

The Hong Kong University of Science and Technology

Dept of Information Systems, Business Statistics and Operations Management
Dept of Industrial Engineering & Decision Analytics
Joint Seminar Announcement



Structure Beyond Nonconvexity: Hidden Geometry in Optimization, Control, and Operations

By

Professor Xin CHEN

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Date	:	6 July 2026 (Monday)
Time	:	2:30 – 3:45 PM
Venue	:	Case Room G001, G/F, LSK Business Building

Abstract:

Many foundational models in operations and control lead to optimization problems that are formally nonconvex, yet simple first-order methods often perform remarkably well in practice. This talk explains why by identifying structural features that make these problems effectively more tractable than their formulations suggest.

I will present two recent theoretical developments: (i) a characterization of the optimization landscape for policy-gradient methods in finite-horizon MDPs, and (ii) a hidden convexity phenomenon in queueing control. In both settings, I highlight verifiable conditions under which the objective satisfies a Polyak–Łojasiewicz-type condition, which in turn yields global convergence guarantees for gradient-based algorithms. I will show how these insights exploit structural features in classical operations models—such as base-stock inventory systems and cash-balance control—providing a unified explanation for why first-order methods can be reliable in complex stochastic systems.

I will also discuss a class of stochastic optimization models in which decisions are truncated by random variables, motivated by applications in network revenue management and inventory systems with uncertain supply. Although these problems appear nonconvex in their native form, they admit efficient solution via implicit convex reformulations that reveal an underlying hidden convexity. Collectively, these results suggest that many nonconvex problems in operations possess substantially more benign geometry than their surface structure indicates, opening opportunities for sharper theory and scalable algorithm design.

Bio:

Xin Chen holds the James C. Edenfield Chair and is a Professor in the H. Milton Stewart School of Industrial and Systems Engineering at Georgia Tech. Previously, he was a professor of industrial engineering at the University of Illinois at Urbana-Champaign. His research focuses on optimization, data analytics, revenue management, and supply chain management. Dr. Chen was awarded the INFORMS Revenue Management and Pricing Section Prize in 2009. He is the co-author of *The Logic of Logistics: Theory, Algorithms, and Applications for Logistics and Supply Chain Management* (Second Edition, 2005; Third Edition, 2014). He currently serves as the Department Editor of *Logistics and Supply Chain Management* for *Naval Research Logistics* and as an Associate Editor for leading journals such as *Operations Research*, *Management Science*, and *Production and Operations Management*.