



Joint Thematic Symposium title:

Data-Driven and Deep Learning in Action: Smart Monitoring, analysis and Damage Prediction for Materials and structures

(China Structural Integrity Consortium (CSIC); CEN-TC 346 WG17; ESIS TC19; ESIS TC20)

Short description of the Joint thematic TC19-TC20-symposium:

Structural integrity is at the heart of both advanced engineering applications and the preservation of our built heritage. While **Technical Committee 19 (TC 19)** explores cutting-edge data-driven and machine-learning approaches to design, assess, and optimize modern structures and materials, **Technical Committee 20 (TC 20)** focuses on condition monitoring and the long-term preservation of (historical) buildings and structures in the face of environmental and climatic challenges. This **joint mini symposium** brings together experts and practitioners from both domains to share innovations, methodologies, and case studies, bridging the gap between new-build performance optimization and optimal maintenance and (heritage) conservation.

Main topics:

1. Machine Learning and Data-Driven Design for Structural and Material Performance (TC 19 Focus)

- Advances in data-driven approaches and machine learning based methods for predicting material behavior and structural response.
- Forward and inverse design frameworks for developing novel materials and structures targeting at enhanced mechanical properties—e.g., fatigue, fracture toughness, and durability.
- Open-source toolchains and benchmark databases for reproducible, high-throughput evaluation of structural integrity models.

2. Condition Monitoring and Risk Assessment of Historical Structures (TC 20 Focus)

- Non-destructive sensing technologies (e.g., ultrasonic, infrared, acoustic emission,...) for real-time health monitoring of (heritage) assets.
- Impact of climate variability and extreme events on structures.
- Data analytics for damage detection, prognosis, and decision support in condition monitoring, restoration and maintenance planning.

3. Integrated Approaches for Predictive Maintenance in Heritage and Modern Infrastructure (TC 19 & TC 20 Joint)

- Hybrid machine-learning frameworks combining modern performance models with historical condition datasets.
- Case studies: applying data-driven methods to the integrity or fatigue life prediction of modern (or historical) assets, structures and materials.



- Developing digital twins for continuous monitoring and adaptive maintenance strategies across asset lifecycles which may be supported by data-driven methods.

Please, indicate on BECCSI registration and submission form (<https://www.beccsi2025.com/authorscenter/>) that you want to participate to this joint minisymposia and send an email to chao.gao@ntnu.no and chiara.bertolin@ntnu.no.

Best regards

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