fMRI data and the AOMIC cohort

In this projects, we will work on fMRI data from the Amsterdam Open MRI Collection (AOMIC).

The AOMIC dataset gathers MRI data from more than a thousand individuals obtained on a 3 Tesla imager. For each subject we can access the T1-weighted images (anatomical image), the diffusion-weighted images (white-matter tracts) and fMRI sequences (task-based and resting states). The dataset gives access to both raw *and* preprocessed (*derivative*) data. The description of the data acquisition and processing is available here :

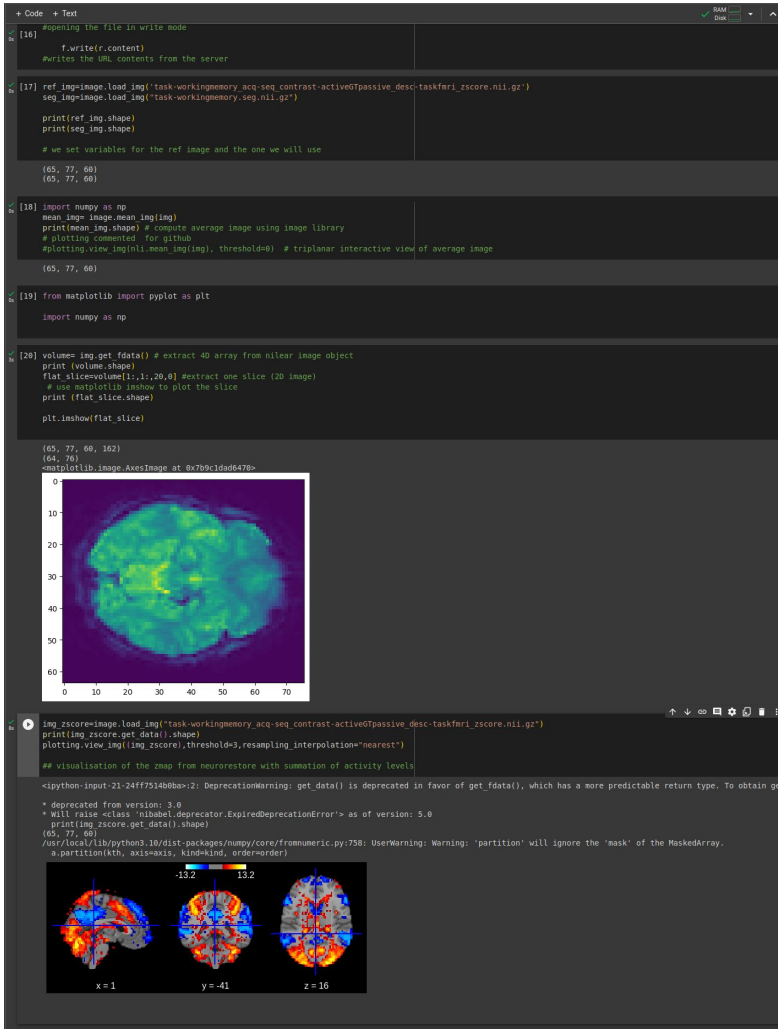
Snoek, L., van der Miesen, M. M., Beemsterboer, T., Van Der Leij, A., Eigenhuis, A., & Scholte, H. S. (2021). The Amsterdam Open MRI Collection, a set of multimodal MRI datasets for individual difference analyses. *Scientific data, 8*(1), 1-23.

All data are publicly available for downloads using **AWS s3 buckets** s3://openneuro.org/.

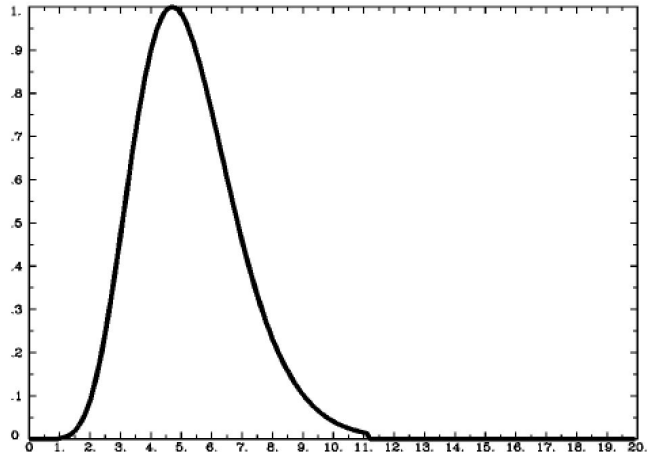
The participants will familiarize with the The Brain Imaging Data Structure (BIDS) is an emerging standard for the organization of neuroimaging data.

Using **Jupyter Notebook** (and/or Google Collab)
with the following library : *numpy, scipy,* ***scikit-learn****;* ***nilearn***

With nilearn , participants have access to high-level library to :
Manipulate and and visualize brain image volumes, as well as decode, predict, analyse and propose functional connectivity maps.



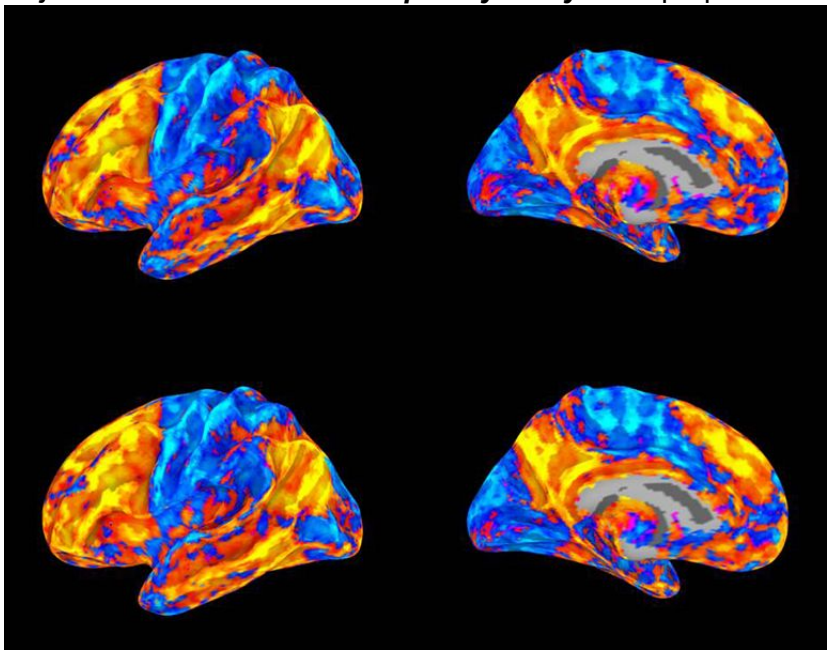
Projetc 1 : we will study **Hemodynamic Response Function** (HRF) variation for various task.



Wi will use *convolution tools* to fine tune HRF models in different activation task using SPM model.

https://github.com/andrewjahn/AndysBrainBook/blob/master/docs/SPM/SPM_Short_Course/SPM_Statistics/SPM_03_Stats_HRF_Overview.rst

Project 2 : we will use ***time-frequency analysis*** to propose ***connectivity map*** in resting-state data:



We will compare our results with the Resting-State Networks proposed in the paper :

Smith, SM, Fox, PT, Miller, KL, Glahn, DC, Fox, PM, Mackay, CE, Filippini, N, Watkins, KE, Toro, R, Laird, AR, Beckmann, CF (2009). Correspondence of the brain's functional architecture during activation and rest. *Proc Natl Acad Sci U S A*, 106, 31:13040-5.