Numerical Analysis Seminar

Quantify the data uncertainty in inverse parabolic source problems

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Abstract

In this talk, we investigate the regularized solutions, and their finite element, POD solutions to the inverse source problems governed by parabolic equations, and establish the stochastic convergence and optimal finite element convergence rates of these solutions, under point wise measurement data with random noise. The regularization error estimates and the finite element error estimates are derived with explicit dependence on the noise level, regularization parameter, mesh size, and time step size, which can guide practical choices among these key parameters in real applications. The error estimates also suggest an iterative algorithm for determining an optimal regularization parameter. We develop a fast algorithm to solve the optimization problem in parabolic inverse source problems, which is referred to as the POD method. Moreover, we design an a posteriori algorithm to find the optimal regularization parameter in the optimization problem using the proposed POD method without knowing the noise level. Under a weak regularity assumption on the solution of the parabolic PDEs, we prove the convergence of the POD method in solving the forward parabolic PDEs. In addition, we obtain the error estimate of the POD method for parabolic inverse source problems.

Date:	May 17, 2023 (Wednesday)
Time:	10:00am – 11:00am
Venue:	ZOOM: https://hku.zoom.us/j/
	Meeting ID: 913 6532 3891
	Password: 310656

All are welcome