NFIQ 2 v2.3 and the Future of ISO/IEC 29794-4

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NIST INFORMATION TECHNOLOGY LABORATORY

Collaboration

NIST

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY
U.S. DEPARTMENT OF COMMERCE

Federal Office for Information Security

Fraunhofer IGD

Bundeskriminalamt

h_da
HOCHSCHULE DARMSTADT
UNIVERSITY OF APPLIED SCIENCES

secunet

Special ISO/IEC 29794-4:2024/v2.3 thank you:

Christoph Busch, Daniel Hartung, Olaf Henniger, Ralph Lessmann, Sven Utcke

Purpose

NFIQ 2 v2.3: 0
NFIQ 2 v2.2: 1

NFIQ 2 v2.3: 48
NFIQ 2 v2.2: 49

NFIQ 2 v2.3: 98
NFIQ 2 v2.2: 94

Quality
degree to which a biometric sample meets the specified requirements for its targeted application (i.e., character, fidelity, ***utility***)

Utility
degree to which a biometric sample supports biometric recognition performance (e.g., FNMR/FMR)

Image source: NIST NFIQ 2 Conformance Dataset (00002497_N_500_palm_09, 00002523_S_500_slap_04, 00002645_S_500_slap_01). Definitions: ISO/IEC 29794-1:2024

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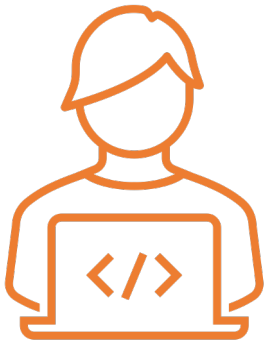
ISO/IEC 29794-4:2024 Changes

- Readability improvements
- Revised conformance dataset
- Alignment
  - ISO/IEC 29794-1:2024
    - Quality component normalization
    - Terminology
  - Reference Implementation
- Bug fixes to quality features

Alignment

ISO/IEC 29794-4:2017

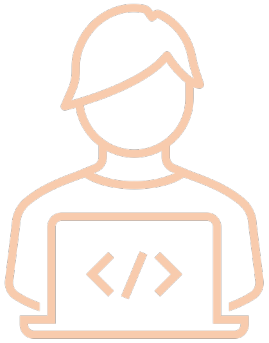


NFIQ 2 v2.0

NFIQ 2 v2.1
NFIQ 2 v2.2

Alignment

ISO/IEC 29794-4:2017



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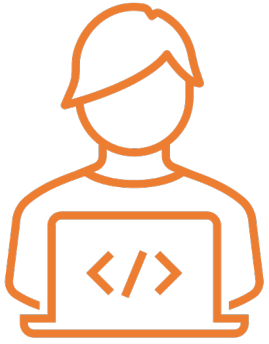
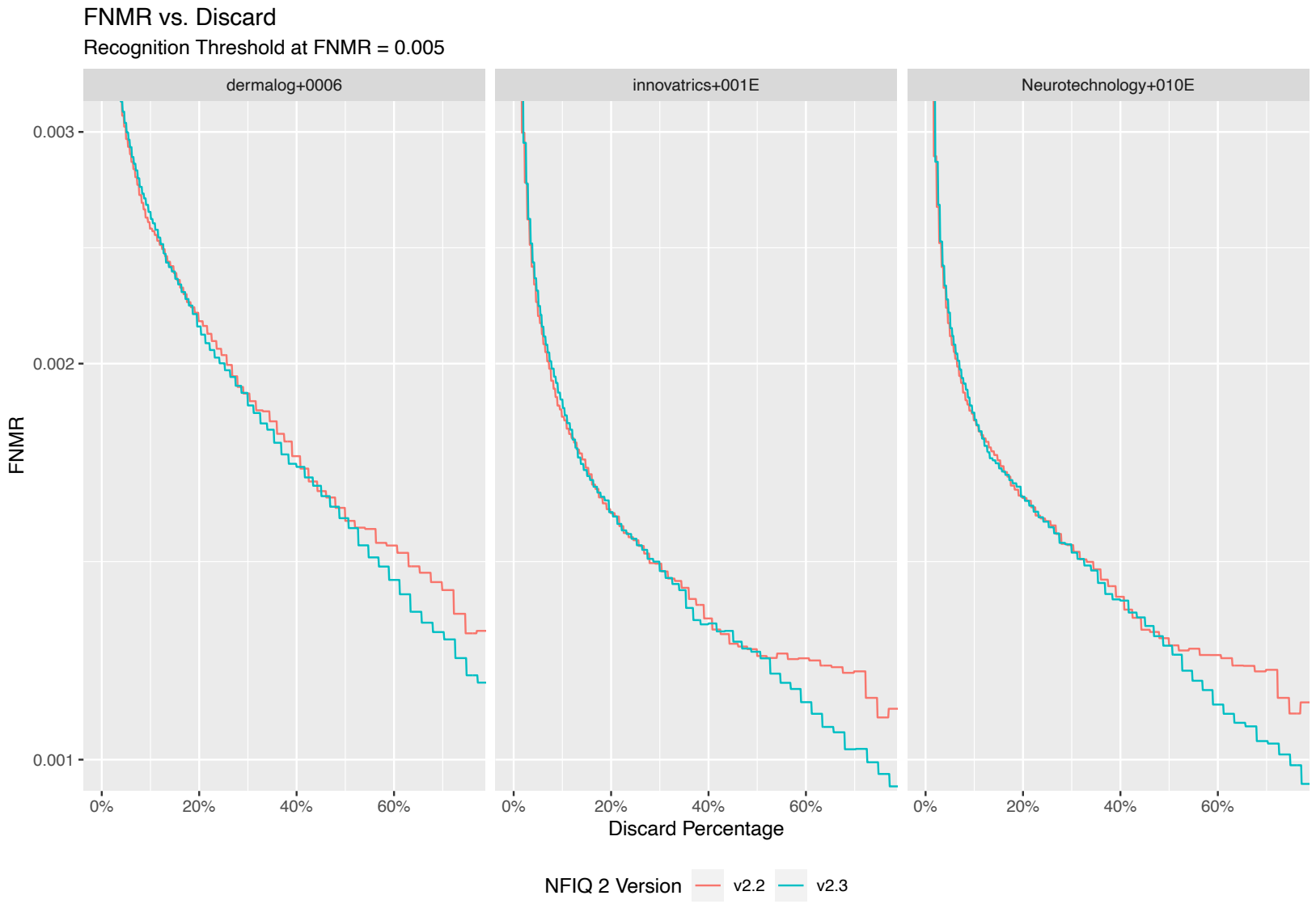
ISO/IEC 29794-4:2024



NFIQ 2 v2.3

FNMR vs. Discard



Thank you: Dermalog, Innovatrics, Neurotechnology. MINEX III submissions used for EDC with company permission.

Image source: Author.

FMR vs. Discard

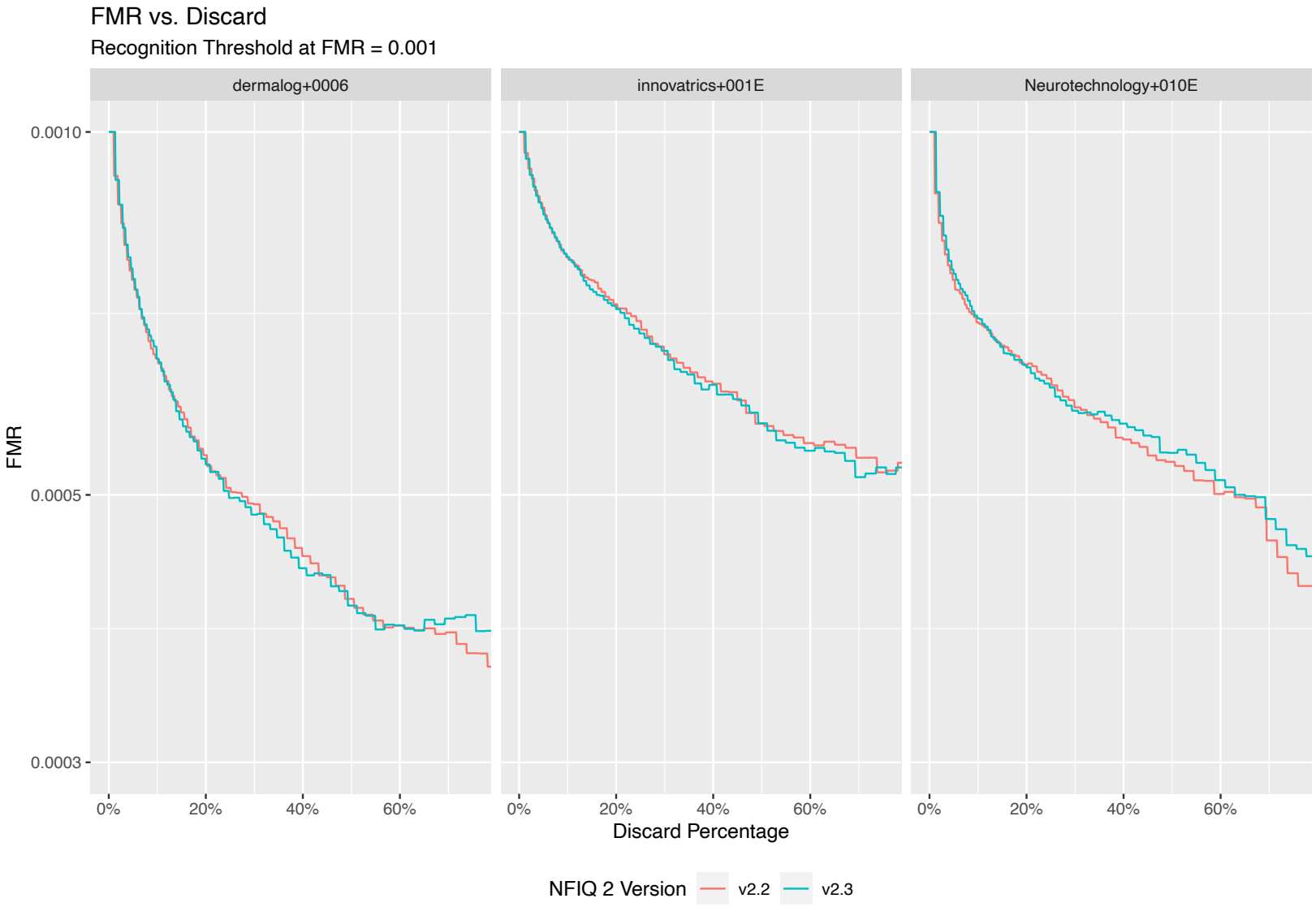


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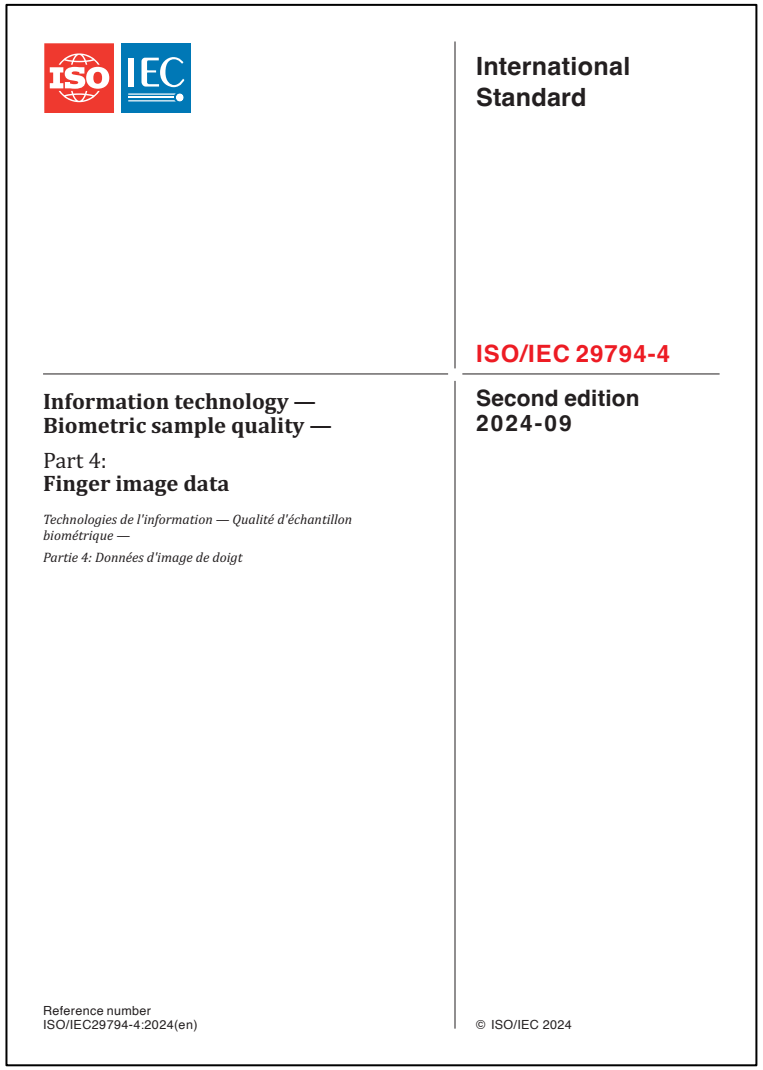
Image source: Author.

Version 2.3 Changes

- Quality Features Changes
  - Block size correction
  - ROI bug fix
  - Circularity of angles
- Quality component normalization
- Retraining
  - Faster (6%), smaller (60%) model
- Other:
  - OpenCV 4.10
  - Some dependencies updated
  - Windows debug support
  - Arbitrary number of trees
  - API terminology alignment with ISO/IEC 29794-4:2024, ISO/IEC 29794-1:2024
  - +macOS 15 (Universal), +Ubuntu 24.04 (x64), +Raspberry Pi OS 12

Standard



ISO IEC

International Standard

ISO/IEC 29794-4

Second edition
2024-09

Information technology — Biometric sample quality —

Part 4:
Finger image data

Technologies de l'information — Qualité d'échantillon biométrique —

Partie 4: Données d'image de doigt

Reference number
ISO/IEC29794-4:2024(en)

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https://www.iso.org/standard/83827.html
https://fingerprint.nist.gov/nfiq2

Image source: ISO/IEC JTC 1

Future/Wish List

- Intra-version calibration
- Impression types (rolls, contactless)
- Faster (optimize)
- More/better quality components
- More code examples
- Cleanroom implementation of existing quality components
- Better training
- Replace Random Forest?
- Mobile friendly out-of-the-box
- Native 1 000 PPI?
- Newer/better comparison algorithms
- Newer, better feature extractor
- …

Ad-Hoc Group for Finger Image Quality

Attendance

Organization	Count
AFNOR	1
ANSI	4
DIN	10
eu-LISA	1
European Commission	1
SFS	1

18 participants representing **6** organizations

- as of end of year 2024
- including 3 guests (DIN)

Additions to Scope

Current Scope

- 500 PPI + 8 BPP Grayscale + Ink Scan/Optical Area + Contact + Plain impression

Ranked Priorities

1. Rolled impression
2. Mobile + other capture technologies (e.g., TFT)
   - Profiles based on factors?
3. 1000 PPI
   - Resampling strategy?

Recommendations

1. Continue ad-hoc group through January 2026
    - New terms:
        - Determine roadmap for ISO/IEC 29794-4, edition 3
        - Develop and test reference implementation
            - Additions based on identified priorities
        - Provide status updates at July 2025 and January 2026 meetings
        - Advise on timeline for PWI or WD of ISO/IEC 29794-4, edition 3

Roadmap Questions

Questions

1. Should “manual” quality components be eliminated in favor of a neural network based only on similarity scores?

Current

Image source: ISO/IEC JTC 1

Question

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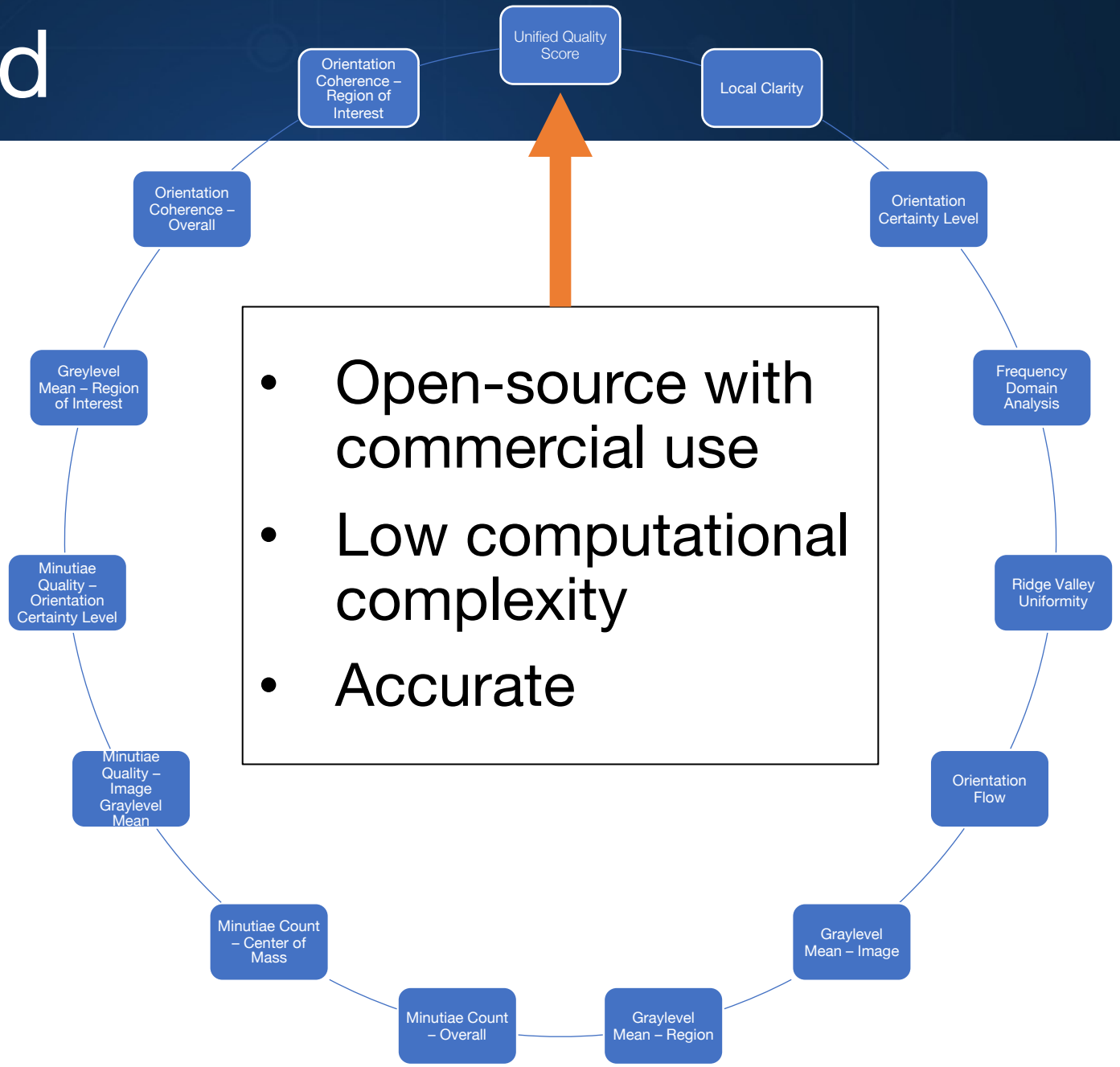
Current

Image source: ISO/IEC JTC 1

Proposed



- Open-source with commercial use
- Low computational complexity
- Accurate

Image source: ISO/IEC JTC 1

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2. Do you support investigating a "hybrid" manual + neural network approach?
3. Should machine-learned models (trained outside of SC 37) be permitted in ISO/IEC 29794-4?

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Questions

4. Should affordances be made to allow for alternate reference implementations?
    - Swapping minutiae extractor*, with placement conformance

*using your own vendor identifier

Open Questions

- Data (training and conformance)
  - New impression types
  - New capture technologies
  - Imageless training?

- Interaction with 29794-12 (fingermark)

Other Activities

- Reference implementation
  - Bug fixes
  - Optimizations
  - Build improvements
  - New quality components
- Standard text
  - Clarity, de-duplication
- New comparison algorithms
  - Training dataset selection
- NIST finger image quality evaluation
  - NIST random forest model

Formal request for contributions

Prepping for ISO/IEC 29794-4 Edition 3 Working Draft

Next Meeting

23 April 2025, 13:00 UTC

ISO/IEC JTC 1/SC 37/WG 3 N 1670

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https://fingerprint.nist.gov/nfiq2 | https://github.com/usnistgov/nfiq2