

Non-Functional Requirements for Machine Learning Systems

Machine learning (ML) systems are increasingly deployed in safety-critical domains, raising concerns about non-functional requirements (NFRs) such as fairness, transparency, explainability, and safety. Many NFRs require reinterpretation, some gain or lose relevance, and new ones like retrainability emerge. Defining and measuring them is challenging due to the unique nature of ML systems.

This research applies a design science approach—combining interviews, surveys, literature mapping, and domain-specific investigations in the automotive industry—to identify practitioner challenges and needs. Based on these insights, it delivers a validated five-step NFR management framework and ML-specific maintainability metrics. The findings show that managing NFRs is complex yet essential for trustworthy, high-quality ML systems, offering both practical tools and theoretical contributions that clarify critical NFRs, bridge research–practice gaps, and guide future work to improve quality assurance in safety-critical ML deployments.



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