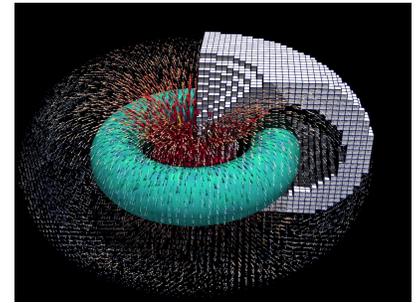


Workshop II: Learning Models from Data for Multi-Fidelity Fusion Plasma Physics

APRIL 13 - 17, 2026



Scientific Overview

Recent advancements in artificial intelligence (AI) and machine learning (ML) offer numerous opportunities for learning models of complex physical phenomena directly from data. However, these models often come without error guarantees, act as black boxes, can require large amounts of training data, and cannot always be trusted in the same way as traditional high-fidelity, physics-based models that are derived from first principles. However, AI/ML models have proven useful in multi-fidelity computations, where AI/ML models are used for speeding up computations while high-fidelity, physics-based models remain in the loop to establish trust in predictions and decisions. This workshop will explore mathematical and computational foundations of learning models from data as well as their integration into multi-fidelity methods, bridging the gap between data-driven and physics-based approaches in fusion plasma physics.

Key challenges to be addressed include active data acquisition for generating training data and as well as training methods for learning AI/ML models of high-dimensional kinetic equations, developing methods for learning generative models of stochastic, turbulent, and chaotic systems, and integrating AI/ML models with physics-based models in multi-fidelity methods. Additionally, the workshop will discuss effective use of AI/ML models in multi-fidelity methods for robust and reliable uncertainty quantification, design, and control in the context of fusion plasma physics. By tackling these challenges, the workshop aims to provide a deeper understanding of how AI and physics-based models can work together to advance plasma simulations and facilitate tasks that are infeasible in terms of high-fidelity, physics-based simulations such as the design and control of optimized fusion devices.

Long Program Schedule

This workshop is part of the long program Multi-Fidelity Methods for Fusion Energy (MFE2026).

- Multi-Fidelity Methods for Fusion Energy Tutorials : March 10-13, 2026
- Workshop I: Multi-Fidelity Methods for Fusion Plasma Physics : March 23-26, 2026
- **Workshop II: Learning Models from Data for Multi-Fidelity Fusion Plasma Physics : April 13-17, 2026**
- Workshop III: Fusion Device Design and Engineering : May 4-8, 2026
- Workshop IV: Multi-Fidelity Methods to Enable Robust Optimization and Real-Time Control of Fusion Processes: May 18 - 22, 2026

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

- Anima Anandkumar** (California Institute of Technology)
- Ionut-Gabriel Farcas** (Virginia Tech)
- Greg Hammett** (Princeton Plasma Physics Lab)
- Benjamin Peherstorfer** (Courant Institute of Mathematical Sciences)
- Yunan Yang** (Cornell University)

Invited Speakers

- Peter Benner** (Max Planck Institute for Dynamics of Complex Technical Systems, Magdeburg)
- Luis Chacon** (Los Alamos National Laboratory)
- Andrew Christlieb** (Michigan State University)
- Steve Cowley** (Princeton Plasma Physics Lab)
- Diego Del-Castillo-Negrete** (University of Texas at Austin)
- Ammar Hakim** (Princeton Plasma Physics Lab)
- Jiequn Han** (Flatiron Institute)
- Jingwei Hu** (University of Washington)
- Azarakhsh Jalalvand** (Princeton University)
- Shantenu Jha** (Princeton Plasma Physics Lab)
- Nikola Kovachki** (Nvidia Corporation)
- Boris Kramer** (University of California San Diego)
- Qin Li** (University of Wisconsin-Madison)
- Luis Oliveira e Silva** (Instituto Superior Tecnico, University of Lisbon)
- Jingmei Qiu** (University of Delaware)
- Cristina Rea** (Massachusetts Institute of Technology)
- Benjamin Sande** (Centrum Wiskunde & Informatica (CWI))
- Alexander Velberg** (Massachusetts Institute of Technology)
- Li Wang** (University of Minnesota, Twin Cities)
- Karen Willcox** (University of Texas at Austin)
- Leonardo Zepeda-Núñez** (Google Inc.)
- Guannan Zhang** (Oak Ridge National Laboratory)



For more information, visit the program web page:

www.ipam.ucla.edu/MFEWS2