Tuesday, 18 January, 2021

10:00 - 11:00 **Prof. Kody Law, University of Manchester**

Zoom link: https://epfl.zoom.us/j/65282553418

Randomized multilevel Monte Carlo for inference

Abstract: Often in the context of data centric science and engineering applications, one endeavors to learn complex systems from observed data in order to make more informed predictions and high stakes decisions under uncertainty. The Bayesian framework provides an elegant solution to such problems, however it is typically far more expensive to compute than its deterministic counterparts. In the 21st century, and increasingly over the past decade, a growing number of methods have emerged which allow one to leverage cheap low-fidelity models in order to precondition algorithms for performing inference with more expensive models and make Bayesian inference tractable in the context of high-dimensional and expensive models. Some notable examples are multilevel Monte Carlo (MLMC), multi-index Monte Carlo (MIMC), and their randomized counterparts (rMLMC), which are able to provably achieve a dimension-independent (including infinite-dimension) canonical complexity rate with respect to mean squared error (MSE) of 1/MSE. Recently introduced double randomization approaches deliver i.i.d. estimators of quantities of interest which are unbiased with respect to the infinite resolution target distribution and can be simulated in parallel. This talk will describe the general approach with a focus on a Markov chain Monte Carlo method. Time permitting, some sequential Monte Carlo methods will be discussed.

Bio: Kody is a professor of Applied Mathematics in the Department of Mathematics and the Institute of Data Science and AI at the University of Manchester, and Fellow of The Alan Turing Institute and the European Lab for Learning and Intelligent Systems, specializing in computational applied mathematics and statistics. He received his PhD in Mathematics in 2010 from the University of Massachusetts, Amherst, and subsequently held positions at the University of Warwick, King Abdullah University of Science and Technology, Oak Ridge National Laboratory, and the University of Tennessee in Knoxville. He has published in the areas of computational applied mathematics, statistics, scientific computing, and physics. His current research interests are focused on the fertile intersection of mathematics and statistics, and in particular (a) data assimilation and inverse methodology: involving merging physical/engineering models with data; as well as (b) data-driven methodology: learning directly from data alone, for example to infer a model when one does not exist.