

Alexander Loftus

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Author, network machine learning textbook: Publishing contract with Cambridge University Press.
1st place ranking, \$100,000 Machine Learning competition: First place prize pool of \$25,000, against 1249 teams.
Best workshop poster, NeurIPS: Won best poster award for saliency clustering paper at NeurIPS 2023.
Open-source contributions: Primary contributor to microsoft network statistics package graspologic
Teaching and Leadership: Led a team of three to develop an object detection augmentation algorithm; a team of five to contribute to a brain network estimation pipeline; assistant director managing 8-12 instructors; paid bioinformatics TA

EDUCATION

Northeastern University <i>PhD</i> Computer Science <i>Advisor:</i> Dr. David Bau	Boston, MA 2024-
Johns Hopkins University <i>MSE</i> Biomedical Engineering: Machine Learning & Data Science Focus <i>Advisor:</i> Dr. Joshua Vogelstein	Baltimore, MD 2019-2021
Thesis: Hands-On Network Machine Learning dean's list, highest honors, GPA 3.95/4.0 Paid Teaching Assistant for neural data science and bioinformatics.	
Western Washington University <i>BS</i> Behavioral Neuroscience — <i>Minors:</i> Chemistry, Philosophy Founder & President, Computational Neuroscience Club Vice President, Neuroscience Club Built computational neuroscience club from scratch, taught weekly seminars.	Bellingham, WA 2014-2018

FELLOWSHIPS & AWARDS

Khoury Distinguished Fellowship Northeastern University PhD fellowship	2024
First Place Winner Kaggle Vesuvius Competition , \$100,000	2023
Best Poster Award NeurIPS 2023 LatinX AI Workshop	2023
MIT EECS GAAP MIT mentorship program	2023
AWS Research Grant \$10,00 grant for computational research	2019

TEXTBOOK

[Hands-on Network Machine Learning](#): *Eric Bridgeford, Alexander Loftus, Joshua Vogelstein.* Cambridge University Press publishing contract. Contributed 120 pages, 91 figures, all structural edits in final draft.

TALKS & PUBLICATIONS

[A Saliency-based Clustering Framework for Identifying Aberrant Predictions](#): Paper, 2023, NeurIPS LatinX AI Workshop. **Won best poster.** Second author, wrote half the paper, designed poster, did literature review.
[A low-resource reliable pipeline to democratize multi-modal connectome estimation and analysis](#): Paper, 2022, Nature Methods, under review. Second author, wrote infrastructure for the codebase. [Preprint](#) on biorxiv. [Code](#) on github.
[State of the Art in Knowledge Editing](#): Presentation, 2023, for 30 people. Presented on current techniques in knowledge localization and editing in both attention-based and diffusion models, vision and text data
[1st Place Solution - Vesuvius Ink Competition](#): Presentation, 2023, for 60 people. Presenting on our winning solution to a \$100,000 Kaggle competition, part of the \$1,000,000 Vesuvius competition.
[ICML Conference Highlights](#): Talk, 2023, about machine learning techniques in drug discovery and medicine at ICML 2023
[Linear Algebra, from Dot Products to Neural Networks](#): I created a YouTube tutorial series on the fundamentals of linear algebra for machine learning. Created from tutoring sessions given to a friend.
[Working with LLMs](#): Talk, 2023, for 100 people at the AIML San Diego meetup

Effects of an unc-43 (CaMKII) Gene Deletion on Short-Term Memory for Associative Conditioning in C. elegans: Talk, presented at Psychfest, 2017, Bellingham, WA.
Role of CAMKII in Associative Conditioning and GLR-1 Expression in C. Elegans: Poster, presented at Society for Neuroscience, 2017, Washington, DC. Later author, conducted most of the later experiments.

EXPERIENCE

Creyon Bio San Diego, CA
Data Scientist 2023

ESP Embeddings: Feature representation learning for electrostatic potential data. Contrastive learning approach resulted in 10x improvement over previous method in l^2 -norm reconstruction accuracy.

Neuron Toxicity Detection: Built deconvolution and segmentation pipeline to detect toxicity in neurons.

Molecule Diffusion: Find toxicity direction in the latent space of a denoising VAE trained to generate molecule representations.

Blue Halo Rockville, MD
Research Engineer 2021-2023

Conditional Image Generation with Generative Adversarial Networks: Augment datasets with diffusion images. Received commendations for my work.

Detecting Objects with Enhanced Yolo and Knowledge Graphs: Object detection & natural language processing project. Predicted network semantic properties of objects in videos.

Geometric Multi-Resolution Analysis: Natural language processing project. Used a low-dimensional manifold on news data to create a hierarchically clustered semantic space.

Johns Hopkins University Baltimore, MD
Research Assistant & MS Researcher — Dr. Joshua Vogelstein 2018-2021

Network Machine Learning: Textbook author. Publishing contracts offered by both Springer Publishing and Cambridge University Press. Wrote 120 pages, generated 91 figures, edited into final draft.

Open-Source Contributor to Microsoft network ML package Graspologic: Development and implementation of dimensionality reduction models on networks. Found and addressed a fundamental & difficult problem with a paper I implemented.

Primary maintainer & Developer of m2g, an open-source brain network estimation pipeline: Diffusion MRI to graphs pipeline. AWS cloud-computing integration with pytest CI/CD infrastructure. Eliminated over 1000 lines of code and halved computation time.

University of Washington Seattle, WA
Assistant Director, iD Tech Camps 2014-2018 summers

Assistant Director: Administrator for a STEM education camp which taught C++, Python, Java, game design, and robotics at the University of Washington. Managed 8-12 instructors with 80-120 students per week.

Curriculum Designer: Conceptualized, designed, and built an online curriculum teaching a Dota 2 modding course. Resulted in a curriculum used across 50 camp locations in the United States by tens of thousands of students.

Instructor: Taught game development courses for three years in summers during college. Regularly received feedback from students that I was the best instructor in the camp.

Western Washington University Bellingham, WA
Research Assistant 2015-2018

Associative learning in C. elegans: Knockout assays for CAMKII, a protein involved in learning. Python automation pipeline resulted in 5 days of work cut down to 5 minutes. Resulted in research presented at the Society for Neuroscience, 2017.

TEACHING EXPERIENCE

Teaching Assistant Johns Hopkins University
[NeuroData Design II](#), *EN.BME.438/638* Spring 2020

Teaching Assistant Johns Hopkins University
[NeuroData Design I](#), *EN.BME.437/637* Fall 2019

Head Teaching Assistant Johns Hopkins University
Intro to Bioinformatics, *EN.BME.410/634* Spring 2021

Teaching Assistant Western Washington University
Intro to Behavioral Neuroscience, *PSY.220* Winter 2017

SKILLS SUMMARY

Languages: Python, R, Rust, Bash, CSS, Mojo. Expertise in Python.

Tools & Frameworks: pytorch, pytorch-lightning, tensorflow, jax, numpy, scipy, pandas, polars, sklearn, seaborn, matplotlib, docker, AWS, google cloud (GCP), photoshop, SQL, weights & biases, mlflow, kubernetes, linux

Areas of Expertise: Linear algebra, probability & statistics, deep learning, information theory, transformers, diffusion models, convolutional autoencoders, embeddings, GPUs and cuda, public speaking, leadership & management, teaching, natural language processing, computer vision