

Learning the solution to SDEs using rough paths theory and machine learning

Tuesday 18 September 2018 15:00 (15 minutes)

Abstract: In this talk, we consider the supervised learning problem where the explanatory variable is a data stream. We provide an approach based on identifying carefully chosen features of the stream which allows linear regression to be used to characterise the functional relationship between explanatory variables and the conditional distribution of the response; the methods used to develop and justify this approach, such as the signature of a stream and the shuffle product of tensors, are standard tools in the theory of rough paths and provide a unified and non-parametric approach with potential significant dimension reduction. Motivated by the numerical schemes of SDEs, we propose the new algorithm combining the recurrent neural network (RNN) with the signature feature to further improve the efficiency of the linear signature method. We apply it to the example of learning the unknown SDEs and demonstrate the superior effectiveness of this method benchmarked with RNN with raw data.

Bio: Dr Hao Ni is a senior lecturer in financial mathematics at UCL and the Turing Fellow at the Alan Turing institute since September 2016. Prior to this she was a visiting postdoctoral researcher at ICERM and Department of Applied Mathematics at Brown University from 2012/09 to 2013/05 and continued her post-doctoral research at the Oxford-Man Institute of Quantitative Finance until 2016. She finished her D.Phil. in mathematics at University of Oxford. Her research interests include stochastic analysis, financial mathematics and machine learning. More specifically she is interested in non-parametric modelling effects of data streams through rough paths theory and statistical models and its various applications, e.g. online Chinese handwritten character and financial data streams analysis.

Presenter: Dr NI, Hao (Senior Lecturer in Financial Mathematics at UCL and the Turing Fellow at The Alan Turing Institute)

Session Classification: Day 2