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Information technology — Artificial intelligence — Objectives and approaches for explainability and interpretability of machine learning (ML) models and artificial intelligence (AI) systems

Technologies de l'information — Intelligence artificielle — Objectifs et approches pour l'explicabilité et l'interprétabilité des modèles d'apprentissage automatique (AA) et des systèmes d'intelligence artificielle (IA)

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Foreword

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This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 42, *Artificial intelligence*.

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Introduction

When AI systems are used to help make decisions that affect people's lives, it is important that people understand how those decisions are made. Achieving useful explanations of the behaviour of AI systems and their components is a complex task. Industry and academia are actively exploring emerging methods for enabling explainability, as well as scenarios and reasons why explainability can be required.

Due to the multitude of stakeholders and communities contributing to this effort, the field is suffering from a certain terminological inconsistency. Most notably, the methods to provide such explanations of the behaviour of an AI system are discussed under the banner of "explainability", "interpretability", (sometimes even other terms like "transparency"), raising the question of how these terms relate to each other. This document aims to provide practical guidance for stakeholders regarding compliance with regulatory requirements labelled one way or another. With this goal in mind, it uses the umbrella term "explainability" and provides a non-exhaustive taxonomy and list of approaches that stakeholders can use to comply with regulatory requirements.

While the overarching goal of explainability is to evaluate the trustworthiness of AI systems, at different stages of the AI system life cycle, diverse stakeholders can have more specific objectives in support of the goal. To illustrate this point, several examples are provided. For developers, the goal can be improving the safety, reliability and robustness of an AI system by making it easier to identify and fix bugs. For users, explainability can help to decide how much to rely on an AI system by uncovering potential sources or existence of unwanted bias or unfairness. For service providers, explainability can be essential for demonstrating compliance with legal requirements. For policy makers, understanding the capabilities and limitations of different explainability methods can help to develop effective policy frameworks that best address societal needs while promoting innovation. Explanations can also help to design interventions to improve business outcomes.

This document describes the applicability and the properties of existing approaches and methods for improving explainability of machine learning (ML) models and AI systems. This document guides stakeholders through the important considerations involved with selection and application of such approaches and methods.

While methods for explainability of ML models can play a central role in achieving the explainability of AI systems, other methods such as data analytics tools and fairness frameworks can contribute to the understanding of AI systems' behaviour and outputs. The description and classification of such complementary methods are out of scope for this document.

Information technology — Artificial intelligence — Objectives and approaches for explainability and interpretability of machine learning (ML) models and artificial intelligence (AI) systems

1 Scope

This document describes approaches and methods that can be used to achieve explainability objectives of stakeholders with regard to machine learning (ML) models and artificial intelligence (AI) systems' behaviours, outputs and results. Stakeholders include but are not limited to, academia, industry, policy makers and end users. It provides guidance concerning the applicability of the described approaches and methods to the identified objectives throughout the AI system's life cycle, as defined in ISO/IEC 22989.

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