Yulai Zhao

Homepage Google Scholar DBLP ORCID Semantic Scholar ResearchGate GitHub LinkedIn

yulaiz@princeton.edu

Research Interests

Reinforcement Learning, ML for Science

Education

Princeton University, Department of Electrical and Computer Engineering 2022 - Present

- Ph.D. in Machine Learning
- Advisor: S. Y. Kung

Princeton University, Department of Electrical and Computer Engineering 2022 - 2024

- M.A. in Electrical and Computer Engineering
- Advisor: S. Y. Kung

Tsinghua University, Department of Electronic Engineering 2018 - 2022

- B.Eng. in Electronic Information Science and Technology
- Advisors: Simon S. Du, Hongwei Chen

Research Internships

Magnit Global @ Genentech Sept 2024 - Dec 2024

- Machine Learning Scientist
- Employed by Magnit Global to conduct research at Genentech.
- Develop novel generative models for protein/RNA design to contribute to the drug discovery process.
- Mentors: Gabriele Scalia, Ehsan Hajiramezanali, Masatoshi Uehara

Genentech — BRAID (Biology Research | AI Development) May 2024 - Aug 2024

- Intern - Fundamental ML and Generative AI, DELTA Lab
- Affiliated to gRED (Research & Early Development) Computational Science.
- Worked on diffusion models specifically tailored for DNA/RNA sequences.
- Mentors: Ehsan Hajiramezanali, Masatoshi Uehara

Publications

* denotes equal contribution or alphabetical ordering.

Conference Proceedings

1. **Adding Conditional Control to Diffusion Models with Reinforcement Learning**
   Yulai Zhao*, Masatoshi Uehara*, Gabriele Scalia, Sunyuan Kung, Tommaso Biancalani, Sergey Levine, Ehsan Hajiramezanali
   International Conference on Learning Representations (ICLR) 2025
2. **Bridging Model-Based Optimization and Generative Modeling via Conservative Fine-Tuning of Diffusion Models**
   Masatoshi Uehara*, **Yulai Zhao***, Ehsan Hajiramezanali, Gabriele Scalia, Gökcen Eraslan, Avantika Lal, Sergey Levine, Tommaso Biancalani
   Conference on Neural Information Processing Systems (NeurIPS) 2024
3. **Feedback Efficient Online Fine-Tuning of Diffusion Models**
   Masatoshi Uehara*, **Yulai Zhao***, Kevin Black, Ehsan Hajiramezanali, Gabriele Scalia, Nathaniel Lee Diamant, Alex M Tseng, Sergey Levine, Tommaso Biancalani
   International Conference on Machine Learning (ICML) 2024

4. **Provably Efficient CVaR RL in Low-rank MDPs**
   Yulai Zhao*, Wenhao Zhan*, Xiaoyan Hu*, Ho-fung Leung, Farzan Farnia, Wen Sun, Jason D. Lee
   International Conference on Learning Representations (ICLR) 2024
5. **Local Optimization Achieves Global Optimality in Multi-Agent Reinforcement Learning**
   Yulai Zhao, Zhuoran Yang, Zhaoran Wang, Jason D. Lee
   International Conference on Machine Learning (ICML) 2023
6. **Blessing of Class Diversity in Pre-training**
   Yulai Zhao, Jianshu Chen, Simon S. Du
   International Conference on Artificial Intelligence and Statistics (AISTATS) 2023
   (Oral presentation & notable paper, 2% acceptance rate)
7. **Provably Efficient Policy Gradient Methods for Two-Player Zero-Sum Markov Games**
   Yulai Zhao, Yuandong Tian, Jason D. Lee, Simon S. Du
   International Conference on Artificial Intelligence and Statistics (AISTATS) 2022

Working Papers

1. **Reward-Guided Iterative Refinement in Diffusion Models at Test-Time with Applications to Protein and DNA Design**
   Masatoshi Uehara, Xingyu Su, **Yulai Zhao**, Xiner Li, Aviv Regev, Shuiwang Ji, Sergey Levine, Tommaso Biancalani
   arXiv preprint
2. **Inference-Time Alignment in Diffusion Models with Reward-Guided Generation: Tutorial and Review**
   Masatoshi Uehara, **Yulai Zhao**, Chenyu Wang, Xiner Li, Aviv Regev, Sergey Levine, Tommaso Biancalani
   arXiv preprint
3. **Derivative-Free Guidance in Continuous and Discrete Diffusion Models with Soft Value-Based Decoding**
   Xiner Li, **Yulai Zhao**, Chenyu Wang, Gabriele Scalia, Gokcen Eraslan, Surag Nair, Tommaso Biancalani, Shuiwang Ji, Aviv Regev, Sergey Levine, Masatoshi Uehara
   arXiv preprint
4. **Understanding Reinforcement Learning-Based Fine-Tuning of Diffusion Models: A Tutorial and Review**
   Masatoshi Uehara*, **Yulai Zhao***, Tommaso Biancalani, Sergey Levine
   arXiv preprint
5. **Fine-Tuning of Continuous-Time Diffusion Models as Entropy-Regularized Control**
   Masatoshi Uehara*, **Yulai Zhao***, Kevin Black, Ehsan Hajiramezanali, Gabriele Scalia, Nathaniel Lee Diamant, Alex M Tseng, Tommaso Biancalani, Sergey Levine
   arXiv preprint
6. **Optimizing the Performative Risk under Weak Convexity Assumptions**
   Yulai Zhao
   NeurIPS 2022 Workshop on Optimization for Machine Learning

Awards/Honors

International Conference on Artificial Intelligence and Statistics (AISTATS) Notable Paper *2023*

Scholarship of Academic Excellence *2019,2020*
Awarded to Tsinghua students ranking top 5 %.

Toyota Scholarship *2019*
Awarded to the department's top 3 out of 260+ students.

Top 10 in the *Infinity of Math* Competition *2018*
Awarded to students outperforming 150+ participants in the school-wide calculus contest.

Programming and Computing Skills

- Proficient: Python (NumPy, PyTorch, pandas)
- Intermediate: MATLAB, C/C++, Kdb+