

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

Air Force Research Laboratory, Information Directorate, Rome, NY 2018–2020
Associate Computer Engineer, DR-01
Advisors: Dr. Qing Wu, Ph.D. and Mr. Morgan Bishop
Project: Exploiting hierarchical label structure for robust object detection
Leading an in-house research effort studying methods for incorporating semantic context into object detection frameworks. Research effort aims to improve object detection performance on Air Force datasets. 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 am exploring 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 am utilizing 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**, 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

- Machine Learning Tech Talk, MADLab Center of Excellence Air Force Research Lab, January 18, 2023.

PROFESSIONAL SERVICE

Journal and Conference Reviewing:

- 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

Programming Skills: C++/C, Java, Python, Jax+Flax, PyTorch, Git, Matlab, Linux, L^AT_EX