Past OPLOG Seminars since September 2013

Date: Monday, September 9, 2013

Speaker: Baris Ata, Management Booth School of Business, University of Chicago
Topic: Structural Estimation of Callers' Delay Sensitivity in Call Centers
Time: 3:30PM - 5.00PM
Place: Henry Angus 454

We model callers' decision making process in call centers as an optimal stopping problem. After each period of waiting, a caller decides whether to abandon or to continue to wait. The utility of a caller is modeled as a function of her waiting cost and reward for service. We use a random-coefficients model to capture the heterogeneity of the callers and estimate the cost and reward parameters of the callers using the data of individual calls made to an Israeli call center. We also conduct a series of counterfactual analyses that explore the effects of changes in service discipline on resulting waiting times and abandonment rates. Our analysis reveals that modeling endogenous caller behavior can be important when major changes (such as a change in service discipline) are performed, and that using a model with an exogenously specified abandonment distribution may be misleading.

Date: Monday, September 16, 2013

Speaker: Marisol Castro, School of Resource and Environmental Management, Simon Fraser University
Topic: Multiple Discrete Choices
Time: 3.30PM - 5.00PM
Place: Henry Angus 969

Abstract: Discrete choice models have been widely used to study consumer preferences for the choice of a single discrete alternative from among a set of available and mutually exclusive alternatives. However, in many choice occasions, consumers face the situation where they can choose more than one alternative at the same time, although they are not bound to choose all available alternatives. In addition, in such situations, the consumer usually also decides on a continuous dimension (or quantity) of consumption. These scenarios arise, for example in the choice of activity participation and duration, consumer demand for products and vacation destination decisions. Modelling these situations has been a challenge in the past, but in the last decade a new approach to model such situations has emerged. The modelling approach is based on the microeconomic theory, adopting a direct utility framework to obtain the analytic expressions for demand functions. In this seminar, we will examine several issues associated with modeling multiple discrete choices and will illustrate empirical applications of such models.

Date: Monday, September 23, 2013

Speaker: Vikram Krishnamurthy, Department of Electrical and Computer Engineering, UBC
Topic: Active Sensing and Social Learning: Structural Results in POMDPs
Time: 3.30PM - 5.00PM
Place: Henry Angus 969

Abstract: This talk considers two classes of problems where structural results in partially observed Markov decision processes (POMDPs) can yield useful results. Since POMDPs are computationally intractable to solve, our aim is to characterize the structure of the optimal strategy using concepts in lattice programming. The first class of problems we consider, deals with active sensing where sensors reconfigure their behaviour in real time to minimize the mean square estimation error. The second class of problems arises in multi-agent social learning where individual agents learn from their private observations and local actions of previous agents. How can such a multi-agent system use the local decisions to make a global decision required in sequential decision making problems? We show that social learning can yield unusual behavior - in stopping-time problems, the stopping set is non-convex and also the optional policy has a multi-threshold structure.

Date: Monday, September 30, 2013

Speaker: Mike Tretheway, InterVISTAS Consulting
Topic: Measuring Airport Market Power in Retail and Parking: The Importance of Power Tests for Type II Errors
Time: 3:30PM - 5:00PM
Place: HA 969

Abstract: Beginning in 1987, a number of major airports have been privatised. While most of these privatisations had a regulatory regime imposed for aeronautical charges, non-aeronautical services, such as food/beverage/retail and auto parking, have been exempt from regulation. A question is whether airports have market power in non-aeronautical service and earn economic rents from these activities. This question is also important not only for regulatory purposes but also for valuation of airport property. One can observe the price paid for the shares of a privatised airport company but this is enterprise value and would reflect both the value of the assets (e.g., airport land and improvements) as well as any economic rents. This research project assembled carefully constructed data on airport retail income (i.e., the income airports receive from their concessionaire tenants, not gross retail spending) and airport parking rates to test whether there is a premium for airports in monopoly markets versus those airports that face competition from other airports in their catchment area. The results indicated a monopoly premium for both retail and parking, but the statistical significance was 89%. This raised the issue as to whether rejecting the findings and accepting the null hypothesis would create a Type II error, that is the error of incorrectly rejecting a finding is true. This resulted in a series of statistical tests for Type II error, as well as tests for normality and heteroskedasticity. (The data is

cross section, so no test of autocorrelation were undertaken.) Tests for Type II error are largely ignored in econometric studies and a discussion is provided of these issues (e.g., Ziliak and McCloskey) and statistical issues of power tests. The relevance in non-criminal court proceedings where the criteria is typically on the "balance of probabilities" is also discussed. The research results led the author to conclude that rejecting the finding of a monopoly power premium had a high probability of Type II error, and the balance between a moderately low Type I error vs. a high likelihood of Type II error. Thus it is concluded that the finding of a substantial premium for airport monopoly was the correct interpretation of the statistical results.

Date: Monday, October 21, 2013

Speaker: Martin Skutella, Technische Universität, Berlin
Topic: The notion of time in network routing problems
Time: 3.30PM - 5.00PM
Place: David Lam Amphitheatre (DL 125)

Abstract: The notion of time plays a vital role in many real-world routing problems. Examples are road and air traffic control, production systems, communication networks, evacuation planning, and financial flows, to mention just a few. In such applications, flow values on the arcs of a network (streets, communication links, etc.) are not constant but may change over time. Moreover, commodities do not travel instantaneously through these networks but requires a certain amount of time to get from their origin to their destination. Already back in the 1950s Ford and Fulkerson introduced Dynamic Network Flows as a suitable mathematical model for such routing problems. Since then several more sophisticated models and algorithms for solving them have been studied in the fields of mathematics, computer science, and operations research. In this talk we give a general introduction to this interesting and active area of research. We also give a high-level presentation of some more recent results.

Date: Tuesday, October 22, 2013

Speaker: David Hodgkinson, Associate Professor, University of Western Australia Law School
Topic: Even Nobel Prize winners can't solve the aviation emissions problem
Time: Noon to 1.00PM
Place: Henry Angus - HA 233

Abstract: Aviation emissions account for about 5% of cumulative global warming and between 2% and 8% of total emissions according to the IPCC. If global aviation was a country its emissions would be ranked 7th on CO2 alone. Air travel is growing, as are emissions from aviation. The Kyoto Protocol to the United Nations Framework Convention on Climate Change provides that the International Civil Aviation Organization (ICAO) shall be responsible for the limitation or reduction of aviation emissions – for addressing the aviation emissions problem. However, since 1994, ICAO has failed to agree on any such limitation or reduction, this failure leading to the passage of legislation by the EU and recent retaliatory legislative action

by China and the United States. Earlier this month ICAO held its triennial assembly, the main aim of which was to address the aviation emissions problem and to find a global solution to it. This seminar analyses the outcomes of the ICAO assembly, and examines aspects of the aviation emissions problem. It is argued that the aviation climate change problem represents in microcosm the climate change problem generally. "Solving" the former might assist in addressing the latter. Neither seems likely.

Date: Monday, October 28, 2013

Event: Centre for Operations Excellence ProjecttFest
Time: 3:15PM - 5.00PM
Place: David Lam Amphitheatre (DL 125)

Abstract: The Master of Management in Operations Research requires students to do a significant applied consultancy project. "ProjectFest" is an annual event to allow students to showcase their completed projects—of which they are justifiably very proud! Each student will give a 10 minute presentation on their project, which includes time for a few questions.

Alex Akulov:	Measuring passenger flow time through YVR.
Amanda Yuen:	Home health care capacity at Fraser Health: present and future.
Rene Lagos:	Developing a scheduling optimization tool for Tree Island.
Sandy Pan:	Understanding drivers of physiotherapy care use at WorkSafe BC.
Victor Rios:	Improving the Debt Collection Process at TELUS Mobility.
Raluca Mic:	Improving the Efficiency of Portering Service Response at Peace Arch Hospital.
Jan Schnider:	Using simulation to predict delay risk for a flight line.
Leah Weber:	Implementing a chemotherapy scheduling optimization tool at Abbotsford Regional Hospital.

Date: Monday, November 4, 2013

Speaker: Long Gao, UC Riverside
Topic: Dynamic Supply Risk Management with Procurement Diversification, Discretionary Selling and Signal-Based Forecast
Time: 3.30pm - 5.00pm
Place: Henry Angus 969

Abstract: We examine the critical role of advance supply signals---such as suppliers' financial health and production viability---in dynamic supply risk management. The firm operates a multisupplier, multiclass customer inventory system. The sales are discretionary and suppliers are susceptible to both operational and disruptive risks. We develop a hierarchical Markov model that captures the essential features of advance supply signals and then integrate it with

procurement and selling decisions. We pin down the exact form of the optimal policy by two sequences of monotone thresholds. The optimal procurement is driven by supply diversification and intertemporal substitution; the optimal selling is driven by customer segmentation and intertemporal rationing; they should be synchronized with dynamic forecast, resulting in coordinated, resilient, and adaptive risk mitigation. We make two methodological contributions: the decomposition solution procedure for high-dim MDP and the condition for preserving multidimentional submodularity under maximization.

This work advances our understanding on when and how to use advance supply signals in dynamic risk management. Future supply risk erodes profitability but enhances the marginal profit of current stock. A signal of future disruption raises both base-stock and rationing levels, thereby boosting current production and tightening sales now. Signal-based dynamic forecast plays two roles---to guide the strategy planning and to coordinate the execution. Its value depends critically on supply volatility and scarcity. It should be used when: (1) supplier and customer heterogeneity is high, (2) inventory holding and backlog costs are low, (3) systematic forecast errors are limited, and (4) capacity supply is moderate.

Date: Friday, November 8, 2013

Speaker: Marisol Castro, University of Texas at Austin
Topic: How much do we spend on travel? Modeling household's transportation expenditures
Time: Noon to 1.00pm
Place: Henry Angus 233

Abstract: Transportation expenditures account for large share of household's income. In fact, this is the second largest family expense category after housing. For example, in Canada transportation costs account for nearly 20.6% of the total household expenditures, compared to about 17.5% in the U.S., 15.2% in the U.K. and 9.8% in Japan. The study of transportation expenditures has been of much interest in recent years; however, there has been relatively little research on identifying the factors affecting the many disaggregate-level components of transportation expenditures, such as vehicle purchase, gasoline, and public transportation.

This presentation will develop a novel discrete choice model to analyze transportation-related expenditures. The proposed modeling framework is based on the random utility-maximization theory to explicitly recognize that households choose to consume various transportation-related goods and commodities in differing amounts. The methodology accommodates the possibility of zero consumption of certain commodities, and incorporates rich substitution patterns as well as allows complementarity among the transportation expenditure categories.

Date: Monday, November 18, 2013

Speaker: Fabian Chudak, D-Wave Systems Inc.
Topic: Progress and challenges using D-Wave Quantum Computing Systems
Time: 3.30pm - 5.00pm
Place: Henry Angus 969

Abstract: This talk concerns D-Wave quantum integrated computing systems, that as opposed to regular computer systems, rely on quantum mechanics to perform computations. These systems have been engineered to harness the power of quantum evolution to solve optimization problems. First I will present a brief introduction to adiabatic quantum computation, the theoretical quantum physics fundamentals in which our systems are based on. I will then cover the specifics of some of our systems, its current features and how they can be used to solve optimization problems. The focus of the remainder of the talk will be on applications and challenges of using D-Wave quantum computers. In particular, I will discuss applications to several problems such as machine learning, factoring, Ramsey numbers, and a special type of black box binary optimization. Finally I will address some of our current research topics.

Date: Monday, November 25, 2013

Speaker: Xiao Huang, Assistant Professor, Concordia University
Topic: United We Stand, Divided We Fall: Strategic Supplier Alliances under Default Risk
Time: 3.30pm - 5.00pm
Place: Henry Angus 969

Abstract: We study the alliance formation of suppliers in the presence of exogenous default risks under an n suppliers and one assembler/buyer framework. Each supplier is endowed with risk-absorptive resources that can mitigate the chance of a default. The suppliers then have to decide whether to join larger alliances that have better chances of survival or smaller ones that may grant them higher profit allocations. We characterize coalition-proof Nash-stable alliance structures for both complementary suppliers in assembly systems and substitutable suppliers in competitive markets. The analysis reveals that alliance formation is mainly driven by risk-reduction rather than competition-reduction effect. In general, a supply base with high risk levels and/or similar risk characteristics favors larger alliances, whereas substitutable suppliers and customer demands with lower pass-through rates result in relatively smaller alliances. We also endogegnize the risk levels faced by the suppliers via preventive risk construction investment, and find that the decision may have contrasting impact on alliance formation, depending on the level of investment cost, whether the cost is incurred by the downstream or upstream parties, and whether the suppliers are complementary or substitutable.

Date: Thursday, November 28, 2013

Speaker: Zijun Shi, MSc student of transportation economics, UBC
Topic: Airport Charge, Traffic Volume, and Car Rental Price: Empirical Evidence at US Airports
Time: Noon to 1.00pm
Place: Henry Angus 233

Abstract: This paper examines the interaction among airport aeronautical charge, traffic volume, and car rental service charge by employing a cross-section dataset covering 337 airports in the United States. Other determinants of the aeronautical charge are also examined. The main empirical findings are: (1) Car rental price has no significant impact on passenger volume, indicating that rental cost, which is an important cost category of airport concessional goods, does not affect passenger volume of airport. (2) Car rental price has no significant effect on aeronautical charge. (3) Only rental price in airports with a very low transfer rate responds positively to passenger volume. Overall, rental price does not respond to passenger volume or aeronautical charge. (4) Aeronautical charge has significant negative effect on passenger volume, and it has no significant effect on car rental price.

Date: Monday, December 2, 2013

Speaker: Harish Krishnan, Operations and Logistics Division, UBC
Topic: The impact of demand uncertainty on trade credit and supply chain cohesion
Time: 3.30pm - 5.00pm
Place: Henry Angus 969

Abstract: Firms routinely delay payments for inputs, buying on credit from suppliers. But given that trade credit is costly -- it increases working capital requirements -- what explains its widespread use? One argument is that, by binding firms in a supply chain through delayed payment, trade credit sustains supply chains by resolving moral hazard problems. Firms are less likely to shirk when they are bound financially, through trade credit, to their supply chain partners. Trade credit, therefore, performs an efficiency role in supply chains. In this paper, we consider the impact of demand uncertainty on the efficiency role of trade credit. We show that as the probability of a negative demand shock increases, delayed payments necessary to sustain the supply chain also increase. In other words, as economic conditions weaken, more trade credit is required to sustain the supply chain. The increasing probability of a negative demand shock, therefore, will also raise the cost of offering trade credit. The costs associated with financing trade credit can impose a burden that becomes unsustainable for supply chains. Since trade credit sustains supply chains by resolving moral hazard, weak economic conditions can unravel supply chains by making trade credit too expensive.

Date: Tuesday, December 3, 2013 (Centre for Transportation Studies Seminar)

Speaker: Tiziana D'Alfonso, Sapienza Università di Roma
Topic: Product competition in vertically differentiated markets: the case of airports
Time: 12.15pm - 1.15pm
Place: Henry Angus 333

Abstract: We study airports competition when vertically differentiated products may be strategically offered at the time of ticket purchase through the Internet: a base product – the flight – and a composite product – the flight plus some premium commercials (PCs), as car parking, car rental or hotel reservation. We model a two-stage game: airports first decide whether to offer PCs online, thus making the purchasing decisions interact through observability of aviation and commercial prices. Then, they engage in Bertrand competition deciding on both prices. We find that PCs will exert a downward pressure on the aviation charge whenever airports are both competing on online offers. Nevertheless, when only one airport purses the online offer, PCs can exert an upward pressure in the aviation charge, as long as profits from retail earned at the facility on the travel day are not high enough. This suggests that the combined effect between airports competition on side businesses and demand complementarity does moderate airports market power in the core business. The Nash equilibrium of the game is such that both airports offers PCs on line, making travelers account for the surplus they would gain from both the sides of the business when they buy air tickets. This is welfare enhancing. Nevertheless, when profits from retail earned at the airports on the travel day are sufficiently high, the facilities are caught in a Prisoner's Dilemma. (Joint work with Valentina Bracaglia and Alberto Nastasi, Sapienza Università di Roma)

Date: Monday, December 9, 2013

Speaker: Rekha Thomas, University of Washington
Topic: Lifts of Convex Sets and Cone Factorizations
Time: 3.30pm - 5.00pm
Place: Henry Angus 969

Abstract: The representation of a convex set is crucial for the efficiency of linear optimization algorithms. A common idea to optimize a linear function over a complicated convex set is to express the set as the projection of a much simpler convex set in a higher dimension, called a ``lift" of the original set. In the early 1990s Yannakakis showed that there is a remarkable connection between the size of the smallestpolyhedral lift of a polytope and the nonnegative rank of the slack matrix of the polytope. I will show how this theorem can be generalized to convex sets via cone factorizations of nonnegative operators. In practice, one usually only has a numerical approximation to a cone factorization. I will also show how such approximate factorizations can be used to construct efficient approximations of polytopes, and mention some of the many open questions in this area. Joint work with Joao Gouveia (University of Coimbra) and Pablo Parrilo (MIT).

Date: Monday, January 6, 2014

Speaker: Alireza Sabouri, Sauder School of Business
Topic: "Optimal Issuing Policies for Hospital Blood Inventory"
Time: 3.30pm - 5.00pm
Place: Henry Angus 969

Abstract: Red blood cells (RBCs) are the most common blood product used in transfusions, and have a permitted maximum shelf life of 42 days in Canada and the United States. Previous studies in the Operations Research literature suggest issuing blood in order from oldest to youngest inventory, so as to minimize shortage and wastage. However, recent findings in medicine suggest that the age of transfused blood can affect health outcomes, with older blood contributing to more complications. In response to these findings, there has been recent interest in designing issuing policies that balance the trade-offs between shortages and the age of the blood transfused.

We propose a dynamic programming model, which assigns an age-dependent penalty cost to each RBC unit transfused, representing the expected cost of any complications after the transfusion, and another penalty for each unit of shortage, representing the cost of satisfying the demand from another source. Our goal is then to minimize the total expected cost by deciding which units of blood on-hand and of what age to issue to satisfy the demand in each period. This dynamic programming formulation suffers from the curse of dimensionality due to the large state and decision spaces. We show several properties regarding the structure of an optimal issuing policy and use them to develop an efficient solution algorithm. Our results, based on data from a large hospital in British Columbia, suggest we can significantly reduce the age of transfused blood with only a relatively small increase in the shortage rate.

Date: Monday, January 13, 2014

Speaker: Robin Roundy, Bringham Young University
Topic: "Multidimensional Approximation Algorithms for Capacity-Expansion Problems"*
Time: 3.30pm - 5.00pm
Place: Henry Angus 969

Abstract: We develop multidimensional balancing algorithms to compute provably near-optimal capacity-expansion policies. Our approach is computationally efficient and guaranteed to produce a policy with total expected cost of no more than twice that of an optimal policy. We overcome the curse of dimensionality by introducing novel cost-separation schemes to separate the lost-sales cost of the system into exact monotonic subparts. This is the first approximation technique for multimachine, multiproduct systems facing stochastic, nonstationary, and correlated demands. To show the generality of this separation technique, we apply it to the capacity-expansion problem under two different production planning models: monotone production and revenue-maximizing production. We make the assumptions of minimal inventory and lost sales.

- Joint work with Van-Anh Truong, of the Department of Industrial Engineering and Operations Research, Columbia University

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Date: Monday, January 20, 2014

Speaker: Tim Huh, Operations and Logistics, Sauder School of Business
Topic: "Pricing under the Nested Attraction Model with a Multi-Stage Choice Structure"
Time: 3.30pm - 5.00pm
Place: Henry Angus 969

Abstract: We develop a solution approach to the centralized pricing problem of a nested attraction model with a multi-stage tree structure. We identify conditions under which the optimal solution can be uniquely determined and characterize the optimal solution as a fixed-point of a single variable. In the special case of a multi-stage nested logit model, we show the impact of asymmetry in price sensitivity and adjustment index (also known as the dissimilarity index) and we derive a closed-form solution when the tree structure is symmetric. Many existing results in the literature regarding the single or two-stage nested attraction model are shown to be special cases of the results derived in this note.

Date: Monday, January 27, 2014

Speaker: Leon Chu, University of Southern California
Topic: "Bundled Procurement for Technology Acquisition and Future Competition"
Time: 3.30pm - 5.00pm
Place: Henry Angus 969

Abstract: We study a procurement mechanism that bundles the project procurement with the technology transfer for a buyer who aims to compete with current suppliers in the future. We propose a dynamic game theoretic model that analyzes the optimal technology offers of the asymmetric suppliers and highlights how the relative size of the current project and the supplier competition determine the effectiveness of the bundled procurement mechanism. Under the two-supplier case, we find that each supplier has a dominant technology offer strategy that is independent of the opponent's technology offer strategy. When this size of the procurement project is small, the suppliers only offer obsolete technologies even if they are perfect substitutes. While suppliers offer better technologies as the size increases, the suppliers' technology offers are not continuous with respect to the size. Once the size reaches some threshold, the supplier's optimal response jumps and the best technology will be offered. We find that a relative size of 5% to 10% is sufficient for the suppliers to offer the best technologies under reasonable market conditions. When the suppliers offer their best technologies, the additional premium for technology transfer is negligible compared to the profit from the future market.

Date: Tuesday, January 28, 2014

Centre for Transportation Studies Seminar

Speaker: Brigadier-General C.A. Lamarre, National Defence Headquarters, Ottawa
Topic: "Logistics Lessons: Moving Goods Out of Kandahar"
Time: 3.00pm - 4.30pm
Place: David Lam Amphitheatre (DL 125)

Abstract: The Canadian Armed Forces were committed to the conflict in Afghanistan shortly after 9/11. Over the following 10 years, Canadian soldiers, sailors, airmen and women conducted military operations in Kabul and Kandahar during some of the most intense fighting of the campaign. Many others, located in nearby countries, Europe, and Canada provided critical support to enable this mission.

The sustainment of the mission involved a logistics effort that saw the movement of thousands of tons of materiel and equipment over extensive sea, air and ground lines of communication which spanned the globe. Once in Afghanistan, this became a complex tactical logistics effort in the face of a determined foe. At the end of the mission, the Canadian Armed Forces completed its most complex mission termination operation since the end of the Second World War. The Task Force Commander for that mission, Brigadier-General Chuck Lamarre, will discuss the mission, the logistical challenge of the modern battlefield, and the closure of Canada's extensive involvement in Southern Afghanistan.

Date: Monday, February 3, 2014

Speaker: Olivier Durand De Gevigney, OPLOG, Sauder School of Business
Topic: "Orientation of Graphs and Connectivity"
Time: 3.30pm - 5.00pm
Place: Henry Angus 969

Abstract:: A fundamental parameter of networks is reliability, that is, the network should keep working even if a few elements fail. As an example, in a road network, cutting a few roads or crossings should not impede traffic. Giving a direction to each street of a road network drastically changes its reliability and one may try to find an assignment of directions such that the resulting directed road network achieves some reliability properties. In Graph Theory this problem is modeled as follows: given a graph, can we find an orientation of this graph that achieves a specified connectivity.

We explain some successful approaches that solve the arc-connectivity case. Then we disprove a conjecture regarding the vertex-connectivity case that turns out to be NP-complete. However a positive result gives the hope to prove a sufficient condition for the existence of k-vertex-connected orientations. Finally we give an application of orientation to trees packing in graphs

Date: Thursday, February 6, 2014

Centre for Transportation Studies Seminar

Speaker: Changmin Jiang, OPLOG, Sauder School of Business*
Topic: "Effects of High-speed Rail and Airline Cooperation under Hub Airport Capacity Constraint"
Time: Noon to 1.30pm
Place: Henry Angus 969

Abstract: This paper analyzes the effects of cooperation between a hub-and-spoke airline and a high-speed rail (HSR) operator when the hub airport may be capacity-constrained. We find that such cooperation reduces traffic in markets where prior modal competition occurs, but may increase traffic in other markets of the network. The cooperation improves welfare, independent of whether or not the hub capacity is constrained, as long as the modal substitutability in the overlapping markets is low. However, if the modal substitutability is high, then hub capacity plays an important role in assessing the welfare impact: If the hub airports are significantly capacity-constrained, the cooperation improves welfare; otherwise, it is likely welfare reducing. Through simulations we further study the welfare effects of modal asymmetries in the demands and costs, heterogeneous passenger types, and economies of traffic density. Our analysis shows that the economies of traffic density alone cannot justify airline-HSR cooperation.

* work with Anming Zhang

Date: Thursday, February 13th, 2014

Centre for Transportation Studies Seminar

Speaker: Achim Czerny, WHU - Otto Beisheim School of Management, Germany
Topic: "Should charges for airport infrastructure be per-flight or per-passenger based?
Time: Noon to 1.30pm
Place: Henry Angus 969

Abstract: While airport aeronautical charges are traditionally aircraft weight related, currently an increasing share of aeronautical airport revenues is derived from passenger related charges. This paper compares the optimal airport charges structures from the carriers' and the social viewpoints conditional on airport cost recovery, where the analysis of a monopoly airline helps us to concentrate on ticket prices and frequency supply (i.e., schedule delays). It turns out that the carrier’s optimal per-passenger charge is indeed strictly positive when frequency supply is endogenously determined, while the carrier's and the social viewpoints are in line only if the full fares composed of the ticket price and schedule delay costs are minimized. We further show that the carrier may benefit less from an increase in the per-passenger charge when the business passengers' valuations of schedule delays are high relative to the leisure passengers' valuations, which depends on whether prices are uniform or discriminating.

Date: Monday, February 24, 2014

Speaker: Peter Glynn, Stanford University
Topic: "A Flexible Point Process Model for Describing Arrivals to a Service Facility"*
Time: 3.30pm - 5.00pm
Place: Henry Angus 969

Abstract: In many applied settings, one needs a description of incoming traffic to the system. In this talk, we argue that the Palm-Khintchine superposition theorem dictates that the process should typically look "locally Poisson". However, there are usually obvious time-of-day effects that should be reflected in the model. Furthermore, in many data sets, it appears that medium-scale burstiness is also present. In this talk, we consider a Poisson process that is driven by a mean-reverting process as a flexible vehicle for modeling such traffic. We argue that this model is tractable computationally, is parsimonious, has physically interpretable parameters, and can flexibly model different behaviors at different scales. We discuss estimation methodology and hypothesis tests that are relevant to this model, and illustrate the ideas with call center data.
* Joint work with Jeff Hong and Xiaowei Zhang.

Date: Monday, March 3, 2104

Speaker: Bruce Shepherd, McGill University
Topic: "Performance of Online Vector Bin Packing Algorithms"
Time: 3.30pm - 5.00pm
Place: Henry Angus 969

Abstract: In the d-dimensional bin packing problem (VBP), one is given vectors $x_1, x_2, \ldots, x_n$ R_d and the goal is to partition them into a minimum number of "feasible" sets. A set is feasible if the sum of its vectors does not have a component exceeding 1. Online VBP refers to the case where the vectors arrive sequentially and an algorithm must try to create these feasible sets on the fly. This problem has received renewed interest due to its relevance to placing virtual machines in a cloud platform.

The competitive ratio for an online algorithm is an upper bound on its worst case performance against an adversary which tries to choose a difficult sequence of incoming vectors. It had been outstanding for almost 20 years to clarify the gap between the best lower bound $\Omega(1)$ on the competitive ratio for online VBP versus the best upper bound of $O(d)$. We settle this by describing a $\Omega(d / \log d)$ lower bound. We also present several remaining open questions in the area.

Date: Monday, March 10, 2014

OPLOG Division and Centre for Operations Research and Analytics in Health (CORAH) Seminar

Speaker: Pinar Keskinocak, Georgia Institute of Technology
Topic: "Operations Management Application in Healthcare"
Time: 3.30pm - 5.00pm
Place: Henry Angus **233**

Abstract: In this presentation I will first give a brief overview or my research in healthcare operations management. Then we will discuss two public health applications: (i) Disease modeling, preparedness and response for pandemic flu, and (ii) Catch-up scheduling for recommended immunizations.

Date: Monday, March 17, 2014

Speaker: Jiawei Zhang, Stern School of Business, New York University
Topic: "Process Flexibility: Performance Guarantee of Sparse Flexibility Structures"
Time: 3.30pm - 5.00pm
Place: Henry Angus 969

Abstract: Process flexibility has been widely applied in many industries as a competitive strategy to improve responsiveness to demand uncertainty. An important flexibility concept is the long chain proposed by Jordan and Graves. The effectiveness of the long chain has been investigated via empirical as well as theoretical analysis for specific probability distributions of the random demand.

In the first part of the talk, we present a closed-form distribution-free bound on the ratio of the expected sale of the long chain relative to that of full flexibility. Our bound depends only on the mean and standard deviation of the random demand, but compares very well with the bound that uses complete information of the demand distribution. This suggests the robustness of the performance of thelong chain under different distributions.

In the second part of the talk, we focus on the design of sparse flexible process structures that can achieve any given performance guarantee (relative to full flexibility). We introduce a new concept called probabilistic graph expanders. Compared with other designs such as the k-chain or (normal) expanders, our probabilistic expanders achieve (almost) the same performance guarantee, but require much less production flexibility.

Bio: Jiawei Zhang is an Associate Professor of Operations Management and Harold MacDowell Faculty Fellow at the Stern School of Bsiness, New York University. He received a B.S. degree

in Applied Mathematics and an M.S. degree in Operations Research from Tsinghua University, and a Ph.D. in Operations Research from Stanford University. His research interests include mathematical programming and its applications in operations management. He was a recipient of the INFORMS Optimization Prize for Young Researchers in 2004. He currently serves as an Associate Editor for Operations Research and Mathematics of Operations Research.

The talk will be based on three papers. Two of them are available at the following links:

1. Process Flexibility: A Distribution-Free Bound on the Performance of K-Chain:

http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2311268

2. Optimal Sparse Designs for Process Flexibility via Probabilistic Expanders

http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2400768

Date: Monday, March 24, 2014

Joint OPLOG Division and Centre for Operations Research and Analytics in Health (CORAH) Semianr

Speaker: Archis Ghate, University of Washington
Topic: Optimal fractionation in radiotherapy
Time: 3.30pm - 5.00pm
Place: Henry Angus 969

Abstract: The goal in radiotherapy for cancer is to maximize the biological effect of radiation on the tumor while limiting its toxic effects on nearby healthy anatomies. This is attempted by following a two-pronged approach: spatial localization of radiation dose, and temporal dispersion of radiation dose.

The spatial component of the problem involves prescribing a high dose to the tumor and putting upper limits on the dose delivered to the healthy anatomies. The radiation field's intensity profile is then optimized to meet this treatment protocol as closely as possible. This is called fluence-map optimization.

The temporal component of the problem involves breaking the total planned dose into several equal-dose treatment sessions called fractions that are administered over several weeks. This is designed to give the healthy tissue some time to recover between sessions, as it possesses better damage-repair capabilities than the tumor. The key challenge on this temporal side is to choose an optimal number of fractions and the corresponding dosing schedule. This is called the optimal fractionation problem and it has been studied clinically for over a century.

In this talk, we will discuss the optimal fractionation problem from a mathematical viewpoint by using the standard linear-quadratic model of dose-response. We will introduce stylized as well as computationally challenging full-scale optimization models for this problem. Our stylized models assume that a fluence-map optimization problem has been solved a priori and then we will show that it is possible to solve the optimal fractionation problem essentially in closed-form. Our full-scale model attempts to simultaneously optimize the fluence-map as well as the number of fractions. This results in a non-convex problem that includes tens of thousands of variables and a similar number of constraints. We will present mathematical analyses and an efficient convex optimization algorithm for approximate solution of our spatiotemporally integrated model. Numerical experiments and sensitivity analyses on head-and-neck and prostate cancer test cases will be discussed. The potential clinical benefit of solving the spatiotemporally integrated model as compared to solving the stylized model will be quantified.

This is joint work with Fatemeh Saberian and Minsun Kim.

Date: Thursday, March 27, 2014

Centre for Transportation Studies Seminar

Speaker: Trevor Heaver, Professor Emeritus, OPLOG Division
Topic: "What makes the Gateway squeaky? Or, life's not fair! The working of multi-channel interlocking chains: Containers through the port of Vancouver"
Time: Noon to 1.30pm
Place: Henry Angus **966**

Abstract: Before the newspapers carried daily columns about the strike affecting the port of Vancouver, the most likely column to read was the success of the port in attracting more traffic and handling it efficiently. The role of collaboration among the players in the gateway has been a common theme. Where is the disconnect? What went wrong?

Finding some answers is an interesting exercise. It also raises some interesting academic research questions.

Date: Monday, March 31, 2014

Speaker: Zizhuo Wang, University of Minnesota
Topic: Dynamic Learning Algorithms for Online Linear/non-linear optimization problems
Time: 3.30pm - 5.00pm
Place: Henry Angus 969

Abstract: In this talk, we consider two online optimization problems. The first one is the online linear programming problem. In this problem, the underlying optimization problem is a linear program, however, its constraint matrix is revealed column by column along with the corresponding objective coefficient and a decision variable has to be set each time a column is revealed without observing the

future inputs. The goal is to maximize the overall objective function. In this talk, we provide a near-optimal algorithm for this general class of online problems under the assumption of random order of arrival of the inputs. Specifically, our learning-based algorithm works by dynamically updating a threshold price vector at geometric time intervals, where the dual prices learned from the revealed columns in the previous period are used to determine the sequential decisions in the current period. Due to the feature of dynamic learning, the competitiveness of our algorithm improves over the past study of the same problem. We also present a worst-case example showing that the performance of our algorithm is near-optimal. We then extend the scope of our learning algorithm to solve a generalization of one special case of the online linear program, the online matching problem. In the generalization, the objective function no longer needs to be linear, but could be general concave functions. This formulation has important applications in online adwords allocation problem when there is a convex under-delivery cost, or the click-through rate is concave in the number of impressions. We show that our algorithm is still near-optimal under some conditions on the inputs. Some numerical results are shown to validate the efficiency of our approach.

Date: Thursday, April 3 2014

Centre for Transportation Studies Seminar

Speaker: Tae Oum, OPLOG Division, Sauder School of Business
Topic: "Measuring Effects of Government Corruption on Cost Efficiency of Airports"
Time: Noon to 1.30pm
Place: Henry Angus **967**

Abstract: By Tae Oum (in collaboration with Jia Yan, Xiaowen Fu, Laigno Randriangarisoa, and other ATRS colleagues)
I have been working on this topic for the last five years and will continue to work on this topic. Since we have now several papers accepted for publication on this topic, it is probably a good time for a CTS seminar on this topic.

The seminar will present the following:
- Summary on the theory of institutional choice for public infrastructure management, and their effects – literature summary
- Econometric models for measuring the effects of government corruptions on efficiency of airport operations and management
- Discussion and choice on measuring the degree of government corruptions
- Application and empirical results on the US airports: focusing on the airports run by the Aviation Departments of cities or metropolitan governments vs. quasi-independent airport authorities
- Application and empirical results on the European airports including Eastern European airports

Some of the interesting findings are:
- U.S. Case: In less corrupt environment, the independent airport authority and/or privatized airports perform significantly better than city-run airports while in highly corrupt environments, the city-run airports tend to do better;
- In corrupt environments, the inefficiency and high costs appear to occur because of the abuse

of outsourcing activities by politicians/decision makers

- European Case: In the less corrupt environments, airports operated by private enterprise (majority owned by private sector) are more efficient than 100% govt owned or majority government owned airports.
- Consistently as in the case of USA, a majority of 100% government owned airports are more efficient than a majority of 100% private owned airports.

As we extend our research to other continents, there is a growing interest in our research by international lending agencies such as World Bank, Asian Development Bank, etc.

Date: Monday, April 7, 2014

Speaker: Murray Carlson, Finance Division, Sauder School of Business
Topic: “The impact of probability weighting on static and dynamic portfolio choice”
Time: 3.30pm - 5.00pm
Place: Henry Angus 969

Abstract: Experimental evidence has established that, when exposed to risk, most individuals overweight utility from low probability gains and underweight utility from high probability gains. This behavior violates expected utility and has motivated the development of models of investor preferences with “probability weighting functions," such as cumulative prospect theory (CPT) and rank dependent expected utility (RDEU). We provide new solutions for the optimal portfolio choice problem in a dynamic, binomial setting where RDEU investors can trade in a stock and bond each period. A by-product of probability weighting functions is reversal of preference as uncertainty resolves. We consider solutions that can be implemented under pre-commitment as well as those that require investors be strategic about their preference reversal. Our results are novel in both the static and dynamic contexts and allow for precise, quantitative evaluation of the impact of probability weighting on portfolio choice. Our model provides testable implications in the cross section of investors as well as in dynamics of individual behavior. Assuming pre-commitment, an RDEU investor with the typical “inverse S" shape probability weighting function chooses terminal wealth with downside protection, provided by an in-the-money put, and upside opportunity, provided by an out-of-the-money call. In a calibrated example, we show that the equity share of an RDEU investor's portfolio is larger than that of an expected utility investor. Furthermore, the allocation to stock increases with the investing horizon. Under the same calibration, we show that long-term RDEU investors would need to be compensated with as much as 10% of their wealth to switch from the optimal portfolio under RDEU to the optimal portfolio under expected utility

Date: Thursday, April 10, 2014

Centre for Transportation Studies Seminar

Speaker: Anming Zhang, OPLOG Division, Sauder School of Business
Topic: "Port Investments on Coastal and Marine Disasters Prevention: An Economic and Policy Investigation"
Time: Noon to 1.30pm
Place:Henry Angus **966**

Abstract: Work with: Yi-bin Xiao, Xiaowen Fu, and Adolf K.Y. Ng
Located along shorelines, ports are highly vulnerable to coastal and marine natural disasters. Damage caused by disasters can be prevented or alleviated if sufficient investments are made in a timely manner. However, despite a wide range of investment options and well-developed engineering expertise, port investment on disaster prevention remains a challenging task involving great complexities. So far, there has been little definite government policy or guidance either. This study develops an integrated economic model for the analysis of disaster prevention investments at a "landlord" port. It simultaneously considers the uncertainty of disaster occurrence and associated return of prevention investments, the information accumulation and related investment timing, and the spillovers (externalities) of investment among stakeholders. Analytical results suggest that the timing of port investments depends on the probability of disasters. Immediate investment is optimal for disasters with high probability, whereas investment should be postponed if such a probability is very low. Optimal timing for cases of intermediate probability can't be determined as it is influenced by other factors such as discount rate, information accumulation and efficiency of investments. Positive externalities between a port and its tenants lead to under-investment, which can be corrected by coordination between stakeholders. However, since there are risks of over-investment due to uncertainty, government intervention is only optimal with a good understanding of disaster probability distribution. Our study also demonstrates the importance of scientific research, which brings significant economic value in operation planning and investment decisions.

Date: Monday, April 14, 2014

Speaker: Guoming Lai, McCombs School of Business, University of Texas at Austin
Topic: "Dynamic Bargaining in a Supply Chain with Asymmetric Demand Information"
Time: 3.30pm - 5.00pm
Place: Henry Angus **333**

Abstract: We analyze a dynamic bargaining game in which a seller and a buyer negotiate over quantity and payment to trade for a product. Both firms are impatient, and they make alternating offers until an agreement is reached. The buyer is privately informed about his type, which can

be high or low: the high-type's demand is stochastically larger than the low-type's. In the dynamic negotiation process, the seller can screen while the buyer can signal information through their offers, and the buyer has an endogenous and type-dependent reservation profit. With rational assumptions on the seller's belief structure, we characterize the perfect Bayesian equilibrium of the bargaining game. Interestingly, we find that both quantity distortion and information rent may be avoided depending on the firms' relative patience, and the seller may reach an agreement with either the high type or the low type first, or with both simultaneously. Furthermore, we explore our model to characterize the effect of demand forecasting accuracy on firm profitability. We find that improved demand forecast benefits the buyer but hurts the seller when the buyer's forecasting accuracy is low. However, once the buyer's forecasting accuracy exceeds a threshold, both firms will benefit from further improvement of the forecast. This observation makes an interesting contrast to previous findings based on the one-shot principal-agent model, in which improvement of forecasting accuracy mostly leads to a "win-lose" outcome for the two firms, and the buyer has an incentive to improve his forecasting accuracy only when it is extremely low.

Bio: Guoming Lai is an Assistant Professor of Operations Management at the McCombs School of Business, the University of Texas at Austin. His research interest is in Supply Chain Management and the interfaces of Operations and Finance and Operations and Marketing. He has published articles in the journals of Management Science, Operations Research, Manufacturing & Service Operations Management, and Production and Operations Management. Guoming received his PhD degree and a master's degree from Carnegie Mellon University. He also earned a Master's degree and a Bachelor's degree from Tsinghua University in China.

Date: Thursday, April 17, 2014

Centre for Transportation Studies

Speaker: Ian Druce, Steer Davies Gleave
Topic: "Trends and Issues in Integrated Transportation Planning: Overview and a Case Study"
Time: Noon to 1.30pm
Place: Henry Angus **233**

Abstract:
Overview – Trends and Issues in Integrated Planning
Far too often, cities and regions do their planning in isolation – land-use plans and population forecasts get set by higher levels of government and then the local transit agency struggles to decide how and where best to put their service. The good news is that increasingly, planners are beginning to realise that more integration is needed in developing their plans and that to be effective, integrated planning needs to include land-use, transportation and economic development. This presentation will cover some of the emerging trends and issues around North America in changing the way we plan, develop and move about our cities.

Expo Line Upgrade – Case Study
The Expo Line, the backbone to Vancouver's rapid transit system, has served millions of customers since its operation in 1986. With continued passenger demand growth, service overcrowding will reduce service levels unless the line's capacity is increased. To support the BC Provincial Transit Plan goal of doubling the Expo Line capacity, TransLink and the BC Ministry of Transportation and Infrastructure conducted a comprehensive study that identified the appropriate timing and costs of Expo Line upgrades needed over the next 30 years. The study team reviewed Expo Line ridership forecasts, identified the current system constraints and developed Multiple Account Evaluation to support a business case for the proposed upgrade strategy. The strategy outlined a 30-year implementation plan to accommodate staged and gradual upgrades to the Expo Line with some components of the strategy being currently implemented.

Date: Wednesday April 23, 2014

Speaker: Martin Skutella, Technische Universität Berlin
Topic: "An improved additive approximation for the ring loading problem"
Time: 2.30pm - 4.00pm
Place: Henry Angus **HA 967**

Abstract: The ring loading problem is an optimal routing problem arising in the planning of optical communication networks which use bidirectional SONET rings. In mathematical terms, the ring loading problem refers to the unsplittable multicommodity flow problem on undirected ring networks. We prove that any split routing solution to the ring loading problem can be turned into an unsplittable solution while increasing the flow value on any edge of the ring by no more than 1.4 times the maximum demand value d_max. This improves upon a classical result of Schrijver, Seymour, and Winkler (1998) who obtained a slightly larger bound of 1.5 times d_max. On the negative side we prove a lower bound of 1.1 times d_max on the best possible performance guarantee.

Date: Thursday, May 8, 2014

Centre for Transportation Studies

Speaker: Garland Chow, OPLOG Division, Sauder School of Business
Topic: "Improving Taxi Regulation through Performance Measurement"
Time: Noon to 1.30pm
Place: Henry Angus **233**

Abstract: The taxi industry is regulated in many municipalities around the world. Such regulation has often been criticized as unnecessary but little research has been conducted on how to regulate more effectively. A major challenge for regulatory authorities is the determination of the number of licenses that should be permitted and this is exacerbated by the peaking of taxi

demand during short periods of the week. The regulatory authorities in the City of Vancouver and the British Columbia government (the Passenger Transportation Board) and the Vancouver taxi industry have cooperated to meet this challenge through the issuance of peak operating permits supported by rigorous evidence. The permits themselves were temporary and part of a regulatory process that seeks to link the increase in licenses to objectively measured taxi service performance and productivity. This paper describes the research that produced the taxi performance metrics and analyzes the feasibility of embedding such a process into the regulatory process. The goal is to improve regulatory effectiveness by enabling it to be performance driven.

ate: Monday, May 26, 2014

Speaker: Michael Joswig, Technische Universität Berlin
Topic: "Long and Winding Central Paths"
Time: 3.30pm - 5.00pm
Place:Henry Angus **HA 969**

Abstract: We disprove a continuous analog of the Hirsch conjecture proposed by Deza, Terlaky and Zinchenko, by constructing a family of linear programs with 3r+4 inequalities in dimension 2r+2 where the central path has a total curvature in Omega(2^r/r). Our method is to tropicalize the central path in linear programming. The tropical central path is the piecewise-linear limit of the central paths of parameterized families of classical linear programs viewed through logarithmic glasses. We show in particular that the tropical analogue of the analytic center is nothing but the tropical barycenter, that is, the maximum of a tropical polyhedron. It follows that unlike in the classical case, the tropical central path may lie on the boundary of the tropicalization of the feasible set, and may even coincide with a path of the tropical simplex method. Finally, our counter-example is obtained as a deformation of a family of tropical linear programs introduced by Bezem, Nieuwenhuis and Rodriguez-Carbonell.

This is joint work with Xavier Allamigeon, Pascal Benchimol and Stéphane Gaubert.

Date: Thursday, May 29, 2014

Centre for Transportation Studies

Speaker: Marta Gonzalez-Aregall, Universitat de Barcelona
Topic: “On the spatial effects of transportation on industrial employment"
Time: Noon to 1.30pm
Place: Henry Angus **333**

Abstract: This article examines the direct and indirect impacts of transport infrastructures on industrial employment. We estimate regressions with spatial econometric methods using data of Spanish regions for the period 1995-2008. We find that the density of motorways and the amount of port traffic (particularly general non-containerized and container traffic) are relevant determinants of industrial employment in the region, while we do not find clear effects of the

density of railways and airport traffic. Furthermore, our empirical analysis shows the existence of relevant negative spatial spillovers for the density of motorways and container port traffic while the impact of general non-containerized port traffic seems to be mainly local.

Joint work with Xavier Fageda (Universitat de Barcelona).