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.

E-mail: ruiyang.ge@ubc.ca / ruiyangge@hotmail.com / ninetlab@gmail.com

2. Usage of toolbox

 \rightarrow 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).

Browse For Folder	×
Select the File Folder	
sub01	
sub02	
sub03	
sub04	
sub05	~
Folder: Data	
Make New Folder OK	Cancel

Fig.2 The setting of input dataset.

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

Browse For Folder	×
Select the Save Path	
sub03	^
sub04	
sub05	
> funcs_called	
Results	
	×
Folder: Results	
Make New Folder OK	Cancel

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.

 \rightarrow Select the ROI mask (Fig. 4).

📝 Select the tar	rget mask		×
Look in:	Insula 💌	← 🗈 💣 📰▼	
Quick access Desktop Libraries This PC	Name Left_Insula.nii Right_Insula.nii	Date modified 2016-04-01 9:44 AM 2016-04-01 9:44 AM	Type NII File NII File
	<		>
	File name: Right_Insula.nii	_	Open
	Files of type: (".img, ".nii)	•	Cancel

Fig.4 The setting of ROI mask.

 \rightarrow Set the number of parcels (Fig. 5).



Fig.5 The setting of number of parcels.

 \rightarrow 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).

CU	mmand Window			
٩	New to MATLAB? Watch this <u>Video</u> , see <u>Demos</u> , or read <u>Getti</u>	ing Started.		
	Dictionary of the files: "D:\Segregatic	on Methods\Scripts\Data\sub(01".	
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	Dictionary of the saved file: "D:\Segre	gation_Methods\Scripts\Resu	ults\K=2".	
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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).

Data (D:) > Segregation_Methods > Scripts > Results				
Name	^	Date modified	Туре	
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.

lame		Date modified	Туре	Size
📣 IDX_all.mat	אַ מו״	all" contains the indices of a	l voxels for all indi	viduals within the BOI
📣 IDX_group.mat	with e	ach index represents one pa	rcel. "IDX_group"	contains the indices of al
📣 right_insula_AS.mat	voxels	for the group within the RO	I. "***_AS" contai	ns the consensus matrix.
right_insula_group.hdr		2016 00 01 2-26 DM		1 // D
right_insula_group.img	Parcel	lation results at the group-le	evel, with all parcel	is in a single file.
Ҟ 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		Parcellation results at the group-level, with different parcels in		
right_insula_group_3seed.hdr		separate files.		
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	Parcol	lation results at the individu		reals in a single file
right_insula_sub01.img	Faiter			
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
	_	2016-09-01 2:26 PM	HDR File	1 KB
right_insula_sub01_2seed.img		Parcellation results at the i	ndividual-level, wi	th different parcels in
		separate files.		
right_insula_sub01_3seed.img		2016-09-01 2:26 PM	IMG File	1,062 KB
ኛ 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 bdr		2016-09-01 2:26 PM	HDR File	1 KB

Fig. 9 Naming of the output files.



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