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 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, 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 which extended simulation error model to include leakage errors in tansmon quantum circuit models

Recent Publications and Presentations

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, Python, C++, Rust, Git/GitHub, LaTeX
- Familiarity with quantum simulation techniques and simulable quantum subtheories including tensor network states, stabilizer states, and free fermion dynamics