Special Issue

Artificial Intelligence Approaches for Sustainable Building Performance

Message from the Guest Editors

Artificial intelligence is gaining an increasingly important role in the building sector, offering new possibilities to improve performance, reduce energy consumption, and strengthen resilience throughout a building's life cycle. This Special Issue focuses on advanced AI-driven methods, tools, and frameworks that support sustainable building performance at material, component, and whole-building scales. Particular attention is given to applications related to Building Physics, including machine learning for predictive modelling, AI-based optimization for energy and moisture management, hygrothermal performance assessment, and intelligent building envelope design. Contributions that combine physical simulation, data-driven analytics, uncertainty quantification, and decision-support systems are welcomed. The aim is to collect high-quality research demonstrating how AI can enhance sustainability through improved durability, circularity, operational efficiency, and climate-adaptive building control.

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About the Journal

Message from the Editor-in-Chief

Current urban environments are home to multi-modal transit systems, extensive energy grids, a building stock, and integrated services. Sprawling neighborhoods are composed of buildings that accommodate living and working quarters. However, it is expected that the cities and communities of the future will face complex and enormous challenges, including maintenance, interconnectivity, resilience, energy efficiency, and sustainability issues, to name but a few. A smart city uses advanced technologies and a digital infrastructure to improve the outcomes in every aspect of a city's operations. A smart building optimizes the experience of occupants, staff, and management by using a modern and connected environment. Innovations in technology that can bring dramatic improvements to design, planning, and policy are critical in developing the cities and buildings of the future.

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