

Ethan Davis

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Research Interests

Bayesian machine learning, sequence modeling, generative modeling, reinforcement learning, representation learning, transfer learning, ensemble learning, healthcare AI.

Education

M.S., Computer Science 2024–2026

University of Washington — Seattle, WA

Thesis: *When Bayesian ML Benefits MI-EEG BCIs* — Advisor: Prof. Erika Parsons

B.S., Computer Science 2020–2022

Oregon State University — Corvallis, OR

B.S., Mathematics 2011–2015

University of Portland — Portland, OR

Research Experience

Master Thesis 2024–present

Smart Neurorehabilitation Ecosystem — University of Washington

- Conducted a comprehensive evaluation of Bayesian versus frequentist ML models for motor-imagery EEG (MI-EEG) brain-computer interface classification.
- Compared top-performing MI-EEG classifiers, including linear spatial filters, Riemannian geometric filters, and deep neural networks.
- Implemented Bayesian models with diverse priors (Gaussian, Laplace, Cauchy) and inference methods: Laplace approximation, variational inference, and HMC sampling.
- Assessed models on discrimination, calibration, and sharpness metrics, identifying conditions where Bayesian ML improves predictive performance.
- Utilized MOABB benchmark for standardized preprocessing, model selection, and statistical evaluation across multiple MI-EEG datasets.
- Investigated the effect of prior distribution, inference speed/accuracy tradeoffs, and classifier type on Bayesian versus frequentist performance.

Graduate Researcher 2024–present

Independent Research — University of Washington

- Developed and benchmarked high-performance GEMM in CUDA, OpenMP, and C++, comparing against CuBLAS and BLAS using FLOPS analysis.
- Implemented EVD, SVD, QR, and power methods in C with correctness proofs and loop fusion for numerical stability.
- Authored a 400-page DSA textbook covering 120+ problems with implementations, tests, and complexity analyses.
- Built Hadoop MapReduce ACO for the traveling salesman problem on AWS EC2 with full deployment documentation.

- Designed distributed Apache Spark triangle counting for graph analytics and community detection on AWS EC2.
- Explored metaheuristic and HPC methods connecting cloud systems, optimization, and machine learning research.

Technical Reports

- [1] Ethan Davis. *Data Structures and Algorithms*. Zenodo, Oct. 2025. URL: <https://doi.org/10.5281/zenodo.17297422>.
- [2] Ethan Davis. *Exploration-Exploitation-Evaluation (EEE): A Framework for Metaheuristic Algorithms in Combinatorial Optimization*. 2025. arXiv: [2510.05027](https://arxiv.org/abs/2510.05027) [cs.NE]. URL: <https://arxiv.org/abs/2510.05027>.
- [3] Ethan Davis. *High Performance Matrix Multiplication*. 2025. arXiv: [2509.04594](https://arxiv.org/abs/2509.04594) [cs.PF]. URL: <https://arxiv.org/abs/2509.04594>.
- [4] Ethan Davis. *Linear Algebra for Image Compression*. Mar. 2025. URL: <https://doi.org/10.5281/zenodo.17180358>.

Software & Reproducibility

- [1] Ethan Davis. *davisethan/aco: Badge release*. Version v1.0.2. Oct. 2025. URL: <https://doi.org/10.5281/zenodo.17274214>.
- [2] Ethan Davis. *davisethan/data_structures_algorithms: DOI release*. Version v1.0.2. Oct. 2025. URL: <https://doi.org/10.5281/zenodo.17289626>.
- [3] Ethan Davis. *davisethan/eigenface: DOI release*. Version v1.0.1. Oct. 2025. URL: <https://doi.org/10.5281/zenodo.17299529>.
- [4] Ethan Davis. *davisethan/gemm: DOI release*. Version v1.0.1. Oct. 2025. URL: <https://doi.org/10.5281/zenodo.17299758>.
- [5] Ethan Davis. *davisethan/triangle_counting: DOI release*. Version v1.0.1. Oct. 2025. URL: <https://doi.org/10.5281/zenodo.17299086>.

Teaching & Mentoring

Teaching Assistant

2025–present

Computer Science Course — University of Washington

- Assisted MS advisor in updating a Mathematics for Machine Learning course curriculum and teaching materials.
- Surveyed leading ML textbooks (Duda et al., Bishop, Deisenroth et al.) to recommend optimal teaching resources.
- Drafted lecture schedule and slides introducing core math foundations for linear algebra, vector calculus, probability, and optimization.

Research Mentor

2025–present

Smart Neurorehabilitation Ecosystem — University of Washington

- Authored comprehensive onboarding documentation reducing new researcher ramp-up time from 3+ months to 1 week.
- Centralized key BCI and ML resources, experiment design guides, and software references for lab-wide accessibility.

- Established standardized, statistically valid BCI benchmarking procedures aligned with state-of-the-art Riemannian models.

Selected Industry Experience

Software Engineer

2022–2024

SeekOut — Bellevue, WA

- Developed ETL pipelines for integrating applicant tracking system (ATS) data into a centralized data sink for search indexing using C# .NET and Azure.
- Contributed to integrations supporting high-value customer accounts (over \$1M), ensuring reliable and performant data ingestion at scale.
- Produced UML diagrams, documentation, and unit tests to enforce maintainable, SOLID software design, enabling scalable ATS data integration services.

Software Engineer

2017–2020

Independent Project — Seattle, WA

- Designed and implemented a scalable image-sharing platform using Java Spring micro-services, Docker containers, and Kubernetes orchestration.
- Built reproducible cloud infrastructure on AWS with Terraform for provisioning, Ansible for configuration management, MongoDB for data storage, and S3 for BLOB storage.
- Developed a React.js frontend with full CRUD functionality, deployed via Node.js web servers within Docker containers in the Kubernetes cluster.

Software Engineer

2015–2017

StackBrew — Redmond, WA

- Developed core micro-services for cloud-based software platform, including a JavaScript AST interpreter (Node.js and C++ addon) for real-time variable inspection in the online editor.
- Built a git-based micro-service enabling version control and automated CI/CD pipeline integration, streamlining development workflows.
- Implemented a collaborative editing micro-service using CRDTs for consistent concurrent edits; platform technologies included Node.js, Go, MongoDB, Docker, Kubernetes, and GCP.

Conference Posters

- “Bayesian Deep Learning for Electroencephalogram Signal Recognition,” *PUMPS+AI ACM*, Barcelona, ES, July 2025. [Poster](#)

Certifications & Training

PUMPS+AI ACM

July 2025

Statement of Accomplishment in CUDA workshops — [Verify](#)