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Use of support vector machines to automatically detect epileptic activity in EEG data

Fernandes, Miguel

2012-02-14
http://hdl.handle.net/10539/11311

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Abstract

This dissertation evaluates the effectiveness of using Support Vector Machines (SVM) to identify Inter-ictal epileptic activity in Electroencephalogram (EEG) data. There are existing systems that already do this but identifying the best solution requires comparative studies. A sample of data was randomly selected from 20 patients. A number of features were extracted and a PBIL algorithm was then used to identify the set of features that provided the best separability within the dataset. These were found to be related to the chaoticity, frequency and variability of the signal. The features were then used to train an SVM model. This method resulted in 88.7% accuracy but left 31.1% of inputs unclassifiable. This performance is comparable with existing solutions.

The strengths of the designed system were computational efficiency and system accuracy. The limitations were that the high degree of Artifacts masked indicative patterns and therefore decreased the classification accuracy in some cases. This system could be used as a screening tool for detecting patients that possibly have epilepsy. The system cannot be used to rule out epilepsy in a patient due to the high rate of unclassifiable data.

Some areas were identified where future work could be done, namely a spike detection method, multi-channel analysis, and improved Artifact extraction classification. These areas could improve the general performance of the classification system in terms of more clearly separating epileptic from non-epileptic activity.