

Sampling, Inference, and Data-Driven Physical Modeling in Scientific Machine Learning

July 14-18, 2025

Scientific Overview

In recent years, the synergy between data-driven modeling and artificial intelligence, particularly generative modeling, has become an indispensable avenue in scientific discovery. Advances in machine learning have led to novel techniques addressing inverse and forward problems in traditional modeling, such as those involving partial differential equations and dynamical systems. Concurrently, scientific computing concepts can enhance the performance of data-driven methods, like generative modeling. Recent progress has highlighted profound synergy within these methods, underpinned by shared mathematical foundations. A crucial motivation for this workshop is to discuss advances in neural network-based approaches and high-dimensional approximations for parameterizing solution operators or formulating the structure of the underlying mathematical model. The computational and applied mathematics community is increasingly applying these techniques to dynamical systems and nonlinear phenomena. We will bring together leading researchers from various fields to capitalize on this synergy, seeking a unified understanding of hidden mathematical and data-informed structures in sampling, inference, and data-driven modeling in scientific machine learning. Through vigorous discussions and presentations, the initiative aims to address real-world data challenges and pave the way for future explorations.

Participation

Additional information about this workshop including links to register and to apply for funding, can be found on the webpage listed below. Encouraging the careers of women and minority mathematicians and scientists is an important component of IPAM's mission, and we welcome their applications.



Organizers

Markos Katsoulakis (University of Massachusetts Amherst)
Rongjie Lai (Purdue University)
Wenjing Liao (Georgia Institute of Technology)
Scott McCalla (Montana State University - Bozeman)
Stanley Osher (University of California, Los Angeles (UCLA))
Hayden Schaeffer (University of California, Los Angeles (UCLA))
Carola Schönlieb (University of Cambridge)
Rachel Ward (University of Texas at Austin)
Yunan Yang (Cornell University)

Speakers

TBD



UCLA



For more information, visit the program webpage:
www.ipam.ucla.edu/SID2025B