Brendan Mallery

+1 207-837-1607 | brendanmallery9@gmail.com |

Education

Tufts University — **Medford, MA**
PhD in Mathematics — *Expected Spring 2026*

University at Albany, SUNY — **Albany, NY**
Masters of Arts in Mathematics — *Spring 2020*

Bowdoin College — **Brunswick, ME**
Bachelor of Arts in Mathematics and Chemistry — *Spring 2018*

Research Interests

1. Representation learning for probability distributions;
2. Geometric approaches to machine learning and data science;
3. Interpretability and safety in AI, through the analysis of latent spaces in deep learning models.

Work Experience

PhD Candidate — Medford, MA
Tufts University — *September 2021–Present*

- Applying statistical optimal transport methods for inference, representation learning, and dimensionality reduction.
- Researching novel representation learning and nonlinear dimensionality reduction methods for high-dimensional data.
- Developing scalable optimization algorithms and running large-scale GPU experiments in Python, PyTorch, and CUDA.

Data Science Intern — Boston, MA
Liberty Mutual — *June-September 2025*

- Developed statistical methods and Python pipelines to analyze and evaluate vision–language model performance on aerial image time-series data.
- Built fine-tuning and deployment workflows for locally hosted large (7B+ parameters) vision–language models using PyTorch, MLflow for experiment tracking, custom preprocessing, and multi-GPU/distributed training.
- Presented research findings and model evaluations in weekly data science forums to cross-functional teams.

Space, Communications and Navigations (SCaN) Intern — Remote
NASA Glenn & Goddard Space Flight Center — *June 2021-August 2023*

- Developed Python software to simulate and analyze time-evolving networks compatible with NASA's Satellite Orbit Analysis Program (SOAP).
- Introduced and implemented curvature-based methods for dynamic network analysis, with applications to community and bottleneck detection.
- Conducted research on geometric methods for modeling delay-tolerant and time-evolving communication networks.

Research Assistant — Remote
PI: Professor Justin Curry, SUNY Albany — *June 2020-June 2021*

- Conducted research in applied/topological data analysis under the supervision of Prof. Justin Curry.
- Developed methods for analyzing structured and high-dimensional datasets arising from satellite networks and neuroscience data.

Data Science Intern — Remote
VisioStack, Inc. — *August-November 2020*

- Provided software development and consulting for a signal processing application.
- Improved upon methods for detecting events in high-noise vibration data with the goal of fault prediction, and integrated software into existing VisioStack framework.

Selected Publications

1. *Synthesis and Analysis of Data as Probability Measures With Entropy-Regularized Optimal Transport*, with James Murphy and Shuchin Aeron. Published in the **Proceedings of the 28th International Conference on Artificial Intelligence and Statistics (AISTATS 2025)**, PMLR, 2025. GitHub

2. *Linearized Wasserstein Barycenters: Synthesis, Analysis, Representational Capacity, and Applications*, with Matthew Werenski, James Murphy, and Shuchin Aeron. Published in the **Proceedings of the 28th International Conference on Artificial Intelligence and Statistics (AISTATS 2025)**, PMLR, 2025. GitHub

3. *Multi-domain Routing in Delay Tolerant Networks*, with Alan Hylton, Jihun Hwang, Mark Ronnenberg, Miguel Opez, Oliver Chiriac, Sriram Gopalakrishnan, and Tatum Rask. Published in the **Proceedings of the IEEE Aerospace Conference**, 2023.

4. *From Trees to Barcodes and Back Again II: Combinatorial and Probabilistic Aspects of a Topological Inverse Problem*, with Jordan DeSha, Adélie Garin, Kathryn Hess, and Lida Kanari. Published in **Computational Geometry: Theory and Applications**, Special Issue on Computational and Applied Topology, 2021.

All Publications

1. *Houghton-like Groups From "Shift-Similar" Groups*, with Matthew Zaremsky. Published in the **Journal of Combinatorial Algebra**, Vol. 9, Nos. 3–4, 2025.

2. *Multi-domain Routing in Delay Tolerant Networks*, with Alan Hylton, Jihun Hwang, Mark Ronnenberg, Miguel Opez, Oliver Chiriac, Sriram Gopalakrishnan, and Tatum Rask. Published in the **Proceedings of the IEEE Aerospace Conference**, 2023.

3. *Towards Time Synchronization in Delay Tolerant Network-based Solar System Internetworking*, with Alan Hylton, Natalie Tsuei, Mark Ronnenberg, Jihun Hwang, Jonathan Quartin, Colin Levaunt, and Jeremy Quail. Published in the **Proceedings of the IEEE Aerospace Conference**, 2023.

4. *A Lattice-Theoretic Perspective on the Persistence Map*, with Adélie Garin and Justin Curry. Published in the **Proceedings of the 38th International Symposium on Computational Geometry (SoCG) Young Researchers Forum**, 2022.

5. *Sheaf Theoretic Models for Routing in Delay Tolerant Networks*, with Robert Short, Alan Hylton, Jacob Cleveland, Michael Moy, Robert Cardona, Robert Green, Justin Curry, Gabriel Bainbridge, and Zara Memon. Published in the **Proceedings of the IEEE Aerospace Conference**, 2022.

6. *Introducing Tropical Geometric Approaches to Delay Tolerant Networking Optimization*, with Jacob Cleveland, Alan Hylton, Robert Short, Robert Green, Justin Curry, Devavrat Vivek Dabke, and Olivia Freides. Published in the **Proceedings of the IEEE Aerospace Conference**, 2022.

7. *A Survey of Mathematical Structures for Lunar Networks*, with Alan Hylton, Robert Short, Jacob Cleveland, Olivia Freides, Zara Memon, Robert Cardona, Robert Green, Justin Curry, Sriram Gopalakrishnan, Devavrat Vivek Dabke, Brittany Story, and Michael Moy. Published in the **Proceedings of the IEEE Aerospace Conference**, 2022.

8. *Medium-scale Curvature at Larger Radii in Finitely Generated Groups*, with Robert Kropholler, 2020.

Teaching & Mentoring

Teaching Assistant Fall 2021-Ongoing

Tufts University *Medford, MA*

- Led weekly recitation sessions, wrote problem sets, held office hours and graded problem sets for the following classes: Graduate Probability (Spring 2026), Graduate Analysis (Fall 2025), Stochastic Processes (Spring 2025), Introduction to Mathematical Statistics with R (Spring 2024), Ordinary Differential Equations (Spring 2023), Introduction to Mathematical Modeling with Python (Spring 2022),Calculus III (Fall 2021)

Teaching Assistant Fall 2018-Spring 2021

SUNY Albany *Albany, NY*

- Tutor and grader for: Introductory Statistics, Introduction to Mathematical Probability, and Calculus (I-III) courses at SUNY Albany.

Lecturer Fall 2019

SUNY Albany *Albany, NY*

- Lecturer for Precalculus (AMAT 100) at SUNY Albany.

I have also guided several high school students through research projects on topics including spectral clustering of biomedical data, permutation statistics, and Ollivier Ricci curvature of networks.