**Steps to take before running main recon file for any datasets (including DHCP)**

Before running the scripts on any dataset, create a conda environment and install the following:

Python 3.8, NumPy, SciPy, SimpleITK, Nilearn, sklearn, pandas, NiBabel, Nipype.

The MATLAB code should then be executed from inside the conda environment. Also, make sure to test if python commands can be executed from the MATLAB window. Here is some information on how to call python commands from MATLAB:

<https://www.mathworks.com/help/matlab/call-python-libraries.html>

Execute the MATLAB main file only after making sure that python commands can be called from MATLAB window. Otherwise, we may run into errors.

If you get the error "unable to resolve the name py.(module name), add the directory containing the module to the python path using the following command:

py. importlib.import\_module('vvr\_regtofirstvolofmo'), replace vvr\_\* with the func name.

For every subject, create a folder with the subject name and create two sub-folders named “bgremoved” and “motionparams”.

Currently, the python code MaskOutBackground.py, which is used for generating fMRI time series by masking the background, cannot be called from the MATLAB window. I have not been able to resolve this issue. So, before running the main file, run the MaskOutBackground.py (from outside the environment) on the datasets and save the background removed fMRI time series in the “bgremoved” subfolder.

Steps to run the main file.

1. Create a folder with the subject name and create two sub-folders named “bgremoved” and “motionparams”.
2. Create a text file (to be used in the main file and by MaskOutBackground.py) with the full paths to the fMRI time series corresponding to different subjects (e.g., dhcp\_filenames\_bahram.txt)
3. Run MaskOutBackground.py to generate the masked fMRI time series and save the Nifti file corresponding to it in the “bgremoved” folder.
4. To start, create a main file corresponding to the class of data on which the reconstruction algorithm is going to be applied (e.g., main\_ReconMultipleDHCPFiles.m for DHCP datasets).
5. Run the main file and save the reconstructions corresponding to “No scrubbing” and “Scrubbing”.
6. Also, several plots are displayed when the main file is executed. If it’s not needed, the lines corresponding to their display can be commented out.

**Recon file when slice level parameters are incorporated:**

In the slice level forward model, current implementation does not include the application of Gaussian operator. The transpose of the gaussian operator, which corresponds to the flipping of the kernel from left to right and top to bottom (for 2D and additional flipping for 3D) needs to be implemented as well.

Sometimes I get the following error and the main file stops. In such cases, restart MATLAB (also terminal window) and run recon again. Works for now, but not an ideal solution. It will be good to fix this bug.

Another approach could be instead of using all the workers for joblib (for Z sub problem), we could use fewer workers and see if this problem still persists.

Following error in command window in MATLAB:

***Traceback (most recent call last):***

***File "/home/ch208071/anaconda3/envs/py38/lib/python3.8/site-packages/joblib/externals/loky/\_base.py", line 625, in \_invoke\_callbacks***

***callback(self)***

***File "/home/ch208071/anaconda3/envs/py38/lib/python3.8/site-packages/joblib/parallel.py", line 359, in \_\_call\_\_***

***self.parallel.dispatch\_next()***

***File "/home/ch208071/anaconda3/envs/py38/lib/python3.8/site-packages/joblib/parallel.py", line 794, in dispatch\_next***

***if not self.dispatch\_one\_batch(self.\_original\_iterator):***

***File "/home/ch208071/anaconda3/envs/py38/lib/python3.8/site-packages/joblib/parallel.py", line 861, in dispatch\_one\_batch***

***self.\_dispatch(tasks)***

***File "/home/ch208071/anaconda3/envs/py38/lib/python3.8/site-packages/joblib/parallel.py", line 779, in \_dispatch***

***job = self.\_backend.apply\_async(batch, callback=cb)***

***File "/home/ch208071/anaconda3/envs/py38/lib/python3.8/site-packages/joblib/\_parallel\_backends.py", line 531, in apply\_async***

***future = self.\_workers.submit(SafeFunction(func))***

***File "/home/ch208071/anaconda3/envs/py38/lib/python3.8/site-packages/joblib/externals/loky/reusable\_executor.py", line 177, in submit***

***return super(\_ReusablePoolExecutor, self).submit(***

***File "/home/ch208071/anaconda3/envs/py38/lib/python3.8/site-packages/joblib/externals/loky/process\_executor.py", line 1115, in submit***

***raise self.\_flags.broken***

***joblib.externals.loky.process\_executor.BrokenProcessPool: A task has failed to un-serialize. Please ensure that the arguments of the function are all picklable.***

Upon closing MATLAB the following warnings appear in the terminal window:

[ch208071@bahram Arvind]$ /home/ch208071/anaconda3/envs/py38/lib/python3.8/site-packages/joblib/externals/loky/backend/resource\_tracker.py:318: UserWarning: resource\_tracker: There appear to be 6 leaked semlock objects to clean up at shutdown

warnings.warn('resource\_tracker: There appear to be %d '

/home/ch208071/anaconda3/envs/py38/lib/python3.8/site-packages/joblib/externals/loky/backend/resource\_tracker.py:318: UserWarning: resource\_tracker: There appear to be 1 leaked folder objects to clean up at shutdown

warnings.warn('resource\_tracker: There appear to be %d '