Yifan (Frank) Zhang

Department of Electrical & Computer Engineering, Princeton University, Princeton, NJ 08543
Google Scholar   Email: yz4281@princeton.edu

Research Interest: quantum information theory; quantum computing; physics for AI; many-body physics; quantum magic; classical simulation; quantum device and engineering; tensor network; condensed matter physics; information in physical systems; 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

JOURNAL PUBLICATIONS

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. PRL (2025)

Zhang, Y. F. & Gopalakrishnan, S. Approximate Markovianity in High-Temperature Hidden Markov Networks. submitted to 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 PUBLICATIONS

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

Markov Length, Mixed-state Phases, and Diffusion Models. Cornell University (Dec 2025)

Approximate Markovianity and Classical Simulation of Noisy Quantum Circuits. University of Maryland (Dec 2025)

Approximate Markovianity and Classical Simulation of Noisy Quantum Circuits. University of Chicago (Nov 2025)

Beyond Belief Propagation: Cluster-Corrected Tensor Network Contraction with Exponential Convergence. Thompson group meeting, Princeton University (Oct 2025)

Beyond Belief Propagation: Cluster-Corrected Tensor Network Contraction with Exponential Convergence. Google TN weekly (Oct 2025)

Classically Sampling Noisy Quantum Circuits in Quasi-Polynomial Time under Approximate Markovianity. Columbia University (May 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)

CONTRIBUTED TALKS
Zhang, Y. & Gopalakrishnan, S. How Efficiently can Measurement Induce Entanglement? APS March Meeting 2024.

ADADEMIC VISITS
Cornell University (Dec 2025)

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)

TEACHING
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