Optimization of Seizure Detection Using the Machine Learning Algorithm SVM

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Epilepsy is a very common and devastating neurological disorder that affects 65 million people globally. Electroencephalography (EEG) recording is an essential tool in evaluating seizure activity, critical for epilepsy drug development and patient care. However, due to the random and low frequency of seizures, seizure evaluation requires continuous, long-term EEG monitoring for weeks and months, producing huge volumes of data. This creates a formidable challenge for real-time tracking of seizures using wearable devices which have low computational power. Current algorithms for automating EEG seizure classification use computationally expensive methods to analyze minute features within small fragments of seizure events. However, despite this complexity, current algorithms still underperform, and laboratory technicians and clinical physicians alike still do not fully rely on these algorithms, opting to manually sift through thousands of hours of EEG data. Human visual analysis still drastically outperforms computer analysis. The proposed method in this study attempts to mimic the simplistic analysis of human vision for EEG seizure classification by focusing on broad, global trends in condensed EEG seizure data. EEG seizure clips were normalized and processed through a rolling mean function, producing smoothed EEG clips that represent the global shape of each clip. These signals were then directly inputted for machine training. This method achieved an accuracy rate of approximately 98.51%. Our approach provides an unique advantage in patient epilepsy management using wearables, where accuracy, computational cost, and speed are all critical to improving patient quality of life.

Awards Won:

American Statistical Association: Certificate of Honorable Mention