ARTISTE2025
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Special Session Title:

Smart Engineering for Circular Steel Structures: AI and Evolutionary Algorithms for Sustainable Design

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Abstract

This special session highlights how artificial intelligence (AI) and evolutionary optimization techniques, such as genetic algorithms, can play a key role in guiding the transition toward sustainable practices in the steel construction sector—particularly through reuse-oriented and reuse-based design approaches. As the industry embraces circular economy principles, there is a growing need for design and construction methods that enable disassembly, adaptability, and efficient reuse of steel components as well as improve the constructability of steel buildings with innovative assembly-in-situ or preassembly solutions. We welcome contributions exploring optimization frameworks based on AI techniques and/or evolutionary algorithms that support this transformation—enhancing automation, enabling circular design strategies, and promoting resource-efficient decision-making across the steel lifecycle. We invite original contributions that explore the use of AI techniques (e.g. machine learning, Neural networks) combined with automation technologies to enhance design, analysis, monitoring, and decision-making processes. Topics of interest include, but are not limited to:

- AI-powered structural and infrastructure optimization;
- Circular design and construction of steel structures (Recycling and reusing);
- LCA and LCC assessment of optimized structural system;
- Neural networks for modelling complex engineering systems;
- Structural optimization for the Additive Manufacturing of sustainable products;
- Structural optimization for Bio-inspired, porous and meta-materials;
- Autonomous systems for design, simulation, and control;
- Robotics and automation in construction and infrastructure;
- Digital twins, real-time sensing, virtual commissioning, and AI-integrated feedback loops.

This session aims to foster interdisciplinary collaboration and highlight innovative research bridging AI, optimization, and sustainable engineering practice. Submissions showcasing practical applications, reuse-driven frameworks, or forward-looking methodologies are particularly encouraged.

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