

Seminar

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Topic

Stability and Error Analysis of Reduced-Order Methods Based on POD with Finite Element Solutions for Nonlocal Diffusion Problems

Date| Time

16 July 2025 (Wednesday) | 11:00 am – 12:00 nn (HK Time)

Venue

TU817

Abstract

In this talk, we will introduce the formulation and theoretical analysis of the reduced-order numerical method constructed by proper orthogonal decomposition (POD) for nonlocal diffusion problems with a finite range of interactions. Due to the nonlocality, the corresponding discrete systems of nonlocal models have less sparsity than those for PDEs. Given the challenges of frequently handling large systems of linear equations with much lower sparsity, we establish a reduced-order model (ROM) for nonlocal diffusion problems to expedite the iterative solution process. The ROM is constructed using FE solutions in a very small time interval as snapshot data and has much fewer degrees of freedom than FEMs. In this contribution, we focus on discussing mathematical justifications for the existence, stability, and error estimates of the ROM method, which have not been considered in previous research for nonlocal models. Another important component of our work is that we systematically explore the effect of different parameters on the behavior of the POD algorithms. Numerical examples will be finally presented to validate the theoretical conclusions and to illustrate the efficiency of the proposed method.

ALL ARE WELCOME