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**Safety of machinery — Relationship  
with ISO 12100 —**

**Part 5:  
Implications of artificial intelligence  
machine learning**

*Sécurité des machines — En relation avec l'ISO 12100 —*

*Partie 5: Implications de l'intelligence artificielle pour l'apprentissage  
automatique*



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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](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 199, *Safety of machinery*.

A list of all parts in the ISO/TR 22100 series can be found on the ISO website.

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](http://www.iso.org/members.html).

## Introduction

The primary purpose of this document is to provide guidance for the development of artificial intelligence (AI) machine learning applications. Safety can be compromised due to the significant complexity of introducing AI machine learning to machines.

A control system can use machine learning (a technology of artificial intelligence) to improve performance of the machine or to execute tasks. The control system learns its expected behaviour through training. This involves two stages: training and inference (autonomous operation).

This document assists machinery designers to develop solutions appropriate for their particular applications. It describes how to apply the risk assessment process according to ISO 12100 to AI machine learning applications.

AI machine learning is a rapidly evolving technology and has not been a subject of machinery safety until now.



# Safety of machinery — Relationship with ISO 12100 —

## Part 5: Implications of artificial intelligence machine learning

### 1 Scope

This document addresses how artificial intelligence machine learning can impact the safety of machinery and machinery systems.

This document describes how hazards being associated with artificial intelligence (AI) applications machine learning in machinery or machinery systems, and designed to act within specific limits, can be considered in the risk assessment process.

This document is not applicable to machinery or machinery systems with AI applications machine learning designed to act beyond specified limits that can result in unpredictable effects.

This document does not address safety systems with AI, for example, safety-related sensors and other safety-related parts of control systems.

### 2 Normative references

There are no normative references in this document.

### 3 Terms and definitions

For the purposes of this document, the following terms and definitions 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 <http://www.electropedia.org/>

#### 3.1

##### **artificial intelligence**

##### **AI**

branch of science devoted to developing data processing systems that perform functions normally associated with human intelligence, such as reasoning, learning, and self-improvement

[SOURCE: ISO/IEC 2382:2015, 2121393, modified – The word "computer" has been deleted from the definition.]

#### 3.2

##### **machine learning**

process using algorithms rather than procedural coding that enables learning from existing data in order to predict future outcomes

[SOURCE: ISO/IEC 38505-1:2017, 3.7]