alexloftus2004@gmail.com
Alexander Loftus
alex-loftus loftusa alex-loftus.com

Author, network machine learning textbook: Publishing contract with Cambridge University Press.

1st place ranking, $100,000 Machine Learning competition: Work featured on cover of Scientific American. Competed against 1249 teams. Vesuvius scroll ink detection.

Best poster, NeurIPS: Won best poster award for saliency clustering paper at NeurIPS 2023 LatinX workshop.

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.

Education

Northeastern University — Boston, MA
PhD Computer Science — 2024-
Advisor: Dr. David Bau

Johns Hopkins University — Baltimore, MD
MSE Biomedical Engineering: Machine Learning & Data Science Focus — 2019-2021
Advisor: Dr. Joshua Vogelstein
Thesis: Hands-On Network Machine Learning
dean's list, highest honors, GPA 4.0/4.0.

Western Washington University — Bellingham, WA
BS Behavioral Neuroscience — *Minors*: Chemistry, Philosophy — 2014-2018
Founder & President, Computational Neuroscience Club
Vice President, Neuroscience Club
Built computational neuroscience club from scratch, taught weekly seminars.

Textbook

Hands-on Network Machine Learning: *Eric Bridgeford,* ***Alexander R. Loftus****, Joshua Vogelstein.* Cambridge University Press, in copy-editing phase. 2025.
Spectral representation theory on networks. 530 pages, 147 figures.

Publications

* indicates equal contribution.

NNsight and NDIF: Democratizing Access to Open-Weight Foundation Model Internals: ***A.R. Loftus****, *J.Fiotto-Kaufman**, et al.* Paper, ICLR, 2024.
Easily explore and manipulate foundation model internals.

A Saliency-based Clustering Framework for Identifying Aberrant Predictions: *A. Tersol Montserrat,* ***A.R. Loftus****, Y. Daihes.* Paper, NeurIPS LatinX AI Workshop, 2023. **Won best poster.**
Use embeddings of saliency map crops to identify predictions caused by spurious features.

A low-resource reliable pipeline to democratize multi-modal connectome estimation and analysis: *J. Chung, R. Lawrence,* ***A.R. Loftus****, et al.* Paper, in review at Nature Methods, 2024
Turn diffusion MRI scans into adjacency matrices. Code on github.

Role of CAMKII in Associative Conditioning and GLR-1 Expression in C. Elegans: *M. Pribic,* ***A.R. Loftus****, et al.* Poster, Society for Neuroscience, 2017.
Removing a protein involved in learning blocks associative conditioning in worms.

Talks

State of the Art in Knowledge Editing: ***A.R. Loftus***, 2023
Current techniques in multimodal knowledge localization and editing.

1st Place Solution - Vesuvius Ink Competition: *R. Chesler,* ***A.R. Loftus****, A. Tersol Montserrat, T. Kyi*, 2023
Presenting on our winning solution to a $100,000 Kaggle competition, part of the $1,000,000 Vesuvius competition.

ICML Conference Highlights: ***A.R. Loftus***, 2023
Machine learning techniques in drug discovery and medicine at ICML 2023.

Working with LLMs: ***A.R. Loftus***, 2023.
For 100 people at the AI/ML San Diego meetup.

Linear Algebra, from Dot Products to Neural Networks: ***A.R. Loftus***, 2023.
Created a YouTube tutorial series on the fundamentals of linear algebra for machine learning.

Effects of an unc-43 (CaMKII) Gene Deletion on Short-Term Memory for Associative Conditioning in C. elegans: ***A.R. Loftus***, Psychfest 2017.
Mechanistic understanding of roundworm neural circuitry.

Fellowships & Awards

First Place Winner
Kaggle Vesuvius Competition, $100,000. 2023

Khoury Distinguished Fellowship
Northeastern University PhD fellowship. 2024

Best Poster Award
NeurIPS 2023 LatinX AI Workshop. 2023

MIT EECS GAAP 2023
MIT mentorship program.

AWS Research Grant
$10,00 grant for computational research on cloud services. 2019

Experience

Data Scientist San Diego, CA
Creyon Bio 2023

ESP Embeddings: Developed constrastive feature representation learning approach for electrostatic potential data. 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.

Machine Learning Research Engineer Rockville, MD
Blue Halo 2021-2023

Conditional Image Generation with Generative Adversarial Networks: Augment datasets with diffusion images.

Detecting Objects with Enhanced Yolo and Knowledge Graphs: Predicted network semantic properties of objects in videos.

Geometric Multi-Resolution Analysis: Used a manifold on news data to create a hierarchically clustered semantic space.

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

Network Machine Learning: Publishing contracts offered by both Springer Publishing and Cambridge University Press.

Open-Source Contributor to Microsoft network ML package Graspologic: Built dimensionality reduction models on networks.

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

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

Leader and Manager: 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.

Research Assistant Bellingham, WA
Western Washington University 2015-2018

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

Teaching Experience

Head Teaching Assistant — Johns Hopkins University
Foundations of Computational Biology and Bioinformatics, *EN.BME.410/634* — Spring 2021

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

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

Curriculum Designer — iD Tech Camps
Built curriculum used across 50 locations in the United States by tens of thousands of students. — Spring 2017

Instructor — iD Tech Camps
Taught programming and game design to high school students. — 2014-2018 summers

Skills Summary

Languages: Python, R, Rust, Bash, CSS, Mojo, English, Broken Spanish

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

Fun

Gaming: Starcraft 2 grandmaster in high school, competed and won in Seattle-area tournaments.

Music: Fingerstyle guitarist. Played at open mic nights.

Dancing: Partner dance instructor and competition winner. Fusion, West Coast Swing, Zouk, Salsa, Bachatta.