

XU XU

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RESEARCH INTERESTS

Distributed and fault-tolerant quantum computing, with emphasis on quantum networking, QEC-aware compilation, remote logical operations, entanglement management, and resource-efficient execution across interconnected QPUs.

EDUCATION

Stony Brook University (SBU)

Stony Brook, NY, USA

Ph.D. in Computer Engineering

Aug. 2023–Present (Expected: June 2028)

Research Lab: High Performance Computing and Networking Research Laboratory

Relevant Coursework: Quantum Information Science (A); Quantum Computing and Applications (A); Quantum Programming (A); Quantum Information Systems (A); Switching and Routing in Parallel Systems (A)

Nanjing University (NJU)

Nanjing, China

B.S. in Physics

Sept. 2019–June 2023

RESEARCH EXPERIENCE

Graduate Research Assistant — Distributed and Fault-Tolerant Quantum Systems

Aug. 2023–Present

Stony Brook University, Department of Electrical and Computer Engineering

Stony Brook, NY

Advisor: Prof. Yuanyuan Yang

- **Distributed compilation and remote-gate scheduling:** formulated scheduling problems involving gate teleportation (Telegate) and qubit teleportation (Teledata); developed LABUBU and related heuristics that reduce entanglement consumption by up to 90% and 25% relative to Telegate-SA and Teledata-ZS, respectively, while respecting QPU-capacity constraints.
- **Circuit transformation and qubit mapping:** co-developed joint optimization methods that reduce inter-QPU communication while preserving circuit executability and satisfying distributed hardware constraints.
- **Distributed fault-tolerant architecture and resource allocation:** designed a surface-code-based architecture that distributes logical computation, magic-state factories, and buffer resources across interconnected QPUs; formulated joint computation placement, factory placement, buffer allocation, and layer-level scheduling to minimize logical circuit failure probability under physical-qubit and magic-state constraints.
- **QEC-aware entanglement preparation:** developed an end-to-end reliability framework integrating entanglement generation, physical purification, encoding, QEC, logical purification, Bell-pair storage, and remote circuit execution.
- **Quantum networking and photonic interconnects:** evaluated static and switched photonic interconnects for distributed trapped-ion QPUs; contributed to nonblocking multistage optical switching and routing methods for scalable quantum networks.
- **Simulation and benchmarking:** built Monte Carlo models capturing latency, fidelity, retries, storage aging, and physical-qubit demand; implemented Python/Qiskit evaluation pipelines and Gurobi optimization baselines for structured, random, and QEC-encoded circuits.

TECHNICAL SKILLS

Quantum Computing	Distributed and fault-tolerant quantum computing; quantum networking; surface and CSS/Steane codes; stabilizer methods; logical operations; entanglement generation and purification
Algorithms & Systems	Circuit transformation; qubit mapping; remote-gate and dependency-aware scheduling; resource allocation; reliability and performance modeling; integer programming; heuristic optimization
Software & Tools	Python; NumPy; SciPy; Matplotlib; Qiskit; Qiskit Aer; PennyLane; Gurobi; Monte Carlo simulation; PyTorch; Git; LaTeX; C and Java for coursework and systems programming

SELECTED PUBLICATIONS

- **X. Xu** et al., “Resource Allocation for Distributed Fault-Tolerant Quantum Computing with Surface Codes,” *IEEE International Conference on Distributed Computing Systems (ICDCS)*, 2026.
- **X. Xu** et al., “Labubu: Layer-Buffered Bundled Optimization for Efficient Remote Gate Scheduling in Distributed Quantum Computing,” *IEEE/ACM Transactions on Networking*, 2026.
- **X. Xu** et al., “Remote Gate Scheduling in Distributed Quantum Computing,” *IEEE International Conference on Distributed Computing Systems (ICDCS)*, 2025.
- X. Zhang, **X. Xu**, et al., “Joint Optimization of Circuit Transformation and Qubit Mapping for Distributed Quantum Computing,” *IEEE International Conference on Computer Communications (INFOCOM)*, 2026.
- X. Zhang, Y. Liu, Y. Mao, **X. Xu**, and Y. Yang, “CARL: Crosstalk-Aware Quantum Compilation Based on Reinforcement Learning,” *IEEE International Conference on Distributed Computing Systems (ICDCS)*, 2026.
- Y. Liu, Y. Mao, **X. Xu**, et al., “A Nonblocking Multistage Switching Network for Distributed Quantum Computing,” *IEEE/ACM Transactions on Networking*, 2025.
- Y. Mao, Y. Liu, **X. Xu**, et al., “Performance Analysis of Interconnection Networks for Distributed Quantum Computing,” *IEEE Global Communications Conference (GLOBECOM)*, 2024.

CURRENT MANUSCRIPTS

- **X. Xu**, Y. Liu, Y. Mao, and Y. Yang, “Reliability-Aware Qubit Mapping and Entanglement Preparation for Distributed Fault-Tolerant Quantum Computing.”
- Z. Yi, X. Zhang, Y. Liu, Y. Mao, **X. Xu**, and Y. Yang, “A Strictly Nonblocking Multistage Switching Network for Distributed Quantum Computing.”

ADDITIONAL RESEARCH EXPERIENCE

Researcher — Computer Vision and Medical Imaging	Oct. 2022–June 2023
Nanjing University	Nanjing, China
• Developed and evaluated CNN-, ResNet-, and Transformer-based pipelines for breast-ultrasound classification using Python and PyTorch.	

TEACHING AND PROFESSIONAL SERVICE

Teaching Assistant, Stony Brook University	2023–Present
ESE 333 Real-Time Operating Systems; ESE 123 Introduction to Electrical and Computer Engineering; ESE 272 Electronics.	

Professional Service: PC Member, IEEE QCNC 2026; Subreviewer, ACM SIGCOMM 2024, IEEE INFOCOM 2025–2026, and IEEE ICDCS 2024.