Università degli Studi di Udine

Dottorato di Ricerca in Scienze dell'Ingegneria Energetica e Ambientale

Seminar of PhD Week 2019

Nonlinear model reduction for rapid simulation of large-scale physics models

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Sala Verde DPIA

Abstract Computational science is one of the main drivers of our society's technological advancement, playing a key role for design and decision making. The ``extreme-scale'' computing era we are living in is enabling a paradigm shift: we no longer approach a problem with a few, target runs for specific choices of parameters and conditions, but we aim increasingly more at combining higher fidelity models with uncertainty quantification (UQ) methods to address, e.g., design optimization and parameter-space exploration. This approach allows us to discover rare events and critical behaviors of a system, which is key information for high-consequence systems and cutting-edge engineering. If the system of interest is expensive to query, UQ can become impractical to complete within a reasonable amount of time. Projection-based reduced-order models (ROMs), due to their accuracy, computational efficiency and certification, constitute a promising technique to overcome this computational barrier, and make high-fidelity predictive simulations feasible for UQ and time-critical problems.
This seminar aims at presenting advances in nonlinear model reduction for large-scale problems and highlight their impact on UQ. The talk will cover basic concepts behind model reduction as well as more advanced topics related to nonlinear manifolds, error models and HPC computational efficiency.

CV Dr. Francesco Rizzi has a diversified educational background ranging from engineering, to applied math and computational physics. He holds a Ph.D. in Mechanical Engineering awarded by The Johns Hopkins University. He has experienced working and collaborating with government labs (including an experience as staff member at Sandia National Labs California), industries, and universities worldwide. Broadly speaking, his profile lies at the intersection of applied math, engineering and high-performance computing (HPC). His main interests and expertise include uncertainty quantification, HPC, resilience and fault-tolerance, task-based programming models, continuum and discrete physics, programming languages, Bayesian inference, and inverse problems.