数学与系统科学研究院

计算数学所系列学术报告

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报告题目：

Model Reduction Methods for Parameterized PDEs

邀请人：　明平兵 研究员

报告时间：**2021** 年 **5** 月 **19** 日（周三）

上午 **10:00-11:00**

报告地点：　数学院南楼

802 教室

Abstract:

During the last few decades there has been a rapid development in reduced (or surrogate) modeling for computational models governed by parameterized PDEs. This explosion in interest has been driven by practical applications including uncertainty quantification, shape and topological optimizations, as well as Bayesian inversions. In these applications, repeated simulations of parameterized PDE systems are required. High-fidelity numerical schemes, which are also referred to as simulators, can give accurate predictions for the outputs of these PDE systems, e.g., the finite element methods with a posteriori error bounds. However, simulators are typically computationally expensive, especially when modeling complex science and engineering problems. In order to reduce the costs in these many-query problems of computational models, cheap reduced models, which are also called emulators, are actively developed to replace the simulators.

There are three kinds of widely used reduced models. The first kind is the interpolation or regression based models, which include polynomial chaos (PC) surrogates, generalized polynomial chaos (gPC) surrogates and Gaussian process (GP) emulators. The second is the projection based models, which include reduced basis (RB) approximations, where the reduced bases can be constructed through either greedy procedures or proper orthogonal decomposition (POD) (which is also called principal component analysis (PCA)). The third kind is based on both interpolation and projection, i.e., a combination of the first and the second kinds.

In this talk, I'd discuss our progresses in model reduction for the challenging problems with high-dimensional inputs, which include novel reduced basis methods, Gaussian process regressions, and their extensions for Bayesian inference.

This is joint work with Howard Elman of the University of Maryland, Guang Lin of Purdue University, Jinglai Li of the University of Birmingham, and Chen Chen of the University of Maryland.

欢迎大家参加！