THE HONG KONG UNIVERSITY OF SCIENCE TECHNOLOGY

Department of Mathematics

MATHEMATICS COLLOQUIUM

Nonregular Causal Inference

By

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Abstract

Modern causal inference increasingly integrates flexible machine learning, optimization, and graph-based discovery methods. However, standard inferential procedures typically rely on regularity conditions—such as asymptotic normality—that often fail in realistic, data-driven, or high-dimensional settings. In this talk, we provide a unified framework for nonregular inference, where estimators deviate from classical asymptotic behavior, and we introduce practical methods for valid uncertainty quantification even under slow nuisance convergence, weak identification, or data-dependent selection. In particular, we highlight how our perturbed inference approach can restore valid coverage by injecting small perturbations that yield reliable confidence sets without requiring classical asymptotic normality. In this talk, I will focus on Perturbed Double Machine Learning and Distributionally Robust Synthetic Control.

Bio: Prof. Guo is a Qiushi Chair Professor in the Center for Data Science at Zhejiang University. He received his B.S. in Mathematics from The Chinese University of Hong Kong in 2012 and his Ph.D. in Statistics from the University of Pennsylvania in 2017, where he was advised by Professor T. Tony Cai. From 2017 to 2025, he served on the faculty of the Department of Statistics at Rutgers University, advancing from Assistant Professor to tenured Associate Professor, before returning to China to join Zhejiang University in 2025.

Date	**:**	**13 March 2026 (Friday)**
Time	**:**	**3:00pm - 4:00pm**
Venue	**:**	**Lecture Theatre F (Lift 25/26)**

All Are Welcome!