**Steps for fMRI time series motion compensated reconstruction.**

**Run main\_onDataFromAA.m to generate reconstructions.**

1. Convert DICOMS to Nifti format (filename.nii.gz).
2. Save the fMRI time series after removing the background (for each volume) in thefolder named “bgremoved", which is inside the folder containing the files.The background removed file should be named as "filename\_bgremoved.nii.gz". [MaskOutBackground.py](https://github.com/bchimagine/rsfMRI-motioncompensation/blob/main/MaskOutBackground.py) can be used to remove the background. However, the script failed to create a background-removed time series for some datasets. If you have another tool to extract background, please use it.
3. If the main file is used to estimate the motion parameters, the files are automatically saved inside the folder named motion params. If any other software such as FSL is used, then make sure that the files are named the right way and are saved in the right folder. Also make sure the params estimated from FSL match the params estimated using the main file.
4. Check slice timing info from the json file and update the variable opt.slice\_acq\_order in line 38.
5. Some of the free parameters for the algorithm are listed under Set parameters (~ line 70).

* I have observed that the same value of mu (25) worked for different classes of datasets (ABCD, DHCP, etc.).
* I have set beta and beta\_fac to 7 and 1.05 respectively. For now, don't change it. Run the algorithm on Alyssa's dataset using the pair. From the analysis results, we can determine if we need to change the value of this pair.
* opt.maxIter refers to maximum number of iterations for the x-subproblem. Depending on the dataset, this should be changed. It is good to begin with a higher value.
* opt.overall\_maxIter refers to the overall iterations for the algorithm. I have set this to 15. Again, this can change depending on the dataset. In the future, we could set the both the iterations (overall\_maxIter and maxIter) to a higher value and have an exit condition depending on a threshold. The algorithm exits depending on whichever condition (threshold or maximum iterations) is met first.
* For now, do not change the value of p and eta.

The algorithm is first run on the 'un-scrubbed' dataset by calling the function ‘reconstruct\_timeseries\_noscrub.m’. The output of the algorithm is a super-resolved (in time) time series. This series is down sampled from any starting point to match the sampling period of the measured fMRI data. The down sampled output is then fed as input to the second part of the algorithm (MainFunctionForInterpScrubbedData.m). Here, the volumes whose framewise displacement (FD) > threshold (Figure 1) are marked for scrubbing. The missing entries are then interpolated using the proposed matrix completion technique.

For the second part, the free parameters are tolerance, maxIter, filter size (ft). The filter size is set to length of time series/2. All three parameters depend on the dataset and need to be optimized for datasets belonging to a class.

I will share the folders containing Alyssa’s dataset with you.