

UNIVERSITY of HOUSTON

Department of Mathematics

Scientific Computing Seminar

Dr. Marco Tezzele

Oden Institute for Computational Engineering and Sciences
UT Austin

Reduced order modelling as enabler for optimization and digital twins

Thursday, March 23, 2023

1 PM- 2 PM

Room 646 PGH

Abstract:

We present data-driven reduced order models with a focus on reduction in parameter space to fight the curse of dimensionality in design optimization. We show two extensions of the Active Subspaces (AS) technique: a kernel version exploiting an intermediate mapping to a higher dimensional space, and a local approach in which a clustering induced by a global active subspace is used for regression and classification tasks. Parameter space reduction methods can also be used within a multi-fidelity nonlinear autoregressive scheme to improve the approximation accuracy of high-dimensional functions, using only high-fidelity data. Finally, we integrate AS into the genetic algorithm to enhance the convergence during the optimization of high-dimensional quantities of interest. These methods are applied to solve large scale optimization tasks in naval engineering. The last part of the talk will be devoted to an ongoing work on digital twins of unmanned aerial vehicles and adaptive planning strategies in a Bayesian setting.