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Karen Medlin

Ph.D. Candidate in Applied Mathematics

Summary

- Seeking a 2024 summer internship in the tech industry to apply and develop skills acquired as a ML researcher and applied math Ph.D. candidate. 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.
- Beginning to intermediate coding skills 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 in 2022) 2019 - 2025 (expected)
Co-advisors: M. Gregory 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.
- Master's project: Deployed a numerical model of the human respiratory tract to investigate how airborne viruses, including variants of Covid-19, travel and grow inside our nasal passages. Worked in Python and ran simulations on a Linux-based supercomputer.
- Courses: data structures, machine learning, numerical linear algebra, optimization, probability, scientific computing, and statistical modeling

IBM Research Summer School on Sketching and Tensor Algebra, San Jose, CA
Collaboration between IBM and Mathematical Sciences Research Institute (MSRI) July 2023

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

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

Papers

"PLEUM: Performance-driven Learning and Exploratory Undersampling," to be submitted to *Computational Statistics and Data Analysis* (in progress).

"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," in *Virus,* General Virology: Mathematical Modeling of Viral Infection (in review).

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

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

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)

Certified Data Specialist 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.

Minority Science Education Improvement Program Grant 2017, 2018

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.

Teaching Experience

Recitation Leader

- Math 233: Calculus III, UNC Chapel Hill Fall 2023
- Math 232: Calculus II, UNC Chapel Hill Spring 2023
- Math 125: Calculus with Analytic Geometry II, Univ. of Washington Fall 2018, Winter 2019, Spring 2019

Assistant

- Math 347: Linear Algebra for Applications, UNC Chapel Hill Fall 2020, 2021, 2022
- Math 383: First Course in Differential Equations, UNC Chapel Hill Fall 2021, 2022
- Math 566: Introduction to Numerical Analysis, UNC Chapel Hill Fall 2020
- Math 381: Discrete Mathematics, UNC Chapel Hill Spring 2019

Conferences, Talks & Posters

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

Underrepresented Students in Topology and Algebra Research Symposium (USTARS) Apr. 2018
Reed College
Poster: Neural Networks and the Shape of Data

BMCC/CUNY Annual Research Symposium (BARS) May 2017
Borough of Manhattan Community College
Talk: The Perceptron: An Introduction to Machine Learning

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

Membership & Involvement

Graduate Mathematics Association 2019 - present
UNC Chapel Hill Mathematics Department
- Treasurer, 2021-2022

Society for Industrial and Applied Mathematics 2019 - present

Association for Women in Mathematics 2018 - present
- Local UNC chapter Treasurer, 2021-2022

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

Service

Super Computing Conference Nov. 2022 & 2023
Student Volunteer at SC22 in Dallas and SC23 in Denver

Invited Speaker Nov. 2021
UNC Chapel Hill Mathematics Department
Facilitated a workshop on unconscious bias as part of the Graduate Teaching Seminar for first-year graduate students.

National Math Festival Apr. 2021
Society for Industrial and Applied Mathematics
Assistant for break-out sessions led by Tim Chartier, Aaron Luttman, and Genetha Gray

Prospective Graduate Student Weekend Feb. 2021, 2022
UNC Chapel Hill Mathematics Department
Spoke about UNC Math Dept.'s ARC group to prospective students.

Reference Contact Information

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