ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

EE-514

Brain-Computer Interaction

Competition Report

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for the course taught by
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1 Selected classifiers

For the competition, we received a dataset containing the recordings of 3 subjects. We selected the 4 classifiers of our project that had the best results (in terms of AUC) on our personal data, as described in Table 1. This classifiers were evaluated first by cross-validation, then by testing the model on unseen data (session2), as described in our final report.

For the competition, the models were trained on the same training set (personal data from session1) and then used to predict labels from 2 different classes - hard and easy - on the subject data from the competition.

	Subject	AUC	Error Session2	Classifier	Selection Mode	Features
C1	AF6	0.8614	0.2859	DLDA	Fisher	460
C2	AF6	0.702	0.3525	SVM Lin	ReliefF	801
C3	AF6	0.85219	0.2409	DQDA	PCA	330
C4	AH2	0.5757	0.4844	DQDA	PCA	280

Table 1: Reminder of the best classifiers obtained from our project. See full report for more details.

2 Results

We tested our models on the competition dataset. For this, we extracted features from the recordings of the subjects 1, 2 and 3, and tried to predict the labels for the whole trajectory. The performance of the classifiers for each subject are reported below :

Subject	AUC C1	AUC C2	AUC C3	AUC C4
1	0.5361	0.5130	0.5808	0.5754
2	0.6277	0.5643	0.6611	0.6098
3	0.5402	0.5278	0.5474	0.7344

Table 2: Area Under Curve for each subject depending on the classifier. The best AUC for each subject was highlighted in color.

The figures 1, 2 and 3 represent the ROC plots for the best results by subject. For subject 1 and 2, the best classifier is the 3rd one (DQDA-PCA-330). For subject 3, the best classifier is the 4th one (DQDA-PCA-280), with an AUC value of 0.7344.
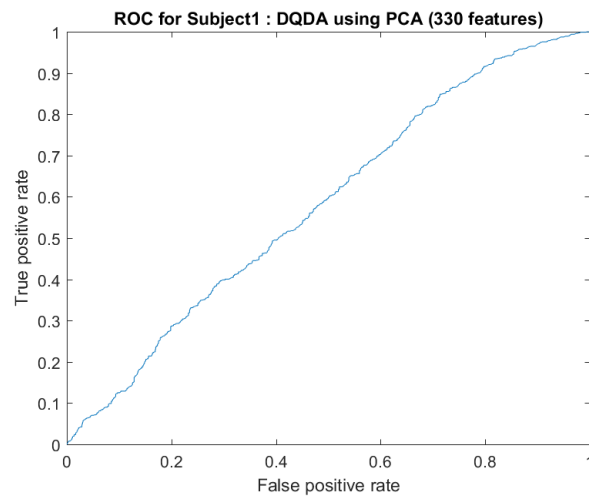
Figure 1: ROC plot for the best result for subject 1 ($AUC = 0.5808$). Classifier: DQDA; features: 330 first Principal Components with most variance.
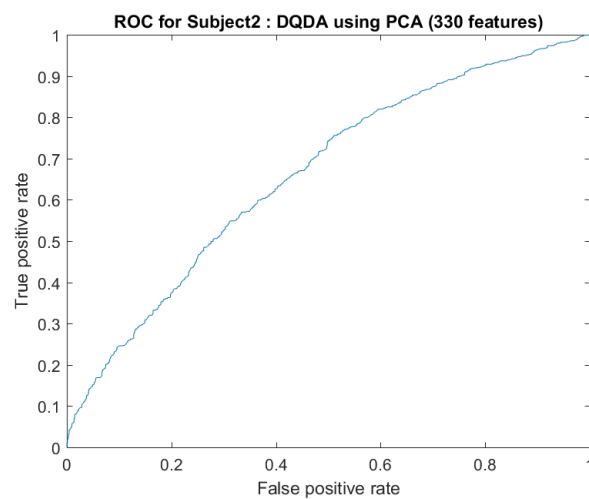

Figure 2: ROC plot for the best result for subject 2 ($AUC = 0.6611$). Classifier: DQDA; features: 330 first Principal Components with most variance.
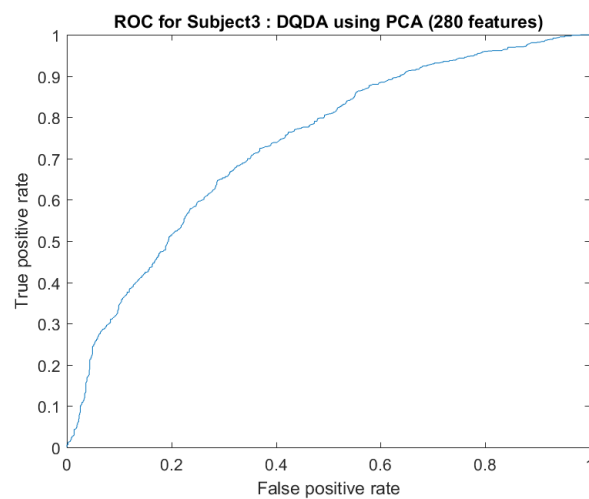
Figure 3: ROC plot for the best result for subject 3 ($AUC = 0.7344$). Classifier: DQDA; features: 280 first Principal Components with most variance.