

# EMILY SAUNDERS

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## WORK EXPERIENCE

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### MetLife Legal Plans

Remote

*Full Stack Web Development Intern*

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.

### Columbia University

New York, NY

*PhD Candidate - Advisor: Andrew J. Blumberg*

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.

## EDUCATION

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### Columbia University

New York, NY

*PhD in Mathematics*

September 2019 - May 2025

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

### Harvard University

Cambridge, MA

*BA in Mathematics*

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 & Probability I, Graduate Probability II, Analysis of Algorithms.

## PROJECTS

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### Shoe Tracker

*Independent*

May 2025 - June 2025

- Developed a web application where users keep track of their preferred running shoes. Implemented with a React frontend and Django REST framework API backend.

### 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 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

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### Programming Languages

Python, JavaScript

### Web Development

HTML5, CSS3, React, Django, Flask, Bootstrap

### Tools & Frameworks

Git, GitHub