



## 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:** August 28, 2020 (Friday)

**Time:** 3pm – 4pm (Hong Kong Time)

**Zoom Link:** <https://cuhk.zoom.us/j/92775210812>

### Training Neural Networks and Mean-field Langevin dynamics

*Speaker: Professor Zhenjie Ren,  
CEREMADE, Université Paris-Dauphine*

**Abstract:** The neural networks have become an extremely useful tool in various applications such as statistical learning and sampling. The empirical success urges a theoretical investigation based on mathematical models. Recently it has become popular to treat the training of the neural networks as an optimization on the space of probability measures. In this talk we show that the optimizer of such optimization can be approximated using the so-called mean-field Langevin dynamics. This theory sheds light on the efficiency of the (stochastic) gradient descent algorithm for training the neural networks. Based on the theory, we also propose a new algorithm for training the generative adversarial networks (GAN), and test it to produce sampling of simple probability distributions.

**Bio:** Dr. Ren did his undergraduate study in mathematics at Fudan University, and then obtained his master and PhD degree in applied mathematics at Ecole Polytechnique Paris. His research so far focuses on the topics closely related to the theory of stochastic processes and optimal control, such as the path-dependent PDE, the backward SDE and the mean-field games. He is mostly interested in the applications in quantitative finance and, more recently, in neural networks.