A: Datasheet

Algorithm: deepsea_001

Developer: Tencent Deepsea Lab

Submission Date: 2019_07_29

Template size: 2048 bytes

Template time (2.5 percentile): 731 msec

Template time (median): 738 msec

Template time (97.5 percentile): 1038 msec

Investigation:

Frontal mugshot ranking 68 (out of 259) −− FNIR(1600000, 0, 1) = 0.0043 vs. lowest 0.0009 from sensetime_005

Mugshot webcam ranking 44 (out of 221) −− FNIR(1600000, 0, 1) = 0.0159 vs. lowest 0.0062 from sensetime_005

Mugshot profile ranking 95 (out of 190) −− FNIR(1600000, 0, 1) = 0.8138 vs. lowest 0.0591 from sensetime_005

Immigration visa−border ranking 54 (out of 142) −− FNIR(1600000, 0, 1) = 0.0095 vs. lowest 0.0014 from visionlabs_009

Immigration visa−kiosk ranking 55 (out of 139) −− FNIR(1600000, 0, 1) = 0.1398 vs. lowest 0.0694 from cib_000

Identification:

Frontal mugshot ranking 70 (out of 259) −− FNIR(1600000, T, L+1) = 0.0461, FPIR=0.001000 vs. lowest 0.0018 from sensetime_004

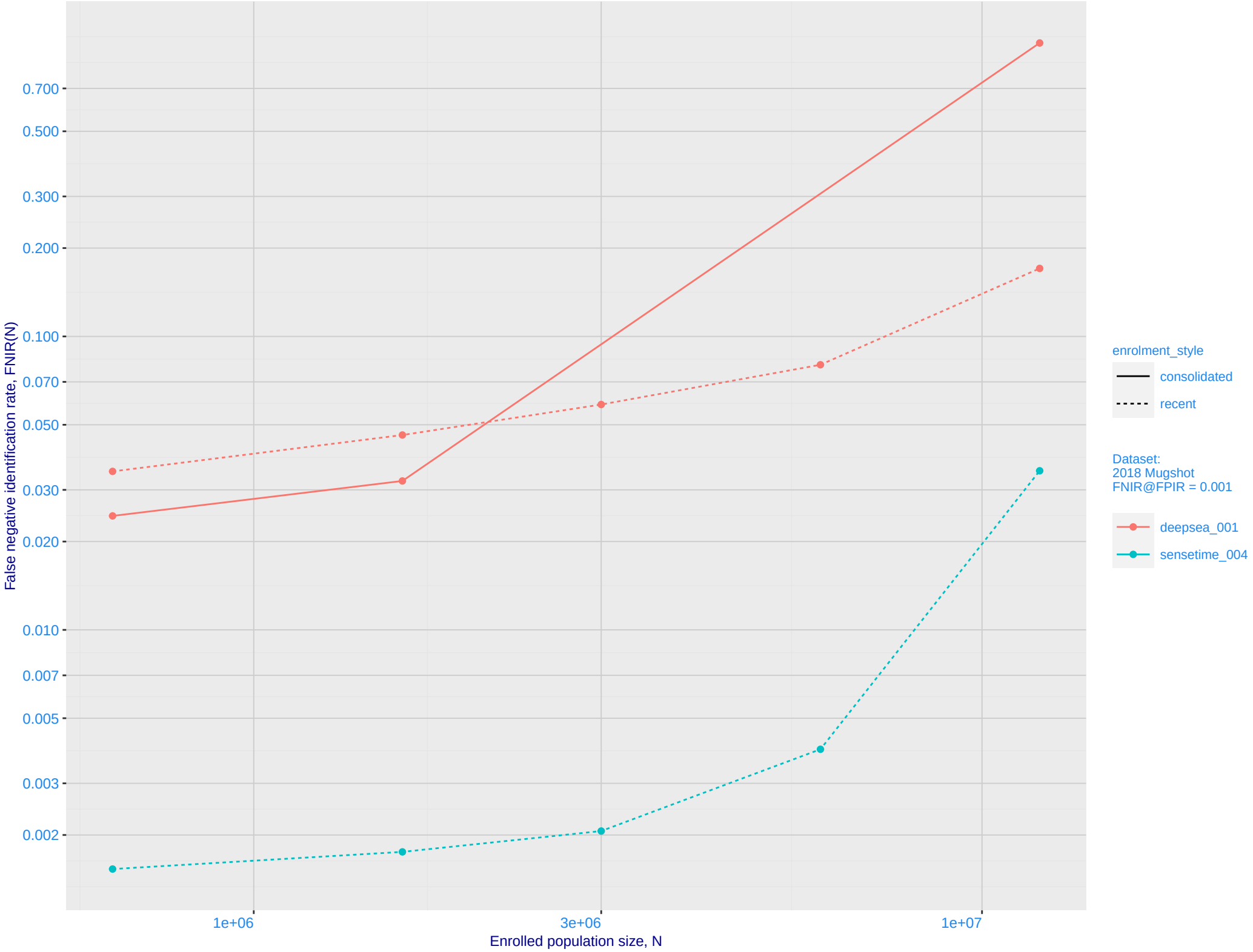
Mugshot webcam ranking 61 (out of 219) −− FNIR(1600000, T, L+1) = 0.1013, FPIR=0.001000 vs. lowest 0.0122 from sensetime_003

Mugshot profile ranking 65 (out of 189) −− FNIR(1600000, T, L+1) = 0.9846, FPIR=0.001000 vs. lowest 0.1733 from sensetime_005

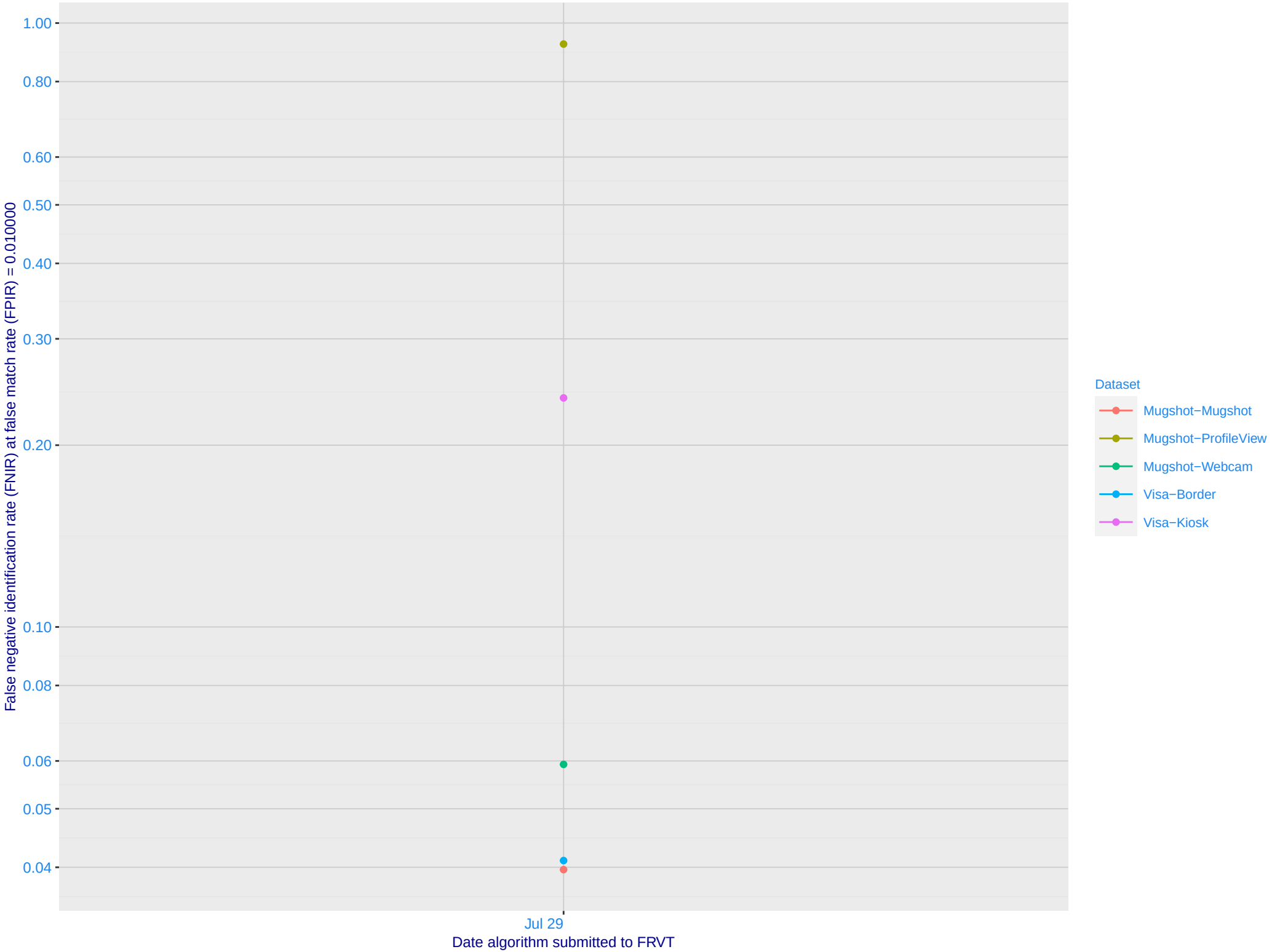
Immigration visa−border ranking 56 (out of 139) −− FNIR(1600000, T, L+1) = 0.0768, FPIR=0.001000 vs. lowest 0.0059 from sensetime_004

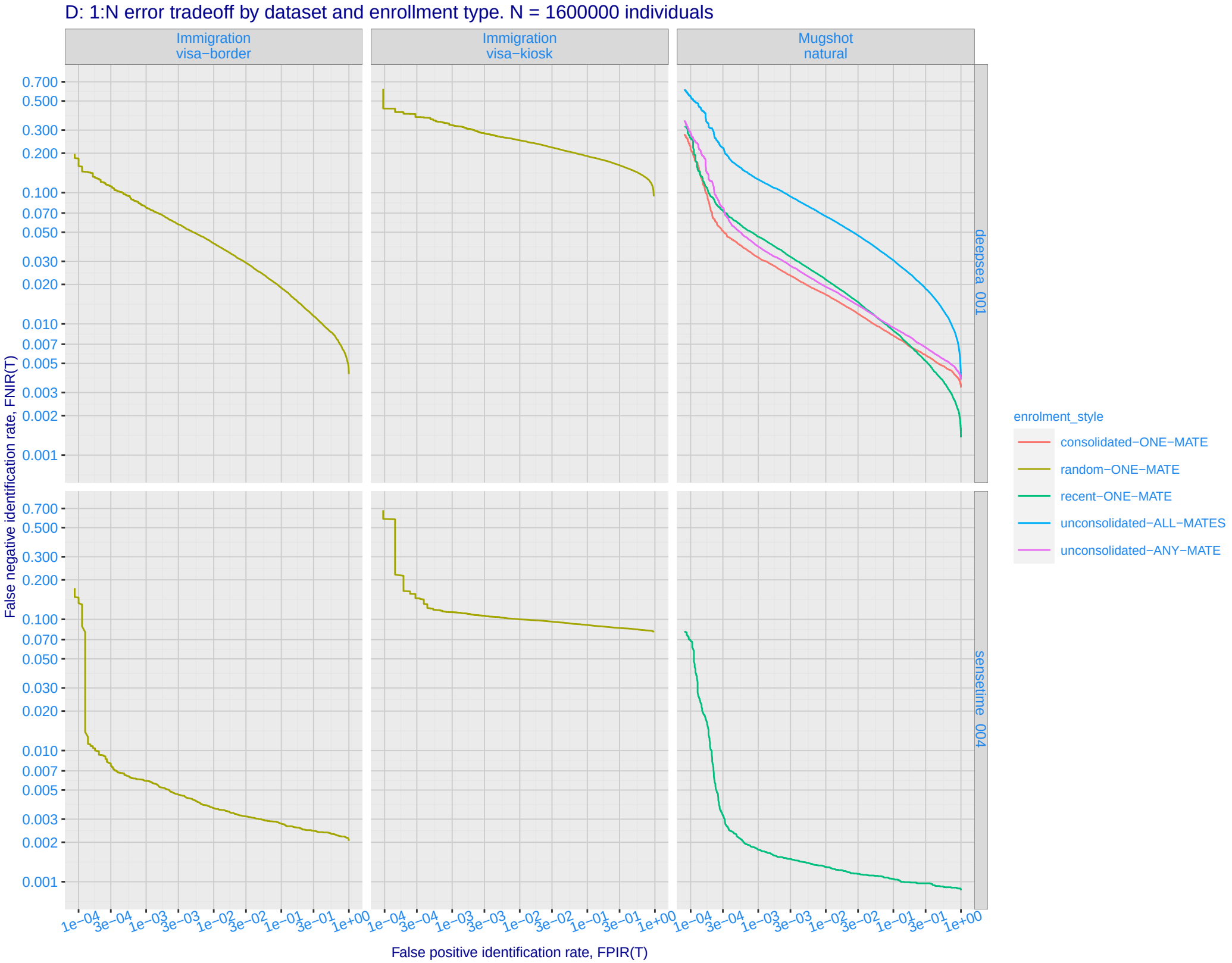
Immigration visa−kiosk ranking 42 (out of 134) −− FNIR(1600000, T, L+1) = 0.3280, FPIR=0.001000 vs. lowest 0.1048 from sensetime_005

B: Mugshot natural images, identification mode: FNIR(N, L+1, T) vs. most accurate (sensetime_004)

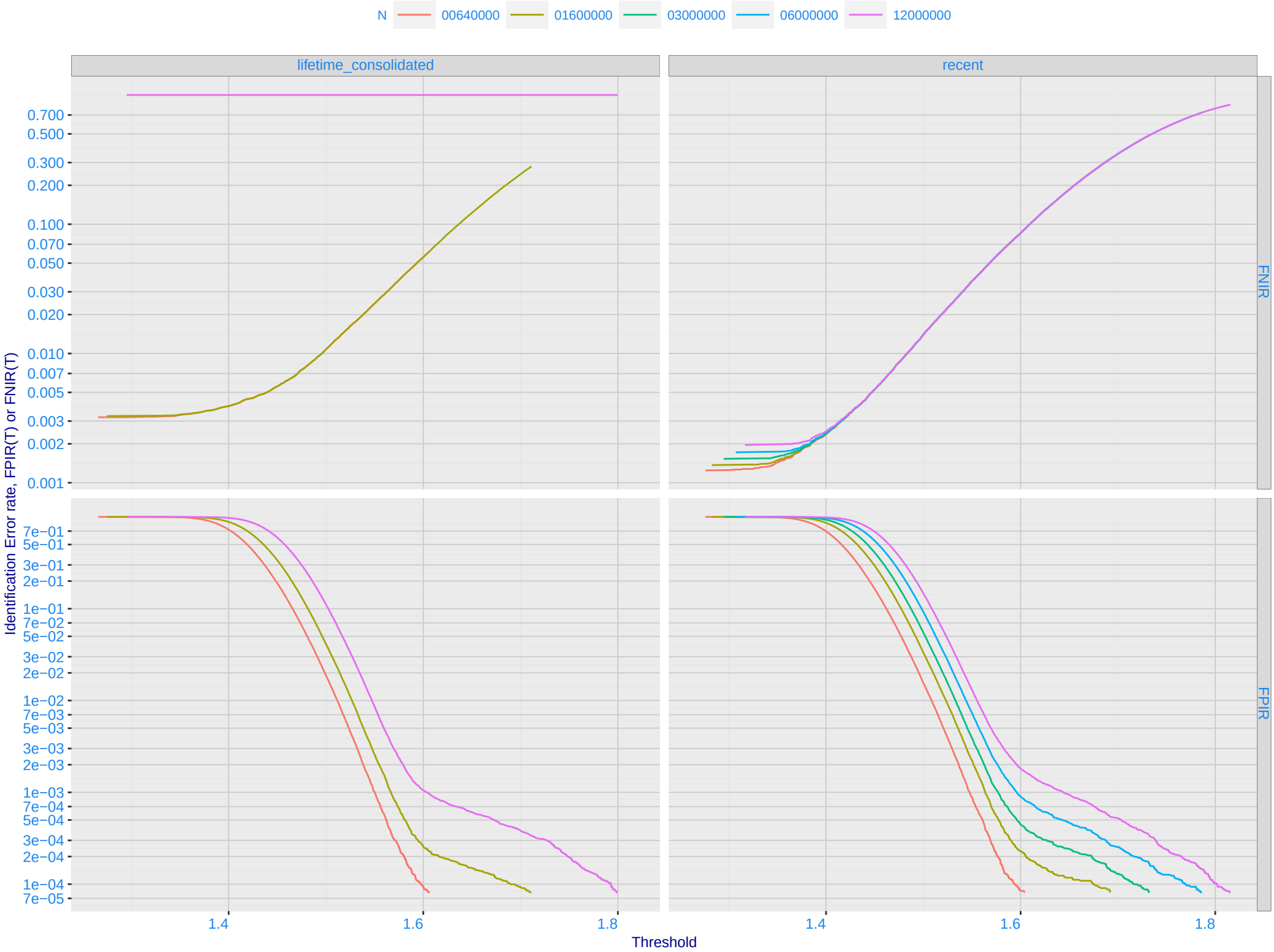


C: Evolution of accuracy for DEEPSEA algorithms on three datasets 2018 − present

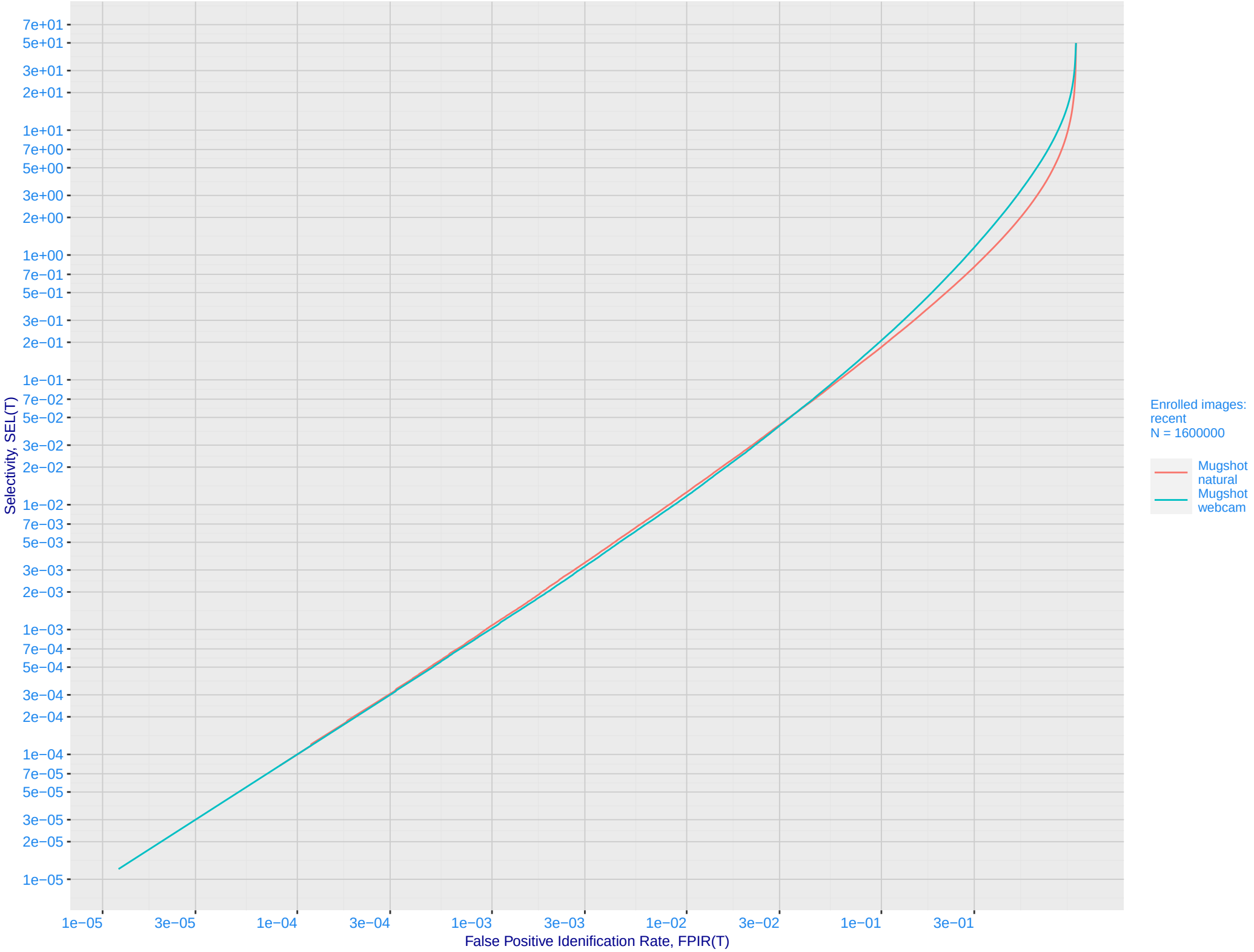


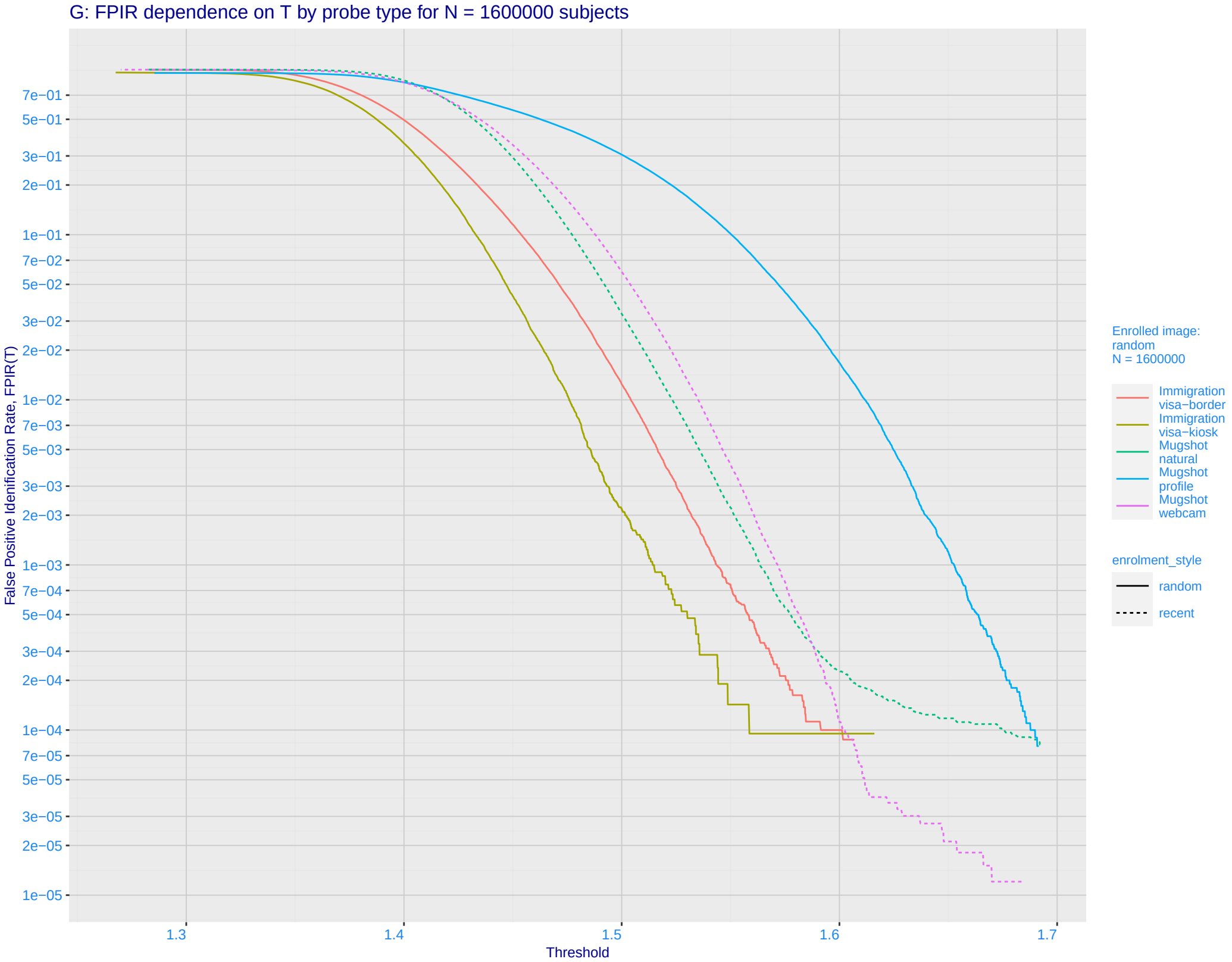

D: 1:N error tradeoff by dataset and enrollment type. N = 1600000 individuals
Immigration visa−border
Immigration visa−kiosk
Mugshot natural
deepsea_001
sensetime_004
False negative identification rate, FNIR(T)
False positive identification rate, FPIR(T)
0.700
0.500
0.300
0.200
0.100
0.070
0.050
0.030
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
enrolment_style
consolidated−ONE−MATE
random−ONE−MATE
recent−ONE−MATE
unconsolidated−ALL−MATES
unconsolidated−ANY−MATE

E: Dependence of error rates on T by number enrolled identities, N, for Mugshot natural images

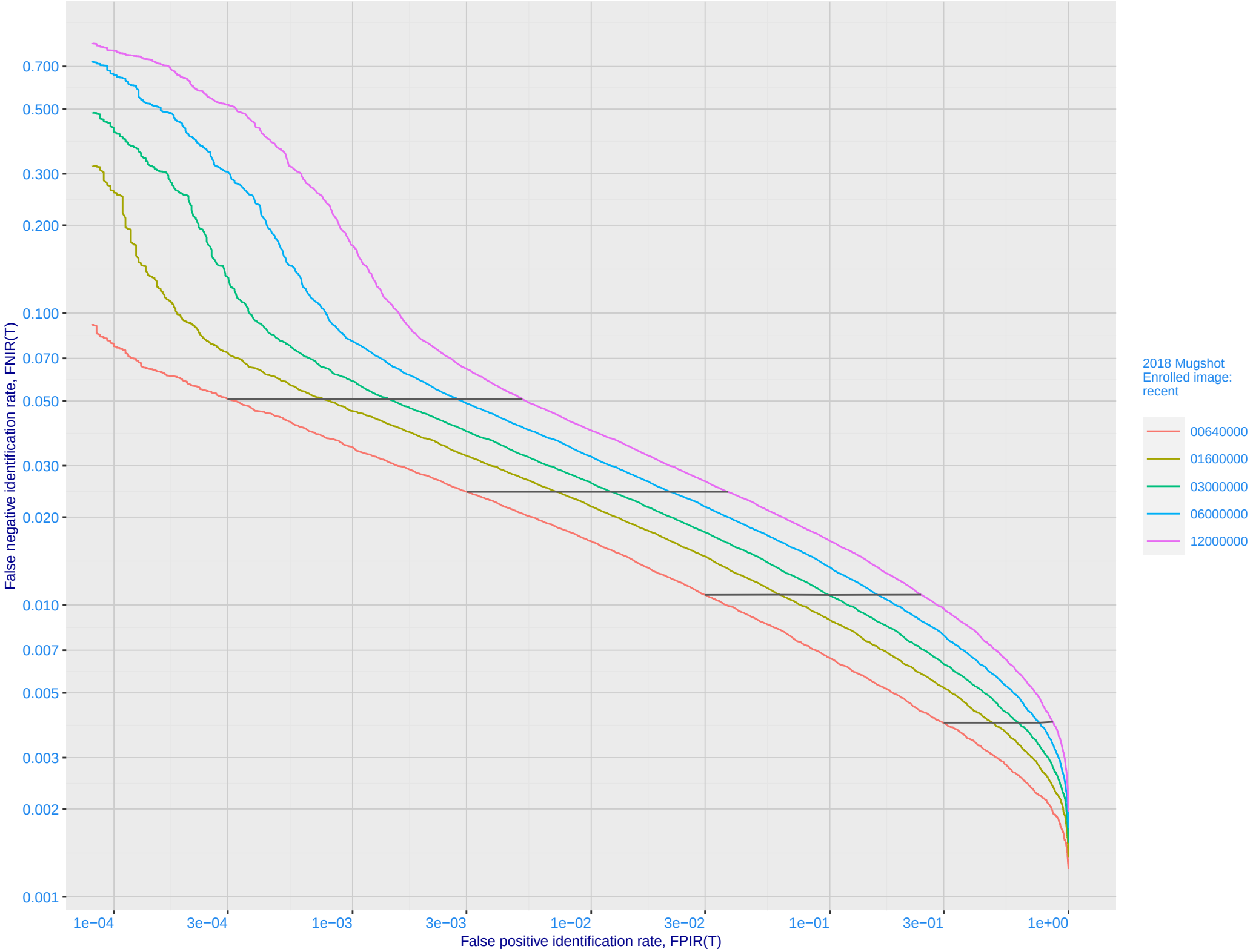


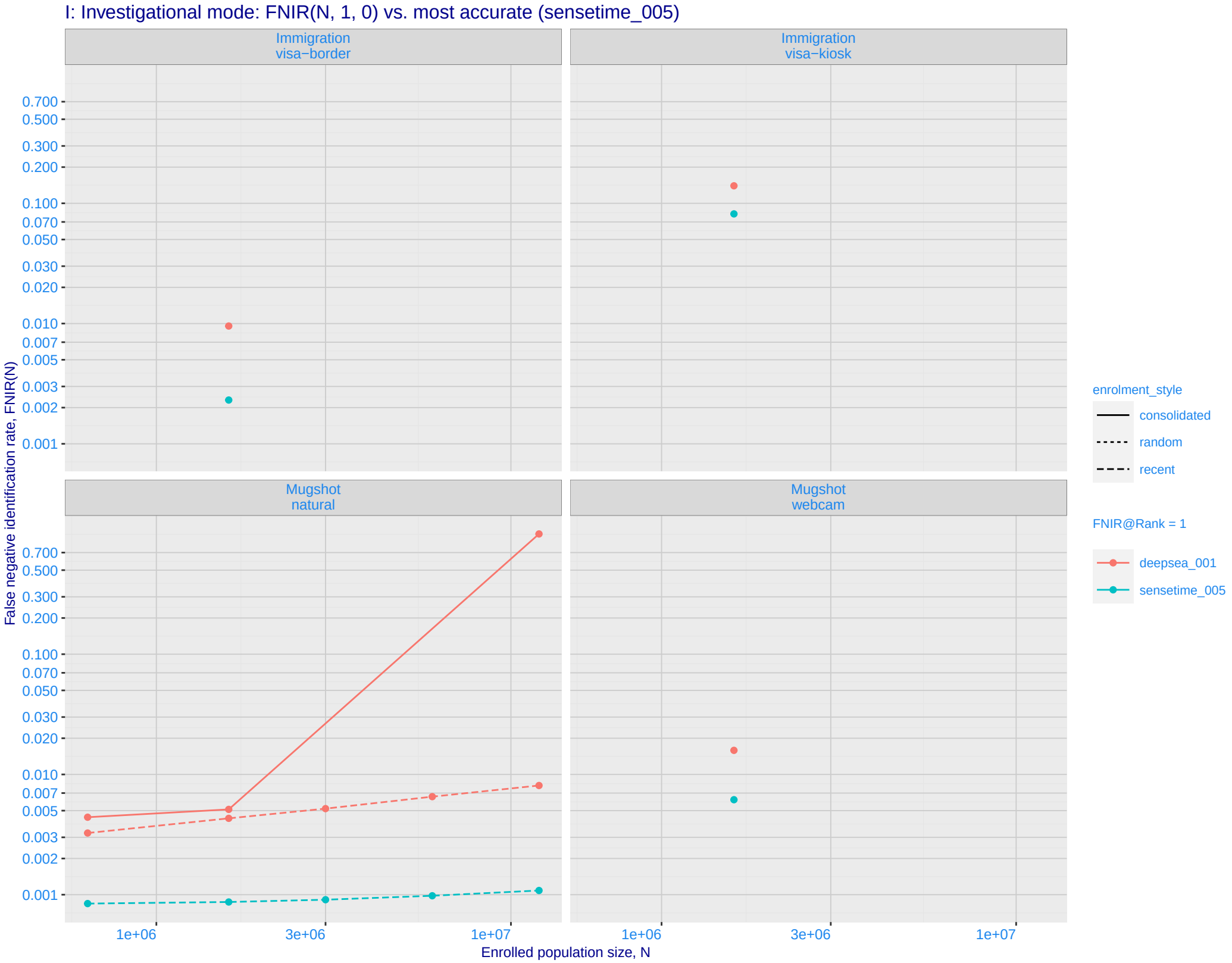
F: FPIR vs. Selectivity for mugshot images, N = 1600000 subjects enrolled with one recent mate

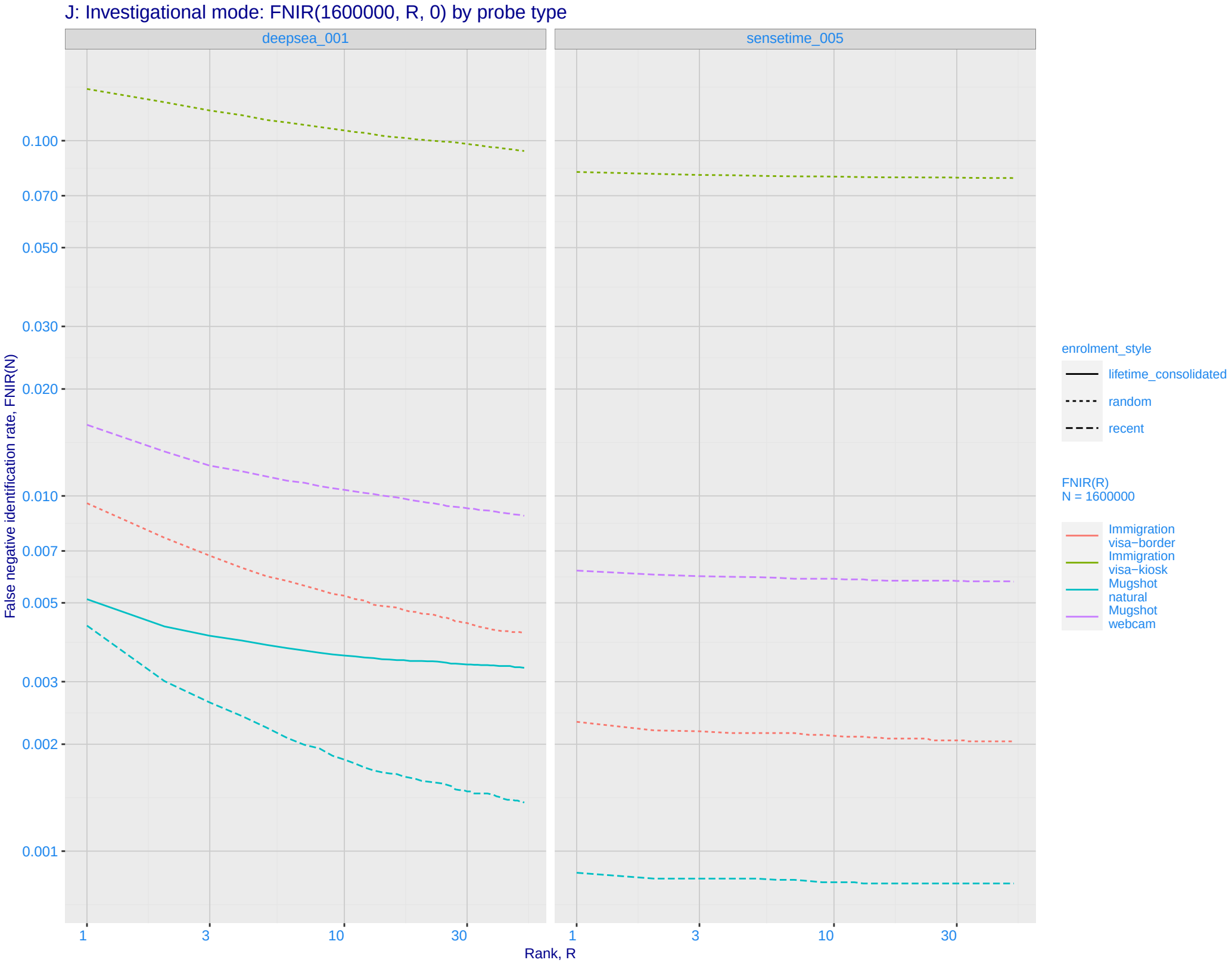



G: FPIR dependence on T by probe type for N = 1600000 subjects
False Positive Idenification Rate, FPIR(T)
7e−01
5e−01
3e−01
2e−01
1e−01
7e−02
5e−02
3e−02
2e−02
1e−02
7e−03
5e−03
3e−03
2e−03
1e−03
7e−04
5e−04
3e−04
2e−04
1e−04
7e−05
5e−05
3e−05
2e−05
1e−05
1.3
1.4
1.5
1.6
1.7
Threshold
Enrolled image:
random
N = 1600000
Immigration visa−border
Immigration visa−kiosk
Mugshot natural
Mugshot profile
Mugshot webcam
enrolment_style
random
recent

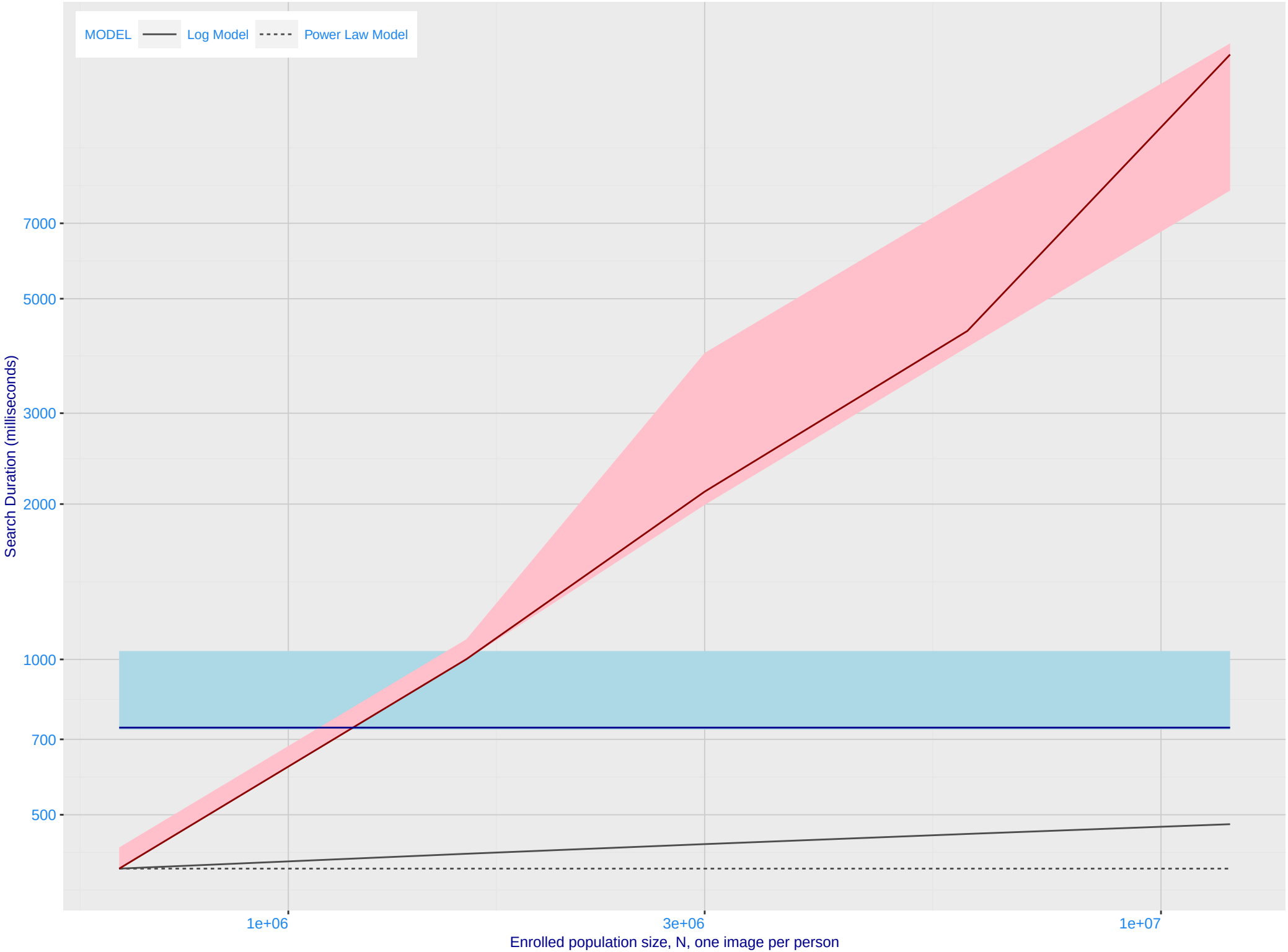
H: DET for Mugshot natural images and various N. Links connect points of equal threshold.



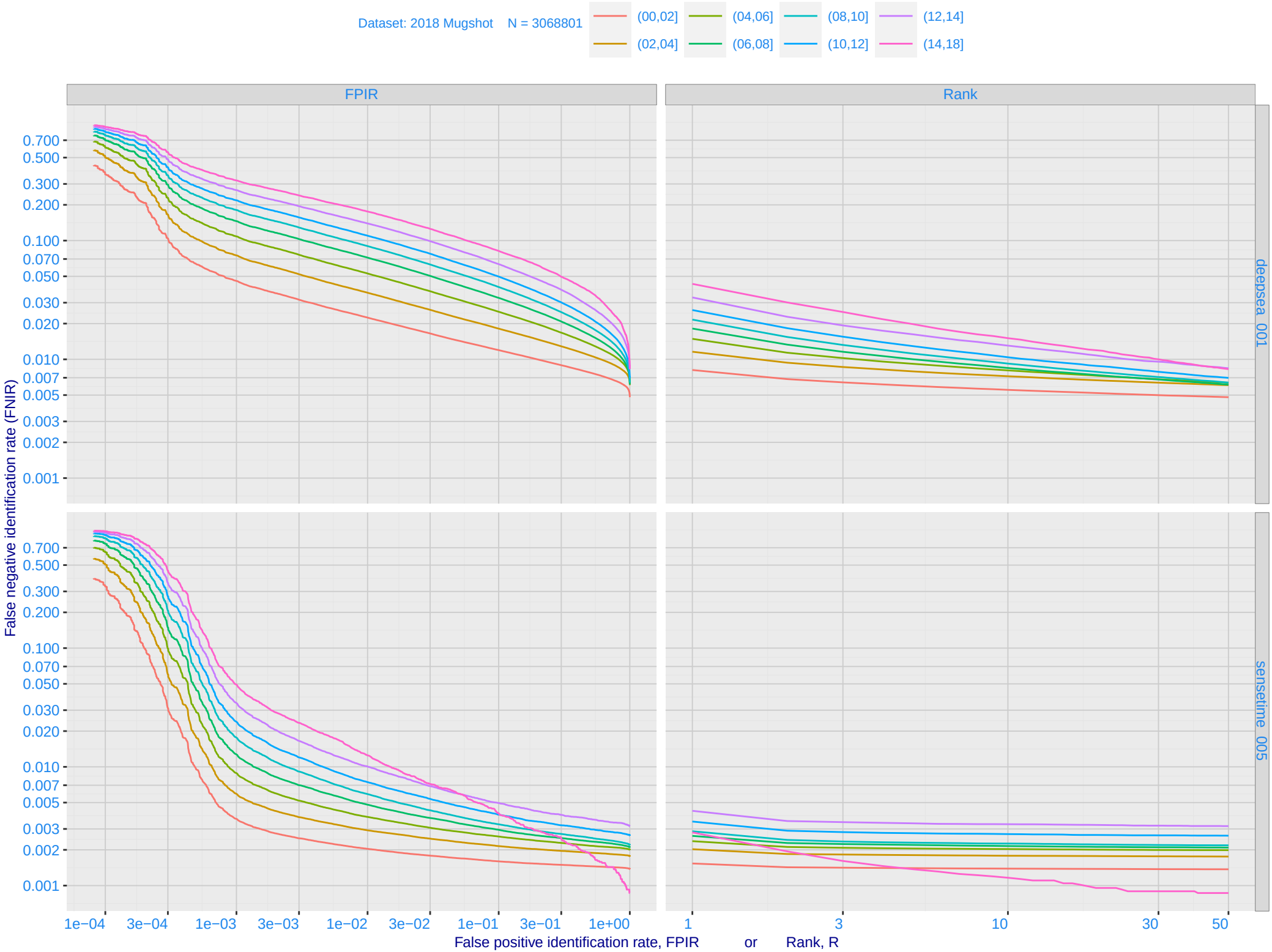

I: Investigational mode: FNIR(N, 1, 0) vs. most accurate (sensetime_005)
Immigration visa−border
Immigration visa−kiosk
Mugshot natural
Mugshot webcam
False negative identification rate, FNIR(N)
0.700
0.500
0.300
0.200
0.100
0.070
0.050
0.030
0.020
0.010
0.007
0.005
0.003
0.002
0.001
1e+06
3e+06
1e+07
Enrolled population size, N
enrolment_style
consolidated
random
recent
FNIR@Rank = 1
deepsea_001
sensetime_005

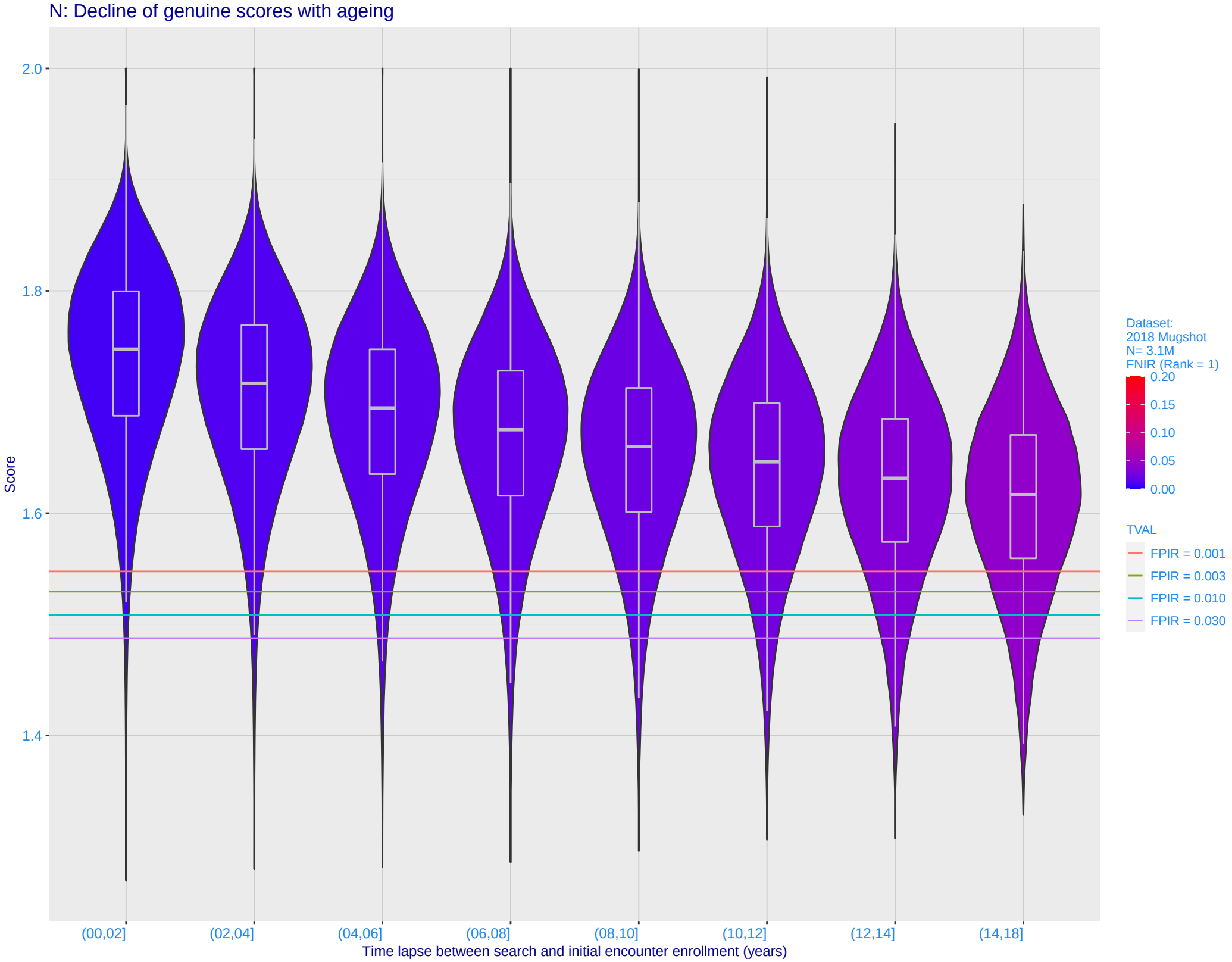

J: Investigational mode: FNIR(1600000, R, 0) by probe type
deepsea_001
sensetime_005
False negative identification rate, FNIR(N)
0.100
0.070
0.050
0.030
0.020
0.010
0.007
0.005
0.003
0.002
0.001
1
3
10
30
Rank, R
enrolment_style
lifetime_consolidated
random
recent
FNIR(R)
N = 1600000
Immigration visa−border
Immigration visa−kiosk
Mugshot natural
Mugshot webcam

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: Identification FNIR(N, T, L+1) and Investigational FNIR(N, 0, R) under ageing




N: Decline of genuine scores with ageing
Score
2.0
1.8
1.6
1.4
(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