

CONTACT INFORMATION	Department of Mathematics University of Michigan 530 Church St Ann Arbor, MI 48109	<i>Cell:</i> (734) 255-8806 <i>Email:</i> eaxinn@umich.edu
EDUCATION	University of Michigan PhD in Applied and Interdisciplinary Mathematics (Expected 2029) MS in Applied and Interdisciplinary Mathematics (2026) Dissertation: <i>Parameter Optimization Algorithms for Stochastic Simulators</i> Advisors: Professors Victoria Booth and Denise Kirschner Rackham Graduate Student Pre-Candidate Research Grant	
	Tufts University BS in Mathematics (2024) Magna Cum Laude	
RESEARCH INTERESTS	Stochastic and nonlinear optimization, simulation-based Bayesian inference, machine learning for stochastic dynamical systems, loss design and identifiability, differential-equation and agent-based models.	
PUBLICATIONS	Axinn, E. et al. “Orthogonal Polynomials on Bubble-Diamond Fractals.” <i>Complex Analysis and Operator Theory</i> , 2025.	
RESEARCH EXPERIENCE	Optimization of Stochastic ODE Models <i>University of Michigan · Dissertation research</i>	<i>2024–present</i>
	• Built a differentiable-simulation pipeline in PyTorch that fits a stochastic ODE model of sleep–wake dynamics to EEG/EMG recordings, backpropagating through the numerical integrator with reparameterized Poisson noise • Showed that a Gaussian-kernel MMD loss on raw time series is, to leading order, insensitive to temporal structure, leaving event-rate parameters nearly unidentifiable despite smooth convergence; designed a moment-matching loss that restores identifiability • Refined the resulting basin with density-based sampling (CaliPro), shrinking the search region by 98%; tested parameter sets showed no significant differences from recorded bout counts, state occupancy, and bout durations • Trained a Neural Spline Flow (simulation-based inference) on CaliPro samples to map near-optimal parameters and their correlations; held-out coverage tests show conservative credible regions • Automated hyperparameter search with Optuna’s Tree-structured Parzen Estimator (Bayesian optimization), reducing tuning time from weeks to ~20 hours on the Great Lakes HPC cluster	

Calibration Benchmarks for Agent-Based Models

2026–present

University of Michigan · Dissertation research

- Designing a benchmark of simulation-based (CaliPro, rejection ABC), gradient-based (automatic differentiation, stochastic gradient approximation), and machine-learning (neural posterior/likelihood estimation) calibration on epidemiological agent-based models of graded complexity
- Comparing methods on sample efficiency, parameter-recovery accuracy, scaling with parameter dimension, and wall-clock cost

Probability of Tree Changes in the Ancestral Recombination Graph

Indiana University REU

Summer 2023

- Derived closed-form transition probabilities for genealogical tree topologies using martingale and Markov chain methods, and characterized the long-run distribution of tree changes as a function of recombination rate

PROJECTS

WNBA Player Valuation and Salary Cap Optimization

Summer 2026

Erdős Institute Data Science Boot Camp · Awarded With Distinction

- Built a Random Forest model predicting fair market value salaries across 965 player-seasons (2025 holdout RMSE: \$41,368; R^2 : 0.634), tuned by cross-validated grid search and benchmarked against five baselines including Ridge Regression and Gradient Boosting
- Stratified evaluation by contract group to account for CBA salary floor constraints; built a team-level Cost Per Win framework comparing actual versus model-implied spending across all 2025 WNBA teams

TALKS

- *Gradient-based Optimization of Noisy ODE Models for Polyphasic Rodent Sleep*: AMS 2025 Fall Eastern Virtual Sectional Meeting (contributed talk), Oct 2025; Applied and Interdisciplinary Math Departmental Seminar, University of Michigan, Sept 2025.
- *The Coalescent With Recombination*: Indiana REU Conference, Indianapolis, IN, July 2023.

TEACHING

EXPERIENCE

Instructor of Record: Calculus I and Precalculus

2024–2026

University of Michigan

- Sole instructor for sections of 20 students; independently designed and delivered lectures, quizzes, and exams

LEADERSHIP AND SERVICE

Executive Board Member, Association for Women in Mathematics, University of Michigan Chapter

2024–present

SKILLS

Programming: Python (PyTorch, NumPy, SciPy, Optuna), MATLAB, GitHub, Lean, $\text{\LaTeX}$; High-Performance Computing (Great Lakes Cluster)

Methods: Stochastic and nonlinear optimization, automatic differentiation, simulation-based inference, Bayesian optimization, statistical learning, Markov chains, dynamical systems