Randolph W. Linderman

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EDUCATION

Duke University, Pratt School of Engineering, Durham, NC — 2020–current

Ph.D. Candidate, Electrical and Computer Engineering — GPA: 3.8/4.0

Thesis: Exploiting interclass relationships for improved deep neural network generalization in open-world environments

Research Interests: Continual learning, out-of-distribution detection, Bayesian non-parametrics, interpretability, and robustness in machine learning.

Advisor: Yiran Chen, Ph.D.

Relevant Coursework: Deep learning approaches in machine learning, Probabilistic machine learning, Software Engineering: Object Oriented Design w/ Java, Programming in C++/C, Intro to Computer Architecture

Cornell University, College of Engineering, Ithaca, NY — 2016–2017

Master of Engineering, Biomedical Engineering, *Cum Laude* — GPA: 3.74/4.0

M.Eng. Project: Computational Fluid Dynamics Analysis of the Hemodynamic Environment in the Developing Cardiac Outflow Tract

Advisor: Jonathan Butcher, Ph.D.

Relevant Coursework: Computer Analysis of Biomedical Imaging, Soft Tissue Biomechanics, Quasilinear Viscoelasticity and Biphasic Theory, Advanced Bio-Fluid Mechanics, Principles of Tissue Engineering, Innovation and Design of Biomedical Technologies

Cornell University, College of Agriculture and Life Sciences, Ithaca, NY — 2012–2016

Bachelor of Science, Biological Engineering, Minor: Biomedical Engineering — GPA: 3.38/4.0

Relevant Coursework: Biomedical Engineering Core Sequence: Cell, Tissue, & System-level Analysis, Engineering Mathematics Sequence, Engineering Physics: Mechanics & Electromagnetism

PROFESSIONAL EXPERIENCE

Kitware Inc., Computer Vision Group, Carrboro, NC — Summer 2024

Research and Development Intern

Advisors: Brian Clipp, Ph.D., Mr. Daniel Davila

I contributed my expertise in computer vision and machine learning methods to the IARPA HAYSTAC project modeling behavior patterns from simulated GPS traces. Also, I modernized Kitware's object re-identification machine learning implementations.

Air Force Research Laboratory, Information Directorate, Rome, NY — 2018–2020

Associate Computer Engineer, DR-01

Advisors: Qing Wu, Ph.D. and Mr. Morgan Bishop

Project: Exploiting hierarchical label structure for robust object detection

I lead an in-house research effort studying methods for incorporating semantic context into object detection frameworks. My research effort aimed to improve object detection performance on Air Force datasets by designing novel approaches for modeling interclass relationships that are detection framework independent and end-to-end trainable utilizing a fully-connected classification network with a layer for each subset of the label hierarchy.

Project: On the effects of quantized training on adversarial robustness

As a member of the Robust and Secure Machine Learning corporate research and development fund team, I explored the susceptibility of quantized neural networks and quantized training methods to adversarial attacks developed on full-precision networks and low-precision networks.

Project: Quantized training of deep networks on the IBM NorthPole neural inference processor
In conjunction with Dr. Dharmendra Modha's group at IBM Research Almaden developing a novel neural inference processor, NorthPole, on contract with the Air Force, I utilized quantized training techniques to create models for AFRL applications to run inference on NorthPole.

Cardiovascular Developmental Bioengineering Lab., Cornell University, Ithaca, NY   2014–2017
Graduate and Undergraduate Researcher
Advisor: Jonathan Butcher, Ph.D.
Researched mechanotransductory relationship between hemodynamic forces and pharyngeal arch artery (PAA) remodeling during critical developmental stages of avian outflow tract development. Performed computational fluid dynamics simulations on reconstructed micro-CT geometries to determine the mechanical forces acting on vessel walls. Correlated hemodynamic forces to geometric changes in PAAs. Reconstructed 3D geometries on day 3 to day 7 chick embryos with Mimics, 3-matic, and Geomagic software packages. Presented findings at laboratory meetings every semester.

Air Force Research Laboratory, Information Directorate, Rome, NY   Summer 2016
Summer Intern Advisor: Dr. Qing Wu, Ph.D.
Performed neural spike train analysis utilizing deep convolutional neural networks to capture spatial and temporal features

Air Force Research Laboratory, Information Directorate, Rome, NY   Summer 2013 & 2014
Summer Intern Advisors: Dr. Qing Wu, Ph.D. and Mr. Morgan Bishop
Built a highly parallelized Large Vocabulary Continuous Speech Recognition system utilizing a deep neural network acoustic model paired with a hidden Markov model N-gram language model. Accelerated training algorithm by distributing the computational burden over a cluster of 30 graphics processing units.

HONORS AND AWARDS

- Honorable mention for impact and relevance to DoD research objectives at the NDSEG National Fellows Conference   2022
- National Defense Science and Engineering Graduate Fellowship (NDSEG)   2020

PUBLICATIONS

- **Randolph Linderman**, Yiran Chen, and Scott Linderman. A Bayesian nonparametric perspective on Mahalanobis distance for out of distribution detection. *In Submission; arXiv preprint arXiv:2502.08695..*
- Matthew Inkawhich, Nathan Inkawhich, Hao Yang, Jingyang Zhang, **Randolph Linderman**, Yiran Chen. OSR-ViT: A simple and modular framework for open-set object detection and discovery. *IEEE International Conference on Big Data (BigData).* 2024.
- **Randolph Linderman**, Jingyang Zhang, Nathan Inkawhich, Hai Li, and Yiran Chen. Fine-grain inference on out-of-distribution data with hierarchical classification. *Conference on Lifelong Learning Agents.* 2023.
- Jingyang Zhang, Nathan Inkawhich, **Randolph Linderman**, Ryan Luley, Yiran Chen, and Hai Li. SIO: Synthetic in-distribution data benefits out-of-distribution detection. *arXiv Preprint*, 2023.
- **Randolph Linderman**, Jingyang Zhang, Nathan Inkawhich, Hai Li, and Yiran Chen. Fine-grain inference on out-of-distribution data with hierarchical classification. *NeurIPS ML Safety Workshop.* 2022.
- Jingyang Zhang, Nathan Inkawhich, **Randolph Linderman**, Yiran Chen, and Hai Li. Mixture outlier exposure for out-of-distribution detection in fine-grained settings. *Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision (WACV)*, 2023.

INVITED TALKS

- Research Tech Talk, Kitware Inc., Carrboro, NC, August 7, 2024.
- Machine Learning Tech Talk, MADLab Center of Excellence Air Force Research Lab, January 18, 2023.

Professional Service

Journal and Conference Reviewing:

- IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)
- International Conference on Machine Learning (ICML)

Teaching Experience

Software Engineering: Object Oriented Design w/ Java, Duke University, Durham, NC   Spring 2022
Graduate TA, Professors Andrew Hilton

- Guided 2 groups' team projects. Groups tasked with creating a strategy game following agile processes with multiple delivery dates throughout the semester.

Programming, Data structures, and Algorithms in C++, Duke University, Durham, NC   Fall 2021
Graduate TA, Professors Andrew Hilton & Genevieve Lipp, Ph.D.

- Taught recitation sessions to reinforce concepts
- Hosted office hours to aid in the students' understanding

Electrical and Chemical Physiology, Cornell University, Ithaca, NY   Spring 2017
Graduate TA, Drs. Peter Doerschuk, Ph.D. & Shivaun Archer, Ph.D.

- Prepared, organized, and supervised 3-hour laboratory exercises
- Hosted office hours to aid in the students' understanding of the laboratory

Computer Programming – MATLAB, Cornell University, Ithaca, NY   Spring & Fall 2013
Undergraduate TA, Prof. C. Lindsay Anderson, Ph.D.

- Prepared, organized, and supervised 3-hour laboratory exercises
- Hosted office hours to aid in the students' understanding of the laboratory

Skills

Machine Learning:	Vision Transformers, Structured Variational Autoencoders, Bayesian Nonparametrics, Convolutional Neural Networks
Programming Skills:	C++/C, Java, Python, Jax+Flax, PyTorch, Git, Matlab, Linux, LaTeX