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Evaluation of Hyperparameter Optimization in Machine and Deep Learning Methods for Decoding Imagined Speech EEG

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Supplementary

Table 1 S1. Number of trainable parameters per CNN per dataset.

	Shallow CNN		Deep CNN		EEGNet	
	Words	Vowels	Words	Vowels	Words	Vowels
Trainable parameters	49562	48245	268481	268260	5990	5477

Table 2 S2. Inner-fold validation accuracies for number of epochs.

	Shallow CNN		Deep CNN		EEGNet	
	Words	Vowels	Words	Vowels	Words	Vowels
20	37.22	41.80	27.88	32.70	25.29	29.33
40	51.69	56.59	38.49	44.55	26.40	30.46
60	53.43	58.26	41.06	47.01	26.45	30.54
80	53.43	58.31	41.10	47.12	26.51	30.57

Table S3. Average precision scores for the benchmark and CNN classifiers trained on imagined words.

	Benchmark Methods						CNN Methods					
	SVM		RdF		rLDA		Shallow		Deep		EEGNet	
	Intra	Inter	Intra	Inter	Intra	Inter	Intra	Inter	Intra	Inter	Intra	Inter
Accuracy	18.85	18.42	18.33	18.70	20.85	20.97	24.91	24.29	24.45	24.86	24.46	24.88
Std.	2.85	2.44	2.82	3.17	2.68	2.14	1.56	1.95	1.89	1.79	1.72	0.92
Max.	23.81	23.76	22.61	23.40	24.10	25.04	27.39	28.26	30.30	28.32	28.35	26.51

Table S4. Average precision scores for the benchmark and CNN classifiers trained on imagined vowels.

	Benchmark Methods						CNN Methods					
	SVM		RdF		rLDA		Shallow		Deep		EEGNet	
	Intra	Inter	Intra	Inter	Intra	Inter	Intra	Inter	Intra	Inter	Intra	Inter
Accuracy	22.20	22.26	23.13	23.25	25.75	26.16	29.67	29.37	29.09	29.62	30.04	30.19
Std.	2.97	3.35	3.89	4.10	3.11	2.33	3.42	2.51	2.54	1.77	2.67	2.71
Max.	26.76	27.15	30.13	29.24	31.71	29.73	35.85	33.37	33.24	32.47	32.31	35.15