Introduction to Neural Engineering — Cornell ECE/BME 5040
Homework 2 — March 21, 2019

Feature analysis on multi-channel iEEG recording

Overview

- The goal of this homework is for you to perform basic time and frequency domain feature analysis on multi-channel iEEG recording of epileptic patients to identify regions of brain associated with seizures.
- You may implement your solution in any programming language you choose, but you should provide a report with readable and commented codes.
- Submissions are due Tuesday, April 9, at 2pm, via Blackboard. Submit a single pdf including your code and plots of features (described below).

Data format

- Attached data.mat file includes a continuous intracranial EEG recording that spans two minutes prior to an expert-marked seizure onset until two minutes after the end of the seizure period.
- The multi-channel signal is recorded using 47 electrodes sampled at 5000Hz.
- You can load the data file using loadmat function of the scipy.io package in python.

Feature implementation and channel selection

Assume a window size of 1sec and extract the following features from 3-5 most informative channels that best represent the seizure segment. Plot the extracted features and mark them with corresponding channel number.

1. Line-length
2. Energy
3. Variance
4. Spectral power in the following bands:
   Beta: 12–30 Hz
   HFO: 100–600 Hz