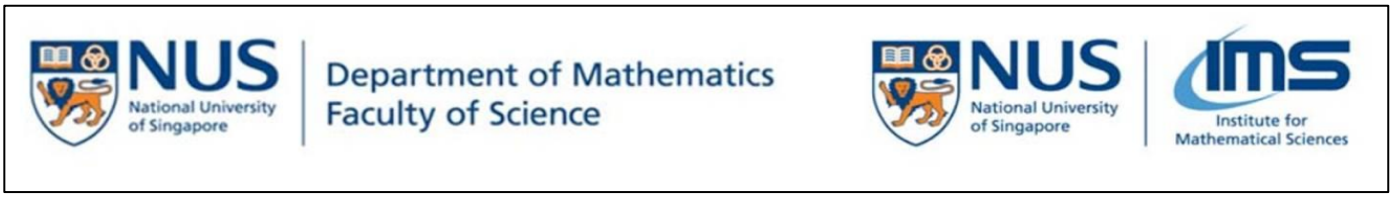

SIAM@NUS Event Series: Invited Talk I

Date: 28 Apr 2021 (Wednesday)
Time: 1600hr – 1700hr (Singapore Time Zone, GMT + 8)
Zoom Info:
https://nus-sg.zoom.us/j/81802272112?pwd=YWtma2szR0ZhY1M4TDkyd1V6bnpDZz09
Meeting ID: 818 0227 2112 / **Passcode**: 618759

Scaling Properties of Deep Residual Networks

Speaker: Dr. Renyuan Xu (Oxford U)

Dr. Renyuan Xu is currently a Hooke Research Fellow in the Mathematical Institute at the University of Oxford, mentored by Professor Rama Cont. She is also a member at St Hugh's College. She received her Bachelor's degree in Mathematics from University of Science and Technology of China in 2014. She completed her Ph.D. in IEOR Department at UC Berkeley under the supervision of Professor Xin Guo. Dr. Xu is joining USC Viterbi School of Engineering in Fall 2021 as the WiSE Gabilan Assistant Professor.

About the Talk

Abstract: Residual networks (ResNets) have displayed impressive results in pattern recognition and, recently, have garnered considerable theoretical interest due to a perceived link with neural ordinary differential equations (neural ODEs). This link relies on the convergence of network weights to a smooth function as the number of layers increases. We investigate the properties of weights trained by stochastic gradient descent and their scaling with network depth through detailed numerical experiments. We observe the existence of scaling regimes markedly different from those assumed in neural ODE literature. Depending on certain features of the network architecture, such as the smoothness of the activation function, we prove the existence of an alternative ODE limit, a stochastic differential equation, or neither of these. These findings cast doubts on the validity of the neural ODE model as an adequate asymptotic description of deep ResNets and point to an alternative class of differential equations as a better description of the deep network limit. This is based on joint work with Rama Cont (Oxford), Alain Rossier (Oxford), and Alain-Sam Cohen (InstaDeep).