**Data and Code structure for LFP analysis of data collected by Dr. J Patrick Mayo**

This file summarizes the data structure and codes for doing LFP analysis on data collected by Dr. J Patrick Mayo in Dr. John Maunsell’s lab. The monkeys performed an attention task with valid, invalid and neutral cues, while data was recorded from both hemifields of area V4. For details of spiking data analysis, see Mayo and Maunsell, 2016, JNS.

Within the parent project folder that contains everything related to this dataset, there is a Data folder. In addition, there is one programs folder for each project. Hence, the contents of this parent folder are as follows:

* Parent\_Folder
  + Data
  + MayoProjectPrograms (<https://github.com/supratimray/MayoProjectPrograms>)
  + MayoProject2 (<https://github.com/supratimray/MayoProject2>)
* The “Data” folder contains the following
  + extractedData – original data provided by Patrick, along with extracted LFP data. Data from 2 monkeys and 26 sessions (of which 25 were used). Size: 120 GB.
  + segmentedData – following a particular convention used in our lab, data is subsequently segmented in a specific format and saved in this folder. Size: 24.4 GB.
  + savedData & savedDataSummary – see details under MayoProjectPrograms below.
* MayoProjectPrograms – this was the first project on this dataset, details of which can be found in Prakash et al., 2021, Cerebral Cortex. This folder has a lot of files, which are used to convert extractedData to segmentedData (for example, by running runSaveSegmentedDataMayo.m which runs saveSegmentedDataMayo.m), and to generate intermediate data that is subsequently used for all analysis. However, this intermediate data is not stored within this folder but instead in the main Data folder (in savedData and savedDataSummary folders; see above). The display programs in this folder read from these intermediate folders to show the results. They do not work unless these intermediate data are available, which are several GB in size.
* MayoProject2 (current folder) – this is the second project on this dataset. Here, we will study how different neural measures – spikes, LFP power, LFP phase, phase consistency, noise correlations etc can be used to predict behavior (hit versus miss). Unlike the first project, intermediate data will also be stored within this folder. One set of programs generate and save this intermediate data. Another set of programs then analyze this data and show results.

The programs in MayoProject2 folders are described below.

**Codes and data files for MayoProject2**

**How to get “intermediate data” for further analysis?**

**Data files:** To start with, the following data folder/files are required and should be present in “Data” folder inside the parent folder within which this folder is kept. For example, if the location of this folder is X/MayoProject2, then we expect the Data folder to be X/Data (X being the parent folder).

1. ***extractedData***: contains codes files and DAT files which are used to obtain task related and behavioral data.
2. ***segmentedData***: contains LFP, spikes data for each attention conditions segmented between -0.5 s to 0.1 s relative to target onset.
3. ***electrodeArrayList***: contains the list of good electrodes of all the 25 sessions. (This file is present in the savedDataSummary folder inside the Data folder). It is also saved locally in savedData

**Data codes:** These set of programs are used to restructure the data which are subsequently used by analysis codes.

1. ***getAttentionExperimentDetails.m*** – This code gives the filenames of each session data.
2. ***getBehavior.m***: This program gives the behavioral performance of the monkey. This also saves the behavioral data locally in savedData/behaviorData if it is not present there already.
3. ***saveDataForAnalysis.m*** – This program concatenates LFP and spikes data for one single orientation of all attention conditions. This datafile is saved locally in a new *savedData/neuralData* folder and used by the analysis codes.
4. ***runDisplayBehaviorAndSaveData*** – It is the main program to locally save data. It also displays the orientation that is used for each condition.

**Analysis codes:** These set of programs are used to analyze the data. They take the locally saved data from *savedDataForAnalysis* folder obtained from getDataForAnalysis.m code.

1. ***aucAnalysisPower.m*** – This program gives PSDs, firing rates for every trial and electrode and computes dPrimes and AUCs.
2. ***ROCAnalysis.m*** – This program does the ROC analysis of the hits and miss trials of a given attention condition which is called by *aucAnalysisPower.m*

**Display codes:** These set of programs display the plots/figures.

1. ***plotAucAnalysisPower.m*** – This program plots the figure which displays the PSD, firing rate, dPrime and AUCs for a single electrode and these measures averaged across electrodes.
2. ***getPlotHandles.m*** – creates subplot layout for the figure.
3. ***makeDirectory*** – generic program to create a directory if it is not present already.