

# Joanna Piper Morgan, PhD

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## Education

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### Oregon State University

Ph.D., Mechanical Engineering

Corvallis, OR

Sept 2020 – June 2025

*Minor: Nuclear Engineering | Emphasis: Thermal Fluid Sciences*

*Dissertation: Algorithms and Software Engineering Schemes for Time-Dependent Radiation Transport on Heterogeneous Compute Architectures.*

*Advisors: Kyle E. Niemeyer & Todd S. Palmer*

## Professional & Research Experience

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### Lawrence Livermore National Lab (LLNL)

Sept 2025 – Present

*Postdoctoral Research Scholar, Nuclear Criticality Safety Division*

- Design and evaluate TEX Experiments, focusing on advanced computational methodologies.
- Develop  $S_N$  and Monte Carlo algorithms utilizing MFEM and PETSc for large-scale simulations.

### Oregon State University (OSU)

June 2020 – June 2025

*Graduate Research Assistant, School of Mechanical Industrial and Manufacturing Engineering*

- Developed Python-based acceleration and abstraction of compute kernels for dynamic Monte Carlo in the rapid methods development code MC/DC (Center for Exascale Monte Carlo Neutron Transport).
- Investigated the one-cell inversion method as an alternative to transport sweeps for deterministic dynamic neutron transport on GPUs to accelerate scientific discovery.

### Advanced Micro Devices (AMD)

Sept 2023 – May 2024

*Co-Op Research Intern, HPC GPU Apps Support Group*

- Engineered Python–Numba compiler bindings for AMD GPUs and Sn numerical methods in rocSOLVER.
- Conducted extensive profiler testing for the MI300a architecture to optimize multi-physics applications.

### Los Alamos National Laboratory (LANL)

June 2021 – May 2023

*Graduate Research Intern, XCP-3 & CCS-2*

- Implemented Woodcock delta tracking on a structured mesh within the production code MCATK; successfully pushed work to a production version release. (XCP-3)
- Explored novel vectorizable variance reduction methods for thermal radiation transport (TRT). (CCS-2)

## Selected Technical Skills

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- **Languages & Libraries:** Python (Numba, mpi4py, Numpy, Scipy, CuPy), C/C++ (OpenMP, C-CUDA, HIP/ROCm, Kokkos, MPI), PETSc, MFEM, LLVM.
- **Tools & Compilers:** Numba (LLVM bindings), Intel/GCC/Clang compilers, Git, Vtune, N-Sight.
- **Domain Expertise:** High-Performance Computing (HPC), GPU acceleration, multiphysics/multiscale PDE solvers, deterministic and Monte Carlo simulation.

## Selected Publications

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- J. P. Morgan, I. Variansyah, B. Cuneo, T. S. Palmer, and K. E. Niemeyer. (2025) *Performant and Portable Monte Carlo Neutron Transport via Numba*. *Computing in Science and Engineering (IEEE)* 27(1) pp. 75-65. doi 10.1109/MCSE.2025.3550863. arXiv:2409.04668.
- J. P. Morgan, et al. (2024) *Monte Carlo / Dynamic Code (MC/DC): An accelerated Python package for fully transient neutron transport and rapid methods development*. *Journal of Open Source Software* **96(9)**. doi 10.21105/joss.06415.
- J. P. Morgan, I. Variansyah, T. S. Palmer, and K. E. Niemeyer. (2025) *One-Cell Inversion for Solving Higher-Order Time-Dependent Radiation Transport on GPUs*. *Nuclear Science and Engineering*. 10.1080/00295639.2025.2510004. arXiv:2503.00264.
- J. P. Morgan, B. Cuneo, I. Variansyah, K. E. Niemeyer. *Enabling GPU portability into the Numba-JITed Monte Carlo particle transport code MC/DC*. (2025). *International Conference on Mathematics and Computational Methods Applied to Nuclear Science and Engineering (ANS M&C 2025)*. Denver, CO, USA. doi 10.13182/MC25-47142. arXiv:2501.05440
- J. P. Morgan, I. Variansyah, K. B. Clements, T. S. Palmer, K. E. Niemeyer. *Hybrid Woodcock-delta Tracking Schemes Using a Track-Length Estimator*. *Journal of Computational and Theoretical Transport*. doi 10.1080/23324309.2026.2618791. arXiv:2510.00152.