

报告题目: Wavelet-based Methods for Numerically Solving PDEs 报告人: Prof. Bin Han (University of Alberta) 时间: 2025-05-09 星期五 10:00--11:00 地点: 光华楼东主楼2001

报告摘要:

Wavelets have been applied to many areas including image processing and numerical PDEs. In this talk, we discuss wavelet-based methods for numerically solving the elliptic interface problem and the Helmholtz equation. The elliptic interface problem has piecewise smooth diffusion coefficients and source terms which are discontinuous across interface curves. Hence, the exact solution \$u\$ has low regularity \$u\in H^{1+\epsilon} (\Omega)\$ with \$\epsilon<1/2\$. The solutions of Helmholtz equations have high frequencies leading to ill-conditioned indefinite linear systems for large wavenumbers. These impose challenges to traditional methods. All current known methods require complicated treatment along the interface and lack uniformly bounded condition numbers. First, we shall present some basics on wavelets in Sobolev spaces for the purpose of numerical PDEs. For 2D elliptic interface problems, then we discuss high-order wavelet methods for Helmholtz equations with or without interfaces. Finally, we present a second-order wavelet method with proved convergence and uniformly bounded condition numbers. This talk is based on joint work with M. Michelle.

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