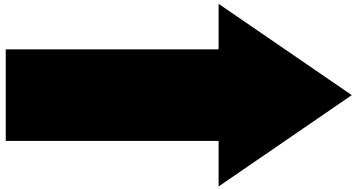
SlicerAutoscoper[M]

BVR Workflow Demonstration

Slicer-Autoscoper^{M} Workflow Overview

Pre-processing

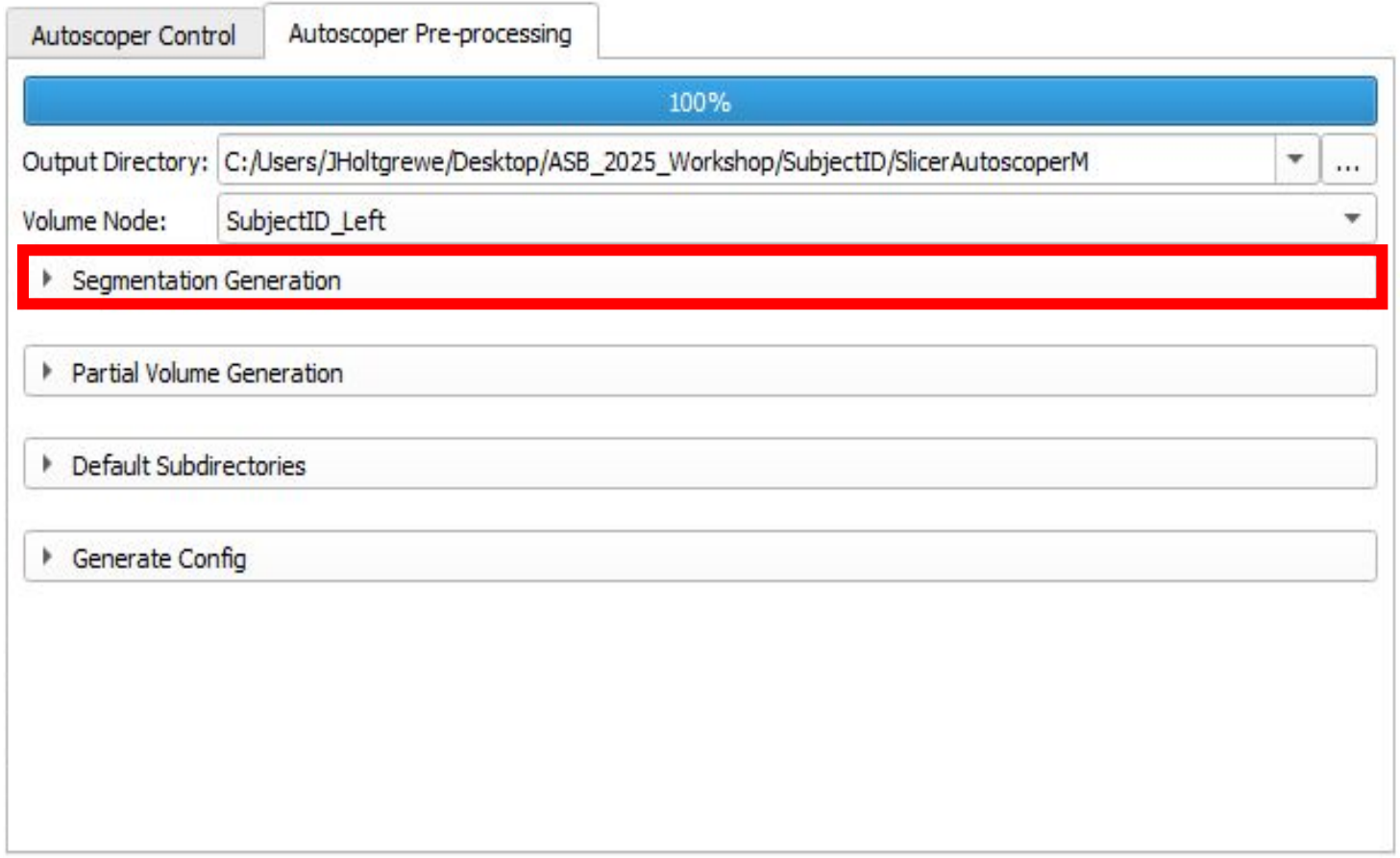
- Organizing files
- Generating partial volumes
- Generating configuration file



Tracking

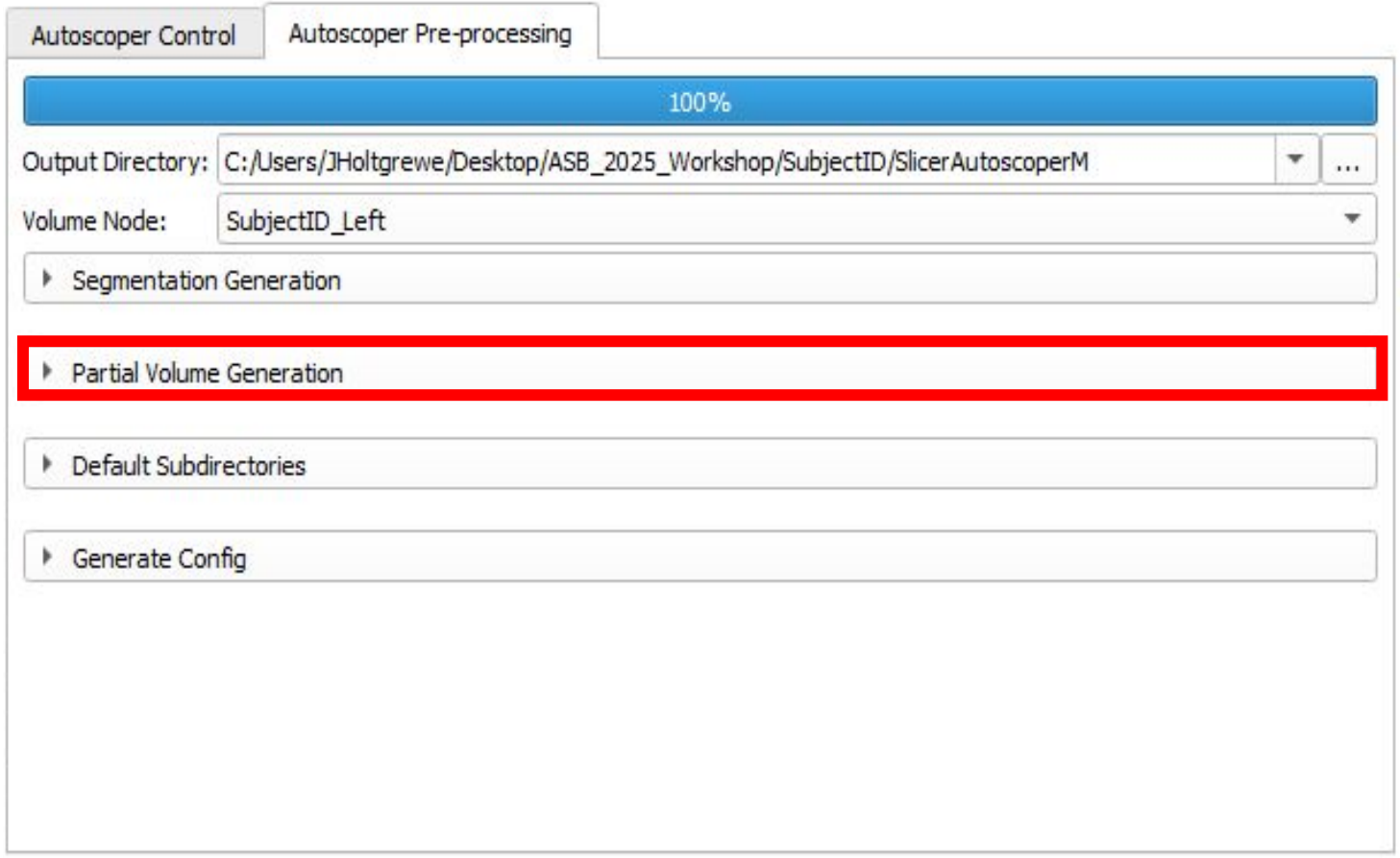
- Loading trials
- Applying filters
- Aligning volumes
- Tracking volumes
- Saving results

Slicer-Autoscoper^{M} Pre-processing Module



Automatically generate segmentations or load in existing segmentations

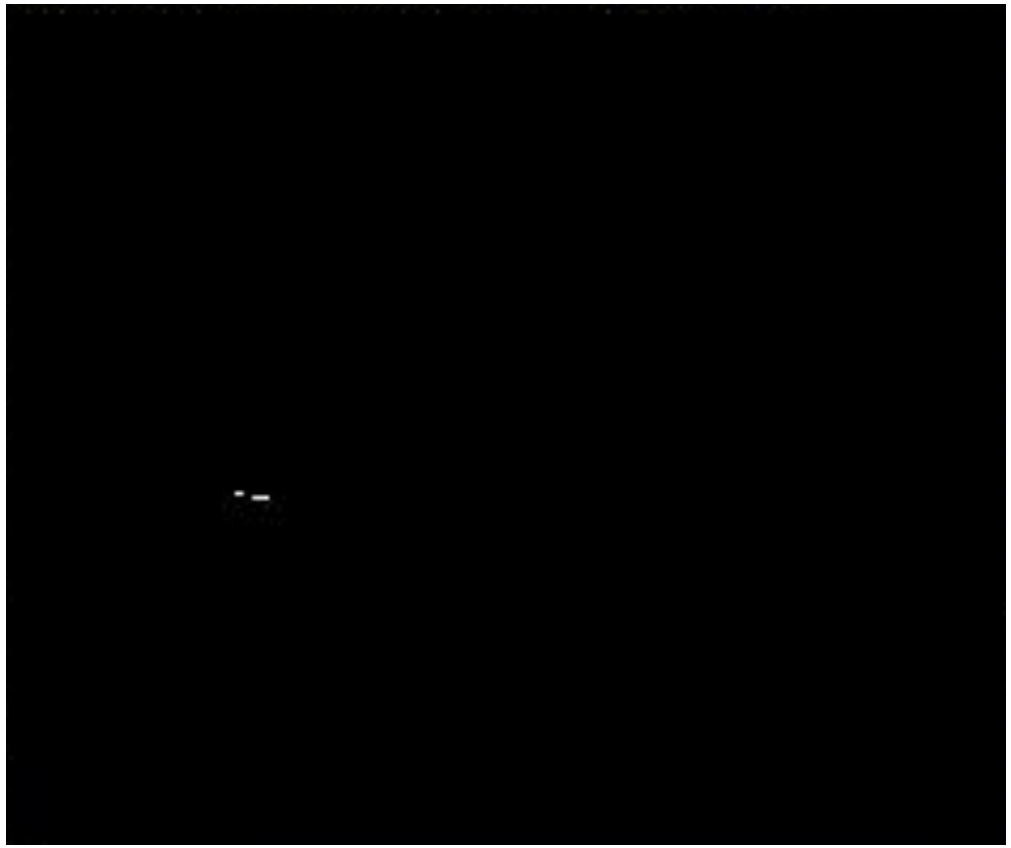
Slicer-Autoscoper^{M} Pre-processing Module



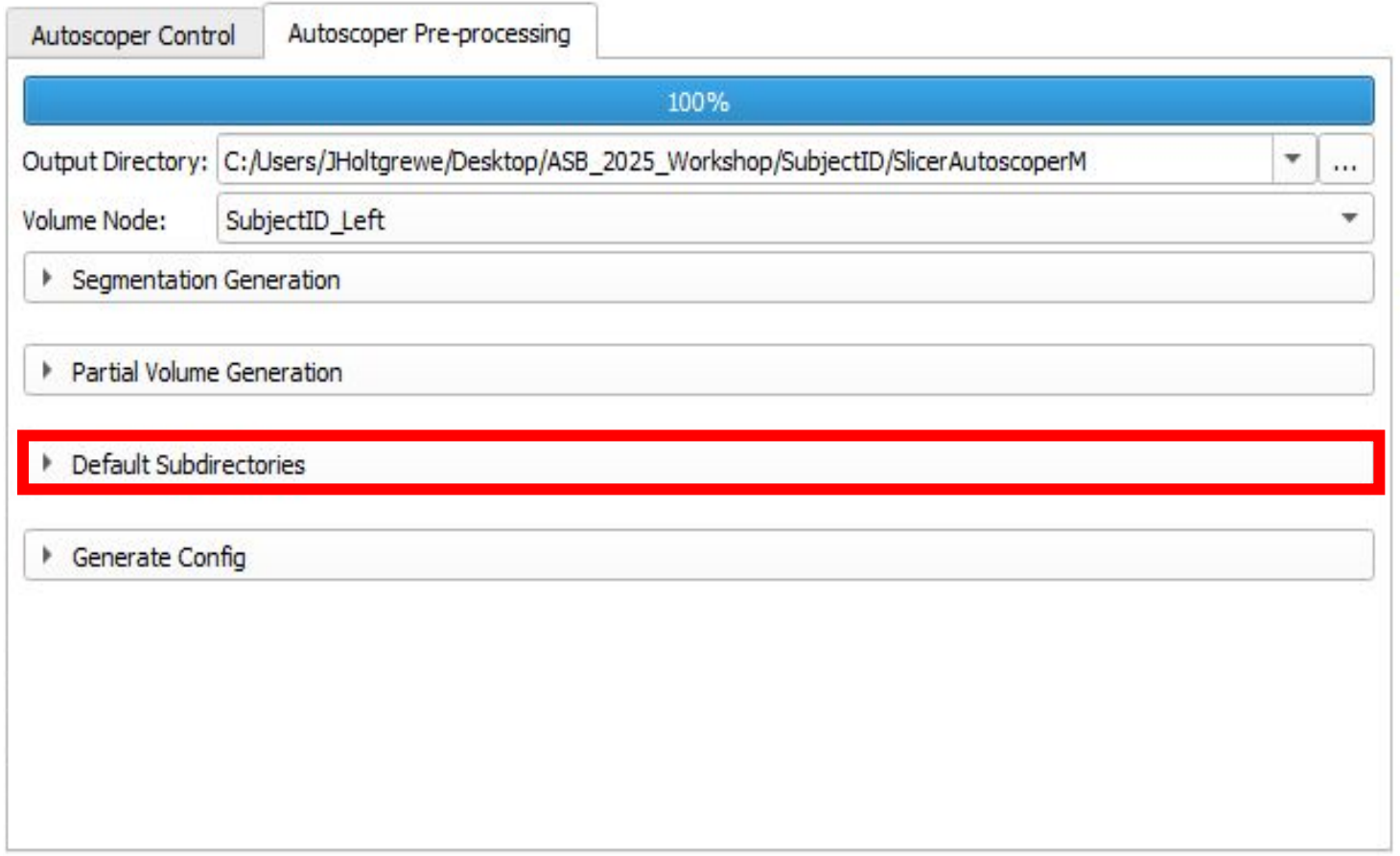
Generate **partial volumes** from segmentations

What is a partial volume?

Partial Volume:
A volumetric image data file saved as a TIFF stack and represents a subset of 3D CT scan data, defined by a segmented rigid body and cropped to its dimensions.

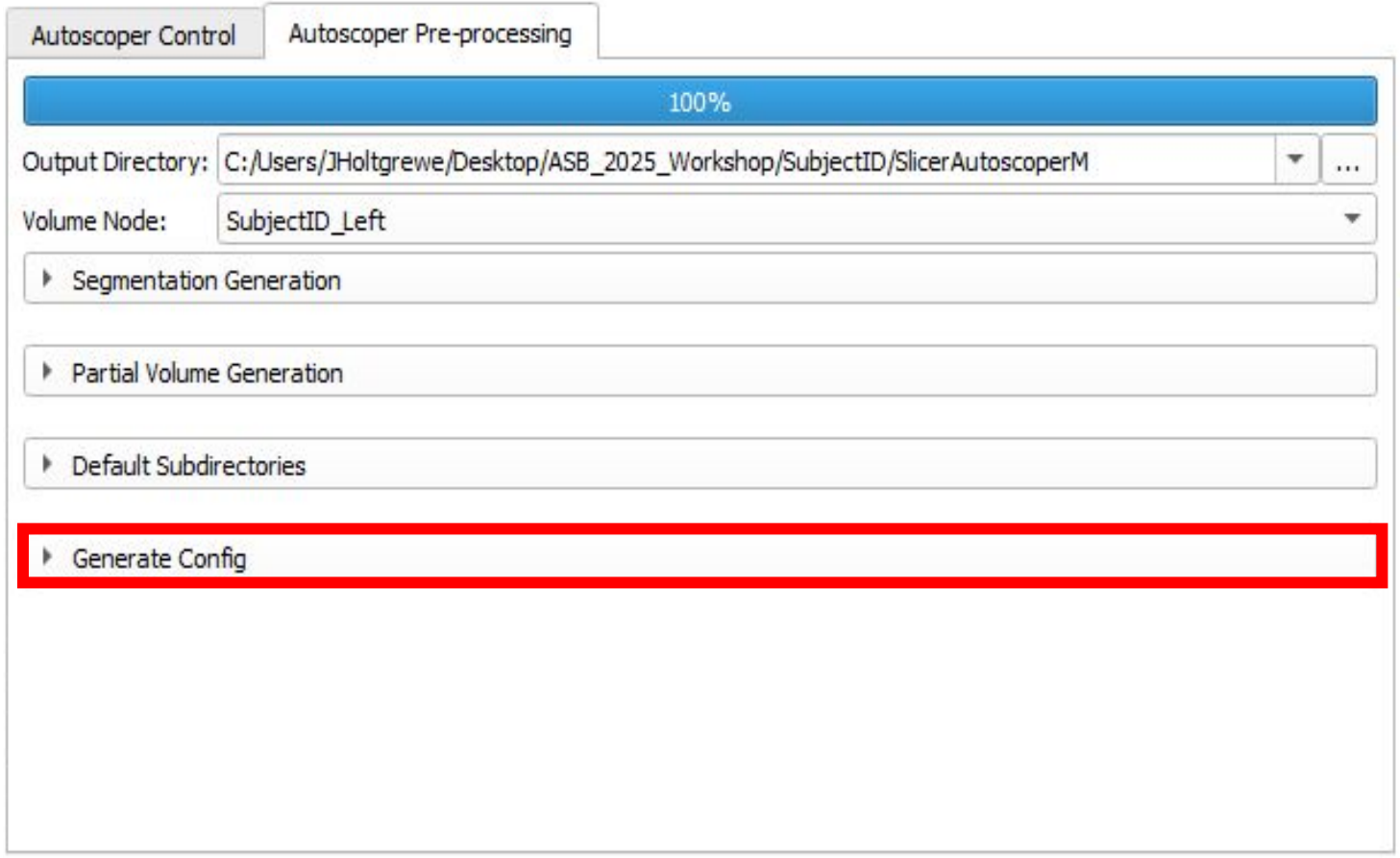


Slicer-Autoscoper^{M} Pre-processing Module



Change name of subdirectory names to fit desired naming conventions

Slicer-Autoscoper^{M} Pre-processing Module



Generate configuration file to load into Autoscoper

What is a configuration file?

```
Version 1.1

# Camera Calibration Files
mayaCam_csv Calibration\SubjectID_Camera01_Calibration.txt
mayaCam_csv Calibration\SubjectID_Camera02_Calibration.txt

# Camera Root Directories
CameraRootDir RadiographImages\SubjectID_Trial_Cam01_Undistorted
CameraRootDir RadiographImages\SubjectID_Trial_Cam02_Undistorted

# Volumes
VolumeFile Volumes\SubjectID_Left_Femur.tif
VolumeFlip 0 0 0
VoxelSize 0.369 0.369 0.625
VolumeFile Volumes\SubjectID_Left_Tibia.tif
VolumeFlip 0 0 0
VoxelSize 0.369 0.369 0.625

# Render Resolution
RenderResolution 1760 1760

# Optimization Offsets
OptimizationOffsets 0.1 0.1 0.1 0.1 0.1 0.1
```

Configuration File:
.cfg file generated by the user in the SAM Pre-processing module that contains the information necessary to load a trial into Autoscoper

What is a configuration file?

```
Version 1.1

# Camera Calibration Files
mayaCam_csv Calibration\SubjectID_Camera01_Calibration.txt
mayaCam_csv Calibration\SubjectID_Camera02_Calibration.txt

# Camera Root Directories
CameraRootDir RadiographImages\SubjectID_Trial_Cam01_Undistorted
CameraRootDir RadiographImages\SubjectID_Trial_Cam02_Undistorted

# Volumes
VolumeFile Volumes\SubjectID_Left_Femur.tif
VolumeFlip 0 0 0
VoxelSize 0.369 0.369 0.625
VolumeFile Volumes\SubjectID_Left_Tibia.tif
VolumeFlip 0 0 0
VoxelSize 0.369 0.369 0.625

# Render Resolution
RenderResolution 1760 1760

# Optimization Offsets
OptimizationOffsets 0.1 0.1 0.1 0.1 0.1 0.1
```

A

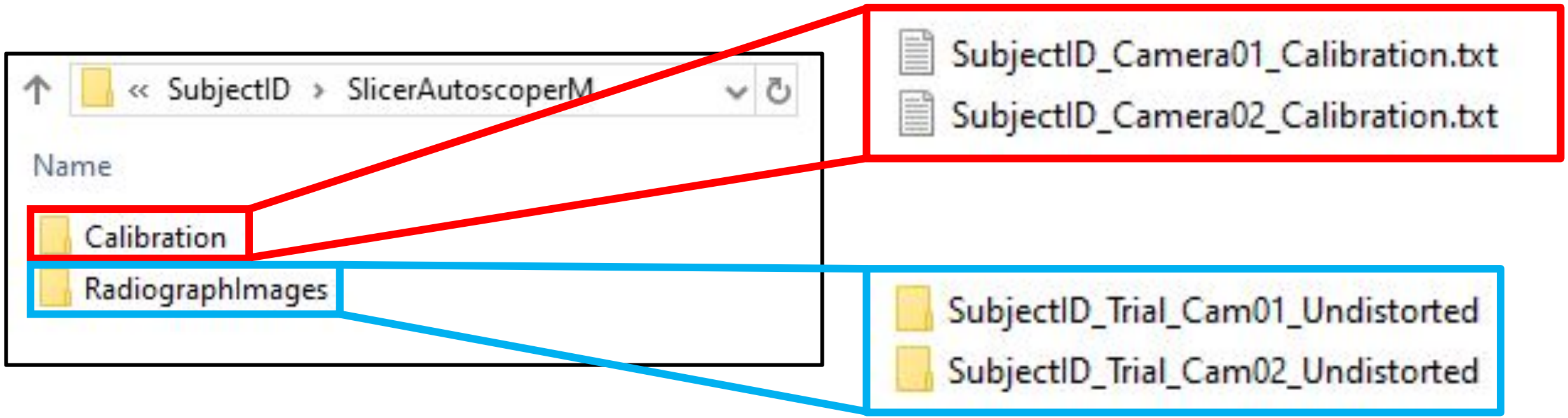
Generated outside of SlicerAutoscoper^{M}

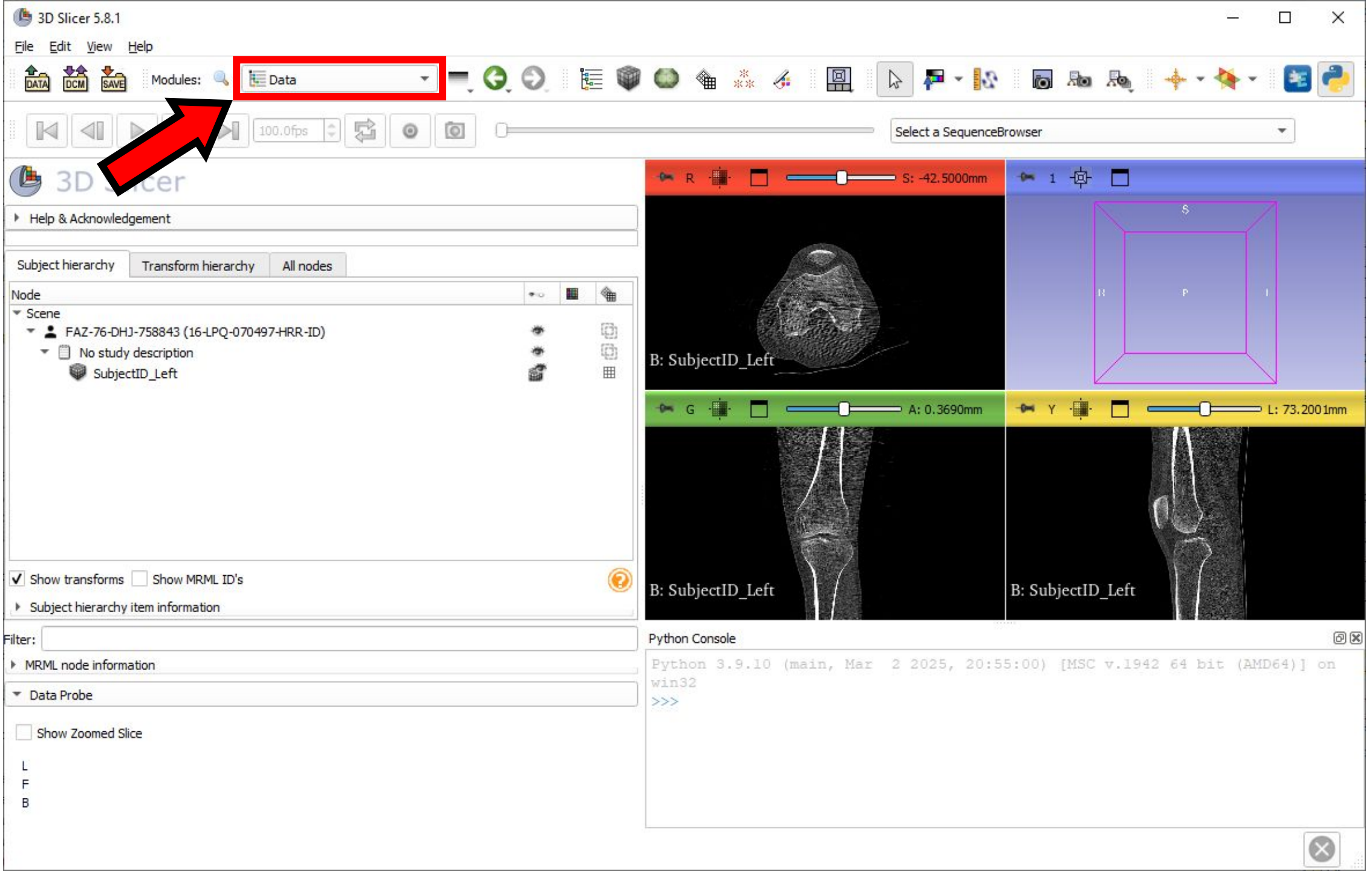
B

Generated in SlicerAutoscoper^{M} Pre-processing Module

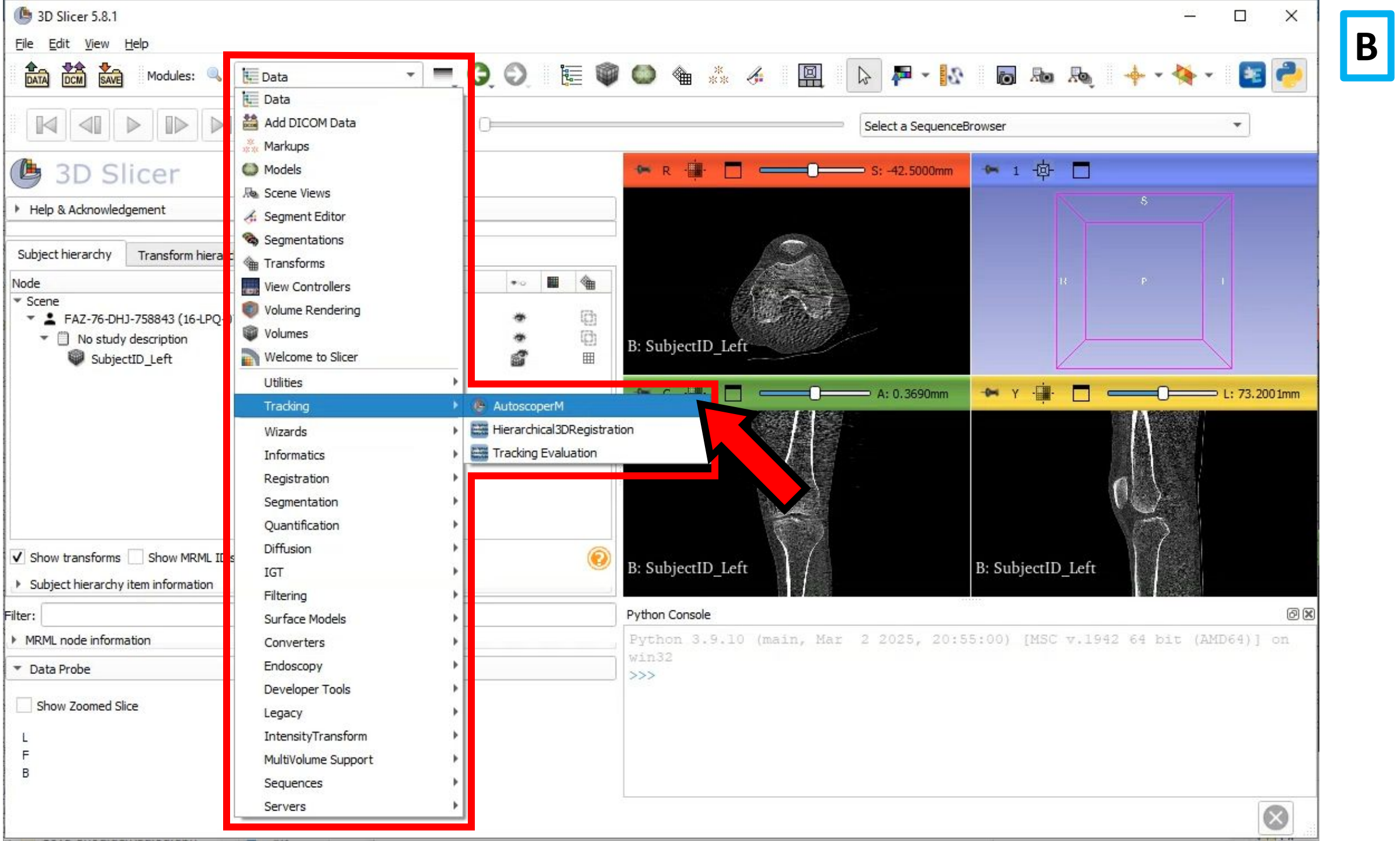
Creating Subject Directory

A




3D Slicer 5.8.1
File Edit View Help
Modules:
Data
Select a SequenceBrowser
Help & Acknowledgement
Subject hierarchy
Transform hierarchy
All nodes
Node
Scene
FAZ-76-DHJ-758843 (16-LPQ-070497-HRR-ID)
No study description
SubjectID_Left
Show transforms
Show MRML ID's
Subject hierarchy item information
Filter:
MRML node information
Data Probe
Show Zoomed Slice
L
F
B
R
S: -42.5000mm
B: SubjectID_Left
1
S
I
P
G
A: 0.3690mm
B: SubjectID_Left
Y
L: 73.2001mm
B: SubjectID_Left
Python Console
Python 3.9.10 (main, Mar 2 2025, 20:55:00) [MSC v.1942 64 bit (AMD64)] on win32
>>>

B


3D Slicer 5.8.1
File Edit View Help
Modules:
Data
Data
Add DICOM Data
Markups
Models
Scene Views
Segment Editor
Segmentations
Transforms
View Controllers
Volume Rendering
Volumes
Welcome to Slicer
Utilities
Tracking
Wizards
Informatics
Registration
Segmentation
Quantification
Diffusion
IGT
Filtering
Surface Models
Converters
Endoscopy
Developer Tools
Legacy
IntensityTransform
MultiVolume Support
Sequences
Servers
AutoscoperM
Hierarchical3DRegistration
Tracking Evaluation
Select a SequenceBrowser
3D Slicer
Help & Acknowledgement
Subject hierarchy
Transform hiera
Node
Scene
FAZ-76-DHJ-758843 (16-LPQ-
No study description
SubjectID_Left
Show transforms
Show MRML IDs
Subject hierarchy item information
Filter:
MRML node information
Data Probe
Show Zoomed Slice
L
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B
R
S: -42.5000mm
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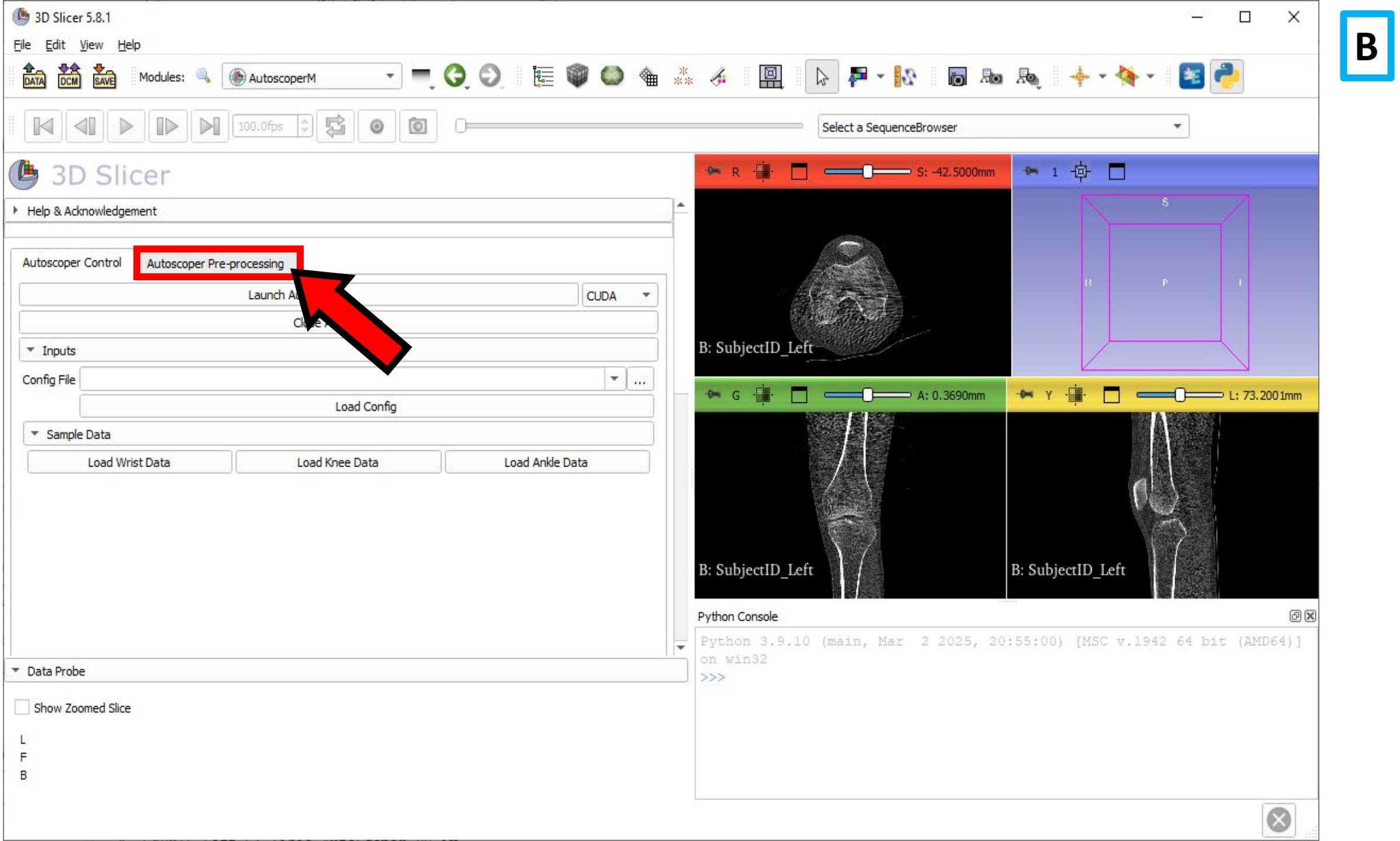
B: SubjectID_Left
B: SubjectID_Left
Python Console
Python 3.9.10 (main, Mar 2 2025, 20:55:00) [MSC v.1942 64 bit (AMD64)] on win32
>>>

B


3D Slicer 5.8.1
File Edit View Help
Modules: AutoscoperM
Select a SequenceBrowser
3D Slicer
Help & Acknowledgement
Autoscoper Control
Autoscoper Pre-processing
Launch A
CUDA
Inputs
Config File
Load Config
Sample Data
Load Wrist Data
Load Knee Data
Load Ankle Data
Data Probe
Show Zoomed Slice
L
F
B
R
S: -42.5000mm
B: SubjectID_Left
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P
G
A: 0.3690mm
B: SubjectID_Left
Y
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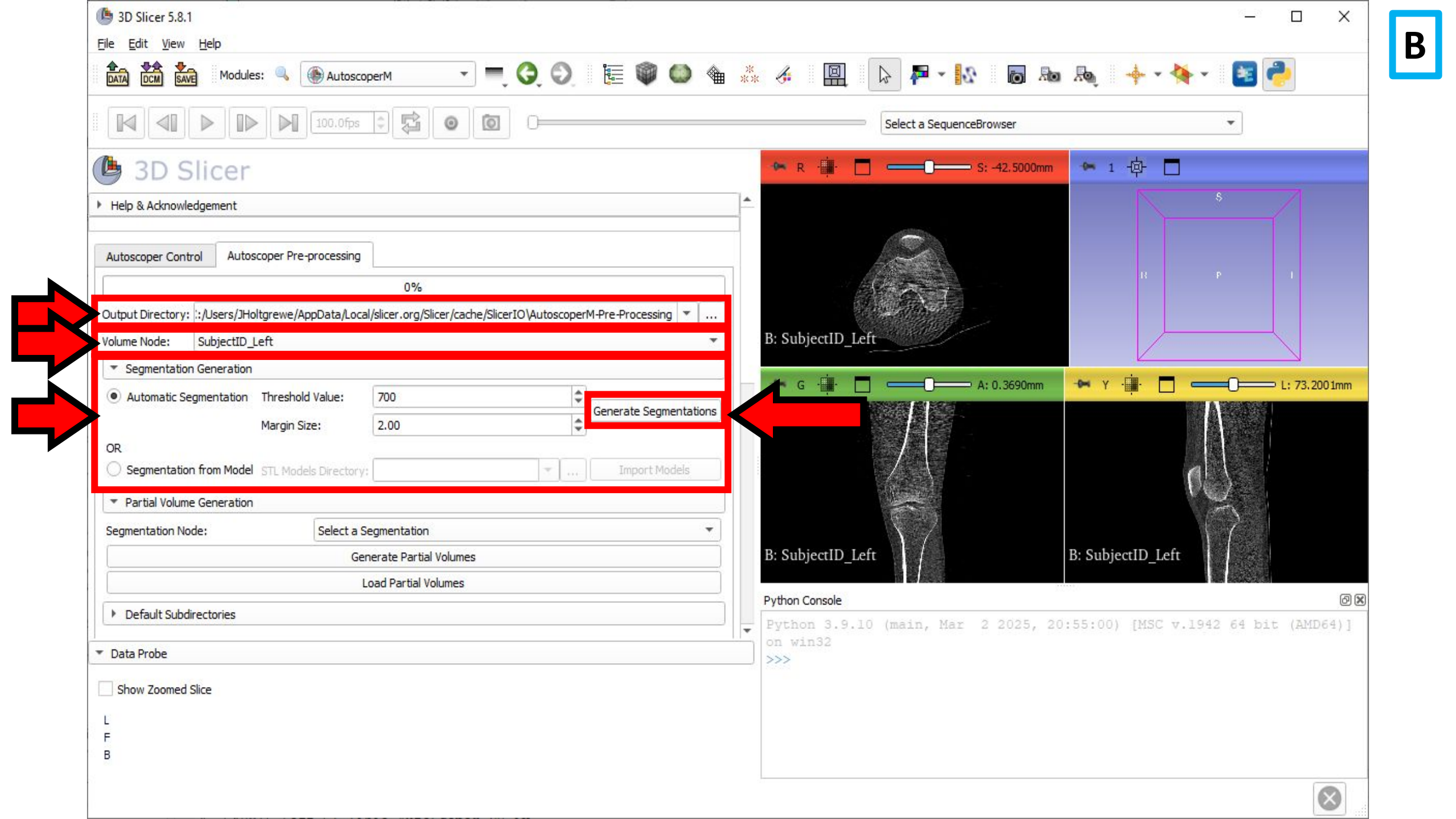
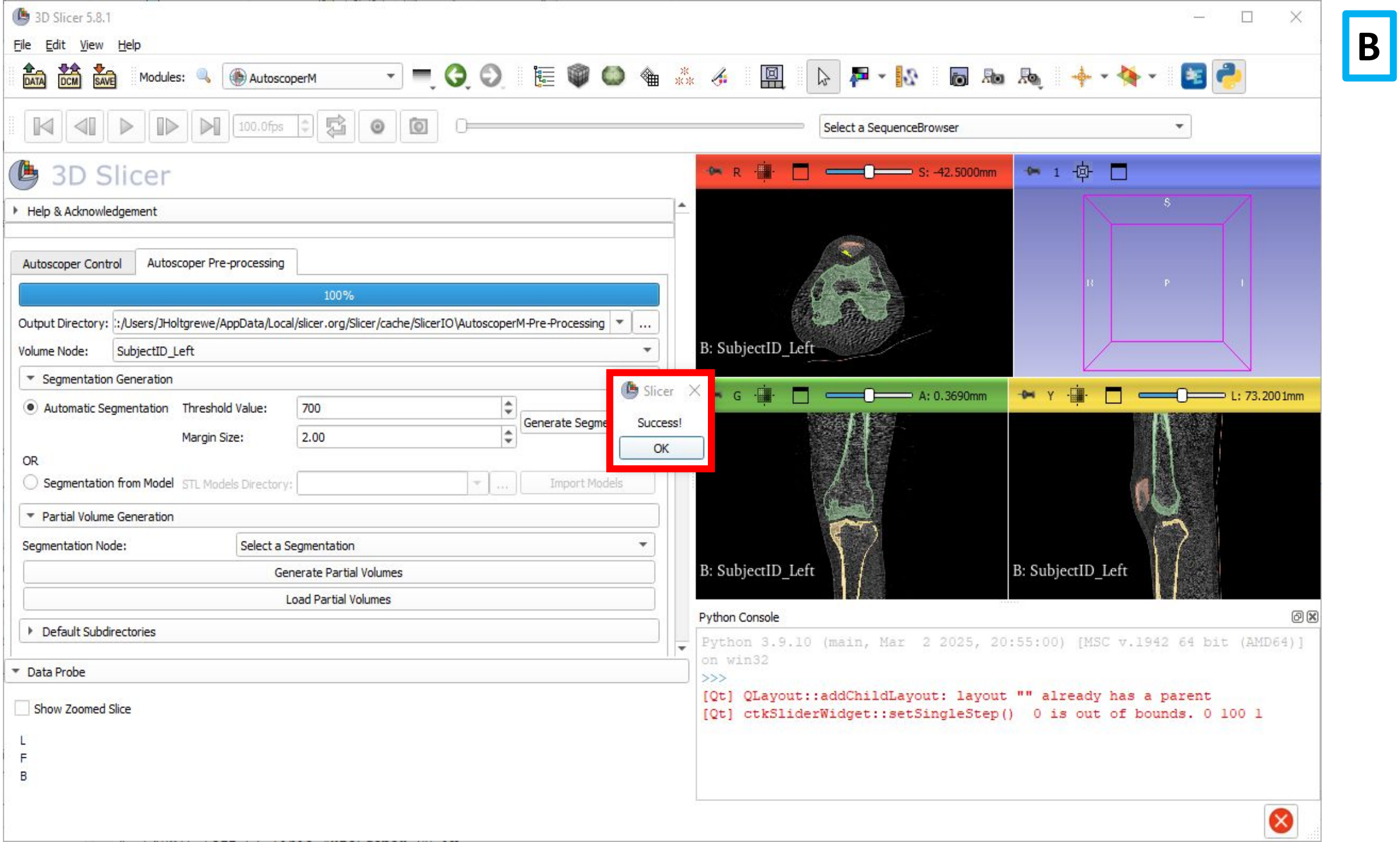
B: SubjectID_Left
Python Console
Python 3.9.10 (main, Mar 2 2025, 20:55:00) [MSC v.1942 64 bit (AMD64)]
on win32
>>>

B


B
3D Slicer 5.8.1
File Edit View Help
Modules: AutoscoperM
Select a SequenceBrowser
3D Slicer
Help & Acknowledgement
Autoscoper Control
Autoscoper Pre-processing
0%
Output Directory: :/Users/JHoltgrewe/AppData/Local/slicer.org/Slicer/cache/SlicerIO\AutoscoperM-Pre-Processing
Volume Node: SubjectID_Left
Segmentation Generation
Automatic Segmentation
Threshold Value: 700
Margin Size: 2.00
Generate Segmentations
OR
Segmentation from Model
STL Models Directory:
Import Models
Partial Volume Generation
Segmentation Node: Select a Segmentation
Generate Partial Volumes
Load Partial Volumes
Default Subdirectories
Data Probe
Show Zoomed Slice
L
F
B
R
S: -42.5000mm
B: SubjectID_Left
1
S
I
P
G
A: 0.3690mm
B: SubjectID_Left
Y
L: 73.2001mm
B: SubjectID_Left
Python Console
Python 3.9.10 (main, Mar 2 2025, 20:55:00) [MSC v.1942 64 bit (AMD64)]
on win32
>>>


B
3D Slicer 5.8.1
File Edit View Help
Modules: AutoscoperM
Select a SequenceBrowser
3D Slicer
Help & Acknowledgement
Autoscoper Control
Autoscoper Pre-processing
100%
Output Directory: :/Users/JHoltgrewe/AppData/Local/slicer.org/Slicer/cache/SlicerIO\AutoscoperM-Pre-Processing
Volume Node: SubjectID_Left
Segmentation Generation
Automatic Segmentation
Threshold Value: 700
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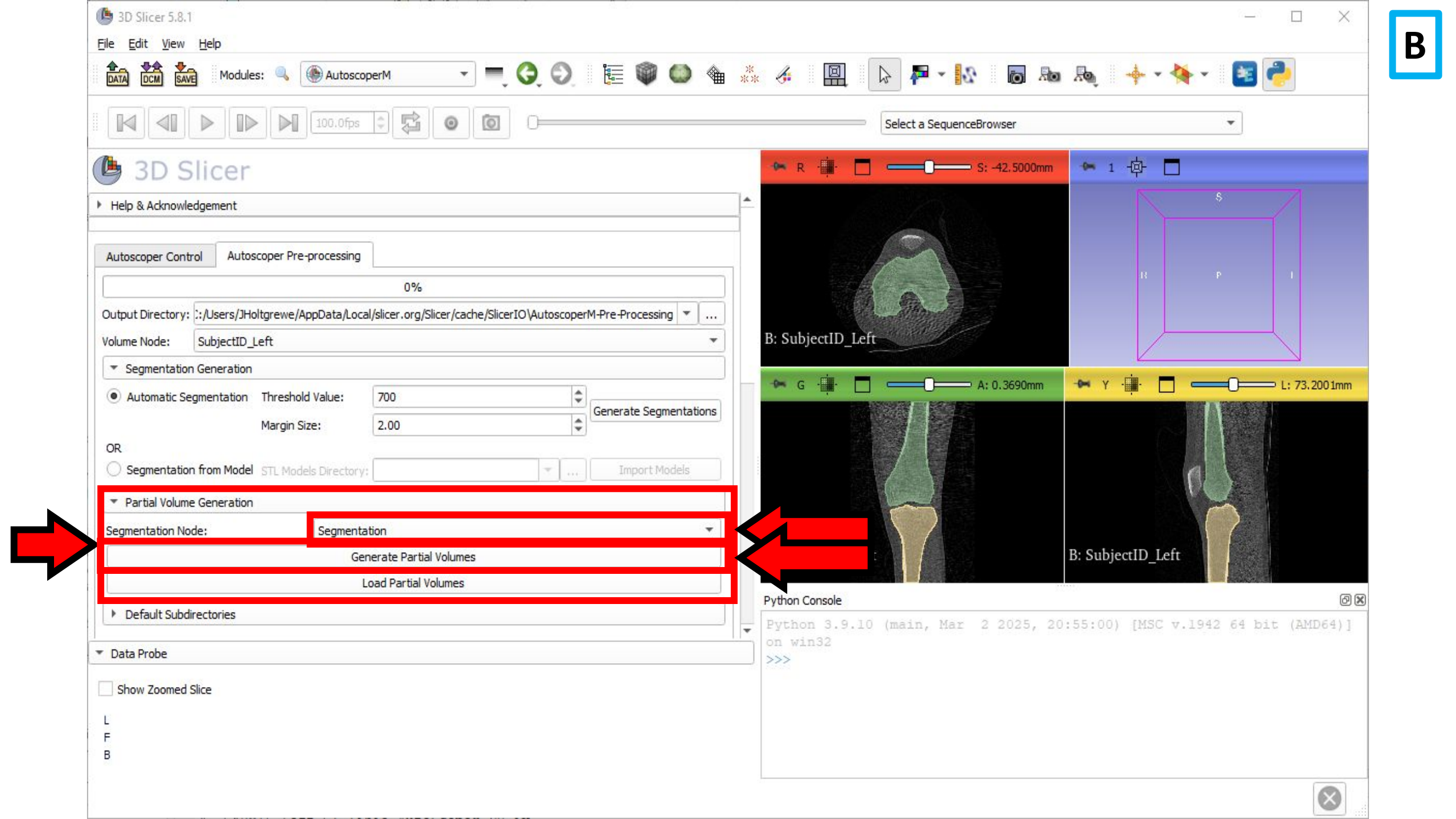
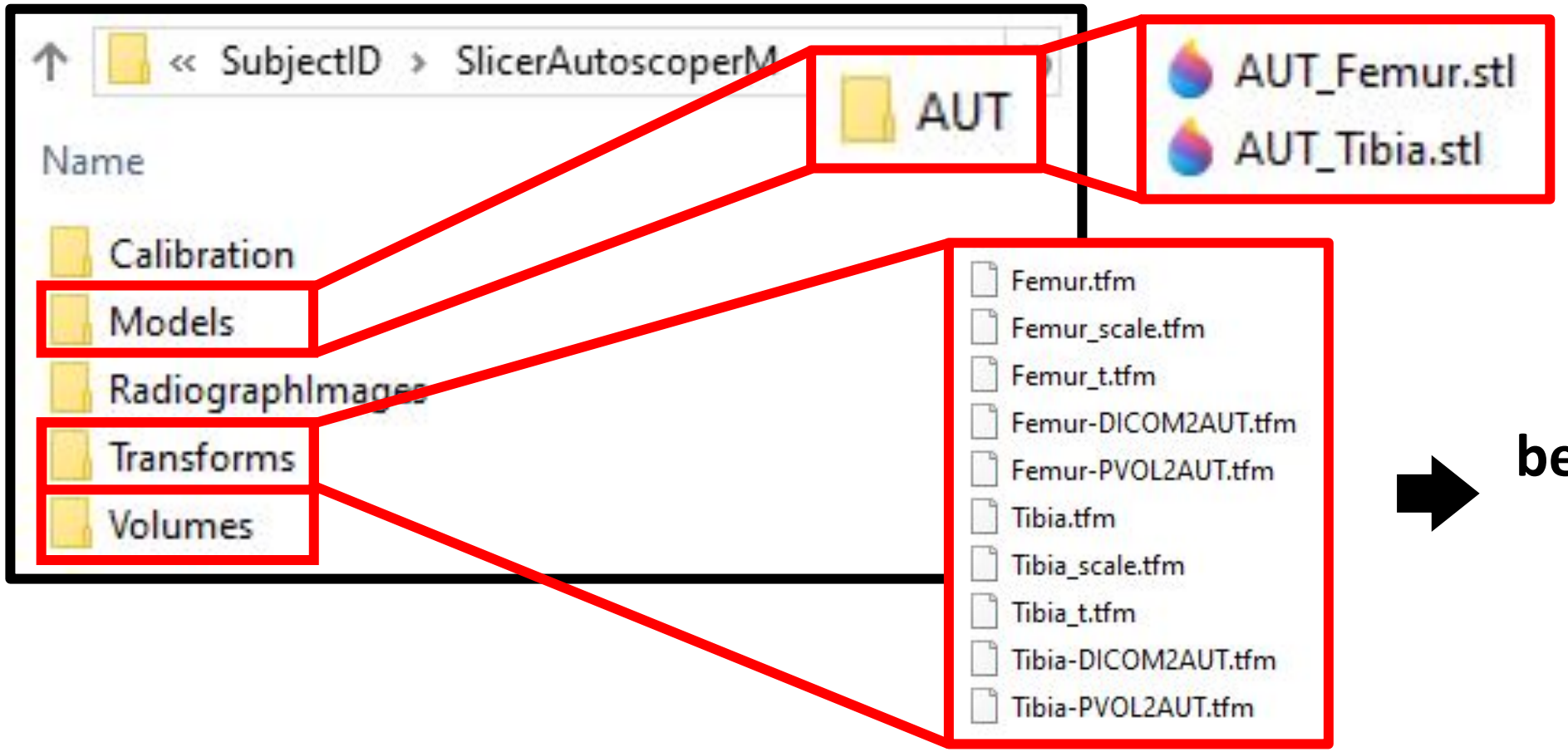
STL Models Directory:
Import Models
Partial Volume Generation
Segmentation Node: Select a Segmentation
Generate Partial Volumes
Load Partial Volumes
Default Subdirectories
Data Probe
Show Zoomed Slice
L
F
B
Slicer
Success!
OK
R S: -42.5000mm
B: SubjectID_Left
1
S
I
P
G A: 0.3690mm
B: SubjectID_Left
Y L: 73.2001mm
B: SubjectID_Left
Python Console
Python 3.9.10 (main, Mar 2 2025, 20:55:00) [MSC v.1942 64 bit (AMD64)] on win32
>>>
[Qt] QLayout::addChildLayout: layout "" already has a parent
[Qt] ctkSliderWidget::setSingleStep() 0 is out of bounds. 0 100 1


B
3D Slicer 5.8.1
File Edit View Help
Modules: AutoscoperM
Select a SequenceBrowser
3D Slicer
Help & Acknowledgement
Autoscoper Control
Autoscoper Pre-processing
0%
Output Directory: ::/Users/JHoltgrewe/AppData/Local/slicer.org/Slicer/cache/SlicerIO\AutoscoperM-Pre-Processing
Volume Node: SubjectID_Left
Segmentation Generation
Automatic Segmentation
Threshold Value: 700
Margin Size: 2.00
Generate Segmentations
OR
Segmentation from Model
STL Models Directory:
Import Models
Partial Volume Generation
Segmentation Node: Segmentation
Generate Partial Volumes
Load Partial Volumes
Default Subdirectories
Data Probe
Show Zoomed Slice
L
F
B
R S: -42.5000mm
B: SubjectID_Left
1
S
R P I
G A: 0.3690mm
Y L: 73.2001mm
B: SubjectID_Left
Python Console
Python 3.9.10 (main, Mar 2 2025, 20:55:00) [MSC v.1942 64 bit (AMD64)] on win32
>>>

Generating Partial Volumes

B



Mesh files of segmented volumes

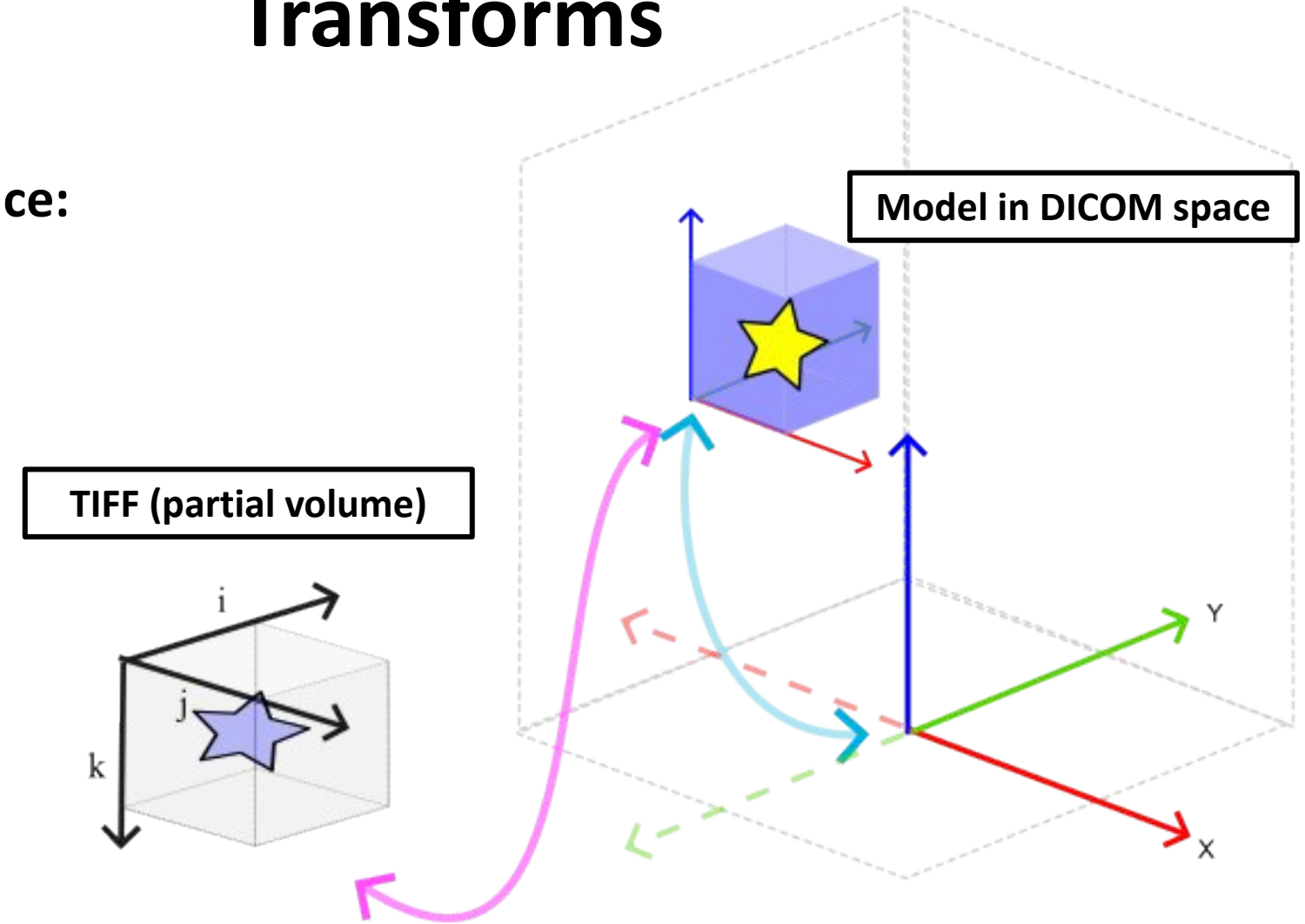
Transforms between various coordinate systems

Transforms

B

Transforms to DICOM space:

- Femur.tfm
- Femur_scale.tfm
- Femur_t.tfm
- Femur-DICOM2AUT.tfm
- Femur-PVOL2AUT.tfm
- Tibia.tfm
- Tibia_scale.tfm
- Tibia_t.tfm
- Tibia-DICOM2AUT.tfm
- Tibia-PVOL2AUT.tfm



{bone}.tfm → Transform between .tiff space and DICOM space (pink arrow)

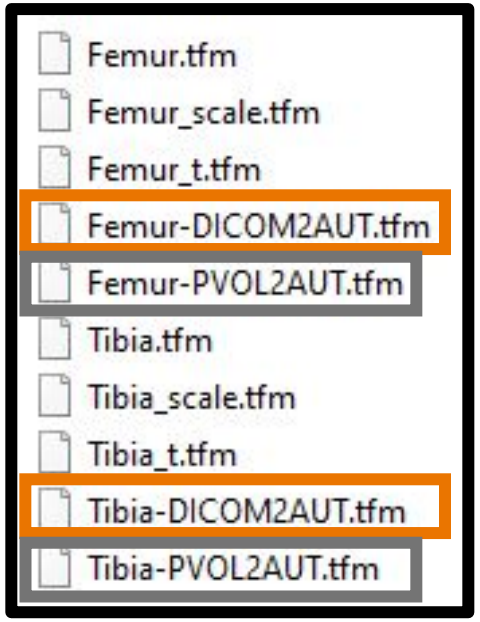
{bone}_t.tfm → Transform between world origin and DICOM space (blue arrow)

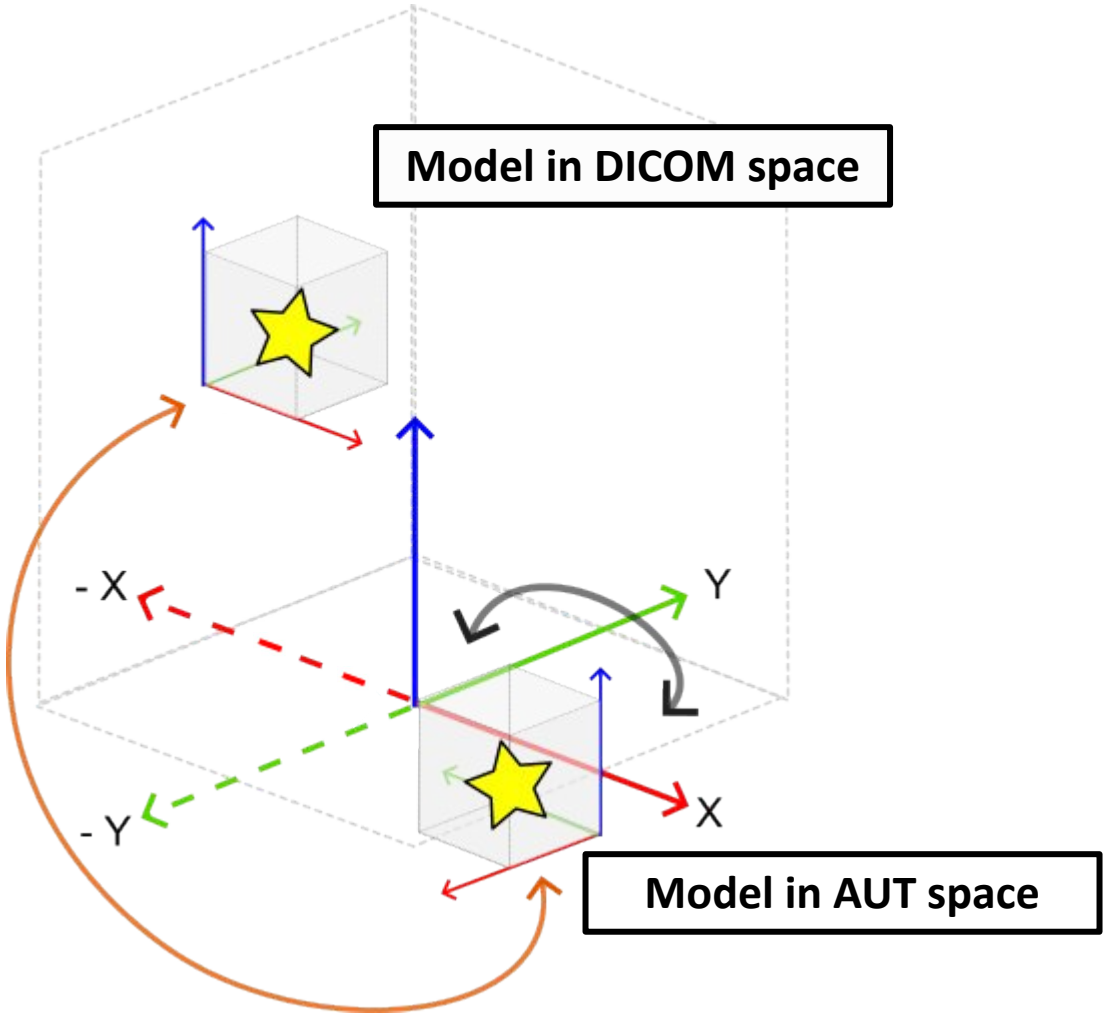
More Information: https://autoscoper.readthedocs.io/en/latest/transforms.html

Transforms

B

Transforms to Autoscoper space:





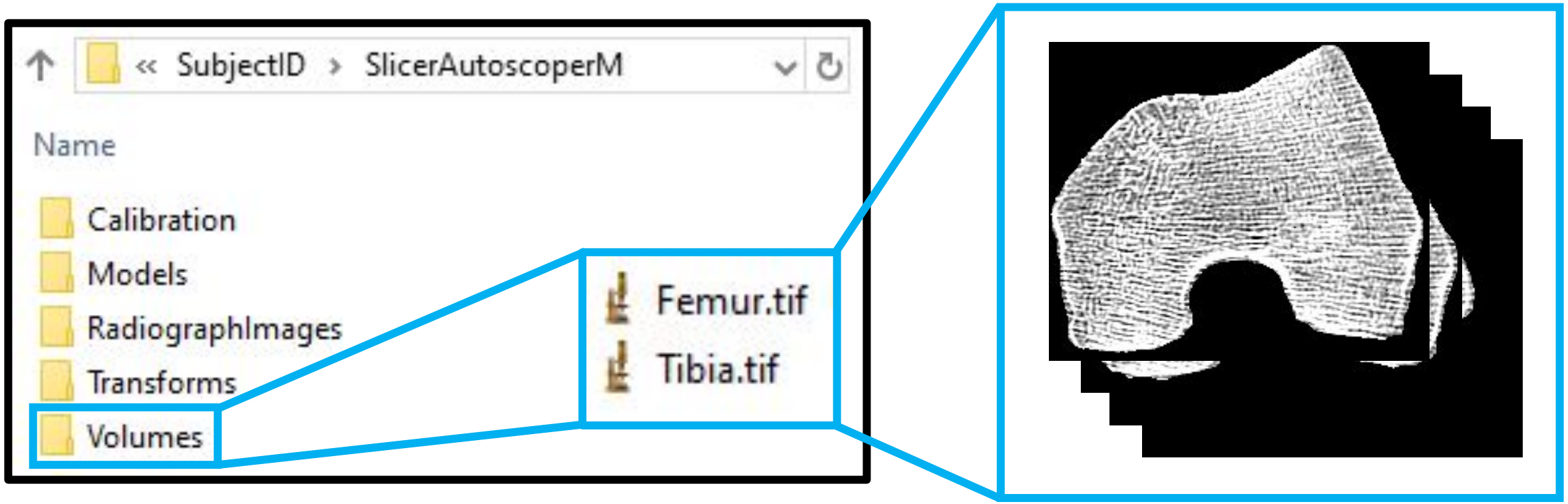
{bone}-DICOM2AUT.tfm → Transform between DICOM space and Autoscoper space (orange arrow)

{bone}-PVOL2AUT.tfm → Transform between world space and Autoscoper space (gray arrow)

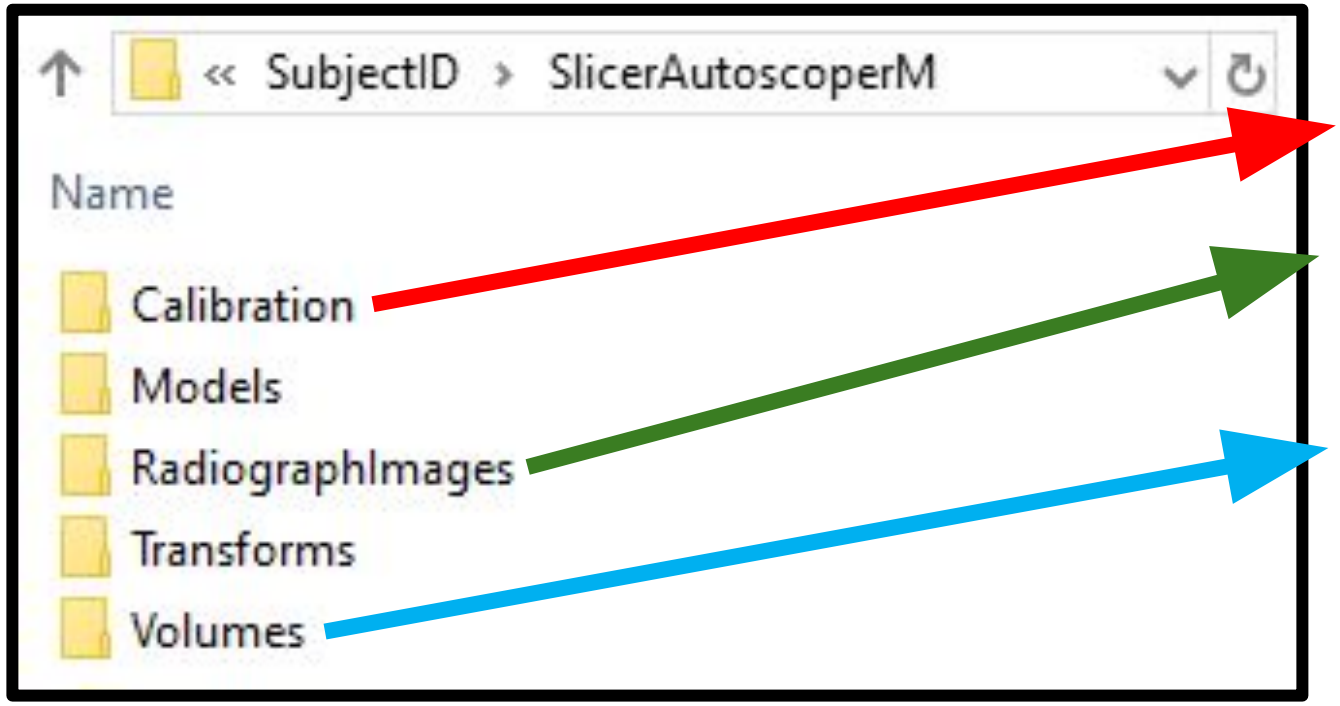
More Information: https://autoscoper.readthedocs.io/en/latest/transforms.html

Generating Partial Volumes

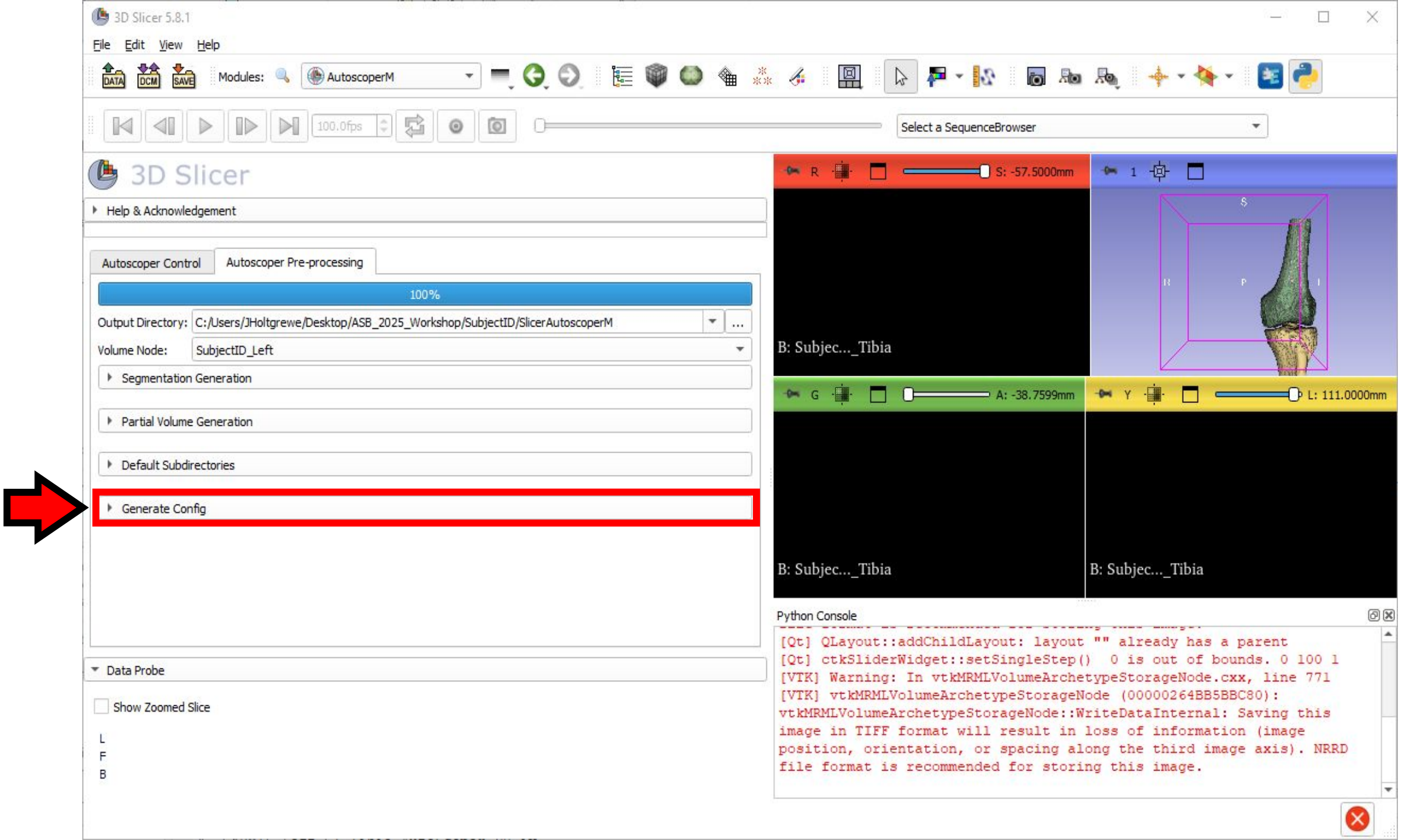
B

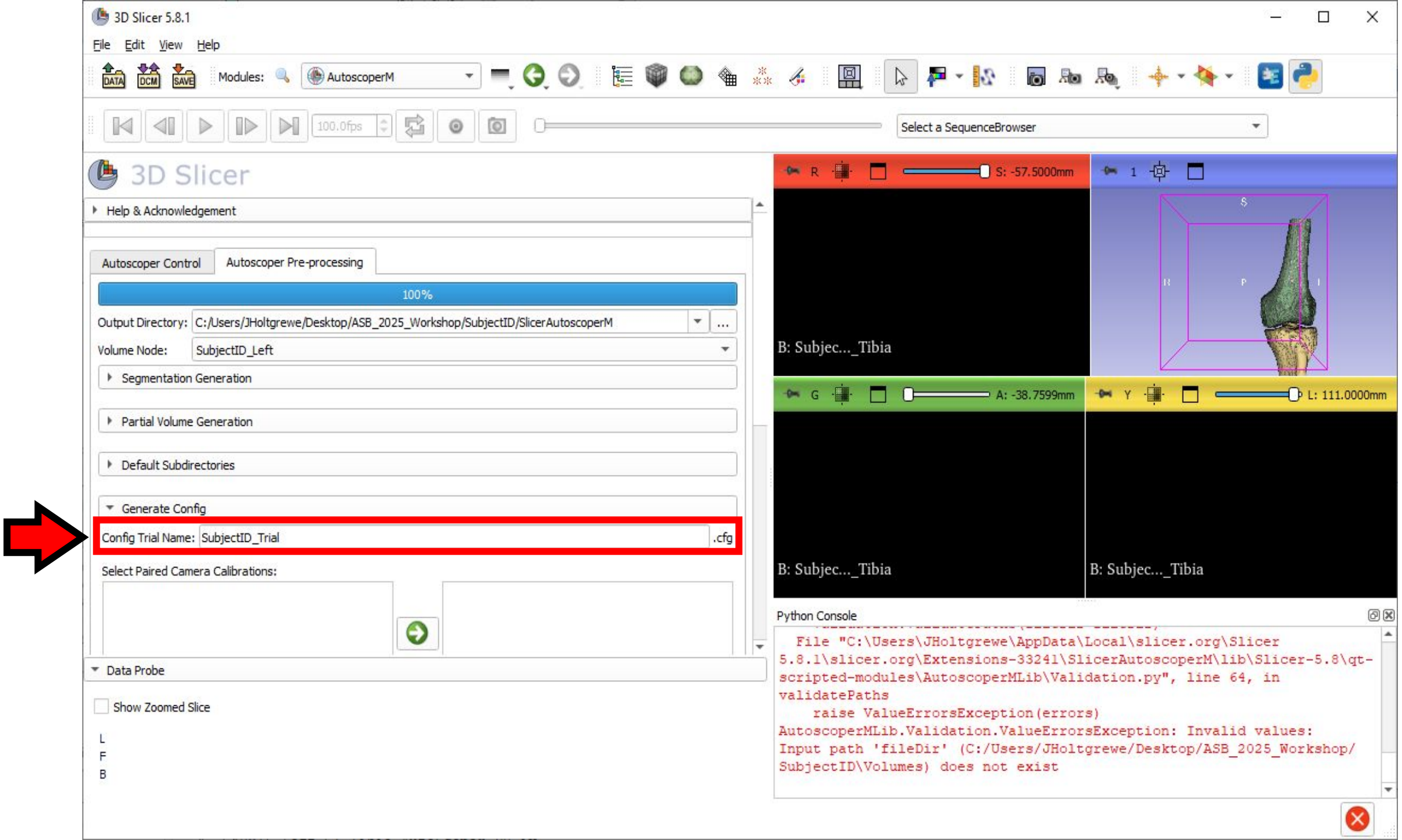


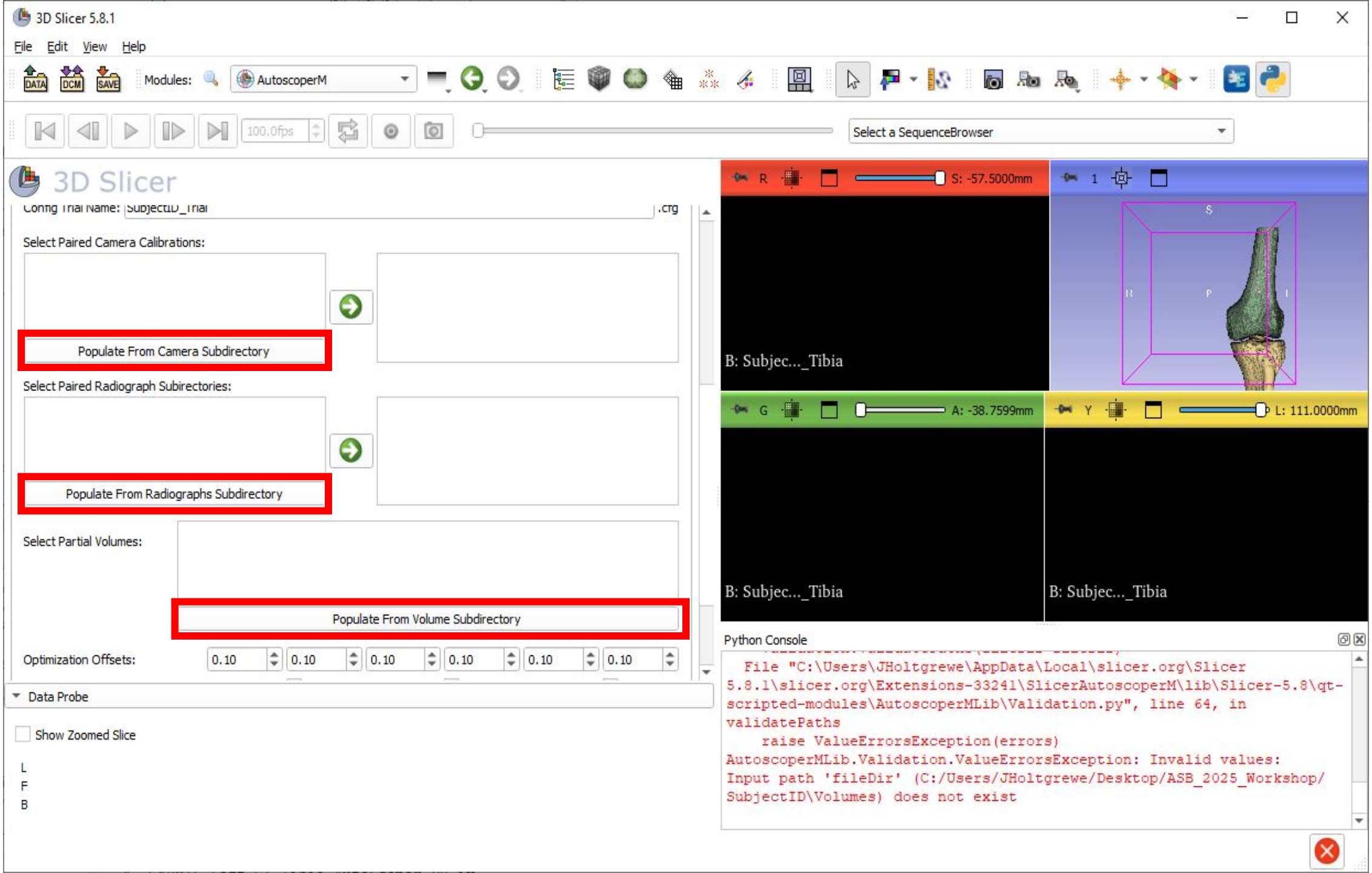
Generating Configuration File




```
Version 1.1

# Camera Calibration Files
mayaCam_csv Calibration\SubjectID_Camera01_Calibration.txt
mayaCam_csv Calibration\SubjectID_Camera02_Calibration.txt

# Camera Root Directories
CameraRootDir RadiographImages\SubjectID_Trial_Cam01_Undistorted
CameraRootDir RadiographImages\SubjectID_Trial_Cam02_Undistorted

# Volumes
VolumeFile Volumes\SubjectID_Left_Femur.tif
VolumeFlip 0 0 0
VoxelSize 0.369 0.369 0.625
VolumeFile Volumes\SubjectID_Left_Tibia.tif
VolumeFlip 0 0 0
VoxelSize 0.369 0.369 0.625

# Render Resolution
RenderResolution 1760 1760

# Optimization Offsets
OptimizationOffsets 0.1 0.1 0.1 0.1 0.1 0.1
```


3D Slicer 5.8.1
File Edit View Help
Modules: AutoscoperM
Select a SequenceBrowser
3D Slicer
Help & Acknowledgement
Autoscoper Control
Autoscoper Pre-processing
100%
Output Directory: C:/Users/JHoltgrewe/Desktop/ASB_2025_Workshop/SubjectID/SlicerAutoscoperM
Volume Node: SubjectID_Left
Segmentation Generation
Partial Volume Generation
Default Subdirectories
Generate Config
Data Probe
Show Zoomed Slice
L
F
B
S: -57.5000mm
B: Subjec..._Tibia
A: -38.7599mm
L: 111.0000mm
Python Console
[Qt] QLayout::addChildLayout: layout "" already has a parent
[Qt] ctkSliderWidget::setSingleStep() 0 is out of bounds. 0 100 1
[VTK] Warning: In vtkMRMLVolumeArchetypeStorageNode.cxx, line 771
[VTK] vtkMRMLVolumeArchetypeStorageNode (00000264BB5BBC80):
vtkMRMLVolumeArchetypeStorageNode::WriteDataInternal: Saving this
image in TIFF format will result in loss of information (image
position, orientation, or spacing along the third image axis). NRRD
file format is recommended for storing this image.


3D Slicer 5.8.1
File Edit View Help
Modules: AutoscoperM
Select a SequenceBrowser
3D Slicer
Help & Acknowledgement
Autoscoper Control
Autoscoper Pre-processing
100%
Output Directory: C:/Users/JHoltgrewe/Desktop/ASB_2025_Workshop/SubjectID/SlicerAutoscoperM
Volume Node: SubjectID_Left
Segmentation Generation
Partial Volume Generation
Default Subdirectories
Generate Config
Config Trial Name: SubjectID_Trial
.cfg
Select Paired Camera Calibrations:
Data Probe
Show Zoomed Slice
L
F
B
S: -57.5000mm
B: Subjec..._Tibia
A: -38.7599mm
L: 111.0000mm
Python Console
File "C:\Users\JHoltgrewe\AppData\Local\slicer.org\Slicer 5.8.1\slicer.org\Extensions-33241\SlicerAutoscoperM\lib\Slicer-5.8\qt-scripted-modules\AutoscoperMLib\Validation.py", line 64, in validatePaths
raise ValueErrorsException(errors)
AutoscoperMLib.Validation.ValueErrorsException: Invalid values:
Input path 'fileDir' (C:/Users/JHoltgrewe/Desktop/ASB_2025_Workshop/SubjectID\Volumes) does not exist


3D Slicer 5.8.1
File Edit View Help
Modules: AutoscoperM
100.0fps
Select a SequenceBrowser
3D Slicer
Select Paired Camera Calibrations:
Populate From Camera Subdirectory
Select Paired Radiograph Subirectories:
Populate From Radiographs Subdirectory
Select Partial Volumes:
Populate From Volume Subdirectory
Optimization Offsets:
0.10
0.10
0.10
0.10
0.10
0.10
Data Probe
Show Zoomed Slice
L
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B
R
S: -57.5000mm
B: Subjec..._Tibia
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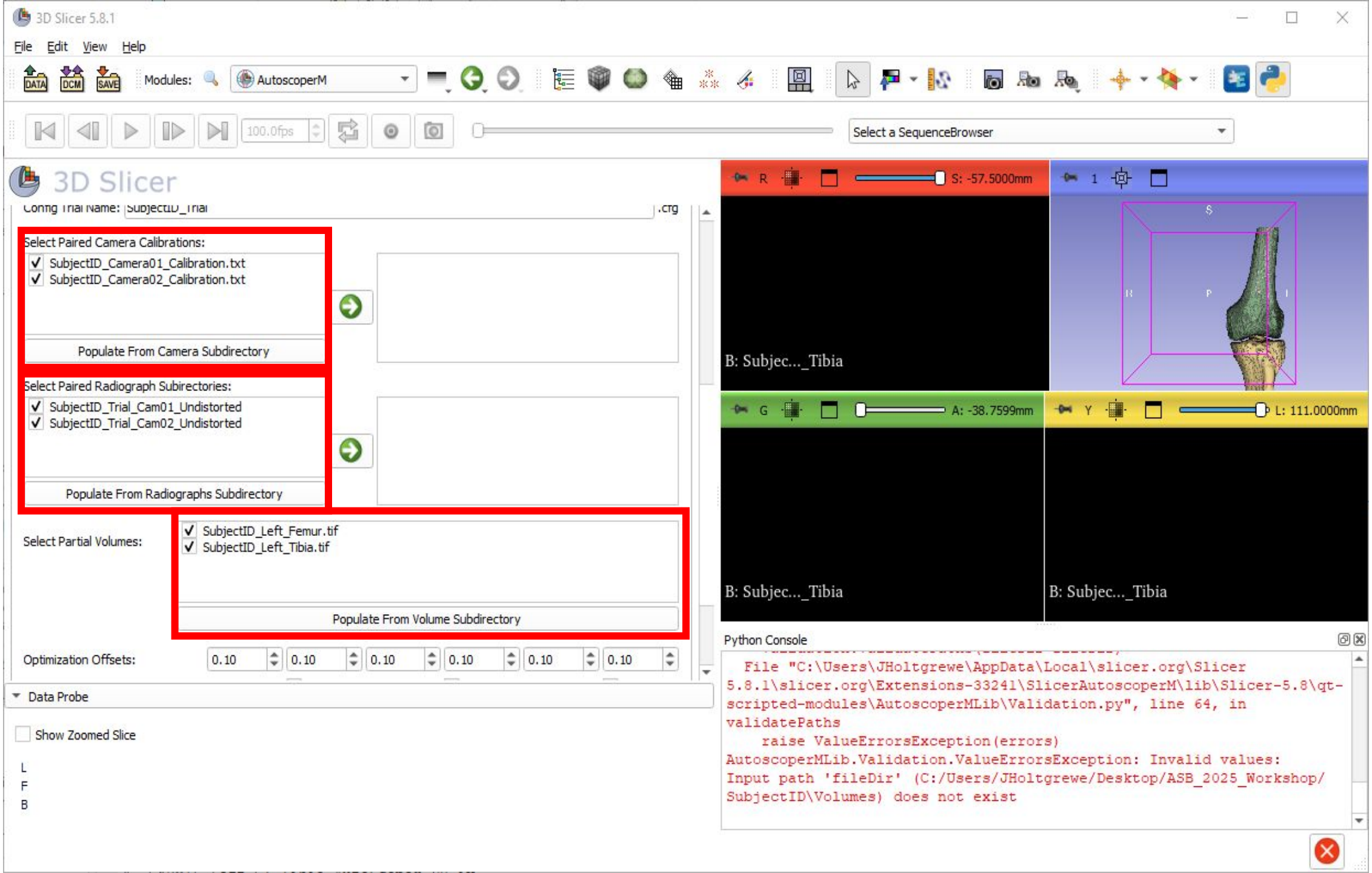
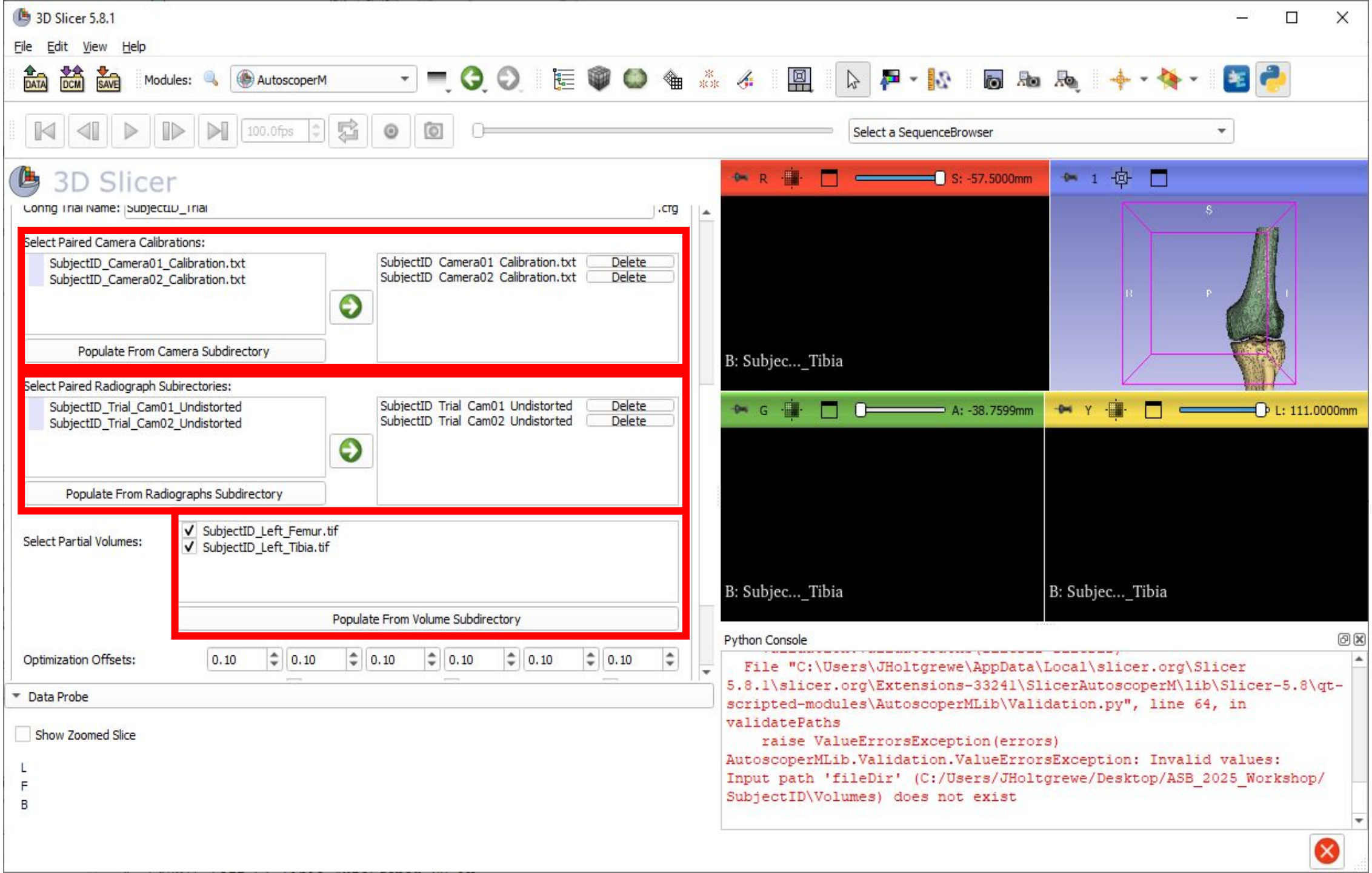
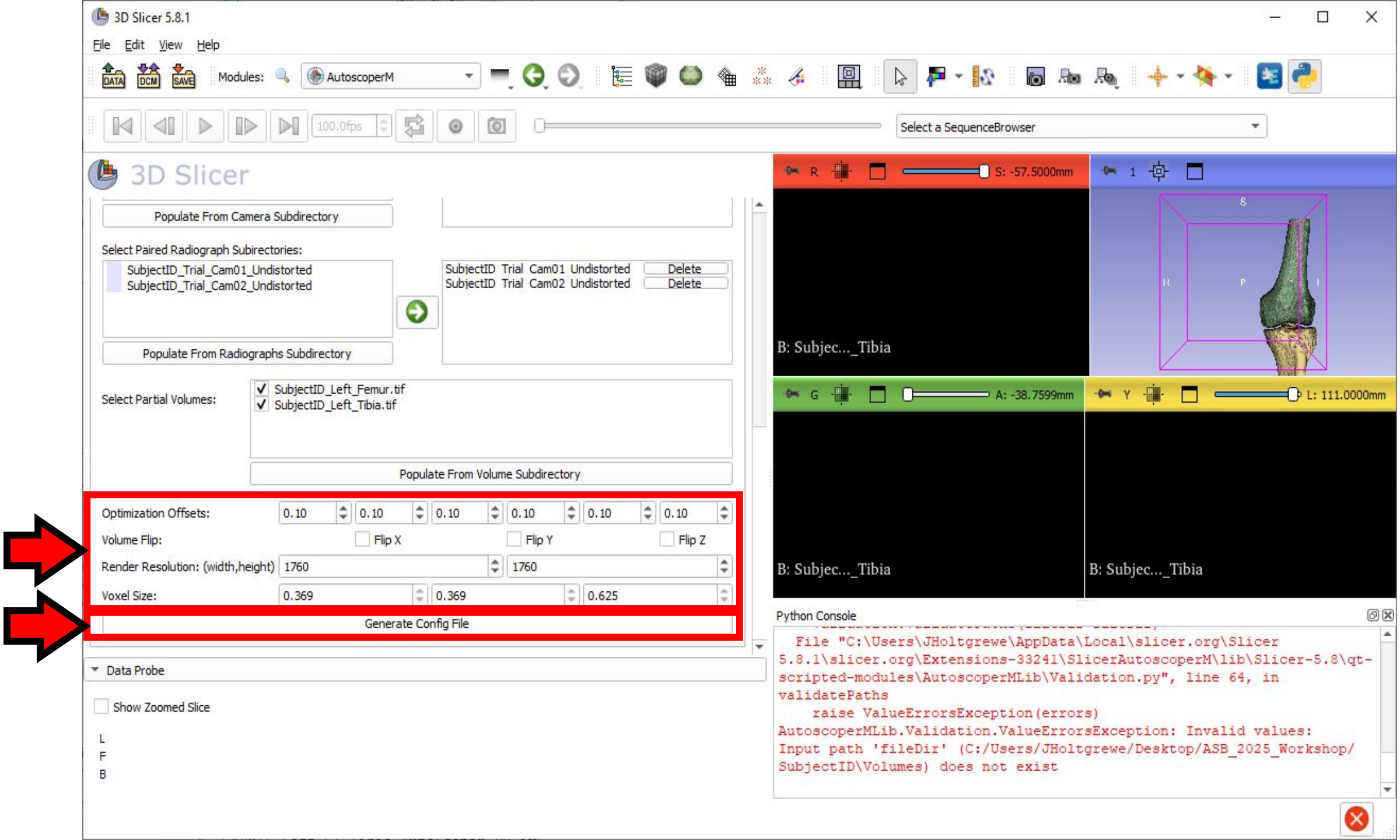
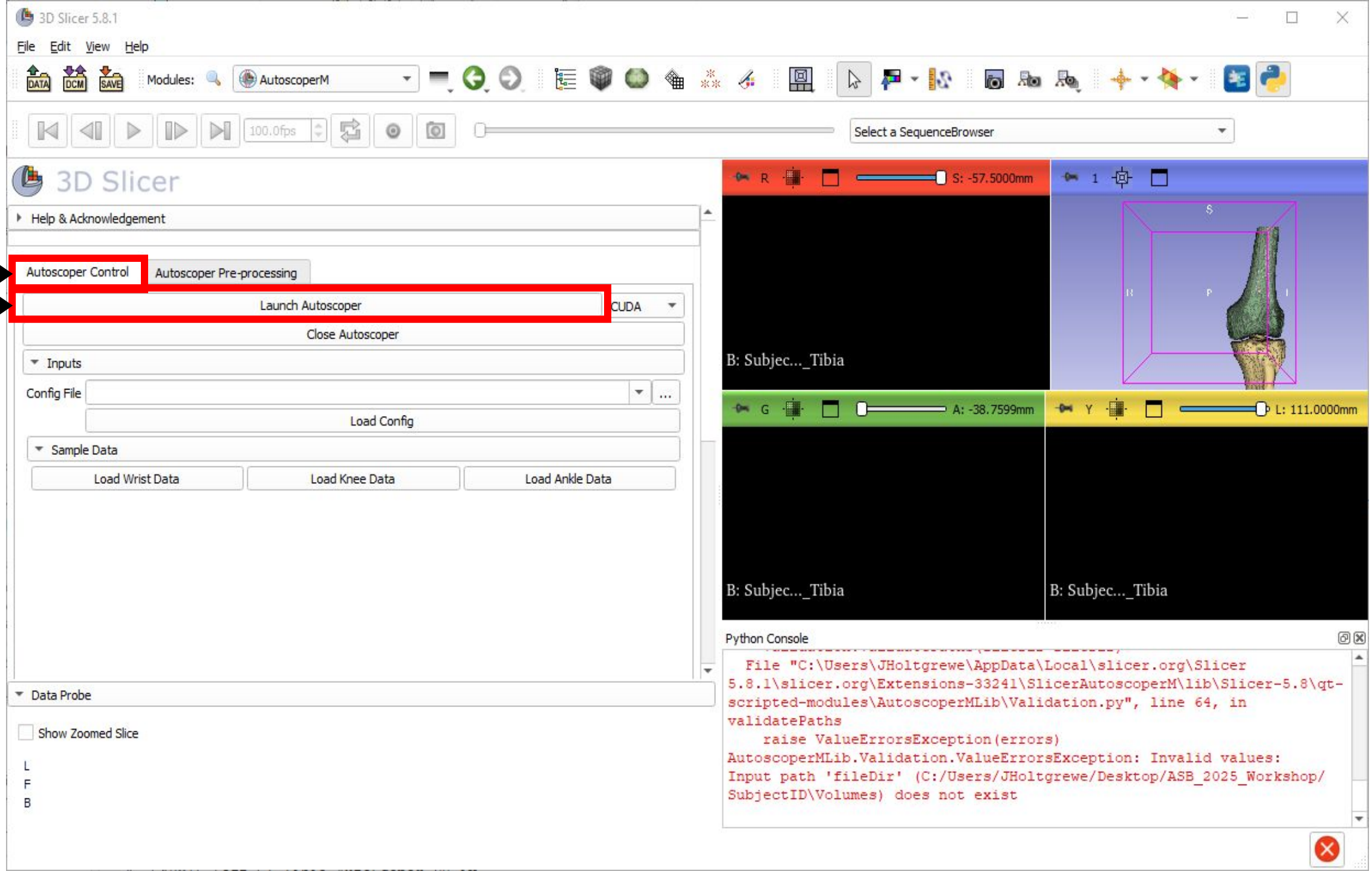
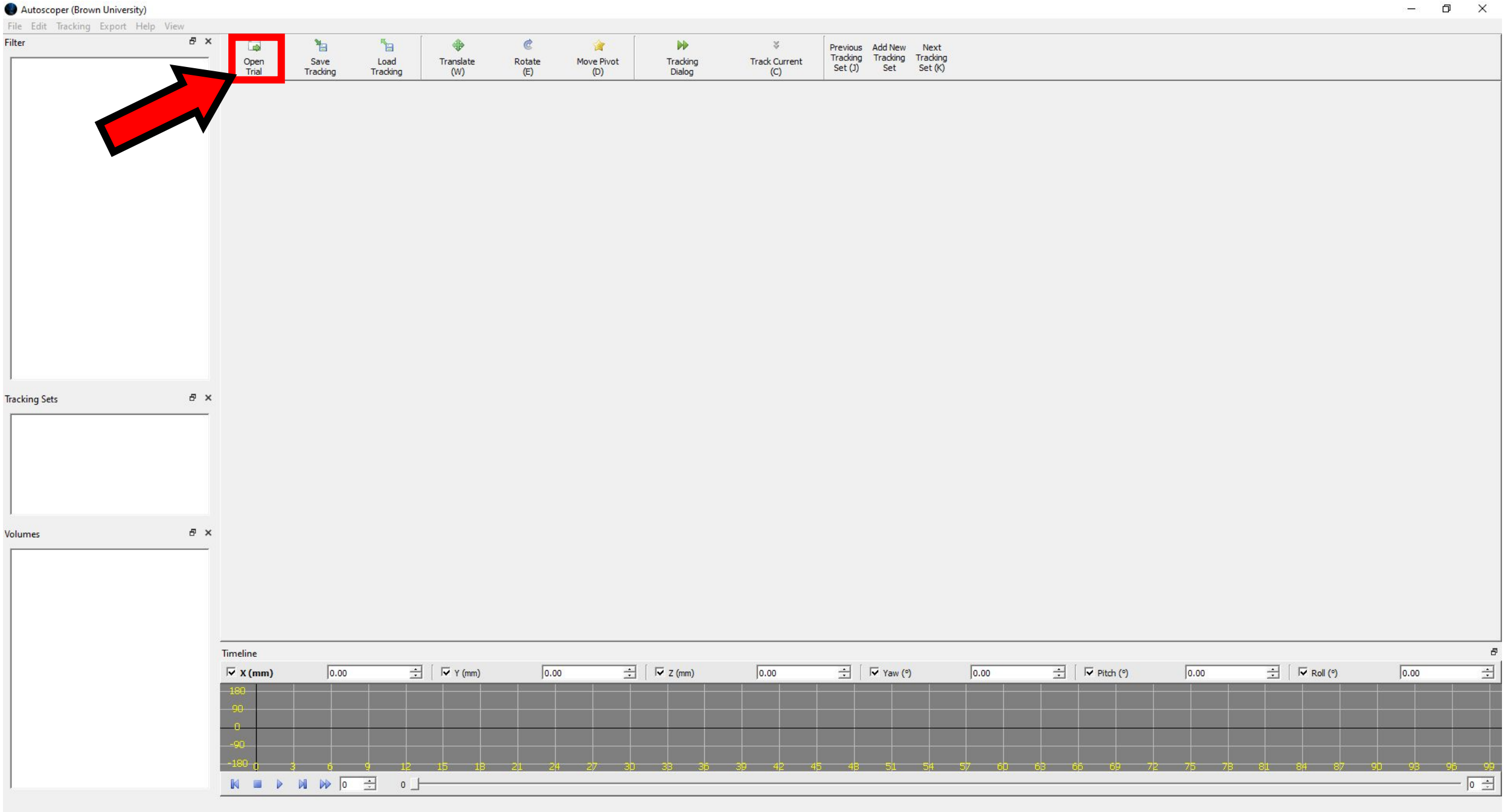
G
A: -38.7599mm
B: Subjec..._Tibia
Y
L: 111.0000mm
B: Subjec..._Tibia
Python Console
File "C:\Users\JHoltgrewe\AppData\Local\slicer.org\Slicer 5.8.1\slicer.org\Extensions-33241\SlicerAutoscoperM\lib\Slicer-5.8\qt-scripted-modules\AutoscoperMLib\Validation.py", line 64, in validatePaths
raise ValueErrorsException(errors)
AutoscoperMLib.Validation.ValueErrorsException: Invalid values:
Input path 'fileDir' (C:/Users/JHoltgrewe/Desktop/ASB_2025_Workshop/SubjectID\Volumes) does not exist

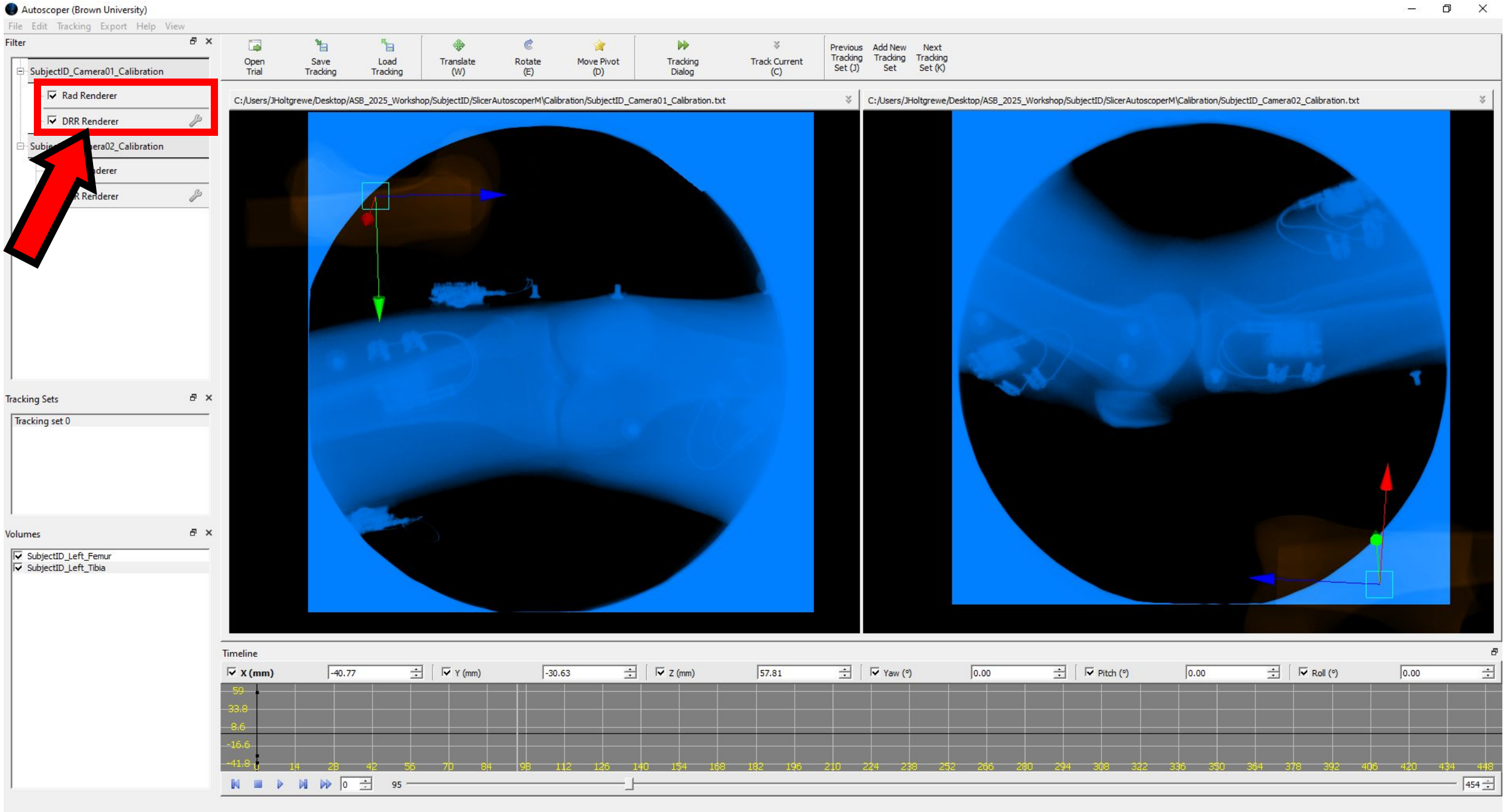

3D Slicer 5.8.1
File Edit View Help
Modules: AutoscoperM
Select a SequenceBrowser
3D Slicer
Select Paired Camera Calibrations:
SubjectID_Camera01_Calibration.txt
SubjectID_Camera02_Calibration.txt
Populate From Camera Subdirectory
Select Paired Radiograph Subirectories:
SubjectID_Trial_Cam01_Undistorted
SubjectID_Trial_Cam02_Undistorted
Populate From Radiographs Subdirectory
Select Partial Volumes:
SubjectID_Left_Femur.tif
SubjectID_Left_Tibia.tif
Populate From Volume Subdirectory
Optimization Offsets:
0.10
Data Probe
Show Zoomed Slice
L
F
B
S: -57.5000mm
B: Subjec..._Tibia
A: -38.7599mm
L: 111.0000mm
Python Console
File "C:\Users\JHoltgrewe\AppData\Local\slicer.org\Slicer 5.8.1\slicer.org\Extensions-33241\SlicerAutoscoperM\lib\Slicer-5.8\qt-scripted-modules\AutoscoperMLib\Validation.py", line 64, in validatePaths
raise ValueErrorsException(errors)
AutoscoperMLib.Validation.ValueErrorsException: Invalid values:
Input path 'fileDir' (C:/Users/JHoltgrewe/Desktop/ASB_2025_Workshop/SubjectID\Volumes) does not exist

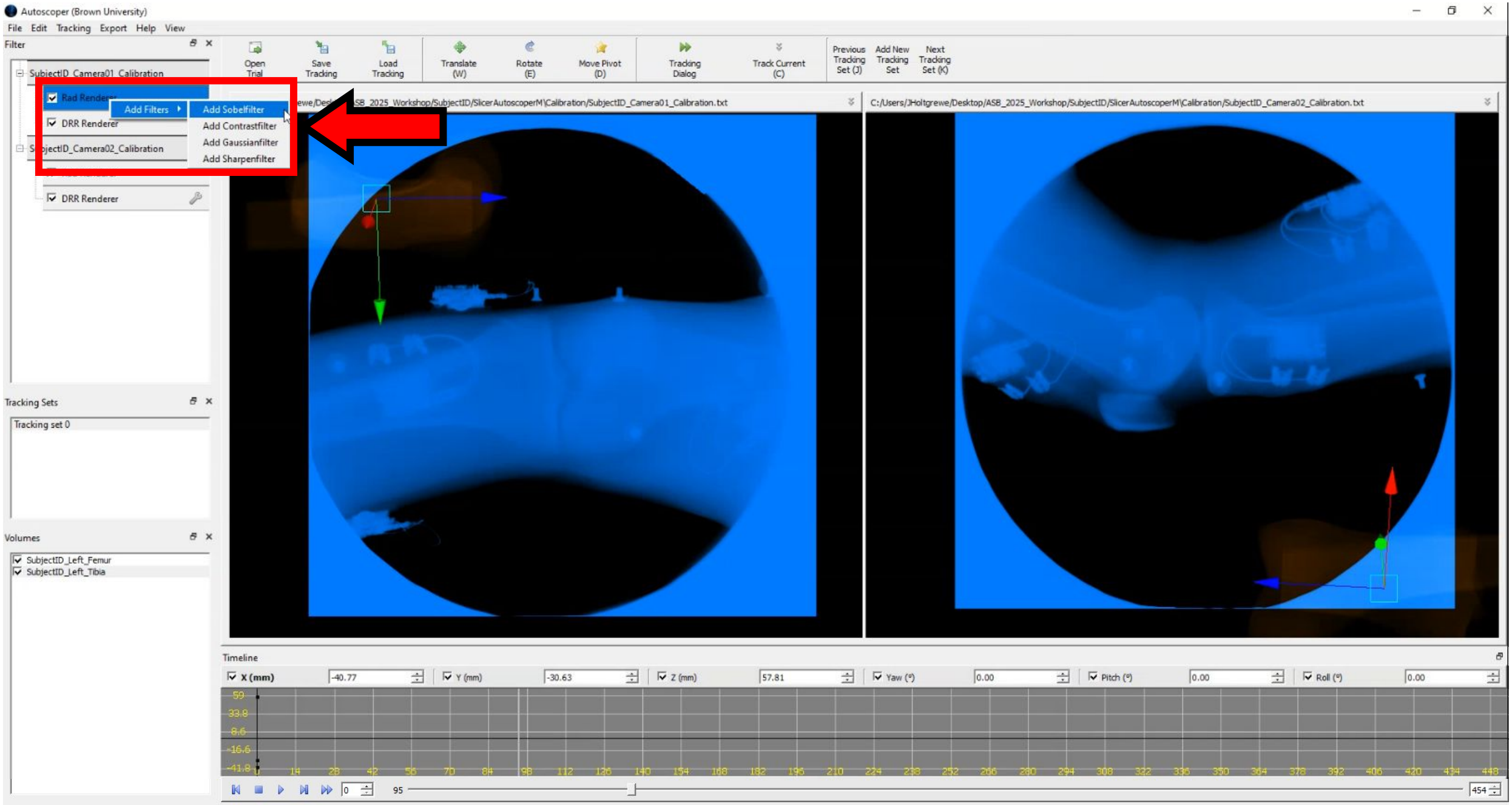

3D Slicer 5.8.1
File Edit View Help
Modules: AutoscoperM
Select a SequenceBrowser
3D Slicer
Config Trial Name: SubjectID_Trial .cfg
Select Paired Camera Calibrations:
SubjectID_Camera01_Calibration.txt
SubjectID_Camera02_Calibration.txt
SubjectID Camera01 Calibration.txt Delete
SubjectID Camera02 Calibration.txt Delete
Populate From Camera Subdirectory
Select Paired Radiograph Subirectories:
SubjectID_Trial_Cam01_Undistorted
SubjectID_Trial_Cam02_Undistorted
SubjectID Trial Cam01 Undistorted Delete
SubjectID Trial Cam02 Undistorted Delete
Populate From Radiographs Subdirectory
Select Partial Volumes:
SubjectID_Left_Femur.tif
SubjectID_Left_Tibia.tif
Populate From Volume Subdirectory
Optimization Offsets: 0.10 0.10 0.10 0.10 0.10 0.10
Data Probe
Show Zoomed Slice
L
F
B
R S: -57.5000mm
B: Subjec..._Tibia
1
G A: -38.7599mm
B: Subjec..._Tibia
Y L: 111.0000mm
B: Subjec..._Tibia
Python Console
File "C:\Users\JHoltgrewe\AppData\Local\slicer.org\Slicer 5.8.1\slicer.org\Extensions-33241\SlicerAutoscoperM\lib\Slicer-5.8\qt-scripted-modules\AutoscoperMLib\Validation.py", line 64, in validatePaths
raise ValueErrorsException(errors)
AutoscoperMLib.Validation.ValueErrorsException: Invalid values:
Input path 'fileDir' (C:/Users/JHoltgrewe/Desktop/ASB_2025_Workshop/SubjectID\Volumes) does not exist

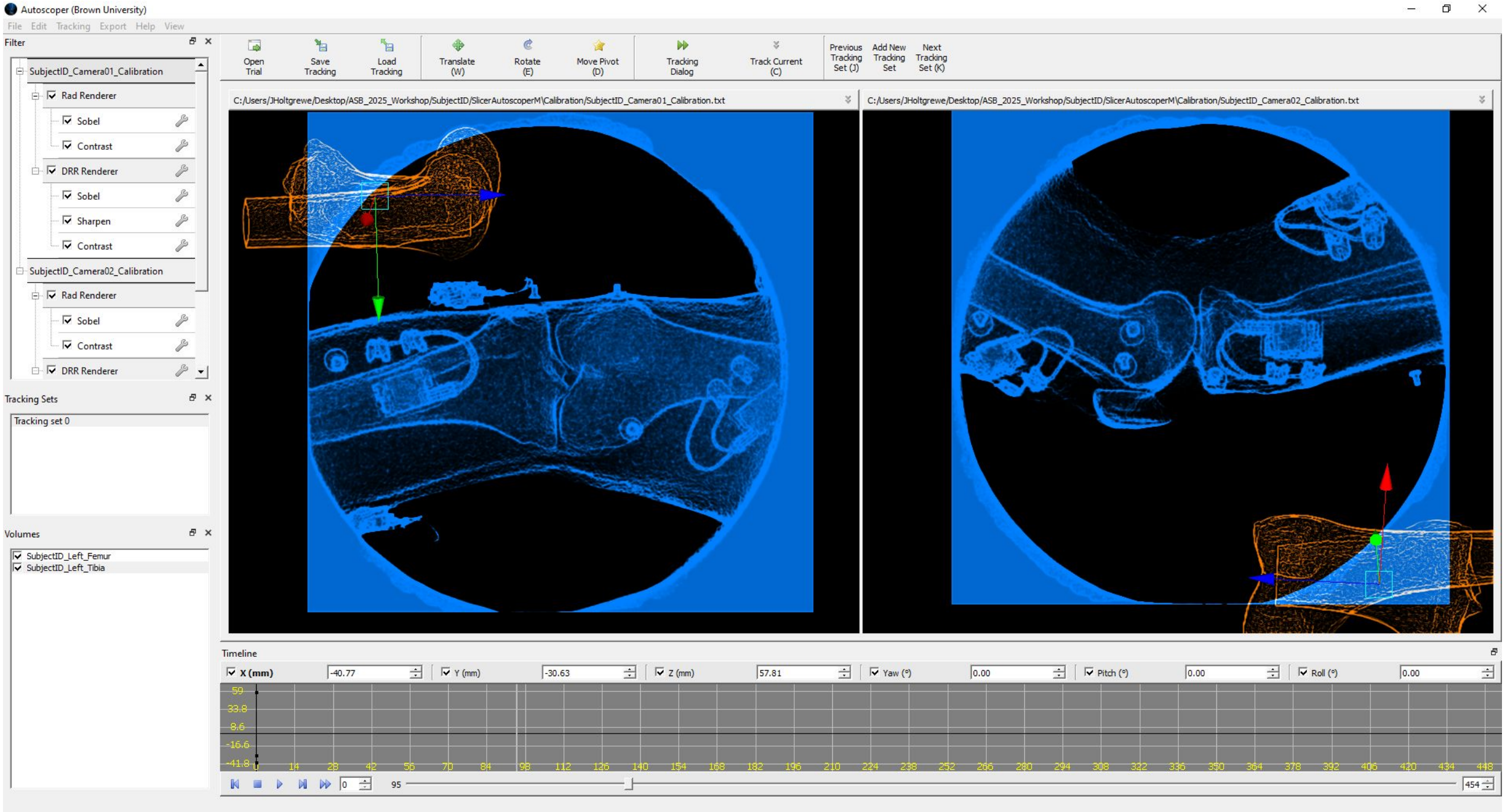

3D Slicer 5.8.1
File Edit View Help
Modules: AutoscoperM
Select a SequenceBrowser
3D Slicer
Populate From Camera Subdirectory
Select Paired Radiograph Subirectories:
SubjectID_Trial_Cam01_Undistorted
SubjectID_Trial_Cam02_Undistorted
SubjectID Trial Cam01 Undistorted Delete
SubjectID Trial Cam02 Undistorted Delete
Populate From Radiographs Subdirectory
Select Partial Volumes:
SubjectID_Left_Femur.tif
SubjectID_Left_Tibia.tif
Populate From Volume Subdirectory
Optimization Offsets: 0.10 0.10 0.10 0.10 0.10 0.10
Volume Flip: Flip X Flip Y Flip Z
Render Resolution: (width,height) 1760 1760
Voxel Size: 0.369 0.369 0.625
Generate Config File
Data Probe
Show Zoomed Slice
L
F
B
R S: -57.5000mm
1
B: Subjec..._Tibia
G A: -38.7599mm
Y L: 111.0000mm
B: Subjec..._Tibia
B: Subjec..._Tibia
Python Console
File "C:\Users\JHoltgrewe\AppData\Local\slicer.org\Slicer 5.8.1\slicer.org\Extensions-33241\SlicerAutoscoperM\lib\Slicer-5.8\qt-scripted-modules\AutoscoperMLib\Validation.py", line 64, in validatePaths
raise ValueErrorsException(errors)
AutoscoperMLib.Validation.ValueErrorsException: Invalid values:
Input path 'fileDir' (C:/Users/JHoltgrewe/Desktop/ASB_2025_Workshop/SubjectID\Volumes) does not exist

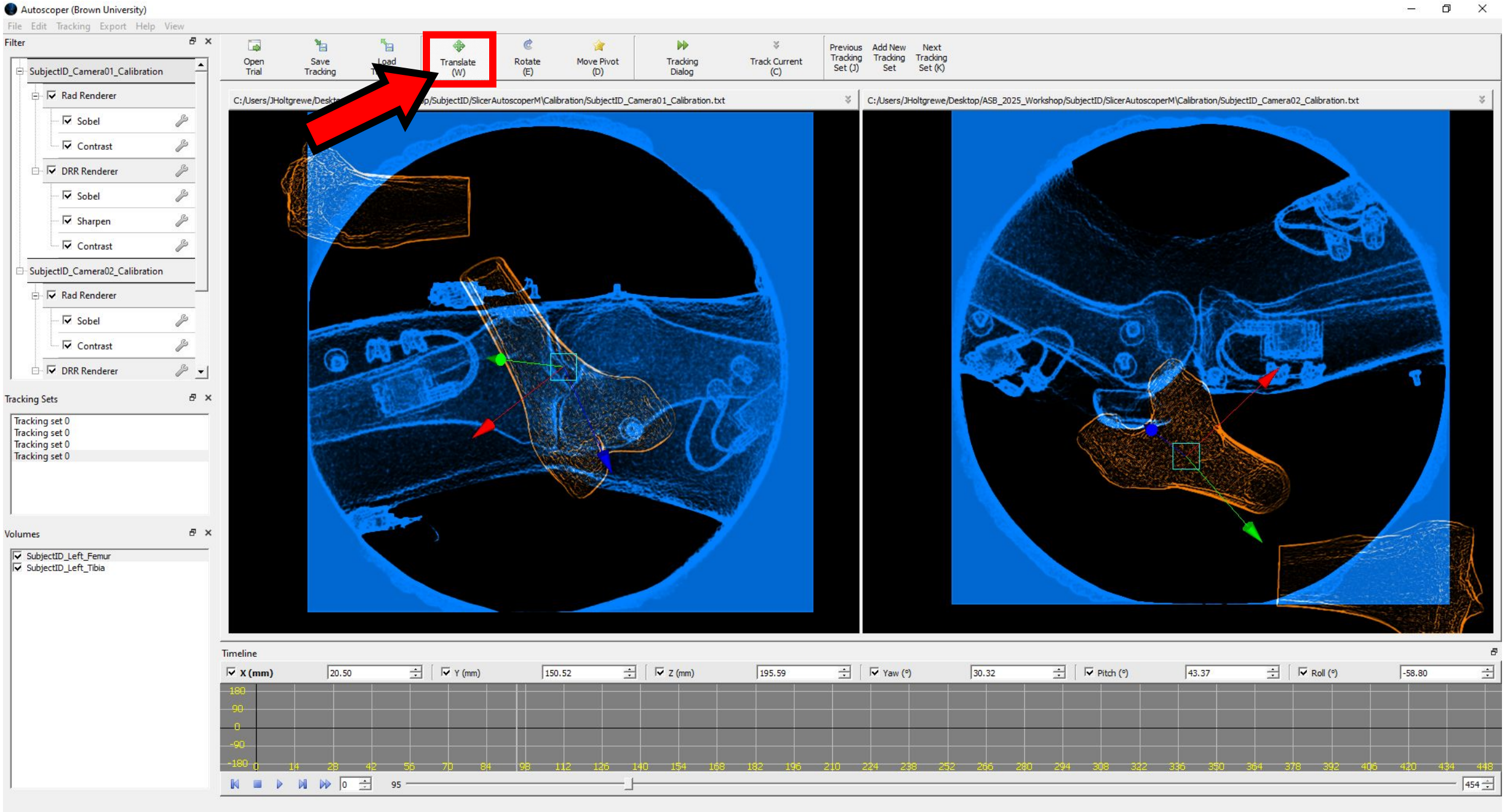

3D Slicer 5.8.1
File Edit View Help
Modules: AutoscoperM
Select a SequenceBrowser
3D Slicer
Help & Acknowledgement
Autoscoper Control
Autoscoper Pre-processing
Launch Autoscoper
CUDA
Close Autoscoper
Inputs
Config File
Load Config
Sample Data
Load Wrist Data
Load Knee Data
Load Ankle Data
Data Probe
Show Zoomed Slice
L
F
B
R
S: -57.5000mm
B: Subjec..._Tibia
1
G
A: -38.7599mm
B: Subjec..._Tibia
Y
L: 111.0000mm
B: Subjec..._Tibia
Python Console
File "C:\Users\JHoltgrewe\AppData\Local\slicer.org\Slicer 5.8.1\slicer.org\Extensions-33241\SlicerAutoscoperM\lib\Slicer-5.8\qt-scripted-modules\AutoscoperMLib\Validation.py", line 64, in validatePaths
raise ValueErrorsException(errors)
AutoscoperMLib.Validation.ValueErrorsException: Invalid values:
Input path 'fileDir' (C:/Users/JHoltgrewe/Desktop/ASB_2025_Workshop/SubjectID\Volumes) does not exist

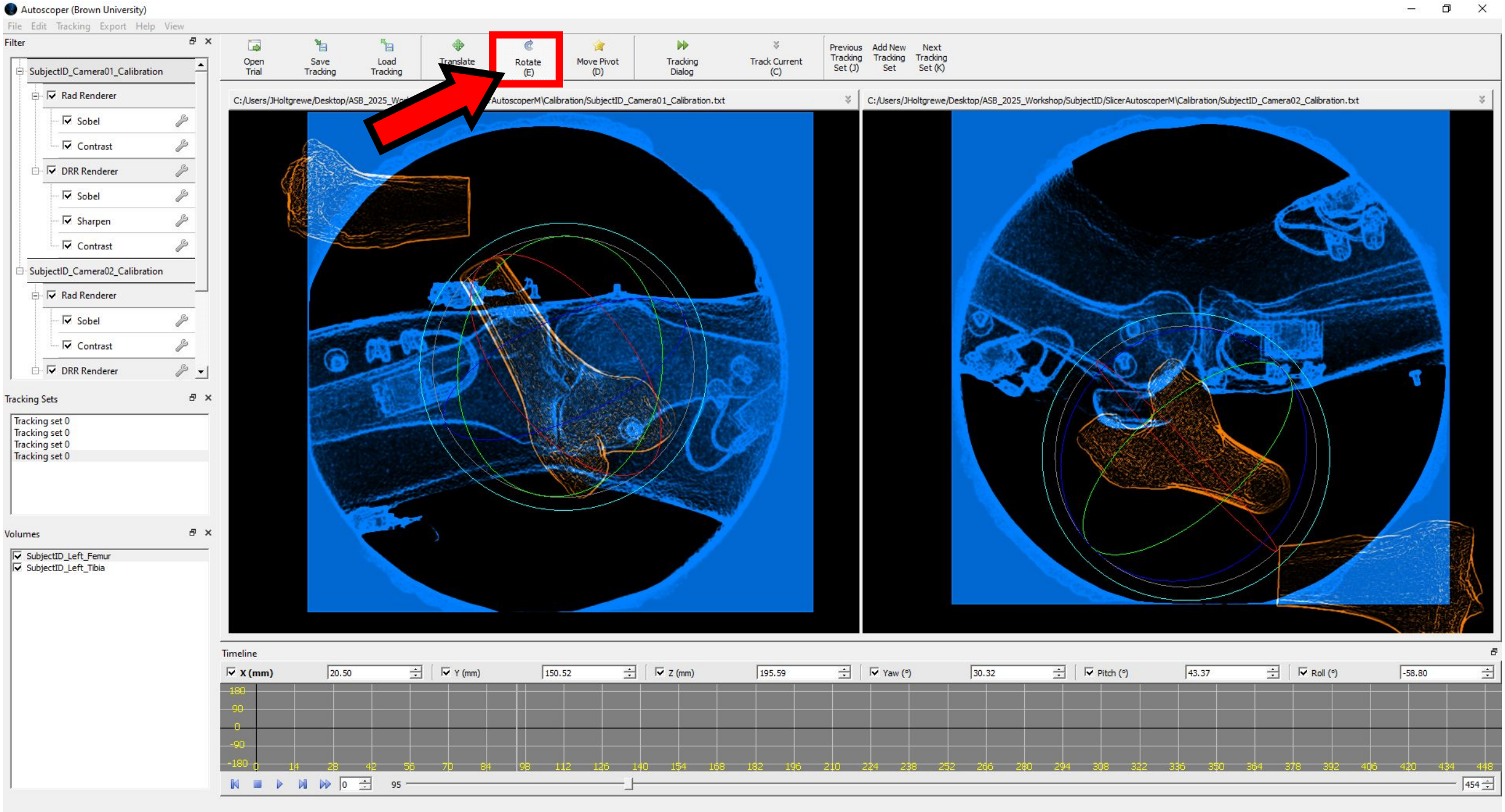

Autoscoper (Brown University)
File Edit Tracking Export Help View
Filter
Open Trial
Save Tracking
Load Tracking
Translate (W)
Rotate (E)
Move Pivot (D)
Tracking Dialog
Track Current (C)
Previous Tracking Set (J)
Add New Tracking Set
Next Tracking Set (K)
Tracking Sets
Volumes
Timeline
X (mm) 0.00
Y (mm) 0.00
Z (mm) 0.00
Yaw (°) 0.00
Pitch (°) 0.00
Roll (°) 0.00
180
90
0
-90
-180
0 3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48 51 54 57 60 63 66 69 72 75 78 81 84 87 90 93 96 99

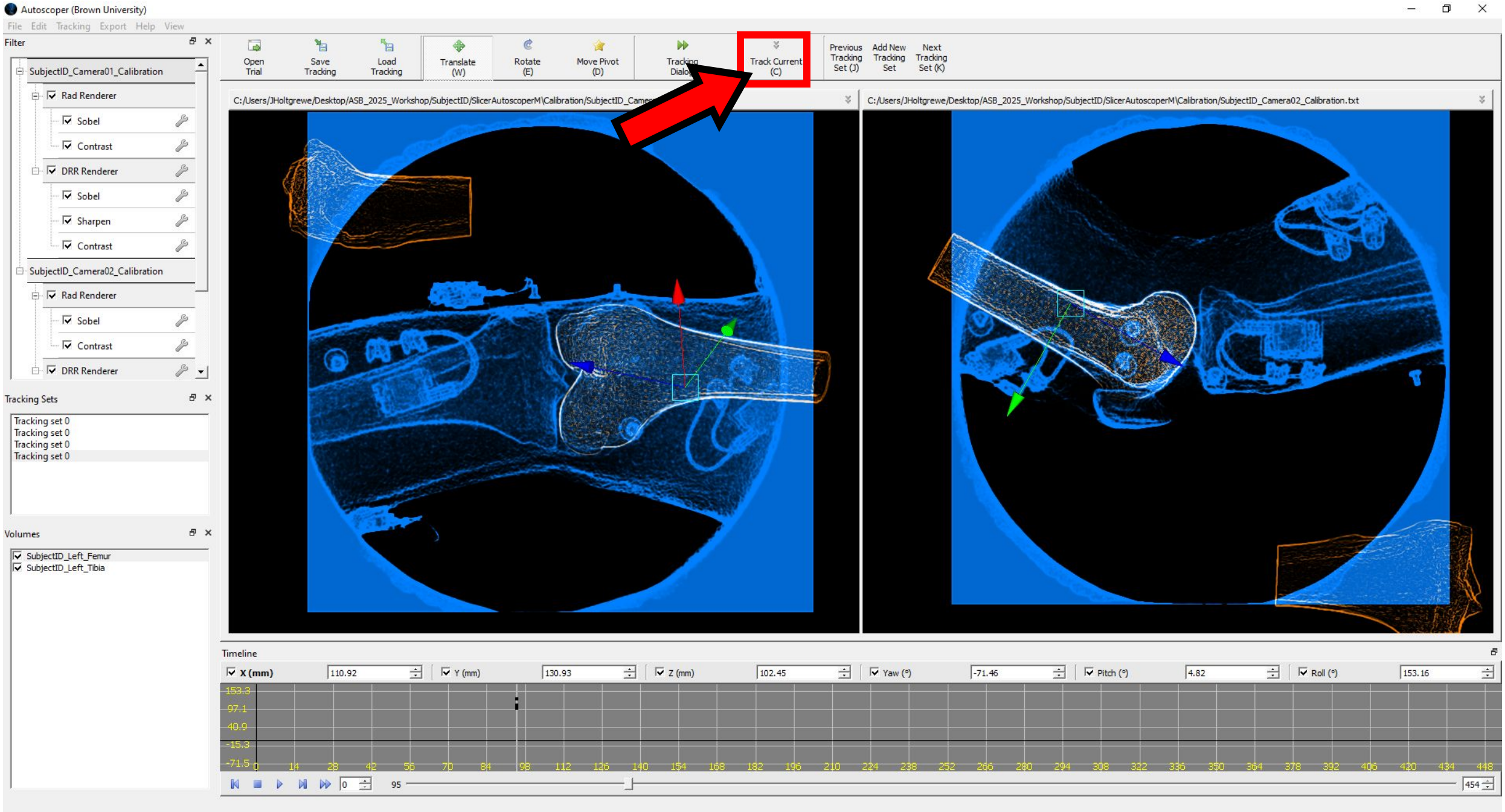

Autoscoper (Brown University)
File Edit Tracking Export Help View
Filter
SubjectID_Camera01_Calibration
Rad Renderer
DRR Renderer
Tracking Sets
Tracking set 0
Volumes
SubjectID_Left_Femur
SubjectID_Left_Tibia
Open Trial
Save Tracking
Load Tracking
Translate (W)
Rotate (E)
Move Pivot (D)
Tracking Dialog
Track Current (C)
Previous Tracking Set (J)
Add New Tracking Set
Next Tracking Set (K)
C:/Users/JHoltgrewe/Desktop/ASB_2025_Workshop/SubjectID/SlicerAutoscoperM\Calibration/SubjectID_Camera01_Calibration.txt
C:/Users/JHoltgrewe/Desktop/ASB_2025_Workshop/SubjectID/SlicerAutoscoperM\Calibration/SubjectID_Camera02_Calibration.txt
Timeline
X (mm) -40.77
Y (mm) -30.63
Z (mm) 57.81
Yaw (°) 0.00
Pitch (°) 0.00
Roll (°) 0.00
59
33.8
8.6
-16.6
-41.8
0 14 28 42 56 70 84 98 112 126 140 154 168 182 196 210 224 238 252 266 280 294 308 322 336 350 364 378 392 406 420 434 448
0
95
454

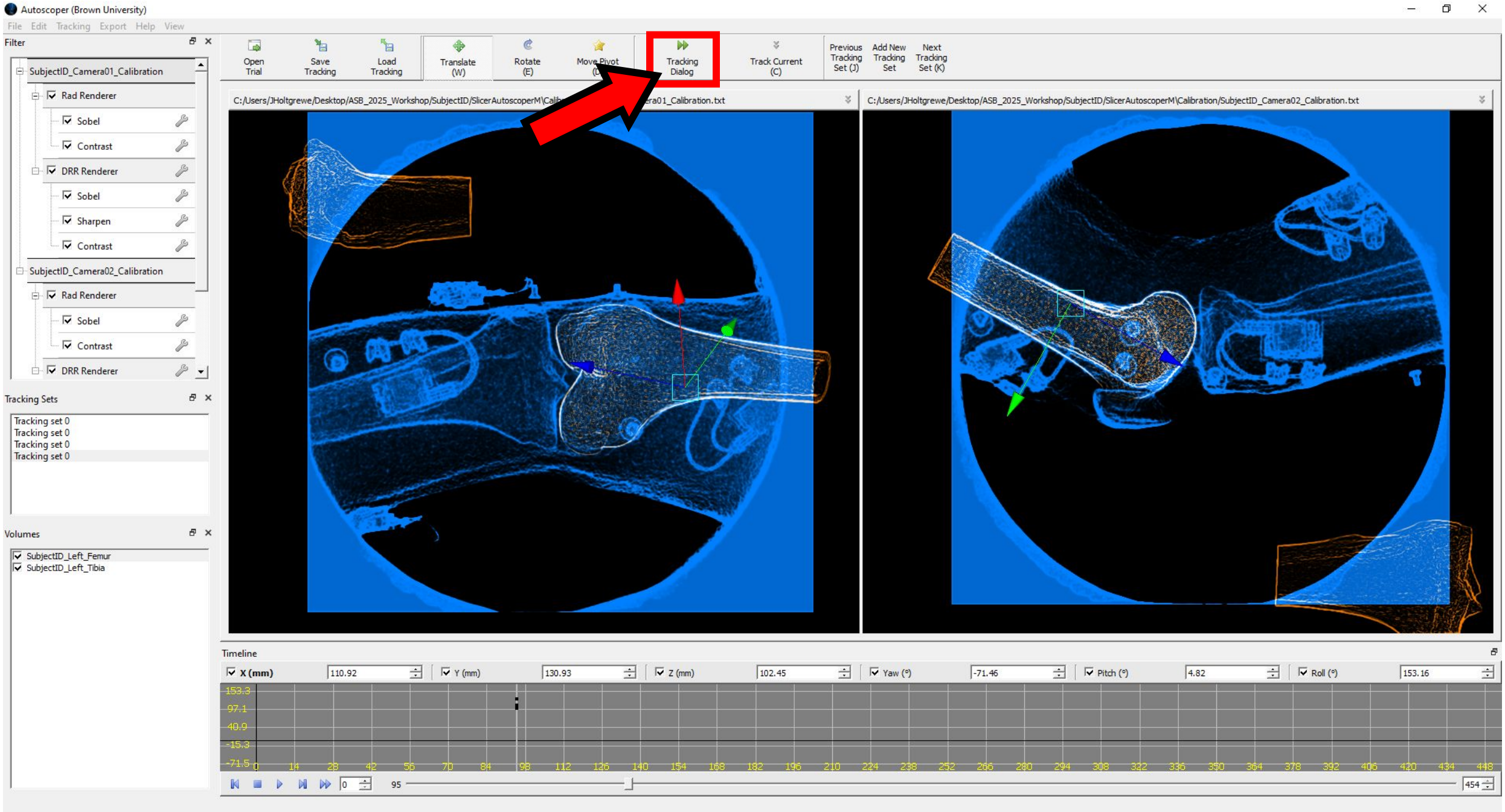

Autoscoper (Brown University)
File Edit Tracking Export Help View
Filter
SubjectID_Camera01_Calibration
Rad Renderer
DRR Renderer
Add Filters
Add Sobelfilter
Add Contrastfilter
Add Gaussianfilter
Add Sharpenfilter
SubjectID_Camera02_Calibration
DRR Renderer
Open Trial
Save Tracking
Load Tracking
Translate (W)
Rotate (E)
Move Pivot (D)
Tracking Dialog
Track Current (C)
Previous Tracking Set (J)
Add New Tracking Set
Next Tracking Set (K)
C:/Users/JHoltgrewe/Desktop/ASB_2025_Workshop/SubjectID/SlicerAutoscoperM\Calibration/SubjectID_Camera02_Calibration.txt
Tracking Sets
Tracking set 0
Volumes
SubjectID_Left_Femur
SubjectID_Left_Tibia
Timeline
X (mm) -40.77
Y (mm) -30.63
Z (mm) 57.81
Yaw (°) 0.00
Pitch (°) 0.00
Roll (°) 0.00

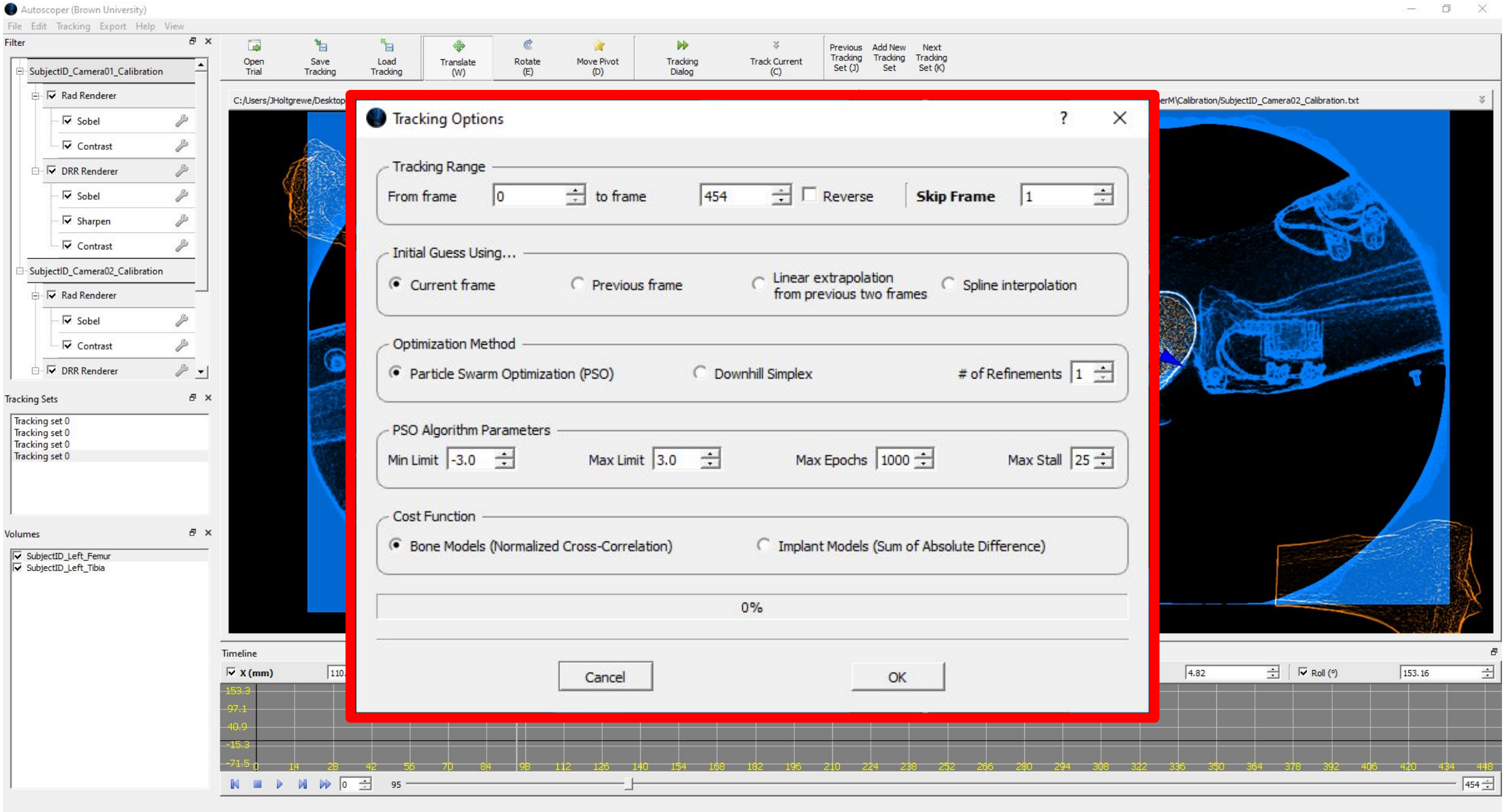

Autoscoper (Brown University)
File Edit Tracking Export Help View
Filter
SubjectID_Camera01_Calibration
Rad Renderer
Sobel
Contrast
DRR Renderer
Sobel
Sharpen
Contrast
SubjectID_Camera02_Calibration
Rad Renderer
Sobel
Contrast
DRR Renderer
Tracking Sets
Tracking set 0
Volumes
SubjectID_Left_Femur
SubjectID_Left_Tibia
Open Trial
Save Tracking
Load Tracking
Translate (W)
Rotate (E)
Move Pivot (D)
Tracking Dialog
Track Current (C)
Previous Tracking Set (J)
Add New Tracking Set
Next Tracking Set (K)
C:/Users/JHoltgrewe/Desktop/ASB_2025_Workshop/SubjectID/SlicerAutoscoperM\Calibration/SubjectID_Camera01_Calibration.txt
C:/Users/JHoltgrewe/Desktop/ASB_2025_Workshop/SubjectID/SlicerAutoscoperM\Calibration/SubjectID_Camera02_Calibration.txt
Timeline
X (mm) -40.77
Y (mm) -30.63
Z (mm) 57.81
Yaw (°) 0.00
Pitch (°) 0.00
Roll (°) 0.00
59
33.8
8.6
-16.6
-41.8
0 14 28 42 56 70 84 98 112 126 140 154 168 182 196 210 224 238 252 266 280 294 308 322 336 350 364 378 392 406 420 434 448
0
95
454

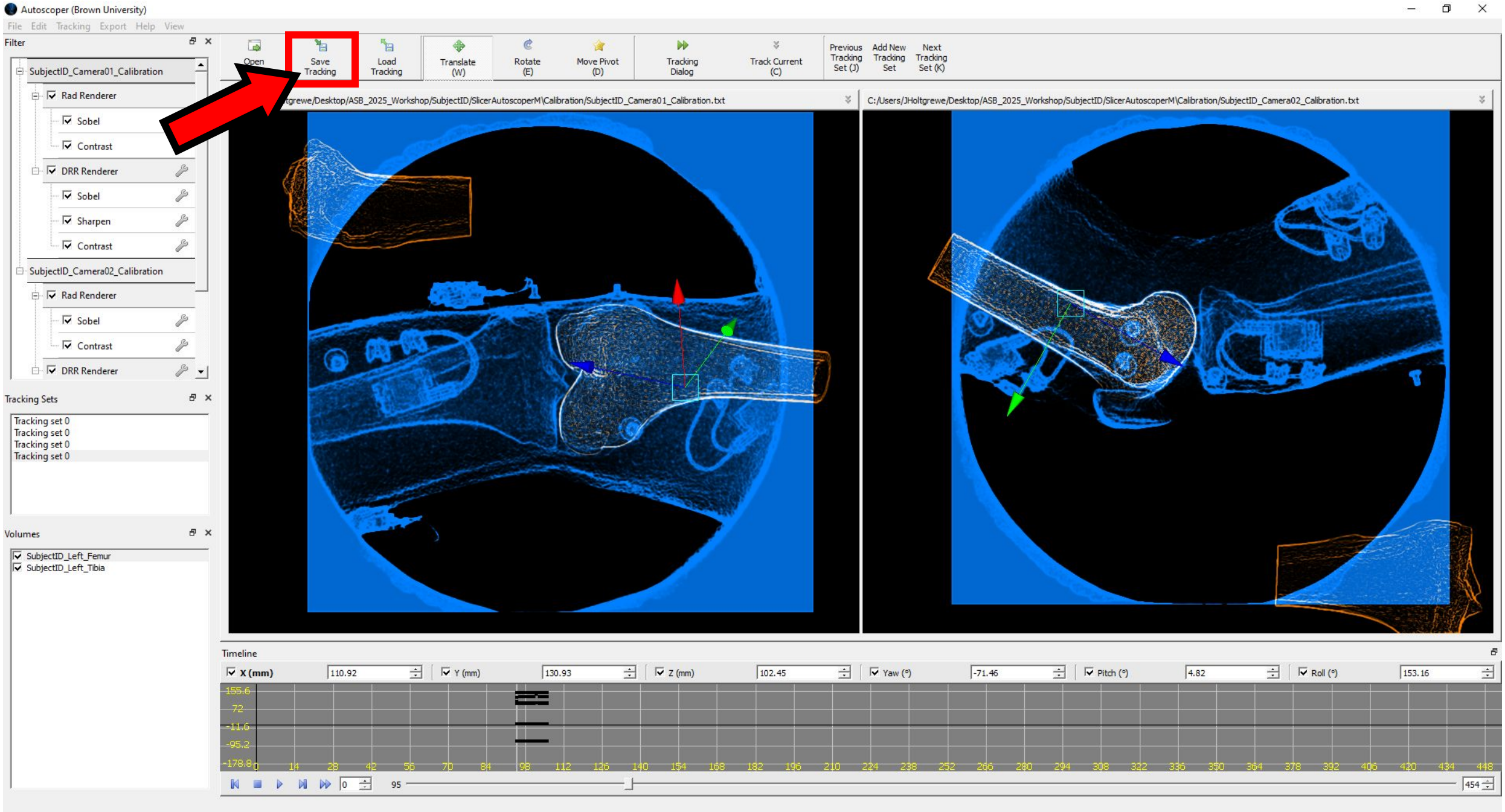

Autoscoper (Brown University)
File Edit Tracking Export Help View
Filter
SubjectID_Camera01_Calibration
Rad Renderer
Sobel
Contrast
DRR Renderer
Sobel
Sharpen
Contrast
SubjectID_Camera02_Calibration
Rad Renderer
Sobel
Contrast
DRR Renderer
Tracking Sets
Tracking set 0
Tracking set 0
Tracking set 0
Tracking set 0
Volumes
SubjectID_Left_Femur
SubjectID_Left_Tibia
Open Trial
Save Tracking
Load
Translate (W)
Rotate (E)
Move Pivot (D)
Tracking Dialog
Track Current (C)
Previous Tracking Set (J)
Add New Tracking Set
Next Tracking Set (K)
C:/Users/JHoltgrewe/Desktop/SubjectID/SlicerAutoscoperM\Calibration/SubjectID_Camera01_Calibration.txt
C:/Users/JHoltgrewe/Desktop/ASB_2025_Workshop/SubjectID/SlicerAutoscoperM\Calibration/SubjectID_Camera02_Calibration.txt
Timeline
X (mm) 20.50
Y (mm) 150.52
Z (mm) 195.59
Yaw (°) 30.32
Pitch (°) 43.37
Roll (°) -58.80
180
90
0
-90
-180
0 14 28 42 56 70 84 98 112 126 140 154 168 182 196 210 224 238 252 266 280 294 308 322 336 350 364 378 392 406 420 434 448
0
95
454

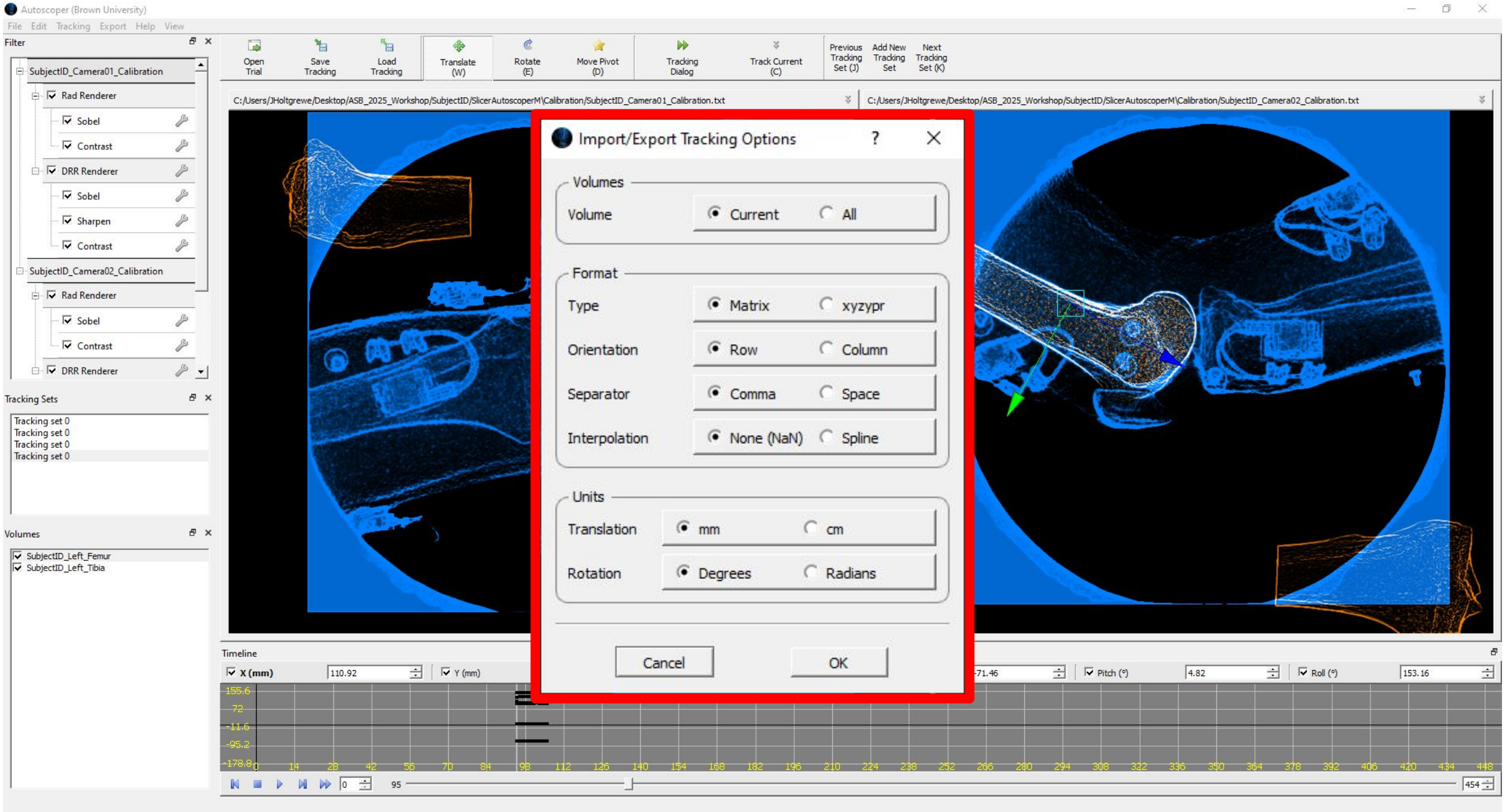

Autoscoper (Brown University)
File Edit Tracking Export Help View
Filter
SubjectID_Camera01_Calibration
Rad Renderer
Sobel
Contrast
DRR Renderer
Sobel
Sharpen
Contrast
SubjectID_Camera02_Calibration
Rad Renderer
Sobel
Contrast
DRR Renderer
Tracking Sets
Tracking set 0
Tracking set 0
Tracking set 0
Tracking set 0
Volumes
SubjectID_Left_Femur
SubjectID_Left_Tibia
Open Trial
Save Tracking
Load Tracking
Translate
Rotate (E)
Move Pivot (D)
Tracking Dialog
Track Current (C)
Previous Tracking Set (J)
Add New Tracking Set
Next Tracking Set (K)
C:/Users/JHoltgrewe/Desktop/ASB_2025_Workshop/SubjectID/SlicerAutoscoperM\Calibration/SubjectID_Camera01_Calibration.txt
C:/Users/JHoltgrewe/Desktop/ASB_2025_Workshop/SubjectID/SlicerAutoscoperM\Calibration/SubjectID_Camera02_Calibration.txt
Timeline
X (mm) 20.50
Y (mm) 150.52
Z (mm) 195.59
Yaw (°) 30.32
Pitch (°) 43.37
Roll (°) -58.80
180
90
0
-90
-180
0 14 28 42 56 70 84 98 112 126 140 154 168 182 196 210 224 238 252 266 280 294 308 322 336 350 364 378 392 406 420 434 448
0
95
454


Autoscoper (Brown University)
File Edit Tracking Export Help View
Filter
SubjectID_Camera01_Calibration
Rad Renderer
Sobel
Contrast
DRR Renderer
Sobel
Sharpen
Contrast
SubjectID_Camera02_Calibration
Rad Renderer
Sobel
Contrast
DRR Renderer
Tracking Sets
Tracking set 0
Tracking set 0
Tracking set 0
Tracking set 0
Volumes
SubjectID_Left_Femur
SubjectID_Left_Tibia
Open Trial
Save Tracking
Load Tracking
Translate (W)
Rotate (E)
Move Pivot (D)
Tracking Dialog
Track Current (C)
Previous Tracking Set (J)
Add New Tracking Set
Next Tracking Set (K)
C:/Users/JHoltgrewe/Desktop/ASB_2025_Workshop/SubjectID/SlicerAutoscoperM\Calibration/SubjectID_Camera02_Calibration.txt
Timeline
X (mm) 110.92
Y (mm) 130.93
Z (mm) 102.45
Yaw (°) -71.46
Pitch (°) 4.82
Roll (°) 153.16
153.3
97.1
40.9
-15.3
-71.5
0 14 28 42 56 70 84 98 112 126 140 154 168 182 196 210 224 238 252 266 280 294 308 322 336 350 364 378 392 406 420 434 448
0
95
454


Autoscoper (Brown University)
File Edit Tracking Export Help View
Filter
SubjectID_Camera01_Calibration
Rad Renderer
Sobel
Contrast
DRR Renderer
Sobel
Sharpen
Contrast
SubjectID_Camera02_Calibration
Rad Renderer
Sobel
Contrast
DRR Renderer
Tracking Sets
Tracking set 0
Tracking set 0
Tracking set 0
Tracking set 0
Volumes
SubjectID_Left_Femur
SubjectID_Left_Tibia
Open Trial
Save Tracking
Load Tracking
Translate (W)
Rotate (E)
Move Pivot
Tracking Dialog
Track Current (C)
Previous Tracking Set (J)
Add New Tracking Set
Next Tracking Set (K)
C:/Users/JHoltgrewe/Desktop/ASB_2025_Workshop/SubjectID/SlicerAutoscoperM\Calibration/SubjectID_Camera02_Calibration.txt
Timeline
X (mm) 110.92
Y (mm) 130.93
Z (mm) 102.45
Yaw (°) -71.46
Pitch (°) 4.82
Roll (°) 153.16
153.3
97.1
40.9
-15.3
-71.5
0 14 28 42 56 70 84 98 112 126 140 154 168 182 196 210 224 238 252 266 280 294 308 322 336 350 364 378 392 406 420 434 448
0
95
454


Autoscoper (Brown University)
File Edit Tracking Export Help View
Filter
SubjectID_Camera01_Calibration
Rad Renderer
Sobel
Contrast
DRR Renderer
Sobel
Sharpen
Contrast
SubjectID_Camera02_Calibration
Rad Renderer
Sobel
Contrast
DRR Renderer
Tracking Sets
Tracking set 0
Tracking set 0
Tracking set 0
Tracking set 0
Volumes
SubjectID_Left_Femur
SubjectID_Left_Tibia
Open Trial
Save Tracking
Load Tracking
Translate (W)
Rotate (E)
Move Pivot (D)
Tracking Dialog
Track Current (C)
Previous Tracking Set (J)
Add New Tracking Set
Next Tracking Set (K)
C:/Users/JHoltgrewe/Desktop
erM\Calibration/SubjectID_Camera02_Calibration.txt
Tracking Options
Tracking Range
From frame 0 to frame 454 Reverse Skip Frame 1
Initial Guess Using...
Current frame
Previous frame
Linear extrapolation from previous two frames
Spline interpolation
Optimization Method
Particle Swarm Optimization (PSO)
Downhill Simplex
# of Refinements 1
PSO Algorithm Parameters
Min Limit -3.0
Max Limit 3.0
Max Epochs 1000
Max Stall 25
Cost Function
Bone Models (Normalized Cross-Correlation)
Implant Models (Sum of Absolute Difference)
0%
Cancel
OK
Timeline
X (mm)
Roll (°)
153.3
97.1
40.9
-15.3
-71.5
0 14 28 42 56 70 84 98 112 126 140 154 168 182 196 210 224 238 252 266 280 294 308 322 336 350 364 378 392 406 420 434 448
95
454


Autoscoper (Brown University)
File Edit Tracking Export Help View
Filter
SubjectID_Camera01_Calibration
Rad Renderer
Sobel
Contrast
DRR Renderer
Sobel
Sharpen
Contrast
SubjectID_Camera02_Calibration
Rad Renderer
Sobel
Contrast
DRR Renderer
Tracking Sets
Tracking set 0
Tracking set 0
Tracking set 0
Tracking set 0
Volumes
SubjectID_Left_Femur
SubjectID_Left_Tibia
Open
Save Tracking
Load Tracking
Translate (W)
Rotate (E)
Move Pivot (D)
Tracking Dialog
Track Current (C)
Previous Tracking Set (J)
Add New Tracking Set
Next Tracking Set (K)
tgrewe/Desktop/ASB_2025_Workshop/SubjectID/SlicerAutoscoperM\Calibration/SubjectID_Camera01_Calibration.txt
C:/Users/JHoltgrewe/Desktop/ASB_2025_Workshop/SubjectID/SlicerAutoscoperM\Calibration/SubjectID_Camera02_Calibration.txt
Timeline
X (mm) 110.92
Y (mm) 130.93
Z (mm) 102.45
Yaw (°) -71.46
Pitch (°) 4.82
Roll (°) 153.16
155.6
72
-11.6
-95.2
-178.8
0 14 28 42 56 70 84 98 112 126 140 154 168 182 196 210 224 238 252 266 280 294 308 322 336 350 364 378 392 406 420 434 448
0
95
454


Autoscoper (Brown University)
File Edit Tracking Export Help View
Filter
SubjectID_Camera01_Calibration
Rad Renderer
Sobel
Contrast
DRR Renderer
Sobel
Sharpen
Contrast
SubjectID_Camera02_Calibration
Rad Renderer
Sobel
Contrast
DRR Renderer
Tracking Sets
Tracking set 0
Tracking set 0
Tracking set 0
Tracking set 0
Volumes
SubjectID_Left_Femur
SubjectID_Left_Tibia
Open Trial
Save Tracking
Load Tracking
Translate (W)
Rotate (E)
Move Pivot (D)
Tracking Dialog
Track Current (C)
Previous Tracking Set (J)
Add New Tracking Set
Next Tracking Set (K)
C:/Users/JHoltgrewe/Desktop/ASB_2025_Workshop/SubjectID/SlicerAutoscoperM\Calibration/SubjectID_Camera01_Calibration.txt
C:/Users/JHoltgrewe/Desktop/ASB_2025_Workshop/SubjectID/SlicerAutoscoperM\Calibration/SubjectID_Camera02_Calibration.txt
Import/Export Tracking Options
Volumes
Volume
Current
All
Format
Type
Matrix
xyzypr
Orientation
Row
Column
Separator
Comma
Space
Interpolation
None (NaN)
Spline
Units
Translation
mm
cm
Rotation
Degrees
Radians
Cancel
OK
Timeline
X (mm)
110.92
Y (mm)
Pitch (°)
4.82
Roll (°)
153.16
155.6
72
-11.6
-95.2
-178.8
0 14 28 42 56 70 84 98 112 126 140 154 168 182 196 210 224 238 252 266 280 294 308 322 336 350 364 378 392 406 420 434 448
95
454

How we use SAM Outputs: Visualizing Tracking in 3D

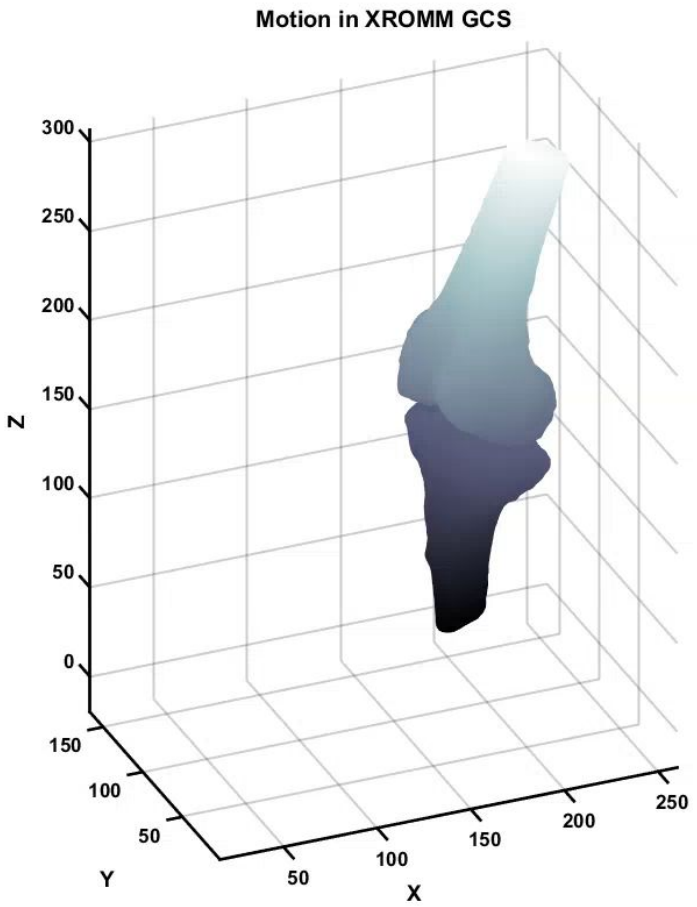
AUT_Femur.stl

AUT_Tibia.stl

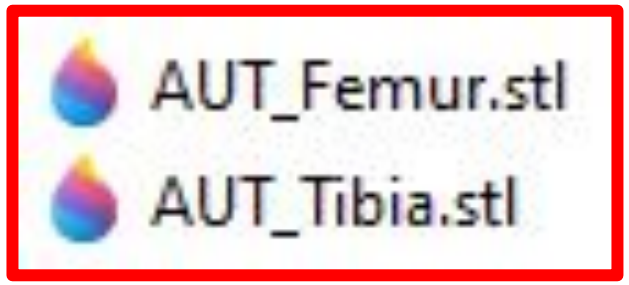
SubjectID_Trial_Femur.tra

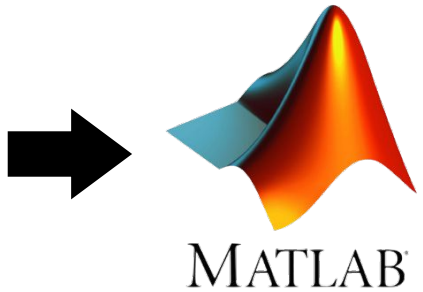
SubjectID_Trial_Tibia.tra

MATLAB

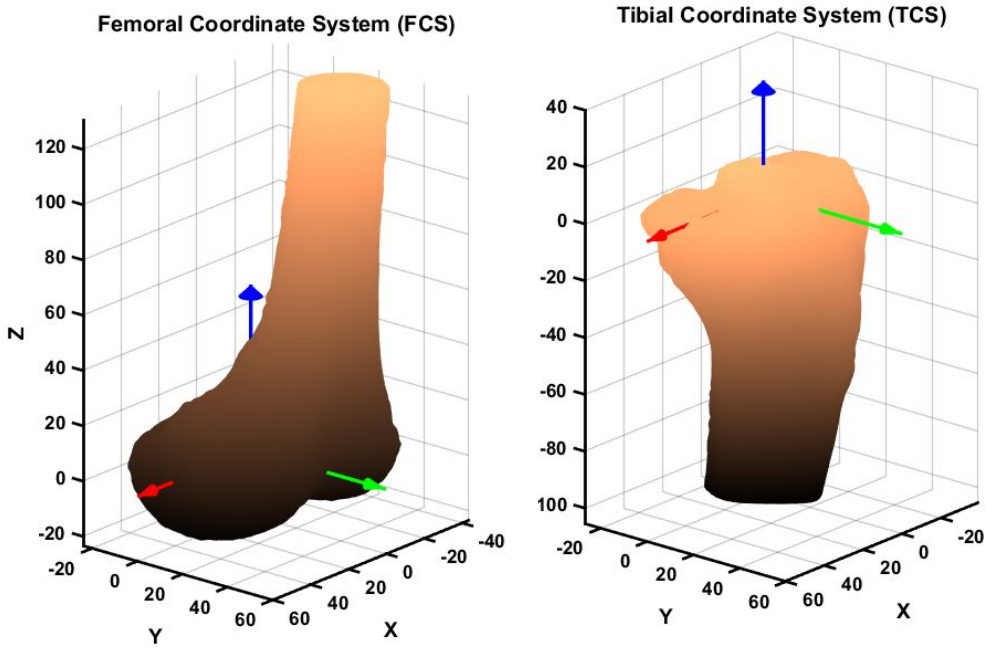


How we use SAM Outputs: Building Anatomical Coordinate Systems[1] Using SAM Generated Models





Anatomical Coordinate Systems



1. Miranda, D.L. et al. J Biomech Eng (43)

Summary

Pre-processing

- Organizing files
- Generating partial volumes
- Generating configuration file

* Slicer-Autoscoper^{M} Pre-processing Module

Tracking

- Loading trials
- Applying filters
- Aligning volumes
- Tracking volumes
- Saving results