PURDUE UNIVERSITY | Mitchell E. Daniels, Jr. School of Business

PURDUE OPERATIONS CONFERENCE

DANIELS SCHOOL OF BUSINESS
PURDUE UNIVERSITY
SEPTEMBER 8-10, 2023

Two major trends are observed in today's business world. One is the rapid evolution of technologies and how data plays an increasing role in daily operations among a wide and varied range of organizations. The other is the long-term impact of the pandemic in changing many business processes and practices. Both induce noteworthy change in the practice of operations management, inspiring researchers to rethink our modeling and analysis. The intent of this conference is to bring the leading and young scholars together to share their latest work, learn from one another, and generate new ideas and research. Leveraging the diverse faculty expertise in the Supply Chain & Operations Management (SC&OM) area, we hope to provide a platform to foster open discussions among faculty and Ph.D. students who would work jointly to shape the future of operations management through their impactful research. We plan to host this event annually, with 2023 being the very first one!

We are excited to have colleagues from over 30 universities joining us in the coming two-and-half days! We appreciate your participation and welcome!

Supply Chain & Operations Management Area
Daniels School of Business, Purdue University

PARTICIPATING UNIVERSITIES

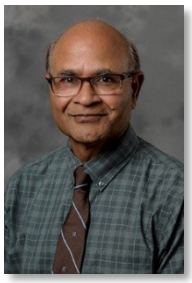
- Boston University
- Columbia University
- Duke University
- Georgia Institute of Technology
- Indiana University
- Lehigh University
- Massachusetts Institute of Technology
- McGill University
- Northern Carolina State University
- North Illinois University
- Northwestern University
- Ohio State University
- Rutgers University
- Stanford University
- Texas A&M University
- Tianjin University
- University of California, Berkeley
- University of California, Davis
- University of Chicago
- University of Illinois Urbana-Champaign
- University of Maryland
- University of Miami
- University of Michigan
- University of Minnesota Twin Cities
- University of Missouri – St. Louis
- University of Nebraska-Lincoln
- University of North Carolina at Chapel Hill
- University of Pennsylvania
- University of Rochester
- University of Science & Technology of China
- University of Texas at Dallas
- University of Wisconsin-Madison
- Washington University in St. Louis

In 2022, Purdue announced a major initiative to reimagine the School of Management into a new School of Business that will redefine the preparation of business leaders, grounded in the hallmarks of a Purdue education, including STEM disciplines and business analytics. Graduates from the School of Business will be uniquely positioned to bring discoveries to the marketplace, scale up innovations and effect societal change. On February 3, 2023, Purdue's business school was formally renamed the Mitchell E. Daniels, Jr. School of Business, honoring the 12th president of Purdue. The school will achieve excellence at scale by increasing enrollment and faculty size and housing them in a state-of-the-art facility, while integrating business with the university's world-renowned strength in STEM fields. Students will be provided with expanded transformational experiential learning opportunities as they are taught to better communicate the importance of business to effectively build bridges between technology and humanity.

The **Supply Chain & Operations Management (SC&OM) Area** has consistently retained high rankings in educational programs, and an increasingly strong reputation of faculty research among top institutes. Our educational program has a unique reputation for training students with data-driven problem-solving skills to address issues in supply chain and operations management with a significant emphasis on global contexts. In the 2023 U.S. News & World Report rankings, our undergraduate programs are listed #9 in Production/Operations Management and #12 in Supply Chain Management/Logistics, and our graduate programs are listed #3 in Production/Operations Management and #9 in Supply Chain Management/Logistics.

A diverse faculty research profile covers a wide range of application domains, including inventory planning, sourcing strategy, contract and negotiation, revenue management and dynamic pricing, logistics network design, hospital operations, manufacturing planning, reliability analysis, supply chain risk analysis, e-commerce and sharing platforms, etc. We have faculty experts mastering a variety of methodologies, including stochastic modeling, optimization, data-integrated decision modeling, game theory, statistical machine learning, econometrics analysis, etc. The SC&OM faculty has extensively collaborated with private, public, and non-profit sectors in applied research. Recent collaborators include Allegion, Applied Materials, AstraZeneca, Avis, Bell Lab, Carle Clinic, Caterpillar, Corteva, Dow, Evonik, GE Aviation, INDOT, IU Health, Jeco, Juniper, MES Inc., MSI Surfaces, OilDri, Oscar Winski, Pentland, Pepperidge Farm, P&G, PepsiCo, Ports of Indiana, Purdue University Press, TideCleaners, R.D. Gardi Medical College, Red Gold, ., Rolls Royce, Shop Direct, Southwire, St. Vincent DePaul, Standard Industrial, Tippecanoe County, UPS, US Foods, Wabash Group, Whole Earth, WFTDA, and Wyze. Our faculty serves over twenty major editorial positions (associate editors, senior editors, area editors) in the top four Operations Management journals.

SC&OM Research Faculty

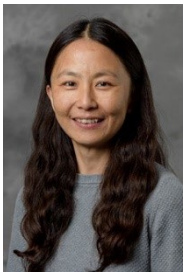


Suresh Chand
Louis A. Weil Jr. Chair of Operations Management

Professor Chand's research and teaching interests include analysis and improvement of production processes on dimensions of cost, quality, time and flexibility with applications in manufacturing and healthcare. He has published over 50 papers on topics including: Just in Time Scheduling, Effects of reducing setup times, Process Improvement–Allocating resources to process improvement vs. production, Process Flexibility, Effects of learning and forgetting in processes, Improving Patient Flows and Power Generation Management. He served as Associate Editor for *Management Science* (1986-2008), Associate Editor for *INFOR*, *Canadian Journal of Operational Research and Information Processing* (1985-99), Area Editor for *Production and Operations Management* (1992-2003), Associate Editor for *Production and Operations Management* (2009-15), and Senior Editor for *Manufacturing and Service Operations Management* (1999-2004).

Gökçe Esenduran
Associate Professor of Supply Chain & Operations Management

Professor Esenduran received her Ph.D. from Kenan-Flagler Business School, the University of North Carolina at Chapel Hill. Before joining Purdue, she was an associate professor at The Ohio State University. Gökçe's current research primarily focuses on sustainable operations. She has published in journals such as *Management Science*, *Manufacturing & Service Operations Management*, *Production and Operations Management*, *Journal of Operations Management, IISE Transactions*, and *Naval Research Logistics*. She received the Krannert Young Faculty Scholar Award in 2019. She is a senior editor for *Production and Operations Management* and associate editor for *Decision Sciences Journal*.



Qi Annabelle Feng
John and Donna Krenicki Chair in Operations Management

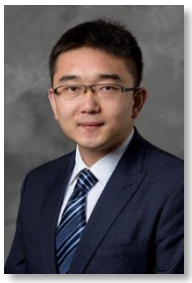
Professor Feng's current research mostly focuses on the development of stochastic functions and data-integrated decisions. A significant portion of her work analyzes firms' procurement, inventory and pricing strategies, and negotiations of sourcing contract. She also works in the areas of subsidy design, resource planning, product development and proliferation management, economic growth models, and information system management. She served as a department editor for *Production and Operations Management*, and is currently an associate editor for *Management Science*, *Operations Research*, and *Manufacturing & Service Operations Management.* She was named a POMS Fellow in 2020.

William Haskell
Assistant Professor of Supply Chain & Operations Management

Professor Haskell's research focuses on dynamic Operations Management problems, risk-aware decision-making, and optimization algorithms. In the area of dynamic OM, he has investigated data-driven dynamic programming and its statistical properties, and fairness in resource allocation. In the area of risk-aware decision-making, he has proposed several new preference robust optimization models. In the area of optimization algorithms, he has developed new methods for semi-infinite programming and for performance analysis in online optimization. He currently teaches supply chain analytics to undergraduate and MBA students in the Daniels School of Business.

Chen-An Lin
Assistant Professor of Supply Chain & Operations Management

Professor Lin's research primarily focuses on developing optimal dynamic control policies in wait-time based queueing systems, with applications to service systems and make-to-order systems. His work aims to capture complex interactions within queues and provide structural managerial insights. His research has been published in a leading journal, *Management Science*, and he has presented his findings at major conferences in the field, such as the INFORMS Annual Meeting, MSOM Conference, and POMS Annual Conference. Notably, he was honored with the Student Paper Award in 2021 from the POMS College of Sustainable Operations.



Mengshi Lu
Associate Professor of Supply Chain & Operations Management

Professor Lu's current research interests include infrastructure network design for supply chains and service systems, supply chain risk management, management of innovative operations, and project management. He applies robust optimization, stochastic optimization, and game theory to study various supply chain and service operations management problems, taking into consideration risks, ambiguity, incentives, and behavioral issues. His research has been funded by research foundations and funding agencies, including the National Science Foundation. His work has appeared in journals such as *Management Science*, *Manufacturing & Service Operations Management*, and *Production and Operations Management*.

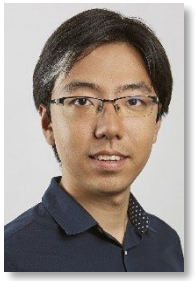
Susan Lu
Professor of Supply Chain & Operations Management

Professor Lu's research interests focus on health operations, technology and analytics. Applying both empirical and machine learning methodologies, she investigates the operational drivers of healthcare delivery performance to understand the impact of public policies and technological innovations on healthcare operations. Her paper has been published in leading economics and management journals such as *Management Science, Manufacturing & Service Operations Management, Production and Operations Management, American Economics Review, Review of Economics and Statistics,* and *Information Systems Research*. Her work gained considerable visibility in the media such as WSJ Barron's, Nature, Freakonomics and Vox. She serves as an associate editor for *Management Science*, *MSOM* and *POMS*. She offered her testimony before the United States Senate Special Committee on Aging.

Zhan Pang
Lewis B. Cullman Rising Star and Professor of Supply Chain & Operations Management

Professor Pang is a Purdue Innovation and Entrepreneurship Fellow and Experiential Education Champion. His research interests include statistical learning and decision theory, healthcare delivery systems, supply chain risk management, and pricing and revenue management. He is a senior editor for *Production and Operations Management* and a founding editor of *Journal of Blockchain Research*.

SC&OM Research Faculty

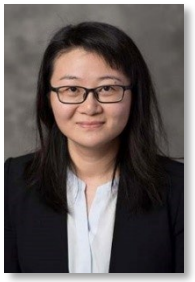


Pengyu Qian
Assistant Professor of Supply Chain & Operations Management

Professor Qian's current research focuses on networked marketplaces with an emphasis on online decision-making and market design, using tools from applied probability, modern optimization and game theory. He is interested in foundational theoretical models motivated by problems in revenue management and pricing, matching markets, platform economy, and other emerging applications. His research emphasizes algorithms and mechanisms that not only have good theoretical guarantees, but also are simple, robust, and hence practical for real-world systems.

J. George Shanthikumar
Richard E. Dauch Distinguished Chair in Manufacturing & Operations Management

Professor Shanthikumar's research interests are in integrated inter-disciplinary decision making, model uncertainty and learning, production systems modeling and analysis, queueing theory, reliability, scheduling, semiconductor yield management, simulation, stochastic processes, and sustainable supply chain management. He has written or written jointly over 300 journal articles on these topics, and is a coauthor of the book "Stochastic Models of Manufacturing Systems" and "Stochastic Orders and Their Applications". He serves the editorial board for a numerous number of academic journals, and is currently an Area Editor of *Management Science* and a Department Editor of *Production and Operations Management*. He has extensively consulted for various companies including AMD, Applied Materials, Bellcore, IBM, Fujitsu, KLA-Tencor, NTT, Intel, Intermolecular, LSI, Motorola, ReelSolar, Safeway, Southern Pacific Railways, TI, Toshiba, TSMC, UMC., Inter Molecular Inc., and Reel Solar Inc. He is a fellow of INFORMS and a fellow of POMS.



Pengyi Shi
Associate Professor of Supply Chain & Operations Management

Professor Shi received her Ph.D. degree in Industrial Engineering from Georgia Institute of Technology before joining Purdue in 2014. Her research interests include data-driven modeling and decision-making in healthcare and service operations. She has collaborated with practitioners from different healthcare organizations, including major hospitals in the US, Singapore, and China. Most recently, she is collaborating with community correctional programs to develop data-based evaluation and human-in-the-loop machine learning algorithms. Her research has won the first place of MSOM Responsible Research in OM Award in 2021, the first place of INFORMS Pierskalla Best Paper Award in 2018, and the second place of POMS CHOM Best Paper Award in 2019 and 2020.

Meet Our Postdocs & Ph.D. Students

Postdoc Fellows

Wei Liu

Ross-Lynn Postdoctoral Fellow

Yang Yang

Postdoctoral Fellow

Doctoral Students

Bingrui Bian

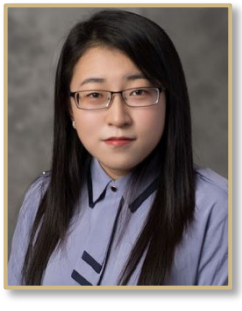
Ph.D. Student

Rajeev Karunanayake

Ph.D. Candidate

Chiran Kodippili

Visiting Ph.D. Candidate

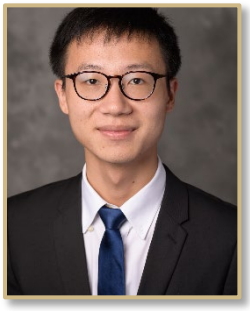


Jianing Li

Ph.D. Student

Zhengbo Liang

Ph.D. Student



Jian Wu

Ph.D. Candidate

Day	Time & Location	Event
9/7	6:00PM-8:00PM	**Welcome Reception @ Hampton Inn**
9/8	8:00AM-8:30AM	Registration & Refreshments
	8:30AM-9:00AM	Opening Remark **Dean James B. Bullard** and **Senior Associate Dean Lin Nan**
	9:00AM-10:30AM Stew 202	**Peng Sun (Duke)** *Equilibrium with Communication and Linear Programming: Applications in Collusion in Auctions and Quantity Competition* **George Shanthikumar (Purdue)** *Beyond Random Utility Models –Temporal Trees, Representation and Identification* *Session chair: Gokce Esenduran*
	10:30AM-10:45AM	**Coffee Break**
	10:45AM-12:15PM Stew 202	**Baris Ata (Chicago)** *Dynamic Scheduling of a Multiclass Queue in the Halfin-Whitt Regime: A Computational Approach for High-Dimensional Problems* **Karen Zheng (MIT)** *Incentive Design for Sustainable Practices in Smallholder Supply Chains* *Session chair: Annabelle Feng*
	12:15PM-2:00PM	**Lunch Break @** Krannert Center
	2:00PM-3:30PM KCTR 108	**Rodney Parker (IU)** *Dynamic Learning for Joint Pricing, Advertising, and Inventory Management* **Jian Yang (Rutgers)** *Road to the Best (s,S,p) Policy in Joint Inventory-Price Control Involving Demand Ambiguity* **William Haskell (Purdue)** *Error Propagation in Asymptotic Analysis of the Data-Driven (s, S)-Policy* *Session chair: William Haskell*
	2:00PM-3:30PM KCTR 114	**Hong Wan (NSCU)** *Bonferroni-Free and Indifference-Zone-Flexible Sequential Elimination Procedures for Ranking and Selection* **Cathy Xia (OSU)** *An Equilibrium Approach Toward the Optimal Fleet Management of a Last Mile Transit Service* **Kyle Harshbarger (Dow Chemical)** *Scheduling and Planning High Uncertainty Seasonal Products at Dow* *Session chair: Pengyu Qian*
	2:00PM-3:30PM KCTR 124	**Fei Gao (IU)** *Friend or Foe? How to Compete Against Unsustainable Knockoffs with Advertising and Open-Source Strategy* **Xiaoyang Long (WISC)** *Waste Not Want Not? The Environmental Implications of Quick Response and Upcycling* **Natalie Huang (UMN)** *Understanding the Impact of Ride-hailing on the Primary and Secondary Car Sales Markets: The Role of Platform Vehicle Age Limits* *Session chair: Gokce Esenduran*
	3:30PM-4:00PM	**Coffee Break**
	4:00PM-5:30PM KCTR 108 (Student Presentation)	**Shukai Li (Northwestern)** *Learning to Price under Competition for Multinomial Logit Demand* **Jingwen Tang (Michigan)** *Offline Feature-Based Pricing under Censored Demand: A Causal Inference Approach* **Feng Zhu (MIT)** *Regret Distribution in Stochastic Bandits: Optimal Interplay between Expectation and Tail Risk* *Session chair: William Haskell*
	4:00PM-5:30PM KCTR 114 (Student Presentation)	**Yongchun Li (GA Tech)** *On the Partial Convexification of the Low-Rank Constrained Optimization* **Chunlin Sun (Stanford)** *Maximum Optimality Margin: A Unified Approach for Contextual Linear Programming and Inverse Linear Programming* **Haofeng Zhang (Columbia)** *Estimate-Then-Optimize versus Integrated-Estimation-Optimization versus Sample Average Approximation: A Stochastic Dominance Perspective* *Session chair: Pengyu Qian*
	4:00PM-5:30PM KCTR 124 (Student Presentation)	**Yishen Cai (WashU)** *Startup Blitzscaling and the Venture Capital Method* **Yanting Li (Rochester)**

Day	Time & Location	Event
		On the Design of a Shared Waiting Room **Zhengbo Liang (Purdue/Tianjin)** *Subsidize Farmers or the Retailer? Government Subsidy Policy in the Agricultural Supply Chain Considering Yield Uncertainty* *Session chair: Gokce Esenduran*
	6:00PM-8:00PM	**Dinner**
9/9	8:00aA-8:30Am Rawls Hall 2nd Floor	**Refreshments**
	8:30AM-10:00AM RAWL 2058	**Qiong Wang (UIUC)** *New Policies Exploiting Randomness of Lead Times in Inventory Systems* **Linwei Xin (Chicago)** *The Informational Benefits of Delay to Online Decision-Making* **Jinglong Zhao (BU)** *Adaptive Neyman Allocation* *Session chair: Annabelle Feng*
	8:30AM-10:00AM RAWL 2070	**Shouqiang Wang (UTD)** *Information Design of a Delegated Search* **Chen-An Lin (Purdue)** *Queuing Control with Pricing and Strategic Delay* **Rachel Chen (UC Davis)** *Vertical Competition with Common Attributes* *Chair: Chen-An Lin*
	8:30AM-10:00AM RAWL 2082	**Ashish Kabra (Maryland)** *Multiplicity in Product Expiration Dates and Food Waste in Retail Stores* **Basak Kalkanci (GA Tech)** *Tip Your Farmer? Implication of Tipping in Agriculture on Sustainability and Financial Inclusion* **Telesilla Kotsi (OSU)** *Fleet Composition Management of Humanitarian Organizations in Response to Armed Conflicts* *Session chair: Gokce Esenduran*
	10:00AM-10:30AM	**Coffee Break**
	10:30AM-12:00PM RAWL 2058 (Student Presentation)	**Li Ding (GA Tech)** *Breaking the Invisible Cage: Investigating the Gender Wage Gap in Gender-Blind Online Platforms* **Lamis E. Amer (Miami)** *Future Proofing Septic Systems to Sea-Level Rise – Valuing Adaptations and Decision Modelling* **Chengcheng Zhai (IU)** *Keep Water Flowing: the Hidden Crisis of Rural Water Management* *Session chair: Annabelle Feng*
	10:30AM-12:00PM RAWL 2070 (Student Presentation)	**Shikha Safaya (GA Tech)** *Matching Volunteers with Clients in a Non-Profit Organization* **Yasaman Asayesh (UMN)** *From Policy to Productivity: Unpacking the Effects of Medicaid Expansion on Labor Productivity in the US Manufacturing Industry* **Zhen Shao (USTC)** *Help and Haggle: Boosting Social Reach Through Randomized, Adaptive, All-or-Nothing Discounts* *Session Chair: Chen-An Lin*
	10:30AM-12:00PM RAWL 2082 (Student Presentation)	**Nan Jiang (GA Tech)** *ALSO-X and ALSO-X+: Better Convex Approximations for Chance Constrained Programs* **Mo Liu (UCB)** *Active Label Acquisition with Personalized Incentives in the Assortment Optimization* **Zexing Xu (UIUC)** *Personalized Pricing with Group Fairness Constraint* *Session chair: Pengyu Qian*
	12:00PM-2:00PM	**Lunch Break** @ RAWL 2011
	2:00PM-3:30PM RAWL 2058	**Xuying Zhao (TX A&M)** *Content Length Limit: How Does it Matter for a Consumer-to-Consumer Media Platform?* **Yuqian Xu (UNC)** *Operational Risk Management: Optimal Inspection Policy* **Pengyi Shi (Purdue)** *Breaking Barriers: Deploying OR Solutions in Healthcare and Criminal Justice* *Session chair: Pengyi Shi*
	2:00PM-3:30PM	**Andre Calmon (GA Tech)** *Business Model Innovation for Ambulance Systems in Developing Economies*

Day	Time & Location	Event
	RAWL 2070	**Owen Wu (IU)** *Anti-Corruption and Humanitarian Aid Management in Ukraine* **Can Zhang (Duke)** *Farm Equipment Sharing in Emerging Economies* *Session chair: Gokce Esenduran*
	2:00PM-3:30PM RAWL 2082	**Sanjith Gopalakrishnan (McGill)** *A Model of International Transfers of Carbon Mitigation Outcomes: Analyzing the Impact of Article 6 of the Paris Agreement* **Nur Sunar (UNC)** *Design of Power Purchase Agreements with Renewable Energy Generators* **Christian Blanco (OSU)** *Pooling Carbon Targets* *Session chair: Suresh Chand*
	3:30PM-4:00PM	**Coffee Break**
	4:00PM-5:30PM RAWL 2058 (Student Presentation)	**Xingyu Bai (UIUC)** *Asymptotic Optimality of Open-Loop Policies in Lost-Sales Inventory Models with Stochastic Lead Times* **Buyun Li (IU)** *Dynamic Scheduling with Bayesian Updating of Customer Characteristics* **Xiaoquan Gao (Purdue)** *Stopping the Revolving Door: MDP-Based Decision Support for Community Corrections Placement* **Wei Liu (Purdue)** *Data-driven Aircraft Assignment To Minimize Delay Propagation* *Session chair: Pengyi Shi*
	4:00PM-5:30PM RAWL 2070 (Student Presentation)	**Jiannan Xu (Maryland)** *Assortment Personalization in a Clothing Rental Subscription Model* **Austin Iglesias Saragih (MIT)** *Pivotal Uncertainties to Resolve: Optimal Information Gathering for Supply Chain Design* **Ye Liu (WUSTL)** *Optimal Hog Farm Finishing Stage Management via Deep Reinforcement Learning* **Jianing Li (Purdue)** *Effects of Ride-Hailing Platforms on Dual-Distribution Channels* *Session chair: Suresh Chand*
	4:00PM-5:30PM RAWL 2082 (Student Presentation)	**Vishrut Rana (Wharton)** *Data-driven Metrics for Optimal Spatial Allocation of Renewable Energy Generation* **Zhuoli Yin (Purdue)** *DeepBike: A Deep Reinforcement Learning Based Model for Large-scale Online Bike Share Rebalancing* **Byeongmok Kim (Purdue)** *A Multi-Agent Reinforcement Learning Model for Inventory Transshipments under Supply Chain Disruption* **Jian Wu (Purdue)** *Contextual Data-Integrated Newsvendor Solution with Operational Data Analytics (ODA)* *Session chair: Chen-An Lin*
	6:00PM-8:00PM	**Dinner**
9/10	8:00AM-8:30AM	**Refreshments**
	8:30AM-10:45AM RAWL 1086	**Sridhar Seshadri (UIUC)** *Dual Sourcing Systems: Introduction, Developments and Questions* **Xin Chen (GA Tech)** *Efficient Algorithms for Minimizing Compositions of Convex Functions and Random Functions and Its Applications in Network Revenue Management* **Annabelle Feng (Purdue)** *The Operational Data Analytics (ODA) Framework* Session chair: William Haskell
	10:45AM-11:15AM	**Coffee Break**
	11:15AM-12:00PM RAWL 1086	Panel Discussion: Xin Chen, Annabelle Feng, Sridhar Seshadri, and George Shanthikumar Closing Remark: Annabelle Feng and Zhan Pang
	12:00PM-2:00PM	**Lunch @** RAWL 2011

***Baris Ata**, University of Chicago,* baris.ata@chicagobooth.edu

Session: 10:45AM-12:15PM, 09/08/2023 @ STEW 202

Title: **Dynamic Scheduling of a Multiclass Queue in the Halfin-Whitt Regime: A Computational Approach for High-Dimensional Problems**

We consider dynamic control a finite-horizon Markovian queueing model of a telephone call center, where multiclass calls are served by a single pool of agents. Calls can terminate either through service completion or abandonment. Each call class is characterized by its unique arrival rate process, service rate, abandonment rate, and abandonment penalty. We focus on solving this MDP with high-dimensional state vectors, which poses challenges for conventional dynamic programming methods. To address this, we adopt the Halfin-Whitt heavy traffic regime and describe an approximating diffusion control problem. The resulting HJB equation from the limiting diffusion control problem characterizes the optimal policy. Building upon earlier work by Han et al. (Proceedings of the National Academy of Sciences, 2018, 8505-8510), we develop a simulation-based computational method using deep neural networks to solve the associated HJB equation and approximate the optimal policies. We test the performance of our method using test problems based on call center data that is publicly available. For the test problems studied so far, our method does as well as or better than the best benchmark we could find and is computationally feasible at least up to dimensions K = 100.

Bio: *Ata takes a problem-driven approach to bridge the theory and the practice of operations management, and has used stochastic models to study stochastic networks, manufacturing and service operations, revenue management, delivery of health care services and operational innovation in the social sector. His research focuses on dynamic decision making in complex settings under uncertainty. On the theory side, Ata's current research interests include solving high-dimensional stochastic control and learning problems. On the application side, Ata currently works on identifying the right candidates for xenotransplantation, operational improvements in the criminal justice system and alleviating the logistical challenges in the last-mile delivery problems in Africa. Ata's research has been recognized by the Best Paper in Service Science Award, INFORMS (2009), William Pierskalla Best Paper Award, INFORMS (2015) and Wickham Skinner Best Paper Award, POMS (2019). He is also a recipient of the Manufacturing and Service Operations Management Young Scholar Prize, INFORMS (2015) and Emory Williams MBA Teaching Award at Chicago Booth (2021). Ata serves as the editor for the Stochastic Models and Simulation Department of Management Science and the deputy editor for Stochastic Systems. He has also served as an associate editor for Mathematics of Operations Research, Operations Research, Management Science, Manufacturing & Service Operations Management, and Stochastic Systems.*

***Xin Chen**, Georgia Institute of Technology,* xin.chen@isye.gatech.edu

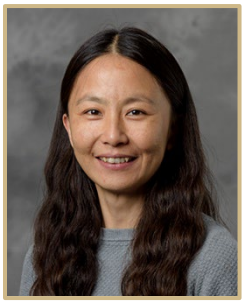
Session: 8:30AM-10:45AM, 09/10/2023 @ RAWL 1086

Title: **Efficient Algorithms for Minimizing Compositions of Convex Functions and Random Functions and Its Applications in Network Revenue Management**

Abstract Motivated by network revenue management problems using booking limit control and inventory models with random capacities, we study a class of nonconvex stochastic optimization in which the objective function is a composition of a convex function and a random function. Leveraging a convex reformulation via a variable transformation, we develop stochastic gradient-based algorithms and establish their sample and gradient complexities for achieving an epsilon-global optimal solution. Interestingly, our proposed Mirror Stochastic Gradient (MSG) method operating in the original variables achieves complexities that match the lower bound for solving stochastic convex optimization problems. Extensive numerical experiments on air-cargo network revenue management problems with random two-dimensional capacity, random consumption, and routing flexibility demonstrate the superior performance of our proposed MSG algorithm and booking limit control policies vs. state-of-the-art bid-price-based control policies.

Bio: *Xin Chen is the James C. Edenfield Chair and Professor in ISyE. He obtained his PhD in Operations Research from MIT (2003), MS in Computational Mathematics from Chinese Academy of Sciences (1998) and BS in Computational Mathematics*

from Xiangtan University (1995). His research interest lies in optimization, revenue management and supply chain management. He received the Informs revenue management and pricing section prize in 2009. He is the coauthor of the book "The Logic of Logistics: Theory, Algorithms, and Applications for Logistics and Supply Chain Management (Second Edition 2005 & Third Edition 2014)". His research interests are in data analytics; revenue management and dynamic pricing; operations research; operations management; optimization; optimal stochastic control; computational mathematics; and production, inventory and supply chain management.



***Annabelle Feng**, Purdue University,* annabellefeng@purdue.edu

Session: 8:30AM-10:45AM, 09/10/2023 @ RAWL 1086

Title: **The Operational Data Analytics (ODA) Framework**

Abstract: Decision making with limited data is challenging. In this talk, we introduce the framework of Operational Data Analytics (ODA) that integrates data to predictive or prescriptive solutions. This framework strikes a delicate balance between the (likely imprecise) structural knowledge and the data. The two pillars of the ODA framework are (i) a data-integration model that identifies the class of operational statistics based on the desired structural properties of the models within the domain of validation, and (ii) a validating model that appropriately utilizes the data to evaluate the choice of the operational statistics. We show that the ODA framework generalizes the existing approaches including (smart) predict-then-optimize approach, regularized empirical optimization, robust optimization, robust satisficing and order statistics. We further demonstrate that the data-integration model and the validating model in the ODA framework must be formulated in a coordinated way based on the preciseness of the knowledge and the availability of the data. We present several specific applications of the ODA framework.

Bio: *Qi Annabelle Feng is the John and Donna Krenicki Chair in Operations Management at Daniels School of Business, Purdue University since 2014. She joined Purdue in 2012 and was a faculty member at McCombs School of Business, The University of Texas at Austin during 2006-2012. She received her Ph.D. in Operations Management from UT Dallas in 2006. Her current research interests lie in developing notions of stochastic functions and approaches for data-integrated decision making with the applications to supply chain management, service design, resource planning, and policy making. She was a Department Editor of Data Science, Stochastics and Optimization for Production and Operations Management, and a Department Editor of Supply Chain Management for Flexible Manufacturing and Service Journal. She currently serves as an Associate Editor for Operations Research, an Associate Editor for Management Science, and an Associate Editor for Manufacturing & Service Operations Management. She received the first prize in the INFORMS Junior Faculty Paper Competition in 2009, the Franz Edelman Award in 2009, the Wickham Skinner Early-Career Research Accomplishment Award in 2012, and the Wickham Skinner Best Paper Award in 2018. She is a fellow of Production and Operations Management Society since 2020.*

***Sridhar Seshadri**, University of Illinois Urbana-Champaign,* sridhar@illinois.edu

Session: 8:30AM-10:45AM, 09/10/2023 @ RAWL 1086

Title: **Dual Sourcing Systems: Introduction, Developments and Questions**

In this talk I will describe dual sourcing systems and their growing importance in supply chain management. I will survey several results including proposed heuristics, with emphasis on Tailored Base Surge (TBS) policies. I will describe asymptotic results, including recent exact characterization of TBS cost in a specific operational regime. I will conclude the talk with open questions. This talk draws upon the work with Ganesh Janakiraman, Sripad Devalkar and Anshul Sheopuri.

Bio: *Sridhar Seshadri is Alan J. and Joyce D. Baltz Endowed Professor and teaches business administration. He joined Illinois in 2018, and spends his research energies on stochastic modeling and applications in manufacturing, supply chain management, and revenue management. He was named a James F. Towey Faculty Fellow in 2018. Seshadri earned his Bachelor of Technology in mechanical engineering, with distinction, at the Indian Institute of Technology at Madras in 1978. From the*

Indian Institute of Management at Ahmedabad, he received a postgraduate diploma in management in 1980. He earned his PhD in management science in 1993 from the University of California at Berkeley.

***J. George Shanthikumar**, Purdue University,* shanthikumar@purdue.edu

Session: 9:00AM-10:30AM, 09/08/2023 @ STEW 202

Title **Beyond Random Utility Models – Temporal Trees, Representation and Identification**

Abstract A consumer choice probability model (CCPM) characterizes the consumer choice probabilities (CCPs) through a set of equality and inequality constraints. We develop a temporal tree consumer choice probability model where it is fully characterized by their branching probabilities and terminal Decisions. We will show that such trees fully characterize the consumer choice probabilities of all rational and irrational consumer choice models (CCMs).

We will outline the Temporal Tree Representation of standard CCMs such as Multinomial Logit Model and its variants, Exponomial Model, Markov Chain Model etc. We will show that a suitably defined subclass of Temporal Trees can be uniquely identified for any given rational consumer choice probabilities. This makes the Temporal Tree amenable for Identification using machine learning algorithms with extension to consumer choice models that are built on consumer and/or product attributes. Further we will discuss structured Temporal Trees that go beyond the classical random utility models (RUMs) representing irrational CCPs.

Bio: *J. George Shanthikumar is Richard E. Dauch Chair Professor of Operations Management and a University Distinguished Professor of Management at, Purdue University, West Lafayette, IN. He is Professor Emeritus of Industrial Engineering and Operations Research at the University of California, Berkeley, CA. Before joining Purdue, he was a Chancellor's Professor of Industrial Engineering and Operations Research at the University of California, Berkeley, CA. He received the B. Sc. degree in Mechanical Engineering from the University of Sri Lanka, Peradeniya, and the M. A. Sc. and Ph. D. degrees in Industrial Engineering from the University of Toronto, Toronto, Canada.*

His research interests are in integrated inter-disciplinary decision making, model uncertainty & learning, risk analytics, production systems modeling and analysis, queueing theory, reliability, scheduling, semiconductor yield management, simulation, stochastic processes, and sustainable supply chain management. He has written or written jointly over 300 papers on these topics. He is a coauthor (with John A. Buzacott) of the book Stochastic Models of Manufacturing Systems and a coauthor (with Moshe Shaked) of the book Stochastic Orders and Their Applications and the book Stochastic Orders. He has served numerous roles in editorial board for major journals, and is currently an area Editor for Management Science and a Department Editor for Production and Operations Management. He is a fellow of INFORMS and POMS.

Dr. Shanthikumar has extensively consulted for various companies like Applied Materials (AMAT), Bellcore, IBM, KLA-Tencor, NTT (Japan), Intel, Intermolecular, Reel Solar, Safeway, and Southern Pacific Railways and through KLA-Tencor worked on Joint Development Projects for AMD, IBM, Intel, LSI, Motorola, TI, Toshiba, Fujitsu, TSMC and UMC. He was an advisory consultant for Sensor Analytics and was a member of the technical advisory board of Inter Molecular Inc. and Reel Solar, Inc. He is currently working with AMAT, Nuevozen Corp., and others in developing co-learning and transfer-learning algorithms for process monitoring, control, maintenance and other applications.

***Peng Sun**, Duke University,* peng.sun@duke.edu

Session: 9:00AM-10:30AM, 09/08/2023 @ STEW 202

Title: **Equilibrium with Communication and Linear Programming: Applications in Collusion in Auctions and Quantity Competition**

Abstract: Linear programming and its duality theory provide analytical tools to study games with communication. After reviewing the basic concepts of equilibrium with communication, we study two applications. In the first application, we show that in simple environments, a bidding ring operating at a first price sealed-bid auction cannot achieve any gains relative to non-cooperative bidding if the ring is unable to control the bids that its members submit at the auction. In the second application, we study a

Cournot competition model in which the players are able to share information about the uncertain market potential. We show that there is no incentive for the players to fully share their information. The comparison between the non-cooperative equilibrium and an upper bound indicates conditions under which players may share partial information and coordinate to increase collective gain.

Bio: *Peng Sun is a JB Fuqua Professor in the Decision Sciences area at the Fuqua School of Business, Duke University. He researches mathematical theories and models for resource allocation decisions under uncertainty, and incentive issues in dynamic environments. His work spans a range of applications areas, from operations management, economics, finance, marketing, to health care and sustainability. He serves as a Department Editor at Management Science, and an Associate Editor at Operations Research, two leading academic journals of the profession of Operations Research and Management Science. At the Fuqua School, Professor Sun has taught MBA core course Decision Models and elective course Strategic Modeling and Business Dynamics, and PhD course Dynamic Programming and Optimal Control.*

Karen Zheng, *Massachusetts Institute of Technology*, yanchong@mit.edu

Session: 10:45AM-12:15AM, 09/08/2023 @ STEW 202

Title: **Incentive Design for Sustainable Practices in Smallholder Supply Chains**

Abstract: Nearly 20% of humanity's yearly carbon footprint can be sequestered by farmers and ranchers worldwide through sustainable practices. However, this potential is largely unrealized due to a lack of wide-spread adoption of these practices. This is especially true for smallholder farmers in developing countries as adopting sustainable practices often comes at a forbidding cost to smallholder farmers facing considerable uncertainties and resource constraints. In practice, incentives for adoption are provided via two main channels: (i) carbon "offsetting" projects in which third-party intermediaries provide financial rewards for adoption; (ii) carbon "insetting" projects in which downstream buyers directly incentivize farmers within their value chain. It is an open debate as to when either approach may be more effective and economical than the other—a critical question faced by many organizations as they develop their investment strategies to meet carbon goals. In this paper, we examine optimal incentive design and economic viability for these two approaches in the context of uncertain agricultural prices and limited resources. We develop a novel principal-agent model where the principal aims to ensure continued compliance with sustainable practices at minimal cost, while farmers allocate limited resources between two competing efforts: sustainable practices and agricultural production. Our analysis suggests that insetting contracts with direct value-chain interventions (e.g., purchasing sustainable products at a premium) can significantly outperform offsetting contracts that focus exclusively on sustainability payments. This is because insetting contracts help to prevent farmers from engaging in undesirable trade-offs between agricultural production and sustainability actions. We also explore the adverse impact of side-selling on insetting contracts. Our findings underscore the need for integrating sustainability investment with agricultural sourcing, rather than implementing them separately. They also stress the role of traceability and vertical supply chain integration in promoting sustainable practices among smallholder farmers.

Bio: *Y. Karen Zheng is the George M. Bunker Professor and an Associate Professor of Operations Management at the MIT Sloan School of Management. Karen's research studies operations and supply chain management problems with a behavior-centric, data-driven, field-based approach. Her recent research examines the design and impact of digital platforms to enable efficient physical supply chains in resource constrained environments. Karen collaborates with both public and private partners on the ground to ensure that her research leads to positive impacts in practice. Karen's research is recognized by various awards, including the NSF CAREER Award, the Management Science Best Paper Award in Operations Management, the MSOM Responsible Research Award, and the INFORMS Doing Good with Good OR Award. Karen received her bachelor's and master's degrees from Tsinghua University, and her PhD from Stanford University.*

Christian Blanco, *Ohio State University,* blanco.58@osu.edu
Session: 2:00PM-3:30PM, 09/09/2023 @ RAWL2082
Title: **Pooling Carbon Targets**
Abstract: Many corporations now set voluntary direct (Scope 1) and indirect (Scope 2) carbon emissions reduction targets, but low success rates reflect that firms are not experienced in designing these targets. Moreover, the link between carbon targets and costs remains under-explored. How should firms design their carbon targets to increase their likelihood of success? Do voluntary carbon targets increase costs for the company? We use ten years of data collected by the CDP (formerly the Carbon Disclosure Project) to explore our research questions.
Bio: *Christian Blanco is an assistant professor of operations management at the Fisher College of Business. He joined the Operations and Business Analytics department (formerly Management Sciences) after receiving his Ph.D. from the UCLA Anderson School of Management in 2017. His research domain is sustainable operations management. His research has been published in Manufacturing and Service Operations Management, Production and Operations Management, Risk Analysis, Energy Policy, Journal of the Association for Consumer Research, and Business Horizons. Blanco uses data and text analytics to examine business and environmental problems. He is among the first scholars in his field to apply text analytics in sustainable OM. He has also implemented text analysis in other domains of OM, such as pharmaceutical manufacturing. Prior to pursuing his Ph.D. at UCLA, Blanco was part of the Renewable and Appropriate Energy Lab at UC Berkeley. He collaborated with a team of scientists in developing a model called "SWITCH" that identifies the least-cost combination of energy technologies that will provide low-carbon electricity in 11 western states."*

Andre Calmon, *Georgia Institute of Technology,* andre.calmon@gatech.edu
Session: 2:00PM-3:30PM, 09/09/2023 @ RAWL2070
Title: **Business Model Innovation for Ambulance Systems in Developing Economies**
Abstract: Several low- and middle-income countries' (LMICs) emergency transportation systems (ETSs) do not have a centralized emergency number. Instead, they have many independent ambulance providers, each with a small number of ambulances. As a result, ETSs in these contexts lack coordination and ambulances. To address these issues, several startups with innovative platform-based business models have emerged. In this talk, we present results from a research project with two such startups: India-based StanPlus and Kenya-based Flare. This project aimed to investigate strategic operational challenges in LMICs and create analytical tools for these platform-based business models. We also discuss how our results can help entrepreneurs and policymakers in LMICs navigate various tradeoffs in improving their countries' ETS.
Bio: *Andre's research involves using data, analytics, and mathematical modeling to address sustainability and efficiency issues in innovative business models. He also studies operations management challenges faced by companies in emerging markets. More generally, Andre's research investigates how organizations can innovate to generate positive social and environmental impact while increasing profits.*

Rachel Chen, *University of California, Davis*, rachen@ucdavis.edu
Session: 8:30AM-10:00AM, 09/09/2023 @ RAWL2070
Title: **Vertical Competition with Common Attributes**
Abstract: Vertically differentiated products in a competitive market often share common attributes (e.g., location value, infrastructure, or technologies) provided by third-parties. In this study, we characterize how common attributes affect high- and low-quality firms in their offerings of individual attributes and pricing, and consequently affect market competition and social welfare. First, we disentangle three distinctive effects of common attributes on vertical competition, and identify a "bottom-up" influence through which common attributes affect the low-quality firm greater than the high-quality firm. Second, we show that more desirable common attributes have different implications for vertical competition in different product markets. For information goods, the high-quality firm improves individual attributes in response to more desirable common attributes, but the low-quality firm reduces individual attributes. For industrial goods, both firms mostly reduce individual attributes. In equilibrium, more desirable common attributes weaken the dominance of the high-quality firm for information goods, whereas the weakening effect is negligible for industrial goods. For both product types, a major portion of the benefit from desirable common attributes is passed through to end consumers. Finally, we examine a retail platform's commission policy when its infrastructure constitutes common attributes for vertically differentiated vendors, and identify a ``top-down'' influence through which the commission policy

affects the high-quality firm greater than the low-quality firm in moderating the impact of common attributes. We show that more advanced infrastructure motivates the platform to implement a higher commission, which leads both firms to offer inferior individual attributes.

Bio: *Professor Rachel Chen is an expert in operations research and supply chain management. Her work has been published in leading journals, including IIE Transactions, Management Science, Marketing Science, Manufacturing & Service Operations Management, Operations Research Letters and Production and Operations Management.Chen has presented her research widely in the U.S. and internationally, including the International Annual Overseas Chinese Scholars Association in Management Science and Engineering (OCSAMSE) Conference (Tianjin, China), Shanghai University of Finance and Economics; Shanghai JiaoTong University, the Production and Operations Management Society (POMS) Conference, Cornell University's Johnson Graduate School of Management, the Manufacturing and Service Operations Management Society (MSOM) Conference (Haifa, Israel), the Institute for Operations Research and Management Science (INFORMS) Conference, the Michael H. Rothkopf Memorial Conference, Penn State University's Smeal College of Business, and many more. She is an associate editor of Decision Science Journal and IIE Transactions and a senior editor of Production and Operations Management Journal.*

Fei Gao*, Indiana University,* fg1@iu.edu

Session: 2:00PM-3:30PM, 09/08/2023 @ KCR124

Title: **Friend or Foe? How to Compete Against Unsustainable Knockoffs with Advertising and Open-Source Strategy**

Abstract: We build a game theoretical model to study the competition between a sustainable firm with proprietary technology and a knockoff competitor. In particular, we study two strategies that have been used by sustainable firms to cope with unsustainable knockoffs: (i) releasing the green technology as open source and (ii) launching an advertising campaign either to promote the awareness of the product's environmental quality (i.e., self-promotion advertising) or reduce consumers' social reward from buying the knockoffs (i.e., anti-knockoff advertising).

Bio: *Fei Gao is an associate professor in the department of operations & decision technologies at Kelley School of Business in Indiana University. He receives his Ph.D. from University of Pennsylvania in 2027. His research focuses on Omnichannel operations management, marketing-operations Interface, and socially responsible operations management.*

Sanjith Gopalakrishnan, *McGill University,* sanjith.gopalakrishnan@mcgill.ca

Session: 2:00PM-3:30PM, 09/09/2023 @ RAWL2082

Title: **A Model of International Transfers of Carbon Mitigation Outcomes: Analyzing the Impact of Article 6 of the Paris Agreement**

Abstract: Under the Paris Agreement, countries independently determine their contributions to help achieve the goals of the treaty. These "nationally determined contributions" (NDCs) establish targets for greenhouse gas (GHG) emissions reductions. However, Article 6 (of the Paris Agreement) recognizes that it may sometimes be beneficial for countries to collaborate in reducing their joint emissions and proposes a mechanism called Internationally Transferred Mitigation Outcomes (ITMOs). ITMOs allow countries to transfer "mitigation outcomes", i.e. a reduction of emissions in one country can be credited to another. In this paper, we present a theoretical and stylized model for the implementation of ITMOs between two countries, one producing a low carbon fuel and the other reliant on a high carbon fuel. We show that, under certain restrictions, low carbon fuel trade can benefit consumers and firms in both countries. Furthermore, if a transfer of ITMOs is allowed, a higher amount of trade can be sustained to the benefit of all parties. Essentially, we argue that with trade and ITMOs, countries can reduce global GHG emissions. We also outline the impacts of ITMOs on domestic energy prices and the energy consumption mix in the two countries and discuss implications of our results for operationalizing ITMOs.

Bio: *He is an Assistant Professor of Operations Management at the Desautels Faculty of Management, McGill University, since 2020. He obtained my PhD in Operations Management from the Sauder School of Business, University of British Columbia. Previously, he completed my B.S. and M.S. in Physics from the Indian Institute of Technology, Madras. His main research interests are in environmental and socially sustainable operations management. He is also interested in the interplay of information, incentives, and fairness in multi-agent environments and networks. He has handled data projects for several Canadian organizations such as Best Buy Canada, Lululemon, Procurify, and Lighthouse Labs. In other engagements, his interests in sustainable urban transport planning have led him to serve on the Transportation Advisory Committee to the City of Vancouver.*

***Kyle Harshbarger**, Dow Chemical,* kharshbarger@dow.com

Session: 2:00PM-3:30PM, 09/08/2023 @ KCR114

Title: **Scheduling and Planning High Uncertainty Seasonal Products at Dow**

Abstract: Dow manufactures and sells products with a joint problem of high seasonality and high uncertainty. Proper framing and modeling of the problem allows scheduling and planning processes to be brought under control. Planning for the whole season requires changing buffers with backwards scheduling. Scheduling requires balancing immediate high service level needs to avoid stockouts and rest-of-season analysis to minimize excess inventory. Model fitting of sales history identified a Gamma distribution as best fit to predict future demand in future periods. Monte Carlo approaches are used to accumulate periodic demand for operational requirements.

Bio: *Harshbarger is a Senior Innovation Manager, Technical Fellow Track, on the Supply Chain Innovation team at Dow. He drives the Supply Chain Digital Vision and manages the research agenda to develop and implement competitively advantaged technology. Prior to this role, he was a Senior Supply Chain Improvement Manager for Industrial Intermediates & Infrastructure, responsible for strategic inventory management and development of supply chain optimization technology. He has experience in identifying, developing, and deploying technical supply chain solutions at multiple Fortune 100 companies. His technical domain includes inventory management, supply chain strategy, management science, simulation, mathematical modeling. He holds a BS in Mechanical Engineering from Purdue University; an MBA from University of Illinois in Urbana-Champaign; and a Master of Global Supply Chain Management from Purdue University. He also holds an Adjunct Faculty position in Quantitative Studies and Operations Management at Southern New Hampshire University.*

***William Haskell**, Purdue University*, whaskell@purdue.edu

Session: 2:00PM-3:30PM, 09/08/2023 @ KCR108

Title: **Error propagation in asymptotic analysis of the data-driven (s, S)-policy**

Abstract: We study periodic review stochastic inventory control in the data-driven setting where the retailer makes ordering decisions based only on historical demand observations without any knowledge of the probability distribution of the demand. Since an (s, S)-policy is optimal when the demand distribution is known, we investigate the statistical properties of the data-driven (s, S)-policy obtained by recursively computing the empirical cost-to-go functions. This policy is inherently challenging to analyze because the recursion induces propagation of the estimation error backwards in time. In this work, we establish the asymptotic property of this data-driven policy by fully accounting for the error propagation. In this setting, the empirical cost-to-go functions for the estimated parameters are not i.i.d. sums due to the error propagation. Our main methodological innovation comes from an asymptotic representation for multi-sample U-processes in terms of i.i.d. sums. This representation enables us to apply empirical process theory to derive the influence functions of the estimated parameters and to establish joint asymptotic normality. We demonstrate some useful applications of our asymptotic results, including sample size determination and interval estimation.

Bio: *William B. Haskell received his B.S. Mathematics and M.S. Econometrics degrees from the University of Massachusetts Amherst. He then obtained his M.S. Operations Research, M.A. Mathematics, and Ph.D. Operations Research degrees from the University of California Berkeley in 2007, 2010, and 2011, respectively.He is currently an Assistant Professor in the Supply Chain & Operations Management Area in the Daniels School of Business at Purdue University. His research focuses on algorithms for convex optimization and dynamic programming, with an emphasis on risk-aware decision-making.*

***Natalie Huang**, University of Minnesota*, huangx@umn.edu

Session: 2:00PM-3:30PM, 09/08/2023 @ KCR124

Title: **Understanding the Impact of Ride-Hailing on the Primary & Secondary Car Sales Markets: The Role of Platform Vehicle Age Limits**

Abstract: We study an important decision for ride-hailing platforms, namely, imposing a vehicle age limit. The limit influences not only the price and service quality of ride-hailing, but also its competition with the primary and secondary car sales markets. We explore both the economic and environmental implications of this decision.

Bio: *Ximin Natalie Huang is an Assistant Professor of Supply Chain and Operations at the Carlson School of Management at the University of Minnesota. She received a Ph.D. in Operations Management from Georgia Institute of Technology, and an MPhil and a BSc in Applied Mathematics from the University of Hong Kong. Her research focuses on supply chain management and sustainable operations. Her current projects focus on impacts of environmental legislation on firms' sustainability strategies. For example, how the take-back legislation based on Extended Producer Responsibility incentivizes firms to involve in end-of-life product collection and recycling, as well as*

designing environmentally-sound products, or how the carbon emission legislation influences the firms' production technology choices. She is also interested in exploring how sustainable operational strategies help enhance firms' profitability.

Ashish Kabra, *University of Maryland,* akabra@umd.edu
Session: 8:30PM-10:00AM, 09/09/2023 @ RAWL2082
Title: **Multiplicity in Product Expiration Dates and Food Waste in Retail Stores**
Abstract: Perishable products with multiple expiration dates contribute to expiration waste (EW) in food retailers. Consumers tend to choose units with later expiration dates, resulting in waste of units with sooner expiration dates. Retailers use strategies like price markdowns and inventory rotation to reduce this waste, but lack awareness of its extent. This study presents the first large-scale evidence of the contribution of multiple-dates-led expiration waste (MDEW) to overall waste. The study introduces a novel methodology that calculates its lower and upper bounds. For a large dataset from a European retailer, the study finds that MDEW contributes 21-52% of the EW. This research provides a basis for academic investigation and offers a practical method for measuring MDEW in store operations.
Bio: *Ashish Kabra conducts empirical and theoretical research using causal inference, structural estimation, game theory, and optimization methods. His research focuses on studying the interplay between platform operations, consumer behavior, and sustainability in the domains such as e-commerce, online B2B platforms, retail stores, and urban transportation. His research work has been published in top journals and has won several prestigious best paper awards. His teaching has been recognized with the prestigious Allen J. Krowe teaching award at the Smith School. Prior to joining Maryland, he completed his graduate studies in Operations Management at INSEAD, France and undergraduate studies in Computer Science from BITS-Pilani, India.*

Basak Kalkanci, *Georgia Institute of Technology*, basak.kalkanci@scheller.gatech.edu
Session: 8:30AM-10:00AM, 09/09/2023 @ RAWL2082
Title: **Tip Your Farmer? Implication of Tipping in Agriculture on Sustainability and Financial Inclusion**
Abstract: An emerging financial innovation enabled by technological advancements in agricultural supply chains is the capability to "tip the farmers." This innovation empowers socially-conscious customers to identify the individual farmers of their sustainably-sourced products and reward these farmers by sending them direct payments, or tips, through mobile apps. To shed light on the implications of a tipping mechanism on different market participants, we construct a model that captures the interactions between a mass of infinitesimal farmers, a population of socially-conscious customers, and an agricultural firm who plays the intermediary role between farmers and customers. We characterize the equilibrium of the game with and without tipping and identify the conditions under which each group of stakeholders (farmers, customers, and the firm) may be better off or worse off with tipping. In particular, we show that if tipping is implemented under the right conditions (e.g., when farmers' outside option is moderate and customers are relatively socially conscious about farmers' earnings), it can create a triple win for all supply chain members including every individual farmer. When these conditions do not hold, in contrast, farmers and/or consumers could be worse off in the presence of tipping. Further, even in situations where farmers benefit from tipping in expectation, this financial innovation can entail disparity and exacerbate inequity in the farmer population, which is undesirable from a social responsibility standpoint. Thus, firms must exercise caution in implementing the tipping capability as it may lead to reduction in farmers' expected and actual income and consumer welfare.
Bio: *Basak Kalkanci is an Associate Professor of Operations Management at the Georgia Institute of Technology Scheller College of Business. Her current research focuses on socially and environmentally responsible supply chain management, behavioral operations management, supply risk management, contracting and information sharing in supply chains. She worked as a postdoctoral associate at MIT before joining Georgia Tech.*

Telesilla Kotsi, Ohio State University, kotsi.1@osu.edu
Session: 8:30AM-10:00AM, 09/09/2023 @ RAWL2082
Title: **Fleet Composition Management of Humanitarian Organizations in Response to Armed Conflicts**
Abstract: With my co-authors, Professors Alfonso Pedraza-Martinez and Maria Besiou, we investigate transportation expenses of a humanitarian organization (HO) that operates in armed conflict settings. We combine a multi-year proprietary data set to study fleet decisions of vehicle rentals and subcontracting. Rentals are relatively expensive but do not permit security breaches because nonprofit authorized staff members drive the rented vehicles. Subcontracting is relatively cheap but permits security breaches because subcontracted drivers outside the nonprofit drive the cars. We use

econometric models to find that in areas of armed conflict the HO prefers vehicle rentals to subcontracting to ease security concerns and maintain better control of their operations.

Bio: *Telesilla Kotsi is an assistant professor of operations management at the Fisher College of Business. She joined the Management Sciences department after receiving her PhD from the Kelley School of Business at Indiana University. Telesilla combines field research with rigorous analytical methods to study challenges that nonprofit organizations face. For example, in her current work, she uses game theory, dynamic programming, and econometrics. Nonprofit operations management is an important area of research, given the nonprofits' contribution to the US economy is larger than the individual contributions in all but three states. "Nonprofits must provide good and services to their beneficiaries in a timely, equitable, and efficient manner, while ensuring they do "no harm" to other stakeholders, and responding to their donors' pressures for accountability and transparency," Telesilla says. Therefore, her primary research interest centres on how allocation of resources (cash, assets, personnel, etc.) affect a nonprofit's own performance and services provided to its beneficiaries. Prior coming to the US for pursuing her doctoral studies, Telesilla worked at INSEAD Humanitarian Research Group as a Research Assistant and received a MSc in Operations Research with Computational Optimization from the University of Edinburgh in the UK. Her BSC Degree is on Mechanical Engineering from the Aristotle University of Thessaloniki in Greece.*

Chen-An Lin*, Purdue University,* lin1800@purdue.edu

Session: 8:30AM-10:00AM, 09/09/2023 @ RAWL2070

Title: **Queuing Control with Pricing and Strategic Delay**

Abstract: This paper studies using pricing and release-time to control a single-server, First-Come-First Serve (FCFS), make-to-order system with heterogeneous customer requests. Impatient (resp. patient) requests are more (resp. less) sensitive to waiting and value the service higher (resp. lower). Each request's type is the customer's private information. The time to complete each request is deterministic and identical for all requests. The firm's objective is to maximize the long-run average revenue. In addition to pricing, the firm may choose to delay the release time after finishing the service on a request. We show that it is indeed optimal for the firm to delay the release of a patient customer's request when the total completion time for all the requests already in the queue is lower than the threshold. Interestingly, the delayed release time is set to the threshold, regardless of the exact completion time state, which makes the control easy to implement. Furthermore, when there is no delay, whether the firm should serve more or less patient customers depend on an intuitive trade-off between the direct value of serving a customer and its externality to the system.

Bio: *Andy Lin is an Assistant Professor of Management in the Supply Chain & Operations Management area at Mitchell E. Daniels, Jr. School of Business, Purdue University. Before he joined the Daniels School, he earned his Ph.D. in Operations Management from Duke University's Fuqua School of Business under the mentorship of Professor Kevin Shang and Professor Peng Sun. He focused his doctoral research on dynamic pricing and revenue management for queueing systems within congestion-prone supply chains and service operations. His research primarily focuses on developing optimal dynamic control policies in queueing systems. His work has been published in the renowned journal Management Science, and he has presented his research at prestigious conferences such as the INFORMS Annual Meeting, MSOM Conference, and POMS Annual Conference. Notably, he was honored with the Student Paper Award in 2021 from the POMS College of Sustainable Operations.*

Xiaoyang Long*, University of Wisconsin-Madison*, xiaoyang.long@wisc.edu

Session: 2:00PM-3:30PM, 09/08/2023 @ KCR124

Title: **Waste Not Want Not? The Environmental Implications of Quick Response and Upcycling**

Abstract: Overproduction is often cited as the fashion industry's biggest environmental issue, as textile production is notoriously resource intensive and pollutive, and much of the textile produced may end up as "deadstock" fabric or finished products that do not sell. In this paper, we study two major approaches commonly adopted by the fashion industry to address this issue: quick response, whereby finished product inventory is replenished on demand, and upcycling, whereby deadstock fabric is reused to make new clothes. Proponents of these strategies typically focus on their positive environmental impact in downstream supply chain stages (e.g., finished products production and waste disposal). Less is known, however, about their impact on upstream supply chain activities such as raw material acquisition. In this work, we study the effect of quick response and upcycling options on firms' fabric acquisition and production decisions, as well as the firms' incentives to adopt these strategies. We then assess these strategies' environmental impact by analyzing their influence on both deadstock generation and total input (i.e., fabric) acquired by the

firm. Our results show that quick response--when implemented in isolation--reduces deadstock of finished products, but could have the unintended consequence of increasing the amount of fabric acquired, which results in more total deadstock (in both finished products and fabric form). Upcycling together with quick response could alleviate total deadstock generation, but further increases the firm's demand for fabric from the upstream of the fashion supply chain. We discuss the optimal design of two types of waste reduction policies--subsidizing quick response/upcycling and banning deadstock destruction--and analyze their effectiveness in reducing deadstock and curbing firms' need for fabric. Overall, our work highlights a tradeoff between downstream deadstock reduction and upstream fabric acquisition, and suggests that regional policies that aim to reduce local deadstock could often have adverse global impacts.

Bio: *Xiaoyang Long joined the Wisconsin School of Business after completing her Ph.D. in Operations Management at the Hong Kong University of Science and Technology. She also holds a B.A. in Physics from Princeton University. Her research interests include behavioral operations, the interface between marketing and operations, supply chain management, and new product development.*

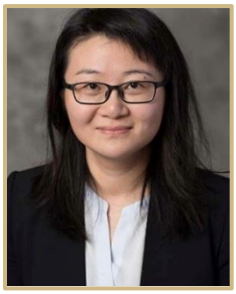
Rodney Parker*, Indiana University,* rodp@indiana.edu

Session: 2:00PM-3:30PM, 09/08/2023 @ KCR108

Title: **Dynamic Learning for Joint Pricing, Advertising, and Inventory Management**

Abstract: Startup firms typically are small and by their nature their founders are required to make cross-functional decisions because disciplinary departments -- for example, marketing and operations -- simply do not exist as separate entities in their firms. Simultaneously considering marketing and operational decisions which are interdependent is challenging, but considerably more so in the absence of actionable data regarding customers. Such firms may be required to learn about their customers' preferences while actually deciding marketing decisions such as pricing and advertising and operational decisions such as inventory levels. This paper studies a setting where a firm jointly determines pricing, inventory, and advertising decisions for T periods while learning demand and advertising response models. Solving for the optimal policy in this setting is computationally complex. Therefore, we first characterize a family of policies that can achieve exponentially fast learning rates. Furthermore, we provide an easy-to-implement policy that is asymptotically optimal -- we establish that the gap between this policy's profit and that of a clairvoyant with perfect information of the demand and advertising models is O(log T). We numerically show that learning about the advertising model is necessary to learn about the pricing model.

Bio: *Rodney Parker is an associate professor of operations management at the Indiana University Kelley School of Business. He previously taught at the University of Chicago, Cornell University and Yale University. He is an expert in supply management, inventory theory, healthcare operations management, capacity limits, industrial organization, marketing-operations interface, finance, and accounting-operations interface. He received his Ph.D. and MSE from the University of Michigan and his M.Mgt. and his Bachelor of Economics (with honor) from the University of Melbourne.*



Pengyi Shi*, Purdue University,* shi178@purdue.edu

Session: 2:00PM-3:30PM, 09/09/2023 @ RAWL2058

Title: **Breaking Barriers: Deploying OR Solutions in Healthcare and Criminal Justice**

Abstract: In this talk, I will present two latest endeavors that leverage advanced OR-based solutions to address critical societal challenges. The first project involves a state-wide innovative nurse deployment program in collaboration with Indiana University Health System. We implement an integrated predictive-prescriptive framework for optimizing nurse deployment and staffing at an unprecedented scale, enabling dynamic responses to short-term patient census fluctuations across 16 hospitals. The second project focuses on deploying technology solutions to the criminal justice system, specifically for an incarceration diversion program. We enhance the assignment process, diverting non-violent offenders from incarceration and guiding them towards appropriate rehabilitation programs for fostering community reintegration. Both initiatives exemplify the power of data-driven, analytics-based solutions in addressing complex challenges across diverse domains.

Bio: *Professor Shi joined Purdue in January 2014. She is an Associate Professor of Operations Management. She is also an affiliate faculty of the Regenstrief Center for Healthcare Engineering and the Integrative Data Science Initiative. She received her Ph.D. Degree from the School of Industrial and Systems Engineering at Georgia Institute of Technology before joining Purdue. Professor Shi's research focuses on building data-driven, high fidelity models and developing predictive and prescriptive analytics to support decisions making under uncertainty in healthcare and service systems. One of her main*

research streams is to develop patient flow models to improve hospital operations and patient outcomes. This stream of research has been implemented as tools for supporting inpatient discharge management and for supporting COVID-19 response in the hospital systems in Indiana. Recently, she has started working on developing predictive and operations tools for the criminal justice system. Her research methodologies include stochastic models, queueing theory, Markov decision process, machine learning, reinforcement learning, and online learning. See her full publications at https://web.ics.purdue.edu/~shi178/"

***Nur Sunar**, University of North Carolina*, nur_sunar@kenan-flagler.unc.edu

Session: 2:00PM-3:30PM, 09/09/2023 @ RAWL2082

Title: **Design of Power Purchase Agreements with Renewable Energy Generators**

Abstract: Motivation: Decarbonizing electricity generation is crucial to combat climate change. Many Fortune 500 companies have been increasingly investing in renewable energy to reduce their carbon footprints. A common way to invest in renewable energy is to sign a power purchase agreement (PPA) with a renewable power producer. The global renewable PPA volume has increased by around 6-fold from 2015 to 2021 and is estimated to grow even more in upcoming years. Despite the prominence of this investment tool in practice, there is no prior work that investigates the optimal design of corporate PPAs with a prospective renewable energy production facility. Our paper studies this topic. Model: We analyze a setting where the company decides when to sign a long-term PPA with a renewable energy developer, considering the wholesale market dynamics over time. The company also chooses a transfer payment for the developer, which induces the capacity of a new renewable energy facility as well as a price for renewable energy generation. The company faces an uncertain electricity demand, and the developer's renewable energy production quantity is random at any given time. The company's objective is to maximize its expected total discounted benefit from the renewable power purchase agreement. Main Results/Insights: We find that under the optimal PPA (for the company), although a decrease in renewable energy investment cost shortens the time to sign the PPA, it strictly reduces the renewable energy investment size. This result offers a key policy insight: Federal investment tax credit for renewable facilities can unintendedly reduce the sizes of new renewable energy projects when they are developed based on a PPA. We also find that total renewable energy generation under the PPA is maximized when the renewable energy site has moderate efficiency (i.e., moderate capacity factor). Thus, in contrast to the common understanding in practice, restricting renewable energy development to most efficient sites benefits neither the developer nor the environment.

Bio: *Nur Sunar studies innovative business models, policies and technologies, and their impacts on inclusion. A key theme of her current research is doing good with management science. She is particularly interested in renewable energy technologies (such as rooftop solar panels), sustainability and smart city technologies (such as the Internet of Things, smart meters and residential batteries). She is also passionate about the operations of online marketplaces/platforms and innovative business solutions for inclusive health. Her earlier work examines firms' investment strategies under incomplete information and the design of service systems. Dr. Sunar has collaborated with a variety of companies for research. She uses various methods, including machine learning methods (clustering, deep learning and text mining), data-driven optimization, stochastic analysis, game theory and econometrics. Dr. Sunar has published papers in leading academic journals such as Management Science, M&SOM and Operations Research. Her research received multiple prestigious awards, including the INFORMS Data Mining Best Paper Award and the People's Choice Award in the Early-Career Sustainable Operations Management Workshop. Dr. Sunar teaches courses in operations management. She received her PhD from Stanford Graduate School of Business at Stanford University and her BS in industrial engineering from Bogazici University in Istanbul.*

***Hong Wan**, North Carolina State University,* hwan4@ncsu.edu

Session: 2:00PM-3:30PM, 09/08/2023 @ KCR114

Title: **Bonferroni-Free and Indifference-Zone-Flexible Sequential Elimination Procedures for Ranking and Selection**

Abstract: This paper proposes two fully sequential procedures for selecting the best system with a guaranteed probability of correct selection (PCS). The main features of the proposed procedures include the following: (1) adopting a Bonferroni-free model that overcomes the conservativeness of the Bonferroni correction and delivers the exact probabilistic guarantee without overshooting; (2) conducting always valid and fully sequential hypothesis tests that enable continuous monitoring of each candidate system and control the type I error rate (or equivalently, PCS) at a prescribed level; and (3) assuming an indifference-zone-flexible formulation, which means that the indifference-zone parameter is not

indispensable but could be helpful if provided. We establish statistical validity and asymptotic efficiency for the proposed procedures under normality settings with and without the knowledge of true variances. Numerical studies conducted under various configurations corroborate the theoretical findings and demonstrate the superiority of the proposed procedures.

Bio: *Hong Wan received her Ph.D. in industrial engineering and management sciences from Northwestern University in 2004. She earned a B.S. in chemistry from Peking University in 1998, an M.S. in materials sciences in 2001 and an M.S. in industrial engineering and management sciences in 2002, both from Northwestern University. Before joining the NC State faculty, she was an associate professor in the School of Industrial Engineering at Purdue University. She also directed the Purdue Blockchain Lab, co-directed the Smart Design Lab, and is part of the SEED Center for Data Farming at the Naval Postgraduate School. Wan's research focuses on the areas of data, simulation, and blockchain. On the data side, she concentrates on simulated data and internet data trying to find the algorithm by first analyzing them. For simulation, she wants to focus on the sampling strategy and data analysis. She is the director of the ISE department's blockchain lab that focuses on studying blockchain as a complex system using simulation, feature selection, game theory, optimization, and other operations research and statistical methods.*

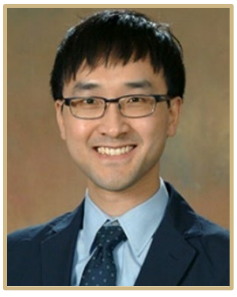
Qiong Wang, *University of Illinois Urbana-Champaign,* qwang04@illinois.edu

Session: 8:30AM-10:00AM, 09/09/2023 @ RAWL2058

Title: **New Policies Exploiting Randomness of Lead Times in Inventory Systems**

Abstract: Stolyar & Wang (2021) provide a proof-of-concept that randomness of lead times in inventory systems can be exploited to achieve large - potentially unlimited - performance improvements, compared to the case of constant lead time. In this paper we explore what improvements are actually achievable under practical system constraints, and which policies both allow significant improvements and are attractive for practical use. In addition to the discrete-time version of the Generalized Base Stock (GBS), introduced and studied in Stolyar & Wang (2021), we introduce two new policies, labeled ADAPTIVE and PIPELINE. We prove the stochastic stability of GBS and PIPELINE policies, in the important special case of bounded lead time. We use simulations to evaluate the performance of the three policies, and its dependence on lead time distributions. We observe that the performance improvements, provided by our policies under practical constraints can indeed be very significant, and they are larger when the lead time "randomness" (say, variance) is larger. It also appears that PIPELINE policy typically has the best performance and is robust from the practical use point of view.

Bio: *Wang is an associate Professor in Industrial & Enterprise Systems Engineering, The Grainger College of Engineering, University of Illinois Urbana-Champaign. He research in the area of Financial Engineering and Operations Research. He receives his Ph.D. in Engineering and Public Policy from Carnegie-Mellon University.*



Shouqiang Wang, *University of Texas at Dallas,* shouqiang.wang@utdallas.edu

Title: **Information Design of a Delegated Search**

Session: 8:30AM-9:00AM, 09/09/2023 @ RAWL2070

Abstract: A principal delegates a sequential search in finite horizon to an agent, who bears the search cost and controls when to terminate the search. Upon termination, the search payoff is split between the principal and agent. However, only the principal can evaluate each search outcome, whose value is thus unobservable to the agent. Leveraging this informational advantage, the principal designs an information policy to strategically provide the agent with some information about the search results over time. We obtain a complete analytical characterization of the principal's optimal policy, which is fully prescribed by a sequence of deterministic acceptance standards, one for each period. The agent is recommended and voluntarily willing to continue the search if and only if the current termination payoff fails to meet that period's standard. In particular, the principal gradually lowers the standard over time. When the search results are not recallable, the acceptance standards are informative and determined recursively across different periods as the optimal stopping thresholds that the principal would employ should she conduct each search by herself at a shadow cost. The shadow cost signifies how difficult it is for the principal to persuade the agent to conduct the search. When the search results are recallable, the optimal policy provides no information and the agent keeps searching up to a cutoff period, after which the acceptance standard in each subsequent period is determined independently of other periods by equating the agent's search cost with his marginal return from an additional search in that period.

Bio: *Shouqiang Wang is currently an Assistant Professor in the Operations Management area at the Naveen Jindal School of Management, University of Texas at Dallas. His research focuses on strategic operations problems that arise from both*

business settings as well as public domains, with a particular interest in incentive issues in the presence of asymmetric information and dynamic interactions among decentralized stakeholders in these contexts. His research has been published at premier business research journals such as Management Science and Operations Research, and has received multiple best paper awards. He teaches statistics, business analytics, spreadsheet modeling, operations management, logistics, and procurement at undergraduate, graduate, and MBA levels. He received his Bachelor's in mathematics and economics from Peking University, his Master in statistics and PhD in business administration from Duke University.

Owen Wu, *Indiana University,* owenwu@indiana.edu
Session: 2:00PM-3:30PM, 09/09/2023 @ RAWL2070
Title: **Anti-Corruption and Humanitarian Aid Management in Ukraine**
Abstract: The flow of humanitarian aid, both monetary and in-kind, as a response to the Russian Federation's full-scale invasion of Ukraine was unprecedented. In this context, one of the most pressing issues is how to regulate the delivery of humanitarian aid to the final beneficiaries, preventing its loss and misuse due to corrupt behavior in the delivery process. However, strengthening anti-corruption efforts is costly. This cost is part of the total financial aid and it therefore comes at the expenses of people in need. In this paper, we analyze this tradeoff and provide managerial insights in the context of humanitarian aid management in Ukraine.
Bio: *Professor Wu is an associate professor in Operations & Decision Technologies and the Director of Research and Outreach, Institute for Environmental & Social Sustainability at Kelley School of Business, Indiana University. His research focuses on operations management for sustainability with a particular emphasis on investment and operations of energy resources, electricity market competition, supply and demand management for energy and water, sustainable business models. He also researches on operations management for social responsibility including humanitarian operations, social equity, anti-corruption, and cross-sector partnership. He received his PhD in Management Science from University of British Columbia.*

Cathy Xia*, Ohio State University*, xia.52@osu.edu
Session: 2:00PM-3:30PM, 09/08/2023 @ KCR114
Title: **An Equilibrium Approach Toward the Optimal Fleet Management of a Last Mile Transit Service**
Abstract: While there currently are many excellent models for transit services in the literature, there is little consideration of the fact that passengers are independent actors who are influenced by supply-side variables. This oversight can lead to low utilization and other poor performance metrics post implementation. In this talk, we attempt to bridge that gap with a framework for modeling this behavior by presenting an example of a Last Mile Transit System (LMTS). We examine the interdependence of fleet size and passenger demand by way of three models: a queuing model, a mode choice model, and a fixed-point map. The LMTS is analyzed as a queuing model and performance bounds are established. This information is passed to a mode choice model where the performance is closely related to the demand. This interplay between the queuing model and the mode choice model is captured with a fixed point map, providing additional constraints to the overall optimization problem. We further discuss how the equilibrium framework can be incorporated in the design, planning, and operations management to enable successful transit services.
Bio: *Dr. Cathy Honghui Xia is a professor in the Department of Integrated Systems Engineering at OSU, with a courtesy appointment from Computer Science and Engineering. Before joining OSU, she was a senior research scientist at IBM T.J. Watson Research Center. Dr. Xia received a Ph.D. in Operations Research and a M.S. in Statistics, both from Stanford University. She obtained a B.S. (with honors) in Applied Mathematics from Peking University, Beijing, China. Dr. Xia's research focuses on using stochastic models and probabilistic analysis to provide insights and solutions for efficient design, operations management, and control of complex networks and systems, with applications to cloud computing, green manufacturing and transportation, and supply chain management. Dr. Xia is the recipient of 2019 OSU Lumley Research Award, 2016 INFORMS George Nicholson Best Student Paper Honorable Mention Award, and 2013 IEEE INFOCOM Best Paper Runner-up Award. She holds 16 US and International Patents and published over 90 articles in peer-reviewed journals and conference proceedings. Dr. Xia is currently serving on the editorial board of Stochastic Models and the international journal of Performance Evaluation, and was previously an associate editor of IISE Transactions. She is the co-editor of Books Performance Modeling and Engineering (Springer 2008) and Special Issue on Cloud Computing as a Service (Service Science 2013). She is a longtime member of ACM Sigmetrics, INFORMS, and Applied Probability Society.*

Linwei Xin, *University of Chicago,* linwei.xin@chicagobooth.edu

Session: 8:30AM-10:00AM, 09/09/2023 @ RAWL2058

Title: **The Informational Benefits of Delay to Online Decision-Making**

Abstract: Real-time decisions are usually irrevocable in many contexts of online decision-making. One common practice is delaying real-time decisions so that the decision-maker can gather more information to make better decisions (for example, in online retailing, there is typically a time delay between when an online order is received and when it gets picked and assembled for shipping). However, decisions cannot be delayed forever. In this paper, we study this fundamental trade-off and aim to theoretically characterize the informational benefits of delaying real-time decisions. We provide a theoretical foundation for a broad family of online decision-making problems by proving that the gap between the proposed online algorithm with delay and the offline optimal hindsight policy decays exponentially fast in the length of delay. We also conduct extensive numerical experiments on the benefits of delay, using both synthetic and real data that is publicly available. Both our theoretical and empirical results demonstrate an important managerial insight: a little delay is all we need. Finally, we extend our analysis and results to the setting with unknown demand distribution and the setting in which decisions are made in batches. This is joint work with Yaqi Xie (Chicago Booth School of Business) and Will Ma (Columbia Business School).

Bio: *Linwei Xin is an associate professor of operations management at the University of Chicago Booth School of Business. He specializes in inventory and supply chain management, where he designs cutting-edge models and algorithms that enable organizations to effectively balance supply and demand in various contexts with uncertainty. Xin's research using asymptotic analysis to study stochastic inventory theory is renowned and has been recognized with several prestigious INFORMS paper competition awards, including First Place in the George E. Nicholson Student Paper Competition in 2015 and the Applied Probability Society Best Publication Award in 2019. His research on implementing state-of-the-art multi-agent deep reinforcement learning techniques in Alibaba's inventory replenishment system was selected as a finalist for the INFORMS 2022 Daniel H. Wagner Prize, with over 65% algorithm-adoption rate within Alibaba's own supermarket brand Tmall Mart. His research on designing dispatching algorithms for robots in JD.com's intelligent warehouses was recognized as a finalist for the INFORMS 2021 Franz Edelman Award, with estimated annual savings in the hundreds of millions of dollars. Xin's research has been published in journals such as Operations Research, Management Science, Mathematics of Operations Research, and INFORMS Journal on Applied Analytics.*

Yuqian Xu, *University of North Carolina,* yuqian_xu@kenan-flagler.unc.edu

Session: 2:00PM-3:30PM, 09/09/2023 @ RAWL2058

Title: **Operational Risk Management: Optimal Inspection Policy**

Abstract: Major banks around the world lost nearly $210 billion during the period of 2011-2016 due to operational risk events (Huber and Funaro 2018). To mitigate the severe consequences that can arise from such events, the Basel Regulatory Committee has mandated that financial institutions worldwide conduct inspections on operational risk. In light of the importance of operational risk and its current regulation in the industry, this paper proposes a continuous-time principal-agent model that explores the optimal inspection policy of a financial firm (principal) and the effort of its employees (agent) to reduce the occurrence of risk events. First, we characterize the optimal inspection strategy under two commonly used policies in practice, namely random and periodic policies. This characterization reveals the conditions for two different modes of inspection (effort inducement and error correction), as well as the nuanced interactions among the inspection frequency, the penalty charged for errors, and the wage paid to employees. Next, by comparing random and periodic policies, we find that the random policy outperforms the periodic policy if and only if the inspection cost is high. Furthermore, we propose a hybrid policy that strictly dominates the random policy and weakly dominates the periodic policy, suggesting that a proper reduction of the random element in the inspection policy, in the manner of our proposed hybrid policy, can always improve its performance. Finally, we examine the complete information benchmark (without moral hazard), supplemental mitigation strategies, and numerical studies to provide further insights and show the robustness of our main findings.

Bio: *Yuqian Xu researches operations in financial services and digital platforms. Her focus of methodology includes applied probability, stochastic models, econometrics and machine learning. Her teaching interests are operations management, risk analysis and data analytics. In her research work, she has collaborated with companies such as Watsi, Alibaba, JD.com, Bank of China and ICBC. Dr. Xu has given talks at academic, industry, and government conferences and organizations, such as the Federal Reserve Bank and China Banking Regulatory Committee. She is an editorial member of Probability in Engineering and Informational Sciences, and associate editor of Service Science. She received her PhD with honors in operations management*

from the NYU Stern School of Business, where she received with the Herman E. Krooss Dissertation Award. She received her BS in mathematics from Kuang Yaming Honors School of Intensive Instruction in Science and Arts at Nanjing University.

Jian Yang, *Rutgers University*, jyang@business.rutgers.edu
Session: 2:00PM-3:30PM, 09/08/2023 @ KCR108
Title: **Road to the Best (s,S,p) Policy in Joint Inventory-price Control Involving Demand Ambiguity**
Abstract: We study joint inventory-price control in which a firm chooses among a finite number of prices to influence the demand to be realized; also, the firm's ordering activities may incur fixed setup costs. While intending to settle down on an optimal (s,S,p) inventory-price policy all catering to the long-run average criterion, the firm knows little, not even any form presumably taken by the demand-price relationship such as multiplicative or additive, about the demand distributions that it is to face under various prices. We propose an adaptive policy in which exploration involving all-price sweeps and exploitation relying on best policies catered to empirical demand distributions are carried out intermittently, with the latter activity becoming ever more pervasive over time. When its learning-doing schedule is finely tuned, this policy can achieve an O(T^{2/3}) regret guarantee. Other policy ideas have been considered as well. One that applies the UCB principle to the determination of policies to be adopted in ever lengthier intervals can achieve an O(T^{1/2}) regret guarantee for the special case without fixed setup costs. Our numerical analysis reveals the merits of other policies.
Bio: *Jian Yang received his Ph.D., in Management Science from the University of Texas at Austin. Before joining the Rutgers Business School, Professor Yang taught at New Jersey Institute of Technology. His teaching and research interests include stochastic modeling, inventory control, and revenue management.*

Can Zhang, *Duke University,* c.zhang@duke.edu
Session: 2:00PM-3:30PM, 09/09/2023 @ RAWL2070
Title: **Farm Equipment Sharing in Emerging Economies**
Abstract: In emerging economies, there is a growing number of farm equipment sharing platforms that connect smallholder farmers with tractor owners who are willing to fulfill farmers' requests for mechanization services. Given the small farm sizes and low digital literacy in rural areas of emerging economies, these platforms often rely on the so-called "booking agents" to collect demand from individual farmers and submit the aggregated demand on the platform. This is in contrast to conventional sharing platforms without booking agents and the service providers directly fulfill service requests from individual customers. In this paper, we explicitly capture the role of booking agents on a farm equipment sharing platform and study how the platform should choose the price and wage rates to appropriately incentivize all entities on the platform (including farmers, tractor owners, and booking agents). While the farm equipment sharing platforms are popularly referred to as "Uber for Tractors," our analysis offers insights into when and why these platforms should not rely on conventional wisdom derived from ride-sharing or other typical sharing settings, due to the presence of booking agents. Further, in contrast to the current practice of existing platforms that pay a constant ratio of the price to booking agents, our analysis reveals that it is optimal for the platform to pay a higher ratio of the price to booking agents in scenarios with a higher number of tractors on the platform. Finally, inspired by the increasing efforts in practice from governments or donor agencies to enhance the supply and demand sides of these platforms (such as by increasing the number of tractors on the platform or by making booking agents' demand aggregation more efficient), our analysis also sheds light on how such efforts affect the platforms' optimal decisions and the welfare of all entities on the platform.
Bio: *Can Zhang is an Associate Professor in the Operations Management area at the Fuqua School of Business at Duke University. His research focuses on socially responsible and sustainable operations with an emphasis on emerging economies and underserved populations. Specifically, his existing and ongoing work spans three interrelated areas: 1) nonprofit and public sector operations, 2) healthcare supply chains, and 3) smallholder agricultural supply chains. A common theme of his research is to study how organizations in these sectors can effectively manage their resources tobetter serve their beneficiaries and create societal benefits. In his research, he works closely with industry collaborators to motivate research questions from real-world challenges and data. He also aims to deliver implementable solutions and actionable insights to make a practical impact. His work has received multiple recognitions, including the first place for the 2021 MSOM Best Paper Award, 2019 MSOM Award for Responsible Research in OM, 2017 MSOM Practice-Based Competition, 2017 MSOM Student Paper Competition, 2017 INFORMS Doing Good with Good OR Student Paper Competition, honorable mention for the 2019 INFORMS George B. Dantzig Dissertation Award, and a finalist for the 2022 Public Sector Operations Research Best Paper Award, 2017 INFORMS Franz Edelman Award, and 2015 INFORMS George Nicholson Student Paper Competition. At*

Fuqua, Prof. Zhang teaches Operations Management for the Daytime MBA program. Prior to joining Fuqua, he received a Ph.D. in Industrial Engineering from Georgia Institute of Technology and a B.S. in Civil Engineering from Tsinghua University.

Jinglong Zhao, *Boston University,* jinglong@bu.edu
Session: 8:30AM-10:00AM, 09/09/2023 @ RAWL2058
Title: **Adaptive Neyman Allocation**
Abstract: In experimental design, Neyman allocation refers to the practice of allocating subjects into treated and control groups, in possibly unequal numbers that are proportional to their respective standard deviations, with the objective of minimizing the standard deviation of the treatment effect estimator. This widely recognized approach increases statistical power in scenarios where the sample size is limited, as is often the case in social experiments, clinical trials, and marketing research. However, Neyman allocation cannot be implemented unless the standard deviations are known in advance. Fortunately, the multi-stage nature of the aforementioned applications allows the use of earlier stage observations to estimate the standard deviations, which further guide the allocation in later stages. In this paper, we introduce a competitive analysis framework to study this multi-stage experimental design problem and proposes a simple, near-optimal adaptive Neyman allocation algorithm. Our result nearly matches the information-theoretic limit of conducting experiments, making our algorithm a simple and effective solution for multi-stage experimental designs.
Bio: *Jinglong Zhao is an Assistant Professor of Operations and Technology Management at Questrom School of Business at Boston University. He works at the interface between optimization and econometrics. His research leverages discrete optimization techniques to design field experiments with applications in online platforms. Jinglong completed his PhD in Social and Engineering Systems and Statistics at Massachusetts Institute of Technology.*

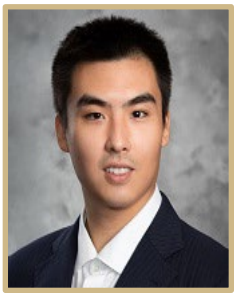
Xuying Zhao, *Texas A&M University,* xzhao@mays.tamu.edu
Session: 2:00PM-3:30PM, 09/09/2023 @ RAWL2058
Title: **Content Length Limit: How Does it Matter for a Consumer-to-Consumer Media Platform?**
Abstract: Our study is inspired by the rapid growth of consumer-to-consumer (C2C) media platforms such as TikTok. We adopt a classical economical approach to modeling how utility-maximizing consumers select content pieces to view on a C2C media platform through a sequential inspection process, and investigate how a platform in pursuit of desired market performance can devise an optimal policy on content length limit to induce desired viewer behaviors. First, we show that when content on the platform is longer, viewers set a higher standard of match value in selecting content to view. This leads to a lower click-through rate of contributed content on the platform. This finding suggests that a tight limit on content length increases click-through rate. Second, we show that extended content length on the platform first enhances its performance but then hurts its performance, following an inverted U-shape curve. This is true for short-term performance measured by viewer traffic and total viewing time, as well as for long-term performance measured by total consumer surplus. This suggests the existence of an optimal content length. Third, we find that the optimal content length that maximizes viewer traffic is smaller than that maximizes total viewing time, which is further smaller than that maximizes consumer surplus. As such, a platform that switches the strategic focus from short-term advertising revenue to long-term growth will benefit from extending the content length limit and enhancing consumer surplus.
Bio: *Xuying Zhao conducts research on supply chain management and service operations management. In recent papers, she has investigated theoretical models of channel competition and coordination, advance selling strategy, time based competition in service industry, and inventory management with limited demand information. Xuying teaches core courses on business process analytics. After gaining a BA in Computer Science from ZheJiang University in China, she was a software engineer for Microsoft. She subsequently earned an M.S. and Ph.D in Management Science from University of Texas at Dallas.*

***Lamis E. Amer**, University of Miami,* lxa659@miami.edu
Session: 10:30AM-12:00PM, 09/09/2023 @ RAWL2058
Title: **Future Proofing Septic Systems to Sea-Level Rise – Valuing Adaptations & Decision Modelling**
Abstract: This research delves into the valuation of on-site wastewater treatment and disposal systems in the context of current and projected sea-level rise. Our primary goal is to develop an integrated decision-making model that simultaneously minimizes adaptation costs and maximizes the resilience of these crucial wastewater systems. The proposed model incorporates a range of adaptation strategies, including connecting to existing sewer networks, implementing clusters of micro sewer networks, and constructing mound systems. To tackle the computational challenges posed by largescale instances, we devise a cluster-based optimization algorithm. This enables efficient handling of extensive datasets and streamlines the application of our model to real-world scenarios. In particular, we apply our approach to actual data sourced from Miami-Dade County, offering insightful comparisons with the county's existing adaptation plans. The results of our study showcase the practical relevance of our model in optimizing on-site wastewater systems' resilience under varying sea-level rise scenarios, and more importantly it sheds the lights on the application of the cluster sewer systems as the most economical and environmental alternative to the regional sewer systems.

***Yasaman Asayesh**, University of Minnesota,* yasaman@umn.edu
Session: 10:30AM-12:00PM, 09/09/2023 @ RAWL2070
Title: **From Policy to Productivity: Unpacking the Effects of Medicaid Expansion on Labor Productivity in the US Manufacturing Industry**
Abstract: Does government-sponsored healthcare insurance influence labor productivity? We answer this question by leveraging the variation across the US states in their decisions on the adoption of a controversial health policy in 2014, namely Medicaid expansion. We conduct a difference-in-differences analysis of county-year-level labor productivity data from 2010 to 2017 on 2791 counties across 46 states, out of which 27 expanded Medicaid in 2014, but 19 did not. This study reveals a notable positive impact (2.3% to 2.7%) of Medicaid expansion on labor productivity in the US manufacturing industry. By analyzing the underlying channel, we find that this positive impact is driven not by a reduction in employment but by an increase in economic output. Further, the positive impact of Medicaid expansion is not unconditional, with this impact discernible only in counties with better healthcare infrastructure (but no such impact in counties with inadequate healthcare infrastructure). Our findings are robust to synthetic control methods, alternative productivity measures, and falsification tests. By elucidating the role of Medicaid expansion in influencing labor productivity, the channel driving the increase in labor productivity, and the boundary conditions under which the impact is obtained, our study contributes to the literature on productivity and public health policy.

***Xingyu Bai,** University of Illinois Urbana-Champaign*, xingyub3@Illinois.edu
Session: 4:00PM-5:30PM, 09/09/2023 @ RAWL2058
Title: **Asymptotic Optimality of Open-Loop Policies in Lost-Sales Inventory Models with Stochastic Lead Times**
Abstract: Inventory models with lost sales and large lead times are notoriously difficult to manage due to the curse of dimensionality. Recently, Goldberg et al. (2016) and Xin and Goldberg (2016) proved that in the lost-sales inventory model with divisible products, as the lead time grows large, a simple open-loop constant-order policy is asymptotically optimal. In this paper, we consider the lost-sales inventory model in which the lead time is not only large but also random. Under the assumption that the placed orders cannot cross in time, we establish the asymptotic optimality of constant-order policies as the lead time increases for the model with divisible products. For the model with indivisible products, we propose an open-loop bracket policy, which alternates deterministically between two consecutive integer order quantities. By employing the concept of multimodularity, we prove that the bracket policy is asymptotically optimal. Our results on divisible products hold for the models with order crossover and random supply functions. As main methodological contributions, we establish the convergence of the average cost incurred by the optimal open-loop policy in a finite-period problem, which serves as a lower bound of the optimal long-run average cost, to the long-run average cost generated by our proposed open-loop policies. Finally, we provide a numerical study to derive further insights, and find that the proposed open-loop policies perform well even for short lead times when the ratio between the lost-sales penalty cost and holding cost is moderate.

Li Ding, *Georgia Institute of Technology*, li.ding@scheller.gatech.edu
Session: 10:30AM-12:00PM, 09/09/2023 @ RAWL2058
Title: **Breaking the Invisible Cage: Investigating the Gender Wage Gap in Gender-Blind Online Platforms**
Abstract: We investigate differences in self-evaluation biases between genders as potential contributors to the gender wage gap in online platforms, and explore strategies to mitigate the gap. Leveraging a gender-blind online labor platform, we conduct an online experiment, wherein workers are presented with the opportunity to work on math grading tasks over two phases. We consider two interventions: (1) task recommendation, wherein workers are nudged to work on hard and high-paying (HH) tasks early on, and (2) giving workers performance feedback on the first task before they select the second task. We find that in the absence of a nudge, women are more likely to select easier and lower-paying tasks than men, and performance feedback alone reinforces this behavior. However, combining performance feedback with a nudge to take on HH tasks early on reduces the subsequent gender wage gap.

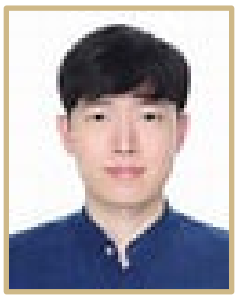


Yishen Cai, *Washington University in St. Louis*, c.yishen@wustl.edu
Session: 4:00PM-5:30PM, 09/08/2023 @ KCR124
Title: **Startup Blitzscaling and the Venture Capital Method**
Abstract: Blitzscaling is a business strategy that prioritizes growth over efficiency in profit and it is typically found among expansion-stage startups. It attempts to expand both the market and the size of the operation with significant costs financed by serious investors such as Venture Capitalists (VCs). In practice today, the standard equity finance mechanism between a VC and a startup is derivative of Venture Capital Method. Contrary to other equity finance schemes, VC finance features an investor whose entire profit model pivoted on exit rather than profit sharing. The investee is a long-term (3-7 years) high-risk (90% failure) startup venture. We try to close the gap between practice and literature by modeling an expansion stage VC-backed startup with operational decisions that allocate a limited budget on marketing and capacity under different types of VC contracts.

Xiaoquan Gao, *Purdue University*, gao568@purdue.edu
Session: 4:00PM-5:30PM, 09/09/2023 @ RAWL2058
Title: **Stopping the Revolving Door: MDP-Based Decision Support for Community Corrections Placement**
Abstract: Community corrections (CC) offer an alternative to incarceration that can reduce jail overcrowding and recidivism rates, particularly among individuals with complex needs. However, placing all eligible individuals in CC may overload case managers, which leads to loosened supervision and increased recidivism, undermining the purpose of CC programs to stop the revolving door of incarceration. We develop a Markov Decision Process (MDP) model to capture the complex tradeoffs in the community correction placement problem, accounting for the short- and long-term recidivism risks of individuals and the negative societal effects of overcrowded jail and CC programs. Our model supports placement decisions, determining whom to divert to CC and which CC programs to assign them. By incorporating proven structural properties and timescale-based approximations, we develop a scalable and interpretable decision support system to maximize societal benefits. We showcase the effectiveness of our algorithm in solving the originally intractable real-world problems through a case study using data from our community partner. We also provide valuable policy insights from the case study, including the significance of our approach in breaking the vicious cycle of overcrowding and recidivism and guidance on capacity planning.

Nan Jiang, *Georgia Institute of Technology*, nanjiang@gatech.edu
Session: 10:30AM-12:00PM, 09/09/2023 @ RAWL2082
Title: **ALSO-X and ALSO-X+: Better Convex Approximations for Chance Constrained Programs**
Abstract: Chance constrained programs (CCPs) are generic frameworks for decision-making under uncertain constraints. The objective of a CCP is to find the best decision that violates the uncertainty constraints within the prespecified risk level. A CCP is often nonconvex and is difficult to solve to optimality. This paper studies and generalizes the ALSO-X, originally proposed by Ahmed, Luedtke, Song, and Xie (2017), for solving a CCP. We first show that the ALSO-X resembles a bilevel optimization, where the upper-level problem is to find the best objective function value and enforce the feasibility of a CCP for a given decision from the lower-level problem, and the lower-level problem is to minimize the expectation of constraint violations subject to the upper bound of the objective function value provided

by the upper-level problem. This interpretation motivates us to prove that when uncertain constraints are convex in the decision variables, ALSO-X always outperforms the state-of-art conditional-value-ta-risk (CVaR) approximation. We further show (i) sufficient conditions under which ALSO-X can recover an optimal solution to a CCP; (ii) an equivalent bilinear programming formulation of a CCP, inspiring us to enhance ALSO-X with a convergent alternating minimization method (ALSO-X+); (iii) extensions of ALSO-X and ALSO-X+ to solve distributionally robust chance constrained programs (DRCCPs) under Wasserstein ambiguity set. Our numerical study demonstrates the effectiveness of the proposed methods.



Byeongmok Kim, *Purdue University*, kim3453@purdue.edu
Session: 4:00PM-5:30PM, 09/09/2023 @ RAWL2082
Title: **A Multi-Agent Reinforcement Learning Model for Inventory Transshipments under Supply Chain Disruption**
Abstract: The COVID19 pandemic has significantly disrupted global Supply Chains (SCs), emphasizing the importance of SC resilience, which refers to the ability of SCs to return to their original or more desirable state following disruptions. This study focuses on collaboration and proposes a novel collaborative structure that incorporates a fictitious agent to manage inventory transshipment decisions between retailers in a centralized manner while maintaining the retailers' autonomy in ordering. The proposed collaborative structure offers the following advantages: (i) it facilitates decision synchronization for enhanced retailer collaboration, and (ii) it allows retailers to collaborate without the need for information sharing, addressing the potential issue of information sharing reluctance. Additionally, this study employs non-stationary probability to capture the uncertain nature of the ripple effect and the highly volatile customer demand caused by the pandemic. A new Reinforcement Learning (RL) algorithm is developed to handle non-stationary environments and to implement the proposed collaborative structure. Experimental results demonstrate that the collaborative structure using the new RL algorithm achieves superior SC resilience compared with centralized inventory management systems with transshipment and decentralized inventory management systems without transshipment using traditional RL algorithms.

Buyun Li, *Indiana University,* libu@iu.edu
Session: 4:00PM-5:30PM, 09/09/2023 @ RAWL2058
Title: **Dynamic Scheduling with Bayesian Updating of Customer Characteristics**
Abstract: We study the dynamic scheduling problem in a multi-class queueing process, where the system manager updates their belief about the service rewards and waiting costs of each class using Bayesian method. We propose a state-dependent index, characterized by the busy period of the queue, that can be used as a basis for an optimal index policy when only one class of customer rewards and waiting costs is unknown. Although the index policy is not optimal for more general systems, we numerically test the performance of the policy. To evaluate the performance of our proposed policy, we design computational tests using various scenarios and compare it with existing policies in terms of key performance metrics.

Shukai Li, *Northwestern University,* shukaili2024@u.northwestern.edu
Session: 4:00PM-5:30PM, 09/08/2023 @ KCR108
Title: **Learning to Price under Competition for Multinomial Logit Demand**
Abstract: In this paper, we consider a sequential price competition problem faced by a seller when multiple sellers selling the same product are competing on prices under an unknown multinomial logit (MNL) demand. In particular, at the beginning of each period, each seller first (simultaneously) posts a price and then observes their own realized demand and posted prices of other sellers. However, they do not observe the demand of other sellers. The goal is to find a pricing policy as a function of historical observations to maximize the expected revenue over the selling horizon. This problem is introduced in van de Geer et al. (2019) as a part of the Dynamic Pricing Challenge at the 2017 INFORMS Revenue Management & Pricing Conference. However, to the best of our knowledge, prior to this work there is no known algorithm with provable guarantees. Gallego et al. (2006) study a corresponding single period price competition problem under a known MNL model and show a unique pure-strategy Nash equilibrium. We give a stochastic gradient-based online learning algorithm in the sequential setting and show that it converges to the unique Nash equilibrium. In particular, we reformulate the learning problem with multiple sellers under a stationary MNL demand to learning under a non-stationary logit demand for a single seller. Furthermore, we show that for any seller, our algorithm achieves an expected regret at most O(T^{2/3} logT log^2 N) as compared to the expected revenue of seller i under full information where we fix the sequence of

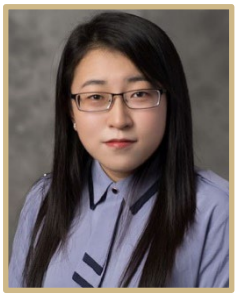
prices of other sellers in all periods and optimize the price for seller in each period. Here N and T are the numbers of sellers and sequentially arriving customers respectively. This full-information benchmark is stronger than the benchmark of expected revenue for the seller at Nash equilibrium.

Yanting Li, *Rochester University,* yanting.li@simon.rochester.edu
Session: 4:00PM-5:30PM, 09/08/2023 @ KCR124
Title: **On the Design of a Shared Waiting Room**
Abstract: We investigate the design of a service system where different types of customers seek different services, provided by designated servers. We examine two waiting room designs: the designated waiting room, where each server has its own designated waiting area, and the shared waiting room, where all customers are waiting together. In the designated waiting room design, customers observe the number of customers waiting for the same service, whereas in the shared waiting room, customers cannot identify what service the other customers are waiting for, but can still observe the total number of customers in the waiting room and make a joining/balking decision accordingly. When types differ with respect to their designated server, we show that both types of customers adopt an identical pure equilibrium threshold. We find the shared waiting room design achieves higher throughput than the designated waiting room design when the congestion rate is low. However, the shared waiting room is always preferable in terms of social welfare. Furthermore, we extend our analysis to the asymmetric case, where the arrival rates of the two types differ from each other. Finding the equilibrium strategies in this case is more challenging and requires an iterative process. We show that mixed equilibrium thresholds can emerge, and that the designated waiting room does not always improve system performance, even when considering social welfare. Our findings suggest that when designing a waiting room, service operators should carefully consider whether to pool customers' type information. A different set of parameters may affect waiting room performances in opposite directions.

Yongchun Li, *Georgia Institute of Technology*, ycli@gatech.edu
Session: 4:00PM-5:30PM, 09/08/2023 @ KCR114
Title: **On the Partial Convexification of the Low-Rank Constrained Optimization**
Abstract: The low-rank constrained optimization arises in various machine learning and optimization problems. It minimizes a linear objective function subject to multiple linear inequalities and a low-rank domain set. Although the low-rank constrained optimization is generally NP-hard, a viable approach is to convexify the domain set (i.e., replace it with its convex hull), known as "partial convexification." Partial convexification often leads to a tractable convex relaxation, but its solution quality lacks theoretical guarantees. To fill this gap, (i) we establish the necessary and sufficient conditions under which partial convexification matches the original low rank constrained optimization; and (ii) we derive an upper bound on the minimum rank among all the optimal solutions of the partial convexification and prove its tightness. To efficiently solve the partial convexification, we develop a column generation algorithm combined with a rank reduction algorithm. This combination ensures that the output solution satisfies the theoretical guarantees. Finally, numerical experiments validate the strength of the partial convexification and the effectiveness of the proposed algorithms.

Zhengbo Liang, *Purdue University & Tianjin University,* zbliang@tju.edu.cn
Session: 4:00PM-5:30PM, 09/08/2023 @ KCR124
Title: **Subsidize Farmers or the Retailer? Government Subsidy Policy in the Agricultural Supply Chain Considering Yield Uncertainty**
Abstract: Government usually offers subsidies to promote the planting of organic crops and protect the profit of each player in the agricultural supply chain. We focus on two kinds of government subsidies under which the government offers a cost subsidy to the farmers or a procurement subsidy to the retailer. In addition to examining the effectiveness of the two government subsidies in terms of net benefit, net social value, and net welfare, we also analyze the performance of government subsidy policies according to a fixed government implementation input. Results show that given the same level of the government budget, it can be optimal for the farmers, consumers, or social welfare under the cost or procurement subsidy. Especially, farmers may be hurt by the government cost subsidy compared with the occasion without subsidy. Therefore, a quadratic subsidy to the retailer is introduced and can always outperform the cost and procurement subsidies in terms of farmers' profit except for a high farmers' risk-averse level and high yield uncertainty. The increase in

government subsidy may lead to a negative net benefit under the government cost or procurement subsidy. Thus, the cost of providing subsidies can exceed the profit of the subsidy receiver. With the increase in government subsidy, both the net social value and net welfare can also be negative.



Jianing Li, *Purdue University*, li3193@purdue.edu
Session: 4:00PM-5:30PM, 09/09/2023 @ RAWL2070
Title: **Effects of Ride-Hailing Platforms on Dual-Distribution Channels**
Abstract: The emergence of ride-hailing platforms has significantly impacted the automotive industry, influencing both the sales and rental markets. Dealers and rental agencies, once operating in separate markets, have become indirect competitors due to this transformation. Therefore, considering both markets simultaneously is crucial to understand the platforms' impact. In this paper, we develop a comprehensive model that incorporates the manufacturer, dealer, and rental agency, allowing us to analyze how a platform's presence influences firm decisions and total car ownership. We show that the dealer increases its orders for products with high marginal costs due to the value enhancement effect, wherein car ownership becomes more valuable with the presence of a platform. Importantly, we find that neglecting the rental market - as most of the existing literature does - underestimates this effect. While the value enhancement effect does not extend to the rental market, a platform's presence may motivate the rental agency to increase its orders for products with low marginal costs and new-car valuation. However, the increase in rental cars is generally relatively modest compared to the decrease in personally owned cars, resulting in an overall increase in total ownership only for products with sufficiently high marginal costs and rental-car valuation. Moreover, we show that failing to consider both markets and their interactions may lead to inaccurately assessing the total change in ownership compared to the platform's absence. Finally, we discuss the implications of car owners' partial or heterogeneous participation rate in the platform and demonstrate that our results generally hold.

Mo Liu, *University of California, Berkeley,* mo_liu@berkeley.edu
Session: 10:30AM-12:00PM, 09/09/2023 @ RAWL2082
Title: **Active Label Acquisition with Personalized Incentives in the Assortment Optimization**
Abstract: We study how to tailor incentives to motivate customers to reveal their preferences during the survey process for the capacitated assortment optimization problem. Based on the survey responses collected, the retailer develops a model that predicts each customer's preference and customizes the assortment. To assign incentives to customers efficiently, the primary challenge lies in evaluating each customer's potential revenue contribution to the prediction model. This evaluation depends on the current prediction model and the customer type. Notably, a smaller prediction error in the customers' preference model does not necessarily guarantee better assortment decisions or higher revenue. We initially investigate a less complex problem called the product selection problem, which we then apply to determine personalized incentives in the capacitated assortment optimization problem, where customers follow the MNL choice model. For both problems, we design efficient algorithms to offer personalized incentives based on the upper bounds derived for the newly introduced notion called value of information. In addition, we derive non-asymptotic guarantees for both the cumulative label cost and the risk of the final prediction model. Our findings demonstrate that by offering personalized incentives, the retailer can significantly reduce the label cost compared to fixed incentive strategies. Furthermore, our numerical experiments on both real-world and synthetic datasets demonstrate the practical value of our personalized incentive algorithms compared to fixed incentive strategies.

Wei Liu, *Purdue University ,* liu3568@purdue.edu
Session: 4:00PM-5:30PM, 09/09/2023 @ RAWL2058
Title: **Data-driven Aircraft Assignment To Minimize Delay Propagation**
Abstract: We propose a new approach to reduce the delay propagation by optimizing the assignment between incoming and outgoing flights flown by an airline at a given airport. Specifically, we provide a data-driven approach to estimate the arrival delay distribution, and then derive several assignment policies based on the estimated distribution. We show that the assignments derived from the data-driven approach can offer a verifiable improvement compared to the optimal assignment (FIFO) derived in the deterministic setting by using the real data of Delta Airlines at Atlanta airport.

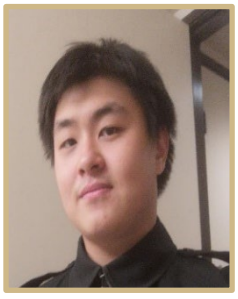
Ye Liu, *Washington University in St. Louis,* ye.liu@wustl.edu
Session: 4:00PM-5:30PM, 09/09/2023 @ RAWL2070
Title: **Optimal Hog Farm Finishing Stage Management via Deep Reinforcement Learning**
Abstract: We examined a finishing stage planning for a pork producer, The Maschhoffs, who weekly must decide which hogs to sell, retain for an additional week, or deliver to a meatpacker based on market prices and contract obligations. Shortfalls in delivery incur penalties based on a market index. The current "always fulfill" (AF) policy ensures contractual commitments are always met, with surplus sold in the open market or underweight hogs substituted at a discount if a shortage in the supply of regular-weight hogs arises. We apply the Deep Reinforcement Learning (DRL) approach to offer an alternative to the AF policy using the rich data set of our application environment. Our research is generalizable beyond the specific application context, and we contribute to the existing literature by (i) extending the use of neural networks into a complex application with continuous and unbounded spaces; (ii) adapting an existing algorithm fully accounting for operational constraints; and (iii) employing machine learning techniques, including optimal classification trees, to interpret the DRL agent's decisions. Our DRL strategy surpasses the AF policy by 25.86% on average in numerical experiments. We are able to provide insights on decision features DRL exploits for this superior performance. Compared to an exact dynamic solution derived for a smaller, analytically tractable operating horizon, the DRL agent is less than 1% worse on average, an impressive performance for a complex dynamic problem.

Vishrut Rana, *University of Pennsylvania*, vishrut@wharton.upenn.edu
Session: 4:00PM-5:30PM, 09/09/2023 @ RAWL2082
Title: **Data-driven Metrics for Optimal Spatial Allocation of Renewable Energy Generation**
Abstract: As renewable energy becomes more desirable and the power grids across the world experience an increasing penetration of renewable energy, the process of efficient spatial allocation of generation capacity becomes increasingly important. Renewable generation capacity is needed to be located such that the variable and often uncontrollable generation from these resources can match the fluctuating demand without being heavily supplemented with expensive long-duration storage. Generation sites have historically been selected based on maximizing expected lifetime generation among a set of ecologically viable locations. This expected lifetime generation approach is projected to be insufficient when selecting sites for renewable energy plants, as it fails to capture the differences in value of electricity generated at different times and locations and assumes all generated electricity as identical (an assumption that remains valid for coal and natural gas but fails for variable renewable energy). As a remedy, we propose new data-driven site selection metrics that measure spatial and temporal value of electricity generation and validate our methodology for different wind energy development scenarios in Texas using high granularity wind-speed geospatial data. We conclude our study with a detailed impact assessment on wholesale electricity market prices when renewable generation locations are selected with our proposed methodology.

Shikha Safaya, *Georgia Institute of Technology,* shikha.safaya@scheller.gatech.edu
Session: 10:30AM-12:00PM, 09/09/2023 @ RAWL2070
Title: **Matching Volunteers with Clients in a Non-Profit Organization**
Abstract: Non-profit organizations are often challenged with volunteer participation and retention in the absence of monetary incentives. We explore the tradeoff between incorporating volunteer preferences in task assignments versus pooling volunteers to alleviate mismatch between supply and demand. In doing so, we endogenize volunteers' decisions to participate based on their expected utilities from serving clients and from their outside options. We analytically derive the conditions under which a particular policy may be preferred by all the stakeholders (the non-profit, volunteers, and clients). Consequently, we suggest levers that can be utilized by non-profits to better align the incentives of all the stakeholders.

Austin Iglesias Saragih, *Massachusetts Institute of Technology*, saragih@mit.edu
Session: 4:00PM-5:30PM, 09/09/2023 @ RAWL2070
Title: **Pivotal Uncertainties to Resolve: Optimal Information Gathering for Supply Chain Design**
Abstract: A critical strategic decision-making problem in supply chain management is the design of supply chain networks, especially in the face of a multitude of uncertainties. Existing approaches consider uncertainties as inputs. However, which uncertainties are pivotal to resolve in our network? To answer this, we devise the strategic trade-off of resolving them through information gathering. In this paper, we optimize the trade-off between the cost reduction achieved from designing a supply chain network with resolved uncertainties through gathered information and the expenses incurred from gathering the information. We formulate this trade-off as a non-monotone non submodular minimization problem. To model the problem, we leverage the Value of Information (VOI) analysis in stochastic programming which identifies the optimal Information Gathering Strategy (IGS). This strategy locates the most crucial uncertainties in the supply chain network that can pivot facility decisions. Results: We show the significant value of optimal IGS and provably solve the problem near-optimally with approximation bounds and an approximation algorithm that achieves a constant approximation guarantee. We also uncover the pivotal uncertainties of our pharmaceutical supply chain design case study. Optimal IGS improves the overall objective and proves to be the pivotal uncertainties we should resolve. This method is extendable to other stochastic programming problems.

Zhen Shao*, The University of Science and Technology of China*
Session: 10:30AM-12:00PM, 09/09/2023 @ RAWL2070
Title: **Help and Haggle: Boosting Social Reach Through Randomized, Adaptive, All-or-Nothing Discounts**
Abstract: We study a novel social e-commerce practice known as “help-and-haggle,” whereby an online shopper can ask friends to help her “haggle” over the price of a product, and if she cuts the product price down to zero within a time limit, she will get the product for free; otherwise, the product reverts to the original price. Help-and-haggle enables the firm to promote its product and boost its social reach as consumers effectively refer their friends to the firm. Three innovative features distinguish this social e-commerce scheme: the amount of the tentative discount each successful referral triggers is randomized and determined in an adaptive fashion without prior commitment, whereas the total discount the consumer effectively enjoys is all-or-nothing in nature. We analyze help-and-haggle using a dynamic game-theoretic model that captures these three features. We obtain three sets of results. First, the firm’s ability to randomize discounts can lead to a wider social reach, a lower promotion expense, and a higher profit from product sales than if the discounts must be made deterministic. Second, the ability to adaptively set (deterministic) price cuts, despite its flexibility, may hurt the interest of the firm, who would earn a higher total payoff if it could commit to a fixed price cut throughout. Yet, the ability to randomize discounts may compensate for the inability to commit. Third, help-and-haggle as an all-or-nothing scheme is more cost-effective in social reach than a reward-per-referral program that offers consumers a cash reward for each successful referral. However, using the prospect of a free product to attract referrals cannibalizes product sales, potentially causing help-and-haggle to fall short. Yet, if consumers differ in both product valuation and referral cost, help-and-haggle can outperform the reward-per-referral program.



Chunlin Sun, *Stanford University,* chunlin@stanford.edu
Session: :4:00PM-5:30PM, 09/08/2023 @ KCR114
Title: **Maximum Optimality Margin: A Unified Approach for Contextual Linear Programming and Inverse Linear Programming**
Abstract: In this work, we study the predict-then-optimize problem where the output of a machine learning prediction task is used as the input of some downstream optimization problem, say, the objective coefficient vector of a linear program. The problem is also known as predictive analytics or contextual linear programming. The existing approaches largely suffer from either (i) optimization intractability (a non-convex objective function)/statistical inefficiency (a suboptimal generalization bound) or (ii) requiring strong condition(s) such as no constraint or loss calibration. We develop a new approach to the problem called maximum optimality margin which designs the machine learning loss function by the optimality condition of the downstream optimization. The max-margin formulation enjoys both computational efficiency and good theoretical properties for the learning procedure. More importantly, our new approach only needs the observations of the optimal solution in the training data rather than the objective function, which makes it a

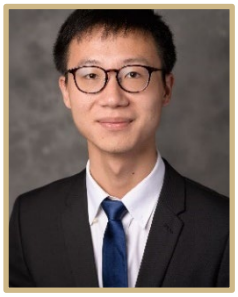
new and natural approach to the inverse linear programming problem under both contextual and context-free settings; we also analyze the proposed method under both offline and online settings, and demonstrate its performance using numerical experiments.

***Jingwen Tang**, Michigan University,* tjingwen@umich.edu
Session: :4:00PM-5:30PM, 09/08/2023 @ KCR108
Title: **Offline Feature-Based Pricing under Censored Demand: A Causal Inference Approach**
Abstract: We study a feature-based pricing problem with demand censoring in an offline data-driven setting. In this problem, a firm is endowed with a finite amount of inventory, and faces a random demand that is dependent on the offered price and the covariates (from products, customers, or both). Any unsatisfied demand that exceeds the inventory level is lost and unobservable. The firm does not know the demand function but has access to an offline dataset consisting of quadruplets of historical covariates, inventory, price, and potentially censored sales quantity. Our objective is to use the offline dataset to find the optimal feature-based pricing rule so as to maximize the expected profit. Through the lens of causal inference, we propose a novel data-driven algorithm that is motivated by survival analysis and doubly robust estimation. We derive a finite sample regret bound to justify the proposed offline learning algorithm and prove its robustness. Extensive numerical experiments demonstrate the robust performance of our proposed algorithm in accurately estimating optimal prices on both training and testing data. Furthermore, these experiments highlight the value of considering demand censoring in the context of feature-based pricing.

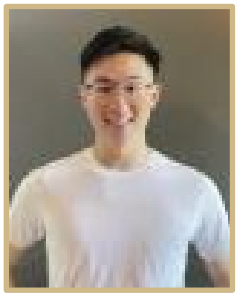
***Jiannan Xu,** University of Maryland,* jiannan@umd.edu
Session: 4:00PM-5:30PM, 09/09/2023 @ RAWL2070
Title: **Assortment Personalization in a Clothing Rental Subscription Model**
Abstract: This paper focuses on a clothing rental subscription model where customers can rent clothes from a personalized closet of designer brands. We incorporate “ex-post” information, i.e. whether the customer renewed their subscription or not, in the construction of the recommendation algorithm. Clothing is a product category where “trying on” the product, i.e., ascertaining fit not only from objective data about product features but also from how it looks and feels to a customer upon receipt, is highly relevant to customer satisfaction and retention. We formulate this problem as a bilevel optimization problem and provide lower bounds and upper bounds for the objective function, making it significantly easier to solve. We derive insights on how subscription service providers can optimize the contents of a subscription box to maximize the expected lifetime revenue from each customer.

***Zexing Xu,** University of Illinois Urbana-Champaign,* zexingx2@illinois.edu
Session: 10:30AM-12:00PM, 09/09/2023 @ RAWL2082
Title: **Personalized Pricing with Group Fairness Constraint**
Abstract: In the realm of big data, the advent of personalized pricing, which customizes prices based on customer characteristics, has raised concerns over fairness due to potential price bias. This study explores the concept of personalized pricing under the lens of fairness constraints for diverse customer groups. We establish group fairness constraints utilizing multiple distance metrics and translate the challenge into a stochastic optimization model designed to maximize revenue. This model is then simplified to a linear program for efficiency in determining the optimal pricing policy, and we provide theoretical analysis for the difference in revenue between discrete and continuous pricing scenarios. Additionally, we expand fairness to cover aspects such as demand, consumer surplus, and nonpurchasing valuation. Interestingly, we prove the inability to concurrently satisfy multiple fairness constraints. An analysis of a seller's profit-driven pricing strategy under these constraints offers insight into their impact on revenue, social welfare, the Gini Index, and consumer surplus. Under a linear demand model with specific regularizing conditions, price fairness is found to augment social welfare and consumer surplus, while fairness in demand or consumer surplus consistently decreases social welfare. Non-purchasing valuation fairness, however, consistently boosts social welfare. Finally, empirical evaluations substantiate our approach's superiority over baseline methods using synthetic and real-world datasets. Our findings also provide managerial implications for seMng an appropriate fairness degree and selecting an optimal discrete price set size.

Chonghuan Wang, *Massachusetts Institute of Technology,* **chwang9**@mit.edu
Session: 10:30AM-12:00AM, 09/09/2023 @ RAWL2058
Title: **Multi-armed bandit experimental design: online decision-making and adaptive inference**
Abstract: Multi-armed bandit has been well-known for its efficiency in online decision-making in terms of minimizing the loss of the participants' welfare during experiments (i.e., the regret). In clinical trials and many other scenarios, the statistical power of inferring the treatment effects (i.e., the gaps between the mean outcomes of different arms) is also crucial. Nevertheless, minimizing the regret entails harming the statistical power of estimating the treatment effect, since the observations from some arms can be limited. In this paper, we investigate the tradeoff between efficiency and tatistical power by casting the multi-armed bandit experimental design into a minimax multi-objective optimization problem. We introduce the concept of Pareto optimality to mathematically characterize the situation in which neither the statistical power nor the efficiency can be improved without degrading the other. We derive a useful sufficient and necessary condition for the Pareto optimal solutions to the minimax multiobjective optimization problem. Additionally, we design an effective Pareto optimal multiarmed bandit experiment that can be tailored to different levels of the trade-off between the two objectives. Moreover, we extend the design and analysis to the setting where the outcome of each arm consists of an adversarial baseline reward and a stochastic treatment effect, demonstrating the robustness of our design. Finally, motivated by clinical trials, we examine the setting where the employed experiment must split the experimental units into a small number of batches propose a flexible Pareto optimal design.



Jian Wu, *Purdue University,* wu1549@purdue.edu
Session: 4:00PM-5:30PM, 09/09/2023 @ RAWL2082
Title: **Contextual Data-Integrated Newsvendor Solution with Operational Data Analytics (ODA)**
Abstract: We analyze the inventory decision for an unknown demand that may be learned from historical data of the demand and related covariates. We apply the operational data analytics (ODA) framework to formulate the data-integration model and the validation model. The data-integration model features a class of decision rules, called operational statistics, with certain desired properties. The operational statistics directly maps data to decisions. The validation model seeks to validate the operational statistics using the true demand or its close proxy obtained by bootstrapping. In a parametric model, the uniform optimality of the ODA solution is established. In a nonparametric model, we improve the performance of existing solutions using the idea of sequential boosting, which leads to a consistent ODA solution. Through extensive numerical experiments, our proposed ODA solution demonstrates superior performance compared with existing approaches in the literature especially with a small sample size.



Zhuoli Yin, *Purdue University,* yin195@purdue.edu
Session: 4:00PM-5:30PM, 09/09/2023 @ RAWL2082
Title: **DeepBike: A Deep Reinforcement Learning Based Model for Large-scale Online Bike Share Rebalancing**
Abstract: Bike share systems (BSSs), as a potentially environment-friendly mobility mode, are being deployed globally. BSSs in top ridership cities have expanded to having more than 500 stations. To address spatially and temporally imbalanced bike and dock demands, BSS operators need to redistribute bikes among stations using a fleet of rebalancing vehicles. Existing studies mainly generate BSS rebalancing solutions from mixed-integer programming (MIP) algorithms or heuristic methods. However, the existing algorithms are only designed for and evaluated on small-scale BSSs or subsets of BSSs (less than 300 stations), while deploying small-size rebalancing fleets (less than five vehicles). How to produce online rebalancing solutions for large-scale BSS with multiple rebalancing vehicles to minimize customer loss is important for system operation yet remains unsolved. To address this gap, we proposed a deep reinforcement learning based model — DeepBike — that trains a designed deep Q-network (DQN) to learn the optimal strategy for dynamic bike share rebalancing. DeepBike uses real-time states of rebalancing vehicles and stations, and predicted demands as inputs to output the long-term quality values of rebalancing actions of each rebalancing vehicle. Rebalancing vehicles could work asynchronously as they solve the DQN separately. Then, we built a simulator to compare the performances of different approaches for dynamic bike share rebalancing. The simulator is based on historical trip records from Divvy BSS in Chicago, which possesses more than 500 stations and 16 rebalancing vehicles. The evaluation results show that our proposed DeepBike model was able to be[er reduce customer loss by 111.09% and 57.6% than the MIP and heuristic-based models, respectively, and increased overall net profits by 101.26% and 220.01%, respectively. The DeepBike model is effective for large-scale dynamic bike share rebalancing problems and has the potential to improve the operation of shared mobility systems.

Chengcheng Zhai, *Indiana University,* zhaic@iu.edu
Session: 10:30AM-12:00PM, 09/09/2023 @ RAWL2058
Title: **Keep water Flowing: the Hidden Crisis of Rural Water Management**
Abstract: In rural areas of sub-Saharan Africa (SSA), people rely on communal handpumps for clean drinking water. But these handpumps break down frequently. Thus, it is crucial to proactively maintain and reactively repair these handpumps to ensure continuing access to water. Nongovernmental organizations (NGOs) face the challenge of implementing an effective maintenance program, which includes scheduling mechanic visits to service water points to minimize water point downtime and the associated logistics cost, collecting handpump functionality information, and choosing their logistical approach of being proactive or reactive. We first conducted field research in Ethiopia and Malawi to understand the context and problem of water maintenance. We then collected 56,344 water point functionality observations from NGOs implementing water point maintenance programs in the Central African Republic, Ethiopia, and Malawi. Lastly, we develop a Markov decision process that determines the optimal schedule for NGO mechanics to visit water points. We apply the optimization model to data from the three countries to identify the gap between practice and optimality, while exercising two heuristic policies (cyclic and responsive) observed in practice. The optimization model reduces water point downtime by as little as 19.3% in Ethiopia and as much as 49.8% in Malawi, at a minor increase in logistics cost, if any. The responsive (cyclic) heuristic policy is more effective when repair demand is low (high). The availability of functionality information is more valuable in reducing downtime and logistics cost when the NGO is less financially constrained. Our results challenge the prevailing belief among NGOs that preventive maintenance is excessively costly. We recommend NGOs incorporate preventive maintenance in their programs. We also recommend resource constrained NGOs invest in increasing water point reliability and reducing major repair costs before expanding functionality information collection.

Haofeng Zhang, *Columbia University,* hz2553@columbia.edu
Session: 4:00PM-5:30PM, 09/08/2023 @ KCR114
Title: **Estimate-Then-Optimize versus Integrated-Estimation-Optimization versus Sample Average Approximation: A Stochastic Dominance Perspective**
Abstract: In data-driven stochastic optimization, model parameters of the underlying distribution need to be estimated from data in addition to the optimization task. Recent literature considers integrating the estimation and optimization processes by selecting model parameters that lead to the best empirical objective performance. This integrated approach, which we call integrated-estimation-optimization (IEO), can be readily shown to outperform simple estimate then- optimize (ETO) when the model is mis specified. In this paper, we show that a reverse behavior appears when the model class is well-specified and there is sufficient data. Specifically, for a general class of nonlinear stochastic optimization problems, we show that simple ETO outperforms IEO asymptotically when the model class covers the ground truth, in the strong sense of stochastic dominance of the regret. Namely, the entire distribution of the regret, not only its mean or other moments, is always better for ETO compared to IEO. Our results also apply to constrained, contextual optimization problems where the decision depends on observed features. Whenever applicable, we also demonstrate how standard sample average approximation (SAA) performs the worst when the model class is well-specified in terms of regret, and best when it is mis specified. Finally, we provide an experimental study.

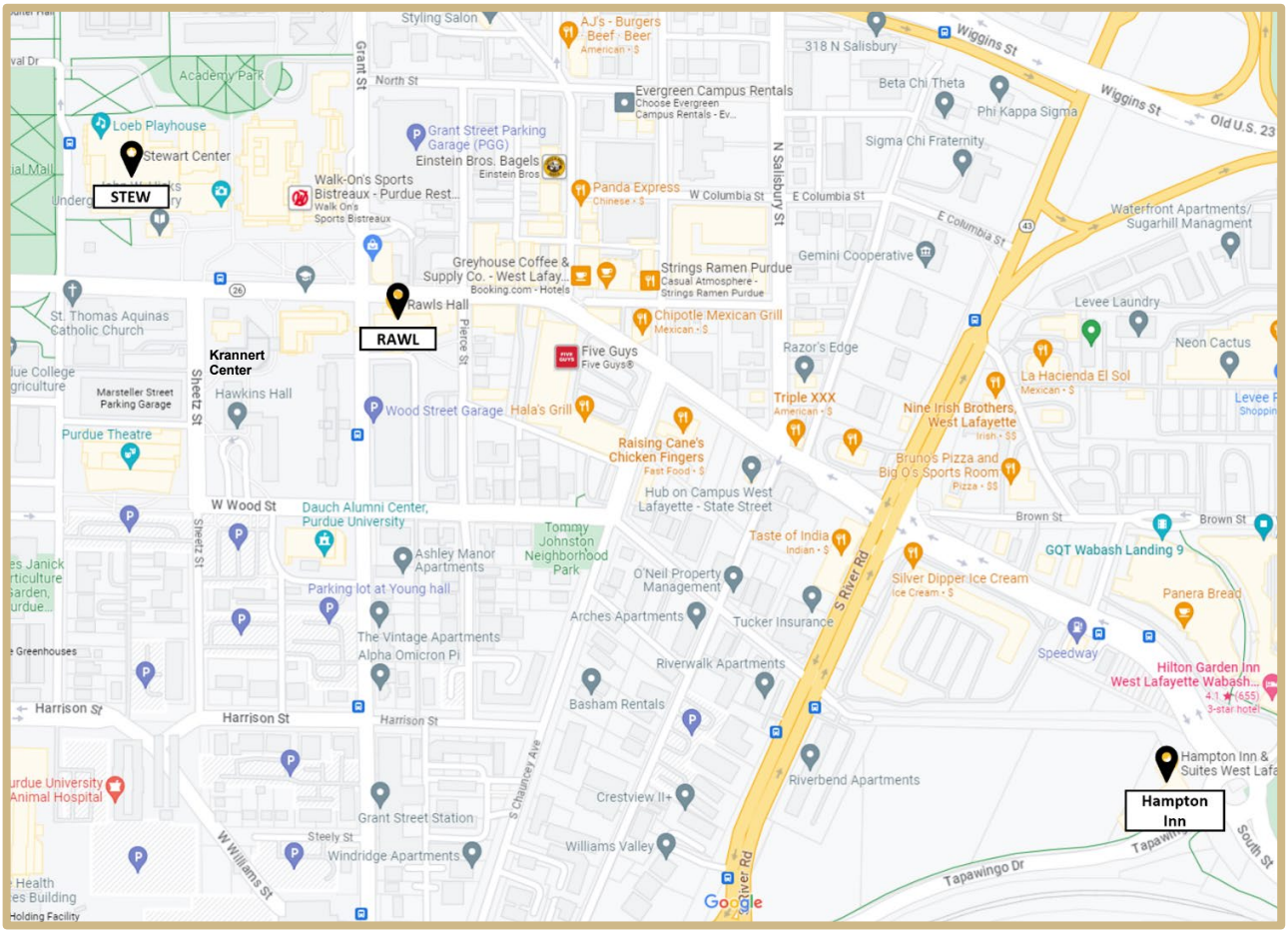
Feng Zhu, *Massachusetts Institute of Technology*, fengzhu@mit.edu
Session: 4:00PM-5:30PM, 09/08/2023 @ KCR108
Regret Distribution in Stochastic Bandits: Optimal Interplay between Expectation and Tail Risk
Abstract: We study the trade-off between expectation and tail risk for regret distribution in the stochastic multi-armed bandit problem. We fully characterize the interplay among three properties for policy design: worst-case optimality, instance-dependent consistency, and light-tailed risk. We show how the order of expected regret affects the decaying rate of regret tail probability for both the worst-case and instance-dependent scenario. Simple and novel policies are proposed to characterize the optimal regret tail probability for any regret threshold. Moreover, we discover an intrinsic gap of the optimal regret tail rate under the instance-dependent scenario depending on whether the time horizon is known a priori or not. Interestingly, when it comes to the worst-case scenario, this gap disappears. Finally, we extend our policy designs to the stochastic linear bandit setting. Our results reveal insights on the trade-off between regret expectation and tail risk for both worst-case and instance-dependent scenarios, indicating that more sub-optimality and inconsistency leave space for more light-tailed risk of incurring a large regret, and that knowing the planning horizon in advance can make a difference on alleviating tail risks.

Conference Schedule

day	Time	Location	Event (Steward Center[i])		
9/7	6:00PM-8:00PM	Hampton Inn	**Welcome reception**		
9/8	8:00AM-8:30AM		Registration & Refreshments		
	8:30AM-9:00AM	Stew 202	Opening Remark Dean James B. Bullard and Senior Associate Dean Lin Nan		
	9:00AM-10:30AM	Stew 202	Speakers: Peng Sun (Duke), George Shanthikumar (Purdue) Session chair: Gokce Esenduran		
	10:30AM-10:45AM	Coffee Break			
	10:45AM-12:15PM	Stew 202	Speakers: Baris Ata (Chicago), Karen Zheng (MIT) Session chair: Annabelle Feng (Purdue)		
	12:15PM-2:00PM	Lunch (Krannert Center)			
	2:00PM-3:30PM	Krannert Center 108/114/124	Rodney Parker (IU) Jian Yang (Rutgers) William Haskell (Purdue) *Chair: William Haskell*	Hong Wan (NSCU) Cathy Xia (OSU) Kyle Harshbarger (Dow) *Chair: Pengyu Qian*	Fei Gao (IU) Xiaoyang Long (WISC) Natalie Huang (UMN) *Chair: Gokce Esenduran*
	3:30PM-4:00PM	Coffee Break			
	4:00PM-5:30PM	Krannert Center 108/114/124	Student Session Shukai Li (Northwestern) Jingwen Tang (Michigan) Feng Zhu (MIT) *Chair: William Haskell*	Student Session Yongchun Li (GA Tech) Chunlin Sun (Stanford) Haofeng Zhang (Columbia) *Chair: Pengyu Qian*	Student Session Yishen Cai (WashU/Miami) Yanting Li (Rochester) Zhengbo Liang (Purdue) *Chair: Gokce Esenduran*
	6:00PM-8:00PM	Dinner			
9/9	8:00AM-8:30AM	Refreshments (Rawls Hall)			
	8:30AM-10:00AM	Rawls 2058/2070/2082	Qiong Wang (UIUC) Linwei Xin (Chicago) Jinglong Zhao (BU) *Chair: Annabelle Feng*	Shouqiang Wang (UTD) Chen-An Lin (Purdue) Rachel Chen (UC Davis) *Chair: Chen-An Lin*	Ashish Kabra (Maryland) Basak Kalkanci (GA Tech) Telesilla Kotsi (OSU) *Chair: Gokce Esenduran*
	10:00AM-10:30AM	Coffee Break			
	10:30AM-12:00PM	Rawls 2058/2070/2082	Student Session Li Ding (GA Tech) Chengcheng Zhai (IU) Chonghuan Wang (MIT) *Chair: Annabelle Feng*	Student Session Shikha Safaya (GA Tech) Yasaman Asayesh (UMN) Zhen Shao (USTC) *Chair: Chen-An Lin*	Student Session Nan Jiang (GA Tech) Mo Liu (UCB) Zexing Xu (UIUC) *Chair: Pengyu Qian*
	12:00PM-2:00PM	Lunch Break (Rawls 2011)			
	2:00PM-3:30PM	Rawls 2058/2070/2082	Xuying Zhao(TX A&M) Yuqian Xu (UNC) Pengyi Shi (Purdue) *Chair: Pengyi Shi*	Andre Calmon (GA Tech) Owen Wu (IU) Can Zhang (Duke) *Chair: Gokce Esenduran*	Sanjith Gopalakrishnan (McGill) Nur Sunar (UNC) Christian Blanco (OSU) *Chair: Suresh Chand*
	3:30PM-4:00PM	Coffee Break			
	4:00PM-5:30PM	Rawls 2058/2070/2082	Student Session Xingyu Bai (UIUC) Buyun Li (IU) Xiaoquan Gao (Purdue) Wei Liu (Purdue) *Chair: Pengyi Shi*	Student Session Jiannan Xu (Maryland) Austin I. Saragih (MIT) Ye Liu (WUSTL) Jianing Li (Purdue) *Chair: Suresh Chand*	Student Session Vishrut Rana (Wharton) Zhuoli Yin (Purdue) Byeongmok Kim (Purdue) Jian Wu (Purdue) *Chair: Chen-An Lin*
	6:00PM-8:00PM	Dinner			
9/10	8:00AM-8:30AM	Refreshments			
	8:30AM-10:45AM	Rawls 1086	Speakers: Sridhar Seshadri (UIUC), Xin Chen (GA Tech), Annabelle Feng (Purdue) Session chair: William Haskell		
	10:45AM-11:15AM	Coffee Break			
	11:15AM-12:00PM	Rawls 1086	Panel Discussion: Xin Chen, Annabelle Feng, Sridhar Seshadri, and George Shanthikumar Closing Remark: Annabelle Feng and Zhan Pang		
	12:00PM-2:00PM	Lunch (Rawls 2011)			

PURDUE UNIVERSITY | Mitchell E. Daniels, Jr. School of Business

Locations & Contacts



Steward Center : 128 Memorial Mall Dr, West Lafayette, IN 47907

Krannert Center : Southeast corner to the intersection of Sheetz Street and State Street

Rawls Hall : 100 S Grant Street

Transportation to Purdue : https://www.purdue.edu/visit/getting-here/index.php

Visitor Parking (Grant St Parking): https://www.purdue.edu/visit/getting-here/parking.php

Hampton Inn West Lafayette : https://www.hilton.com/en/hotels/lafwehx-hampton-suites-west-lafayette/

Purdue campus map : https://www.purdue.edu/campus-map/

*If you need urgent help, please contact Zhan Pang @ 765-701-7866 or Annabelle Feng @ 469-879-3725.