

Yifan (Frank) Zhang

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Research Interest: quantum information theory; quantum computing; physics for AI; many-body physics; physics of information & computation; quantum complexity; tensor network; non-equilibrium physics; condensed matter physics; quantum device and engineering; mathematical physics

EDUCATION

Princeton University — 2022–Present

Ph.D Candidate in Electrical & Computer Engineering

M.A. in Electrical & Computer Engineering (2024)

Cornell University — 2019–2022

B.S. in Electrical & Computer Engineering

John G. Pertsch Prize (top two in department), GPA 4.2/4.0

Cooper Union for the Advancement of Science and Art — 2018–2019

B.Eng in in Electrical & Computer Engineering

EMPLOYMENT

Quantum Applications Intern, QuEra Computing Inc. — Feb 2026–Present

JOURNAL PUBLICATIONS

Song, Z. et. al. Evaluating Large Language Models in Scientific Discovery. arXiv:2512.15567 (2025)

Zhang, Y. F. & Gopalakrishnan, S. Stability of mixed-state phases under weak decoherence. arXiv:2511.01976 (2025)

Zhang, Y. F., Lee, S., Jiang, L. & Gopalakrishnan, S. Classically Sampling Noisy Quantum Circuits in Quasi-Polynomial Time under Approximate Markovianity. arXiv:2510.06324 (2025)

Midha, S. & **Zhang, Y. F.** Beyond Belief Propagation: Cluster-Corrected Tensor Network Contraction with Exponential Convergence. arXiv:2510.02290 (2025)

Hu, F., Liu, G., **Zhang, Y. F.**, & Gao, X. Local Diffusion Models and Phases of Data Distributions. arXiv:2508.06614 (2025)

Zhang, Y. F. & Gopalakrishnan, S. Conditional Mutual Information and Information-Theoretic Phases of Decohered Gibbs States. *Physics Review Letter* 135 (16), 160401 (2025) (*editor's suggestion*)

Zhang, Y. F. & Gopalakrishnan, S. Approximate Markovianity in High-Temperature Hidden Markov Networks. *PRB* (2025)

Zhang, Y., Zhang, Y. Classical Simulability of Quantum Circuits with Shallow Magic Depth. *PRX Quantum* 6 (1), 010337 (2025) (*special International Year of Quantum collection*)

Chang, R. D, Shumiya, N., McLellan, R., **Zhang, Y.** et al. Eliminating Surface Oxides of Superconducting Circuits with Noble Metal Encapsulation. *Physics Review Letter* 134 (9), 097001 (2025) (*editor's suggestion*)

Zhang, Y., Gopalakrishnan, S. & Styliaris, G. Characterizing MPS and PEPS Preparable via Measurement and Feedback. *PRX Quantum* 5 (4), 040304 (2024)

Zhang, Y., Samajdar, R. & Gopalakrishnan, S. Nanoscale sensing of spatial correlations in nonequilibrium current noise. *arXiv:2404.15398* (2024)

Zhang, Y. & Gopalakrishnan, S. Nonlocal growth of quantum conditional mutual information under decoherence. *Physical Review A* 110 (3), 032426 (2024).

Zhang, Y. et al. Tight-Binding Bandstructure of α - and β - Ga₂O₃ and Al₂O₃. *J. Appl. Phys* (2021).

CONFERENCE PROCEEDINGS

Zhang, Y., Liu, M., Khalsa, G. & Jena, D., A Tight-Binding Model for Gallium Oxide: The Newest Ultra Wide-Bandgap Semiconductor. 2020 IEEE MIT Undergraduate Research Technology Conference.

INVITED TALKS

Approximate Markovianity and Classical Simulation of Noisy Quantum Circuits.

University of Maryland (Dec 2025)

University of Chicago (Nov 2025)

Columbia University (May 2025)

Beyond Belief Propagation: Cluster-Corrected Tensor Network Contraction with Exponential Convergence.

Thompson group meeting, Princeton University (Oct 2025)

Google TN weekly (Oct 2025)

Fantastic Shallow Magic Depth Circuits and Where to Find Them.

University of Toronto (April 2025)

Characterizing MPS and PEPS Preparable via Measurement and Feedback.
Quantum Info & Computing Meeting at Max Planck Quantum (Oct 2024)

A Short Introduction to Matrix Product States and Matrix Product Unitaries.
CMP/QFT Group Meeting at Institute of Advanced Study (Sep 2024)

How Efficiently can Measurement Induce Entanglement?
Quantum Group Meeting at Princeton University (Nov 2023)

ACADEMIC VISITS

University of Maryland (Dec 2025)

University of Chicago (Nov 2025)

KITP, University of California, Santa Barbara (Sep 2025)

Les Houches Summer School (Aug 2025) (cancelled due to visa policy)

Tsinghua University (Jun 2025) (cancelled due to visa policy)

University of Toronto (April 2025)

Perimeter Institute (April 2025)

Max Planck Institute for Quantum Optics (Oct 2024)

Minnesota Summer School on Quantum Dynamics (Jun 2023)

JUNIOR COLLABORATORS

graduate student at Princeton University:

- Siddhant Midha
- Hongkun Chen
- Inci Anali
- Cheng Wang

undergraduate student at Princeton University:

- Hannah Nichols

TEACHING

Spring 2026 — TA of ECE569: Quantum Information and Entanglement

Fall 2025 — TA of ECE396: Introduction to Quantum Computing

Spring 2025 — TA of ECE569: Quantum Information and Entanglement

Fall 2024 — TA of ECE396: Introduction to Quantum Computing

Fall 2023 — TA of ECE396: Introduction to Quantum Computing

SERVICES

- Referee for Nature Communications, Physical Review Letters, PRX Quantum, Physical Review A, Quantum Science and Technology, and Journal of Applied Physics.
- Presenter and participant at Princeton applied physics journal club for four years
- Regular mentorship at open houses and orientations of Princeton ECE and QSE departments
- Organized many group outing events