NUCLEAR ENGINEERING RESEARCH SEMINAR

Advances in computational geometry for Monte Carlo particle transport

ABSTRACT

Computational geometry is a foundational component of Monte Carlo particle transport, influencing simulation performance, robustness, and the complexity of systems that can be represented. As modeling demands grow and computing architectures evolve, new opportunities are emerging to rethink how geometry is represented and traversed in particle transport applications. This talk will examine the current state of computational geometry in OpenMC and discuss ongoing efforts to expand its capabilities through new software infrastructure, advanced geometric representations, and hardware-accelerated algorithms. Looking beyond current developments, the talk will explore emerging research directions at the intersection of computational geometry, computer graphics, and scientific computing, highlighting opportunities to improve efficiency, enable new classes of analysis, and broaden the role of geometry in high-fidelity nuclear simulation.

PURDUE UNIVERSITY

School of Nuclear Engineering

WEDNESDAY, November 11, 2026
3:30 PM | WTHR 200



Dr. Patrick Shriwise,
Argonne National Laboratory

Patrick Shriwise earned his Ph.D. and Masters at the University of Wisconsin — Madison and is currently a staff scientist at Argonne National Laboratory specializing in computational nuclear engineering, particle transport, computational geometry, and high-performance scientific computing. His research focuses on developing advanced computational methods for high-fidelity simulations of complex nuclear systems, with particular interest in cross-cutting methodologies between computer graphics and particle transport.
Dr. Shriwise's research focuses on developing scalable, high-fidelity computational methods for modeling complex nuclear systems. His expertise includes advanced particle tracking algorithms, computational geometry, CAD-based radiation transport, GPU-accelerated ray tracing, and scientific visualization. Dr. Shriwise is an technical committee member and core developer of OpenMC, an open-source Monte Carlo particle transport code, where his work includes advanced particle tracking techniques, visualization, and support for high fidelity multiphysics applications. He is a core developer of the Direct Accelerated Monte Carlo (DAGMC) toolkit and project lead for the Accelerated Discretized Geometry (XDG) project, enabling efficient particle transport simulations involving complex engineering geometries.