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THE HONG KONG UNIVERSITY OF SCIENCE & TECHNOLOGY

Department of Mathematics

MATHEMATICS COLLOQUIUM

Techniques for Data Enhancement

By

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Abstract

Extracting extra information from data can allow for more insight into the interaction between disparate scales. It can also aid in minimising error and decreasing noise in data. While the ability to move data from fine resolutions to coarser resolutions is straight forward utilizing a multi-resolution analysis framework, moving data from a coarse resolution to a finer resolution while reducing errors is more challenging. This relies on combining filtering techniques into the multi-resolution analysis framework [Ryan, CAMC 2022; Picklo & Ryan, SISC 2022]. This approach has the further advantage of requiring fewer computations to gain insight into calculations such as for Bohm speed [Picklo et al. JCP 2024]. In this talk, we present methods for data enhancement through multi-resolution analysis and the Smoothness-Increasing Accuracy-Conserving (SIAC) filtering framework. SIAC is known to inherently take advantage of the underlying physics and allow for the full resolution of the approximation and its derivatives in both the physical domain and Fourier signal space. We discuss recent advances and reliance of the approach on the underlying numerical method that generated the data.

Biography

Prof. Jennifer Ryan is currently a professor at the department of mathematics, KTH Royal Institute of Technology in Sweden. She also serves as their division head for Numerical analysis, Optimization and Systems Theory. She got her Ph.D. in applied mathematics from Brown University in 2003 and MS degree from Courant Institute, New York University. Before moving to Sweden, she was a Householder fellow at Oak Ridge National Laboratory in the US and held tenure track positions in various institutes including Colorado School of Mines, University of East Anglia, Delft University of Technology and Virginia Tech. Prof. Ryan is an expert in the analysis, design, and development of numerical algorithms for various applications. As a distinguished applied mathematician, she has served on editor board for various journals such as Journal of Scientific Computing and ESIAM: Mathematics Modeling and Numerical Analysis (M2AN).

Date : 8 March 2024 (Fri)

Time : 3:00pm – 4:00pm

Venue : Lecture Theater F (Lifts 25/26)

All Are Welcome!