



NA-MIC

National Alliance for Medical Image Computing

<http://www.na-mic.org>

Automatic LA Scar Detection

Greg Gardner, Alan Morris, Danny Perry, Josh Cates

SCI Institute/CARMA Center

University of Utah

ggardner@sci.utah.edu | 801.585.0649

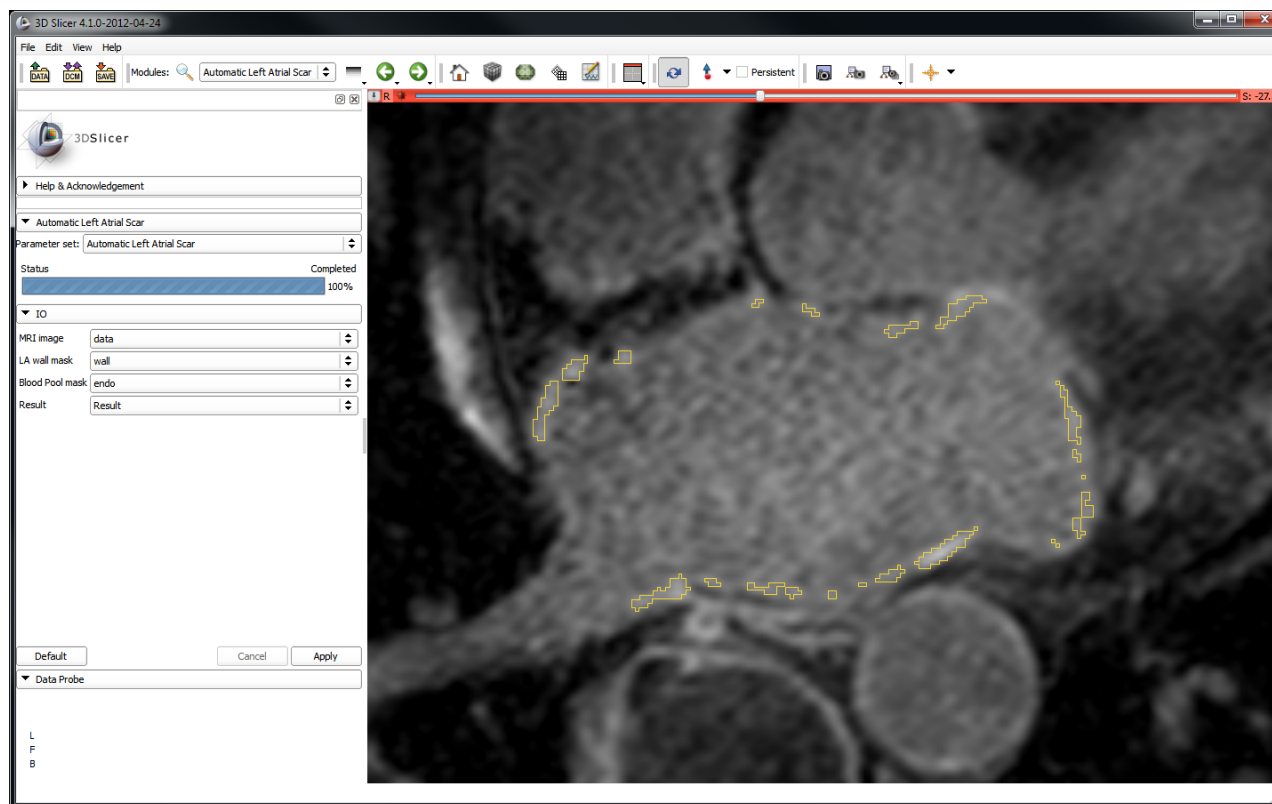
NA-MIC Tutorial Contest: Summer 2012



© 2011, All Rights Reserved



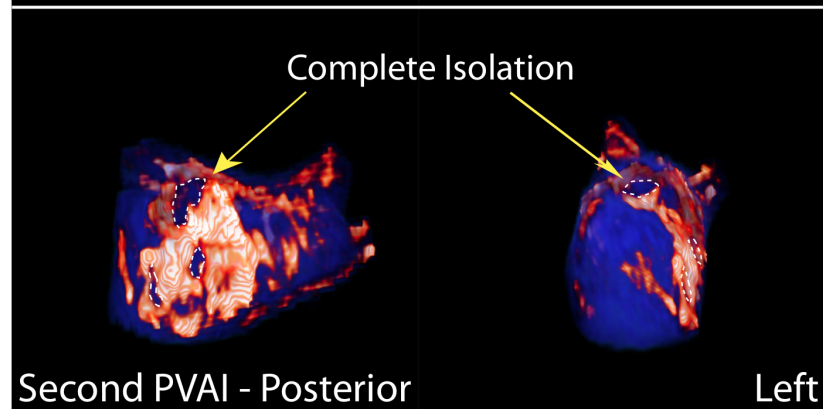
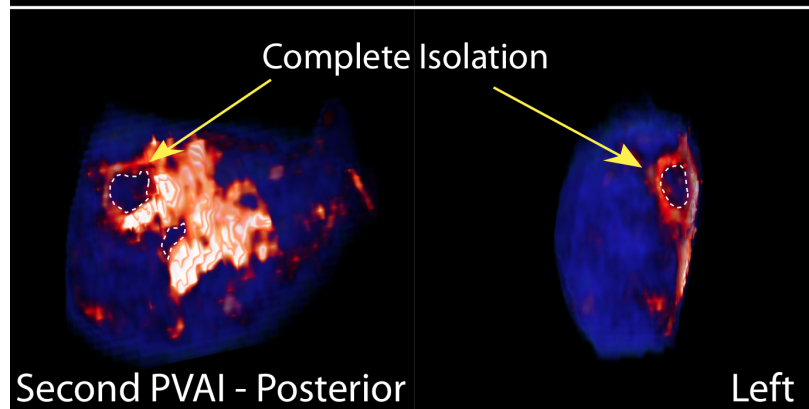
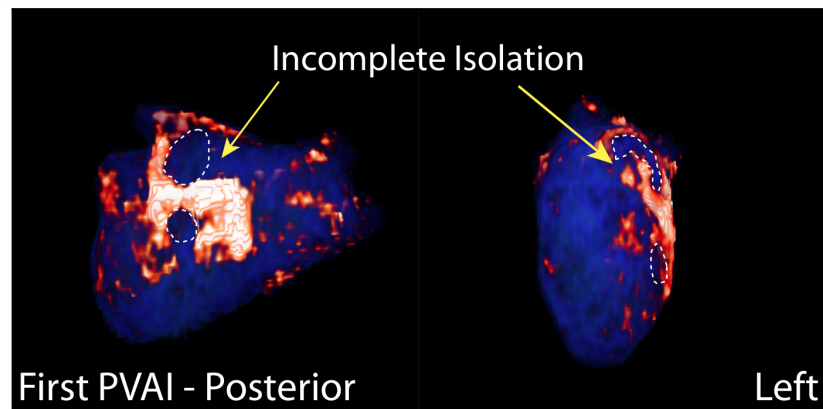
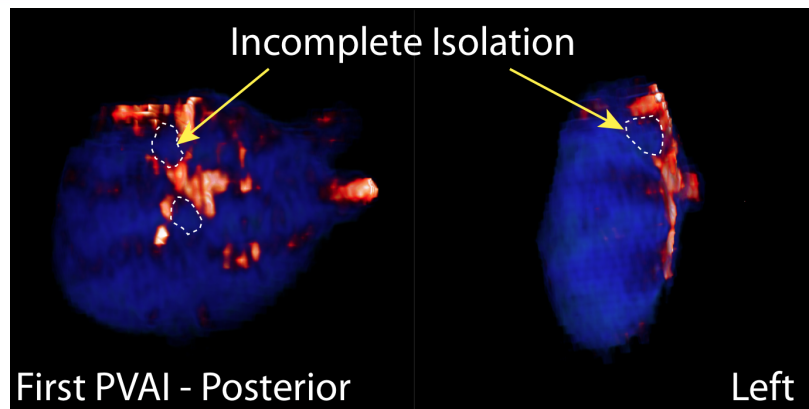
Learning Objective



Automatic left atrial (LA) scar detection in Slicer



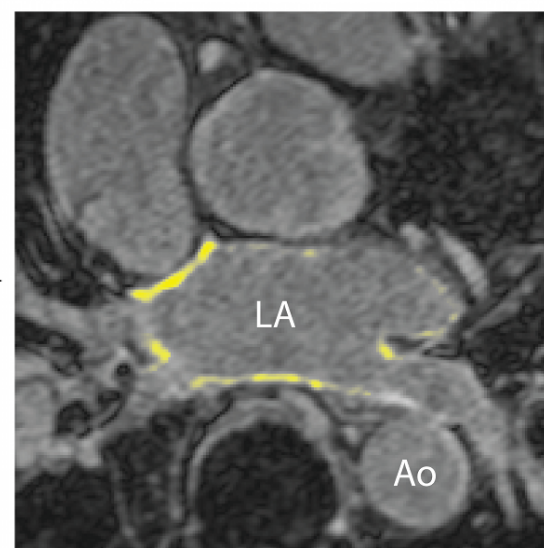
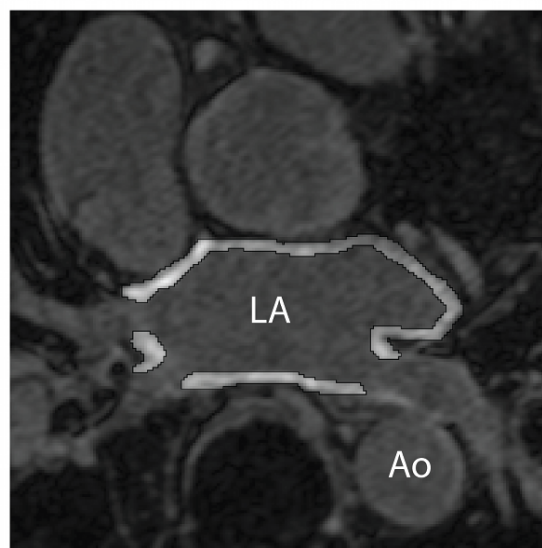
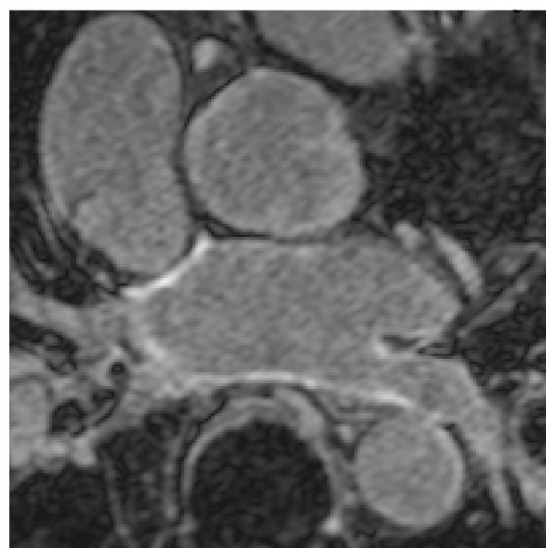
Background



McGann et al. JACC,52(15): 1263-1272, 2008



Current Workflow



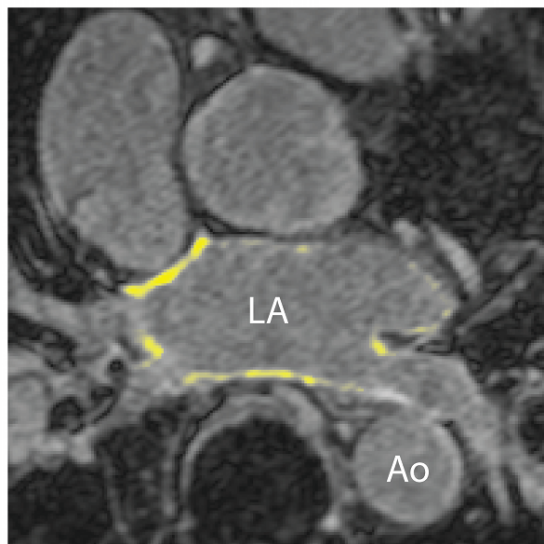
Acquire
LGE-MRI

Manually segment
LA wall

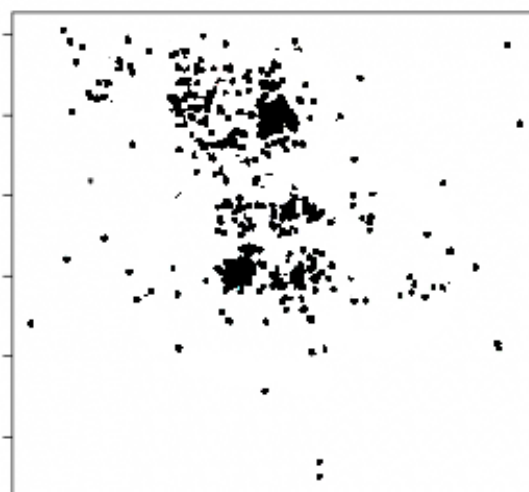
Manually
segment scar



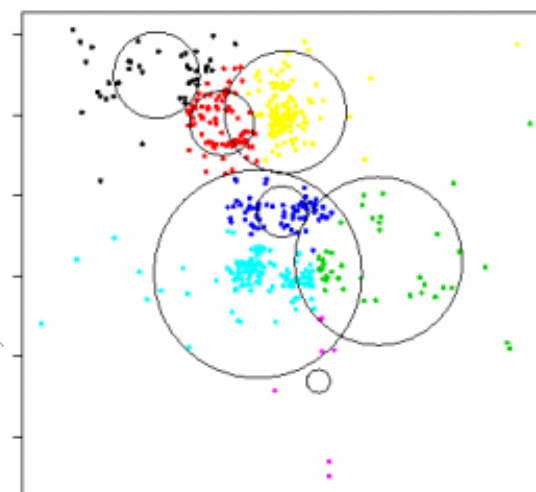
Current Workflow



Manually
segment scar



Raw Data



Clustered Data

Automatically
segment scar

Perry et al. SPIE, Feb. 2012



Required Materials

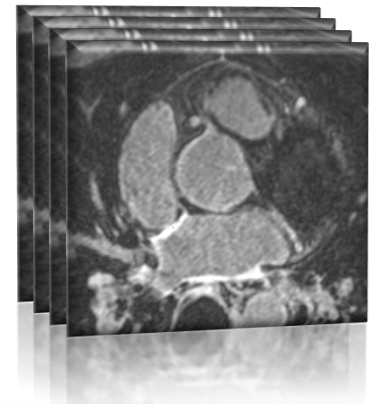
- **Slicer:** Release 4.1

<http://www.slicer.org/pages/Downloads/>



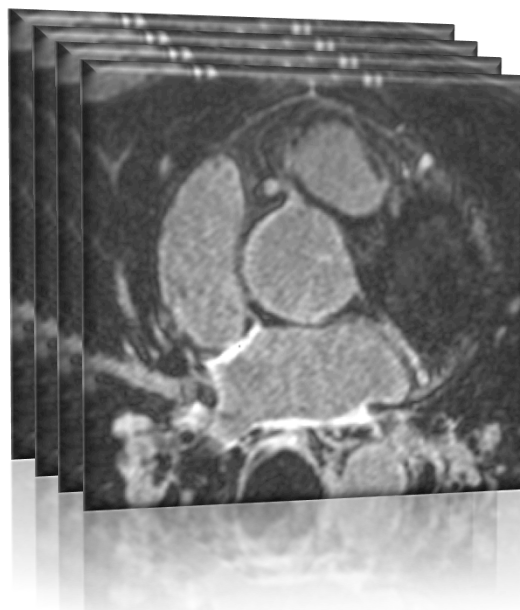
- **Data:** CARMA Left Atrial Scar

http://wiki.na-mic.org/Wiki/index.php/File:CARMA-LA-Scar_TutorialContestSummer2012.zip





Additional Sample Data



32 patients

MIDAS

<http://www.insight-journal.org/midas/collection/view/197>



Pre-requisite Tutorial



Surgical Planning Laboratory
Brigham and Women's Hospital
Boston, Massachusetts USA

a teaching affiliate of
Harvard Medical School

Data Loading and 3D Visualization

Sonia Pujol, Ph.D., Harvard Medical School
Director of Training, National Alliance for Medical Image Computing

<http://www.slicer.org/slicerWiki/index.php/Documentation/4.0/Training>



Platforms

Developed

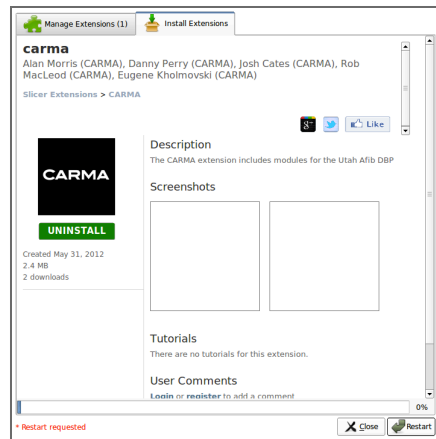


Tested

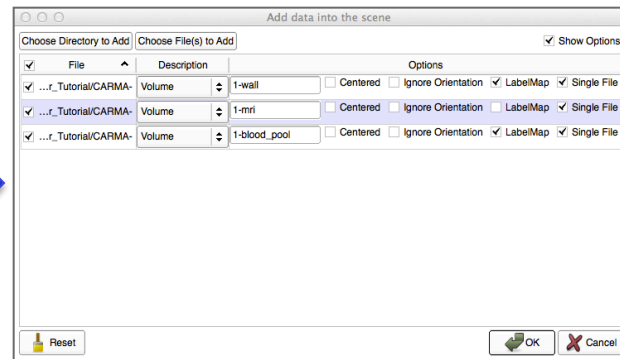




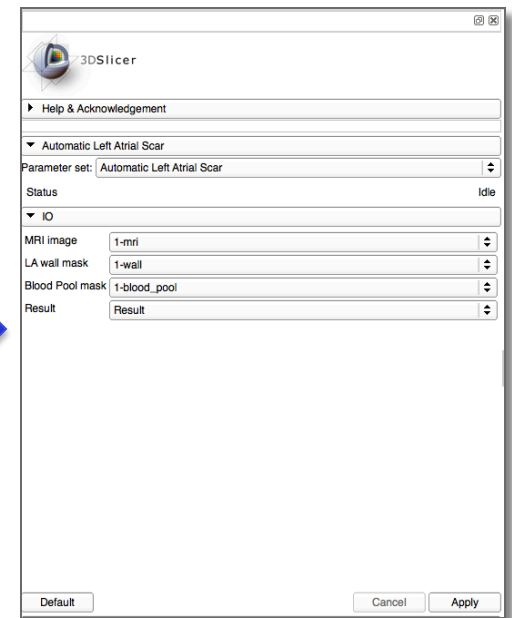
Overview



Load the
module



Load the
dataset



Automatic scar
detection



Loading the Module

Select View>Extension Manager in the menu bar (or push ⌘4)

If the Extension Manager isn't revealed, see the next 2 slides; otherwise, skip them

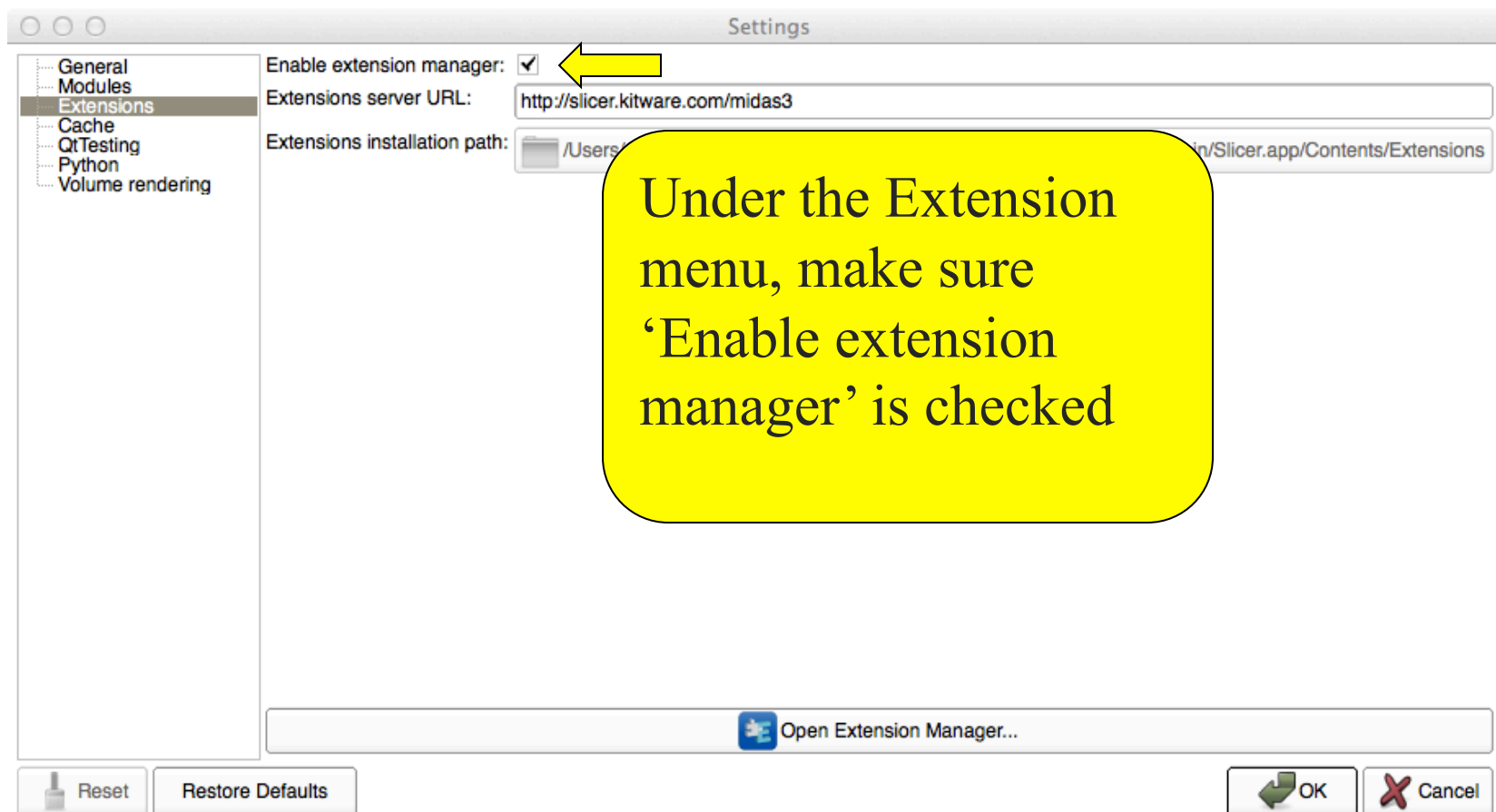


Loading the Module

To load the Extension Manager, Select
Edit>Application
Settings in the menu bar
(or push ⌘2)

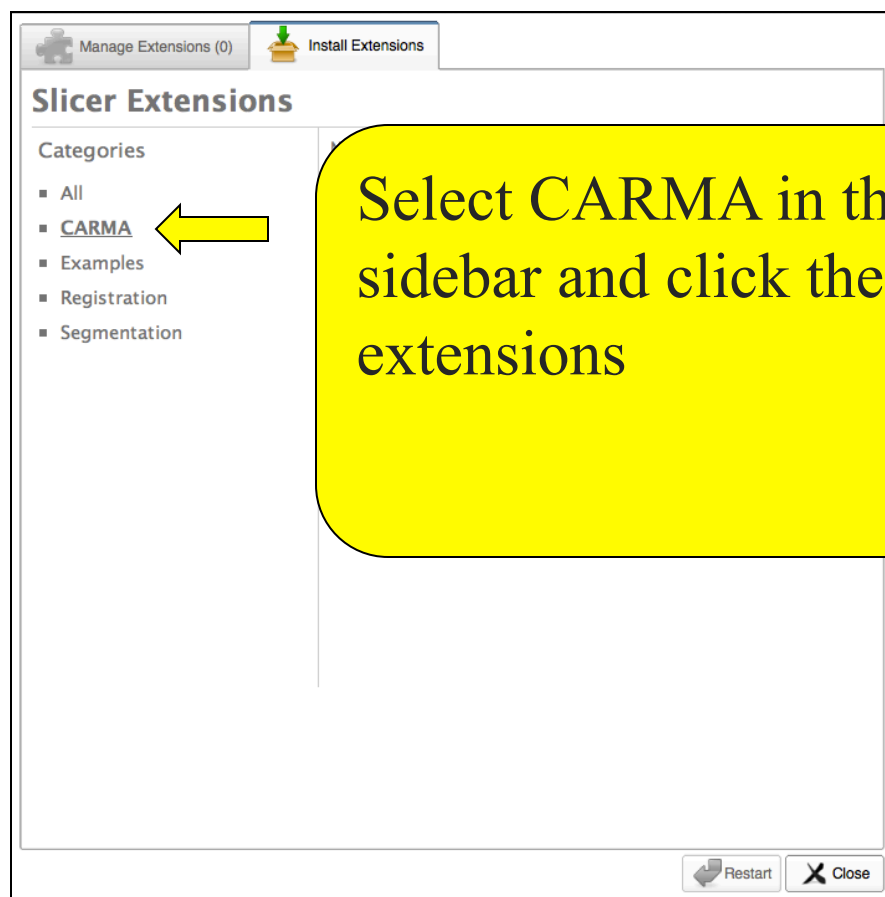


Loading the Module





Loading the Module





Loading the Module

Manage Extensions (1) Install Extensions

carma
Alan Morris (CARMA), Danny Perry (CARMA), Josh Cates (CARMA), Rob MacLeod (CARMA), Eugene Kholmovski (CARMA)

Slicer Extensions > CARMA

UNINSTALL

Created May 31, 2012
2.4 MB
2 downloads

Description
The CARMA extension includes modules for the Utah Afib DBP

Screenshots

Tutorials
There are no tutorials for this extension.

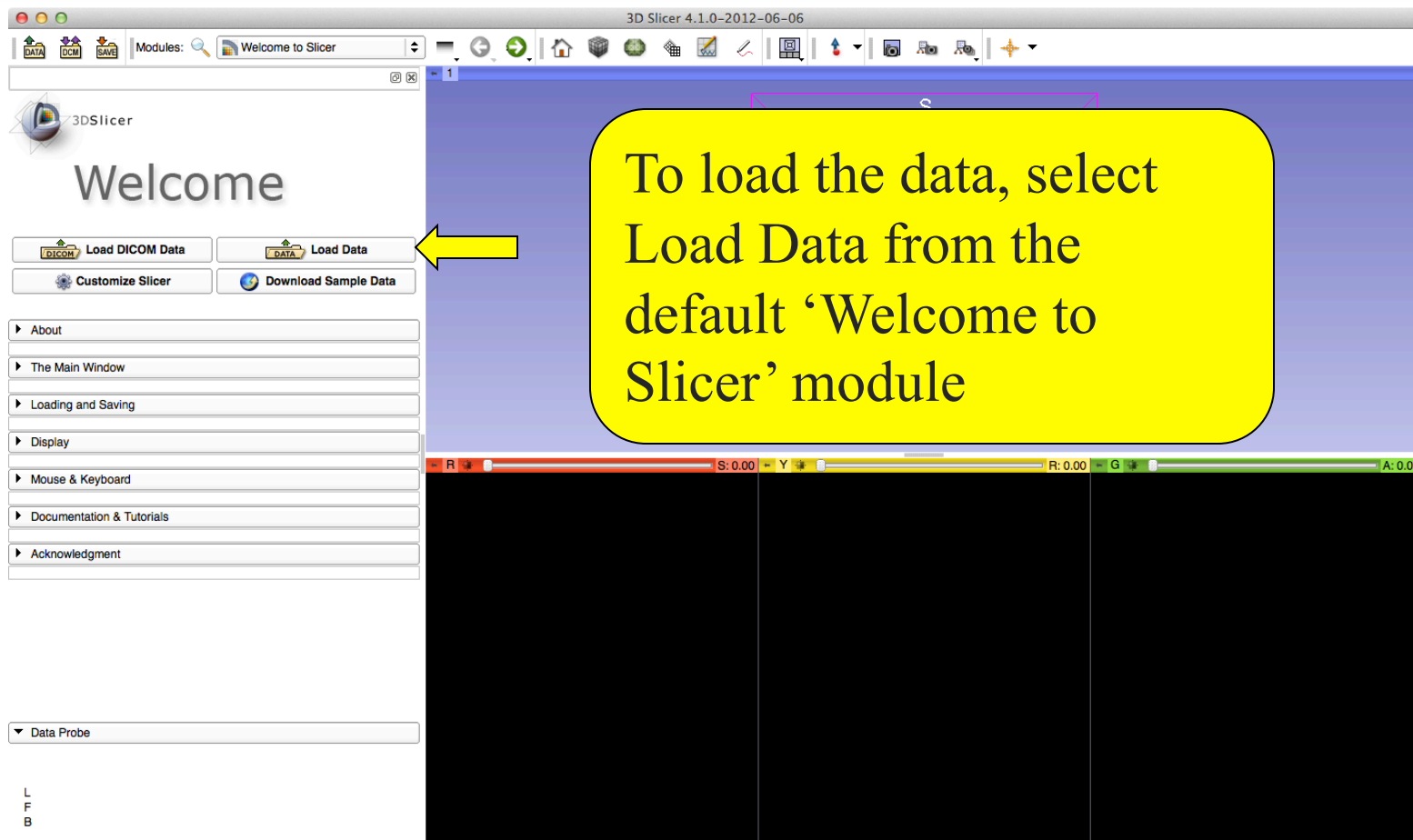
User Comments
[Login](#) or [register](#) to add a comment

* Restart requested

Close Restart

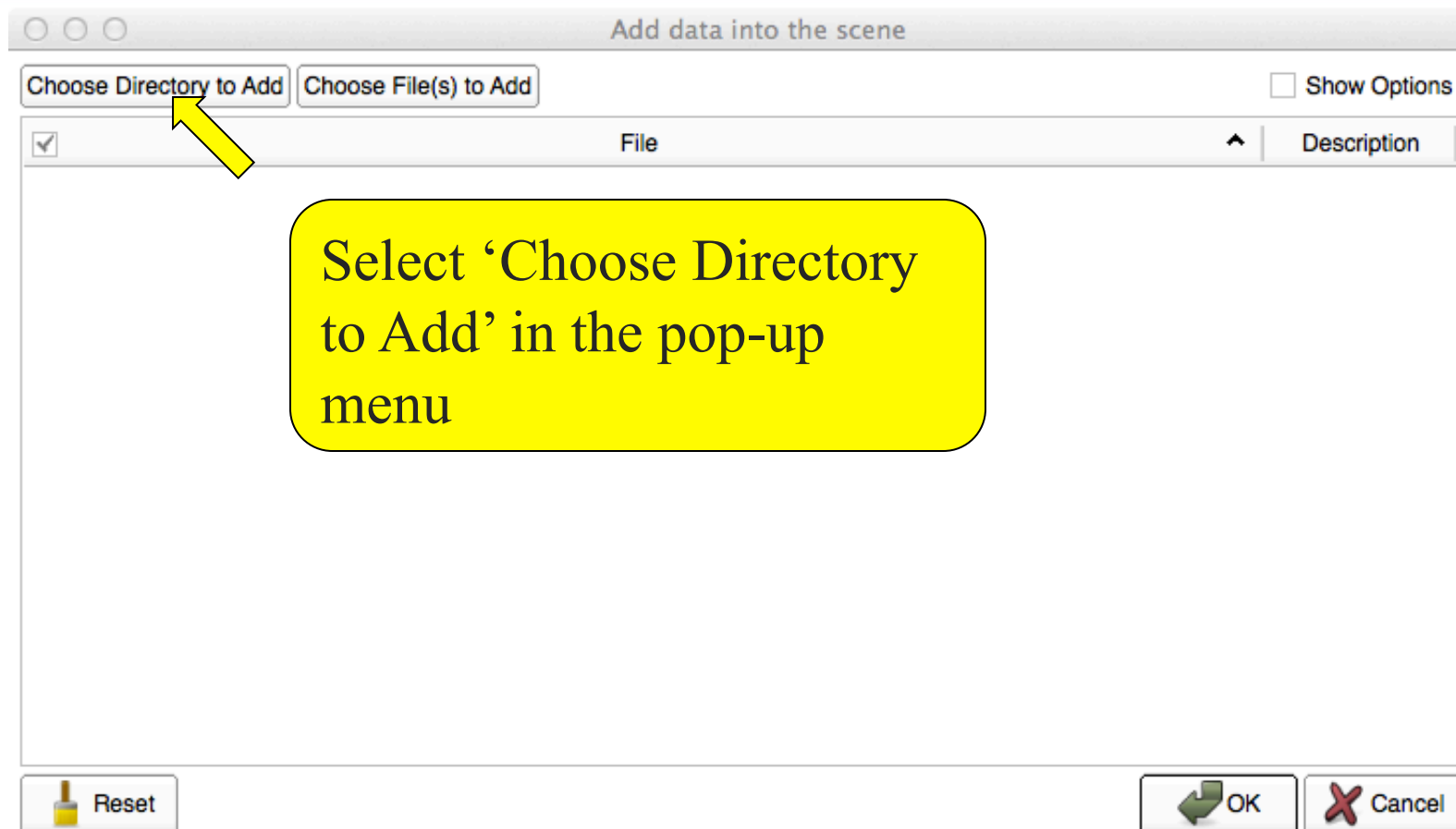


Loading the Data



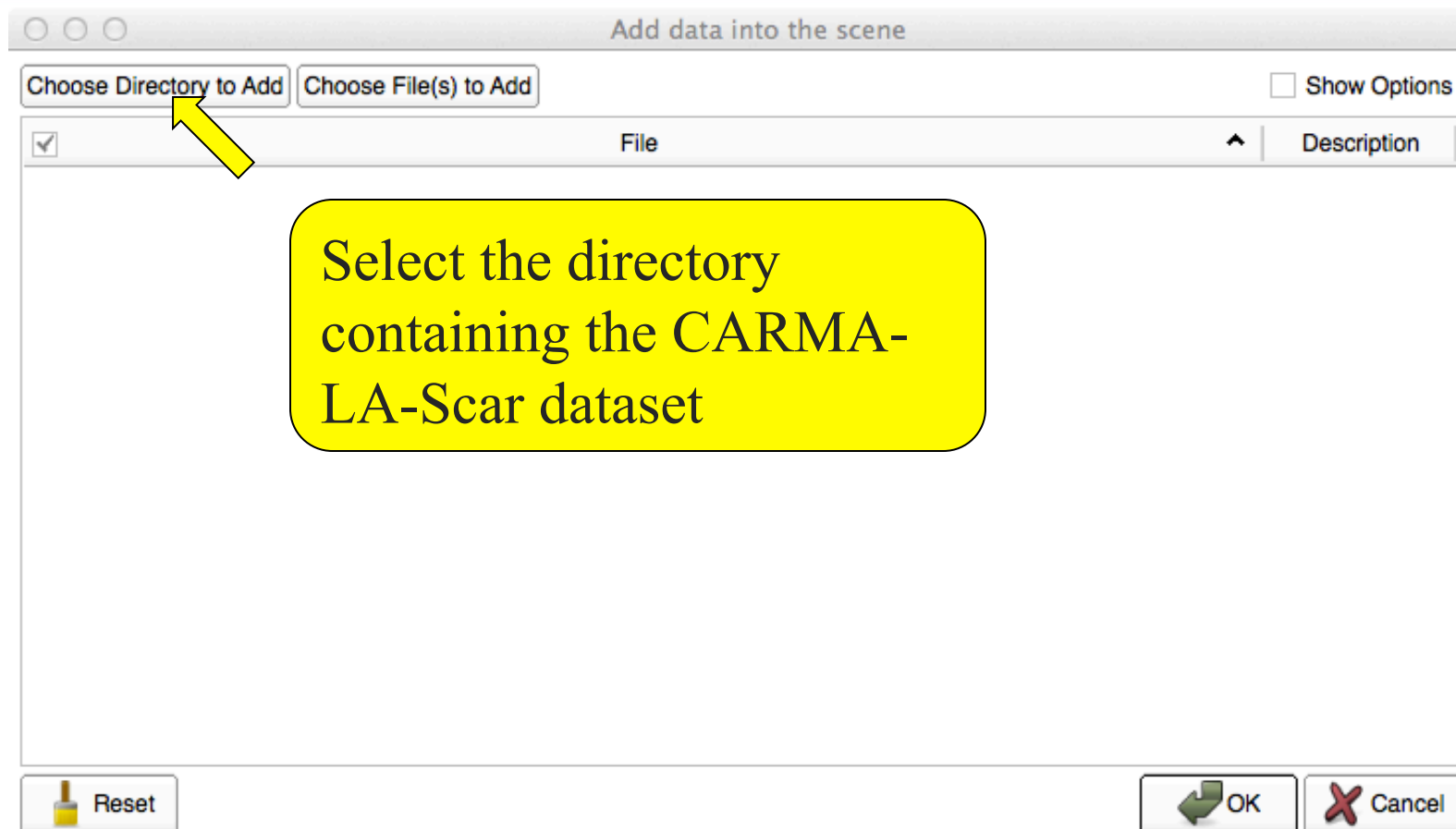


Loading the Data





Loading the Data





Loading the Data

Add data into the scene

Choose Directory to Add Choose File(s) to Add Show Options

<input checked="" type="checkbox"/>	File	Description
<input checked="" type="checkbox"/>	/Users/Greg/Desktop/Scar_Tutorial/CARMA-LA-Scar_TutorialContestSummer2012 2/1/1-wall.nrrd	Volume
<input checked="" type="checkbox"/>	/Users/Greg/Desktop/Scar_Tutorial/CARMA-LA-Scar_TutorialContestSummer2012 2/1/1-mri.nrrd	Volume
<input checked="" type="checkbox"/>	/Users/Greg/Desktop/Scar_Tutorial/CARMA-LA-Scar_TutorialContestSummer2012 2/1/1-blood_pool.nrrd	Volume

Reset OK Cancel

Make sure all 3 volumes are selected and click 'Show Options'



Loading the Data

Add data into the scene

Choose Directory to Add Choose File(s) to Add Show Options

<input checked="" type="checkbox"/>	File	Description		Options
<input checked="" type="checkbox"/>	...r_Tutorial/CARMA-	Volume	1-wall	<input type="checkbox"/> Centered <input type="checkbox"/> Ignore Orientation <input checked="" type="checkbox"/> LabelMap <input checked="" type="checkbox"/> Single File
<input checked="" type="checkbox"/>	...r_Tutorial/CARMA-	Volume	1-mri	<input type="checkbox"/> Centered <input type="checkbox"/> Ignore Orientation <input type="checkbox"/> LabelMap <input checked="" type="checkbox"/> Single File
<input checked="" type="checkbox"/>	...r_Tutorial/CARMA-	Volume	1-blood_pool	<input type="checkbox"/> Centered <input type="checkbox"/> Ignore Orientation <input checked="" type="checkbox"/> LabelMap <input checked="" type="checkbox"/> Single File

Designate the wall and blood pool volumes as label masks, then push 'OK'

Reset OK Cancel



Adjusting the Viewer

Expose the viewer options, and select the button to link the viewers

File->Load Scene:
This load command selected from Slicer's File Menu will close the current scene, pop up a File Browser, and load data from the MRML scene file you select.

File->Import Scene:
This load command selected from Slicer's File Menu will pop up a File Browser, and add all data referenced in the MRML scene file you select into the current scene.


File->Add Volume:
This command allows the loading of individual volumes or use of Slicer's DICOM browser.

File->Download Sample Data:
This command provides an option to download a variety of anonymized datasets for learning and testing in Slicer. Because the datasets are hosted in a remote repository, a network connection is required to access them.

L
F
B

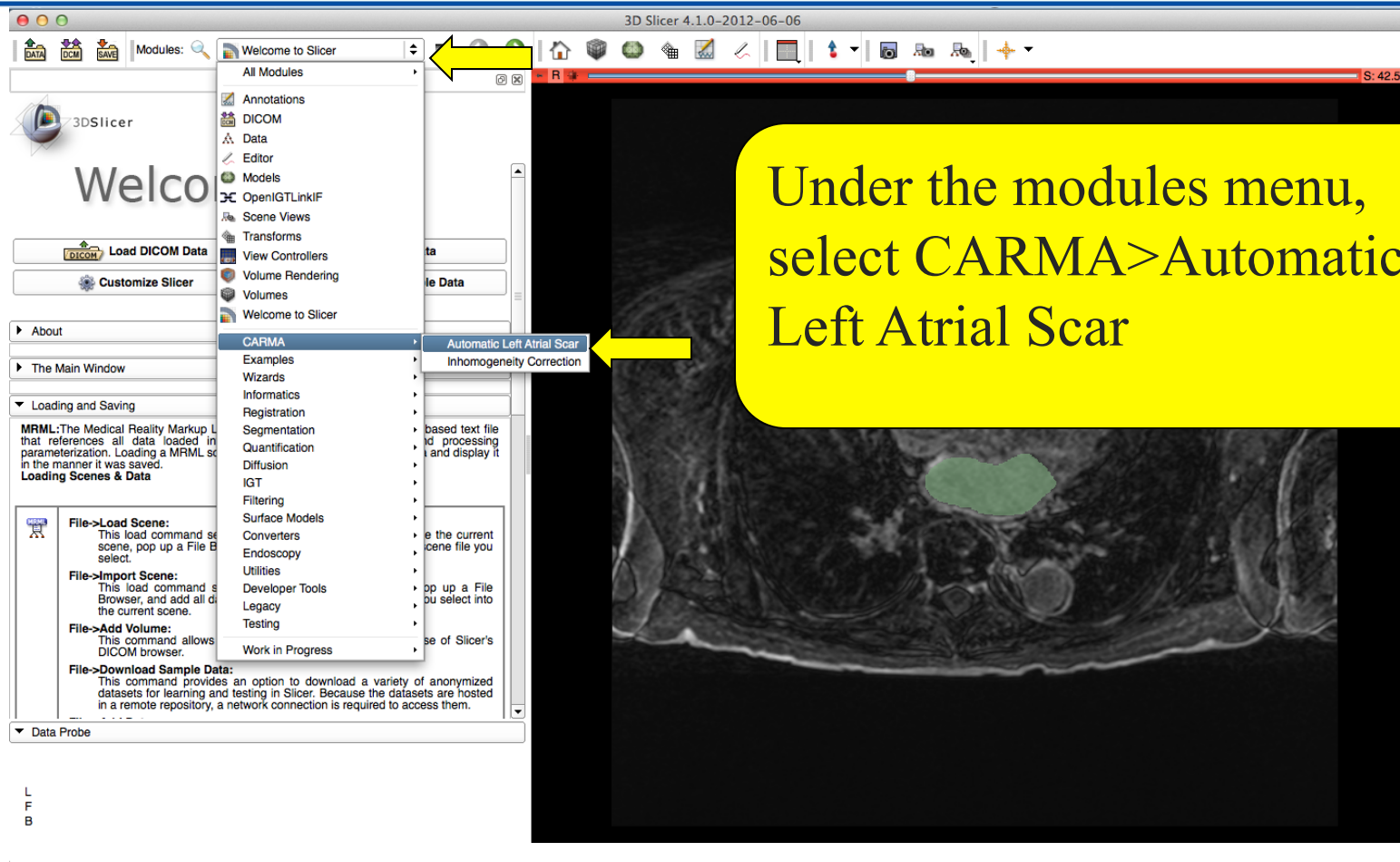


Adjusting the Viewer

Click the  icon and select 'Red slice only' from the drop-down menu

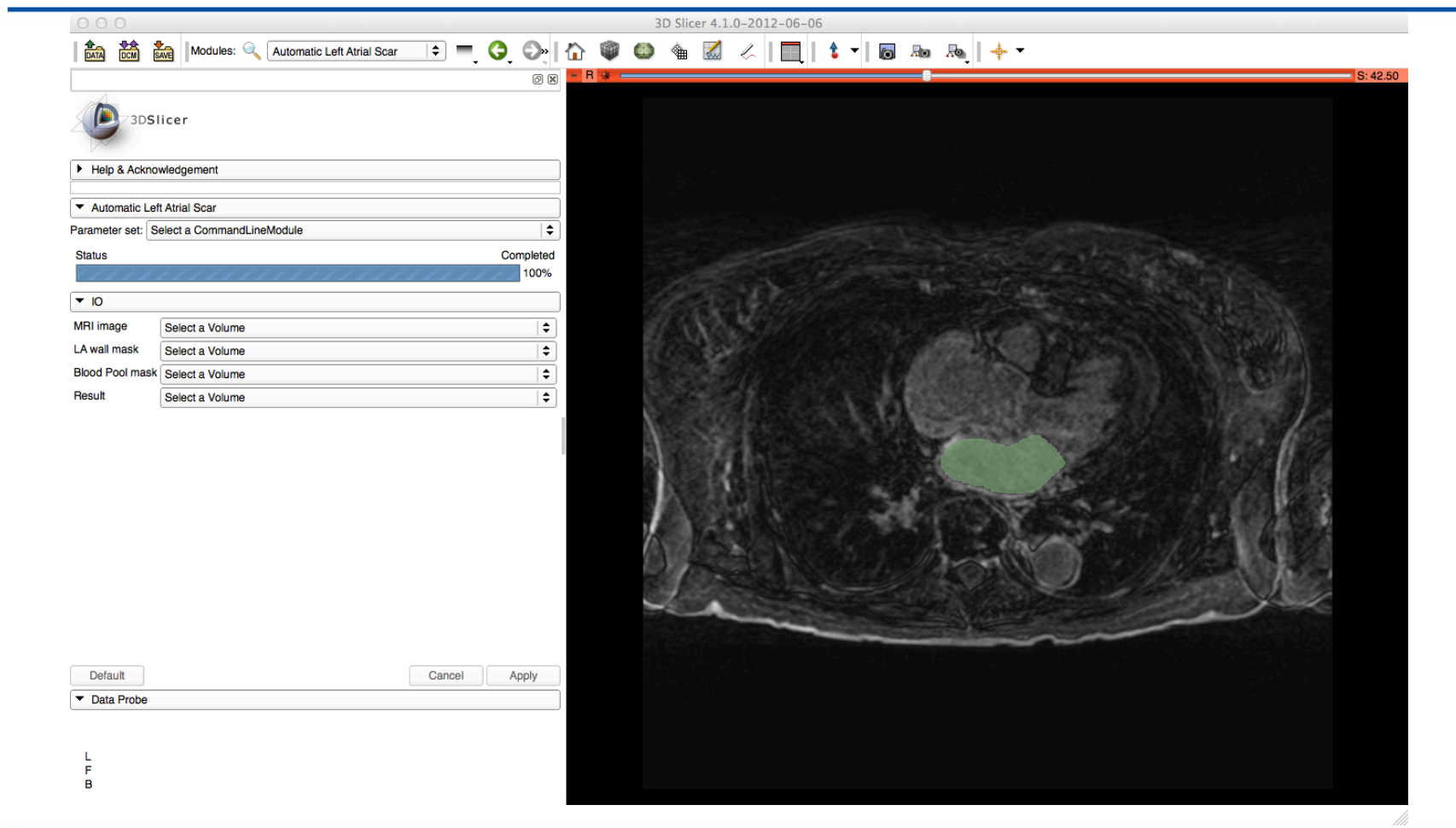


Automatic Scar Detection





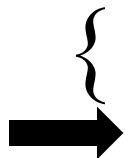
Automatic Scar Detection





Automatic Scar Detection

Input volumes
Output volume



3DSlicer

▶ Help & Acknowledgement

▼ Automatic Left Atrial Scar

Parameter set: Automatic Left Atrial Scar

Status Idle

▼ IO

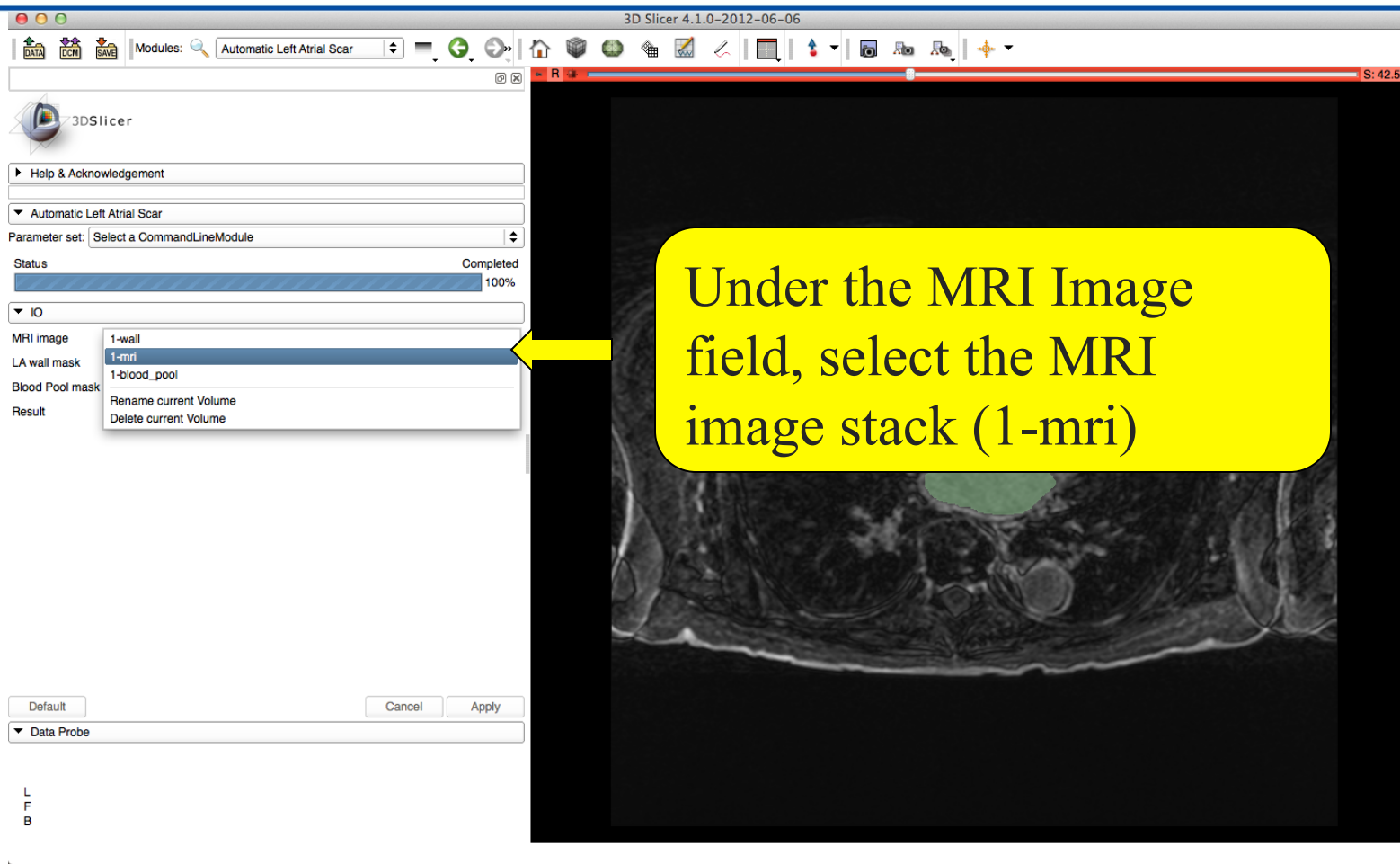
MRI image	1-mri
LA wall mask	1-wall
Blood Pool mask	1-blood_pool
Result	Result

Default Cancel Apply

← Parameter Sets

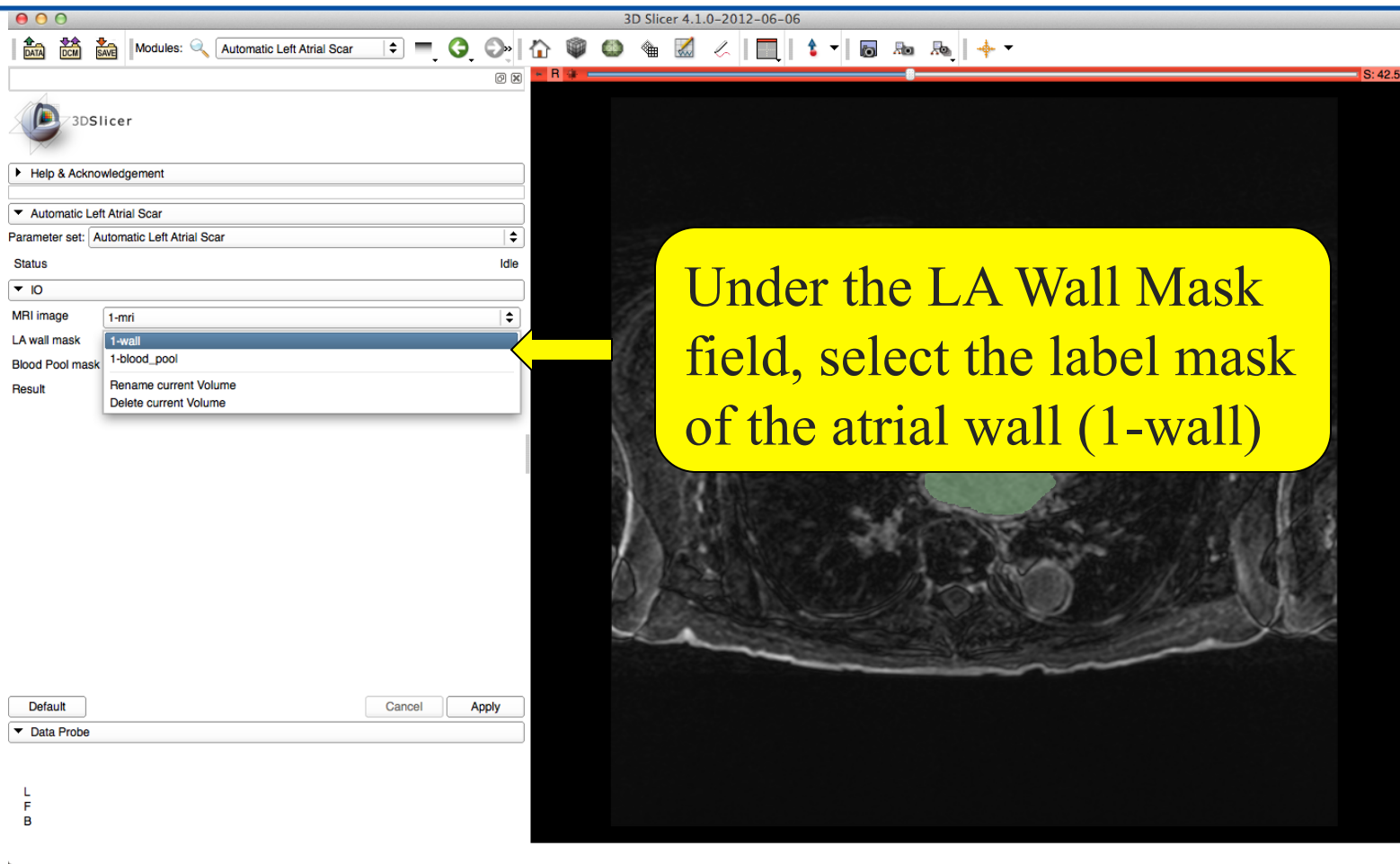


Automatic Scar Detection



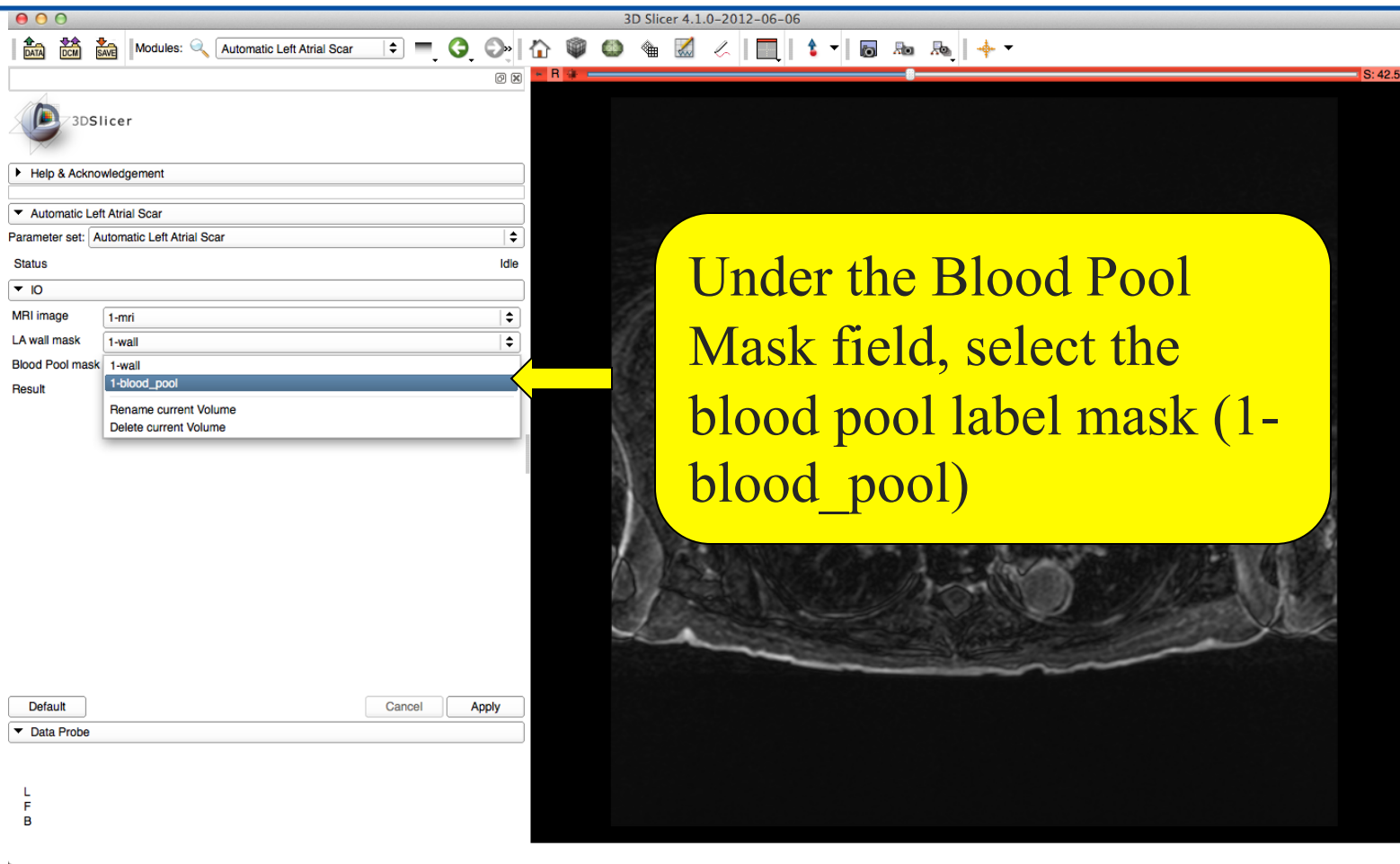


Automatic Scar Detection





Automatic Scar Detection





Automatic Scar Detection

3D Slicer 4.1.0-2012-06-06

Modules: Automatic Left Atrial Scar

3DSlicer

Help & Acknowledgement

Automatic Left Atrial Scar

Parameter set: Automatic Left Atrial Scar

Status: Idle

IO

MRI image: 1-mri

LA wall mask: 1-wall

Blood Pool mask: 1-blood_pool

Result: 1-wall, 1-blood_pool

Rename current Volume

Create new Volume

Create and rename new Volume

Delete current Volume

Default Cancel Apply

Data Probe

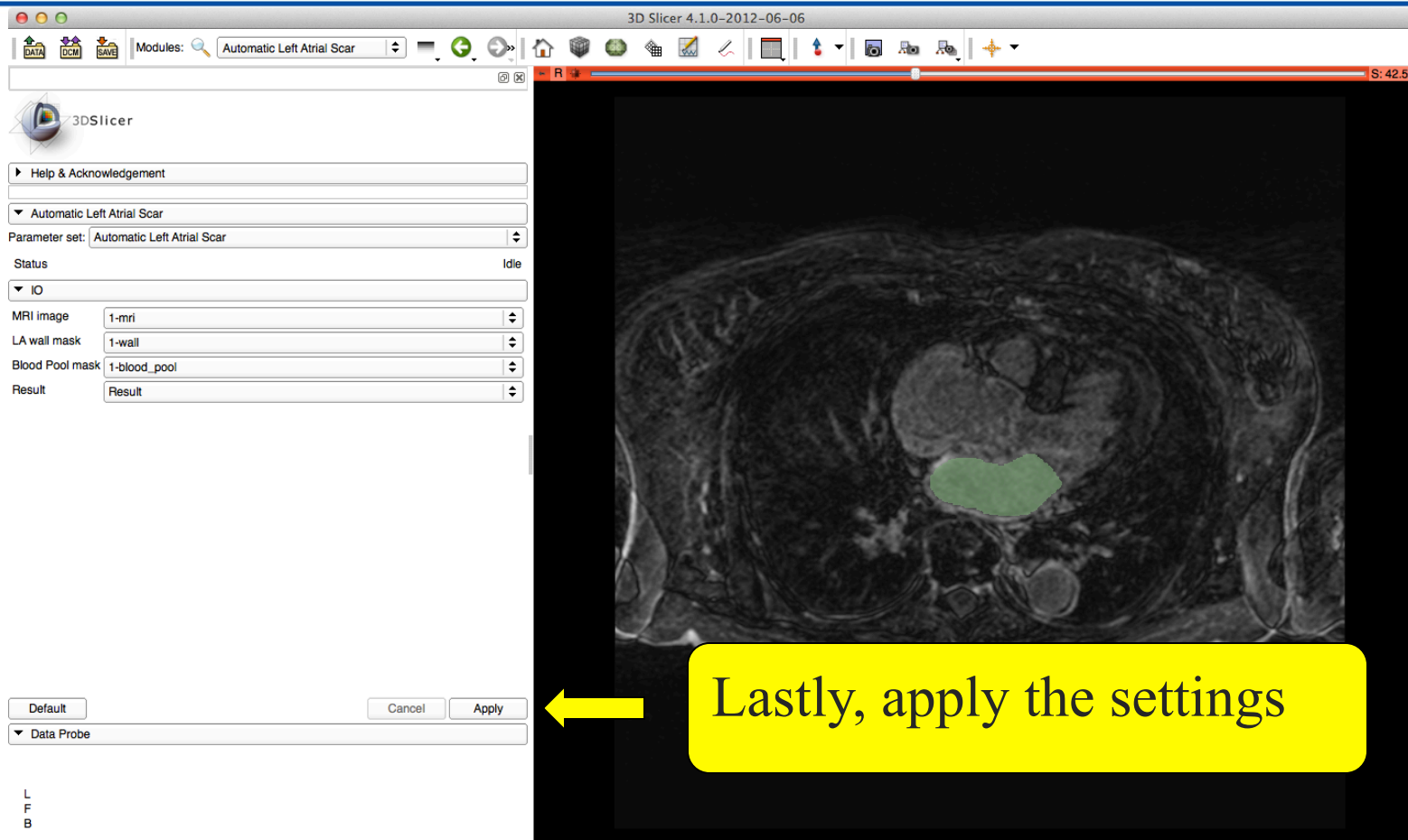
L
F
B

S: 42.50

Under the Result field, select 'Create New Volume,' which will be named Result

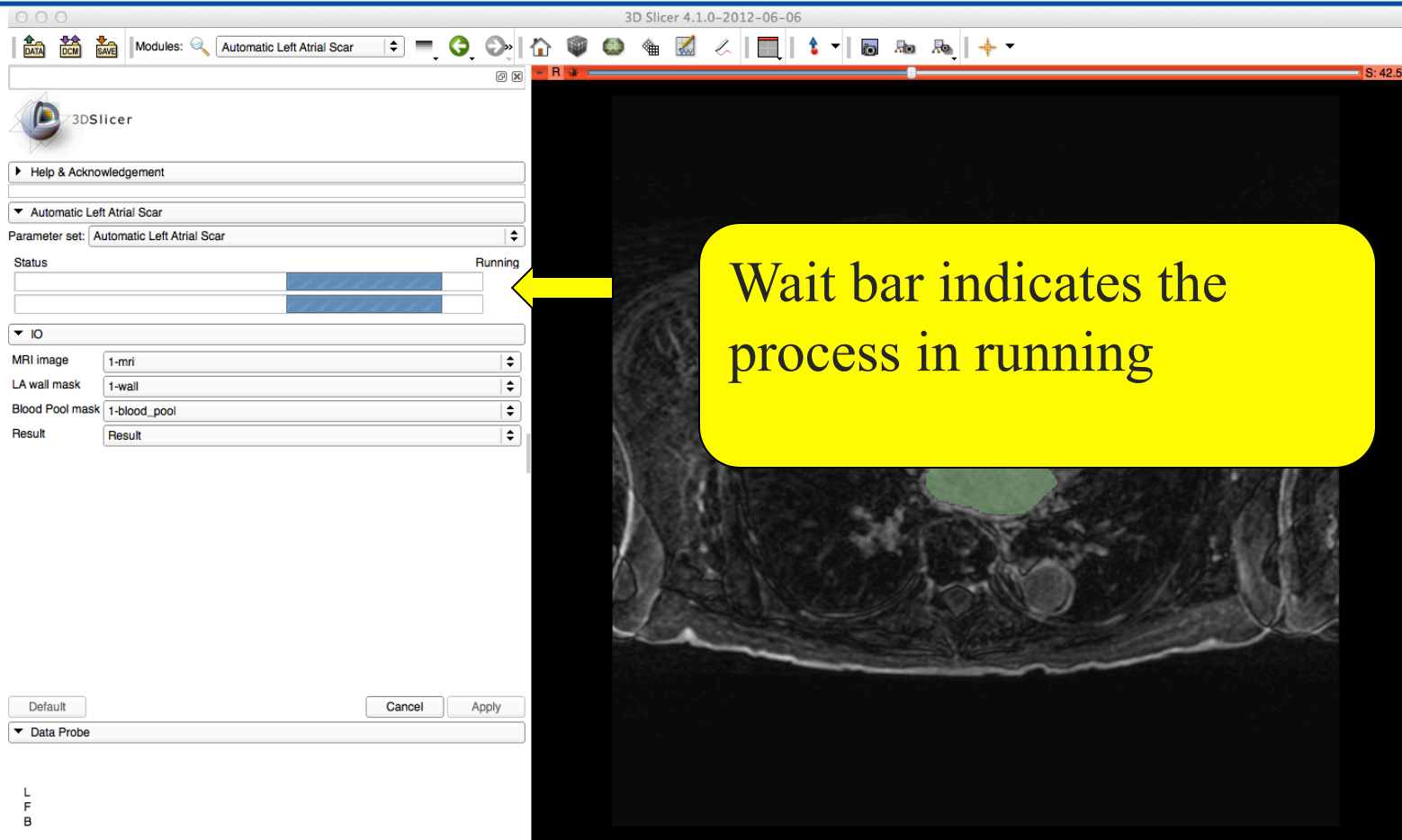


Automatic Scar Detection





Automatic Scar Detection





Automatic Scar Detection

3D Slicer 4.1.0-2012-06-06

Modules: Automatic Left Atrial Scar

3DSlicer

Help & Acknowledgement

Automatic Left Atrial Scar

Parameter set: Automatic Left Atrial Scar

Status Completed 100%

IO

MRI image 1-mri

LA wall mask 1-wall

Blood Pool mask 1-blood_pool

Result Result

Viewer automatically updates to show the resulting label mask

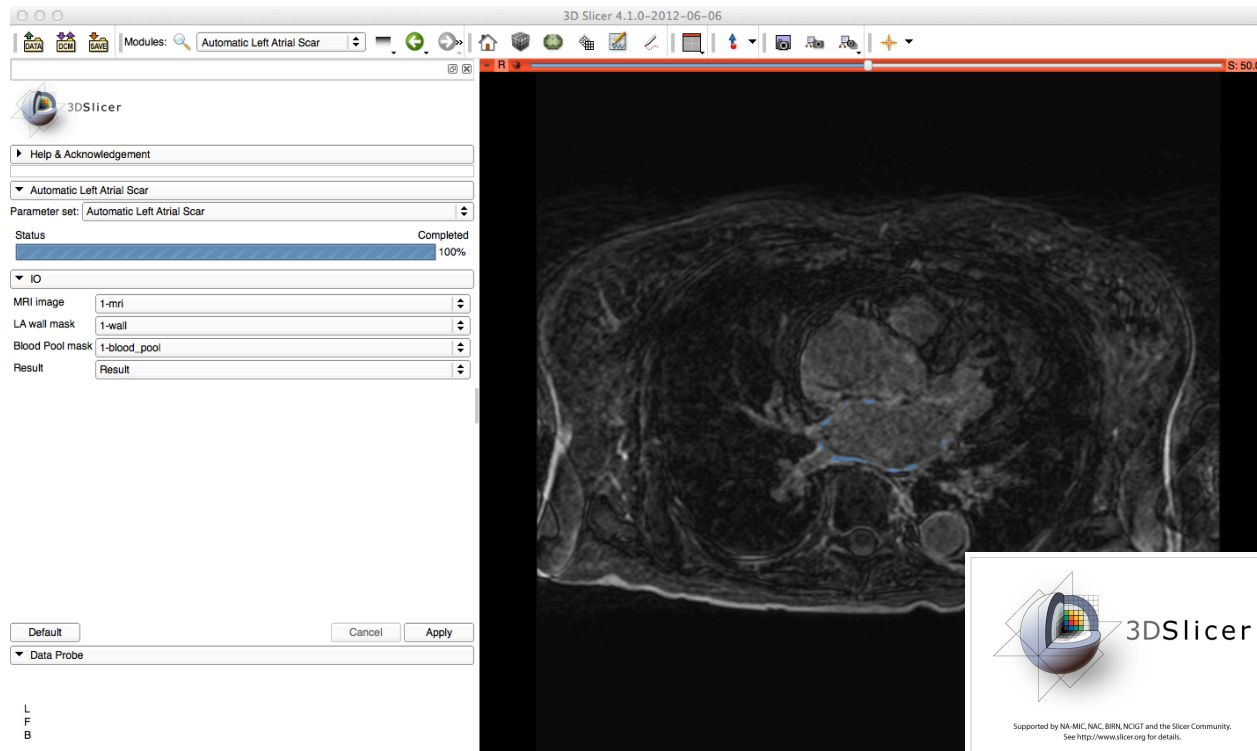
Default Cancel Apply

Data Probe

L
F
B



Conclusion



Student can use the module to automatically detect LA scar in Slicer 4.1



Acknowledgments



National Alliance for Medical Image Computing
NIH U54EB005149

