

Minbo Gao

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Education

- 2021- **Ph.D. Student**, *Institute of Software, Chinese Academy of Sciences*, Beijing, China
 - Advised by Prof. Mingsheng Ying and Prof. Zhengfeng Ji.
- 2017-2021 **B.Sc. in Computer Science and Technology (Yao Class)**, *Institute for Interdisciplinary Information Sciences, Tsinghua University*, Beijing, China

Research Interest

My research interests lie in two closely related directions. The first is **quantum algorithms**, particularly for problems motivated by *optimization*, such as graph and discrete optimization problems [4,5,6], as well as distributional and learning-related tasks [2,8,10,11]; I am also interested in *quantum algorithms for quantum dynamics and simulation* [1,9]. The second is **quantum program logic**, especially *relational quantum Hoare logics* [3,7], where I am interested in bringing in tools from *quantum optimal transport* and other optimization-based methods to develop new logical and semantic results.

Publications

Author order follows the alphabetical convention in theoretical computer science unless otherwise specified.

- [1] **Minbo Gao**, Zhengfeng Ji, Qisheng Wang, Wenjun Yu, Qi Zhao. Quantum Hamiltonian Certification. Proceedings of the 2026 Annual ACM-SIAM Symposium on Discrete Algorithms (SODA 2026), 1424-1467.
- [2] Kean Chen, **Minbo Gao**, Tongyang Li, Qisheng Wang, Xinzhao Wang. Quantum Multi-Level Estimation of Functionals of Discrete Distributions. To appear in the 53rd International Colloquium on Automata, Languages, and Programming (ICALP 2026).
- [3] Gilles Barthe, **Minbo Gao**, Jam Kabeer Ali Khan, Matthijs Muis, Ivan Renison, Keiya Sakabe, Michael Walter, Yingte Xu, Tianshi Yu, Li Zhou. Complete Relational Logic for Infinite-Dimensional Quantum Programs with Unbounded Assertions. To appear in the 41st Annual ACM/IEEE Symposium on Logic in Computer Science (LICS 2026).
- [4] **Minbo Gao**, Zhengfeng Ji, Qisheng Wang. Quantum Approximate k -Minimum Finding. Proceedings of the 33rd Annual European Symposium on Algorithms (ESA 2025), 351, 51:1–51:15.
- [5] Chenghua Liu, **Minbo Gao**, Zhengfeng Ji, Mingsheng Ying (by contribution). Quantum Speedup for Hypergraph Sparsification. Proceedings of the 42nd International Conference on Machine Learning (ICML 2025), PMLR 267:38448-38466, 2025.
- [6] Simon Apers, **Minbo Gao**, Zhengfeng Ji, Chenghua Liu. Quantum Speedup for Sampling Random Spanning Trees. Proceedings of the 52nd International Colloquium on Automata, Languages, and Programming (ICALP 2025), 334, 13:1–13:21.
- [7] Gilles Barthe, **Minbo Gao**, Theo Wang, Li Zhou. Complete Quantum Relational Hoare Logics from Optimal Transport Duality. 2025 40th Annual ACM/IEEE Symposium on Logic in Computer Science (LICS 2025), 884-925.
- [8] **Minbo Gao**, Zhengfeng Ji, Tongyang Li, Qisheng Wang. Logarithmic-Regret Quantum Learning Algorithms for Zero-Sum Games. Advances in Neural Information Processing Systems 36 (NeurIPS 2023), 31177-31203.

Selected Preprints

Author order follows the alphabetical convention in theoretical computer science.

- [9] **Minbo Gao**, Zhengfeng Ji, Chenghua Liu. Lévy-Khintchine Structure Enables Fast-Forwardable Lindbladian Simulation. arXiv:2511.10253.
- [10] Jinge Bao, **Minbo Gao**, Qisheng Wang. On Estimating the Quantum Tsallis Relative Entropy. arXiv:2510.00752.
- [11] **Minbo Gao**^{*}, Tianle Xie^{*}, Simon S. Du, Lin F. Yang (by contribution; ^{*} indicates equal contribution, with the first two authors ordered alphabetically). A Provably Efficient Algorithm for Linear Markov Decision Process with Low Switching Cost. arXiv:2101.00494.

Professional Service

Conferences Reviewer for ITCS 2023; QIP 2023–2026; STOC 2024; NeurIPS 2024–2025; QCE 2023–2026; AQS 2023; TQC 2024, 2026; QCrypto 2024; QCNC 2025; STACS 2026; ICALP 2026; ICLR 2025–2026; AISTATS 2025–2026; AAI 2026 (PC).

Journals TPAMI; Quantum; ACM Transactions on Quantum Computing.

Recognition Notable Reviewer, ICLR 2025.

Academic Activities

- 2021– **Long-term Visiting Student**, *Center for Quantum Software, Department of Computer Science and Technology, Tsinghua University, Beijing, China*
Hosted by Prof. Zhengfeng Ji.
- July, 2025 **Invited Speaker at 2025 INFORMS International Meeting**, Singapore
Presenting our work “Logarithmic-Regret Quantum Learning Algorithms for Zero-Sum Games”.
- April 2025 **Participant at Workshop on Quantum Information and Optimization**, *Tianyuan Mathematics Research Center, Kunming, China*
Presenting our work “Quantum Approximate k -Minimum Finding”.
- Nov 2024 **Visiting Student**, *School of Artificial Intelligence, Wuhan University, Wuhan, China*
Hosted by Prof. Yinan Li.
- Nov 2023 – Jan 2024 **Visiting Student**, *Graduate School of Mathematics, Nagoya University, Nagoya, Japan*
Hosted by Prof. François Le Gall.
- July 2023 **Visiting Student**, *Department of Computer Science and Technology, Nanjing University, Nanjing, China*
Hosted by Prof. Penghui Yao.
- Jan 2020 **Participant, Quantum Computer Science Summer School 2020**, *University of Technology Sydney, Sydney, Australia*