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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: Vesuvius Ink Detection. Competed 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.

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.

Fellowships & Awards

Khoury Distinguished Fellowship — 2024
Northeastern University PhD fellowship

First Place Winner — 2023
Kaggle Vesuvius Competition, $100,000

Best Poster Award — 2023
NeurIPS 2023 LatinX AI Workshop

MIT EECS GAAP — 2023
MIT mentorship program

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

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. Preprint on biorxiv. 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***. Poster, presented at Society for Neuroscience, 2017, Washington, DC. Conducted most of the later experiments.

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.

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 programming & game development courses for three years.

Research Assistant — Bellingham, WA
Western Washington University — 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

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

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