



# ContactSegmentation\_SYSU

## User Manuals

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China

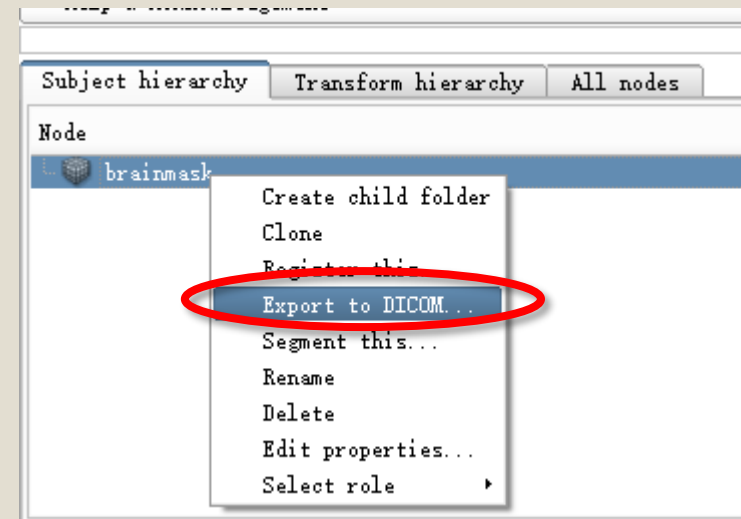
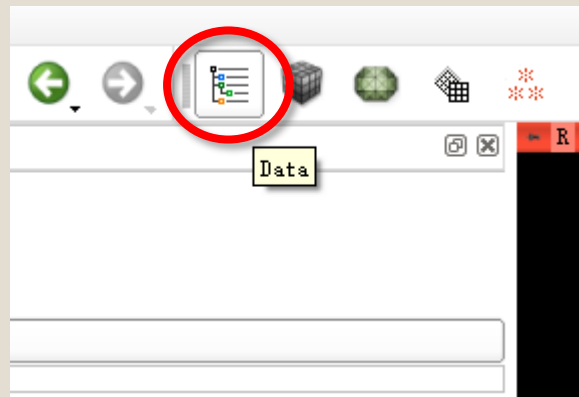
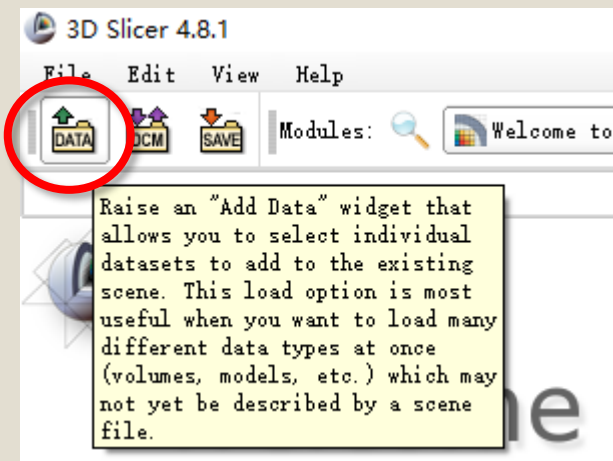
# ContactSegmentation\_SYSU

A Friendly MATLAB-based Graphical User Interface (GUI)  
for Automatically Localizing SEEG Electrode Contacts

1. Image Data Preparation
2. GUI Introduction
3. GUI Usage

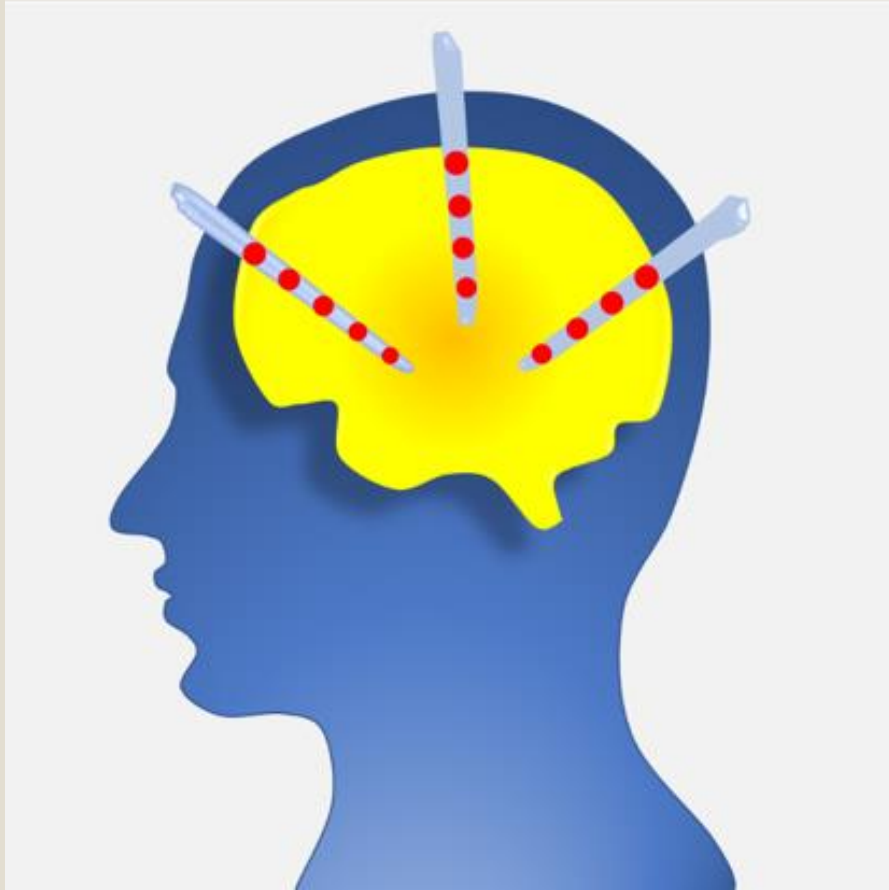
# 1. Image Data Preparation

- 1.1 Package the patient's MRI T1 images (dicom format) into a separate folder and name it '**MR\_T1**'.
- 1.2 Package the patient's CT scans (dicom format) into another separate folder and name it '**CT**'.
- 1.3 MRI T1 data of the patient should be reconstructed with FreeSurfer to obtain the mri/brainmask.mgz. Then open the brainmask.mgz with 3DSlicer, export to dicom files and name them as '**FsBrainmask**'.

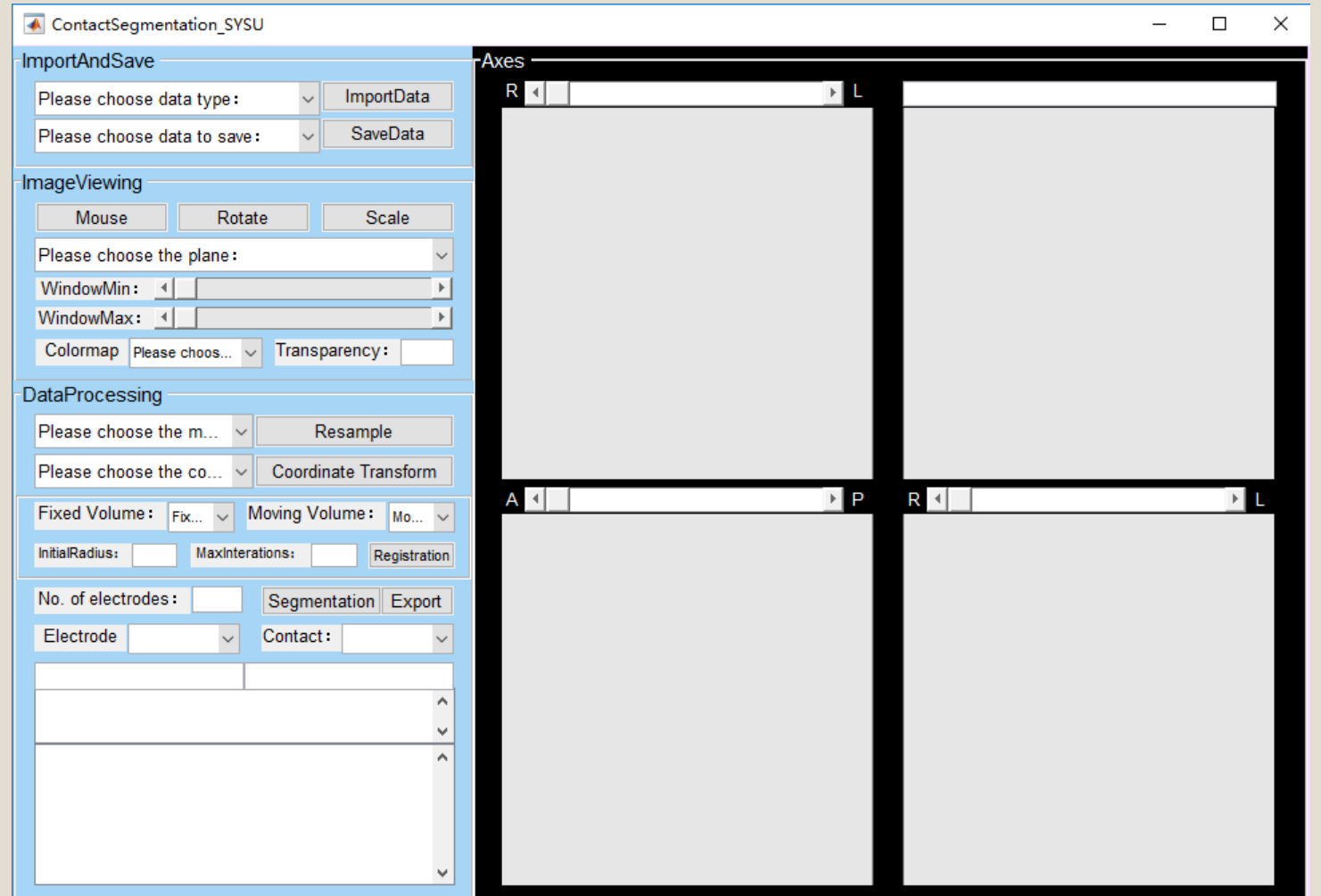


## 2. GUI Introduction

### Icon



### Interface



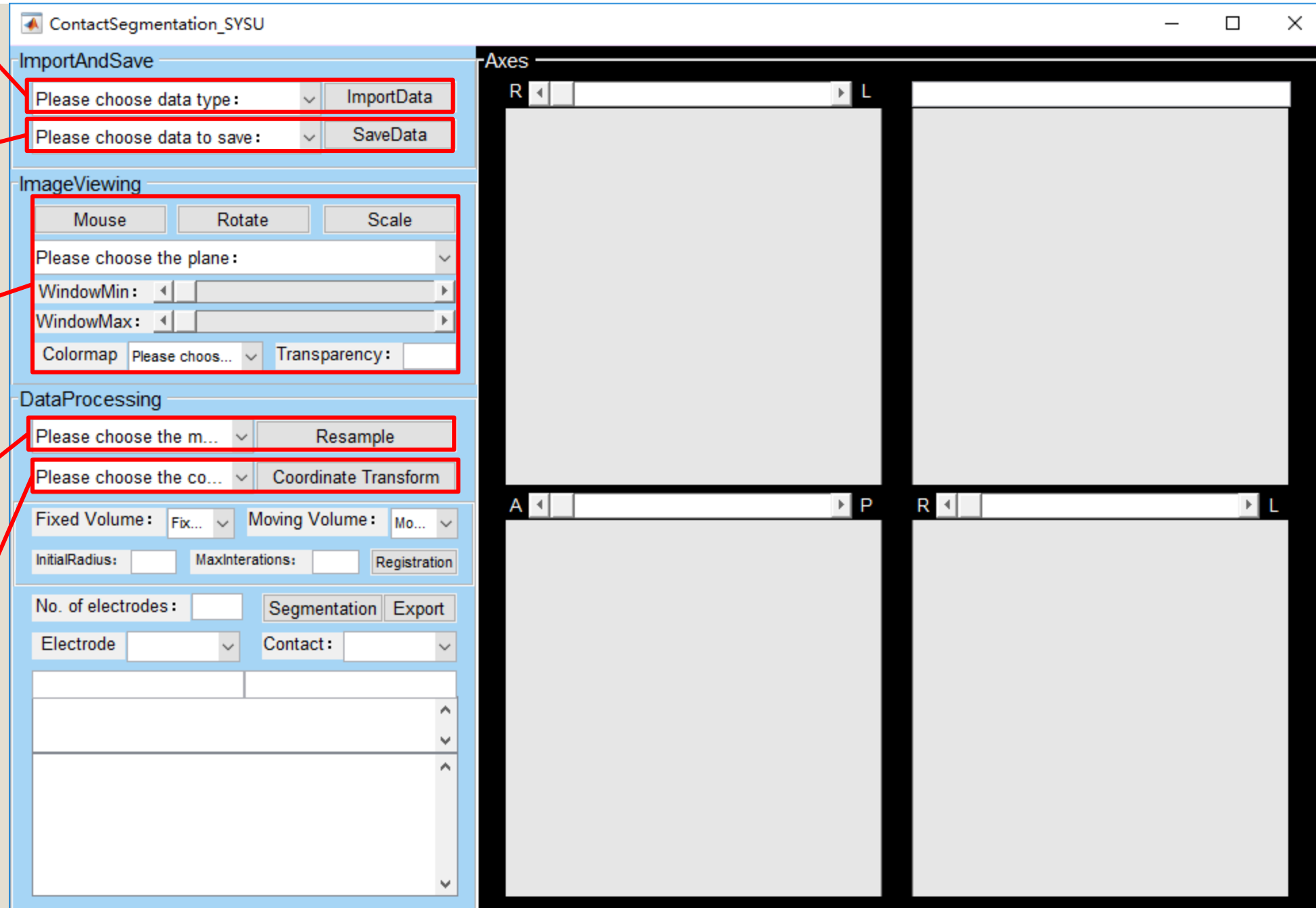
There are three data types to choose: dicom, nii and mat.

You can save the imported data or calculation results in mat format for direct use next time.

- Rotate and scale.
- Adjust window width and window level.
- Adjust the color bar and transparency.

Images Resampling:  
Nearest, linear and cubic are three interpolation methods, and **nearest** is usually chosen.

Coordinate transformation:  
LPH and RAS are two coordinate systems, and **RAS** is usually chosen.



## Registration

### Fixed Volume:

Choose the fixed volume.

### Moving Volume:

Choose the moving volume.

### InitialRadius:

Input the initial step size of the iteration.

### MaxIterations:

Input the maximum number of iterations.

## Segmentation

### No. of electrodes:

Input the total number of implanted electrodes in the patient's brain.

### Electrode:

Choose a specific electrode.

### Contact:

Choose a specific contact.

### Export:

Export the contact information to an Excel (Windows) or TXT (Mac) format file.

ContactSegmentation\_SYSU

ImportAndSave

Please choose data type:

Please choose data to save:

ImageViewing

Please choose the plane:

WindowMin:

WindowMax:

Colormap   Transparency:

DataProcessing

Please choose the m...

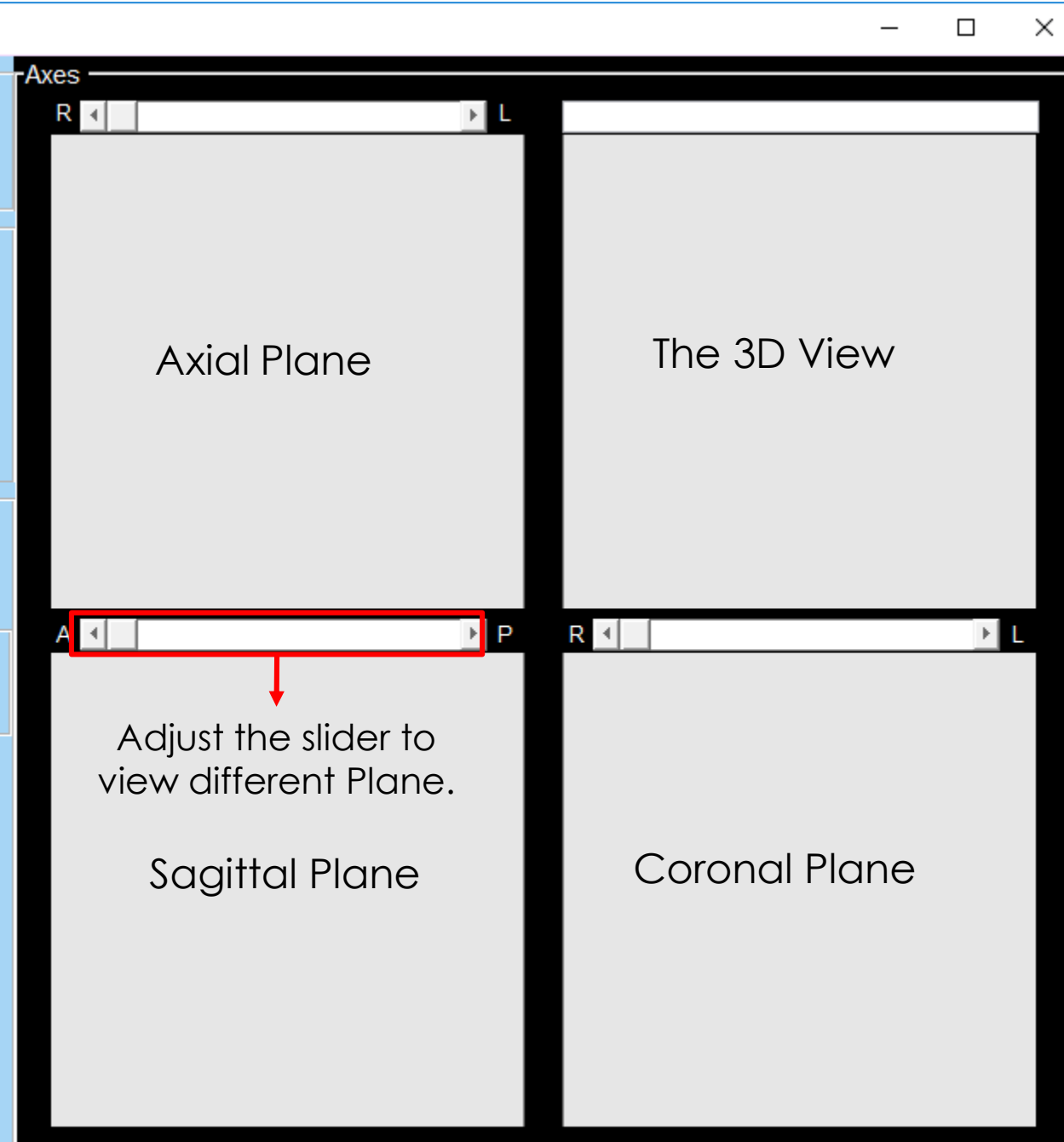
Please choose the co...

Fixed Volume:   Moving Volume:

InitialRadius:  MaxIterations:

No. of electrodes:

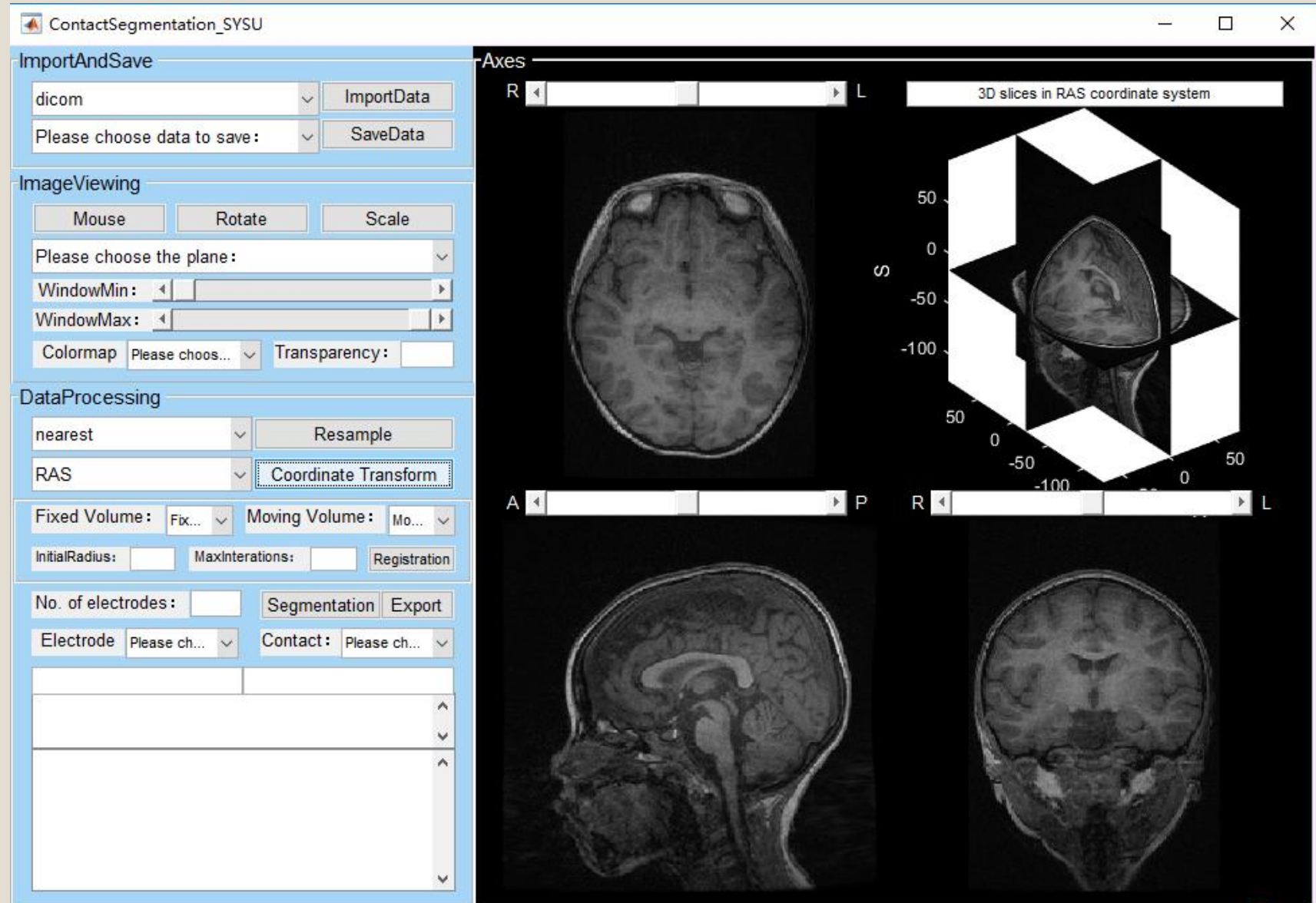
Electrode  Contact:



# 3. GUI Usage

## 3.1 Data import and Preprocessing

(1) Select 'dicom' data type and click 'ImportData' to import the patient's MR\_T1 images.

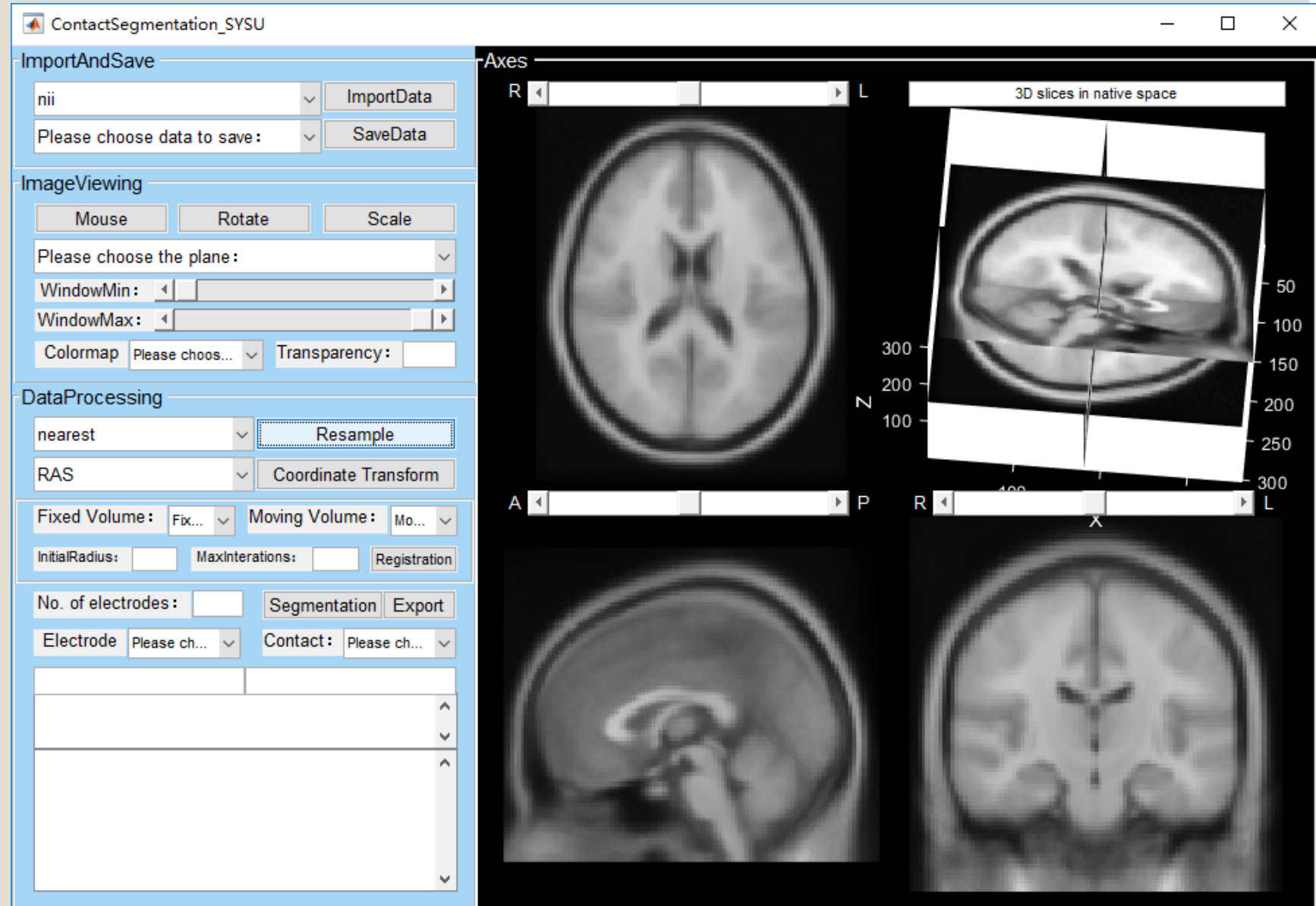




# 3. GUI Usage

## 3.1 Data import and Preprocessing

- (1) Select 'dicom' data type and click 'ImportData' to import the patient's MR\_T1 images.
- (2) Select 'nearest' interpolation method and click 'Resample' to resample the images.
- (3) Select 'RAS' coordinate system and click 'Coordinate Transform' to carry out coordinate transformation (**this step is optional**).
- (4) Repeat the above steps to preprocess the patient's CT and FsBrainmask images.

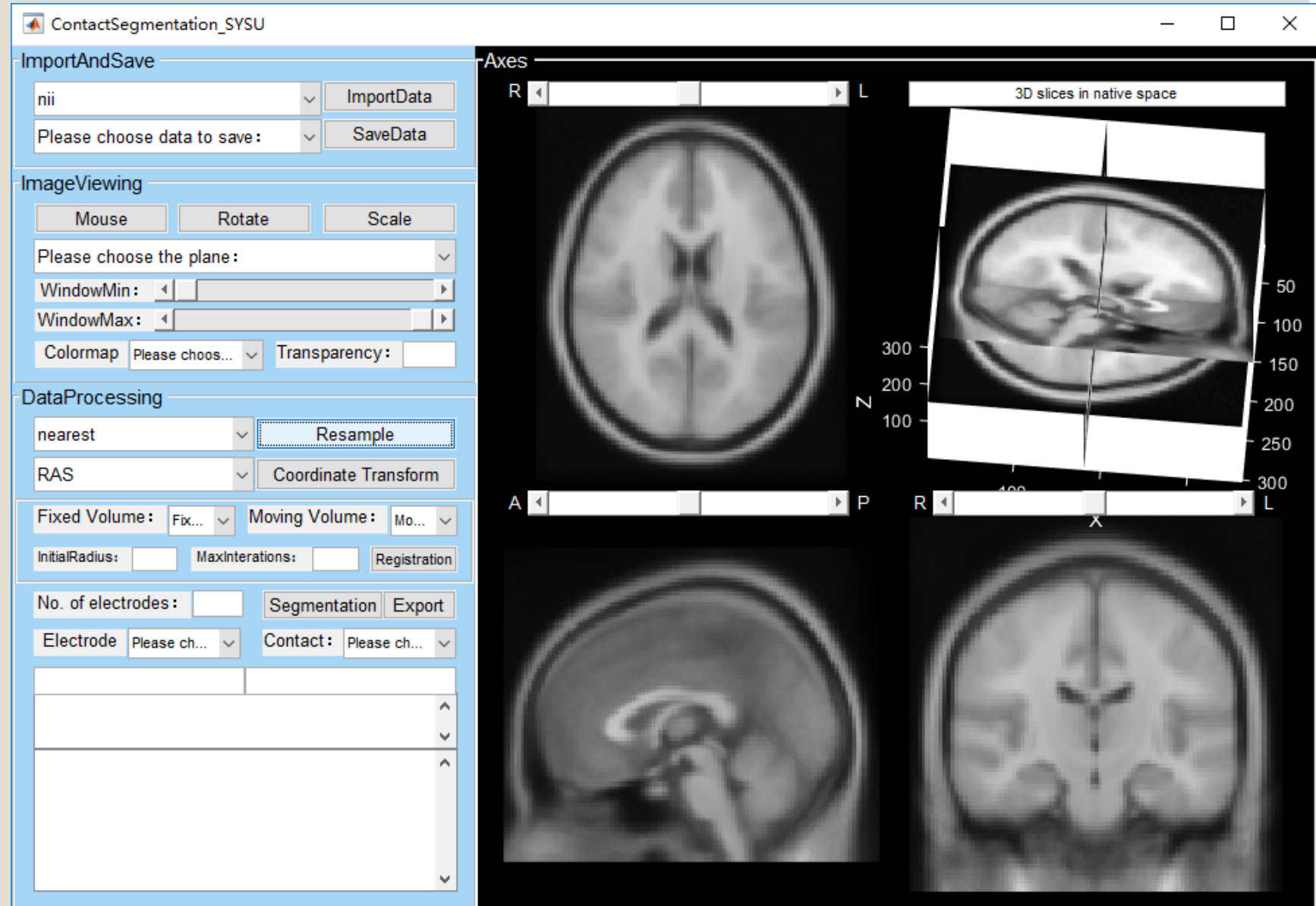




# 3. GUI Usage

## 3.1 Data import and Preprocessing

- (1) Select 'dicom' data type and click 'ImportData' to import the patient's MR\_T1 images.
- (2) Select 'nearest' interpolation method and click 'Resample' to resample the images.
- (3) Select 'RAS' coordinate system and click 'Coordinate Transform' to carry out coordinate transformation (**this step is optional**).
- (4) Repeat the above steps to preprocess the patient's CT and FsBrainmask images.
- (5) Select 'nii' data type and click 'ImportData' to import a canonical brain (avg152T1.nii). Then, repeat the steps in (2) and (3).



# 3. GUI Usage

## 3.2. Registration

(1) Register CT onto MR:

Fixed Volume: MR\_T1

Moving Volume: CT

InitialRadius: 0.005

MaxIterations: 1000

(2) Register FsBrainmask onto regCT:

Fixed Volume: regCT

Moving Volume: FsBrainmask

InitialRadius: 0.005

MaxIterations: 1000

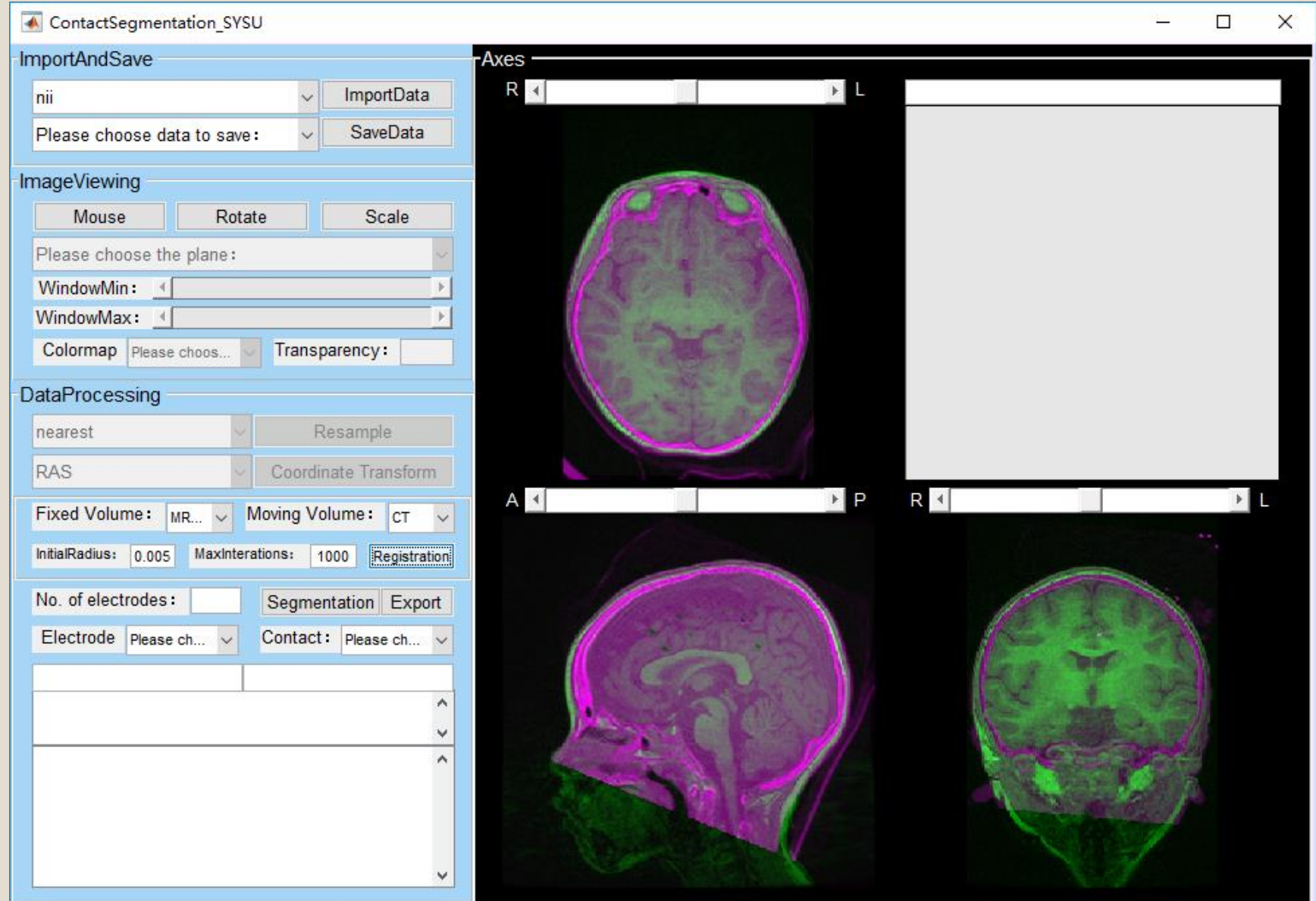
(3) Register MR\_T1 onto avg152T1:

Fixed Volume: avg152T1

Moving Volume: MR\_T1

InitialRadius: 0.0001

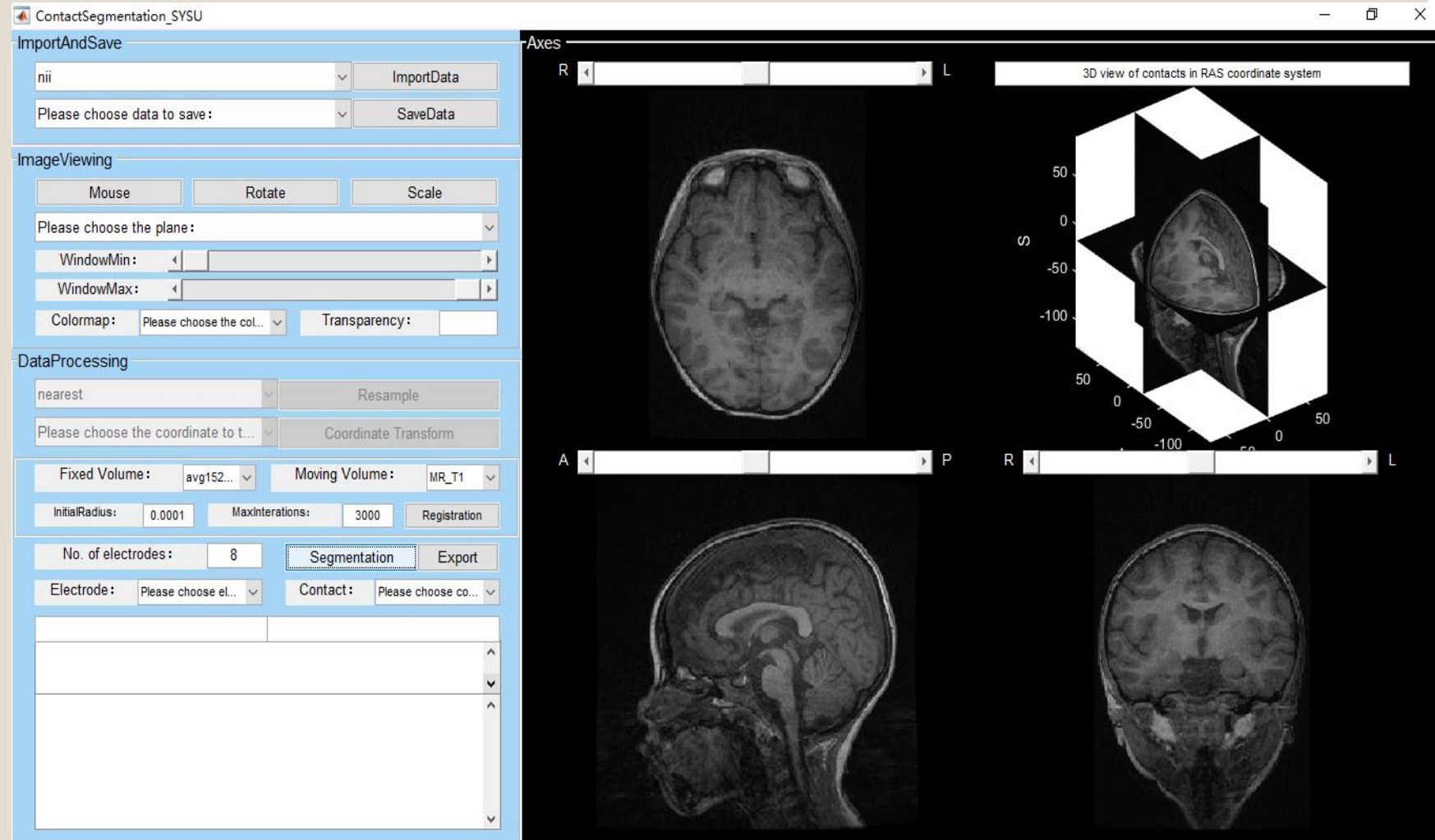
MaxIterations: 3000



# 3. GUI Usage

## 3.3. Contact Segmentation

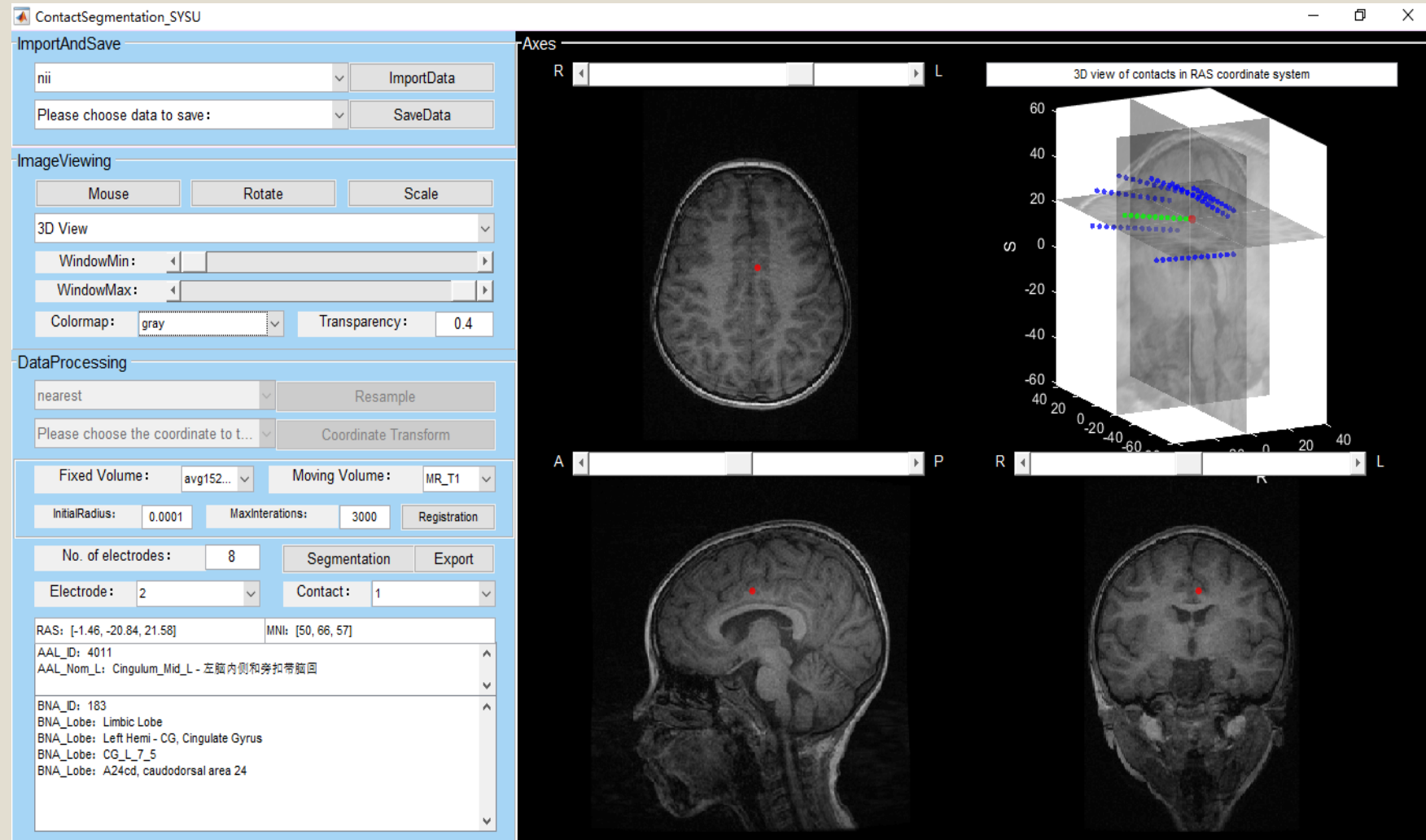
- (1) Input the total number of the electrodes implanted in the patient's brain in 'No. of electrodes'.
- (2) Click 'Segmentation' to perform automatic contact segmentation. It may cost more than 8 minutes, please wait patiently.



# 3. GUI Usage

## 3.3. Contact Segmentation

- (1) Input the total number of the electrodes implanted in the patient's brain in 'No. of electrodes'.
- (2) Click 'Segmentation' to perform automatic contact segmentation. It may cost more than 8 minutes, please wait patiently.
- (3) Choose the electrode number in 'Electrode' to view a specific electrode. At this time, the three sliders still can be adjusted to view different anatomical planes.
- (4) Choose the contact number in 'Contact' to view a specific electrode contact. At this time, the Axes Area shows the planes where the current electrode contact localized, and the three sliders cannot be adjusted now.





# 3. GUI Usage

## 3.4 Data Saving

(1) Select regCT, mask2regCT, T12avg, T12avg\_geomtfoem, e17EiContacts\_RASC, e17EiContacts\_sub and ElecInfo\_cell to save, respectively.

### All outputs:

**regCT:** volume produced by co-registering MR\_T1 and CT

**mask2regCT:** volume produced by co-registering regCT and FsBrainmask

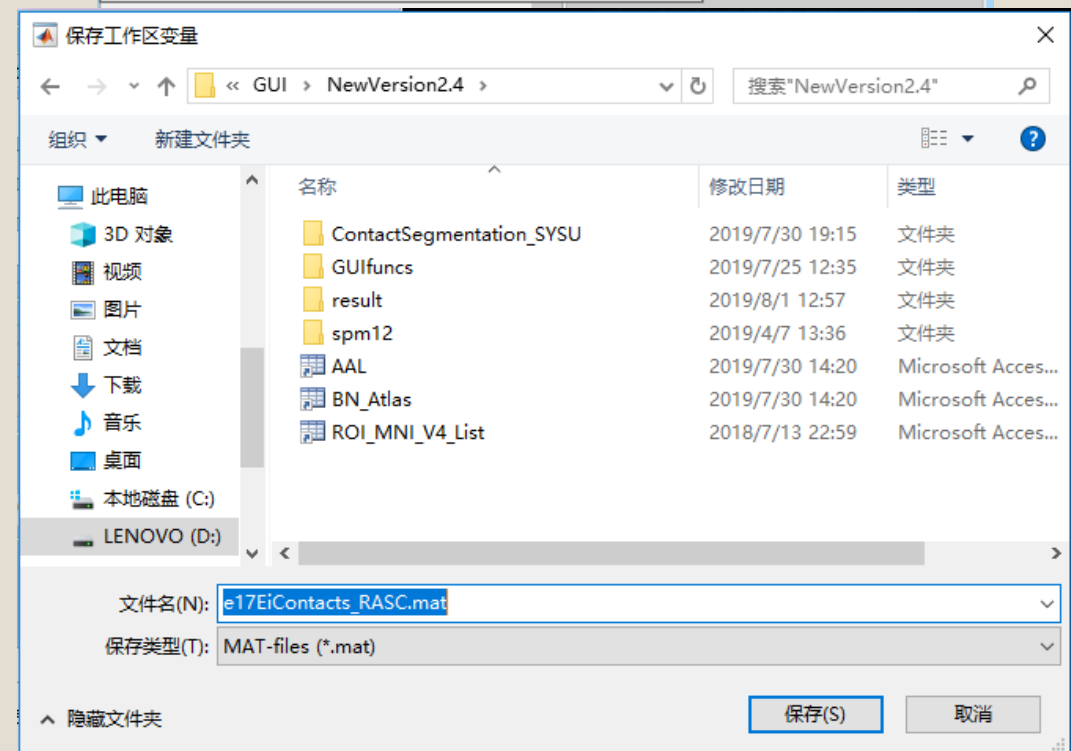
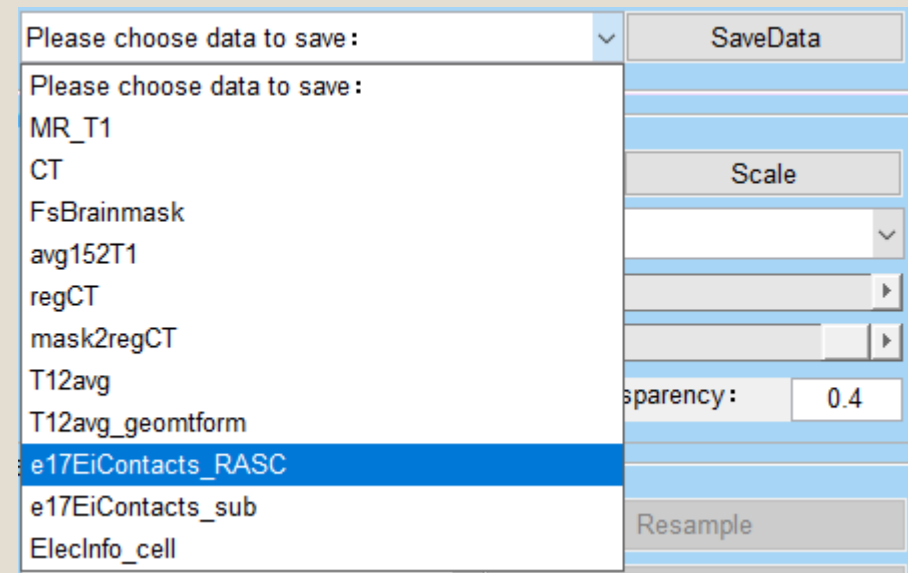
**T12avg:** volume produced by co-registering avg152T1 and MR\_T1

**T12avg\_geomtfoem:** transformational matrix produced by co-registering avg152T1 and MR\_T1

**e17EiContacts\_RASC:** RAS coordinates of all contacts

**e17EiContacts\_sub:** subscript index of all contacts

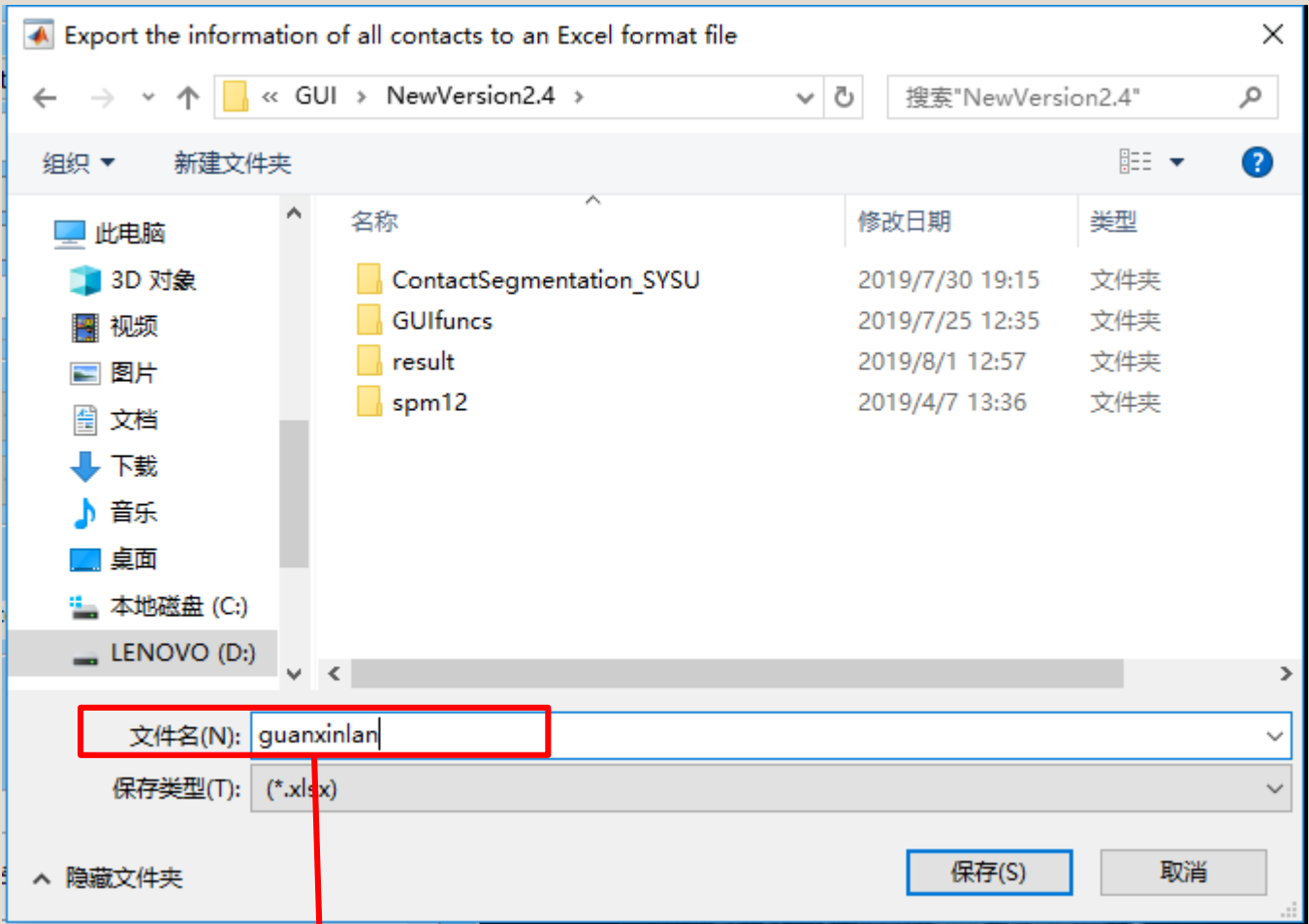
**ElecInfo\_cell:** information including RAS coordinates, MNI coordinates, AAL and Brainnetome (BN) brain region of each contact



# 3. GUI Usage

## 3.4 Data Saving

- (1) Select regCT, mask2regCT, T12avg, T12avg\_geomtfoem, e17EiContacts\_RASC, e17EiContacts\_sub and ElecInfo\_cell to save, respectively.
- (2) click 'Export' to export the contact information to an Excel (Windows) or TXT (Mac) format file.



Input the patient's name

文件 开始 插入 页面布局 公式 数据 审阅 视图 福昕PDF 告诉我您想要做什么...

剪贴板

等线 11 A A

B I U

自动换行

常规

条件格式 套用 单元格样式

插入 删除 格式

自动求和 填充 清除

排序和筛选 查找和选择

粘贴 格式刷 字体 对齐方式 数字 样式 单元格 编辑

A2

✕ ✓ fx 1

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	Electrode	Contact	N R	A	S	MNI_Index	AAL ID	AAL_Nom	AAL_Nom	BNA ID	BNA_Lobe	BNA_Gyrus	BNA_Hemi	BNA_Descriptions				
2	1	1	0.319664	-60.9801	14.26027	[49, 40, 55]	4011	CINMG	Cingulum_	175	Limbic Lob	Left Hemi	CG_L_7_1	A23d, dorsal area 23				
3	1	2	-3.17591	-61.0454	14.42361	[51, 40, 55]	4011	CINMG	Cingulum_	153	Parietal Lo	Left Hemi	PCun_L_4_4	A31, area 31 (Lc1)				
4	1	3	-6.67149	-61.1107	14.58696	[53, 40, 55]	4011	CINMG	Cingulum_	153	Parietal Lo	Left Hemi	PCun_L_4_4	A31, area 31 (Lc1)				
5	1	4	-10.1671	-61.1761	14.7503	[55, 40, 55]	--	--	--	--	--	--	--	--				
6	1	5	-13.6626	-61.2414	14.91365	[56, 40, 55]	--	--	--	--	--	--	--	--				
7	1	6	-17.1582	-61.3068	15.07699	[58, 40, 55]	--	--	--	--	--	--	--	--				
8	1	7	-20.6538	-61.3721	15.24034	[60, 40, 55]	--	--	--	129	Parietal Lo	Left Hemi	SPL_L_5_3	A5l, lateral area 5				
9	1	8	-24.1494	-61.4374	15.40368	[62, 40, 55]	--	--	--	129	Parietal Lo	Left Hemi	SPL_L_5_3	A5l, lateral area 5				
10	1	9	-27.6449	-61.5028	15.56703	[64, 40, 55]	--	--	--	137	Parietal Lo	Left Hemi	IPL_L_6_2	A39rd, rostro-dorsal area 39(Hip3)				
11	1	10	-31.1405	-61.5681	15.73037	[66, 40, 55]	6201	P2G	Parietal_Inf	137	Parietal Lo	Left Hemi	IPL_L_6_2	A39rd, rostro-dorsal area 39(Hip3)				
12	1	11	-34.6361	-61.6334	15.89372	[68, 40, 55]	6201	P2G	Parietal_Inf	--	--	--	--	--				
13	1	12	-38.1317	-61.6988	16.05706	[69, 40, 55]	6201	P2G	Parietal_Inf	141	Parietal Lo	Left Hemi	IPL_L_6_4	A40c, caudal area 40(PFm)				
14	1	13	-41.6272	-61.7641	16.22041	[71, 40, 55]	6201	P2G	Parietal_Inf	141	Parietal Lo	Left Hemi	IPL_L_6_4	A40c, caudal area 40(PFm)				
15	1	14	-45.1228	-61.8295	16.38375	[73, 40, 55]	6201	P2G	Parietal_Inf	141	Parietal Lo	Left Hemi	IPL_L_6_4	A40c, caudal area 40(PFm)				
16	1	15	-48.6184	-61.8948	16.5471	[75, 40, 55]	6201	P2G	Parietal_Inf	141	Parietal Lo	Left Hemi	IPL_L_6_4	A40c, caudal area 40(PFm)				
17	1	16	-52.114	-61.9601	16.71044	[77, 40, 55]	6211	GSMG	SupraMarg	141	Parietal Lo	Left Hemi	IPL_L_6_4	A40c, caudal area 40(PFm)				
18	1	17	-55.6095	-62.0255	16.87378	[79, 39, 55]	--	--	--	--	--	--	--	--				
19	1	18	-59.1051	-62.0908	17.03713	[81, 39, 56]	--	--	--	--	--	--	--	--				
20	2	1	-1.46436	-20.8396	21.58112	[50, 66, 57]	4011	CINMG	Cingulum_	183	Limbic Lob	Left Hemi	CG_L_7_5	A24cd, caudodorsal area 24				
21	2	2	-4.90404	-21.1132	22.16743	[52, 65, 57]	4011	CINMG	Cingulum_	9	Frontal Lo	Left Hemi	SFG_L_7_5	A6m, medial area 6				
22	2	3	-8.34372	-21.3868	22.75373	[54, 65, 58]	--	--	--	--	--	--	--	--				
23	2	4	-11.7834	-21.6604	23.34004	[55, 65, 58]	--	--	--	--	--	--	--	--				
24	2	5	-15.2231	-21.934	23.92635	[57, 65, 58]	--	--	--	--	--	--	--	--				

guanxinlan



# How to use the software to view the existing registration results or contact segmentation results ?

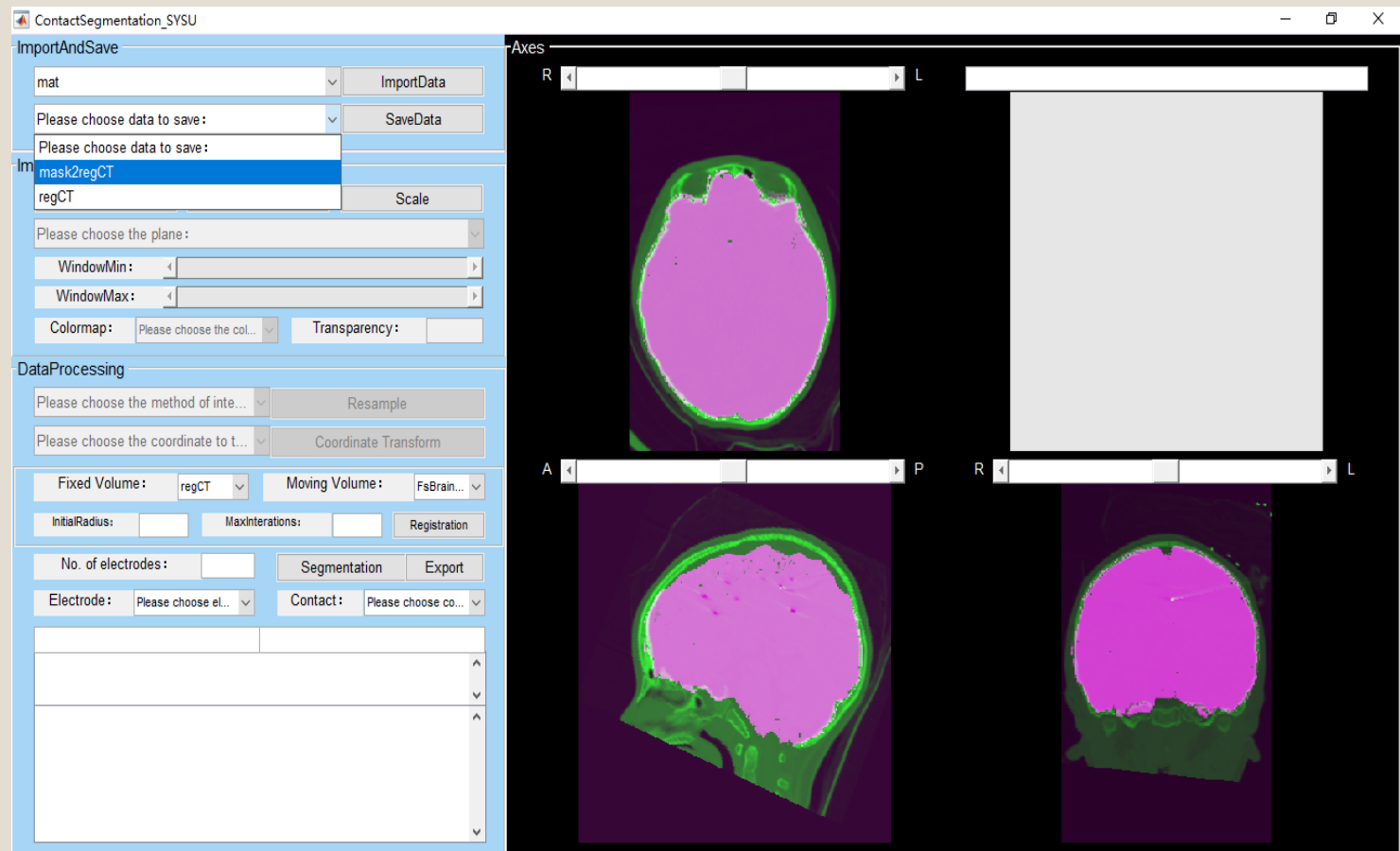
## I. View existing registration results

Just import the Fixed Volume and Moving Volume to view. For example, to view the results of registering CT onto MR\_T1, the steps are as follows:

- (1) Select 'dicom' and click 'ImportData' to import patient's MR\_T1 images.
- (2) Select 'mat' and click 'ImportData' to import the registration result — regCT.
- (3) Select MR\_T1 as the Fixed Volume and CT as the Moving Volume, and click 'Registration' directly. InitialRadius and MaxIterations are not needed to input.

For another example, if you want to view the results of registering FsBrainmask onto regCT, just do like this:

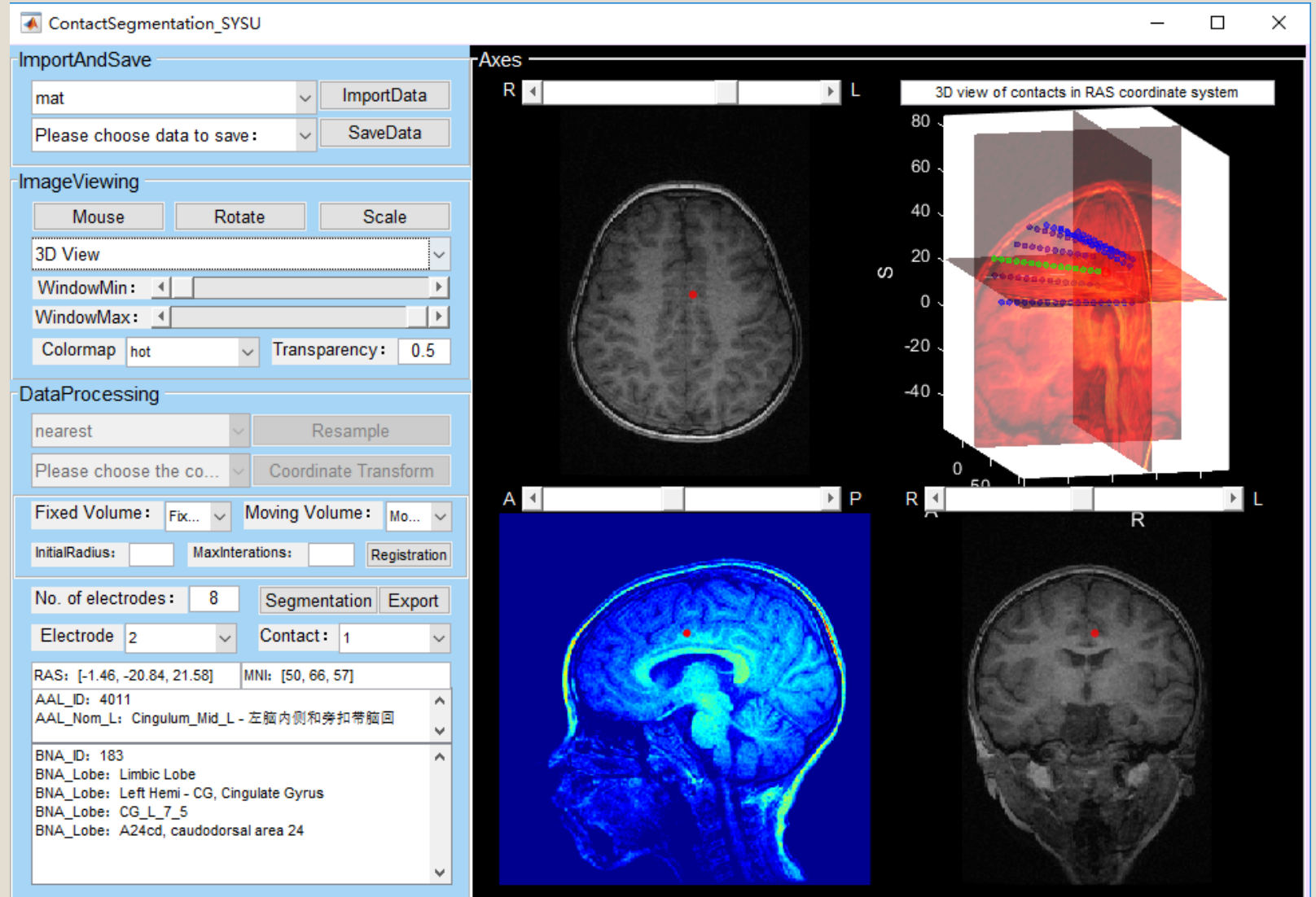
- (1) Select 'mat' and click 'ImportData' to import the registration results regCT and mask2regCT (you can hold down 'Ctrl' or 'Command' key to import multiple files at one time).
- (2) Select regCT as the Fixed Volume and FsBrainmask as the Moving Volume, and click 'Registration' directly. InitialRadius and MaxIterations are not needed to input.



# How to use the software to view the existing registration results or contact segmentation results ?

## II. View existing contact segmentation results

- (1) Select 'dicom' and click 'ImportData' to import patient's MR\_T1 images.
- (2) Select 'nearest' interpolation method and click 'Resample' to resample the images.
- (3) Select 'mat' and click 'ImportData'. Then, hold down 'Ctrl' or 'Command' key to select T12avg\_geomtfoem, e17EiContacts\_RASC, e17EiContacts\_sub and ElecInfo\_cell to import them at one time.
- (4) Input the total number of the electrodes implanted into the patient's brain in 'No. Of electrodes' and click 'Segmentation' to view the segmented contacts. Different contacts on different electrodes can be viewed by selecting the electrode number in 'Electrode' and the contact number in 'Contact'.



## ***What should I do if I forget to export the contact information after the segmentation?***

If you have saved the segmentation results, you can select the 'mat' data type and click 'ImportData' to import ElecInfo\_cell. Then, click 'Export' to export the contact information to an Excel or TXT format file.

But if you did not save the segmentation results, you should perform all the segmentation steps again.

**THANKS !**