



ARTISTE2025

14-17 September 2025 – Politecnico di Torino, Turin, Italy

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Special Session Title:

Data-Driven and AI-Assisted Evaluation and Design of Cement-Based Materials and Structures for Environmental Sustainability

Organizers

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Abstract

In recent years, the integration of data analytics and Artificial Intelligence (AI) into the construction sector has begun to transform how materials are developed and used, particularly within the realm of cement-based materials. Driven by the need to minimize environmental impacts and enhance the sustainability and resilience of building practices, these technologies are playing a crucial role in evolving industry standards and practices. However, the challenges of ensuring that these new materials and methods can be introduced in the industry reveal significant gaps in current research, particularly in terms of environmental sustainability. This special session focuses on cutting-edge research and innovations in data-driven strategies and AI applications for the sustainable and resilient design of cement-based materials and structures. It features contributions on AI-enhanced predictive modeling, optimization of material compositions, and advanced analytics for design, retrofit, lifecycle assessment, and resource efficiency. These contributions showcase significant progress in reducing environmental impacts and enhancing structural resilience, while also highlighting the need for further research to address challenges like data scarcity, model predictive performances, and the integration of AI with traditional construction methods. This issue aims to drive advancements towards smarter, more resilient, and environmentally friendly building solutions.

Contents of interest include, but are not limited to, the following topics:

- Data-driven optimization of cement-based compositions
- Data-driven design of cement-based structural components
- AI in cement-based material and structure design
- Probabilistic analysis and evaluation for cement-based materials and structures
- Performance prediction using advanced machine learning algorithms
- Case studies on sustainable and resilient cement-based construction practices using data-driven and AI-assisted approaches



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