

1 Per-fold Acoustic Only models: LR

Table 1: **Acoustic-Only.** Logistic Regression trained on acoustic features only (dataset: $N=9772$, $D=261$, speakers = 1082). Per-fold results and mean \pm std over 10 outer folds are reported for waveform- and speaker-level evaluation, plus APS conformal prediction outputs.

Waveform-level classification (per fold)										
Fold	n_{test}	τ	ROC-AUC	PR-AUC	ACC	UAR	Sens	Spec	PPV	NPV
1	960	0.2500	0.7527	0.5682	0.6479	0.6784	0.7645	0.5923	0.4721	0.8406
2	945	0.3333	0.7549	0.5624	0.7333	0.6861	0.5870	0.7851	0.4915	0.8431
3	1043	0.3505	0.7235	0.4383	0.6663	0.6518	0.6172	0.6865	0.4463	0.8141
4	988	0.3974	0.6444	0.4282	0.6306	0.5894	0.4776	0.7012	0.4245	0.7441
5	976	0.3256	0.7121	0.4587	0.6342	0.6564	0.7031	0.6097	0.3905	0.8524
6	1021	0.2857	0.6375	0.3814	0.6484	0.6157	0.5465	0.6848	0.3828	0.8085
7	979	0.3214	0.6818	0.4859	0.6639	0.6486	0.6078	0.6895	0.4709	0.7945
8	919	0.2928	0.6651	0.5229	0.6007	0.6122	0.6438	0.5805	0.4169	0.7778
9	911	0.2924	0.6441	0.3627	0.6037	0.6158	0.6458	0.5859	0.3977	0.7962
10	1030	0.3836	0.5967	0.4390	0.6311	0.5789	0.4011	0.7568	0.4740	0.6981

Cougher-level classification (per fold)										
Fold	n_{test}	τ	ROC-AUC	PR-AUC	ACC	UAR	Sens	Spec	PPV	NPV
1	108	0.204	0.7712	0.5698	0.4907	0.6167	0.9000	0.3333	0.3418	0.8966
2	108	0.304	0.7772	0.5944	0.7222	0.7251	0.7308	0.7195	0.4524	0.8939
3	108	0.250	0.7589	0.4333	0.6111	0.7027	0.8929	0.5125	0.3906	0.9318
4	108	0.334	0.6430	0.3984	0.6111	0.5705	0.4828	0.6582	0.3415	0.7761
5	108	0.308	0.6790	0.4435	0.6574	0.6875	0.7500	0.6250	0.4118	0.8772
6	108	0.290	0.5483	0.3283	0.5648	0.5346	0.4667	0.6026	0.3111	0.7460
7	107	0.332	0.6801	0.4865	0.6636	0.6238	0.5333	0.7143	0.4211	0.7971
8	108	0.282	0.6929	0.5661	0.6019	0.5955	0.5806	0.6104	0.3750	0.7833
9	109	0.308	0.6224	0.3049	0.6239	0.6134	0.5926	0.6341	0.3478	0.8254
10	110	0.362	0.6190	0.3745	0.6727	0.5757	0.3438	0.8077	0.4231	0.7500

Classification summary (mean \pm std over folds)		
Metric	Waveform ($\mu \pm \sigma$)	Speaker ($\mu \pm \sigma$)
Threshold (τ)	0.3233 ± 0.0455	0.2974 ± 0.0450
ROC AUC	0.6813 ± 0.0530	0.6792 ± 0.0745
PR AUC	0.4648 ± 0.0701	0.4500 ± 0.1025
ACC	0.6460 ± 0.0377	0.6219 ± 0.0639
UAR	0.6333 ± 0.0363	0.6246 ± 0.0620
Sensitivity	0.5994 ± 0.1052	0.6273 ± 0.1856
Specificity	0.6672 ± 0.0725	0.6218 ± 0.1290
PPV	0.4367 ± 0.0395	0.3816 ± 0.0455
NPV	0.7969 ± 0.0477	0.8277 ± 0.0672

Conformal prediction summary (mean \pm std over folds)				
Level	α	Coverage ($\mu \pm \sigma$)	Set size ($\mu \pm \sigma$)	[Singleton]
Waveform	0.10	0.8981 ± 0.0389	1.479 ± 0.064	$[0.521 \pm 0.064]$
Waveform	0.05	0.9436 ± 0.0366	1.668 ± 0.095	$[0.332 \pm 0.095]$
Speaker	0.10	0.9039 ± 0.0419	1.442 ± 0.078	$[0.558 \pm 0.078]$
Speaker	0.05	0.9492 ± 0.0318	1.642 ± 0.083	$[0.358 \pm 0.083]$

2 Per-fold Acoustic Only models: CatBoost

Table 2: **Acoustic-Only.** CatBoost trained on acoustic features only (dataset: $N=9772$, $D=261$, speakers = 1082). Per-fold results and mean \pm std over 10 outer folds are reported for waveform- and speaker-level evaluation, plus APS conformal prediction outputs.

Waveform-level classification (per fold)										
Fold	n_{test}	τ	ROC-AUC	PR-AUC	ACC	UAR	Sens	Spec	PPV	NPV
1	960	0.3338	0.7268	0.5446	0.6500	0.6555	0.6710	0.6400	0.4706	0.8031
2	945	0.3513	0.7784	0.5765	0.6889	0.7122	0.7611	0.6633	0.4444	0.8870
3	1043	0.3608	0.7212	0.4506	0.6731	0.6585	0.6238	0.6932	0.4543	0.8182
4	988	0.3369	0.6771	0.4406	0.5931	0.6414	0.7724	0.5104	0.4213	0.8293
5	976	0.3494	0.7096	0.4467	0.6506	0.6562	0.6680	0.6444	0.4005	0.8452
6	1021	0.3249	0.6834	0.4194	0.6543	0.6459	0.6283	0.6636	0.4005	0.8331
7	979	0.3652	0.6954	0.4868	0.6711	0.6271	0.5098	0.7444	0.4756	0.7696
8	919	0.2290	0.6917	0.4915	0.5571	0.6297	0.8288	0.4306	0.4040	0.8438
9	911	0.2456	0.6424	0.3822	0.5532	0.6214	0.7897	0.4531	0.3794	0.8357
10	1030	0.2889	0.6428	0.4842	0.6417	0.6190	0.5412	0.6967	0.4937	0.7353

Cougher-level classification (per fold)										
Fold	n_{test}	τ	ROC-AUC	PR-AUC	ACC	UAR	Sens	Spec	PPV	NPV
1	108	0.302	0.7496	0.5449	0.6204	0.6449	0.7000	0.5897	0.3962	0.8364
2	108	0.292	0.8086	0.6490	0.6019	0.6984	0.8846	0.5122	0.3651	0.9333
3	108	0.362	0.7705	0.4453	0.6852	0.6946	0.7143	0.6750	0.4348	0.8710
4	108	0.392	0.6626	0.4226	0.6481	0.5849	0.4483	0.7215	0.3714	0.7808
5	108	0.302	0.6527	0.3793	0.5833	0.6143	0.6786	0.5500	0.3455	0.8302
6	108	0.240	0.5776	0.3728	0.4444	0.5333	0.7333	0.3333	0.2973	0.7647
7	107	0.320	0.7169	0.5331	0.6822	0.6673	0.6333	0.7013	0.4524	0.8308
8	108	0.240	0.7453	0.5175	0.6019	0.6726	0.8387	0.5065	0.4062	0.8864
9	109	0.314	0.6292	0.3251	0.6055	0.6136	0.6296	0.5976	0.3400	0.8305
10	110	0.284	0.6611	0.4077	0.6545	0.6550	0.6562	0.6538	0.4375	0.8226

Classification summary (mean \pm std over folds)		
Metric	Waveform ($\mu \pm \sigma$)	Speaker ($\mu \pm \sigma$)
Threshold (τ)	0.3186 ± 0.0481	0.3048 ± 0.0474
ROC AUC	0.6969 ± 0.0405	0.6974 ± 0.0720
PR AUC	0.4723 ± 0.0576	0.4597 ± 0.0990
ACC	0.6333 ± 0.0483	0.6127 ± 0.0688
UAR	0.6467 ± 0.0273	0.6379 ± 0.0518
Sensitivity	0.6794 ± 0.1073	0.6917 ± 0.1198
Specificity	0.6140 ± 0.1090	0.5841 ± 0.1160
PPV	0.4344 ± 0.0387	0.3846 ± 0.0497
NPV	0.8200 ± 0.0424	0.8387 ± 0.0489

Conformal prediction summary (mean \pm std over folds)				
Level	α	Coverage ($\mu \pm \sigma$)	Set size ($\mu \pm \sigma$) [Singleton]	
Waveform	0.10	0.8957 ± 0.0424	1.451 ± 0.082	$[0.549 \pm 0.082]$
Waveform	0.05	0.9353 ± 0.0383	1.590 ± 0.116	$[0.410 \pm 0.116]$
Speaker	0.10	0.9040 ± 0.0386	1.427 ± 0.096	$[0.573 \pm 0.096]$
Speaker	0.05	0.9502 ± 0.0358	1.601 ± 0.094	$[0.399 \pm 0.094]$

3 Per-fold Fused-features models: LR

Table 3: **Fused Features.** Logistic Regression trained on fused features (dataset: $N=9772$, $D=277$, speakers = 1082). Per-fold results and mean \pm std over 10 outer folds are reported for waveform- and speaker-level evaluation, plus conformal prediction outputs.

Waveform-level classification (per fold)										
Fold	n_{test}	τ	ROC-AUC	PR-AUC	ACC	UAR	Sens	Spec	PPV	NPV
1	960	0.1967	0.8276	0.6871	0.6604	0.7324	0.9355	0.5292	0.4866	0.9451
2	945	0.2785	0.8612	0.7671	0.6952	0.7453	0.8502	0.6404	0.4555	0.9236
3	1043	0.3589	0.8169	0.5900	0.7287	0.7493	0.7987	0.7000	0.5216	0.8946
4	988	0.3388	0.7684	0.6165	0.7055	0.6976	0.6763	0.7189	0.5262	0.8279
5	976	0.3659	0.8363	0.6374	0.7828	0.7722	0.7500	0.7944	0.5647	0.8994
6	1021	0.2483	0.7173	0.5078	0.6543	0.6578	0.6654	0.6503	0.4050	0.8446
7	979	0.3077	0.7811	0.6481	0.6987	0.6917	0.6732	0.7103	0.5137	0.8270
8	919	0.3529	0.8480	0.7168	0.7911	0.7902	0.7877	0.7927	0.6389	0.8891
9	911	0.3400	0.7991	0.5924	0.7475	0.7118	0.6236	0.8000	0.5690	0.8339
10	1030	0.2919	0.7854	0.6126	0.7214	0.6911	0.5879	0.7943	0.6097	0.7791

Speaker-level classification (per fold)										
Fold	n_{test}	τ	ROC-AUC	PR-AUC	ACC	UAR	Sens	Spec	PPV	NPV
1	108	0.260	0.8372	0.6898	0.6759	0.7551	0.9333	0.5769	0.4590	0.9574
2	108	0.326	0.8598	0.7812	0.7315	0.7444	0.7692	0.7195	0.4651	0.9077
3	108	0.334	0.8228	0.5572	0.7315	0.7491	0.7857	0.7125	0.4889	0.9048
4	108	0.360	0.7660	0.6206	0.7130	0.6838	0.6207	0.7468	0.4737	0.8429
5	108	0.400	0.8020	0.6087	0.7963	0.7464	0.6429	0.8500	0.6000	0.8718
6	108	0.148	0.6868	0.4694	0.5648	0.6269	0.7667	0.4872	0.3651	0.8444
7	107	0.356	0.7805	0.6277	0.6916	0.6433	0.5333	0.7532	0.4571	0.8056
8	108	0.412	0.8580	0.7098	0.8056	0.7673	0.6774	0.8571	0.6562	0.8684
9	109	0.386	0.7823	0.5462	0.7798	0.7170	0.5926	0.8415	0.5517	0.8625
10	110	0.288	0.7933	0.5903	0.7364	0.7127	0.6562	0.7692	0.5385	0.8451

Classification summary (mean \pm std over folds)		
Metric	Waveform ($\mu \pm \sigma$)	Speaker ($\mu \pm \sigma$)
Threshold (τ)	0.3080 ± 0.0548	0.3270 ± 0.0789
ROC AUC	0.8041 ± 0.0430	0.7989 ± 0.0511
PR AUC	0.6376 ± 0.0729	0.6201 ± 0.0895
ACC	0.7185 ± 0.0459	0.7226 ± 0.0700
UAR	0.7239 ± 0.0411	0.7146 ± 0.0486
Sensitivity	0.7348 ± 0.1089	0.6978 ± 0.1166
Specificity	0.7130 ± 0.0884	0.7314 ± 0.1193
PPV	0.5291 ± 0.0702	0.5055 ± 0.0830
NPV	0.8664 ± 0.0517	0.8711 ± 0.0428

Conformal prediction summary (mean \pm std over folds)				
Level	α	Coverage ($\mu \pm \sigma$)	Set size ($\mu \pm \sigma$)	[Singleton]
Waveform	0.10	0.8982 ± 0.0427	1.339 ± 0.093	$[0.661 \pm 0.093]$
Waveform	0.05	0.9576 ± 0.0192	1.533 ± 0.067	$[0.467 \pm 0.067]$
Speaker	0.10	0.9104 ± 0.0355	1.322 ± 0.084	$[0.678 \pm 0.084]$
Speaker	0.05	0.9621 ± 0.0188	1.510 ± 0.068	$[0.490 \pm 0.068]$

4 Per-fold Fused-features models: CatBoost