

# 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:** [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 Foundation Model Internals:** *A.R. Loftus\**, *J. Fiotto-Kaufman\**, *et al.* Paper, arxiv, 2024. Preprint for ICLR submission.

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

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### 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

### AWS Research Grant

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

2019

## EXPERIENCE

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### Data Scientist

Creyon Bio

San Diego, CA

2023

*ESP Embeddings*: Developed contrastive 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

Blue Halo

Rockville, MD

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

Johns Hopkins University — Dr. Joshua Vogelstein

Baltimore, MD

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

iD Tech Camps — University of Washington

Seattle, WA

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

Western Washington University

Bellingham, WA

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

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<b>Head Teaching Assistant</b> Foundations of Computational Biology and Bioinformatics, <i>EN.BME.410/634</i>	Johns Hopkins University Spring 2021
<b>Teaching Assistant</b> <a href="#">NeuroData Design II</a> , <i>EN.BME.438/638</i>	Johns Hopkins University Spring 2020
<b>Teaching Assistant</b> <a href="#">NeuroData Design I</a> , <i>EN.BME.437/637</i>	Johns Hopkins University Fall 2019
<b>Teaching Assistant</b> Introduction to Behavioral Neuroscience, <i>PSY.220</i>	Western Washington University Winter 2017
<b>Curriculum Designer</b> Built curriculum used across 50 locations in the United States by tens of thousands of students.	iD Tech Camps Spring 2017
<b>Instructor</b> Taught programming and game design to high school students.	iD Tech Camps 2014-2018 summers

## SKILLS SUMMARY

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**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

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**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.