HAOYU LIU

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EDUCATION

Ph.D. in Operations Research, University of California, Berkeley *2023-current*

Bachelor of Economics, Peking University *2018-2022*

B.S. in Mathematics, Peking University *2018-2022*

RESEARCH AREAS

Controllable Generative AI, Diffusion Models, Large Language Models, LLM Agent, Optimization, Stochastic Modeling, A/B Tests, Experiment Design, Economic Theory, Inference Efficiency

SKILLS

Programming Languages: Python, C/C++
Deep Learning Frameworks: PyTorch, Tensorflow
Data Systems: SQL

PROFESSIONAL EXPERIENCE

Optiver *Sep 2022 - Jul 2023*
Quantitative Researcher (full-time)

- Developed medium-frequency trading and execution strategies for convertible bonds, leveraging advanced machine learning tools for data-driven decision-making.
- Designed and implemented a system for stock index and ETF trading, integrating extensive data analysis to optimize performance and enhance trading efficiency.

Shanghai Aizeer Information Technology Co., Ltd. *May 2024 - Aug 2024*
Software Development Intern

- Developed a real-time driving state recognition algorithm based on iPhone sensors data.
  - The algorithm serves as a core part of **BeatsDrive**, an app that interactively transforms driving behaviors into musical elements.
- Developed a generative AI model for controllable symbolic music generation that serves as potential music library for the app.

JOURNAL PUBLICATIONS

1. **Learning to Simulate Sequentially Generated Data via Neural Networks and Wasserstein Training** (with Tingyu Zhu and Zeyu Zheng)
   ACM Transactions on Modeling and Computer Simulation 33.3 (2023), pp. 1-34.
2. **On the Concavity of Consumption Function under Habit Formation** (with Lun Li)
   Journal of Mathematical Economics 106 (2023), p. 102829.

CONFERENCE PROCEEDINGS

1. **Efficient Fine-Grained Guidance for Diffusion-Based Symbolic Music Generation**
   H. Liu†, T. Zhu†, Z. Wang, Z. Jiang, Z. Zheng (co-first author)
   Accepted by *International Conference on Machine Learning (ICML) 2025*

2. **Large Language Model Assisted Experiment Design with Generative Human-Behavior Agents** (2024)
   H. Liu, Y. Tang, Z. Zhang, Z. Zheng, T. Zhu (in alphabetical order)
   Proceedings of 57th Winter Simulation Conference (WSC), 2024

PREPRINTS AND WORKING PAPERS

1. **IDA-Bench: Evaluating LLMs on Interactive Guided Data Analysis**
   H. Li†, H. Liu†, T. Zhu†, T. Guo†, Z. Zheng, X. Deng, M. Jordan (co-first author)
   Available at arXiv preprint https://arxiv.org/abs/2505.18223

2. **Learning to Generate Heavy-tailed Conditional Distribution via Diffusion Model**
   H. Liu†, T. Zhu†, J. He, Z. Zheng (co-first author)
   Presented at *2024 INFORMS Annual Meeting*
   Available at SSRN: https://ssrn.com/abstract=4975931

3. **Structured Diffusion Models with Mixture of Gaussians as Prior Distribution**
   N. Jia, T. Zhu, H. Liu, Z. Zheng
   Available at arXiv preprint https://arxiv.org/abs/2410.19149

AWARDS

- IEOR First Year Faculty Fellowship *2024*
- First Prize in National Mathematics Competition (top 1% in Beijing) *2019 and 2020*
- National Scholarship (the highest honor scholarship of college students in China) *2021*
- May 4th Scholarship (the highest honor scholarship of Peking University) *2019 and 2020*
- First Place in the "Challenge Cup" Competition of Peking University (the most authoritative and influential student academic competition) *2019 and 2020*
- Academic Innovation Award (outstanding academic performance) *2021*
- Merit student Pacesetter (the highest honor individual award, for outstanding comprehensive performance in academic, social work, volunteer service, cultural activities and sports) *2020*
- Fengqi Scholarship (outstanding academic performance in Finance and Economics) *2020*

TEACHING EXPERIENCES

Teaching Assistant, University of California, Berkeley
INDENG 115, Industrial and Commercial Data Systems *Fall 2024*

- Topic: Relational algebra, SQL, normalization, with an emphasis on industrial and commercial applications.

Teaching Assistant, Peking University
Microeconomics *Spring 2022*

- Topic: Classical price theory (consumer choice, producer theory and market equilibrium analysis), market failure (externality and public goods), as well as some recent exciting developments in game theory and information economics.