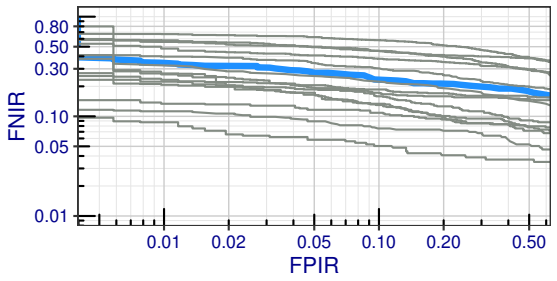
NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY
U.S. DEPARTMENT OF COMMERCE

Metric	Value		Place (of 15)
Rank-1 Hit Rate (i.e., no threshold)[1]	85.3 %	(highest: 96.5 %)	11
Benefit of providing EFS features	-20 pp	(highest: 97.2 %)	15
Benefit of reviewing 5 ranks	+6 pp	(highest: 97.2 %)	8
Rank-100 Hit Rate at FPIR = 10% (i.e., with threshold)	76.9 %	(highest: 95 %)	10
Latent Feature Extraction Duration (Average)	0.3 s	(fastest: 0.22 s)	2
Single Finger Feature Extraction Duration (Average)	0.3 s	(fastest: 0.26 s)	3
Search Duration (Average)	4 h 52 min	(fastest: 14.6 s)	15
Database Storage	736.7 GB	(smallest: 61.9 GB)	14
Search RAM Consumption (Average)	250.1 GB		

Detection Error Tradeoff (DET)

DET shows the tradeoff between false positive (i.e., "false alarm") and false negative (i.e., "miss") errors, the two types of errors produced by identification algorithms. Accuracy is a balance of the rate of these two errors, *FPIR* and *FNIR*, based on observed similarity scores while under evaluation. Because there is a tradeoff of error at every similarity score, a single performance number (e.g., hit rate) is inadequate to fully represent accuracy. **This is NIST's *preferred* accuracy metric** because operating costs grow with the rate of these two errors.

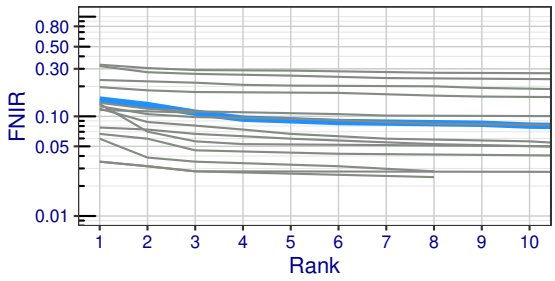


Neurotechnology+0108 is highlighted in blue, alongside all other algorithms in gray (algorithms target the lower-left).

Cumulative Match Characteristic (CMC)

CMC shows one type of error, false negatives, when considering subjects on a candidate list at or above a position (i.e., *rank*).

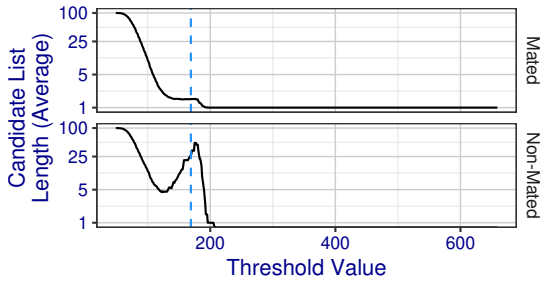
Hit rate is a popular metric derived from FNIR, by computing 100 × (1 – FNIR). The resulting value is the percentage of times that the correct subject appears at or above a rank in the candidate list. Despite its popularity, NIST prefers to report FNIR instead so that CMC results are directly comparable to DET results (on the left).



Neurotechnology+0108 is highlighted in blue, alongside all other algorithms in gray (lower is better).

Threshold

Algorithms indicate *support for same source* by producing a high similarity score. Points on a DET curve are associated with a similarity score, allowing the rate of errors in a system to be managed by determining an acceptable similarity score called a *threshold*. A higher threshold likely corresponds with fewer subjects for manual review.



The similarity score indicated in blue is the threshold at which Neurotechnology+0108 achieves 10% FPIR.

Considerations

CMC and hit rate do not consider the effect of the similarity score assigned to a subject on the candidate list. This means that subjects with *limited support for same source* and *strong support for same source* are weighted equally. Ignoring the similarity score has real world implications, such as unnecessary expenditure of practitioner time manually comparing fingerprints on weak hits.

Random Access Memory (RAM)

Unlike disk storage, RAM can be costly and is limited by the number of physical slots available on a motherboard. The amount of RAM required creates an upper bound on the number of searches that can be performed simultaneously. Constraints on RAM, combined with the search duration, *may* indicate the rate at which a practitioner can begin performing subsequent steps of their job and may imply a higher cost for required hardware. Measuring RAM accurately and fairly is complex and actively evolving in ELFT, so place is not currently reported.

ELFT evaluates algorithms, *not* systems. Algorithms may not behave identically *within* deployed systems.[2]

[1] Unless otherwise specified, values and plots displayed here are derived from searching the 285 probes from the dataset entitled *FBI-Provided Solved Dataset #1* where feature data was available but *not* provided (i.e., "lights-out" search), with ≈ 1 600 000 distractor subjects in the enrollment database.

[2] Name, version, country, and marketing information regarding Neurotechnology+0108 was provided by Neurotechnology and reproduced verbatim. NIST does not and cannot verify provided information, nor that the tested algorithm is identical to algorithms of the same name and version available from Neurotechnology. Any mention of commercial companies or products is for information only and does not imply recommendation or endorsement by NIST.