# Nathaniel T. Stemen

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## Employment

**Member of Technical Staff** Unitary Fund *Mar* 2022–

- Lead developer, product manager, and team coordinator for the open-source Python package `mitiq` (175,000+ downloads, 110+ citations). Drive both technical innovation and strategic roadmap development to enhance quantum error mitigation. Manage contributors, oversee project planning, and foster collaboration within a distributed, open-source team.
- Developed software to test hypotheses for publications and integrated novel quantum error mitigation techniques (classical shadows, and quantum subspace expansion) from research literature into `mitiq`, bridging theory and practice.
- Manage a thriving open-source community by organizing weekly technical talks, facilitating community calls, and conducting user outreach to inform teams development across multiple projects.
- Directed unitaryHACK 2023, overseeing event planning, issue curation, and participant engagement. Coordinated efforts across 70 hackers to close 99 issues across the quantum open-source ecosystem, distributing over $11,000 in rewards to contributors.

**Software Developer** Overleaf 2017–2021

- Improved LaTeX autocomplete using statistical analysis of open-source documents, enhancing user experience for 300,000+ daily users.
- Maintained and optimized large **Rails** and **Node** applications through bug fixes, performance improvements, and feature delivery.
- Monitored and supported data migration from **PostgresQL** to **MongoDB**, ensuring data integrity throughout the process.

**Summer Researcher** New York University 2016

- Used **Python** to numerically solve nonlinear Schrödinger equations modeling electromagnetic pulse propagation in nonlinear media.

**Summer Researcher** Yale University (PROSPECT Experiment) 2014 & 2015

- Built an optical simulation in **C++** to optimize detector design and study light collection and uniformity.
- Implemented pulse-shape discrimination techniques in **Python** to improve neutrino event selection.

## Education

**University of Waterloo** MMath in Applied Mathematics 2020–2022

- Thesis: *Quantum Circuit Compilation from the Ground Up* advised by Joel Wallman

**New York University** B.Sc. in Mathematics and Physics 2013–2017

- Thesis: *An Investigation of Q-Balls* advised by Luciano Medina

## Publications

1. LaRose, R. et al. (Aug. 2022). Mitiq: A software package for error mitigation on noisy quantum computers. *Quantum* 6, p. 774. URL: https://doi.org/10.22331/q-2022-08-11-774.

2. McDonough, B. et al. (2022). "Automated quantum error mitigation based on probabilistic error reduction". In: *2022 IEEE/ACM Third International Workshop on Quantum Computing Software (QCS)*, pp. 83–93. arXiv: 2210.08611 [quant-ph].
3. Ashenfelter, J. et al. (2016). Background Radiation Measurements at High Power Research Reactors. *Nucl. Instrum. Meth.* A806, pp. 401–419. arXiv: 1506.03547 [physics.ins-det].
4. Ashenfelter, J. et al. (2015). Light Collection an Pulse-Shape Discrimination in Elongated Scintillator Cells for the PROSPECT Reactor Antineutrino Experiment. *JINST* 10.11, P11004. arXiv: 1508.06575 [physics.ins-det].

## Teaching

**Fundamentals of University Teaching** University of Waterloo 2020–2022
- Completed program designed to help graduate students learn evidence-based strategies for teaching through workshops and practice teaching sessions.

**Mathematics Teacher** NYU Metro Center College Prep Academy 2015–2017
- Independently planned and taught Pre-Calculus course for high school students.
- Facilitated numerous extra-curricular math courses of 30 students as a class assistant by providing additional guidance to students.

## Service

**QED-C mentor** 2023–
**Equity, Diversity and Inclusion Committee** University of Waterloo; IQC 2021–2022
**Strategic Plan Implementation Working Group** University of Waterloo 2021

## Coninuing Education

**CSE 534: Quantum information and computation** University of Washington (audit) *Sep–Dec* 2024
**Quantum Machine Learning Workshop** QSciTech-QuantumBC *Jan–Feb* 2022
**Presenting Data and Information** Edward Tufte *Nov* 2019

## Tools

**Languages**
- Python, JavaScript, SQL, Ruby, bash, HTML
- English (native), Mandarin Chinese (beginner)

**Software**
- git/GitHub, AWS, docker, Linux, MacOS