Qiao Sun

(+86) 17317700890 / (+1) 6172568632

sqa24@mit.edu
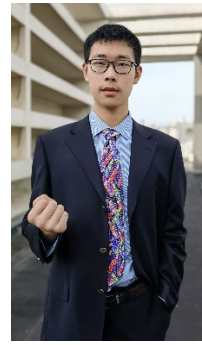
EDUCATION

2024.09-Present	Massachusetts Institute of Technology	Undergraduate

- Double major in AI and Mathematics (Expected Graduation Year: 2028), GPA: 5.00/5.00

2023.09-2024.07	Tsinghua University	Pre-college

- Institute for Interdisciplinary Information Sciences, GPA: 4.00/4.00

RESEARCH EXPERIENCE

2024.09-Present	Undergraduate Research	Professor: Kaiming He

- Work as a UROP student at Prof. He's computer vision group
- Work as a team with Hanhong, Zhicheng, Xianbang and Yiyang, under direct supervision by Prof. He
- Research focus: Mostly **Generative models** (Diffusion-based models, Normalizing Flows, etc.) Our team is also investigating **multimodal models (vision-language understanding + T2I generation)**, with the hope to unify understanding and generation.
- All research is conducted based on **TPUs** with **JAX**. Also have extensive experience with GPU and PyTorch development.

Is Noise Conditioning Necessary for Denoising Generative Models? (ICML poster 2025, first author)

- Challenge common wisdom and revisit the necessity of noise conditioning in Diffusion & Flow Matching
- Reimplement 8 denoising generative models on different datasets and test their performance w/o noise conditioning
- Present uEDM, a noise-unconditional diffusion model, achieving comparable performance with previous SOTA
- Theoretical analysis that matches experiment results, explaining why noise conditioning is not necessary
- Removal of noise conditioning paves the way for new chances for classic methods (e.g. energy-based models)

Bidirectional Normalizing Flow: From Data to Noise and Back (project lead & first author)

- Revisit Normalizing Flows (NFs), one of the oldest yet principled generative modeling framework
- Use a learned inverse to eliminate the need of calculating explicit inverse flow, which eliminates slow auto-regressive inference, and enables architectural flexibility together with single-evaluation (1-NFE) NF-based generation
- Different from distillation, we guide the reverse learning by aligning middle representations. The performance of learned reverse model is no longer limited by pretrained forward model.
- Our BiFlow yields state-of-the-art results among NF-based methods and competitive performance among single-evaluation ("1-NFE") methods. It represents a significant advancement in NFs, demonstrating that direct and efficient generation can coexist with high fidelity.

One-step Latent-free Image Generation with Pixel Mean Flows (first author)

- Diffusion-based models often rely on iterative sampling; modern diffusions operate in latent space of pretrained tokenizer
- These approaches, though effective, deviates from the end-to-end spirit of deep learning
- We set a strong baseline for fastforward (1-NFE) and pixel-space generative modeling, via MeanFlow with x-prediction
- 2.22 FID on ImageNet 256, and 2.48 FID on ImageNet 512
- Open-source codebase: Lyy-iiis/pMF: Official Implementation of pMF

SKILLS

- Programming skills: Prominent in C and python; expert in **PyTorch** and **JAX**
- Language: English (fluent), Mandarin (native)

COURSE PROJECTS

Fast Humanoid Loco-Manipulation via Flow Matching (Robotics Manipulation)

- Video available at MIT 6.4210 Project Video: Fast Humanoid Loco-Manipulation via Flow Matching
- Get hands-on experience on robotics with simulation
- We re-implement the work BeyondMimic, which leverages Diffusion models to model state-action trajectory for control
- Pipeline overview: data preparation via trained motion tracking; diffusion training; post-hoc control tasks through guidance
- We use a better alternative for DDPM: Flow Matching, and show that FM can work with lower latency (5 steps vs 20-50 steps reported in original paper). Moreover, we incorporate guidance into FM and complete manipulation tasks.

CERTIFICATES AND HONORS

2024	2nd place in 2024 Putnam Mathematical Competition
2023	Gold Medal & 11th Place in 2023 International Mathematics Olympiad
2022	Gold Medal & 1st Place with Perfect Score in 2022 Chinese Mathematics Olympiad
2022&2023&2024	Excellent Award in Alibaba Global Mathematics Competition, Top 70 out of 50,000+ participants