



European Safety and
Reliability Conference
14–19 June 2026
Braga, Portugal

SS-05: Explainable Artificial Intelligence (XAI) and Causal Modeling for Reliability, Availability, Maintainability and Safety (RAMS) Applications

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Description

The effective use of Artificial Intelligence (AI) models within frameworks for the assessment of system Reliability Availability Maintainability and Safety (RAMS) remains limited. One of the main reasons is the "black-box" nature of AI models, i.e. their inner workings are obscure. This is particularly detrimental in RAMS applications, as the lack of transparency reduces trust and hinders accountability.

Explainable AI (XAI) addresses this issue by aiming to unlock the black box, making AI models more transparent and interpretable. This effort is complemented by Causal Modeling, which moves beyond correlations to identify the underlying cause-and-effect relationships within the system.

This special session is intended to present contributions to the development of XAI and Causal Modeling for RAMS applications, in an effort to gather the expert community and share knowledge for future advancements and developments in the field.

Main Topics

XAI Methods:

- Ante-hoc (e.g. rule-based systems and decision trees)
- Post-hoc (e.g. LIME and SHAP)
- Visual explanations (e.g. feature visualization and saliency maps)
- Model-specific (e.g. DeepLIFT and integrated gradients)
- Inherently explainable models

Causal Modeling:

- Causal Discovery
- Causal Inference
- Counterfactual Analysis
- Integration of Causal Modeling and XAI

Applications:

- Safety analysis
- Risk assessment and management
- Anomaly detection
- Fault diagnostics and prognostics
- Predictive maintenance
- Accident anticipation
- Human-AI collaboration