Department of Applied Mathematics Seminar

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Topic
Uncertainty quantification for some simple inverse problems and fast algorithms

Date | Time
29 September 2025 (Monday) | 11:00 am – 12:00 nn (HK Time)

Meeting ID｜Password
892 3263 2492｜0929

Zoom Link
https://polyu.hk/zXvah

Abstract:
In this talk, we investigate uncertainty quantification for regular solutions of simple inverse problems governed by partial differential equations. Under randomly noisy pointwise measurement data, we demonstrate the stochastic convergence and optimal finite element probabilistic convergence of these solutions. Regularization error estimates and finite element error estimates depend on noise magnitude, regularization parameter, mesh size, and time step, among other factors. Based on these error estimates, an iterative algorithm for determining the optimal regularization parameter is also proposed. For the inverse source problem of parabolic equations, a data-driven model reduction method is additionally presented. We identify a low-dimensional structure in solutions to parabolic equations within a class of forward problems and construct appropriate POD basis functions to achieve significant computational dimensionality reduction. Under the assumption of weak regularity for parabolic partial differential equations, we prove the convergence of the POD algorithm for solving parabolic inverse problems.

ALL ARE WELCOME