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Proposing a new artificial intelligent system for automatic detection of Epileptic seizures

Mohammad Parsa Hosseini

¹Rutgers University, USA

²Henry Ford Health System, USA

Epilepsy is defined by the occurrence of at least two recurrent epileptic seizures in less than 24 hours. Neurologists and trained physicals visually scan the long term EEG records to detect epileptic seizures but it takes many hours for making a distinction between normal and abnormal activities. Therefore, developing an automatic method for detection and monitoring epileptic seizures in long-term EEG would greatly assist healthcare. Artificial intelligence programs have been developed to perform diagnosis and make recommendations for therapy. In this study an automatic method is proposed for seizure detection task. In the first step, EEG recording is preprocessed to eliminate non-cerebral origin noises and artifacts. Then, the rhythmic nature of seizure discharge is analyzed by using of a wavelet transform. After evaluating the result of the common wavelet transforms, Daubechies-4 has been selected to find approximation and detail of seizure segment. In the next step, many frequency and time domain features are extracted from seizure segment. Then, Independent Component Analysis (ICA) is used for feature reduction and generating uncorrelated and independent features from the data. Finally, among pattern recognition classifiers, support vector machine is developed to classify the extracted features to normal or epileptic. To avoid overfitting in classification, the ensemble learning method is applied for classification task. Using a clinical database on five epileptic patients and four normal subjects, a sensitivity of 84% is achieved by leave-one-out cross validation. The results confirm the validity of the proposed method for automatic seizure detection in long-term EEG records.

Biography

Mohammad Parsa Hosseini is a PhD candidate in the Department of Electrical and Computer Engineering at Rutgers University, NJ. He is contributing with Radiology Image Analysis Lab, Henry Ford Health System, MI, on medical imaging and data analysis projects. He has published many journal and conference papers in the field of epilepsy health care and medical data processing. He has been serving as a Reviewer in some engineering conferences.

parsa@cac.rutgers.edu

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