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Information technology — Artificial intelligence (AI) — Bias in AI systems and AI aided decision making

Technologie de l'information — Intelligence artificielle (IA) — Tendance dans les systèmes de l'IA et dans la prise de décision assistée par l'IA



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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

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

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

Bias in artificial intelligence (AI) systems can manifest in different ways. AI systems that learn patterns from data can potentially reflect existing societal bias against groups. While some bias is necessary to address the AI system objectives (i.e. desired bias), there can be bias that is not intended in the objectives and thus represent unwanted bias in the AI system.

Bias in AI systems can be introduced as a result of structural deficiencies in system design, arise from human cognitive bias held by stakeholders or be inherent in the datasets used to train models. That means that AI systems can perpetuate or augment existing bias or create new bias.

Developing AI systems with outcomes free of unwanted bias is a challenging goal. AI system function behaviour is complex and can be difficult to understand, but the treatment of unwanted bias is possible. Many activities in the development and deployment of AI systems present opportunities for identification and treatment of unwanted bias to enable stakeholders to benefit from AI systems according to their objectives.

Bias in AI systems is an active area of research. This document articulates current best practices to detect and treat bias in AI systems or in AI-aided decision-making, regardless of source. The document covers topics such as:

— an overview of bias (5.2) and fairness (5.3);

— potential sources of unwanted bias and terms to specify the nature of potential bias (Clause 6);

— assessing bias and fairness (Clause 7) through metrics;

— addressing unwanted bias through treatment strategies (Clause 8).

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Information technology — Artificial intelligence (AI) — Bias in AI systems and AI aided decision making

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1 Scope

This document addresses bias in relation to AI systems, especially with regards to AI-aided decision-making. Measurement techniques and methods for assessing bias are described, with the aim to address and treat bias-related vulnerabilities. All AI system lifecycle phases are in scope, including but not limited to data collection, training, continual learning, design, testing, evaluation and use.

2 Normative references

ISO/IEC 22989[1)], *Information technology — Artificial intelligence — Artificial intelligence concepts and terminology*

ISO/IEC 23053[2)], *Framework for Artificial Intelligence (AI) Systems Using Machine Learning (ML)*

3 Terms and definitions

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

ISO and IEC maintain terminological 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 Artificial intelligence

3.1.1
maximum likelihood estimator
estimator assigning the value of the parameter where the likelihood function attains or approaches its highest value

Note 1 to entry: Maximum likelihood estimation is a well-established approach for obtaining parameter estimates where a distribution has been specified [for example, normal, gamma, Weibull and so forth]. These estimators have desirable statistical properties (for example, invariance under monotone transformation) and in many situations provide the estimation method of choice. In cases in which the maximum likelihood estimator is biased, a simple bias correction sometimes takes place.

[SOURCE: ISO 3534-1:2006, 1.35]

3.1.2
rule-based systems
knowledge-based system that draws inferences by applying a set of if-then rules to a set of facts following given procedures

[SOURCE: ISO/IEC 2382:2015, 2123875]

1) Under preparation. Stage at the time of publication: ISO/DIS 22989:2021.

2) Under preparation. Stage at the time of publication: ISO/DIS 23053:2021.

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