

BCI Competition IV

- Data sets 1

Group information

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Processing Techniques

- 1). 16 electrodes (11 13 15 26 27 28 29 30 31 32 43 45 47 50 52 54) were selected. These electrodes are located across somatosensorial cortical representation.
- 2). Short Time Fourier Transform (STFT) from time windows of 0.1s was used to get the time-frequency values of the independent components obtained from ICA (infomax) [1] and its variance was computed. The ICs which had the smallest variance were removed. The Choi Williams distribution of the ICs was determined using the algorithm given in [2]. The dominant frequency band of the signal was found from this distribution. A second frequency band between 8-30Hz was also included as feature.
- 3). The Power Spectrum Density Features (PSDF) were obtained from STFT on each channel. The time window was 0.5s with 50% overlap. The feature vector was $\text{trail} \times \text{channels} \times \text{PSDF}$. To simplify the features, Principal component analysis (PCA) was used. PCA eliminated those principal components that contribute less than 2% to the total variation in the data set.
- 4). Two Support Vector Machine (SVM) classifiers were used to get the distribution probability by one vs rest method. The classifiers were optimized by changing the parameters (c, g of radial basis function (RBF)-kernel-SVM). RBF kernel was $\exp(-g \cdot |u-v|^2)$. The ultimate distribution probability was the “probability of classifier 1- probability of classifier 2”.

Artificial data sets.

We might guess that the data sets (c, e, f) were artificially generated.

Reference

[1] John L. Semmlow. Biosignal and Biomedical Image Processing: MATLAB-based Applications. Published by CRC Press, 2004. pp.167-175

[2] A Delorme, S Makeig. "EEGLAB: an open source toolbox for analysis of single-trial EEG dynamics," Journal of Neuroscience Methods 2004,134 pp. 9-21