

18th IFAC Symposium on Information Control Problems in Manufacturing
28-30 August 2024 | Vienna, Austria



Invited Session Title

Artificial Intelligence and Machine Learning Approaches to Design, Operations and Control of Intralogistics Systems.

Invited Session Abstract

Artificial intelligence (AI) is the technology with one of the most rapid paces of innovation in recent years. Due to its ability to leverage new potentials and efficiencies, it is also increasingly becoming relevant to the design, planning, and control of intralogistics systems such as distribution centers, warehouses, cross-dock facilities, and production supply systems. This session is intended to provide a forum for researchers and/or practitioners to share their work on AI applications in such systems. We invite contributions in AI, specifically methods from the area of machine learning (ML), relating to any aspect or application in intralogistics. The methodologies for training could involve simulation, model-based optimization, or model-free learning approaches. The aspects covered may include but are not limited to the design of intralogistics facilities (layout, equipment selection, storage, level of automation, etc.), operations (batching, picking, sortation, etc.), or control of autonomous robots (AGVs, AMRs, etc.) acting individually or in cooperation. Concept papers, models, and/or case studies are welcome.

Invited Session Goals and Objectives

AI applications have been exploding in the field of Industry 5.0 which includes intelligent manufacturing, production, and distribution. This development is not surprising: Industry 5.0 and especially the logistics industry is particularly well suited for the use of AI methods due to its specific characteristics. The environment in which logistics systems operate is characterized by a fluctuating consumer market, many different players, and conflicting goals that must be reconciled. Thus, it is a highly dynamic and complex environment that leads to complex optimization problems that must be solved to achieve efficient logistics processes. AI methods offer new possibilities to capture these complex relationships in the logistics environment. To do so, they require a large amount of data, which is becoming increasingly available in the logistics industry through the widespread use of sensor technology and tracking & tracing.

The variety of learning algorithms that find application in this domain is wide: Depending on the area of application, supervised and unsupervised as well as reinforcement learning methods are being used more and more. Furthermore, there are other distinguishing aspects of AI technologies relating to how exactly learning takes place: is it model driven, model free, etc. If it is model driven, the question then becomes what kind of model is necessary. To this end, researchers have proposed simulation models, reinforcement learning models, or other models based on simulation and/or optimization.

This session focuses on AI in intralogistics, usually limited to the four walls and/or docks of a distribution facility within a supply chain network. Such facilities include but are not limited to warehouses, distribution centers, cross-docking facilities, production supply systems, etc. The facilities are data-rich and present several opportunities for the use of AI techniques for planning and control. The planning and control of such facilities may include virtual entities such as schedules, sequences, task assignments, etc. or physical entities that work independently or together in cooperation such as sorters, conveyors, mobile robots, etc.

We invite work in intelligent single or multi-agent systems and are interested in any of the standard AI methodologies: model based, model free, machine learning, deep learning, etc. The work could include conceptual models for one or more aspects of such systems or proofs-of-concept/implementations based on case-studies.

Another area of interest in this session is the use of AI in the design of such systems. Design tasks are much more complicated and involve intuition, expertise, and a higher level of knowledge. Therefore, the use of higher-level AI techniques to aid in the design process of intralogistics facilities is of interest.

The final area of interest in this session is the integration of humans in such systems since that is a vital component of Industry 5.0. To this end, digital twinning, virtual reality systems or any cognitive or ergonomics aspect covered through the “human-in-the-loop” approach is of interest.

Paper submission

Please proceed as an invited paper and indicate the invited session identification code 133e9. Guidelines for the preparation of manuscripts are provided on the conference website and on IFAC:

<https://www.incom2024.org/cfp/>

<https://www.ifac-control.org/conferences/authors-guide>

If you experience any difficulties, please contact one of the organizers.

Submission Deadline: 31.01.2024

Final Paper Deadline: 15.04.2024

Invited session chairs and contact information

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