Ruihao Zhu

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Academic Position

Purdue Krannert School of Management
Assistant Professor of Supply Chain and Operations Management, 2021-now

Education

Massachusetts Institute of Technology
Interdisciplinary Ph.D. in Statistics, 2021

University of Michigan, Ann Arbor
B.Eng. in Computer Science and Engineering, 2015

Professional Experience

Amazon Supply Chain Optimization Technologies
Research Intern, 2020

Google Research
Research Intern, 2019

Research Interests

My research seeks to develop efficient and robust data-driven solutions for e-commerce, digital experimentation, supply chain analytics, and retailing using tools from statistical learning, reinforcement learning, game theory, and optimization. Most recently, I have been focusing on

1. Sequential prediction (*e.g.*, demand forecast) and decision-making (*e.g.*, recommendation, pricing, and inventory control) in dynamically changing environments
2. Cost-effective experimentation for off-policy evaluation and transfer learning

As part of it, I have been working closely with different companies, such as Amazon and AB InBev.

Awards

Honorable Mention, INFORMS George E. Nicholson 2019 Student Paper Competition
Finalist, POMS-JD.com 2019 Best Data-Driven Research Paper Competition
Finalist, INFORMS Service Science Section 2021 Best Cluster Paper Award
Semi-Finalist (Winner TBD), INFORMS Innovative Applications in Analytics Award 2022

Recent Working Paper

Safe Optimal Design with Applications in Policy Learning
R. Zhu and B. Kveton
– In collaboration with Amazon Science
– Preliminary version appeared in AISTATS 2022 and MIT 2021 Conference on Digital Experimentation (CODE@MIT)

Fueling Sales Analytics amid Pandemic with Machine Learning
D. Simchi-Levi, M. Wu, R. Zhu, T. Gui, and I. Montenegro
In preparation for ***Harvard Business Review***

Journal Papers

Non-Stationary Reinforcement Learning: The Blessing of (More) Optimism
W. C. Cheung, D. Simchi-Levi, and R. Zhu
Management Science (Accepted subject to Minor Revision)

– Preliminary version appeared in ICML 2020

Hedging the Drift: Learning to Optimize under Non-Stationarity
W. C. Cheung, D. Simchi-Levi, and R. Zhu
Management Science (2021)
– *Honorable Mention*, INFORMS George E. Nicholson 2019 Student Paper Competition
– *Finalist*, POMS-JD.com 2019 Best Data-Driven Research Paper Competition
– *Service Operations SIG Meeting*, MSOM 2019
– Preliminary version appeared in AISTATS 2019

Meta-Dynamic Pricing: Transfer Learning Across Experiments
H. Bastani, D. Simchi-Levi, and R. Zhu
Management Science (2021)
– *Spotlighted Track*, INFORMS 2019 RM&P

Under Revision & Review

Calibrating Sales Forecast in a Pandemic Using Competitive Online Non-Parametric Regression
D. Simchi-Levi, R. Sun, M. Wu, and R. Zhu
Major Revision, ***Management Science***
– In collaboration with AB InBev, successfully reduce sales forecast error by over 35% in AB InBev's four top markets during 2021 Q1 (January to March). See **here** for a reference from AB InBev
– *Finalist*, INFORMS Service Science Section 2021 Best Cluster Paper Award
– *Semi-Finalist* (Winner TBD), INFORMS Innovative Applications in Analytics Award 2022
– *Supply Chain Management SIG Meeting*, MSOM 2021
– Preliminary version appeared (as oral presentation) in KDD 2021 Workshop on Machine Learning for Consumers and Markets

Model-Free Non-Stationary RL: Near-Optimal Regret and Applications in Multi-Agent RL and Inventory Control
W. Mao, K. Zhang, R. Zhu, D. Simchi-Levi, and T. Basar
Under Review, ***Management Science***
– Preliminary version appeared in ICML 2021

Learning to Route Efficiently with End-to-End Feedback: The Value of (Identifiable) Networked Structures
R. Zhu and E. Modiano

Conference Paper

Safe Optimal Design with Applications in Policy Learning
R. Zhu and B. Kveton
Proceedings of the 25^{th} *International Conference on Artificial Intelligence and Statistics* (***AISTATS 2022***)

Near-Optimal Model-Free Reinforcement Learning in Non-Stationary Episodic MDPs
W. Mao, K. Zhang, R. Zhu, D. Simchi-Levi, and T. Basar
Proceedings of the 38^{th} *International Conference on Machine Learning* (***ICML 2021***)

Reinforcement Learning for Non-Stationary Markov Decision Processes: The Blessing of (More) Optimism
W. C. Cheung, D. Simchi-Levi, and R. Zhu
Proceedings of the 37^{th} *International Conference on Machine Learning* (***ICML 2020***)

Learning to Optimize Under Non-Stationarity
W. C. Cheung, D. Simchi-Levi, and R. Zhu
Proceedings of the 22^{nd} *International Conference on Artificial Intelligence and Statistics* (***AISTATS 2019***)

Coresets for Differentially Private K-means Clustering and Applications to Privacy in Mobile Sensor Networks
D. Feldman, C. Xiang, R. Zhu, and D. Rus
Proceedings of the 26^{th} *ACM/IEEE International Conference on Information Processing in Sensor Networks* (***IPSN 2017***)

Threshold Bandits, With and Without Censored Feedback
J. Abernethy, K. Amin, and R. Zhu
Advances in Neural Information Processing Systems 29 (***NIPS 2016***)

Differentially Private and Strategy-Proof Spectrum Auction with Approximate Revenue Maximization
R. Zhu and K. G. Shin
Proceedings of the 2015 IEEE International Conference on Computer Communications (***INFOCOM 2015***)

Differentially Private Spectrum Auction Mechanism with Approximate Revenue Maximization
R. Zhu, Z. Li, F. Wu, K. G. Shin, and G. Chen
Proceedings of the 15^{th} *ACM International Symposium on Mobile Ad Hoc Networking and Computing* (***MobiHoc 2014***)

STAMP: A Strategy-Proof Auction Mechanism for Spatially Reusable Items
R. Zhu, F. Wu, and G. Chen
Proceedings of the 2013 IEEE Global Communications Conference (***GLOBECOM 2013***)

SAFE: A Strategy-Proof Auction Mechanism for Multi-Radio, Multi-Channel Spectrum Allocation
R. Zhu, F. Wu, and G. Chen
Proceedings of International Conference on Wireless Algorithms, Systems, and Applications (***WASA 2013***)

Teaching

Purdue MGMT36100 Operations Management
Instructor, 2021
– Enrollment: 135, undergraduate core class
– Rating: 4.56/5.0

MIT 1.266 Supply Chain and Demand Analytics
Teaching Assistant, 2021
– Enrollment: 25 (primarily MBA, Master of Supply Chain Management, and Leaders for Global Operations students)

MIT 1.267 Statistical Learning in Operations
Teaching Assistant, 2020 - 2021
– Enrollment: 15 (primarily PhD students)

MIT 15.774 The Analytics of Operations Management
Teaching Assistant, 2019

– Enrollment: 61 (primarily MBA, Master of Business Analytics, Supply Chain Management, and Leaders for Global Operations students)
– Rating: 6.0/7.0

Invited Talks

NYU Leonard N. Stern School of Business, Operations Management (2021)
MSOM, Supply Chain Management SIG (2021)
Wharton School of UPenn, Guest Lecture (2021)
Fidelity Investments, Artificial Intelligence Center (2021)
UC Berkeley, Risk Analytics & Data Analysis Group (2021)
UNC Kenan-Flagler Business School, Operations (2021)
UBC Sauder School of Business, Operations and Logistics (2021)
Purdue Krannert School of Management, Supply Chain & Operations Management (2021)
Cornell University, Operations Research and Information Engineering (2021)
Boston College Carroll School of Management, Business Analytics (2020)
Wisconsin School of Business, Operations and Information Management (2020)
UC Berkeley Haas School of Business, Operations and IT Management (2020)
Amazon Research, Forecasting Team Bandit Workshop (2020)
Kellogg-Wharton OM Workshop (2020)
MIT Data Science Lab Workshop on Learning and Optimizing in Operations (2019)
UC Berkeley, Department of Industrial Engineering and Operations Research (2019)
Google AI, Modeling Decisions for Activity-based, Temporal, and Sequential Data (2019)
MSOM, Service Management SIG (2019)
INFORMS RM&P Section Conference, Spotlight Session (2019)
NYU Leonard N. Stern School of Business, Operations Management (2019)
NUS Institute of Operations Research and Analytics (2018)
Harvard John A. Paulson School of Engineering and Applied Sciences, Economics and Computer Science (2017)

Professional Service

Journal Reviewer for *Management Science, Operations Research, M&SOM, Math. of OR, POM, Journal of Machine Learning Research (JMLR), IEEE Journal on Selected Areas in Information Theory (JSAIT)*

Conference Reviewer for *MSOM Service Operations SIG 2020-21, International Conference on Machine Learning (ICML) 2020-2021, Conference on Neural Information Processing Systems (NeurIPS) 2019-2021, International Conference on Algorithmic Learning Theory (ALT) 2019*

Coordinator of MIT Data Science Lab seminar series (2019-2021)