NUS National University of Singapore | 新加坡国立大学重庆研究院 NUS (Chongqing) Research Institute

NUS National University of Singapore | Institute of Operations Research and Analytics

ANALYTICS FOR X 2023

CHONGQING, CHINA

9 - 10 DECEMBER 2023

HOSTED BY

NATIONAL UNIVERSITY OF SINGAPORE (CHONGQING) RESEARCH INSTITUTE

INSTITUTE OF OPERATIONS RESEARCH AND ANALYTICS

Table of Contents

Foreword..... 1

About NUSRI-CQ..... 3

About IORA..... 4

Conference Schedule..... 5

Abstracts for Keynote and Plenary Talks..... 7

Abstracts for Conference Papers..... 11

Organizing Team..... 25

Conference Notice..... 27

Note Page..... 29

Foreword

Dear Participants,

Welcome to the "Analytics for X" Academic Conference 2023! Here, we unite leading minds in supply chain and social good, diving into the latest breakthroughs and innovations. It's more than just a symposium; it's a dynamic forum for enriching and sharing knowledge in operations research, analytics, and industry best practices.

Consider how supply chain and social good have reshaped today's business world. The evolution of supply chains is not just about corporate success; it's a journey towards more efficient, cost-effective, and sustainable operations. Meanwhile, social good pushes us to think beyond profits, towards business practices that positively impact society and our planet.

Picture this conference as a melting pot of ideas, where esteemed scholars worldwide illuminate these critical topics. It's an opportunity not just to learn, but to forge deep connections between academia and industry, sparking innovations that could redefine our future.

Our gratitude goes to our distinguished speakers and diligent organizing committee. Your efforts are the backbone of this conference. To all attendees, we hope this event in the scenic city of Chongqing opens new horizons of knowledge and inspiration for you.

Here's to an enlightening journey together at this conference!

Teo Chung Piaw
Executive Director, Institute of Operations Research and Analytics
National University of Singapore
Director, Center on Modern Logistics
NUS (Chong Qing) Research Institute

Introduction of NUSRI-CQ

NUS (Chongqing) Research Institute ('NUSRI-CQ') was jointly established by the National University of Singapore ('NUS') and the Chongqing Liangjiang New Area Administrative Committee ('LJNAAC') on April 7, 2020.

Leveraging on NUS' excellent research expertise and global resources in a broad spectrum of areas, NUSRI-CQ, the only physical presence of NUS in the western region of China, established R&D platforms in advanced manufacturing and materials, intelligent sensing and AI, modern logistics, as well as finance and financial risk management. NUSRI-CQ also built a deep-tech enterprise platform for technology transfer and commercialization; and an education centre for talents' cultivation and academic exchanges. The development of NUSRI-CQ will be aligned with the theme and directions set for China-Singapore (Chongqing) Demonstration Initiative on Strategic Connectivity by the Singapore and China governments as well as the focuses of Chongqing Liangjiang New Area.

Research Centres

Research Centre	Research Areas
Advanced Manufacturing and Materials	• An integrated platform with multifunctional CAD/CAM/Digital-Twin tools for the hybrid manufacturing process chains • Digital platform of integrated design, manufacturing and end-of-line for product life cycle of high-value products • High-fidelity simulations of physical and chemical processes in advanced manufacturing and materials synthesis/processing • Advanced structural and functional materials, and devices
Intelligent Sensing and AI	• Advanced spin and quantum sensing • Advanced RF sensing • Embedded AI for advanced visual sensing • Advances multimodal data analytics for smart transportation
Modern Logistics	• Strategic Analysis for Building and Improving E-Commerce Supply Chain and Sustainability • Human Behavior, incentive, and Process in Operations • Supply Chain Risk Analytics • Last Mile Operations in Smart City
Finance and Financial Risk Management	• Methods and Applications in Fintech and RegTech • The digital transformation of private and public organizations • Robo-advising, asset allocation and portfolio risk management • Modelling of risk for large portfolios • The Impact of Mobile Payment Technology

Research Team

40 NUS academic staff partially seconded

100 NUSRI-CQ-affiliated PhD students

42 Full-time researchers (Including 22 PhD holders)

NUS National University of Singapore | Institute of Operations Research and Analytics

Introduction of IORA

Established in November 2016, the Institute of Operations Research and Analytics (IORA) conducts cutting-edge research on the optimization, analysis and management of service systems, including model formulation, algorithm design, analysis of service strategies, and software development. As part of the NUS's Smart Nation Research Cluster, IORA works with various partners to develop innovative measures and inventive solutions for real-world issues.

Since its inception, IORA has been steadfast in its core missions:

01 To develop world-class research programs to modernize the practice of Operations Research in this new data-intensive environment.

02 To modernize the teaching and nurture a new generation of PhD students, well versed in the tools and theories in the integration of Data Analytics into Operations Research.

03 To leverage on the combined expertise of NUS faculty in related areas to establish a centre of excellence in the field of Operations Research and Analytics.

The IORA faculty is made up of strong Operations Research and Analytics expertise housed in various departments including computer science, economics, engineering, mathematics, statistics, analytics and operations. Taking a multidisciplinary approach to research, our students learn from faculty members at the forefront of their respective fields. Graduates are trained to be conversant in the new science of data driven analytics, with expertise in Operations Research, Machine Learning and Computational Techniques, capable of discovering new solutions and models to make smart inference from high dimensional and voluminous data.

Conference Schedule

Day 1 – 9th Dec 2023

9:00-9:10	Opening Address Prof Teo Chung Piaw Executive Director, Institute of Operations Research and Analytics National University of Singapore Director, Center on Modern Logistics NUS (Chong Qing) Research Institute
9:10-10:25	Keynote Address Got (optimal) Milk? Pooling Donations in Human Milk Banks with Machine Learning and Optimization Timothy Chan University of Toronto
10:25-10:50	Tea Break
10:50-11:25	Flexible Operations Strategies for Drone Networks with an Application in Emergency Medical Service Ruijiu Mao IORA, National University of Singapore
11:25-12:00	Treatment Planning of Victims with Heterogeneous Time-sensitivities in Mass Casualty Incidents Yunting Shi Shanghai Jiao Tong University
12:00-12:35	Should Firms Promote COVID-19 Vaccination to their Customers? Evidence of Economic Impact from a Natural Experiment in Ridesharing Zhaoyan Liu Department of Analytics and Operations, National University of Singapore
12:35-13:45	Lunch Break
13:45-14:20	Labor Supply Dynamics in the Gig Economy: Participation and Working Time Decision Sixing Hu NUS (Chong Qing) Research Institute
14:20-14:55	An Approximate Dynamic Programming Approach to Order Acceptance Problems for Industrial Internet Platform Jiannan Ke Wuhan University
14:55-15:30	Reliable Supply Network Design under Disruptions with Correlated Uncertainties in Supply, Demand, and Links Yongzhen Li Southeast University
15:30-16:00	Tea Break
16:00-17:00	Plenary Speaker On Targeting and Allocation: Allocation Policy Design in Social Aid Programs Huan Zheng Shanghai Jiao Tong University
18:00 – 20:00	Dinner Reception Qiao Yuan Restaurant (俏园饭店)

Day 2 – 10th Dec 2023

9:10-10:25	Keynote Address (Online): Online Stochastic Optimization with Wasserstein Based Non-stationarity Jiawei Zhang New York University's Leonard N. Stern School of Business
10:25-10:50	Tea Break
10:50-11:25	Robust Supply Chain Network Design Maximizing Matching Size Upon Adversarial Node Deletion Ang Teng Yen Eugene IORA, National University of Singapore
11:25-12:00	Waste Reduction of Perishable Products through Markdowns at Expiry Dates Jinglong Zhao (Online) Boston University
12:00-12:35	Network Design and Service Operations for Heart Transplant under Preservation-Extending Technology Yuhan Miao Southern University of Science and Technology
12:35-13:45	Lunch Break
13:45-14:20	The Impact of Workload on Operational Performance Empirical Evidence from Last-Mile Delivery Yuchen Liang IORA, National University of Singapore
14:20-14:55	A Randomized Controlled Trial of Information Sharing on Cancer Screening Decision: Screening Process Information Matters More Than Clinical Information Xiaodong Wang Singapore Management University
14:55-15:30	Resource Allocation for Food Bank Operations: Achieving Ex-Ante and Ex-Post Fairness Simultaneously Guodong Lyu School of Business and Management, Hong Kong University of Science and Technology
15:30-15:55	Tea Break
15:55-16:30	Multi-Objective Simulation-Optimization for Integrated Automated Storage and Retrieval Systems (AS\/RS) Planning Considering Energy Consumption Zakka Ugih Rizqi (Online) National Taiwan University of Science and Technology
16:30-17:30	Plenary Speaker Capacity Expansion in the Inverse Newsvendor Environment Peiwen Yu Chongqing University
17:30-17:40	Closing address

Abstracts for Keynote and Plenary Talks

Keynote Address: Timothy Chan
Associate Vice-President and Vice Provost
University of Toronto

Title: Got (Optimal) Milk? Pooling Donations in Human Milk Banks with Machine Learning and Optimization

Abstract: *Problem definition*: Human donor milk provides critical nutrition for millions of infants who are born preterm each year. Donor milk is collected, processed, and distributed by milk banks. The macronutrient content of donor milk is directly linked to infant brain development and can vary substantially across donations, which is why multiple donations are typically pooled together to create a final product. Approximately half of all milk banks in North America do not have the resources to measure the macronutrient content of donor milk, which means pooling is done heuristically. For these milk banks, an approach is needed to optimize pooling decisions. *Methodology/results*: We propose a data-driven framework combining machine learning and optimization to predict macronutrient content of donations and then optimally combine them in pools, respectively. In collaboration with our partner milk bank, we collect a data set of milk to train our predictive models. We rigorously simulate milk bank practices to fine-tune our optimization models and evaluate operational scenarios such as changes in donation habits during the COVID-19 pandemic. Finally, we conduct a year-long trial implementation, where we observe the current nurse-led pooling practices followed by our intervention. Pools created by our approach meet clinical macronutrient targets approximately 31% more often than the baseline, although taking 60% less recipe creation time. *Managerial implications*: This is the first paper in the broader blending literature that combines machine learning and optimization. We demonstrate that such pipelines are feasible to implement in a healthcare setting and can yield significant improvements over current practices. Our insights can guide practitioners in any application area seeking to implement machine learning and optimization-based decision support.

Keynote Address: Jiawei Zhang
Professor of Technology, Operations, and Statistics & Michael Armellino Professor in Business
New York University's Leonard N. Stern School of Business

Title: A Primal-Dual Algorithm for Nonstationary Online Stochastic Optimization

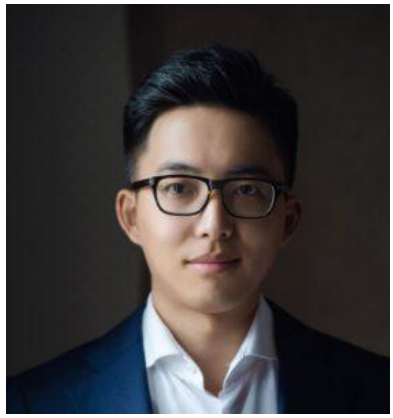
Abstract: We consider a general online stochastic optimization problem with multiple budget constraints over a horizon of finite time periods. In each time period, a reward function and multiple cost functions are revealed, where cost function corresponds to the consumption of one budget constraint, and the decision maker needs to specify an action to collect the reward and consume the budgets. The objective of the decision maker is to maximize the cumulative reward subject to the budget constraints. This formulation captures a wide range of applications including online order fulfillment and network revenue management, among others. The reward function and the cost functions of each time period are drawn from an unknown distribution but a prior estimate, which could be arbitrarily non-stationary and possibly inaccurate, is available. We develop an informative gradient descent algorithm, which takes a primal-dual perspective and integrates the offline prior estimate of the underlying distributions into an online gradient descent procedure in the dual space. We prove that our algorithm achieves a tight regret bound with optimal dependency on the time horizon and on the error of the prior estimate.

Keynote Address: Huan Zheng
Professor, Department Head, Management Science Department
Shanghai Jiao Tong University

Title: On Targeting and Allocation: Allocation Policy Design in Social Assistant Programs

Abstract: Over 2020-2021, 1.39 billion people in 218 countries benefited from 2,349 social assistance programs, that is, one out of six people in the world received social assistance. Despite the great coverage, social assistant programs face several challenges. First, the targeting issue. The exclusion errors of the targeted programs reviewed varied between 44% and 97%, which dampens the effectiveness of these programs. Second, how to effectively and fairly allocate donations to beneficiaries. In this talk, I share recent works on targeting and allocation for Cash Transfer Programs and Food Banks.

Plenary Speaker: Peiwen Yu
Professor, Vice-Dean, School of Economics and Business Administration
Chongqing University



Title: Capacity Expansion in the Inverse Newsvendor Environment

Abstract: In the inverse newsvendor problem, a firm adjusts prices to match uncertain demand with a fixed capacity. Within this context, how can we assess the impact of capacity expansion on revenue? In this paper, we develop a structural approach to address this question. Our method estimates the underlying inverse newsvendor model using historical price and sales data exclusively, and with these estimates, we conduct counterfactual analyses for capacity expansions. Our approach also identifies the firm's "information quality," reflecting its ability to gather demand information. We apply our approach to a budget hotel chain. The counterfactual evidence suggests that the effect of capacity expansion on revenue is more pronounced for hotels experiencing greater demand censoring, but this is not necessarily the case for hotels with higher capacity utilization. The expansion of capacity exhibits diminishing marginal returns, while the improvement in information quality demonstrates increasing marginal benefits. Interestingly, we discover that capacity expansion and information quality improvement complement each other when capacity is low but act as substitutes when capacity is high.

Abstracts for Conference Papers

Flexible Operations Strategies for Drone Networks with an Application in Emergency Medical Service

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Abstract: Drones offer a versatile mode of transport with many strategically important applications, such as Emergency Medical Services (EMS). In light of these applications, we study a drone network design and dispatching problem where a high service level is needed. We first find that under popular modeling assumptions, such as Poisson request arrivals, direct dispatching strategies with a simple distance-based network design is good enough. However, our real-world data indicates that request arrivals often "cluster" together, demanding a significantly higher drone redundancy to maintain a high service level. We find that such inefficiency can be greatly mitigated by flexibility, e.g., allowing each drone to fulfill multiple requests in a trip. For example, just by allowing each drone to fulfill two requests per trip, we can achieve up to a 42.3% reduction in drone requirement, ensuring a response time within a 30-minute mark with a 5% Conditional Value at Risk (CVaR). As such, our insight helps to resolve the tension among efficiency, service level, and management complexity.

Treatment Planning of Victims with Heterogeneous Time-sensitivities in Mass Casualty Incidents

Yunting Shi (Antai College of Economics and Management, Shanghai Jiao Tong University)
Nan Liu (Carroll School of Management, Boston College)
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Abstract: The current emergency response guidelines suggest giving priority of treatment to those victims whose initial health conditions are more critical. While this makes intuitive sense, it does not consider potential deterioration of less critical victims. Deterioration may lead to longer treatment time and irrecoverable health damages, but could be avoided if these victims were to receive care in time. Informed by a unique timestamps dataset of surgeries operated in a field hospital set up in response to a large-scale earthquake, we develop scheduling models to aid treatment planning for mass casualty incidents (MCIs). A distinguishing feature of our modeling framework is to simultaneously consider victim health deterioration and wait-dependent service times in making decisions. We identify conditions under which victims with a less critical initial condition have higher or lower priority than their counterparts in an optimal schedule—the priority order depends on victim deterioration trajectories and the resource (i.e., treatment time) availability. A counterfactual analysis based on our data shows that adopting our model would significantly reduce the surgical makespan and the total numbers of overdue and deteriorated victims compared to using the then-implemented treatment plan; dynamic adjustment of treatment plans (if a second batch of victims arrive) and care coordination among surgical teams could further improve operational efficiency and health outcomes. By demonstrating the value of adopting data-driven approaches in MCI response, our research holds strong potentials to improve emergency response and to inform its policy making.

Should Firms Promote Public Health to their Customers? Evidence of Economic Impact from a Natural Experiment in Ridesharing During the COVID-19 Pandemic

Vivek Choudhary (Nangyang Technological University)
Zhaoyan Liu (National University of Singapore)
Pavel Kireyev (Institut Européen d'Administration des Affaires)

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Abstract: By late 2021, a fraction of the world's population had been vaccinated for COVID-19, and an even smaller fraction had received boosters to combat ever-emerging variants. Governments and firms have invested billions of dollars to encourage first-time and repeat vaccination. While research has shown that nudges by health organizations can increase vaccinations, there is limited evidence of how vaccination nudges by firms affect demand for their services, especially for firms unrelated to the healthcare industry. Furthermore, firms may hesitate to promote vaccination if they view such initiatives as having an ambiguous effect on their business. Partnering with the Middle East's largest ridesharing platform Careem, using a natural experiment and adopting a difference-in-differences (DID) approach to measure the widget's impact on number of trips taking on the platform, we find evidence that nudging customers to vaccinate can have a positive impact on revenues. Without providing financial incentives (e.g., discounts), a simple nudge can generate demand for the platform's services by providing timely information (e.g., closest vaccine centers) and convenience. Analyzing ~4 million customer trips, we found that the nudge led to 3.54-7.67%which translated to ~$50,200-$117,700 in additional weekly revenues for the platform. Our findings can encourage firms to experiment with promoting vaccination to their customers, even if their business is unrelated to healthcare. Our findings also speak more generally to how vaccine-related nudges can be a profitable pro-social strategy in the "world after COVID-19" where vaccination for other types of diseases may be viewed by consumers as a social cause more so than before the pandemic.

Understanding Labor Supply in Gig Economy: Evidence from a Logistics Platform

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Abstract: We provide a detailed examination of labor supply behavior on an e-commerce logistics platform. Specifically, we study the nuanced interplay between daily compensation and labor supply by empirically characterizing the extensive (participation decision) and intensive (working time decision) margins, respectively. Utilizing a unique dataset with predetermined compensation for 'scheduled' jobs, we uncover the compensation offered to nonparticipating agents, thus avoiding many common sources of endogeneity. We employ the Heckman two-stage model with a unique instrumental variable to test the robustness of our findings. Additionally, we investigate the 'intraday' dynamic margins, which entail how compensation changes during different periods of the day affect the labor supply for the remainder of the day. Many of our results confirm the qualitative insights of the seminal work by Camerer on New York Cabdrivers, albeit in a different context and via a more comprehensive methodology. For instance, we find that the intensive margin is negative, primarily towards the end of the day, supporting the interpretation that agents set loose 'income targets'. Conversely, we observe that the extensive margin is positive, meaning higher compensation leads to increased agent participation. This positivity is predominantly seen at the start of the day, suggesting that agents first decide whether to work at all, and then how long to work. When the intensive and extensive margins are combined, the total labor supply correlates positively with compensation. We discuss the prescriptive implications, which potentially diverge from those of Camerer's findings selected.

An Approximate Dynamic Programming Approach to Order Acceptance Problems for Industrial Internet Platform

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Jiannan Ke (Economics and Management School, Wuhan University)

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Abstract: In view of the dynamically arrived customer orders that are composed of diversified products, the industrial Internet platform needs to make decisions on order acceptance to maximize revenues within a given planning horizon. Once the order is accepted, the platform reschedules the production plan by a scheduling optimization model. For each order, different types of products should be delivered to the customer simultaneously. If the delivery time exceeds the due date of the order, the platform has to pay a tardiness cost. To address this problem, we establish a stochastic dynamic programming model, in which the state transitions are determined by the acceptance decisions as well as the scheduling optimization model. The approximate dynamic programming (ADP) approach is employed due to the challenge of the "curse of dimensionality". To deal with a large number of constraints in the resulting approximate linear programs (ALPs), we use a constraint sampling technique with states and actions generated from benchmark policies. A dynamic policy is proposed with parameters solved from the ALPs. In the numerical study, we compare the dynamic policy with two other strategies: profit acceptance (PA) and total delayed acceptance (TDA). Simulation results show that our strategy outperforms PA by 3% to 36% and TDA by 5% to 38%.

Reliable Supply Network Design under Disruptions with Correlated Uncertainties in Supply, Demand, and Links

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Abstract: Disruptive events in supply chains usually lead to uncertainties to the supply side, the demand side, and the links between them. These uncertainties are inherently correlated particularly when the disruptions are caused by natural disasters or systemic threats. This paper studies the supply network design problem under uncertain disruptive events, which can affect the demand side, the supply side (the availability of prepositioned inventory), and the links (the shipment capacities) between supply and demand nodes at the same time. We characterize the disruptive events with an unknown joint distribution, which belongs to an ambiguity set based on the marginal and cross disruption probabilities. The uncertainties across the demand and supply sides and the links between them are characterized by linear functions of disruptive events. A two-stage distributionally robust model is formulated to simultaneously minimize the fixed location-allocation cost, the inventory pre-positioning cost, and the expected transportation cost under the worst-case disruption distribution. To solve this challenging model, we deploy a cutting plane algorithm based on the Benders decomposition, where the separation problem to calculate the worst-case disruption distribution is solved by a column generation approach. We explore two interesting special cases focusing on bottleneck links and bottleneck inventory, respectively. For the first one focusing on bottleneck links with an application in disaster-relief network design, the robust model admits a tractable mixed integer linear programming reformulation. For the second one focusing on bottleneck inventory with an application in sourcing and capacity planning, the robust model is equivalent to a two-stage stochastic model after proving the closed-form worst-case distribution for the second-stage problem. Extensive numerical experiments, including a case study on the Jiuzhaigou earthquake, are conducted to validate the effectiveness and efficiency of the proposed models, reformulations, and algorithms.

Robust Supply Chain Network Design: Maximizing Matching Size With Adversarial Node Deletion

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Abstract: Supply chain disruptions are a major challenge for businesses and economies worldwide, which can arise from natural disasters, geopolitical events, and mali- cious attacks on network structures. Adversarial node deletion is one such shock that negatively affects network connectivity and efficiency. This paper explores the issue of supply chain resilience through network design and graph theory ap- plication. Specifically, we investigate how appropriate graph design can enhance the robustness of supply chain networks, by maximizing its matching size in the residual graph in the face of adversarial node deletion. In brevity, this is a (n, m, k) problem, where n and m are the order and the size of the designed graph G respectively, and k is the number of adversarially deleted nodes.

We find the optimal graph designs G such that the residual graphs G retain the maximum matching size of (n - k)/2. When n and k have the same parity, we show that the optimal graph designs have certain graph properties such as connectedness and a minimum degree of k + 1. When n and k are of different parity, we obtain bounds on the size of the optimal graph G by analyzing disconnected graph designs and reducing the formulation to a discrete convex problem. We show that the size of our disconnected graph constructions is at most twice the size of the optimal graph G. We employ a graph-theoretic approach to design optimal network structures up to their isomorphism classes. To quantify the loss in matching size due to size constraints, we construct corresponding loss curves for fixed n and k. We illustrate how certain graph classes determine the loss thresholds along the curves.

Through our work, we provide a valuable framework for stakeholders to enhance their supply chain networks' robustness and adaptability in an increasingly volatile world.

Waste Reduction of Perishable Products through Markdowns at Expiry Dates

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Hermanus M. Jansen (Department of Engineering, University College Roosevelt)
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Abstract: We study whether giving discounts for perishable products on their expiry dates can simultaneously reduce waste and increase profit. In particular we consider a seller of a single perishable product who daily replenishes inventory up to a certain order-up-to level, and who serves customers whose purchase probabilities both depend on price and on the remaining shelf life of the product. We model the inventory dynamics as a Markovian process and show that the system converges to a steady state. Because the resulting expressions are not amenable for optimization, we then consider a scaling limit in which customer arrivals and order-up-to level grow at the same rate. We prove that the scaled system converges to a deterministic dynamical system, which allows us to derive explicit expressions for waste and profit. In a multinomial-logit demand setting we show that a markdown pricing policy, which gives discounts to the expiring products, reduces waste compared to a fixed price policy. We prove several structural properties, including the perhaps counterintuitive results that markups for products at their expiry date may be optimal, and that optimal markdown prices are not always monotone in the salvage value. We conduct extensive simulations and identify two regimes where markdown pricing leads to more waste reduction: when the salvage value is low, and when the product nearing its expiry date remains almost as appealing as the fresher product. The optimal solution from the scaling limit can serve as starting point in numerical optimization schemes, which can significantly reduce computation time.

Network Design and Service Operations for Heart Transplant under Preservation-Extending Technology

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Abstract : Motivated by the disruptive technology of the Organ Care System (OCS) in extending organ preservation time, we propose an integrated analytical paradigm that jointly supports organ al- location, OCS technology adoption, and service mechanism design. Patients self-select hospitals via a discrete choice model. We consider a setting wherein patients' heterogeneity in urgency is private, and a queueing mechanism approach is used to ensure their incentive-compatible registrations. Through stylized analysis, we identify disparities in prioritization that arise when considering both service and admission aspects, and we also explore the potential occurrence of strategic delays. To estimate patients' characteristics, we employ data analytics using data obtained from the United Network for Organ Sharing (UNOS). Furthermore, we operationalize the integrated model in computational studies based on the estimations derived from the choice model, providing empirical evidence to support our theoretical findings. Our results indicate that the successful implementation of OCS technology has the potential to enhance treatment rates and improve social welfare due to its leverage effect.

Workload Imbalance and Its Implications: Empirical Evidence from Last Mile Delivery

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Guodong Lyu (Department of Information Systems, Business Statistics and Operations Management, Hong Kong University of Science and Technology)
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Abstract: Leveraging a data set of last-mile deliveries from a parcel operator in Singapore, we examine the impact of employees' workload on delivery performance. We find that workload exhibits a U-shape relationship with delivery failure rate. We study moderating factors and subsample analysis. We investigate the workload design problem to balance workload through a workload assignment model that employs various assignment mechanisms. We find that a long-chain mechanism can strike a balance between operational performance and delivery efficiency.

Screening Process Information Matters More Than Clinical Information: A Randomized Controlled Trial of Information Sharing on Cancer Screening Decision

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Abstract: Information sharing is frequently used by policymakers to swing one's decision-making. It is particularly relevant in the healthcare service systems, where sharing "proper" information could induce desired behavior from patients. However, there is no consensus on the effective components of information to share in the literature. This paper focuses on information sharing in the context of cancer screening promotion. Leveraging data collected from a randomized controlled trial specifically related to colorectal cancer, we find that sharing relevant information significantly improves participants' intention to take up screening. More specifically, our findings suggest that sharing information on the screening process significantly improves the screening intention, whereas the effect of sharing clinical information about cancer is insignificant. In addition, sharing information that is already known to participants can generate comparable effectiveness in boosting the screening intention compared to providing new information. We also study heterogeneous responses from subpopulations to different information contents, and identify groups of people to whom sharing new information on the screening process is more effective. Our findings provide actionable insights for healthcare policymakers.

Achieving Ex-Ante and Ex-Post Fairness: Design of Allocation Rules for Mobile Food Pantries

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Abstract: Mobile food pantries (MFPs) have increasingly expanded in recent years to help alleviate world hunger by allocating surplus food to underserved communities that face challenges in accessing conventional food banks. As non-profit programs, MFPs prioritize operational efficiency and minimizing food waste. However, this approach can result in unequal distribution of services among beneficiaries from different communities. To address this issue, we design a sequential food allocation framework that focuses on serving the sequentially revealed demand of each targeted community during the food delivery trip. This framework aims to maximize the expected minimum fill rate across communities (ex-post fairness criteria), while simultaneously meeting the predetermined expected fill rate target (ex-ante fairness requirement) for each community.

We show that this particular type of food allocation problem, constrained by the ex-ante fairness considerations, can be simplified by solving a series of stochastic dynamic programming problems with randomized coefficients in the objective function. The technique of online convex optimization is applied for analysis. Furthermore, we highlight that the optimal solution to the stochastic dynamic problem, under the ex-post fairness maximization criteria, exhibits a two-threshold structure. This structure explicitly reveals the trade-offs between achieving optimal performance in ex-post fairness while ensuring fair food delivery service to all communities in an ex-ante manner. Extensive numerical experiments with both synthetic data and real-world data showcase the promising benefits of our allocation rules over existing benchmarks.

Multi-Objective Simulation-Optimization for Integrated Automated Storage and Retrieval Systems (AS/RS) Planning Considering Energy Consumption

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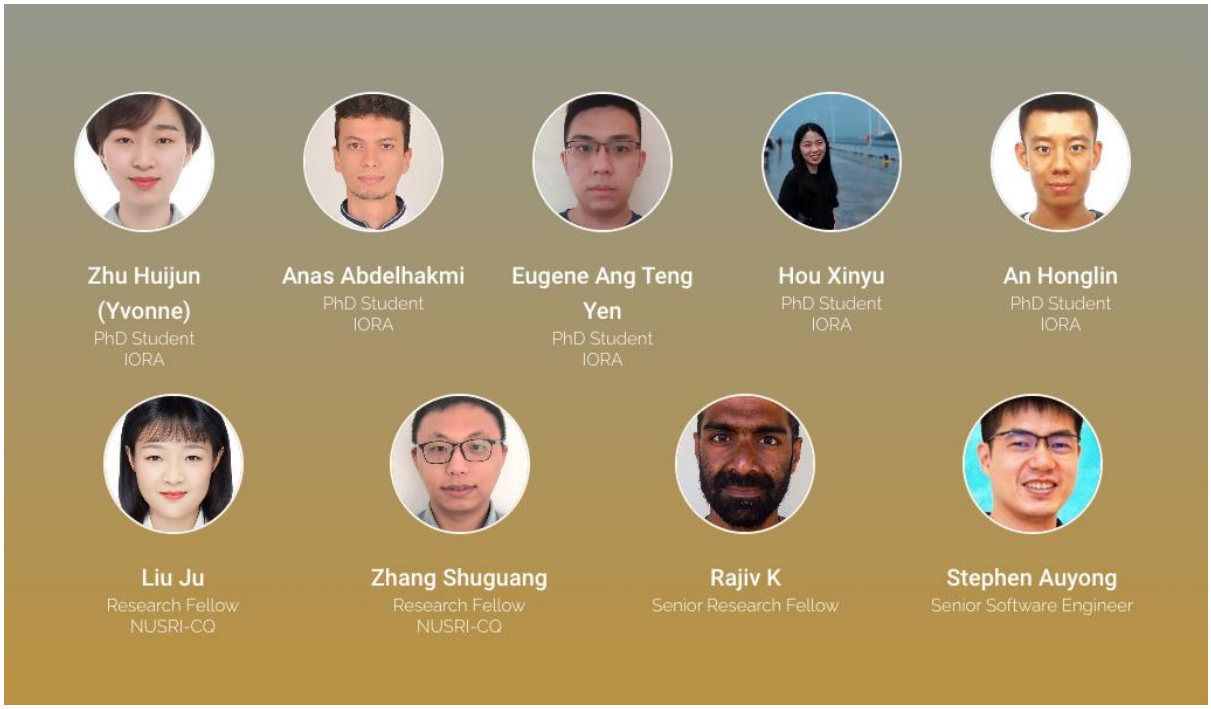
Abstract: An Automated Storage and Retrieval System (AS/RS) is one of the modern technologies in warehouse operation. Despite many advantages offered by AS/RS such as improving accuracy, efficiency, and safety, AS/RS planning is very complex starting from strategical, tactical, to operational level. Performing sequential optimization of AS/RS may result in local optimal solution leading to inefficiency and carbon-intensive operations since AS/RS operates exclusively on electricity. Thus, reaching the optimal combination for all decisions becomes important. However, due to the dynamic complexity as well as uncertainty in supply–demand, it cannot be solved analytically. Therefore, this study introduces a simulation-optimization (SO) framework for integrated AS/RS planning considering 7 decisions at a time. Furthermore, a comprehensive mathematical model for measuring AS/RS energy consumption is formulated. The proposed framework is implemented in China's warehouse company for optimizing multi-objective namely energy consumption and travel time per unit. Non-dominated Sorting Genetic Algorithm II (NSGA-II) is developed as metaheuristic algorithm and discrete-event simulation is modeled based on FlexSim. The results produce pareto front that is further analyzed through clustering algorithm resulting in 4 different clusters with significantly different impacts that provide insightful analysis and managerial implications for AS/RS planning toward green operation.

Organizing Team



Conference Notice

- Conference Dates: December 9, 2023 - December 10, 2023
- Conference Venue:

  Orchid Hall, 1st Floor, National University of Singapore Chongqing Research Institute,
  Building 4, Phase II, Internet Industry Park, No. 2 Huizhu Road, Yubei District, Chongqing

- Accommodation Information:

  Howard Johnson Downtown Hotel

  Address: Building 1, China Huarong Modern Plaza, No. 439 Xinnan Road, Yubei District, Chongqing, Tel: 023-67208888
  Check-in: 2:00 PM, Check-out: 12:00 PM

  Citadines Gaoke Liangjiang Chongqing

  Address: Building 1A, Wealth Park, No. 9 Wealth Avenue, Yubei District, Chongqing, Tel: 023-63368666
  Check-in: 2:00 PM, Check-out: 12:00 PM

- Meal Arrangements:

Date	Style	Restaurant Name	Dining Location	Travel Method
December 9 Lunch	Buffet	Liangjiang Zhihui Restaurant	Building 3, Phase II, Internet Industry Park	260 meters, Walking
December 9 Dinner	Set Menu	Qiao Garden (Longhu MOCO Store)	F2 Donghai Hall, MOCO168-A Pavilion, No. 168 Xinnan Road, Yubei District, Chongqing	Shuttle Bus
December 10 Lunch	Buffet	Liangjiang Zhihui Restaurant	Building 3, Phase II, Internet Industry Park	260 meters, Walking

Note: For lunch buffet on December 9 and December 10, please collect your buffet tickets at the registration desk upon check-in and keep your meal tickets properly.

- Conference Transportation:

Date	Departure Time	Starting Location	Destination	Vehicle Type
December 9	8:10	Howard Johnson Downtown Hotel	Chongqing Research Institute, National University of Singapore	Shuttle Bus
	8:10	Citadines Gaoke Liangjiang Chongqing		Shuttle Bus
	17:20	Chongqing Research Institute, National University of Singapore	Qiao Garden (Longhu MOCO Store)	Shuttle Bus
	20:00	Qiao Garden (Longhu MOCO Store)	Xingletin Apartment Hotel	Shuttle Bus
December 10	8:10	Howard Johnson Downtown Hotel	Chongqing Research Institute, National University of Singapore	Shuttle Bus
	8:10	Citadines Gaoke Liangjiang Chongqing		Shuttle Bus

Note:

1. If you miss the departure time, please proceed to conference venue on your own.
2. Attendees driving themselves can park at the reserved parking spots in front of the National University of Singapore Chongqing Research Institute's gate.
3. For inquiries: Zhang Shuguang 15215152295, Zhong Junjie 17784457822

Note Page