

# 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](#):** First place prize pool of \$25,000, against 1249 teams.  
**Best workshop poster, NeurIPS:** Won best poster award for saliency clustering paper at NeurIPS 2023.  
**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; paid bioinformatics TA

## EDUCATION

<b>Northeastern University</b> <i>PhD</i> Computer Science <i>Advisor:</i> Dr. David Bau	Boston, MA 2024-
<b>Johns Hopkins University</b> <i>MSE</i> Biomedical Engineering: Machine Learning & Data Science Focus <i>Advisor:</i> Dr. Joshua Vogelstein	Baltimore, MD 2019-2021
Thesis: <a href="#">Network Machine Learning</a> dean's list, highest honors, GPA 3.95/4.0 Paid Teaching Assistant for neural data science and bioinformatics.	
<b>Western Washington University</b> <i>BS</i> Behavioral Neuroscience — <i>Minors:</i> Chemistry, Philosophy Founder & President, Computational Neuroscience Club Vice President, Neuroscience Club Built computational neuroscience club from scratch, taught weekly seminars.	Bellingham, WA 2014-2018

## FELLOWSHIPS & AWARDS

<b>Khoury Distinguished Fellowship</b> Northeastern University PhD fellowship	2024
<b>First Place Winner</b> Kaggle Vesuvius Competition, \$100,000	2023
<b>Best Poster Award</b> NeurIPS 2023 LatinX AI Workshop	2023
<b>MIT EECS GAAP</b> MIT mentorship program	2023
<b>AWS Research Grant</b> \$10,00 grant for computational research	2019

## TEXTBOOK

**[Hands-on Network Machine Learning](#):** *Eric Bridgeford, Alexander Loftus, Joshua Vogelstein.* Cambridge University Press publishing contract. Contributed 120 pages, 91 figures, all structural edits in final draft.

## TALKS & PUBLICATIONS

**[A Saliency-based Clustering Framework for Identifying Aberrant Predictions](#):** Paper, 2023, NeurIPS LatinX AI Workshop. **Won best poster.** Second author, wrote half the paper, designed poster, did literature review.  
**[A low-resource reliable pipeline to democratize multi-modal connectome estimation and analysis](#):** Paper, 2022, Nature Methods, under review. Second author, wrote infrastructure for the codebase. [Preprint](#) on biorxiv. [Code](#) on github.  
**[State of the Art in Knowledge Editing](#):** Presentation, 2023, for 30 people. Presented on current techniques in knowledge localization and editing in both attention-based and diffusion models, vision and text data  
**[1st Place Solution - Vesuvius Ink Competition](#):** Presentation, 2023, for 60 people. Presenting on our winning solution to a \$100,000 Kaggle competition, part of the \$1,000,000 Vesuvius competition.  
**[ICML Conference Highlights](#):** Talk, 2023, about machine learning techniques in drug discovery and medicine at ICML 2023  
**[Linear Algebra, from Dot Products to Neural Networks](#):** I created a YouTube tutorial series on the fundamentals of linear algebra for machine learning. Created from tutoring sessions given to a friend.  
**[Working with LLMs](#):** Talk, 2023, for 100 people at the AIML San Diego meetup

**Effects of an unc-43 (CaMKII) Gene Deletion on Short-Term Memory for Associative Conditioning in C. elegans:** Talk, presented at Psychfest, 2017, Bellingham, WA.  
**Role of CAMKII in Associative Conditioning and GLR-1 Expression in C. Elegans:** Poster, presented at Society for Neuroscience, 2017, Washington, DC. Later author, conducted most of the later experiments.

## EXPERIENCE

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**Creyon Bio** San Diego, CA  
Data Scientist 2023

*ESP Embeddings:* Feature representation learning for electrostatic potential data. Contrastive learning approach 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.

*Molecule Diffusion:* Find toxicity direction in the latent space of a denoising VAE trained to generate molecule representations.

**Blue Halo** Rockville, MD  
Research Engineer 2021-2023

*Conditional Image Generation with Generative Adversarial Networks:* Augment datasets with diffusion images. Received commendations for my work.

*Detecting Objects with Enhanced Yolo and Knowledge Graphs:* Object detection & natural language processing project. Predicted network semantic properties of objects in videos.

*Geometric Multi-Resolution Analysis:* Natural language processing project. Used a low-dimensional manifold on news data to create a hierarchically clustered semantic space.

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

*Network Machine Learning:* Textbook author. Publishing contracts offered by both Springer Publishing and Cambridge University Press. Wrote 120 pages, generated 91 figures, edited into final draft.

*Open-Source Contributor to Microsoft network ML package Graspologic:* Development and implementation of dimensionality reduction models on networks. Found and addressed a fundamental & difficult problem with a paper I implemented.

*Primary maintainer & Developer of m2g, an open-source brain network estimation pipeline:* Diffusion MRI to graphs pipeline. AWS cloud-computing integration with pytest CI/CD infrastructure. Eliminated over 1000 lines of code and halved computation time.

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

*Assistant Director:* 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.

*Curriculum Designer:* Conceptualized, designed, and built an online curriculum teaching a Dota 2 modding course. Resulted in a curriculum used across 50 camp locations in the United States by tens of thousands of students.

*Instructor:* Taught game development courses for three years in summers during college. Regularly received feedback from students that I was the best instructor in the camp.

**Western Washington University** Bellingham, WA  
Research Assistant 2015-2018

*Associative learning in C. elegans:* Knockout assays for CAMKII, a protein involved in learning. Python automation pipeline resulted in 5 days of work cut down to 5 minutes. Resulted in research presented at the Society for Neuroscience, 2017.

## TEACHING EXPERIENCE

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**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

**Head Teaching Assistant** Johns Hopkins University  
*Intro to Bioinformatics, EN.BME.410/634* Spring 2021

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

## SKILLS SUMMARY

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**Languages:** Python, R, Rust, Bash, CSS, Mojo. Expertise in Python.

**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