GKN AEROSPACE

Master Thesis – Designing Secure LLM Frameworks and leveraging them for rare event detection in Small, Unbalanced and Noisy datasets (2 Students)

About us

GKN Aerospace is the world's leading multi-technology tier 1 aerospace supplier. With 55 manufacturing locations in 15 countries, we serve over 90% of the world's aircraft and engine manufacturers. We design and manufacture innovative smart aerospace systems and components. Our technologies are used in aircraft ranging from the most used civil aircraft to the world's advanced 5th generation fighter aircraft and the Ariane orbital rockets used by ESA.

Problem Description

Additive Manufacturing (AM) is one of the most actively researched domains in modern industries, producing massive volumes of multimodal data daily. The aim of this task is to design and evaluate secure LLM-based frameworks that preserve privacy and robustness while improving rare-event detection performance in small, noisy and unbalanced datasets. Given the sensitive and export-controlled nature of the data, it is imperative to ensure strict data security and confidentiality throughout the process. Students are expected to:

- To design a secure and privacy preserving LLM-based framework tailored for rare-event detection in small, unbalanced and noisy datasets.
- To leverage LLMs for extracting complex temporal and contextual patterns to improve the identification of rare events beyond traditional approaches.
- To provide interpretable, human-readable explanations for rare-event detections that enhance user trust while preventing leakage of sensitive data.
- To systematically evaluate the framework with respect to detection performance (e.g., PR-AUC, F1, MCC), robustness to adversarial attacks, explainability, and computational overhead.
- The LLM should generate structured reports using a standard template that summarize detection outcomes.

Qualifications:

- Masters in Computer Science or Mathematics or Physics or any related engineering background is preferred.
- Good theoretical and Hands experience on LLM's is a must.
- Proficient in Python and ML frameworks such as PyTorch, TensorFlow.
- Curious, independent, and passionate about solving challenging problems.
- Knowledge in Additive Manufacturing is a merit.

Please send your applications to: **nikhil.masinete@gknaerospace.com**