COMPUTATIONAL MODELING AND DATA ANALYTICS

Distinguished Lecture Series

KAREN WILLCOX

DATA TO DECISIONS FOR THE NEXT GENERATION OF COMPLEX ENGINEERED SYSTEMS

The next generation of complex engineered systems will be endowed with sensors and computing capabilities that enable new design concepts and new modes of decision-making. For example, new sensing capabilities on aircraft will be exploited to assimilate data on system state, make inferences about system health, and issue predictions on future vehicle behavior – with quantified uncertainties – to support critical operational decisions. However, data alone is not sufficient to support this kind of decision-making; our approaches must exploit the synergies of physics-based predictive modeling and dynamic data. This talk describes our recent work in adaptive and multifidelity methods for optimization under uncertainty of large-scale problems in engineering design. We combine traditional projection-based model reduction with machine learning methods to create data-driven adaptive reduced models. We develop multifidelity formulations to exploit rich information sources, using cheap approximate models as much as possible while maintaining the quality of higher-fidelity estimates and associated guarantees of convergence.

Karen E. Willcox is Professor of Aeronautics and Astronautics at the Massachusetts Institute of Technology. She is also Co-Director of the MIT Center for Computational Engineering and formerly the Associate Head of the MIT Department of Aeronautics and Astronautics. Before joining the faculty at MIT, she worked at Boeing Phantom Works with the Blended-Wing-Body aircraft design group. Willcox is currently Co-director of the Department of Energy DiaMonD Multifaceted Mathematics Capability Center on Mathematics at the Interfaces of Data, Models, and Decisions, and she leads an Air Force MURI on optimal design of multi-physics systems. She is also active in education innovation, serving as co-Chair of the MIT Online Education Policy Initiative and the 2013-2014 Institute-wide Task Force on the Future of MIT Education, and lead of the Fly-by-Wire project developing blended learning technology as part of the Department of Education's First in the World program.

TUESDAY • 25 APRIL • 5–6 PM
NEW CLASSROOM BUILDING 360

VirginiaTech

Academy of Integrated Science
CMDA Student Club

siam