

Ruizhe Zhang

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RESEARCH INTERESTS	Theoretical computer science, quantum computing, and machine learning.	
EDUCATION	The University of Texas at Austin Ph.D. in Computer Science Advisor: Dana Moshkovitz	2018 - Present
	Fudan University B.S. in Computer Science, <i>Honors Class</i>	2014 - 2018
EXPERIENCE	The University of Texas at Austin Position: Research Assistant Supervisors: Dana Moshkovitz, Scott Aaronson	Fall 2018 - Fall 2021
	Zapata Computing, Inc. Position: Quantum Research Intern Supervisors: Peter Johnson, Guoming Wang	Summer 2021, Summer 2022
HONORS AND AWARDS	University Graduate Continuing Fellowship, UT Austin Graduate School Fudan University First Prize Scholarship, Wonders Information The ACM-ICPC Asia Regional Contest Gold Medal, Shanghai Site The ACM-ICPC Asia Regional Contest Gold Medal, Hefei Site	2022 2017 2015 2015
PUBLICATIONS	<p>[1] Andrew Childs, Tongyang Li, Jin-Peng Liu, Chunhao Wang, Ruizhe Zhang. Quantum Algorithms for Sampling Log-Concave Distributions and Estimating Normalizing Constants. In <i>Proceedings of the 36th Conference on Neural Information Processing Systems (NeurIPS)</i>, 2022. In <i>26th Annual Conference on Quantum Information Processing (QIP)</i>, 2023. (Contributed talk)</p> <p>[2] Tongyang Li, Ruizhe Zhang. Quantum Speedups of Optimizing Approximately Convex Functions with Applications to Logarithmic Regret Stochastic Convex Bandits. In <i>Proceedings of the 36th Conference on Neural Information Processing Systems (NeurIPS)</i>, 2022.</p> <p>[3] Yichuan Deng, Zhao Song, Omri Weinstein, Ruizhe Zhang. Fast Distance Oracles for Any Symmetric Norm. In <i>Proceedings of the 36th Conference on Neural Information Processing Systems (NeurIPS)</i>, 2022.</p> <p>[4] Baihe Huang, Shunhua Jiang, Zhao Song, Runzhou Tao, Ruizhe Zhang. Solving SDP Faster: A Robust IPM Framework and Efficient Implementation. In <i>Proceedings of the 63rd Annual Symposium on Foundations of Computer Science (FOCS)</i>, 2022.</p> <p>[5] Ruizhe Zhang, Guoming Wang, Peter Johnson. Computing Ground State Properties with Early Fault-Tolerant Quantum Computers. In <i>Quantum, Volume 6, Number 761</i>, 2022.</p> <p>[6] Jason Gaitonde, Max Hopkins, Tali Kaufman, Shachar Lovett, Ruizhe Zhang. Eigenstripping, Spectral Decay, and Edge-Expansion on Posets. In <i>Proceedings of the 26th International Conference on Randomization and Computation (RANDOM)</i>, 2022.</p>	

- [7] Zhao Song, **Ruizhe Zhang**. Hyperbolic Concentration, Anti-concentration, and Discrepancy. In *Proceedings of the 26th International Conference on Randomization and Computation (RANDOM)*, 2022.
- [8] Sitan Chen, Zhao Song, Runzhou Tao, **Ruizhe Zhang**. Symmetric Sparse Boolean Matrix Factorization and Applications. In *Proceedings of the 13th Innovations in Theoretical Computer Science Conference (ITCS)*, 2022.
- [9] Nai-Hui Chia, Chi-Ning Chou, Jiayu Zhang, **Ruizhe Zhang**. Quantum Meets Minimum Circuit Size Problem. In *Proceedings of the 13th Innovations in Theoretical Computer Science Conference (ITCS)*, 2022.
- [10] Zhao Song, Shuo Yang, **Ruizhe Zhang**. Does Preprocessing Help Training Over-Parameterized Neural Networks? In *Proceedings of the 35th Conference on Neural Information Processing Systems (NeurIPS)*, 2021.
- [11] Yuxuan Zhang, **Ruizhe Zhang**, Andrew C. Potter. QED driven QAOA for network-flow optimization. In *Quantum, Volume 5, Number 510*, 2021.
- [12] Scott Aaronson, Jiahui Liu, Qipeng Liu, Mark Zhandry, **Ruizhe Zhang**. New Approaches for Quantum Copy-Protection. In *Proceedings of the 41st Annual International Cryptology Conference (CRYPTO)*, 2021.
- [13] Scott Aaronson, Nai-Hui Chia, Han-Hsuan Lin, Chunhao Wang, **Ruizhe Zhang**. On the Quantum Complexity of Closest Pair and Related Problems. In *Proceedings of the 35th Computational Complexity Conference (CCC)*, 2020.

PREPRINTS

- [1] Hongru Yang, Ziyu Jiang, **Ruizhe Zhang**, Zhangyang Wang, Yingbin Liang. Convergence and Generalization of Wide Neural Networks with Large Bias. *arXiv preprint arXiv:2301.00327*, 2023.
- [2] Josh Alman, Jiehao Liang, Zhao Song, **Ruizhe Zhang**, Danyang Zhuo. Bypass exponential time preprocessing: Fast neural network training via weight-data correlation preprocessing. *arXiv preprint arXiv:2211.14227*, 2022.
- [3] Zhao Song, Baocheng Sun, Omri Weinstein, **Ruizhe Zhang**. Quartic Samples Suffice for Fourier Interpolation. *arXiv preprint arXiv:2210.12495*, 2022.
- [4] Guoming Wang, Daniel Stilck França, **Ruizhe Zhang**, Shuchen Zhu, Peter D. Johnson. Quantum algorithm for ground state energy estimation using circuit depth with exponentially improved dependence on precision. *arXiv preprint arXiv:2209.06811*, 2022.
- [5] Baihe Huang, Shunhua Jiang, Zhao Song, Runzhou Tao, **Ruizhe Zhang**. A Faster Quantum Algorithm for Semidefinite Programming via Robust IPM Framework. *arXiv preprint arXiv:2207.11154*, 2022.
- [6] Zhao Song, Baocheng Sun, Omri Weinstein, **Ruizhe Zhang**. Sparse Fourier Transform over Lattices: A Unified Approach to Signal Reconstruction. *arXiv preprint arXiv:2205.00658*, 2022.
- [7] Baihe Huang, Zhao Song, Omri Weinstein, Hengjie Zhang, **Ruizhe Zhang**. A Dynamic Fast Gaussian Transform. *arXiv preprint arXiv:2202.12329*, 2022.
- [8] Zhao Song, Lichen Zhang, **Ruizhe Zhang**. Training Multi-Layer Over-Parametrized Neural Network in Subquadratic Time. *arXiv preprint arXiv:2112.07628*, 2021.

[9] Baihe Huang, Zhao Song, Runzhou Tao, **Ruizhe Zhang**, Danyang Zhuo. InstaHide’s Sample Complexity When Mixing Two Private Images. *arXiv preprint arXiv:2011.11877*, 2020.

TALKS

Quantum Speedups of Continuous Sampling and Optimization Problems

- Invited talk at MIT Quantum Information Processing Seminar Jan, 2023

Solving SDP Faster: A Robust IPM Framework and Efficient Implementation

- The 63rd Annual Symposium on Foundations of Computer Science (FOCS 2022) Nov, 2022

Ground State Energy and Property Estimation with Low Quantum Circuit Depth

- Invited talk at QUARK Lab at Peking University Oct, 2022

Hyperbolic Concentration, Anti-concentration, and Discrepancy

- The 26th International Conference on Randomization and Computation (RANDOM 2022) Sept, 2022

On the Quantum Fine-Grained Complexity of Closest Pair and Related Problems

- Invited talk at University of Washington Theory Seminar May, 2022

Computing Ground State Properties with Early Fault-Tolerant Quantum Computers

- Contributed talk at APS March Meeting 2022 Mar, 2022

Symmetric Sparse Boolean Matrix Factorization and Applications

- The 13th Innovations in Theoretical Computer Science Conference (ITCS 2022) Feb, 2022

Quantum Speedup for Annealing and Sampling

- Invited talk at Simons Institute reading group Dec, 2021

Quantum Meets the Minimum Circuit Size Problem

- Second Kyoto Workshop on Quantum Information, Computation, and Foundation (QICF 2021) Sept, 2021

On the Quantum Complexity of Closest Pair and Related Problems

- Computational Complexity Conference (CCC 2020) Sept, 2020
- The 15th Conference on the Theory of Quantum Computation, Communication and Cryptography (TQC 2020) Aug, 2020

MENTORING

Baocheng Sun (Master’s student at Weizmann Institute of Science)

TEACHING

At UT Austin

- TA for CS395T, Coding Theory (graduate class) Spring 2022
- TA for CS388R, Randomized Algorithms (graduate class) Fall 2021
- TA for CS388T, Theory of Computation (graduate class) Spring 2020

At Fudan University

- TA for Data Structure (undergraduate class) Fall 2016

SERVICES

Conference referee:

- ESA 2020, Eurocrypt 2021, QIP 2021, AQIS 2021, QIP 2022, STOC 2022, ICML 2022, SODA 2023, QIP 2023, AAAI 2023, STACS 2023, STOC 2023

Journal referee:

- Quantum, PRX Quantum, Transactions on Information Theory, Advances in Engineering Software

CODING SKILLS C/C++, Python, Matlab, Latex