(404) 403-7940 | karenamedlin@gmail.com
linkedin.com/in/kkmedlin | github.com/kkmedlin

Karen Medlin

Ph.D. in Applied Mathematics

Summary

Applied mathematician and computational scientist with a Ph.D. in Applied Mathematics and expertise in optimization, rare-event classification, and **bias mitigation for imbalanced data.** At **Argonne National Laboratory** as a DOE SCGSR Fellow, developed scalable ML pipelines in **Python (PyTorch, scikit-learn)** and implemented algorithms on **high-performance CPU/GPU systems** for applications in cybersecurity, **fraud detection,** and computational biology. Experienced in cross-institutional collaboration, publishing at venues such as **IJCNN** (with additional ML work under review at ICLR). Backed by competitive funding from the U.S. Department of Energy and NSF, with a strong record of delivering reproducible research, advancing algorithm design, and applying ML methods to **real-world, high-stakes problems.**

Technical Skills

- **Languages:** Python (PyTorch, NumPy, scikit-learn), R, Bash
- **ML/AI:** Deep learning (imbalanced data, optimization, rare-event classification), model evaluation, explainability, HPC training on GPUs/CPUs
- **Systems & Tools:** GitHub, Linux, SLURM, HPC Systems, AI-powered development tools (e.g., ChatGPT)

Education

University of North Carolina at Chapel Hill, Chapel Hill, NC
Ph.D. Applied Mathematics (M.S. in Mathematics, 2022) 2019 - 2025
Co-advisors: Greg Forest, Sven Leyffer (Argonne National Lab)

- Dissertation: Designed and deployed machine learning systems for imbalanced data, rare-event classification. Introduced a novel bilevel optimization framework to sampling methods, resulting in up to 15% improvement over SOTA. Applications include cybersecurity, fraud detection, and computational biology.
- Relevant coursework: Advanced Linear Algebra, Machine Learning, Numerical Analysis, Optimization, Probability, Scientific Computing, Statistical Modeling.

IBM Research (Almaden Lab) Summer 2023
Participant, MSRI/SLMath Summer School on "Mathematics of Data: **Sketching and Tensor Algebra**," a collaborative workshop with researchers across academia and industry.

University of Washington, Seattle, WA
Graduate-level coursework in mathematics 2018 - 2019

Research & Industry Experience

U.S. Dept. of Energy Graduate Research Fellow 2019 – 2025
Argonne National Laboratory & UNC Chapel Hill

- **Machine Learning for Imbalanced Data:** Developed bilevel optimization–based resampling algorithms (Python, PyTorch) to rebalance training data, improving fraud/anomaly detection accuracy by up to 15%.
- **Scalable ML Engineering:** Designed and deployed reproducible ML pipelines (data preprocessing, feature engineering, training, hyperparameter tuning, model evaluation and validation) on HPC clusters (SLURM, 1000+ cores, GPUs).
- **Applied Computational Science:** Ran large-scale numerical models of virus dynamics.
- **Collaboration & Dissemination:** Published results in peer-reviewed venues (IJCNN 2025, Viruses), with additional ML research under review at ICLR 2026.

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

- Secured $3M+ annually through data-driven reporting and strategic funding proposals, coordinating metrics and outcomes across departments.
- Strengthened cross-functional communication and stakeholder engagement, skills now applied in collaborative research projects.

Selected Publications

K. Medlin, S. Leyffer and K. Raghavan. Sampling Imbalanced Data with Multi-objective Bilevel Optimization, 2025. Submitted to *ICLR 2026* (Inter. Conference on Learning Representations).

K. Medlin, S. Leyffer and K. Raghavan. A Bilevel Optimization Framework for Imbalanced Data Classification, 2024. Accepted for presentation at *IJCNN 2025* (Inter. Joint Conference on Neural Networks, acceptance rate $\sim$ 40%)

L. Zhang, K. Medlin, M. G. Forest., et al. Computational Modeling Insights into Extreme Heterogeneity in COVID-19 Nasal Swab Data. *Viruses*, 16(1): 69, 2024.

Awards

U.S. DOE Office of Science Graduate Research Fellowship	2023 – 2024
NSF Mathematical Sciences Graduate Internship	2022, 2023
UNC Dissertation Completion Fellowship	2024 – 2025

Conferences and Professional Affiliations

Selected Presentations: Talk, International Joint Conference on Neural Networks (IJCNN), Rome, Italy (2025); Poster, SIAM Conference on the Mathematics of Data Science (MDS24), Atlanta, GA (2024); Talk, NSF Math Sciences Graduate Internship Symposium (2023).

Affiliations: ACM/IEEE (Awarded 2025 ACM-W Scholarship and SC22-23 Supercomputing Student Volunteer); SIAM (Member since 2019).