

BE 521: Homework 0 Questions

Introduction

Spring 2021

15 points

Due: Thursday 1/28/2021 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 4 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. In your own words, 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