A: Datasheet

Algorithm: rankone_010

Developer: Rank One Computing

Submission Date: 2020_11_05

Template size: 261 bytes

Template time (2.5 percentile): 194 msec

Template time (median): 198 msec

Template time (97.5 percentile): 218 msec

Investigation:

Frontal mugshot ranking 38 (out of 271) −− FNIR(1600000, 0, 1) = 0.0022 vs. lowest 0.0009 from sensetime_005

Mugshot webcam ranking 17 (out of 232) −− FNIR(1600000, 0, 1) = 0.0098 vs. lowest 0.0062 from sensetime_005

Mugshot profile ranking 38 (out of 201) −− FNIR(1600000, 0, 1) = 0.3738 vs. lowest 0.0591 from sensetime_005

Immigration visa−border ranking 37 (out of 160) −− FNIR(1600000, 0, 1) = 0.0048 vs. lowest 0.0013 from visionlabs_010

Immigration visa−kiosk ranking 49 (out of 157) −− FNIR(1600000, 0, 1) = 0.1263 vs. lowest 0.0568 from hr_000

Identification:

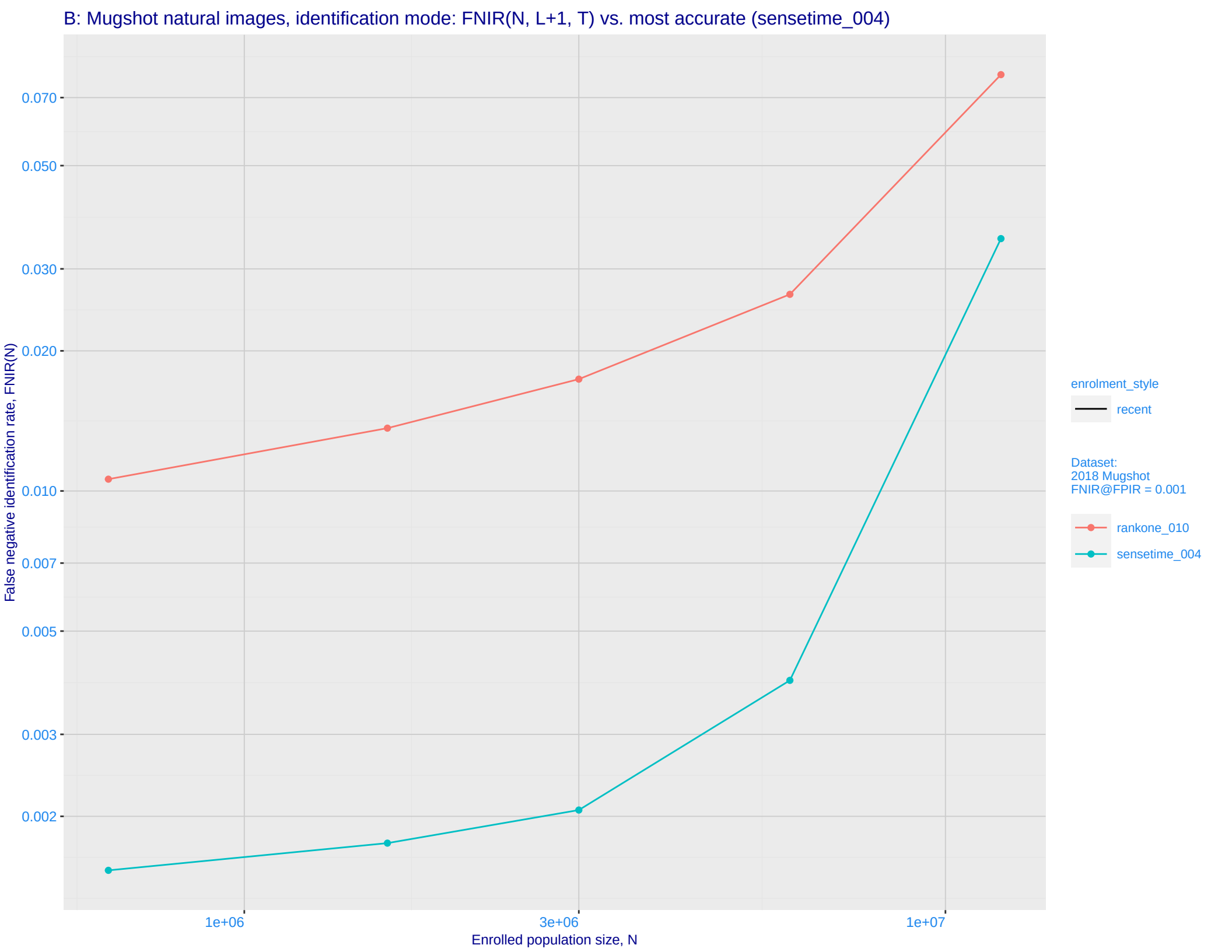
Frontal mugshot ranking 23 (out of 271) −− FNIR(1600000, T, L+1) = 0.0136, FPIR=0.001000 vs. lowest 0.0018 from sensetime_004

Mugshot webcam ranking 33 (out of 230) −− FNIR(1600000, T, L+1) = 0.0582, FPIR=0.001000 vs. lowest 0.0122 from sensetime_003

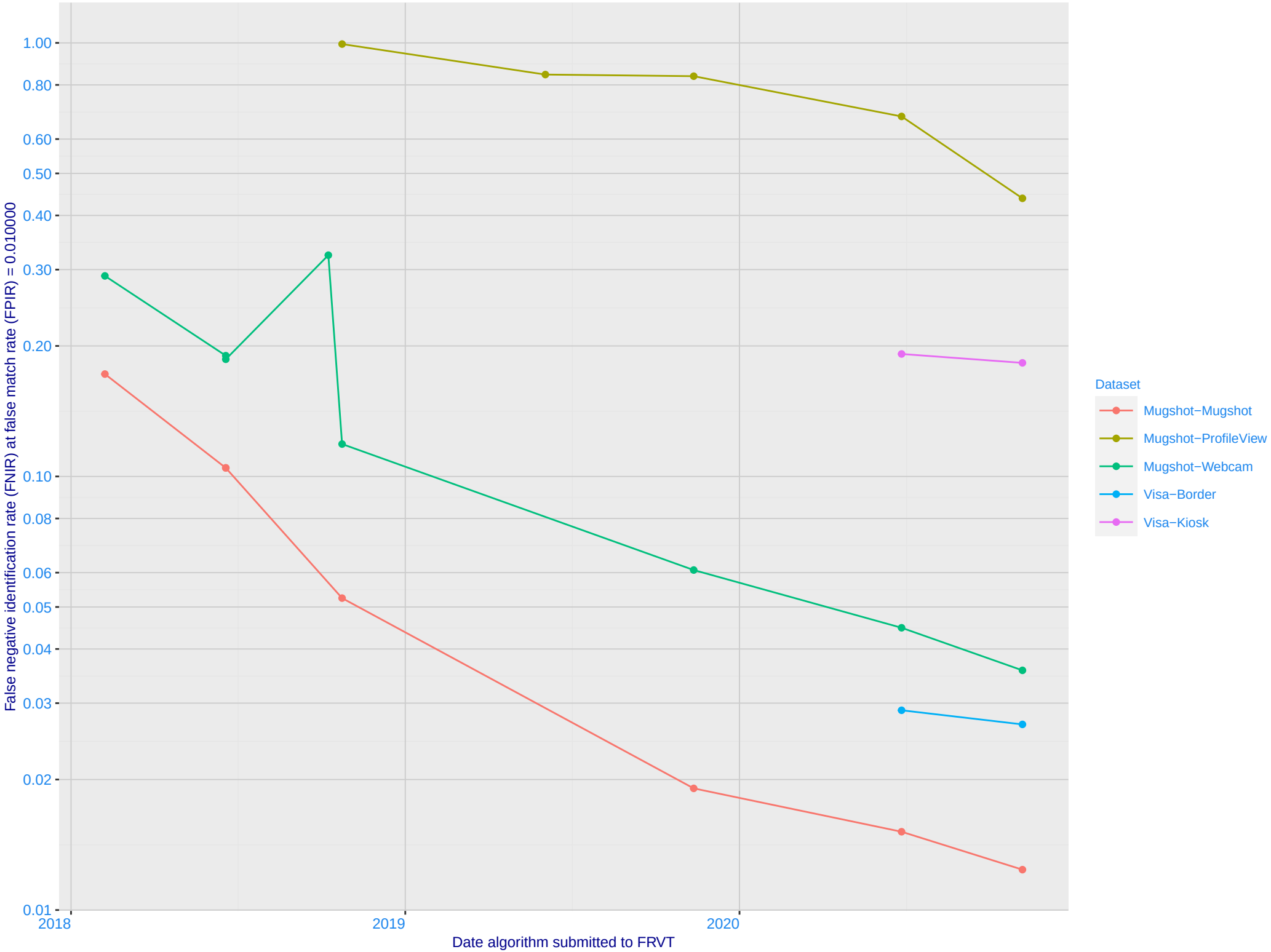
Mugshot profile ranking 22 (out of 200) −− FNIR(1600000, T, L+1) = 0.8015, FPIR=0.001000 vs. lowest 0.1331 from hr_000

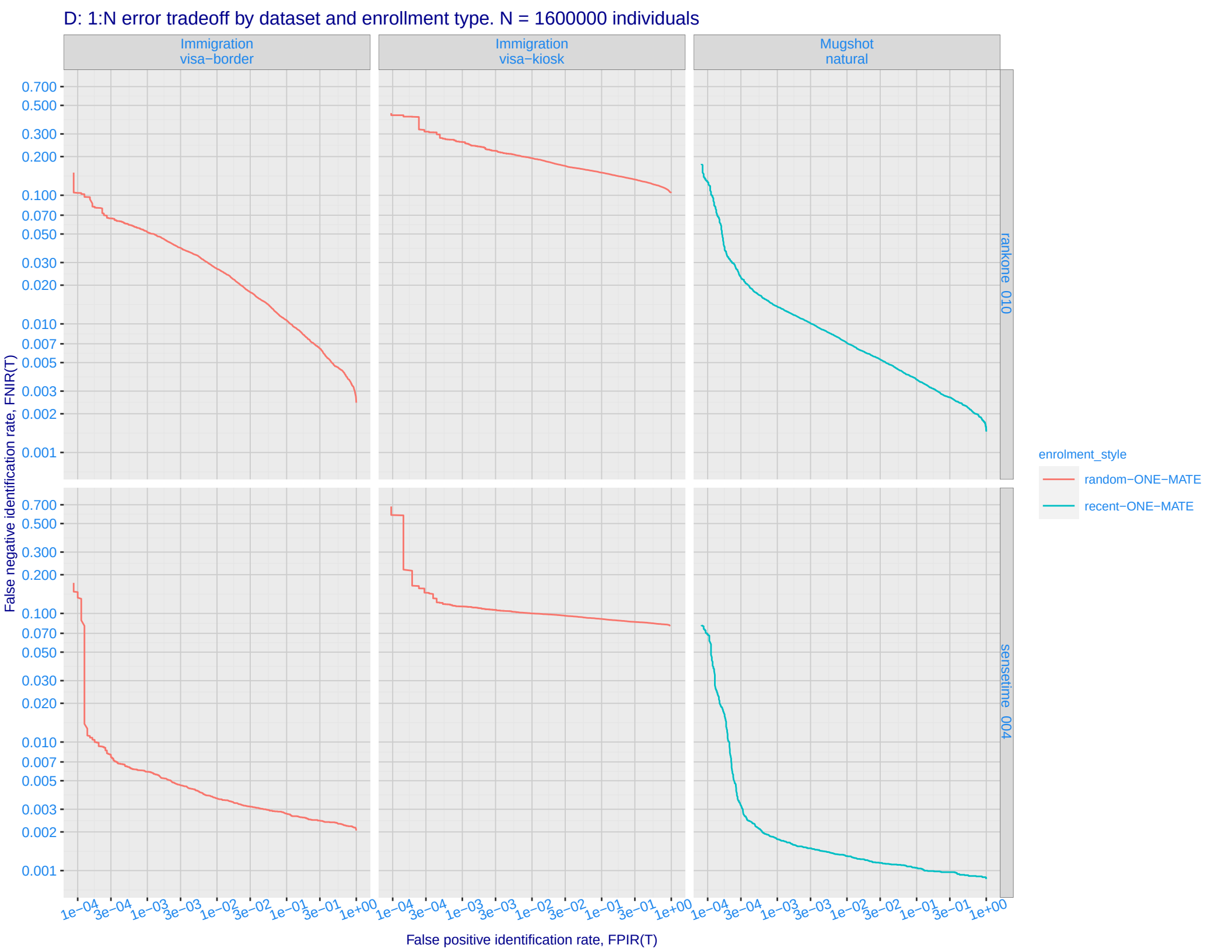
Immigration visa−border ranking 48 (out of 159) −− FNIR(1600000, T, L+1) = 0.0517, FPIR=0.001000 vs. lowest 0.0047 from idemia_008

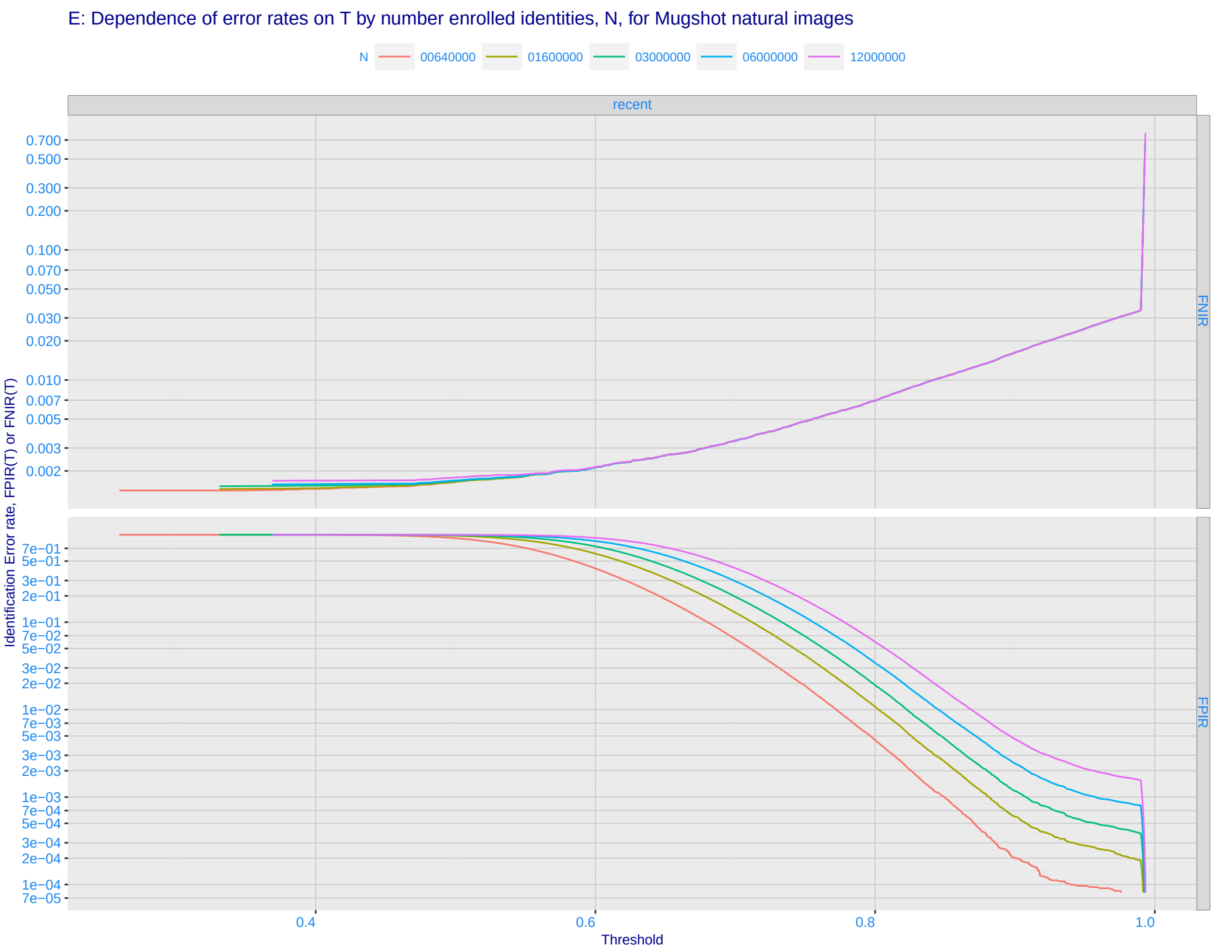
Immigration visa−kiosk ranking 32 (out of 154) −− FNIR(1600000, T, L+1) = 0.2601, FPIR=0.001000 vs. lowest 0.0996 from hr_000

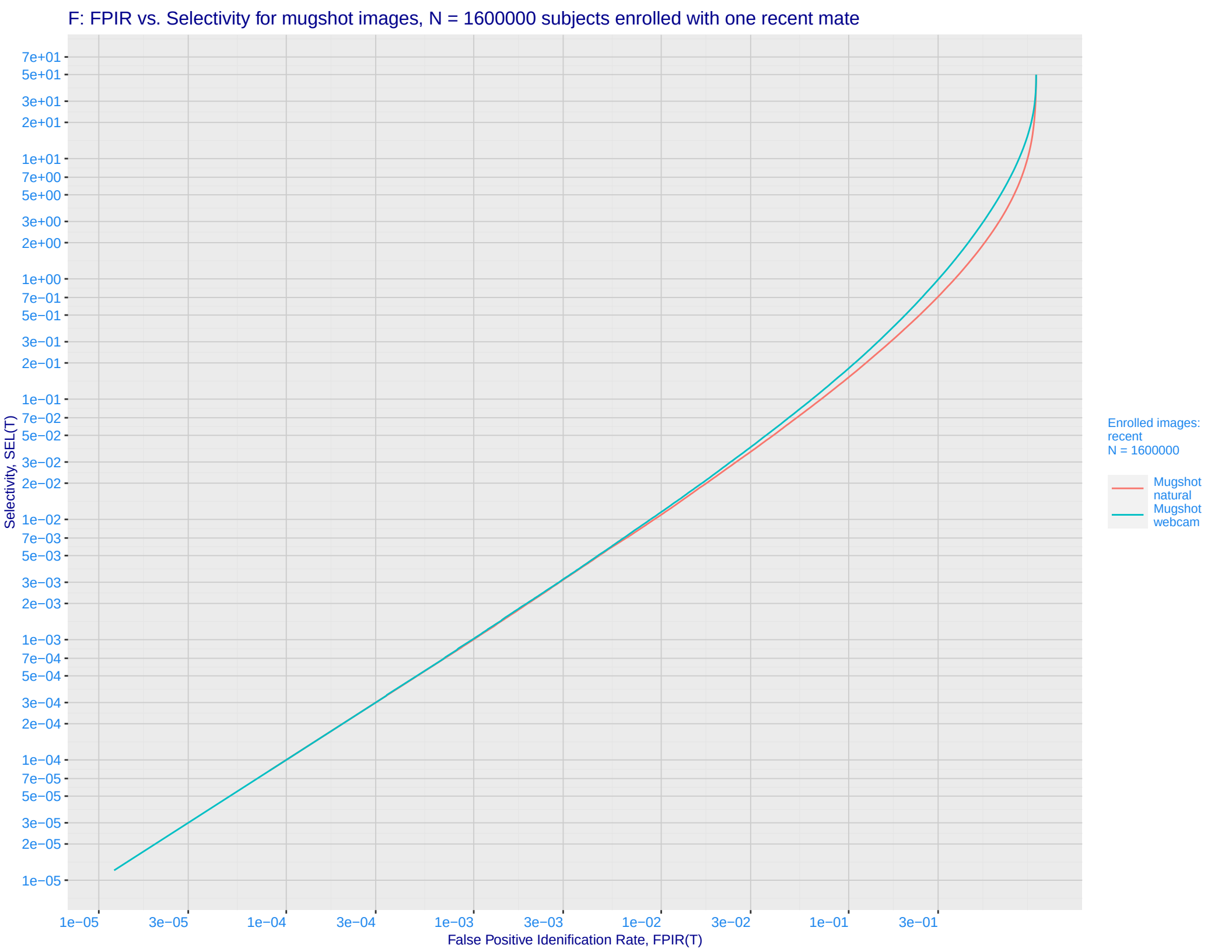

B: Mugshot natural images, identification mode: FNIR(N, L+1, T) vs. most accurate (sensetime_004)
False negative identification rate, FNIR(N)
0.070
0.050
0.030
0.020
0.010
0.007
0.005
0.003
0.002
1e+06
3e+06
1e+07
Enrolled population size, N
enrolment_style
recent
Dataset:
2018 Mugshot
FNIR@FPIR = 0.001
rankone_010
sensetime_004

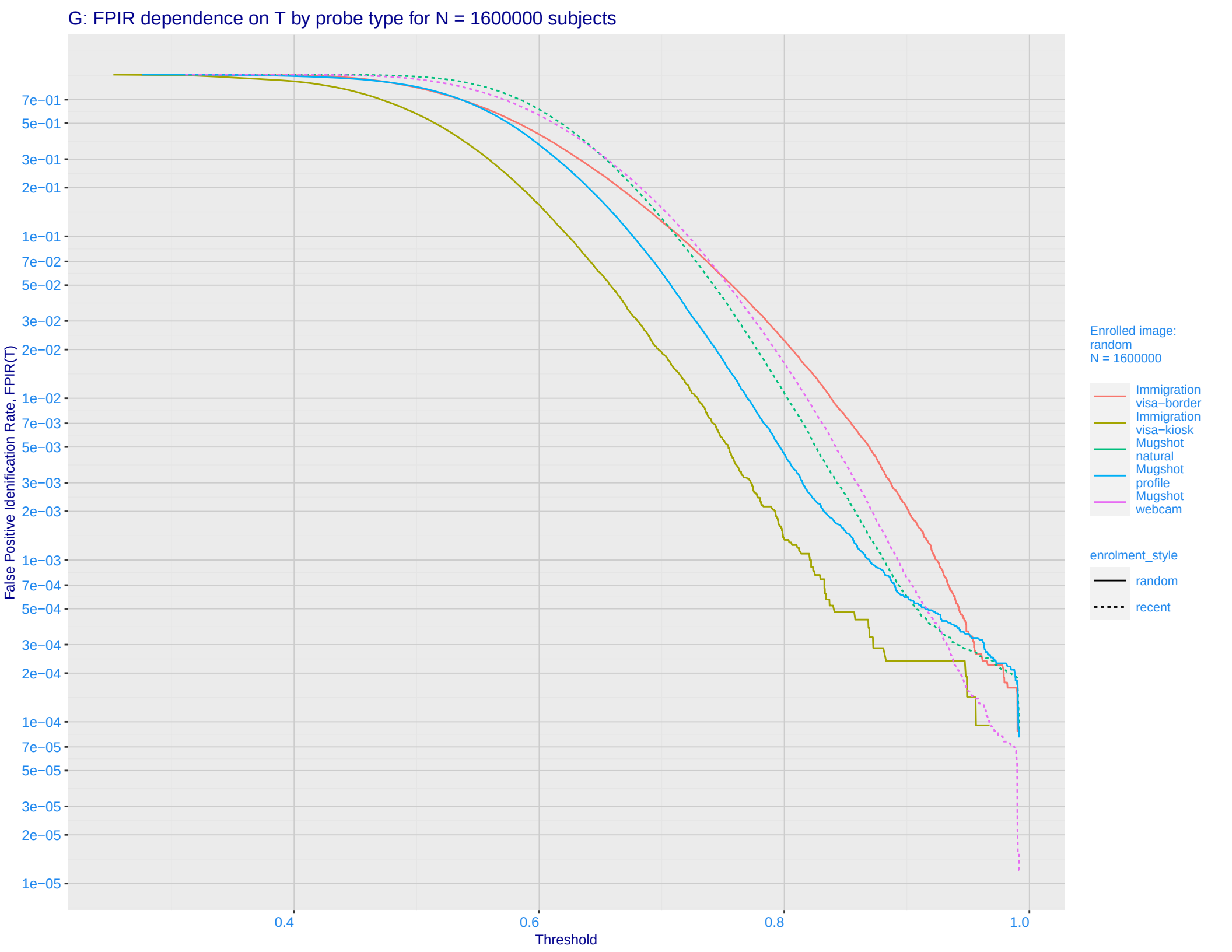
C: Evolution of accuracy for RANKONE algorithms on three datasets 2018 − present

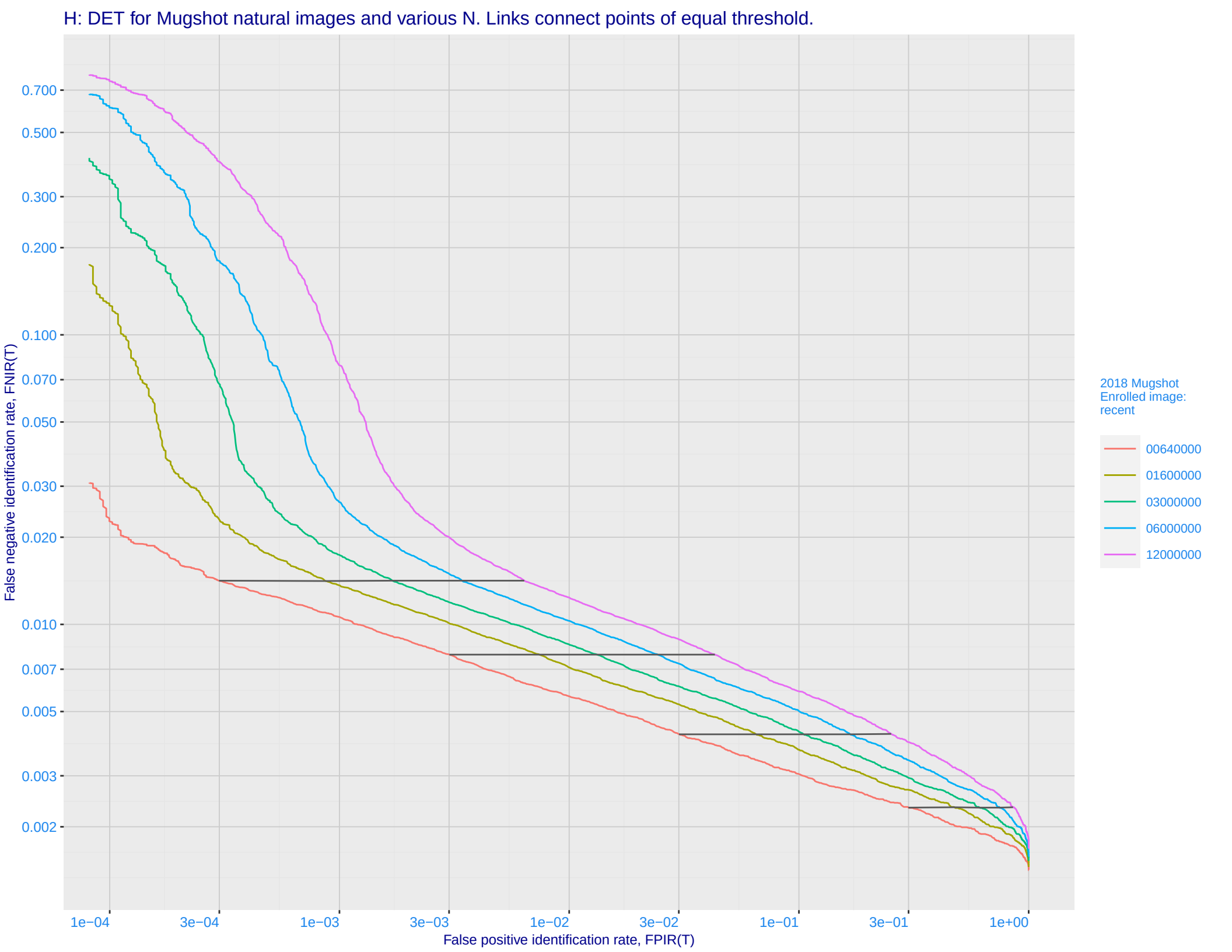


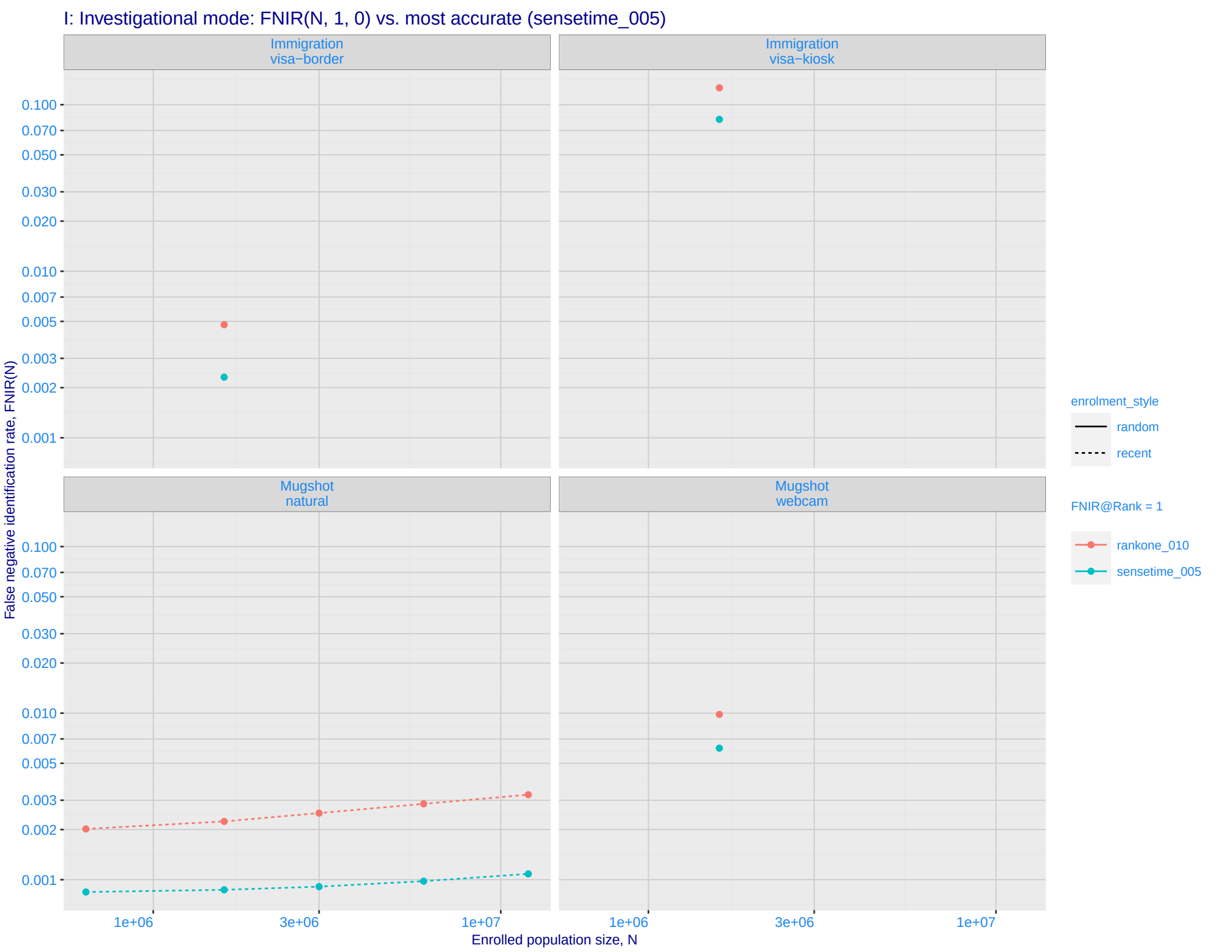

D: 1:N error tradeoff by dataset and enrollment type. N = 1600000 individuals
Immigration visa−border
Immigration visa−kiosk
Mugshot natural
rankone_010
sensetime_004
False negative identification rate, FNIR(T)
0.700
0.500
0.300
0.200
0.100
0.070
0.050
0.030
0.020
0.010
0.007
0.005
0.003
0.002
0.001
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

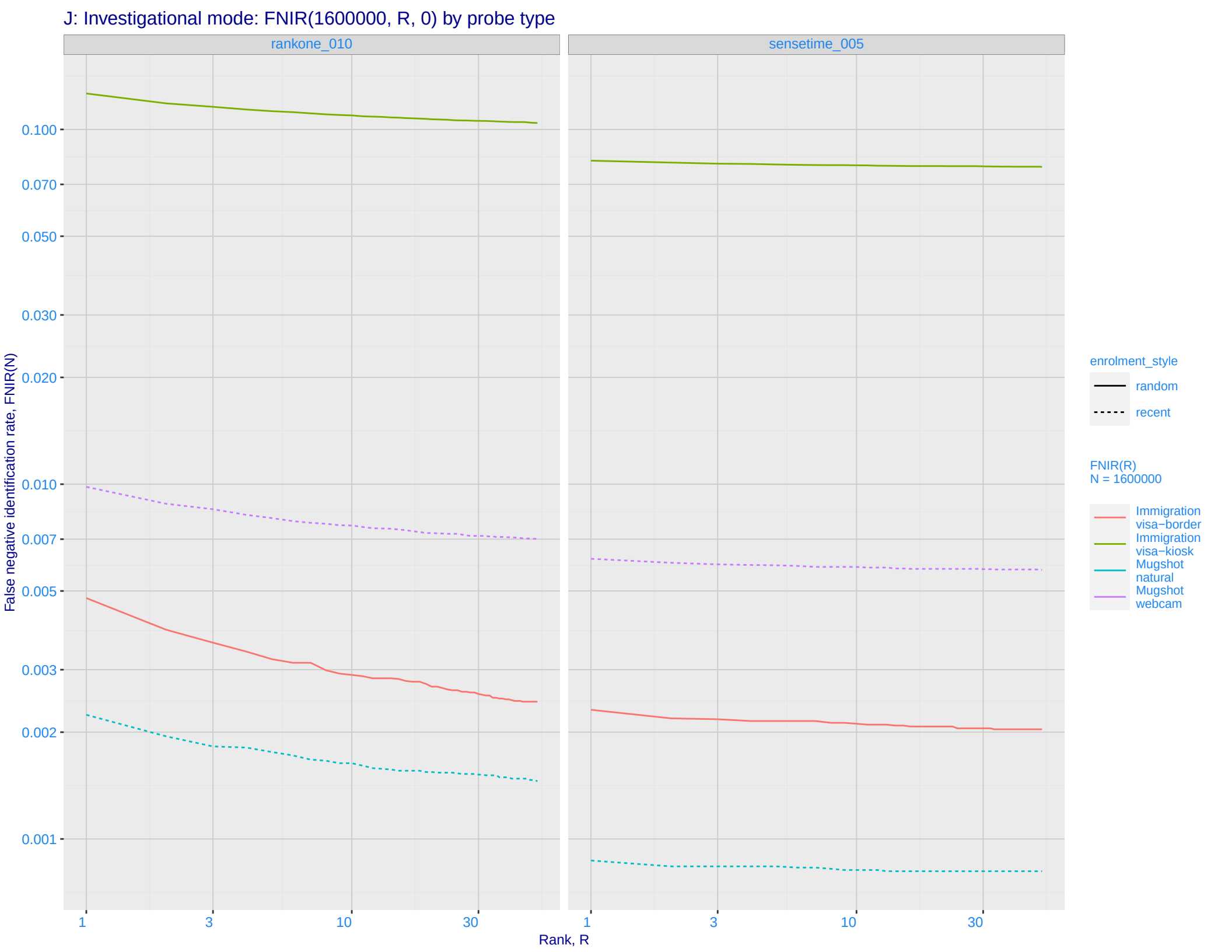

E: Dependence of error rates on T by number enrolled identities, N, for Mugshot natural images
N
00640000
01600000
03000000
06000000
12000000
recent
FNIR
FPIR
Identification Error rate, FPIR(T) or FNIR(T)
0.700
0.500
0.300
0.200
0.100
0.070
0.050
0.030
0.020
0.010
0.007
0.005
0.003
0.002
7e−01
5e−01
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
0.4
0.6
0.8
1.0
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
1e−05
3e−05
1e−04
3e−04
1e−03
3e−03
1e−02
3e−02
1e−01
3e−01
False Positive Idenification Rate, FPIR(T)
Enrolled images:
recent
N = 1600000
Mugshot
natural
Mugshot
webcam

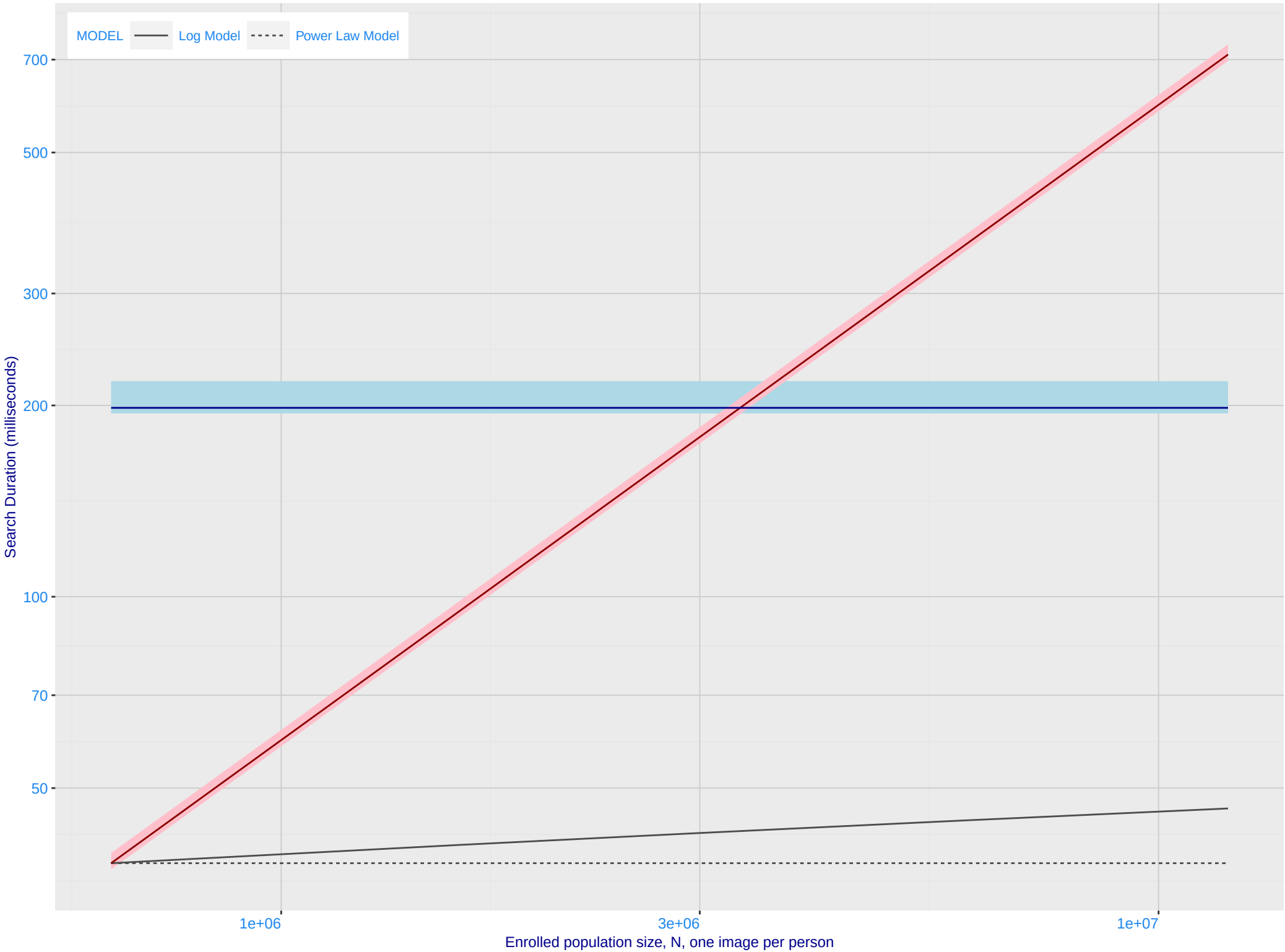

G: FPIR dependence on T by probe type for N = 1600000 subjects
False Positive Idenification Rate, FPIR(T)
7e−01
5e−01
3e−01
2e−01
1e−01
7e−02
5e−02
3e−02
2e−02
1e−02
7e−03
5e−03
3e−03
2e−03
1e−03
7e−04
5e−04
3e−04
2e−04
1e−04
7e−05
5e−05
3e−05
2e−05
1e−05
0.4
0.6
0.8
1.0
Threshold
Enrolled image:
random
N = 1600000
Immigration
visa−border
Immigration
visa−kiosk
Mugshot
natural
Mugshot
profile
Mugshot
webcam
enrolment_style
random
recent


H: DET for Mugshot natural images and various N. Links connect points of equal threshold.
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
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
03000000
06000000
12000000


I: Investigational mode: FNIR(N, 1, 0) vs. most accurate (sensetime_005)
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
rankone_010
sensetime_005


J: Investigational mode: FNIR(1600000, R, 0) by probe type
rankone_010
sensetime_005
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

K: 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



M−A: FNIR(T, N = 1.6 million) by sex, age and time−lapse

Algorithm: rankone_010, Dataset: Border−Crossing Ageing
Threshold: 0.831047 set to achieve FPIR(30−45, Male) = 0.001

Color encodes log(FNIR)

Age group at time of enrollment	Female						Male					
	10	11	12	13	14	15	10	11	12	13	14	15
(60:99]	0.079	0.082	0.102	0.102	0.119	0.143	0.055	0.055	0.058	0.074	0.070	0.081
(45:60]	0.072	0.072	0.083	0.095	0.107	0.116	0.041	0.045	0.053	0.063	0.067	0.074
(30:45]	0.084	0.089	0.100	0.116	0.126	0.124	0.045	0.043	0.057	0.070	0.079	0.075
(21:30]	0.120	0.122	0.137	0.156	0.163	0.170	0.071	0.074	0.089	0.108	0.126	0.121
(18:21]	0.205	0.204	0.217	0.244	0.254	0.258	0.210	0.201	0.230	0.266	0.297	0.304
(15:18]	0.268	0.260	0.280	0.308	0.327	0.272	0.386	0.391	0.429	0.487	0.509	0.520
(12:15]	0.332	0.321	0.349	0.379	0.395	0.376	0.554	0.548	0.613	0.635	0.667	0.667

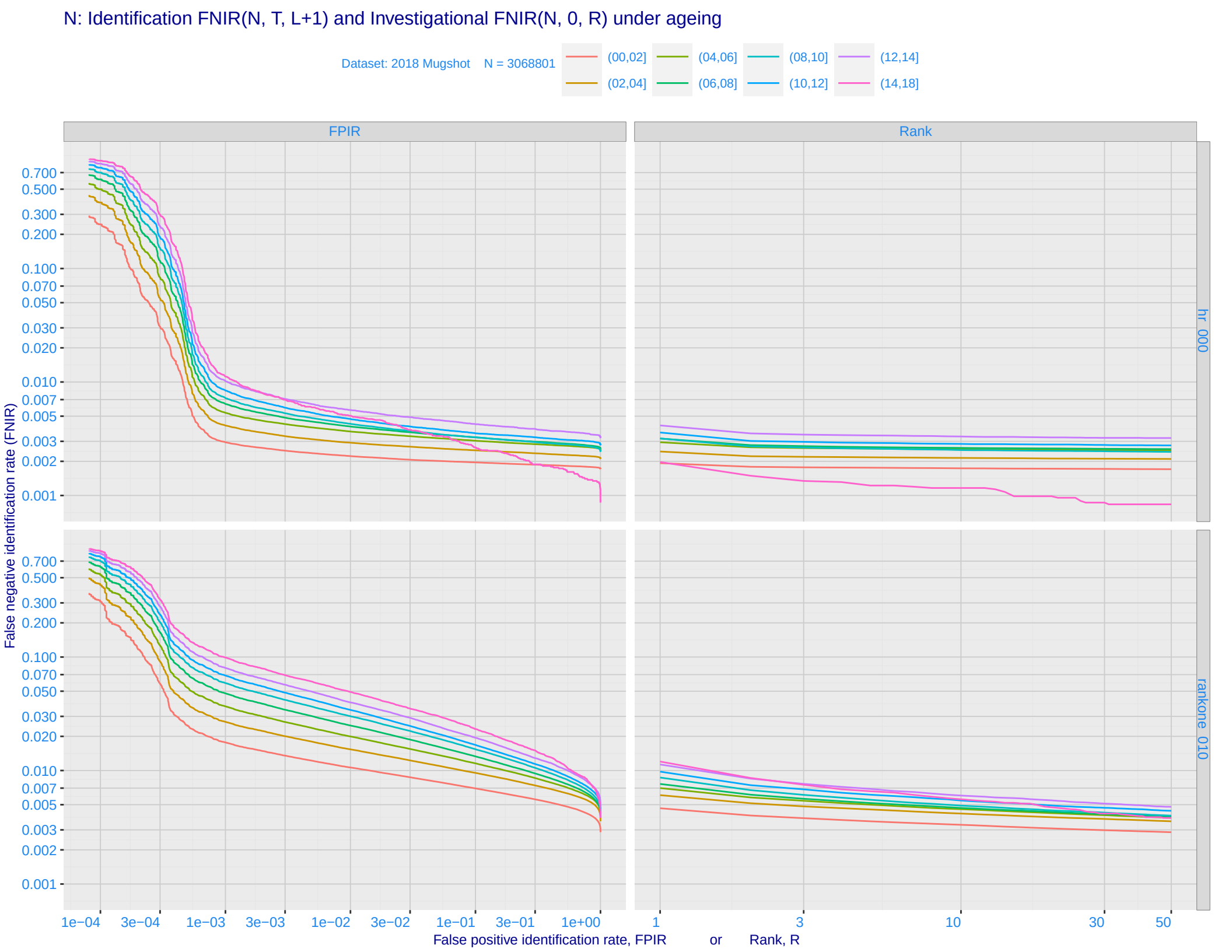
Time between probe and enrollment (years)

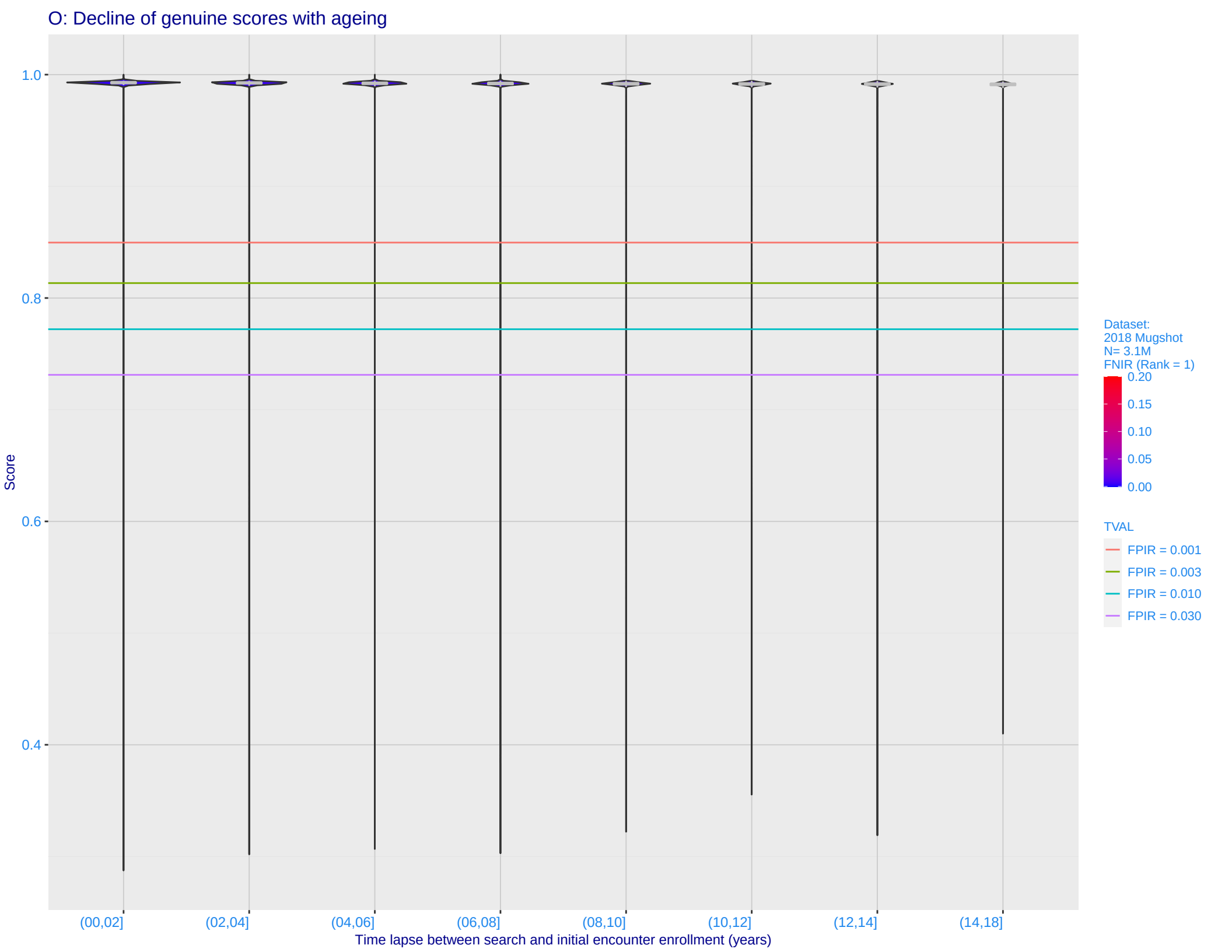
M−B: FPIR(T, N = 1.6 million) by sex and age

Algorithm: rankone_010, Dataset: Border−Crossing Ageing
Threshold: 0.831047 set to achive FPIR(30−45, Male) = 0.001

Color encodes log(FPIR)

−4 −3 −2 −1


N: 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
hr 000
rankone 010
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


O: Decline of genuine scores with ageing
1.0
0.8
0.6
0.4
Score
(00,02]
(02,04]
(04,06]
(06,08]
(08,10]
(10,12]
(12,14]
(14,18]
Time lapse between search and initial encounter enrollment (years)
Dataset:
2018 Mugshot
N= 3.1M
FNIR (Rank = 1)
0.20
0.15
0.10
0.05
0.00
TVAL
FPIR = 0.001
FPIR = 0.003
FPIR = 0.010
FPIR = 0.030