

Caleb Rotello

Renewable Energy and Quantum Information Researcher || Writer || Eagle Scout

[Github](#) || [LinkedIn](#) || caleb@rotello.dev || [My Website](#) || [Google Scholar](#)

Education

M.S. in Quantum Engineering Colorado School of Mines May 2021 – Aug 2022
Thesis: “Symmetry-protected subspaces in quantum simulations”
Advisor: Eliot Kapit (Physics)
GPA 4.0/4.0

B.S. in Computer Science Colorado School of Mines Aug 2018 – May 2021
GPA 3.79/4.0 (Major GPA 4.0); Magna Cum Laude

Research Experience

- **Researcher II at NREL** July 2023 – Present
Complex Systems, Simulation, and Optimization Group
 - Developed quantum computer algorithms for stochastic programming, computing m -point chemical correlation functions, and optimization.
 - Led research and software development for quantum computing resource estimation and benchmarking on real-world energy problems.
 - Proposal development for: integrated systems of quantum sensors, networks, and computers on the power grid; practical quantum computing; quantum algorithms for stochastic programming.
 - Mentored interns Jacob (Coby) Sagal and Mandy Bowman.
- **Machine Learning Research Intern at NREL** Nov 2021 – July 2023
Mentored by Dr. Eric B. Jones and Dr. Peter Graf
 - Derived analytical methods using graph theory to [predict symmetries](#) in quantum simulations.
 - Researched the application of quantum computers to the power grid.
- **Graduate Research Assistant at CSM** Summer 2021 – Summer 2022
Mentored by Professor Eliot Kapit, *Physics*
 - Used Google Sycamore processor to [calculate spin-foam amplitudes in loop quantum gravity](#).
 - Created software to analyze different quantum algorithms for boolean SAT problems.
 - Mentored undergraduate physics student Jacob Millar (now engineer at Salesforce).
- **Bioinformatics Research Intern at Invitae** (prev ArcherDX) Summer 2020, 2021
Mentored by Abel Licon
 - Developed linear time algorithm with Levenshtein automata to pair noisy DNA sequences.
 - Wrote algorithms to pair RNA alpha and beta sequences across multiple cells.
- **Undergraduate Researcher at CSM** Fall 2020
Mentored by Professor Judith Klein, *Chemistry*
 - Created sentiment analysis models to predict Covid-19 outbreaks from Twitter data.Mentored by Professor Tom Williams, *Computer Science* Spring, Summer 2020
 - Wrote software to recognize deictic gestures (gestures that convey meaning).

Publications & Manuscripts

- J. Sagal, ..., C. Rotello. *Benchmarks and Resource Estimation of QAOA for Unit Commitment on Real-World Power Grids*. (In preparation, expected Jan 2025).
- C. Rotello. *Quantum algorithm for approximating the expected value of a random-exist quantified oracle*. [arXiv:2412.00567](https://arxiv.org/abs/2412.00567) (2024). (submitted, npj Quantum Information).

- E. B. Jones, ..., **C. Rotello**, ..., W. Jones. *Dynamic, Symmetry-Preserving, and Hardware-Adaptable Circuits for Quantum Computing Many-Body States and Correlators of the Anderson Impurity Model*. In review at Physical Review Research (2024). [arXiv:2405.15069](https://arxiv.org/abs/2405.15069). (in review, Physical Review Research)
- **C. Rotello**, ..., W. Jones. *Calculating the expected value function of a two-stage stochastic optimization program with a quantum algorithm*. [arXiv:2402.15029](https://arxiv.org/abs/2402.15029) (2024). (submitted, Quantum)
- **C. Rotello**, ..., E. Kapit. *Automated detection of symmetry-protected subspaces in quantum simulations*. [Physical Review Research, 5, 033082 \(2023\)](https://doi.org/10.1103/PhysRevResearch.5.033082).
- **C. G. Rotello**. *Symmetry Protected Subspaces in Quantum Simulations*. MS Thesis, Colorado School of Mines, (2022).

Presentations

- *Exploring Quantum Computing for a Robust Traffic Signal Control*
 - Podium talk at International Conference in Transportation & Development, ASCE 07.2025
- *Quantum algorithms for calculating the expected value of #P-Hard stochastic programming problems*
 - Poster at Southwest Quantum Information and Technologies workshop 10.2024
- *Automated detection of symmetry-protected subspaces in quantum simulations*
 - Accepted talk at Southwest Quantum Information and Technologies workshop 11.2023
 - Invited talk at Superconducting Quantum Materials and Systems Center, Fermilab 08.2022

Honors & Awards

- **Key Contributor Award** at National Renewable Energy Laboratory 2024
- **1st Place** at IBM Humans vs. Quantum Computers Challenge in Hackathon by Womanium 2022
- **Dean's List** at CSM 2018-21
- **2nd Place** at CS Algobowl Hackathon by CSM Computer Science Department 2020
- **4th Place** HackCU VI International Hackathon 2020
- C-MAPP Transamerica Scholar by CSM Computer Science Department 2019-20
- NASA RASC-AL **Semifinalist** for Gateway-based Cis-lunar Tug 2019

Leadership & Service

- Advisory Committee, Mountain Vista High School Engineering Program 2024 –
- Study Group, **DARPA ISAT**, “CATS: Countering Adversarial Technology Systems” 2024 –
- Vice President, CSM Creative Writing Club 2021 – 22
- Poetry Editor, High Grade Journal for Creative Arts 2021 – 22
- **Eagle Scout**, Boy Scouts of America (awarded '17) 2011 – 17

Work Experience

- Research Scientist NREL 2023 –
- Research Intern NREL 2021 – 2023
- Research Assistant Department of Physics, CSM 2021 – 2022
- Bioinformatics Intern Invitae 2020 – 2021
- Tutor Contracting 2019 – 2020
- App Developer Contracting with Police Depts. 2019
- IT Technologist Valor Christian High School 2017 – 2018

Skills

- Quantum information science, computational chemistry, optimization, machine learning, software dev.
- Transmission line calibration, photolithography, clean room, evaporation, low temperature measurement