Sunday, 8:00am - 9:30am

■ SA01

Tutorial: Decision Analysis = Decision Engineering

Cluster: Tutorials
Invited Session

Chair: James Matheson, Chairman and CFO, SmartOrg, Inc., jmatheson@smartorg.com

1 - Tutorial: Decision Analysis = Decision Engineering
James Matheson, Chairman and CFO, SmartOrg, Inc., jmatheson@smartorg.com

Decision analysis is an engineering approach to helping decision makers reach rational decisions. It incorporates system engineering and decision theory to build value-based models and carry out computations needed to deal with complexity,uncertainty, and dynamics, as well as the processes for reaching good decisions with real people and gaining their commitment to carry them out. Decision analysis is a discipline with underlying principles and procedures adaptable to diverse situations.

■ SA02

Optimization Modeling in Environmental/ Natural Resources Planning

Contributed Session

Chair: Jose Cruz, Assistant Professor, University of Connecticut, 2100 Hillside Road, Unit 1041, Storrs, CT, 06269-1041, United States, jcruz@business.uconn.edu

1 - Evaluating the Effects of ISO 14001 Certification: A Concept Mapping Approach
Gyula Vastag, Kelley School of Business, Indiana University, 801 West Michigan Street, BS 4027, Indianapolis, United States, gvastag@iu.edu

Using case studies of manufacturing plants in North America and Europe, we examine the effects of the certification. A structured conceptualization method, involving managers and environmental team members from the plant, was used to defineand analyze the conceptual domain of the impacts. As a result of the certification process, employees and managers experienced attitudinal changes and the plants realized operational improvements.

2 - Implications of Pollutant Trading on Mercury Waste Management
Yogendra Shastri, Graduate Research Assistant, University of Illinois, Chicago, Dept. of Bioengineering, 851, S. Morgan, University of Illinois, Chicago, Chicago, IL, 60607, United States, yshast1@uic.ed, Urmila Diwekar, Sanjay Mehrotra

The work proposes an optimization technique based decision making framework for regulators and industries when pollutant trading is a waste management option. Deterministic and stochastic models are analyzed and health care cost is incorporated in decision making. The model is applied on mercury waste management case study of Savannah river basin. Results indicate significant cost savings but also highlight the importance of health care cost and uncertainty consideration in problem solution.

3 - Forest Planning with Timber Species Balancing in Southern Brazil
Fabrizio Marodin, ExecutiveOfficer, Kybernetics / Unisinos, Guaiba 3040, Porto Alegre, 91900-420, Brazil, fmarodin@terra.com.br
Denis Borenstein, Giuliano Marodin

This paper addresses the problem of determining the management activities and flow of timber products from a forest composed of several stands, which vary in age, species composition and production potencial. We propose a harvest scheduling linear programming model that maximizes earnings subject to minimum flow and timber species balancing constraints. The system can provide a very useful decision support tool for long-term forest and operations planning of verticalized companies.

4 - Optimizing Water Irrigation System with Environmental Considerations
Zichao Li, Mr, National University of Singapore, The Logistics Institute Asia Pacific, National University of Singapore, Singapore, 119081, Singapore, zichao.li@nus.edu.sg, Guangyu Xu

The World Bank has invested massively to increase irrigation coverage in Northern China.However,the design of irrigation ditches and pipelines never considers the water leakage speed on different types of soil and pipeline material.This objective is to choose optimal combination of ditch and pipe diameters so as to minimize cost of a looped water distribution system as well as minimizing water leakage and environmental damage.The author used a two-level multi-objective genetic algorithm(MOGA).

5 - Supply Chain Networks with Corporate Social Responsibility through Integrated Environmental Decision
Jose Cruz, Assistant Professor, University of Connecticut, 2100 Hillside Road, Unit 1041, Storrs, CT, 06269-1041, United States, jcruz@business.uconn.edu

We develop a dynamic framework for the modeling and analysis of supply chains networks with corporate social responsibility through integrated environmental decision-making. We model the multicriteria decision-making behavior of the various decision-makers (manufacturers, retailers, and consumers), which includes the maximization of net return, the minimization of waste, and the minimization of risk. We explore the dynamic evolution of the product flows, and the associated product prices.

■ SA03

Advances in Teaching Operations Research and Management Science

Sponsor: Education (INFORM-ED)
Sponsored Session

Chair: Matt Drake, Doctoral Student, Georgia Institute of Technology, School of Industrial and Sys Engineering, 765 Ferst Drive, Atlanta, GA, 30332, United States, gtg148k@prism.gatech.edu

1 - The Outsourcing Game
Andy Tsay, atsay@stanfordalumni.org
Jason Amaral

Traditional OM/SCM courses do not do a very good job of addressing the "wheeling and dealing" aspect of inter-firm interactions and procurement. This has motivated the creation of a role-playing simulation called "The Outsourcing Game," to illustrate the changed nature of decision-making in an outsourced supply chain environment. This game was introduced in an MBA elective at Santa Clara University, and has since been run at ASU, MIT, Purdue, and in internal training inside Hewlett-Packard.

2 - A New Excel Tool for Teaching Sensitivity Analysis
Susan Palocsay, palocssw@jmu.edu

Sensitivity analysis is one of the most important and valuable concepts taught in introductory OR/MS courses. To emphasize its practical relevance in the business environment, we have begun teaching our students to use the Scenario Manager in Excel. We will demonstrate how to use this tool with several types of spreadsheet models and discuss the potential pedagogical benefits.

3 - A Global Supply Chain Project by International Student Teams
Jo Min, Associate Professor, IMSE/Iowa State University, 2019 Black Engineering, Ames, IA, 50011, United States, jomin@iastate.edu
Leopoldo Cárdenas-Barrón, Peter Ball, John Jackman, Cheng-Kang Chen

For a team project of students from several countries in an undergraduate course, we consider a global supply chain problem. Each team relies on an Internet-based collaboration platform with gradually constructive delivery of information for interaction.
The progress and future direction, including assessment of students' learning, will be discussed.

4 - The Building Blocks of Supply Chain Management
Matt Drake, Doctoral Student, Georgia Institute of Technology, School of Industrial and Sys Engineering, 765 Ferst Drive, Atlanta, GA, 30332, United States, gtg148k@prism.gatech.edu
John Mawhinney

We discuss a classroom simulation designed to introduce undergraduate business and operations research students to the challenges of managing and coordinating a supply chain. The, activity simulates a manufacturing supply chain with a raw material supplier, three manufacturing plants, a distributor,and a customer with Lego pieces as a product. We provide an activity overview as well as our experiences in using the simulation in business and industrial engineering classes.

■ SA05

Panel Discussion: The Academic Job Search

Cluster: Job Placement Committee
Invited Session

Chair: David Kim, Oregon State Univ, 121 Covell Hall, Corvallis, OR, 97331, United States, david.kim@orst.edu

1 - Panel Discussion: The Academic Job Search
David Kim, Oregon State Univ, 121 Covell Hall, Corvallis OR, 97331, United States, david.kim@orst.edu
Joyendu (Joy) Bhadury, Lawrence W. Robinson, Reha Uzsoy Zelda Zabinsky

The panel will discuss the academic interview process and do's and don'ts associated with the job search. In addition to comments by current or former search chairs, time will be provided for questions and answers.

■ SA06

Joint Session Practice/CPMS: Spreadsheets in Practice

Sponsor: Spreadsheet Productivity Research
Sponsored Session

Chair: Mary Crissey, Analytical Strategist, SAS Institute, 17030 Vista Park Dr, San Antonio, TX, 78247, United States, mary.crissey@sas.com

1 - Implementing Large-scale OR Models with Genetic Algorithms and Spreadsheets
Claudio Cunha, Prof Dept of Transp Engineering, University of Sao Paulo, Sao Paulo, SP, Brazil, cbcunha@usp.br, Flavio Galvão

This session will cover some real-world problems in logistics and transportation, including recent work implementing a Genetic Algorithm with spreadsheet for solving a multi-period vehicle scheduling problem for wood waste collection. Due to the complexity of the problem, we had to decompose it in order to properly solve it. The GA is used in an integrated fashion with Excel Solver for a problem with dozens of thousands of decision variables.

2 - Excel Add-ins for Application and Education
Paul Jensen, Professor Emeritus, University of Texas, Austin, TX, United States, pjensen@mail.utexas.edu

We describe an extensive collection of Excel add-ins that implement a variety of the analytical procedures from operations research ranging from mathematical programming to project management. The add-ins make complicated procedures immediately and easily available so that analysts can focus on data and modeling rather than formulas and algorithms. The add-ins are free and can be found at www.ormm.net.

3 - The U.S. Army Uses Network Optimization to Designate Career Fields for Officers
Alexandra Newman, Colorado School of Mines, Division of Economics and Business, Golden, CO, United States, anewman@mines.edu
Daniel Shrimpton

The United States Army's career-progression pattern assigns, or "designates," Army officers to specialized roles in which the officers must serve. Manually assigments are impossible due to the size of the problem. Therefore, we develop a network optimization model, the Career-Field Designation Model, that runs in a spreadsheet and makes these assignments in minutes on, a personal computer. The Army continues to use the model to designate about 1,500 officers each year.

4 - Launch Complex NLP with SAS from a Microsoft Excel Interface
Mary Crissey, Analytical Strategist, SAS Institute, 17030 Vista Park Dr, San Antonio, TX, 78247, United States, mary.crissey@sas.com

As the Science of Better marketing campaign states, business leaders today lack awareness of the value our profession offers. Break through this ignorance and fear by embedding complex optimization models under a familiar spreadsheet GUI. By keeping them in their comfort zone (microsoft office environment) we can empower them to point and click their way through a challenging cost minimization problem.

■ SA07

Pricing and Revenue Management in Operations

Sponsor: Manufacturing & Service Oper Mgmt
Sponsored Session

Chair: Philipp Afeche, Asst. Prof., University of Chicago, | 5807 South Woodlawn Avenue, Chicago, IL, 60637, United States, pafeche@gsb.uchicago.edu

1 - Various Learning Schemes under Dynamic Pricing for Non-perishable Products
Victor Araman, Asst. Prof., NYU Stern School of Business, 44W 4th Street, New York, NY, 10012, United States, varaman@stern.nyu.edu
Rene Caldentey

A retailer sells a fixed amount of units of a non-perishable product. A terminal value is achieved when all units are sold. A stochastic Poisson demand process is considered which rate is partially unknown. Through a dynamic control of prices, we consider different learning schemes ranging from active to passive learning. We look at optimal policies but also suboptimal ones that are easy to implement and lead to robust results.

2 - Dynamic Pricing with Changeover Costs
Sergei Savin, Associate Professor, GSB, Columbia University, 404 Uris Hall, 3022 Broadway, New York, NY, 10027, United States, svs30@columbia.edu, Alp Muharremoglu, Sabri Celik

We consider a problem of dynamic pricing of inventories in the settings where price changes are costly. We formulate the inventory pricing problem as a finite-horizon stochastic dynamic program and partially characterize optimal pricing policies. Several pricing heuristics are introduced, and their effectiveness is studied through extensive numerical experiments.

3 - Strategic Capacity Rationing When Customers Learn
Garrett van Ryzin, Professor, Columbia University, gjv1@columbia.edu
Qian Liu

Rationing risk provides an incentive for customers to buy early at higher prices. In such cases, under-stocking products may be an optimal selling strategy. Yet customers may only learn about availability through repeat experience. We investigate how the dynamics of customer learning impact optimal capacity rationing decisions.

4 - Dynamic Pricing and Bayesian Learning of Customer Time-Sensitivity in Queues
Philipp Afeche, Asst. Prof., University of Chicago, 5807 South Woodlawn Avenue, Chicago, IL, 60637, United States, pafeche@gsb.uchicago.edu, Baris Ata

Virtually the entire revenue management literature for queues assumes that providers know the distribution of customer demand attributes. We relax this assumption and consider the case of unknown customer impatience. We characterize the dynamic pricing policy that optimally trades off revenue generation and learning customer demand. We analytically evaluate how the value of perfect demand information depends on operational and economic system characteristics.

■ SA08

Global Production and Innovation Management

Sponsor: Manufacturing & Service Oper Mgmt
Sponsored Session

Chair: Cuihong Li, Assistant Professor, University of Connecticut, School of Business, 2100 Hillside Road, Storrs, C, 06269, United States, Cuihong.Li@business.uconn.edu

Co-Chair: Jiong Sun, Carnegie Mellon University, Tepper School of Business, Pittsburgh, PA, 15213, United States, jiongs@andrew.cmu.edu

1 - Strategic Technology Investment: Tacit Collusion and Information Time Lag
Tao Yao, Stanford University, Terman 464, Stanford, CA, 94305, United States, taoyao@stanford.edu, John Weyant

This paper develops a stochastic differential game framework for analyzing strategic exercise of options under technical and market uncertainty. We characterize a collusion (cooperative) equilibrium based on the use of a trigger strategy with an information time lag. We analyze the role of information and uncertainty on the likelihood of tacit collusion and provide implications of strategic effects for antitrust and merger control in innovation markets.

2 - Optimal Stopping Policy for New Product Positioning
Zuobing Xu, graduate student, University of California, Santa Cruz, 1156 High St., Santa Cruz, CA, 95060, United States, zbxu@soe.ucsc.edu, Ram Akella

One of the key marketing decisions a firm entering a new market is how to position its product. Reduction of new product development cycle time and improvements in product attributes level become strategic objectives for many technology-driven firms. These goals may conflict, however, and firms must explicitly consider the tradeoff between them. Our paper gives an analytic model to help the managerial executive to make right decision in R&D process.

3 - Global New Product Introduction
Jiong Sun, Carnegie Mellon University, Tepper School of Business, Pittsburgh, PA, 15213, United States, jiongs@andrew.cmu.edu, Cuihong Li, Sunder Kekre

We study strategies for a firm having a presence in different countries to supply these markets with continuously improved versions of a base product. Each time an improved product version is generated in a lead market, the firm's decisions are whether to make the new version available in the lag markets, whether the supporting technology should be transferred to the lag markets, and which product version each affiliate should produce for the local market and/or for export.

■ SA09

H - Ballroom Level, Yosemite A

Retail Operations Management

Cluster: Supply Chain Management
Invited Session

Chair: Narendra Agrawal, Santa Clara University, Leavey School of Business, OMIS Department, Santa Clara, CA, 95053, United States, nagrawal@scu.edu

Co-Chair: Stephen Smith, Professor, Santa Clara University, OMIS Department, 500 El Camino Real, Santa Clara, CA, 95053-0382, United States, SSmith@scu.edu

1 - Assortment Planning and Inventory Management Under Consumer Choice with Dynamic Substitution
Vishal Gaur, New York University, 44 West 4th St., 8-72, New York, NY, 10012, United States, vgaur@stern.nyu.edu, Sridhar Seshadri, Dorothee Honhon

We consider assortment planning and inventory decisions for a retailer serving random demand from a population of heterogeneous customers. A customer visiting the retailer chooses an item from the assortment available at the time of her visit (dynamic substitution). We establish the optimal solution for a one-period model for a restricted choice model, and use the structural insights to construct heuristics for general preferences.

2 - Contracting for Improved Retail Supply Chain Execution
Nicole DeHoratius, Asssistant Professor, University of Chicago, Graduate School of Business, 5807 S. Woodlawn Ave., Chicago, IL, 60637, United States, ndehorat@chicagogsb.edu, Sergio Chayet, Canan Savaskan

We examine the incentives supply chain parties have to invest in the quality of order delivery (on-time, right quantity, right product, etc.) in a single manufacturer - single retailer supply chain. In particular, we investigate some of the contracts used in practice (linear wholesale, buy back, revenue sharing, and quantity discounts) and study the impact of supplier monitoring on supply chain profits.

3 - Retail Assortment Planning under Category Captainship
Mumin Kurtulus, Visiting Assistant Professor, Vanderbilt University, Owen Graduate School of Management, mumin.kurtulus@insead.edu, Beril Toktay

Retailers in consumer goods industry often rely on their leading manufacturers in the product categories for recommendations on retail assortment selection, a practice often referred to as category captainship. We investigate the impact of category captainship on the retail assortment and retail profitability under various category captainship strategies. We provide recommendations for the retailers as how to best implement category captainship.

4 - Optimizing Retail Assortments Based on Customer Choice Models
Stephen Smith, Professor, Santa Clara University, OMIS Department, 500 El Camino Real, Santa Clara, CA, 95053-0382, United States, SSmith@scu.edu

This paper develops a methodology for optimizing retail assortments based on various product choice models for a set of potential customers with heterogeneous preferences. Predicted market shares and expected profits are determined, as well as the sensitivity of the results to making incorrect customer choice assumptions. A data set of customer utilities developed through conjoint analysis of responses collected at an Internet website is used to illustrate the methods.

■ SA10

Manufacturing Flexibility in the Automotive Industry

Cluster: Supply Chain Management
Invited Session

Chair: Stephan Biller, Group Manager, General Motors R&D, MC: 480-106-359, 30500 Mound Road, Warren, MI, 48090, United States, stephan.biller@gm.com

1 - Chaining: Robust Cross-Training Strategies for Manufacturing Flexibility
Dennis Blumenfeld, Staff Research Scientist, General Motors, MC: 480-106-359, 30500 Mound Road, Warren, MI, 48090, United States, dennis.blumenfeld@gm.com, Robert Inman, William Jordan

Training workers to perform multiple tasks can improve workforce flexibility, but is costly and limited by learning capacity. We investigate how cross-training impacts work performance in the context of maintenance at an automotive manufacturing plant. Results show that chaining, in which some workers are strategically cross-trained, can yield most of the benefits of cross-training all workers and is very robust with respect to task assignments, chain formation, and changing plant conditions.

2 - Global Capacity Investment Decisions for Product Variants
Chen Xiang, PhD Candidate, Carnegie Mellon University, Tepper School of Business, 5000 Forbes Avenue GSIA A-19b, Pittsburgh, PA, 15213, United States, ccx@cmu.edu, Bahar Biller

We study the capacity investment decision faced by a firm that customizes its product to satisfy product regulations in different markets. The firm invests in ``base capacity" for producing the common features of the product and ``customizing capacity" for fulfilling the market specific regulations. Our analysis provides the structure of the firm's optimal investment strategy in base and customizing capacities and measures its sensitivity to model primitives.

3 - Impact of Price Postponement on Capacity and Flexibility Investment Decisions
Stephan Biller, Group Manager, General Motors R&D, MC: 480-106-359, 30500 Mound Road, Warren, MI, 48090, United States, stephan.biller@gm.com, Yongmei Zhang, Ana Muriel

We study the effect of the price decision delay on the optimal investments on dedicated and flexible capacity. Computational experiments show that considering price postponement at the planning stage leads to a large reduction in capacity investments, especially in the more expensive flexible capacity, and a significant increase in profits. This effect is stronger as demand correlation grows and demand elasticity decreases

4 - A Real Option Approach to Valuation of Flexibility with 2 State Variables and Regime Switching
Chi-Guhn Lee, Assistant Professor, University of Toronto, 5 King's College Road, Toronto, ON, M5S 3G8, Canada, chi@mie.utoronto.ca, M.I.M. Wahab

A real option approach is proposed to quantify the value of flexibility in a manufacturing system, where the capacity level is optimally adjusted to maximize the total expected profit over a planning horizon. The demands for two products are assumed to follow correlated Wiener processes and to evolve through 2-stage product life. A lattice is constructed, once the original processes are transformed to uncorrelated ones, upon which the NPV is computed.

■ SA11

Queuing and Other Stochastic Models in Supply Chain Management

Contributed Session

Chair: Diederik Claerhout, University of Antwerp, Prinsstraat 13, Antwerp, 2000, Belgium, diederik.claerhout@ua.ac.be

1 - Incentive-Compatible Allocation Policy: Individual Versus Social Optimization
Kwan Wee, Assistant Professor, Singapore Management University, 469 Bukit Timah Road, Singapore, 259756, Singapore, kewee@smu.edu.sg

We consider two customer allocation policies for a two-server queuing system: one induced by individuals' self-interest while the second based on social benefits. We show that in the equilibrium, when the servers incur penalty with respect to customers' waiting time, there is a threshold such that when the per unit time penalty exceeds the threshold, the social optimum induces higher service rates from the servers than the individual optimum; otherwise the result is reversed.

2 - Queuing Models for Networks with Assembly Operations
Ram Ramakrishnan, Dept of DSES, Rensselaer Polytechnic Institute, 110 8th Street, Troy, NY, 12180, United States, ramakr@rpi.edu, Ananth Krishnamurthy

We consider assembly systems where end products are produced from multiple components. The components are supplied by independent manufacturing facilities and the system operates under pull control. The system is modeled as a closed queuing network with fork join stations and new parametric decomposition based methods are developed to evaluate system performance.

3 - Policy Iteration Formulations For Optimizing Service Facilities Modeled as M/M/s Queues
Avi Giloni, Assistant Professor, Sy Syms School of Business, Yeshiva University, 500 West 185th Street, New York, NY, 10033, United States, agiloni@ymail.yu.edu, Phil Troy

We study the problem of optimizing organizational service facilities modeled as M/M/s queues via a policy iteration framework. We derive policy iteration formulations to socially optimize and revenue maximize service facilities. These formulations avoid many of the standard restrictions/assumptions and lead directly to important characterizations of the optimal policies.

4 - Analysis and Comparison of Queues with Different Levels of Delay Information: A General Model
Pengfei Guo, Ph.D. Candidate, Duke University, P.O. Box 368, Fuqua School of Business, Durham, NC, 27708, United States, pg18@duke.edu, Paul Zipkin

To explore effects of delay information on queues, we consider a queue with balking under three levels of delay information: no information, partial information (the system occupancy) and full information (the exact waiting time). We show that when the distribution of customers' delay sensitive parameter satisfys an elastic condition, telling information is good for the server. We also do some stochastic comparisons of the stable distributions of the queues under different delay information.

5 - The Allocation of Safety Time in Queueing Networks
Diederik Claerhout, University of Antwerp, Prinsstraat 13, Antwerp, 2000, Belgium, diederik.claerhout@ua.ac.be, Nico Vandaele

Open queueing networks have been used to model the performance of a variety of manufacturing environments. Currently, we are translating the output of these models into operational decisions by setting release authorizations. Incorporating these release authorizations into queueing networks allows us to study the opportunity to reduce total lead times by imposing minimal lead times on the queues.

■ SA12

Empirical Analysis of Online Auction Marketplaces

Cluster: Applications of Auction and Game Theory
Invited Session

Chair: Robert Zeithammer, Assistant Professor, Graduate School of Business, University of Chicago, 5807 South Woodlawn Ave, Chicago, IL, 60637, United States, rzeitham@gsb.uchicago.edu

1 - Empirical Tests of Information Aggregation
Pai-Ling Yin, Assistant Professor, HBS, Morgan Hall 241, HBS - Soldiers Field, Boston, MA, 02163, United States, pyin@hbs.edu

This paper empirically examines information aggregation in auction prices. Tests are based on comparative statics with respect to the number of bidders and dispersion of information signals and comparison of actual to predicted Nash equilibrium prices. eBay computer auctions partially aggregate information but do not converge to the common value. Even partial information aggregation may represent a potential efficiency gain over 1-to-1 trade of used goods with uncertain common values.

2 - Vettes and Lemons on EBay
Christopher Adams, Economist, Federal Trade Commission, 601 New Jersey Ave, NW, Washington, DC, 20580, United States, cadams@ftc.gov, Laura Hosken, Peter Newberry

The paper tests the "lemons" hypothesis using bidding data for 'Vettes. The paper measures the discount for a used 'Vette over a new 'Vette. The paper also tests whether auctions for 'Vettes are common value auctions. The data includes information on characteristics of the car, the price that the car sold at, and the number of bidders who bid on the car. The paper finds some limited evidence to support Akerlof's lemons hypothesis for used 'Vettes sold on eBay.

3 - Auctions vs. Posted Prices: Which Selling Format to Use?
Robert Zeithammer, Assistant Professor, Graduate School of Business, University of Chicago, 5807 South Woodlawn Ave, Chicago, IL, 60637, United States, rzeitham@gsb.uchicago.edu

eBay provides a clean institutional framework for studying the age-old question of how to sell a good. Three selling formats are currently available: posted prices, auctions, and a "Buy-It-Now" auction format. Are these three distinct formats, or is Buy-It-Now "between" posted price and a pure auction? How should the seller decide which format to use? How do eBay sellers seem to decide? What can we learn about the theoretical limits to the scope of auctioning?

4 - When and Why Nobody Buys it Now? An Empirical Investigation of the Signaling Effect of Buy-Now Price
Chun Qiu, University of Alberta, School of Business, Edmonton, AB, T6H4M5, Canada, cqiu@ualberta.ca, Peter Popkowski-Leszczyc, Yongfu He

This paper presents a model explaining the severe asymmetric usage of buy-now prices among bidders and auctioneers in the online auctions for some product categories. It is argued that when the good is difficult to assess, bidders will rely on a buy-now price to update their values rather than paying the price. Therefore, it is advantageous for auctioneers to set a high buy-now price to signal the quality. We test the existence of a signaling effect of the buy-now price in two empirical studies.

■ SA13

Software Demonstration

Cluster: Software Demonstrations
Invited Session

1 - Advantage for Analysts- Advantage for Analysts™ Tames Complexity and Eases Optimization
Mahmut Karayel, Advantage for Analysts, 2 Harrison St., 6th Fl., San Francisco, CA 94105, United States, advantage@AdvantageForAnalysts.com,Dennis Moritz

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■ SA14

Optimization and Simulation Approaches for Some Military Applications

Contributed Session

Chair: Karthik Thyagarajan, PhD Student, University at Buffalo (SUNY), 341 Bell Hall, UB North Campus, Buffalo, NY, 14214, United States, kt25@eng.buffalo.edu

1 - A Two-Stage Facility Location, Multi-Echelon Inventory Model with Capacitated Service
Ben Van Roo, Doctoral Candidate, University of Wisconsin-Madison, 975 University Avenue, Madison, WI, 53706, United States, bdvanroo@wisc.edu, James Rappold

We discuss the design and placement of repair capacity to support a multi-echelon, -item, -indentured inventory system in a military setting. Formulated as a MINLP problem, we discuss a two-stage solution approach that exploits the major cost drivers of the problem. Furthermore, we incorporate testing network solution robustness through the use of simulation.

2 - An Experimental Design with Combat Simulations for Finding Optimal Strategy
Yoon G. Hong, Professor, Hansung University, 389, 3-Ga, Samsun-Dong, Sungbuk-Ku, Seoul, 136-792, South Korea, yhong@hansung.ac.kr

It is important for commanders to search a reliable and effective way to get an optimal strategy in a combat. Taguchi method as an experimental design is introduced and explains a way to find the initial optimal condition for combat parameters. The simulation models are used and this method makes the analysis easier or simple, and reduces the total number of experiments. The suggested method might be useful in such a case that input parameters can not be represented quantitatively.

3 - Transforming US Army Logistics: A Strategic Supply Chain Approach
Greg Parlier, COL, USA Retired, University of Alabama in Huntsville, 230 Fieldridge Lane, Harvest, AL, 35749, United States, parlieg@email.uah.edu

This paper presents a systems approach guiding an ongoing project addressing significant challenges confronting Logistics Transformation. A multi-stage supply chain model is used to segment and guide this effort, to diagnose structural disorders and prescribe remedies. An "analytical architecture" is developed, icluding an "engine for innovation" and a "dynamic strategic logistics planning" process, to guide Logistics Transformation for the Army.

4 - Modeling Army Force Generation Using Simulation
Steven Stoddard, Operations Research Analyst, Center for Army Analysis, 6001 Goethals Road, Fort Belvoir, VA, 22060, United States, steven.stoddard@caa.army.mil, Mark Brantley

The Army developed the AFGM simulation to determine the best size for the force. We simulate the flow of units through lifecycles. AFGM allows us to examine force structure by illustrating gaps or redundancies, and associated deployment tempos. It also allows us to examine force generation options, such as how long rotations should last and when to mobilize reserves. The Army has adopted AFGM to analyze its force structure for the Quadrennial Defense Review and other analytical efforts.

5 - Routing of Multiple UAVs to Maximize the Chance of Escape During Mission Ingress
Karthik Thyagarajan, PhD Student, University at Buffalo (SUNY), 341 Bell Hall, UB North Campus, Buffalo, NY, 14214, United States, kt25@eng.buffalo.edu, Rajan Batta, Mark Karwan

This work addresses the problem of routing UAVs over a network to maximize the chance of escape during mission ingress. The problem is formulated as a MILP and a column generation based algorithm is then developed to generate the desired routes. An example is provided and computational results are reported.

■ SA15

Scheduling and Optimization

Cluster: Scheduling
Invited Session

Chair: Lei Lei, Associate Professor, Rutgers University, MSIS Dept., Rutgers Business School, 180 University Avenue, Newark, NJ, 07102, United States, llei@business.rutgers.edu

1 - Inventory Control and Scheduling with Facilities in Parallel and in Series
Vladimir Krasik, New York University, IOMS-Operations Management, Stern School of Business, New York, NY, 10012, United States, vkrasik@stern.nyu.edu, Jiawei Zhang, Joseph Leung, Michael Pinedo

We consider a framework for models with inventory control as well as scheduling aspects which encompasses many existing inventory models and scheduling models. We present polynomial time algorithms for several models within our framework.

2 - Scheduling for Optic-Fiber Financial Networks
Uday Rao, Associate professor, University of Cincinnati, 528 Carl H. Lindner Hall,, P.O. Box 0130,, Cincinnati, OH, 45221, United States, uday.rao@uc.edu, Ramesh Bollapragada, Ozgur Ozluk

We consider the scheduling of maintenance activities on links of an optic-fiber network (for financial services). We formulate an MILP model that optimizes total downtime while scheduling activities within certain time windows. The constraints incorporate activity categories, priorities, and precedence relations. We also present and evaluate heuristic solution approaches.

3 - Frameworks For Integrating Short Run Operations And Long-Term Distribution And Supply Chain Planning
Tan Miller, Director of Logistics, Pfizer, 201 Tabor Road, Morris Plains, NJ, 07950, United States, Tan.Miller@pfizer.com

This presentation will focus on some of the key components required to facilitate effective planning and management of both large-scale and small-scale supply chains. Specifically, we will review general frameworks that have been applied in industry for organizing a firm's supply chain planning and management activities.

4 - On the Integrated Port-Vessel Scheduling Problem
Yao Zhao, Assistant Professor, Rutgers University, Dept. of MSIS, Rutgers Business School, 180 University Avenue, Newark, NJ, 07102, United States, yaozhao@andromeda.rutgers.edu, Lei Lei, Hua Zhong

We study the problem of scheduling the operations of an ocean port and container vessels with conflict objectives. The port aims to minimize the space requirement and the land cost of its container yard, while the shipping company aims to maximize the vessel utilization. We propose a search algorithm that finds an integrated operation schedule to optimally compromise two objectives.

5 - New Approaches to Call Center Agent Scheduling
Turgut Aykin, ac2 Solutions, 1 Bethany Rd., Suite 52, Hazlet, NJ, 07730, United States, taykin@ac2solutions.com

Over the past decade, call centers have become the major point of contact between public and private enterprises and their customers. Effective scheduling of call center agents is a critical management function that affects customer service, operating costs, and customer satisfaction. This session will focus on the new approaches to the call center agent scheduling problem and present information on their industrial applications.

■ SA16

R&D and Product Performance

Sponsor: Organization Science
Sponsored Session

Chair: Laura Cardinal, Tulane University, A. B. Freeman School of Business, 7 McAlister Drive, New Orleans, LA, 70118, United States, cardinal@tulane.edu

1 - Multi-Dimentional Product Differentiation Strategy and Incumbent Survival During Market Fusion
Raja Roy, Tulane University, A. B. Freeman School of Business, 7 McAlister Drive, New Orleans, LA, 70118, United States, rroy@tulane.edu

Hotelling's model suggests that horizontal differentiation on a one-dimensional scale is beneficial for the performance of the incumbents. I investigate incumbents' product differentiation strategies during market fusion in the US machine tool industry during the 1970s and 1980s. My results suggest that during market fusion, horizontal differentiation alone does not lead to the improved survival chances.

2 - Modular Design: Effects on the Speed of Performance Improvement and Imitation
Susan McEvily, Assistant Professor, University of Pittsburgh, Katz School of Business, 252 Mervis Hall, Pittsburgh, PA, 15260, United States, smcevily@katz.pitt.edu, Frits Pil

We find evidence in the automobile industry that modular product design accelerates performance improvement, but little to suggest it facilitates imitation. Performance improves faster on quality items that originate in modular sources. Yet, the dispersion of quality performance across competing products, and the stability of their quality rankings are higher for modular criteria, suggesting that imitation remains imperfect.

3 - Managing the Tension from Geographic Search
Laura Cardinal, Tulane University, A. B. Freeman School of Business, 7 McAlister Drive, New Orleans, LA, 70118, United States, cardinal@tulane.edu, Donald Hatfield

March's (1991) insight on exploration and exploitation has been the focus of much research. We build on this literature by developing and testing hypotheses regarding not only the direct effects of accessing external knowledge, but also the indirect effects of coordination. We examine the impact of geographic dispersion on patent behavior and new drug development. In doing so, we are able to examine how organizational structure impacts firm learning.

■ SA17

Models for Pharmaceutical R&D Management

Cluster: New Product Development
Invited Session

Chair: Stefanos Zenios, Stanford University, 518 Memorial Way, Stanford, CA, United States, Stefzen@leland.stanford.edu

1 - Real Options in Partnership Deals: The Perspective of Cooperative Game Theory
Stefan Scholtes, Judge Business School, University of Cambridge, Cambridge, CB2 1AG, United Kingdom, s.scholtes@jims.cam.ac.uk, Nicos Savva

Pharmaceutical co-development deals form the practical background for this paper. We study the effect of phased investments and optionality on the negotiation set, the core, of a cooperative game. The valuation focuses on two cases: (i) the uncertainty can be fully hedged and (ii) hedging opportunities are discarded and preferences are expressed by certainty equivalents. In both cases the stochastic game can be reduced to an equivalent deterministic game. We discuss managerial implications.

2 - Optimal Licensing for R&D Projects
Bert De Reyck, London Business School, Regent's Park, London, UK, NW1 4SA, United Kingdom, bdereyck@london.edu, Pascale Crama, Zeger Degraeve

We design optimal licensing contracts for R&D projects with milestone payments and royalties. We maximize the licensor's expected NPV for diverse states in terms of information on the licensee's valuation and control over the licensee's effort. The optimal contract depends on the scenario and in the case of incomplete information and control, the licensor uses trade-offs between milestones and royalties to screen the licensee and vary the incentives. We conclude with managerial insights.

3 - Toward Optimizing R&D Allocation in the Pharmaceutical Industry
John Cavallaro, PhD Candidate, Stanford University, Mangement Science & Engineering, Stanford, CA, United States, john.cavallaro@stanford.edu, Stefanos Zenios

We model the optimal budget allocation between pharmaceutical R&D and marketing. Regression against observed returns is significant but weak. However, when the firms are clustered into two groups, those high in both therapeutic area (TA) intensity and US sales (vs. low in both), significance and strength improve. The cluster with high TA intensity and high US sales correlates well with the model, suggesting that for some firms, adjusting the R&D allocation could improve return.

■ SA18

Large Scale Problems in Transportation

Contributed Session

Chair: Ahmad Jarrah, Assistant Professor of Decision Sciences, University of Wyoming, Department of Management and Marketing, College of Business, Laramie, WY, 82071, United States, jarrah@uwyo.edu

1 - A Variant of the Continuous Network Design Problem Solvable for Large-Scale Systems
Gary Davis, Professor, University of Minnesota, 122 CivE, 500 Pillsbury Drive SE, Minneapolis, MN, 55455, United States, drtrips@umn.edu, Kate Sanderson

We describe a variant of the continuous network design problem (NDP), where the objective is to find the minimum amount of new lane-miles of highway capacity needed to satisfy quality of service constraints. We demonstrate an equivalence between the Karush-Kuhn-Tucker points of our NDP and the solutions to a set of nonlinear equations. A version of the method of successive averages is used to solve these equations, and is applied tothe freeway system of the Twin Cities.

2 - Factors that Impact Solution Run-times of Arc-based Formulations of the Vehicle Routing Problem
Ilgaz Sungur, Ph.D. Candidate, University of Southern California, Industrial Engineering Department, 3715 McClintock Avenue GER 240, Los Angeles, CA, 90089-0193, United States, sungur@usc.edu, Fernando Ordonez, Maged Dessouky

It is well known that the VRP becomes more difficult to solve as the problem size increases, however little is known about what makes a VRP difficult or easy to solve for problems of the same size. In this paper we investigate the effect of formulation and data parameters on the efficiency with which we can obtain exact solutions to the VRP by a commercial IP solver. We show experimentally how solution run-times of five different arc-based formulations are affected by data parameters.

3 - Convergence to Neologism-Proof Equilibria
Amy Taylor, University of New Hampshire, 217-F McConnell Hall, Durham, NH, 03824, United States

The vexing problem of multiplicity of equilibria in cheap-talk games has spurred research on refinements but equilibrium selection remains an as-yet unresolved theoretical issue. In the present paper we test neologism proofness in cheap-talk games with costless messages.

4 - Heuristic Approaches for a TSP Variant: Meter Reading Shortest Tour Problem
Jing Dong, University of Maryland, Department of Civil & Environmental Eng., 1173 Glenn Martin Hall, College Park, MD, 20742, United States, jdong@mail.umd.edu, Ning Yang, Ming Chen, Bruce Golden

We propose a TSP variant, Meter Reading Shortest Tour Problem (MRSTP), which has applications in Automatic Meter Reading. We seek a minimal length tour in a Euclidean plane that covers (within a distance) all the customer nodes (meters). Two heuristic algorithms are proposed and computational results are provided.

5 - Load Plan Design for Large LTL Carriers
Ahmad Jarrah, Assistant Professor of Decision Sciences, University of Wyoming, Department of Management and Marketing, College of Business, Laramie, WY, 82071, United States, jarrah@uwyo.edu, Luke Neubert, Ellis Johnson

We present a novel formulation for the problem of designing the planned flow of freight for large less-than-truckload carriers. The model uses a one-week repeating planning horizon and addresses practical operational considerations including empty repositioning costs and hub processing capacities. We present an effective solution algorithm that makes use of load planning tree generation in conjunction with a search heuristic. Computational results are provided.

■ SA19

KLIC I — Individual-Organizational Linkages (Knowledge, Learning & Intellectual Capital)

Sponsor: Technology Management
Sponsored Session

Chair: Charles Weber, Assistant Professor, Portland State University, Post Office Box 751, Department of Engineering and Technology, Portland, OR, 97207-0751, United States, charles.weber@etm.pdx.edu

1 - Characterizing the Value-Driven Learning Curve
Charles Weber, Assistant Professor, Portland State University, Post Office Box 751, Department of Engineering and Technology, Portland, OR, 97207-0751, United States, charles.weber@etm.pdx.edu

The traditional cost-driven learning curve does not satisfactorily explain many high tech organizational learning phenomena such as learning high-velocity environments (Eisenhart & Bourgeois) learning before doing (Pisano), yield-driven learning, (Bohn & Terwiesch) learning while ramping (Terwiesch & Bohn), designing for learning, platform leadership (Gawer & Cusumano) and increasing returns (Arthur). A promising value-based alternative is presented.

2 - Agent-based Social Simulation in Organizational Learning: A Micro Perspective
Brent Capps-Zenobia, Ph.D. Student, Portland State University - ETM, bcapps@hevanet.com, Charles Weber

Historically, organizational learning has focused on the macro-perspective (learning curve, Lotka-Volterra equations). The the point of view of the individual has not been discussed exhaustively. Agent-based social simulation, an approach in which human behavior is simulated by automata, presents itself as an alternative. A case from innovation adoption is presented.

3 - A Dynamic Model of Transactive Memory Systems
Edward Anderson, University of Texas at Austin Business School, McCombs School of Business, 1 University Station B6500, Austin, TX, 78733, United States, Edward.Anderson@mccombs.utexas.edu, Kyle Lewis

A key determinant of any product development group's performance is its transactive memory system (TMS): its shared, tacit memory system for managing and communicating information relevant to the group. We build a system dynamics model relating TMS to productivity by leveraging the theory of learning-by-doing at both the group and individual levels. We also include the effects of "group forgetting," specialization, and knowledge obsolescence.

4 - Individual-Organization Link and Knowledge
Teppo Felin, Visiting Assistant Professor, Emory, 1300 Clifton Road, Atlanta, GA, 30322, United States, teppo_felin@bus.emory.edu, William Hesterly

In this paper we address the individual-organization link as it relates to knowledge, and we explicate the problem of transformation between levels. Specifically - how, when, and why can we meaningfully talk about organizational knowledge? We also address some of the fallacies associated with specifying the organization as the repository knowledge and move toward explicating the underlying theoretical mechanisms and micro-foundations. Finally we outline critical future directions related to the micro-macro link for knowledge-based work in organization science.

■ SA20

Equilibrium and Simulation Models for Power Generation Planning in Wholesale Electricity Markets

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

Chair: Alvaro Baillo, Professor, Universidad Pontificia Comillas, Santa Cruz de Marcenado 26, Madrid, 28015, Spain, alvaro.baillo@iit.upco.es

1 - Option-Based Valuation of Electricity Generation Facilities
Valeriy Ryabchenko, PhD student, University of Florida, 473 Weil Hall, Gainesville, FL, 32611-6595, United States, valeriy@ufl.edu, Stan Uryasev

The paper considers a new algorithm for pricing spark spread options. It is based on linear programming approaches. We price electricity generation facilities under various assumptions (start-up costs, ramp up time, etc.).

2 - Joint Determination of Electric Energy and Reserves via Stochastic Linear Programming
David Fuller, Department of Management Sciences, University of Waterloo, Waterloo, ON, N2L 3G1, Canada, dfuller@engmail.uwaterloo.ca

The ISO solves a stochastic LP: first stage variables are generators' capacities to be made ready; second stage variables are energy outputs, and line flows, in each scenario, as defined by equipment outages, and demand. Outputs include energy spot and day-ahead prices. Reserve prices cannot be defined easily.

3 - Hydroelectric System Scheduling by Simulation
Andrés Ramos, Professor, Universidad Pontificia Comillas, Alberto Aguilera 23, Madrid, 28015, Spain, Andres.Ramos@iit.icai.upco.es, Jesùs Latorre, Alejandro Perea, Rafael Bellido, Santiago Cerisola

Simulation is a suitable tool for modeling the hydro system operation. The main reasons are complexities and interdependencies in the operation rules, cascaded topology of hydro basins, and stochastic hydro inflows. Some conflicting objectives must be considered: to avoid spillage from reservoirs, to satisfy the non electric uses of water, to keep a minimum downstream flow, and to maximize the profit of electricity sale. An object oriented simulation model has been developed with these features.

4 - Electricity Market Equilibrium Model with Risk Constraints via Benders Decomposition
Jordi Cabero, Ph. D. Student, Universidad Pontificia Comillas, Santa Cruz de Marcenado 26, Madrid, 28015, Spain, Jordi.Cabero@iit.upco.es, Alvaro Baillo, Mariano Ventosa, Santiago Cerisola

In this paper we propose a model to address the medium term hydrothermal coordination problem faced by a generation company when operating in an electricity market. The model measures the market risk faced by the company by means of CVaR. Our formulation leads to stochastic complementarity problems that we solve using Benders decomposition technique.

■ SA21

Learning to Rank: ROC Optimization in Data Mining

Sponsor: Data Mining
Sponsored Session

Chair: Nick Street, Associate Professor, University of Iowa, S232 Pappajohn Business Bldg., Iowa City, IA, 52241, United States, nick-street@uiowa.edu

1 - How to Predict the Best ROC
Rich Caruana, Assistant Professor, Cornell University, 4157 Upson Hall, Ithica, NY, 14853, United States, caruana@cs.cornell.edu

We present results from an empirical comparison of the ROC performance of ten learning methods: SVMs, neural nets, logistic regression, naive bayes, memory-based learning, random forests, decision trees, bagged trees, boosted trees, and boosted stumps. We not only show which learning methods predict good ROC, but also show that any model that predicts good ROC can be converted to a model that predicts good probabilities by calibrating the model with Platt's Method or Isotonic Regression.

2 - Rank Optimization by Maximizing the Area Under the ROC Curve using Linear Programming
Kaan Ataman, University of Iowa, Pappajohn Business Bldg., Iowa City, IA, 52242, United States, kaan-ataman@uiowa.edu, Nick Street

We introduce and analyze different linear programming formulations for directly optimizing an approximation to the area under the ROC curve (AUC). We also introduce techniques for reducing the geometrically increasing number of con-

straints in the model to make the LP scalable to larger problems.

3 - Regional Optimization of ROC Curves by Boosting
Yi Zhang, University of Iowa, Pappajohn Business Bldg., Iowa City, IA, 52242, United States, yi-zhang-2@uiowa.edu, Nick Street

ROC curves are often used to evaluate the ranking performance of learning models. Usually, however, people are only interested in a certain area of the ROC curve. We modify the standard boosting algorithm so that the resulting ensemble is able to optimize a fixed point on an ROC curve.

■ SA22

Information Systems Economics

Sponsor: Information Systems
Sponsored Session

Chair: Vidyanand Choudhary, Prof., University of California Irvine, GSM, UC Irvine, Irvine, CA, 92617, United States, VeeCee@uci.edu

1 - Impact of Software Vulnerability Announcements on the Market Value of Software Vendors
Rahul Telang, Carnegie Mellon University,, rtelang@andrew.cmu.edu, Sunil Wattal

While software vendors have been getting bad press for poor security of their products, we do not understand their incentives to provide secure software. Using the event study methodology, we collect data by searching for reports on published software vulnerabilities and show that vulnerability disclosures lead to about six percent loss in the market value of a software vendor. The change in stock price is more negative if the vendor fails to provide a patch at the time of disclosure.

2 - Profiting from Partial Allowance of Ticket Resale
Xianjun Geng, Assistant Professor, University of Washington, UW Business School, Box 353200, Seattle, WA, 98195, United States, gengxj@u.washington.edu

Prior research on ticket resale implicitly deems a resale market a unity, and so argues either for or against it. This paper argues that there is a third option - acknowledging that a resale market is often continuous and buyers often arrive at different times, it is possible to divide the resale market into two segments, then allowing resale in the first segment and denying it in the second. We also discuss how the use of online resale venues facilitates partial allowance of resale.

3 - Consumer Privacy and Marketing Avoidance
Il-Horn Hann, Marshall School of Business, USC, 3670 Trousdale Parkway, Los Angeles, CA, United States, hann@marshall.usc.edu, Kai-Lung Hui, Ivan Png, Tom Lee

We introduce consumer avoidance into analytical marketing research. We show that consumer efforts to conceal themselves and to deflect marketing have a crucial impact on sellers' marketing strategy. Seller marketing is a strategic complement with consumer concealment. Policies that encourage consumers to conceal their identities would lead sellers to increase marketing. By contrast, policies that encourage consumers to deflect seller marketing would lead sellers to reduce marketing.

■ SA23

Best Financial Services Student Paper Competition

Sponsor: Financial Services
Sponsored Session

Chair: Suresh Nair, Professor, University of Connecticut, School of Business, Storrs, CT, 06269, United States, suresh.nair@uconn.edu

1 - The Impact New Jersey Home Ownership Security Act on Subprime Mortgage Loans
Wei Yu, Rutgers Business School, kellyyu@pegasus.rutgers.edu

This paper examines the impact of New Jersey Home Ownership Security Act on subprime mortgage lending. We study the impact at both the neighborhood and individual loan level in different stages of the law. By matching four different data sources, we control for a broad set of borrower, lender, property and loan characteristics. Simultanous equation and Heckman's selection correction model are used to address the endogeneity and sample selection bias problems. Different results are compared.

2 - Dynamic Hedging of Options with Transaction Costs Using Stochastic Programming and Horizon Control
Peter Meindl, Stanford University, pmeindl@stanford.edu, James Primbs

Dynamically hedging a short option in discrete time with transaction costs has generally been approached through either an instantaneous horizon sub-optimal analytical solution or a long horizon dynamic program whose solution is often computationally prohibitive. We propose a new methodology combining stochastic programming and receding horizon control that results in significantly reduced mean absolute hedging error vs. analytic solutions.

3 - Linking Stochastic Program and Policy Simulator for the U.S. Defined-Benefit Pension System
Zhuojuan Zhang, Princeton University, zhuojuan@Princeton.EDU

This paper presents a risk-based and anticipatory modeling framework to integrate an industry with its defined-benefit pension system. We develop an approach for risk-neutral valuation of contributions by plan sponsors. By linking stochastic program with a policy simulator, we study the problem of finding optimal policy rules such as pension investment and contribution rules. Empirical analysis indicates that pension decisions need to be tailored to the characteristics of different industries.

4 - Modern Portfolio Management with Conditioning Information
I-Hsuan Ethan Chiang, Boston College, chiangih@bc.edu

This paper considers how active portfolio managers may use conditioning information in forming portfolios to optimize performance measures. We provide explicit solutions for multiple risky assets, either with or without a risk free asset and also consider various constraints on portfolio risk. Abstracting from misspecification and estimation errors, our solutions improve the performance measure by four times when compared with the portfolios ignoring conditioning information.

■ SA24

Financial Models and Analysis I

Cluster: Financial Engineering
Invited Session

Chair: Xin Guo, Assistant Professor, Cornell University, School of ORIE, Cornell University, Ithaca, NY, 14853, United States, xg29@cornell.edu

1 - Robust Portfolio Selection Problems
Garud Iyengar, Associate Professor, Columbia University, garud@ieor.columbia.edu, Emre Erdogan

In this talk we survey some of our recent work on using robust optimization techniques in the context of portfolio selection. The intent of the robust optimization framework is to systematically correct for parameter uncertainties in optimization problems.

2 - Portfolio Optimization Via Approximate Dynamic Programming
Benjamin Van Roy, Stanford University, Terman 315, Stanford University, Stanford, CA, 94305-4023, United States, bvr@stanford.edu, Jiarui (Jared) Han, Xiang (Robbie) Yan

We will discuss approximate dynamic programming methods for portfolio optimization. Applications include long-term investment management and transaction cost optimization in high-frequency trading.

3 - Long Term Portfolio Optimization with Stochastic Programming and Receding Horizon Control
Peter Meindl, Stanford University, 1038 Guinda Street, Palo Alto, CA, 94301, United States, peter.meindl@stanfordalumni.org, James Primbs

Long term portfolio optimization is central to investment management, yet no generally accepted solution currently exists due to high computational hurdles. We approach the problem through a combination of stochastic programming and receding horizon control in an environment with many dynamic assets and transaction costs. Our methodology's advantages are its ability to optimize in realistically complex environments over a long horizon, while at the same time remaining computationally feasible.

4 - Revenue Management of Callable Products
Guillermo Gallego, Professor, Columbia University, 326 S.W. Mudd Building, New York, NY, 10027, United States, ggallego@ieor.columbia.edu, Haengju Lee

Providers of perishable capacities sold through a low-to-high booking process can significantly increase revenues by inducing low fare customers to grant them call options on capacity at a given strike price. This enables providers to resell this capacity to high fare customers. In this talk we investigate optimal booking and option exercise policies when the options expire before the end of the booking process.

■ SA26

JFIG- Paper Competition I

Sponsor: JFIG, Junior Faculty Interest Group
Sponsored Session

Chair: Joseph Geunes, Associate Professor, University of Florida, 303 Weil Hall, Gainesville, FL, 32611, United States, geunes@ise.ufl.edu

1 - Semi Continuous Cuts for Mixed Integer Programming

Ismael de Farias, Assistant Professor, University at Buffalo, SUNY, 403 Bell Hall, United States, defarias@buffalo.edu

We study the convex hull of the feasible set of the semi-continuous knapsack problem, in which the variables belong to the union of two intervals. Besides being important in its own right, the semi-continuous knapsack problem is a relaxation of general mixed-integer programming. We show how strong inequalities valid for the semi-continuous knapsack polyhedron can be derived and used in a branch-and-cut scheme for mixed-integer programming and problems with semi-continuous variables. We present computational results that demonstrate the effectiveness of these inequalities, which we call collectively semi-continuous cuts. Our computational experience also shows that dealing with semi-continuous constraints directly in the branch-and-cut algorithm through a specialized branching scheme and semi-continuous cuts is considerably more practical than the textbook approach of modeling semi-continuous constraints through the introduction of auxiliary binary variables in the model.

2 - Inspection and Replenishment Policies for Systems with Inventory Record Inaccuracy

Gurhan Kok, Assistant Professor, Duke University, 1 Towerview Dr., Durham NC 27708, United States, gurhan.kok@duke.edu, Kevin Shang

For many companies, inventory record inaccuracy is a major obstacle to achieving operational excellence. In this paper, we consider an inventory system in which inventory records are inaccurate. The manager makes inventory inspection and replenishment decisions at the beginning of each period. There is a fixed cost associated with each inspection. If an inspection is performed, inventory records are aligned with physical inventory. The objective is to develop a joint inspection and replenishment policy that minimizes total costs in a finite horizon. We show that an inspection adjusted base-stock (IABS) policy is near-optimal. Under this policy, the manager performs an inspection if the recorded inventory level is less than a threshold level and orders up to a base-stock level that depends on the inspection decision. In addition to this structural result, our study (1) provides guidelines for managers to design effective inspection schedules, (2) shows that the commonly-practiced cycle count policy can be effective if the right inspection cycle is chosen, and (3) quantifies the true value of RFID systems.

3 - Compound Poisson Disorder Problem

Savas Dayanik, Princeton University, sdayanik@princeton.edu Semih Sezer

In a compound Poisson disorder problem, arrival rate and/or jump distribution of some compound Poisson process change suddenly at some unknown and unobservable time. The problem is to detect the change (or disorder) time as quickly as possible. A sudden regime-shift may require some counter-measures be taken promptly, and a quickest detection rule can help with those efforts. We describe complete solution of compound Poisson disorder problem with several standard Bayesian risk measures. Solution methods are feasible for numerical implementation and are illustrated on examples.

■ SA27

2005 Dantzig Dissertation Award Finalists

Cluster: Dantzig Dissertation Prize
Invited Session

Chair: Linda Green, Professor, Columbia University, 3022 Broadway, New York, NY, 10027, United States, lvg1@columbia.edu

Dantzig Dissertation Prize

The Dantzig Prize is offered for the best PhD in Operations Research with applied content. The winner will likely offer a presentation, as will some of the strongest finalists.

1 - First Place - Randomization and Heavy Traffic Theory: New Approaches to the Design and Analysis of Switch Algorithms

Devavrat Shah, MIT, devavrat@MIT.EDU

High speed data networks, such as the Internet, present the algorithm designer with highly constrained problems: the algorithms need to work at a very high speed while providing good performance and accessing limited computing resources. Consequently, only the simplest algorithms are implementable. But such algorithms may perform rather poorly. This tension between implementability and goodness of performance is acutely experienced by the designer of switch scheduling algorithms. In the first part of my talk I will show how randomization may be used to simplify the implementation of switch schedulers. Specifically, I will exhibit a simple randomized scheduling algorithm that delivers 100% throughput while providing low delay. The second part of my talk concerns a new approach for analyzing the packet delay induced by an algorithm. I shall explain why traditional approaches based, for example, on queueing and large deviation theories are inadequate, and advance a new approach based on Heavy Traffic Theory. This approach helps explain some intriguing observations other researchers have made about the delay of scheduling algorithms based on simulations. It also leads to the characterization of a delay-optimal scheduling algorithm.

2 - Lot-Sizing and Scheduling for Flexible Flow Lines

Daniel Quadt, Daniel.Quadt@gmx.net

We consider the lot-sizing and scheduling problem for flexible flow lines. Flexible flow lines are flow lines with parallel machines on some or all production stages. The objective is to minimize setup, inventory holding and back-order costs as well as the mean flow time. The lot-sizing and the scheduling problem are interdependent. An integrative, three-phased solution approach is presented. In its first phase, a lot-sizing and scheduling problem for the bottleneck stage is solved on product family level. The phase is based on a novel MIP-model, which uses integer instead of binary variables. In the second phase, the schedule is rolled out to the other production stages. The third phase employs two nested Genetic Algorithms with a novel representation scheme to compute a detailed schedule on product level. The approach has been implemented in a semiconductor back-end.

3 - Uncertainty in Emergency Response - Estimating Ambulance Travel Times

Susan Budge, sbudge@ualberta.ca

An important component of virtually any model of emergency operations, is the travel time of the vehicles, especially of those vehicles enroute to a call. This is true because often the most critical performance measure for such a system is the time it takes to respond to an emergency, and the travel time of the vehicle to the scene of the emergency is typically a large portion of this response time. On the surface, the problem of estimating travel times may seem trivial, one might think it is simple - just divide the travel distance by the speed. However, if we look beyond the surface, it quickly becomes apparent that the problem is much more complicated than it first appears. This paper provides a thorough empirical analysis of ambulance travel times, focusing on the distribution (and in particular the variability) of actual travel times for ambulances, and how to incorporate that distribution into methods for estimating the travel time.

■ SA28

Consumer-Based Revenue Management

Sponsor: Revenue Management & Pricing
Sponsored Session

Chair: Patrice Marcotte, DIRO,, Université de Montréal, CP 6128, Succursale Centre-Ville, Montréal, QC, H3C 3J7, Canada, marcotte@iro.umontreal.ca

1 - An Exact Algorithm for Bilevel Toll Setting

Luce Brotcorne, Maître de Conférences, UVHC, Le Mont Houy, Valenciennes, 59313, France, luce.brotcorne@univ-valenciennes.fr, Fabien Cirinei, Patrice Marcotte, Gilles Savard

We describe a path-based framework for solving a bilevel pricing model, where the leader maximizes the revenue raised from tolls imposed on a set of network links, while taking into account the cost minimizing behaviour of customers. The performance of the algorithm is contrasted against that of a mixed integer formulation.

2 - Design and Positioning of Revenue Management Products

Kalyan Talluri, Universitat Pompeu Fabra, Department of Economics and Business, Barcelona, 08005, Spain, kalyan.talluri@upf.edu

Revenue management products are frequently redesigned (conditions of purchase, prices etc.), and can be almost considered an operational problem. There are very few models however in the literature specifically designed for RM products. We present an additive utility model in product attributes and derive structural results and an optimal solution for the one-dimensional version and then extend some of the results to multi-dimensional problems.

3 - Competitive Supply Chain Contracting: RM for Tour Operators

Benjamin Marcus, Richard Ivey School of Business, 1151 Richmond Street N, London, ON, N6A 3K7, Canada, bmarcus@ivey.uwo.ca, Chris Anderson

Tour operators provide bundled products (airline, hotel, car rental) for resort vacations. Depending on the tour operator they may not own any of this capacity, entering into contracts to secure rooms, seats etc. We will discuss the tour RM problem, presenting some approaches along with the use of contracts used in risk sharing.

4 - Pricing Models based on Reservation Prices

Romy Shioda, University of Waterloo, 200 University Avenue West, Waterloo, ON, Canada, rshioda@math.uwaterloo.ca, Levent Tuncel

We consider revenue management models for pricing a product line with several customer segments. We work under the assumption that every customer's product choice is determined entirely by their reservation price. We formulate a maximum utility and several probabilistic choice models as mixed-integer programming problems and illustrate some computational results. We also highlight key mathematical properties of the maximum utility model.

■ SA29

H - 4th Floor, Union Square 23

OR and Computing

Contributed Session

Chair: Brett Landry, Asst Professor, University of New Orleans, Dept of Management, 2000 Lakeshore Drive, NO, LA, 70148, United States, blandry@uno.edu

1 - A Genetic Algorithm with Adaptive Crossover Probabilities
Patricia Randall, Clemson University, Department of Industrial Engineering, 110 Freeman Hall, Clemson, SC, 29634, pcavedo@clemson.edu, Mary Beth Kurz

The performance of a genetic algorithm is heavily influenced by the choice of crossover operation and its respective rate. An adaptive GA is given that uses one of two crossover selection mechanisms: a regulatory gene added to each chromosome and roulette wheel crossover selection.

2 - Use of Automated Information Systems to Improve Efficiency in HR Management
Mohammad Bsat, Professor, Jackson State University, 5201 Lakeland Dr, Suite 169, Jackson, 39232, United States, mdbsat@yahoo.com, stephen trouard, Astrid Beckers

This research hypothesizes that automated collection,storage,& retrieval of information related to the hr element in any organization helps make more informed,lasting decisions about utilization & retention of its HR which helps the organization in its competitive efforts.A large-scale household appliance manufacturer who implemented an automated process for its hr information gathering & now relies on a completely computerized storage,retrieval,& utilization of the hr-related data was surveyed

3 - An Open Source Algebraic Modeling and Programming Software
Suleyman Karabuk, Assistant Professor, University of Oklahoma, 202 West Boyd, Room 124, Norman, OK, 73019, United States, karabuk@ou.edu

We describe an initiative in designing and developing an open source algebraic modeling and programming software similar to the current commercial products such as AMPL and GAMS among many others. There are two motivations to this effort: (i) cross the bridge between general purpose programming languages and domain specific algebraic modeling languages, (ii) create an open platform for the community to diffuse research in extending the current state of algebraic modeling languages.

4 - Analysis of Semantic Interoperability to Provide Design Guidelines for Interfacing Design and Engineering
Cheolsoon Im, Ph.D. student/ Research Assistant, Wayne State Univ, 80 E. Hancock Apt 702, Detroit, MI, 48201, United States, cim@wayne.edu, Namkyu Park

I plan to achieve semantic interoperability between engineering and design in automotive design process. I identified major inefficiencies at an automotive company. Often, suppliers are on board late and designers tend not to honor detailed design. I would analyze system design specification to define data semantics and construct ontology. Expected benefit would be better communication which will foster trust building, early design freeze and reduction of time spent in design process.

5 - Developing Secure RFID Networks
Brett Landry, Asst Professor, University of New Orleans, Dept of Management, 2000 Lakeshore Drive, NO, LA, 70148, United States, blandry@uno.edu

Organizations that adopt RFID can gain tremendous gains in both efficiency and effectiveness. However, when viruses, worms, spyware, and trojan horses target these resources, the organization can cease to function. Therefore, RFID based networks should be secure, private, and separate from other computing resources. The problem for many organizations is that they do not have the infrastructure necessary to support this division.

■ SA30

Finance Engineering in Investment Decsion Making

Contributed Session

Chair: Eymen Errais, Stanford University, Terman Engineering, 494, Stanford, CA, 94305, United States, eymen@stanford.edu

1 - Optimizing Portfolio Weights for the Second Degree Stochastic Dominance with Maximum Expected Return
Choonho Ryu, Associate Professor, Hong-ik University, Dep't of Bus. Admin., 72-1 Sangsoo-dong Mapo-gu, Seoul, 121-791, South Korea, ryuch@wow.hongik.ac.kr

Unlike the mean-variance approach, the stochastic dominance approach is to form a portfolio that stochastically dominates a predetermined benchmark portfolio such as Dow Jones Index and KOSPI. This study is to search a set of portfolio weights for the second degree stochastic dominance with maximum expected return by managing the constraint set and the objective function separately. An algorithm was developed and tested with promising results against Korean stock market data sets.

2 - International Portfolio Choice and Political Instability Risk
K. Smimou, Faculty of Management, University of Lethbridge, Box 21043 Westview P.O., Lethbridge, AB, T1K6X4, Canada, kamal.smimou@uleth.ca

Despite the demonstrated benefits from direct international portfolio diversification into foreign nations including the less developed countries are well documented, the idea is discouraged by market imperfections such as political instability and taxes. Using alternative instability risk proxies in the context of mean-variance framework, two models are proposed and the impact of this type of risk on international portfolio investment decision is corroborated.

3 - Pricing Credit Default Swap Bermudan Options : An Approximate-Dynamic Programming Approach
Eymen Errais, Stanford University, Terman Engineering, 494, Stanford, CA, 94305, United States, eymen@stanford.edu, Damiano Brigo, Hatem Ben Ameur

We define a new credit derivatives product, Credit Default Swap Bermudan option, and devise a numerical method to price it. We model the default event within the doubly stochastic intensity framework where the intensity is defined by an extension of CIR, the CIR++ model. The numerical method developed is based on dynamic programming with finite elements and piecewise linear approximation.

■ SA31

Joint Session OR Practice/Roundtable: Supply Chain Management in the Automotive Industry

Cluster: OR Practice, Roundtable

Invited Session

Chair: Mark Everson, Ford Motor Company, Infotronics & Systems Analytics Department, SRL Bldg, MD # 2122, 2101 Village Rd., Dearborn, MI, 48124, meverson@ford.com

Co-Chair: Erica Klampfl, Ford Motor Company, Infotronics & Systems Analytics Department, SRL Bldg, MD # 2122, 2101 Village Rd, Dearborn, MI, 48124, United States, eklampfl@ford.com

1 - Supply Chain Network Optimization Model for Commodity Sourcing
Erica Klampfl, Ford Motor Company, Infotronics & Systems Analytics Department, SRL Bldg, MD # 2122, 2101 Village Rd, Dearborn, MI, 48124, United States, eklampfl@ford.com, Oleg Gusikhin, Roger Tenney

Commodity sourcing is a complex problem faced by automotive manufacturers, which must take into account transportation, production, and inventory costs, as well as the capability and capacity constraints of the suppliers. This talk presents a network modeling approach to represent the possible configurations of the supply chain of automotive commodity subassemblies. The mathematical formulation and solution technique will be discussed and illustrated with an application example.

2 - Models and Algorithms for Scheduling in Automotive Stamping Plants
Amy Cohn, University of Michigan, 1205 Beal Avenue, Ann Arbor, MI, 48109-2117, United States, amycohn@engin.umich.edu, Giuseppe Rossi, Yakov Fradkin, Ada Barlatt, Oleg Gusikhin

Automotive stamping plants contain sequential workstations which jobs pass through until each product is fully assembled. Such manufacturing environments have complex production and material handling requirements. We present novel models and algorithms to find minimum cost sequences and batch sizes on each workstation. Preliminary computational results are provided.

3 - Capacity Optimization for the Supply Chain
Mark Everson, Ford Motor Company, Infotronics & Systems Analytics Department, SRL Bldg, MD # 2122, 2101 Village Rd., Dearborn, MI, 48124, meverson@ford.com, David A. Ostrowski

Determining assembly and supply base capacity for a multi-product manufacturer like an automotive company is a problem that has many facets. Important issues include: consumer demand uncertainty characterization, the level of part commonality, and the flexibility of both assembly plants and the supply base. This talk will overview a number of planning models that determine optimal supply base capacity given demand uncertainty.

4 - Measuring Manufacturing Flexibility Value in an Automotive Supply Chain
Charu Chandra, Associte Professor, University of Michigan-Dearborn, 4901 Evergreen Road, 2230 Engineering Complex, Dearborn, MI, 48128, United States, charu@umich.edu, Mark Everson, Janis Grabis

Manufacturing flexibility is a recognized strategy for dealing with demand uncertainty. This paper expands flexibility research by determining flexibility requirements for the entire manufacturing supply chain, focusing on enabling volume flexibility, and analyzing impact of product variety. A stochastic programming model for optimization of flexibility requirements is developed. Model solving approaches are compared. Experimental studies using data from a major automotive company are conducted.

■ SA32

Recent Advances in Sports Modeling

Sponsor: OR in SpORts
Sponsored Session

Chair: Michael Trick, Carnegie Mellon University, Tepper School of Business, Pittsburgh, PA, United States, trick@cmu.edu

1 - Scheduling Major League Baseball
Michael Trick, Carnegie Mellon University, Tepper School of Business, Pittsburgh, PA, United States, trick@cmu.edu, Kelly Easton, George Nemhauser

The Sports Scheduling Group has created the schedules for Major League Baseball for the 2005 and 2006 seasons. We outline some of the issues in defining these schedules and some of the approaches we use in creating them.

2 - Beating the Brackets
Joel Sokol, Assistant Professor, Georgia Institute of Technology, School of Industrial & Systems Engineeri, Georgia Institute of Technology, Atlanta, GA, 30332-0205, United States, jsokol@isye.gatech.edu, Paul Kvam

We describe a data-simple logistic regression/Markov chain (LRMC) model for rating NCAA basketball teams. Our most recent compuational results show that our model makes more accurate predictions than expert ranking systems, rating systems, and Las Vegas oddsmakers, even when those other methods are enhanced by dynamic programming. The difference is amplified as the complexity of tournament pool scoring systems increase.

3 - Bill James 'Pythagorean Method Of Baseball' - Some Findings And Potential Alternatives
James Cochran, Department of Marketing and Analysis, College of Administration and Business, Louisiana Tech University, Ruston, LA, 71272, jcochran@cab.latech.edu

In the early 1980's Bill James suggested a relationship between the win/loss percentage of a MLB team and the ratio of squared runs scored to squared runs scored plus squared runs allowed. While the relationship works well, questions still exist - Is another functional form superior? What is the optimal value of the exponent? Has it changed over time? Does it differ between leagues? Does any franchise consistently overachieved or underachieved over a prolonged period? We address these questions.

■ SA33

Process Monitoring and Diagnosis(2)

Sponsor: Quality, Statistics and Reliability
Sponsored Session

Chair: Fugee Tsung, Associate Professor, Hong Kong University of Science and Techonology, IELM Department of HKUST, Kowloon, Hong Kong, season@ust.hk

1 - A Weighted CUSUM Chart For Detecting Patterned Mean Shifts
Wei Jiang, Assistant Professor, Stevens Institute of Technology, Castle Point of Hudson, Hoboken, NJ, 07030, United States, wjiang@stevens.edu, Lianjie Shu

For monitoring residuals from a time series, conventional control charts may perform poorly as they do not consider the information contained in the patterned mean shift. This paper proposes a weighted cumulative sum (WCUSUM) procedure which first estimates the dynamic mean of the sequence then uses the estimates for weighting the monitoring sequence. The WCUSUM chart performs far superior than the CUSUM chart when forecast recovery is present, and performs similarly otherwise.

2 - A CUSUM Chart with Local Signal Amplification for Detecting a Range of Unknown Shifts
Yanting Li, Hong Kong University of Science and Techonogy, Tower A403,, HKUST, Clear Water Bay, Kowloon, Hong Kong, ielyt@ust.hk, Fugee Tsung, Dong Han

A traditional CUSUM chart can only be optimally designed to detect a pre-specified mean shift. With an aim to enhance the detection of small, medium and large mean shifts range, we propose LSA_CUSUM by combining local signal amplification technique with the CUSUM chart; also we present the optimum design procedures. Simulations are conducted to compare the performance of the proposed LSA-CUSUM chart with other CUSUM-type control charts. The results show that LSA-CUSUM outperforms other schemes.

3 - Estimating the Change Point of Exponentially Distributed Observations in SPC
Marcus B. Perry, Air Force Institute of Technology, Department of Operational Sciences, Marcus.Perry@afit.edu, Sharif Melouk

Following a control chart signal, locating a process change point would simplify the search for and identification of the special cause. This research compares the maximum likelihood estimator (MLE) of the process change point to the change point estimator of the exponential CUSUM control chart. Results show the MLE outperforms the CUSUM estimator across a wide range of change magnitudes.

4 - Multivariate Cuscore Control Charts for Monitoring the Mean Vector in Autocorrelated Processes
Harriet Black Nembhard, Marcus Department of Industrial & Manufacturing Engineering, The Pennsylvania State University, 310 Leonhard Building, University Park, PA, 16802, hbnembhard@psu.edu, Shuohui Chen

A multivariate Cuscore procedure based on the likelihood ratio test and fault signature analysis is proposed. A case study with a reactive ion etch (RIE) process used in the semiconductor manufacturing industry illustrates how the MCuscore is applied.

■ SA34

Sensor II

Sponsor: Quality, Statistics and Reliability
Sponsored Session

Chair: Yong Chen, University of Iowa, Mechanical and Industrial Engineering, Iowa City, IA, United States, yongchen@engineering.uiowa.edu

1 - Enemy Track Based Threat Evaluation for Military Sensor/Fusion Networks
Rajan Batta, Professor, University at Buffalo (SUNY), 438 Bell Hall, Department of Industrial Engineering, Buffalo, NY, 14260, United States, batta@eng.buffalo.edu, Abhay Joshi, Rakesh Nagi

In a recent paper, Patel et al. (2005) proposed a dynamic maximal expected coverage model for sensor networks operating under a uniform threat environment. This is applicable at a strategic level. At a tactical level enemy track information is available, which can be used to obtain refined threat probabilities, which vary in space and time. The first part of our work is in the calculation of these time/space dependent probabilities. We then enhance Patel et al.'s model and study the benefit.

2 - Range-free Localization for Ad Hoc Sensor Networks Using Range Means
Ming-En Wang, Assistant Professor, University of Pittsburgh, 1034 Benedum Hall, Pittsburgh, PA, 15261, United States, MEWang@engr.pitt.edu

Knowing node locations is critical to many applications of ad hoc sensor networks. A popular approach to ad hoc localization is to determine node locations based on estimated distances between nodes and location-aware anchors. We propose a range-free, distributed distance estimation scheme based on the probability distribution of the location of h-hop nodes. Simulations show that the proposed range-mean method consistently outperforms the well known DV-hop method in various network settings.

3 - Sensors and Data Fusion for Traffic Monitoring
Pitu Mirchandani, Professor, University of Arizona, Systems and Industrial Engineering, P.O. Box 210020, Tucson, AZ, 85721, United States, pitu@sie.arizona.edu

We will briefly discuss various sensors available for monitoring vehicular traffic on transportation networks. Some models for data analysis and traffic parameter estimation will be presented, with clear indication of how these may be applied for traveler information systems and embedded in real-time traffic monitoring systems.

4 - Monitoring of Process and Sensor Fault Based on a Fault-quality Model
Yong Chen, University of Iowa, Mechanical and Industrial Engineering, Iowa City, IA, United States, yongchen@engineering.uiowa.edu, Yu Ding, Shan Li

Linear fault-quality models have been developed in recent years for quality modeling and improvement. Changes on quality characteristics are typically due to process faults and/or sensor faults. An SPC strategy is developed in this research to online monitor both process and sensor faults. The process faults and sensor faults can be monitored separately by projecting observations of quality characteristics to two orthogonal spaces based on the fault-quality model.

■ SA35

Rail Applications Academic Session

Sponsor: Railroad Applications
Sponsored Session

Chair: Christopher Barkan, Associate Professor & Director - Railroad Engineering Program, Department of Civil and Environmental Engineering, University of Illinois at Urbana-Champaign, 205 N Mathews Ave., 1201 NCEL, MC-250, Urbana, IL, 61801, United States, cbarkan@uiuc.edu

1 - A Risk-Cost Approach to Rail-Truck Intermodal Transportation of Mixed Freight
Manish Verma, Memorial University, mverma@mun.ca, Vedat Verter

Rail-truck intermodal transportation of hazardous and regular freight is discussed. Tradeoff analyses driven by the element of "time" dictate the evaluation of drayage and train make-up. Mathematical models, a general case and two special cases, developed to capture the time-based rail-truck intermodal transportation of mixed freight are presented.

2 - Genetic Algorithm to Minimize Earliness and Tardiness of Outbound Trains in a Rail Yard
Rob Randall, Clemson University, 110 Freeman Hall, Clemson University, Clemson, SC, 29633, United States, rrandal@clemson.edu, Mary Beth Kurz

We develop a genetic algorithm to solve the rail yard scheduling problem to minimize earliness and tardiness of outbound trains. This problem is np-complete and it is therefore necessary to find a method to approximate the optimal value for realistic problem instances. We consider a hump yard with multiple switch and yard engines and allow delay to be inserted between trains.

3 - Optimization of the Loading Patterns of Intermodal Freight Trains
Yung-Cheng Lai, Graduate Research Assistant, University of Illinois at Urbana-Champaign, B118 Newmark Lab., 205 N. Mathews Ave., Urbana, IL, 61801, United States, lai3@uiuc.edu, Hayri Onal, Christopher Barkan

Intermodal trains incur greater aerodynamic penalties and increased fuel consumption than other trains due to constraints imposed by equipment design and loading patterns. Gap length and position-in-train are the two most important factors; hence, minimizing the gaps and placing loads with shorter gaps near the front generates lower aerodynamic resistance. We present a model for determining optimum loading patterns which minimize aerodynamic resistance and yield the highest fuel efficiency.

4 - A Decision Support System for Train Scheduling Problem
Krishna Jha, Research Director, Innovative Scheduling, 2153 SE Hawthorne Road, Suite 128, Gainesville, FL, 32641, United States, krishna@innovativescheduling.com, Ravindra Ahuja, Pooja Dewan, Arvind Kumar

For a class I railroad in US, the train scheduling problem is extremely large,complex, and multi-objective combinatorial optimization problem. Mathematically,it is very difficult to generate an implementable train schedule without user intervention. We have developed a decision support system, which is empowered with highly efficient network flow heuristics at the back end, to assist users in creating implementable train schedule.

■ SA36

Joint Session Simulation/ QSR: Design and Analysis of Simulation Experiments

Sponsor: Simulation, Quality, Statistics and Reliability
Sponsored Session

Chair: Bruce Ankenman, Associate Professor, Northwestern Univeristy, 2145 Sheridan Rd., Evanston, IL, 60208, United States, ankenman@northwestern.edu

1 - Controlled Sequential Factorial Design for SImulation Factor Screening
Hong Wan, Assitant Professor, Purdue University, Industrial Engineering Department, 315 N. Grant Street, West Layfayette, IN, 47907, United States, hwan@purdue.edu, Hua Shen

We propose controlled sequential factorial design for discrete-event simulation factor screening. It combines a sequential hypothesis-testing procedure with the traditional factorial design to control the Type I Error and power for each factor under heterogeneous variances conditions. The method requires minimum assumptions and demonstrates robust performance with different system conditions.

2 - Estimation of Percentiles of Cycle Time in Manufacturing Simulation
Barry Nelson, Professor, Northwestern University, Dept. of Industrial Engr. & Mgmt. Sci., 2145 Sheridan Road, Evanston, IL, 60208-3119, United States, nelsonb@northwestern.edu, Bruce Ankenman, Feng Yang

We presents a simulation-based method for estimating percentiles of the cycle time distribution of a manufacturing system as a function of the factory throughput and percentile of interest. The method fits metamodels to the first three moments of cycle time as a function of throughput, and then uses a moment-based approximation to obtain the percentiles of interest.

3 - Estimating Cycle-Time Quantiles in Manufacturing Systems
Jennifer McNeill, Graduate Student, Arizona State University, Department of Industrial Engineering, Tempe, AZ, 85287, United States, Jennifer.Mcneill@asu.edu, John Fowler, Gerald Mackulak, Barry Nelson

Previous cycle-time quantile estimation work has suggested that the Cornish-Fisher expansion (CFE) can be used effectively to provide cycle-time quantile estimates. However, when dispatching rules are implemented, the shape of the cycle time distribution may change severely. In such situations, the accuracy of the CFE can degrade, motivating the need for a modification to the expansion. A solution approach combining a data transformation, the maximum transformation, with the CFE is presented.

4 - An Adaptive Method for Factor Screening for Simulation Experiments
Bruce Ankenman, Associate Professor, Northwestern Univeristy, 2145 Sheridan Rd., Evanston, IL, 60208, United States, ankenman@northwestern.edu, Russell Cheng, Sue Lewis

The sequential method is based on an orthogonal array, but assumes that some factor effects have a known direction. The rows of the orthogonal array are run in a strategic order to allow for group factor screening of these factors. If the group screening is effective in eliminating null factors, then the orthogonal array is reduced in size and the procedure continues. Methods for adding power control and detection of dispersion effects to the screening procedure will also be discussed.

■ SA37

Joint Session AP/ Workforce: Queueing Systems with Flexible Servers I

Sponsor: Applied Probability, Workforce Flexibility
Sponsored Session

Chair: Sigrun Andradottir, Professor, Georgia Institute of Technology, School of ISyE, Atlanta, GA, 30332, United States, sa@isye.gatech.edu

1 - Discretionary Task Completion: A Key Difference between White-Collar and Blue-Collar Work System
Gigi Yuen, Northwestern University, 2145 Sheridan Road, C229, Evanston, IL, 60208, United States, gigiyuen@northwestern.edu, Seyed Iravani, Wally Hopp

We study models that capture characteristics of white-collar work systems, particularly workers' level of discretion on task completion. The optimal work structure and effectiveness of various heuristics are investigated for single and multiple class systems. Contrary to traditional blue-collar framework, congestion may intensify when capacity increases. Moreover, information about job types in queue is less useful in systems discretionary task completion system.

2 - Dynamic Routing of Generic Customers to Stations with Dedicated Traffic
Serhan Ziya, Assistant Professor, University of North Carolina, Department of Statistics and Operations, Chapel Hill, NC, United States, ziya@email.unc.edu, Nilay Argon, Kevin Glazebrook, Li Ding

We consider a network of parallel heterogeneous service stations each modeled as a single server queue. Each station serves its own dedicated customers as well as generic customers who are routed from a central controller. Both dedicated and generic customers incur waiting costs for the time they spend in the system. We develop heuristic routing policies that minimize the long-run average cost and provide numerical results that compare the performance of different heuristics.

3 - Evaluating Robustness of Networks with Flexible Servers
Douglas Down, McMaster University, Department of Computing and Software, Hamilton, ON, Canada, downd@mcmaster.ca, Hayriye Ayhan, Sigrun Andradottir

We investigate how server flexibility can decrease sensitivity to disturbances in the underlying system (due to causes such as demand variability and errors in parameter estimation). We first identify desirable properties of flexibility structures. We then propose a means for quantifying the ability of a particular flexibility structure to mitigate the effects of such disturbances.

4 - Impulse Control of Brownian Motion: The Constrained Average Cost Case

Melda Ormeci, Georgia Institute of Technology, School of Industrial & Systems Eng., Atlanta, GA, 30332, United States, ormecime@isye.gatech.edu, John H. Vande Vate, Jim Dai

Consider a storage system whose content fluctuates as a Brownian motion in the absence of control. Inventory level can be adjusted by any quantity at a fixed plus proportional cost. A linear holding cost is incurred continuously. We show control band policies are optimal and calculate the optimal policy parameters. Developing techniques based on Lagrangian relaxation we show that this type of policy is optimal even with constraints on the size of adjustments and on the maximum inventory level.

■ SA38

Applications of Semidefinite and Second-Order Cone Programming

Cluster: Linear/Nonlinear Programming

Invited Session

Chair: Stephen Wright, Professor, University of Wisconsin, Computer Sciences Department, 1210 W. Dayton Street, Madison, WI, 53706, United States, swright@cs.wisc.edu

1 - SOCP Methods for Total Variation-based Image Restoration and Cartoon-texture Decomposition

Donald Goldfarb, Professor, Columbia University, Department of IEOR, 500 West 120th Street, New York, NY, 10027, United States, goldfarb@columbia.edu, Wotao Yin

We present methods for image restoration and cartoon-texture decomposition based on the total variation minimization framework of Rudin, Osher and Fatemi and second-order cone programming. Analyical results will be presented as well as computational results illustrating the effectiveness of our approach.

2 - Approximating K-means-type Clustering via Semidefinite Programming

Jiming Peng, Assistant Professor, McMaster, Department of Coputing and Software, McMaster University, Hamilton, ON, L8P4K1, Canada, pengj@mcmaster.ca, Yu Wei

K-means is the most intuitive and popular clustering algorithm and is the working horse for clustering. In this talk, we first show that the classical K-means clustering can be modelled as 0-1 semidefinite programming. Our new model provides an unified framework for several different clustering approaches. By using singular value decomposition, we obtain a rounding procedure that can provide a 2-approximation to the oriiginal problem.

3 - Optimal MRI Tissue Segmentation using Sequential Semidefinite Optimization

Christopher Anand, Assistant Professor, McMaster University, Department of Computing and Software, 1280 Main St. West, ITB-202, Hamilton, ON, L8S 4K1, Canada, anand@cas.mcmaster.ca, Renata Sotirov, Tamas Terlaky, Zhuo Zheng

We propose a novel method of reconstructing quantitative tissue densities from Magnetic Resonance Imaging data, based on a model of tissue component properties, and a novel semidefinite merit function. For the special case of Steady-State Free Precession experiments, we formulate a non-linearly constrained SD problem and solve it using sequential semidefinite optimization.

4 - A Framework for Kernel Regularization with Application to Protein Clustering

Stephen Wright, Professor, University of Wisconsin, Computer Sciences Department, 1210 W. Dayton Street, Madison, WI, 53706, United States, swright@cs.wisc.edu, Fan Lu, Sunduz Keles, Grace Wahba

We develop a novel framework for extracting a positive definite kernel matrix from possibly noisy and incomplete dissimilarity information between pairs of objects. Semidefinite and second-order cone programming formulations result in a kernel that places the objects in a Euclidean space to fit the observed dissimilarity information while controlling complexity. An application to protein clustering is presented.

■ SA39

Modern Gradient Methods for Large-scale Optimization Problems

Sponsor: Optimization/ Linear Programming and Complementarity
Sponsored Session

Chair: Yurii Nesterov, Professor, CORE/INMA, UCL, 34 voie du Roman Pays, Louvain-la-Neuve, 1348, Belgium, nesterov@core.ucl.ac.be

1 - Improved Approximation Schemes for Linear Programming Relaxations of Combinatorial Problems

Fabian Chudak, Dr., IFOR ETHZ, ETH-Zentrum, CLP, Zurich, CH 8092, Switzerland, chudak@math.ethz.ch

We consider a generic paradigm to design improved approximation schemes for linear programming relaxations of combinatorial optimization problems. In essence, the improvements are due to the fact that our algorithms are gradient-based as opposed to the previously known subgradient-based algorithms. Our results build mainly on work of Nesterov and extend the work of Bienstock and Iyengar.

2 - Maximum Margin Matrix Factorization using Smooth Semidefinite Optimization

Alexandre d'Aspremont, Assistant Professor, Princeton University, E-Quad E-424, ORFE Princeton University, Princeton, NJ, 08544, United States, aspremon@princeton.edu

We present a semidefinite relaxation for the maximum margin matrix factorization problem, i.e. the problem of fitting a target matrix Y with a low-rank matrix X by minimizing a hinge-loss function. We show how Nesterov's smooth minimization algorithm can be used on a related binary search problem and reconstruct a solution to the original problem.

3 - Mirror-Prox Algorithm with O(1/t) Rate of Convergence for Large-scale Smooth Saddle Point Problems

Arkadi Nemirovski, Professor, School of Industrial and Systems Engineering, Georgia Institute of Technology, 765 Ferst Drive NW, Atlanta, GA, 30332-0205, United States, nemirovs@isye.gatech.edu

We present a prox-type method with O(1/t) rate of convergence for approximating saddle points of smooth convex-concave functions and solutions of variational inequalities with monotone Lipschitz continuous operators. We discuss a number of large-scale numerical experiments with matrix games, Support Vector Machines, computing Lovasz capacity number and sum-of-squares representation of polynomials.

4 - Minimizing Functions with Bounded Variation of Subgradient

Yurii Nesterov, Professor, CORE/INMA, UCL, 34 voie du Roman Pays, Louvain-la-Neuve, 1348, Belgium, nesterov@core.ucl.ac.be

In many applications it is easy to justify a reasonable bound for possible variation of subgradients of objective function rather than for their uniform magnitude. In this talk we present a new class of efficient primal-dual subgradient schemes for such problems.

■ SA40

Computational Game Theory and the Price of Anarchy

Sponsor: Optimization/ Network Optimization
Sponsored Session

Chair: Nicolas Stier-Moses, Assistant Professor, Columbia Business School, Uris Hall, Room 418, 3022 Broadway, New York, NY, 10027, United States, ns2224@columbia.edu

1 - Complexity and Computability in Congestion Games

Carol Meyers, Massachusetts Institute of Technology, 77 Massachusetts Avenue, Office E40-130, Cambridge, MA, 02139, carol@mit.edu, Andreas S. Schulz

Congestion games are a broad class of games in which the cost of using a resource depends solely on the number of users of that resource. We address complexity and computability issues relating to such games, and properties of Nash equilibria. Complexity results are presented for the problem of finding a minimum cost solution to a congestion game, under a variety of different cost functions. We also discuss the existence and computability of equilibria in weighted congestion games, in which users may have varying amounts of demand.

2 - A Network Design Game with Fixed and Variable Edge Costs

Fei Qian, Industrial and Systems Engineering, Georgia Institute of Technology, Atlanta, GA, 30332, gtg120s@mail.gatech.edu, Ozlem Ergun

We consider a collaborative game induced by a general network design problem. In this game every player wants to connect to a set of terminals and hence build a subnetwork with minimum cost to satisfy their demands. There exists fixed and variable cost s on the edges. It is NP-complete to test the emptiness of the core of this game. However, in some cases the core is nonempty if and only if an LP formulation of the problem has no integrality gap. We also consider how much cost we can allocate fairly and efficiently when the core is empty or not.

3 - Oligopoly Competition : Bertrand versus Cournot
Amr Farahat, Assistant Professor, Johnson Graduate School of Management, Cornell University, Ithaca, NY, 14853, United States, aaf33@cornell.edu, Georgia Perakis

We study an oligopoly where firms compete on differentiated products. Each firm proposes a contract specifying what information it communicates to the market (Bertrand and Cournot models are special cases). We compare Bertrand and Cournot prices and payoffs for substitutable as well as complementary products. We highlight extensions that incorporate a multi-period setting and allow finite capacities.

4 - The Inefficiency of Equilibria in Nonatomic Congestion Games
Nicolas Stier-Moses, Assistant Professor, Columbia Business School, Uris Hall, Room 418, 3022 Broadway, New York, NY, 10027, United States, ns2224@columbia.edu, Andreas S. Schulz, Jose R. Correa

We present a short geometric proof to bound the price of anarchy in nonatomic congestion games. This novel proof also provides new insights that allow us to give pseudo-approximation results that depend on the allowed cost functions and to derive improved bounds that help to explain why the price of anarchy in empirical observations of vehicular traffic networks do not match the theoretical worst-case bounds.

■ SA41

Joint Session Optimization/Minority: Cutting Planes in Mixed Integer Programming

Sponsor: Optimization/ Integer Programming, Minority Issues
Sponsored Session

Chair: Jean-Philippe Richard, Assistant Professor, Purdue University, 315 North Grant Street, West Lafayette, IN, 47907, United States, jprichar@ecn.purdue.edu

1 - 3-Separations and the Stable Set Polytope
Illya Hicks, assistant professor, Texas A&M University, 237K Zachry Engineering Center, 3131 TAMU, College Station, TX, 77843-3131, United States, ivhicks@tamu.edu, Sandeep Sachdeva

A k-separation of a graph G is a pair of edge disjoint subgraphs whose union of nodes and edges form G and whose intersection of vertices has order k. We offer preliminary research for a facet generation procedure for the well-studied stable set polytope of a graph G that contains a 3-separation. The procedure is based upon the composition of polyhedra corresponding to two subgraphs of G related to a 3-separation of G. This work is based upon the earlier work of Barahona and Mahjoub.

2 - Facets of the Lot-Sizing Poyhedron with Backlogging
Simge Kucukyavuz, University of Arizona, Systems and Industrial Engineering, Tucson, AZ, United States, simge@sie.arizona.edu, Alper Atamturk

The convex hull of feasible solutions to the uncapacitated lot-sizing problem with backlogging, in its original space of production, inventory and backlogging variables, has been an open problem for many years. In this talk, we give a class of facets that generalize the known inequalities for this problem. We give exact separation algorithms for some special cases.

3 - Extending Superadditive Valid Inequalities to Mixed-integer Programs by Lifting Continuous Variables
Yanjun Li, Assistant Professor, Purdue University, West Lafayette, IN, 47907, United States, li14@purdue.edu, Lisa Miller, Jean-Philippe Richard

Johnson (1974) extended the superadditive theory of cutting planes to MIPs to obtain mixed-integer cutting planes. Richard, de Farias and Nemhauser (2003) developed the theory and algorithm for continuous variable lifting and introduced the concept of superlinear lifting. Using a superlinear approximation of the continuous lifting function of superadditive inequalities, we derive Johnson's mixed-integer cutting planes. Conditions for achieving better approximations are also discussed.

4 - Polyhedral Combinatorics of Some Capacity-constrained Ordering Problems
Herve Kerivin, Assistant Professor, Laboratoire LIMOS, CNRS UMR 6158, Universite Clermont-Ferrand II, Complexe scientifique des Cezeaux, Aubiere, 63177, France, kerivin@math.univ-bpclermont.fr, Renaud Sirdey

We study several models of a capacity-contrained ordering problem with application to distributed systems dynamic reconfiguration procedures. We investigate the polyhedral structure of these models and report computational results.

■ SA42

Solving Specially Structured Stochastic Programs

Sponsor: Optimization/ Stochastic Programming
Sponsored Session

Chair: Andrew Schaefer, Assistant Professor, University of Pittsburgh, Department of Industrial Engineering, Pittsburgh, PA, United States, schaefer@ie.pitt.edu

1 - Column Generation within the L-shaped Method for Stochastic Linear Programs
Mehmet Demirci, University of Pittsburgh, 1048 Benedum Hall, Pittsburgh, PA, 15261, United States, mcd21@pitt.edu, Andrew Schaefer, Jay Rosenberger, Brady Hunsaker

We develop a method for incorporating column generation within a stochastic programming framework. This method generates columns for the master problem and the subproblems of the L-shaped method. It also generates feasibility and optimality cuts based on the current columns in the master problem. We present different algorithmic strategies, discuss computational results and explore two-stage stochastic versions of the cutting stock and multi-commodity flow problems.

2 - Inverse Stochastic Linear Programming
Gorkem Saka, PhD Student, University of Pittsburgh, 1048 Benedum Hall, Pittsburgh, PA, 15261, United States, gos2@pitt.edu, Andrew Schaefer

An inverse optimization problem consists of making a minimum adjustment to the objective function so that a specific feasible solution becomes an optimal solution. We apply this technique to two-stage stochastic linear programs. We then discuss several solution methodologies such as different decomposition algorithms to solve the resulting inverse stochastic linear program.

3 - Totally Unimodular Stochastic Programs
Nan Kong, Assistant Professor, University of South Florida, 4202 E. Fowler Ave, ENB118, Tampa, FL, 33620, United States, kong@eng.usf.edu, Andrew Schaefer, Shabbir Ahmed

We consider a class of totally unimodular stochastic programs (TUSPs), that is, stochastic integer programs whose extensive forms have TU constraint matrices. Several necessary and sufficient conditions are given to characterize TUSPs. When solving TUSPs using the L-shaped method it is not clear whether the integrality restrictions should be imposed on the master. Our computational results investigate this trade-off.

■ SA43

Integrated Methods for Optimization I

Sponsor: INFORMS Computing Society/ Constraint and Integer Programming
Sponsored Session

Chair: John Hooker, T. Jerome Holleran Professor of Business Ethics and Social Responsibility, Professor of Operations Research, Carnegie Mellon University, Tepper School of Business, Pittsburgh, PA, 15213, United States, john@hooker.tepper.cmu.edu

1 - Shorter Path Constraints for the Resource Constrained Shortest Path Problem
Meinolf Sellmann, Assistant Professor, Brown University, P.O. Box 1910, Providence, RI, 02912, United States, sello@cs.brown.edu

Recently, new cost-based filtering algorithms for shorter-path constraints have been developed. We provide the first extensive experimental evaluation of the new algorithms in the context of the resource constrained shortest path problem. We investigate the impact of required-edge detection, undirected versus directed filtering, and the choice of the algorithm optimizing the Lagrangian dual.

2 - Reductions for the Stable Set Problem
Edward Sewell, Professor, Southern Illinois University Edwardsville, Department of Mathematics & Statistics, Edwardsville, IL, 62026-1653, United States, esewell@siue.edu, Sheldon Jacobson, Hemanshu Kaul

This paper introduces several new reductions for the maximum stable set (MSS) problem, extends several well-known reductions to the weighted MSS problem, demonstrates how reductions for the generalized stable set problem can be used in conjunction with probing to produce powerful new reductions, and shows how hypergraphs can be used to generalize clique projections. The effectiveness of these techniques is illustrated on challenging MSS problems arising from Steiner Triple Systems.

3 - Scheduling and Routing of Automated Guided Vehicles: A Hybrid Approach
Louis-Martin Rousseau, Professor, Ecole Polytechnique de Montréal, CP 6079 Succ Centre Ville, Montréal, QC, H3C 3A7, Canada, louis-martin.rousseau@polymtl.ca, André Langevin, Ayoub Insea Correa

This problem consists in the simultaneous assignment, scheduling and conflict-free routing of AGV. Our approach consists in a decomposition method where the master problem (scheduling) is modelled with Constraint Programming and the sub problem (conflict-free routing) with Mixed Integer Programming. Logic cuts are generated and used to prune optimal scheduling solutions whose routing plan exhibits conflicts.

4 - A Search-infer-and-relax Framework for Integrating Solution Methods

John Hooker, T. Jerome Holleran Professor of Business Ethics and Social Responsibility, Professor of Operations Research, Carnegie Mellon University, Tepper School of Business, Pittsburgh, PA, 15213, United States, john@hooker.tepper.cmu.edu

We present a framework for integrating solution methods that combines search, inference, and relaxation. Many OR, constraint programming, global optimization and heuristic methods are special cases. The framework allows elements of different solution methods to be combined. These include continuous relaxations for global constraints in CP, the linking of CP and MILP via Benders, constraint propagation in global optimization, and relaxation bounds in local search and GRASPs.

■ SA44

Joint Session Computing/Health: Computational Biomedicine

Sponsor: INFORMS Computing Society/ OR and Biomedicine, Health Applications
Sponsored Session

Chair: Ariela Sofer, Professor and Chair, George Mason University, SEOR Dept, MS 4A6, Fairfax, VA, 22030, United States, asofer@gmu.edu

1 - Inference and Analysis of Regulatory Mechanisms in Genetic Systems using Micro-Array data

Sanjay Mehrotra, Professor, Northwestern University, 2145 Sheridan Rd., Room C140, Evanston, IL, 60601, United States, mehrotra@iems.northwestern.edu, Reuben Thomas

We consider the problem of model-based inference of regulatory interactions from DNA micro-array data. We develop Integer Programming based inference frameworks for three classes of experiments - those that involve biophysical perturbations, gene knockouts and gene over-expression assuming S-system formalism of the genetic system. The inference framework is tested on E.coli bacteria.

2 - LAD-based Diagnosis of Ischemic Structure

Peter L. Hammer, Director, RUTCOR, Rutgers University, 640 Bartholomew Road, Piscataway, NJ, 08854, United States, hammer@rutcor.rutgers.edu, Joseph Azok, Gerard Hoehn, King Li, Gabriela Alexe, Alison Baird, Vimla Gulabani, Anupama Reddy, Pierre Lemaire, Hua Yu, Neal Jeffries, Violet Wright

Application of Logical Analysis of Data to protein expression profiling of plasma allows identification of a support set of five peptides, and of a diagnostic system which accurately distinguishes stroke patients from controls. Moreover, the patterns provide new information on the importance and nature of peptides, and identify new classes.

3 - Prediction of Chemotherapy Response in High Risk AML Patients Using Gene Expression Profile

Rajesh Ganesan, Assistant Professor, George Mason University, Fairfax, VA, 22030, United States, rganesan@gmu.edu, Tapas K. Das, Wandaliz Torres-Garcia

Low rates of success of chemotherapy of Acute Myeloid Leukemia (AML) patients and high treatment related mortality have made prediction of chemotherapy response a critical translational research issue. We present a methodology for identifying gene expression patterns in a cancer cell that would indicate chemotherapy performance. Samples will be procured from high-risk AML patients enrolled in a Moffitt Cancer Center clinical trial.

4 - Large-Scale Biocomputing for Cancer Diagnosis

Eva Lee, Associate Professor & Director, Center for Operations Research in Medicine, Georgia Institute of Technology, Industrial & Systems Engineering, Atlanta, GA, 30332-0205, United States, evakylee@isye.gatech.edu, Zorina Galis

The cardiovascular system provides oxygen/nutrients to the body. Tissue ischemia, due to obstruction of arterial blood flow, can result in serious effects (vision/limb loss). Development of new vessels can fuel the progression of cancer and macular degeneration. We present a pattern recognition algorithm and an optimization-based predictive model to analyze artery patterns. We illustrate its use for disease diagnosis/monitoring via classification of healthy vs diseased microvascular networks.

■ SA45

Urban Transportation Planning Models V: Transportation Planning

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Thad Usowicz, usowicz@sfsu.edu

1 - Transportation Modeling for Enhancing Emergency Preparedness

Daiheng Ni, Georgia Institute of Technology, 790 Atlantic Dr., Atlanta, GA, 30332-0355, United States, daiheng.ni@ce.gatech.edu, John Leonard

The main objective of this paper is to develop a transportation modeling framework to assist emergency management agencies to make decisions in terms of maximizing the capabilities of transportation facilities in the process of emergency evacuation. Other objectives include identifying key issues (e.g., policy and institutional) that can potentially further improve transportation capabilities and indentifying future directions and improve the functionality of this research.

2 - Multiple Scenario Modeling of User Costs Associated with Innovative Highway Contractual Methods

Peter Martin, Associate Professor, University of Utah, Civil and Environmental Engineering, 122 South Campus Dr. Rm 104, Salt Lake City, UT, 84112-0561, United States, peter@trafficlab.utah.edu, Aleksandar Stevanovic

Incentive driven construction highway contracts are likely to reduce overall delay to road users. This paper presents the findings of a traffic assignment modeling assessment of several road improvements under a variety of construction scenarios. The projects are taken from the Utah Department of Transportation Statewide Transportation Improvement. They show that potential user cost savings in delay associated with innovative construction contracts can be significant.

■ SA46

Urban Transportation Planning Models I: Urban System Design and Modeling

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: David Boyce, Northwestern University, 2149 Grey Avenue, Evanston, IL, 60201, United States, dboyce@uic.edu

1 - Estimation and Analysis of an Integrated Travel Choice Model for the Tucson Region

David Boyce, Professor, Northwestern University, 2149 Grey Avenue, Dept. of Civil and Environmental Engrg., Evanston, IL, 60201, United States, d-boyce@northwestern.edu, Yuhwa Lee, Hillel Bar-Gera, Mark Hickman

An integrated (combined) multiclass model of origin-destination, mode and auto user-optimal route choice was implemented for the Tucson, Arizona, Region. Parameters were estimated, and the results analyzed. The findings and lessons learned from this research will be presented.

2 - A Multi-Resolution System Dynamic Framework for Urban System of Systems Modeling

Yi-Chang Chiu, Assistant Professor, University of Texas at El Paso, Engrg Bldg E201P, 500 W University Ave, El Paso, TX, 79968, United States, chiu@utep.edu, Jorge Villalobos

We present a Multi-Resolution System Dynamic (MRSD) modeling methodology to assist in urban transportation policy decision making. The unified High-Level with Operational/Planning-Level methodology, integrated by a system dynamics framework, is aimed to capture interactions of different urban systems with varying temporal and spatial resolutions.

3 - An MPCC Model for Continuous Network Design Problem under Asymmetric User Equilibrium

Henry Liu, Assistant Professor, University of Minnesota, Department of Civil Engineering, 500 Pillsbury Drive SE, Minneapolis, MN, 55455, United States, henryliu@umn.edu, Michael Ferris, Jeff Ban

The Continuous network design problem (CNDP) under asymmetric user equilibrium can be formulated as a mathematical program with complementarity constraints, This is a special case of a mathematical program with equilibrium constraints with a general variational inequality simplified by a nonlinear complementarity problem in the lower level. The MPCC based CNDP model can be solved by a combination of the relaxation and decomposition schemes due to the special structure of the proposed MPCC model.

4 - Solving Asymmetric User Equilibrium by Decomposition and Synchronization Schemes

Michael Ferris, Professor, University of Wisconsin, Computer Sciences, Madison, WI, 53706, United States, ferris@cs.wisc.edu, Henry Liu, Jeff Ban

The asymmetric user equilibrium can be formulated as a multi-commodity network flow problem with non-separable cost and as a nonlinear complementarity problem defined on disaggregated link flows. The NCP formulation has a special structure such that the defining set is a Cartesian product of a number of lower-dimension sets. A synchronization scheme is developed in which an optimal step size is computed via a synchronization nonlinear programming problem. Numerical examples are provided.

■ SA47

Optimization Models for Traffic Signal Priority

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Larry Head, Research Professor, University of Arizona, Systems & Industrial Engineering Dept., P.O. Box 210020, Tucson, AZ, 85721, United States, larry@sie.arizona.edu

1 - Modeling Adaptive Transit Signal Priority on Actuated Control Systems

Meng Li, Assistant Development Engineer, California PATH, Universtiy of California, Berkeley, 1357 S. 46th Street, Bldg 452, Richmond, CA, 94804-4603, United States, meng_lee@uclink.berkeley.edu, Yafeng Yin

We propose a quadratic optimization model that determines real-time signal timings for transit signal priority, based on current signal status and predictions of bus arrival times and traffic flows. The model formulates the typical eight-phase ring-barrier structure of NEMA actuated controllers, and is able to achieve explicitly a tradeoff between bus intersection delay and other traffic delay. A numerical example is presented to demonstrate and validate the model.

2 - Scheduling Priority Service at Actuated Traffic Signals

Larry Head, Research Professor, University of Arizona, Systems & Industrial Engineering Dept., P.O. Box 210020, Tucson, AZ, 85721, United States, larry@sie.arizona.edu, Zhiping Wei

This paper presents a model for scheduling service for multiple priority requests that can be generated from emergency vehicles, heavy rail, or transit. An optimization model is formulated that considers the traditional dual-ring traffic signal controller with constraints for safety and pedestrian service.

3 - Traffic Signal Priority Control with Colored Petri Nets

Lefei Li, Graduate Research Associate, Systems & Industrial Engineering Dept., P.O. Box 210020, Tucson, AZ, 85721-0020, United States, lefeil@email.arizona.edu, Hongchao Liu, Wei-Hua Lin

A Colored Petri Net (CPN) model for traffic signal priority is described. The model incorporates the priority request of transit vehicles into traffic signal control. Compared with 'uncolored' Petri Nets (PN), CPN provides a broader modeling capability for traffic signal priority control. A simple priority evaluation procedure is proposed to provide different priorities under multiple priority requests.

4 - Strategies for Integrated Real-time Signal Control and Dynamic Vehicle Route Assignment

Stacy Eisenman, Maryland Transportation Initiative, University of Maryland, College Park, MD, 20742-3021, United States, eisens@umd.edu, Hani Mahmassani

Strategies for integrated real-time signal control in conjunction with dynamic vehicle route assignment are developed for congested network traffic management. Implementation is achieved through an iterative process with a feedback loop for the dynamic routing of vehicles through the network, while adjusting signal controls to quasi-optimally serve the resulting flows. Results of numerical experiments are discussed to illustrate and evaluate the strategies.

■ SA48

Operating Room Management

Sponsor: Health Applications
Sponsored Session

Chair: Michael Carter, Professor, University of Toronto, Mech & Ind Engineering, 5 King's College Rd, Toronto, ON, M5S 3G8, Canada, carter@mie.utoronto.ca

1 - Modeling Patient Flow in a Cardiac Surgery Department for Operating Room Management

Michael Carter, Professor, University of Toronto, Mech & Ind Engineering, 5 King's College Rd, Toronto, ON, M5S 3G8, Canada, carter@mie.utoronto.ca, Hai Ein (Jean) Yong

A discrete-event simulation model was developed to model the patient flow in an in-patient cardiac surgery department to determine surgical booking policy for the expansion of operating room. Working with hospital managers and clinicians from participating hospital, a patient classification technique was adopted to produce statistically and clinically meaningful patient groups to drive model.

2 - Scheduling Surgical Service Block Time to Improve Patient Flow

Tom Rohleder, Haskayne School of Business, University of Calgary, Calgary, AB, T2N 1N4, Canada, tom.rohleder@haskayne.ucalgary.ca

We present a mixed integer programming formulation that allocates operating time blocks to surgical services. Our model addresses improved patient flow, extended time horizons, and schedule consistency. In particular we consider the effect of surgeon specific productivity levels on patient flows within the hospital. Data from a hospital are used to evalute the effectiveness of the scheduling methods. Patient flow performance is determined via a patient flow simulator.

3 - An Outpatient Capacity Planning Model: Estimation of Stakeholder Costs

David Strum, Queen's University, Department of Anesthesiology, KGH, 76 Stuart Street, Kingston, ON, K7L 2V7, Canada, dstrum1@cogeco.ca, Luis G. Vargas

We modeled capacity planning and investigated its effect on stakeholders. To allocate outpatient (OP) capacity, we used a newsvendor model and rescheduling heuristics. Historical cases were parsed into inpatient and OP facilities to minimize total institutional costs and patient wait time. Total stakeholder costs were compared using linear regression. This study is proof of concept of an optimization model based on scheduling heuristics and used to plan capacity for OP facilities.

4 - Forecasting Outpatient Surgery No-Shows

Timothy Butler, Wayne State University, 5201 Cass Avenue, Detroit, MI, 48202, United States, ad4518@wayne.edu, Marc Basson, Harish Verma

No-Shows for outpatient surgery contribute to inefficiency because hospital personnel such as surgeons, anesthesists, surgery technicians, and nurses are left idle. We reviewed OR utilization at the John D. Dingell VA Hospital in Detroit and found patient no-shows to be a substantial source of surgical cancellations. We propose models to help administrators plan surgery schedules.

■ SA49

Dynamic Programming Applications

Sponsor: Decision Analysis
Sponsored Session

Chair: Laura Kornish, Leeds School of Business, University of Colorado, 419 UCB, Boulder, CO, 80309, United States, kornish@duke.edu

1 - Adopting a Technology of an Uncertain Value

Canan Ulu, The Fuqua School of Business, Duke University, Box 90120, Durham, NC, 27708-0120, United States, canan.ulu@duke.edu, James E. Smith

We consider a discrete-time dynamic programming formulation of a technology adoption problem where the firm is offered a technology whose value is uncertain and may be non-stationary. The firm can choose to adopt, reject or gather more information. After receiving the information, the firm updates beliefs in a Bayesian manner. We use the probability distribution of the uncertain value as a state variable and obtain very general structural results.

2 - Optimal Sequential Exploration: A Binary Learning Model

Eric Bickel, Assistant Professor, Department of Industrial and Systems Engineering, Texas A&M University, 236B Zachry Engineering Center, 3131 TAMU, College Station, TX, 77843-3131, United States, ebickel@tamu.edu, James E. Smith

In many situations (e.g., oil and gas exploration and pharmaceutical drug development), value can created through optimal sequencing of exploration activities. This sequencing takes advantage of information learned via previous results (e.g., drilling a dry hole). To effectively model this learning and solve for the optimal policy, we employ information-theoretic techniques in conjunction with dynamic programming.

3 - Optimal Franchising or Scale-up Policy

Neda Farzinnia, Ph.D. candidate, The Anderson School at UCLA, 110 Westwood Plaza, Box 951481,, Los Angeles, CA, 90095, United States, neda@stat.ucla.edu, Kevin McCardle

A firm is contemplating entering a new line of investment that could be franchised or scaled-up in one of the two ways, and is uncertain about its profitability and the optimal franchised (scale-up) policy. As the firm continues to implement the investment it updates its belief about the profitability of the investment. We provide optimal thresholds rules.

4 - Repeated Commit-or-Defer Decisions with an Inventory Deadline: The Influenza Vaccine Composition

Laura Kornish, Leeds School of Business, University of Colorado, 419 UCB, Boulder, CO, 80309, United States, kornish@duke.edu, Ralph Keeney

We study a dynamic decision problem for a seasonal good with time-intensive production, in which the decision maker must balance information collection and production time in the pre-season. We frame our model using the annual influenza vaccine composition decision: deciding between strains of the virus to include, which must happen in a timely manner to allow for vaccine production before the flu season begins.

■ SA50

Applications of Decision Analysis to Homeland Security

Sponsor: Decision Analysis
Sponsored Session

Chair: Vicki Bier, Professor, University of Wisconsin-Madison, 3158 Engineering Centers Building, 1550 Engineering Drive, Madison, WI, 53705, United States, bier@engr.wisc.edu

1 - Using Risk Analysis to Counter Terrorism
Detlof von Winterfeldt, Professor, USC, School of Policy, Planning, and Developm, RGL 312 University Park, Los Angeles, CA, 90089, United States, detlof@aol.com

This presentation will review several risk analysis approaches to analyze and evaluate terrorism threats and it will describe two applications of risk analysis to reduce the risks of missile attacks on airplanes and of dirty bomb attacks of a major harbor in the US.

2 - National Center for the Study of Terrorism and Responses to Terrorism (START)
Kathleen Tierney, tierneyk@colorado.edu

START, a DHS-funded center of excellence at the University of Maryland, has been given a 3-year grant to develop social science knowledge and provide research, training, and guidance on the life cycle of terrorism; i.e., its origins, dynamics, and societal impacts. The consortium includes more than 15 universities and approximately 3 dozen U.S. researchers and international partners. This presentation will discuss START's organization, research plan, and educational and outreach activities.

3 - Risk Management Strategies for Interdependent Security
Howard Kunreuther, Cecilia Yen Koo Professor, 556 & 559 Jon M. Huntsman Hall, 3730 Walnut Street, Philadelphia, PA, 19104-6340, United States, kunreuth@wharton.upenn.edu, Geoffrey Heal

In an interdependent world, the failure of one agent to take action can impact on others. For example, the terrorism risks faced by any given airline are affected by lax security at other carriers or airports. This talk examines game theoretic aspects of interdependent security and indicates the importance of public-private partnerships for improving the expected profits of individual firms as well as social welfare.

4 - Choosing What to Protect: Strategic Defense Allocation against an Unknown Attacker
Santiago Oliveros, University of Wisconsin, Madison, 6473 Social Science Building, 1180 Observatory Drive, Madison, WI, 53706, United States, soliveros@students.wisc.edu, Vicki Bier, Larry Samuelson

We study a defender-attacker game in which the defender does not know the attacker's preferences. The defender's problem generates negative externalities that are useful to manipulate the attacker's behavior, sometimes leaving a location undefended. We show that, as the number of possible targets grows, only the attacker's preferences matter for the defensive allocation (spying is useful), that centralization is desirable, and that the defender prefers to disclose the defensive structure.

Sunday, 10:00am - 11:30am

■ SB01

Tutorial: Transforming Railroads Through Cutting-Edge Operations Research

Cluster: Tutorials
Invited Session

1 - Tutorial: Transforming Railroads Through Cutting-Edge Operations Research
Ravindra Ahuja, Professor, University of Florida, Dept. of Industrial and Systems Eng., 303 Weil Hall P.O. Box 116595, Gainesville, FL, 32611, United States, ahuja@ufl.edu, Guvenc Sahin, Claudio Cunha

The past few decades have witnessed numerous applications of operations research in logistics. However, the US railroad industry has not benefited from the advances. This tutorial describes cutting-edge operations research algorithms that use state-of-the-art ideas from linear and integer programming, network flows, discrete optimization, heuristics, and very large-scale neighborhood (VLSN) search, and demonstrates potential benefits from tens to hundreds of millions of dollars annually.

■ SB02

Special Topics in Environmental/Natural Resourses

Contributed Session

Chair: Chialin Chen, Queen's University, Queen's School of Business, Kingston, ON, K7L 3N6, Canada, cchen@business.queensu.ca

1 - Coupling Reserve Constraints in the Unit Commitment Problem
Jose Restrepo, Research Assistant, McGill University, 3480 University St., Room 633, Montreal, QC, H3A 2A7, Canada, jose.restrepo@mail.mcgill.ca, Francisco D. Galiana

The security-constrained unit commitment problem in a power system defines the on/off status of generating units such that they securely meet the demand at lowest cost. Security is accomplished by scheduling different types of generation reserves, each following different control schemes and time constants. This presentation highlights the strong coupling that can exist between different types of reserves when solving the unit commitment problem.

2 - Strategic Decision Making in Transmission Investment for Deregulated Power Systems
Sevin Sozer, Auburn University, 207 Dunstan Hall, Industrial and Sys. Eng. Dept., Auburn, AL, 36849, United States, sozerse@auburn.edu, Chan S. Park

Two important goals of the transmission investment are to ensure reliability and to facilitate competition. Transmission expansion planning process is studied from the perspective of the System Operator (SO) considering both reliability criteria and economic incentives. Interdependencies of market agents' strategic decisions are introduced into the transmission investment model and a detailed economic analysis is provided.

3 - Benefits, Drawbacks, and Applications of Ranked Set Sampling
Barry Nussbaum, Chief, Analytical Products Branch, US Environmental Protection Agency, 1200 Pennsylvania Ave, NW, Mail Code 2842T, Washington, DC, 20460, United States, nussbaum.barry@epa.gov, Deborah Rachlin

Ranked set sampling estimates the mean of a population based on measurements of some secondary variable. RSS provides a more efficient estimate compared to traditional simple random sample, even if the measurement of the ancillary variable is not very good. In this paper, some basics of RSS will be presented along with an important environmental application using RSS for a low-cost estimate of gasoline's Reid Vapor Pressure, and resultant hydrocarbon emissions.

4 - Market Based Decision Model for Ecologically Sustainable Product Development
Dawood Abugharbieh, Portland State U, 15 SW Hamilton Ct. #2, Portland, OR, 97239, United States, dawood@pdx.edu, Robert Harmon

Ecologically Sustainable Development is emerging as an issue with potential to impact new product innovation. New strategies to reduce the ecological footprint of new products are needed. Existing research seems primarily focused on corporate policy and environmental management, with little insight into innovative approaches for development of ecologically and economically sustainable products. We posit a model for ecologically sustainable product development to favorably impact market outcomes.

5 - Analyzing Simulataneous and Sequential Games for Green Product Development
Chialin Chen, Queen's University, Queen's School of Business, Kingston, ON, K7L 3N6, Canada, cchen@business.queensu.ca, Kilsun Kim

We develop models of simultaneous and sequential games to analyze the pricing, quality, and entry decisions for green product development. We identify the conditions for a sub-game perfect equilibrium where two firms enter with distinct efficient quality sets to engage in Bertrand competition. One major result shows that the first mover in quality choice will introduce a green product with less than 50% of green customers in a market if a desirable arrangement of price leadership can be reached.

■ SB03

New Cases in Supply Chain Management and Information Technology

Sponsor: Education (INFORM-ED)
Sponsored Session

Chair: Eric Johnson, Professor, Tuck School of Business, Dartmouth College, Hanover, NH, 03755, United States, M.Eric.Johnson@dartmouth.edu

1 - Structured and Unstructured IT
Andrew McAfee, Associate Professor, Harvard Business School, Harvard University, Boston, MA, 02163, amcafee@hbs.edu

Some information technologies faciliate unstructured inter-group interactions, while others impose new structured interactions (i.e. business processes). This session explores the impacts and managerial challenges of these two different technology categories, and presents teaching cases about each.

2 - Excellence in Supply Chain Collaboration: Evidence from the German Retail and FMCG Industry
Arnd Huchzermeier, Professor, WHU, Otto-Beisheim GSM, Burgplatz 2, Vallendar, 56179, Germany, Arnd.Huchzermeier@whu.edu, Daniela Burkhardt

We present 6 case studies on 10 years of ECR implementation in Germany. In the past, Category Management and Supply Chain Integration were the main levers. In the future, strategy, collaborative shopper value creation, product identification and communication standards, RFID technology and exchanges are the new drivers of performance.

3 - Building a Customer-Focused Supply Chain
Eric Johnson, Professor, Tuck School of Business, Dartmouth College, Hanover, NH, 03755, United States, M.Eric.Johnson@dartmouth.edu

After the successful launch of its first major drug, Biogen needed to re-examine its supply chain to support future growth. This biotech firm chose to make a significant IT investment in CRM. Using the systems, case managers could build an intimate relationship with patients, supporting them throughout their therapy with information and timely product shipments.

■ SB05

Panel Discussion: The Industry Job Search

Cluster: Job Placement Committee
Invited Session

Chair: David Kim, Oregon State Univ, 121 Covell Hall, Corvallis, OR, 97331, United States, david.kim@orst.edu

1 - Panel Discussion: The Industry Job Search
Moderator: David Kim, Oregon State Univ, 121 Covell Hall, Corvallis, OR, 97331, United States, david.kim@orst.edu, Panelists: Jeffrey Alden, Rajiv Saxema, Jack Griffin, Lisa Szytel

The panel will discuss the industry interview process and do's and don'ts associated with the job search. In addition to comments by current or former industrial recruiters, time will be provided for questions and answers.

■ SB06

Research About Spreadsheets

Sponsor: Spreadsheet Productivity Research
Sponsored Session

Chair: Thomas Grossman, Ph.D., Associate Professor, School of Business & Management, University of San Francisco, 2130 Fulton St., San Francisco, CA, 94117-1045, United States, tagrossman@usfca.edu

1 - Critically Important Spreadsheets
Thomas Grossman, Ph.D., Associate Professor, School of Business & Management, University of San Francisco, 2130 Fulton St., San Francisco, CA, 94117-1045, United States, tagrossman@usfca.edu, Ozgur Ozluk, Vijay Mehrotra

Spreadsheets are perceived as ubiquitous in business world, but are almost invisible in the research literature, in part because the vital importance of spreadsheets is known only anecdotally. We demonstrate the vital importance of spreadsheets by documenting diverse and compelling examples of essential spreadsheets. We provide examples of spreadsheets as commercial applications, for senior executive decision making, for complex analytics, and integrated with essential key business processes.

2 - A Survey of Spreadsheet Users
Stephen Powell, stephen.g.powell@dartmouth.edu

This paper summarizes the results of a survey of spreadsheet users, covering their practices with respect to designing, building, testing, documenting, using, sharing, modifying, and archiving spreadsheet models. In addition, the survey probed the organizational use of standards, training, and incentives surrounding spreadsheet activities.

3 - Online Spreadsheet Forums: What Are They Talking About?
Roger Grinde, Associate Professor of Management Science, University of New Hampshire, Whittemore School of Business & Econ, 15 College Road/McConnell Hall, Durham, NH, 03824, United States, roger.grinde@unh.edu

Many of the millions of spreadsheet users are not aware of the huge virtual help system available worldwide, in the form of other spreadsheet users. The focus of this research is to begin to quantify the types of topics discussed in online forums devoted mostly to the Microsoft Excel spreadsheet. Given that users of online forums are probably more advanced spreadsheet users, this research provides a glimpse into how often more advanced features of Excel are used and/or discussed.

■ SB07

Auction

Sponsor: Manufacturing & Service Oper Mgmt
Sponsored Session

Chair: Rachel Chen, Assistant Professor, University of California at Riverside, 146 Anderson Hall, 900 University Ave., Riverside, CA, 92521, United States, rachel.chen@ucr.edu

1 - Combinatorial Coalition Formation and Cost Sharing for Group-Buying
Cuihong Li, Assistant Professor, University of Connecticut, School of Business, 2100 Hillside Road, Storrs, C, 06269, United States, Cuihong.Li@business.uconn.edu, Junichi Yamamoto, Katia Sycara, Alan Scheller-Wolf

In group-buying, combinatorial coalition formation (CCF) allows buyers to announce reservation prices on item bundles when valuations of items are not additive. Determining the optimal coalitions in CCF to maximize the total utility of buyers is NP-hard. We present a heuristic algorithm for CCF, and a cost sharing mechanism in the core of the resulting coalitions. Insights are then generated on when group-buying is most effective for buyers and sellers.

2 - The Buyer-Determined Multi-Attribute Auction Theoretical and Empirical Characterization
Elena Katok, Associate Professor, Penn State University, 5F BAB, State College, PA, United States, ekatok@psu.edu, Ernan Haruvy, Richard Engelbrecht-Wiggans

Reverse auctions used for many procurement activities. In the past, the majority of such auctions have been price-based, but recently multi-attribute procurement auctions have started to gain momentum. We investigate two mechanisms commonly used by FreeMarkets, a major provider of reverse auction services, in a setting in which buyer's welfare is affected by non-price attributes.

3 - Sealed-Bid Auctions of Split-Awards
Kemal Guler, Senior Scientist, Hewlett-Packard Laboratories, 1501 Page Mill, Palo Alto, CA, 94304-1100, United States, kemal.guler@hp.com

A common procurement practice is split-awards ®C total requirements are purchased under two or more contracts from multiple suppliers. Two common methods for auctioning multiple contracts are (i) single-lot ®C each bidder submits a single bid and the contracts are awarded to the two bidders with the best bids,(ii) multiple-lots ®C each bidder submits two bids, one for each contract. We analyze and compare the sealed-bid equilibrium outcomes of both options under various market settings.

4 - Payment to the Auctioneer in Multi-Unit Vickrey Auctions
Rachel Chen, Assistant Professor, University of California at Riverside, 146 Anderson Hall, 900 University Ave., Riverside, CA, 92521, United States, rachel.chen@ucr.edu, Rachel Zhang

We consider the charge system set by the auctioneer in multi-unit Vickrey auctions for procurement in supply chain settings. The auctioneer charges a two-part tariff, commission plus entry fee, to both the buyer and the sellers. The buyer and the sellers may change their bidding strategies depending on their payments to the auctioneer. We examine how the charge system affects bidding behavior as well as the exchange efficiency of the auction.

■ SB08

Dynamic Models of Imperfect Competition I

Sponsor: Manufacturing & Service Oper Mgmt
Sponsored Session

Chair: Benjamin Van Roy, Stanford University, Terman 315, Stanford University, Stanford, CA, 94305-4023, United States, bvr@stanford.edu

1 - Avoiding the Curse of Dimensionality in Dynamic Stochastic Games
Ulrich Doraszelski, Department of Economics, Harvard University, Littauer Center, Cambridge, MA, 02138, United States, doraszelski@harvard.edu, Kenneth Judd

Discrete-time stochastic games suffer from a curse of dimensionality. We show that continuous-time stochastic games avoid the curse of dimensionality and are orders of magnitude faster to solve.

2 - Strategic Experimentation and Disruptive Technological Change
Martin Schneider, New York University and Federal Reserve Bank of Minneapolis, 50 Hennepin Avenue, Minneapolis, MN, United States, ms1927@nyu.edu, Fabiano Schivardi

This paper studies the diffusion of a new technology that is brought to market while its potential is still uncertain. In a dynamic game, firms improve both a new and a rival old technology while learning about the relative potential of both. The model helps understand historical evidence on diffusion and market structure. It explains why a change in market leadership often goes along with slow diffusion. It also provides a rational explanation for observed "incumbent inertia".

3 - Markov Perfect Industry Dynamics with Many Firms
Gabriel Y. Weintraub, Management Science and Engineering Dept., Stanford University, Terman Engineering Center, 3rd Floor, Stanford University, Stanford, CA, 94305, United States, gweintra@stanford.edu, C. Lanier Benkard, Benjamin Van Roy

We propose an approximation method that dramatically reduces the computational complexity of solving stochastic dynamic models of imperfect competition. We provide conditions under which our method closely approximates an equilibrium as the market size becomes large. We derive a performance bound that can assess accuracy for any given market size. Experimental results demonstrate how our method greatly expands the set of economic problems that can be analyzed computationally.

■ SB09

Analyzing Competitive and Cooperative Behavior in Supply Chains

Cluster: Supply Chain Management

Invited Session

Chair: Eda Kemahlioglu Ziya, University of North Carolina at Chapel Hill, Campus Box 3490, Chapel Hill, NC, 27599, United States, Eda_KemahliogluZiya@unc.edu

1 - Stability of Information-Sharing Alliances in a Three-Level Supply Chain
Greys Sosic, Assistant Professor, University of Southern California, Marshall School of Business, Bridge Hall 401, Los Angeles, CA, 90089, United States, sosic@marshall.usc.edu

We analyze a three-level supply chain, consisting of a supplier, a manufacturer, and a retailer, which faces a nonstationary end demand. Supply chain members can share demand information, which reduces information distortion and thus decreases their inventory holding and shortage costs. We distribute the savings from information sharing among the supply chain members according to Shapley value, and we use these allocations to determine farsighted stable information-sharing alliances.

2 - Process Innovation and Knowledge Sharing in Supply Networks
Fernando Bernstein, Associate Professor, Duke University, The Fuqua School of Business, 1 Towerview Drive, Durham, NC, 27708, United States, fernando@mail.duke.edu, Gurhan Kok

We consider general decentralized assembly networks, in which suppliers invest in process innovation and cost reduction, while the buyer may partly subsidize those activities. We investigate how the investment levels depend on the structure of the supply network. We also explore the impact of knowledge sharing among suppliers on their investments in process innovation and on their ability to reduce costs.

3 - The Competitive Start-up: Capacity, Pricing, and Uncertain Demand
Serguei Netessine, Assistant Professor, University of Pennsylvania, 3730 Walnut St. Suite 500, Philadelphia, PA, 19104, United States, netessin@wharton.upenn.edu, Robert Swinney, Gerard Cachon

We model competition between two firm that either maximize the expected profit or minimize the probability of bankruptcy (as a start-up company would do). We allow firms to select whether they want to lead or follow in the game. We find that when profit maximizing firms compete the companies are likely to make decisions simultanously while if a start-up firm competes against a profit maximizing firm or against another start-up, the only equilbria are sequential.

4 - Collaboration to Improve Inventory Availability under Demand Spillover
Eda Kemahlioglu Ziya, University of North Carolina at Chapel Hill, Campus Box 3490, Chapel Hill, NC, 27599, United States, Eda_KemahliogluZiya@unc.edu, Almula Camdereli, Jay Swaminathan

We consider a supply chain with a single supplier and two retailers. A percentage of the customers who cannot find the product at one retailer will look for it at the other retailer. In addition, a percentage of the stock at both of the retailers is unavailable for sale due to problems such as misplacement. We answer questions such as: How will each party's profits change if the retailers invest in technology to improve availability? How should the benefits be shared to ensure participation?

■ SB10

Sales Channel

Cluster: Supply Chain Management

Invited Session

Chair: Ozalp Ozer, Management Science and Engineering, Stanford University, Stanford, CA, United States, ozalp@stanford.edu

1 - Dating and Marriage between a Manufacturer and a Reseller
Kay-Yut Chen, Principal Scientist, Hewlett-Packard Laboratories, 1501 Page Mill Road, MS 1u-2, Palo Alto, CA, 94304, United States, kay-yut.chen@hp.com, Teck Ho, Murat Kaya

Consider a two period model of a manufacturer selling a new product via a reseller. Initially, neither firm knows how the retailer will perform (compatibility). However, both will learn, asymmetrically, about the reseller's compatibility from the result in the first period. Product sales is a function of the manufacturer's investment, the retailer's compatibility, and his sales effort. We characterize how the retailer manipulates the manufacturer's learning under different scenarios.

2 - Coordination in a Dual-Channel Distribution System with Service Competition
Murat Kaya, Stanford Univerisity, Management Science and Engineering Dept., Stanford, CA, 94305, United States, mkaya@stanford.edu, Ozalp Ozer, Kay-Yut Chen

We consider the coordination problem of a manufacturer who sells through direct and retailer channels that compete in service. Service is defined as product availability in the traditional retailer channel and as waiting time in manufacturer's direct online channel. Customers, who differ in their aversion to waiting time, consider service levels as well as search costs in their purchase decision. We study different scenarios to quantify the value of the dual channel to the firms and consumers.

3 - Optimal Pricing in Customer-Pull Channels
Robert Phillips, Founder, Nomis Solutions, 1150 Bayhill Dr., Suite 305, San Bruno, CA, 94066, United States, robert.phillips@nomissolutions.com

We consider the common practice of pricing on a "customer-pull" basis. Customer-pull pricing both enables greater customization of prices but it also provides "win loss" information that can be used to separate price-response effects from secular demand changes. We describe algorithms for optimizing customized prices and applications to business-to-business and business-to-consumer markets.

■ SB11

Optimization Models for Inventory System in Supply Chain Management

Contributed Session

Chair: Ajay Natarajan, Penn State University, 310 Leonhard Building, State College, PA, 16802, United States, azn110@psu.edu

1 - Product Variety Management in a Supply Chain
Renato de Matta, Associate Professor, University of Iowa, 108 PBB, Iowa City, IA, 52241, United States, renato-dematta@uiowa.edu, Lifang Wu, Timothy Lowe

The product substitution by customers when their preferred products run out poses a challenge which complicates a firm's product variety decision in a supply chain. We formulate a single period, stochastic programming problem to find the profit maximizing product design, order quantity, and retail pricing decisions when stochastic demand and product substitution are both present. A heuristic procedure is proposed to solve this problem. Computational results are presented.

2 - Joint Price and Inventory Decisions in Revenue Management
Michael Zhang, Mr., Richard Ivey School of Business, 1151 Richmond St N, London, ON, Canada, mzhang@ivey.uwo.ca

In this study, we address simultaneous determination of prices and inventory decisions for the single item newsvendor problem, where the item can be sold to different demand classes. We consider a booking limit type of policy structure for sequentially realized demands. Specifically, a portion of the initial stock is protected or reserved for the higher priced demand class. Our problem here is to find the optimal inventory, booking limit as well as prices charged for different demand classes.

3 - Inventory Rationing in a Capacitated Supply Chain with Two Demand Classes
Weihua Zhou, IEEM, HKUST, Clear Water Bay, Hong Kong, China, larry@ust.hk, Chung-Yee Lee, David Wu

A capacitated production and inventory control problem with single product, two demand classes in a periodical review environment is studied. Customers of the first class are backlogged if not satisfied immediately by on-hand product, while customers of the second class are lost when meeting stock out. We prove that the optimal production policy is of the modified base stock type and there exists a rationing level in each period below which the second class customers are rejected.

4 - Finite Horizon Optimal Inventory Decision
Jian Li, Purdue University, Krannert School of Management, W. Lafayette, IN, 47906, United States, li53@mgmt.purdue.edu, Suresh Chand

We examine a stochastic multi-period inventory decision problem with limited order opportunities. Our focus is on the structure of the optimal policy. The form of optimal policy is developed under appropriate conditions.

5 - A Multi Criteria Model for Joint Inventory-Transportation Policies in Supply Chains.
Ajay Natarajan, Penn State University, 310 Leonhard Building, State College, PA, 16802, United States, azn110@psu.edu, A. Ravi Ravindran

The Single Warehouse Multi Retailer system is treated as a multi-criteria optimization problem where transportation cost is explicitly considered as one of the criterion. A modified base period policy is developed to solve the multi-criteria problems. Closed form solutions are obtained at each retailer and the warehouse. Numerical examples are presented to illustrate the methodology.

■ SB12

Auctions, Games and Equilibria in Industry

Cluster: Applications of Auction and Game Theory
Invited Session

Chair: Tapas K. Das, Professor, University of South Florida, United States, das@eng.usf.edu

1 - Procurement Mechanism Design: An Operations Perspective
Fuqiang Zhang, Assistant Professor, University of California, GSM 433, Irvine, CA, 92697, United States, fzhang@uci.edu

We study a buyer's procurement strategy when both price and responsive delivery are considered. The suppliers have private cost information and can hold inventories to improve service. We identify the optimal mechanism for the buyer and propose several simple mechanisms. It is demonstrated that the simple mechanisms perform very well.

2 - Linear Production Inventory Games
Ziming Guan, University of Auckland, Auckland, New Zealand, z.guan@auckland.ac.nz

We consider a class of linear production-inventory games of many players over many periods with several products. We study subgame-perfect equilibria in these games and a number of different assumptions on the game structure and data. We give an example of the application of these games to the international market for dairy products.

3 - Must-run Auctions in Electricity Markets
Geoff Pritchard, University of Auckland, Auckland, New Zealand, geoff@stat.auckland.ac.nz

We consider a wholesale spot market for electricity, of the type operated in New Zealand, Australia, and some parts of the UK and USA. In these markets there are circumstances in which generators may wish to offer energy at negative prices, e.g. to avoid being shut down for a short period. Such behaviour creates some severe computational difficulties. The "must-run auction" is a system used to handle such cases in New Zealand; we consider its properties under stochastic demands.

4 - Equilibrium Experiments Over the New Zealand Electricity Market
Golbon Zakeri, g.zakeri@auckland.ac.nz, Andy Philpott, Geoff Pritchard

We consider equilibrium models of electricity offers into the New Zealand market in the context of MPECs. The long term models consider stochastic demand and aim to produce accurate prices and optimal network expansion policies.

■ SB13

Software Demonstration

Cluster: Software Demo
Invited Session

1 - StatPoint, Inc.- Statistical Analysis Using STATGRAPHICS Centurion XV
Neil Polhemus, CTO, StatPoint, Inc., 2325 Dulles Corner Rd., Suite 500, Herndon, VA, 20171, United States, neil@statgraphics.com

Dr. Polhemus will demonstrate the capabilities of STATGRAPHICS Centurion XV, the most powerful and intuitive statistical software available for Windows. The session will illustrate the trademark tools that are designed for anyone who wishes to do serious data analysis without investing weeks learning how to use a statistical package, and will include performing statistical analyses such as time series analysis and automatic forecasting.

2 - Business Simulations- Business Simulations for Manufacturing and Operations Management
David A. Jordan, Business Simulations, 139 Oak Drive, Beaver Falls, PA, 15010, United States, dave@bussim-ed.com

In this session three simulations will be overviewed, including an Operations Management, a Manufacturing Management and a Transportation/Supply Chain Management Simulation. These simulations are intended for use by instructors who want applications based teaching tools to accompany text materials. These simulations are downloadable from our website.

■ SB14

Sensor and Search Problems for Military Applications

Contributed Session

Chair: Marc Thibault, George Mason University, 4400 University Drive, Fairfax, VA, United States, mthibau1@gmu.edu

1 - Modeling Urban Operations for Data Fusion and OR Applications
Justin Yates, SUNY Buffalo, 415 Lawrence D. Bell Hall, Buffalo, NY, 14260, United States, jtyates@buffalo.edu

Military operations in asymmetric warfare necessitate the fusion of data from many diverse sources to support decision making. Given fusion results, the OR analyst can conduct mission planning: game theoretic routing of troops under uncertainty. We focus on GIS-based modeling and simulation of urban operations to support development of scalable fusion technologies and operational algorithms.

2 - Stochastic Network Interdiction with Asymmetric Information
Halil Bayrak, University of Pittsburgh, 1048 Benedum Hall, Pittsburgh, PA, 15213, United States, hab8@pitt.edu, Matthew Bailey

We consider the sensor placement problem. We formulate this as a shortest path network interdiction problem. We introduce information asymmetry, i.e. the evader and the interdictor have different information about the arc lengths (detection probabilities). We solve the problem for both deterministic and stochastic arc lengths. We also consider the cases where there is uncertainty about the origin and destination nodes, and the evader's intelligence about the locations of the interdicted arcs.

3 - A Model of Human Interpretation of Multisensory Images for Military Applications
Amanda Muller, Ph.D. Candidate, Wright State University, BIE Department, 207 Russ Center, 3640 Colonel Glenn Highway, Dayton, OH, 45432, United States, muller.4@wright.edu, S. Narayanan

The cognitive processes of the human operator should be taken into account in the design of any decision aid. This is particularly true for military applications, where the cost of human error can be high. To this end, a concurrent protocol analysis was used to determine how humans interpret information from multiple, disparate sensors. Both high-stress and low-stress situations were modeled. The model will be used to create a mutisensor data fusion system for pilots in high-stress situations.

4 - Optimum Search for a Set of Uniformly Distributed Immobile Entities on a Network
Arun Jotshi, Doctoral Student, University at Buffalo (SUNY), 438 Bell Hall, Department of Industrial Engineering, Buffalo, NY, 14260, United States, aajotshi@buffalo.edu, Rajan Batta

We are concerned with searching for a set of uniformly distributed immobile entities on a network. The goal is to find a search path that minimizes the expected search time. Theoretical results, examples, and computational results will be highlighted. We draw a comparison of this problem with the Chinese Postman Problem and utilize this relationship in the development of our solution method. Extensions of the basic problem for non-uniformly distributed entities will be briefly discussed.

5 - Efficiency Analysis of U.S. Coast Guard's Small Boat Search and Rescue Stations
Marc Thibault, George Mason University, 4400 University Drive, Fairfax, VA, United States, mthibau1@gmu.edu

The purpose of this is study is to use Data Envelopment Analysis and other Efficiency-Analysis techniques to help determine how the U.S. Coast Guard can minimize the loss life while maximizing the effectiveness of its small boat forces. It is anticipated that the study will help the USCG save lives, reduce rescue costs and help place fewer Coast Guard personnel at risk. This study will be conducted with the assistance of search and rescue experts from the U.S. Coast Guard.

■ SB15

Scheduling Models and Systems

Cluster: Scheduling
Invited Session

Chair: Bryan Norman, Associate Professor, University of Pittsburgh, 1033 Benedum Hall, Pittsburgh, PA, 15261, United States, banorman@engrng.pitt.edu

1 - Personnel Scheduling Models to Optimize Human and System Performance
Bryan Norman, Associate Professor, University of Pittsburgh, 1033 Benedum Hall, Pittsburgh, PA, 15261, United States, banorman@engrng.pitt.edu, Emmett Lodree

Personnel are critical components of many systems. Properly considering human capability and the man-machine interface is essential in order to maximize system effectiveness. The overall performance of the system is often directly related to how system personnel are scheduled. In this talk we summarize research related to scheduling personnel where the objective is to optimize system performance while considering human performance limitations and personnel well being.

2 - Integrating Assignment and Sequencing of Product Families on Multiple Lines to Minimize Set-up
Susan Monkman, University of Texas at Austin, McCombs School of Business, United States, Susan.Monkman@mccombs.utexas.edu, Douglas Morrice, Jonathan Bard

We develop an optimization model that both assigns and sequences product families on parallel assembly lines to minimize complex sequence-dependent set-up costs for an ATO electronics manufacturer. Due to special factory requirements and spatial constraints, we model it as a traveling salesman subtour problem (TSSP). We combine the assignment of families to lines with a TSSP for each line to minimize set-up costs and solve the model using a GRASP heuristic.

3 - Single Machine Scheduling Equal Length Jobs with Release Dates to Minimize Total Weighted Tardiness
John Fowler, Professor, Arizona State University, Department of Industrial Engineering, Tempe, AZ, 85287, United States, john.fowler@asu.edu, Hari Balasubramanian, Andrew Gamalski, Vinayak Muralidhar

We consider the single machine total weighted tardiness scheduling problem where jobs have unequal release dates but the same processing time. The complexity of the problem has not yet been established. We formulate the problem as integer program and propose heuristics that produce optimal or near-optimal solutions.

4 - Performance Prediction and Preselection for Optimization Procedures
Nicholas Hall, Professor, The Ohio State University, Fisher College of Business, Columbus, Oh, 43210-1144, United States, hall.33@osu.edu, Marc Posner

This work demonstrates how existing optimization procedures can be used more effectively. We predict the relative performance of alternative optimization procedures, using easily computed problem characteristics. This methodology enables us to preselect optimization procedures for a specific data set, without the need for extensive computational testing. We apply this methodology to the 0-1 Knapsack Problem, for which competing optimization procedures are available.

■ SB16

Evolution, Innovation & Competitive Heterogeneity

Sponsor: Organization Science
Sponsored Session

Chair: Tammy Madsen, Associate Professor, Santa Clara University, Management Department, Santa Clara, CA, 95053, United States, tmadsen@scu.edu

1 - Managing Returns to Investments in Capabilities: A Conceptual Framework
Catherine Maritan, Syracuse University, Whitman School of Management, 721 University Avenue, Syracuse, NY, 13244, United States, cmaritan@syr.edu, Todd Alessandri

In this paper, we consider the relationship between the investment decision process and returns to investments in capabilities. First, we integrate arguments from the capabilities and real options literatures to develop a framework that delineates the components of returns to capability investments. We then link these components to the investment decision-making process to identify a set of organizational levers that can strongly influence investment returns.

2 - The Value of Not Being in Sync: Temporal Resource Selection and Product Innovation
Riitta Katila, Assistant Professor, Stanford University, Dept. of Management Science and Engineering, Terman 413, Stanford, CA, 94305, rkatila@stanford.edu

In contrast to the traditional firm-centric view, we examine resource selection relative to competitors. Using product innovation data from worldwide industrial automation organizations over a 15-year period, we confirm the benefits of selecting resources earlier than competitors, but reject the uniform liabilities of moving late.

■ SB17

New Product/Service Development

Cluster: New Product Development
Invited Session

Chair: Weiyu Tsai, Assistant Professor, University of Utah, 1645 E. Campus Center Dr., #107, Salt Lake City, UT, United States, mgtwt@business.utah.edu

1 - How Component Sharing Impacts Consumer Perceptions about Product Similarity and Product Preferences
Kamalini Ramdas, Associate Professor, UVA-Darden, 189 FOB, 100 Darden Blvd, Charlottesville, VA, United States, ramdask@Darden.virginia.edu, Oleksandr Zhylyevskyy

While many researchers have examined the impact of components sharing on costs, the market impact of components sharing is less well understood. Using data from a simulated test market (STM) experiment using 302 test consumers that we conducted at a major multinational wristwatch manufacturer, we empirically examine the impact of the sharing of different types of components on A) consumer preferences and B) perceived similarity across products.

2 - Technology Markets: The Case of Component Providers
Sanjiv Erat, College of Management, Georgia Institute of Technology, Atlanta, United States, sanjiv.erat@mgt.gatech.edu, Cheryl Gaimon, Stylianos Kavadias

Many firms in technology intensive end-product markets act as component-integrators and buy their core components from outside providers. Such technology providers who sell the components are near-monopolies when compared to the intense competition that characterizes the end-product markets. In such a setting, we examine the two main dimensions of technology provider's development decision - the technological advancement to offer in the component, and the additional functionality to provide.

3 - Customer Activity Chain: The Source of Promise in New Service Development
Weiyu Tsai, Assistant Professor, University of Utah, 1645 E. Campus Center Dr., #107, Salt Lake City, UT, United States, mgtwt@business.utah.edu, Rohit Verma

In today's competitive market, product-oriented as well as service-oriented companies are increasingly seeking service innovation to sustain their growth and long term survival. Especially for manufacturing companies in search of growth in the market flooded with commoditized products, it seems appealing to offer new and novel services peripheral to their core products. We suggest focusing on the "Customer Activity Chain" to define/design/deliver/debug (4-d) the NSD process.

■ SB18

AGIFORS Spotlight: Anna Valicek Awards and Current Hot Topics

Sponsor: Aviation Applications
Sponsored Session

Chair: Tim Jacobs, Tim.Jacobs@aa.com

1 - A Qualitative Choice Model for the US Airline Network
Dipasis Bhadra, Principal Economist, MITRE/CAASD, 7515 Colshire Avenue, McLean, VA, 22102, United States, dbhadra@mitre.org, Brendan Hogan

We use a multinomial choice model to explore two questions: What are the fundamental factors that determine and drive evolutions in the US airline network? Second, how can temporary or permanent network changes be adequately explained? Answering these questions may provide us with some important insight into understanding the formation and evolution of the US airline network. Furthermore, this may lead us to improved policy-making in the context of the industry that appears to be ever changing.

2 - A New Approach to Solve the Probabilistic Nonlinear Seat Inventory Control Problem
Andreea Popescu, Ph.D. candidate, Georgia Institute of Technology, School of Industrial and Systems Engineering, 765 Ferst Drive NW, Atlanta, GA, 30332-0205, United States, andreeap@isye.gatech.edu

The seat inventory control problem is to maximize expected revenue of future scheduled flights by allocating seats to different itinerary / fare classes. We solve the probabilistic version using the Lagrangian dual formulation. We show that the Lagrangian dual can be solved by using a trust region based Newton method, in which the gradient and the Hessian are computed efficiently based on exploiting information from the primal representation. Special cases and schemes to adjust the dual and the primal variables are discussed.

3 - Modeling the Competitive Dynamic among Air-travel Itineraries with Generalized Extreme Value Models
Gregory Coldren, gregorycoldren@yahoo.com, Frank S. Koppelman

We estimate air-travel itinerary share models that capture the underlying competitive dynamic among itineraries along the dimensions of time of day, carrier and level-of-service. Estimation results are intuitive and the advanced models outperform the more basic specifications. Finally, the most basic of the presented models was implemented into a major U.S. carrier's existing itinerary share model, leading to significant improvements in its forecasting accuracy.

■ SB19

KLIC II — Fundamental Models and Processes (Knowledge, Learning & Intellectual Capital)

Sponsor: Technology Management
Sponsored Session

Chair: David Moore, Assistant Professor, Colorado School of Mines, Economics and Business Division, 814 15th Street, Golden, CO, 80401, United States, dmoore@mines.edu

1 - Linking Learning Services with Business Processes: The Strategic Value of Learning

Thomas Hill, Director, Learning and Knowledge Management, Genetech, 1 DNA Way, South San Francisco, CA, 94080-4990, United States, hill.thomas@gene.com

This work analyzes the programs of companies like Shell, Reuters, HP and Genentech in moving learning from an event orientation to a process one, showing the linkages of learning services to business processes, alignment with corporate business processes and finally positioning and evaluating learning based on strategic business impact.

2 - Production Functional Structures of Additive Production Performance Metrics

David Moore, Assistant Professor, Colorado School of Mines, Economics and Business Division, 814 15th Street, Golden, CO, 80401, United States, dmoore@mines.edu

Existence of additive decompositions of performance metrics such as cycle time, throughput, cost and yield as posited by (Zhangwill and Kantor) will be demonstrated in a production economic framework. We characterize all functional representations of production technologies having performance metrics with additive decompositons, and present empirical tests verifying, and apriori technological conditions implying existence of additive decompositions.

3 - Prior Knowledge in the Learning Curve: An Exploration of Form and Function

Nile Hatch, Marriott School - BYU, 790 TNRB, Provo, UT, 84602, United States, nile@byu.edu, Stefan Reichelstein

It is common to assume that the cost of the first unit is a control for the level knowledge at the beginning of a learning curve. We show that the shape and rate of learning depends on the level of prior knowledge and that the cost of the first unit does not control for this knowledge. We propose a functional form that controls for prior learning and test its performance in estimating learning curves in semiconductor manufacturing.

4 - Evolving Backwards: Technological Knowledge as a Causal Graph

Roger Bohn, Professor, UC San Diego, 9500 Gilman Drive, MC 0519, La Jolla, CA, 92093, United States, Rbohn@UCSD.edu

Technological knowledge can be modeled as a causal knowledge graph (CKG). In this model, knowledge tends to evolve backwards over time, from effect to cause. 200 years of firearms manufacturing at Beretta provide the main example. Strengths and limits of the CKG will be sketched. Among other features, CKGs can be used directly by engineers to learn about, store, and combine knowledge. CKGs and their evolution explain society-wide organization of technological knowledge into firms.

■ SB20

Electricity Market Modeling

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

Chair: Javier Contreras, Universidad de Castilla - La Mancha, Campus Universitario s/n, 13071 Ciudad Real, Spain, Javier.Contreras@uclm.es

1 - An Optimisation Approach for Oligopolistic Electricity Markets Simulation with Network Constraints

Begoña Vitoriano, Doctor, Universidad Pontificia Comillas (IIT), Santa Cruz de Marcenado 26, Madrid, 28015, Spain, bvitoriano@upcomillas.es, Julià n Barqu"n, Félix Fernàndez-Menéndez

An optimisation based model to simulate electricity markets that allows to take into account simultaneously constraints related to network and multiperiod systems (as water management, or start-up and shut-down thermal plants characteristics) will be presented. The oligopolistic nature of the competition is addressed through conjectural variations, and the model will be applied to two different ways of managing the network: capacity auctions versus market splitting.

2 - Locational Marginal Price Sensitivities

Roberto Minguez, Universidad de Castilla - La Mancha, 13071 Ciudad Real, Spain, Roberto.Minguez@uclm.es, Antonio Conejo

Within an optimal power flow market clearing framework, this paper provides expressions to compute the sensitivities of locational marginal prices with respect to power demands. Sensitivities with respect to other parameters can also be obtained. An example and a case study are used to illustrate the expressions derived.

3 - Dynamic Oligopolistic Electric Power Network Competition with Joint Constraints and Ramping Costs

Reetabrata Mookherjee, Doctoral student, Industrial Engineering, Pennsylvania State University, 244 Leonhard Building, University Park, PA, 16802, United States, reeto@psu.edu, Terry Friesz, Benjamin Hobbs, Matthew Rigdon

We articulate a dynamic model of electric power network competition that includes two critical features: (i) ramping costs for changing the power output of generating units and (ii) joint regional sales cap constraints. The resulting problem is a generalized Nash equilibrium that we articulate as a differential quasi-variational inequality. We provide a restricted formulation and an implicit fixed point algorithm to solve it. We discuss a numerical example and some extensions of the model.

4 - Global Optimization of Collusive Games in Transmission-constrained Electricity Markets

Andrew Liu, Dept. Applied Math. & Statistics, The Johns Hopkins University, Baltimore, MD, United States, lliu@jhu.edu, Joe Harrington, Jong-Shi Pang, Benjamin Hobbs

We present an optimization model that describes a collusive game among non-cooperative players. The model is then extended to the case of deregulated electricity markets with linearized DC transmission networks, and is reformulated as a mathematical program with equilibrium constraints (MPECs). A branch-and-bound type algorithm specially tailored to handling the linear complementarity constraints will be presented, along with numerical examples.

■ SB21

Clustering Methods for Knowledge Discovery

Sponsor: Data Mining
Sponsored Session

Chair: Nick Street, Associate Professor, University of Iowa, S232 Pappajohn Business Bldg., Iowa City, IA, 52241, United States, nick-street@uiowa.edu

1 - Consensus Solutions from Multiple Unsupervised Classifications

Alexander Topchy, Nielsen Media Research, 501 Brooker Creek Blvd, Oldsmar, FL, 34677, United States, Alexander.Topchy@NielsenMedia.com

Data clustering is increasingly focusing on combining multiple partitions as a way to improve the robustness of clustering solutions. We demonstrate how a meaningful consensus in clustering ensemble can be reached by several consensus functions derived from statistical and information-theoretic principles. We give some formal arguments on ensemble convergence and empirical evidence that individual algorithms can be significantly relaxed in favor of weaker and inexpensive partition generation.

2 - Iterative Clustering & Classification to Identify Response-Specific Subpopulations

Ding Yuan, University of Iowa, Pappajohn Business Bldg., Iowa City, IA, 52242, United States, ding-yuan@uiowa.edu, Nick Street

We propose an integrated two-level modeling process that combines supervised and unsupervised learning to build predictive models for different clusters simultaneously. Both the performance of different predictive models and the similarities between the data points in the original feature space are used to guide the cluster construction.

3 - Constraint Clustering, Global Algorithm

Yu Xia, The Institute of Statistical Mathematics, 4-6-7 Minami-Azabu, Minato-Ku, Tokyo, 106-8569, Japan, yuxia@ism.ac.jp

Some existing clustering methods have been adapted to the constraint clustering. However, as the case of unconstraint clustering, it is difficult to find a global solution for the constraint clustering. In this paper, I propose a cutting method for constraint clustering, which find global solution in finite steps theoretically.

■ SB22

Economic Analysis of Pricing and E-Business

Sponsor: Information Systems
Sponsored Session

Chair: Anindya Ghose, Assistant Professor, New York University, Stern School of Business, New York, NY, United States, aghose@stern.nyu.edu

1 - Market Transparency in Internet-Based Selling: Modeling and Empirical Analysis

Robert J. Kauffman, Director MISRC Research Center, Professor and Chair, University of Minnesota, Information and Decision Sciences Dept., 3-365 Carlson School of Management, Minneapolis, MN, 55455, United States, kauff002@umn.edu, Nelson F. Granados, Alok Gupta

Internet technology brought significant changes in the availability of product and price information to consumers, or the level of market transparency. We model the impact of market transparency on consumers' willingness-to-pay and derive the optimal relative prices and transparency levels for two Internet-based sellers who wish to maximize profits. Based on the guidelines from the model, we evaluate cross-channel transparency strategies in air travel using a large dataset of airline tickets.

2 - Pricing Options Contracts: A Continuous-Time Model

D.J. Wu, Associate Professor, Georgia Institute of Technology, 800 West Peachtree Street NW, Atlanta, GA, 30332, United States, dj.wu@mgt.gatech.edu, Shi-Jie Deng

In a continuous-time setting, we study the pricing of real options on capacity contracts. We compare with earlier theoretical results for the two-period case with continuous-time case. We discuss practical implications of our results for electronic markets in the context of contract manufacturing and hotel channel management.

3 - Pricing and Product Line Strategies of Information Goods: Theory and Evidence from E-Business

Anindya Ghose, Assistant Professor, New York University, Stern School of Business, New York, NY, United States, aghose@stern.nyu.edu, Arun Sundararajan

The adoption of Internet-based commerce has provided researchers with a wealth of new data enabling demand estimation in a number of industries. Based on an ecommerce-based panel data collected between 2004-2005, this paper estimates the extent of quality distortion due to versioning in software and tests existing & new theories on product line offerings using price-elasticities. It also empirically proves the optimality of mixed bundling for software.

■ SB23

Modeling Financial Services

Sponsor: Financial Services
Sponsored Session

Chair: Aparna Gupta, Asst Prof, Rensselaer Polytechnic Institute, 110 Eighth Street, Troy, NY, 12180, United States, guptaa@rpi.edu

1 - The Adoption of Internet Banking and its Implications for Service Delivery Management

Mei Xue, Assistant Professor, Boston College, xueme@bc.edu, Lorin Hitt, Pei-yu Chen

Though millions of dollars has been invested in building the infrastructure for Internet banking, it is seen that the adoptions of Internet banking by consumers has been relatively slow and far below expectations. In this paper, we study the retail bank customers' adoptions of Internet banking using a large panel data set. The implications of the findings for service delivery management are explored.

2 - Comparing Contribution Schemes for Simulated Portfolios

Harold Schleef, Lewis & Clark College, Social Sciences Division, Portland, OR, schleef@lclark.edu

This paper compares several contribution schemes for personal investment portfolios. Simulation models allow comparison of different asset allocations and evaluation of the risk associated with achieving specific portfolio targets. The risk of failing to reach a specific portfolio value on a target date may be substantial, given constant annual contribution amounts. Other schemes may achieve the desired portfolio value.

3 - Options-based Pricing Strategies for Internet Services

Aparna Gupta, Asst Prof, Rensselaer Polytechnic Institute, 110 Eighth Street, Troy, NY, 12180, United States, guptaa@rpi.edu

Provision of Quality of Service (QoS) guaranteed services on the Internet is inherently risky due to uncertainties caused by competing traffic in the Internet. We develop appropriate models for QoS guaranteed contracts and options-pricing based techniques for pricing the risk in these contracts.

■ SB24

Computational Methods for Portfolio Optimization

Cluster: Financial Engineering
Invited Session

Chair: John Birge, Professor, University of Chicago, Graduate School of Business, Chicago, 60637, United States, john.birge@gsb.uchicago.edu

1 - Modeling and Computation of Portfolio Optimization Problems with Transaction Costs, Part I

Zhen Liu, Northwestern University, 2145 Sheridan Road, Department of IEMS, Evanston, IL, 60208, United States, zliu@northwestern.edu, John Birge

We discuss portfolio optimization problems with transaction costs under different governing processes. In part I, we discuss the valuation of buy-and-hold strategy. New modeling of the dynamics of a portfolio is proposed. Then the complicated resulting parabolic PDE problem is changed into a heat transfer problem in unbounded region. An exact Artificial Boundary Condition is given and numerical experiments confirm the effectiveness.

2 - Optimal Investment and Order Submission Strategy with Execution Delay

Tim Maull, PhD Student, University of Michigan, Department of IOE, 1205 Beal Avenue, Ann Arbor, MI, 48109-2117, United States, timmaull@umich.edu, Jussi Keppo, Hong Liu

We examine the affects of transaction delays on portfolio value. These transaction delays are similar to transaction costs and can arise from illiquid markets or from technological constraints. Portfolio values and optimal actions with and without delay are discussed. Applications of modeling delays in financial markets are considered.

3 - A Simulation Based Optimization Scheme for Large Portfolios with Transaction Costs

Kumar Muthuraman, Asst. Professor, Purdue University, 315 N Grant St, West Lafayette, IN, 47906, United States, kumar@ecn.purdue.edu, Haining Zha

Solutions to portfolio optimization problems with proportional transaction costs are obtained by solving a related free-boundary PDE (HJB). Runtimes of existing solution methods grow super exponentially with dimension - making them unsuitable for problems with more than even 3 stocks. We describe a scheme that scales polynomially in dimension. The scheme transforms the HJB to a sequence of fixed boundary problems and estimates the solution to the fixed boundary problems by simulation.

■ SB26

JFIG- Paper Competition II

Sponsor: JFIG, Junior Faculty Interest Group
Sponsored Session

Chair: Joseph Geunes, Associate Professor, University of Florida, 303 Weil Hall, Gainesville, FL, 32611, United States, geunes@ise.ufl.edu

1 -Minimizing Flow Disruption due to Network Maintenance

Yanjun Li, Assistant Professor, Purdue University, West Lafayette IN 47907, United States, li14@purdue.edu, Mohit Tawarmalani

This paper introduces a network maintenance scheduling problem under maintenance capacity restrictions and studies the effect of maintenance operations on productivity loss. The objective is to minimize the flow disruption, a measure of the loss of productivity, during maintenance activities. Unfortunately, this maintenance scheduling problem is intractable even when the underlying network is linear and the flows are allowed to take two different values. Our study first targets linear networks with a special flow structure which includes the uniform flow case. We devise a polynomial-time combinatorial algorithm for solving the minimum disruption network maintenance problem, characterize the structure of the set of all optimal schedules, discuss the impact of maintenance capacities on flow disruption and identify specific types of flow changes that retain optimality of a maintenance schedule. As shown here, the optimal maintenance schedules have a peculiar structure and this structure yields many insights into general maintenance scheduling. Then, with a general flow structure, we develop an integer programming formulation for the acyclic network maintenance problem and a specialized formulation for linear network maintenance problem. We derive valid inequalities, use reformulation-linearization technique to tighten formulation, and conduct polyhedral study of formulations using network flow and primal-dual methods. We computationally demonstrate that our formulations are capable of solving reasonably large instances of the problems. Finally, we extend our model and analysis to the maintenance problems on directed networks and network nodes.

2 -The Optimal Time to Disclose Software Vulnerability

Jeevan Jaisingh, Assistant Professor, The Hong Kong University Of Science and Technology, Clear Water Bay, Kowloon, Hong Kong, Hong Kong, jeevan@ust.hk, Qing Li

Software vulnerability disclosure has been a critical area of concern for social planners. It is well known that while early disclosure may push vendors to create patches sooner, late disclosure reduces the risk of making the vulnerabilities known to malicious users. This paper provides a new view of the problem. We argue that to set an optimal disclosure policy, the social planners must trade off an incentive effect for an information effect. On one hand, because vendors typically have different objectives than the social planners have, social planners need to use disclosure as an incentive scheme for coordination. That is, the incentive effect favors early disclosure. On the other hand, social planners must decide on a disclosure policy before they know when the vulnerabilities would be discovered by benign users, but vendors can postpone their patching decisions until that information is known. Since the vendors are endowed with more accurate information and hence are able to make more informed choices, they should be left unregulated. That is, the information effect favors late disclosure. As a result of this tradeoff, social planners should disclose the vulnerabilities after a finite and non-zero grace period or keep them secret, depending on which effect dominates, but they should never disclose them instantly. Two factors may affect the tradeoff: the vendors' liability for their customers' losses resulting from attacks and the experience that hackers can accumulate on the vulnerabilities over time. We show how these two factors affect the incentive conflict and information asymmetry and hence the optimal disclosure policy.

3 -Stochastic Revenue Management Models for Media Broadcasting

Victor Araman, Asst. Prof., NYU Stern School of Business, 44W 4th Street, New York NY 10012, United States, varaman@stern.nyu.edu
Ioana Popescu

An important challenge faced by media broadcasting companies is how to allocate the limited advertising capacity between upfront contracts and the scatter market in order to maximize profits. We develop stylized optimization models of inventory allocation for one client and one media channel, in the presence of audience uncertainty. Closed form solutions for upfront contract allocation are obtained. Dynamic make-goods allocation are investigated under reversible and irreversible commitment strategies. We provide structural properties and sensitivity analysis for the value function and optimal solution with respect to contract parameters, audience and time. Our results hold under very general performance metrics, and bring out interesting parallels with standard inventory and revenue management frameworks.

■ SB27

2005 Dantzig Dissertation Award Finalists

Cluster: Dantzig Dissertation Prize
Invited Session

Chair: Linda Green, Professor, Columbia University, 3022 Broadway, New York, NY, 10027, United States, lvg1@columbia.edu

The Dantzig Prize is offered for the best PhD in Operations Research with applied content. The winner will likely offer a presentation, as will some of the strongest finalists.

1 - Optimal Policies for the Acceptance of Living- and Cadaveric-Donor Livers

Oguzhan Alagoz, University of Wisconsin-Madison, Department of Industrial and Systems Engineering, 3162 Engineering Centers Building, 1550 Engineering Drive, Madison, WI, 53706, United States, alagoz@engr.wisc.edu

Transplantation is the only viable therapy for end-stage liver diseases (ESLD) such as hepatitis B. In the United States, patients with ESLD are placed on a waiting list. When organs become available, they are offered to the patients on this waiting list. This dissertation focuses on the decision problem faced by these patients: which offer to accept and which to refuse? A recent analysis of liver transplant data indicates that 60% of all livers offered to patients for transplantation are refused. This problem is formulated as a discrete-time Markov decision process (MDP). This dissertation analyzes three MDP models, each representing a different situation. We derive structural properties of all three models, including several sets of conditions that ensure the existence of intuitively structured policies such as control-limit policies. The computational experiments use clinical data, and show that the optimal policy is typically of control-limit type.

2 - First Place - Communicating Preferences and Determining Outcomes in Combinatorial Auctions

Bob Day, University of Connecticut, 2100 Hillside Rd. U-1041, Storrs, CT, 06269, United States, Bob.Day@business.uconn.edu

In this talk I will summarize the contributions to the study of combinatorial auctions made in my dissertation. I begin by showing an improved technique for the computation of "bidder-Pareto-optimal" prices within the "core." This technique calls for the automated solution of several "winner-determination" problems, and like similar combinatorial auction techniques requires each bidder to submit valuations for all bundles of interest to a proxy. Unfortunately, communicating preferences to a proxy may require an exponential amount of information relative to the number of items being auctioned. To address this exponential communication problem, I introduce two new compact bidding languages, and discuss the details, implementations, and relative merits of these approaches.

■ SB28

Pricing and Revenue Management in Service Systems

Sponsor: Revenue Management & Pricing
Sponsored Session

Chair: Philipp Afeche, Asst. Prof., University of Chicago, 5807 South Woodlawn Avenue, Chicago, IL, 60637, United States, pafeche@gsb.uchicago.edu

1 - The Effect of Uncertainty on Decision Optimality

Roxy Cramer, Senior Scientist, PROS Revenue Management, 3100 Main Street, Suite 900, Houston, TX, 77002, United States, rcramer@prosrm.com, Ed Kambour, John Salch

The effect of randomness in optimization is typically handled by examining expected revenue. However, the presence of uncertainty in the underlying random process can change things considerably. In this presentation we will describe, in general, some of the ramifications of uncertainty on the decision making process and show the explicit value of additional data gathering. In addition, we will present supporting example cases.

2 - Robust Product Pricing when Customer Preferences are Unknown using a Competitive Ratio Analysis

Costis Maglaras, Columbia Business School, 3022 Broadway, New York, NY, 10027, United States, c.maglaras@gsb.columbia.edu, Serkan Eren, Garrett van Ryzin

We study the monopolist's pricing problem when the firm operates in a market with no information about customer preferences. Adopting a worse-case (competitive ratio) analysis we characterize the structure and performance of the optimal pricing policy in a variety of settings with/without learning and/or capacity constraints.

3 - Pricing Strategies and Service Differentiation in an M/M/1queue - A Profit Maximization Perspective

Akshay Katta, Columbia University, Department of IEOR, 500 West 120th Street, NewYork, NY, 10027, United States, ark2001@columbia.edu, Jay Sethuraman

Consider the problem of designing a profit maximizing pricing-scheduling policy for a service facility serving heterogeneous customers with private information about their service value and time-sensitivity. For the problem where each customer belongs to one of N discrete types, and under certain model assumptions, we give an efficient algorithm to find an optimal policy. For the problem with continuous types, we derive the conditions under which the priority auction is optimal.

4 - Revenue Management and Delay Tactics under Competition and Customer Choice

Philipp Afeche, Asst. Prof., University of Chicago, 5807 South Woodlawn Avenue, Chicago, IL, 60637, United States, pafeche@gsb.uchicago.edu

Consider the problem of two providers who compete for heterogeneous and delay sensitive customers with private information about their delay tolerance. How should they design price-delay menus and schedule their resources? We characterize the price-delay equilibria and discuss how they depend on capacity levels, competition, and the value of market segmentation.

■ SB29

Joint Session Research/JFIG: JFIG Research Clinic- Operations Management with Weather Forecasts

Cluster: Research Clinics, JFIG, Junior Faculty Interest Group
Invited Session

Chair: Eva Regnier, Naval Postgraduate School, 1 University Circle, Monterey, CA, 93943, United States, eregnier@nps.edu

1 - Operations Management with Weather Forecasts

Eva Regnier, Naval Postgraduate School, 1 University Circle, Monterey, CA, 93943, United States, eregnier@nps.edu, Tuell Green, Ron Sznaider, David Titley, Michael Petrie

Industry and public sector panelists present problems related to use of weather forecasts in planning. These experts will discuss the impact of weather on their operations and decisions, highlighting decision support tools and problems they would like to see solved. Topics will include the design of forecasts for decision support in the transportation sector, the integration of weather data in decision support tools for homeland security managers and the development of quantitative rules for operational decision-making and design of next-generation meteorological products for the U.S. Navy. The purpose of this panel is to build a bridge between a community of operational experts and the OR/MS community whose tools and experience have the potential to make a huge impact in improving the use and value of weather information.

■ SB30

Problems in the Management of Finance Risk

Contributed Session

Chair: Cigdem Gurgur, Professor, Colorado School of MINES, Business and Economics Division, 1500 Illinois Street, GOLDEN, CO, 80401, United States, cgurgur@mines.edu

1 - Vertical Integration in Banking - Myth or Formula for Success?
Tom Gellrich, JW Goethe University & E-Finance Lab, Bockenheimer Landstr. 42, Frankfurt, HE, 60325, Germany, gellrich@wiwi.uni-frankfurt.de, Markus Holzhaeuser, Andreas Hackethal

We examine vertical integration and its impact on profitability and shareholder value in the global banking industry. We find that Anglo-Saxon banks operate on a less integrated basis. Our results show that banks either operating on highly integrated or highly disintegrated levels of vertical integration display superior performance and stock market figures. We also find an interrelation between vertical integration and outsourcing.

2 - The Role of Financial Institutions and Productivity Growth of Firms
Zhonghua Wu, PhD Candidate, National U of Singapore, BIZ2, Level 6, Research Office, Business link, National U of Singapore, Singapore, 117592, Singapore, g0403303@nus.edu.sg

Based on agency theory, we focus on the effect of ownership held by financial institutions on firm productivity growth by developing a model of endogenous productivity growth and testing its implications against data on 163 Japanese manufacturing firms spanning 1979-2001. We find a U-shaped financial ownership ®C productivity growth relation, which is negatively moderated by the level of financial leverage in a firm.

3 - The Sensitivity Study on Investment Expenditure and Cash Flow of Chinese IT Industrial Company
Yanxi Li, Associate Professor, Management School of Dalian University of Technology ,China, Dalian University of Technology, Dalian, 116024, China, mrliyx@dlut.edu.cn

Using ICF as the indicator to evaluate the internal financing ability of the company, this paper conducts a sensitivity study on the listed companies of Chinese IT industry based on the investment expenditure and ICF when these companies face to various kinds of financing constraints . This study shows that the greater financing constraint the listed company of Chinese IT industry faces, the greater influence it's ICF holds on it's investment expenditures.

4 - Continuous and Dynamic Funding of Warranty Reserves
Cigdem Gurgur, Professor, Colorado School of MINES, Business and Economics Division, 1500 Illinois Street, GOLDEN, CO, 80401, United States, cgurgur@mines.edu

It is common for many companies to create a reserve fund to cover future liabilities arising from product warranties. We propose an optimal warranty reserve policy to determine the funding level at the beginning of a fiscal period, the amount of contribution after each sale; and cash flows at the end of the period.

■ SB31

Joint Session Practice/ Roundtable: OR at UPS - Making a Difference with Technology

Cluster: OR Practice, Roundtable
Invited Session

Chair: Jeff Winters, OR Division Mgr, United Parcel Service, 2311 York Rd, Timonium, MD, 21093, United States, JWinters@ups.com

1 - Why OR Projects Fail - Or Succeed
Jeff Winters, OR Division Mgr, United Parcel Service, 2311 York Rd, Timonium, MD, 21093, United States, JWinters@ups.com

UPS has a long history of utilizing Operations Research from tactical to strategic planning. This presentation will examine techniques for the successful use and implementation of projects utilizing OR.

2 - OR and Hub Operations at UPS
Doug Mohr, United Parcel Service, 2311 York Rd, Timonium, MD, 21093, United States, dMohr@ups.com

UPS has utilized the hub and spoke concept in package routing and sorting for many years. This presentation will provide an overview of the UPS efforts to utilize operations research in improving the efficiency and effectiveness of hub operations.

3 - OR in Long Haul Operations at UPS
William Boga, Lead Technical User Rep, United Parcel Service, 2311 York Rd, Timonium, MD, 21093, United States, wBoga@ups.com

An examination of the use of operations research to plan and improve UPS over the road long haul operations. The presentation will include a description of the UPS over the road long haul problem, a brief history of the use of OR to solve these problems, and a glimpse into future plans to further leverage operations research in this area.

■ SB32

Issues in Logisitcs and Scheduling

Contributed Session

Chair: Johann Hurink, Dr., University of Twente, P.O. Box 217, Enschede, 7500 AE, Netherlands, j.l.hurink@utwente.nl

1 - The Network of Logistics Decisions
James Campbell, Professor, University of Missouri-St. Louis, College of Business Administration, 1 University Blvd, St. Louis, MO, 63121-4499, United States, campbell@umsl.edu, Diane Riopel, André Langevin

Logistics decision-making is challenging due to the complex inter-relationships among decisions. This presentation provides a framework for logistics decision-making by classifying logistics decisions and highlighting the relevant linkages among them. We focus on the precedence relationships among logistics decisions and the resulting sequencing of decision-making that this implies.

2 - Logistics Network Design using Consolidation Hubs
Michelle L.F. Cheong, Practice Assistant Professor, Singapore Management University, 80, Stamford Road, Singapore, 178902, Singapore, michcheong@smu.edu.sg, Rohit Bhatnagar, Stephen Graves

We address the 3PL challenge in consolidating flows when managing suppliers for multiple clients. We locate hubs near the suppliers and consolidate shipments, to improve visibility and lower cost. Using hub shipping options, we perform precomputations to reduce model complexities, and to determine the inventory policy and network design simultaneously.

3 - Meta-Heuristics for Distribution Network Design with Truckload Consolidations
Homarjun Agrahari, Department of Industrial Engineering, Texas A&M University, College Station, TX, United States, homarjun@tamu.edu, Halit Uster

We consider a capacitated network design problem where smaller loads are consolidated into truckloads during their origin to destination transportation. We present heuristics based on SA and TS frameworks and large scale neighborhoods. We also provide a summary of computational results.

4 - A Tabu search for the flowshop scheduling problem
Burak Eksioglu, Assistant Professor, Mississippi State University, PO Box 9542, Miss. State, MS, 39759, United States, beksioglu@ie.msstate.edu, Sandra Eksioglu, Pramod Jain

A Tabu search procedure is developed for the flowshop scheduling problem. To generate an initial solution for tabu search a new heuristic is developed that considers due dates, release times, and processing times of the jobs on each machine. The initial solution is then improved using a tabu search procedure. Several neighborhood definitions are used to test the effect of the neighborhood size on the solution quality.

5 - Efficiency of Local Search for some Scheduling Problems
Johann Hurink, Dr., University of Twente, P.O. Box 217, Enschede, 7500 AE, Netherlands, j.l.hurink@utwente.nl, Tobias Brueggemann

Local Search methods are nowadays very popular solution methods for solving scheduling problems. In this paper we present some theoretical results on bounds on the quality or computational time for applying local search to some specific scheduling problems. Furthermore, we discuss some results on efficiency of large scale neighborhoods.

■ SB33

Journal of Quality and Reliability Engineering International

Sponsor: Quality, Statistics and Reliability
Sponsored Session

Chair: Douglas Montgomery, Professor, Industrial Engieering Dept., Industrial Engieering Dept., Arizona State University, Tempe, AZ, 85287, United States, doug.montgomery@asu.edu

1 - Design Strategies for the Multivariate Exponentially Weighted Moving Average Control Chart
Connie Borror, cborror@uiuc.edu

The multivariate exponentially weighted moving average (MEWMA) control chart has received significant attention from researchers and practitioners because of its desirable properties. There are several different approaches to the design of MEWMA control charts: statistical design; economic-statistical design; and robust design. In this paper a review and comparison of these design strategies is provided.

2 - A Change Point Method for Linear Profile Data
Mahmoud Mahmoud, mamahmou@vt.edu, Peter Parker, Douglas Hawkins, Bill Woodall

We propose a change point approach based on segmented regression and maximum likelihood for testing the constancy of the regression parameters in a linear profile data set. We compare the performance in detecting sustained step shifts in the parameters to that of the most effective Phase I control chart approaches using simulation. We provide a calibration application from NASA Langley Research Center.

3 - Process Optimization through Robust Parameter Design in the Presence of Categorical Noise Variables
William A. Brenneman, brenneman.wa@pg.com, Tim Robinson, William R. Myers

When categorical noise variables are present in the robust parameter design context, one can reduce process variance by adjusting the proportions associated with the levels of the categorical noise factors. In this setting, we propose the use of a parts per million defective objective function and use the desirability function approach to determine optimal operating conditions when non-uniform control factors are present. This methodology is illustrated with an example from industry.

■ SB34

QSR Best Student Paper Competition

Sponsor: Quality, Statistics and Reliability
Sponsored Session

Chair: Yu Ding, Assistant Professor, Industrial Engineering, Texas A&M University, Texas A&M University, MS3131, College Station, TX, 77843, United States, yuding@iemail.tamu.edu

1 - QSR Best Student Paper Competition
Yu Ding, Assistant Professor, Industrial Engineering, Texas A&M University, Texas A&M University, MS3131, College Station, TX, 77843, United States, yuding@iemail.tamu.edu

The Quality Statistics and Reliability (QSR) Section of INFORMS announces the Best Student Paper Award to recognize excellence among its student members. Four finalists for the Best Student Paper Award will be selected to make presentations during the conference. The winner will be announced and the Best Student Paper Award presented annually at the QSR Section business meeting later at the INFORMS annual meeting. All finalists' papers will be posted on the webpage of the QSR Section.

■ SB35

RASIG Student Paper Competition

Sponsor: Railroad Applications
Sponsored Session

Pooja Dewan, BNSF Railway, 2400 Western Center, Fort Worth, TX, United States, pooja.dewan@bnsf.com

RASIG Student Paper Competition

RASIG (Rail Applications Special Interest Group), a subdivision of INFORMS (Institute for Operations Research and Management Science) sponsored a student research paper contest on Management Science in Railroad Applications. Authors of First Place, Second Place, and Honorable Mention papers will be asked to present the papers at this session.

1 - First Place: Decreasing the Passenger Waiting Times for IC Networks of Belgian Railways
Peter Vansteenwegen

To improve passenger service, a generalized waiting cost, weighting different types of waiting, is minimized. To safeguard important transfers, ideal buffer times are calculated based on the delay distributions of trains, passenger numbers and different waiting types. Linear goal programming is used to construct an improved timetable with suitable transfer times, respecting as much as possible the ideal buffers. Simulation evaluates different LP-generated schedules. For the case of the IC network, the waiting cost is reduced by 40 percent.

2 - Second Place: N-tracked Railway Traffic Rescheduling During Disturbances
Johanna Tornquist

Railway systems are often characterized by high traffic density and heterogeneous traffic that is sensitive to disturbances. Difficulties analyzing how disturbances propagate and which actions to take in order to minimize the consequences for multiple stakeholders have been studied in research projects funded by the Swedish National Rail Administration. An optimization approach to the problem of re-scheduling traffic in an n-tracked network is presented. The theoretical and practical implications of an implementation are also discussed.

3 - Honorable Mention: Revenue Management of Auto Train at Amtrak
Soheil Sibdari

Auto Train offered by Amtrak is a distinctive service in the United States that lets passengers bring their own vehicles on the train. This service is offered daily to shuttle between Lorton, VA and Sanford, FL. Amtrak accepts different types of vehicles including Automobile, VAN/SUV, and Motorcycle to board the train. In addition, Amtrak also provides different types of accommodation for passengers, including Super Coach Seat, Superliner Lower level Coach Seat, Superliner Bedroom Suite, and Family Bedroom. The capacities of these accommodations are fixed and Amtrak starts selling the tickets about 335 days before the train's departure date. In this paper, we study revenue management strategies in order to maximize the expected revenue of this service.

■ SB36

Joint Sim/ Artificial Intelligence: Tutorial on Agent-based Modeling and Simulation

Sponsor: Simulation, Artificial Intelligence
Sponsored Session

Chair: Charles Macal, Senior System Engineer, Argonne National Laboratory, Decision & Information Sciences Division, 9700 S. Cass Ave., Argonne, IL, 60439, United States, macal@anl.gov

1 - Tutorial on Agent-based Modeling and Simulation
Charles Macal, Senior System Engineer, Argonne National Laboratory, Decision & Information Sciences Division, 9700 S. Cass Ave., Argonne, IL, 60439, United States, 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 thoughts on its relationship to OR.

■ SB37

Joint Session AP/ Workforce: Queueing Systems with Flexible Servers II

Sponsor: Applied Probability, Workforce Flexibility
Sponsored Session

Chair: Hayriye Ayhan, Associate Professor, Georgia Institute of Technology, School of IsyE, Georgia Institute of Technology, Atlanta, GA, 30332-0205, United States, hayhan@isye.gatech.edu

1 - Dynamic Allocation of Flexible Resources in a Serial Line with Reliability Considerations
Mark E. Lewis, Associate Professor, Cornell University, School of ORIE, 206 Rhodes Hall, Ithaca, NY, 14853, United States, melewis@orie.cornell.edu, Cheng-Hung Wu

We describe a heuristic based on a two-station tandem queueing system for allocating reconfigurable rescources in the N-station model. The two-station model is examined via Markov decision processes where monotonicity results for an optimal policy are proved. A detailed numerical study shows that the heuristic performs well when compared to several policies suggested in the literature.

2 - Staffing Decisions for Heterogeneous Workers with Turnover
Rhonda Righter, Professor, Department of IEOR, University of California, Berkeley, CA, 94720, rrighter@ieor.berkeley.edu, Hyun-soo Ahn, J. George Shanthikumar

We consider a firm that employs heterogeneous wokers to meet demand for its product or service. Workers differ in their skills, speed, and/or quality, and they randomly leave, or turn over. Each period the firm must decide how many workers of each type to hire or fire in order to meet randomly changing demand forecasts at minimal expense. We explore several different notions of discrete convexity and their impact on structural results for the optimal policy.

3 - Operational and Inventory Flexibility in a Make-to-Stock System with Backorders
Mark van Oyen, Associate Professor, University of Michigan, Industrial and Operations Engineering, 1205 Beal Avenue, Ann Arbor, MI, 48109, United States, MVanOye@orion.luc.edu, Seyed Iravani, Bora Kolfal

A make-to-stock operation has the "operational flexibility" to produce two products. If a stochastically arriving order finds a stockout of the lower-grade product, "inventory flexibility" may be used to upgrade it. We provide insights into optimal dynamic control and the relative value of operational versus inventory flexibility.

4 - Throughput Maximization in Tandem Lines with Flexible Failure-Prone Servers
Hayriye Ayhan, Associate Professor, Georgia Institute of Technology, School of IsyE, Georgia Institute of Technology, Atlanta, GA, 30332-0205, United States, hayhan@isye.gatech.edu, Douglas Down, Sigrun Andradottir

Consider a tandem queueing network with two stations and two or three flexible servers who are subject to failures. We study the dynamic assignment of these servers to stations in order to maximize the long-run average throughput.

■ SB38

Optimization Models in Finance

Cluster: Linear/Nonlinear Programming
Invited Session

Chair: Javier Pena, Associate Professor of Operations Research, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA, 15213, United States, jfp@andrew.cmu.edu

1 - Sparse PCA with Applications in Finance
Alexandre d'Aspremont, Assistant Professor, Princeton University, E-Quad E-424, ORFE Princeton University, Princeton, NJ, 08544, United States, aspremon@princeton.edu

We examine the problem of decomposing a covariance matrix into sparse factors (i.e. sparse Principal Component Analysis). This can interpreted as a variance maximization penalized by proportional transaction costs and we detail application to portfolio hedging with fixed and proportional transaction costs.

2 - Closed-form Solutions of Semiparametric Bounds Arising in Finance Applications
Luis Zuluaga, Assistant Professor, University of New Brunswick, P.O Box 4400, Fredericton, NB, E3B 5A3, Canada, lzuluaga@unb.ca, Donglei Du, Javier Pena

Semi-parametric bounds are used in finance to set bounds for option prices under the risk-neutral measure pricing theory and to examine the relationship between option prices and the true distribution of the underlying asset price. These bounds are also used in stochastic programming, inventory theory, and robust optimization. We derive closed-form solutions to some semi-parametric bounds arising in financial applications such as option pricing and risk management.

3 - Modeling Country Risk Ratings Using Partial Order
Miguel Lejeune, Tepper School of Business, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA, 15213, United States, mljne@yahoo.com, Peter L. Hammer, Alexander Kogan

To evaluate the creditworthiness of countries, a learning model is induced from S&P country risk ratings, using economic and political indicators. It allows the construction of a partially ordered set describing the relative superiority of countries on the basis of their creditworthiness, and it is shown that the Condorcet linear extensions of this poset match closely S&P's ratings. The model gives excellent ratings when applied to subsequent years or to ratings of previously unrated countries.

■ SB39

Advances in Interior Point Methods for Linear and Cone Programming

Sponsor: Optimization/ Linear Programming and Complementarity
Sponsored Session

Chair: Maziar Salahi, Ph.D. Candidate, McMaster University, 218 Hamilton Hall-Department of Mathematics-McMaster University, Hamilton, ON, l8s 4k1, Canada, msalahi@optserv.cas.mcmaster.ca

1 - A First-Order Algorithm for Convex Program Based on Adaptive Ellipsoid Preconditioning
Zhaosong Lu, Zeev Nehari Visiting Assistant Professor, Carnegie Mellon University, Department of Mathematical Sciences, Pittsburgh, PA, 15213-3890, United States, zhaolu@andrew.cmu.edu, Renato Monteiro

We first develop a first-order algorithm for minimizing a nondegenerate bounded below self-concordant function based on an adaptive ellipsoid preconditioning technique that was developed by Monteiro, O'Neal and Nemirovski (2004). The complexity of this algorithm is established. Following a similar procedure, we develop a first-order algorithm for convex program and the associated complexity is established.

2 - Projective Pre-Conditioners for Improving the Behavior of a Homogeneous Conic Linear System
Alexandre Belloni, MIT, E40-149, 77 Massachusetts Ave., Cambridge, MA, United States, belloni@MIT.EDU, Robert M. Freund

We consider the problem F: Ax = 0, x \in C\{0} where C is a regular convex cone and A a linear operator. F has good computational complexity if an IPM for solving F has a good iteration bound, and has good geometry if the width of the cone of feasible solutions is large. We show how to construct a projective transformation of F to an equivalent system F' which has good complexity and geometry guarantees. Finally, we show how random walks can be used to implement this scheme efficiently.

3 - Overcoming Some Disadvantages of a Mehrotra-Type Interior Point Algorithm for Linear Programming
Coralia Cartis, Dr, University of Oxford, Computing Laboratory Wolfson Bldg, Parks Road, Oxford, OX1 3QD, United Kingdom, ccartis@comlab.ox.ac.uk

We construct a similar algorithm to Mehrotra's highly-popular predictor-corrector algorithm, the Primal-Dual Corrector (PDC), and show that the PDC may fail to converge to a solution of the linear programming problem in both exact and finite arithmetic. Further, we present two ways of modifying the PDC algorithm that lead to theoretically reliable and practical methods.

4 - On Mehrotra-Type Predictor-Corrector Algorithms
Maziar Salahi, Ph.D. Candidate, McMaster University, 218 Hamilton Hall-Department of Mathematics-McMaster University, Hamilton, ON, l8s 4k1, Canada, msalahi@optserv.cas.mcmaster.ca, Jiming Peng, Tamas Terlaky

In this paper we discuss the polynomiality of a variant of Mehrotra-type predictor-corrector algorithms that has been widely used in several IPM based optimization packages. By an example we show that in this variant the usual Mehrotra-type adaptive choice of the parameter μ might force the algorithm to take many small steps to keep the iterates in a certain neighborhood of central path, which is essential to prove the polynomiality of the algorithm.

■ SB40

Location and Clustering Problems

Sponsor: Optimization/ Network Optimization
Sponsored Session

Chair: Dorit S. Hochbaum, UC Berkeley

1 - On the Average Case Performance of Some Greedy Approximation Algorithms For the Uncapacitated Facility Location Problem
Juan Vera, Carnegie Mellon University, Wean Hall, Room 6113, Pittsburgh, PA, 15213-3890, jvera@andrew.cmu.edu, Alan Frieze, Abraham D. Flaxman

We analyze the performance of 3 related approximation algorithms for the uncapacitated facility location problem (from [Jain, Mahdian, Markakis, Saberi, Vazirani, 2003] and [Mahdian, Ye, Zhang, 2002]) when each is applied to an instance created by placing n points uniformly at random in the unit square. We find that, with high probability, these 3 algorithms do not find asymptotically optimal solutions, while, a simple plane partitioning heuristic does.

2 - On the Convergence Time of the K-Means Algorithm
Sergei Vassilvitskii, Gates Computer Science Building, 4B, Stanford University, Stanford, CA, 94305-9045, sergei@cs.stanford.edu, Rajeev Motwani, David Arthur

The k-means algorithm first proposed by Lloyd in 1982 is a popular clustering algorithm and is used widely in practice. Although it is known for its speed, up until recently no theoretical bounds were known on its running time. We show that in the worst case the running time of the k-means algorithm can be exponential. However, we explain the observed speed of the algorithm by showing that under very weak assumptions about the underlying distribution, the running time is quadratic in the number of points and the spread of the pointset.

3 - Aggregating Inconsistent Information: Ranking and Clustering
Alantha Newman, Institut fur Mathematik, TU Berlin, alantha@csail.mit.edu, Moses Charikar, Nir Ailon

Given a set of k complete rankings (clusterings) of the same set of n elements, we wish to output a single ranking (clustering) that best represents the input information. One approach is to find the ranking (clustering) that minimizes the "disagreements" with the input. For both these NP-hard optimization problems, we obtain new algorithms using the same simple principle. Our techniques also apply to related problems such as min feedback arc set in tournaments and correlation clustering in complete graphs.

4 - Group Ranking and Multi-criteria Decision Making: Models and Flow-based Algorithms
Dorit S. Hochbaum, UC Berkeley

Models of the aggregation of individual rankings typically lead to NP-hard problems (the Kemeny measure of minimizing the number of rank reversals is one example). We describe similar models that minimize the penalty of deviation from the individual rankings that are polynomial time solvable, and with efficient flow techniques.

■ SB41

Joint Session Optimization Integer/Nonlinear Programming: Mathematical Programming in the Petroleum and Chemical Process Industries

Sponsor: Optimization/ Integer Programming, Optimization/ Nonlinear Programming

Sponsored Session

Chair: Kevin Furman, Exxon Mobil, 1545 Route 22 East, Annandale, NJ, 08801, United States, kevin.c.furman@exxonmobil.com

1 - Strategic Capacity Decisions in Manufacturing Stochastic Systems using Adaptive Dynamic Programming

Matthew Realff, Associate Professor, Georgia Institute of Technology, Chemical and Biomolecular Engineering, Atlanta, GA, 30332, United States, Matthew.Realff@chbe.gatech.edu, Nikolaos Pratikakis, Jay Lee

Optimal resource planning and allocation under uncertainty is one of the fundamental challenges of industrial scheduling applications. We consider a general multistage capacity planning and allocation problem of industrial interest. We use Markov chains to model the system uncertainty, and formulate it as a Markov Decision Process. To solve the problem an adaptive dynamic programming approach is developed that improves upon a mathematical programming heuristic for initial policy generation.

2 - Short Term Optimization of the Upstream Natural Gas Supply Chain

Ajay Selot, Massachusetts Institute of Technology, Room 66-365, 77 Massachusetts Avenue, Cambridge, MA, 02139, United States, selot@MIT.EDU, Paul Barton

We present a case study on the short term planning of the upstream natural gas supply chain with contractual rules. The physical model of the system involves nonconvex constraints to represent the flow-pressure relationship in the network and models of processing facilities. The major challenge in the study is to formulate a mathematical representation of complex contractual rules and operational constraints, which in general necessitates the use of binary variables. The resulting mathematical program is a MINLP with nonconvex constraints.

3 - Decomposition Method for Simultaneous Planning and Scheduling of Multiproduct Continuous Plants

Ignacio Grossmann, Professor, Carnegie Mellon University, Dept. Chemical Engineering, Pittsburgh, PA, 15213, United States, grossmann@cmu.edu, Muge Erdirik

We present a rigorous two-level decomposition scheme for optimal planning and scheduling of multiproduct continuous single processing plants. The objective is to maximize profit accounting for sales, inventories and sequence dependent changeovers. The upper level planning and lower level scheduling problems are formulated as aggregated and detailed continuous-time MILP models. The decomposition scheme relies on novel superset, subset and capacity cuts that greatly reduce computation.

■ SB42

Stochastic Optimization in Transportation

Sponsor: Optimization/ Stochastic Programming

Sponsored Session

Chair: Warren Powell, Professor, Princeton University, Dept of Oper Res and Fin Eng'g, Princeton, NJ, 08544, United States, powell@princeton.edu

1 - Market Optimization for Express Package Carriers

Diego Klabjan, Professor, University of Illinois at Urbana-Champaign, 1206 West Green Street, Urbana, IL, 61801, United States, klabjan@uiuc.edu, Luke Schenk

Express package carriers move large quantities of packages from several stations to the ramp with various conveyance types such us containerized or bulk trucks and aircraft. In this project we streamline the transportation and sorting costs. Large cost savings can be obtained by appropriately forming containers at stations in order to bypass resorting at the ramp. The large-scale optimization problem is solved by approximate dynamic programming.

2 - Computational Experimentation with Two-Stage Stochastic Programs

Huseyin Topaloglu, Assist. Prof., Cornell University, 223 Rhodes Hall, Ithaca, NY, 14853, United States, topaloglu@orie.cornell.edu, Warren Powell, Julia Higle, Lei Zhao

We report on our computational experience on sampling-based methods for large-scale two-stage stochastic programs. In particular, we compare two algorithms. The first one of these algorithms is Stochastic Decomposition. The second one is a heuristic extension of our earlier work and uses separable approximations of the recourse function.

3 - Merging Stochastic Programming and Approximate Dynamic Programming for High Dimensional Problems

Warren Powell, Professor, Princeton University, Dept of Oper Res and Fin Eng'g, Princeton, NJ, 08544, United States, powell@princeton.edu, Abraham George

The management of multiattribute resources (equipment, people) can introduce a curse of dimensionality, producing stochastic programs with millions of rows. Stochastic programming implicitly assumes the rows can be enumerated. We describe the use of techniques from approximate dynamic programming, including hierarchical learning and exploration strategies, that help to overcome this problem, producing practical algorithms for very large-scale problems.

4 - Price-Directed Control of a Closed Logistics Queueing Network

Dan Adelman, Professor, University of Chicago, Graduate School of Business, 5807 South Woodlawn Ave., Chicago, IL, 60637, United States, dan.adelman@gsb.uchicago.edu

Motivated by one of the leading intermodal logistics suppliers in the United States, we consider an internal pricing mechanism for managing a fleet of service units (shipping containers) flowing in a closed queueing network. Nodes represent geographic locations and arcs represent travel between them. Customer requests for arcs arrive over time, and the problem is to find an accept/reject policy that maximizes the long-run time average reward rate from accepting requests.

■ SB43

Constraint Programming

Sponsor: INFORMS Computing Society/ Constraint and Integer Programming

Sponsored Session

Chair: Laurent Michel, Assistant Professor, University of Connecticut, 371 Fairfield Road, Storrs, CT, 06269, United States, ldm@engr.uconn.edu

1 - Non-Deterministic Control in Hybrid Search

Laurent Michel, Assistant Professor, University of Connecticut, 371 Fairfield Road, Storrs, CT, 06269, United States, ldm@engr.uconn.edu, Pascal Van Hentenryck

Hybrid algorithms combining local and systematic search often use nondeterminism in fundamentally different ways. This talk presents nondeterministic control structures to express a variety of hybrid search algorithms concisely and elegantly. These abstractions are compiled in terms of first-class continuations. The resulting search language is high-level, flexible, and directly extensible. The abstractions are illustrated on an hybrid jobshop scheduling algorithm.

2 - Exploiting Temporal Flexibility to Obtain High Quality Schedules

Stephen Smith, Research Professor, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA, 150213, United States, sfs@cs.cmu.edu, Xiaofang Wang, Angelo Oddi, Nicola Policella

We consider a schedule optimization problem where each activity to be scheduled has a duration-dependent quality profile, and activity durations must be determined that maximize overall quality within given deadline and resource capacity constraints. We develop and empirically evaluate two precedence constraint posting algorithms. Following from experimental results, we discuss potential synergy between the scheduling objectives of maintaining temporal flexibility and maximizing quality.

3 - Edge Finding for Cumulative Scheduling

Pascal Van Hentenryck, Brown University, Box 1910, Providence, RI, United States, pvh@cs.brown.edu, Luc Mercier

Edge-finding algorithms for cumulative scheduling are at the core of commercial constraint-based schedulers. This paper shows that Nuijten's edge finder for cumulative scheduling, and its derivatives, are incomplete. It then presents an edge-finding algorithm running in time O(n^2 k), where n is the number of tasks and k is the number of different capacity requirements of the tasks. Finally, it also proposes the first extended edge-finding algorithm running in time O(n^2 k).

4 - On Global Warming: Flow Based Soft Global Constraint

Louis-Martin Rousseau, Professor, Ecole Polytechnique de Montréal, CP 6079 Succ Centre Ville, Montréal, QC, H3C 3A7, Canada, louis-martin.rousseau@polymtl.ca, Gilles Pesant, Willem-Jan van Hoeve

We describe soft versions of the global cardinality constraint and the regular constraint, with efficient filtering algorithms maintaining domain consistency. For both constraints, the softening is achieved by augmenting the underlying graph. The softened constraints can be used to extend the meta-constraint framework for over-constrained problems

■ SB44

Panel Discussion: Creating an Testbed of Industry Problems for OR Model and Algorithm Development

Sponsor: INFORMS Computing Society/ Optimization Services and Open Source Software

Sponsored Session

Chair: Robin Lougee-Heimer, IBM Research, TJ Watson Research Center, 1101 Kitchawan Road, Yorktown Heights, NY, 10598, United States, robinlh@us.ibm.com

1 - Panel Discussion: Creating an Testbed of Industry Problems for OR Model and Algorithm Development
Moderator: Robin Lougee-Heimer, IBM Research, TJ Watson Research Center, 1101 Kitchawan Road, Yorktown Heights, NY, 10598, United States, robinlh@us.ibm.com, Panelists: Debasis Mitra, David Heltne, Jeffrey Tew, Suvrajeet Sen, Robert Fourer, Michael Grant, Ranganath Nuggehalli

Many OR researchers are challenged with developing algorithms and models for industrial problems...without industry data. Data access can influence the applicability and impact of research. This panel session will analyze the challenges of sharing industry data and explore viable paths to creating a test bed of industry problems for OR.

■ SB45

Urban Transportation Planning Models VI: Microsimulation and Evaluation of Traffic Flow

Sponsor: Transportation Science & Logistics

Sponsored Session

Chair: Henry Liu, Assistant Professor, University of Minnesota, Department of Civil Engineering, 500 Pillsbury Drive SE, Minneapolis, MN, 55455, United States, henryliu@umn.edu

1 - Probabilistic Modeling and Evaluation of Incident Management Strategies for Urban Networks
Kaan Ozbay, Associate Professor, Rutgers University, Civil and Environmental Engineering, 632 Bowser Road, Piscataway, NJ, 08854-8014, United States, kaan@rci.rutgers.edu

This paper focuses on the effective use of resources to reduce the average incident durations. Traffic Management Centers (TMC) have two ways to manage incidents, namely, waiting until an incident is detected and then dispatching a traffic flow restoration unit (TFRU) from the depot to clear it, or having TFRUs patrolling along specific routes and clear the incidents on their patrol routes. We examine the effects of these two alternatives using Rutgers Incident Management Simulation (RIMS).

2 - Evaluation of New Jersey Turnpike Time of Day Pricing Program
Jose Holguin-Veras, Assoicate Professor, Rensselaer Polytechnic Institute, Civil and Environmental Engineering, 4030 Jonsson Engineering Center, Troy, NY, 12180, United States, jhv@rpi.edu, Kaan Ozbay, Ozlem Yanmaz

This paper presents the evaluation results of two stages of the NJ Turnpike (NJTPK) time of day pricing program. Impacts on users will be presented based on the before and after evaluation analysis conducted using observed traffic volumes, microscopic simulation modeling of the NJTPK and commuter surveys.

3 - Microscopic Traffic Flow Simulation Model and Validation
Andrei Boitor, Graduate Student, University of Southern California, Electrical Engineering - Systems, Electrical Engineering Bldg Room 200B, Los Angeles, CA, 90089-2562, United States, boitor@usc.edu, Petros Ioannou, Jarvis Lim

A section of the I-80 freeway is modeled with CORSIM and VISSIM, two microscopic simulation models. The models are validated and the effects of the model parameters on the simulation are analyzed. The possibility of implementing a roadway controller is discussed.

4 - Intelligent Traffic Control Strategies for Incident Management in an Urban Street Network
Suresh Khator, Professor, University of South Florida, ENB 118, Industrial Mgmt & Systems Engrg, Tampa, FL, 33620-5350, United States, khator@eng.usf.edu

The problem of incident congestion on surface street networks is addressed. Microscopic simulation is used to simulate incident scenarios on three corridors in the Tampa Bay area. The incident scenarios are subject to two enhancements—variable speed limits and an appropriate signal strategy that respond to volumes. The interaction between network type, signal strategy and speed strategy is studied. This research provides decision support for planning corridor enhancements and road building.

■ SB46

Urban Transportation Planning Models II: Freight Models and Planning

Sponsor: Transportation Science & Logistics

Sponsored Session

Chair: Jay Rosenberger, Assistant Professor, The University of Texas at Arlington, Dept of Industrial & Manufacturing Engg., P.O.Box 19017, Arlington, TX, 76019, United States, jrosenbe@uta.edu

1 - A Network Capacity Model for the Strategic Planning of Multimodal Freight Transportation Systems
Amelia Regan, University of California, Irvine, Institute of Transportation Studies, Computer Science and Civil Engineering, Irvine, CA, United States, aregan@uci.edu, Minyoung Park

We present a network capacity model intended to be used for the strategic planning of multimodal freight transportation systems. A bi-level programming approach incorporates key factors that influence network capacity. The model is tested through application to a test problem, and results are assessed for reasonableness and utility.

2 - Freight Movement Model Development for the State of Oklahoma
Karthik Ayodhiramanujan, Oklahoma State University, 322, Engineering North, Oklahoma State University, Stillwater, OK, 74078, United States, karthik.ayodhiramanujan@okstate.edu, Yasin Yavuz, Ricki Ingalls, Simin Pulat, Manjunath Kamath, Guoqiang Shen

We present a two-tiered approach based on the urban travel demand model to estimate the freight movement for Oklahoma. Tier one includes a regional model that analyzes the freight flow between states to estimate the freight flow in, out and through Oklahoma. Tier two focuses on a state model that analyzes the freight flow within Oklahoma utilizing the outputs of the regional model. The integrated model will part of a decision support system for policy-making and infrastructure planning.

3 - The Production Scheduling and Vehicle Routing Problem for Perishable Goods: Model and Algorithm
Huey-Kuo Chen, Professor, National Central University, No. 300, Jung-Da Road, Jung-Li, TY, 32001, Taiwan, ncutone@cc.ncu.edu.tw, Mei-Shiang Chang, Che-Fu Hsueh

This paper combines production scheduling for perishable goods and vehicle routing with time windows. Demand is probabilistic. The expected profit maximizing production quantity, production start time, and vehicle route plan are determined. We propose a nonlinear mathematical model and a solution algorithm composed of the constrained Nelder-Mead method and a heuristic for the vehicle routing problem with time windows. Computational results indicate our algorithm is effective and efficient.

4 - Computing Shortest Paths with Logistic Constraints
Michael Florian, Professor, University of Montreal, Montreal, QC, H3C 3J7, Canada, mike@crt.umontreal.ca, Teodor Gabriel Crainic

When modeling freight flows it is often required to specify constraints on the paths that may be used to transport a given commodity. Such constraints reflect the particular logistic chain used to transport the product and may involve a sequence of modes or subsets of modes and particular transfer nodes. A polynomial shortest path algorithm is developed for the computation of such shortest paths. The paths so computed may be used in freight network assignment methods.

■ SB47

Network Routing and Assignment under Uncertainty

Sponsor: Transportation Science & Logistics

Sponsored Session

Chair: Elaine Chang, Assistant Professor, University of South Florida, Dept of Civil and Enviro Engineering, 4204 East Fowler Ave ENB118, Tampa, FL, 33620, United States, echang@eng.usf.edu

1 - Quantifying Impacts of Wireless Information in Stochastic System Optimum Network Assignment Problems
Natalia Ruiz-Juri, Ph.D. Candidate, The University of Texas at Austin, Dept of Civil, Enviro & Architec Eng, 6.508 ECJ Hall, Austin, TX, 78712, United States, nruizjuri@mail.utexas.edu, Travis Waller

This paper analyzes the problem of routing wireless-communication-capable assets over stochastic networks. Marginal cost evaluation is used to explore the effects of different information supply schemes on the expected total system cost. Mathematical formulations for the marginal costs are provided, and expected-cost minimizing algorithms are outlined.

2 - Online Minimum Variance Routing in Stochastic Networks with One-Step Spatial Dependency

Steve Boyles, Graduate Research Assistant, The University of Texas at Austin, Dept of Civil, Enviro and Archi Engineer, 6.202 ECJ Hall, Austin, TX, 78712, United States, sboyles@mail.utexas.edu, Travis Waller

Online network routing under uncertainty is a problem which has important applications in the transportation of critical goods and elsewhere; however, approaches that consider variance in addition to expected cost have not been extensively treated in the literature. We describe the problem for the case of one-step spatial dependence, discuss obstacles which confound the problem, and present methods that find paths with minimum variance.

3 - Vehicle Routing and the Effect of Distance Approximations in a Grid-based City with Numbered Streets

Guiselle Garcia, Vision Software S.A., Bogota D.C., Colombia, Guisselle.Garcia@bizagi.com, German Riano, Andres Medaglia

Bogotà, the fourth largest city in the Americas, is a grid-based planned city and it has most of its streets identified by numbers (instead of names). A rough (but natural) approximation of an address is obtained by simply extracting the numbers of the intersecting streets and forming a point in the Euclidean plane. We illustrate, with a case study of school routing, the existing tradeoff between rough approximations and exact distances obtained through geocoding and exact shortest paths.

4 - Modeling Random Flow Times in Certain Production and Logistics LP Models

German Riano, Assistant Professor, Universidad de los Andes, Carrera 1 No. 18A-10, Bogota, DC, Colombia, griano@uniandes.edu.co, Steve Hackman, Richard Serfozo

We present methods to model non-integer flow times times, and, more generally random flow times in production planning, transportation and other logistics models. The relationship between input and output flows is linear, so the complexity of the model is not dramatically altered. Examples will be presented. The technique is based on a novel Transient Little Law.

5 - Intermodal Hazmat Transportation Problem with Time-Dependent Travel Risk

Vaggelis Floros, University of Thessaly, Mitropoleos 27, Karditsa, Ka, Greece, Floros3@otenet.gr, Thanasis Ziliaskopoulos, Elaine Chang

This paper is concerned with the problem of routing hazardous material on a multimodal network with time varying link travel times and intermodal options. The problem is efficiently formulated and an intermodal/multimodal shortest path algorithm is modified to compute minimum risk paths by combining the available transport modes. It's efficient computational complexity makes it appropriate for use on actual networks

■ SB48

Recent Advances in Disease Modeling and Treatment

Sponsor: Health Applications

Sponsored Session

Chair: Andrew Schaefer, Assistant Professor, University of Pittsburgh, Department of Industrial Engineering, Pittsburgh, PA, United States, schaefer@ie.pitt.edu

1 - A Class of Matrix Decomposition via Optimization

Gino Lim, Assistant Professor, University of Houston, Department of Industrial Engineering, E206 Engineering Bldg 2, Houston, TX, 77204, United States, ginolim@uh.edu

We present techniques to solve a class of matrix decomposition problem based on a medical application. A matrix must be decomposed into uniquely shaped submatrices such that the sum of the sub-matrices multiplied by integer multipliers equals the original matrix (A = w'S). Various optimization problem formulations as well as solution techniques are explored using MINLP and MIP formulations. An iterative approach is introduced to substantially speed up the solution process for a practical use.

2 - Optimizing Testing and Discharge Decisions in the Management of Severe Sepsis

Jennifer Kreke, University of Pittsburgh, Department of Industrial Engineering, Pittsburgh, PA, United States, jekreke@msn.com, Andrew Schaefer, Mark Roberts, Matthew Bailey

We present a Markov decision process that models a clinician's decision of when to discharge a patient with sepsis from the hospital. We then discuss our results and their potential impact on current clinical practice. Finally, we motivate the incorporation of new testing procedures by discussing a partially observable Markov decision process model and our directions for future research.

3 - Optimal Region Design for the Liver Allocation and Transplantation System

Nan Kong, Assistant Professor, University of South Florida, 4202 E. Fowler Ave, ENB118, Tampa, FL, 33620, United States, kong@eng.usf.edu, Andrew Schaefer, Brady Hunsaker, Mark Roberts

Transplantable organ allocation in the U.S. has been a contentious issue for decades. Our objective is to cluster Organ Procurement Organizations (OPOs) such that transplant efficiency is maximized. We model this problem as a set partitioning problem and adapt branch and price to overcome inherent computational challenges. In our branch and price, intensive study on the column generation will be discussed. An alternative objective to balance tranplant efficiency and equity is also addressed.

■ SB49

Game Theory and Decision Analysis

Sponsor: Decision Analysis

Sponsored Session

Chair: Robert Nau, Professor, Duke University, Fuqua School of Business, Durham, NC, 27708, United States, robert.nau@duke.edu

1 - Embedded Nash Bargaining

Kevin McCardle, Professor, UCLA Anderson School of Management, 110 Westwood Plaza, D-513, Los Angeles, CA, 90095-1481, United States, kevin.mccardle@anderson.ucla.edu, Steven Lippman

In telling the tale of, and analyzing the decisions made by, an heir claimant to a large fortune, Lippman and McCardle (2004) introduce "embedded Nash bargaining", an approach to modeling joint decision making. The purpose of the current paper is to provide theoretical underpinnings for that approach and to establish some general results regarding the existence, uniqueness, and comparative statics (with respect to risk aversion and time discounting) of the embedded Nash bargaining solution.

2 - Individual Behavior and Group Membership

Luca Rigotti, Professor, Duke University, Fuqua School of Business, Durham, NC, 27708-0120, United States, rigotti@duke.edu, Gary Charness, Aldo Rustichini

We consider an experimental environment in which an audience is sometimes present when strategic choices are made. We show that the audience presence affects behavior, and that participants anticipate this effect. The audience presence increases the hosts' aggressiveness. The effect on the outcomes depends on the game. In Battle of the Sexes, hosts aggressiveness leads to coordination on an efficient outcome; in the Prisoner's Dilemma, it leads to conflict and inefficient outcomes.

3 - Subsidized Security and Stability of Equilibrium Solutions in an N-Player Game with Errors

Jun Zhuang, University of Wisconsin-Madison, 3155 Engineering Centers Building, 1550 Engineering Drive, Madison, WI, 53706, United States, jzhuang@wisc.edu, Vicki Bier

Optimizing resource allocation in interdependent security problems is a serious challenge for U.S. homeland security. In this paper, game theory is applied to this challenge in the case where investment by one defender has positive externalities for other players. We explore how to target subsidized security to achieve the best results from tipping. We show that subsidization of security investments can increase the stability of equilibrium solutions, and also decrease the total social costs.

4 - Bayesian Decision Analysis, Game Theory, and Finance: A Synthesis

Robert Nau, Professor, Duke University, Fuqua School of Business, Durham, NC, 27708, United States, robert.nau@duke.edu

Decision analysis, game theory, and the theory of financial markets under uncertainty all have roots in Bayesian theory, but traditionally they have been only loosely integrated, with somewhat different views of subjective probability and different interactive rationality standards and knowledge assumptions. This paper presents a synthesis in which the common rationality standard is the no-arbitrage principle and the common parameters of belief and knowledge are risk neutral probabilities.

■ SB50

Decision Analysis Practice

Sponsor: Decision Analysis
Sponsored Session

Chair: Mazen A. Skaf, Partner, Strategic Decisions Group, 735 Emerson St., Palo Alto, CA, 94301, United States, mskaf@sdg.com

1 - Board Decision Quality
Carl Spetzler, Chairman, Strategic Decisions Group, 735 Emerson St., Palo Alto, CA, 94301, United States, cspetzler@sdg.com

There are fundamental flaws in the current advocacy/approval approach to board decision-making. Boards need to engage seriously in the few truly strategic decisions using a Board Decision Quality (BDQ) process. BDQ uses a dialog that engages the board in the choice among alternatives. BDQ brings significant benefits to both the CEO and the board. It helps the board to meet its a trust obligation. Decisions become better. Boards "own" the decision along with the CEO, a great asset when the going gets rough. BDQ provides a clear audit trail for later defense of a decision. BDQ also prevents or resolves the dysfunctional power relationships that are emerging between boards and managements.

2 - Teaching Decision-Making From the Classroom to the Boardroom
Bruce Judd, Executive Director, Decision Education, SDG, 735 Emerson St., Palo Alto, CA, 94301, United States, bjudd@sdg.com

After 25 years teaching decision-making to MBAs, consultants, and executives, I have found six common elements of successful courses. These work well for me and for my students; will they work for you?

3 - Earnings-at-Risk: System and Process for Financial Risk Management in a Corporation
Mazen A. Skaf, Partner, Strategic Decisions Group, 735 Emerson St., Palo Alto, CA, 94301, United States, mskaf@sdg.com

We present a system and process for measuring, monitoring, and managing financial risk in a corporation with operations involving a range of commodities on the raw materials and finished goods sides. The system supports decision-making for decisions ranging from the level of investment in a specific industry as part of the corporate portfolio to hedging transactions related to a specific commodity. We conclude with a case study to illustrate the features and benefits of the approach.

Sunday, 1:30pm - 3:00pm

■ SC01

Tutorial: Useful Recent Trends in Simulation Methodology

Cluster: Tutorials
Invited Session

1 - Tutorial: Useful Recent Trends in Simulation Methodology
Shane Henderson, Cornell University, School of ORIE, 230 Rhodes Hall, Cornell University, Ithaca, NY, 14853, United States, sgh9@cornell.edu

This tutorial is aimed at experienced users of simulation who are curious about useful recent trends in simulation methodology. We will discuss, and probably argue about, the following topics. 1. Simulation optimization - how can we optimize a function that is evaluated by simulation? 2. Input uncertainty - what happens when some (most?) of the input distributions are only known approximately? 3. Dependence modeling - how can we model dependent random variables?

■ SC02

Nicholson Student Paper Prize Competition, I

Cluster: Nicholson Student Paper Prize
Invited Session

Chair: Pinar Keskinocak, Associate Professor, Georgia Institute of Technology, School of Industrial and Systems, 765 Ferst Drive, Atlanta, GA, 30345, United States, pinar@isye.gatech.edu

Nicholson Student Paper Prize

This session features selected finalists in the Nicholson Student Paper Prize Competition. It represents an opportunity for faculty, professionals and other students to see some of the best research being performed by students. All are welcome.

1 - Robust Linear Optimization and Coherent Risk Measures
David Brown,MIT, L.I.D.S., 32-D560, Cambridge MA 02139, United States, dbbrown@mit.edu

We propose an axiomatic methodology for constructing uncertainty sets within the framework of robust optimization for linear optimization problems with uncertain data. We take as primitive for such problems a coherent risk measure, and utilize a duality theorem to construct corresponding uncertainty sets in the robust optimization framework.

2 - Mathematical Programming Representations of Discrete-Event System Dynamics
Victor Chan

This paper introduces a methodology for modeling discrete-event system dynamics as mathematical optimization problems and discusses a variety of applications. Discrete-event systems are common in many sectors of modern society. With their mathematical programming representations, techniques and algorithms from mathematical programming can be used to model and analyze the system behaviors. As applications, we derive mathematical programming representations for open and closed tandem queueing networks under various blocking scenarios. We use these formulations to study reversibility and symmetry properties of tandem queues. We also apply the methodology to generate constraint sets for optimal resource scheduling with a specific example of deriving a linear program for optimally scheduling a semiconductor manufacturing cluster tool. The mathematical structure of this linear program leads, in turn, to a more concise simulation model. In addition, optimization representations of discrete-event systems provide a framework for studying stochastic monotonicity and convexity properties. Finally, the methodology is used to derive gradient estimators for system performance measures using dual shadow prices.

3 - Ambiguous Chance Constrained Problems and Robust Optimization
Emre Erdogan,IEOR Department, Columbia University, New York NY, United States, ee168@columbia.edu

We study ambiguous chance constrained problems (ACCP) where the distributions of the random parameters in the problem are themselves uncertain. We assume that the uncertainty set of the distributions is a ``ball" centered around a measure Q. The ACCP is approximated by a robust sampled problem where each sample is drawn according to the central measure Q. Our main contribution is to show that the robust sampled problem is a good approximation for the ambiguous chance constrained problem with a high probability and it can be solved efficiently both in theory and in practice.

■ SC03

Teaching Case Competition I

Sponsor: Education (INFORM-ED)
Sponsored Session

Chair: Tasha R. Inniss, Assistant Professor of Mathematics, Spelman College, 350 Spelman Lane, SW, Box 320, Atlanta, GA, 30314-4399, United States, TInniss@spelman.edu

1 - Presentations of Finalists #1 and #2 for the Sixth Annual INFORMS Case Competition
Tasha R. Inniss, Assistant Professor of Mathematics, Spelman College, 350 Spelman Lane, SW, Box 320, Atlanta, GA, 30314-4399, United States, TInniss@spelman.edu

The four finalists for the 2005 INFORMS Case Competition will deliver final presentations of their cases to a panel of judges and the audience. All are welcome to attend and observe these presentations as well as to ask questions of the finalists. The winner of the competition will be selected by the judges at the end of the four presentations. The winner and runners-up will be announced at the INFORM-Ed Annual Business Meeting in San Francisco.

■ SC05

OR/MS Applications in the Service Industry

Contributed Session

Chair: Adelina Gnanlet, PhD Student, University of North Carolina-Chapel Hill, CB#3490 McColl Bldg,, Kenan-Flagler Busi School, UNC, Chapel Hill, NC, 27599, United States, gnanleta@unc.edu

1 - Use of Options in Service
Antonios Printezis, Assistant Professor, Arizona State University, 4701 West Thunderbird Road, P.O. Box 37100, Phoenix, Az, 85069-7100, United States, AntP@case.edu, Apostolos Burnetas

In supply chains, a tradeoff between customer's flexibility to select service mode and service provider's ability to plan for capacity is often met. We propose a mechanism that addresses this tradeoff by employing options for service. These options are targeted for customers who regularly require service and want to be protected against occasional extensive delays. A customer purchases a number of them and can exercise one to obtain immediate service, after observing current system congestion.

2 - Retail Store Execution
Jayanth Krishnan, Doctoral Student, University of Pennsylvania, The Wharton School/OPIM, Philadelphia, PA, 19104, United States, jayanth@wharton.upenn.edu, Marshall Fisher, Serguei Netessine

We empirically investigate the role of in-store operational execution in influencing customer-satisfaction and financial performance. While the role of inventory management and good supply chain practices has been well documented, the benefits of these practices depend crucially upon the execution of in-store processes. We identify the makeup of good operational policies in different retail segments. We also present some guidance on research paths that derive from our insights.

3 - Service Capacity Competition and Service Networks
Vikram Tiwari, Ph.D. Student, Kelley School of Business, Indiana University, Bloomington, BU570, 1309 E 10th Street, Bloomington, In, 47405, United States, vtiwari@indiana.edu, H. Sebastian Heese

When forming service networks, service providers often simultaneously collaborate on some dimensions while competing on others. Developing a model of capacitated service providers under price competition, we derive general insights into the pricing problem and more specifically analyze the impact of capacity scarcity on the equilibrium outcomes. We then characterize environments under which the formation of alliances is preferable to individual capacity expansions.

4 - Optimal Customer Value Growth with Reacting Customers
Zeynep Aksin, Koc University, Rumeli Feneri Yolu, Istanbul, 34450, Turkey, zaksin@ku.edu.tr, Evrim Gunes, Hazal Ozden, Lerzan Ormeci

The relationship of a customer with a firm, represented as a natural progression through loyalty states and eventual exit are modeled as a Markovian process. The firm has value growing initiatives with which it can influence the upward mobility of the customer. Not all customers like this type of intervention, and excessive value growth actions may result in a negative reaction of the customer, leading to early exit. We analyze the optimal value growth strategy with such customer reaction.

5 - Impact of Productivity on Optimal Cross-Training Decisions
Adelina Gnanlet, PhD Student, University of North Carolina-Chapel Hill, CB#3490 McColl Bldg,, Kenan-Flagler Busi School, UNC, Chapel Hill, NC, 27599, United States, gnanleta@unc.edu, Wendell Gilland

We derive a closed form expression for the optimal amount of cross-training of nurses between two hospital units. We use a two-stage stochastic programming with recourse model that minimizes cost for general demand distributions. We analyze the impact of cross-training cost, demand variation and productivity on optimal nurse flexibility.

■ SC06

Spreadsheets and Sarbanes-Oxley

Sponsor: Spreadsheet Productivity Research
Sponsored Session

Chair: Jeffrey Keisler, Assistant Professor, University of Massachusetts Boston, College of Management, Boston, MA, 02125, United States, jeff.keisler@umb.edu

1 - The Importance and Criticality of Spreadsheets in The City of London
Grenville Croll, member@croll-management.freeserve.co.uk

Spreadsheets have been with us in their present form for over a quarter of a century. We have become so used to them that we forget that we are using them at all. It may serve us well to stand back for a moment to review where, when and how we use spreadsheets in the financial markets and elsewhere in order to inform research that may guide their future development. In this paper I bring together the experiences of a number of senior practitioners who have spent much of their careers working with large spreadsheets that have been and continue to be used to support major financial transactions and manage large institutions in the City of London. The author suggests that the City of London is presently exposed to significant reputational risk through the continued uncontrolled use of critical spreadsheets in the financial markets and elsewhere

2 - Solutions Forum
Janet Wagner, Associate Dean, UMASS Boston, CM Dean's Office, 100 Morrissey Blvd, Boston, MA, 02125, United States, janet.wagner@umb.edu

Various academic and commercial solutions are available to help insure spreadsheet integrity and assist with Sarbannes-Oxley compliance. Vendors and fans will demonstrate and discuss some of the software solutions available in this area.

3 - Spreadsheet Use and Compliance with EU and US Legislation: A Look at Three UK Organizations
Pat Cleary, University of Wales Institute Cardiff, pmcleary@uwic.ac.uk

Research (Panko and Ordway, 2005) indicates that spreadsheets are both widely used and error prone. The Sarbanes-Oxley Act 2002 and other similar European Union regulations attempt to strengthen compliance through corporate governance and to foster investor confidence disillusioned by a series of US corporate and accounting standards (Knights, 2004 cited in Cleary et. al., 2005). This paper examines investigations into spreadsheet development and use in three UK organizations and comments upon the state of compliance of these organizations with EU and US legislation.

■ SC07

Panel Discussion: Research Opportunities at the MS/OM-Finance Interface

Sponsor: Manufacturing & Service Oper Mgmt
Sponsored Session

Chair: John Birge, Professor, University of Chicago, Graduate School of Business, Chicago, 60637, United States, john.birge@gsb.uchicago.edu

1 - Research Opportunities at the MS/OM-Finance Interface
Moderator: John Birge, Graduate School of Business, The University of Chicago, Chicago, IL, 60637, United States, jbirge@gsb.uchicago.edu, Panelists: Panos Kouvelis, David Simchi-Levi, John Buzacott

Recent research trends display an increasing blurring of boundaries across disciplines. The MS/OM-Finance interface is one such example. In this discussion, panelists will present views on research opportunities at this interface and discuss some of the challenges to such interdisciplinary work.

2 - Managing Risk in the Supply Chain
David Simchi-Levi, dslevi@mit.edu

Our objective is to find out whether financial instruments can be used in supply chain management to effectively manage risk and uncertainty. We focus on financial instruments such as Real Options; Portfolio Optimization; Deviation measures such as Mean-Variance and Conditional-Value-at-Risk; and Utility theory and concepts

■ SC08

Dynamic Models of Imperfect Competition II

Sponsor: Manufacturing & Service Oper Mgmt
Sponsored Session

Chair: Benjamin Van Roy, Stanford University, Terman 315, Stanford University, Stanford, CA, 94305-4023, United States, bvr@stanford.edu

1 - Investment Dynamics in Electricity Markets
Alfredo Garcia, University of Virginia, P.O. Box 400747, 151 Engineer's Way, Charlottesville, VA, 22904, United States, agarcia@virginia.edu, Ennio Stacchetti

A simple dynamic model of strategic investments is introduced to investigate how firms adjust capacity stocks in electricity markets without regulatory intervention. For a wide range of parameters, there are Markovian (non-collusive) equilibria that sustain negligible or no excess capacity along the outcome path. This suggests that market mechanisms alone produce inadequate incentives for the provision of `security capacity'.

2 - Optimal Rules for Patent Races
Sevin Yeltekin, MEDS Kellogg School of Management , Northwestern University, 2001 Sheridan Road 5th Floor, Evanston, IL, 60208, United States, s-yeltekin@northwestern.edu

There are two important rules in a patent race: what an innovator must accomplish to receive the patent and the allocation of the benefits that flow from the innovation. Most patent races end before R\&D is completed and the prize to the innovator is often less than the social benefit of the innovation. We study the optimal combination of prize and minimal accomplishment necessary to obtain a patent in a dynamic multistage innovation race. A planner, who cannot distinguish between competing firms, chooses the innovation stage at which the patent is awarded and the magnitude of the prize to the winner. We examine both social surplus and consumer surplus maximizing patent race rules. We show that a key consideration is the efficiency costs of transfers and of monopoly power to the patentholder. We show that races are undesirable only when efficiency costs are low, firms have similar technologies, and the planner maximizes social surplus. However, in all other circumstances, the optimal policy spurs innovative effort through a race of nontrivial duration. Races are also used to filter out inferior innovators.

3 - Estimating Dynamic Models of Imperfect Competition
C. Lanier Benkard, Stanford Graduate School of Business, 518 Memorial Way, Stanford, CA, 94305-5015, United States, lanierb@stanford.edu, Patrick Bajari, Jonathan Levin

We describe a two-step algorithm for estimating dynamic games under the assumption that behavior is consistent with Markov Perfect Equilibrium. In the first step, the policy functions and the law of motion for the state variables are estimated. In the second step, the structural parameters are estimated using the optimality conditions for equilibrium. The algorithm applies to a broad class of models, including models with both discrete and continuous controls such as Ericson and Pakes (1995).

■ SC09

Empirical Research in Supply Chain Management using Secondary Data

Cluster: Supply Chain Management
Invited Session

Chair: Serguei Netessine, Assistant Professor, University of Pennsylvania, 3730 Walnut St. Suite 500, Philadelphia, PA, 19104, United States, netessin@wharton.upenn.edu

Co-Chair: Gerard Cachon, University of Pennsylvania, The Wharton School, 500 JMHH, Philadelphia, PA, 19104, United States, cachon@wharton.upenn.edu

1 - Some New Operational Drivers of Financial Performance: A Cross-Industry Empirical investigation
Serguei Roumiantsev, PhD candidate, Wharton Business School, box 500 JMHH Walnut st 3730, Philadelphia, PA, 19104, United States, roumiant@wharton.upenn.edu, Serguei Netessine

We are analyzing the historically weak link between operational activities of companies and their bottom lines. Using panel data, we develop a statistical methodology that looks not only at firm-level controls in explaining variability of accounting returns but also at the characteristics of managerial decisions (imputed from the data using inventory models). We find that superior earnings are associated with the speed of change of inventory with respect to various exogenous parameters.

2 - Information Sharing, Incentives and Supply Chain Performance
Taylor Randall, University of Utah, David Eccles School of Business, Salt Lake City, UT, United States, acttr@business.utah.edu, Susan Kulp, Shoshanah Cohen

This study investigates the information flows and incentive conflicts that occur between the sales, forecasting, production, and inventory management functions. We are interested in how increased information availability throughout the chain affects performance and what types of information would have benefited the company most. Additionally, we will analyze whether information sharing alone would have prevented the problem or whether incentives are necessary to change employee behavior.

3 - In Search of the Bullwhip Effect
Gerard Cachon, University of Pennsylvania, The Wharton School, 500 JMHH, Philadelphia, PA, 19104, United States, cachon@wharton.upenn.edu, Taylor Randall, Glen Schmidt

The objective of this study is to document the existence of the bullwhip effect in industry level U.S. data. We find the bullwhip effect among wholesalers, but little evidence of the bullwhip effect among retailers and only some with manufacturers. We explain why our results are apparently at odds with the existing literature.

4 - Delays in New Product Introduction and Long-term Corporate Performance
Vinod Singhal, College of Management Georgia Institute of Technology, 800 West Peachtree Street NW, Atlanta, GA, 30332, United States, vinod.singhal@mgt.gatech.edu, Kevin Hendricks

This paper investigates the long-term shareholder value and operating performance consequences of delays in new product introductions. The evidence is based on an analysis of more than 600 publicly announced new product introduction delays made during 1985-2003. We provide evidence on the magnitude of the economic impact of delaying the introduction of new products as well as how long does it take firms to recover from the negative effect of delays.

■ SC10

Empirical Research in OM using Primary Data

Cluster: Supply Chain Management
Invited Session

Chair: Vinayak Deshpande, vinayak@exchange.purdue.edu

1 - An Empirical Study of Ordering Behavior of Retail Stores
Vishal Gaur, New York University, 44 West 4th St., 8-72, New York, NY, 10012, United States, vgaur@stern.nyu.edu, Karel van Donselaar, Tom van Woensel, Rob Broekmeulen, Jan Fransoo

We study the impact of logistical and product characteristics, such as case pack size, excess shelf space, variety, margin, etc. on ordering behavior of retail stores in a supermarket chain. Using orders and shipments data, and POS sales data for 8884 items in three stores, we analyze various aspects of ordering behavior relative to a computerized replenishment system. We find that stores deviate systematically from the system and determine the reasons for deviation.

2 - Performance Based Logistics in a Multi-Echelon Defense Context: A Framework for Empirical Research
Morris Cohen, The Wharton School, 3730 Walnut St. Suite 500, Philadelphia, PA, 19104, United States, cohen@wharton.upenn.edu, Sang-Hyun Kim, Serguei Netessine

Traditional contracting mechanisms are based on the sale of the product and high margin support services. The PBL approach requires customers to pay only for actual use/up-time of the products. Such "power by the hour" payment mechanisms are expected to lead to more reliable products with a lower cost of ownership and improved overall supply chain performance. In this talk, we will review a framework that has been developed to analyze the impact PBLs in an Aerospace and Defense context.

3 - Closed Loop Supply Chain Management of Repairable Service Parts: An Empirical Analysis
Vinayak Deshpande, vinayak@exchange.purdue.edu, Asima Mishra, Ananth Iyer

We present an analysis of repair capacity management for repairable service parts supply chain based on empirical data obtained from the US Coast Guard for the following questions: How should repair capacity be managed during an aircraft upgrade from an old to new version? What is the optimal conversion schedule and mix of service parts to support the old and new aircraft versions? What is the impact of priority repair and inventory allocation schemes in a closed loop supply chain?

4 - Productivity and Technological changes in the Indian Auto Component Industry
Ananth Iyer, Purdue University, Rawls Hall, West Lafayette, IN, 47907, United States, aiyer@exchange.purdue.edu, Sridhar Seshadri, Haritha Saranga

We study the impact of certification and quality awards on productivity gains in the Indian auto component industry during the period 1993-2003. We separate technical change from productivity change and compute the change in relative efficiency for each firm by using a Data Envelopment Analysis approach. The data analysis suggests that productivity improvement and profitability was affected by management choices regarding certification or award based changes.

■ SC11

Inventory Management in Supply Chain Management

Contributed Session

Chair: Mustafa Dogru, PhD Student, Technische Universiteit Eindhoven, Department of Technology Management, PAV. E-16, Eindhoven, 5600 MB, Netherlands, m.k.dogru@tm.tue.nl

1 - Vendor Managed Inventory Programs: A Comparative Study
Peter Salzarulo, Doctoral Candidate, Indiana University, 3960 Whitewood Way, Bloomington, IN, 47404, United States, psalzaru@indiana.edu

This paper investigates three replenishment strategies in a two echelon serial supply chain. Under the first strategy, Vendor Managed Inventory, a manufacturer makes production and shipping decisions by setting signal points which are based on the customer's inventory levels. Traditional Make-to-Order and Make-to-Stock replenishment systems are also investigated. Probability models are developed for each strategy and numerical analysis is used to compare performance in various environments.

2 - Channel Power Analysis Under Vendor-Managed Inventory and a General (Q, R) Inventory Policy
Bogdan Bichescu, PhD student, University of Cincinnati, Department of QAOM, College of Business, University of Cincinnati, Cincinnati, OH, 45221, United States, bichesbc@email.uc.edu, Michael Fry

We analyze decentralized supply chains that function according to general (Q, R) policies which allow the decision-making responsibilities to be split between supply chain agents. We compare a traditional RMI scenario with a VMI scenario, in which the retailer chooses the service level, R, and the supplier chooses the order quantity, Q. Within the VMI scenario, we explore several channel power distribution schemes. A numerical analysis is performed to explore the effects of channel power.

3 - An Investigation of the Impacts of Consignment and VMI on Supply Chain Performance
Chungsuk Ryu, Ph.D. Student, SUNY at Buffalo, 320 Jacobs Management Center, SUNY at Buffalo, Buffalo, NY, 14260, United States, cryu@buffalo.edu, Nallan Suresh

This study investigates the impacts of two supply chain coordination initiatives on supply chain performance: consignment and vendor managed inventory (VMI) systems. Based on profit-based models, two coordination initiatives are compared with the traditional supply chain system. Numerical examples of the proposed supply chain models imply that the supply chain coordina-tion initiatives can be beneficial to the buyer as well as the supplier.

4 - An MIP Model with Lot-Sizing that Generates Obsolescence and Inventories
Ileana Castillo, Assisstant Professor, ITESM Toluca, Eduardo Monroy Càrdenas No. 2000, Toluca, MX, 50110, Mexico, castillo_ileana@hotmail.com, Itzel Càrdenas, Manuel Robles

With this MIP model we show that batch ordering causes obsolescence and inventory. The model is motivated by a study of the bullwhip effect in three pharmaceutical companies located in the central part of Mexico, and because of its operating restrictions we assume a unique supplier and a manufacturer that sales its products to a distributor. We also assume deterministic demand, products with different deterministic life times, and several transportation modes with deterministic lead times.

5 - The Effect of Balance Assumption on Expected System Costs in One-Warehouse Multi-Retailer Systems

Mustafa Dogru, PhD Student, Technische Universiteit Eindhoven, Department of Technology Management, PAV. E-16, Eindhoven, 5600 MB, Netherlands, m.k.dogru@tm.tue.nl, Geert-Jan van Houtum, Ton De Kok

The balance (allocation) assumption is a widely used presupposition in the analysis of one-warehouse multi-retailer inventory systems under periodic review. This assumption leads to a relaxed version of the original problem for which the structure of the optimal policy is known. First, we characterize the optimal policy partially without making the balance assumption. Then solving the original problem using stochastic DP, we show the precise impact of the balance assumption.

■ SC12

Applications of Auctions to Supply Chains

Cluster: Applications of Auction and Game Theory
Invited Session

Chair: Gustavo Vulcano, New York University, 44 West 4th Street, Suite 8-76, New York, NY, 10012, United States, gvulcano@stern.nyu.edu

1 - Is it Always Optimal to Bid in Last Minutes?

Gangshu Cai, Assistant Professor, Texas A&M International University, The Business School, Laredo, TX, United States, gangshu@gmail.com

Online auctions with fixed deadlines have become popular. Sniper websites tout that bidding in the last minute is the optimal strategy for buyers even with traffic congestion. This work studies the stochastic impacts e.g. stochastic entrants and traffic congestion, on buyers' behaviors in online auctions. We conclude that it is not always optimal for buyers to bid in last-minute online auctions with stochastic impacts when bidders are risk-neutral.

2 - Kemeny Rule for Preference Aggregation

Jayant Kalagnanam, jayant@us.ibm.com, Andrew Davenport

One drawback of majority voting procedures when three or more alternatives are being ranked is the presence of cycles in the majority preference relation. The Kemeny order is a social welfare function which has been designed to tackle the presence of such cycles in majority graphs. We develop mathematical formulations that provide a model for this problem and discuss the properties of these models.

3 - Auctions with Bidder Qualification Checks

Damian Beil, Ross School of Business at the University of Michigan, 701 Tappan Street, D8204, Ann Arbor, MI, 48109, United States, dbeil@umich.edu, Zhixi Wan

We consider a manufacturer who uses a reverse auction in combination with qualification checks to determine which qualified supplier will be awarded a contract. While suppliers can be qualified prior to the action (pre-qualification), we allow the manufacturer to delay all or part of the qualification until after the auction (post-qualification). Using an optimal mechanism approach we explore the tradeoffs between varying levels of pre- and post-qualification.

4 - Effects of Information Disclosure of First- and Second-Price Auctions in a Supply Chain Setting

Ying-Ju Chen, PhD Candidate, IOMS-Operations Management, Stern School of Business, New York University, 44 West 4th Street, KMC 8-152, New York City, NY, 10012, United States, ychen0@stern.nyu.edu, Gustavo Vulcano

We analyze a two-stage supply chain setting, where two retailers bid for the capacity of a seller, and then compete in the consumer market. The seller's capacity is sold as a bundle, and retailers can get additional items in a spot market. We study this model under a first and second price auction, and analyze the impact of the information elicited by the seller in the first stage of the game.

■ SC13

Software Demonstration

Cluster: Software Demo
Invited Session

1 - Maximal Software, Inc. - Introducing the New Release 5.0 of MPL Modeling System for Optimization

Bjarni Kristjansson, Maximal Software, Suite 700, Suite 700, Arlington, VA, 22201, info@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. Several new solvers (COIN, GLPK, LGO, PATH) have been added and existing solvers updated (CPLEX, XPRESS, XA, CONOPT). Data access has been improved with new native drivers (ORACLE, SAP) and now offers full XML/SOAP support for Internet connectivity.

2 - AMPL Optimization LLC- A Practical Guide to Acquiring AMPL® for Applications in Large-Scale Optimization

Robert Fourer, Professor, Northwestern University, Dept of Industrial Eng & Mgmnt Sciences, 2145 Sheridan Road, Evanston, IL, 60208-3119, United States, 4er@iems.northwestern.edu

AMPL® has set the standard for an optimization modeling language that handles complex models naturally and large models efficiently. As a result it is available from many more sources and for many more solvers than competing products. Bob Fourer, AMPL's co-developer, will give a quick but lucid tour of the current state of AMPL, with emphasis on the practical issues that come up in deciding to purchase an algebraic modeling language. Topics will include 64-bit versions, AMPL's new extra-flexible floating license manager, the AMPL Studio graphical interface and COM objects for Windows, and the range of AMPL/solver packages and distributors.

■ SC14

Air Mobility

Sponsor: Military Applications
Sponsored Session

Chair: LtCol Raymond W Staats, Division Chief, Operations Research, Air Force Institute of Technology, 2950 Hobson Way, Wright-Patterson AFB, OH, 45433, United States, raymond.staats@afit.edu

1 - An Advanced Tabu Search Heuristic for Solving the Theater Distribution Problem

LTC Robert Burks, AFIT, 2950 Hobson Way, Wright-Patterson AFB, OH, 45433, United States, Robert.Burks@afit.edu

The theater distribution problem is a military operational problem that requires synchronizing all elements of the logistics system to ensure the correct delivery of the "right things" to the "right place" at the "right time". This research seeks to blend the characteristics of both the pickup and delivery problem with time windows (PDPTW) and location routing problem (LRP) to formulate a location pick-up and delivery problem with time windows (LPDPTW) to solve the theater distribution problem.

2 - Theater Aerial Refueling Vehicle Routing Models

Maj Jeffrey Havlicek, AFIT, 2950 Hobson Way, Wright-Patterson AFB, OH, 45433, United States, jeffrey.havlicek@afit.edu

The Theater Aerial Refueling Vehicle Routing Problem (TARVRP) is the task of finding k weighted-arc-and-node-capacitated cycles on a general graph originating from one of a set of source nodes, traversing a subset of demand nodes, and returning to its origin that maximizes customers served while minimizing the arc travel costs subject to time windows, node-path incompatibilities, and network cycle constraints.

3 - A Value-Focused Selection Model for the Global En-Route Airfield Location Problem

LtCol Raymond W Staats, Division Chief, Operations Research, Air Force Institute of Technology, 2950 Hobson Way, Wright-Patterson AFB, OH, 45433, United States, raymond.staats@afit.edu, Marykathryn Tharaldson

The Global War on Terrorism (GWOT) has yielded new challenges to the United States' strategic airlift infrastructure. The network of en-route airfields that serve as refueling and maintenance stops were designed primarily to service relatively static Cold War requirements. We use "value focused" methodology to identify and select a portfolio of en-route airfield locations that simultaneously maximizes cargo throughput capability while possessing a high degree of adaptability.

■ SC15

Contemporary Scheduling

Cluster: Scheduling
Invited Session

Chair: Chung-Yee Lee, Professor and Head, Department of IEEM, Hong Kong UST, Clear Water Bay, Kowloon, HK, Hong Kong, cylee@ust.hk

1 - Rescheduling for Job Unavailability

Nicholas Hall, Professor, The Ohio State University, Fisher College of Business, Columbus, Oh, 43210-1144, United States, hall.33@osu.edu, Chris N. Potts

We consider problems where the processing of jobs has been planned, assuming they are all available initially. If the availability of some jobs is then delayed, the decision maker needs to adjust the existing schedule but without causing excessive disruption to the planned schedule. For four classical scheduling objectives, we provide a computationally efficient optimal algorithm, an intractability proof which shows that this algorithm is the best possible, exact worst case analysis of a simple heuristic and a fully polynomial time approximation scheme.

2 - Survey of Integrated Production-Distribution Scheduling Models and Results

Zhi-Long Chen, Associate Professor, Robert H. Smith School of Business, University of Maryland, College Park, MD, 20742, United States, zchen@rhsmith.umd.edu

We present a survey of existing models and results in the area of integrated production-distribution scheduling. There are existing surveys on production-distribution models. However, all existing surveys address strategic- or tactical-level decisions. The focus of this survey is on production-distribution models at the detailed scheduling level. We will also identify several sub-areas for future research.

3 - Optimal Policies to Schedule Jobs with Due Dates and Subject to an Unknown Deadline

Xiaoqiang Cai, Professor, The Chinese University of Hong Kong, Department of Systems Eng. & Eng. Mgmt, Hong Kong, China, xqcai@se.cuhk.edu.hk, Xian Zhou

A set of jobs are to be processed by a single machine. In addition to their due dates, the jobs are subject to an unknown deadline. There is a tardy cost if a job is completed before the deadline but after its due date. Moreover, there is a substantial loss if a job is unable to be completed before the deadline. We obtain optimal policies to minimize the expected total loss.

4 - Minimizing Total Completion Time for UET Systems

Joseph Leung, Professor, New Jersey Institute of Technology, Department of Computer Science, Newark, NJ, 07102, United States, leung@cis.njit.edu, Yumei Huo

We propose that Hu's algorithm be used for minimizing total completion time for unit-execution-time task systems with intree precedence constraints, and that Coffman-Graham algorithm be used for arbitrary precedence constraints. It is shown that Hu's algorithm gives a performance guarantee of 3/2, and that Coffman-Graham algorithm has a performance guarantee of 2.

■ SC16

Engineering Networks

Sponsor: Organization Science
Sponsored Session

Chair: Santiago Mingo, Harvard Business School, Sherman Hall, Soldiers Field Park, HBS, Boston, MA, 02163, United States, smingo@hbs.edu

1 - Networks and Knowledge Sharing: The Search Transfer Problem Revisited

William J. McEvily Jr., bmcevily@andrew.cmu.edu, Ray Reagans

Current research treats the structural characteristics that facilitate search as being in opposition to those that promote transfer. However, empirical research has yet to examine: the associations between social networks and search and transfer directly, or the links between social networks and both search and transfer. To shed light on how social networks affect the search-transfer problem, we analyze how range and closure affect search behavior and the ease of knowledge transfer.

2 - Brokerage and Collaborative Creativity

Santiago Mingo, Harvard Business School, Sherman Hall, Soldiers Field Park, HBS, Boston, MA, 02163, United States, smingo@hbs.edu, Lee Fleming

In this paper, we explore empirically the mechanism through which brokerage and cohesion influence an individual's creativity. We argue that brokerage confers contingent benefits, based on the level of trust and non-redundant information between collaborators, the creative experiences of the individual, and whether the outcome is initial creativity or its impact upon future creative search. We present supporting evidence using the structural career histories of over 100,000 inventors.

3 - Private Benefit from Public Good? Startup Strategies for Participation in an Open Standards Community

David M. Waguespack, Assistant Professor, Robert H. Smith School of Business, University of Maryland, College Park, MD, 20742, United States, dwag@iname.com, Lee Fleming

We examine U.S. based IT startups that participate in the IETF, a volunteer organization that creates and approves internet standards. We compare the hazard of a liquidity event (an IPO or Acquisition) for IETF community participants and non-participants. Three types of participation are evaluated: passive monitoring, technical contribution, and community leadership. IETF participation of any sort decreases time to IPO or acquisition, unless the startup possesses a strong patent portfolio.

4 - Broadcast Search and Solution Attraction in Scientific Problem Solving

Karim R. Lakhani, Lecturer, MIT Sloan School of Management, 50 Memorial Drive, E52-557, Cambridge, MA, United States, lakhani@mit.edu, Lars Bo Jeppesen

We study problem solving via broadcast search, a method by which organizations draw on diverse set of problem solvers outside their own organization and as a alternative to local search. Application to 170 scientific problems shows high solving rates (30%) with novel solutions arriving from a dispersed pool of solvers. The probability of solving a problem is dependent upon the number of different intellectual interests of solvers and learning by seeker firms on how to articulate problems.

■ SC17

Experimental and Empirical Research in NPD

Cluster: New Product Development
Invited Session

Chair: Svenja Sommer, Purdue University, Krannert School of Management, 403 W. State Street, W. Lafayette, IN, 47907, United States, ssommer@krannert.purdue.edu

1 - Social Goals, Emotions, and Motivation of Professional Workers

Christoph Loch, Professor of Technology Management, INSEAD, Boulevard de Constance, Fontainebleau Cedex, 77305, France, Christoph.Loch@insead.edu, Julie Urda

R&D professionals have autonomy and cannot be fully monitored; thus, motivation is important for their performance. Work in psychology has shown that people pursue social goals—status, reciprocity, and group identity—for their own sake. We present evidence from laboratory experiments that the social goals work through the triggering of emotions: their fulfillment or denial causes happiness, anger, sadness, etc. These results have implications for managerial actions to motivate R&D workers.

2 - Preliminary Results from an Empirical Analysis of Managing Outsourced Product Design

Edward Anderson, University of Texas at Austin Business School, McCombs School of Business, 1 University Station B6500, Austin, TX, 78733, United States, Edward.Anderson@mccombs.utexas.edu, Geoffrey Parker, Davis-Blake

We present preliminary statistical results from a survey studying how firms manage and integrate outsourced portions of their core product development process in environments characterized by rapid technological and market change. In particular, we discuss the role of supply chain integrators whose job is to maintain product coherence across firm boundaries.

3 - Valuing R&D Projects in the Pharmaceutical Industry

Christian Terwiesch, Associate Professor, The Wharton School, 548 Jon M. Huntsman Hall, Philadelphia, PA, 19104.6366, United States, terwiesch@wharton.upenn.edu, Karan Girotra, Karl Ulrich

We present an empirically grounded valuation of R&D projects in the pharmaceutical industry. Our data is based on a multi-year research collaboration with a large pharmaceutical company as well as a proprietary database of several thousand compounds.

4 - Flexibly Managing Start-Ups: A Method for Monitoring Progress and Overcoming Crises

Svenja Sommer, Purdue University, Krannert School of Management, 403 W. State Street, W. Lafayette, IN, 47907, United States, ssommer@krannert.purdue.edu, Christoph Loch

Managers of start-ups face many unforeseen challenges and are often forced to make decisions without having a clear idea of the likely outcomes. This requires a degree of flexibility beyond what standard risk management techniques would recommend. We present preliminary results of a survey trying to identify planning and monitoring methods that are adjusted to different levels of complexity and uncertainty that various new ventures face.

■ SC18

OR Applications for Off-Schedule Operations (OSO) in the Airline Industry

Sponsor: Aviation Applications
Sponsored Session

Chair: Tuell Green, Principal Operations Research, American Airlines, 4333 Amon Carter Blvd, MD 5358, Fort Worth, TX, 76155, United States, Tuell.Green@aa.com

1 - Flight Cancellation Management at American Airlines

Remi Salam, Sr. Analyst Operations Research, American Airlines, 4333 Amon Carter Blvd, MD 5358, Fort Worth, TX, 76155, United States, remi.salam@aa.com, Tim Niznik

Off-Schedule-Operation (OSO) management has risen to be a critical airline function in the current low-fare environment where operating with lower costs is just as important as higher revenues. Flight cancellations are very disruptive OSO manifestations. This talk highlights an optimization solution currently in production at American Airlines that recommends the "least disruptive" set of cancellations. We present some modeling considerations, solution approach and potential future directions.

2 - Automated Passenger Re-accommodation for Real-time, Day-of-ops Passenger Recovery

Tuell Green, Principal Operations Research, American Airlines, 4333 Amon Carter Blvd, MD 5358, Fort Worth, TX, 76155, United States, Tuell.Green@aa.com, Murali Ande

We present an optimiztion model that assigns alternate itineraries to customers affected by flight cancellations and/or delays. The model maximizes the total number of rebooked customers while giving the best options to those customers deemed most valuable to the airline. A description of the optimization model, the re-accommodation application, and current stats are included.

3 - Scenario-based Air Traffic Flow Management: From Theory to Practice

P. Barry Liu, PhD Student, University of California at Berkeley, 107E McLaughlin Hall, UC Berkeley, Berkeley, CA, 94720, United States, barryliu@berkeley.edu, Mark Hansen, Avijit Mukherjee

Recent developments in solving the single airport ground holding problem use static or dynamic optimization to manage the uncertainty of how airport capacities will evolve. Scenario trees of airport arrival capacity profile provide the basis for formulating multistage recourse problems. We present methodologies for generating scenario trees from empirical data and examine the performance of scenario-based models in a real-world setting.

4 - A/C Maintenance Compliance Optimization with Manpower and Work-slot Constraints

Goutham Ekollu, Lead Programmer Analyst, United Airlines, 1200 E Algonquin Rd, Elk Grove, IL, 60007, United States, goutham.ekollu@united.com, Ram Narasimhan

Various maintenance items need to be accomplished at regular (but varying based operational schedule, control type etc.) intervals in order to comply with FAA safety mandates. A/C routers schedule these maintenance items with the goal to minimize the green time wasted. They are constrained by the limited manpower and work-slots available on each day at various stations. We present a maintenance assignment optimization model which optimizes the assignments for all the A/C over a 7 day period.

■ SC19

KLIC III — Knowledge Transfer Decision Support (Knowledge, Learning & Intellectual Capital)

Sponsor: Technology Management
Sponsored Session

Chair: David Moore, Assistant Professor, Colorado School of Mines, Economics and Business Division, 814 15th Street, Golden, CO, 80401, United States, dmoore@mines.edu

1 - Managing Employee Knowledge through External Knowledge Transfer and Learning-by-Doing

Cheryl Gaimon, Regents Professor, Georgia Institute of Technology, 800 West Peachtree St. NW, Atlanta, GA, United States, cheryl.gaimon@mgt.gatech.edu, Gulru Ozkan

We consider the situation where employee training is needed. We analyze dynamic strategies pursued by a firm that increases employee knowledge through learning-by-doing (internal source of knowledge creation) and by hiring consultants (external source for knowledge transfer). Key issues we address include the appropriate duration of consultancy engagement, the rate of pursuit in knowledge transfer, and the effect of learning-by-doing on the knowledge transfer process.

2 - The Economics of Speed

Rob Leachman, Professor, University of California, Berkeley, 4135 Etcheverry Hall, Berkeley, CA, 94720-1777, United States, leachman@ieor.berkeley.edu, Shengwei Ding

A delay cost model is introduced that quantitatively assesses revenue gains resulting from increased speed of manufacturing deployment and execution. Costs of projects or investments that increase speed may be weighed against revenue gains calculated using the model. The model is demonstrated on semiconductor industry data.

3 - Targeted Knowledge Transfer and Accelerated Organizational Learning

David Moore, Assistant Professor, Colorado School of Mines, Economics and Business Division, 814 15th Street, Golden, CO, 80401, United States, dmoore@mines.edu

The functional structure of production technologies having additively decomposible performance metrics may be exploited to accelerate learning. We present a general mathematical and economic framework for identifying productivity-enhancing knowledge transfer opportunities and evaluating the potential economic impact of successful knowledge transfer. Efficient data collection and analysis strategies, and differences between input-reducing and output-expanding learning will be highlighted.

4 - The Effect of Information Technology on Organizational Learning and Knowledge Transfer

Linda Argote, Professor, Carnegie Mellon University, Tepper School of Business, 5000 Forbes Ave., Pittsburgh, PA, 15213, United States, argote@andrew.cmu.edu, Michael J. Ashworth, Tridas Mukhopadhyay

We examine whether information technology affects organizational learning and knowledge transfer. We conducted an analysis of monthly data spanning five years at six financial institutions. Information technology was found to have a positive impact on productivity and quality as well as increase the rates at which the units improve their productivity and quality with experience. Information technology significantly enhances the transfer of productivity-enhancing knowledge.

■ SC20

Electricity Markets Development & Planning

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

Chair: Uday Shanbhag, University of Illinois, Mechanical and Industrial Engg, Urbana, IL, 61801, United States, udaybag@stanford.edu

1 - Market Architecture and Relevant Markets

Yves Smeers, CORE, Universite' Catholique de Louvain, Louvain-la-Neuve, Belgium, smeers@core.ucl.ac.be, Andreas Ehrenmann

Competition authorities traditionally begin their investigation of concentration cases by assessing the relevant market of the involved companies. We examine the extent to which the yet undefined organisation of cross border trade can have an impact on the definition of the geographic relevant market. We conduct the analysis on a stylised example, and compare results from nodal pricing, market splitting, coordinated auction and market coupling.

2 - A Look at Simple, Learnable Pricing Policies in Electricity Markets

Steve Kimbrough, University of Pennsylvania, Wharton School, Philadelphia, PA, 19104, United States, sok@wharton.upenn.edu, Fred Murphy

We model aspects spot markets and day ahead markets as indefinitely repeated games played by small numbers of players. Players are agents with repertoires of comparatively simple pricing and supply policies. The agents engage in straightforward learning (e.g., reinforcement learning, use of Hernnstein's matching law) in this policy space. We compare the behavior of this agent-based model with the behavior of current models pertaining to the electricity markets in question.

3 - A Framework for the Analysis of Transmission Planning in the Market Environment

Javier Contreras, Universidad de Castilla - La Mancha, Campus Universitario s/n, 13071 Ciudad Real, Spain, Javier.Contreras@uclm.es, George Gross

The need for investment in and maintenance of the transmission grid has not been met in the competitive environment. A framework for the analysis of issues in the planning of transmission in the competitive environment is proposed that extends congestion analysis. The principal notion is to evaluate the relevant metrics with and without the transmission asset investment(s). We apply the framework to investigate transmission expansion scenarios from the ISO point of view.

4 - A Complementarity Framework for Forward Contracting under Uncertainty
Uday Shanbhag, University of Illinois, Mechanical and Industrial Engg, Urbana, IL, 61801, United States, udaybag@stanford.edu, Peter Glynn, Gerd Infanger

We construct a two-period oligopolistic model in which agents have access to spot and forward markets. Uncertainty exists in generation capacity, spot-market demand and network capacity. We play a simultaneous stochastic Nash game in forward decisions and recourse-based spot decisions. A decomposition-based iterative method is proposed for solving the resulting stochastic complementarity problem. Some results are provided for a 6-node network under uncertainty.

■ SC21

Joint Session DMA/CPMS/DM:
Data Mining in Ecology and the Environment

Cluster: Data Mining Applications, CPMS,
The Practice Section of INFORMS; Data Mining
Invited Session

Chair: Mary Crissey, Analytical strategist, SAS Institute, 17030 Vista Park Dr, San Antonio, TX, 78247, United States, mary.crissey@sas.com

1 - Quantification of Representative Monitoring Sites of PM2.5 using False Discovery Rate
Seoung Bum Kim, Assistant Professor, Manufacturing and Industrial Systems Engineering, University of Texas at Arlington, Arlington, TX, United States, sbkim@isye.gatech.edu

Quantifying the representatives of monitoring sites provides the guideline of air quality assessment and public health study. In this study we propose multiple testing procedures controlling false discovery rate to quantify the representativeness of 1206 monitoring sites of PM2.5 over the United States.

2 - What Started as Simple Goal of Reducing Lapsing Fishing Licenses
Kenneth Fritz, Deputy CIO, Ohio Dept Natural Resources, 2035 Morse Rd, building I, Columbus, OH, 43229, United States, Ken.Fritz@dnr.state.oh.us

Who'd have imagined? Tackling the challenge of Predicting which fishing licenses might Lapse would net an increase of $500,000 in revenue! The Recreational user data warehouse combined with analytical intelligence gave Wildlife division managers ability to target and segment their customers. Collaborative efforts are underway with other state agencies to leverage what we're doing with to improve our internal decision support so that they too can deliver improved recreational services.

3 - Mining to Model State Transitions for Ozone Pollution Control Strategies
Victoria Chen, Associate Professor, University of Texas at Arlington, Dept. of Ind. & Manuf. Sys. Eng., Campus Box 19017, Arlington, TX, 76019-0017, United States, vchen@uta.edu, Michael Chang, Zehua Yang

Exploration of potential strategies for controlling ozone pollution requires a model of how the state of the relevant air chemistry changes subsequent to applied controls. The EPA's Urban Airshed Model may be employed for this purpose, but is computationally intensive. Instead, a mining and metamodeling process is developed to efficiently approximate these state transitions. These are incorporated into a stochastic dynamic programming formulation to identify promising control strategies.

4 - Copula Model Selection Procedures for Flood Forecasting
Kobi Abayomi, Columbia University, Environmental Eng. and Statistics, New York, NY, 10027, United States, kabayomi@ciesin.columbia.edu, Upmanu Lall, Victor de la Peña

Copulas model dependencies in multivariate data. We investigate model selection procedures for the purpose of capturing mutual information between flood incidence and its predictors - which include precipitation, ground cover, water table, etc.

■ SC22

The Economics of Information Exchange

Sponsor: Information Systems
Sponsored Session

Chair: Neveen Awad, Wayne State University, 300 Prentis Hall, Cass Ave, Detroit, MI, 48202, United States, nawad@wayne.edu

1 - Competition and Vertical Integration in the Search Engine Market
Kartik Hosanagar, The Wharton School, Penn, 3730 Walnut St, Suite 500, philadelphia, pa, 19104, United States, kartikh@wharton.upenn.edu, Karthik Kannan, Rahul Telang

The search engine market has witnessed considerable in the recent past, including decisions by Yahoo and MSN to stop outsourcing their search technology and instead own their own search algorithms. This paper analyzes the dynamics of competition between two search engines and the incentives for vertical integration. We find that the primary drivers of technology integration by search engines are similarity in service features across search engines and ratio of their cost of quality.

2 - Strategic Manipulation of Internet Opinion Forums
Chrysanthos Dellarocas, R. H. Smith School of Business, University of Maryland, College Park, MD, 20742, United States, dell@mit.edu

There is growing evidence that consumers are influenced by Internet-based opinion forums before making a variety of purchase decisions. Firms whose products are being discussed in such forums are, therefore, tempted to manipulate consumer perceptions by posting costly anonymous messages that praise their products or that bad-mouth their competitors. This paper offers a theoretical analysis of the impact of such behavior on firm profits and consumer surplus.

3 - Efficient Dynamic Allocation with Uncertain Valuations
Thomas Weber, Assistant Professor, Stanford University, 442 Terman, Stanford, CA, 94305-4026, United States, webert@stanford.edu, Abhishek Bapna

We provide a solution to the problem of efficiently allocating an object of initially unknown value to one of N agents. Agents may learn about the object's value from experience with it. Applications include the repeated sale of a paid referral or the dynamic allocation of an exclusive R&D facility in a firm.

4 - Information Exchange, Network Structure and Technology Adoption
Arun Sundararajan, New York University, 44 West 4th Street, KMC 8-93, New York, NY, 10012, United States, asundara@stern.nyu.edu

Information sharing patterns between agents often determines technology adoption. I model how the structure of complex networks that describe these patterns and the intensity of inter-agent information sharing affect optimal and Bayes-Nash equilibrium outcomes in a general technology adoption game, towards contrasting centrally mandated and decentralized IT governance policies.

■ SC23

Stochastic Modeling in Financial Services

Sponsor: Financial Services
Sponsored Session

Chair: James Primbs, Stanford University

1 - Linking Stochastic Program and Policy Simulator for the U.S. Defined-Benefit Pension System
Zhuojuan Zhang, Princeton University, zhuojuan@Princeton.EDU

This paper presents a risk-based and anticipatory modeling framework to integrate an industry with its defined-benefit pension system. We develop an approach for risk-neutral valuation of contributions by plan sponsors. By linking stochastic program with a policy simulator, we study the problem of finding optimal policy rules such as pension investment and contribution rules. Empirical analysis indicates that pension decisions need to be tailored to the characteristics of different industries.

2 - Pricing Barrier Options with Stochastic Volatility and Local Volatility Models
Rongwen Wu, Freddie Mac, rongwen_wu@freddiemac.com

We consider the valuation of barrier options using stochastic volatility and local volatility models. The stochastic volatility models are based on time changing Levy processes. Empirically we show the existence of model risk.

3 - A New Stochastic Control Approach to Robust Portfolio Optimization
James Primbs, Assistant Professor, Stanford Unversity, 444 Terman Engr. Ctr., Mail Code 4026, Stanford, CA, 94305, United States, japrimbs@stanford.edu, Chang Hwan Sung

Long term portfolio optimization is central to investment management, yet no generally accepted solution currently exists due to high computational hurdles. We approach the problem through a combination of stochastic programming and receding horizon control in an environment with many dynamic assets and transaction costs. Our methodology™ advantages are its ability to optimize in realistically complex environments over a long horizon, while at the same time remaining computationally feasible.

■ SC24

Financial Models and Analysis II

Cluster: Financial Engineering
Invited Session

Chair: Xin Guo, Assistant Professor, Cornell University, School of ORIE, Cornell University, Ithaca, NY, 14853, United States, xg29@cornell.edu

1 - Irreversible Investment under Dynamic Capacity Constraints
Peter Bank, Assistant Professor, Columbia University, Department of Mathematics, 2990 Broadway, New York, NY, 10027, United States, pbank@math.columbia.edu

We study irreversible investment problems where the overall investment up to any point in time may not exceed a given time varying threshold, thus imposing a dynamic capacity constraint. We derive a first order characterization of optimal policies based on the Snell envelope of the objective functional's gradient at the optimum. The optimal control policy is constructed explicitly in terms of the solution to a representation theorem for stochastic processes.

2 - A Robust Risk Measure
Steven Kou, Columbia University, 312 Mudd Building, Dept. of IEOR, New York, NY, United States, sk75@columbia.edu, Chris Heyde

In this talk, we first review some controversies over tailweight of distributions, and then present a robust risk measure. The talk is based on the papers by Heyde and Kou (2004, 2005).

3 - Dynamic Portfolio Optimization, Duality and Security Design
Ashish Jain, Columbia Business School, 130 Morning Side Drive #47A, NYC, NY, 10027, United States, aj2109@columbia.edu, Martin Haugh

Haugh, Kogan & Wang (HKW) showed how duality theory could be used to evaluate sub-optimal solutions to dynamic portfolio optimization problems. In the examples considered by HKW, only the trading strategies were used to compute the upper bounds as their value functions were not known. We extend this earlier work by evaluating new sub-optimal trading strategies and by explicitly computing their value functions. We also use these trading strategies to draw some conclusions for security design.

4 - Time-Changed Hawkes Processes and Tranche Pricing
Kay Giesecke, Cornell University, 237 Rhodes Hall, Ithaca, NY, 14853, United States, giesecke@orie.cornell.edu

We consider single-tranche collateralized debt obligations and other multi-name credit derivative instruments as options on cumulative portfolio default losses. The dynamics of cumulative losses are modeled by a time-changed Hawkes process. Options on this process are valued based on an explicit representation of the characteristic function of the process.

■ SC26

Panel Discussion: Research and Publications

Sponsor: JFIG, Junior Faculty Interest Group
Sponsored Session

Chair: Feryal Erhun, Assistant Professor, Stanford University, Management Science&Engineering, Stanford, CA, 94305, United States, ferhun@stanford.edu

1 - Panel Discussion: Research and Publications
Moderator: Candace Yano, Professor, UC Berkeley, 4141 Etcheverry Hall, Berkeley, CA, 94720-1777, United States, yano@ieor.berkeley.edu, Panelists: Garrett van Ryzin, Kalyan Singhal, Wallace Hopp

In this panel discussion, we will discuss the role of publishing in academia. We plan to: 1) provide an overview of the publication outlets for Engineering and Business School faculty; 2) describe how the publishing process works; 3) present strategies for picking topics for publication; and 5) discuss the research/practice interface.

■ SC27

Panel Discussion: How to Have an OR Career

Sponsor: CPMS, The Practice Section of INFORMS
Sponsored Session

Chair: Stephen Strauss, AT&T Labs, 180 Park Avenue, Building 103 Room A009, Florham Park, NJ, 07932, United States, sstrauss@att.com

1 - Panel Discussion: How to have an OR Career
Moderator: Stephen Strauss, AT&T Labs, 180 Park Avenue, Building 103 Room A009, Florham Park, NJ, 07932, United States, sstrauss@att.com, Panelists: Brandi Goodman, Harlan Crowder

Panelists from a range of industries; experience; and educational levels and backgrounds will discuss how they got into OR, how they got some of their positions and what kind of career paths they have followed.

■ SC28

The Re-solving Issue in Revenue Management

Sponsor: Revenue Management & Pricing
Sponsored Session

Chair: Nicola Secomandi, Assistant Professor of Operations Management & Manufacturing, Tepper School of Business, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA, 15213, United States, ns7@andrew.cmu.edu

1 - Is It Better To Re-Optimize?
William Cooper, University of Minnesota, 111 Church St. SE, Minneapolis, MN, 55455, United States, billcoop@me.umn.edu

In revenue management it is common practice to repeatedly re-solve a static optimization problem throughout the booking horizon in order to obtain booking controls. Such optimization problems typically do not take into account the fact that the revenue manager plans to re-solve in the future. In this talk, I discuss a simple example that shows the revenue manager may be better off in expectation by not re-optimizing.

2 - Multi-Stage Stochastic Programming Models in Revenue Management
Tito Homem-de-Mello, tito@northwestern.edu, Lijian Chen

We discuss the use of stochastic programming models in revenue management, focusing on the seat allocation problem. We present a non-linear multi-stage stochastic program and describe some characteristics of it (notably lack of convexity). A re-solving strategy is proposed for obtaining approximating solutions to the problem and assessing their quality. Numerical results are presented to illustrate the approach.

3 - Dynamic Pricing Strategies for Multi-Product Revenue Management Problems
Joern Meissner, 2840 Broadway #284, New York, NY, 10027, United States, joe@meiss.com, Costis Maglaras

We consider a firm that owns a fixed capacity of a resource that is consumed in the production of multiple products. We show how this well-studied revenue management problem can be reduced to a common formulation where the firm controls the aggregate rate at which products jointly consume capacity. In this context, we suggest several static and dynamic pricing heuristics. In particular, we show that "resolving" the fluid heuristic achieves asymptotically optimal performance under fluid scaling.

4 - An Analysis of the Re-Solving Issue in Network Revenue Management
Nicola Secomandi, Assistant Professor of Operations Management & Manufacturing, Tepper School of Business, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA, 15213, United States, ns7@andrew.cmu.edu

Most network-revenue-management policies are based on math programs that are periodically re-solved during the booking period. The effect of this re-solving on the performance of the booking policy is not well understood in theory. The talk presents a theory of re-solving and analyzes the re-solving behavior of booking-limit and bid-price policies.

■ SC29

Joint Session Research/ QSR: QSR Research Clinic- Quality and Statistics in Healthcare Modeling and Decision Making

Cluster: Research Clinics, Quality, Statistics and Reliability
Invited Session

Chair: Harriet Black Nembhard, Marcus Department of Industrial & Manufacturing Engineering, The Pennsylvania State University, 310 Leonhard Building, University Park, PA, 16802, hbnembhard@psu.edu

1 - Quality and Statistics in Healthcare Modeling and Decision Making
Harriet Black Nembhard, Marcus Department of Industrial & Manufacturing Engineering, The Pennsylvania State University, 310 Leonhard Building, University Park, PA, 16802, hbnembhard@psu.edu, Christopher Hollenbeak, Julie Simmons Ivy, Elissa Ozanne, Scott Ransom

Abstract not available at this time.

■ SC30

Risk Analysis

Contributed Session

Chair: Xia Pan, Assistant Professor, University of Illinois at Springfield, One University Plaza, Springfield, IL, 62703, United States, xpan1@uis.edu

1 - Designing the Stock Trading Processes by Utilizing Six Sigma Method

Hsueh-Ming Stev Wang, Assistant Professor, Chang Gung University, 259 Wen Hua 1st Rd, Kwei-Shan, Tau-Yuan, Taiwan, steve@mail.cgu.edu.tw

This research uses Six Sigma method to construct a new trading process in the Proprietary Trading Department of a securities house. the empirical operating benefits through testing of samples, from Taiwan 50 Exchange Traded Funds in two different periods were analyzed. The results show that RSI is the important key factor for the stock trading process. Six Sigma methods not only can apply in the industry well but also can be used in financial institutions as well.

2 - Application of Risk Analysis to Economic Factors

Marc Rose, Manager, OR Division, MCR, LLC, 600 Maryland Ave, SW, Suite 700, Washington, DC, 20024, United States, mrose@mcri.com, Gabriela Rohlck

Application and demonstration of risk analysis techniques applied to economic analysis/return on investment. Included is a synopsis of cost & benefits risk analysis with the application of correlation to develop high confidence estimates. We will then use these results to perform component allocation and return on investment (B/C, NPV, IRR) estimates.

3 - The Similairties between SPC and VaR: Applying Quality Control Methods in Risk Control.

Xia Pan, Assistant Professor, University of Illinois at Springfield, One University Plaza, Springfield, IL, 62703, United States, xpan1@uis.edu

Statistical process control (SPC) method has been a popular methods used in Quality control for decades in production and manufacturing. On the other hand, Value-at-Risk (VaR) has just about ten year history in financial industy specifically in banking business, started from JP Morgan's introduction of RiskMetric and the rugualtions by Bank of International Settlement. However, ther are a lot of similaritis between these two methods. This paper will discuss the similarities and differences.

4 - Efficient Monte Carlo Methods for Convex Risk Measures

Stefan Weber, Cornell University, 279 Rhodes, ORIE, Ithaca, NY, 14853, United States, sweber@orie.cornell.edu, Joern Dunkel

We discuss efficient MC methods for the estimation of convex risk measures in portfolio credit risk models. We focus on the Utility-based Shortfall Risk measures (SR) which do not share the deficiencies of the current industry standard VaR. The analysis of large financial losses in realistic portfolio models requires extensive numerical simulations. In the present paper we demonstrate that importance sampling can be used to construct efficient estimators for SR.

■ SC31

Auctions in the Supply Chain

Cluster: Applications of Auction and Game Theory

Invited Session

Chair: David Wu, Lehigh University, 27 Memorial Drive West, Bethlehem, Pa, United States, david.wu@lehigh.edu

1 - Procurement in the Presence of Learning by Doing

Wedad Elmaghraby, University of Maryland, Wedad_Elmaghraby@rhsmith.umd.edu, Se-Kyoung Oh

Under an erosion rate policy, the buyer initially competitively awards production to the lowest-bid supplier via an auction. Before the auction takes place, the buyer makes it clear to the suppliers that, if chosen, a sequence of price reductions will be mandatory in subsequent periods. In this paper, we study the design of the optimal eroding price schedule. We go on to compare the performance of the erosion rate policy against other popular procurement mechanisms.

2 - Procurement Auctions with Supply Constraints

G. Anandalingam, University of Maryland, Van Munching Hall, College Park, MD, 20742, United States, ganand@rhsmith.umd.edu, Abhishek Pani

Many organizations conduct repeated auctions to procure goods, materials and services. Suppliers with capacity constraints who win procurement deals in one auction may be too strapped to participate in a subsequent auction. We present a model that determines an optimal bidding schedule for suppliers with capacity constraints. We examine the impact on the buying organization as well.

3 - Procurement Auctions for Capacity-Bound Suppliers

Serkan Ozkan, Ph. D. Candidate, Lehigh University, 200 W. Packer Ave, Bethlehem, PA, 18015, United States, seo4@lehigh.edu, David Wu

In this study, we conduct a competitive equilibrium analysis for the repeated (sequential) procurement auctions. We consider capacitated suppliers (bidders), each with a U-shaped cost function that captures the economies (and diseconomies) of scale in bidding quantity. Cases with both homogenous and non-homogenous bidders are considered in a symmetric incomplete information setting. We derive key mechanism design results for this repeated auction using Myerson's framework.

■ SC32

Quality and Reliability

Contributed Session

Chair: HyunWoo Cho, Research Associate, University of Tennessee, 307 East Stadium Hall, Knoxville, TN, 37996, United States, hwcho@postech.ac.kr

1 - Development of the Dining Experience Scorecard

Tsu-Hong Yen, Associate Professor, San Jose State University, One Washington Square, San Jose, CA, 95192-0211, United States, yen@casa.sjsu.edu, Gonzaga da Gama, John R. Collins, Colin Johnson

The transition from service economies to experience economies in the post-industrial era (Pine and Gilmore, 1999) has resulted in changing service operations priority from customer services to customer experience. This study, using a restaurant as an example, develops the "Dining Experience Scorecard" which integrates the customer's dining experience and managerial financial performance. Results from the study could be applied to service design, service operations, and revenue management.

2 - How Did TQM Affect Customer Satisfaction Among Quality Award Winners In Europe?

Mehmet Ceyhan, Ph.D. Student, Northeastern University, 360 Huntington Avenue, Boston, MA, 02115, United States, erkanceyhan2000@yahoo.com, Fatma Pakdil, Emanuel Melachrinoudis

TQM is one of the most effective management strategies to reach high-level corporate performance for organizations aiming to gain competitive advantage. This study examines the impact of TQM on customer-related performance based on an empirical study performed among EFQM and TUSIAD-KalDer Quality Award Winners between 1993 and 2003.

3 - A Multicriteria Decision Framework for Customer-preference Based Process Target Optimization

Srikrishna Govindaluri, Assistant Professor of Management, Ramapo College of New Jersey, 505 Ramapo Valley Rd., Mahwah, NJ, 07430, United States, sgovinda@ramapo.edu

The process target problem as studied in the literature involves selecting a process mean that minimizes sum of rejection costs and quality loss with respect to prespecified specification limits. Although this problem is widely discussed from a monetary viewpoint customer preferences are often neglected. Therefore, a multiobjective decision framework is proposed to integrate customer preferences in to the process target problem with multiple quality characteristics.

4 - ISO 9000: A Proposed Model of Indirect Financial Performance Benefits

Victor Wayhan, Ph.D., Assistant Professor of Management, Sam Houston State University, Box 2056, Huntsville, TX, 77341, United States, vwayhan@shsu.edu, Erica Balderson

Empirical research that has explored the impact of ISO 9000 certification on financial performance has presumed and tested direct effects, often with contradictory findings. As an alternative, an indirect model is proposed that links ISO 9000 certification with financial performance through two intervening constructs: cost structure and productivity.

5 - Use of Kernel Based Nonlinear Discriminant Analysis for Classifying Fault Data

HyunWoo Cho, Research Associate, University of Tennessee, 307 East Stadium Hall, Knoxville, TN, 37996, United States, hwcho@postech.ac.kr, Myong K. Jeong

For productivity and quality improvement, multivariate statistical techniques such as principal component analysis (PCA) and Fisher discriminant analysis (FDA) have been developed to solve a fault diagnosis problem of batch processes. In this work we propose a kernel based nonlinear diagnosis model using kernel FDA. A case study on two batch processes has been conducted, and the performance of the proposed method was compared with that of an existing diagnosis method based on linear FDA.

■ SC33

Panel Discussion: New Research Directions in Process Monitoring

Sponsor: Quality, Statistics and Reliability
Sponsored Session

Chair: Fugee Tsung, Associate Professor, Hong Kong University of Science and Techonology, IELM Department of HKUST, Kowloon, Hong Kong, season@ust.hk

1 - Panel Discussion: New Research Directions in Process Monitoring

Moderator: Fugee Tsung, Associate Professor, Hong Kong University of Science and Techonology, IELM Department of HKUST, Kowloon, Hong Kong, season@ust.hk, Panelists: Bill Woodall, Douglas Montgomery, Joe H. Sullivan, George Runger, Tze Leung Lai, Jan Shi

This panel will invite six research leaders in the statistical process control (SPC) area to share their views on new challenges, methodologies, and visions in quality control research.

■ SC34

Reliability Testing and Modeling

Sponsor: Quality, Statistics and Reliability
Sponsored Session

Chair: Yong Chen, University of Iowa, Mechanical and Industrial Engineering, Iowa City, IA, United States, yongchen@engineering.uiowa.edu

1 - Multi-Component Degradation Modeling in Large Scale Systems

Yong Chen, University of Iowa, Mechanical and Industrial Engineering, Iowa City, IA, United States, yongchen@engineering.uiowa.edu, Nagi Gebraeel

This research develops multi-component degradation models for monitoring degradation of large scale systems. Specifically, we investigate several classes of stochastic degradation models coupled with a random effects linear model to compute residual life distributions of partially degraded components. This methodology is validated using real world vibration-based degradation data from rolling element bearings.

2 - Reliability Inference Based on A Class of Nonhomogeneous Gaussian Processes

Xiao Wang, Department of Statistics, University of Michigan, Ann Arbor, MI, United States, wangxiao@umich.edu, Vijay Nair

Recent advances in sensing and measurement technologies are making it feasible to collect extensive amounts of data on degradation. We propose a class of models, which are based on non-homogeneous Gaussian processes obtained through appropriate transformations of the Wiener process, for degradation data and describe their application for reliability inference.

3 - X-Testing using Binary Data with Applications to Reliability

David Mease, dmease@stat.berkeley.edu, Vijay Nair

Reliability demonstration plans are used to verify that reliability exceeds a specified target. When this target is close to 100%, traditional plans require extremely large sample sizes and have low power. In this talk, we consider the use of extreme testing, or "X-testing", to deal with these problems.

4 - Semi-parametric Likelihood Estimation with Estimating Equations in Accelerated Life Testing

Ni Wang, Ph.D. Student, Georgia Institute of Technology, Industrial and Systems Engineering, 765 Ferst Drive NW, Atlanta, GA, 30332, United States, gtg586c@mail.gatech.edu, Jye-Chyi Lu, Paul Kvam, Di Chen

This paper uses the empirical likelihood to model accelerated life test data. Structures about acceleration function and distribution moments are included in estimating equations for improving estimating efficiency and inference accuracy. Impact of mis-specifying the acceleration function or lifetime distribution is investigated via asymptotic derivations. A real-life example illustrates the potential of the proposed method.

■ SC35

RASIG Roundtable: Part I

Sponsor: Railroad Applications
Sponsored Session

Chair: Michael Gorman, Assistant Professor, University of Dayton, Dept. of MIS/OM/DSC, 300 College Park, Dayton, OH, 45469-2130, United States, michael.gorman@udayton.edu

1 - Service Design and Capacity Planning at BNSF

Richard Margl, BNSF, richard.margl@bnsf.com

I will discuss capacity planning from a service design perspective at BNSF. Capacity planning generally occurs at three levels: 1) strategic capital planning, 2) development of a base service plan and 3) operations tactical planning. I will present a brief summary of the challenges that pose difficulties for efforts to manage and optimize capacity utilization, as well as a perspective on the areas of greatest opportunity for Operations Research methodologies.

2 - Yield and Capacity Management

Reilly McCarren, jrmccarren@comcast.net

I will relate my experiences conducting yield and capacity management at Wisconsin Central.

3 - Integrated Capacity and Financial Modeling

Larry Shughart, Innovative Scheduling, larry@InnovativeScheduling.com

Mr. Shughart will present a model that links railroad capacity utilization to the financial performance of a railroad. He will examine the relationship of Pricing, Network and Productivity Capacity to the Operating Ratio. We will empirically examine the important capacity drivers, and indicate if each driver is largely a management/strategic variable or if the driver can be significantly improved with the application of OR techniques

4 - Capacity Planning at CSX

Lawrence Ratcliffe, CSX, Lawrence_Ratcliffe@csx.com

I will discuss my experience at CSX conducting capacity planning from a financial perspective.

■ SC36

Simulation Optimization Methods and Applications In The Medical, Voting, and Software Industries

Sponsor: Simulation
Sponsored Session

Chair: Theodore Allen, Associate Professor, The Ohio State University, 1971 Neil Avenue, 210 Baker Systems, Columbus, OH, 43210, United States, allen.515@osu.edu

1 - Simulation In Scientific Software Development

Mike Bernshteyn, Partner, Sagata Ltd., 6205 Somerled Ave, Suite 407, Montreal, QC, H3X2B5, Canada, mberns@sagata.com, Theodore Allen

We will describe challenges and solutions relating to Monte Carlo and other forms of simulation in the development of statistical software. Issues will include the development and deployment of test cases, time predictions for scientific calculations, and the associated user interface issues.

2 - Multi-Fidelity Technology For Discrete Event Simulation Optimization with Applications In Hospitals

Deng Huang, Principal Research Scientist, Scientific Forming Technologies Corporation, 5038 Reed Road, Columbus, OH, 43220, United States, dhuang@deform.com, Theodore Allen, Jason Schenk, Ning Zheng

It is expensive to make highly detailed simulation models to explore different design options. Simpler models are cheaper, but there is a loss. This talk describes "multi-fidelity" technology that can keep optimization costs down by supplementation using simpler models, while producing high quality solutions. Applications in hospitals illustrate the methods.

3 - A Simulation Optimization Method For Maximizing Success Probabilities

Ning Zheng, Graduate Teaching Assistant, The Ohio State University, 1971 Neil Avenue, 210 Baker Systems, Columbus, OH, 43210, United States, zheng.481@osu.edu, Theodore Allen

The problem of finding the binomial population with the highest success probability is considered when the number of binomial populations is large. The first rigorous indifference zone subset selection procedures and genetic algorithm extensions are proposed. Computational comparisons are also described focusing on optimal experimental planning applications.

4 - Optimally Allocating Voting Machines to Precincts In Future Presidential Elections

Steven Hertzberg, Project Director, Election Sciences Institute, 2269 Chestnut Street, Suite 611, San Francisco, CA, 94123, United States, steven@electionscience.org, Mike Bernshteyn, Theodore Allen, Fritz Scheuren

During the 2004 Presidential Election voters in Franklin County, Ohio experienced some of the longest wait times in the country. This collaborative research between the Franklin County Board of Elections and the Election Science Institute will explore the optimal allocation of machines to precincts using available data. A method including input analysis and optimization will be described. U.S. nation-wide deployment issues will be discussed together with remaining challenges.

■ SC37

Queueing Networks Approximations

Sponsor: Applied Probability
Sponsored Session

Chair: John Hasenbein, Professor, University of Texas at Austin, 1 University Station, C2200, Austin, TX, 78712, United States, jhas@mail.utexas.edu

1 - Dynamic Scheduling in a Fading Downlink Channel Driven by a Mean-Reverting Diffusion
Konstantinos Zachariadis, Ph.D. Student, Northwestern University, kez@chione.ece.northwestern.edu, Baris Ata

We consider a novel model of a dynamic scheduling problem in a multi-user downlink channel, where each user's channel state follow a mean reverting diffusion process, effecting the quality of service. We derive a non-greedy optimal policy that minimizes the long-run average delay penalties. A fast-fading asymptotic regime is also discussed.

2 - A Diffusion Approximation for a Many Server Queue with a Finite Population
Otis Jennings, otisj@duke.edu, Francis de Vericourt

Consider a sequence of closed queueing networks, each with a finite population of jobs that alternate between up and down states. Jobs in the up state shift spontaneously to the down state. Upon achieving the down state, jobs enter a many-server queue and, once processed, are restored to the up state. Shifting times and processing times are exponential. We prove a heavy traffic limit theorem in the Halfin-Whitt regime and explore the asymptotic system performance under various staffing schemes.

3 - Congestion Collapse in Load-Sensititve Processing Networks
David Alderson, Postdoctoral Scholar, California Institute of Technology, 1200 E. California Blvd., MC 107-81, Pasadena, CA, 91125, United States, alderd@cds.caltech.edu

I will review recent work on the behavior and control of load-sensitive processing networks—systems with stations that are susceptible to "congestion-induced collapse", in the sense that their output rate tends toward zero as their system workload gets large. Leveraging stochastic flow models and their deterministic (fluid) counterparts, we characterize key features of system behavior and consider several different management policies for achieving optimal throughput while preventing collapse.

4 - Optimal Draining of Fluid Networks with Stochastic Parameters
Burak Buke, PhD Student, The University of Texas at Austin, 1 University Station C2200, Austin, TX, 78712, United States, bukeb@mail.utexas.edu, John Hasenbein, David Morton

When parameters of the system are deterministically known, close-form solutions can be found to drain a fluid network in minimum time. However, things can get complicated when the deterministic parameters assumption is relaxed. In this work, we analyze the similarities and differences between the deterministic and stochastic settings. We also employ stochastic programming techniques to solve the stochastic parameters case.

■ SC38

Applications in Cone Programming

Cluster: Linear/Nonlinear Programming
Invited Session

Chair: Samuel Burer, Assistant Professor, University of Iowa, Department of Management Scienes, S346 Pappajohn Business Building, Iowa City, IA, 52242-1000, United States, samuel-burer@uiowa.edu

1 - A New Algorithm for Solving the Hypergraph Bisection Problem with Semidefinite Programming
Changhui Choi, Graduate Student, University of Iowa, Department of Management Scienes, S210 Pappajohn Business Building, Iowa City, IA, 52242-1000, United States, laplacia@hotmail.com, Samuel Burer

Hypergraph bisection is an important problem in computer circuit design. We present a method to formulate this problem as a quadratically constrained quadratic programming problem, which is equivalent to the original problem. Then, we relax it as a semidefinite program (SDP). We present a new approach for heuristically solving the hypergraph bisection problem using SDP.

2 - The Computation of Steiner Minimal Trees in Euclidean d-Space
Marcia Fampa, UFRJ, UFRJ - COPPE/PESC, CT, Bl. H, s. 319, Cidade Universitaria, C.P. 68.511, Rio de Janeiro, RJ, 21941-972, Brazil, marcia-fampa@uiowa.edu

We present a mathematical programming formulation for the Euclidean Steiner problem, which asks for the shortest network interconnecting a set of terminals in d-space. We consider the computation of lower bounds on the length of Steiner minimal trees and discuss their incorporation into a branch-and-bound framework.

3 - A Semidefinite Optimization Approach for Row Layout Problems
Miguel Anjos, Assistant Professor, University of Waterloo, 200 University Avenue West, Waterloo, ON, N2L 3G1, Canada, anjos@cheetah.vlsi.uwaterloo.ca, Anthony Vannelli

The row layout problem is concerned with finding a placement of facilities with varying dimensions on one or more parallel rows so as to minimize the total cost arising from their pairwise connectivities. We propose a semidefinite programming approach that provides feasible placements as well as a global lower bound on the optimal value of the problem. Computational results show that the placements obtained are consistently within a few percentage points of the global optimal solution.

■ SC39

Special Topics in Nonlinear Programming

Contributed Session

Chair: Bogumila Lai, Assistant Professor, St. Joseph's College, 155 West Roe Boulevard, Patchogue, NY, 11772, United States, blai@sjcny.edu

1 - Curve Smoother for an Autonomous Vehicle
Holly Jin, Postdoctoral Researcher, Stanford University, Terman Engineering Building, Stanford University, Stanford, CA, 94305, United States, hollyjin@stanford.edu, Michael Saunders

The DARPA Grand Challenge is an off-road robot competition to promote research on autonomous vehicles. In this year's race, vehicles must navigate 175 miles through desert terrain in less than 10 hours with no human intervention. We describe an optimization model and an iterative algorithm to generate a smooth curve for a vehicle to follow, given corridor data released two hours before the race. The model is solved by SNOPT.

2 - An Optimal Learning Algorithm for Purchasing Assets Over Time
Warren Powell, Professor, Princeton University, Dept of Oper Res and Fin Eng'g, Princeton, NJ, 08544, United States, powell@princeton.edu, Juliana Nascimento

We describe an adaptive learning algorithm for the problem of purchasing assets at randomly varying prices over time to meet an uncertain demand in the future. We generalize the SPAR algorithm for two-stage problems to this multistage setting, where piecewise linear functions are estimated from exogenous information. We prove convergence, combining concepts from approximate dynamic programming and stochastic programming. Convergence does not require explicit exploration strategies.

3 - Generalized Poincare-Hopf Theorem for Compact Nonsmooth Regions
Alp Simsek, MIT, 77 Massachusetts Avenue, Cambridge, MA, 02142, United States, alpstein@mit.edu, Daron Acemoglu, Asu Ozdaglar

We present an extension of the Poincare-Hopf Theorem to generalized critical points of a function on a compact region with nonsmooth boundary, M, defined by a finite number of smooth inequality constraints. We use the extended Poincare-Hopf Theorem to present sufficient conditions for the uniqueness of stationary points of nonconvex optimization problems.

4 - Dual Methods for Probabilistic Optimization Problems
Bogumila Lai, Assistant Professor, St. Joseph's College, 155 West Roe Boulevard, Patchogue, NY, 11772, United States, blai@sjcny.edu, Darinka Dentcheva, Andrzej Ruszczynski

We consider nonlinear stochastic optimization problems with probabilistic constraints. The concept of a p-efficient point of a probability distribution is used to derive equivalent problem formulations. Two algorithms are developed for solving the dual problem. Numerical illustration will be presented to solve a bond portfolio problem with probabilistic liquidity constraint.

■ SC40

Networking Issues

Sponsor: Optimization/ Network Optimization
Sponsored Session

Chair: Ramesh Johari, Assistant Professor, Stanford University, Mgmt. Sci. and Eng., Terman Eng. Ctr., Room 319, Stanford, CA, 94305, United States, ramesh.johari@stanford.edu

1 - Using Symmetry To Compute In Faulty Networks
David Pritchard, University of Waterloo, 290 Westcourt Place, Waterloo, ON, N2L 2R7, Canada, daveagp@gmail.com, Santosh Vempala

Motivated by sensor nets and amorphous computing, we investigate fault-tolerant distributed computing. Many known algorithms for dynamic networks rely on symmetry: at each point in time, all nodes perform the same symmetric local computation. We show several fault-tolerant algorithms following this design principle, including ones for leader-based clustering, biconnectivity, and network traversal. We show how agents are useful, and give a simple description of Tarjan's maximum flow algorithm.

2 - Triangulation and Embedding using Small Sets of Beacons
Alex Slivkins, Computer Science Dept, Cornell University, Ithaca, NY, 14853, slivkins@cs. cornell.edu, Jon Kleinberg, Tom Wexler

Node-to-node latencies is a notion of distance in the Internet. For emerging peer-to-peer applications it is useful to represent this distance via coodinates in a low-dimensional Euclidean space and, moreover, compute these coordinates in a decentralized fashion, with low overhead on participating nodes. In particular, each node is allowed only a near-constant #distance measurements. This is in sharp contrast with the theoretical work on metric embeddings which assumes full (and centralized) access to the distance matrix. Here we bridge this gap between theory and applications.

3 - Power Optimization for Connectivity Problems
Vahab S. Mirrokni, MIT, Computer Science and Artificial Intelligence Laboratory, 32 Vassar Street, Room 32G-580, Cambridge, MA, 02139, mirrokni@theory.lcs.mit.edu

In this talk, we study power optimization problems motivated by applications in fault-tolerant wireless multi-hop networks. Given an edge-weighted graph, the power of each node is the cost of the maximum edge connected to this node and the power of the graph is the sum of the powers of the nodes of this graph. We design $\min(4k,O(\log^4(n))$ and $\sqrt(n)$-approximation algorithms for the minimum power k-connected and k-edge connected subgraph problems. We also present hardness results for different variants of this problem.

4 - Contract-Based Models for Network Formation
Ramesh Johari, Assistant Professor, Stanford University, Mgmt. Sci. and Eng., Terman Eng. Ctr., Room 319, Stanford, CA, 94305, United States, ramesh.johari@stanford.edu, Shie Mannor, John Tsitsiklis

We consider a network game where the nodes of the network wish to form a graph to route traffic between themselves. We present a model where costs are incurred for routing traffic, as well as for a lack of network connectivity. We study the structure of connected stable networks, best response dynamics, and efficiency properties for several special cases.

■ SC41

QUBO: Quadratic Unconstrained Binary Optimization

Sponsor: Optimization/ Integer Programming
Sponsored Session

Chair: Peter L. Hammer, Director, RUTCOR, Rutgers University, 640 Bartholomew Road, Piscataway, NJ, 08854, United States, hammer@rutcor.rutgers.edu

1 - Preprocessing QUBO Problems
Peter L. Hammer, Director, RUTCOR, Rutgers University, 640 Bartholomew Road, Piscataway, NJ, 08854, United States, hammer@rutcor.rutgers.edu, Endre Boros, Gabriel Tavares

We present applications of roof-duality and other techniques for determining optimal values of subsets of variables, finding binary relations between optimal values of pairs of variables, and decomposing problems into pair-wise disjoint smaller ones. Applications include optimal solutions of stability problems in planar graphs with 500,000 vertices.

2 - Local Optimization of Quadratic Pseudo-Boolean Functions
Endre Boros, Professor, Rutgers University, RUTCOR, 640 Bartholomew Road,, Piscataway, NJ, 08854, United States, boros@rutcor.rutgers.edu, Gabriel Tavares, Peter L. Hammer

We propose a family of heuristics which start from a possibly fractional point and change iteratively the values of variables. Comparative computational studies on problems with thousands of variables and hundreds of thousands of terms indicate both the efficiency and effectiveness of the proposed methods.

3 - Exact Methods for QUBO
Gabriel Tavares, Rutgers University, RUTCOR, Piscataway, NJ, 08854, United States, gtavares@rutcor.rutgers.edu, Endre Boros, Peter L. Hammer

We propose an exact branch-and-bound type algorithm for quadratic 0-1 optimization using a combination of theoretical results, repeated preprocessing, and fast heuristics. The efficiency of the proposed method is demonstrated in a comparative study on benchmarks and on randomly generated problems.

■ SC42

Risk-Averse Stochastic Optimization

Sponsor: Optimization/ Stochastic Programming
Sponsored Session

Chair: Andrzej Ruszczynski, Rutgers University, 94 Rockafeller Road, Piscataway, NJ, 00854, United States, rusz@business.rutgers.edu

1 - Optimization Under Stochastic Dominance Constraints
Andrzej Ruszczynski, Rutgers University, 94 Rockafeller Road, Piscataway, NJ, 00854, United States, rusz@business.rutgers.edu, Darinka Dentcheva

We consider optimization problems with stochastic dominance constraints of first and second order. We develop optimality and duality theory for these problems. We show that von Neumann utility functions play the role of Lagrange multipliers associted with these constraints. We show that the second order dominance constraint is a convexification of the first order constraint. We also discuss the construction of numerical methods for these problems.

2 - Valid Inequalities for First Order Stochastic Dominance Constraints
Nilay Noyan, Graduate Assistant, RUTCOR Rutgers, the State University of New Jersey, 640 Bartholomew Road, Piscataway, NJ, 08854, United States, noyan@rutcor.rutgers.edu, Andrzej Ruszczynski

We introduce a mixed 0-1 knapsack formulation of a discrete first-order dominance constrained optimization model. The main challenge is the potential non-convexity of the feasible region. By restating the inequalities arising from the underlying combinatorial structure as logical conditions simple disjunctions are obtained. We generate cuts that are valid inequalities for the corresponding disjunctive relaxations by applying the lift-and-project procedure, developed by Balas et al., 1993.

3 - A Dual Approach to Linear Stochastic Optimization Problems with Second Order Dominance Constraints
Gabor Rudolf, Graduate Assistant, RUTCOR - Rutgers University, 640 Bartholomew Rd, Piscataway, NJ, 08854, United States, grudolf@rutcor.rutgers.edu, Andrzej Ruszczynski

We develop a duality theory for linear stochastic optimization problems involving second-order dominance constraints. The main feature of our approach is the reduction of the index space of dual variables by applying Strassen's theorem on the existence of measures on product spaces with given marginals. In particular, in the discrete case this leads to a dual solution method via column generation featuring a quadratic reduction in the number of variables.

4 - Deviation Measures in Optimization and Risk Analysis
Michael Zabarankin, assistant professor, Stevens Institute of Technology, Department of Mathematical Sciences, Hoboken, NJ, 07030, United States, mzabaran@stevens.edu, R. Tyrrell Rockafellar, Valeriy Ryabchenko

The role of deviation measures and risk measures in optimization is analyzed, and the possible influence of "acceptably free lunches" is thereby brought out. Optimality conditions based on concepts of convex analysis, but relying on the special features of risk envelopes, are derived in support of a variety of potential applications, such as portfolio optimization and variants of linear regression in statistics.

■ SC43

Joint Session Computing/ Health: Computational Biology and Bioinformatics

Sponsor: INFORMS Computing Society/ OR and Biomedicine, Health Applications
Sponsored Session

Chair: J. MacGregor Smith, Professor, University of Massachusetts, Elab Building, Amherst, MA, 01003, United States, jmsmith@ecs.umass.edu

1 - New Advances on Solving the Protein Folding Protein in 3D HP Lattice Model
Cesar Rego, Associate Professor, University of Mississippi, University, Oxford, MS, 38677, United States, crego@bus.olemiss.edu, Haitao Li, Fred Glover

A new dynamic and adaptive search method has proved to be highly successful for solving the two-dimensional HP lattice model. We extend this method to the three-dimensional model, yielding a new advance for handling practical applications in 3D protein folding.

2 - Novel Approaches for Analyzing Biological Networks
Wel Wilhelm, Professor, Texas A&M University, TAMUS 3131, College Station, TX, 77843-3131, United States, wilhelm@tamu.edu, Balabhaskar Balasundaram, Svyatoslav Trukhanov, Sergiy Butenko

This paper proposes clique relaxations to identify clusters in biological networks. In particular, the maximum n-clique and maximum n-club problems on an arbitrary graph are introduced and their recognition versions are shown to be NP-complete. In addition, integer programming formulations are proposed and the results of sample numerical experiments performed on biological networks are reported.

3 - Steiner Minimal Trees, Twist Angles and the Protein Folding Problem
J. MacGregor Smith, Professor, University of Massachusetts, Elab Building, Amherst, MA, 01003, United States, jmsmith@ecs.umass.edu

The Steiner Minimal Tree (SMT) problem determines the minimal length tree network for connecting a given set of vertices in 3-dimensional space. SMTs are also useful in modelling minimum energy configurations such as though in proteins. With the SMT topologies, we can define planes within the amino acids and in the backbone topology that have a surprising regularity property. Computational experience with these twist angle properties is demonstrated for the protein folding problem.

■ SC44

Vehicle Routing

Sponsor: INFORMS Computing Society
Sponsored Session

Chair: Edward Wasil, Professor of Management Science, American University, Kogod School of Business, Washington, DC, 20016, United States, ewasil@american.edu

Co-Chair: Bruce Golden, Professor, Robert H. Smith School of Business, University of Maryland, College Park, MD, 20742, United States,
bgolden@rhsmith.umd.edu

1 - Multiple-Penalty Compressed Annealing with Application to the VRPTW

Jeffrey Ohlmann, Assistant Professor, Department of Management Sciences, University of Iowa, Iowa City, IA, 52242, United States, jeffrey-ohlmann@uiowa.edu, Barrett Thomas

This talk describes a variant of simulated annealing incorporating a variable penalty method with multiple penalty multipliers. After an analytic discussion of the behavior of this stochastic search algorithm, we consider its application to the VRPTW. We relax time window constraints and vehicle capacity constraints with two distinct penalty terms. Appropriately varying the two corresponding penalty multipliers, we search the relaxed solution space for the optimal solution.

2 - An Efficient Variable Neighborhood Search Heuristic for Huge Scale Vehicle Routing Problems

Michel Gendreau, Professor, Center for Research on Transportation, University of Montreal, Montreal, Canada, michelg@crt.umontreal.ca, Olli Braysy, Jari Kytojoki, Teemu Nuortio

We present a variable neighborhood search heuristic for the capacitated VRP that is specifically aimed at solving very large scale real-life instances. Computational results on existing benchmarks, as well as on 20 new huge scale instances, show that the method can find high-quality solutions for instances with up to 20,000 customers within reasonable CPU times.

3 - A New Heuristic and Test Problems for the Vehicle Routing Problem with Split Deliveries

Si Chen, Robert H. Smith School of Business, University of Maryland, College Park, MD, 20742, United States, Si_Chen@rhsmith.umd.edu, Bruce Golden, Edward Wasil

In the split delivery vehicle routing problem (SDVRP), a customer's demand can be split between two or more vehicles. We describe a new heuristic for the SDVRP that is based on integer programming and apply it to test problems taken from the literature and to new benchmark problems that we have developed. The computational results indicate that our new heuristic generally outperforms well-known SDVRP heuristics including tabu search.

4 - Solving the Open Vehicle Routing Problem: New Heuristic and Test Problems

Feiyue Li, Department of Mathematics, University of Maryland, College Park, MD, 20742, United States, lify@math.umd.edu, Edward Wasil, Bruce Golden

In the open vehicle routing problem (OVRP), a vehicle does not return to the depot after servicing the last customer on a route. We describe a new heuristic for the OVRP that is based on record-to-record travel and apply it to sixteen test problems taken from the literature and to new benchmark problems that we have developed. The computational results indicate that our new heuristic performs well when compared to existing OVRP heuristics including threshold accepting and tabu search.

■ SC45

Vehicle Routing

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Karen Smilowitz, Northwestern University, 2145 Sheridan Rd, Dept of IE/MS, Evanston, IL, 60208, United States, ksmilowitz@northwestern.edu

1 - Vehicle Routing Problem with Time Windows

Marius Solomon, College of Business Administration, Northeastern University, m.solomon@neu.edu, Brian Kallehauge, Jesper Larsen, Oli B.G. Madsen

In this paper we discuss advances in the column generation approach for Vehicle Routing Problem with Time Windows. We address cuts, master problem acceleration strategies and the subproblem solution and report recent computational results for the classic Solomon test sets.

2 - Seaport Drayage Routing Given a Time Slot Appointment System

Rajeev Namboothiri, Georgia Tech, rnamboot@isye.gatech.edu, Alan Erera

We study truck operations for a seaport drayage company serving a port where access is controlled via a time-dependent slot appointment system. For a given operational period, the drayage company is allotted a fixed number of container gate moves during each half-hour time slot during the day. We develop heuristic algorithms based on column generation for determining near-optimal container slot selections and truck routing plans.

3 - The Pickup and Delivery Problem Split Loads

Maciek Nowak, mnowak@georgiasouthern.edu, Ozlem Ergun, Chelsea C. White, III

We generalize the Pickup and Delivery Problem to allow for multiple vehicles to service a common load requiring delivery. We find the upper bound on the benefit of allowing split loads. A heuristic is developed to solve large scale problems, with experimental results supporting the structural results. Finally, the heuristic is applied to a real world problem.

4 - The Multiple Choice Elementary Constrained Shortest Path Problem

Karen Smilowitz, Northwestern University, 2145 Sheridan Rd, Dept of IE/MS, Evanston, IL, 60208, United States, ksmilowitz@northwestern.edu, Guangming Zhang

This paper considers a variation of the Elementary Constrained Shortest Path Problem (ECSPP) in which nodes are separated into subsets and a feasible path through the network may contain at most one node from each subset. This problem arises as a subproblem in a column generation solution method for a variation of the vehicle routing problem.

■ SC46

Urban Transportation Planning Models III: Travel Demand Experiments and Models

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Shinya Kikuchi, Professor, University of Delaware, Civil and Environmental Engineering, Newark, DE, 19716, United States, kikuchi@ce.udel.edu

1 - Observability and Path Choice in Urban Networks

George List, Professor, Rensselaer Polytechnic Institute, JEC 4052, 110 Eighth St, Troy, NY, 12180, United States, listg@rpi.edu

GPS and RFID make it possible for vehicles to become probes. Flow patterns can be observed in real time. Optimal decisions can be made about signal timing, variable message signs, tolls, route guidance, etc. In an ATIS experiment, a fleet of 200 vehicles shared data about network congestion and made real time path choice decisions. New paths avoided incidents and congestion. This presentation describes the experiment, results, and challenges ahead.

2 - Improved Sampling and Prediction Techniques for Spatial Econometric Models

Chris Frazier, Analyst, PB Consult, 6100 Uptown Blvd. NE, Albuquerque, NM, 87110, United States, rawls@pbconsult.com

Due to the large computational demands of spatial econometric models, sampling is often necessary for feasible model estimation. This paper examines a sampling technique which exploits the assumptions of spatial econometric models by breaking the region being modeled down into smaller, more localized areas. Also explored is utilizing the model results for predictions, as well as how this sampling method compares with random techniques. Results for population and land use models are presented.

3 - Sensitivity Analysis of the Combined Travel Demand Model with Applications

Zhong Zhou, Ph.D Student, Civil and Environmental Engineering Department, Utah State University, Logan, UT, 84341, United States, zhongzhou@cc.usu.edu, Chao Yang, Anthony Chen

A sensitivity analysis for the combined travel demand model will be presented in this talk. Analytical expressions are explicitly derived for Oppenheim's model, which combines travel-destination-mode-route choice. Applications of the sensitivity expressions will also be presented.

■ SC47

Optimization in Airline Planning I

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Diego Klabjan, Professor, University of Illinois at Urbana-Champaign, 1206 West Green Street, Urbana, IL, 61801, United States, klabjan@uiuc.edu

1 - Robust Fleet-assignment and Crew Integrated Planning Imposing Station Purity
Chungua Gao, Georgian Institute of Technology, 765 Ferst Drive, Atlanta, GA, United States, cgao@isye.gatech.edu, Ellis Johnson, Barry Smith

We study integrated fleet-assignment and crew planning problems, aiming at developing robust solutions relative to operations. Fleet purity and crew base purity are imposed, by limiting the number of fleet types and crew bases allowed to serve each airport. Taking advantage of airline network structure, the station decomposition method is extended to solve the problem, where the spoke plan includes connections, fleet type and crew base type assignment. Computational results are presented.

2 - Faster Pairing Solver by Solving Multiple Shortest Paths Simultaneously
Curt Hjorring, Carmen Systems, Odinsgatan 9, SE-411 03, Gothenburg, Sweden, curt.hjorring@carmensystems.com, Johan Ivarsson

The current practice at airlines is to solve a crew pairing problem for a single planned timetable. On the actual day of operation many changes to the timetable occur, due to mechanical failures, weather, and crew sicknesses. In this work we investigate various approaches that attempt to take this timetable uncertainty into account, and evaluate their effectiveness by running a simulation of the airline's operations, along with various recovery options. Over the last 20 years CPU performance has increased by 50% per year, while main memory speed has only increased by 7%. This relative slow down in memory speed has been partially compensated for by the addition of caches. However, for many programs the bottleneck is now memory access. We show that Carmen's pairing pricing algorithm is memory bound, but can be reorganised to significantly reduce the number of memory accesses, and thus improve overall performance.

3 - Dynamic Airline Scheduling: Models and Algorithms
Hai Jiang, MIT, 77 Massachusetts Ave, Room 1-235D, Cambridge, MA, United States, haijiang@mit.edu, Cynthia Barnhart

We develop flight schedule and fleet assignment models and methods to adjust airline networks dynamically during the booking process to adjust market capacity to match passenger demand. We utilize data from revealed and future demand forecasts and conduct experiments to investigate the benefits of our models and methods.

4 - Collaborative Logistics in the Air Cargo Industry
Lori Houghtalen, Ozlem Ergun, Joel Sokol

What are the characteristics of a profitable alliance among carriers and forwarders in the air cargo industry? We use various revenue allocation mechanisms and combinations of collaborators (carriers only, forwarders only, or both) to explore different alliance structures. First we determine, for a given network, a system optimal flow. We then vary system parameters (such as penalties paid by a carrier for the use of another carrier's leg, or capacity available to a specific forwarder) to achieve an equilibrium revenue allocation among collaborators.

■ SC48

Healthcare Decision Making

Sponsor: Health Applications
Sponsored Session

Chair: Liam ONeill, Asst Prof, Cornell University, 105 MVR Hall, PAM Dept., Ithaca, NY, 14853, United States, lo22@cornell.edu

1 - A Decision Analytic Model to Identify High-Cost, Uninsured Patients
Jami DelliFraine, jami.dellifraine@med.va.gov, Tiffany Radcliff, Murray Côté

We use internal claims and accounting data for calendar years 1999-2001 from a representative safety net facility to describe the distribution of costs and any characteristics that distinguish high-cost cases from other uninsured patients. Based on this data, we develop a decision analytic model to identify these high-cost, uninsured patients.

2 - Integrating DEA and GIS as Tools for Hospital Marketing
Liam ONeill, Asst Prof, Cornell University, 105 MVR Hall, PAM Dept., Ithaca, NY, 14853, United States, lo22@cornell.edu, Franklin Dexter

While some US hospitals have excess capacity, others are over-extended, without evidence that this relates to the latter providing higher quality or lower cost care. In this paper, Data Envelopment Analysis (DEA) is used to assess hospitals' "market capture" for inpatient, elective surgery. Geographic Information Systems (GIS) are used to identify geographic patterns of patient choice of hospitals, as well as the relative competitiveness of rural hospital markets.

3 - Bayesian Methods for Predicting Anesthesia and Radiological Times
Franklin Dexter, Professor, University of Iowa, Dept. of Anesthesia, Iowa City, IA, 52242, United States, franklin-dexter@uiowa.edu

Some radiological procedures rely on general anesthesia. Inaccurate anesthesia times for radiology hindered integration of anesthesia into enterprise-wide scheduling for radiology. Anesthesia times estimated by expert judgment had better face validity, internal consistency, and accuracy. Bayesian methods were also developed and validated to estimate upper and lower prediction bounds from the expert estimates. Bayesian methods were also accurate for operating room times.

4 - Calibrating an Individual Health Evolution Model for Long-term Care Decisions
Aparna Gupta, Asst Prof, Rensselaer Polytechnic Institute, 110 Eighth Street, Troy, NY, 12180, United States, guptaa@rpi.edu, Zhisheng Li

Quantifying uncertainties in the evolution of an individual's health is essential for planning of long-term healthcare financing. After constructing a comprehensive health indicator index and a health risk factor system, this paper calibrates a stochastic health evolution model using the National Health Interview Survey data.

■ SC49

Using the Precise Decision Language

Sponsor: Decision Analysis
Sponsored Session

Chair: Ron Howard, Professor, Stanford University, Terman Engineering Center 700-420, Stanford, CA, 94305-4026, United States, rhoward@sdg.com

1 - Learning, Teaching, and Using the Precise Decision Language
Ali Abbas, Assistant Professor, UIUC, 104 S Matthews Ave, Urbana, IL, 61801, United States, aliabbas@Stanford.edu

In this talk I will present my views learning the Precise Decision Language, then teaching it to graduate students at Stanford and UIUC, as well teaching it to high school students and high school math teachers with the Decision Education Foundation, and also to business executives.

2 - Experiential Learning and Strictly Proper Scoring Rules
Eric Bickel, Assistant Professor, Department of Industrial and Systems Engineering, Texas A&M University, 236B Zachry Engineering Center, 3131 TAMU, College Station, TX, 77843-3131, United States, ebickel@tamu.edu

Experiential learning is perhaps the most effective way to teach decision making. One such example of this is the scoring method used for exams in some decision analysis programs. This grading scheme is strictly proper and provides great insight into students' understanding of course material. We will discuss the properties of this scoring rule and demonstrate the insights that can be achieved by both students and instructors.

3 - Decision Concepts and Language in Practice
Ron Howard, Professor, Stanford University, Terman Engineering Center 700-420, Stanford, CA, 94305-4026, United States, rhoward@sdg.com

Organizations often confuse information issues and preference issues. Boards finding an alternative "too risky" may question either its characterization or their willingness to take on an alternative so characterized. Characterization concerns may be that "the probability of success is too high" or "the probability of failure is too low". With appropriate characterization, the question is desirability given company risk preference: "whether they have the stomach for it".

4 - Decision Analysis Terminology
Ross Shachter, Associate Professor, Stanford University, Terman Eng Ctr 416, 380 Panama Street, Stanford, CA, 94305-4026, United States, shachter@stanford.edu

I teach decision analysis to a class, including freshman undergraduates and graduate students in industry, using Ron Howard's lecture notes. Clarity in language plays a central role in the course and it applies to the course content as well. I will reflect on my experiences and some challenges we face.

■ SC50

Risk Analysis vs. Decision Analysis

Sponsor: Decision Analysis
Sponsored Session

Chair: Robin Dillon Merrill, Assistant Professor, Georgetown University, McDonough School of Business, 418 Old North, Washington, DC, 20057, United States, rld9@georgetown.edu

1 - Using Decision and Risk Analysis for Managing Low Probability Events
Howard Kunreuther, Cecilia Yen Koo Professor, 556 & 559 Jon M. Huntsman Hall, 3730 Walnut Street, Philadelphia, PA, 19104-6340, United States, kunreuth@wharton.upenn.edu

In evaluating alternatives for low probability high consequence events, limited available data to estimate the risks often leads to disagreements among experts. This talk illustrates the role that catastrophe models can play in characterizing the nature of the uncertainties associated with these risks and reconciling expert differences. Risk and decision analysts can then develop and choose between strategies for managing the risks associated with natural and technological hazards.

2 - Speaking the Truth in Maritime Risk Assessment
Jason Merrick, Associate Professor, Virginia Commonwealth University, P.O. Box 843083, 1001 W. Main St., Richmond, VA, 23284, United States, jrmerric@vcu.edu, Rene van Dorp

Several major risk studies have been performed in recent years in the maritime transportation domain. However, the National Research Council found our approach to be promising but incomplete, as the uncertainty in its results was not assessed. We combine two previously developed pieces of methodology to perform a full-scale assessment of risk and uncertainty for two case studies, studies of ferries in San Francisco Bay and the Washington State Ferries.

3 - Evaluating the Viability of 100 Percent Container Inspection at America's Ports
Susan Martonosi, MIT, sem18@mit.edu

As US maritime security adapts to the terrorist threat, we argue that quantitative analysis should be used to evaluate security initiatives and present a case study of one proposed measure - 100% scanning of containers entering the US. By assessing the minimum attack likelihood required to justify increased inspection costs, we conclude that 100% scanning is cost effective only if the attack damages or likelihood of an attack are quite high.

4 - Interpreting Near-Miss Events
Robin Dillon Merrill, Assistant Professor, Georgetown University, McDonough School of Business, 418 Old North, Washington, DC, 20057, United States, rld9@georgetown.edu

We examine how, why, and to what degree project managers incorporate precursor events (specifically, near-misses) into their decision-making process at key points in a program or mission, and whether an attention to these near-miss events influences interpretations of probabilities and propensity towards risk. This research will present results from a NASA-sponsored series of student experiments where the decision-maker had to make daily operations decisions for a Mars rover.

Sunday, 4:30pm - 6:00pm

■ SD01

Tutorial: Therapeutic Optimization via Markov Decision Processes

Cluster: Tutorials
Invited Session

1 - Tutorial: Therapeutic Optimization via Markov Decision Processes
Andrew Schaefer, Assistant Professor, University of Pittsburgh, Department of Industrial Engineering, Pittsburgh, PA, United States, schaefer@ie.pitt.edu

Models that create patient-specific treatment plans, known as therapeutic optimization models, are becoming increasingly important. In this tutorial, we describe how an enormous number of such decisions occur in a stochastic and dynamic environment, and lend themselves naturally to Markov decision process (MDP) formulations. We discuss various questions that arise in applying MDPs to practical therapeutic optimization problems, such as parameter estimation and structural properties. Finally, we describe ways of developing research relationships with clinicians.

■ SD02

Nicholson Student Paper Prize Competition, II

Cluster: Nicholson Student Paper Prize
Invited Session

Chair: Pinar Keskinocak, Associate Professor, Georgia Institute of Technology, School of Industrial and Systems, 765 Ferst Drive, Atlanta, GA, 30345, United States, pinar@isye.gatech.edu

Nicholson Student Paper Prize

This session features selected finalists in the Nicholson Student Paper Prize Competition. It represents an opportunity for faculty, professionals and other students to see some of the best research being performed by students. All are welcome.

1- Large Scale Semidefinite Programming with a Saddle Point Mirror-prox Algprithm
Zhaosong Lu,Zeev Nehari Visiting Assistant Professor, Carnegie Mellon University, Department of Mathematical Sciences, Pittsburgh PA 15213-3890, United States, zhaolu@andrew.cmu.edu

We first demonstrate that positive semidefiniteness of a large well-structured sparse symmetric matrix can be represented via positive semidefiniteness of a bunch of smaller matrices linked, in a linear fashion, to the matrix. We derive also the ``dual counterpart" of the outlined representation, which expresses the possibility of positive semidefinite completion of a well-structured partially defined symmetric matrix in terms of positive semidefiniteness of a specific bunch of fully defined submatrices of the matrix. Using the representations, we then reformulate well-structured large-scale semidefinite problems into smooth convex-concave saddle point problems, which can be solved by a Prox-method developed by Nemirovski (2004) with efficiency {\cal O}(\epsilon^{-1}). Implementations and some numerical results for large-scale Lov{\'a}sz capacity and MAXCUT problems are finally presented.

2- Two-Stage Robust Network Flow and Design under Demand Uncertainty
Muhong Zhang,University of California-Berkeley, 4141 Etcheverry Hall, Berkeley CA 94720, United States, mhzhang@ieor.berkeley.edu

Abstract not available at this time.

■ SD03

Teaching Case Competition II

Sponsor: Education (INFORM-ED)
Sponsored Session

Chair: Tasha R. Inniss, Assistant Professor of Mathematics, Spelman College, 350 Spelman Lane, SW, Box 320, Atlanta, GA, 30314-4399, United States, TInniss@spelman.edu

1 - Presentations of Finalists #3 and #4 for the Sixth Annual INFORMS Case Competition
Tasha R. Inniss, Assistant Professor of Mathematics, Spelman College, 350 Spelman Lane, SW, Box 320, Atlanta, GA, 30314-4399, United States, TInniss@spelman.edu

The four finalists for the 2005 INFORMS Case Competition will deliver final presentations of their cases to a panel of judges and the audience. All are welcome to attend and observe these presentations as well as to ask questions of the finalists. The winner of the competition will be selected by the judges at the end of the four presentations. The winner and runners-up will be announced at the INFORM-Ed Annual Business Meeting in San Francisco.

■ SD05

New Applications of Revenue Management

Cluster: Service Sector Operations
Invited Session

Chair: Diwakar Gupta, Professor and IE Director of Graduate Studies, University of Minnesota, Department of Mechanical Engineering, Minneapolis, MN, 55455, United States, guptad@me.umn.edu

1 - Revenue Management in Railways - Current Status and Future Directions in Indian Railways
Goutam Dutta, Professor, Indian Institute of Management Ahmedabad, Ahmedabad-380 015, Gujarat, India, goutam@iimahd.ernet.in

This paper starts with a survey of revenue management in railways. It discusses two major success stories in Europe (SNCF and Deutche Bahn). In the third part, it discusses the current practices of revenue management in the second largest railway in the world, Indian Railways. The paper concludes with the scope of application of future research in this area of transportation industry in the Indian context.

2 - Revenue Management for a Primary Care Clinic
Diwakar Gupta, Professor and IE Director of Graduate Studies, University of Minnesota, Department of Mechanical Engineering, Minneapolis, MN, 55455, United States, guptad@me.umn.edu, Lei Wang

Patients calling to book appointments at a primary care clinic make different choices. Some want an appointment on the same day, others prefer to schedule one for a future date; some visit only their designated doctor, others visit any doctor at the convenient time. This talk will describe various models for managing appointment systems to maximize clinic revenue. We also study the effect of patient loyalty, load imbalance and physicians' willingness to flex capacity.

3 - Profit Maximization in a B2B Cargo Overbooking Problem
Lama Moussawi, Ph.D. Candidate, The University of Texas at Dallas, 2601 N. Floyd Rd., SM30, School of Management, Richardson, TX, 75080, United States, lam018100@utdallas.edu, Metin Cakanyildirim

We formulate a two dimensional cargo overbooking problem. We discuss the weight and volume dependent revenues and costs. We show that the detailed problem is bounded and we provide formulations for the lower and upper bound problems. We solve the lower and upper bound models, compare their optimal solutions and perform a simulation to analyze their performances. Our results indicate that the lower bound model is a good approximation of the detailed model and is easy to implemented in practice.

4 - Allocation Policies based on Demand Aggregation in an Assemble-to-Order System
Fernando Bernstein, Associate Professor, Duke University, The Fuqua School of Business, 1 Towerview Drive, Durham, NC, 27708, United States, fernando@mail.duke.edu, Gregory DeCroix, Yulan Wang

We consider an assemble-to-order system where one or more components are common to multiple products. The common components are allocated based on demands and contribution margins for the products. We propose a collection of allocation mechanisms that differ in how demands are aggregated and satisfied, and explore their impact on sales revenues.

■ SD06

Managing Spreadsheet Risks

Sponsor: Spreadsheet Productivity Research
Sponsored Session

Chair: Janet Wagner, Associate Dean, UMASS Boston, CM Dean's Office, 100 Morrissey Blvd, Boston, MA, 02125, United States, janet.wagner@umb.edu

1 - Verifying Documentation Standards in Spreadsheet Analysis
Larry LeBlanc, Professor, Vanderbilt University, Owen Graduate School of Management, 401 21st Avenue South, Nashville, TN, 37203, United States, Larry.Leblanc@owen.vanderbilt.edu, Michael Galbreth

We describe VBA procedures for verifying documentation in Excel spreadsheet models. These include cell comments that accurately reflect the formulas in the corresponding cells, appropriate borders and shading, and (in the case of optimization models) correct Solver options. The procedures mark all cells not meeting the required standards for further evaluation by the instructor. This approach enables the instructor to check the documentation of student spreadsheet models very efficiently.

2 - Developing an Auditing Protocol for Spreadsheet Models
Stephen Powell, stephen.g.powell@dartmouth.edu

We report on a detailed, step-by-step auditing protocol we are developing and testing for auditing spreadsheets. The protocol uses two software tools (Spreadsheet Professional and XLAnalyst) to assist the auditor in locating potential errors. Our research is designed ultimately to provide insight into which auditing procedures, used in what sequence and combination, are most effective across a wide range of spreadsheet applications.

3 - Operations Research, Meet the Sales Force! Designing a Spreadsheet Tool That Even a Spreadsheet Neophyte Can Use
Susan Cholette, San Francisco State University, cholette@sfsu.edu

A third-party logistics provider for direct-to-consumer wine shipments needed to demonstrate their value to prospective clients. The author developed a spreadsheet model to quantify potential cost savings based on industry data and user inputs. The primary users were to be sales reps, who would not be proficient with the model itself. Also, the tool was intended for field use during customer calls to provide an immediate on-site analysis. Thus the tool had to be made as simple and as foolproof as possible, and the author will share some of the techniques used in its design and maintenance.

4 - The Relevance of Human Factors to the Management of Spreadsheet Risks
S. Thorne, University of Wales Institute Cardiff, sthorne@uwic.ac.uk, D. Ball

Human Factors, Overconfidence and Complexity may all contribute to poor quality spreadsheet models. We consider human factors affect a simplified development cycle and what the potential consequences may be. The relationship between systems failure in End User Development (EUD) (e.g. spreadsheets) and human factors is then highlighted. We scrutinize the human/computer relationship to demonstrate the need for alternative development methods in EUD and review a proposed concept of interaction that exploits machine-learning techniques via Example Driven Modelling (EDM).

■ SD07

The Interface Between Operations Management and Finance

Sponsor: Manufacturing & Service Oper Mgmt
Sponsored Session

Chair: Nicola Secomandi, Assistant Professor of Operations Management & Manufacturing, Tepper School of Business, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA, 15213, United States, ns7@andrew.cmu.edu

1 - Operational Hedge under Global Competition
Ping Su, Olin School of Business, Washington University in St. Louis, St. Louis, MO, 63130, United States, sup@olin.WUSTL.EDU, Panos Kouvelis, Lingxiu Dong

We study the effect of operational hedge for a global firm who has a competitor in the foreign market. The firm has to invest in capacity in the face of the currency exchange rate uncertainty and the competition uncertainty in the foreign market. We study how operational flexibility (hedge) affects the competition equilibrium in this global environment.

2 - The Interaction of Resource Flexibility and Financial Hedging under Costly External Financing
Onur Boyabatli, INSEAD, Boulevard de Constance, Fontainebleau, France, onur.boyabatli@insead.edu, Beril Toktay

This paper analyzes the interaction between resource flexibility and financial risk management under costly external financing. Our analysis contributes to the understanding of the role of resource flexibility as part of a firm's overall risk management strategy. We delineate the value and limitations of resource flexibility in the firm's overall risk management strategy, identify its impact on a firm's financial risk management strategy, and quantify its value under financial constraints.

3 - Shipper Valuation and Hedging of Network Contracts for Natural Gas Pipeline Transport Capacity
Nicola Secomandi, Assistant Professor of Operations Management & Manufacturing, Tepper School of Business, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA, 15213, United States, ns7@andrew.cmu.edu, Xiaofang Wang

In the U.S., natural gas shippers buy the commodity at supply market hubs and contract with pipeline companies to transport it to demand market hubs where they sell it. We develop models to value and hedge pipeline network contracts, consisting of multiple receipt points directly connected to multiple delivery points.

■ SD08

Inventory Management

Sponsor: Manufacturing & Service Oper Mgmt
Sponsored Session

Chair: Doug Thomas, Penn State, 463 Business Building, University Park, PA, 16802, United States, dthomas@psu.edu

1 - Virtual Pooling with Multiple In-Cycle Transshipments
Nagihan Comez, Ph.D Student, The University of Texas at Dallas, 2601 N Floyd Rd, SM 30, School of Management, Richardson, TX, 75083-0688, United States, nxc023100@utdallas.edu, Metin Cakanyildirim, Kathryn E. Stecke

We study two retailers, replenished periodically. A retailer may get transshipment from the other retailer not to incur backlog delay cost, but incurs a transshipment delay cost due to transshipment time. Allowing transshipments any time during the period, one question is when to request a transshipment and when to accept one. We show that there exists an interesting non-stationary transshipment policy. The model is altered by end of cycle holding costs, which induces more a dynamic policy.

2 - Inventory and Effort Choice with Sales Agents
David Huff, Penn State University, 436 Business, Smeal College of Business, University Park, PA, 16802, United States, dhuff@psu.edu, Phil Lederer

We model dependencies between inventory levels and sales-force compensation. We present a single-agent two-way moral hazard model with effort-driven demand and a supply constraint. We derive closed-form solutions and find comparative statics that run counter to those of previous research that ignored supply constraints. Next we study a multiple-agent model. Here commission rates sometimes respond differently to parameter changes when compared to the single-agent model.

3 - Computing Optimal Policies in Generalized Joint Replenishment
Dan Adelman, Professor, University of Chicago, Graduate School of Business, 5807 South Woodlawn Ave., Chicago, IL, 60637, United States, dan.adelman@gsb.uchicago.edu, Diego Klabjan

We present the first known algorithm for computing epsilon-optimal policies for the generalized joint replenishment problem.

4 - Inventory Management with Retail Pre-Packs
Doug Thomas, Penn State, 463 Business Building, University Park, PA, 16802, United States, dthomas@psu.edu, Long Gao, Mike Freimer

The use of prepacks (batch orders) is a common practice in the retail industry because of efficiencies in shipping and handling. We develop optimal inventory strategies involving prepacks containing one or several products, and we use these results to address issues in prepack design.

■ SD09

Dynamic Models of Imperfect Competition III

Cluster: Supply Chain Management
Invited Session

Chair: Benjamin Van Roy, Stanford University, Terman 315, Stanford University, Stanford, CA, 94305-4023, United States, bvr@stanford.edu

1 - Dynamic Competition under Supermodularity
Hyun-soo Ahn, Ross School of Business, University of Michigan, D8203 701 Tappan Street, Ann ARbor, MI, 48109, United States, hsahn@umich.edu, Tava Olsen

We consider a general non-linear framework for competition in a stochastic multi-period setting. Unlike traditional models in the operations literature, we do not assume a linear structure for costs and state transitions. We prove the existence of a Markov perfect Nash equilibrium and demonstrate supermodular properties of this equilibrium. We show how these properties lead to insights regarding operational decisions.

2 - Information Acquisition in a Limit Order Market
Uday Rajan, Ross School of Business, University of Michigan, 701 Tappan Street, Ann Arbor, MI, 48109, United States, urajan@umich.edu, Ronald Goettler, Christine Parlour

We model a market for a financial asset as a dynamic stochastic game with asymmetric information. The asset has both a common and a private value. Traders choose whether to buy information about the common value. On arriving at the market, they may post prices or accept previously posted prices. Traders with unexecuted orders randomly reenter the market to change their orders. We numerically solve for the equilibrium of the trading game and characterize equilibria with information acquisition.

3 - Finite State Dynamic Games With Assymetric Information: A Framework for Applied Work
Ariel Pakes, Department of Economics, Harvard University, Rm. 117 Littauer Center, Cambridge, MA, 02138, United States, ariel@ariel.fas.harvard.edu, Chaim Fershtman

The paper presents a framework for the applied analysis of dynamic games with asymmetric information. The framework consists of a definition of equilibrium, and an algoirthm to compute it. For specificity we present our results in the context of a dynamic oligopoly game with collusion in which the outcome of firms' investments are random and only observed by the inverting agent.

■ SD10

Pricing, Capacity and Competition in Supply Chains

Cluster: Supply Chain Management
Invited Session

Chair: Candace Yano, Professor, UC Berkeley, 4141 Etcheverry Hall, Berkeley, CA, 94720-1777, United States, yano@ieor.berkeley.edu

1 - Strategic Dynamic Sourcing from Competing Suppliers: The Value of Commitment
Cuihong Li, Assistant Professor, University of Connecticut, School of Business, 2100 Hillside Road, Storrs, C, 06269, United States, Cuihong.Li@business.uconn.edu, Laurens Debo

Building a long-term relationship by committing to source from a single supplier over time is risky for a buyer. Without commitment, the buyer has the option to switch, at a certain cost, to a more efficient supplier. We develop a model that analyzes when a buyer, facing uncertainty about market demand and supplier cost, should commit to source from a single supplier over a long term.

2 - Effect of Slotting Fees on Variety and Supplier Competition
Roman Kapuscinski, University of Michigan, 701 Tappan St., Ann Arbor, MI, United States, Roman.Kapuscinski@umich.edu, Ravi Anupindi, Ling Wang

We investigate how slotting fees affect product variety offered by retailer. We consider a game, where retailer decides on slotting fees first. Then, sequential entry decisions of two asymmetric suppliers follow. We find that the slotting fees typically lead to smaller variety and an increase in the total channel profit under certain conditions.

3 - Incentive Alignment through Performance Based Logistics (PBL)
Serguei Netessine, Assistant Professor, University of Pennsylvania, 3730 Walnut St. Suite 500, Philadelphia, PA, 19104, United States, netessin@wharton.upenn.edu, Sang-Hyun Kim, Morris Cohen

Performance Based Logistics (PBL) is reshaping service parts supply chain management in the defense industry. We formulate a principal-agent model of backorder-based resource allocation problem and compare several widely-used contracts including PBL. We provide managerial insights on the impact of environmental characterstics, especially of the role of cost and performance uncertainties.

4 - Supplier Pricing of National and Store Brands under Capacity Constraints
Candace Yano, Professor, UC Berkeley, 4141 Etcheverry Hall, Berkeley, CA, 94720-1777, United States, yano@ieor.berkeley.edu

We consider a supply chain with a retailer that sells a store brand and a competing national brand. The supplier of the national brand independently sets its price recognizing competition from the national brand. The supplier of the store brand sets its wholesale price, possibly under the influence or control of the retailer. The retailer sets prices to optimize total profit from both products. We examine optimal pricing by the suppliers when both suppliers are capacity constrained.

■ SD11

Pricing Strategies in Supply Chain Management

Contributed Session

Chair: Felipe Villegas, University of Edinburgh, 231 Nithsdale Road, Glasgow, G415HA, United Kingdom, f.a.villegas-moran@sms.ed.ac.uk

1 - Vendor-Buyer Coordination for Multiple Items using Volume and Quantity Discounts
Ajay Mishra, Assistant Professor, SUNY-Binghamton, School of Management, Binghamton, NY, 13902, United States, amishra@binghamton.edu

We study the sales of multiple items by a vendor to a buyer in a deterministic environment. The vendor and buyer incur procurement, ordering or order processing, and holding costs. The buyer's demand is known but price-sensitive. We study the use of volume discounts and quantity discounts from the supplier to improve channel profits and share the gains. In addition, we study coordination when joint replenishment costs are also incurred.

2 - Supply Chain Coordination with Sales Promotions and Price Contracts
Jiang Zhang, Assistant Professor, School of Business, Adelphi University, Garden City, NY, 11530, United States, zhang@adelphi.edu, Joseph Szmerekovsky

We develop models for determining equilibrium marketing and investment efforts for manufacture and retailer of a supply chain. Manufacture uses co-op promotion mechanism to motivate sales at the retailer and promotes its product nationally and help develop brand knowledge and preference. Retailer's local promotion brings actual sales. We address the impact of band name investments, local promotion, price deduction on co-op programs in these models.

3 - Analyzing Terminal Pricing Strategies for Petroleum Supply Chains
Hui Wang, Cornell University, School of ORIE, Cornell University, Rhodes Hall, Ithaca, NY, 14853, United States, hwang@orie.cornell.edu, Jack Muckstadt, John Muckstadt, Jr

In a petroleum supply chain, terminals' prices can greatly impact their spot sales. If over priced, a terminal may suffer insufficient demand; otherwise if under priced, it may run out on spot sales and fail to meet contractual obligations. We will examine response patterns of spot demand to price, analyze the impact of various pricing strategies, and present models which determine the optimal prices that maximize spot revenue while not undermining the contractual business.

4 - Group Buying: Volume Discounted and Combinatorial Cases
Ertunga Ozelkan, Professor, University of North Carolina at Charlotte, 9201 University City Blvd, Charlotte, NC, 28223, United States, ecozelka@uncc.edu

Group-buying is a business process that brings small businesses together to increase their buying power. This paper provides a mathematical programming model for group-buying in a B2B framework for volume discounted and combinatorial procurement cases. The objective is to identify the suppliers and the procurement quantities such that total procurement cost is minimal while the customer demand is met and additional business requirements are satisfied.

5 - Transfer Pricing in Multinational Supply Chains, Under Duty Drawback and Transport Costs
Felipe Villegas, University of Edinburgh, 231 Nithsdale Road, Glasgow, G415HA, United Kingdom, f.a.villegas-moran@sms.ed.ac.uk

Multinational Supply Chains (MNSC) operate in more than one tax jurisdiction with the problem to decide on trade flows of products and services, transfer prices and transport cost between their divisions and facilities. They should optimise profits given corporate and governmental parameters such as dividends and royalties, subsidiaries' ownership, income taxes, duties and quotas, etc. This research generalizes and extends the Theory of the Multinational Firm for the particular case of MNSC.

■ SD12

Special Topics in Auction/Bidding

Contributed Session

Chair: Shanshan Hu, Ph.D Candidate, University of Michgan, Business School, 701 Tappan Street D2201, Ann Arbor, MI, 48104, United States, husz@bus.umich.edu

1 - A Branch and Price Algorithm for CAMBO
Dries Goossens, K.U.Leuven, Naamsestraat 69, Leuven, 3000, Belgium, Dries.Goossens@econ.kuleuven.be, Frits Spieksma

In combinatorial auctions, bidders are allowed to bid on sets of items. It is well-known that the winner determination problem for these auctions is NP-hard, and that, in the unrestricted case, the bid data are of exponential size. Day (2004) presented a restricted-preference combinatorial auction using matrix bids with order (CAMBO). We present a branch-and-price algorithm for the CAMBO winner determination problem, and show that the corresponding pricing problem is a shortest path problem.

2 - Brand Valuation-case Study of Crocin-was it a Best Buy?
Raghavi Pampule, Rajesh Srivastava

If the valuation techniques are straitjacketed then why do different buyers pay different values for the same asset? Consider the above case, the most talked about deal i.e. the takeover of the Brand Crocin by Glaxo SmithKline, for Rs 45 Crore.

3 - Modeling and Analysis of a Logistics Auction Market
Semra Agrali, University of Florida, Department of Industrial and Systems Engineering, Gainesville, FL, United States, sagrali@ufl.edu, Baris Tan, Fikri Karaesmen

We consider a logistics market where the orders from a number of customers with goods to transport to various destinations are matched with carriers through a reverse auction. In order to analyze the effects of various system parameters on the transportation costs, we develop a queueing-based stochastic model. We then evaluate various performance measures in the steady state. We discuss various estimation and implementation issues in an application at an industrial zone in Turkey.

4 - Antecedents of Online Auction Bidding Behaviors: A Fuzzy Set Theory Approach
Jennifer Zhang, Assistant Professor, University of Toledo, 2801 W. Bancroft St. MS#103, Toledo, OH, 43615, United States, jennifer.zhang@utoledo.edu, Ilya Lipkin

To analyze the bidders' behaviors in online auctions, two methods are presented. One is a statistical analysis of online bidder behavior through a hedonic regression model. Another method is through the use of Fuzzy Logic auto rule generation techniques, to come up with a predictor model based on knowledge rules. The two models will then be compared and cross validated. This paper presents a better understanding of what drives bids and what makes some sellers more successful than the others.

5 - Competitive Price-Quantity Bidding in Electricity Markets
Shanshan Hu, Ph.D Candidate, University of Michgan, Business School, 701 Tappan Street D2201, Ann Arbor, MI, 48104, United States, husz@bus.umich.edu, Roman Kapuscinski, William Lovejoy

This paper considers a price-quantity bidding game where electricity distributors facing exogenous demand processes procure their supply from multiple electricity plants with fixed costs and capacities. Characterizing the Nash equilibrium structurally, we derive the competitive pricing curve and interpret the predicted price dispersion at varying levels of industry utilization.

■ SD13

Software Demonstration

Cluster: Software Demo

Invited Session

1 - Lumina Decision Systems, Inc.-Analytica: Beyond the Spreadsheet
Max Henrion, Lumina Decision Systems, Inc., 26010 Highland Way, Los Gatos, CA, 95033, United States, henrion@lumina.com

A rare chance to see Analytica demonstrated by its originator: users prefer Analytica to spreadsheets because of its transparency, flexibility for multiple dimensions, efficient Monte Carlo, scalability and its powerful new Optimizer. Analytica models are typically 10 to 100 times more compact than equivalent spreadsheets, and correspondingly easier to build, understand and audit.

■ SD14

Urban Operations Modeling and Simulation

Sponsor: Military Applications

Sponsored Session

Chair: MAJ John Willis, TRADOC Analysis Center, ATTN: ATRC-RDM, Box 8695, Monterey, CA, 93940, United States, john-willis@us.army.mil

1 - Mobility Throughput Representation in Urban Environments
Dr. George Mason, Research Civil Engineer, ERDC, 3909 Halls Ferry Road, Vicksburg, MS, 39180-6199, United States, George.L.Mason@erdc.usace.army.mil, John Green

Vehicle pass rates are computed as part of the Theater-Level Logistical Network Aggregation (nominated as an AMSO standard SRD-00060). These theater-level M&S trafficability rates are only for roads on open country terrain. Factors for roads located in urban terrain are not considered. An approach is presented for assigning military vehicle throughput rates through urban environments.

2 - Research Plan Management for Modeling and Simulation of Urban Operations
MAJ John Willis, TRADOC Analysis Center, ATTN: ATRC-RDM, Box 8695, Monterey, CA, 93940, United States, john-willis@us.army.mil

To combat deficiencies in urban operations (UO) representation in M&S, the US Army created a UO Focus Area Collaborative Team (FACT). The UO FACT employs a systematic approach that is designed to (1) identify the best UO M&S projects that will address prioritized deficiencies and (2) identify potential collaboration opportunities, and (3) provide stewardship of ongoing projects. This paper details the methodology and results of the UO FACT including details of current priorities and projects.

■ SD15

Recent Advances in Machine Scheduling

Cluster: Scheduling

Invited Session

Chair: Chung-Lun Li, Professor, The Hong Kong Polytechnic University, Department of Logistics, Hung Hom, Kowloon, Hong Kong, China, lgtcli@polyu.edu.hk

1 - Job Formation and Scheduling in Semiconductor Manufacturing
Erhan Kutanoglu, Assistant Professor, The University of Texas at Austin, 1 University Station C2200, Austin, TX, 78712, United States, erhank@mail.utexas.edu

We investigate a scheduling problem motivated by challenges in semiconductor manufacturing wafer fabs. Individual orders with different due dates and weights are grouped into jobs (job formation), which are then scheduled over time (job scheduling). The overall performance depends on both formation and scheduling. We extend our earlier models to stochastic settings, develop solution techniques, and present our preliminary results.

2 - Bicriteria Scheduling on a Batch Processing Machine
Chi-To Daniel Ng, The Hong Kong Polytechnic University, Department of Logistics, Hung Hom, Kowloon, Hong Kong, China, lgtctng@polyu.edu.hk, Lili Liu, T. C. Edwin Cheng

In this talk, we consider the problems of scheduling jobs on a single batch processing machine so as to minimize a primary and a secondary criterion. We provide optimal algorithms and/or NP-completeness proofs for various combinations of primary and secondary criterion.

3 - Bin-Packing Problem with Concave Costs of Bin Utilization
Chung-Lun Li, Professor, The Hong Kong Polytechnic University, Department of Logistics, Hung Hom, Kowloon, Hong Kong, China, lgtcli@polyu.edu.hk, Zhi-Long Chen

We consider a generalized one-dimensional bin-packing model where the cost of a bin is a nondecreasing concave function of the utilization of the bin. Four popular heuristics from the literature of the classical bin-packing problem are studied. We analyze their worst-case performances when they are applied to our model.

4 - Coordinating Production and Distribution of Jobs with Bundling Operations
George Vairaktarakis, Case Western Reserve University, Department of Operations, Cleveland, OH, 44106, United States, gxv5@case.edu, Chung-Lun Li

Jobs completed in 2 bundling machines are batched and delivered to customers at different locations. The objective is to minimize the sum of arrival times of jobs plus the total transportation cost. We develop solutions for direct versus milk-run deliveries and compare them computationally.

■ SD16

Organization Science: Perpectives on the Journal

Sponsor: Organization Science
Sponsored Session

Chair: Linda Argote, Professor, Carnegie Mellon University, Tepper School of Business, 5000 Forbes Ave., Pittsburgh, PA, 15213, United States, argote@andrew.cmu.edu

1 - Organization Science: Current Status and Future Directions
Linda Argote, Professor, Carnegie Mellon University, Tepper School of Business, 5000 Forbes Ave., Pittsburgh, PA, 15213, United States, argote@andrew.cmu.edu

The session will focus on INFORMS journal, Organization Science's Current Status and Future Directions The session will provide an overview of Organization Science, including its editorial team, the vision for the journal, objectives, and its operation. Statistics about review time and acceptance rates will be presented. Future directions including special issues will be described.

2 - Organization Science: Aiming for a Successful Experience
Richard Burton, Professor, Duke University, Fuqua School of Business, 1 Towerview Drive, Durham, NC, 27708, United States, rmb2@mail.duke.edu

The session will discuss how to increase the likelihood of a successful experience when submitting a manuscript to Organization Science. Characteristics of manuscripts that editors and reviewers regard positively will be identified. Common shortcomings of manuscripts will be described. How to respond successfully to editor's and reviewers' comments will be discussed.

3 - Transactive Memory Systems, Learning, and Learning Transfer
Kyle Lewis, Asst. Professor, University of Texas, McCombs School of Business, 1 University Station B6300, Austin, TX, 78712, United States, Kyle.Lewis@mccombs.utexas.edu, Donald Lange, Lynette Gillis

We present a framework for understanding TMSs as learning systems that affect group learning and learning transfer, and we test major outcomes of the framework in an empirical study. Findings show that TMSs help groups develop transferable knowledge about the task domain after performing two similar tasks. We found little evidence that TMSs influence learning transfer after a single task. Implications for TMS and learning theories are discussed.

4 - Cognition and Hierarchy: Rethinking the Microfoundations of Capabilities' Development
Giovanni Gavetti, Professor, Harvard Business School, 237 Morgan Hall, Boston, MA, 02164, ggavetti@hbs.edu

My research identifies gaps in microfoundations of capabilities research and argues that it focused excessively on the quasi-automatic, routine-based aspects of capability development, and neglected the roles played by cognition and organizational hierarchy. Through a model that considers both how routine-based and cognitive logics of action coexist within organizational hierarchy to affect capability development, this article leads to novel propositions and sets an agenda for future research.

■ SD17

Panel Discussion: New Product Development, Innovation and Technology Management

Cluster: New Product Development
Invited Session

Chair: Janice Carrillo, Assistant Professor, University of Florida, P.O. Box 117169, Gainesville, FL, 32611-7169, United States, janice.carrillo@cba.ufl.edu

1 - Panel Discussion: New Product Development, Innovation and Technology Management
Moderator: Janice Carrillo, Assistant Professor, University of Florida, P.O. Box 117169, Gainesville, FL, 32611-7169, United States, janice.carrillo@cba.ufl.edu, Panelists: Cheryl Gaimon, Wallace Hopp, Vish Krishnan, Christoph Loch, Christian Terwiesch, Garrett van Ryzin

A panel of editors will convene to discuss research opportunities in the areas of New Product Development, Innovation and Technology Management. The panel will identify current trends in this important field of inquiry, and discuss publishing opportunities within the Management Science community.

■ SD18

Airline Pricing and Revenue Management

Sponsor: Aviation Applications
Sponsored Session

Chair: Laurie Garrow, Assistant Professor, Georgia Institute of Technology, School of Civil & Environmental Engr., 790 Atlantic Drive, Atlanta, GA, 30332-0355, United States, Laurie.Garrow@ce.gatech.edu

1 - Optimizing with Respect to User Preferences
François Gilbert, Ph D student, Université de Montréal, CP 6128, Succursale Centre-Ville, Montréal, QC, H3C 3J7, Canada, gilbertf@iro.umontreal.ca, Patrice Marcotte, Gilles Savard

We consider an airline that maximizes revenue over its network, taking into account competitors' price schedules as well as customer behaviour, the latter characterized by utility maximization. We analyze two situations, one where customer choice is dictated by a discrete choice model, another where utility maximization leads to a bilevel formulation. We emphasize the parallels between both nonconvex models, and propose algorithms for solving them to optimality or ear-optimality.

2 - Airline Passengers' On-line Searching and Booking Behavior
Laurie Garrow, Assistant Professor, Georgia Institute of Technology, School of Civil & Environmental Engr., 790 Atlantic Drive, Atlanta, GA, 30332-0355, United States, Laurie.Garrow@ce.gatech.edu, Roger Parker

We assess the viability of using stated preference choice surveys to develop price elasticity models for airline customers searching for flights on SideStep, an on-line low-fare search engine. Preliminary results suggest SideStep customers are very price sensitive and are influenced by choice set presentation. Further, econometric modeling techniques that integrate a "reference dependent" approach from psychology tend to exibit the best predictive power.

■ SD19

KLIC IV — Organizing for Learning (Knowledge, Learning & Intellectual Capital)

Sponsor: Technology Management
Sponsored Session

Chair: Nile Hatch, Marriott School - BYU, 790 TNRB, Provo, UT, 84602, United States, nile@byu.edu

1 - Managing Customer Outrage: Focus Organizational Learning Efforts on Service Failure or Recovery?
Michael Lapre, Vanderbilt University, Owen Graduate School of Management, 401 21st Avenue South, Nashville, TN, 37203, United States, michael.lapre@owen.vanderbilt.edu

Firms must be prepared to recover from service failures to turn angry customers into loyal customers. Using mishandled-baggage data for 9 major US airlines over 11 years, I find that dissatisfaction with recovery contributes 88% to the variation in customer outrage, whereas service failure contributes only 12%. A U-shaped learning-curve effect and heterogeneity in learning curves are more important for recovery than for service failure. Hence, firms should pay more attention to service recovery.

2 - Towards a Behavioral Theory of Core-Periphery Evolution in Networks: A Model Based Analysis
Nitin Joglekar, BU School of Management, 595 Commonwealth Avenue, Boston, MA, United States, joglekar@bu.edu, N. Venkatraman

We model the evolution of the core and the periphery of a social-network by extending the tenets of firm level behavioral decision making (i.e. target setting, expectations and choices that guide organizational learning) into network level constructs: embeddedness and interdependence. Our results document the efficacy of exploration and exploitation heuristics for building positional advantage and illustrate that performance of these heuristics is crucially affected by behavioral biases.

3 - Organizing for Innovation in the Motor Sports (NASCAR) Industry Cluster in Charlotte, NC
Carlos Martinez-Vela, MIT, 292 Main St, E38-104, Cambridge, MA, 02139, United States, camv@mit.edu

In this case study I examine how NASCAR teams located in Charlotte, NC integrate knowledge to innovate and coordinate change. I find that integration is a social process that occurs when product development teams can initiate and sustain collaboration and conversations across occupational and organizational boundaries. I illustrate how NASCAR teams organize this process and propose a grounded theory model for organizing innovation and integration.

4 - Managerial Knowledge, Learning, and Intellectual Capital.
Margaret Peteraf, Professor, Tuck School of Business, Dartmouth, 100 Tuck Hall, Hanover, NH, 03755, United States, margaret.a.peteraf@dartmouth.edu, Mark Shanley

Managerial knowledge is a resource for firms. At the same time, the accumulation and deployment of that knowledge constitutes an important organizational capability. Coming to grips with a resource and capability set that is part of the entire firm's resource configuration and yet determines that configuration and how it evolves is a major task for theory development.

■ SD20

Valuation and Risk Management in Energy Markets

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

Chair: Shi-Jie Deng, Asst. Professor, Georgia Inst. of Tech., 765 Ferst Dr, Atlanta, GA, 30332, United States, deng@isye.gatech.edu

1 - Investment Timing and Optimal Size of Small Hydropower Projects
Stein-Erik Fleten, Associate professor, SINTEF, Technology and Society, SP. Andersensv. 5, Trondheim, NO-7465, Norway, stein-erik.fleten@sintef.no, Thor Bockman, Erik Juliussen

We take the view of a river resource owner that has an option to invest in a hydropower plant and sell the output to an open electricity market. We find the optimal (continuous) plant scale as a function of uncertain electricity prices, and evaluate the deferrable opportunity to invest. We find a lower bound for the price triggering project initiation. Above this bound one invests according to the optimal scale function.

2 - Risk-Constrained Electricity Procurement for a Large Consumer
Antonio Conejo, Professor, University Castilla - La Mancha, Ciudad Real, Spain, Antonio.Conejo@uclm.es, Carrion Miguel

This paper formulates and provides a solution technique for the electricity procurement problem faced by a large consumer. The objective of this consumer is to minimize procurement cost while limiting the risk of cost fluctuation due to pool price volatility. Electricity sources include the pool, bilateral contracts and self-production. Uncertainty is related to electricity pool prices. A realistic case study is analyzed and results presented. Conclusions are duly drawn.

3 - Optimal Design of an Interruptible Electric Load Service Scheme
Shi-Jie Deng, Asst. Professor, Georgia Inst. of Tech., 765 Ferst Dr, Atlanta, GA, 30332, United States, deng@isye.gatech.edu, Youyi Feng

An interruptible load service program is often offered by an electricity service provider to its large industrial customers. The objective is to minimize the total electricity procurement costs for serving all demands by inducing certain customers to voluntarily reduce their power consumption in times of unexpected demand surge. Taking the best response by customers into consideration, we investigate the structure of an optimal design for a stylized demand responese program.

4 - Optimal Management of Oil Lease Inventory: Option Value and New Information
Michael Rothkopf, Professor, Rutgers University, MSIS Department, 640 Bartholomew Road, Piscataway, NJ, United States, rothkopf@rutcor.rutgers.edu, Radford Schantz, Lee Upton

Companies buy oil leases that expire undrilled. Rational explanation of this depends upon option values. We present a model based upon changes in the likelihood of discovering oil rather than in oil prices. It optimizes the number of leases to buy, hold, drill, and farm out. It fits Gulf of Mexico data and explains response to government polices.

■ SD21

Data Mining in Market Research

Sponsor: Data Mining
Sponsored Session

Chair: Julia Tsai, Research Lead, Information Resources, Inc., 150 North Clinton Street, Chicago, IL, 60661, United States, Julia.Tsai@infores.com

1 - New Store Brands: How Do Consumers Learn?
Hui-ming Deanna Wang, Assistant Professor, San Francisco State University, College of Business, 1600 Holloway Ave, San Francisco, CA, 94132, United States, wang00@purdue.edu, Julia Tsai

Store brands have been gaining market shares in many product categories. By exploiting a rich panel dataset that contains consumer purchase records prior to and post store brand entries, this study aims to examine how a consumer™ quality perception of a new store brand evolves over time.

2 - Forecasting SKU data
Konstantinos Nikolopoulos, Research Associate, Lancaster University, Lancaster University Management School, Dept. of Management Science, Lancaster, LA14YX, United Kingdom, k.nikolopoulos@lancaster.ac.uk, Robert Fildes, Paul Goodwin

The size and complexity of forecasting at the Stock Keeping Unit (SKU) level, in most companies, necessitates the use of a Forecasting Support System (FSS). The present study reports the findings of a research project examining monthly and weekly demand data and forecasts for SKUs collected from 10 major U.K. companies. The paper discusses: a) the level of homogeneity of SKU data, and b) a competition of company forecasts versus to classical extrapolation techniques, as well as established FSSs.

3 - A Neural Network-Based Algorithm for Monitoring the Wholesale Power Prices in Ohio
Hisham Choueiki, Senior Energy /Telecommunications Specialist, PUCO, 180 E. Broad Street, 3rd floor, Columbus, OH, 43215, United States, hisham.choueiki@puc.state.oh.us, David Wang

A model employing a neural network-based algorithm has been developed by the PUCO staff to monitor the reasonableness of prices in wholesale electricity markets. This model builds a relationship between published index prices on the one hand, and several independent variables; such as temperature, power plant production, type of day, and historical wholesale prices of electricity and natural gas on the other hand. Preliminary results indicate a model accuracy of +/- 5 to 6%.

4 - Statistical Approach for Anomaly Detection in Retail Sales Data
Julia Tsai, Research Lead, Information Resources, Inc., 150 North Clinton Street, Chicago, IL, 60661, United States, Julia.Tsai@infores.com, Michael Kruger, Arvid Johnson, Trevor Mason

This paper describes a statistical approach to detect anomalous patterns in retail sales data. This statistical approach is implemented in the quality control (QC) system to ensure the quality of the data. The procedure of the QC system is presented, and various distributions for the measures are investigated. The use of a parametric distribution provides a forum in which other statistical techniques may be explored to detect abnormality of the data and hence to build an effective QC system.

■ SD22

Behavioral Issues in IS

Sponsor: Information Systems
Sponsored Session

Chair: Waleed Muhanna, The Ohio State University, Fisher College of Business, 2100 Neil Avenue, Columbus, OH, 43210, United States, wmuhanna@cob.ohio-state.edu

1 - Insights into the Adaptive Behavior of Alternate Learning Classifier System Models
David A. Gaines, University of Kentucky, dgaines@uky.edu, Ramakrishnan Pakath, Cidambi Srinivasan

We describe the design of, and findings from, a set of experiments comparing the performances of a series of Learning Classifier System-based artificial agents, ranging from the traditional LCS to the more modern XCS, in the Iterated Prisoner's Dilemma game-playing environment. This environment allows us to model realistic business/social situations including coping with non-Markov environments, asymmetric knowledge-base updates, and consciously opting for irrational behavior.

2 - Trust Formation in Online Markets: An Experimental Investigation
James R. Wolf, Ohio State University, wolf_206@cob.osu.edu, Waleed Muhanna

Extant literature on trust in online marketplaces, such as eBay, has largely focused on seller's feedback ratings as the sole determinant of buyer trust. Drawing on theories from economics and psychology, we extend existing models by identifying attitudinal and other psychological antecedents that influence buyer trust in individual sellers. We examine in a laboratory setting the differential effects of these factors on trust as well as their role as moderators of the relationship between seller reputation and buyer trust.

3 - Evaluating Web Accessibility Guidelines for the Cognitively Disabled
Clyde W. Holsapple, University of Kentucky, cwhols@uky.edu, Sharath Sasidharan, Ramakrishnan Pakath

Despite the proliferation of the WWW and E-commerce, only recently has the access of websites by the disabled begun to receive attention. The WWW Consortium and the US Government have proposed guidelines to help foster accessibility and implementation efforts are underway. We propose a theoretically-grounded framework to help assess value added, by guideline adherence, to existing best practices and report preliminary experimental findings in the context of cognitive disabilities.

■ SD23

Basel Accord and Portfolio Management

Sponsor: Financial Services
Sponsored Session

Chair: Lyn Thomas, University of Southampton, School of Management, United Kingdom, L.Thomas@soton.ac.uk

1 - Multi Period Expected Loss Prediction
Catalina Stefanescu, Assistant Professor of Decision Sciences, London Business School, Regent's Park, London, United Kingdom, cstefanescu@london.edu, Stuart Turnbull, Sudheer Chava

We investigate modeling of the expected loss over multi year horizons, focusing on the joint determinants of default probability and of the loss given default. The unobserved heterogeneity is modelled using frailties, while the recovery rate varies over the credit cycle and is negatively correlated with the frequency of default. Lastly, we examine some implications of a multi factor expected loss model for risk management.

2 - Loan Rate Optimization as a Convex Programming Problem
Frank Bria, Khimetrics, Inc, fbria@khimetrics.com

We explore different ways the problem of maximizing profit on a loan portfolio can be constructed as a convex programming problem when you take different business requirements into consideration. Several strategic business scenarios are presented along with their respective structural and computational challenges.

3 - Risk Management for International Portfolios
Kurtay Ogunc, Alpha Dynamics Group, Dallas, TX, kurtay@alphadynamicsgroup.com

We incorporate behavioral issues as it relates to the management of risk in international portfolios. First, we introduce separate risk aversion parameters for asset and currency markets, and conclude that lower hedge ratios would arise due to the asymmetric nature of the compensation structure of currency managers. Then, we evaluate the problem in an axiomatic framework, and conclude that the more disappointment-averse the investor becomes, the less likely it is to have higher hedge ratios.

4 - Impact of Basel New Accord on Credit Risk Models of Consumer Loan Portfolios and Practice
Lyn Thomas, University of Southampton, School of Management, United Kingdom, L.Thomas@soton.ac.uk

The Basel New Accord imposes a corporate credit risk model on portfolios of consumer loans and there are questions whether such models are appropriate. This talk will discuss the New Accord rules governing consumer credit risk modeling, and it will point out the lack of a model that can justify these rules. It proposes a structural model for the credit risk of consumer loan portfolios which possibly can support these rules.

■ SD24

Recent Developments in Financial Engineering

Cluster: Financial Engineering
Invited Session

Chair: Ronnie Sircar, Associate Professor, Operations Research and Financial Engineering, Princeton University, sircar@princeton.edu

1 - Minimizing the Probability of Lifetime Ruin under Borrowing Constraints
Erhan Bayraktar, T.H. Hildebrandt Research Assistant Professor, Department of Mathematics, University of Michigan, 525 East University, Ann Arbor, MI, 48109, United States, erhan@umich.edu

We determine the optimal investment strategy of an individual who targets a given rate of consumption and who seeks to minimize the probability of going bankrupt before she dies. We impose two types of borrowing constraints: First, we do not allow the individual to borrow money to invest in the risky asset nor to sell the risky asset short. Second, we allow the individual to borrow money but only at a rate that is higher than the rate earned on the riskless asset.

2 - A Top Down Approach to Multi-Name Credit
Lisa Goldberg,MSCI Barra, 2100 Milvia Street, Berkeley CA 94704, United States, lisa.goldberg@mscibarra.com, Kay Giesecke

We examine multi-name credit models from the perspective of point processes. We pursue a top down approach: the economy as a whole is modeled first. Random thinning consistently generates sub-models for individual firms or portfolios. A candidate for this approach is a self-exciting process, whose intensity at any time depends on the events observed up to that time.

3 - Bounds and Approximations for Multifactor Portfolio Credit Risk
Sira Suchintabandid, Columbia University, 4W Uris Hall, Columbia Business School, New York, NY, 10027, United States, ss1855@columbia.edu, Paul Glasserman

We develop bounds and approximations for the loss-distribution in the multifactor normal copula model of credit risk. Our bounds and approximations are expressed in terms of low-factor (primarily independent-obligor or single-factor) models. While a suitable single-factor model can sometimes approximate a multifactor model, this paper uses several single-factor models for possible improvement. We discuss the performance of our approximation through numerical examples.

■ SD26

Panel Discussion: Do's and Do Not's of NSF Grant Proposals

Sponsor: JFIG, Junior Faculty Interest Group
Sponsored Session

Chair: Ana Muriel, Assistant Professor, University of Massachusetts, 160 Governors Drive, Amherst, MA, 01003, United States, muriel@ecs.umass.edu

1 - Panel Discussion: Do's and Do Not's of NSF Grant Proposals
Moderator: Ana Muriel, Assistant Professor, University of Massachusetts, 160 Governors Drive, Amherst, MA, 01003, United States, muriel@ecs.umass.edu, Panelists: Ozlem Ergun, Abhijit Deshmukh, Matthew Realff

Panel members will discuss their experiences in writing and reviewing NSF proposals, to give junior faculty a perspective on what works and what doesn't. Questions and lively interaction will be most welcomed.

■ SD27

Panel Discussion: How to Write a Good Practice Paper. What Makes a Good Practice Paper, Why You Should Write One, Who is the Audience and What are You Trying to Accomplish.

Sponsor: CPMS, The Practice Section of INFORMS
Sponsored Session

Chair: Stephen Strauss, AT&T Labs, 180 Park Avenue, Building 103 Room A009, Florham Park, NJ, 07932, United States, sstrauss@att.com

1 - Panel Discussion: How to Write a Good Practice Paper. What Makes a Good Practice paper, Why you Should Write One, Who is the Audience and What are You Trying to Accomplish
Moderator: Stephen Strauss, AT&T Labs, 180 Park Avenue, Building 103 Room A009, Florham Park, NJ, 07932, United States, sstrauss@att.com, Panelists: Fred Murphy, Jeffrey Camm, Stephen Graves, Terry Harrison, Barry List

The panel consists of past and present editors of Interfaces and the Interfaces special editions as well as the PR director for INFORMS who will address the following issues: * What makes a good practice paper. * Why you should write a practice paper. * Who is the audience. * What can/should you be trying to accomplish. In addition we will make a general practice paper template available via the web. (web link to follow)

■ SD28

Modeling and Optimization in Revenue Management

Sponsor: Revenue Management & Pricing
Sponsored Session

Chair: Dan Zhang, University of Chicago, 5807 S Woodlawn Ave, Chicago, IL, 60637, United States, dan.zhang@chicagogsb.edu

1 - Managing Clearance Sales in the Presence of Strategic Customers
Dan Zhang, University of Chicago, 5807 S Woodlawn Ave, Chicago, IL, 60637, United States, dan.zhang@chicagogsb.edu, William Cooper

We study the effect of strategic customer behavior on pricing, rationing, and capacity decisions of a supplier selling a single product. The product is sold in two periods, and the supplier may ration the quantity offered in the second period. Some customers are "smart" and respond to the pricing and rationing decisions by timing their purchases. We study the impact of customer behavior on supplier revenue under various assumptions on supplier capacity and pricing flexibility.

2 - On the Choice-Based Linear Programming Model for Network Revenue Management
Qian Liu, Graduate School of Business, Columbia University, New York, NY, United States, ql2002@columbia.edu, Garrett van Ryzin

Gallego et. al recently proposed a customer-choice-based LP model for network RM which parallels the widely-used deterministic LP model. We explore applications of their approach. First, we characterize optimal offer sets using a notion of "efficiency" and show only efficient sets are optimal asymptotically. Second, we propose a practical decomposition heuristic to generate a dynamic control policy, which significantly improves on the performance of the static LP solution.

3 - An Asymptotically-Optimal Policy for a Quantity-Based Network Revenue Management Problem

Marty Reiman, Bell Laboratories, Room 2C-315, 600 Mountain Ave., Murray Hill, NJ, 07974, United States, marty@research.bell-labs.com, Qiong Wang

We consider a canonical revenue management problem on a finite time horizon. Each resource has a fixed capacity. Each customer class has an associated arrival process, route and price. We introduce an admission control policy motivated by fluid and diffusion limits (as the capacities and arrival rates grow large) that involves solving two linear programs. We show that this policy is asymptotically optimal on diffusion scale, and that other approaches such as booking limits are not.

4 - Transforming Pricing Problems

Maarten Oosten, Senior Scientist, PROS Revenue Management, 3100 Main Street Suite 900, Houston, TX, 77002, United States, moosten@prosrm.com, Darius Walczak

The pricing problems we will discuss assume that demand behaves according to the lowest open fare model: when multiple price classes are available, all customers opt for the lowest price. We define a certain data transformation and demonstrate that under plausible conditions this more general revenue optimization model is equivalent to the traditional revenue management model. After investigating the theoretical underpinnings, we will illustrate the approach and address some practical issues.

■ SD29

Product Strategy

Sponsor: E-Business
Sponsored Session

Chair: Aydin Alptekinoglu, Assistant Professor, University of Florida, Warrington College of Business, 358 Stuzin Hall, Gainesville, FL, 32611-7169, United States, aalp@ufl.edu

1 - Standard and Custom Products: Duopoly Analysis

Sampath Rajagopalan, Professor, USC, IOM Department Marshall School of, Business, BRI 400D, USC, Los Angeles, CA, 90089-0809, United States, Srajagop@marshall.usc.edu, Nan Xia

Standard products are available immediately but only in a few variants of an attribute specification. Custom products match the customer's attribute preference exactly but are available after a finite lead time. We study variety, price and lead time decisions of firms offering standard and custom products in various competitive scenarios.

2 - A Static Approximation for Dynamic Demand Substitution with Applications in a Competitive Market

Xiaowei Xu, Assistant Professor, Department of Management Science & Information Systems, The State University of New Jersey, Newark, NJ, 07102, United States, xiaoweix@andromeda.rutgers.edu, Wally Hopp

We propose a static approximation of dynamic demand substitution behavior based on a fluid network model and a service-inventory mapping. Then we study a price and service competition between single-product retailers. We find that competition results in overstock. Finally, we study a duopolistic competition on price, service and product assortment. We find that competition on product assortment may result in shorter product lines and less inventory than in an analogous monopolistic market.

3 - Immediate Gratification and Network Externalities

Kerem Tomak, University of Texas at Austin, 1 University Station, Austin, TX, 78712, United States, kerem.tomak@mccombs.utexas.edu

We model impatience in consumption for digital goods via hyperbolic discounting approach. We find that as network externalities effect become more salient, by serving the "impatient" consumers, the monopolist can decrease the downward price pressure in the first period while increasing its overall profits; hence mass customization is a solution to Coase conjecture.

4 - When Mass Customization Entails Hidden Variety

Subhajyoti Bandyopadhyay, Assistant Professor, University of Florida, 364 Stuzin Hall, Gainesville, FL, 32611, United States, shubho.bandyopadhyay@cba.ufl.edu, Aydin Alptekinoglu

Motivated by Lab21, a company that sells custom skincare products based on a DNA test, we develop an address model of product differentiation with consumers highly uncertain about their preferences and the extent of product variety on offer. The consumers' inability to specify their desired product in terms of attributes lie at the heart of an information asymmetry that some firms engaged in mass customization are taking advantage of. We explore the market implications of this asymmetry.

■ SD30

Joint Session Research/ Revenue Management & Pricing: Revenue Management Research Clinic- Pricing for Computer Distributors

Cluster: Research Clinics, Revenue Management & Pricing
Invited Session

Chair: Harun Ahmet Kuyumcu, Chief Scientist, Zilliant, Inc., 3815 South Capital of Texas Highway, Suite 300, Austin, TX, 78704, United States, ahmet.kuyumcu@zilliant.com

1 - Pricing for Computer Distributors

Harun Ahmet Kuyumcu, Chief Scientist, Zilliant, Inc., 3815 South Capital of Texas Highway, Suite 300, Austin, TX, 78704, United States, ahmet.kuyumcu@zilliant.com, Garrett van Ryzin, Anton Kleywegt, Guillermo Gallego, Massoud Ashrafi

Consider the problem of optimally pricing desktop/laptop computers and related products (such as printers) for a computer distributor. The problem has the following characteristics:

- The computer components experience fast technological changes.
- Product lifecycle is very short for a specific configuration of components in a system
- Price is subject to rapid erosion as components become obsolete.
- The industry is extremely competitive with few barriers to entry.
- Margins on low-end systems are extremely slim (~1-2%).
- Price of a base model affects sales of other base models and complementary products
- List prices for base models are generally published monthly, but negotiated discounts, upgrades and other promotions are commonly leveraged to increase sales.
- Available supply is a factor in deciding when to discount/promote.
- The cost of each component is available and rapidly changing (usually eroding). In this session, we will describe the overall problem for the computer distributor industry and discuss the potential application of operations research techniques.

■ SD31

Joint Session Practice/ Roundtable: Applying OR/MS in the Public Sector to Benefit Citizens

Cluster: OR Practice, Roundtable
Invited Session

Chair: Arnie Greenland, IBM Distinguished Engineer, IBM, 6710 Rockledge Drive, Bethesda, MD, 20902, United States, arnold.greenland@us.ibm.com

1 - Reducing Burdens on Disabled Citizens and Improving Administrative Efficiency

Arnie Greenland, IBM Distinguished Engineer, IBM, 6710 Rockledge Drive, Bethesda, MD, 20902, United States, arnold.greenland@us.ibm.com

A major responsibility of the Social Security Administration is to administer the nearly $100 million in disability payments to those eligible under the Social Security Act. In recent years, SSA has used advanced analytic methods to improve the administrative efficiency of the program. This paper describes the business challenge, reviews the specific statistical and data mining methods used, and evaluates the impacts on beneficiaries and the government.

2 - The Use of Simulation Models in Reducing Taxpayer Compliance Burden

John Guyton, Senior Consultant, IBM, 12902 Federal Systems Park Drive, Fairfax, VA, 22033, United States, john.guyton@us.ibm.com, Michael Chesman

The IRS Office of Taxpayer Burden Reduction, the IRS Office of Research, and IBM, jointly seek to understand the drivers of taxpayer compliance burden. This paper describes the use of burden simulation models at IRS, including methodology and example results. The focus is on microsimulation models currently in use and a process flow model in development. The paper concludes with a discussion of the benefits of these simulation models, lessons learned, and areas for further research.

3 - Do Spreadsheet Errors Harm Decision Making in Public Organizations?

Layne Morrison, MS/PPM Candidate, Carnegie Mellon University, Pittsburgh, PA, United States, layney@cmu.edu, Timothy Weidemann, Jonathan P. Caulkins

Interviews with executives and senior managers/analysts reveal that spreadsheet errors in public organizations can lead to flawed decision making, negatively impacting citizens. Quality control processes were informal, and few formal risk assessment tools were employed. We discuss the implications and comparisons with the private and nonprofit sectors.

4 - Strategic Budgeting for Wildfire Management in the U.S.
Gyana Parija, Research Staff Member, IBM T.J. Watson Research Center, Yorktown Heights, NY, 10598, United States, parija@us.ibm.com, Dan Keller, Brian Booher, Samer Takriti

We will present an optimization model, and a mathematical programming based solution approach for optimizing the initial response (IR) organization needed to maximize the effectiveness of various fire management activities under different annual fire season scenarios. An initial response organization could consist of a set of hand crews, engines, bull-dozers, helicopters, water-tenders and the like.

■ SD32

spORts Arcade

Sponsor: OR in SpORts
Sponsored Session

Chair: Eric Bickel, Assistant Professor, Department of Industrial and Systems Engineering, Texas A&M University, 236B Zachry Engineering Center, 3131 TAMU, College Station, TX, 77843-3131, United States, ebickel@tamu.edu

1 - Automation of the Umpire Crew Scheduling Process for Tennis Tournaments
Jeffrey Smith, Professor, Auburn University, 207 Dunstan Hall, Auburn University, AL, 36849, United States, jsmith@auburn.edu, Adam Farmer

Results of a project with the USTA for scheduling umpires at tennis tournaments are presented. The number and skill levels of umpires needed on a court can differ from court to court and valid assignments must adhere to strict regulations. Matches at a major event are played on up to 18 courts over the course of three weeks. In general, each court has two rotating crews, each filling up-to nine line positions. Results from use of the system at the 2004 and 2005 US Opens will be discussed.

2 - Using Mathematical Modeling to Study Some Claims, Conjectures and Questions Inspired by Moneyball
Bruce Bukiet, Associate Professor, New Jersey Institute of Technology, University Heights, Newark, NJ, 07102-1982, United States, bukiet@oak.njit.edu

Michael Lewis's bestseller, Moneyball, highlights how analytical approaches can help baseball teams of modest means compete against wealthier teams. The values of strategies and relative influence of some performance measures on team success are discussed. Most of the book's conclusions are based on statistical analyses. Here, we apply mathematical modeling, including Markov chains and dynamic programming, to investigate some claims the book makes and some questions inspired by the book.

3 - Modeling a Baseball Game to Optimise Pitcher Substitution Incorporating Handedness of Players
Nobuyoshi Hirotsu, Researcher, Japan Institute of Sports Sciences, 3-15-1 Nishigaoka, Kita-Ku, Tokyo, 115-0056, Japan, hirotsu.nobuyoshi@jiss.naash.go.jp, Mike Wright

We propose a method for identifying the optimal strategy for substituting players in baseball, taking into consideration the handedness of players. Using a Markov chain model we incorporate the effect of the handedness by introducing the concept of the Defensive Earned Run Average as a measure of the defensive ability of pitchers. We then develop a DP formulation including the effect of the handedness. This method is illustrated using a match based on the line-ups of the Rockies and the Giants.

4 - On the Value of Throwing Strikes
Eric Bickel, Assistant Professor, Department of Industrial and Systems Engineering, Texas A&M University, 236B Zachry Engineering Center, 3131 TAMU, College Station, TX, 77843-3131, United States, ebickel@tamu.edu

On old baseball adage is that the first strike is the most important strike of a plate appearance because it is important to "get ahead" of the hitter. In this talk we will use a Markov model, supported by game data, to quantify the value of throwing strikes for each count. While it is always a good idea for the pitcher to try and throw a strike, the 0-0 count is one of the least important counts on which to do so. As we will show, 3-2 is the count on which a strike is the most valuable.

■ SD33

Research Advancement and Vision in Quality, Statistics, Reliability

Sponsor: Quality, Statistics and Reliability
Sponsored Session

Chair: Judy Jin, Associate Professor, Department of Industrial and Operations Engineering, The University of Michigan, 1205 Beal Ave, Ann Arbor, MI, 48109-2117, United States, jhjin@umich.edu

1 - Recent Advances in Reliability Engineering Research
Elsayed Elsayed, Rutgers University, Department of Industrial and Systems Eng, 96 Frelinghuysen Road, Piscataway, NJ, 08854, United States, elsayed@rci.rutgers.edu

In this presentation we highlight the research directions and its applications in industry. We address research issues in modeling large scale systems, criticality of the systems' components, reliability testing at normal and accelerated conditions, reliability prediction for highly reliable systems and condition-based maintenance issues under the current advances in sensors and communication systems.

2 - Taguchi's Robust Parameter Design: A 25-year Retrospective Look at the Contributions and Impact
Vijay Nair, Department of Statistics, University of Michigan, Ann Arbor, MI, United States, vnn@umich.edu

Genichi Taguchi's ideas on robust parameter design were first introduced in the US in 1980, starting with his visit to Bell Labs. Since then, they have elicited a lot of excitement and controversy, both in industry and in academia. This talk will provide a personal assessment of the novel contributions to and impact on industrial practice as well as statistical methodology relating to design and analysis of industrial experiments.

3 - Stream of Variation For MMP: Review of Current Accomplishments and Future Research Topics
Jan Shi, Professor, The University of Michigan, 1205 Beal Avenue, Ann Arbor, MI, 48109-2117, United States, shihang@umich.edu

Stream of Variation (SoV) methodologies were developed for variation modeling, analysis and control for multistage manufacturing processes (MMP). This presentation summarizes the motivation, challenges, major accomplishments up to date, and some potential research topics in the SoV theory and applications.

■ SD34

Reliability Research I

Sponsor: Quality, Statistics and Reliability
Sponsored Session

Chair: David Coit, Associate Professor, Rutgers University, Industrial & Systems Engineering, 96 Frelinghuysen Rd., Piscataway, NJ, 08844, United States, coit@rutgers.edu

1 - Computer Algebra Applications in Reliability
Lawrence Leemis, Professor, Department of Mathematics, The College of William and Mary, P.O. Box 8795, Williamsburg, VA, 23187-8795, United States, leemis@MATH.WM.EDU

Complex reliability problems can be solved using APPL (A Probability Programming Language). Several applications illustrate the versatility of this Maple-based language, including determining the survivor function associated with a system of components, model discrimination for a right-censored data set, and goodness-of-fit testing.

2 - Bayesian Semiparametric Analysis for a Single Item Maintenance Optimization
Elmira Popova, Associate Professor, University of Texas at Austin, 1 University Station C2200, Austin, TX, 78712, United States, elmira@mail.utexas.edu, Timothy Hanson, Paul Damien, Alexander Galenko

In this paper we address the problem of a finite horizon single item maintenance optimization structured as a combination of preventive and corrective maintenance in a nuclear power plant environment. We present two Bayesian semiparametric models to estimate the failure time distribution and costs involved. We show the effectiveness of this research using real data from South Texas Project Nuclear Operating Company.

3 - On Capacitated Two-terminal Reliability and Uncertainty
Jose Ramirez-Marquez, jmarquez@stevens.edu, Wei Jiang

Capacitated two-terminal reliability is defined as the probability that network capacity, generated by capacitated components, between a set of nodes is greater than or equal to a known demand. Reliability depends on the uncertainty associated to the reliability of the network arcs. This study explores interactions between arc and network reliability uncertainty. It provides a structured approach that generates an alpha level confidence interval for capacitated two-terminal network reliability.

4 - Reliable Assignment of Network Services in Ad-Hoc Wireless Networks
Abdullah Konak, Assistant Professor of Information Sciences and Technology, Penn State Berks, Tulpehocken Road, P.O. Box 7009, Reading, PA, 19610, United States, konak@psu.edu

This paper introduces the problem of assigning network services to nodes in wireless ad-hoc networks to maximize a reliability measure. Reliability is defined as the probability that a client has access to all required services. Reliability measures for wireless ad-hoc networks are discussed. In addition, a meta-heuristic algorithm is introduced to solve the defined problem.

■ SD35

RASIG Roundtable: Part II

Sponsor: Railroad Applications
Sponsored Session

Chair: Michael Gorman, Assistant Professor, University of Dayton, Dept. of MIS/OM/DSC, 300 College Park, Dayton, OH, 45469-2130, United States, michael.gorman@udayton.edu

1 - Capacity and Yield Management
Reilly McCarren, jrmccarren@comcast.net

I will relate my experience with capacity and yield management at Wisconsin Central.

2 - Service Design and Capacity Management at BNSF
Richard Margl, BNSF, richard.margl@bnsf.com

I will discuss capacity planning from a Service Design perspective at BNSF.

3 - Capacity Planning at CSX
Lawrence Ratcliffe, CSX, Lawrence_Ratcliffe@csx.com

I will share my experiences with financial capacity planning at CSX.

4 - Integrated Financial and Capacity Planning
Larry Shughart, Innovative Scheduling, larry@InnovativeScheduling.com

Mr. Shughart will present a model that links railroad capacity utilization to the financial performance of a railroad. He will examine the relationship of Pricing, Network and Productivity Capacity to the Operating Ratio. We will empirically examine the important capacity drivers, and indicate if each driver is largely a management/strategic variable or if the driver can be significantly improved with the application of OR techniques

■ SD36

Input Modeling and Applications

Sponsor: Simulation
Sponsored Session

Chair: Bahar Biller, Assistant Professor, Carnegie Mellon University, Tepper School of Business, 5000 Forbes Avenue Posner Hall 360, Pittsburgh, PA, 15213, United States, billerb@andrew.cmu.edu

1 - The Bootstrap Embedded Sequential Testing (BEST) Algorithm for Identifying the Best System Design
Thomas R. Willemain, Professor, Rensselaer Polytechnic Institute, Decision Science and Engineering Systems, Troy, NY, 12180, United States, willet@rpi.edu, Huaiyu Harry Ma

BEST combines sequential hypothesis testing with two innovations in bootstrapping: mirroring the data series around the zero axis and pooling results when there is more than one independent data sample. Experiments showed BEST improved on the KN++ algorithm, both in probability of correct selection and average number of simulation observations.

2 - Comparing Experiment Designs for Forward-Inverse Metamodels
Russell Barton, Professor, Penn State University, Smeal College of Business, 406 Business Building, University Park, PA, 16802, United States, rbarton@psu.edu

Metamodels provide estimates of simulation output as a function of design parameters. One can use 'inverse' metamodels to map system performance requirements to design parameters. These models can be fitted with the same experimental data used to fit the usual 'forward' metamodels. This talk compares experiment designs for this situation.

3 - Vessel Arrival Process and Queueing in Marine Ports
Tayfur Altiok, Professor, Rutgers University, Department of Industrial Engineering, Piscataway, NJ, 08854, United States, altiok@rci.rutgers.edu, David Jagerman

Vessel arrival process in bulk ports handling either cargo containers or minerals is presented. Impact of lay period on the port performance is discussed. SHIP/G/1 queue is presented to study the queueing behavior at the port. Approximations for asymptotic probabilities of delays and number of vessels are discussed.

4 - Behavior of VARTA in Higher Dimensions
Ismail Civelek, PhD Candidate, Carnegie Mellon University, 4135 Murray Avenue, Pittsburgh, PA, 15217, United States, icivelek@andrew.cmu.edu, Bahar Biller

We study the behavior of VARTA (Vector-Autoregressive-To-Anything) method as the number of components and the order of dependence of the input process increase. We observe that this method fails when the autoregressive coefficients do not satisfy the stability condition, which implies stationarity, or the correlation matrices of base and white noise processes are not positive definite. Our objective is to quantify the failure probability of the VARTA method due to each one of these reasons.

5 - Copula-based Input Models for Stochastic Simulation
Bahar Biller, Assistant Professor, Carnegie Mellon University, Tepper School of Business, 5000 Forbes Avenue Posner Hall 360, Pittsburgh, PA, 15213, United States, billerb@andrew.cmu.edu

Although the Vector-Autoregressive-To-Anything (VARTA) process is a general input model for dependence modeling in the current simulation input modeling literature, they fall short in the simulation of stochastic systems with complex interactions and interdependencies. In this talk, we present a new framework that will enable us to address the shortcoming of the VARTA input model and go beyond the use of linear correlation as a dependence measure.

■ SD37

Asymptotic Analysis of Stochastic Systems

Sponsor: Applied Probability
Sponsored Session

Chair: Sunil Kumar, Stanford Graduate School of Business, 518 Memorial Way, Stanford, CA, 94305, United States, kumar_sunil@gsb.stanford.edu

1 - Customer Abandonment in Heavy Traffic
Joshua Reed, Georgia Institute of Technology, Industrial and Systems Engineering, Atlanta, GA, United States, je-reed@isye.gatech.edu, Amy Ward

We study a single server queue in which each arriving customer independently abandons the queue if his service has not begun within a generally distributed amount of time. Under some mild conditions on the deadline distribution, we identify a limiting heavy traffic regime in which the resulting diffusion approximation contains the entire deadline distribution. In addition, we also derive simple formulae which completely characterize the stationary distribution of the approximating diffusion.

2 - On Exponential Ergodicity in Multiclass Queueing Networks
David Gamarnik, MIT, daveg@us.ibm.com, Sean Meyn

It is known that the stability of the fluid limit model implies stability of an underlying multiclass queueing network. Also, if all the moments of the stochastic primitives are finite, then, all the moments of the queue lengths are finite in steady state. A natural conjecture is that the same holds for exponential moments. Surprisingly, this turns out not to be the case and we provide a counter example.

3 - Asymptotically Optimal Control of a 2-Tier Assemble-to-Order System
Erica Plambeck, Associate Professor of Operations, Information and Technology, Stanford Graduate School of Business, Memorial Way, Stanford, CA, 94305, United States, plambeck_erica@gsb.stanford.edu

This paper derives an asymptotically optimal control policy for an Assemble-to-Order system with capacitated component production, shipping delays, and both fixed and variable shipping costs. The policy is surprisingly simple -independent threshold control of each component. The policy is asymptotically optimal in the regime of high order arrival rates.

4 - Integration of Real-time and File Sharing Internet Traffic: Fluid and Diffusion Limits
Sunil Kumar, Stanford Graduate School of Business, 518 Memorial Way, Stanford, CA, 94305, United States, kumar_sunil@gsb.stanford.edu, Laurent Massoulie

We study the behavior of a communication link that divides its capacity fairly among file transfers and streaming flows. We obtain fluid and diffusion limits in asympotic regimes via weak convergence techniques. These limits provide intuition for the observed behavior of systems, such as long relaxation times.

■ SD38

Linear Programming and Equilibria

Cluster: Linear/Nonlinear Programming
Invited Session

Chair: Yinyu Ye, Stanford University, yinyu-ye@stanford.edu

1 - How Good are Interior Point Methods? Klee-Minty Cubes Tighten Iteration-complexity Bounds
Tamas Terlaky, Professor, McMaster University, Department of Computing and Software, McMaster University, Hamilton, ON, L8S4K1, Canada, terlaky@mcmaster.ca, Eissa Nematollahi, Antoine Deza

By adding redundant inequalities the central path can be forced to visit any small neighborhood of all the vertices of the Klee-Minty cube, in the same order as simplex methods do. A careful refinement and analysis of the example over the Klee-Minty n-cube allows to exhibit a nearly worst-case example for path-following interior point methods.

2 - Solving Linear Optimization Problems with MOSEK
Bo Jensen, MOSEK, Fruebjergvej 3, Box 16, Copenhagen, 2100, Denmark, bo.jensen@mosek.com

MOSEK is a software package intended at solution of large-scale linear and convex nonlinear optimization problems. This talk will present the linear optimization capabilities in MOSEK. In particular we will review the recent advances in the linear optimization algorithms implemented. Finally, we will present numerical results that compares the interior-point and simplex algorithms as implemented in MOSEK.

3 - Design of Price Mechanisms for Network Resource Allocation via Price of Anarchy
Ying-Ju Chen, PhD Candidate, IOMS-Operations Management, Stern School of Business, New York University, 44 West 4th Street, KMC 8-152, New York City, NY, 10012, United States, ychen0@stern.nyu.edu, Jiawei Zhang

In this paper, we propose to use the concept of price of anarchy as a criterion in designing price mechanisms for cost-sharing games. In particular, we investigate the network resource allocation problem studied by Johari and Tsitsiklis [2005], where users gather utilities by sending flows through the communication network with quadratic cost structure. The search of optimal price schemes is confined within the mechanisms characterized by a set of commonly adopted axioms in cost-sharing games.

4 - Paths to Arrow-Debreu Exchange Market Equilibria
Yinyu Ye, Stanford University, yinyu-ye@stanford.edu

We present polynomial-time algorithms for solving the Fisher and Arrow-Debreu competitive market equilibrium problems with linear utilities and n players. We show that, for the first time, these problems admit the same time complexity bound for linear programming of the same dimension and size. We also present continuous paths leading to the set of the Arrow-Debreu equilibrium, similar to the central path developed for linear programming interior-point methods.

■ SD39

Algorithms in Structured Convex Programming

Sponsor: Optimization/ Linear Programming and Complementarity
Sponsored Session

Chair: Osman Guler, Professor, University of Maryland, Baltimore County, 1000 Hilltop Circle, Baltimore, 21250, United States, guler@math.umbc.edu

1 - On the Minimum Volume Ellipsoid Containing Part of a Given Ellipsoid
Filiz Gurtuna, Graduate student, University of Maryland, Baltimore County, 1000 Hilltop Circle, Baltimore, 21250, United States, gurtuna1@math.umbc.edu, Osman Guler

The formulae for the minimum volume ellipsoid containing two—sided cuts of a given ellipsoid is known and the proof is based on a guess and its verification. We formulate the problem as an optimization problem and use KKT conditions and other tools to obtain some insights into its structure. These ellipsoids are used in a recently proposed conjugate gradient algorithm incorporating adaptive ellipsoid preconditioning.

2 - Differentiation of Functions of Hermitian Matrices and Applications to Interior-Point Methods
Olena Shevchenko, Graduate student, University of Maryland, Baltimore County, 1000 Hilltop Circle, Baltimore, 21250, United States, olenshe1@math.umbc.edu, Osman Guler

One of the major difficulties in extending interior-point methods from LP to SDP is noncommutativity of matrix multiplication. One of the approaches is to symmetrize the complementarity condition that leads to symmetric search directions. In this case, the analysis of the methods involves estimations of directional derivatives of a function of a hermitian operator. In this talk, we will discuss the differentiation techniques and their applications in the analysis of the IPMs for SDP.

3 - Noncommutative Analysis in Interior-point Methods
Osman Guler, Professor, University of Maryland, Baltimore County, 1000 Hilltop Circle, Baltimore, 21250, United States, guler@math.umbc.edu

In semidefinite programming, the decision variables are matrices which do not necessarily commute. In fact, this lack of commutation is present in many types of optimization problems beyond linear programming. This causes major difficulties in interior-point methods, both in devising algorithms and in their analysis. In this talk, we present a calculus for noncommuting variables and demonstrate its relevance in sdemidefinite programming.

■ SD40

Characterizing and Controlling Congestion

Sponsor: Optimization/ Network Optimization
Sponsored Session

Chair: Lisa K. Fleischer, IBM, T J Watson Research, Yorktown Heights, NY, 10598, United States, lkf@watson.ibm.com

1 - Pricing, Investment, and Market Structure in Industries with Congestion
Gabriel Y. Weintraub, Management Science and Engineering Dept., Stanford University, Terman Engineering Center, 3rd Floor, Stanford University, Stanford, CA, 94305, United States, gweintra@stanford.edu, Ramesh Johari

We model an industry with congestion as a network with parallel links. We analyze a game where firms compete setting prices and investing to modify their latency functions. Consumers traffic is routed according to a Wardrop equilibrium. We characterize industry equilibria, compare equilibrium investment levels to the social optimum, and study market structure as market size increases.

2 - Networks with Heterogeneous Congestion Control Protocols
Steven Low, Professor, Caltech, MC256-80, Caltech, Pasadena, CA, 91125, United States, slow@caltech.edu, Ao Tang, Jiantao Wang, Mung Chiang

When heterogeneous congestion control protocols that react to different pricing signals share the same network, the resulting equilibrium may no longer be interpreted as a solution to the standard utility maximization problem. We develop a model for equilibrium properties of such a network, derive conditions for global uniqueness and stability of the equilibrium, and present experimental results to verify these findings.

3 - Applications of Generalized Poincare-Hopf in Network Optimization
Asu Ozdaglar, MIT, 77 Massachusetts Avenue, 32-D630, Cambridge, MA, 02446, United States, asuman@MIT.EDU, Alp Simsek, Daron Acemoglu

The operation and structure of today's networks necessitate considering nonconvex optimization problems for resource allocation. In this paper, we present an analysis for these problems using the index theory of differential topology. In particular, we show that the recent generalization of the Poincare Hopf theory can be used to establish uniqueness of critical points and stability in a variety of network optimization problems.

4 - Routing Without Regret
Katrina Ligett, Department of Computer Science, Carnegie Mellon University, Pittsburgh, PA, 15213, katrina@cs.cmu.edu, Eyal Even-Dar, Avrim Blum

There has been substantial work on simple, efficient ``no-regret" algorithms for a number of adaptive game-playing problems including online routing. There has also been substantial work on analyzing properties of Nash equilibria in routing games. In this talk, we will consider the question: if each player in a routing game uses a no-regret strategy, will behavior converge to a Nash equilibrium, and under what conditions and in what sense?

■ SD41

Integer Programming

Sponsor: Optimization/ Integer Programming
Sponsored Session

Chair: Alper Atamturk, University of California, Berkeley, Department of IEOR, Berkeley, CA, United States, atamturk@ieor.berkeley.edu

1 - Computational Experience with Branching on Hyperplane Algorithms for Mixed Integer Programming
Sanjay Mehrotra, Professor, Northwestern University, 2145 Sheridan Rd., Room C140, Evanston, IL, 60601, United States, mehrotra@iems.northwestern.edu, Huanyuan(Wayne) Sheng

We will present our computational experience with branching on hyperplane algorithms for mixed integer programming. Results will be discussed based on the performance of basis reduction algorithms and implementation strategies for different formulations of this approach. Results based on an implementation in a

solver system "IMPACT" will be presented on difficult knapsack and market split problems; and depending on the progress, on sparse mixed integer programming problems.

2 - Is Thinner Better?
Gabor Pataki, Dept. of Statistics and Operations Research, University of North Carolina, Chapel Hill, NC, United States, gabor@unc.edu, Bala Krishnamoorthy

We present a class of hard integer programs, called cascade problems, in which branching on directions in which the polyhedron is "thin" is inferior to branching on "less thin", but dominant directions. We also show that this phenomenon appears in some practical instances as well; and why a preconditioning method called column basis reduction provably makes these instances easy for branch-and-bound.

3 - Optimizing over the MIR closure
Sanjeeb Dash, Research Staff Member, IBM Research, IBM T. J. Watson Research Center, 1101 Kitchawan Road, Yorktown Heights, NY, 10598, United States, sanjeebd@us.ibm.com, Oktay Gunluk, Andrea Lodi

We study the problem of separating an arbitrary point from the MIR closure of a polyhedron (finding violated rank-1 MIR cuts). Motivated by the work of Fischetti and Lodi (2005), who gave an MIP model for separating from the Chvatal closure of a polyhedron, we describe an MIP model for separating from the MIR closure of a polyhedron. Our analysis yields a short proof of the result of Cook, Kannan and Schrijver (1990) that the split closure of a polyhedron is again a polyhedron.

4 - 3-state Unconstrained Quadratic Programming
Deepak Rajan, Post Doc, IBM Research, IBM T. J. Watson Research Center, 1101 Kitchawan Road, Yorktown Heights, NY, 10598, United States, drajan@us.ibm.com, Andrea Lodi, Sanjeeb Dash

We study the unconstrained {-1,0,1} Quadratic Programming problem. Our main contributions are cutting planes that strengthen its linearization, and a branching strategy that allows us to add these cuts in the branch-and-bound tree, and yet maintain sufficient problem structure to transform the new formulation into a min-cost network flow (MCF), and eventually to a slightly modified max flow problem. Finally, we present computational results using this approach on real-world problem instances.

■ SD42

Risk-Averse Stochastic Optimization

Sponsor: Optimization/ Stochastic Programming
Sponsored Session

Chair: Darinka Dentcheva, Associate Professor, Stevens Institute of Technology, 1 Castle Point on Hudson, Hoboken, NJ, 07030, United States, ddentche@stevens.edu

1 - Inverse Stochastic Dominance and Rank Dependent Utility
Darinka Dentcheva, Associate Professor, Stevens Institute of Technology, 1 Castle Point on Hudson, Hoboken, NJ, 07030, United States, ddentche@stevens.edu, Andrzej Ruszczynski

We consider optimization problems with second order stochastic dominance constraints formulated as a relation of Lorenz curves. We characterize the relation in terms of rank dependent utility functions. We develop optimality conditions and duality theory for problems with Lorenz dominance constraints. We prove that Lagrange multipliers associated with these constraints can be identified with rank dependent utility functions.

2 - Portfolio Construction Based on Stochastic Dominance and Target Return Distributions
Gautam Mitra, Professor, Brunel University, Middlesex, Uxbridge, UB8 3PH, United Kingdom, Gautam.Mitra@brunel.ac.uk, Diana Roman, Ken Darby- Dowman

The construction of a portfolio, which is non-dominated with respect to second order stochastic dominance and whose return distribution has specified desirable properties, is considered. The proposed model leads to portfolios which are optimal for rational and risk-averse investors. The model is multi-objective and is transformed into a single objective model by using the reference point method. The performance of the models on real data drawn from the Hang Seng index is also investigated.

3 - Statistical Tests for Stochastic Dominance
Ludmyla Rekeda, Stevens Institute of Technology, Dep. of Math.Sc., Hoboken, NJ, United States, luda.rekeda@novartis.com, Darinka Dentcheva

The comparison of distributions of uncertain prospects has been of considerable interest in various branches of science. One of the most popular stochastic orders is based on the notion of stochastic dominance. Stochastic dominance plays an increasingly prominent role in the decision theory under uncertainty, and has multiple applications. We shall present the comparison between the existing approaches for testing stochastic dominance, and shall propose a new approach.

4 - Most Informative Component Analysis in Application to a Stock Market
Anton Molyboha, Ph.D. student, Stevens Institute of Technology, Department of Mathematical Sciences, Hoboken, NJ, 07030, United States, amolyboh@stevens.edu, Michael Zabarankin, Jeffrey Nickerson

The Most Informative Component Analysis (MICA) for analysis of complex stochastic systems has been developed. The MICA is based on the notion of mutual information and identifies the most informative robust factors for describing stochastic system states and comparing states one to another. It significantly reduces human workload in information processing and latency in decision making. As an example, the MICA is used for analyzing a stock market and a sensor network.

■ SD43

Robust Search in CP

Sponsor: INFORMS Computing Society/ Constraint and Integer Programming
Sponsored Session

Chair: Gilles Pesant, CRT, University of Montreal, Montreal, Qc, Canada, pesant@crt.umontreal.ca

1 - No-good Learning and Search Restart for Impact Based Strategies
Philippe Refalo, ILOG, Les Taissounieres, 1681, route des Dolines, Sophia Antipolis, 06560, France, prefalo@ilog.fr

Impact-based strategies are general purpose strategies that select variables and values by observing, during search, the effect of instantiations on the reduction of the search space. We have studied primal and dual impact based strategies together with nogood learning and restart. On various problems, such as sport scheduling and multiknapsack, classical strategies are outperformed.

2 - Comparison of Search Methods for the Talent Scheduling Problem
Paul Shaw, Principal Scientist, ILOG, 1681 route des Dolines, Valbonne, France, pshaw@ilog.fr

The talent scheduling problem involves the minimization of talent waiting costs by best ordering the filming of scenes. In this talk, we present various search methods for the problem, including constructive techniques, local search methods, and hybrids, such as large neighborhood search. We compare our methods on problems from the literature and a new larger set of problems that we have created.

3 - Increasing Robustness by Means of Randomization for LP Based Methods
Carla Gomes, gomes@cs.cornell.edu

I will discuss how the accuracy of LP based relaxations can vary dramatically as a function of the problem space and show how randomization can be very effective in increasing the robustness of branch and bound methods.

4 - Multiconsistency and Robustness with Global Constraints
Khaled Elbassioni, Professor, Max-Planck Institute for Informatics, Saarbrucken, 66123, Germany, elbassio@mpi-sb.mpg.de, Irit Katriel

We propose a natural generalization of arc-consistency, which we call multiconsistency: A value v in the domain of a variable x is k-multiconsistent with respect to a global constraint C if there are at least k solutions to C in which x is assigned the value v. We present algorithms that determine which variable-value pairs are k-multiconsistent with respect to several well known global constraints.

5 - Constraint-Based Search Strategies
Gilles Pesant, CRT, University of Montreal, Montreal, Qc, Canada, pesant@crt.umontreal.ca

In constraint programming, tractable substructures of a problem have been encapsulated in constraints and then used to filter the domains of variables. But other information can often be obtained with little extra work, such as the number of solutions of the constraint. We investigate strategies exploiting the evolution of the number of solutions of each constraint to make search more robust.

■ SD44

Heuristics for Large Scale Computing Systems

Sponsor: INFORMS Computing Society/ Heuristic Search
Sponsored Session

Chair: Pano Santos, HP labs, 1501 Page Mill Road, MS1140, Palo Alto, CA, 94304,
United States, cipriano.santos@hp.com

Co-Chair: Pedro Flores, Universidad de Sonora, Av. Rosales y Blvd. Transversal S/N, Hermosillo, Son., 83000, Mexico, pflores@gauss.mat.uson.mx

1 - A Mapper For Managing Shared, Virtualized Computing and Network

Robert P Ricci, University of utah, ricci@cs.utah.edu, Jay Lepreau

To virtualize shared computing and network resources, it is necessary to map virtual resource specification onto available physical resources. We present design, implementation, and evaluation of a solver for this problem. Our solver uses randomized heuristic techniques to find very good solutions in seconds, and scales on large synthetic topologies.

2 - Applying Bin-Packing Algorithms to Server Consolidation

Alex Zhang, HP Labs, 1501 Page Mill Road, MS1140, Palo Alto, CA, 94304, United States, alex.zhang@hp.com, Fereydoon Safai, Dirk Beyer

We apply bin-packing algorithms to server consolidation based on performance trace data and user-defined consolidation constraints. We extend the deterministic bin-packing heuristics (first-first decreasing and best-fit decreasing) to high-dimensional (20,000+), probabilistic bin capacities, where the dimensions are server performance metrics and time intervals in the trace. We will also present implementation results.

3 - Automated Application Component Placement at a Computing Utility

Pano Santos, HP labs, 1501 Page Mill Road, MS1140, Palo Alto, CA, 94304, United States, cipriano.santos@hp.com, Xiaoyun Zhu, Norman Salazar, Jim Jim Pruyne, Pedro Flores

This paper presents the optimal placement of application components to computing servers. A self-adapting genetic algorithm is used, since it gives more freedom in the definition of objectives and constraints than mathematical programming approaches, and provides reasonably good solution in a satisfactory amount of time.

4 - Solutions for Scheduling Data Recovery Operations after Disasters

Kimberly Keeton, HP Labs, 1501 Page Mill Road, MS1140, Palo Alto, CA, 94304, United States, kimberly.keeton@hp.com, Dirk Beyer, Ernesto Brau, Arif Merchant, Pano Santos, Alex Zhang

When failures occur at dependable storage systems, administrators schedule recovery based on rules of thumb. With multiple workloads and protection techniques, the number of possibilities is large, so the decision process is not trivial. We will describe the data recovery scheduling problem, a mathematical programming and a heuristic solution approaches.

■ SD45

Dynamic Routing

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Barrett Thomas, Assistant Professor, University of Iowa, Department of Management Sciences, 108 Pappajohn Business Building, Iowa City, IA, 52242, United States, barrett-thomas@uiowa.edu

1 - Robust Formulations for Empty Repositioning Problems

Juan Morales, Graduate Student, Georgia Institute of Technology, School of Industrial and Systems Engineering, 765 Ferst Drive NW, Atlanta, GA, 30332-0205, United States, jmorales@isye.gatech.edu, Alan Erera, Martin Savelsbergh

Dynamic asset repositioning models are used in many freight transportation contexts to enable operators to cost-effectively serve demand which may be both geographically and temporally imbalanced. We develop a new robust approach for dynamic asset repositioning problems with demand uncertainty. Robust formulations will be presented and solution techniques discussed.

2 - Vehicle Routing Problems in a Competitive Environment

Miguel Figliozzi, University of Sydney, miguel@itls.usyd.edu.au, Hani Mahmassani, Patrick Jaillet

In this presentation, we extend a prize collecting TSP to a dynamic environment with time windows and uncertainties in the prizes and/or cities to visit. We model, analyze, and discuss some properties of this problem in a dynamic setting. Different solution strategies are developed and simulated.

3 - A Parallelizable Dynamic Fleet Management Model with Random Travel Times

Huseyin Topaloglu, Assist. Prof., Cornell University, 223 Rhodes Hall, Ithaca, NY, 14853, United States, topaloglu@orie.cornell.edu

We present a dynamic feet management model with random travel times. Our approach decomposes the problem into time-staged subproblems by formulating it as a dynamic program and uses approximations of the value function. In order to deal with random travel times, the state variable of our dynamic program includes all individual decisions over a relevant portion of the history. We show how to approximate the value function in a tractable manner under this new high-dimensional state variable.

4 - Real-time Heuristics for Anticipating Service Requests from Known Customer Locations

Barrett Thomas, Assistant Professor, University of Iowa, Department of Management Sciences, 108 Pappajohn Business Building, Iowa City, IA, 52242, United States, barrett-thomas@uiowa.edu

This talk focuses on real-time heuristics for maximizing the number of previously unknown customer service requests that can be inserted into a prespecified route when the unknown requests arrive throughout the time horizon and all customer locations are known with certainty. The heuristics are derived from analytical results on the structure of the optimal policy, and the heuristic policies are compared to optimal policies for a number of instances.

■ SD46

Urban Transportation Planning Models IV: Transit Models and Planning

Sponsor: Transportation Science & Logistics
Sponsored Session

Chair: Grisselle Centeno, Assistant Professor, University of South Florida, Industrial and Management Systems Engine, 4202 E. Fowler Ave. ENB118, Tampa, FL, 33620-5350, United States, gcenteno@eng.usf.edu

1 - Identifying Driver Preferences for Flexible Shifts

Juan Carlos Munoz, Assistant Professor, Universidad Catòlica de Chile, V Mackenna 4860, Santiago, Santiago, 6904411, Chile, jcm@ing.puc.cl, Felipe Miranda

Transit productivity could be considerably improved if drivers were requested to work a combination of short and long shifts since a better match with typical passenger demand fluctuations could be obtained. We develop a methodology for identifying driver preferences regarding these shifts and apply it in Santiago de Chile.

2 - Bidding Process for a Transit System: A Minimum Cost Network Flow Approach

Diego Molina, SECTRA, Santiago, Chile, damolina@ing.puc.cl, Juan Carlos Munoz

The transit system in Santiago de Chile is being completely restructured. The city was divided into 15 subsystems which were open for a bidding process. Each subsystem would be assigned to the firm requesting the lower fare per passenger. However, for strategical reasons, certain sets of subsystems could not be assigned to the same firm. The problem is solved as a Minimum Cost Network Flow Problem. The results of the Santiago bidding process are shown and discussed.

3 - Measuring Uncertainty in the Reasoning Process: A Case of Justifying a Large -Scale Transit Project

Shinya Kikuchi, Professor, University of Delaware, Civil and Environmental Engineering, Newark, DE, 19716, United States, kikuchi@ce.udel.edu, Sharat Chandra Mangalpally

This study measures the logical strength of reasoning chains that are involved in planning a large-scale transit project. The reasoning chains consist of series of "if…then… statements. The strength of the overall logical chain depends on the uncertainty of individual links and how they are connected. We propose a method that measures uncertainty in individual links based on the available information and after aggregation, measures the overall integrity of the logic of the plan.

4 - Integrated Integer Programming and Scheduling Models for Maintenance Decisions

Grisselle Centeno, Assistant Professor, University of South Florida, Industrial and Management Systems Engine, 4202 E. Fowler Ave. ENB118, Tampa, FL, 33620-5350, United States, gcenteno@eng.usf.edu, Paula Lopez-Alvarado

This research combines IP and scheduling models with forecasting techniques to allocate resources in maintenance departments. The information resulting from the models is entered into a support system that generates scenarios that facilitate the process of resource planning and resource allocation. Better planning of job repairs result in cost savings, timely maintenance and reduction of road calls which translates into better and more cost effective transit services.

■ SD47

Emergency and Security Planning in Transportation Systems

Contributed Session

Chair: Ying Liu, University of Maryland, Department of Civil Engineering, University of Maryland, College Park, 20742, United States, lyng@wam.umd.edu

1 - A Methodology for Identifying Connectivity Disruption Zones in a Transportation Network

Pamela Murray-Tuite, Assistant Professor, Virginia Tech, Northern Virginia Center, 7054 Haycock Road, Falls Church, VA, 22043, United States, murray@alumni.duke.edu

This paper presents a methodology for identifying disruption zones in a surface transportation network. An index defines the network connectivity disruption caused by damage to a particular link. This index, combined with the network structure, defines the connected set of links that form a disruption zone. These zones identify areas in the network that may benefit from additional alternate routes.

2 - Data Integration for Improving Management of Traffic Incidents

Paul Salasznyk, Research Assistant, Rensselaer Polytechnic Institute, CII 5107, 110 Eighth St, Troy, NY, 12180, United States, salasp@rpi.edu, Earl Lee, George List, William Wallace

In the wake of the terrorist attacks of September 11, 2001, incident response must be faster, more integrated, and more intelligent in responding to these events in order to reduce the human, economic and environmental losses. Improving data sharing requires rigorous systems analysis, including what needs to be shared and what common form the shared data must be in.

3 - Emergency Vehicle Routing on an Uncertain Transportation Network

Christopher Rump, Assistant Professor, Applied Stats & Operations Research, College of Business Administration, Bowling Green State University, Bowling Green, OH, 43403, United States, cmrump@bgnet.bgsu.edu, Daniel Chomiakow

We consider the routing of emergency vehicles in the wake of a natural disaster such as a major earthquake. Due to the possibly damaged transportation infrastructure at bridges and highway overpasses, we draw upon concepts in network reliability to obtain expected travel time and variance estimates for a tree of alternative paths. We develop and test our routing algorithms with an eye towards their use as input for higher-level dispatching decisions.

4 - An Optimization/Simulation Model for Emergency Evacuation: Case Study for Ocean City

Ying Liu, University of Maryland, Department of Civil Engineering, University of Maryland, College Park, 20742, United States, lyng@wam.umd.edu, Gang-Len Chang

This study presents an integrated optimization/simulation model for emergency evacuation. The proposed model first employs an MIP module to optimize the initial set of network control parameters, and then executes a microscopic simulation module to identify potential operational issues and network physical constraints. The solution algorithm with the iterative optimization/simulation process can ensure the optimized evacuation plan has taken into account all real-world operational constraints.

■ SD48

Planning and Evaluating Healthcare Interventions

Sponsor: Health Applications
Sponsored Session

Chair: Elissa Ozanne, Harvard Medical School, 101 Merrimac St., 10th Fl., Institute for Technology Assessment, Boston, MA, 02114, United States, elissa@mgh-ita.org

1 - A Deterministic Simulation Model to Assess the HIV/AIDS Interventions

Christian Viladent, Assistant, HEC Business School-University of Lausanne, BFSH-1 Dorigny, Lausanne, 1015, Switzerland, Christian.Viladent@unil.ch, Ann Van Ackere

We developed a two-sex deterministic simulation model of the Human Immunodeficiency Virus transmission in selected sub-Saharan countries. Calibration will be performed on data from Botswana. We plan to apply our model to assess the local impact of the Highly Active Antiretroviral Therapies delivered during the UNAIDS 3 x 5 Program.

2 - Allocating Funds for HIV/AIDS: The Case of KwaDukuza

Arielle Lasry, Student, University of Toronto, 5 King's College Road, Dept. of Mech. & Industrial Engineering, Toronto, ON, M5S 3G8, Canada, arielle@mie.utoronto.ca, Greg Zaric, Michael Carter

The current HIV prevalence rate in the municipality of KwaDukuza, South Africa, hovers around 33% for a population of 170,000. We conducted 40 interviews to understand the manner in which funds are being allocated towards HIV/AIDS interventions in KwaDukuza. We establish the types of political and social constraints faced by decision-makers when allocating resources to HIV/AIDS programs. Our research aims to suggest strategies for improving the HIV/AIDS resource allocation process in KwaDukuza.

3 - The Physician's Dilemma: Keeping Patients Healthy and Costs Down

Julie Simmons Ivy, Assistant Professor, University of Michigan, 701 Tappan Street, Ann Arbor, MI, United States, jsimmons@umich.edu

We develop a model of the physician's decision process for deciding whether to screen a patient for disease. We use the theory of partially observable Markov decision processes for the single patient case and present extensions for the n-patient model for two examples: breast cancer and cervical cancer screening.

4 - The Minimal Risk Partitioning Algorithm: A Bayesian Cure Model for Breast Cancer

Elissa Ozanne, Harvard Medical School, 101 Merrimac St., 10th Fl., Institute for Technology Assessment, Boston, MA, 02114, United States, elissa@mgh-ita.org, Laura Esserman, James Miller

Previous long-term studies of patients with breast cancer have demonstrated that an appreciable proportion is no longer at risk of disease progression after surgery and radiation. We have developed the Minimal Risk Partitioning Algorithm (MRPA) to identify cured patients that integrates Kaplan-Meier analysis, step-wise logistic regression, and step-wise Cox regression in a Bayesian framework. The MRPA was built and then validated using two long-term outcome databases.

■ SD49

Analysis of Complex Systems for Decision Making

Contributed Session

Chair: Kathleen Whitcomb, Associate Professor, University of South Carolina, Moore School of Business, Columbia, SC, 29208, United States, whitcomb@moore.sc.edu

1 - A Decision Support System for Managing Technological Innovation Process

Sharon Ordoobadi, Assistant Professor, University of Massachusetts-Dartmouth, 285 Old Westport Road, N. Dartmouth, MA, 02747, United States, sordoobadi@umassd.edu

The process of technological innovation in small manufacturing companies is studied to better understand the process and improve it. The study revealed that intuition played a major role in this process. To facilitate the transfer of intuition/experience from one manager to another, a decision support system is developed through the use of Similarity-based reasoning and proverbs.

2 - A Plug and Play Framework for Rapid Decision Modeling

Kim Hua Tan, Dr., Nottingham University Business School, Jubilee Campus, Wollaton Road, Nottingham, United Kingdom, kim.tan@nottingham.ac.uk

This paper proposes a plug & play framework that allows managers to rapidly build simplified models of complex operating situations. These models enable them to understand and experiment with these complex situations. The salient features of the framework are its ability to serve as scaffolding for managers building their own models, and to provide support for knowledge access and re-application. This paper introduces the plug & play principle and discusses the implication of this research.

3 - Revenue Management Models for IT Service Providers using Virtualization Techniques

Thomas Setzer, Research Assistant, Technische Universitat München, Chair of Internet-based Information Systems (IBIS), Boltzmannstr. 3, Garching / Munich, 85748, Germany, setzer@in.tum.de, Bichler Martin

In this paper we propose and evaluate policies for allocating virtualized resources of IT service providers when they are faced with stochastic demand for heterogeneous services. Our models maximize total profits by accepting or rejecting service requests, depending on their profit-opportunity costs ratios. Opportunity costs - high demand may exploit resource pools and entail rejections - are calculated based on service prices, service levels, consumption coefficients and estimated workload.

4 - Using Multiattribute Value Theory as a Manipulation Detection Tool in Stock Market

Dr. Guldal Buyukdamgaci Alogan, Vice President, TUBITAK, Tunus Cd. No:80 Kavakl˝dere, Ankara, 06100, Turkey, mistikler@gmail.com, Ozan Ozcan

Distinguishing legal and manipulated purchasing/selling transactions has vital importance. Deciding if there is manipulation in the market necessitates modeling the decision environment and making transactions on this valid model. In this study a model is developed to detect manipulation by comparing the general situation of the stocks with the market and implemented in capital markets. The method is presented with multiattribute value measurement that is based on Edwards's SMARTS method.

5 - Eliciting Utilities and Similarity Measures for Case Based Decision Theory

Kathleen Whitcomb, Associate Professor, University of South Carolina, Moore School of Business, Columbia, SC, 29208, United States, whitcomb@moore.sc.edu

Gilboa, Schmeidler, and Wakker (2002) showed that, in principle, similarity measures and utilities can be derived based on observed preferences. We describe a procedure for eliciting similarities and utilities for a finite state space based on their results.

■ SD50

DAS Practice Award Finalists

Sponsor: Decision Analysis
Sponsored Session

Chair: Kazuo Ezawa, Senior Director, Daiichi Medical Research Inc, One Maynard Drive, Park Ridge, NJ, 07656-0712, KazuoEzawa@DMR.DaiichiUS.com

DAS Practice Award Finalists

The Decision Analysis Society (DAS) of INFORMS seeks entries for the annual DAS Practice Award competition for every year. The intent of this award is to recognize, promote, and publicize good decision analysis practice. This year's finalists are as follows:

1 - How to Win Friends & Influence Deal Terms

Ajoy Chakrabarti, Assoc. Director Strategic Planning & Decision Analysis, Bristol Myers Squibb Co. (BMS), Ajoy.Chakrabarti@bms.com

Decision analysis techniques were used to value an oncology in-licensing candidate. The key issues involved analyzing the possible launch scenarios, suggesting modifications to the clinical plan and optimizing the milestone payments. Negotiations influenced by our analysis resulted in a set of deal terms that realistically addressed alternative launch scenarios and managed risk for both parties.

2 - Improving Quality of Decision Making — A Collaborative Approach between Universidad de los Andes and BP Exploration Company - Colombia

Mario Castillo, Associate Professor, University of Los Andes, Calle 19A # 1-37 Este Of. W510, Cra. 8 # 85-31 Ap. 801, Bogotà, DC, Colombia, mcastill@uniandes.edu.co, Alvaro Mendoza, Sergio Cabrales

BP Colombia faces high-impact decision making problems such as technology selection, oil exploitation strategies, and reserve estimation. To solve these problems BP and UniAndes have jointly developed methodologies and models based on decision analysis techniques. 60 engineers were trained on such techniques. This development has had a remarkable impact on BP's decision making processes.

3 - Patient Progression through Clinical Trials

James C. Felli, Ph.D, Lilly Research Laboratories, A Division of Eli Lilly and Company, Lilly Corporate Center, Indianapolis, IN, 46285, FELLI_JAMES_C@LILLY.COM, Wesley H. Anderson, James P. Kremidas, Stephen J. Ruberg

Clinical trials constitute large, resource-intensive endeavors for pharmaceutical companies. Accounts have estimated the number of patients involved in U.S. clinical trials as high as 725,000 with costs in excess of $19 billion annually. We designed and implemented a semi-Markov model to estimate a clinical trial's patient population profile to facilitate the framing and evaluation of trial management alternatives.

4 - An Assessment of Oil Market Disruption Risks

Phillip C. Beccue, 2228 Knollcrest Place, Westlake Village, CA, 91361, United States, phil_beccue@baxter.com, Hillard G. Huntington

The Energy Modeling Forum at Stanford developed a risk assessment framework and evaluated the likelihood of at least one foreign oil disruption over the next ten years. Leading geopolitical, military, and oil-market experts provided their expertise on the probability of different events occurring, and their corresponding link to major disruptions in key oil market regions.