Adaptation in P300 braincomputer interfaces: A two-classifier cotraining approach - DTU Orbit (18/02/2019)

Adaptation in P300 braincomputer interfaces: A two-classifier cotraining approach

A cotraining-based approach is introduced for constructing high-performance classifiers for P300-based braincomputer interfaces (BCIs), which were trained from very little data. It uses two classifiers: Fishers linear discriminant analysis and Bayesian linear discriminant analysis progressively teaching each other to build a final classifier, which is robust and able to learn effectively from unlabeled data. Detailed analysis of the performance is carried out through extensive cross-validations, and it is shown that the proposed approach is able to build high-performance classifiers from just a few minutes of labeled data and by making efficient use of unlabeled data. An average bit rate of more than 37 bits/min was achieved with just one and a half minutes of training, achieving an increase of about 17 bits/min compared to the fully supervised classification in one of the configurations. This performance improvement is shown to be even more significant in cases where the training data as well as the number of trials that are averaged for detection of a character is low, both of which are desired operational characteristics of a practical BCI system. Moreover, the proposed method outperforms the self-training-based approaches where the confident predictions of a classifier is used to retrain itself. © 2010 IEEE.

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