Invited Session: **Code: 8ku6u**

Intelligent and adaptive AI-enabled Resilient Manufacturing Systems

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In response to recent global disruptions and the growing emphasis on sustainability and resilience, manufacturing industries are increasingly turning to AI-driven solutions to enhance their adaptability and robustness. Artificial intelligence (AI) can enable manufacturing systems to be more flexible, responsive, and sustainable in the face of both short- and long-term challenges. AI-driven methods are critical in modernizing industrial processes, boosting production agility, and ensuring continuity during disruptions. By leveraging AI-enabling tools such as machine learning, advanced data analytics, and robotics, manufacturers can anticipate and forecast disruptions, optimize production schedules, and adapt supply chains in real-time. This allows them to mitigate risks associated with fluctuating demand, material shortages, and transportation delays.

Real-time data and AI-based decision support systems empower factories to self-regulate, respond swiftly to disturbances, and continuously improve efficiency. Moreover, AI-enabling methods can support cybersecurity for digital infrastructure safeguarding, addressing the increasing threat of cyberattacks in a highly connected industrial environment. Furthermore, integrating AI into manufacturing aligns with the broader goals of sustainability and circular economy. AI can enable sustainable resource use, reduce waste, and lower emissions through optimizing energy efficiency and material flows across the supply chain. For example, AI-driven optimization in product design and manufacturing processes can enhance material reuse, recycling, and remanufacturing efforts. AI's influence in manufacturing extends beyond technical aspects. It offers manufacturers the potential to better address societal and environmental goals. AI provides a pathway for more human-centric manufacturing, fostering collaboration between AI systems and workers. It can enhance human decision-making, enabling workers to focus on more strategic and creative tasks. This ultimately leads to a safer and more inclusive working environment.

The session aims to *i)* comprehensively understand how AI can make manufacturing systems more resilient, competitive, and sustainable and *ii)* illuminate the transformative role of AI in shaping the future of manufacturing through expert presentations and case studies. Attendees will gain insights into how AI-driven solutions can address current and future challenges, ensuring a more resilient, sustainable, and human-centered industrial landscape. Key topics will include (but not limited to):

- AI for adaptive and resilient supply chain management.
- The role of AI in predictive maintenance and operational optimization.
- AI's contribution to sustainability and the circular economy.

- AI and its impact on workforce collaboration and industrial safety.
- AI-enhanced cybersecurity for protecting critical infrastructure.