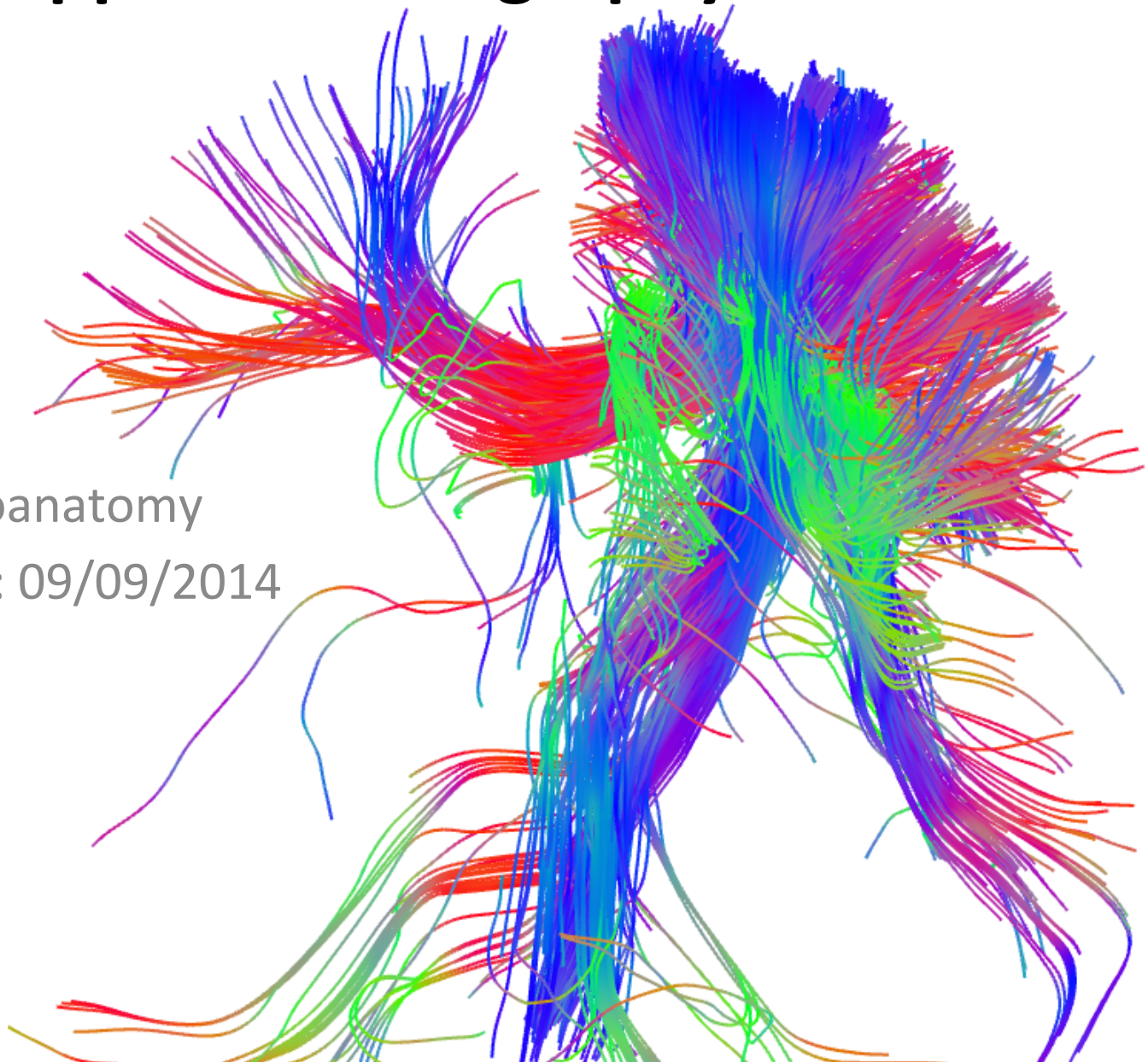
Applied Tractography - Part 1



Virtual Neuroanatomy

Lecture Date: 09/09/2014

Goals

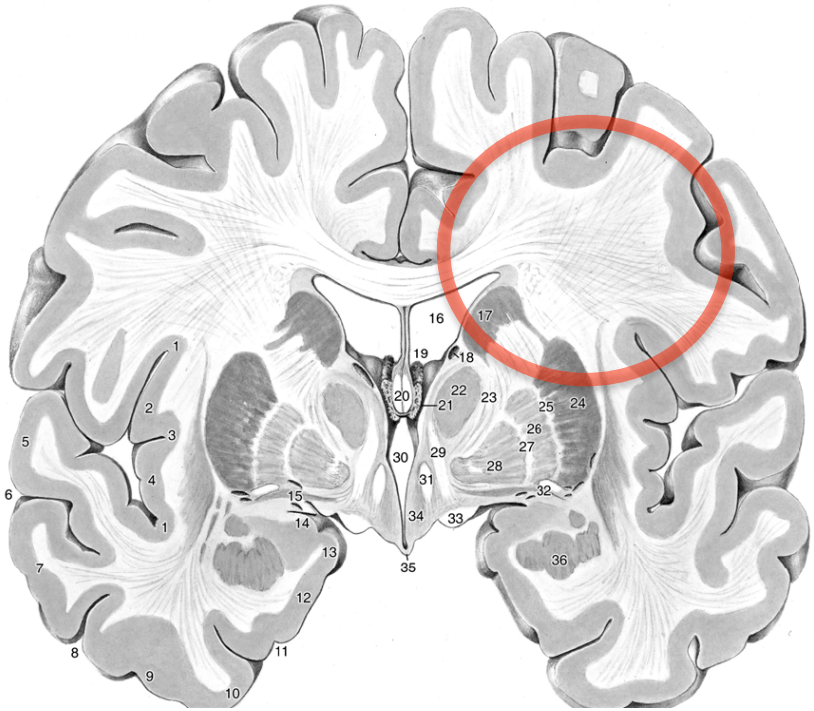
A. Gain exposure doing simple region of interest mapping.

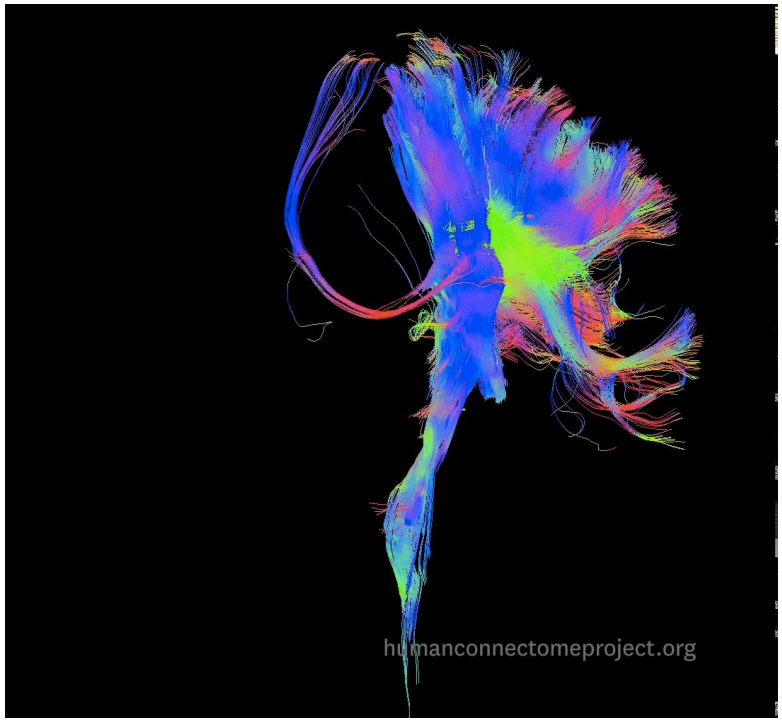
B. Qualitatively compare tractography reliability across reconstruction method.

Picking up from last class

1. Reconstructed single subject data
2. Used three different approaches:
    a. Diffusion Tensor Imaging
    b. QBI
    c. GQI
3. Generated simple region of interest.

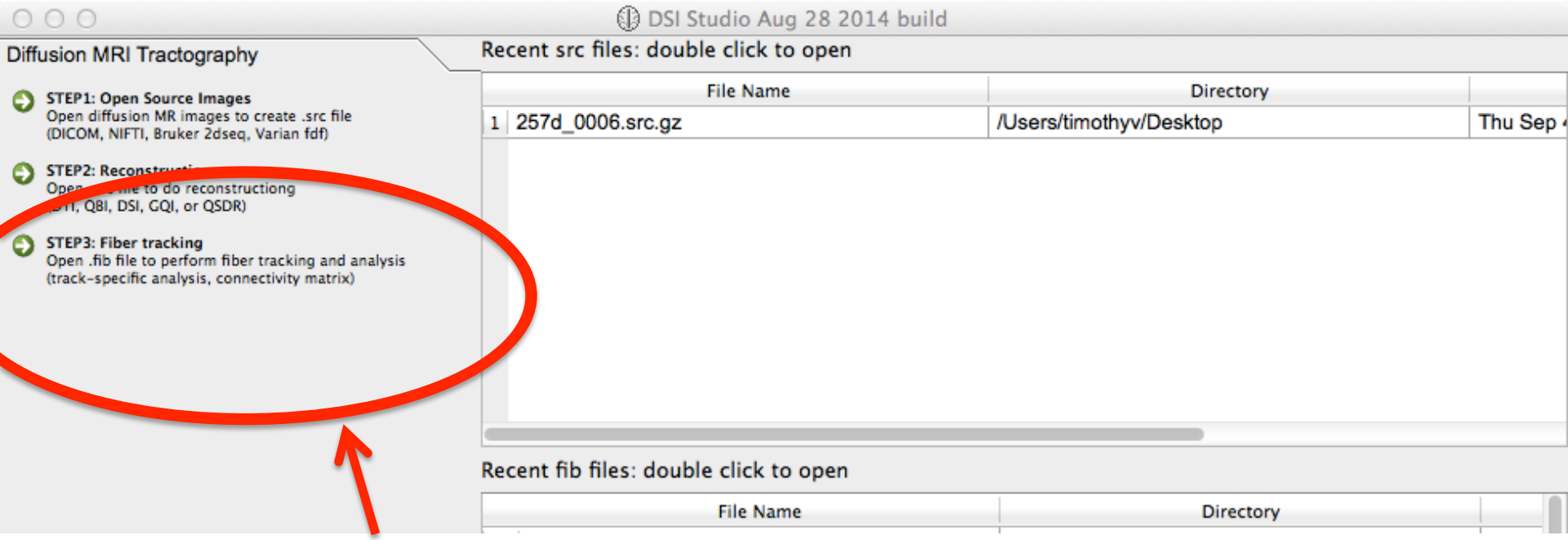
Centrum Semiovale



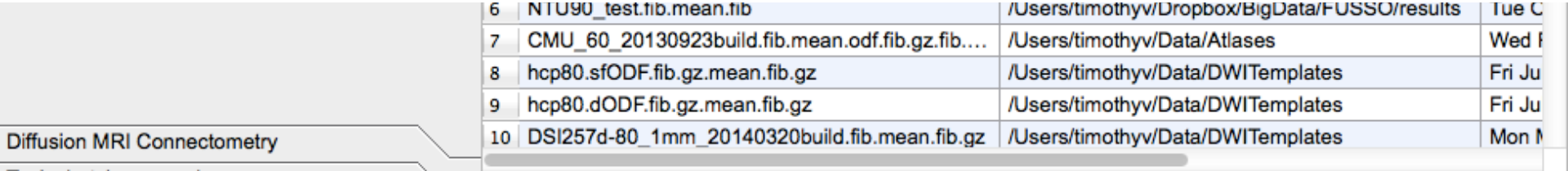


Tractography

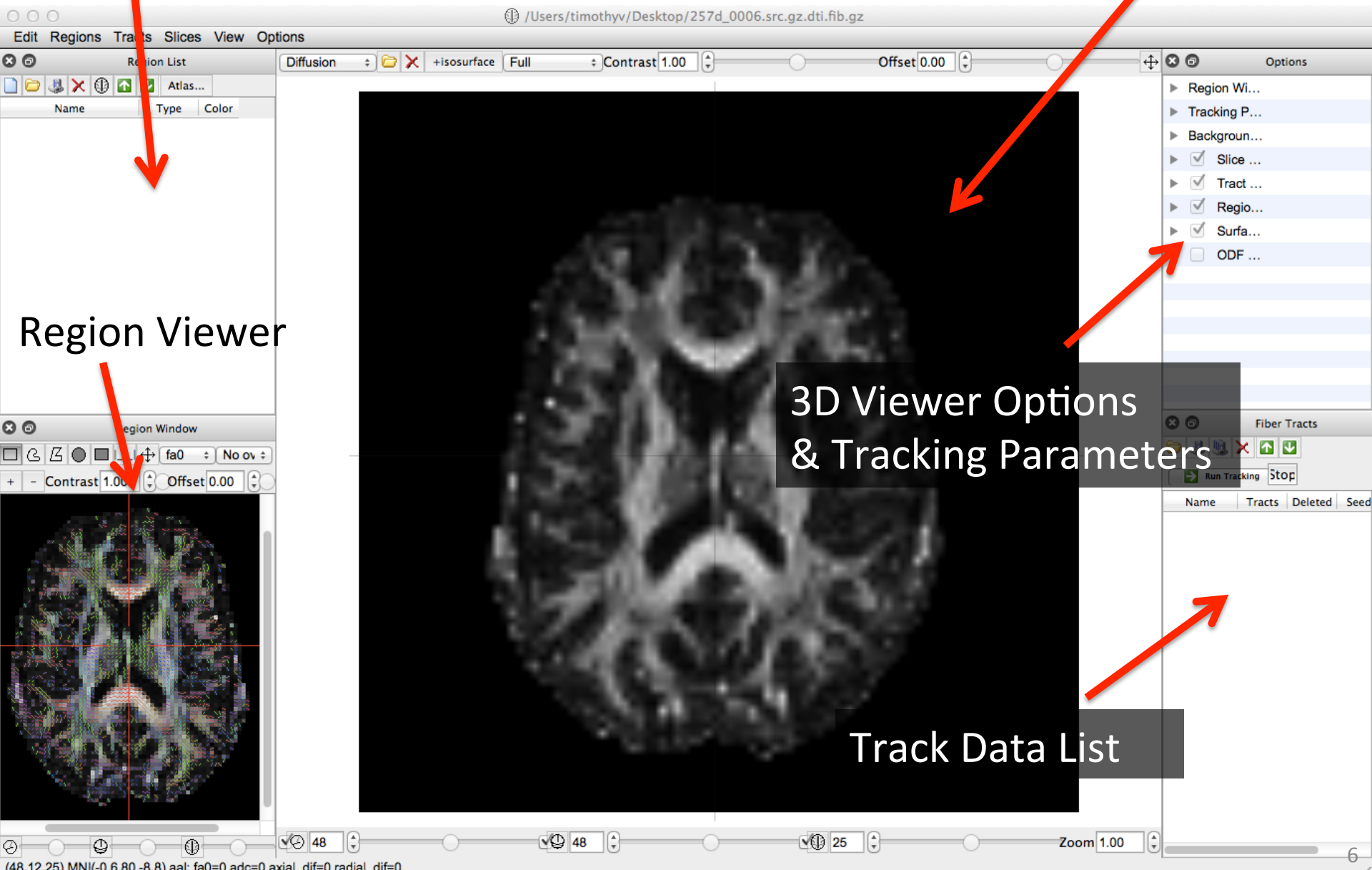
1. Open DSI Studio (on the Desktop)



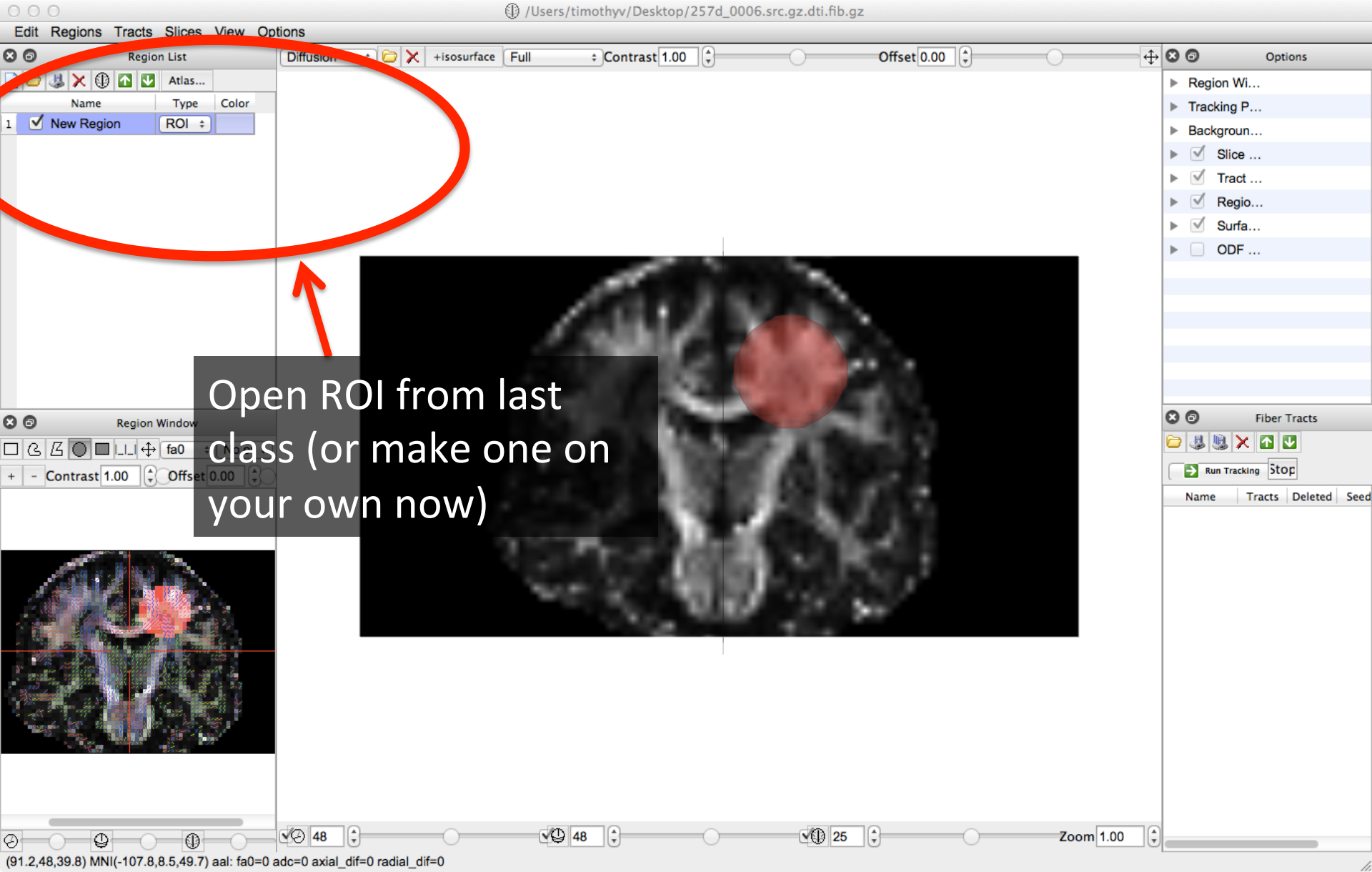
2. Select Step 3: Fiber Tracking
3. Open the DTI reconstruction from last class



DSI Studio Interface

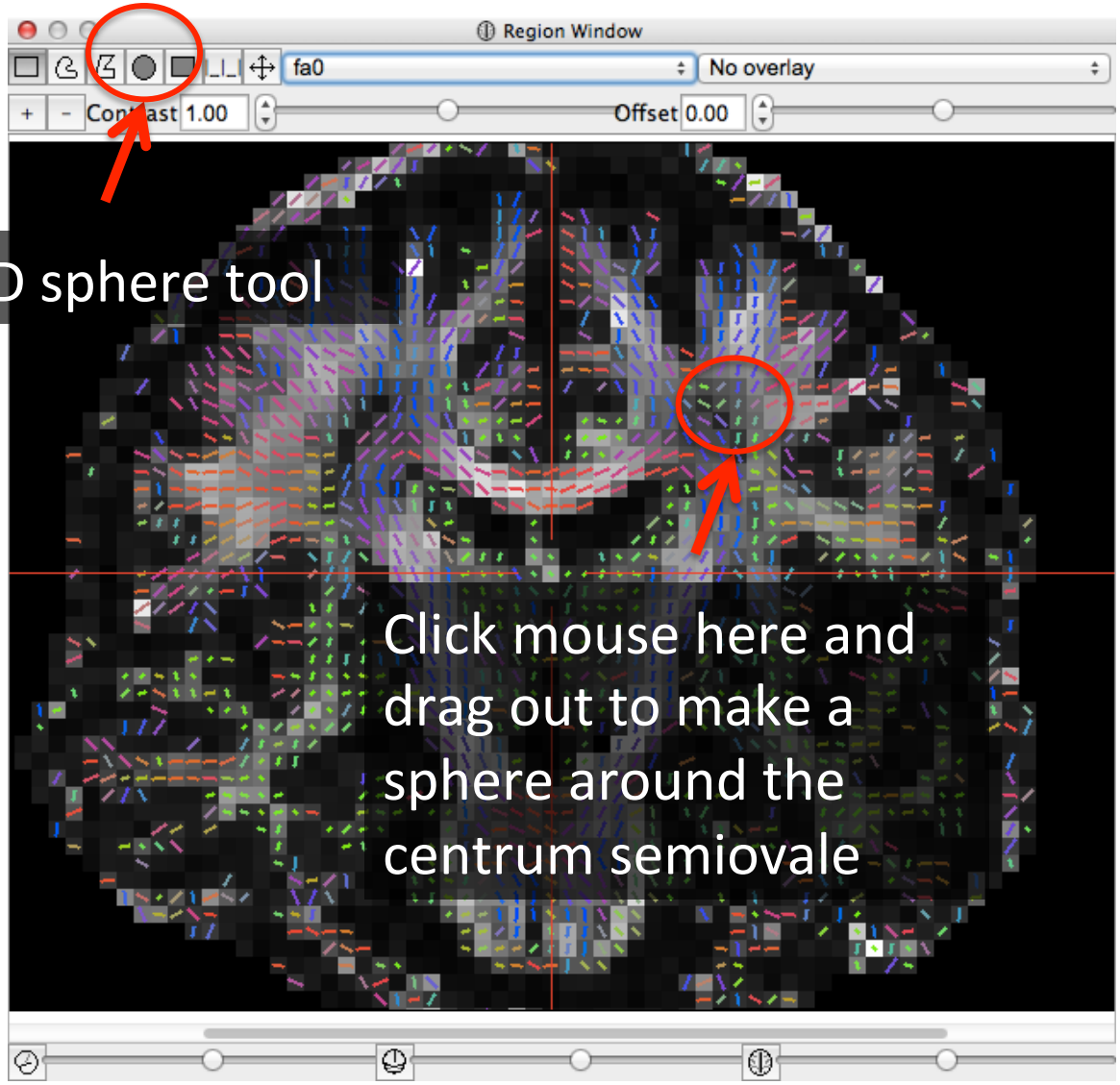


Tractography

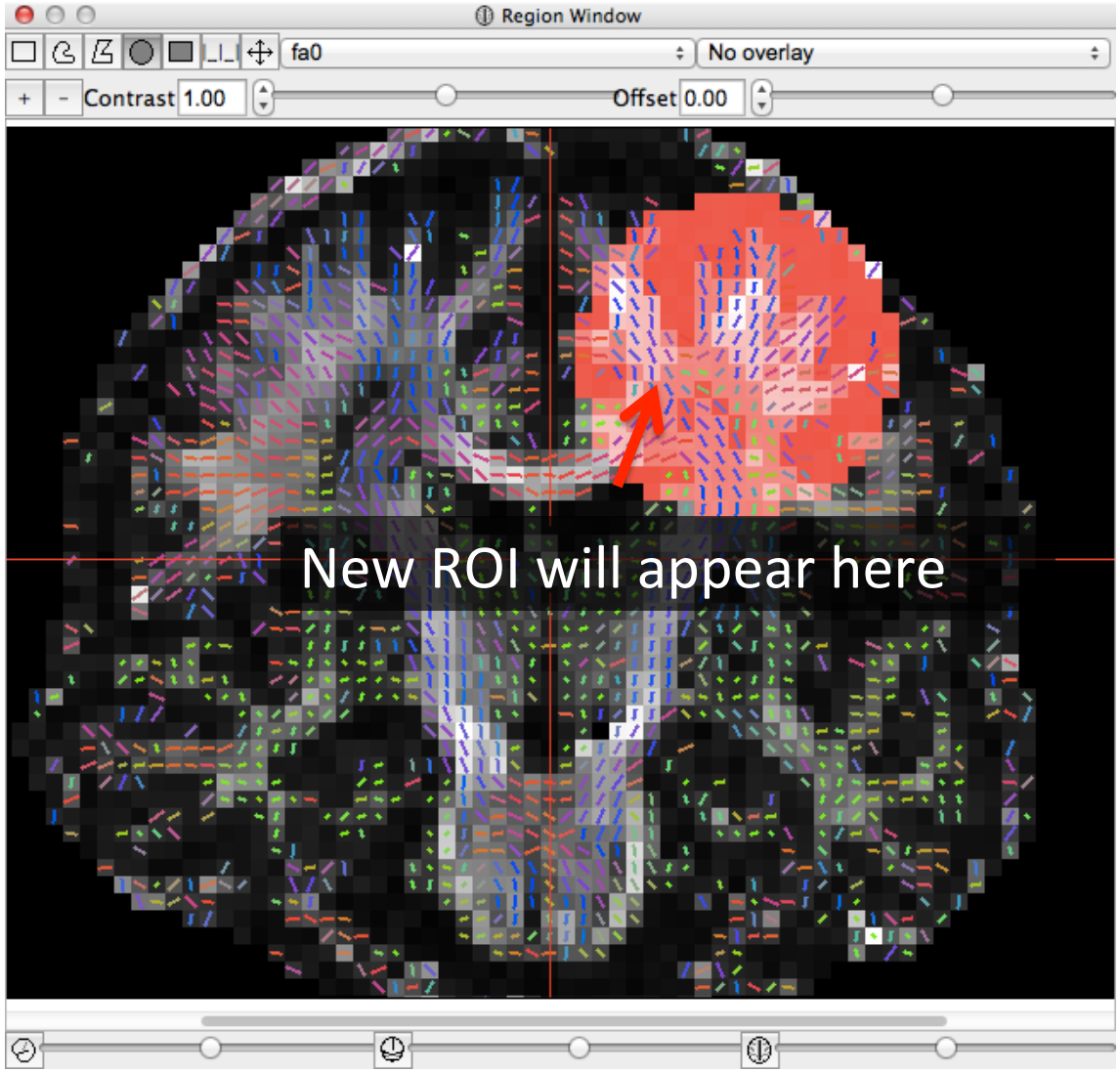


But what if I forgot my ROI?

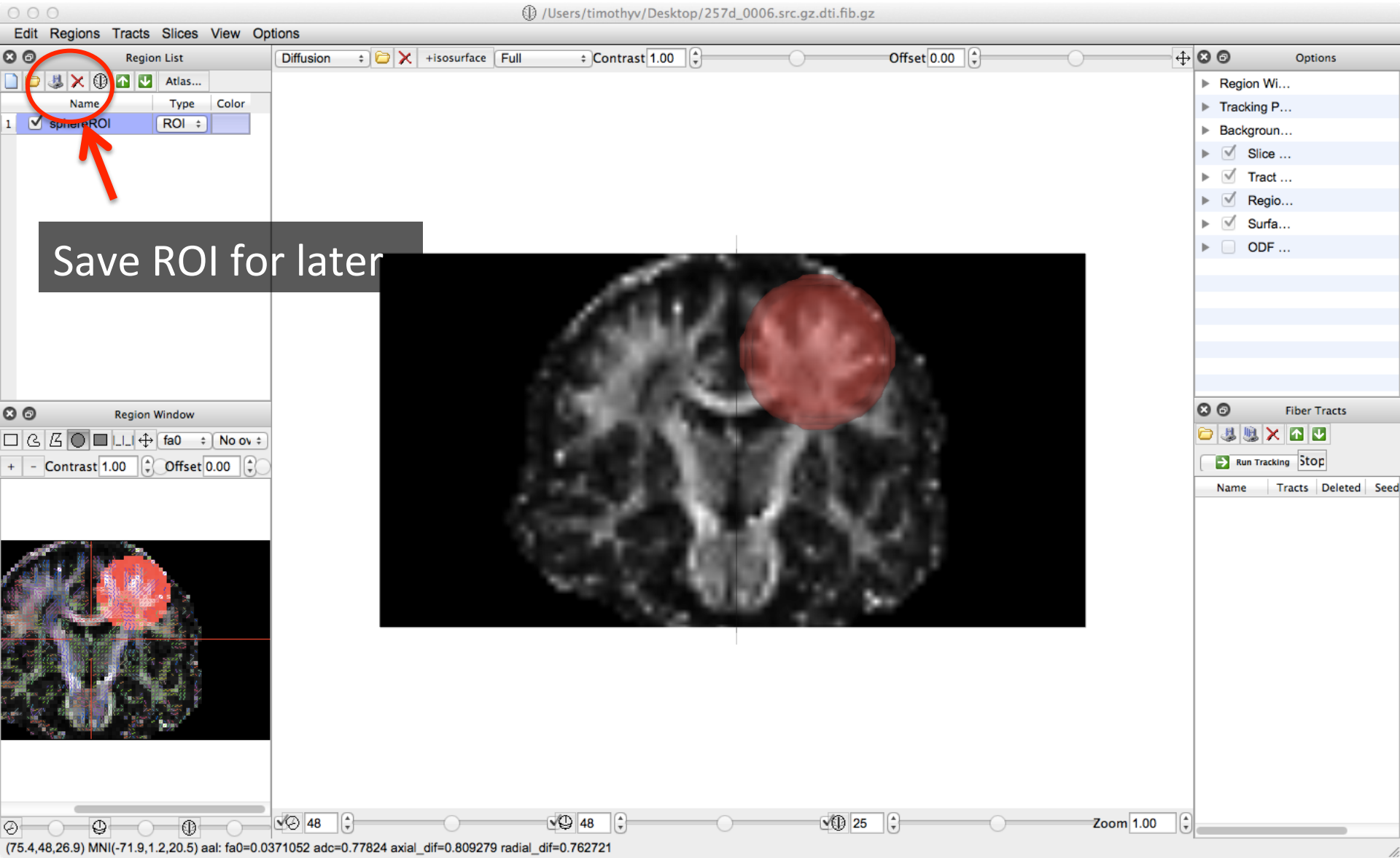
To draw an ROI again



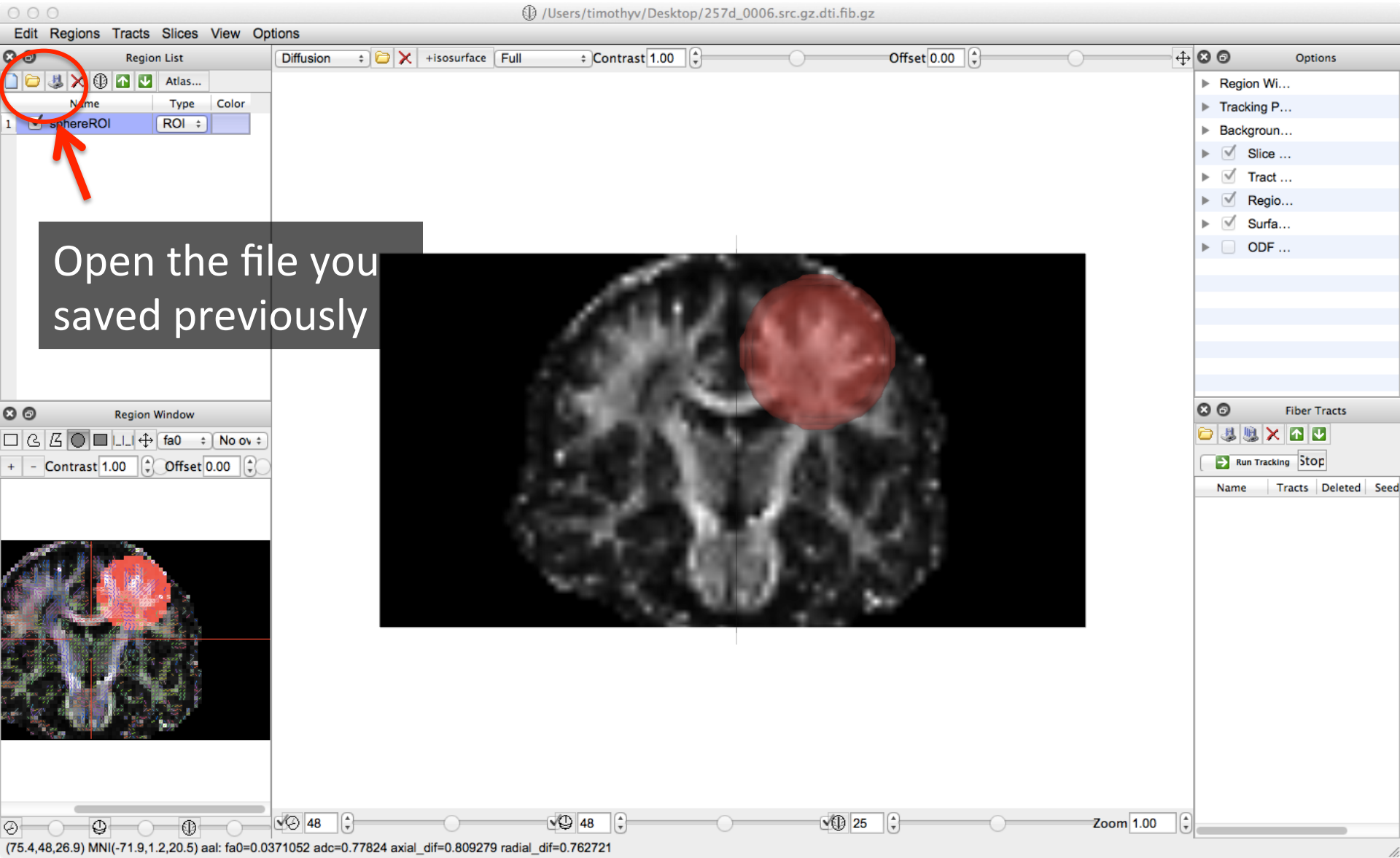
To draw an ROI again



To draw an ROI again



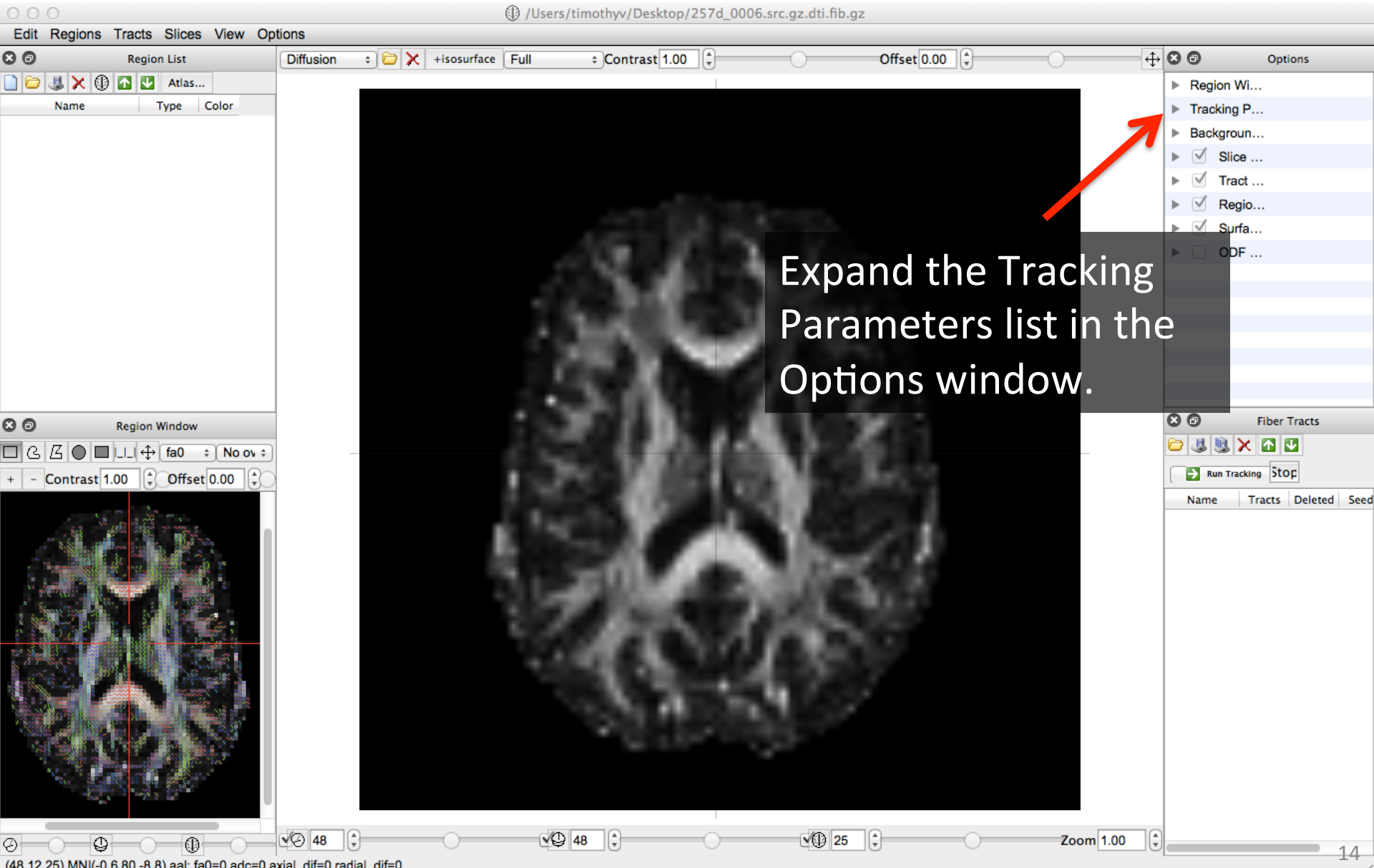
Or open the one you've saved

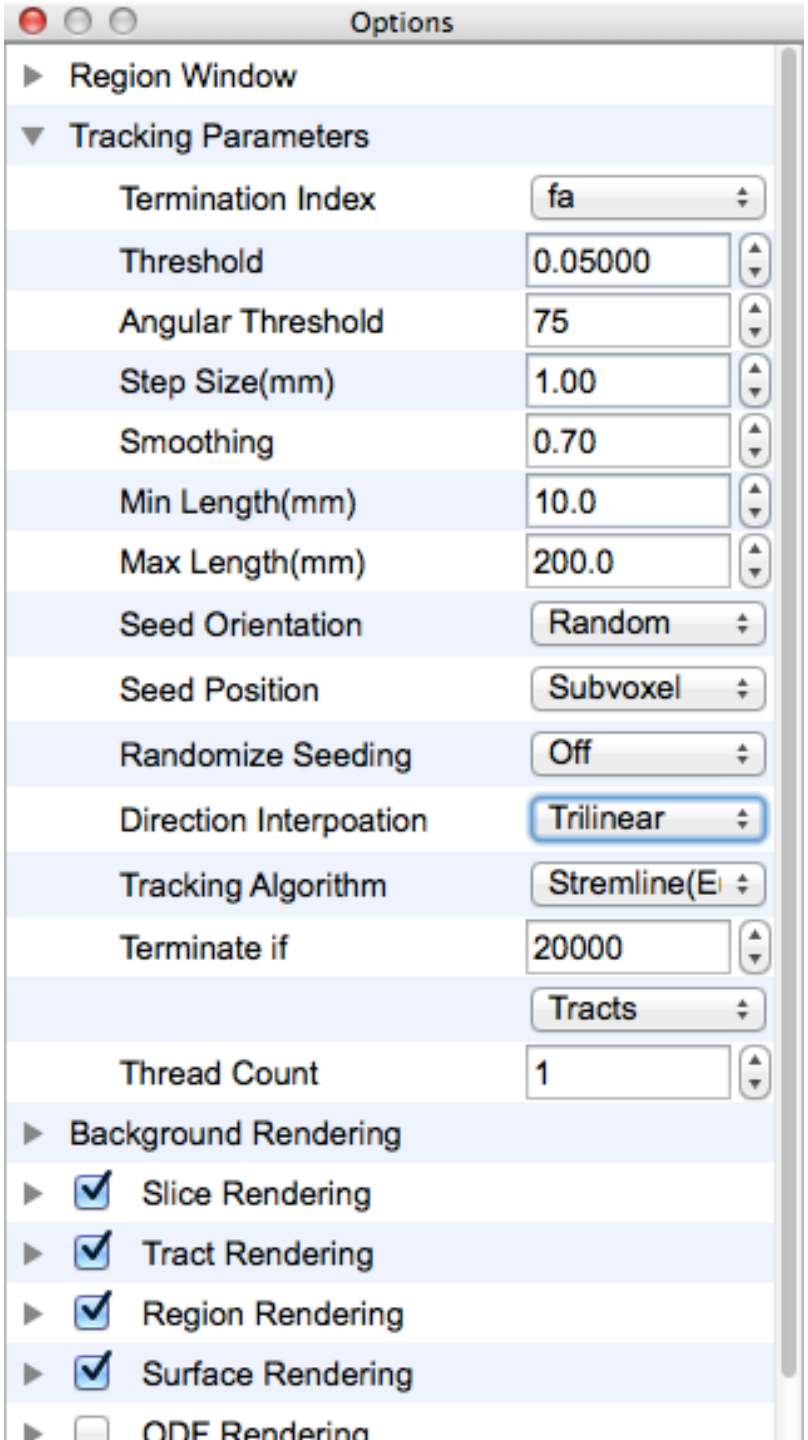


How do the different reconstruction algorithms recover the three pathways that cross in the centrum semiovale:

1. the corpus callosum
2. corticospinal
3. arcuate/SLF

Tractography





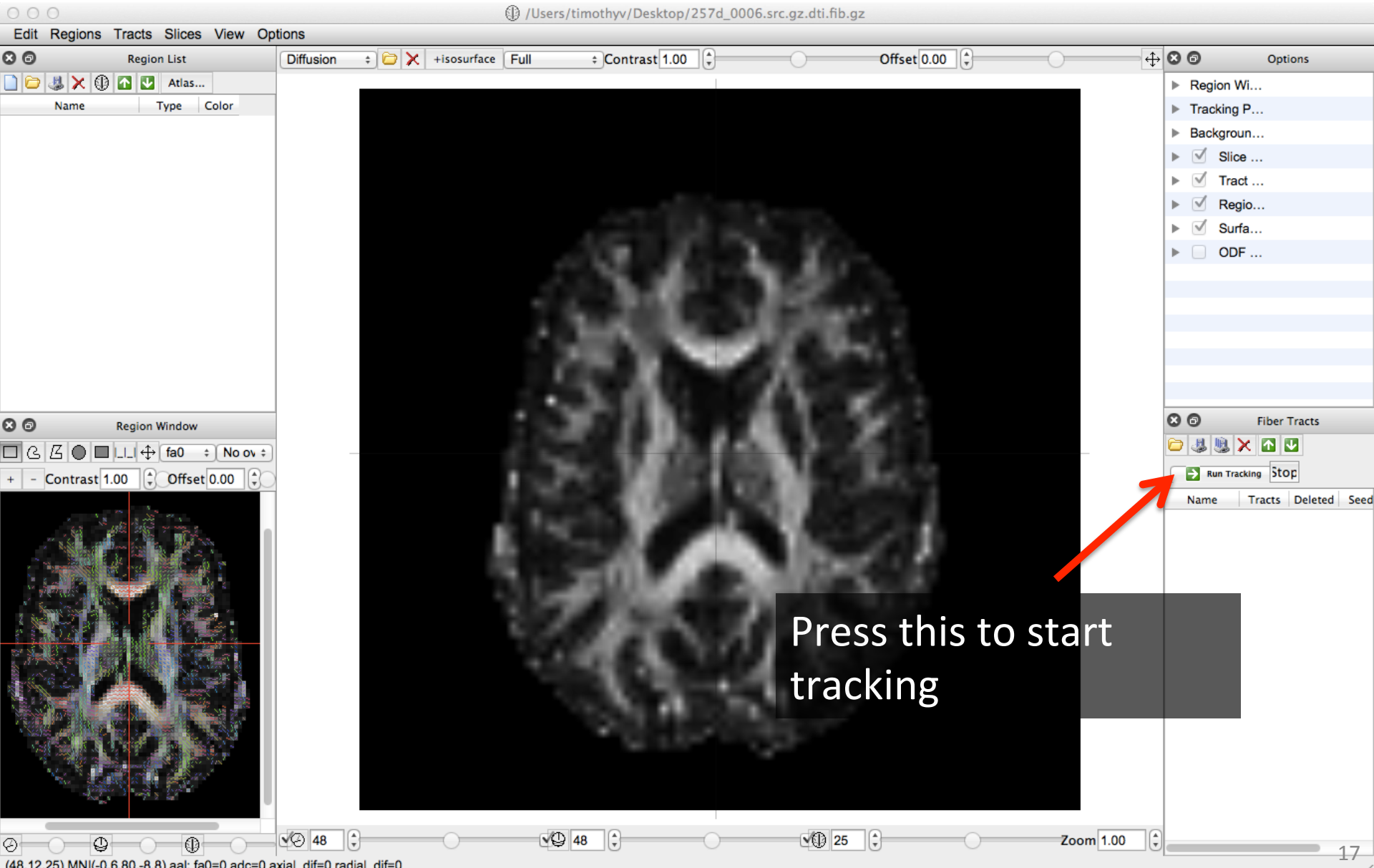
The menu screen should look like this.

Tractography

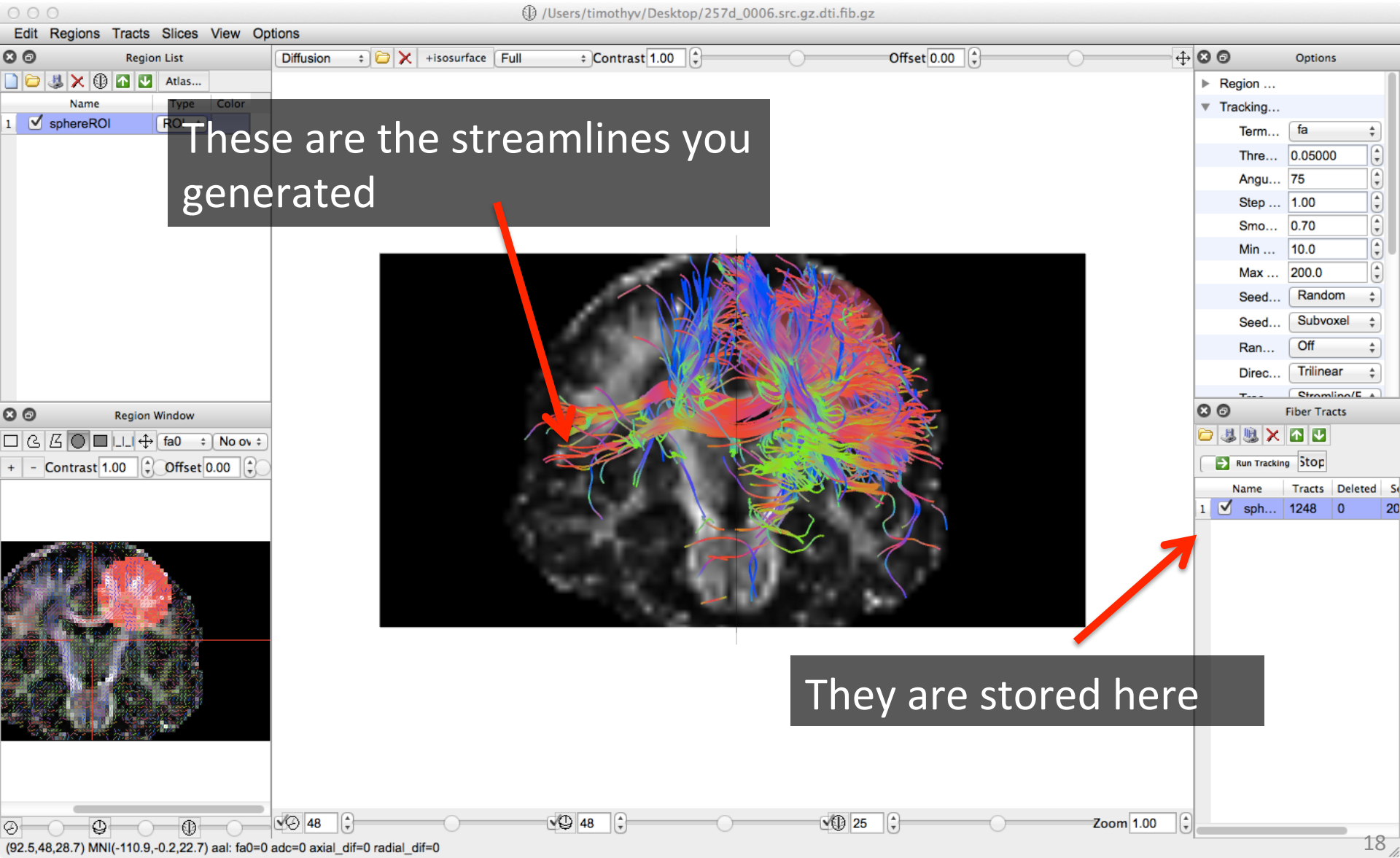
Parameter	Value
Termination Criteria	FA
Threshold	0.05
Max Angle	75 Degrees
Step Size	1 mm
Smoothing	0.70
Length	10-200 mm
Initial Direction	Random
Seed Position	Subvoxel
Interpolation	Trilinear
Tracking Algorithm	Streamline
Termination	20000 Seeds

Set the Tracking Parameters to these values.

Tractography



Tractography



Tractography

File naming note

- The .trk file format is a binary file that is readable by the TrackVis visualization tool. It is substantially smaller and faster to read than the alternative .txt file format.

Repeat all steps for GQI and QBI

Parameter	Value
Termination Criteria	QA
Threshold	0.05
Max Angle	75 Degrees
Step Size	1 mm
Smoothing	0.70
Length	10-200 mm
Initial Direction	Random
Seed Position	Subvoxel
Interpolation	Trilinear
Tracking Algorithm	Streamline
Termination	20000 Seeds

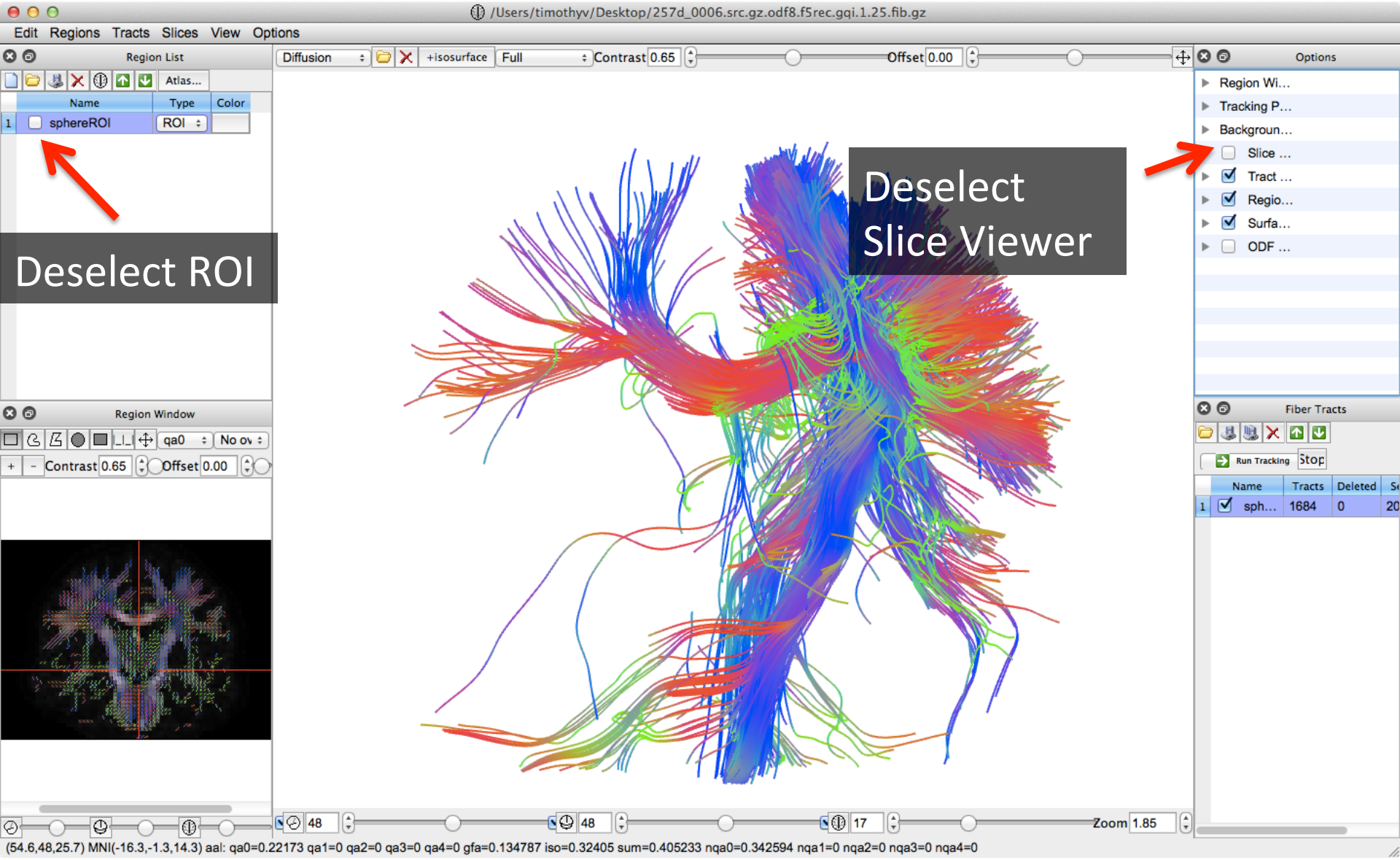
Output file: "DSI_QQI.trk"

Parameter	Value
Termination Criteria	QA
Threshold	0.05
Max Angle	75 Degrees
Step Size	1 mm
Smoothing	0.70
Length	10-200 mm
Initial Direction	Random
Seed Position	Subvoxel
Interpolation	Trilinear
Tracking Algorithm	Streamline
Termination	20000 Seeds

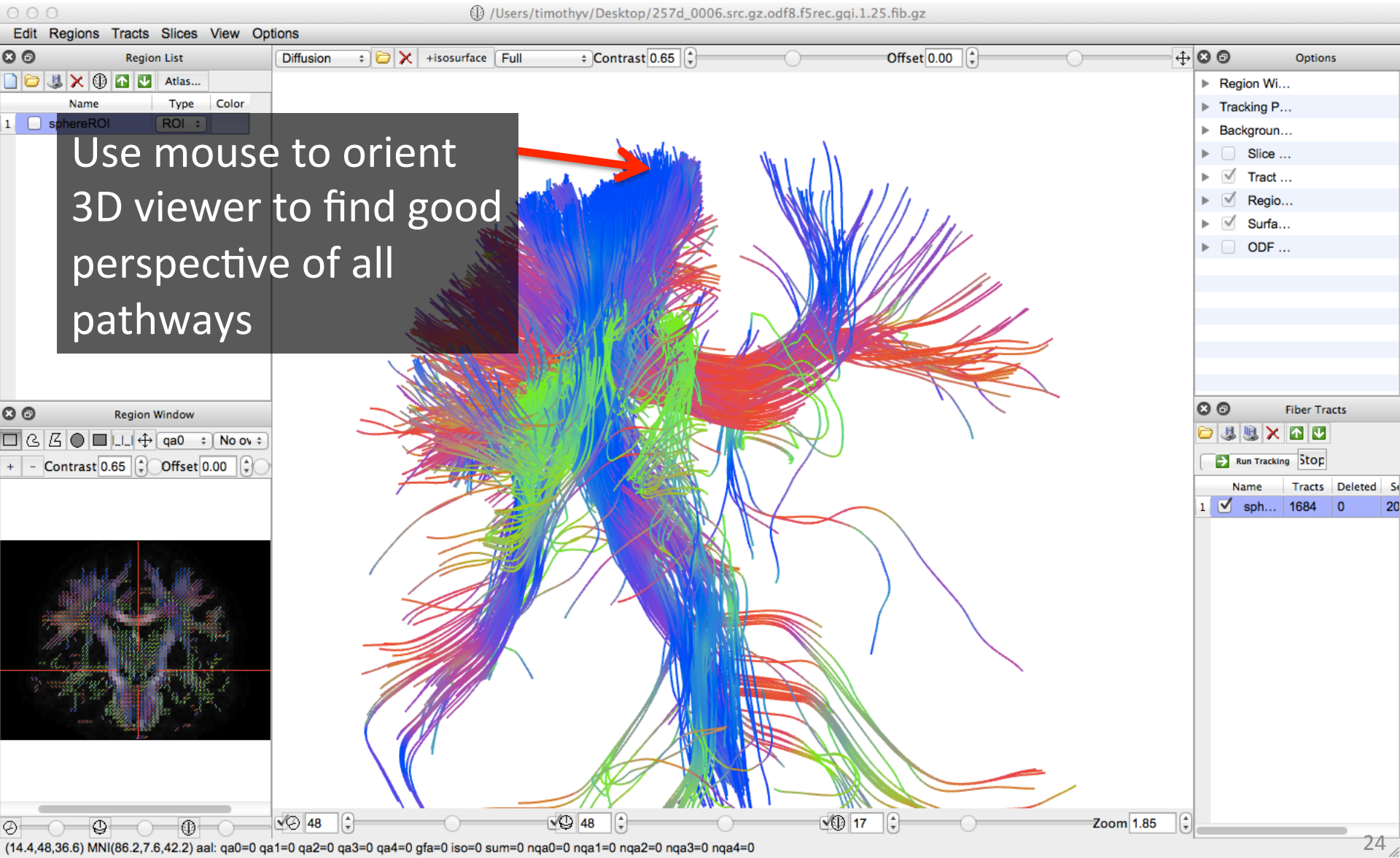
Output file: "DSI_QQI.trk"

Visualizing what you've done

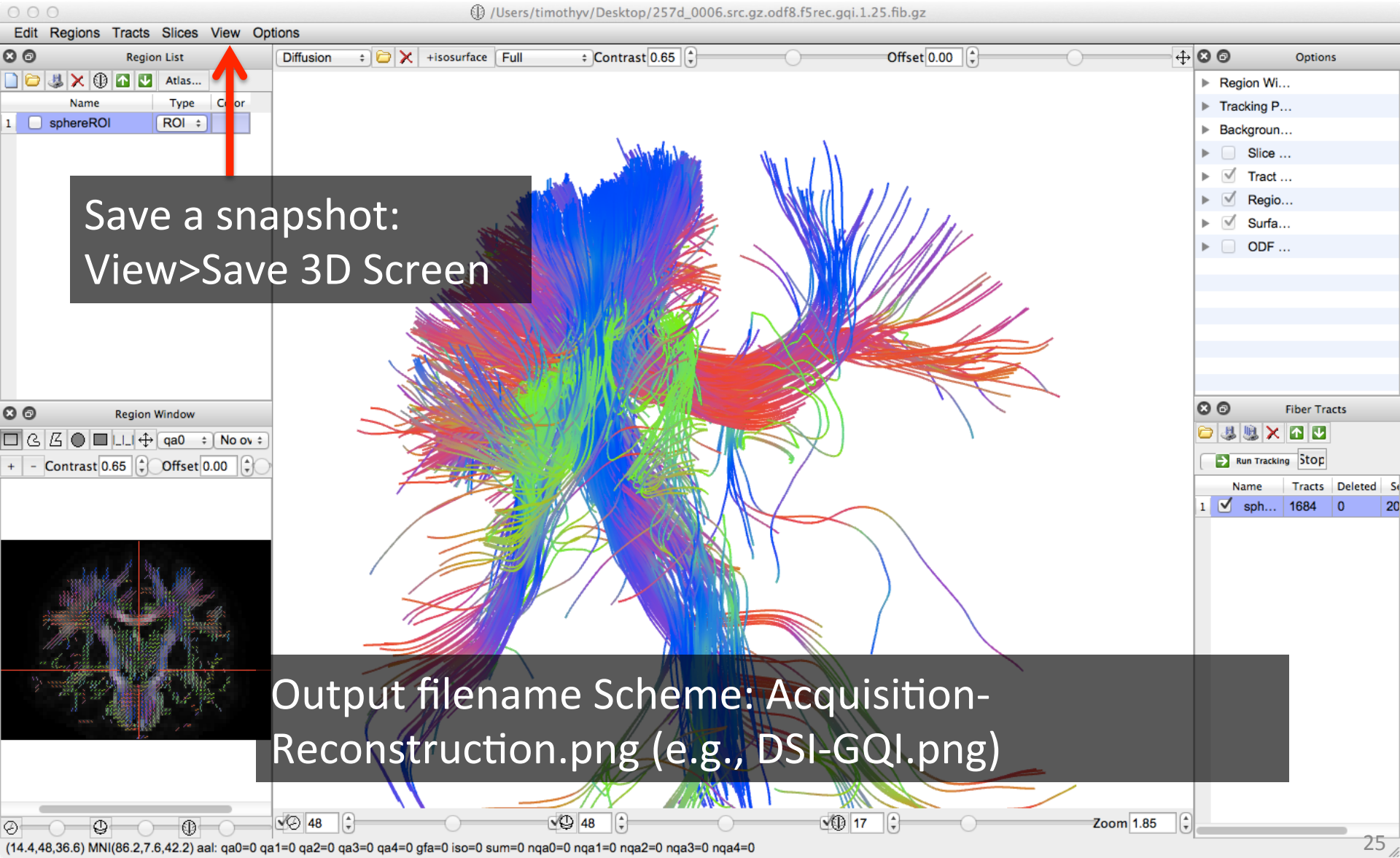
Basic Visualization



Basic Visualization



Basic Visualization



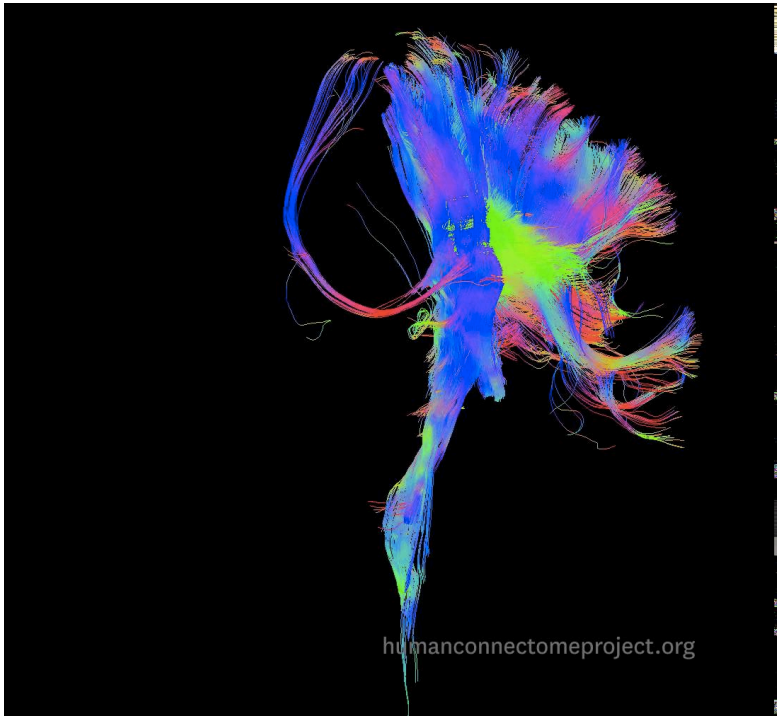
Save a snapshot:
View>Save 3D Screen

Output filename Scheme: Acquisition-Reconstruction.png (e.g., DSI-GQI.png)

Homework

In a word document, show how each reconstruction method recovers the underlying pathways. Describe qualitatively what each tracking result looks like. Use separate pages for each pathway.

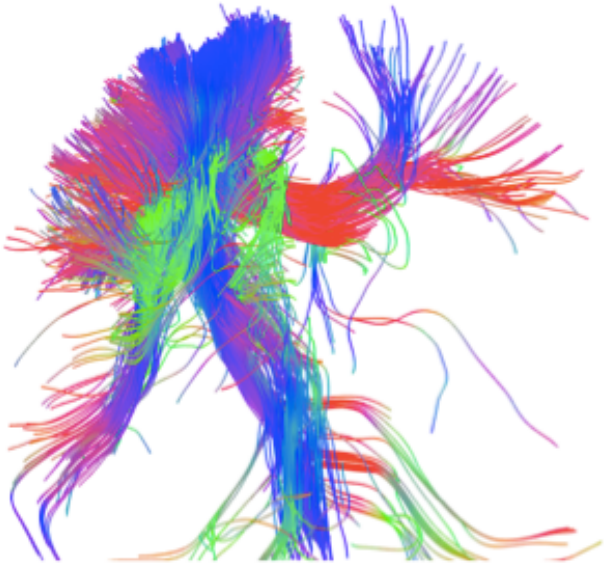
Due at the beginning of class on Thursday (9/11)



Homework (example)

Acquisition: DSI ¶
Reconstruction: GQI ¶
¶
¶

Summary: Few noisy streamlines. Good coverage of all three major pathways in the semiovale. Few artifacts appear to be present. ¶
¶



¶