Department of Mathematics
The Institute of Mathematical Sciences
The Chinese University of Hong Kong

數學系
數學科學研究所
香港中文大學

Phone: (852) 3943 7988 / 3943 7989 • Fax: (852) 2603 5154 • Email: dept@math.cuhk.edu.hk
Phone: (852) 3943 8036 / 3943 8038 • Fax: (852) 3942 1020 • Email: ims@ims.cuhk.edu.hk
Rm. 220, Lady Shaw Building, The Chinese University of Hong Kong, Shatin, N.T., Hong Kong
Unit 601, Academic Building No. 1, The Chinese University of Hong Kong, Shatin, N.T., Hong Kong

Joint Colloquium

Sparse Operator Compression for Higher Order Elliptic PDEs and Graph Laplacians with Rough Coefficients

Professor Thomas Y. Hou

Applied & Computational Mathematics, California Institute of Technology

Abstract

We introduce the sparse operator compression to compress a self-adjoint higher order elliptic operator with rough multiscale coefficients. The operator compression is achieved by using localized basis functions, that are energy minimizing functions on local patches. On a regular mesh with mesh size h, the localized basis functions have supports of diameter $O(h \log(1/h))$, and give optimal compression rate of the solution operator. We show that our method achieves the optimal compression rate of the solution operator. We then discuss how to generalize this operator compression to develop a fast solver for graph Laplacians with rough coefficients using a novel energy decomposition method. This decomposition framework naturally reflects the intrinsic geometric information of the operator that inherits the localities of the topological structure. Utilizing this information, we propose a multiresolution operator compression scheme for the inverse operator of a symmetric positive definite matrix with controllable compression error and condition number. This is a joint work with Pengchuan Zhang, De Huang, and Ka Chun Lam.

Date:	22 October 2018 (Monday)
Venue:	C1, Lady Shaw Building, The Chinese University of Hong Kong, Shatin
Time:	4:30 p.m. – 5:30 p.m.

All are Welcome!