



## MATH-IMS Joint Applied Mathematics Colloquium Series The Chinese University of Hong Kong

*This MATH-IMS Joint Colloquium Series is organized by Center for Mathematical Artificial Intelligence (CMAI), under Department of Mathematics and Institute of Mathematical Sciences (IMS) at The Chinese University of Hong Kong. The colloquium series focuses on mathematics and applications of artificial intelligence, big data and related topics.*

**Date:** Sep 9, 2022 (Friday)

**Time:** 10:00-11:00am (Hong Kong Time)

**Zoom Link:** <https://cuhk.zoom.us/j/92775210812>

### Understanding the Universality Phenomena in High-Dimensional Estimation and Learning: Some Recent Progresses

*Speaker: Professor Yue M. Lu  
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**Abstract:** Universality is a fascinating high-dimensional phenomenon. It points to the existence of universal laws that govern the macroscopic behaviour of wide classes of large and complex systems, despite their differences in microscopic details. The notion of universality originated in statistical mechanics, especially in the study of phase transitions. Similar phenomena have been observed in probability theory, dynamical systems, random matrix theory, and number theory. In this talk, I will present some recent progresses in rigorously understanding and exploiting the universality phenomena in the context of statistical estimation and learning on high-dimensional data. Examples include spectral methods for high-dimensional projection pursuit, statistical learning based on kernel and random feature models, approximate message passing algorithms, and regularized linear regression on highly structured, strongly correlated, and even (nearly) deterministic data matrices. Together, they demonstrate the robustness and wide applicability of the universality phenomena.

**Bio:** Professor Yue M. Lu attended the University of Illinois at Urbana-Champaign, where he received the M.Sc. degree in mathematics and the Ph.D. degree in electrical engineering, both in 2007. He is currently Gordon McKay Professor of Electrical Engineering and of Applied Mathematics at Harvard University. He has also held visiting appointments at Duke University in 2016 and at the École Normale Supérieure (ENS) in 2019. His research interests include the mathematical foundations of statistical signal processing and machine learning in high dimensions. He is a recipient of the 2015 ECE Illinois Young Alumni Achievement Award, and serving as an IEEE Signal Processing Society Distinguished Lecturer (2022-2023).