



# Technical Report

**ISO/IEC TR 24722**

## **Information technology — Biometrics — Multimodal and other multibiometric fusion**

*Technologies de l'information — Biométrie — Fusion  
multimodale et autre fusion multibiométrique*

**Third edition  
2024-12**



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Published in Switzerland

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## Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

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 document 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) or [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs)).

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This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 37, *Biometrics*.

This third edition cancels and replaces the second edition (ISO/IEC TR 24722:2015), which has been technically revised.

The main changes are as follows:

- the content of Clause 3 has been removed and ISO/IEC 2382-37 has been listed as a normative reference;
- to enhance information accessibility, symbol descriptors have been paired with clear descriptions;
- the structure of the document has been updated, and various editorial modifications have been made, in order to improve technical accuracy and bring the document in line with the most recent edition of the ISO/IEC Directives Part 2.

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) and [www.iec.ch/national-committees](http://www.iec.ch/national-committees).

## Introduction

Some applications of biometrics require a level of biometric performance that is difficult to obtain with a single biometric measure. Such applications include the prevention of multiple applications for national identity cards and security checks for air travel. In addition, provisions are needed for data subjects who are unable to give a reliable biometric sample for some biometric characteristic types.

Use of multiple biometric measurements from substantially independent biometric sensors, algorithms or characteristic types typically gives improved technical performance and reduces risk. This includes an improved level of performance where not all biometric measurements are available, such that decisions can be made from any number of biometric measurements within an overall policy on accept/reject thresholds.

Of the various forms of multibiometric systems, the potential for multimodal biometric systems, each using an independent measure, has been discussed in technical literature since at least 1974.[\[22\]](#),[\[45\]](#) Advanced methods for combining measures at the score level have been discussed in References [\[15\]](#) and [\[16\]](#). At the current level of understanding, combining results at the score level typically requires knowledge of both mated and non-mated score distributions. All of these measures are highly application-dependent and generally unknown in any real system. Research on the methods not requiring previous knowledge of the score distributions is continuing and research on fusion at both the image and feature levels is still progressing.

Given the current state of research into these questions and the highly application-dependent and generally unavailable data required for proper fusion at the score level, work on multibiometric fusion can in the meantime be considered mature. By intention, this document is not issued as International Standard, in order not to force industrial solutions to conform to the methodology described herein. Rather, the present edition of this document provides a mature technical description for developments of multibiometric systems. It also provides a reference on multibiometric fusion for developers of other biometric standards and implementers.



# Information technology — Biometrics — Multimodal and other multibiometric fusion

## 1 Scope

This document provides descriptions and analyses of current practices on multimodal and other multibiometric fusion, including (as appropriate) references to more detailed descriptions.

This document contains descriptions and explanations of high-level multibiometric concepts to aid in the explanation of multibiometric fusion approaches including: multi-characteristic-type, multi-instance, multi-sensorial, multialgorithmic, decision-level and score-level logic.

## 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 2382-37, *Information technology — Vocabulary — Part 37: Biometrics*