Modifications of unsupervised neural networks for single trial P300 detection

P300 brain-computer interfaces (BCIs) have been gaining attention in recent years. To achieve good performance and accuracy, it is necessary to optimize both feature extraction and classification algorithms. This article aims at verifying whether supervised learning models based on self-organizing maps (SOM) or adaptive resonance theory (ART) can be useful for this task. For feature extraction, the state-of-the-art Windowed means paradigm was used. For classification, proposed classifiers were compared with state-of-the-art classifiers used in BCI research, such as Bayesian Linear Discriminant Analysis, or shrinkage LDA. Publicly available datasets from 15 healthy subjects were used for the experiments. The results indicated that SOM-based models yield better results than ART-based models. The best performance was achieved by the LASSO model that was comparable to state-of-the-art BCI classifiers. Further possibilities for improvements are discussed