

YULAI ZHAO

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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. **Reward-Guided Refinement in Diffusion Models With Applications to Protein and DNA Design**

Masatoshi Uehara, Xingyu Su, **Yulai Zhao**, Xiner Li, Aviv Regev, Shuiwang Ji, Sergey Levine, Tommaso Biancalani

International Conference on Machine Learning (ICML) 2025

2. **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

3. **Bridging Model-Based Optimization and Generative Modeling via Conservative Fine-Tuning of Diffusion Models**

Masatoshi Uehara*, **Yulai Zhao***, Ehsan Hajiramezanali, Gabriele Scalia, Gökçen Eraslan, Avantika Lal, Sergey Levine, Tommaso Biancalani

Conference on Neural Information Processing Systems (NeurIPS) 2024

4. **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
5. **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
6. **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
7. **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)
8. **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. **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
2. **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
3. **Understanding Reinforcement Learning-Based Fine-Tuning of Diffusion Models: A Tutorial and Review**
Masatoshi Uehara*, **Yulai Zhao***, Tommaso Biancalani, Sergey Levine
arXiv preprint
4. **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
5. **Optimizing the Performative Risk under Weak Convexity Assumptions**
Yulai Zhao
NeurIPS 2022 Workshop on Optimization for Machine Learning

AWARDS/HONORS

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|---|------------------|
| International Conference on Artificial Intelligence and Statistics (AISTATS) Notable Paper | <i>2023</i> |
| Scholarship of Academic Excellence | <i>2019,2020</i> |
| Awarded to Tsinghua students ranking top 5 %. | |
| Toyota Scholarship | <i>2019</i> |
| Awarded to the department's top 3 out of 260+ students. | |
| Top 10 in the <i>Infinity of Math</i> Competition | <i>2018</i> |
| Awarded to students outperforming 150+ participants in the school-wide calculus contest. | |

PROGRAMMING AND COMPUTING SKILLS

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