Emily Saunders

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Education

Columbia University New York, NY
PhD in Mathematics September 2019 - May 2025

- Completed a PhD in persistent homology, advised by Professor Andrew J. Blumberg.
- Completed coursework in Machine Learning, Artificial Intelligence, Probability, and Algorithms.

Harvard University Cambridge, MA
BA in Mathematics September 2015 - June 2019

- Graduated *magna cum laude* with highest honors in mathematics. GPA: 3.89; In-major GPA: 3.93.
- Recipient of the Herb Alexander Award for an outstanding undergraduate in the Mathematics Department.

Work Experience

Columbia University New York, NY
PhD Candidate - Advisor: Andrew J. Blumberg September 2019 - May 2025

- Wrote and defended a dissertation generalizing the theory of persistent homology to zig-zag bifiltrations.
- Taught and TA'd undergraduate math courses including Calculus, Linear Algebra, and Analysis. Led seminar courses on Combinatorics and Category Theory.

MetLife Legal Plans Remote
Full-Stack Web Development Intern November 2023 - May 2024

- Developed and maintained React/Django tools, fixing UI and backend bugs while collaborating on Git workflows, issue tracking, and code reviews.

Projects

Forecasting Delhi Air Quality Index Time Series with SARIMAX
Independent August 2025

- Forecasted Delhi AQI using a SARIMAX model with weather-based exogenous regressors.
- Evaluated using walk-forward validation. Observed unbiased errors and stable, statistically significant parameter values.

Breast Cancer Classifier (UCI Dataset)
Independent August 2025

- Conducted EDA and built multiple classification models (Decision Tree, Random Forest, SVM, Logistic Regression), evaluating and comparing performance with precision, recall, and F1 scores.

Colorpedia
Columbia University April 2024 - May 2024

- Built and deployed Colorpedia (colorpedia.net), a React/Flask web app for learning color theory.

Persistent Homology of Zig-Zag Bifiltrations
Columbia University September 2021 - April 2025

- Generalized multi-parameter persistent homology to zig-zag bifiltrations.
- Defined a metric on the space of persistence modules over zig-zag bifiltrations, proved stability and convergence results, adapted invariants to the space of zig-zag bifiltrations, and adapted Gromov-Prokhorov stability results for density sensitive bifiltrations to the zig-zag setting.

Technical Skills

Programming Languages	Python, JavaScript
Tools & Frameworks	NumPy, Pandas, Scikit-learn, HTML/CSS, React, Django, Flask, Bootstrap, Git, GitHub