University of the Basque Country System for NIST 2010 Speaker Recognition Evaluation

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Partitioning of the previous SRE databases

spkrs	SRE04	SRE05	SRE06	SRE08	FU08
SRE04	310	0	0	0	0
SRE05	0	525	348	0	0
SRE06	0	348	949	112	0
SRE08	0	0	112	1336	150
FU08	0	0	0	150	150

- Universal Background Models (UBM)
- Channel Compensation (CHC)
- SVM Impostors (IMP)
- Z-Norm score normalization (SN-ZNorm)
- T-Norm score normalization (SN-TNorm)
- Development set

signals	Female	Male	Total
UBM	2804	2119	4923
CHC	4586	3531	8117
IMP	2780	2094	4874
TNorm	1479	960	2439
ZNorm	1403	1146	2549

signals	FU08
CHC	4208
Tnorm	1993
ZNorm	2087

signals	SRE08	SRE08*	devA	devB
train	3263	3149	1621	1528
test	6377	6211	3306	2905

(*) 112 speakers from SER06 were removed

The EHU Speaker Recognition System

Preprocessing
- Qualcomm-ICSI-OGI noise reduction (Wiener Filter)
- Interviewer attenuation

Feature Extraction
- 13MFCC, CMS, FW, Δ+ΔΔ
- Sautrela Toolkit

UBM
- Gender dependent
- 1024 components
- Sautrela Toolkit

GMM-SVM & LE-GMM
- SUNSDV-SRE08 recipe
- Eigenchannels: 20+20+40
- Sautrela Toolkit + SVMTorch

GLDS-SVM

$$\hat{f}_t = f_t - \sum_k \frac{\gamma_k(t)}{n_k} \Sigma_k^{\frac{1}{2}} c_k^x$$

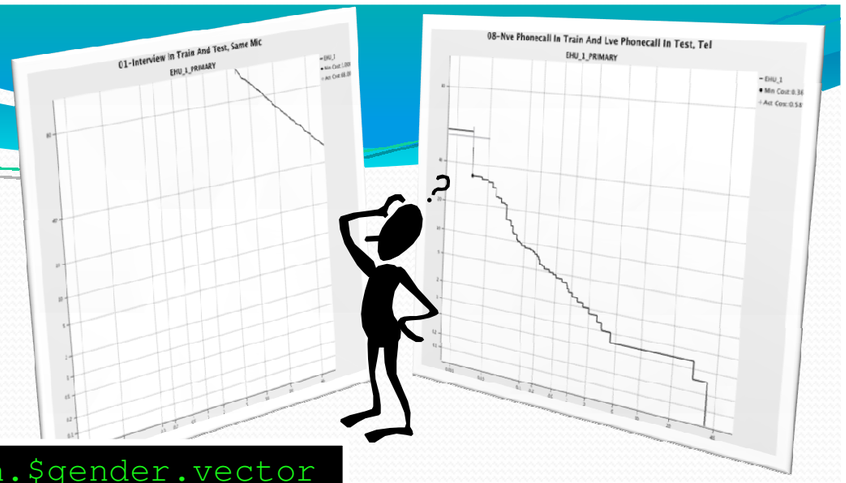
- Feature domain CC from Suff-Stat
- Sautrela Toolkit + SVMTorch

JFA
- BUT Matlab JFA recipe
- 200 eigenvoices
- 100 eigenchannels

ZT normalization
- Channel type condition: 1MIC , 0MIC , 2MIC
- Channel & gender dependent ZT

Fusion & Calibration
- Side info conditional fusion & calibration (channel type + gender)
- Hard accept/reject decisions by Bayes threshold of 6,907
- FoCal Toolkit

Debugging




```
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grep -f test.regexp *.$gender.vector > test.$gender.vector
```
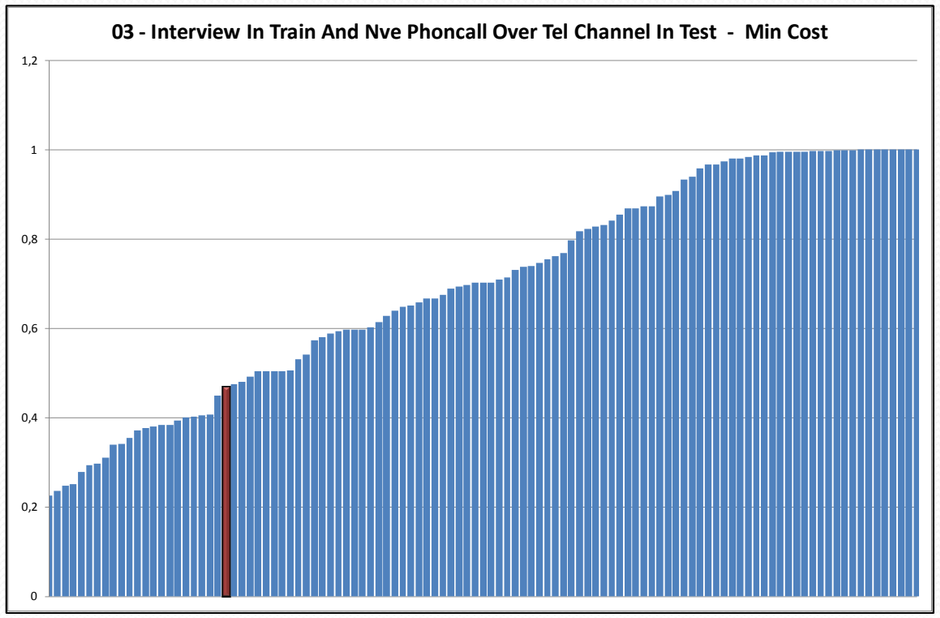
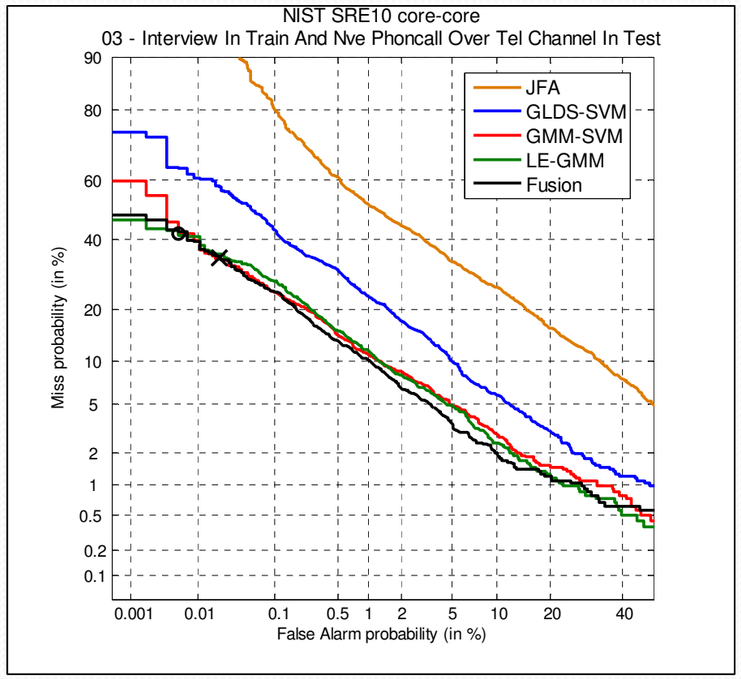

```
grep -f train.regexp *.train.$gender.vector > train.$gender.vector
grep -f test.regexp *.test.$gender.vector > test.$gender.vector
```

	Original		Debugged	
	Min Cost	EER	Min Cost	EER
01	1	49,68	0,5439	2,93
02	1	47,82	0,8061	6,65
03	1	28,72	0,4683	4,23
04	1	27,94	0,6931	5,28
05	1	37,01	0,7270	4,38
06	0,7936	6,93	0,7936	6,93
07	0,7270	8,64	0,7270	8,64
08	0,3675	2,01	0,3675	2,01
09	0,4251	2,76	0,4251	2,76

Results Analysis (core-core, cond-03 … our best)

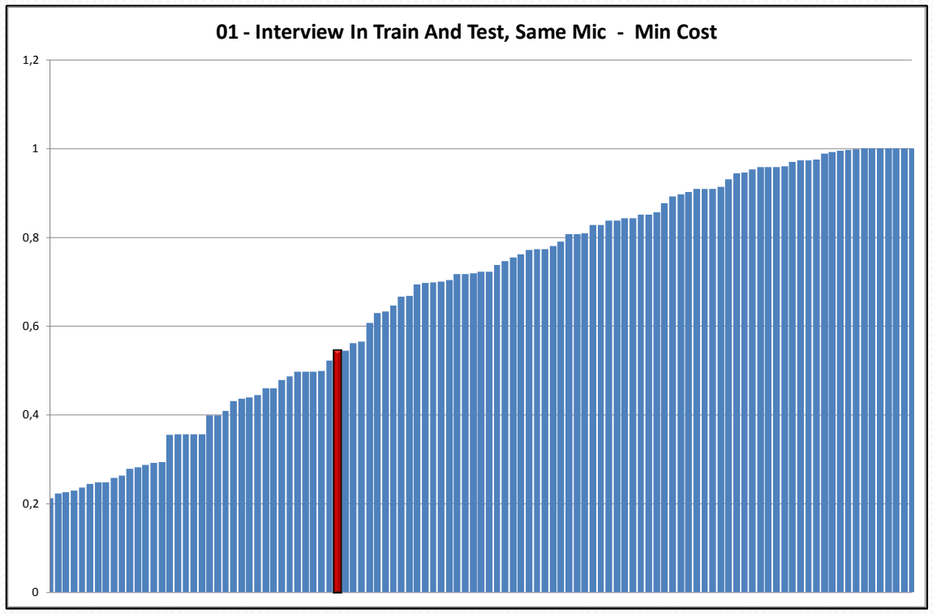


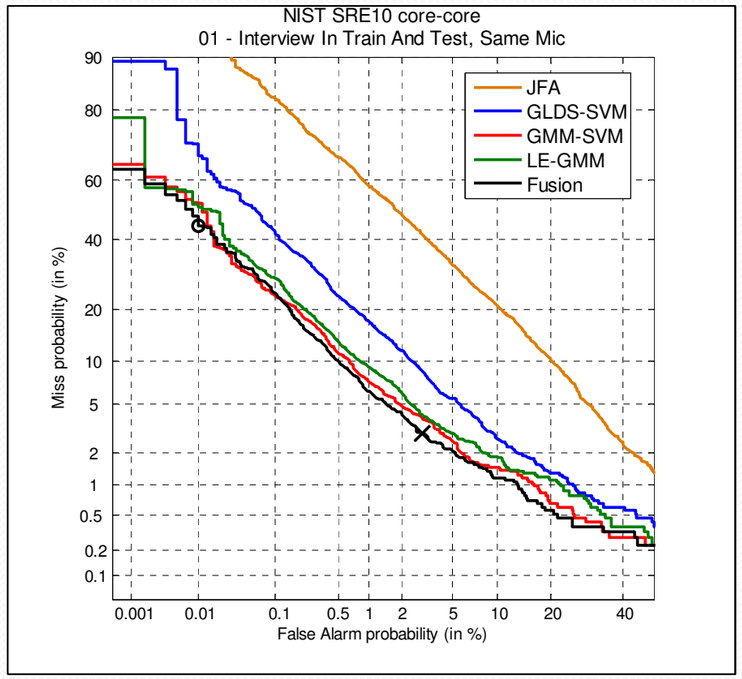


	Act Cost	Min Cost	EER
GMM-SVM	0,8843*	0,4732	4,96
LE-GMM	0,8984*	0,4537	4,90
GLDS-SVM	0,9859*	0,6747	7,10
JFA	1*	0,9982	17,76
Fusion	**0,5353**	**0,4683**	**4,23**

(*) uncalibrated scores

Results Analysis (core-core, cond-01 … not so good)

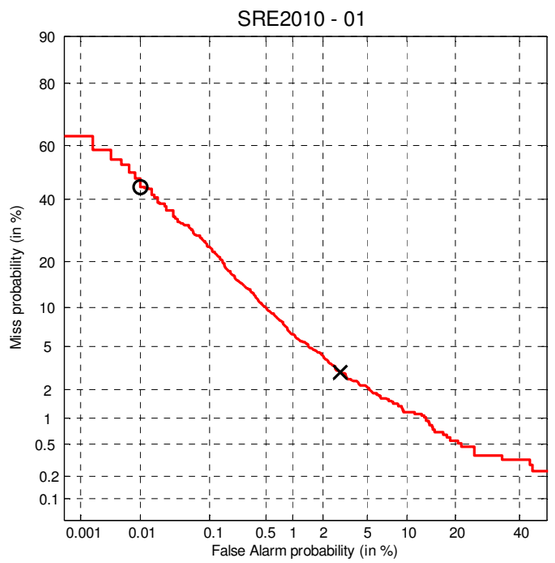


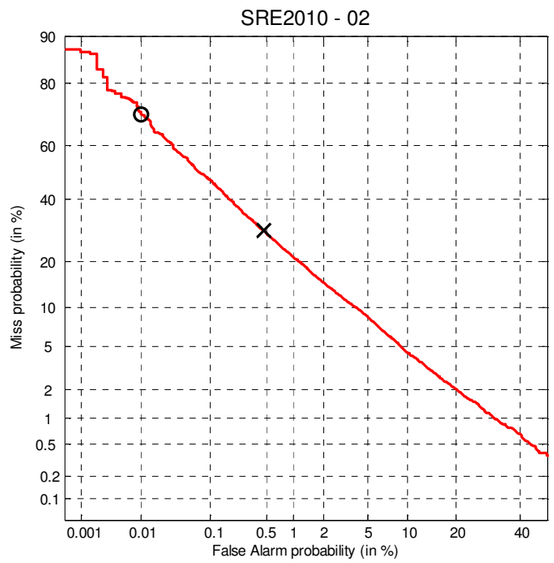


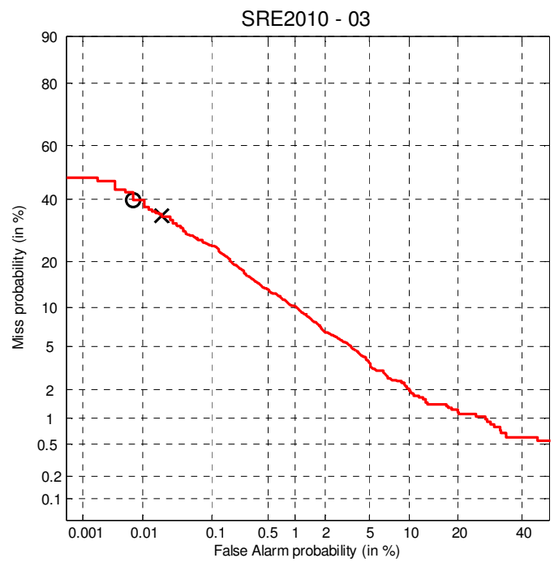
	Act Cost	Min Cost	EER
GMM-SVM	1,2498*	0,5423	3,53
LE-GMM	1,0675*	0,5890	3,63
GLDS-SVM	1,0981*	0,7594	5,34
JFA	0,9969*	0,9709	14,73
Fusion	**29,401**	**0,5439**	**2,93**

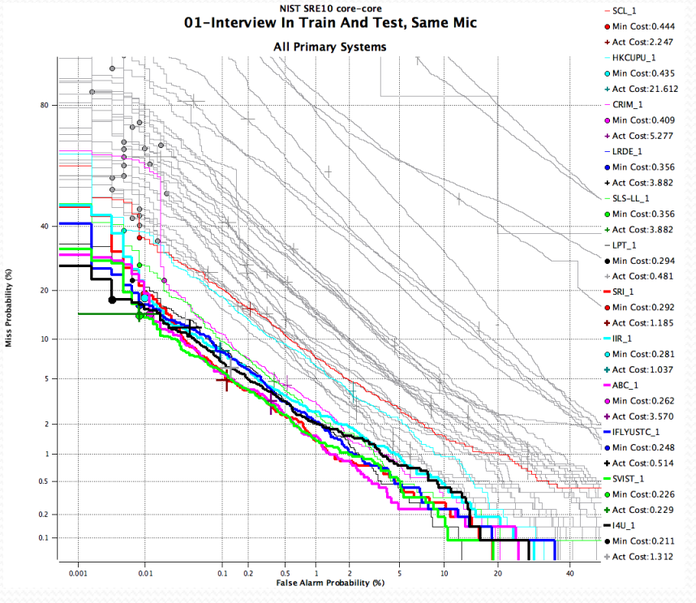
(*) uncalibrated scores

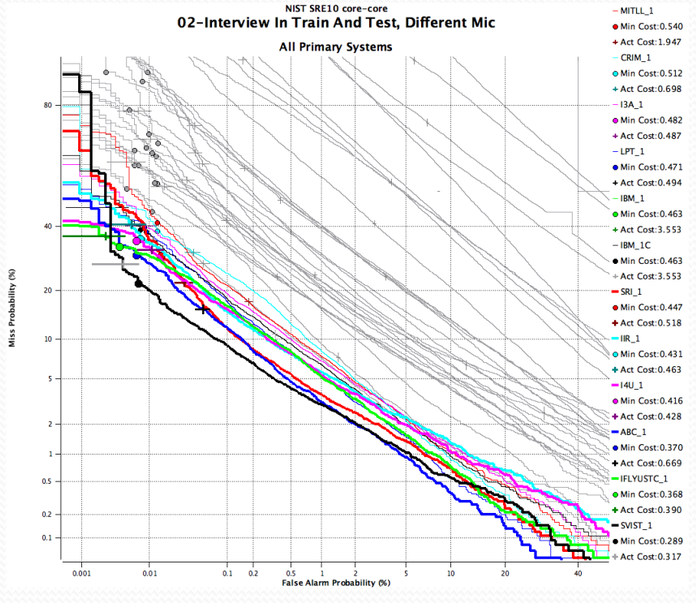
DET curves, core-core, conditions 01-03

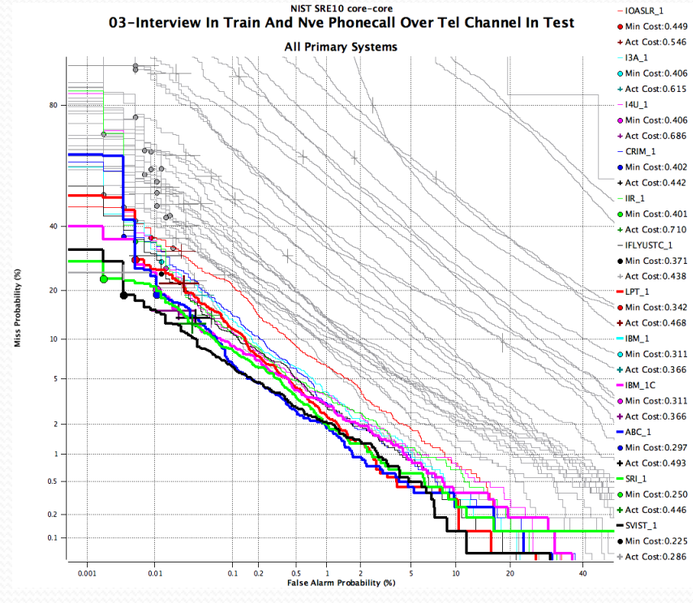




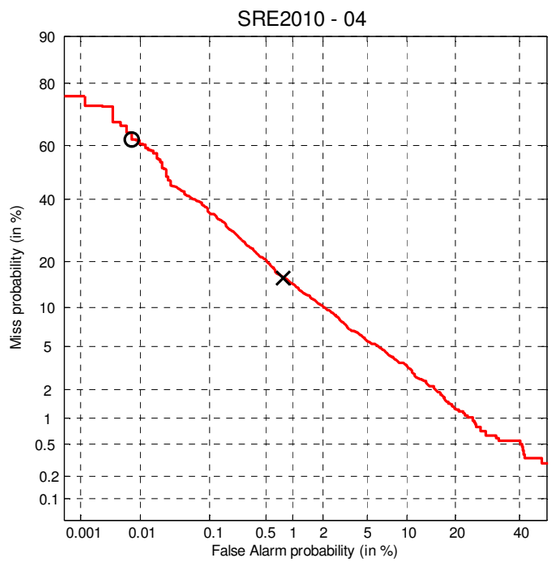


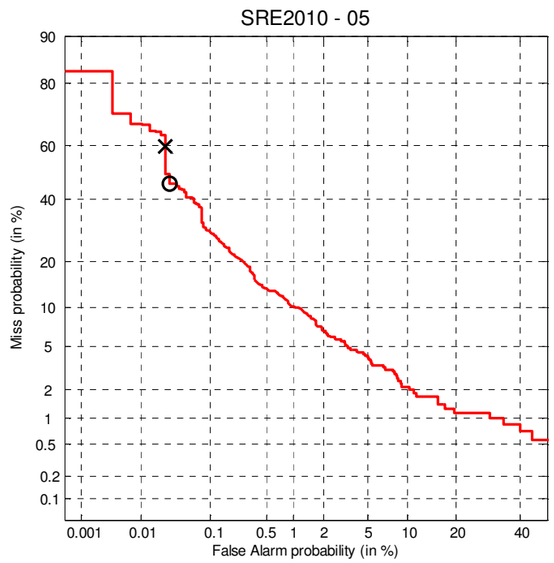


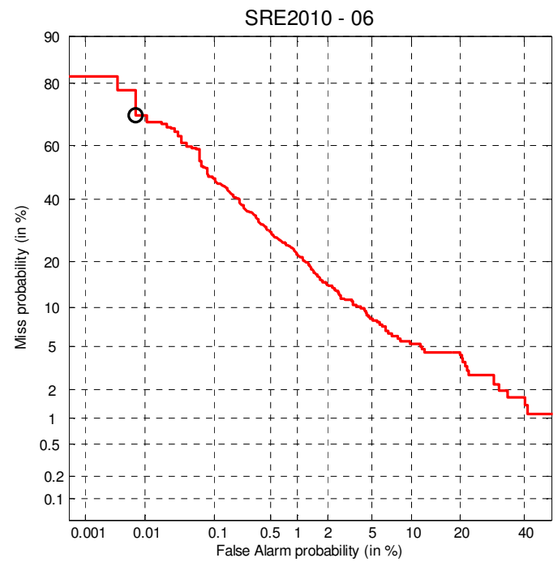


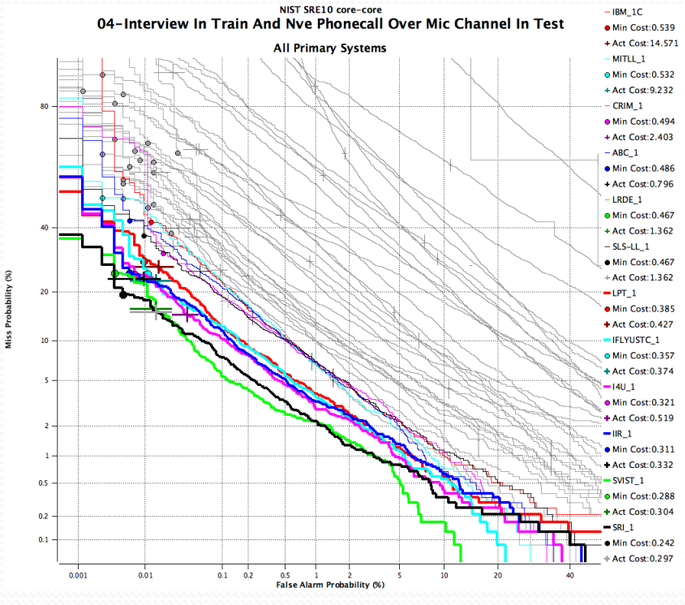


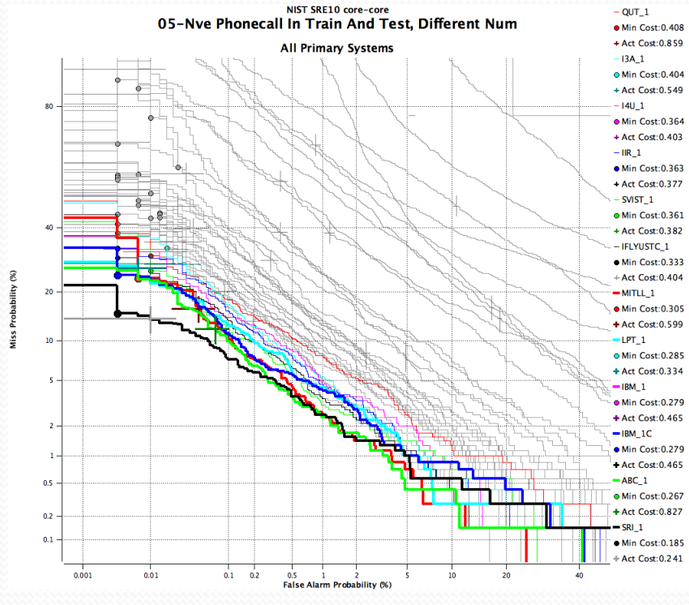
DET curves, core-core, conditions 04-06

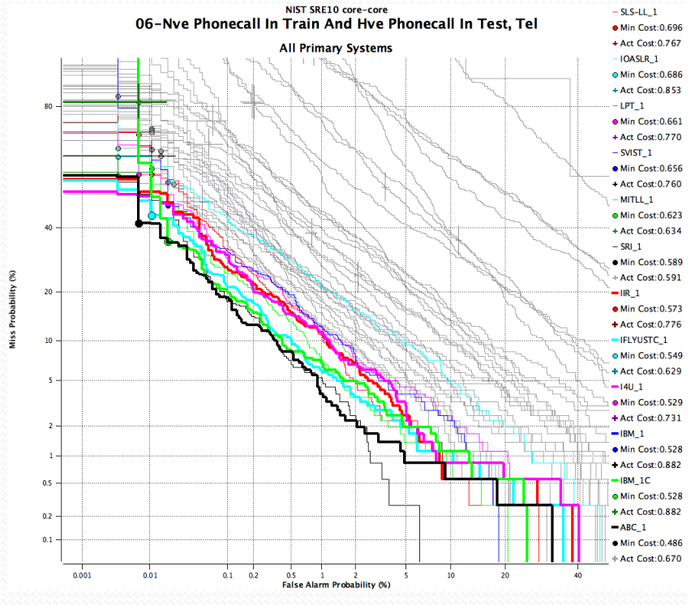
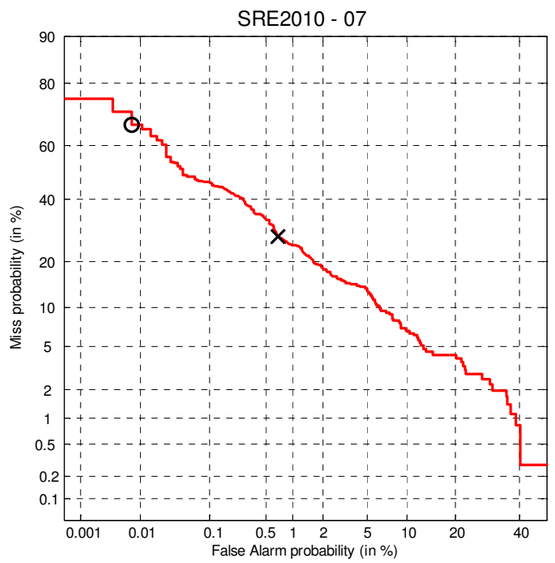
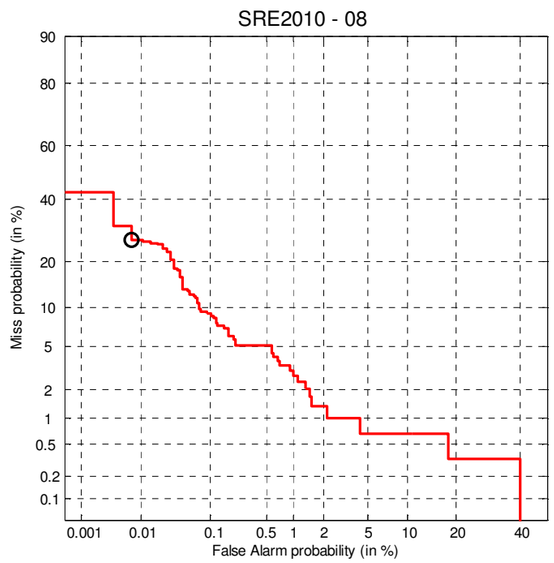
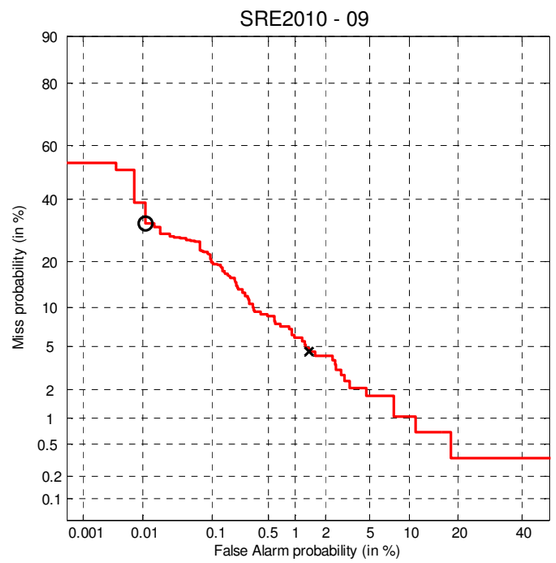
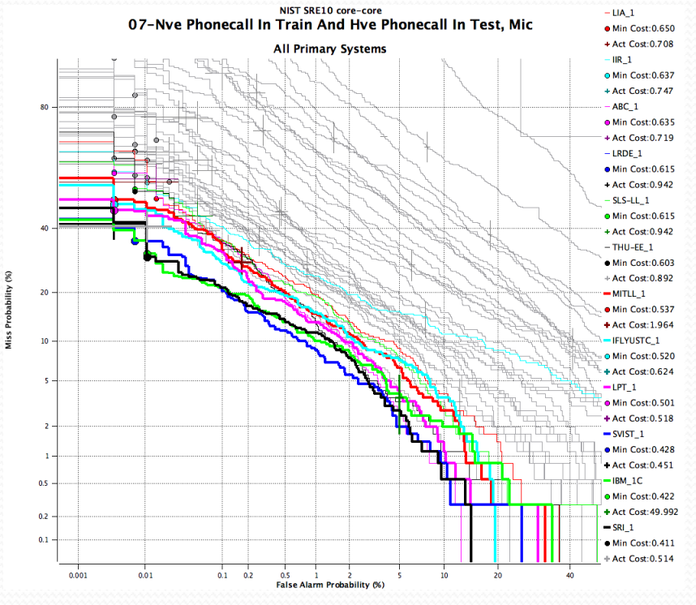
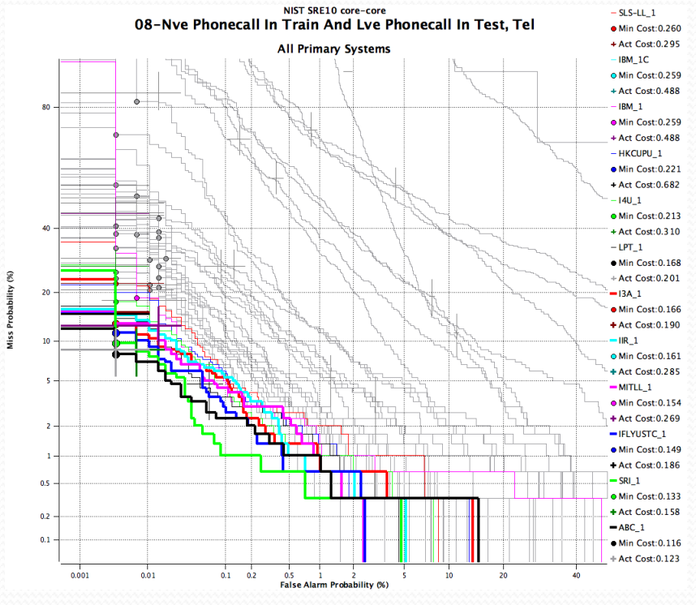
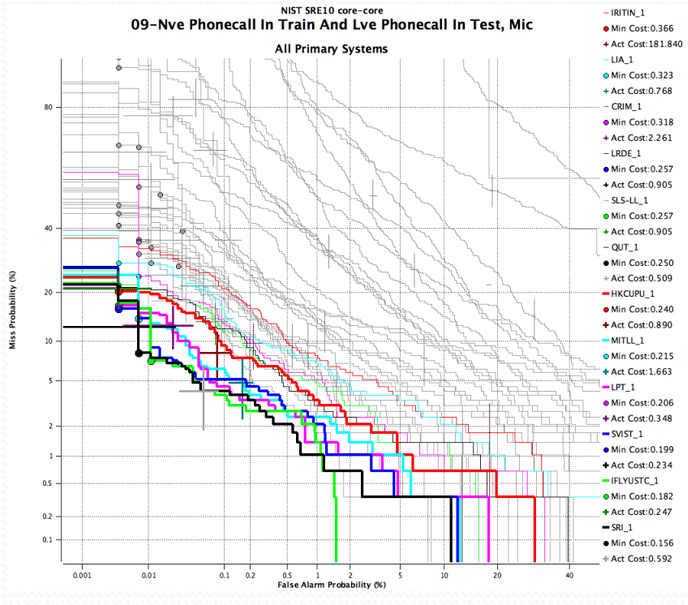












DET curves, core-core, conditions 07-09