

ACMS Grad & Postdoc Seminar



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Wednesday, March 18, 2026
154 Hurley Hall
3:30 PM – 4:30 PM

Deep Learning for Multiscale Models

In this talk, I present a structure-preserving Lagrangian algorithm for solving multiscale models, specifically the Cahn-Hilliard equation. Based on the Energetic Variational Approach (EnVarA), the algorithm employs neural networks for spatial discretization. The proposed scheme is derived directly from the energy-dissipation law; this guarantees the monotonic decay of the system's free energy, which prevents unphysical solutions and ensures long-term numerical stability. To address challenges arising from steep gradients, we introduce an adaptive sampling method to better capture the diffuse interface. Furthermore, we solve for the flow map increments, an approach that is computationally memory-efficient. The resulting neural network-based scheme is mesh-free, enabling the solution of gradient flows in high dimensions. I will conclude by presenting numerical experiments that demonstrate the accuracy and stability of the scheme, followed by a discussion of future applications to other multi-scale models.

The Department of Applied and Computational
Mathematics and Statistics

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