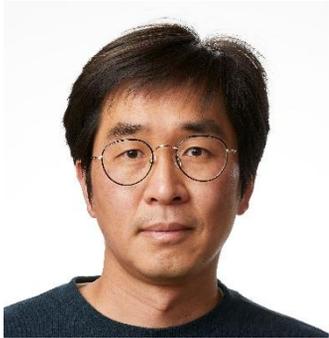




Foundation Models in Computational Science



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Computational science is at the forefront of modern technology, enabling groundbreaking simulations—from quantum molecular dynamics and magnetic fusion to complex wave phenomena. These advances have ushered in the era of digital twins, accelerating the design, build, test, and learn (DBTL) process across diverse applications. Yet even the most advanced simulations remain computationally expensive, often pushing high-performance computing systems to their limits. Fortunately, machine learning (ML) and artificial intelligence (AI) offer promising strategies to enhance simulation speed without sacrificing accuracy. In this talk, I will introduce several foundation models designed to accelerate computational simulations. I will critically evaluate these models, distinguishing between those that offer nice, yet incomplete gains and those that deliver genuine, comprehensive performance improvements. A highlight of the discussion will be the data-driven finite element method (DD-FEM), a robust foundation model whose effectiveness I will demonstrate across three applications: lattice-type structure design, steady Navier–Stokes porous media flow, and time-dependent 2D Burgers advective flow with multiple disturbances, achieving roughly 1000x speed-up and 100x scale-up with a relative error of $O(1\%)$.

Monday, February 9, 2026, 4:00 PM

Please pre-register for the Zoom meeting at

https://us06web.zoom.us/meeting/register/zLx7Sx_5R8ez4EknoP9Yyg

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For more information, please contact us at computationalscience@utep.edu.