Invited session: Knowledge-Driven, AI, and Neurosymbolic AI-Enabled Decision-Making Systems for Frugal and Sustainable Manufacturing and supply chain

Code: 3552h

Organized by:

Dr. Esma Yahia	Arts et Métiers, France	Esma.yahia@ensam.eu
Dr. Camélia Dadouchi	Polytechnique Montréal, Canada	camelia.dadouchi@polymtl.ca
Dr. Ambre Dupuis	Université du Québec à Trois-Rivières, Canada	Ambre.Dupuis@uqtr.ca
Dr. Mario Lezoche	Université de Lorraine, France	Mario.Lezoche@univ-lorraine.fr

Session Scope & objectives:

As industries face increasing pressure to adopt sustainable practices, the need for frugal and sustainable manufacturing and supply chain systems has become critical. Central to the success of these systems is enhanced decision-making, which must balance cost-efficiency with environmental sustainability. To support this, integrating Artificial Intelligence (AI) for process optimization, Symbolic AI for rule-based reasoning, and the structuring of domain-specific knowledge is a key enabler.

By structuring knowledge into formal models such as ontologies and rules, decision-making processes are enriched with deeper contextual understanding, enabling AI systems to provide rational, informed choices that align with sustainability goals and regulatory requirements. AI, through its ability to recognize patterns and optimize processes, and Symbolic AI, by reasoning with structured rules and knowledge, will together ensure that decisions in both manufacturing and supply chain contexts are data-driven and aligned with broader ecological and economic objectives.

This session will focus on the integration of AI, Symbolic AI, and knowledge structuring to create intelligent systems capable of optimizing resources in real time while adapting to dynamic environments. By facilitating more context-aware, rule-based decision-making, these systems will ensure that manufacturing and supply chain processes are not only cost-effective but also environmentally sustainable over the long term. The merging of these technologies will address the urgent need for innovative decision-support solutions in both the manufacturing and supply chain industries, enabling the shift toward a more sustainable, resource-efficient future.

Keywords:
This special session invites high-quality submissions that explore key research challenges, reviews, case studies, and applications pertaining to the following topics (though not limited to):

- Artificial Intelligence for Frugal & Sustainable Manufacturing and supply chain
- Neuro-Symbolic AI Frugal & Sustainable Manufacturing and supply chain
- Knowledge Structuring, Knowledge Integration Complexity, semantic layer
- Context-Aware Decision-Making
- Ontologies, knowledge graph
- Rule-Based Reasoning
- Contextual Understanding
- Resource Optimization with Sustainability vs. Cost Trade-offs
- Scalability of AI Models
- Contextual Reasoning Limitations
- Interdisciplinary Knowledge Gaps
- Data-Driven Decision Alignment