Final Assignment for the course
Neurocognitive Methods and Data-Analysis II
Summer Term 2024
Part 1: fMRI

Final presentation of your work: Have your code on a github and walk us through.
Compose a short 5 min Presentation, in which you show your code and discuss difficulties you have had, decisions which you had to make (+reasoning).
Please include screenshots of your analysis and final results

Task: fMRI
1.1 Automatization of data processing SPM12 manual
During the semester, you have performed data analyses as described in Chapter 31 of the SPM12 Manual (https://www.fil.ion.ucl.ac.uk/spm/doc/spm12_manual.pdf)
Please write a set of scripts which automatizes the processing described in the Manual up to the computation of the first-level contrast images (including as last step 31.3.1).
Please put appropriate comments in your code. You do not need to write anything about this task in the documentation.
Make your Pipeline BIDS compatible.

1.2 Dataset from real study
Please download the dataset via the link posted on Blackboard (Link to FU.box), which contains original functional and structural data of one subject. Additionally, you will find two types of logfiles: Cogent-Logfiles (which you do not need, but might help to understand what was happening when) and Matlab-logfiles. When loading the Matlab-logfiles, you will find a matrix called *Design*. Each column of the matrix represents one trial (You will find information on the meaning of the number-codes in the additionally provided file *Design.txt)*. Together with the description of the experiment in the file *Materials and Methods.docx* on Blackboard, you should first take some time to understand the experiment and to understand the matrix *Design* in the logfiles (Maybe count the trials of every type and calculate if the ITIs were as specified). Most importantly note that the first row refers to the onset of each trial after the start of a functional run.
Please compile a set of scripts (SPM12 batch scripts), which automatically perform the following preprocessing steps on this dataset:
- DICOM import (+ sorting the data in appropriate folders – e.g. following the BIDS format conventions)
- Realignment
- Coregistration
- Segmentation
- Normalization
- Smoothing

Write a script, which generates a first-level GLM with appropriate regressors for the task conditions + motion parameters. You might want to load the logfile for every run and then automatize the selection of onsets for each regressor.

Report in the Documentation a screenshot of your SPM Design Matrix.

Write a script which defines and estimates the following contrasts:
   (1) Stimulation > Imagery (pooled over the different types of stimuli)
   (2) Imagery > Stimulation (pooled over the different types of stimuli)
   (3) Imagery Flutter > Attention
   (4) Attention > Stimulation

Inspect the contrasts at p<0.001 (uncorrected) and provide a representative image of every contrast (e.g. a surface rendering or a selection of section images (aka slices)) in the Documentation.