

Yuqing Wang

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<https://yzwangyuqing.github.io>

RESEARCH INTERESTS

machine learning, optimization, (stochastic) dynamical systems, sampling, computational mathematics

PROFESSIONAL EXPERIENCE

Fall 2024 Research Fellow
Program: *Modern Paradigms in Generalization*, joint with *Special Year on Large Language Models and Transformers Part 1*
Simons Institute for the Theory of Computing, University of California, Berkeley

EDUCATION

Aug 2024 Ph.D. in Mathematics
Georgia Institute of Technology
Advisor: Prof. Molei Tao

June 2018 B.S. in Mathematics
Nankai University

PREPRINTS AND PUBLICATIONS

Yuqing Wang, Ye He, Molei Tao. “Evaluating the design space of diffusion-based generative models”. *Advances in Neural Information Processing Systems* (2024).

Yuqing Wang, Zhenghao Xu, Tuo Zhao, Molei Tao. “Good regularity creates large learning rate implicit biases: edge of stability, balancing, and catapult”. Short version is accepted in *Mathematics of Modern Machine Learning*, *NeurIPS 2023 Workshop*; long version is under review.

Bo Yuan, Jiaojiao Fan, **Yuqing Wang**, Molei Tao, and Yongxin Chen. “Markov Chain Monte Carlo for Gaussian: A Linear Control Perspective”, in *IEEE Control Systems Letters*, vol. 7, pp. 2173-2178, 2023, doi: 10.1109/LCSYS.2023.3285140.

Lingkai Kong, **Yuqing Wang**, and Molei Tao. “Momentum Stiefel Optimizer, with Applications to Suitably-Orthogonal Attention, and Optimal Transport”. *International Conference on Learning Representations* (2023).

Yuqing Wang, Minshuo Chen, Tuo Zhao and Molei Tao. “Large Learning Rate Tames Homogeneity: Convergence and Balancing Effect”. International Conference on Learning Representations (2022).

Kaixuan Huang*, **Yuqing Wang***, Molei Tao, and Tuo Zhao. “Why Do Deep Residual Networks Generalize Better than Deep Feedforward Networks?—A Neural Tangent Kernel Perspective.” Advances in neural information processing systems 33 (2020): 2698-2709. (*: equal contribution)

TALKS

- Oct 2024 The mechanism behind the implicit biases of large learning rates: edge of stability, balancing, and catapult, SIAM Conference on Mathematics of Data Science (MDS24), October 21–25, 2024, Atlanta, Georgia
- Sep 2024 (joint with Molei Tao) How well does diffusion model generate? - a training and sampling combined quantification, Emerging Generalization Settings Workshop, Simons Institute, University of California, Berkeley
- Apr 2024 What creates edge of stability, balancing, and catapult, the second Southeast Applied and Computational Math Student Workshop, Georgia Institute of Technology
- Dec 2023 Quantitative acceleration of convergence to invariant distribution by irreversibility in diffusion processes, PDE seminar, Georgia Institute of Technology
- Oct 2023 What creates edge of stability, balancing, and catapult, ACO student seminar, Georgia Institute of Technology
- May 2023 Implicit bias of large learning rate, SIAM Conference on Applications of Dynamical Systems (DS23), Machine Learning for Dynamical Systems & Dynamical Systems for Machine Learning - Part I of III (MS143), Portland, Oregon
- Feb 2023 Implicit bias of large learning rate, Data Sciences Symposium, Spelman College

POSTERS

- Feb 2024 Georgia Scientific Computing Community, Emory University
- Nov 2023 Rising Stars in Data Science workshop, University of Chicago
- Nov 2023 EECS Rising Star workshop, Georgia Institute of Technology
- June 2023 Machine Learning Theory Summer School, Princeton University
- Mar 2023 Algorithms, Combinatorics and Optimization Research Network (ACORN) workshop, Georgia Institute of Technology

HONERS

2024 Outstanding Teaching Assistant, Georgia Institute of Technology
2023 Rising star in data science
2023 Rising star in EECS
2023 Top graduate student, Georgia Institute of Technology
2022 “Thank a teacher” award, Georgia Institute of Technology

SERVICE

Co-organizer:

Minisymposium on “The dynamical view of machine learning”, SIAM Conference on Mathematics of Data Science (MDS24), October 21–25, 2024, Atlanta, Georgia

SIAM student seminar, Georgia Institute of Technology, Fall 2021

Reviewer:

NeurIPS and Nature Communications

Others:

Vice President for SIAM Student Chapter, Georgia Institute of Technology, Fall 2021

TEACHING

Teaching Assistant in School of Mathematics, Georgia Institute of Technology:
teach 4 hours of studios per week

Fall 2018, Spring 2019, Fall 2019, Fall 2020, Spring 2021, Fall 2023
MATH 2552 Differential Equation

Spring 2020
MATH 2551 Multivariable Calculus

Summer 2019, Summer 2024
MATH 2550 Introduction to Multivariable Calculus

Head Teaching Assistant in the School of Mathematics, Georgia Institute of Technology:
design worksheets; teach 2 hours of studios per week

Spring 2022, Spring 2023
MATH 2552 Differential Equation