From Electroencephalogram to Epileptic Seizures Detection by Using Artificial Neural Networks

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Abstract : Seizure is the main factor that affects the quality of life of epileptic patients. The diagnosis of epilepsy, and hence the identification of epileptogenic zone, is commonly made by using continuous Electroencephalogram (EEG) signal monitoring. Seizure identification on EEG signals is made manually by epileptologists and this process is usually very long and error prone. The aim of this paper is to describe an automated method able to detect seizures in EEG signals, using knowledge discovery in database process and data mining methods and algorithms, which can support physicians during the seizure detection process. Our detection method is based on Artificial Neural Network classifier, trained by applying the multilayer perceptron algorithm, and by using a software application, called Training Builder that has been developed for the massive extraction of features from EEG signals. This tool is able to cover all the data preparation steps ranging from signal processing to data analysis techniques, including the sliding window paradigm, the dimensionality reduction algorithms, information theory, and feature selection measures. The final model shows excellent performances, reaching an accuracy of over 99% during tests on data of a single patient retrieved from a publicly available EEG dataset.
Keywords : artificial neural network, data mining, electroencephalogram, epilepsy, feature extraction, seizure detection, signal processing

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