Nolan J. Coble

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Education

PhD **University of Maryland, College Park** Computer Science — Aug 2020 – Nov 2025

- Dissertation: "New Directions From Old Codes"
- Advisors: Alexander Barg and Matthew Coudron
- Vice Chair, Graduate Student Council for the College of Computer, Mathematical, & Natural Sciences (CMNS), 2024–present

BS **SUNY Brockport** Mathematics and Physics — Aug 2016 – May 2020

- Thesis: "Spectral properties of quaternionic unit gain cycles"
- Advisor: Nathan Reff

Publications

[1] A. Barg, N. J. Coble, D. Hangleiter, and C. Kang, "Geometric structure and transversal logic of quantum Reed–Muller codes," *IEEE Transactions on Information Theory*, pp. 1–1, 2025.

[2] N. Coble and A. Barg, "Coxeter codes: Extending the Reed–Muller family," in *2025 IEEE International Symposium on Information Theory (ISIT 2025)*, 2025. arXiv: 2502.14746.

[3] N. J. Coble, M. Coudron, J. Nelson, and S. S. Nezhadi, *Hamiltonians whose low-energy states require $\Omega(n)$ T gates*, In submission, 2023. arXiv: 2310.01347.

[4] N. J. Coble, M. Coudron, J. Nelson, and S. S. Nezhadi, "Local Hamiltonians With No Low-Energy Stabilizer States," in *18th Conference on the Theory of Quantum Computation, Communication and Cryptography (TQC 2023)*, 2023. arXiv: 2302.14755 [quant-ph].

[5] Z. Holmes, N. J. Coble, A. T. Sornborger, and Y. Subaşı, "Nonlinear transformations in quantum computation," *Phys. Rev. Res.*, vol. 5, p. 013 105, 1 Feb. 2023.

[6] F. Belardo, M. Brunetti, N. J. Coble, N. Reff, and H. Skogman, "Spectra of quaternion unit gain graphs," *Linear Algebra and its Applications*, vol. 632, pp. 15–49, Jan. 2022, ISSN: 00243795.

[7] K. Srinivasan, N. J. Coble, J. Hamlin, T. Antonsen, E. Ott, and M. Girvan, "Parallel machine learning for forecasting the dynamics of complex networks," *Phys. Rev. Lett.*, vol. 128, p. 164 101, 16 Apr. 2022.

[8] N. J. Coble and M. Coudron, "Quasi-polynomial time approximation of output probabilities of geometrically-local, shallow quantum circuits.," in *Conference on Quantum Information Processing (QIP),* and *Symposium on Foundations of Computer Science (FOCS)*, 2021. arXiv: 2012.05460.

[9] N. J. Coble and N. Yu, "A reservoir computing scheme for multi-class classification.," in *Proceedings of the 2020 ACM Southeast Conference*, Association for Computing Machinery, 2020, ISBN: 9781450371056.

Experience

IonQ Inc. Research Scientist, Quantum error correction team — Dec 2025 — present

IonQ Inc. Internship, Quantum error correction team — Summer 2025

- Advisors: Min Ye, Nicolas Delfosse

Los Alamos National Lab Quantum Computing Summer School Fellowship — Summer 2021

- Advisor: Yigit Subasi

- Project title: "'Generating Polynomials of Density Matrices"

University of Maryland Training and Research Experiences in Nonlinear Dynamics (TREND) REU — Summer 2019

- Advisors: Michelle Girvan, Ed Ott, Thomas Antonsen
- Project title: "Predicting Network Dynamics with a Parallel Machine Learning Approach"

University of Rochester Photonics REU — Summer 2018

- Advisor: Benjamin Miller
- Project title: "Finite-Element Modeling of Waveguide Structures Using COMSOL Multiphysics"

Programs

Circles Simons Institute – Jane Street Small Group Collaborations — Jan 2026 – present

- Project title: "Building bridges: codes, TCS, and geometric group theory"
- This initiative supports groups of three to six researchers for four week-long visits spread over two years, to collaborate intensely on an ambitious research project.
- Inaugural Cohort

Simons Institute for the Theory of Computing Visiting Graduate Student — Spring 2024

- Semester-long program: "Quantum Algorithms, Complexity, and Fault Tolerance"

Skills

Python, MATLAB

Graduate Coursework

Computer Science: Quantum Information Processing, Quantum Algorithms, Quantum Error Correction and Fault-Tolerance, Quantum Complexity, End-to-End Quantum Applications, Scientific Computing, Advanced Numerical Optimization, Applications of Zero-knowledge Proofs

Mathematics: Algebra I and II, Brauer Groups, Complex Analysis, Differential Geometry

Talks

[1] *Quantum Reed–Muller codes and their transversal logic*, Presented at the workshop "The Interplay Between Distance Geometry, Combinatorics, and Coding Theory" at the Brin Mathematics Research Center, University of Maryland, College Park, 2025.

[2] *Hamiltonians whose low-energy states require $\Omega(n)$ T gates*, Presented to the IQC Math & CS Seminar, University of Waterloo, ON, CAN, 2024.

[3] *Divide-and-conquer method for approximating output probabilities of geometrically-local, shallow quantum circuits*, Presented to the IQC-QuICS Math and Computer Science Seminar, 2021.

Teaching

Quantum Information Processing — Fall 2024

Precalculus — Fall 2020, Spring 2022

Awards

University of Maryland, College Park

- Ann G. Wylie Dissertation Fellowship 2025
- MathQuantum Fellowship 2024
- Outstanding Graduate Teaching Assistant Award 2023
- NSF GRFP Honorable Mention 2022
- Aziz Osborn Gold Medal in Teaching Excellence 2021
- Dean's Fellowship 2020

SUNY Brockport

- SUNY Chancellor's Award for Student Excellence 2020
  - Recognizes model students who have integrated academic excellence with other aspects of their lives and is the highest honor bestowed upon a student by the State University of New York system.
- School of Arts and Sciences Outstanding Undergraduate Award 2020
  - Recognizes the School of Arts and Sciences's top undergraduate student.
- Honors College Scholar Award 2020
- Robert E. Hall Memorial Scholarship for Mathematics 2020
- Department of Computer Science Undergraduate Research Award 2020
- Belva A. Waite Memorial Scholarship 2019, 2016
- Interdisciplinary Award in Mathematics 2018
- Harvard House Award 2018
- Physics, Mathematics, and Computer Science Award 2018, 2017