Elena Axinn **Curriculum Vitae**

CONTACT INFORMATION

Department of Mathematics
University of Michigan

Cell Phone: (734) 255-8806
Email: eaxinn@umich.edu

EDUCATION

University of Michigan
PhD in Applied and Interdisciplinary Mathematics (Expected 2029)

Tufts University
Bachelor of Science in Mathematics (2024)
Magna Cum Laude

INTERESTS

Stochastic optimization, algorithm design, mathematical neuroscience.

RESEARCH AND PROJECTS

Gradient-based Optimization of Noisy ODE Models

- Applied deep learning–inspired optimization tools (ADAM, autograd) to infer parameters in ordinary differential equation systems under stochastic noise.
- Employed kernel- and transport-based distributional metrics (MMD, Wasserstein) for model fit evaluation.
- Identified optimal parameters for optimization pipeline based on model sensitivity and hand-tuning.
- Interpreted biophysical and neuronal implications of parameter values.

Probability of Tree Changes in the Ancestral Recombination Graph

- Modeled stochastic processes on evolving genealogical trees to study random transitions in genetic ancestry.
- Implemented martingale and Markov chain methods to analyze long-term system behavior.
- Explored probabilistic modeling techniques relevant to ecological and evolutionary systems.

Orthogonal Polynomials on Bubble-Diamond Fractals

- Studied fractal calculus analogs and spectral methods on Sierpinski-type geometries.
- Explored potential applications of fractal analysis to diffusion and transport phenomena in irregular domains.
- Published in *Complex Analysis and Operator Theory*.

Conferences, Workshops and Talks

Talks:

- *Gradient-based Optimization of Noisy ODE Models for Polyphasic Rodent Sleep*: 2025 Fall Eastern Virtual Sectional Meeting, October 25, 2025.
- *Gradient-based Optimization of Noisy ODE Models for Polyphasic Rodent Sleep*: Applied and Interdisciplinary Math Seminar, September 26, 2025.
- *The Coalescent With Recombination*: Indiana REU Conference, Indianapolis, IN, July 26, 2023.
- *Introduction to Control Theory*: Tufts Directed Reading Program Symposium, Medford, MA, Dec 8, 2022.
- *Orthogonal Polynomials on the Bubble Fractal Family*: VERSEIM-REU Symposium, Medford, MA, Aug 10, 2022.

Contributed Posters:

- *Orthogonal Polynomials on the Bubble Fractal Family.* Joint Mathematics Meeting, Boston, MA, Jan 2023.
- *Lean as a Proof Assistant.* Tufts Undergraduate Research Symposium, Medford, MA, May 2022.

Workshops and Conferences Attended:

- 2025 Fall Eastern Virtual Sectional Meeting, Virtual, October 2025.
- Indiana REU Conference, Indianapolis, IN, July 2023.
- Joint Mathematics Meeting, Boston, MA, Jan 2023.
- Xena Project Undergraduate Workshop, Imperial University, London, UK, Sept 2022.
- Cornell Conference on Analysis, Probability, and Mathematical Physics of Fractals, Ithaca, NY, June 2022.

Teaching Experience

Instructor: Calculus I and Precalculus, 2024–2026

- Sole instructor for 20 students; designed lectures, quizzes, and exams emphasizing analytical modeling and quantitative reasoning.

Grader: Differential Equations

- Developed detailed rubrics and evaluated 120 weekly problem sets to reinforce conceptual understanding.

Memberships

Society for Industrial and Applied Mathematics (SIAM)

American Mathematical Society (AMS)

Association for Women in Mathematics (AWM) - Executive Board for University of Michigan Chapter

Computer Skills

MATLAB, Python (NumPy, SciPy, PyTorch), High-Performance Computing (Great Lakes Cluster), Lean, GitHub, LaTeX