

# Portfolio assignment4 fMRI Preprocessing

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## **fMRI preprocessing exercise**

In this exercise we are going to prepare fMRI data for analysis and look at some of the output. The data is the same dataset as last week, although this week we will be looking at all the fMRI data from one participant (participant 1).

## **Deadline**

March 1, 2018.

## **Data**

The data can be found in a zip-file at blackboard entitled “fMRI\_data\_raw.zip”. Note that this file contains 400 functional images (called f...nii) and 1 structural anatomical image (called s...nii).

Save the structural data to a separate file.

## **Tasks**

### **1. Initial alignment of data to standard stereotactic space (MNI-space)**

Attempt to position the anterior commissure in  $[0,0,0]$  of the first functional image using the Display function in SPM.

1.a. How much does it have to be moved (indicate 3 translations and 3 rotations)?

Apply transformation to all functional images.

Align the anterior commissure of the structural image to  $[0,0,0]$ .

1.b. How much does that have to be moved?

### **2. Preprocessing of fMRI data**

Follow the example in the SPM12 manual chapter 30. Apply the same preprocessing procedure to the current data. This means:

2.a. realignment,

2.b. coregistration of function and structural data (hint: use “dependency” to point to the mean functional image),

2.c. segmentation of structural data (again, use dependency to point the coregistered structural image),

2.d. normalization using the forward deformation field from segmentation (hint: dependency and NB: No need to change voxel size), and

- 2.e. smoothing (choose dependency and output from normalization) using a [8,8,8] mm FWHM gaussian kernel.
- 2.f. Save and report output from the graphics window using the SPM figure menu.

### 3. Realignment parameters

SPM produces a file with the realignment parameters, i.e. the calculated participant movement and rotation per time point (called “rp...txt”).

Import the realignment parameters into R.

- 3.a. Make a lineplot of the realignment parameters in R.
- 3.b. How far has the participant moved for each dimension during the experiment (Hint: use “apply()” to run a function across columns)?
- 3.c. Are any of the realignment parameters significantly correlated with the fMRI model (same model as used in exercise 3)?

Remove linear effects of time from the realignment parameters (hint: 1:400, fit a line and use residuals).

- 3.d. Make a lineplot of the realignment parameters with time removed.
- 3.e. Make a lineplot including only the first realignment parameter before and after removal.
- 3.f. Are the realignment parameters (corrected for effects of time) now correlated with the fMRI model?

### Reporting:

Use r\_markdown in RStudio for the part of the report conducted in R. Collect figures and report and submit as a single pdf-file.

Submit report to Blackboard.