

EDUCATION

- University of Massachusetts** Amherst, MA
M.S./Ph.D. in Computer Science (Advisors: Daniel Sheldon and Madalina Fiterau) 2019–2026
– Thesis: *Orthogonal coordinates for representation learning*
- University of Michigan** Ann Arbor, MI
B.S.E in Computer Science with Math Minor, *Magna Cum Laude* 2013–2016

EXPERIENCE

- University of Massachusetts** Amherst, MA
Graduate Research Assistant, Information Fusion Lab Sep 2019 – Present
– Published papers at top conferences on normalizing flows and dimensionality reduction.
– Implemented all research from scratch in JAX, building three open-source libraries for diffusion/flow based generative models, stochastic processes, and Riemannian geometry.
– Applied methods across problem domains including self-supervised representation learning, time series generation, and density estimation on manifolds.
- SRI International** Menlo Park, CA
Computer Science Laboratory - Research Intern Jun 2021 – Aug 2021
– Led research project on finding principal structure in normalizing flow models
– Developed theory and algorithms to extract low-dimensional structure from normalizing flow models
– Intern project resulted in paper that was accepted at ICML 2022
- Garmin** Olathe, KS
Sensors and Algorithms Team / GPS Positioning Jul 2017 – May 2019
– Used sensor measurements from wrist mounted watch to develop Bayesian machine learning models
– Developed real-time routing and positioning algorithm to build optimal race pace segments
– Built Python testing framework for C++ algorithms, drastically reducing algorithm development time
- Apple** Cupertino, CA
Apple Watch Team - Software Engineering Intern May 2016 – Aug 2016
– Developed automated testing framework for Apple Watch software, reducing manual QA effort for the team
– Implemented features in Objective-C, Swift, and Python for the Apple Watch software platform

PUBLICATIONS

- [1] **E. Cunningham**, *Conformal Coordinate Frames for Disentanglement*, Under review, ICLR 2026 Workshop on Geometry-grounded Representation Learning and Generative Modeling (GRaM), 2026.
- [2] **E. Cunningham**, M. Fiterau, and D. Sheldon, *On Autoregressive Time Series Generation using Flow-based Generative Models*, Preprint, 2025.
- [3] **E. Cunningham**, A. Cobb, and S. Jha, “Principal Component Flows”, in *International Conference on Machine Learning (ICML)*, 2022.

- [4] **E. Cunningham** and M. Fiterau, “A Change of Variables Method For Rectangular Matrix-Vector Products”, in *International Conference on Artificial Intelligence and Statistics (AISTATS)*, 2021.
- [5] **E. Cunningham** and M. Fiterau, *Pixel Adaptive Convolutions for Generative Modeling with Normalizing Flows*, Preprint, 2020.
- [6] **E. Cunningham**, R. Zabounidis, A. Agrawal, M. Fiterau, and D. Sheldon, “Normalizing Flows Across Dimensions”, in *ICML Workshop on Invertible Neural Networks, Normalizing Flows, and Explicit Likelihood Models*, 2020.
- [7] **E. Cunningham**, D. Schlegel, and A. DeOrio, “Explainable Inheritance Pattern Prediction”, in *NeurIPS Workshop on Machine Learning for Health (ML4H)*, 2018.
- [8] D. Schlegel, **E. Cunningham**, X. Zhang, Y. Abdulkhak, A. DeOrio, and T. Jayasundera, *Inheritance Pattern Prediction - An Ophthalmic Model for Digital Pedigree Feature Extraction and Machine Learning*, National Society of Genetic Counselors Conference (NSGC), 2017.

SOFTWARE

- **local_coordinates**
 - Riemannian geometry in JAX with automatic curvature tensors, geodesics, and coordinate transforms.
- **lindex**
 - JAX library for linear SDEs that supports diffusion, flow matching, and state space models.
- **generax**
 - Implementation of a wide array of normalizing flow layers and models in JAX.

SKILLS

- **Research:** Normalizing flows, independent component analysis, diffusion models, flow matching, stochastic optimal control, optimal transport, variational inference, Boltzmann sampling, differential geometry, time series modeling, self-supervised representation learning.
- **Programming:** Python, JAX, PyTorch, NumPy, C++

SCHOLARSHIPS AND AWARDS

- Spaulding-Smith Fellowship 2019–2020, 2024–2025