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EUROPEAN CONFERENCE ON NON-DESTRUCTIVE TESTING

SPECIAL SESSION

From Limited Data to Reliable Diagnostics: Data Generation, Augmentation and Exploitation for Machine Learning

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OBJECTIVE AND TOPICS:

The objective of this special session is to gather contributions on the generation and/or intelligent exploitation of datasets to ensure satisfactory performance of machine learning models in NDT&E and SHM, where data availability is often limited. Submissions that bridge the gap between theoretical and practical engineering domains are particularly encouraged, with the aim of fostering the development of intelligent, interpretable, and deployable solutions.
In this context, we especially welcome approaches that integrate data-driven and simulation-driven strategies. This includes the generation or augmentation of datasets using physics-based simulators, virtual flaw generation and generative models. It also includes the intelligent exploitation of existing datasets through a variety of machine learning techniques, including transfer learning, domain adaptation, physics-informed and knowledge-driven learning, meta-learning, and few- or zero-shot learning.

Contributions may address machine learning tasks such as classification and regression for diagnostic purposes (e.g. defect detection, classification and characterisation) and metamodeling applications (e.g. realistic data generation, uncertainty quantification and propagation). Traditional and emerging inspection technologies may be considered, including radiographic testing, ultrasonic testing, ultrasonic guided waves, acoustic emission, eddy current testing, thermography and ground penetrating radar.

Areas of interest include, but are not limited to:
Data exploitation and generation

- Numerical simulations, Virtual Flaw Generation, Experimental Datasets, Generative Models (e.g., GANs, Diffusion)

Machine Learning Techniques of Interest and applications:

- Deep Neural Networks, Kernel Methods (e.g., Support Vector Machines, Gaussian Processes), Ensemble Methods
- Transfer Learning, Physics-Informed Learning, Knowledge-Driven Learning, Meta-Learning, Few- & Zero- Shot Learning
- Uncertainty Quantification, Explainability & Interpretability

NDT&E and SHM methods and applications

- Radiographic Testing, Ultrasonic Testing, Guided Wave Ultrasonics, Acoustic Emission, Eddy Current Testing, Infrared Thermography Testing, Ground Penetrating Radar

All the instructions for paper submission are included in the conference website: https://www.ecndt2026.org