

Speaker: Dr. Lukasz Spruch

Talk Title: Martingale Functional Control variates via Deep Learning

Talk Abstract:

We propose black-box-type control variate for Monte Carlo simulations by leveraging the Martingale Representation Theorem and artificial neural networks. We developed several learning algorithms for finding martingale control variate functionals both for the Markovian and non-Markovian setting. The proposed algorithms guarantee convergence to the true solution independently of the quality of the deep learning approximation of the control variate functional. We believe that this is important as the current theory of deep learning functions approximations lacks theoretical foundation. However the quality of the deep learning functional approximation determines the level of benefit of the control variate. The methods are empirically shown to work for high-dimensional problems. We provide diagnostics that shed light on appropriate network architectures

If time permits I'll also discuss novel mathematical approaches to understand better deep learning.

Speaker Bio:

Lukasz is a Reader (Associate Professor) at the School of Mathematics, University of Edinburgh. He is also the director of Finance and Economics programme at The Alan Turing Institute, London. Before moving to Edinburgh, he was a Nomura Junior Research Fellow at the Institute of Mathematics, University of Oxford, and a member of the Oxford-Man Institute for Quantitative Finance.

Lukasz has a broad research interest in probability theory, mean-field models, stochastic control, statistics and quantitative finance. He is also pursuing research on deep neural networks and reinforcement learning.