Deep Learning
Deep Neural Networks for Interpretable Analysis of EEG Sleep Stage Scoring

Student: Anders Bæk (s160159). **Supervisors:** Sirin W. Gangstad and Albert Vilamala

Motivation

An automation of sleep stage annotations is possible by feeding transformed EEG signals as multitaper spectrogram images to a pre-trained CNN. An investigating of the time dependence in the transitions between the sleep stages can be obtained by adding a RNN on top of the pre-trained CNN. The stacked neural network will learn the time dependence and purportedly improve the automated annotations of sleep stages.

The hypothesis is that it will be possible to learn the transitions rules in the time domain and create an improved classifier.

Background

Developing an automated sleep stage classifier, which is able to learn the transition rules between the five stages of sleep, is profitable for patients and doctors around the world. The current approach of annotating sleep stages is done manually by highly trained professionals and based upon complex transition with high probability of a subjective interpretion. The project is based upon the article "Deep Convolutional Neural Networks for Interpretable Analysis of EEG Sleep Stage Scoring" by Vilamala, Madsen, and Hansen where the pre-trained CNN has been implemented. The scope of this project is to expand the pre-trained CNN with a RNN on top.

Milestones

The development of the project is considered as an iterative process. The milestones are dynamic and are influenced by the iterative processes of research implementation as well as other courses.

- 1/11-2017: Understand the main article. Setting up the proper AWS infrastructure.

- 10/11-2017: Finish the implementation of the CNN baseline.

- 20/11-2017: Finish the research of CNN and RNN implementations.

- 5/12-2017: Development process of the CNN and RNN is done.

- 10/12-2017: Final performance measures of the CNN and RNN is done and compared with the CNN baseline. Then turn full focus on to the presentation and develop the article simultaneously.

- 18/12-2017: Presentation of the project.

- 3/1-2018: Hand in final article.

References

[1] A. Vilamala, K. H. Madsen, and L. K. Hansen. "Deep Convolutional Neural Networks for Interpretable Analysis of EEG Sleep Stage Scoring". In: *ArXiv e-prints* (Oct. 2017). arXiv: `1710.00633 [cs.CV]`.