John Nicholas Neuberger

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PhD Candidate | Research Assistant (DOE funded), North Carolina State University

Education

PhD, Applied Mathematics (expected May 2026)
Dissertation: Optimal experimental design techniques for large-scale infinite-dimensional Bayesian inverse problems.
Advisor: Alen Alexanderian

MS, Applied Mathematics (North Carolina State University, Spring 2023)
BS, Mathematics (Northern Arizona University, Spring 2021)

Professional appointments

Sandia National Laboratories, Center for Computing Research (CCR)
Research Intern (Spring 2023–Present)

- Developed scalable frameworks for the optimal design of PDE-governed Bayesian inverse problems.
- Integrated advanced OED/UQ methods in FEinCS 2019 and Sandia's HPC software (MrHyDE).

Academic appointments

North Carolina State University

- *Graduate Research Assistant:* DOE funded (Spring 2022–present)
- *Instructor:* Calculus III, NCSU (Fall 2022)
- *Teaching Assistant:* Calculus II/III, NCSU (Fall 2021–Fall 2022)

Northern Arizona University

- *TA/Tutor:* Lumberjacks Mathematics Center (2017–2019)

Current research interests

General

- Bridging mathematical theory with advanced computational techniques.
- Prediction, control, and decision-making in complex systems.
- Novel visualization techniques for interpreting uncertainty.

Specific

- Infinite-dimensional Bayesian inverse problems for PDE-governed systems.
- Optimal experimental design (OED) of inverse problems.
- Low-rank, scalable methods for uncertainty quantification.

Skills

Theory: Bayesian inverse problems, OED, functional analysis, PDEs, probability, optimization
Computation: Python, C/C++, MATLAB, parallel/HPC workflows
Systems: MrHyDE (Sandia National Laboratories), FEniCS 2019, ParaView
Developer tools: GitHub, Anaconda, Docker, Linux, LaTeX

Relevant Coursework

Numerical analysis I/II	Matrix theory I/II	Functional analysis I/II
Advanced functional analysis	Inverse problems	Uncertainty quantification
Harmonic analysis	Data-driven modeling and analysis	C/C++/Python for mathematicians

Publications

- J. Nicholas Neuberger, Alen Alexanderian, Bart van Bloemen Waanders, Ahmed Attia,
  Optimal design of sensor trajectories for infinite-dimensional Bayesian inverse problems.
  Manuscript in preparation.
- J. Nicholas Neuberger, Alen Alexanderian, Bart van Bloemen Waanders,
  Goal-oriented optimal design of infinite-dimensional Bayesian inverse problems using quadratic approximations.
  arXiv preprint; accepted by the Journal of Scientific Computing.
- Nick Neuberger, Bart Van Bloemen Waanders, and Alen Alexanderian,
  Computational aspects of optimal experimental design for large-scale Bayesian linear inverse problems.
  Computer Science Research Institute Summer Proceedings 2023, Sandia National Laboratories, 2023.

- Neuberger, N., Yildiz, B. (2020).
  An Elementary Proof of Weisman's Congruence When $p = 2$. PUMP Journal of Undergraduate Research, 3, 146–157.

Presentations & Awards

Selected Presentations

SIAM MSE 2024 (Poster): *Goal-Oriented Optimal Experimental Design.*
SIAM CSE 2025 (Talk): *Goal-Oriented Optimal Experimental Design.*

Funding & Awards

DOE-funded Graduate Research Assistant (current)
Karen and Terrence Hall Scholarship (NAU)