TREVOR VINCENT, PHD

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ABOUT

Experienced C++ and Python programmer (100,000+ lines in both) with expert-level knowledge in numerical solution techniques for partial differential equations and quantum computing algorithms. I have been the lead developer on a number of projects, led teams of programmers, and worked on several different programming teams.

EXPERIENCE

MindKing Inc.   Nov. 2022 - Nov. 2023
High Performance Computing (HPC) Consultant

- Built software for QC Design, a company specializing in error correction for quantum computers.
- Developed a high-performance C++ unionfind decoder with a Python frontend for QC Design. Speed measurements showed it was faster than competitor decoders.
- Developed a high-performance C++ graph library with a Python frontend that underlies the entire QC Design software stack.
- Developed a Kokkos-based GPU Clifford state simulator with a Python frontend. Showed a 50x speedup over a CPU-based simulator used by QC Design.

Xanadu Quantum Technologies   Dec. 2019 - Nov 2022
High Performance Computing (HPC) Specialist

- Lead HPC theorist/software engineer on the Borealis Quantum Advantage demonstration. [Nature 606]. This demonstration helped make Xanadu a billion-dollar unicorn company.
- Lead author, inventor (pending patent) and developer of the task-based tensor network quantum circuit simulator Jet. [Github], [Quantum 6 (2022), 709]. Led a development team of five people. In our paper, we showed Jet was faster than other state-of-the-art tensor-network simulators.
- Lead developer of Pennylane-Lightning-Kokkos, the first AMD-GPU quantum circuit simulator. [Github]
- Creator and lead developer of the first benchmark regression analyzer software called 'Benchmark'. It currently analyzes the software Pennylane for performance regressions and notifies the commit owner on Slack.
- Helped write C++ and Python code in critical parts of several Xanadu libraries (Pennylane, Pennylane Lightning, FlamingPy, TheWalrus).

EDUCATION

University of Toronto   Sept. 2013 - Aug. 2019
PhD in Physics (Advisor: Prof. Harald Pfeiffer)

Developed next-generation numerical methods for solving the Einstein field equations (General Relativity) on supercomputers for the collisions of neutron stars and black holes. In parallel with this, I worked on the neutrino and matter emission properties of binary neutron star mergers for the Nobel-prize winning collaboration LIGO as well as on a team of 10+ developers across multiple universities to create the astrophysics code SpECTRE. My PhD work was funded by an NSERC CGSD scholarship ($105,000) and a NSERC CGSM scholarship ($30,000).

University of Winnipeg   Sept. 2008 - Aug. 2013
Bachelor of Science with Honours (Advisor: Prof. Melanie Martin)

Undergraduate work was funded by 15 scholarships, including three NSERC summer research awards and one CIHR summer research award. Winner of the Governor General Academic Medal for the highest graduating GPA in the university. Developed a state-of-art GPU-accelerated (via CUDA) C++ code for the diffusion and collision of water molecules around randomly oriented axons in 3d brain-matter. The simulator has been used in 2 scientific publications, used in a PhD thesis by Morgan Mercredi, and used in a Honours thesis by Michael Honke.