

# Abhijit Chowdhary

APPLIED MATH PHD STUDENT

Department of Mathematics, North Carolina State University, Raleigh, NC 27607

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## Education

### North Carolina State University

PHD IN APPLIED MATH (GPA 4.0)

- (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

Raleigh, NC

Aug. 2020 - Present

### New York University

B.A. JOINT MATHEMATICS AND COMPUTER SCIENCE, CLASSICS MINOR

New York, NY

Sep. 2016 - May. 2020

### University of Maryland

VISITING STUDENT

College Park, MD

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, C++, Matlab

**Technologies** Git,  $\LaTeX$ , Linux, PETSc, MPI, CUDA, FEniCS(x), Vim, Jupyter,

**Languages** English, Latin, Hindi

## Experience

### RESEARCH EXPERIENCE

#### Argonne National Laboratory

GIVENS ASSOCIATE

Lemont, IL

May. 2023 - Aug. 2023

- Awarded the Givens internship for the summer 2023.
- 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 a new research project with Ahmed Attia and Alen Alexanderian in trying to extend previous efforts in robust optimal experimental design from the linear Bayesian inversion setting to the nonlinear setting.
- Culminated in three talks (one at the SASSy seminar at Argonne 2023, and two planned for the SIAM UQ24 conference), and two papers in review.

#### North Carolina State University

RESEARCH ASSISTANT

Raleigh, NC

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 sensitivity 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. This paper is currently in review.

#### Ohio State University

UNDERGRADUATE RESEARCH ASSISTANT

Athens, OH

June. 2019 - Aug. 2019

- Joined a research team under 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

TEACHING ASSISTANT

Raleigh, NC

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

TEACHING ASSISTANT

- 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.

New York, NY

Sep. 2017 - May 2019 and Spring 2020

## SERVICE

### Applied Math Graduate Student Seminar

ORGANIZER

Raleigh, NC

Aug. 2022 - Now

### Student Association of Computing @ New York University

ON THE EBOARD

New York, NY

2017 - 2020

## Publications

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PyOED: An Extensible Suite for Data Assimilation and Model-Constrained Optimal Design of Experiments

Abhijit Chowdhary, Shady E. Ahmed, Ahmed Attia

(2023). arXiv, 2023

Weak Diffusive Stability of Roll Solutions at the Zigzag Boundary

Abhijit Chowdhary, Mason Haberle, William Ofori-atta, Qiliang Wu

(2023). arXiv, 2023

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

Abhijit Chowdhary, Shanyin Tong, Georg Stadler, Alen Alexanderian

(2023). arXiv, 2023

## Presentations

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### 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

February 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

## Service

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2022-Now **Organizer**, Applied Math Graduate Student Seminar

Raleigh, NC

2017-2020 **Treasurer**, Student Association of Computing @ New York University

New York, NY