A: Datasheet

Algorithm: imagus_008

Developer: Imagus Technology Pty Ltd

Submission Date: 2022_05_26

Template size: 2048 bytes

Template time (2.5 percentile): 405 msec

Template time (median): 446 msec

Template time (97.5 percentile): 463 msec

Investigation:

Frontal mugshot ranking 302 (out of 353) −− FNIR(1600000, 0, 1) = 0.0860 vs. lowest 0.0008 from sensetime_007

Mugshot webcam ranking 260 (out of 315) −− FNIR(1600000, 0, 1) = 0.0933 vs. lowest 0.0056 from sensetime_007

Mugshot profile ranking 82 (out of 284) −− FNIR(1600000, 0, 1) = 0.3051 vs. lowest 0.0521 from sensetime_007

Immigration visa−border ranking 159 (out of 242) −− FNIR(1600000, 0, 1) = 0.0213 vs. lowest 0.0008 from sensetime_007

Immigration visa−kiosk ranking 108 (out of 239) −− FNIR(1600000, 0, 1) = 0.1192 vs. lowest 0.0487 from cubox_000

Identification:

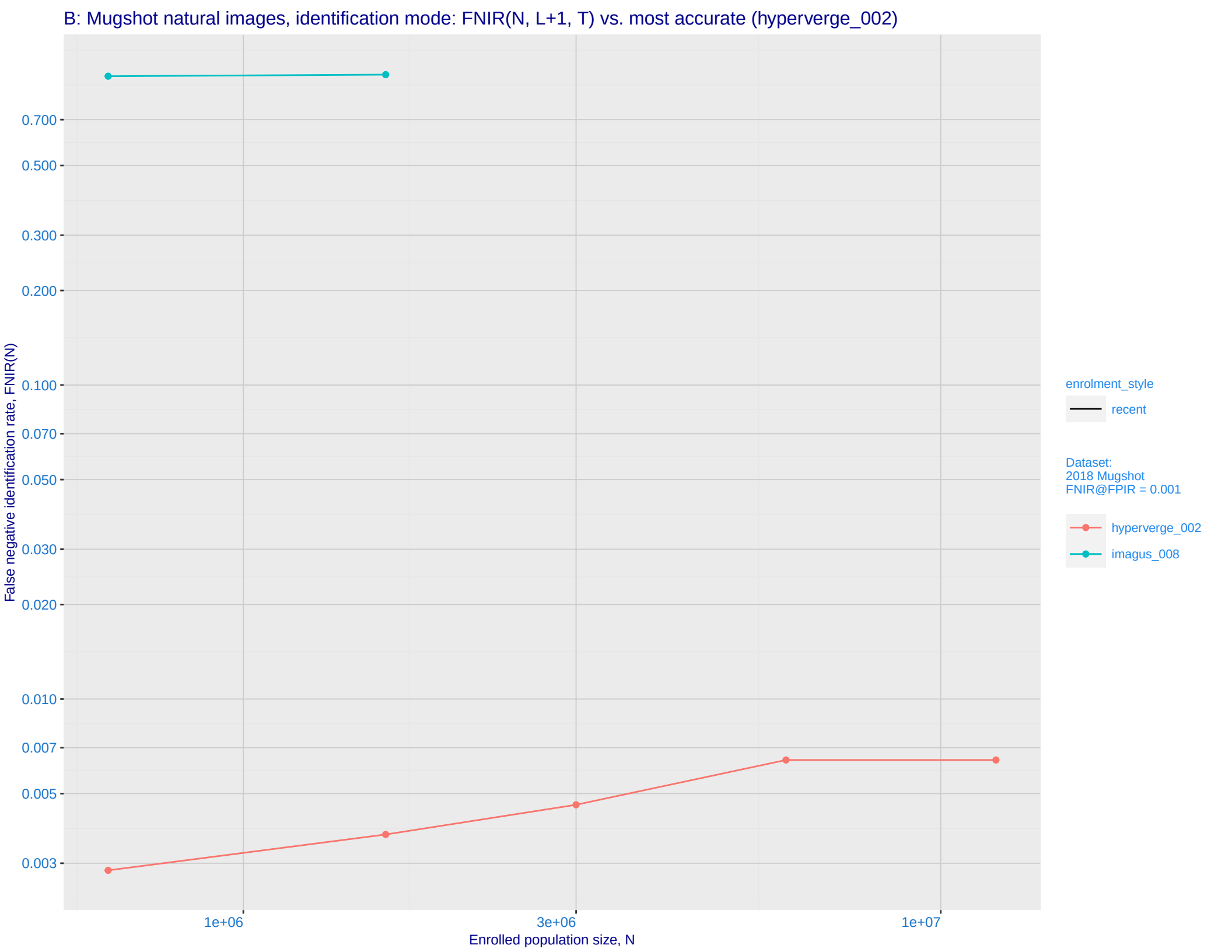
Frontal mugshot ranking 341 (out of 353) −− FNIR(1600000, T, L+1) = 0.9739, FPIR=0.001000 vs. lowest 0.0014 from sensetime_007

Mugshot webcam ranking 287 (out of 313) −− FNIR(1600000, T, L+1) = 0.7722, FPIR=0.001000 vs. lowest 0.0093 from sensetime_007

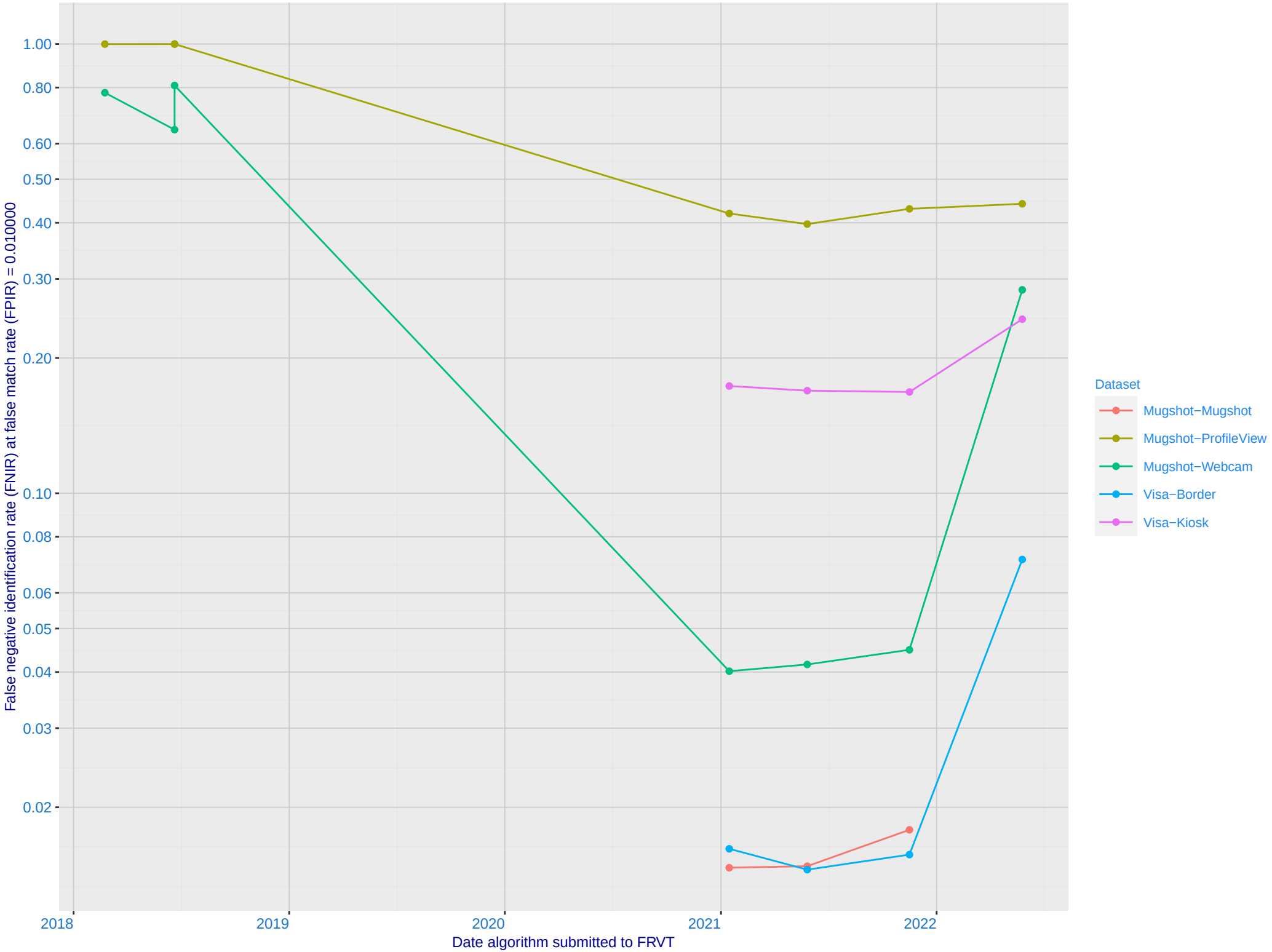
Mugshot profile ranking 162 (out of 283) −− FNIR(1600000, T, L+1) = 0.9956, FPIR=0.001000 vs. lowest 0.1093 from cloudwalk_mt_000

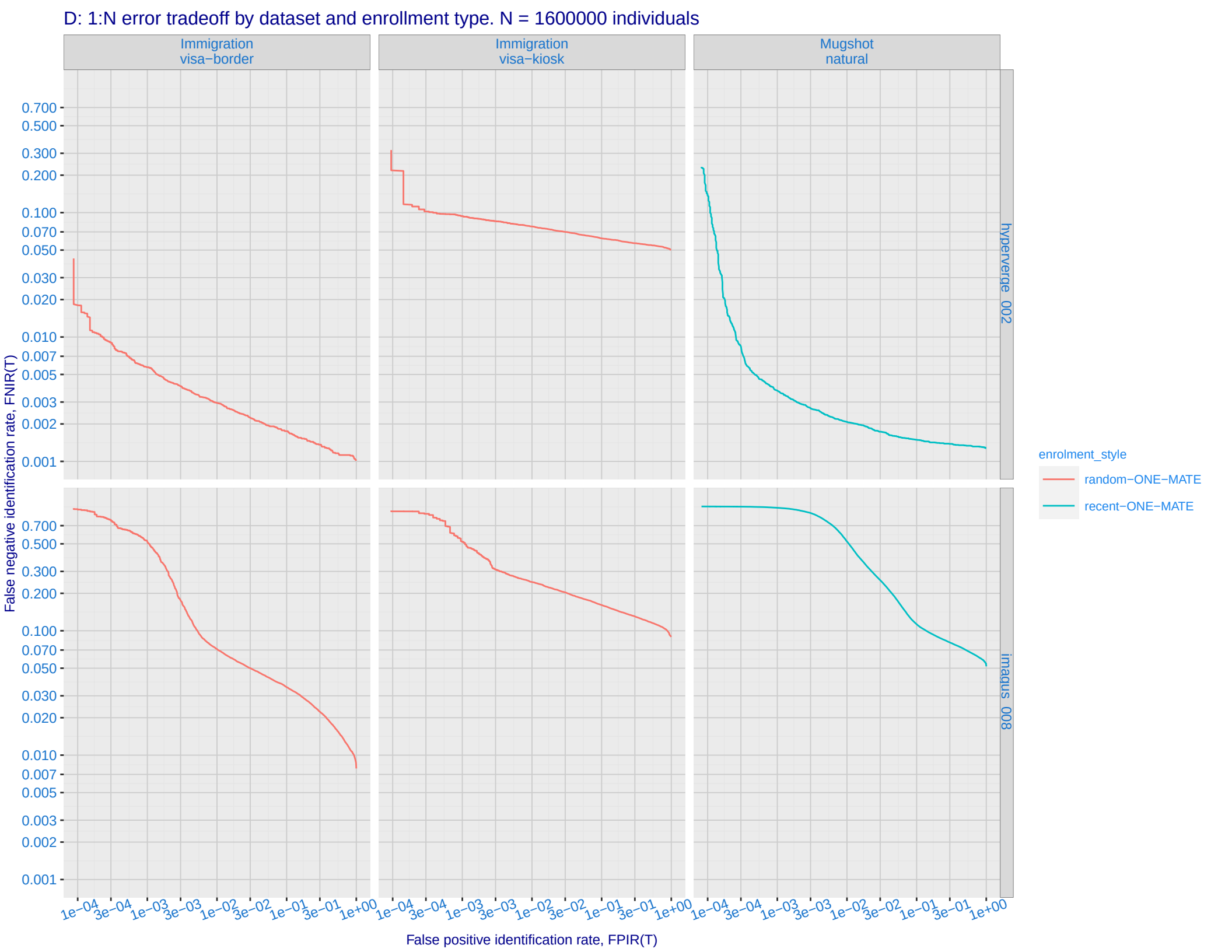
Immigration visa−border ranking 194 (out of 241) −− FNIR(1600000, T, L+1) = 0.5202, FPIR=0.001000 vs. lowest 0.0024 from cloudwalk_mt_000

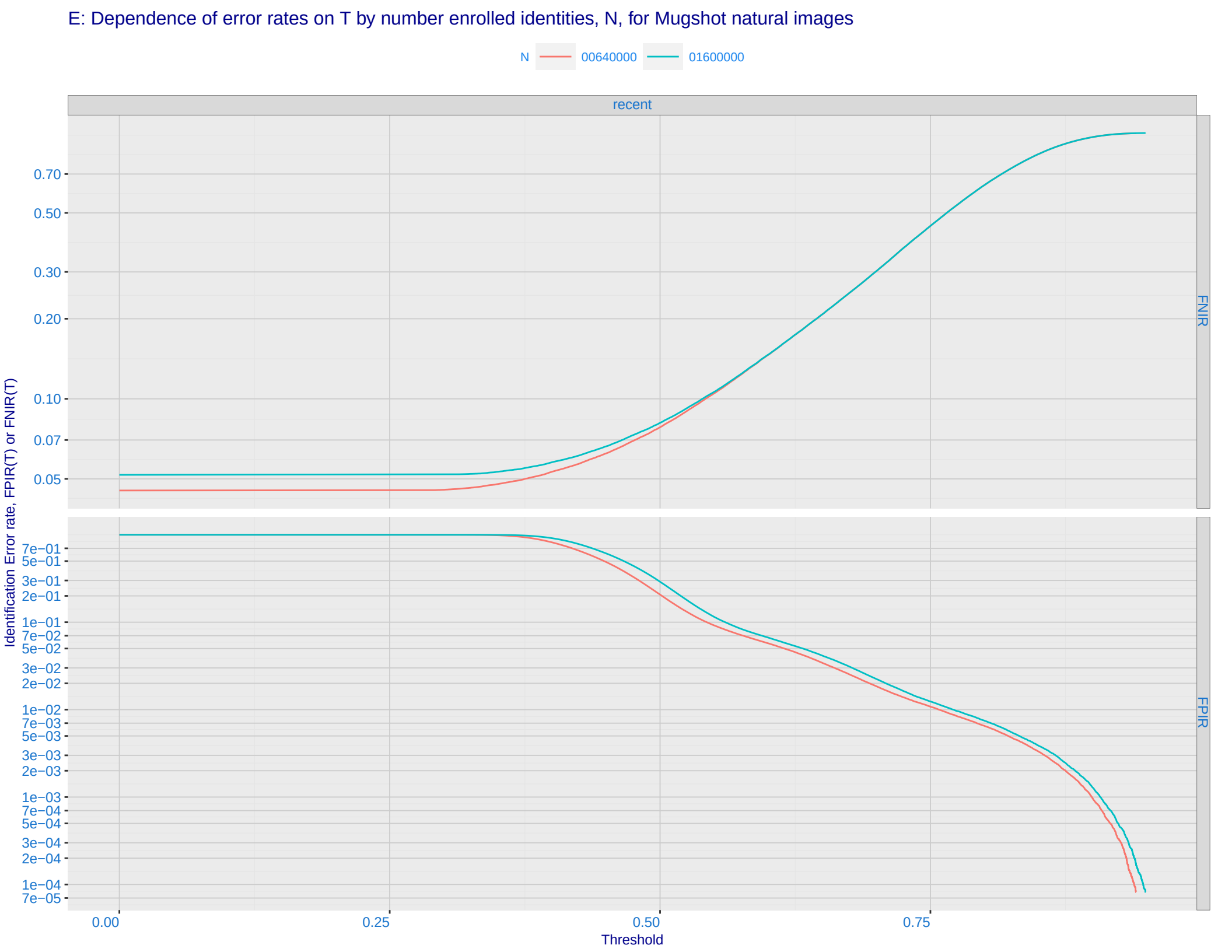
Immigration visa−kiosk ranking 131 (out of 236) −− FNIR(1600000, T, L+1) = 0.5205, FPIR=0.001000 vs. lowest 0.0719 from cloudwalk_mt_000

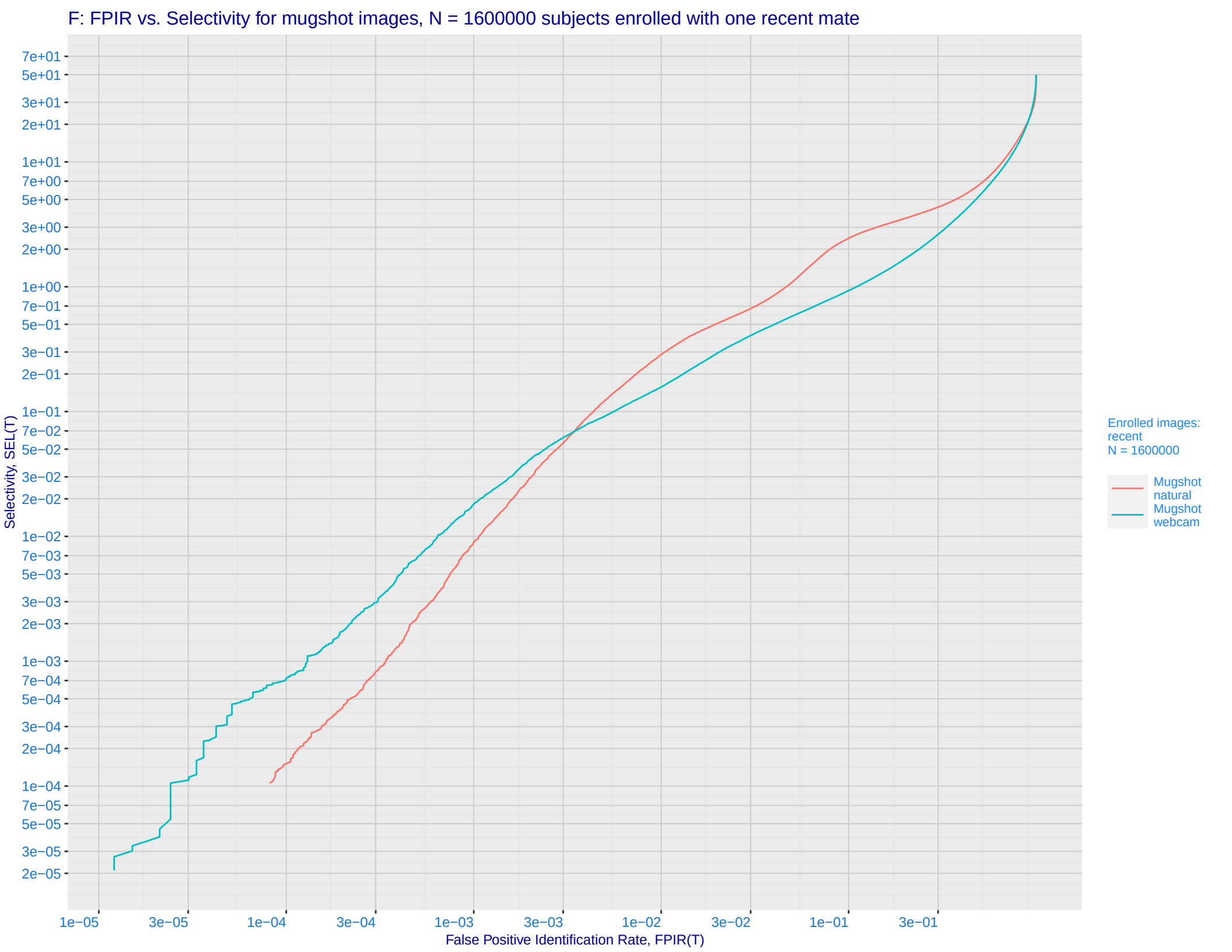

B: Mugshot natural images, identification mode: FNIR(N, L+1, T) vs. most accurate (hyperverge_002)
False negative identification rate, FNIR(N)
0.700
0.500
0.300
0.200
0.100
0.070
0.050
0.030
0.020
0.010
0.007
0.005
0.003
1e+06
3e+06
1e+07
Enrolled population size, N
enrolment_style
recent
Dataset:
2018 Mugshot
FNIR@FPIR = 0.001
hyperverge_002
imagus_008

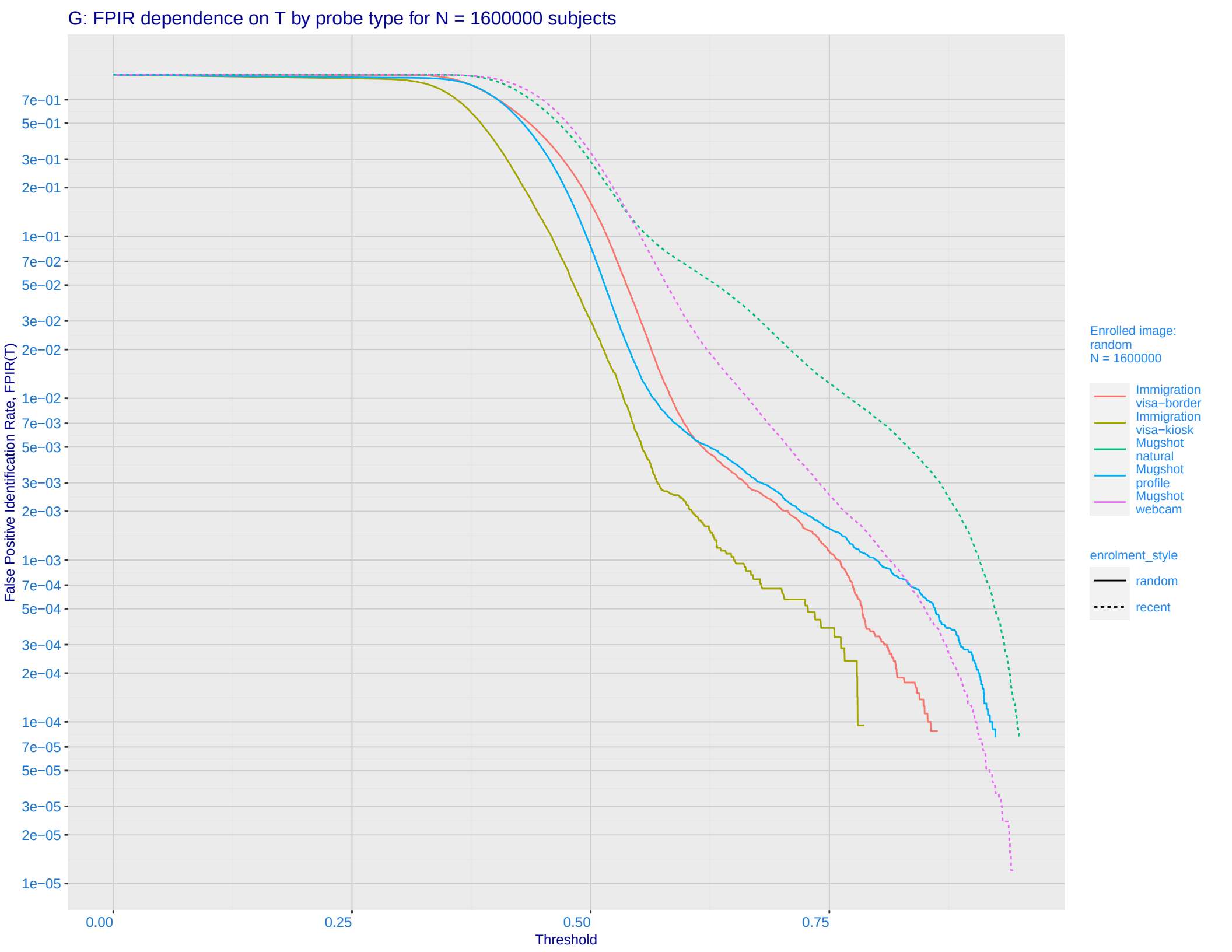
C: Evolution of accuracy for IMAGUS algorithms on three datasets 2018 − present

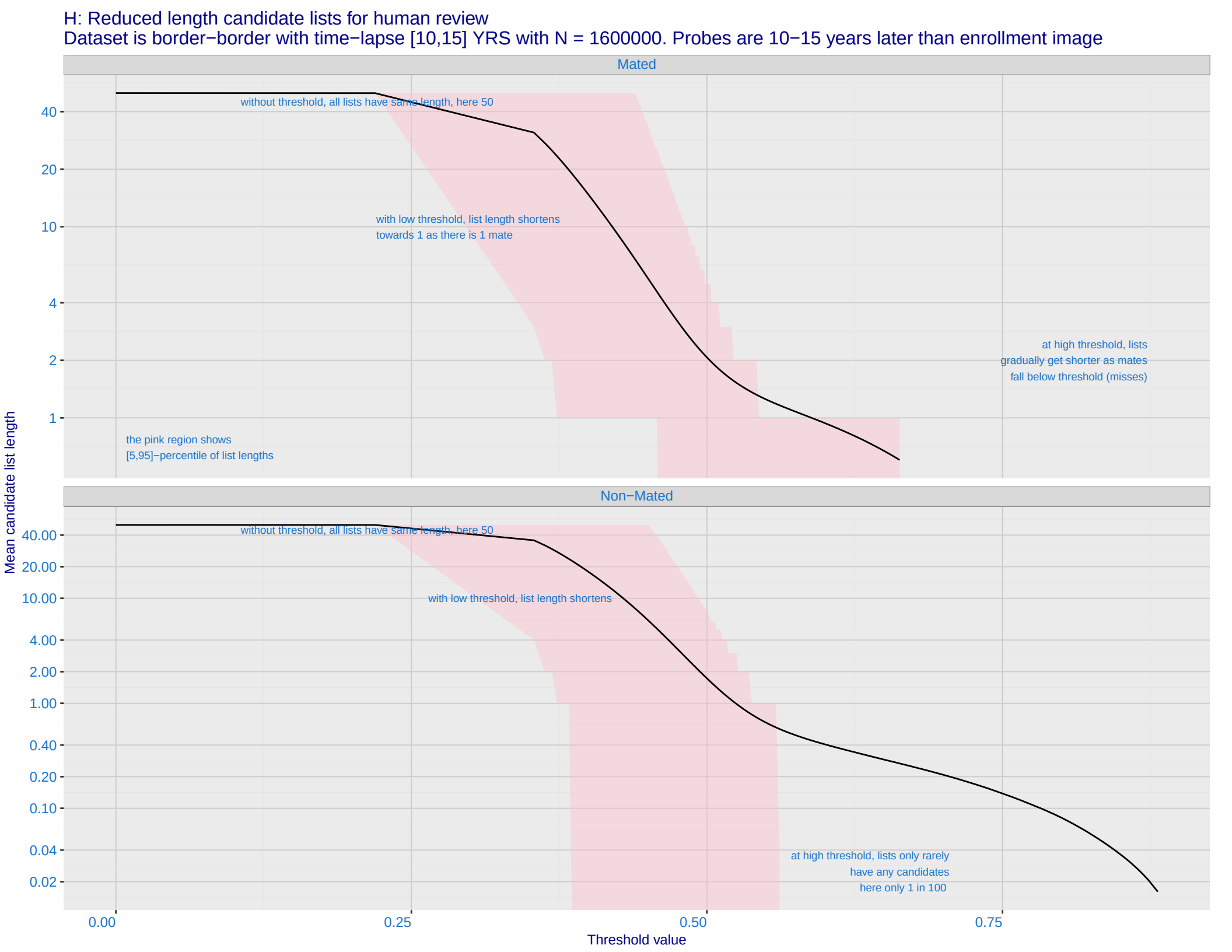


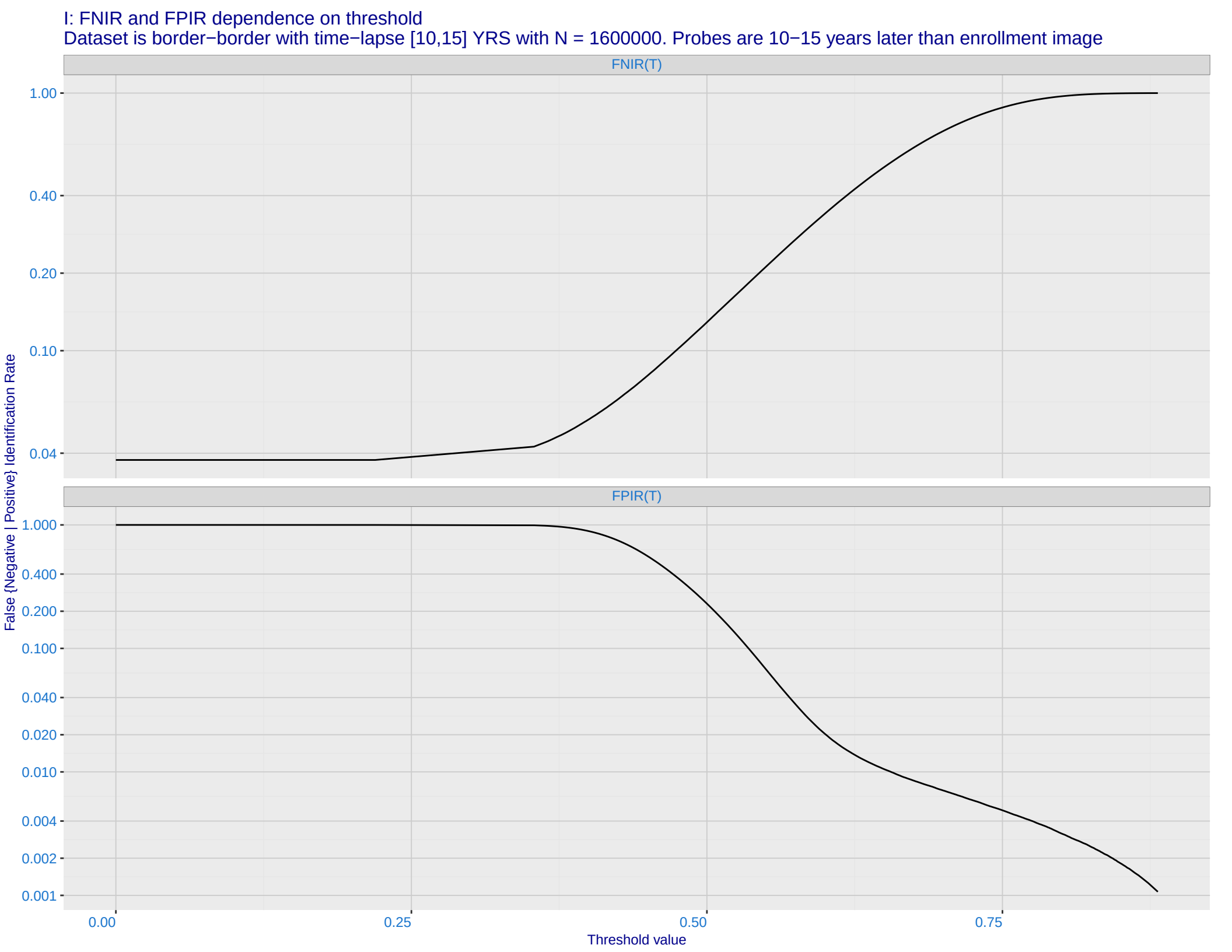

D: 1:N error tradeoff by dataset and enrollment type. N = 1600000 individuals
Immigration visa−border
Immigration visa−kiosk
Mugshot natural
hyperverge_002
imagus_008
False negative identification rate, FNIR(T)
0.700
0.500
0.300
0.200
0.100
0.070
0.050
0.030
0.020
0.010
0.007
0.005
0.003
0.002
0.001
1e−04
3e−04
1e−03
3e−03
1e−02
3e−02
1e−01
3e−01
1e+00
False positive identification rate, FPIR(T)
enrolment_style
random−ONE−MATE
recent−ONE−MATE

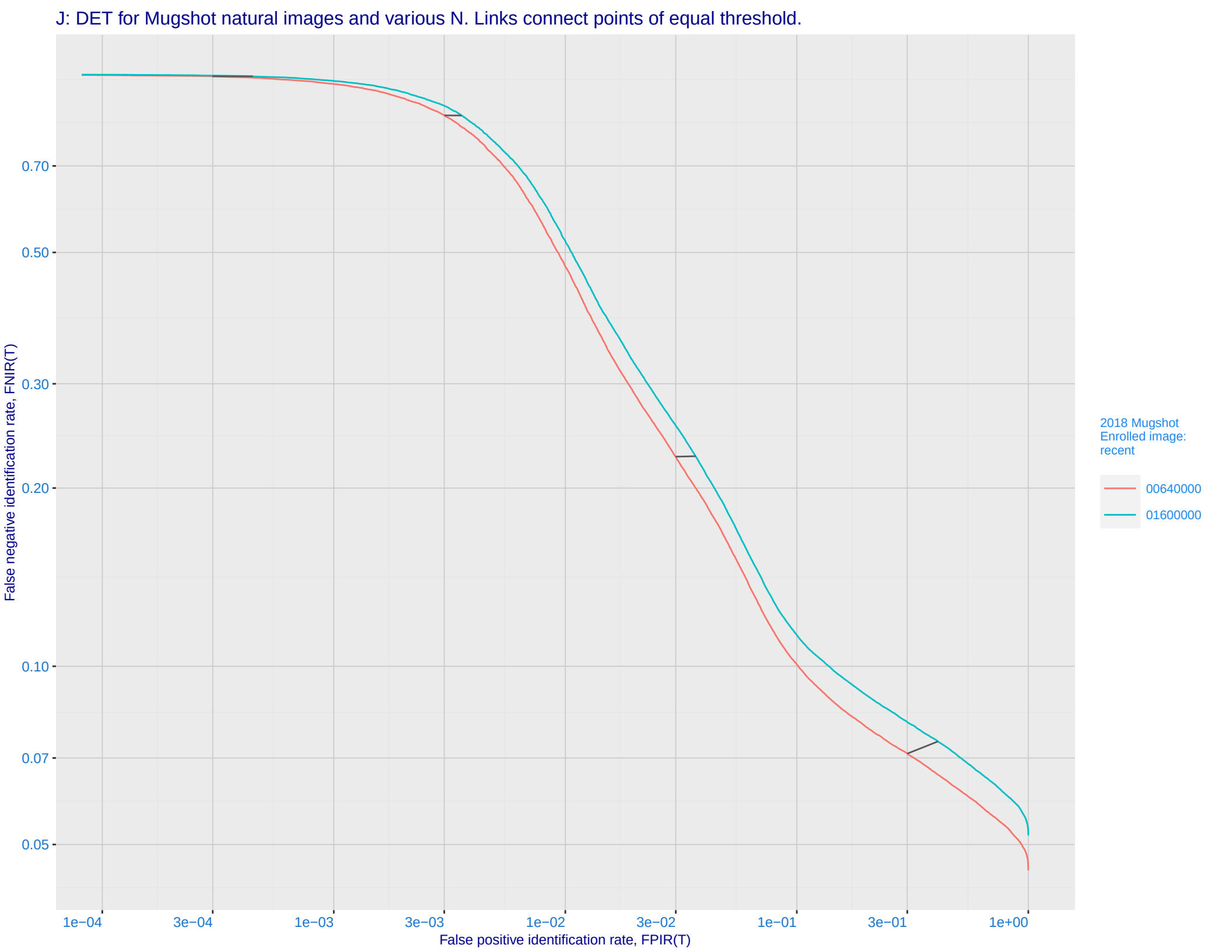

E: Dependence of error rates on T by number enrolled identities, N, for Mugshot natural images
N
00640000
01600000
recent
FNIR
FPIR
Identification Error rate, FPIR(T) or FNIR(T)
0.70
0.50
0.30
0.20
0.10
0.07
0.05
7e−01
5e−01
3e−01
2e−01
1e−01
7e−02
5e−02
3e−02
2e−02
1e−02
7e−03
5e−03
3e−03
2e−03
1e−03
7e−04
5e−04
3e−04
2e−04
1e−04
7e−05
0.00
0.25
0.50
0.75
Threshold

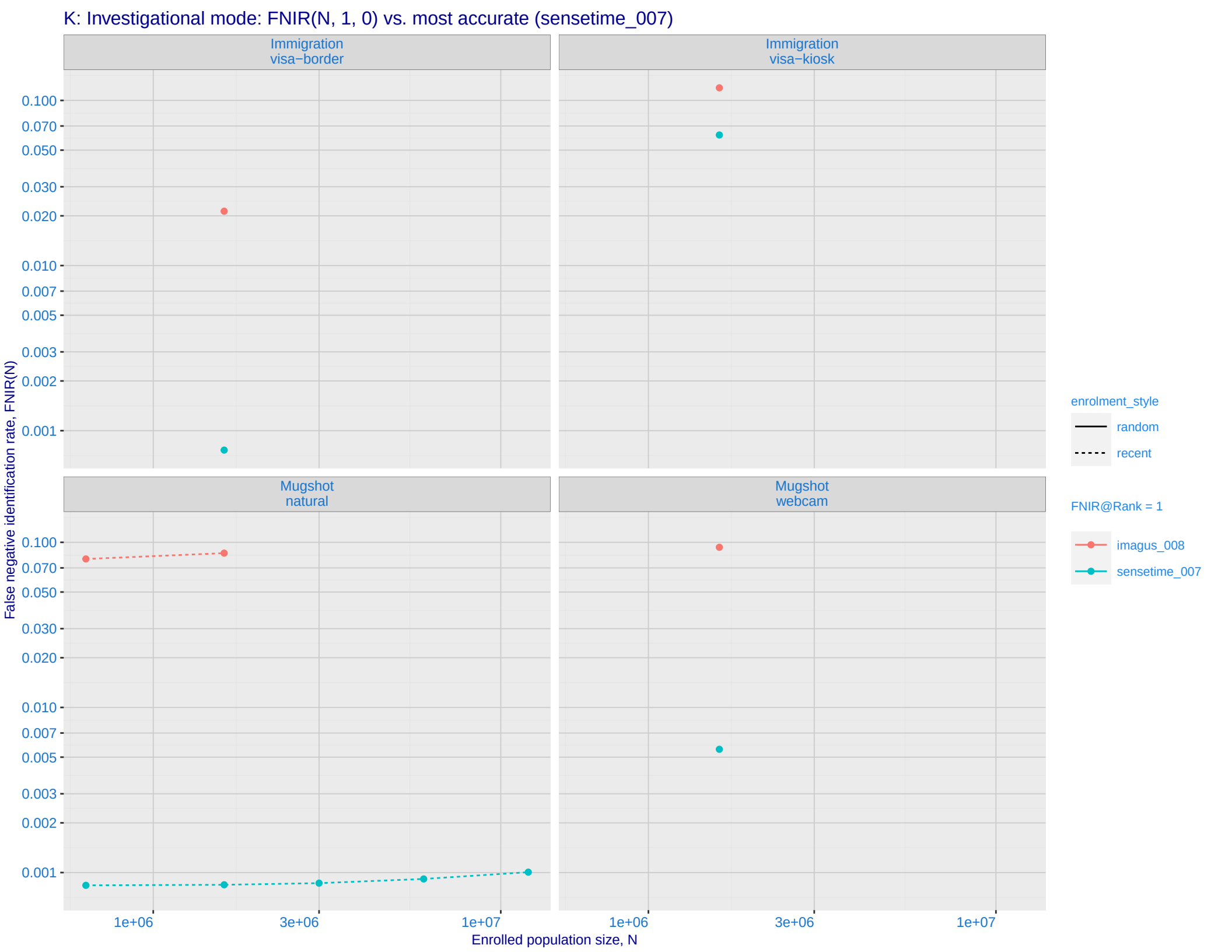

F: FPIR vs. Selectivity for mugshot images, N = 1600000 subjects enrolled with one recent mate
Selectivity, SEL(T)
7e+01
5e+01
3e+01
2e+01
1e+01
7e+00
5e+00
3e+00
2e+00
1e+00
7e−01
5e−01
3e−01
2e−01
1e−01
7e−02
5e−02
3e−02
2e−02
1e−02
7e−03
5e−03
3e−03
2e−03
1e−03
7e−04
5e−04
3e−04
2e−04
1e−04
7e−05
5e−05
3e−05
2e−05
1e−05
3e−05
1e−04
3e−04
1e−03
3e−03
1e−02
3e−02
1e−01
3e−01
False Positive Identification Rate, FPIR(T)
Enrolled images:
recent
N = 1600000
Mugshot
natural
Mugshot
webcam

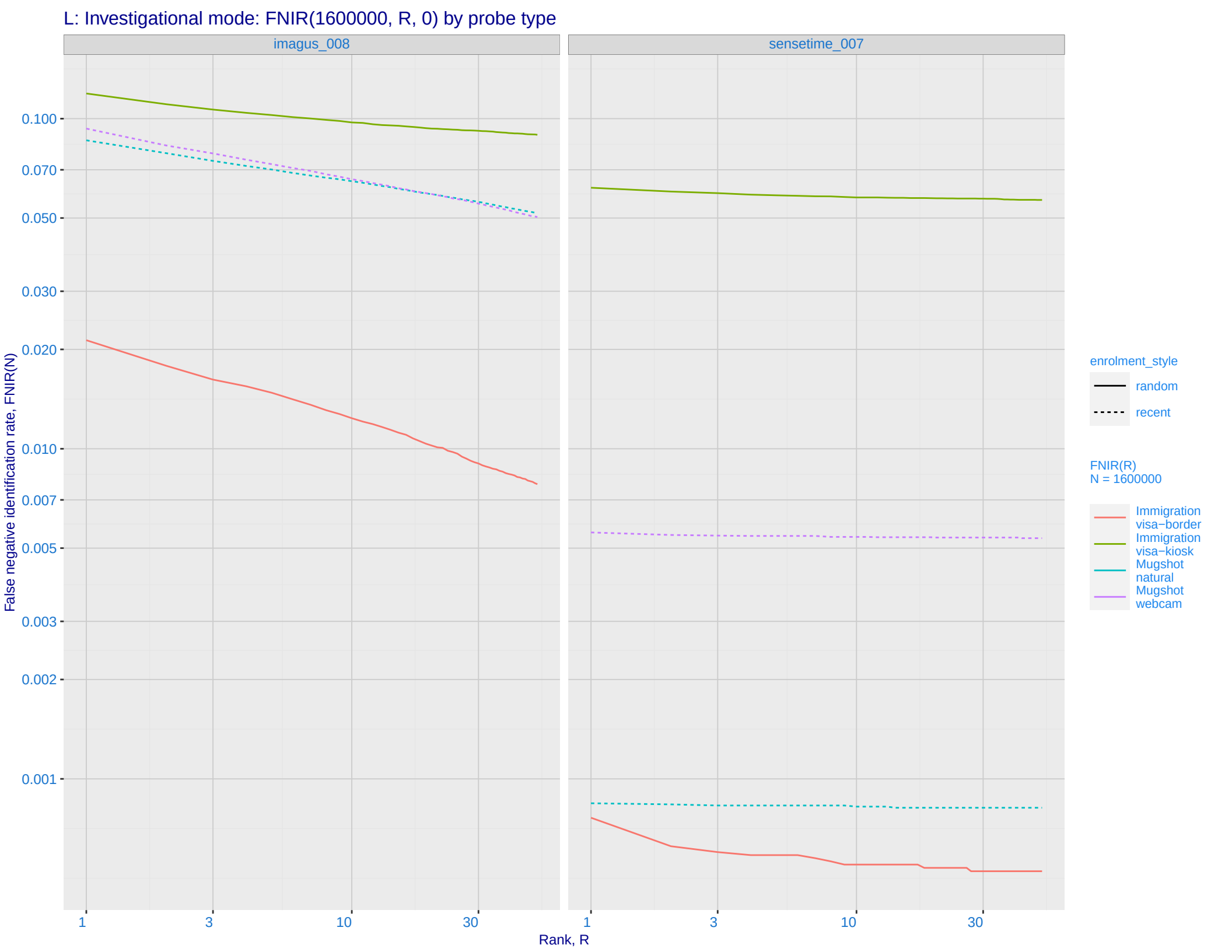

G: FPIR dependence on T by probe type for N = 1600000 subjects
False Positive Identification Rate, FPIR(T)
7e−01
5e−01
3e−01
2e−01
1e−01
7e−02
5e−02
3e−02
2e−02
1e−02
7e−03
5e−03
3e−03
2e−03
1e−03
7e−04
5e−04
3e−04
2e−04
1e−04
7e−05
5e−05
3e−05
2e−05
1e−05
0.00
0.25
0.50
0.75
Threshold
Enrolled image:
random
N = 1600000
Immigration visa−border
Immigration visa−kiosk
Mugshot natural
Mugshot profile
Mugshot webcam
enrolment_style
random
recent


H: Reduced length candidate lists for human review
Dataset is border−border with time−lapse [10,15] YRS with N = 1600000. Probes are 10−15 years later than enrollment image
Mated
without threshold, all lists have same length, here 50
with low threshold, list length shortens
towards 1 as there is 1 mate
at high threshold, lists
gradually get shorter as mates
fall below threshold (misses)
the pink region shows
[5,95]−percentile of list lengths
Non−Mated
without threshold, all lists have same length, here 50
with low threshold, list length shortens
at high threshold, lists only rarely
have any candidates
here only 1 in 100
Mean candidate list length
40
20
10
4
2
1
40.00
20.00
10.00
4.00
2.00
1.00
0.40
0.20
0.10
0.04
0.02
0.00
0.25
0.50
0.75
Threshold value

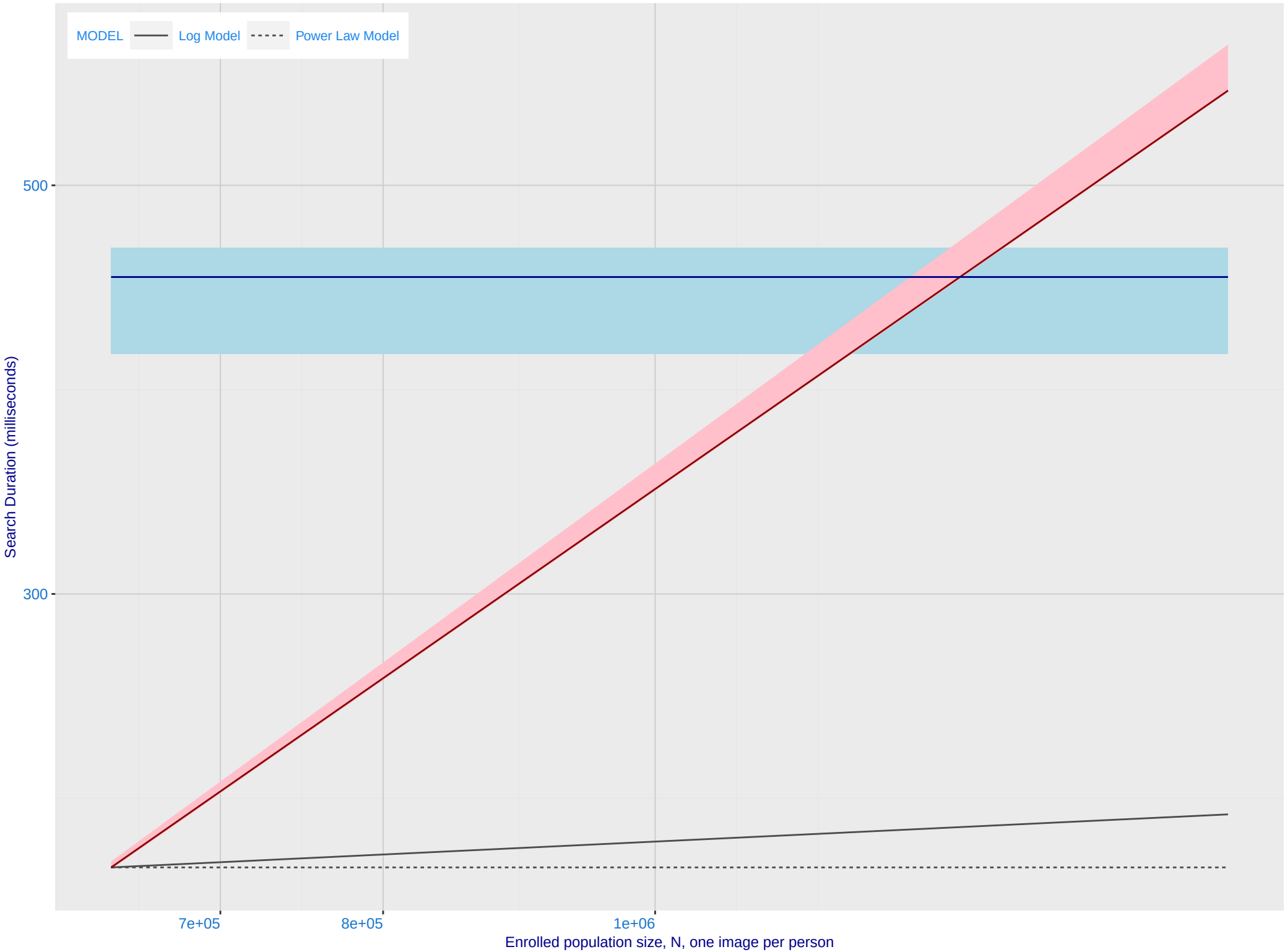

I: FNIR and FPIR dependence on threshold
Dataset is border−border with time−lapse [10,15] YRS with N = 1600000. Probes are 10−15 years later than enrollment image
FNIR(T)
FPIR(T)
False {Negative | Positive} Identification Rate
1.00
0.40
0.20
0.10
0.04
1.000
0.400
0.200
0.100
0.040
0.020
0.010
0.004
0.002
0.001
0.00
0.25
0.50
0.75
Threshold value

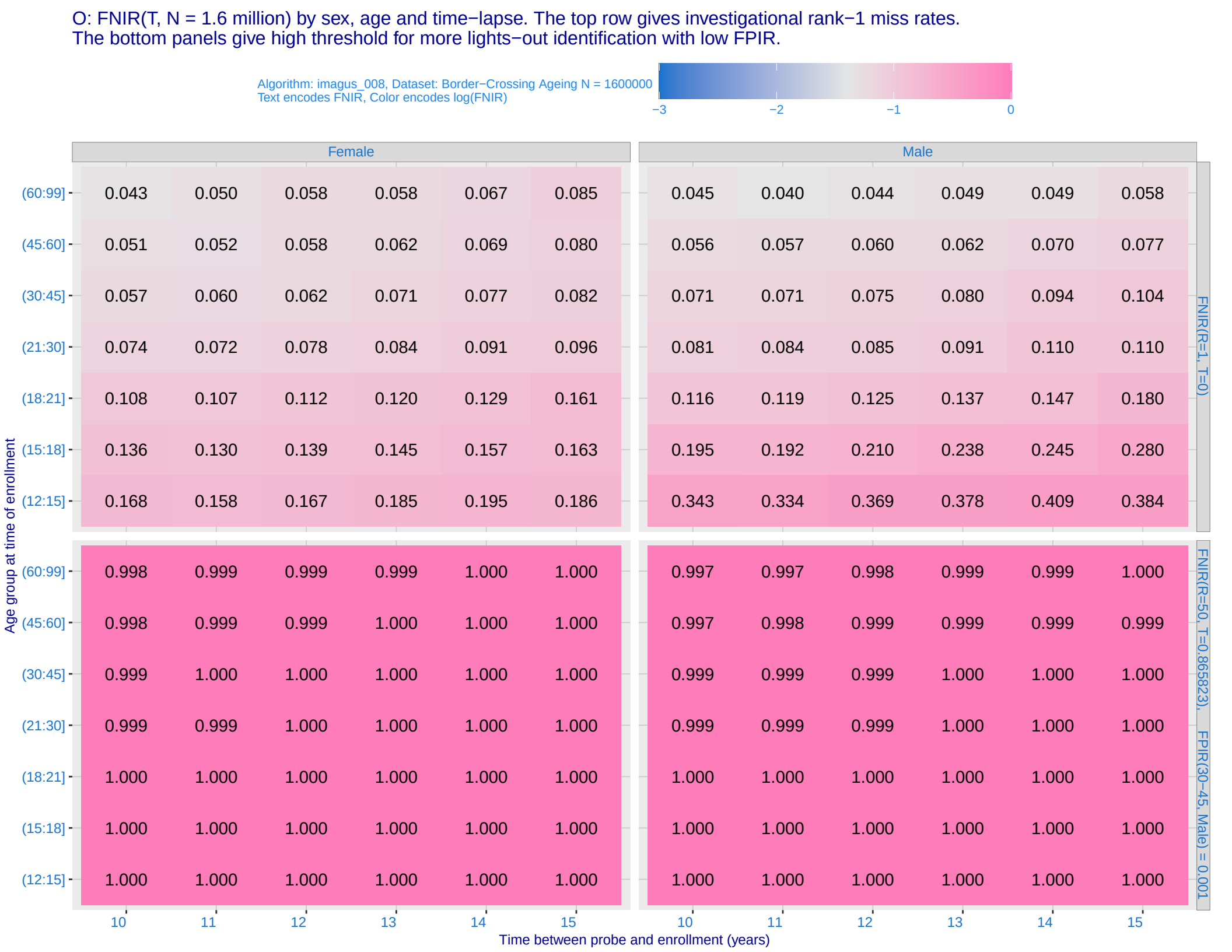

J: DET for Mugshot natural images and various N. Links connect points of equal threshold.
False negative identification rate, FNIR(T)
0.70
0.50
0.30
0.20
0.10
0.07
0.05
1e−04
3e−04
1e−03
3e−03
1e−02
3e−02
1e−01
3e−01
1e+00
False positive identification rate, FPIR(T)
2018 Mugshot
Enrolled image:
recent
00640000
01600000


K: Investigational mode: FNIR(N, 1, 0) vs. most accurate (sensetime_007)
Immigration visa−border
Immigration visa−kiosk
Mugshot natural
Mugshot webcam
False negative identification rate, FNIR(N)
0.100
0.070
0.050
0.030
0.020
0.010
0.007
0.005
0.003
0.002
0.001
1e+06
3e+06
1e+07
Enrolled population size, N
enrolment_style
random
recent
FNIR@Rank = 1
imagus_008
sensetime_007

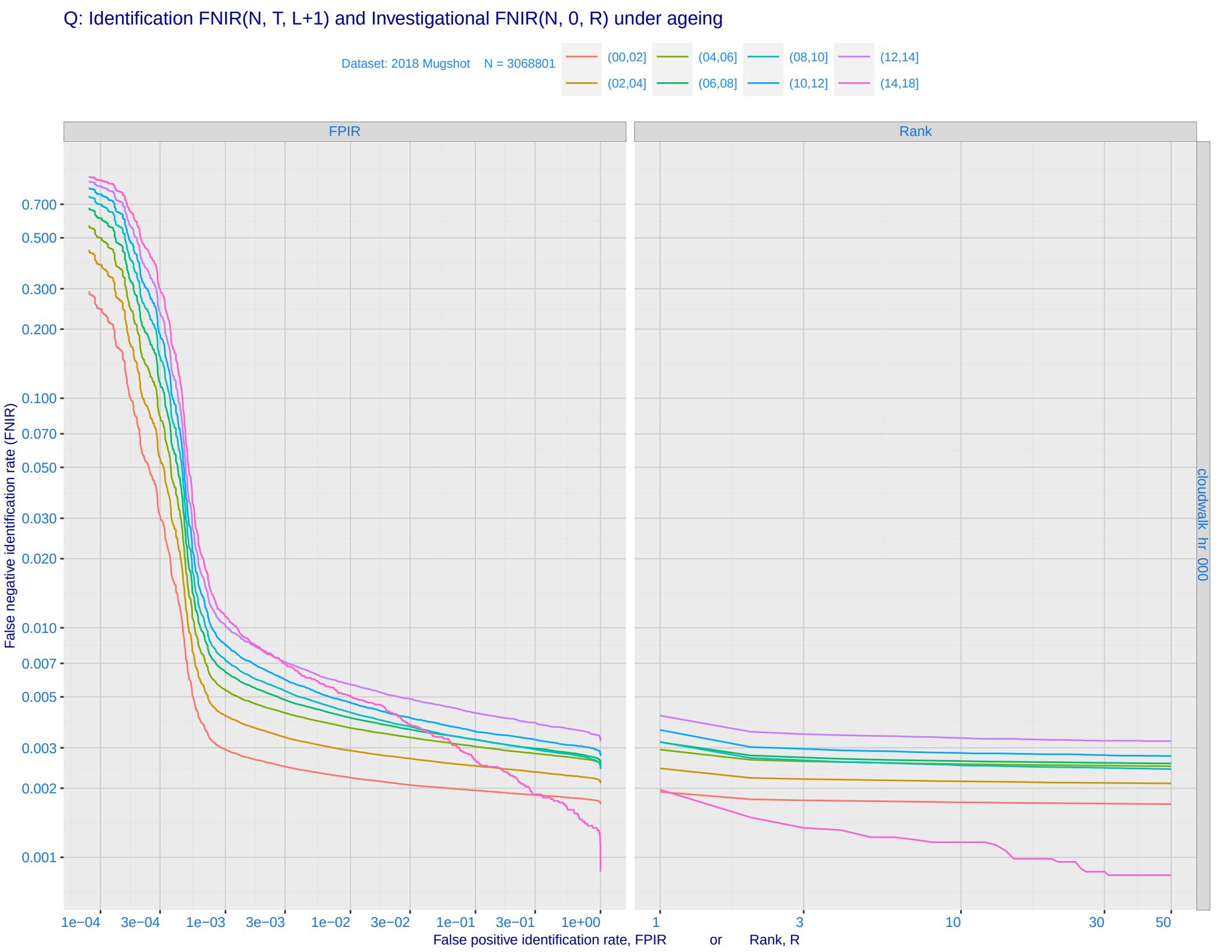

L: Investigational mode: FNIR(1600000, R, 0) by probe type
imagus_008
sensetime_007
False negative identification rate, FNIR(N)
0.100
0.070
0.050
0.030
0.020
0.010
0.007
0.005
0.003
0.002
0.001
1
3
10
30
Rank, R
enrolment_style
random
recent
FNIR(R)
N = 1600000
Immigration visa−border
Immigration visa−kiosk
Mugshot natural
Mugshot webcam

M: Template duration; search duration vs. N. The blue and pink ribbon covers 95 percent of observed measurements.
The template generation time is independent of N. The log and power−law models are fit to the first two (N,T) observations




O: FNIR(T, N = 1.6 million) by sex, age and time−lapse. The top row gives investigational rank−1 miss rates.
The bottom panels give high threshold for more lights−out identification with low FPIR.
Algorithm: imagus_008, Dataset: Border−Crossing Ageing N = 1600000
Text encodes FNIR, Color encodes log(FNIR)
−3
−2
−1
0
Female
Male
(60:99]
(45:60]
(30:45]
(21:30]
(18:21]
(15:18]
(12:15]
0.043 0.050 0.058 0.058 0.067 0.085
0.051 0.052 0.058 0.062 0.069 0.080
0.057 0.060 0.062 0.071 0.077 0.082
0.074 0.072 0.078 0.084 0.091 0.096
0.108 0.107 0.112 0.120 0.129 0.161
0.136 0.130 0.139 0.145 0.157 0.163
0.168 0.158 0.167 0.185 0.195 0.186
0.045 0.040 0.044 0.049 0.049 0.058
0.056 0.057 0.060 0.062 0.070 0.077
0.071 0.071 0.075 0.080 0.094 0.104
0.081 0.084 0.085 0.091 0.110 0.110
0.116 0.119 0.125 0.137 0.147 0.180
0.195 0.192 0.210 0.238 0.245 0.280
0.343 0.334 0.369 0.378 0.409 0.384
FNIR(R=1, T=0)
0.998 0.999 0.999 0.999 1.000 1.000
0.998 0.999 0.999 1.000 1.000 1.000
0.999 1.000 1.000 1.000 1.000 1.000
0.999 0.999 1.000 1.000 1.000 1.000
1.000 1.000 1.000 1.000 1.000 1.000
1.000 1.000 1.000 1.000 1.000 1.000
1.000 1.000 1.000 1.000 1.000 1.000
0.997 0.997 0.998 0.999 0.999 1.000
0.997 0.998 0.999 0.999 0.999 0.999
0.999 0.999 0.999 1.000 1.000 1.000
0.999 0.999 0.999 1.000 1.000 1.000
1.000 1.000 1.000 1.000 1.000 1.000
1.000 1.000 1.000 1.000 1.000 1.000
1.000 1.000 1.000 1.000 1.000 1.000
FNIR(R=50, T=0.865823), FPIR(30−45, Male) = 0.001
Age group at time of enrollment
10 11 12 13 14 15
Time between probe and enrollment (years)


P: FPIR(N = 1.6 million) by sex and age. It is typical for false positive identification rates to be higher in women except in their teens.
Algorithm: imagus_008, Dataset: Border−Crossing Ageing
Threshold: 0.865823 set to achive FPIR(30−45, Male) = 0.001
Color encodes log(FPIR)
−4
−3
−2
−1
(60:99]
(45:60]
(30:45]
(21:30]
(18:21]
(15:18]
(12:15]
0.0000
0.0001
0.0008
0.0009
0.0027
0.0010
0.0037
0.0013
0.0025
0.0016
0.0019
0.0017
0.0011
0.0009
Age group of person in non−mate probe
(The age of the highest non−mates will usually be similar to that of the probe.)
Female
Male
Sex of person in non−mate probe
(The sex of the highest non−mates will usually be that of the probe.)


Q: Identification FNIR(N, T, L+1) and Investigational FNIR(N, 0, R) under ageing
Dataset: 2018 Mugshot N = 3068801
(00,02]
(02,04]
(04,06]
(06,08]
(08,10]
(10,12]
(12,14]
(14,18]
FPIR
Rank
False negative identification rate (FNIR)
0.700
0.500
0.300
0.200
0.100
0.070
0.050
0.030
0.020
0.010
0.007
0.005
0.003
0.002
0.001
1e−04
3e−04
1e−03
3e−03
1e−02
3e−02
1e−01
3e−01
1e+00
1
3
10
30
50
False positive identification rate, FPIR or Rank, R
cloudwalk hr 000