MATH-IMS Joint Applied Mathematics Colloquium Series
The Chinese University of Hong Kong

This MATH-IMS Joint Colloquium Series is organized by Center for Mathematical Artificial Intelligence (CMAI), under Department of Mathematics and Institute of Mathematical Sciences (IMS) at The Chinese University of Hong Kong. The colloquium series focuses on mathematics and applications of artificial intelligence, big data and related topics.

Date: Mar 18, 2021 (Friday)
Time: 10:00-11:00am (Hong Kong Time)
Zoom Link: https://cuhk.zoom.us/j/92775210812

How much can one learn a PDE from its solution data?
Speaker: Professor Hongkai Zhao
Duke University

Abstract: In this work we study a few basic questions for PDE learning from observed solution data. Using various types of PDEs, we show 1) how the approximate dimension (richness) of the data space spanned by all snapshots along a solution trajectory depends on the differential operator and initial data, and 2) identifiability of a differential operator from its solution data and possible instabilities. Then we propose a consistent and sparse local regression method for general PDE identification. Our method requires minimal amount of local measurements in space and time from a single solution by enforcing global consistency and sparsity.

Bio: Prof Zhao is currently a Professor of Mathematics at Duke University. Prior to joining Duke, Prof. Zhao was the Chancellor's Professor of Mathematics and Computer Science at the University of California, Irvine (UCI). He earned his B.S. from Peking University, M.S. from University of Southern California and Ph.D from UCLA, all in mathematics. He was the Gábor Szegő Assistant Professor at Stanford University before joining UCI. Prof. Zhao's recent work focuses on inverse and imaging problems, which have direct applications for medical technologies such as CT and MRI scans, ultrasound, optical tomography and radar imaging. Some of his research fields include developing, improving and analyzing algorithms in the imaging pipeline; developing numerical methods for PDEs with applications in physical sciences; 3-D shape modeling and analysis. Combining insight from multiscale physical computation, inverse problems around imaging and machine learning, he has also studied questions in astrophysics and learning in physical systems. Prof. Zhao has served on the editorial board of several prestigious journals such as Annals of Mathematical Sciences and Applications, SIAM Multiscale Modeling and Simulation, Progress in Mathematics, etc. Besides mentoring many outstanding students and postdocs, Prof. Zhao has received the Sloan Research Fellowship (2002–2004) and Feng Kang Prize for Scientific Computing in 2007.