

Grasp-and-Lift EEG Detection

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Project description

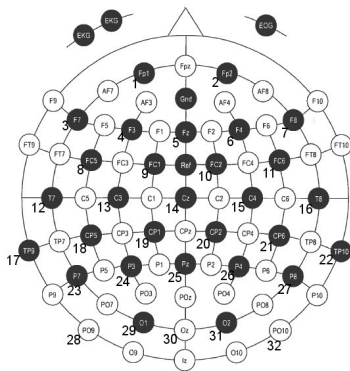
Identify hand motions from EEG recordings

- Goal: classify hand motions from its EEG signal data.
- Purpose: Brain-Computer Interface prosthetic devices for restoring a patient's ability to perform basic daily tasks.



Dataset

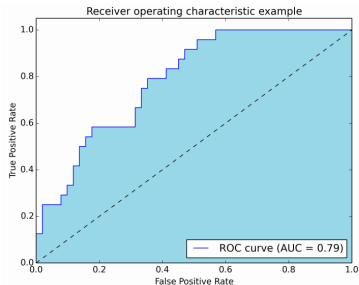
32 EEG signals:



- 30 Grasp And Lift series.
- Training data set: 96 files
- testing data set: 24 files
- Size: 1.5 Gb.
- Multi class classification: Hand start, First digit touch, Start load phase, lift off, Replace, Both released

Evaluation Criteria

Mean Column-wise Area Under the Curve (MCAUC): the mean of individual areas under the ROC curve for each predicted columns.



Pipeline

Preprocessing

KDawn Filter: with hyper parameter 2-3-4

VLAD

Number of clusters: $2^3 \rightarrow 2^{15}$

PCA

number of components = 0.9

SVM

C: $2^{-3} \rightarrow 2^3$

Performance optimization

- Preprocess: store the data for each component and use that in the next step of the pipeline
- VLAD: save the cluster centroids in an instance variable (in kmeans algorithm) and reuse them in VLAD
- kmeans: inertia convergence criteria

Total time $\sim 5h$

- Preprocessing: $< 1h$
- All other steps: $\sim 4h$

VLAD: $\sim 12s$ with 32 clusters and $0.5M$ local descriptors (with ubuntu dual core cpu, 3Gb ram)

SVM C	VLAD clusters	score
0.1	32	0.267
1	32	0.268
10	32	0.269

Table: N components=2

text

The End