COMPUTATIONAL RESEARCH in BOSTON and BEYOND SEMINAR

COMPUTATIONAL ANALYSIS OF NUCLEAR REACTOR TRANSIENTS

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ABSTRACT:

Since nuclear experiments are costly and require extensive safety precautions, the nuclear industry relies heavily on modeling and simulation of nuclear systems. The state-of-the-art simulation tool for steady-state neutron transport is Monte Carlo, a probabilistic approach to solving for the distribution of neutrons.

Although it is the most accurate tool available, it is very computationally expensive. Monte Carlo is even more burdensome when coupled to other physics which allows us to properly capture feedback effects from density and temperature changes. Nonetheless, it is imperative to do such coupling because nuclear reactor designs rely on these intrinsic feedback mechanisms to ensure passive safety. In addition to coupling Monte Carlo with other physics codes, there is an additional hurdle to overcome for time-dependent simulations. These are a few of the reasons why nuclear reactor simulations are a target of Exascale computing initiatives.

This talk will cover a number of coupling schemes that create feasible runtimes for coupled time-dependent Monte Carlo simulations. In particular, we will give consideration to high-order/low-order schemes where Monte Carlo and diffusion solvers are paired to deliver accurate results in efficient time.

ABOUT THE SPEAKER: Miriam Kreher is a PhD candidate in the Computational Reactor Physics Group in the MIT Nuclear Science and Engineering Department. She is also a fellow of the DOE Computational Science Graduate Fellowship program. Kreher received a BS in Engineering Science from the University of Pittsburgh in 2016. Kreher is a contributor of OpenMC and currently serves on the Board of Directors of the American Nuclear Society.

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ZOOM MEETING info:

https://mit.zoom.us/j/96155042770
Meeting ID: 961 5504 2770

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