

OPLOG DIVISION AND COE SEMINARS

SEPTEMBER 2015 – AUGUST 2016

Date: Tuesday, August 30th, 2016

Speaker: Timo Hilger, University of Cologne, Germany

Topic: "Optimizing service operations of one-way car-sharing networks"

Time: Noon - 1:30 PM

Place: Henry Angus 233

Abstract: Metropolitan areas worldwide demand for eco-friendly solutions that offer mobility and reduce the negative impacts on the environment. Urban transportation has changed significantly through the emergence of car-sharing, in particular services that provide one-way trips where the vehicle can be left at the destination without returning it to the origin. Providers such as Daimler's car2go have pioneered this business model. Because it is a new model, companies are still figuring out optimization strategies to improve operational efficiencies. This paper explores the challenges of servicing and refueling vehicles as the location of vehicles is constantly changing. We develop a new analytic framework through which we model the servicing decision using data from car2go's operation in four Canadian cities, and we develop a novel optimization model that considers conditional profits through which car-sharing fleets can be serviced more efficiently.

Centre for Transportation Studies

Date: Friday, July 15th, 2016

Speaker: Silvio Nocera, IUAV, University of Venice

Topic: "Greenhouse Gas Emissions in Transport: Relevance and Problems for a Fair Quantification and Valuation"

Time: Noon - 1:30 PM

Place: Henry Angus 233

Abstract: Reducing CO₂ emissions has become one of the most delicate challenges of transport planning. Coherently with EU and national directives, urban mobility and traffic plans should consider CO₂ emissions reductions as a primary goal. In an apparent contradiction, however, the measures generally proposed within urban transport plans seem to operate primarily for different aims, such as reducing traffic congestion, and improving public transit service and non-motorized transport modes. This relegates CO₂ emission reductions to a subordinate goal, and a general inefficiency in the policies that are adopted. Practically, carbon emissions are often

considered secondary to mobility planning, which entails policy measures designed for other purposes, and whose GHG effects are not carefully quantified.

Current estimates of the costs of CO₂ emissions range from \$-10.00/tC to \$7,243.73/tC. It is extremely difficult to choose a single, suitable monetary value within this huge range. This problem has induced intense debates in transport policy as far as resource allocation and priorities.

This seminar will dwell upon the relationship between transport planning and climate change, discussing case studies and effective policies.

Date: Tuesday, June 21st, 2016

Speaker: Moshe Haviv, The Hebrew University of Jerusalem

Topic: Queues and cooperative games

Time: Noon - 1:00 PM

Place: Henry Angus 233

Abstract: The area of cooperative game theory deals with models in which a number of individuals, called players, can form coalitions so as to improve the utility of its members. In many cases, the formation of the grand coalition is a natural result of some negotiation or a bargaining procedure. The main question then is how the players should split the gains due to their cooperation among themselves. Various solutions have been suggested among them the Shapley value, the nucleolus and the core.

Servers in a queueing system can also join forces. For example, they can exchange service capacity among themselves or serve customers who originally seek service at their peers. The overall performance improves and the question is how they should split the gains, or, equivalently, how much each one of them needs to pay or be paid in order to cooperate with the others. Our major focus is in the core of the resulting cooperative game and in showing that in many queueing games the core is not empty.

Finally, customers who are served by the same server can also be looked at as players who form a grand coalition, now inflicting damage on each other in the form of additional waiting time. We show how cooperative game theory, specifically the Aumann-Shapley prices, leads to a way in which this damage can be attributed to individual customers or groups of customers.

Date: Monday, April 11th

Speaker: Timothy Chan, University of Toronto

Topic: "Goodness of Fit in Inverse Optimization"

Time: 3:30 PM - 5:00 PM

Place: Henry Angus 969

Abstract: The classical inverse optimization methodology for linear optimization assumes a given solution is a candidate to be optimal. Real data, however, is imperfect and noisy: there is no guarantee that a given solution is optimal for any cost vector. Inspired by regression, this paper presents a unified framework for cost function estimation in linear optimization consisting of a general inverse optimization model and a corresponding goodness-of-fit metric. Although our inverse optimization model is in general nonconvex, we derive a closed-form solution and present the corresponding geometric intuition. Our goodness-of-fit metric, ρ , termed the coefficient of complementarity, has similar properties to R^2 from regression and is quasiconvex in the input data, leading to an intuitive geometric interpretation. We derive a lower bound for ρ that possesses the same properties but is more tractable. We demonstrate the application of our framework for model estimation and evaluation in production planning and cancer therapy.

Date: Monday, April 4th

Speaker: Elodie Adida, University of California at Riverside

Topic: "Bundled Payment vs. Fee-For-Service: Impact of Payment Scheme on Performance"

Time: Noon - 1:30pm

Place: Henry Angus 967

Abstract: Healthcare reimbursements in the US have been traditionally based upon a fee-for-service (FFS) scheme, providing incentives for high volume of care, rather than efficient care. The new healthcare legislation tests new payment models that remove such incentives, such as the bundled payment (BP) system. We consider a population of patients (beneficiaries). The provider may reject patients based on the patient's cost profile, and selects the treatment intensity based on a risk-averse utility function. Treatment may result in success or failure, where failure means that unforeseen complications require further care. Our interest is in analyzing the effect of different payment schemes on outcomes such as the presence and extent of patient selection, the treatment intensity, the provider's utility and financial risk, and the total system payoff. Our results confirm that FFS provides incentives for excessive treatment intensity and results in suboptimal system payoff. We show that BP could lead to suboptimal patient selection and treatment levels that may be lower or higher than desirable for the system, with a high level of financial risk for the provider. We also find that the performance of BP is extremely sensitive to the bundled payment value and to the provider's risk aversion. The performance of both BP and FFS degrades when the provider becomes more risk averse. We design two payment systems, hybrid payment and stop-loss mechanisms, that alleviate the shortcomings of FFS and BP and may induce system optimum decisions in a complementary manner.

Date: Monday, March 21st

Speaker: Sanjay Mehrotra, Northwestern University

Topic: “Solutions of Large Stochastic Programs with Applications in Workforce Management and System Design”

Time: 3:30 PM - 5:00 PM

Place: Henry Angus 333

Abstract: Stochastic Programming is an established modeling technique for modeling decision problems under uncertainty. In two-stage stochastic programs, a here-and-now decision needs to be made, which is then followed by an adjustment to the here-and-now decision once the uncertainty reveals. Stochastic optimization problems are notoriously difficult when the decisions in first and second stage are represented by continuous as well as discrete variables. In this talk we will present decomposition based approaches for solving large scale two-stage stochastic programs. We will show that under suitable conditions these problems can be solved efficiently. Specifically, we will illustrate our ideas using problems in workforce planning in healthcare, and production planning problems under demand uncertainty. Several orders of magnitude improvement is possible using a carefully developed implementation in the software package iOptimize on a multi-core machine. Using a combination of theoretical analysis and the implementation in iOptimize we managed to solve realistic problems using real data from Northwestern Memorial Hospital for nurse scheduling involving a few million integer variables, and nearly a billion continuous variables within a few minutes.

Date: Tuesday, March 15th

Speaker: Greys Sasic, Marshall School of Business, University of Southern California

Topic: “Impact of Recyclability on Product Greenhouse Gas Emissions and Related Cost Analysis”*

Time: Noon - 1:30 PM

Place: HA 969

Abstract: We build supply chain models to evaluate the impact of recyclability on the emissions through the product's lifecycle and derive conditions that lead to reduction in the long-run average emissions. We then investigate the cost of recycling and emissions imposed on the supply chain and on the society to understand optimal decisions for centralized and decentralized cases. We compare outcomes obtained when recycling is run by the government and when it is done by the manufacturer.

* Joint work with Hailong Cui

Date: Monday, March 14th

Speaker: Vernon Hsu, The Chinese University of Hong Kong

Topic: “A Multinational Firm’s Strategic Decision of Selling to a Rival: The Impacts of Tax and Transfer Pricing”

Time: 3:30 PM - 5:00 PM

Place: Henry Angus 969:

Abstract: We consider an integrated multinational firm (MNF) who produces a product in a low-tax country and sells it in a high-tax country. The global firm faces the decision of whether to sell the product (and at what price) to an external rival who has its own in-house production capability. Using a Cournot competition model, we show that in addition to the traditional tradeoffs between wholesale and retail profits, two salient elements of the transfer pricing between the MNF’s affiliated divisions — namely the incoming shifting effect (the tax benefit of generating more profits in the low tax division) and the arm’s length principle (ALP) effect (the requirement of selling to internal and external buyers at a single market-based price)—have significant impacts on the outcomes of sale or no sale between the two rivals.

We find that when the income shifting effect is weak, a sale will (will not) occur when the rival’s (in-house) cost is low (high). This is because under ALP, the pricing parity removes the MNF’s ability to aggressively prop up its retail division’s competitiveness through a low transfer price. Thus the rival is motivated to buy from the MNF, even at a price higher than its own cost, in exchange for a softened competition in the retail market. On the other hand, the MNF would rather forego its wholesale profits by not selling to a weak rival (with a high cost) in order to maintain its retail market dominance. When the income shifting effect is strong, the outcome of sale or no sale is reversed—the sale will (will not) occur when the rival’s cost is high (low). This is because the higher benefit from income shifting magnifies the attractiveness of wholesale profits, making the MNF more willing to sell to the rival. However, when the rival is competitively strong with a low cost, it will refuse to buy from the MNF even when being offered a price lower than its own cost, knowing well that the latter’s tax cost is too high for it to become a credible threat in the retail market via a low transfer price.

Date: Monday, March 7th

Speaker: Hossein Mehrizi, University of Waterloo

Topic: “The effects of speedup and slowdown on the performance of service systems”

Time: 3:30 PM - 5:00 PM

Place: Henry Angus 233

Abstract: Basic queueing theory typically deals with a single class of customers with exogenous arrival rates and service times that are independent of system congestion, with no customer bounce backs to the system. In many real world applications though, these assumptions do not hold and models should deal with multi-class of customers with endogenous arrival and service times and a chance of customer bounce-back. An example is medical and surgical classes of patients in a hospital, where a high inpatient load of medical patients could increase Length of Stay (LOS) for newly admitted surgical patients due to delays in starting their care. Motivated by analyzing hospital readmission, we model a system with endogenous arrival and service times, with the latter affecting customer bounce-backs. We first model the system as a Markov chain with Markovian arrival and service processes and provide the conditions under which the system is stable. We then examine the dynamics of the system using a fluid approximation. We analyze the long-run behavior of the system and characterize system workload equilibriums. Then, we examine how different classes of customers affect the congestion of the system. We also model the system using a diffusion approximation and obtain the distribution of the number of customers in the system. We conclude by briefly discussing the optimal controls of the system including the arrival and service processes such that the long-run average congestion is minimized.

Centre for Transportation Studies

Date: Friday, February 26th

Speaker: Alex Bigazzi, Dept of Civil Engineering, UBC

Topic: "Beyond mode choice: Modeling pedestrian and bicycle trip attributes”

Time: Noon - 1:30 PM

Place: Henry Angus 967

Abstract: The last two decades have seen growing interest active transportation (AT) modes in North American cities. Increasingly sophisticated models of mode choice have been developed to help us understand how transportation policy and infrastructure affect AT mode share. But we have relatively poor understanding of on-road pedestrian and bicycle behavior and limited ability to model trip attributes such as route, speed, and energy expenditure. These trip attributes are important for planning and design of AT infrastructure and for estimation of health impacts through physical activity, air pollution inhalation, and crashes. This seminar describes recent work examining the relationships between bicyclist route and speed preferences and pollution inhalation dose. In addition, on-going and proposed work to develop AT behavior and performance models will be discussed.

Date: Monday, February 22nd

Speaker: Dan Iancu, Stanford University

Topic: "Operating Flexibility and the Agency Costs of Debt"

Time: 3:30 PM - 5:00 PM

Place: Henry Angus 969

Abstract: We study the potential inefficiencies stemming from a firm's operating flexibility under debt. We find that flexibility in replenishing or liquidating inventory, by providing risk shifting incentives, could lead to borrowing costs that erase more than a third of the firm's value. In this context, we examine the effectiveness of practical and widely used covenants in restoring firm value by limiting such risk shifting behavior. We find that simple financial covenants can fully restore value for a firm that possesses a mid-season inventory liquidation option. In the presence of added flexibility in replenishing or partially liquidating inventory, financial covenants fail, but simple borrowing base covenants successfully restore firm value. By explicitly characterizing the optimal covenant tightness, we find that better market conditions, such as lower inventory depreciation rate, higher gross margins or increased product demand, are typically associated with tighter covenants. Our results suggest that inventory-heavy firms can reap the full benefits of additional operating flexibility, irrespective of their leverage, by entering simple debt contracts of the type commonly employed in practice. For such contracts to be effective, however, firms with enhanced flexibility and/or operating in better markets must also be willing to abide by more and/or tighter covenants. Time-permitting, we also briefly discuss settings where the firm can dynamically adjust prices over multiple periods, outlining the resulting inefficiencies and their evolution across time.

Based on joint work with Nikos Trichakis (HBS), Gerry Tsoukalas (Wharton), and Omar Besbes (Columbia GSB).

Centre for Transportation Studies

Date: Friday, February 5th

Speaker: Eren Inci, Sabanci University

Topic: "Unbundling Curbside Parking Costs from Housing Prices and Rents"

Time: Noon - 1:30 PM

Place: Henry Angus 333

Abstract: This paper empirically shows that at least some of the costs of curbside parking spaces are capitalized in housing prices even though these parking spaces are not formally bundled with housing units. Making use of Istanbul's transition from free and informal curbside parking to paid and formal, we find that housing prices decreased by about 9.2 percent as a response to the city operating curbside parking, while rents remained statistically the same. Thus, although the transition unbundles parking costs from housing prices, the depreciation in house values is not reflected in rents.

Date: Wednesday, February 3rd

Speaker: Jannik Matuschke, Technical University of Berlin

Topic: "Recent Advances in Robust Network Flows"

Time: Noon - 1:30 PM

Place: Henry Angus 969

Abstract: Our society increasingly depends on the constant availability of network services in areas such as communication, energy, or transportation. Robust network flows are a concept for making these services more reliable by anticipating link failures, external interferences, or even targeted attacks. The underlying idea is to introduce an adversary, the interdicator, who, after we send the flow through the network, tries to reduce its value by attacking the links of the network. Our goal is to find a flow whose remaining value after a worst-case attack by the interdicator is maximal.

In this talk, we will discuss some recent developments in the area and describe various models tailored towards different applications:

- a basic model, in which a fixed number of links in the network can fail,
- a model in which the interdicator can target individual flow paths but we can buy protection for the flow,
- models in which flow can be re-routed after the interdiction,
- a flow-over-time variant, in which travel times are uncertain.

We will discuss under which conditions maximal robust flows can be computed efficiently, and establish hardness results and approximation algorithms.

Date: Monday, February 1st

Speaker: Sanjith Gopalkrishnan, Sauder School of Business

Topic: "Allocation of Greenhouse Gas Emissions in Supply Chains"*

Time: 3:30 PM - 5:00 PM

Place: Henry Angus 969

Abstract: Governments in many countries are either considering or already implementing schemes aimed towards curbing greenhouse gas emissions. Accounting and assigning responsibility for emissions is a first step in any carbon reduction effort. We formulate the problem of assigning emission responsibilities as a cooperative game, referred to as the GREEN game, and use cooperative game theory methodology to suggest allocations of emission responsibility among the various parties in the supply chain while avoiding double counting. We derive an explicit expression for the Shapley value of the GREEN game, which is shown to have a very simple and intuitive interpretation, as well as new axiomatic characterizations of the Shapley value, which provide additional insights into its suitability as an emission responsibility

allocation method in supply chains. We also discuss the suitability of the nucleolus of the GREEN game as an allocation method and develop a polynomial-time algorithm for its computation.

* Joint work with Daniel Granot, Frieda Granot, Greys Sosic and Hailong Cui.

Date: Monday, January 25th

Speaker: Michael Ball, Robert H. Smith School of Business, University of Maryland

Topic: “A Novel Approach to Group Decision-Making: Applying Majority Judgement over Polyhedral Sets”

Time: 3:30 PM - 5:00 PM

Place: Henry Angus 969

Abstract: We describe new methods in group decision making by extending the “Majority Judgment” ranking method to handle a candidate space of infinite size. Specifically, the candidate space is modeled as a polyhedral set. The output of the process is a member of the candidate space chosen based on inputs from a group of decision makers. The process for choosing a candidate uses certain optimization models that employ the Majority Judgement criterion. Two approaches are developed. The first approach relies on multiple rounds of grading (or voting) and iterative candidate generation. The candidate generation employs a novel integer programming model. The second approach employs a robust optimization framework and only takes as input each decision maker’s most preferred candidate. The vector output is the candidate that has the best worst-case guarantee in terms of majority grade. We demonstrate the effectiveness of our approaches through two case studies involving group decision making: 1) a capital budgeting problem; and 2) a strategic air traffic flow management problem.

* Joint work with Cindy Barnhart, Prem Swaroop, Vikrant Vaze, Chiwei Yan

Date: Monday, January 18th

Speaker: Margaret Brandeau, Stanford University

Topic: "Public Health Preparedness: Our Multi-Billion Dollar Problem/Opportunity"

Time: 3:30 - 5:00 PM

Place: Henry Angus 969

Abstract: Public health security is a key aspect of national security in any country. In the US, public health security and preparedness efforts are supported by the Strategic National Stockpile (SNS), a federally held \$6 billion repository of medical and pharmaceutical supplies that is intended for use in any type of public health emergency, including a terrorist or bioterror attack, when local supplies are insufficient. We describe models we developed to address three questions relevant to the SNS and public health response: (1) What would be the costs and benefits of alternative strategies for stockpiling and dispensing medical and pharmaceutical supplies in the event of an anthrax attack? (2) To what extent should inventories for anthrax response be pre-positioned in local communities? (3) What types and quantities of medical and pharmaceutical supplies should be held in the SNS? We conclude with a broader discussion of key challenges in public health preparedness and opportunities where modeling can inform decisions.

Date: Monday, January 11th

Speaker: Peter Frazier, Cornell University

Topic: “Parallel Bayesian Global Optimization of Expensive Functions, for Metrics Optimization at Yelp”

Time: 3:30 PM - 5:00 PM

Place: Henry Angus 969

Abstract: We consider parallel derivative-free global optimization of expensive-to-evaluate functions. We present a new decision-theoretic algorithm for this problem, which places a Bayesian prior distribution on the objective function, and chooses the set of points to evaluate next that provide the largest value of the information. This decision-theoretic approach was previously proposed by Ginsbourger and co-authors in 2008, but was deemed too difficult to actually implement in practice. Using stochastic approximation, we provide a practical algorithm implementing this approach, and demonstrate that it provides a significant speedup over the single-threaded expected improvement algorithm. We then describe how Yelp, the online business review company, uses this algorithm to optimize the content that their users see. An open source implementation, called the Metrics Optimization Engine (MOE), was co-developed with engineers at Yelp and is available at github.com/yelp/MOE

CENTRE FOR TRANSPORTATION STUDIES

Date: Monday, January 11th

Speaker: Shinya Hanaoka, Tokyo Institute of Technology

Topic: “Passenger’s choice on direct and connecting flights in Indonesian domestic market”

Time: Noon - 1.30pm

Place: Henry Angus 333

Abstract: Jakarta Soekarno-Hatta Airport located in the Western region of Indonesia is currently facing serious congestion problems because it is operating far above its capacity. Makassar Airport serves as a regional hub in the Eastern region, thus it is possible to be a large-scale domestic hub with increased connecting flights for mitigating congestion at Jakarta Airport. This study aims to identify the passenger choice characteristics of direct and connecting flights in both full-service carrier (Garuda Indonesia) and low-cost carrier (Lion Air), and to estimate passenger’s choice model to determine important factors affecting the choice of direct or connecting flights by Revealed and Stated Preference survey. Major findings were (1) The departure time of the flight is most significant and (2) Mixed Multinomial Logit model based on a combination of revealed preference and stated preference data outperformed other models.

CENTRE FOR TRANSPORTATION STUDIES

Date: Friday, January 8th

Speaker: Adolf K. Y. Ng, Asper School of Business, University of Manitoba

Topic: “Climate Change and Adaptation Planning for Ports: The Need for a New Paradigm?”

Time: Noon - 1.30pm

Place: Henry Angus 967

Abstract: Climate change is arguably an irreversible process and could lead to catastrophic climate change-related risk posed to human lives and activities. Hence, taking effective port adaptation measures to climate change is not a choice but necessity nowadays. However, the decision-making process is subject to uncertainty and financial constraints, and so it is a challenging task to derive rational decisions through synthesizing uncertain and incomplete data. The study analyzes ports’ adaptation to the potential impacts posed by climate change. Specifically, it poses the question on whether there is a need to reform the existing port planning paradigm. It offers important insight on how to develop efficient climate change adaptation measures in a wide context so as to achieve the sustainability of ports, transport, and supply chains.

Date: Monday, January 4th

Speaker: Reza Skandari, Sauder School of Business

Topic: “Optimal vascular access planning for patients with chronic kidney disease”

Time: 3:30 PM - 5:00 PM

Place: Henry Angus 969

Abstract: Approximately 65% of patients with end stage renal disease depend on hemodialysis (HD). There are two major vascular access types for receiving HD, arteriovenous fistula (AVF) and central venous catheter. An AVF is often considered the gold standard for delivering HD due to better patient survival and higher quality of life. However, AVFs must be surgically created, and a majority of these surgeries are unsuccessful. We use three operations research models to address optimal vascular access planning for patients at different stages of chronic kidney disease (CKD). In the first model, using a data-driven simulation model, we study different AVF creation strategies for patients with CKD. In the second model, we apply continuous-time dynamic programming to seek individualized policies that maximize a patient’s survival and quality-adjusted life expectancy. In the last model, we develop a partially observable Markov model to address the heterogeneity of patients’ CKD progression when making AVF creation decisions.

Date: Tuesday, December 15th

Speaker: Xuan Zhao, Wilfred Laurier University

Topic: "Risk Management in Spot Market for Supply Chains Under Competition"

Time: 12:30 PM - 1:30 PM

Place: Henry Angus 333

Abstract: This paper studies two risk management strategies related to spot market to mitigate demand uncertainty: operational hedging and financial hedging. Consider a supplier selling an intermediate good to two manufacturers, who use it to produce a final product and compete with each other in the final product market. The manufacturer can reduce the supply and demand mismatch risk by operational hedging through sourcing in the spot market, or reduce the profit variability by financial hedging. We find that the supplier charges a lower contract price when selling to operational hedger(s), which hurts the supplier. However, the operational hedger may not benefit from the lower contract price when competing with a financial hedger. By opting out of spot trading and making a commitment to the final production output, the financial hedger benefits from competing with an operational hedger, who is forced to reduce his procurement quantity and final output to avoid intense competition when the former commits a large output. Furthermore, the profit variation of the financial hedger is reduced by a larger percentage when competing with an operational hedger. As a result, both firms may incline to adopt financial hedging instead of operational hedging, leading to a situation of the Prisoner's Dilemma.

Date: Monday, December 7th

Speaker: Chunhua Wu, Marketing and Behavioural Science Division, Sauder School of Business

Topic: "Mobile Hailing Technology, Worker Productivity and Digital Inequality: A Case of the Taxi Industry"

Time: 3:30 PM - 5:00 PM

Place: Henry Angus 969

Abstract: There are split regulatory movements as to the enforcement of e-hail programs where taxi drivers can use mobile hailing technology to pick up rides. Cities such as NYC have allowed their taxi drivers to opt in the newly launched e-hail programs, while others still declaring wars against the mobile hailing technology. This paper empirically investigates whether and to what extent mobile hailing technology increases taxi drivers' productivity. We exploit a unique natural experiment setting of taxi drivers adopting mobile hailing technology. We obtain 1 TB minute-by-minute geo-location data of 3,000 taxi drivers, and construct trip-level data to calculate hourly earnings, waiting time between trips, miles travelled, and number of taxi rides on the street for each of the 12,960 clock hours from Jan 2013 to Jun 2014. A key data challenge is that we only observe driving patterns but not actual adoption decision. To overcome the challenge, we build a change point model on the underlying process of mobile technology adoption and estimate parameters of changes in taxi drivers' hourly earnings with MCMC Bayesian method. We validate our recovered adoption rate with collected survey data, as well as mobile company's internal data. We find that mobile hailing technology adoption increases a taxi driver's

productivity on average by 25% to 50%. Yet the productivity gains perish over time as market adoption rate goes up. In the long run the overall impact of mobile hailing technology on productivity increase stabilizes at 15%. Comparing the pre- and post-decision driving patterns, we show that productivity gains are achieved through reduction in idling time between trips, overall demand surge in rides, and selection over more profitable trips. In addition, contrary to prior research on information technology, we did not find empirical support for mobile hailing technology adoption induced digital inequality. Indeed, productivity dispersion between low and high-wage drivers is reduced.

Date: Monday, November 23rd

Speaker: Shuya Yin, Paul Merage School of Business, UC Irvine

Topic: “Guaranteed Trade-in Prices: A Triple Bottom Line Perspective”

Time: 3:30 PM - 5:00 PM

Place: Henry Angus 969

Abstract: This paper aims to analyze a trade-in price guarantee program from perspectives of firms, consumers and the environment. Specifically, we consider a two-period model consisting a value chain with a firm manufacturing and selling a durable product and another firm offering a trade-in price guarantee to consumers. Through this model, we study how such a guarantee affects the firms’ performance and the surplus enjoyed by consumers. What is its environmental footprint in terms of its effect on demand for new products that use new materials and energy to produce? We also address how these perspectives are impacted by whether the guarantee is provided directly by the firm itself or a third party.

Date: Monday, November 16th

Speaker: Thomas Rothvoss, University of Washington

Topic: “Polynomiality for Bin Packing with a Constant Number of Item Types”

Time: 3:30 PM - 5:00 PM

Place: Henry Angus 969

Abstract: We consider the bin packing problem with d different item sizes s_i and item multiplicities a_i , where all numbers are given in binary encoding. This problem formulation is also known as the 1-dimensional cutting stock problem.

In this work, we provide an algorithm which, for constant d , solves bin packing in polynomial time. This was an open problem for all $d \geq 3$.

In fact, for constant d our algorithm solves the following problem in polynomial time: given two

d-dimensional polytopes P and Q , find the smallest number of integer points in P whose sum lies in Q .

Our approach also applies to high multiplicity scheduling problems in which the number of copies of each job type is given in binary encoding and each type comes with certain parameters such as release dates, processing times and deadlines. We show that a variety of high multiplicity scheduling problems can be solved in polynomial time if the number of job types is constant.

This is joint work with Michel X. Goemans.

Centre for Transportation Studies

Date: Monday, November 9th

Speaker: , Yukihiro Kidokoro, GRIPS, National Graduate Institute for Policy Studies

Topic: "Port Privatization, Self-financing, and Port Clusters"*

Time: Noon - 1:30pm

Place: Henry Angus 966

Abstract: Using a general equilibrium model including consumers, shipping liners, and a port surrounded by cluster firms, we analyze i) the effects of port clusters on port charges and port capacity, ii) the rule for the determination of the size of port clusters, and iii) possibility of self-financing. An important feature of the model is that we include the agglomeration benefits in cluster firms, which result in a decrease in shipping costs and an increase in rents of land that surrounds the port. First, we characterize the results under social welfare maximization, and investigate whether self-financing is feasible or not. Second, we derive the results under profit maximization by a privatized monopolistic port, show the effects of privatization, and discuss the possibility of self-financing. Third, we demonstrate that the existence of an alternative route drastically changes the results and that the solutions under social welfare maximization and under profit maximization coincide. Our analysis suggests that in a realistic situation where many competitive shipping routes coexist, no regulation is necessary for a privatized port in terms of social welfare.

* This is a joint work with Prof. Anming Zhang (University of British Columbia).

Date: Monday, November 9th

Speaker: Ari Belenkiy, SFU

Topic: “Norms of coining at the Royal Mint and Newton’s revolution”

Time: 3:30 PM - 5:00 PM

Place: Henry Angus 969

Abstract: Producing coins at the Royal Mint included ten quite diverse operations supervised by the Master of the Royal Mint. The norms, known as the Master’s remedies in shear and assay, initially introduced in mid-13th century by King Edward I, were to check on the Master’s overall performance, i.e., ensure that the coins conformed to the standard weight and fineness within a certain error margin.

From the very beginning, the remedies were set unreasonably wide, in part, due to inability to control the variations in a coin’s weight and fineness. This situation, in the end of the 17th century, led to the pernicious practice by English bankers and goldsmiths of culling the heavy guineas and gaining profit from melting them to strike lighter weight coins.

However, in 1719, Sir Isaac Newton, then the Master of the Royal Mint, in a letter to the Treasury claimed to have stopped the practice of culling in Great Britain thus “saving some thousands of pounds to the Crown.” By examining Newton’s archive and the statistical data from the Jury Verdicts from the trials of the Pyx, held during Newton’s tenure at the Royal Mint (1696-1727), I speculate on what improvements he could have achieved in coining and estimate of how many “thousands of pounds” he saved the Crown.

Next I introduce the variation in weight of a country’s major gold coin, a quarter of ounce, as a new measure of the technological level of a country. I trace this parameter for several epochs from 1663 to the modern times and discuss its limitations.

Ari Belenkiy, “The Master at the Royal Mint: How much money did Newton save Britain?” (Journal of the Royal Statistical Society: Series A, 176 (2), 2013, 481-498).

Key words: Royal Mint, Isaac Newton, the guinea, trials of the Pyx, Jury Verdicts, remedies in shear and assay, margin, practice of culling, normal distribution, standard deviation, small samples, the Law of Large Numbers

Date: Friday, October 30th, 2015

Speaker: Centre for Operations Excellence MMOR Student Presentations

Topic: Centre for Operations Excellence ProjectFest 2015

Time: 10:00 AM - Noon

Place: 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.

Mining Unstructured Text for Risk Assessment

Industry partner: WorkSafe BC

MMOR students: Susie Tang, Benjamin Squire, and Hans Aisake

How the Post-Anesthesia Care Unit (PACU) Impacts Surgeries

Industry partner: Fraser Health Authority

MMOR students: Qinlu (Louisa) Chen and Laura Walker

Making Inventory Work for You

Industry partner: Tree Island Steel Inc.

MMOR students: Siamak Farahmand and Ravi Khandelwal

Learning about Top Talent and Retention with HR Analytics

Industry partner: Boeing Canada-AeroInfo

MMOR students: Bingjing Yu and Alex Dueck

Matching Capacity to the Market

Industry partner: A major lumber producer

MMOR students: Haider Shah, Jodie Lam, and Stephanie Zhang

From Twitter to Airline Operations

Industry partner: Boeing Canada-AeroInfo

MMOR students: Christopher Pang, Tony Guo, and Frank Qiu

Date: Monday, October 19th, 2015

Speaker: Yehua Wei, Fuqua School of Business, Duke University

Topic: “Process Flexibility for Multi-Period Production Systems”

Time: 3:30 PM - 5:00 PM

Place: Henry Angus 969

Abstract: We develop a theory for the design of process flexibility in a multi-period production system. We propose and formalize a notion of “effective chaining” termed the Generalized Chaining Condition (GCC), which includes the chaining structure put forth by Jordan and Graves (1995) as a special case. We show that any partial flexibility structure that satisfies GCC is near-optimal under a class of policies called the Max-Weight policies, i.e., gaining nearly as much benefit as a fully flexible system. Furthermore, we show that GCC can be satisfied using very sparse flexibility structures, and we provide an efficient algorithm for finding such structures. Our numerical study confirms insights from our theoretical results. The goal of this paper is to make progress towards the better understanding of the key design principles of process flexibility structures in a multi-period environment, the study of which has been limited due to its inherent complexity.

This is joint work with Cong Shi from University of Michigan and Yuan Zhong from Columbia University.

Date: Friday, October 9th, 2015

Speaker: Yunan Liu, NC State University

Topic: “Controlling Excessive Delays in Service Systems with Time-Varying Demand”

Time: Noon - 1:30 PM

Place: Henry Angus 966

Abstract: Queueing theory is a field driven by applications. But unfortunately, there still remains a large gap between tractable theoretical studies and practical applications, such as call centers and health care systems, which have many realistic features (e.g., time-varying arrivals, customer abandonment, non-exponential distributions, and complicated network structures). In response to the challenge, we study a general $G_t/GI/s_t+GI$ queueing model, which has a non-stationary non-Poisson arrival process (the G_t), non-exponential service times (the first GI), and allows customer abandonment according to a non-exponential patience distribution (the $+GI$). To bridge the gap between mathematical tractability and model applicability, we develop fundamental principles and optimal control policies for such a general queueing model.

Analytic formulas are developed to set the time-dependent number of servers in order to stabilize important service-level indicators, including: mean customer delay, probability of abandonment,

and tail probability of delay (TPoD). Taking the TPoD for example: for any delay target $w > 0$ and probability target $0 < \alpha < 1$, we determine appropriate time-dependent staffing levels (the s_t) so that the time-varying probability that the waiting time exceeds a maximum acceptable value w is stabilized at α at all times. In addition, effective approximating formulas are provided for other important performance functions such as the probabilities of delay and abandonment, and the means of delay and queue length. Many-server heavy-traffic limit theorems in the efficiency-driven regime are developed to show that (i) the proposed staffing function achieves the goal asymptotically as the scale increases, and (ii) the proposed approximating formulas for other performance measures are asymptotically accurate as the scale increases. Extensive simulations show that both the staffing functions and the performance approximations are effective, even for smaller systems having an average of 3 servers.

Date: Monday, September 28th, 2015

Speaker: Maren Martens, University of Applied Sciences Landshut, Germany

Topic: "Routing Problems in Logistics:

Time: 3:30 PM - 5:00 PM

Place: Henry Angus 969

Abstract: Logistics is everywhere and everything in logistics can be optimized! However, many of the arising optimization problems are NP-hard, implying that in real life logistics approximations are indispensable.

In this talk, we concentrate on two routing problems in the field of logistics: One being a routing problem in a supply chain when delivering goods from suppliers through production sites and distribution centers to customers, the other being a generalized packet routing problem in the warehouse. The objective in both such problems is to minimize costs, which arise, e.g., from transportation, storage, or time restrictions. Various constraints make the two problems NP-hard. For the first problem such constraints contain unsplittability of orders, minimum throughputs for warehouses, or non-linear transport cost. For the second problem, we extend the general packet routing problem in basically two ways: Firstly, we introduce operating times for every packet in every node; secondly, we give each packet sets of nodes from which one node for every set has to be visited.

We model the two logistic routing problems as mixed integer programs, thereby discussing new algorithmic challenges and open problems.

Date: Monday, September 21st, 2015

Speaker: Amy Ward, Marshall School of Business, University of Southern California

Topic: "Incentive-Based Service System Design: Staffing and Compensation to Trade-Off Speed and Quality"

Time: 3:30 PM - 5:00 PM

Place: Henry Angus 969

Abstract: Most common queueing models used for service system design assume the servers work at fixed (possibly heterogeneous) rates. However, real-life service systems are staffed by people, and people may change their service speed in response to their compensation incentives. The delicacy is that the resulting employee service rate affects the staffing, but also the staffing affects the resulting employee service rate. Our objective in this paper is to find a joint compensation and staffing policy that induces optimal service system performance.

We do this under the assumption that there is a trade-off between service speed and quality, and that employees are paid based on both. The employees each selfishly choose their own service speed in order to maximize their own expected utility, which can have a monetary and a non-monetary component. We characterize the equilibrium service speed in large systems under a simple linear compensation and staffing policy. We show that there is a limiting first best policy within that class. The important insight is that in the large system limit the problem decouples into one where the system manager first jointly determines the staffing and service speed, and second uses the compensation to achieve that desired service speed. We further show conditions under which a critically loaded, efficiency-driven, quality-driven, or mixed regime – in which there is simultaneous customer abandonment and server idling – emerges under a first-best policy.

*joint work with Dongyuan Zhan

Date: Monday, September 14th, 2015

Speaker: Chris Tang, UCLA

Topic: “Economic Value of Market Information for Farmers in Developing Countries”

Time: 3:30 PM - 5:00 PM

Place: Henry Angus 969

Abstract: Farmers in developing countries often lack market information for making informed manufacturing/selling decisions. To alleviate poverty, various non-governmental organizations (NGOs) and for-profit companies have developed different ways to distribute information about market price and farming technique to farmers. We investigate a fundamental question: will information create economic value for farmers? We construct a stylized model in which farmers face an uncertain market price (demand) and must make production decisions before the market price is realized. Each farmer has an imprecise private signal and an imprecise public signal to estimate the actual market price. By examining the equilibrium outcomes associated with a Cournot competition game, we show that private signal does create value by improving farmers' welfare. However, this value deteriorates as public signal becomes available (or more precise). In contrast, in the presence of private signal, public signal does not always create value for the farmers. More importantly, we find that public signal can reduce welfare inequality when farmers have non-identical private signal precisions.