Monday, 8:00am - 9:30am

■ MA01

INFORMS - Opportunities to Shape the Future (Panel Discussion)

Sponsor: Women in OR/MS
Sponsored Session

Chair: Tina Wakolbinger, Assistant Professor, University of Memphis, 332 Fogelman College Admin Bldg, Memphis, TN, United States of America, tbwklbng@memphis.edu

1 - INFORMS - Opportunities to Shape the Future (Panel Discussion)
Moderator: Tina Wakolbinger, Assistant Professor, University of Memphis, 332 Fogelman College Admin Bldg, Memphis, TN, United States of America, tbwklbng@memphis.edu,
Panelists: Burcu Keskin, Mary Crissey, Ana Muriel, Victoria Chen, Soheila Jorjani

In this panel, past and current female chairs and presidents of fora, societies, regional chapters, and student chapters will talk about their experiences related to being actively involved in INFORMS activities. The goal of this panel is to inform members interested in taking on leadership roles about the different possibilities and to encourage INFORMS members, especially women, to get actively involved.

■ MA02

Empirical Research in Information Systems & Economics

Sponsor: Information Systems
Sponsored Session

Chair: Bruce Weber, Professor of Information Management, London Business School, Regents Park, London, NW1 4SA, United Kingdom, bweber@london.edu

1 - "Look at me! Look at me!": The Competitive Dynamic of Wikis and Online Communities
Brian Butler, University of Pittsburgh, 226 Mervis Hall, Pittsburgh, PA, 15260, United States of America, bbutler@katz.pitt.edu

Web 2.0 systems, such as wikis and online communities, are often assumed to be spontaneous, emergent, collaborative structures. Yet, because they are fundamentally dependent on the voluntary action of individuals, they are also subject to a variety of competitive forces. In this presentation we examine the nature of the competitive ecologies in Usenet and Wikipedia and discuss the implications for the design and management of social computing systems.

2 - Fixing SOX IT Control Problems: Relief for Shareholders?
Bruce Weber, Professor of Information Management, London Business School, Regents Park, London, NW1 4SA, United Kingdom, bweber@london.edu

Section 404 of the Sarbanes-Oxley Act (SOX) of 2002 has increased scrutiny of corporate governance practices including those around IT controls. An event study is conducted on a sample of 52 firms with material weaknesses in their internal IT controls. Negative abnormal returns are evident around (0,+1) 2005 10K filings with adverse disclosures. A value reduction occurs when the 2006 10K is filed with remediating and unremediating firms suffering negative abnormal returns.

3 - Profit in the Long Tail
Michael Smith, Associate Professor, Heinz School-CMU, mds@cmu.edu, Erik Brynjolfsson, Mohammad Rahman

One important difference between online and physical markets is the ability of online retailers to stock a virtually unlimited number of products, a phenomenon that has come to be known as "the long tail." Much of the academic literature on the long tail has focused on the role of these niche titles in increasing consumer surplus. In this paper we use a unique dataset provided by a large publisher to analyze the role of long tail titles in enhancing producer surplus.

■ MA03

Joint Session Homeland/Humanitarian: Preparedness for Pandemic Influenza

Cluster: Homeland Security, Humanitarian Logistics and Disaster Preparedness
Invited Session

Chair: Richard Larson, MIT, E40-231, Cambridge, MA, 02139, United States of America, rclarson@MIT.EDU

1 - STEM: The Spatiotemporal Epidemiological Modeler
Daniel Ford, IBM, 86 Indian Hill Road, Mount Kisco, NY, 10549, United States of America, daford@almaden.ibm.com, James Kaufman

The Spatiotemporal Epidemiological Modeler (STEM) is an open source computer software system for defining and visualizing simulations of the spread of infectious disease in space and time. As part of the Eclipse Open Healthcare Framework (OHF), http://www.eclipse.org/ohf, STEM is designed to offer the research community the power and extensibility to develop, validate, and share models on a common collaborative platform.

2 - Modeling as a Means and Barrier to Decision-making
Richard Hatchett, Associate Director for Radiation Countermeasures Research and Emergency Preparedness, NIH/NIAID, 6610 Rockledge Drive, Room 4057, Bethesda, MD, 20892, United States of America, hatchettr@niaid.nih.gov

Policy determinations are seldom if ever driven exclusively by science, much less by the outcomes of modeling exercises. Policy making harmonizes claims and counterclaims, competing interests, political priorities, and science in a delicate balancing act. The author describes how data derived from pandemic mitigation modeling, historical analysis, and studies of influenza epidemiology informed the development of national pandemic preparedness policy.

3 - How to Prepare for Pandemic Flu in a University
Karima Nigmatulina, MIT, knigmatu@MIT.EDU, Richard Larson

With their unique populations and functions, universities will face unusual challenges in the case of pandemic flu. The first question that must be addressed is if and when to send their student body home. This brings up the question of whether this is even possible. Other issues involve supporting the remaining student body on campus, and sustaining the vital functions of the university through this prolonged outage. We present several case studies with a focus on the MIT plan.

■ MA05

Methods and Models for Congestion Pricing I

Cluster: Network Congestion and Congestion Management
Invited Session

Chair: Siriphong Lawphongpanich, University of Florida, Industrial and Systems Engineering, 303 Weil Hall, Gainesville, FL, 32611, United States of America, lawphong@ise.ufl.edu

1 - Risk-neutral Second Best Toll Pricing
Xuegang (Jeff) Ban, Assistant Professor, Rensselaer Polytechnic Institute, 110 8th St, JEC 4034, Civil and Environmental Engineering, Troy, NY, 12180, United States of America, banx@rpi.edu, Michael Ferris

We study second best toll pricing (SBTP) when the user equilibrium (UE) solution is not unique. In this case, we show how the toll designer's risk-taking behaviors can be considered. In particular, if one wants to minimize the expected objective value as UE solution varies, a risk-neutral SBTP can be modeled as a stochastic program. We illustrate such risk-neutral SBTP concept and show how to solve it by the simulation-based optimization technique.

2 - Relating Tolls to the Presence of Loops in Multicommodity Flows
Robert Abrams, Professor, University of Illinois, Information and Decision Sciences, 601 S Morgan, Chicago, IL, 60607-7124, United States of America, rabrams@uic.edu, Jane Hagstrom

Given a desired traffic flow in a network, nonnegative commodity-independent tolls can be added to costs to create a Wardrop equilibrium if and only if the given traffic flow does not contain a multicommodity/single-commodity loop in the sense of Gallager (1977). We relate such loops to the necessity/possibility of commodity-independent, commodity-dependent, or negative tolls using a theorem of the alternative. We show by example that commodity-dependent tolls can reduce total user costs.

3 - Robust Pricing with Boundedly Rational User Equilibrium

Yingyan Lou, yingyan@ufl.edu, Yafeng Yin,
Siriphong Lawphongpanich

This paper designs a robust pricing scheme with boundedly rational user equilibrium (BRUE). Users with bounded rationality seek for acceptable paths rather than a necessarily minimum one. BRUE flow distribution is generally non-unique and can be characterized as a non-convex set by relaxing the Wardrop's First Principle. A robust pricing scheme is determined by solving a nonlinear mathematical program with complementarity constraints to minimize the worst-case travel time.

4 - Discrete-time Dynamic User Equilibrium Models

Qipeng Phil Zheng, PhD Student, University of Florida,
Department of Industrial and Systems Eng, 303 Weil Hall, PO Box
116595, Gainesville, FL, 32611-6595, United States of America,
zqp@ufl.edu, Siriphong Lawphongpanich

We present models for determining dynamic user equilibrium flow distributions based on a discrete time horizon. The models consider both route and departure time choices and rely on a time-expanded network. Because time is discretized, it is possible that no flow distribution satisfies the traditional user equilibrium conditions. When this occurs, we assume that users switch to a least-cost route only if doing so reduces their costs by a sufficiently large amount.

■ MA06

Auctions Theory - Moving Forward: In Honor of Mike Rothkopf

Cluster: Auctions
Invited Session
Chair: Wedad Elmaghraby, University of Maryland, College Park, MD,
Wedad_Elmaghraby@rhsmith.umd.edu

1 - Information Variability Impacts in Auctions

Justin Jia, Smeal College of Business, The Pennsylvania State
University, 483A Business Building, The Penn State University,
State College, PA, 16802, United States of America,
zuj100@psu.edu, Michael Rothkopf, Ronald Harstad

A wide variety of auction models exhibit close relationships between the winner's expected profit and the expected difference between the highest and second-highest order statistics of bidders' information, and between expected revenue and the second-highest order statistic of bidders' expected asset values. We use stochastic orderings to see when greater environmental variability of bidders' information enhances expected profit and expected revenue.

2 - The Bidding Problem in One-shot Combinatorial Auctions: A Look from Decision Analysis

Natalia Santamaria, Smeal College of Business, Penn State, 471B
Business Building, Penn State, University Park, PA, 16802,
United States of America, nsantam@psu.edu

This presentation explores the problem a bidder faces to determine his bids in an one-shot sealed bid combinatorial auctions of two objects. Bidders in the auction can have superadditive or subadditive preferences for the bundle. The tool we use to model the problem is decision analysis.

3 - Do Auctioneers Pick Optimal Reserve Prices? Theory and Evidence

Elena Katok, Associate Professor, Penn State University, 465
Business Building, University Park, PA, 16802, United States of
America, ekatok@psu.edu, Anthony Kwasnica, Andrew Davis

We investigate how auctioneers set reserve prices in second-price auctions. Previous research has proven that the optimal reserve price is independent of the number of buyers. We extend this proof to include certain risk averse preferences and also provide evidence that these results fail to exist through an experimental investigation.

4 - Practical Procurement – Beyond Reverse and Combinatorial Auctions

Olga Raskina, Lead Scientist, Emptoris, 200 Wheeler Road,
Burlington, MA, 02476, United States of America,
ORaskina@emptoris.com

We consider some of the challenges in implementing multiple item procurement auctions in a business environment. We will discuss our experience with handling more advanced auction requirements we have observed in the field. Many of them go beyond familiar theoretical auction setup, but need to be addressed to align the auction with the actual business needs. Emptoris is a leading provider of enterprise supply management solutions for Global 5000 companies with emphasis in strategic sourcing.

■ MA07

Models of Strategic Customers

Sponsor: Manufacturing & Service Oper Mgmt
Sponsored Session
Chair: Tava Olsen, Washington University in St. Louis, Olin Business
School, 1 Brookings Dr., St. Louis, MO, 63141, United States of
America, olsen@wustl.edu

Co-Chair: Gad Allon, Kellogg School of Management,
2001 Sheridan Road, Evanston, IL, United States of America,
g-allon@kellogg.northwestern.edu

1 - Buy Now and Match Later: The Impact of Posterior Price Matching on Profit with Strategic Consumers

Guoming Lai, Tepper School of Business, Carnegie Mellon
University, pittsburgh, pa, 15213, United States of America,
laiguoming@gmail.com, Katia Sycara, Laurens Debo

With a posterior price matching policy, a seller guarantees to reimburse the price difference to a consumer who bought the product before the seller marks down. In this talk, we examine the impact of a posterior price matching policy on consumers' purchasing behavior, a seller's pricing and inventory decisions, and their expected payoffs. We find that the price matching policy eliminates strategic consumers' waiting incentive and thus allows the seller to increase the price.

2 - Advance Selling, Strategic Consumers and Competition

Gerard Cachon, The Wharton School, University of Pennsylvania,
3730 Walnut St., JMHH Suite 500, Philadelphia, PA, 19104,
United States of America, cachon@wharton.upenn.edu,
Pnina Feldman

Advance selling has been shown to be able to provide a firm with higher profits than spot selling. We investigate whether this continues to hold when firms compete in an environment of strategic consumers.

3 - Capacity Management with Strategic Customers

Haiyan Wang, Washington University in St. Louis, Olin Business
School, 1 Brookings Dr., St. Louis, MO, 63130, United States of
America, hwang27@wustl.edu, Tava Olsen

We consider a service provider managing capacity in the presence of demand surges. Under this strategy, some customers who arrive in the peak demand period are offered a discount if they are willing to be postponed to a non-peak period. However, some non-peak period customers are strategic and may pretend to be a peak period customer in order to obtain a discount. We analyze the effect of the strategic customers' behavior on the service provider's capacity decisions and postponement strategy.

4 - "We Will Be Right with You": Managing Customers with Vague Promises

Gad Allon, Kellogg School of Management, 2001 Sheridan Road,
Evanston, IL, United States of America,
g-allon@kellogg.northwestern.edu, Achal Bassamboo,
Itay Gurvich

Delay announcements informing customers about anticipated service delays are prevalent in service-oriented systems. We examine this problem of information communication by considering a model in which both the firm and the customers act strategically: the firm in choosing announcements, and the customers in interpreting the announcements and in making the decision when to join and when to balk. We characterize the equilibrium language that emerges between the service provider and her customers.

■ MA08

Finance-Operations Management Interfaces

Sponsor: Manufacturing & Service Oper Mgmt/ Interface between
Finance, Operations, and Risk Management (iFORM)
Sponsored Session
Chair: Phillip Lederer, Associate Professor, Simon Graduate School of
Business Administration, Univesity of Rochester, Rochester, NY, 14627,
United States of America, lederer@simon.rochester.edu

1 - Demand-supply Mismatches and Stock Market Reaction: Evidence from Excess Inventory Announcements

Vinod Singhal, Professor, College of Business, Georgia Institute of
Technology, Atlanta, GA, 30332, vinod.singhal@mgt.gatech.edu,
Kevin Hendrick

This paper documents that excess inventory announcements, an indication of demand-supply mismatch, are associated with an economically and statistically significant negative stock market reaction. The results are based on a sample of 276 excess inventory announcements made during 1990-2002. Over the day of the announcement and the day before the announcement the mean the stock market reaction ranges from -6.79% to -6.93% depending on the benchmark used to estimate the market reaction.

2 - Capital Structure, Inventory Management, and Coordination

Matthew Sobel, Professor, Weatherhead School, Department of Operations Management, Case Western Reserve, Cleveland, OH, 44106-7235, United States of America, Matthew.Sobel@Case.edu, Qaiohai (Joice) Hu

We optimize the expected present value of dividends in a dynamic model of a firm with long-term debt and stochastic product market demand. The results depend on whether short-run operating and financial decisions are coordinated or decentralized. Coordinated decisions yield higher expected dividends net of capital subscriptions with smaller inventories, retained earnings, and default risk. A firm that coordinates short-term decisions needs less long-term debt than if it decentralizes them.

3 - Capital Justification and Project Risk

Phillip Lederer, Associate Professor, Simon Graduate School of Business Administration, Univesity of Rochester, Rochester, NY, 14627, United States of America, lederer@simon.rochester.edu, Michael Raith

This paper studies the agency problem when project proposers have more information about project risk than the capital allocator, and the proposer can hide his actions. We study this problem in two situations where risk matters: limited liability and risk aversion of proposers, and seek optimal contracts. We show that agency costs can be very large, and lower project value significantly.

4 - Earning Management and Operations Response

Song (Alex) Yang, PhD Student, The University of Chicago Graduate School of Business, 5807 S Woodlawn Ave, Chicago, IL, 60637, United States of America, syang1@chicagogsb.edu, John Birge

In accounting literature, there is substantial evidence that managers manage earnings by manipulating real operations activities. While it is questionable if it is the ``right'' thing to do, it unveils some manager's incentive under the current market equilibrium. In this talk, we will investigate how optimal operational decisions should be made under those incentives.

■ MA09

Joint Session QSR/CS: Statistical Monitoring for Healthcare Quality

Sponsor: Quality, Statistics and Reliability, Computing Society Sponsored Session

Chair: Harriet Nembhard, Associate Professor, Penn State University, Department of Industrial Engineering, 310 Leonhard Building, University Park,, PA, 16802, United States of America, hbn2@psu.edu

1 - Recent Research in Disease and Public Health Surveillance

Kwok-Leung Tsui, Professor, Georgia Institute of Technology, 765 Ferst Drive, Atlanta, GA, 30332, United States of America, ktsui@isye.gatech.edu, David Goldsman

Due to various outbreaks of influenza, research on disease and public health surveillance has become very important. In this talk we will present overview and review of general issues involved in healthcare, public health, and syndromic surveillance. We review the latest research in disease transmission models, surveillance systems, monitoring methods, and performance measures. We also discuss the research challenges and illustrate them with various problems and examples.

2 - Economic Design for Individual Measurements, Motivated by Models of Flu Activity

Justin Chimka, University of Arkansas, 4207 Bell Engineering, Fayetteville, AR, United States of America, jchimka@uark.edu, Jia Zhou

Consider situations in which the sample used for process monitoring consists of an individual unit. Our motivation comes from gamma regression model-based control charts for flu activity, where individual units are absolute values of residuals. We have developed probability statements for computing true errors associated with individuals control charts of continuously distributed measurements. Assuming simple cost functions, we have searched for and discovered economic designs.

3 - Using the Repeated Two-sample Rank (RTR) Procedure for Detecting Anomalies in Space and Time

Ronald Fricker, Associate Professor, Naval Postgraduate School, Operations Reaserch Dept, 1411 Cunningham Road, Monterey, CA, 93943, United States of America, rdfricke@nps.edu

The RTR procedure is a nonparametric statistical process control methodology. The method transforms a sample of data into univariate statistics; changes in the distribution of the data are then detected using nonparametric rank tests. In this discussion we explore its use as a spatio-temporal event detection and monitoring methodology. Upon a signal of a possible distributional change, the methodology suggests a way to graphically indicate the likely location of the distributional change.

4 - On Quality and Reliability of Electronic Prescribing in Primary Care: A Case Study

Yi-Chin Lin, PhD Student, Carnegie Mellon University, 515 S Aiken Ave Apt 503, Pittsburgh, PA, 15232, United States of America, yichinl@andrew.cmu.edu, Keith Kanel, Toni Fera, Rema Padman

We examine the adverse impact of an IT failure on the quality and reliability of the prescribing process as a critical barrier to adoption of electronic prescribing in primary care. We apply a statistical change-point detection algorithm to identify the tipping point in actual usage and control charts to monitor trends in usage behavior that will allow for early detection of system failures and rapid process improvement.

5 - An Analogues-changepoint Methodology for Influenza-like-illness and Drug Sales Surveillance

Harriet Nembhard, Associate Professor, Penn State University, Department of Industrial Engineering, 310 Leonhard Building, University Park,, PA, 16802, United States of America, hbn2@psu.edu, Elisabeta Vergu, Bruno Lambert, Clément Turbelin, Wenny Chandra, Antoine Flahault

We design an SPC analogues-changepoint methodology to monitor French Influenza-Like-Illness (ILI) weekly incidence (clinical data) and support it with multivariate monitoring of weekly pharmaceutical sales (non-clinical data) of 14 preselected medications in ILI context. Our results show that drug sales data provide indirect but earlier indicator of influenza outbreak which could serve as early warning for public health officials.

■ MA10

Managing Risk in Competitive Electricity Markets

Sponsor: Energy, Natural Resources & the Environment/ Energy Sponsored Session

Chair: Shmuel Oren, Professor, UC Berkeley, IEOR Department, Rm. 4119 Etcheverry Hall, Berkeley, CA, 94720, United States of America, oren@ieor.berkeley.edu

1 - A Multi-period Equilibrium Pricing Model for Weather Derivatives

Yongheon Lee, yhlee@ieor.berkeley.edu, Shmuel Oren

Weather derivatives are gaining popularity as financial instruments for hedging price or volumetric risk, however pricing such instruments is challenging due to the lack of a valued underlying. We introduce a multi-period equilibrium pricing model based on supply and demand for weather derivatives that are determined dynamically from utility indifference pricing and portfolio optimization. A numerical example illustrates the equilibrium pricing methodology and hedging results.

2 - Evaluating the Impact of Real-time Demand Response on the Integration Cost of Wind

Ramteen Sioshansi, Assistant Professor, The Ohio State University, ISE Department, Baker Systems Building, Columbus, OH, 43210, United States of America, ramteen@ieor.berkeley.edu

Wind generation presents unique operational planning challenges due to its highly variable and uncertain availability that can result in suboptimal and costly unit commitments and dispatches. Demand response can help to reduce these costs by allowing loads to react to real-time resource availability. We analyze a model of the Texas electric power system to show the cost of wind forecasting errors and demonstrate the potential for real-time demand response to reduce these costs.

3 - Systematic Optimistic Bias in Market Equilibria: Application to the Northwest European Power Market

Ming-Che Hu, Johns Hopkins University, Department Geography & Environ. Engineering, Baltimore, MD, 21218, United States of America, mhu4@jhu.edu, Benjamin F. Hobbs

Under uncertain costs and demand, outcomes of market models suffer from optimistic biases, where the projected performance of markets is better, on average, than what is actually realized. Net benefit estimates for new technologies are also optimistically biased under certain assumptions. Biases are quantified for a parameterized power market model.

4 - A Stochastic Power Market Equilibrium with Risk-averse Investors

Lin Fan, lfan@jhu.edu, Catherine S. Norman, Benjamin F. Hobbs

A simulation considers producers in a competitive market. Investment decisions are a two-stage equilibrium problem. Initially, investment is made under regulatory uncertainty; then the regulatory state is revealed and producer's returns realized. Under carbon emission regulation risk, risk-averse producers prefer less carbon-intensive investment. We then discuss implications for electricity modeling.

■ MA11

Forestry V: Wildfire and Pest Management

Sponsor: Energy, Natural Res & the Environment/ Forestry
Sponsored Session
Chair: Robert Haight, USDA Forest Service, Northern Research Station, 1992 Folwell Ave, St. Paul, MN, 55108, United States of America, rhaight@fs.fed.us

1 - Combating the "Broken Windows" of Arson

Douglas Thomas, Building and Fire Research Laboratory, National Institute of Standards and Tech, 100 Bureau Drive, Mailstop 8603, Gaithersburg, MD, 20899, United States of America, douglas.thomas@nist.gov, Jeffrey Prestemon, David Butry

From criminology, we know that indicators of urban decay provide would-be criminals with signals identifying neighborhoods with lower crime detection and apprehension rates. We model the incidence of arson as a function of "broken window" indices and identify several factors that affect future incidents. Changes in these indices, through neighborhood watches, police patrolling, or community beautification, can combat other, less controllable, but predictable factors, such as weather.

2 - Scheduling Fuels Removal Projects Across a Forest

Richard Church, Department of Geography, University of California, Santa Barbara, CA, 93106, United States of America, church@geog.ucsb.edu

To reduce the chance of large devastating fires and protect habitat, The US Forest Service has been been under a court order to develop plans for SPLATs (strategically placed areas for treatment). In order to maximize the "Finney" effect, such treatements should be clustered whenever possible. We describe a scheduling model to spatially cluster fuels removal projects to the greatest extent possible. Applications will also be discussed along with the implementation of the model in Arc/GIS.

3 - Integrated Forest Fire Detection and Initial Attack Planning

David Martell, Faculty of Forestry, University of Toronto, 33 Willcocks Street, Toronto, M5S 3B3, United States of America, martell@smokey.forestry.utoronto.ca

Forest fire detection system managers attempt to find and report fires at small sizes on the assumption that initial attack system performance declines as detection size increases. Detection system management is complicated by the "unorganized" public detection system which detects and reports many fires at little or no cost. We describe the development of an integrated detection-initial attack model and how we used it to develop detection system performance measures for the province of Ontario.

4 - Cost-effective Detection and Eradication of Forest Pest Colonies

Robert Haight, USDA Forest Service, Northern Research Station, 1992 Folwell Ave, St. Paul, MN, 55108, United States of America, rhaight@fs.fed.us

Establishment and growth of invasive species are ongoing processes, and managers need cost-effective strategies to detect and eradicate colonies over time. We address this problem with an age-class model of colony establishment and growth and determine cost-minimizing search strategies where eradication cost depends on colony size at time of detection. Results are presented for gypsy moth control in the western United States.

■ MA12

Predictive Modeling for Business Intelligence

Cluster: Data Mining
Invited Session
Chair: Maytal Saar-Tsechansky, Assistant Professor, University of Texas at Austin, Austin, TX, 78712, United States of America, Maytal.Saar-Tsechansky@mccombs.utexas.edu

1 - Multi-component Rating and Collaborative Filtering for Recommender Systems

Nachiketa Sahoo, The Heinz School of Public Policy and Management Carnegie Mellon University, nsahoo@gmail.com

Collaborative filtering algorithms have been traditionally designed to work with user ratings with only one component. However, recently there has been growing interest in using ratings on multiple aspects of items. In this work we present a mixture model based collaborative filtering algorithm for multi-component rating data. In developing this approach we draw from psychometric literature pertaining to the halo effect in multi-component rating. We evaluate the algorithm using data collected from Yahoo Movies. We found that the use of multiple components leads to improvement in recommendations over using only one component when very little training data is available. However, it is observed that when a lot of training data is available we do not gain much from using additional components of the ratings. Beyond generating recommendation, we also show that we can use the proposed model to fill-in missing rating components.

2 - Opinion Aggregation in Social Information Systems

Srujana Merugu, Yahoo! Research, United States of America, srujana@yahoo-inc.com

Recent advances in Web 2.0 applications and tools that facilitate generation and publication of content have resulted in huge social information systems, e.g., product review/rating systems (Epinions, Youtube, Yelp), community forums (Y! Answers), social encyclopedias (Wikipedia). The availability of community generated opinions can be of tremendous value as it can enable individual users to leverage the "wisdom of crowds". However, aggregating opinions involving heterogeneous topics and sources (i.e., users/automated information extraction agents) is highly challenging due to a variety of reasons: (1) sources tend to have varying bias and expertise w.r.t. different topics and can often be anonymous, unreliable and even malicious, (2) the observed opinions are often sparse and cannot be assumed to be missing at random, (3) the notion of "objective truth" is often not meaningful, and is known only for an extremely limited number of cases even when applicable making it difficult to calibrate the system. In this talk, we describe a principled statistical opinion aggregation methodology (for the special case where there exists an "objective truth") that relies on modeling the opinion generation process as a stochastic transformation of the "truth".

3 - BANTER: Anything Interesting Going On Out There in the Blogosphere?

Claudia Perlich, T.J. Watson IBM Research, 1101 Kitchawan Rd, RTE 134, Yorktown Heights, United States of America, perlich@us.ibm.com

Social media marketing is of extreme relevance in today's dynamic market environment. The youngest and by traditional means least understood is the Web 2.0 media. Marketing groups are very curious to learn what people in general and their customers in particular are saying in their blogs, how the expressed opinions could impact business, and how to extract business insight and value from these blogs. The BANTER (Blog Analysis of Network Topology and Evolving) system integrates a number of different analytical and machine learning techniques including active and transfer learning to provide an effective tool to support marketing with insights from the Blogosphere. We will address the 4 main components: 1) The identification of a RELEVANT subset of the 77M size blog universe, 2) the identification of authorities in this sub-universe, 3) the analysis of the relevance and sentiment of the expressed opinions and 4) the detection of emerging hot topics and themes.

4 - Ordering Links on a Web Page when Learning User Profiles

Pelin Atahan, The University of Texas at Dallas, 800 West Campbell Road, Richardson, TX, 75080, United States of America, pxa041000@utdallas.edu, Sumit Sarkar

Websites can learn user profiles quickly by carefully determining the links to make available to a user. The set of links that is more informative in terms of learning the profile can be made available to a user at each page. This research examines how the order of links in the offer set should be determined in order to learn profiles quickly.

■ MA13

Joint Session DM/CS: Data Mining Methods and Applications

Sponsor: Data Mining, Computing Society
Sponsored Session
Chair: Paul Brooks, Assistant Professor, Virginia Commonwealth University, PO Box 843083, Richmond, VA, 23284, United States of America, JPBrooks@vcu.edu

1 - Variable Selection in High-dimensional Ordinal Class Prediction Problems with Genomics Applications

Kellie Archer, Assistant Professor, Virginia Commonwealth University, 730 East Broad Street, PO Box 980032, Richmond, VA, 23298-0032, United States of America, kjarcher@vcu.edu

Although classification accuracy is often a goal in predictive modeling, often when conducting high-throughput genomic experiments, it is of interest to identify the genes most predictive of the observed class. Herein, measures of variable importance from bootstrapped classification trees using our proposed ordinal impurity function will be compared to variables identified from L1-penalized GLMs predicting the ordinal response. Results will be presented for both simulated and genomic datasets.

2 - A Frequentist Assessment of Bayesian Inclusion Probabilities for Quantiative Trait Loci

Edward Boone, Assitant Professor of Statistics, Department of Statistical Sciences and Operations Research, Virginia Commonwealth University, 1001 W. Main St, Richmond, VA, 23284, United States of America, elboone@vcu.edu, Albert Lee

Bayesian inclusion probabilities have become a popular tool for variable assessment. This presentation shows how a frequentist may evaluate Bayesian inclusion probabilities. This evaluation looks at both restricted and unrestricted model spaces and develops a framework that can be utilized for inclusion probabilities that preserve Type I error rates. This framework is applied to an analysis of the Arabidopsis thaliana with respect to determining QTL associated with cotelydon opening angle.

3 - Mining Oriented Frontier Outliers

Jose Dula, Associate Professor, Virginia Commonwealth University, School of Business, Richmond, VA, United States of America, jdula@vcu.edu

Frontier outliers attain upper or lower limits of the magnitudes not just in one dimension but also when these are combined. They are naturally interesting since they may expose risk, profit, fraud, or security. Their identification is a challenge especially when no weights are designated for combining the attributes and when the data set is massive. We present a framework for defining and processing frontier outliers in general magnitude data sets.

4 - Robust L1 Principal Component Analysis

Paul Brooks, Assistant Professor, Virginia Commonwealth University, PO Box 843083, Richmond, VA, 23284, United States of America, JPBrooks@vcu.edu, Edward Boone

Principal component analysis (PCA) can be viewed as an optimization problem on a given training data set. The objective is to find a linear subspace such that the sum of orthogonal distances of observations to the linear subspace is minimized. In the interest of increasing robustness to outlier observations, we introduce a method for PCA where the L1 distance of points to the hyperplane is minimized, rather than the sum of squared Euclidean distances.

■ MA14

Software Demonstration

Cluster: Software Demonstrations
Invited Session

1 - Responsive Learning Technologies, Inc.- Online Games to Teach Operations and Supply Chain Management

Sam Wood, President, Responsive Learning Technologies, Inc., 10181 Partlett Pl., Cupertino, CA, 95014, wood@responsive.net

Participate in a demonstration of online games that are used in operations management courses and supply chain management courses in more than 100 undergraduate and MBA-level programs to teach topics like capacity management, lead time management, inventory control, and supply chain design and logistics.

2 - Fair Isaac - Building Optimization Applications in Xpress-MP

Gabriel Tavares, Fair Isaac, gabrieltavares@fairisaac.com

This tutorial will focus on developing and deploying complete optimization applications using Fair Isaac's array of mathematical modeling and optimization tools. These tools can be used for modeling, solving, analyzing and visualizing optimization problems, and integrating them seamlessly in business applications. We will explain how Xpress-Mosel, Xpress-IVE and Xpress-Application Developer can decrease development time for new optimization applications and enable you and your customers to make smarter decisions. The proven technologies offered by Fair Isaac can be used in a range of applications such as supply chain management, transportation, finance, energy, manufacturing, retail, insurance, manufacturing industries, to name a few.

■ MA15

Panel Discussion: Service Science Curriculum Development Responding to Educational Goals and Field Demands

Sponsor: Service Science
Sponsored Session

Chair: Namkyu Park, Associate Professor, Ohio University, Industrial & Systems Engineering, Stocker Hall 277, Athens, OH, 43016, United States of America, parkn@ohio.edu

1 - Panel Discussion: Service Science Curriculum Development Responding to Educational Goals and Field Demands

Moderator: Namkyu Park, Associate Professor, Ohio University, Industrial & Systems Engineering, Stocker Hall 277, Athens, OH, 43016, United States of America, parkn@ohio.edu, Panelists: Kwang-Jae Kim, John Surtherland

This session will embrace several viewpoints coming out of a range of academic foci as well as industry demands in the context of service sciences curriculum development. Activities in other countries are going to be introduced as well. Academic endeavors and experiences on the NSF-supported service science curriculum development will be shared in this session.

■ MA16

Information Asymmetry and Customer Behavior

Sponsor: Manufacturing & Service Oper Mgmt/
Service Management
Sponsored Session

Chair: Senthil Veeraraghavan, The Wharton School, University of Pennsylvania, 3730 Walnut Street, Suite 500, Philadelphia, PA, 19104, United States of America, senthilv@wharton.upenn.edu

1 - Seat Value in Stadiums and Theaters: An Empirical Investigation

Ramnath Vaidyanathan, PhD Student, The Wharton School, 500 Jon M Huntsman Hall, 3730 Walnut Street, Philadelphia, PA, 19104, United States of America, ramnathv@wharton.upenn.edu, Senthil Veeraraghavan

We study how seat value perceived by patrons attending an event in a theater/stadium, depends on the location of their seat relative to the stage/field. Using a proprietary dataset collected by a professional baseball franchise, we quantify the influence of seat location and consumer characteristics on customers' ex-post valuations. We find that frequent customers experience lower variance in their valuations, and customers in symmetric seat locations might perceive very different values.

2 - Consumer Returns Policies and Supply Chain Contracts

Xuanming Su, Haas School of Business, University of California, Berkeley, CA, 94720, United States of America, xuanming@haas.berkeley.edu

Many stores offer consumer returns policies. Although such policies stimulate demand, firms may be left with excess inventory as a result of product returns. We discuss the implications of consumer returns policies on supply chain coordination.

3 - Quality and Information Asymmetry in Service Outsourcing

Justin Ren, Boston University, 595 Commonwealth Ave., Boston, MA, United States of America, ren@bu.edu, Fuqiang Zhang

This paper studies how to design service outsourcing contracts with quality consideration and the presence of asymmetric information. An outsourcer procures a service from a service provider whose cost structure is private information. Our results suggest that outsourcing companies can use relatively simple and yet robust contracts to assure a high level of capacity and quality service even when they do not have perfect information of the service provider.

4 - Speculative Behavior in a Queue

Andres Catalan-Cardenas, The Wharton School, University of Pennsylvania, Philadelphia, PA, andresc@wharton.upenn.edu, Senthil Veeraraghavan, Gerard Cachon

Not all the customers waiting for a service actually want the service: sometimes people queue solely to make a profit from customers. We analyze the behavior of a speculator in a single queue that sells his position to the arriving customers. We find the price he will request and derive different thresholds in terms of queue length, system utilization and the speculator's waiting costs that lead him to behave speculatively (i.e. to hold his position and wait) to maximize his profit.

■ MA17

Joint Session QSR/DM: Statistical Data Mining Techniques for Process Monitoring

Sponsor: Quality, Statistics and Reliability, Data Mining
Sponsored Session

Chair: Myong K. (MK) Jeong, Rutgers, The State University of New Jersey, RUTCOR, Department of Industrial and Systems Eng, Piscataway, NJ, United States of America, mjeong@utk.edu

1 - Spatial Correlogram-based Dynamic Time Warping for Detection of Defect Patterns in Wafer Maps

Youngseon Jeong, PhD Student, Rutgers, The State University of New Jersey, Department of Industrial and Systems Eng, Piscataway, NJ, United States of America, yjeong@utk.edu, Seong-Jun Kim, Myong K. (MK) Jeong

This paper proposes a new methodology which combines spatial correlogram with dynamic time warping (DTW) for the automatic detection of defect patterns in semiconductor wafer maps. Spatial correlogram is used for the detection of the presence of spatial autocorrelations while DTW distance is adopted for the automatic classification of defect patterns. The experimental results show that our method is robust to random noise, defect location and size.

2 - A Framework for a Self Healing Assembly System

Jaime Camelio, Assistant Professor, Michigan Technological University, Department of Mechanical Engineering, 815 R.L. Smith ME-EM Building, Houghton, MI, 49931, United States of America, jcamelio@mtu.edu

Advances in statistical process monitoring and control have focused primarily on more efficient ways to diagnosis faults, reducing variation, developing robust design techniques, and increasing sensor capabilities. System level advances are largely dependent on the introduction of new techniques in the listed areas. A unique system level manufacturing process is introduced in this paper as a means to integrate rapidly advancing computing technology and analysis methods.

3 - A Simple Bayesian Regression Diagnostic to Account for Bias

Theodore Allen, Associate Professor, Ohio State University, 1971 Neil Ave, Columbus, OH, 43210, United States of America, allen.515@osu.edu, Ravishankar Rajagopa

To provide diagnostic information about the bias and other summative information, we propose a model diagnostic that can be used like adjusted R2 but which explicitly accounts for bias errors. Unlike the Cp statistic, our proposed diagnostic can be estimated even if the bias sources are inestimable using ordinary least squares. The proposed diagnostic has the simple interpretation of being the expected plus or minus prediction errors in the units of the response.

4 - In-situ Monitoring of Etching Processes of the Oxide Film Using Optical Emission Spectral Signals

Myong K. (MK) Jeong, Rutgers, The State University of New Jersey, RUTCOR, Department of Industrial and Systems Eng, Piscataway, NJ, United States of America, mjeong@utk.edu, Young-Don Ko, Byungwhan Kim, Youngseon Jeong

In situ optical emission spectroscopy (OES) signals are used to monitor the etching processes. This paper proposes kernel based process modeling such as kernel partial least square regression for the etch rate and uniformity in plasma process. Based on the experimental results, we can conclude that in-situ OES data can be used to predict the performance of plasma etching process as well as detect fault patterns of the process via the kernel based modeling.

■ MA18

Joint Session QSR/CS: Decision Theoretic Approaches for Quality and Reliability Assessment

Sponsor: Quality, Statistics and Reliability, Computing Society
Sponsored Session

Chair: Martin Wortman, Professor, Texas A&M University, Industrial & Systems Engineering, College Station, TX, 77843-3131, wortman@tamu.edu

Co-Chair: Zhenyu (James) Kong, Assistant Professor, Oklahoma State University, Stillwater, OK, 74078, United States of America, james.kong@okstate.edu

1 - Reliability, Risk, and High-stakes Wagering

Martin Wortman, Professor, Texas A&M University, Industrial & Systems Engineering, College Station, TX, 77843-3131, wortman@tamu.edu

The analytical relationship between reliability, risk, and high-stakes wagering will be examined within the context of technology assessment. Particular emphasis will be given to predictive modeling and subsequent computational methods for identifying, from among competing alternatives, that alternative having the most favorable risk.

2 - The Mathematics of Decision Making

George Hazelrigg, NSF, ghazelri@nsf.gov

Decision making has 3 components, determination of alternatives from which a decision maker may choose, prediction of outcomes for each alternative, and expression of preferences against which the most preferred alternative may be determined. To get the mathematics of decision making correct, we must apply decision theory only to decisions, formulate predictions that are consistent with our beliefs and data, accept that predictive models cannot be validated, and construct a valid preference function.

3 - Monitoring CMP Process by Particle Filtering through Parameter Estimation and Prediction

Zhenyu (James) Kong, Assistant Professor, Oklahoma State University, Stillwater, OK, 74078, United States of America, james.kong@okstate.edu, Satish Bukkapatnam, Ranga Komanduri

Chemical Mechanical Planarization (CMP) has been widely used in semiconductor manufacturing industry to polish surface of wafers with more planarity. This paper proposes a method of online dynamic modeling to estimate and predict process state parameters, and further predict MRR. The fundamental challenge of this task is the non-linear nature of the CMP processes. This challenge is tackled by applying particle filtering method, to capture the non-linear dynamic of the CMP process.

4 - The Utility of Reliability and Survival

Nozer Singpurwalla, Distinguished Research Professor, George Washington University, Department of Statistics, 2140 Penn. Av., Washington, DC, 20052, United States of America, nozer@gwu.edu

It is by now a well appreciated fact that the purpose of reliability and life testing is to make coherent decisions. Utility is a key element of decision making. In this talk I propose a model for eliciting a decision maker's utility for reliability. The model is motivated by the Rasch Model of item response theory. I describe how the model can be invoked in practice and propose a statistical approach for estimating the model parameters. I conclude by presenting a real life case study.

■ MA19

Building Decision Analysis Approaches at FDA

Sponsor: Decision Analysis
Sponsored Session

Chair: Kara Morgan, Senior Advisor for Risk Analysis, US FDA/ORA, 5600 Fishers Lane, HFC-1 14C-20, Rockville, MD, 20857, United States of America, kara.morgan@fda.hhs.gov

1 - Using Decision Analysis to Regulate Medical Devices

Telba Irony, telba.irony@fda.hhs.gov, David Chan, Larry Kessler

The Center for Devices and Radiological Health at the FDA is investigating the use of quantitative decision analysis in regulating medical devices across the total product life cycle. The idea is to analyze certain situations and determine how much evidence is needed in each case in order to make a decision about a certain medical device product. In this talk we will describe the ideas being explored and request feedback from the audience on how to streamline our efforts.

2 - Applying More Formalized Approaches to Drug Risk-benefit Assessments

Theresa Mullin, Theresa.Mullin@fda.hhs.gov

FDA risk-benefit assessment includes safety and effectiveness data for a specified drug, findings for other drugs for the same indication, and other factors, using quantitative analysis as well as subjective weighing of evidence. Some have recommended FDA adopt formalized multi-attribute approaches; FDA is interested in exploring the potential applicability and limitations. This talk will describe candidate case studies where more formalized methods might be helpful and criteria for evaluation.

3 - Risk-based Approaches for Directing Field Activities

Kara Morgan, Senior Advisor for Risk Analysis, US FDA/ORA, 5600 Fishers Lane, HFC-1 14C-20, Rockville, MD, 20857, United States of America, kara.morgan@fda.hhs.gov

Risk-based models are in full bloom at FDA, particularly to inform decisions to direct field activities for inspections and imports. Now that the models are developed, an evaluation strategy will be developed to ensure the models are on a continuous improvement path. This talk will describe research being conducted into linking public health outcomes to FDA activities as a means for validating and improving these risk based models.

4 - Comments on Building Decision Analysis Approaches at FDA

> Jeffrey Stonebraker, Assistant Professor, University of Denver, Daniels College of Business, 2101 S. University Blvd, Denver, CO, 80208, United States of America, Jeffrey.Stonebraker@du.edu

The discussant will provide comments and questions for the FDA speakers, and facilitate a discussion about the methods and approaches that have been described in their talks.

◼ MA20

Joint Session DA/ENRE: Green Decision Analysis

Sponsor: Decision Analysis, Energy, Natural Res & the Environment
Sponsored Session

Chair: Max Henrion, CEO, Lumina Decision Systems, Inc, 26010 Highland Way, Los Gatos, CA, 95033, United States of America, henrion@lumina.com

1 - Adaptive Capacity Planning for Data Centers

> Max Henrion, CEO, Lumina Decision Systems, Inc, 26010 Highland Way, Los Gatos, CA, 95033, United States of America, henrion@lumina.com, Surya Swamy

The rapid growth in energy use by data centers puts them on track to exceed the carbon emissions of worldwide air travel by 2012. There are many promising methods to improve efficiency of data centers. ADCAPT is a decision tool to assist data center managers create adaptive capacity plans that dramatically reduce costs and energy use, while meeting IT demand in the face of large uncertainties about demand growth, Moore's law, and the energy efficiency of new IT, cooling and power technologies.

2 - Applying Expert Elicitations to Inform Climate Policy: Carbon Capture and Storage

> Erin Baker, University of Massachusetts, Amherst, 220 ELab, Amherst, MA, United States of America, edbaker@ecs.umass.edu, Jeffrey Keisler

We combine economics and decision analysis to incorporate the uncertainty of technical change into climate change policy analysis. We present the results of an expert elicitation on the prospects for technical change in carbon capture and storage. We conclude that we need to gather more information about the technical and societal potential for Carbon Capture.

3 - Risk Analysis of DOE Energy R&D Programs

> Sam Baldwin, Chief Technology Officer, Department of Energy/EERE, 1000 Independence Ave., SW, Washington, DC, 20585, United States of America, Sam.Baldwin@ee.doe.gov

A methodology has been developed for quantitatively evaluating the technical risks of energy technology system R&D and the associated economic and environmental benefits. Key issues include: the probability assessment process; expert recruitment; energy technology system modeling; evaluation of alternative technology pathways; benefits analysis; decision analysis; and lessons learned.

4 - Stochastic Modeling to Support Energy R&D Decisions

> Walter Short, Principal Researcher, National Renewable Energy Laboratory, 1617 Cole Blvd, Golden, CO, 80401, United States of America, Walter_Short@nrel.gov, James Milford

This presentation will describe the Stochastic Energy Deployment System model under development by seven national laboratories for the Department of Energy. This model simulates the U.S. energy system over the next 50 years with explicit consideration of the uncertainties inherent in technology development, fuel prices, market factors, and policy. We will describe its development and immediate use for the evaluation of different technology portfolios of federal energy R&D efforts.

◼ MA21

Joint Session Computational Biology/CS: Optimization Problems in Complex Biological Systems

Cluster: Computational Biology (Joint Cluster CS)
Invited Session

Chair: Teresa Przytycka, Principal Investigator, NIH | NLM | NCBI, przytyck@ncbi.nlm.nih.gov

1 - Optimization of the Genetic Code and Gene Sequences for Translational Robustness

> Eugene Koonin, NCBI, NIH, koonin@ncbi.nlm.nih.gov

The universal, standard genetic code table has a distinctly non-random structure, with similar amino acids often encoded by codons series that differ by a single amino acid substitution, typically, in the third or the first position of the codon. It has been repeatedly argued that this structure of the code results from selective optimization for translational robustness such that translational misreading has the minimal adverse effect. Indeed, it has been shown in several studies that the standard code is more robust than a substantial majority of random codes. However, it remains unclear how much evolution the standard code underwent, what is the level of optimization, and what is the likely starting point. I describe a simulation analysis of evolution of the genetic code that leads to the conclusions that the universal code is a result of partial optimization of a random code for translational robustness.

2 - Systems Biology of Infectious Disease

> Jason Papin, University of Virginia, papin@virginia.edu

Infectious disease is a tremendous global health problem. Systems biology promises to integrate high-throughput data in a mathematical context to make the connection between genotype and phenotype, and thus may facilitate the rapid identification of drug targets for emerging pathogens. Two topics will be discussed: (1) the development of novel computational approaches for interrogating properties of mathematical representations of biochemical networks; and (2) the discovery of fundamental biology with systems-level models of human pathogens.

3 - New Methods for Identification of Transcription Factor Binding Sites

> John Spouge, NCBI,NIH, spouge@ncbi.nlm.nih.gov

Many computational methods for identifying regulatory elements use a likelihood ratio between motif and background models. Often, the methods use a background model of independent bases. At least two different Markov background models have been proposed with the aim of increasing the accuracy of predicting regulatory elements. Both Markov background models suffer theoretical drawbacks. I discuss a new a ontext dependent Markov background model from fundamental statistical principles.

4 - Using Combinatorial Optimization to Predict Domain-domain Interactions

> Teresa Przytycka, Principal Investigator, NIH | NLM | NCBI, przytyck@ncbi.nlm.nih.gov

Comprehending the cell functionality requires knowledge about the functionality of individual proteins as well as the interactions among them. Proteins typically contain two or more domains, and a protein interaction usually involves binding between specific pairs of domains. Identifying such interacting domain pairs is an important step towards determining the protein-protein interaction network. We demonstrate that evolutionary parsimony principle combined with combinatorial optimization techniques leads to an approach to detecting domain-domain interactions that outperforms other methods to attack the problems.

◼ MA22

CP/OR interface II

Sponsor: Computing Society: Constraint Programming and Operations Research
Sponsored Session

Chair: John Hooker, Carnegie Mellon University, Tepper School of Business, Pittsburgh, PA, 15213, United States of America, john@hooker.tepper.cmu.edu

1 - Strong Inequalities for Disjunctive Sets Via Lifting

> Mohit Tawarmalani, Associate Professor of Management, Purdue University, 100 S. Grant Street, West Lafayette, IN, 47907-2076, United States of America, mtawarma@purdue.edu, Jean-Philippe Richard

The lifting theory is used to generate convex hulls and strong cuts for disjunctive sets. Illustrative examples involving small-dimensional sets are presented. A generalization of perspective cuts is derived by lifting the Fenchel-Young inequalities. The theory is applied to bilinear knapsack sets, where the lifting function is found to be supermodular. This property is then used to develop valid inequalities for bilinear knapsacks and covering sets.

2 - A Unifying Framework for Domain Reduction

> Nick Sahinidis, John E. Swearingen Professor, Carnegie Mellon University, Department of Chemical Engineering, 5000 Forbes Avenue, Pittsburgh, PA, 15213, United States of America, sahinidis@cmu.edu, Mohit Tawarmalani

Based on Lagrangian outer-approximation, we present a unified treatment of existing and several new domain reduction techniques for integer programming, global optimization, and constraint programming.

3 - Advancing AND/OR Search for Optimization

> Rina Dechter, Professor, UC Irvine, Irvine, California, Irvine, CA, United States of America, dechter@ics.uci.edu, Radu Marinescu

Recently, Branch-and-Bound search algorithms were developed, exploring the AND/OR search graph for solving constraint optimization problems, demonstrating tremendous gain using problem decomposition (using AND

nodes), equivalence (by caching) and irrelevance (via the mini-bucket heuristics). We show here additional improvements gained by exploiting constraint propagation, using initial upper bounds generated via stochastic local search and improving the quality of the guiding pseudo tree.

4 - Efficient Context-Free Grammar Constraints

Meinolf Sellmann, Brown University, PO Box 1910, Providence, RI, United States of America, sello@cs.brown.edu, Serdar Kadioglu

Recently, constraints based on grammars higher up in the Chomsky hierarchy were introduced. We devise a time- and space-efficient incremental arc-consistency algorithm for context-free grammars. Particularly, we show how to filter a sequence of monotonically tightening problems in cubic time and quadratic space. Experiments on a scheduling problem show orders of magnitude improvements in time and space consumption.

■ MA23

The Applied Probability Society Markov Lecture

Sponsor: Applied Probability
Sponsored Session
Chair: Steven E. Shreve, Orion Hoch Professor of Mathematics, arnegie Mellon University, shreve@steve.math.cmu.edu

1 - Mixing Models to Capture Stock Price Volatility

Steven E. Shreve, Orion Hoch Professor of Mathematics, Carnegie Mellon University, shreve@steve.math.cmu.edu

The celebrated Black-Scholes formula for the price of a European call assumes that the underlying stock price is a geometric Brownian motion with constant volatility, which implies that the distribution of the stock price at each .xed time is log-normal. If this were actually the case, then the same value for the volatility parameter in the Black-Scholes formula could be used to price all options on a particular stock. Market data shows signi.cant departures from this idealized situation, and for exotic options (i.e., those with path-dependent payo.s), these departures can create serious errors in prices and hedges. To address this short-coming of the Black-Scholes model, a variety of models have been implemented in which the volatility is itself a stochastic process. One of these is the local volatility model of B. Dupire in which the volatility at each time is a function of the time and the stock price at that time. This function is chosen so that the prices produced by the model match a variety of market prices of calls and puts with various expiration dates and strike prices. In addition, some ad hoc .xes have been implemented. One of these ad hoc .xes is to assume that the distribution of the stock price at each time is a mixture of log-normal distributions. This mixture of distributions can produce realistic prices for a variety of European calls and puts with the same expiration date, and thus has practical appeal. However, it is not really a model because it speci.es the distribution of the stock price at one or several times but does not specify how the stock price evolves over time. In other words, it does not specify the distribution of the paths of the stock price. In this talk, we describe how to build a model for the evolution of the stock price so that at each particular time, the distribution of the stock price is a mixture of the distributions produced by two di.erent models. This model is in the spirit of a local volatility model, although the volatility may now depend on more than the current time and the current stock price. The model extends a result by Gy®ongy on the construction of a di.usion process that has desired one-dimensional distributions. This is joint work with former PhD Student Gerard Brunick, Department of Mathematics, University of Texas at Austin. The discussants for this presentation are Paul Glasserman, Graduate School of Business, Columbia University and Ronnie Sircar, Department of Operations Research and Financial Engineering, Princeton University.

■ MA24

Joint Session CS/ Optimization/Discrete Optimization: Cutting Planes

Sponsor: Computing Society, Optimization
Sponsored Session
Chair: Robin Lougee-Heimer, IBM Research, 1101 Kitchawan Road, Yorktown Heights, NY, 10598, United States of America, robinlh@us.ibm.com

1 - A Decomposition Algorithm for Solving a Large-scale MILP Model for Petroleum Supply Operations

Roger Rocha, PETROBRAS, Av. Horàcio de Macedo 950, Rio de Janeiro, Brazil, rrocha@andrew.cmu.edu, Ignacio Grossmann, Marcus V. S. Poggi de Aragão

We consider a problem faced by PETROBRAS. This problem is to determine a minimum cost offloading scheduling of platforms to supply refineries. In this work we propose a decomposition algorithm that resembles the Benders decomposition algorithm but we present a new way of generating cuts based on disjunctive program.

2 - Cutting Planes in SCIP

Kati Wolter, PhD Candidate, Zuse Institute Berlin (ZIB), Takustr. 7, Berlin, 14195, Germany, wolter@zib.de

SCIP is a solver for constraint integer programming, which integrates constraint programming and mixed integer programming modeling and solving techniques. We introduce one component of the solver, namely the generation of cutting planes. The solver includes efficient separation algorithms for general cutting planes as well as for problem specific cutting planes.

3 - Cardinality Cuts: Optimization and Aggregation

Osman Oguz, Associate Professor, Bilkent University, Department of Industrial Engineering, Ankara, 06800, Turkey, ooguz@bilkent.edu.tr

We use cardinality cuts as a means of cutting away the explored regions of the underlying polyhedron associated with a 0-1 integer programming problem. Exploration is done by solving smaller size restricted subproblems by customary branch-and-cut. Our computational experiments show that significant savings (up to more than ten times) in computing time and memory space are possible for large problems using this method.

4 - Simultaneous Lifting in Knapsack Polytopes

Todd Easton, Associate Professor, Kansas State University, 2021 Durland Hall, Manhattan, KS, 66506, United States of America, teaston@ksu.edu, Kamana Sharma, Jessica Heier

The binary knapsack has been one of the most widely studied polytopes. This talk describes a new technique to generate numerous exact simultaneously lifted cover inequalities in quadratic time. Conditions when these inequalities are facet-defining are also presented along with some computational results.

■ MA25

Computational Intelligence in Financial and Prediction Markets

Sponsor: Computing Society
Sponsored Session
Chair: Sanmay Das, Assistant Professor, Rensselaer Polytechnic Institute, Department of Computer Science, 110 8th St, Troy, NY, 12180, United States of America, sanmay@cs.rpi.edu

1 - Quantifying Market Liquidity from Order Flow

Adlar Kim, Postdoctoral Associate, Massachusetts Institute of Technology, 77 Massachusetts Avenue, Cambridge, MA, 02139, United States of America, jwkim@csail.mit.edu

In the first part of this talk, I demonstrate statistical modeling techniques to model order flow generation of financial markets. A simulation of the model successfully replicates various statistical properties of price returns. In the second half, I argue that change in market liquidity explains how my order flow model satisfies the weak form of Efficient Market Hypothesis. A method of quantifying market liquidity from order flow data is introduced to explain this.

2 - How do Prediction Markets Predict?

Abraham Othman, Carnegie Mellon University, 5560 Bartlett Street, Pittsburgh, PA, 15217, United States of America, aothman@cs.cmu.edu

Prediction markets are remarkable aggregators of information. But are they more accurate than, say, a subsidized average estimate from a handful of their most prescient contributors? In this talk, I discuss the evidence for and against the so-called "Marginal Trader Hypothesis", which attributes virtually all of a market's success to a small group of savvy participants. I discuss the implication of this hypothesis in the design of future markets, and computation's vital role in that future.

3 - Blind Portfolio Auctions

Michael Padilla, Stanford University, Packard, Stanford, CA, 94305, United States of America, mtp@stanford.edu, Benjamin Van Roy

Institutional investors sell a large volume of assets to brokers using blind portfolio auctions, typically first-price auctions where the investor engages a few potential buyers and provides limited information about the portfolio contents. Such trades can be inefficient for several reasons. We propose a mechanism that addresses these concerns via careful information management. This mechanism can be implemented through either a trusted mediator or an equivalent cryptographic protocol.

4 - Adapting to a Shock: Optimal Sequential Market-making

Sanmay Das, Assistant Professor, Rensselaer Polytechnic Institute, Department of Computer Science, 110 8th St, Troy, NY, 12180, United States of America, sanmay@cs.rpi.edu, Malik Magdon-Ismail

We present a dynamic-programming approach to optimal sequential price-setting in a stylized model of dealer markets. Our algorithm reveals a surprising insight: an optimal monopolist can provide more liquidity to the market in periods of high uncertainty, because she is willing to absorb initial losses to learn valuations more quickly.

■ MA26

Open Source Trends

Sponsor: Computing Society: Open Source Software
(Joint Cluster INFORMS Optimization)
Sponsored Session

Chair: Joao Goncalves, IBM Research, T. J. Watson Research Center, 1101 Kitchawan Road, Yorktown Heights, NY, 10598, United States of America, jpgoncal@us.ibm.com

1 - Performance of Huge Scale Collaborative Network
Yuji Fujita, research expert, NiCT, 2-2-2 Hikaridai, Seika-cho, Kyoto, Japan, fyuji@nict.go.jp, Yutaka Hamaoka

Groups of huge scale has been formed on the Internet of their own accord to develop various open-source software or provide support for their software products. This kind of people's network has some notable points that its membership is changeable or has multiple roles that supporting users and creating software. About 2 thousands of open-source projects are examined in this study concerning about progress of development, communications and other aspects and their correlations.

2 - The Effect of Evolving Software Complexity on Open Source Co-developer Participation
Rajiv Jayant, PhD Candidate, School of Management, University of Texas at Dallas, 800 West Campbell Road, Richardson, TX, 75080, United States of America, rajiv@utdallas.edu

In this study, we examine the effect of software complexity on co-developer activity as OSS projects evolve over time. Co-developers act as maintainers by fixing bugs and creating new features. However, with OSS being a voluntary activity, it is hard to know apriori if the software will be maintained once adopted. To this end, we develop a model for the pattern of co-developer participation over time. The results of testing this model on real world OSS projects are presented and discussed.

3 - A Parallel Open Software and Hardware Reference Platform for the Operations Research Community
Timothy Middelkoop, University of Florida, PO Box 116595, Gainesville, FL, 32611, United States of America, t.middelkoop@ufl.edu

In this work we propose that the natural extension of an open source optimization framework is a standards based open software and hardware reference system. We first outline the need for such a platform and its requirement to be parallel followed by an overview of a concept system based on the PS3. We then show that it can be used both to promote the open exchange of ideas and as an educational platform with a low barrier to entry. We conclude with forward looking ideas and a demonstration.

4 - A Comparison of Open Source Versus Commercial Operations Research Software
Haluk Akin, Research Assistant, University of Central Florida, 4000 Central Florida Blvd., PO Box 162993, Orlando, FL, 32816, United States of America, halukakin@gmail.com, José Sepulveda

Open source software is emerging as an important part of Today's software world. Availability of free software creates equal access opportunity independent of available funds in many academic fields. In this paper we will compare performances of three optimization software, COIN-OR (open source), LPSOLVE (open source) and CPLEX (commercial). We will use five highly cited multi-dimensional knapsack problem sets as test beds. We will compare the solution times and the best solutions found.

■ MA27

Applied Probability and Optimization in Wireless Sensor Networks

Sponsor: Applied Probability
Sponsored Session

Chair: Yannis Paschalidis, Associate Professor, Boston University, Center for Information & Systems Eng., 15 Saint Mary's St., Brookline, MA, 02446, United States of America, yannisp@bu.edu

1 - Dynamic Sleep Time Control in Wireless Sensor Networks Using Traffic Statistics
Christos Cassandras, Professor, Boston University, Department of Manuf. Engineering, 15 St. Mary's St., Brookline, MA, 02446, United States of America, cgc@bu.edu, Xu Ning

We present a dynamic optimization approach to save energy in wireless sensor networks at the link level. Using known traffic statistics, we optimally control the sleep interval between consecutive wake-ups of the receiver. We derive necessary conditions for optimality and propose an explicit solution algorithm. When statistics are unknown, we use an iterative scheme to estimate them and provide a second algorithm. Simulation shows the optimal policy dominating the best fixed sleep time control.

2 - Expected Delay Analysis for Constrained Queuing Systems
Ness Shroff, Ohio Eminent Scholar in Networking and Communications, and Professor of ECE and CSE, The Ohio State University, Department of ECE, Columbus, OH, 43210, United States of America, shroff@ece.osu.edu, Gagan Gupta

We analyze the expected delay for a general class of shared resource systems, which impose arbitrary constraints on the set of users that can be served simultaneously at any given time. This model has been used to describe input-queued switches and wireless networks. We provide lower and upper bounds for scheduling policies in this system. These bounds lead us to the development of an accurate estimate of the expected delay for the well-known Maximum Weighted Matching (MWM) scheduling policy.

3 - Arbitrary Throughput and Complexity Tradeoffs in Presence of Delay Guarantees in Wireless Networks
Saswati Sarkar, Associate Professor, University of Pennsylvania, 200 S. 33rd St., Philadelphia, PA, 19104, United States of America, swati@seas.upenn.edu, Saikat Ray

We develop a class of parameterized policies that given any positive constant a that is between 0 and 1, approximates the maximum throughput region in a large class of wireless networks within a factor of a, using a computation time that depends only on the maximum node degree and a. These policies also attain asymptotically optimal delays in these networks.

4 - Localization in Sensor Nets: Adventures in Decision Theory and Facility Location
Yannis Paschalidis, Associate Professor, Boston University, Center for Information & Systems Eng., 15 Saint Mary's St., Brookline, MA, 02446, United States of America, yannisp@bu.edu, Dong Guo

I will present an approach for a localization system allowing Wireless Sensor Networks to determine the physical location of their nodes. Such a service has many applications including asset and personnel tracking. Information theoretic tools help us characterize performance and we address the problem of optimal deployment. We show that localization decisions can be distributed. The approach is validated in a testbed yielding promising results.

■ MA28

Dynamic Oligopoly Models

Cluster: Applied Dynamic Optimization
Invited Session

Chair: Gabriel Weintraub, Columbia Business School, gweintraub@columbia.edu

1 - Nash-Cournot Equilibrium Problems under Uncertainty: Solution Properties and Scalable Algorithms
Uday Shanbhag, Asst. Professor, University of Illinois at Urbana-Champaign, 216 Transportation Bldg, Urbana, Il, 61822, United States of America, udaybag@uiuc.edu, Peter W. Glynn, Gerd Infanger

We consider a class of stochastic Nash-Cournot equilibrium problems arising from settings where agents are competing in a two-period setting. The resulting dynamic game is often referred to as an S-adapted open-loop equilibrium problem. We provide existence and uniqueness results for such games, as well as their generalizations. A scalable Newton-splitting method is suggested for solving such a class of problems.

2 - Extensions to Oblivious Equilibrium
Gabriel Weintraub, Columbia Business School, gweintraub@columbia.edu, C. Lanier Benkard, Benjamin Van Roy

Oblivious equilibrium (OE) is a new solution concept for approximating Markov perfect equilibrium in dynamic oligopoly models. In this talk we extend our base model, OE, and our algorithms to incorporate aggregate random shocks common to all firms. This extension is important when analyzing the dynamic effects of industry-wide business cycles and it further expands the set of dynamic industry models that can be analyzed computationally.

3 - Structural Estimation of Dynamic Demand Models
Che-Lin Su, Assistant Professor of Operations Management, Graduate School of Business, University of Chicago, 807 South Woodlawn Avenue, Chicago, IL, 60637, United States of America, che-lin.su@chicagogsb.edu

We consider the dynamic analog of the discrete choice demand system with forward-looking consumers. We look at the cases, such as in durable goods markets, where consumers are strategic about when they purchase. We propose a constrained optimization formulation that minimizes the GMM objective function subject to the constraints that Bellman's equation is satisfied at all consumer states and that the market share equations hold. We discuss numerical results from Monte Carlo experiments.

4 - The Flat Rental Puzzle
John Rust, Professor of Economics, University of Maryland, 4115 E Tydings Hall, College Park, MD, 20742, United States of America, jrust@gemini.econ.umd.edu

Why don't rental car companies rent older cars at a discount versus renting only relatively new cars at full price? We present a detailed analysis of a large rental car company that gave us unprecedented access to its operations. We show that it can significantly increase profits by keeping its cars twice as long as it currently does and discounting the prices of older cars to induce its customers to rent them. These predictions were confirmed in a field experiment run by the company.

■ MA29

NSF Grants - The Inside Scoop

Cluster: INFORMS Outreach
Invited Session
Chair: Cerry Klein, Program Officer, NSF, 4201 Wilson Blvd, Arlington, VA, 22230, United States of America, cklein@nsf.gov

1 - Funding Opportunites at NSF and Proposal Writing Tips
Cerry Klein, Program Officer, NSF, 4201 Wilson Blvd, Arlington, VA, 22230, United States of America, cklein@nsf.gov

Service, manufacturing and operations research are key areas essential to the continued growth of our economy. This presentation will discuss the efforts and funding opportunities at the National Science Foundation in these areas, give hints on proposal writing and allow for an open discussion related to the future of these areas.

■ MA30

Defense Supply Chain Analysis I

Sponsor: Military Applications
Sponsored Session
Chair: Alan Johnson, Associate Professor, Air Force Institute of Tech, Wright-Patterson AFB, Dayton, OH, United States of America, alan.johnson@afit.edu

1 - Inland Troop Resupply Without a Road or Runway: Airdrop Solutions Including High-altitude Precision
Derek Williamson, AF Insitute of Technology, 2950 Hobson Way, Bldg 641, Wright-Patterson AFB, OH, United States of America, derek.williamson@wpafb.af.mil, Shane Hall, Brad Anderson

Given the variety of airdrop options available, it may be difficult to determine the least cost mix of paradrop and aircraft types to employ in a strategic military setting and how the chosen types affect delivery weight capacity while meeting specified sustainment goals subject to drop zone weight, altitude, offset, and accuracy requirements. We present a methodology to analyze these decisions. Several different scenarios are considered and practical insights are discussed.

2 - Optimizing a Worldwide Maintenance and Logistics Support Network
Dr Doug Popken, Systems View, 2127 Mountain Maple Ave, Highlands Ranch, CO, United States of America, dpopken@systemsview.com, Kevin Roderick

This presentation describes a decision support system that will model the performance of certain fielded military IT systems. The model will allow managers to assess alternative support scenarios with respect to a set of "performance-based logistics" criteria. The problem is difficult, requiring simultaneous optimization of maintenance labor and inventory levels. Problem complexity led us to an approach based on simulation-optimization.

3 - Translating Chem-bio Effects on Airports into Theater-level Impacts
Phil Collins, Senior Scientist, BBN Technologies, 1337 Park Plaze, Suite 3, O'Fallon, IL, United States of America, pcollins@bbn.com, Jeff Tustin, Dan Hazen

A Chem-Bio attack on a theater aerial port of debarkation (APOD) has far-reaching impacts on theater operations, including capability loss from contamination, anti-access and higher reliance on transload operations, which hurt the warfight. Previous attempts to model these impacts were confined to reducing the Maximum-on-Ground or degrading the APOD throughput. We show a capability to accurately model port-level throughput degrades and higher order effects on the theater.

4 - Integrated Distribution Planning and Forecasting for Medical Logistics
Scott Mason, Associate Professor, University of Arkansas, 4207 Bell Engineering, Fayetteville, AR, 72701, United States of America, mason@uark.edu, Heather Nachtmann, Edward Pohl

Demand at military medical facilities must be managed in the face of unexpected events (natural disasters, humanitarian efforts, and military conflicts). In today's constantly changing world, there exists a need for effective forecasting capabilities to plan for future events while simultaneously being able to plan and coordinate transportation activities and movement of medical supplies for current military operations. We present mathematical models for distributing military medical supplies.

■ MA31

Activity Detection for Counter Insurgency / Counter Terrorism

Sponsor: The Practice Section of INFORMS
Sponsored Session
Chair: Tom Mifflin, Directon of East Coast Operations, Metron, Inc., 11911 Freedom Dr., Suite 800, Reston, Va, 20190, United States of America, mifflin@metsci.com

1 - Track Analysis and Anomaly Detection - Maritime (TAANDEM) for Maritime Domain Awareness (MDA)
Bob Zarnich, Senior Manager, Metron, Inc, 11911 Freedom Dr, Reston, VA, 20190, United States of America, zarnich@metsci.com

A Maritime Domain Awareness (MDA) capability is sought by the Department of Homeland Security and the U.S. Navy. A key component is automated alerts of tracks inconsistent with "Normal" behavior of commercial traffic. This presentation will provide an overview of the methods developed to address this capability. Of critical concern is defining normal behavior and choosing statistics oriented towards intuitive justification via graphical display while controlling the alert rate of the system.

2 - A Supervised Learning Approach to Detect Threatening Cargo
Chris Boner, Senior Manager, Metron, Inc., 11911 Freedom Dr, Suite 800, Reston, VA, 20190, boner@metsci.com

This paper describes a supervised learning technique to (a) learn joint cargo feature values that are good discriminators between threat and non-threat cargo, and (b) to estimate a threat probability for each new cargo shipment based on its strongest threat indicator. This approach is implemented in Metron, Inc.'s Shipping Cargo Anomaly Detection and Classification (ScanDeck) technology and has demonstrated impressive detection performance during evaluations at Customs and Border Protection.

3 - A Bayesian, Nonlinear Particle Filtering Approach for Tracking the State of Terrorist Operations
Greg Godfrey, Senior Manager, Metron, Inc., 11911 Freedom Drive, Suite 800, Reston, VA, 20190, United States of America, godfrey@metsci.com, Tuan Tran

We describe a novel approach to track the progress of suspected terrorist operations and to optimize courses of action to delay or disrupt these operations. The approach uses Monte Carlo sampling and Bayesian, nonlinear particle filtering to estimate the state (schedule) of a terrorist operation, specified as a project management model with uncertain task durations. We perform a set of experiments that evaluate the effectiveness of the estimation given observables of variable quality.

■ MA32

Daniel H. Wagner Prize Competition

Cluster: The Daniel H. Wagner Prize for Excellence in
Operations Research
Invited Session
Chair: Allen Butler, President, Daniel H. Wagner Assoc., 2 Eaton Street,
Suite 500, Hampton, VA, 23669, Allen.Butler@va.wagner.com

Seven finalist teams have been selected for 2008 and these seven will be
presented in three sessions on Monday and the winning entry announced on
Tuesday morning.

1 - Modeling and Optimizing the Public Health Infrastructure for Emergency Response

   Eva Lee, Associate Professor and Director, Georgia Institute of
   Technology, Ctr for Operations Research in Medicine, Industrial &
   Systems Engineering, Atlanta, GA, 30332-0205, United States of
   America, evakylee@isye.gatech.edu, Chien-Hung Chen,
   Hannah Smalley

Planning for a catastrophe involving a disease outbreak or mass casualties is an
ongoing challenge for first responders and emergency managers. They must
make critical decisions on treatment distribution points, staffing levels, impacted
populations and potential impact in a compressed window of time when seconds
could mean life or death. In this talk, we present the design and implementation
of a software enterprise system that provides an adaptive planning and
assessment tool for large-scale emergencies. The program can assist in the design
and of an all-encompassing, flexible and dynamic public health emergency
response capability that requires strategic and operational systems planning.

■ MA33

Capacity Planning and Scheduling in Health Care

Sponsor: Health Applications Section
Sponsored Session
Chair: Nilay Argon, Assistant Professor, University of North Carolina,
Department of Statistics and Operations Res., Smith Building CB#3260,
Chapel Hill, NC, 27599, United States of America, nilay@unc.edu

1 - Long Term Capacity Planning for a Residential Care Facility

   Martin Puterman, Professor, Sauder School of Business UBC,
   2053 Main Mall #470, Vancouver, BC, V6T 1Z2, Canada,
   Martin.Puterman@sauder.ubc.ca, Marc Levine

As board members of a residential care facility in Vancouver, we faced the
challenge of planning capacity expansion to meet the needs of constituents
through 2021. To this end, we developed forecasting and queuing models to
investigate the sensitivity of capacity to model inputs. Finding that capacity
projections were most sensitive to length of stay (LOS), we used censored data
methods to forecast LOS. Results were presented to the board and
implementation planning has begun.

2 - Clinical Scheduling of Patients with Heterogeneous No-show Probabilities

   Mark Lawley, Purdue University, 206 S. Martin Jischke Drive,
   West Lafayette, IN, 47907, United States of America,
   malawley@purdue.edu, Ayten Turkcan, Bo Zeng, Ji Lin

We consider clinical scheduling problem with overbooking for heterogeneous
patients with different no-show probabilities. Our objective is to maximize the
expected profit, which includes revenue, patient waiting time and physician
overtime costs. We derive the properties of an optimal schedule. We propose a
local search algorithm and two sequential scheduling algorithms. We show the
significance of considering heterogeneous patients instead of homogeneous
patients.

3 - Dynamic Scheduling of Outpatient Appointments under Patient No-shows and Cancellations

   Nan Liu, University of North Carolina, 210 Smith Building, CB
   #3260, Chapel Hill, NC, 27599, United States of America,
   nliu@email.unc.edu, Serhan Ziya, Vidyadhar Kulkarni

We build an MDP model for the outpatient appointment scheduling problem
under patient no-shows and cancellations, and propose heuristic methods based
on the idea of applying one step of the policy-improvement algorithm on a state-
independent policy. The heuristic assigns an appointment date to each request,
depending on the appointment schedule. Our simulation study shows that our
methods outperform some of the policies that are used in practice, particularly
when the clinic capacity is small.

4 - Stochastic Sequential Scheduling without Fixed Appointment Slot for Outpatient Clinics

   Santanu Chakraborty, Purdue University, 203 Martin Jischke
   Drive, Mann Hall, Suite 225, West Lafayette, IN, 47907,
   United States of America, santanu@purdue.edu, Mark Lawley,
   Kumar Muthuraman

In this paper we develop a sequential scheduling algorithm for the case where
the service period is not divided into slots. We assume that the service time
distribution is exponential and each patient is characterized by a certain no-show
probability.

■ MA34

OR, Infectious Diseases, and Public Policy

Sponsor: Health Applications Section
Sponsored Session
Chair: Ruben Proano, Assistant Professor, Rochester Institute of
Technology, 81 Lomb Memorial Drive, KGCOE, Rochester, NY, 14823,
United States of America, rapeie@rit.edu

1 - A Game Theoretical Approach for Hospital Stockpiling in Preparation for Pandemics

   Po-Ching DeLaurentis, PhD Candidate, Purdue University, 203
   Martin Jischke Drive, Mann Hall Suite 225, West Lafayette, IN,
   47907, United States of America, chenp@purdue.edu,
   Elodie Adida, Mark Lawley

Our problem addresses the issue of hospital stockpiling in preparing for a flu
pandemic. Taking into account the uncertain demand that may occur under
various possible pandemic scenarios, we consider the problem of determining the
stockpile quantity of one critical medical item. A game theoretical framework is
used to capture any mutual aid agreement that a group of hospitals may have. A
discussion on the implications of the game results will be presented.

2 - Healthcare Associated Infections: An Agent-based Simulation of the Dynamics of Pathogen Flows

   Reidar Hagtvedt, Assistant Professor, University of Alberta School
   of Business, 3-23 Business Building, Edmonton, AB, T6G 2R6,
   Canada, hagtvedt@yahoo.com, Gregory Todd Jones, Paul Griffin,
   Pinar Keskinocak

Healthcare associated infections (HAIs) are an increasing concern the world over,
especially as resistant pathogens multiply. The economics of regulation of HAIs
and the dynamics of pathogen flows may be analyzed in a system of
interdependent agents, e.g. as a collective goods problem. We generalize previous
studies on pathogen flows in individual units to an agent-based simulation on a
social network, and in particular, consider emergent properties and policy.

3 - An SI Model with Behavioral Feedback and Trajectories That Reach a DNSS Point in Positive Time

   Irmgard Zeiler, Post-doctoral fellow, Department of Mathematical
   Methods in Economics, Vienna University of Technology,
   Argentinierstrasse 8/105-4, Vienna, A-1040, Austria,
   irmgard.zeiler@gmx.net, Jonathan P. Caulkins, Dieter Grass,
   Gernot Tragler

We apply optimal dynamic control to a standard epidemiological SI-model
augmented to include behavioral change in the incidence rate and parameterized
for HIV. The solution is substantively provocative and manifests an interesting
new type of threshold behavior not previously reported in the optimal control
literature.

4 - Bridging Theory and Applied: Operational Science in Health Care

   Moderator: John Fontanesi, Director, Center for Management
   Science in Health, University of California, San Diego, 9500
   Gilman Drive, #0821, La Jolla, Ca, 92093, United States of
   America, jfontanesi@ucsd.edu, Panelists: David Goldsman,
   Debra Bowers, Kwok-Leung Tsui

Health systems are struggling in a world of increasing complexity and limited
resources. With few exceptions, Operational Science has not been well used,
largely because of misunderstandings between health and O/R professionals
about eaxh others core concepts. This panel presentation will review specific
examples of how O/R improved public health nursing, emergency department-
to-Hospital throughput and patient compliance and provided challenges to O/R.

■ MA35

Panel Discussion: Teaching Modern Project Management - Tactical Issues

Sponsor: INFORM-ED
Sponsored Session

Chair: Nicholas G. Hall, Professor, The Ohio State University, Management Sciences, 2100 Neil Avenue, Columbus, OH, 43210-1144, United States of America, hall_33@fisher.osu.edu

1 - Teaching Modern Project Management- Tactical Issues
Moderator: Nicholas G. Hall, Professor, The Ohio State University, Management Sciences, 2100 Neil Avenue, Columbus, OH, 43210-1144, United States of America, hall_33@fisher.osu.edu, Panelists: G. Anand Anandalingam, Edward Anderson, Ted Klastorin, George Vairaktarakis

This panel discussion considers several tactical issues related to the teaching of project management. These include: syllabus design, advance information for students, workload and work variety, level of technical detail, software support, PMI certification content and relevance, finding good case materials, in class presentations of case analysis, in class discussion issues, games and other simulation exercises, finding good guest speakers, final exam design.

■ MA37

Tutorial: Optimal Learning

Cluster: Tutorials
Invited Session

Chair: Warren Powell, Princeton University, Department of ORFE, Princeton University, Princeton, NJ, 08540, United States of America, powell@princeton.edu

1 - Optimal Learning
Warren Powell, Princeton University, Department of ORFE, Princeton University, Princeton, NJ, 08540, United States of America, powell@princeton.edu, Peter Frazier

Optimal learning addresses the challenge of efficiently collecting information to improve our knowledge of the parameters of an optimization problem. Applications include finding the best choice from a list, allocating resources and finding the best path through an uncertain network. We describe on-line and off-line applications, and review a variety of practical techniques, including the knowledge gradient algorithm which we illustrate for a general class of learning problems.

■ MA38

Methods in Integer Programming

Sponsor: Optimization/ Discrete Optimization
Sponsored Session

Chair: Jean-Philippe Richard, Assistant Professor, Purdue University, School of Industrial Engineering, Purdue University, 315 N. Grant Street, West Lafayette, IN, 47907-2023, United States of America, jprichar@ecn.purdue.edu

1 - Parallel Approximation and Integer Programming Reformulation
Gabor Pataki, UNC-Chapel Hill, Hanes Building, Chapel Hill, NC, United States of America, pataki@email.unc.edu, Mustafa Tural

We prove that in a low density knapsack problem branching on a vector which is "near parallel" to the constraint vector gives a short proof of infeasibility for almost all right hand sides. As a corollary we prove that in a reformulation using basis reduction, branching on the last variable achieves the same result.

2 - The Mixing-MIR Set with Two Nondivisible Capacities
Ismael de Farias, Associate Professor, Department of Industrial Engineering, Texas Tech, Lubbock, TX, United States of America, defarias@buffalo.edu, Ming Zhao

The capacitated mixing-MIR set, CMMIR, is a generalization of Nemhauser and Wolse's mixed-integer rounding (MIR) set and of Gunluk and Pochet's mixing-MIR set. Recently, it has been shown that linear optimization over CMMIR can be performed in polynomial time when the capacities are divisible. Here we show that when there are two different nondivisible capacities, linear optimization over CMMIR can be performed in polynomial time.

3 - A Heuristic Approach for Solving Large 0-1 Integer Programs
Ahmet Keha, Assistant Professor, Arizona State University, PO Box 875906, Tempe, AZ, 85287, United States of America, Ahmet.Keha@asu.edu, Gerardo Trevino

In this talk we introduce an approach that can be used for finding near optimal solutions to large scale 0-1 integer programs. The approach solves the problem over a reduced feasible region that hopefully contains the optimal solution. We compare several ways to generate the reduced feasible region and give an approach to improve the reduced feasible region. We also give extensive computational results that show that our heuristic gives solutions that are very close to the optimal ones.

■ MA39

Algorithmic and Economic Aspects of Social Networks

Sponsor: Optimization/ Networks
Sponsored Session

Chair: Mohammad Mahdian, Research Scientist, Yahoo! Research, 2821 Mission College Blvd, Santa Clara, CA, 95054, United States of America, mahdian@alum.mit.edu

1 - Optimal Marketing over Social Networks
Vahab Mirrokni, Google Research, New York, NY, United States of America, mirrokni@theory.csail.mit.edu, Jason Hartline, Mukund Sundararajan

We discuss the use of social networks in viral marketing. While influence maximization has been studied in this context, we study revenue maximization. In our model, a buyer's decision to buy an item is influenced by the price of the item and the set of buyers that own the item. To solve this problem, we identify influence-and-exploit strategies. We first argue why such strategies are reasonable and then show how to use submdoualr maximization to implement these strategies.

2 - Treasure Hunt: Social Learning in Real-World Social Networks
Markus Mobius, Associate Professor of Economics, Harvard University, Cambridge, MA, 02138, United States of America, mobius@fas.harvard.edu, Tuan Phan, Maya Eden

We design a simple experiment to measure the spread of information in a real-world social network. We carefully document subjects' evolving beliefs and whom they talk to. We analyze the resulting data using a simple model which allows us to estimate (1) how far information travels, and (2) how subjects weigh information from different regions of the social network.

3 - The Role of Compatibility in the Diffusion of Technologies in Social Networks
Nicole Immorlica, Northwestern University, Evanston, IL, Evanston, IL, United States of America, nickle@eecs.northwestern.edu, Mohammad Mahdian, Jon Kleinberg, Tom Wexler

Competing technologies often adopt a limited amount of compatibility with one another. We show that, in a simple model of diffusion in social networks in which users choose between two technologies of varying qualities, or both at an additional compatibility cost, limited compatability may arise from purely strategic considerations: in some cases, for one technology to survive the introduction of another, the compatibility cost must be balanced within a narrow, intermediate range.

4 - Effects of Community Structure on Respondent-Driven Sampling
Sharad Goel, Yahoo! Research, 111 W. 40th Street, 17th Floor, New York, NY, 10018, United States of America, goel@yahoo-inc.com, Matthew Salganik

Respondent-driven sampling (RDS) is a widely used technique for estimating disease prevalence in hidden populations. The sample is collected through a form of snowball sampling where current sample members recruit future sample members. We present RDS as Markov chain Monte Carlo importance sampling, and examine the effects of community structure and recruitment methodology on the estimates. Our results are based on data collected as part of the National Longitudinal Study of Adolescent Health.

■ MA40

Stochastic Optimization of Inventory Management, Revenue Management and Healthcare Management

Sponsor: Optimization/ Stochastic Programming
Sponsored Session

Chair: Retsef Levi, Professor, Sloan School, MIT, 50 Memorial Drive, Building E53-389, Cambridge, MA, 02142, United States of America, retsef@mit.edu

1 - Average Cost Inventory Models: An Analysis Using a Vanishing Discount Approach

Mahesh Nagarajan, Assistant Professor, University of British Columbia, 2053 Main Mall, Vancouver, BC, V6T1Z2, Canada, mahesh.nagarajan@sauder.ubc.ca, Woonghee Tim Huh, Ganesh Janakiraman

We characterize, for single stage stochastic inventory models that can be modeled as Markov decision processes with non-compact action spaces and weakly continuous transition probabilities, a set of sufficient conditions under which the optimal policies under the infinite horizon discounted cost criterion converge to the optimal policy under the average cost criterion as the discount factor approaches one. These conditions are relatively easy to verify.

2 - Stochastic Depletion Problems: On the Greedy Policy for a Class Of Dynamic Optimization Problems

Vivek Farias, Assistant Professor, MIT Sloan School of Management, 30 Wadsworth Street, E53-317, Cambridge, MA, 02142, United States of America, vivekf@mit.edu, Carri Chan

We consider 'Stochastic Depletion Problems'. These problems are difficult both from a pragmatic computational perspective as also from a theoretical perspective. We isolate two simple properties that, if satisfied by a problem within this class, guarantee that a myopic policy is a 2-approximation. We demonstrate applications of the result to problems ranging from stochastic broadcast scheduling to delay sensitive control of a discrete time `call-center' model.

3 - A Sampling-based Approach to Appointment Scheduling

Mehmet Begen, PhD Candidate, Sauder School of Business, University of British Columbia, 2053 Main Mall, Vancouver, BC, V6T1Z2, Canada, mehmet.begen@sauder.ubc.ca, Retsef Levi, Maurice Queyranne

We consider the appointment scheduling problem with discrete random durations, studied by Begen and Queyranne, but without assuming the knowledge of the job duration distributions. Instead, information on the duration distributions may be obtained by random sampling. We show that the objective function is convex under a simple condition and characterize its subdifferential, and determine the number of independent samples required to obtain a provably near-optimal solution with high probability.

■ MA41

Innovation Networks

Cluster: New Product Development
Invited Session

Chair: Olav Sorenson, Rotman School, University of Toronto, 50 Prince Arthur Ave, Toronto, ON, M5S3E6, Canada, olav.sorenson@rotman.utoronto.ca

1 - Noncompetes and the Value of Social Capital

Lee Fleming, Harvard Business School, Morgan 485, Boston, MA, 02163, United States of America, lfleming@hbs.edu

Though sociologists have long argued for the importance of social capital, they have had less success in demonstrating and measuring its value. How legal regimes and laws influence the value of social capital has also remained underexplored. By exploiting an inadvertent change in noncompete laws by the State of Michigan, we demonstrate how the law changed the value of an inventor's social networks for future mobility.

2 - Networks in Nanotechnology

Stine Grodal, Assistant Professor, Boston University, 595 Commonwealth Ave., School of Management, Boston, MA, 02215, United States of America, grodal@bu.edu

A central issue during the emergence of an organizational field is the creation of symbols that enables distinct communities to collaborate across institutional barriers. The creation of a field is thus impacted by communities' shared linguistic practice. I use network analysis to examine the linguistic development of five communities in the nanotechnology field. The results show that over time the nanotechnology label became increasingly central to the communities' linguistic practices.

3 - Heterogeneity, Network Position and Performance

Jeongsik Lee, Assistant Professor, Georgia Institute of Technology, 800 W Peachtree St NW, Atlanta, GA, 30308-1149, United States of America, Jeongsik.Lee@mgt.gatech.edu

I examine how past performance influences actor positions and how accounting for endogeneity alters position-performance association. On the collaboration network of U.S. biotech inventors, I find that inventors with superior track records are more apt to occupy brokering positions. Controlling for past performance weakens the relationship between brokering position and patent performance. When inventor-level heterogeneity is accounted for, the position-performance correlation almost disappears.

4 - Private and Public Networks: What You Know Versus What You Show

David Waguespack, University of Maryland, 4511 Beechwood, College Park, MD, 20740, United States of America, dwaguesp@rhsmith.umd.edu, Tim Simcoe, Lee Fleming

Research about superior network positions frequently suffers from the fact that intrinsic and extrinsic explanations are simultaneously loaded on a single observable. A good network position simultaneously deliver better resources and information to the focal actor, making the actor more attractive, but also sends signals to third parties. In this paper we exploit a natural experiment to compare how private network positions and revealed (public) network positions influence future tie formation.

■ MA42

Global Optimization Problems Arising in Networks and Graphs

Sponsor: Optimization/ Global Optimization
Sponsored Session

Chair: Jitamitra Desai, Lehigh University, 200 W Packer Ave, Bethlehem, PA, United States of America, jdesai@lehigh.edu

1 - Network Simplex-like Algorithms for Stochastic Appointment Scheduling

Robert Storer, Professor, Lehigh University, 200 West Packer Av, Bethlehem, PA, 18015, United States of America, rhs2@lehigh.edu, Camilo Mancilla

Scheduling appointment times when appointment durations are random is a common problem. Given the sequence of appointments, and scenarios generated from duration distributions, optimizing appointment starting times is an LP. We develop a "network simplex-like" algorithm to solve it, and contrast with previous algorithms based on the L-shaped method.

2 - Fractional Multiple-ratio Combinatorial Optimization on Graphs

Oleksii Ursulenko, Industrial and Systems Engineering, Texas A&M University, College Station, TX, United States of America, ursul@tamu.edu, Sergiy Butenko, Oleg Prokopyev

We consider fractional programming problems such as Minimum Multiple-Ratio Spanning Tree, Minimum Multiple-Ratio Shortest Path and Minimum Multiple-Ratio Shortest Cycle, which extend classical combinatorial optimization problems to the case of a sum-of-ratios objective function. Complexity results, a global optimization framework for this type of problems, and computational results are presented.

3 - Positioning Mobile Agents to Decontaminate a Graph

John Penuel, University of Florida, 303 Weil Hall PO Box 116595, Gainesville, FL, 32611-6595, United States of America, jpenuel@ufl.edu, J. Cole Smith

We consider the problem of using mobile agents to decontaminate a graph. We model the problem as a two-stage MIP. In the first stage, we position agents. In the second stage, we determine the fastest cleaning strategy (we show this is NP-hard). Previous literature focuses on the minimum number of agents required to clean the graph. We focus on how quickly the graph can be cleaned. We give formulations and propose a method to optimally position agents so to minimize average cleaning time.

4 - A Fractional Programming Approach to Determine the Independence Number of a Graph

Jitamitra Desai, Lehigh University, 200 W Packer Ave, Bethlehem, PA, United States of America, jdesai@lehigh.edu, Baski Balasundaram, Ruken Duzgun

In this paper we present a continuous optimization approach to determine the independence number of a graph via a fractional programming formulation. Previously known properties are utilized in developing two new global optimization algorithms to determine the independence number of a graph. Computational results that show the efficacy of these approaches and comparisons to other bounds on the independence number are also provided.

■ MA43

Mitigating the Risk of Outsourcing

Cluster: Managing Disruptions in Supply Chains
Invited Session
Chair: A. Ravi Ravindran, Professor, Penn State University, 310 Leonhard Building, University Park, PA, 16802, United States of America, aravi@psu.edu

1 - Disruption Risk Modeling and Mitigation in Outsourcing
　　Ufuk Bilsel, PhD Student, Penn State University, 215 W. Fairmount Ave #514, State College, PA, 16801, United States of America, rub150@psu.edu, A. Ravi Ravindran

This research presents a risk quantification framework based on extreme value distributions. Risks are divided into several components which are first independently quantified and then aggregated. We use this framework to quantify disruption risks and include the risk value as an objective to minimize in a multicriteria mathematical model. The model determines primary suppliers and order allocations as well as backup suppliers in a multiple product - multiple supplier supply chain.

2 - Mechanisms for Mitigating Quality Risk with Outsourced Manufacturing
　　Sean Handley, The Ohio State University, 600 Fisher Hall, 2100 Neil Ave, Columbus, OH, United States of America, handley.20@osu.edu, John Gray

Increasingly, companies in the food, drug and medical device industries are outsourcing manufacturing. Previous research has shown that there is an increased quality risk with outsourced production relative to internal production. We empirically evaluate the conditions under which various quality risk mitigation approaches are most effective.

3 - Procurement Contracts for Supply Chains Considering Decision Makers' Risk Attitudes
　　Seong Hyun Nam, Associate Professor, University of North Dakota, Management Department, Grand Forks, ND, 58202, United States of America, seong_nam@und.edu

Most research on supply chain contracts assumes that decision-makers are risk-neutral. In practice, they are usually risk averse. The level of risk aversion plays an important role in the buyer's strategy and it influences procurement decisions. The focus of this paper is on contracts design for supply chain considering of a buyer and its suppliers,compare the contracts under different risk constraints,and derive the best overall contract for the buyer and suppliers.

■ MA44

Risk Management in Supply Chain

Cluster: Managing Disruptions in Supply Chains
Invited Session
Chair: Tieming Liu, Assistant Professor, Oklahoma State University, 322 Engineering North, Stillwater, OK, 74074, United States of America, tieming.liu@okstate.edu

1 - Dual Sourcing and Supplier Improvement under Supply Risk
　　Yimin Wang, Assistant Professor, Arizona State University, W.P. Carey School of Business, Department of Supply Chain Management, Tempe, AZ, 85287, United States of America, Yimin_Wang@asu.edu, Wendell Gilland, Brian Tomlin

The existing literature treats supplier uncertainty as exogenous. Yet, industry evidence suggests that many firms can influence supplier uncertainty through supplier improvement efforts. In this research we relax the exogenous assumption in supply uncertainty and connect the diversification strategy with the process improvement strategy. We characterize the firm's optimal strategy and obtain a number of important managerial insights.

2 - Inventory Systems with Stochastic Demand and Supply: Properties and Approximations
　　Amanda Schmitt, Postdoctoral Associate, MIT Center for Transportation & Logistics, 77 Massachusetts Ave., E40-266, Cambridge, MA, 02139, United States of America, aschmitt@mit.edu, Lawrence V. Snyder, Max Shen

We develop tools for analysis for a retailer subject to supply disruptions. We combine discrete-event uncertainty (disruptions) and continuous sources of uncertainty (stochastic demand or supply yield), which have differing impacts on optimal inventory settings and make closed-form optimal solutions unachievable. We develop a closed-form approximate solution by focusing on a single stochastic period of demand or yield and demonstrate that it performs very well compared to the optimal solution.

3 - Supply Disruptions in a One-warehouse Multiple-retailer System
　　Zumbul Bulut, zub205@lehigh.edu, Lawrence V. Snyder

In this study, we examine the impact of supply disruptions on the OWMR systems. We analyze a locally controlled OWMR system with identical retailers each having deterministic demand. Assuming that supply disruptions happen only in the supply system of warehouse or retailers, we derive the expressions for the optimal base-stock levels. We propose a heuristic for approximating the base-stock levels when the disruptions happen in the supply systems of all locations.

4 - Manufacturing Disruption Management with Cross Pricing and Cross Production
　　Tieming Liu, Assistant Professor, Oklahoma State University, 322 Engineering North, Stillwater, OK, 74074, United States of America, tieming.liu@okstate.edu, Ho-Yin Mak, Max Shen

We study the optimal capacity investment portfolio of a firm by considering responsive pricing and partial manufacturing flexibility. The firm produces two substitutable products and invest in resources that can be used for both products but with different efficiencies. We characterize the structure of the optimal pricing and allocation policies and derive managerial insights on the benefits of production and pricing flexibilities.

■ MA45

Topics on Sales Channel and Supplier Management

Sponsor: Manufacturing & Service Oper Mgmt/Supply Chain Management
Sponsored Session
Chair: Ozalp Ozer, Stanford University, Stanford, CA, United States of America, oozer@stanford.edu

1 - Supplier Selection in Health Care
　　Rohit Verma, Associate Professor, Cornell University, School of Hotel Administration, 338 Statler Hall, Ithaca, NY, 14853, United States of America, rohit.verma@cornell.edu, Jin Kyung Kwak

Although there has been extensive research on supplier selection, health care industry has rarely been the focus, despite its importance. In this study, we conducted an extensive empirical analysis of how decision-makers in hospitals make supplier-selection decision when purchasing expensive medical equipments.

2 - Behavioral Experiments in Dual Sales Channel Management
　　Murat Kaya, Sabanci University, Tuzla, Istanbul, TR, Turkey, mkaya@sabanciuniv.edu, Kay-Yut Chen, Ozalp Ozer

We develop a model to determine effective dual (online and retail) sales channel strategies. We also conducted behavioral experiments with human subjects and study whether the model's predictions are consistent with human behavior. We determine risk aversion as an important behavioral factor. We also determine optimal pricing strategies that take into consideration behavioral issues. To do so, we extend the model to account for risk aversion with mean-variance trade-off.

3 - Supply Chain Dynamics and Contracting in the Presence of Gray Market
　　Mehmet Sekip Altug, PhD Candidate, Columbia University, maltug10@gsb.columbia.edu, Garrett van Ryzin

We consider a supply chain with one manufacturer and several authorized retailers that face uncertain demand and a potential gray market. While the gray market can be seen as an opportunity to sell any excess inventory, it also is a threat for authorized retailer's demand. We characterize the equilibrium market-clearing gray market price and analyze how gray market changes the supply chain dynamics including certain contracts that are provided by the manufacturer to its authorized retailers.

4 - Sales Competition and the Value of Capacity
　　Navid Sabbaghi, MIT, 77 Massachusetts Ave. #32-D712, Cambridge, MA, 02139, United States of America, sabbaghi@mit.edu, Yossi Sheffi, John Tsitsiklis

We consider a supply chain model with supplier competition. Using the model, we motivate and define the value of capacity, show existence and uniqueness, and characterize that value. Finally, we show how the value of capacity can be calculated for a related model.

■ MA46

Supply Chain Execution by integrated Optimization- Negotiation Approaches

Sponsor: Manufacturing & Service Oper Mgmt/
Supply Chain Management
Sponsored Session

Chair: Hans-Juergen Sebastian, Deutsche Post Chair of Optimization of Distribution Networks, RWTH Aachen University, Templergraben 64, Aachen, 52062, Germany, Sebastian@or.rwth-aachen.de

1 - Improving Supply Chain Execution by an Integrated Optimization- Negotiation Approach

Hans-Juergen Sebastian, Deutsche Post Chair of Optimization of Distribution Networks, RWTH Aachen University, Templergraben 64, Aachen, 52062, Germany, Sebastian@or.rwth-aachen.de, Christoph Hempsch, Tung Bui

We consider the execution phase of SCM. A supply chain agent analyses the current state of the SC and uses a structured set of optimization models to compute decision alternatives in order to find out how to fulfill customer orders. This alternatives are the basis of negotiation processes between the SC-agent and customer agents. We will explain the advantages of the integrated optimization-negotiation approach.

2 - Implementation of Optimization and Negotiation Support for the Capable-to-promise Function

Christoph Hempsch, Deutsche Post Chair of Optimization of Distribution Networks, RWTH Aachen University, Templergraben 64, Aachen, 52062, Germany, hempsch@or.rwth-aachen.de, Hans-Juergen Sebastian, Tung Bui

In a production environment that is driven by customer orders a company needs to decide which orders to fulfill and what lead times to promise to the customers. The combination of optimization techniques and negotiation processes allows the company to make this decision more effectively and to operate the supply chain at higher efficiency. The paper puts focus on the integrated implementation of the two aspects to support this capable-to-promise function within a supply chain.

3 - Promising Delivery Dates by Multi-objective Optimization under Stochastic Uncertainty

Tobias Winkelkotte, Deutsche Post Chair of Optimization of Distribution Networks, RWTH Aachen University, Templergraben 64, Aachen, 52062, Germany, winkelkotte@or.rwth-aachen.de

Promising delivery dates requires considering many conflicting aspects. On the one side customers expect an early delivery. On the other side the delivery time should not be too short to avoid backlogs and to reduce stocks. Since lead times are stochastic, the factors are measured by metrics depending on a service level that describes the probability of in-time-delivery. We search for a service level that optimizes all aspects by multi-criteria optimization to promise a reliable delivery date.

■ MA47

Cost-Effectiveness of Healthcare Interventions

Sponsor: Health Applications Section
Sponsored Session

Chair: Stephanie Earnshaw, Global Head, US Health Economics, RTI Health Solutions, 3040 Cornwallis Rd, PO Box 12194, RTP, NC, 27709, United States of America, searnshaw@rti.org

1 - Cost-effectiveness of Darunavir for Treatment-experienced Adults with HIV Infection in the US

Anita Brogan, Senior Director, Health Economics, RTI Health Solutions, 3040 Cornwallis Rd, RTP, NC, 27709, United States of America, abrogan@rti.org, Erik Smets, Silas Martin, Josephine Mauskopf

Darunavir is a novel protease inhibitor used with other antiretroviral medications for the treatment of HIV infection. We developed a Markov model to estimate the cost-effectiveness of darunavir versus other protease inhibitors in treatment-experienced adults. The model tracks the remaining lifetime of a treatment-experienced cohort by virologic and immunologic response to treatment. We discuss this model with an emphasis on the application of modeling techniques to HIV.

2 - Cost-effectiveness of Fluticasone Propionate/Salmeterol (250/50mcg) Compared to Salmeterol (50mcg)

Christopher Blanchette, Director, CPOR, Lovelace Respiratory Research Institute, PO Box 760, Davidson, NC, 28036, United States of America, cblanchette@lrri.org, Harris Silver, Hans Petersen, Meaghan St. Charles

Bootstrapping methods were assessed to provide population-based parameter estimates for a cost-effectiveness analysis of Fluticasone Propionate/Salmeterol 250/50mcg (FSC) compared to Salmeterol 50mcg (SAL) from a trial based economic analysis using incremental cost-effectiveness ratios (ICER).

3 - Modeling HIV Testing Options in the Emergency Department Setting

Teresa Kauf, Associate Professor, University of Florida, PO Box 100496, Gainesville, FL, 32610-0496, United States of America, kauf@cop.ufl.edu

The Centers for Disease Control and Prevention recommends routine HIV testing in all health care settings. Yet, existing cost-effectiveness analyses have not considered the perspective of specific providers, such as emergency departments (EDs), when evaluating the cost-effectiveness of testing. This paper uses decision analysis to compare the cost-effectiveness of HIV testing from the perspective of an ED and the overall health care system. Barriers to efficient testing are discussed.

4 - Optimization of Prostate Cancer Screening Decisions

Jingyu Zhang, North Carolina State University, Graduate Program in Operations Research, Campus Box 7913, Raleigh, NC, 27695-7913, United States of America, jzhang2@ncsu.edu, Hari Balasubramanian, Nilay Shah, Brant Inman, Brian Denton

Prostate Specific Antigen (PSA) testing is widely used in screening for prostate cancer, although the cost and quality of life benefit remains uncertain. In our talk, we propose a Markov Decision Process model to determine the optimal PSA threshold at which to refer a patient for biopsy. We describe structural properties of the problem and present numerical results based on real data from a large longitudinal data set.

■ MA48

KLIC: Origin, Diffusion and Management of Knowledge for Competitive Advantage

Sponsor: Technology Management
Sponsored Session

Chair: David Moore, KLICNET.ORG, 3788 Davidson Place, Boulder, CO, United States of America, dmoore@klicnet.org

1 - Offshoring and the Geography of Innovation

Francisco Veloso, Associate Professor, Carnegie Mellon University, 5000 Forbes Avenue, Baker Hall 131D, Pittsburgh, PA, 15213, United States of America, fveloso@cmu.edu, Brian Fifarek

This paper investigates the long term impact of the globalization of knowledge and value chain offshoring on the spatial distribution of innovation activities. It examines the spatial pattern of innovation in rare earth applications from 1976 to 2002. It finds that rare earth catalyst innovation activities expand globally, while rare earth magnet innovation activities become more clustered and that these responses are conditioned by the role of geographic within value chain knowledge.

2 - The Evolution of Technological Paths and Market Value

Kun Liu, Assistant Professor, Washington State University, Pullman, WA, United States of America, k_liu@wsu.edu

We investigate how the evolution of technological path affects the firm's market value. We suggest that innovations of the same technological paths are genealogically related, which allows the firm to better protect and appropriate value from its intellectual property rights. Our results show that such superior position of appropriating value from intellectual property rights increases the firm's market value.

3 - Institutional Convergence and the Diffusion of University- Versus Firm-origin Technologies

Andrew Nelson, Asst Professor of Strategy, University of Oregon, Lundquist College of Business, Eugene, OR, 97403, United States of America, andrew.nelson@stanford.edu

While knowledge flows are a major theme in the strategy literature, our understanding of the processes by which knowledge moves between different organizations remains thin. By mixing longitudinal network analyses with rich archival data for specific inventions, I outline various channels through which knowledge spreads over time, the reliance of these channels on personal networks, and the role of personal connections in shaping the struggle between community and competitive orientations.

4 - Not Invented Here: Managing Corporate Innovation in a New Era

Vareska van de Vrande, Assistant Professor, Rotterdam School of Management, Erasmus University, Burgemeester Oudlaan 50, Room T7-33, Rotterdam, 3062 PA, Netherlands, vvrande@rsm.nl

Nowadays, the behavior of innovating firms has changed considerably. Instead of performing all their R&D activities in-house, companies are now increasingly looking for new ideas outside the boundaries of their own organization. As a result, the portfolio of external sourcing modes firms engage in has expanded.

This thesis focuses on the use of different modes for external technology sourcing, including strategic alliances, corporate venture capital investments, and mergers and acquisitions.

■ MA49

Using Simulation for Solving Difficult Problems

Sponsor: Simulation - INFORMS Simulation Society
Sponsored Session

Chair: Bahar Biller, Assistant Professor, Tepper School of Business, 5000 Forbes Ave., Pittsburgh, PA, 15213, United States of America, billerb@andrew.cmu.edu

1 - A Monte Carlo Study of Uncertainty in Random Forest Scores

Thomas Willemain, Professor, Rensselaer Polytechnic Institute, Troy, NY, 12180, United States of America, willet@rpi.edu, Randall Dahlberg

We present a Monte Carlo study of the factors governing uncertainty in scores generated by random forest classifiers. Included is an assessment of bootstrap estimates of the standard errors of scores produced by random forests built on transactional databases. Implication for practice relate to determining sample sizes required for accurate estimates of scores and accounting for score uncertainty when developing lists of putative members of the interesting class.

2 - Skart: A Skewness- and Autoregression-adjusted Batch-means Procedure for Simulation Analysis

James Wilson, Professor, North Carolina State University, 111 Lampe Drive, Campus Box 7906, Raleigh, NC, 27695, United States of America, jwilson@ncsu.edu, Ali Tafzzoli, Emily Lada, Natalie Steiger

We discuss Skart, an automated sequential batch-means procedure for constructing a skewness- and autoregression-adjusted confidence interval for the steady-state mean of a simulation output process that satisfies user-specified requirements on (absolute or relative) precision and coverage probability. In an extensive performance evaluation, Skart compared favorably with ASAP3, WASSP, SBatch, ABATCH, LBATCH, and the Heidelberger-Welch and Law-Carson procedures.

3 - Setting Inventory Targets in a Multi-Product, Joint Service-Level Model with Correlated Demands

Bahar Biller, Assistant Professor, Tepper School of Business, 5000 Forbes Ave., Pittsburgh, PA, 15213, United States of America, billerb@andrew.cmu.edu, Sridhar Tayur

We introduce a simulation-based framework that develops mixed integer linear programs for multi-product settings in which joint service-level criteria naturally arise and solves them for inventory-target estimators using a simulation-optimization technique. A computational study illustrates the importance of using this framework for managing multi-product inventory subject to joint service-level criteria under multivariate time-series demand uncertainty.

■ MA50

Computational Integer Programming I

Sponsor: Optimization/ Computational Optimization and Software (Joint Cluster Optim/CS)
Sponsored Session

Chair: Ricardo Fukasawa, Postdoctoral Fellow, IBM Research, 1101 Kitchawan Road / Rte 134, Yorktown Heights, NY, 10598, United States of America, rfukasaw@us.ibm.com

1 - Constraint Orbital Branching

Jeff Linderoth, University of Wisconsin Madison, 1513 University Avenue, Madison, WI, United States of America, linderoth@wisc.edu, Stefano Smriglio, James Ostrowski, Fabrizio Rossi

Orbital branching is a method for branching on variables in integer programming that reduces the likelihood of evaluating redundant, isomorphic nodes in the branch-and-bound procedure. In this work, the orbital branching methodology is extended so that the branching disjunction can be based on an arbitrary constraint. Computations computing the optimal incidence width of Steiner Triple Systems and minimum cardinality covering designs are discussed.

2 - Mixed Integer Programming Models for Non-separable Piecewise Linear Cost Functions

Juan Pablo Vielma, H. Milton Stewart School of Industrial and Systems Engineering, Georgia Institute of Technology, 765 Ferst Drive, NW, Atlanta, 30332, United States of America, gtg531t@mail.gatech.edu, George Nemhauser, Shabbir Ahmed

We review several Mixed Integer Programming formulations for separable continuous piecewise linear cost functions and their extensions to the non-separable and/or discontinuous cases. We compare both existing and new formulations by their theoretical properties and by their performance in computational experiments. We present results for different classes of transportation problems with separable/non-separable, continuous/lower-semicontinuous non-convex piecewise linear cost functions.

3 - Performance Variability in Mixed Integer Programming

Emilie Danna, Ilog Inc., 1195 W Fremont Ave, Sunnyvale, CA, 94087, United States of America, edanna@ilog.com

The solving time for a given MIP model sometimes varies dramatically if the branch-and-cut algorithm used to solve it is modified slightly, even if the algorithmic change is theoretically neutral with respect to performance. We will present evidence of this performance variability, examine its causes, describe its consequences, propose a few ideas to address it, and raise several related questions.

4 - Experiments with Extended Capacity Cuts

Ricardo Fukasawa, Postdoctoral Fellow, IBM Research, 1101 Kitchawan Road / Rte 134, Yorktown Heights, NY, 10598, United States of America, rfukasaw@us.ibm.com, Artur Pessoa, Eduardo Uchoa

Extended Capacity Cuts (ECC) are derived from an extended reformulation of the fixed-charge network flow problem. Simple ECCs have been used successfully to significantly reduce the duality gap of combinatorial optimization problems like the Capacitated MST, but can be applied to other important problems like vehicle routing and machine scheduling. We perform exact separation of ECCs and a variation called path-ECCs based on a result by Dash et al.. Computational results are presented.

■ MA51

Diffusion in Social Networks

Sponsor: Information Systems
Sponsored Session

Chair: Monica Johar, Assistant Professor, University of North Carolina at Charlotte, 9201 University City Blvd, Friday 352-C, Charlotte, NC, 28223, United States of America, msjohar@uncc.edu

1 - Location, Location and Location: An Analysis of Profitability and Position in Online Advertising

Kartik Hosanagar, Wharton School of the University of Pennsylvania, PA, kartikh@wharton.upenn.edu, Michael Smith, Ashish Agarwal

Advertisers engage in intense competition in online ad auctions in order to secure top positions in the list of sponsored results. We evaluate the impact of ad placement on revenues and profits generated from sponsored search using data from for several hundred keywords from the ad campaign of an online retailer. Using a hierarchical Bayesian model, we find that the topmost position is not necessarily the revenue-maximizing or profit-maximizing position.

2 - Combinatorial Search in Social Networks

Vijay Mookerjee, The University of Texas at Dallas, 800 West Campbell Road, Richardson, TX, United States of America, vijaym@utdallas.edu, Milind Dawande, Yunxia Zhu, Chelliah Sriskandarajah

We study three important problems of search in social networks: elite group, portal, and influence group. These problems and preliminary solution methods are discussed.

3 - Network Effects: The Influence of Quality and Diversity of Ties on Value of Software Innovation

Ram Gopal, University of Connecticut, University of Connecticut, School of Business, 2100 Hillside Road, Storrs, CT, 06269, United States of America, Ram.Gopal@business.uconn.edu, Xinxin Li, Harpreet Singh

Software innovations are heterogeneous in value with majority of them worth little. In this study, we investigate the impact of network social capital on value of software innovation. Based on empirical analysis on software patents data, we find that the count of quality weighted external direct contacts of a team and regional diversity of contacts significantly influence the value of innovation while the count of quality weighted external indirect contacts of a team has no significant impact.

4 - Using Knowledge Sharing in Organizational Social Networks to Improve Service Delivery

Su Dong, Student, University of North Carolina at Charlotte, 9201 University City Blvd, Friday, Charlotte, NC, 28223, United States of America, sdong1@uncc.edu, Monica Johar, Ram Kumar

This paper illustrates how knowledge sharing in organizational social networks can be used to enhance service delivery. We present an integer-programming model in which employees can use their social networks to acquire knowledge required to complete service-related tasks. A simulation-based heuristic is used to solve this problem. Our model can be used to study the impact of different network structures and task assignment strategies on organizational performance, and knowledge diffusion.

■ MA52

Remanufacturing Operations

Cluster: Environmentally Conscious Operations /
Closed Loop Production Supply Chain
Invited Session
Chair: Meltem Denizel, Professor, Sabanci University, Faculty of Management, Orhanli Tuzla, Istanbul, 34956, Turkey, denizel@sabanciuniv.edu

1 - Production Planning and Common Part Strategy in Closed-loop-supply Chains

Jenny Steinborn, TU Braunschweig, Institut for Production and Logistics Management, Katharinenstrasse 3, Braunschweig, 38106, Germany, j.steinborn@tu-bs.de, Grit Walther, Thomas S. Spengler

For OEMs with many product variants, a combination of product and component recycling strategies hold economic potentials. But strategies have to be implemented into forward production planning regarding rivalry for returned products and uncertainties. A model is developed for integrated production and recycling planning on tactical level. Returned products are allocated to recycling strategies allowing assessment of feasibility of recycling strategies and impact on demand for new components.

2 - Network Configuration and Capacity Planning in Hybrid Manufacturing/Remanufacturing Systems

David Francas, University of Mannheim, Schloss, S233, Mannheim, 68131, Germany, francas@bwl.uni-mannheim.de, Stefan Minner

We study hybrid manufacturing/remanufacturing systems with uncertain demand and return where manufacturing and remanufacturing processes are conducted in the same facility or each process is dedicated to separate facilities. With respect to different priorizations of the two processes, we analyze the optimal capacity decisions for both network configurations. Our analysis further demonstrates that shared facilities may be preferred due to the benefits of pooling demand and return risks.

3 - Harvesting and Refurbishing Decisions of a Remanufacturer

Oznur Ozdemir, Sabanci University, Sabanci University Faculty of Management, Orhanli Tuzla, Istanbul, 34956, Turkey, oznurozdemir@su.sabanciuniv.edu, Mark Ferguson, Meltem Denizel

We consider the disposition decisions of a remanufacturer. There are three options: a core can be refurbished, harvested for spare parts or salvaged at a certain value. The demand for the refurbished products and the spare parts are uncertain over time. The core availability is limited to meet all demand. We address the problem in a revenue management framework to maximize the firm's revenue over a T period horizon.

4 - Solution Approaches for a Capacitated Multi-Product Lot-Sizing Problem with Remanufacturing

Ibrahim Karakayali, Graduate Research Assistant, University of Florida, 303 Weil Hall, Gainesville, FL, 32611-6595, United States of America, ibrahimk@ufl.edu, Sila Cetinkaya, Halit Uster, Elif Akcali

We consider a capacitated multi-product lot-sizing problem for a hybrid manufacturing and remanufacturing system. We focus on a setting where manufactured and remanufactured items are perfectly substitutable; manufacturing, remanufacturing, and disposal activities are capacitated; and manufacturing capacity is shared among multiple product types. We develop decomposition-based solution approaches, and present computational results illustrating the efficiency of the proposed solution approaches.

■ MA53

Advances in Finance Engineering

Sponsor: Financial Services
Sponsored Session
Chair: James Primbs, Stanford University, japrimbs@stanford.edu

1 - Efficient Pricing of Discretely Monitored Barrier Options in a Lévy Model

Gudbjort Gylfadottir, University of Florida, Industrial and Systems Engineering, Gainesville, FL, United States of America, gudbjort@ufl.edu, Farid AitSahlia

We present a recursive method to price barrier options of European exercise style and where the underlying is assumed to follow an exponential Lévy process. The option is monitored at a specific set of discrete dates. Our method relies also on an efficient combination of quadrature approximations with the Lévy-Khintchine representation.

2 - Pricing Double-barrier Options under a Hyper-exponential Jump Diffusion Model via Laplace Transform

Xiangwei Wan, The Chinese University of Hong Kong, RM B104, PGH5, of Hong Kong, Shatin, N. T., Hong Kong, China, xwwan@se.cuhk.edu.hk, Ning Cai, Nan Chen

This paper studies the double-barrier options pricing under a jump diffusion model whose jump sizes are hyper-exponential distribution. By double-Laplace transform, analytical solution is given. And the option price is given by Laplace inversion algorithm. We prove the non-singular property of the matrix which guarantees the existence and uniqueness of the solution. Extensional barrier options are also formulated. Numerical examples are given at the end of the paper.

3 - American Option Pricing with Stochastic Volatility

Kumar Muthuraman, University of Texas at Austin, McCombs School of Business, Austin, TX, United States of America, kumar.muthuraman@mccombs.utexas.edu, Arun Chockalingam

We present a method to compute the optimal exercise policy and the price of an American options when the underlying asset price has stochastic volatility and a jump component. The method we present is essentially a transformation that transforms the arising free boundary partial integro differential equations into a sequence of fixed boundary problems.

4 - Fast Receding Horizon Methods for Hedging High Dimensional Options

James Primbs, Stanford University, japrimbs@stanford.edu

We present receding horizon dynamic hedging methods designed for high dimensional option hedging. Receding horizon methods repeatedly solve optimization problems in order to construct a hedging policy. In this talk, we provide and compare formulations designed to efficiently handle very high dimensional options.

5 - Optimal Hedging of Prediction Errors Using Prediction Errors

Yuji Yamada, Associate Professor, University of Tsukuba, 3-29-1 Otsuka, Bunkyo-ku, Tokyo, 112-0012, Japan, yuji@gssm.otsuka.tsukuba.ac.jp

Predicting the future weather conditions is considered important in real businesses for many industries including electricity producers and suppliers, because their profit or loss is largely affected by the weather conditions. Under these circumstances, we may have a new risk when the prediction error exists. In this work, we will propose a new type of weather derivative to effectively hedge the loss caused by prediction errors.

■ MA54

Models for Managing Cybersecurity Risk

Cluster: Risk Security
Invited Session
Chair: Lawrence Bodin, Professor Emeritus, University of Maryland, R. H. Smith School of Business, College Park, MD, 20742, United States of America, LBodin@rhsmith.umd.edu

1 - Identity Theft and Enterprise Data Leakage

Eric Johnson, Professor, Dartmouth College, Center for Digital Strategies, Tuck School of Business, Hanover, NH, 03755, United States of America, M.Eric.Johnson@tuck.dartmouth.edu

Identity theft impacts millions of consumers each year. We model the link between enterprise data leakage and the incidence of identity theft. Using data sets from US consumer complaints and file leakage from the top US banks, we find a statistical link between leak propensity and reported identity thefts.

2 - Impacts of Optimal Investment Models on Cybersecurity Risk Management

Kanta Matsuura, Professor, University of Tokyo, Tokyo, Japan, kanta@iis.u-tokyo.ac.jp

In cybersecurity risk management, it is difficult to find a straightforward way to use optimal investment models in practice. However, existing models have made impacts on the research community through their implications. For the purpose of exploring more applications, this talk discusses some of the realized and potentially expected impacts including new cyber-insurance issues in a recent model.

3 - Effectiveness of Software Assurance Programs: Evidence from Common Criteria

Rahul Telang, Associate Professor, Carnegie Mellon University, 4800 Forbes Avenue, HBH 2107D, Pittsburgh, PA, 15213, United States of America, rtelang@andrew.cmu.edu, Yubao Yang

To overcome the information asymmetry problem, one potential reason for poor security, governments have proposed certification programs like common criteria. Numerous countries have adopted common criteria and government agencies do not purchase a software unless it is certified. We collected data over many different product markets on vulnerabilities in a software product to test whether the certification programs lead to fewer vulnerabilities. Results are presented in this talk.

4 - Multiple Criteria Risk Measures for Cybersecurity

Lawrence Bodin, Professor Emeritus, University of Maryland, R. H. Smith School of Business, College Park, MD, 20742, United States of America, LBodin@rhsmith.umd.edu, Martin Loeb, Lawrence Gordon

Most procedures that have been developed for assessing risk for Cybersecurity base the analysis on a single criterion. However, assessing risk for Cybersecurity is best viewed in terms of multiple criteria. In this paper, we describe a process for carrying out this multi-criteria analysis and illustrate this process with several examples.

■ MA55

Joint Session TELCOM/CS: Telecommunications Network Design

Sponsor: Telecommunications, Computing Society
Sponsored Session
Chair: Youngwook Kim, Korea University / Division of Information Management Engineering, Sung-buk ku Anam dong 5-1,Seoul, S.Korea, Seoul, St, Korea, Republic of, actsmile@korea.ac.kr

1 - Clustering Telecommunications Nodes: Objectives and Challenges

John Klincewicz, Principal Member of Technical Staff, AT&T Labs, 200 South Laurel Avenue, Room D5-3C06, Middletown, NJ, 07748, United States of America, klincewicz@att.com

Planners often partition large networks into clusters that represent communities of interest. Clusters should have high volumes of intra-cluster traffic, be well-connected by network links and be compact in a geographic sense. In this talk, we discuss the shortcomings of applying traditional clustering algorithms to this problem and suggest possible approaches.

2 - Equitable Bandwidth Allocation in Content Distribution Networks

Hanan Luss, Senior Scientist, Telcordia Technologies, One Telcordia Drive, RRC-1D254, Piscataway, NJ, 08854, United States of America, hluss@telcordia.com

We present a bandwidth allocation model for a network that consists of multiple trees, where the root of each tree has a server that broadcasts multiple programs. The model is formulated as an equitable resource allocation problem with a lexicographic maximin objective function. The constraints include link capacity constraints and tree-like ordering constraints. We present an algorithm that provides an equitable solution in polynomial time for certain performance functions.

3 - A Branch-and-cut Procedure for Solving a Large-scale Next Generation Access Network Design Problem

Youngwook Kim, Korea University / Division of Information Management Engineering, Sung-buk ku Anam dong 5-1,Seoul, S.Korea, Seoul, St, Korea, Republic of, actsmile@korea.ac.kr, Kyunam Jang, Youngho Lee, Gigyoung Park

We present a branch-and-cut procedure for finding the optimal solution of large-scale broadband convergence access network. We formulate the problem as a three-level capacitated facility location-allocation model that minimizes the total cost, while satisfying nonlinear QoS constraints. The proposed branch and cut procedure implements a class of disjunctive cuts.

■ MA56

Maritime Transportation & Routing

Sponsor: Transportation Science & Logistics
Sponsored Session
Chair: Kevin Furman, ExxonMobil, 1545 Route 22 East, Annandale, NJ, 08801, United States of America, kevin.c.furman@exxonmobil.com

1 - Procuring Transportation for US Food Aid

Ozlem Ergun, Georgia Institute of Technology, 765 Ferst Drive, NW, Atlanta, GA, United States of America, oergun@isye.gatech.edu, Owen Carroll, Justin Stowe, Steven Butt, Emily Sarver, Jan Zhang

The US sends food aid through the Food for Peace program. Each month, an invitation to bid is published to acquire and transport food commodities. After the government receives all bids from commodity suppliers and ocean carriers, it awards contracts so that the total cost is minimized. We discuss an analytical tool that uses forecasting techniques, an optimization model to simulate the contract awarding process, and analysis tools to aid the ocean carriers in selecting the best bid price.

2 - Routing and Scheduling of Bulk Shipments: An Australian Perspective

Heng-Soon Gan, Department of Mathematics and Statistics, The University of Melbourne, Parkville, VIC, 3010, Australia, hsg@unimelb.edu.au, Olivia Smith, Natashia Boland

We present a multi-product ship scheduling problem encountered by a major Australian importer of bulk materials.We consider ships with different hold sizes (fixed bulkheads). Demands must be met by incoming shipments, existing inventory or trucks from nearby facilities. The problem is to determine a minimal cost shipping (and trucking) schedule such that demands, draft constraints, contractual obligations and practical limits are met. We solve this problem as a multi-stage mixed integer program.

3 - A Novel Heuristic to Solve Tanker Routing and Scheduling Problems

Iftekhar Karimi, Professor, National University of Singapore, Department of Chem & Biomolecular Eng, 4 Engineering Drive 4, Singapore, Singapore, cheiak@nus.edu.sg, Hong Choon Oh

Tanker routing and scheduling problems have attracted extensive interest from researchers for more than half a century. To date, none of these researchers manage to offer efficient solution methodologies that meet the practical needs of industry practitioners. This paper aims to bridge the application gap by introducing a novel solution methodology that can efficiently solve tanker routing and scheduling problem with account of all key operating constraints.

4 - A Maritime Split Pickup and Split Delivery Problem with Multiple Commodities and Non-paired requests

Frank Hennig, PhD Candidate, Norwegian University of Science and Technology, Alfred Getz veg 3, Trondheim, 7491, Norway, frank.hennig@iot.ntnu.no, Bjorn Nygreen

We discuss alternative formulations of the multi commodity split pickup and split delivery problem without predefined pairings of pickups and deliveries. The solution defines which pickups serve which deliveries. All pickups/deliveries can be split between an arbitrary number of ships. We assume that we have available a heterogeneous fleet of ships. Each ship can carry several commodities simultaneously. We wish to report computational results for small test cases solved by different approaches.

■ MA57

Green Supply Chain Management

Sponsor: Junior Faculty Interest Group
Sponsored Session
Chair: Lawrence V. Snyder, Lehigh University, 200 West Packer Ave., Mohler Lab, Bethlehem, PA, 18015, United States of America, lvs2@lehigh.edu

1 - Design and Operation of Closed-loop Supply Chains: Practical Aspects and Analytical Models

Elif Akcali, Associate Professor, University of Florida, 303 Weil Hall, Gainesville, FL, 32611-6595, United States of America, akcali@ise.ufl.edu, Halit Uster, Sila Cetinkaya

The increased popularity of remanufacturing requires firms to design and operate efficient closed-loop supply chain (CLSC) systems. In this talk, we will provide a critique of the existing literature on network design and inventory and production planning for CLSC systems. We examine the degree to which the existing quantitative models address the practical challenges encountered in industry. We also discuss new research avenues that will aid in the practical implementation of remanufacturing.

2 - Replacement Strategies for Potentially Hazardous Substances
Feryal Erhun, Stanford University, Department of MS&E,
Stanford, CA, United States of America, ferhun@stanford.edu,
Tim Kraft, Robert Carlson, Dariush Rafinejad

In 2007 the EU established strict chemical regulations to better protect human health and the environment. The US does not have such laws in place; hence there is often a gap between discovery of potentially hazardous substances and regulation. As a result, firm's replacement decisions are made without clear insight into risks and future regulations. We model a replacement decision, including public relations and competition risk. We then derive insights into how this reshapes a firm's strategy.

3 - LCA Methods for Estimating Supply-chain Contaminant Emissions for Construction Projects
Seth Guikema, Assistant Professor, Johns Hopkins University,
Department of Geography and, Environmental Engineering,
Baltimore, MD, 21218, United States of America,
sguikema@jhu.edu, Neethi Rajagopalan

Supply chains have been shown to account for a significant portion of total contaminant emissions from construction projects, and environmental assessments that ignore supply chain effects miss this portion of the environmental impact of these projects. However, life-cycle assessment for construction projects is challenging. This talk provides an overview and comparison of the two basic methods for incorporating supply chain effects into a life-cycle assessment for construction projects.

■ MA58

Topics in Aviation OR
Sponsor: Aviation Applications
Sponsored Session
Chair: Stefan Karisch, Director, Operations Research and Optimization, Jeppesen, 1800 McGill College Avenue, Suite 1930, Montreal, QC, H3A 3J6, Canada, Stefan.Karisch@jeppesen.com

1 - Aircraft Operations for Minimum Environmental Impact
Stephen Altus, Jeppesen, 225 West Santa Clara Street, Suite 1600,
San Jose, CA, 95113, United States of America,
steve.altus@jeppesen.com, Geoffrey Bower

There is a direct relationship between aircraft operating costs, fuel, and emissions, but just how close are their optimal solutions? We review current optimization methods, including the impact of rising fuel prices in the solution, and compare different merit functions. How close are the results, and what is the sensitivity to changes in specific costs? Ongoing research to optimize operations for cost and environment, including fleet and schedule implications, is described.

2 - Extending the Basic Airline Crew Pairing Problem
Johan Ivarsson, Jeppesen, Odingsgatan 9, Gothenburg, 411 03,
Sweden, johan.ivarsson@jeppesen.com, Lennart Bengtsson,
Curt Hjorring, Fredrik Altenstedt, Henrik Delin

We will look at two extensions to the crew pairing problem, which at first sight might not appear related but may be addressed with the same technique, namely retiming and fly below rank. Retiming is about changing the actual flight schedule in order to obtain a better solution, whereas fly below rank is about letting a crew change to a more junior role temporarily. The variable crewing extension will also be discussed briefly, which addresses how to team crew together efficiently.

3 - Large Scale Crew Rostering- A Combined Local Search and Column Generation Approach
Tomas Gustafsson, Head of Optimization, Jeppesen, Jeppesen
Systems AB | PO Box 192, Goteborg, 411 03, Sweden,
tomas.gustafsson@jeppesen.com, Hamid Kharraziha

Large scale weighted fair share crew rostering problems are in them selves very challenging to solve. If you add the requirement that the approach should work for more or less any airline without significant changes, the challenge increase dramatically. We will describe the current Jeppesen approach in production with many major airlines and discuss further ideas to increase performance.

4 - Airline Operations Control Modeling
Goran Stojkovic, Jeppesen, 1800 McGill College Avenue,
Suite 1930, Montreal, QC, H3A 3J6, Canada,
goran.stojkovic@jeppesen.com

Most airlines are organized in functional silos. The resulting fragmented processes prove suboptimal and can be costly, slow and inconsistent in operations. To provide an efficient holistic solution, we created the airline business process model that maps functional areas and processes. The developed model helps to measure efficiency, detect bottlenecks, create what-if scenarios and build robust, integrated mathematical models. Examples that highlight the value of our approach will be provided.

■ MA59

Pricing and Learning in Competitive Networks
Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session
Chair: Nicolas Stier-Moses, Columbia Business School, Uris 418, New York, NY, 10027, United States of America, ns2224@columbia.edu
Co-Chair: Asu Ozdaglar, MIT, 77 Massachusetts Avenue , 32-D630, Cambridge, MA, 02139, United States of America, asuman@mit.edu

1 - The Anarchy of Price Competition
Amr Farahat, Cornell University, 370 Sage Hall, Ithaca, NY, 14853,
United States of America, farahat@cornell.edu, Georgia Perakis

We investigate the effects of price competition, compared to centralized pricing, on industry profits and total surplus in differentiated oligopolies. The products are gross substitutes, the number of firms is arbitrary, and the demand model is a nonnegative extension of the affine function. We provide sharp bounds on the ratio of decentralized to centralized profits that are independent of marginal costs and we prove that the loss of efficiency due to competition is no more than 25%.

2 - Markups in Network Pricing
Nicolas Stier-Moses, Columbia Business School, Uris 418, New
York, NY, 10027, United States of America, ns2224@columbia.edu,
Jose Rafael Correa

We study a game in which producers adopt price functions proportional to their production costs by deciding which markups to charge. In a second phase, consumers learn the producers' price functions, which leads to an allocation of consumers to producers. We look at characteristics of the resulting equilibrium and show that its social cost is close to that of the optimal allocation. In particular, we study the worst-case inefficiency as a function of the competitiveness of the marketplace.

3 - Rule-of-Thumb Learning in Social Networks
Angelia Nedich, UIUC, angelia@uiuc.edu, Asu Ozdaglar,
Daron Acemoglu

We study the problem of dynamic learning by a social network of connected agents. Each agent receives a signal about an underlying time-varying state and communicates with a subset of agents (his neighbors). We consider the rule of thumb learning rules whereby each agent constructs his posterior as a weighted average of his prior, his signal and the information he receives from neighbors. Our main results characterize the convergence behavior of beliefs.

4 - Decision-making in Social Networks
Ilan Lobel, 77 Massachusetts avenue, Cambridge, MA, 02139,
United States of America, lobel@mit.edu, Daron Acemoglu,
Munther Dahleh, Asu Ozdaglar

We study the equilibrium of a model of learning and decision-making over a social network. Each individual receives some signal about an underlying state, observes the actions of a neighborhood of individuals, and chooses an action. We characterize conditions that allow efficient aggregation of information. We show that information with unbounded likelihood almost always propagates efficiently, while bounded likelihood demands specific network topologies for information aggregation.

■ MA60

Student Rail Research Paper Contest
Sponsor: Railway Applications
Sponsored Session
Chair: Michael Gorman, Associate Professor, University of Dayton, School of Business, 300 College Park, Dayton, OH, 45469-2130, United States of America, michael.gorman@udayton.edu

1 - Student Rail Research Paper Finalists
Michael Gorman, Associate Professor, University of Dayton,
School of Business, 300 College Park, Dayton, OH, 45469-2130,
United States of America, michael.gorman@udayton.edu

This presentation, and two others in this session, will showcase finalists in the Rail Applications Section's student paper contest.

2 - First Prize: A Decision Support Framework for Rolling Stock Rescheduling
Lars Nielsen, PhD Student, Erasmus University Rotterdam,
Rotterdam School of Management, PO Box 1738, Rotterdam ZH
3000DR, Netherlands, lnielsen@rsm.nl

We present a generic framework for modeling disruptions in railway rolling stock schedules. A disruption is modeled as an online rolling stock rescheduling problem where information on resource availability becomes available as the situation evolves. We propose a rolling horizon approach to decompose the problem and

extend an existing model for generic rolling stock scheduling to the real time case. We perform computational tests on instances constructed from real life cases and discuss their implications.

3 - Second Prize: An Algorithm for Railway Crew Rescheduling
Daniel Potthoff, PhD Student, Erasmus University Rotterdam, Econometric Institute, PO Box 1738, Rotterdam ZH 3000DR, Netherlands, potthoff@few.eur.nl, Guy Desaulniers, Dennis Huisman

On the Dutch railway network, there are daily about 20 disruptions. In this paper, we present an algorithm to reschedule the crew when such a disruption occurs. The algorithm is based on column generation techniques combined with Lagrangian heuristics. Since the number of duties is in practical instances very large, we first define a core problem of tractable size which has a high chance to deliver a good rescheduling solution. Then the algorithm performs a limited number of large neighborhood search steps to improve the solution.

■ MA61

Transportation Network Vulnerability and Performance Assessment
Sponsor: Transportation Science & Logistics
Sponsored Session
Chair: Anna Nagurney, John F. Smith Memorial Professor, University of Massachusetts Amherst, Isenberg School of Management, Amherst, MA, 01003, United States of America, nagurney@gbfin.umass.edu

1 - Assessing Transportation Network Vulnerability Considering Driver Re-routing
Pam Murray-Tuite, Assistant Professor, Virginia Tech, 7054 Haycock Road, Falls Church, VA, 22043, United States of America, murraytu@vt.edu

Transportation network vulnerability assessments must consider more than the network topology. The drivers are independent entities who exert independent control over their decisions to travel if at all and the route, which may change once begun. A mathematical program is presented to identify links to which the network is most vulnerable considering driver decisions.

2 - The Impacts of Area-covering Disruptions in Road Networks
Erik Jenelius, Royal Institute of Technology (KTH), Teknikringen 78B, Stockholm, SE-100 44, Sweden, jenelius@infra.kth.se, Lars-Göran Mattsson

Events such as snow storms and earthquakes can affect extended areas of the transport system. We present a systematic methodology for analyzing the consequences of such events. The studied road network is covered with grids of varying sizes and positions, where each square represents a disrupting event. The consequences, in terms of travel time increases, of each disruption are then calculated for different regions. The methodology is applied to the Swedish road network.

3 - Optimizing Network Infrastructure Service Recovery
Alan Murray, Professor, Arizona State University, School of Geographical Sciences, Tempe, AZ, 85287, United States of America, atmurray@asu.edu, Timothy Matisziw

Reestablishing functionality to network infrastructure following a damaging event is an essential component of any disaster recovery plan. However, necessary repairs can be costly and time consuming, and recovery efforts need to be prioritized to ensure repairs take place as efficiently as possible. This paper details a multi-objective spatial optimization approach for prioritizing recovery efforts with respect to budgetary and scheduling constraints.

4 - A Relative Total Cost Index for the Evaluation of Transportation Network Robustness
Qiang Qiang, Doctoral Student, University of Massachusetts Amherst, Isenberg School of Management, Amherst, 01003, United States of America, qqiang@som.umass.edu, Anna Nagurney

We show how to capture the robustness of a transportation network in the case of degradable links. With the use of BPR user link travel cost functions, we propose two relative total cost indices to assess transportation network robustness in the case of U-O or S-O travel behavior. We derive certain upper bounds and illustrate the indices on several transportation networks.

■ MA62

Pricing for Goods and Services
Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session
Chair: Yun Fong Lim, Assistant Professor, Singapore Management University, Lee Kong Chian School of Business, 50 Stamford Rd, #04-01, Singapore, 178899, Singapore, yflim@smu.edu.sg

1 - Numerical Analysis of Optimal Product-line Design
Chi-Guhn Lee, Associate Professor, University of Toronto, 5 King's College Road, Toronto, ON, M5S 3G8, Canada, cglee@mie.utoronto.ca, Kevin Ferreira

In this research we have developed an optimization framework to find a product-line, a collection of products with varying specifications and prices, which maximizes the expected total. We have performed optimization in various market situations to shed light on how optimal product-line reacts to changing market conditions. We also carried out the analysis on a large scale consumer survey.

2 - Inventory Models with Fully Backlogged Orders and Alternative Delivery Lead Time
Haifeng Wang, Chinese University of Hong Kong, Hong Kong, China, hfwang@se.cuhk.edu.hk, Houmin Yan

A supplier has a periodical review inventory system that provides multiple lead-time options to customers. The supplier serves a higher and lower priority class with a short and a flexible lead-time requirement, respectively. Unsatisfied customer orders are fully backlogged. With the backlogged the orders, one has to consider the priority to clear backlogs. We consider FCFS and SCFS rules. We characterize optimal inventory-commitment and inventory-replenishment policies.

3 - Channel Management in the Sale of After-Sales Services
Ming Hu, Assistant Professor, Rotman School of Management, University of Toronto, 105 St. George Street, Toronto, ON, M5S 3E6, Canada, ming.hu@rotman.utoronto.ca, Shailendra Jain, Jose Luis Beltran, Julie Ward, Guillermo Gallego

The work extends research in the field of after-sales service management by examining competition in selling extended warranties and service contracts between a supplier and a retailer. Since the supplier depends on the retailer for product sales and competes with her for services, it is challenging to manage these relationships. A product-service bundling schedule with wholesale price discount is proposed to coordinate the decentralized supply chain.

4 - Dynamic Pricing for Hotels Considering Multiple-Day Stays
Yun Fong Lim, Assistant Professor, Singapore Management University, Lee Kong Chian School of Business, 50 Stamford Rd, #04-01, Singapore, 178899, Singapore, yflim@smu.edu.sg, Qing Ding, Kum-Khiong Yang

We study the pricing policy that maximizes the expected revenue for hotels with stochastic and nonstationary arrivals of requests for a single room type. We consider the capacity requirement of multiple-day stays if customers make such reservations. We formulate this problem as a stochastic dynamic program. Our results suggest that we should substantially raise the rental rates for high-demand days and simultaneously lower the rental rates for their neighboring, low-demand days.

■ MA63

Material Handling in Wafer Fabrication
Sponsor: Transportation Science & Logistics
Sponsored Session
Chair: Dima Nazzal, Assistant Professor, the Department of Industrial Engineering and Management Systems, University of Central Florida, 4000 Central Florida Blvd., Orlando, FL 32816, United States of America, dnazzal@mail.ucf.edu

1 - A Queuing Model of a Conveyor-based AMHS to Support Configuration Design of Semiconductor Wafer Fabs
Dima Nazzal, Assistant Professor, the Department of Industrial Engineering and Management Systems, University of Central Florida, 4000 Central Florida Blvd., Orlando, FL 32816, United States of America, dnazzal@mail.ucf.edu, Hector J. Carlo, Jesus Jimenez, Andy Johnson

This study proposes an analytical queuing model of a conveyor-based Automated Material Handling System (AMHS) to enable rapid capacity and configuration design of semiconductor wafer fabs. The goal of the study is to accurately estimate the work-in-process (WIP) on the AMHS and assess the system stability. Numerical examples demonstrate and validate the queuing model over a wide range of operating configurations. Results show that this model estimates expected WIP with reasonable accuracy.

2 - Efficient Modeling Abstractions for Simulating the Wafer Fab and the AMHS

Jesus Jimenez, Assistant Professor, Texas State University-San Marcos, Ingram School of Engineering, 601 University Drive, San Marcos, TX, 78666-4616, United States of America, jesus.jimenez@txstate.edu

Simulation models representing the wafer processing steps and the automated material handling systems (AMHS) are used for wafer fab design. However, it takes too much time to build and analyze such models. This research presents several abstraction methods for simulating the fab at lower levels of detail, seeking to accurately and efficiently appraise the fab capacity and the AMHS. Our results show that some abstractions generate good performance estimates while reducing computational time.

3 - A Metamodel Approach to Simulate Material Handling in Wafer Fabs

Yan Wang, Assistant Professor, University of Central Florida, 4000 Central Florida Blvd., Orlando, FL, 32816, United States of America, wangyan@mail.ucf.edu, Ola Batarseh, Dima Nazzal

Simulation is used to model automated material handling systems (AMHS) in wafer fabs. The models produce accurate assessments of performance but are time-consuming to construct and execute. We present a metamodel that provides fast and reasonably accurate estimates of the AMHS response time to move requests. The metamodel is based on a new reliable simulation mechanism that takes essential simulation parameters as intervals to incorporate uncertainties associated with dependency relationships.

■ **MA64**

Joint Session TSL/AAS: Optimization Models for Enroute Air Traffic

Sponsor: Transportation Science & Logistics, Aviation Applications
Sponsored Session

Chair: David Lovell, Associate Professor, University of Maryland, 1173 Martin Hall, Department of Civil & Env. Eng., College Park, MD, 20742, United States of America, lovell@umd.edu

1 - Weather Integrated Airspace Capacity Modeling and Optimization

Tim Myers, Senior Analyst, Metron Aviation, 431 W Princess Anne Road, Norfolk, VA, 23517, United States of America, myers@metronaviation.com

Achieving the FAA Flight Plan goals of increased capacity and reduced congestion will require an evolving understanding of existing airspace capacity and congestion issues. Research was conducted using recently-enhanced weather forecasting products to derive improved airspace capacity forecasts which were applied in a network flow model representation of the National Airspace System to optimize the routing and scheduling of aircraft under dynamic capacity and demand constraints.

2 - A Comparison of Resource Allocation Algorithms for Traffic Flow Management with Rerouting

Nathaniel Gaertner, Analyst, Metron Aviation, 131 Elden St. Ste 200, Herndon, VA, 20170, United States of America, gaertner@metronaviation.com, Robert Hoffman

The need to address the problem of resource allocation in traffic flow management while incorporating rerouting as well as delay has spawned a variety of algorithms and models, ranging in approach from classic optimization to heuristics. Though efficiency in terms of total cost is a primary driver, consideration should also be given to other performance metrics such as equity, predictability, flexibility, and runtime. We evaluate and compare alternative algorithms for solving this problem.

3 - Prediction of Weather Related Center Delays

Deepak Kulkarni, NASA, MS 169-2, Moffett Field, CA, 94035, United States of America, deepak.kulkarni@nasa.gov, Dr. Banavar Sridhar

In this study, the methodology used for estimating the delay at the national level was extended to estimate delays caused by a center and delays experienced by a center. It was found that delays caused by a center can be predicted using that center's WITI whereas delays experienced by a center are best predicted using WITI of that center and that of a few prominent centers. Futhermore, there is differential impact of weather of different centers on center delays.

■ **MA65**

Strategic Planning

Contributed Session

Chair: Arief Suharko, PT Bakrie & Brothers Tbk, Jl. HR Rasuna Said, Jakarta Selatan, Indonesia, suharko@indosat.net.id

1 - Multistage Stochastic Program for Planning of Offshore Oilfield Infrastructure under Uncertainty

Bora Tarhan, Graduate Student, Carnegie Mellon University, 5000 Forbes Ave., Pittsburgh, PA, 15213, United States of America, btarhan@andrew.cmu.edu, Ignacio Grossmann

We consider design and planning of an oilfield infrastructure over a planning horizon. Main uncertainties considered are initial maximum oil flowrate, size and water breakthrough time of reservoir, which are gradually revealed as a function of design and operation decisions. We propose a multistage stochastic programming model that optimizes investment and operation decisions. Solution method relies on duality based branch and bound method involving nonconvex mixed-integer nonlinear subproblems.

2 - New Product Introduction Timing and Capacity Allocation: A Dynamic Programming Approach

Banu Gemici-Ozkan, PhD Candidate, Lehigh University, 200 West Packer Ave, Bethlehem, PA, 18015, United States of America, bag4@lehigh.edu, S. David Wu, Chung-Yee Lee

Contract Manufacturer (CM) often faces the strategic options of devoting its capacity entirely to a brand-carrying customer (BC), or leveraging its capabilities to develop its own market presence. We propose a dynamic programming approach to analyze market entry timing and capacity allocation decisions for varying diffusion models.

3 - Measuring Customer Satisfaction in Multi Service Companies

Baris Carikci, TUSSIDE, Gebze / Kocaeli, Istanbul, Turkey, bcarikci@yahoo.com

The reorganization of a multiservice company makes trouble, when the services are interrelated and provided in different locations. To measure customer satisfaction of each service of a multiservice company by using only survey seems to be a solution to find a customer oriented structure. In this practice, the survey process and its effect on reorganization will be discussed.

4 - A Simulation Model for Steel Project Development Optimization

Arief Suharko, PT Bakrie & Brothers Tbk, Jl. HR Rasuna Said, Jakarta Selatan, Indonesia, suharko@indosat.net.id

A simulation model is developed to assist the decision making process in determining the path to be chosen in developing a steel mill complex. The objectives of the exercise are to find the maximum economic value for the parent company while concurrently maximizing the fair risk and returns for the related subsidiary companies such as in the area of the property and general infrastructure.

■ **MA66**

Architecture and Governance

Cluster: Governance of Software Development
Invited Session

Chair: Tim Klinger, IBM Thomas J. Watson Research Center, 19 Skyline Drive, Hawthorne, NY, 10532, United States of America, tklinger@us.ibm.com

1 - Adaptive Architectures and Governance

Peri Tarr, IBM Thomas J. Watson Research Center, 19 Skyline Drive, Hawthorne, NY, 10510, United States of America, tarr@us.ibm.com

Architectures represent the mapping of a problem domain into a software solution. As such, they are early indicators of degree of alignment between a business need and a proposed solution. Although every system has an identifiable architecture, substantial portions of architectures arise via emergence and adaptation over time. We present adaptive architectures, focusing on architectures from agile and open source projects and what they teach us about developing business-aligned architectures.

2 - The Value of Software Architecture

Clay Williams, Manager, Governance Science Research, IBM, IBM Research, Hawthorne, NY, 10532, United States of America, clayw@us.ibm.com

Software architecture has moved beyond addressing purely computational concerns, as academics in both computer science and business have explored how architectures can create value for a firm. In this talk, I will review some of

the fundamental work exploring the economics of software architecture. I will then present a framework where architecture is central to the questions of value and governance in software development. I conclude by discussing some open research questions.

■ MA67

Location Models

Sponsor: Location Analysis
Sponsored Session

Chair: Zvi Drezner, Professor, California State University, Fullerton, Department of ISDS, Fullerton, CA, 92834, United States of America, zdrezner@Fullerton.edu

1 - Max Dispersion Territory Design Problems

Stefan Nickel, Professor, Saarland University and Fraunhofer ITWM, Campus A 5 3, Saarbrücken, Germany, s.nickel@orl.uni-saarland.de, Jörg Kalcsics, Elena Fernandez, Roger Rios

The problem we discus is motivated by the new recycling directive WEEE of the EC. The core of this law is that each company which sells electronic products has the obligation to recollect and recycle an amount which is proportional to the market share of the company. To avoid a monopoly in some region, all basic areas which are allocated to the same corporation should be geographically as dispersed as possible. We present a mathematical model, properties and computational results.

2 - Strategic Redeployment of Emergency Helicopters based on Weather and Visibility

Rajan Batta, Professor, Department of Industrial & Systems Engineering, University at Buffalo (SUNY), 420 Bell Hall, Buffalo, NY, 14260, United States of America, batta@eng.buffalo.edu, Elif Tokar-Erdermir

Emergency helicopters may not be dispatched under bad weather/visibility conditions, and night dispatch requires larger helipads. We study the problem of locating ambulances and emergency helicopters under changing weather/visibility conditions, and whether to redeploy the helicopters at different states of the system. We consider three coverage types: only ground, only air, and joint ground-air. Objective is to maximize accident coverage at each state without exceeding relocation cost limit.

3 - Bi-objective Coverage Models for EMS Facility Location

P. M. Dearing, Clemson University, PO Box 340975, Clemson, SC, 296340975, United States of America, pmdrn@clemson.edu, Matthew Saltzman, Jennifer Van Dyken

Location problems may involve trade offs between conflicting objectives. We present algorithms for generating all nondominated outcomes for locating a fixed number of EMS facilities while maximizing coverage of demand points within two different response times and for minimizing the number of facilities while maximizing coverage within a given time.

4 - A Cover-based Competitive Location Model

Tammy Drezner, California State University, Fullerton, Department of ISDS, Fullerton, CA, 92834, United States of America, tdrezner@fullerton.edu, Pawel Kalczynski, Zvi Drezner

We propose a new approach to estimating market share captured by competing facilities. Each competing facility has a 'sphere of influence' determined by its attractiveness level. More attractive facilities have a larger radius of the sphere of influence. The buying power of a customer in the sphere of influence of several facilities is equally divided among the competing facilities. The buying power of a customer in the sphere of influence of no facility is lost.

■ MA68

Issues in Customer Relationship Management

Sponsor: Marketing Science
Sponsored Session

Chair: B.P.S. Murthi, Associate Professor, The University of Texas at Dallas, SM 32 School of Management, 800 West Campbell Road, Richardson, TX, 75080, United States of America, murthi@utdallas.edu

1 - Returns to Consumer Search and its Determinants

Shweta Singh, Assistant Professor, Texas Woman's University, 304 Administration Drive, PO Box 425589, Denton, TX, 76204, United States of America, Shweta_utd@hotmail.com, B.P.S. Murthi, Brian Ratchford

We provide a comprehensive approach to measuring returns to consumer search. We base our conceptual framework of returns to search on the household production model and define returns to search as the efficiency with which

consumers are able to make optimal choices. We employ Data Envelopment Analysis (DEA) to create a measure of returns to search. Our findings indicate that Internet users and more experienced and informed consumers tend to make more efficient choices.

2 - Uniform Pricing for Digital Goods: Effects on Competition

Dinah Vernik, PhD Candidate, Fuqua School of Business, Duke University, Durham, NC, 27708, United States of America, dav2@duke.edu, Preyas Desai, Debu Purohit

The digitization of goods such as music and movies has led to the emergence of a new class of retailers that specialize in digital downloads. The resulting competition has led to interesting pricing policies. Online retailers tend to prefer uniform pricing where all "products" carry a single price, while traditional retailers differentiate prices. In our paper we show how the asymmetric equilibrium we observe in the market can change with the nature of competition between the retailers.

3 - Optimal Referral Bonuses with Asymmetric Information: Firm-Offered and Interpersonal Incentives

Laura Kornish, Assistant Professor, Leeds School of Business, University of Colorado, UCB 419, Boulder, CO, 80305, United States of America, kornish@colorado.edu, Qiuping Li

Referral bonuses are currently a popular way to stimulate word-of-mouth in some categories. We analyze optimal bonuses and pricing, when people's reasons for making product recommendations include placing value on a friend having a positive experience with a product they recommend. We find that in many cases, the more that people care about the outcomes of their recommendations, the higher the referral bonus should be. However, if people care enough about others, the firm should not use bonuses.

4 - The Effect of Modes of Acquisition and Retention Strategies on Customer Profitability

Erin Steffes, Assistant Professor, Towson University, 8000 York Road, Towson, MD, 21252, United States of America, esteffes@towson.edu, B.P.S. Murthi, Ram Rao, Andrei Strijnev

We investigate how acquisition and retention strategies differ in their ability to attract and keep profitable customers in the credit card industry. Among the acquisition modes, Internet and direct mail generate more profitable customers than telemarketing and direct selling. We find that customers with loyalty cards and/or affinity cards are less profitable. Our work adds to the CRM literature and our results have managerial implications for marketing resource allocation.

5 - Risk Adjusted Lifetime Value: An Application to Credit Card Market

B.P.S. Murthi, Associate Professor, The University of Texas at Dallas, SM 32 School of Management, 800 West Campbell Road, Richardson, TX, 75080, United States of America, murthi@utdallas.edu, Shweta Singh, Erin Steffes

Current customer lifetime value models are not suitable for application in financial services industry as they only consider the discounted profits generated by a customer but do not control for the associated risk factors. We use Stochastic Frontier Analysis(SFA) techniques to develop a Risk-adjusted lifetime value model (RALTV). We apply it to credit card market and show that it performs better than current lifetime value models in identifying profitable but less risky customers.

Monday, 11:00am - 12:30pm

■ MB01

Equilibria in eBusiness

Sponsor: eBusiness
Sponsored Session

Chair: Bob Day, Assistant Professor, University of Connecticut, 2100 Hillside Road, Storrs, CT, 06269, United States of America, bob.day@business.uconn.edu

1 - Expectation-based Versus Potential-aware Automated Abstraction in Imperfect Information Games

Andrew Gilpin, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA, United States of America, gilpin@cs.cmu.edu, Tuomas Sandholm

Automated abstraction algorithms for sequential imperfect information games are a key component in developing competitive game theory-based agents. Previously, agents whose construction has used automated abstraction have only been compared under confounding effects. We conduct systematic experiments on Rhode Island Hold'em poker, comparing abstraction algorithms against each other, against optimal play, and against each agent's nemesis.

2 - Supply Chain Progress Monitoring Based on Individualized Trace Data

Jun Shu, Assistant Professor, Penn State, Department of Supply Chain and Informati, 462 Business Building, University Park, PA, 16802, United States of America, junshu@psu.edu, Dr. Russell Barton

Although quality control is widely used in manufacturing, its use in supply chains is practiced ad hoc, rather than rigorously defined using statistical characterizations. We develop a mathematical framework to represent and manipulate individualized trace data at multiple levels of aggregation. Using this framework, we propose several generic quality measures for the progress of entities through a supply chain and describe methods to monitor these measures.

3 - Online Bidding Agents and Walrasian Equilibrium Prices

Bob Day, Assistant Professor, University of Connecticut, 2100 Hillside Road, Storrs, CT, 06269, United States of America, bob.day@business.uconn.edu, Rohit Aggarwal

Minimal Walrasian equilibrium prices can be used to provide a benchmark for the study of markets consisting of online auctions for identical or nearly identical items. The derivation of these equilibrium prices suggests bidding strategies that can be implemented by automated agents, and we show conditions under which the use of these bidding agents forms a Nash equilibrium.

4 - RFID Adoption through Supply Chain Collaboration and Standardization

Jun Shu, Assistant Professor, Penn State, Department of Supply Chain and Informati, 462 Business Building, University Park, PA, 16802, United States of America, junshu@psu.edu, Terry Harrison

We present a theory that predicts and guides the adoption and standardization of RFID technology in early stage. We show that without a strong presence of network effects for \emph{all} firms involved—-a fact in RFID adoption currently—-a universal standard will not form; however, with the sharing of individual firms' network benefits from technology, we can increase the sizes and reduce the number of isolated standard coalitions, and help the technology's overall adoption.

■ MB02

Joint Session IS/CS:Digital Goods and Markets: Emerging Models and New Frontiers II

Sponsor: Information Systems, Computing Society
Sponsored Session

Chair: Sudip Bhattacharjee, Associate Professor, University of Connecticut, OPIM Department, School of Business, Storrs, CT, United States of America, Sudip.Bhattacharjee@business.uconn.edu

1 - Diffusion of User-Generated Digital Content in a Social Network Structure

Anjana Susarla, Assistant Professor, University of Washington, 336 Mackenzie, Box 353200, Seattle, WA, 98195, United States of America, asusarla@u.washington.edu, Yong Tan, Jeongha Oh

The growth of social computing models in a variety of online markets has increased access to information and greatly expanded the available set of choices to consumers. We gather data from YouTube to understand the role of social influence on the diffusion of digital content. Econometrically, the contribution of this paper is to identify social influence in digital markets. Another contribution is to distinguish between social contagion and user heterogeneity in the diffusion process

2 - Influential Research in Information Systems: A Social Network Analysis of Research in Digital Goods

Sudip Bhattacharjee, Associate Professor, University of Connecticut, OPIM Department, School of Business, Storrs, CT, United States of America, Sudip.Bhattacharjee@business.uconn.edu, Harpreet Singh, James R. Marsden

We identify over 130 research papers in two digital goods domains - software and music - published in peer-reviewed journals. We then create a social network based on a paper's listed references within the set of chosen papers. We identify influential papers in each domain, and provide a structured identification and classification of key papers and contributors. We also contrast network linkage density between the domains, and draw conclusions and suggestions for future research.

3 - Music for a Song: An Empirical Look at Uniform Song Pricing and its Alternatives

Joel Waldfogel, Professor, Wharton, 1405 ShDh, The Wharton School, Philadelphia, PA, 19104, United States of America, waldfogj@wharton.upenn.edu, Ben Shiller

We explore various song pricing schemes, including song-specific pricing, bundling, and third-degree price discrimination, using survey-based data. We

find that revenue could be increased by a tenth while maintaining consumer surplus at the high level accompanying current $0.99 uniform song pricing. Even with sophisticated pricing, however, much of the area under the demand curve for this product cannot be appropriated as revenue.

4 - The Impact of Music Blogging on Consumption

Jui Ramaprasad, University of California, Irvine, Paul Merage School of Business, Irvine, CA, United States of America, jramapra@uci.edu, Sanjeev Dewan

We examine an integrated framework of music blogging, sampling and sales. We first study the impact of blog and music characteristics on sampling; then we examine the relationship between sampling/blog buzz and album sales. We gain insights on the role of blog influence and popularity on sampling in the body and tail of the sales distribution. Ongoing work uses Granger causality analysis to study the relationship between blog buzz and album sales for 'independent' vs. 'mainstream' music.

■ MB03

Current Research in Homeland Security and Counterterrorism: Reports from the Daniel Rose Technion-Yale Initiative and the NPS-JIEDDO Program

Cluster: To The Memory of Richard Rosenthal
Invited Session

Chair: Ed Kaplan, Yale University, School of Management, edward.kaplan@yale.edu

1 - Dynamic Coordination between Two Asymmetric Agents Moving Along a Route

Boaz Golany, Technion - Israel Institute of Technology, golany@ie.technion.ac.il, Konstantin Kogan, Uriel G. Rothblum

We consider a two-agent dynamic location problem with asymmetric settings. The model can be implemented in various environments: sales, inventory control, homeland security and more. Since each agent has its individual objective function and these functions are interdependent, decisions made by one agent may affect the performance of the other agent and thus affect the overall performance of the system. We show that under a broad range of system's parameters, centralized (system-wide optimal) and non- cooperative (Nash) behavior of the agents are characterized by a similar structure. Specifically, the faster agent captures first a greater territory at its maximum speed, but then slowly retreats to some optimal location to possibly rest before getting back to the starting point in a similar way. The timing of these trajectories and the intermediate speeds are however different. Moreover, non- cooperative agents travel more and may never rest and thus the system performance deteriorates under decentralized decision- making. We show that a general (static) linear reward approach developed in Golany and Rothblum (2006) can be extended to provide coordination of the moving agents and suggest its dynamic modification.

2 - Why it is Hard to Defeat Insurgencies: The Effect of Intelligence in Counterinsurgency Operations - A Best Case Scenario

Roberto Szechtman, Naval Postgraduate School, Operations Research Department, Monterey, CA, 93940, United States of America, rszechtm@nps.edu, Moshe Kress

In insurgency situations, the government organized force is confronted by a small guerrilla group that is dispersed in the general population with no or very small signature. Effective counterinsurgency operations require good intelligence. Absent intelligence, not only the insurgents may get away unharmed and continue their violent actions, but collateral damage caused to the general population from poor targeting may generate adverse response against the government and create popular support for the insurgents, which may result in higher recruitment to the insurgency. We model the dynamic relations among intelligence, collateral casualties in the population, attrition, recruitment to the insurgency, and reinforcement to the government force. Even under best case assumptions we show that the government cannot totally eradicate the insurgency by force. The best it can do is contain it at a certain fixed level.

3 - Confronting Elusive Insurgents

Ed Kaplan, Yale University, School of Management, edward.kaplan@yale.edu, Roberto Szechtman, Moshe Kress

Under what conditions should government forces attack insurgent strongholds? How should the government allocate its force across different strongholds when the insurgents' threat to the population must be taken into account? How should the government respond to "smart insurgents" who anticipate government's optimal plan of attack and prepare accordingly? Using Lanchester models modified to account for imperfect intelligence, we approximate optimal force allocations for the government, and model the resulting sequential force allocation game between the insurgents and the government where the (zero sum) payoffs are determined by government battle and homefront casualties.

■ MB05

Methods and Models for Congestion Pricing II

Cluster: Network Congestion and Congestion Management
Invited Session

Chair: Yafeng Yin, University of Florida, Civil and Coastal Engineering, 365 Weil Hall, Box 116580, Gainesville, FL, 32611, United States of America, yafeng@ce.ufl.edu

1 - Network Topology and the Global Effectiveness of Decentralized Road Pricing Strategies

Lei Zhang, Assistant Professor, Oregon State University, School of Civil & Construction Engineering, 220 Owen Hall, Corvallis, OR, 97331, United States of America, imleich@yahoo.com

This paper considers a particular scenario of road pricing where a number of decentralized agents set toll rates according to independent non-cooperating objectives. Pricing games between multiple private roads or between local jurisdictions are real-world examples of this decentralized network pricing scenario. The global effectiveness of decentralized decisions, defined at the system level, is examined for networks with various topologies (e.g. grid, hub-spoke, ring, scale-free, and hybrid).

2 - Solving the Pareto-improving Toll Problem

Siriphong Lawphongpanich, University of Florida, Industrial and Systems Engineering, 303 Weil Hall, Gainesville, FL, 32611, United States of America, lawphong@ise.ufl.edu, Yafeng Yin

Congestion tolls are said to be Pareto-improving if they lead to an improvement in travel delay or social benefit and ensure that no user is worse off when compared to the situation without any tolling. The problem of finding Pareto-improving tolls can be formulated as a mathematical program with complementarity constraints. Using concepts from manifold suboptimization, we propose a new algorithm that converges to a strongly stationary solution in a finite number of iterations.

3 - Self-sufficient and Pareto-improving Toll with Continuously Distributed Travel Times

Marco Nie, Northwestern University, 2145 Sheridan Road, Evanston, IL, 60208, United States of America, y-nie@northwestern.edu

This paper considers a static congestion pricing model in which users select a mode from either, passenger car or transit service, to minimize their own travel cost. The cumulative distribution of users' value of time (VOT) is assumed to be a continuous function. A general condition is established to ensure the existence of a self-sufficient and pareto-improving toll scheme. We prove that a self-sufficient and Pareto-improving toll always exists if the VOT distribution function is concave.

4 - Pareto-improving Congestion Pricing on Multimodal Transportation Networks

Di Wu, University of Florida, Department of Civil & Coastal Engineering, Gainesville, FL, 32611, United States of America, thu.woody@gmail.com, Yafeng Yin, Siriphong Lawphongpanich

This paper determines a pricing scheme to maximize the social benefit without increasing any individual user's travel cost or transportation authority's expense on a multimodal transportation network with transit services, high-occupancy/toll and regular lanes. The Pareto improvement is achieved by designing transit fares and highway link tolls to optimally distribute travel demand among the available modes. A multimodal Pareto-improving toll model is presented with numerical examples.

■ MB06

Mike Rothkopf's Influence on Research in Auctions and Beyond

Cluster: Auctions
Invited Session

Chair: Jonathan Eckstein, Professor, Rutgers University, 640 Bartholomew Road, RUTCOR Room 155, Piscataway, NJ, 08854, United States of America, jeckstei@rci.rutgers.edu

1 - Dedicated to Mike Rothkopf: Monitoring an Information Source under a Politeness Constraint

Jonathan Eckstein, Professor, Rutgers University, 640 Bartholomew Road, RUTCOR Room 155, Piscataway, NJ, 08854, United States of America, jeckstei@rci.rutgers.edu, Avigdor Gal

Imagine scheduling a limited number of polls to an information source whose contents are continuously modified by a nonhomogeneous Poisson process. We develop an optimal polling schedule model that is ill-suited to either standard nonlinear or integer programming methods, but - following a suggestion of Mike Rothkopf's - can be solved to near optimality by a combination of dynamic programming and local search, with provable quality guarantees.

2 - Mike Rothkopf's Contribution to the Analysis of Bidding in Sequential Auctions

Shmuel Oren, Professor, UC Berkeley, IEOR Department, Rm. 4119 Etcheverry Hall, Berkeley, CA, 94720, United States of America, oren@ieor.berkeley.edu

This paper will detail an early contribution by Mike Rothkopf and myself to the analysis of multiplicative bidding strategies in sequential auctions. The work examines the affect of competitive interaction where bidders who interact repeatedly in sequential auctions adjust they strategies in response to prior bidding behavior of their rivals.

3 - Optimization and Dynamical Systems Algorithms for Finding Equilibria of Stochastic Games

Arun Sen, Senior Consultant, NERA Economic Consulting, 1166 Ave. of the Americas, 28th floor, New York, NY, 10036, United States of America, sen@post.harvard.edu, Dave Shanno

We present two new algorithms for computing Nash equilibria of stochastic games. One is a global random start algorithm based on nonlinear programming, while the other combines a dynamical system with nonlinear programming to find stable equilibria. Promising numerical results are presented.

■ MB07

MSOM Fellows Presentation

Sponsor: Manufacturing & Service Oper Mgmt
Sponsored Session

Chair: Martin Lariviere, Kellogg School of Management, Evanston, IL, United States of America, m-lariviere@northwestern.edu

1 - Stochastic Processing Networks

J. Michael Harrison, Graduate School of Business, Stanford University, Stanford, CA, 94305, United States of America, harrison_michael@gsb.stanford.edu

About 50 years ago, a general linear model of an operating enterprise was developed by mathematicians and economists working in the area that T. C. Koopmans called "activity analysis." Stochastic processing networks are a class of system models which extend that powerful conceptual framework in a natural way, adding stochastic variability and feedback control. This model class has a potentially important role to play in a unified theory of operations management.

2 - Assesing Risk to Hospitals in Response to a Pandemic Influenza

John Muckstadt, Acheson-Laibe Professor, Cornell University, 286 Rhodes Hall, Cornell UNiversity, Ithaca, NY, 14853, United States of America, jack@orie.cornell.edu, Peter Jackson

We describe a decision support environment that provides decision makers in hospitals with a dynamic analysis of how a varying set of human and material resources, and a set of policies governing their deployment, will perform under the time-dependent demands resulting from a pandemic infuenza.

3 - Multi-echelon Inventory Models – An Overview

Sven Axsäter, Lund University, PO Box 118, Lund, 22100, Sweden, sven.axsater@iml.lth.se

We give an overview of stochastic multi-echelon inventory models starting with the early contributions by Clark and Scarf, and Sherbrooke. The main focus is on serial and distribution inventory systems. Different control policies and other assumptions are discussed. We describe the problems that we face when going from single-echelon to multi-echelon models. Advantages and difficulties with different approaches are analyzed. Finally, we discuss practical implications of the research results.

■ MB08

Game Theory Applications to the Interface between Finance, Operations, and Risk Management

Sponsor: Manufacturing & Service Oper Mgmt/ Interface between Finance, Operations, and Risk Management (iFORM)
Sponsored Session

Chair: Volodymyr Babich, University of Michigan, 1205 Beal Ave., Ann Arbor, MI, 48109, United States of America, babich@umich.edu

1 - Optimal Market-making with Risk Aversion

David Simchi-Levi, Professor, MIT, 77 Massachusetts Ave. Rm. 1-171, Cambridge, MA, United States of America, dslevi@MIT.EDU, Miao Song, Kan Huang

Market-makers have the obligation to trade securities at quoted bid or ask prices, and their inventories are exposed to the potential loss when the market price moves in an undesirable direction. One approach to reduce this risk is to adjust the inventory at the price of losing potential spread gain. We show that a threshold inventory control policy is optimal with respect to an exponential utility criterion, and more general results are obtained for mean-variance analysis.

2 - Capacity Investment by Competitive Start-ups

Robert Swinney, Graduate School of Business, Stanford University, 518 Memorial Way, Stanford, CA, 94305-5015, United States of America, swinney@stanford.edu, Gerard Cachon, Serguei Netessine

We analyze duopolistic capacity investment games in which firms may be either start-ups (subject to bankruptcy risk) or established firms (with no chance of bankruptcy). Firms build capacity in advance for a market facing a stochastic multiplicative demand shock. We consider how the presence of one or more start-ups affects total equilibrium capacity investment and price. We also endogenize the order of commitment to enter the market and address how start-ups affect market entry.

3 - On Supply Risk and Asymmetric Information

Zhibin Yang, University of Michigan, Ann Arbor, MI, zhibiny@umich.edu, Goker Aydin, Volodymyr Babich, Damian Beil

We study a manufacturer using dual-sourcing and backup-production (manufacturer's or supplier's) options to manage supply risk under asymmetric information about supplier reliability. These options may be more or less valuable for the manufacturer under asymmetric information. Asymmetric information discourages the manufacturer from using dual-sourcing and supplier backup production options with the less reliable supplier type. Higher reliability may not be a substitute for information.

4 - Financing in Supply Chain Management

Song (Alex) Yang, PhD Student, The University of Chicago Graduate School of Business, 5807 S Woodlawn Ave, Chicago, IL, 60637, United States of America, syang1@chicagogsb.edu, John Birge

In supply chains, it is common for one party, who normally has easier access to financial market, to finance the other party in various ways (trade credit, loans, etc.). In this talk, we discussed the advantages and limitations of supply chain financing, as well as associated problems, including incentives and credit risks, based on a model where firms make operational and financing decisions jointly.

■ MB09

Bayesian Reliability Modeling and Uncertainty Analysis

Sponsor: Quality, Statistics and Reliability
Sponsored Session

Chair: Refik Soyer, Professor, Department of Decision Sciences, The George Washington University, Washington, DC, 20052, United States of America, soyer@gwu.edu

1 - Bayesian Models for Executives' Environmental Uncertainty After 9/11

Ehsan Soofi, Professor, University of Wisconsin-Milwaukee, PO Box 742, Milwaukee, WI, United States of America, esoofi@uwm.edu, Paul Nystrom, Masoud Yasai-Ardekani

Shortly after 9/11, we solicited probabilities from 93 executives to study their uncertainties about the state of future economy, its effects on the organizations, and organizational ability to respond. The data provide two bivariate marginal distributions. The trivariate distributions of state-effect-response are imputed by maximum entropy. Uncertainty about probabilities is modeled using a Dirichlet model and by a Bayesian hierarchical model. A set of uncertainty tableaux present the results.

2 - A New Bayesian Approach to Analyzing the Marshall-Olkin Model

Thomas Mazzuchi, EMSE, George Washington university, Washington, DC, 20052, United States of America, mazzu@gwu.edu

A new approximation to the Multivariate Marshall-Olkin Model for common cause failure is presented. The model aggregates component failures due to outside shocks into ordered modes, where each mode is composed of all possible failure combinations of a given number of components. The model is analyzed in a Bayesian framework and results of the new model are produced for a three component system using simulated data.

3 - Bayesian Mortgage Default Models and Reliability Analysis

Refik Soyer, Professor, Department of Decision Sciences, The George Washington University, Washington, DC, 20052, United States of America, soyer@gwu.edu, Feng Xu

The Bayesian point of view is rather new in the mortgage default literature. In this talk we present some recent Bayesian mortgage models for analysis of aggregate and individual loan level data. In so doing, we also discuss how these models can be used for loan maintenance using a decision theoretic approach.

4 - A Markov Modulated Poisson Model for Software Reliability

Joshua Landon, Institute for Integrating Statistics in Decision Sciences, The George Washington University, Washington, DC, 20052, jlandon@gwu.edu, Suleyman Ozekici, Refik Soyer

In this paper we consider a latent Markov process governing the intensity rate of software failures. The latent process represents the behavior of the debugging operations over time and enables us to deal with imperfect debugging scenario. We develop the Bayesian inference for the model and introduce a method to infer the unknown dimension of the Markov process.

■ MB10

Energy Security and Risk Management

Sponsor: Energy, Natural Resources & the Environment/ Energy
Sponsored Session

Chair: Frederic Murphy, Professor, Temple University, Fox School of Business, Philadelphia, PA, 19122, United States of America, fmurphy@temple.edu

Co-Chair: Fernando Oliveira, Assistant Professor, ESSEC Business School, Avenue Bernard Hirsch - BP 50105, 95021 - Cergy-Pontoise, France, oliveira@essec.fr

1 - Designing and Valuation of Financial Options on the Strategic Petroleum Reserve

Fernando Oliveira, Assistant Professor, Warwick Business School, Gibbet Hill Road, Coventry, 1, CV4 7AL, United Kingdom, Fernando.Oliveira@wbs.ac.uk, Frederic Murphy

We design and evaluate financial options for market-based management of the U.S. government's Strategic Petroleum Reserve (SPR). We use a coupled Markovian Decision Process to model a game in which a public maximizes social welfare and a private player is a speculator. We compute the optimal number of options required by the optimal policy. Finally, we analyze the conditions under which the value of such options can be computed and we solve instances of the model using Monte-Carlo simulation.

2 - The Energy Independence and Security Act (EISA) 2007 and Future Refining Needs

Peter Whitman, Policy Analyst, Department of Energy, 1000 Independence Ave SW, Washington, DC, 20585, United States of America, Peter.Whitman@hq.doe.gov

The Energy Independence and Security Act of 2007, with its renewable fuel and vehicle efficiency mandates, will have a significant impact on the petroleum product mix in the U.S over the next 15 years. In particular, it is expected that the additional renewable fuels will impact the gasoline pool much more than diesel. We use an LP based refinery model to examine the ability of the domestic refining industry to respond to these changes.

3 - Energy Only, Capacity Market and Security of Supply: A Stochastic Equilibrium Analysis

Yves Smeers, Professor, Universite Catholique de Louvain, 34 Voie du Roman Pays, Louvain la Neuve, 1348, Belgium, yves.smeers@uclouvain.be, Andreas Ehrenmann

We formulate an equilibrium model of the electricity sector with both investments and operations. Electricity prices are set at the fuel cost of the last operating unit when there is no curtailment, and at some regulated price cap when there is curtailment. The equilibrium model is stochastic We model risk aversion of the agents through a CVaR of the net margin of the industry. The CVaR induces a risk neutral probability according to which investors value their plants.

4 - A Risky Two Stage Nash Game for Modeling Investment

Danny Ralph, University of Cambridge, Judge Business School, Cambridge, United Kingdom, d.ralph@jbs.cam.ac.uk, Yves Smeers

We present a Nash game where the 1st stage involves investment in both electricity generation capacity and financial instruments (hedges), with production to occur in an uncertain 2nd stage environment. Electricity generators are risk averse, and seek to minimise their cost (or maximise profit) across both stages. The cost of future production is assessed via risk measures instead of expectations. This is a new game in which (risk neutral) probabilities are endogenous - found at equilibrium.

■ MB11

Applications of Operations Research in the Mining Industry

Sponsor: Energy, Natural Res & the Environment/ Forestry
Sponsored Session

Chair: Alexandra Newman, Associate Professor, Colorado School of Mines, Division of Economics and Business, Golden, CO, 80401, United States of America, anewman@mines.edu

1 - Scheduling the Excavation of an Open Pit Mine: An Integer Programming Approach

Marcos Goycoolea, Assistant Professor, Universidad Adolfo Ibanez, Diagonal Las Torres 2640, Oficina 534 C., Santiago, Chile, marcos.goycoolea@uai.cl, Daniel Espinoza, Eduardo Moreno, Enrique Rubio

We consider a classic integer programming formulation for the open-pit-mine scheduling problem. Using standard optimization software results in prohibitively long computation times. By introducing rounding heuristics (based on topological sortings), clever branching rules, and pre-processing into the branch-and-bound process we significantly improve computational performance. Computational results from three medium-sized mines are presented.

2 - Cluster Analysis Based Aggregation in Mine Planning Models

Andres Weintraub, Professor, University of Chile, 701 Republica, Santiago, Chile, aweintra@dii.uchile.cl, Ricardo Vega, Marianela Pereira, Ximena Schultz, Andreas Bley

CODELCO, the largest mining firm in Chile, has developed large scale models to support detailed planning of mine extraction. For purposes of corporate planning or when incorporating uncertainty, aggregate planning is adequate. We use cluster analysis and both a priori (on raw data) and a posteriori (on the detailed LP formulation) aggregation. Computational results show significant reductions in problem size and CPU run time, while guaranteeing a moderate bound on the error due to aggregation.

3 - Open Pit Mine Production Scheduling

Alexandra Newman, Associate Professor, Colorado School of Mines, Division of Economics and Business, Golden, CO, 80401, United States of America, anewman@mines.edu

We present a model for open pit mine production scheduling in which we maximize net present value of the extracted blocks subject to production and processing constraints. We show how we are able to use variable elimination, cuts, and Lagrangian Relaxation to solve problem instances containing about 20,000 blocks and 6-10 time periods in minutes, whereas it is not possible for commercial software to obtain even a feasible solution for the monolith in days.

4 - Local Search for the Open-pit-mine Scheduling Problem

Thomas Prevost, Universite Catholique de Louvain, Louvain, Belgium, prevost.thomas@gmail.com, Marcos Goycoolea, Eduardo Moreno, Jorge Amaya

Directly solving real-sized open-pit-mine scheduling problems with an integer programming solver is not possible due the huge number of variables. We present a local search algorithm which, starting from simple heuristic solutions, computes better ones by optimizing over randomly selected small sections of the mine. This method is not limited by mine size, and adapts well to parallel architectures. Computational results are presented.

■ MB12

Novel Methodologies for Capturing and Using Data to Model and Measure Behavior

Cluster: Data Mining
Invited Session

Chair: Theodoros Evgeniou, INSEAD, Boulevard de Constance, Fontainebleau, Fr, France, theodoros.evgeniou@insead.edu

1 - Why Wikipedia Works: Modeling the Stability of Collective Information Update Processes

Sanmay Das, Assistant Professor, Rensselaer Polytechnic Institute, Department of Computer Science, 110 8th St, Troy, NY, 12180, United States of America, sanmay@cs.rpi.edu, Malik Magdon-Ismail

How do Wikipedia pages become stable and trusted information sources? We analyze highly edited Wikipedia pages and show that they almost inevitably converge to a stable state instead of continuing to accrue edits (the expected behavior under traditional growth models). We present a stochastic model of information growth for Wikipedia pages and show that this model provides an excellent fit to the actual accumulation of edits on highly-edited Wikipedia pages.

2 - Effective Re-Identification in Dynamic Networks

Shawndra Hill, University of Pennsylvania, 3730 Walnut Street, Suite 500, Philadelphia, PA, 19104, United States of America, shawndra@wharton.upenn.edu

Re-identification in the context of dynamic networks is a matching problem that involves comparing the behavior of networked entities. A similarity score can be assigned to pairs observed over two different time periods. The score can be used as an attribute to classify the pair of entities as a match or a non-match. This work presents the impact of network structure and choices one can make when representing entities on dynamic networks on re-identification.

3 - A Unified Framework for Active Classifier Learning

Maytal Saar-Tschansky, Assistant Professor, University of Texas at Austin, Austin, TX, 78712, United States of America, Maytal.Saar-Tschansky@mccombs.utexas.edu

Empirical active learning approaches for classification often offer intuition to explain how the policies identify informative examples for learning. However, the intuitions are sometimes inconsistent and do not help explain some empirical results. I will present a unified theoretical framework that can be used to explain the benefits of popular active learning policies. The framework also lays foundations for the development of new active learning policies.

4 - Models of Behavior and Models for Market Data Analysis

Theodoros Evgeniou, INSEAD, Boulevard de Constance, Fontainebleau, Fr, France, theodoros.evgeniou@insead.edu

Marketing has been a key application area of data mining and machine learning. Meanwhile, researchers in consumer behavior and psychology have been developing theories of how people "actually" make decisions. However, there has been little interaction between these two fields. In this talk we discuss novel methods for analyzing consumer data that are based on principles from these two seemingly unrelated fields.

■ MB13

Bayesian Approaches in Data Mining

Sponsor: Data Mining
Sponsored Session

Chair: Ilona Murynets, PhD Student, Stevens Institute of Technology, Hoboken, NJ, United States of America, imurynet@stevens.edu

1 - Accounting for Multivariate Parameter Uncertainty in Large-scale Simulations

Canan Gunes, PhD Student, Tepper School of Business, 5000 Forbes Ave., Pittsburgh, PA, 15213, United States of America, canalp.canan@gmail.com, Bahar Biller

We consider a large-scale stochastic simulation with correlated inputs and develop a Bayesian framework that provides point estimates and confidence intervals for performance measures by accounting for stochastic and multivariate input uncertainties. We demonstrate the importance of the joint representation of stochastic and multivariate input uncertainties for multi-product inventory simulations.

2 - Monitoring Data Quality in Distributed Data Warehouses with Delays

Ilona Murynets, PhD Student, Stevens Institute of Technology, Hoboken, NJ, United States of America, imurynet@stevens.edu, Wei Jiang, Rong Duan, S. Tom Au

Poor data quality and the lack of integration in data warehouse (DWH) make it difficult for business users to obtain a consistent view of business processes. To monitor operational data feeding systems, this paper proposes a statistical model for data feeding systems from heterogeneous databases to a central DWH. An online statistical process control (SPC) procedure is developed to identify inconsistencies in the feeding data.

3 - Asymptotic Theory of Sequential Change Detection and Identification

Kazutoshi Yamazaki, Graduate Student, Princeton University, ORFE Department, Princeton University, Princeton, NJ, 08540, United States of America, kyamazak@gmail.com, Warren Powell, Savas Dayanik

Suppose the distribution of a sequence of i.i.d. random variables changes suddenly at some unobservable time to one of finitely many distinct alternatives, then one needs to detect and identify the change at the earliest. We propose a sequential decision strategy that triggers an alarm when the posterior probability of a certain type of change exceeds some threshold, and show its asymptotic optimality under the Bayesian and the fixed-error formulations.

4 - Adaptive SMOTE for Imbalanced Learning

Yafeng Yin, Stevens Institute of Technology, ECE Department, Castle Point on Hudson, Hoboken, NJ, 07030, United States of America, startor.2006@gmail.com, Hong Man, Haibo He, Jing Wang

This paper presents a novel approach for adaptively generating synthetic minority classes based on SMOTE. The main idea is to assign different weighted distribution for each minority class during the up-sampling process. Therefore, this approach can reduce the bias of the data set as well as forcing the learning algorithms to focus more on the minority classes that are relatively more difficult to learn. Simulation results shows improvement in the prediction accuracy and F-values.

■ MB14

Software Demonstration

Cluster: Software Demonstrations
Invited Session

1 - Imagine That, Inc. - ExtendSim-Power Tools for Simulation
Dave Krahl, Imagine That, Inc., 6830 Via Del Oro, Ste. 230, San Jose, CA, 95119, davek@extendsim.com

See how quickly you can build robust, intuitive models with the power tool for simulation - ExtendSim. Revolutionary new simulation technology and 3D animation in ExtendSim is paired with core ExtendSim features such as hierarchical model building, user interface creation, and interactive modeling to make it the tool to watch in the simulation industry. Don't miss this demo!

2 - XJ Technologies –AnyLogic - Professional Tool for Multi-Method Simulation Modeling
Andrei Borshchev, CEO and Managing Director, XJ Technologies, Office 410, 49 Nepokorennykh pr., St., Petersburg, 195220, Russia, andrei@xjtek.com

AnyLogic is the first and only simulation tool that supports system dynamics, process-centric (discrete event) and agent-based methods within one modeling language and one model development environment. We will demo several AnyLogic models and show how the user can benefit from using different modeling methods, and from agent-based modeling in particular.

■ MB15

Measurement and Metrics in Service Science

Sponsor: Service Science
Sponsored Session

Chair: Michael Goul, Professor, Arizona State University, PO Box 874606, W.P. Carey School of Business, Tempe, AZ, 85287-4606, United States of America, Michael.Goul@asu.edu

Co-Chair: Haluk Demirkan, Assistant Professor, W. P. Carey School of Business, Arizona State University, PO Box 874606, Tempe, AZ, 85287-4606, United States of America, Haluk.Demirkan@asu.edu

1 - Call Center Workforce Optimization Through Simulation Incorporating Retrial Calls
Hideki Yamanaka, Fujitsu Laboratories Ltd., 4-1-1 Kamiodanaka, Nakahara-ku, Kawasaki, 211-8588, Japan, hyamanaka@jp.fujitsu.com

A call center model with retrial calls was validated by analyzing the CTI log with notified customer telephone numbers in real call centers, with the result that hourly average retrial call ratios and retrial intervals for abandoned calls vary considerably with human behavior, giving us another room for workforce optimization.

2 - Selecting Sourcing Partners for a Make-to-order Supply Chain
Yu Xia, Assistant Professor, Middle Tennessee State University, Department of MGT&MKT, Murfreesboro, TN, 37132, United States of America, axia@mtsu.edu, Thuhang Tran, Bintong Chen, Jinfeng Yue

Our research provides a decision supporting system to facilitate the sourcing process for these manufacturers using information about their sourcing partners' cost and processing time. For a desired service level, a range of sourcing alternatives instead of a single optimal sourcing solution is presented. The portfolio allows the manufacturer to make trade-offs between cost and probability to finish the job on time.

■ MB16

Manufacturing

Sponsor: Manufacturing & Service Oper Mgmt/ Service Management
Sponsored Session

Chair: Justin Ren, Boston University, 595 Commonwealth Ave., Boston, MA, United States of America, ren@bu.edu

1 - An Econometric Analysis of Patient Flows in the Cardiac ICU
Diwas Kc, The Wharton School, University of Pennsylvania, Philadelphia, PA, 19104, United States of America, diwas@wharton.upenn.edu, Christian Terwiesch

This paper explores the rationing of bed capacity in a cardiac intensive care unit (ICU). We find that a patient is likely to be discharged early when the occupancy in the ICU is high. This in turn leads to an increased likelihood of the patient having to be readmitted to the ICU at a later time. We analyze the capacity implications of revisits, shedding light on the question if an ICU should apply an aggressive discharge strategy.

2 - Does Performance-Based Contracting Improve Product Reliability? An Empirical Study
Jose Guajardo, The Wharton School, University of Pennsylvania, 3730 Walnut Street, Suite 500, Philadelphia, PA, 19104, United States of America, josegu@wharton.upenn.edu, Morris Cohen, Serguei Netessine, Sang-Hyun Kim

In this paper we analyze the impact of a performance based contract to provide after sales maintenance and repair services. Based on a primary data sample from a major Aerospace and Defense manufacturer, we analyze the impact of such a contract on long term product reliability. Our econometric model incorporates the endogeneity of contract selection into the estimation process.

3 - Outsourcing a Two-tier Service Process
Hsiao-Hui Lee, PhD Student, Simon School, 711 University Park, Rochester, NY, 14620, United States of America, hsiao-hui.lee@simon.rochester.edu, Edieal Pinker, Robert Shumsky

Many service processes are constructed as a two-level system where the first level serves as a gatekeeper for the second level. Service firms who outsource these processes must decide which part to outsource (first level, second level, or both). We examine this outsourcing decision as well as the contract design problem, given the decision to outsource particular levels.

4 - An Empirical Study of the Relations between Hospital Volume, Teaching Status and Service Quality
Carol Theokary, Doctoral Student, Boston University School of Management, 595 Commonwealth Avenue, Room 664, Boston, MA, 02215, United States of America, carolth@bu.edu, Justin Ren

This paper contributes to research on quality drivers in healthcare settings. We propose that the impact of a hospital teaching status on its service quality can vary across hospitals of different sizes. We use a new large dataset that measures objective operations quality on the treatment for three conditions in all major US hospitals. Our results suggest that the impact of teaching intensity on quality is dependent upon the specifics of each condition and might vary with hospital size.

■ MB17

Novel Quality Control Strategies to Improve Process Efficiency

Sponsor: Quality, Statistics and Reliability
Sponsored Session

Chair: Seoung Bum Kim, Assistant Professor, University of Texas at Arlington, 500 W. First Street, Arlington, TX, 76019, United States of America, sbkim@uta.edu

1 - Continuously Monitoring a Fraction in Service Processes and Achieving the Nominal False Alarm Rate
Rodrigo Duran, Teaching Assistant, Department of Industrial and Systems Engineering, Rutgers University, 173 Clinton St., South Bound Brook, NJ, 08880, United States of America, rodduran@eden.rutgers.edu, Susan Albin

In service processes where we continuously monitor fractions, traditional p-charts may not be useful. The fraction may be anywhere between 0 and 1 and rules of thumb such as Np>5 may not be helpful. We propose a Cusum chart where the nominal false alarm rate is achieved, and the parameters are calculated easily (without tables, simulation, or Markov Chain analysis). The new method also has a superior sensitivity compared with other easily designed existing methods.

2 - A Discretization Method for Approximating ARL with the Markov Chain Method

Chang-Ho Chin, Assistant Professor, Kyung Hee University, 1 Seocheon-dong, Giheung-gu, Yongin-si, Korea, Republic of, chin@khu.ac.kr

The integral equation method and the Markov chain method are generally used to approximate the ARL of control charts. The former is more accurate than the latter. However, the integral equation method cannot be used with certain kinds of control charting problems. Although the Markov chain method is more versatile, it has an important limitation in implementation − a memory space problem due to the large state space. A discretization method to alleviate the difficulty is discussed.

3 - Multistage-PRIM for Optimization of Multistage Manufacturing Processes with Insufficient Data

Doh-Soon Kwak, Division of Mechanical and Industrial Engineering, Pohang University of Science and Technology, Republic of Korea, dskwak@postech.ac.kr, Kwang-Jae Kim

We propose a new method to optimize a multistage manufacturing process. The proposed method is based on a data mining technique, called Patient Rule Induction Method (PRIM). The issues associated with insufficiency of the observational data, which is often encountered in electronics industry, are also discussed. The performance of the proposed method is demonstrated using a case from a semiconductor manufacturing process.

■ MB18

QSR Best Student Paper Award Session

Sponsor: Quality, Statistics and Reliability
Sponsored Session

Chair: Hong Wan, Assistant Professor, School of IE, Purdue Univ., 315 N. Grant Street, West Lafayette, IN, 47906, United States of America, hwan@purdue.edu

1 - QSR Best Student Paper Award

Hong Wan, Assistant Professor, School of IE, Purdue Univ., 315 N. Grant Street, West Lafayette, IN, 47906, United States of America, hwan@purdue.edu

This session includes presentations from four finalists for the QSR best student paper award. The four finalists are selected after reviewing all of the submitted papers for this competition. The results will be announced at the QSR business meeting.

■ MB19

Panel Discussion: Portfolio Decision Analysis

Sponsor: Decision Analysis
Sponsored Session

Moderator: Jeffrey Keisler, Assoc. Professor, Univ. of Massachusetts Boston, 100 Morrissey Blvd, Boston, MA, 02125, United States of America, Jeff.Keisler@umb.edu

Co-Chair: Alec Morton, London School of Economics, A.Morton@lse.ac.uk

1 - Portfolio Decision Analysis and Organizational Planning- Who Are We and What can We Offer?

Panelists: Alec Morton, London School of Economics, A.Morton@lse.ac.uk, Martin Schilling, Ahti Salo, James Felli

Decision Analysts are not the only analytic professionals who want and have a role in organizational resource planning. Finance professionals often drive capital budgeting. Information systems provide much of the data decisions require. Cheap computation and user-friendly software make math programming approaches ever more practical. As a group with a distinct identity, how do we position ourselves in this crowded marketplace? How do/should we relate to other providers of modeling and advice?

■ MB20

Environmental Decision Analysis

Sponsor: Decision Analysis
Sponsored Session

Chair: Richard Anderson, Assistant Professor, Duke University, Box 90328 - Nicholas Sch of the Environ, LSRC A321, Durham, NC, 27708, United States of America, richard.anderson@duke.edu

1 - Evaluating Alternatives for Wetland and Barrier Island Building in the Mississippi River Delta

Melissa A. Kenney, Postdoctoral Fellow, Environmental Decision Analysis, Johns Hopkins University, 3400 N Charles St, 313 Ames Hall, Baltimore, MD, 21218, United States of America, m.kenney@jhu.edu, Benjamin F. Hobbs, Robert R. Twilley

Since the 1930s, the Mississippi River Delta has lost ~1.2 million acres of land. Agencies are making important restoration decisions regarding the locations and methods of sediment and freshwater delivery. We re-evaluate which of the proposed 27 projects are in the non-dominated set and discuss their tradeoffs, providing guidance for which projects give the "biggest bang for your buck."

2 - Using Decision Analysis to Guide Oyster Restoration in North Carolina, USA

Richard Anderson, Assistant Professor, Duke University, Box 90328 - Nicholas Sch of the Environ, LSRC A321, Durham, NC, 27708, United States of America, richard.anderson@duke.edu

Restoration of North Carolina oysters and the reefs they create involves tradeoffs between ecosystem services and fishery revenue hitherto unquantified for North Carolina. Quantifications of flows of services derived from oyster reef ecosystems depend on hypotheses about how they depend upon ecological functions. We develop a decision analytic framework to explore the implications of these considerations for management of North Carolina native oyster populations.

3 - Using Multiobjective Analysis for Multi-dam Removal Decisions in the Lake Erie Basin

Pearl Q. Zheng, PhD Candidate, 313 Ames Hall, Department Geography & Environmental Engineering, Johns Hopkins University, 3400 N Charles St, Baltimore, MD, 21218, pzheng1@jhu.edu, Benjamin F. Hobbs, Joseph F. Koonce

Removal of deteriorating dams on tributaries to Lake Erie involves tradeoffs between ecological benefits and costs. We develop a mixed integer linear program to select a portfolio of potential dam removals that could achieve the best possible value of a weighted sum of objective(s), while still satisfying the constraints.

■ MB21

Joint Session Computational Biology/CS: Population Genetics

Cluster: Computational Biology (Joint Cluster CS)
Invited Session

Chair: Tanya Berger-Wolf, University of Illinois at Chicago, Department of Computer Science, 851 S. Morgan St, Chicago, IL, 60607, United States of America, tanyabw@uic.edu

1 - Theoretical and Experimental Results for Haplotyping Problems with Recombination

Daniel Brown, Associate Professor, University of Waterloo, 200 University Ave W, Waterloo, ON, N2L 3G1, Canada, browndg@uwaterloo.ca

Haplotype inference problems entered the computer science literature relatively recently. As mathematical problems, they show a surprising connection to random graphs, to mathematical programming, and to linear algebra. As computer science problems, they are an example of a problem area that is theoretically hard, but almost always easy in practice. We show a few recent results from this domain, paricularly oriented toward practical examples that incorporate recombination.

2 - Reliable Genotype Tagging

Alex Zelikovsky, Georgia State University, Department of Computer Science, Atlanta, GA, 30303, United States of America, alexz@cs.gsu.edu, Irina Astrovskaya

It is widely accepted that variation of a single nucleotide polymorphism (SNP) is covered by another SNP if their correlation is greater than 0.8. Tagging saves budget by genotyping less SNPs and haplotype computation by reducing the size of the SNP data. We propose a new 2LR-tagging method that finds less SNPs than widely accepted Tagger and avoids of overfitting of tagging based on multiple linear regression.

3 - Hidden Markov Models of Haplotype Diversity and Applications in Genetic Epidemiology

Ion Mandoiu, University of Connecticut, Computer Science & Engineering Departmen, 371 Fairfield Way, Unit 2155, Storrs, CT, 06269-2155, United States of America, ion@engr.uconn.edu, Justin Kennedy, Bogdan Pasaniuc

Currently there is much interest in mapping genes involved in complex human diseases using whole-genome association studies. Harnessing the full power of these studies requires addressing several challenging computational problems including genotype phasing, genotype error detection, and missing data imputation. This talk will review inapproximability results and efficient heuristics for finding maximum-likelihood solutions to these problems based on Hidden Markov Models of haplotype diversity.

4 - Reconstructing Sibling Relationships from Microsatellite Data

Tanya Berger-Wolf, University of Illinois at Chicago, Department of Computer Science, 851 S. Morgan St, Chicago, IL, 60607, United States of America, tanyabw@uic.edu, Bhaskar DasGupta, Saad Sheikh, Art Chaovaitwongse, Mary Ashley

Reconstruction of sibling relationships from genetic data is an important part of many biological applications. Most reconstruction methods use statistical and heuristic techniques that rely on a priori knowledge about various parameter distributions. We present a deterministic algorithm that parsimoniously reconstructs sibling groups. We use Mendelian laws of inheritance to generate feasible sibling groups and optimally select a minimum set of groups necessary to explain the data.

■ MB22

Constraints and Search

Sponsor: Computing Society: Constraint Programming and Operations Research
Sponsored Session
Chair: Meinolf Sellmann, Brown University, PO Box 1910, Providence, RI, United States of America, sello@cs.brown.edu

1 - Hidden Structure in Constraint Reasoning Problems

Bistra Dilkina, Cornell University, Department of Computer Sciences, 4148 Upson Hall, Ithaca, NY, 14853, United States of America, bistra.cs.cornell.edu, Ashish Sabharwal, Carla P. Gomes, Bart Selman

Modern constraint solvers can handle problems with up to a million variables and several million constraints. A recent explanation for the good scaling properties of state-of-the-art constraint solvers is that in many real-world combinatorial problems the true combinatorics is captured by a relatively small set of critical variables, called backdoor variables. We will discuss a series of new insights into backdoor variables sets.

2 - Postoptimality Analysis for Integer Programming Using Binary Decision Diagrams

John Hooker, Carnegie Mellon University, Tepper School of Business, Pittsburgh, PA, 15213, United States of America, john@hooker.tepper.cmu.edu, Tarik Hadzic

We show how binary decision diagrams (BDDs) can be used to solve and obtain postoptimality analysis for linear and nonlinear integer programming problems. The constraint set corresponds to a unique reduced BDD that represents all feasible or near-optimal solutions, and in which optimal solutions correspond to certain shortest paths. The BDD can be queried in real time for in-depth postoptimality reasoning. We illustrate the analysis on capital budgeting and network reliability problems.

3 - Elimination Algorithm for Integer Binary Inequalities

Chendong Li, Texas Tech University, Compter Science Department, 8th & Boston, Lubbock, TX, 79409, United States of America, chendong.li@ttu.edu, Yuanlin Zhang

The problem of solving inequalities involving two variables has been studied in both the Constraint Programming and the Mathematical Programming community. In this paper, we present a new simple algorithm on solving those inequalities with integer variables. The algorithm is based on the idea of Motzkin Elimination on real variables and a new representation of an inequality.

4 - Detailed Scheduling in ILOG CP Optimizer

Paul Shaw, Constraint Programming R&D, ILOG, 9 rue de Verdun, Gentilly, France, pshaw@ilog.fr, Philippe Laborie, Jerome Rogerie, Petr Vilim

This talk describes the detailed scheduling support in ILOG CP Optimizer. The modeling framework uses interval variables, precedence constraints, sequences and functions to model a wide variety of problems. Automatic search uses various techniques including: the computation of partial order schedules, linear temporal relaxation to guide re-optimization, and machine learning to speed up convergence. The robustness of the approach is illustrated on a large panel of scheduling problems.

■ MB23

Asymptotic Analysis of Queueing Systems

Sponsor: Applied Probability
Sponsored Session
Chair: Achal Bassamboo, Managerial Economics & Decision Sciences, Kellogg School of Management, Northwestern University, Evanston, IL, 60208, United States of America, a-bassamboo@kellogg.northwestern.edu

1 - Stability Analysis of Queueing Systems Using Augmented Fluid Models

Tolga Tezcan, Assistant Professor, University of Illinois at Urbana-Champaign, 117 Transportation Bldg., 104 S. Mathews Ave, Urbana, IL, 61801, United States of America, ttezcan@uiuc.edu

In this talk we introduce the concept of augmented fluid models (AFM). AFM's are related but more powerful than traditional fluid models because they can be used to establish the stability of policies that cannot be analyzed using traditional fluid models. We illustrate how AFM's can be used by solving some open problems from the literature. In particular, we focus on N-model systems with multiple servers under static-priority policies and threshold-type policies.

2 - On the Optimality of Chaining for Flexible Retail and Service Systems

Ramandeep Randhawa, The University of Texas at Austin, Austin, TX, 78704, United States of America, Ramandeep.Randhawa@mccombs.utexas.edu, Achal Bassamboo, Jan Van Mieghem

It is known that chained configurations yield good performance. In this talk, we demonstrate that they are in fact optimal in retail and service systems. We provide explicit prescriptions for the optimal configuration of flexibility in inventory systems (newsvendor models). Further, we show that when faced with arrival rate uncertainty and impatient customers, queueing systems reduce to newsvendor models, and thus our results apply to these settings as well.

3 - Global Dual Sourcing: Tailored Base & Surge Allocation to Mexico and China

Gad Allon, Kellogg School of Management, 2001 Sheridan Road, Evanston, IL, United States of America, g-allon@kellogg.northwestern.edu, Jan Van Mieghem

When designing a global dual sourcing strategy, a firm must determine the average order rates placed to each source since it affects supplier management and cost. We consider a firm that has access to a responsive but expensive source (Mexico) and a cheap but remote source (China). The firm determines an inventory sourcing policy to satisfy random demand. We analyze a base-surge policy, which is simple, used in practice, and captures the classic tradeoff between cost versus responsiveness.

■ MB24

Recent Advances in Integer Programming

Sponsor: Computing Society
Sponsored Session
Chair: Hans Mitttelmann, Professor, Arizona State University, Box 871804, Tempe, AZ, 85287, United States of America, MITTELMANN@asu.edu

1 - Benchmark Updates in Integer and Nonlinear Programming

Hans Mitttelmann, Professor, Arizona State University, Box 871804, Tempe, AZ, 85287, United States of America, MITTELMANN@asu.edu

Areas in numerical optimization that have seen recent progress include sparse optimization, derivative-free optimization, and mixed integer programming. Software in the latter area has reached the most mature state and it is also needed in a wide variety of applications. The talk will give an overview of the state-of-the-art in mixed integer linear and nonlinear programming covering free and some commercial software. Progress in a few other areas such as SDP/SOCP may also be documented.

2 - Detecting Orbitopal Symmetries

Timo Berthold, Zuse Institute Berlin (ZIB), Takustr. 7, Berlin, 14195, Germany, berthold@zib.de, Marc E. Pfetsch

Symmetries are present in many IP models, but they are usually not desirable, since they derogate the performance of IP-solvers. Symmetries for which blocks of variables encode an assignment structure can be effectively handled with so-called orbitopes. We present an algorithm that detects orbitopal symmetries. It bases on the analysis of the IP's constraint graph. Furthermore, we show that the detection of orbitopal symmetries is as hard as the graph isomorphism problem for bipartite graphs.

3 - Solving Nonconvex MINLPs with LaGO- Current and Future Developments

Stefan Vigerske, Humboldt University Berlin, Department of Mathematics, Unter den Linden 6, Berlin, 10099, Germany, stefan@math.hu-berlin.de

COIN-OR/LaGO implements an extended Branch and Cut algorithm for the solution of block-separable nonconvex mixed-integer nonlinear programs (MINLPs). First, nonconvex terms are underestimated by quadratic terms using a powerful heuristic. Subsequently, nonconvex quadratic terms are convexified. Further, a simple constraint propagation method is applied to reduce variable bounds. Finally, we discuss future developments on integrating LaGOs techniques in the constraint programming framework SCIP.

■ MB25

AI and Computing in Counterterrorism

Sponsor: Computing Society
Sponsored Session

Chair: Amy Ding, University of Illinois, IL, United States of America, wxding@uic.edu

1 - Modeling and Simulation Methodology: The Challenge of Complex Endeavors

Bernard Zeigler, Professor, Arizona Center for Integrative Modeling and Simulation, Arizona, Tucson, AZ, 85715, United States of America, zeigler@ece.arizona.edu

Complex Endeavors have been defined as arising when a large group of disparate entities join together to achieve a common goal. Such endeavors pose extreme challenges to current modeling and simulation methodology. In this talk, we review the issues that have been raised and discuss cutting edge approaches and technologies that can help address these challenges.

2 - Representing Social-science Knowledge of Terrorism and Counterterrorism with Qualitative Models

Paul Davis, Principal Researcher, RAND, 1776 Main St., Santa Monica, CA, 90407-2138, United States of America, pdavis@rand.org

Social science has much to say about terrorism, but the form of that knowledge is often not suitable for analysis intended to inform strategy, policy, and operations. This paper describes an approach of qualitative causal modeling that draws heavily upon existing social science, but expresses it in a theoretical framework intended to fill that gap. The methods employed include qualitative modeling, multiresolution modeling, and exploratory analysis.

3 - Identifying Significant Facilitators of Social-network Evolution

Siddharth Kaza, Assistant Professor, Towson University, 8000 York Rd., Room 467, Towson, MD, 21252, United States of America, skaza@towson.edu, Hsinchun Chen, Daning Hu

Social networks evolve over time with the addition and removal of nodes and links to survive and thrive in their environments. In a research partnership with law enforcement agencies, we used dynamic social network analysis methods to examine several plausible link formation facilitators in a large-scale narcotics network consisting of individuals and vehicles.

4 - Modeling the Psychosocial Effects of Terror Threats and its Social Dynamics

Amy Ding, University of Illinois, IL, United States of America, wxding@uic.edu

In the area of information war, information can be used to produce various psychosocial impacts on the society. In this talk, we analyze the working procedure of brain components that are in charge of human memory and decision making. We then use differential dynamics to model how individual generates a response decision when facing a threat and project population-level possible psychosocial consequences.

■ MB26

Research Projects That Use Open Source Software

Sponsor: Computing Society: Open Source Software (Joint Cluster INFORMS Optimization)
Sponsored Session

Chair: Lijian Chen, Assistant Professor, University of Louisville, 5241 Craigs Creek Dr, Louisville, KY, 40241, United States of America, lijian.chen@louisville.edu

1 - DICE: Software for Collaborative Engineering

Suvrajeet Sen, Professor, The Ohio State University, 1971 Neil Ave, Columbus, OH, 43210, United States of America, sen.22@osu.edu, Shugang Kang, Yunwei Qi

DICE is a collaborative environment which allows a engineers to gain insights into a system by interacting with a data using natural language queries. The software provides a retrospective understanding of the system through its database, and a predictive outlook of the system using modeling and simulation.

2 - Random Number Generators and Open Source

Jiheng Zhang, Georgia Institute of Technology, 765 ferst dr, Atlanta, GA, 30332, United States of America, jrz@gatech.edu

Numerical experiments on stochastic systems normally involves random number generators. The quality of random numbers generated is very important in obtaining accurate insight from numerical results. We discuss some existing random number generators, and present a user friendly and open source package written by the the speaker.

3 - Development of a Supply Chain Design Optimization Tool Using Xpress-Mosel and GLPK

Ricki Ingalls, Associate Professor, Oklahoma State University, 322 Engineering North, Stillwater, OK, 74078, United States of America, ricki.ingalls@okstate.edu, Chinnatat Methapatara, Peerapol Sittivijan, Mario Cornejo

This paper addresses an on-going effort of developing a supply chain modeling tool that combines optimization and simulation. Two different versions of the optimization module are developed, one using Xpress-Mosel and the other one using the open source software GLPK (GNU Linear Programming Kit). This paper discusses the advantages and disadvantages of using a commercial solver such as Xpress-Mosel and an open source solver such as GLPK. It also discusses modeling and execution issues.

4 - Solving the Large Scale Stochastic Programming with Sampling, Decomposition

Lijian Chen, Assistant Professor, University of Louisville, 5241 Craigs Creek Dr, Louisville, KY, 40241, United States of America, lijian.chen@louisville.edu

We will talk about my experience when conducting numerical experiments on solving the large scale stochastic programming with sampling, decomposition, and Monte-carlo simulations. I found the COIN-OR project is quite powerful to handle some operations, such as matrix operations, which are typically completed by commercial packages. We also present a random number generator for selected distributions.

■ MB27

Algorithmic Large Deviations and Sharp Approximations

Sponsor: Applied Probability
Sponsored Session

Chair: Jose Blanchet, Columbia University, ‏500 W 120th St # 450, 3rd Floor, New York, NY, 10027, United States of America, jose.blanchet@columbia.edu

1 - Importance Sampling for a Tandem Queue with Server Slowdown

Kevin Leder, Postdoctoral Fellow, Columbia University, 500 W 120th St # 450, 3rd Floor, New York, NY, 10027, United States of America, kevinleder@gmail.com, Paul Dupuis, Hui Wang

We consider the problem of estimating buffer overflow probabilities of a queuing system with two queues in tandem where the service rate of the first server slows down when the buffer size of the downstream queue reaches a given threshold. We propose an importance sampling algorithm for estimating these probabilities and show that this algorithm is asymptotically efficient. The construction of our change of measure is based on a PDE approach to importance sampling that is broadly applicable.

2 - Beyond Edgeworth Expansions for Regularly Varying Random Walks

Henry Lam, PhD Student, Harvard University, 1 Oxford St. 7th Floor, Cambridge, MA, 02138, United States of America, khlam@fas.harvard.edu, Jose Blanchet, Martin Bazant, Damian Burch

Edgeworth expansions provide additional correction terms to the Central Limit Theorem up to the highest moment. We provide subsequent correction terms beyond these expansions for regularly varying random walks. Our extra terms can be expressed in terms of the Dawson integral and behave qualitatively different depending on whether the highest moment is odd, even or non-integer. Surprisingly, these terms can blend smoothly with large deviations or not depending on the qualitative behaviors.

3 - Importance Sampling Methodology for Multidimensional Heavy-tailed Random Walks

Jose Blanchet, Columbia University, ‏500 W 120th St # 450, 3rd Floor, New York, NY, 10027, United States of America, jose.blanchet@columbia.edu

Estimating small first-passage time probabilities for multidimensional heavy-tailed random walks involves an interesting interplay among the drift, the dependence of the coordinates and the position of a target set. We construct an importance sampling estimator with uniformly bounded coefficient of variation. The construction of our estimator hinges on a Lyapunov inequality that bounds its second moment. Moreover, it involves interesting connections between linear algebra and regular variation.

■ MB28

Approximate Dynamic Programming Applications

Cluster: Applied Dynamic Optimization
Invited Session
Chair: Huseyin Topaloglu, Assistant Professor, Cornell University, School of ORIE, Cornell University, Ithaca, NY, 14853, United States of America, ht88@cornell.edu

1 - Capacity-dependent Bid-prices for Network Revenue Management

Huseyin Topaloglu, Assistant Professor, Cornell University, School of ORIE, Cornell University, Ithaca, NY, 14853, United States of America, ht88@cornell.edu

We develop a method to approximately solve the dynamic programming formulation of the network revenue management problem. Our approach is based on relaxing the constraints that link the decisions for different flight legs. The resulting policy can be interpreted as a capacity-dependent bid-price policy.

2 - A Duality Based Relaxation and Decomposition Approach for Inventory Distribution Systems

Sumit Kunnumkal, Assistant Professor, Indian School of Business, AC 4, Level 1, 4116, Indian School of Business, Hyderabad, AP, 500032, India, sumit_kunnumkal@isb.edu, Huseyin Topaloglu

We present a new method to make the inventory replenishment decisions in a distribution system consisting of multiple retailers and a single warehouse. Our method is based on relaxing the constraints that ensure the nonnegativity of the shipments to the retailers by associating Lagrange multipliers with them. Numerical studies show that our method can provide significant improvements over traditional methods when the balance assumption of Clark and Scarf (1960) is not satisfactory.

3 - Approximate LP for Network Control: Column Generation and Upper Bounds

Michael Veatch, Gordon College, 255 Grapevine Rd, Wenham, MA, 01984, United States of America, mike.veatch@gordon.edu

Approximate linear programming (ALP) bounds average cost for queueing network control problems. Column generation more efficiently solves the dual LP. For certain quadratic approximation architectures, the algorithm is very efficient; examples with 40 queues are approximated. Upper bound methods based on expected Bellman error are discussed.

■ MB29

Communicating Your Research to the News Media

Cluster: INFORMS Outreach
Invited Session
Chair: Barry List, Director of Communications, INFORMS, 7240 Parkway Dr., Hanover, MD, 21076, United States of America, barry.list@informs.org

1 - Communicating Your Research to the News Media

Barry List, Director of Communications, INFORMS, 7240 Parkway Dr., Hanover, MD, 21076, United States of America, barry.list@informs.org, Denise Graveline

As an O.R professional, you need to communicate your research with those outside our field; reporters, interviewers, clients, even friends and family. Join media trainer Denise Graveline, who conducts workshops for AAAS, as she discusses why the news media matter in public outreach; the reporter's job; your job as an interviewee; everyday tips for working with reporters; and how to work with your communications office. This program is sponsored by the INFORMS Public Information Committee.

■ MB30

Defense Supply Chain Analysis II

Sponsor: Military Applications
Sponsored Session
Chair: Alan Johnson, Associate Professor, Air Force Institute of Tech, Wright-Patterson AFB, Dayton, OH, United States of America, alan.johnson@afit.edu

1 - Return on Investment of Extended Warranties for Material Handling and Construction Equipment

Dan Widdis, Principal Operations Research Analyst, Concurrent Technologies Corporation, 5897 Castleberry Peak Ave, Las Vegas, NV, 89131-2043, United States of America, widdisd@ctc.com, John Dulin

Since 1998, the US Marine Corps Program Manager, Engineering Systems has procured warranties for Material Handling and Construction Equipment. Standard warranties provide direct savings in spares and labor costs, while extended warranties also save transportation costs. In addition, contractor logistics support has demonstrated significant reductions in Repair Cycle Time. Analysis techniques for determining the return on investment of the cost of the extended warranties will be presented.

2 - Aggregating Aircraft Mission Capable Rates to Determine Total Airlift Availability

Bill Cunningham, Professor of Logistics Management, AF Insitute of Technology, 2950 Hobson Way, Bldg 641, Wright-Patterson AFB, OH, United States of America, william.cunningham@afit.edu, John Johnson, Alan Johnson

We examine the Logistics Balanced Scorecard metrics for aircraft Mission Capable (MC) rates and recommend a MC rate aggregation method for families of aircraft and a method for defining the mission areas of Red, Yellow, and Green stop light standards used by the Air Force. We used an Analytic Hierarchy process to classify aircraft in terms of speed, range, and payload. Capability-weighting factors were developed to enable standardization to a C-17 equivalent.

3 - Future Combat System (FCS) Deployability Analysis

Kaye McKinzie, Principal Analyst, TRADOC Analysis Center, 255 Sedgwick Ave, Fort Leavenworth, KS, United States of America, Kaye.McKinzie@us.army.mil

This analytical work updates previous deployment work with current FCS BCT (FBCT) structure. This analysis compared two Corps one with Future Combat Systems (FCS) Brigade Combat Teams (FBCT) compared to one with heavy BCTs (HBCT) conducting strategic deployment (SD); and operational maneuver from strategic distances (sea) (OMSD) and operational maneuver (air and sea) (OM) of an FBCT compared to an HBCT; and impacts of using transportation assets in 2015 to those that would be available in 2024.

4 - Modeling the C-5 Isochronal Inspection Process

Martha Cooper, Professor of Logistics Management, AF Institute of Technology, 2950 Hobson Way, Bldg 641, Wright-Patterson AFB, OH, United States of America, Martha.cooper@afit.edu, Ted Heiman, Alan Johnson

Isochronal (ISO) inspections are a periodic examination of military aircraft health. The Air Force plans to streamline ISO flow and reduce the number of C-5 ISO inspection sites from five to three, to reduce cost and promote inspection scheduling predictability. We use an Arena-based simulation and DOE to estimate the expected impacts to cost and fleet mission capability.

■ MB31

Joint Session Practice/MAS: Force Management/Personnel Readiness

Sponsor: The Practice Section of INFORMS, Military Applications
Sponsored Session
Chair: Joseph Albert, Computer Laboratory Director/Instructor, MPRI/Army Force Management School, 5500 21st Street, Bldg 247, Suite 1400, Fort Belvoir, VA, 22060, United States of America, joseph.albert@us.army.mil

1 - Measuring the Impact of Force Generation Policies on Force Size

Steven Stoddard, Operations Research Analyst, Office of the Secretary of Defense, Program Analysis and Evaluation, Land Forces Division, Washington, DC, 20301-1800, United States of America, Steven.Stoddard@osd.mil

To analyze force size and rotation/readiness policies, we employ a method that shows contingency and enduring operations along with a service's force generation policies. We use a graphical frontier to show feasible combinations of events under various force generation policies. Each frontier is a graph of supply

capacity that is constant for any force size and force generation policy. This allows assessment of force size, force generation process, and the range of potential demand scenarios.

2 - Consequence Management (CM) Response Study

Lisa Seymour, Homeland Defense Analyst, OSD, PA&E, SAC, 1225 S Clark Street, Arlington, VA, 22202, United States of America, Lisa.Seymour.Ctr@osd.mil, Thom Ford, Dan Lotz

The DoD is in the process of configuring and sourcing CM response forces. The objective of our study will be to determine the demand (based on effects of the National Planning Scenarios (NPS)) and the supply (capabilities) of the CM response units from DoD and other early responders. Our analysis will evaluate capability gaps or overmatch, where current and projected capabilities fail to meet or exceed projected NPS demands.

3 - A Proposed Multi-agent Framework for Future Global Force Management (GFM)

Greg Godfrey, Senior Manager, Metron, Inc., 11911 Freedom Drive, Suite 800, Reston, VA, 20190, United States of America, godfrey@metsci.com, Charles H. Shaw, III

Future operations by the US Military Services will require greater collaboration within the government and with the private sector. Commercial enterprises that normally compete with one another will have to cooperate to satisfy the goals of our National Security and Military Strategies in support of the Global War on Terrorism (GWOT) and other operations. Of particular interest is the management of human capital/ personnel which is the focus of a new Global Force Management System (GFMS) and emerging policies, standards, and methods vice existing Military Service and Government Agency centric Personnel Management Systems. This presentation will provide insights into and lessons learned from other "Global" efforts to optimize constrained resources under stochastic conditions with often significant uncertainty across organizations, time and space. A market-based approach currently implemented for constrained supplies and services called the Virtual Personnel Command (VPC) will also be presented using autonomous Software Agents (SWA) to represent the interests of each Service and Agency collaboratively.

4 - Negotiation Mechanisms for Coordinated Unmanned Aerial Vehicle Surveillance

Greg Godfrey, Senior Manager, Metron, Inc., 11911 Freedom Drive, Suite 800, Reston, VA, 20190, United States of America, godfrey@metsci.com

As the size of unmanned aerial vehicle (UAV) fleets increases in the future, so will the need to coordinate these fleets effectively. In this paper, we define several negotiation mechanisms for autonomous, distributed coordination of surveillance tasks. These mechanisms are based on dynamic target swapping between UAVs, where the criterion for swapping can be greedy or cooperative and where the amount of information shared by UAVs can be relatively high or low. The results show that high-quality system solutions can be obtained through local optimization by individual UAVs. In addition, we show how the rate of convergence to good system solutions can improve given cooperative UAV behavior (adherence to system goals rather than strictly local goals) and greater information sharing.

■ MB32

Daniel H. Wagner Prize Competition

Cluster: The Daniel H. Wagner Prize for Excellence in Operations Research
Invited Session

Chair: Allen Butler, President, Daniel H. Wagner Assoc., 2 Eaton Street, Suite 500, Hampton, VA, 23669, Allen.Butler@va.wagner.com

Seven finalist teams have been selected for 2008 and these seven will be presented in three sessions on Monday and the winning entry announced on Tuesday morning.

1 - Managing Inventory in Supply Chains with Non-Stationary Demand

John J. Neale, Boston University School of Management, jneale@bu.edu, Sean P. Willems

Many companies experience nonstationary demand due to product lifecycle effects, seasonality, customer buying patterns, or other factors. We present a practical model for managing inventory in a supply chain facing stochastic, nonstationary demand. Our model is based on the guaranteed service modeling framework. We first describe how inventory levels should adapt to changes in demand at a single stage. We then show how nonstationary demand propagates in a supply chain, allowing us to link stages and apply a multiechelon optimization algorithm originally designed for stationary demand. We describe two successful applications of this model. The first is a strategic project to evaluate the benefits of an inventory pool at Case New Holland (CNH). The second is a tactical implementation to support monthly safety stock planning at Microsoft.

2 - Correcting Heterogeneous & Biased Forecast Error at Intel for Supply Chain Optimization

Matthew P. Manary, Intel Corporation, matthew.manary@intel.com, Alison F. Shihata, Sean P. Willems

Inventory optimization techniques generally require demand characterization be well behaved in error structure. However, imperfections such as bias, heterogeneity, and non-parametric residuals are common in practice. Add in system and organizational complexities that make traditional corrective procedures infeasible and modeling efforts quickly become sub-optimal. This presentation covers techniques and algorithms Intel has developed over several years to counter these common hurdles while working within the reality of corporate dynamics.

■ MB33

Optimization in Healthcare and Medicine

Sponsor: Health Applications Section
Sponsored Session

Chair: Hari Balasubramanian, Mayo Clinic, Rochester, 200 First St. SW, Rochester, MN, United States of America, Balasubramanian.Hari@mayo.edu

1 - An Applied Example of Operations Research Simulation Modeling Within an Outpatient Procedure Center

Todd Huschka, Health Systems Analyst, Mayo Clinic, 901 1st St. SW, Rochester, MN, 55905, United States of America, huschka.todd@mayo.edu, Bradly Narr, Adam Thompson, Brian Denton

Surgery accounts for a large portion of a hospital's total expenses and revenues. Therefore efficient use of operating rooms and other surgical resources is of great importance. We describe a discrete event simulation model to evaluate a number of scenarios involving the movement and expansion of an outpatient procedure center while attempting to answer some important questions regarding the new environment and how it may impact the operations of this area.

2 - A Capacity Planning Model for Internal Access Within a Large Integrated Academic Practice

Brian Bailey, Operations Research Analyst, Mayo Clinic, 200 1st St. SW, Rochester, MN, 55905, United States of America, bailey.brian@mayo.edu, Hari Balasubramanian

Within an integrated medical practice, appointment capacity is allocated between varying sources of demand. New medical encounters are often booked weeks in advance, whereas internal downstream referrals are requested within a few days. Using actual appointment and resource data from Mayo Clinic of Rochester, we introduce a multi-period planning model to forecast internal demand. The model is being evaluated as a short-range planning tool to assign capacity and minimize schedule changes.

3 - Flexible Shift Scheduling of Medical Residents

Jens Brunner, Technische Universität München, Arcisstrasse 21, München, D-80333, Germany, jens.brunner@wi.tum.de, Jonathan Bard, Rainer Kolisch

This research addresses a shift scheduling problem in which medical residents are assigned to demand periods. We propose a new modeling approach that requires shifts to be generated implicitly. The objective is to minimize the paid out overtime hours under the restrictions given by the labor agreement. Our problem is formulated as a mixed-integer program and solved with CPLEX. Computational results indicate that high quality schedules can be obtained.

4 - Reducing Ward Congestion at Vancouver Island Health Authority Through Improved Surgical Scheduling

Vincent Chow, Operations Research Analyst, British Columbia Cancer Agency, 600 West 10th Avenue, Vancouver, BC, V5Z 4E6, Canada, vchow@bccancer.bc.ca, Neda Salehirad, Derek Atkins, Wenhai Huang, Martin Puterman

This talk describes a significant study carried out at Royal Jubilee Hospital in Victoria BC, Canada involving surgical scheduling and its impact on downstream ward utilization. We developed a portable MS EXCEL based simulation model (BUS) which we combined with an integer program to help surgical planners reduce ward congestion. Results from the project are currently being used within the health authority.

■ MB34

Applications in Disease Management

Sponsor: Health Applications Section
Sponsored Session

Chair: Jose Zayas-Castro, Professor & Chair, IMSE, University of South Florida, IMSE, University of South Florida, 4202 E. Fowler Avenue, ENB118, Tampa, Fl, 33620, United States of America, josezaya@eng.usf.edu

1 - Optimizing Screening Strategies for Chronic Diseases from a Dynamic Angle

Marion Rauner, Associate Professor, University of Vienna, Bruennerstr. 72, Vienna, A-1230, Austria, marion.rauner@univie.ac.at, Walter Gutjahr, Joachim Wagner, Joseph Pasia, Kurt Heidenberger

We present a dynamic risk-group oriented chronic disease model embedded within a Pareto Ant Colony Optimization of the policy variables. Policy-makers are provided with Pareto-optimal breast cancer screening schedules for risk groups by considering cost and effectiveness outcomes as well as budget constraints. We then discuss policy implications of 16 mammography screening scenarios varying the screening schedule and the rate of women tested.

2 - Optimal Control of Dosage Decisions in Controlled Ovarian Hyperstimulation

Miao He, Graduate Student, Tsinghua University, Beijing, 100084, China, hem03@mails.tsinghua.edu.cn, Lei Zhao, Warren Powell

We formulate an MDP model for the controlled ovarian hyperstimulation (COH) cycle in the IVF-ET therapy. We then study the impact of misclassification of patients' responsiveness to gonadotropin dosages on their treatment cycle outcomes.

3 - Risk Identification, Assessment, and Monitoring in the Delivery of Health-care Services.

Laila Cure, Graduate Student, University of South Florida, IMSE, University of South Florida, 4202 E. Fowler Avenue, ENB118, Tampa, Fl, 33620, United States of America, lncure@mail.usf.edu, Jose Zayas-Castro, Peter Fabri

Patient safety research evidence the existence of risk beyond patient disease or chronic condition. This risk is intrinsic to the health-care delivery system and it is generally attributed to human error. We believe most incidents stem from substandard interactions of system components. We propose a methodology to combine expertise and near-miss reports to assess and monitor risk in health-care service delivery.

■ MB35

Panel Discussion: Teaching Modern Project Management - Strategic Issues

Sponsor: INFORM-ED
Sponsored Session

Chair: Nicholas G. Hall, Professor, The Ohio State University, Management Sciences, 2100 Neil Avenue, Columbus, OH, 43210-1144, United States of America, hall_33@fisher.osu.edu

1 - Teaching Modern Project Management- Strategic Issues

Moderator: Nicholas G. Hall, Professor, The Ohio State University, Management Sciences, 2100 Neil Avenue, Columbus, OH, 43210-1144, United States of America, hall_33@fisher.osu.edu, Panelists: G. Anand Anandalingam, Edward Anderson, Ted Klastorin, George Vairaktarakis

This panel discussion considers several strategic issues related to the teaching of project management, especially for new instructors. These include: whether to teach this course, generating student interest, overview of course design, learning objectives, prerequisite courses, managing students' expectations, students' varied experience levels, and opportunities for synergistic course development (e.g., how a well-designed PM course is related to most other courses in an MBA curriculum).

■ MB37

Tutorial: Is It Really Safe to Fly?

Cluster: Tutorials
Invited Session

Chair: Arnie Barnett, Sloan School of Management, E53-379 MIT, Cambridge, MA, 02139, United States of America, abarnett@mit.edu

1 - Is It Really Safe to Fly?

Arnie Barnett, Sloan School of Management, E53-379 MIT, Cambridge, MA, 02139, United States of America, abarnett@mit.edu

This tutorial investigates how the mortality risk of passenger air travel has evolved over the last half-century. Much of the news is good: fatal air accidents in the First World are on the verge of extinction. But a near-extinct species can stage a major comeback, and I discuss future risks related to airport and midair collisions. I also discuss the menace of aviation terrorism, which might pose considerably greater risk to future air travelers than all other hazards combined.

■ MB38

Mixed-integer Programming: Strong Formulations and Cuts

Sponsor: Optimization/ Discrete Optimization
Sponsored Session

Chair: Ismael de Farias, Associate Professor, Department of Industrial Engineering, Texas Tech, Lubbock, TX, United States of America, defarias@buffalo.edu

1 - Modeling Disjunctive Constraints with a Logarithmic Number of Binary Variables and Constraints

Juan Pablo Vielma, H. Milton Stewart School of Industrial and Systems Engineering, Georgia Institute of Technology, 765 Ferst Drive, NW, Atlanta, 30332, United States of America, gtg531t@mail.gatech.edu, George Nemhauser

For specially structured disjunctive constraints we give sufficient conditions for constructing mixed integer programming (MIP) formulations with a number of binary variables and extra constraints that is logarithmic in the number of terms of the disjunction. Using these conditions we introduce formulations with these characteristics for SOS1, SOS2 constraints and piecewise linear functions. We present computational results showing that they can significantly outperform other MIP formulations.

2 - Generalized MIR Cuts

Jean-Philippe Richard, Assistant Professor, Purdue University, School of Industrial Engineering, Purdue University, 315 N. Grant Street, West Lafayette, IN, 47907-2023, United States of America, jprichar@ecn.purdue.edu, Santanu Dey

In this talk, we present a generalization of the MIR procedure so as to generate cutting planes using multiple rows of a simplex tableau. To this end, we study an extension of the simple MIR set with three unstructured constraints that contains two integer and one continuous variable. Using the facet-defining inequalities of this constraints set, a technique is presented to generate valid cutting planes that consider three rows of a simplex tableau simultaneously.

3 - Optimization with Cardinality Constraints: Computational Experience and 0-norm Learning

Silvia Canale, Department of Computer and Systems Sciences, University of Rome "Sapienza", via Ariosto 25, Rome, 00185, Italy, canale@dis.uniroma1.it, Ismael de Farias, Ming Zhao

We present computational experience with branch-and-cut and Lagrangian relaxation to solve large-scale optimization problems with cardinality constraints. In particular, we apply the algorithm to the problem of maximizing sparsity of large-margin classifiers in supervised machine learning.

■ MB39

Message-passing Algorithms and Network Optimizaiton

Sponsor: Optimization/ Networks
Sponsored Session

Chair: Mohsen Bayati, Microsoft Research, One Microsoft Way, Redmond, WA, 98052, United States of America, bayati@stanfordalumni.org

1 - Message-passing Algorithms for Bounded Depth Steiner Trees

Riccardo Zecchina, Professor, Politecnico di Torino, Corso Duca degli Abruzzi 24, Turin, 10129, Italy, riccardo.zecchina@polito.it, Mohsen Bayati, Christian Borgs, Alfredo Braunstein, Jennifer Chayes, Abolfazl Ramezanpour

The Minimum Weight Steiner Tree (MST) is a basic optimization problem over networks. Here we discuss a general technique to translate the imposed global connectivity constrain into many local ones that can be analyzed with Belief Propagation techniques. This approach leads to a new message-passing algorithm for MST with bounded depth and for its generalizations. We discuss the statistical properties of optimal MSTs on random graphs of various types together with some benchmark examples.

2 - Message Passing Algorithms for Stochastic Loss Networks

Kyomin Jung, MIT, 77 Massachusetts Ave, Cambridge, MA, 02139, United States of America, kmjung@mit.edu, Mayank Sharma, Mark Squillante, Yingdong Lu, Devavrat Shah

We proposes a novel message passing algorithm for estimating the stationary loss probabilities in stochastic loss networks based on structural properties of the exact stationary distribution. We show it converges to asymptotically exact results. Using a variational characterization of the stationary distribution, an alternative proof is provided for an important result due to Kelly. We determine structural properties of the inverse Erlang function characterizing the region of capacities.

3 - Random Matchings in Forests with Given Marginals

Arash Asadpour, Stanford University, Terman Engineering Building, Room 395, Stanford, CA, 94305, United States of America, asadpour@stanford.edu, Amin Saberi

In this work, we propose a message passing algorithm to sample matchings in a forest when the marginal probability of every edge is given. We study the properties of final probability distribution made by this method and show that it in fact is a distribution which maximizes the entropy. We show how this method can be used as a crucial part in designing an approximation algorithm for a seemingly irrelevant resource allocation problem.

4 - Belief Propagation and Linear Programming

Mohsen Bayati, Microsoft Research, One Microsoft Way, Redmond, WA, 98052, United States of America, bayati@stanfordalumni.org, Christian Borgs, Jennifer Chayes, Riccardo Zecchina

Belief propagation (BP) is an iterative, message-passing algorithm for making inference in graphical models. We study the relationship between the convergence and correcness of the BP and integrality of linear programming (LP) in the context of combinatorial optimizaiton problems. We show some theoretical results which shed more light on this often noted but poorly understood connection.

■ MB40

Stochastic Programming Models in Operations Management

Sponsor: Optimization/ Stochastic Programming
Sponsored Session

Chair: Kai Huang, Assistant Professor in Supply Chain Management, Binghamton University, State University of New York, School of Management, Binghamton University, Binghamton, NY, 13902, United States of America, K.Huang@tue.nl

1 - Dominance Constrained Stochastic Programs for Energy System Operation

Ruediger Schultz, Professor, Duisburg-Essen University, Forsthausweg 2, 47057 Duisburg, Duisburg, Germany, schultz@math.uni-duisburg.de

We consider random optimization problems in energy systems operation for which the framework of two-stage stochastic programming is one possible modeling alternative. Rather than optimizing expectations or mean-risk expressions of recourse functionals, we set up models where the recourse functionals occur within stochastic dominance constraints. We analyze these models, propose decomposition algorithms for their numerical treatment, and conclude with computational results.

2 - Oil Supply to Nepal- Steady State Inventory

Stein W. Wallace, Professor, Molde University College, PO Box 2110, Molde, 6402, Norway, Stein.W.Wallace@himolde.no, Biju Kumar Thapalia

We present a two-stage stochastic programming model for analyzing the steady state of inventory control in oil supply to Nepal. The focus will be on how we formulate this infinite horizon problem as a two-stage program.

3 - Cost Minimization of Assemble-to-order Systems via Stochastic Programming

Kai Huang, Assistant Professor in Supply Chain Management, Binghamton University, State University of New York, School of Management, Binghamton University, Binghamton, NY, 13902, United States of America, K.Huang@tue.nl, Ton de Kok

We develop a two-stage stochastic integer programming model for joint optimization of base stock levels and component allocation in Assemble-To-Order systems. This model is based on the concept of "matching" between supply and assembly of components, and counts the inventory holding cost and order backlogging cost accurately. The algorithm design is discussed.

■ MB41

Collaboration Challenges in NPD

Cluster: New Product Development
Invited Session

Chair: Stylianos Kavadias, Associate Professor, Georgia Institute of Technology, 800 W. Peachtree St., NW, Atlanta, GA, United States of America, Stylianos.Kavadias@mgt.gatech.edu

1 - Hogging the Credit and Assigning Blame: The Role of Outcomes & Nature of Group Task

Sanjiv Erat, University of California at San Diego, serat@ucsd.edu

The old adage that "success has many fathers while failure is an orphan" is one proposition that not many managers would disagree with. Still, the empirical studies that have tested this proposition, have found evidence for it mixed. In this paper, I shall analytically develop and empirically test a set of propositions that link the nature of the group task and the task outcome to the degree to which each group member claims credit for success (or assigns blame for failure).

2 - Being Different or Being Better? Vertical Individualism Facilitates Creative Idea Generation

Jack Goncalo, Cornell University, Ithaca, NY, United States of America, jag97@cornell.edu

Recent research suggests that individualism facilitates creativity in groups. However, there are two types of individualism (1) vertical which promotes competition and (2) horizontal which promotes equality and no research to investigate whether one form of individualism stimulates greater creativity than the other. The results of an experiment show that VI facilitates the expression of creative ideas and that group creativity requires not just independence but also competition.

3 - Coordination and Performance of Engineers in New Product Innovation

Bilal Gokpinar, Assistant Professor, University College London, Management Science and Innovation, London, WC1E 6BT, United Kingdom, bilal@northwestern.edu, Seyed Iravani, Wallace Hopp

In this empirical study, we investigate the role of organizational networks in new product innovation. Our results suggest that design engineers who have more coordination links to their peers perform better, but that it takes longer for them to resolve design issues. We discuss how this insight may help managers improve the design process along both the speed and quality dimensions.

■ MB42

Joint Session OPTIM/HAS: Medical Decision Making

Sponsor: Optimization/ Medicine and Healthcare, Health Applications Section
Sponsored Session

Chair: Eva Lee, Associate Professor and Director, Georgia Institute of Technology, Ctr for Operations Research in Medicine, Industrial & Systems Engineering, Atlanta, GA, 30332-0205, United States of America, evakylee@isye.gatech.edu

1 - MINLP Model for Scheduling the Adjuvant Endocrine Therapy for Early Stage Breast Cancer

Sergiy Butenko, Assistant Professor, Texas A&M University, Department of Industrial and Systems Eng, College Station, TX, 77843-3131, United States of America, butenko@tamu.edu, Sera Kahruman, Elif Ulusal, Illya Hicks, Kathleen Diehl

Based on the data available through published trial results, we propose a mixed integer nonlinear programming (MINLP) model in order to find an optimal treatment plan for a given Hr+ early stage breast cancer patient who is postmenopausal. The results of numerical experiments suggest the effectiveness of some of the schedules currently used in practice, as well as indicate some effective alternative treatment plans.

2 - Pattern-based Techniques in Integrative Cancer Genomics

Gabriela Alexe, Research Scientist, The Broad Institute of MIT and Harvard, 7 Cambridge Center, Cambridge, MA, 02142, United States of America, galexe@broad.mit.edu

Integrative cancer genomics is aimed to integrate multiple forms of molecular information for understanding the mechanisms of cancer. This novel type of coordinated research raises strategic challenges in the identification of relevant genomic cancer signatures. We review a framework for integrative cancer genomics which addresses some of these challenges. The proposed approach is rooted in the Logical Analysis of Data methodology initiated by Peter L. Hammer.

3 - Interactive Multiobjective Optimization in Radiotherapy

Kaisa Miettinen, Professor, University of Jyvaskyla, Department of Math Inf Tech, PO Box 35 (Agora), University of Jyvaskyla, FI-40014, Finland, kaisa.miettinen@jyu.fi, Henri Ruotsalainen

In radiotherapy, conflicting goals, i.e. treating a tumor with radiation without irradiating healthy tissue, cannot be satisfied simultaneously. We employ interactive multiobjective optimization to avoid specifying more or less artificial weights or penalties and trial-and-error planning. In our approach, a treatment planner can utilize one's expertise and direct the solution process interactively to find the best treatment plan. We report encouraging results in both IMRT and brachytherapy.

■ MB43

Information Sharing for Managing Disruptions

Cluster: Managing Disruptions in Supply Chains
Invited Session
Chair: Sanjay Kumar, Pennsylvania State University, Erie, Black School of Business, 5101 Jordan Rd, Erie, PA, United States of America, sxk89@psu.edu

1 - Mitigate Supply Interruption Risk by Sharing Information and Using Coordinating Contract

Zhaolin Li, Assistant Professor, City University of Hong Kong, P7620, 83 Tat Chee Avenue, Hong Kong, Hong Kong - China, zherli@cityu.edu.hk

We consider a one-supplier-one-retailer inventory system with random supply interruption, fixed upstream setup cost, lost sales, and stochastic demand. We show that the optimal policy for the retailer is a (s,S) policy. We propose a coordinating contract that coordinates the system (the retailer's optimal (s,S) policy is the same as the system optimum). We then perform a sensitivity analysis on contract parameters to see how various cost parameters may affect the channel performance.

2 - A General Framework for Cooperation under Uncertainty

Ulas Ozen, Researcher, Bell Labs Ireland, Alcatel-Lucent, Alcatel-Lucent, Blanchardstown Industrial Park, Dublin, 15, Ireland, uozen@alcatel-lucent.com, Henk Norde, Marco Slikker

In this paper, we introduce a general framework for situations with decision making under uncertainty and cooperation possibilities. This framework is based upon a two stage stochastic programming approach. We show that under relatively mild assumptions the cooperative games associated with these situations are totally balanced and, hence, have non-empty cores. Finally, we consider several example situations, which can be studied using this general framework.

3 - Revenue Sharing Contract in Supply Chain under Asymmetry Information and Disruptions

Pin Zhuang, Nanjing University of Aeronautics and Astronautics, 29 Yudao Street, Nanjing, 210016, China, zhuang-pin@163.com

Revenue sharing contracts for a two-level supply chain model under asymmetric information and disruptions are investigated. With non-linear demand and the retailer's cost asymmetric information, a revenue sharing contract is proposed in a regular scenario. After retailer's cost is disrupted, we obtain the optimal emergency strategies of supply chain by considering deviation cost. We illustrate the results by numerical examples.

4 - Supply Chain Efficiency with Downside Risk-averse Agents

Sudarsan Rangan, The University of Alabama, ISM Department Box 870226, Tuscaloosa, AL, 35487, United States of America, srangan@cba.ua.edu, Charles Sox

We consider supply chains with one or more downside risk-averse agents. The downside risk-averse supplier is the Stackelberg leader in the decentralized chain and designs the "optimal" contract parameters. We compare the performance of this decentralized contract with channel performance under two centralized coordinating contracts: coordinating contracts with and without consideration of agent risk perspectives.

■ MB44

Risk-Informed Pricing and Sourcing

Cluster: Managing Disruptions in Supply Chains
Invited Session
Chair: Metin Cakanyildirim, University of Texas at Dallas, School of Management SM 30, Richardson, TX, United States of America, metin@utdallas.edu

1 - Sourcing and Pricing Strategies under Capacity Uncertainties

Qi Feng, Assistant Professor, The University of Texas at Austin, 1 University Station, B6500, Austin, TX, 78712, United States of America, Annabelle.Feng@mccombs.utexas.edu

We examine simultaneous ordering and pricing decisions in a periodic review inventory system with random supply capacities. We show that there is a reorder point for each of the suppliers. The reorder points are in the increasing order of the procurement costs, indicating that cost consideration dominates the risk consideration in the sourcing decision. Additional insights of the problem are also obtained by discussing several special applications of the problem.

2 - A Two-period Newsvendor Problem with Production Cost Learning

He Xiuli, Visiting Assistant Professor, School of Management, University of Texas at Dallas, Richardson, 75083, United States of America, xiulihe@utdallas.edu, Suresh Sethi

We consider a supply chain with a manufacturer and a retailer who faces demand uncertainty. We adopt a price-dependent newsvendor model which takes the multiplicative form. We assume that the manufacturer can reduce the per unit product cost in the second period as a result of accumulated production experience in economy of scale. The retailer decides a retail price and an order quantity prior to facing random demand in each period. We consider two cases: a myopic and a far-sighted retailer.

3 - Pricing Services with Strategic Customers

Pengfei Guo, Hong Kong Polytechnic University, Kowloon, Hong Kong - China, lgtpguo@polyu.edu.hk, Yulan Wang

The paper studies a two-period pricing game in a single-server service system. We assume two types of servers: one is to maximize its revenue and the other is to maximize the social welfare. Then we consider both myopic and strategic customers and derive the subgame perfect Nash equilibrium (SPNE) prices. We evaluate the impact on the system's performance measures of misunderstanding strategic customers to be myopic and myopic customers to be strategic by decision makers.

4 - Optimal Transshipments and Orders: A Tale of Two Retailers in Competition

Metin Cakanyildirim, University of Texas at Dallas, School of Management SM 30, Richardson, TX, United States of America, metin@utdallas.edu, Nagihan Comez, Kathryn E. Stecke

Consider a decentralized system of retailers that order/sell the same product. When a customer demand occurs at a stocked-out retailer, that retailer can request a unit to be transshipped from the other retailer. If this request is rejected, the unsatisfied customer can go to the other retailer with a demand overflow probability. Each retailer maximizing own profit makes two types of decisions: initially the order quantity from a manufacturer and afterwards transshipment decisions.

■ MB45

Biopharmaceutical Supply Chain Optimization

Sponsor: Manufacturing & Service Oper Mgmt/Supply Chain Management
Sponsored Session
Chair: Max Shen, Professor, UC Berkeley, IEOR, Berkeley, CA, 94720, United States of America, shen@ieor.berkeley.edu

1 - An Automated Planning Engine for Biopharmaceutical Production

Rob Leachman, Professor, University of Calif. at Berkeley, 4127 Etcheverry Hall, Berkeley, CA, 94720-1777, United States of America, leachman@ieor.berkeley.edu

This optimization-based production planning system generates capacity-feasible batch processing schedules for the facilities in a biomanufacturing supply chain and an availability schedule for finished product against given demands. It precisely reflects constraints imposed by regulatory approvals, outcomes of quality testing and processing options. Problems with 30,000 binary variables, 150,000 linear variables and 90,000 constraints are automatically formulated and solved within several hours.

2 - Clinical Trial Supply Chains for Biotech Pharmaceuticals

Micah Siegel, Planner, Global Biologics Supply Chain, 133 Airdale Road, Bryn Mawr, PA, 19010, United States of America, MSiegel1@CNTUS.JNJ.COM

Learn about the steps required to provide experimental drug to a patient participating in an investigative study. Discuss risks to supply and demand and ways to mitigate those risks. Discuss OR tactics, software, and innovative supply strategies for improving efficiency and lead times in clinical supply chains.

3 - Planning for Demand Failure: A Dynamic Lot Size Model for Clinical Trial Supply Chains

Adam Fleischhacker, Rutgers University, 180 University Ave #35, Newark, NJ, 07102, United States of America, adam_fleischhacker@yahoo.com, Yao Zhao

How much of a product do you manufacture if demand for that product may disappear? To answer this question, we generalize the Wagner-Whitin (W-W) model to incorporate the risk of disappearing demand. We highlight this model's applicability and relevance to the clinical trial drug supply chain. In addition, we show how to transform this stochastic model into the deterministic W-W model and thus, one can directly apply decades of W-W model results in cases where demand may suddenly cease.

4 - New Drug Development in the Pharmaceutical Industry-A Teaching Game

Shan Li, PhD Candidate, UC Berkeley, IEOR, Berkeley, CA, 94720, United States of America, lisapine@berkeley.edu, Max Shen, Yao Ma

We developed a game to help students understand the complexity involved in selecting which new drugs to develop and how to schedule the production of these drugs. The problem is further complicated with the presence of capacity constraints and the dependencies between drug candidates. The game is also capable of evaluating the performance of several practical decision rules.

■ MB46

Product Variety Management

Sponsor: Manufacturing & Service Oper Mgmt/Supply Chain Management
Sponsored Session
Chair: Aydin Alptekinoglu, SMU Cox School of Business, Dallas, TX, United States of America, aalp@ufl.edu

1 - Assortment Selection and Pricing for Configurable Products

Betzabe Rodriguez, PhD Student, University of Michigan - Ann Arbor, 1205 Beal Avenue, Ann Arbor, MI, 48109, United States of America, betzabe@umich.edu, Goker Aydin

Consider a retailer selling a configurable product, whose price depends on what option the customer chooses for each feature. We analyze the retailer's option assortment and pricing problem. We utilize a two-stage consumer choice model: The customer first decides whether or not to visit the retailer, followed by the actual purchase decision. We show that options with higher demand uncertainty will be dropped from the assortment and tighter service level goals result in narrower assortments.

2 - An Algorithm and Demand Estimation Procedure for Retail Assortment Optimization

Ramnath Vaidyanathan, PhD Student, The Wharton School, 500 Jon M Huntsman Hall, 3730 Walnut Street, Philadelphia, PA, 19104, United States of America, ramnathv@wharton.upenn.edu, Marshall Fisher

We consider the problem of choosing a subset of SKUs in a category, to be carried by a retailer, to maximize sales or a defined profit function. Assortments can vary by store, subject to a maximum number of different assortments. We describe an approach to estimate demand and substitution parameters from sales history, and propose heuristics to select the optimal assortment. We apply this approach to optimize assortments for two categories, tires and snacks, producing sales lifts of 41% and 36%.

3 - When to Carry Eccentric Products? Optimal Assortment under Product Returns

Alex Grasas, University of Florida, Department of Industrial & Systems, Engineering, 303 Weil Hall, PO Box 116595, Gainesville, FL, 32611, United States of America, agrasas@ufl.edu, Elif Akcali, Aydin Alptekinoglu

Motivated with the question of whether retailers should consider product returns when merchandising (as they compose their product lines), we explore the interactions between product assortment and return policy decisions of a firm under both make-to-order (MTO) and make-to-stock (MTS) environments. We show that the structure of the optimal assortment critically depends on the refund fraction and whether the products are supplied on an MTO or MTS basis.

■ MB47

OR Models for Disease Management

Sponsor: Health Applications Section
Sponsored Session
Chair: Vedat Verter, Associate Professor, McGill University, 1001 Sherbrooke Street W., Montreal, QC, H3A 1G5, Canada, vedat.verter@mcgill.ca

1 - Emergency Room Service Facility Location and Capacity Planning Problem

Elif Akcali, Associate Professor, University of Florida, 303 Weil Hall, Gainesville, FL, 32611-6595, United States of America, akcali@ise.ufl.edu, Chin-I Lin

A hospital may declare divert status, when its emergency room (ER) is full or all intensive care beds are occupied. To a critical patient, this can be the difference between life and death. We present a model that simultaneously determines the number of ER service facilities to be opened as well as their respective locations and capacity levels where the probability that an ER facility declares divert status does not exceed a pre-determined level.

2 - A Partially Observable Model for the Liver Transplant Waiting List

Burhaneddin Sandikci, Assistant Professor, University of Chicago, Graduate School of Business, Chicago, IL, 60637, United States of America, burhaneddin.sandikci@chicagogsb.edu, Mark Roberts, Lisa Maillart, Andrew Schaefer

The liver transplantation system in the United States publishes incomplete information about the composition of the liver transplant waiting list. We model and analyze the accept/reject decision of a liver patient under this incomplete information system as a partially observed Markov decision process (POMDP). We compare the POMDP model to a previous MDP model to obtain more precise estimates of the patient's price of privacy. We present the results of clinically driven numerical experiments.

3 - Radiation Therapy Treatment Decision Making for Prostate Cancer Patients Based on PSA Dynamics

Mariel Lavieri, University of British Columbia, 2053 Main Mall, Vancouver, BC, Canada, Mariel.Lavieri@sauder.ubc.ca, Steven Shechter, Scott Tyldesley, Martin Puterman

In this talk we model the decision of when to start radiation therapy (RT) in prostate cancer patients who are undergoing neoadjuvant hormone therapy. We develop and validate a dynamic Kalman filter model for within patient serial PSA values. Our decision making model trades off the risk of beginning RT too soon so that hormone therapy has not achieved its maximum effect vs. waiting too long to start therapy so that there is an increased risk of tumor cells becoming resistant to the treatment.

4 - Planning for HIV Screening and Treatment at the VA

Sarang Deo, Northwestern University, s-deo@kellogg.northwestern.edu, Kumar Rajaram, Uday Karmarkar

Routine HIV screening has been shown to be cost-effective in a variety of settings and is now recommended by the CDC. However, these studies typically ignore resource constraints at an organizational level that can impede implementation. We formulate a dynamic optimization model combining a disease progression model with a patient flow model under constrained resources. We apply this model to a VA facility and demonstrate the impact of resource constraints on the optimal screening policy.

5 - Designing Antithrombotic Therapy for Stroke Prevention in Atrial Fibrillation

Beste Kucukyazici, McGill University, 1001 Sherbrooke West, Montreal, QC, Canada, beste.kucukyazici@mail.mcgill.ca, Vedat Verter

Randomized trials show that antithrombotic therapy with warfarin reduces the risk of stroke, however it also increases risk of major bleeding. Given the benefits and risks of therapy, decisions are two-fold: initialization of the therapy, and the intensity of warfarin use. Hence, we aim to develop an analytical framework for designing optimal therapy with a patient-centered approach by incorporating complex probabilistic data and permitting explicit quantitative comparison of benefits and risks.

■ MB48

Service Innovation

Sponsor: Technology Management
Sponsored Session
Chair: Pedro Oliveira, Assistant Professor, Catholic University of
Portugal Palma de Cima, 1649-023 Lisboa, Lisbon, Portugal,
poliveira@fcee.ucp.pt

1 - Service Innovation in Manufacturing

John E. Ettlie, Professor, E. Phillip Saunders College of Business,
Rochester Institute of Technology, 107 Lomb Memorial Drive,,
Rochester, NY, 14623-5608, jettlie@saunders.rit.edu,
Stephen Rosenthal

In spite of the dominance of the service sector in developed countries there is
little applied research on service innovation. In this longitudinal study of nine
significant service innovations in seven manufacturing firms, persistence of the
new service concept served as the dependent variable. The new service offering
survived for all nine cases, although in two cases the innovation was spun-off as
a separate business. Emergent concepts attendant to successful service innovation
were organizational philosophy,championship, and multifunctional strategy-
making.

2 - Intangible Factors of Service Delivery Readiness

Jillian Davis, PhD Student, Clemson University, Department of
Management, 101 Sirrine Hall, Clemson, SC, 29634, United States
of America, jilliad@CLEMSON.EDU, Aleda Roth, Janis Miller

We empirically investigate the intangible factors of a new "service delivery
readiness," construct, which we define as the capability to perform service
delivery requirements across a range of conditions and environments. We model
service delivery readiness as a second-order latent construct comprised of three
interrelated intangible competencies: employee development, organizational
support and customer development. Operational measures of these competencies
are presented.

**3 - Retail Information Processing and Store Design Strategy:
Testing a Model of Alignment**

Jeff Shockley, PhD Student, Clemson University, 101 Sirrine Hall,
Department of Management, Clemson, SC, 29634, United States
of America, tshockl@clemson.edu, Lawrence Fredendall,
Aleda Roth

This study examines the operational alignment of delivery system design
strategies with the information requirements of retail service encounters. Using
survey data from 175 stores in the Southeastern US, we develop and test a
model of design strategy coalignment. We find that higher overall employee and
customer satisfaction is strongly associated with the retailer's ability to align job
and structural design strategies with the information requirements of store
service encounters.

**4 - The Mediating Role of the Usability Requirements on Electronic
Retail Satisfaction**

Diogo Gonçalves, Research Assistant, FCEE - Catòlica, Catholic
University of Portugal, School of Economics and Management,
Lisboa, 1649-023, Portugal, diogo.goncalves@yahoo.com,
Pedro Oliveira, Marlene Amorim

We empirically explore the following research questions: what are the main
typologies of electronic retail customers according to their psychographic and
demographic characteristics? How do these characteristics influence their
usability requirements? How do the usability requirements and B2C capabilities
influence electronic retail satisfaction and loyalty? We show how the different
customer segment's expectations towards the provider's portal vary across their
usability requirements.

**5 - New Service Development through Lead-Users:
An Empirical Investigation**

Rosa Eterno, Research Assistant, Catholic University of Portugal,
School of Economics and Management, Lisbon, PT, Portugal,
rpe@fcee.ucp.pt, Pedro Oliveira, Ana Pòvoa

There is increasing evidence that most new products are developed by users, who
then to give ideas to manufacturers. Despite the importance of services, scarce
attention has been paid to the study of service innovation through lead-users.
This research attempts to fill that gap. We empirically investigate (using data
from a large Portuguese service company) the extent to which users can be
sources of ideas for new services, the antecedents that influence innovation and
the implications of such practices for the company.

■ MB49

Tutorial on Agent-based Modeling and Simulation

Sponsor: Simulation - INFORMS Simulation Society
Sponsored Session
Chair: Charles Macal, Senior Systems Engineer, Argonne National
Laboratory, 9700 S. Cass Ave., Decision & Information Sciences
Division, Argonne, IL, 60439, United States of America, macal@anl.gov

1 - Tutorial on Agent-based Modeling and Simulation

Charles Macal, Senior Systems Engineer, Argonne National
Laboratory, 9700 S. Cass Ave., Decision & Information Sciences
Division, Argonne, IL, 60439, United States of America,
macal@anl.gov, Michael North

Agent-based modeling and simulation (ABMS) is a new approach to modeling
systems comprised of autonomous, interacting agents. Complex adaptive systems,
emergent behavior, and self-organization are a few of the notions from ABMS.
Applications are growing rapidly in fields ranging from modeling the stock
market to predicting the spread of epidemics. This tutorial covers the foundations
of ABMS, development toolkits and methods, practical aspects, and the
relationship of ABMS to conventional OR.

■ MB50

Computational Integer Programming II

Sponsor: Optimization/ Computational Optimization and Software
(Joint Cluster Optim/CS)
Sponsored Session
Chair: Yan Xu, SAS Institute Inc., SAS Campus Drive, Cary, NC, 27519,
United States of America, Yan.Xu@sas.com

**1 - Implementation and Evaluation of Separation Algorithms Based
on Mixed Integer Rows**

Philipp Christophel, DS&OR Lab, University of Paderborn,
Warburgerstr. 100, Paderborn, 33098, Germany,
christophel@dsor.de, Uwe Suhl, Leena Suhl

Cutting plane separation algorithms are an important part of modern mixed
integer programming (MIP) solvers. For generating cutting planes from the rows
of the constraint matrix three separation algorithms are usually implemented:
aggregated c-MIR cuts, flow cover cuts and flow path cuts. In this talk we give
some details about the implementation of these algorithms, show alternatives
and extensions to them and evaluate their importance for solving MIP problems.

**2 - A New Rule to Branch in the Branch and Bound Algorithm Based
on Flatness Information**

Ivan Derpich, Doctor, University of Santiago of Chile, Av Ecuador
3769 Estacion Central, Santiago, Chile, iderpich@usach.cl

The rule proposed is related to measures of the integer with, as provided by so
called "Flatness theorem". Our selection rule uses that knowledge to define
branching priorities on the variables. Computational results with simulated
integer problems are presented, as well with multi-knapsack problems. These
show savings of about 40% in CPU time, as well in nodes generated in the
search tree, and compare favorable with reports to the others standard branching
rules.

**3 - On Branching on General Hyperplanes for Mixed Integer
Programming**

Ashutosh Mahajan, Lehigh University, 200 W Packer Ave,
Bethelehem, PA, 18015, United States of America,
asm4@Lehigh.edu, Ted Ralphs

Most implementations of branch-and-bound method for solving Mixed Integer
Programs (MIPs) consider branching on variable-disjunctions only. We consider
the problem of selecting more general disjunctions for branching. We study two
criteria for selecting best such disjunctions: integer width and maximizing lower
bound. We formulate this problem as a MIP and solve it using a standard solver.
We report the effects of using these hyperplanes on the size of the tree for some
instances.

**4 - Lifted Inequalities for 0-1 Mixed Integer Programs:
A Computational Study**

Amar Narisetty, Purdue University, School of Industrial
Engineering,, Purdue University, 315 N. Grant Street,
West Lafayette, IN, 47907-2023, United States of America,
anariset@purdue.edu, George Nemhauser, Jean-Philippe Richard

In this paper we describe five families of strong inequalities for 0-1 MIP
problems. We first show how these inequalities can be applied to the simplex
tableaux of the LP relaxations of 0-1 MIPs. We then show how these inequalities
can be applied to the formulation of 0-1 MIPs and propose different separation
algorithms. Finally we present the results of a computational study comparing
the performance of these cuts on a family of randomly generated problems.

■ MB51

Online Trust and Electronic Commerce

Sponsor: Information Systems
Sponsored Session
Chair: Han Zhang, Associate Professor, Georgia Institute of Technology, 800 West Peachtree Street, NW, Atlanta, GA, 30308, United States of America, Han.Zhang@mgt.gatech.edu

1 - Understanding the Impact of Brand Equity in Electronic Markets: An Empirical Investigation
Wenjing Duan, Assistant Professor, The George Washington University, Washington, DC, 20052, United States of America, wduan@gwu.edu, Mark Parry, Qing Cao

This study examines the impact of brand equity in electronic markets. On the one hand, it helps establish brand name more quickly, therefore making the impact of brand equity stronger. On the other hand, it provides more information about unknown (niche) products, thus helping the sales of more unpopular brands. Using a panel data from CNET.com, we document the extent to which brand equity influence consumers product choices on the Internet.

2 - Don't Ask My Personal Information Too Much: Consumer's Personal Information Disclosure Behavior on the Web
Dan Kim, Associate Professor, University of Houston - Clear Lake, 2700 Bay Area Blvd, Houston, TX, 77058, United States of America, KimDan@UHCL.edu

The present study proposes a research framework including factors which affect an Internet consumer's personal information disclosure decision. Drawing upon previous literature, we adopt three factors (i.e., Consumer Trust, Perceived Value, and Perceived Risk) affecting the decision. Along with these three factors, we propose another cost factor (i.e., Perceived Irksomeness) which is accompanied by the labor of filling in or typing in personal information.

3 - Trust-Or-Not: Exploring the Dark Side of Trust in Electronic Commerce
Dezhi Yin, Doctoral Student, Georgia Institute of Technology, 800 West Peachtree Street, NW, Atlanta, GA, 30308, United States of America, Dezhi.Yin@mgt.gatech.edu, Han Zhang, Samuel Bond

Building trust has become one of the most vital issues in e-commerce. Unfortunately, most prior papers focus on the trust-enhancing mechanisms, overlooking the trust-destroying ones. Based on prior literature, we define the distrust concept, argue for its separable role from trust, and build a framework to reveal their distinct fundamental structures. We point out the potential problems of conceptualizing/measuring trust previously, and provide a new exciting perspective for future research.

■ MB52

Pricing and Contracting in Closed-Loop Supply Chains

Cluster: Environmentally Conscious Operations / Closed Loop Production Supply Chain
Invited Session
Chair: Jonathan Linton, Power Corporation Professor, Universit of Ottawa, 55 Laurier Street, Ottawa, ON, Canada, linton@telfer.uottawa.ca

1 - Impact of Refill Shops on Cartridge Business
Deniz Ozdemir, Professor, Universidad Autonoma de Nuevo Leon, Graduate Program in Systems Engineering, San Nicolas de los Garza, 66420, Mexico, deniz@yalma.fime.uanl.mx, Xachitl Aquiahuatl

The operational impact of refill shops on the original printer cartridge manufacturer is studied. We consider consumer concerns as depreciated satisfaction for the products of recovery shop. A mathematical model is developed to analyze the impact of price and collection effort of the original manufacturer on collection and recovery activities of independent agents. We showed that consumer preferences and pricing policy of both parties affect their profits nonlinearly.

2 - Consumers' Willingness to Pay for Recycled Versus New/Conventional
Jonathan Linton, Power Corporation Professor, University of Ottawa, 55 Laurier Street, Ottawa, ON, Canada, linton@telfer.uottawa.ca, Leila Hamzaoui

An empirical study of the willingness to pay for product that contains recycled or reused product is conducted to obtain a better understanding of the factors that positively and negatively influence consumers willingness to purchase recycled/refurbished/remanufactured product instead of new product.

■ MB53

Banking Operations

Sponsor: Financial Services
Sponsored Session
Chair: Mei Xue, Boston College, 350 Fulton Hall, 140 Commonwealth Ave., Chestnut Hill, MA, United States of America, xueme@bc.edu

1 - Why Are the Banks Still Opening Branches? The Impact of On-line Channel on Off-line Channel Capacity
Mei Xue, Boston College, 350 Fulton Hall, 140 Commonwealth Ave., Chestnut Hill, MA, United States of America, xueme@bc.edu, Lorin Hitt, Jun Zhang

In this paper we study the impact of the on-line channel (e.g. Internet banking) on the capacity expansion of a firm's existing off-line channel (e.g. bank branches) with both analytical modeling and empirical study. We first present a dual-channel spatial model and then we test a series of hypotheses regarding service capacity expansion based on the model and related literature. The empirical study finds strong support for the proposed model and mixed results of the alternative explanations.

2 - Staffing Home Equity Lending Operations During a Financial Crisis
Jim Bander, Assistant Vice President, Wells Fargo, 11601 N Black Canyon Hwy, Phoenix, AZ, 85029, United States of America, Jim.Bander@wellsfargo.com

We present a model for simultaneously determining optimal staffing levels and schedules in the face of uncertain sales forecasts, dynamic credit policies, and challenging service level agreements and deadlines. Methodological issues include the integration of forecasting with simulation and optimization. Data management issues include change management and the exchange of information between management, technical staff, and subject matter experts.

3 - Outsourcing Arrangements in Financial Services Operations under Stochastic Staffing Demand
Preetam Basu, University of Connecticut, OPIM Department, 2100 Hillside Road, Storrs, CT, 06269, United States of America, Preetam.Basu@business.uconn.edu

Complementing in-house staffing with outsourcing is an effective strategy in meeting the highly volatile and stochastic demand requirements of financial services operations. Economic implications of the contractual arrangement, in-house employee scheduling constraints and the volatility of demand determine the capacity that is maintained in-house and the proportion of work that is outsourced.

■ MB54

Modeling of Interdependent Power and Networking Infrastructure Systems

Cluster: Risk Security
Invited Session
Chair: Alex Sprintson, Assistant Professor, Texas A&M University, TAMU 3128, College Station, TX, 77843, United States of America, spalex@tamu.edu

1 - Establishing the Link Between Climate Change and the Frequency of Hurricane Landfalls
Roshanak Nateghi, Miss, JHU, 511 Ames, 3400 N Charles, Baltimore, MD, 21218, United States of America, roshanak.nateghi@googlemail.com, Steven Quiring, Seth Guikema

Hurricanes pose significant risk to power systems. Therefore it is of crucial importance to be able to predict their frequency and intensity. The collected data consists of counts of the hurricane landfalls in the Atlantic Coast and Gulf Region of the U.S. One particular challenging aspect of the data is the excess number of zero counts. We develop statistical models for estimating the impact of Climate Change on the frequency and intensity of hurricanes landfalls.

2 - Probabilistic Modeling and Performance Prediction of Power and Water Systems Using Synthetic Cities
Arijit Bagchi, Graduate Student, Texas A&M University, 320 B, Weisenbaker Engg Research Center, Texas A&M University, College Station, TX, 77843, United States of America, abagchi82@neo.tamu.edu, Jacob Torres, Kelly Brumbelow, Seth Guikema, Chanan Singh

Modeling and predicting the performance of interdependent infrastructure systems in order to prepare for and recover from catastrophic events is important for emergency management and resource allocation. This work will show how a synthetic, yet realistically developed city can be used for modeling and evaluating the performance of power and water systems during fire spread events.

3 - Genetic Algorithms for Network Availability Evaluation
Graham Booker, Texas A&M University, MS 3128, College Station, TX, 77843, United States of America, gbooker@tamu.edu, Emily Zechman, Alex Sprintson

In this talk we analyze the availability of backbone communication networks in the presence of multiple links failures. Due to built-in redundancy and protection mechanisms such networks are highly reliable. This makes them difficult to evaluate through traditional means since their failures are comprised of numerous rare events. In this talk we will present efficient availability evaluation methods based on genetic algorithms and show their advantage over traditional Monte-Carlo based methods.

4 - Modeling Impact of Natural Disasters on Power System Reliability Using Markov Cut-Set Approach
Yong Liu, PhD Student, Texas A&M University, Lincoln Ave 313, Apt 134, College Station, TX, 77840, United States of America, liuy0004@neo.tamu.edu, Chanan Singh

In the environment of catastrophic events, such as hurricanes, modeling and evaluation of power system reliability, considering the interdependence with other infrastructure systems, is a challenging task. We are investigating OPF-based Markov Cut Set method to achieve this goal. The proposed approach has been implemented in modified IEEE Reliability Test System. The application cases demonstrate that the proposed method is effective and efficient.

■ MB55

Wireless Networking

Sponsor: Telecommunications
Sponsored Session
Chair: Timothy Matis, Texas Tech University, Department of Industrial Engineering, Lubbock, Tx, United States of America, timothy.matis@ttu.edu

1 - Parallel Optimization Algorithms for the Lifetime Prolonging Design of Wireless Sensor Networks
Hui Lin, Texas A&M University, Industrial and System Engineering, College Station, TX, 77843-3131, United States of America, linhui@tamu.edu, Halit Uster

We present an integrated analytical modeling framework for wireless sensor networks design incorporating topology control and routing decisions. The model attempts to promote energy efficiency with the purpose of prolonging network lifetime.We develop efficient parallel heuristics reinforced with exact methods and cut generations. Computational evidence suggests that such framework and algorithm can provide very good solutions with significantly improved solution times compared to exact methods.

2 - Wireless Ad-hoc Biological Habitat Sensor Networks with Semantic Data Processing
Ivan Guardiola, Assistant Professor, Department of Engineering Management and Systems Engineering University of Missouri S & T, 223 Engineering Management 1870 Miner Ci, Rolla, MO, 65409-0370, United States of America, ivan.guardiola@ttu.edu

In wireless ad-hoc networks often wireless radio transmissions are the most energy costly operation. Hence, in an effort to reduce the overall number of transmissions within such networks a semantic data processing technique is presented. In particular, this research focuses in the identification of animals through Hidden Markov Models in an effort to eliminate useless information and distribute the data processing necessary for identification amongst the sensors node participants.

3 - A MAC-layer Modification to Increase Ad-hoc Network Performance
Aaron Phillips, Texas Tech University, Box 43061, Lubbock, Tx, United States of America, aaron.phillips@ttu.edu

This is a proposed scheme to dynamically modify the Request To Send/Clear To Send mechanism of the MAC-Layer. In this scheme, the retry limit settings are first evaluated for significance, then, through designed experimentation, they are chosen according to their performance at different mobile states. These levels are then combined to create a dynamic mechanism that allows transmitting nodes to adjust their settings based on their own specific mobile states.

4 - On the Development of Dynamic Ad-hoc Protocols
Timothy Matis, Texas Tech University, Department of Industrial Engineering, Lubbock, Tx, United States of America, timothy.matis@ttu.edu

There have been many recent statistical studies examining the influence of environmental factors on the performance of established link and MAC layer protocols. We illustrate many of these and propose new directions towards the development of dynamics adjustments to optimize end-to-end performance measures.

■ MB56

Decision Making in Freight Transportation

Sponsor: Transportation Science & Logistics
Sponsored Session
Chair: Richard Chen, University of Michigan, Industrial and Operations Engineering, Ann Arbor, MI, United States of America, richchen@umich.edu

1 - Scheduling Truckload Shipments with Customer Flexibility
Jonathan Turner, IEMS at Northwestern University, 2145 Sheridan Rd, Evanston, IL, 60201, United States of America, jonathan@northwestern.edu, Soonhui Lee, Karen Smilowitz, Mark Daskin, Tito Homem-de-Mello

A small trucking firm wishes to maintain its delivery rate while reducing its fleet size. While existing scheduling techniques can achieve some of the desired results, we demonstrate that shifting delivery times can achieve even more. To receive a load at an hour different than initially requested customers will require an incentive. Our model schedules delivery of certain and uncertain demand and reduces fleet size while minimizing needed incentives.

2 - Optimal Quoting of Delivery Service in a Price and Time-Sensitive Market
Muhammed Ali Ulku, PhD Candidate, Management Sciences, University of Waterloo, 200 University Avenue West, Waterloo, ON, Canada, maulku@engmail.uwaterloo.ca, James H. Bookbinder

We consider joint decisions on pricing and shipment-release policies for a transportation provider whose customers are sensitive to both price and delivery-time guarantee. For differential and for uniform pricing schemes, the profit rate is maximized through the choice of length of consolidation period. We also report on optimality structures when there are freight discounts.

3 - An Implicit Bidding Mechanism for Combinatorial Auctions- A Truckload Procurement Example
Richard Chen, University of Michigan, Industrial and Operations Engineering, Ann Arbor, MI, United States of America, richchen@umich.edu, Amitabh Sinha, Amy Cohn, Damian Beil

We present an implicit bidding mechanism for fully enumerated combinatorial auctions. In our approach, the bidder's bid-generating functions are explicitly embedded within a mathematical program that is used to solve the winner-determination problem. We present extensive computational results for truckload procurement auctions to demonstrate the effectiveness of our approach.

4 - Solving Stochastic Combinatorial Truckload Procurement Auctions in Parallel
Shervin AhmadBeygi, University of Michigan, 1205 Beal Avenue, Ann Arbor, MI, United States of America, Shervin@umich.edu, Damian Beil, Amitabh Sinha, Richard Chen, Amy Cohn

We present a stochastic multi-commodity-flow formulation to solve the winner determination problem for combinatorial procurement auctions in which the carrier costs are uncertain. We exploit the problem structure in order to develop a solution approach based on Benders Decomposition which can be implemented within a parallel processing framework to improve the algorithm tractability.

■ MB57

Green Supply Chains and Operational Excellence

Sponsor: Junior Faculty Interest Group
Sponsored Session
Chair: Lawrence V. Snyder, Lehigh University, 200 West Packer Ave., Mohler Lab, Bethlehem, PA, 18015, United States of America, lvs2@lehigh.edu

1 - Extending the Horizons: Green Supply Chains as Driver of Operational Excellence
Charles Corbett, Professor, UCLA Anderson School of Management, 110 Westwood Plaza, Box 951481, Los Angeles, CA, 90095-1481, United States of America, charles.corbett@anderson.ucla.edu

Companies worldwide are increasingly involved in green supply chains. Some companies are proactively encouraging better environmental practices among supply chain partners; other companies are experiencing pressure from customers or regulators. We will review examples of how supply chains in a wide range of sectors are becoming greener. We will see how greener supply chains are often also more profitable, even if these economic benefits can be difficult to predict in advance.

■ MB58

OR for Airlines at AD OPT

Sponsor: Aviation Applications
Sponsored Session
Chair: Norbert Lingaya, Manager of Operational Research, AD OPT, a Kronos division, 3535 Queen Mary Rd., Suite 605, Montreal, QC, H3V 1H8, Canada, Norbert.Lingaya@Kronos.com

1 - Using OR to Enable an Airline's Business Agility
Norbert Lingaya, Manager of Operational Research, AD OPT, a Kronos division, 3535 Queen Mary Rd., Suite 605, Montreal, QC, H3V 1H8, Canada, Norbert.Lingaya@Kronos.com

Traditionally, OR is used to build tools that help Airlines solve their complex combinatorial problems. This talk quickly reviews classic tools (Crew Pairings, Crew Rostering) as well new tools (Ressource Planning, Network Design)and then focuses on a new area meant to enable the Airline's business agility.

2 - Insight into an Airline's Strategic Resource Planning
Dominique Tourillon, AD OPT, a Kronos division, 3535 Queen Mary rd, suite 605, Montreal, QC, H3V 1H8, Canada, dominique.tourillon@kronos.com

In most airlines, strategic resource planning is a lengthy process performed manually or through the use of basic spreadsheets which involves tasks, such as building a training plan and ensuring sufficient crewmembers are qualified to meet forecasted flying and non-flying duties over a multi-year horizon. This presentation provides an overview of how AD OPT's Altitude Insight optimization solution can help airline planners make more informed decisions using a global solving approach.

3 - Local Influence, Global Impact
Remy Gauthier, AD OPT, a Kronos division, 3535 Queen Mary Rd, Suite 605, Montreal, QC, H3V 1H8, Canada, remy.gauthier@kronos.com

Airline carriers face many challenges. Aside from rising fuel costs, crew shortages, and increasingly complex rules and regulations, process re-engineering may be the next area that will influence the success and potential survival of all carriers. This presentation provides a high level view of how we intend to bridge the gap between the various planning silos that exist within airlines, and how small changes in approach can yield large benefits.

4 - The Repair Module - A Solver for Short-Term Planning
Carl Mitchelson, AD OPT, a Kronos division, 3535 Queen Mary Rd, Suite 605, Montreal, QC, H3V 1H8, Canada, Carl.Mitchelson@kronos.com

In the airline industry, some flexible carriers have to adapt their operations to many short-term disturbances to the flight schedule. We present a real-life problem whose objective is to repair at least cost the crewmembers' schedules over an horizon of a few days, given new aircraft routes and the set of modifications to the flight schedule. We focus on the operational constraints that have driven our approach towards solving the crew routes and crew schedules simultaneously.

■ MB59

Revenue Management: Competition and Coordination

Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session
Chair: Elodie Adida, Assistant Professor, University of Illinois at Chicago, MIE Department (MC 251) 3025 ERF, 842 W. Taylor St., Chicago, IL, 60607, United States of America, elodie@uic.edu

1 - Generalized Quantity Competition for Multiple Products and Loss of Efficiency
Georgia Perakis, MIT, E53-359, 77 Massachusetts Avenue, Cambridge, MA, 02139, United States of America, georgiap@mit.edu, Jonathan Kluberg

We study quantity competition in oligopoly markets in order to understand when firms produce multiple products under a variety of constraints (i.e., capacity constraints), how "bad" the total profit and welfare in the market can become. We derive bounds that are independent of the constraints but rather depend on the number of firms, their market power and number of products.

2 - Strategic Experimentation in Social Networks
Asu Ozdaglar, MIT, 77 Massachusetts Avenue , 32-D630, Cambridge, MA, 02139, United States of America, asuman@mit.edu, Kostas Bimpikis, Daron Acemoglu

We study a model of strategic experimentation between agents connected through a social network. Each agent combines her private information with observations from her neighborhood to choose an action at every time period. We are interested in identifying structural properties of the network as well as conditions on prior beliefs of the agents about the state of the world that guarantee asymptotic learning, i.e. choosing the optimal action in the limit.

3 - A Stochastic Multiple Leader Stackelberg Model: Analysis, Computation, and Application
Victor de Miguel, Associate Professor, London Business School, Regents Park, London, UK, United Kingdom, avmiguel@london.edu

We study an oligopoly consisting of M leaders and N followers that supply a homogeneous product. Leaders choose their supply levels first, knowing the demand function only in distribution. Followers make their decisions after observing the leader supply levels and the realized demand function. We show the existence and uniqueness of equilibrium, propose a computational approach to find the equilibrium, and apply this framework to model competition in the telecommunication industry.

4 - Role of Capacity in a Joint Inventory Management and Pricing Game
Elodie Adida, Assistant Professor, University of Illinois at Chicago, MIE Department (MC 251) 3025 ERF, 842 W. Taylor St., Chicago, IL, 60607, United States of America, elodie@uic.edu, Georgia Perakis

We study a demand-based pricing and production model where two firms compete over a differentiated substitutable product. The firms are symmetric differing only by their production capacity. We consider both the decentralized Nash equilibrium game and a centrally controlled setting. We study the capacity effects on the firms, compare prices, production levels, profits and loss of efficiency between the firms in the two settings. We design a contract for capacity level decision making.

■ MB60

Generating & Evaluating Railroad Hazardous Materials Routings

Sponsor: Railway Applications
Sponsored Session
Chair: Carl Van Dyke, Partner, Oliver Wyman, 212 Carnegie Center, 3rd Floor, Princeton, NJ, 08540, United States of America, Carl.VanDyke@oliverwyman.com

1 - Transportation Security and Rail Routing
Robert Fronczak, Assistant Vice President Environment & Haz Mat, Association of American Railroads, 50 F Street, N.W., Washington, DC, 20001, United States of America, rfronczak@aar.org

This presentation will discuss requirements in DOT's Pipeline and Hazardous Materials Safety Administration's (PHMSA) interim final rulemaking on rail routing published in April 2008. A risk model being developed to assist in compliance with the PHMSA rulemaking will be discussed as well. The presentation will also cover network operation issues associated with PHMSA's notice of proposed rulemaking on improving the safety of railroad tank car transportation of toxic inhalation hazard materials.

2 - A Comparison of Safety and Security Factors on Alternative Rail Routes
Theodore S. Glickman, Professor, The George Washington University, Decision Sciences Department, 415 Funger Hall, Washington, DC, 20052, United States of America, glickman@gwu.edu, Galen Evans, Ryan Engstrom, Nuala Cowan

The issue of how to route trains carrying highly hazardous materials is examined for a selected case study. Using public information on factors related to safety and security (where the concerns are release accidents and terrorist attacks, respectively), as well as profitability (where the concern is operating costs and revenues), a GIS is applied to a selected shipment scenario in order to evaluate and compare the factors. The implications of the results for risk management are discussed.

3 - Strategies for Rail Hazmat Routing Risk Assessment and Management
Michael Swain, Manager Car Scheduling, CSX Transportation, 500 Water Street, Jacksonville, FL, 32202, United States of America, michael_swain@csx.com, Suneil Kuthiala, Dharma Acharya

In order to comply with new federal regulations pertaining to hazmat car routings and reporting, new risk assessment tools are being developed. The process involved and the role of operations research and rail car movement simulation techniques in addressing the new federal regulations will be discussed.

4 - Hazardous Materials Route Generation and Evaluation

Carl Van Dyke, Partner, Oliver Wyman, 212 Carnegie Center, 3rd Floor, Princeton, NJ, 08540, United States of America, Carl.VanDyke@oliverwyman.com, Paul Stephens, Dave Hunt

New Federal regulations require that all railroads assess the routing of selected HazMat shipments with respect to 27 different attributes. This includes assessing both historic routings and proposed future routes. For future routes, up to 2 alternative routes must also be identified, and the "best" route selected. This talk will explore the algorithms and methods for finding and assessing these alternate routings.

■ MB61

Advances in Dynamic Network Problems

Sponsor: Transportation Science & Logistics
Sponsored Session
Chair: Avinash Unnikrishnan, University of Texas Austin, avinashu@gmail.com

1 - Multi-resolution Assignment and Loading of Transportation Activities (MALTA)

Yi-Chang Chiu, Assistant Professor, University of Arizona, 1209 E 2nd St. Room 206, Department of Civil Eng.and Eng. Mech., Tucson, AZ, 85721, United States of America, chiu@email.arizona.edu, Jorge Villalobos, Pitu Mirchandani

MALTA is a temporally and spatially scalable dynamic vehicular traffic simulation and assignment model that is based on network partitioning concepts and techniques for both mesoscopic traffic simulation and time-dependent shortest path algorithms. In this talk we present the overall model structure and the numerical experiment results on a test urban traffic network.

2 - System Optimal and User Equilibrium in CTM-based DTA

Georgios Kalafatas, Purdue University, United States of America, gkalafat@purdue.edu, Srinivas Peeta

The two most widely used traffic assignment objectives, the SO and the UE, have been recently modeled in CTM-based DTA model. In our research, we interpret the SO and UE routing patterns from a graph theoretic perspective by using the Graph Theoretic CTM (GT-CTM). Theoretical and practical insights are drawn for different traffic density conditions for the single destination DTA case.

3 - Inferring Link Flows Using Partial Flow Information: A Strategic Vehicle Sensor Deployment Approach

Srinivas Peeta, peeta@purdue.edu, Shou-Ren Hu

Current studies generally assume that full scale link traffic flow information is available for development of relevant traffic management strategies. However, such assumptions are unrealistic due to budgetary limitations of highway management agencies. We develop a basis approach to strategically deploy vehicle sensors so that link flows can be determined using information collected by some sensors. Numerical analysis is conducted to verify the merits of this approach.

■ MB62

Behavioral Models in Pricing

Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session
Chair: Xuanming Su, Haas School of Business, University of California, Berkeley, CA, 94720, United States of America, xuanming@haas.berkeley.edu

1 - On the Value of Psychological Elation and Disappointment Effects on Capacity and Pricing Decisions

Qian Liu, HKUST, Hong Kong - China, qianliu@ust.hk, Stephen Shum

We apply a model of disappointment proposed by Bell (1985) to customers' purchase decisions; that is, besides the economic payoff, customers also consider their psychological satisfaction into their decision making under uncertainty. We examine how such psychological satisfaction affects a firm's capacity and pricing decisions. The results are quite different from those under conventional expected utility theory.

2 - Pricing Access Services and Warranties

Ozge Sahin, University of Michigan, ozge@bus.umich.edu, Guillermo Gallego

We consider how consumer's uncertainty in the valuations and the amount they will consume impact the demand over time and how the firm can exploit consumer's uncertainty in pricing decisions. We investigate the optimal structure of the contracts that a firm should offer in industries that charge access fees to consumers. We provide guidelines on pricing access services and warranties if the consumers are facing time inconsistency and have different risk preferences.

3 - Consumer Waiting for End-of-period Discounts: Evidence From a Behavioral Game

Anton Ovchinnikov, Darden School of Business, University of Virginia, 100 Darden Blvd, Charlottesville, VA, 22903, United States of America, ovchinnikova@darden.virginia.edu

This paper presents a behavioral experiment. The seller varies the price to maximize the revenue, and the buyers decide to wait for a possible discount or buy early and guarantee the product. We discuss the case where human subjects play as buyers. How do they decide to wait-or-buy? How do subjects learn about the policy of the seller and other buyers? How do they react to the information the seller reveals?What information should the seller reveal? We discuss these and other related questions.

4 - Peer-induced Fairness and Pricing

Xuanming Su, Haas School of Business, University of California, Berkeley, CA, 94720, United States of America, xuanming@haas.berkeley.edu, Teck Ho

We introduce the concept of peer-induced fairness because people have a drive to make social comparisons with their peers. We theoretically analyze and experimentally validate our model. We relate our findings to existing models of fairness and discuss implications for pricing.

■ MB63

Production and Manufacturing

Sponsor: Transportation Science & Logistics
Sponsored Session
Chair: Zheng Wang, Associate Professor, School of Automation, Southeast University, 2 Si Pai Lou, Nanjing, 210096, China, wangz@seu.edu.cn

1 - Stability of Time-delayed Queuing Networks

Zheng Wang, Associate Professor, School of Automation, Southeast University, 2 Si Pai Lou, Nanjing, 210096, China, wangz@seu.edu.cn

Networked manufacturing systems (NMS) should be modeled by a time-delayed queueing network (TDQN) instead of usual queueing networks, because the time-delay for material flow cannot be neglected. Stability condition of a TDQN is obtained based on the Lyapunov Theorem, for the situation of non-stationary customer arriving or dispatching processes; and a stabilization algorithm is also proposed. Based on the stability theory of TDQN, the production process of an NMS can be well controlled.

2 - Comparing DRS with APO Strategies in Manufacturing Systems

Li Sun, Graduate Research Assistant, University of Louisville, 305, JB Speed Building, Industrial Engineering Dept, Louisville, KY, 40292, United States of America, l0sun004@gwise.louisville.edu, Mark Spearman, Lijian Chen, Sunderesh Heragu

We compare a dynamic risk-based scheduling (DRS) strategy with the traditional advanced planning optimization (APO) strategy for scheduling the release of orders into a manufacturing system. Simulation and analytical models are used to estimate key performance measures of a manufacturing system processing multiple products under the two strategies. Results from the simulation models match well with those obtained from the analytical models. Often, it is beneficial to use the DRS strategy.

3 - Integrated Manufacturing and Distribution Scheduling

Eray Cakici, University of Arkansas, 4207 Bell Engineering Ctr, Fayetteville, AR, 72701, United States of America, ecakici@uark.edu, Scott Mason, Neil Geismar, John Fowler

We investigate production scheduling and batch delivery in the manufacturing and distribution phases of supply chains. The scheduling problem can be modeled as either parallel machines or a flexible flowshop. Products are delivered in batches by capacitated vehicles to multiple customers. Different inventory holding costs and job priorities are taken into account. Efficient mathematical modeling and near-optimal heuristic approaches are presented for minimizing total weighted completion time.

■ MB64

Routing and Logistics

Sponsor: Transportation Science & Logistics
Sponsored Session
Chair: Miguel Figliozzi, Assistant Professor, Portland State University, figliozzi@pdx.edu

1 - Approximations to the Average Length of Vehicle Routing Problems with Time Window Constraints

Miguel Figliozzi, Assistant Professor, Portland State University, figliozzi@pdx.edu

Using asymptotic properties of vehicle routing problems and the average probability of successfully sequencing a customer with time windows a new expression to estimate VRP distances is developed. The increase in the number of routes when time constraints are added is modeled probabilistically. The approximation proposed is tested in instances with different customer spatial distributions, depot locations and number of customers.

2 - A RAMP Approach for the Facility Location Problem

Dorabela Gamboa, Polytechnic of Porto, ESTGF, Apt. 205, Felgueiras, 4610-156, Portugal, dgamboa@estgf.ipp.pt, Cesar Rego

Dual approaches have proved effective in computing lower bounds and solving a variety of facility location problems (FLP). We examine a dual RAMP algorithm for the uncapacitated FLP and present a computational study on standard and other particularly difficult instances that reveals an extremely good performance.

■ MB65

Recent Developments in Call Center Staff Planning and Scheduling

Cluster: Scheduling in the Service Industry
Invited Session

Chair: Vijay Mehrotra, Assistant Professor, San Francisco State University, Department of Decision Sciences, 1600 Holloway Avenue, San Francisco, CA, 94132, United States of America, drvijay@sfsu.edu

1 - Arrival Rate Uncertainty and Its Forecasting with Application to Workforce Management

Haipeng Shen, Assistant Professor, Department of Statistics and Operations Research, University of North Carolina, Chapel Hill, NC, 27599, United States of America, haipeng@email.unc.edu

Arrival rates of customers to call centers and other labor-intensive service operations are often random. We investigate statistical techniques for forecasting and updating such rates that account for this uncertainty. Implications for workforce management will also be discussed.

2 - Cross Training in Call Centers with Uncertain Arrivals and Global Service Level Agreements

Tom Robbins, Assistant Professor, East Carolina University, trrobbins@mac.com, Terry Harrison

We consider agent cross-training in call centers where arrival rates are uncertain and the call center is subject to a global service level constraint. We investigate the option of cross training a subset of agents so that they may serve calls from two separate projects, a process we refer to as partial pooling. We find that cross training a modest portion of the staff yields significant benefits.

3 - Real-time Staffing and Rostering of Virtual Call Centers

Matthew Keblis, Assistant Professor, Mays Business School, Texas A&M University, College Station, TX, 77843-4217, United States of America, MKeblis@mays.tamu.edu, Ying Li, William Stein

We present an approach to perform tactical planning in a virtual call center. Our approach combines staffing and rostering into one step, while eliminating scheduling altogether. This enables a more global optimization of the tactical planning problem. Our approach however is about more than simply combining process steps. It also leverages the inherent flexibility of the virtual call center model. A simulation study reveals the financial benefit of our approach.

4 - Intraday Schedule Updating in the Presence of Uncertain (and Corellated) Arrival Rates

Vijay Mehrotra, Assistant Professor, San Francisco State University, Department of Decision Sciences, 1600 Holloway Avenue, San Francisco, CA, 94132, United States of America, drvijay@sfsu.edu, Ozgur Ozluk, Robert Saltzman

Agent schedules are typically created several weeks ahead of time. There is significant evidence suggesting that actual call arrival volumes early in day can provide valuable information about the distribution of volumes later in the day. We develop a framework for managers to make optimal intra-day resource adjustment decisions that take into account information that becomes available after the day begins. We also conduct empirical tests to demonstrate the value of this methodology.

■ MB66

Real-time Algorithms for Plan Adaptation

Cluster: Real-Time Systems
Invited Session

Chair: Stefan Bock, Professor, University of Wuppertal, Gauflstrafle 20, Wuppertal, 42119, Germany, sbock@winfor.de

1 - Active Model Adjustment for Dynamic Decision Making: Generic Approaches and Simulation Experiments

Jörn Schönberger, Dr., University of Bremen, Bremen, Germany, jsb@uni-bremen.de, Herbert Kopfer

In a dynamic decision problem, once made decisions require revision or confirmation after the considered decision situation has changed. Rolling horizon planning consecutively re-solves a mathematical model and the model is updated reactively driven only by the changed problem data. Generic approaches to update the decision model actively by exploiting solution evaluation results to adjust parameters in the decision model are presented. The predominance of the active approach is demonstrated.

2 - Real-time Distribution of Perishable Goods Using Past Request Information to Forecast Future Demand

Francesco Ferrucci, University of Wuppertal, Gauflstrafle 20, Wuppertal, 42119, Germany, fferrucci@winfor.de, Stefan Bock, Simon Goertz

This presentation introduces a real-world variant of the Dynamic Vehicle Routing Problem. Here, goods have to be delivered under extreme time pressure because of their high perishability. Thus, the minimization of service time, i.e., the time difference between request arrival and request delivery, has to be integrated into the objective function. A new real-time approach is proposed where forecasted demands are integrated into dynamic tour planning by the generation of artificial requests.

3 - Real-time Control of Long-distance-JiT Mass Manufacturing Processes

Stefan Bock, Professor, University of Wuppertal, Gauflstrafle 20, Wuppertal, 42119, Germany, sbock@winfor.de

Automotive manufacturers tend to force their suppliers to offshore their production systems to low labor cost countries. Although this may reduce their procurement costs substantially, there is a significant increase in distance between manufacturer and supplier which creates the need for sophisticated real-time control systems at the manufacturer site. This presentation proposes a new real-time approach that integrates the scheduling problem of the painting shop into the sequencing problem.

■ MB67

Network Design Models

Sponsor: Location Analysis
Sponsored Session

Chair: Lian Qi, Missouri University of Science and Technology, 101 Fulton Hall, Rolla, MO, United States of America, lianqi@mst.edu

1 - A p-Robust Multi-commodity Network Design Model With Disruptions

Peng Peng, PhD Candidate, Lehigh University ISE Department,, 200 W.Packer Ave., Bethlehem, PA, 18015, United States of America, pep206@lehigh.edu, Lawrence V. Snyder

We study a multi-commodity network design problem in which random disruptions are modeled using scenarios. The model makes open/close decisions in the first stage and flow decisions in the second. We consider a bill-of-materials that specifies how input products are combined at each node. We propose a p-robust model which minimizes the nominal cost, while bounding the cost that can occur in each scenario. We also provide insights obtained from computational results.

2 - Facility Location Problems with Multi-level Capacity Restrictions and Flexible Demand

Joseph Geunes, University of Florida, 303 Weil Hall, PO Box 116595, Gainesville, FL, 32611, United States of America, geunes@ise.ufl.edu, Chase Rainwater, Edwin Romeijn

We consider a generalization of the capacitated facility location problem where facilities are grouped into sets and a fixed cost is incurred for the procurement of a set of facilities. Each facility set shares an aggregate capacity, and customers allow flexibility in delivery quantity. We discuss various optimization approaches including a decomposition of the problem into efficiently solvable subproblems that can be embedded in a large scale neighborhood search procedure.

3 - Sheltering Network Design and Resource Management Responding to Natural Disasters

Mingzhou Jin, Associate Professor, Mississippi State University, Department of Ind. and Sys. Eng., PO Box 9542, Mississippi State, MS, 39762, United States of America, MJin@ise.msstate.edu

Natural disasters usually have early warnings, which provide opportunities to deliver resources to shelters. We model the sheltering network design and resource management problem as a two-stage stochastic program. In the first stage the locations and capacity of permanent shelters are decided. In the second stage resources are shipped from distribution centers and other sources or from other shelters to the shelters in needs. The model also provides a plan to transport expected evacuees.

4 - Transitional Hydrogen Supply Chain Modeling

Scott Grasman, Associate Professor, Missouri S&T, 230 EMSE, Rolla, MO, 65409, United States of America, grasmans@mst.edu

This presentation highlights research that addresses the need for a viable transition to hydrogen infrastructure (and as a consequence, reduction in supply chain costs). These models attempt to capture the benefits of phased development, while addressing the questions related to early feasible introduction locations, and how the introduction of hydrogen technologies in these locations affects continued introduction of hydrogen technologies on a local, regional, and national basis.

■ MB68

Retailing

Sponsor: Marketing Science
Sponsored Session
Chair: Qin Zhang, Assistant Professor of Marketing, University of Texas at Dallas, SM 32, School of Managment, Richardson, TX, 75080, United States of America, zhangq@utdallas.edu

1 - Preference Minorities and the Internet

David Bell, Wharton School, 700 Huntsman Hall, 3730 Walnut Street, Philadelphia, PA, 19104, United States of America, davidb@wharton.upenn.edu, JeongHye Choi

Internet retailing is pervasive yet its value to individual shoppers is largely determined by the local offline context. We examine local customer adoption of a specialized online retailing service (Diapers.com) and find that demand first decreases then increases in the local proportion of customers who are matched to the service. In addition, we document a similar effect at the product level and compare the Internet demand patterns for nationally branded and specialty producuts.

2 - An Empirical Investigation of the Impact of Rapidly Increasing Gasoline Prices on Consumers Shopping

Yu Ma, Assistant Professor, University of Alberta, Business Building 4-30G, Edmonton, AB, T6G2R6, Canada, yu.ma@ualberta.ca, Dhruv Grewal, Dinesh Gauri

We obtain a Neilson panel data in Chicago area for two years (2006-2007), which tracks hundreds of shoppers' store visits and purchases in all major product categories. We then match a chronological Chicago gasoline prices data to the panel data by time. We document the impact of the increasing gasoline prices on consumer's shopping behavior, and explore potential solutions that can minimize the negative impact to the retailing industry.

3 - Too Close to be Similar: Product and Price Competition in Retail Gasoline Markets

P.B. (Seethu) Seetharaman, Professor of Marketing, Rice University, Jesse H. Jones Grad School of Management, McNair Hall, MS 531, Houston, TX, 77252, United States of America, seethu@rice.edu

We examine product and pricing decisions of retail gasoline stations. We analytically show that closely located retailers who face sufficient income dispersion across consumers in a local market will differentiate on product design and pricing strategies. Using empirical survey data on prices and characteristics representing 724 gasoline stations in St. Louis, and employing a multivariate logit model, we find strong support for the central implications of the theory.

4 - Store Loyalty as a Category-specific Trait C- What Drives It?

Qin Zhang, Assistant Professor of Marketing, University of Texas at Dallas, SM 32, School of Managment, Richardson, TX, 75080, United States of America, zhangq@utdallas.edu, Manish Gangwar, P.B. (Seethu) Seetharaman

The literature on store loyalty views a consumer as possessing store loyalty to a particular store for their overall grocery shopping needs. In this study, we show that store loyalty is a category-specific trait of a consumer instead. We call it Store-Category Loyalty (SCL). We propose a model to investigate the factors that can potentially affect a consumer's SCL. We estimate the model using purchase data of 1321 households across 288 grocery categories and 16 stores.

Interactive Session

■ Monday, 12:30pm - 1:30pm

Chair: Pablo Durango-Cohen, Associate Professor, Northwestern University, 2145 Sheridan Road, Evanston, IL, United States of America, pdc@northwestern.edu

1 - A Study on Heuristics Routing and Seed Grouping Algorithm

Omer Faruk Baykoc, Gazi University, Maltepe, 06570, Ankara, Turkey, baykoc@gazi.edu.tr, Zelal Denli

In this study, execution of five various heuristics routings on order groups made up by seed algorithm has been carried out, as a result the best yielding strategy has been selected out of heuristics routing. As grouping strategy, heuristics seed algorithm which keeps the computerized process time shorter has been selected and whereupon heuristics routing strategies which are return, S-shaped, largest gap, composite and combined have been executed and average route distances have been evaluated.

2 - Dynamic Discrete Disaster Decision Simulation System (D4S2)

Shengnan Wu, Research Assistant, University of Pittsburgh, 1048 Benedum Hall, Industrial Engineering, Pittsburgh, PA, 15261, United States of America, SHW14@pitt.edu, Larry Shuman, Bopaya Bidanda, Matthew Kelley, Oleg Prokopyev, Ken Sochats, Carey Balaban

We have built a hybrid simulator (i.e., contains both agent-based and discrete event components) to assess the performance of disaster response systems. This rare-event simulation model has been validated in different manners. We also have developed an efficient, dynamic simulation optimization procedure to quickly locate good solutions for real time decision making during disasters.

3 - A Center for Innovation in Logistics Systems (CILS)

Greg Parlier, Senior Systems Analyst, SAIC, 6723 Odyssey Drive, Huntsville, AL, 35806, United States of America, GREG.H.PARLIER@saic.com

Fully engaged in the Global War on Terror, the US Army is also committed to a comprehensive and ambitious "Transformation" endeavor. An "analytical architecture" is presenred consisting of four complementary modeling approaches collectively referred to as Dynamic Strategic Logistics Planning. An organizational construct is presented to accelerate and sustain continual improvement for Army logistics and supply chain management - a "Center for Innovation in Logistics Systems".

4 - Freight Movement Model for Oklahoma: Methodology and Applications

Sandeep Srivathsan, Graduate Research Assistant, Oklahoma State University, 502 Engineering North, Stillwater, OK, 74078, United States of America, sandeep.srivathsan@okstate.edu, Guoqiang Shen, Charu Ojha, Saniye Aydin, Peerapol Sittivijan, Manjunath Kamath

We present a comprehensive methodology for predicting the flow of commodities by various modes into, out of, through and within the state (of Oklahoma). We outline various approaches that could be used for assigning freight flows to links in the transportation network (e.g. highway network). We also discuss how the Freight Movement Model could play a key role in infrastructure planning activities within the state by predicting freight flow patterns and supporting scenario analysis.

5 - What is Location Information Really Worth? A Competitive Analysis of the On-line TSP

F. Jordan Srour, PhD Candidate, Rotterdam School of Management, Erasmus University, Burg. Oudlaan 50, Rotterdam, 3062 PA, Netherlands, jsrour@rsm.nl, Rob Zuidwijk, Steef van de Velde

In studying a variant of the on-line TSP with release dates, characterized by the disclosure of a city's location at one point in time followed by the disclosure of that city's release date at a later point in time (yet in advance of the actual release date), we conclude that in certain scenarios advanced location information alone can yield an optimal solution.

6 - Contracts and Discounting Decisions

Kiran Panchamgam, PhD Candidate, Robert H. Smith School of Business, University of Maryland College Park, College Park, MD, 20742, United States of America, kpancham@rhsmith.umd.edu, Itir Karaesmen

We develop a stylized model with one retailer and one supplier to study the effects of various forms of contracts on the retailer's ordering and markdown pricing decisions, and the supplier's wholesale pricing decisions. Analytical results and are complemented with observations from extensive computational experiments.

7 - Cournot Competition in Power Markets under Uncertainty

Pavee Siriruk, Graduate Student, Auburn University, 420 N Dean Rd APT 222, Auburn, AL, 36830, United States of America, oatkum2@hotmail.com

Several oligopoly models have been proposed for representing strategic behavior in deregulated electricity markets, notable among which is Cournot model. The goal of this research is to provide analytical models, procedures based on generation system and load data for representing oligopoly. Specifically, uncertainty factors as well as their sensitivity analysis will be considered and show their effects on the market prices.

8 - Transdisciplinarity in Decision Sciences: A Discourse on Polymath-Renaissance Man Methodology

Orhan Guvenen, Professor/Institute Director, Bilkent University, INWOSEC, Ankara, TR, Turkey, gorhan@bilkent.edu.tr, Murat Hakan Ozturk

In the recent century, through the developments of analytical methods in Decision Sciences, reductive subset analysis has emerged as a main challenge in the analysis of socio-economic phenomena. In this study, we are going to explore the integrated fallicies in the theory of decision sciences ranging from information distortion to rationality concept.

9 - A Tolerance Design of Mixture Components with External Variables Using Response Surface Methods

Seong-Jun Kim, Kangnung National University, Department of Industrial and Systems Eng, Kangnung, Korea, Republic of, sjkim@kangnung.ac.kr, Jong-In Park, Myong K. (MK) Jeong

Performance variations in mixture products such as medicine, chemicals, and alloys can be caused by their components. To determine appropriate mixture tolerances is essential in maintaining the product quality. This paper proposes a new approach to finding optimum tolerances of mixture components. We use response surface methods for empirical modeling and investigating effects of external variables. Our technique is illustrated by example of a lithium-ion rechargeable battery design.

10 - Optimal Replenishment Policies with Inaccurate Information in Newsvendor Models

Lihui Bai, Assitant Professor, Valparaiso University, 1909 Chapel Drive, College of Business Administration, Valparaiso, IN, 46383, United States of America, lihui.bai@valpo.edu, Joseph Szmerekovsky, Jiang Zhang

Retailers may face ineffective store shelves replenishment, misplacement of store inventory, or inaccurate point of sale date, thus they could have inaccurate inventory or demand information when making inventory replenishment decisions. We develop a Newsvendor model and provide optimal replenishment policies that maximize the expected profits under various scenarios. Numerical examples show that the proposed policies are as simple as heuristics in the literature and are superior.

11 - Methodology and Implementation of Value-at-Risk Measures in Emerging Fixed-Income Markets with Infrequency

Gonzalo Cortazar, Professor, P. Universidad Catolica de Chile, Vicuna Mackenna 4860, Santiago, Chile, gcortaza@ing.puc.cl, Diether Beuermann, Alejandro Bernales

This paper proposes and implements a methodology to calculate Value-at-Risk (VaR) measures on fixed income portfolios with low frequency of transactions which make these risk measures difficult to calculate. We provide an empirical implementation of the methodology for the Chilean fixed income market. The proposed methodology seems to provide reliable VaR measures for thinly traded markets addressing an important issue for financial risk management in emerging markets.

12 - Determining Optimal Schedule Requirements for Green Hotel Renovations

Cara Dienes, PhD Student, Iowa State University, 3013 Black Engineering, Ames, IA, 50011, United States of America, cdienes@iastate.edu, Lizhi Wang, Zhaoyang Duan

With growing interest in green buildings and the need for renovations in the hospitality industry, there is potential for hotels to initiate green renovations of their structures. We use mixed integer programming to incorporate guest room renovation scheduling with revenue management to assist hotels in determining optimal scheduling requirements.

13 - Optimal Multiple Hostages Rescue Problem

Mong Shan Ee, Assistant Professor, University of Nottingham Malaysia Campus, Nottingham University Business School, Jalan Broga, Semenyih, 43500, Malaysia, Mong-Shan.EE@nottingham.edu.my, Seizo Ikuta, Fengbo Shi

This paper proposes a mathematical model for optimal multiple hostages rescue problem. The objective is to minimize the probability of a given number or more hostages being killed, where the given number is determined as the policy of the person in charge of the crisis.

14 - Operational Supply Chain Modelling in Disaster Response

Abbas Afshar, University of Maryland, 1173 Glenn Martin Hall, college park, md, 20742, United States of America, afshar@umd.edu, Masoud Hamedi, Ali Haghani

This research offers a mathematical model that describes the FEMA's supply chain operations in response to natural disasters. The model combines facility location problem, multimodal flow of relief commodities and unconventional vehicle routing with emergency-specific objective function and constraints to support the post-disaster operations of aid agencies.

15 - Improving Health Facility Access in Burkina Faso

Cara Cocking, University of Heidelberg, Department of Computer Science, INF 368, Heidelberg, 69120, Germany, cara.cocking@gmail.com

Using a model of discrete facility location—network design, we improve access to health facilities in Nouna, Burkina Faso. A budget is given for construction, and both facilities and roads may be built, with the goal of minimizing total travel costs. We develop novel solution techniques for this NP-hard problem.

16 - Scirus Topic Pages: New Publication Possibilities for INFORMS Members

Fred Phillips, Professor, Marshall Goldsmith School of Management, Alliant International University (San Diego), and Maastricht School of Management (The Netherlands), Alliant International University Bldg A, 10455 Pomerado Road, San Diego, CA, 92131, United States of America, fphillips@alliant.edu

Elsevier's Scirus is a moderated wiki for encyclopedia-style summaries of scientific topics. The presentation will outline Scirus' possibilities as a scholarly publication outlet. It will compare Scirus with Google's Knol. It will also describe the publisher's efforts to position Scirus as a peer-reviewed outlet that deserves consideration in e.g. university rank promotion decisions. The author is Consulting Editor to Elsevier for the "Management of Technology and Innovation" Scirus Topic Pages.

17 - Airport Gate Assignment: New Model and Implementation

Chendong Li, Texas Tech University, Compter Science Department, 8th & Boston, Lubbock, TX, 79409, United States of America, chendong.li@ttu.edu

In this paper, we study the Airport Gate Assignment Problem (AGAP) and propose a new model, implement it with Optimization Programming language (OPL). We construct experiments with the data obtained from Continental Airlines, Houston Gorge Bush Intercontinental Airport IAH, which demonstrate that our model is both energetic and effective.

18 - Design and Optimization of Runs Rules for Geometric Control Charts

Kamran Paynabar, PhD Pre-candidate, University of Michigan, Industrial and Operations Eng. Dept,, 1205 Beal Ave, Ann Arbor, MI, 48109, United States of America, kamip@umich.edu, Judy Jin, Majid Aminnayeri

Geometric control charts (GCCs) have been effectively used for monitoring high yield processes. To improve the performance of Shewhart control charts in detecting small process changes, runs rules are widely used. However, the existing runs rules designed for Shewhart charts, cannot be directly used for GCCs due to the violation of the normality assumption. This research will present a new method for designing and optimizing runs rules for GCCs.

19 - DOE-Based Heuristics for Remanufacturing Reconfigurable Storage Requirements

Aysegul Topcu, Ph.D. Candidate, Northeastern University, 381 Commonwealth Ave. Apt. 6, Boston MA 02115, United States of America, topcu.a@neu.edu, James Benneyan, Thomas Cullinane

The design of facilities that house both manufacturing and remanufacturing operations is a vital component of supply chains. Significant variability in the number of re-usable parts retrieved from returned products contributes to fluctuations in storage capacity requirements. Simulation and experimental design were used to develop heuristics for identifying efficient remanufacturing storage reconfiguration policies that minimize total costs of internal, reconfigured, and external storage.

20 - Portfolio Optimization: A Scenario Generation Method Using Heteroskedasticity and Moment Matching

Erhan Deniz, PhD Candidate / Teaching Assistant, Rutgers University, 31 Redcliffe Ave., Highland Park, 08904, United States of America, erhan@eden.rutgers.edu, James T. Luxhöj

We present a portfolio management framework composed of a new scenario generation algorithm and a stochastic programming (SP) model. The algorithm is built on heteroskedastic models and moment matching approach to construct scenario trees representing the randomness in asset returns. The multi-stage SP model uses the generated scenario tree to maximize the expected final wealth and control risk exposure by the limitation of Conditional Value-at-Risk at each decision epoch over the scenario tree

21 - Modeling and Simulation of Business Processes and their Applications to the IT Service Processes

Genady Grabarnik, Researcher, T. J. Watson Research, IBM, 19 Skyline Dr, Hawthorne, NY, 10532, United States of America, genadyg@hotmail.com, Aaron Kershenbaum, Jay Benayon, Larisa Shwartz

IT System Management research considers the service as a business process. Business processes has graph structure, support a notion of synchronization and expose stochastic behavior. We model service as a BP graph with synchronization and stochastic properties, and simplify the BP based on stochastic reduction for the case that covers most of the practical applications. Simulation example illustrates the application of these methods to the evaluation and comparison of IT processes.

22 - Batch Scheduling with Distinct, Assignable Due Dates

Rui Zhang, PhD Candidate, McMaster University, 1280 Main Street West, Hamilton, ON, L7L6S6, Canada, zhangr6@mcmaster.ca

We study a batch scheduling problem with distinct, assignable due dates, in which our goal is to minimize the sum of weighted number of late jobs, due-date-assignment costs and batch-delivery costs. For three different cases, we propose a strong NP-hardness proof, a pseudo-polynomial algorithm, an FPTAS and a polynomial algorithm.

23 - E-mail Communication as a Paradigm for Quantifying Complex Network Evolution

Dean Malmgren, PhD Candidate, Northwestern University, 2145 Sheridan Rd., Evanston, IL, 60208, United States of America, r-malmgren@northwestern.edu, Julio Ottino, Luis Amaral

The existence of ubiquitous properties of complex networks across sociological, technological, and biological disciplines raises an important question: what can we learn from Mother Nature's design of these systems? We investigate this question with data from three universities that not only records e-mail communication patterns, but also records social affiliations. This data enables us to quantitatively investigate plausible mechanisms for social network evolution.

24 - Maximizing Advertisements Diffusion: A Simulation Study of The Dynamics of Mobile Viral Advertising

Jiang Wu, Dr, Huazhong University of Science and Technology, 1037 Luoyu Road, Wuhan, 430074, China, jiangwu.john@gmail.com

We propose a computational model to reconstruct the spreading of advertisements in social network and acquire implications about how to choose an initial set of people to maximize the performance of spreading advertisements. Also, we analyze the impacts of the network structures including topology, size and density and the initial selected number of targeted people on the dynamics of mobile viral advertising. We also run simulations in a real mobile-online social network.

25 - Multi Objective Decision Models for Informs Issues and Product Roadmaps

Ernest Forman, Professor, George Washington Universtity, Departement of Decision Sciences, Washington, DC, 20052, United States of America, forman@gwu.edu, Myron Hatcher, Thad Usowicz

Elicit issues and alternatives for important INFORMS decisions. Construct a multi-objective evaluation model for participants to evaluate at the meeting and to publish the model on the internet for the entire INFORMS membership following meeting. Present and elicit feedback about a new multi-objective optimization model for product roadmaps.

26 - Drawdowns Preceding Drawups in a Finite Time Horizon

Hongzhong Zhang, Graduate Student, CUNY, 365, 5th ave,, New York, NY, 10016, United States of America, hzhang3@gc.cuny.edu, Olympia Hadjiliadis

Drawdowns are increasingly being used as measures of risk in hedge-funds. We derive the probability of a drawdown preceding a drawup of equal or unequal units in a pre-specified time horizon. We assume a random walk model and discuss extensions to more general models including geometric Brownian motion.

27 - A Bin Packing Algorithm for Bus Crew Scheduling

Wenxin Qiao, University of Maryland-College Park, 1173 Glenn L. Martin Hall, College Park, MD, 20742, United States of America, wxqiao@umd.edu, Masoud Hamedi, Ali Haghani

The bus crew scheduling problem involves assigning bus work to drivers such that all pieces of works are covered and the operational cost is minimized. We propose a bin packing approach which uses a modified Best-Fit-Decreasing algorithm to solve the problem. A case study and numerical results are presented.

28 - Approximating Inpatient Census Distributions with Queuing Based Regression

James Broyles, Arizona State University, PO Box 875906, | Tempe, AZ, 85287-5906, United States of America, James.Broyles@asu.edu

Hospital inpatient census predictions are used for budgeting, staffing, and capacitating. Frequently, hospitals only know arrival rates and historical census at discrete times. This research creates a queuing theory based maximum likelihood regression model to predict long term inpatient census distributions with limited data input requirements.

29 - How do PMBOK & ICB Approach Projects?

Yasaman Khodadadegan, PhD Student, Arizona State University, Arizona State University, GWC502, Tempe, AZ, United States of America, ykhodada@asu.edu, Moeed Haghnevis, Homayoon Sajedi, Fateme Foroozanfar

This paper represents PMBOK and ICB elements to magnify their differences and similarities. It provides some insights to culminate project implementation by utilizing advantages of the models and removing their shortcomings. The possibility of extending social aspects of ICB to PMBOK and development of PMBOK tools to ICB is discussed.

30 - Optimal Location of Bluetooth Sensors for Collecting Travel Time Data

Mona Asudegi, Graduate Student, University of Maryland at College Park, 4307 Rowalt Drive,Apt 302, College Park, 20740, United States of America, asudegi@umd.edu, Ali Haghani, Abbas Afshar

This research aims at modeling and optimizing the location of a limited number of Bluetooth sensors over the transportation network in order to maximize data collection quality and minimize the installation cost.

31 - The Role of TRIZ in Increasing Productivity of Project Risk Management

Moeed Haghnevis, Graduate Student, PhD, Department of Industrial Engineering, Arizona State University, GWC502, Arizona State University, Tempe, AZ, 85287, United States of America, mhaghnev@asu.edu, Homayoon Sajedi, Yasaman Khodadadegan

This paper examines the mediatorial roles of TRIZ principles to improve PMBOK risk model and evaluate the interactions of those principles with each phase separately. The aim of this research is bonding TRIZ, as a supplementary tool, to risk management process in such a way that spells more productive results.

32 - Discrete Optimization Methods to Curate Metabolic Models

Vinay Satish Kumar, Graduate Research Assistant, The Pennsylvania State University, 147A Fenske Building, State College, PA, 16802, United States of America, vskumar@engr.psu.edu, Costas Maranas

Mathematical models of cellular metabolism have been built for describing metabolic processes. These models are incomplete with missing functionalities resulting in erroneous predictions of cellular behavior. We discuss discrete optimization methods to pinpoint deficiencies in these models and resolve them. First, we discuss methods to identify and resolve connectivity problems in these models. Then, we discuss a procedure to automatically reconcile model predictions with experimental data.

33 - Integer Program Optimization of Train Consisting Within a Complex Network

Steven Kolarz, University of Maryland, 7903 Orion Circle, Apt. 314C, Laurel, MD, 20724, United States of America, skolarz@gmail.com

In recent months the integrative role of passenger rail in national transport has become obvious. However, previous funding issues and current manufacturing leads prevent quick capacity increases. Through an IP approach, this research aims to tailor train consists to demand in order to allow car reassignment to more crowded trains.

34 - Multi-echelon Maintenance and Service Parts Inventory Policy Optimization: A Multiobjective Approach

Oscar Martinez, Research Associate, University of Central Florida, 4000 Central Florida Blv, Eng 2 room 312, Orlando, FL, 32816, United States of America, omartine@mail.ucf.edu, Christopher Geiger

Service parts inventories are maintained to support the maintenance function in maximizing equipment readiness. However, maintenance and service parts inventory policies are often optimized separately. We present a joint maintenance and service parts model for a two-echelon service parts supply system, followed by an empirical analysis of the model's performance.

35 - Online Algorithms for Scheduling Weighted Packets with Deadlines in a Bounded Buffer

Fei Li, Assistant Professor, George Mason University, 4400 University Drive MSN 4A5, Fairfax, VA, 22030, United States of America, lifei@cs.gmu.edu

We consider online scheduling of packets with deadlines in a bounded buffer. A buffer can store at most b packets. Each packet has a release date, a non-negative value, and an integer deadline. Only one packet is sent in a time step. Our objective is to maximize the total value gained by the packets sent by their deadlines. We present a deterministic 3-competitive and a randomized 2.618-competitive algorithms. The algorithmic framework and its analysis include several interesting features.

36 - MetModel GUI: Software for Building Optimization-based Models of Cellular Metabolism

Paul Brooks, Assistant Professor, Virginia Commonwealth University, PO Box 843083, Richmond, VA, 23284, United States of America, JPBrooks@vcu.edu, Steve Fong, Seth Roberts, Wil Burns

MetModel GUI can be used to build and analyze linear programming-based models of cellular metabolism. The authors have designed and implemented a gap analysis algorithm, a tool for creating consistent models. Additional capabilities of the software include the ability to investigate the effects of gene and protein knockouts on the cell.

37 - Role of Trust in the E-Commerce Adoption on Virtual Community

Hyoung-Yong Lee, Assistant Professor, Hansung University, 389 Samseon-Dong 2-Ga,, Seongbuk-Gu, SEOUL, 136-792, Korea, Republic of, leemit@hansung.ac.kr, Hyunchul Ahn

Since the aim of the company is to make money, many virtual community operators seek to create revenue model, and they have interests in building E-Commerce in their communities. However, it is never easy to facilitate E-Commerce under the virtual communities. In order to understand and manage the activities of E-Commerce under the virtual community environment, this paper analyze trust, based on Technology Acceptance Model.

38 - Current Studies in Kaizen Event Effectiveness, Sustainability, and Programs

Wiljeana Glover, Virginia Tech, 365 Oaktree Blvd, Christiansburg, VA, 24073, United States of America, wjglover@vt.edu

A Kaizen event is a focused and structured improvement project, using a dedicated cross-functional team to improve a targeted work area, with specific goals, in an accelerated timeframe. This poster highlights projects that use qualitative and quantitative methods to understand the critical factors that influence Kaizen event outcome achievement and sustainability. The projects are a part of an ongoing Kaizen event field research study by Virginia Tech and Oregon State University.

39 - On the Dynamic Feedback Analysis of Non-profitable Hospital Promoting Competitive Ability

Xiaoyong Lu, Nanchang University, Nanchang University North Campus, Nanchang, China, kxxhz@hotmail.com

This article promulgates restriction factor that affects non-profitable hospital competitive ability and proposes the development upper limit principle. It has proposed eliminating principle which propose the effective dynamic management countermeasure and establish common goal, responsibility and benefit that eliminate balancing feedback restriction in various stages. We promote hospital competitive ability through realizing common goal between society and hospital, responsibility and benefit.

40 - Online Model Selection Embedded in Product Development for Improving Printer's Color Consistency

Chao-Lung Yang, PhD Candidate, Purdue University, 2043 Tampa Dr, West Lafayette IN 47906, United States of America, yang33@purdue.edu, Jan P. Allebach, George T. C. Chiu, Yuehwern Yih

Color consistency is crucial for printing quality of color laser printers. The tone curve stabilization model has been developed to compensate the printing deviation for improving color consistency. In order to embed the model implementation in the R&D stage, the online steady-state identification method was proposed to search an optimal model by utilizing data in the product life-test. The preliminary result shows the proposed procedure is able to locate a model by using economic size of data.

41 - Application of Multi-Criteria Dynamic Linear Programming Model to SCM of Crude Oil in Nigeria

Okesola M. Olusola, md/ceo, Oludoy Dynamix Consulting Limited, 8,Kafi Street,Off Awolowo Road, Alausa,Ikeja, Lagos, 234, Nigeria, okesolaj@yahoo.com

This paper presents a multi-criteria decision analysis of the supply chain management of crude oil in Nigeria with the objective to minimize the total cost of integrating activities such as discovery of oil and allocation of oil wells, acquiring equipments for exploration, production processes, distribution/transportation, and SML-T market demand forecast.

42 - Dependent Poisson Race Model and Its Application in Conjoint Choice Study

Shiling Ruan, Food And Drug Administration, 1350 Piccard Drive, HFZ 550, Rockville, MD, 20850, United States of America, shiling.ruan@fda.hhs.gov, Thomas Otter, Steven MacEachern, Angela Dean

The Poisson race model has long been used to model the decision making in psychology. A new class of Poisson race model which can be used to model dependence structure between alternatives has been developed for the conjoint choice data. This talk will discuss the formulation of the Poisson race model with a dependence structure for conjoint choice data with more than two alternatives. This model demonstrates better predictive performances as compared to the traditional choice models.

43 - Study on the Group-buying Auction

Jian Chen, Professor, Tsinghua University, School of Economics and Management, Beijing, 100084, China, jchen@tsinghua.edu.cn

The group-buying auction (GBA) is a new kind of dynamic pricing mechanism on the Internet. In this talk, we first analyze the group-buying auction under some assumptions and build an incomplete information dynamic game model to illustrate the bidders' bidding process. Then, we analyze the seller's pricing strategy with the GBA and the performance of both sides when the bidders collude. Finally, we extend our study to B2B commerce.

44 - Simulation-Based Preventive Maintenance Optimization

Dmitriy Belyi, University of Texas at Austin, 4306 Avenue A #107, Austin, TX, 78705, United States of America, dmitriy.belyi@gmail.com, Elmira Popova

This work addresses the problem of finding the minimal-cost preventive maintenance schedule for a single item. We develop an optimization algorithm that reduces the time effort to find the optimal schedule. This approach relies on the item having an increasing failure rate, which is typical, and employs a Gibbs sampling algorithm to simulate from the hazard rate distribution using real data. We then analyze the effectiveness of this approach on some generated and real data sets.

45 - Optimal Selection of Technology Transferor in Technology Chain Network

Jong-IL Lee, Yonsei University, 134 Shinchon-dong, Seodaemun-ku, Information and Industrial Engineering, Seoul, Korea, Republic of, ljistar@yonsei.ac.kr, Bongju Jeong

This study proposes a procedural method for optimally selecting the technology transferor when a technology transferee needs to buy a specific technology. We develop a technology chain network where technology supplier, technology marketer, and technology transferee are informatively linked. The selection is made by maximizing the technology similarity index and minimizing the technology transfer costs. keywords : Technology Chain Network; Technology Transferor Selection; Technology Similarity

46 - A Risk-adjusted Scan Statistic for Non-homogeneous, Hence Non-binomial Dichotomous populations

Aysun Taseli, Northeastern University, 360 Hungtington Ave, 368 Snell Engineering Building, Boston, MA, 02115, United States of America, aysunt_qpl@yahoo.com

When a population can be partitioned into J sub-populations with non-identical risk probabilities, the number of cases can no longer be explained by a binomial distribution. A model adjustment to Kulldorff's scan statistic is proposed for such non-homogeneous dichotomous populations. The performance of these models, based on J-Bernoulli and J-Binomial distribution versus standard Bernoulli and Poisson models are investigated.

47 - Assessment of Project Management Office Capabilities

IMRAN DALWAI, MBA Candidate, Katz Graduate School of Business, Mervis Hall, Pittsburgh, PA, 15260, United States of America, imdalwai@katz.pitt.edu, Brian Butler

Projects are increasingly viewed as investments, driving development of Project Management Offices (PMOs). We propose an assessment process based on benchmarking PMOs engagement in five areas. Using examples from application of the process, we describe how it facilitates goal specification and provides an action dashboard for advancing Project Management maturity.

48 - A Study on EPR System in Reverse Supply Chain of Cellular Phone Industry in Korea

Kiman Kim, Yonsei University, 134 Shinchon-dong, Seodaemun-ku, Information and Industrial Engineering, Seoul, Korea, Republic of, kimkiman@yonsei.ac.kr, Kibum Kim

This study investigates the EPR(Extended Producer Responsibility) system in view of both government and industrial companies in reverse supply chain. The government eco-policy often conflicts with the goal of companies. We propose a mathematical model to find the optimal take-back rate and recycling rate which satisfies both sides. The cellular phone industry of Korea is analyzed to illustrate our findings Keywords : EPR, Reverse Supply Chain, Optimization, Cellular Phone Industry

49 Real-Time Available to Promise (ATP): The Solution Quality of a Stochastic Programming Model

Chien-Yu Chen, Assistant Professor, George Mason University, School of Management, 4400 University Dr., Fairfax, VA, 22030, United States of America, cchen8@gmu.edu

To support real-time order-promising, we develop a stochastic programming model to pre-allocate a critical resource over multiple demand channels and time periods. Both Benders decomposition and importance sampling techniques are applied to quickly obtain near-optimal solutions. We examine the solution quality by investigating the statistics of optimality gaps and solving times.

50 - A Portfolio Selection Strategy Using Genetic Algorithms

Miranda Montgomery, Clemson University Industrial Engineering Dept., 110 Freeman Hall, Clemson University, Clemson, SC, 29634, United States of America, montgo5@clemson.edu, Mary Beth Kurz

Using a Genetic Algorithm (GA), an artificial intelligence technique, this study proposes a portfolio selection strategy that will generate an optimal investment mix of assets using measures such as cost, risk, and return. This strategy will be compared to exact mathematical methods to assess its performance.

51 - Quantum Inspired Genetic Algorithms and Grammatical Evolution

Sean McGarraghy, Dr, University College Dublin, School of Business, Belfield, Dublin, Dublin 4, Ireland, sean.mcgarraghy@ucd.ie, Colm O'Dowd, Micheal Phelan

Modified Quantum Inspired Genetic Algorithms (QIGA) are developed, which outperform a standard Genetic Algorithm (GA) on a standard suite of benchmark problems, including the Knapsack problem and function optimization problems. This QIGA is used to replace - and again outperforms - a GA as the search engine in Grammatical Evolution (GE). The GE/QIGA with appropriate grammars is applied to the Supply Chain Beer Game and again shows improved performance in developing an optimal order policy.

52 - Accommodating Transmission Range Uncertainty in Deploying Wireless Ad Hoc Networks

Kangyuan Zhu, Research Assistant, University of Virginia, Department of Systems Eng,, University of Virginia, Charlottesville VA 22903, United States of America, kz3y@virginia.edu, Stephen Patek

It is typically assumed that nodes in wireless sensor networks have known transmission range while in practice it is highly uncertain a priori. This paper addresses a dynamic and sequential node deployment problem in which a robot would be responsible for maximizing the probability of network connectivity given probabilistic models of node's transmission ranges subject to (i) the number of available network nodes and (ii) the linear time/distance that can be operated by the robot or technician.

53 - Quantitative Evaluation of IT Risk and Loss

Bee Yew, Assistant Profesoor, Fayetteville State University, 1200 Murchison Rd, Fayetteville NC 28311, United States of America, byew@uncfsu.edu

Risk is defined to be the likely effect an IT asset will be successfully attacked during a time period. In our proposed model, the risk quantification model is a product of vulnerability, threat and the sum of asset value and loss of productivity. The Risk components include private information, loss productivity and impact on reputation and public trust. Vulnerability is the difference between an asset's protections and the force that can be applied against it.

Monday, 1:30pm - 3:00pm

■ MC01

Purchasing Behavior and Competition in Online Retailing

Sponsor: eBusiness
Sponsored Session
Chair: Daewon Sun, University of Notre Dame, 359 MCOB, Notre Dame, IN, 46556, United States of America, dsun@nd.edu

1 - Website Features and Online Shopping: How Technology Usage Impacts Consumer Demand

Mohammad Rahman, University of Calgary, 2500 University Dr. NW, Calgary, Alberta, T2N 1N4, Canada, mohammad.rahman@haskayne.ucalgary.ca, Prabuddha De, Yu Hu

Today virtually all Internet companies provide advanced technological features such as search functions and recommendation systems on their websites. Despite the widespread adoption of search and recommendation technologies, empirical research that tackles the economic impact of these technologies is scarce. Does consumers' technology usage have an impact on consumer demand? How does this impact vary for different technologies and across different products? Our research studies these questions.

2 - Contracting on Consignment Sales

Jun Ru, University of Texas at Dallas, SOM3.224, 800 West Campbell Road, Richardson, TX, 75080, United States of America, jun.ru@utdallas.edu, Yunzeng Wang

Motivated by Amazon's online retailing, we study a consignment contract where the retailer charges a supplier a pre-specified percentage of the list price of the product sold to the market, and the supplier is allowed to choose the list price for its product. We build a game-theoretic model to demonstrate that managed under such a contract, the channel incurs a minimum loss of 26.4% in efficiency. We then propose an alternative contract to improve the channel performance.

3 - Price and Quantity Competition in Online Retailing: Amazon's Marketplace Contract

Daewon Sun, University of Notre Dame, 359 MCOB, Notre Dame, IN, 46556, United States of America, dsun@nd.edu, Xuying Zhao, Jennifer Ryan

We investigate the impact of Amazon's Marketplace contract, in which online retailers can list their products and ship customer orders. We formulate this problem as a three-channel competition model in which Amazon sells a given product, while an e-retailer sells the same product through both Amazon and her own online store. We model each channel as a newsvendor problem, with price and order quantity as decision variables, and we analyze the equilibrium behavior of the system.

■ MC02

Information Technology Evaluation, Impact, and Virtualization

Sponsor: Information Systems
Sponsored Session
Chair: Andrew Chen, University of Kansas, School of Business, Lawrence, KS, 66049, United States of America, achen@ku.edu

1 - The Impacts of Virtualization on IT Infrastructure: An Analysis Based on an SSME Framework

Minder Chen, Associate Professor, California State University, Channel Islands, One University Drive, Camarillo, CA, 93012, United States of America, minder.chen@csuci.edu

Gardner called virtualization the "highest-impact trend" for the information technology world through 2012. In our study, we will discuss various software virtualization approaches and their benefits. A service sciences, management, and engineering (SSME) framework has been used in guiding our analysis of virtualization technology. An IT Service standard, ITIL, is used in assessing the impacts of virtualization to IT services.

2 - The Impact of IT and Knowledge Management on Supply Chain Performance

Chandrasekar Subramaniam, Assistant Professor, University of North Carolina at Charlotte, 9201 University City Blvd, Charlotte, NC, 28223, United States of America, csubrama@uncc.edu, Yuan Niu

One of the major shifts in supply chain (SC) relationships is the emphasis on collaboration with SC partners. Despite this recognition of the role of SC collaboration, there is little research that theorizes an SC's KM capability. This paper proposes a framework relating IT capability and KM capability and their impact on SC performance. The contributions of our research include advancing the theory on SC value creation and improving our understanding of IT in supply chains.

3 - Structuring Preference Ranking Markets for Early Stage Emerging Technology Evaluation

Li Chen, University of Connecticut, 2100 Hillside Road Unit 1041, Storrs, CT, 06269, United States of America, li.chen@business.uconn.edu, Paulo Goes, James Marsden, John Zhang

Selection of early stage emerging technologies is a challenging decision. Recently, several large companies are interested in using information markets as preference aggregation and group decision-making tools to rank new technologies. We set up two internal preference markets with one market using an additional play-money incentive. Our analysis focus on participant and market behavior, dynamic preference aggregation, and market performance. Results indicate promising expectations.

■ MC03

Lot-size Problems in Inventory Management

Contributed Session

Chair: Mehmet Onal, University of Florida, Department of Industrial and Systems Eng., Gainesville, FL, 32611, United States of America, monal@ufl.edu

1 - Slowing Down Production Using Power of Two Scheduling

Amit Eynan, Professor, University of Richmond, 1 Gateway Rd, Richmond, VA, 23173, United States of America, aeynan@richmond.edu

Traditional lot sizing scheduling utilizes the nominal production rate as specified by the machine capacity. In recent years it became apparent that in presence of excess capacity slowing down the production rate and taking up available idle time reduces operating costs due mainly to inventory reduction. Available works considered various policies for slowing down but all assumed a common cycle time. This work explores the potential benefit of allowing multiple cycles using a power of two scheme

2 - Stochastic Dynamic Inventory Problem under Inbound Cargo Costs

Liqing Zhang, Texas A&M University, Industrial & Systems Engineering, College Station, TX, liqing@tamu.edu, Sila Cetinkaya

We study a single item, periodic review, stochastic dynamic inventory problem where the inventory replenishment cost includes a multiple set-up cost term representing the truck costs and capacities. We first propose a new replenishment policy called the (Q, s, S) policy. We examine the sufficient conditions under which this policy is optimal. Then, we investigate how various system parameters such as the fixed set-up cost and truck capacity affect the policy parameters.

3 - Manufacturing Parts Sourcing with Delayed Transportation Policy

Emre Sancak, MSc., Koc University, Rumelifeneri Yolu 34450 Sariyer, Istanbul, 34450, Turkey, esancak@ku.edu.tr, F. Sibel Salman

We optimize the multiple item lot-sizing problem of the manufacturer where the transportation costs from the suppliers are charged to the manufacturer. We show that delaying part of the shipment improves the cost of the manufacturer in the case of less-than full truckload. The effects of delaying parts on both cost and service levels are shown using data from a bus manufacturer. The effects of lead time uncertainty is also investigated.

4 - Blood Banking in India

Harshal Lowalekar, Student(Phd), Indian Institute Of Management,Ahmedabad, Vastrapur, Ahmedabad, Gj, 380015, India, harshal@iimahd.ernet.in, N. Ravichandran

We shall review the Operations of Blood Banks in India. We shall critically identify the decision making opportunities that exists in the Indian Blood Banks. We shall study the differences between the Contexts of Hospital Blood Banks and the Stand Alone Blood Banks. We shall provide a review of the previous work in the area of Blood Banking and the current practices in Indian Blood Banks. We shall also identify some issues that need scientific investigation in the context of Indian Blood Banks

5 - Perishable Inventories with Deterministic Lifetimes

Mehmet Onal, University of Florida, Department of Industrial and Systems Eng., Gainesville, FL, 32611, United States of America, monal@ufl.edu, Edwin Romeijn, Amar Sapra

We consider an extension to the basic economic lot size problem where we assume that products spoil after some number of periods and can not be sold. We present polynomial time algorithms to the problem assuming various inventory strategies and different consumer preferences.

■ MC05

Models and Methods for Congestion Pricing III

Cluster: Network Congestion and Congestion Management
Invited Session

Chair: Marco Nie, Northwestern University, 2145 Sheridan Road, Evanston, IL, 60208, United States of America, y-nie@northwestern.edu

1 - Congestion Pricing for a Freeway Considering Queue Spillbacks

Zhen (Sean) Qian, Doctoral Student, University of California Davis, One Shield Ave, Davis, CA, United States of America, zqian@ucdavis.edu, Michael Zhang

This paper proposes a method to compute the time-dependent marginal cost (MC) in a freeway network with multiple O-Ds but an unique path for each one. This method applies to situatuions when queues from one link can spill back to upstream links, and is implemented with the help of a dynamic loading procedure, from which the cumulative curves for each link are obtained to evaluate small variations in link travel times, which in turn provides the MC for congestion pricing in such a network.

2 - Dynamic Congestion Pricing: Models and Computational Methods

Terry Friesz, Marcus Professor, Penn State University, Department of Industrial & Mfg Engr., 305 Leonhard Bldg, University Park, PA, 16802, United States of America, tfriesz@psu.edu, Changhyun Kwon, Matthew Rigdon, Tae Il Kim

We provide a brief review of dynamic congestion pricing models. In particular, we discuss the dynamic efficient toll problem and the dynamic optimal toll problem with dynamic user equilibrium constraints. Some algorithms and numerical examples are also presented.

3 - Dynamic Congestion Pricing Strategies with Drivers' Stochastic Dynamic Behavior

Fan Yang, City University of New York (CUNY), fyang@ccny.cuny.edu

Drivers' behavior plays an important role in the success of a congestion pricing strategy. This study aims at providing insight on how to force the traffic system to evolve from the status quo to a stationary state of system optimal, considering a general drivers' stochastic and dynamic behavior adjustment process.

4 - Dynamic Pricing with Heterogeneous Users

Hani Mahmassani, Professor, Northwestern University, Transportation Center, Evanston, Il, 60208, United States of America, masmah@northwestern.edu, Jing Dong

This study presents a dynamic pricing scheme taking into consideration of heterogeneity in users' route choice behavior and in value of time (VOT). A multi-criterion traffic assignment model is adapted to achieve traffic management goal through time-dependent link pricing strategies.

5 - Bounding the Inefficiency of Price and Investment Competition in an Oligopoly Market

Feng Xiao, Postdoctoral Researcher, University of California Davis, Engr. III 1001, One Shields Avenue, Davis, CA, 95616, United States of America, sheffi2004@gmail.com

In service industries with congestion effects firms compete with each other by not only choosing prices but investments. In this paper oligopoly competition is studied where firms determine their price and investment simultaneously. General situations are considered including symmetric and asymmetric markets, concave and convex demand curves and various returns to scale in investment. Upper-bounds of efficiency loss are established when market is symmetric.

■ MC06

Auction Theory: In Honor of Mike Rothkopf

Cluster: Auctions
Invited Session

Chair: Wedad Elmaghraby, University of Maryland, College Park, MD, Wedad_Elmaghraby@rhsmith.umd.edu

1 - Combinatorial Auctions

Sasa Pekec, Duke University - The Fuqua School of Business, 1 Towerview Road, Durham, NC, 27708-0120, United States of America, pekec@duke.edu

Combinatorial auctions have been in focus of interdisciplinary research efforts combining economics, computer science and OR. Mike Rothkopf's ideas and research played a pioneering role in defining the area, making it interdisciplinary, and shaping research directions. In this talk I will review Mike's contributions and their impact on our current understanding of combinatorial auctions, as well as some of Mike's ideas that still seem to be ahead of currently fashionable research topics.

2 - Preemption and Jump Bidding

Vladimir Mares, Assistant Professor, Olin School of Business, One Brookings Drive, St. Louis, MO, 63105, United States of America, MARES@WUSTL.EDU

This paper constructs an integrated model of preemption and joint bidding in open auctions. The decision to discretely increase the price is endogenous and relies purely managing the flow of information among a bidder's competitors.In doing so they affect both the expected price and the allocation of the asset. Increased competition can actually strengthen these incentives. The paper characterizes optimal bidding plans and derives comparative statics.

3 - Mike Rothkopf's Recent Contributions in Charity Auctions

Peter Popkowski Leszczyc, University of Alberta, 4-20F School of Business, Edmonton, AB, T6G2R6, Canada, ppopkows@ualberta.ca

This talk will focus on some of Mike's latest contributions in the area of Charity Auctions. It discusses "Laura's" model of charitable bidding in auctions and presents important results from a number of controlled field experiments.

4 - Relative Performance Auctions

Octavian Carare, Assistant Professor, UT Dallas, 2604 N Floyd Rd, SM 3.1, Richardson, TX, United States of America, carare@utdallas.edu, Vladimir Mares

We analyze the behavior of bidders in auctions where the relative performance of bidders matters. We consider several bidding environments involving sequential and simultaneous auction procedures in which the bidders' payoffs are affected by the relative ranking of their auction winnings. Conditioning payoffs on relative performance is generally detrimental to efficiency.

■ MC07

Product Variety Management

Sponsor: Manufacturing & Service Oper Mgmt
Sponsored Session

Chair: Muge Yayla-Kullu, Asst. Professor, Lally School of Mgmt. & Tech., RPI, 110 8th Street, Troy, NY, 12180, United States of America, yaylah@rpi.edu

1 - Empirical Examination of the Long Tail of Electronic Commerce

Serguei Netessine, The Wharton School, University of Pennsylvania, Philadelphia, PA, United States of America, netessin@wharton.upenn.edu, Tom Tan

Online distribution is posed to change the variety of products that is available to customers. The idea behind the "long tail" of electronic commerce is that consumers will demand more and more of products that currently have very little or no demand. Using data from an Internet video rental company we test this assertion empirically.

2 - Product Introduction Strategies for a New Market

Wenjun Gu, University of Illinois, 1206 S. Sixth St, Champaign, United States of America, wgu3@uiuc.edu, Dilip Chhajed

Traditional product design literature hasn't studied quality and price decisions when a firm sequentially extends its business from one market to two. In this paper we analyze various product introduction strategies; some involving introducing existing products which saves cost and some involving introducing customized products that are more targeted for the new market. We present the results and managerial insights for optimal product introduction strategies.

3 - Vertically Differentiated Product Line Design under Competition

Muge Yayla-Kullu, Asst. Professor, Lally School of Mgmt. & Tech., RPI, 110 8th Street, Troy, NY, 12180, United States of America, yaylah@rpi.edu, Ali Parlakturk, Jayashankar Swaminathan

In this paper, we study the firm's best response in terms of product line choice, capacity allocation and pricing decisions in the face of competition. We show that incorporating capacity limitation may dramatically change the product line decisions. In contrast to existing literature, competition may result in less supply in the market than the monopolist markets. Moreover, the average quality offered may decrease with firm entry to the market.

4 - Product-Line Competition: Customization vs Proliferation

Ali Parlakturk, Ali_Parlakturk@unc.edu, Haim Mendelson

We study a market with customers who have heterogeneous preferences for product attributes. We consider two types of firms that compete on price and product variety: A traditional firm, which chooses a limited set of product configurations, and a customizing firm, which can produce any configuration to order. The traditional firm carries product inventories and experiences a lead-time delay. The customizing firm does not carry inventory and its customers incur waiting costs.

■ MC08

Real Option Applications in Operations Management

Sponsor: Manufacturing & Service Oper Mgmt/ Interface between Finance, Operations, and Risk Management (iFORM)
Sponsored Session

Chair: Nicola Secomandi, Assistant Professor, Tepper School of Business, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA, 15213, United States of America, ns7@andrew.cmu.edu

1 - Physical Commodity Trading in a Network and Its Impact on Prices

Victor Martinez de Albeniz, Assistant Professor, IESE Business School, Av. Pearson 21, Barcelona, 08034, Spain, valbeniz@iese.edu

We consider in this paper the trading of a single commodity in several locations which define a network. We model shipping capacity constraints through quadratic trading costs. We first analyze the basic strategy of a trader between two nodes, which affects prices in each node. This allows us to characterize the (stochastic) price evolution in the nodes over time. We use the model to analyze numerically the kerosene price differences between New York, Los Angeles and the Gulf Coast.

2 - Outsourcing Contract and Timing under Cost Uncertainty

Tao Yao, Assistant Professor, Pennsylvania State University, 310 Leonhard Building, University Park, PA, 16802, United States of America, taoyao@psu.edu, Bin Jiang, Yongma Moon

This paper studies outsourcing contract for firms with in-house capability in an environment of uncertain cost. We develop a real options model for valuation and optimal outsourcing timing of three type contracts, fixed-price, cost-plus, and gain-sharing. We study the impact of managerial flexibility on contract selection strategies.

3 - Valuing Adaptive Quality and Shutdown Options in Production Systems

Danko Turcic, Assistant Professor of Operations, Olin Business School, Washington University in St. Louis, 1 Brookings Drive, St. Louis, MO, 63130-4899, United States of America, danko.turcic@case.edu, Peter Ritchken

We consider two forms of operational flexibility in a production setting: the option to shut down production temporarily, and the option to control expected production yield through effort. The absolute values of both options are sensitive to costs and prices of finished goods, and they increase with price uncertainty. Their relative contribution to the value of production technology may increase or decrease as price uncertainty increases; sufficient conditions are provided for both.

4 - Optimal Commodity Trading with a Capacitated Storage Asset

Nicola Secomandi, Assistant Professor, Tepper School of Business, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA, 15213, United States of America, ns7@andrew.cmu.edu

This talk investigates the optimal inventory trading policy with a capacitated storage asset and discusses managerial insights related to (1) the meaning of high-low commodity prices, (2) the benefit of coordinating inventory trading and operational decisions, (3) the shares of the asset value that can be attributed to price uncertainty and deterministic variability (seasonality), and (4) the performance of a policy obtained by sequential reoptimizations of a deterministic model.

■ MC09

Joint Session QSR/CS: Decision Trees and Their Applications

Sponsor: Quality, Statistics and Reliability, Computing Society
Sponsored Session

Chair: Tianyang Wang, McCombs School of Business, The University of Texas at Austin, IROM Department, McCombs School of Business, UT Austin, Austin, TX, 78712, United States of America, tianyang.wang@phd.mccombs.utexas.edu

1 - Posterior Preference Articulation Approach to Dual Response Surface Optimization

Dong-Hee Lee, Department of Industrial and Management Engineering, Pohang University of Science and Technology, Republic of Korea, princeps@postech.ac.kr, Kwang-Jae Kim, In-Jun Jeong

In dual response surface optimization, the mean and the standard deviation responses are often in conflict. To obtain a satisfactory compromise, a Decision Maker (DM)'s preference information on the tradeoffs between the responses should be incorporated into the problem. In most of the existing works, the DM expresses the subjective judgment on the responses through a preference parameter before the problem solving process, and then a single solution is obtained. In this work, we propose a posterior preference articulation approach to dual response surface optimization. The posterior preference articulation approach first finds a set of nondominated solutions without the DM's preference information, and then allows the DM to select the best one among the nondominated solutions.

2 - An Implied Binomial Tree Approach to Value Multi-factor Real Options
   Tianyang Wang, McCombs School of Business, The University of Texas at Austin, IROM Department, McCombs School of Business, UT Austin, Austin, TX, 78712, United States of America, tianyang.wang@phd.mccombs.utexas.edu, James Dyer

This paper proposes a numerical algorithm for solving a multi-factor real options problem by approximating it with a single factor implied binomial tree. It provides a simple, computationally efficient and accurate way to price high dimensional real option problems with smooth, arbitrary distributions. For risk managers, it serves as a straight forward method for capital budgeting for projects involving flexibility.

■ MC10

Modeling Energy Markets at USDOE/FERC/USEPA
Sponsor: Energy, Natural Resources & the Environment/ Energy
Sponsored Session
Chair: Benjamin F. Hobbs, Schad Chair of Environmental Management, The Johns Hopkins University, Department Geography & Environ. Engineering, Baltimore, MD, 21218, United States of America, bhobbs@jhu.edu

1 - Optimal Transmission Switching
   Emily Bartholomew Fisher, PhD Student, The Johns Hopkins University / Lawrence Berkeley National Laboratory, DoGEE, 313 Ames Hall, Baltimore, MD, 21218, United States of America, ebartho3@jhu.edu, Richard O'Neill, Michael Ferris

In this paper, we formulate the problem of finding an optimal generation dispatch and transmission topology to meet a specific inflexible load as a mixed integer program. Our model is a mixed-integer linear program because it employs binary variables to represent the state of the equipment and linear relationships to describe the physical system. We find that on the standard 118-bus IEEE test case a savings of 25 percent in system dispatch cost can be achieved.

2 - Analysis of Biomass Competition for Bioenergy and Biofuels Using U.S. EPA MARKAL Model
   Ozge Kaplan, Research Fellow, U.S. EPA - Office of Research and Development, Mail Drop: E305-02, 109 T.W. Alexander Drive, Research Triangle Park, NC, 27711, United States of America, Kaplan.Ozge@epamail.epa.gov, Tim Johnson

This study examines how interactions between the bioenergy supply chain and larger energy system affect regional feedstock demand and distribution-related energy needs. The analysis combines a GIS assessment of regional variation in feedstock supply, transportation infrastructure, and biofuels demand with output from the U.S.EPA's MARKAL energy system model.

3 - Biofuels Analytical Activities at the U.S. Department of Energy
   Zia Haq, Senior Analyst, US Department of Energy, 1000 Independence Avenue, SW, Mail Stop EE-2E, Washington, DC, 20585, United States of America, Zia.Haq@ee.doe.gov

Biofuels derived from cellulosic feedstocks have the potential to moderate the nation's dependence on imported oil, reduce greenhouse gas emissions, and revitalize rural economies. The Department of Energy is engaged in analytical activities that are focused on: resource assessment, economic analysis, sustainability impacts, and market assessment. This paper will provide an overview of these activities.

4 - EPA's Application of a Detailed Power Sector Model for Analysis of GHG Cap and Trade Proposals
   Misha Adamantiades, Senior Analyst, US Environmental Protection Agency, 1200 Pennsylvania Avenue, 6204J, Washington, DC, 20460, United States of America, Adamantiades.Mikhail@epa.gov

This session will focus on U.S. EPA's application of the Integrated Planning Model, a detailed LP model of the U.S. power sector, in recently completed analyses of legislative proposals to reduce domestic emissions of GHGs. The session will highlight key modeling results, model assumptions, approach, and impacts of the analyses.

■ MC11

Joint Session ENRE/CS: Stochastic Optimization in Energy Systems
Sponsor: Energy, Natural Resources & the Environment/ Energy, Computing Society
Sponsored Session
Chair: Warren Powell, Princeton University, Department of ORFE, Princeton University, Princeton, NJ, 08540, United States of America, powell@princeton.edu

1 - Electricity Markets for Unpredictable and Uncertain Participants
   Geoffrey Pritchard, University of Auckland, Private Bag 92019, Auckland, Au, New Zealand, g.pritchard@auckland.ac.nz, Andy Philpott, Golbon Zakeri

We discuss a stochastic-programming-based method for scheduling electric power generation subject to uncertainty. Such uncertainty may arise from either imperfect forecasting or moment-to-moment fluctuations, and on either the supply or the demand side. The method gives a system of locational marginal prices which reflect the uncertainty, and these may be used in a market settlement scheme in which payment is for energy only. We can show that this scheme is revenue-adequate in expectation.

2 - One Stage R&D Portfolio Optimization with an Application to Solid Oxide Fuel Cells
   Lauren Hannah, Princeton University, Department of ORFE, Princeton University, Princeton, NJ, lhannah@princeton.edu, Jeff Stewart, Warren Powell

This presentation gives a novel model for the one stage R&D portfolio problem, which simplifies to a stochastic combinatorial optimization problem with a noisy cost function and large integer constraint set. We give an original solution method to this problem, a stochastic gradient-based optimization algorithm. Theoretical results are given along with a numerical example for Solid Oxide Fuel Cell R&D. The results are compared to competing algorithms.

3 - Smart Markets for Water Resources
   John Raffensperger, Senior Lecturer, University of Canterbury, Private Bag 4800, Department of Management, Christchurch, 8140, New Zealand, john.raffensperger@canterbury.ac.nz

Smart markets hold great promise to help solve the world's problems of water allocation, nutrient and sediment run-off, and impermeability from new development. In this presentation, I will describe practical solutions that rely on economics, hydrology and O.R. I will present a general framework for hydrological markets, discuss transaction costs, propose realistic institutional arrangements, and compare hydrological markets to the modern markets for electricity.

4 - A Dynamic Energy Resource Modeling System
   Abraham George, Research Associate, Princeton University, Department of Oper Res and Financial Engg., Princeton, NJ, 08544, United States of America, ageorge@princeton.edu, Warren Powell

We describe a model that optimizes the allocation of energy from different sources to different types of demand on an hourly time scale, while deciding how much of different types of energy capacity should be added over a multi-decade horizon. A deterministic version of an aggregate model produces a linear program with millions of variables. We present an approximate dynamic programming model that closely matches optimal on deterministic problems while handling multiple forms of uncertainty.

■ MC12

Web and Network Mining
Cluster: Data Mining
Invited Session
Chair: Olivia Sheng, Presidential Professor, University of Utah, David Eccles School of Business, Salt Lake City, UT, United States of America, Olivia.sheng@business.utah.edu

1 - Maintaining and Evolving a Taxonomy with Social Tagging
   Harris Wu, Old Dominion University, hwu@odu.edu, Kurt Maly, Mohammed Zubair

Browsing large digital collections can benefit from well-maintained taxonomies. This presentation talks about how social tagging can be utilized systematically in maintaining and evolving a taxonomy: 1) to complement a taxonomy with new category entries, 2) to categorize items into the taxonomy.

2 - Marketing Campaign Optimization: An Interest Support Based Subspace Clustering Approach

Wei Gao, Fordham University, Graduate School of Bus Administration, New York, NY, United States of America, weigao@fordham.edu, Xiao Fang, Zhuo Yang, Olivia Sheng

Marketing campaign optimization finds groups of customers that could generate the maximal profits while considering the cost of campaign. The proposed approach uses particular heuristics to discover interesting subspace clusters more efficiently and selects a proper set of subspace clusters (i.e., groups of customers) as the solution to the campaign optimization problem. The experimental results show our approach is effective and efficient to discover the near-optimal solution.

3 - Predicting Vendors' Reliability in Search Results

Olivia Sheng, Presidential Professor, University of Utah, David Eccles School of Business, Salt Lake City, UT, United States of America, Olivia.sheng@business.utah.edu, Zhongming Ma, Gautam Pant

A search engine provides two distinct types of results, organic and sponsored, and each of them uses different mechanisms for selecting and ranking relevant web pages. Vendors appearing in these results are expected to have varying reliability ratings (e.g., a satisfactory or unsatisfactory record based on overall customer experiences). In this paper we attempt to examine a vendor's reliability rating based on cues such as product price, type of result, and result index and page.

4 - Using Tags for Collaborative Filtering

Iljoo Kim, University of Utah, pactik@business.utah.edu, Gautam Pant, Olivia Sheng

While tagging has been widely deployed to support search and categorization applications, studies that investigate the use of tags for improving the performance of recommender systems are limited. We propose a modified collaborative-filtering recommendation system that uses tag-based profiling and present an empirical evaluation of the proposed system.

■ MC13

Data Mining Competition I

Sponsor: Data Mining
Sponsored Session
Chair: Nick Street, The University of Iowa, Iowa City, IA, nick-street@uiowa.edu

1 - Data Mining Competition

Nick Street, The University of Iowa, Iowa City IA, nick-street@uiowa.edu

In 2008 the Data Mining Section held the first INFORMS Data Mining Contest: The Antibiotic Protocol Case. The challenge was to identify patients at highest risk for developing an pneumonia during their hospital stay, and to design an optimal protocol for prophylactic antibiotic treatment. In this session, contest entrants will describe the approaches they took to this challenge.

■ MC14

Software Demonstration

Cluster: Software Demonstrations
Invited Session

1 - LINDO Systems, Inc. - Optimization Modeling

Mark Wiley, VP Marketing, LINDO Systems, Inc., 1415 North Dayton St., 1415 North Dayton Street, Chicago, IL, 60642, United States of America, mwiley@lindo.com

LINDO Systems will demonstrate the latest enhancements to LINDO API, LINGO and What'sBest - their popular linear, integer, quadratic, general nonlinear and global optimization tools. Find out how easy it is to: quickly build complex optimization models; effortlessly access data in Excel and databases; seamlessly embed optimization into your own applications.

2 - Maximal Software, Inc. - New Release of MPL Modeling System for Optimization with New and Enhanced Features

Bjarni Kristjansson, President, Maximal Software, Inc., 2111 Wilson Boulevard, Suite 700, Arlington, VA, 22201, United States of America, Bjarni@maximalsoftware.com

We will be demonstrating the newest release of MPL, one of the fastest and most scalable modeling languages on the market today. The innovative OptiMax 2000 Component Library, which allows MPL models to be easily embedded into end-user applications, has been augmented to include several new objects and methods. The speed and scalability of the model generation has been greatly enhanced, and with the new 64-bit Itanium version capable of solving much

larger models than ever before. Several new solvers have been added and existing solvers updated. Data access has been improved with new native drivers and now offers full XML/SOAP support for Internet connectivity.

■ MC15

Advances in Service Science

Sponsor: Service Science
Sponsored Session
Chair: Matthew Realff, Associate Professor, Georgia Tech, Ford ES&T Building, 311 Ferst Drive, Atlanta, GA, 30332, United States of America, matthew.realff@chbe.gatech.edu

1 - Comprehending Service Systems

Chris Tofts, Principal Researcher, HP, HP Labs, Filton Road, Bristol, BS34 8QZ, United Kingdom, chris.tofts@hp.com, Richard Taylor

To successfully design service systems all of the stakeholders must first comprehend them. There is a belief that the complex and concurrent development of services makes this either impossible or impractical. Unfortunately in the absence of comprehension it is certain that services will continue to be plagued with poor delivery and efficiency improvement. These challenges could be largely overcome by exploiting abstract models as a communication medium.

2 - Opportunities in Healthcare Systems Engineering

Ronald L. Rardin, White Distinguished Professor, University of Arkansas, Industrial Engineering, Bell 4169, Fayetteville, AR, 72762, United States of America, rrardin@uark.edu

Healthcare delivery in the United States is in a crisis of inconsistent and sometimes dismal quality, safety and efficiency, with exploding cost. While engineering is at the heart of many of the dramatic advances in medicine, the engineering that has been done on healthcare delivery processes and operations has had more limited impact. This presentation reviews the vast array of opportunities in such healthcare systems engineering.

3 - NSF and Research in Service Enterprises

Cerry Klein, Program Officer, NSF, 4201 Wilson Blvd, Arlington, VA, 22230, United States of America, cklein@nsf.gov

Service now accounts for approximately 80% of the U.S. economy. Research in understanding and promoting service enterprises is essential to the continued growth of the U.S. economy and the understanding of how this sector distinctly operates and interacts with other sectors. This presentation will discuss the efforts and funding opportunities at the National Science Foundation in this area.

■ MC16

Advances in Call Center Workforce Management

Sponsor: Manufacturing & Service Oper Mgmt/
Service Management
Sponsored Session
Chair: Yongpin Zhou, Associate Professor, ISOM Department, Foster School of Business, University of Washington, Seattle, WA, 98195-3200, United States of America, yongpin@u.washington.edu

1 - Delay Estimation for Delay Announcements in Call Centers With Customer Abandonment

Rouba Ibrahim, Department of Industrial Engineering and Operations Research, Columbia University, New York, NY, 10027, United States of America, rei2101@columbia.edu, Ward Whitt

We use heavy-traffic limits and computer simulation to study the performance of alternative real-time delay estimators in overloaded multi-server queuing models, allowing customer abandonment. These delay estimates may be used to make delay announcements in call centers. We exploit established approximations for performance measures with a non-exponential abandonment-time distribution to obtain delay estimates that effectively cope with non-exponential abandonment-time distributions.

2 - Staffing Call Centers Using Fixed-queue-ratio and Simulation-based Optimization

Itay Gurvich, Columbia University, New York, NY, 10027, United States of America, ig2126@columbia.edu, Rouba Ibrahim, Zohar Feldman

We study call centers with multiple customer classes and multiple agent pools. Building on the Fixed-Queue-Ratio family of routing rules, we develop a simulation-based optimization procedure to solve the problem of minimizing staffing costs while maintaining pre-specified quality-of-service constraints of various types. We illustrate the performance of our procedure by applying it to realistic settings with time varying arrivals and staffing levels that are allowed to vary throughout the day.

3 - Staffing Call Centers with Differentiated Levels of Service

Achal Bassamboo, Managerial Economics & Decision Sciences, Kellogg School of Management, Northwestern University, Evanston, IL, 60208, United States of America, a-bassamboo@kellogg.northwestern.edu, Assaf Zeevi

We consider a call center model with multiple customer classes and multiple server pools. Calls arrive randomly over time customers are impatient and may abandon the system before their service commences. The objective is to minimize staffing costs subject to some QoS constraints. We use duality theory to convert this constrained problem into an unconstrained formulation. The resulting prescription for the staffing level can be shown to be almost optimal in a suitable mathematical sense.

4 - Stochastic Shift Scheduling with Recourse

Noah Gans, Associate Professor, OPIM Department, The Wharton School, University of Pennsylvania, Philadelphia, PA, 19104-6340, United States of America, gans@wharton.upenn.edu, Yongpin Zhou, Nikolay Korolev, Alan McCord, Herbert Ristock, Haipeng Shen

Arrivals of customers to call centers and other consumer systems are often doubly stochastic. We develop forecast updating and workforce management scheduling techniques that account for this form of uncertainty and evaluate the cost and quality-of-service benefits they provide.

■ MC17

Journal of Quality Technology

Sponsor: Quality, Statistics and Reliability
Sponsored Session

Chair: Dan Apley, Associate Professor, Northwestern University, Department of Industrial Engineering, Evanston, IL, 60208-3119, United States of America, apley@northwestern.edu

1 - Analysis of Optimization Experiments

James Delaney, Visiting Assistant Professor, Carnegie Mellon University, Baker Hall 132B, Department of Statistics, Pittsburgh, PA, 15213-3890, United States of America, jdelaney@stat.cmu.edu, Roshan Josep Vengazhiyil

For the purposes of analyzing optimization experiments, we propose methodology using the practical significance level, which is a quantity that a practitioner can easily specify. We also propose utilizing empirical Bayes estimation which accounts for the randomness in the observations. Interestingly, the mechanics of statistical testing can be viewed as an approximation to empirical Bayes estimation, but with a significance level in the range of 15—40%.

2 - A Weighted CUSUM Chart for Detecting Patterned Mean Shifts

Wei Jiang, Stevens Institute of Technology, Castle Point of Hudson, Hoboken, NJ, United States of America, wjiang@stevens.edu, Lianjie Shu, Kwok-Leung Tsui

Conventional control charts may perform poorly when monitoring sequences with dynamic shift patterns. This paper proposes a new weighted cumulative sum (WCUSUM) procedure by first estimating the dynamic mean of the sequence then using the estimates for weighting the incremental in the conventional CUSUM chart. It is found that the WCUSUM chart performs far superior to other charts for detecting small to moderate shifts when forecast recovery is present.

■ MC18

Joint Session QSR/CS: Recent Advances in Design, Analysis and Modeling of Computer Experiments

Sponsor: Quality, Statistics and Reliability, Computing Society
Sponsored Session

Chair: Peter Qian, Assistant Professor, University of Wisconsin-Madison, 1300 University Ave, Madison, WI, 53706, United States of America, peterq@stat.wisc.edu

1 - Two-stage Group Screening for Computer Experiments

Thomas Santner, Professor, The Ohio State University, 1958 Neil Avenue, Cockins Hall 404, Columbus, OH, 43210, United States of America, tjs@stat.osu.edu, Hyejung Moon, Angela Dean

Experimentation using computer codes to simulate physical processes is used in many research fields. Such codes often have many inputs and are cpu intensive. We propose a two-stage group screening procedure to identifying active inputs. Stage 1 partitions the inputs into groups and identifies an output for each group; the it identifies active groups using main effect and total sensitivity indices. Stage 2 identifies active inputs from the individual inputs that comprise the active groups.

2 - G-Selc: Optimization by Sequential Elimination Using Genetic Algorithms and Gaussian Processes

C. F. Jeff Wu, Professor, Georgia Institute of Technology, 755 Fest Dr. NW, Atlanta, GA, United States of America, jeffwu@isye.gatech.edu

The Sequential Elimination of Level Combinations (SELC) algorithm by Mandal, Wu and Johnson (2006), though powerful, fails to extract substantial information from the data to guide the search efficiently as it is not based on statistical modeling. The proposed approach uses Gaussian Process modeling to improve upon SELC. Its performance is illustrated using test functions and on a real pharmaceutical data set for finding a group of chemical compounds with optimal properties.

3 - Effects of Warpage on Fatigue Reliability of Solder Bumps: Experimental and Analytical Studies

Ying Hung, Georgia Institute of Technology, 755 Ferst Dr. NW, Altanta, GA, yhung@isye.gatech.edu, C. F. Jeff Wu, Wei Tan, Charles Ume

Out-of-plane displacement has been a major thermomechanical reliability concern for electronic packages. In this research, the effect of initial PWB warpage on the low cycle thermal fatigue reliability of the solder bumps was evaluated from experimental thermal cycling tests and finite element results. Kriging model was used to predict solder bump fatigue life based on the initial PWB warpage, package locations, and solder bump materials.

4 - Sequential Quasi-Monte Carlo Sampling: Construction and Diverse Applications

Ben Haaland, Student, UW-Madison, 3818 Frosted Leaf Dr., Madison, WI, 53719, United States of America, benhaaland@hotmail.com, Peter Qian

Sequences of nested, extendable space filling designs are useful in statistics, computer science, and numerical analysis. Results for nesting and extending a class of designs with good uniformity properties, the (t,m,s)-nets and (t,s)-sequences, are presented. Applications and examples in numerical integration, design and modeling for computer experiments with multiple levels of accuracy and expense, and stochastic programming are given.

■ MC19

Game Theory and Decision Analysis: Alternative Approaches

Sponsor: Decision Analysis
Sponsored Session

Chair: Barry Cobb, Associate Professor, Virginia Military Institute, 335 Scott Shipp Hall, Lexington, VA, 24018, United States of America, cobbbr@vmi.edu

1 - Advances in Hypergame Theory

Russell R Vane III, IBM Global Business Services, 2102 Capston Circle, Herndon, VA, 20170, United States of America, russ@vaneteam.com

Hypergame Theory, using a cardinal value approach, explores more dimensions of the outguessing problem by constructing a model of perceptions. Adversaries are allowed to create new options unknown by their opponents to calculate the value of information. Hypergame Expected Value is proposed as a confidence indexed decision criteria.

2 - A Decision Analysis Approach to Solving the Signaling Game

Barry Cobb, Associate Professor, Virginia Military Institute, 335 Scott Shipp Hall, Lexington, VA, 24018, United States of America, cobbbr@vmi.edu, Atin Basu Choudhary

The decision analysis approach of van Binsbergen and Marx (2007) for determining Nash equilibria in extensive-form games is compared to a modified approach that models mixed strategies as decision tree chance nodes. This modified approach is compared to a traditional game-theoretic approach for solving the asymmetric signaling game.

3 - Effects-based Operations Planning as a Multi-criteria Decision Analysis Problem

Jouni Pousi, Researcher, Systems Analysis Laboratory, Helsinki University of Technology, Otakaari 1M, 02150 Espoo, Espoo FI, Finland, jouni.pousi@hut.fi, Kai Virtanen, Raimo P Hämäläinen

Effects-Based Operations (EBO) is a modern military planning concept that approaches the planning from a systems perspective by taking into account multiple goals of an operation. We present a new EBO planning process based on multi-criteria decision analysis. In the process, a system model and a method for evaluating effects are needed. We illustrate a case including a multi-criteria influence diagram.

■ MC20

Dynamic Programming Applications

Sponsor: Decision Analysis
Sponsored Session
Chair: Canan Ulu, University of Texas at Austin, 1 University Station, IROM, B6500, Austin, TX, 78712, United States of America, Canan.Ulu@mccombs.utexas.edu

1 - Irreversible Treatment Decisions under the Possibility of Improved Treatment Discoveries
Steven Shechter, Assistant Professor, University of British Columbia, 2053 Main Mall, Vancouver, BC, V6T 1Z2, Canada, steven.shechter@sauder.ubc.ca, Mark Roberts, Oguzhan Alagoz

We consider a patient with a degenerative disease who may take some currently available treatment which extends life but has significant consequences for quality of life (e.g., mastectomy). Moreover, the treatment is irreversible so that should a better treatment become available, the patient could no longer take advantage of it. We present an MDP that explicitly considers new treatment discovery in this context and how it may affect decisions regarding the available irreversible treatment.

2 - Dynamic Programming for Efficient Container Inspection Policies
Noam Goldberg, Rutgers University, 640 Bartholomew Rd, Piscataway, United States of America, ngoldberg@rutcor.rutgers.edu, Paul Kantor, Jonathan Word, Endre Boros

We consider the problem of optimally combining any given set of stochastically independent diagnostic tests into an inspection system that maximizes detection subject to a budget constraint. Our inspection policies can be represented as mixtures of decision trees. We present a dynamic programming algorithm that enumerates all efficient, undominated, inspection policies. Our approach directly solves the bicriterion optimization problem, allowing for sensitivity analysis.

3 - The Adoption of Multiple Dependent Technologies
Soo-Haeng Cho, Assistant Professor, Tepper School of Business, Carnegie Mellon University, 5000 Forbes Ave., Pittsburgh, PA, 15213, United States of America, soohaeng@andrew.cmu.edu, Kevin McCardle

A firm often makes an adoption decision regarding an improvement of one technology depending on changes in other technologies. While the literature has attributed the slow adoption of an innovation mainly to uncertainties outside the firm, this paper shows that the economic dependence among multiple types of technologies that inherently defines cost relationships inside the firm can significantly influence the timing of adoption. We support results with evidence from the semiconductor industry.

4 - Repeat Purchase Decisions in Technology Adoption
Canan Ulu, University of Texas at Austin, 1 University Station, IROM, B6500, Austin, TX, 78712, United States of America, Canan.Ulu@mccombs.utexas.edu, James Smith

Consumers contemplating replacing a technology they own with a new one need to think about future adoption decisions and uncertainties about future innovations. We formulate this problem as a dynamic programming model and study its structural properties: What changes in benefits and costs make the consumer better off? Decreases in costs and increases in benefits are good for the consumer, but how is she willing to trade off between increased costs and increased benefits (or decreases in both)?

■ MC21

Joint Session Computational Biology/CS: Protein Structure

Cluster: Computational Biology (Joint Cluster CS)
Invited Session
Chair: Carl Kingsford, Assistant Professor, University of Maryland, College Park, Department of Computer Science, 3113 Biomolecular Sciences Bldg #296, College Park, MD, 20742, United States of America, carlk@umiacs.umd.edu

1 - Protein Structure Prediction by Linear Programming
Jinbo Xu, Assistant Professor, Toyota Technological Institute at Chicago, 1427 East 60th Street, Chicago, IL, 60637, United States of America, j3xu@tti-c.org

This talk will present a linear programming approach to protein threading, one of the most successful methods for protein structure prediction. The LP approach can empirically solve the protein threading problem within polynomial-time, although this problem is NP-hard. A protein structure prediction package, RAPTOR, has been developed based on this LP approach. RAPTOR is one of the best prediction programs in two consecutive CASP (Critical Assessment of Protein Structure Prediction) events.

2 - Automatic Detection of Influenza Reassortments
Carl Kingsford, Assistant Professor, University of Maryland, College Park, Department of Computer Science, 3113 Biomolecular Sciences Bldg #296, College Park, MD, 20742, United States of America, carlk@cs.umd.edu

When a single host is infected by two strains of influenza simultaneously, the genomes of the progeny viruses can be a mixture of those strains. We present a novel framework for comparing weighted ensembles of phylogenetic trees to detect such reassortment events. The method accounts for uncertainty in the phylogenetic reconstructions when detecting disagreements between the trees for different influenza segments by reducing the problem to finding maximum and maximal bicliques.

3 - Residue-residue Hydrophobic Contact Prediction for Alpha-helical Proteins Via MILP Optimization
Christodoulos Floudas, Stephen C. Macaleer '63 Professor in Engineering and Applied Science, Princeton University, Department of Chemical Engineering, Princeton, NJ, 08544, United States of America, floudas@titan.princeton.edu

A new optimization-based method is presented to predict the hydrophobic residue contacts in alpha-helical proteins. These residue contacts are highly useful in narrowing down the conformational space searched by protein structure prediction algorithms. The proposed approach uses a high resolution distance dependent force field to calculate the interaction energy between different residues of a protein.

4 - New Methods for Modeling Biomolecular Structures
Christopher Langmead, Assistant Professor, Carnegie Mellon University, cjl@cs.cmu.edu

The structural dynamics of proteins mediate biological function. These dynamics are most often studied using molecular dynamics simulation, which is extremely expensive. We present a fast and accurate alternative to MD that can be used to study the thermodynamics of biomolecular systems. Our method uses Markov Random Fields and Generalized Belief Propagation to perform free energy calculations. We present results relevant to: i) protein design, and ii) the rational design of drugs and proteins.

■ MC22

Contracts and Policies in Supply Chain Management

Contributed Session
Chair: Sean Zhou, Assistant Professor, Chinese University of Hong Kong, Department SE&EM, Hong Kong, China, zhoux@se.cuhk.edu.hk

1 - Joint Price-delivery Decision in Three Stage Supply Chain
Jungkyu Kim, Postech, San 31, Hyoja, Pohang, 790-784, Korea, Republic of, m819@postech.ac.kr, Yushin Hong

We investigate pricing and ordering policies maximizing an average joint profit in three stage supply chain consisting of a single manufacturer, a single wholesaler and multiple retailers. Demand for retailers is linearly decreasing functions of a retail price and each retailer places orders according to EOQ policy. A mathematical model is formulated and a solution procedure is developed to determine the optimal policy.

2 - Quantity Flexibility Contracts and Buy Backs for Relational Contracting
Michaela Isabel Hoehn, Dipl.-Math., WHU - Otto Beisheim School of Management, Burgplatz 2, Vallendar, 56179, Germany, michaela.hoehn@whu.edu, Arnd Huchzermeier, Martin A. Lariviere

This paper studies a two-firm supply chain, where repeated transactions via supply contracts and continued quality-improvement efforts are governed by a relational contract. We are able to characterize an optimal relational contract, i.e., to develop policies for supplier and buyer that structure investments in quality and flexibility in a way that no other self-enforcing contract generates higher expected joint surplus. We examine both quantity-based and price-based returns mechanisms.

3 - Capacity Allocation Policy Impact on Order Fulfillment Performance
Amir-Behzad Samii, MIT-Zaragoza International Logistics Program, Gomez Laguna 25, Zaragoza, AR, 50009, Spain, absamii@mit.edu, Prashant Yadav, Richard Pibernik

The standard and the theft nesting capacity allocation policies are commonly used by airlines and other companies that regularly ration a perishable resource among different customer classes. We derive exact expressions for different order fulfillment performance measures of the individual customer classes and the overall system, under no-nesting (as reference) and both nesting policies. These expressions determine the conditions under which one nesting allocation performs better than the other.

4 - Socially Responsible Practices in the Supply Chain and Stakeholder Expectations

Amrou Awaysheh, Assistant Professor of Operations Management, Instituto de Empresa (IE) Business School Maria de Molina, 12 Madrid, Madrid, 28006, Spain, amrou.awaysheh@ie.edu, Robert D Klassen

A firm can engage in a number of different socially responsible practices that can impact different members of its supply chain. This presentation examines how supply chain structure impacts stakeholders' expectations of firm's involvement in various socially responsible practices within a supply chain context. Results from a national Canadian survey and an archival source are combined to examine the level to which this alignment of expectations and practices impacts performance.

5 - Reverse Auction Procurement with Flexible Noncompetitive Contracts

Sean Zhou, Assistant Professor, Chinese University of Hong Kong, Department SE&EM, Hong Kong, China, zhoux@se.cuhk.edu.hk, Zhijie Tao, Nianbing Zhang, Gangshu Cai

We consider the case of a buyer who wants to procure multiple units of a certain product from a group of potential suppliers. The buyer adopts a hybrid procurement mechanism, in which she first offers some flexible noncompetitive contracts to suppliers followed by a reverse auction. We show that the suppliers may prefer accepting the flexible noncompetitive offers to declining them and joining the auction. Also, the buyer can benefit from offering such kind of contracts to suppliers.

■ MC23

Queueing Systems with Heavy Tails

Sponsor: Applied Probability
Sponsored Session

Chair: Hayriye Ayhan, Associate Professor, Georgia Institute of Technology, School of ISyE, Atlanta, GA, 30332-0205, United States of America, hayriye.ayhan@isye.gatech.edu

1 - Large Deviations for Random Walks under Subexponentiality: The Big-jump Domain

Ton Dieker, Georgia Institute of Technology, School of ISyE, Atlanta, GA, 30332-0205, United States of America, ton.dieker@isye.gatech.edu, Denis Denisov, Vsevolod Shneer

Stimulated by applications to internet traffic modeling and insurance mathematics, distributions with heavy tails have been widely studied over the past decades. This talk addresses a fundamental large-deviation problem for random walks with heavy-tailed step-size distributions. Our investigations are motivated by the so-called single-server busy period problem with heavy tails, which will also be discussed.

2 - Evaluating SRPT Based Policies for Parallel Queues

Douglas Down, Associate Professor, McMaster University, Department of Copmputer and Software, Hamilton, ON, L8S 4l7, Canada, downd@univmail.cis.mcmaster.ca

We consider the problem of routing jobs to parallel queues where the service time of a job is known on arrival. For various routing strategies, we develop approximations (based on recent results identifying fluid limits for the SRPT discipline in a single queue) to evaluate the performance when SRPT is used as the local scheduling policy. Using these approximations, we compare such policies to other (non-SRPT based) policies, with emphasis on the case when the service times are heavy-tailed.

3 - Rare-event Simulation for Heavy-tailed Multi-server Queues

Jingchen Liu, Harvard University, 1 Oxford Street, Cambridge, MA, 02138, United States of America, jcliu@stat.harvard.edu, Jose Blanchet, Peter W. Glynn

I will present the first provably efficient simulation algorithm for steady-state estimation of long delays in a positive recurrent two-server queue with heavy-tailed service requirement. In such systems, long delays are usually caused by one or two customers who have extremely large service requirement and block the servers for long time. We propose a three-step program to design the algorithm and prove its efficiency.

4 - Machine Scheduling Problems in the Presence of Highly Variable Resource Demands

Ana Radovanovic, Research Scientist, Google Inc., 76 Ninth Avenue, New York, NY, 10011, United States of America, anaradovanovic@google.com

We observe a scheduling problem where a stream of different types of users arrive to the system requesting resources (cpu, ram, disk) for some random amount of time. User requests are served by a single, assigned available machine from the large pool. Our goal is to design a dynamic scheduling policy that performs well, i.e., minimizes job loss rate due to system's inability to provide resources, in the presence of highly variable users' demand.

■ MC24

Joint Session CS/ Optimization: Computational Integer Programming

Sponsor: Computing Society, Optimization
Sponsored Session

Chair: Jeff Linderoth, University of Wisconsin Madison, 1513 University Avenue, Madison, WI, United States of America, linderoth@wisc.edu

1 - Challenges in Exact Linear and Integer Programming: Exact Precision Linear Algebra

Dan Steffy, Georgia Institute of Technology, dsteffy@isye.gatech.edu, William Cook

A successful approach to solving linear programming problems exactly has been to solve the problems with increasing levels of fixed precision, checking the final basis in exact arithmetic and then doing additional pivots if necessary. This work is a computational study comparing different techniques for the core element of our exact computation: solving sparse rational systems of linear equations exactly.

2 - Strong Branching Disjunctive Cuts for MIP

Mustafa Kilinc, PhD Student, University of Wisconsin-Madison, kilinc@wisc.edu, Jeff Linderoth, Andrew Miller

Strong Branching is an effective branching technique that can significantly reduce the size of branch-and-bound tree and the solution time for MIP algorithms. In this talk, we demonstrate how to effectively use "discarded" information from strong branching to create disjunctive cutting planes. Computational results reveal that the tree size can be effectively reduced using these inequalities.

3 - Flexible Isomorphism Pruning

James Ostrowski, Lehigh University, jao204@lehigh.edu, Jeff Linderoth, Francois Margot

Isomorphism Pruning is an extremely powerful symmetry breaking tool when applied to integer programs. However, Isomorphism Pruning has the limitation that the algorithm must use a restricted choice of branching variables during the search. In this talk, we show how remove this limitation—-modifying isomorphism pruning to allow for complete flexibility in the choice of branching variable. Computational results showing the benefit of this flexibility will be given.

4 - A Pseudocost-based Tree Size Estimation Method for Mixed Integer Programs

Wasu Glankwamdee, Lehigh University, 200 W Packer Ave, Bethlehem, PA, 18015, United States of America, wag3@lehigh.edu, Jeffrey Linderoth

We describe a mechanism to estimate the size of the search tree resulting from a branch-and-bound method for solving MIP. Pseudocosts are used as a key ingredient in estimation procedure. The method can be used as the search progress, and does not require knowledge of feasible solution values in order to make estimates. Computational results on a wide variety of instances will be given and show that the method compares favorably to other methods in the literature.

■ MC25

Joint Session CS/TELCOM: Network Design and Optimization

Sponsor: Computing Society, Telecommunications
Sponsored Session

Chair: Eli Olinick, Associate Professor, SMU, EMIS Department, PO Box 750123, Dallas, TX, 75275, United States of America, olinick@engr.smu.edu

1 - An Optimization Based Algorithm for Designing WLANs for Multi-story Buildings

Jason Kratz, Graduate Student, Southern Methodist University, Dallas, TX, United States of America, jkratz@mail.smu.edu

This manuscript presents a set of optimization models and algorithms to design a wireless local area network for a multistory building. Our algorithm selects the location and frequency assignment of access points in an attempt to maximize the expected network capacity. Our algorithm has been empirically tested on three buildings on the campus of Southern Methodist University. Comparison of our designs with those developed by local IT personnel yielded improvements of 20%, 33%, and 33%.

2 - A Column Generation Heuristic for Traffic Grooming in Wavelength-Routed Optical Networks.

Sanjeewa Naranpanawe, SAS Institute Inc., 100 SAS Campus Drive, Cary, NC, 27513, United States of America, Sanjeewa.Naranpanawe@sas.com, Chelliah Sriskandarajah, Rakesh Gupta, Milind Dawande

We consider the problem of traffic grooming in all-optical networks with the objective of maximizing traffic subject to constraints on the number of transceivers at each node, the link load, and the capacity of each lightpath. Based on the structural properties of the problem, we propose a heuristic based on column generation and summarize the results from an extensive computational study.

3 - Heuristics for the Minimum-cost Ring-cover Problem

Eli Olinick, Associate Professor, SMU, EMIS Department, PO Box 750123, Dallas, TX, 75275, United States of America, olinick@engr.smu.edu

The minimum-cost ring-cover problem is an important and difficult optimization problem arising in the design of reliable, high-speed telecommunications networks. We present an integer-programming formulation for this problem and an empirical analysis of a heuristic for solving it based on column generation.

4 - Dual-Connected Steiner Trees and their Application to Reliable Video Broadcasts

Dave Allen, Verizon Network & Technology, 2400 N Glenville Rd, Richardson, TX, 75082, United States of America, dave.allen1@verizon.com, Peter Kubat

Recent deployment of ROADM (Reconfigurable Optical Add-Drop Multiplexers) in medium/long haul telecom networks has allowed a cost efficient distribution of broadcast video channels via a simple tree topology. Models for such a broadcast node/link failure protected network are developed and solved for minimum cost.

■ MC26

Open-Source Solutions for Real-World Problems

Sponsor: Computing Society: Open Source Software (Joint Cluster INFORMS Optimization)
Sponsored Session
Chair: Matthew Saltzman, Department of Mathematical Sciences, Clemson University, Clemson, SC, United States of America, mjs@clemson.edu

1 - PLOT: A Tool for Developing POM Alternatives via Integer Programming

Raphael Laufer, Systems Planning and Anlysis, Inc., 2001 North Beauregard Street, Alexandria, VA, rlaufer@spa.com, Joel Durgavich, Stephen Gossin, Zachary Firth, Leon Simms, Dennis Guzik

Every other year, each of the nation's armed services must submit a proposed 6-year budget subject to various spending constraints and political requirements. The goal is maximizing benefit under these constraints, and given that some of the constraints are "fuzzy" the need exists for both sensitivity analyses and the development of alternative solutions.

2 - A Northwest and Delta Airlines Merger Analysis

Dan Larsen, Student, University of Cincinnati, 707 W Martin Luther King Dr, #711E, Cincinnati, OH, 45220, United States of America, asel_dan@msn.com

This past April, Northwest and Delta Airlines have announced their intent to merge. Is keeping their seven existing hubs realistic? By utilizing open source software (namely, COIN-OR) I wish to evaluate an optimal network structure for the combined airline, given current fuel prices. The data source is public data provided by the DOT.

3 - The Java Simulation Library in Designing and Optimizing a Supply-Chain Simulation Model

Hugh Medal, PhD Student, University of Arkansas, 4207 Bell Engineering Center, Industrial Engineering Department, Fayetteville, AR, 72701, United States of America, hmedal@uark.edu, Manuel Rossetti

We demonstrate the use of the Java Simulation Library (JSL) through the entire process of optimizing a supply-chain simulation model. We introduce the unique features of the JSL and its useful framework for supply-chain, transportation logistics, and inventory modeling. We next outline the statistical features of the JSL and how they facilitate simulation-based optimization. Finally, we discuss oppurtunities for users to easily extend existing simulation-based optimization capabilities.

■ MC27

Some New Developments in Markov Decision Processes and Approximate Dynamic Programming

Sponsor: Applied Probability
Sponsored Session
Chair: Spyros Reveliotis, Associate Professor, ISyE, Georgia Tech, 765 Ferst Drive, Atlanta, GA, 30332, United States of America, spyros.reveliotis@isye.gatech.edu

1 - On Polynomial Cases of the Unichain Classification Problem for Markov Decision Processes

Eugene Feinberg, Department of Applied Mathematics and Statistics, Stony Brook University, Stony Brook, NY, 11794, United States of America, efeinberg@notes.cc.sunysb.edu, Fenghsu Yang

The unichain classification problem detects whether a finite state and action MDP is unichain under all deterministic policies. As shown by John Tsitsiklis, this problem is NP-hard. This paper provides polynomial algorithms for the unichain classification for an MDP with either a state that is recurrent under all deterministic policies or with a state that is absorbing under some action.

2 - Approximate Stochastic Dynamic Programming for Resource Management with Partial Observations

Edwin Chong, Professor, Colorado State University, 1373 Campus Delivery, Fort Collins, CO, 80523-1373, United States of America, Edwin.Chong@colostate.edu

Recent progress in approximation methods for solving partially observable Markov decision problems has encouraged the formulation and solution of a wide variety of resource management problems using this optimization framework. In this talk, we describe methods based on Bellman's dynamic programming principle and approximations of the cost-to-go. We focus on Monte Carlo sampling methods. We also show several recent examples involving sensor resource management problems.

3 - Customized Learning Algorithms for Episodic Tasks with Acyclic State Spaces

Spyros Reveliotis, Associate Professor, ISyE, Georgia Tech, 765 Ferst Drive, Atlanta, GA, 30332, United States of America, spyros.reveliotis@isye.gatech.edu, Theologos Bountourelis

We present a Probably Approximately Correct (PAC) learning algorithm for reinforcement learning tasks that evolve episodically over acyclic state spaces. In addition, we offer a number of algorithmic enhancements that streamline the implementation of the algorithm and render it efficient from a practical standpoint. Finally, a series of computational experiments demonstrate the efficacy of the proposed implementation and the gains attained compared to the typically used Q-learning algorithm.

4 - Approximate Dynamic Programming in the Presence of Rare Events

Shie Mannor, Assistant Professor, McGill University, McConnell Engineering Building, Rm. 525, 3480 University Street, Montreal, QC, H3A-2A7, Canada, shie.mannor@mcgill.ca, Doina Precup, Jordan Frank

We consider approximate dynamic programming in an environment in which rare significant events occur independently of the actions selected by the controlling agent. Assuming access to a simulator, in which the rare event probabilities can be artificially altered, we introduce algorithms for policy evaluation, using both tabular and function approximation representations of the value function. We present empirical performance of the algorithms on a large network planning task.

■ MC28

Adaptive Inventory Control

Cluster: Online Decision Making
Invited Session
Chair: Huseyin Topaloglu, Assistant Professor, Cornell University, School of ORIE, Cornell University, Ithaca, NY, 14853, United States of America, ht88@cornell.edu

1 - Adaptive Inventory Control with Demand Feedback

Justin Azadivar, University of California, Berkeley, Department of Industrial Engineering, jazad@ieor.berkeley.edu, Max Shen, Peng Li

We examine inventory control and optimization methods for situations where the demand varies in response to previous inventory control decisions and demands. We model this using a satisfaction model, and extend to models based on separate communities with internal communication mechanisms.

2 - Approximate Dynamic Programming for Serial Multi-echelon Systems with Economies of Scale

Diego Klabjan, Associate Professor, Northwestern University, Ind. Eng. and Mgmt. Sci., d-klabjan@northwestern.edu, Wei Xie

The value function of a serial systems with economies of scale is very complex and the underlying policies are not structured. We present a computational study based on algorithms that combine Monte-Carlo sampling and optimization. Various approximations to the value function are discussed.

3 - Adaptive Methods for Inventory Control

Huseyin Topaloglu, Assistant Professor, Cornell University, School of ORIE, Cornell University, Ithaca, NY, 14853, United States of America, ht88@cornell.edu, Sumit Kunnumkal

We describe a generic adaptive approach to compute the optimal projection levels in a number of inventory control problems. Our approach requires only samples of the demand random variables and it continues to work when the demand random variables are censored by the inventory availability.

4 - An Approximate Dynamic Programming Approach to a Production-inventory Problem

Christiane Barz, University of Chicago, Graduate School of Business, Chicago, IL, 60637, barz@uchicago.edu, Dan Adelman

We present an approximate dynamic programming (ADP) approach to a deterministic production-inventory control problem in which not all states are reachable from every other state. We address the technical difficulties in applying ADP to resolve this issue, and discuss theoretical and numerical results.

■ MC29

Panel Discussion: The Industry Job Search

Cluster: Job Placement Service
Invited Session

Chair: Talisa Murray, Systems Analyst, The Johns Hopkins University Applied Physics Laboratory, 11100 Johns Hopkins Road, Laurel, MD, 20723, Talisa.Murray@jhuapl.edu

1 - Panel Discussion: Industry Job Search

Moderator: Talisa Murray, Systems Analyst, The Johns Hopkins University Applied Physics Laboratory, 11100 Johns Hopkins Road, Laurel, MD, 20723, Talisa.Murray@jhuapl.edu, Panelists: Kamal Jain, Valerie Tardif, Afi Harrington, Dennis Baer

The panel will lead an informal discussion concerning the industry interview process, the appropriate steps to take during the job search, and the challenges that may be faced along the way. Time will be provided for questions and answers.

■ MC30

Modeling and Simulation - Assessing and Enhancing Capabilities

Sponsor: Military Applications
Sponsored Session

Chair: Niki Goerger, LTC, USMA, MADN-SE, Mahan Hall BLDG 752, West Point, NY, 10996, United States of America, niki.goerger@usma.edu

1 - Integrated Soldier Situational Awareness/ Search and Target Acquisition Modeling

John Willis, LTC, United States Military Academy, Department of Systems Engineering, Mahan Hall, West Point, NY, 10996, United States of America, john.willis@usma.edu

This work seeks to identify capability gaps and Soldier M&S analysis needs for the interrelated concepts of Situational Awareness (SA) and Search and Target Acquisition (STA). Our research objectives are to: (1) Identify and evaluate Soldier SA and STA representation within current M&S; (2) Develop an understanding of the interrelationships between Soldier SA and STA; and (3) Develop algorithms and implementations to represent SA and its impacts on STA with a focus on IWARS, OOS, and COMBATXXI.

2 - Bringing Geospatially Enriched Environments into Simulation for Unmanned Ground Vehicle Assessment

Suzanne Delong, US Army ERDC, ATTN:GM-M, 3909 Halls Ferry Road, Vicksburg, MS, 39180, United States of America, suzanne.delong@usma.edu, Joyce Nagle, Niki Goerger

Geospatially enriched synthetic environments are needed for development and assessment of unmanned ground vehicle performance to support sensor fusion and sense making. How can the high fidelity/resolution environment achieved via high performance computing be integrated to inform simulations addressing critical questions? This presentation will address the investigation of a multi-resolution modeling capability and results and lessons learned in developing an experiment for proof of concept.

3 - Overview of MATREX

Tom Hurt, US Army RDECOM, Fort Belvoir,, VA, United States of America, tom.hurt@us.army.mil, Chris Metivier

The Modeling Architecture for Technology, Research, and EXperimentation (MATREX) Program is a key distributed modeling and simulation environment in the US Army. It provides a unifying M&S architecture, supporting tools, and infrastructure to ease integration and use of multi-fidelity live, virtual, and constructive applications. The MATREX program's adaptable environment and tools support Systems of Systems design and development from requirements through test and integration.

4 - The Dynamic Capability Assessment Model: A Complex Capabilities-based Planning and Asset Management

Ted Thomas, Booz Allen Hamilton, 6703 Odyssey Dr, Suite 200, Huntsville, AL, 35806, United States of America, thomas_theodore@bah.com

The Dynamic Capability Assessment Model (DCAM) is an analytic modeling and visualization platform that allows decision makers to align their current and planned decisions, investments, and project schedules to best meet organizational goals. DCAM allows decision makers to perform visual "what-if" analyses on construction timelines, organizational moves, and other activities, enabling them to predict outcomes and the status of various installations based upon a set of planned actions.

■ MC31

Navy Workforce Management

Sponsor: The Practice Section of INFORMS
Sponsored Session

Chair: David Cashbaugh, Director, NPRST, 5720 Integrity Drive, Millington, TN, 38055, United States of America, david.cashbaugh@navy.mil

1 - FUTURE: Force Utilization through Unit Readiness and Efficiency

Tanja Blackstone, Economist, NPRST, 5720 Integrity Drive, Millington, TN, 38055, United States of America, tanja.blackstone@navy.mil, David Cashbaugh

FUTURE is an integrated system of decision support tools (DSTs) that will enable resource allocation decisions at the enterprise, unit and individuals levels. FUTURE is designed to provide a validated virtual DST that simulates the impacts of individual, unit, and Navy decisions on cost and readiness includes what-if simulation functionality.

2 - Simulation Modeling and Analysis of the Street-to-first-contract-renewal Supply Chain

Mehdi Amini, Professor, University of Memphis, Memphis, TN, United States of America, mamini@memphis.edu, Thomas Jones, Rodney Myers, Tanja Blackstone, Michael Racer, David Cashbaugh

Approaches applied for understanding and improvement of traditional supply chain with focus on products and services are also shown to be effective in studying the "human" supply chain. We present a simulation modeling and analysis approah to undrstand and improve the behavior of Navy's street-to-first-contrcat-renewal supply chain for AMEK job family. This supply chain is responsible for recruiting, training, distribution, placement, and contrcat renewal of sailors.

3 - OptForce™: Strategic Workforce Optimization and Diversity Planning

Jay April, Chief Development Officer, OptTek Systems, Inc., 1919 Seventh Street, Boulder, CO, 80302, United States of America, april@OptTek.com, Fred Glover, James Kelly, Marco Better

This presentation describes the simulation optimization technology being developed under a National Science Foundation SBIR Phase II award, projected to be used to support strategic workforce optimization and enhance diversity planning and management. The listener will learn how the system supports the cost-effective achievement of workforce readiness, diversity goals and objectives, improvements to workforce capabilities and performance, and enhanced business performance.

**4 - Simulation Toolset for Experimental Environment
Research (STEER)**

Thomas Jones, NPRST-2222, Memphis, TN,
thomas.jones4@navy.mil

STEER is an agent-based simulation platform that uses multiple incentive
structures to align individual readiness and resource allocation decisions with
organizational Navy objectives. Using an integrated system of agent based
simulation-optimization analysis tools, STEER is designed to quantify the impact
of varying market-based personnel policies on individual, unit, and enterprise
behavior.

■ MC32

Daniel H. Wagner Prize Competition

Cluster: The Daniel H. Wagner Prize for Excellence in Operations
Research
Invited Session

Chair: Allen Butler, President, Daniel H. Wagner Assoc., 2 Eaton Street,
Suite 500, Hampton, VA, 23669, Allen.Butler@va.wagner.com

Seven finalist teams have been selected for 2008 and these seven will be
presented in three sessions on Monday and the winning entry announced on
Tuesday morning.

1 - Towards a Single European Sky

Yael Grushka-Cockayne, London Business School, Regent's Park,
London, United Kingdom, ygrushka.phd2003@london.edu,
Bert De Reyck

We describe an integrated decision-making framework and model for supporting
the unification of the fragmented European air traffic management systems,
developed to aid Eurocontrol in its vital role in the construction of a Single
European Sky. Combining multi-criteria decision analysis with large-scale
optimization, our model facilitates the process by which the numerous European
aviation stakeholders evaluate and select technological enhancements. We take
into account multiple objectives and potential disagreements and differing
priorities among stakeholders.

**2 - Using OR to make Urgent Sourcing Decisions in a Distressed
Supplier Environment**

Erica Klampfl, Technical Leader, Ford Research & Advanced
Engineering, Systems Analytics & Env. Sciences Department, RIC
Bldg, MD #2122, 2101 Village Rd., Dearborn, MI, 48124, United
States of America, eklampfl@ford.com, Yakov Fradkin,
Chip McDaniel, Michael Wolcott

Ford was tasked with determining the best sourcing footprint for its $1.5 billion
Automotive Components Holdings, LLC Interiors business. This extensive
undertaking required a complete re-engineering of the supply footprint of 42
high-volume product lines over 26 major manufacturing processes and more
than 50 potential supplier sites. We present a decision support tool and novel
approach to solve the underlying large-scale Mixed Integer Nonlinear Program
that resulted in savings of approximately $40 million in upfront investment over
the previously preferred alternative.

■ MC33

Surgical Planning

Sponsor: Health Applications Section
Sponsored Session

Chair: Michael Carter, Mechanical & Industrial Engineering, University
of Toronto, 5 King's College Rd., Toronto, ON, M5S3G8, Canada,
carter@mie.utoronto.ca

**1 - A Generalised Perioperative Simulation-based Decision
Support Tool**

Daphne Sniekers, University of Toronto, Mechanical and
Industrial Engineering, 5 King's College Road, Toronto, ON, M5S
3G8, Canada, daphne.sniekers@utoronto.ca, Michael Carter

The perioperative process of three Ontario hospitals has been modelled from
decision to operative to discharge. The models simulate patient flow and allows
the use to evaluate a variety of strategic decisions in an effort to improve key
measures such as procedure volume, cancellation rate and utilisation. Common
process flow characteristics between hospitals are compiled in an effort to build a
reusable base model for any hospital.

**2 - You Can Do It, We Can Help: An OR Toolkit for
Patient Scheduling**

Sherry Weaver, Haskayne School of Business, University of
Calgary, 2500 University Drive NW, Calgary, AB, T2N1N4,
Canada, sherry.weaver@haskayne.ucalgary.ca, Michael Carter,
Tom Noseworthy

You are familiar with this scenario: after developing a successful simulation/DSS
for one location, you're asked to create a similar system for a slightly dissimilar
location. We're in the fortunate situation of knowing we'll be asked to create
similar patient scheduling systems at multiple facilities performing hip/knee
arthroplasty. Hence, our goal is to create a flexible 'OR toolkit' for efficient imple-
mentation across multiple sites. Lessons 'learned' and 'learning still' will be pre-
sented.

3 - Factors Affecting the Turnover Times between Surgeries

David P. Strum, Associate Professor, Hospital University of
Pennsylvania, 680 Dulles, Hospital U of Pennsylvania, 3400
Spruce Street, Philadelphia, PA, 19104, United States of America,
strumdp@uphas.upenn.edu, Luis G. Vargas

Surgical scheduling is complicated by variability inherent in the turnover times
(TT) between surgeries. We investigated TT with the goal to describe variability
in TT and the associated factors that might be predicted, controlled, or altered to
improve surgical scheduling. Our results suggest numerous factors affect
turnover times and knowledge of the sources of variability in TT are important to
improve surgical scheduling and reduce sub-optimal utilization of costly
operating rooms.

**4 - Decision Support Tool for Childhood Immunization Catch-up
Scheduling**

Faram Engineer, Georgia Tech, School of Industrial and, Systems
Engineering, Atlanta, GA, 30332, United States of America,
fenginee@isye.gatech.edu, Pinar Keskinocak, Larry Pickering

We developed a decision support tool incorporating a dynamic programming
algorithm to help providers and caretakers in constructing catch-up schedules for
childhood immunization. These schedules ensure that a child continues to
receive timely coverage against vaccine preventable diseases if one or more doses
have been delayed. The tool is available for free download from the CDC
website.

■ MC34

Innovations in the Modeling of Health Care

Sponsor: Health Applications Section
Sponsored Session

Chair: Chris P. Lee, Assistant Professor, The Wharton School, 3730
Walnut St., University of Pennsylvania, Philadelphia, PA, 19104,
United States of America, cpclee@wharton.upenn.edu

1 - Modeling Proton Beam Allocation at a Cancer Treatment Center

Min Wang, Columbia Business School, 3022 Broadway, New York,
NY, 10027, United States of America,
mwang13@gsb.columbia.edu, Chris P. Lee, Sergei Savin

Proton cancer therapy has a high facility cost requiring a high utilization to
maintain profitability. We consider the problem of allocating and switching
proton beam time among multiple treatment rooms to maximize throughput at a
large proton center. We develop a deterministic version of the problem as a
mixed integer programming model and a heuristic algorithm for solving it. For
the stochastic version, we incorporate uncertainty in patient arrivals and the
duration of patient prepping.

**2 - Capacity Investment under Competition: Evidence from
US Hospitals**

Diwas Kc, The Wharton School, University of Pennsylvania,
Philadelphia, PA, 19104, United States of America,
diwas@wharton.upenn.edu, Christian Terwiesch, Chris P. Lee

Operations Management theory suggests that competition tends to spur capacity
investment. We test this theory in the context of healthcare delivery using
capacity and demand data from a cross-section of US hospitals.

**3 - Ambulance Diversion in Emergency Departments: The Role of
Hospital Capacity**

Sarang Deo, Northwestern University, s-
deo@kellogg.northwestern.edu, Wuqin Lin, Gad Allon

Emergency department (ED) overcrowding and consequent ambulance diversion
is one of the most pressing healthcare delivery problems in the US. In this paper
we develop a two-stage queuing model to study the impact of structural factors
such as the size and utilization of the hospital and the size of the ED on
ambulance diversion status of the ED. We then test the key insights from our
model using cross-sectional data on about 300 EDs in California and find
moderate evidence for our results.

4 - A Dynamic Index Policy for Liver Allocation System

Fatih Safa Erenay, University of Wisconsin-Madison, Madison, WI, United States of America, erenay@wisc.edu, Mustafa Akan, Oguzhan Alagoz, Baris Ata

We propose a more efficient liver allocation system considering patient preferences, where efficiency is measured by number of wasted organs or total quality adjusted life years. We capture the dynamics of disease evolution by a fluid model, whose solution leads to an intuitive dynamic index policy for assigning livers. We compare the proposed policy with current liver allocation policy by using a simulation model and real data, which shows that our proposed policy outperforms the current one.

■ MC35

Teaching Project Management and Management Science

Sponsor: INFORM-ED
Sponsored Session

Chair: Will Millhiser, Assistant Professor of Management, Baruch College, City University of New York, 1 Bernard Baruch Way, Box B9-240, New York, NY, 10010, United States of America, William_Millhiser@baruch.cuny.edu

1 - A Long Strange Trip: My 4 Year Odyssey Teaching Project Management

Vijay Mehrotra, Assistant Professor, San Francisco State University, Department of Decision Sciences, 1600 Holloway Avenue, San Francisco, CA, 94132, United States of America, drvijay@sfsu.edu

The first semester that I taught an MBA course in project management was an absolute disaster. After a series of changes, both radical and incremental, the same course is now one of the most popular and highly rated in our entire MBA program. In this session, I'll describe the experience of re-making this class, with a special emphasis on the use of case studies to connect the "soft" aspects of project management practice to the "hard" OR/Project Scheduling methods that are so familiar to us.

2 - A New Paradigm for Project Management Education

Gary Mitchell, Assistant Professor of Operations Management, Pamplin School of Business, University of Portland, 5000 N. Willamette Boulevard, Portland, OR, 97203, United States of America, mitchelg@up.edu

In recent years, project management (PM) has become increasingly important to organizations of all types. An effective PM course relates to all business disciplines and therefore is likely to have a greater appeal than most MS courses. In this presentation, we discuss how PM may be the perfect context for introducing business students to MS tools that support and encourage the critical thinking a project manager needs, while stimulating greater interest in other MS courses.

3 - An Update on the Status of OR/MS in Undergraduate Business Curricula

Susan Palocsay, Professor of Computer Information Systems and Management Science, James Madison University, CIS & MS Department, MSC 0202, Harrisonburg, VA, 22807, United States of America, palocssw@jmu.edu, Ina Markham, Scott Stevens

In 2003, AACSB International approved a new set of standards for accreditation of business programs that include a requirement for coverage of "statistical data analysis and management science." We discuss trends for OR/MS in undergraduate business curricula since the standards' revision, including student and faculty perception of its relevance and increased use of Excel-based tools in other business disciplines.

■ MC37

Tutorial: Personalization and Recommender Systems

Cluster: Tutorials
Invited Session

Chair: Alexander Tuzhilin, New York University. Stern School of Business., 44 W 4TH ST #8-92, New York, NY, United States of America, atuzhili@stern.nyu.edu

1 - Personalization and Recommender Systems

Alexander Tuzhilin, New York University. Stern School of Business., 44 W 4TH ST #8-92, New York, NY, United States of America, atuzhili@stern.nyu.edu, Zan Huang, Gediminas Adomavicius

In this tutorial, we present an overview of the personalization field and review different types of personalization. We also discuss the general personalization process and position the field of recommender systems as an integral part of this process. We review the field of recommender systems by describing a number of "traditional" recommendation approaches and their extensions. Finally, we discuss several future research directions for personalization and recommender systems, including integrated personalization process, data acquisition for recommender systems, advanced modeling of user preferences, other model-based techniques for recommendation, evaluation of recommender systems, recommendation flexibility and scalability, and trust and privacy issues in recommender systems.

■ MC38

Discrete Optimization: Theory and Algorithms

Sponsor: Optimization/ Discrete Optimization
Sponsored Session

Chair: Hanif Sherali, University Distinguished Professor, Virginia Tech, 250 Durham Hall, ISE Department (0118), Blacksburg, VA, 24061, United States of America, hanifs@vt.edu

1 - Dynamic Lagrangian Dual and Reduced RLT Constructs for Solving 0-1 Mixed-integer Programs

Cole Smith, Associate Professor, ISE, University of Florida, Weil Hall 303, PO Box 116595, Gainesville, FL, 32611, United States of America, j.cole.smith@gmail.com

We enhance the strength of Lagrangian relaxations for solving mixed-integer programs, by dynamically augmenting the Lagrangian dual with cuts induced from a disjunction implied by partial branch-and-bound enumeration. These cuts are also obtainable via an appropriate Reformulation-Linearization Technique (RLT) representation. We exploit the strength inherent in such higher-dimensional RLT reformulations, and thus also limit the number of variables controlled by subgradient optimization.

2 - Maximizing a Class of Submodular Utility Functions

Shabbir Ahmed, H. Milton Stewart School of Industrial and Systems Engineering, Georgia Institute of Technology, 765 Ferst Drive, NW, Atlanta, 30332, United States of America, sahmed@isye.gatech.edu, Alper Atamturk

We report polyhedral results for a class of combinatorial optimization problems involving submodular utility maximization. Strong valid inequalities are derived by lifting lower dimensional inequalities. By exploiting special structure, we provide a complete characterization of the lifting function and its subadditive approximation. Computational experiments with capital budgeting problems show the effectiveness of the derived inequalities within a branch-and-cut approach.

3 - Two-stage Robust Network Design with Uncertain Capacities

Alper Atamturk, University of California, 4175 Etcheverry Hall MC 1777, Berkeley, CA, United States of America, atamturk@berkeley.edu, Muhong Zhang

In this talk we consider a two-stage robust network design problem with uncertain capacities. We give a characterization of the feasible region for the first stage and discuss the separation problem under a budget uncertainty set. Numerical experiments will be presented.

4 - Symmetry Compatible Formulations Via Objective Perturbations and Hierarchical Constraints

Ahmed Ghoniem, Virginia Tech, Durham 250 (0118), Blacksburg, VA, 24060, United States of America, aghoniem@vt.edu, Hanif Sherali

We discuss how hierarchical constraints can be combined with objective perturbations in a nonpreemptive multiobjective framework in order to defeat symmetry in combinatorial optimization problems. We also present the concept of symmetry compatible formulations and its relationship with these two symmetry-defeating paradigms. Computations for selected applications are presented.

■ MC39

KLIC: Knowledge Networks and the Emergence of New Technologies (Sloan Session)

Sponsor: Technology Management
Sponsored Session
Chair: Erica Fuchs, Assistant Professor, Carnegie Mellon University, 5000 Forbes Avenue, Baker Hall 131E, Pittsburgh, PA, 15213, United States of America, erhf@andrew.cmu.edu

1 - The Evolution and Performance of Research Groups
Francisco Veloso, Associate Professor, Carnegie Mellon University, 5000 Forbes Avenue, Baker Hall 131D, Pittsburgh, PA, 15213, United States of America, fveloso@cmu.edu, Leonardo Reyes-Gonzalez

This work analyzes how research groups (RGs) in institutions are formed and evolve. We characterize RGs by looking at co-authorship and assessing the strength and cohesiveness of ties among authors over time, both within and across institutions. With this technique, we track the movement of researchers across co-authorship groups and assess how science self-organizes over several decades and across entire scientific fields. We then explore how the nature of RG relates to performance and impact.

2 - Institutional Environments & Network Emergence: The Case of Human Embryonic Stem Cell Research
Jeff Furman, Assistant Professor, Boston University, 595 Commonwealth Ave - 653a, Boston, MA, 02215, United States of America, furman@bu.edu, Fiona Murray

This paper examines the role of institutional environments on the emergence of scientific networks. Specifically, we consider the case of human embryonic stem cell (hESC) research. We exploit the fact that key research materials are subject to different IP restrictions in the US and Europe to examine the relationship between institutional environments and the growth and structure of the hESC research communities.

3 - The Role of DARPA in Seeding and Encouraging New Technology Trajectories
Erica Fuchs, Assistant Professor, Carnegie Mellon University, 5000 Forbes Avenue, Baker Hall 131E, Pittsburgh, PA, 15213, United States of America, erhf@andrew.cmu.edu

This study unpacks how DARPA leverages social networks among technologists to seed and encourage new technology trajectories in the computing industry. The results show how DARPA (1) facilitates brainstorming sessions among thought leaders, (2) provides seed funding to unconnected researchers working on related projects, (3) brings funded researchers together to discuss their results, and (4) acting as third party validation of new technologies to latter-stage funding agencies and industry.

4 - Collaboration Matters: Evidence from the US-Japan Inventor Survey
John Walsh, Professor, Georgia Institute of Technology, Public Policy, 685 Cherry St, Atlanta, GA, 30332, United States of America, john.walsh@pubpolicy.gatech.edu, Sadao Nagaoka

Using the US-Japan inventor surveys, we examine collaboration patterns across the two countries, and how the innovation process varies by industry and organization. We find invention draws heavily on outside sources and is often a cooperative activity, much more than bibliometric data suggests. Furthermore, the degree of cooperation is broadly similar across the two countries. We also find, using the US data, that collaboration is associated with patent value and commercialization.

■ MC40

Stochastic Dominance And Applications

Sponsor: Optimization/ Stochastic Programming
Sponsored Session
Chair: Sanjay Mehrotra, Northwestern University, IEMS Department, MEAS, Evanston, IL, 60208, United States of America, mehrotra@iems.northwestern.edu

1 - Inverse Cutting Plane Methods for Problems with Second Order Stochastic Dominance Constraints
Andrzej Ruszczynski, Professor, Rutgers University, 94 Rockefeller Road, Piscataway, NJ, 08854, United States of America, rusz@business.rutgers.edu, Darinka Dentcheva

We propose new cutting plane methods for solving optimization problems with second order stochastic dominance constraints. The methods are based on the inverse formulation of stochastic dominance constraints using Lorenz functions. Convergence of the methods is proved for general probability distributions. In the case of discrete distributions convergence is finite, without the assumption of equal probabilities of the realizations. Comparison with primal cutting plane methods is provided.

2 - An Algorithm for Optimization Problems with Stochastic Order Constraints Induced by Linear Recourse
Dimitri Drapkin, Faculty of Mathematics, University of Duisburg-Essen, Duisburg, Forsthausweg 2, 47057 Duisburg, Duisburg, Germany, drapkin@freenet.de, Ruediger Schultz

We derive a cutting plane decomposition method for stochastic programs with first-order dominance constraints induced by linear recourse models with continuous variables in the second stage. Computational results indicate that our method is favorable over the application of general-purpose mixed-integer linear programming solvers.

3 - Robust Stochastic Dominance Constraints
Darinka Dentcheva, Professor, Stevens Institute of Technology, Castle Point on Hudson, Hoboken, NJ, 07030, United States of America, darinka.dentcheva@stevens.edu, Andrzej Ruszczynski

We introduce a new preference relation in the space of random variables, which we call robust stochastic dominance. We consider stochastic optimization problems where risk-aversion is expressed by a robust stochastic dominance constraint. These are composite semi-infinite optimization problems with constraints on compositions of measures of risk and utility functions. We develop necessary and sufficient conditions of optimality for such optimization problems.

4 - A Cutting Surface Method for Linear Programs with Linear Stochastic Dominance Constraints
Sanjay Mehrotra, Northwestern University, IEMS Department, MEAS, Evanston, IL, 60208, United States of America, mehrotra@iems.northwestern.edu, Tito Homem-de-Mello

We study linear optimization problems with multi-dimensional linear-positive-second-order-stochastic-dominance constraints. By using the polyhedral properties of the second-order-linear dominance condition we present a cutting-surface algorithm, and show its finite convergence. We present a novel branch-and-cut algorithm for finding the cut by combining ideas from concave minimization with those from binary integer programming.

■ MC41

New Product Development

Contributed Session
Chair: Jie Xu, Northwestern University, 2145 Sheridan Road, Rm C210, Evanston, IL, 60208, United States of America, jie.xu@u.northwestern.edu

1 - Optimal Investment Policy with Rental Bids in Rent-to-Own Industry
Soheil Sibdari, Charlton College of Business, University of Massachusetts, North Dartmouth, MA, 02747, ssibdari@umassd.edu, Michael H. Anderson

In this study, we address product investment decisions that a firm faces in rent-to-own industry. In a rent-to-own industry, customers arrive according to a random process and request one unit of the product to rent and possibly own it after making all payments. At the time of request, if the product is available in stock, the firm accepts the bid and rents it to the customer. If not, the firm should make a decision of whether to purchase the product and rent it to the customer or reject the bid. The bid has two characteristics of contract duration and payment type using which the periodic payments will be calculated. In this paper, we use a dynamic programming model to address this problem and determine the firm's optimal decision.

2 - Quality Dynamics of Multi-generation Products
Gokhan Dogan, PhD Student, MIT Sloan School of Management, 30 Wadsworth Street E53-364, Cambridge, MA, 02138, United States of America, gdogan@mit.edu, Nelson Repenning

Quality problems of multi-generation products (such as cars or construction equipment) discovered after the start of production are carried over to next generation. We empirically investigate the impact of these carry-over problems on product quality and find that the impact is substantial. We also analyze the consequences of different problem solving policies that utilize carry-over problem information.

3 - NPD Scheduling: An Experimental Investigation of Hybrid Iterative Design Modes

Michael Hoeck, Professor, TU Freiberg, Department of Operations Management, Lessingstrasse 45, Freiberg, 09596, Germany, michael.hoeck@bwl.tu-freiberg.de, Yvonne Busshoff

Our contribution in this paper is twofold. First, we show how design iterations can be modeled modifying the Multi-Mode Resource-Constrained Project Scheduling Problem (MRCPSP) - a standard project scheduling model. Based on the MRCPSP we then perform an experimental investigation to analyze the benefits of hybrid design iterations, i.e. a combination of parallel, sequential or overlapping iterations considering multiple constraints.

4 - Joint Product Line and Supply Chain Design

Jie Xu, Northwestern University, 2145 Sheridan Road, Rm C210, Evanston, IL, 60208, United States of America, jie.xu@u.northwestern.edu, Wallace Hopp, Barry L Nelson

Platform design, in which modular components are added to platforms to produce a family of products, is widely used to provide product variety efficiently. An important strategic question is how to structure the product family (e.g., many platforms with few component options or vice versa). We find that different supply chain structures lead to qualitatively different optimal product lines.

■ MC42

Joint Session CS/HAS: OR Applications in Metabolic and Regulatory Networks

Sponsor: Computing Society: Bioinformatics and
Systems Biology (Joint Cluster HAS)
Sponsored Session
Chair: Allen Holder, Trinity University, One Trinity Place, San Antonio, TX, United States of America, aholder@trinity.edu

1 - Simulating Metamotifs

Leonardo B. Lopes, Assistant Professor, University of Arizona, Systems & Industrial Eng. Department, 1127 E. North Campus Drive, Tucson, AZ, 85721, United States of America, leo@sie.arizona.edu, Weini Zhang

We present a Matlab framework for describing and simulating networks of Motifs and analyzing their behavior. The framework also searches for networks that reproduce a desired behavior.

2 - Signal Transduction Network Inference from Double Causal Experimental Evidence

Bhaskar DasGupta, Associate Professor, University of Illinois at Chicago, 851 South Morgan Street, Chicago, IL, 60607, United States of America, dasgupta@bert.cs.uic.edu, Reka Albert, Riccardo Dondi, Sema Kachalo, Eduardo Sontag, Alex Zelikovsky, Kelly Westbrooks, Ranran Zhang

We introduce a new method of combined synthesis and inference of biological signal transduction networks. We validate the biological usability of our approach by successfully applying it to a previously published signal transduction network and by using it to synthesize and simplify a novel network corresponding to activation induced cell death in large granular lymphocyte leukemia.

3 - Investigating Cycles in Metabolic Networks

Tim Nunamaker, Trinity University, 1 Trinity Pl 1818, San Antonio, TX, United States of America, Timothy.Nunamaker@Trinity.edu

We construct a metabolic network for E. coli and interpret the behavior of cycles within the network. A graph is constructed by connecting all pairs of reactions in which the first reaction produces a resource and the second reaction consumes it. A cycle is a subgraph in which a closed path can be identified, allowing amy reaction to process a finite quantity of resources infinitely many times. We attempt to classify cycles according to unique characteristics and trends.

4 - Degeneracy in Flux Balanced Analysis

Allen Holder, Trinity University, One Trinity Place, San Antonio, TX, United States of America, aholder@trinity.edu

Flux Balance Analysis provides a computational tool to understand a metabolic network under constant growth. The underlying optimization model is commonly degenerate, something we explore mathematically and computationally. We further highlight the mapping between environment and growth by introducing a minimal environment.

■ MC43

Disruptions Risks in Various Industries

Cluster: Managing Disruptions in Supply Chains
Invited Session
Chair: M. Johnny Rungtusanatham, Associate Professor, University of Minnesota, 3-150 CSOM, 321 19th Ave S, Minneapolis, MN, 55455, United States of America, rung0002@umn.edu

1 - Analysis of Disruption Risks in a Food Supply Chain

Monika Weishaeupl, Research Assistant, Vienna University of Economics and Business Administration, Nordbergstr. 15, Vienna, AT, 1090, Austria, monika.weishaeupl@wu-wien.ac.at, Heidrun Rosic, Werner Jammernegg

We consider the disruption risks in a food supply chain where raw material is perishable and only available during a limited time period but the final product is a durable good. Using dynamic process simulation we analyze alternative strategies for mitigating the impacts of disruption risks with respect to cost and service level. Examples of strategies are decentralization of production and warehousing and other sourcing options.

2 - Multiple Risk Perspectives and Decision Making Within the U.S. Imported Food Inspection System

Jaime Frittman, Analyst, ANSER, 2900 South Quincy Street, Suite 800, Arlington, VA, 22206, United States of America, jgivens2103@comcast.net, Georganne John, Nicki Borkowski, Art Pyster, Annette Pacella, Clarke Ansel

As concerns about the safety of imported foods grow, a systems view of the federal imported food inspection process, stakeholders, and their risk-based decision making may improve the understanding of current port inspection capabilities. This paper summarizes data from literature reviews, case study examinations, and stakeholder interviews to describe stakeholders' risk perspectives and how their perspectives influence inspection decisions at U.S. ports of entry.

3 - A Risk-informed Decision Framework for Hurricane Protection and Coastal Planning

Martin Schultz, Environmental Engineer, Engineer Research and Development Center, US Army Corps of Engineers, 3909 Halls Ferry Road, Vicksburg, MS, 39180, United States of America, Martin.T.Schultz@usace.army.mil, Burton Suedel, Jongbum Kim, Igor Linkov, Greg Kiker, Todd Bridges

A risk-informed decision framework for selecting hurricane system protection alternatives for the Louisiana Coastal Protection and Restoration (LACPR) project is described. Multicriteria decision analysis techniques are used to rank candidate plans and optimize the level of risk reduction achieved considering uncertainty in selected planning assumptions and the diversity of stakeholder preferences. Lessons learned from the practice of applying these techniques will be discussed.

4 - Evaluation of Urban Chemical Disaster Emergency Evacuation Strategies

Scott Parr, Student, Florida Atlantic University, 777 Glades Road, Boca Raton, FL, 33431, United States of America, sparr1@fau.edu

A subsection area of a major metropolitan area was simulated using the software program AIMSUN in order to test emergency evacuation techniques employed by the city and state localities. This is due to the high level risk of man made disastrous eventualities. The goal of this project focuses on the development of a traffic simulation model in order to integrate an emergency preparedness plan in order to effectively determine the best strategies to use for evacuation.

5 - A Taxonomy of Risk Mitigation Strategies

Scott Ellis, Assistant Professor, Clemson University, 101 Sirrine Hall, Clemson, SC, United States of America, ellis9@clemson.edu, Aleda Roth, M. Johnny Rungtusanatham

Extant research suggests that buying firms simultaneously adopt multiple risk mitigation tactics to minimize the threat of supply disruption. In this study, we investigate buyers' simultaneous use of inventory positioning, contingency planning, and relationship management tactics and develop a taxonomy of risk mitigation strategies. Further, we examine how buyers' demographics, product attributes, supply market factors, and perceptions of supply risk vary across risk mitigation strategies.

■ **MC44**

Supply Chain Management of Perishable Items

Cluster: Managing Disruptions in Supply Chains
Invited Session
Chair: Feryal Erhun, Stanford University, Department of MS&E,
Stanford, CA, United States of America, ferhun@stanford.edu

1 - A Simulation Approach for Inventory Management at Hacettepe
University Hospitals' Blood Center

Banu Yuksel-Ozkaya, Hacettepe University, Department of
Industrial Engineering, Ankara, 06800, Turkey,
byuksel@hacettepe.edu.tr, Murat Caner Testik, Salih Aksu,
Osman Ilhami Ozcebe, Volkan Sonmez

Necessity for an effective management of blood banks, emerge from the short life
times for components of blood and the uncertainty of the supply from donors.
Apart from these, unsatisfied demand and disposal of blood components (at the
end of their lifetimes) are vital, from both humanitarian and cost points of view.
In this study, we analyze the blood inventory management of Hacettepe
University Hospitals' Blood Center using simulation techniques and discuss
improvement recommendations.

2 - Renewal Strategies for Perishable Products with Random
Demand and Dynamic Pricing

Amar Sapra, Assistant Professor, University of Florida,
303 Weil Hall, Gainesville, FL, 32611, United States of America,
sapra.amar@gmail.com, Li-Ming Chen

We consider joint inventory control and pricing decisions for a perishable item
with random demand and lost-sales. The demand in a period depends on both
age of the inventory and price. We develop three different models with
increasing flexibility. In the first model, the replenishment frequency is
determined in advance and is fixed during the planning horizon. This assumption
is relaxed in the second model. In the third model, we allow partial disposal
when excessive inventory is on-hand.

3 - Improving Platelet Supply Chain Management at Stanford
Blood Center (SBC)

Yenho Thomas Chung, Stanford University, 334 Olmsted Rd #139,
Stanford, CA, 94305, United States of America,
yhthomas@stanford.edu, Feryal Erhun

Managing platelet supply chains is a challenging task due to many demand and
supply uncertainties. In early 2006, SBC was struggling with a perishability rate
of around 20%. We study demand and supply processes of SBC. Through a set of
improvements on collection schedule, contract execution, and operational
inefficiencies we decrease the perishability rate to 13%. We focus on the
incentive misalignment between SBC and hospitals that it serves to study general
contracting issues on platelets.

■ **MC45**

Supply Chain Management

Sponsor: Manufacturing & Service Oper Mgmt/Supply Chain
Management
Sponsored Session
Chair: Julie Simmons Ivy, North Carolina State University, ISE
Department, Campus Box 7906, Raleigh, NC, 27695, United States of
America, jsivy@ncsu.edu

1 - The Impact of Changes in Demand Variability on Logistics
Strategy with Two Modes of Supply

Ana Vila-Parrish, North Carolina State University, 400 Daniels
Hall, Campus Box 7906, Raleigh, NC, United States of America,
anita.vilaparrish@gmail.com, Julie Simmons Ivy, Russell E. King

We consider a make-to-order firm, with a geographically distant supplier, that
decides the order quantity for each of two supply modes on a periodic basis. We
explore the relationship of product life cycle demand characteristics, through the
use of Markovian demand process, and the impact on ordering strategies using a
Markov decision process.

2 - Operational Decisions in Inventory Models with Unknown
Demand and Unobserved Lost Sales

Arnab Bisi, Assistant Professor of Management, Purdue University,
403 W. State Street, West Lafayette, IN, 47907, United States of
America, abisi@purdue.edu, Surya Tokdar, Maqbool Dada

We study optimal ordering policies in dynamic inventory problems with censored
demand data. We address storable and perishable inventory models over finite
horizon as well as perishable model over infinite horizon. For Weibull and
exponential demand distributions, we compute the optimal policies and develop
managerial insights. The implications of scalability for the censored newsvendor
problem is discussed.

3 - Product Line Selection and Inventory Control for
Correlated Products

Mabel C. Chou, National University of Singapore, 1 Business Link,
BIZ 1, Singapore, mabelchou@nus.edu.sg, Hua Tao

Many companies now offer hundreds, if not thousands, of SKUs in order to
compete in the market place. High correlations may exist among the utilities of
these products due to common attributes among them, and these correlations
may affect the customer's choice and the resulting sale of each product. Based on
a model which addresses an inherent limitation of the popular Multinomial Logit
model, we consider such correlations in making the product line selection and
inventory control decisions.

4 - Managing Time-based Contracts with Delayed Payments

Dharma Kwon, Assistant Professor, University of Illinois at
Urbana-Champaign, Department of Business Administration,
Champaign, IL, 61820, United States of America, hyok-
jon.kwon.2008@anderson.ucla.edu, Steven Lippman,
Kevin McCardle, Chris Tang

Some manufacturers impose a time-based contract on their suppliers under
which each supplier is paid only when all of the suppliers have completed their
tasks. We set up a model with one manufacturer and two suppliers and study the
impact of the time-based contract on each supplier's effort level and on the
manufacturer's profit. When the suppliers' completion times are uncertain, the
time-based contract is more profitable if and only if the manufacturer's project is
sufficiently small.

■ **MC46**

The After-Market Supply Chain

Sponsor: Manufacturing & Service Oper Mgmt/
Supply Chain Management
Sponsored Session
Chair: Vishal Agrawal, PhD Student, Georgia Tech, 800 W Peachtree
St, Atlanta, GA, 30308, United States of America,
gth767p@mail.gatech.edu

1 - Warranty Inventory Optimization with Visibility into the
Reverse Channel

John Khawam, PhD Candidate, Stanford University, 380 Panama
Street, Terman 371, Stanford, CA, 94305, United States of
America, jkhawam@stanford.edu, Warren H. Hausman

In warranty inventory management, customers return allegedly malfunctioning
products for replacement or credit. Useful products may be recovered through
testing and/or remanufacturing. We formulate both exact and heuristic dynamic
programming models for this situation to minimize system costs. We also explore
the effects of visibility in the reverse channel.

2 - Enhancing Flexibility by Integrating Product Recovery in
Spare Parts Procurement

Karl Inderfurth, Professor, University of Magdeburg,
Universitaetsplatz 2, Magdeburg, D-39106, Germany,
Karl.Inderfurth@WW.Uni-Magdeburg.DE, Rainer Kleber

Product recovery gains increasing importance in spare parts acquisition,
especially during the service period after end-of-production. Considering product
recovery in addition to traditional procurement options (final order, extra
production) makes the underlying stochastic dynamic planning problem highly
complex. An efficient heuristic for problem solving is developed and used to
evaluate and measure the contribution to procurement flexibility that can be
expected from product recovery.

3 - Installed Base Management with Deterministic Obsolescence

Cerag Pince, PhD Candidate, Erasmus University Rotterdam,
Room H09-06, Burg. Oudlaan 50, PO Box 1738, Rotterdam, DR,
3000, Netherlands, pince@few.eur.nl, Rommert Dekker

For slow moving items using install base information may lead to very accurate
forecasts of time and magnitude of sudden drops in demand rate. When such
characteristics are known in advance, prior action can be taken to remove excess
stocks in order to adjust the new inventory position. We consider a continuous
review inventory system in which the demand rate can shift to a lower state at a
deterministic time point and propose approximate solutions for the optimal time
to remove excess stocks.

4 - Leasing & Selling: The Environmental Implications of Product
Recovery & Marketing Strategies

Vishal Agrawal, PhD Student, Georgia Tech, 800 W Peachtree St,
Atlanta, GA, 30308, United States of America,
gth767p@mail.gatech.edu, Mark Ferguson, Beril Toktay,
Valerie Thomas

We evaluate the environmental implications of the lease versus sell decision
based on the total environmental impact in the life cycle of the product. We
extend the results on durable goods from the economics literature and on closed-

loop supply chains in the operations literature. We find the optimal recovery, disposition & remarketing strategies under both leasing and selling. Next we examine conditions under which each strategy is both profitable and environmentally superior.

∎ MC47

2008 Pierskalla Prize Finalists

Sponsor: Health Applications Section
Sponsored Session

Chair: Jay Rosenberger, Assistant Professor, The University of Texas at Arlington, PO Box 19017, Arlington, TX, 76019, United States of America, jrosenbe@uta.edu

1 - Patient Flow in an ICU
Edieal Pinker, Simon School, University of Rochester, Rochester, NY, 14627, United States of America, ed.pinker@simon.rochester.edu, Gregory Dobson, Hsiao-Hui Lee

Many ICUs face overcrowding.One response is to bump ICU patients to other departments to make room for new patient arrivals. Bumping clearly has the potential to reduce care quality. We develop a stochastic model of a single ICU with patient bumping to enable planners to predict performance, under differing capacity and arrival patterns. We develop a aggregation-disaggregation algorithm that enables us to track the system time for each patient despite the high dimensionality of the problem.

2 - Reserving Capacity for Urgent Patients in Primary Care
Gregory Dobson, Simon School of Business, University of Rochester, Rochester, NY, United States of America, dobson@simon.rochester.edu, Edieal Pinker

We examine the common practice of reserving slots for urgent patients in a primary care practice. Using a stochastic "dam" model of appointment scheduling, we optimize system performance accounting for revenue and the two service quality measures as a function of the number of reserved slots for urgent patients. Our results suggest that, performance may improve if no slots are reserved for urgent patients.

3 - Division of Labor in a Medical Office Practice
Edieal Pinker, Simon School, University of Rochester, Rochester, NY, 14627, United States of America, ed.pinker@simon.rochester.edu, Gregory Dobson

This paper examines the staffing, division of labor, and resulting profitability of primary care physician practices based on data from a sample of these practices. We test two hypotheses: H1) controlling for staff size, greater delegation through the use of more staff types will decrease the throughput of visits, and H2) controlling for staff size, income per unit time generated by the practice is decreasing in the number of staff types. We find evidence supporting both hypotheses.

4 - Solving Beam-Angle Selection and Dose Optimization Simultaneously via High-Throughput Computing
Hao Zhang, University of Wisconsin-Madison, 922 Erin St. Apt. 4, Madison, WI, United States of America, haoz@cae.wisc.edu, Leyuan Shi, Robert Meyer, Warren D'Souza

We provide a framework for integrating two stages of Radiation Treatment Planning (RTP): Beam Angle Selection (BAS) and Dose Optimization (DO). Alternative BAS and DO algorithms or commercial RTP software and clinical experience can be embedded within the framework. Automated BAS and improved dose distribution are achieved within the framework. Computational efficiency is achieved by utilizing High-Throughput Computing (HTC) via the Condor system.

∎ MC48

Joint Session TMS/NPD: Discussion Panel: Meet the Editors and Ask Them Questions

Sponsor: Technology Management, New Product Development
Sponsored Session

Moderator: Stylianos Kavadias, Associate Professor, Georgia Institute of Technology, 800 W. Peachtree St., NW, Atlanta, GA, United States of America, Stylianos.Kavadias@mgt.gatech.edu

1 - MS Department Editor of "R&D and Innovation"
Panelist: Christoph Loch, Professor of Technology Management, INSEAD, Boulevard de Constance, 77305 Fontainebleau, France, Christoph.LOCH@insead.edu

Meet the department editor of "R&D and Inovation" of Mnanagement Science

2 - Christian Terwiesch - New Product Development, R&D, and Project Management
Panelist: Christian Terwiesch, The Wharton School, University of Pennsylvania, Philadelphia, PA, United States of America, terwiesch@wharton.upenn.edu

Meet the department editor of the New Product Development, R&D, and Project Management department at POM.

3 - Cheryl Gaimon - Management of Technology
Panelist: Cheryl Gaimon, Georgia Institute of Technology, 800 West Peachtree St NW, Atlanta, GA, 30308, United States of America, cheryl.gaimon@mgt.gatech.edu

Meet the department editor of the Management of Technology department at POM.

4 - Olav Sorenson - Organizations and Social Networks
Panelist: Olav Sorenson, Rotman School, University of Toronto, 50 Prince Arthur Ave, Toronto, ON, M5S3E6, Canada, olav.sorenson@rotman.utoronto.ca

Meet the department editor of the Organizations and social Networks department at Management Science.

5 - Journal Reviews at Management Science and POMS
Panelist: Vish Krishnan, Professor of Innovation, Technology & Operations, University of California at San Diego, Rady School of Management, Otterson Hall, Room 3S144 9500 Gilman Dr, La Jolla, CA, 92093-0553, United States of America, vkrishnan@ucsd.edu

In this panel, we review our editorial philosophy at POMS and how it is different from Management Science.

∎ MC49

Dynamic Data Driven Adaptive Multi-scale Simulation (DDDAMS)

Sponsor: Simulation - INFORMS Simulation Society
Sponsored Session

Chair: Young-Jun Son, Associate Professor, The University of Arizona, Systems and Industrial Engineering, Tucson, AZ, 85721, United States of America, son@sie.arizona.edu

1 - A Combined Optimization-simulation Approach for Computing Order Promising Parameters
Yingjie Lan, PhD Candidate, University of Maryland, 7323 Parkwood Ct Apt 204, Falls Church, 22042, United States of America, ylan@rhsmith.umd.edu, Michael Ball, Michael Fu

We develop an optimization model for computing certain order promising parameters, e.g. delivery date. The core model is an integer program, but a simulation is used to evaluate part of the objective function, which is an expected value. We evaluate alternate solution approaches including a cross-entropy approach.

2 - Dynamical Data Driven Integrated Simulation and Optimization for Wildfire Containment
Lewis Ntaimo, Assistant Professor, Texas A&M University, 3131 TAMU, College Station, TX, 77843, United States of America, ntaimo@tamu.edu, Xiaolin Hu

We present a DDDAS simulation and optimization framework for wildland fire containment called DEVS-FIRE. DEVS-FIRE integrates fire behavior simulation for generating fire spread scenarios, stochastic programming for initial attack to compute the optimal mix of firefighting resources to deploy to multiple bases, and then which of the resources to dispatch to multiple fire scenarios, and fire suppression simulation to evaluate the dispatch plans under realistic firefighting tactics.

3 - Dynamic-data-driven Adaptive Multi-scale Simulation for Control of Manufacturing Enterprises
Nurcin Koyuncu, PhD Candidate, The University of Arizona, Systems and Industrial Engineering, Tucson, AZ, 85721, United States of America, koyuncu@email.arizona.edu, Young-Jun Son

Our goal is to adaptively adjust the fidelity of a simulation model against available computational resources. Four algorithms are embedded into a simulation model to perform data filtering, fidelity selection, fidelity assignment, and task generation. Grid computing and Web Services are used for computational resources management and inter-operable communications among distributed software components. The proposed approach is applied for control of distributed manufacturing enterprises.

■ MC50

Computational Integer Programming III

Sponsor: Optimization/ Computational Optimization and Software
(Joint Cluster Optim/CS)
Sponsored Session

Chair: Eva Lee, Associate Professor and Director, Georgia Institute of Technology, Ctr for Operations Research in Medicine, Industrial & Systems Engineering, Atlanta, GA, 30332-0205, United States of America, evakylee@isye.gatech.edu

1 - Test-and-prune: A Parallelized Algorithm for Solving Bi-level Optimization Problems

Amy Cohn, Assistant Professor, Industrial and Operations Engineering, University of Michigan, 1205 Beal Ave., Ann Arbor, MI, 48105, United States of America, amycohn@umich.edu, Duncan Callaway, Oleg Gusikhin, Richard Chen, Ada Barlatt

We have recently developed a new algorithm, Test-and-Prune, for solving a broad class of bi-level optimization problems. In this talk, we extend this algorithm to take advantage of parallel computing resources. Examples are given from a range of application areas.

2 - Revisiting the Constraint Activating Outer Polar Method

Samid Hoda, Tepper School of Business, 5000 Forbes Avenue, Pittsburgh, PA, 15213, United States of America, shoda@andrew.cmu.edu, Egon Balas, Francois Margot

We examine the performance of the Constraint Activating Outer Polar Method (CAOPM) on a small testbed of 0-1 programs. The CAOPM is a method for solving 0-1 programs that starts with a subset of the problem constraints that defines a bounded relaxation of the feasible region. It then adds only as many of the remaining problem constraints as are needed to find a relaxation that lies within the outer polar of the integer hull. The best feasible solution found is an optimal solution to the problem.

3 - Using Analytic Centers to Find Feasible Solutions in Mixed Integer Programming

Joe Naoum-Sawaya, University of Waterloo, Management Sciences Department, University of Waterloo, 200 University A, Waterloo, ON, N2L3G1, Canada, jnaoumsa@uwaterloo.ca, Samir Elhedhli

We present an algorithm for finding feasible solutions for MIPs based on the notion of analytic centers. The algorithm searches along two line segments connecting the analytic center and two extreme points. Cuts related to the violated constraints are added to shift the analytic center until a feasible integer solution is found. The algorithm is tested on a set of problems from MIPLIB. Results showed that our algorithm outperforms the feasibility pump in a number of instances.

4 - Large-scale Column Generation Approaches for Solving QPMIPs Arising from Cancer Treatment

Eva Lee, Associate Professor and Director, Georgia Institute of Technology, Ctr for Operations Research in Medicine, Industrial & Systems Engineering, Atlanta, GA, 30332-0205, United States of America, evakylee@isye.gatech.edu, Kyungduck Cha

We describe a column generation scheme that was designed for solving intractable large-scale quadratic mixed integer programs arising from cancer treatment. Problem characteristics will be described and computational results and their clinical significance on real patient data will be analyzed.

■ MC51

Joint Session IS/CS: Digital Goods and Markets: Emerging Models and New Frontiers I

Sponsor: Information Systems, Computing Society
Sponsored Session

Chair: Sudip Bhattacharjee, Associate Professor, University of Connecticut, OPIM Department, School of Business, Storrs, CT, United States of America, Sudip.Bhattacharjee@business.uconn.edu

1 - On the Temporal Nature of Sales to Rank Relationships in the Music Industry

Ramnath Chellappa, Associate Professor, Goizueta Business School, Emory University, 1300 Clifton Road, Atlanta, GA, 30322, United States of America, ram@bus.emory.edu, Conny Karnes

Recently, a significant amount of work in IS, economics and marketing has used the relationship suggested by Chevalier and Goolsbee (2003) to impute demand from the relative sales-rank of a product in its category. However many industries, in particular the music industry are subject to temporal changes suggesting that the sales to rank relationship may not be fixed. Our research examines factors that define this relationship post digitization.

2 - Unbundling Information Goods: An Empirical Analysis of Consumer Created Custom CDs

Jesse Bockstedt, George Mason University, 4400 University Drive, Fairfax, VA, 22030, United States of America, jesse.bockstedt@gmail.com, Kim Huat Goh

We perform an empirical analysis of over 25,000 consumer-created custom CDs to gain insights into consumer behavior in the context of unbundling and customized bundling of information goods. We find that slight differences in the pricing scheme have a dramatic impact on the distribution of bundle sizes. We also analyze the bundle contents to determine whether consumers tend to create bundles of hits or "long tail" songs. This paper provides insights for selling unbundled information goods.

3 - Measuring Product Competition in Online Retailers from Revealed Preferences of Online Recommendation

Bin Gu, Assistant Professor, University of Texas at Austin, 2100 Speedway B6500, Austin, TX, 78712, United States of America, Bin.Gu@mccombs.utexas.edu, H. Michelle Chen, Prabhudev Konana

This study investigates differentiated product competition for consumer consideration and choice in online retailers. We find that despite the greater product variety suggested by the Long Tail in online retailers, more than half of the purchase decisions are made by consumers considering two or fewer alternatives. The results show that being first considered by consumers plays a dominant role in product competition, and that pricing strategies only influence product competition for choice.

■ MC52

Coordination in Closed-Loop Supply Chains

Cluster: Environmentally Conscious Operations /
Closed Loop Production Supply Chain
Invited Session

Chair: Grit Walther, Technische Universität Braunschweig, Katharinenstr. 3, Braunschweig, 38106, Germany, g.walther@tu-bs.de

1 - Sharing Responsibility for Product Take-Back Across the Supply Chain

Brian Jacobs, Georgia Tech, 800 W. Peachtree NW, Atlanta, GA, 30308, United States of America, brian.jacobs@mgt.gatech.edu, Ravi Subramanian

We use a two-echelon model to determine the impacts of EPR collection and recycling mandates on profits for integrated and decentralized supply chains. We demonstrate how the sharing of EPR program costs between the echelons can move a decentralized chain closer to the coordinated profit benchmark. We propose a social welfare construct that considers consumer surplus, supply chain profits, and environmental externalities to aid the social planner in assessing the effectiveness of EPR programs.

2 - Optimal Acquisition and Sorting Policies for Remanufacturing over a Finite Planning Horizon

Yihao Lu, University of Massachusetts, 160 Governors Drive, Amherst, MA, 01003, United States of America, lyihao@ecs.umass.edu, Ana Muriel

The objective is to minimize the total acquisition, remanufacturing and inventory holding costs to satisfy a given demand over the planning horizon. A more restrictive sorting policy requires a higher acquisition cost, but a lower remanufacturing cost. While the remanufacturing cost increases with time as the product ages, the acquisition cost decreases. We show the existence of a single optimal acquisition and sorting policy, and the procedure to achieve this optimum.

3 - Coordination of Recycling Networks

Grit Walther, Technische Universität Braunschweig, Katharinenstr. 3, Braunschweig, 38106, Germany, g.walther@tu-bs.de, Thomas S. Spengler, Eberhard Schmid

A decentralized negotiation mechanism is presented allowing independent recycling companies to assign tasks within recycling networks. Thereby, contracts are negotiated between a focal company and recycling companies with minimum data exchange. The negotiation approach is implemented via Lagrangian relaxation and subgradient optimization. Applicability of the mechanism is shown and performance is tested on a numerical study based on real-world data. Managerial insights are derived.

■ MC53

Optimal Trading and Portfolio Management

Sponsor: Financial Services
Sponsored Session
Chair: Aparna Gupta, Decision Science & Engineering Department, Rensselaer Polytechnic Institute, 110 8th Street, Troy, NY, 12180, United States of America, guptaa@rpi.edu

1 - Robustness and Sensitivity Analysis of Risk Measurement Procedures
   Romain Deguest, IEOR Dep - Columbia University, 500 West 120th Street, NYC, NY, 10027, United States of America, rd2304@columbia.edu, Rama Cont, Giacomo Scandolo

Measuring the risk of a portfolio involves two steps: estimating its loss distribution from data and computing a risk measure which summarizes its risk. We define the notion of risk measurement procedure, which includes those two steps, study the robustness of risk measurement procedures and their sensitivity to a change in the data set. We illustrate a conflict between subadditivity and robustness and show in particular that using historical VaR leads to a robust procedure.

2 - A Robust Dynamic Programming Approach to Buying a Large Block of Security with Adaptive Safe Price
   Ye Lu, MIT, 77 Mass. Ave. E40-130, Cambridge, MA, 02139, United States of America, yelu@MIT.EDU, Asu Ozdaglar, David Simchi-Levi

We consider the problem of dynamically trading a security over a finite time horizon. We assume that a trader has a ``safe price'' for the security, which is the highest price that the trader is willing to pay for this security in each time period. We show that the greedy policy is not always optimal and provide conditions under which the greedy policy is optimal. We also provide bounds on the performance of the greedy policy relative to the performance of the optimal policy.

3 - Optimal Market-Making with Risk Aversion
   Miao Song, MIT, 77 Mass. Ave. Room 1-235, Cambridge, MA, United States of America, msong@mit.edu, Kan Huang, David Simchi-Levi

Market-makers have the obligation to trade fixed amounts of securities at quoted bid or ask prices, and their inventories are exposed to the potential loss when the market price moves in an undesirable direction. One approach to reduce the risk brought by price uncertainty is to adjust the inventory at the price of losing potential spread gain. Using stochastic dynamic programming, we show that a threshold inventory control policy is optimal with respect to an exponential utility criterion.

4 - Impact of Incomplete Information on Optimal Dynamic Portfolio
   Haleh Valian, PhD candidate, Rutgers University, 96 Frelinghuysen Road, Piscataway, NJ, 08854, United States of America, valian@rci.rutgers.edu, Davood Golmohammadi, Mohsen Jafari

This paper examines the impact of uncertainty about parameters of asset pricing model on the dynamic portfolio decision. The state of this system is estimated from noisy observations by applying filtering theory. Moreover, the sequence of optimal actions of an agent who takes the error of predicted variables into account is compared to an agent who is blind to it. The result shows that uncertainty of parameters usually induces risk averse agents to choose the higher trading volume.

■ MC54

Modeling and Managing Security Risk for Complex Systems

Cluster: Risk Security
Invited Session
Chair: Seth Guikema, Assistant Professor, Johns Hopkins University, Department of Geography and, Environmental Engineering, Baltimore, MD, 21218, United States of America, sguikema@jhu.edu

1 - Mitigation Assessment of Water Supply Systems for Insufficient Fire Flows: A Multi-objective Approach
   Lufthansa Kanta, Graduate Assistant Teaching, Texas A&M University, College Station, 603 Southwest Parkway, Apt. 32, College Station, TX, 77840, United States of America, lufthansa_kanta@neo.tamu.edu, Emily Zechman, Kelly Brumbelow

Effective mitigation strategies for urban fire events for water distribution systems (WDS) are developed using an evolutionary multiobjective optimization-simulation framework. An elitist non-dominated sorting genetic algorithm is applied with a little modification. The objectives considered are minimizing fire damages, minimizing water quality deficiencies, and minimizing the cost of mitigation. A set of Pareto-optimal solutions is generated to understand the trade-offs between the objectives.

2 - An Agent-based Simulation-Optimization Framework for Water Distribution Threat Management
   Emily Zechman, Assistant Professor, Texas A&M University, Zachry Department of Civil Engineering, 3136 TAMU, College Station, TX, 77843-3136, United States of America, ezechman@civil.tamu.edu

The development of management strategies for contamination threats in water distribution systems can be informed through the use of a simulation-optimization framework. Agent-based and mechanistic models are coupled to capture the dynamic interactions between managers' operation decisions, consumers' water consumption choices and contaminant transport in the network for evaluating consumer exposure. Optimization methods are applied to identify response plans to protect public health.

3 - Risk Classification and Uncertainty Propagation for Water Distribution System Contamination Events
   Kelly Brumbelow, Assistant Professor, Texas A&M University, Zachry Department of Civil Engineering, 3136 TAMU, College Station, TX, 77843-3136, United States of America, kbrumbelow@civil.tamu.edu, Jacob Torres, Seth Guikema

A risk classification scheme is employed for identifying vulnerable water distribution system (WDS) components subject to a malevolent water contamination event. This is followed by an uncertainty analysis for quantifying uncertainties in WDS input data. A few inputs include: demands, tank levels, and contaminant quantity. It is shown that reasonable uncertainties in model inputs produce high variability in contamination exposure levels, requiring greater resources for effective mitigation.

4 - Multicriteria Security System Performance Assessment Using Fuzzy Logic
   William McGill, Assistant Professor, Penn State University, 307B IST Building, State College, PA, 16801, United States of America, wmcgill@ist.psu.edu

Modern security problems focus on sensibly allocating resources to decrease the magnitude of potential threats, decrease the chances of adversary success given an attempt, or minimize loss following a successful attack. This talk describes a model that approximates the true relationship between defensive capabilities and probability of adversary success using techniques from fuzzy logic. A simple example demonstrating the proposed model to support decision making accompanies this discussion.

■ MC55

Resource Allocation in Radio and Wireless Networks

Sponsor: Telecommunications
Sponsored Session
Chair: Vidyadhar Kulkarni, University of North Carolina, 209 Smith Building, CB# 3260, Chapel Hill, NC, 27599, United States of America, vkulkarn@email.unc.edu

1 - Opportunistic Spectrum Access in Cognitive Radio Networks
   Xin Liu, Assistant Professor, University of California, Davis, One Shields Ave., Davis, CA, 95616, United States of America, liu@cs.ucdavis.edu

Cognitive radio is a promising technology to mitigate spectrum shortage in wireless communications. It enables secondary users to opportunistically access low-occupancy primary spectral bands while protecting the legacy primary users. In this talk, we present a medium access scheme for secondary users that dynamically adapt their transmission and sensing strategies to maximize their channel access time while limiting collision with primary users.

2 - Large Deviations of Queues Served by a Wireless Channel
   Alexander Stolyar, Bell Labs, Alcatel-Lucent, 600 Mountain Ave, 2C-322, Murray Hill, NJ, 07974, United States of America, stolyar@research.bell-labs.com

Multiple queues, each with own input flow, are served by a wireless channel whose capacity varies randomly and asynchronously with respect to different queues. The problem is to find a scheduling algorithm that optimally controls large deviations of the queues, namely maximizes the minimum (weighted) exponential decay rates of the queues' distribution tails. We prove optimality of the simple and parsimonious "exponential" (EXP) scheduling rule.

3 - An Index Policy for Scheduling Users in a Wireless Cell
Nomesh Bolia, UNC Chapel Hill, 210 Smith Bldg, UNC, Chapel Hill, NC, United States of America, nomesh@email.unc.edu, Vidyadhar Kulkarni

We consider resource allocation for data transfer between the base station and users with finite data queues within a cell of a wireless telecommunication network. We derive an index policy that is stable and attempts to minimize congestion. The index policy is based on a closed form index for every user derived using a policy improvement approach based on Markov Decision Processes. We compare its performance with existing policies through simulation.

4 - Scheduling Despite Inexact Job Size Information
Adam Wierman, Assistant Professor, California Institute of Technology, 1200 E. California Blvd, Pasadena, CA, 91125, United States of America, adamw@caltech.edu, Misja Nuyens

Motivated by the optimality of Shortest Remaining Processing Time (SRPT) for mean response time, many computer systems have begun to "favor small jobs". However, rarely do computer systems have knowledge of exact remaining sizes. In this paper, we prove new results characterizing the impact of inexact job size information on the performance of SRPT and related policies.

■ MC56

Freight Transportation Models

Sponsor: Transportation Science & Logistics
Sponsored Session
Chair: Michel Gendreau, Professor, Université de Montréal, C.P. 6128, Succ. Centre-ville, Montreal, QC, H3C 3J7, Canada, michelg@crt.umontreal.ca

1 - Network Design for Two-echelon City Logistics System
Claudio Sterle, PhD, University, Via Claudio, Napoli, 80125, Italy, claudio.sterle@unina.it, Teodor Gabriel Crainic, Antonio Sforza

The freight distribution is one of the most challenging issue of the city logistics. In this work we propose several formulations for a two-echelon city logistic system where we want to determine the number and locations of intermodal platforms and additional facilities, "satellites", where freights are transferred and aggregated on small trucks, in order to minimize the effects of freight transportation in urban areas. We will also provide a discussion about possible solution approaches.

2 - An Integrated Evaluation Platform for Regional Planning Methods for Freight Transportation Systems
Rajeev Namboothiri, Post-Doctoral Research Fellow, CIRRELT, Universite de Montreal, C.P. 6128, succ. Centre-ville, Montreal, QC, H3C 3J7, Canada, rajeev@crt.umontreal.ca, Teodor Gabriel Crainic, Michel Gendreau, Jean Damay

This talk presents an evaluation platform dedicated to strategic regional planning of freight transportation systems. We develop methodologies to perform an actual multimodal, multi-product freight transportation system simulation. These tools efficiently model the different components of these systems, and their complex interactions. They provide a realistic representation of the current state of the system, and serve as a comprehensive analysis tool for system state changes in the future.

3 - Procurement Order Consolidation: A Case Study
Suzanne Marcotte, Professor, Department Management & Technology, ESG, UQAM, CP 8888, centre ville, Montréal, QC, H3C 3P8, Canada, Suzanne.Marcotte@cirrelt.ca, Teodor Gabriel Crainic, Matthias Takouda, Walter Rei

In this paper, we present a case study on the integration of operations research models within the purchasing management process of a retail company. In order to achieve economy of scale within the demand-driven and total cost trade-off paradigms of supply chain management, we propose the consolidation of small orders shipments into container loads to be shipped together. This is effectively obtained by inserting a decision aid system based on bin packing models into the order-release process.

4 - Modeling Collaboration among Rail Carriers in Transporting Goods Arriving on Spot Markets
Elise Miller-Hooks, Associate Professor, University of Maryland, Department of Civil & Environmental Engin., 1173 Glenn Martin Hall, College Park, MD, 20742, United States of America, elisemh@umd.edu, April Kuo

Concepts of collaborative decision-making are incorporated within a combinatorial auction-based framework to support competing rail carriers operating within an alliance in co-transporting one-off loads arriving on spot markets. A train space leasing problem is also addressed. The proposed techniques aid in forming profitable trains that might otherwise be underutilized and permit carriers to compete with truck transport on the spot market.

■ MC57

Panel Discussion: Funding Opportunities from the Government Agencies

Sponsor: Junior Faculty Interest Group
Sponsored Session
Chair: Serguei Netessine, The Wharton School, University of Pennsylvania, 3730 Walnut Street, Suite 500, Philadelphia, PA, 19104, United States of America, netessine@wharton.upenn.edu

1 - Funding Opportunities from the Government Agencies
Moderator: Donald Hearn, Optimization and Discrete Mathematics Program Manager, Airforce Office of Scientific Research, 875 North Randolph Street, Suite 325, Room 3112, Arlington, VA, 22203, United States of America, donald.hearn@afosr.af.mil, Panelists; Cerry Klein, Grace Peng, Teresa Zayas-Caban

We will discuss the funding opportunities for the junior faculty from the leading agencies. The panelists are program directors from National Science Foundation, National Institute of Health, Agency for Healthcare Research and Quality, and Airforce Office of Scientific Research. The panel will discuss the areas that they fund, explain how the funding process works, and describe strategies for writing winning proposals. Part of the panel will be dedicated to discussion with the audience.

■ MC58

Joint Session AAS/TSL: Aviation System Performance Analysis I

Sponsor: Aviation Applications, Transportation Science & Logistics
Sponsored Session
Chair: Andrew Churchill, Graduate Research Assistant, University of Maryland, 1173 Martin Hall, College Park, MD, 20742, United States of America, churchil@umd.edu

1 - Simulation and Validation of Airport Capacity Models
Amy Kim, Student, University of California, Berkeley, 107D McLaughlin Hall, Berkeley, CA, 94720, United States of America, amy_kim@berkeley.edu

Development of a new airport capacity model is under consideration by the FAA; however, this requires a better understanding of existing models and how their predictions compare to empirical information. Runway operations are simulated using computer models. Empirical data is then used to estimate runway capacity under a given set of conditions. The goal is to compare the simulated capacity results with one another, and with empirical data results, to determine sources of inconsistencies.

2 - Value of Flight Cancellation and Cancellation Decision Modeling
Jing Xiong, Phd Candidate, University of California, Berkeley, NEXTOR, 107E McLaughlin Hall, Berkeley, CA, 94720, United States of America, jingxiong@berkeley.edu, Mark Hansen

Current studies are focused on flight delays to assess the performance of the National Airspace System (NAS). However, flight cancellations should be studied to consummate delay metrics. In this study, we will explore Ground Delay Program (GDP) post operation data to infer the relative value of cancellations in terms of delay savings. Two cancellation metrics are developed for this purpose. In addition, we model flight cancellation decisions with a discrete choice model.

3 - Continuum Modeling of Aircraft Flows in Queues
David Lovell, Associate Professor, University of Maryland, 1173 Martin Hall, Department of Civil & Env. Eng., College Park, MD, 20742, United States of America, lovell@umd.edu, Kleoniki Vlachou

To build quickly executing macroscopic models of airspace flows in a queuing network, we explore the adaptation of tools from continuum modeling. The flows in the national airspace system are not sufficient to warrant a direct interpretation as fluid flow. Instead, we explore the use of fluid approximations by considering aircraft as divisible objects whose flow in the system carries stochastic implications. We test these ideas on the DELAYS queuing model and a diffusion model.

4 - Examining the Aggregate Relationship between Aircraft Load Factor and Cancellation Rate
Andrew Churchill, Graduate Research Assistant, University of Maryland, 1173 Martin Hall, College Park, MD, 20742, United States of America, churchil@umd.edu, Michael Ball, Shin-Lai Tien, David Lovell

Given the swift increase in aircraft load factors in the United States over the past several years, carriers are increasingly faced with fewer options for accommodating passenger demand during irregular operations. In this work, we

seek to examine the use of decreased flight cancellations as a mechanism for coping with increased load factors. To this end, we use regression models to examine both nationwide and market-specific data to estimate the strength of this trend.

■ MC59

New Frontiers in Pricing and Revenue Management
Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session

Chair: Georgia Perakis, MIT, E53-359, 77 Massachusetts Avenue, Cambridge, MA, 02139, United States of America, georgiap@mit.edu

1 - Estimating Primary Demand for Substitutable Products from Sales Transaction Data
Garrett van Ryzin, Professor, Columbia University, 412 Uris Hall, NY, NY, 10027, United States of America, gjv1@columbia.edu, Gustavo Vulcano, Richard Ratliff

We consider an approach for estimating substitute and lost retail demand when only sales transaction data are available and not all products are available in all periods. The problem we consider is how to jointly estimate the parameters of a choice model and arrival rates using only sales transaction data. We develop an efficient algorithm based on estimating "primary" (first-choice) demand and illustrate it on two industry data sets.

2 - A Bilevel Model for Media Pricing and Broadcasting
Patrice Marcotte, Professor, University of Montreal, C.P. 6128, Succursale Centre-ville, Montreal, QC, Canada, marcotte@iro.umontreal.ca, Nicolas Chan, Gilles Savard

We consider the problem of jointly determining the price and schedule of advertising spots faced by a media broadcaster, where customers are heterogeneous with respect to their performance (audience) requests. We propose a bilevel programming formulation of the problem, whose difficulty comes from the presence of upper level constraints and discrete lower level variables. We analyze its structure, describe solution algorithms, and present numerical results.

3 - Are Restrictions on Low Fare Customers Beneficial?
Vijay Desai, PhD Candidate, Industrial Engineering and Operations Research Department, Rm. 313, SEAS, Columbia University, 500 West 120th Street, New York, NY, 10027, United States of America, vvd2101@columbia.edu, Guillermo Gallego

We consider the network revenue management problem with MNL as consumer choice behavior model. We assume the consumer's utility function depends on schedule quality and price. By analyzing the DP value function we can show that the revenue is monotonically increasing in schedule quality. This result suggests that imposing artificial restrictions on lower fare customers like 14 day advance purchase, weekend stay are actually detrimental to revenue. We explore other extensions of this model.

■ MC60

Railyard Simulation and Tools for Crew Assignments
Sponsor: Railway Applications
Sponsored Session

Chair: Kamalesh Somani, Manager Operations Research, CSX Transportation, 3019 Warrington Street, Jacksonville, FL, 32254, United States of America, Kamalesh_Somani@CSX.com

1 - Win-win on Regular Work Assignments for Union and Carrier
Scott Setser, Dir Crew Plng & Utilization, CSX Transportation, Inc., 116 Druid Street, Jacksonville, FL, 32254, United States of America, Scott_Setser@csx.com

Railroad manpower is impacted by employee mark-offs. Providing regular work assignments with set rest days allows for improved quality of life for crews and requires fewer railroad employees to run equal or better performing trains. This opportunity requires better tools to advertised "Assigned-Jobs", because of crew penalty payments and train performance issues, due to the labor agreement.

2 - Yard Simulation Optimizer: A Decision Support System for Intermodal Yard Planning
Rob Girardot, Dir Network Simplification, CSX Intermodal, Inc., 301 West Bay Street, Jacksonville, FL, 32202, United States of America, Rob_Girardot@csx.com, Michael Gatto

CSX has developed a decision support system for intermodal yards that can be used for designing yard layouts, improving yard layouts, understanding and testing yard processes, and capacity planning. This talk will describe the modeling, algorithmic, and animation components of this system, and give the demonstration of this system applied to a CSX yard.

3 - Extensible Simulation Framework for Railyard Operations
David Ciemnoczolowski, Union Pacific Railroad, DDCIEMNO@UP.COM

Simulation provides an excellent framework for analyzing impacts of operational rules, yard design, and service design. Unfortunately, railyard operations do not readily fit into the classic server/queue network typically assumed in discrete-event simulation. In this talk, we will outline an extensible simulation approach using plug-in modules to evaluate different control policies.

■ MC61

Public Transit I
Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Luca Quadrifoglio, Assistant Professor, Texas A&M University, CE/TTI Bldg., Room 301I, College Station, TX, 77843-3136, United States of America, lquadrifoglio@civil.tamu.edu

1 - Reducing Bus Bunching
Donald Eisenstein, Donald.Eisenstein@ChicagoGSB.edu, John J. Bartholdi

Transportation systems such as buses suffer from what is commonly known as "bunching", resulting in long and variable wait times. We explore a new way to help reduce bunching.

2 - RealTime Control Strategies for Transit Operations on a Corridor with Vehicles' Capacity Constraints
Ricardo Giesen, Assistant Professor, Universidad Catolica de Chile, Vicuna Mackenna 4860, Transport Engineering and Logistics, Santiago, RM, 6904411, Chile, giesen@ing.puc.cl, Felipe Delgado, Juan Carlos Munoz, Aldo Cipriano

We present a math programming model to update operational plans on a transit corridor, based on real-time information about demands and travel times, which considers additional waiting time at stops due to vehicles' capacity constraints. The performance of proposed strategies is simulated on high demand scenarios, and the benefits are discussed.

3 - Optimal Route Spacing and Headway of a Transit Network for Analyzing Hierarchy Structure
Junsik Park, Post-doctoral Researcher, University of Texas at Austin, 1 University Station C 1761, ECJ Hall 6.508, Austin, TX, 78712, United States of America, forejs@paran.com, Travis Waller

Optimal route spacing and headway can be decided to minimize the total cost of a transit network. At the optimal route spacing and headway, the total cost of a transit network can be simplified in a form of travel cost plus non-travel cost. The hierarchical structure of a transit network was analyzed using the simplified total cost function of a transit network. This study shows the condition when a hierarchical transit network is more efficient than a transit network without hierarchy.

4 - A Methodology to Derive the Critical Demand Density for Designing and Operating Feeder Transit Services
Xiugang Li, Zachry Department of Civil Engineering, Texas A&M University, College Station TX, li_xiugang@tamu.edu, Luca Quadrifoglio

We study the impact on productivity of specific operating practices currently used by PAratransit providers. We investigate the effect of using a zoning vs. a no zoning strategy and time window settings on performance measures such as total trip miles, deadhead miles and fleet size. We conduct this study through a simulation model of the operations for a provider in Los Angeles County.

■ MC62

Revenue Management Applications
Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session

Chair: Nagihan Comez, Bilkent University, Bilkent, Ankara, 06800, Turkey, comez@bilkent.edu.tr

1 - Dynamic Cruise Ship Revenue Management
Bacel Maddah, American University of Beirut, School of Engineering, PO Box 11-0236, Beirut, 1107-2020, Lebanon, bm05@aub.edu.lb, Lama Moussawi

This paper analyzes a two-dimensional cruise ship revenue management problem, where customers arrive in groups and request one cabin of a particular category and a number of lifeboat seats. Accepting a family on board requires two resources: Cabins and lifeboat seats. The decision is to accept/reject a request. We formulate this problem as a discrete time dynamic program. We propose several heuritics, compare their performance and make recommendations.

2 - Advertising Inventory Allocation Based on Multi-Objective Optimization

Jimmy Yang, Yahoo! Inc., 4401 Great America Parkway, Santa Clara, CA, 95054, United States of America, jianyang@yahoo-inc.com, John Tomlin

Allocation of advertising inventory is one of the critical issues in revenue management for media industry. Given a set of advertising demand, a media company must decide how to allocate limited inventory to achieve certain business objectives. This research reviews various allocation objectives and different approaches to optimize for these objectives. A framework based on multi-objective optimization is developed to test different objectives and analyze the trade-off.

3 - Revenue Management in the Parking Industry

Kostas Triantis, Professor, Virginia Tech, 7054 Haycock Road, Falls Church, VA, 22043-2311, United States of America, triantis@vt.edu

This research explores how revenue management (RM) principles would integrate into a parking system, and how advanced reservations, coupled with dynamic pricing (based on booking limits) could be used to maximize parking revenue. Furthermore, it evaluates how the application of RM in the parking industry and within urban parking districts can mitigate traffic congestion.

4 - Joint Dynamic Pricing of Multiple Perishable Products under Consumer Choice

Yalcin Akcay, Turkey, yakcay@ku.edu.tr, Susan Xu, Harihara Prasad Natarajan

We consider a dynamic pricing problem facing a firm that sells given initial inventories of multiple substitutable products over a finite horizon. Product demands are linked through consumer choice processes, depending on the nature of product differentiation. We formulate this joint dynamic pricing problem as a stochastic dynamic program and characterize the optimal prices.

■ MC63

Transportation Logistics and Energy Supply Chain

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Yueyue Fan, Assistant Professor, University of California, Department of Civil Engineering, Davis, CA, 95616, United States of America, yyfan@ucdavis.edu

1 - Optimal Design of Storage Facility in Bio-ethanol Supply Chain under Uncertainty

Yongxi Huang, Graduate Student, University of California, Institute of Transportation Studies, Davis, 95616, United States of America, yxhuang@ucdavis.edu, Yueyue Fan

The design of ethanol production system using biomass is subjected to feedstock seasonality and highly uncertain future demands. A multistage stochastic model is proposed in this paper for optimal design and operation of biorefineries as well as storage facilities for both feestocks and fuels, in order to enhance the system reliability and efficiency of the entire ethanol supply chain.

2 - Optimizing Biofuel Transportation and Refinery Locations in Illinois

Seungmo Kang, Postdoctoral Fellow, University of Illinois at Urbana-Champaign, Department of Civil & Environmental Engineering, Urbana, IL, 61801, United States of America, skang2@uiuc.edu, Hayri Onal, Umit Tursun, Jurgen Scheffran, Yanfeng Ouyang

We find the optimal locations and capacities of new biofuel refineries in Illinois, including expansion of the existing facilities, using a MIP facility location model. The model minimizes the total cost of crop production and harvesting, transportation costs between farms, refineries and consumers, and processing costs at the refineries. This problem is solved by both CPLEX and a customized Lagrangian relaxation algorithm. Numerical results are presented.

3 - Optimal Allocation of Multiple Biomass Resources for Biofuel Production in the United States

Nathan Parker, Graduate Student Researcher, University of California, Davis, Institute of Transportation Studies, Davis, CA, 95616, United States of America, ncparker@ucdavis.edu, Yueyue Fan

In this talk, we will present how multiple biomass resources, including energy crops and biowastes, could be optimally allocated for biofuel production in the United States for two policy goals. First, we will estimate the supply of biofuels as an economic substitute for petroleum fuel. Second, we will estimate the potential for climate change mitigation through biofuels. We consider the costs and climate impacts of the entire fuel supply chain from the feedstock to the end users.

4 - Management of Logistics Planning

Björnar Aas, Molde University College, Britvegen 2, Molde, 6402, Norway, bjornar.aas@himolde.no, Stein W. Wallace

We propose a conceptual framework for management of logistics planning. Logistics problems are gradually becoming more complex and the proposed framework contributes to a better understanding of logistics management as a subject. We believe that the application of the proposed framework could lead to more cost-efficient logistics planning. A case study from the oil-and gas industry is presented.

■ MC64

Transportation Network Design

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Xuesong Zhou, Assistant Professor, University of Utah, 122 South Central Campus Dr., Salt Lake City, UT, 84112, United States of America, zhou@eng.utah.edu

1 - Dynamic Traveler Response Modeling and Robust Network Design for Seismic Risk Analysis of Transportation

Xuesong Zhou, Assistant Professor, University of Utah, 122 South Central Campus Dr., Salt Lake City, UT, 84112, United States of America, zhou@eng.utah.edu, Hyun-chan Kim

Earthquakes could significantly impact road network capacity and further change spatial and temporal traffic demand patterns. Based on a case study in the Salt Lake City metropolitan area, we first present a day-to-day demand adjustment model to capture the traveler behavior in a damaged transportation network, and then discuss how to use a robust network design tool to enhance existing infrastructure systems so as to minimize expected structural risk and post-earthquake traffic delays.

2 - Reformulating and Solving Discrete Network Design Problem via an Active Set Technique

Lihui Zhang, University of Florida, 2777 SW Archer Rd, Apt. V106, Gainesville, FL, 32608, United States of America, zhanglh0@ufl.edu, Yafeng Yin, Siriphong Lawphongpanich

This paper addresses an equilibrium discrete network design problem that is to improve the performance of a highway network by construction of new links and expansion of existing links. The problem is formulated as a new mathematical program with complementarity constraints, solved by an active set approach. Numerical experiments are carried out to demonstrate and validate the formulation and solution approach

3 - Stochastic and Dynamic Shipper Carrier Network Design Problem

Avinash Unnikrishnan, Graduate Student, University of Texas at Austin, 1 University Station C1761, Austin, TX, 78712, United States of America, avinash@mail.utexas.edu, Travis Waller

The focus of this work is to determine the optimal storage capacity to be installed on transshipment nodes by shippers in a dynamic shipper carrier network under stochastic demand. A two stage mathematical program with recourse formulation is developed where in the first stage, the shipper decides the optimal capacity to be installed on transshipment nodes. In the second stage, the shipper chooses a routing strategy based on the realized demand.

4 - A Descent Method for Bi-level Dynamic Transportation Network Design Problem

Dung-Ying Lin, UT Austin, 1 University Station, C1761, Department of Civil Engineering, Austin, TX, 78712, United States of America, dylin@mail.utexas.edu, Travis Waller

To efficiently solve the bi-level dynamic network design problem, we develop a descent method that finds the system-wide gradient in a network with multiple origins and destinations. The method finds the rational direction that decreases the upper-level objective while maintaining the feasibility of the lower-level program. The proposed techniques can be further extended to calibrate dynamic traffic assignment or determine dynamic tolls.

■ MC65

Joint Session Scheduling in SI/HAS: Scheduling in Health Care Delivery Systems

Cluster: Scheduling in the Service Industry,
Health Applications Section
Invited Session
Chair: Shelly Qu, Assistant Professor, North Carolina A&T State University, ISE Department, NC A&T State Univ., 1601 E. Market Street, Greensboro, NC, 27411, United States of America, xqu@ncat.edu

1 - Yield Management in Health Care Clinics with Open Access Scheduling
Linda LaGanga, Director of Quality Systems & Operational Excellence, Mental Health Center of Denver, 4141 East Dickenson Place, Denver, CO, 80222, United States of America, linda.laganga@mhcd.org, Stephen Lawrence

We extend our previous yield-management results in health-care clinics to allow open-access scheduling. We develop an optimizing algorithm that allows a mix of both same-day open access appointments and longer-term forward appointments. Our algorithm maximizes clinic utility by trading off the benefits of clinic productivity with the costs of patient waiting and clinic overtime. Results demonstrate the optimum mix of open-access and long-term appointments under a variety of conditions.

2 - Patient/ Physician Scheduling and Routing to Improving Spatial Access for Outpatient Specialty Care
Nan Kong, Assistant Professor, Purdue University, 206 S. Martin Jischke Dr., West Lafayette, IN, United States of America, nkong@purdue.edu, Peter Fabri

Cost containment and workforce utilization typically involve healthcare access regionalization and hospital location analysis. Little attention has been given to conceptualize geographic access in the era of greater delivery mobilization. As a result, many outpatients encounter huge travel burden. We present several routing and scheduling models to distribute outpatient specialty care dynamically in a network. Our initial aim is to minimize patient travel distance and time.

3 - Stochastic Surgery Scheduling Problem under Capacity Constraints
Daiki Min, Purdue University, 315 N. Grant Street, West Lafayette, IN, United States of America, dmin@purdue.edu, Yuehwern Yih

The objective of this study is to investigate the stochastic optimization model which determines an optimal surgery schedule of elective patients with consideration of uncertain surgery activity. The sample average approximation (SAA) method is used for obtaining an optimal surgery schedule with respect to minimizing the total cost that consists of patients-related costs and overtime cost. A computational study is presented to evaluate the significance of the stochastic surgery scheduling model.

4 - Evaluation of Direct-to-pharmacy Strategy Using Simulation of Pharmaceutical Supply Chain
Lisa Niziolek, Purdue University, 315 N. Grant Street, West Lafayette, IN, 47907, United States of America, tieman@purdue.edu, Yuehwern Yih

In pharmaceutical supply chains, most products flow through wholesalers. Although wholesalers provide services to drug makers and pharmacies, drug makers may consider selling directly to pharmacies. Using a simulation model, we evaluate the impact of bypassing wholesalers on performance measures, including service level and costs. Sensitivity analysis will determine how performance measures vary given changes to parameters such as demand variation, production reliability, and product mix.

■ MC66

Dynamic Routing and Logistics under Real-Time ITS Information

Cluster: Real-Time Systems
Invited Session
Chair: Alper E. Murat, Assistant Professor, PhD, Department of Industrial and Manufacturing Engineering, Wayne State University, 4815 Fourth Street, Detroit, MI, 48202, United States of America, amurat@wayne.edu

1 - Dynamic Vehicle Routing under Real-time Congestion and Incident Information for JIT Logistics
Ali R. Guner, PhD Candidate, Wayne State University, 4815 Fourth St., Detroit, MI, 48202, United States of America, ali@aguner.com, Ratna Babu Chinnam, Alper E. Murat

We propose a dynamic vehicle routing model in stochastic nonstationary road networks which integrates recurring and incident-based nonrecurring congestion models using real-time traffic and incident information. We illustrate the effectiveness of jointly modeling recurring and nonrecurring congestion in reducing travel time delay and variability. Our results are illustrated on a real case study from Southeast Michigan region.

2 - Dynamic Freight Routing on Air-road Intermodal Network Using Real-time Congestion Information
Farshid Azadian, PhD Candidate, Wayne State University, f_azadian@wayne.edu, Alper E. Murat, Ratna Babu Chinnam

This paper addresses routing of time-sensitive freight shipments subject to congestion on the road network and flight departure delays. We propose a stochastic dynamic routing model on the road-air inter-modal network. Routing decisions include selecting between alternative airports and flights based on real-time data on road traffic and flight delays. We illustrate the application of our modal with an air cargo routing in the Michigan-Ohio road-air inter-modal network

3 - Real-time Traffic Rerouting in an Electrical Analog Platform
Md. Ashfaque-Ur Rahman, MSE Candidate, Grand Valley State University, 32 Winter Ave SW, Winter Hall, Apt#241, Grand Rapids, MI, 49504, United States of America, auvibuet@yahoo.com, Charles Standridge, PhD, Shabbir Choudhuri, PhD

When an incident happens in a major highway, traffic is detoured to the arteries whose capacities are lower. So congestion occurs. Monitoring the detour route based on real-time information is necessary to avoid major disruption in the overall network. The situation calls for continuous evaluation of the surrounding network and real time rerouting. An electrical analog of the road network is developed to find the lowest cost path that is independent of the map complexity.

4 - Modeling Traffic Incidents for Dynamic Vehicle Routing Applications
Ali R. Guner, PhD Candidate, Wayne State University, 4815 Fourth St., Detroit, MI, 48202, United States of America, ali@aguner.com, Ratna Babu Chinnam, Alper E. Murat

Non recurring incidents critically impact travel time in transportation networks. Literature mostly considers recurring congestion as the main source of travel time delay. We compare and contrast existing nonrecurring congestion delay models with data from real incidents on transportation networks. We also offer new compact incident delay models for efficient and effective representation.

■ MC67

Location and Allocation Analysis - Research and Industrial Applications

Sponsor: Location Analysis
Sponsored Session
Chair: Hongzhong Jia, Researcher, Microsoft, 1065 La Avenida St., Mountain View, CA, 94043, United States of America, billjia@microsoft.com

1 - Facility Location for Emergency Evacuation
Rongbing Huang, York University, 4700 Keele Street, Toronto, ON, M3J1P3, Canada, rhuang@yorku.ca, Mozart Menezes, Seokjin Kim

In the p-median and p-center problems, people take advantage of the facility located at the same site. However, in the situation of some natural disasters like hurricane Katrina, the whole city may become functionless. Therefore, customers can't rely on the facility located at the same place. We compare this problem with the p-median and p-center problems and analyze the problem on some simple networks. An efficient algorithm is provided for the problem on the general network.

2 - A Bilevel Model for Preventive Healthcare Facility Network Design with Congestion
Yue Zhang, PhD Candidate, McGill Unviersity, 1001 Sherbrooke Street West, Montreal, QC, H3A 1G5, Canada, yue.zhang3@mail.mcgill.ca, Vedat Verter, Patrice Marcotte, Oded Berman

This paper provides a methodology for designing a network of preventive healthcare facilities so as to maximize participation. To determine the number of open facilities and the location of each facility, we formulate the problem as a bilevel optimization model. A heuristic solution procedure is provided. A real life application (breast cancer screening centers in Montreal) is examined at last, and the impacts of capacity pooling are discussed.

3 - Quantification of Railway Infrastructure Decisions
Thomas Schlechte, Research Assistant, Zuse Institute Berlin, Takustrasse 7, Berlin, 14195, Germany, schlechte@zib.de, Ralf Borndoerfer

This talk focuses on the macroscopic track allocation problem, which consists in finding a conflict free set of train routes of maximum value in a given railway network. We present how the construction of optimal or saturated timetables by integer programming techniques can be used to support and quantifiy main railway infrastructure decisions. All experiments are performed on a part of German long distance area; tttplib.zib.de provides these simplified realistic data sets.

4 - Using Location Modeling Framework to Optimally Distribute Traffic and Storage Usage for Web Services
Hongzhong Jia, Researcher, Microsoft, 1065 La Avenida St., Mountain View, CA, 94043, United States of America, billjia@microsoft.com

A web service often needs to host numerous users that store and access their online data. To provide services, the hardware is purchased and configured as nodes, each hosting a number of users. Built at different times, the nodes have distinct traffic processing capability and storage capacity. We present a modeling framework to allocate the user traffic and storage across the heterogeneous nodes. The framework enables the web services to achieve the maximal capacity and the best performance.

■ MC68

Optimal Advertising and Pricing for Information Goods
Sponsor: Marketing Science
Sponsored Session
Chair: Brian Ratchford, University of Texas at Dallas, 800 West Campbell Rd., SM32, Richardson, TX, 75080, United States of America, btr051000@utdallas.edu

1 - Product Form Bundling: Implications for Marketing Digital Products
Nevena Koukova, Assistant Professor, Lehigh University, nek205@lehigh.edu, P. K. Kannan, Brian Ratchford

Marketing of information media in digital form or bundled with the conventional form has become increasingly common in product categories such as books, newspapers and music. As the content is common to both forms, the attractiveness to consumers of acquiring both is relatively low. However, the forms often have advantages over one another in specific usage situations. We find that emphasizing such usage situations increases the intent to purchase both forms as long as the second is discounted.

2 - Optimal Advertising Policy in the Presence of Pre-Launch Effects
Dongling Huang, Assistant Professor, Renssalear Polytechnic Institute, Lally School of Management, Rensselaer Polytechnic Institute, Troy, NY, 12180, United States of America, huangd3@rpi.edu

In this paper we investigate the optimal advertising policy in a monopolistic market where advertising starts before the product's launch in order to generate interest in the product under consideration. We show that the optimal advertising policy may be increasing during the pre-launch period, but decreasing in the post-launch period. The majority of the literature shows that when pre-launch effect is not considered, optimal advertising policy is either decreasing or increasing monotonically.

3 - Scaling Response Parameters: A Multivariate Probit Approach
Sri Duvvuri, Assistant Professor, University of Iowa, S348 PBB, Iowa City, IA, 52245, United States of America, sri-duvvuri@uiowa.edu, Minakshi Trivedi, Karthik Sridhar

This research compares consumer response parameters across categories and different regions. In specifying random coefficient choice models, the variation in the mean responses is taken into account while the variation in the variances is ignored. Recently, studies have explored the implications of this assumption and point out that a comparison of estimated parameters across segments and/or data sets might confound the results. We investigate these issues using a multivariate probit model.

4 - The Evolution of Competition Between Online and Offline Sellers
Brian Ratchford, University of Texas at Dallas, 800 West Campbell Rd., SM32, Richardson, TX, 75080, United States of America, btr051000@utdallas.edu

Employing survey data on consumer behavior and actual data on prices from several periods between 2000 and 2007, this paper examines the evolution of competition between different seller types in the book and CD markets. The evidence indicates that competition between online and offline sellers (the latter have tended to add online channels) is at least as intense as competition within a given format.

Monday, 4:30pm - 6:00pm

■ MD01

Peer-to-Peer Networks
Sponsor: eBusiness
Sponsored Session
Chair: Bin Gu, Assistant Professor, University of Texas at Austin, 2100 Speedway B6500, Austin, TX, 78712, United States of America, Bin.Gu@mccombs.utexas.edu

1 - Digital Distribution: The Impact of New Digital Distribution Channels on Internet Piracy
Michael Smith, Associate Professor, Heinz School-CMU, mds@cmu.edu, Rahul Telang, Samita Dhanasobhon

Digital piracy has concern among content creators that if consumers have access to freely available pirated content, they will no longer have an incentive to purchase content through legitimate channels. We test the impact of legitimate digital distribution channels on piracy demand. Our results suggest that the addition of digital distribution channels reduce the demand for pirated content.

2 - Dynamic Referrals in Peer-to-Peer Media Distribution
Kartik Hosanagar, Wharton School of the University of Pennsylvania, PA, kartikh@wharton.upenn.edu, Yong Tan, Peng Han

Product diffusion in P2P is unique because free riders - users who download content from others in the network without redistributing it to others - can create a supply constraint that results in the incomplete fulfillment of generated demand. P2P firms offer distribution referrals, i.e. payments to users who distribute content to others, to provide users with incentives to distribute content. In this paper, we study a P2P firm's optimal referral strategy.

3 - Peer-to-Peer File Sharing and the Market for Digital Information Goods
Andres Hervas-Drane, PhD Candidate, Harvard Business School / UAB, 6 Mount Auburn St. Apt. 6, Cambridge, MA, 02138, United States of America, andresonline@gmail.com, Ramon Casadesus-Masanell

We study competitive interaction between two alternative models of digital content distribution: peer-to-peer (p2p) file sharing and centralized client-server distribution. We present a stylized model of p2p file sharing to analyze the optimal strategy of a profit-maximizing firm, such as Apple, that offers content at positive prices. We show that the firm may be better off setting high prices, allowing the network to survive, and that the p2p network may work more efficiently in its presence.

4 - Indirect Reciprocity in Contributions to a Peer-to-Peer Sharing Network- An Empirical Analysis
Bin Gu, Assistant Professor, University of Texas at Austin, 2100 Speedway B6500, Austin, TX, 78712, United States of America, Bin.Gu@mccombs.utexas.edu, Yun Huang, Wenjing Duan, Andrew Whinston

This study assesses the influence of indirect reciprocity on individual contribution to a P2P network. We find that users show strong indirect reciprocity when they first join the P2P network. However, their level of indirect reciprocity decreases as the individual gains more experience. The phenomenon is consistent with findings from economic experiments, suggesting that individuals in the P2P network learn over time to become more economic oriented.

■ MD02

Production Process in Supply Chain Management
Contributed Session
Chair: Jin-Kyu Park, Assistant Professor, Florida International University, 10555 W. Flager St. EC 3121, Miami, FL, 33174, United States of America, kyupark@fiu.edu

1 - Supply Chain Coordination under Yield Uncertainty
Yu Tang, Washington University, 1 Brookings Drive, St Louis, MO, 63130, United States of America, ytang@wustl.edu

We consider a supply chain with a single manufacturer and a single supplier with yield uncertainty at the supplier's production process. We investigate supply chain coordination issues under deterministic demand and stochastic demand. We show that a cost sharing or a shortage penalty contract can achieve supply chain coordination when demand is deterministic. We study a full pay back scheme and several contingent payment schemes and show that none of them can coordinate the supply chain.

2 - Production and Design Outsourcing in Supply Chain Management

Jun Shan, PhD candidate, Hong Kong University of Science and Technology, Department of IELM, HKUST, Clear Water Bay, Kowloon, Hong Kong, Hong Kong - China, jshan@ust.hk, Kaijie Zhu

We consider the problem that a firm is launching a product to the market. The firm can decide whether it should outsource only the production work or both production and design works to an offshore manufacturer due to cost advantages. And it will set price and design level both of which are assumed factors influencing demand. The problem is studied based on a sequential game framework. We compare system performances and identify the best choice for both players under different situations.

3 - Optimal Control of an Assembly System with Demand for the End Product and Intermediate Components

Oben Ceryan, PhD Candidate, University of Michigan, 1205 Beal Ave. 1710 IOE, Ann Arbor, MI, 48109, United States of America, oceryan@umich.edu, Yoram Koren, Izak Duenyas

We study a two-stage assembly system with demand for the intermediate components as well as the end product. The manufacturer has the option to accept or reject a demand for any of the components in addition to having admission control for the product. We characterize the optimal production, assembly and admission policy. Since the optimal policy structure is rather complex, we also propose an effective heuristic that is easy to implement and robust over a range of problem sizes and parameters.

4 - Production Fragmentation in a Global Supply Chain

Renato de Matta, Associate Professor, University of Iowa, 108 PBB, Iowa City, IA, 52242, United States of America, renato-dematta@uiowa.edu, Tan Miller

Fragmentation divides an integrated production system into specialized and distinguishable units to perform various phases of production. In this study, we formulate a model that finds tax efficient countries where to locate those units and sets intra-company transfer prices between units such that the total global after-tax profit is maximized. We discuss the managerial implications of our results, and the potential applications and benefits of the model.

5 - The Impact of Product Architecture on Firm's Supplier-choice Behavior

Jin-Kyu Park, Assistant Professor, Florida International University, 10555 W. Flager St. EC 3121, Miami, FL, 33174, United States of America, kyupark@fiu.edu

This study's goal is to investigate the consequences of the change of PA (product architecture) from modular to integral on firm's behavior regarding internal/external supplier choice. This study draws on TCE, RBV, and performance feedback model. Given that most previous relevant literature focuses on exploring the impact of PA change from integral to modular on firm's supplier choice strategy, this study is believed to be very valuable.

■ MD03

Inventory Systems

Contributed Session

Chair: Ozden Engin Cakici, PhD Candidate, Simon School of Business, Univ. of Rochester, Carol G Simon Hall 4-349, Rochester, NY, 14627, United States of America, engin.cakici@simon.rochester.edu

1 - Analytical Description of the Classes in an ABC Inventory System

Robert E. Stanford, Professor, UAB School of Business, Department of FEQM, 1150 Tenth Avenue South, Birmingham, AL, 35294, United States of America, stanford@uab.edu

We extend the results of our earlier analysis of optimal class structure in an ABC inventory system, and present algebraic descriptions of the proportions of system items optimally assigned to each class. The derived proportions are expressed in terms of the fundamantal parameter in the system's Distribution-by Value curve.

2 - Periodic Review Lost-sales Inventory Models with Constant Lead Times of Any Length

Marco Bijvank, VU University Amsterdam, De Boelelaan 1081a, Amsterdam, 1081HV, Netherlands, mbijvank@few.vu.nl, Soren G. Johansen

Contrary to almost all literature on lost-sales inventory models we allow constant lead times of any length instead of integer multiples of the review period. Such a model can be used to determine the optimal review period length. We consider a pure base-stock policy and a policy with a restriction on the maximum order size. Numerical results show that the latter policy performs within 1% from the optimal cost. We also propose an approximation procedure to determine the base-stock levels.

3 - Economic Impact of RFID in Hospital Setting

Ozden Engin Cakici, PhD Candidate, Simon School of Business, Univ. of Rochester, Carol G Simon Hall 4-349, Rochester, NY, 14627, United States of America, engin.cakici@simon.rochester.edu, Abraham Seidmann, Harry Groenevelt

Our research focuses on identifying the economic impacts of Radio Frequency Identification (RFID) technology on inventory management in hospital setting. We present new models that explain why the adoption of RFID technology in clinical settings is growing rapidly and why it has a high cost reduction potential relative to the commonly used barcodes.

■ MD05

Dynamic User Equilibrium

Cluster: Network Congestion and Congestion Management
Invited Session

Chair: Xuegang (Jeff) Ban, Assistant Professor, Rensselaer Polytechnic Institute, 110 8th St, JEC 4034, Civil and Environmental Engineering, Troy, NY, 12180, United States of America, banx@rpi.edu

1 - Dynamic Traffic Assignment for Operations Planning

Andy Chow, Postdoc Scholar, California PATH, 1357 S. 46th Street, Richmond Field Station, Bldg 452, Richmond, CA, 94804, United States of America, ahfchow@path.berkeley.edu, Xuegang (Jeff) Ban

This paper investigates the development and application of dynamic traffic assignment for real world traffic operations planning. We particularly highlight some theoretical features and limitations of DTA models (e.g. existence of user equilibrium, path-based and link-based formulations, and approximation schemes for solving large-scale problems) and the ways we tackle the challenges. The findings can also support further analysis and model development in this area.

2 - Dynamic Traffic Assignment and the Route-link Consistency Issue

Hillel Bar-Gera, Dr., Ben-Gurion University, 5038 S. Hardy Dr., #2095, Tempe, AZ, 85282, United States of America, bargera@bgu.ac.il, Michal Blumberg, Shmuel Rahamim

Most macroscopic dynamic traffic assignment models focus either on traffic flow behavior or on flow propagation along trajectories. Each approach suffers from consistency issues, which will be illustrated by specific examples. As an alternative, we propose to integrate the two approaches using "anticipated arrival order" combined with LWR flow behavior.

3 - Dual Time Scale Dynamic User Equilibria with Demand Growth: Formulation and a Convergent Algorithm

Terry Friesz, Marcus Professor, Penn State University, Department of Industrial & Mfg Engr., 305 Leonhard Bldg, University Park, PA, 16802, United States of America, tfriesz@psu.edu, Matthew Rigdon, Changhyun Kwon, Tae Il Kim

We approximate the dynamic network loading problem by a system of ordinary differential equations. This approximation is used in conjunction with a fixed point algorithm to solve the dynamic user equilibrium problem. Some numerical examples are presented.

4 - A Link-node Complementarity DUE Model with Departure Time Choice

Xuegang (Jeff) Ban, Assistant Professor, Rensselaer Polytechnic Institute, 110 8th St, JEC 4034, Civil and Environmental Engineering, Troy, NY, 12180, United States of America, banx@rpi.edu

We present a link-node complementarity model for dynamic user equilibrium (DUE) with departure time choice. The departure time choice is modeled by introducing penalty functions for late/early arrivals in the link-node fashion. Numerical results are provided to show the performance of the model.

■ **MD06**

Energy Auctions: In Honor of Mike Rothkopf

Cluster: Auctions
Invited Session
Chair: Wedad Elmaghraby, University of Maryland, College Park, MD,
Wedad_Elmaghraby@rhsmith.umd.edu

1 - Equilibrium Prices in Power Exchanges with Non-convex Bids
Richard O'Neill, Federal Energy Regulatory Commission, 888 First
St NE, Washington, DC, 20426, United States of America,
Richard.ONeill@ferc.gov, Paul M. Sotkiewicz, Michael H. Rothkopf

We show uniform, linear prices in power exchange markets, such as in the
Amsterdam Power Exchange (APX) Day-Ahead market or the Nord Pool Elspot
market, that allow non-convex, "fill or kill" block bids by market participants
may not result in an equilibrium in an economic sense, nor do they maximize
surplus to market participants. We propose, as an alternative, a multi-part,
discriminatory pricing mechanism that results in a market equilibrium in an
economic sense and maximizes surplus for market participants. These multi-part
prices do not require proceeds from outside the market to be implemented. In
addition, we propose algorithms to ensure the use of linear prices for market
clearing where feasible, and if not feasible, prices that minimize deviations from
linear prices. We also describe a simple pro rata method for implementing the
discriminatory multi-part prices, and discuss the degrees of freedom in pricing
ordered by the prices proposed through the use of simple examples.

**2 - Auction Design in Regulated Electric Power Markets: Problems
Past and Future**
Benjamin F. Hobbs, Schad Chair of Environmental Management,
The Johns Hopkins University, Department Geography & Environ.
Engineering, Baltimore, MD, 21218, United States of America,
bhobbs@jhu.edu, Richard O'Neill

The core of power markets in the US consists of centrally-administered day-
ahead and real-time auctions for energy and ancillary services. Auctions are also
important for long-term energy and power contracts. We discuss problems that
our colleague Michael Rothkopf worked on as a consultant to FERC, and review
future challenges.

3 - Economic Analysis of the Right of First Refusal
Shehzad Wadalawala, swadalawala@gmail.com, Shmuel Oren

Right of First Refusal (ROFR) in an auction provides its owner the opportunity to
match a third party's winning offer. We analyze the economic consequences of
such a right and show possible negative consequences on sellers' revenue and on
social welfare due to suppression of competition. We also describe circumstances
where an ROFR is beneficial and should be awarded as part of a contract
negotiation.

■ **MD07**

**On Timing in OM: Product Development, Supply
Chain, and Product Allocation**

Sponsor: Manufacturing & Service Oper Mgmt
Sponsored Session
Chair: Opher Baron, University of Toronto, 105 St. George Street,
Toronto, ON, M5S3E6, Canada, Opher.Baron@Rotman.Utoronto.Ca

**1 - Improving Production Yield through Learning by Doing and
Knowledge Sharing**
Hasan Arslan, Suffolk University, Boston, MA, 02108,
United States of America, harslan@suffolk.edu, Thomas Roemer,
Ali Yassine

We address the production ramp-up for products with low initial yields. Our
principal focus is on when to switch over from pilot to full production. We
distinguish between process focused firms, who strive for a high degree of
similarity between product lines, such as Intel's copy exactly strategy and skill
focused firms, whose strength lie in their employees' skills of learning
autonomously. We show that switch-over decisions must consider future margins
and the focus orientation of the firm.

**2 - Capacity and Inventory Control in a Two-Stage Supply Chain with
Limited Information Sharing**
Fikri Karaesmen, Koc University, Rumeli Feneri Yolu, Istanbul,
34450, Turkey, fkaraesmen@ku.edu.tr, Alper Altan,
Selcuk Karabati

We consider a decentralized supply chain consisting of a retailer and a supplier.
The retailer faces a Poisson demand process whose rate is price-sensitive and
employs a base-stock inventory policy. The supplier operates a capacitated
production system modeled by a queue. Optimal capacity, inventory and pricing
decisions in this supply chain and their impacts are investigated under the
assumption that some cost parameters are not common knowledge.

3 - Incentives for Transshipment in a Decentralized Supply Chain
Jing Shao, University of British Columbia, Box 524, 6335
Thunderbird Crescent, Vancouver, BC, V6T 2G9, Canada,
jing.shao@sauder.ubc.ca, Harish Krishnan, S. Thomas McCormick

We investigate the incentives for transshipment in a decentralized supply chain,
where a monopoly manufacturer sells through competing retailers. We find
when the wholesale price is endogenous, the manufacturer and retailers'
incentives for transhipment depends on the transhipment price. When the
transsshipment decisions are also endogenous, transhipment may not happen,
and whether the manufacturer and retailers benefit from transshipment depends
on their control of transsshipment decisions.

**4 - Strategies for an M/G/1 Make-to-stock Queue Serving
Different Markets**
Baris Balcioglu, University of Toronto, 5 Kings College Rd,
Toronto, ON, Canada, baris@mie.utoronto.ca,
Hossein Abouee Mehrizi, Opher Baron

For an M/G/1 queue serving an identical product to distinguishable and
prioritized markets we choose product dispatching and base-stock levels when
inventory is decentralized or centralized. We provide exact analysis (optimal
base-stock levels and cost) for a decentralized policy demonstrating, numerically,
its effectiveness. For a centralized system we approximate the inventory-
rationing and the strict-priority policies and showing numerically that inventory
rationing is more effective.

■ **MD08**

**Linkages Between Risk, Financial and Operational
Performance**

Sponsor: Manufacturing & Service Oper Mgmt/ Interface between
Finance, Operations, and Risk Management (iFORM)
Sponsored Session
Chair: Nitin Joglekar, Boston University, 595 Commonwealth Avenue,
Boston, MA 02215, United States of America, joglekar@bu.edu

**1 - Market Value of Flexibility: Evidence from the Clean
Energy Industry**
Jane Davies, Boston University, 595 Commonwealth Avenue,
Boston, MA, 02215, United States of America, jdavies@bu.edu,
Nitin Joglekar

We develop a framework that links market value of firms with a variety of
flexibility measures. We test this framework using evidence from 200 clean
energy firms. Results indicate that slack - a measure of liquidity that can create
ex-post options - is significantly associated with value. Other flexibility
constructs, such as operational responsiveness and R&D investment are
selectively associated with value depending on whether a firm is in the mature
or in the growth phase of its lifecycle.

**2 - Can Stock Price Movements Inform Operational Improvement
Efforts? Evidence from the Airline Industry**
Kamalini Ramdas, Associate Professor, University of Virginia, 189
FOB, 100 DArden Blvd, Charlottesville, VA, 22902, United States
of America, RamdasK@Darden.virginia.edu, Marc Lipson, Wei Li,
Jonathan Williams

We investigate the use of stock price movements as a source of valuable
information on where operations managers should focus their improvement
efforts, and demonstrate our approach in the context of airline service quality.
Airlines measure service quality along several dimensions. Using 16 years of
monthly panel data for the nine major U.S. air carriers, we examine the impact
on their stock prices of deviations from predicted performance along each
dimension of service quality.

3 - Hedging New Product Development Contests
Edward Anderson, Associate Professor, The University of Texas at
Austin, McCombs School of Business, 1 University Station, B6500,
CBA 5.202, Austin, TX, 78712-0212, United States of America,
Edward.Anderson@mccombs.utexas.edu, Saurabh Bansal

In this paper, we develop an analytic model of a firm that employs a contest for a
component of a new product development effort. The firm, however, may hedge
this contest with a simultaneous internal NPD effort to protect against the case in
which the best solution of the contest is of insufficient quality. We characterize
the situations under which such hedging will occur as well as the potential
benefits to be realized from a hedging strategy.

■ MD09

Joint Session QSR/CS: PHM, Sensors, RFID

Sponsor: Quality, Statistics and Reliability, Computing Society
Sponsored Session

Chair: Abe Zeid, Professor, Northeastern University, MIE Dept, 334SN, 360 Huntington Ave., Boston, MA, 02115, United States of America, Zeid@coe.neu.edu

Co-Chair: Sagar Kamarthi, Department of Industrial and Mechanical Engineering, Northeastern University, 360 Snell Engineering, Boston, MA, 02115, sagar@coe.neu.edu

1 - IC-Card System's Technical Simulation Model Analysis

Donghun Yoon, Keio University, Graduate School of Media and Governance, 5322 Endo Fujisawa, Kanagawa, 252-8520, Japan, nature@sfc.keio.ac.jp

IC-Card provides a means of effecting business transactions in a flexible,secure,standard way with minimal human intervention. It has been applied to various fields: the traffic IC-Card(Suica,Pasmo,Mobile),Electronic Money(Edy),Credit Card,ID Card. This paper describes IC-Card system's efficient improvement direction by theoretical study of IC-Card system's technical simulation model analysis. This study would contribute to scientific reaserch and enhance the value of IC-Card system model study.

2 - Overview of Controlled Accelerated Degradation Techniques of Hard Disk Drives for Diagnostics and Prognostics

Tarun Kothia, Department of Industrial and Mechanical Engineering, Northeastern University, 360 Snell Engineering, Boston, MA, 02115, kothia.t@neu.edu, Abe Zeid, Sagar Kamarthi

Hard disk drives (HDD) are complex electromechanical devices that can suffer performance degradation or failures due to a single event or a combination of events occurring over time. The Mean Time Between Failure (MTBF) of a HDD which is closely associated with its useful life is typically about 208,926 Hours. Diagnostics and prognostics studies of HDD performance usually require degrading them quicker than their normal useful lives. The key issue here is not to "kill" a HDD instantly, but instead gradually over a reasonable period of time, so we can collect degradation performance data over a short period of time. If we consider mechanical failure of HDD, performance data is usually measured in terms of the vibration characteristics of the HDD, namely amplitude and frequency. Various techniques of accelerating the "death" of HDD have been reported in the literature. They are temperature, voltage, dust particles, and scratch on platter surface. This paper reviews the methodology of each technique, its advantages, and disadvantages. The paper also reports some results using some of these techniques in our sensors research lab at Northeastern University.

3 - Towards an Analytical Model to Assess Read-rate Probabilities in RFID Systems

Satish Bukkapatnam, Oklahoma State University, EN 322, Stillwater, OK, 74078, United States of America, satish.t.bukkapatnam@okstate.edu

We present a statistical model based on modified Friis free space equation to estimate read-rates of RFID systems in multiple environments. Experimental results show that the model capture the read rate probabilities and trends.

4 - Sensors in the Emergency Department: Opportunities for Applications in Decision-making

David Claudio, PhD Candidate, The Pennsylvania State University, 310 Leonhard Building, University Park, PA, 16802, United States of America, dave.claudio@psu.edu, Erica Fields, Gul Kremer, Andris Freivalds

Many researches have described the successful implementation of sensors in health care. This article reviews the reported applications of sensing technology in the Emergency Department. In addition, it reviews several studies on how nurses make decisions and proposes new ideas on how RFID technology can aid nurses in the decision-making process under dynamic environments.

■ MD10

Models and Methods in Energy Markets

Sponsor: Energy, Natural Resources & the Environment/ Energy
Sponsored Session

Chair: Steve Gabriel, Associate Professor, University of Maryland, 1143 Martin Hall, Department of Civil & Env. Eng., College Park, MD, 20742, United States of America, sgabriel@umd.edu

1 - A Benders Method for Solving Stochastic Complementarity Problems with an Application in Energy

David Fuller, Professor, University of Waterloo, Department of Management Sciences, Waterloo, ON, N2L 3G1, Canada, dfuller@engmail.uwaterloo.ca, Steve Gabriel

We present a Benders decomposition method to solve stochastic complementarity problems. The master and subproblem are complementarity problems that are solved iteratively until a convergence gap is sufficiently close to zero. As well as details of the method, numerical results are provided, based on an electric power market model of Hobbs [2001] but with added stochastic elements. The results validate the approach and indicate dramatic improvements in solution times.

2 - Solving MPEC Problems for Electricity Markets Using Disjunctive Constraints and Linearization

Florian Leuthold, Dresden University of Technology, Chair of Energy Economics, Dresden, 01062, Germany, Florian.Leuthold@tu-dresden.de, Steve Gabriel

In this paper, we present a mathematical formulation in order to solve a Stackelberg game for a network constrained electricity market. We assume that there is one strategic player. The resulting MPEC is reformulated as MIP by using disjunctive constraints and by parameterizing the output decision of the strategic player. We report computational results for a stylized Western European grid with realistic data assigning market power to the French company EDF.

3 - Analyzing Future Investments and Developments in the Natural Gas Market with the World Gas Model

Ruud Egging, PhD Candidate, University of Maryland, 3401 Chatham Road, Hyattsville, MD, 20783, United States of America, regging@umd.edu, Steve Gabriel, Franziska Holz, Christian Von Hirschhausen

WGM is a fully parameterized multi-period complementarity model covering 98% of world gas production and consumption and allowing capacity investments in liquefied natural gas terminals, pipelines and storage. We analyze contemporary and future developments in the global natural gas market, including the possible establishment of a gas cartel, for the impact on gas importing countries in terms of consumption and prices; alternative trade flows that may develop; and the impact on investments..

4 - The Haiku Electricity Market Model

Anthony Paul, Program Fellow, RFF, 1616 P St, NW, Washington, DC, 20036, United States of America, paul@rff.org, Richard Sweeney, Steve Gabriel

The Haiku Electricity Market Model is a highly parameterized model of the US electricity sector with endogenous components for investment in generation capacity and pollution abatement technology, electricity prices and demand, interregional power trading, fuel markets, and pollution allowance markets. The model, presented here, is designed for policy analysis, particularly for environmental and climate policies.

■ MD11

Optimization Issues in Energy Systems

Sponsor: Energy, Natural Resources & the Environment/ Energy
Sponsored Session

Chair: Panos Pardalos, Distinguished Professor, University of Florida, 303 Weil Hall, ISE Department, Gainesville, FL, 32611, United States of America, pardalos@cao.ise.ufl.edu

1 - Electricity Portfolio Optimization for Public Services: A Case Study

Steffen Rebennack, University of Florida, 303 Weil, Gainesville, FL, United States of America, steffen@ufl.edu, Panos Pardalos, Josef Kallrath

We discuss a portfolio optimization problem occurring in the energy market. Given is an electricity distributor of a local which has to decide how much energy has to be produced in its own power plant, how much has to be bought from the spot market and from open supply contracts. This decision problem is formulated as a mixed integer linear programming problem and implemented in GAMS modeling language.

2 - Monte Carlo Evolutionary Policy Iteration with Applications to Energy R&D Portfolio Optimization

Lauren Hannah, Princeton University, Department of ORFE, Princeton University, Princeton, NJ, lhannah@princeton.edu, Warren Powell

This presentation extends Evolutionary Policy Iteration, a technique for solving Markov Decision Processes, to optimization of a noisy cost function over a finite decision set. A sampling regime and proof of convergence are given. EPI-MC is used in the context of energy R&D portfolio optimization. It is compared numerically on this problem to other algorithms.

3 - Optimization of Fuel Contract Management and Maintenance Scheduling for Thermal Plants

Niko Iliadis, Engineering Analyst, EnerCoRD, Plastira street 4, Nea Smyrni, Athens, 171 21, Greece, Niko.Iliadis@EnerCoRD.com, Raphael Chabar, Sergio Granville, Mario Pereira

This work presents a tool that determines, in an integrated approach, the optimal dispatch and maintenance schedule strategy of thermal power plants while considering the specifications of Take or Pay contracts. Electricity purchase and selling at the spot market and a detailed modelling of the power plant are considered during the optimization. The problem is time-coupled, multi-stage with stochastic electricity spot prices. The methodology applied is Stochastic Dual Dynamic Programming (SDDP).

4 - A Review on Stochastic Optimization Algorithms for Power Systems Optimization

Steffen Rebennack, University of Florida, 303 Weil, Gainesville, FL, United States of America, steffen@ufl.edu

We provide a review of the existing algorithms that treat stochastically the problem of power systems operation optimization for a centrally dispatched (cost minimization) and a locally dispatched in a liberalized market (revenue maximization).

■ MD12

Applied Data Analysis and Optimization: Real Problems - Practical Solutions

Cluster: Data Mining
Invited Session

Chair: Sumit Sarkar, UT Dallas, 3.422 SOM, 800 West Campbell Road, Richardson, TX, 75080, United States of America, sumit@utdallas.edu

Co-Chair: Sameep Mehta, Research Staff Member, IBM Research, India, IBM India Research Lab, ISID Campus,, Plot 4 Sector C Vasant Kunj, New Delhi, 110070, India, sameepmehta@in.ibm.com

1 - Real Time Transaction Scheduler for Scheduling Services Based on Client and Service Characteristics

Sameep Mehta, IBM India Research Lab, IBM India Research lab, Institutional Area, Block C, Vasant Kunj, New Delhi, India, sameep99@gmail.com, Sameep Mehta, Gyana Parija, Vikas Kedia

We focus on developing real time transaction scheduler which simultaneously takes into account client profile and service characteristics and provides differentiated QoS.The system will be useful in various domains like FSS,Retail and Disaster Management(DM).The client profile captures importance of the client eg, preferred customers.Similarly,service characteristics captures profitability(FSS),criticality(DM)etc.Real life constraints like fairness,starvation etc are taken into account.

2 - Recent Advances in Remote Sensing Data Mining: Small Learning Sample Case

Raju Vatsavai, Research Scientist, Oak Ridge National Laboratory, PO.Box 2008. MS-6017, Oak Ridge, TN, 37831, United States of America, vatsavairr@ornl.gov, Budhendra Bhaduri

We present a review of recent advances in remote sensing (RS) data mining, especially in the area of classification with few training samples. Recently significant efforts were placed on methods that use large number of unlabeled samples in conjunction with small number of labeled samples (aka semi-supervised learning). Here we present various extensions of semi-supervised learning, including spatial and multi-source cases, along with classification results on real RS images.

3 - Mining Censored Data and Occurrence Time Prediction

Young Ryu, University of Texas at Dallas, School of Management, SM33, 800 West Campbell Road, Richardson, TX, 75080, United States of America, ryoung@utdallas.edu

There exist few data mining models utilizing censored observations. Presented are mathematical models and a neural net model for event occurrence time prediction with a mixture of complete and right censored observations.

4 - Improving Web-site Structure to Facilitate Effective User Navigation

Min Chen, University of Texas at Dallas, 800 West Campbell Road, School of Management, SM33, Richardson, TX, 75080, United States of America, min.chen@student.utdallas.edu

It has been long recognized that designing usable Web sites is not a trivial task. In this paper, we propose an integer programming model to improve the navigation effectiveness of a Web site while minimizing unnecessary changes to its structure, as it bears business or organizational logics. Thus, our approach can be applied for Web site maintenance on a regular basis. The test results show that we can provide significant improvements over the site structure by introducing very few changes.

■ MD13

Data Mining Competition II

Sponsor: Data Mining
Sponsored Session

Chair: Patricia Cerrito, University of Louisville, pcerrito@louisville.edu

1 - Data Mining Competition

Nick Street, The University of Iowa, Iowa City IA, nick-street@uiowa.edu

In 2008 the Data Mining Section held the first INFORMS Data Mining Contest: The Antibiotic Protocol Case. The challenge was to identify patients at highest risk for developing an pneumonia during their hospital stay, and to design an optimal protocol for prophylactic antibiotic treatment. In this session, contest entrants will describe the approaches they took to this challenge.

■ MD14

Software Demonstration

Cluster: Software Demonstrations
Invited Session

1 - ILOG, Inc. - ILOG CP Optimizer: Model and Automatically Solve Your Detailed Scheduling Problems

Dider Vidal, Senior Product Manager, Optimization ILOG SA, 9 Rue de Verdun, Gentilly Ile-de-France 94253, France, dvidal@ilog.fr

Learn how to use ILOG CP Optimizer 2.0 to solve detailed scheduling problems with finite capacity resources and reservoirs. An interval-based modeling framework supports compact models that do not grow with increasing time granularity, providing excellent performance. We present results comparing CP Optimizer - using default settings - against specialized algorithms on several benchmarks from scheduling literature.

2 - Lumina Decision Systems, Inc. - Analytica: What it Does that Spreadsheets Can't

Max Henrion, CEO, Lumina Decision Systems, Inc, 26010 Highland Way, Los Gatos, CA, 95033, United States of America, henrion@lumina.com

A rare chance to see Analytica demonstrated by its originator: Experienced analysts prefer Analytica to spreadsheets because of its visual influence diagrams, Intelligent Arrays, fast Monte Carlo, and scalability. Users say that they can build, verify, and analyze models in a quarter to half the time it takes with a spreadsheet.

■ MD15

Hospitality Services

Sponsor: Service Science
Sponsored Session

Chair: Rohit Verma, Associate Professor, Cornell University, School of Hotel Administration, 338 Statler Hall, Ithaca, NY, 14853, United States of America, rohit.verma@cornell.edu

1 - Forecasting Demand in Hotel Food and Beverage Outlets

Gary Thompson, Professor, Cornell University, 352 Statler Hall, Ithaca, NY, 14853, United States of America, gmt1@cornell.edu

We look at whether lodging properties can use occupancy data to improve demand forecast accuracy in their food and beverage outlets, using 4 hotels with a total of 41 outlet & day part combinations. We examine 27 forecasting methods, which we test using an 8 week holdback. In 34 cases, the best forecast originated with one of the models incorporating occupancy, and the accuracy improved over 14% on average. Our findings will be of interest to food and beverage managers in lodging properties.

2 - Opaque Versus Transparent Product Pricing

Chris Anderson, Cornell University, School of Hotel Administration, Ithaca, NY, 14850, United States of America, cka9@cornell.edu, Kristine Xie

We investigate differences in consumer purchasing behavior via choice models for purchasing channels of differing levels of product opaqueness.

3 - Service Design for Changing Markets

Rohit Verma, Associate Professor, Cornell University, School of Hotel Administration, 338 Statler Hall, Ithaca, NY, 14853, United States of America, rohit.verma@cornell.edu, Michael Dixon

In the context of service design, both operations and marketing managers have to be aware of shifting trends in market preferences and have to work together to coordinate the "what" and the "how" of the service concept. In this study we use both CMR data and discrete choice modeling methodology to uncover difference in preferences over time between existing loyal and potentially loyal customers. Implications for service design are discussed.

4 - Revenue Management and the Knowledgeable Consumer – Application of Discrete-Choice Analysis

Leo MacDonald, Assistant Professor, Kennesaw State University, Coles College of Business, 1000 Chastain Road, Kennesaw, GA, 30144, United States of America, lmacdon4@kennesaw.edu, Chris Anderson, Rohit Verma

Service providers continue to face more knowledgeable consumers, created in part by online channels. It is critical that service providers understand the consumer's purchase decision process to asses services and amenities, as well as setting the right price controls. We develop a discrete choice model using a combination of revealed and stated preference data. We present the results and insights generated from the model, and how the results can enhance revenue management.

■ MD16

Staffing and Routing in Call Centers

Sponsor: Manufacturing & Service Oper Mgmt/ Service Management
Sponsored Session

Chair: Amy Ward, USC, Bridge Memorial Hall, BRI 401H, Los Angeles, CA, 90089-0809, United States of America, amyward@marshall.usc.edu

1 - A Chance-constrained Optimization Approach to Call-center Staffing

Itay Gurvich, Columbia University, New York, NY, 10027, United States of America, ig2126@columbia.edu, Tolga Tezcan

We consider the problem of staffing call-centers with multiple customer classes and agent types operating under quality-of-service constraints. We introduce a chance-constrained optimization approach that takes into account the imminent uncertainty of the forecasted arrival rates. The optimization problem that we construct reduces to a simple non-linear program with a relatively small number of constraints. We show that our solution is asymptotically optimal in an appropriate sense.

2 - Call Routing Strategies in the Presence of Servers with Heterogeneous Performance Attributes

Vijay Mehrotra, Assistant Professor, San Francisco State University, Department of Decision Sciences, 1600 Holloway Avenue, San Francisco, CA, 94132, United States of America, drvijay@sfsu.edu, Yongpin Zhou, Kevin Ross

Call center models have focused on measures of customer waiting time. However, recent research has revealed that First Call Resolution is also a critical measure of quality and satisfaction. We develop a framework for multiple queues and agent types, with each agent type having different characteristics across different queues. We propose routing rules and conduct empirical tests, showing that these rules can be used to increase FCR while simultaneously decreasing waiting times.

3 - Fair Dynamic Routing Policies in Large-scale Service Systems with Heterogeneous Servers

Mor Armony, Associate Professor, NYU, 44 West 4th Street, New York, NY, 10012, United States of America, marmony@stern.nyu.edu, Amy Ward

Call centers typically have many agents answering calls with different speeds. A key control issue that arises is how to route calls to agents. It has been shown that routing calls to the fastest agent first asymptotically minimizes steady-state customer waiting times. Unfortunately, this policy penalizes the faster agents by keeping them busy at all times. We address the question of how to optimize system performance subject to fairness with respect to server utilization.

4 - A Policy for Dynamic Outsourcing in Call Centers

Amy Ward, USC, Bridge Memorial Hall, BRI 401H, Los Angeles, CA, 90089-0809, United States of America, amyward@marshall.usc.edu, Levent Kocaga

Call centers often experience times when all agents are busy. Customers are then unhappy, because they are forced to wait. Hence it is natural for the call center to consider paying to outsource calls during overloaded periods. We address the question of how to dynamically outsource calls in order to minimize average cost.

■ MD17

Design of Experiments: The Science and Art of Efficient Data Collection

Sponsor: Quality, Statistics and Reliability
Sponsored Session

Chair: Peter Qian, Assistant Professor, University of Wisconsin-Madison, 1300 University Ave, Madison, WI, 53706, United States of America, peterq@stat.wisc.edu

1 - Nested Maximin Latin Hypercube Designs

Gijs Rennen, Tilburg University, Room K 531, PO Box 90153, Tilburg, 5000 LE, Netherlands, g.rennen@gmail.com

Latin hypercube designs (LHDs) play an important role in building metamodels for computer simulation models. To obtain data with good space-filling properties, the maximin criterion is commonly used i.e. the objective is to obtain an LHD of n points in k dimensions for which the minimal distance between any pair of points is maximized. In some situations, we however want two space-filling LHDs where one is a subset of the other. These nested LHDs will be the main topic of this presentation.

2 - STRONG: A Design-of-experiment-based Simulation Optimization Framework

Hong Wan, Assistant Professor, School of IE, Purdue Univ., 315 N. Grant Street, West Lafayette, IN, 47906, United States of America, hwan@purdue.edu, Kuohao Chang

STRONG is a newly developed DOE-based simulation optimization framework. It has nice convergence guarantee and does not require human intervention in the process. We will present a general version of STRONG which relaxes the normal assumption of the responses (compared to the traditional response surface methodology) to any general distribution with bounded second moment.

3 - Two-stage Group Screening for Detection of Interactions in Experiments

Angela Dean, Professor, The Ohio State University, Department of Statistics, Cockins Hall, Columbus, OH, 43210, United States of America, amd@stat.osu.edu, Susan Lewis

A key tool for product improvement is the exploitation of interactions between control factors, which can be set in product specification, and noise factors, which cannot. The strategy of two-stage group screening will be discussed, with the goal of identifying control-by-noise interactions with high probability. Web-based software will be described for elicitation of information from subject specialists. Group screening methodology will be illustrated through an experiment run at Jaguar Cars.

4 - Listing Unique Fractional Factorial Designs

Abhishek Shrivatsava, Texas A&M University, Industrial and Systems Engineering, 3131 TAMU, College Station, TX, 77843, United States of America, akshriv@tamu.edu, Yu Ding

Fractional factorial designs are a popular choice for designing experiments. Choosing a design requires searching among all the statistically distinct designs. We provide a method for efficiently enumerating 2-level designs distinct under relabeling of factor, level and run labels. We use a graph to model each design and provide a sufficient condition for checking isomorphism of two designs. We also provide an efficient algorithm for generating non-isomorphic designs.

■ MD18

Curriculum Development in QSR

Sponsor: Quality, Statistics and Reliability
Sponsored Session

Chair: Zhenyu (James) Kong, Assistant Professor, Oklahoma State University, Stillwater, OK, 74078, United States of America, james.kong@okstate.edu

1 - Some Ideas on the Advanced Quality Control Course

Jianjun Shi, The Carolyn J. Stewart Chair Professor, Georgia Institute of Technology, 765 Ferst Drive, Room 214, Atlanta, GA, 30332-0205, United States of America, jshi33@isye.gatech.edu

Advanced quality control is an important course in a IE graduate curriculum. Though the course is routinely offered in different universities, there are not much standard contents or coverage among different programs. This presentation presents some AQC course outlines in different IE programs. Some ideas for the course design will be presented for further discussion.

2 - Sensor Data Characterization

Soundar Kumara, Allen E. Pearce/Allen M. Pearce Chaired Professor, The Pennsylvania State University, 310 Leonhard Building, University Park, PA, 16802, United States of America, skumara@psu.edu

In this talk the importance of sensor data analysis and real-time aspects as important components of quality control curriculum will be discussed. Ideas on the aspects of real time signal characterization will be presented.

3 - Traditional and Evolution of the Quality Curriculum

George Runger, Professor, Arizona State University, runger@asu.edu

A review of elements of quality curriculum and the basis for these elements will be presented. Prevailing trends in industry and academics and the effect on the change to the curriculum will be discussed.

■ MD19

Tutorial: Some Future Directions in Vehicle Routing Research

Cluster: Tutorials
Invited Session
Chair: Bruce Golden, University of Maryland, Van Munching Hall, College Park, MD, United States of America, bgolden@rhsmith.umd.edu

1 - Some Future Directions in Vehicle Routing Research

Bruce Golden, University of Maryland, Van Munching Hall, College Park, MD, United States of America, bgolden@rhsmith.umd.edu, Ed Wasil, Chris Groer

In this tutorial, we discuss some of our recent work in vehicle routing. First, we discuss two multi-period vehicle routing problems. The first arises in the small package shipping industry. The second is important in the utility industry. In addition, we present a cooperative parallel algorithm for generating high quality vehicle routing solutions.

■ MD20

Decision Analysis Society Awards

Sponsor: Decision Analysis
Sponsored Session
Chair: Craig Kirkwood, Arizona State University, Department of Supply Chain Management, W. P. Carey School of Business, Tempe, AZ, 85287-4706, United States of America, craig.kirkwood@asu.edu

1 - Practice Award

Karen Jenni, Insight Decisions LLC, 1616 17th Street, Suite 268, Denver, CO, 80202, United States of America, kjenni@insightdecisions.com

The Decision Analysis Society Practice Award competition is to recognize, promote, and publicize good decision analysis practice. We will recognize the winner and finalists for the 2008 Practice Award.

2 - Student Paper Award

Robert Clemen, Professor, Duke University, Fuqua School of Business, PO Box 90120, Durham, NC, 27708, United States of America, clemen@mail.duke.edu

The Decision Analysis Student Paper Award is given annually to the best decision analysis paper by a student author, as judged by a panel of the INFORMS Decision Analysis Society. Students who did not complete their PhD prior to May 1, 2007 are eligible for this year's competition.

3 - Decision Analysis Publication Award

James Dyer, Professor, University of Texas-Austin, MSIS Dept, 1 University Sta Stop B6500, Austin, TX, 78712-0212, United States of America, j.dyer@mccombs.utexas.edu

The Decision Analysis Publication Award is given annually to the best decision analysis article or book published two years earlier. To be considered for this year's award, a work must have been published during 2006. The intent of the award is to recognize the best publication in decision analysis, broadly defined — including theoretical work on decision analysis methodology, descriptions of applications, and/or experimental studies.

4 - Frank P. Ramsey Medal

Ralph Keeney, Research Professor, Duke University, Fuqua School of Business, 101 Lombard Street Suite #704W, San Francisco, CA, 94111, United States of America, keeneyr@aol.com

The Frank P. Ramsey Medal is the highest award of the Decision Analysis Society, and it recognizes distinguished contributions to the field of decision analysis. The medal is named in honor of Frank Plumpton Ramsey, a Cambridge University mathematician who was one of the pioneers of decision theory in the 20th century.

■ MD21

Joint Session Computational Biology/CS: Sequence Analysis

Cluster: Computational Biology (Joint Cluster CS)
Invited Session
Chair: Michael Brudno, Assistant Professor, University of Toronto, 10 King's College Rd, Pratt Bldg 283, Toronto, ON, M5R2Z2, Canada, brudno@cs.toronto.edu

1 - Parameter Estimation for RNA Folding

Chuong Do, Graduate Student, Stanford University, Stanford, CA, 94305, chuongdo@stanford.edu

A key element in developing accurate computational tools for RNA secondary structure prediction is the development of accurate scoring functions for distinguishing correct secondary structures from incorrect suboptimal structures. Traditionally, parameter estimation in RNA thermodynamic models have relied primarily on optical melting experiments, though in recent years, statistical approaches to parameter learning for RNA folders have gained in popularity. In this talk, we describe techniques for estimation of folding parameters for RNA secondary structured prediction from known RNA secondary structures using methods from convex optimization. In particular, we describe simple dual coordinate ascent algorithms for learning RNA folding models efficiently on single-processor machines.

2 - Learning Parameters for Sequence Alignment from Partial Examples

John Kececioglu, The University of Arizona, Department of Computer Science, Tucson, AZ, 85721-0077, United States of America, kece@cs.arizona.edu

A rigorous way to compute parameter values that are appropriate for aligning biological sequences is through inverse parametric sequence alignment. We extend prior work on inverse parametric alignment to partial examples, which contain regions where the alignment is left unspecified, and to an improved formulation based on minimizing the average error between the score of an example and the score of an optimal alignment.

3 - Ab Initio Whole Genome Shotgun Assembly

Paul Medvedev, University of Toronto, Deparment of Computer Science, 10 King's College Road, Room 3302, Toronto, ON, M5S3G4, Canada, pashadag@cs.toronto.edu, Michael Brudno

Next Generation Sequencing (NGS) technologies are capable of reading millions of short DNA sequences both quickly and cheaply. In this talk, we give a novel network flow-based algorithm for ab-initio genome assembly. By taking advantage of the high coverage provided by NGS, it accurately estimates the copy counts of repeats in a genome. We also give a second algorithm that combines the predicted copy-counts with mate-pair data in order to assemble the reads into contigs.

4 - Discovering Structural Genome Variation

Michael Brudno, Assistant Professor, University of Toronto, 10 King's College Rd, Pratt Bldg 283, Toronto, ON, M5R2Z2, Canada, brudno@cs.toronto.edu, Seunghak Lee, Elango Cheran

Structural genomic variants have come to the forefront as a significant source of variation in the human population. We expand on the clone-end sequencing approach for detecting structural variants by building an automated, probabilistic framework. Our approach does not rely on an a priori determined mapping of all reads to the reference. Instead, we build a framework for finding the most probable assignment of clones to potential structural variants based on their similarity to other clones.

■ MD22

Models and Application in Scheduling
Contributed Session

Chair: Erick Moreno Centeno, PhD Student, UC Berkeley, Department of IEOR, 4141 Etcheverry Hall, Mail Code 1777, Berkeley, CA, 94720, United States of America, erick_moreno@berkeley.edu

1 - Long Term Care Access: The True Cause of Hospital Congestion?
Jonathan Patrick, Assistant Professor, University of Ottawa, 55 Laurier ave, Ottawa, ON, K1S2M8, Canada, patrick@telfer.uottawa.ca

Poor access to long term care facilities has resulted in a significant portion of non-critical patients occupying hospital beds greatly hampering the hospital's ability to function effectively. We present a Markov decision model of long term care access in the Ottawa region. This is a complex problem due to multiple demand categories competing for the same beds spread out in multiple facilities. Patient preference and urgency of need both play a significant part in the decision process.

2 - Space Search Formulations based on Job Interference for the Job-shop Scheduling Problem
Chandrasekhar Ganduri, Ohio University, 270 Stocker Center, Athens, OH, 45701, United States of America, ganduri@bobcat.ent.ohiou.edu, Dusan Sormaz

Space search is a well known paradigm in AI and heuristic state evaluation functions (SEFs) form the basis for applying space search. The formulation of the algorithm for construction of partial schedules based on job addition is described. Different SEFs formulated in terms of job interference are proposed. Job interference is based on overlapping operations of different jobs on same machine. Measures for quantifying job interference and procedures for interference resolution are described.

3 - A Fuzzy Preventive Maintenance Scheduling in Labor Limited Systems
Emin Gundogar, Professor, Sakarya University, Muhendislik Fak. Esentepe, Kampus Serdivan, Adapazari, SA, 54187, Turkey, gun@sakarya.edu.tr, Baha Guney, Fuat Simsir, Imdat Taymaz

Preventive Maintenance (PM) is a vital function in manufacturing systems in order not to disturb production systems with frequent and severe failures. PM activities should be done on time as planned. This could be achieved easily with enough labor resource. In this study, PM activities are scheduled using fuzzy priority under labor limited case where performance criteria is set as minimum deviation from PM plan.

4 - A Network Flow-based Relaxation of the Split Delivery Vehicle Routing Problem
Erick Moreno Centeno, PhD Student, UC Berkeley, Department of IEOR, 4141 Etcheverry Hall, Mail Code 1777, Berkeley, CA, 94720, United States of America, erick_moreno@berkeley.edu, Moshe Dror, Alper Atamturk

We examine a progressive sequence of relaxations of the generic Vehicle Routing Problem (VRP) as Split Delivery Routing problems (SDVRP). In particular, we show that relaxing the SDVRP constraints impeding commodity transfers between the vehicles leads to a new interpretation for the SDVRP. Moreover, the new SDVRP relaxation generates very tight bounds and can be solved relatively fast.

■ MD23

Joint Session AP/Minority Issues: Queueing Systems
Sponsor: Applied Probability, Minority Issues
Sponsored Session

Chair: Mark Lewis, Associate Professor, School of Operations Research and Information Engineering, Cornell University, 226 Rhode Hall, Ithaca, NY, 14850, United States of America, mark.lewis@cornell.edu

1 - Queues with Collaborative Flexible Servers
Hayriye Ayhan, Associate Professor, Georgia Institute of Technology, School of ISyE, 326 Groseclose Building, Atlanta, GA, 30332-0205, United States of America, hayhan@isye.gatech.edu, Sigrun Andradottir, Douglas Down

Consider a tandem queueing network with two stations, two flexible servers, infinite supply of jobs in front of station 1, infinite room for completed jobs after station 2, and finite buffer between the stations. We assume that the servers can work together, but they become less efficient when they collaborate. Our objective is to determine how the optimal dynamic server assignment policy depends on how well the servers work together.

2 - Allocating Flexible Servers with Switching Costs and Switching Times
Maria Mayorga, Assistant Professor, Clemson University, Department of Industrial Engineering, 146 Freeman Hall, Clemson, SC, 29634-0920, United States of America, MAYORGA@exchange.clemson.edu

We model a tandem queuing system allocating flexible servers to maximize throughput or minimize costs. In the collaborative case with switching costs we characterize the structure of the optimal policy, and present sensitivity analysis to show how the structure of the optimal policy changes. Our results show that the policy losses its monotone structure in the case that holding costs at the first station are higher. We also approximate the optimal policy when switching times are introduced.

3 - The Variability Adjusted Flexibility Index for Flexible Queueing Systems
Douglas Down, Associate Professor, McMaster University, Department of Computing and Software, 1280 Main Street West, Hamilton, ON, L8S 4L7, Canada, downd@mcmaster.ca, Sigrun Andradottir, Hayriye Ayhan

One reason for introducing flexibility (through server cross-training) is to cope with variability. We introduce the Variability Adjusted Flexibility Index (VAFI) to evaluate cross-training schemes. This index takes variability directly into account. Using the VAFI, we demonstrate when it is important to consider variability when making cross-training decisions.

4 - The c-mu Rule with Abandonments
Mark Lewis, Associate Professor, School of Operations Research and Information Engineering, Cornell University, 226 Rhode Hall, Ithaca, NY, 14850, United States of America, mark.lewis@cornell.edu, Douglas Down

We consider the problem of allocating a single server to two parallel queues. Customers that arrive to each queue abandon if they have not begun service after an exponential amount of time. Conditions under which a c-mu type rule is optimal are presented.

■ MD24

Computational Methods and Applications for Large-Scale Optimization Problems
Sponsor: Computing Society
Sponsored Session

Chair: Gino Lim, Assistant Professor, University of Houston, E211, Engr. Bldg 2, 4800 Calhoun Road, Houston, TX, 77204, United States of America, ginolim@uh.edu

1 - Fast and Robust Techniques for the Euclidean p-Median Problem
Gino Lim, Assistant Professor, University of Houston, E211, Engr. Bldg 2, 4800 Calhoun Road, Houston, TX, 77204, United States of America, ginolim@uh.edu, Allen Holder

We discuss new solution techniques for the p-median problem, with the goal being to improve the solution time and quality of current techniques. In particular, we hybridize the discrete Lloyd algorithm and the vertex substitution heuristic. We also compare three starting point techniques and present a new solution method that provides consistently good results when appropriately initialized.

2 - Large-Scale Quaratic Integer Programming Problems
Panos Pardalos, Distinguished Professor, University of Florida, 303 Weil Hall, PO Box 116595, Gainesville, FL, 32611, United States of America, pardalos@ufl.edu

In this talk we are going to present computational results using exact algorithms and heuristics for large-scale quadratic 0-1 problems.

3 - Dynamic Programming Based Inequalities for the Multi-Item Capacitated Lot-sizing Problem
Esra Buyuktahtakin, PhD Candidate, University of Florida, 303 Weil Hall, PO Box 116595, Gainesville, FL, United States of America, iesra@ufl.edu, Joseph Hartman, J. Cole Smith

Iterative solutions of dynamic programming formulations for the CLSP are used to generate valid inequalities for the integer programming formulation of its multi-item version. The inequalities essentially capture convex and concave envelopes of intermediate-stage value functions, and can be lifted by examining potential state information at future stages. A set of experiments are presented to illustrate the computational efficiency of the inequalities.

4 - Making Dark Shadows with Linear Programming

Robert Vanderbei, Professor, Princeton University, E-226 E-Quad, Princeton, NJ, 08544, United States of America, rvdb@Princeton.EDU

A leading concept for NASA's upcoming planet-finding telescope involves placing an occulter 70,000 km in front of a 4m telescope. The purpose of the occulter is to block the bright starlight thereby enabling the telescope to image planets orbiting the blocked star. But, diffraction effects prevent a simple circular occulter from providing a fully dark shadow—-a specially shaped occulter is required. I will explain how this shape-optimization problem can be solved with linear programming.

■ MD25

Computational Decision and Behavioral Analysis

Sponsor: Computing Society
Sponsored Session

Chair: Cole Smith, Associate Professor, ISE, University of Florida, Weil Hall 303, PO Box 116595, Gainesville, FL, 32611, United States of America, j.cole.smith@gmail.com

1 - Specifying Team Sizes with Interdependent Tasks and Nonlinear Sharing Functions

Ronald Askin, Professor and Chair, Arizona State University, Tempe, AZ, United States of America, Ron.Askin@asu.edu, Liangjie Xue

We consider the problem of determining the optimal sizes of task teams for projects with multiple, interdependent tasks. Based on task requirements, nonlinear worksharing functions are used to define cumulative team efficiency as a function of team size. Computational results demonstrate the performance of several strategies and allocation methods for various project configurations and task characteristics.

2 - Dynamic Modeling of Human Decisions Using Decision Field Theory

Andres Abad, University of Michigan, Department of Industrial, and Operations Engineering, Ann Arbor, MI, 48109, United States of America, agabad@umich.edu, Young-Jun Son, Judy Jin

This research aims to extend the decision field theory to model the dynamic characteristics of human decision processes. The inherent linkage between the statistical classifier design and the expected attention weights is at the first time investigated. An adaptive estimation of the expected attention weights is also presented based on sequentially observed human decisions.

3 - Integrated Human Decision Making and Planning Model for Emergency Evacuation Crowd Simulation

Young-Jun Son, Associate Professor, The University of Arizona, Systems and Industrial Engineering, Tucson, AZ, 85721, United States of America, son@sie.arizona.edu, Judy Jin, Seungho Lee

An integrated Belief-Desire-Intention (BDI) modeling framework is proposed for human decision behavior, which involve Bayesian belief network, Decision-Field-Theory, and probabilistic depth first search technique. Attributes of the model are reverse-engineered from human experiments conducted in CAVE. The proposed BDI model is demonstrated for human's evacuation behaviors under a terrorist bomb attack. The environment and agents are implemented in AnyLogic agent-based simulation software.

■ MD26

New Additions to Existing Projects in COIN-OR

Sponsor: Computing Society: Open Source Software (Joint Cluster INFORMS Optimization)
Sponsored Session

Chair: Kipp Martin, University of Chicago, 5807 South Woodlawn, Chicago, IL, United States of America, kipp.martin@chicagogsb.edu

1 - Developing Applications Based on CHiPPS

Yan Xu, SAS Institute Inc., SAS Campus Drive, Cary, NC, 27519, United States of America, Yan.Xu@sas.com, Ted Ralphs, Laszlo Ladanyi, Matthew Saltzman

CHiPPS is the COIN-OR Open Parallel Search Framework, a framework for implementing parallel algorithms based on tree search. The current CHiPPS architecture consists of three layers: ALPS, BiCePS and BLIS. In this talk, first we briefly introduce the main concepts of CHiPPS, then we use VRP/TSP as an example to show how to develop specific applicatoins based on CHiPPS.

2 - Calculating Spare Hessian Using Algorithmic Differentiation

Brad Bell, Principal Mathematician, APL University of Washington, 1013 NE 40th Street, Seattle, WA, 98105-6698, United States of America, bradbell@seanet.com

The CppAD package can use the fact that a Hessian is sparse to reduce the work necessary to calculate the Hessian. We will review how multiple columns of a sparse Hessian can be computed with the same work as one column. CppAD uses the greedy distance two graph coloring algorithm to group columns that can be computed together. We will review this algorithm and some speed tests of the sparse Hessian calculation. Finally we will suggest some ways in which this calculation can be improved.

3 - Modeling Stochastic Programs in COIN FlopC++ and Smi

Alan King, IBM Research, PO Box 218, Yorktown Heights, NY, 10598, United States of America, kingaj@us.ibm.com, Michal Kaut, Tim Hultberg

We present an overview of our proposal for modeling stochastic programs using the combined capabilities of the FlopC++ and Smi packages from COIN-OR.

4 - Recent Developments in OSiL/SE

Horand Gassmann, Professor, Dalhousie University, Faculty of Management, 6100 University Avenue, Halifax, NS, B3H 3J5, Canada, Horand.Gassmann@Dal.Ca, Robert Fourer, Kipp Martin, Jun Ma, Huan-Yuan Sheng

OSiL is an XML schema for the formulation of a large class of mathematical programming problems. This talk concerns recent advances in the description of stochastic programs. Also described are a parser, internal data objects and a rudimentary implementation of a decomposition algorithm.

■ MD27

Performance of Queueing Systems

Sponsor: Applied Probability
Sponsored Session

Chair: Wuqin Lin, Kellogg School of Management, 2001 Sheridan Rd, Evanston, IL, 60091, United States of America, wuqin-lin@kellogg.northwestern.edu

1 - Utility-Maximizing Resource Control: Diffusion Limit and Asymptotic Optimality for a Two-Bottleneck

David D. Yao, IEOR Department Columbia University, New York, NY, 10027, yao@columbia.edu, Hengqing Ye

We study a stochastic network that consists of two servers shared by two classes of jobs under heavy traffic. The real-time allocation of the service capacity among the job classes takes the form of a solution to an optimization problem that maximizes a utility function. We derive the diffusion limit of the network and establish its asymptotic optimality. It also highlights the key issues involved in multiple bottlenecks.

2 - Environment-dependent Ordering Policies in a Production-inventory System in a Random Environment

Keqi Yan, SAS Institute Inc., 500 SAS Campus Dr., Cary, 27513, United States of America, Keqi.Yan@sas.com, Vidyadhar Kulkarni

We study a general production-inventory system where production and demand rates are modulated by a random environment process. When orders from external suppliers are needed, the order quantities can be depend on the state of the environment at the time of order placement. We study the limiting behavior of this system and derive a general stochastic decomposition property in a matrix form. We develop a method to compute the optimal ordering policies that minimize the long run average costs.

3 - An Approximation Model for Sojourn Time Distributions in Multi-server Queueing Networks

Kevin Gue, Associate Professor, Auburn University, Department of Industrial and Systems Eng, Auburn, AL, 36830, United States of America, kevin.gue@auburn.edu, Hyun Ho Kim

We develop an approximation model for the sojourn time distribution of customers or jobs arriving to a multi-server queueing network. The model accepts general interarrival and service times, and is based on the characteristics of phase-type distributions. Distributions produced by the model agree well with those produced by simulation for a variety of serial and general networks. We offer some potential uses of the model in retail order fulfillment systems.

■ MD28

Dynamic Revenue Management
Cluster: Online Decision Making
Invited Session
Chair: Paat Rusmevichientong, paatrus@cornell.edu

1 - An Adaptive Algorithm for Dynamic Assortment Optimization
Paat Rusmevichientong, paatrus@cornell.edu, Max Shen, David Shmoys

We consider the problem of dynamic assortment optimization. In our model, a retailer does not have any prior knowledge about the demand for each product, and must learn the demand by offering different product assortments and observing customer purchases. We propose an adaptive algorithm that integrates demand learning with assortment optimization, and establish convergence properties of the algorithm. Numerical results validate the performance of the algorithm.

2 - Dynamic Pricing Using Scenario Based Optimization
Ruben Lobel, rlobel@mit.edu, Georgia Perakis

We discuss a dynamic pricing problem under fixed capacities. Demand is a function of the price with uncertain parameters. We develop a scenario based optimization model to find a closed-loop pricing strategy that maximizes revenue robustly, without making distributional assumptions on the uncertainty. We provide a bound on the number of scenario samples that achieve a desired confidence level for this solution. We also present numerical results to support our findings.

3 - Approximate Solutions for the Capacity Allocation Problem-Performance and Computation
Thiam Lee, Columbia University, 500W 120th Street, MC 4704, New York, NY, thl2102@columbia.edu, Woonghee Tim Huh, Retsef Levi

We define a new class of solutions for the airline flight capacity allocation problem with independent demands and non-monotonic demand arrivals, and prove for them performance bounds relative to an optimal one. We show an algorithm that obtains from demand samples an instance from this class with high probability. Furthermore, the number of samples required to obtain, with a certain confidence probability, a solution of a desired performance level is polynomial in the parameters.

4 - Demand Learning and Dynamic Pricing for Events
Masoud Talebian, Columbia University, 325 Mudd Bldg, NY, NY, 10027, United States of America, mt2251@columbia.edu, Guillermo Gallego

We consider a revenue management model for events where the capacity provider knows from historical data the premium/discount relative to the core value for different seats in the venue and the customers' elasticity. The provider only has a prior about the market size, and does not know the core value that customers assign to the show. We show how the provider should update his prior based on the market response, and update his prices to maximize expected revenues over a rolling horizon.

■ MD29

Tutorial: Expressive Commerce and Its Application to Sourcing: Experiences from Conducting over $40 Billion of Generalized Combinatorial Auctions
Cluster: Tutorials
Invited Session
Chair: Tuomas Sandholm, Professor, Carnegie Mellon University, Computer Science Department, 5000 Forbes Ave, Pittsburgh, PA, 15213, United States of America, sandholm+@cs.cmu.edu

1 - Expressive Commerce and Its Application to Sourcing: Experiences from Conducting over $40 Billion of Generalized Combinatorial Auctions
Tuomas Sandholm, Professor, Carnegie Mellon University, Computer Science Department, 5000 Forbes Ave, Pittsburgh, PA, 15213, United States of America, sandholm+@cs.cmu.edu

I will discuss a generalization of combinatorial and multi-attribute auctions which we call expressive commerce. Here supply and demand are expressed in drastically greater detail than in traditional electronic auctions, and are algorithmically cleared. This creates a Pareto efficiency improvement in the allocation (aka win-win). I will share our experiences from CombineNet, Inc. of hosting over $40 billion of such transactions over the last eight years in the domain of strategic sourcing, yielding over $5 billion in savings. I will tie in very recent pertinent game theory on a few of the topics. For example, any form of added expressiveness can only increase efficiency. Topics include: -Natural bidding languages that made combinatorial auctions practical here. -The ways by which expressive bidding increases efficiency. -Scalability of state-of-the-art winner determination algorithms. -Expressiveness by the bid taker, and associated scenario navigation capabilities. These enable the bid taker to make the allocation implementable, express preferences, help internal stakeholder alignment, and obtain a quantitative understanding of the tradeoffs available in the supply chain. -How we use winner determination to automatically (re-)engineer the entire (multi-level) supply chain. -How we use winner determination to automatically configure the items to be sourced. -How incumbency and other special considerations can/should be treated.

■ MD30

Modeling Military Systems
Sponsor: Military Applications
Sponsored Session
Chair: Andrew Hall, LTC, United States Army, 4760 N 40th St, Arlington, Va, United States of America, ahall@rhsmith.umd.edu

1 - Optimal Army Officer Retirement
Andrew Hall, LTC, United States Army, 4760 N 40th St, Arlington, Va, 22207, United States of America, Andrew.O.Hall@us.army.mil

We model an Army officer's decision to retire as an optimal stopping problem. We solve the resulting Markov Decision Process by dynamic programming, linear programming and simulation. Previous results suggested an optimal retirement point for Lieutenant Colonels at 23 years. Our results suggest a shift in the optimal retirement point to 20 years. We explore manpower planning and policy implications of shifting retirement behavior and possible mitigation strategies.

2 - The Use of Spies in Strategic Situations
Scott Provan, Professor, Univiversity of North Carolina, Department of Stat. and Operations Research, CB#3260, Chapel Hill, NC, 27599, United States of America, Scott_Provan@UNC.edu

The use of spies is a valuable tool in strategic situations, and it is important to gain a deeper understanding of the underlying framework of spying. We study the use of spies in 2-person matrix games. We formulate the context of a spying in such games, and model a number of situations involving single or multiple types of spies, spies for one or both sides, and the use of decoy strategies to mislead spies. Computational studies indicate the advantage of using spies under various scenarios.

3 - The Aviation Weather Routing Tool: A Decision Support System for Manned/Unmanned Aircraft Routing
David Knapp, Chief, Atmospheric Modeling Applications Branch, Army Research Laboratory, AMSRD-ARL-CI-EM, Bldg 1622, Rm 112A, White Sands Missile Range, NM, 88002-5501, United States of America, dknapp@arl.army.mil, Andrew Butler, David Marlin, Edward Measure, David Sauter, Terry Jameson

A decision support system has been developed to improve the routing of manned/unmanned aircraft systems around adverse weather conditions to improve mission success rates. The Aviation Weather Routing Tool (AWRT) addresses the complexity of forecasting flight route weather impacts on aircraft by implementing an automated route optimization capability to determine the best route(s) to a target area, loitering waypoints, or desired destination point with the lowest enroute weather hazards risk.

4 - Weather for Combat Models: Methodology, Techniques and Results
Richard Shirkey, Dr., Army Research Laboratory, Attn: AMSRD-ARL-CI-EM, WSMR, NM, 88002, United States of America, rshirkey@arl.army.mil

Techniques have been developed that allow significant improvement in weather effects and impacts for combat models. Parametric curves were constructed to represent infrared sensors acquiring targets under specified weather conditions in conjunction with environmental impact thresholds for determination of go/no-go weather situations for platforms or systems. We found that the wargame realism was increased without impacting run time. Results were verified using AWARS.

■ MD31

Searching for Distressed Persons II
Sponsor: The Practice Section of INFORMS
Sponsored Session
Chair: John Frost, Information/Search Planning Specialist, U. S. Coast Guard, Office of Search and Rescue, Suite 3106, 2100 Second St. SW, Washington, DC, 20593-0001, United States of America, John.R.Frost@uscg.mil

1 - History of Operations Research Applied to Search and Rescue
John Frost, Information/Search Planning Specialist, U. S. Coast Guard, Office of Search and Rescue, Suite 3106, 2100 Second St. SW, Washington, DC, 20593-0001, United States of America, John.R.Frost@uscg.mil

This presentation reviews the application of operations research, and search theory in particular, to search and rescue since search theory's initial development during the Second World War.

2 - Planning with Multiple SRUs in SAROPS
Thomas Kratzke, Senior Analyst, Metron, Inc., Reston, VA, United States of America, tkratzke@metsci.com

When assigning rectangular search areas to multiple Search units, one is faced with a large set of constraints. For example, there is a relatively small number of dimensions for each rectangle, and some of the rectangles cannot overlap. In this talk, we discuss the constraints, and the algorithm that we used to find good rectangles for the SRUs.

3 - Applying Optimal Search Theory to Inland SAR: Steve Fossett Case Study
Colleen Keller, Senior Analyst, Metron, Inc, 512 Via de la Valle, Suite 301, Solana Beach, CA, 92075, United States of America, keller@ca.metsci.com, Mark Anderson

Steve Fossett, a famous adventurer, disappeared during a solo pleasure flight in a light aircraft on 3 September 2007 in a remote area of Nevada. An intense search was conducted by both private parties and multiple government agencies. This paper describes an independent effort to aid the on-going search using probabilistic search theory and optimization techniques.

■ MD32

Daniel H. Wagner Prize Competition
Cluster: The Daniel H. Wagner Prize for Excellence in Operations Research
Invited Session
Chair: Allen Butler, President, Daniel H. Wagner Assoc., 2 Eaton Street, Suite 500, Hampton, VA, 23669, Allen.Butler@va.wagner.com

Seven finalist teams have been selected for 2008 and these seven will be presented in three sessions on Monday and the winning entry announced on Tuesday morning.

1 - Route Designs for Delivery of Optical Scan Voting Machines
Michael J. Fry, University of Cincinnati, Jeffrey W. Ohlmann

The 2002 Help America Vote Act required election boards to move to electronic voting by 2006. This change greatly increases the operational complexities of administering elections. We describe our work with Hamilton County, Ohio, to (1) solve a vehicle routing problem with time windows problem to deliver optical scanning voting machines; and (2) modify the means in which poll workers choose machine delivery times in order to gain greater flexibility in our solutions.

2 - An Integrated Outbound Logistics Model for Frito-Lay: Coordinating Aggregate Level Production and Distribution Decisions
Sila Cetinkaya, Associate Professor, Texas A&M University, Industrial & Systems Engineering, College Station, TX, 77840-3131, United States of America, sila@tamu.edu, Halit Uster, Gopal Easwaran, Burcu Keskin

We describe research results that are aimed at improving Frito-Lay's outbound logistics activities via simultaneous optimization of inventory and transportation decisions. We develop an integrated lot-sizing and vehicle routing model with explicit plant-to-store delivery considerations. We present an iterative solution approach that builds on decomposing the model into lot-sizing and routing components. We demonstrate that plant-to-store deliveries, along with efficient inventory and transportation decisions, present a significant opportunity for cost savings.

■ MD33

Matching Demand with Supply in Health Care
Sponsor: Health Applications Section
Sponsored Session
Chair: Sergei Savin, Associate Professor, Columbia Business School, 3022 Broadway, New York, NY, 10027, United States of America, svs30@columbia.edu

1 - Appointment Scheduling with Discrete Random Durations
Mehmet Begen, PhD Candidate, Sauder School of Business, University of British Columbia, 2053 Main Mall, Vancouver, BC, V6T1Z2, Canada, mehmet.begen@sauder.ubc.ca, Maurice Queyranne

We determine optimal appointment times for a given sequence of jobs (medical procedures) on a single processor (operating room, examination facility), to minimize the expected total underage and overage costs when each job has a random duration given by its discrete probability distribution. A simple condition on the cost rates implies that the objective function is submodular and L-convex. Then there exists an optimal appointment schedule which is integer and can be found in polynomial time.

2 - Batching Behavior in an Emergency Department
Hsiao-Hui Lee, PhD Student, Simon School, 711 University Park, Rochester, NY, 14620, United States of America, hsiao-hui.lee@simon.rochester.edu, Vera Tilson, Arvind Sainathan, Gregory Dobson

We model, as a continuous time Markov Chain, resident and attending physicians in and Emergency Department to understand how their decisions to batch work affect both the throughput of the operation and the flow time of patients. Examples include residents batching patient exams before presenting to an attending, and attendings batching the work to access labs, listen to presentations, or see patients after the residents' presentations.

3 - Optimal Outpatient Appointment Scheduling
Ger Koole, VU University Amsterdam, De Boelelaan 1081a, Amsterdam, ZH, 1081 HV, Netherlands, koole@few.vu.nl

We consider outpatient appointment scheduling. We show a local search procedure that converges to the optimal schedule with a weighted average of expected waiting times of patients, idle time of the doctor and tardiness as an objective. We allow for no-shows to happen. For certain combinations of parameters we find the well-known Bailey-Welch rule as optimal appointment schedule.

4 - The "Nurseboy Problem": Nurse Staffing in the Presence of Absenteeism
Sergei Savin, Associate Professor, Columbia Business School, 3022 Broadway, New York, NY, 10027, United States of America, svs30@columbia.edu, Linda Green, Nicos Savva

Unpredictable patient volumes and needs make the identification of effective nurse staffing levels a major challenge for hospitals. This problem is compounded by significant levels of nurse absenteeism which can lead to high costs due to overtime and/or deterioration in patient care. We develop a nurse staffing model which incorporates absenteeism and propose effective staffing policies under several scenarios corresponding to different hospital environments.

■ MD34

Applications of Markov Decision Processes (MDPs) in Healthcare
Sponsor: Health Applications Section
Sponsored Session
Chair: Murat Kurt, Doctoral Student, University of Pittsburgh, Department of Industrial Engineering, Pittsburgh, PA, 15217, United States of America, muk7@pitt.edu

1 - Which Waiting Lists Should an End-stage Liver Disease Patient Join?
Gorkem Saka, Health Economist, Merck Research Labs, 1122 Station Square Blvd., Lansdale, PA, 19446, United States of America, gorkem_saka@merck.com, Oguzhan Alagoz, Mark Roberts, Lisa Maillart, Andrew Schaefer

Each end-stage liver disease patient joins at least one waiting list in order to be eligible for cadaveric liver offers. However, patients have the right to join several waiting lists, a practice referred to as "multiple listing". We analyze the question of where a patient should list in order to maximize her total life expectancy under certain conditions. We model this problem as an MDP. We propose a modified branch-and-bound algorithm to solve the problem and provide numerical results.

2 - Are Living-donor Liver Transplants Timed to Maximize Life Expectancy?

Sepehr Nemati Proon, PhD Student, University of Pittsburgh, 1048 Benedum Hall, Department of Industrial Engineering, Pittsburgh, PA, 15261, United States of America, sepehr.nemati@gmail.com, Mark Roberts, Burhaneddin Sandikci, Andrew Schaefer

The major clinical decision in living-donor liver transplantation is the appropriate time to transplant. We use a Markov decision process model parameterized with clinical data to optimize the timing of the transplant decision for a given end-stage liver disease patient with a living-donor. We compare the timing decision suggested by this model, which maximizes patient's total discounted life expectancy, to the actual transplant decision of the patient and present the results for 721 patients.

3 - Inverse MDP Optimization for Determining Living-donor Liver Transplantation Rewards

Zeynep Erkin, PhD Student, University of Pittsburgh, Department of Industrial Engineering, 1048 Benedum Hall, Pittsburgh, PA, 15261, United States of America, zeyneperkin@yahoo.com, Lisa Maillart, Matthew Bailey, Andrew Schaefer

A Markov decision process model for determining the optimal timing of a living-donor liver transplant to maximize patient life expectancy has been well-studied in the literature. Current practice, however, appears to be suboptimal. Therefore, we examine alternative reward structures under which current practice is optimal. To generate the new rewards, we solve a linear program that minimizes the distance between the data-estimated reward vectors and the new reward vectors.

4 - The Optimal Timing of Statin Initiation for Patients with Type 2 Diabetes

Murat Kurt, Doctoral Student, University of Pittsburgh, Department of Industrial Engineering, Pittsburgh, PA, 15217, United States of America, muk7@pitt.edu, Andrew Schaefer, Nilay Shah, Steven Smith, Brian Denton

Lipid abnormalities increase the risk of coronary heart disease (CHD) and stroke for patients with Type 2 diabetes and can be treated by statins with some potential side effects. We formulate the optimal timing of statin initiation problem as an infinite-horizon Markov decision process. We present several structural properties of the model and compare individualized treatment policies between patients with varying risk factors. We also present computational results based on clinical data.

■ MD35

Teaching Project Management

Sponsor: INFORM-ED
Sponsored Session
Chair: Will Millhiser, Assistant Professor of Management, Baruch College, City University of New York, 1 Bernard Baruch Way, Box B9-240, New York, NY, 10010, United States of America, William_Millhiser@baruch.cuny.edu

1 - Teaching a Case-based Project Management Course

Bert De Reyck, London Business School, Regents Park, London, United Kingdom, bdereyck@london.edu

In 2000 I launched a Project Management course at London Business School, amid scepticism about its suitability in a business school environment. 8 years later, the course attracts more than 200 MBA students each year, making it one of the largest electives, and consistently tops the rankings for evaluation scores. An essential ingredient of this success is the fact that the course is case-based, using real-life projects as a means to present project management frameworks and techniques.

2 - RESCON: A Classroom MFC Application for the RCPSP

Filip Deblaere, Katholieke Universiteit Leuven, Naamsestraat 69, Leuven, BE-3000, Belgium, Filip.Deblaere@econ.kuleuven.be, Erik Demeulemeester, Willy Herroelen

RESCON is an educational software tool for solving and visualizing the resource-constrained project scheduling problem. It has been developed in Microsoft Visual C++ 6.0 and has a window-based user interface. The tool visualizes project networks, project schedules, resource profiles and Gantt charts. Problem instances can either be read in from files or created manually using the GUI. Project schedules can then be calculated using a variety of exact and heuristic solution procedures.

3 - Teaching Goldratt's Critical Chain: The Academic Debate, Open Questions and Numerical Examples

Will Millhiser, Assistant Professor of Management, Baruch College, City University of New York, 1 Bernard Baruch Way, Box B9-240, New York, NY, 10010, United States of America, William_Millhiser@baruch.cuny.edu, Joseph Szmerekovsky

Goldratt's Critical Chain (1997) has been popular in our business schools but a subject of disagreement among our scholars. We survey the literature on the pros/cons of Critical Chain Project Management and discuss strategies for holding this debate with students. Second, we share questions that students ask during the reading, but as far as we know, have not been answered by scholars. Finally, we present numerical examples to reinforce the concepts and highlight complications Goldratt ignored.

■ MD37

Tutorial: Cooperative and Noncooperative Games for Capacity Planning and Scheduling

Cluster: Tutorials
Invited Session
Chair: Nicholas G. Hall, Professor, The Ohio State University, Management Sciences, 2100 Neil Avenue, Columbus, OH, 43210-1144, United States of America, hall_33@fisher.osu.edu

1 - Cooperative and Noncooperative Games for Capacity Planning and Scheduling

Nicholas G. Hall, Professor, The Ohio State University, Management Sciences, 2100 Neil Avenue, Columbus, OH, 43210-1144, United States of America, hall_33@fisher.osu.edu, Zhixin Liu

This tutorial provides an overview of cooperative and noncooperative games for capacity planning and scheduling decisions. For both cooperative and noncooperative games, we present some basic definitions and concepts, review the recent literature, and discuss our own current research. The discussion of the literature of cooperative games includes sequencing games, models of outsourcing operations, and economic lot-sizing and schedule planning games. Our research considers a combined capacity planning and scheduling problem where a supplier allocates capacity to distributors, who may then cooperate to share their capacity allocations and resubmit revised orders. The discussion of the literature of noncooperative games includes capacity allocation mechanisms based on order sizes and sales, incentives for truth telling, models of decentralized versus centralized decision making, and auction mechanisms for capacity allocation. Our research develops an auction mechanism to allocate capacity to various agents with jobs that can be scheduled profitably; depending upon the choice of market good in the auction, there may be some flexibility in converting the allocated capacity into a feasible schedule. We also provide a discussion of future research directions, where we identify several issues that can be studied using new cooperative and noncooperative games.

■ MD38

Integer Programming

Sponsor: Optimization/ Discrete Optimization
Sponsored Session
Chair: Gabor Pataki, UNC-Chapel Hill, Hanes Building, Chapel Hill, NC, United States of America, pataki@email.unc.edu

1 - Enhanced Lift-and-project Cuts from the LP Simplex Tableau

Egon Balas, Professor, Tepper School of Business, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA, 15213, United States of America, eb17@andrew.cmu.edu, Pierre Bonami

We revisit the Balas-Perregaard procedure for generating lift-and-project cuts from the LP simplex tableau, with new details and several generalizations. We discuss computational experience with several variants of the procedure.

2 - Continuing Work on Provably Tight Knapsack Formulations

Dan Bienstock, Professor, Columbia University, Department of IEOR, 500 West 120th St., New York, NY, 10027, United States of America, dano@columbia.edu

We present continuing work on formulations for knapsack problems that guarantee a provably tight bound, regardless of the objective vector.

3 - Basis Reduction and Integer Programming Approaches to Number Partitioning

Bala Krishnamoorthy, Washington State University, PO Box 643113 WSU, Pullman, WA, 99164-3113, United States of America, bkrishna@math.wsu.edu, William Webb, Nathan Moyer

The Number Partitioning Problem (NPP) is to divide n numbers in to two subsets, the difference of whose sums is minimized. We propose a mixed integer program (MIP) model for NPP, for which we consider basis reduction (BR) based reformulations. Second, we describe transformations of NPP to the shortest vector problem (SVP), which we tackle using BR algorithms. Third, we propose a heuristic called truncated NPP, where we solve an NPP instance with the last several digits of the numbers truncated.

4 - On the Size of the Enumeration Tree in Integer Programming Reformulation Techniques

Gabor Pataki, UNC-Chapel Hill, Hanes Building, Chapel Hill, NC, United States of America, pataki@email.unc.edu, Mustafa Tural

We give an upper bound in the size of the enumeration tree in Integer Programming reformulation techniques. As a corollary we show that for almost all IPs, where the coefficients are drawn from from a sufficiently large interval, the size of the enumeration tree for ordinary (i.e. branching on unit variables) branch-and-bound is at most 1.

■ MD39

Network Design

Sponsor: Optimization/ Networks
Sponsored Session
Chair: MohammadTaghi Hajiaghayi, Senior Researcher, AT&T Labs-Research, Rm: C225, 180 Park Ave., Florham Park, NJ, 08904, United States of America, hajiagha@mit.edu

1 - The Directed Pairs Connection Problem

Guy Kortsarz, Rutgers University, Buisness and Science Building, Pen and T, Camden, NJ, United States of America, guyk@camden.rutgers.edu, Zeev Nutov, Moran Feldman

We deal with the problem of connecting a collection of pairs in a directed graph at minimum cost. More generally given a number k the goal is to connect at least k of the pairs at minimum cost. We give improved results for both problems.

2 - Two-stage Robust Network Design with Exponential Scenarios

Vahab Mirrokni, Google Research, New York, NY, United States of America, mirrokni@theory.csail.mit.edu, Rohit Khandekar, MohammadReza Salavatipour, Guy Kortsarz

We study two-stage robust variants of network design problems. We focus on the case of {\em exponentially many} scenarios given implicitly. We present the first constant-factor approximation algorithms for the two-stage robust Steiner tree and robust uncapacitated facility location problems and an $O(\log n)$-approximation for robust Steiner forest problem. We conclude our results by several inapproximability results for these problems.

3 - Graph Augmentation Problems

Samir Khuller, Professor and Associate Chair, University of Maryland, Department Of Computer Science, College Park, MD, 20742, United States of America, samir@cs.umd.edu

This is a survey talk on a basic problem referred to as the Augmentation Problem. You are given a spanning tree of a graph G=(V,E) and we would like to select a subset of the edges of G, to add to T, to make T 2-connected. We consider several different variations - we may require 2-vertex connectivity, or 2-edge connectivity. The edges of G may be unweighted or weighted. The complexity of the problem varies from polynomial to NP-hard depending on the assumptions.

4 - Minimizing Movement

Amin Sayedi, Carnegie Mellon University, 5000 Forbes Ave, Tepper School of Business, PhD program, Pittsburgh, PA, 15213, United States of America, ssayedir@andrew.cmu.edu, MohammadTaghi Hajiaghayi, Erik Demaine, Shayan Oveisgharan, Morteza Zadimoghaddam, Hamid Mahini

We give approximation algorithms and inapproximability results for a class of movement problems. In general, these problems involve planning the coordinated motion of a large collection of objects (representing anything from a robot swarm or firefighter team to map labels or network messages) to achieve a global property of the network while minimizing the maximum or average movement.

■ MD40

Stochastic Programming and Applications

Sponsor: Optimization/ Stochastic Programming
Sponsored Session
Chair: Lewis Ntaimo, Assistant Professor, Texas A&M University, 3131 TAMU, College Station, TX, 77843, United States of America, ntaimo@tamu.edu

1 - A Stochastic Programming Model for the Feature Selection Problem

Clara Novoa, Assistant Professor, Texas State University - San Marcos, 601 University Dr, San Marcos, TX, 78666, United States of America, cn17@txstate.edu

We present a stochastic programming model to address the feature selection problem. A column generation approach is proposed to choose solutions that minimize the expected distortion and have subsets of features whose size is significantly lower than the original feature set. Since the classification or clustering phase is a time consuming one, we study the feature selection problem sampling over subsets of the original data set.

2 - New Development in Searching for Markovian Particles

Nedialko Dimitrov, Postdoctoral Fellow, The University of Texas at Austin, Graduate Program in Operations Research, Austin, TX, 78712, United States of America, ned.dimitrov@gmail.com, David Morton, Constantine Caramanis

We consider the classical problem of searching for a particle moving via a Markov chain. In particular, we consider both discrete search effort and continuous search effort under several objective functions including maximizing the probability of finding the particle in T time steps and minimizing the expected time to find the particle.

3 - Finite Dimensional Approach to Stochastic Approximation in Hilbert Space

Ankur Kulkarni, PhD Student, University of Illinois at Urbana-Champaign, Urbana, United States of America, akulkar3@uiuc.edu, Vivek Borkar

We address a convex stoch prog where the underlying probability measure is not necessarily a counting measure and provide a stochastic approximation algorithm for the same. The stoch prog has a random variable as solution, making the stochastic approximation infinite dimensional and unimplementable. Assuming the solution to lie in a Hilbert space we give a new finite dimensional approach that is soundly justifiable and computationally efficient. Bounds on the dimensionality needed are provided.

4 - MIP Approaches to Joint Chance-Constrained Programs with Random Technology Matrices

Matthew Tanner, PhD Student, Texas A&M University, 3131 TAMU, College Station, TX, 77843, United States of America, mtanner@tamu.edu, Lewis Ntaimo

A joint chance-constrained program with discretely distributed random parameters can be reformulated as an MIP. We present two methods for solving this problem to optimality and give computational results. The first method is a new class of cutting planes called IIS cuts, which are derived from irreducibly infeasible subsets of the constraints of the problem. The second method is a metaheuristic based on a reformulation of the problem that has a finite number of feasible solutions.

■ MD41

Tools and Models for Product Development

Contributed Session
Chair: Lu (Wendy) Xu, IEMS Department, Northwestern University, C210 IEMS Department, 2145 Sheridan Rd, Evanston, IL, 60208, United States of America, wendy-xu@northwestern.edu

1 - System Components Bundling

Kunpeng Li, Utica College, 1600 Burrstone Road, Utica, NY, 13502, United States of America, kli@utica.edu, Dilip Chhajed

We study two prevailing production models in the computer-based industries, the integrated model and the non-integrated model. In the integrated model, a firm designs and manufactures both the hardware and the software of a product. In the non-integrated model, the software is provided by an independent software firm. Consumers have different perceptions towards product quality and variety from the two models. We study optimal model strategies and examine the characteristics of the two models.

2 - Quantitative Models for Evaluating Disruptive Technologies

Chialin Chen, Queen's University, Queen's School of Business, Kingston, ON, K7L 3N6, Canada, cchen@business.queensu.ca, Lucy Q. Liu

We develop quantitative models to analyze the market conditions that favor the introduction of a disruptive technology with the considerations of consumer valuations, costs for production and R&D, and product performance improvements over time. Our analyses show some interesting patterns of designing and positioning existing and disruptive technologies by established and new firms.

3 - Bridge Positioning is a Tool to Optimize Resources

Rajesh Srivastava, Director, Dimat, 2/9/12, Bluemoon,Bhawaninagar,Marol, Mumbai, India, srivastava@vsnl.net

Companies should try and get the highest level of fit between the USP and the UCP of the product / brand they are promoting. Bridge Positioning can play an important role in bridging the gap between customer perception and product USP by relying more on UCP than USP based positioning statement. The study further focused on how bridge positioning can be validated in terms of consumer intention to purchase.

4 - Assessing the Benefits of Integrated Vehicle Life Cycle Planning

Lu (Wendy) Xu, IEMS Department, Northwestern University, C210 IEMS Department, 2145 Sheridan Rd, Evanston, IL, 60208, United States of America, wendy-xu@northwestern.edu, Wallace Hopp, Jonathan Owen, Barry L Nelson

Decisions are made at different stages of vehicle life cycle to address different metrics. They interact with each other. We present a Markovian decision process model to access the value of integrating decisions at portfolio planning and product assignment stages. We use analytical and numerical results to show that incorporating the impact of decisions later in the life cycle enables more sophisticated decisions at upstream stages, and therefore gives better response to demand uncertainty.

■ MD42

Joint Session CS/HAS: Bioinformatics

Sponsor: Computing Society: Bioinformatics and Systems Biology (Joint Cluster HAS)
Sponsored Session

Chair: J E Beasley, Brunel University, Mathematical Sciences, Uxbridge, United Kingdom, John.Beasley@brunel.ac.uk

1 - Multiple Instance Learning Via Margin Maximization

Erhun Kundakcioglu, University of Florida, 303 Weil Hall, PO Box 116595, Gainesville, FL, 32611, United States of America, erhun@ufl.edu, Onur Seref, Panos Pardalos, Cole Smith

Multiple instance learning (MIL) refers to classification of unseen bags based on the labeled bags of instances as the training data. We first consider the margin maximization problem for multiple instance data and prove that the problem is NP-hard. We also propose solution methods and present computational results on publicly available data sets.

2 - Protein Folding Type Prediction via MILP

Fadime Uney Yuksektepe, PhD Candidate, Koc University, College of Engineering, Rumelifeneri yolu, Sariyer, Istanbul, 34450, Turkey, funey@ku.edu.tr, Metin Turkay

In this study, a three-stage mixed-integer programming (MIP) based hyper-box enclosure method is presented for protein folding type prediction. The performance of this method is tested on distinct protein folding type benchmark data sets. Leave-one-out (jack-knife) test results shows that proposed approach is efficient.

3 - A Large-scale Computational Model for DNA Sequencing Problems

Kapil Gupta, Georgia Institute of Technology, Industrial and Systems Engineering, Atlanta, GA, United States of America, kgupta@isye.gatech.edu, Eva Lee

Recent years have witnessed a large number of innovations in the field of bioinformatics, as exemplified by the Human Genome Project. Consequently, the rapid increase in the amount of sequence data requires efficient algorithms to analyze and make important discoveries in this exciting field. The talk will present Integer Programming models to address this need. Computational results involving column generation and cutting planes on large-scale sequence analysis problems will be discussed.

4 - An Optimization Model for Metabolic Pathways

J E Beasley, Brunel University, Mathematical Sciences, Uxbridge, United Kingdom, John.Beasley@brunel.ac.uk, F Planes

We present an integer-programming based optimisation model for metabolic pathways. Given a source compound, and a target compound, this model is capable of recovering the complete experimentally determined pathway reported in the literature. Computational results are reported for 40 metabolic pathways associated with E. Coli.

■ MD43

OR and Strategy I

Cluster: OR and Strategy
Invited Session

Chair: Peter Bell, Professor, Management Science and Information Systems, Richard Ivey School of Business, University of Western Ontario, London, ON, N6A 3K7, Canada, PBell@ivey.uwo.ca

1 - Influence of OR Practices to Drive Corporate Strategic Choices at Procter & Gamble

Glenn Wegryn, Associate Director, Product Supply Analytics, The Procter & Gamble Company, 2 Procter & Gamble Plaza, TN-5-328, Cincinnati, OH, 45202, United States of America, wegryn.gw@pg.com

The speaker will discuss the practical use of O.R. methods, including decision analysis, optimization and simulation, to drive high-value, strategic-level decisions for P&G. Examples will be drawn from supply chain integration in an acquisition, new manufacturing plant investment decisions and brand name decision-making.

2 - Applications of Operations Research to Strategic Policy

Richard Staats, Department Head, MITRE, Box 1232, McLean, VA, 22101, United States of America, rstaats@mitre.org

The development and application of strategy stands at the pinnacle of decision-making in governments and private organizations, but, while the applications of Operations Research (OR) to business processes and portfolio management are legion, the application of OR to the development and implementation of strategic policy is less well documented. This paper explores some OR techniques and approaches that are pertinent to a wide variety of policy and strategy developments and instantiations.

3 - OR and Strategy

Peter Bell, Professor, Management Science and Information Systems, Richard Ivey School of Business, University of Western Ontario, London, ON, N6A 3K7, Canada, PBell@ivey.uwo.ca

This presentation presents results from a longitudinal study of Edelman Prize finalist applications from both the corporate and not-for-profit sectors and suggests a number of different ways that OR work can be linked to an organization's strategy.

■ MD44

Risk Assessment

Cluster: Managing Disruptions in Supply Chains
Invited Session

Chair: Sanjay Kumar, Pennsylvania State University, Erie, Black School of Business, 5101 Jordan Rd, Erie, PA, United States of America, sxk89@psu.edu

1 - Risk Assessment and Critical Asset Analysis for Power Grids

Farnaz Farzan, Graduate Student, Rutgers, The State University of New Jersey, 96 Frelinghuysen Road, Piscataway, NJ, 08854, United States of America, FARNAZFN@eden.rutgers.edu, Ali Rezvani, Kaveh Akram, Mohsen Jafari

We consider the problem of quantifying cyber-attack-related risk in power grids and critical asset identification.Risk is defined as a function of consequence,threat and vulnerability.The consequence assessment is available through existing tools for power grids.The likelihood of threat is taken to be one.The vulnerability assessment includes an attack map in which the reachablity of a node,possible further progress, and the minimum penetration needed for a successful attack are determined.

2 - Modeling Market Share Risk in the Event of Supply Chain Disruption

Mahesh M V, Doctoral Student, IIM Bangalore, Bannerghatta Road, Bangalore, 560076, India, maheshm04@iimb.ernet.in

The paper develops a framework for the modeling and analysis of impact of supply chain disruptive events on the market share of firms in product markets. Evidence from multiple case studies suggest that supply chain disruption would lead to market share loss.The model thus looks at the competitiveness angle in the case of disrption risk in supply chains. The product market is characterised and risk management decisions are presented in such cases.

3 - Emergency Medical Service System Design with Risk Measures

Nilay Noyan, Assistant Professor, SABANCI University, Faculty of Engineering and Natural, Sciences, Orhanli Tuzla., Istanbul, 34956, Turkey, nnoyan@sabanciuniv.edu

The stochastic nature of emergency service requests is a critical issue in constructing models representing real life emergency medical service (EMS) systems. We consider EMS system design models where the network coverage is quantified using risk measures on random unmet demands. In particular, we describe stochastic optimization models involving integrated chance constraints introduced by Klein Haneveld (1986), and dominance constraints introduced by Dentcheva and Ruszczynski (2003).

■ MD45

Inventory Management in Supply Chains

Sponsor: Manufacturing & Service Oper Mgmt/Supply Chain Management
Sponsored Session

Chair: Lawrence V. Snyder, Assistant Professor, Lehigh University, 200 West Packer Ave., Mohler Lab, Bethlehem, PA, 18015, United States of America, larry.snyder@lehigh.edu

1 - Finding Near-optimal (r,nQ,T) Policies is Not Harder Than Solving Single-stage Problems

Kevin Shang, Duke University, Fuqua School of Business, Durham, NC, United States of America, khshang@duke.edu, Sean Zhou

We consider a periodic-review, serial inventory system in which each stage implements an echelon (r,nQ,T) policy. Two types of fixed costs are considered: one is associated with producing a batch, and the other is associated with each inventory review. The objective is to find policy parameters such that the total supply chain cost per period is minimized. We propose a near-optimal heuristic by solving a series of single-stage problems with the original problem data.

2 - Spare Parts End of Life Inventory Problem

Morteza Pourakbar, PhD Candidate, Erasmus University Rotterdam, 3000 DR, Rotterdam, Netherlands, pourakbar@few.eur.nl, Rommert Dekker

We consider an appliance manufacturer problem of controlling the inventory of spare parts in the final phase, which begins when the production of the part is discontinued and ends when the last service contract expires. We consider the possibility of an alternative policy such as swapping the defected part. We develop an optimal solution approach to find final order quantity and time to switch to the alternative policy simultaneously.

3 - Capacity Competition in Multi-indentured Service Supply Chain

Sang-Hyun Kim, Assistant Professor, Yale School of Management, 135 Prospect Street, New Haven, CT, 06520, United States of America, sang.kim@yale.edu, Morris Cohen, Serguei Netessine

We study a setting in which multiple firms providing different components of a product face investment decisions that impact after-sales service performance. In particular, each component provider can invest in either service capacity or spare parts inventory. A product-level service requirement demanded by the customer creates an externality among firms that drives strategic behavior. We contrast between the efficiencies of two commonly observed contracts under this environment.

4 - A Scalable Heuristic for Base-stock Levels in Multi-echelon Distribution Systems

Zumbul Bulut, zub205@lehigh.edu, Ying Rong, Lawrence V. Snyder

We construct a decomposable upper bound for the optimal cost of distribution systems with stochastic demand managed with a continuous-review base-stock policy and FIFO allocation rule. By simplifying the upper bound construction procedure and by utilizing the risk-pooling effect, we propose a heuristic for approximating the base-stock levels of all locations. Our heuristic outperforms other recent heuristics on most test instances with average cost 0.81% higher than the optimal cost.

■ MD46

Information Sharing Models in Supply Chain Management

Sponsor: Manufacturing & Service Oper Mgmt/
Supply Chain Management
Sponsored Session

Chair: Gad Allon, Kellogg School of Management, 2001 Sheridan Road, Evanston, IL, United States of America, g-allon@kellogg.northwestern.edu

1 - Buying from the Babbling Newsvendor: Availability Information and Cheap Talk

Gad Allon, Kellogg School of Management, 2001 Sheridan Road, Evanston, IL, United States of America, g-allon@kellogg.northwestern.edu, Achal Bassamboo

Provision of real-time information by a firm to its customers has become prevalent in recent years in both the service and retail sectors. In this paper, we study a retail operations model where customers are strategic in both their actions and in the way they interpret information, while the retailer is strategic in the way it provides information. This paper focuses on the ability (or the lack thereof) to communicate credibly unverifiable information.

2 - On the Value of Commitment and Availability Guarantees when Selling to Strategic Consumer

Fuqiang Zhang, Assistant Professor, Washington University, Olin Business School, St. Louis, MO, United States of America, FZhang22@wustl.edu, Xuanming Su

The possibility of stockouts discourages patronage when consumers incur a sunk cost before visiting the store. We formulate a rational expectations game to model this situation. We find that commitment and availability guarantees are useful strategies that can increase the seller's profits.

3 - Trust and Trustworthiness in Forecast Information Sharing

Ozalp Ozer, Stanford University, Stanford, CA, United States of America, oozer@stanford.edu, Kay-Yut Chen, Yanchong Zheng

We examine the problem of a supplier soliciting forecast information from a manufacturer who has private information about future demand, and has an incentive to exaggerate. Standard theory predicts that asking for forecast will result in a "babbling equilibrium" in which no information will be exchanged. However, laboratory experiments revealed that parties exchange information far better than predicted. We propose a behavioral theory and model to explain this phenomenon.

■ MD47

2008 Pierskalla Prize Finalists

Sponsor: Health Applications Section
Sponsored Session

Chair: Brian Denton, Assistant Professor, Edward P. Fitts Department of Industrial & Systems Engineering, North Carolina State University, 111 Lampe Drive, Raleigh, NC, 27695-7906, United States of America, bdenton@ncsu.edu

1 - Bonder Scholarship: Estimating the Patient's Price of Privacy in Liver Transplantation

Burhaneddin Sandikci, The University of Pittsburgh, Pittsburgh, PA, bus2+@pitt.edu

The end-stage liver disease patients in the United States join a waiting list for cadaveric liver transplantation. The details of the composition of this list are only partially available to the public. We call the loss associated with having suboptimal accept/reject decisions due to incomplete information as the price of privacy. We present different models (for an individual patient) to estimate the patient's price of privacy. We also present numerical results parameterized by clinical data.

2 - Novel Optimization Models for Abnormal Brain Activity Classification

Art Chaovaitwongse, Assistant Professor, Rutgers University, 96 Frelinghuysen Rd, Piscataway, NJ, 08854, United States of America, wchaoval@rci.rutgers.edu, Ya-Ju Fan, Rajesh Sachdeo

This paper proposes a new classification technique, called Support Feature Machine (SFM), for multidimensional time series data. The proposed technique was applied to the classification of abnormal brain activity represented in electroencephalograms (EEGs). The idea is to optimize the electrode selection such that the selected electrodes show a good separability between two classes. The results suggest that the proposed technique can be used in practical settings of brain diagnosis.

3 - Optimal Design of a Pharmaceutical Price-Volume Agreement

Hui Zhang, Lakehead University, 955 Oliver Rd, Thunder Bay, ON, P7B 5E1, Canada, hzhang2@lakeheadu.ca, Greg Zaric

Price-volume agreements are commonly negotiated between drug manufacturers and third-party payers for drugs. In one form of price-volume agreement a drug manufacturer pays a rebate to the payer on a portion of sales in excess of a specified sales threshold. We examine the optimal design of such an agreement under two different assumptions about pricing, each under complete and asymmetric information about the mean demand.

■ MD48

Joint SessionTMS/NPD: TMS Distinguished Speaker: Carliss Baldwin (HBS)

Sponsor: Technology Management, New Product Development
Sponsored Session

Chair: Sebastian Fixson, Babson College, Tomasso Hall 226, Babson Park, MA, 02457, United States of America, sfixson@babson.edu

1 - A Design-centric View of the Economy

Carliss Baldwin, Professor, Harvard Business School, Baker Library 355, Boston, MA, United States of America, cbaldwin@hbs.edu

Designs are the instructions based on knowledge that turn resources into things that people use and value. All goods and services have designs, and a new design lies behind every innovation. I argue that designs - sometimes called recipes (Nelson and Winter) or prescriptive knowledge (Mokyr) - are a special kind of knowledge deserving of focused attention by scholars of innovation. In the first place, all innovation rests on new designs. An innovation is, by definition, a new design that has been realized, that is, turned into a new product or process. In the second place, designs have observable structures (architecture). Their structure can be mapped in terms of hierarchies of modules with coordinating interfaces. Design structure influences (but is also influenced by) the organization of firms and the economy, including the location and design of transactions. Thirdly, the unit of change or innovation is not an entire product, process or system, but a module within the product, process or system. Modules are "units of a larger system whose elements are powerfully connected among themselves and relatively weakly connected to elements in other units." Thus it is relatively easy to substitute one module design for another without changing other parts of the system. As a result, modules carry option value, which in turn provides incentives for to invest resources in innovative effort. Investigating the modular structure of designs, the option value of modules, and how different institutions support or impede the evolution of complex designs is an exciting, open avenue of inquiry in the study of technological change and innovation.

■ MD49

Monte Carlo Methods in Information Management and Computer Interface Design

Sponsor: Simulation - INFORMS Simulation Society
Sponsored Session

Chair: Peter Haas, IBM Almaden Research Center, 650 Harry Raod, San Jose, CA, United States of America, peterh@almaden.ibm.com

1 - Advances in Processing SQL Queries on Probabilistic Data

Christopher Re, University of Washington, Computer Science Department, Seattle, WA, United States of America, chrisre@cs.washington.edu, Dan Suciu

A SQL query over a relational database returns a set of answers (tuples), which in practice can be often be quite large: hundreds or thousands of tuples. When the relational data is probabilistic, then the SQL system needs to compute for each answer tuple a probability. This computation is expensive, because it requires running a Monte Carlo simulation, and needs be repeated for each tuple in the answer. This work presents two methods for speeding up the SQL processor.

2 - Optimizing Touch-screen Keyboards for Human Performance and Learning

Barton Smith, Manager, Collaboration Science, IBM Research, 650 Harry Road, San Jose, CA, 95120, United States of America, basmith@almaden.ibm.com, Shumin Zhai

To increase the efficiency of text input on the increasingly powerful and ubiquitous hand-held devices, we have found near optimal layouts for letter positions on touch-screen keyboards using a Metropolis Monte Carlo Method. The objective functions used in the simulations included a term that models the input speed for expert users and was based on empirically-determined letter pair frequencies from collections of sampled text. Substantial text input speed improvements were obtained.

3 - A Monte Carlo Approach to Information Recovery

Jun Yang, Professor, Duke University, Durham, Durham, NC, 27708, United States of America, junyang@cs-duke.edu, Haixun Wang, Junyi Xie, Yuguo Chen, Philip S. Yu

Recently, we have witnessed a surge of interest in noisy and incomplete data. An approach for recovering information from such data should incorporate prior knowledge, even if it has complex forms that do not admit closed-form solutions. Moreover, the approach should quantify uncertainties and correlations in the recovered data. We present such an approach based on Monte Carlo sampling, and illustrate it in the contexts of noisy sensor data and privacy-preserving data publishing.

4 - MCDB: A Monte Carlo Approach to Handling Uncertainty in Database Systems

Chris Jermaine, University of Florida, Computer and Info Sciences and Eng. Dept, Gainesville, FL, 32611, United States of America, cjermain@cise.ufl.edu

MCDB is a database system that allows a user to attach distributions to database records, to represent uncertainty that is present within the records. To answer queries, MCDB generates many database instances using those distributions, and runs the underlying query over each of them to measure the effect of the uncertainty on the query result. MCDB's Monte Carlo approach allows specification of arbitrary distributions and estimation of arbitrary functionals of the query-result distribution.

■ MD50

Computational Integer Programming IV

Sponsor: Optimization/ Computational Optimization and Software (Joint Cluster Optim/CS)
Sponsored Session

Chair: Todd Easton, Associate Professor, Kansas State University, 2021 Durland Hall, Manhattan, KS, 66506, United States of America, teaston@ksu.edu

1 - A Parallel Branch-and-cut Algorithm for Solving Dense Market-share Instances

Eva Lee, Associate Professor and Director, Georgia Institute of Technology, Ctr for Operations Research in Medicine, Industrial & Systems Engineering, Atlanta, GA, 30332-0205, United States of America, evakylee@isye.gatech.edu, Sid Maheshwary

In this talk, we will describe a parallel branch-and-cut algorithm involving cutting planes derived from the conflict hypergraphs of a 0/1 integer program. Aggregated branching and separation heuristics are developed. Applications to dense MIP instances arising from market-share will be presented.

2 - Randomization and Rounding Heuristics for Finding Feasible Solutions of General Integer Programs

Mahdi Namazifar, PhD Student, University of Wisconsin-Madison, 3239 Mechanical Eng. Building, 1513 University Av., Madison, WI, 53706, United States of America, namazifar@wisc.edu, Andrew Miller

Finding integer feasible solutions for a general mixed integer program (MIP) is far from trivial. In this research we seek to find feasible solutions by rounding randomly generated points of the polyhedron defined by an LP relaxation. We generate these points in such a way that they are likely to be "close" to the optimal solution of the LP relaxation, and therefore of good quality. The initial results show that this method could be promising for many MIPs.

3 - UAV Routing with Limited Fuel Burn Variance

Siriwat Visoldilokpun, PhD Student, University of Texas at Arlington, PO Box 19017, The University of Texas at Arlington, Arlington, TX, 76019, United States of America, siriwatvi@yahoo.com, Jay Rosenberger

We present a branch-and-cut-and-price algorithm for a UAV routing problem in which we limit variance of fuel consumption. The problem is modeled as a set-partitioning problem with a quadratic constraint. The pricing sub-problem generates new routes by solving a constrained shortest path problem. We show that the quadratic constraint can be reduced to a single knapsack constraint. We propose a new class of valid inequalities to encourage integrality. Finally, computational results are discussed.

4 - The Fobenius Number and the Unbounded Knapsack Problem

Ping Heidi Huang, Research Scientist, Regenstrief Center for Healthcare Engineering, Purdue University, West Lafayette, IN, 47907, United States of America, huang74@purdue.edu, Thomas L. Morin

For the unbounded knapsack problem, turnpike theorems specify a lower bound on optimally loading at least one unit of the best item (the one with the highest bang-for-buck ratio). They can be used for problem preprocessing. Their successive applications reduce the problem size, and thus lower the computational requirement. We consider loading not only the best but also the second best item to achieve even smaller bounds. The new theorems are based upon a classical result on the Frobenius number.

■ MD51

Policy Issues in Information Systems

Sponsor: Information Systems
Sponsored Session

Chair: Subhajyoti Bandyopadhyay, University of Florida, Warrington College of Business, Gainesville, FL, United States of America, shubho.bandyopadhyay@cba.ufl.edu

1 - Net Neutrality, Broadband Market Coverage, and Innovations at the Edge

Hong Guo, University of Florida, 351 STZ, PO Box 117169, Gainesville, FL, 32611, United States of America, guohong@ufl.edu, Subhajyoti Bandyopadhyay, Hsing Cheng

The policy debate of net neutrality has the potential to alter the dynamics of accessing online content in U.S. How net neutrality affects broadband market coverage and innovations at the edge are crucial issues. We propose a game theoretical model with the ISP serving as the intermediary between content providers and consumers. We perform a two-sided market analysis to investigate how the regulation (Net Neutrality) will affect innovations and market coverage on the two sides of the market.

2 - Transfer of Security Breach Information

Jackie Rees, Purdue University, 100 S. Grant Street, West Lafayette, IN, 47907, United States of America, jrees@purdue.edu, Karthik Kannan, Ta-Wei Wang

This paper examines whether the security breach information announced by news articles is transferred within industry, supply chain, and / or within affiliated companies. After exploring the existence of information transfer, we further investigate why some non-breached firms are more seriously affected than others.

3 - Digitizing and Sharing Health Records

Zafer Ozdemir, Assistant Professor, Miami University, 319 Upham Hall, Oxford, OH, 45056, United States of America, ozdemir@muohio.edu, Subhajyoti Bandyopadhyay

Electronic health records (EHR) have an enormous potential to improve the safety, quality, and efficiency of health care. The availability of complete patient health information at the point of care delivery can prevent many errors and adverse events from occurring. Unfortunately, the adoption of EHR has been lagging in the U.S. In this research we investigate the economic policies that can help facilitate adoption by medical providers, as well as the welfare implications of these policies.

4 - The Impact of Digital Technologies on Government Cultural Policy

Sean Marston, Ph D Student, University of Florida, PO Box 117169, Gainesville, FL, 32611-7150, United States of America, sean.marston@cba.ufl.edu, Juan Feng, Hsing Cheng, Gary Koehler

The advances in digital technology create new avenues, such as the internet, for consumers to access foreign entertainment programs bypassing the government protection methods. We build a unified analytical framework to study the impact of digital technology on traditional cultural protection policies, including quota, tariff and subsidy.

■ MD52

New and Remanufactured Product Management

Cluster: Environmentally Conscious Operations / Closed Loop Production Supply Chain
Invited Session
Chair: Ana Muriel, Associate Professor, University of Massachusetts Amherst, 160 Governors Drive, Amherst, MA, 01003, United States of America, muriel@ecs.umass.edu

1 - Transient and Steady State Profitability of New/Remanufactured Product Substitution

Ana Muriel, Associate Professor, University of Massachusetts Amherst, 160 Governors Drive, Amherst, MA, 01003, United States of America, muriel@ecs.umass.edu, Yue Jin, Yihao Lu

We investigate the profitability of offering remanufactured products for a monopoly firm in single-period and steady state, multi-period settings. We identify when customer segmentation drives the remanufacturing decision, so that the firm benefits from offering new products as remanufactured. While in the single period model the substitution decision depends solely on the new product cost, it depends on the weighted average of manufacturing and remanufacturing cost in the steady state.

2 - Optimal Prices and Production Rate in a Closed Loop Supply Chain under Heavy Traffic

Sarah Ryan, Professor, Iowa State, Ames, IA, 50011, United States of America, smryan@iastate.edu, Ananda Weerasinghe, Lizhi Wang, Arka Ghosh

We analyze a simple queuing network model of a manufacturing and remanufacturing firm. Long run average cost is minimized by setting the price ratio of remanufactured to new products to induce heavy traffic and then solving a diffusion control problem for the asymptotically optimal production rate. A similar analysis applies to minimizing infinite horizon discounted cost. Numerical results show how various parameters affect the optimal decisions.

3 - On Product Life and Remanufacturability in a Manufacturer-service Provider Supply Chain

Jo Min, Iowa State University, IMSE Department, 2019 Black, Ames, IA, 50011, United States of America, jomin@iastate.edu, Sasidhar Malladi

We model and analyze the economic relationships among the levels of product life and remanufacturing under the framework of a manufacturer/remanufacturer and a service provider who utilizes the manufacturer's product to provide service to his/her customers. We also discuss the economic impact of various environmental regulations on the aforementioned supply chain in terms of product life, remanufacturability, and profitability.

■ MD53

Trading & Technology in Markets

Sponsor: Financial Services
Sponsored Session
Chair: Bruce Weber, Professor of Information Management, London Business School, Regents Park, London, NW1 4SA, United Kingdom, bweber@london.edu

1 - Trading Content Access and Reuse Rights to Support Social Production Models for Culture Goods

Karl Reiner Lang, Professor, Baruch College, CUNY, Zicklin School of Business, 55 Lexington Ave, B11-220, New York, NY, 10010-5585, United States of America, Karl_Lang@baruch.cuny.edu, Roumen Vragov, Richard Shang

Using Web 2.0 technologies producers and consumers of digital culture goods increasingly collaborate in co-creating new products. We present an electronic market design that supports social production models for cultural content and study experimentally the economic impacts of trading products with different content access and reuse licensing arrangements.

2 - Adverse SOX Disclosures and Persistent Portfolio Underperformance

Bruce Weber, Professor of Information Management, London Business School, Regents Park, London, NW1 4SA, United Kingdom, bweber@london.edu

Portfolios made up of companies disclosing SOX corporate governance weaknesses in the period 2003-07 underperform the market. Mandatory disclosures began with 2005 10Ks of firms valued $75 million+. Noncompliant firms performed in line with an equal weighted index before 2005, but underperform after. Firms that fail to remediate and disclose material weaknesses in their 2006 10Ks have annual returns 29% below an index benchmark. Firms that remediate underperform by 22% annually.

3 - Shareholder Returns Reactions to IT Standard Setting Events

Eric Walden, Professor, Texas Tech University, Rawls College of Business, Box 42101, Lubbock, TX, 79409, United States of America, eric.walden@ttu.edu

Using the event study methodology on a sample of 789 standard setting events, we test the hypothesis, and find it true, that increasing the number of firms participating in a standard setting initiative decreases the systematic risk of each firm but increases the unsystematic risk to each firm.

■ MD54

Joint Session Risk/DA/Homeland: Game Theory and Homeland Security

Cluster: Risk Security, Decision Analysis, and Homeland Security
Invited Session
Chair: Jun Zhuang, Assistant Professor, Department of Industrial and Systems Engineering, University at Buffalo, The State University of New York, Buffalo, NY, 14260, United States of America, jzhuang@buffalo.edu

1 - A Game-theoretic Model for Jamming Radio-controlled Improvised Explosive Devices

Kyle Lin, Associate Professor, Naval Postgraduate School, 1411 Cunningham Rd, Monterey, CA, 93943, United States of America, kylin@nps.edu, Yu-Chu Shen

An electronic jammer can emit electromagnetic energy to interfere with radio signals that detonate improvised explosive devices. Due to power and other constraints, the jammer often needs to select which radio frequencies to interfere with. This presentation discusses a game-theoretic model to solve this problem.

2 - Constrained Defense Allocations for Multiple Targets

Susan Martonosi, Harvey Mudd College, 301 Platt Blvd., Claremont, CA, 91711, United States of America, martonosi@hmc.edu, Eugene Quan

The decision of how to allocate limited security resources to defend several potential targets for attack is an important problem in homeland security. We consider a two-target game involving an attacker and defender, who must choose at what levels to attack/defend each target, subject to budget constraints. We show how the attacker's/defender's respective decisions to attack/defend neither, one or both targets depend on the size of their respective budgets and other game parameters.

3 - How Many Containers to Inspect to Deter Terrorist Attacks

Naraphorn Haphuriwat, Research Assistant, University of Wisconsin-Madison, 3237 Mechanical Engineering Building, 1513 University Avenue, Madison, WI, 53706, United States of America, naraphoh@cae.wisc.edu, Vicki Bier

This research project aims to construct a model for identifying the optimal number of containers to inspect in order to minimize the defender's expected loss, using game theory. We consider multiple types of attackers; each deciding whether to smuggle a particular type of weapon into the U.S. Results show that with a sufficiently high detection probability (and a sufficiently high smuggling cost to the attacker), attackers can be deterred with less than one hundred percent inspection.

4 - Modeling Secrecy and Deception in a Multiple-period Attacker-defender Signaling Game

Jun Zhuang, Assistant Professor, Department of Industrial and Systems Engineering, University at Buffalo, The State University of New York, Buffalo, NY, 14260, United States of America, jzhuang@buffalo.edu, Vicki Bier, Oguzhan Alagoz

In this work, we apply game theory to model strategies of secrecy and deception in a multiple-period, attacker-defender, resource-allocation and signaling game with incomplete information. Our model provides insights into the balance between capital and expense for defensive investments, and shows how defenders can achieve more cost-effective security through secrecy and deception in a multiple-period game. We solve our model using numerical dynamic programming methods.

■ MD55

Security and Resilience in Telecommunications Networks

Sponsor: Telecommunications
Sponsored Session
Chair: Louis A (Tony) Cox, Jr., TCoxDenver@aol.com

1 - A Risk Analysis Model for Internet Security Management for Organizations

Soumyo D. Moitra, Professor, IIM Calcutta, Diamond Harbour Road, Joka, Kolkata, WB, 700104, India, sdmoitra@hotmail.com

This paper proposes a model that would help an organization achieve an optimal network security. The model considers the patterns of Internet crimes against organizations and postulates a relationship between security measures and incidence of cyber attacks. The model balances the reduction in the expected damage caused to the organization's systems with the cost of the network security. An illustrative example is provided. The model can be implemented quite easily by organizations.

2 - The Network Restoration Ratio and Meshiness

John Klincewicz, Principal Member of Technical Staff, AT&T Labs, 200 South Laurel Avenue, Room D5-3C06, Middletown, NJ, 07748, United States of America, klincewicz@att.com, Herbert Shulman

Given a set of nodes and traffic demands, an important problem is to find a minimum cost topology (links and link capacities) that can carry the traffic under normal and failure conditions. In our investigation, we studied the relationship between "Restoration Ratio", a measure of overbuild, and Average Node Degree, a measure of "meshiness." In this talk, we describe a number of interesting empirical results relating these two measures, based on an analysis of a large number of networks.

3 - Risk Analysis of Internet Interconnection Architecture

Dohoon Kim, Professor, Kyung Hee University, School of Business, Hoegi-dong 1, Dongdaemoon-gu, Seoul, 130-701, Korea, Republic of, dyohaan@khu.ac.kr

This paper studies a way to increase stability and reliability of the Internet interconnection network. First, we summarize various interconnection options. Then, conducted is a series of experiments to identify the weakest point of the current Internet interconnection system. Based on our simulation results, we present not only the guidelines for a robust interconnection architecture, but also a risk analysis framework to evaluate pros and cons of interconnection alternatives.

4 - Game Theory Models of Telecommunications Networks Resilient Against Terrorist Attacks

Louis A (Tony) Cox, Jr., TCoxDenver@aol.com

How successfully can telecommunications networks withstand deliberate attacks by intelligent agents? Although optical networks can now be designed that quickly reroute traffic around affected areas, network operators may lack incentives to build them. Network owners and users may both benefit from binding commitments to make larger investments in network resiliency.

■ MD56

Freight Management

Sponsor: Transportation Science & Logistics
Sponsored Session
Chair: Yongpei Guan, Assistant Professor, University of Oklahoma, 202 West Boyd Street, Rm124, Norman OK 73019, United States of America, yguan@ou.edu

1 - A Study of Crane Scheduling for Berth Allocation

Kang-Hung Yang, PhD Student, University of Oklahoma, 114 W. Constitution St. Apt. G, Norman, OK, 73072, United States of America, kang_yang@ou.edu, Zhili Zhou, Yongpei Guan

Berth allocation and crane scheduling are two relevant research topics for container terminal operations. Most past researches focused on either berth allocation or crane scheduling. In this talk, we study incorporating crane scheduling into berth allocation problem. We study a mathematical model for the problem and develop algorithms that include heuristics and exact solution approaches. Experiments show the effectiveness of our approach compared with the one obtained by a commercial software.

2 - An Integrated Routing and Capacity Management Model for Rail Operations

Pavankumar Murali, Doctoral Student, USC, 3715 McClintock Ave, GER 240, Univ. of Southern California, Los Angeles, CA, 90089-0193, United States of America, pmurali@usc.edu, Fernando Ordonez, Maged Dessouky

We present an integer programming model to route & schedule trains through a network, based on expected travel times, to minimize delays. Aggregation techniques are employed to maintain the tractability of the model while routing trains over large complex networks. Delay estimation equations for the aggregated sections of a network are developed using simulation. This integrated routing & capacity management model is validated using a railway network in Los Angeles with the actual daily traffic.

3 - Data Mining for the Development of A Global Port-to-port Commodity Movement Database

Jiahui Wang, University of Oklahoma, 202 W Boyd St., Room 216, Norman, OK, 73071, United States of America, jiahuiwang@ou.edu

A clear understanding of the containerized freight flow movement from ports to ports is critically important. This paper starts with a comprehensive survey of containerized freight databases available in the USA. Secondly, the paper applies a simple data mining model in containerized freight movement project. Some useful software packages, such as TransCAD in GIS, MatLab in math, Access in database are also discussed with respect to their relative merits in data mining and integration.

4 - Modeling the Effects of a Transportation Security Incident upon the Marine Transportation System

David Kelton, Professor, University of Cincinnati, Department of Quant. Analysis & Ops. Mgmt., Cincinnati, OH, 45221-0139, United States of America, david.kelton@uc.edu, Edward Pidgeon, Gerald Brown, Jeff Kline

We simulate US west-coast container ports with an eye toward the effect of incapacitation or degradation of one or several ports. If a ship's destination port is down, the shipper's economic self interest determines an alternate port. We include container unloading, storage, and landside transport to one-digit ZIP codes. Outputs include demurrage, time delays, and utilizations. Several transportation security incidents are modeled and their effects are measured.

■ MD57

Panel Discussion: Early Career Tips for Tenure and Promotion

Sponsor: Junior Faculty Interest Group
Sponsored Session
Chair: Eylem Tekin, Assistant Professor, Texas A&M University, Industrial and Systems Engineering, College Station, TX, 77843, United States of America, eylem@tamu.edu

1 - Early Career Tips for Tenure and Promotion

Moderator; Mark Ferguson, Associate Professor, Georgia Tech, 800 W Peachtree St, Atlanta, GA, 30308, United States of America, Mark.Ferguson@mgt.gatech.edu, Panelists: Serguei Netessine, Max Shen, Karen Smilowitz, Esma Gel

In this panel session, we will discuss the expectations that junior faculty in engineering and business schools face. The panelists will share their own experiences regarding the tenure process. The goal of the panel is to highlight the measures with respect to publications, service, teaching and time management issues, and provide effective strategies to be successful in the tenure process. Part of the panel will be dedicated to interactive discussion with the audience.

■ MD58

Joint Session AAS/TSL: Aviation System Performance Analysis II

Sponsor: Aviation Applications, Transportation Science & Logistics
Sponsored Session

Chair: Mark Hansen, Professor, U.C. Berkeley, 114 McLaughlin Hall, U.C. Berkeley, Berkeley, CA, 94720, United States of America, mhansen@ce.berkeley.edu

1 - Measuring and Modeling National Airspace System Level of Service

Tasos Nikoleris, PhD Student, U.C. Berkeley, 107 McLaughlin Hall, U.C. Berkeley, Berkeley, CA, 94720, United States of America, nikoleris@berkeley.edu, Mark Hansen, Jing Xiong

In this paper we introduce an alternative delay metric, Daily Average Flight Time Index, which avoids shortcomings in measuring delays, and can be decomposed into different flight phase components. We then employ this metric to model day to day variation in NAS level of service. First, we consider the impacts of weather forecast errors. Second, we investigate how casual factors contribute to delay in different flight phases.

2 - Impact of Convective Weather on Outages of NAS Equipment

Jasenka Rakas, Institute of Transportation Studies, 107 McLaughlin Hall, Berkeley, CA, United States of America, jrakas@ce.berkeley.edu, Zhuolun Yao

The safety and operability of airports and airspace depends on the functionality of critical automation, surveillance, navigation and landing systems equipment. Weather is one of the main contributors to equipment outages, specifically lightning strikes. This study analyzes the impact of convective weather on service interruptions of equipment related to the National Airspace System (NAS) so that resources can be directed at the facilities found to be most vulnerable.

3 - Fast-time Simulation of the Benefits of the FAA's Operational Evolution Partnership

Joseph Post, Manager, Modeling and Simulation, FAA/ATO-P, 800 Independence Avenue, SW, Washington, DC, 20591, United States of America, Joseph.Post@faa.gov, Kimberly Noonan, John Gulding, James Bonn, Daniel Murphy

The FAA uses computer models to quantify the impact of planned investments on the performance of the National Airspace System (NAS). NASPAC, the principle system-wide model in use, is a discrete-event simulation which represents the NAS as a network of airport and airspace queues. The authors present the results of a simulation study of the projected benefits to NAS users of the Operational Evolution Partnership (OEP), the Agency's modernization plan.

4 - Passenger Flow Simulation Model in A Complex Networked Transportation System

Danyi Wang, Metron Aviation Inc., 45300 Catalina Ct., Dulles, VA, 20166, United States of America, wang@metronaviation.com, George Donohue, Bert Hackney, Lance Sherry

This paper describes a passenger flow simulation which captures the asymmetric and unique passenger trip on-time performance and reflects the complexity and significance of the impact of a small set of cancelled flights and missed connections on passenger trip delays. It measures system performance from the flying public's view. Furthermore, it enables researchers to conduct experiments outside the range of historical data.

■ MD59

Pricing Issues and Applications

Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session

Chair: Victor Araman, AUB/NYU, 44 West Fourth Street, New York, NY, Lebanon, varaman@stern.nyu.edu

1 - Clearing Pricing Optimization at Zara

Felipe Caro, Assistant Professor, UCLA Anderson School of Management, 110 Westwood Plaza, Suite B420, Los Angeles, CA, 90095, United States of America, fcaro@anderson.ucla.edu, Jeremie Gallien

As part of an ongoing collaboration with Spain-based retailer Zara, we address the problem of deciding the price markdowns during clearance sales. We have approached the pricing problem by formulating two models, one to forecast demand during clearance sales, and the other to optimize the markdown decisions with a finite horizon in mind. The main challenge in the forecasting model has been to overcome the lack of pricing data due to Zara's single-price policy during the regular season.

2 - Computing Bid-prices for Revenue Management under Customer Choice Behavior

Gustavo Vulcano, Stern School of Business, New York University, 44 West Fourth St, Suite 8-76, New York, NY, 10012, United States of America, gvulcano@stern.nyu.edu, Juan Manuel Chaneton

We develop a stochastic approximation algorithm to compute bid prices for network revenue management, accounting explicitly for choice behavior effects. Our numerical experiments show that the approach has interesting potential.

3 - Dynamic Pricing with Reluctant Customers

Victor Araman, AUB/NYU, 44 West Fourth Street, New York, NY, Lebanon, varaman@stern.nyu.edu

Products proliferation and market competition make the consumer more reluctant in buying a new item. We study in this work how retail companies can benefit from available information about reluctant customers to adjust their prices accordingly. We assume a Poisson arrival of customers interested in some item who will spend a positive amount of time before deciding whether to buy or not. We compare such model to that of a generic one where customers are revealed only when they buy the item.

4 - Dynamic Assortment Planning

Rene Caldentey, Stern School of Business, New York University, New York, NY, rcaldent@stern.nyu.edu, Felipe Caro

We investigate optimal assortment planning strategies for a retailer with limited shelf space. The retailer can choose among basic and fashion items with low and high risk (and return) respectively. Our motivation is in the apparel industry, and we explicitly model the vogue as a stochastic process that the retailer tries to follow. The objective is to maximize the long-term value of the retail business by dynamically adjusting the menu of products on display.

■ MD60

Hot Topics in Rail OR

Sponsor: Railway Applications
Sponsored Session

Chair: Michael Gorman, Associate Professor, University of Dayton, School of Business, 300 College Park, Dayton, OH, 45469-2130, United States of America, michael.gorman@udayton.edu

1 - Disruption Management at Netherlands Railways

Dennis Huisman, OR Consultant & Assistant Professor, Netherlands Railways & Erasmus University Rotterdam, Econometric Institute, PO Box 1738, Rotterdam, ZH, 3000DR, Netherlands, huisman@few.eur.nl, Leo Kroon, Gabor Maroti, Daniel Potthoff, Lars Nielsen

On the Dutch railway network, there are about 20 disruptions per day. The infrastructure manager is responsible for modifying the timetable. However, the rolling stock circulation and the crew schedules are the responsibility of the operators, of which Netherlands Railways is the largest one. We will discuss several, recently developed, methods to re-schedule rolling stock and crew. Finally, we will show some computational experiments on real-world instances.

2 - Real-time Railcar Scheduling

Shankara Kuppa, Systems Engineer, Union Pacific Railroad, 1400 Douglas Street MC 580, Omaha, NE, 68179, United States of America, skuppa@up.com, David Ciemnoczolowski

Car scheduling is one of the core operations of a railroad. Many constraints exist on routing cars on trains, including terminal capacities, restrictions on length and weight of trains, etc. Given a schedule for trains, we use a multicommodity flow approach to routing cars on trains while jointly considering block definitions and real-time exceptions. We will present case-studies of the application of the approach.

3 - A Hybrid Algorithm and Compaction Process for Railcar Movement Reconstruction

Ingrid Schultze, Sr Mgr Rail Industry Analysis, Union Pacific Railroad, 1400 Douglas St. Stop 1350, Omaha, NE, 68179, United States of America, ischultze@up.com, John Ransom, Chris Sanford, John Gray

Charged with accurate reconstruction of railcar movement over select rail corridors, a Union Pacific team supporting regulatory compliance initiatives developed a hybrid algorithm and compaction process capable of routing over 10.5 million railcars in less than one hour while adhering to historical event reportings.

■ MD61

Public Transit II

Sponsor: Transportation Science & Logistics
Sponsored Session
Chair: Nicholas Lownes, Assistant Professor, University of Connecticut, 261 Glenbrook Road U 2037, Storrs, CT, United States of America, nlownes@engr.uconn.edu

1 - Connecting a Fixed Guideway System to the Network
Nicholas Lownes, Assistant Professor, University of Connecticut, 261 Glenbrook Road U 2037, Storrs, CT, United States of America, nlownes@engr.uconn.edu, Wei (David) Fan

Fixed-guideway transit systems (heavy, light, commuter rail and BRT systems) have in many places led to improvements in not only mobility, but in social cohesion and economic development. To harness these benefits the fixed-guideway system must be well connected to the existing network and the served communities. This paper investigates the sensitivity of circulator/distributor routing to operator and user costs.

2 - A Math Programming Approach for Designing Express Services on a High Demand Transit Corridor
Ricardo Giesen, Assistant Professor, Universidad Catòlica de Chile, Vicuna Mackenna 4860, Transport Engineering and Logistics, Santiago, RM, 6904411, Chile, giesen@ing.puc.cl, Carola Leiva, Juan Carlos Munoz

We study the design of express services on a high-demand transit corridor. We present a mathematical programming based method for obtaining the best express services to provide on a corridor. We determine the set of routes and their frequencies that would minimize the expected total costs for a given origin-destination demand matrix.

3 - Stochastic Transit Assignment with Boarding Decisions
Mark Hickman, University of Arizona, Civil Engineering, PO Box 210072, Tucson, AZ, 85721-0072, United States of America, mhickman@email.arizona.edu

We consider the current state-of-the-art in both deterministic and stochastic models for transit assignment. Recent deterministic transit assignment methods have explicitly considered passenger "boarding strategies", where the passenger will decide whether to board a vehicle only when that vehicle arrives. We examine extensions of this framework to stochastic transit assignment methods.

■ MD62

Panel Discussion: Marketing Science and Revenue Management, Contrast and Commonality (Joint Session Pricing and Revenue Mang/ Marketing)

Sponsor: Revenue Management & Pricing (Sponsored/Invited)
Sponsored Session
Chair: Robert Shumsky, Professor, Tuck School of Business, Dartmouth College, Hanover, NH, 03755, United States of America, robert.shumsky@dartmouth.edu

1 - Marketing Science and Revenue Management, Contrast and Commonality
Moderator: Robert Shumsky, Professor, Tuck School of Business, Dartmouth College, Hanover, NH, 03755, United States of America, robert.shumsky@dartmouth.edu, Panelists: Guillermo Gallego, Eyal Biyalogorsky, Steven Shugan, Ioana Popescu

Those who identify themselves as "Marketing Science" and "Revenue Management" professionals often are working on the same set of problems. Yet historically the two fields have seen relatively little overlap in research methods, journal publishing, and conference participation. Lately, however, the two fields seem to be growing closer. We bring together representatives of both fields to discuss the historical roots of the two fields, current research styles, and future directions.

■ MD63

Sloan: Planning Problems in the Transportation Industries

Sponsor: Transportation Science & Logistics
Sponsored Session
Chair: Alan Erera, Associate Professor, Georgia Institute of Technology, School of Industrial and Systems Engineering, 765 Ferst Drive NW, Atlanta, Ga, United States of America, alan.erera@isye.gatech.edu

1 - Perishable Product Transportation with Costly Observation
Tae Su Cheong, PhD Student, Georgia Institute of Technology, H. Milton Stewart School of ISyE, 765 Ferst Drive, NW, Atlanta, GA, 30332, United States of America, tcheong3@gatech.edu, Chelsea C. White, III

We investigate the value of knowing freight status in the movement from an origin to a destination through intermediate points in the cold-chain logistics. Freight status can be observed at each intermediate point for a cost. At each intermediate point, freight may be returned to the origin, or can continue toward the destination. We model the problem as partially observed MDP.

2 - Pups vs. Vans: Trailer Mix Decisions for LTL Linehaul Operations
J. Antonio Carbajal, Georgia Institute of Technology, School of Industrial and Systems Engineering, 765 Ferst Drive NW, Atlanta, GA, 30332, United States of America, gtg107u@mail.gatech.edu, Alan Erera, Martin Savelsbergh

LTL carriers can attain cost savings by correctly identifying the types of trailer equipment to use on different linehaul service lanes. To date, research has focused on short haul mix problems. Given a load plan, we investigate models to determine which direct trailer moves should be loaded with pups (28' trailers) and which with vans (53' trailers). We attempt to specify the simplest nontrivial problem and present an arc-based IP formulation. Computational results are shown for test instances.

3 - Base Location and Fleet Allocation for a Per-seat, On-demand Air Transportation Service
Gizem Keysan, Georgia Institute of Technology, 58 6th Street NE, Unit 2201, Atlanta, GA, 30308, United States of America, gkeysan@isye.gatech.edu, George Nemhauser, Martin Savelsbergh

We address the problem of expanding an air transportation busines that operates without published flight schedules. At the tactical level, the airports in which new facilities will be opened are determined together with fleet allocations while the daily flight schedules are constructed at the operational level. We use an integrated model that determines the flight scheduling as well as the facility locations, and use this model in an incremental fashion to open the facilities gradually in time.

4 - Day-differentiated Load Planning for LTL Carriers
Mike Hewitt, Georgia Institute of Technology, Atlanta, GA, 30332-0205, mhewitt@isye.gatech.edu, Alan Erera, Martin Savelsbergh

We consider an extension of the traditional load planning problem faced by LTL carriers, namely the generation of day-of-week differentiated load plans, which are necessary to remain competitive in the current market. We investigate heuristics that utilize exact optimization and present results indicating significant savings for a national carrier.

■ MD64

Network Modeling and Information Provision

Sponsor: Transportation Science & Logistics
Sponsored Session
Chair: Alexander Paz, Assistant Professor, University of Nevada, Las Vegas, College of Civil and Environmental Engin, 4505 Maryland Parkway, PO Box 454015, Las Vegas, NV, 89154-4015, United States of America, apaz@purdue.edu

1 - Accounting for Information Collection in the Stochastic System-Optimum Network Assignment Problem
Natalia Ruiz, UT Austin, 6.204 ECJ Hall, 1 University Station C1761, Austin, TX, United States of America, natiruizjuri@gmail.com, Travis Waller

This work introduces solution methodologies for stochastic system-optimum network assignment problems under uncertainty which take into account the collection and distribution of information by the system's assets. The proposed solution techniques are based on previously developed mathematical formulations. They include optimal algorithms and heuristic methods, which are discussed along with the potential applications of the novel concepts.

2 - Integrated Corridor Management: A Case Study
Alexander Paz, Assistant Professor, University of Nevada, Las Vegas, College of Civil and Environmental Engin, 4505 Maryland Parkway, PO Box 454015, Las Vegas, NV, 89154-4015, United States of America, apaz@purdue.edu, Yi-Chang Chiu

The objective of the Integrated Corridor Management (ICM) initiative is to demonstrate how Intelligent Transportation Systems technologies can efficiently and proactively enhance the movement of people and goods in major transportation corridors. The ICM initiative seeks the coordination of individual network operations between parallel facilities creating an interconnected system capable of cross network travel management. Simulation results illustrate the potential benefits of ICM.

3 - Network Equilibrium and Design under Information Provision

Avinash Unnikrishnan, Graduate Student, University of Texas at Austin, 1 University Station C1761, Austin, TX, 78712, United States of America, avinash@mail.utexas.edu, Travis Waller

The focus of this work is to determine analytical network equilibrium and design formulations which account for online information provision. Frank Wolfe based solution methods will be discussed where the sub-problems involve calculating online shortest paths.

4 - Optimization Models to Characterize the Broadcast Capacity of Vehicular Ad Hoc Networks

Lili Du, Rensselaer Polytechnic Institute, Troy, NY, dul@rpi.edu, Shivkumar Kalyanaraman, Satish Ukkusuri, Wilfredo Yushimito Del Valle

This study defines the maximum successful concurrent transmissions as the broadcast capacity of vehicular ad hoc networks (VANET). Integer Programming (IP) and statistical models are developed to explore the maximum concurrent successful receivers or transmitters in VANET. Response surface and linear regression technologies are applied to build the statistical models.

■ MD65

Sloan: Scheduling Challenges in the Healthcare Industry

Cluster: Scheduling in the Service Industry
Invited Session

Chair: Amy Cohn, Assistant Professor, Industrial and Operations Engineering, University of Michigan, 1205 Beal Ave., Ann Arbor, MI, 48105, United States of America, amycohn@umich.edu

1 - Industry Studies and Healthcare Scheduling

Amy Cohn, Assistant Professor, Industrial and Operations Engineering, University of Michigan, 1205 Beal Ave., Ann Arbor, MI, 48105, United States of America, amycohn@umich.edu

What is Industry Studies? What roles does it play in healthcare scheduling? How is healthcare different from other industries, in the role that Operations Research can play in solving challenging problems? We address these questions in the context of our work in scheduling healthcare personnel, focusing on both the algorithmic approach and the underlying problem definition.

2 - A Case Study of a Simulation-based Decision Support Tool

Michael Carter, Mechanical & Industrial Engineering, University of Toronto, 5 King's College Rd., Toronto, ON, M5S3G8, Canada, carter@mie.utoronto.ca

We describe work that was done for Hamilton Health Sciences in the 2006-07. The hospital opened a new cardiac operating room in 2006 and they decided to use operations research methods and simulation to determine the best method for planning the surgical schedule. Major issues included the availability of resources such as ICU beds, ward beds and nursing staff. The paper discusses the application as well as the considerable post-implementation effort.

3 - Multi-OR Surgery Scheduling Problem with Surgeon Constraints

Andrew Schaefer, Associate Professor, University of Pittsburgh, Department of Industrial Engineering, 1048 Benedum Hall, Pittsburgh, PA, 15261, United States of America, schaefer@pitt.edu, Hari Balasubramanian, Sakine Batun, Brian Denton, Todd Huschka

Allocation and scheduling of surgeries in a multiple operating room (OR) environment is one of the important operational problems in hospitals. For this problem, we present a stochastic programming model with surgeon constraints, setup times and uncertain surgery durations. We consider performance measures such as fixed cost of opening ORs, overtime and surgeon idle time. We present computational results based on real data.

4 - Home Healthcare Scheduling and Routing

Sarah Root, University of Arkansas, 4207 Bell Engineering, Fayetteville, AR, United States of America, seroot@uark.edu, Edosa Aibangbee

In this talk, we present models which integrate the scheduling and routing of home healthcare workers. We present this as an extension of the VRP, where healthcare workers have different skill levels and can only serve patients for whom they have an adequate care-taking ability. Initial models and computational results are presented, along with directions for future research that draw from our observations with the Center for Innovation in Healthcare Logistics.

■ MD66

Real-time Fleet Management Problems

Cluster: Real-Time Systems
Invited Session

Chair: Frédéric Semet, Professor, University of Valenciennes, LAMIH, Le Mont-Houy, Valenciennes, 59313, France, Frederic.Semet@univ-valenciennes.fr

1 - A Coevolutionary Genetic Algorithm for Dynamic Vehicle Routing

Michel Gendreau, Professor, Université de Montréal, C.P. 6128, Succ. Centre-ville, Montreal, QC, H3C 3J7, Canada, michelg@crt.umontreal.ca, Mohamed Barkaoui

The quality of the convergence process in genetic algorithms depends on the specific choice of strategies and combinations of operators. In this talk, we address this problem by introducing a new approach that uses the concept of coevolution. Application of this approach will be presented for the dynamic vehicle routing problem with time windows.Comparisons with classical genetic algorithms will be presented w.r.t. to the robustness and the quality of the solutions produced.

2 - Using Incompatibilities to Reduce Search Space for Selective and Dynamic VRPs

Aziz Moukrim, Université de Technologies de Compiègne - CNRS UMR 6599 Heudiasyc, Centre de Recherches de Royallieu, Compiègne, Fr, 60205, France, aziz.moukrim@utc.fr, Hermann Bouly

We present a solution method for a specific selective vehicle routing problem for a real life application. An Iterative Destruction/Construction Heuristic is used for solution's improvement. Some pre-processing methods reduce the search space. These methods are based on the use of concepts like incompatibilities and required customers. These concepts help finding better solutions and are usefull for dynamic VRPs.

3 - Management of a Fleet of Tow Trucks in Real-time

Eric Duchenne, Professor, University of Valenciennes, LAMIH, Le Mont-Houy, Valenciennes, 59313, France, eric.duchenne@univ-valenciennes.fr, Frédéric Semet

When a fleet of tow trucks has to be managed in real-time, a key question is the selection of the pending call to which a free tow truck is assigned. In this talk we show how this problem can be modeled and we propose various approaches for its solution.

4 - Management of a Fleet of Trucks For a Mail-order Company

Frédéric Semet, Professor, University of Valenciennes, LAMIH, Le Mont-Houy, Valenciennes, 59313, France, Frederic.Semet@univ-valenciennes.fr, Amine Lamine, François Clautiaux, Said Hanafi, El-ghazali Talbi

In this talk, we describe a distribution problem faced by a mail-order company at a regional level. From a central depot routes has to be designed to serve at set P of distribution points and a set H of customer homes. While points in P remain the same and must be served by the same vehicles, H varies from day to day. We propose a new algorithmic approach based on a decomposition of the problem to handle the demand variations over the time-horizon.

■ MD67

Location Analysis

Sponsor: Location Analysis
Sponsored Session

Chair: Leyla Ozsen, San Francisco State University, 1600 Holloway Ave. BUS 310, San Francisco, CA, 94132, United States of America, leyla_ozsen@mac.com

1 - Capacitated Facility Location Problems with Single Source Constraints and Flexible Customer Demand
Chase Rainwater, University of Florida, 303 Weil Hall, Gainesville, FL, 32611, United States of America, crainwa@ufl.edu, Joseph Geunes, Edwin Romeijn

We consider a generalization of the capacitated facility location problem, where customers permit delivery quantity flexibility within specified ranges. While the supplier's revenue increases in delivery quantity (possibly as a nonlinear function of the quantity supplied), the resulting profit-maximization problem is complicated by capacity limits and supply cost structures. We propose a branch-and-price algorithm, which leads to an interesting class of nonlinear knapsack pricing problems.

2 - Protection and Interdiction of Facilities: A Stochastic Model
Federico Liberatore, PhD Student, Kent Business School, University of Kent, Canterbury, CT2 7WS, United Kingdom, fl51@kent.ac.uk, Mark Daskin, Paola Scaparra

The objective of the Stochastic R-Interdiction Median Problem with Fortification is to optimally locate defensive resources among facilities in order to minimize the worst-case impact of a random number of intentional disruptions of the facilities. A bound based optimal algorithm and some heuristic-concentration type heuristics are illustrated and compared.

3 - A Capacitated Model for the Simultaneous Optimization of Facility Location and Inventory Decisions
Burcu Keskin, Assistant Professor, University of Alabama, Operations Management, Tuscaloosa, AL, United States of America, bkeskin@cba.ua.edu, Sila Cetinkaya, Halit Uster

Recent research has indicated substantial benefits with the integration of facility location and inventory decisions. Motivated by these results, we consider a two-stage integrated facility location and inventory problem while taking total logistics costs and real-life capacity restrictions into account. We model the problem as a nonlinear mixed integer program and develop efficient solution approaches. We present numerical results that illustrate the benefits of integrated decision making.

4 - Benefits of Supply Chain Integration
Leyla Ozsen, San Francisco State University, 1600 Holloway Ave. BUS 310, San Francisco, CA, 94132, United States of America, leyla_ozsen@mac.com

We present managerial insights on the benefits of supply chain integration based on the extensive computational experiments conducted by solving integrated location-inventory, location-routing, and location-inventory-routing problems.

■ MD68

Sloan Industry Studies: Marketing New Technologies and Managing Brands in the Automotive Industry

Sponsor: Marketing Science
Sponsored Session

Chair: Janell D. Townsend, Assistant Professor, Oakland University, 348 Elliott Hall, Rochester, MI, 48114, United States of America, townsend@oakland.edu

1 - Repeat Adopters and Adoption Patterns for Second Generation Automobiles
Kwong Chan, Assistant Professor, University of Massachusetts Amherst, 121 Presidents Drive, Amherst, MA, 01002, United States of America, kwongchan@mktg.umass.edu

A second product generation is offered to two adopter populations: repeat adopters, who consist of innovative adopters that purchased the first generation product, and a larger market of imitative new-adopters that did not. This study models social connections between adopters of second generation automobiles to test for cross-adopter influence. The findings indicate purchase by new adopters of a second generation automobile is accelerated by repeat adopters and to a lesser extent, new adopters.

2 - Product Repositioning and Brand Inertia: The US Automobile Market
Sengun Yeniyurt, Assistant Professor, Rutgers University, Rutgers Business School, 94 Rockafeller Road, Piscataway, NJ, 08854, United States of America, yeniyurt@business.rutgers.edu, S. Chan Choi, Janell D. Townsend

This study investigates factors affecting brand inertia in brand positioning changes over time. A longitudinal perceptual map is generated to track changes in brand positions of 24 major automotive brands competing in the U.S. between 1997 and 2005. The effects of marketing efforts on changes in brand positioning, moderated by brand familiarity, are then estimated using an econometric model.

3 - Information Acceleration for Alternative Fuel Vehicles
Rosanna Garcia, Northeastern University, Hayden Hall, Room 202, Boston, MA, 02115, United States of America, r.garcia@neu.edu

Automobile manufacturers are interested in what drives consumers to purchase alternative fuel vehicles. However, consumers are unable to provide informed choice decisions on unfamiliar technologies. Marketing managers have looked at how multi-media technological advancements can be utilized to develop a method for introducing consumers to these innovations. This method is known as information acceleration. This is an NSF sponsored project MUSES:Environmental Policy, Auto Design & Materials Flow.

4 - Brand Magic: How Brand Strength Magnifies Market Based Investments
Janell D. Townsend, Assistant Professor, Oakland University, 348 Elliott Hall, Rochester, MI, 48114, United States of America, townsend@oakland.edu, Sengun Yeniyurt, Rajendra Srivastava

Brand strength is derived from market based investments. It has also been proposed that brand strength can be leveraged to enhance the productivity of marketing spend, resulting in superior performance. No single study has examined a complete longitudinal model of the role of brand strength in brand performance. We examine these effects in the U.S. automotive market with a large data set spanning all major brands from 1997-2003, and based on over 40,000 observations.