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Application of machine learning and signal processing techniques to real time detection and prediction of epileptic seizures

Epilepsy is a neurological disease, which affects around 50 million people of the world's population and 25% of them have medically resistant form of epilepsy. With the increased development of effective prevention treatments, early diagnosis of epileptic seizures is becoming necessary because the patient can undergo treatments, which can delay or prevent the disease progression. Several studies have been carried out in the past to explore the feasibility of a practical real-time epilepsy seizure detector. However, still there is a need for improved methods of data acquisition, feature extraction and feature space creation for epilepsy seizure detection. Also, there is no known technique available for accurately predict a seizure onset well ahead. An accurate prediction even few minutes before the seizure onset might help prepare the patient, his/her caregiver. This talk will present the energy efficient real-time seizure detection and prediction algorithms we developed [1-5], which can be implemented in wearable, non-invasive EEG devices which would ensure prompt and effective management of seizures. The research focus also includes development of accurate seizure detection and prediction algorithms to prevent or minimize harmful effects of seizure onsets. Our methods [1-5] differ from previous studies mainly on two things; the first is providing a simple yet very effective training set acquisition for epileptic seizure detection and prediction, and the second is testing these novel approaches using a high number of seizure instances, precisely a total of 192 seizures from total 22 pediatric patients.

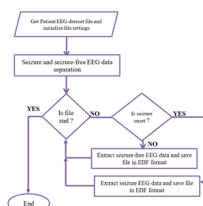


Figure1: Pre-processing of scalp EEG data into separate seizure and seizure free EEG files

Biography

Lalit Garg is a Lecturer in Computer Information Systems at the University of Malta, Malta. He is also an honorary lecturer at the University of Liverpool, UK. He has also worked as a researcher at the Nanyang Technological University, Singapore and at the University of Ulster, UK. He received his first degree in electronics and communication engineering from the Barkatullah University, Bhopal, India, in 1999 and his postgraduate in information technology from the ABV-Indian Institute of Information Technology and Management (IIITM), Gwalior, India in 2001. He received his Ph.D. degree from the University of Ulster, Coleraine, UK., in 2010. His research interests are missing data handling, machine learning, data mining, mathematical and stochastic modelling and operational research, and their applications especially in the healthcare domain. He has published over 80 technical papers in refereed high impact journals, conferences and books and has more than 550 citation count to his publications.

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