

# QI ZHAO

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## EDUCATION

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<b>Doctor of Natural Science</b>   <i>Physics</i> Tsinghua University Supervisor: Xiongfeng Ma	Aug. 2014 – Dec. 2018 Beijing, China
<b>Bachelor of Science</b>   <i>Pure and Applied Mathematics</i> Tsinghua University	Aug. 2010 – Jul. 2014 Beijing, China

## EMPLOYMENT

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<b>Assistant Professor</b> The University of Hong Kong Department of Computer Science	Jul. 2022 to now Hong Kong, China
<b>Hartree Fellow</b> University of Maryland Supervisor: Andrew Childs	Dec. 2019 – May 2022 College Park, MD, USA
<b>Postdoctoral researcher</b> University of Science and Technology of China Supervisor: Chao-Yang Lu	Jan. 2019 – Nov. 2019 Shanghai, China

## RESEARCH INTERESTS

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Quantum Computing, Quantum Simulation, Quantum Information, Quantum Resource Theories, Quantum Communication

## RESEARCH SUMMARY

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- **Publications:** 41 peer-reviewed journal publications (1 Nature, 10 Physical Review Letters, 2 Physical Review X, 3 npj Quantum Information, 1 PNAS, 1 IEEE Transactions on Information Theory, 1 National Science Review, 2 Physical Review Applied, 3 Physical Review Research, 2 Quantum, 2 New Journal of Physics, 10 Physical Review A, 1 Journal of Physics A, 1 Advanced Quantum Technologies)
- **Google Scholar Citations:** 2090 with an H-index of 19, an i10-index of 32  
<https://scholar.google.com/citations?user=VVQuTDMAAAAJ&hl=zh-CN&authuser=1>.

## FUNDING AND AWARDS

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<b>NSFC Theoretical Physics Frontier Leading Project, Co-PI</b> National Natural Science Foundation of China (NSFC)	2024
<b>Research Impact Fund (RIF), Co-PI</b> Hong Kong Research Grants Council (RGC)	2023
<b>NSFC/Research Grants Council (RGC) Joint Research Scheme (JRS), PI</b> Hong Kong Research Grants Council (RGC)	2023
<b>Hong Kong Early Career Scheme (ECS), PI</b> Hong Kong Research Grants Council (RGC)	2023
<b>NSFC Young Scientists Fund, PI</b> National Natural Science Foundation of China (NSFC)	2023

<b>Guangdong Natural Science Fund 2023 General Programme, PI</b> Guangdong Provincial Department of Science and Technology (GDST)	2023
<b>Robust Quantum Simulation Seed Fund, Co-PI</b> AmericaNSF Quantum Leap Challenge Institute for Robust Quantum Simulation	2023
<b>Institute of Physics (IOP) Outstanding Reviewer Award</b> Institute of Physics, IOP	2021
<b>Institute of Physics (IOP) trusted Reviewer</b> Institute of Physics, IOP	2020
<b>QuICS Hartree Fellowship</b> University of Maryland, College Park	2019
<b>China National Scholarship for doctoral students</b> Ministry of Education of the People's Republic of China	2018

## PROFESSIONAL SERVICE

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- **Journal Referee:**  
Nature Communications, Physical Review Letters, Physical Review X, PRX Quantum, Quantum, IEEE Transactions on Information Theory, npj Quantum Information, Physical Review Research, Physical Review A, Journal of Physics A: Mathematical, Quantum Science and Technology, Photonic Research, AVS Quantum Science
- **Conference Referee:**  
Conference on Quantum Information Processing (QIP), International Conference on Quantum Cryptography (QCrypt), Theory of Quantum Computation, Communication and Cryptography (TQC), Asian Quantum Information Science Conference (AQIS)
- **Guest Editors:** Frontiers in Physics
- **Program Committee Member:** Asian Quantum Information Science Conference (AQIS), QCIP Fourth workshop on Quantum Communication and Information Processing

## TEACHING

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<b>Computer Organization</b> The University of Hong Kong, Instructor	Jan. 2023 – May. 2023
<b>Quantum Information</b> Tsinghua University, TA	Sep. 2017 – Jan. 2018
<b>Quantum Information</b> Tsinghua University, TA	Sep. 2016 – Jan. 2017
<b>General Physics I</b> Tsinghua University, TA	Mar. 2016 – Jun. 2017

## SELECTED PUBLICATIONS

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- [1] F. Shi, Y. Ning, **Q. Zhao**, and X. Zhang, "Bounds and constructions on  $k$ -uniform quantum states," *arXiv preprint arXiv:2310.06378*, 2023.
- [2] F. Shi, G. Bai, X. Zhang, **Q. Zhao\***, and G. Chiribella, "Graph-theoretic characterization of unextendible product bases," *Phys. Rev. Res.*, vol. 5, p. 033144, Aug 2023. [Online]. Available: <https://link.aps.org/doi/10.1103/PhysRevResearch.5.033144>
- [3] **Q. Zhao**, Y. Zhou, A. F. Shaw, T. Li, and A. M. Childs, "Hamiltonian simulation with random inputs," *Phys. Rev. Lett.*, vol. 129, p. 270502, Dec 2022. QIP 2022 contributed talk. [Online]. Available: <https://link.aps.org/doi/10.1103/PhysRevLett.129.270502>.

- [4] **Q. Zhao** and Y. Zhou, "Constructing multipartite bell inequalities from stabilizers," *Phys. Rev. Res.*, vol. 4, p. 043215, Dec 2022. [Online]. Available: <https://link.aps.org/doi/10.1103/PhysRevResearch.4.043215>
- [5] P. Zeng, J. Sun, L. Jiang, and **Q. Zhao\***, "Simple and high-precision hamiltonian simulation by compensating trotter error with linear combination of unitary operations," *arXiv preprint arXiv:2212.04566*, 2022.
- [6] D. An, J.-P. Liu, D. Wang, and **Q. Zhao**, "A theory of quantum differential equation solvers: limitations and fast-forwarding," *arXiv preprint arXiv:2211.05246*, 2022.
- [7] F. Shi, M.-S. Li, X. Zhang, and **Q. Zhao\***, "Unextendible and uncompletable product bases in every bipartition," *New Journal of Physics*, vol. 24, no. 11, p. 113025, nov 2022. [Online]. Available: <https://dx.doi.org/10.1088/1367-2630/ac9e14>
- [8] Y. Zhou, B. Xiao, M.-D. Li, **Q. Zhao**, Z.-S. Yuan, X. Ma, and J.-W. Pan, "A scheme to create and verify scalable entanglement in optical lattice," *npj Quantum Information*, vol. 8, no. 1, pp. 1–9, 2022.
- [9] D. Wu, **Q. Zhao (Co-first author)**, C. Wang, L. Huang, Y.-F. Jiang, B. Bai, Y. Zhou, X.-M. Gu, F.-M. Liu, Y.-Q. Mao, Q.-C. Sun, M.-C. Chen, J. Zhang, C.-Z. Peng, X.-B. Zhu, Q. Zhang, C.-Y. Lu, and J.-W. Pan, "Closing the locality and detection loopholes in multiparticle entanglement self-testing," *Phys. Rev. Lett.*, vol. 128, p. 250401, Jun 2022. [Online]. Available: <https://link.aps.org/doi/10.1103/PhysRevLett.128.250401>
- [10] Q. Chen, Y. Du, **Q. Zhao**, Y. Jiao, X. Lu, and X. Wu, "Efficient and practical quantum compiler towards multi-qubit systems with deep reinforcement learning," *arXiv preprint arXiv:2204.06904*, 2022.
- [11] H. Fu, D. Wang, and **Q. Zhao**, "Parallel self-testing of EPR pairs under computational assumptions," in *50th International Colloquium on Automata, Languages, and Programming, ICALP 2023, July 10-14, 2023, Paderborn, Germany*, ser. LIPIcs, vol. 261. Schloss Dagstuhl - Leibniz-Zentrum für Informatik, 2023, pp. 64:1–64:19. [Online]. Available: <https://doi.org/10.4230/LIPIcs.ICALP.2023.64>
- [12] D. Wu, **Q. Zhao (Co-first author)**, X.-M. Gu, H.-S. Zhong, Y. Zhou, L.-C. Peng, J. Qin, Y.-H. Luo, K. Chen, L. Li, N.-L. Liu, C.-Y. Lu, and J.-W. Pan, "Robust self-testing of multiparticle entanglement," *Phys. Rev. Lett.*, vol. 127, p. 230503, Dec 2021. [Online]. Available: <https://link.aps.org/doi/10.1103/PhysRevLett.127.230503>
- [13] **Q. Zhao** and X. Yuan, "Exploiting anticommutation in Hamiltonian simulation," *Quantum*, vol. 5, p. 534, Aug. 2021. [Online]. Available: <https://doi.org/10.22331/q-2021-08-31-534>
- [14] Y.-H. Luo, M.-C. Chen, M. Erhard, H.-S. Zhong, D. Wu, H.-Y. Tang, **Q. Zhao**, X.-L. Wang, K. Fujii, L. Li, N.-L. Liu, K. Nemoto, W. J. Munro, C.-Y. Lu, A. Zeilinger, and J.-W. Pan, "Quantum teleportation of physical qubits into logical code spaces," *Proceedings of the National Academy of Sciences*, vol. 118, no. 36, 2021. [Online]. Available: <https://www.pnas.org/content/118/36/e2026250118>
- [15] X. Yuan, J. Sun, J. Liu, **Q. Zhao\***, and Y. Zhou, "Quantum simulation with hybrid tensor networks," *Phys. Rev. Lett.*, vol. 127, p. 040501, Jul 2021. [Online]. Available: <https://link.aps.org/doi/10.1103/PhysRevLett.127.040501>
- [16] X. Yuan, Y. Liu, **Q. Zhao**, B. Regula, J. Thompson, and M. Gu, "Universal and operational benchmarking of quantum memories," *npj Quantum Information*, vol. 7, no. 1, pp. 1–8, 2021.
- [17] D. Wu, **Q. Zhao\* (Co-first author)**, Y.-H. Luo, H.-S. Zhong, L.-C. Peng, K. Chen, P. Xue, L. Li, N.-L. Liu, C.-Y. Lu, and J.-W. Pan, "Entanglement-free witnessing of quantum incompatibility in a high-dimensional system," *Phys. Rev. Research*, vol. 3, p. 023017, Apr 2021. [Online]. Available: <https://link.aps.org/doi/10.1103/PhysRevResearch.3.023017>

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## PATENTS

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1. Xiongfeng Ma and **Qi Zhao**, "Measurement-device-independent quantum key distribution with biased basis choice," Patent number: ZL201621455743.9
2. Xiongfeng Ma and **Qi Zhao**, "Quantum key distribution based on two-way classical communication," Patent number: ZL201621440463.0
3. Xiongfeng Ma and **Qi Zhao**, "Quantum key distribution data postprocessing for detector efficiency mismatch," Patent number: CN201510500542.X; Publication number: CN105049200A

## CONTRIBUTED TALKS

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1. Tutorial: Hamiltonian simulation algorithms, International Workshop on Frontiers in Quantum Information, Haikou, China, 2023
2. Robust self-testing of many body entanglement, International Conference on Quantum Photonics (QQPhotonX 2023), Jinhua, China, 2023
3. Hamiltonian simulation by compensating Trotter errors with linear-combination-of-unitary operators, International workshop on Quantum Characterization, Verification, and Validation (IWQCVV), Shanghai, China 2023
4. Tutorial: Hamiltonian simulation, QCIP Fourth workshop on Quantum Communication and Information Processing (virtual), 2022
5. Hamiltonian simulation with random inputs, Quantum Information and Processing (QIP) 2022, Caltech, Pasadena, USA
6. Robustness of Quantum Memories: An Operational Resource-Theoretic Approach, Quantum Information and Processing (QIP) 2020, Shenzhen, China
7. Entanglement structure: entanglement partitioning in multipartite systems and its experimental detection using optimizable witnesses, 18th Asian Quantum Information Science Conference (AQIS), Nagoya, Japan
8. Polynomial measure of coherence, 18th Asian Quantum Information Science Conference (AQIS), Nagoya, Japan