BE 521: Homework 0 Questions

Introduction

Spring 2020

15 points

Due: Tuesday 1/21/2020 11:59 PM

Objective: Working with the IEEG Portal, basic matlab commands, publishing LaTeX

1 Unit Activity (15 pts)

The dataset `I521_A0001_D001` contains an example of multiunit human iEEG data recorded by Itzhak Fried and colleagues at UCLA using 40 micron platinum-iridium electrodes. Whenever you get new and potentially unfamiliar data, you should always play around with it: plot it, zoom in and out, look at the shape of individual items of interest (here, the spikes). The spikes here will be events appx. 5 ms in duration with amplitudes significantly greater than surrounding background signal.

1. Using the time-series visualization functionality of the IEEG Portal find a single time-window containing 5 spikes (use a window width of 500 ms). The signal gain should be adjusted so that the spikes can be seen in entirety. Give a screenshot of the IEEG Portal containing the requested plot. Remember to reference the LaTeX tutorial if you need help with how to do this in LaTeX. (2 pts)

   Include screenshot:

   ```
   % \includegraphics[scale=0.3]{screenshot.png}\\
   ```

2. Instantiate a new IEEGSession in MATLAB with the `I521_A0001_D001` dataset into a reference variable called *session* (Hint: refer to the IEEGToolbox manual, class tutorial, or the built-in *methods* commands in the *IEEGSession* object - i.e., *session.methods*). Print the output of *session* here. (1 pt)

   ANSWER HERE

3. What is the sampling rate of the recording? You can find this information by exploring the fields in the *session* data structure you generated above. Give your answer in Hz. (2 pts)

   ANSWER HERE

4. How long (in seconds) is this recording? (1 pt)

   ANSWER HERE

5. (a) Using the *session.data.getvalues* method retrieve the data from the time-window you plotted in Q1.1 and re-plot this data using MATLAB's plotting functionality. Note that the amplitude of the EEG signals from the portal is measured in units of μV (microvolts), so label your y-axis accordingly. (NOTE: Always make sure to include the correct units and labels in your plots. This goes for the rest of this and all subsequent homeworks.). (3 pts)

   ANSWER HERE

   (b) Write a short bit of code to detect the times of each spike peak (i.e., the time of the maximum spike amplitude) within your time-window. Plot an 'x' above each spike peak that you detected superimposed on the plot from Q1.5a. (Hint: find where the slope of the signal changes from positive to negative and the signal is also above threshold.) (4 pts)

   ANSWER HERE

   (c) How many spikes do you detect in the entire data sample? (1 pt)

   ANSWER HERE

6. Content Question- In the assigned reading, you learned about different methods to obtain and localize neural signals for BCIs. Describe the naming convention for the International 10-20 system for EEG recording. Specifically, what do the letters refer to and what can you infer from the parity (even vs. odd) of the number at a given site? (1 pt)

   ANSWER HERE