University of North Carolina at Chapel Hill
Mathematics Department
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Karen Medlin

Ph.D. Candidate in Applied Mathematics

Summary

- Applied math Ph.D. candidate with experience developing and applying new methods for ML models. Expected graduation in May 2025.
- Seasoned professional who has worked with data across multiple realms including a top-tier research university, national lab, and world-renowned arts organization.
- Coding experience in Java, Python (including PyTorch), and R; with Git version control. Demonstrated ability to learn and teach myself.
- Record of accomplishment: Awarded fellowships at top Ph.D. programs, a U.S. Department of Energy Graduate Student Research (SCGSR) grant; and second place finish in the 2023 Carolina Data Challenge - my first hackathon.

Education

University of North Carolina at Chapel Hill, Chapel Hill, NC
Ph.D. Applied Mathematics (M.S. in Mathematics, 2022) 2019 - 2025 (expected)
Co-advisors: Greg Forest, Krishnan Raghavan [1]

- Dissertation research: Developing a new ML algorithm that addresses imbalanced data challenges. As a first application and with the support of a SCGSR award from Department of Energy, customizing the algorithm to predict rare subatomic events detected by the ATLAS particle accelerator at Argonne National Laboratory. Unique in its approach to sampling while standard in its deep neural network model for training and testing, the algorithm will be made public on GitHub.
- Courses: data structures, machine learning, mathematics of data science, numerical linear algebra, optimization, probability, scientific computing, and statistical modeling

IBM Research Summer School on the Mathematics of Big Data, San Jose, CA
Collaboration between IBM and Mathematical Sciences Research Institute (MSRI) July 2023

University of Washington, Seattle, WA
Masters degree coursework in Mathematics 2018 - 2019

City University of New York, New York, NY
Post-baccalaureate coursework in Mathematics 2014 - 2018

Awards & Certificates

U.S. Department of Energy Office of Science SCGSR Award 2023 - 2024

UNC ARPA Graduate Degree Completion Grant 2021 - 2022

Introduction to High Performance Computing (HPC) Certificate Nov. 2022
Super Computing Conference (SC22)

Data Science Certificate Summer 2018
Principal Analytics Prep *Harvard Business School Startup Studio*

- 200+ hours of in-person instruction from 20 senior industry professionals with expertise in: Python, R, SQL, AWS, A/B testing; statistical reasoning and modeling; data wrangling and visualization; and business strategy.

1 Assistant Computational Mathematician Dr. Krishnan Raghavan works at Argonne National Laboratory.

Work Experience

Graduate Research Assistant 2019 - present
UNC Chapel Hill Mathematics Department

- Currently developing algorithms to address the challenges of classifying imbalanced data.
- Working in Python and Git and running code on a Linux-based supercomputer.

National Science Foundation Math Sciences Graduate Intern Summers 2022 & 2023
Argonne National Laboratory

- Began what became my dissertation research as a NSF MSGI fellow in Argonne's Mathematics and Computer Science Division.
- Developed code in Python with PyTorch library.

Senior Grants Manager 2012 - 2017
The Joyce Theater Foundation, Inc., New York, NY

- Exceeded fundraising targets year over year for an operational budget of $10+ million. Increased annual contributed income by $1 million (50%) over five years.
- Daily workflow and donor pipeline in a SQL-based database.

Volunteer Experience

Graduate Mathematics Association 2019 - present
UNC Chapel Hill Mathematics Department

- Treasurer, 2021-2022

Society for Industrial and Applied Mathematics 2019 - present

- National Math Festival Volunteer, 2021

Super Computing Conference Nov. 2022 & 2023

- Student Volunteer at SC22 in Dallas and SC23 in Denver

Anti-Racism Community Group (ARC) 2020 - 2022
UNC Chapel Hill Mathematics Department

- Founder and Organizer

Presentations & Publications

Paper (in progress)
"PLEUM: Performance-driven Learning and Exploratory Undersampling"

Paper (in review)
"Global Sensitivity Analysis of the Onset of Nasal Passage Infection by SARS-CoV-2 With Respect to Heterogeneity in Host Physiology and Host Cell-Virus Kinetic Interactions," *Virus.*

National Science Foundation's MSGI Virtual Symposium Aug.2023
Talk: Classifying Imbalanced Data

Triangle Computational and Applied Mathematics Symposium(TriCAM) Sept. 2022
North Carolina State University
Lightning Talk and Poster: To Classify Imbalanced Data Correctly, Find the Best ~~Model~~ Data

Paper Dec. 2021
"Maximum Covering Subtrees for Phylogenetic Networks," *IEEE/ACM Transactions on Computational Biology and Bioinformatics,* 18(6): 2823-2827, DOI:10.1109/TCBB.2020.3040910.

Joint Mathematics Meeting (JMM) - Atlanta Jan. 2017
Poster: The Perceptron: An Introduction to Machine Learning