

Industry 6.0: Human-Centric, Intelligent, and Sustainable Industrial Transformation

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Abstract

Industrial revolutions have historically been driven by technological breakthroughs that fundamentally transformed production, labour, and society. Industry 6.0 represents the next evolutionary stage of industrial development, building upon the technological foundations of smart manufacturing established in Industry 4.0, such as digitalisation, data-driven automation, the Internet of Things (IoT), and advanced connectivity, as well as the human-centric and sustainability-oriented vision of Industry 5.0. It emphasises the deep integration of advanced Artificial Intelligence (AI), autonomous systems, Digital Twins (DTs), Cyber–Physical Systems (CPSs), Cyber–Physical Social Systems (CPSSs), Large Language Models (LLMs), and large-scale connectivity through distributed intelligence, aligned with human creativity, ethical principles, and sustainability goals.

Industry 6.0 emerges as a natural progression, aiming to harmonise advanced intelligence and autonomy with human oversight, distributed intelligence, sustainability, ethical considerations, and environmental responsibility. It envisions industrial systems that are not only smart and automated, but also adaptive, self-evolving, and socially aware. By integrating cutting-edge technologies with human expertise, Industry 6.0 seeks to address increasingly complex industrial, economic, and societal challenges. In this context, Industry 6.0 represents a holistic vision for the future of industry, combining advanced intelligence and autonomy with human-centric values and sustainability principles.

By integrating distributed AI, autonomous systems, and ethical governance, Industry 6.0 has the potential to transform industrial ecosystems into intelligent, resilient, and socially beneficial systems. This talk presents an overview of Industry 6.0, outlining its core principles, enabling technologies, application domains, and key challenges. It highlights how Industry 6.0 seeks to deliver intelligent, resilient, and sustainable industrial ecosystems by balancing advanced automation with human values, societal needs, and the prioritisation of human creativity.

Index Terms— Industry 6.0, Intelligent Manufacturing, Human-Centric Systems, Artificial Intelligence, Cyber–Physical Systems, cyber–physical social systems (CPSSs), Large Language Models (LLMs), Sustainability.

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