Nathaniel T. Stemen

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Education

University of Waterloo MMath in Applied Mathematics 2020–2022

- Thesis: *Quantum Circuit Compilation from the Ground Up*
- Advisor: Prof. Joel Wallman

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

- Thesis: *An Investigation of Q-Balls*
- Advisor: Prof. Luciano Medina

Employment

Member of Technical Staff Unitary Fund 2022–

- Core maintainer of python package `mitiq` (100,000+ downloads) used for improving the results of quantum algorithms via quantum error mitigation.
- Implemented calibration module to find optimal error mitigation strategy on user backend.
- unitaryHACK 2023 Director. Responsible for all event coordination in which 70 hackers closed 99 issues within the quantum open-source ecosystem.

Software Developer Overleaf 2017–2021

- Provided data for and improved LaTeX autocomplete feature using statistical analyses.
- Maintained large **Rails** and **Node** web applications by providing bug fixes and feature improvements.
- Monitored and maintained data-migration from **PostgresQL** to **MongoDB**.
- Developed career ladder with working group to help promote equity and continuity with growing company.

Summer Researcher New York University 2016

- Numerically computed solutions to nonlinear Schrödinger equations modeling transmission of short electromagnetic pulses in nonlinear media using **python**.

Summer Researcher Yale University (PROSPECT Experiment) 2014 & 2015

- Built optical simulation of prototype detector in **C++** to study light collection, detector uniformity, and optimize light guide shape.
- Surveyed and implemented pulse-shape discrimination methods in **python** to determine optimal method for neutrino event selection.

Publications

Refereed Research Papers

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].

Talks

Conference Presentations

1. A Few Words About Overleaf (Sept. 2019). *TEX Users Group*.
2. Optical Vortex Solitons: Existence and Computation (Oct. 2016). *Gulf Coast Undergraduate Research Symposium, Rice University*.
3. Optical Simulations and Studies with the PROSPECT-20 Detector (Oct. 2015). *Poster presentation, APS Division of Nuclear Physics Conference Experience for Undergraduates*. URL: https://meetings.aps.org/Meeting/DNP15/Event/257843.

Workshops

1. An Introduction to LaTeX for Undergraduates (Sept. 2019). *FYSEM-UA 731: The Mathematics of Ramsey Theory*. Courant Institue of Mathematical Sciences, NYU.

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 *Jun–Aug* 2016
- Independently planned and taught Pre-Calculus course for high school students.

Mathematics Tutor NYU Metro Center College Prep Academy *Oct* 2015–*May* 2017
- Facilitated numerous extra-curricular math courses of 30 students as a class assistant by providing additional guidance to students.

Service

Equity, Diversity and Inclusion Committee University of Waterloo; IQC 2021–2022

Strategic Plan Implementation Working Group University of Waterloo 2021
- Working with the mathematics department to attract and retain people of high potential and accomplishment as well as foster student, staff, and faculty wellbeing.
- Served on hiring board for *community well-being and engagement officer*, a position proposed and made permanent due to the working group.

Foundations and Philosophy of Quantum Mechanics NYU 2016–2017
- Co-organized group of 15 students that met weekly to discuss the mathematical and philosophical foundations of quantum mechanics.

Orientation Leader NYU *Summer* 2014 *&* 2015
- Organized, coordinated, and facilitated events encouraging new students to socialize and discover NYU and NYC.

Certificates

Quantum Machine Learning Workshop QSciTech-QuantumBC *Jan–Feb* 2022
- 3 week workshop covering the basics of quantum machine learning culminating in a team project and poster presentation.

More Feet On The Ground *Dec* 2020
- Online preparation to recognize, and respond to those with mental health crises and concerns.

Presenting Data and Information Edward Tufte *Nov* 2019
- Fundamental design strategies for information displays such as tables, diagrams, charts, images, and other data visualizations.

Tools

Languages

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

Software

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