OPLOG Division Seminars
From September 2017 – Onwards

Date: Friday, August 3rd, 2018

Speaker: Moshe Haviv, The Hebrew University of Jerusalem
Title: "Externalities, optimization and regulation in queues"
Time: 12:30 PM - 1:30 pm
Place: Henry Angus 968

Abstract: The academic research on queues deals mostly with waiting. Yet, the externalities, namely the added waiting time an arrival inflicts on others, are of no less, if not of more, importance. The talk will deal mostly with how the analysis of externalities leads to the socially optimal behavior, while solving queueing dilemmas such as whether or not to join a queue, when to arrive to a queue, or from which server to seek service at. Customers, being selfish, do not mind the externalities they impose on others. We show how in queues too, internalizing the externalities leads to self regulation. In this setting selecting the service regime is one of the tools in one's arsenal.

(Joint with Binyamin Oz)

Date: Monday, July 23rd, 2018

Speaker: Guohua Wan, Shanghai Jiao Tong University
Title: "Home Services Routing and Appointment Scheduling with Stochastic Service Times"
Time: 2:30 PM - 3:30 PM
Place: Henry Angus 969

Abstract: Motivated by the practices of home services, we consider an integrated routing and appointment scheduling problem with stochastic service times. Given a set of customers with known locations and random service times, the professional operator has to visit each customer location exactly once to provide the services. The objective of the problem is to determine the visit route and the appointment times for the customers so as to minimize the total costs of idling of the operator, waiting of the customers and traveling. Given that the distributions of service times are known, we develop a two-stage stochastic programming model using sample average approximation and propose an integer *L*-shaped method to solve the problem. We also propose an easy-to-implement heuristic algorithm that allows solving large-size problem efficiently. For the case that only the mean and variance are known for the service times, we propose a method based on a mixed integer second order cone program to deal with the problem. The effectiveness and efficiency of these methods are demonstrated through computational experiments on randomly generated problem instances.

Date: Tuesday, June 19th, 2018

Speaker: David Stanford, The University of Western Ontario
Title: "An updated approach to Emergency Department prioritization in light of empirical data"
Time: Noon - 1:00 PM
Place: Henry Angus 968

Abstract: In recent years, several presentations I have given have addressed the utility of the Accumulating Priority Queue (APQ) discipline, to respond to the stated limits of Key Performance Indicators for the waiting times, such as the Canadian Triage and Acuity Score (CTAS) and the Australasian Triage Score (ATS). Recently, we have been working with a two-year Emergency Department dataset from a hospital in Southern Ontario, which profiles the demand for emergency care by CTAS category. This profile reveals that this hospital, and others like it in Ontario, are highly dominated by the middle acuity class, CTAS 3 (Urgent cases). This reality changes significantly the appropriateness of an APQ approach, which now needs to entail an element of delay for some classes before priority starts to accumulate. This presentation will explain the rationale behind this conclusion, and present numerical results for the lower acuity class of interest: CTAS 4 (Less Urgent) cases. We may be able to present analytical waiting time results for the higher priority classes; it not, simulation results will be reported.

CENTRE FOR TRANSPORTATION STUDIES

Date: Monday, June 4th, 2018

Speaker: William H.K. Lam, Hong Kong Polytechnic University
Title: "Development of Intelligent Transportation Systems in Hong Kong: Opportunities and Challenges"
Time: 2:00 PM - 3:15 PM
Place: Henry Angus 968

Abstract: Due to the topography and urban development constraints of Hong Kong, there are hardly any available spaces for further expansion of the existing road transport network. Recent development of advanced technologies and availability of Big Data provide opportunities and challenges for development of smart transportation systems in Hong Kong with the use of multi-source data and emerging technologies. In this presentation, an overview of recent development of intelligent transportation systems (ITS) in Hong Kong road network will firstly be given together with further extensions to reliability-based ITS. It will cover the challenges encountered for ITS development in Hong Kong, the provision of real-time road traffic information using limited available data from multiple sensor systems (on-line data) in combination with historical data (off-line data), and a reliability-based routing service with on-time arrival probability, etc. The potential research and development on the extensions of ITS in Hong Kong will also be discussed together with the opportunities and challenges ahead.

Date: Wednesday, May 9th, 2018

Speaker: Nitish Jain, London Business School, UK
Title: "Online Retail: Drivers of Product Returns"
Time: 12:30PM - 1:30PM
Place: Henry Angus 968

Abstract: Product returns constitute a large share of the operational costs of online retailers. In this study, we use detailed customer level transactional data on returns to identify the key drivers of product returns. We find that a customer's return decision is significantly affected by the purchase price, the realized discount level, and the quality of the delivery experience. Furthermore, we find significant difference in return instances between different online channels–Desktop or mobile–on the account of different levels of impulsive purchasing behaviour and levels of uncertainty around a product's fit with the customer's preferences. Using these findings, we estimate the value of curating channel specific discount strategies and investments for resolving product uncertainty (such as virtual showrooms) in reducing product returns.

Date: Monday, May 7th, 2018

Speaker: Jonathan Li, University of Ottawa
Title: "Optimization for measuring risk in stochastic programs"
Time: 2:30PM - 3:30PM
Place: Henry Angus 969

Abstract: Accounting for the adverse impact of "non-average" events has become essential in many applications involving decision making under uncertainty. Its implementation through decision models, namely stochastic programs, requires careful measurement of risk that reflects one's concern about uncertain outcomes. Important theories such as convex risk measures outline conditions required for risk measurement but provide little guidance for cases not meeting the conditions. Unfortunately, such cases are more than common in real-life situations. In particular, in this talk, we study cases where the distribution required by a law invariant risk measure is not available and/or the risk preference required by a risk measure cannot be identified. We aim to provide theoretical, computational, and empirical evidence that in these cases optimization can be a powerful tool to measure risk in a systematic fashion that is hard to achieve otherwise. Applications to operation management and finance will be presented.

Date: Monday, April 30th, 2018

Speaker: Tava Olsen, The University of Auckland
Title: "Modelling Contracts and Incentives in Agricultural Cooperative Supply Chains"
Time: 2:30PM - 3:30PM
Place: Henry Angus 968

Abstract: In agricultural marketing co-operatives (co-ops), a group of farmers, or growers, collaborate under a single cooperative organizational structure to process and market their products. The trade-offs faced within the supply chain are often different to those faced by traditional investor-owned firms. For example, most co-ops pledge to take all product produced by farmers, rather than being able to place specific orders with suppliers. Further, operational and financial decisions become inseparable because capital investment decisions are linked to the co-op's economic transactions with its members. This is particularly true for so-called proportional investment co-ops, where farmers' equity is required to be in proportion to their patronage. That is, farmers who supply a greater quantity of the given product are required to supply a proportionately higher amount of equity for the co-op. Supply yield uncertainty adds another dimension to the difficulty of coordinating the supply chain. In this talk we consider contacts and incentives in the agricultural supply chain. We present two specific models. The first is a game-theoretic model when farmers' efforts lead to higher quality. The second is a Markov decision process wherein the decisions of processing quantity interact with the financial decisions of retained earnings and short term loans.

Date: Monday, April 9th, 2018

Speaker: Karl Sigman, Columbia University
Title: "Simulation for some Multi-server Queueing Systems"
Time: 2:30PM - 3:30PM
Place: Henry Angus 966

Abstract: An overview is given of progress made in the exact simulation of limiting distributions for some multi-server queueing models. “Exact” refers to simulating a random element that has exactly the probability distribution of the desired limiting distribution—even though an explicit form of the distribution is not known. The most common element in such simulation algorithms involve what is called coupling from the past. The most general scenario is for renewal arrivals and independent and identically distributed vectors of service times fed to GI/GI/c queues, or even Fork-Join models.

Joint work with Jose Blanchet (Stanford University) and Yanan Pei (Columbia University).

Date: Friday, April 6th, 2018

Speaker: Mattheo Balliauw, PhD Candidate, University of Antwerp

Title: "Capacity investment decisions of two competing ports under uncertainty: a strategic real options approach"
Time: 2:00PM - 3:15PM
Place: Henry Angus 968

Abstract: Ports worldwide operate in an uncertain environment and compete with nearby ports to attract cargo. The extent of competition is influenced by the geographical location and services offered at two ports. In this paper, the interactions between competition under uncertainty and other typical port characteristics, such as congestion, are related to their impact on both ports' capacity investment decisions. The flexible ports have the option to delay investment in a capacity level that is not ex-ante defined. In a Stackelberg leader-follower game, we consider both the entry deterrence and accommodation strategies for the leader port. When one of the ports only has a limited cost advantage, the leader role will be endogenous and will be the result of preemption. Uncertainty is included in the model by a geometric Brownian motion, allowing us to analyse the impact of growth and uncertainty (variability) independently. We find that higher growth, uncertainty and port customers' aversion to waiting lead to a bigger project installed at a later moment. When competition intensifies, the option value of waiting is reduced, leading to earlier investment in less capacity. Finally, an increase of public money involvement leads to earlier and bigger investment.

Date: Monday, March 26th, 2018

Speaker: Wanmo Kang, Korea Advanced Institute of Science and Technology (KAIST)
Title: "Monte Carlo Simulation: Variability Reduction and Applications"
Time: 2:30PM - 3:30PM
Place: Henry Angus 969

Abstract: We start with basic ideas of the Monte Carlo methods, which is popular in practice. We will also touch some variability issues like variances and biases of Monte Carlo estimators. Then I will present briefly my works on variability reduction in various problems including tail probability estimation of portfolio credit risk, sampling from multifactor stochastic volatility models and sensitivity estimation under general one-dimensional diffusions.

Date: Wednesday, March 21st, 2018

Speaker: Shan Liu, University of Washington
Title: "Optimizing Dynamic Resource Allocation: Models and Insights for Chronic Disease Care"
Time: 2:30PM - 3:30PM

Place: David Lam - DL 125

Abstract: Dynamic resource allocation problems for chronic disease management have received much attention due to excessive healthcare costs and poor quality of care. The goal is to identify optimal intervention strategies under resource constraints to improve population health outcomes over time, while accounting for patients' heterogeneity in disease progression and population dynamics. The problem is challenging due to the complex disease trajectories, unclear intervention priorities, and uncertain intervention effects. I present two applications under U.S. healthcare settings. First, I discuss our current research on designing statistical learning and optimization models to adaptively monitor chronically depressed patients. Mitigating depression has become a national health priority as it affects 1 out of 10 adults in the U.S. Prognostic-based monitoring that stratifies patients' disease risk and adaptively allocates intervention resources to high-risk patients can improve overall health outcomes. Our objective is to translate electronic health record data into solutions regarding who should be monitored and how often, and study how cost-effective these adaptive monitoring strategies could be. Second, I present our current research on designing an efficient algorithm for hepatitis C screening and treatment policy implementation. We consider a discrete-time finite-horizon budget allocation problem within a closed birth-cohort population. To address the computational challenges associated with large-state and multiple-period dynamic decision-making problems, we propose a low fidelity value approximation that preserves the population dynamics under a stationary policy. We then embed the low fidelity value approximation into the high fidelity optimization model to efficiently identify a good non- stationary sequential intervention policy. We show how our approach scales well to problems with high dimensionality due to many decision periods.

Date: Monday, March 19th, 2018

Speaker: Dan Adelman, University of Chicago Booth School of Business
Title: "Dynamic Electricity Pricing to Smart Homes"
Time: 2:30PM - 3:30PM
Place: Henry Angus 968

Abstract: With the rapid growth in residential smart meters across the U.S. in recent years, most homes in the U.S. will soon be capable of moving to time-varying prices for electricity. We develop a methodology for studying the welfare impacts of different pricing strategies on an electricity market when homes deploy smart, price- responsive appliances with forward-looking capabilities. Without assuming any functional form for dynamic prices, we show conditions under which asymptotically as the number of homes increases, social welfare maximizing price schedules in equilibrium are linear in load, are the same for all homes, and incrementally equal expected marginal supply costs over equilibrium loads. We provide an algorithm to compute equilibria for a large population. Using real-world data to calibrate a smart thermostat model, we compare this dynamic pricing strategy against flat and peak pricing strategies when smart thermostats are deployed across ComEd's service region of approximately 3.5 million residential homes. We show that dynamic pricing in equilibrium dominates these competing pricing strategies, and measure the expected improvements as smart thermostats are increasingly

deployed. As compared against the current status quo of relatively few smart thermostats and flat pricing, we reduce adopters' monthly power bills and generation costs from AC loads by 41 and 35%, respectively, while simultaneously increasing social welfare and consumer surplus. Despite these benefits, supplier surplus from adopters decreases by half.

Date: Monday, March 12th, 2018

Speaker: Robert Batt, Wisconsin School of Business
Title: "The Effects of Discrete Work Shifts on a Nonterminating Service System"
Time: 2:30PM - 3:30PM
Place: **David Lam - DL 125**

Abstract: Hospital emergency departments (EDs) provide around-the-clock medical care and as such are generally modeled as nonterminating queues. However, from the care provider's point of view, ED care is not a never-ending process, but rather occurs in discrete work shifts and may require passing unfinished work to the next care provider at the end of the shift. We use data from a large, academic medical center ED to show that the patients' rate of service completion varies over the course of the physician shift. Further, patients that have experienced a physician handoff have a higher rate of service completion than non-handed off patients. As a result, a patient's expected treatment time is impacted by when in the physician's shift treatment begins. Lastly, we show that patients that have been handed off are more likely to revisit the ED within three days, suggesting that patient handoffs lower clinical quality.

This is joint work with Diwas S. KC (Emory University), Bradley R. Staats (University of North Carolina-Chapel Hill), Brian W. Patterson (University of Wisconsin-Madison).

Date: Monday, February 26th, 2018

Speaker: Varun Gupta, University of Chicago Booth School of Business
Title: "Designing load balancing and admission control policies: lessons from NDS regime"
Time: 2:30PM - 3:30PM
Place: Henry Angus 969

Abstract: We will consider two problems in control of queueing systems: (1) load balancing policies for a multi-server system, and (2) admission control into a server with state-dependent service rates. For the first, our goal is to study the performance of simple heuristics such as Join-Shortest-Queue and Join-Idle-Queue, and the effect of service distribution on the performance. For the second system, our goal is to design admission control policies tailored specifically to the service distribution. I will try to illustrate why the recently introduced NDS (non-degenerate slowdown) scaling regime is the right regime in which to study these questions - giving non-trivial control policies, as well as insights which are robust to the scale and traffic intensity of the system.

Date: Wednesday, February 7th, 2018

Speaker: Shi Chen, Foster School of Business, University of Washington
Title: "Pricing Schemes in Cloud Computing: Utilization-Based versus Reservation-Based"
Time: Noon - 1:00PM
Place: Henry Angus 968

Abstract: Cloud computing has been recognized as one of the rising trends in the business world. In this paper, we consider two important pricing schemes offered to long-term customers by major service providers in the cloud industry: the reservation-based scheme (namely the R-scheme) by Amazon and the utilization-based scheme (namely the U-scheme) by Google. We consider a duopoly model with heterogeneous customers characterized by the mean and the coefficient of variation of their usage. We show that the effective price of either scheme is an increasing function of the coefficient of variation of the customer usage. Furthermore, we find that when the providers use different schemes, customers with small demand volatility would prefer the R-scheme and those with large demand volatility would prefer the U-scheme. Finally, we study the impact of evolving market characteristics such as market preference, customer size, market volatility, etc., on the service providers' choices of schemes and settings of the pricing parameters.

Date: Monday, February 5th, 2018

Speaker: David Shmoys, ORIE, Cornell University
Title: "Models and Algorithms for the Operation and Design of Bike-sharing Systems"
Time: 2:30PM - 3:30PM
Place: Henry Angus 969

Abstract: Bike-sharing systems are changing the urban transportation landscape; for example, New York launched the largest bike-sharing system in North America in May 2013, with individual trips expected to exceed 15 million rides for 2017. We have worked with Citibike, using analytics and optimization to change how they manage the system. Huge rush-hour usage imbalances the system - we answer the following two questions: where should bikes be at the start of a day and how can we mitigate the imbalances that develop?

We will survey the analytics we have employed for the former question, where we developed an approach based on continuous-time Markov chains combined with integer programming models to compute daily stocking levels for the bikes, as well as methods employed for optimizing the capacity of the stations. For the question of mitigating the imbalances that result, we will describe both heuristic methods and approximation algorithms that guide both mid-rush hour and

overnight rebalancing, as well as for the positioning of corrals, which have been one of the most effective means of creating adaptive capacity in the system. More recently, we have guided the development of Bike Angels, a program to incentivize users to make “rebalancing rides”, and we will describe its underlying analytics. This is joint work with Daniel Freund, Shane Henderson, and Eoin O’Mahony, as well as Hangil Chung, Nanjing Jian, Ashkan Nourozi-Fard, and Alice Paul.

Date: Monday, January 29th, 2018

Speaker: Gonzalo Romero, Rotman School of Management, University of Toronto
Title: "Consumer Education and Reverse Logistics in the Base of the Pyramid"
Time: 2:30PM - 3:30PM
Place: Henry Angus 969

Abstract: We introduce the value-access paradox that occurs in many developing countries: *consumers that would most benefit from existing life-improving products are those that can least find and afford them*. We model the operations of a social enterprise in a developing market that tackles this paradox by distributing life-improving technologies. Its goal is to profitably increase their adoption by selling through local retailers. The retailers sell to consumers with uncertain product valuation who suffer financial distress. The distributor considers two strategies: (i) improved consumer education and (ii) a higher salvage value for returned products. We prove that increasing the product's salvage value is always beneficial for the distributor, while improving the consumer education level may be detrimental. Moreover, this effect is weakened (strengthened) if the consumers' financial distress is high (low), and the distributor highly values product adoptions. Furthermore, in contrast to developed markets, a more expensive product with higher salvage value can lead to a Pareto-improvement in supply-chain performance, i.e. lead to lower prices to consumers, more product adoptions, more retailer profits, and better distributor's objective value.

This is joint work with Andre Calmon (INSEAD), and Diana Jue-Rajasingh and Jackie Stenson (Essmart, http://www.essmart-global.com/).

Date: Monday, January 15th, 2018

Speaker: Merve Bodur, University of Toronto
Topic: "Two-stage (Dual) Linear Decision Rules for Multi-stage Stochastic (Integer) Programming"
Time: 2:30PM - 3:30PM
Place: Henry Angus 968

Abstract: Multistage stochastic linear programs (MSLP) can be approximated by applying linear decision rules (LDR) on the recourse decisions. This reduces MSLP (its dual) into a static problem which provides an upper (lower) bound on the optimal value. In the first part of the talk,

we introduce two-stage LDRs whose application reduces MSLP (or its dual) into a two-stage stochastic linear program (2SLP). Although solving the corresponding 2SLP approximations is intractable in general, we investigate how approximate solution approaches that have been developed for solving 2SLP can be applied to solve these approximation problems. In addition to yielding better policies and bounds, this approach requires many fewer assumptions than are required to get an explicit reformulation when using the static LDR approach. In the second part of the talk, we introduce dual LDRs for multi-stage stochastic integer programs. We investigate techniques for using these decision rules to obtain bounds on the optimal solution, and compare the strength of the relaxation from different techniques. For both parts, we present numerical results on a capacity expansion model.

This is a joint work with Jim Luedtke.

Link: The preprint of the paper regarding the first part of the talk is available on arXiv: https://arxiv.org/abs/1701.04102

Date: Monday, January 8th, 2018

Speaker: Vishal Gupta, USC Marshall School of Business
Topic: "Small-Data, Large-Scale Linear Optimization"
Time: 2:30PM - 3:30PM
Place: Henry Angus 969

Abstract: Optimization applications often depend upon a huge number of uncertain parameters. In many contexts, however, the amount of relevant data per parameter is small, and hence, we may have only imprecise estimates. We term this setting -- where the number of uncertainties is large, but all estimates have fixed and low precision -- the ``small-data, large-scale regime." We formalize a model for this regime, focusing on linear programs with uncertain objective coefficients, and prove that the small-data, large-scale regime is distinct from the traditional large-sample regime. Consequently, methods like sample average approximation, data-driven robust optimization, regularization, and ``estimate-then-optimize" policies can perform poorly. We propose a novel framework that, given a policy class, identifies an asymptotically best-in-class policy, where the asymptotics hold as the number of uncertain parameters grows large, but the amount of data per uncertainty (and hence the estimate's precision) remains small. We apply our approach to two natural policy classes for this problem: the first inspired by the empirical Bayes literature in statistics and the second by the regularization literature in optimization and machine learning. In both cases, the sub-optimality gap between our proposed method and the best-in-class policy decays exponentially fast in the number of uncertain parameters, even for a fixed amount of data. We also show that in the usual large-sample regime our policies are comparable to the sample average approximation. Thus, our

policies retain the strong large-sample performance of traditional methods, and additionally enjoy provably strong performance in the small-data, large-scale regime. Numerical experiments confirm the significant benefits of our methods.

Joint work with Prof. Paat Rusmevichientong, USC Marshall

Seminar Paper: http://www-bcf.usc.edu/~guptavis/Papers/SmallData_WP.pdf

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Date: Monday, November 27th, 2017

Speaker: John Dickerson, University of Maryland
Topic: "Using Optimization to Balance Fairness and Efficiency in Barter Markets"
Time: 2:30PM - 3:30PM
Place: Henry Angus 969

Abstract: The exchange of indivisible goods without money addresses a variety of constrained economic settings where a medium of exchange - such as money - is considered inappropriate. Participants are either matched directly with another participant or, in more complex domains, in barter cycles and chains with other participants before exchanging their endowed goods. We show that techniques from computer science and operations research, combined with the recent availability of massive data and inexpensive computing, can guide the design of such matching markets and enable the markets by running them in the real world. A key application domain for our work is kidney exchange, an organized market where patients with end-stage renal failure swap willing but incompatible donors. We present new models that address three fundamental dimensions of kidney exchange: (i) uncertainty over the existence of possible trades, (ii) balancing efficiency and fairness, and (iii) inherent dynamism. Next, we combine these dimensions, along with high-level human-provided guidance, into a unified framework for learning to match in a general dynamic setting. This framework, which we coin FutureMatch, takes as input a high-level objective (e.g., "maximize graft survival of transplants over time") decided on by experts, then automatically learns based on data how to make this objective concrete and learns the "means" to accomplish this goal - a task that, in our experience, humans handle poorly. Throughout, we draw on insights from our work with the United Network for Organ Sharing (UNOS) US-wide exchange and experiments on data from the National Health Service UK-wide exchange.

Date: Monday, November 20th, 2017

Speaker: Itai Ashlagi, Stanford University
Topic: "Communication Requirements and Informative Signaling in Matching Markets"
Time: 2:30PM - 3:30PM
Place: David Lam - DL 125

Abstract: We study how much communication is needed to find a stable matching in a two-sided matching market with private preferences. Segal (2007) and Gonczarowski et al. (2015) showed that, in the worst case, any protocol that computes a stable matching requires the communication cost per agent to scale linearly with the total number of agents. In markets with many thousands of agents, this communication requirement is implausibly high, casting doubt on whether stable matchings can arise in large markets. We study markets with realistic assumptions on the preferences of agents and their available information, and show that a stable matching can be found with a much smaller communication requirement. In our model, the preferences of workers are unrestricted, and the preferences of firms follow an additively separable latent utility model. Our efficient communication protocol modifies the worker-proposing deferred acceptance algorithm by having firms signal workers they especially like while also broadcasting qualification requirements to discourage other workers who have no realistic chances from applying. In the special case of tiered random markets, the protocol can be modified to run in two rounds and involve only private messages. Our protocols have good incentive properties and give insights into how to mediate large matching markets to reduce congestion.

Link to the paper: https://web.stanford.edu/~iashlagi/papers/communication-complexity-matching-markets.pdf

Date: Monday, October 30th, 2017

Speaker: Li Chen, Cornell University
Topic: "Retailing with 3D Printing"
Time: 2:30PM - 3:30PM
Place: Henry Angus 969

Abstract: Given the promise of 3D printing, also known as additive manufacturing, some innovative consumer goods companies have started to experiment with such a technology for on-demand production. However, the potential impact of 3D printing on retail and supply chain operations is not well understood. In this paper, we consider two adoption cases of 3D printing in a dual-channel (i.e., online and in-store) retail setting, and evaluate its impact on a firm's product offering, prices for the two channels, as well as inventory decisions. Our analysis uncovers the following effects of 3D printing. First, 3D printing at the factory has the substitution effect of technological innovation for online demands, as 3D printing replaces the traditional mode of production. Such technology substitution not only leads to increased product variety offered online, which allows the firm to charge a price premium for online customers, but also induces the firm to offer a smaller product variety and a reduced price in-store. Second, when 3D printing is used in-store as well, in additional to the substitution effect, the firm also achieves a structural effect due to the fundamental change in the supply chain structure. Since the in-store demand is served in a build to order fashion, the firm achieves postponement benefits in inventory management. Moreover, using 3D printing in-store will require a new supplier-retailer relationship. We find that cost-sharing contracts can coordinate the supply chains where 3D printing is used in-store and the supplier controls the raw material inventory.

Key words: 3D printing; build to order; dual channels; product variety; pricing; supply chain management

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Date: Monday, November 6th, 2017

Speaker: Jussi Keppo, National University of Singapore
Topic: "How the Swine Flu Epidemic Spread: Understanding the Data with an Equilibrium Vigilance Model"
Time: 2:30PM - 3:30 PM
Place: HA 969

Abstract: Contagious diseases are passed on when contagious and susceptible individuals meet. This paper introduces and explores a new matching game, characterized by individuals meeting pairwise, possibly unwittingly passing along a disease in a contagion-like fashion. We assume that individuals can expend costly effort to avoid acquiring it. In this population game, efforts are strategic substitutes: The harder other individuals try, the more lax one can be. We solve for the unique Nash equilibrium when individuals are heterogeneous. We then estimate this structural model and show that it improves on the explanation of the data without endogenous behavior.

Date: Monday, October 16th, 2017

Speaker: John Birge, The University of Chicago, Booth School of Business
Topic: "Dynamic Learning in Strategic Pricing Games"
Time: 2:30PM - 3:30PM
Place: Henry Angus 969

Abstract: In monopoly pricing situations, firms should optimally vary prices to learn demand. The variation must be sufficiently high to ensure learning. In competitive situations, however, varying prices provides information to competitors and may reduce the value of learning. Such situations may arise in the pricing of new products such as pharmaceuticals. The talk will discuss how this effect can be strong enough to stop learning so that firms optimally reduce any variation in prices and choose not to learn demand. The result can be that the selling firms achieve a collaborative outcome instead of a competitive equilibrium. The result has implications for policies that restrict price changes or require disclosures.

Date: Monday, October 2nd, 2017

Speaker: Robert Swinney, Duke University
Topic: "Managing Social Responsibility in Multitier Supply Chains"
Time: 2:30PM - 3:30PM
Place: Henry Angus 969

Abstract: We study the management of social responsibility in a three-tier supply chain in which a Tier 2 supplier sells to a Tier 1 supplier, which in turn sells to a Tier 0 buyer. The Tier 2 supplier potentially violates social and environmental standards, resulting in harm to the Tier 0 and 1 firms. Each member of the supply chain can exert effort to improve the responsibility in Tier 2, and the efforts of Tiers 0 and 1 are substitutable with one another and complementary to the efforts of Tier 2. We show that under these conditions, the buyer's optimal strategy is one of extremes, consisting of direct control (only Tier 0 works with Tier 2), delegation (only Tier 1 works with Tier 2), or no effort (neither firm works with Tier 2). Given that delegation is a much simpler and more scalable strategy for buyers with extensive supply chains, we analyze how buyers can increase the relative attractiveness of this strategy, e.g., by carefully selecting suppliers. When control is optimal, we determine its relative value and discuss how resource-constrained buyers can prioritize the direct control of responsibility management where it has greatest value amongst Tier 2 suppliers. We also examine how pressure from external stakeholders (consumers, NGOs, and governments) influences the buyer's optimal strategy and the level of responsibility in the supply chain.

Date: Monday, September 25th, 2017

Speaker: Dale Griffin, UBC Sauder School of Business
Topic: "Bias(es) in Probabilistic Forecasting"
Time: 2:30PM - 4:00PM
Place: Henry Angus 969

Abstract: For (too) many years, I have studied biases in forecasting with the goal of reducing the vast forest of behavioural biases into a manageable few. In this rough and informal seminar, I will introduce the evidence for the existence of "one bias that rules them all". I will briefly discuss some experimental studies from my own lab, as well as a broad set of data from others' field studies of physicians and meteorologists. Finally, I will discuss new data from research on asset pricing drifts with Murray Carlson that seem to support the general bias proposal. My goal is to change the way that you think about subjective probability!

Date: Monday, September 18th, 2017

Speaker: Shmuel Oren, University of California at Berkley
Topic: "Opportunities and Challenges for Optimization in Electricity Markets"
Time: 2:30PM - 3:30PM
Place: Henry Angus 969

Abstract: Socio economic forces, technological developments and environmental considerations have led to restructuring of the electric power systems in part of the USA and in many systems worldwide, transforming them from vertically integrated regulated monopolies to competitive marked based systems. Electricity markets represent, perhaps, the most challenging supply chain since the commodity is, practically, non-storable; demand is uncertain and highly correlated with weather, all the demand must be satisfied instantaneously with a high level of reliability (one day in ten years criteria for involuntary load curtailment). In addition service is provided over a network that is prone to congestion, flows over transmission lines cannot be directly controlled as in a transportation system (flows follow Kirchoff's laws) and the market is encumbered by numerous externalities and market power. The proliferation of smart grid technologies and the transition of the electric power infrastructure toward massive integration of renewable and distributed resources that are variable and uncertain, poses new challenges in planning and operation of the grid. In particular market mechanisms and optimization tools that have been employed in addressing such task must account for uncertainty and mobilize flexibility on the demand and supply side. This talk will review the basic elements and alternative approaches adopted in restructured power systems and the important role of optimization in system and markets operations. It will also discuss new challenges and opportunities for optimization in handling uncertainty and in exploiting embedded infrastructure flexibility as recourse options in response to contingency and diverse realizations of uncertainties.

Date: Monday, September 11th, 2017

Speaker: Weihua Zhang, UBC Sauder School of Business
Topic: "Analytical Solution to a Partially Observable Machine Maintenance Problem by a Dual Method"
Time: 2:30PM - 3:30PM
Place: Henry Angus 969

Abstract: We study a classic machine maintenance problem in which the state of the machine changes according to a hidden Markov process under regular production. The state can be observed upon inspection at a higher cost and can also be reset through replacement at the highest cost. The objective is to find a production-inspection-replacement policy that minimizes the expected discounted cost over an infinite horizon. We focus on the two machine state problem, where we can use a recently established dual framework to derive an exact, analytical solution to this problem and uncover an elegant cyclic structure in the optimal solution. A widely acknowledged optimal policy, four-region policy, indicates a production-optimal region between the inspection-optimal region and the revision-optimal region for the belief vector of the machine

states. We are able to show that for two state machine state problem, this policy is only optimal when the machine state is never revealed.