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ORIGINAL ARTICLE

Application of local configuration pattern for automated detection of schizophrenia with electroencephalogram signals

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Abstract

Recently, a mix of traditional and modern approaches have been proposed to detect brain abnormalities using bio-signal/bio-image-assisted methods. In hospitals, most of the initial/scheduled assessments consider the bio-signal-based appraisal, due to its non-invasive nature and low cost. Further, brain bio-signal scans can be recorded using a single/multi-channel electrode setup, which is further evaluated by an experienced doctor, as well as computer software, to identify the nature and severity of abnormality. In this paper, we describe the development of a system for computer supported detection (CSD) of schizophrenia using the electroencephalogram (EEG) signal collected with a 19-channel electrode array. Schizophrenia is a mental illness that interferes with the way an individual thinks and behaves. It is characterised by psychotic symptoms such as hallucinations or delusions, negative symptoms such as decreased motivation or a lack of interest in daily activities and cognitive symptoms such challenges in processing information to make informed decisions or staying focused. This research has utilized 1142 EEGs (516 normal and 626 schizophrenia) with a frame length of 25 s (6250 samples) for investigation. The work initially converts the EEG signals to images using a spectrogram. Local configuration pattern features were extracted from the images thereafter, and 10-fold validation technique was used wherein Student's *t*-test and *z*-score standardization were computed per fold. The highest accuracy of 97.20% was achieved with the K-nearest neighbour (KNN) classifier. The results obtained confirm that the KNN classifier is helpful in the rapid detection of schizophrenia. This work is one of the first studies to extract local configuration

pattern features from spectrogram images, yielding a high accuracy of 97.20%, with reduced computational complexity.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available in EEG Database (Olejarczyk, E.; Jernajczyk, W) at http://dx.doi.org/10.18150/repod.0107441. These data were derived from the following resources available in the public domain: - EEG Database (Olejarczyk, E.; Jernajczyk, W), http://dx.doi.org/10.18150/repod.0107441.