**Guide For New Cases Preprocessing**

Prerequisite: Anaconda/Jupyter Notebook and necessary Python library (numpy, pandas, opencv, simpleitk, etc.); dcm2niix available in Command Prompt

* Open Anaconda Prompt
* Type ‘jupyter notebook’ or ‘jupyter\_notebook’ and hit Enter to open Jupyter Notebook in the browser
* Navigate to the location of the code and click on ‘main\_pipeline.ipynb’
* Change following variables in # CELL 2
  + base\_dir
    - folder for all raw PAR REC data with separate folder(s) for different study case(s)
  + out\_dir
    - output folder for everything
* Run CELL 1, CELL 2, CELL 3

**Step 1: Choose wanted sequences and convert PAR REC to Nifti images**

* Run CELL 4 🡪 auto-generate an Excel file named ‘all\_scan\_info.xlsx’ in output folder
* Create an Excel file with name ‘chosen\_sequences’ in output folder
* Copy desired sequence information from ‘all\_scan\_info.xlsx’ to ‘chosen\_sequences.xlsx’

(all\_scan\_info.xlsx)

Graphical user interface, application, table, Excel

Description automatically generated

(chosen\_sequences.xlsx)

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* Save and close ‘chosen\_sequences.xlsx’
* Run CELL 5 🡪 Auto-generate ‘1\_raw\_output’ folder in output folder

**Step 2: Normalize APTw images to range [-5, 5] and copy only wanted images to new folder**

* Run CELL 6 🡪 Auto-generate ‘2\_nifti’ folder in output folder

**Step 3: Co-register structural MRI images to T2**

* Run CELL 7 🡪 Auto-generate ‘3\_coreg2t2’ folder in output folder
* All structural MRI images are now co-registered to T2
* Go to each case folder in ‘3\_coreg2t2’ to fine tune coregistration
  + In ITK-Snap, load T2 image as main image, for each Flair, T1, T1c image:
    - Load the image as additional image
    - Go to Tools 🡪 Registration
    - On the Registration window on the right:
      * Transformation model: Rigid
      * Metric: Mutual information
      * Coarsest level: 2x (generally working well)
      * Finest level: 2x (generally working well)
    - Click on Run Registration
    - Click on Manual (near top-right)
      * Check registration
      * Move/rotate the image until satisfied
    - Reslice the image (3rd icon on lower-right) 🡪 Linear 🡪 OK
    - On the Toolbox on the left, right-click on the ‘resliced’ layer 🡪 Save Image 🡪 Browse 🡪 Click on the same image name (i.e. xxx\_Flair.nii) to overwrite it 🡪 Save 🡪 Yes 🡪 Finish
    - Close the original and resliced image
    - Repeat for other structural MRI images
* Now, all the structural MRI images are co-registered and fine-tuned to T2

**Step 4: Co-register structural MRI images to APT**

* Go to each case folder in ‘3\_coreg2t2’ to generate transform file
* Generate T2 to APT transform file:
  + In ITK-Snap, open apt\_original as main image and T2 as additional image
    - Go to Tools 🡪 Registration
    - On the Registration window on the right:
      * Transformation model: Rigid
      * Metric: Mutual information
      * Coarsest level: 1x (generally working well)
      * Finest level: 1x (generally working well)
    - Click on Run Registration
    - Click on Manual (near top-right)
      * Check registration
      * Move/rotate the image until satisfied
    - Save the transform (2nd icon on lower-right) as ‘2apt.txt’
    - Close ITK-Snap (do not save or reslice any image)
* Run CELL 8 🡪 auto-generate ‘4\_coreg2apt’ folder in output folder

**Step 5: Generate image tiles**

* Run CELL 9
* Run CELL 10