

BCI Competition III Challenge

Contributor:

Sergio Parini*.

Co-Contributors:

Luca Piccini*, Luca Maggi*, Guido Panfili*, Giuseppe Andreoni*.

*** WoWS!-Lab,**

TBMLAB,

Bioengineering Department,

Politecnico di Milano University,

Milan, Italy.

Email: sergio.parini@gmail.com

Email: luca.piccini@polimi.it

Methods:

The developed system has been structured as follows:

1. an adaptive block self-regulating on user-specific signal properties: by analyzing the training dataset, user-specific relevant frequencies (in alpha and beta band) are detected using a shifting Caue Elliptic Filter and a Band-Power analysis on an LDA-based (Linear Discriminant Analysis) classifier.
2. an information-optimizing block: by analyzing the whole training set using an amplitude modulation envelope, the system returns an optimized time-interval in order to allow the classifier to train only on that portion of signal in which event-related phenomena are concentrated. In order to avoid the system training on a stimulus-response-mechanism, we considered time = 3.5s as a threshold.
3. an identification block: specific features are extracted from the windowed signal (1 second window with a one sample shifting) to feed a Boosted Regularized Linear Discriminant Analysis based on a modified sample correlation matrix.

Each features vector (corresponding to a data window) consists of :

- four AR parameters calculated with Burg's method on the raw signal;
- the localized PSDs (Power Spectral Densities) computed from the subsampled signal and centered on the subject's relevant frequencies (considering Ad-Hoc resolution and tolerance);

Dataset O3VR has been fixed according to the additional informations provided by Dr.Alois Schlögl.