DPABI-Surf: A Surface-Based Resting-State fMRI Data Analysis Toolbox

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BIDS structure:
http://bids.neuroimaging.io

Low memory mode (fMRIPrep)

Voxel size (fMRIPrep)


Slice timing (fMRIPrep)
ICA-AROMA


ICA-AROMA

Pruim et al., 2015. Neuroimage

Ciric et al., 2017. Neuroimage

Three Spaces

E.g. (/DPABIPath)/DPABISurf/surf/SurfTemplates/faverage5_lh_cortex.label.gii

Mask

Volume space can be restricted within freesurfer_subcortical_mask
Organize the output files from fMRIPrep

Non-aggressively regressed out the covariates of ICA-AROMA noises.

Nuisance Regression
Same as DPARSF

Spatial Smoothing

Why should you smooth?
- Might Improve CNR/SNR
- Improve intersubject registration

How much smoothing?
- Blob-size
- Typically 5-20 mm FWHM
- Surface smoothing more forgiving than volume-based

Volume-based Smoothing

- Smoothing is averaging of “nearby” voxels

Volume-based Smoothing

- 5 mm apart in 3D
- 25 mm apart on surface!
- Kernel much larger
- Averaging with other tissue types (WM, CSF)
- Averaging with other functional areas
Regional Homogeneity (ReHo)

Similarity or coherence of the time courses within a functional cluster

\[
ReHo = \frac{1}{K^2(n-1)} \sum_{i=1}^{n} (R_i^2) - \frac{1}{K} 
\]

Zuo et al., 2013. Neuroimage

2D ReHo

Zuo et al., 2013. Neuroimage

Define ROI

Degree Centrality

Functional Connectivity

Extract ROI Time Courses

Define ROI

Left Surface Right Surface Volume
Define ROI

ROI List

- ROI Type: Surface Left, Surface Right, Volume

ROI order:
ROISignals_SurfLHSurfRHVolu_FunSurfWCF

Smooth Derivatives

Parallel Workers (if parallel computing toolbox is installed)
Each subject is distributed into a different worker. Do not be too much because of fMRIPrep processing.

Starting Directory Name
If you do not start with raw DICOM images, you need to specify the Starting Directory Name.
E.g. “FunSurfWCF” means normalized, covariates regressed and filtered
Abbreviations:
- W - Normalize
- I - ICA-AROMA Noise non-aggressively regressed
- C - Covariates Removed
- S - Smooth
- F - Filter
- B - ScruBBing

Save parameters to *.mat
Load parameters from *.mat
In addition to the surface-based data, also process the data in volume space processed by DPABI_Surf.
Set data for both left hemisphere and right hemisphere

Masks for both hemispheres

Standardization methods

Space: fsaverage (anatomical) or fsaverage5 (functional)

Output directory: left hemisphere and right hemisphere will be separated in different directories automatically

Smooth results: surface-based smoothing

Run

(DPABI)/DPABI/SurfTemplates/fsaverage5_lh_white.surf.gii
Call DPABI StandAlone:

```
/opt/DPABI/DPABI StandAlone/run_DPABI StandAlone.sh [MCRPath]
```

**Reading and Writing functions**

**Reading:**

```r
(Data, VoxelSize, FileList, Header) = y_ReadAll('XX.func.gii');
Data = 1024x230 single voxel
Header = GIfTI Structure
```

**Processing:**

```r
MeanData = mean(Data, 2);
```

**Writing:**

```r
y_Write(MeanData, Header, 'MeanData.gii');
```

**Further Help**

- **Website:** [http://rfmri.org](http://rfmri.org)
- **Journal Club:** [http://wiki.rfmri.org](http://wiki.rfmri.org)
- **Official Account:** RFMRILab

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**Use DPABISurf Docker**

![Image of DPABISurf Docker interface](image-url)
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Further Help

http://rfmri.org

The R-fMRI Journal Club
Official Account: RFMRILab

http://rfmri.org/wiki

http://rfmri.org/Course

http://deepbrain.com

DPABISurf 并行计算:
每天完成 20 个被试的皮层计算!!!
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Thanks for your attention!