Epilepsy-Detection-Using Deep Learning:

Setup:

Epilepsy can be caused by a hereditary condition or an acquired brain damage such as from a stroke or trauma. A person has aberrant sensations, symptoms and behavior during a seizure, which might include loss of consciousness. Between seizures, there are minimal symptoms. Epilepsy is generally treated with medicine, although it can also be treated with surgery, gadgets, or dietary modifications in rare situations. A seizure is a burst of electrical impulses in brain that occurs suddenly. For a brief period of time, a seizure alters a person's appearance or behavior. During a seizure, a variety of things can happen. During a seizure, body and the brain can accomplish whatever they normally do.

After migraine, epilepsy is the second most prevalent brain condition. The ability to identify epileptic seizures automatically can greatly enhance the quality of life for victims. In real-life circumstances, current EEG (electroencephalogram) -based seizure detection algorithms face several problems. The EEGs are not stationary readings or signals, and seizure patterns differ from patient to patient and recording session to recording session. Furthermore, EEG data is susceptible to a variety of noise forms, which reduces the accuracy of epileptic seizure detection. We propose the deployment of a deep learning-based method that will learn the discriminative EEG characteristics automatically of epileptic seizures to solve these issues. The Long Short-Term Memory (LSTM) algorithm based on Recurrent Neural network principles, is used to establish the high-level models of the normal and epileptic EEG patterns in order to uncover the correlation between subsequent data samples. Softmax function is fed with training features to get the classification results.

The dataset's related time-series is split into a number of observations. Each observation or data point represents the value of an EEG recording at a certain moment. So here we have 11500 samples of shuffled data in rows, each observation in dataset has 178 observations in columns, and where the last column represent label(y) i-e. {1,2,3,4,5} in this case. Subjects falling in class 2,3,4,5 are considered non-Epilepsy seizure patients or subjects in class 1 as Epilepsy patients, for binary classification as done in literature. We have simplified access to dataset by creating the .csv file version of dataset.

Working:

In training_model.ipynb file, dataset is visualized first. Then making of Recurrent neural network for classification with two LSTM layers and with other specification like ‘adam’ optimizer and ‘binary_crossentropy’ for loss calculation. Running number of training epochs, with normalized data as the data is split into train, validation and test sets (training (2900 samples) & testing (2300 samples)). Plotted the accuracy and loss. At last saved the model for future referencing in results.ipynb file. Results.ipynb file will load the save model in folder and prediction for binary classification to see if the input signal is epileptical or non-epileptical.