

Alexander Loftus

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 alex-loftus  loftusa  google scholar

AI researcher & communicator with 7+ years of experience in deep learning & machine learning. Research in code interpretability, attribution, and evaluation for Large Language Models. Seeking pivot into a developer advocate / technical evangelist role where deep technical depth, communication and community-building, and teaching ability can combine.

Career highlights:

Textbook Authorship: Authored a 524-page technical book on statistical network ML (Cambridge University Press, November 2025)

Community-building: Organized the New England Mechanistic Interpretability (NEMI) conference; Linear Algebra YouTube lecture series creator; delivered 10+ invited talks to 20-300 attendees; taught hundreds of students through meetups, summer camps, and tutorials.

Competitions: Part of a 4-person team that won 1st place in the \$1,000,000 Vesuvius Kaggle competition. (1,249 teams); featured on the cover of *Scientific American*.

Research: Subliminal learning work featured in YouTube video with 1m+ subscribers; best poster award for a NeurIPS workshop paper; publications in top conferences. PyTorch

Strategic Advisory: EleutherAI funding strategy consultant; CBAI mentor for Harvard/MIT students; advisor for cybersecurity/mechanistic interpretability startup.

Cloud & AI Infrastructure: Light GCP/AWS background. First author on ICLR paper on scaling up AI systems for interpretability; Scaled up an AWS AI pipeline for computational neuroscience.

EDUCATION

Northeastern University

Boston, MA

PhD Student, Computer Science | AI/ML

2024-Present

Advisor: Dr. David Bau

Focus on mechanistic interpretability in code language models. Data attribution, representation learning, causality.

Johns Hopkins University

Baltimore, MD

2020-2022

MSE Biomedical Engineering | Machine Learning & Data Science Focus

Advisor: Dr. Joshua Vogelstein

Thesis: Hands-On Network Machine Learning

dean's list, highest honors, GPA 3.97/4.0.

Western Washington University

Bellingham, WA

2014-2018

BS Behavioral Neuroscience | Minors: Chemistry, Philosophy

Founder & President, Computational Neuroscience Club

Built computational neuroscience club from scratch, taught weekly seminars.

EXPERIENCE

Data Scientist

San Diego, CA

2023-2024

Creyon Bio

Large Protein Models For Splice-Site Prediction: Explored splice site prediction in LLMs trained on protein sequences. Pre-training, fine-tuning, and benchmarking+evals.

ML for Toxicity Prediction: Developed a novel contrastive learning pipeline to predict oligo toxicity from 3-D electrostatic maps; increased classification AUC from 0.73 to 0.88.

Neuron Toxicity Detection: Developed scalable neuron segmentation and toxicology classification pipeline.

Machine Learning Research Engineer

Rockville, MD

2022-2023

Blue Halo

Conditional Image Generation with Generative Adversarial Networks: Built diffusion-model synthetic data generator.

Detecting Objects with Enhanced Yolo and Knowledge Graphs: Led knowledge graph effort for object detection project. Delivered live demos to program officers.

Geometric Multi-Resolution Analysis: Led infra for document clustering & analysis method.

Research Software Engineer

Baltimore, MD

2018-2020

NeuroData Lab, Johns Hopkins University | Dr. Joshua Vogelstein

MRI-to-Graphs: Optimized a diffusion MRI pipeline with Kubernetes, Docker, and AWS Batch. Halved runtime and cut cloud costs by 40%.

Graspologic: Worked on an open-source graph statistics library. Later adopted by Microsoft Research for large-scale network analysis.

Assistant Director

iD Tech Camps | University of Washington

Seattle, WA

2014-2018 summers

Leader and Manager: Managed 10+ instructors/week and 300+ students.

Curriculum Designer: Authored game development curriculum deployed to 50+ locations, impacting 10k+ students nationwide.

SKILLS SUMMARY

Languages: Python, Bash, R, Rust, SQL

Tools & Frameworks: docker, kubernetes, pytorch, pytorch-lightning, VLLM, AWS, google cloud (GCP), numpy, scipy, pandas, polars, scikit-learn, seaborn, matplotlib, photoshop, SQL, weights & biases, mlflow, linux, cursor, ray, claude code, codex-cli

Areas of Expertise: LLMs for code, interpretability, transformers, GPUs and CUDA, linear algebra, probability & statistics, deep learning, information theory, diffusion models, convolutional autoencoders, public speaking, leadership & management, teaching, natural language processing, computer vision

Soft Skills: Public speaking, technical writing, leadership, mentorship, community-building

TEXTBOOK

Hands-On Network Machine Learning with Python: *Eric Bridgeford, Alexander R. Loftus, Joshua Vogelstein.*

Cambridge University Press. Printed November 2025.

Statistics + spectral representation theory on networks. 524 pages, 147 figures.

SELECTED PUBLICATIONS

* indicates equal contribution.

🏆 indicates best poster.

Token Entanglement in Subliminal Learning: *A. Zur, Z. Ying, A.R. Loftus, et al.* NeurIPS mechanistic interpretability workshop 2025.

Investigation on token entanglement in LLMs. Featured in Welch Labs video on YouTube.

NNsight and NDIF: Democratizing Access to Open-Weight Foundation Model Internals: *A.R. Loftus*, J.Fiotto-Kaufman**, et al. ICLR 2025.

Opensource suite for probing & manipulating LLM weights without engineering overhead. Ray GCS Service backend with AWS object storage and VLLM for inference speed.

ΦA Saliency-based Clustering Framework for Identifying Aberrant Predictions : *A. Tersol Montserrat, A.R. Loftus, Y. Daihes.* Paper, NeurIPS LatinX AI Workshop, 2023.

Detects spurious feature reliance via saliency embeddings.

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

Transforms diffusion MRI scans into graphs; open-sourced ([code](#))

LEADERSHIP & COMMUNITY ENGAGEMENT

Philanthropic Consultant

Developing funding strategy for EleutherAI's 2025 philanthropic effort

EleutherAI

2025

Conference Organizer

Running 200+ person interpretability conference; Raised \$17,000 grant funding.

NEMI

2025

Research Mentor

Mentoring Harvard/MIT students in Summer 2025

CBAI

2025

Strategic Advisor

Advisor to cybersecurity-focused startup specializing in interpretability tooling for AI systems.

Krnel.ai

2025

Meetup Speaker

Speaker & organizer for San Diego AI Meetups.

SDML

2023 - 2024

Hackathon Organizer

Helped organize hackathon & workshop to explore statistics for high-dimensional testing.

NeuroData Workshop

2019

TALKS & DEMOS

White-Box Techniques for Code LLMs: Influence Benchmarking, the Attendome, and Variable State Debugging: *Lawrence Livermore National Laboratory, 2025*

Invited talk on interpretability for code LLMs.

A Shared Infrastructure for Interpretability: *FAR AI Tech. Innovations for AI Policy Conf., 2025*

Invited demo for DC policymakers; showcased live editing of GPT2 internals

State of the Art in Knowledge Editing: *A.R. Loftus, 2024*

Survey talk on LLM knowledge-editing methods.

1st Place Solution - Vesuvius Ink Competition: *R. Chesler, A.R. Loftus, A. Tersol Montserrat, T. Kyi, 2023*

Walkthrough of winning \$100,000 ink-detection model.

ICML Conference Highlights: *A.R. Loftus, 2023*

Selected breakthroughs from ICML. Presented to biotech execs and SDML meetup group.

Working with LLMs: *AI San Diego Conference, 2023.*

Invited talk: Introduction to LLM engineering. 300+ attendees

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.

FELLOWSHIPS & AWARDS

First Place Winner

Kaggle Vesuvius Competition, \$100,000. 2023

Khoury Distinguished Fellowship

Northeastern University PhD fellowship. 2024

GCP Research Grant

\$5,000 grant for computational research. 2025

Best Poster Award

NeurIPS 2023 LatinX AI Workshop. 2023

Harvard AI Safety Technical Fellowship

Harvard fellowship for technical work in AI safety. 2025

AWS Research Grant

\$10,000 grant for computational research on cloud services. 2019

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

FUN

Gaming: Starcraft 2 grandmaster, local tournament winner; WoW 10-man server first ToGC (off-tank)

Music: Fingerstyle guitarist; performed at open mic nights.

Dancing: Partner dance instructor and competition winner (Fusion, West Coast Swing, Zouk)