

# Karen Medlin

PH.D. STUDENT IN APPLIED MATHEMATICS

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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 Raghavan<sup>1</sup>

- Dissertation research: Developing algorithms to improve the classification of imbalanced data, a prevalent challenge in machine learning and in the context of many scientific applications including genomics, toxicology, and neuroscience.
- Courses: data structures, machine learning, numerical linear algebra, optimization, probability, scientific computing, and statistical modeling

**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

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## RESEARCH INTERESTS

Computational mathematics, machine learning algorithms, optimization, statistics/probability

## PAPER

“PLEUM: Performance-driven Learning and Exploratory Undersampling” (draft)

“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 2024  
UNC ARPA Graduate Degree Completion Grant 2021 - 2022  
Minority Science Education Improvement Program (MSEIP) Grant 2017, 2018

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## WORK EXPERIENCE

**Graduate Research and Teaching Assistant** 2019 - present  
UNC Chapel Hill Mathematics Department

- Currently developing algorithms to improve the classification of imbalanced data.
- Previously deployed a numerical model of the human respiratory tract to investigate how airborne viruses, including variants of Covid-19, reproduce and travel after entering our nasal passages. Worked with Python source code and ran simulations on a Linux-based supercomputer. Earned a master’s degree with this project in August 2022.

<sup>1</sup> Assistant Computational Mathematician Dr. Krishnan Raghavan works at Argonne National Laboratory.

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

- Began what became my dissertation research on the classification of imbalanced data during a summer internship in the Mathematics and Computer Science Division at Argonne National Laboratory.

**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.
- 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**

- Math 233: Calculus III, UNC Chapel Hill      Fall 2023
- Math 232: Calculus II, UNC Chapel Hill      Spring 2023
- Math 231L: Lab class for Math 231 - Calculus I, UNC Chapel Hill      Fall 2021
- 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
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CONFERENCES,  
TALKS &  
POSTERS

**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

**Women in Mathematics and Statistics**      Apr. 2017  
Harvard College

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

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MEMBERSHIP & INVOLVEMENT	<b>Graduate Mathematics Association</b>	2019 - present
	UNC Chapel Hill Mathematics Department	
	• Treasurer, 2021-2022	
	<b>Society for Industrial and Applied Mathematics</b>	2019 - present
	<b>Association for Women in Mathematics</b>	2018 - present
	• Local UNC chapter Treasurer, 2021-2022	
	<b>Anti-Racism Community Group (ARC)</b>	2020 - 2022
	UNC Chapel Hill Mathematics Department	
	• Founder and Organizer	

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SERVICE	<b>Super Computing Conference 2022 (SC22)</b>	Nov. 2022
	Student Volunteer	
	<b>Invited Speaker</b>	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.	
	<b>National Math Festival</b>	Apr. 2021
	Society for Industrial and Applied Mathematics	
	Assistant for break-out sessions led by Tim Chartier, Aaron Luttmann, and Genetha Gray	
	<b>Prospective Graduate Student Weekend</b>	Feb. 2021, 2022
	UNC Chapel Hill Mathematics Department	
	Spoke about UNC Math Dept.'s ARC group to prospective students.	

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REFERENCE CONTACT INFORMATION	<a href="#">Dr. M. Gregory Forest</a>
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