EMILY WILLIAMS

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SUMMARY

PhD candidate and research fellow in Computational Science & Engineering at MIT with expertise in scientific computing, machine learning, and high-performance computing. Research background in physics-informed and stochastic ML methods for computational reduced-order modeling with applications ranging from earth systems to molecular dynamics to risk sensitivity.

SKILLS

Languages: Python, MATLAB, C/C++, R, Shell scripting
Frameworks: JAX, PyTorch, TensorFlow/Keras
Computing Tools: Git, HPC, slurm, GPU

EXPERIENCE

Visiting Researcher – Pacific Northwest National Laboratory, Seattle, WA May 2024 – Present

- Built physics-informed **JAX-based deep operator networks** and extracted custom spectral basis functions to enable efficient model reduction of multiscale systems
- Implemented **transfer learning** for network initialization, cutting training time and improving convergence
- Developed **Mori-Zwanzig-reduced models** to capture memory effects, exploring Markovian reformulations for improved stability and computational efficiency

Computational Science Graduate Fellow – MIT, Cambridge, MA Sep 2022 – Present

- Implemented **TensorFlow SDE models** for subgrid-scale predictions of chaotic systems
- Developed physics-informed **PyTorch diffusion models** using variational approaches
- Applied **stochastic optimal control framework** for stability guarantees, applicable to risk-sensitive modeling

Graduate Research Assistant – MIT, Cambridge, MA Sep 2021 – Sep 2022

- Conducted **wall-modeled large-eddy simulations (WMLES)** of Lockheed Martin X-59 on **HPC cluster**, optimizing mesh configuration for accuracy vs computational cost
- Validated near-field pressure signatures against Reynolds-averaged Navier–Stokes (RANS) baselines
- Implemented machine-learning–based and **information-preserving** subgrid-scale models to improve simulation accuracy for canonical flows

EDUCATION

PhD – Computational Science & Engineering, MIT, expected June 2026.
MS – Aeronautics & Astronautics, MIT, June 2023.
BS – Aerospace Engineering, UIUC, June 2021.

SELECTED PAPERS & AWARDS

Generative modeling for closure and linearized stability of chaotic dynamical systems, arXiv 2504.09750, Apr 2025.

What do physics-informed DeepONets learn?, arXiv 2411.18459, Nov 2024.

(Full list: https://scholar.google.com/citations?user=YVWR1kIAAAAJ&hl=en)

DOE Computational Science Graduate Fellowship (2022) · NSF GRFP (2022) · DOD NDSEG Fellowship (2022) · AIAA Aviation Week Network 20 Twenties (2021)