Yuhao Liu

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Education

8/2023 – Now	**Ph.D. in Computer and Information Science** University of Pennsylvania, USA. Advisor: Dr. Gushu Li
8/2023 – 8/2025	**M.S. in Computer and Information Science** University of Pennsylvania, USA.
9/2019 – 5/2023	**B.E. in Computer Science and Technology** Tsinghua University, China. Advisor: Prof. Wei Xue

Research Interests

- Quantum Computing; Quantum Information; Quantum Error Correction
- Programming Language; Formal Methods; Formal Verification
- High-Performance Computing; Compiler Optimization; Compiler Construction

Publications (* = equal contribution)

[HPCA'25]	**Yuhao Liu**, Kevin Yao, Jonathan Hong, Julien Froustey, Ermal Rrapaj, Costin Iancu, Gushu Li, Yunong Shi, "*HATT: Hamiltonian Adaptive Ternary Tree for Optimizing Fermion-to-Qubit Mapping*", the IEEE International Symposium on High-Performance Computer Architecture (HPCA), 2025.
[ASPLOS'24]	**Yuhao Liu**, Shize Che, Junyu Zhou, Yunong Shi, Gushu Li, "*Fermihedral: On the Optimal Compilation for Fermion-to-Qubit Encoding*", the International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS), 2024.
[ASPLOS'26]	Junyu Zhou, **Yuhao Liu**, Shize Che, Anupam Mitra, Efekan Kökcü, Ermal Rrapaj, Costin Iancu, Gushu Li, "*QTurbo: A Robust and Efficient Compiler for Analog Quantum Simulation*", International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS), 2026.
[ASPLOS'25]	Spyros Pavlatos*, Xuting Liu*, **Yuhao Liu**, Vincent Liu, "*λ-trim: Reducing Monetary and Performance Cost of Serverless Cold Starts with Cost-driven Application Debloating*", International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS), 2025.
[PLDI'25]	Xiuqi Cao*, Junyu Zhou*, **Yuhao Liu**, Yunong Shi, Gushu Li, "*MarQSim: Reconciling Determinism and Randomness in Compiler Optimization for Quantum Simulation*", ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI), 2025.

[CAV'25] Kean Chen, **Yuhao Liu**, Wang Fang, Jennifer Paykin, Xin-Chuan Wu, Albert Schmitz, Steve Zdancewic, Gushu Li, "*Verifying Fault Tolerance of Quantum Error Correction Codes*", International Conference on Computer Aided Verification (CAV), 2025.

[ISCA'24] Junyu Zhou, **Yuhao Liu**, Yunong Shi, Ali Javadi-Abhari, Gushu Li, "*Bosehedral: Compiler Optimization for Bosonic Quantum Computing*", the IEEE/ACM International Symposium on Computer Architecture (ISCA), 2024.

[DAC'24] Shize Che, Seongwoo Oh, Haoyun Qin, **Yuhao Liu**, Anthony Sigillito, Gushu Li, "*Fast Virtual Gate Extraction For Silicon Quantum Dot Devices*", the Design Automation Conference (DAC), 2024.

In Submission (* = equal contribution)

[To ASPLOS'26] **Yuhao Liu**, Shuohao Ping, Junyu Zhou, Ethan Decker, Justin Kalloor, Mathias Weiden, Kean Chen, Yunong Shi, Ali Javadi-Abhari, Costin Iancu, Gushu Li, "*AlphaSyndrome: Tackling the Syndrome Measurement Circuit Scheduling Problem for QEC Codes*".

[To ASPLOS'26] Junyu Zhou, **Yuhao Liu**, Ethan Decker, Justin Kalloor, Mathias Weiden, Kean Chen, Costin Iancu, Gushu Li, "*TopoLS: Topological Compilation for Lattice Surgery*".

Undergoing

- Tackling atom loss in syndrome measurement for neutral atom quantum computer with SWAP-based loss detection and cat-state Pauli measurement during each cycle. The project aims to propose a new fault-tolerant syndrome measurement approach that can accommodate atom loss errors, along with an adapted `stim` simulator that incorporates qubit loss error, and a loss-aware decoder.

Conference Presentations

2025 "*HATT: Hamiltonian Adaptive Ternary Tree for Optimizing Fermion-to-Qubit Mapping*", APS Global Physics Summit 2025, Los Angeles, USA.

2025 "*HATT: Hamiltonian Adaptive Ternary Tree for Optimizing Fermion-to-Qubit Mapping*", 2025 IEEE Symposium on High-Performance Computer Architecture (HPCA), Las Vegas, USA.

2024 "*Fermihedral: On the Optimal Compilation for Fermion-to-Qubit Encoding*", the 29th International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS), San Diego, USA.

2022 "*High-Performance Stencil Computation DSL Inside Python*", SOLVER 22, Chongqing, China.

Teaching and Service

Spring 2025 **Teaching Assistant**, Computer Organization and Design, CIS 4710, UPenn, PA

Fall 2024 **Teaching Assistant**, Introduction to Quantum Computing, CIS 3990, UPenn, PA