ESREL 2025 in Stavanger, June 15-19
ESREL 2025 Special Session Submission Form

Topic:

Natural Language Processing for RAMS applications

Description:

Maintenance work orders, accident reports and other working documents (e.g., maintenance instructions, industry standards and Failure Mode and Effect Analysis Tables), contain valuable information for Reliability, Availability, Maintainability and Safety (RAMS) of components and systems. Exploiting these sources of information is a challenging task due to their unstructured nature, inconsistent formatting and the complexity of domain-specific language. Natural Language Processing (NLP) methods, such as vector space models, Pretrained Language Models (PLMs) and Large Language Models (LLMs), Knowledge Graphs (KGs) and ontologies can be used to organise information and extract knowledge relevant to Reliability, Availability, Maintenance and Safety (RAMS) analysis.

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

Examples of models are:

- Vector space models, e.g., Term Frequency Inverse Document Frequency (TFIDF), topic modeling, Word2Vec, Global Vectors for Word Representation (Glove), Doc2Vec;
- Transformer-based models:
    - Pretrained Language Models (PLMs), e.g., Bidirectional Encoder Representations from Transformers (BERT), Robustly Optimized BERT Pretraining Approach (RoBERTa), DistilBERT.
    - Large Language Models (LLMs), e.g., Generative Pretrained Transformer (GPT), Text-to-Text Transfer Transformer (T5), Large Language Model Meta AI (LlaMA), Claude, Gemini;
- Multimodal models, e.g., Data2Vec, Multimodal-BERT, Cross-Modal Retrieval Networks, Foundation models for multimodal data.

Examples of applications are:

- Identification of accident types, causes and influencing factors (including human factors);
- Hazard analysis (e.g., HAZOP, FMEA);
- Reliability parameter estimation;
- Definition of logic and causal models for RAMS (e.g., Markov models, Petri nets, BNs);
- Evaluation of accident consequences and severity;
- Work Order Processing;
- Information retrieval from maintenance documents;
- Labelling of sensor data using maintenance reports.

Organizer(s):

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