DOI: doi.org/10.47363/JAICC/ICMLAIDS2026/2026(5)20

International Conference on Machine Learning, Artificial Intelligence and Data Science (ICMLAIDS 2026)

Conference Proceedings March 20 - 21, 2026 - Virtual

Agentic AI for Advanced Manufacturing: Autonomous Robotic Planning and 3D Simulation for Next-Generation Production Systems

Kevin Patel

Independent Researcher, Chicago, IL, USA

Abstract

The advancement of artificial intelligence, machine learning, and cyber-physical systems is transforming traditional manufacturing into intelligent and autonomous production environments. This work examines the role of Agentic AI architectures in manufacturing systems where autonomous AI agents collaborate to monitor production processes, analyze operational data, and enable adaptive decision-making. By integrating Industrial IoT sensor networks, predictive analytics, collaborative robotics, and digital twin simulation technologies, manufacturing systems can detect anomalies, predict equipment failures, and automatically adjust operational parameters to maintain process stability and product quality. The research highlights how multi-agent AI frameworks combining perception, reasoning, action, and learning capabilities enable continuous process optimization and predictive maintenance.

Additionally, the use of 3D simulation platforms allows engineers to virtually validate production workflows, analyze system bottlenecks, and optimize manufacturing performance before real world deployment. These capabilities contribute to the development of intelligent, resilient, and self-healing production systems aligned with the vision of next-generation Industry 5.0 manufacturing ecosystems.