

DIGITAL TWINS FOR NON-DESTRUCTIVE TESTING AND STRUCTURAL HEALTH MONITORING

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ABSTRACT

Non-destructive testing (NDT) and structural health monitoring (SHM) are essential for ensuring the safety, reliability, and service life of engineering structures. Recent advances in sensing, multi-physics modelling, and data analytics have accelerated the development of digital twins (DTs) for real-time monitoring and predictive maintenance. Digital-twin-enabled NDT/SHM frameworks integrate physics-based simulations with continuous sensing to support damage detection and structural diagnostics, and state-of-the-art reviews show that digital twins significantly enhance monitoring accuracy and support real-time model updating in civil infrastructure [1]. Parallel advancements in AI-assisted NDT—such as automated ultrasonic and radiographic data interpretation—further strengthen DT pipelines by improving defect detection accuracy and reducing operator dependence [2].

Contributions are invited for following topics: (i) multi-physics and data-driven DT modelling; (ii) sensing and data-fusion frameworks; (iii) feature extraction and damage indicators; and (iv) AI-enabled NDT and DT-driven diagnostics. Other relevant topics are also welcome.

REFERENCES

- [1] Qiuting Wang et al., *Current Status and Prospects of Digital Twin Approaches in Structural Health Monitoring*, Buildings, 15(7), 1021, 2025
- [2] Amine el Mahdi Safhi et al., *AI-Driven Non-Destructive Testing Insights*, Encyclopedia MDPI, 4(4), 1760-1769, 2024