AeroAstro team awarded funds for DiaMonD Center

Massachusetts Institute of Technology

A team co-led by MIT Aeronautics and Astronautics Department Professor Karen Willcox has been awarded a $12.5-million grant by the Department of Energy to create the multi-institutional DiaMonD Center. The center, funded under DoE's Advanced Scientific Computing Research program, will address applied mathematics challenges in modeling and simulation for complex problems, with a focus on research at the interfaces of "data, models, and decision-making" (deriving its name from these three terms).

The Center's goals are to:

- develop advanced mathematical methods for multiphysics and multiscale problems driven by frontier DOE applications, including those in subsurface energy and environmental flows, materials for energy storage and conversion, and climate systems
- create theory and algorithms for integrated inversion, optimization, and uncertainty quantification for these complex problems
- disseminate a "data-to-decisions" approach to the broader applied math and computational science communities through workshops and other forms of outreach.

Willcox said that the research could greatly benefit mathematical modeling applications as diverse as tracking and controlling the flows of pollutants in groundwater to designing better energy storage devices.

"Research on forward, inverse, optimization, and uncertainty quantification problems has often progressed in isolation," Willcox said. "This has led to mathematical methods that are prohibitive or suboptimal or unstable when combined with other methods within the framework of inversion, optimization, or uncertainty quantification. The reverse is also true: general-purpose methods developed within these fields can become prohibitive when applied to complex models since they do not exploit model structure."

Other MIT faculty involved with the center are AeroAstro Associate Professor Youssef Marzouk and Civil Engineering Associate Professor Ruben Juanes.

The center is co-led by Professor Omar Ghattas of the University of Texas at Austin, and includes principal investigators from Florida State University, Colorado State University, Stanford University, Los Alamos National Laboratory and Oak Ridge National Laboratory.

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