Abhijit Chowdhary

Cambridge, MA abhijit.chowdhary@tufts.edu abhijit-c.github.io Google Scholar

About Me

I consider myself a computational mathematician and my research interests lie in wielding math to design algorithms for real-world problems. I practice that in developing scalable algorithms to quantify, analyze, and control the uncertainty inherent in mathematical models. During my Ph.D., I focused on the uncertainty quantification (UQ) of large-scale inverse problems for physical phenomena governed by partial differential equations (PDEs). At the moment, I'm pursuing new directions in computational math, via problem structure-exploiting neural architectures, uncertainty quantification, randomized algorithms, among more.

Education

North Carolina State University, PhD in Applied Mathematics – Raleigh, NC — Aug 2020 – May 2025

- Recipient of the Siewert Fellowship

New York University, BA in Mathematics, Computer Science – New York, NY — May 2016 – May 2020

- Minor in Classics

Experience

Postdoctoral Visiting Scholar, ICERM, Brown University – Providence, RI, USA — Jan 2026 – Apr 2026

Postdoctoral Researcher, Tufts University – Somerville, MA, USA — June 2025 – Present

- Working with Elizabeth Newman in structure-exploiting SciML and uncertainty quantification.

Givens Intern, Argonne National Laboratory – Lemont, IL, USA — May 2024 – Aug 2024

Givens Intern, Argonne National Laboratory – Lemont, IL, USA — May 2023 – Aug 2023

- Became a core maintainer of the PyOED project and published a peer reviewed paper in TOMS.
- Published novel research in Robust Optimal Experimental Design, in review at SIAM CSE.
- Under the mentorship under Ahmed Attia.

Research Assistant, North Carolina State University – Raleigh, NC — June 2021 – Present

- Published novel research in scalable UQ for infinite-dimensional Bayesian inverse problems.
- Research Assistant for Alen Alexanderian via NSF Grant DMS-2111044.

Teaching Assistant, North Carolina State University – Raleigh, NC

- Led recitations for Calculus I, II, and the honors variants for 5 semesters.

Undergraduate Research Assistant, Ohio State University – Athens, OH — May 2019 – Aug 2019

- Published novel research in the theory of pattern formation, for the 2D Swift-Hohenberg Equation.

Publications

Boost Like a (Var)Pro: Trust-Region Gradient Boosting via Variable Projection — Mar 2026
Abhijit Chowdhary, Elizabeth Newman, Deepanshu Verma
https://doi.org/10.48550/arXiv.2603.23658 (arXiv preprint)

Scalable Uncertainty Quantification for Infinite-Dimensional Bayesian Inverse Problems — Feb 2025
Abhijit Chowdhary
www.lib.ncsu.edu/resolver/1840.20/45106 (PhD Thesis, NC State University)

Robust optimal design of large-scale Bayesian nonlinear inverse problems Sept 2024
Abhijit Chowdhary, Ahmed Attia, Alen Alexanderian
https://doi.org/10.48550/arXiv.2409.09137 (SIAM Journal on Scientific Computing)

PyOED: An Extensible Suite for Data Assimilation and Model-Constrained Optimal Design of Experiments June 2024
Abhijit Chowdhary, Shady E. Ahmed, Ahmed Attia
https://dl.acm.org/doi/10.1145/3653071 (ACM Transactions on Mathematical Software)

Sensitivity Analysis of the Information Gain in Infinite-Dimensional Bayesian Linear Inverse Problems May 2024
Abhijit Chowdhary, Shanyin Tong, Georg Stadler, Alen Alexanderian
https://doi.org/10.1615/Int.J.UncertaintyQuantification.2024051416 (IJUQ)

Weak Diffusive Stability of Roll Solutions at the Zigzag Boundary Oct 2023
Abhijit Chowdhary, Mason Haberle, William Ofori-atta, Qilian Wu
https://doi.org/10.1137/24M1639683 (SIAM Journal of Mathematical Analysis)

Software

PyOED May 2023 – Present

- Core maintainer of PyOED, an open source research software for model-constrained optimal design.
- Designed to extend and integrate existing codes to rapidly test new developments.
- Used in multiple research groups worldwide.

Talks

VPBoost: Accelerating Gradient Boosting with Variable Projection Mar 2026

- SIAM UQ 2026, Minneapolis, MN

Boosting VarProNets: Efficient Gradient Boosting with Variable Projection Feb 2026

- ICERM, Providence, RI

Boosting VarProNets: Efficient Gradient Boosting with Variable Projection Dec 2025

- CBMS Conference, University of Houston, Houston, TX

Robust OED for Large-Scale Nonlinear Bayesian Inverse Problems Mar 2025

- SIAM CSE 2025, Fort Worth, Texas

Robust optimal design of large-scale Bayesian nonlinear inverse problems Nov 2024

- Applied Math Graduate Student Seminar, Raleigh, NC

Robust OED for Large-Scale Nonlinear Bayesian Inverse Problems Oct 2024

- SIAM MDS 2024, Atlanta Georgia

PyOED and Enabling the Robust Optimal Experimental Design of Nonlinear Inverse Problems Aug 2024

- SASSy Seminar, Argonne National Laboratory

PyOED: An Open Source, Backend-Agnostic, Bayesian OED Toolbox for Rapid Development Feb 2024

- SIAM UQ 2024, Trieste, Italy

Scalable Sensitivity Analysis and Optimal Design for Bayesian Inference Aug 2023

- Applied Math Graduate Student Seminar, Raleigh, NC

Robust Optimal Experimental Design for Non-Linear Bayesian Inference May 2023

- SASSy Seminar, Argonne National Laboratory

Sensitivity Analysis of the Information Gain in Infinite-Dimensional Bayesian Linear Inverse Problems Mar 2023

- SIAM CSE 2023, Amsterdam, Netherlands

Computing Eigenvalue Sensitivities for Sensitivity Analysis of the Information Gain in Bayesian Linear Inverse Problems Sept 2022

- Applied Math Graduate Student Seminar, Raleigh, NC

Infinite-Dimensional Bayesian Inversion for Fault Slip from Surface Measurements Apr 2022

- Applied Math Graduate Student Seminar, Raleigh, NC

Service

Organizer of Mini-Symposia for the following conferences.

- SIAM UQ 2026: Structure-Exploiting Techniques for UQ and ML
- SIAM MDS 2026: Lightweight Learning: Exploiting Structure for Reliable and Efficient ML

Peer-Review for the following journals.

- Journal of Open Source Software (JOSS)
- SIAM Journal on Matrix Analysis and Applications (SIMAX)

Co-Organizer, Postdoctoral and Graduate Student Seminar, ICERM Jan 2026 – Apr 2026

Lead Organizer, Applied Math Graduate Student Seminar (AMGSS), NCSU Jan 2022 – May 2025

Skills

Programming: Proficient in Python, Julia, C, C++, MATLAB, and Shell Scripting

Technologies: Generally familiar with the GPU programming interfaces, the machine learning stacks, Finite element software, high-performance linear algebra, and Linux.

Mathematics: Specialized in scientific computing, uncertainty quantification, and large-scale optimization. Theoretical foundations in the PDE, probability, and functional analysis.

Languages: English (native), Latin, Hindi