Maastricht University

Automated seizure detection for remote monitoring

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Valorization

The existing EEG monitoring systems which include video EEG and ambulatory EEG is not affordable to an epilepsy patient due to its cost [240, 241]. When considering remote monitoring of epilepsy patients in rural places of India, the cost is always the biggest issue. The goal of this thesis is to develop cost-effective mobile-based remote monitoring of epilepsy patients using database-independent optimized algorithms and classification of seizure types. As we know that, manual inspection of long term EEG is time-consuming, tedious, prone to error and expert dependent. Therefore, automated detection of epileptic seizures has an impact on reducing the workload of a neurologist who reviews the long-term EEG during the evaluation of patients with epilepsy. Mobile-based system build using a cross-database algorithm will also help to keep monitor the epilepsy patients in terms of frequency of seizures, seizure onset and to warn the caretakers and doctors in case of emergency. The classification results achieved using cross-database evaluation were appreciable for clinical trials and it is the first of its kind study proposed using five EEG databases. The cross-database evaluation can also lead to cost reduction and time saving as developing a new algorithm is not required for new EEG databases. The classification of seizure types using EEG signals will be a great tool for doctors to take further clinical action on epilepsy patients.

The algorithms developed in this thesis can be made as software packages to run on hospitals. Further, it can also be associated with EEG recording systems as analysis software for real-time seizure detection. Such a compact

model can be installed at RMCH and MUMC hospitals for real-time monitoring.

As we have shown mobile-based seizure monitoring, in the future, EEG can be recorded using EEG headset and can be sent to mobile for analysis and reports can be shared with doctors for further clinical action. Such a system will be able to move epilepsy patients from hospital or ICU to the external environment and real-time monitoring can be done.

As we have proposed a model to overcome inter-database variability to work with multiple databases, AM-FBC can also be applied to other EEG or any physiological signals related to studies to build a robust and generalized algorithm. Such attempts will lead to having more training datasets for any classification model which is essential in machine learning.