16th World Congress on Computational Mechanics and 4th Pan American Congress on Computational Mechanics

July 21-26, 2024, Vancouver Convention Centre, Vancouver, British Columbia, Canada

UNCERTAINTY QUANTIFICATION AND SCIENTIFIC MACHINE LEARNING FOR PREDICTIVE MODELING OF COMPLEX SYSTEMS

Danial Faghihi[1] and Alireza Tabarraei[2] and Kathryn Maupin[3] and Prashant K. Jha[4] and Peng Chen[5]*

[1]University at Buffalo
[2]The University of North Carolina at Charlotte
[3]Sandia National Laboratories
[4]The University of Texas at Austin
[5]Georgia Institute of Technology

MINISYMPOSIUM

Recent advances in computational science have resulted in the ability to perform large-scale simulations and process massive amounts of data obtained from measurements, images, or high-fidelity simulations of complex physical systems. Harnessing such large and heterogeneous observational data and integrating those with physics-based and scientific machine learning models have enabled advancing computational models' prediction capabilities.
This mini-symposium highlights novel efforts to develop predictive computational models and model-based decision-making using physics-based and scientific machine learning models. It provides a forum for advancing scientific knowledge of data-driven complex system modeling and discussing recent uncertainty quantification developments in physics-informed scientific machine learning and data interpretation algorithms. Potential topics may include but are not limited to efforts on:

- Model validation and selection under uncertainty
- Scientific machine learning for complex systems
- Scientific machine learning to accelerate UQ analyses
- UQ methods for scientific machine learning
- Design, control, and decision-making under uncertainty
- Computational imaging
- Operator inference for model reduction and surrogate modeling
- Multi-level, multi-fidelity, and dimension reduction methods
- Learning the structure of the physics-based model from data
- UQ methods for stochastic models with high-dimensional parameter space
- Scalable, adaptive, and efficient UQ algorithms
- Extensible software framework for large-scale inference and UQ

*Sandia National Laboratories is a multimission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.