Yitong Qiu (仇羿彤)

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Education

University of Science and Technology of China, Hefei, Anhui, China 09/2022 – 07/2026

B.S. in Probability and Statistics, Hua Loo-Keng Talent Program in Mathematics
Overall GPA: 3.98/4.3, Major GPA: 4.09/4.3, Overall rank: 6/93

Selected Core Courses

Probability Theory, 95/100; Advanced Probability Theory (Graduate), 100/100; Functional Analysis, 95/100; Real Analysis (Honor), 95/100; Stochastic Process (Graduate), 95/100; Algebraic Graph Theory (Graduate), 98/100.

Research Interests

Theoretical Machine Learning, Diffusion Models,and Reinforcement Learning.

Research Projects

Memorization and Generalization Behavior of Diffusion Models 07/2025 - Present

Supervisor: Molei Tao (Gatech)

- Conducted early-stage experiments revealing spatial preferences in diffusion model generalization, guiding rigorous theoretical analysis of inductive bias and generalization error
- Developed a novel fixed-dimensional analytical framework using gradient flow expectations, combining generalized Mehler's formula with asymptotic Hermite analysis, and used low-rank matrix approximation for the expectations involved in the gradient flow and completed numerical validation, proving the effectiveness of the theory.
- Derived the difference between forward and backward processes under arbitrary test functions theoretically, and studied memorization and generalization in diffusion models through combined theoretical analysis and numerical experiments.

Invariant Measure of High-Dimensional Stochastic Differential Equations 09/2024 - Present

Supervisor: Jianliang Zhai (USTC)

- Conducted literature review on stochastic dynamical systems and extended large-deviation theorems to more complicated systems using quasipotential for metastability analysis.
- Developed a constructive method for high-dimensional stochastic differential equations with locally Lipschitz coefficients, introducing multi-stage control via shifted Legendre polynomials to connect nearby states.
- Proved quasipotential continuity under local Lipschitz conditions—far beyond classical bounded-coefficient restrictions in Freidlin-Wentzell Theory—and are preparing a manuscript.

Unsupervised Learning Based on Diffusion Models 03/2024 - 06/2025

Supervisor: Jianbin Tan (Postdoc, Duke University), Yukang Jiang (Postdoc, UNC), Xueqin Wang (USTC)

- Reviewed stochastic differential equations and their use in diffusion models, deriving theoretical insights for generative and probabilistic frameworks.
- Implemented Python programs to reproduce studies and integrate diffusion models with dimensionality reduction, proposing frameworks combining diffusion and distribution matching.
- Proposed a theoretical noise design framework to accelerate reverse sampling convergence in diffusion models for Gaussian mixture datasets, and validated through numerical experiments.

Skills

- **Programming Languages:** LaTeX, Python, Pytorch, C, R
- **TOEFL:** 101 (R29, L27, S21, W24)

AWARDS

- Meritorious Winner (Top 10%), Interdisciplinary Contest in Modeling (ICM) — Feb. 2025
- Excellent Teaching Assistant Award, USTC — Fall 2024
- Outstanding Student Scholarship (Second-Class), USTC (Top 10%) — Oct. 2024
- Alibaba Global Mathematics Competition, Finalist (Global Rank 109) — Jun. 2024
- Silver Medal (2nd Place Overall), "Jiuzhang Cup" University Mathematics Competition — Apr. 2024
- Jianghuai-NIO Automotive Scholarship (Top 10%) — Oct. 2023
- Hua Loo-Keng Elite Mathematics Program Scholarship (Top 10%) — Oct. 2023, Oct. 2024, Oct. 2025

EXTRACURRICULAR

Teaching Assistant in Course "Linear Algebra (B1)" — Fall 2024 & Fall 2025

- Taught lectures and tutorials for 260 undergraduate students, developed LaTeX-based supplementary materials to support independent learning.
- Recipient of the **Excellent Teaching Assistant Award** for exceptional contributions to student learning.