Matrix Computations and Scientific Computing Seminar

Organizer: J. Demmel and M. Gu

Wednesday, 11:00 am–12:00 pm, 380 Soda Hall

Apr 12 **Youngsoo Choi**, LLNL

Space–time least-squares Petrov–Galerkin projection for nonlinear model reduction

Reduced-order models (ROMs) of nonlinear dynamical systems are essential for enabling high-fidelity computational models to be used in many-query and real-time applications such as uncertainty quantification and design optimization. Such ROMs reduce the dimensionality of the dynamical system by executing a projection process on the governing system of nonlinear ordinary differential equations. The resulting ROM can then be numerically integrated in time. Unfortunately, many applications require resolving the model over long time intervals, leading to a large number of time instances at which the fully discretized model must be resolved. The number of time instances required for the ROM simulation remains large, which can limit its computational savings.

We will go over ROMs for nonlinear dynamical systems. Especially, a novel space-time ROM will be introduced. The model applies space-time least-squares Petrov-Galerkin projection to decrease both spatial and temporal complexity. An error bound with a slow growth rate and numerical results show its strength and advantage over traditional ROMs.