

Data-driven supply chain and operations management in smart production systems

Masoumeh Kazemi Zanjani

Mechanical Engineering Department, Concordia University, Montréal, Canada

*masoumeh.kazemizanjani@concordia.ca

ABSTRACT

Industry 4.0 (I4.0) relies on smart production systems, also known as smart factories (SFs), that integrate advanced technologies like artificial intelligence (AI), internet-of-Things (IoT), and automation to enable adaptive, efficient, and data-driven decision-making across the production lifecycle. The goal is to facilitate mass personalization (MP), which combines product customization with mass production efficiency. This transformation has also had a profound impact on supply chain management (SCM) practices, emphasizing the need for interconnectivity and seamless communication in these value chains.

This talk will cover several recent works from my research team on data-driven decision support tools for supply chain (SC) and operations planning in I4.0 manufacturing networks. The first line of research will uncover the challenges involved in the SC design and planning for MP. We specifically investigate several uncertain factors involved in the manufacturing of customizable modular-structured products, such as order size, design features, and technological limitations of suppliers at different SC echelons. Relatedly, the crucial role of collaborative SC design and planning as a mechanism to enhance reconfigurability, operational efficiency, and customer satisfaction will be discussed. Our research, particularly, promotes the idea of resource sharing among the firms that are active in parallel value chains via designing efficient collaborative decision support tools and benefit-sharing mechanisms. Finally, our recent attempts in integrating predictive maintenance with production planning in SFs will be discussed that relies on leveraging the data obtained from embedded sensors on the machines towards real-time monitoring of their condition and production rate.

The talk will be concluded by summarizing future avenues of research on embedding AI algorithms into the state-of-the-art optimization tools to advance real-time and data-driven planning in the fast-changing manufacturing landscape.