

# Step by Step Tutorials for BrainNet Viewer

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# File list of this tutorials

- Net.mat
  - A resting-state functional network generated using the AAL90 template, including three variables:
    - Net – a 90 x 90 matrix, indicating the weighted brain network connectivity matrix
    - Degree – a 90 x 1 vector, indicating the nodal degree (strength) of the nodes
    - Ci – a 90 x 1 vector, indicating the community or module index of the nodes
- Practice.node
  - An example of node file
- Practice.edge
  - An example of edge file
- Practice1.mat
  - Pre-saved configuration for network drawing
- Practice2.mat
  - Pre-saved configuration for volume mapping
- zFCS
  - Normalized strength map of a voxel based brain network
- OneSample\_ROI11\_NC
  - A statistical map generated from one sample t test on seed-based functional connectivity
- aal.nii
  - The AAL parcellation atlas (*Tzourio-Mazoyer et al., 2002 Neuroimage*)

# Contents

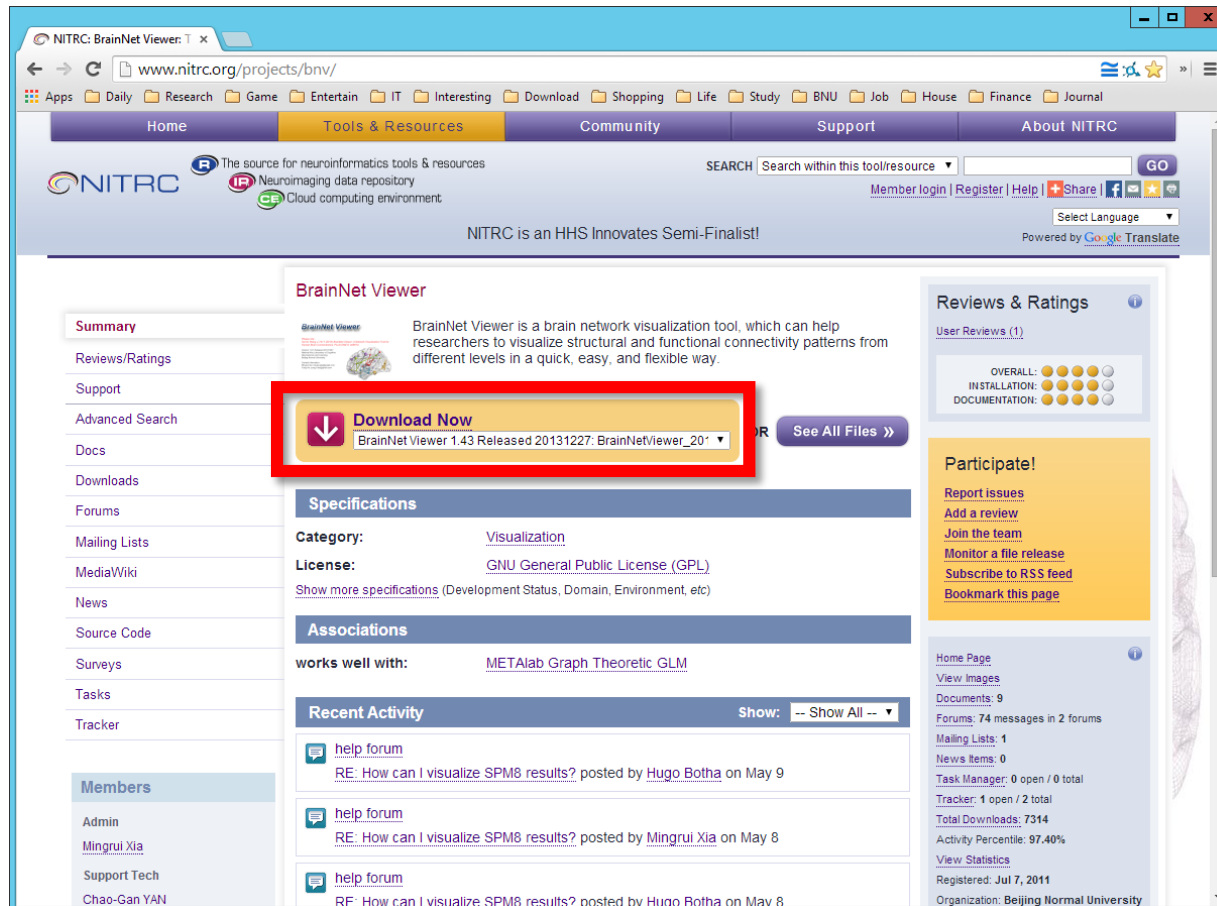
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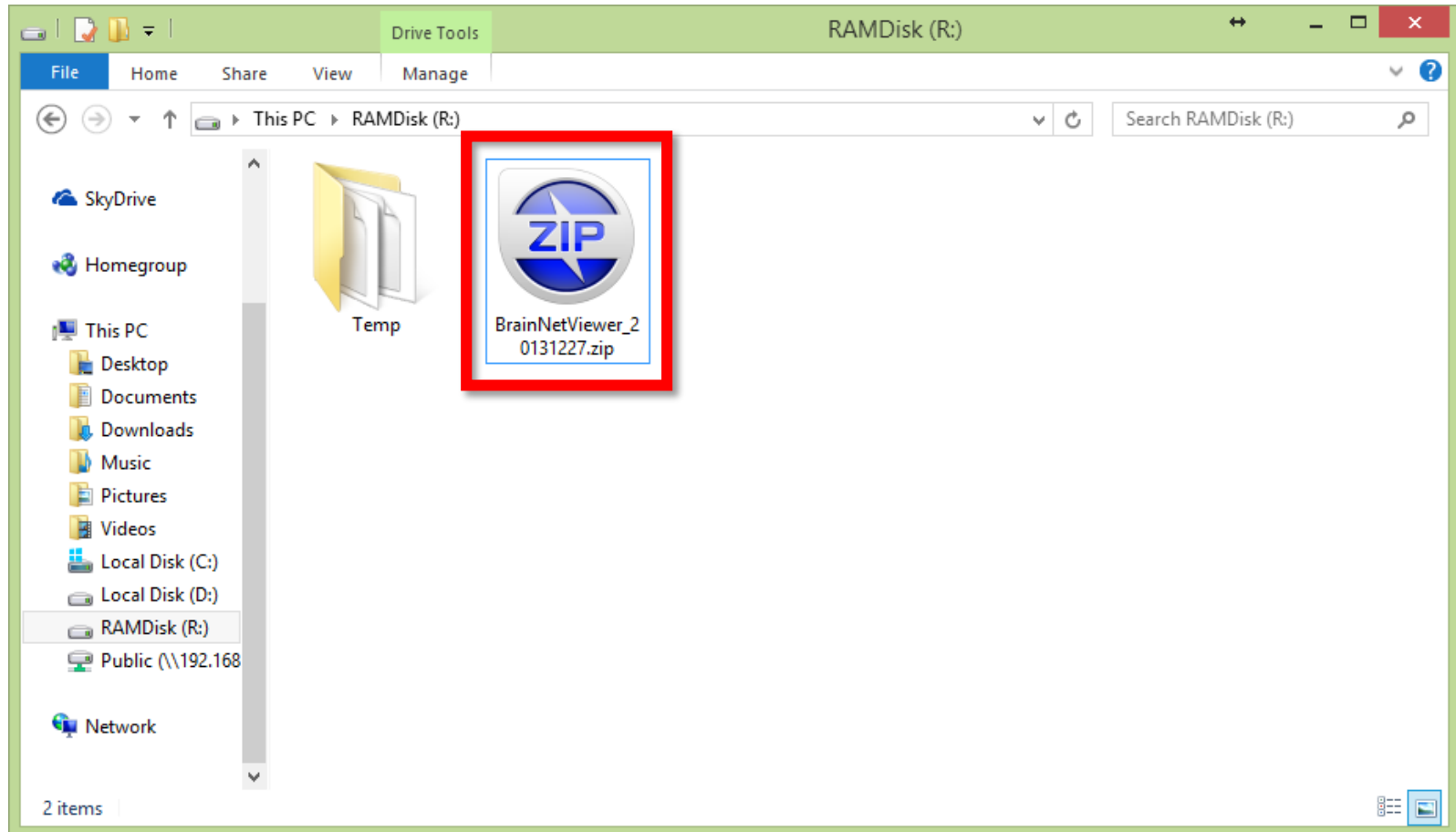
# Download Website

Download Site: <http://www.nitrc.org/projects/bnv/>  
Contact: [mingruixia@gmail.com](mailto:mingruixia@gmail.com)



# Download

*A zip file*

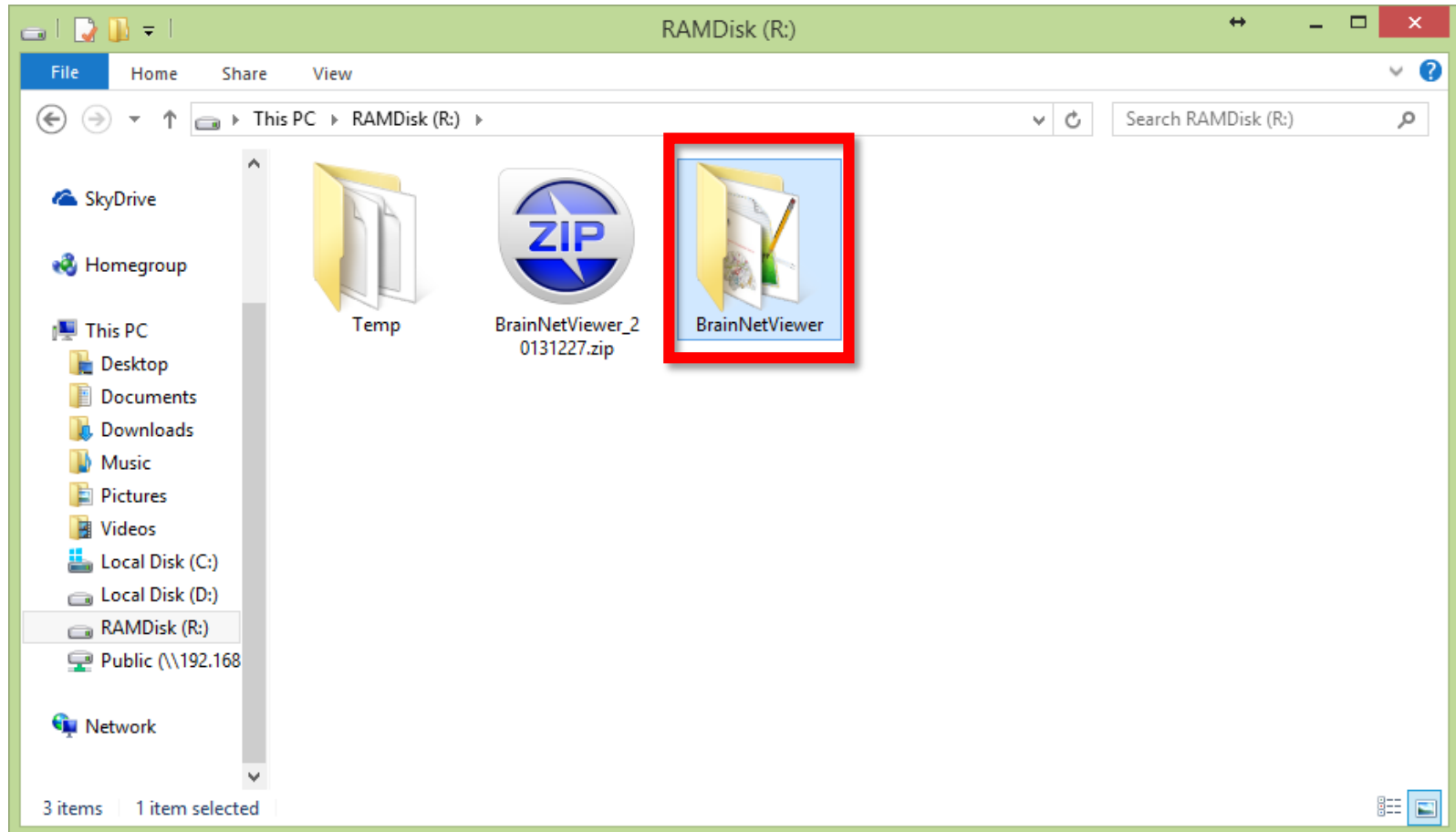


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# Installation

## *Unzip*

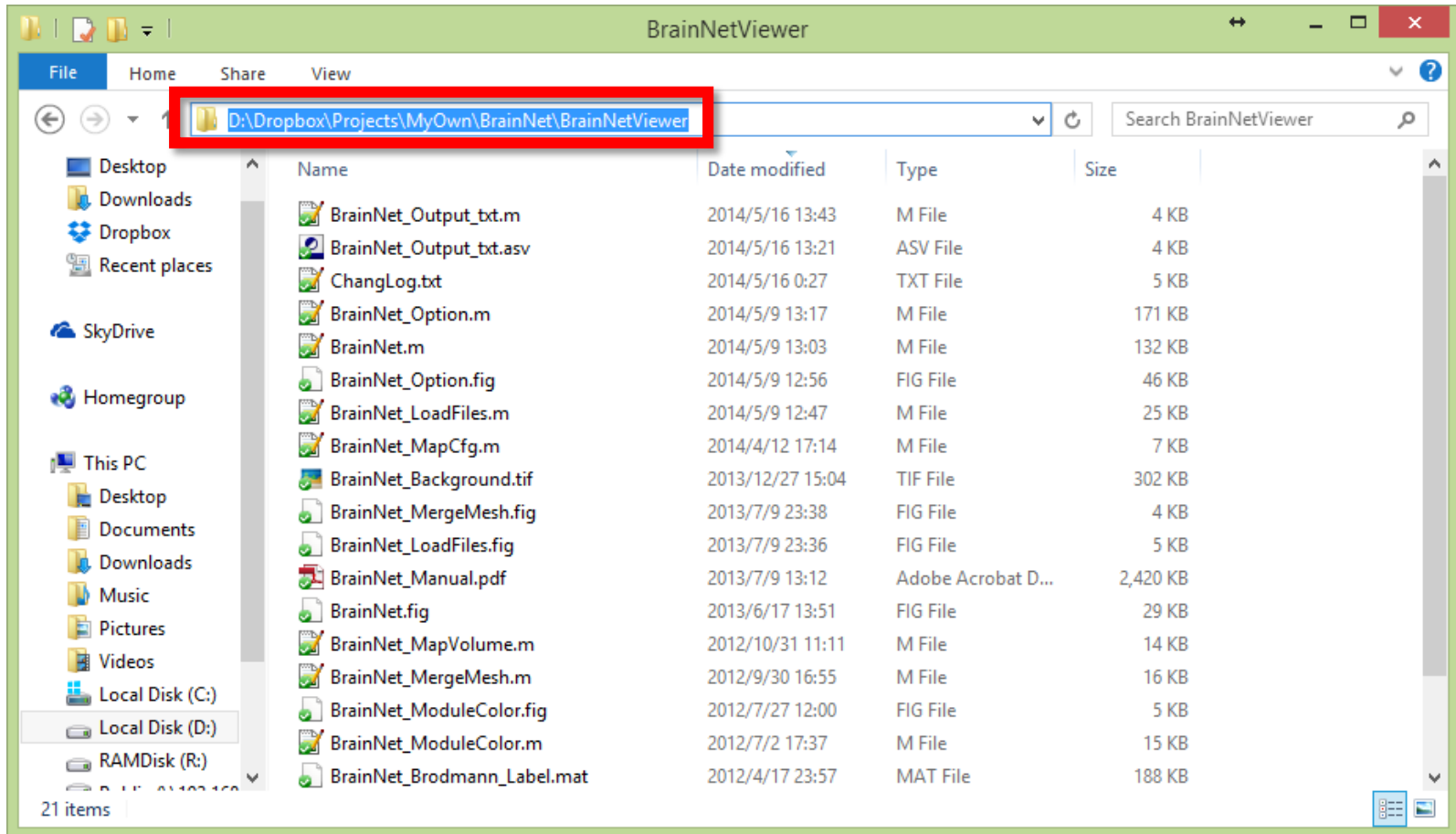




# Installation

## *Move to folder*

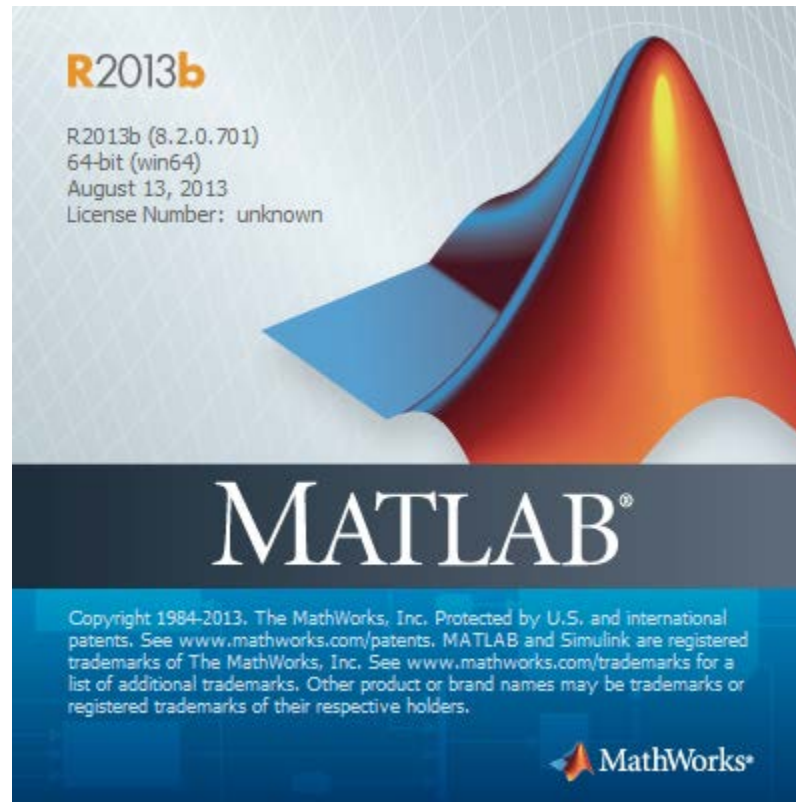
*Note: any folder without blank or non-Latin letters in directory*



# Installation

## *Start Matlab*

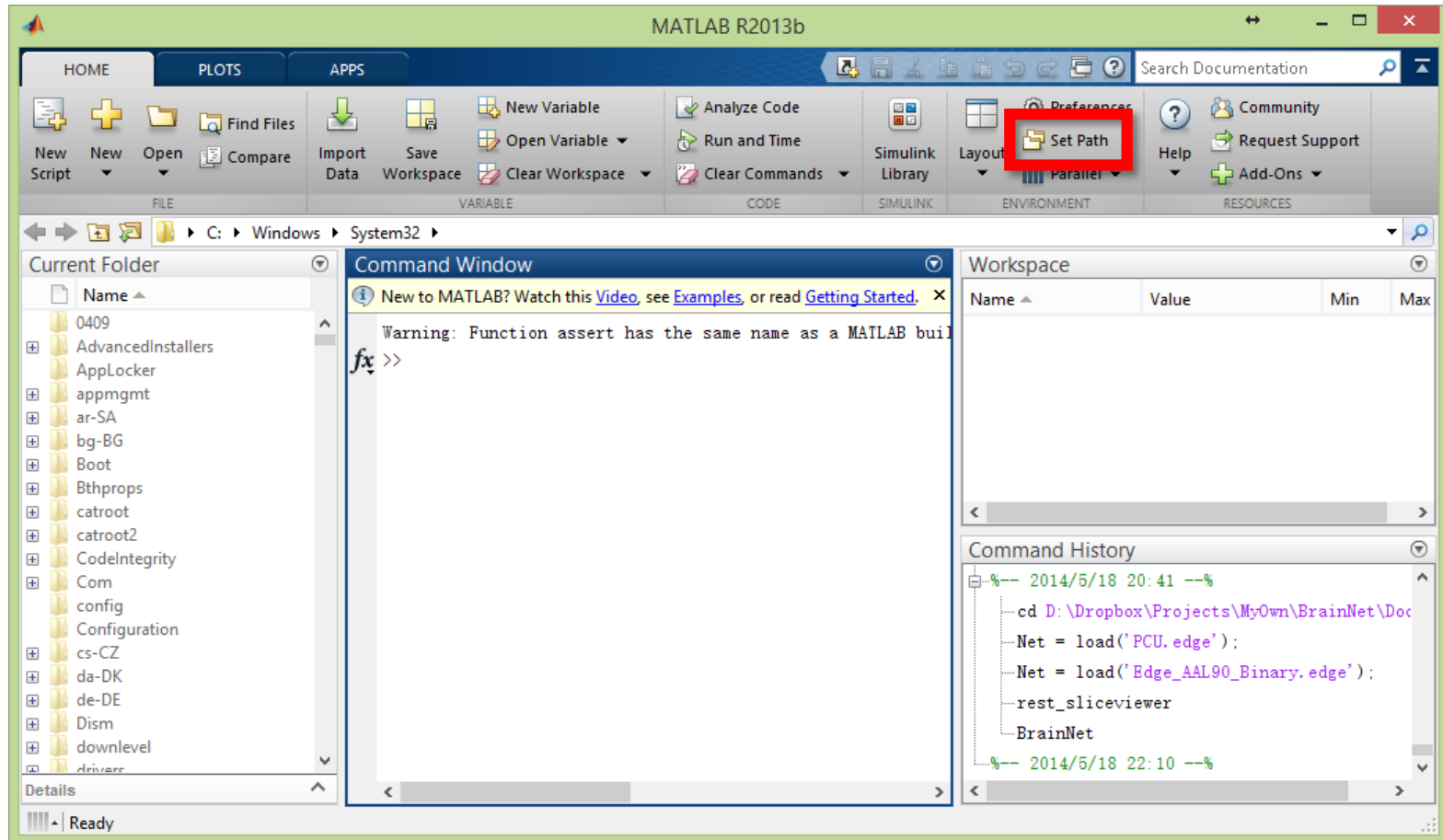
*Note: Matlab version  $\geq$  R2009a*



# Installation

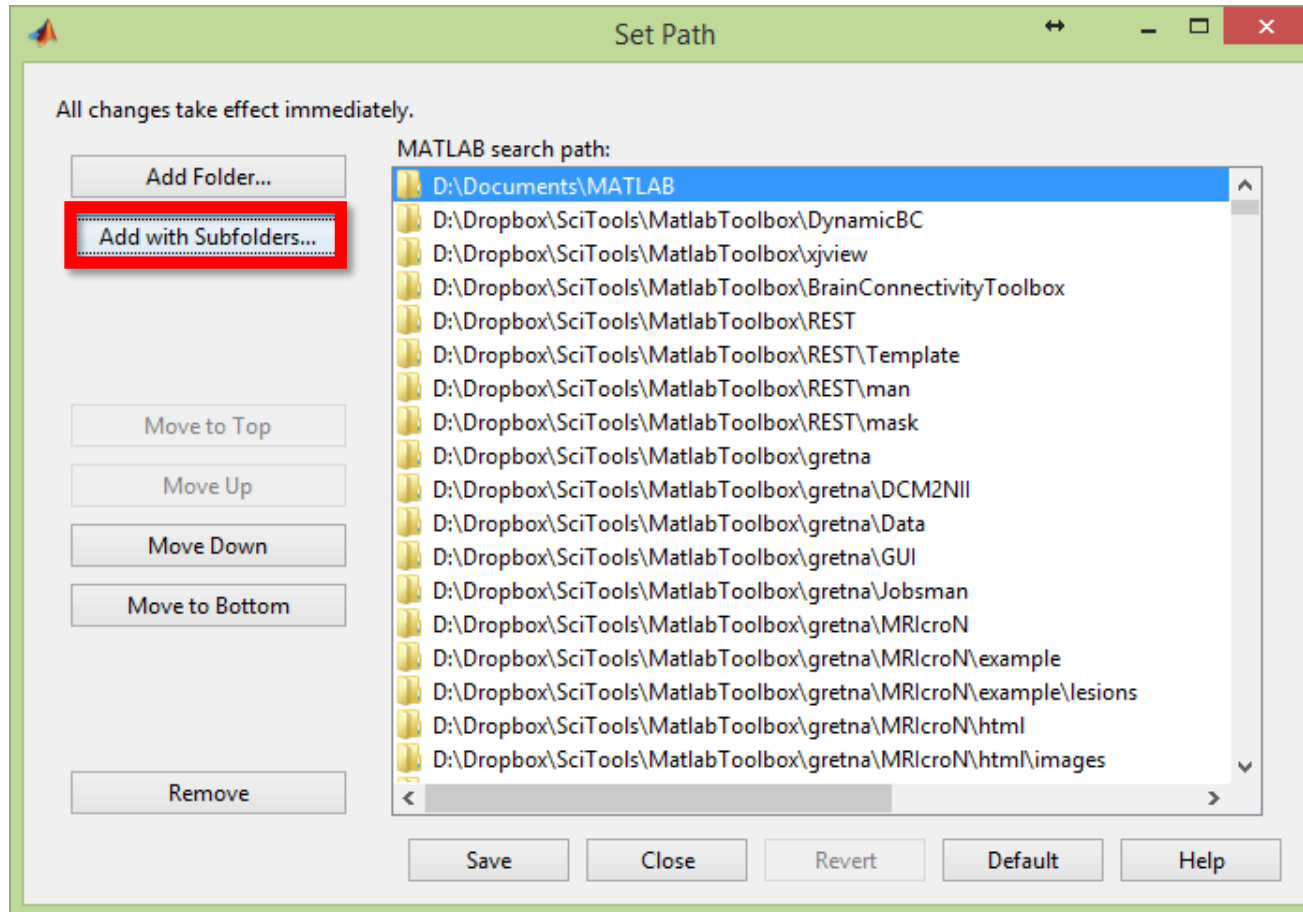
## Set path in Matlab

*Note: in lower version of Matlab: File -> Set Path*



# Installation

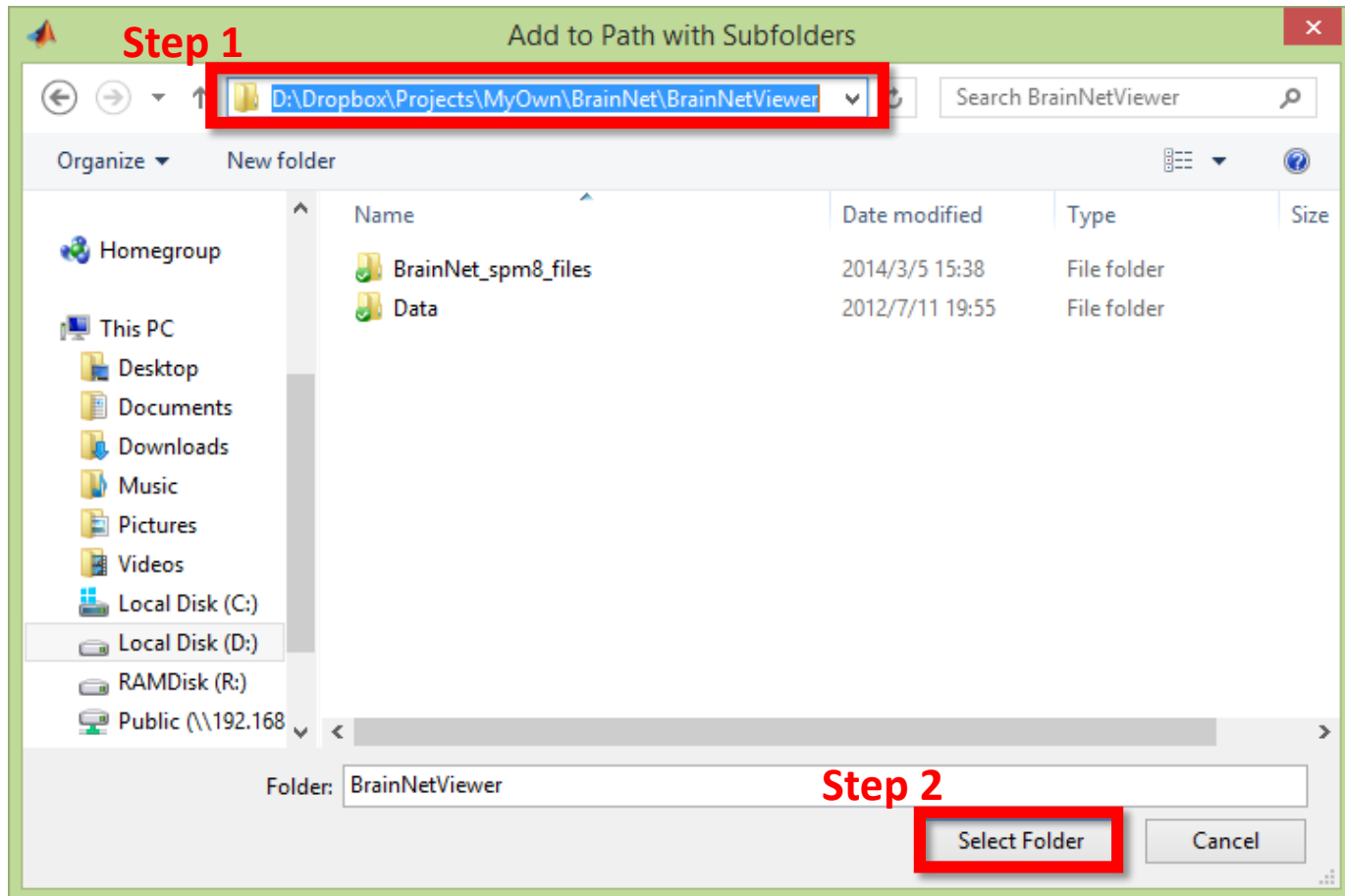
## *Set path in Matlab*



# Installation

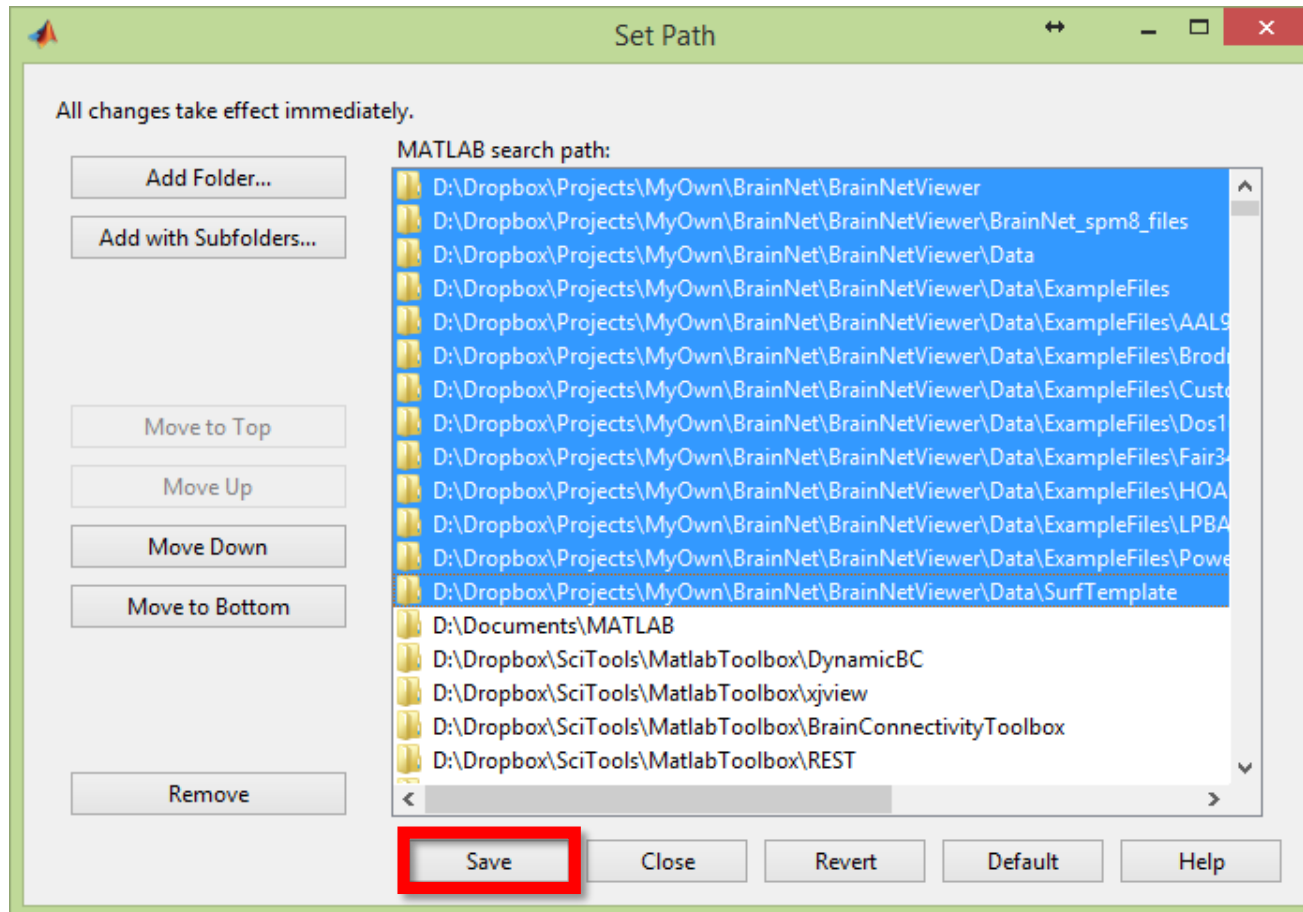
*Set path in Matlab*

*Note: locate the folder where your BrainNet Viewer is in*



# Installation

## *Set path in Matlab*



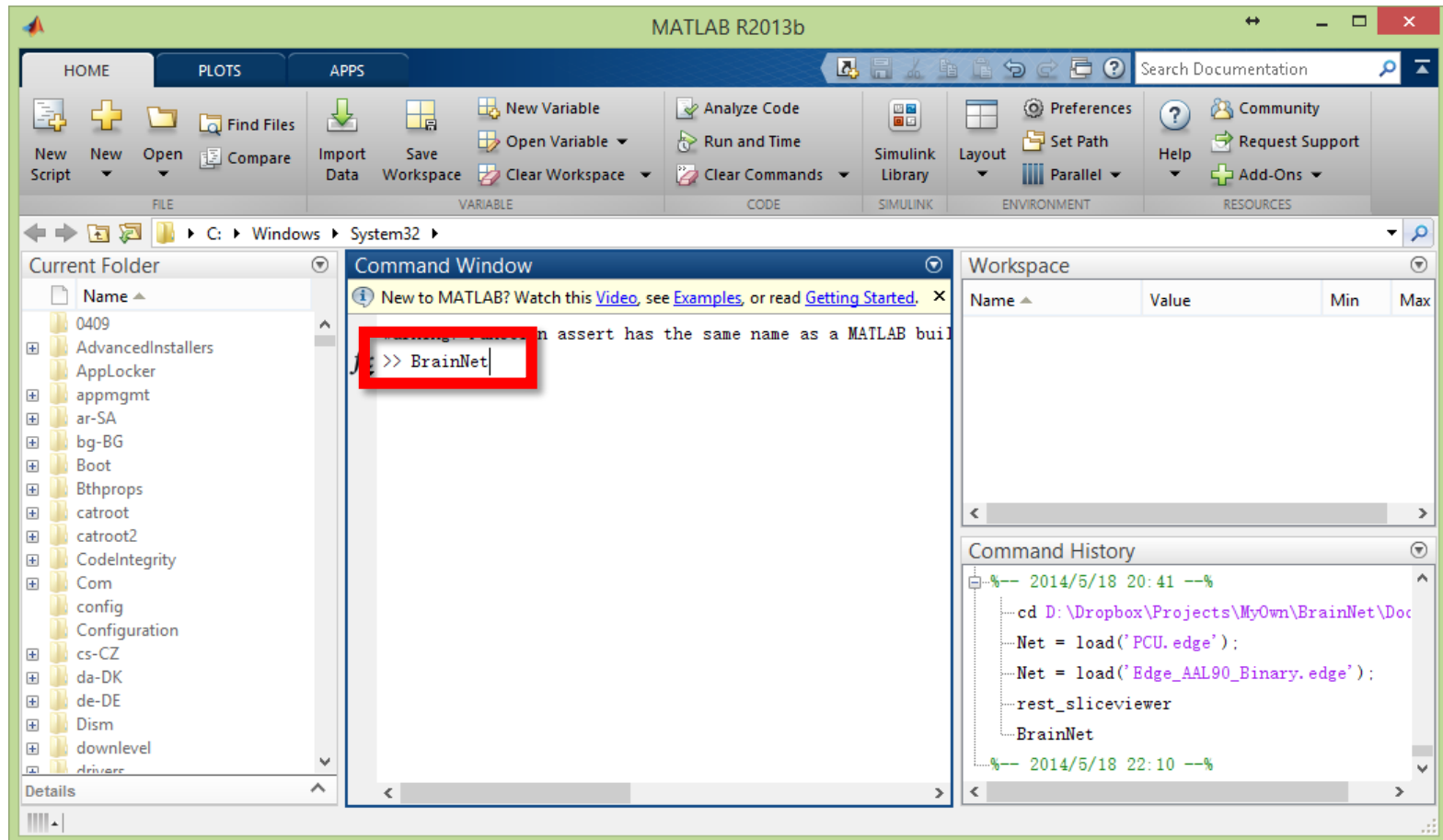
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# Start BrainNet Viewer

*Type command*

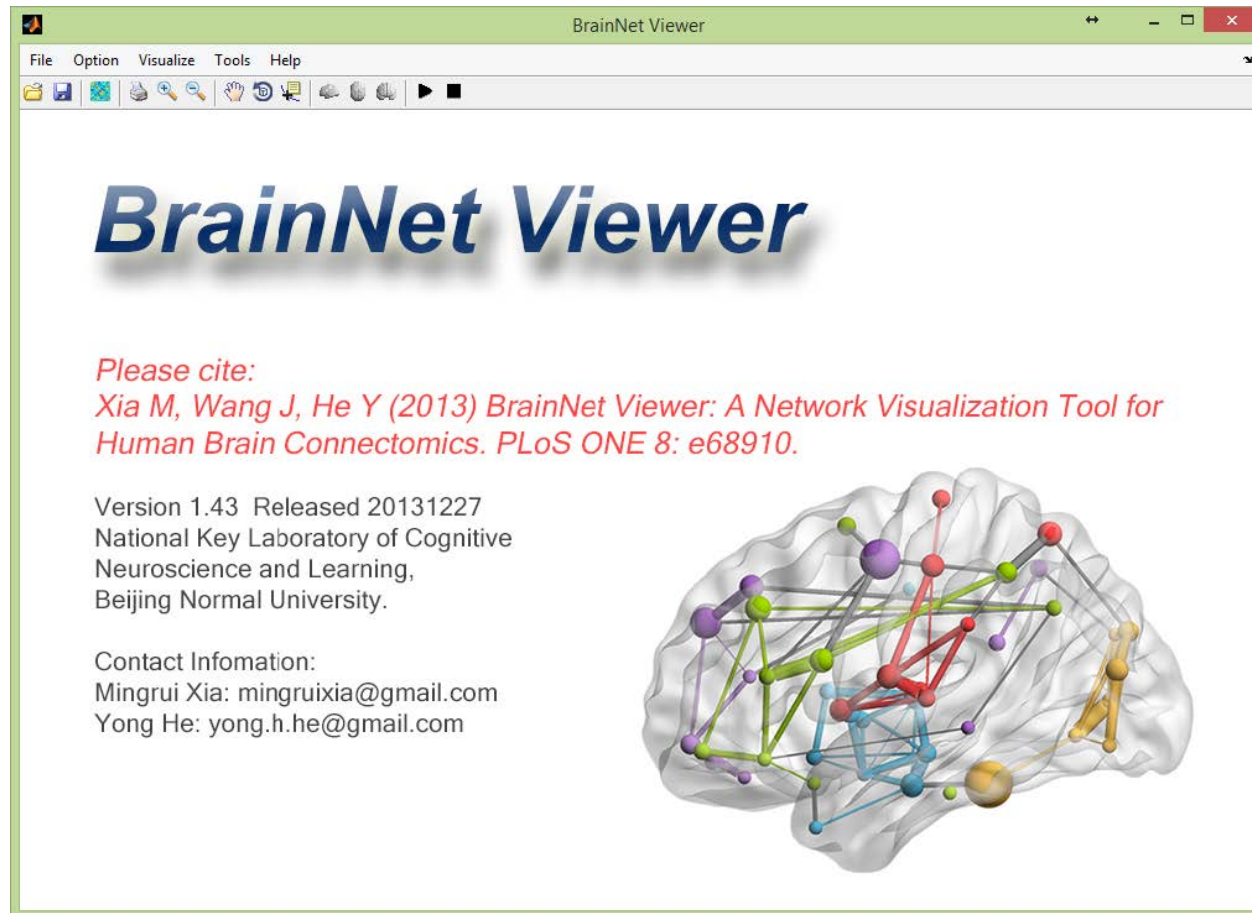
*Note: type BrainNet in Command Window*





# Start BrainNet Viewer

## *Main window of BrainNet Viewer*

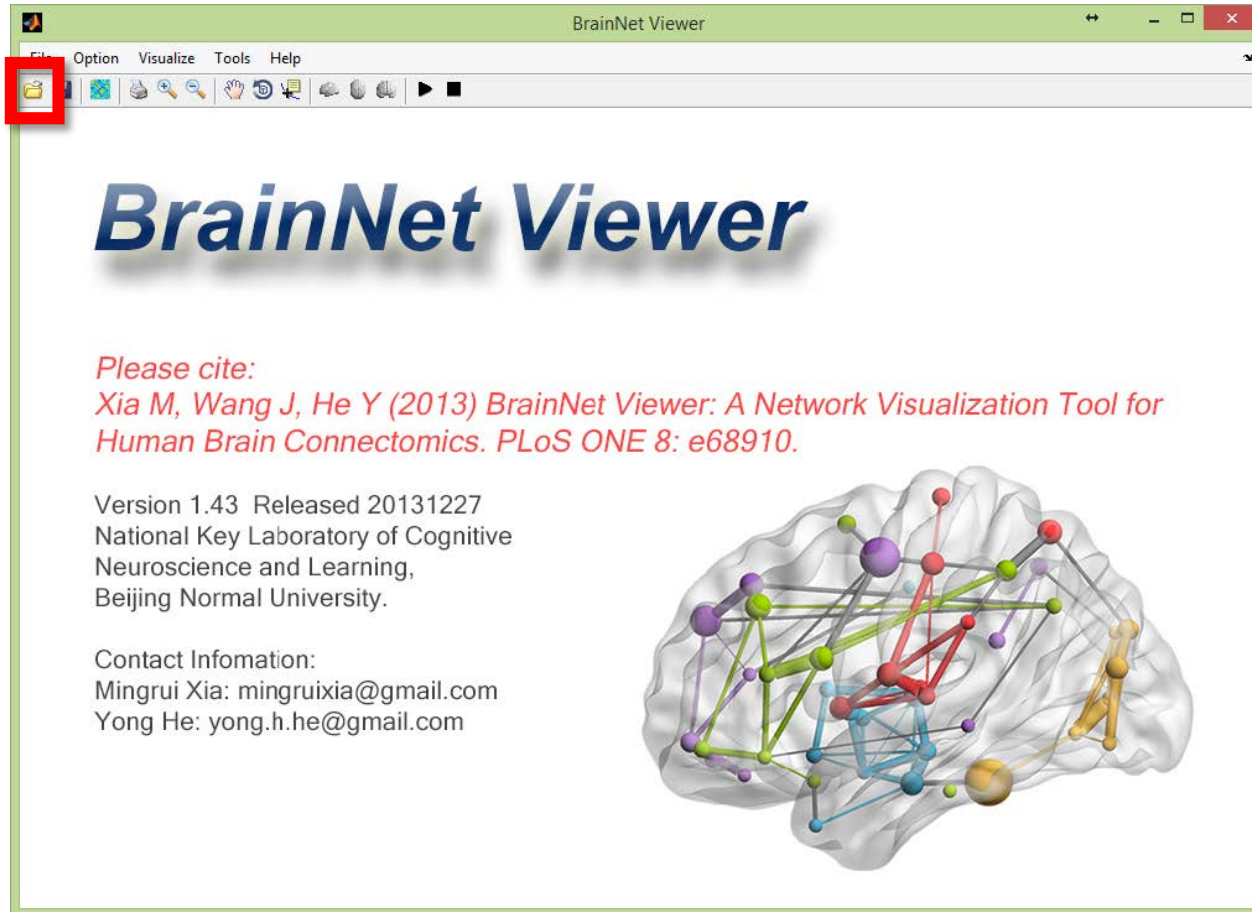


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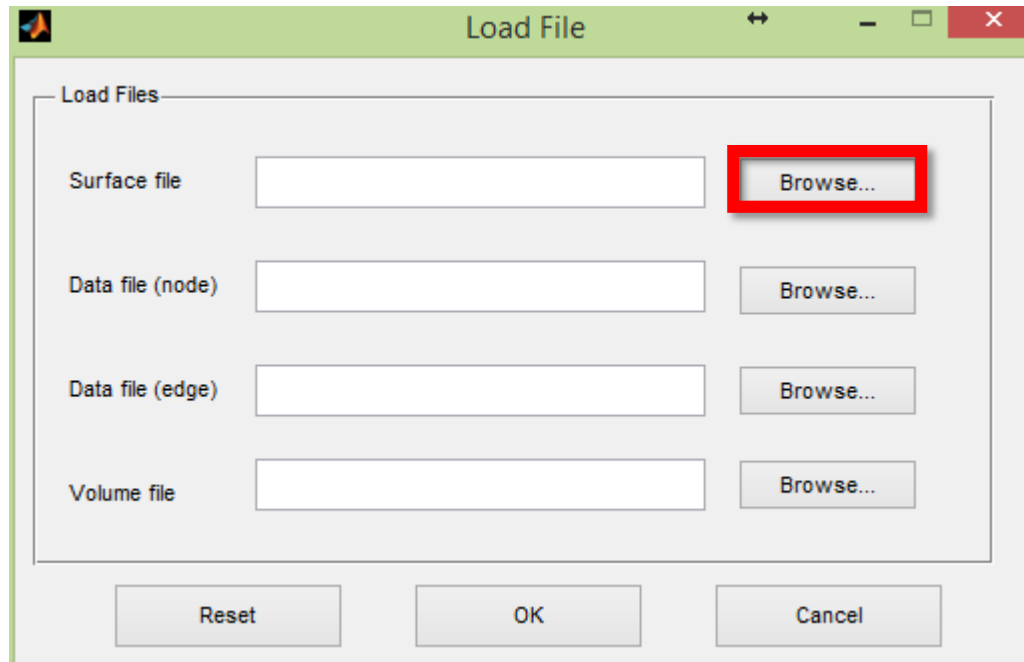
# Example 1: Visualize brain surface

*Load file*



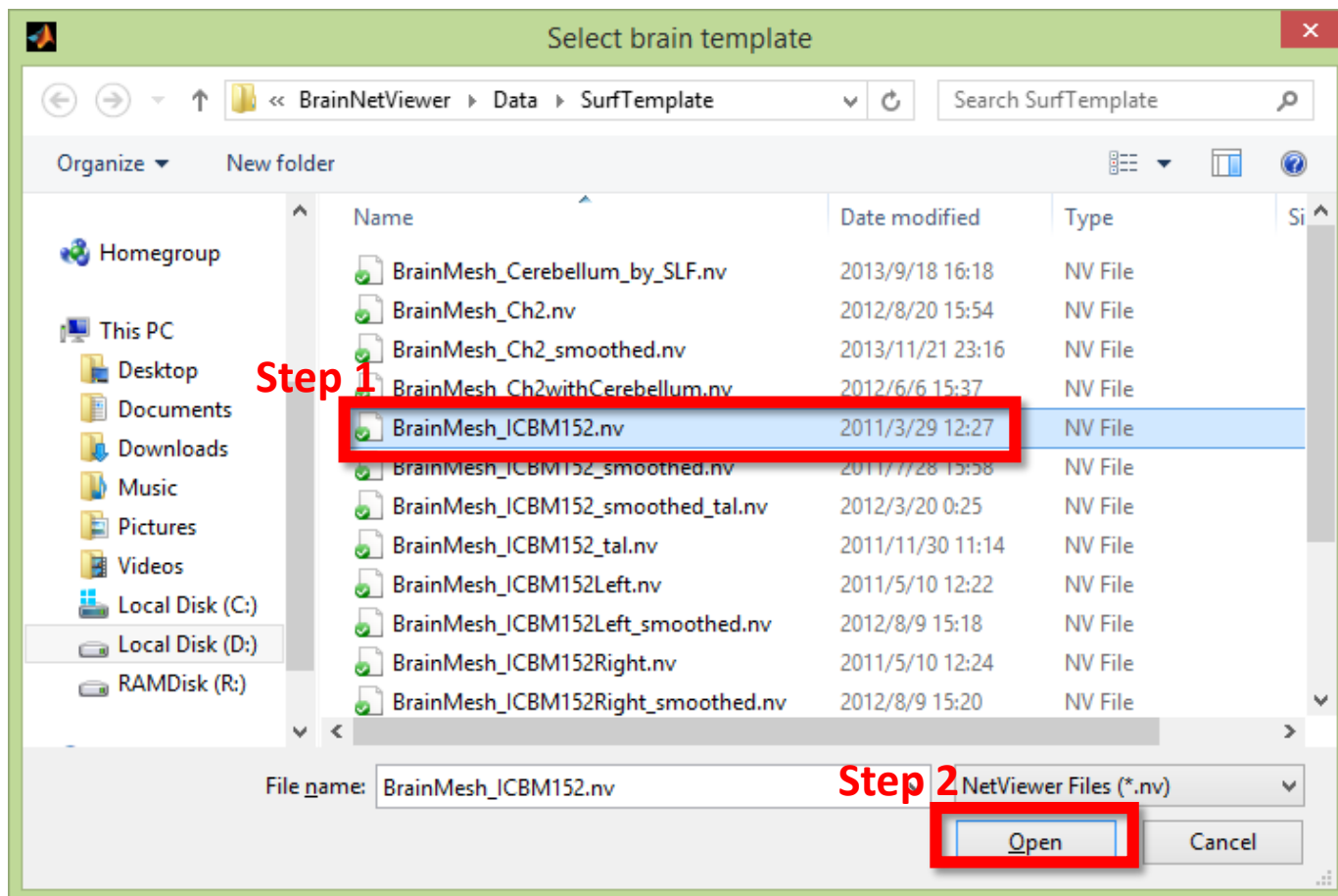
# Example 1: Visualize brain surface

*Load file*



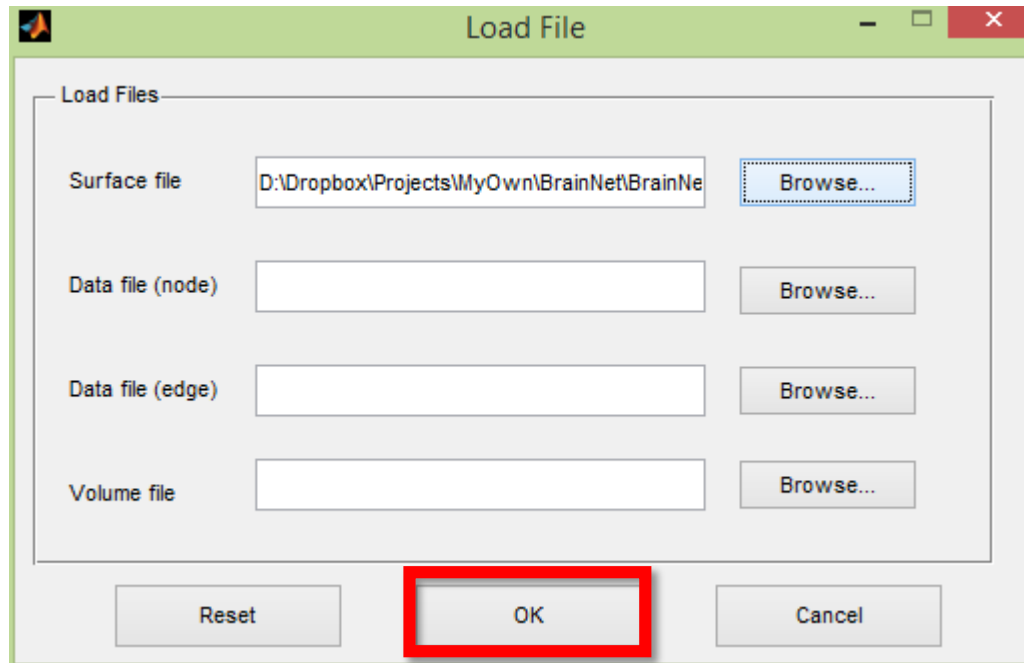
# Example 1: Visualize brain surface

*Load file*



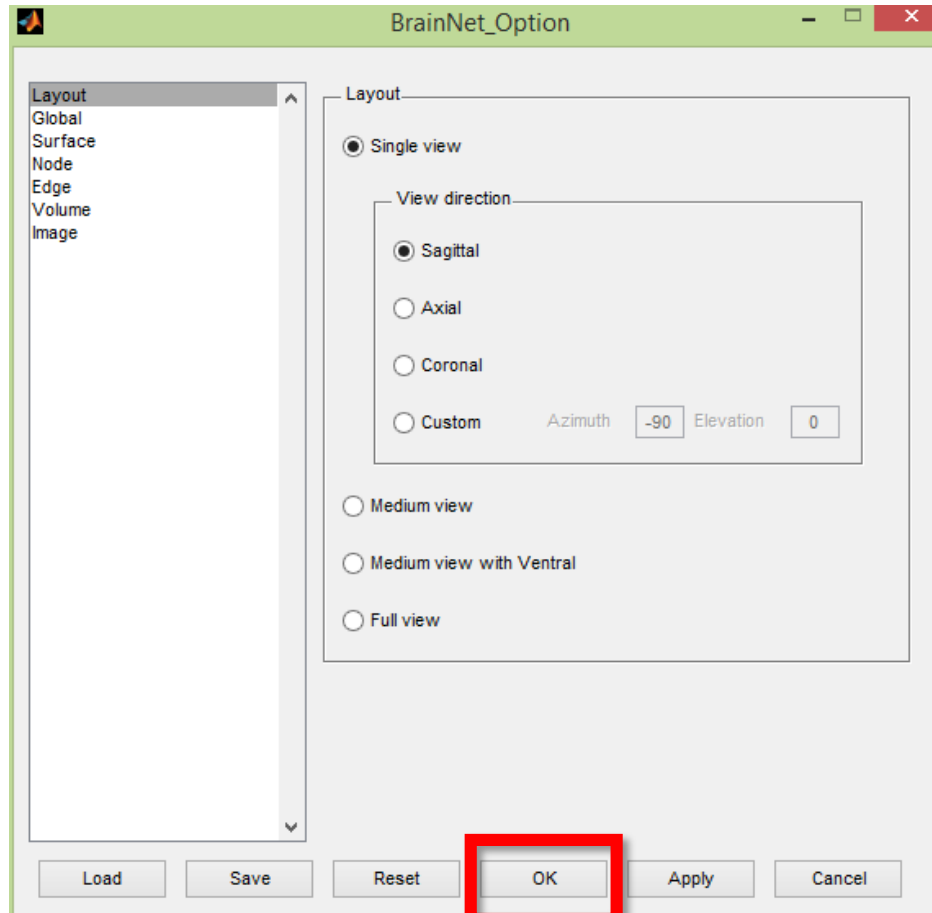
# Example 1: Visualize brain surface

*Load file*



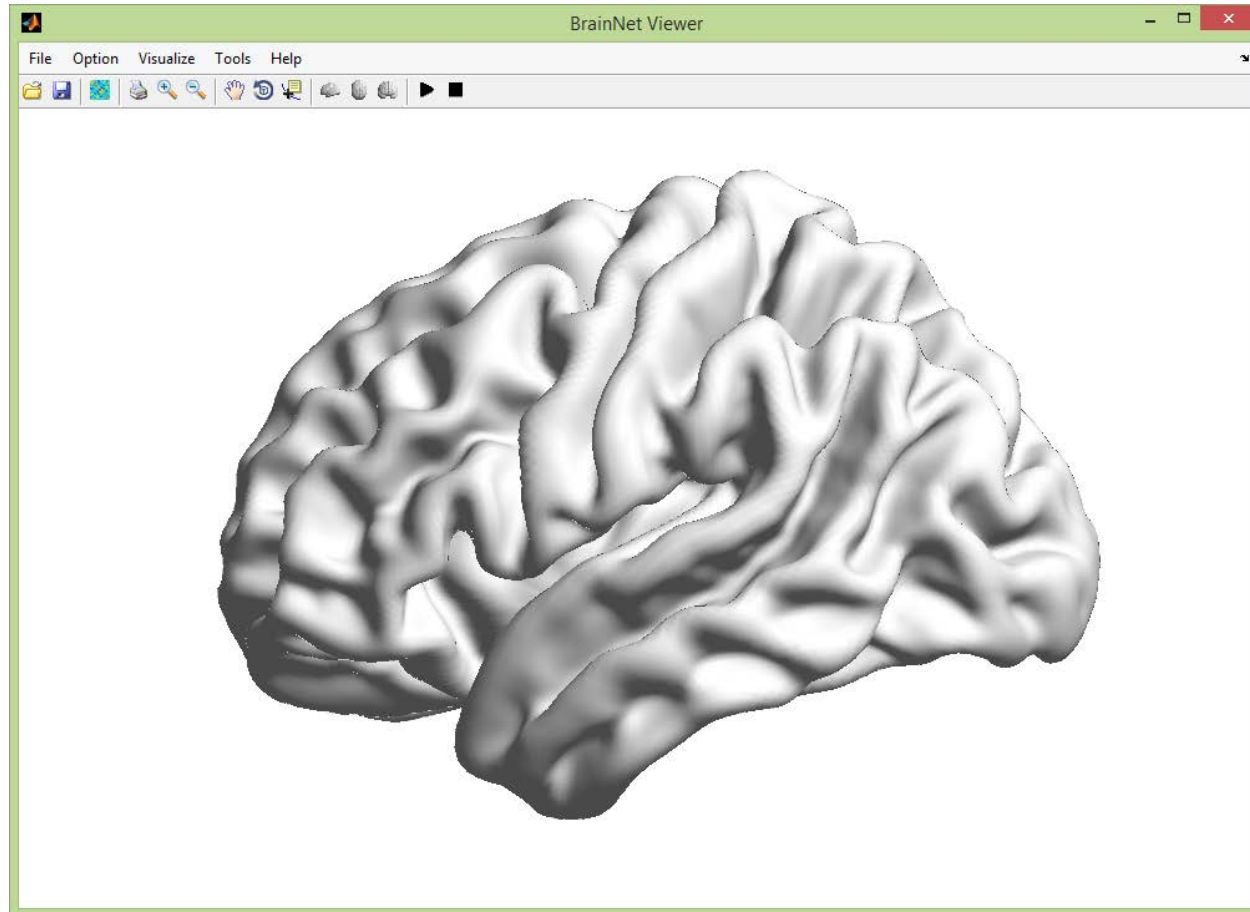
# Example 1: Visualize brain surface *Configuration*

*Note: take default for example*



# Example 1: Visualize brain surface

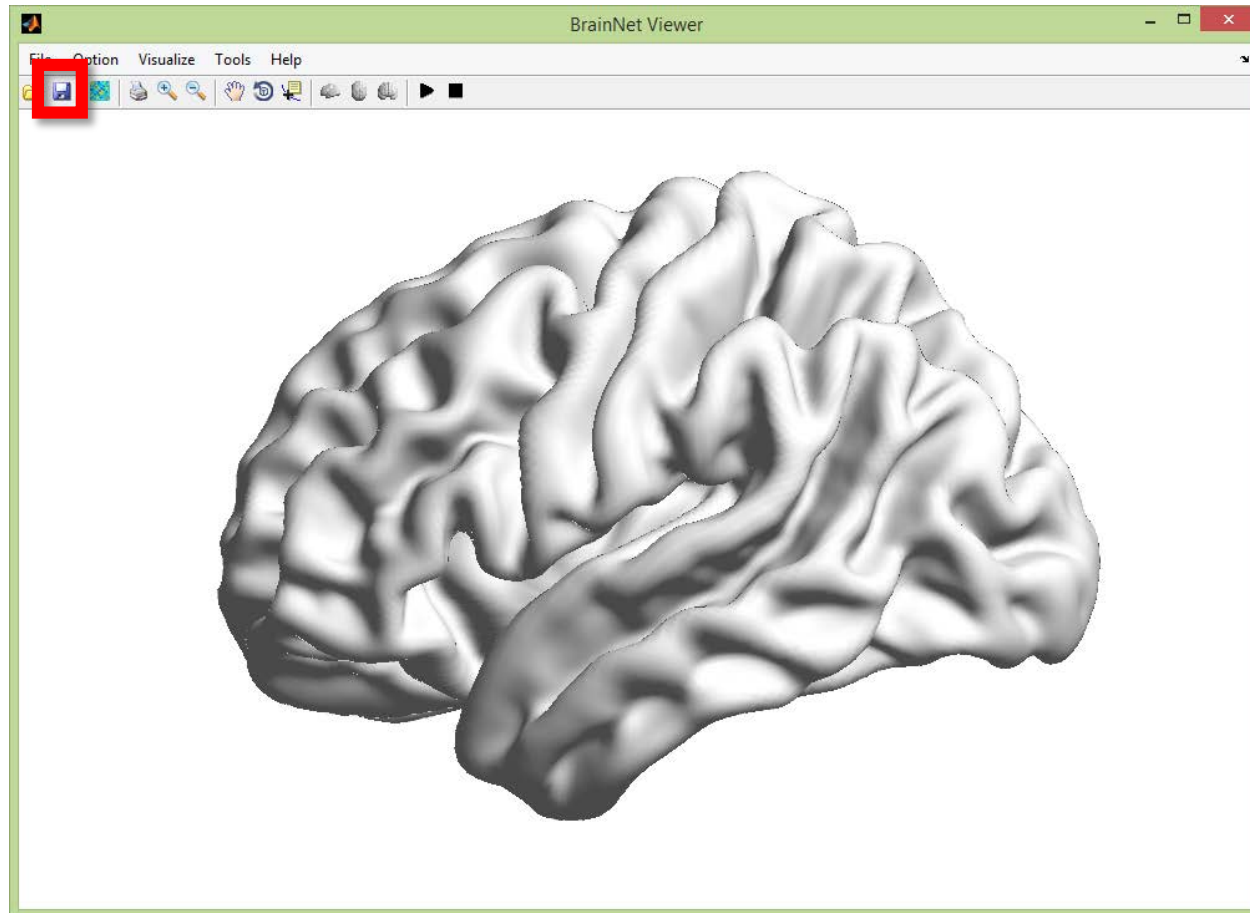
*Figure drawing*





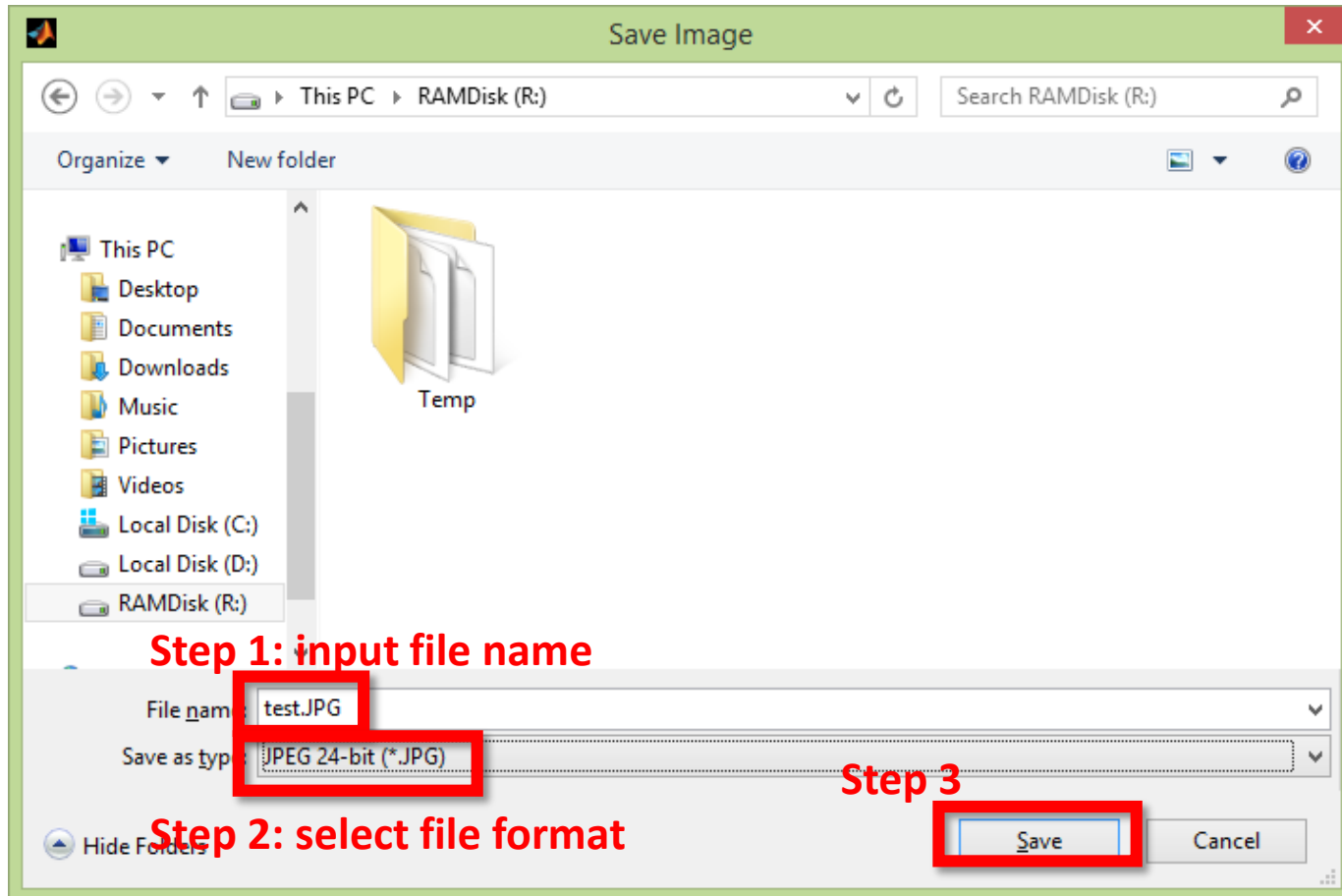
# Example 1: Visualize brain surface

*Save image*



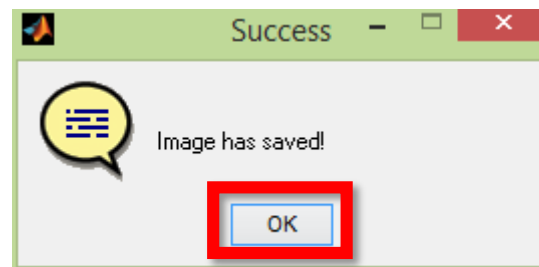
# Example 1: Visualize brain surface

*Save image*



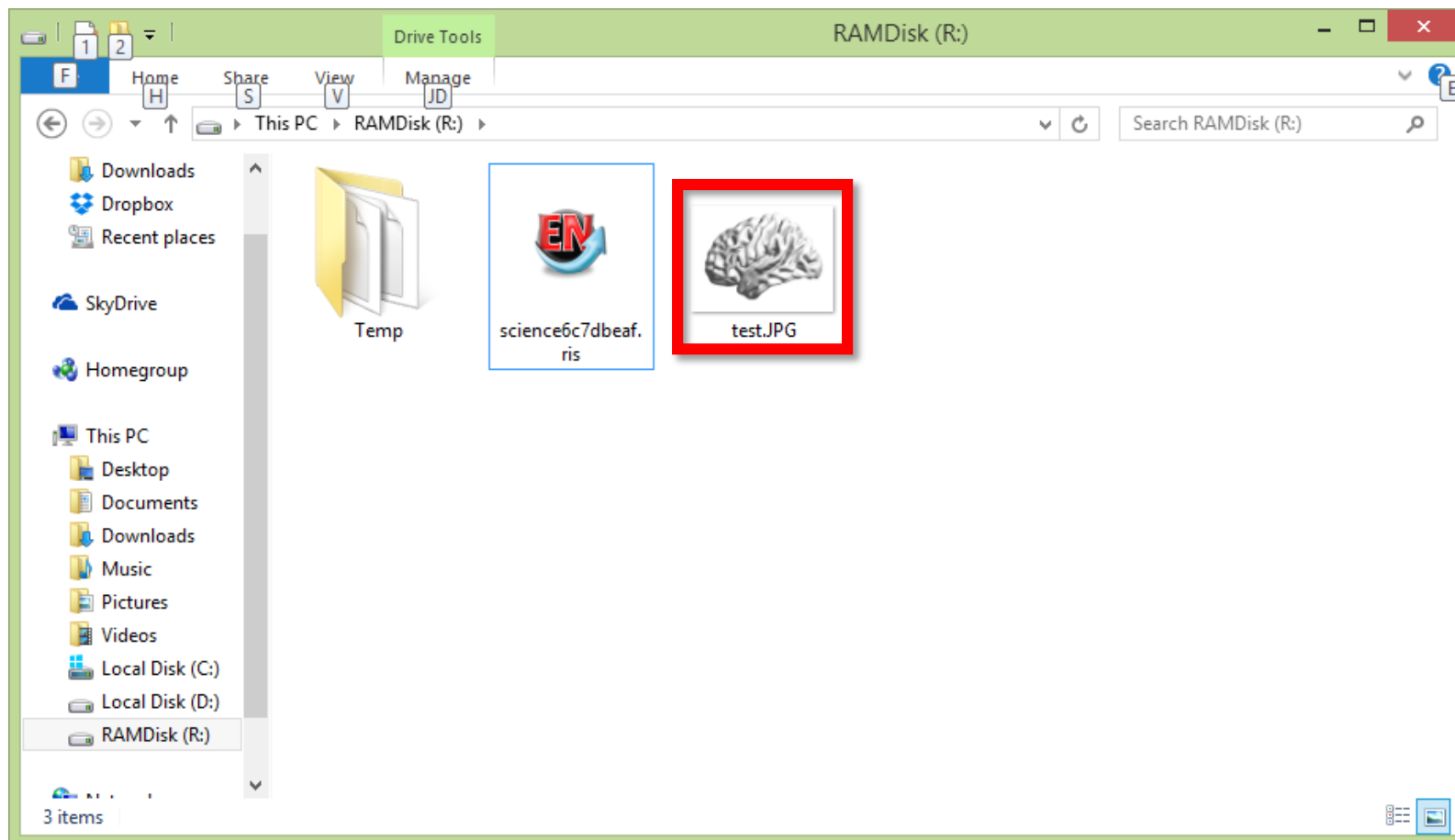
# Example 1: Visualize brain surface

*Save image*



# Example 1: Visualize brain surface

*Saved image*

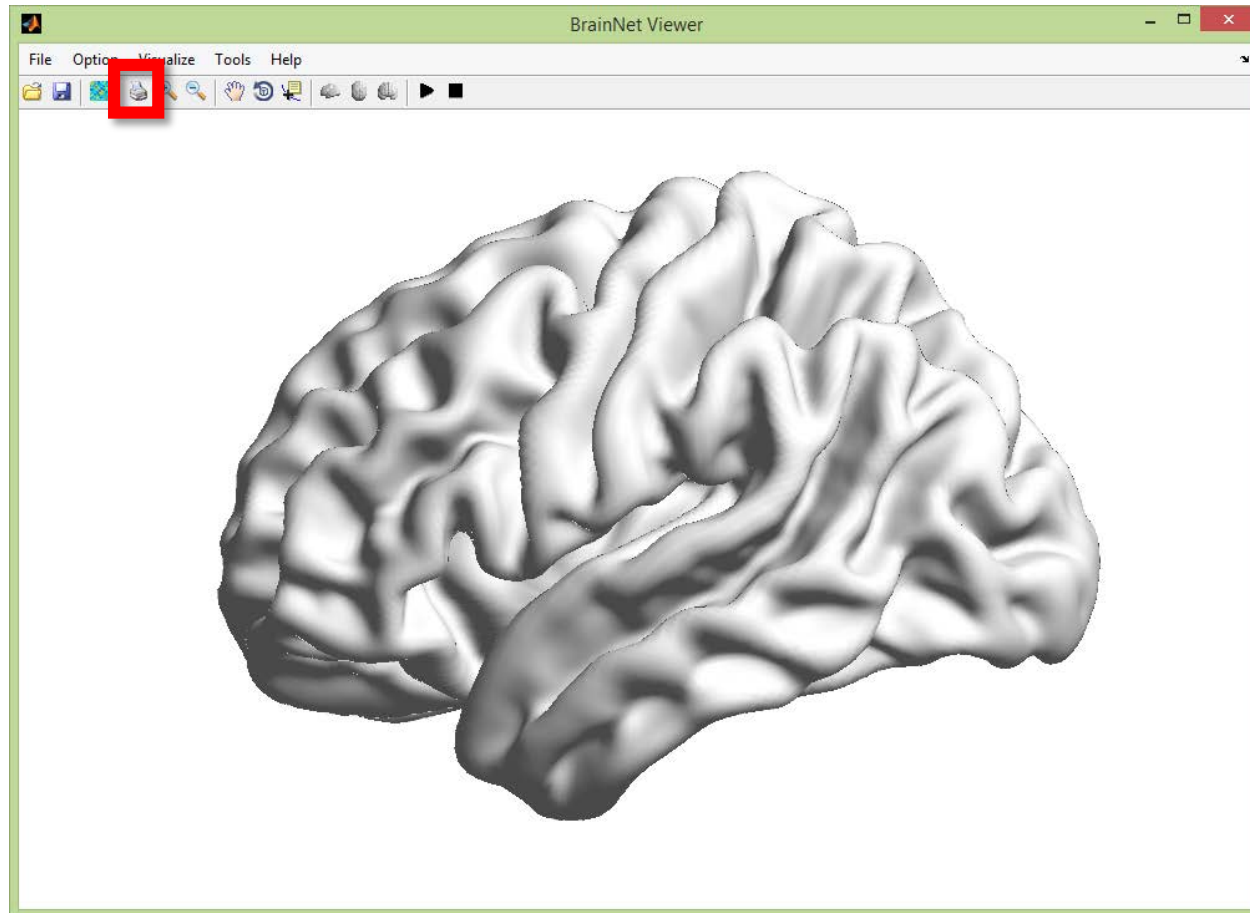


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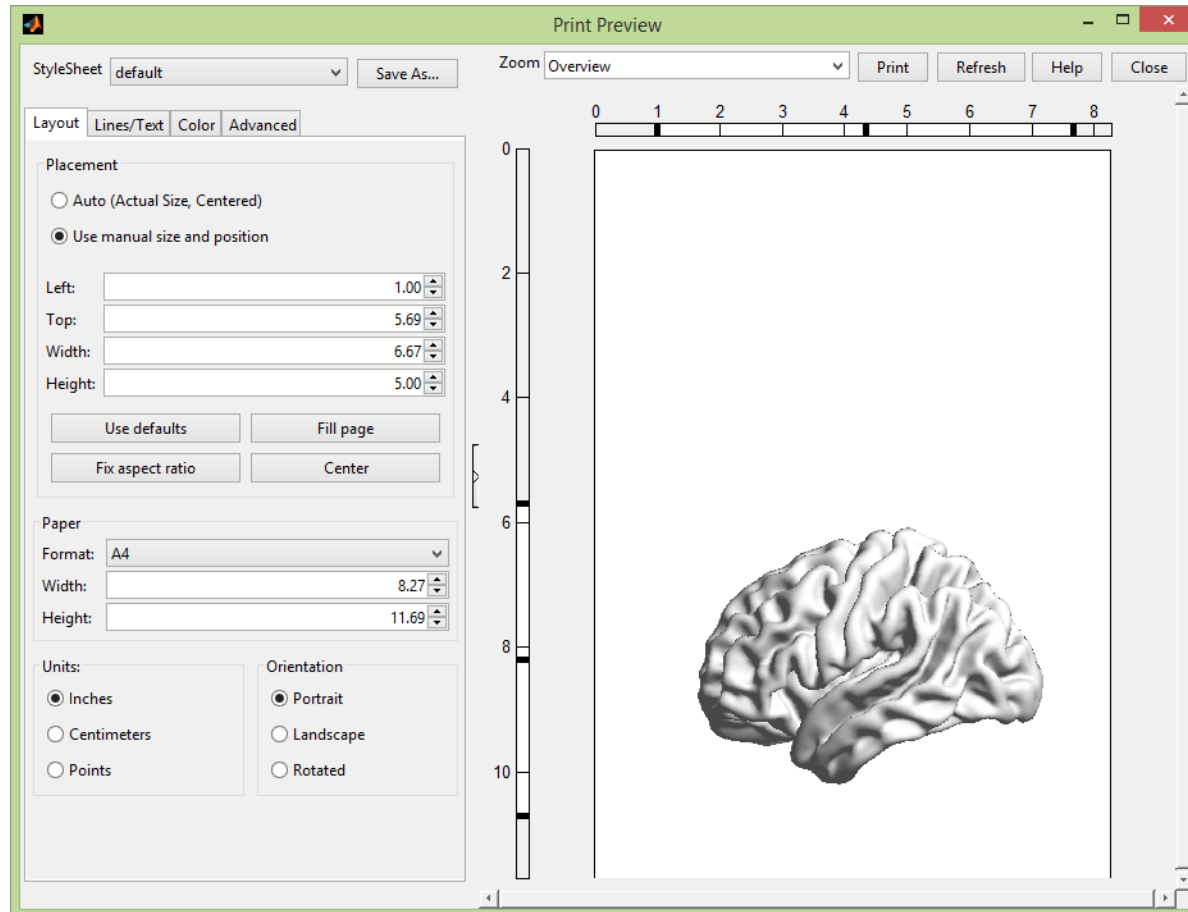
# Example 2: Use interactions

*Print*



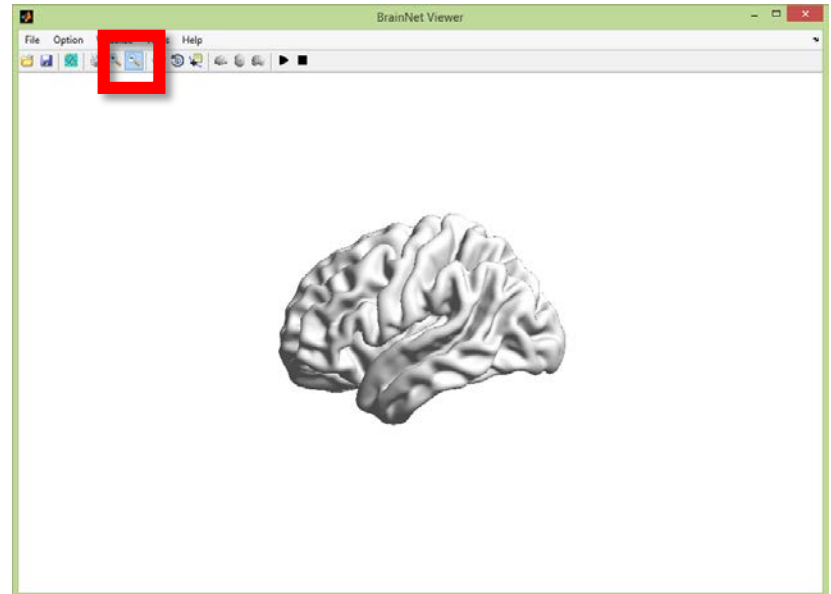
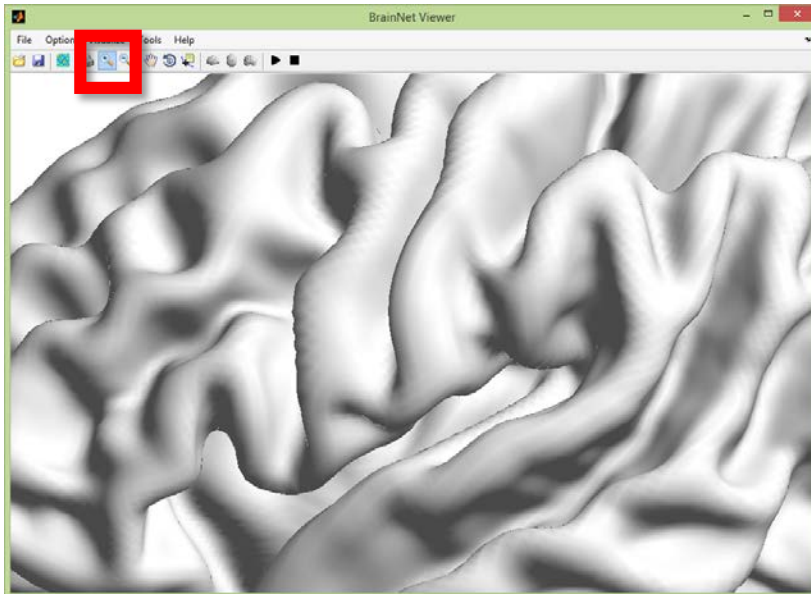
# Example 2: Use interactions

## *Print*



# Example 2: Use interactions

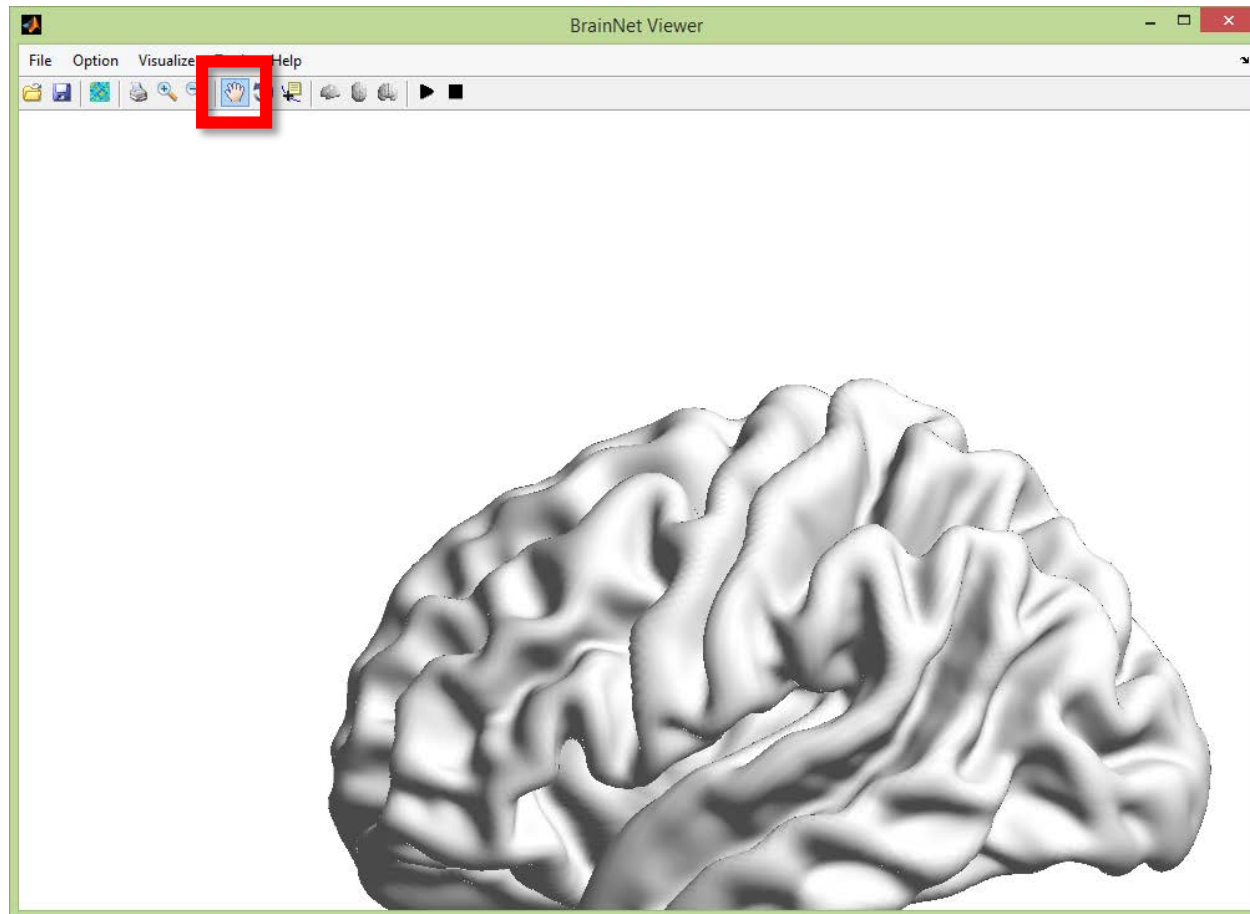
*Zoom in & zoom out*





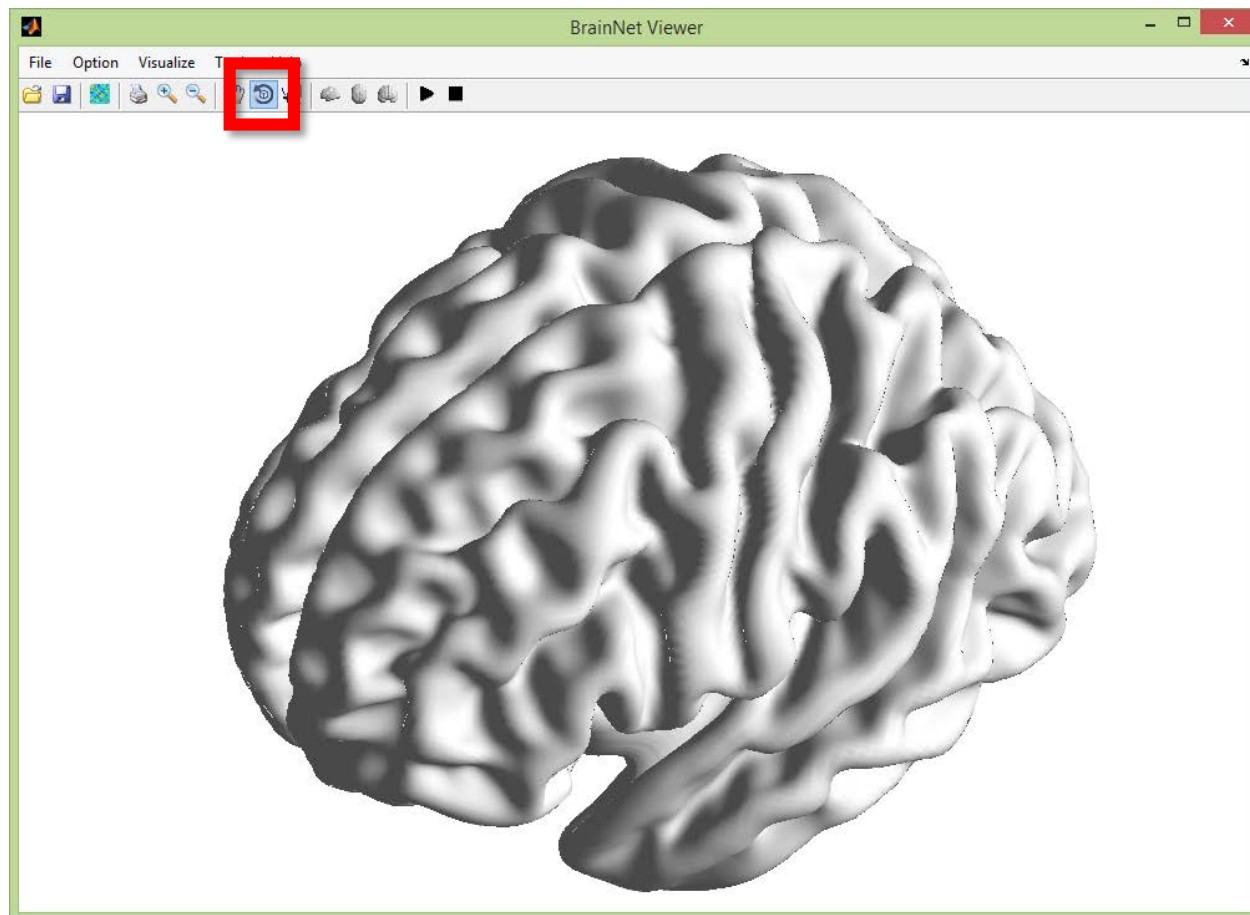
# Example 2: Use interactions

*Move*



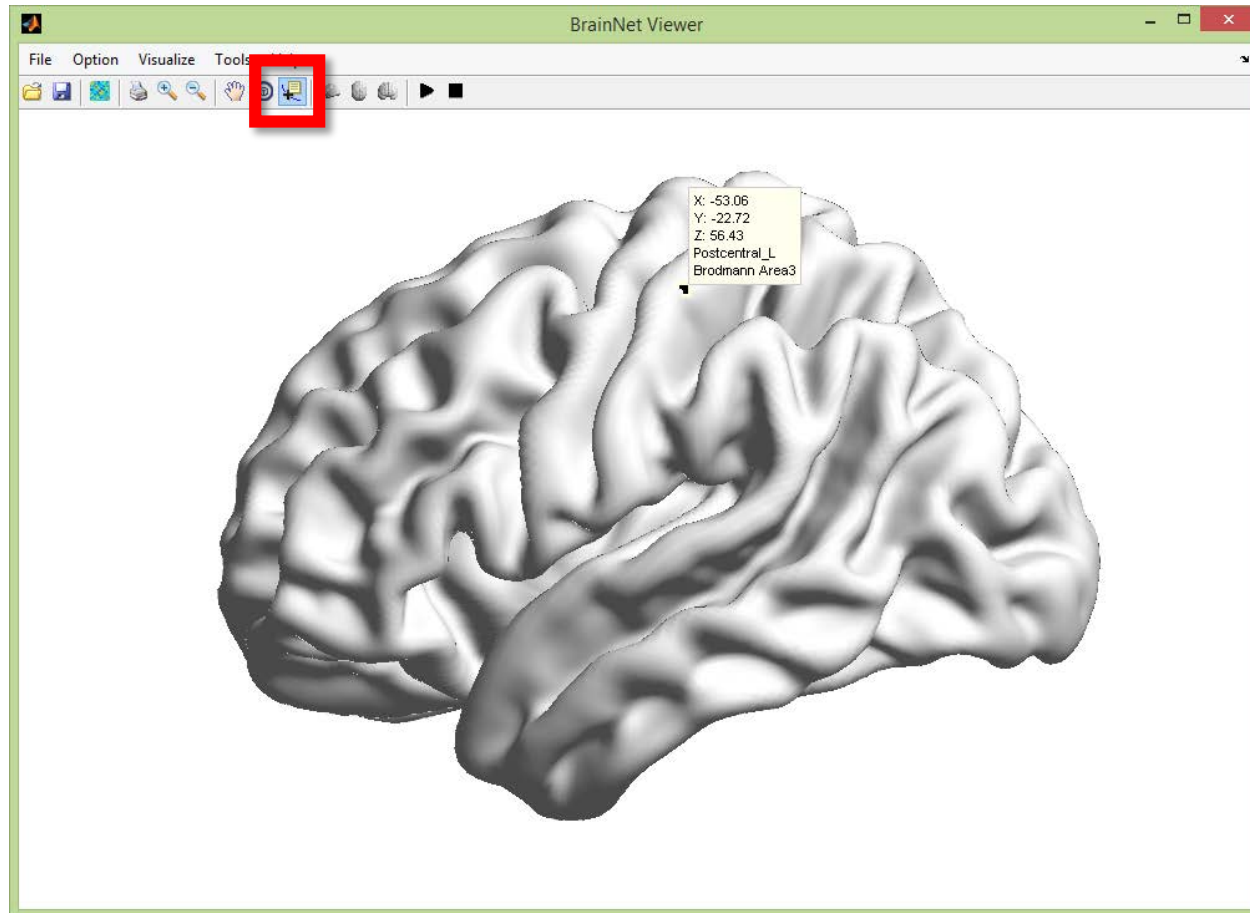
# Example 2: Use interactions

*Rotate*



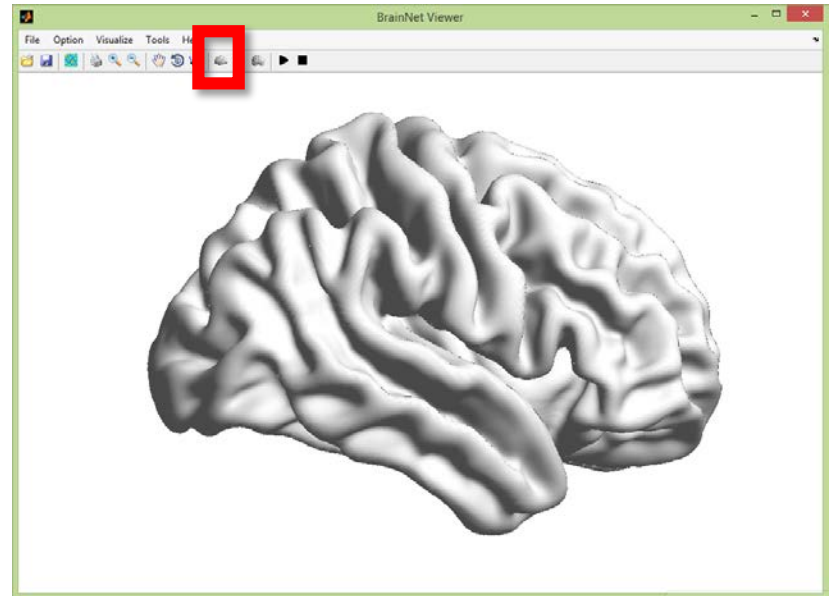
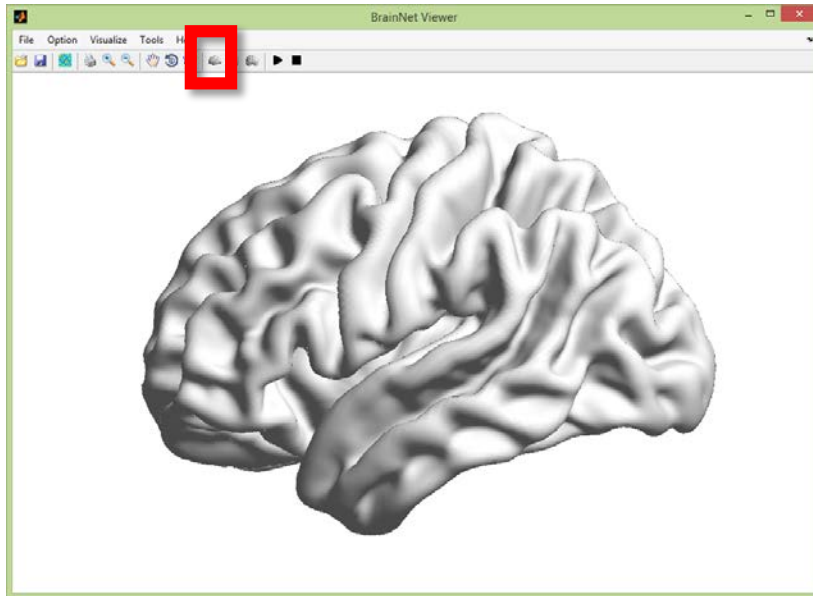
# Example 2: Use interactions

*Data cursor*



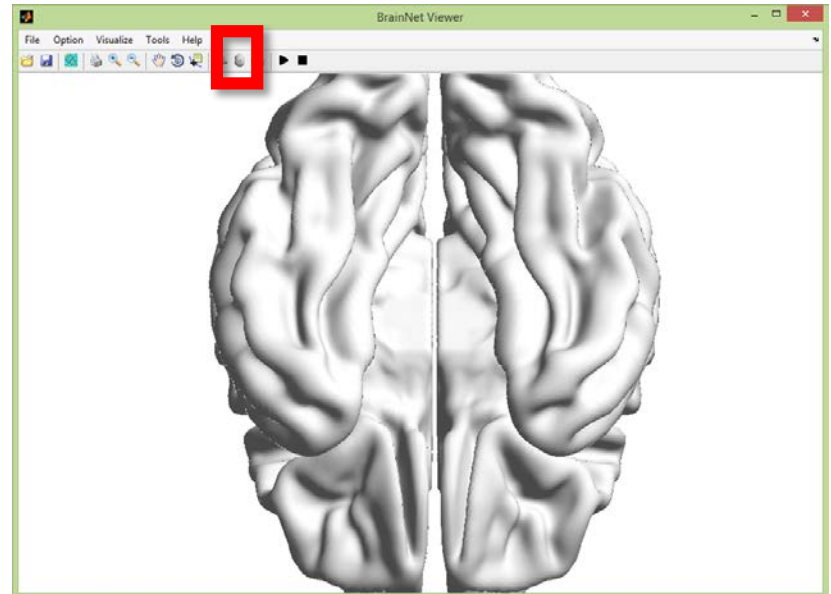
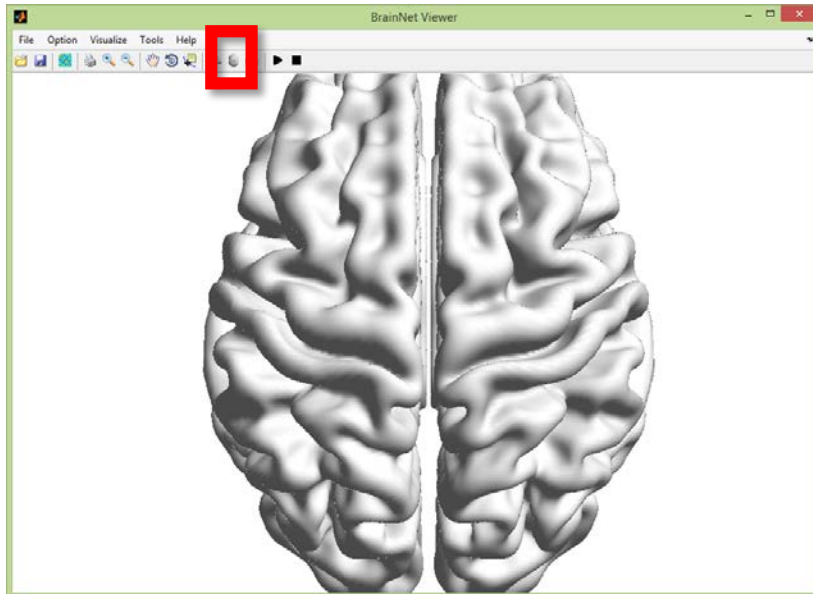
# Example 2: Use interactions

*Sagittal view*



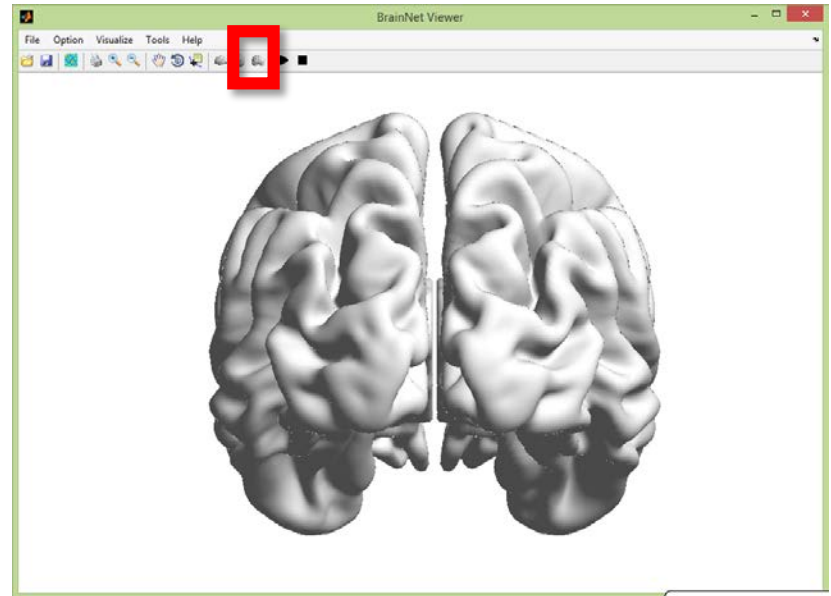
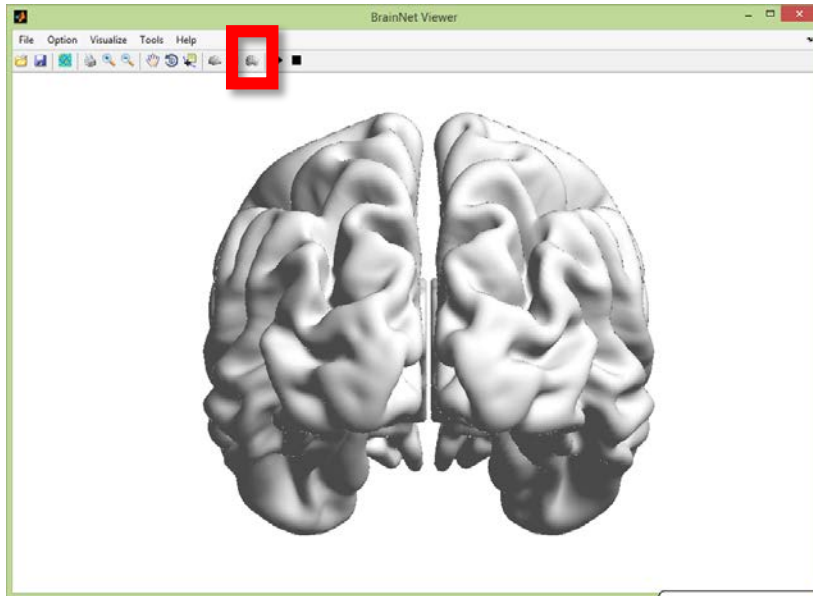
# Example 2: Use interactions

*Axial view*



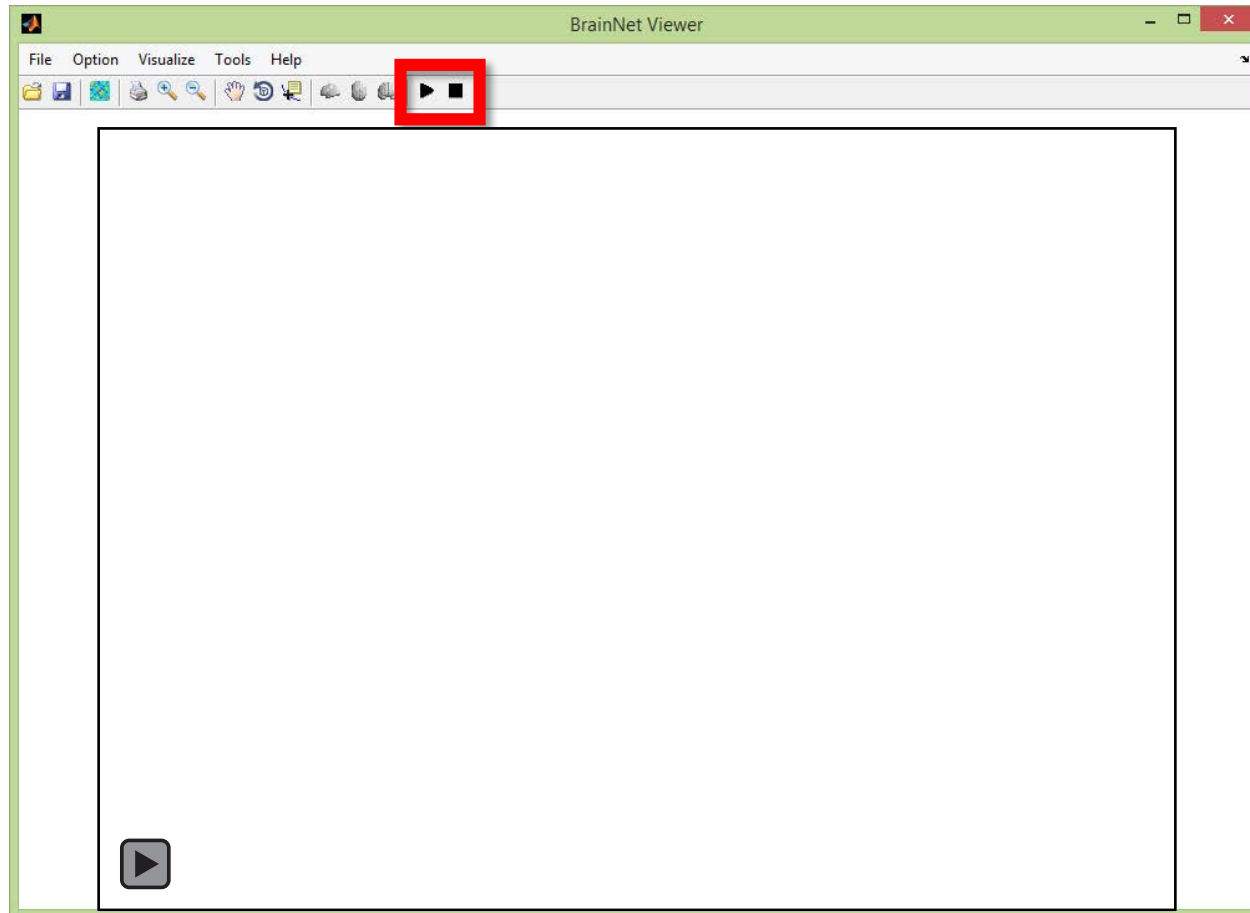
# Example 2: Use interactions

*Coronal view*



# Example 2: Use interactions

*Demo and stop*



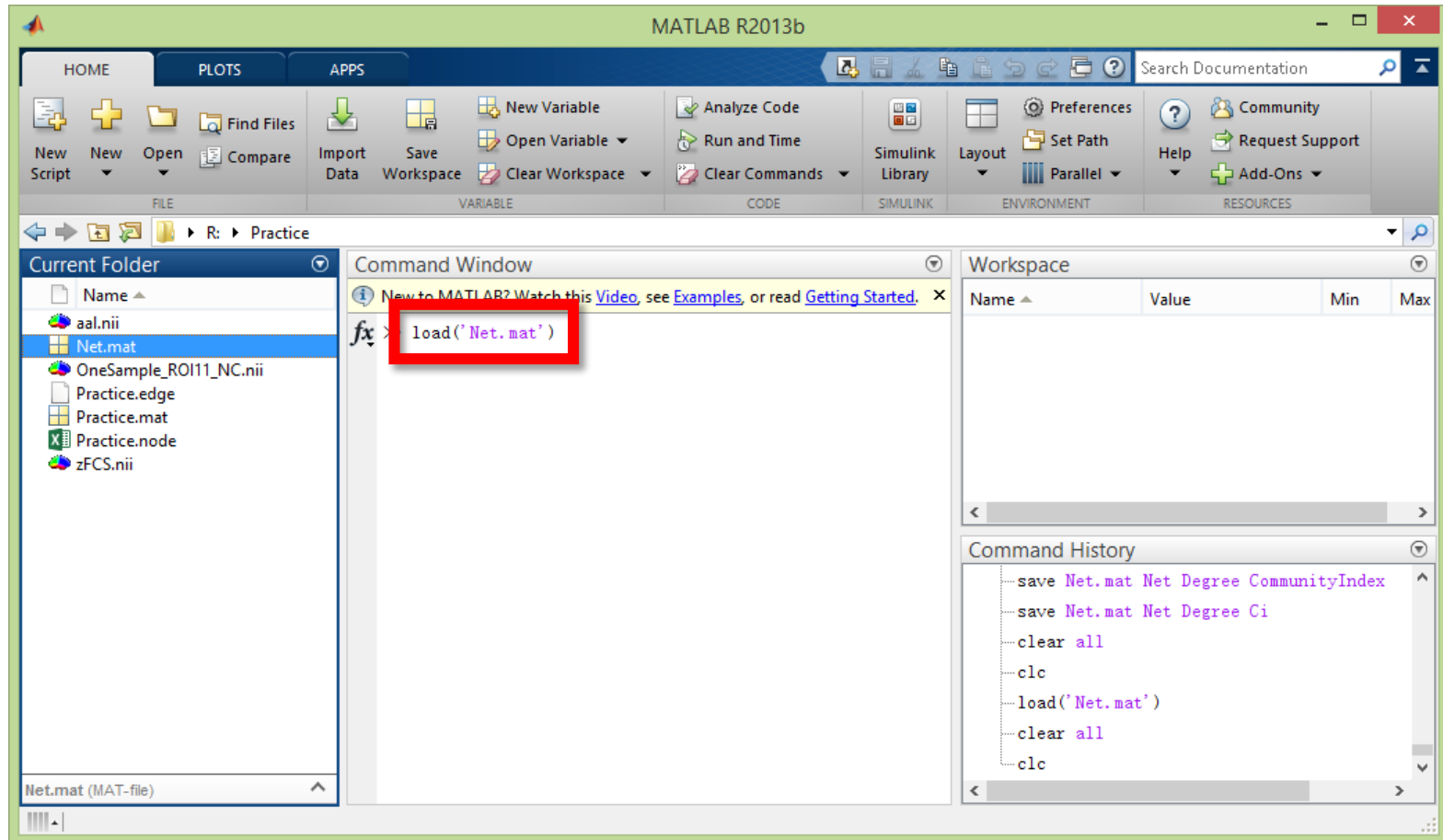
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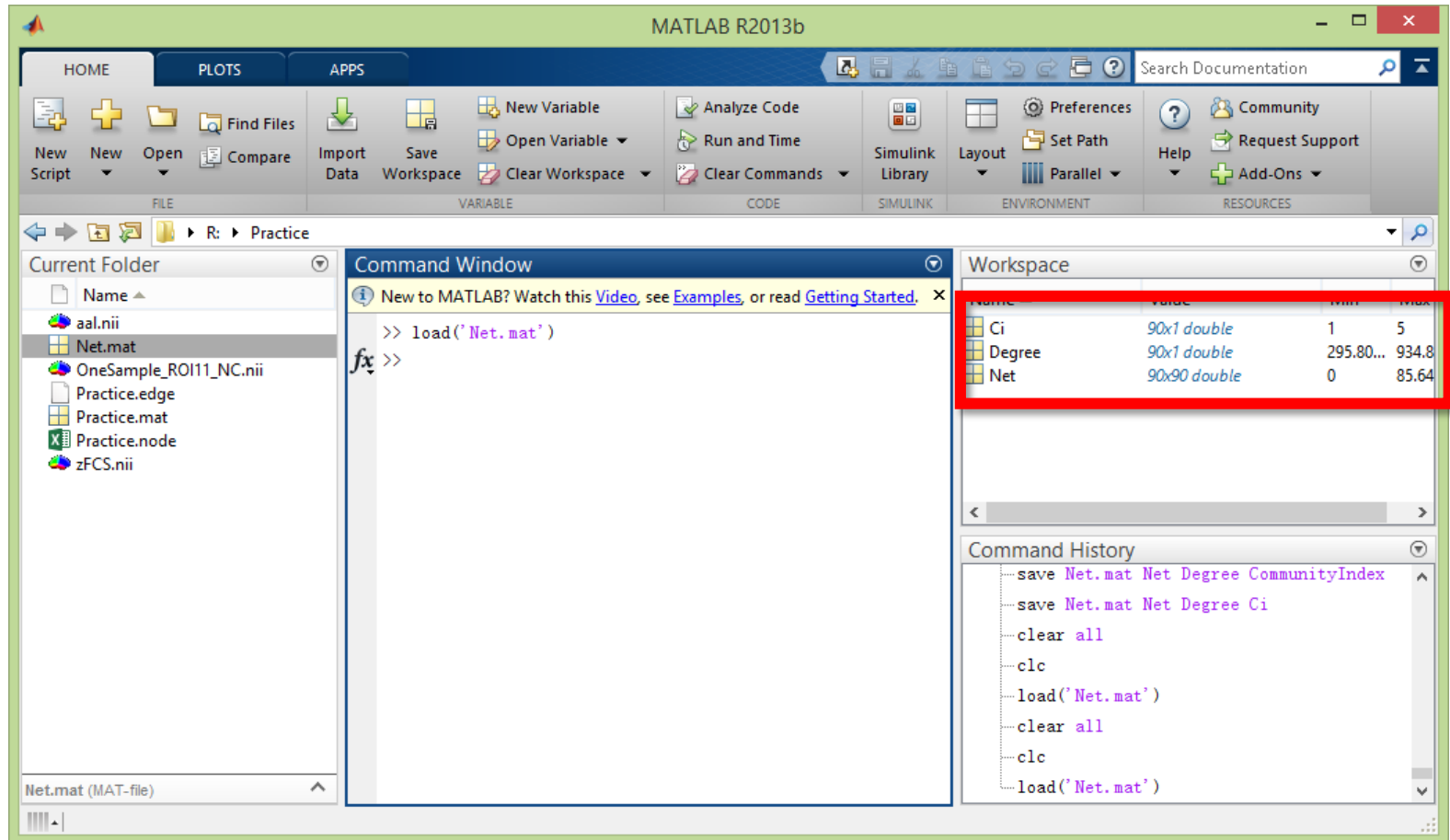
# Example 3: Visualize brain surface and node

## *Prepare node file*



# Example 3: Visualize brain surface and node

## *Prepare node file*



# Example 3: Visualize brain surface and node

## *Prepare node file*

*Note: copy the value of variable Degree*

The image shows the MATLAB R2013b interface. The 'Variables - Degree' window is open, displaying a 90x1 double array. The 'Workspace' window shows the following variables:

Name	Value	Min	Max
Ci	90x1 double	1	5
Degree	90x1 double	295.80...	934.8
Net	90x90 double	0	85.64

The Command Window shows the following commands:

```
>> load('Net.mat')  
fx >>
```

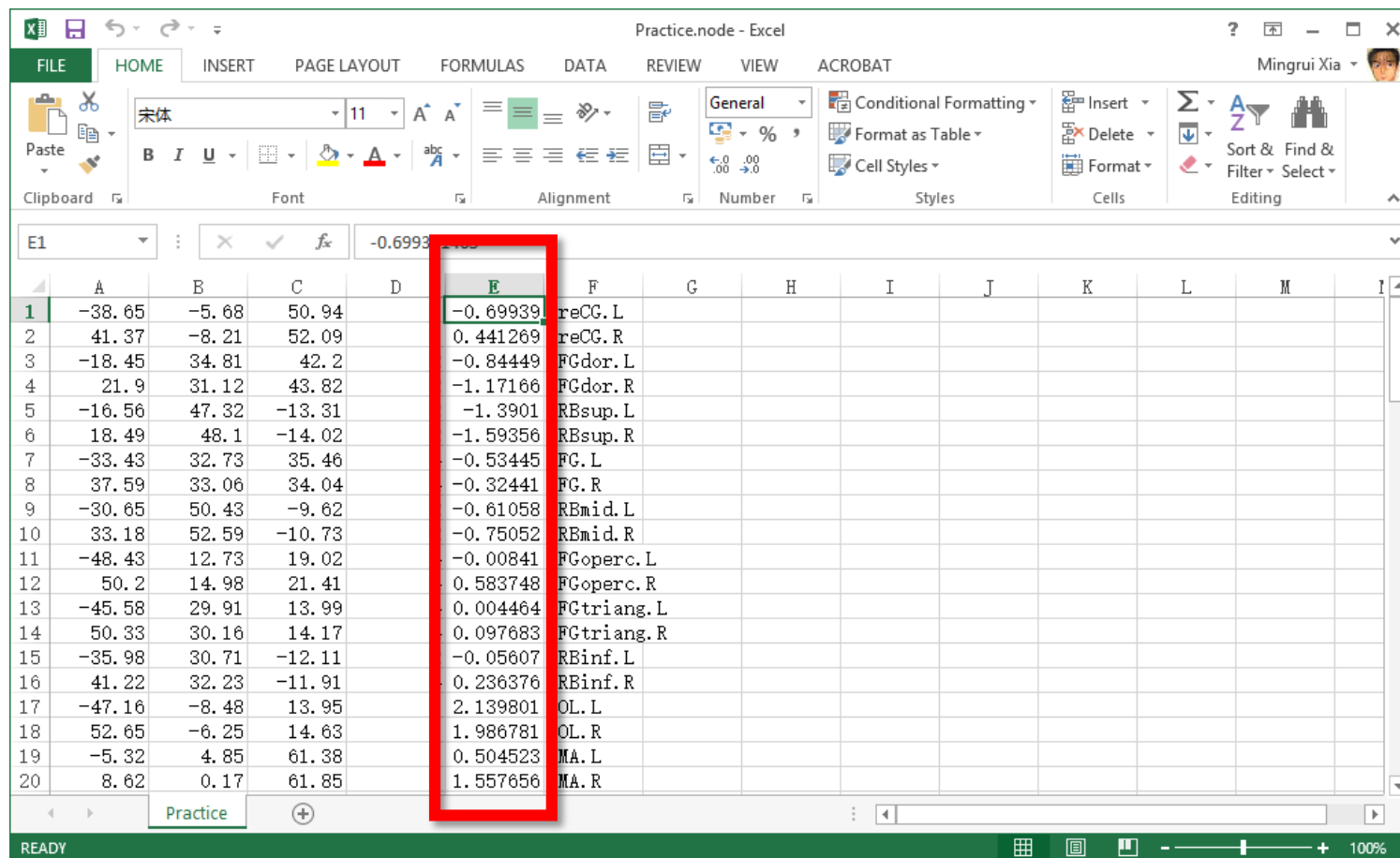
The Command History shows the following commands:

```
save Net.mat Net Degree CommunityIndex  
save Net.mat Net Degree Ci  
clear all  
clc  
load('Net.mat')  
clear all  
clc  
load('Net.mat')
```

# Example 3: Visualize brain surface and node

## *Prepare node file*

*Note: open the node file with Excel*



	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	-38.65	-5.68	50.94		-0.69939	reCG.L								
2	41.37	-8.21	52.09		0.441269	reCG.R								
3	-18.45	34.81	42.2		-0.84449	FGdor.L								
4	21.9	31.12	43.82		-1.17166	FGdor.R								
5	-16.56	47.32	-13.31		-1.3901	REsup.L								
6	18.49	48.1	-14.02		-1.59356	REsup.R								
7	-33.43	32.73	35.46		-0.53445	FG.L								
8	37.59	33.06	34.04		-0.32441	FG.R								
9	-30.65	50.43	-9.62		-0.61058	REmid.L								
10	33.18	52.59	-10.73		-0.75052	REmid.R								
11	-48.43	12.73	19.02		-0.00841	FGoperc.L								
12	50.2	14.98	21.41		0.583748	FGoperc.R								
13	-45.58	29.91	13.99		0.004464	FGtriang.L								
14	50.33	30.16	14.17		0.097683	FGtriang.R								
15	-35.98	30.71	-12.11		-0.05607	RBin.L								
16	41.22	32.23	-11.91		0.236376	RBin.R								
17	-47.16	-8.48	13.95		2.139801	OL.L								
18	52.65	-6.25	14.63		1.986781	OL.R								
19	-5.32	4.85	61.38		0.504523	MA.L								
20	8.62	0.17	61.85		1.557656	MA.R								

# Example 3: Visualize brain surface and node

## Prepare node file

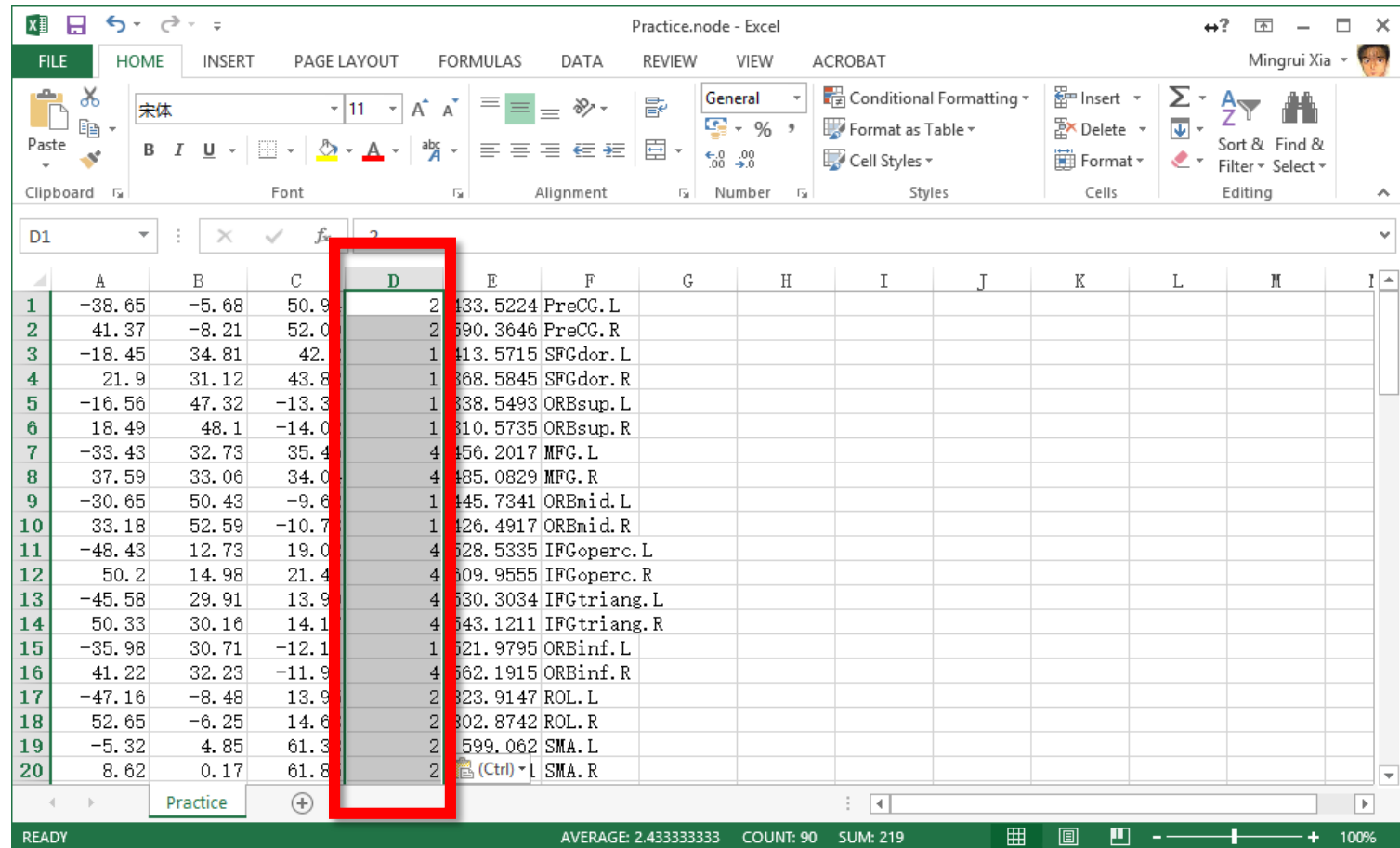
*Note: to display the nodal size as degree, replace the value of the fifth column with the value of Degree*

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	-38.65	-5.68	50.94		433.5224	reCG.L								
2	41.37	-8.21	52.09		590.3646	reCG.R								
3	-18.45	34.81	42.2		413.5715	FGdor.L								
4	21.9	31.12	43.82		368.5845	FGdor.R								
5	-16.56	47.32	-13.31		338.5493	REsup.L								
6	18.49	48.1	-14.02		310.5735	REsup.R								
7	-33.43	32.73	35.46		456.2017	FG.L								
8	37.59	33.06	34.04		485.0829	FG.R								
9	-30.65	50.43	-9.62		445.7341	REmid.L								
10	33.18	52.59	-10.73		426.4917	REmid.R								
11	-48.43	12.73	19.02		528.5335	FGoperc.L								
12	50.2	14.98	21.41		609.9555	FGoperc.R								
13	-45.58	29.91	13.99		530.3034	FGtriang.L								
14	50.33	30.16	14.17		543.1211	FGtriang.R								
15	-35.98	30.71	-12.11		521.9795	RBinf.L								
16	41.22	32.23	-11.91		562.1915	RBinf.R								
17	-47.16	-8.48	13.95		823.9147	OL.L								
18	52.65	-6.25	14.63		802.8742	OL.R								
19	-5.32	4.85	61.38		599.062	MA.L								
20	8.62	0.17	61.85		743.8691	(Ctrl)								

# Example 3: Visualize brain surface and node

Prepare node file

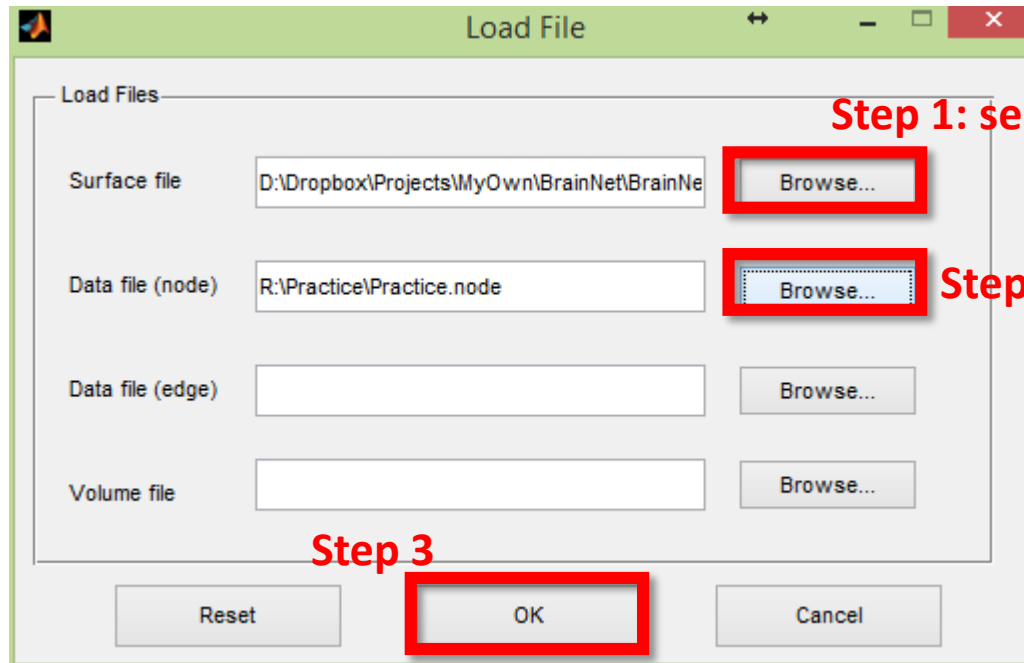
*Note: to display the nodal color as module, replace the value of the forth column with the value of Ci. Last step, save the file as its original format.*



	A	B	C	D	E	F	G	H	I	J	K	L	M	I
1	-38.65	-5.68	50.9	2	433.5224	PreCG.L								
2	41.37	-8.21	52.0	2	590.3646	PreCG.R								
3	-18.45	34.81	42.1	1	413.5715	SPGdor.L								
4	21.9	31.12	43.8	1	368.5845	SPGdor.R								
5	-16.56	47.32	-13.3	1	338.5493	ORBsup.L								
6	18.49	48.1	-14.0	1	310.5735	ORBsup.R								
7	-33.43	32.73	35.4	4	456.2017	MFG.L								
8	37.59	33.06	34.0	4	485.0829	MFG.R								
9	-30.65	50.43	-9.6	1	445.7341	ORBmid.L								
10	33.18	52.59	-10.7	1	426.4917	ORBmid.R								
11	-48.43	12.73	19.0	4	628.5335	IPGoperc.L								
12	50.2	14.98	21.4	4	609.9555	IPGoperc.R								
13	-45.58	29.91	13.9	4	330.3034	IPGtriang.L								
14	50.33	30.16	14.1	4	643.1211	IPGtriang.R								
15	-35.98	30.71	-12.1	1	621.9795	ORBinf.L								
16	41.22	32.23	-11.9	4	662.1915	ORBinf.R								
17	-47.16	-8.48	13.9	2	323.9147	ROL.L								
18	52.65	-6.25	14.6	2	302.8742	ROL.R								
19	-5.32	4.85	61.3	2	599.062	SMA.L								
20	8.62	0.17	61.8	2	(Ctrl) L	SMA.R								

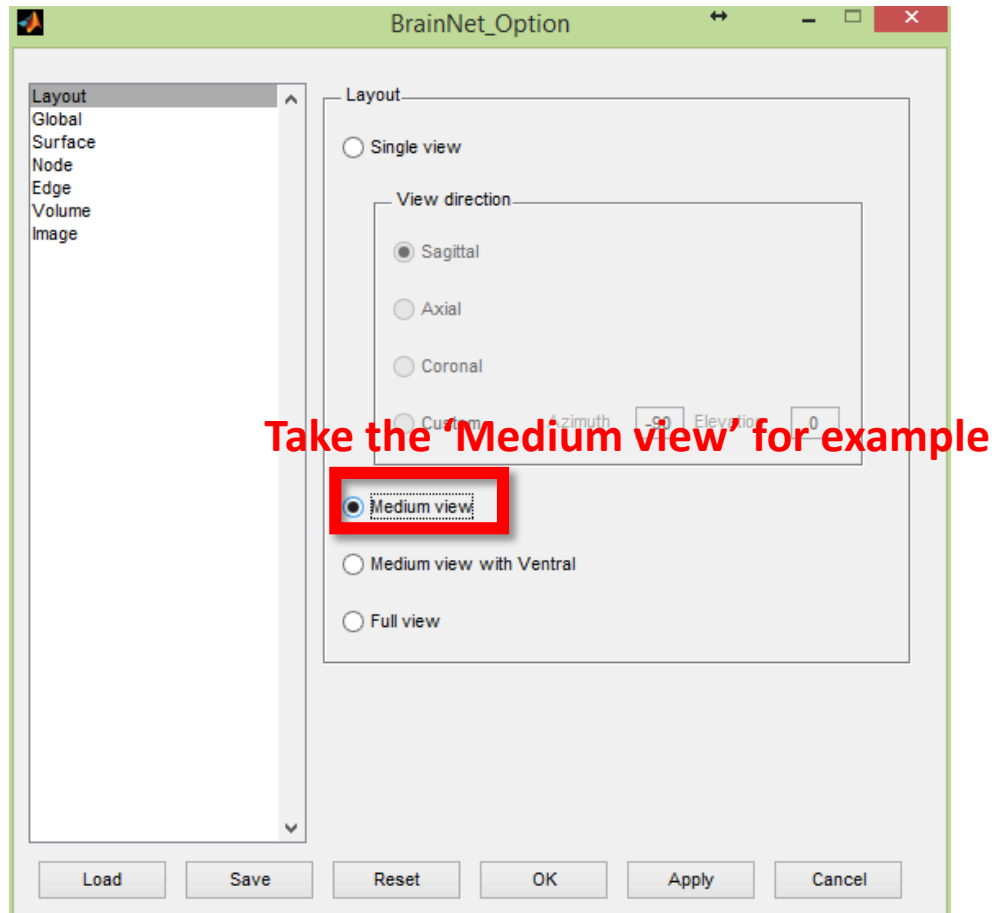
# Example 3: Visualize brain surface and node

## *Load files*



# Example 3: Visualize brain surface and node

## *Configuration - layout*



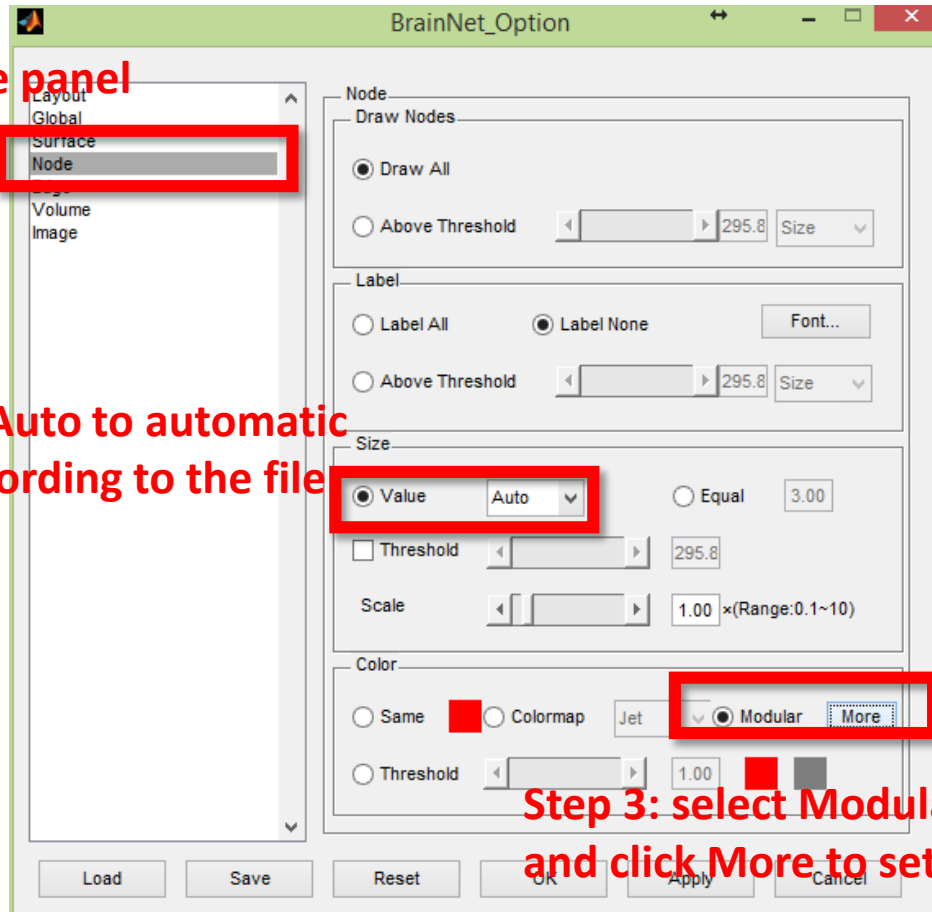


# Example 3: Visualize brain surface and node

## *Configuration - node*

Step 1: select the Node panel

Step 2: select Value->Auto to automatic  
arrange nodal size according to the file

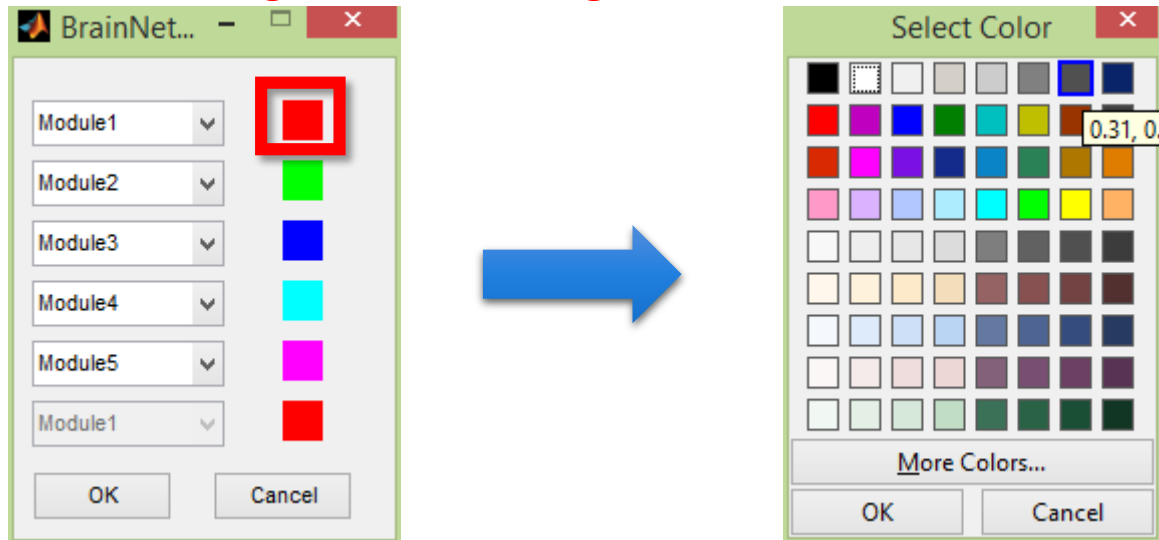


Step 3: select Modular to set nodal color,  
and click More to set the color of each module

# Example 3: Visualize brain surface and node

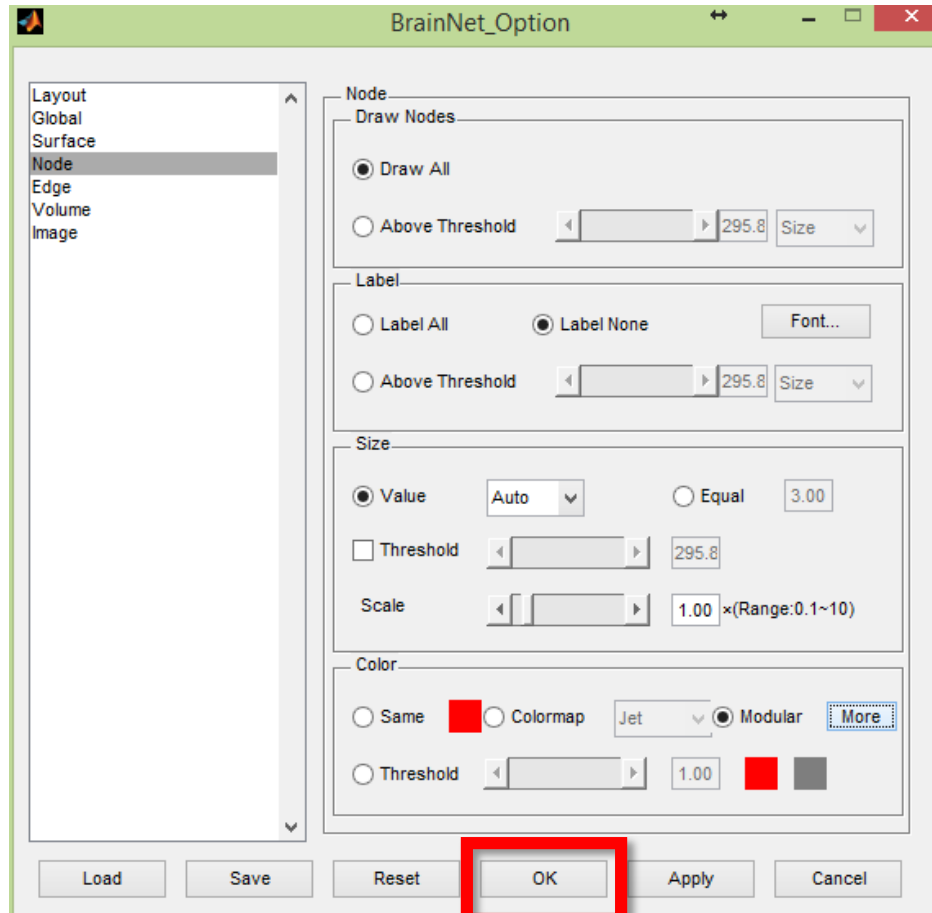
*Configuration – nodal color*

Right click to change color



# Example 3: Visualize brain surface and node

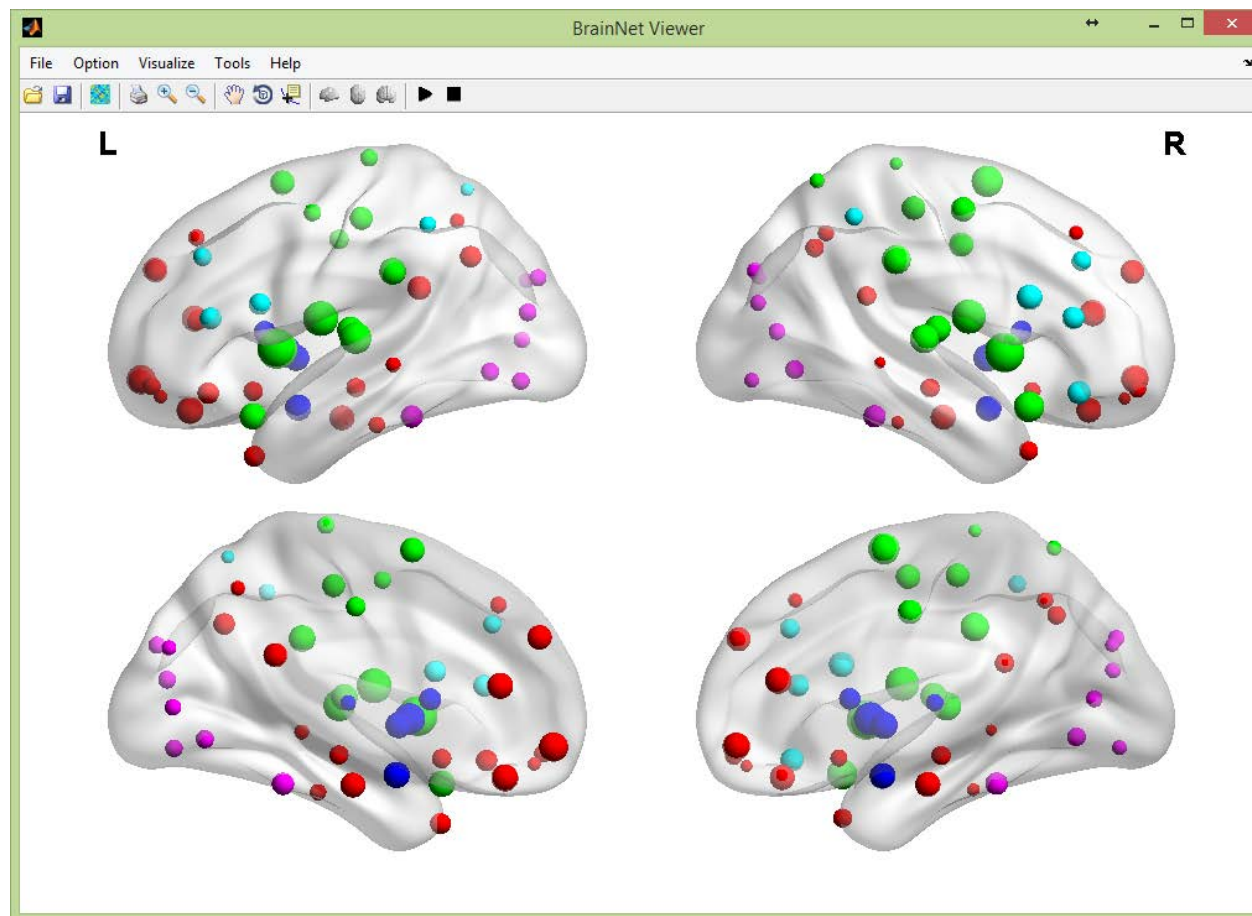
## *Configuration - node*



**Click OK when finish setting**

# Example 3: Visualize brain surface and node

*Figure drawing*



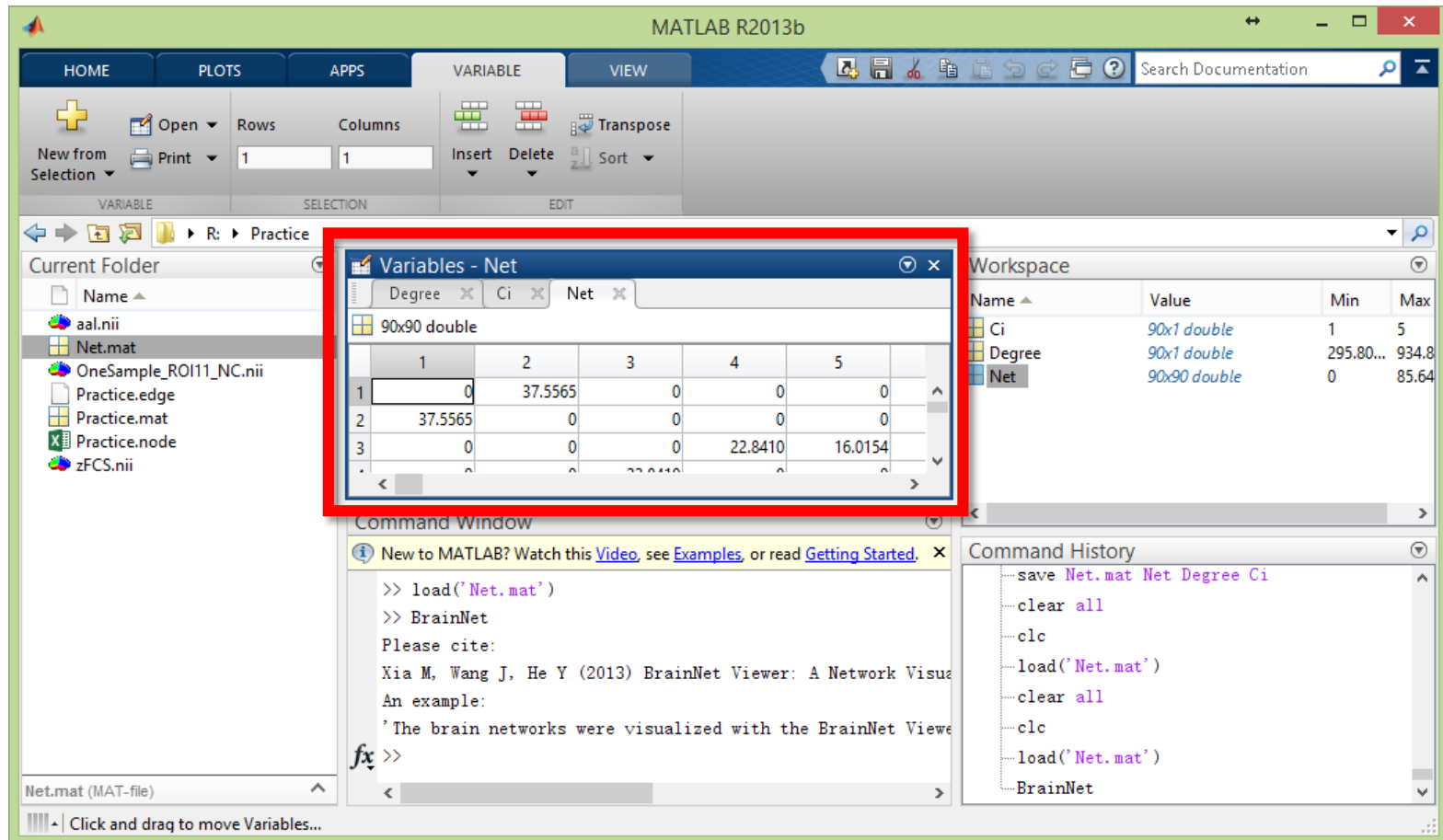
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# Example 4: Visualize brain network

*Prepare edge file, see example 3 for node file preparation*

*Note: copy the value of variable Net*



The screenshot displays the MATLAB R2013b environment. The 'Variables - Net' window is open, showing a 90x90 double matrix. The matrix is highlighted with a red box. The 'Workspace' window shows variables Ci, Degree, and Net. The 'Command Window' shows the execution of 'load('Net.mat')' and 'BrainNet'. The 'Command History' window shows the sequence of commands.

	1	2	3	4	5
1	0	37.5565	0	0	0
2	37.5565	0	0	0	0
3	0	0	0	22.8410	16.0154

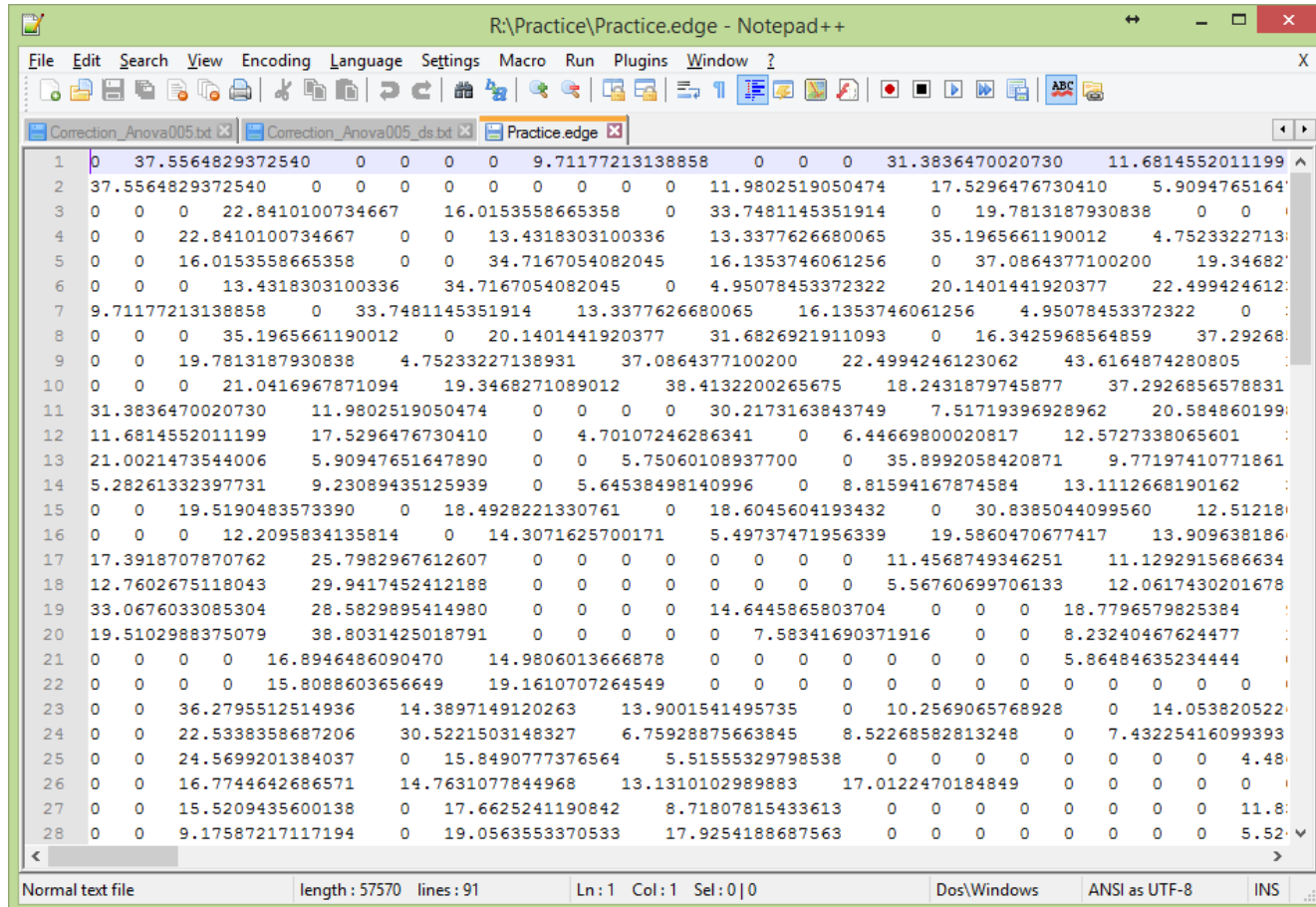
```
>> load('Net.mat')
>> BrainNet
Please cite:
Xia M, Wang J, He Y (2013) BrainNet Viewer: A Network Visual
An example:
' The brain networks were visualized with the BrainNet View
fx >>
```

```
save Net.mat Net Degree Ci
clear all
clc
load('Net.mat')
clear all
clc
load('Net.mat')
BrainNet
```

# Example 4: Visualize brain network

## Prepare edge file

*Note: open the Practice.edge file with text editor, paste the matrix, and save in original file format*

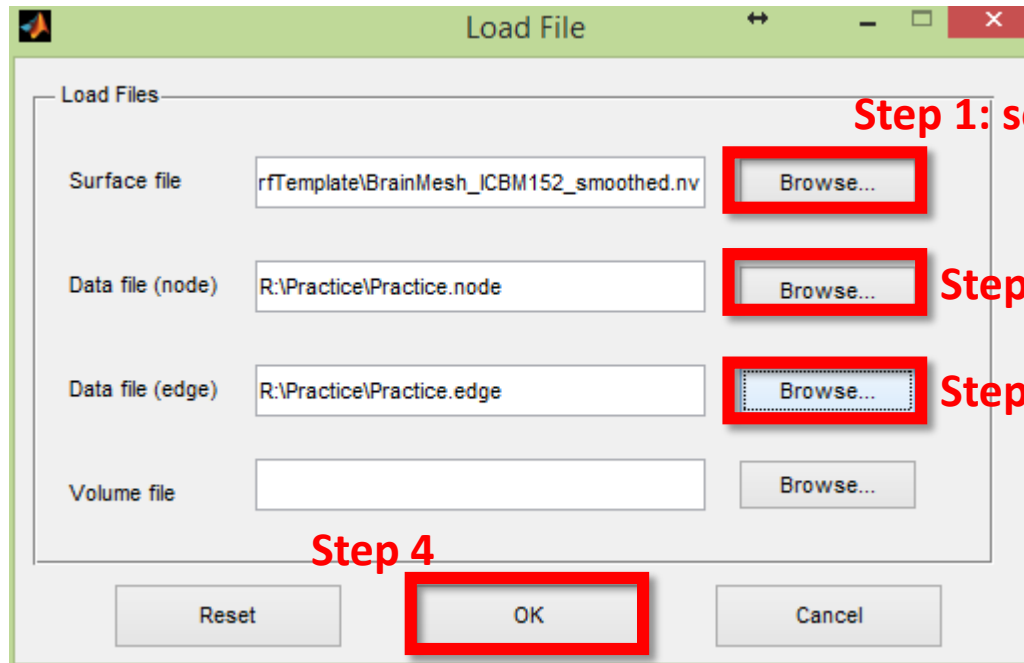


The screenshot shows a Notepad++ window titled "R:\Practice\Practice.edge - Notepad++". The window contains a large matrix of numerical values, likely representing a brain network edge file. The matrix is displayed in a grid format with rows and columns. The values are floating-point numbers, some of which are zero. The window's status bar at the bottom indicates "Normal text file", "length: 57570 lines: 91", "Ln: 1 Col: 1 Sel: 0|0", "Dos\Windows", "ANSI as UTF-8", and "INS".

Line	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8	Col 9	Col 10	Col 11	Col 12	Col 13	Col 14	Col 15	Col 16	Col 17	Col 18	Col 19	Col 20	Col 21	Col 22	Col 23	Col 24	Col 25	Col 26	Col 27	Col 28
1	0	37.5564829372540	0	0	0	0	0	9.71177213138858	0	0	0	31.3836470020730	11.6814552011199															
2	37.5564829372540	0	0	0	0	0	0	0	0	0	0	11.9802519050474	17.5296476730410	5.9094765164														
3	0	0	22.8410100734667	16.0153558665358	0	33.7481145351914	0	19.7813187930838	0	0																		
4	0	0	22.8410100734667	0	0	13.4318303100336	13.3377626680065	35.1965661190012	4.7523322713																			
5	0	0	16.0153558665358	0	0	34.7167054082045	16.1353746061256	0	37.0864377100200	19.34682																		
6	0	0	13.4318303100336	34.7167054082045	0	4.95078453372322	20.1401441920377	22.499424612																				
7	9.71177213138858	0	33.7481145351914	13.3377626680065	16.1353746061256	4.95078453372322	0																					
8	0	0	35.1965661190012	0	20.1401441920377	31.6826921911093	0	16.3425968564859	37.29268																			
9	0	0	19.7813187930838	4.75233227138931	37.0864377100200	22.4994246123062	43.6164874280805																					
10	0	0	21.0416967871094	19.3468271089012	38.4132200265675	18.2431879745877	37.2926856578831																					
11	31.3836470020730	11.9802519050474	0	0	0	0	30.2173163843749	7.51719396928962	20.584860199																			
12	11.6814552011199	17.5296476730410	0	4.70107246286341	0	6.44669800020817	12.5727338065601																					
13	21.0021473544006	5.90947651647890	0	0	5.75060108937700	0	35.8992058420871	9.77197410771861																				
14	5.28261332397731	9.23089435125939	0	5.64538498140996	0	8.81594167874584	13.1112668190162																					
15	0	0	19.5190483573390	0	18.4928221330761	0	18.6045604193432	0	30.8385044099560	12.51218																		
16	0	0	12.2095834135814	0	14.3071625700171	5.49737471956339	19.5860470677417	13.909638186																				
17	17.3918707870762	25.7982967612607	0	0	0	0	0	0	0	0	0	11.4568749346251	11.1292915686634															
18	12.7602675118043	29.9417452412188	0	0	0	0	0	0	0	0	0	5.56760699706133	12.0617430201678															
19	33.0676033085304	28.5829895414980	0	0	0	0	14.6445865803704	0	0	0	18.7796579825384																	
20	19.5102988375079	38.8031425018791	0	0	0	0	7.58341690371916	0	0	8.23240467624477																		
21	0	0	0	16.8946486090470	14.9806013666878	0	0	0	0	0	0	5.86484635234444																
22	0	0	0	15.8088603656649	19.1610707264549	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	36.2795512514936	14.3897149120263	13.9001541495735	0	10.2569065768928	0	14.053820522																			
24	0	0	22.5338358687206	30.5221503148327	6.75928875663845	8.52268582813248	0	7.43225416099393																				
25	0	0	24.5699201384037	0	15.8490777376564	5.51555329798538	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	16.7744642686571	14.7631077844968	13.1310102989883	17.0122470184849	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	15.5209435600138	0	17.6625241190842	8.71807815433613	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	9.17587217117194	0	19.0563553370533	17.9254188687563	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

# Example 4: Visualize brain network

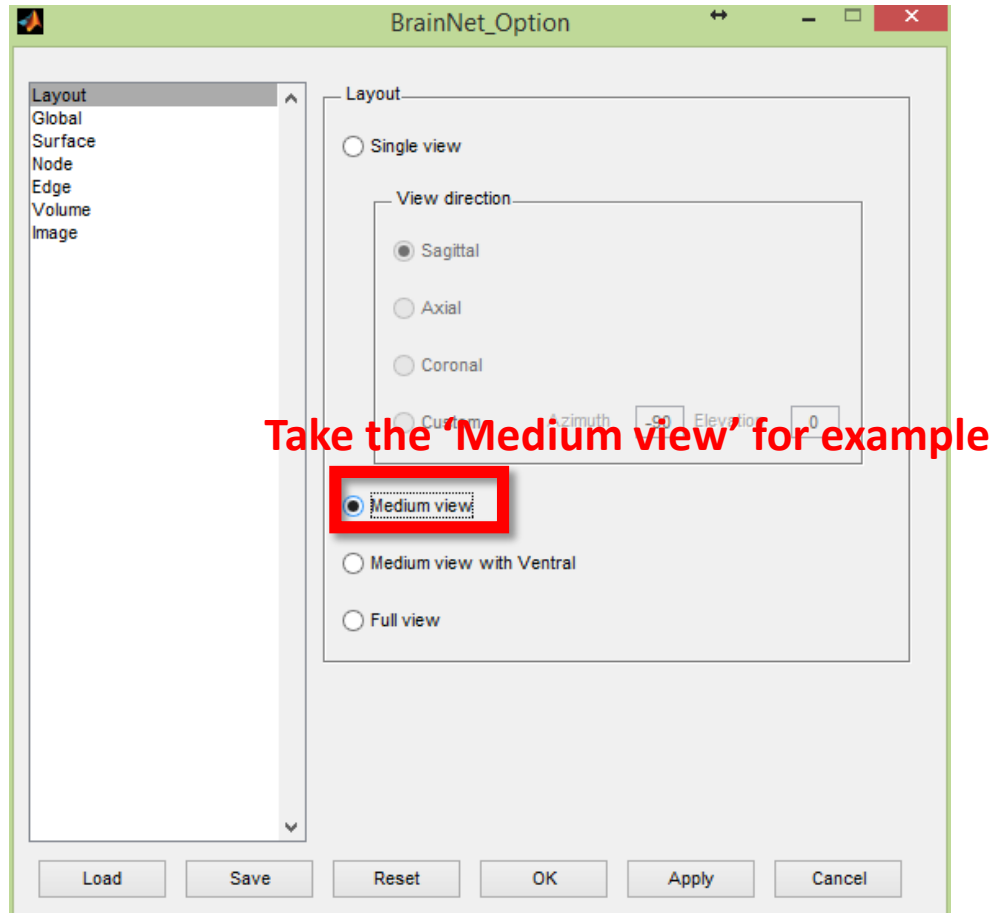
*Load files*





# Example 4: Visualize brain network

## *Configuration - layout*



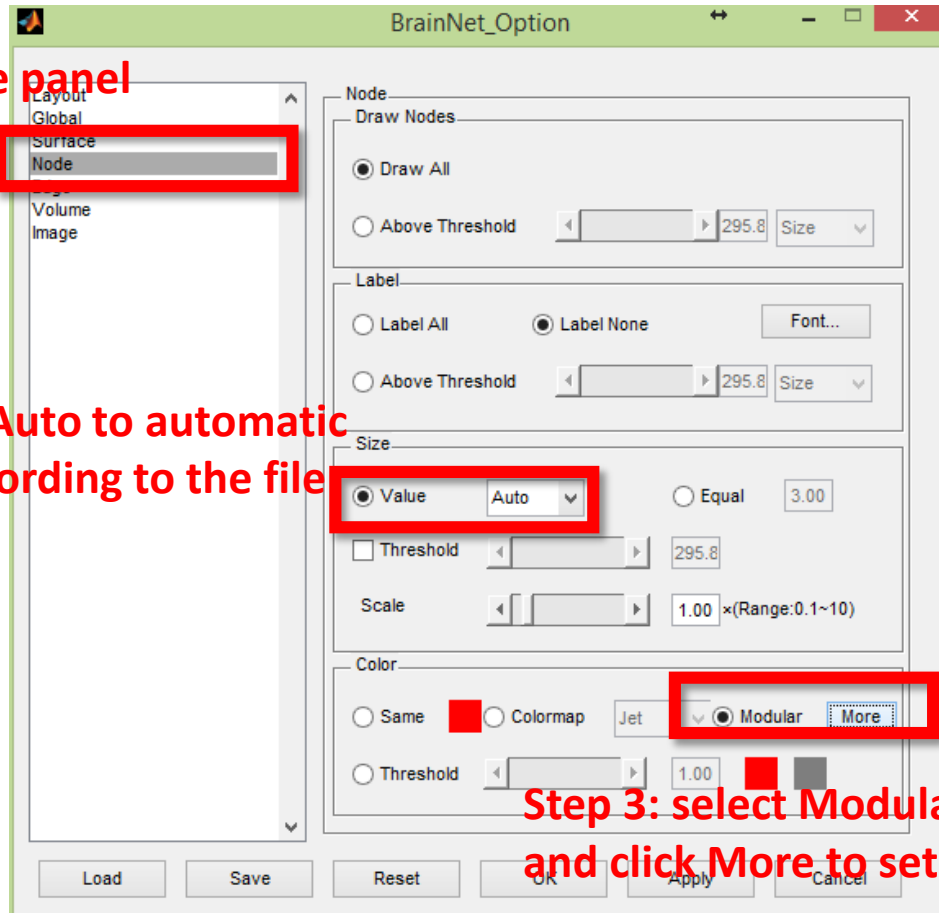
# Example 4: Visualize brain network

## *Configuration - node*

Step 1: select the Node panel

Step 2: select Value->Auto to automatic  
arrange nodal size according to the file

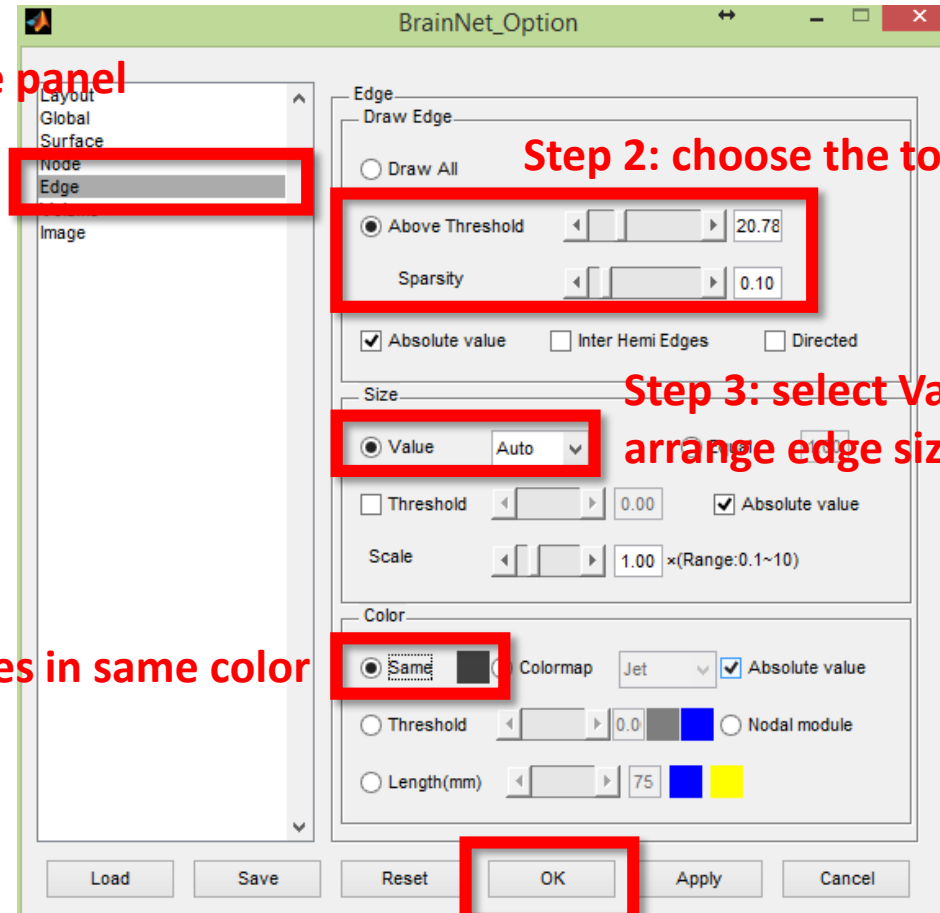
Step 3: select Modular to set nodal color,  
and click More to set the color of each module



# Example 4: Visualize brain network

## *Configuration - edge*

**Step 1: select the Edge panel**



**Step 2: choose the top 10% edge to be drawn**

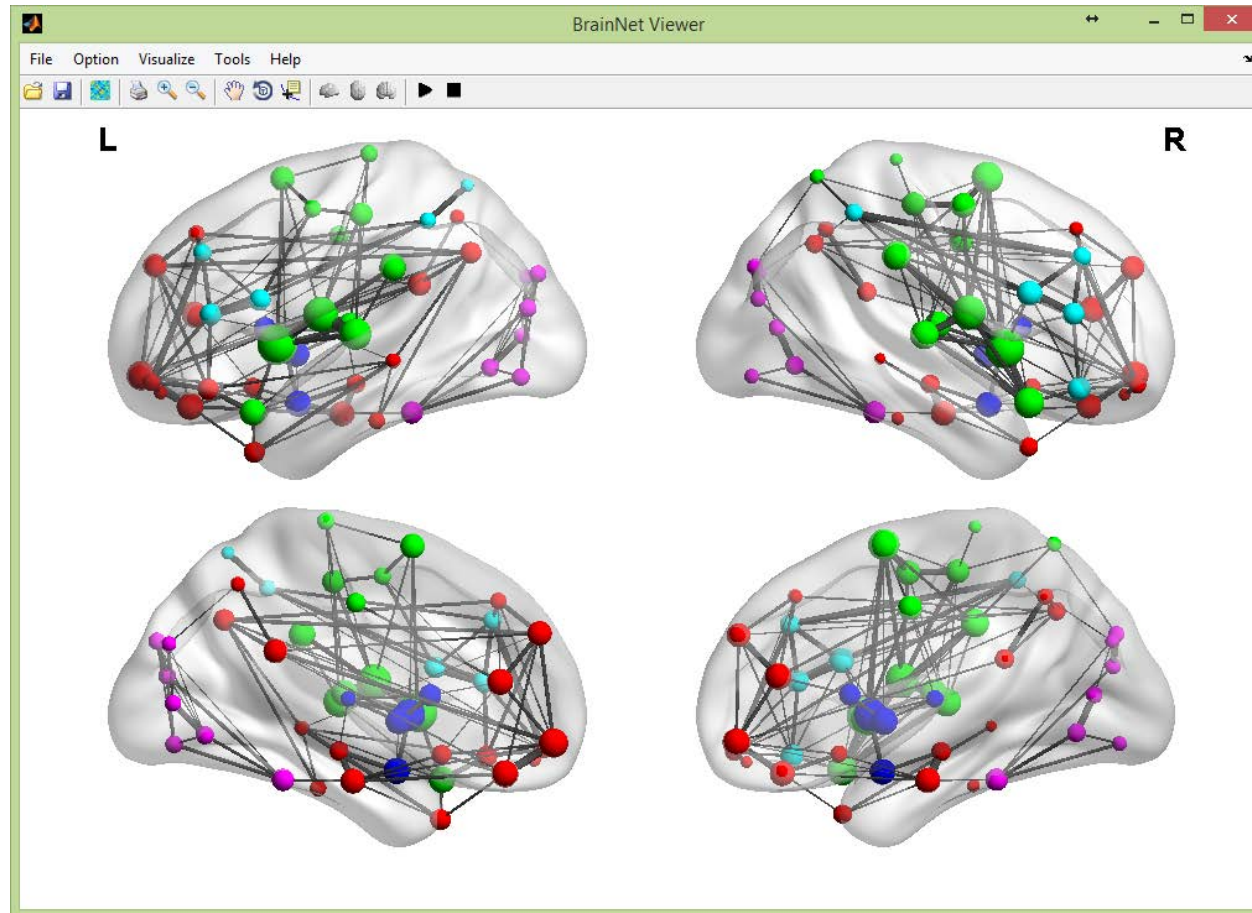
**Step 3: select Value->Auto to automatic arrange edge size according to the file**

**Step 4: display all edges in same color**

**Step 5: click OK when finish**

# Example 4: Visualize brain network

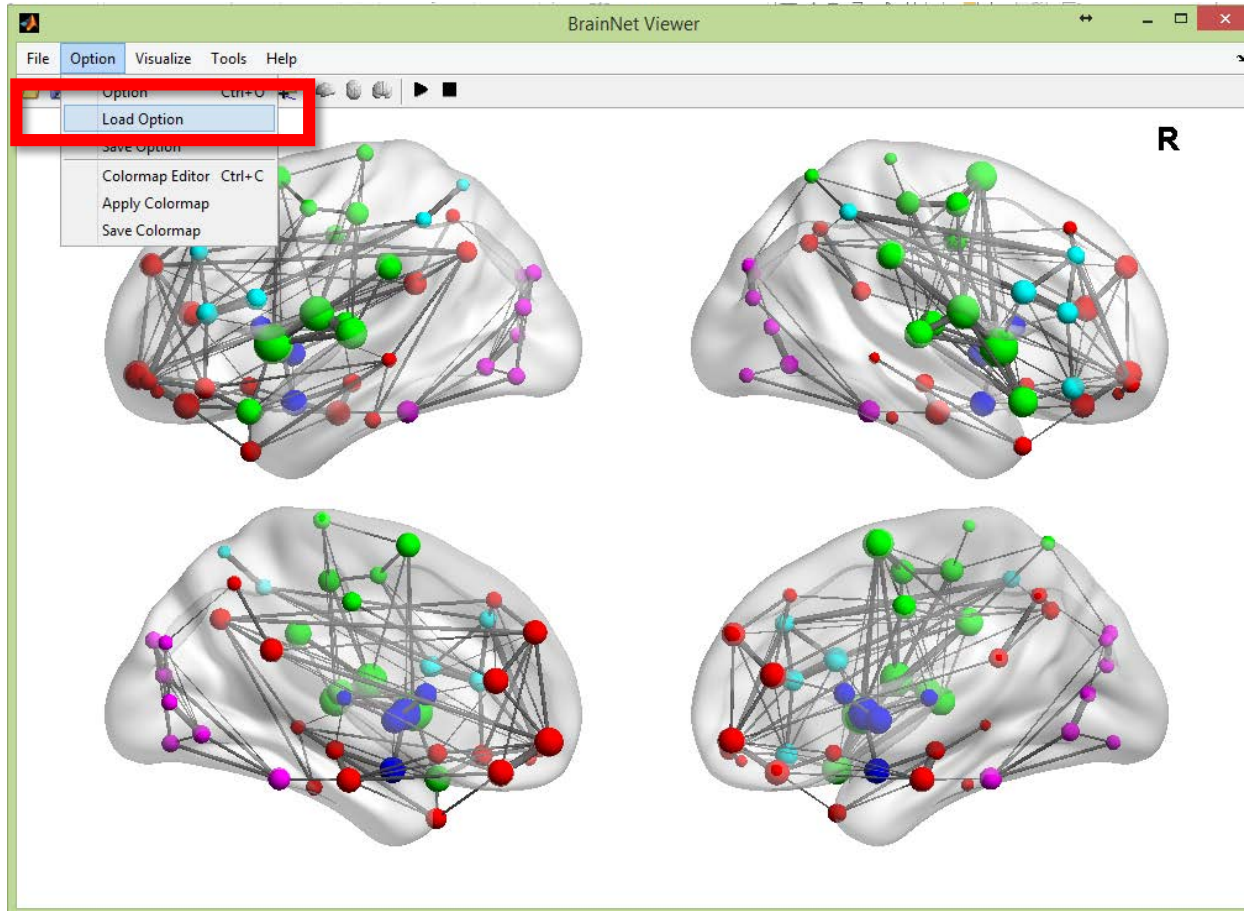
*Figure drawing*



# Example 4: Visualize brain network

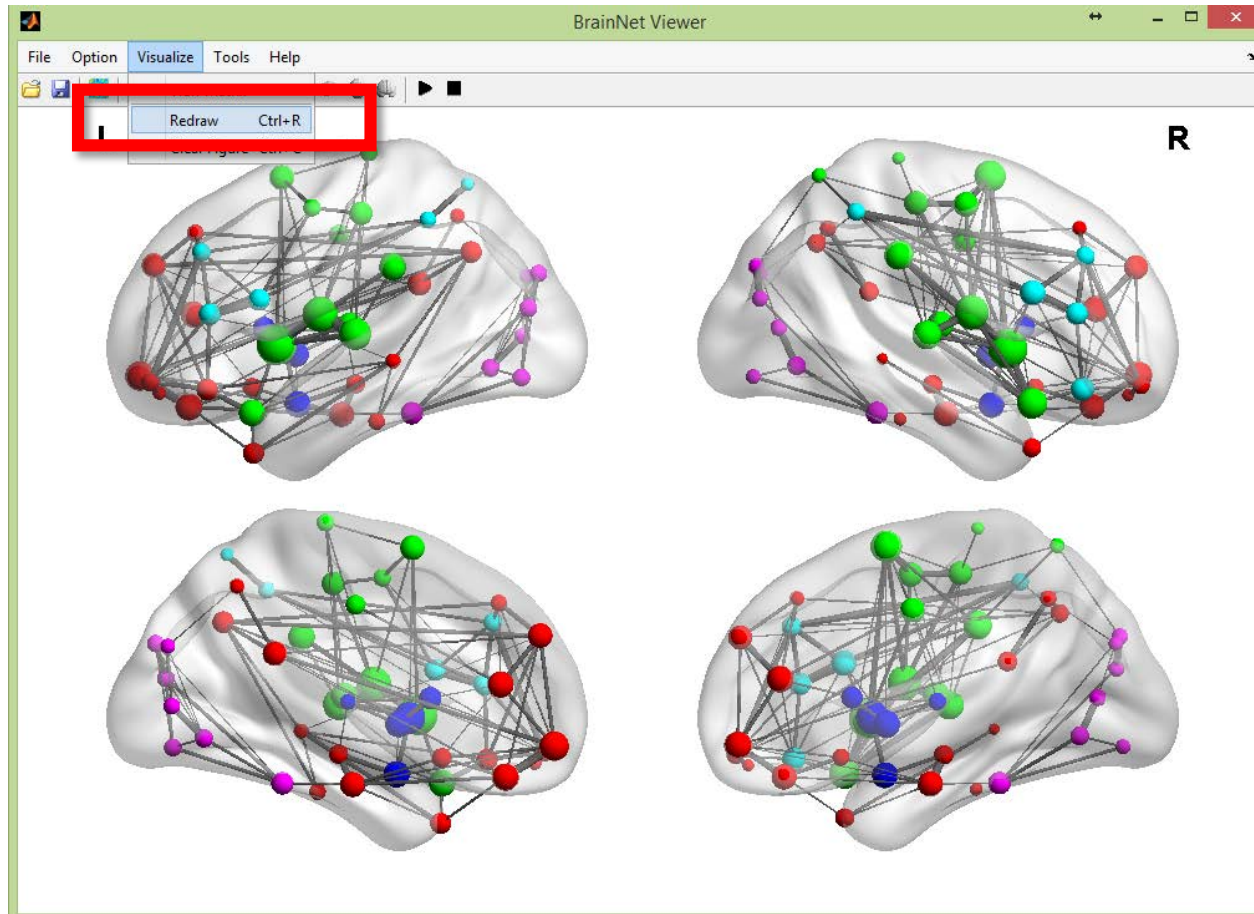
*Load a pre-saved option file*

**Select Practice.mat in the popup dialog**



# Example 4: Visualize brain network

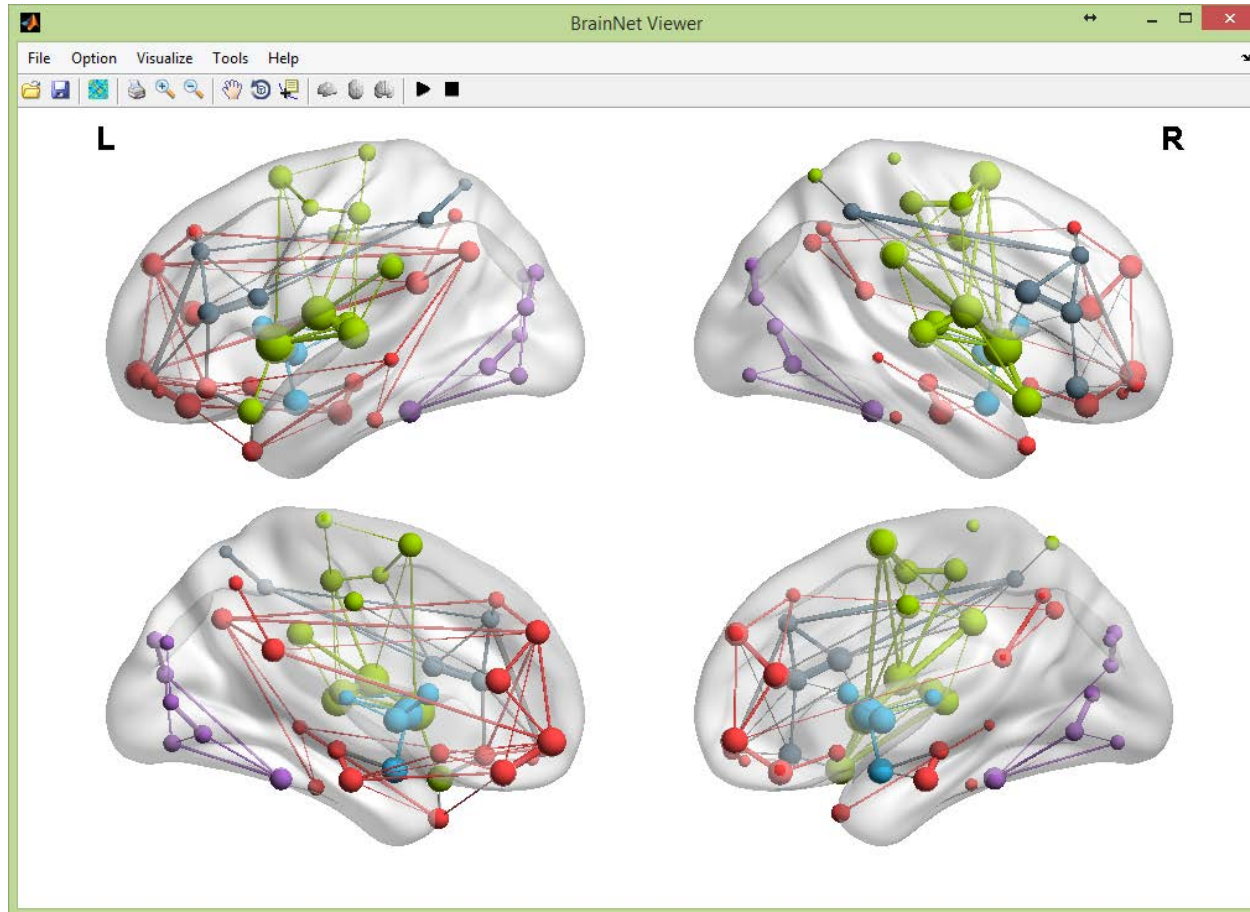
*Load a pre-saved option file*





# Example 4: Visualize brain network

*Load a pre-saved option file*



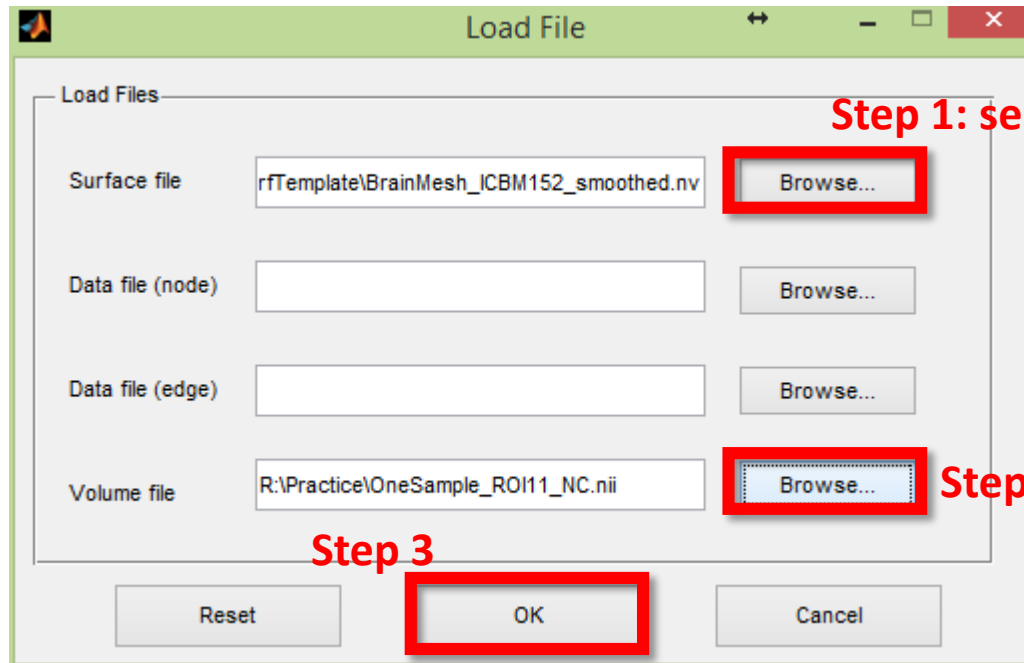
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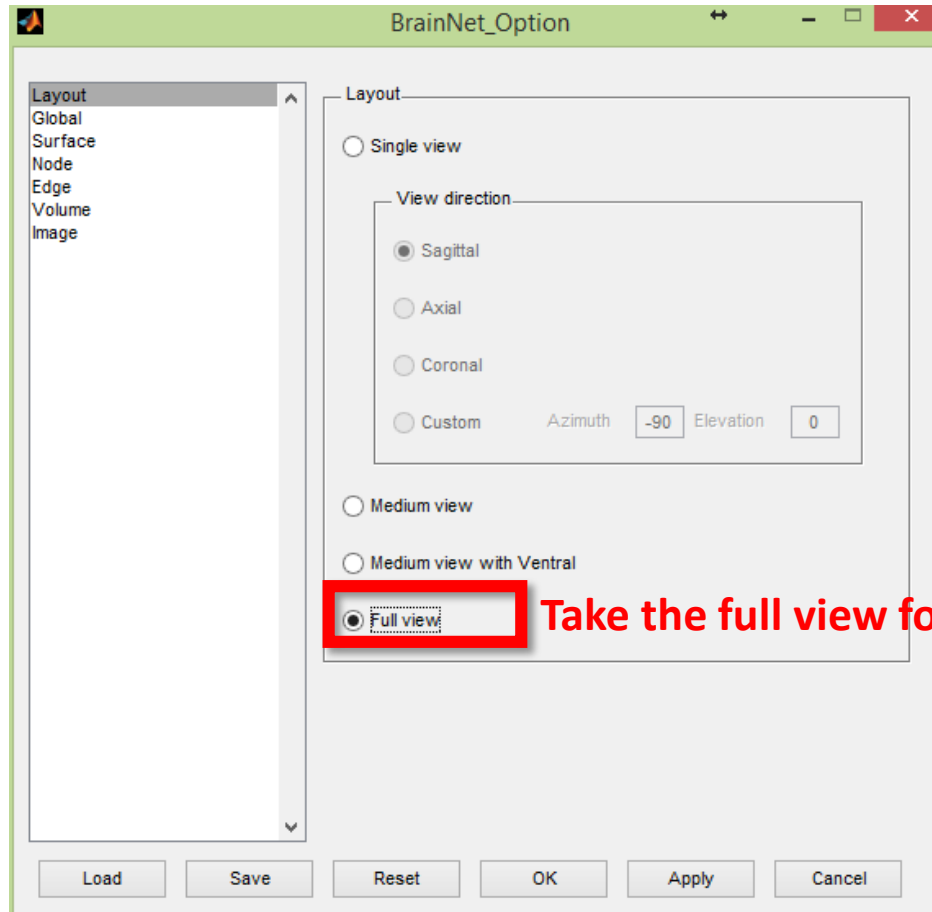
# Example 5: Map statistical volume file

*Load files*



# Example 5: Map statistical volume file

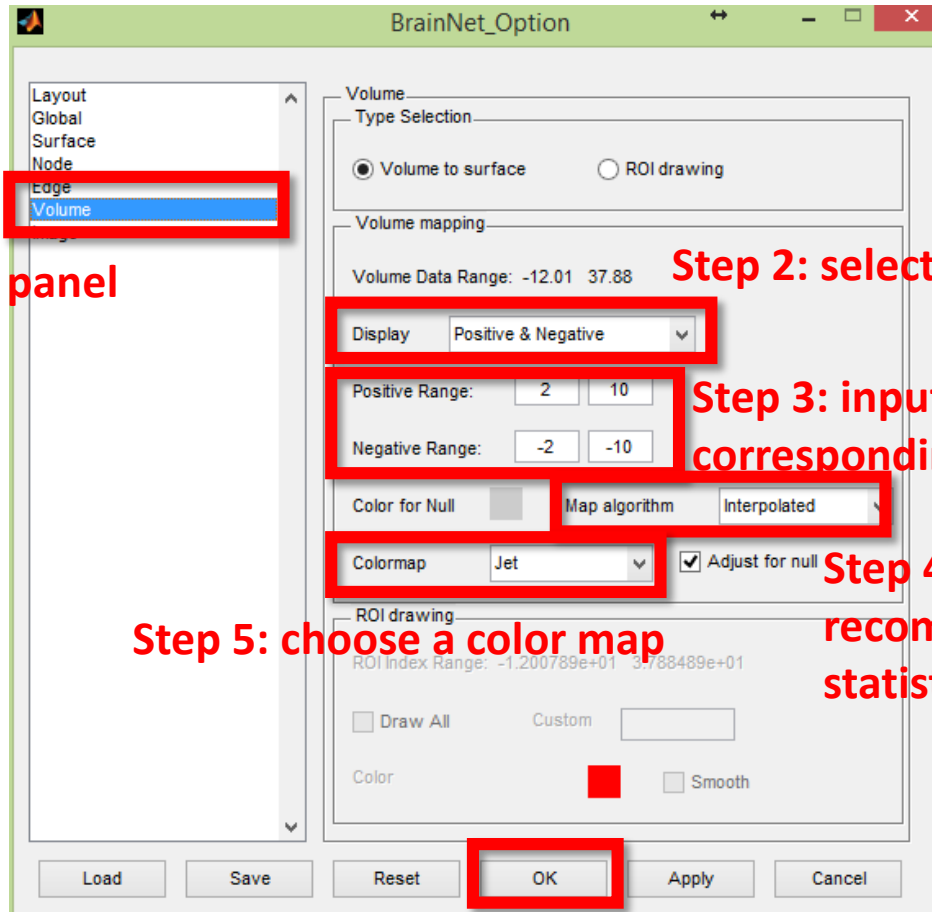
## *Configuration - Layout*



# Example 5: Map statistical volume file

## Configuration - Volume

Step 1: select Volume panel



Step 2: select data

Step 3: input map range, usually corresponding to statistical threshold

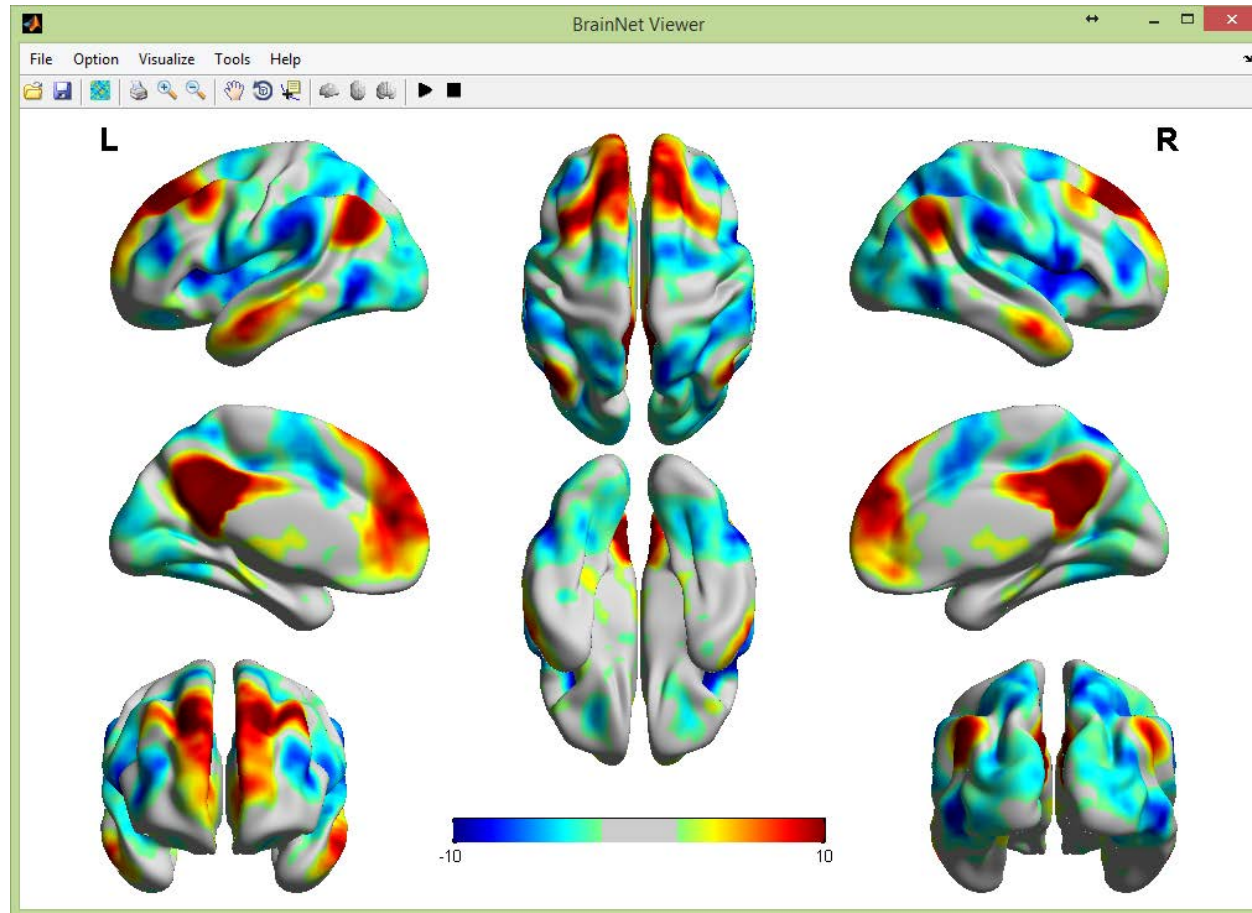
Step 4: select map algorithm, recommend interpolated for statistical map

Step 5: choose a color map

Step 6

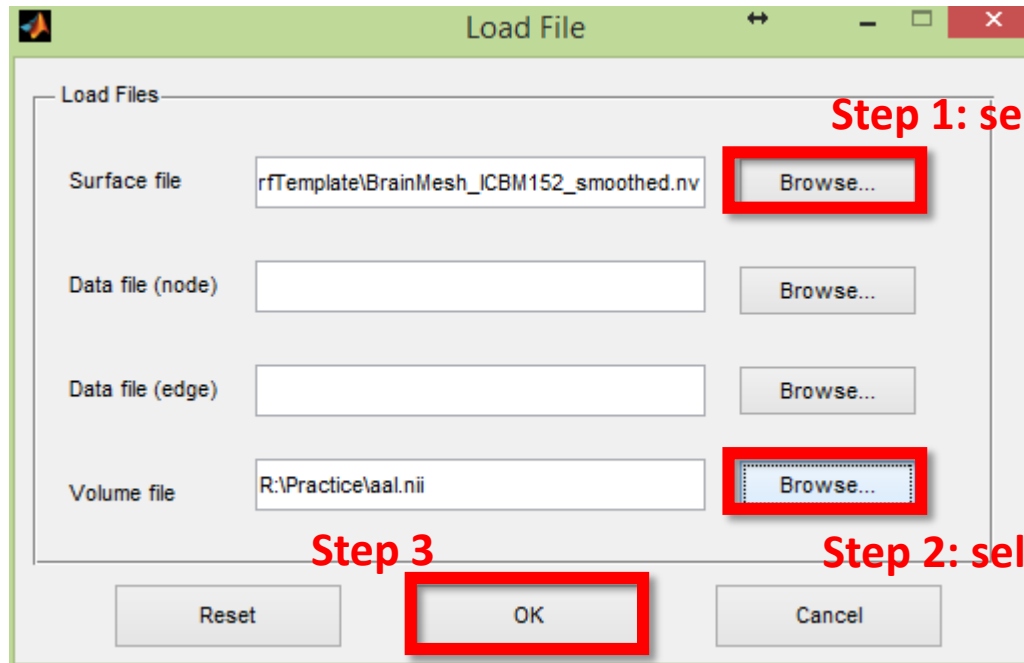
# Example 5: Map statistical volume file

*Figure drawing*



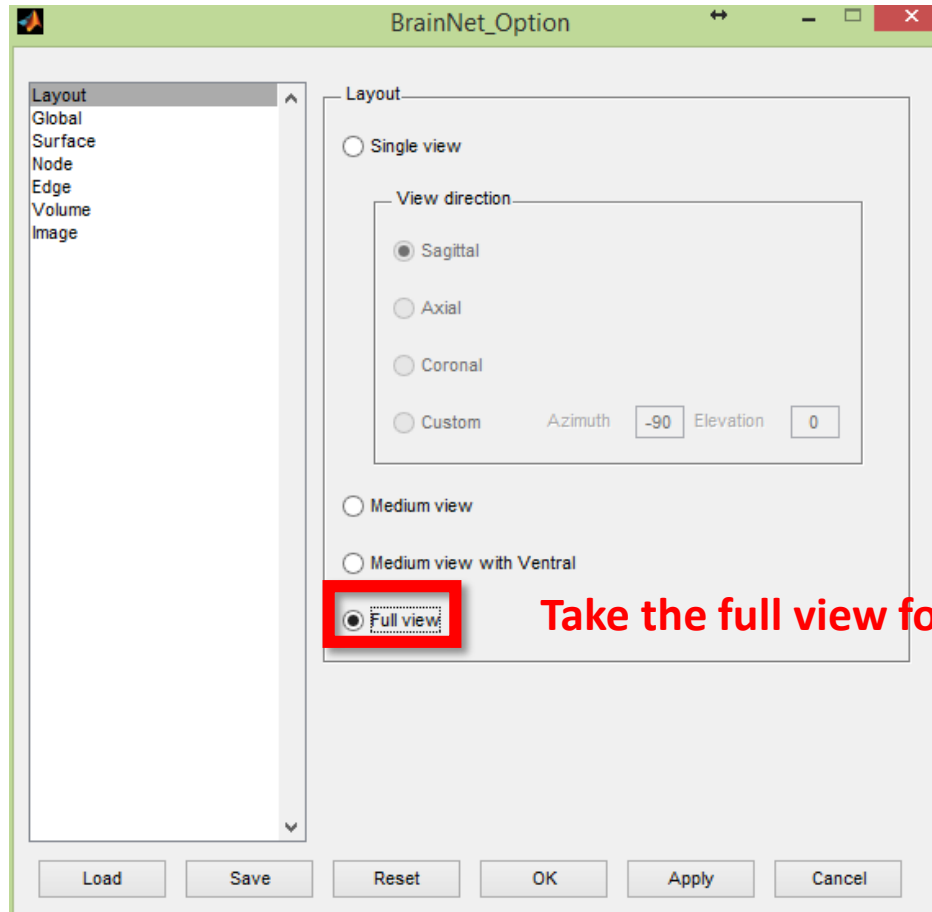
# Example 5: Map atlas volume file

*Load files*



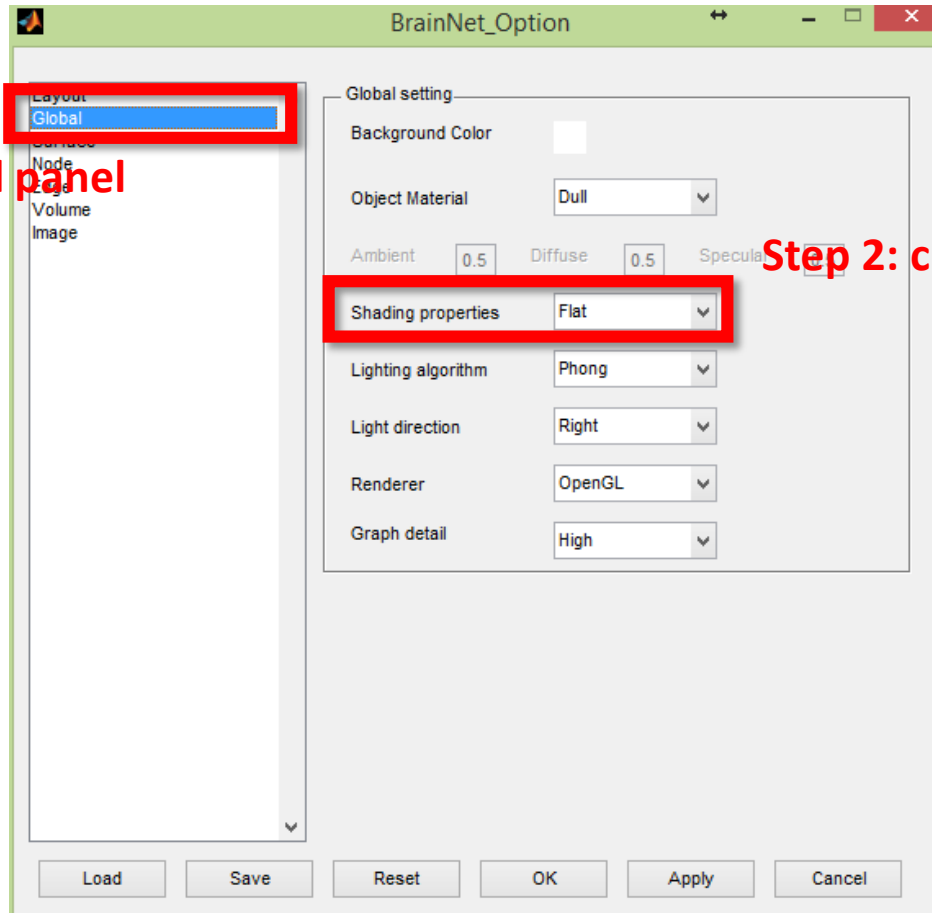
# Example 5: Map atlas volume file

## *Configuration - Layout*



# Example 5: Map atlas volume file

## *Configuration - Global*

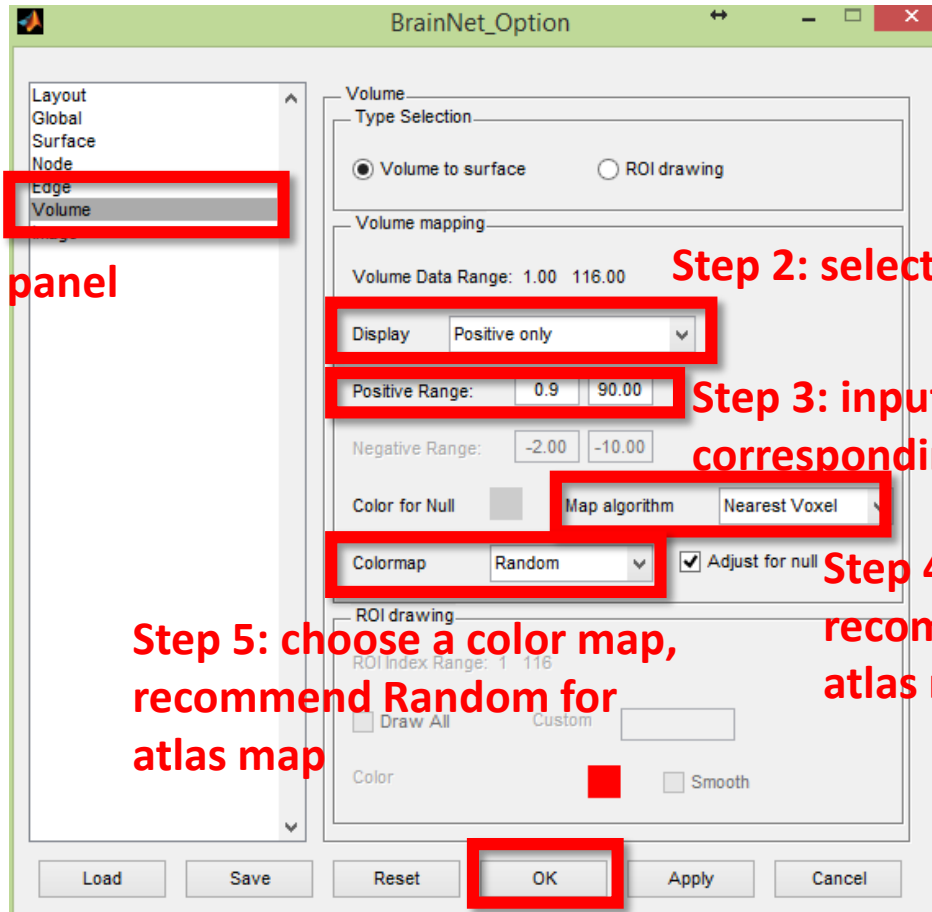


**Step 1: choose Global panel**

**Step 2: change shading to Flat**

# Example 5: Map atlas volume file

## Configuration - Volume



Step 1: select Volume panel

Step 2: select positive only

Step 3: input map range, usually corresponding to brain region

Step 4: select map algorithm, recommend Nearest Voxel for atlas map

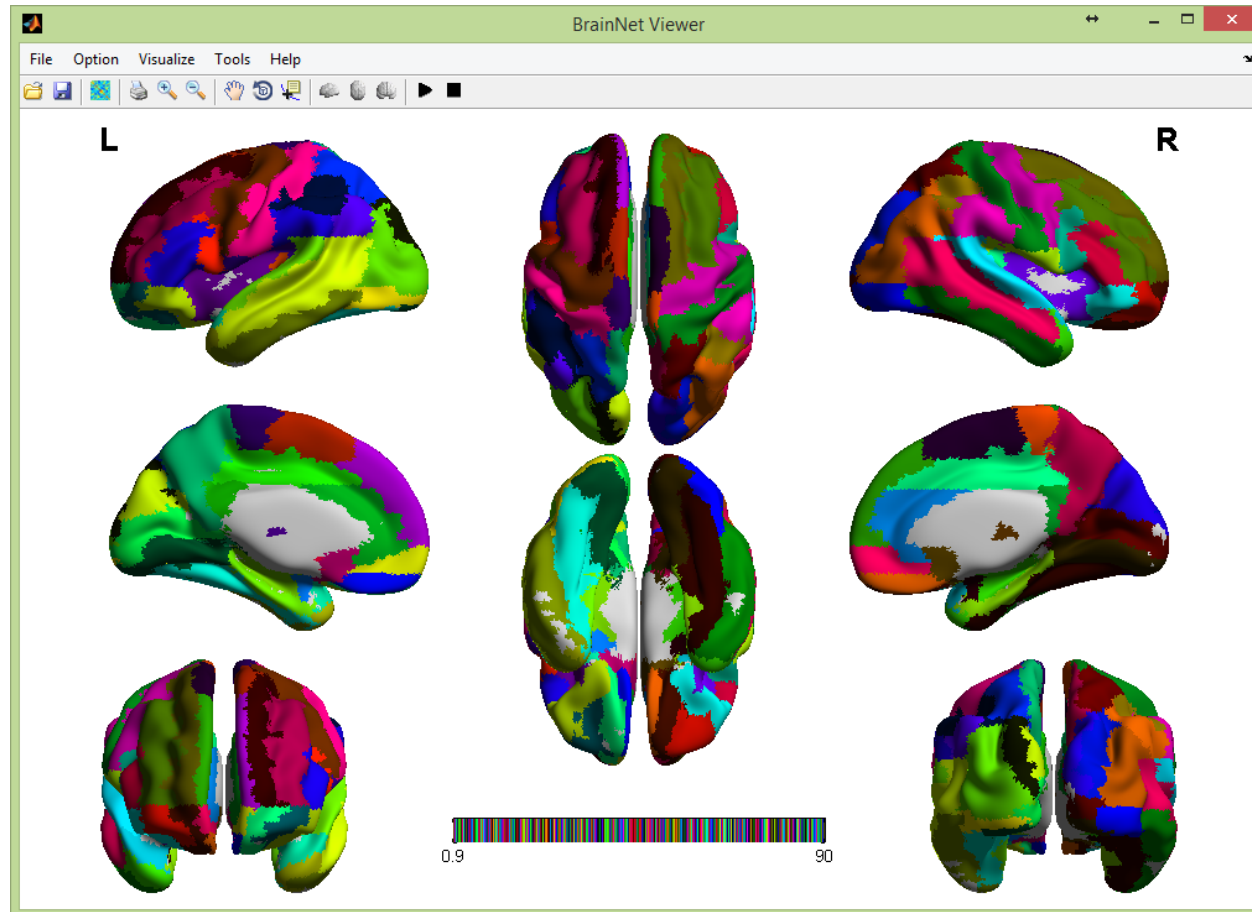
Step 5: choose a color map, recommend Random for atlas map

Step 6



# Example 5: Map atlas volume file

*Figure drawing*

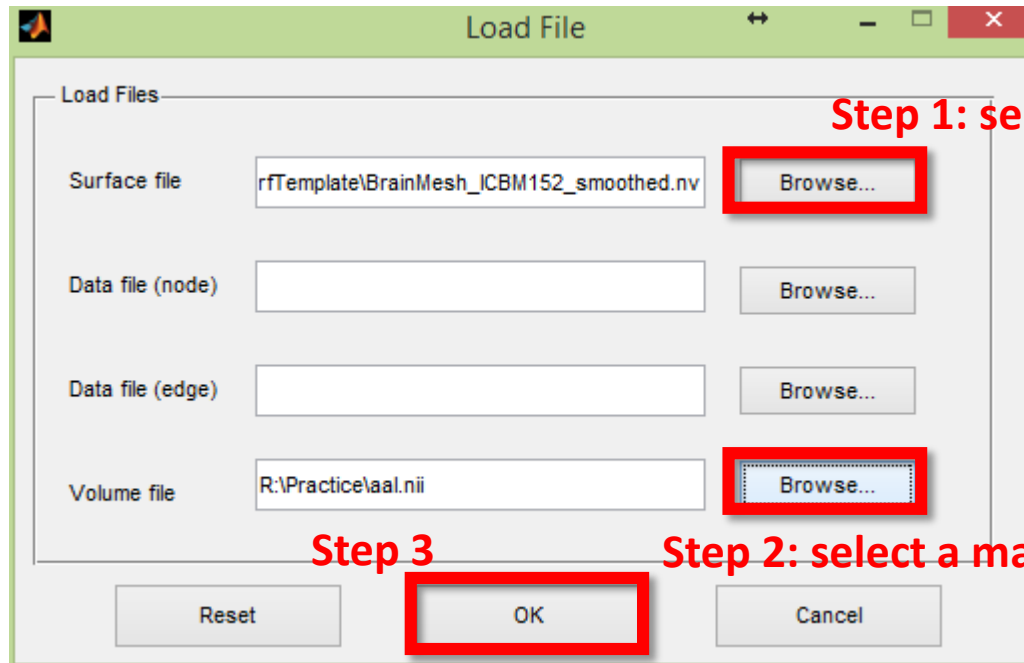


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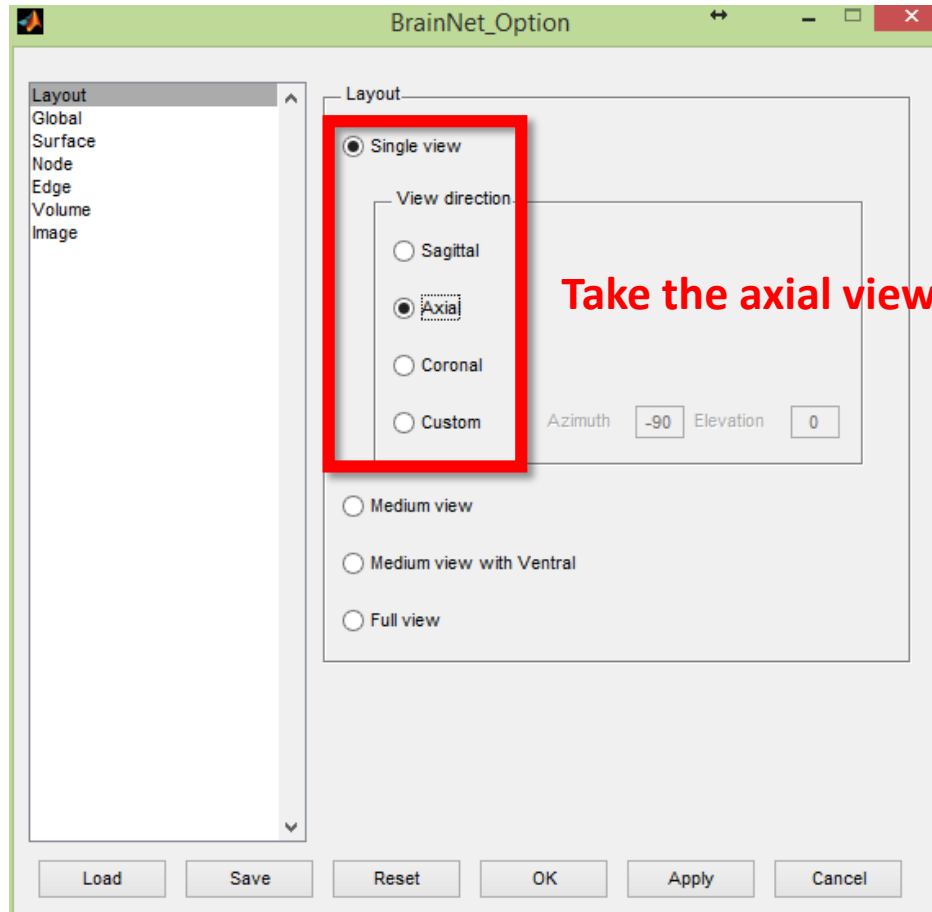
# Example 6: Construct 3D ROI

*Load files*



# Example 6: Construct 3D ROI

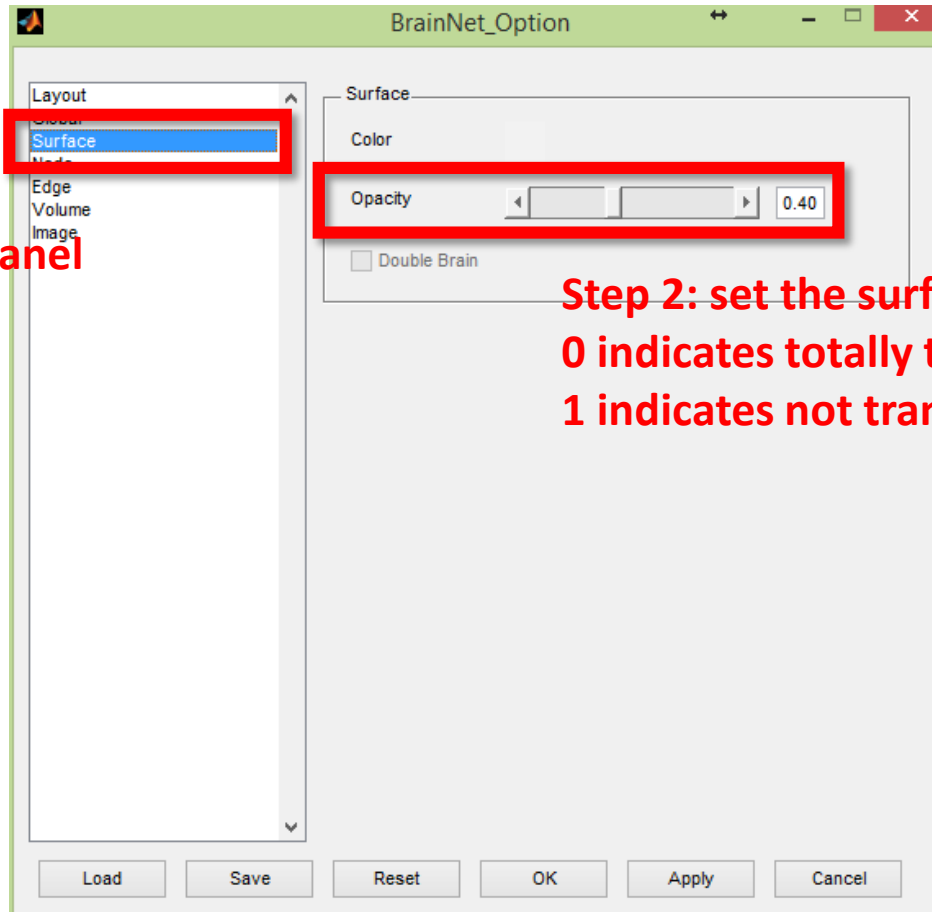
## *Configuration - Layout*



**Take the axial view for example**

# Example 6: Construct 3D ROI

## *Configuration - Surface*

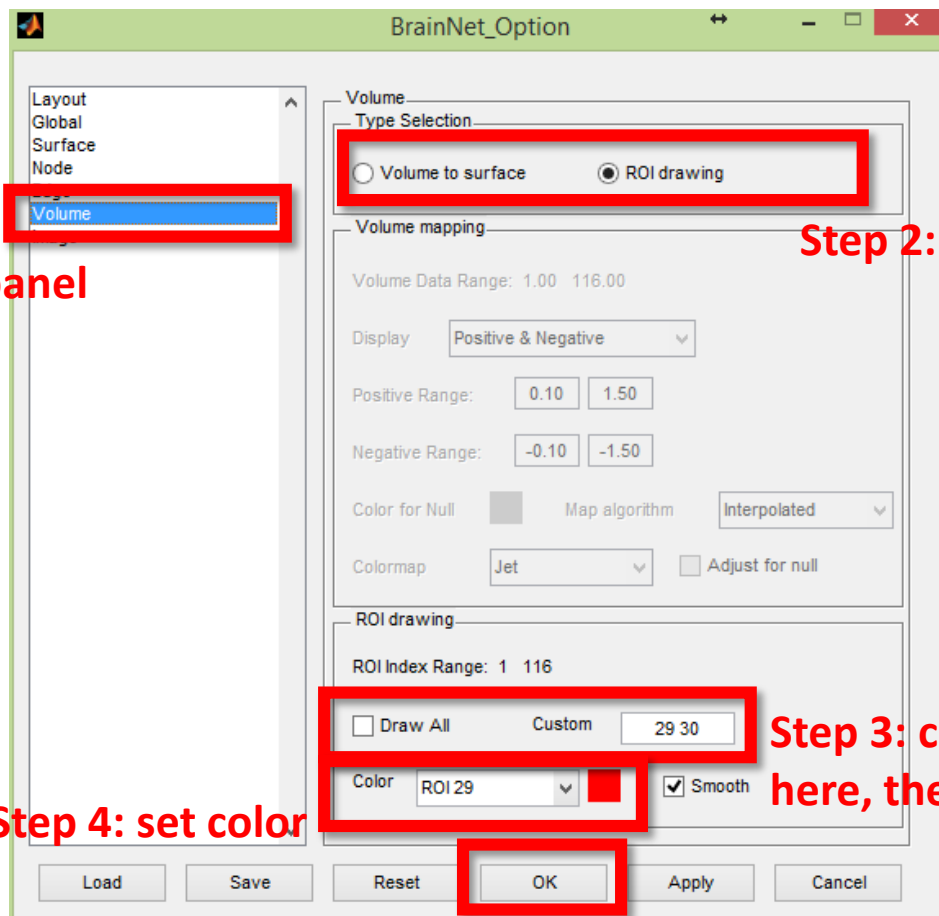


**Step 1: select Surface panel**

**Step 2: set the surface transparent,  
0 indicates totally transparent  
1 indicates not transparent**

# Example 6: Construct 3D ROI

## Configuration - Volume



Step 1: select Volume panel

Step 2: select ROI drawing

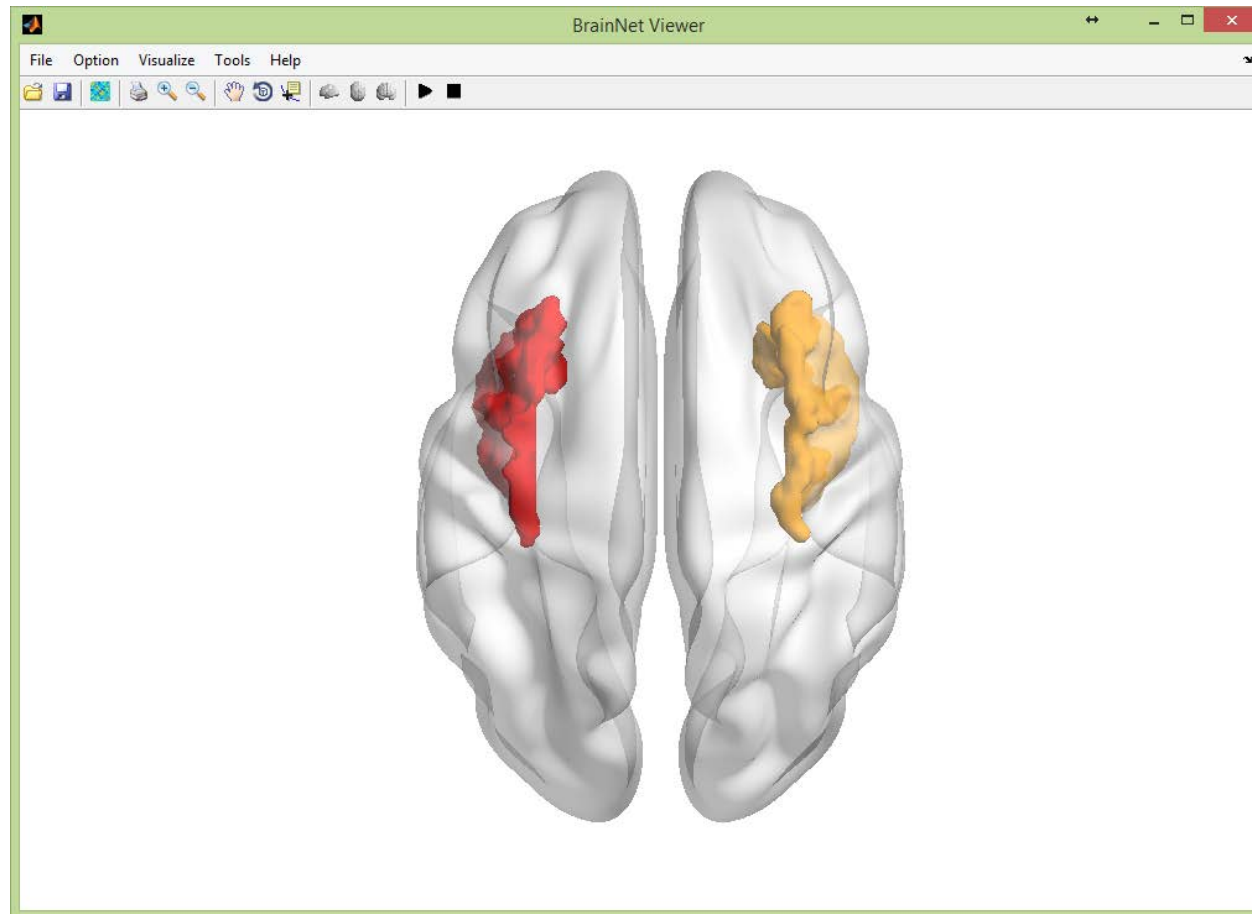
Step 4: set color

Step 3: choose the ROI,  
here, the insula

Step 5

# Example 6: Construct 3D ROI

*Figure drawing*



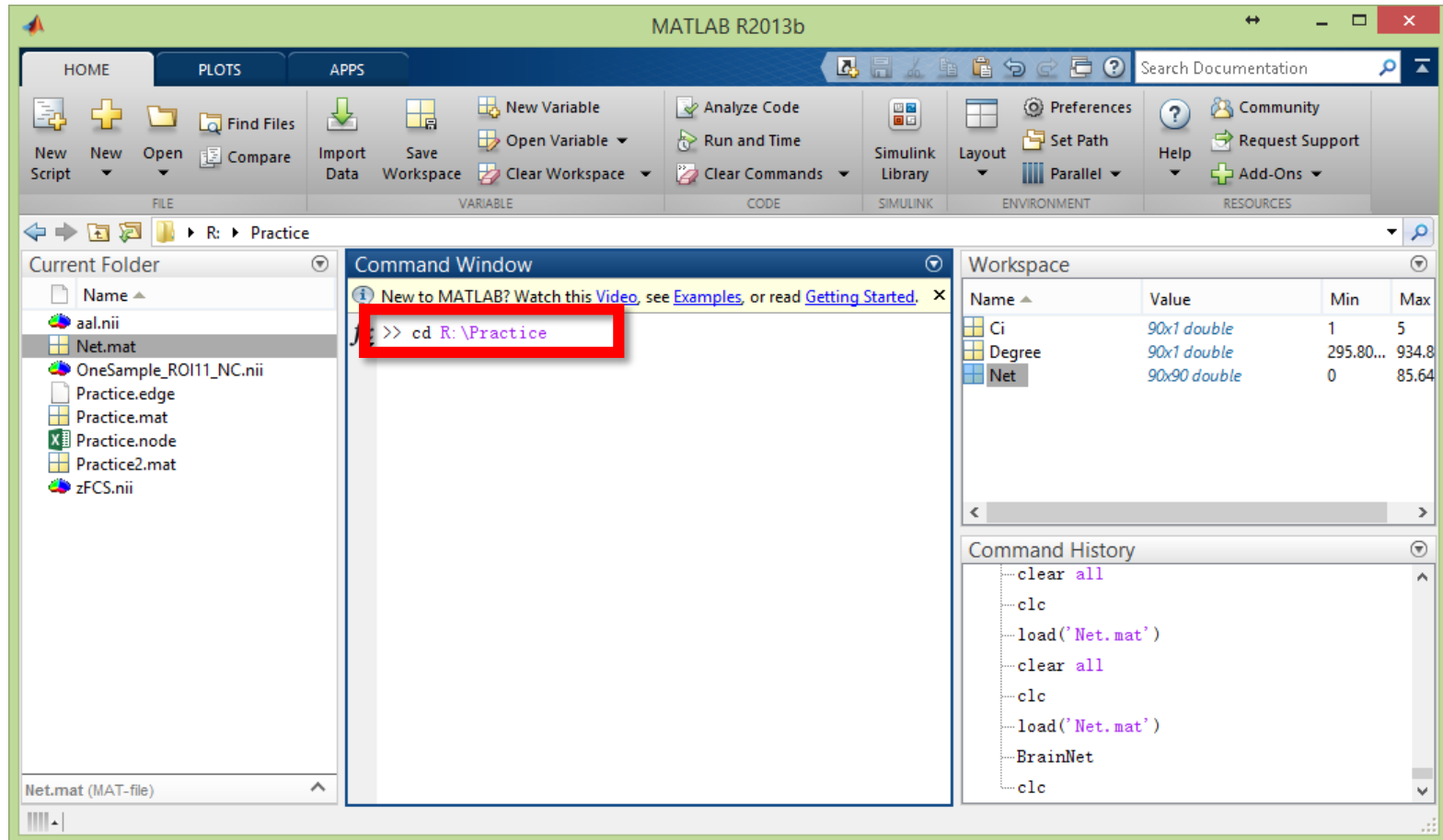
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# Example 7: Use commandline

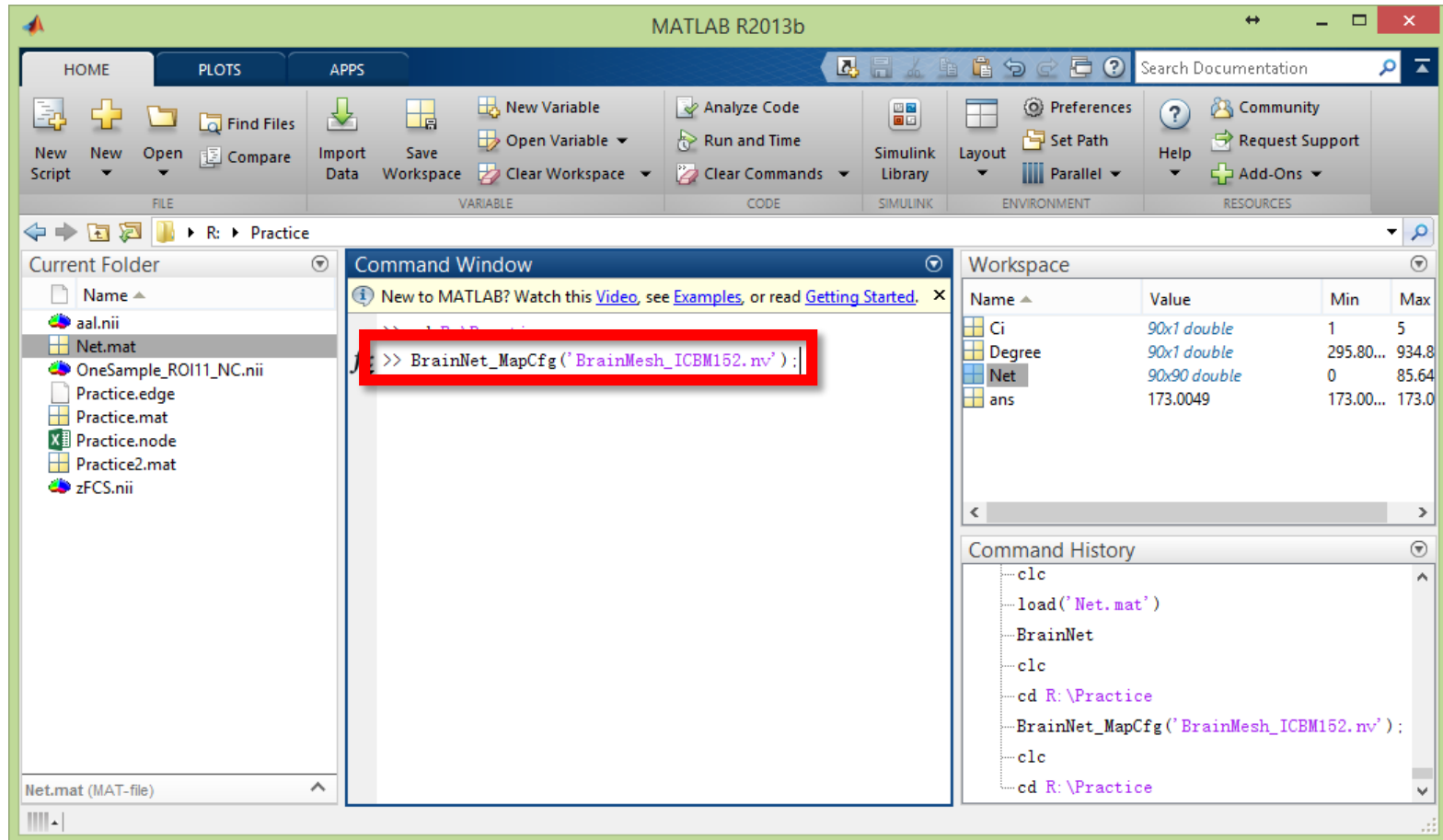
*Change the directory to your file folder*



# Example 7: Use commandline

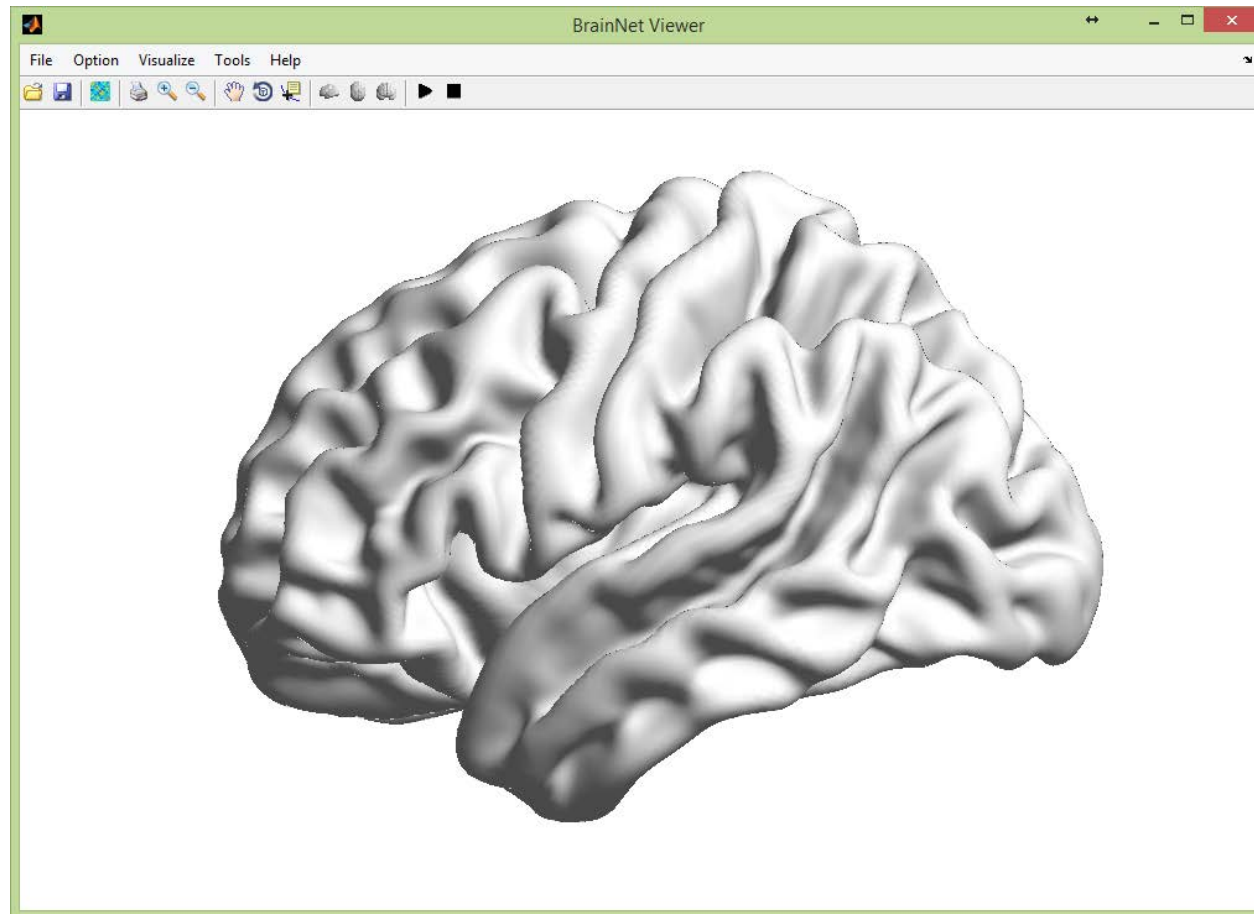
## *Draw a surface*

Type: `BrainNet_MapCfg('BrainMesh_ICBM152.nv');`



# Example 7: Use commandline

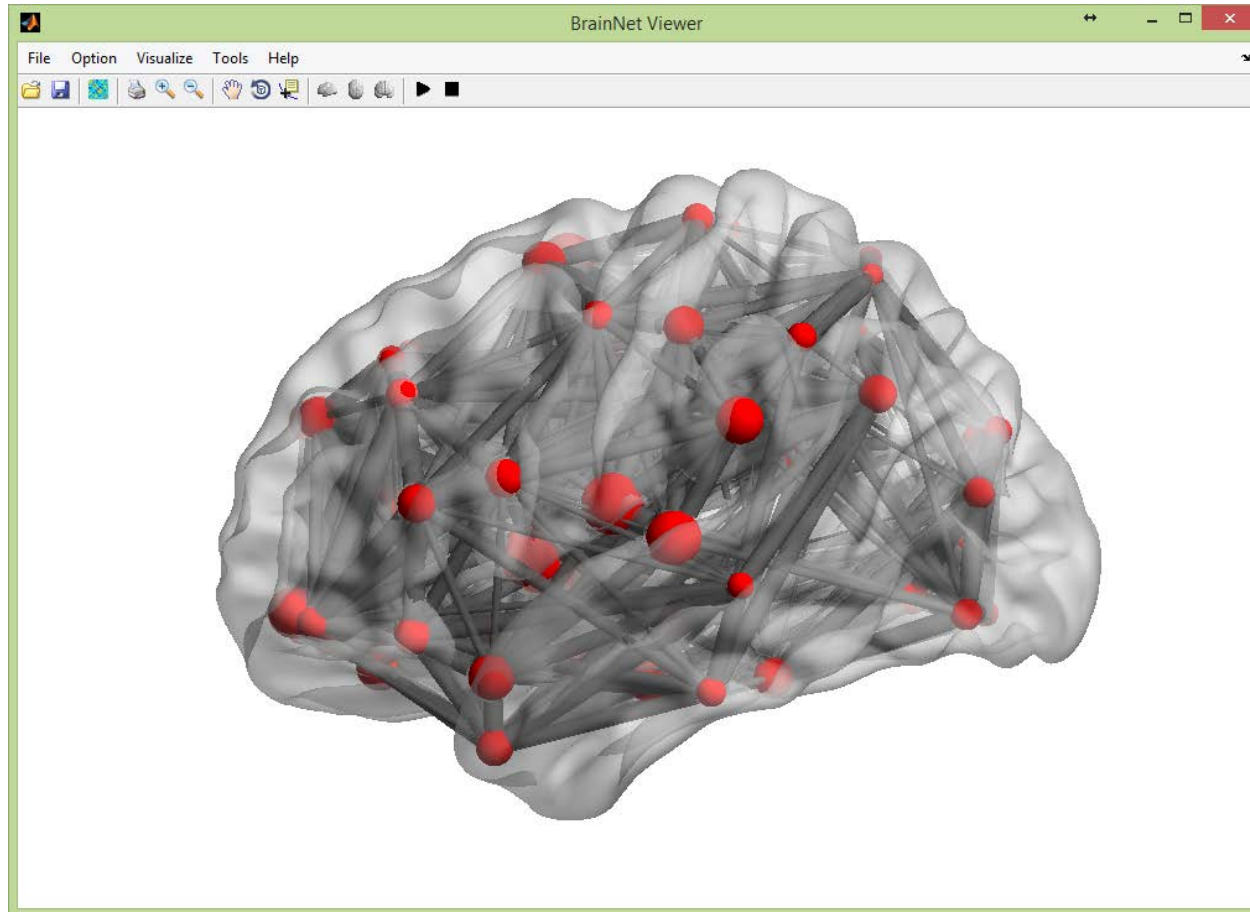
*Draw a surface*



# Example 7: Use commandline

*Draw surface, nodes and edges*

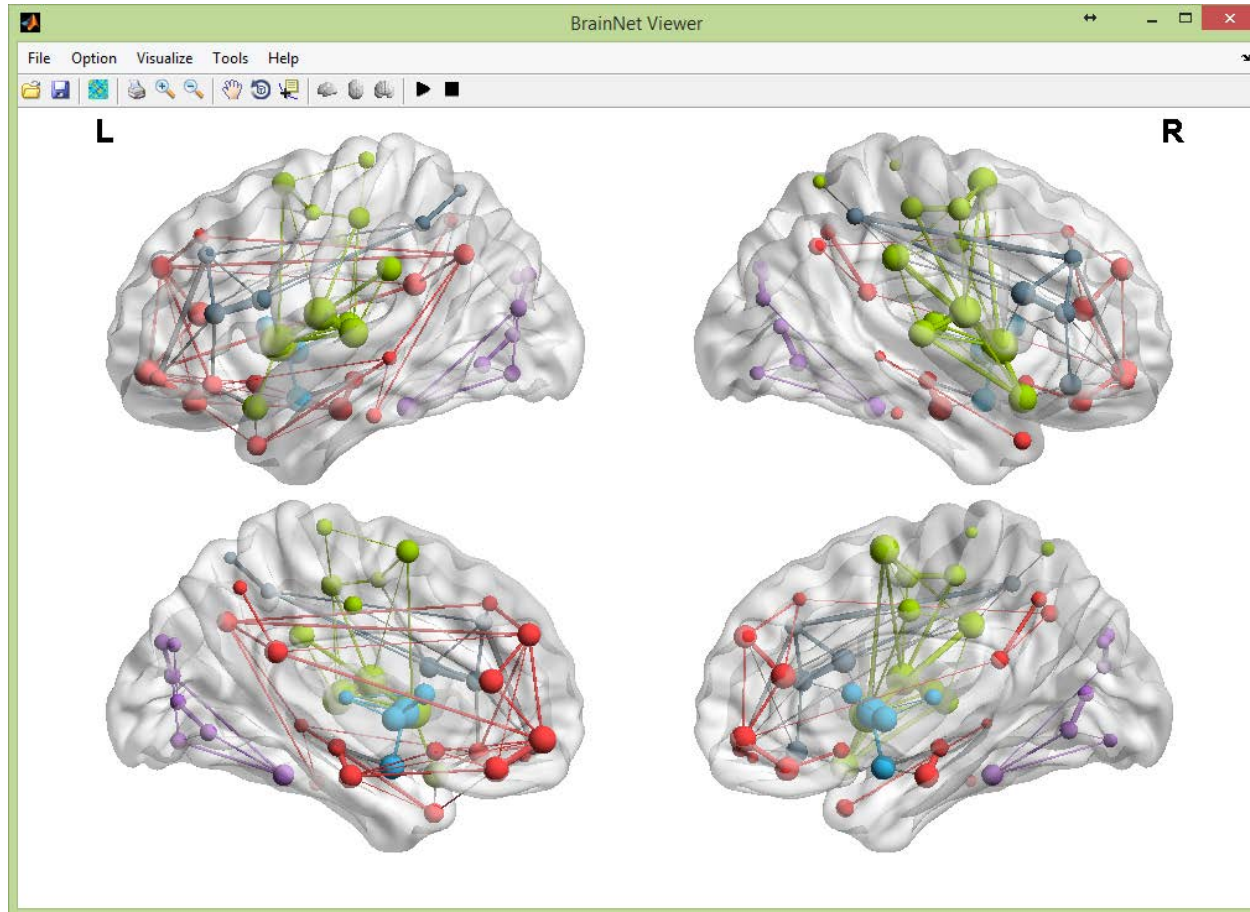
Type: `BrainNet_MapCfg('BrainMesh_ICBM152.nv','Practice.node','Practice.edge');`



# Example 7: Use commandline

*Draw surface, nodes and edges with a pre-saved configuration*

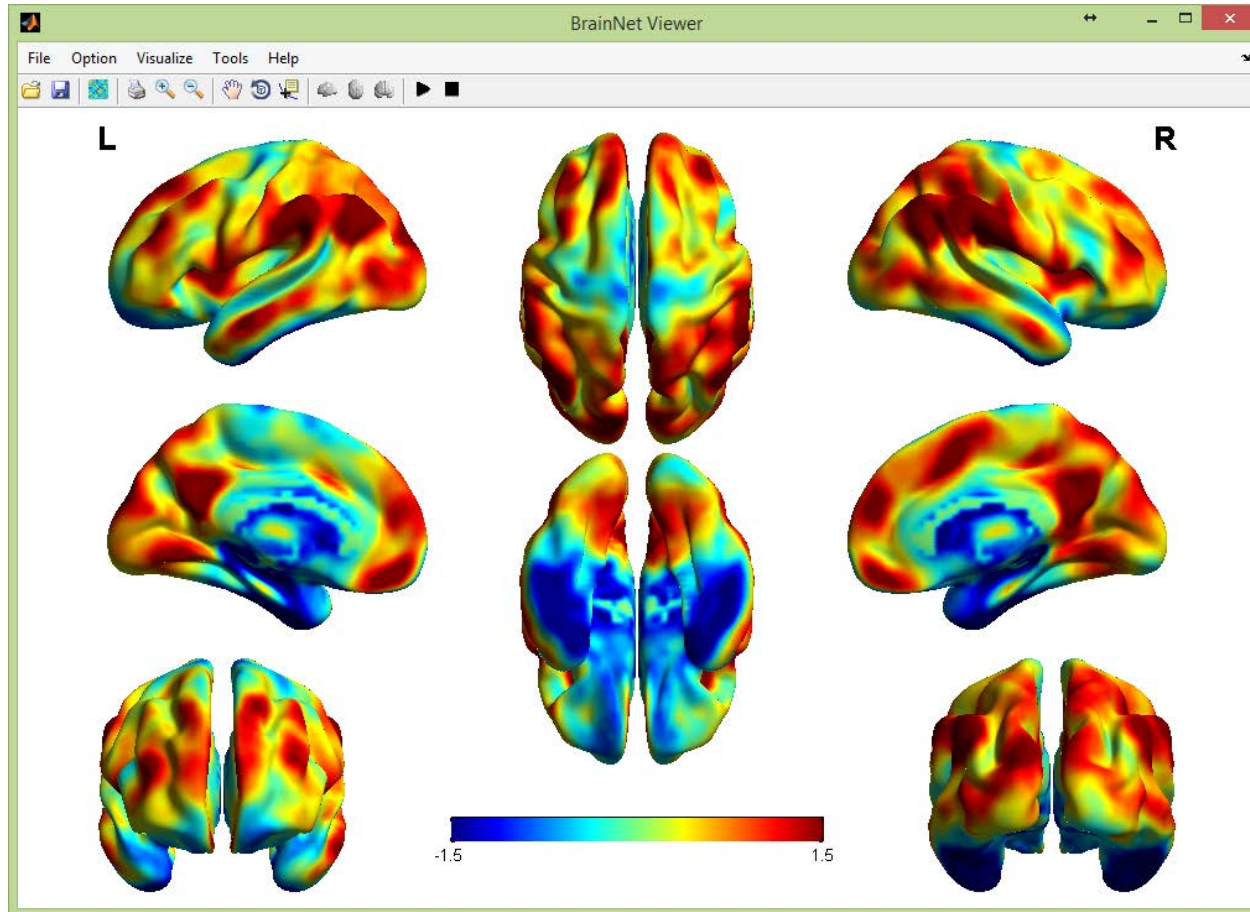
Type: `BrainNet_MapCfg('BrainMesh_ICBM152.nv','Practice.node','Practice.edge','Practice1.mat');`



# Example 7: Use commandline

*Draw volume mapping with pre-saved configuration*

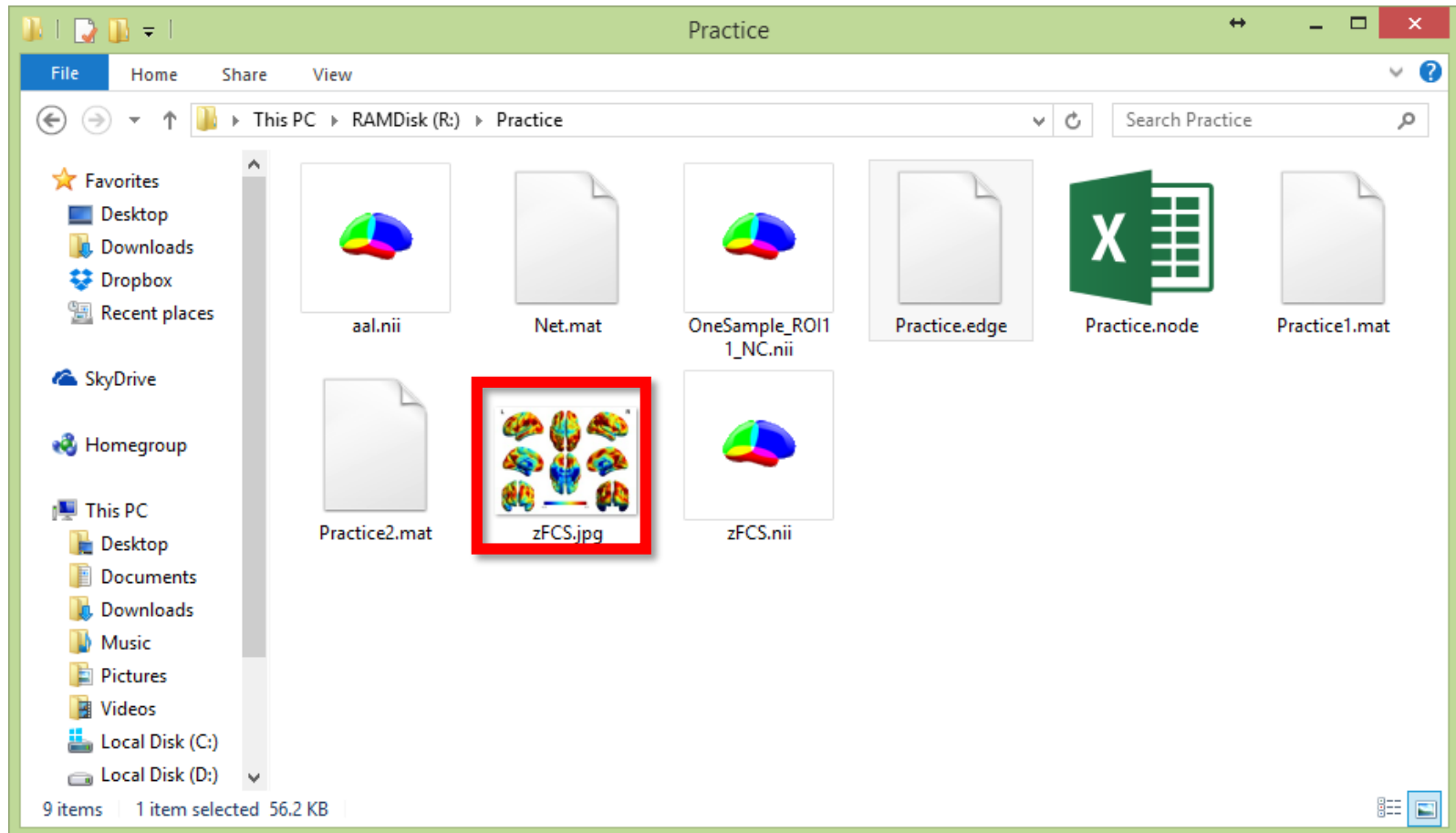
Type: `BrainNet_MapCfg('BrainMesh_ICBM152_smoothed.nv', 'zFCS.nii', 'Practice2.mat');`



# Example 7: Use commandline

*Draw volume mapping with pre-saved configuration,  
and save image*

Type: `BrainNet_MapCfg('BrainMesh_ICBM152_smoothed.nv', 'zFCS.nii', 'Practice2.mat', 'zFCS.jpg');`



Thanks!!