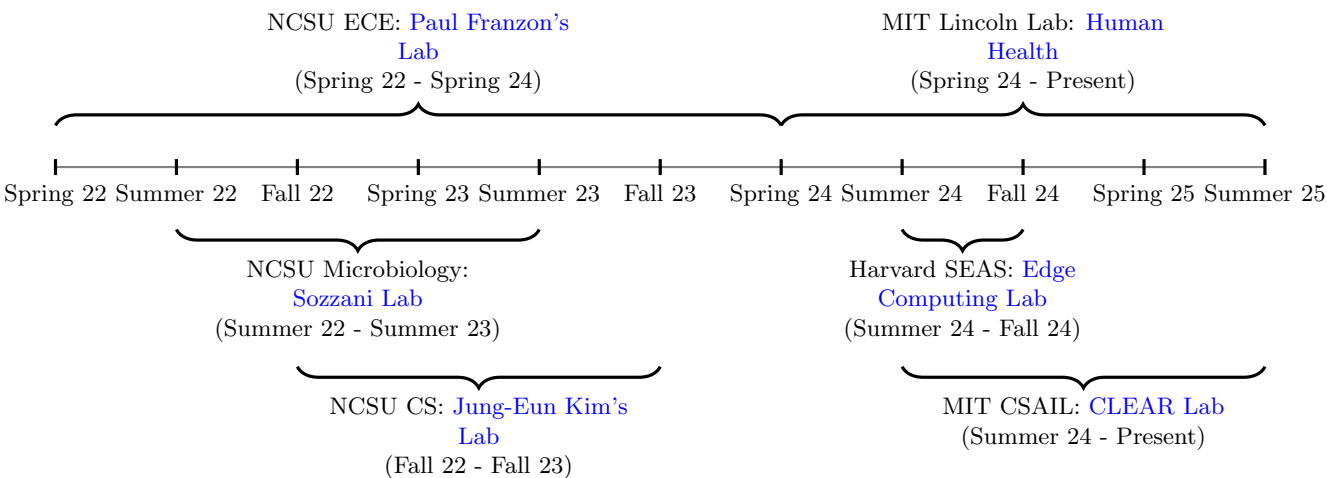


RESEARCH INSTITUTIONS

- Massachusetts Institute of Technology Lincoln Laboratory** Lexington, MA
Student Technical Staff in Human Health and Performance Systems Feb 2024 - Ongoing
 - Developing computer-vision algorithms for brain mapping based on 3D confocal microscopy data.
 - Investigating how to reduce energy consumption in mobile image-segmentation systems to improve the [AI Guide](#), an emergency surgical tool.
 - Quantifying the performance of SSL strategies for tomography.
 - Estimating the intents and behaviors of health-care professionals via control theoretic and inverse reinforcement learning frameworks.
- North Carolina State University** Raleigh, NC
Ph.D Student in Electrical Engineering advised by Prof. [Paul Franzon](#) Aug 2021 - part-time as of Jan 2024
 - Dissertation Topic: Reinforcement Learning, Graphs and Language Models for Electronic Design Automation
 - Research Interests: Neural Network {Model Calibration, Pruning, Knowledge Distillation, Unsupervised Domain Adaptation}, Language Model {Multimodality, Fine-tuning}, Diffusion Models and Graph Networks.
- The University of Texas at Austin** Austin, TX
Bachelor of Science in Electrical Engineering Aug 2016-May 2021
 - Primary Interest: Data Science, Digital Image/Video Processing, Digital Signal Processing
 - Computational Science and Engineering Research Program
 - Terry Foundation Scholar (full tuition and housing)

COLLABORATION TIMELINE



My timeline of research collaborations across multiple institutions. At NCSU, concurrently I worked in three different labs in ECE, CS, and Microbiology, balancing research, mentoring, teaching, and grant writing. Later, while working at MIT Lincoln Laboratory, I again concurrently collaborated with researchers at MIT CSAIL and Harvard SEAS.

RESEARCH FUNDING CONTRIBUTIONS: **\$313,000**

- CISCO Research** 08/16/2024
\$75,000 Rapid 3DIC Thermal Modeling Co-Author
 - ¹ Proposed a diffusion model for transforming power maps into high-resolution heat maps, improving accuracy over traditional methods.
 - Co-wrote the proposal with Prof. Franzon and a labmate.
- CAEML Research Award** 04/28/2024
\$70,000 Natural Language Optimization Models for PCBs and Analog ICs Co-Lead Contributor

¹I had significant technical contribution to these grants/fellowships. They were earned with Prof. Franzon as the PI.

- Developed research vision and methodology for using LLMs in multi-modal query-based optimization.
- Co-led proposal writing with Prof. Franzon; produced technical preview.

05/03/2023

Lead Contributor

Qualcomm Innovation Fellowship

\$100,000 Reinforcement Learning for 3D Floorplanning in EDA

- Proposed and defended novel RL approaches for floorplanning over three rounds of evaluation.
- Co-led proposal with a labmate; supervised by Prof. Franzon and Prof. Xiaorui Liu.

CAEML Research Award

\$68,000 Siamese-Graph Neural Networks for Circuit Graph Isomorphism Detection

- Developed core SGNN architecture and research methodology.
- Wrote the proposal and developed a technical preview; supervised by Prof. Franzon.

04/11/2023

Lead Contributor

IN PREPARATION (FIRST-AUTHOR-LEVEL EFFORT)

Motivation-Guided Feature Generalization for Inverse Reinforcement Learning

Supervised by Prof. Bobu of MIT CSAIL's CLEAR Lab

- Work involving language and human robot interaction (HRI).

[REDACTED]

Supervised by MIT LL

- Work involving HRI, optimal estimation and control.

PUBLICATIONS/UNDER REVIEW

The Over-Certainty Phenomenon

Published in TMLR. First author. Supervised by Prof. Jung-Eun Kim

- Identified a trend in the design of test-time adaptation algorithms (TTA) which harms model calibration.
- Introduced a novel test-time adaptation algorithm which improves calibration.
- Retained comparable accuracy to SOTA.

Just Go With The (Optical) Flow!

Published IEEE EMBC '25. First author. Supervised by MIT LL

- Invited for oral presentation.
- Developed an optical flow-based approach to enhance axon centerline detection and tracing in 3D microscopy data.
- Demonstrated that interpreting volumetric imaging data as sequential frames improves spatial feature extraction for neuron structure identification.

A Domain-Specific Q&A Dataset for Computer Architecture

Published in IEEE CAL. Contributing author. Supervised by Harvard Edge Computing Lab

- Developed a Q&A dataset for benchmarking LLMs in computer architecture.
- Assessed LLMs, identifying gaps in systems topics like memory and interconnects.
- Proposed a roadmap to enhance LM reasoning and design capabilities.

Topology-Preserving Deep Supervision for Axon Centerline Detection

Published in IEEE ISBI '25. Co-first author. Supervised by MIT LL, MBF Bioscience, and Univ. Central Florida

- Addressed the issue of limited annotations for axon centerline detection data in brain mapping.
- Improved performance over baseline despite using only 66% of the annotations.
- Maintained performance for fully-annotated setting.

Mobile-Optimized Real-Time Vessel Detection for Ultra-Sound Guided Surgery

Published in IEEE HPEC '24. Second author. Supervised by MIT LL

- Motivated the processing of tomographic detection algorithms from a discrete computer to a mobile AI system in the next generation of AI Guide.
- Investigated various pruning/quantization techniques for real-time image segmentation of human vessels.
- Contributed to writing a custom application for evaluating performance on a mobile AI system.

Addressing Large Action Spaces in 3D Floorplanning via Spatial Generalization

Under review. First author. Supervised by Qualcomm Fellowship and Prof. Franzon

- Investigated continuous action representations for 3D floorplanning to improve scalability and spatial generalization.
- Developed a decision-transformer-based model that reasons over continuous placements and discretizes actions only at inference.
- Demonstrated that spatial inductive biases enable learning from non-expert and random trajectories.

Can Low-Rank Knowledge Distillation be Useful for Microelectronic Reasoning?

Published in IEEE/ACM LAD '24. Co-first author. Supervised by Prof. Franzon

- Introduced a novel LLM adaptation technique, low-rank knowledge distillation (LoRA-KD).
- Evaluated Llama-2-7B's performance as a microelectronics Q&A expert, focusing on its reasoning and problem-solving abilities.
- Released an evaluation benchmark to support future research.

Optimal Brain Dissection

- Published in *IEEE BIP '23*. *First author*. Supervised by Sozzani Lab and USDA
 - Won Best Paper award.
 - Introduced a technique for feature-importance determination that exploits pruning algorithms.
 - Outperformed the *de facto* gene regulatory network with respect to explaining gene expressions.

DepthGraphNet

- Published in *IEEE/ACM MLCAD '23*. *First author*. Supervised by Prof. Franzon
 - Investigated the use of siamese-graph neural networks for circuit graph isomorphism (CGI) detection.
 - Empirically demonstrated logarithmic run-time complexity with respect to graph size.
 - Outperformed all other classical and neural methods in CGI detection accuracy.

Network Inference Approach for Phosphoproteomics

- Published in *Springer MIMB vol. 2690*. *Second author*. Supervised by Sozzani Lab
 - Described methods to statistically analyze label-free phosphoproteomic data and infer post-transcriptional regulatory networks over time.
 - Used the Bayesian Dirichlet Equivalent Uniform to inference underlying latent causal relationships between variables.

IN PREPARATION (CONTRIBUTOR-LEVEL EFFORT OR SUPERVISION)

Is This Worth Asking?

- Supervised by Prof. Bobu of MIT CLEAR Lab
 - Work involving understanding human effort answering questions.

Large Language Optimization Model for Electronic Design

- Supervised by Prof. Franzon
 - Work involving the design of a multi-modal agent which interfaces with optimization algorithms.

Diffusion Models for Rapid 3DIC Thermal Modeling

- Supervised by Prof. Franzon
 - Work involving the design of a conditional diffusion model which estimates the thermal properties of 3DICs.

RESEARCH TALKS AND CLINICS

- MLCAD talk on *Large Reasoning Models for 3D Hard Macro Placement*. 09/11/2024
- Qualcomm Innovation Fellowship invited talk on *Large Reasoning Models for 3D Floorplanning*. 07/30/2024
- LLM-Aided Design talk on *Low-Rank Knowledge Distillation for LLMs*. 06/29/2024
- MIT-LL clinic on *Axon centerline detection using 3D-UNets*. 05/18/2024
- BioInspired Processing talk on *Optimal Brain Dissection*. 11/29/2023
- MLCAD talk on *Siamese-Graph Neural Networks for Circuit Graph Isomorphism Detection*. 09/12/2023

PROFESSIONAL SERVICE

- Reviewer for Neurips Workshop on Foundation Models for Science (FM4Science 2024).
- Reviewer for IEEE Body Sensor Networks (BSN '25).
- Each year, incoming ECE Ph.D. students at NCSU watch a [video](#) titled *How to Succeed Doing a Ph.D in ECE*. The presentation includes me as an example of a Ph.D. student navigating the program successfully.
- Mentor to four Ph.D students.
- Contributor to *Machine Learning Systems: Principles and Practices of Engineering Artificially Intelligent Systems*, the textbook used for Harvard's CS249R (a course on TinyML).
- Contributor to Tensorflow Probability, SciKit Learn, and Deep Robust python libraries.
- Director of NC State Community Affairs for ECE Graduate Students Association (2021-2022).
- Organized NC State ECE Research Symposium January 28, 2022.
- Organized NC State TEDx Talk with Analog Devices, March 7, 2022.
- Member of UT Austin IEEE Robotics and Automation Society.
- Director of Student Affairs for UT Austin Planet Longhorn (International Students Org) (2020-2021).

TEACHING

- **ECE 220 Analytical Foundations of ECE** Raleigh, NC
Teaching Assistant for North Carolina State University *Aug 2022 - May 2023*
 - Taught a sophomore-level course on circuit theory, control, differential equations and communication systems.
 - Supervised weekly labs which introduced students to MATLAB.
 - Graded homework and exams.
 - Gave career advice to aspiring engineers.
- **ECE 301 Linear Systems and Signals** Raleigh, NC
Teaching Assistant for North Carolina State University *Aug 2021 - May 2022*
 - Taught a junior level course on linear systems and signals.
 - Wrote exams and lead recitation twice a week.
 - Taught students introductory machine learning in MATLAB.
 - Graded homework and exams.
 - Received outstanding feedback from my students.
- **Signal Processing and Data Science Tutor** Austin, TX
Varsity Tutors *Feb 2021 - July 2021*
 - Tutored undergraduates in data science, linear systems and signals
 - Taught introductory classes in Java and Python
 - 4.9/5.0 stars (top 10% of all tutors on platform)

TECHNICAL SKILLS

- Very experienced with PyTorch and TensorFlow.
- Daily usage of Python. Skilled with Java.
- Seasoned with libraries such as OpenCV, PIL, sci-kit-image, Gym and PyBullet.
- Skilled at digital {tomography, image, video, voxel} processing. Strong background in applied reinforcement learning, pattern recognition, detection/estimation theory, Bayesian optimization and large scale self-supervised learning.
- Growing experience in stochastic geometry, algebraic topology and inverse RL.