28th IEEE International Conference on Industrial Technology (ICIT 2027)

Special Session on

AI-Enabled Applications and Digital Twins in Industry 4.0 and Beyond

Organized by

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Call for Papers

Digital Twin technologies are rapidly evolving from static virtual representations into intelligent, adaptive, and increasingly autonomous systems. Powered by Artificial Intelligence, industrial data platforms, and interoperable digital ecosystems, Digital Twins are becoming a cornerstone of Industry 4.0 and of the transition towards more resilient, human-centric, and sustainable industrial systems.

The convergence of Digital Twins with foundation models, generative and agentic AI, multi-agent systems, the Industrial Internet of Things (IIoT), semantic technologies, and data spaces is enabling new capabilities for prediction, optimization, decision support, and autonomous operation across complex cyber-physical systems. Software agents can now reason over Digital Twin models, negotiate with other agents, orchestrate engineering and operational workflows, and act on physical assets in closed loops. This opens new opportunities in industrial automation, manufacturing, automotive, energy systems and smart grids, smart buildings, logistics, critical infrastructure, and agriculture. At the same time, major challenges remain regarding interoperability, trustworthy and explainable AI, safety and security of autonomous decisions, lifecycle integration, data governance, and the seamless exchange of information across heterogeneous engineering and operational environments.

Ongoing efforts in industrial standardization and data sharing, such as the Asset Administration Shell, OPC UA information models, and European data-space initiatives, are creating a common foundation to address these challenges and to unlock scalable Digital Twin ecosystems. This special session aims to bring together researchers and practitioners from academia and industry to present and discuss recent advances in the design, implementation, validation, and deployment of AI-enabled

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Digital Twins and industrial agents for smart applications, with particular attention to real-world results demonstrating measurable industrial, economic, and societal impact.

Topics of interest include, but are not limited to:

- AI-enhanced Digital Twins: modeling, learning, and hybrid physics/data-driven approaches
- Generative AI and foundation models for Digital Twins and industrial engineering
- Manufacturing-X and trustworthy generative AI for manufacturing
- Agent-based and multi-agent systems for industrial automation
- Agentic AI for autonomous operations, orchestration, and decision support
- Digital Twin architectures, interoperability, and integration frameworks
- Digital thread and MES/ERP integration
- Asset Administration Shell, OPC UA, and standardized information models
- Semantic models, ontologies, and knowledge graphs for Digital Twins
- Data spaces and sovereign data sharing in industrial value chains
- Simulation, virtual commissioning, and Digital Twin-based testing
- AI- and Digital Twin-based production planning, scheduling, and control (incl. reinforcement learning)
- Predictive maintenance, condition monitoring, and asset health management
- Edge-cloud continuum and distributed Digital Twin deployments
- Human-centric Digital Twins and human-AI collaboration (Industry 5.0)
- Trustworthy, explainable, safe, and secure AI for cyber-physical systems
- Digital Twins for energy systems, smart grids, and smart buildings
- Digital Twins for circular and sustainable manufacturing and energy efficiency
- Digital Twins for logistics, supply chains, and critical infrastructure
- Digital Twins and smart applications for agriculture and agri-food systems
- Industrial case studies, pilot deployments, and lessons learned
- Presentation of results from Competence Centers, Research Networks, and Major Initiatives on Digital Twins and Industry 4.0

Submission Procedure:

All the instructions for paper submission are included in the conference website**: https://icit2027.ieee-ies.org/**

Deadlines:

- **Special Session Paper Submission Deadline:** December 1st , 2026
- **Special Session Acceptance Notification:** December 20th, 2026
- **Conference Dates:** March 17–19, 2027