Abhijit **Chowdhary**

APPLIED MATH PHD STUDENT

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Education

North Carolina State University   *Raleigh, NC*

PHD IN APPLIED MATH (GPA 4.0)   *Aug. 2020 - Present*

- (Oct. 2023) — Passed Preliminary Exam
- (Aug. 2021 - Present) — Research Assistant for Alen Alexanderian via NSF Grant DMS-2111044
- (Aug. 2021) — Passed Qualification Exams
- (Aug. 2020) — Recipient of the Siewert Fellowship

New York University   *New York, NY*

B.A. JOINT MATHEMATICS AND COMPUTER SCIENCE, CLASSICS MINOR   *Sep. 2016 - May. 2020*

University of Maryland   *College Park, MD*

VISITING STUDENT   *Summers 2017 and 2018*

Research Interests and Skills

Broad Interests	Scientific Computing, Inverse Problems, Uncertainty Quantification, Machine Learning
Specific Interests	Bayesian Inverse Problems, PDE-Constrained Optimization, Sensitivity Analysis, Optimal Experimental Design, Randomized Numerical Linear Algebra, Neural Surrogates, High Performance Computing, Open Source Software
Programming Languages	Python, Julia, C++, Matlab
Technologies	Git, LaTeX, Linux, PETSc, MPI, CUDA, FEniCS(x), Vim, Jupyter,
Languages	English, Latin, Hindi

Experience

RESEARCH EXPERIENCE

Argonne National Laboratory   *Lemont, IL*

GIVENS ASSOCIATE   *Summer 2023, 2024*

- Awarded the Givens internship for the both the summer of 2023 and 2024.
- Worked with Ahmed Attia on the development of the open source python package PyOED, which is an optimal experimental design package with a backend agnostic, extensible, data assimilation framework.
- Began and completed research leveraging a new stochastic framework for optimal experimental design to tackle the robust optimal experimental design problem for non-linear inverse problems.
- Culminated in five talks given by me (Two at the SASSy seminar at Argonne, one at SIAM UQ24, two planned at SIAM MDS24 and SIAM CSE25 respectively).
- Culminated in three papers (one published, one in submission, one in mid-research)

North Carolina State University   *Raleigh, NC*

RESEARCH ASSISTANT   *Aug. 2021 - Present*

- Hired as a research assistant for Alen Alexanderian via NSF Grant DMS-2111044.
- Generally working in the field of Bayesian inverse problems, and their sensivity analysis and optimal experimental design formulation.
- Developed a novel technique for differentiating the information gain of a linear Bayesian inverse problem with respect to the model hyperparameters.
- Culminated in a talk at SIAM CSE23 and a paper.

Ohio State University   *Athens, OH*

UNDERGRADUATE RESEARCH ASSISTANT   *June. 2019 - Aug. 2019*

- Joined a research team udner professor Qiliang Wu, and co-researcher Mason Haberle in researching the field of pattern formation
- Proved the nonlinear stability of the 2D Swift-Hohenberg equation at the zigzag boundary.
- Paper in submission with a published preprint.

TEACHING EXPERIENCE

North Carolina State University   *Raleigh, NC*

TEACHING ASSISTANT   *Aug. 2020 - Aug 2021*

- Taught recitation sections for the department of mathematics and North Carolina State. In particular, taught Calculus I in the fall of 2020, and Calculus II in the spring and summer of 2021.

New York University   *New York, NY*

TEACHING ASSISTANT   *Sep. 2017 - May 2019 and Spring 2020*

- Tutored and graded for undergraduate numerical computing in Spring 2020.
- Taught tutoring sessions and graded for graduate fundamental algorithms in fall 2017 and 2018.
- Taught tutoring sessions and graded for undergraduate basic algorithms in spring 2018 and 2019.

SERVICE
Applied Math Graduate Student Seminar   *Raleigh, NC*

ORGANIZER   *Aug. 2022 - Now*

Student Association of Comptuing @ New York University   *New York, NY*

ON THE EBOARD   *2017 - 2020*

Publications

PyOED: An Extensible Suite for Data Assimilation and Model-Constrained Optimal Design of Experiments
    Abhijit Chowdhary, Shady E. Ahmed, Ahmed Attia
    ACM Transactions on Mathematical Software 50.2 (June 2024) pp. 1–22. 2024

Robust optimal design of large-scale Bayesian nonlinear inverse problems
    Abhijit Chowdhary, Ahmed Attia, Alen Alexanderian
    arXiv preprint arXiv:2409.09137 (2024). 2024

Sensitivity Analysis of the Information Gain in Infinite-Dimensional Bayesian Linear Inverse Problems
    Abhijit Chowdhary, Shanyin Tong, Georg Stadler, Alen Alexanderian
    International Journal for Uncertainty Quantification (2024). 2024

Weak Diffusive Stability of Roll Solutions at the Zigzag Boundary
    Abhijit Chowdhary, Mason Haberle, William Ofori-atta, Qiliang Wu
    (2023). arXiv, 2023

Presentations

Robust optimal design of large-scale Bayesian nonlinear inverse problems   *Raleigh, NC*

APPLIED MATH GRADUATE STUDENT SEMINAR   *November 11th, 2024*

Robust OED of Infinite-Dimensional Nonlinear Bayesian Inversion   *Atlanta, GA*

POSTER SESSION AT SIAM MDS   *October 25th, 2024*

PyOED and Enabling the Robust Optimal Experimental Design of Nonlinear Inverse Problems   *Lemont, IL*

SASSY SEMINAR AT ARGONNE NATIONAL LABORATORY   *August 2nd, 2024*

PyOED: An Open Source, Backend-Agnostic, Bayesian OED Toolbox for Rapid Development   *Trieste, Italy*

SIAM UQ24, MINISYMPOSIA ON COMPUTATIONAL TOOLS FOR LARGE-SCALE INVERSE PROBLEMS AND UQ   *Febuary 27th, 2024*

Scalable Sensitivity Analysis and Optimal Design for Bayesian Inference   *Raleigh, NC*

APPLIED MATH GRADUATE STUDENT SEMINAR   *October 24th, 2023*

Robust Optimal Experimental Design for Non-Linear Bayesian Inference   *Lemont, IL*

SASSY SEMINAR AT ARGONNE NATIONAL LABORATORY   *July 28th, 2023*

Sensitivity Analysis of the Information Gain in Infinite-Dimensional Bayesian Linear Inverse Problems   *Amsterdam, Netherlands*

SIAM CSE23, MINISYMPOSIA ON TRADITIONAL OED AND BEYOND   *March 2nd, 2023*

Computing Eigenvalue Sensitivities for Sensitivity Analysis of the Information Gain in Bayesian Linear Inverse Problems   *Raleigh, NC*

APPLIED MATH GRADUATE STUDENT SEMINAR   *September 26th, 2022*

Infinite-Dimensional Bayesian Inversion for Fault Slip from Surface Measurements   *Raleigh, NC*

APPLIED MATH GRADUATE STUDENT SEMINAR   *April 25th, 2022*