SOHOMA'26 Special Session

Digital Twins for the Industry of the Future: Modelling, Simulation and Control of Socio-Technical Systems

Organisers

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Topic overview

The rise of Industry 4.0 is driving a profound transformation of production systems, now characterised by increasing interconnection between physical, digital and human dimensions. In this context, the Digital Twin (DT) concept has emerged as a central paradigm for the design, operation and optimisation of complex industrial systems. A DT is a dynamic virtual representation of a physical system, enriched by real-time data streams, enabling simulation, analysis and anticipation of system behaviour throughout its entire lifecycle.

Beyond the purely technical dimension, the *Industry of the Future* necessarily integrates human and organisational components. Today's production systems are socio-technical systems in which operators, collaborative robots, cyber-physical systems and artificial intelligence tools coexist and interact. This special session aims to explore how DTs can incorporate this socio-technical complexity in order to support not only industrial performance, but also ergonomics, safety and organisational adaptability.

DTs find applications across a wide range of domains, including predictive maintenance, production planning, operator training, risk management and dynamic reconfiguration of manufacturing systems. Their deployment nevertheless raises major methodological challenges related to: model interoperability, heterogeneous data management, computational cost, simulation model reliability and, more fundamentally, the question of the trust that human users place in information and/or decisions derived from DTs.

This session aims to bring together academic and industrial contributions around recent advances in DTs applied to manufacturing, logistics and service environments. Particular attention will be given to approaches combining discrete-event simulation, machine learning, multi-agent modelling and optimisation, in connection with Industrial Internet of Things (IIoT) architectures

and cloud/edge computing platforms. Contributions presenting real-world use cases, demonstrators or industrial feedback are especially encouraged.

Topics of Interest (non-exhaustive list)

- Architectures and reference frameworks for industrial DTs
- IIoT, cyber-physical and edge/cloud computing integration
- Real-time simulation and optimisation of production processes
- DTs for predictive maintenance and asset management
- Modelling of human and organisational dimensions within DTs
- Reconfigurability, agility and resilience of DT-driven systems
- Embedded artificial intelligence and machine learning in DTs
- Performance evaluation, validation and certification of DTs
- Industrial deployment feedback (SMEs and large enterprises)
- Ethical aspects, data security and digital sovereignty

Keywords
Digital Twin, Modelling, Simulation, Optimization, Automation and Control, Smart Manufacturing, Edge and Fog Computing

Important dates
Full paper submission: 5 April 2026
Notification of decision: 4 May 2026
Early registration and fee payment: 1 June 2026
Final camera-ready paper submission: 13 July 2026

(Please consult the SOHOMA'26 website for updates and further information)