LAB for AI-POWERED FINTECH

香港城市大學
City University of Hong Kong

COLUMBIA UNIVERSITY
IN THE CITY OF NEW YORK

Joint Seminar by AIFT and Columbia University

Theory of Deep Learning

by Prof. Dingxuan Zhou

Chair Professor and Associate Dean,
School of Data Science
Chair Professor, Department of Mathematics
Director, Liu Bie Ju Centre for Mathematical Sciences
City University of Hong Kong

■ Abstract

Deep learning has been widely applied and brought breakthroughs in dealing with big data from speech recognition, computer vision, natural language processing, and many other domains. It is based on deep neural networks with structures designed for various purposes. Compared with its success in practical applications, it is not well understood in theory. A mathematical foundation is desired for understanding modelling, approximation or generalization abilities of deep learning models with network architec- tures and structures. In this walk we consider deep convolutional neural networks (CNNs) which are induced by convolutions. The convolutional ar- chitecture gives essential differences between deep CNNs and the classical neural networks. We describe a mathematical theory for deep CNNs as- sociated with the rectified linear unit activation. In particular, we discuss learning and approximation abilities of deep CNNs dealing with functions of many variables.

■ Biography

Ding-Xuan Zhou is a Chair Professor in School of Data Science and Department of Mathematics, serving also as Director of the Liu Bie Ju Centre for Mathematical Sciences and Associate Dean of School of Data Science. His recent research interest is theory of deep learning. He is an Editor-in-Chief of the journals "Analysis and Application" and "Mathematical Foundations of Computing", and serves editorial boards of more than ten journals. He received a Fund for Distinguished Young Scholars from NSF of China in 2005, and was rated in 2014-2017 by Thomson Reuters/Clarivate Analytics as a Highly-cited Researcher.

■ Date and Time

Feb 18,2022 (Fri) at 9-10am (Hong Kong Time)

Cheap Bootstrap for Fast Uncertainty Quantification

by Prof. Henry Lam

Associate Professor
Department of Industrial Engineering
and Operations Research
Columbia University

■ Abstract

The bootstrap is a versatile method for statistical uncertainty quantification, but when applied to large-scale or simulation-based models, it could face substantial computation demand from repeated data resampling and model refitting. We present a bootstrap methodology that uses minimal computation, namely with a resample effort as low as one Monte Carlo replication, while maintaining desirable statistical guarantees. We describe how this methodology can be used for fast inference across different estimation problems, and its particular relevance and generalizations to handling uncertainties in machine learning and simulation analysis.

■ Biography

Henry Lam is an Associate Professor in the Department of Industrial Engineering and Operations Research at Columbia University. He received his Ph.D. degree in statistics from Harvard University in 2011, and was on the faculty of Boston University and the University of Michigan before joining Columbia in 2017. His research interests include Monte Carlo methods, uncertainty quantification, data-driven optimization and rare-event analysis. His works have been recognized by several venues such as the NSF CAREER Award, JP Morgan Chase Faculty Research Award and Adobe Faculty Research Award. Henry serves on the editorial boards of Operations Research, INFORMS Journal on Computing, Applied Probability Journals, Stochastic Models, Manufacturing and Service Operations Management, and Queueing Systems, and as the Area Editor in Stochastic Models and Data Science in Operations Research Letters.

■ Date and Time

Feb 17,2022 (Thu) at 8-9pm (US Eastern Time)

Venue: AIFT meeting room
Units 1101-1102 & 1121-1123,19W
Hong Kong Science Park

URL: https://cityu.zoom.us/j/3560816699
Meeting ID: 356 081 6699
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