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Alexander Loftus
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I am a strong communicator and leader with deep technical expertise. I strive to help humans understand, evaluate, and control AI in more meaningful, powerful, and trustworthy ways. In the past, I have worked on representation learning, scalable systems, volumetric segmentation, and network statistics.

Some highlights:

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

Textbook author: Publishing contract with Cambridge University Press.

Teaching and Leadership: Assistant director managing 10 team members; led a team of three to develop an object detection augmentation algorithm; led a team of five to contribute to a brain network estimation pipeline.

Publications in top conferences: Best poster award at NeurIPS 2023 LatinX workshop, first author work in ICLR 2024.

Open-source contributions: Primary contributor to microsoft network statistics package graspologic.

Textbook

Hands-on Network Machine Learning: *Eric Bridgeford,* ***Alexander R. Loftus****, Joshua Vogelstein.* Cambridge University Press, in copy-editing phase. To be printed November 2025.

Spectral representation theory on networks. 530 pages, 147 figures.

Experience

Data Scientist — San Diego, CA
Creyon Bio — 2022-2024

ESP Embeddings: Developed contrastive feature representation learning approach for electrostatic potential data. Helped classify toxic drugs to save on drug testing costs.

Neuron Toxicity Detection: Built deconvolution and segmentation pipeline to detect toxicity in neurons. Resulted in a new drug discovery pipeline.

Machine Learning Research Engineer — Rockville, MD
Blue Halo — 2021-2022

Conditional Image Generation with Generative Adversarial Networks: Synthetic data augmentation. Led the switch to diffusion-based methods over GANs.

Detecting Objects with Enhanced Yolo and Knowledge Graphs: Used knowledge graphs to enhance object detection on videos.

Geometric Multi-Resolution Analysis: Infrastructure for a hierarchical clustering method.

Artificial Intelligence Research Engineer — Baltimore, MD
Johns Hopkins University — Dr. Joshua Vogelstein — 2018-2021

Graspologic: Built dimensionality reduction models on networks.

ndmg: Diffusion MRI to graphs pipeline. Kubernetes-orchestrated AWS cloud-computing integration with travis-based 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.

Education

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

Interpretability, evaluations, and training dynamics in Code LLMs.

Johns Hopkins University Baltimore, MD
MSE Biomedical Engineering: Machine Learning & Data Science Focus 2020-2022
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.

Publications

* indicates equal contribution.

NNsight and NDIF: Democratizing Access to Open-Weight Foundation Model Internals: ***A.R. Loftus****, *J.Fiotto-Kaufman**, et al.* ICLR 2025.
Infrastructure project to easily explore and manipulate foundation model internals with no engineering overhead.

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 knowledge localization and editing in LLMs and diffusion models.

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.
Introduction to LLM engineering. Talk given to 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 worm 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.

Harvard AI Safety Technical Fellowship 2025
Harvard fellowship.

AWS Research Grant
$10,000 grant for computational research on cloud services. 2019

Service & Advisory

Consultant Krnel.ai
Advisory role for cybersecurity-based interpretability startup. Spring 2025

Organizer NEMI
Organizing the 200-person New England Mechanistic Interpretability conference. Obtained $17,000 grant. Summer 2025

Teaching

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, 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.