

Shanit

NFIQ-1/2 Observations

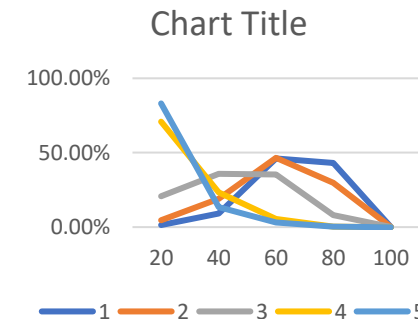
Initial results

Mapping of NFIQ-1 into NFIQ-2

Mapping of a couple of hundred thousand measurements

	20	40	60	80	100	
1	1.52%	9.06%	46.05%	43.16%	0.22%	100.00%
2	4.63%	18.96%	46.53%	29.69%	0.19%	100.00%
3	20.78%	35.71%	35.39%	8.11%	0.01%	100.00%
4	70.91%	23.25%	5.47%	0.36%	0.00%	100.00%
5	83.06%	13.42%	3.17%	0.36%	0.00%	100.00%

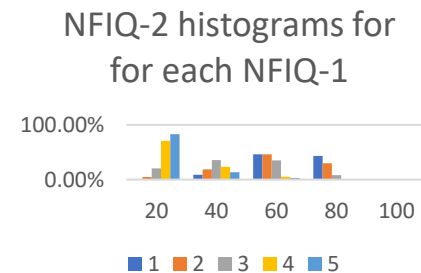
1. No one is perfect. Bin of 80-100 is relatively empty
2. NFIQ-1 = {1-2} concentrated 35-80
3. NFIQ-1 = 3 "smeared" 0-60
4. NFIQ-1 = 4 below 40
5. NFIQ-1 = 5 below 20



Mapping of NFIQ-1 into NFIQ-2

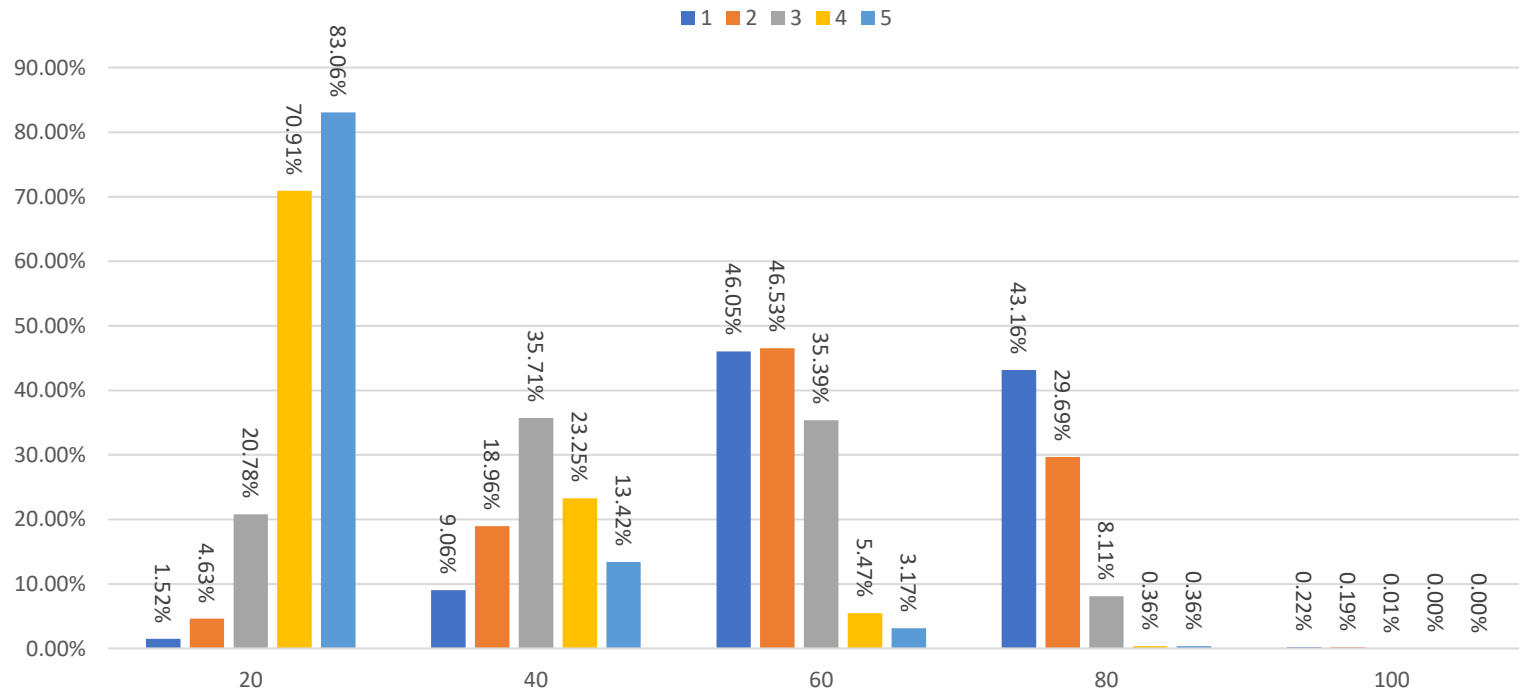
	20	40	60	80	100	
1	1.52%	9.06%	46.05%	43.16%	0.22%	100.00%
2	4.63%	18.96%	46.53%	29.69%	0.19%	100.00%
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5	83.06%	13.42%	3.17%	0.36%	0.00%	100.00%

1. There is no “sharp” mapping between NFIQ-1 and NFIQ-2.
2. So, where should one set the threshold ?



Mapping of NFIQ-1 into NFIQ-2

NFIQ-2 histograms for NFIQ-1

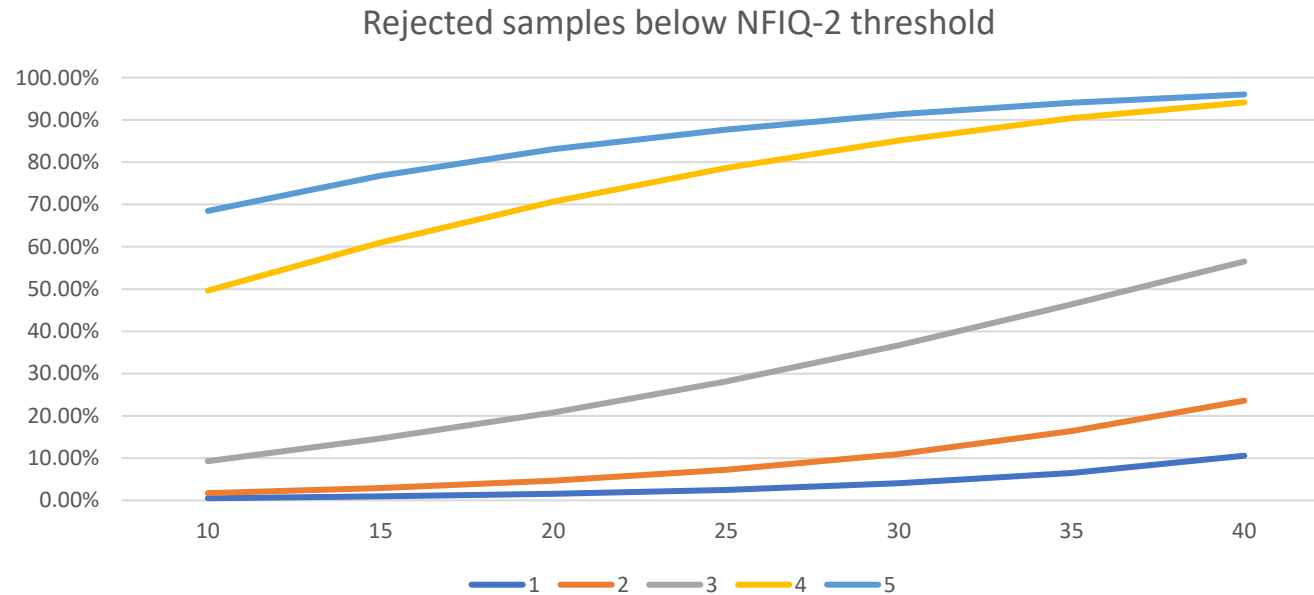


Mapping of NFIQ-1 into NFIQ-2

	Cumulative below NFIQ-2 score						
NFIQ-1	10	15	20	25	30	35	40
1	0.51%	0.95%	1.52%	2.44%	4.05%	6.46%	10.57%
2	1.68%	2.88%	4.63%	7.22%	10.91%	16.40%	23.59%
3	9.26%	14.61%	20.78%	28.14%	36.69%	46.38%	56.49%
4	49.61%	61.00%	70.71%	78.62%	85.14%	90.47%	94.16%
5	68.45%	76.80%	83.06%	87.72%	91.38%	94.09%	96.07%

1. If we set the NFIQ-2 threshold, say at 35 then:
2. 6.46% of NFIQ-1=1 would be rejected.
3. 16.40% of NFIQ-1=2 would be rejected.
4. 46.38% of FNIQ-1=3 would be rejected.

Mapping of NFIQ-1 into NFIQ-2



1. Most of NFIQ-1={1,2} are accepted, as expected.
2. Most of NFIQ-1={4,5} are rejected, as expected.
3. NFIQ-1=3 is ... interesting

Mapping of NFIQ-1 into NFIQ-2

Cumulative rejection at **typical** depository level

Cumulative below NFIQ-w score normalized with typical NFIQ-1 mix									
	Typical	10	15	20	25	30	35	40	
1	51.00%	0.26%	0.48%	0.78%	1.24%	2.07%	3.29%	5.39%	35
2	25.00%	0.42%	0.72%	1.16%	1.81%	2.73%	4.10%	5.90%	6.46%
3	20.00%	1.85%	2.92%	4.16%	5.63%	7.34%	9.28%	11.30%	16.40%
4	3.00%	1.49%	1.83%	2.12%	2.36%	2.55%	2.71%	2.82%	46.38%
5	1.00%	0.68%	0.77%	0.83%	0.88%	0.91%	0.94%	0.96%	90.47%
									94.09%

1. Regular planned depository (unlike latent) has strong accumulation of good data.
2. Thus, rejection by NFIQ-2 criteria should be normalized accordingly.

Mapping of NFIQ-1 into NFIQ-2



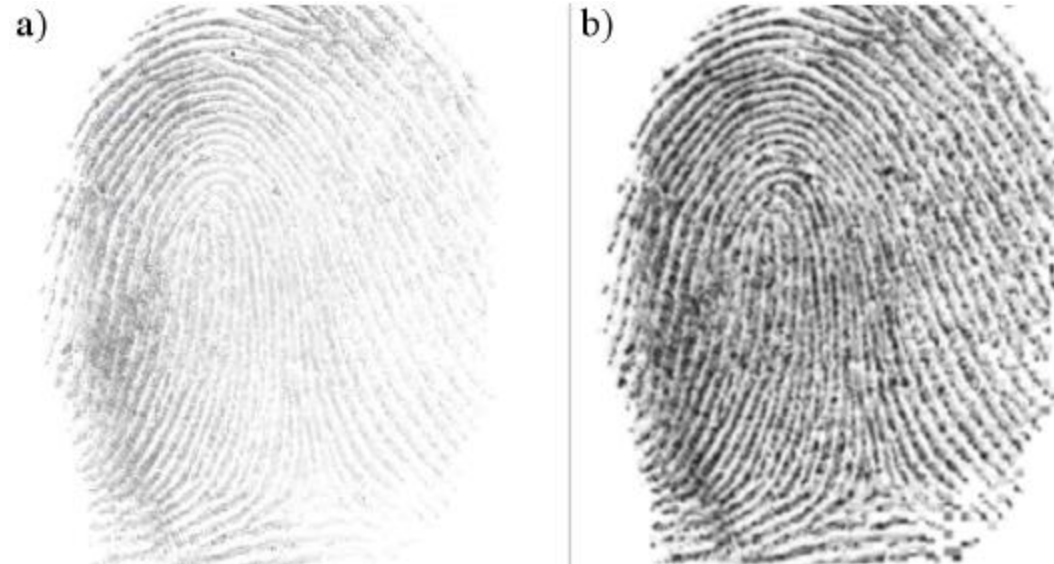
1. **Indication.** Many fingerprints with age-marks get NFIQ-1=5 and still a good NFIQ2 > 35.
2. We **agree with NFIQ-2.**

Mapping of NFIQ-1 into NFIQ-2



1. **Indication.** NFIQ-2 detects many cases of overlapping fingerprints that got good NFIQ-1.
2. We agree with NFIQ2.

Mapping of NFIQ-1 into NFIQ-2



1. **Indication.** Looks like NFIQ-2 is over-sensitive to fingerprint contrast.
2. In many such cases, good minutiae points are created with a sufficient number $\gg 40$ and with good distribution.

Mapping of NFIQ-1 into NFIQ-2



1. **Indication.** NFIQ-2 detects partial blurs.
2. We agree that such fingerprints is less than ideal for identity reference when stored in a depository. NFIQ-1 usually gives good score.

Mapping of NFIQ-1 into NFIQ-2

1. Generally speaking, we see that with $NFIQ-1=\{1,2\}$ an $NFIQ-2$ of $\gg 20$ would be ok.
2. With $NFIQ-1=3$ $NFIQ-2=35$ is needed but rejects about 50% of the fingerprints.
3. With $NFIQ-1=\{4,5\}$ some fingerprints are “salvaged” by $NFIQ-2$.

Mapping of NFIQ-1 into NFIQ-2

1. We miss some guidance on recommended NFIQ-2 thresholds for certain depository sizes. As fingerprint accuracy would have a lower effect on smaller depositories and more effect on larger depositories.
2. We miss some guidance in case more than one fingerprint is used.

Mapping of NFIQ-1 into NFIQ-2

In summary, NFIQ-2 provides more stable results than NFIQ-1.

We could see some benefit in watching **both** MFIQ1 and NFIQ2 for making accept/reject (try to re-enroll) decisions at enrollment.

Mapping of NFIQ-1 into NFIQ-2

Special thanks to all hard
workers on this important
project.

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