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: November 6, 2020 (Friday)
Time: 10am – 11am (Hong Kong Time)
Zoom Link: https://cuhk.zoom.us/j/92775210812

Global convergence of stochastic gradient descent

Speaker: Professor Björn Engquist
U.T. Austin

Abstract: Most convergence results for stochastic gradient descent algorithms are local and global convergence results will naturally be weaker but the analysis is still useful for practical optimization. We will consider two classes of problems. The first is when the stochastic component is added to a deterministic gradient descent method precisely to reach a global rather than just a local optimum. Related classical methods are simulated annealing and genetic algorithms. The other is when the objective function is inherently random or based on random sampling for computational efficiency as in the training process for supervised machine learning. The algorithm we propose has adaptive step size or learning date, which depends on the value of the objective function. We will prove convergence in probability and parameter space.

Bio: Professor Björn Engquist received his PhD in numerical analysis from University of Uppsala in 1975, and taught there during the following years while also holding a professorship at the University of California, Los Angeles. In 2001, he moved to Princeton University as the Michael Henry Stater University Professor of Mathematics and served as the director of the Program in Applied and Computational Mathematics. He has also been the professor at the Royal Institute of Technology in Stockholm since 1993, and is director of the Parallel and Scientific Computing Institute. Professor Engquist currently holds the Computational and Applied Mathematics Chair I at the Institute for Computational Engineering and Sciences at the University of Texas at Austin, after leaving Princeton in 2005. Professor Engquist is well-known for his contributions in computational and applied mathematics and numerical methods for differential equations with applications to multi-scale modeling, electromagnetism, and fluid mechanics. He has authored more than 100 scientific publications and advised 31 PhD students. He has also received numerous honours and awards. He is a member of the American Academy of Arts & Sciences, the Royal Swedish Academy of Sciences and the Royal Swedish Academy of Engineering and Sciences. He is also an invited speaker at the International Congress of Mathematicians in 1982 and 1998, European Congress of Mathematics in 1992, and European Congress of Fluid Mechanics in 1991. He received the first SIAM James H. Wilkinson Prize in Numerical Analysis and Scientific Computing in 1982, Peter Henrici Prize in 2011, and George David Birkhoff Prize in 2012. In 2011, he was selected to the Norwegian Academy of Science and Letters.