

# Anthony Polloreno

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

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linkedin, twitter

## EDUCATION

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2019 - 2023	Ph.D., Physics <i>Thesis Title: Characterizing Quantum Devices Using the Principles of Quantum Information</i> 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
	<b>Awards</b> 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

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2021 - 2023	Graduate Student Intern at Sandia National Laboratories <i>Quantum Characterization</i> 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 $\Psi$ -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 <i>Quantum Control Theory</i> 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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