Abstract

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AI-Based Extraction and Systematic Mapping of Field Evidence to Safety Goals

Traditional safety engineering is often static, whereas new demands driven by rising system complexity, modern regulations (such as the EU AI Act for continuous monitoring) and the rise of Software-Defined Vehicles (SDV) require dynamic, updateable assurance cases backed by field evidence. Though progress is being made, many projects keep engineering artifacts in heterogeneous format and separate tool silos. Moreover, the process of deriving evidence from field data is often not systematic, and the creation of runtime monitors is typically of an ad-hoc nature. The core challenge is how to derive sound safety indicators based on field monitoring that allow for valid statements about the safety state of the system.

To address this, we set up an automated ETL (Extract Transform Load) pipeline for requirements in IBM DOORS to ingest engineering artefacts into a Neo4j graph database. This tooling enables LLM-assisted semantic extraction based on a dedicated safety ontology and taxonomy of Safety Performance Indicators (SPIs). Consequently, we establish a traceable link between dynamic field evidence and static safety arguments.

Using a real-world Automatic Emergency Braking example, we show the derivation from functional design requirements to a safety performance indicator and its runtime monitor. Currently, the approach is piloted on selected features with available monitors. Finally, we discuss how we plan to scale the AI-Assisted pipeline approach from proof-of-concept to deployment across the full requirements database and connect to live data to form a dynamic assurance case.

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