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# Detecting seizures from electroencephalogram (EEG) data

In this project I will study EEG measurements on epileptic subjects and devise a model to predict the onset of seizures in a reasonable amount of time. This project has the potential of turning into a product, where a wearable electronic device measuring brain activity can detect oncoming seizures and warn the patient and/or the health care provider in a timely manner. A similar methodology can also be applied to other medical time-series data (i.e. heart rate, blood pressure etc.) to accurately detect sudden and dangerous episodes. Potential clients who would be interested in this project are medical device and wearable electronics companies, healthcare providers and insurance companies. These clients will be able to provide better quality service to their customers suffering from medical conditions leading to sudden and life-threatening episodes.

The data which will be used in this project is publicly available through online resources such as Kaggle [1], University of Bonn Department of Epileptology [2] and International Epilepsy Electrophysiology Portal [3].

I will initially perform an exploratory analysis and look for possible correlations between the EEG segments and the target (whether the segment is associated with the onset of the seizure or not). Then, I will concentrate on feature engineering to construct a design matrix that can be used in a machine learning algorithm. These features will be based on traditional approaches that has been used before, such as Fourier components, inter and intra channel correlations, and moving averages. Then, a simple baseline model will be constructed and its predictive accuracy will be studied. In the next step, a more modern approach based on long short-term memory (LSTM) networks will be constructed and their performance will be compared to the baseline model.

All of the analysis will be performed using Python employing Scikit-learn (for baseline models) and Tensorflow (for LSTM networks) packages. At the end of the project, the code and a short article describing the findings will be provided in a Github repository.

### References

[1] <https://www.kaggle.com/c/seizure-prediction>

[2] <http://epileptologie-bonn.de/cms/front_content.php?idcat=193&lang=3&changelang=3>

[3] <https://www.ieeg.org/>