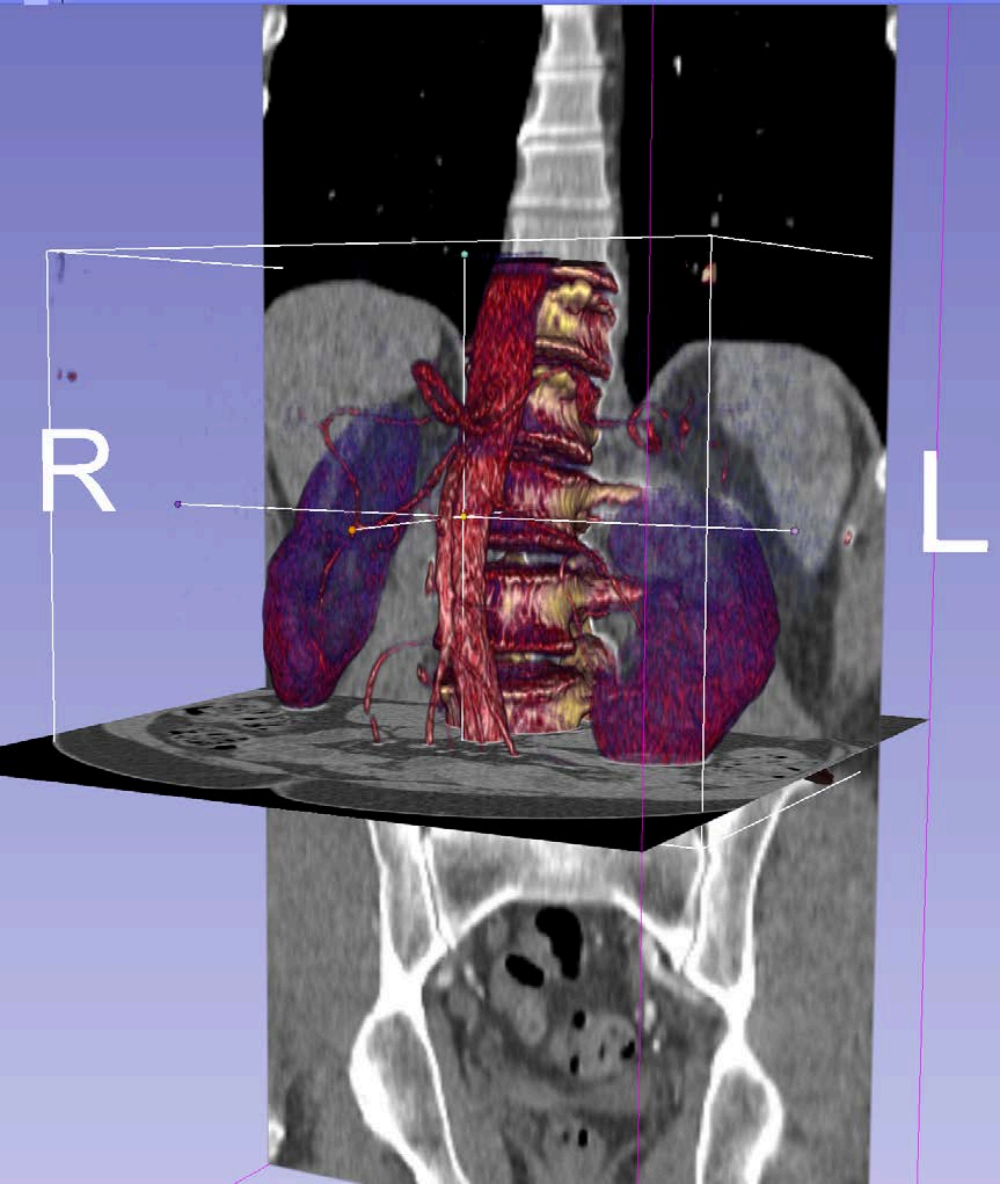

Basics of Data Loading and 3D Visualization in 3D Slicer

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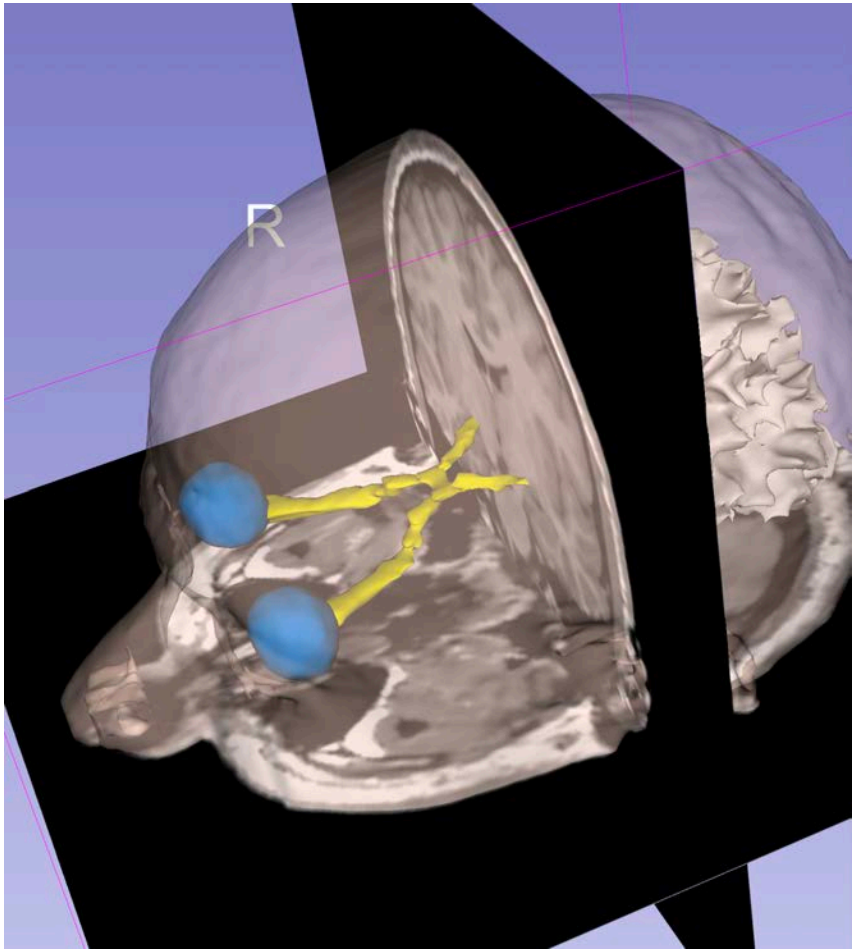
Director of 3D Slicer Training & Education

Assistant Professor of Radiology
Brigham and Women's Hospital
Harvard Medical School

Overall Goal

This tutorial is an introduction to the basics of loading and viewing DICOM images and 3D models in 3D Slicer.

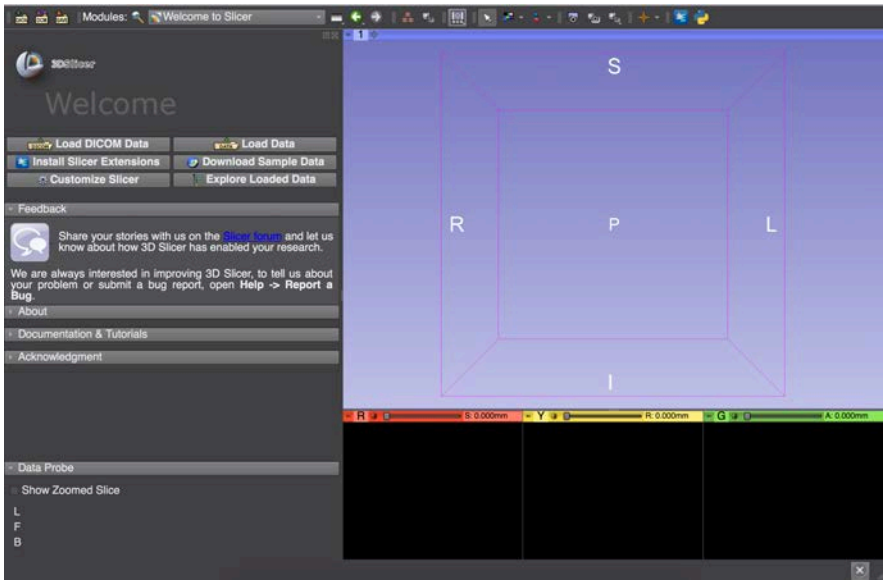


Learning Objectives

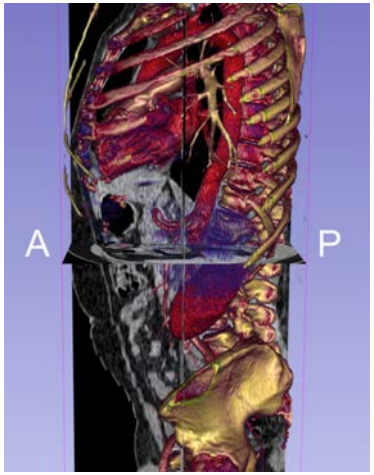
Following this tutorial, you will be able

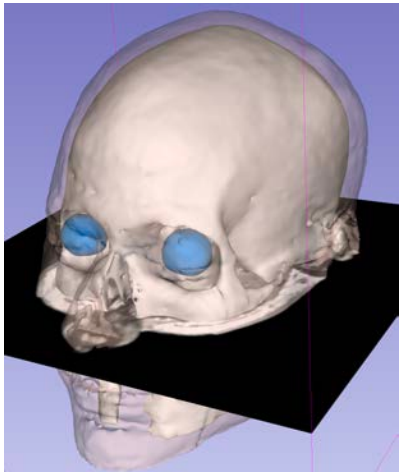
- to load and visualize DICOM images in Slicer
- to perform volume rendering of CT datas
- to load and visualize 3D models reconstructed from MRI data

Tutorial materials



3D Slicer version 4.11.0

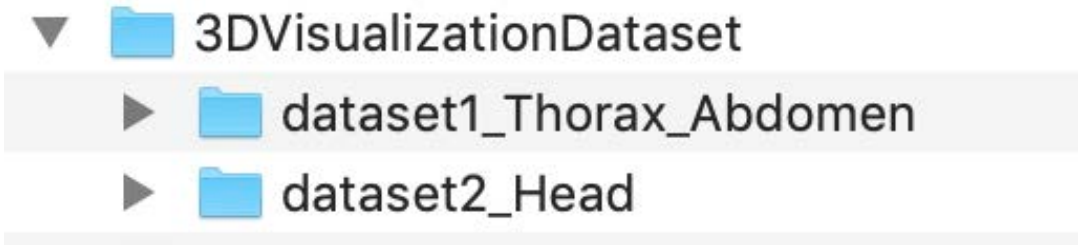




3DVisualizationDataset.zip

Tutorial dataset

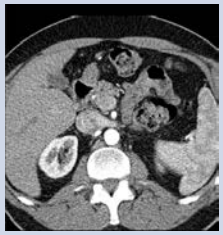
- The file 3DVisualizationDataset.zip contains two directories:
  - dataset1_Thorax_Abdomen
  - dataset2_Head
- Unzip the file 3DVisualizationDataset.zip on your computer to access the datasets



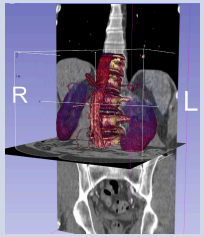
Disclaimer

- 3D Slicer is a free open source software application distributed under a BSD style license.
- The software is not FDA approved or CE-Marked, and is for research use only.

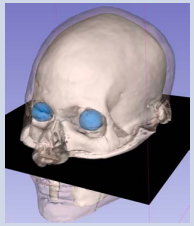
Tutorial Outline



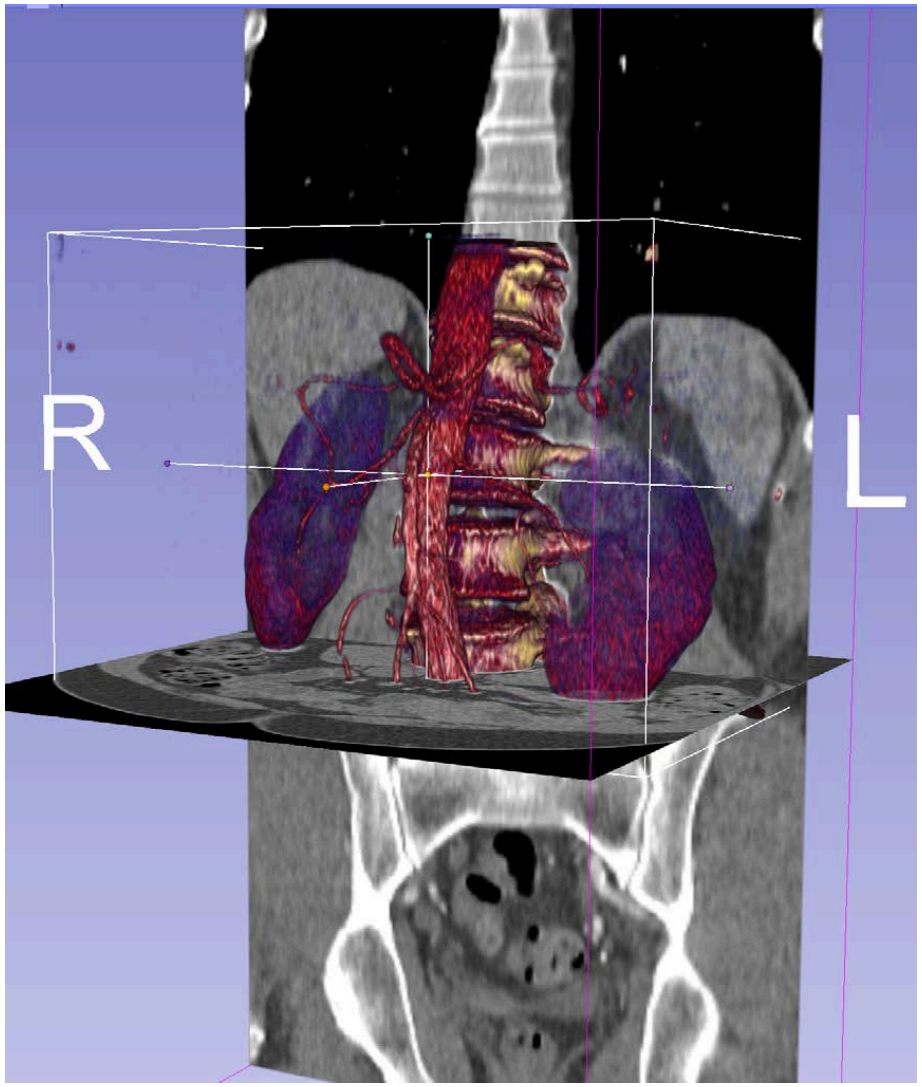
Part 1: Loading and Viewing DICOM data



Part 2: Volume Rendering



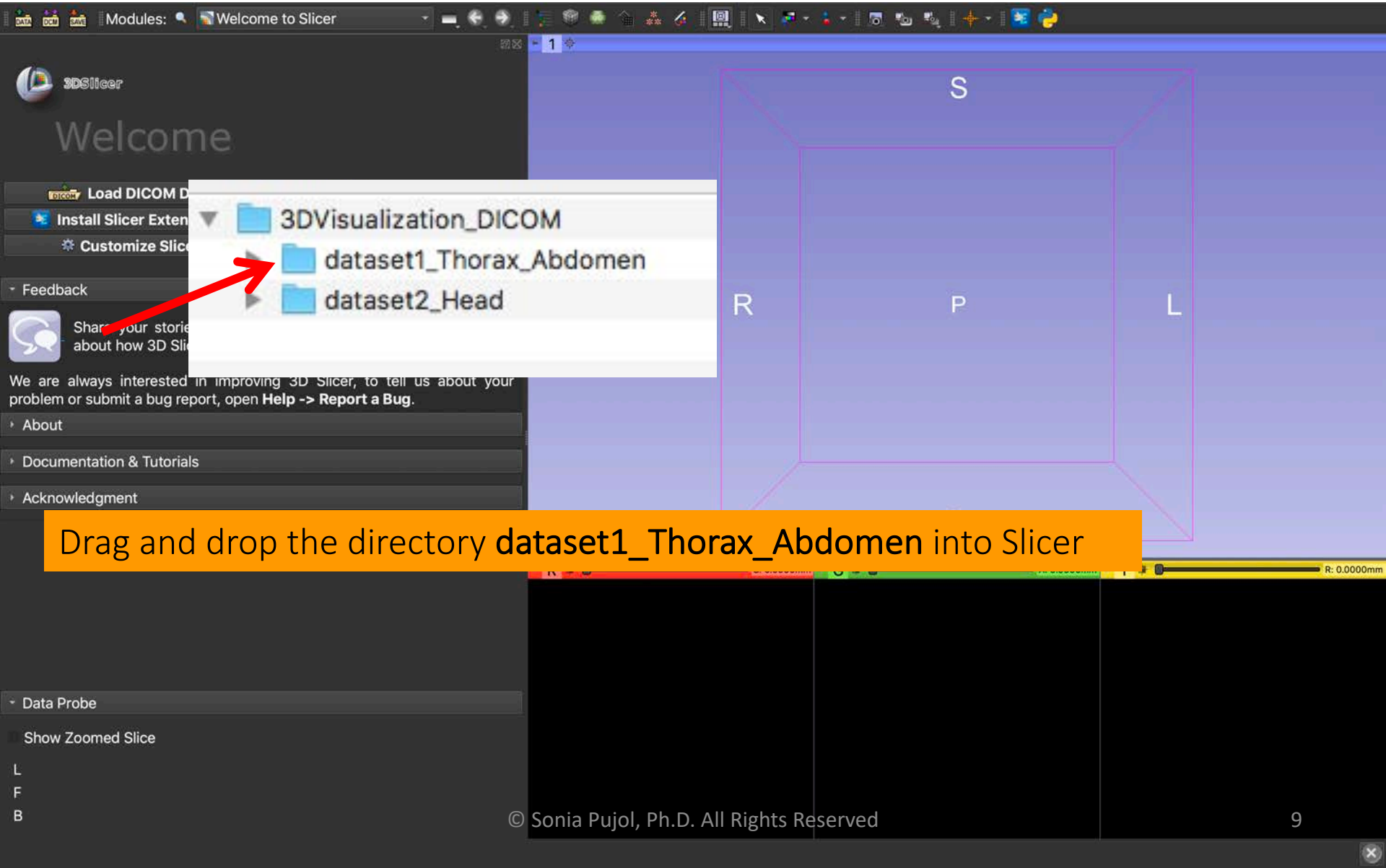
Part 3: Loading and Viewing 3D models



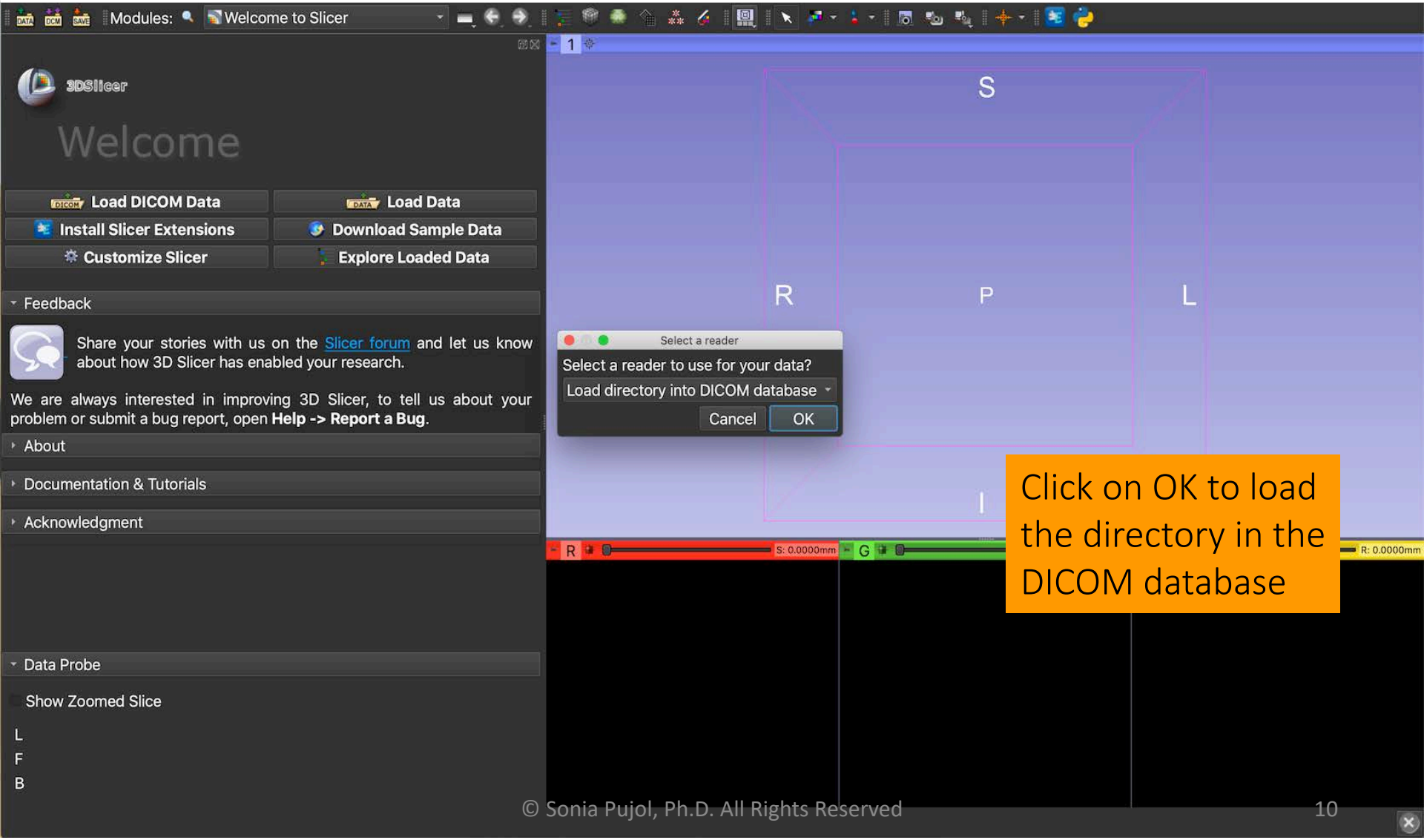
Part 1

DICOM Data Loading

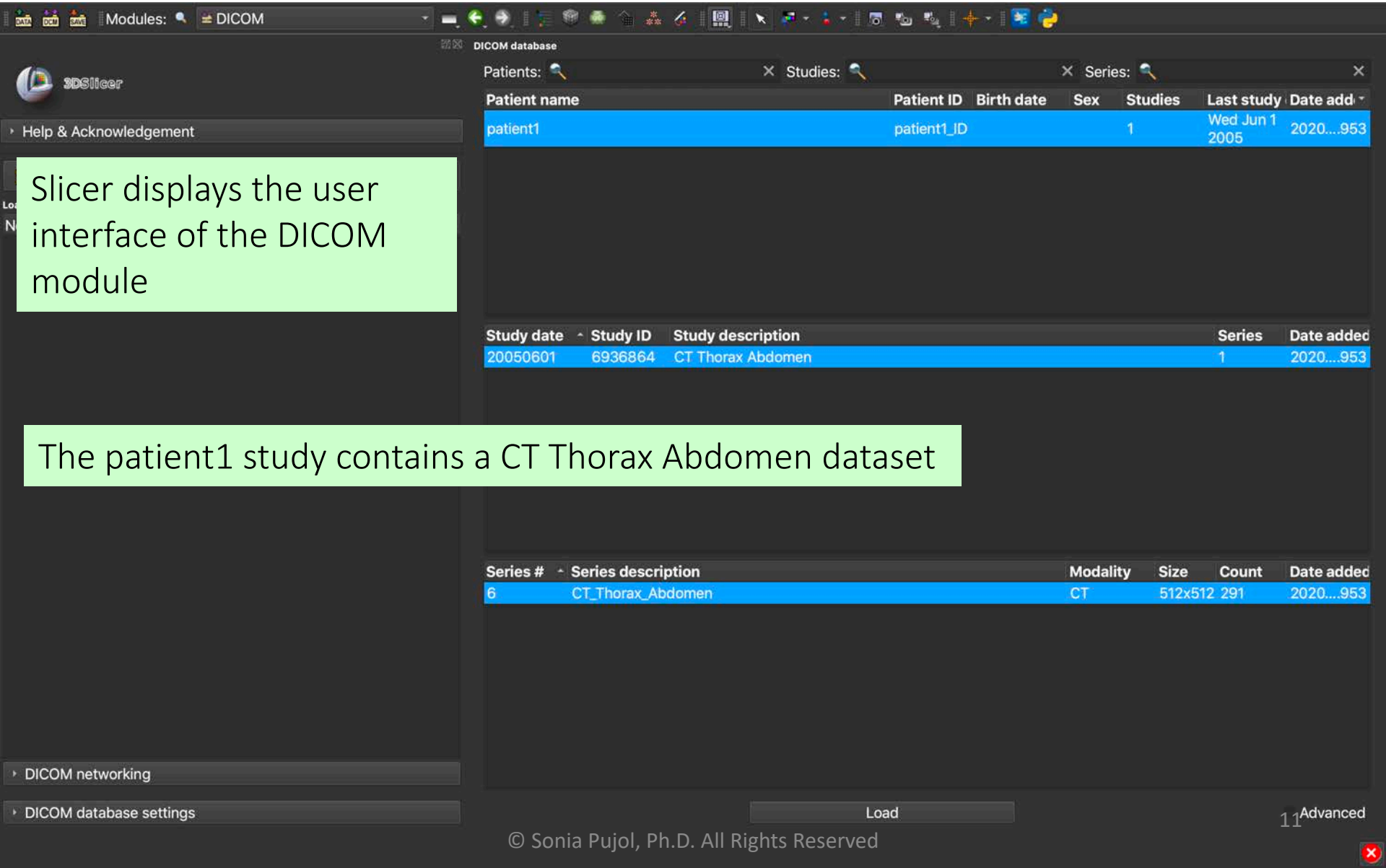
Loading a DICOM volume



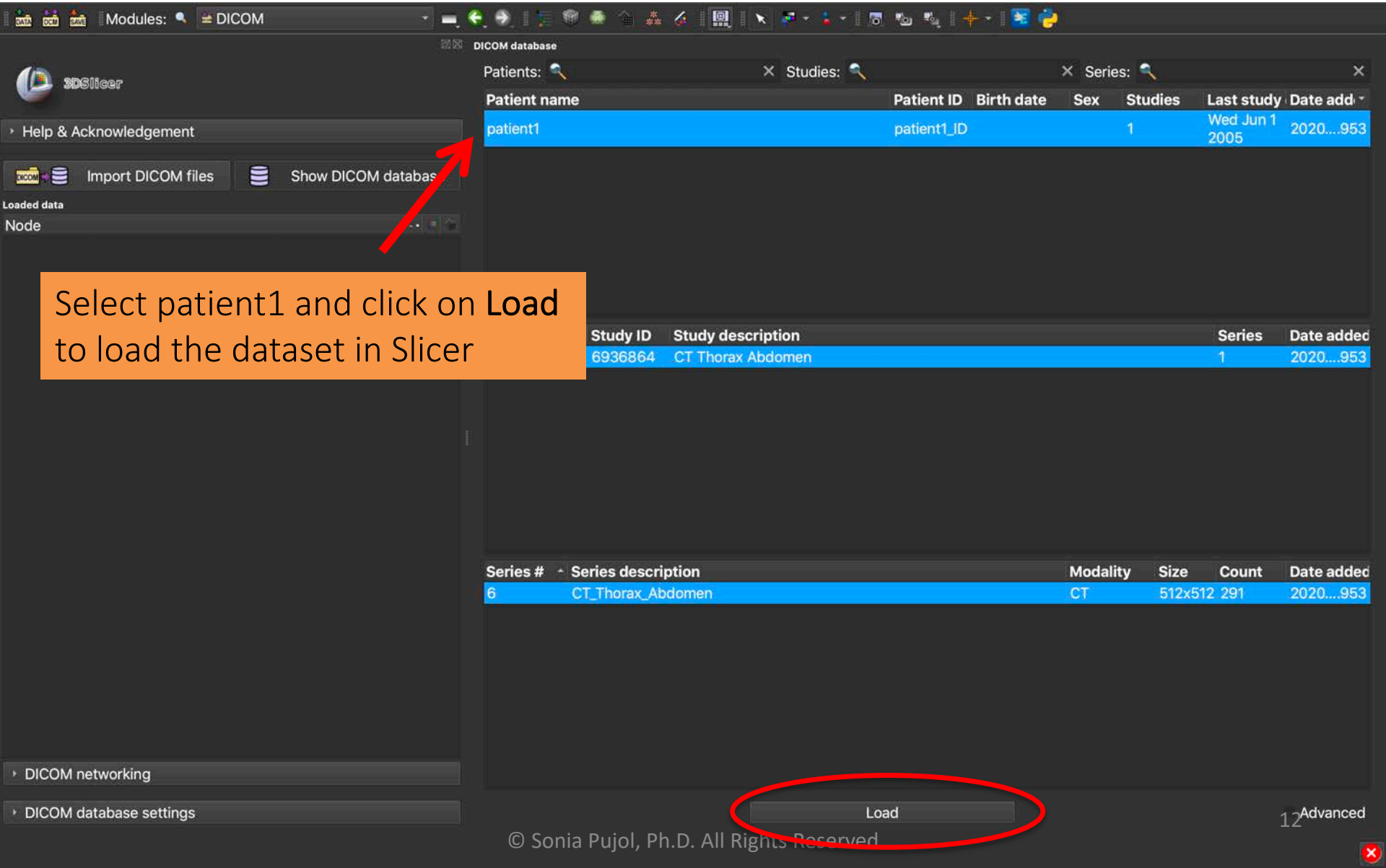
Loading a DICOM volume



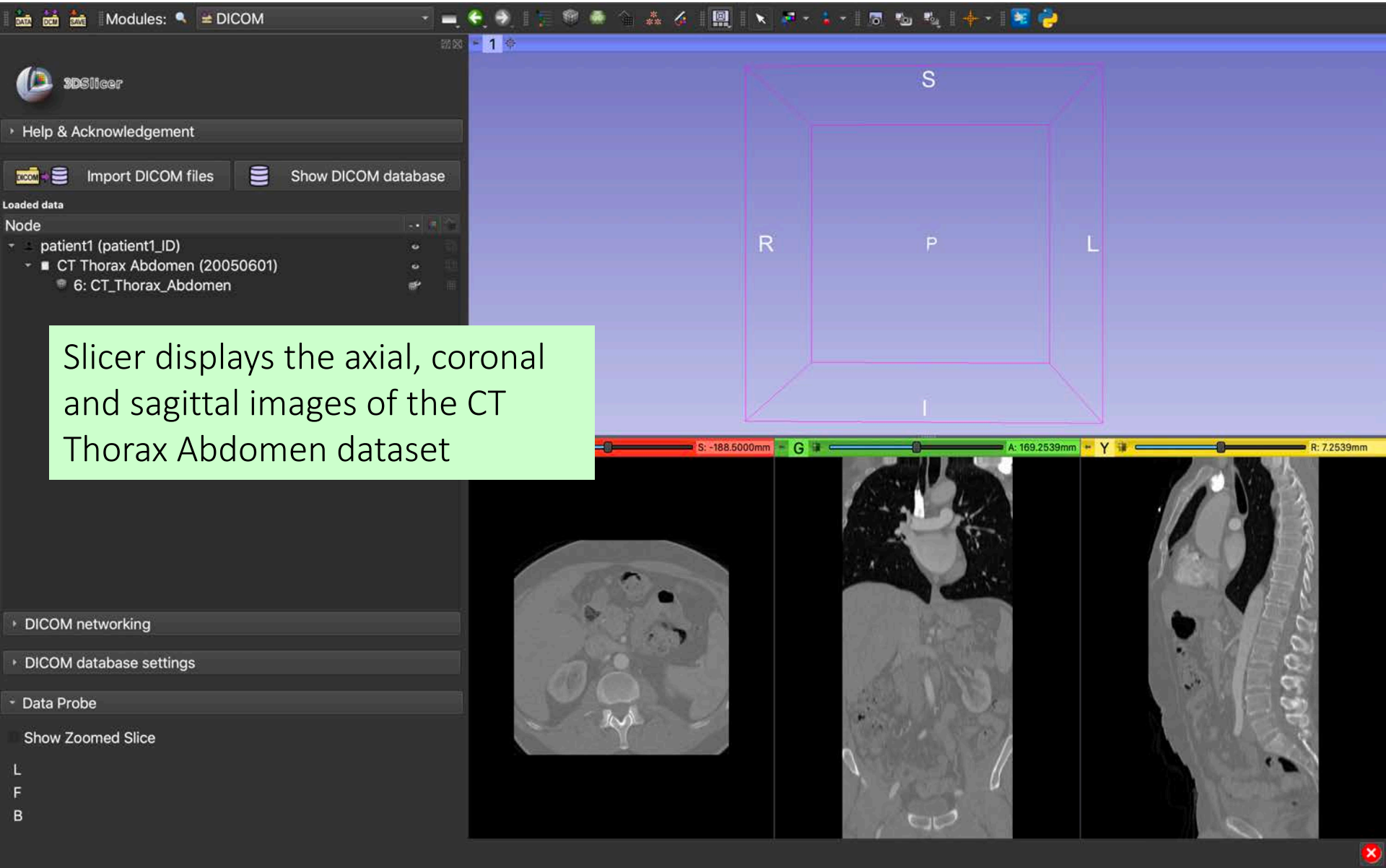
Loading a DICOM volume



Loading a DICOM volume

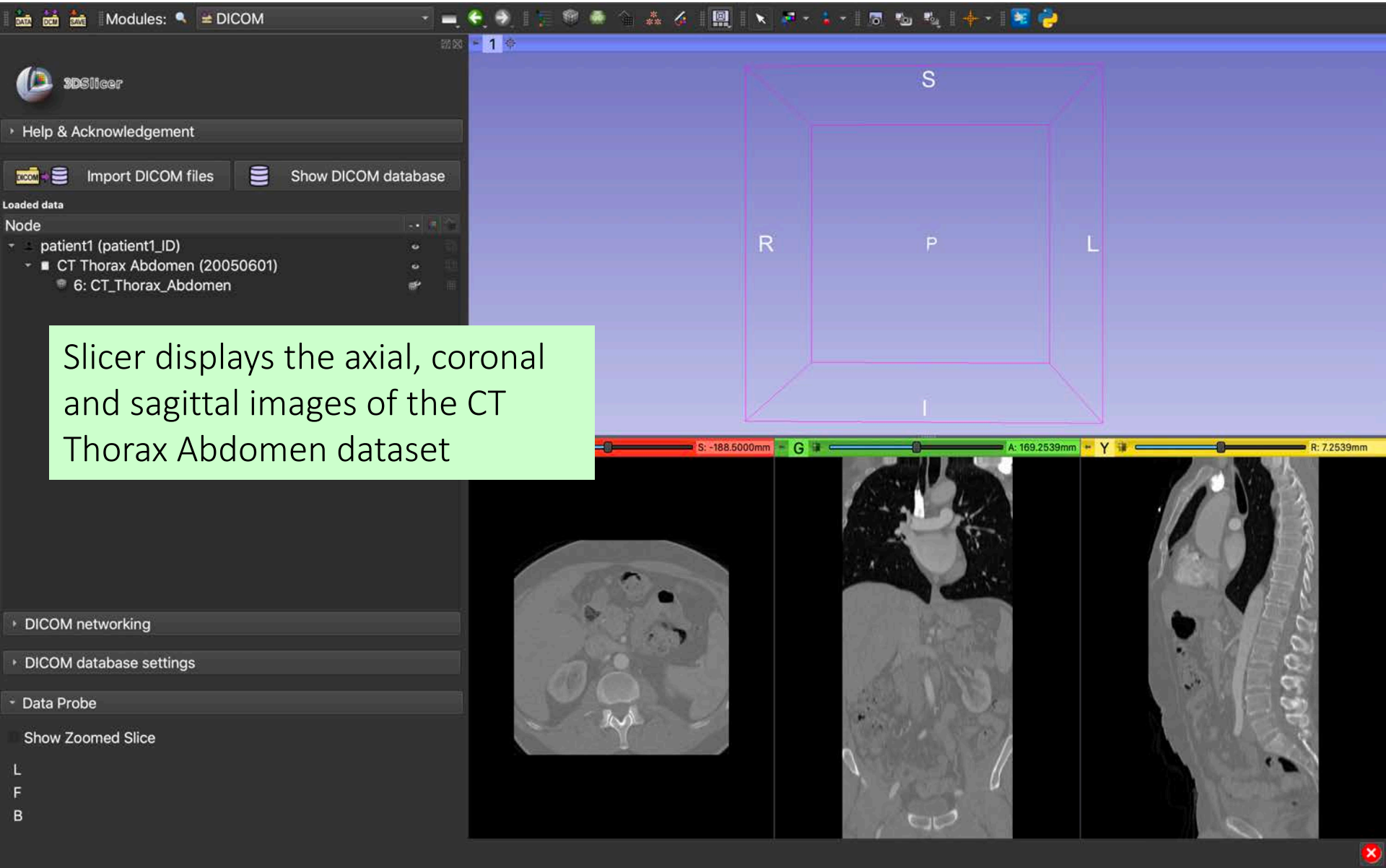


Loading a DICOM volume



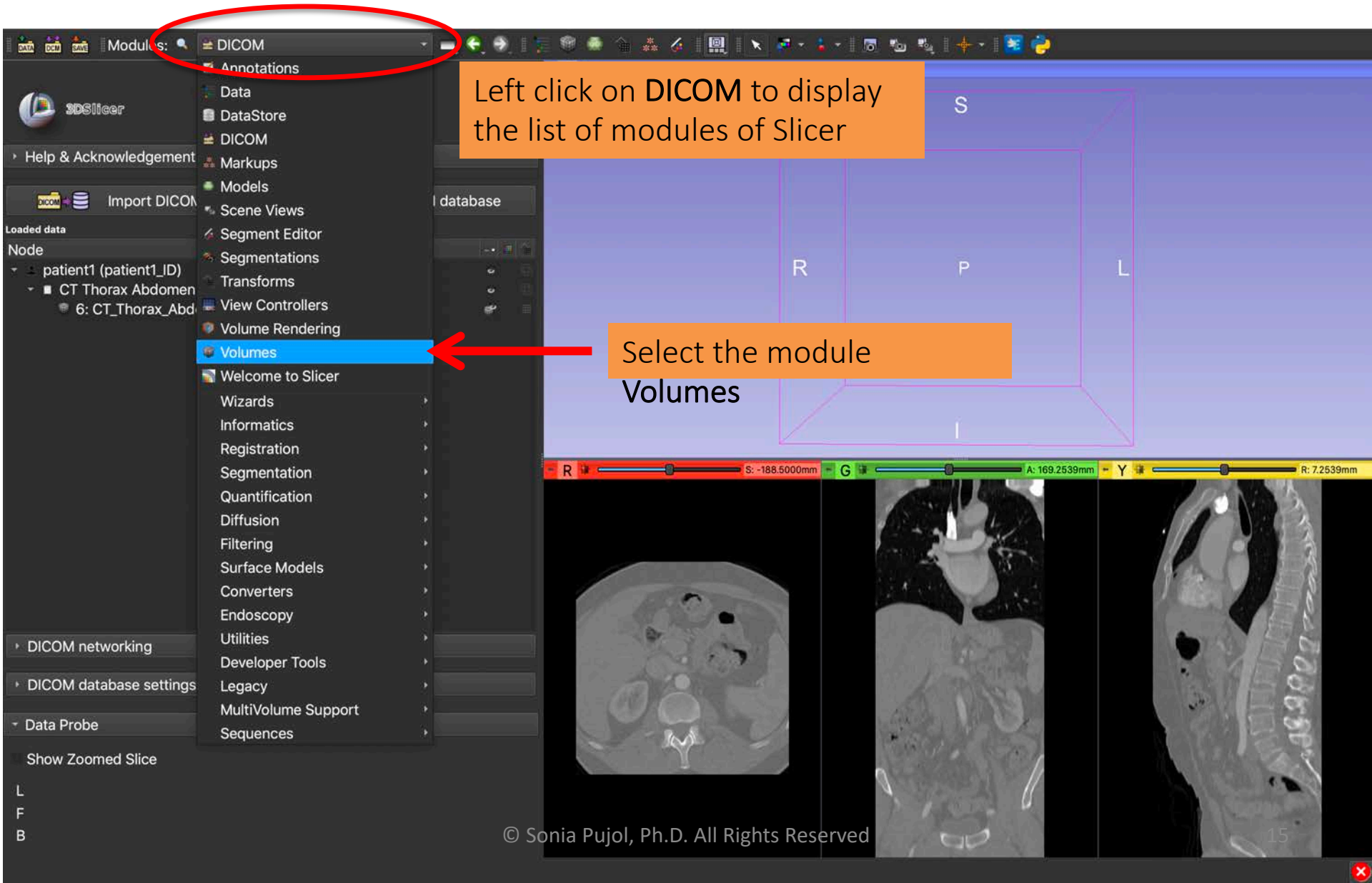
Slicer displays the axial, coronal and sagittal images of the CT Thorax Abdomen dataset

Loading a DICOM volume



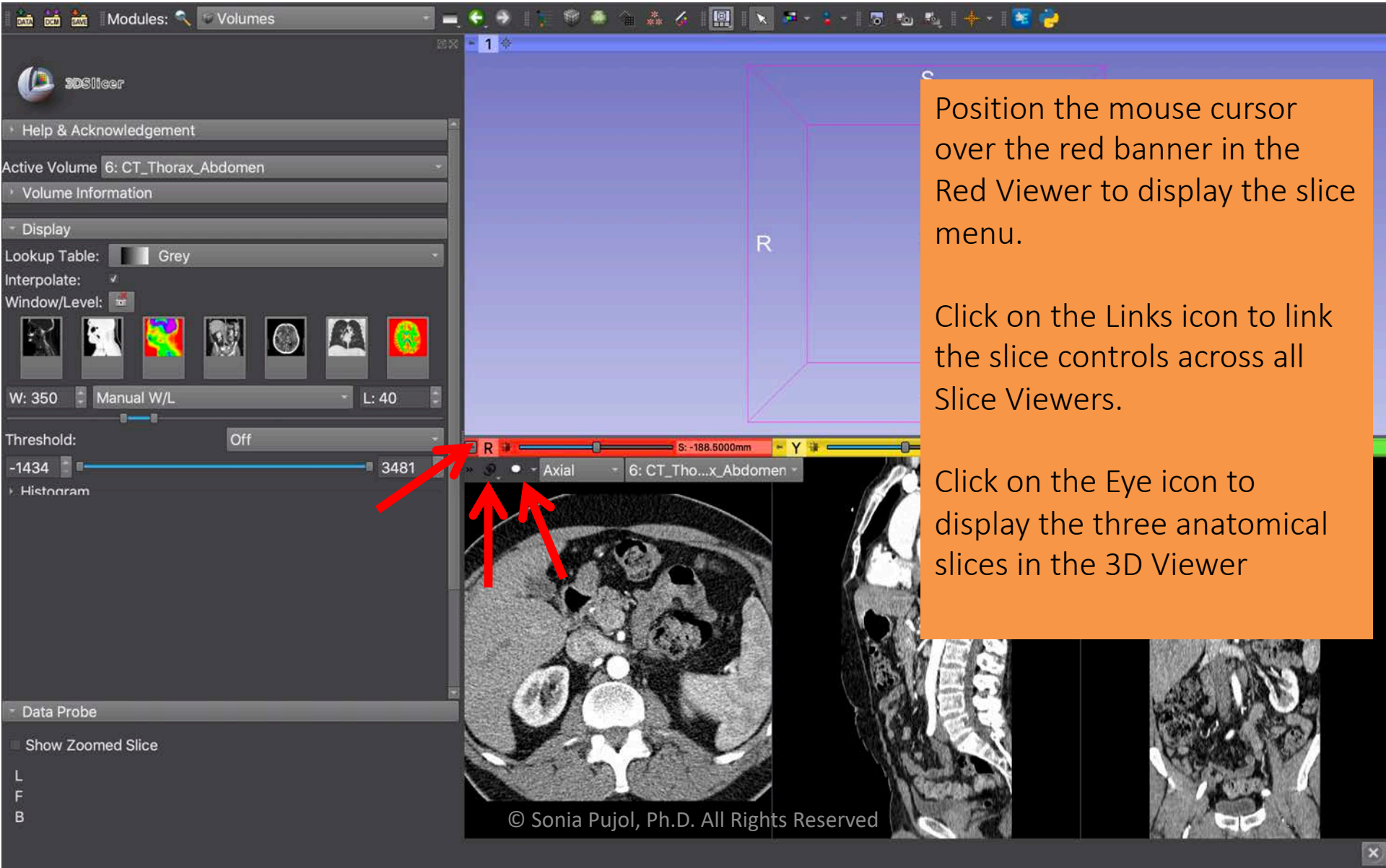
Slicer displays the axial, coronal and sagittal images of the CT Thorax Abdomen dataset

Loading a DICOM volume

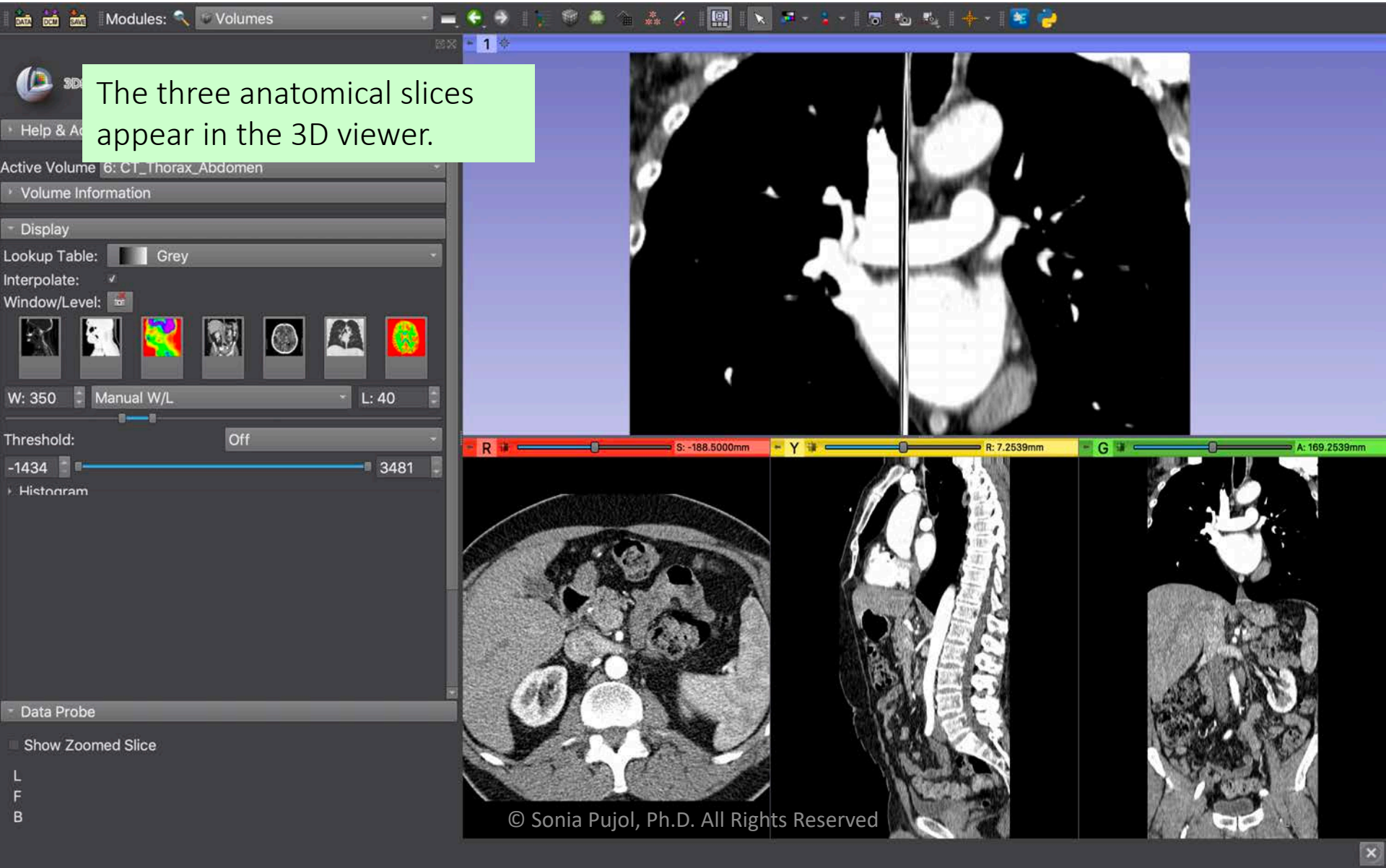


Loading a DICOM volume

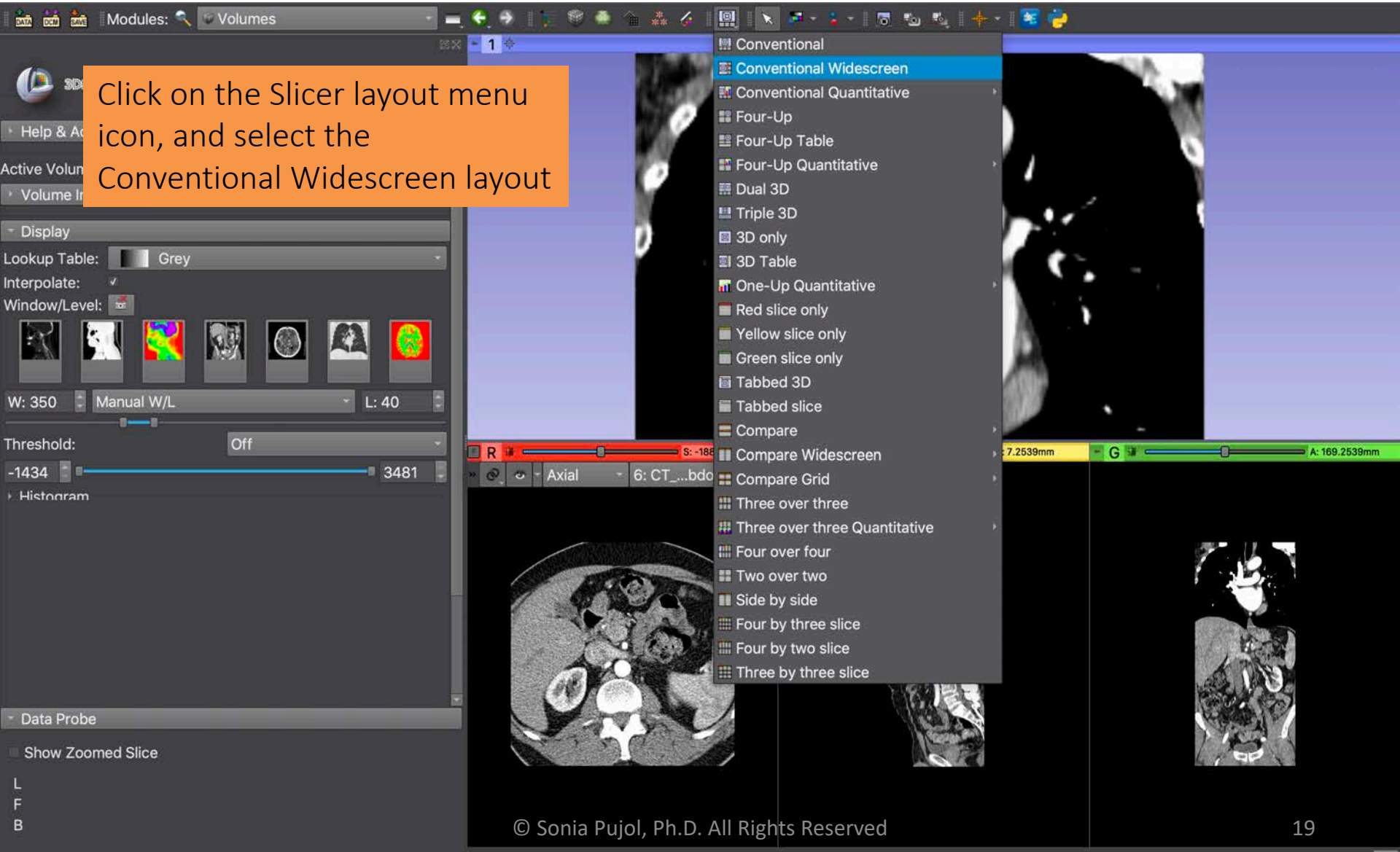
Loading a DICOM volume



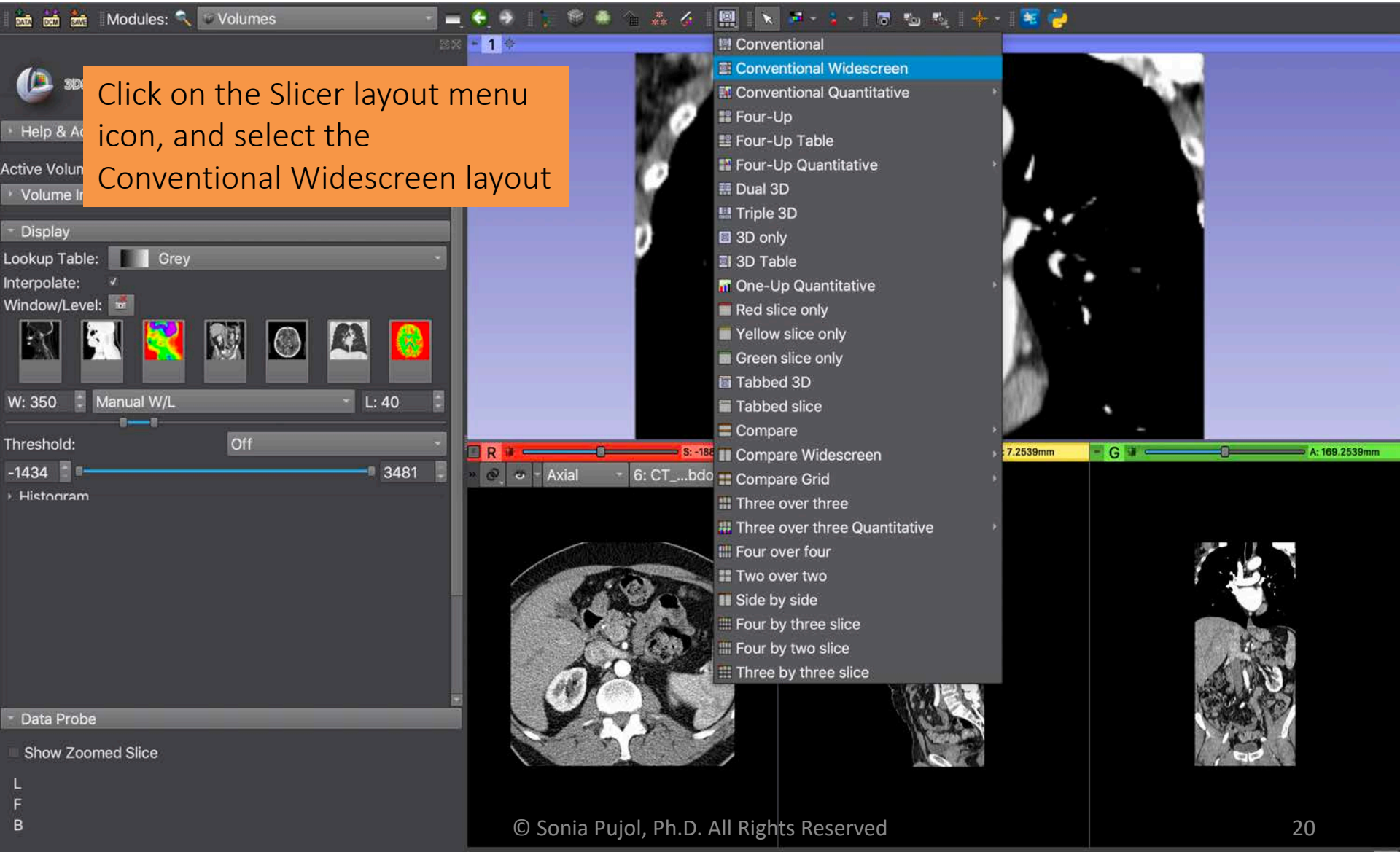
Visualizing DICOM images



Visualizing DICOM images

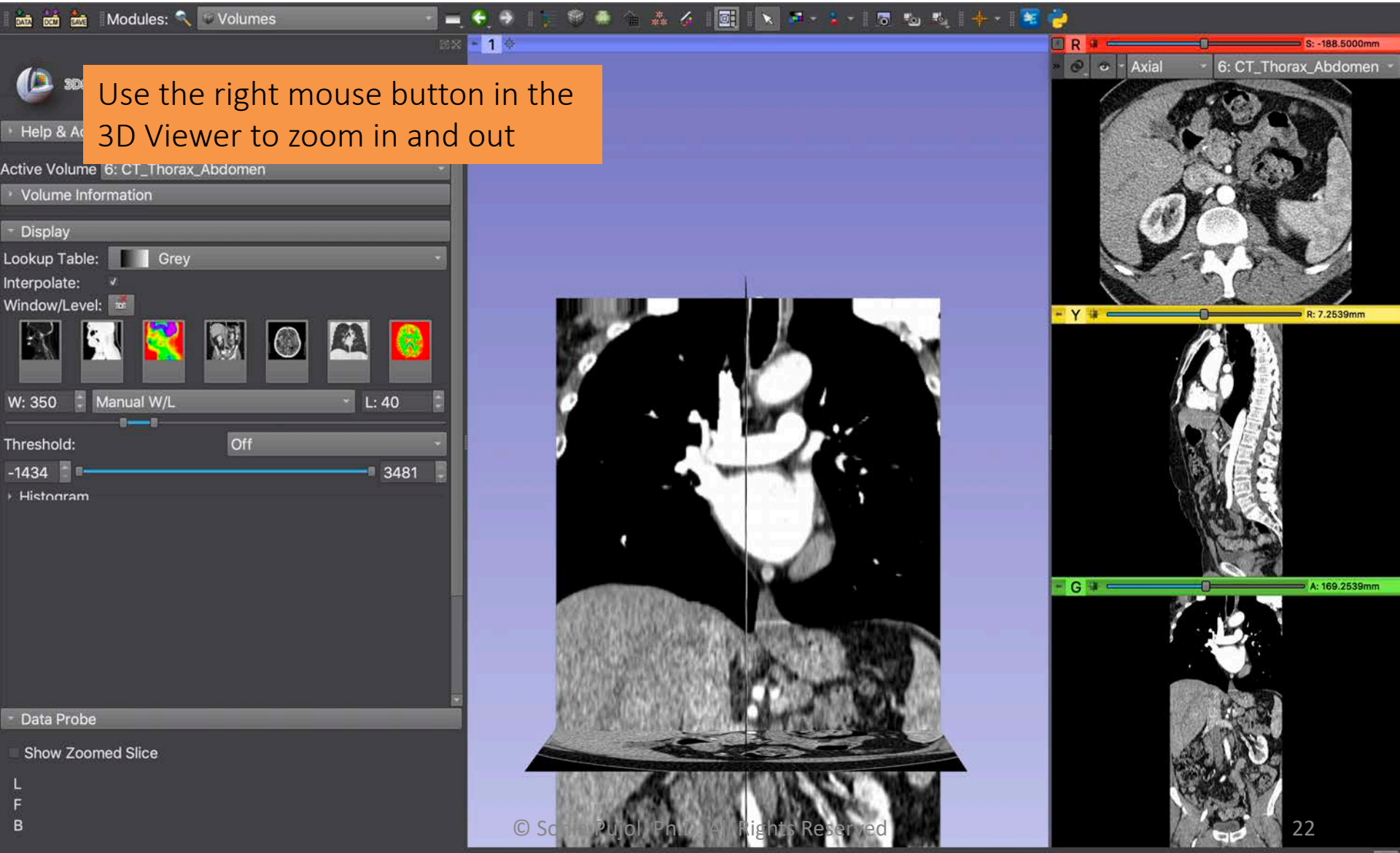


Visualizing DICOM images

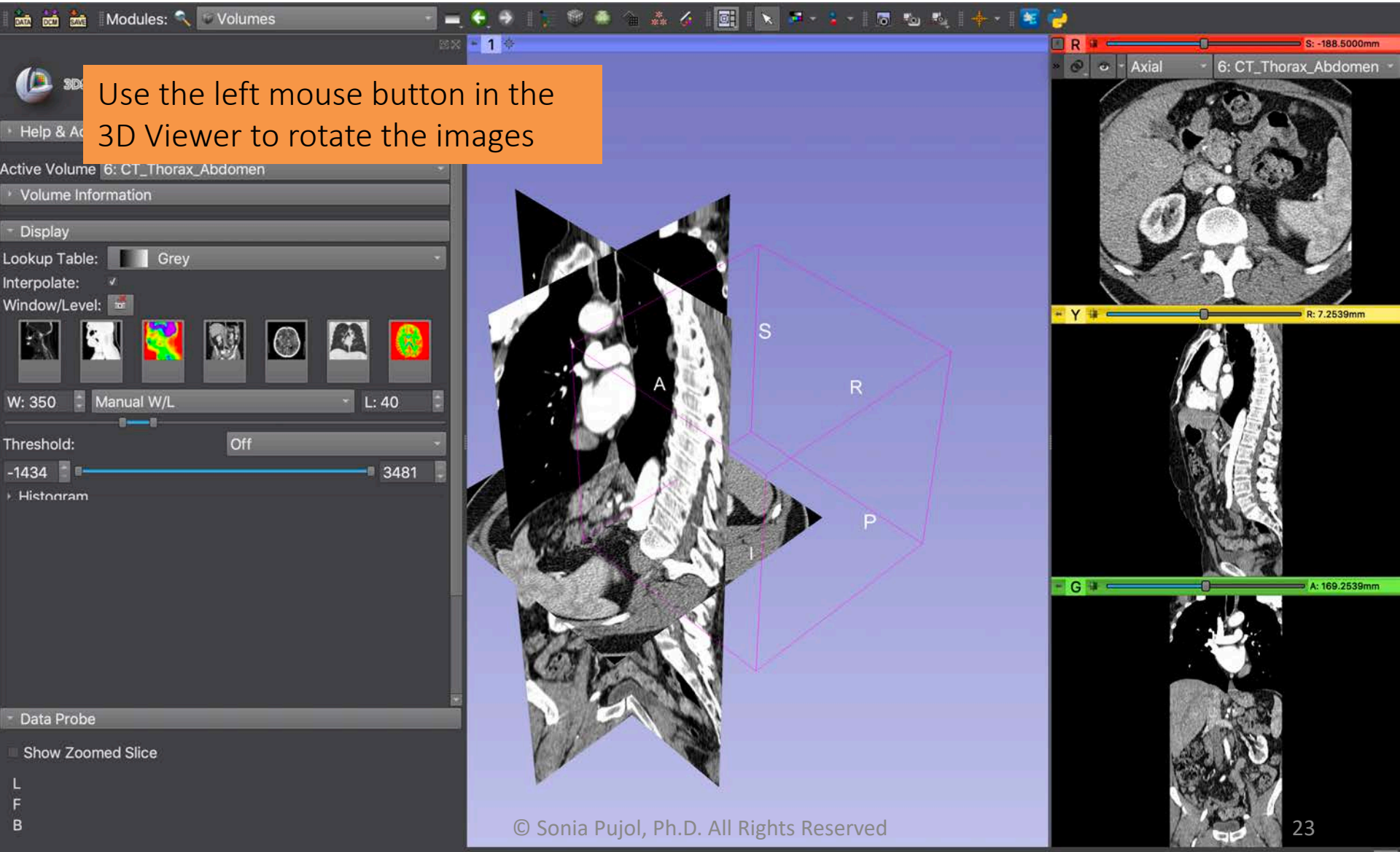


Visualizing DICOM images

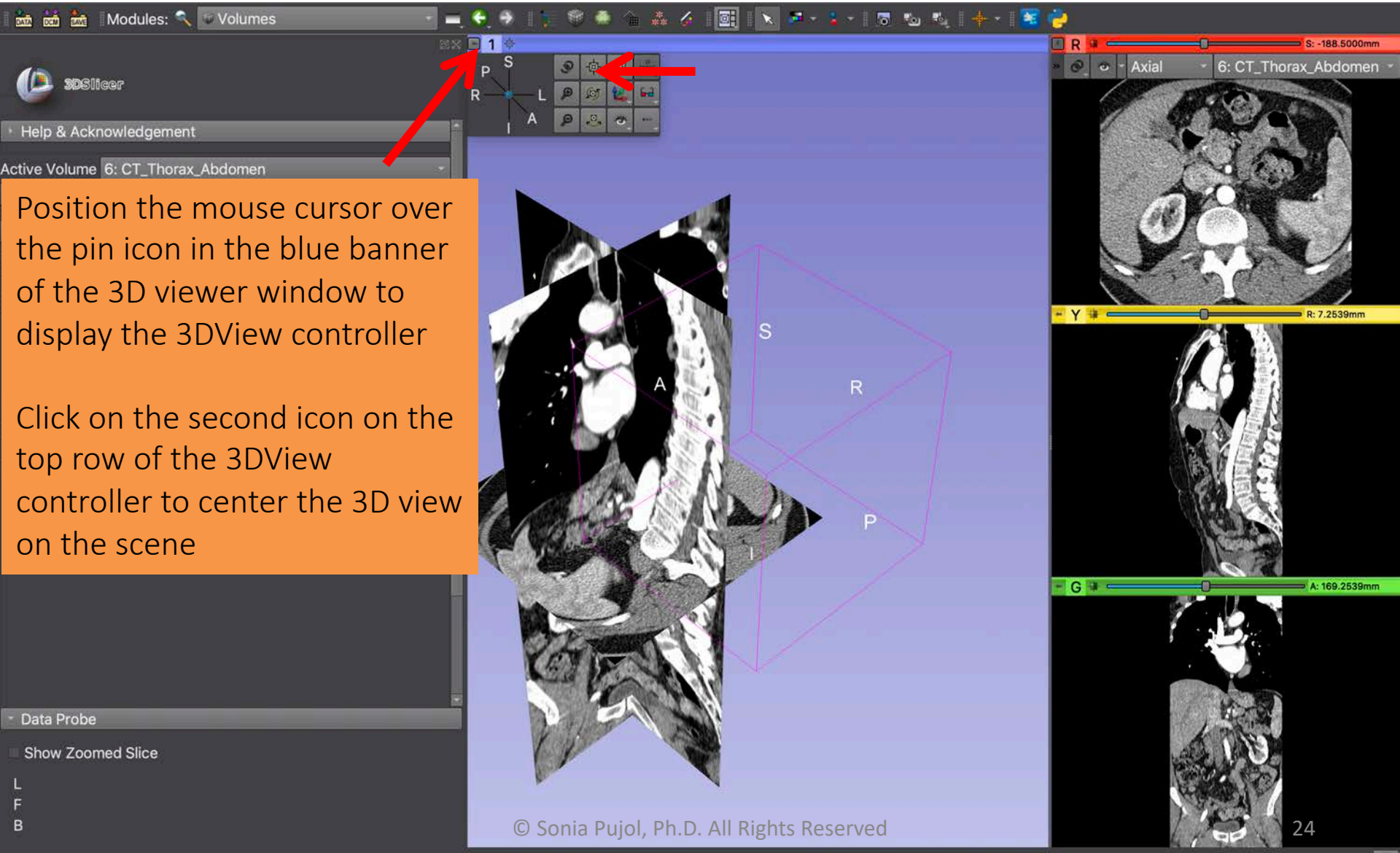
Visualizing DICOM images



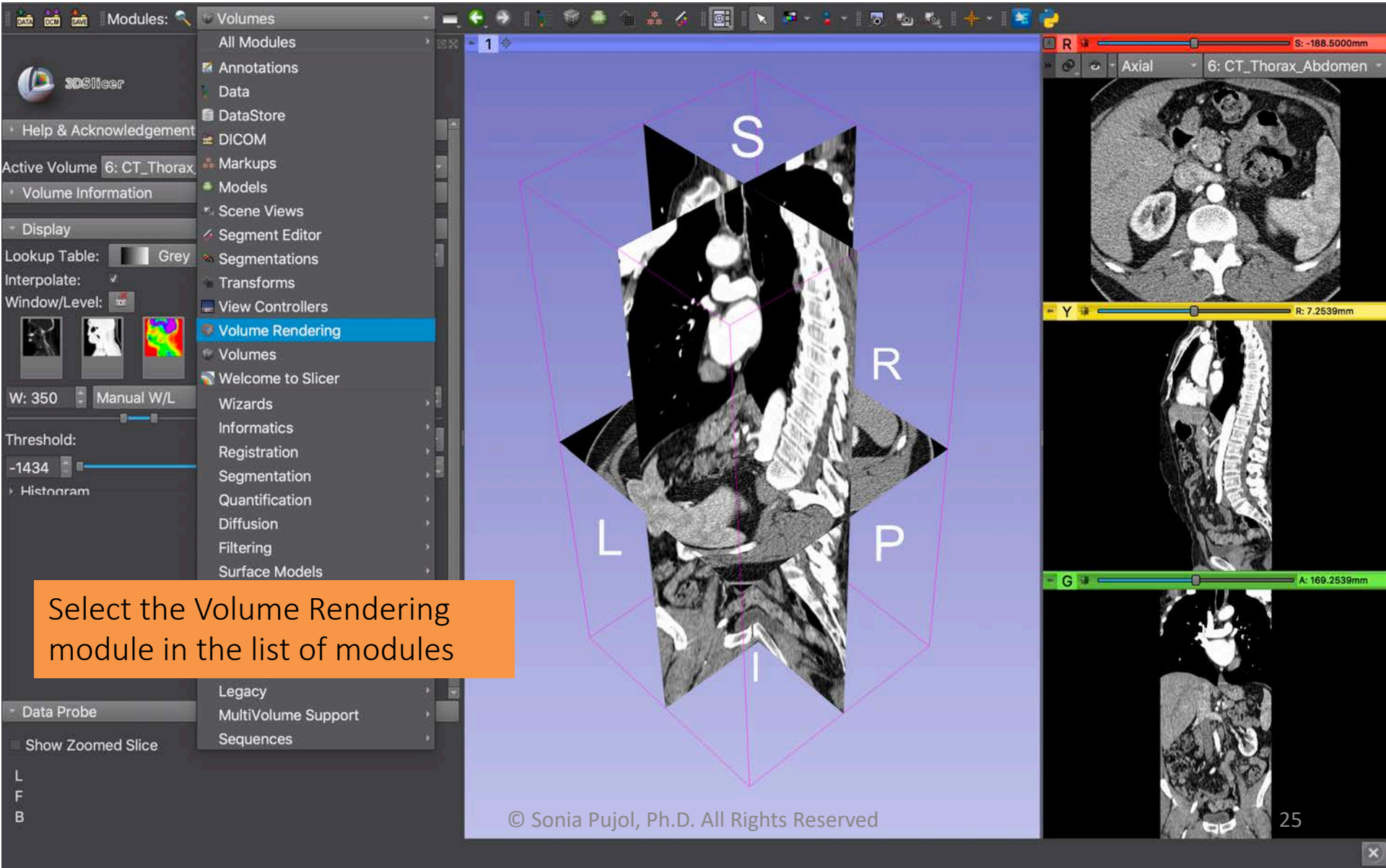
Visualizing DICOM images

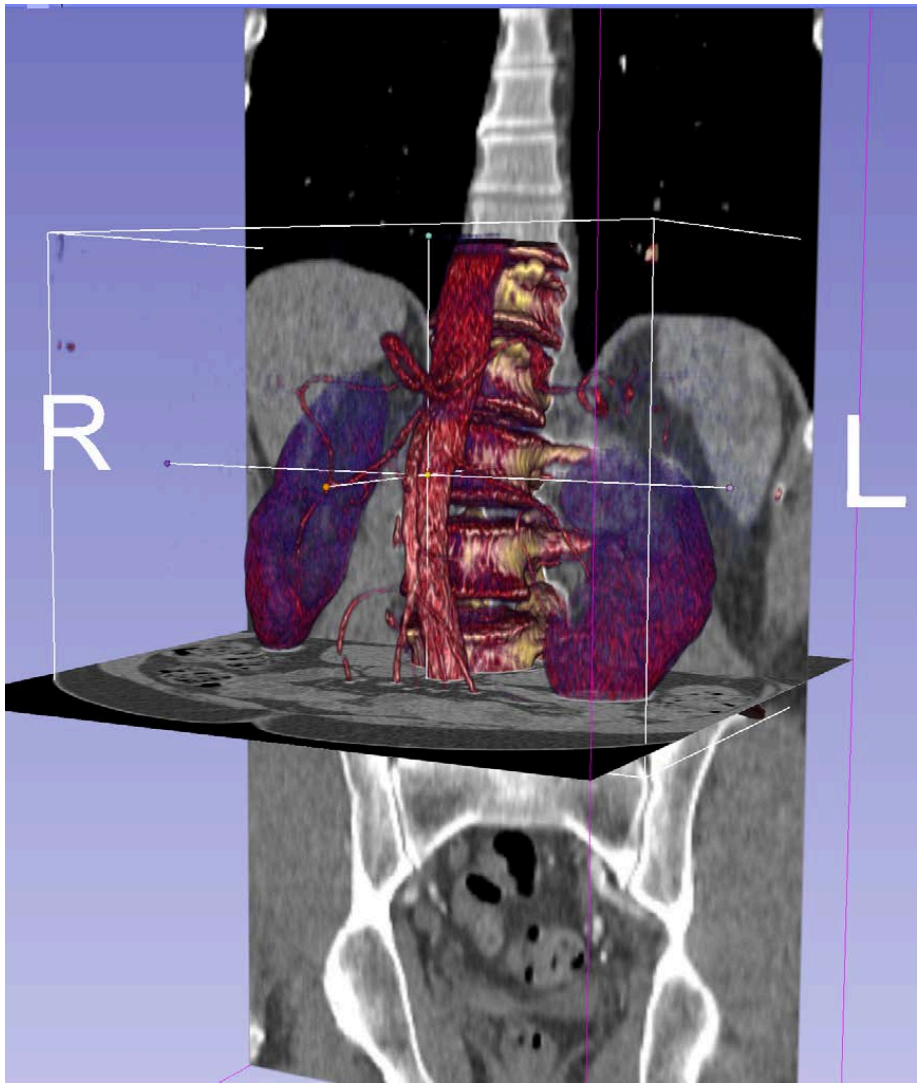


3D Viewer Controller



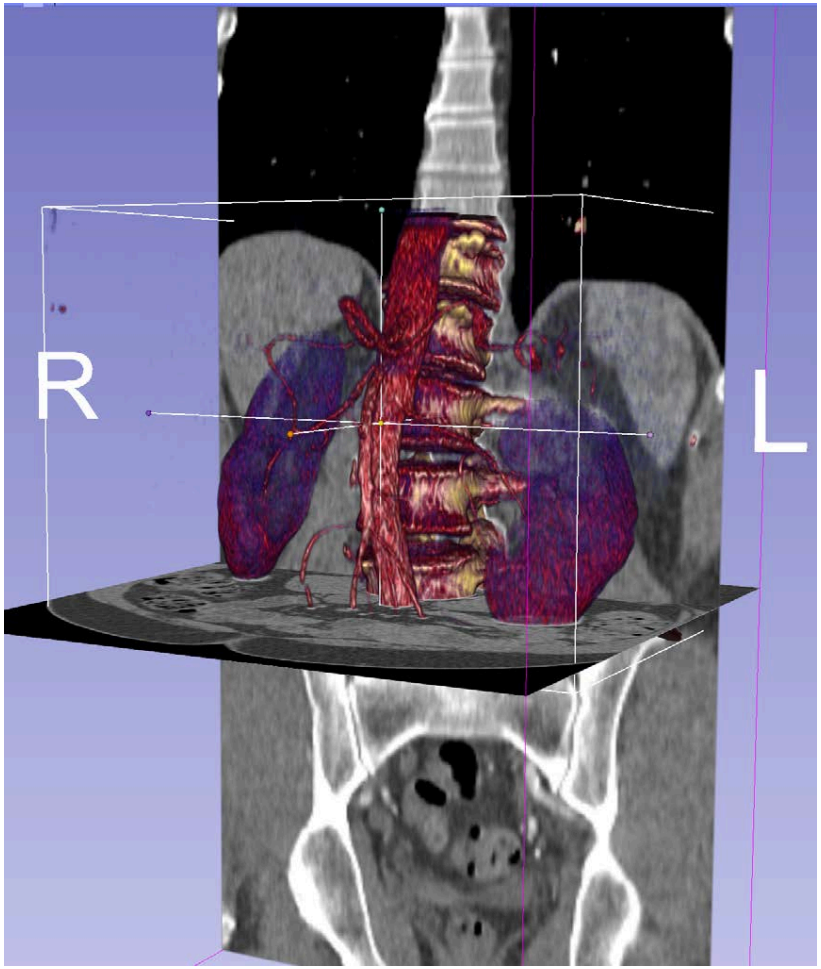
3D Viewer Controller





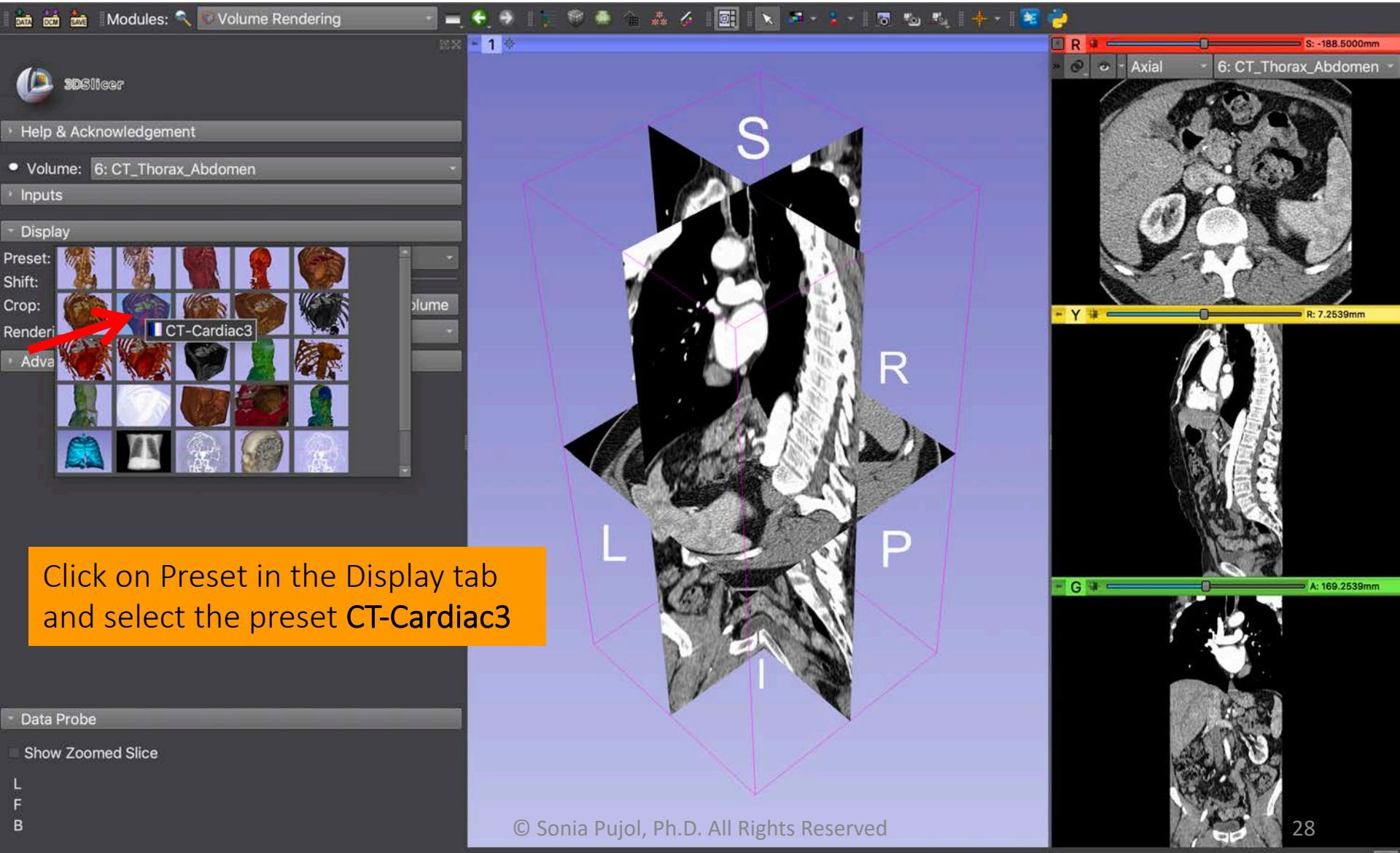
Part 2
Volume Rendering

Volume Rendering



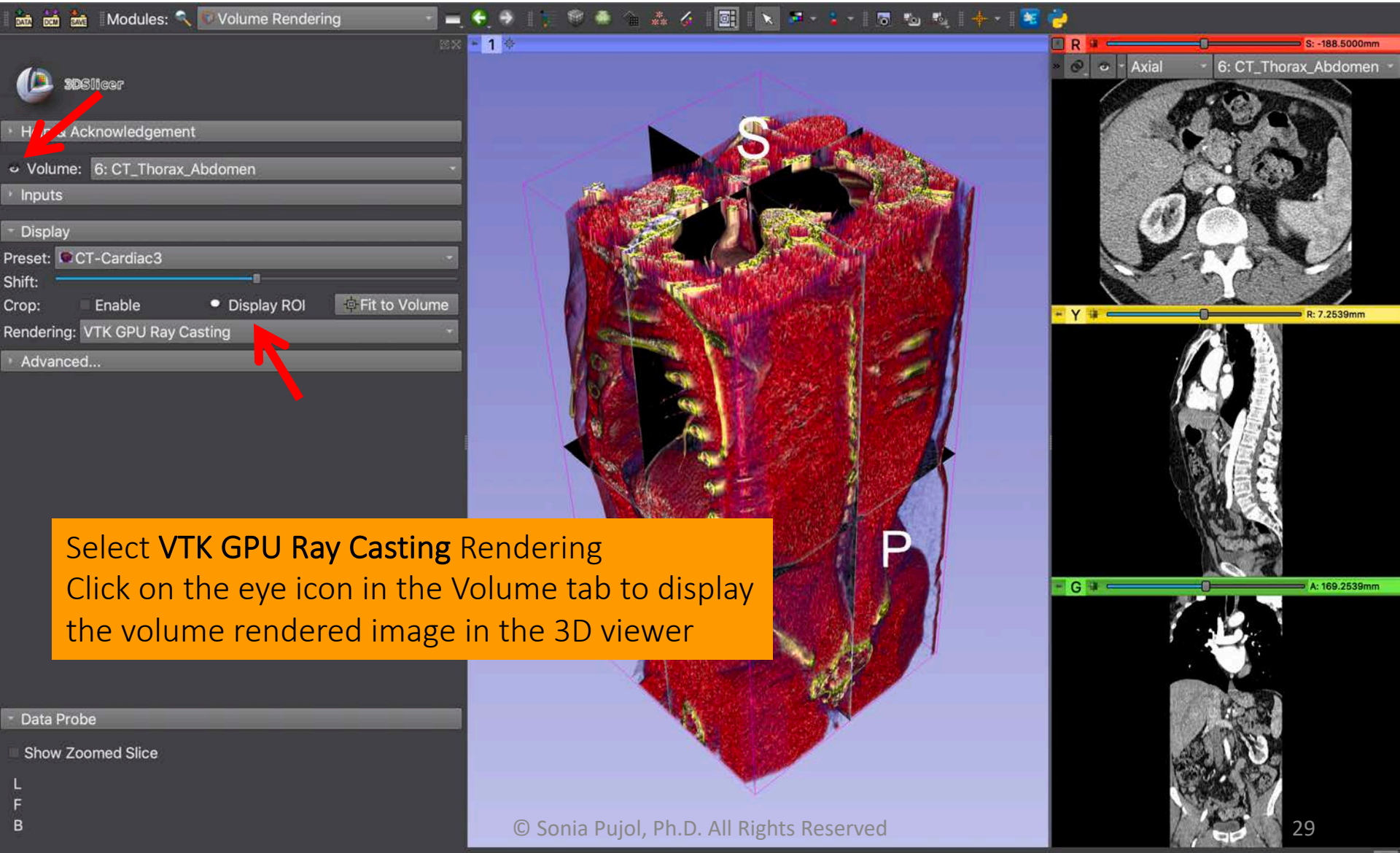
- Volume rendering techniques enable 3D visualization of 3D datasets
- The Volume Rendering module in Slicer enables interactive 3D visualization of DICOM images

Volume Rendering



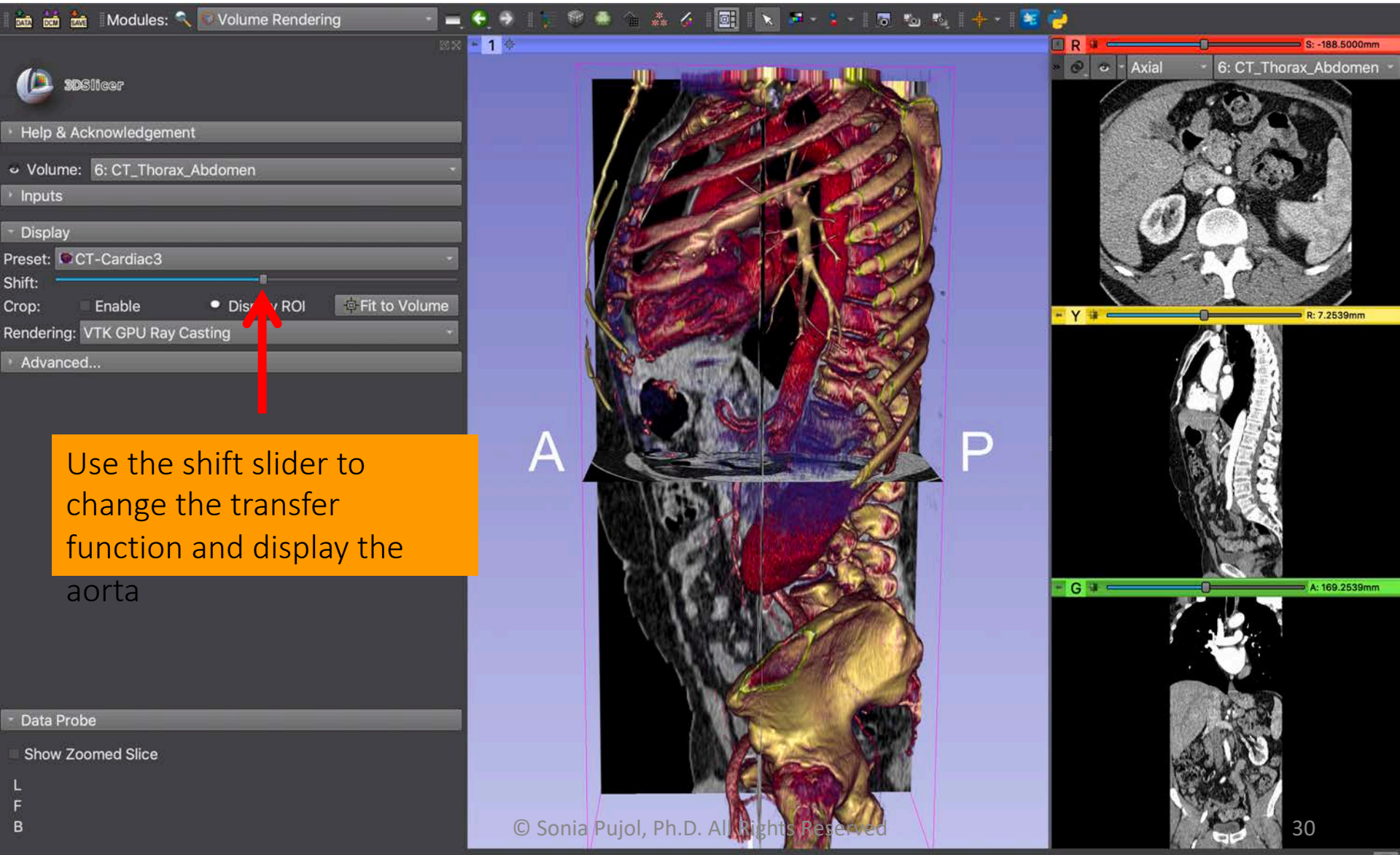
Click on Preset in the Display tab and select the preset **CT-Cardiac3**

Volume Rendering



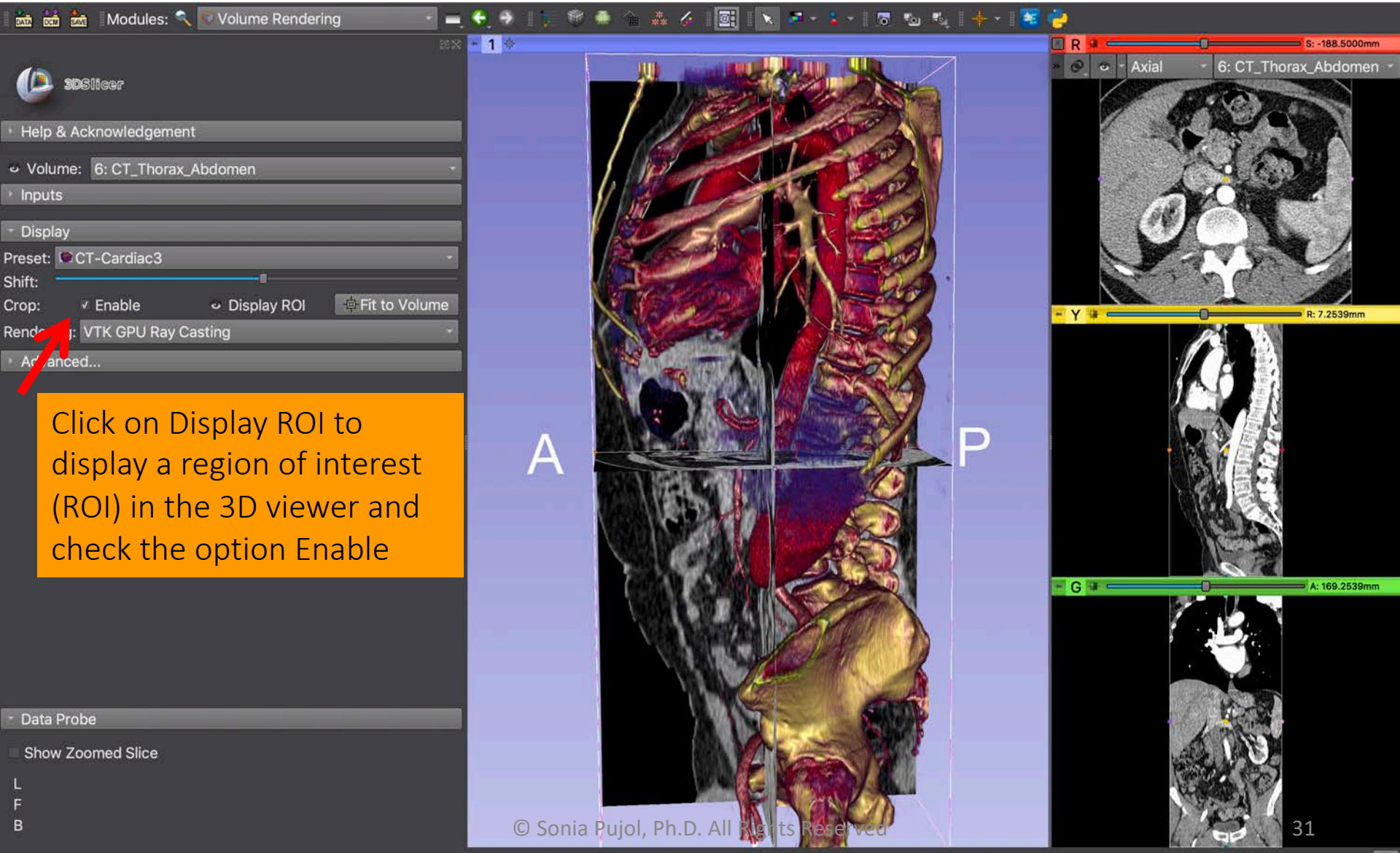
Select **VTK GPU Ray Casting** Rendering
Click on the eye icon in the Volume tab to display the volume rendered image in the 3D viewer

Volume Rendering



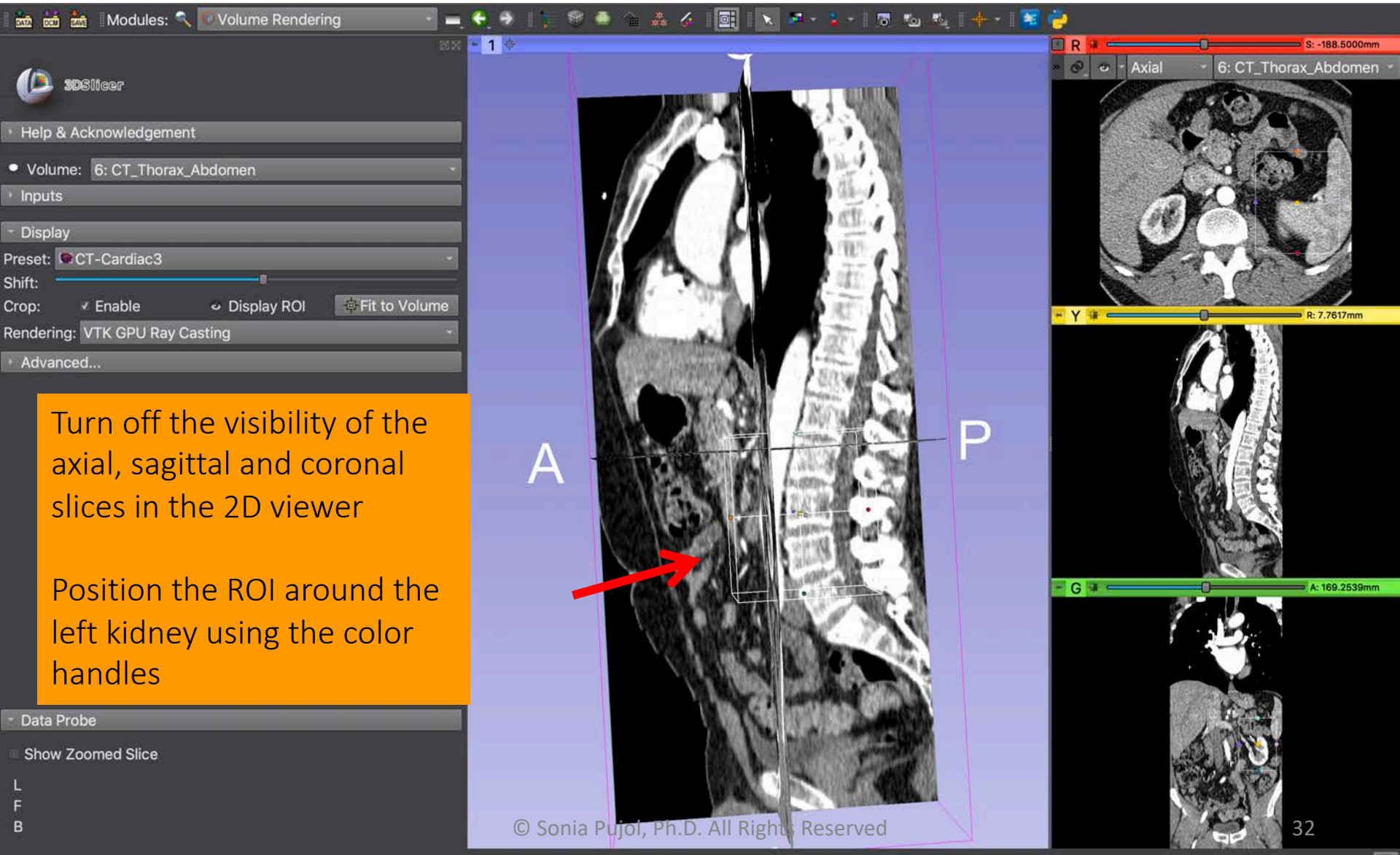
Use the shift slider to change the transfer function and display the aorta

Volume Rendering

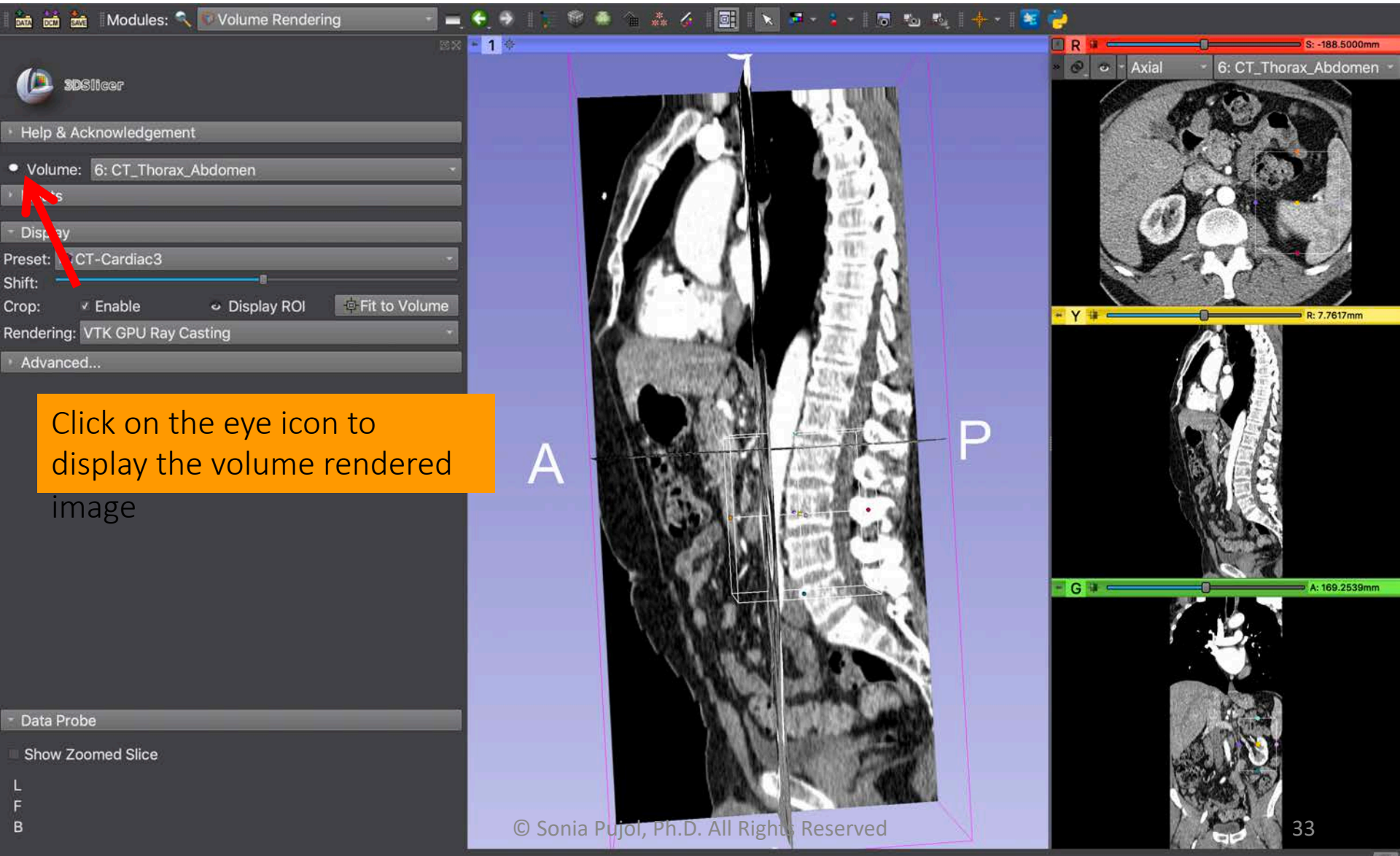


Click on Display ROI to display a region of interest (ROI) in the 3D viewer and check the option Enable

Volume Rendering

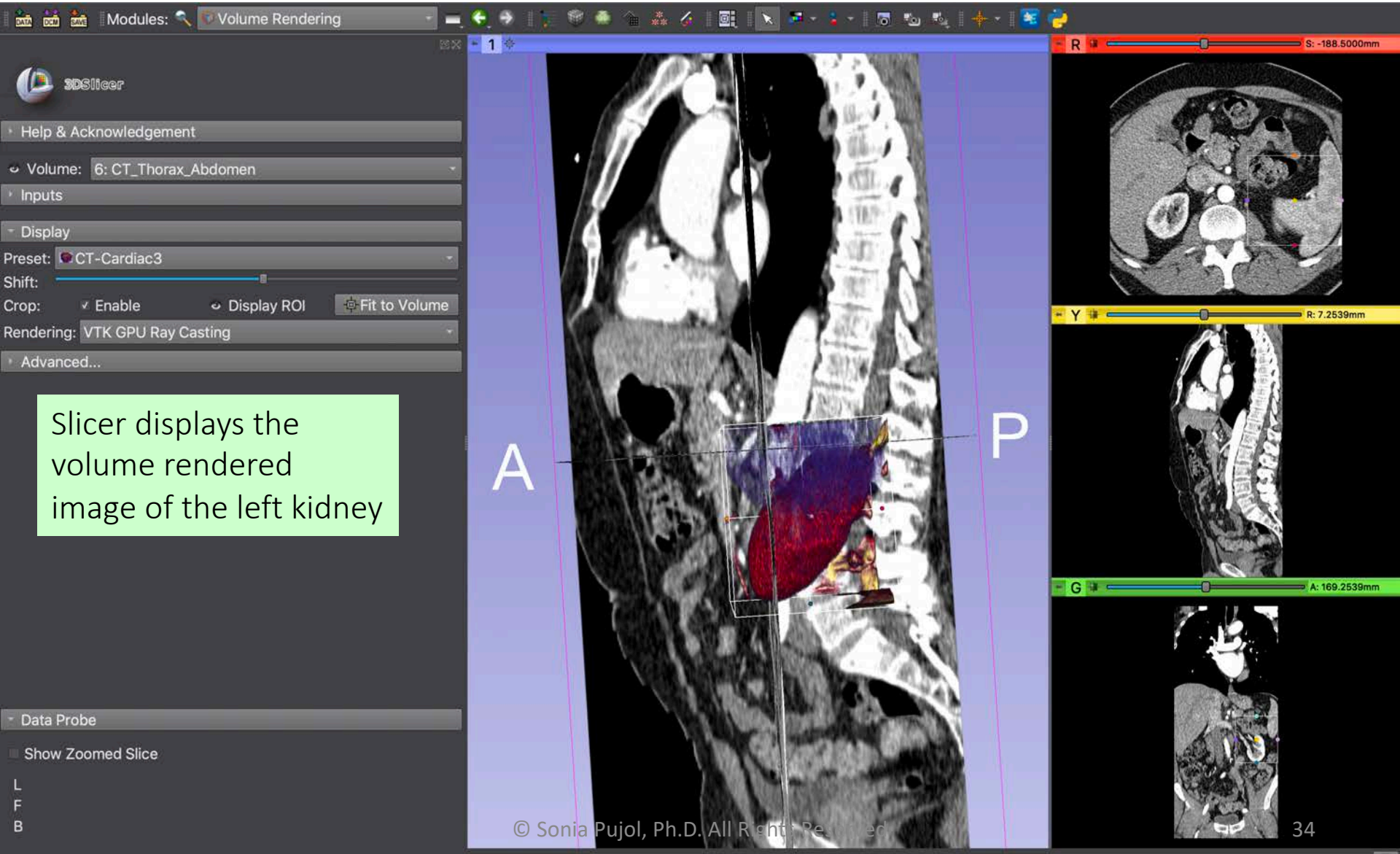


Volume Rendering



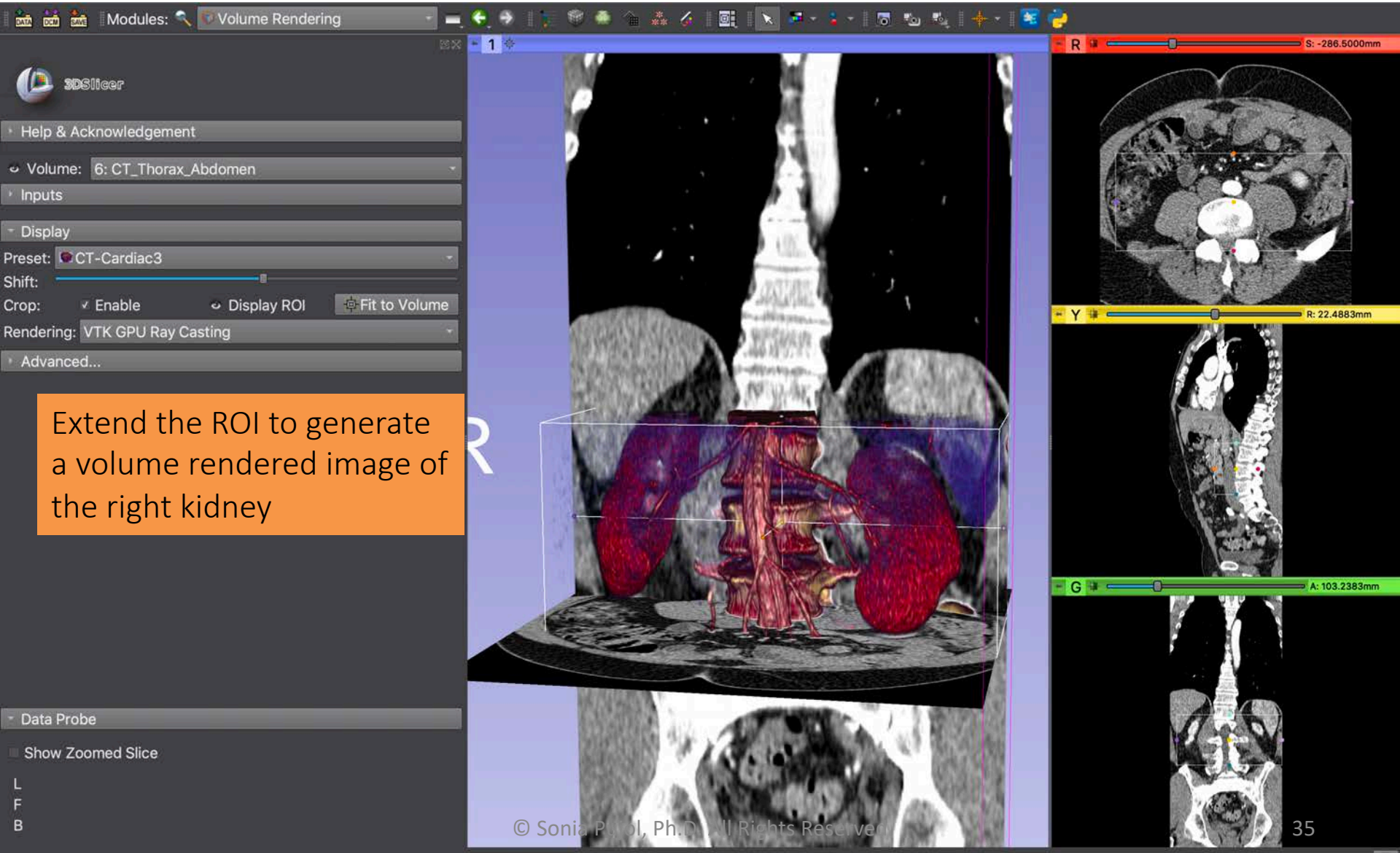
Click on the eye icon to display the volume rendered image

Volume Rendering

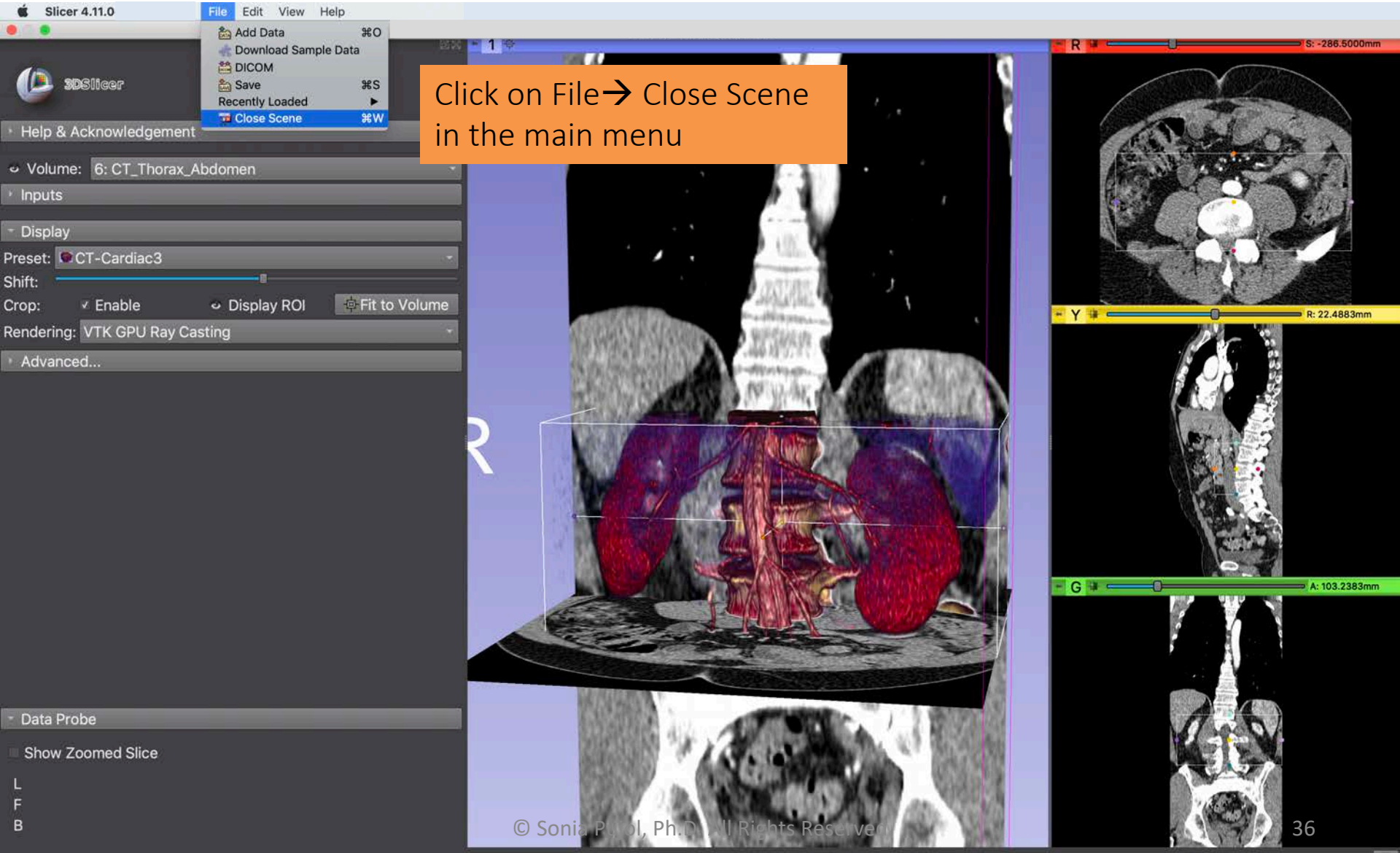


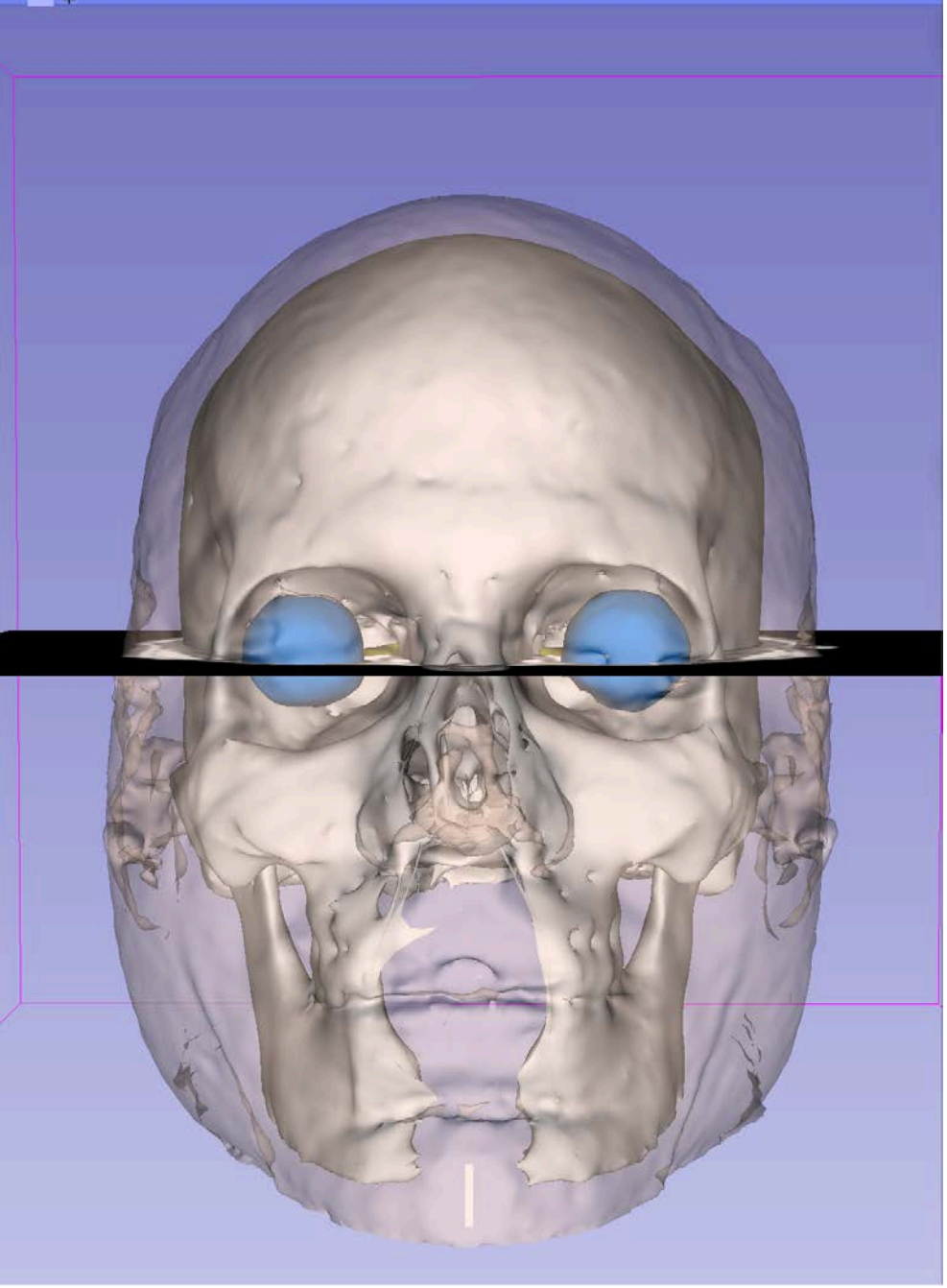
Slicer displays the volume rendered image of the left kidney

Volume Rendering



Volume Rendering

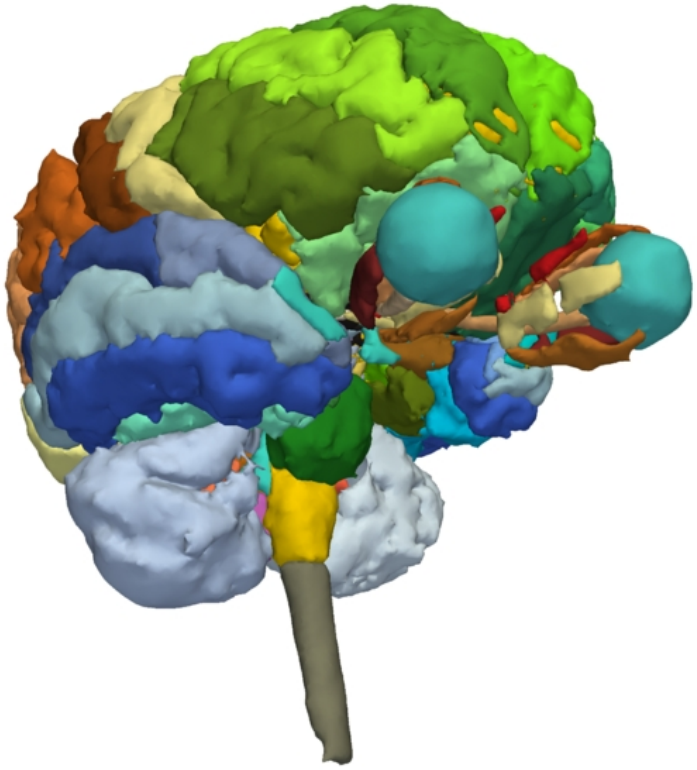


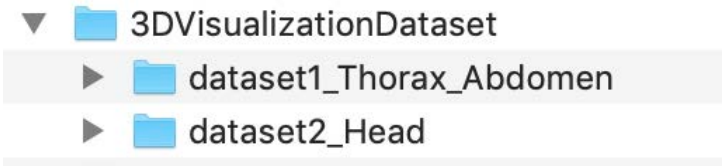


Part 3

Loading and viewing 3D models

Tutorial dataset



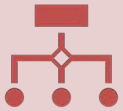


- The directory **dataset2_Head** contains the Slicer scene called **Head_scene.mrb**

- The scene contains 3D models from the **SPL brain atlas** developed by the department of Radiology at Brigham and Women's Hospital, Harvard Medical School (NIH P41 RR013218, NIH R01 MH05074)

Slicer Scene

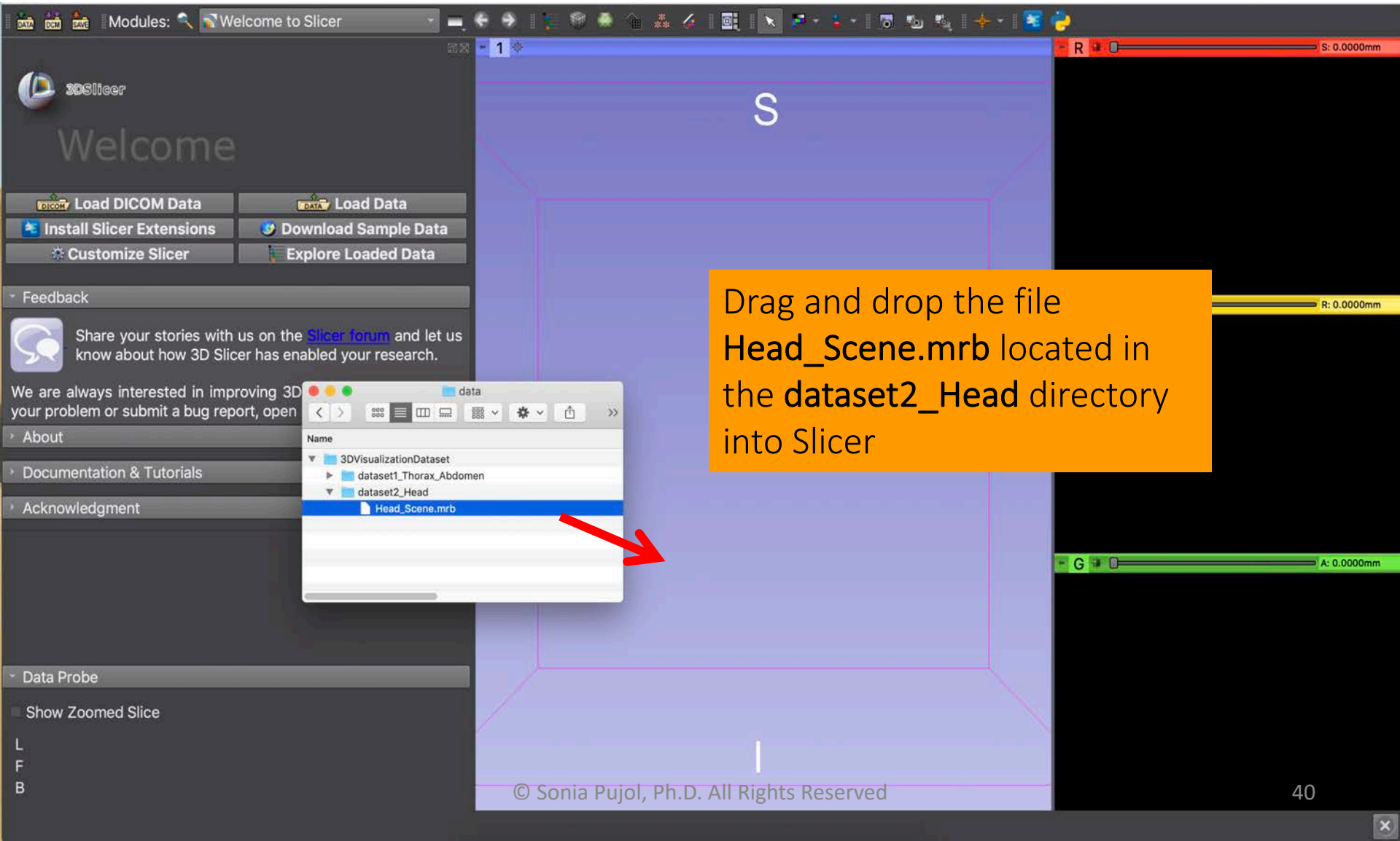
Slicer stores all loaded data in a repository called a scene



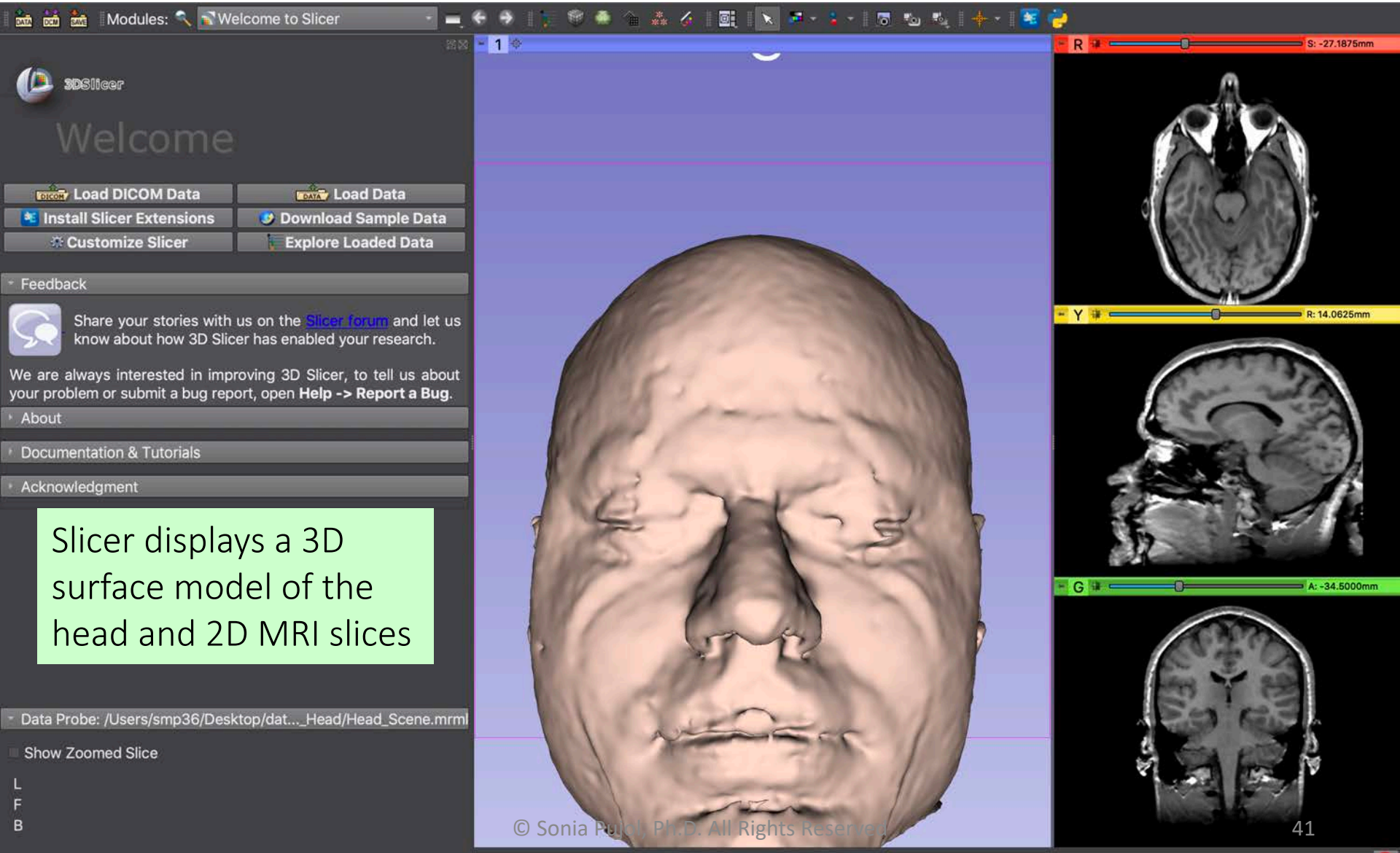
Each data set, such as an image volume, surface model, or point set, is represented as a node in a Slicer scene.

All Slicer modules operate on the data stored in a Slicer scene.

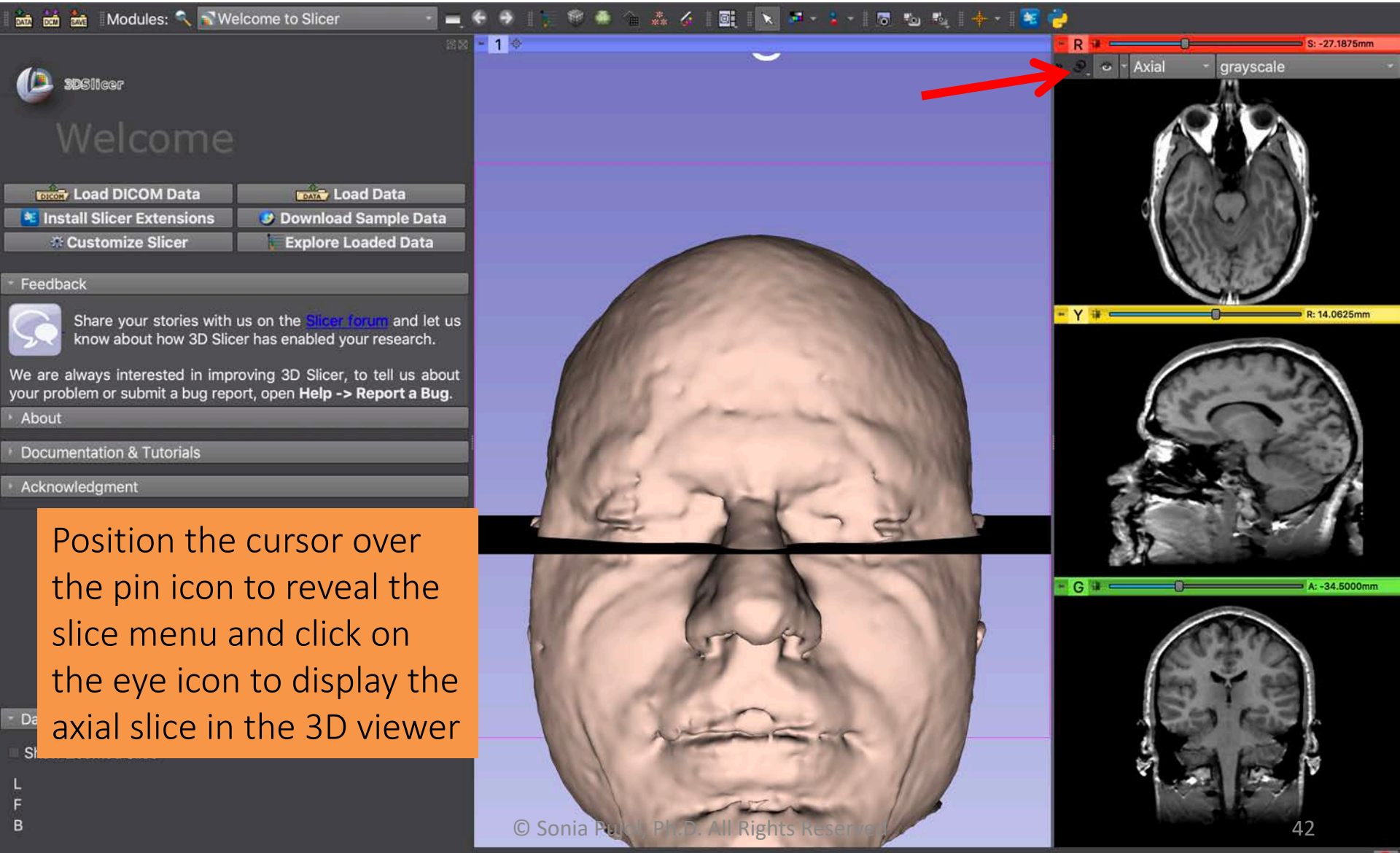
Loading a Scene



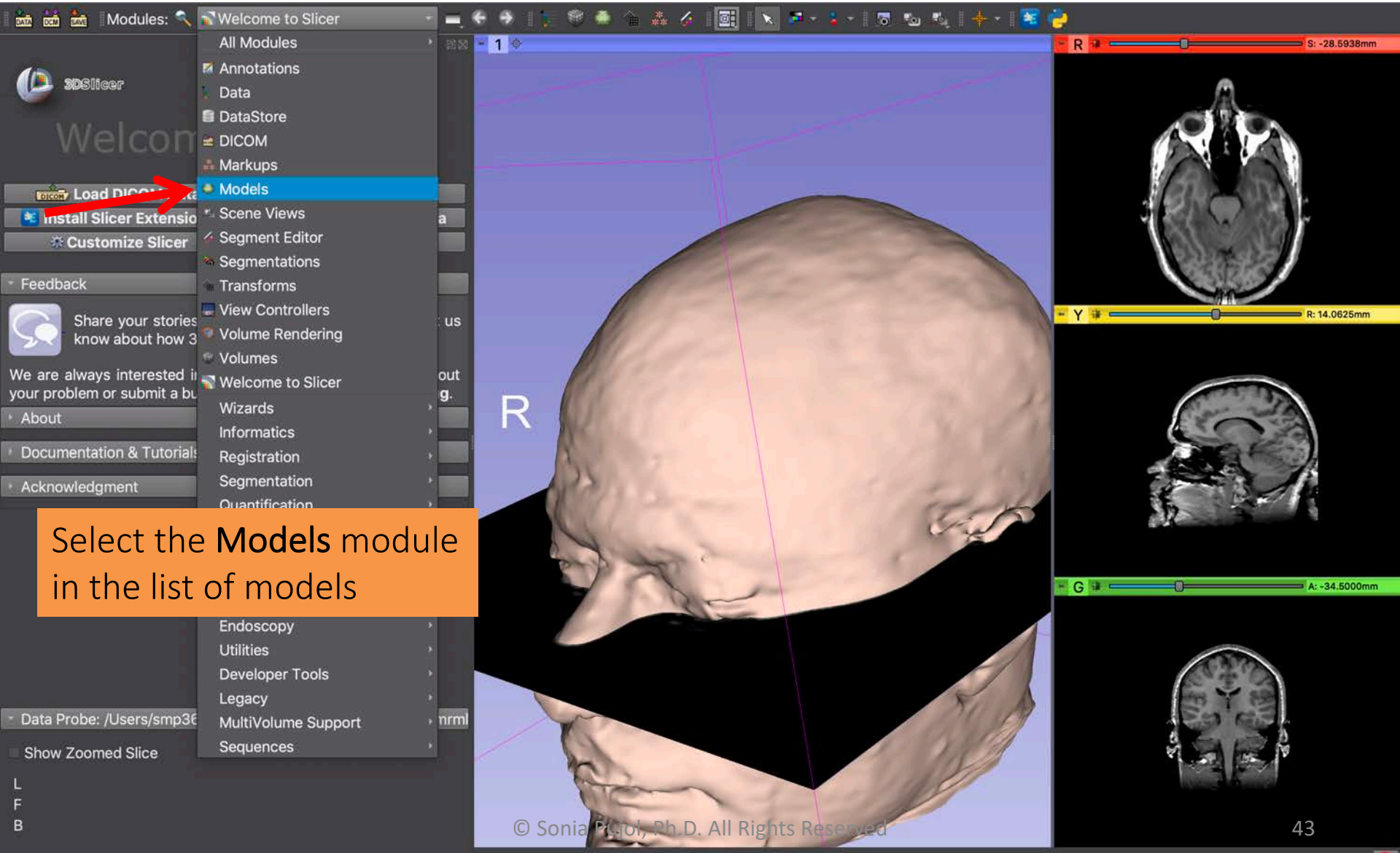
Loading a Scene



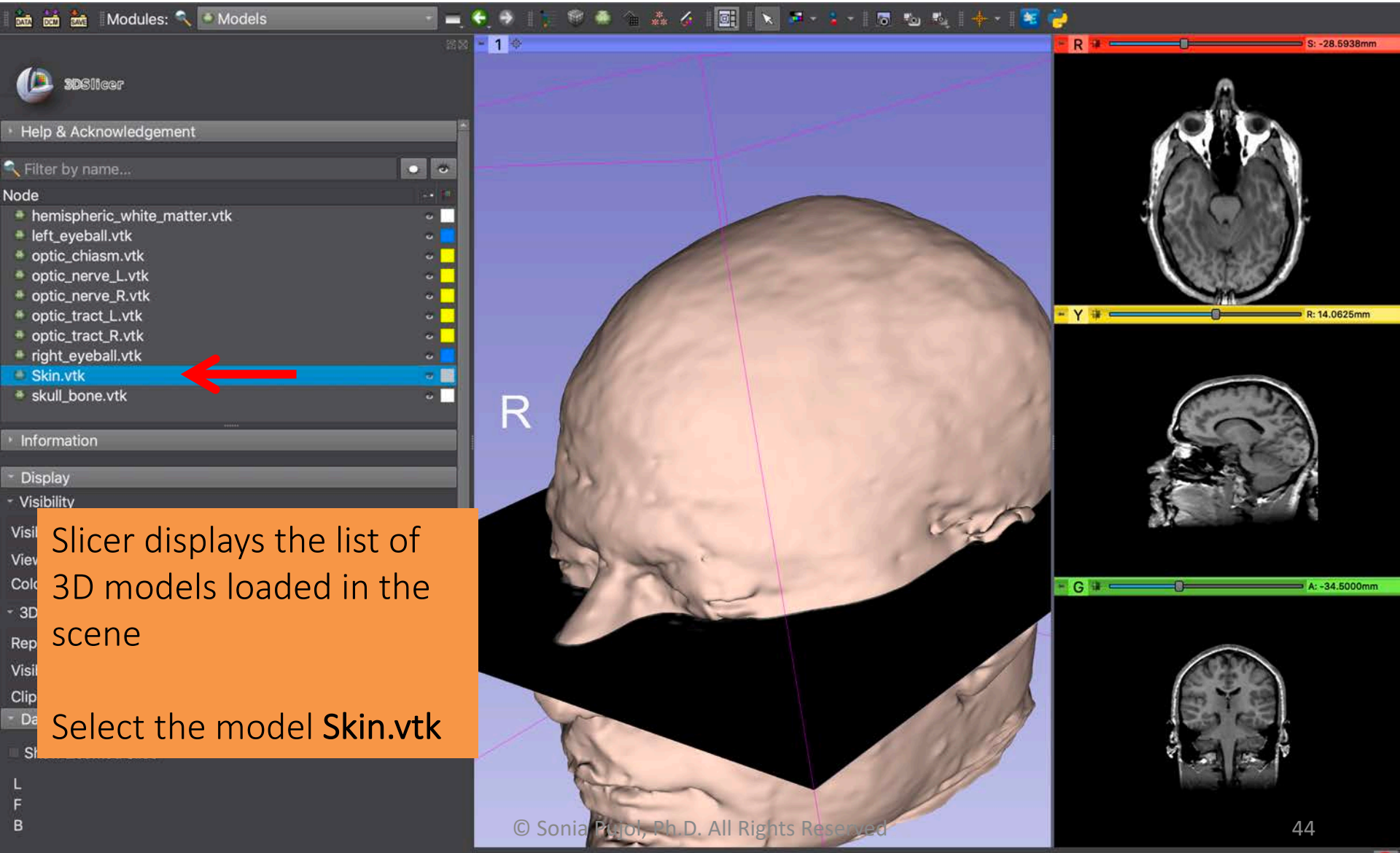
Viewing 3D models



Viewing 3D models



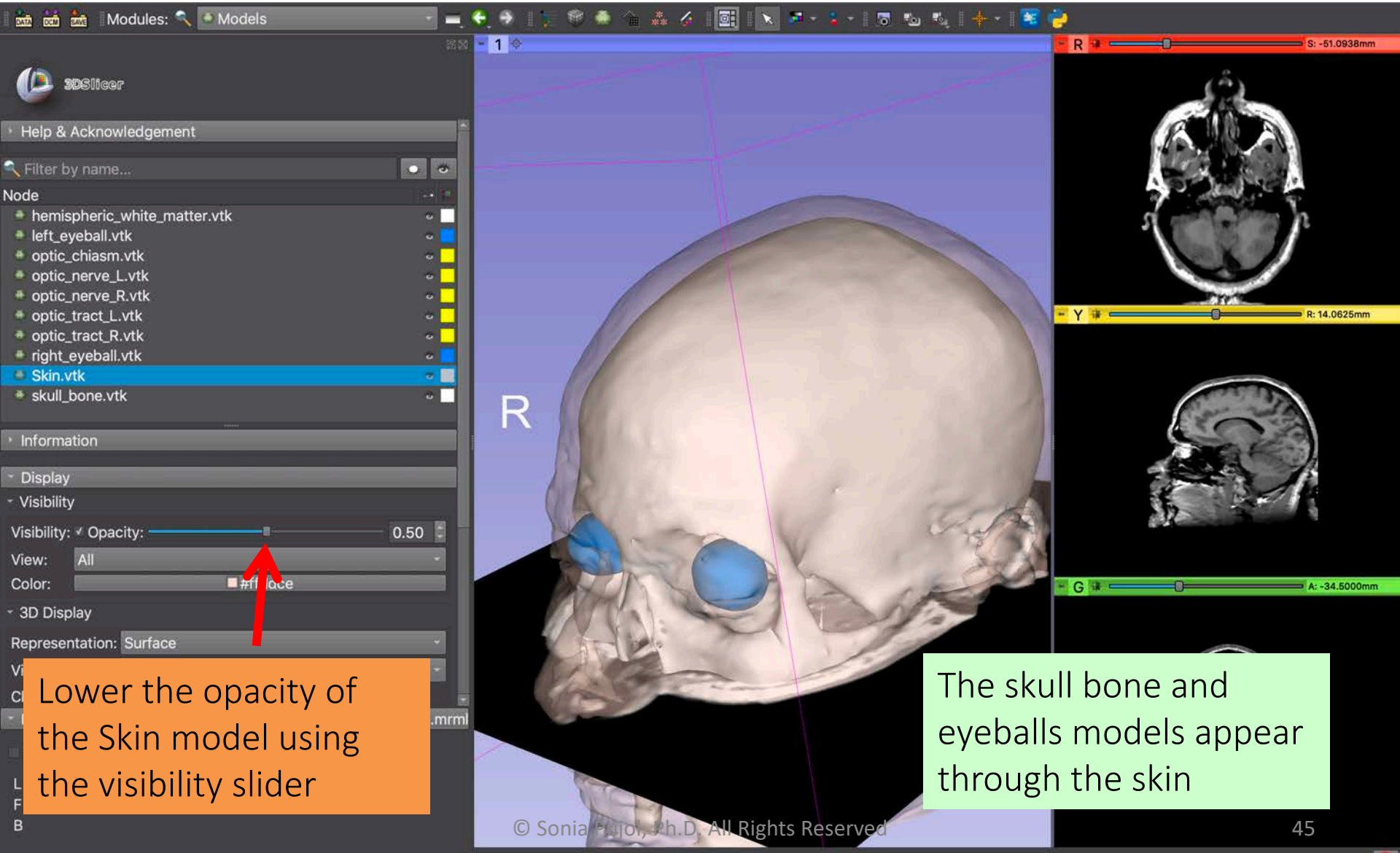
Viewing 3D models



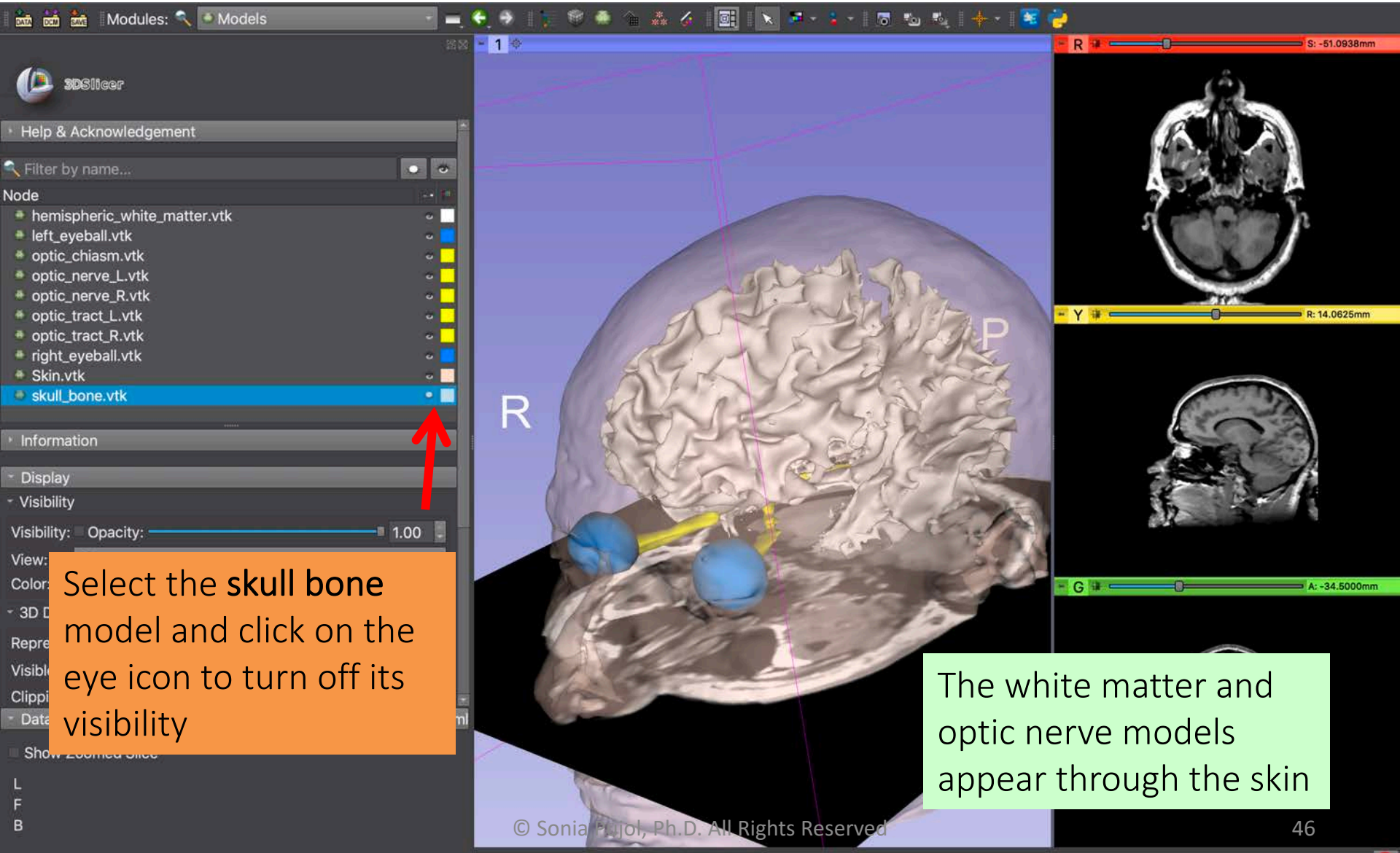
Slicer displays the list of 3D models loaded in the scene

Select the model **Skin.vtk**

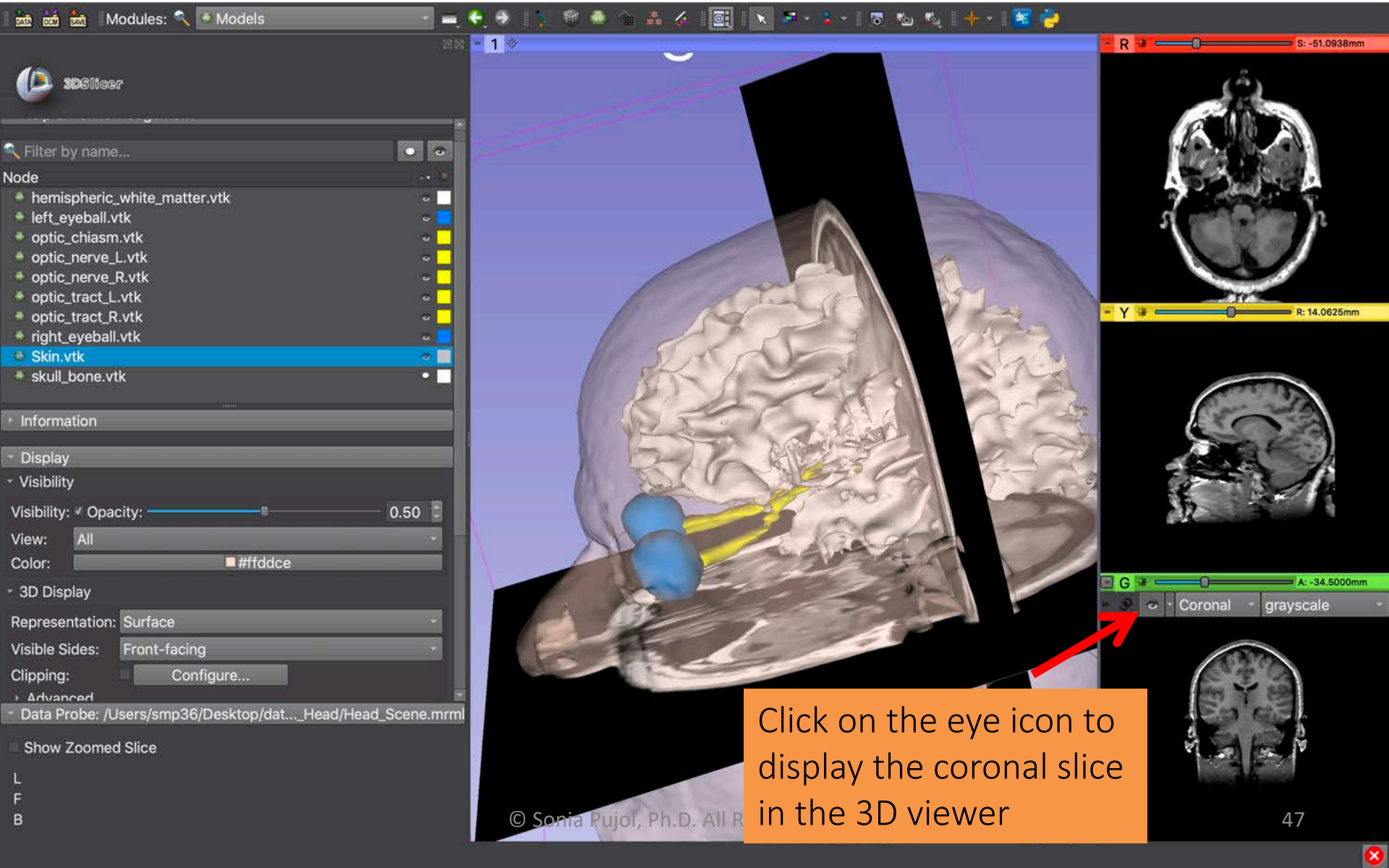
Viewing 3D models



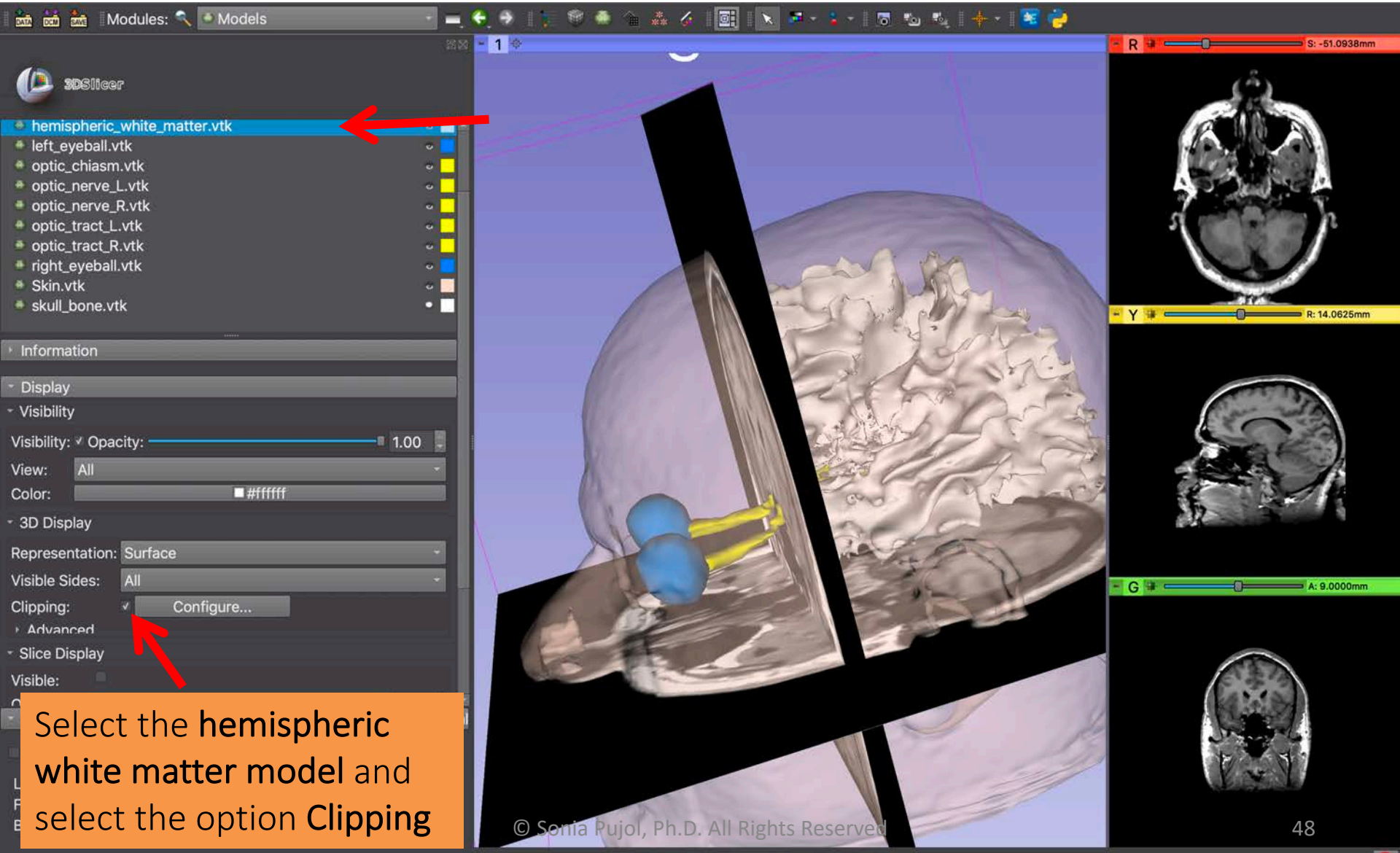
Viewing 3D models



Interacting with 3D models

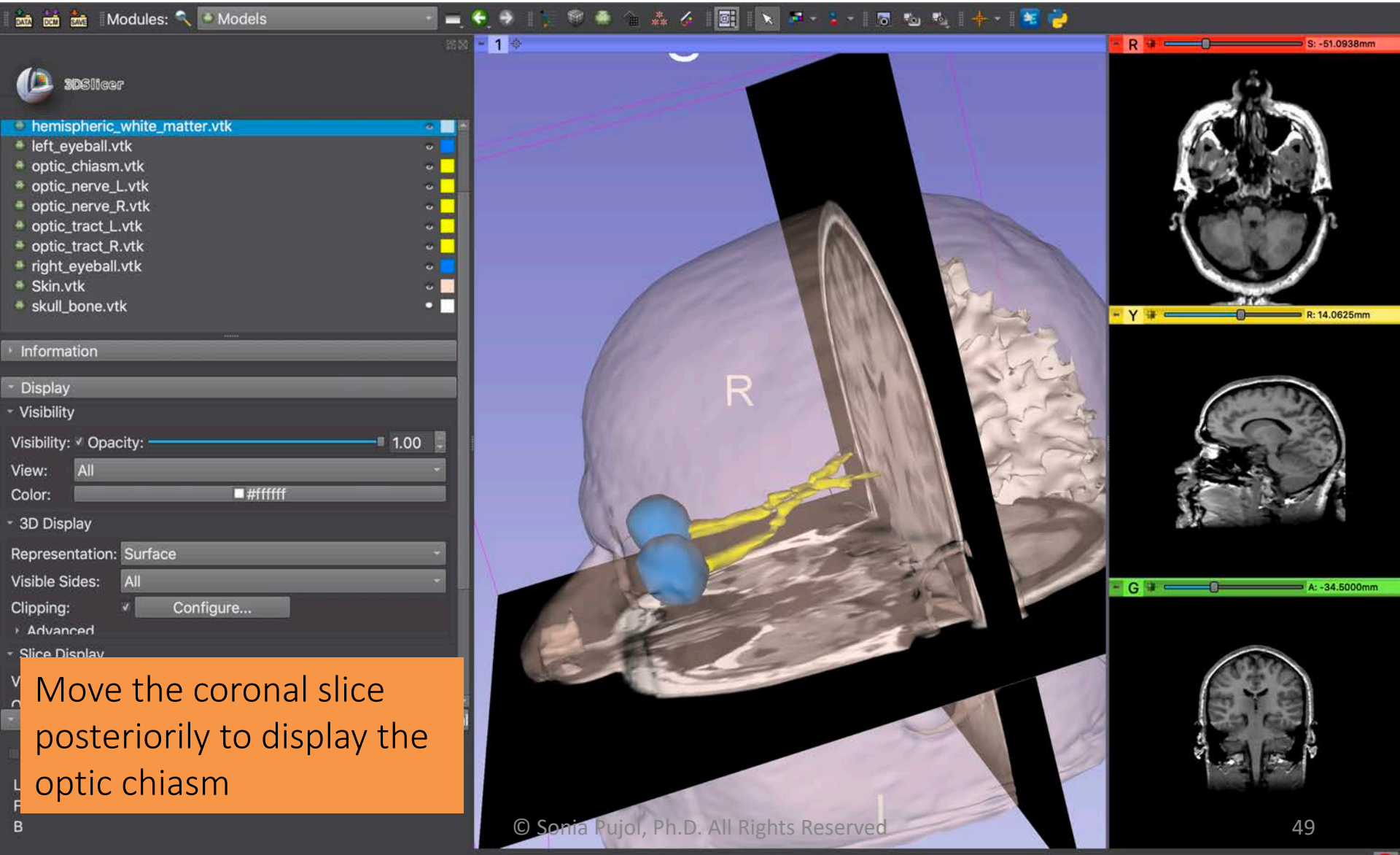


Interacting with 3D models

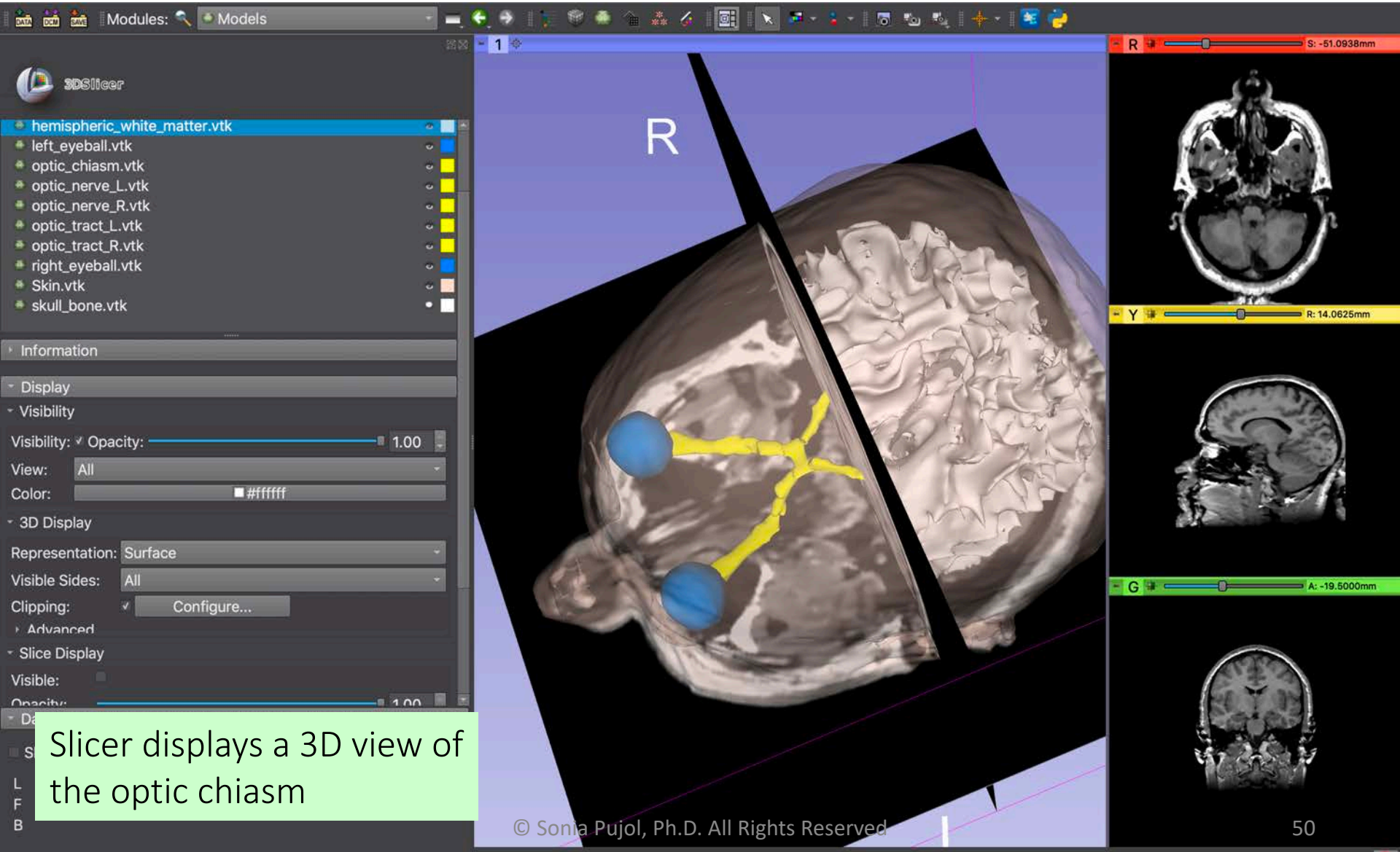


Select the **hemispheric white matter model** and select the option **Clipping**

Interacting with 3D models



Interacting with 3D models



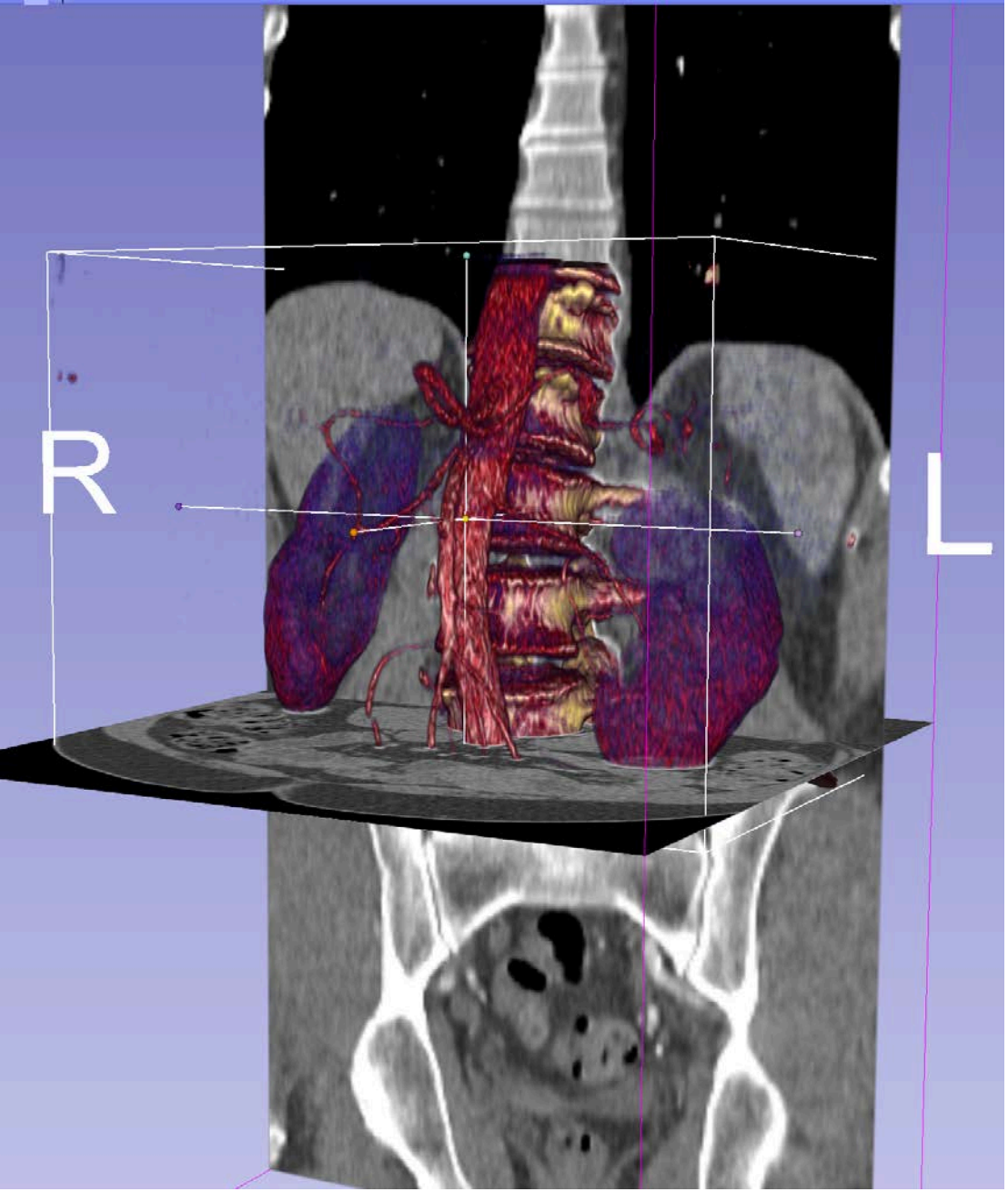
Slicer displays a 3D view of the optic chiasm

Conclusion

- 3D Slicer provides advanced functionalities for loading and viewing 3D medical imaging data

- The tutorial demonstrates how to use volume rendering and 3D surface modeling for interactive visualization of CT and MRI data

Contact: spujol@bwh.harvard.edu



Acknowledgments

Neuroimage Analysis Center
(NIBIB P41 EB015902)