Anthony Polloreno

Ph.D. Information Theory **B.A.** Computer Science
Software Engineering

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linkedin, twitter

Education

2019 - 2023 | Ph.D., Physics
Thesis Title: Characterizing Quantum Devices Using the Principles of Quantum Information
University of Colorado, Boulder

2019 - 2022 | M.S., Physics
University of Colorado, Boulder

2012 - 2016 | B.A., Computer Science, Physics, and Mathematics
University of California, Berkeley

Awards

NASA Space Technology Graduate Research Opportunity (NSTGRO) Fellowship
QISE-NET Award (Cohort 4)
C.U. Boulder Domestic Graduate Travel Grant
Pomerantz Physics Scholarship
U.C. Berkeley Regents' and Chancellor's Scholarship

Work and Research Experience

2021 - 2023 | Graduate Student Intern at Sandia National Laboratories
Quantum Characterization
Developed a cohesive theory of a general statistical technique for characterizing quantum computers that increases the number of qubits that can be characterized by a factor of 10x and is 100x faster than state-of-the-art techniques. Demonstrated that this characterization technique provides a detailed model of a quantum computer and predicts the behavior of complex circuits. Found that errors that occur during logical operations are 2x worse than other errors.

2019 | Software Engineering Consultant at Ψ-inf
Developed tools for storing, structuring and retrieving data from various experiments (Python/SQLAlchemy). Migrated data to backwards compatible Postgres database and collaborated with in-house scientists to automate data storage and retrieval. Improved engineer analysis productivity 2x with structured data logging and retrieval.

2016 - 2019 | Full Stack Software Engineer at Rigetti Computing
Implemented a novel machine learning algorithm using implicit kernels on the quantum processor, improving the error rate by .7% over a baseline of a linear classifier on the MNIST data set. Developed, tested and simulated efficient routines for device bring-up and characterization, replacing 100s of experiments from automated calibration routine (Julia). Primary maintainer and developer of control software suite for experiments and largest internal repository, reviewing and merging 100s of pull requests. Refactored routines used in automated device calibration using a Python DSL for expressing pulse sequences, increasing engineering development speed by more than 2x. Implemented matched filtering of RF signals (C++) to reduce data transfer overhead by more than 10x during experiments. Refactored a statistical analysis technique (randomized benchmarking) into a server (Lisp) to speed up experiment generation time by more than 10x.

2015 - 2016 | Student Intern at Sandia National Laboratories
Quantum Control Theory
Used optimal control theory to robustly reduce errors on quantum logical gates by more than an order of magnitude, both in simulation and experiment with real hardware at Rigetti Computing. By formulating the problem as an instance of convex optimization, I demonstrated a reduction of the number of required FPGA controls by 90%, improved the simulability of the controls by 10x, and showed a 5x increase in gate performance over 87.5% of feasible operating parameter values. Generated controls using gradient descent.

Publications

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Patents

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