

MECHANICAL & AEROSPACE ENGINEERING GRAD STUDENT SEMINAR

Pushing the Limits of Computational Science and Engineering: Hardware-Aware PDE Solvers for the Exascale Era

Friday, September 11
11:00 AM
AME Room 106

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ABSTRACT: As the demand for high-fidelity simulations grows, extracting scientific insight from next-generation supercomputers requires more than raw compute power—it demands scalable, hardware-aware numerical algorithms. In this talk, I will present my research on codesigning solvers for complex partial differential equations (PDEs) to bridge the gap between modern architectural constraints and extreme-scale computational physics. By tailoring algorithms to leadership-class hardware, this work enables predictive models and high-resolution simulations that were previously computationally infeasible.

To demonstrate the broad engineering and physical impact of this hardware-algorithm co-design, I will highlight key algorithmic advances across three distinct application areas:

- **Micro-Scale Multiphysics**
- **Extreme-Scale AMR for Highly Dynamic Systems**
- **Real-Time Predictive Modeling and Inverse Problems**



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