

EMILY SAUNDERS

New York, NY · (207) 239-9156 · emilysaunders28@gmail.com
emilysaunders28.github.io · github.com/emilysaunders28

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

Web Programming with Python and JavaScript, User Interface Design, Artificial Intelligence, Machine Learning, Graduate Analysis and Probability I, Graduate Probability II, Analysis of Algorithms.

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.
- Presented in seminars on topics including infinity category theory, stable homotopy theory, and persistent homology.
- Taught Calculus III, Calculus II, and College Algebra and Analytic Geometry.
- Led seminar courses on combinatorics, *The Probabilistic Method* by Alon and Spencer, and category theory.
- Served as a teaching assistant for Modern Analysis, Analysis and Optimization, Linear Algebra, Calculus III, and Calculus I.

MetLife Legal Plans

Full Stack Web Development Intern

Remote

November 2023 - May 2024

- Contributed to the development and maintenance of internal tools using React and Django in a production-scale web application.
- Fixed UI and backend bugs in collaboration with senior developers, gaining hands-on experience with issue tracking, Git workflows, and code review processes.

PROJECTS

Forecasting Delhi AQI Time Series with SARIMAX

Independent

August 2025

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

Breast Cancer Classifier (UCI Dataset)

Independent

August 2025

- 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

April 2024 - May 2024

- Developed a web application for learning color theory terminology as part of a final project for the User Interface Design course at Columbia University.
- Implemented with a React frontend, Flask backend, and SQLite database. Designed a responsive, user-friendly interface with Bootstrap framework. Deployed at colorpedia.net.

Persistent Homology of Zig-Zag Bifiltrations

Columbia University

September 2021 - April 2025

- Wrote a PhD dissertation on a generalization of multi-parameter persistent homology indexed over zig-zag bifiltrations.
- Main contributions included defining a metric on the space of persistence modules over zig-zag bifiltrations, proving stability with respect to the Gromov-Hausdorff distance on compact metric spaces, proving the convergence of persistence modules obtained via bootstrap resampling, constructing invariants on the space of zig-zag bifiltrations, and adapting Gromov-Prokhorov stability results for density sensitive bifiltrations to the zig-zag setting.

TECHNICAL SKILLS

Programming Languages

Python, JavaScript

Web Development

HTML5, CSS3, React, Django, Flask, Bootstrap

Tools & Frameworks

Git, GitHub