

Appendix C

ELFT-EFS [Evaluation #1]

NIST Evaluation of Latent Fingerprint Technologies: Extended Feature Sets

Additional Results

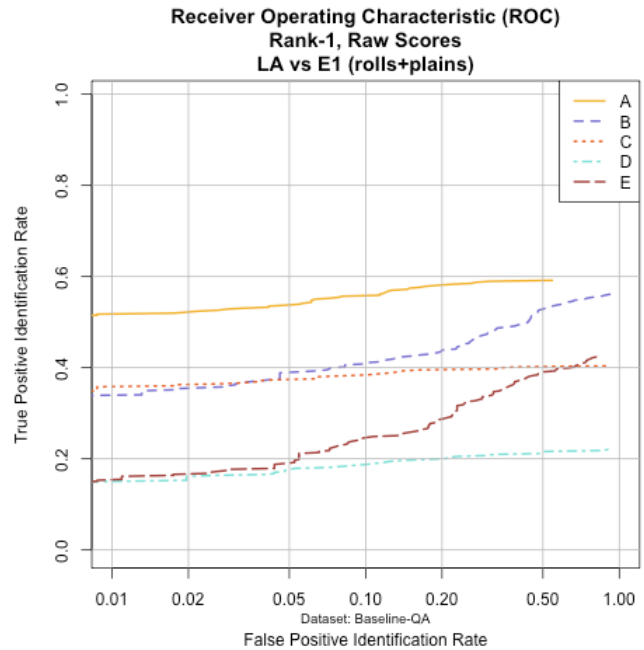
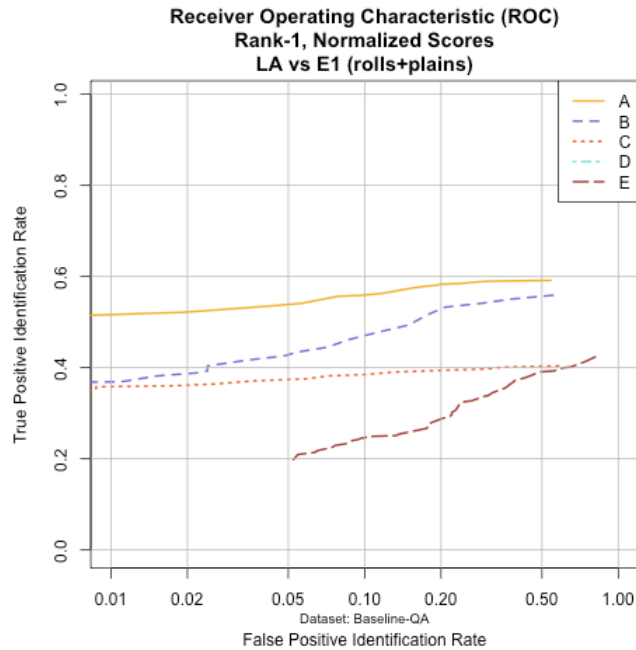
Contents

C-1	Raw score and probability score results.....	1
C-2	CMC results comparing searches of Galleries E1, E2 and E3.....	6
C-3	Performance on latents removed due to markup issues.....	11
C-4	Proportion of hits at rank 1	11

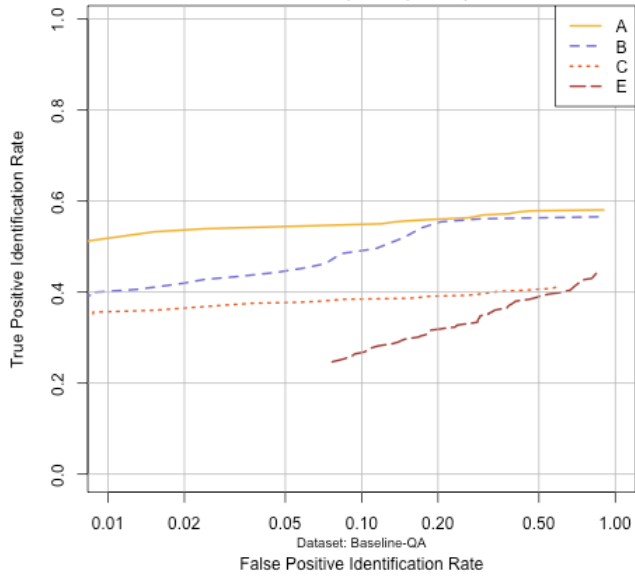
C-1 Raw score and probability score results

The following ROCs show the differences between the normalized “Probability” scores and the raw scores. In each case, participants returned a raw score and a normalized score estimating the probability of a match. In no cases did the raw scores provided better results than the normalized scores, though matcher D notably is better able to populate the range of FPIR values using raw scores. In each case, the probability score is on the left and the corresponding raw score on the right.

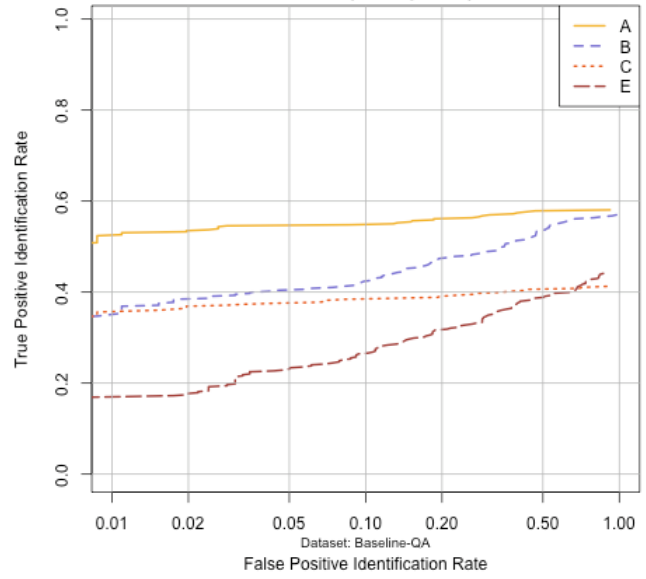
C-1.1 Baseline-QA dataset



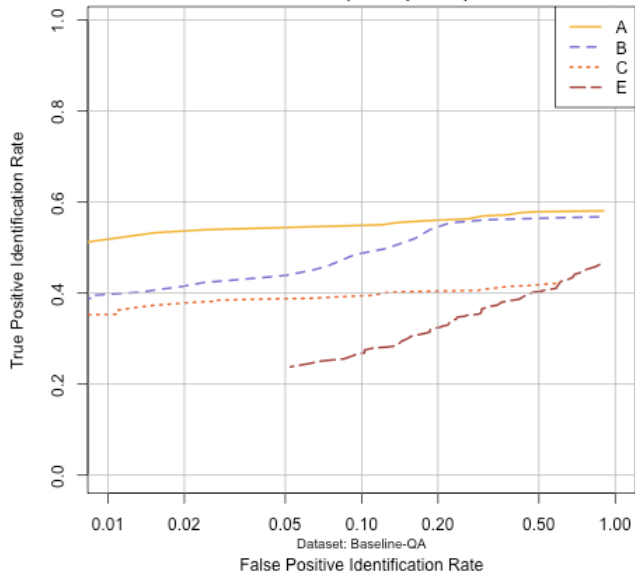
**Receiver Operating Characteristic (ROC)
Rank-1, Normalized Scores
LB vs E1 (rolls+plains)**



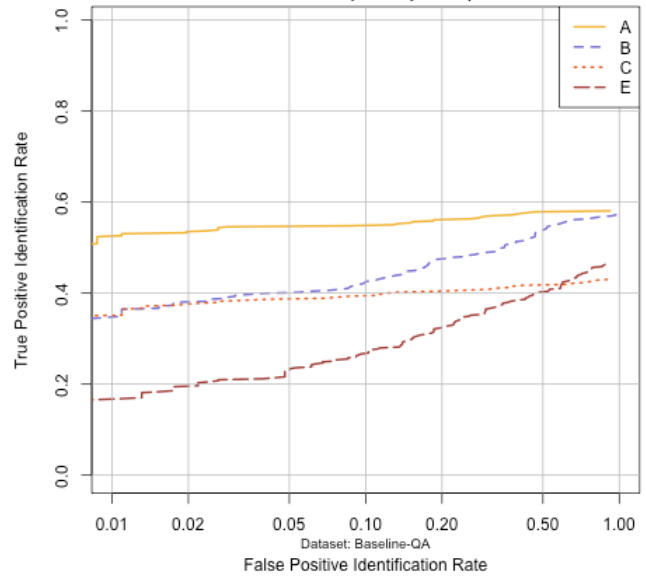
**Receiver Operating Characteristic (ROC)
Rank-1, Raw Scores
LB vs E1 (rolls+plains)**



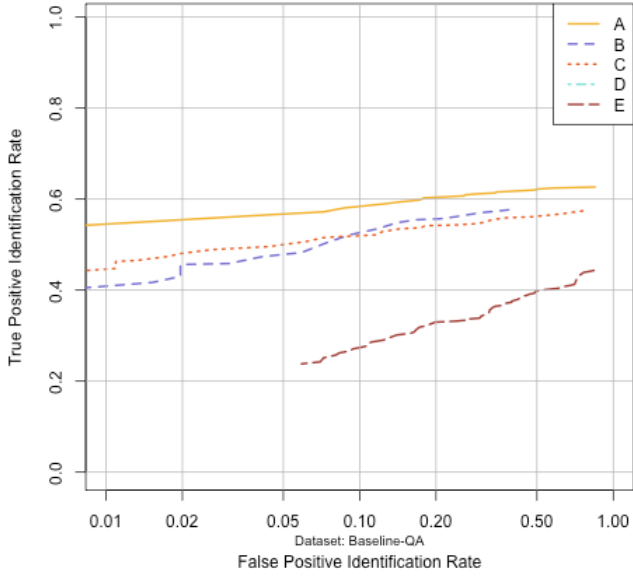
**Receiver Operating Characteristic (ROC)
Rank-1, Normalized Scores
LC vs E1 (rolls+plains)**



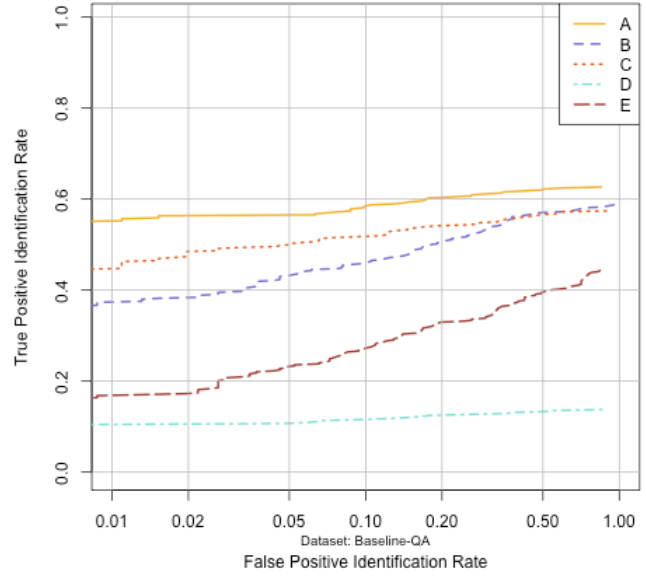
**Receiver Operating Characteristic (ROC)
Rank-1, Raw Scores
LC vs E1 (rolls+plains)**



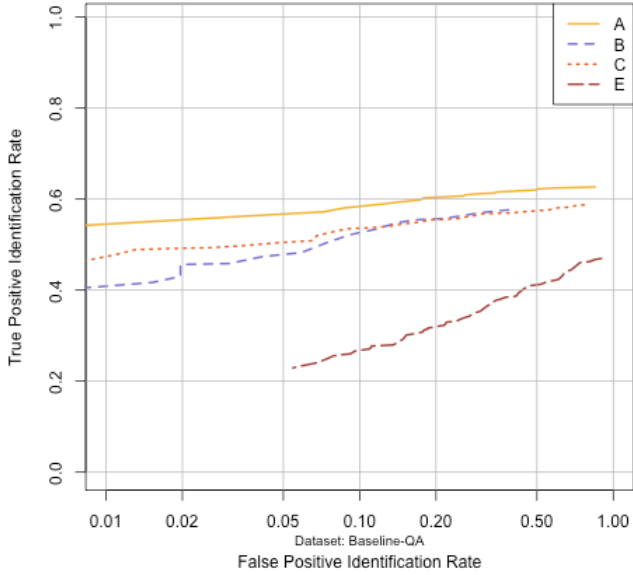
**Receiver Operating Characteristic (ROC)
Rank-1, Normalized Scores
LD vs E1 (rolls+plains)**



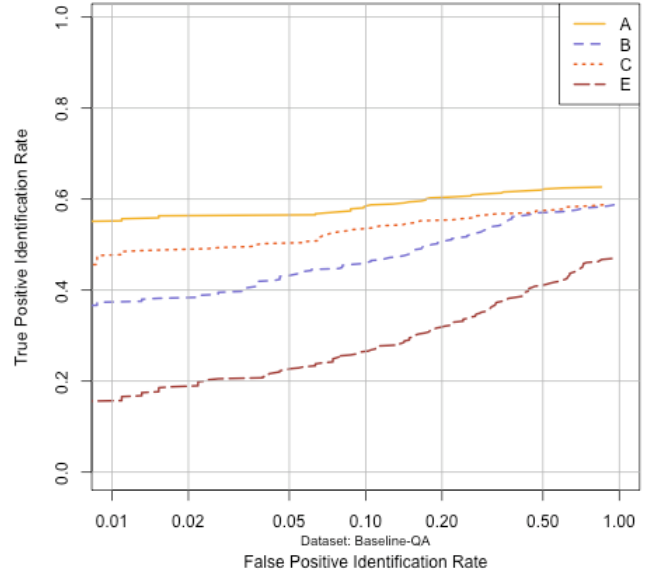
**Receiver Operating Characteristic (ROC)
Rank-1, Raw Scores
LD vs E1 (rolls+plains)**



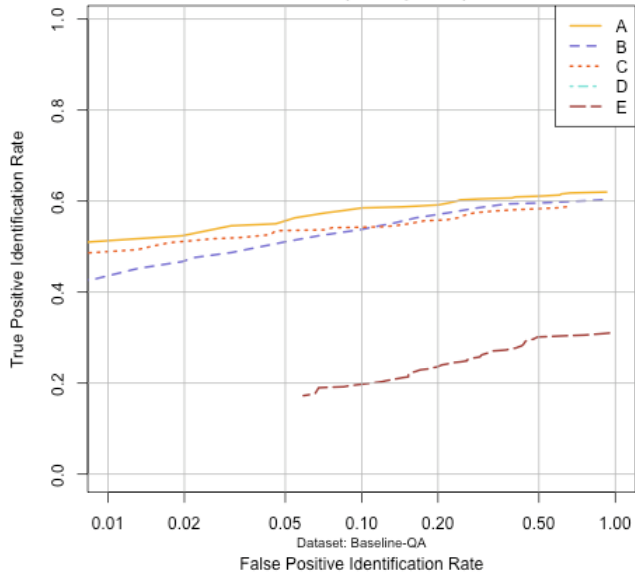
**Receiver Operating Characteristic (ROC)
Rank-1, Normalized Scores
LE vs E1 (rolls+plains)**



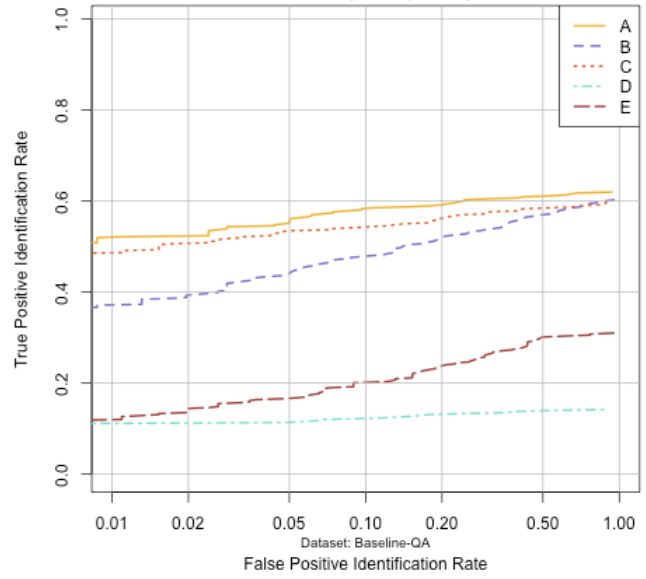
**Receiver Operating Characteristic (ROC)
Rank-1, Raw Scores
LE vs E1 (rolls+plains)**



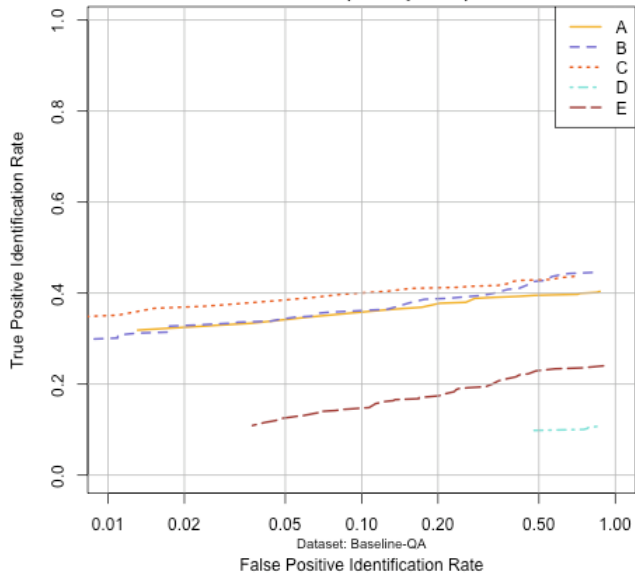
Receiver Operating Characteristic (ROC)
Rank-1, Normalized Scores
LF vs E1 (rolls+plains)



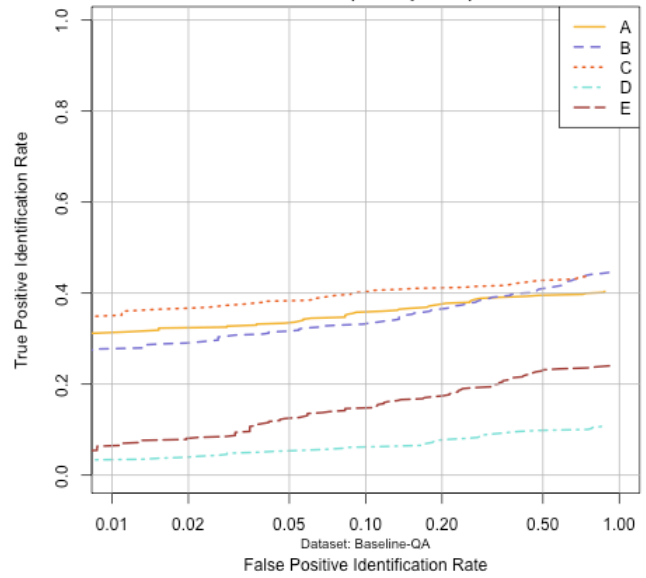
Receiver Operating Characteristic (ROC)
Rank-1, Raw Scores
LF vs E1 (rolls+plains)



Receiver Operating Characteristic (ROC)
Rank-1, Normalized Scores
LG vs E1 (rolls+plains)

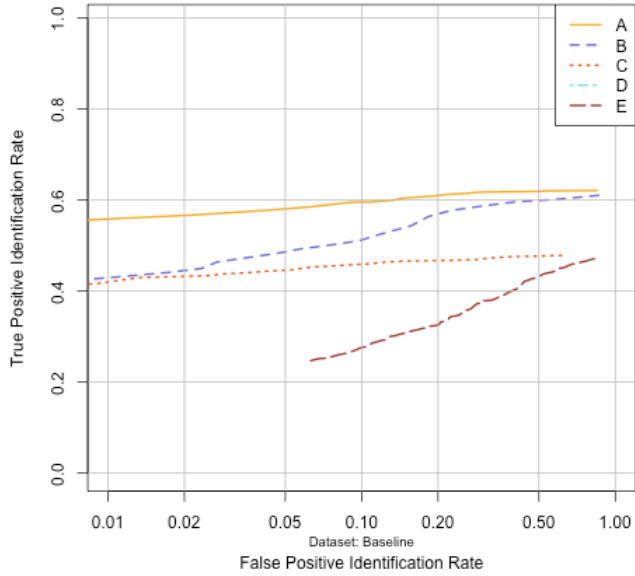


Receiver Operating Characteristic (ROC)
Rank-1, Raw Scores
LG vs E1 (rolls+plains)

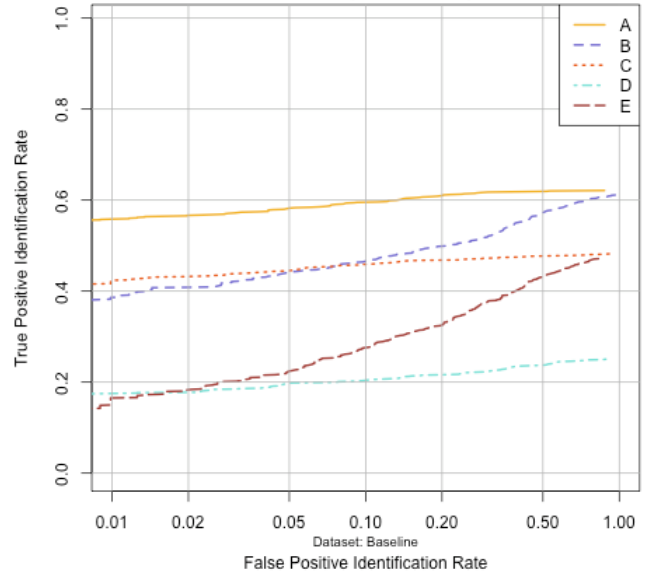


Baseline Dataset

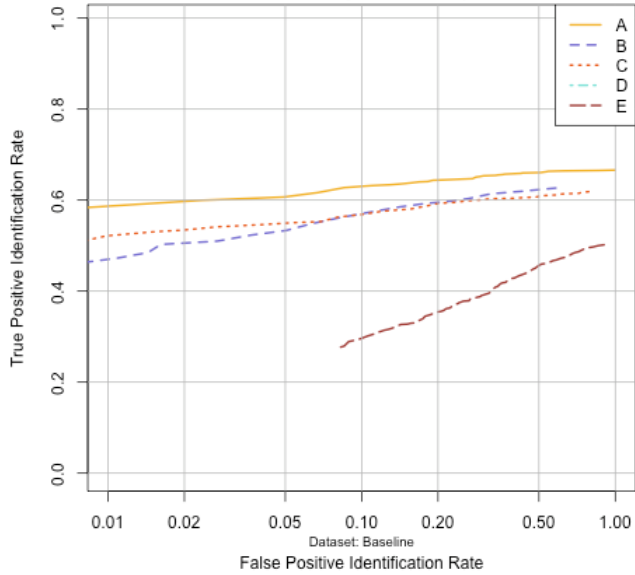
Receiver Operating Characteristic (ROC)
Rank-1, Normalized Scores
LA vs E1 (rolls+plains)



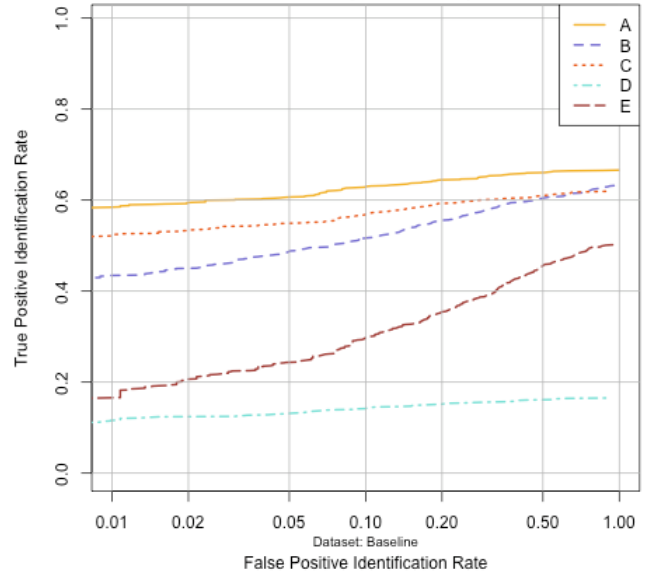
Receiver Operating Characteristic (ROC)
Rank-1, Raw Scores
LA vs E1 (rolls+plains)

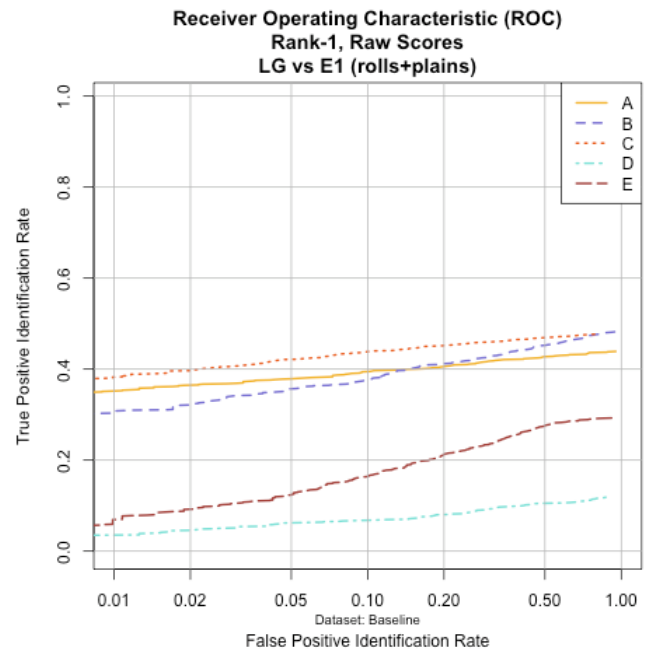
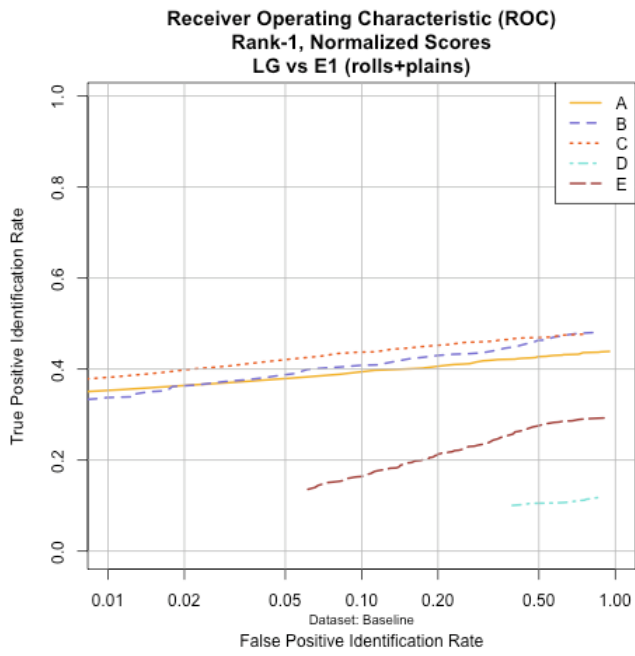


Receiver Operating Characteristic (ROC)
Rank-1, Normalized Scores
LE vs E1 (rolls+plains)



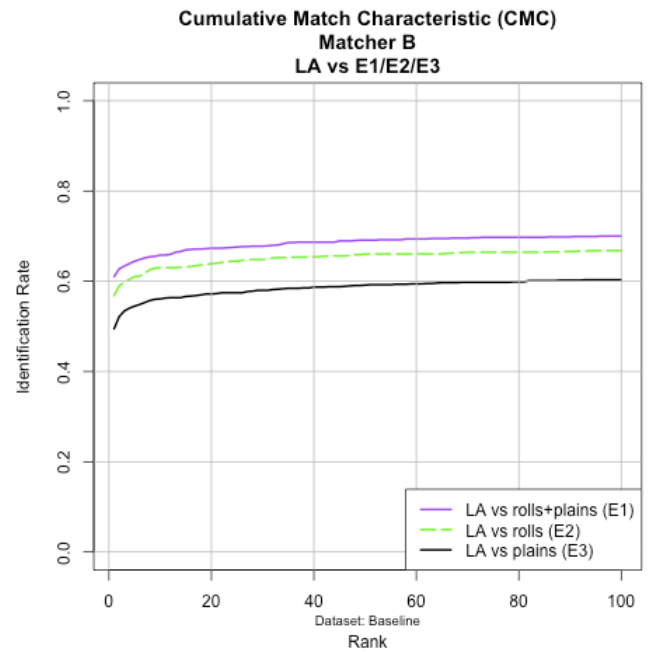
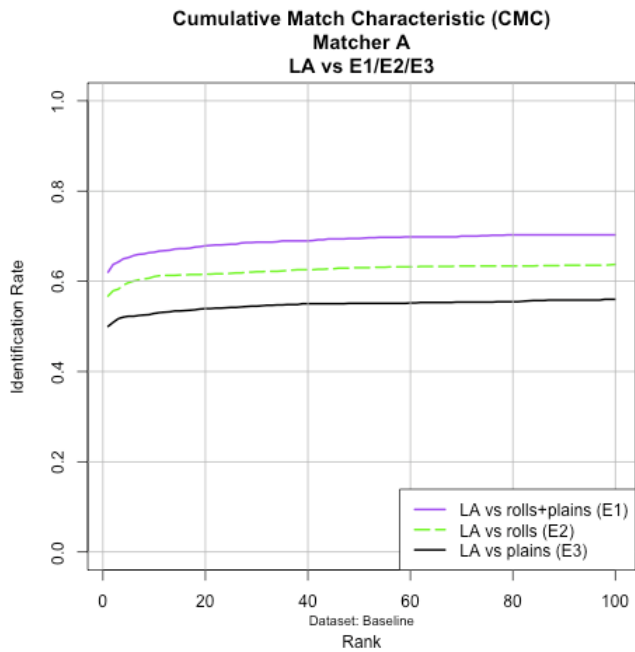
Receiver Operating Characteristic (ROC)
Rank-1, Raw Scores
LE vs E1 (rolls+plains)



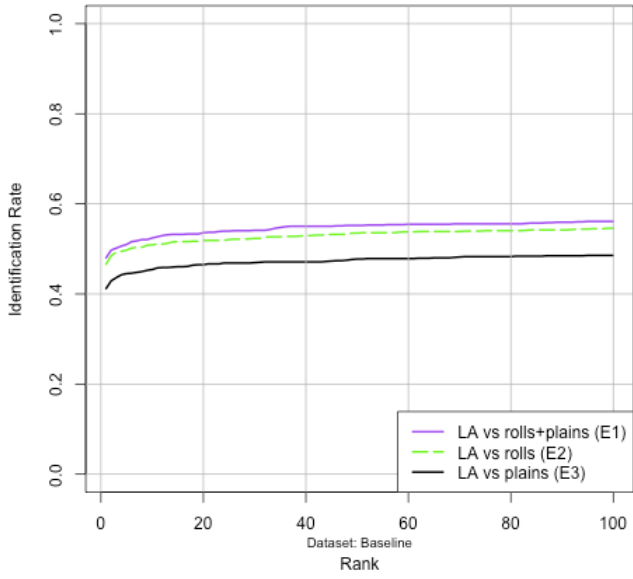


C-2 CMC results comparing searches of Galleries E1, E2 and E3

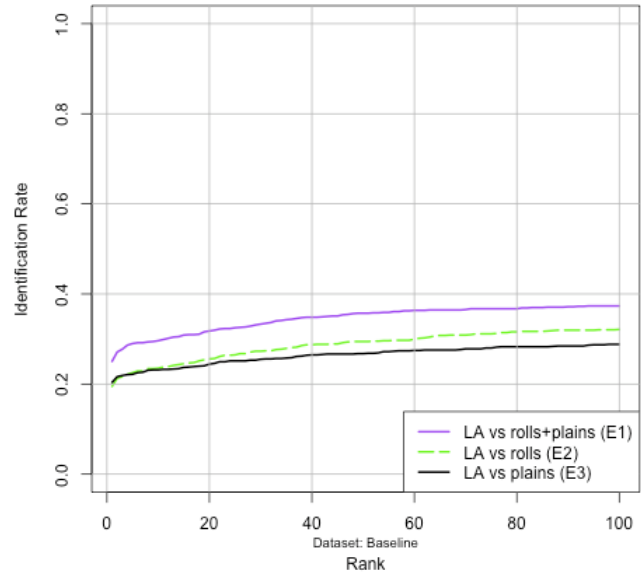
C-2.1 Image-only (LA) Results by Matcher, Baseline Dataset



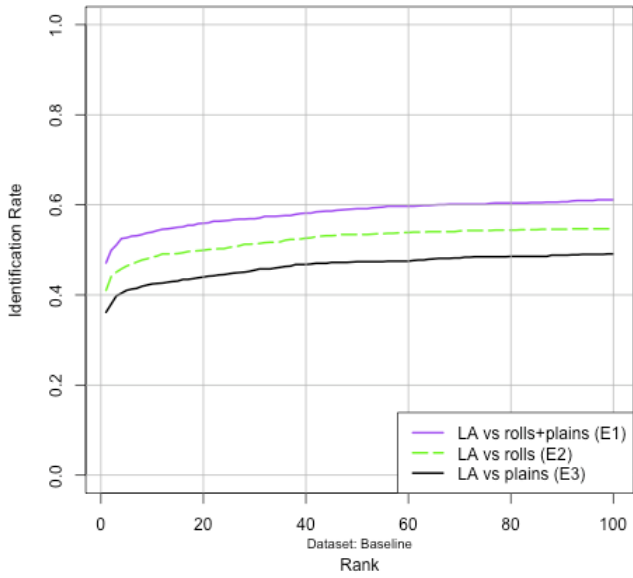
Cumulative Match Characteristic (CMC)
Matcher C
LA vs E1/E2/E3



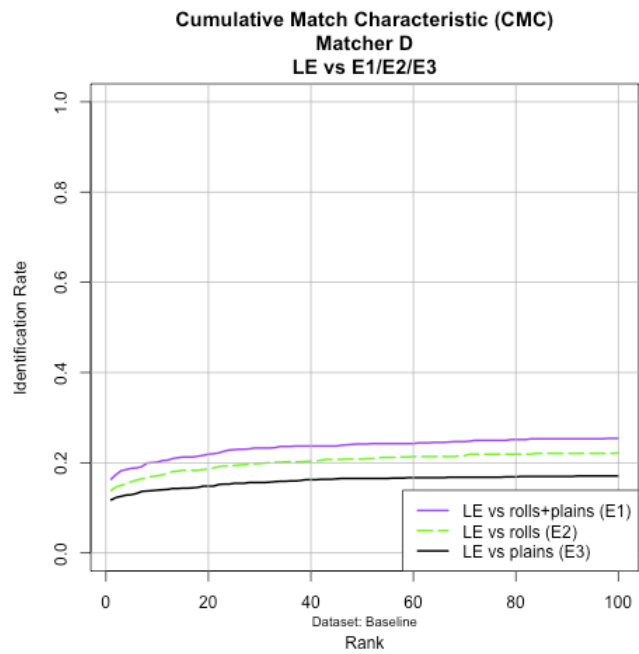
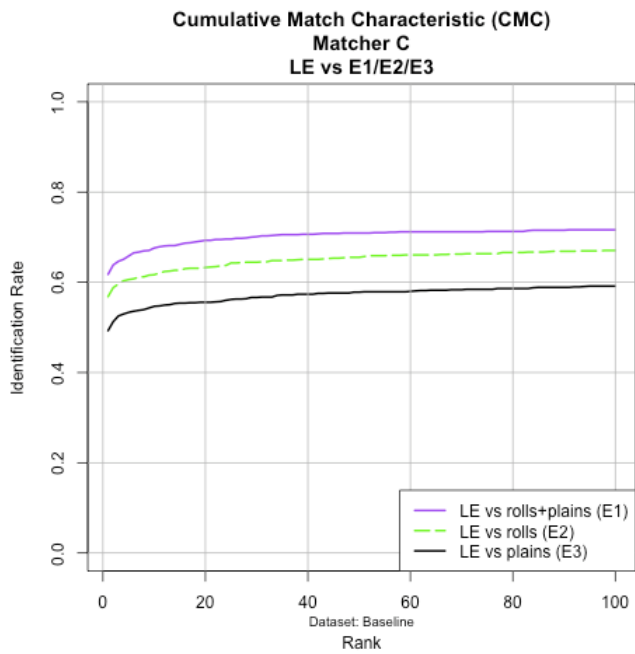
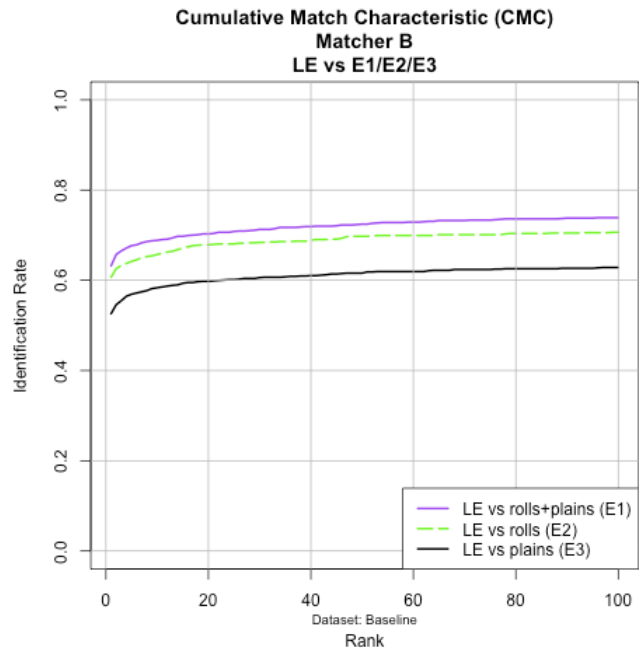
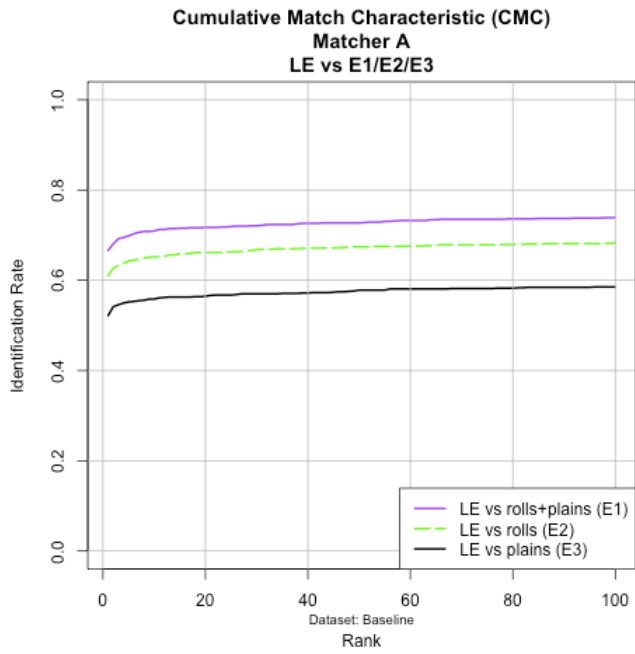
Cumulative Match Characteristic (CMC)
Matcher D
LA vs E1/E2/E3

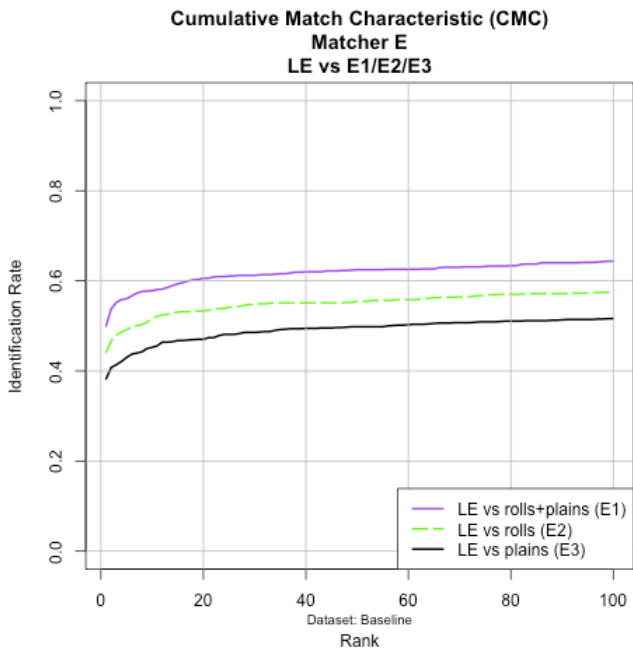


Cumulative Match Characteristic (CMC)
Matcher E
LA vs E1/E2/E3

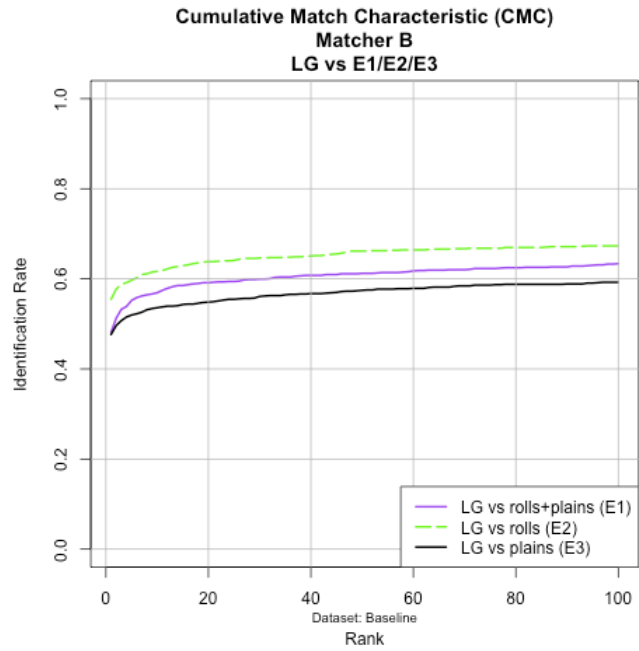
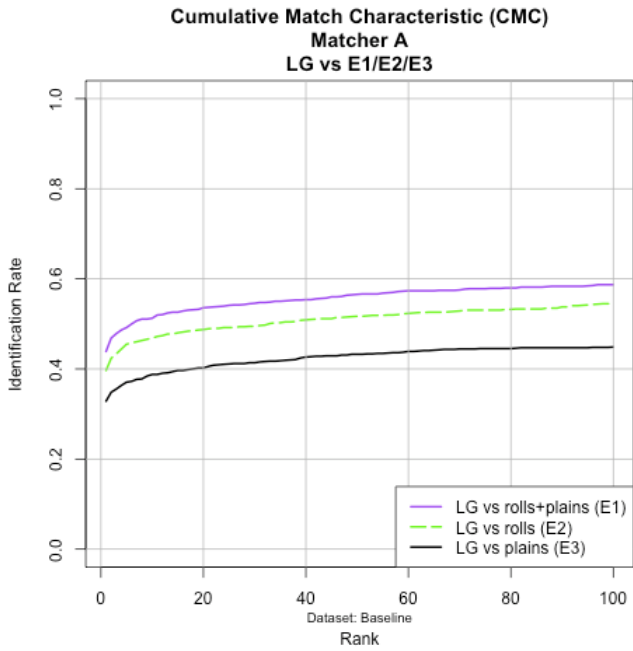


C-2.2 Image + full EFS (LE) Results by Matcher, Baseline Dataset

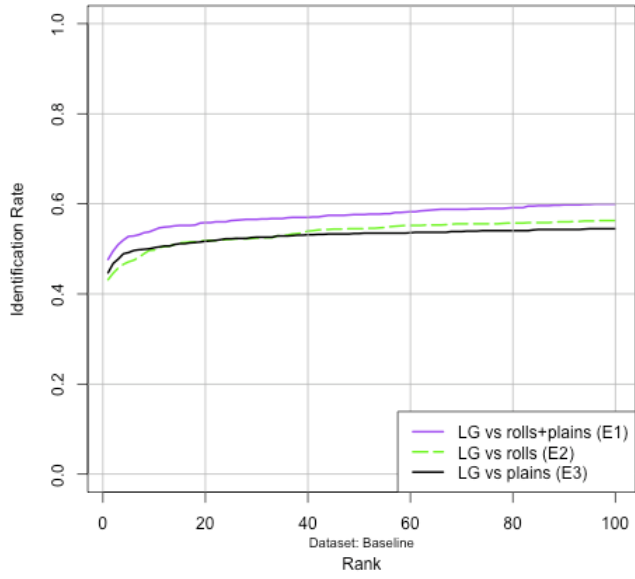




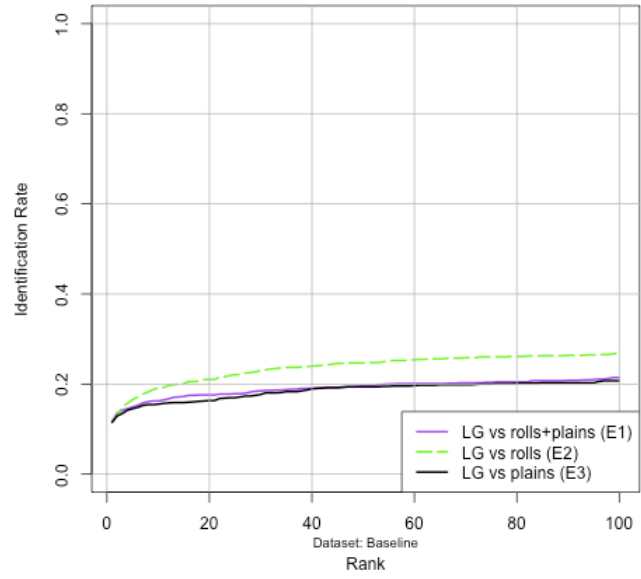
C-2.3 Minutiae Only (LG) Results by Matcher, Baseline Dataset



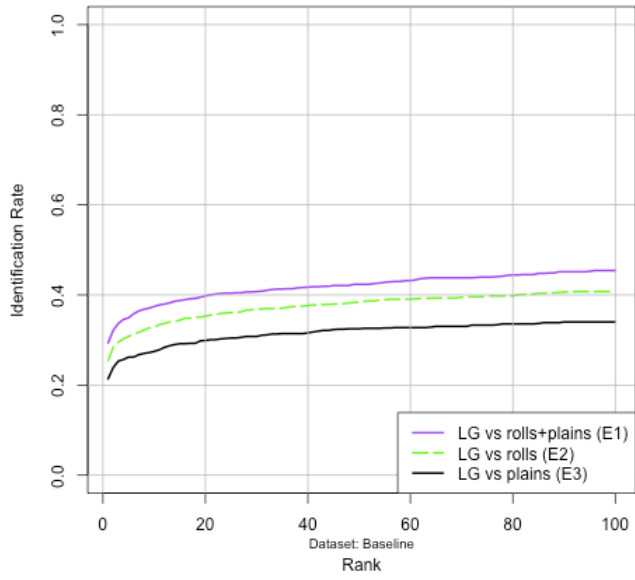
Cumulative Match Characteristic (CMC)
Matcher C
LG vs E1/E2/E3



Cumulative Match Characteristic (CMC)
Matcher D
LG vs E1/E2/E3



Cumulative Match Characteristic (CMC)
Matcher E
LG vs E1/E2/E3



C-3 Performance on latents removed due to markup issues

Summary of rank-1 hit rates for the latents removed due to markup issues (225 latents)

	Latent Subset		
	LA	LE	LG
	Image only	Image + EFS	Minutiae + Ridge Counts only (EBTS)
A	58.0	63.9	31.5
B	50.2	56.6	36.5
C	37.0	53.9	37.4
D	16.9	11.4*	7.76
E	37.0	45.7	22.4

C-4 Proportion of hits at rank 1

The following tables show the proportion of the total hits made by a matcher at any rank (rank ≤ 100) that were rank 1.[†]

Table 1 Proportion of hits at rank 1 for the Baseline-QA dataset (458 latents, subset of Baseline)

	Latent Subset						
	LA	LB	LC	LD	LE	LF	LG
	Image only	Image + ROI	Image + ROI + Pattern Class + Qual map	Image + Minutiae	Image + EFS	Image + EFS + Skeleton	Minutiae only
A	88%	91%	91%	90%	90%	91%	82%
B	87%	87%	87%	88%	88%	88%	78%
C	87%	85%	88%	90%	89%	89%	80%
D	80%	NA	NA	73%	NA	75%	69%
E	82%	78%	82%	79%	83%	73%	68%

Table 2: Proportion of hits at rank 1 for the Baseline dataset (1114 latents)

	Latent Subset		
	LA	LE	LG
	Image only	Image + EFS	Minutiae only
A	92%	93%	82%

* Baseline-QA results for subset LD were used as proxy for Baseline-QA LE for the purpose of scoring Baseline LE

[†] This is sometimes known as the “Ray Moore statistic”. AFIS pioneer Ray Moore observed that this tended to be about 83% at the time.

B	90%	90%	81%
C	89%	89%	86%
D	78%	74%	69%
E	84%	83%	74%