

Alexander Loftus

I am a strong communicator with deep technical expertise. I strive to help humans understand, evaluate, and steer AI more meaningfully, powerfully, and safely. My work has spanned representation learning, scalable data processing pipelines, 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

Creyon Bio

San Diego, CA

2022-2024

ESP Embeddings: Developed a novel contrastive learning method for 3D electrostatic potential data, classifying toxicity for early drug screening.

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

Machine Learning Research Engineer

Blue Halo

Rockville, MD

2021-2022

Conditional Image Generation with Generative Adversarial Networks: Spearheaded synthetic data generation with diffusion models, replacing less performant GAN-based workflows.

Detecting Objects with Enhanced Yolo and Knowledge Graphs: Designed method for conditional generation and object detection on large video datasets using enhanced YOLO and knowledge graphs.

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

Artificial Intelligence Research Engineer

Johns Hopkins University — Dr. Joshua Vogelstein

Baltimore, MD

2018-2021

Graspologic: Co-authored an open-source graph statistics library later adopted by Microsoft Research.

ndmg: Optimized a diffusion MRI pipeline with Kubernetes and AWS orchestration, cutting 1000 lines of legacy code and halving runtime.

Assistant Director

iD Tech Camps — University of Washington

Seattle, WA

2014-2018 summers

Leader and Manager: Directed a high-throughput STEM education camp. Managed 10+ instructors weekly and developed curriculum in C++, Python, and robotics.

Curriculum Designer: Designed and deployed teaching tools and live demos across 50+ locations.

EDUCATION

Northeastern University

PhD Computer Science

Advisor: [Dr. David Bau](#)

Boston, MA

2024-

Interpretability, evaluations, and training dynamics in Code LLMs.

Johns Hopkins University

MSE Biomedical Engineering: Machine Learning & Data Science Focus

Advisor: Dr. Joshua Vogelstein

Thesis: Hands-On Network Machine Learning

dean's list, highest honors, GPA 4.0/4.0.

Baltimore, MD

2020-2022

Western Washington University

BS Behavioral Neuroscience — Minors: Chemistry, Philosophy

Founder & President, Computational Neuroscience Club

Vice President, Neuroscience Club

Built computational neuroscience club from scratch, taught weekly seminars.

Bellingham, WA

2014-2018

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

MIT mentorship program.

2023

Harvard AI Safety Technical Fellowship

Harvard fellowship.

2025

AWS Research Grant

\$10,000 grant for computational research on cloud services.

2019

SERVICE & ADVISORY

Consultant

Advisory role for cybersecurity-based interpretability startup.

Krnel.ai
Spring 2025

Organizer

Organizing the 200-person New England Mechanistic Interpretability conference. Obtained \$17,000 grant.

NEMI
Summer 2025

TEACHING

Head Teaching Assistant

Foundations of Computational Biology and Bioinformatics, *EN.BME.410/634*

Johns Hopkins University
Spring 2021

Teaching Assistant

[NeuroData Design II](#), *EN.BME.438/638*

Johns Hopkins University
Spring 2020

Teaching Assistant

[NeuroData Design I](#), *EN.BME.437/637*

Johns Hopkins University
Fall 2019

Teaching Assistant

Introduction to Behavioral Neuroscience, *PSY.220*

Western Washington University
Winter 2017

Curriculum Designer

Built curriculum used across 50 locations in the United States by tens of thousands of students.

iD Tech Camps
Spring 2017

Instructor

Taught programming and game design to high school students.

iD Tech Camps
2014-2018 summers

SKILLS SUMMARY

Languages: Python, Bash, R, Rust, SQL

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

Soft Skills: Scientific writing, public speaking (100+ audience LLM talks), leadership, rapid debugging, knowledge distillation

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.