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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 in Scientific American. Competed against 1249 teams. Vesuvius ink detection.

Best poster, NeurIPS: Won best workshop 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.

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 3.95/4.0

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 publishing contract. Contributed 120 pages, 91 figures, all structural edits in final draft.

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. Explore large model internals easily.

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**. Wrote half the paper, designed poster.

A low-resource reliable pipeline to democratize multi-modal connectome estimation and analysis: *J. Chung, R. Lawrence,* ***A.R. Loftus****, et al.* Paper, Nature Methods, 2022. Under review. Second author, wrote infrastructure for the codebase. Code on github.

Talks

State of the Art in Knowledge Editing: ***A.R. Loftus****.* 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: *R. Chesler,* ***A.R. Loftus****, A. Tersol Montserrat, T. Kyi.* 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: ***A.R. Loftus****.* Talk, 2023, about machine learning techniques in drug discovery and medicine at ICML 2023.

Working with LLMs: ***A.R. Loftus****.* Talk, 2023, for 100 people at the AIML San Diego meetup.

Linear Algebra, from Dot Products to Neural Networks: ***A.R. Loftus****.* 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****.* Talk, presented at Psychfest, 2017, Bellingham, WA.

Role of CAMKII in Associative Conditioning and GLR-1 Expression in C. Elegans: *M. Pribic,* ***A.R. Loftus****, et al.* Poster, presented at Society for Neuroscience, 2017, Washington, DC. Conducted most of the later experiments.

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

AWS Research Grant
$10,00 grant for computational research 2019

Experience

Data Scientist San Diego, CA
Creyon Bio 2023

ESP Embeddings: Developed constrastive 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 Rockville, MD
Blue Halo 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 Baltimore, MD
Johns Hopkins University — Dr. Joshua Vogelstein 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 Seattle, WA
iD Tech Camps — University of Washington 2014-2018 summers

Asssistant 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.

Research Assistant Bellingham, WA
Western Washington University 2015-2018

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

Teaching Experience

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
Intro 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. 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