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EDUCATION

The University of Chicago — Chicago, IL
Bachelor of Science in Mathematics and Physics, 3.89/4.00 — Expected, June 2026

Relevant coursework

Analysis in Rn (Accelerated) I-II-III; Honors Mechanics, Electricity and Magnetism, Waves Optics and Heat; Computational Physics; Quantum Mechanics I-II; Advanced Electrodynamics I-II (Graduate Course).

EXPERIENCE

Fermi National Accelerator Laboratory — Batavia, IL
Researcher — June 2024 – October 2024

- Report a high-impact neutrino interaction measurement using events with one muon, two protons, and no pions collected by the Short Baseline Neutrino Detector liquid argon time projection chamber detector.
- Coded C++ framework to perform double differential analysis of high volumes of simulated neutrino-Argon interactions and perform comparisons with real detector data, along with statistical analysis of uncertainties.

EPiQC — Chicago, IL
Undergraduate Researcher — September 2023 – Present

- Develop a quantum circuit scheduler for robust gatesets to minimize the effects of crosstalk in hardware through an optimal-control design of the pulses realizing the gates; work done under post-doc Andy Goldschmidt.
- Research and implement tensor network contraction path optimization techniques to improve the performance of existing simulators for quantum Clifford circuits.

Infleqtion — Chicago, IL
Software Engineering Consultant — October 2023 – March 2024

- Actively maintaining the compatibility of QSCOUT's assembly language, Jaqalpaq, with modern Qiskit and Cirq versions, and increasing the rigorousness of unit testing of this and related packages.
- Collaborate on the development of compilation and noise characterization techniques and their integration into Superstaq, Infleqtion's hardware-aware quantum circuit compiler.

Infleqtion — Chicago, IL
Software Engineering Intern — June 2023 – August 2023

- Collaborated in the development of Superstaq, both server- and client-side in preparation for its open-beta launch. Automated the submission of application-level benchmarks across various quantum devices to measure and track advancements in hardware and Superstaq's performance.
- Designed and implemented a minimum viable product of a quantum characterization verification and validation software tool, with protocols such as the randomized measurement toolbox, direct fidelity estimation, and Pauli expectation value estimation through random Clifford measurements.
- Implemented the averaged circuit eigenvalue sampling (arxiv:2108.05803) protocol for the characterization of individual gate Pauli error channels. Measured the performance of the Clifford gateset on IBM's device.

Programming Languages Research Group — Chicago, IL
Undergraduate Researcher — January 2023 – June 2023

- Learned how to program with proof management system Coq to verify validity of quantum circuits optimizations and transformations to use them as bases to build complete verified algorithms.
- Formalized proof of Bernstein-Vazirani algorithm using SQIR (Small Quantum Intermediate Representation) and VOQC (Verified Optimizer for Quantum Circuits) Coq packages.

LEADERSHIP & ACTIVITIES

UChicago Quantum Society Chicago, IL
Head of Education January 2023 – Present

- Design, plan, and execute annual quantum computing crash course spanning introductory topics across quantum hardware, software, and theory.
- Support students interested in quantum computing from all backgrounds, adapt content for every knowledge level, and connect students with further learning opportunities.

PUBLICATIONS AND PREPRINTS

Peláez, E., Omole, V., Gokhale, P., Rines, R., Smith, K.N., Perlin, M.A., Hashim, A., *Average circuit eigenvalue sampling on NISQ devices*, arXiv:2403.12857.

Peláez, E., Das, A., Chani, P.S., Sierra-Sosa, D., *Euler-Rodrigues Parameters: A Quantum Circuit to Calculate Rigid-Body Rotations*, arxiv:2203.12943.

TALKS

Average Circuit Eigenvalue Sampling on NISQ Devices
APS March Meeting 2024, Quantum Latino Conference 2023

Oracle Creation for Quantum Algorithms
Quantum Hackathon CIC-IPN for Qiskit's Fall Fest in October 2021

On the Recursive Construction of Relative Phased Multiple Controlled Toffoli with Minh Pham
People Interested in Quantum Universal Education's one-year anniversary celebration in July 2021

SKILLS

Languages: Spanish native speaker, bilingual level in English (TOEFL iBT score of 114).
Computer: Advanced knowledge of Python, scientific packages like NumPy and SciPy, and other packages like Qiskit. Intermediate knowledge of C++ and working knowledge of JavaScript, HTML, and CSS. Proficient in LaTeX, Microsoft Word, Excel, and PowerPoint.
Certifications: IBM Certified Associate Developer: Quantum Computation using Qiskit v0.2X (2021).