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Software engineering — Systems and software Quality Requirements and Evaluation (SQuaRE) — Quality model for AI systems

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Foreword

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Introduction

High-quality software products and computer systems are crucial to stakeholders. Quality models, quality requirements, quality measurement, and quality evaluation are standardized within the International Standards on SQuaRE, see Annex A for further information.

AI systems require additional properties and characteristics of systems to be considered, and stakeholders have varied needs. AI systems have different properties and characteristics. For example, AI systems can:

— replace human decision-making;

— be based on noisy, or incomplete data;

— be probabilistic;

— adapt during operation.

According to ISO/IEC TR 24028,[2] trustworthiness has been understood and treated as both an ongoing organizational process as well as a non-functional requirement specifying emergent properties of a system — that is, a set of inherent characteristics with their attributes — within the context of quality of use as indicated in ISO/IEC 25010.

ISO/IEC TR 24028 discusses the applicability to AI systems of that have been developed for conventional software. According to ISO/IEC TR 24028, does not sufficiently address the data-driven unpredictable nature of AI systems. While considering the existing body of work, ISO/IEC TR 24028 identifies the need for developing new International Standards for AI systems that can go beyond the characteristics and requirements of conventional software development.

ISO/IEC TR 24028 contains a related discussion on different approaches to testing and evaluation of AI systems. It states that for testing of an AI system, modified versions of existing software and hardware verification and validation techniques are needed. It identifies several conceptual differences between many AI systems and conventional systems and concludes that “the ability of the [AI] system to achieve the planned and desired result … may not always be measurable by conventional approaches to software testing”. Testing of AI systems is addressed in ISO/IEC TR 29119-11:2020.[3]

This document outlines an application-specific AI system extension to the SQuaRE quality model specified in ISO/IEC 25010.

AI systems perform tasks. One or more tasks can be defined for an AI system. Quality requirements can be specified for the evaluation of task fulfilment.

The quality model is considered from two perspectives, product quality as described in Clause 5 and quality in use in Clause 6. The relevance of these terms is explained, and links to other standardization deliverables (e.g. the ISO/IEC 24029 series[4][5]) are highlighted.

ISO/IEC 25012:2008[6] contains a model for data quality that is complementary to the model defined in this document. ISO/IEC 25012:2008 is being extended for AI systems by the ISO/IEC 5259 series.[7]

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Software engineering — Systems and software Quality Requirements and Evaluation (SQuaRE) — Quality model for AI systems

1 Scope

This document outlines a quality model for AI systems and is an application-specific extension to the standards on SQuaRE. The characteristics and sub-characteristics detailed in the model provide consistent terminology for specifying, measuring and evaluating AI system quality. The characteristics and sub-characteristics detailed in the model also provide a set of quality characteristics against which stated quality requirements can be compared for completeness.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 25010:2011, *Systems and software engineering — Systems and software Quality Requirements and Evaluation (SQuaRE) — System and software quality models*

ISO/IEC 22989:2022, *Information technology — Artificial intelligence — Artificial intelligence concepts and terminology*

ISO/IEC 23053:2022, *Framework for Artificial Intelligence (AI) Systems Using Machine Learning (ML)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 22989:2022, ISO/IEC 23053:2022 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1 General

3.1.1
measure, noun
variable to which a value is assigned as the result of measurement

Note 1 to entry: The term “measures” is used to refer collectively to base measures, derived measures, and indicators.

[SOURCE: ISO/IEC/IEEE 15939:2017, 3.15]

3.1.2
measure, verb
make a measurement

[SOURCE: ISO/IEC 25010:2011, 4.4.6]

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