

BSc/MSc-project

Detection of early biomarkers for Parkinson's disease

Introduction:

Parkinson's disease (PD) is the second most common neurodegenerative disease after Alzheimer disease and it can be diagnosed when subjects suffer from motor symptoms such as bradykinesia, muscular rigidity, rest tremor, and postural and gait impairment. Neuropathological studies have shown that the symptoms that characterize PD are consequence of the loss of neurons and abnormal deposition of aggregations of the protein α -synuclein in the substantia nigra and amygdala. According to a world-wide accepted hypothesis, the loss of neurons and the depositions of α -synuclein actually start in the olfactory bulb, then progress to the brain stem and only afterwards reach the substantia nigra. This process may take 10-15 years and lot of effort in research is put in finding biomarkers of PD in its early stages. Sleep is controlled by the brain stem and research studies have shown that REM sleep behaviour disorder (RBD) and sleep alterations might be considered early biomarkers of PD. However, these are not still sufficient to make a definite PD diagnosis and new biomarkers should be found.

Objective:

The main objective of the study is to develop new algorithms for automatic extraction of features from electrophysiological sleep data that have the potentiality of being early biomarkers of PD. The features will be extracted in different patient groups and it will be evaluated whether they can be related to PD development.

Description:

In the project you will work with electrophysiological signals (EEG, EMG, ECG, EOG...) data recorded during sleep. In particular you will focus your attention in the analysis of EEG signals in RBD subjects, healthy controls and PD patients. Some previous studies have proposed some EEG features as early biomarkers of PD, but only during wakefulness and it has to be understood whether they are significant in sleep. In case of bachelor project you will work with features that have already been proposed in literature and you will apply them to the sleep database that we have available. In case of master project, you will also actively work for the development of new features that might give new insights in the PD research. Based on these features, an automated classification of healthy subjects and subjects in different diseases should be achieved with highest possible accuracy. The project research will be performed in collaboration with Rigshospitalet Glostrup and researchers from Germany.



Credit: <http://www.medscape.com/viewarticle/868274>

Max number of students: 2

Prerequisites:

Signal processing, experience in Matlab and profound mathematical skills.

Supervisors:

Assoc. Professor MSK Ph.D. Helge B.D. Sørensen, DTU Elektro

Ph.D. student Matteo Cesari, DTU Elektro

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Medicinsk signalbehandling