

SS-26: AI-Enhanced Structural Health Monitoring for Infrastructure Reliability from Sensing to Risk-Informed Decisions

Syedmilad Komarizadehasl¹, Jose C. Matos², and Behrad Emadi³

¹ Polytechnic University of Catalonia, Spain

² University of Minho, Portugal

³ University of Salerno, Italy

milad.komary@upc.edu; jmatos@civil.uminho.pt; semadi@unisa.it

Description

Aging infrastructure faces intensified loads, climate hazards, and demands for sustainable management. Structural Health Monitoring (SHM) uses IoT sensors, physics-based models, machine learning, and AI to improve safety, infrastructure reliability, and asset management by converting data into risk-informed decisions through comprehensive risk assessment.

This Mini Symposium examines the SHM pipeline (sensing, analytics, diagnostics, system identification, risk management) and AI's role in civil engineering, focusing on agentic AI for management, generative AI for verification/quality control, and AI in SHM. Integrations include structural analysis, sensor processing, inspections, digital twins, computer vision, IoT, predictive analytics, maintenance scheduling, and deep learning.

Contributions are invited on sensing (e.g., accelerometry, corrosion, drive-by), analytics, digital twins for uncertainty, Bayesian updating, deterioration models, climate resilience, and case studies (bridges, tunnels, rail, ports, energy). The session promotes interoperable tools, practical insights from researchers/operators/regulators, and SHM-lifecycle linkages.