Emily Saunders

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Education

Columbia University
PhD in Mathematics

New York, NY
September 2019 - May 2025

- Completed a PhD in persistent homology, a subfield of topological data analysis, advised by Professor Andrew J. Blumberg.

Harvard University
BA in Mathematics

Cambridge, MA
September 2015 - June 2019

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

Relevant Courses

Artificial Intelligence, Machine Learning, Graduate Probability I & II, Analysis of Algorithms, Web Programming, User Interface Design.

Work Experience

Columbia University
PhD Candidate - Advisor: Andrew J. Blumberg

New York, NY
September 2019 - May 2025

- Developed expertise in probability theory and persistent homology through two years of coursework and preparation for qualifying exams.
- Wrote and defended a dissertation generalizing the theory of persistent homology to zig-zag bifiltrations.
- Led seminar courses on combinatorics, The Probabilistic Method by Alon and Spencer, and category theory.
- Taught and TA'd undergraduate math courses including Calculus, Linear Algebra, and Analysis.

MetLife Legal Plans
Full Stack Web Development Intern

Remote
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 AQI Time Series with SARIMAX
Independent

- Forecasted Delhi Air Quality Index (AQI) using a SARIMAX model with weather-based exogenous regressors.

Breast Cancer Classifier (UCI Dataset)
Independent

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

Colorpedia
Columbia University

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

Persistent Homology of Zig-Zag Bifiltrations
Columbia University

- Generalized multi-parameter persistent homology to zig-zag bifiltrations.
- Developed new metrics, proved stability and convergence results, and constructed novel invariants.

Technical Skills

Programming Languages

Python, JavaScript

Web Development

React, Django, Flask, Bootstrap

Tools & Frameworks

Git, GitHub