Seminar Talk

Lasitha Vidyaratne
PhD Candidate
Department of Electrical and Computer Engineering
Old Dominion University

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Title: Real-Time Epileptic Seizure Detection Using EEG

Abstract:

EEG is one the most effective tools used in the diagnosis of epilepsy. However, proper diagnosis of epilepsy requires the detection and analysis of epileptic seizures for a long period of time. Manual monitoring of long term EEG is tedious and costly. Therefore, a reliable automated seizure detection system is desirable. Consequently, we propose two novel patient-specific, real-time automatic epileptic seizure onset detection methods, using EEG. The first technique obtains harmonic multiresolution and self-similarity-based fractal features from EEG for robust seizure onset detection. Accordingly, a fast wavelet decomposition method, known as harmonic wavelet packet transform (HWPT), is computed based on Fourier transform to achieve higher frequency resolutions without recursive calculations. Similarly, fractal dimension (FD) estimates are obtained to capture self-similar repetitive patterns in the EEG signal. A Relevance Vector Machine (RVM) classifies the FD and HWPT features in a timely manner for reliable seizure detection.

Next, we extend this work by introducing a second technique based on neural networks for automated seizure detection. The proposed deep cellular recurrent neural network (DCRNN) architecture improves upon the classical hand-crafted feature based techniques by simultaneously learning both temporal and spatial features from raw seizure EEG, respectively. Consequently, the proposed architecture shows exceptional performance with superior runtime and computing efficiency.

Bio:

Lasitha Vidyaratne is a Ph.D. candidate in the ECE Vision Lab at ODU. He received his BS and MEng degree in Electronic and Communications Engineering from the University of Nottingham, Malaysia Campus. Currently he I working towards his doctoral dissertation which contributes to developing novel deep recurrent neural network architectures for complex computer vision and biomedical signal processing applications. His research interests include deep learning, recurrent neural networks, unsupervised learning, reinforcement learning, brain computer interfacing, and biomedical signal processing.