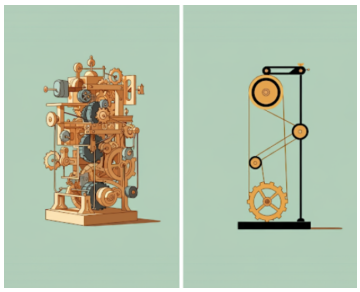
institute for pure & applied mathematics

# Workshop IV: Multi-Fidelity Methods to Enable Robust Optimization and Real-Time Control of Fusion Processes



**May 18-22, 2026**

## Scientific Overview

The workshop will focus on addressing critical challenges in fusion simulation applied for the design of optimal plasma experiments and designing plasma controllers, which are essential for advancing fusion energy. Recent breakthroughs, such as the ignition success at NIF, highlight the crucial role of computational and data-driven models in guiding experimental setups. Future progress will depend on developing high-fidelity computational models informed and validated by experimental data, and reduced-order and surrogate models for many-query applications like optimization and control. These advances will help bring sustainable fusion energy closer to reality by optimizing experiment designs and interventions.

To achieve these goals, the workshop will bring together experts from plasma physics, computational mathematics, and statistics to tackle the complexities of large-scale optimization and decision-making in plasma experiments. Discussions will explore the use of surrogate models, machine learning, and multi-fidelity methods to address challenges like model complexity, computational expense, and uncertainty. Emphasis will be placed on developing scalable algorithms for optimal control and design under uncertainty, with a focus on leveraging both high-fidelity and low-fidelity models. The workshop will also explore reinforcement learning and inverse problem-solving methods to guide experimental data acquisition and improve predictive accuracy in plasma physics applications.

## 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

Jonathan Citrin (DeepMind)
Cristina Rea (MIT)
Tim Wildey (Sanda National Laboratories)

## Invited Speakers

**Michael Abdelmalik (Technische Universiteit Eindhoven)**
**Stephen Becker (University of Colorado Boulder)**
**Gianluca Geraci (Sandia National Laboratories)**
**Cory Hauck (Oak Ridge National Laboratory)**
**Cosmas Heiss (EPFL)**
**Sophia Henneberg (MIT)**
**Mark Kostuk (General Atomics)**
**Bethany Lusch (Argonne National Laboratory)**
**Shancong Mou (University of Minnesota, Twin Cities)**
**Pablo Rodriguez-Fernandez (MIT)**
**Andy Rothstein (Princeton University)**
**Florian Schaefer (New York University)**
**Brian Spears (Lawrence Livermore National Laboratory)**
**Simon Van Mulders (EPFL)**
**Rebekah White (Sandia National Laboratories)**
**Yunan Yang (Cornell University)**

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For more information, visit the program web page:
**www.ipam.ucla.edu/MFEWS4**