

How to make CT DICOMS to 3D STL

3D Slicer (Version 5.2.2)

MeshMixer

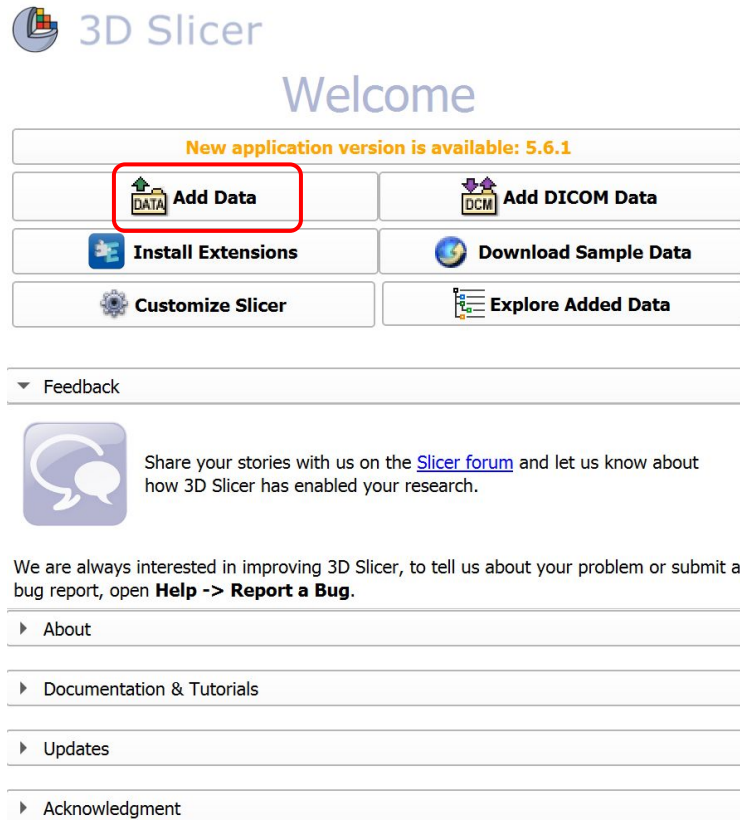
March 24, 2024

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Programs

- 3D Slicer (Version 5.2.2)
- MeshMixer
- Youtube:
<https://www.youtube.com/watch?v=TolkOpDVfpw>
“CT or MRI to 3D print DICOM to STL with Local computer Part 1 of 2” by Tomas Lindehell







Open Slicer and Add Data




3D Slicer

Welcome

New application version is available: 5.6.1

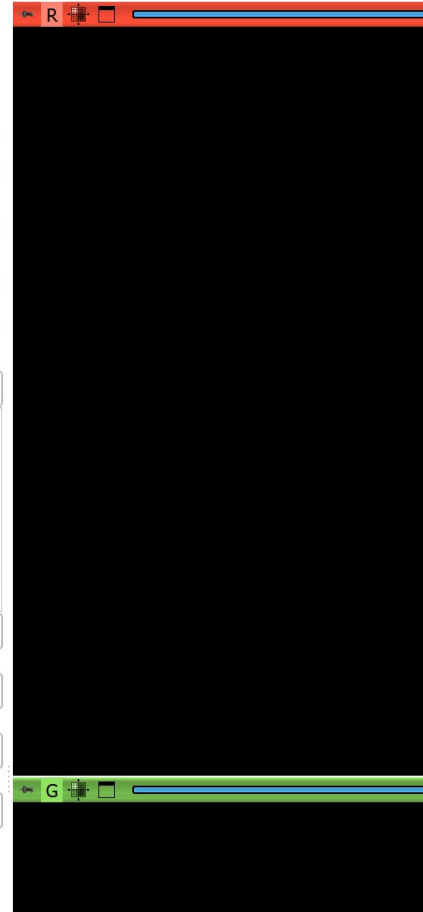
 Add Data	 Add DICOM Data
 Install Extensions	 Download Sample Data
 Customize Slicer	 Explore Added Data

Feedback

 Share your stories with us on the [Slicer forum](#) and let us know about how 3D Slicer has enabled your research.

We are always interested in improving 3D Slicer, to tell us about your problem or submit a bug report, open **Help** -> **Report a Bug**.




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- ▶ Acknowledgment






Import DICOM files

3D Slicer

► Help & Acknowledgement

  **Import DICOM files**  **Show DICOM database**

Loaded data

Node   

DICOM database

Patients:

Patient name

- PAGE, RONALD NMN
- DUBOSE, KHARI DAVID**
- CORTEZ, JAYSON VILLANUEVA

Select the Series to make 3D

DICOM database

Patients: Studies: Series:

Patient name	Patient ID	Birth date	Sex	Studies	Last study date
LICHTSINNSHROYER, JACOB FREDERI	1473822810	1993-09-07	M	1	2018-09-06
PAGE, RONALD NMN	1360541432	1955-10-01	M	1	2023-10-31
DUBOSE, KHARI DAVID	1545096370	1999-07-15	M	1	2022-07-19
CORTEZ, JAYSON VILLANUEVA	1526171310	1998-12-02	M	1	2022-05-20

Study date	Study ID	Study description	Series
20180906	0640-18022842	YAB CT RIGHT UPPER EXTREMITY W/O CONTRAST	10

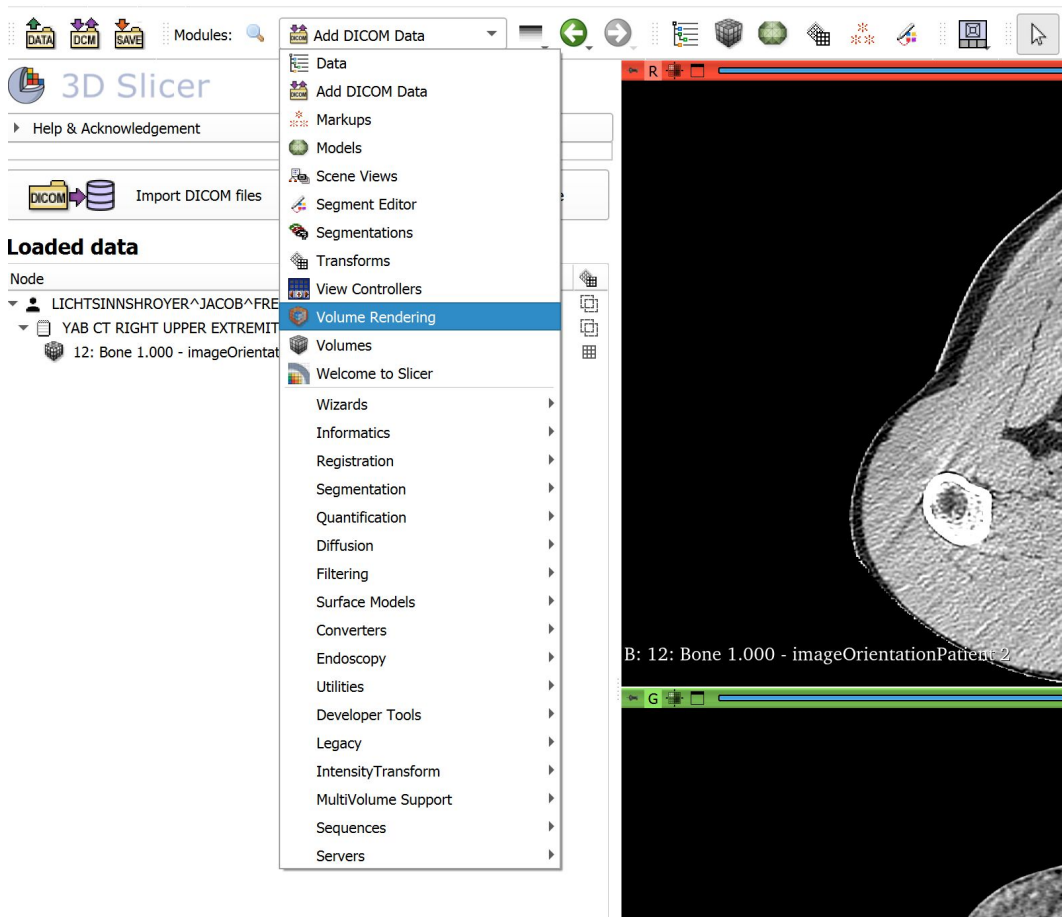
Series #	Series description	Modality	Size	Count
1	2.0	CT	512x512	2
8	Bone 2.000	CT	512x512	116
10	Bone 2.000	CT	512x512	104
12	Bone 1.000	CT	512x512	238
14	Bone 1.000	CT	512x512	197
15	Bone 1.000	CT	512x512	135
16	Bone	CT	680x680	36
17	Bone	CT	680x680	36
19	Body 0.5	CT	512x512	761
20	Bone 0.5	CT	512x512	761

Each CD has different series in the folder. If there is a “bone” series, that’s the one you want.

In this case, there were multiple, so I just selected the 1.0 mm slices.



Module: Volume Rendering



Once the images are loaded, there will be four boxes with the images (the top right is currently blank).

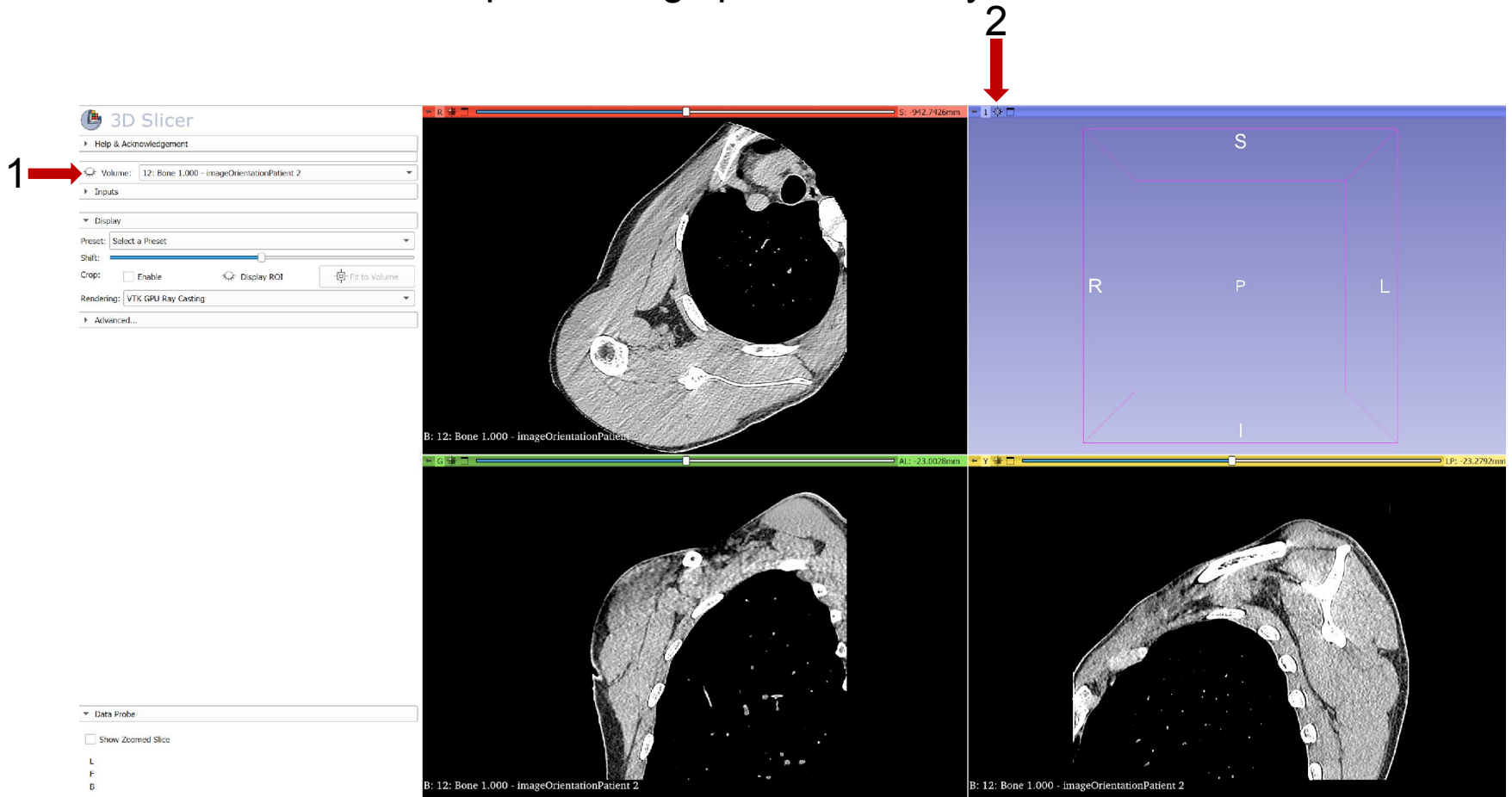
Go to the Module
Volume Rendering

Make 3D

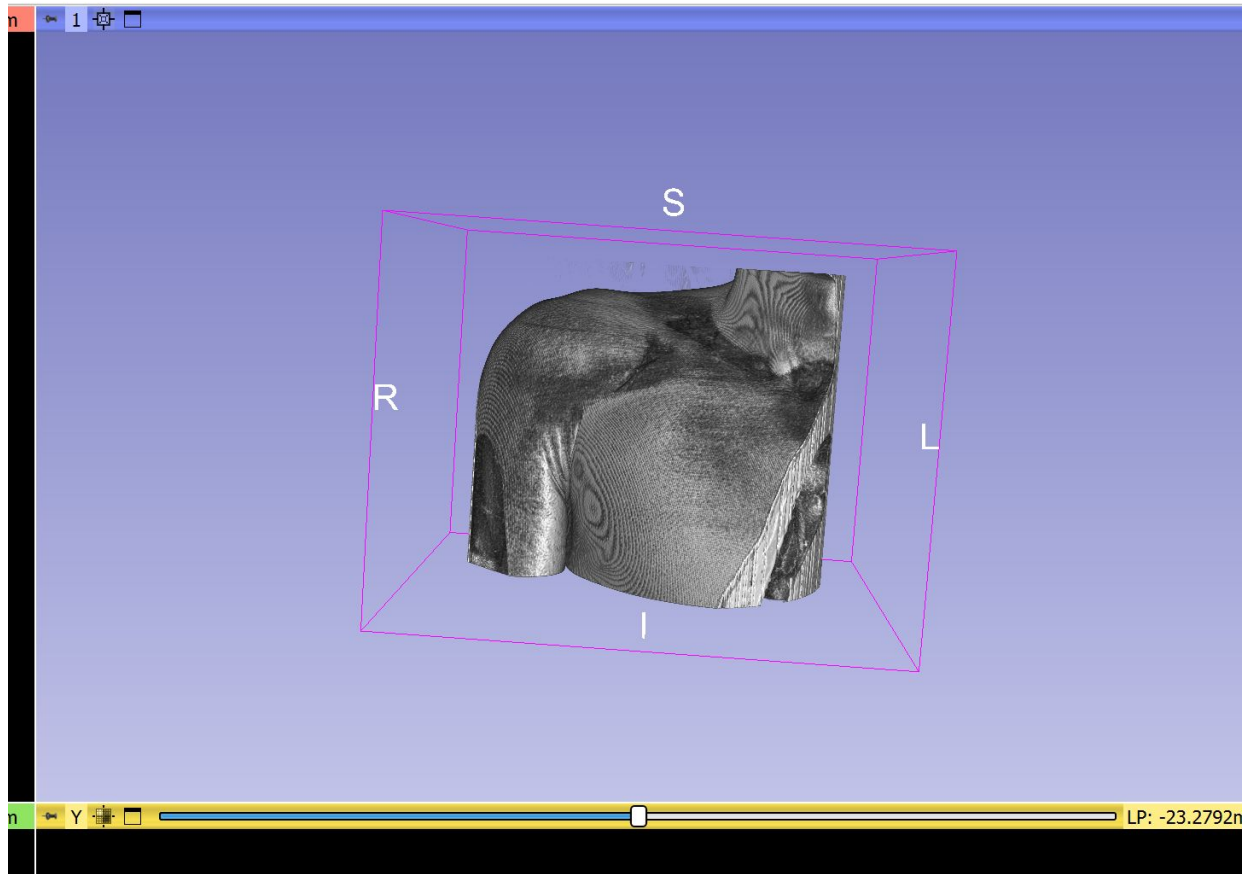
1: Click on the eye next to volume and open it.

2: Then in the top right box, click on the icon shown.

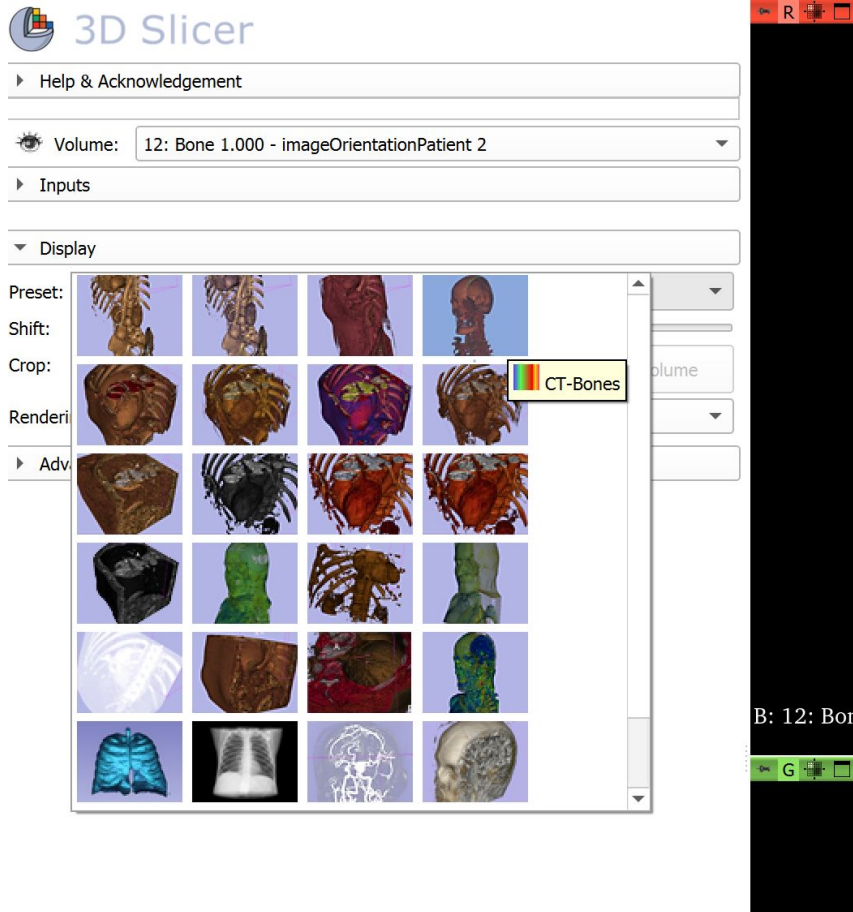
This will display the 3D shoulder. Depending on your processing speed, this may take several seconds.



3D Made



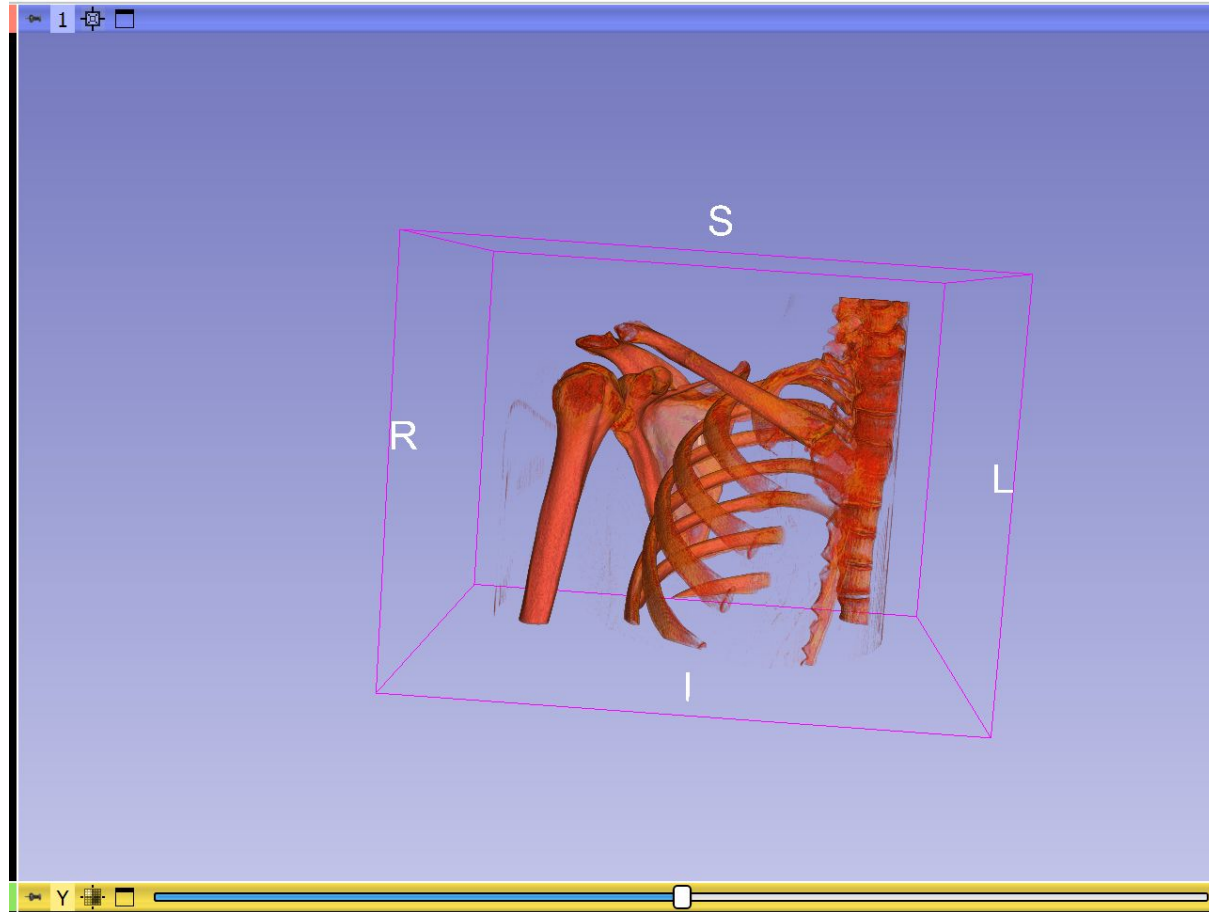
Isolate Bone



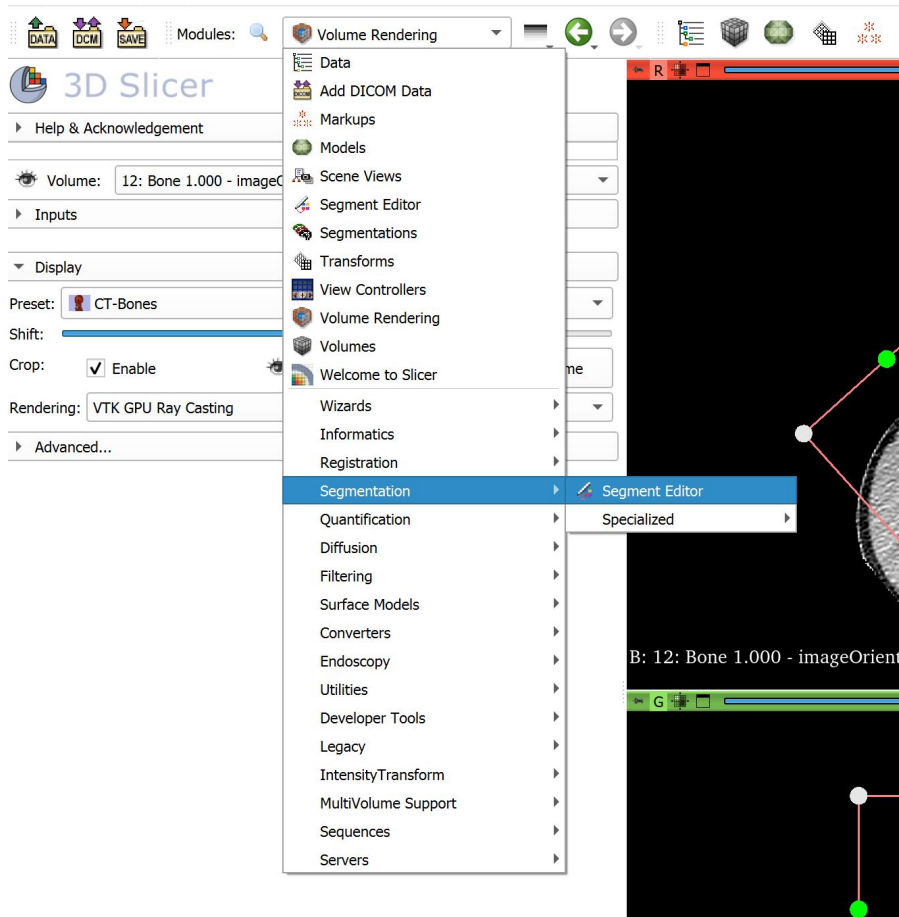
To isolate the bone, there are presets.

Under “Display”, select the CT Bone preset.

3D with just bones



Module: Segment Editor



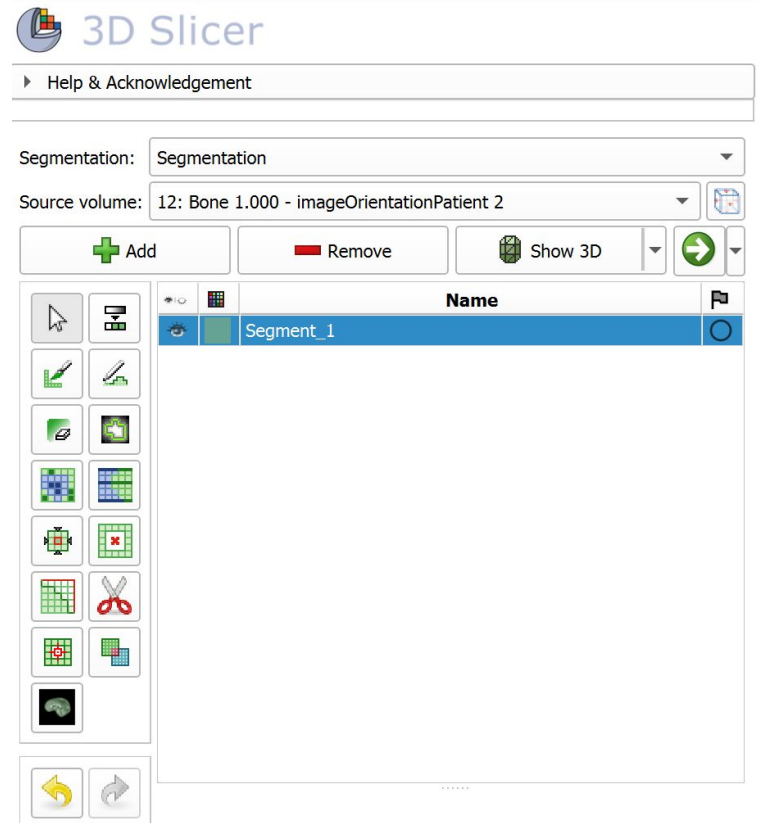
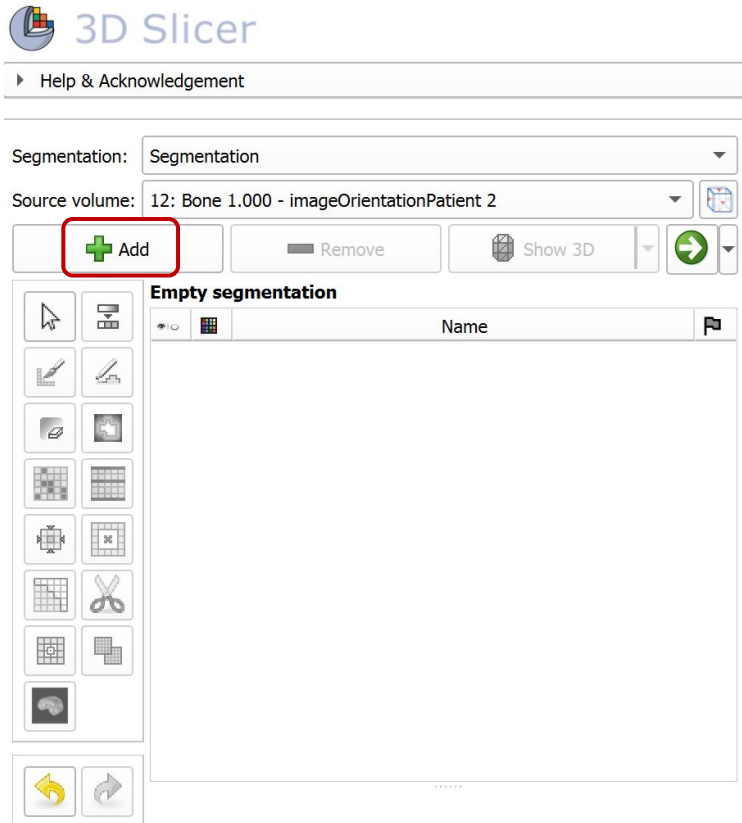
In the segment editor, you are able to isolate various parts of the CT (scapula, humerus, clavicle ribs).

If there is hardware, you can manually select the images to remove it.

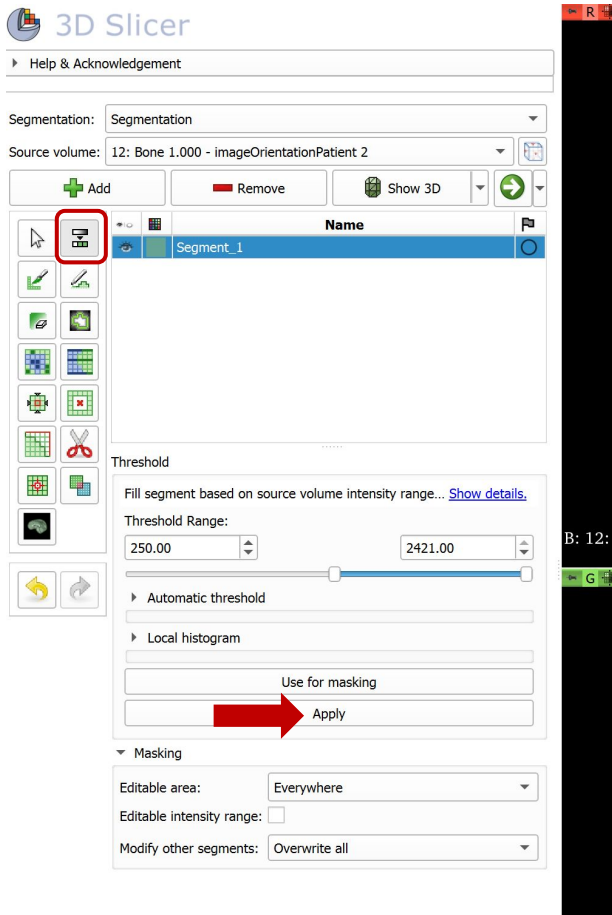
For our purposes, we will only make 1 segment.

“Threshold” is using various levels of contrast to select our image of interest.

Create a Segment



Establish the Threshold



There is an auto-threshold icon, click on it and the images on the right will start blinking. Click on the image and it will stop blinking.

Then adjust the threshold to select only the bone. If the bone of interest is within the set contrast, it will show up as our segment color (in this instance green).

Adjust the contrast accordingly, but 250-2000+ should work well.

Then click Apply.

Export/Save



► Help & Acknowledgement

Segmentation: Segmentation

Source volume: 12: Bone 1.000 - imageOrientationPatient 2

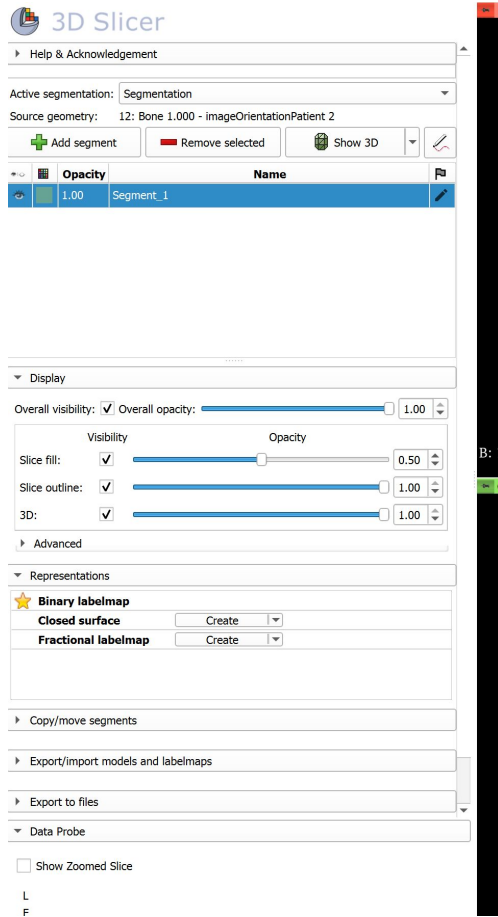
+ Add - Remove Show 3D **→**

Name	
Segment_1	

.....



Export/Save




We want to export our segment.


Select the
“Export/import models and
labelmaps”

We want to save our model.

▼ Export/import models and labelmaps

Operation: Export Import

Output type: Labelmap  Models

Output node: 

▶ Advanced


Export

Then click “Export”

▼ Export/import models and labelmaps

Operation: Export Import

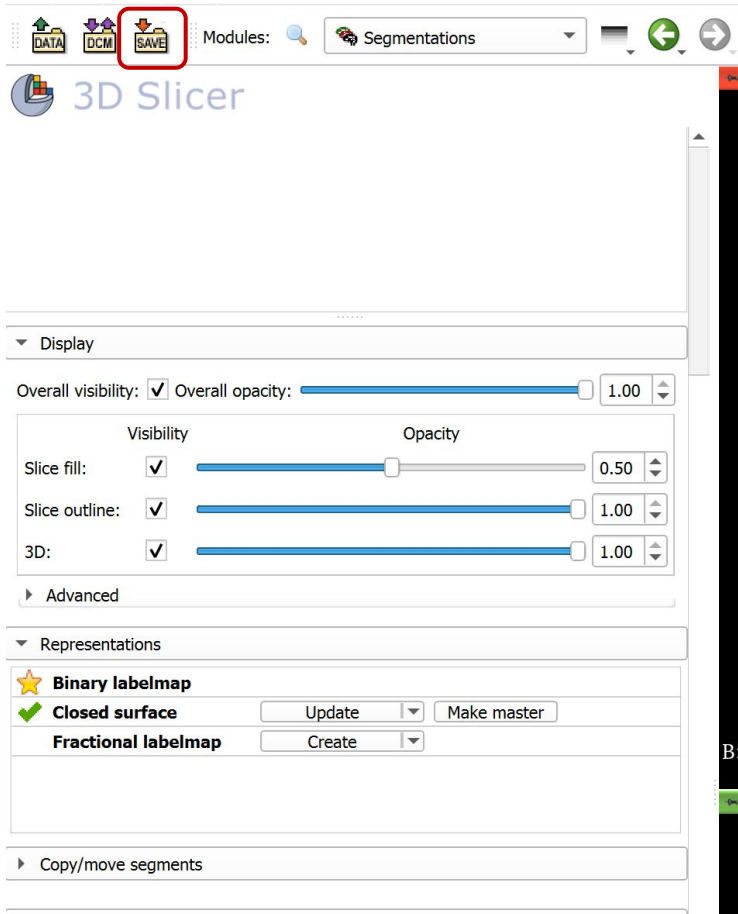
Output type: Labelmap Models

Output node: 

▶ Advanced

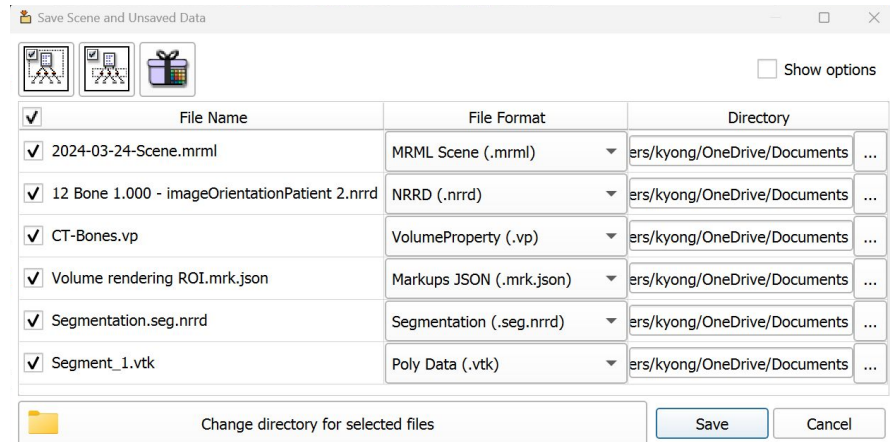
Export

Save

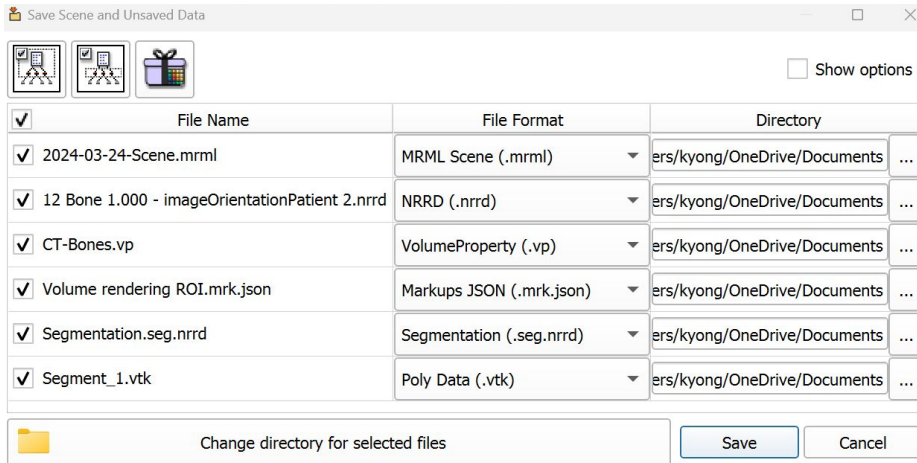


At the top, click the Save icon.

Then a window will pop-up as seen below.

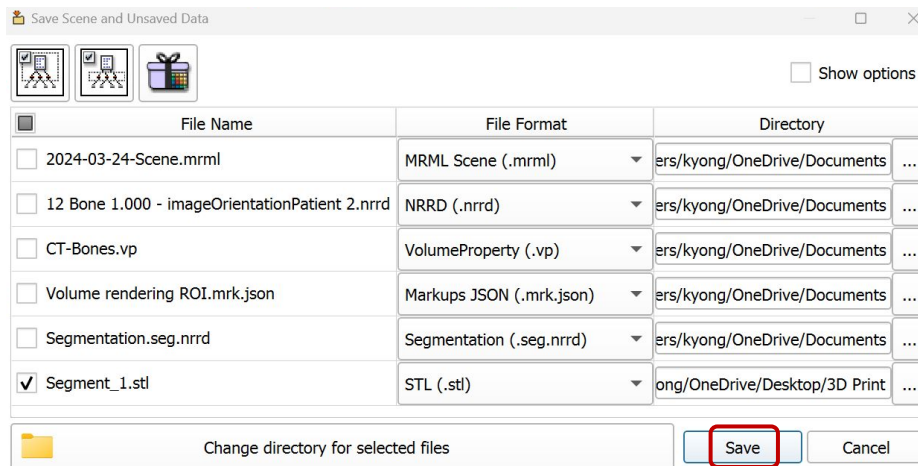


Only STL file



We only want the STL file. So click on our segment (Segment_1) and make the file format STL (.stl).

Make sure you save it to somewhere you can find it (arrow).



File saved in the "3D" Folder

ts	Montgomery, R	✓	3/24/2024 10:03 AM	File folder	
	Moreno, E	✓	3/24/2024 10:09 AM	File folder	
	Moreno, H	✓	3/24/2024 9:57 AM	File folder	
	Ogan, M	✓	3/24/2024 10:00 AM	File folder	
ling	Prevost, J	✓	3/24/2024 9:47 AM	File folder	
	Romero, J	✓	3/24/2024 9:42 AM	File folder	
	Rosson, L	✓	3/24/2024 9:48 AM	File folder	
ots	Scray, S	✓	3/24/2024 9:52 AM	File folder	
	Villegas, H	✓	3/24/2024 10:27 AM	File folder	
loud F	Segment_1	↻	3/24/2024 5:41 PM	Meshmixer Document	185,362 KB



Meshmixer

- Meshmixer can be used to further clean up our 3D STL file.
- Use Meshmixer to open our SLT file.

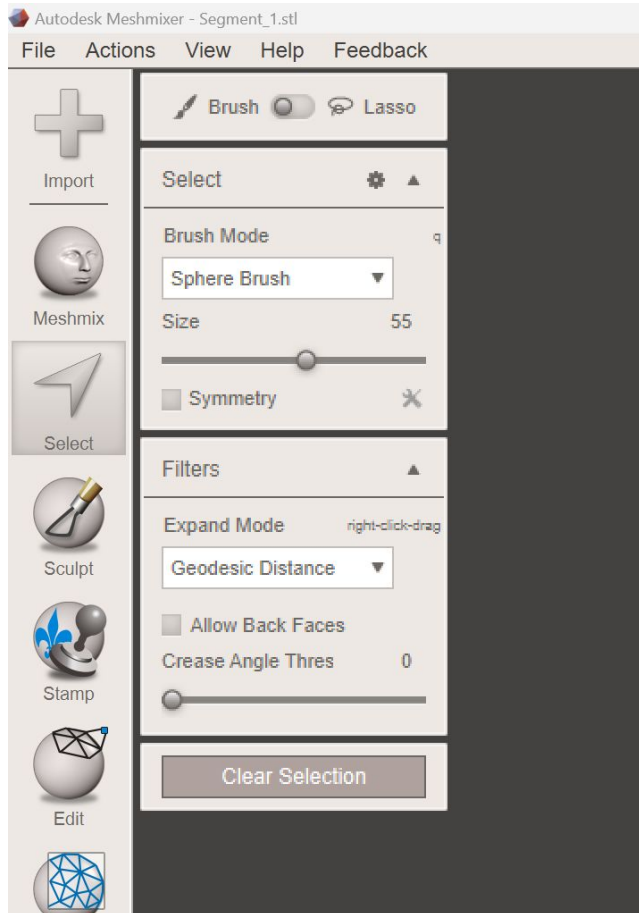
3D-STL file opened in Meshmixer



There is some artifact that was captured and some other structures (spine, clavicle, ect) that we do not need.

So we can use the select tool to delete and remove those items.

Meshmixer: Select tool

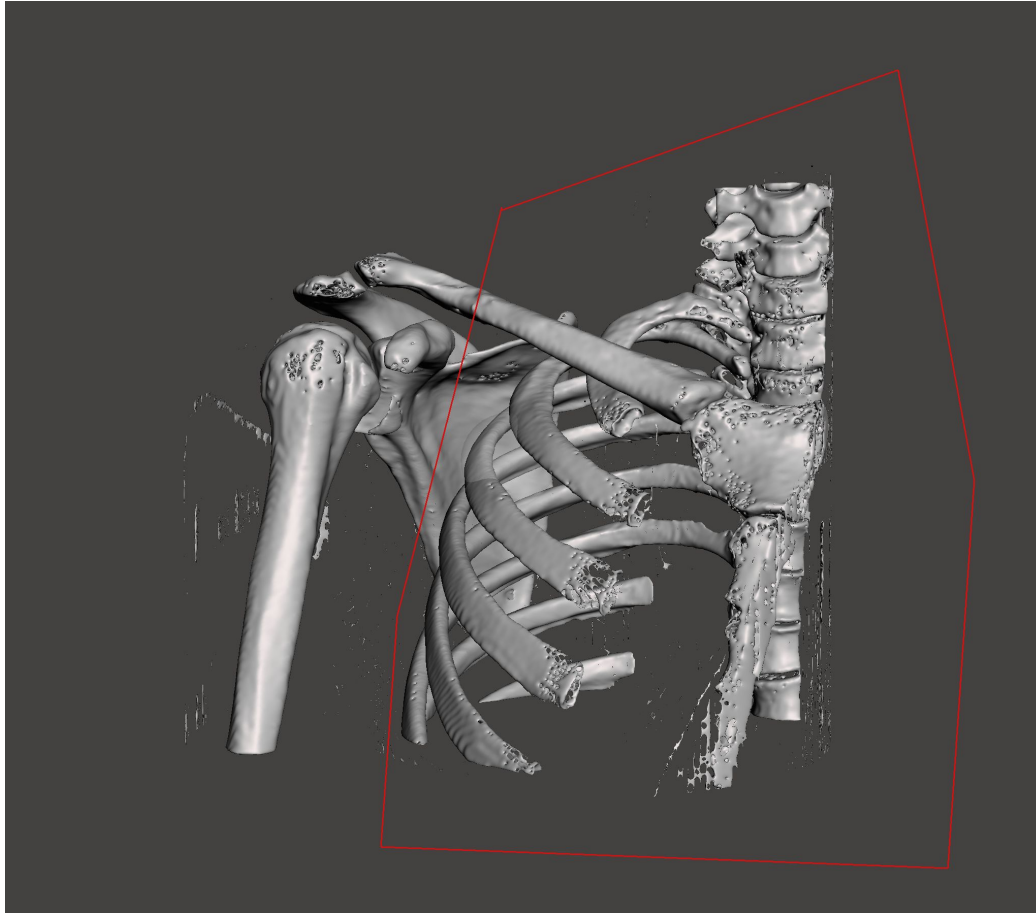


Using the Select tool you can remove parts of the 3D by brushing/erasing or by selecting around the object.

I find it easy to select around and erase.

Click on the Select icon, you don't need to select Brush or Lasso.

Click to highlight and delete

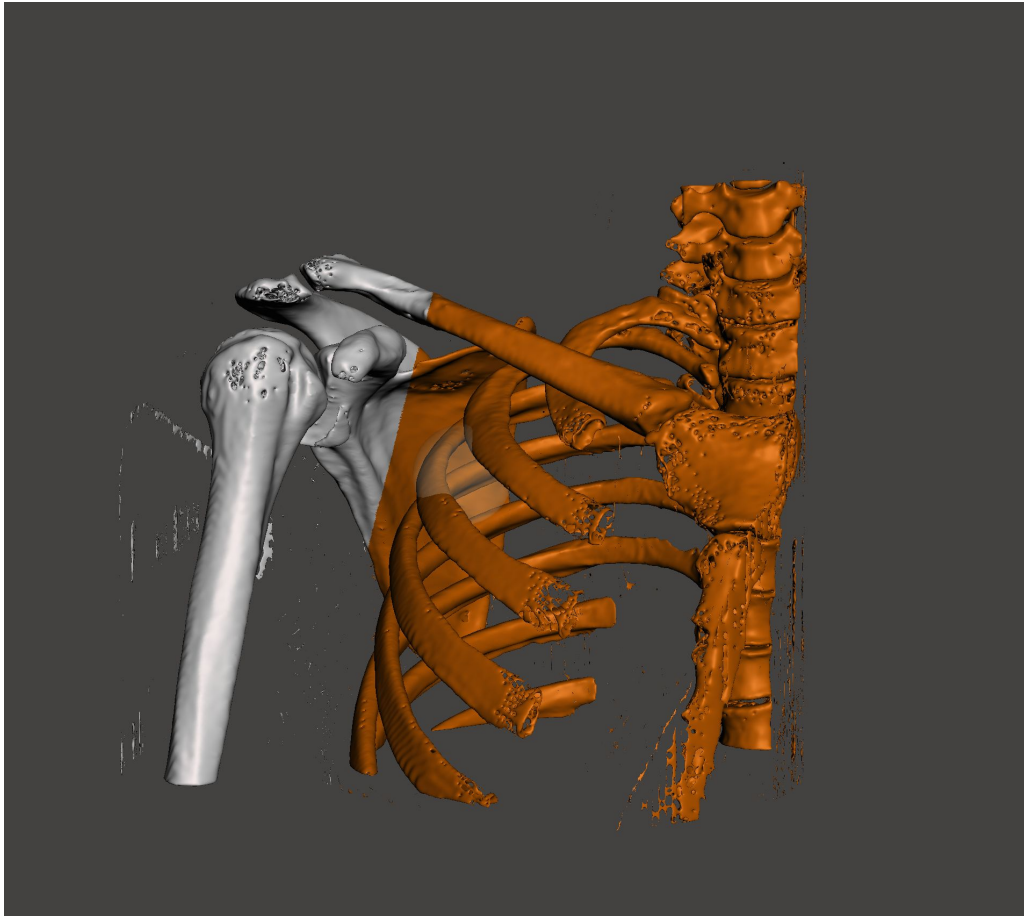


Select around the area you want to delete.

Hold right click and drag to move the image around. You can also Zoom in or out as needed.

Use left click to draw the boundary.

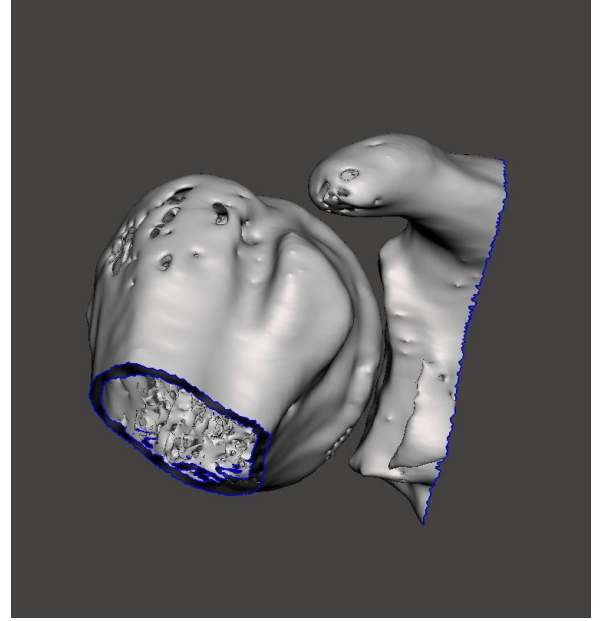
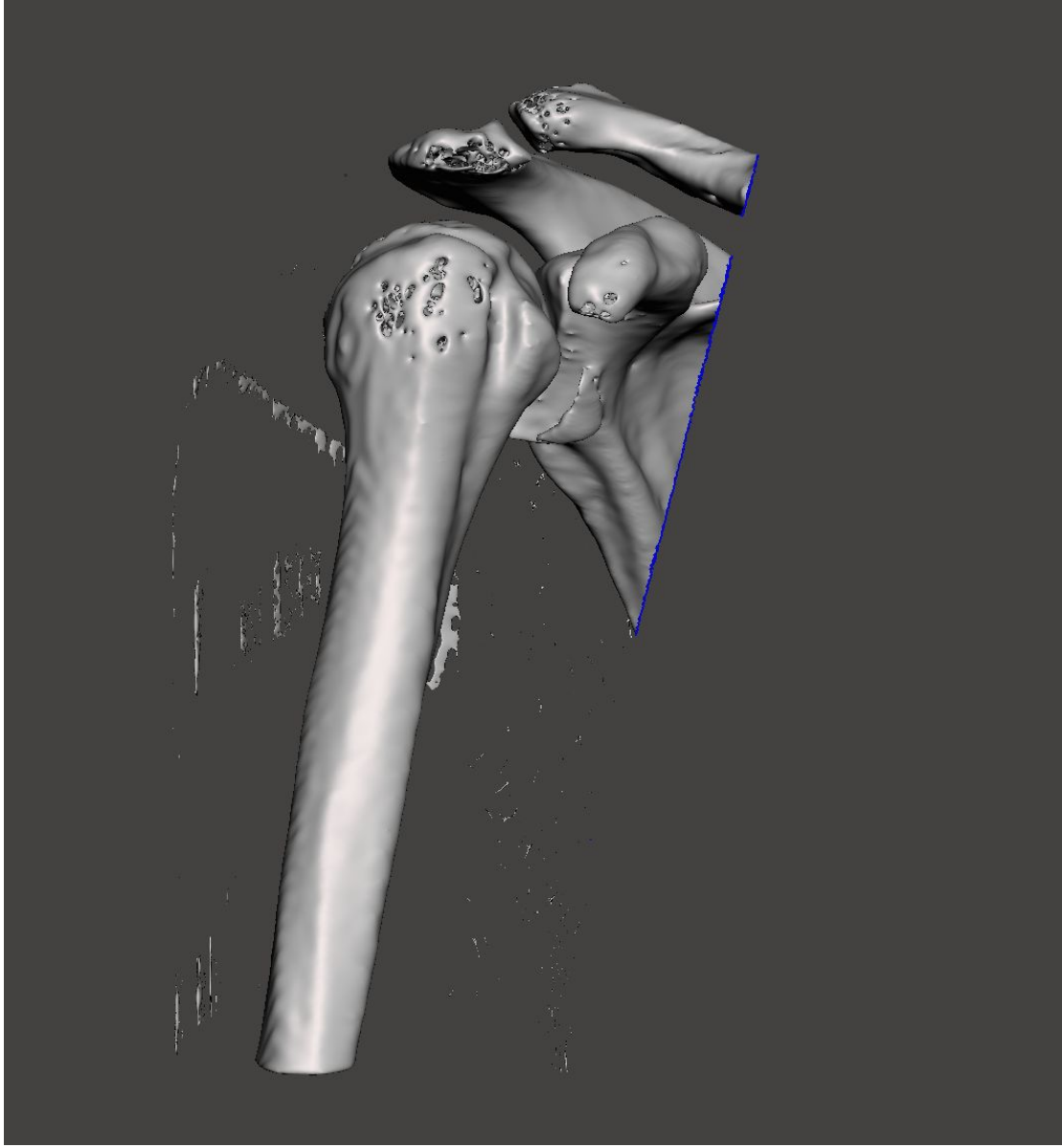
Highlighted section



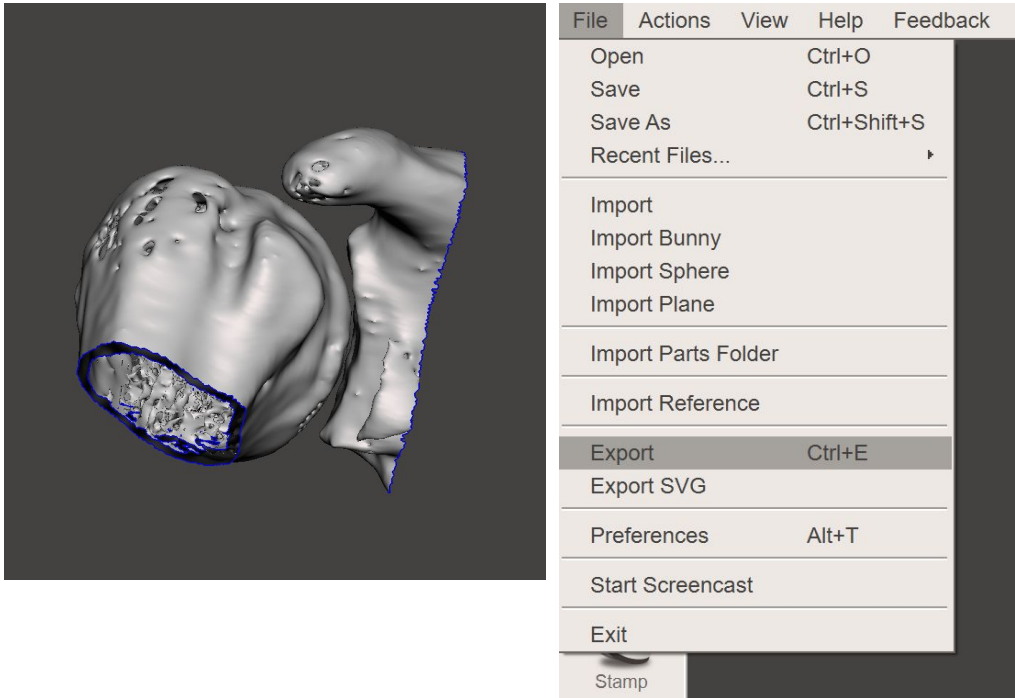
Press “delete” on your keyboard to remove the highlighted section.

Press “escape” to do it over.

Repeat as needed to isolate our area of interest.

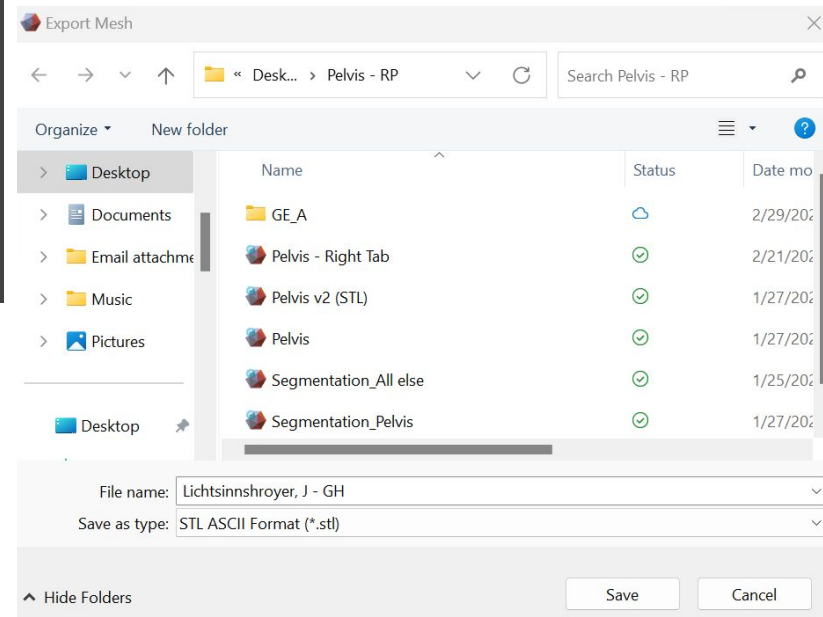


Export (Save)



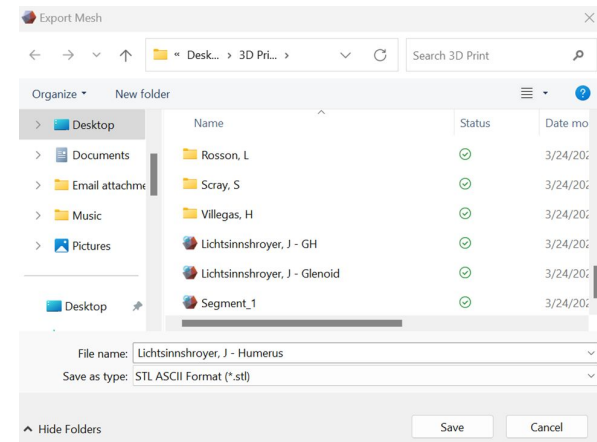
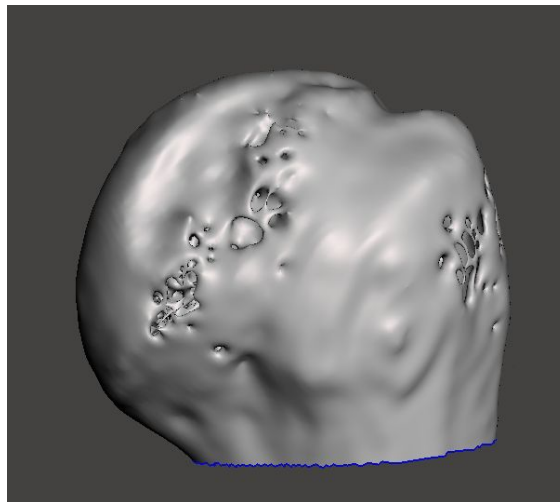
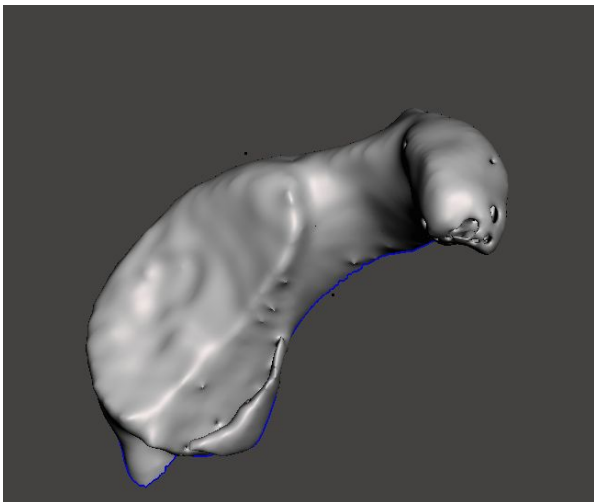
Once we have the isolated glenohumeral joint. Export the file.

Save it as the patient's name and GH.



Separate Humerus & Glenoid

- We need the glenoid and humerus as two different files. So use the selection tool to isolate the area of interest and export/save accordingly.



End Product

- In the end, we should have 4 files:
 - Original Segmentation STL, file name:
Patient Name – All.stl
 - Glenohumeral Joint, file name:
Patient Name – GH.stl
 - Humerus, file name:
Patient Name – Humerus.stl
 - Glenoid, file name:
Patient Name – Glenoid.stl

Printing

- In order to print the SLTs, it needs to be converted to a g-code. This is printer specific. There are various programs that can do this. The most common ones are PrusaSlicer and Cura.
- I use the program that came with my printer (Crealty).
- Each print will probably take 1-4 hours to print depending on the printer and how big the model is.