

Zekai Zhang

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Education

Ph.D., Department of EECS, University of Michigan 09/2024 – 05/2029 (anticipated)

- **Advisor:** Qing Qu **Fellowship:** MICDE Fellowship
- **Research interests:** Generative models, representation learning, effective theory

B.Eng., Department of Automation, Tsinghua University 09/2020 – 06/2024

- **Collaborators:** Qing Qu, Li Yi **Honor:** Chinese National Scholarship (Top 1%)
- **Background:** Machine learning, computational methods, control theory

Selected Publications (* indicates equal contribution)

First-Author

- **Zekai Zhang***, Xiao Li*, Xiang Li, Lianghe Shi, Meng Wu, Molei Tao, and Qing Qu, “Generalization of Diffusion Models Arises with a Balanced Representation Space,” **ICLR 2026**; DeepMath 2025 **Oral** [link]
- Xiao Li*, **Zekai Zhang***, Xiang Li, Siyi Chen, Zhihui Zhu, Peng Wang, and Qing Qu, “Understanding Representation Dynamics of Diffusion Models via Low-Dimensional Modeling,” **NeurIPS 2025** [link]
- Soo Min Kwon*, **Zekai Zhang***, Dogyoon Song, Laura Balzano, and Qing Qu, “Efficient Compression of Over-parameterized Deep Models through Low-Dimensional Learning Dynamics,” **AISTATS 2024** [link]

Co-Authored

- Xiao Li*, Yixuan Jia*, **Zekai Zhang**, Xiang Li, Lianghe Shi, Jinxin Zhou, Zhihui Zhu, Liyue Shen, and Qing Qu, “Evaluating the Representation Space of Diffusion Models via Self-Supervised Principles,” **ICML 2026** [link]
- Lianghe Shi*, Meng Wu*, Huijie Zhang, **Zekai Zhang**, Molei Tao, and Qing Qu, “A Closer Look at Model Collapse: From a Generalization-to-Memorization Perspective,” **NeurIPS 2025 Spotlight** [link]
- Peng Wang, Huijie Zhang, **Zekai Zhang**, Siyi Chen, Yi Ma, and Qing Qu, “Breaking the Curse of Dimensionality: Diffusion Models Efficiently Learn Low-Dimensional Distributions,” **JMLR 2026** [link]

Experience

Representation Learning for Diffusion Language Models 12/2025 – present

Collaborators: TikTok, Prof. Qing Qu (UMich ECE)

- Design encoders for continuous Diffusion Language Models, which apply latent diffusion on text embeddings. Mitigate the discrimination-generation tradeoff, outperform autoregressive counterparts.
- Explore unifying text and image generation with diffusion modeling.

Generalization and Representation Learning in Diffusion Models 07/2024 – present

Collaborators: Prof. Qing Qu (UMich ECE) and Prof. Molei Tao (GaTech Math)

- Study why diffusion models generate novel images from finite training data: networks are biased toward learning data structure, forming internal representations for them, and composing those to generate.
- Enhance representations to improve generalization; locate memorizing representations for privacy.

Efficient Low-Dimensional Training and Compression of Deep Models 07/2023 – 09/2024

Collaborators: Prof. Qing Qu and Prof. Laura Balzano (UMich ECE)

- Used low-dimensional priors (low-rank, sparsity) to compress networks.
- Compressed deep layers of Vision Transformers for classification; extended the analysis toward generative models.

Honors

- ICML 2026 Silver Reviewer 05/2026
- DeepMath 2025 **Oral** 11/2025
- ICML 2025 Top Reviewer 05/2025

Skills

Programming: Python (PyTorch, JAX), C/C++, MATLAB (ordered by proficiency)

Mathematics: Numerical analysis, measure theory, abstract algebra

Reviewer Experience: NeurIPS, ICLR, ICML, TMLR