

Haimeng Zhao

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EDUCATION

California Institute of Technology Ph.D. Candidate in Physics, Advisor: John Preskill and Hsin-Yuan Huang M.Sc. in Physics	Pasadena, CA 2024–Current 2024–2026
Tsinghua University B.Sc. in Mathematics and Physics with <i>Honours</i> and <i>Summa Cum Laude</i> , GPA: 3.95/4 Thesis: <i>Quantum Advantage in Machine Learning</i> , Advisor: Dong-Ling Deng <i>Valedictorian</i> of the Tsinghua Xuetang Talents Program in Physics	Beijing, China 2020–2024
École Polytechnique Fédérale de Lausanne (EPFL) Exchange student in Physics, GPA: 6/6, Advisor: Giuseppe Carleo	Lausanne, Switzerland 2022–2023

EXPERIENCE

Google Quantum AI Student Researcher (Mentored by Jarrod R. McClean)	Los Angeles, CA 2025, 2026
Institute for Interdisciplinary Information Sciences (IIIS), Tsinghua Research Assistant (Mentored by Dong-Ling Deng)	Beijing, China 2023–2024
Institute for Quantum Information and Matter (IQIM), Caltech Summer Undergraduate Research Fellow (Mentored by John Preskill and Matthias C. Caro)	Pasadena, CA 2023
Computational Quantum Science Laboratory (CQSL), EPFL Research Assistant (Mentored by Giuseppe Carleo and Filippo Vicentini)	Lausanne, Switzerland 2022–2023
Department of Astronomy, Tsinghua Research Assistant (Mentored by Wei Zhu)	Beijing, China 2021–2022

HONORS AND AWARDS

• Amazon Web Services (AWS) Graduate Fellowship	2024
• Graduate with the Highest Honours (Honours Degree and 1 st Place in Physics), Tsinghua University	2024
• Graduate with the Highest Distinction (Summa Cum Laude), Tsinghua University	2024
• Valedictorian of Class 2024, Tsinghua Xuetang Talents Program in Physics	2024
• Highest Honor for Undergraduate Students, Tsinghua University (清华特等奖学金)	2023
• Caltech Summer Undergraduate Research Fellowship	2023
• National Scholarship, The Ministry of Education of China	2022
• Scholarship of the National Astronomical Observatory of China	2022
• Lin-bridge Scholarship, Department of Astronomy, Peking University	2022
• S.-T. Yau College Student Mathematics Contest, Hermann Weyl Silver Medal (2 nd Place in Mathematical Physics)	2022
• S.-T. Yau College Student Mathematics Contest, Team Bronze Medal	2022

• Dean's Award (1 st Place in Physics), Zhili College, Tsinghua University	2022
• Spark Research Talents Fellowship, Tsinghua University (星火计划 16 期)	2022–2024
• Tsinghua-Xitai Scholarship for Comprehensive Excellence, Tsinghua University	2021
• Tsinghua-UbiQuant Scholarship for Scientific Innovation, Tsinghua University	2021–2023
• Chi-Sun Yeh Scholarship, Tsinghua Xuetao Talents Program in Physics	2020–2024
• Outstanding Graduate, Shanghai High School	2020
• Best Student Award of Class 2020, Shanghai High School	2020
• S.-T. Yau High School Science Award, Gold Medal (1 st Place) in Computer Science	2019
• 19 th National Awarding Program for Future Scientists, 1 st Place, China Association for Science and Technology	2019
• 36 th Chinese Physics Olympiad, Bronze Medal & First Prize in Shanghai, Chinese Physics Society	2019

ACADEMIC SERVICE

Journal review: Nature Communications, npj Quantum Information, Quantum, Quantum Machine Intelligence, Quantum Information Processing, IEEE Transactions on Information Theory (TIT), IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI), Journal of Machine Learning Research (JMLR), IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD)

Conference review: QIP, TQC, AQIS, QTML, QCTiP, NeurIPS, ICML

TEACHING

Teaching Assistant: Ph/CS 219 Quantum Computation (2025), Ph 220 Quantum Learning Theory (2025) at Caltech

PUBLICATIONS

(* for equal contribution)

- [1] N. Paul, **H. Zhao**, and D. D. Dai, “Learning the closest Slater determinant”, (2026), arXiv:2607.20623.
- [2] **H. Zhao**, A. Zlokapa, H. Neven, R. Babbush, J. Preskill, J. R. McClean, and H.-Y. Huang, “Exponential Quantum Advantage in Processing Massive Classical Data”, (2026), arXiv:2604.07639, covered by New Scientist.
- [3] F. Girardi*, F. A. Mele*, **H. Zhao***, M. Fanizza, and L. Lami, “Random Stinespring Superchannel: Converting Channel Queries into Dilation Isometry Queries”, (2025), arXiv:2512.20599.
- [4] **H. Zhao**, Y. Zhang, and J. Preskill, “Learning to Erase Quantum States: Thermodynamic Implications of Quantum Learning Theory”, npj Quantum Information **12**, 137 (2026).
- [5] **H. Zhao** and D.-L. Deng, “Entanglement-induced Provable and Robust Quantum Learning Advantages”, npj Quantum Information **11**, 127 (2025).
- [6] **H. Zhao***, L. Lewis*, I. Kannan*, Y. Quek, H.-Y. Huang, and M. C. Caro, “Learning Quantum States and Unitaries of Bounded Gate Complexity”, PRX Quantum **5**, 040306 (2024), featured on the cover and in the International Year of Quantum Collection.
- [7] **H. Zhao**, G. Carleo, and F. Vicentini, “Empirical Sample Complexity of Neural Network Mixed State Reconstruction”, Quantum **8**, 1358 (2024).
- [8] **H. Zhao**, “Non-IID Quantum Federated Learning with One-shot Communication Complexity”, Quantum Machine Intelligence **5**, 3 (2023).
- [9] J. Liu, Y. Tang, **H. Zhao**, X. Wang, F. Li, and J. Zhang, “CPS Attack Detection under Limited Local Information in Cyber Security: An Ensemble Multi-Node Multi-Class Classification Approach”, ACM Transactions on Sensor Networks **20**, 1–27 (2024).

- [10] **H. Zhao** and W. Zhu, “MAGIC: Microlensing Analysis Guided by Intelligent Computation”, The Astronomical Journal **164**, 192 (2022).
- [11] **H. Zhao** and P. Liao, “CAE-ADMM: Implicit Bitrate Optimization via ADMM-based Pruning in Compressive Autoencoders”, (2019), arXiv:1901.07196 [cs.CV].

TALKS

1. “Exponential quantum advantage in processing massive classical data”, Invited talk at the Foxconn Quantum Seminar, Hon Hai (Foxconn) Research Institute, Aug. 21st, 2026.
2. “Exponential quantum advantage in processing massive classical data”, Invited talk at the Star River Talk Series, Shanghai Artificial Intelligence Laboratory, Aug. 14th, 2026.
3. “Exponential quantum advantage in processing massive classical data”, Invited talk at the Quantum Seminar Series, NVIDIA, July 21st, 2026.
4. “Exponential quantum advantage in processing massive classical data”, Invited talk at the Quantum Meets Seminar, IIIT Hyderabad, July 15th, 2026.
5. “Exponential quantum advantage in processing massive classical data”, Invited talk at the School of Applied and Engineering Physics, Cornell University, July 1st, 2026.
6. “Exponential quantum advantage in processing massive classical data”, Invited talk at the Quantum Computer Science Group Meeting, Google Quantum AI, June 23rd, 2026.
7. “Exponential quantum advantage in processing massive classical data”, Invited talk at the Quantum Information and Computing Group Meeting, École Polytechnique Fédérale de Lausanne (EPFL), June 23rd, 2026.
8. “Exponential quantum advantage in processing massive classical data”, Invited talk at the Quantum Information and Computation Initiative (QICI) Group Meeting, University of Hong Kong, June 16th, 2026.
9. “Exponential quantum advantage in processing massive classical data”, Invited talk at the Quantum Algorithm and Learning Seminar, Freie Universität Berlin, June 11th, 2026.
10. “Exponential quantum advantage in processing massive classical data”, Invited talk at the Amazon Advanced Solutions Lab Seminar, Amazon, June 3rd, 2026.
11. “Exponential quantum advantage in processing massive classical data”, Invited science talk at the Chair’s Council, Division of Physics, Mathematics and Astronomy, Caltech, May 21st, 2026.
12. “Exponential quantum advantage in processing massive classical data”, Invited talk at the Department of Chemistry, Tsinghua University, May 14th, 2026.
13. “Exponential quantum advantage in processing massive classical data”, Invited talk at the Institute for Advanced Study, Tsinghua University, May 12th, 2026.
14. “Exponential quantum advantage in processing massive classical data”, Invited talk at the Center on Frontiers of Computing Studies, Peking University, May 11th, 2026.
15. “Exponential quantum advantage in processing massive classical data”, Invited talk at the Institute for Interdisciplinary Information Sciences (IIIS), Tsinghua University, May 8th, 2026.
16. “Exponential quantum advantage in processing massive classical data”, Invited talk at the Quo Vadis Seminar, Scuola Normale Superiore di Pisa, Apr. 21st, 2026.
17. “Processing massive classical data on small quantum computers”, Invited talk at the Institute for Quantum Information and Matter (IQIM) Seminar, Caltech, Apr. 10th, 2026.
18. “Learning is physical”, Candidacy Meeting, Caltech, Apr. 2nd, 2026.

19. “Learning to erase quantum states: thermodynamic implications of quantum learning theory”, Contributed talk at the 2026 Cal-Bay Quantum School, Stanford University, Mar. 26th, 2026.
20. “Learning to erase quantum states: thermodynamic implications of quantum learning theory”, Contributed talk at the 2026 APS Global Physics Summit, Denver, Colorado, Mar. 19th, 2026.
21. “Learning to erase quantum states: thermodynamic implications of quantum learning theory”, Plenary talk at the 2025 Annual Southwest Quantum Information and Technology (SQuInT) Conference, The University of New Mexico, Oct. 11th, 2025.
22. “Learning to erase quantum states: thermodynamic implications of quantum learning theory”, Invited talk at the Quantum Meets Mathematics Seminar, Ohio State University, Sep. 23rd, 2025.
23. “Processing classical big data with small quantum computers”, Invited talk at the Quantum Algorithm Meeting, Google Quantum AI, Sep. 17th, 2025.
24. “Learning to erase quantum states: thermodynamic implications of quantum learning theory”, Invited talk at the Quantum Many-body Physics Seminar, Freie Universität Berlin, Jun. 2nd, 2025.
25. “Learning to erase quantum states: thermodynamic implications of quantum learning theory”, Invited talk at the Centre for Quantum Technologies (CQT) CS Seminar, National University of Singapore, May 21st, 2025.
26. “Learning to erase quantum states: thermodynamic implications of quantum learning theory”, Invited talk at the Institute for Interdisciplinary Information Sciences (IIIS), Tsinghua University, Apr. 24th, 2025.
27. “Entanglement-induced provable and robust quantum learning advantages”, Contributed talk at the 2025 APS Global Physics Summit, Anaheim, California, Mar. 17th, 2025.
28. “Learning quantum states and unitaries of bounded gate complexity”, Contributed plenary long talk at the 24th Asian Quantum Information Science Conference (AQIS 24), Hokkaido University, Aug. 30th, 2024.
29. “Learning quantum states and unitaries of bounded gate complexity”, Invited talk at the Fortnight Seminar Series for Young Scientists, KouShare, Dec. 22nd, 2023.
30. “Learning quantum states and unitaries of bounded gate complexity”, Invited talk at the Institute for Advanced Study, Tsinghua University, Dec. 3rd, 2023.
31. “Learning quantum states and unitaries of bounded gate complexity”, Invited talk at the Chi-Sun Yeh Student Seminar, Tsinghua University, Dec. 2nd, 2023.
32. “Learning quantum states and unitaries of bounded gate complexity”, Invited talk at the Institute for Interdisciplinary Information Sciences (IIIS), Tsinghua University, Dec. 1st, 2023.
33. “Non-IID quantum federated learning with one-shot communication complexity”, Contributed talk at Quantum Techniques in Machine Learning (QTML 2023), CERN, Nov. 20th, 2023.
34. “A biased tour in the intersection of physics and machine learning”, Invited talk at the Chi-Sun Yeh Student Seminar, Tsinghua University, Mar. 12th, 2023.
35. “Empirical sample complexity of neural network mixed state tomography”, Invited talk at the Institute for Interdisciplinary Information Sciences (IIIS), Tsinghua University, Mar. 2nd, 2023.
36. “How can AI do science? A case study on microlensing”, Contributed talk at Zhili College Research Forum, Tsinghua University, Oct. 22nd, 2022.
37. “MAGIC: Microlensing analysis guided by intelligent computation”, Contributed talk at the AI for Astronomy conference, National Astronomical Observatory of China, Nov. 25th, 2022.
38. “MAGIC: Microlensing analysis guided by intelligent computation”, Invited talk at the Department of Astronomy, Tsinghua University, Oct. 10th, 2022.
39. “MAGIC: Microlensing analysis guided by intelligent computation”, Contributed talk at the Student Astronomy Seminar, Department of Astronomy, Peking University, Sep. 23th, 2022.