Spring 2025 Physics Colloquium

Friday, April 18th

3:00 PM

PAS 201 or Zoom

(https://arizona.zoom.us/j/86395646910)

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Towards digital twins of particle accelerators: high fidelity computation modeling and data-driven surrogate models

Abstract: Over the past century, particle accelerators have undergone remarkable development and evolution, pushing the boundaries of particle and nuclear physics. Today, their influence extends far beyond probing the universe's fundamental mysteries. These sophisticated machines drive innovation in materials science, biology, and energy research by powering advanced radiation and light sources, and transform fields such as medicine, industry, and national security. With breakthroughs like high-energy, high-intensity lasers, next-generation accelerators are on the horizon, promising to deliver cost-effective, compact solutions that could revolutionize science and technology even further. In this presentation, I will explore the evolution of particle accelerators and discuss how advancements in computation and data-driven science are enhancing their design and operation amidst increasing complexities. In particular, I will outline a promising approach to developing digital twins of particle accelerators, leveraging high-fidelity, multi-scale, multi-physics computational modeling alongside surrogate models enhanced by Scientific Machine-Learning (Sci-ML) techniques that incorporate physical constraints.

* Refreshments served in PAS 218 at 2:30 PM – 3:00 PM *