

Matthew Shumway

mwsaumway7@gmail.com • 508-918-6136 • [LinkedIn](#) • [GitHub](#)

Education

BS, Applied & Computational Mathematics Emphasis (ACME)

April 2025

Brigham Young University

Provo, Utah

- GPA: 4.0
- Full Academic Scholarship, Dean's List
- Concentration in Data Science and Machine Learning
- Relevant Coursework:
 - Machine Learning (Deep Learning, Reinforcement Learning), Optimization, Modeling Data & Uncertainty, Matrix Analysis, Linear and Nonlinear Analysis, Probability, Advanced Linear Algebra, Dynamical Systems

Skills

Advanced: Python (Numpy, PyTorch, Scikit-learn, Matplotlib, Pandas, Scipy),
Proficient Matlab, SQL, C++, Git, Unix

Research Experience

Spectral Graph Theory Research Assistant

December 2023 – Current

Brigham Young University Mathematics Dept.

Provo, Utah

- Investigate properties of nonbacktracking random walks on mathematical graphs using advanced techniques from Markov Chains, Matrix Analysis, and Spectral Graph Theory to analyze graph dynamics
- Formulated a novel analogue of Kemeny's constant for nonbacktracking random walks
- Developed and distributed a Python package (NBRW) to support research on nonbacktracking walks, enabling reproducible analyses and fostering collaboration (accompanying [documentation](#))
- Co-authored a publication in progress: "Kemeny's Constant on Nonbacktracking Random Walks in the Vertex Space", in collaboration with Dr. Mark Kempton, Dr. Jane Breen, and Adam Knudson
- Present findings at the 2025 Joint Mathematics Meetings (JMM) through a poster titled "Kemeny's Constant for Nonbacktracking Random Walks in the Vertex Space"

Control Theory Research Assistant

April 2023 – July 2024

IDeA Labs, Brigham Young University.

Provo, Utah

- Investigated methods of determining the most vulnerable elements of dynamical systems (e.g. Power Grid) to adversarial attacks
- Transitioned code base from Python to Matlab, decreasing run-time by over 90%

Mathematical Biology Research Assistant

August 2023 – April 2024

Brigham Young University Mathematics Dept.

Provo, Utah

- Developed mathematical ODE models in Python and Matlab to enhance understanding of nutrient trafficking
- Extracted useful information from mathematical model to inform biological experiments
- Facilitated communication between math and biology disciplines

Work Experience

R&D Data Science Intern

July 2024 – September 2024

bioMérieux

Salt Lake City, Utah

- Developed a machine learning model to predict the impact of DNA degeneracy in diagnostic tests
- Enhanced model accuracy by 20% and reduced training time by 75% through innovative model architecture and feature engineering
- Conducted in-depth analysis of biological data, successfully visualizing key insights that drove project advancements
- Expanded preexisting dataset by over 900% through the development and experimentation of proprietary diagnostic assays

Computer Science Teaching Assistant and Course Developer

Brigham Young University CS Dept.

January 2023 – June 2023

Provo, Utah

- Taught and tutored Python code to students with little to no prior coding experience
- Assisted students individually in debugging code
- Collaborated on a discord chat bot to give students a ChatGPT-based “Rubber Duck” to debug with

Projects

[Alpha Gomoku](#) | Python, PyTorch, Numpy

- Adapted the AlphaZero reinforcement learning algorithm for the game of Gomoku (also known as 5 in a row)
- Parallelized self-play process for efficient learning on larger state spaces

[NYC Taxi Density](#) | Python, Scikit-learn, LightGBM, Optuna, Pandas, Matplotlib, Jupyter Notebook

- Implemented a LightGBM model to predict taxi pickup densities in NYC based on temporal and geographic features
- Engineered cyclical and geospatial features and optimized hyper parameter search

[Modeling Markets with ODEs](#) | Python, Scipy, SymPy, Matplotlib, Numpy, Jupyter Notebook

- Modeled market competition dynamics within isolated market sectors using a modified Lotka-Volterra system of Ordinary Differential Equations (ODEs)
- Provided insight into market resilience and adaptation by reformulating ODEs to account for transient disruptions and nonlinear interactions

[Forward Forward Algorithm](#) | Python, PyTorch, Numpy

- Explored the Forward Forward algorithm as an alternative to backpropagation in neural networks, testing its applicability on benchmark datasets
- Investigated various alterations such as different measures of goodness and different methods of generating negative data