UNIVERSITY of HOUSTON

Department of Mathematics

Scientific Computing Seminar

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Projection-based reduced-order models for large-scale simulations

Monday, November 7, 2022
3 PM- 3:50 PM
Room 646 PGH

Abstract: In this talk we discuss the model reduction approach for solving large-scale forward PDE problems. We formulate our reduced-order models (ROMs) within projection framework using various types of Krylov subspaces. In particular, depending on the PDE in mind, we consider traditional (polynomial) Krylov subspace as well as less traditional rational one and rather specific parameter-dependent and phase-preconditioned ones. That allows to replace a large-scale problem by an accurate small-scale surrogate that can be efficiently solved. For each of these subspaces, we also discuss the underlying approximation problems and provided estimates of the convergence rates. To show the advantages of using our ROMs, we consider the solution of the time-domain wave and diffusion PDEs.

In particular, we focus on two such applications: 1) computing time-domain transfer function for wave and diffusion PDEs; 2) constructing multiscale spatial discretization for time-domain wavefield simulations. Numerical examples will be presented to verify the performance of the framework.