Weiyuan Gong

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Education

Aug 2019 –June 2023 **Bachelor of engineering**, *Institute for Interdisciplinary Information Sciences (Yao Class)*, Tsinghua University, Beijing, CHN.

- Thesis: *Pauli Channel Estimation with Bounded Quantum Memory*, Outstanding diploma thesis.
- Thesis advisor: Dong-Ling Deng and Sitan Chen.

Sept 2023 –Present **Graduate student**, *John A. Paulson School of Engineering and Applied Sciences*, Harvard University, Cambridge, MA.

- Advisor: Sitan Chen.

Working Experiences

June 2023 –Aug 2023 **Visiting student**, Quantum Laboratory, DAMO Academy, Alibaba, Host: Dr. Jianxin Chen.

Jan 2020 –June 2023 **Member**, Center for Quantum Information, Institute for Interdisciplinary Information Sciences, Tsinghua University, PI: Prof. Dong-Ling Deng.

May 2022 –Dec 2022 **Research Internship**, Center on Frontiers of Computing Studies, Peking University, PI: Prof. Tongyang Li.

Dec 2021 –Sept 2022 **Research Internship (Remote)**, Department of Computer Science, University of Texas at Austin, PI: Prof. Scott Aaronson.

Apr 2021 –Aug 2023 **Research Internship (Remote)**, QuICS, NIST/ University of Maryland, College Park, PI: Prof. Alexey V. Gorshkov.

Preprints & Manuscripts (alphabetic order unless marked)

- Sitan Chen, Weiyuan Gong, Qi Ye, and Zhihan Zhang, "Stabilizer bootstrapping: A recipe for efficient agnostic tomography and magic estimation", *arxiv:2408.06967*, 2024.
- Sitan Chen, Weiyuan Gong, "Efficient Pauli channel estimation with logarithmic quantum memory", *arxiv:2309.14326*.
- Weiyuan Gong*, Yaroslav Kharkov, Minh C. Tran, Przemyslaw Bienias, and Alexey V. Gorshkov, "Improved Digital Quantum Simulation by Non-Unitary Channels", *arxiv:2307.13028*, 2023.
- Weiyuan Gong*, Chenyi Zhang* and Tongyang Li, "Robustness of Quantum Algorithms for Nonconvex Optimization", *arxiv:2212:02548*, 2022.

Publications (alphabetic order unless marked)

- Sitan Chen, Weiyuan Gong, and Qi Ye, "Optimal tradeoffs for estimating Pauli observables", in Proceedings of 65th IEEE Symposium on Foundations of Computer Science (FOCS 2024), *arxiv:2404.19105*, 2024.
- Zhihan Zhang*, Weiyuan Gong*, Weikang Li, and Dong-Ling Deng, "Quantum-classical separations in shallow-circuit-based learning with and without noise", *Commun. Phys. 7, 290*, 2024.
- Weiyuan Gong*, Shuo Zhou*, Tongyang Li, "Complexity of Digital Quantum Simulation in the Low-Energy Subspace: Applications and a Lower Bound", *Quantum 8, 1409*, 2024.

- Jianxin Chen, Dawei Ding, Weiyuan Gong, Cupjin Huang, Qi Ye, "One Gate Scheme to Rule Them All: Introducing a Complex Yet Reduced Instruction Set for Quantum Computing", in *Proceedings of the 29th ACM International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS 2024)*, 2024.
- Weiyuan Gong*, Dong Yuan, Weikang Li, and Dong-Ling Deng, "Enhancing Quantum Adversarial Robustness by Randomized Encodings", *Phys. Rev. Res.* ***6****, 023020*, 2024. See also: *APS March Meeting 2023*.
- Weiyuan Gong* and Scott Aaronson, "Learning Distributions over Quantum Measurement Outcomes", *Proceedings of the 40th International Conference on Machine Learning (ICML 2023), PMLR 202: 11598-11613*, 2023.
- Weiyuan Gong*, Si Jiang* and Dong-Ling Deng, "No-go theorem and a universal decomposition strategy for quantum channel compilation", *Phys. Rev. Res.* ***5****, 013060*, 2023.
- Weiyuan Gong* and Dong-Ling Deng, "Universal Adversarial Examples and Perturbations for Quantum Classifiers" *National Science Review, Volume 9, Issue 6, nwab130*, 2022.

Talks

- *Toward optimal bounds for estimating Pauli observables and purity*, QSE retreat, Harvard Quantum Initiative, Harvard University, Boston MA, Sept 2024
- *Smooth and sharp complexity transitions in learning with bounded quantum memory* , QuICS special seminar, QuICS, University of Maryland at College Park, College Park MD, Mar 2024.
- *Smooth and sharp complexity transitions in learning with bounded quantum memory* , Department of Computer Science, University of Texas at Austin, Austin TX, Feb 2024.
- *Efficient Pauli Channel Estimation with Logarithmic Quantum Memory*, IIIS, Tsinghua University, Beijing, Dec 2023.
- *On the Quantum-classical Separation in Shallow-circuit-based Machine Learning*, Quantum Laboratory, DAMO Academy, Alibaba, Hangzhou, June 2023.
- *Enhancing Quantum Adversarial Robustness via Randomized Encodings*, APS March Meeting, March 2023.
- *On the Universal Decomposition Strategy for Quantum Channel Compilation*, invited talk at Quantum Seminar, Peking University, Beijing, March 2023.
- *Learning Distributions over Quantum Measurement Outcomes*, (virtual) invited talk at Quantum Research Seminars Toronto (QRST), the Matter Lab at the University of Toronto & Zapata Computing, October 2022.
- *Learning Distributions over Quantum Measurement Outcomes*, invited talk at Yao Seminar, IIIS at Tsinghua University, October 2022.

Academic Service & Teaching

- Referee for conferences: STOC 2024, QIP 2024, QSim 2024
- Referee for journals: PRX Quantum, Quantum, Physical Review A, Communications in Mathematical Physics, ACM Transactions on Quantum Computing, TheoretiCS
- Teaching fellow, CS 2243: Algorithms for Data Science, SEAS, Harvard University, 2024 Fall.
- Teaching assistant, Abstract Algebra, IIIS, Tsinghua University, 2023 Spring.

Honor & Awards

June 2023 **Outstanding Diploma Thesis**, Tsinghua University.

Nov 2022 **Academic Excellence Scholarship**, Tsinghua University.

Nov 2022 **Outstanding Scholarship for Scientific and Technological Innovation**, Tsinghua University.

Nov 2020 **Outstanding Scholarship for Social Works**, Tsinghua University.

Nov 2019 **Freshman Scholarship**, *Second Prize*, Tsinghua University.

Nov 2017 **First Prize (Gold Medal) in** 34**-th CPhO. Candidate for China representative of** 49**-th IPhO.**, Chinese Physical Society.