Shifan Xu

Ph.D. Candidate in Applied Physics

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Education

Yale University — *New Haven, CT, USA*
PhD Candidate — *Sep. 2021 - present*
- Advisor: Dr. Yongshan Ding, Dr. Steven M. Girvin
- Major: Applied Physics

University of Chicago — *Chicago, IL, USA*
Visiting Ph.D. Student — *Jan. 2024 - May 2024*

Nanjing University — *Nanjing, China*
BS Undergraduate Degree — *Sep. 2017 - Jun. 2021*
- Major: Physics

University of California, Berkeley — *Berkeley, CA, USA*
Visiting Undergraduate Student — *Jul. 2019 - Jan. 2020*

Professional Experience

2025 **Graduate Student Intern**, Pacific Northwest National Laboratory (PNNL), Richland
2023-2025 **Graduate Research Assistant**, Dept. Applied Physics and Dept. Computer Science, Yale University
2022-2023 **Graduate Teaching Assistant**, Dept. Applied Physics and Dept. Computer Science, Yale University
2019-2021 **Undergraduate Research Assistant**, Dept. Engineering, Nanjing University
2018-2021 **Undergraduate Research Assistant**, Dept. Physics, Nanjing University

Research Experience

Yale University - Applied Physics Department — *New Haven, CT, USA*
Advisor: Dr. Yongshan Ding — *Sep. 2021 - Present*
- Architectural Improvements in Quantum Random Access Memory
- Practical Quantum Memory Architecture in NISQ and Fault-tolerant Era

Pacific Northwest National Laboratory (PNNL) — *Richland, WA, USA*
Advisor: Dr. Ang Li — *Jun. 2025 - Aug. 2025*
- Project: Quantum Secure Query

Nanjing University - Physics Department — *Nanjing, China*
Advisor: Dr. Tianjue Min — *2021*
- Graduation Thesis Project: "Analysis of Background Noise in $p\bar{p}$ Collision Experiments Based on the K-Nearest Neighbors (KNN) Algorithm"

UC San Diego - Department of NanoEngineering — *(remote) San Diego, CA, USA*
Advisor: Dr. Sheng Xu — *2020*
- Project: Circuit Design for Flexible Ultrasonic Array

Nanjing University - Engineering Department — *Nanjing, China*
Advisor: Dr. Xin Li, Dr. Minghui Lu — *2019-2021*
- Project: Preparation and Design of Auxetic Metamaterials

Nanjing University - Physics Department *Nanjing, China*

Supervisor: Prof. Sihui Wang *2018-2019*

- Project: Metal Powder Spectra Analysis

Publications

Published

Shifan Xu, Alvin Lu, and Yongshan Ding. "Fat-Tree QRAM: A High-Bandwidth Shared Quantum Random Access Memory for Parallel Queries." Proceedings of the 30th ACM International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS), Volume 2. 2025.

Samuel Stein, **Shifan Xu**, Andrew W. Cross, Theodore J. Yoder, Ali Javadi-Abhari, Chenxu Liu, Kun Liu, Zeyuan Zhou, Charles Guinn, Yufei Ding, Yongshan Ding, and Ang Li. "HetEC: Architectures for Heterogeneous Quantum Error Correction Codes." Proceedings of the 30th ACM International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS), Volume 2. 2025.

Shifan Xu, Connor T. Hann, Ben Foxman, Steven M. Girvin, and Yongshan Ding. "Systems Architecture for Quantum Random Access Memory." In Proceedings of the 56th Annual IEEE/ACM International Symposium on Microarchitecture (MICRO), pp. 526–538. 2023.

Preprints

Kun Liu, **Shifan Xu**, Tomas Jochym-O'Connor, Zhiyang He, Shraddha Singh, and Yongshan Ding. "In-Situ Simultaneous Magic State Injection on Arbitrary CSS qLDPC Codes." arXiv preprint arXiv:2604.05126 (2026).

Shifan Xu, Kun Liu, Patrick Rall, Zhiyang He, and Yongshan Ding. "Distilling Magic States in the Bicycle Architecture." arXiv preprint arXiv:2602.20546 (2026).

Adrian Harkness, Shuwen Kan, Chenxu Liu, Meng Wang, John M. Martyn, **Shifan Xu**, Diana Chamaki, Ethan Decker, Ying Mao, Luis F. Zuluaga, Tamás Terlaky, Ang Li, and Samuel Stein. "FTCircuitBench: A Benchmark Suite for Fault-Tolerant Quantum Compilation and Architecture." arXiv preprint arXiv:2601.03185 (2026).

D. K. Weiss, **Shifan Xu**, Shruti Puri, Yongshan Ding, and Steven M. Girvin. "Faulty towers: recovering a functioning quantum random access memory in the presence of defective routers." arXiv preprint arXiv:2411.15612 (2024).

Awards, Fellowships, & Grants

2020 **ZhengGang Fellowship**, Nanjing University

2019 **People Scholarship**, Nanjing University
Outstanding Prize in Taiwan College Physics Experiment tournament (TCPT), National Tsing Hua University

2018 **Outstanding Prize in Top-notch Talent Plan**, Nanjing University

Presentations

Invited Talks

Apr. 2026. ***Distilling Magic States in the Bicycle Architecture***. Invited talk hosted by the Xanadu team.

Spring 2024. ***Architectural Improvements in Quantum Random Access Memory***. Invited talk: Prof. Liang Jiang Group Meeting, University of Chicago.

Fall 2023. ***Systems Architecture for Quantum Random Access Memory***. Invited talk: QAISG's Quantum Machine Learning Seminar, Centre for Quantum Technologies, National University of Singapore.

Mentoring

2024-present **Alvin Lu**, Undergraduate student, Yale University *New Haven*

Outreach & Professional Development

Service and Outreach

2024 **Quantum Computing Applications and Systems Workshop (Co-located with 43rd ICCAD)**, Program Committee — *New Jersey, USA*

Journal Refereeing

Physical Review Research
Physical Review A (**PRA**)
PRX Quantum
Physical Review Letters (**PRL**)
Physical Review X (**PRX**)
IEEE Transactions on Parallel and Distributed Systems (**TPDS**)
ACM Transactions on Design Automation of Electronic Systems (**TODAES**)
ACM Transactions on Quantum Computing (**TQC**)

Conference Reviewing

Quantum Information Processing (**QIP**)