Eliot Heinrich

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Summary

Ph.D. candidate in physics specializing in quantum simulation, with strong experience in C++/Python software engineering, high performance computing, and published research in quantum information science. Skilled in building scalable quantum libraries, collaborating across scientific teams, and technical writing.

Education

Boston College — Chestnut Hill, MA

Physics (Masters, Ph.D), GPA: 3.95 — Aug. 2020 – May 2026

University of Vermont — Burlington, VT

Physics (BS), Computer Science (BS), Mathematics (BS), GPA: 3.91 — Sept. 2016 – May 2020

Experience

Quantum Simulation Research (PI: Xiao Chen) — Chestnut Hill, MA

Graduate student — Sept. 2022 – Present

- Developed and maintained modular and efficient framework for large-scale quantum trajectory simulations in C++ with Python API. Stabilizer and matrix product state simulators typically outperform standard libraries (i.e. Qiskit) on similar single-shot tasks by 3-10x.
- Studied dynamic phase transitions characterized by entanglement, participation entropy, stabilizer entropy, and other nonlinear quantities.

Boston College Research Services (High Performance Computing) — Chestnut Hill, MA

High performance computing research assistant — Jan. 2023 – Present

- Collaborated with 35+ interdisciplinary research groups to design optimized HPC workflows, deploy custom modules, and accelerate large-scale simulations.
- Wrote and deployed automated scripts for aggregating and visualizing cluster usage data for monthly report to cluster policy committee.
- Wrote documentation for cluster policies and best practices.

MIT Lincoln Laboratory (Group 89) — Lexington, MA

Quantum theory/software summer intern — June 2022 – Aug. 2022

- Interned with Quantum Information & Integrated Nanosystems group to develop and benchmark algorithms for simulations of quantum circuits in C++ and Python.
- Developed sparse-vector based C++ backend, extending simulation error model to include leakage errors in quantum circuit models and integrated into existing code base.

Recent Publications

E. Heinrich et al, *Critical slowing of participation and stabilizer entropy in non-unitary quantum circuit dynamics,* (in preparation)

E. Heinrich et al, *Measurement induced phase transitions in quantum raise and peel models*, Phys. Rev. B (2024).

Skills

- High performance parallelized computing, open-source software, Linux, C++, Python, Rust, Git/GitHub, LaTeX
- Numerical methods/algorithms for large-scale physics simulations and data visualization
- Markov-chain Monte Carlo techniques for microscopic models of magnetism