HKUST Li & Fung Supply Chain Institute

Global Supply Chain Conference

10th December 2025

Speaker: Prof. David Simchi-Levi

Title: How Generative AI Improves Supply Chain Management

Abstract: Supply Chain Management requires addressing a variety of complex decision-making challenges, from sourcing strategies to planning and execution. Over the last few decades, advances in computation and information technologies have enabled the transition from manual, intuition and experience-based decision-making, into more automated and data-driven decisions using a variety of tools that apply optimization techniques. These techniques use mathematical methods to improve decision-making.

Unfortunately, business planners and executives still need to spend considerable time and effort to (i) understand and explain the recommendations coming out of these technologies; (ii) analyze various scenarios and answer what/if questions; and (iii) update the (mathematical) models used in these tools to reflect current business environments. Addressing these challenges requires involving data science teams and/or the technology providers to explain results or make the necessary changes in the technology and hence significantly slows down decision making.

Motivated by the recent advances in Large Language Models (LLMs), a type of Generative AI, we report how this disruptive technology can democratize supply chain technology – namely, facilitate the understanding of tools outcomes, as well as the interaction with supply chain tools without human-in-the-loop. Specifically, we report how we apply LLMs to address the three challenges described above, thus substantially reducing the time to decision from days and weeks to minutes and hours as well as dramatically increasing planners and executive productivity and impact.

Speaker: Prof. Jian Chen

Title: Combating Plastic Pollution: Consumer Engagement in Reusable Packaging Models

Abstract: As a major contributor to plastic pollution, single-use packaging has become ubiquitous in modern consumption. This presentation addresses the critical challenge of plastic pollution by examining the potential of reusable packaging, with a specific focus on the influence of consumer pro-environmental behavior on its effective adoption. This talk is structured in two parts. First, we examine how the "Bring Your Own Container" (BYOC) program influences a firm's decisions regarding disposable packaging and its corresponding communication strategies. Second, we investigate how firms can influence consumer adoption of reusable packaging by leveraging price incentives and adjusting convenience levels.

(Joint work with Yunlong Peng from the University of Warwick, Fei Gao from Indiana University)

Speaker: Prof. Xiaole Wu

Title: SPOT: A Network Framework for Resilient and Sustainable Supply Chains

Abstract: The SPOT framework integrates supply (S), product (P), ownership (O), and technology (T) networks to offer a holistic and dynamic lens for supply chain analysis. Its construction relies on diverse data sources such as supplier-customer relationships, ownership records, product compositions/key equipment, and patent data. Through three illustrative cases—mineral commodity supply resilience, China's TOP 1000 Program for sustainability, and GE HealthCare China's supply chain strategies—this paper demonstrates how SPOT inspires research questions and guides thought experiments along four key dimensions of supply chain systems. Amid geopolitical tensions and trade wars, adopting a multilayered network perspective of SPOT helps spot a wide range of research opportunities in global supply chains. Specifically, global supply chain reconfiguration will remain dynamic, and its evolution and implications for sustainability require deeper understanding. The new wave of Chinese firms going global exhibits new features and faces extensive challenges, presenting a promising direction for future research. Unified risk assessment and network design necessitate investigations beyond supply networks to incorporate ownership, product, and technology networks. The increasingly stringent technology restrictions imposed by the U.S. have a profound impact on global supply chains. Applying SPOT to analyze their effects on global innovation collaborations, regional industrial distribution, and the diffusion and development of technologies—including green technologies—would provide valuable insights. By providing a systematic and practical framework, SPOT empowers researchers, firms and policymakers to monitor complex supply chain systems, spot vulnerabilities, and navigate through the elusive world.

Speaker: Prof. Ying-Ju Chen

Title: (Un) justified Trade Protectionism For Local Suppliers to Climb the Value Chain

Abstract: N/A

Speaker: Prof. Zhenyu Hu

Title: Gacha: A Simple Mechanism to Screen a Budget-Constrained Buyer

Abstract: A lottery mechanism that allows repeated purchases until the buyer wins a designated item is widely used for both digital goods in Gacha games (e.g., Genshin Impact) and physical goods such as collectible toys (e.g., Labubu). We study this mechanism---referred to as a Gacha mechanism---in what is arguably the simplest possible setting: a seller offering one single item to a budget-constrained buyer. While the optimal mechanism in this setting typically involves designing a large (potentially infinite) menu of lotteries that can only be purchased once, the Gacha mechanism requires only a selling price and a winning probability, making it far more practical to implement. We show that the Gacha mechanism is particularly effective at screening along the budget dimension. While the posted price mechanism can perform arbitrarily poorly compared to the optimal mechanism when the buyer's valuation is public, the Gacha mechanism achieves at least 63.2% of the optimal revenue. It becomes asymptotically optimal as the valuation grows large. Moreover, when the seller has almost no information about the buyer's budget distribution, 63.2% is also the max-min revenue ratio guarantee, which can be achieved by a Gacha mechanism with vanishing winning probability. We also show that the Gacha mechanism is less effective at screening along the valuation dimension. When the valuation is private and the budget is public, the optimal Gacha mechanism reduces to a posted-price mechanism that achieves at least 50% of the optimal revenue. When both valuation and budget are private and independent, and the valuation follows a monotone hazard rate distribution, the Gacha mechanism guarantees at least 23% of the optimal revenue. Finally, we explore two extensions of the Gacha mechanism---one that includes the option of direct purchase, and another that incorporates a pity system.

Speaker: Prof. Amanda Yulan Wang

Title: Regionalization of Global Supply Chain Network

Abstract: Global supply chains have been undergoing gradual restructuring, evolving from a highly integrated globalized structure to a regionalized configuration. This structural shift is good news for global citizens, as the potential impact of disruptions will be more localized. While there has been growing anecdotal evidence of this trend, rigorous and comprehensive empirical validation remains limited. In this study, we investigate the structural evolution of global supply chain networks (GSCNs) as a complex adaptive system: each firm independently makes self-driven decisions regarding trade, taking into account tariff issues, policy changes, and geopolitical factors, and these decisions aggregate and manifest in macro-level evolutionary patterns. To capture such patterns, we use large-scale, fine-grained maritime Automatic Identification System data for 2015–2024. This satellite-based real-time positioning data tracks the global movements of ships, whose activities account for over 80% of the world's trade by volume. In our construction and analysis of container trade flow networks, ports serve as nodes and shipments as edges. Data provides clear empirical evidence for regionalization, showing patterns of clustering. In addition, ports have assumed differentiated functional roles: some serve as hubs facilitating inter-cluster connections, while others handle transshipment primarily within their own clusters. Overall, flows within clusters have intensified relative to flows between clusters. GSCNs have been evolving towards a structure that promotes local redundancy and global flexibility and is more resilient to potential disruptions.

Speaker: Prof. Ying Rong

Title: Theory-Guided Deep Learning for Perishable Inventory Systems with Random Lead Times

Abstract: Managing perishable products with random lead times is especially challenging when demand and lead-time distributions are unknown and only historical data are available. Deep learning offers a flexible, data-driven approach to such environments, but its black-box nature often ignores decades of structural insights from inventory theory. This paper investigates whether embedding simple, theory-guided structure into deep learning models can materially improve decision quality. Our findings highlight a key message for operations management and applied machine learning: inventory theory does more than deliver elegant policies under stylized assumptions. It provides structural guidance that makes deep learning models more sample-efficient with substantial performance gains.

Speaker: Prof. Jing Wu

Title: Supply Chain Restructuring in the Age of AI: Insights from CUHK's Asian Insitutute of Supply Chains & Logistics (AISCL)

Abstract: Global supply chains are undergoing a fundamental restructuring, shifting from a golden era of globalization to an age of regionalization driven by trade tensions, policy decoupling, and geopolitical realignments. This new epoch of high volatility demands a move from passive adjustment to proactive, AI-powered strategy. We pioneer tools like GlobalChain.AI to transform this disruption into opportunity, leveraging data and intelligence to build resilient, responsive, and efficient supply chains for the future.

Speaker: Prof. Shilu Tong

Title: Platform Financing under Seller Competition

Abstract: This study examines retail platform financing mechanisms for competing sellers, distinguishing between capital-constrained (C) and capital-sufficient (S) sellers. The platform faces a strategic choice: providing direct trade financing using its own capital or facilitating indirect financing through a third-party provider (3FP) with lower capital costs. We find that an increase in the proportion of C sellers incentivizes the platform to set higher interest rates than the 3FP. For S sellers, the rate strategy exhibits risk-dependent behavior: more S sellers lead to higher rates under low loan default risk but lower rates under high default risk. We also explore how seller competition influences financing mode selection from the platform's perspective. We find that more C sellers prompts the platform to adopt indirect financing or withdraw financing services, which depends on the default risk.

Speaker: Prof. Stephen Shum

Title: Ex-ante or Ex-post Pricing? Balancing Flexibility and Commitment in Agricultural Contract Pricing

Abstract: Agricultural contract buyers often use flexible pricing to purchase from farmers under market price fluctuations. To ensure supply and handle loss from farmers' side-selling, the buyer combines a guarantee price with an adjustment ratio to protect against downside risk and share upside profit. We explore whether the buyer should commit to the adjustment ratio ex-ante or set it ex-post. We find that the buyer provides a higher guarantee price to induce all farmers' participation under the ex-post pricing. Under ex-post pricing, the buyer leverages less opportunistic farmers' revenue overestimation but suffers from opportunistic farmers' side-selling. Consequently, the ex-post pricing dominates when less opportunistic farmers constitute a large share, or when the yield enhancement is high. Interestingly, the buyer should cultivate more less opportunistic farmers, but aim to keep their tolerance at an intermediate level.

Speaker: Prof. Onur Boyabatli

Title: Capacity Investment in the Presence of Correlated Demand and Production Resource Uncertainties and Its Implications for Financial Hedging

Abstract: In manufacturing firms, besides demand uncertainty, capacity investment decisions may also be subject to uncertainty in the availability of a production resource (e.g., budget or commodity component) which may become constraining for manufacturing. When the production resource uncertainty is tied to a financial index (e.g., asset or commodity price), the firm can enter in financial hedging contracts at the time of capacity investment to engineer this uncertainty. Our paper characterizes the optimal capacity investment and hedging decisions and examine how production resource uncertainty impacts the firm's decisions, profitability, and the value of hedging. We identify three key drivers of these impacts: capacity cost, correlation between demand and production resource, and production resource variability. Our analysis shows that full hedging is optimal when capacity cost is high or correlation is low. Otherwise, the firm chooses no hedging if production resource variability is low, and partial hedging if it is high. Under optimal hedging, higher correlation always enhances profitability, while increased production resource variability is never detrimental. In particular, when no hedging is optimal, both optimal capacity and profitability strictly increase with variability. Interestingly, when partial hedging is optimal, the firm increases its hedge as variability rises, fully offsetting the impact rendering capacity and profitability insensitive to variability. Finally, we find that the value of hedging increases with production resource variability but decreases with correlation. These findings offer valuable managerial insights for firms making capacity investment decisions while managing the fluctuations in production resource availability through financial hedging.

Speaker: Prof. Jiheng Zhang

Title: OR for AI and AI for OR: Queueing Analysis for LLM Inference, and Reinforcement Learning for OR Automation

Abstract: The intersection of Operations Research and Artificial Intelligence opens two complementary research directions: using OR to optimize AI systems, and using AI to automate OR workflows. This talk presents recent work in both directions. In the first part, we tackle LLM inference scheduling through the lens of queueing theory. Large language models exhibit a unique two-phase service pattern—prefill and decode—that creates resource interference on shared GPUs. We develop a stochastic processing network model, derive fluid limits, and design an asymptotically optimal gate-and-route policy that maximizes throughput while respecting latency constraints. In the second part, we explore whether LLMs can formulate optimization problems from natural language descriptions. We introduce TGRPO, a test-time reinforcement learning method that uses consistency across multiple solution attempts as a training signal—eliminating the need for expensive human annotations while achieving state-of-the-art performance with 10× less training data. Together, these works illustrate the rich opportunities at the OR-AI interface, where classical optimization techniques enhance modern AI systems, and AI capabilities transform how we approach optimization itself.

Speaker: Prof. Christoph H. Loch

Title: Market-Side Measures of Supply Chain Diversity and of Innovation Explain Focal Firm Success Better Than Technology-Side Diversity and Innovation

Abstract: Supply chain diversity is known to benefit firm innovation, but most studies have focused on suppliers' technology diversity and on the customer's (Original Equipment Manufacturer, OEM) technology innovation (measured as patents). However, suppliers contribute not only technology knowledge but also knowledge from their exposure to customers from different industries, and patents do not (usually) earn revenues, but new products that are sold in markets do. In other words, literature on the contribution of suppliers on OEM innovation has not paid enough attention to the market side of supply chains.

This study proposes the introduction of market-oriented measures of product innovation and of supply chain diversity: based on data from 172,000 Chinese firms, we measure supplier diversity in their technology capabilities and in their customer exposure, and we measure OEM innovation both in terms of technology (patents) and in terms of new products. We find that it is product innovation that supports market growth and profitability, while technology innovation plays only a supporting role (being a helpful input in product innovation but not market outcomes). Second, supplier market breadth (exposure to a broad set of customer industries) positively affects both product and technology innovation. These results argue for refocusing innovation discussions from patents toward products and services---patents are more productively viewed as an innovation input, not an innovation outcome, and patents are irrelevant for many innovative smaller companies. Our findings also suggest paying more attention to a new dimension of supplier knowledge, namely a broad customer exposure.