香 港 大 學
THE UNIVERSITY OF HONG KONG

Institute of Mathematical Research
Department of Mathematics

Frontiers of Mathematics Lecture

Structures in deep neural networks

Abstract

Deep learning has been widely applied and brought breakthroughs in speech recognition, computer vision, natural language processing, and many other domains. The involved deep neural network architectures and computational issues have been well studied in machine learning. But not much is known about the modelling, approximation or generalization abilities of deep learning models with network architectures and structures, due to some differences between the classical fully-connected neural networks and structured ones used in deep learning.

An important family of structured deep neural networks are deep convolutional neural networks (CNNs) induced by convolutions. It is believed that local shift-invariance of natural images and speeches plays an essential role in the efficiency of CNNs. Another family of structured deep neural networks are transformers based on attention structures where variable dependence is believed to be crucial in processing natural language data. This talk describes approximation and generalization analysis of deep CNNs, transformers, and related structured deep neural networks.

Professor Ding-Xuan ZHOU
School of Mathematics and Statistics
University of Sydney

Date :
May 15, 2026 (Friday)

Time :
4:00 – 5:00 pm

Venue :
P3, Chong Yuet Ming
Physics Building,
The University of Hong Kong

Biography

Ding-Xuan Zhou is a Professor and Head of School of Mathematics and Statistics, University of Sydney. Before moving to Australia, he was a Chair Professor at City University of Hong Kong, serving also as Director of the Liu Bie Ju Centre for Mathematical Sciences (2019-22), Associate Dean of School of Data Science (2018-22), and Head of Department of Mathematics (2006-12). His recent research is focused on theory of machine learning and deep neural networks. 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. His professional service includes being an Editor-in-Chief of the journals “Analysis and Application” and “Mathematical Foundations of Computing” and an editorial board member of more than ten journals.

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