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: September 23, 2022 (Friday)
Time: 10:00am-11:00am (Hong Kong Time)
Zoom Link: https://cuhk.zoom.us/j/92775210812

Computational Graph Completion

Speaker: Professor Houman Owhadi
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Abstract: We present a generalization of Gaussian Process Regression from the approximation of unknown functions to the completion of computational graphs. This generalization is motivated by three observations: (1) Most problems in Computational Sciences and Engineering (CSE) can be formulated as that of completing (from data) a computational graph (or hypergraph) representing dependencies between functions and variables. (2) Replacing unknown functions by Gaussian Processes (GPs) and conditioning on observed data provides a simple but efficient approach to completing such graphs. (3) Since this completion process can be reduced to an algorithm, as one solves $\sqrt{2}$ on a pocket calculator without thinking about it, one could, with the automation of the proposed approach, solve a complex CSE problem by drawing a diagram. We illustrate the proposed framework with applications. These include system identification and solving/learning arbitrary nonlinear PDEs.

Bio: Prof. Owhadi is now a Professor at Department of Computing and Mathematical Sciences in California Institute of Technology. He got his M.S. degree in Mathematics and Physics at Ecole Polytechnique in 1994, and his Ph.D. degree in Mathematics at Ecole Polytechnique Fédérale de Lausanne in 2001. He was a research fellow at CNRS from 2001-2004, became an assistant professor in 2004 at Caltech, and has been a Professor of Applied and Computational Mathematics and Control and Dynamical Systems since 2011. Prof. Owhadi's research interests lie in mathematics of scientific machine learning, physics informed learning, game theoretic approaches to numerical analysis, algorithm design and learning, homogenization and multiscale analysis, uncertainty quantification, etc. Prof. Owhadi has achieved many prestigious awards and honors such as: a plenary lecturer at SIAM CSE 2015 and XVI International Conference on Hyperbolic Problems in 2016, Germund Dahlquist Prize by SIAM in 2019. He has been elected as a SIAM Fellow in 2022. Besides having supervised many outstanding students and postdocs, he has obtained numerous important fundings. He has been served on editorial board for several top journals including SIAM Journal on Numerical Analysis, SIAM Journal on Uncertainty Quantification, Foundations of Data Science.