EMILY WILLIAMS

815-341-4058   ejwllms@mit.edu   emlyjwllms.github.io

SUMMARY

PhD candidate and research fellow in Computational Science & Engineering (MIT) with expertise in scientific computing, machine learning, and HPC simulation. Experienced in applied math and machine learning for physics-informed modeling and optimal control of complex multiscale and chaotic dynamical systems.

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, enabling controlled linearized dynamics to accurately capture sensitivity derivatives

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)