# Nayda Farnsworth

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## Education

**Rutgers University** — New Brunswick, NJ
Ph.D. in Mathematics — August 2026 – Present

**Colgate University** — Hamilton, NY
B.A. in Mathematics and Computer Science, summa cum laude — May 2026

- GPA: 3.93/4.00
- High Honors in Mathematics; High Honors in Computer Science
- Selected Coursework: Combinatorics, Graph Theory, Probability, Ramsey Theory, Theory of Computing

## Publications and Preprints

[1] P. Breiding, J. Cobb, A. Englander, **N. Farnsworth**, J. Hauenstein, O. Henriksson, D. Johnson, J. Lopez Garcia, and D. Mundayur. *Elimination Without Eliminating: Computing Complements of Real Hypersurfaces Using Pseudo-Witness Sets.* Submitted, 2026. arXiv:2601.04383.

[2] H. Kvinge, A. Aguilar, **N. Farnsworth**, G. O'Brien, R. Jasper, S. Scullen, and H. Jenne. *Do Neural Networks Learn Algebraic Worlds? An Investigation into the Group-theoretic Structures Learned by Narrow Models Trained to Predict Group Operations.* Accepted to TAG-DS 2025. arXiv:2601.21150.

## Talks & Presentations

**Colgate University Mathematics Department Seminar** — Hamilton, NY
Presenter, Oral Presentation. — 04/2026
**Title:** *Computers Meet Combinatorics: SAT Solvers and the Search for Hales–Jewett Bounds*

**Rutgers Experimental Mathematics Seminar** — New Brunswick, NJ (Virtual)
Presenter, Oral Presentation. — 03/2026
**Title:** *A Computational Approach to Improving Bounds on the Hales–Jewett Numbers*

**Nebraska Conference for Undergraduate Wisdom in Mathematics** — Lincoln, NE
Presenter, Oral Presentation. — 01/2026
**Title:** *Establishing an Improved Lower Bound on $HJ(3;3)$*

**Osaka University Student Research Symposium** — Osaka, JP
Presenter, Oral Presentation. — 01/2025
**Title:** *Connections between Tridiagonal Matrices and the Fibonacci Sequence*

**Colgate Combinatorics Research Symposium in Tokyo** — Tokyo, JP
Presenter, Oral Presentation. — 01/2025
**Title:** *Connections between Tridiagonal Matrices and the Fibonacci Sequence*

**Nebraska Conference for Undergraduate Women in Mathematics** — Lincoln, NE
Presenter, Oral Presentation. — 01/2025
**Title:** *Connections between Tridiagonal Matrices and the Fibonacci Sequence*

**New York Six Undergraduate Research Conference** — Clinton, NY
Presenter, Poster Presentation. — 11/2024
**Title:** *Optimizing Time to Fairness in Federated Learning on Resource-Constrained Devices*

**University of Massachusetts Summer Undergraduate Research Symposium** — Amherst, MA
Presenter, Poster Presentation. — 08/2024
**Title:** *Optimizing Time to Fairness in Federated Learning on Resource-Constrained Devices*

**Nebraska Conference for Undergraduate Women in Mathematics** — Lincoln, NE
Co-presenter, Poster Presentation. — 01/2024
**Title:** *Reconstructing Monomial Orders*

**New York Six Undergraduate Research Conference** Geneva, NY
Co-presenter, Oral Presentation. 11/2023
**Title:** *Reconstructing Monomial Orders*

**Colgate University Summer Research Poster Symposium** Hamilton, NY
Co-presenter, Poster Presentation. 07/2023
**Title:** *Reconstructing Monomial Orders*

## Teaching Experience

**Colgate University** Hamilton, NY
Teaching Assistant, Course Tutor, Grader, and Peer Tutor 2023 – 2026

- **CLTR**: Peer Tutor in Mathematics and Computer Science, Spring 2023 – Spring 2026
- **Course-Specific Roles**: Discrete Structures (COSC 290), Course TA, Fall 2025; Applied Machine Learning (COSC 410), Course Tutor, Spring 2025; Linear Algebra (MATH 214), Course Tutor and Grader, Fall 2024; From Painting to Pixels (p5.js) (CORE 182), Course Tutor, Fall 2024; Intro to Computing I & II (COSC 101, COSC 102), Laboratory TA, Fall 2023 – Spring 2024

## Selected Awards and Honors

**Rutgers University SGS Fellowship for Excellence** 2026
Rutgers University

**Edwin J. Downie '33 Award for Mathematics** 2026
Colgate University Department of Mathematics

**Edward P. Felt '81 Memorial Prize Fund in Computer Science** 2026
Colgate University Department of Computer Science

**Laura Sanchis Award for Excellence in Research** 2026
Colgate University Department of Computer Science

**Graduate School Access Fund Fellow** 2025 – 2026
Colgate University

**George W. Cobb Award** 2025
Colgate University

**Empacher-IRCA Scholar-Athlete Award** 2024
Intercollegiate Rowing Coaches Association

**Phi Eta Sigma National Honor Society** 2023 – 2026
Colgate University

**Wei Ren '04 Endowed Scholar** 2023 – 2026
Colgate University

**Dean's Award with Distinction for Academic Excellence** 2022 – 2026
Colgate University

## Workshops & Activities

**A CIMPA School on Combinatorial Structures in Geometry, Graphs, and Symmetry** San José, CR
Program Participant 07/2026 – 08/2026

**11th Lake Michigan Workshop on Combinatorics and Graph Theory** South Bend, IN
Workshop Participant 05/2026

**SuperComputing 2025 (SC25)** St. Louis, MO
Short Course Participant: Julia for High-Performance Computing 11/2025

**Preliminary Arizona Winter School** Virtual
Course Participant, Introduction to Mathematical Cryptography 09/2025 – 11/2025

**GROW Columbia 2025** New York, NY
Conference Participant 09/2025

**Workshop on the Applications of Commutative Algebra: Fields Institute** Toronto, ON
Conference Participant, Numerical Algebraic Geometry Group 05/2025

## Research Experience

**Pacific Northwest National Laboratory** — Richland, WA

Research Intern, Math, Stats, & Data Science / Research Computing — Summers 2025 – 2026

- Studied mathematical frameworks for mechanistic interpretability in large language models, combinatorial optimization models for nuclear nonproliferation, and high-performance computing support for laboratory cluster operations.

**University of Massachusetts Amherst** — Amherst, MA

NSF REU Participant, Center for Equitable Energy Transition — Summer 2024

- Analyzed algorithmic bias in federated learning, evaluating the computational cost and empirical reliability of bias mitigation methods.

**Colgate University Department of Mathematics** — Hamilton, NY

Faculty-Initiated Summer Research Fellow — Summer 2023

- Studied reconstructible monomial orders, developing algorithms to analyze matrix structures and reconstructibility criteria.

## Leadership and Service

**Mathematics Club** — 2025 - 2026

President, Colgate University

**Hamilton Central School Coding Club** — 2023 - 2026

Club Leader and Volunteer, Colgate University COVE

**Society for Industrial and Applied Mathematics** — 2023 - 2026

Vice President, Colgate University Chapter

**NCAA Division I Men's Rowing** — 2022 - 2025

Varsity Coxswain, Colgate Men's Rowing

## Technical Skills

**Programming Languages**: Bash, C, Java, Julia, Python

**Research Computing**: Git, LaTeX, Linux-based HPC clusters, Mathematica, MATLAB, SageMath