

**Invited Session on “Emerging Challenges for Robotics and Autonomous Systems in the Era of Industrial Revolutions 4 & 5” for IFAC MIM 2025**

**Invited session identification code **xxxx****

**IFAC MIM 2025, June 30-July 3, 2025, Trondheim, Norway**

<https://conferences.ifac-control.org/mim2025/>

**Session Chairs**

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A Cyber-physical system (CPS) is an emerging concept in system and control theory, resulting from convergence of technology advances in three different areas of control theory, information theory, and communication theory. The Cyber-Physical System (CPS) is a term describing a broad range of multi-disciplinary, next generation engineered systems that integrate embedded computing technologies (cyber parts) into the physical world via sensors and actuators in a feedback loop. In this context the sensor network as well as the edge and cloud computing are the central element, providing a comprehensive synergy between the industry (physical, off-line) and the cyber services (on-line). The marriage between these two provides numerous new opportunities for the production process, with profound implications for the whole society and economy.

In the fourth industrial revolution, the machines and robots are given high level of cognition by which they can see and communicate with other robots and machines in the surrounding. This is the technical core of the fourth industrial revolution. Therefore, CPS is associated with such terms as the Internet of Things (IoT), robotics, perception, navigation, motion planning, network control system, security, cloud robotics, and system of systems.

The research and development in robotics are shifted in the recent years from industrial robotic platforms to intelligent and autonomous robotic systems. The long-term objective of designing such intelligent robots is to facilitate easier and safer integration of these systems with the human life to carry out dangerous, repetitive, and tedious tasks.

The aim of this invited session is to utilise the existing solutions and methodologies in design and development of cyber-physical systems as well as robotic systems in order to cross-fertilise both fields. The session provides a unique platform for the researchers in both fields to discuss the recent advances and cutting-edge solutions in both fields to overcome the challenges faced by the industry and stakeholders in development of a smarter robotic cyber-physical system under operational constraints, and to ensure a robust and stable operation even in case of subsystem failures.

**Session Topics**

The authors and researchers are invited to contribute the theoretical and applied research papers in the areas including but not limited to the following topics:

Control algorithms and methodologies such as robust and adaptive control systems, distributed and networked control systems, event-triggered control systems, integration and fusion of sensors, mobile and static sensor networks, intelligent objects integrated in the internet of things, integration of real-time requirements for robotic applications, machine learning and reinforcement learning used as decision support systems and integrated into robotic systems, detecting and prognosis of faults, fault tolerant and reconfigurable control systems, energy-efficiency in robotics, multi-robot

collaboration, synchronization and management, multi-robot SLAM, teleoperation, and augmented and virtual reality systems.

**Submission**

All papers must be prepared in a two-column format in accordance with the IFAC manuscript style and submitted online through the conference website by **31 December 2024**. The corresponding author submits the pdf-format as **an invited session paper**. Submission as an invited paper requires the **invited session code xxxx**. Several international journals are associated with the IFAC MIM 2025 for publication in the special issues.

**Important dates**

December 31, 2024 Deadline for the submission

January 30, 2025 Notification of acceptance/rejection

February 28, 2025 Deadline for the camera-ready submission