Zhaonan Qu

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Current Academic Employment

Postdoctoral Research Scientist **2024–**
Data Science Institute, Columbia University
Mentors: Agostino Capponi, Simon Lee

Research Interests

I am broadly interested in topics at the intersections of Econometrics, Machine Learning, Operations Research, and Data Science, including Causal Inference, Optimization, Choice Modeling, and Networks. I leverage novel connections and interactions among these topics to develop statistical frameworks and algorithmic solutions motivated by important practical challenges in fields ranging from online marketplaces to transportation networks.

Education

Ph.D in Economics, Stanford University **2017–2024**
Specialization: Econometrics, Operations Research
Dissertation: *Topics in Econometrics and Optimization*
Advisors: Guido Imbens, Yinyu Ye
Committee: Alfred Galichon, Han Hong, Johan Ugander

M.A. in Mathematics, Courant Institute, New York University **2015–2017**
Advisor: Alfred Galichon

A.B. in Mathematics, Princeton University **2011–2015**
Advisors: Elliott H. Lieb, Elias M. Stein

Current Research

Distributionally Robust Instrumental Variables Estimation
Working Paper (2024)
Kwon, Yongchan and Zhaonan Qu

A Bias-Variance Trade-off Framework for Data with Non-negative Outcomes
Working Paper (2024)
Capponi, Agostino and Zhaonan Qu

Causal Analysis of Bail Policy Reforms
In Preparation (2024)
Harvey, Anna, Zhaonan Qu, and Orion Taylor

Doubly Weighted Causal Panel Estimators
In Preparation (2024)
Athey, Susan, Guido Imbens, Zhaonan Qu, and Davide Viviano

Publications and Preprints

Distributionally Robust Instrumental Variables Estimation
Working Paper (2024)
Qu, Zhaonan and Yongchan Kwon
arXiv:2410.15634

A Bias-Variance Trade-off Framework for Data with Non-negative Outcomes
Working Paper (2024)
Capponi, Agostino and Zhaonan Qu

On Sinkhorn's Algorithm and Choice Modeling
Under Revision at *Operations Research* (2023)
Qu, Zhaonan, Alfred Galichon, and Johan Ugander
arXiv:2310.00260

Inferring Dynamic Networks from Marginals with Iterative Proportional Fitting
41st International Conference on Machine Learning (ICML) (2024)
Chang, Serina, Frederic Koehler, Zhaonan Qu, Jure Leskovec, and Johan Ugander
arXiv:2402.18697

Optimal Diagonal Preconditioning
Operations Research (2024)
Qu, Zhaonan, Wenzhi Gao, Oliver Hinder, Yinyu Ye, and Zhengyuan Zhou
arXiv:2209.00809

Computationally Efficient Estimation of Large Probit Models
Under Review at *Journal of Econometrics* (2024)
Ding, Patrick, Guido Imbens, Zhaonan Qu, and Yinyu Ye
arXiv:2407.09371

Scalable Approximate Optimal Diagonal Preconditioning
Revise & Resubmit at *SIAM Journal on Matrix Analysis and Applications* (2023)
Gao, Wenzhi, Zhaonan Qu, Madeleine Udell, and Yinyu Ye
arXiv:2312.15594

Semiparametric Estimation of Treatment Effects in Observational Studies with Heterogeneous Partial Interference
Under Revision at *Journal of Business & Economic Statistics* (2022)
Qu, Zhaonan, Ruoxuan Xiong, Jizhou Liu, and Guido Imbens
arXiv:2107.12420

A Unified Linear Speedup Analysis of Federated Averaging and Nesterov FedAvg
Journal of Artificial Intelligence Research 78: 1143-1200 (2023) [code]
Qu, Zhaonan, Kaixiang Lin, Zhaojian Li, Jiayu Zhou, and Zhengyuan Zhou
arXiv:2007.05690

Inferring Networks from Marginals Using Iterative Proportional Fitting
The Second Learning on Graphs Conference (2023)
Chang, Serina, Zhaonan Qu, Jure Leskovec, and Johan Ugander

Growth Independent Morphometric Machine Learning Workflow for Single-Cell Antimicrobial Susceptibility Testing of Klebsiella pneumoniae to Meropenem
Frontiers in Imaging (2024)
Tjandra, Kristel C., Nikhil Ram-Mohan, Manuel Roshardt, Elizabeth Zudock, Zhaonan Qu, Kathleen E. Mach, Okyaz Eminaga, Joseph C. Liao, Samuel Yang, Pak Kin Wong
bioRxiv:2022.11.03.515093

Federated Learning's Blessing: Fedavg has Linear Speedup
ICLR 2021 Workshop on Distributed and Private Machine Learning (DPML) (2021)
Qu, Zhaonan, Kaixiang Lin, Zhaojian Li, and Jiayu Zhou

Ensemble Methods for Causal Effects in Panel Data Settings
American Economic Association Papers and Proceedings 109: 65-70 (2019)
Athey, Susan, Mohsen Bayati, Guido Imbens, and Zhaonan Qu
arXiv:1903.10079

Other Academic Writings

Identifying Causal Components in Medical Imaging Data for Disease Outcomes (2021) [code] [report]
Interpretable Personalization via Policy Learning with Linear Decision Boundaries by Qu, Zhaonan, Isabella Qian, and Zhengyuan Zhou (2020)

Demand Prediction of Bike Share Systems (2018) [code] [report]

Rating Inflation and Fairness on the Yelp Platform (2017) [report]

Appendices G and J to "The Dynamics of Inequality" by Gabaix, Xavier, Jean-Michel Lasry, Pierre-Louis Lions, and Benjamin Moll *Econometrica 84.6 (2016): 2071-2111.*

Quantum Entanglement of Fermions Undergraduate Thesis (2015) [paper]

Towards a Lithium Radiative/Vapor-Box Divertor by Goldston, Robert, Marius Constantin, and Zhaonan Qu *APS*

Division of Plasma Physics Meeting Abstracts. Vol. 2014.

Teaching

MS&E 311 Optimization (Prof. Yinyu Ye), Stanford Winter 2021
ECON 292 Quantitative Methods for Empirical Research (Prof. Guido Imbens), Stanford Autumn 2020
Preparation Sessions for Qualifying Exams, NYU 2016

Invited Presentations and Poster Sessions

INFORMS 2024 Annual Meeting Session on Financial Analytics and Technology	October 2024
Yinyu Ye Retirement Celebration	July 2024
2024 American Causal Inference Conference Session on Instrumental Variables	May 2024
2024 Banff Research Center Workshop on Optimal Transport and Distributional Robustness	March 2024
INFORMS 2023 Annual Meeting Session on Econometric, Big Data Methods and Applications to Finance	October 2023
INFORMS 2023 Annual Meeting Poster Session on Operations Research and Optimization Methodologies	October 2023
2023 Stanford Data Science Conference Poster Session	May 2023
2022 North American Summer Meeting of the Econometric Society	June 2022
2022 American Causal Inference Conference Poster Session	May 2022
2022 California Econometrics Conference Poster Session	May 2022
INFORMS 2020 Annual Meeting Session on Stochastic Optimization (virtual)	November 2020

Research Affiliations, Honors, and Awards

Arnold Ventures Research Fellowship in Jail Data Initiative Social Science Research Council	2024–2026
Postdoctoral Research Assistant Professor Johan Ugander's Lab	2023–2024
Stanford Interdisciplinary Graduate Fellowship Stanford University	2019–2022
Provost's Global Research Initiative Fellowship, New York University	2016
Magna Cum Laude in Mathematics and Phi Beta Kappa, Princeton University	2015
Smith-Newton Scholar, Princeton Environmental Institute	2013

Peer Review Services

Journal of Econometrics, Journal of Scientific Computing, Journal of Artificial Intelligence Research

Industry Experiences

Microsoft Research New England, Research Data Science Intern
Robustness and Causal Inference — *June 2021–Sept 2021*

Internship project at Microsoft Research New England. Implemented causal inference methods for testing the impact of email campaigns on the subscription of Microsoft 365 membership, and researched theoretical frameworks for robust causal inference using distributionally robust optimization.

Uber, Data Science Intern
Personalized Tipping Suggestions based on Trip Quality — *June 2020–Sept 2020*

Internship project at Uber's Driver Incentives Team. Analyzed potential impacts of quality-based tipping suggestions on improving ride quality and driver income. Designed and implemented a contextual bandit algorithm on Uber's Michelangelo machine learning platform that serves personalized tipping suggestions after a trip completes in real time based on trip quality features. Product was tested in cities across the U.S.

Cruise, Data Scientist Intern
Learning Causal Bayesian Networks through Knockoffs — *June 2019–Sept 2019*

Internship project at Cruise (now GM's autonomous vehicles arm). Designed and implemented a statistical decision making system in Python that applied the knockoff method to select causal stack-level variables relevant to specific types of near-accidents experienced by an autonomous vehicle. Also curated the near-accident type classification dataset combining multiple sources of data on Google BigQuery and PostgreSQL.

Programming Languages

Python, MATLAB, SQL, R