

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

Monday April 13, 2026

- 8:00–8:55 *Check-in/Breakfast (hosted by IPAM)*
- 8:55–9:00 *Welcome and Opening Remarks*
- 9:00 *Session Chair: Ionut-Gabriel Farcas*
- 9:00–9:45 **Steve Cowley** (Princeton Plasma Physics Lab)
Multi-scale Plasma Turbulence — the key to fusion power
- 10:00–10:15 *Break*
- 10:15–11:00 **Li Wang** (University of Minnesota, Twin Cities)
Suppressing Plasma Instability Through Constrained Optimization
- 11:15–11:30 *Break*
- 11:30–12:15 **Jingmei Qiu** (University of Delaware)
Sampling-Based Adaptive Rank Integrators for Multi-scale Kinetic Models
- 12:30–2:30 *Lunch (on your own)*
- 2:30 *Session Chair: Boris Kramer*
- 2:30–3:15 **Nikola Kovachki** (Nvidia Corporation)
Demystifying Data-Driven Probabilistic Medium-Range Weather Forecasting
- 3:30–4:15 *Break & Walk to CNSI*
- 4:30–5:30 **Karen Willcox** (University of Texas at Austin)
Green Family Lecture #1: The Important Role of Mathematics in the Digital Twin Revolution (at UCLA CNSI Auditorium)
- 5:45–6:30 *Reception (Location: IPAM Lobby)*

Tuesday April 14, 2026

- 8:00–9:00 *Check-in/Breakfast (hosted by IPAM)*
- 9:00 *Session Chair: Jingmei Qiu*
- 9:00–9:45 **Peter Benner** (Max Planck Institute for Dynamics of Complex Technical Systems, Magdeburg)
Discovery and Model Reduction of Hamiltonian Systems
- 10:00–10:15 *Break*

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- 10:15–11:00 **Luis Chacon** (Los Alamos National Laboratory)
Data-driven closure learning for radiation transport and plasmas
- 11:15–11:30 *Break*
- 11:30–12:15 **Qin Li** (University of Wisconsin-Madison)
Stabilizing plasma instabilities cast as PDE-constrained optimization
- 12:30–2:30 *Lunch (on your own)*
- 2:30 *Session Chair: Cristina Rea*
- 2:30–3:15 **Jiequn Han** (Flatiron Institute)
Learning Evolution Operators Across PDE Systems: Meta-Learning and Test-Time Generalization
- 3:30–4:15 *Break & Walk to Royce Hall*
- 4:30–5:30 **Karen Willcox** (University of Texas at Austin)
Green Family Lecture #2: Learning Structure-exploiting Reduced Models with Operator Inference (at UCLA Royce Hall)

Wednesday April 15, 2026

- 8:00–9:00 *Check-in/Breakfast (hosted by IPAM)*
- 9:00 *Session Chair: Qin Li*
- 9:00–9:45 **Karen Willcox** (University of Texas at Austin)
Multifidelity Proper Orthogonal Decomposition
- 10:00–10:15 *Break*
- 10:15–11:00 **Diego Del-Castillo-Negrete** (University of Texas at Austin)
Generative Artificial Intelligence methods for turbulence and kinetic computations
- 11:15–11:30 *Break*
- 11:30–12:15 **Cristina Rea** (Massachusetts Institute of Technology)
Data-driven learning for disruption prevention and performance optimization
- 12:30–12:35 *Group Photo*
- 12:35–2:30 *Lunch (on your own)*
- 2:30 *Session Chair: Ammar Hakim*
- 2:30–3:15 **Leonardo Zepeda-Núñez** (Google Inc.)
Learning Turbulent and Chaotic Dynamics via Data-Driven Probabilistic Models
- 3:30–3:45 *Lightning Poster Round*
- 3:45–5:00 *Poster Session & Reception (Hosted by IPAM)*

Thursday April 16, 2026

- 8:00–9:00 *Check-in/Breakfast (hosted by IPAM)*
- 9:00 *Session Chair: Diego Del-Castillo Negrete*
- 9:00–9:45 **Ammar Hakim** (Princeton Plasma Physics Lab)
BEACONS and BEACONS-FM: Lighting a Path to Modular, Composable, Formally Verified Fusion Foundation Models
- 10:00–10:15 *Break*
- 10:15–11:00 **Boris Kramer** (University of California San Diego)
Structure-preserving Lift & Learn: Scientific machine learning for nonlinear conservative partial differential equations
- 11:15–11:30 *Break*
- 11:30–12:15 **Benjamin Sanderse** (Centrum Wiskunde & Informatica (CWI))
Structure-preserving SciML for discovering ODEs and SDEs in fluid flows
- 12:30–2:30 *Lunch (on your own)*
- 2:30 *Session Chair: Jingwei Hu*
- 2:30–3:15 **Luis Oliveira e Silva** (Instituto Superior Tecnico, University of Lisbon)
Ab initio PIC simulations and data-driven techniques for multi-fidelity or reduced plasma models
- 3:30–4:00 *Break*
- 4:00–4:45 **Guannan Zhang** (Oak Ridge National Laboratory)
Generative diffusion models for learning stochastic flow maps in particle-based kinetic simulation

Friday April 17, 2026

- 8:00–9:00 *Check-in/Breakfast (hosted by IPAM)*
- 9:00 *Session Chair: Benjamin Peherstorfer*
- 9:00–9:45 **Jingwei Hu** (University of Washington)
A Neural Score-Based Particle Method for the Vlasov-Maxwell-Landau System
- 10:00–10:15 *Break*
- 10:15–11:00 **Alexander Velberg** (Massachusetts Institute of Technology)
Data-driven discovery of sub-grid models for collisionless magnetic reconnection
- 11:15–11:30 *Break*
- 11:30–12:15 **Shantenu Jha** (Princeton Plasma Physics Lab)
All (Foundation) Models are wrong. Some (Foundation) Models can be made useful

