# Yulai Zhao

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yulaiz@princeton.edu


## Research Interests

Reinforcement Learning, Diffusion Models, LLMs

## 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

**Tencent AI Lab** May 2025 - Aug 2025

- Research Intern - Language Intelligence Research Group
- Identified systematic vulnerabilities in LLM-based reward models to superficial responses and developed a data augmentation strategy to enhance their robustness.
- Mentors: Dian Yu, Dong Yu

**Magnit Global @ Genentech** Sept 2024 - Dec 2024

- Machine Learning Scientist
- Employed by Magnit Global to conduct research at Genentech.
- Developed 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

- Research 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. **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
   *Conference on Neural Information Processing Systems (NeurIPS) 2025*
2. **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*

3. **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*
4. **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*
5. **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*
6. **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*
7. **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*
8. **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)
9. **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. **Every Question Has Its Own Value: Reinforcement Learning with Explicit Human Values**
   Dian Yu, **Yulai Zhao**, Kishan Panaganti, Linfeng Song, Haitao Mi, Dong Yu
   *arXiv preprint*
2. **One Token to Fool LLM-as-a-Judge**
   **Yulai Zhao**, Haolin Liu, Dian Yu, Sunyuan Kung, Meijia Chen, Haitao Mi, Dong Yu
   *NeurIPS 2025 Workshop on Mathematical Reasoning and AI*
3. **Iterative Distillation for Reward-Guided Fine-Tuning of Diffusion Models in Biomolecular Design**
   Xingyu Su, Xiner Li, Masatoshi Uehara, Sunwoo Kim, **Yulai Zhao**, Gabriele Scalia, Ehsan Hajiramezanali, Tommaso Biancalani, Degui Zhi, Shuiwang Ji
   *arXiv preprint*
4. **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*
5. **Understanding Reinforcement Learning-Based Fine-Tuning of Diffusion Models: A Tutorial and Review**
   Masatoshi Uehara*, **Yulai Zhao***, Tommaso Biancalani, Sergey Levine
   *arXiv preprint*
6. **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*
7. **Optimizing the Performative Risk under Weak Convexity Assumptions**
   **Yulai Zhao**

## 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+