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A hybrid automated detection of epileptic seizures in EEG records

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abstract

The paper introduces a new automated seizure detection model that integrates Weighted Per-mutation Entropy (WPE) and a Support Vector Machine (SVM) classifier model to enhance the sensitivity and precision of the detection process. The proposed system utilizes the fact that entropy based measures for the EEG segments during epileptic seizure are lower than in normal EEG. The new suggested model better tracks abrupt changes in the signal and as-signs less complexity to segments that exhibit regularity or are subjected to noise effects. The Weighted Permutation Entropy algorithm relies on the ordinal pattern of the time series along with the amplitudes of its sample points. The proposed technique is implemented and tested on hundreds real EEG signals and the performance is compared based on sensitivity, speci-ficity and accuracy. Various experiments have been applied in different scenarios including healthy with eyes open, healthy with eyes closed, epileptic patients during no-seizure state from two different location of the brain. Other scenarios have been applied accompanied by background simulated noise resulting from physiological and environmental artifacts. Results showed outstanding performance and revealed promising results in terms of discrimination of seizure and seizure-free segments. It also manifests high robustness against noise sources.