Swarm negative selection algorithm for electroencephalogram signals classification

Abstract

The process of epilepsy diagnosis from EEG signals by a human scorer is a very time consuming and costly task considering the large number of epileptic patients admitted to the hospitals and the large amount of data needs to be scored. Therefore, there is a strong need to automate this process. Such automated systems must rely on robust and effective algorithms for detection and prediction. **Approach:** The proposed detection system of epileptic seizure in EEG signals is based on Discrete Wavelet Transform (DWT) and Swarm Negative Selection (SNS) algorithm. DWT was used to analyze EEG signals at different frequency bands and statistics over the set of the wavelet coefficients were calculated to introduce the feature vector for SNS classifier. The SNS classification model use negative selection and PSO algorithms to form a set of memory Artificial Lymphocytes (ALCs) that have the ability to distinguish between normal and epileptic EEG patterns. Thus, adapted negative selection is employed to create a set of self-tolerant ALCs. Whereas, PSO is used to evolve these ALCs away from self patterns towards non-self space and to maintain diversity and generality among the ALCs. **Results:** The experimental results proved that the proposed method reveals very promising performance in classifying EEG signals. A comparison with many previous studies showed that the presented algorithm has better results outperforming those reported by earlier methods. **Conclusion:** The technique was approved to be robust and effective in detecting and localizing epileptic seizure in EEG recording. Hence, the proposed system can be very helpful to make faster and accurate diagnosis decision.