

Karen Medlin

PH.D. CANDIDATE IN APPLIED MATHEMATICS

University of North Carolina at Chapel Hill
Mathematics Department
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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 Raghavan¹

- Dissertation research: As a U.S. Department of Energy Office of Science Graduate Student Research (SCGSR) Awardee, developing algorithms to classify imbalanced data. In collaboration with physicists at Argonne National Laboratory, the novel algorithms will be customized to predict rare subatomic events captured by CERN's ATLAS particle detector.
- Master's project: Deployed a numerical model of the human respiratory tract to investigate how airborne viruses, including variants of Covid-19, travel and reproduce inside our nasal passages. Worked with Python source code and ran simulations on a 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

RESEARCH INTERESTS PAPERS

Computational mathematics, algorithms, statistics/probability, medical applications

"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).

"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

U.S. Department of Energy Office of Science Graduate Student Research Program 2023 - 2024
UNC ARPA Graduate Degree Completion Grant 2021 - 2022
Minority Science Education Improvement Program Grant 2017, 2018

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

WORK EXPERIENCE	Graduate Research and Teaching Assistant UNC Chapel Hill Mathematics Department	2019 - present
	<ul style="list-style-type: none"> Currently developing algorithms to improve the classification of imbalanced data, a prevalent problem in machine learning and in the context of many scientific applications such as detecting rare subatomic events, toxicology, and medical diagnostics. 	
	National Science Foundation Math Sciences Graduate Intern Argonne National Laboratory	Summers 2022 & 2023
	<ul style="list-style-type: none"> Began what became my dissertation research during a summer internship in the Mathematics and Computer Science Division at Argonne National Laboratory. 	
	Senior Grants Manager The Joyce Theater Foundation, Inc., New York, NY	2012 - 2017
	<ul style="list-style-type: none"> Exceeded fundraising targets year over year for an operational budget of \$10+ million. Increased annual contributed income by \$1 million (50%) over five years. Developed business proposals with metrics and narratives for The Joyce's major donors including The Ford Foundation, the Andrew W. Mellon Foundation, National Endowment for the Arts, New York State Council on the Arts, and NYC Department of Cultural Affairs. 	
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TEACHING EXPERIENCE	Recitation Leader	
	<ul style="list-style-type: none"> Math 233: Calculus III, UNC Chapel Hill Math 232: Calculus II, UNC Chapel Hill Math 125: Calculus with Analytic Geometry II, Univ. of Washington 	Fall 2023 Spring 2023 Fall 2018, Winter 2019, Spring 2019
	Assistant	
	<ul style="list-style-type: none"> Math 347: Linear Algebra for Applications, UNC Chapel Hill Math 383: First Course in Differential Equations, UNC Chapel Hill Math 566: Introduction to Numerical Analysis, UNC Chapel Hill Math 381: Discrete Mathematics, UNC Chapel Hill 	Fall 2020, 2021, 2022 Fall 2021, 2022 Fall 2020 Spring 2019
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CONFERENCES, TALKS & POSTERS	Triangle Computational and Applied Mathematics Symposium (TriCAM) North Carolina State University	Sept. 2022
	Lightning Talk and Poster: To Classify Imbalanced Data Correctly, Find the Best Model Data	
	Underrepresented Students in Topology and Algebra Research Symposium (USTARS) Reed College	Apr. 2018
	Poster: Neural Networks and the Shape of Data	
	BMCC/CUNY Annual Research Symposium (BARS) Borough of Manhattan Community College	May 2017
	Talk: The Perceptron: An Introduction to Machine Learning	
	Joint Mathematics Meeting Atlanta	Jan. 2017
	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 Luttmann, 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	Dr. M. Gregory Forest
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