

**Elastic Net-based Parcellation (ENPA)
toolbox manual**

2016.09.01

1. Introduction

The toolbox is for parcellation of brain regions with fMRI data using regularized sparse representation method (elastic net, EN).

The toolbox consists of parcellation modules at group and individual levels. The framework of EN-based parcellation scheme is illustrated in Fig. 1. Generally, the proposed parcellation scheme consists of the following steps: (1) EN method is employed to calculate the representation coefficients of time series of each voxel represented by that of other voxels; (2) a similarity matrix is subsequently constructed based on the representation coefficient matrix and (3) spectral clustering is then applied to the similarity matrix.

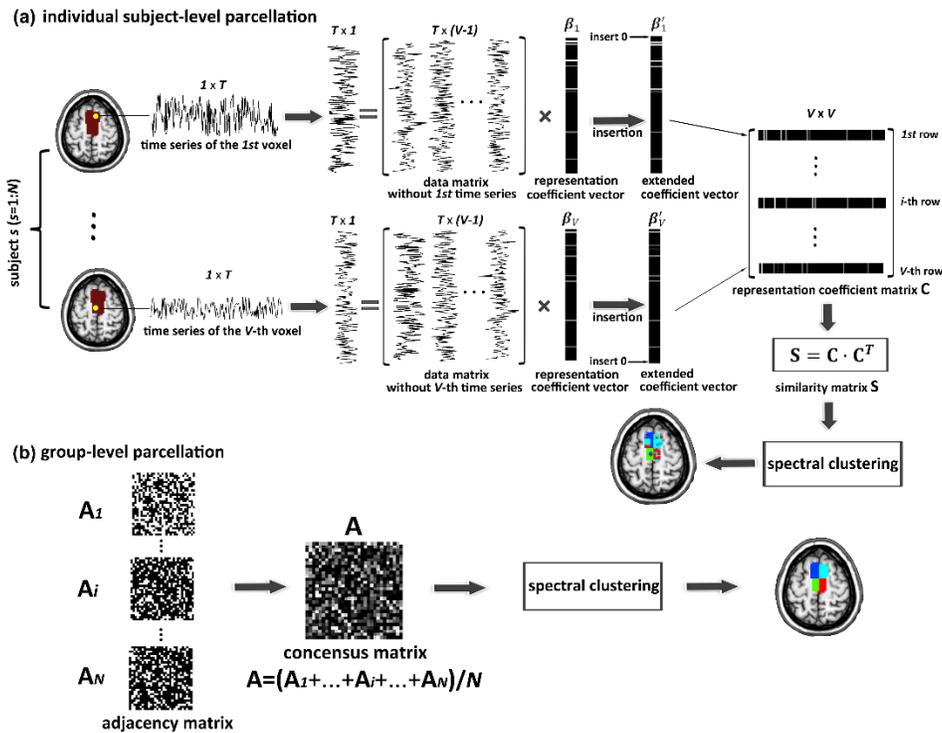


Fig. 1 The individual- and group-level parcellation.

References:

Ruiyang Ge, Adam A. Dipinto, Daniel Blumberger, Jonathan Downar, Zafiris Daskalakis, Joe Tham, Raymond Lam and Fidel Vila-Rodriguez, "A Sparse Representation-based Method for Parcellation of the Resting Brain and Its Application to Treatment-resistant Major Depressive Disorder", submitted.

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2. Usage of toolbox

→ Add the toolbox folder into the Matlab search path.

→ Type `segregation_EN` in the command window, and select the directory of your data¹ (Fig. 2).

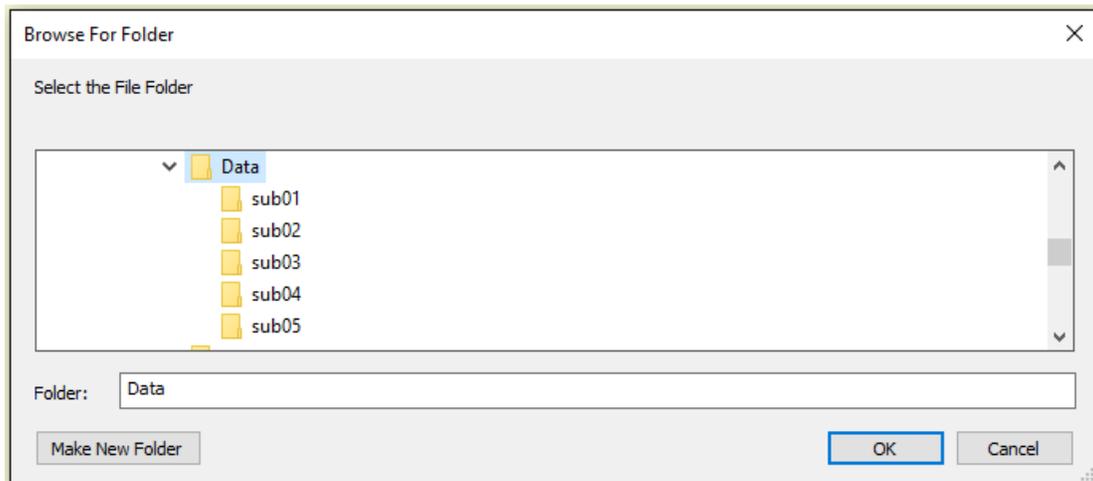


Fig.2 The setting of input dataset.

→ Select the save directory of your results (Fig. 3).

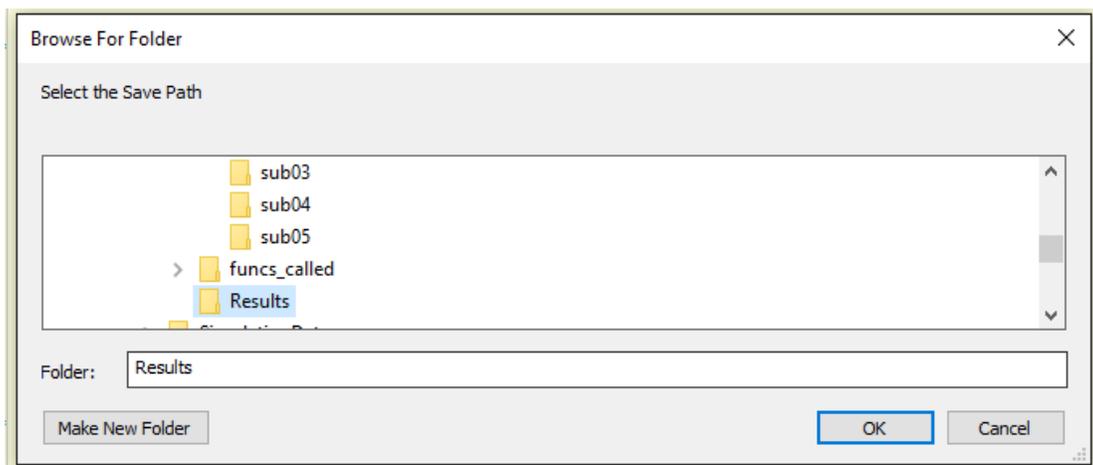


Fig.3 The setting of output directory.

¹ The image data from each individual should be arranged in one folder, and then put these folders in a root directory. Note that the image data should be pre-processed data.

→ Select the ROI mask (Fig. 4).

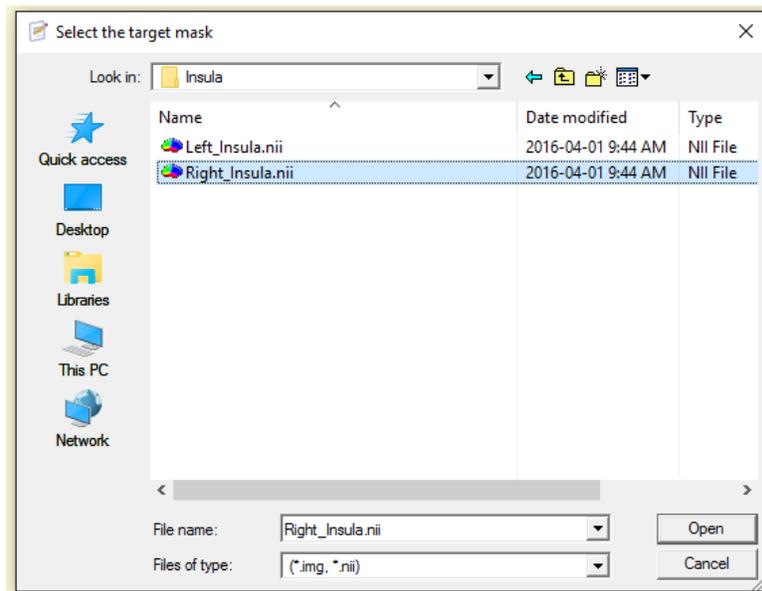


Fig.4 The setting of ROI mask.

→ Set the number of parcels (Fig. 5).

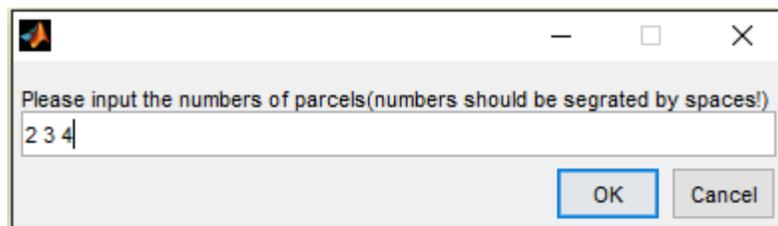


Fig.5 The setting of number of parcels.

→ Set the name of the ROI (Fig. 6).

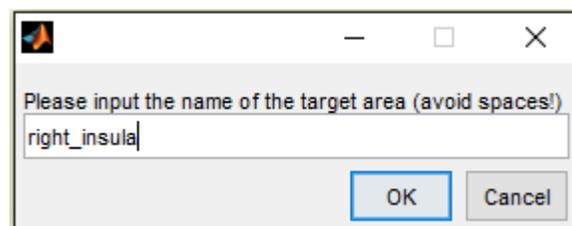


Fig.6 The setting of the name of the ROI.

→ Then the program will run (Fig. 7).

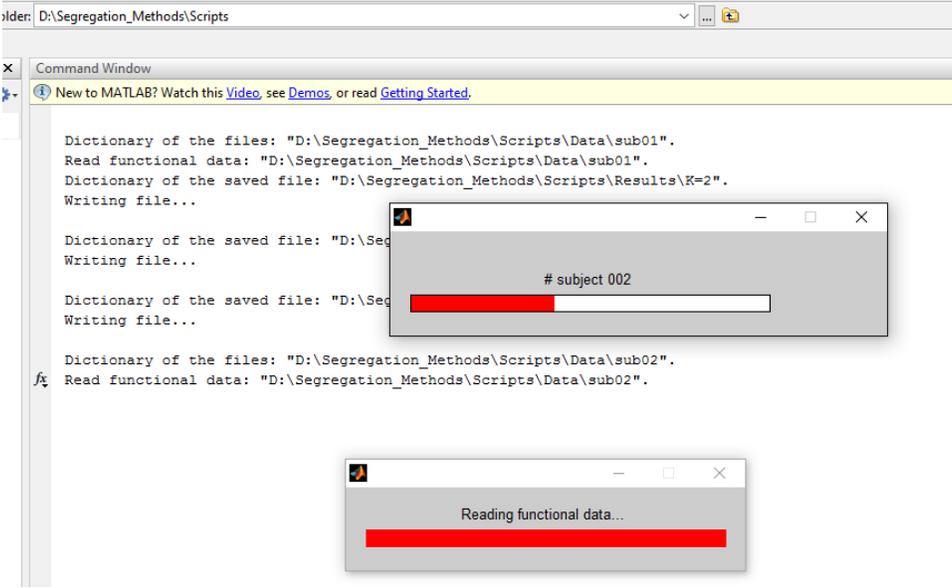


Fig. 7 Running process of the program.

3. Results

The output will be generated within the selected output directory, with different number of parcels stored within different folders (Fig. 8).

Name	Date modified	Type
K=2	2016-09-01 2:18 PM	File folder
K=3	2016-09-01 2:18 PM	File folder
K=4	2016-09-01 2:19 PM	File folder

Fig. 8 Results stored in the selected output directory.

ata (D:) > Segregation_Methods > Scripts > Results > K=4

Name	Date modified	Type	Size
IDX_all.mat			
IDX_group.mat			
right_insula_AS.mat			
right_insula_group.hdr	2016-09-01 2:26 PM	HDR File	1 KB
right_insula_group.img			
right_insula_group_1seed.hdr	2016-09-01 2:26 PM	HDR File	1 KB
right_insula_group_1seed.img	2016-09-01 2:26 PM	IMG File	1,062 KB
right_insula_group_2seed.hdr	2016-09-01 2:26 PM	HDR File	1 KB
right_insula_group_2seed.img			
right_insula_group_3seed.hdr			
right_insula_group_3seed.img	2016-09-01 2:26 PM	IMG File	1,062 KB
right_insula_group_4seed.hdr	2016-09-01 2:26 PM	HDR File	1 KB
right_insula_group_4seed.img	2016-09-01 2:26 PM	IMG File	1,062 KB
right_insula_sub01.hdr			
right_insula_sub01.img			
right_insula_sub01_1seed.hdr	2016-09-01 2:26 PM	HDR File	1 KB
right_insula_sub01_1seed.img	2016-09-01 2:26 PM	IMG File	1,062 KB
right_insula_sub01_2seed.hdr	2016-09-01 2:26 PM	HDR File	1 KB
right_insula_sub01_2seed.img			
right_insula_sub01_3seed.hdr			
right_insula_sub01_3seed.img	2016-09-01 2:26 PM	IMG File	1,062 KB
right_insula_sub01_4seed.hdr	2016-09-01 2:26 PM	HDR File	1 KB
right_insula_sub01_4seed.img	2016-09-01 2:26 PM	IMG File	1,062 KB
right_insula_sub02.hdr	2016-09-01 2:26 PM	HDR File	1 KB
right_insula_sub02.img	2016-09-01 2:26 PM	IMG File	1,062 KB
right_insula_sub02_1seed.hdr	2016-09-01 2:26 PM	HDR File	1 KB

"IDX_all" contains the indices of all voxels for all individuals within the ROI, with each index represents one parcel. "IDX_group" contains the indices of all voxels for the group within the ROI. "***_AS" contains the consensus matrix.

Parcellation results at the group-level, with all parcels in a single file.

Parcellation results at the group-level, with different parcels in separate files.

Parcellation results at the individual-level, with all parcels in a single file.

Parcellation results at the individual-level, with different parcels in separate files.

Fig. 9 Naming of the output files.

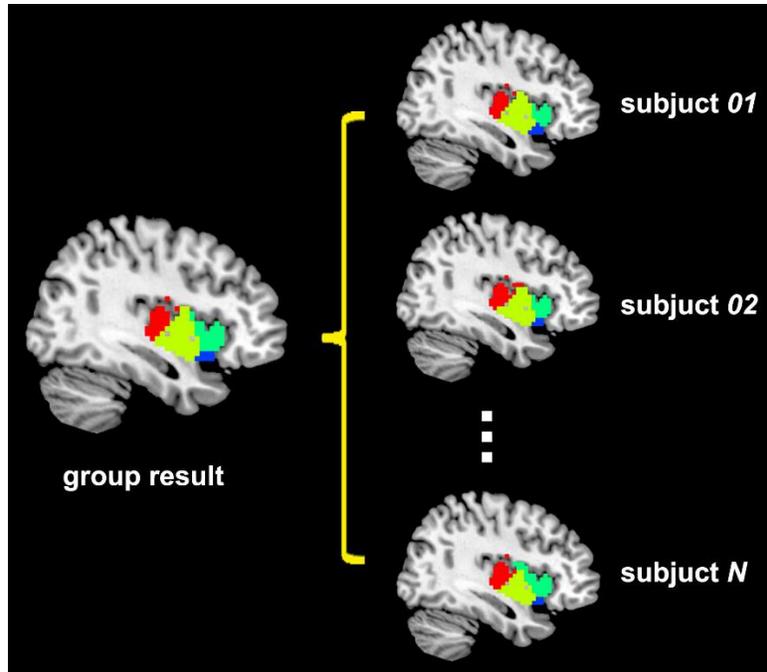


Fig. 10 An example of group-level and individual-level results.