

Region Manual

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This document contains instructions to draw a list of 52 regions, used to create 17 diffusion-based white matter tract renderings. Instructions are given with assumption of basic neuroanatomy, and access to a tracking program such as DSI Studio. To create any given tract, a combination of these regions are used as ROIs and ROAs, for which instructions are also provided.

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Notes

General Notes

- This guide is intended for use with the tracking program DSI Studio
- On the region pages, the crosshairs will be placed either *on* or *near* the respective region. Each of the three views shown (sagittal, axial, coronal) are the views along the lines of the crosshairs.

Numbered Notes

¹ **NAND** regions are “not and” regions, which act as an ROA only if a streamline passes through both NAND regions. Currently this feature is automated via script, so if you are segmenting natively in DSI Studio, do not include these regions

² **_Whole_Brain** regions are made via script by combining the “_Left” and “_Right” regions together so it can be used as a single region in a NAND function. If segmenting natively in DSI Studio, simply merge copies of these regions manually.

³ **_SIDE** refers to either “_Left” or “_Right” depending on the target hemisphere. Regions and tracts that use this terminology will have similar versions in both hemispheres. Draw two separate regions for both the left and right hemisphere. Instructions are only given for the left hemisphere, but the same instructions apply to the right.

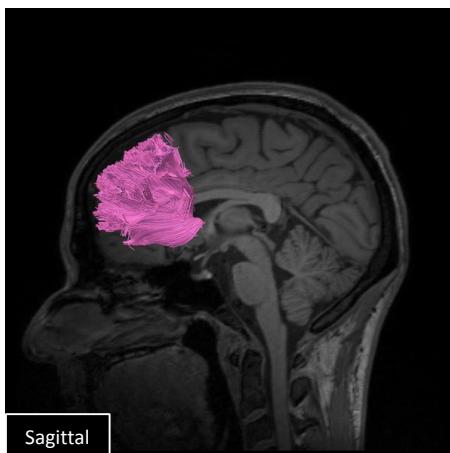
⁴ **_OPPSIDE** refers to the contralateral hemisphere (e.g. “_Right” in the left hemisphere). This is sometimes used to remove unwanted streamlines in the opposite hemisphere.

⁵ **SLF-A** and **SLF-P** are subtracts of the SLF that are *not anatomically relevant on their own*, and should not be analyzed separately. They do not correlate to the SLF-II or SLF-III. This A (anterior) and P (posterior) combination logic is used to eliminate U-fibers along the precentral gyrus.

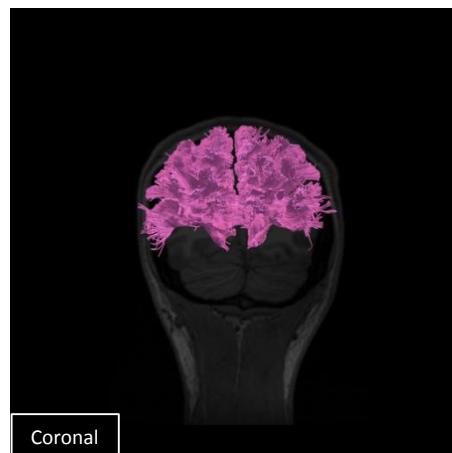
Tract	Tract Family									
	ROIs	END	ROAs	NAND	Interhemispheric Tracts					
Genu_Whole_Brain	Ge, Sa[L], Sa[R]	PG, In[B]			BC, GC					
CCBody_Whole_Brain	CB, Sa[L], Sa[R]	BF, CM[B], Mb, BC, AA[B], Ar			PG, AC[B]					
Splenium_Whole_Brain	Sp, Sa[L], Sa[R]	Mb, TC[B], FC, AC[B], FB, SF[B]			C1[B], C2[B]					
CorpusCallosum_Whole_Brain	Genu_Whole_Brain + CCBody_Whole_Brain + Splenium_Whole_Brain									
Fornix_Whole_Brain	FB, FC	PC, AG, Mb, C1[B], Sp								
CoronaRadiata_Left/Right	In[S]	SR, Ar, TCS, CRS, FC, FB, EX[S], In[O], Ce[O]			AC[S], AA[S]	Capsule Tracts				
ThalamicRads_Left/Right	In[S]	SR, Ar, TCS, CRS, FC, FB, EX[S], In[O], Ce[O], Mb			AC[S], AA[S]					
CST_Left/Right	In[S], Mb, AB, Me	SR, Ar, TCS, CRS, FC, FB, EX[S], In[O], Ce[B]			AC[S], AA[S]					
ExternalCapsule_Left/Right	Ex[S], CM[S]	SR, Ar, TCS, CRS, FC, FB, PC, UA[S], In[S]			AC[S], AA[S]					
Temporal Stem Tracts										
FOF_Left/Right	UC[S], TC[S], PC	SR, AC[S], Ce[B], Mb, FC, FB								
ILF_Left/Right	TC[S], IO[S]	SR, AC[S], Ce[B], Mb, FC, FB, UC[S], UA[S], AG, Ex[S]								
Uncinate_Left/Right	UC[S], UA[S]	SR, TC[S], PC, SF[S]								
Arcuate_Left/Right	AC[S], AA[S]	SR, TC[S], In[S], Ex[S], Mb, IO[S], SF[S]								
SLFA_Left/Right	AC[S], PG	SR, TC[S], In[S], Ex[S], Mb, Ar, PC, AA[S]								
SLFP_Left/Right	AC[S], PC	SR, TC[S], In[S], Ex[S], Mb, Ar, IO[S]								
SLF_Left/Right	SLFA Left/Right + SLFP Left/Right									
Cingulum_Left/Right	C1[S], C2[S]	SR, CM[S], Mb, AS[S], FC, AA[S]								
OpticRads_Left/Right	IO[S]	LG[S]	SR, C1[S], Ce[B], Mb, FC							
FrontalAslant_Left/Right	SF, FS	SR, CM[S], AC[S], FB, AG, Mb, PC								
Language Tracts										
Other Tracts										
Region List		Code	Region Family							
01	Genu	Ge	Interhemispheric Regions							
02	CCBody	CB								
03	Splenium	Sp								
04	SagittalROA	SR								
05	Sagittal_Left	Sa								
06	Sagittal_Right									
07	BodyFornixROA	BF								
08	BodyCingulumROA	BC								
09	GenuCingulumROA	GC								
10	FornixBody	FB								
11	FornixCrura	FC								
12	AnteriorGenuFrontal	AG	Coronal Slice Regions							
13	PosteriorGenu	PG								
14	PosteriorCingulum	PC								
15	InferiorOccipital_Left	IO								
16	InferiorOccipital_Right									
17	Cerebellum_Left	Ce								
18	Cerebellum_Right									
*19	Cingulum1_Left	C1	Cingulum Regions							
*20	Cingulum1_Right									
*21	Cingulum2_Left	C2								
*22	Cingulum2_Right									
23	CingulumROA_Left	CR								
24	CingulumROA_Right									
25	UncinateCoronal_Left	UC	Temporal Stem Regions							
26	UncinateCoronal_Right									
27	UncinateAxial_Left	UA								
28	UncinateAxial_Right									
29	TemporalCoronal_Left	TC								
30	TemporalCoronal_Right									
31	InternalCapsule_Left	In	Axial Regions							
32	InternalCapsule_Right									
33	ExternalCapsule_Left	Ex								
34	ExternalCapsule_Right									
35	CapsuleMerge_Left	CM								
36	CapsuleMerge_Right									
37	SFG_Left	SF								
38	SFG_Right									
39	ArcuateROA	Ar								
40	LGN_Left	LG								
41	LGN_Right									
42	Midbody	Mb								
43	AnteriorBrainstem	AB								
44	Medulla	Me								
*45	ArcuateCoronal_Left	AC	Arcuate Regions							
*46	ArcuateCoronal_Right									
47	ArcuateAxial_Left	AA								
48	ArcuateAxial_Right									
49	ArcuateSagittal_Left	AS								
50	ArcuateSagittal_Right									
51	FASagittal_Left	FS								
52	FASagittal_Right									
Key										
[S] = Same Side (Ipsilateral)										
[O] = Opposite Side (Contralateral)										
[B] = Both Sides										
[L] = Right Side										
[R] = Left Side										
*# = a "_Whole_Brain" version of these regions is also made (via script) by combining "_Left" and "_Right"										

Genu (of the Corpus Callosum)

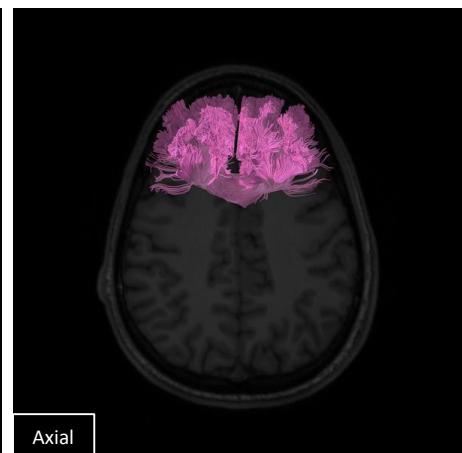
File Name: Genu_Whole_Brain



Sagittal



Coronal



Axial

ROIs

- Genu
- Sagittal_Left
- Sagittal_Right

ROAs

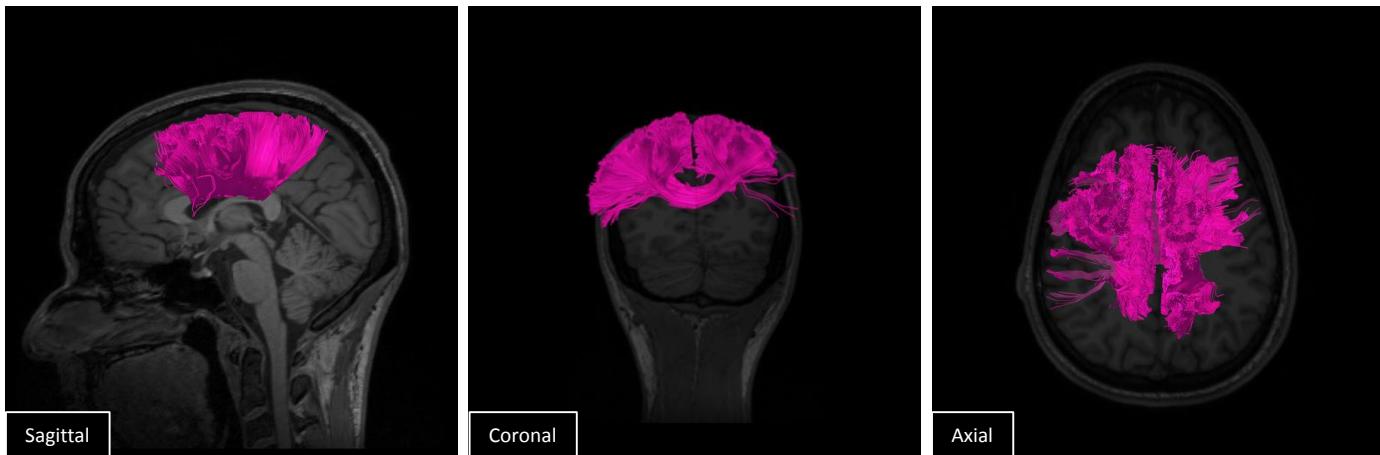
- PosteriorGenu
- InternalCapsule_Left
- InternalCapsule_Right

NAND¹

- BodyCingulumROA
- GenuCingulumROA

Body (of the Corpus Callosum)

File Name: CCBODY_Whole_Brain



Sagittal

Coronal

Axial

ROIs

- CCBODY
- Sagittal_Left
- Sagittal_Right

ROAs

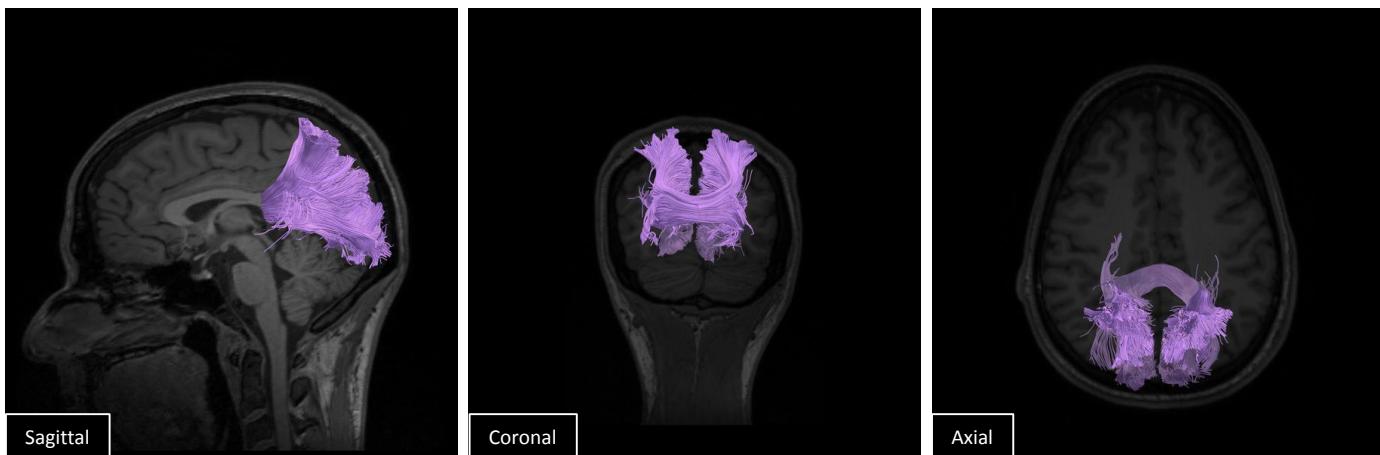
- BodyFornixROA
- CapsuleMerge_Left
- CapsuleMerge_Right
- Midbody
- BodyCingulumROA
- ArcuateAxial_Left
- ArcuateAxial_Right
- ArcuateROA

NAND¹

- PosteriorGenu
- ArcuateCoronal_Whole_Brain²

Splenium (of the Corpus Callosum)

File Name: Splenium_Whole_Brain



ROIs

- Splenium
- Sagittal_Left
- Sagittal_Right

ROAs

- Midbody
- TemporalCoronal_Left
- TemporalCoronal_Right
- FornixCrura
- ArcuateCoronal_Left
- ArcuateCoronal_Right
- FornixBody
- SFG_Left
- SFG_Right

NAND¹

- Cingulum1_Whole_Brain²
- Cingulum2_Whole_Brain

Corpus Callosum

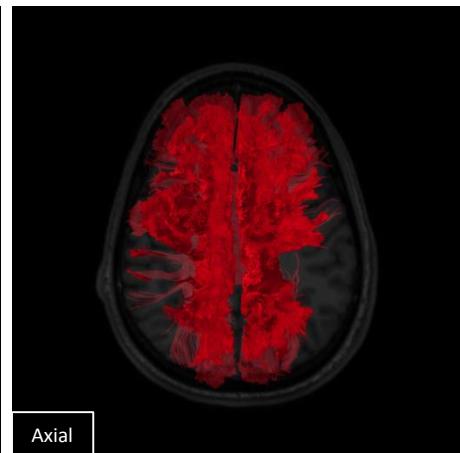
File Name: CorpusCallosum_Whole_Brain



Sagittal



Coronal



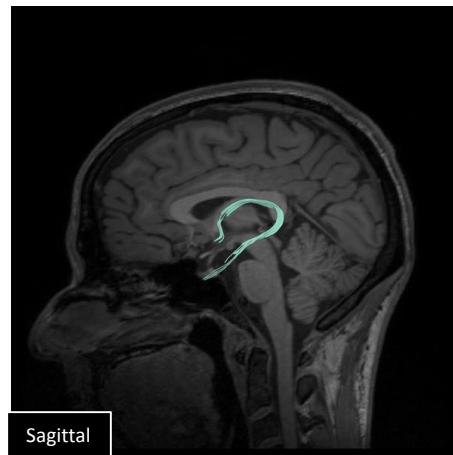
Axial

Tracts

- Genu_Whole_Brain
- Body_Whole_Brain
- Splenium_Whole_Brain

Fornix

File Name: Fornix_Whole_Brain



ROIs

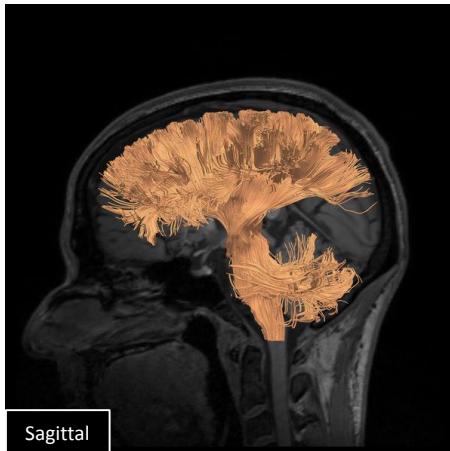
- FornixBody
- FornixCrura

ROAs

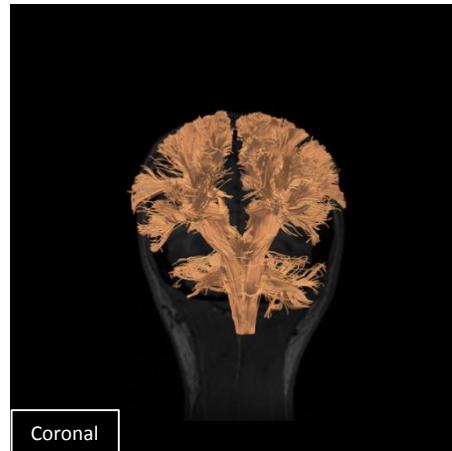
- PosteriorCingulum
- AnteriorGenuFrontal
- Midbody
- Cingulum1_Left
- Cingulum1_Right
- Splenium

Corona Radiata

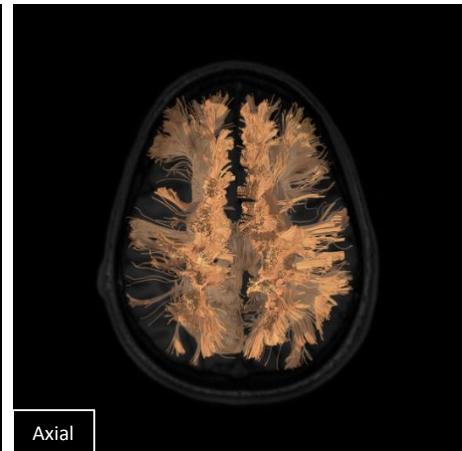
File Name: CoronaRadiata_SIDE³



Sagittal



Coronal



Axial

ROIs

- InternalCapsule_SIDE

ROAs

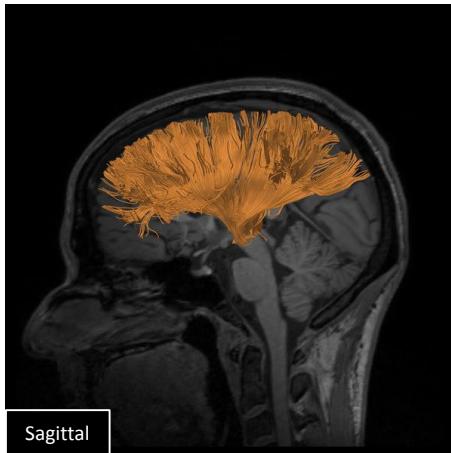
- SagittalROA
- ArcuateROA
- TemporalCoronal_SIDE
- CingulumROA_SIDE
- FornixCrura
- FornixBody
- ExternalCapsule_SIDE
- InternalCapsule_OPPOSITE⁴
- Cerebellum_OPPOSITE

NAND¹

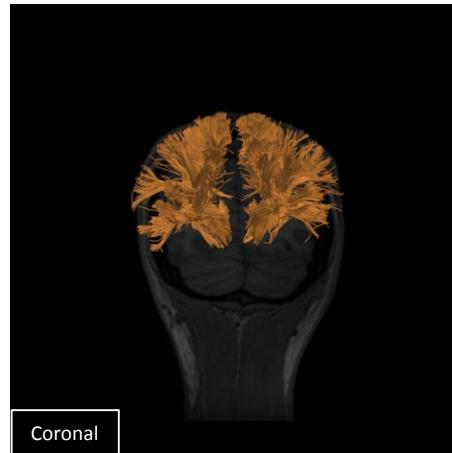
- ArcuateCoronal_SIDE
- ArcuateAxial_SIDE

Thalamic Radiations

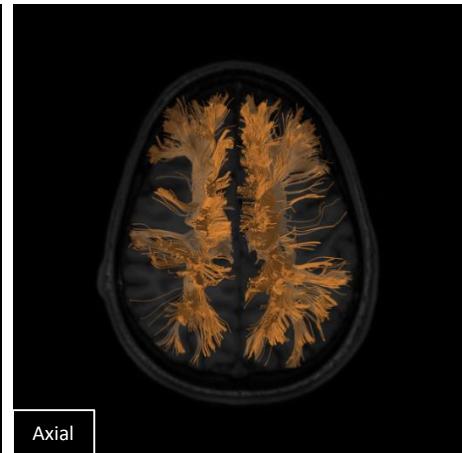
File Name: ThalamicRadiations_SIDE³



Sagittal



Coronal



Axial

ROIs

- InternalCapsule_SIDE

ROAs

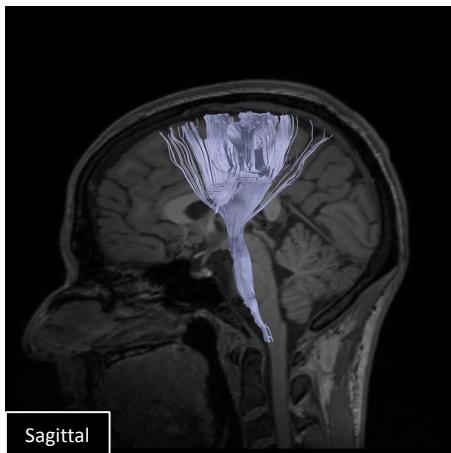
- SagittalROA
- ArcuateROA
- TemporalCoronal_SIDE
- CingulumROA_SIDE
- FornixCrura
- FornixBody
- ExternalCapsule_SIDE
- InternalCapsule_OPPOSITE⁴
- Cerebellum_OPPOSITE
- Midbody

NAND¹

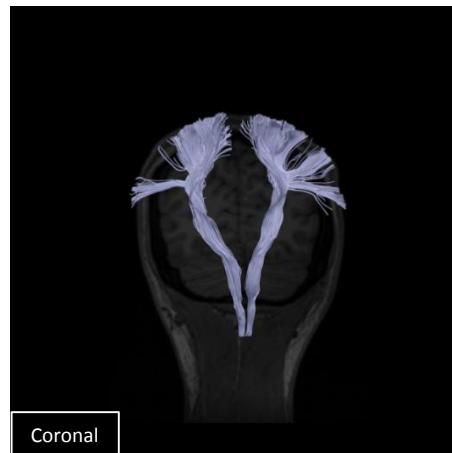
- ArcuateCoronal_SIDE
- ArcuateAxial_SIDE

CST (Corticospinal Tract)

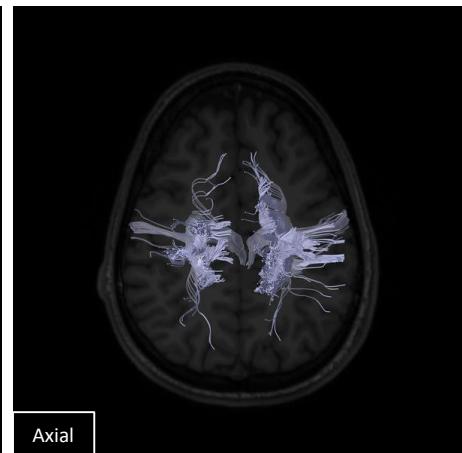
File Name: ThalamicRadiations_SIDE³



Sagittal



Coronal



Axial

ROIs

- InternalCapsule_SIDE
- Midbody
- AnteriorBrainstem
- Medulla

ROAs

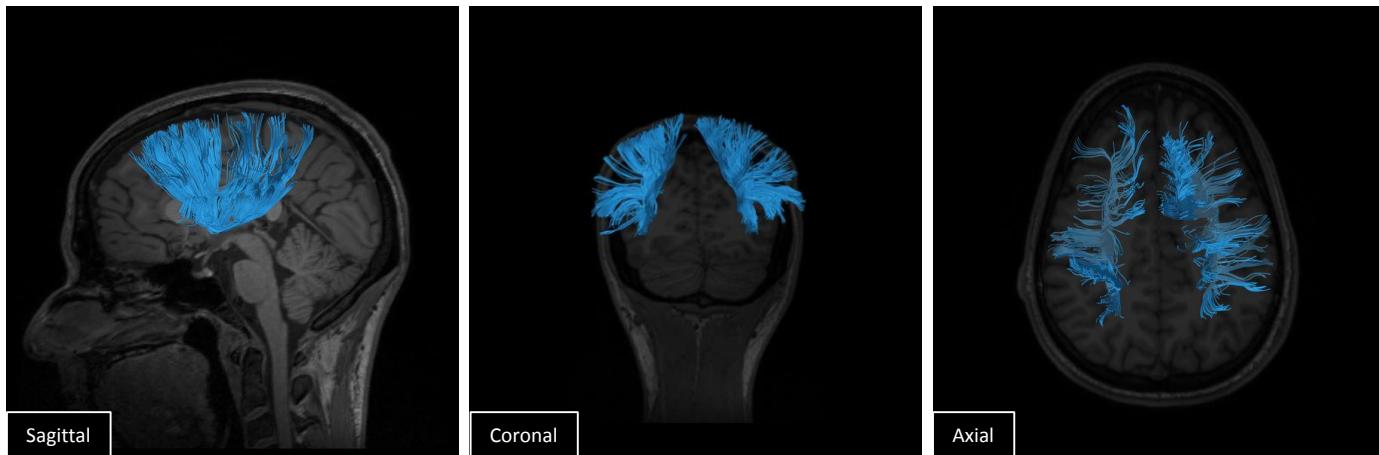
- SagittalROA
- ArcuateROA
- TemporalCoronal_SIDE
- CingulumROA_SIDE
- FornixCrura
- FornixBody
- ExternalCapsule_SIDE
- InternalCapsule_OPPOSITE⁴
- Cerebellum_SIDE
- Cerebellum_OPPOSITE⁴

NAND¹

- ArcuateCoronal_SIDE
- ArcuateAxial_SIDE

External Capsule

File Name: ExternalCapsule_SIDE³



ROIs

- ExternalCapsule_SIDE
- CapsuleMerge_SIDE

ROAs

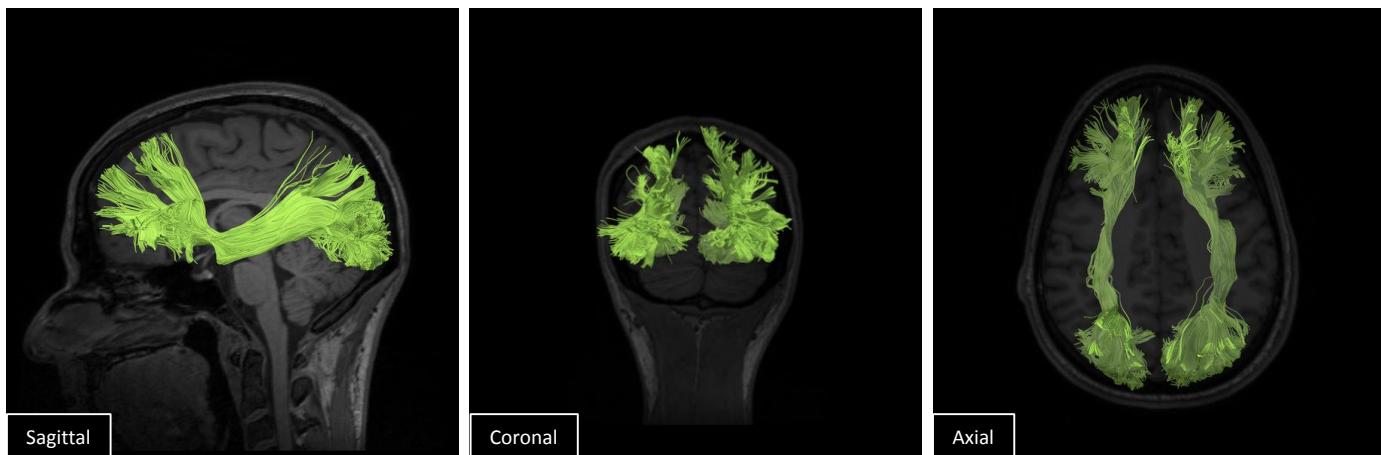
- SagittalROA
- ArcuateROA
- TemporalCoronal_SIDE
- CingulumROA_SIDE
- FornixCrura
- FornixBody
- PosteriorCingulum_SIDE
- UncinateAxial_SIDE
- InternalCapsule_SIDE

NAND¹

- ArcuateCoronal_SIDE
- ArcuateAxial_SIDE

FOF (Fronto-Occipital Fasciculus)

File Name: FOF_SIDE³



ROIs

- UncinateCoronal_SIDE
- TemporalCoronal_SIDE
- PosteriorCingulum

ROAs

- SagittalROA
- ArcuateCoronal_SIDE
- Cerebellum_Left
- Cerebellum_Right
- Midbody
- FornixCrura
- FornixBody

ILF (Inferior Longitudinal Fasciculus)

File Name: ILF_SIDE³



Sagittal



Coronal



Axial

ROIs

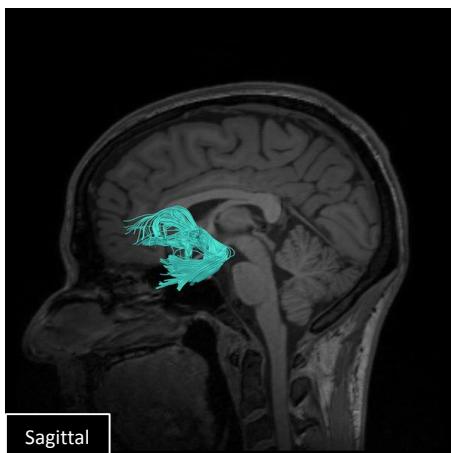
- TemporalCoronal_SIDE
- InferiorOccipital_SIDE

ROAs

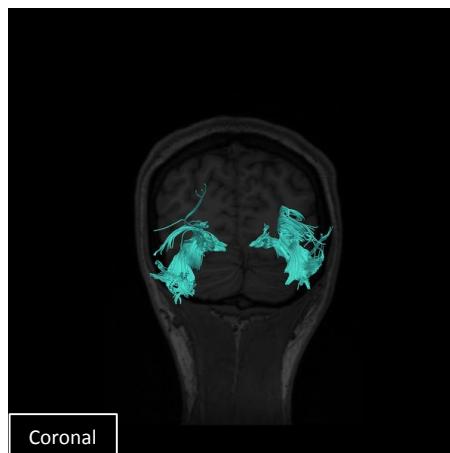
- SagittalROA
- ArcuateCoronal_SIDE
- Cerebellum_Left
- Cerebellum_Right
- Midbody
- FornixCrura
- FornixBody
- UncinateCoronal_SIDE
- UncinateAxial_SIDE
- AnteriorGenuFrontal
- ExternalCapsule_SIDE

Uncinate (Fasciculus)

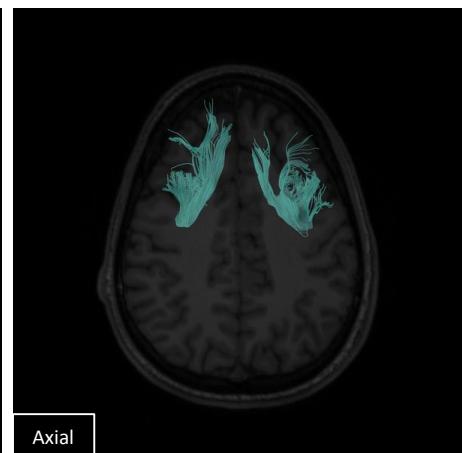
File Name: Uncinate_SIDE³



Sagittal



Coronal



Axial

ROIs

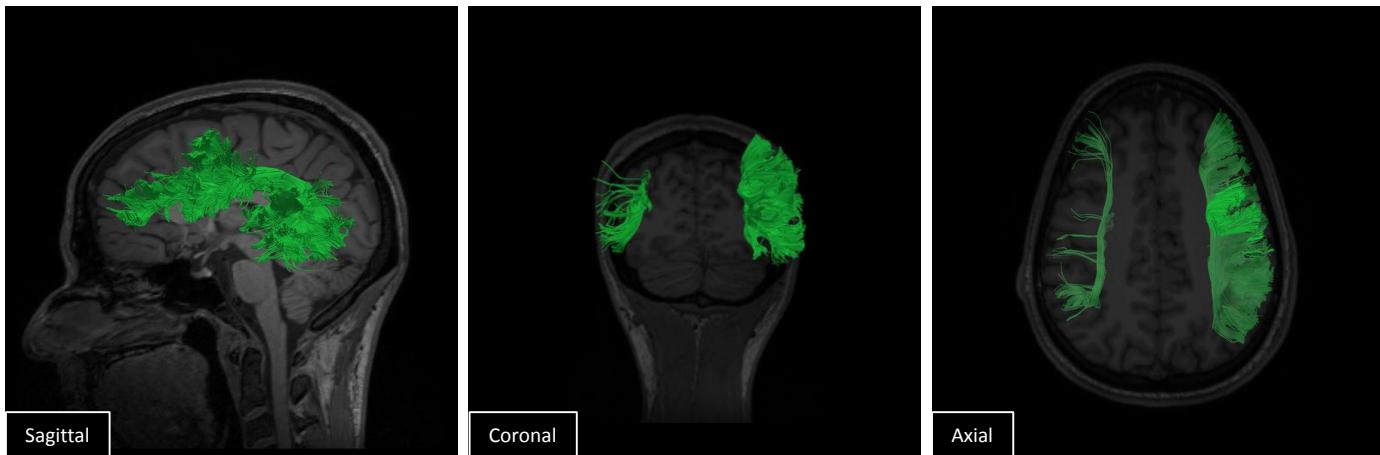
- UncinateCoronal_SIDE
- UncinateAxial_SIDE

ROAs

- SagittalROA
- TemporalCoronal_SIDE
- PosteriorCingulum
- SFG_SIDE

Arcuate (Fasciculus)

File Name: Arcuate_SIDE³



ROIs

- ArcuateCoronal_SIDE
- ArcuateAxial_SIDE

ROAs

- SagittalROA
- TemporalCoronal_SIDE
- InternalCapsule_SIDE
- ExternalCapsule_SIDE
- Midbody
- InferiorOccipital_SIDE
- SFG_SIDE

SLF-A⁵

File Name: SLFA_SIDE³

ROIs

- ArcuateCoronal_SIDE
- PosteriorGenu

ROAs

- SagittalROA
- TemporalCoronal_SIDE
- InternalCapsule_SIDE
- ExternalCapsule_SIDE
- Midbody
- ArcuateROA
- PosteriorCingulum
- ArcuateAxial_SIDE

SLF-P

File Name: SLFP_SIDE

ROIs

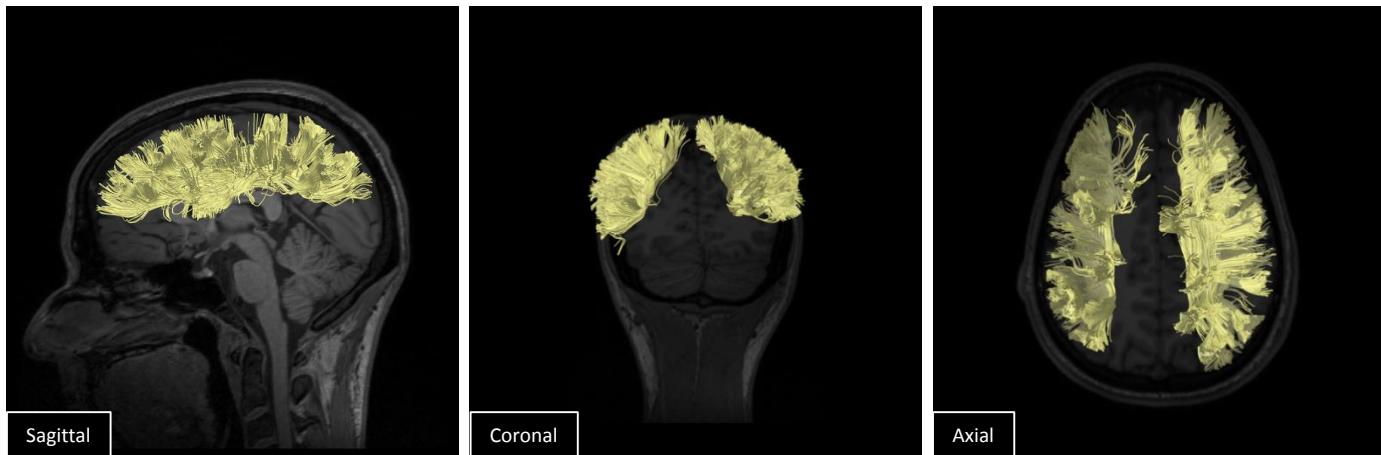
- ArcuateCoronal_SIDE
- PosteriorCingulum

ROAs

- SagittalROA
- TemporalCoronal_SIDE
- InternalCapsule_SIDE
- ExternalCapsule_SIDE
- Midbody
- ArcuateROA
- InferiorOccipital_SIDE

SLF (Superior Longitudinal Fasciculus)

File Name: SLF_SIDE³

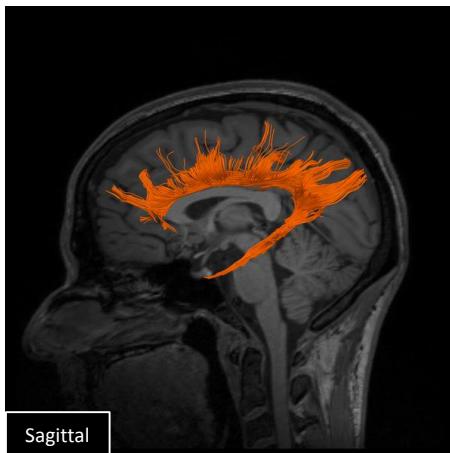


Tracts

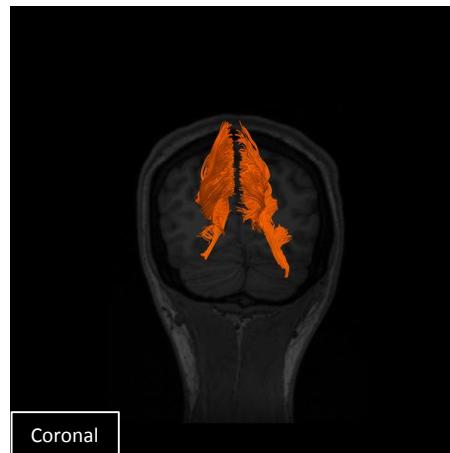
- SLF-A⁵
- SLF-P

Cingulum

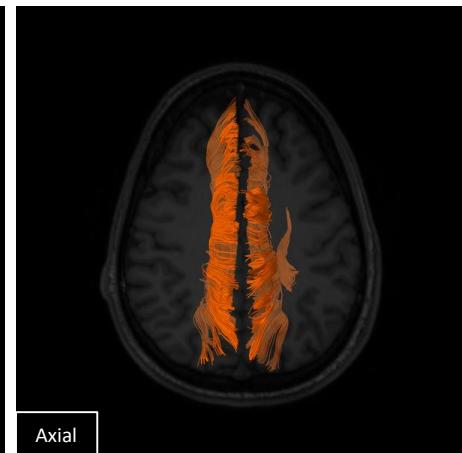
File Name: Cingulum_SIDE³



Sagittal



Coronal



Axial

ROIs

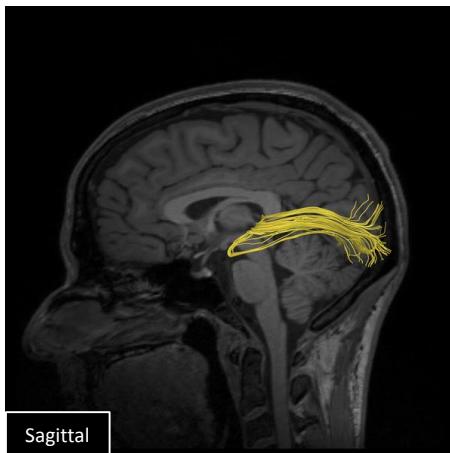
- Cingulum1_SIDE
- Cingulum2_SIDE

ROAs

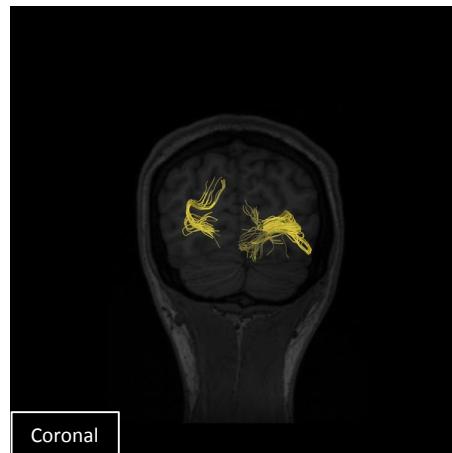
- SagittalROA
- CapsuleMerge_SIDE
- Midbody
- ArcuateSagittal_SIDE
- FornixCrura
- ArcuateAxial_SIDE

Optic Radiations

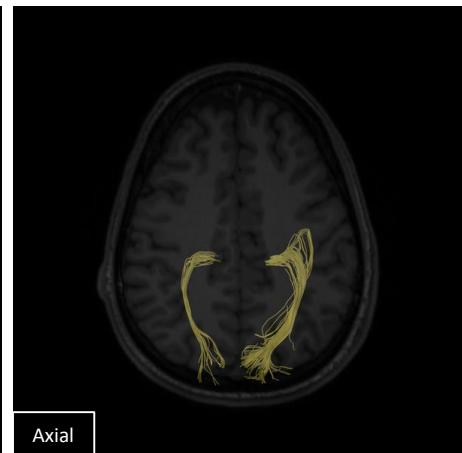
File Name: OpticRads_SIDE³



Sagittal



Coronal



Axial

ROIs

- InferiorOccipital_SIDE

END

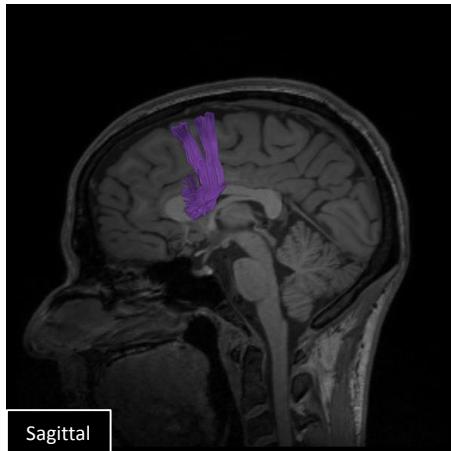
- LGN_SIDE

ROAs

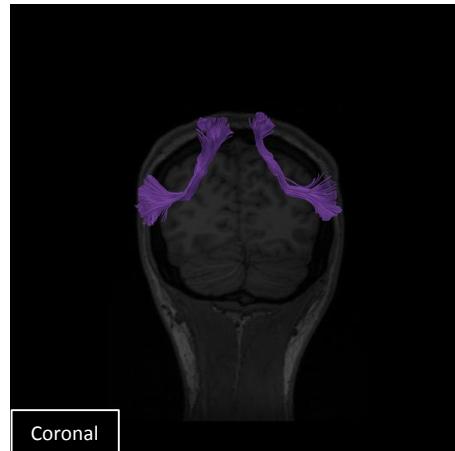
- SagittalROA
- Cingulum1_SIDE
- Cerebellum_Left
- Cerebellum_Right
- Midbody
- FornixCrura

Frontal Aslant

File Name: FrontalAslant_SIDE³



Sagittal



Coronal



Axial

ROIs

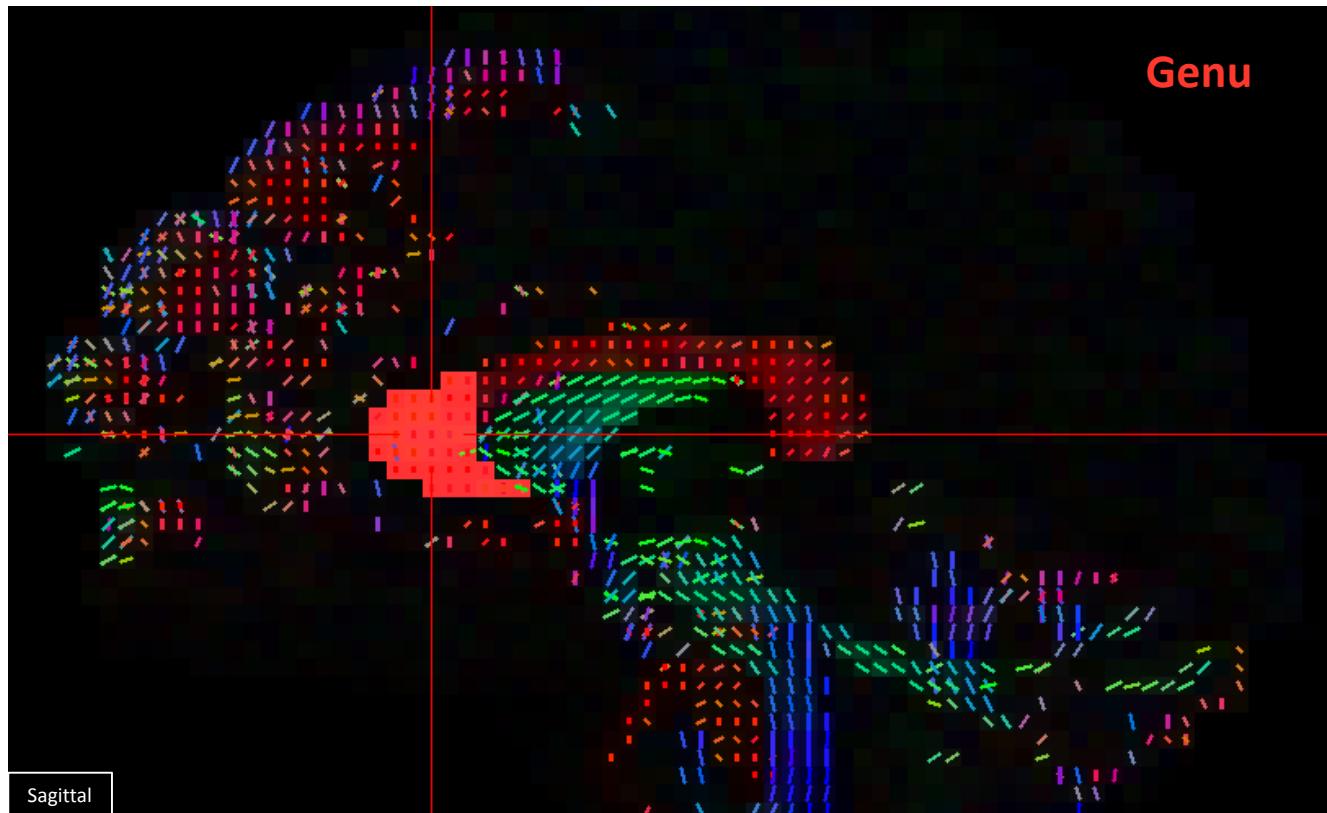
- FASagittal_SIDE
- SFG_SIDE

ROAs

- SagittalROA
- CapsuleMerge_SIDE
- ArcuateCoronal_SIDE
- FornixBody
- AnteriorGenuFrontal
- Midbody
- PosteriorCingulum

Genu

Code: Ge



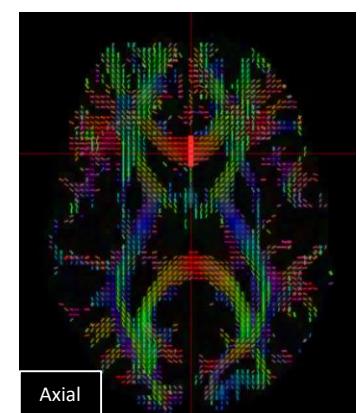
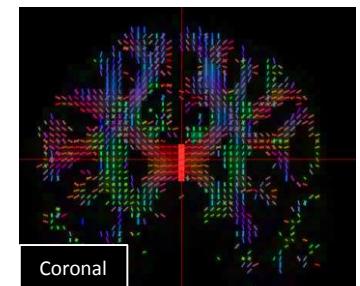
Plane: Sagittal, 2D

Coverage: Conservative

Purpose: Primary ROI for the Genu tract

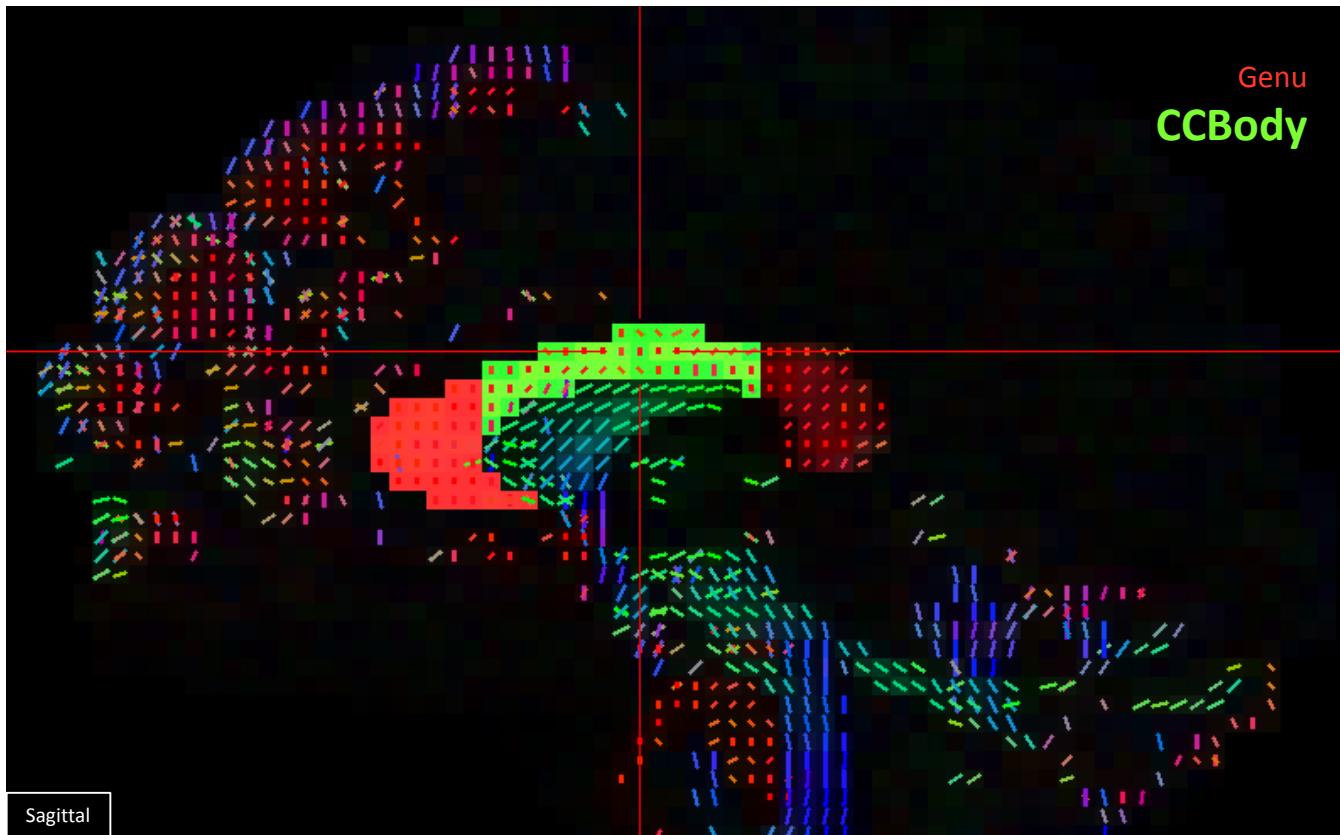
Instructions

- In a mid-sagittal slice
 - Make sure the Cingulum is not visible
- Highlight all continuous **red** (or red-ish) voxels of the Genu, everything anterior to the “drop and hook”
- Include the rostrum, being the segment that hooks back



CCBody

Code: CB



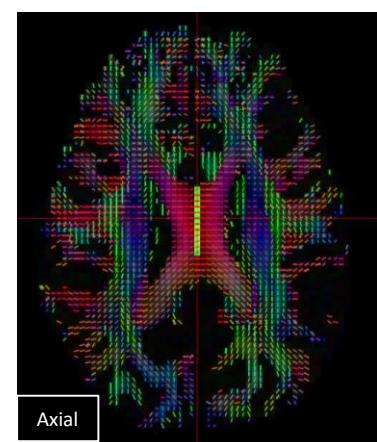
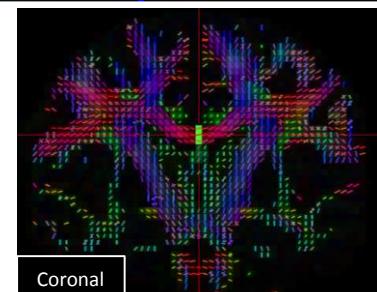
Plane: Sagittal, 2D

Coverage: Conservative

Purpose: Primary ROI for the Body tract

Instructions

- Same mid-sagittal slice as the Genu
- Highlight all continuous **red** voxels of the corpus callosum body between the Genu and Splenium.
- Go as far posterior as 1 voxel before the largest posterior drop
- If the brain is yawed, it may be drawn in a separate slice than the genu, as long as they are continuous when collapsed across the X axis



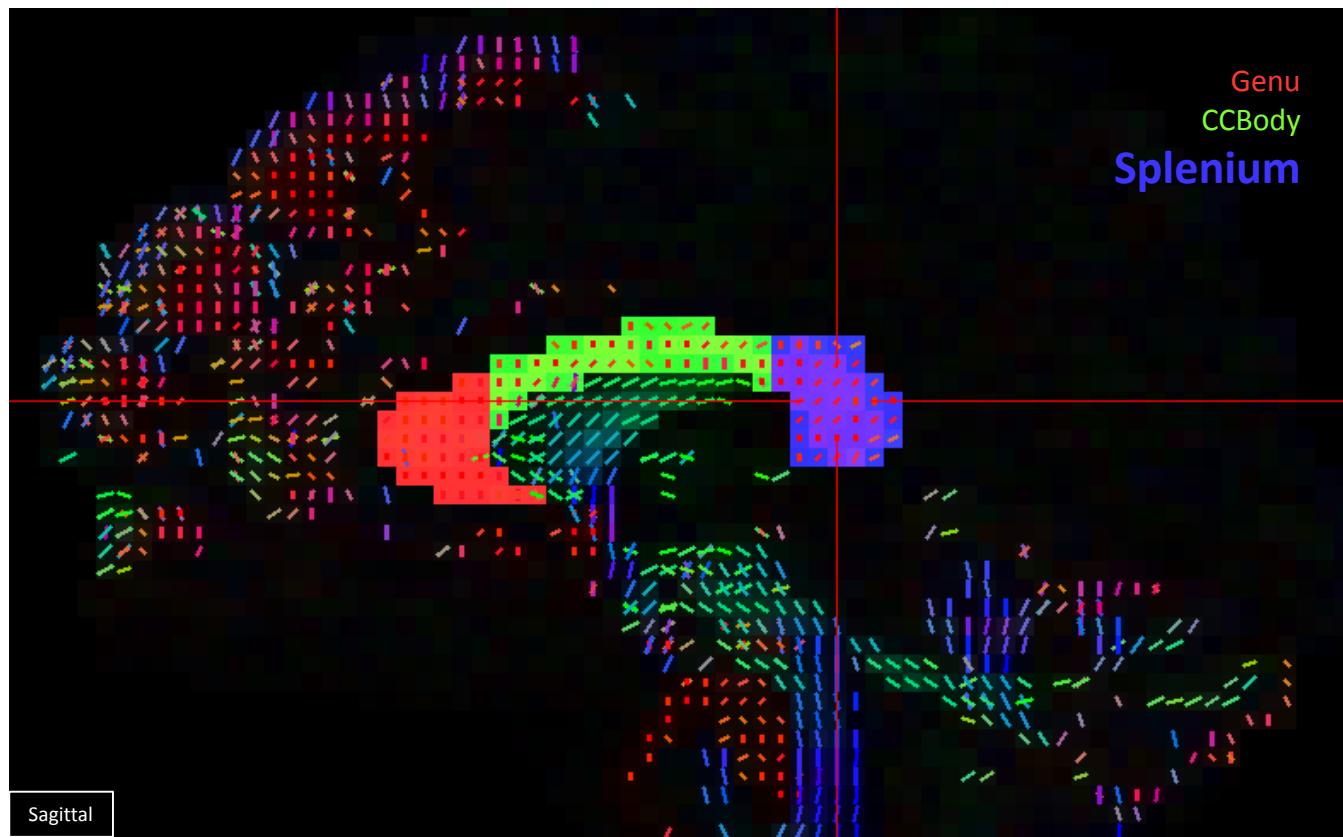
Splenium

Code: Sp

Tracts

ROI: Splenium

ROA: Fornix



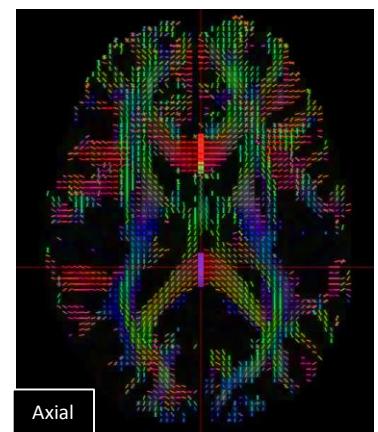
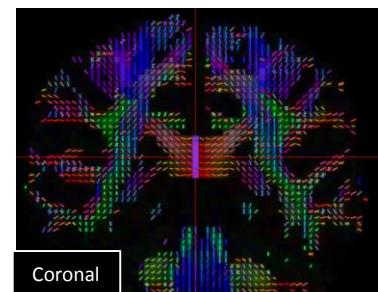
Plane: Sagittal, 2D

Coverage: Conservative

Purpose: Primary ROI for the Splenium tract

Instructions

- Same mid-sagittal slice as the CCBody
- Highlight all continuous **red** voxels of the corpus callosum Splenium, going as far anterior as 1 voxel anterior to the largest posterior drop
- If the brain is yawed, it may be drawn in a separate slice than the CCBody, as long as they are continuous when collapsed across the X axis

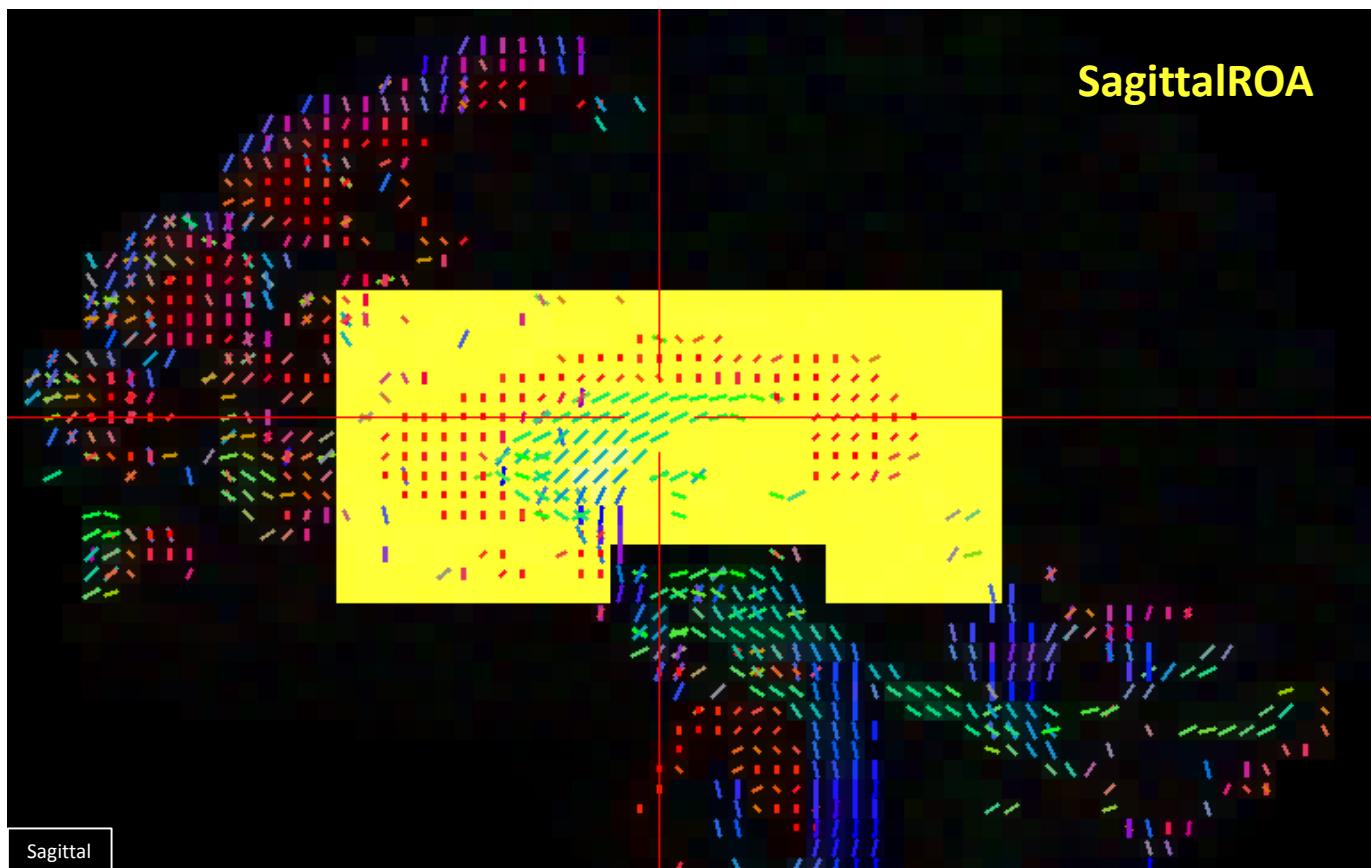


SagittalROA

Code: SR

Tracts

ROA: Corona Radiata, Thalamic Radiations, CST, External Capsule, FOF, ILF, Uncinate, Arcuate, SLF-A⁵, SLF-P, Cingulum, Optic Radiations, Frontal Aslant



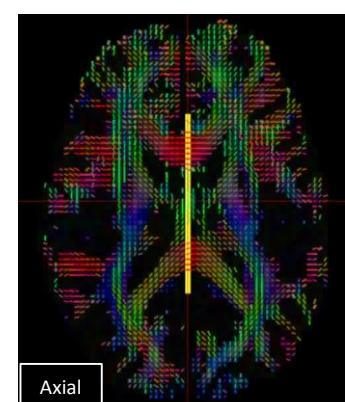
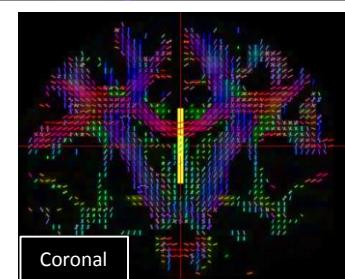
Plane: Sagittal, 2D

Coverage: Liberal

Purpose: Used as an ROA to prevent non-interhemispheric tracts from crossing the midline

Instructions

- In the same mid-sagittal slice as the Genu/CCBody/Splenium, draw a large rectangle over the **red** corpus callosum diffusion data
- If the regions cuts into the blue/green diffusion data of the brainstem or thalamus, remove said voxels so it does not interfere
- If the brain is yawed, it may be drawn in three separates slices (like the corpus callosum segments), as long as they are continuous when collapsed across the X axis



Sagittal_SIDE³

Code: Sa

Tracts
ROI: Genu, Body, Splenium



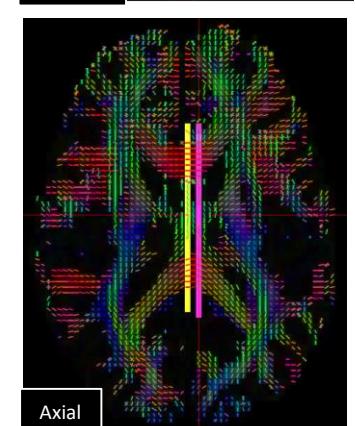
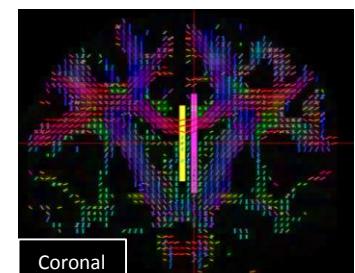
Plane: Sagittal, 2D

Coverage: Liberal

Purpose: Using both the Left and Right versions as ROIs in conjunction with a segment of the Corpus Callosum to ensure fibers fully cross the midline

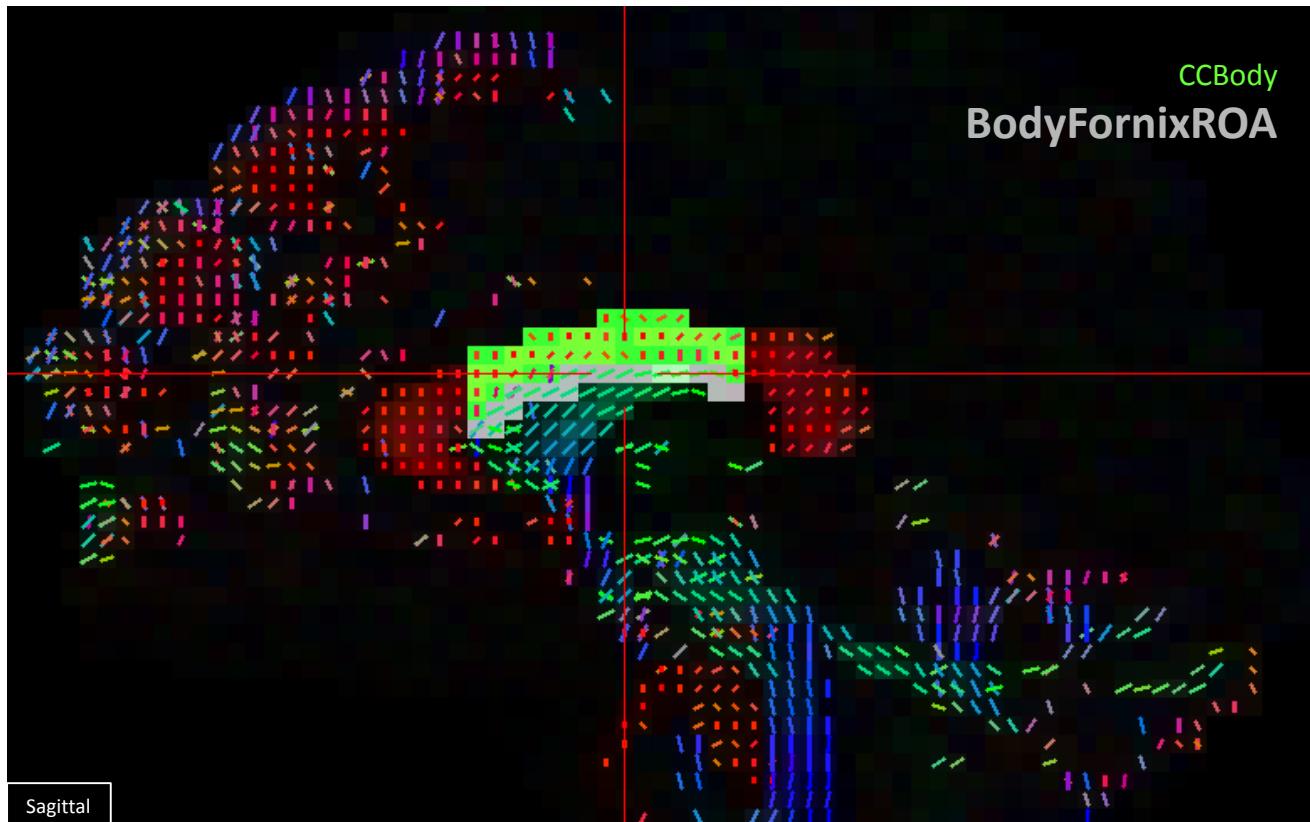
Instructions

- 2 slices lateral to the SagittalROA toward the target hemisphere
- Cover the **red** diffusion data of the corpus callosum
- If the brain is yawed, it may be drawn in three separates slices (like the corpus callosum segments), as long as they are continuous when collapsed across the X axis and 2 slices away from the SagittalROA segments



BodyFornixROA

Code: BF



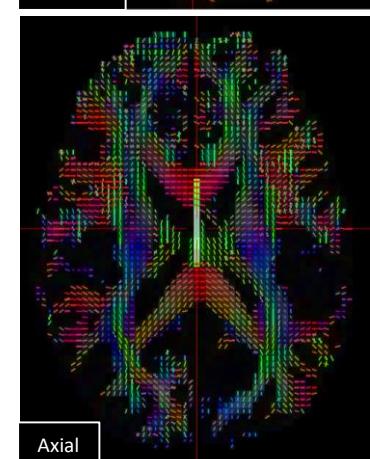
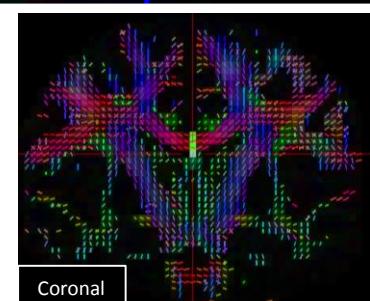
Plane: Sagittal, 2D

Coverage: Conservative

Purpose: Prevent Fornix false continuations when tracking the Body

Instructions

- Same sagittal slice as the CCBody
- Draw a continuous, non-overlapping path 1 voxel wide directly inferior to the CCBody



BodyCingulumROA (1 of 2)

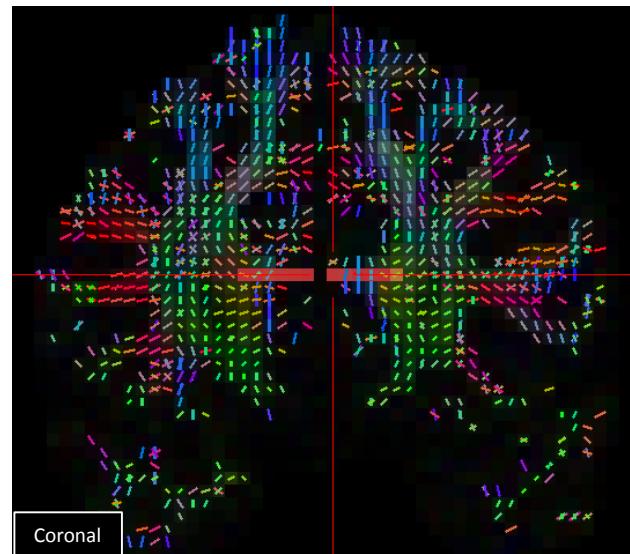
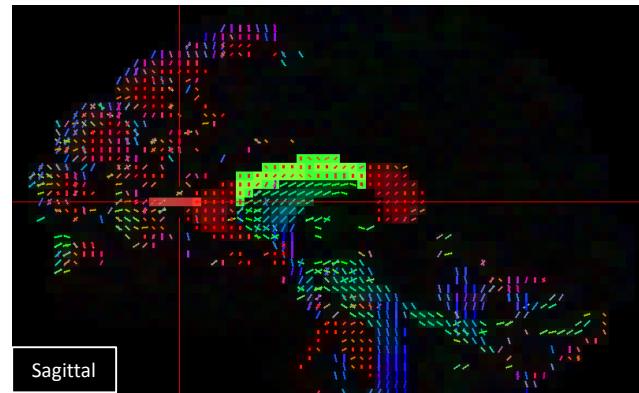
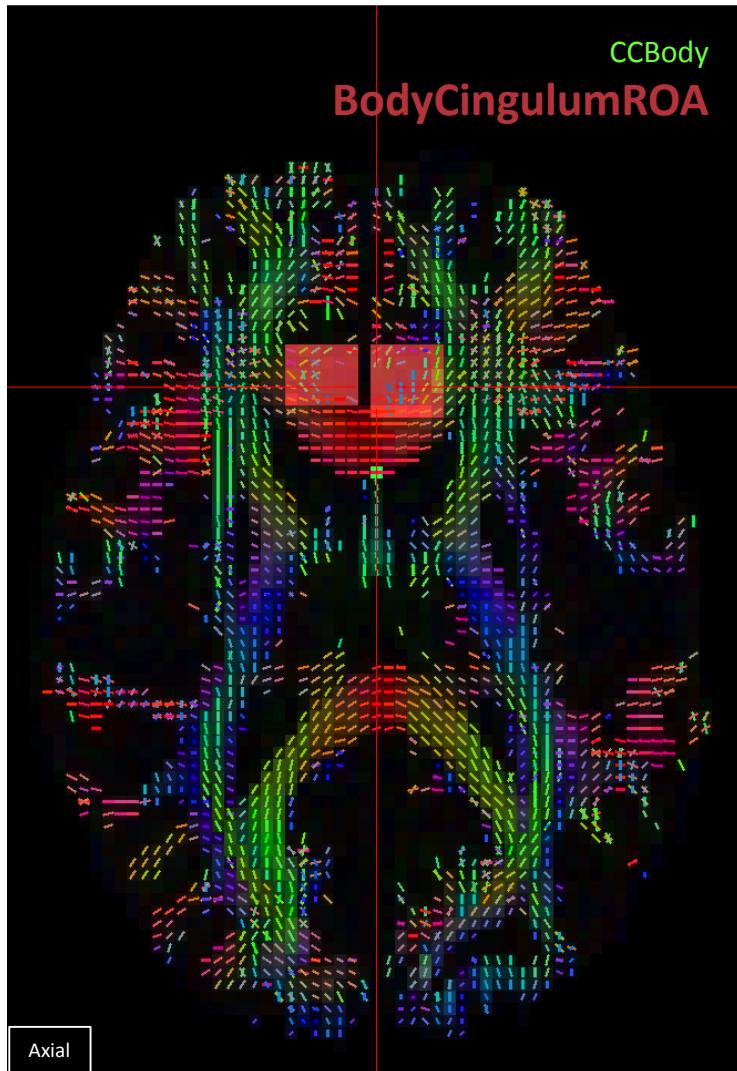
Code: BC

Tracts

ROA: Body

NAND¹: Genu (w/

GenuCingulumROA)



Plane: Axial, 2D

Coverage: Liberal

Purpose: Prevent Cingulum false continuations when tracking the Body (anterior end)

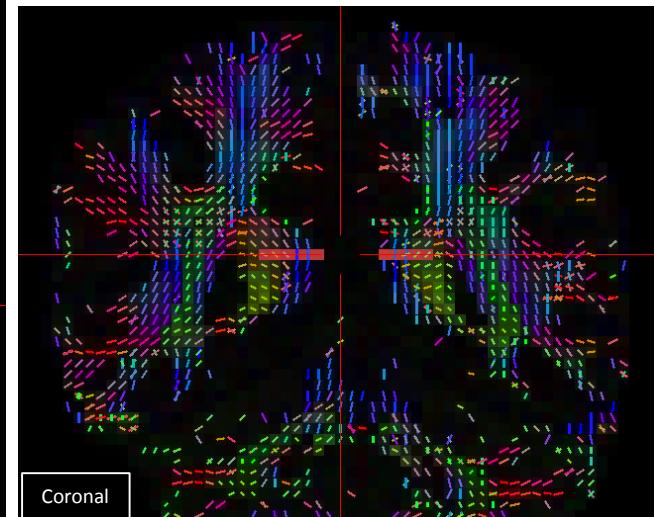
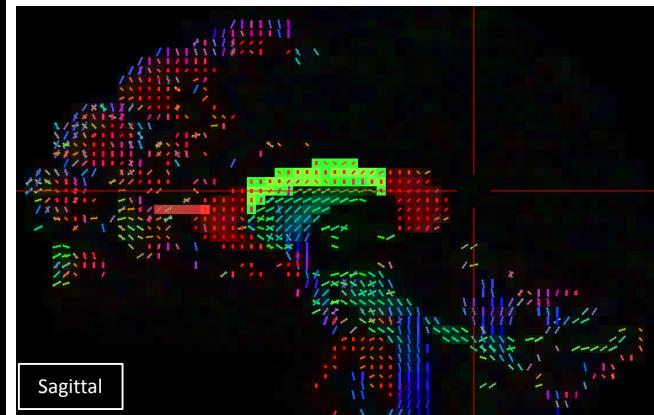
Instructions

- In the sagittal slice of the CCBody, identify the inferior-most voxel in the CCBody's anterior-most column, move axial slice to that level
- In that axial slice, highlight **blue-green** voxels of the Cingulum on the anterior end, bilaterally

BodyCingulumROA (2 of 2)

Code: BC

Tracts
 ROA: Body
 NAND¹: Genu (w/
 GenuCingulumROA)



Plane: Axial, 2D

Coverage: Liberal

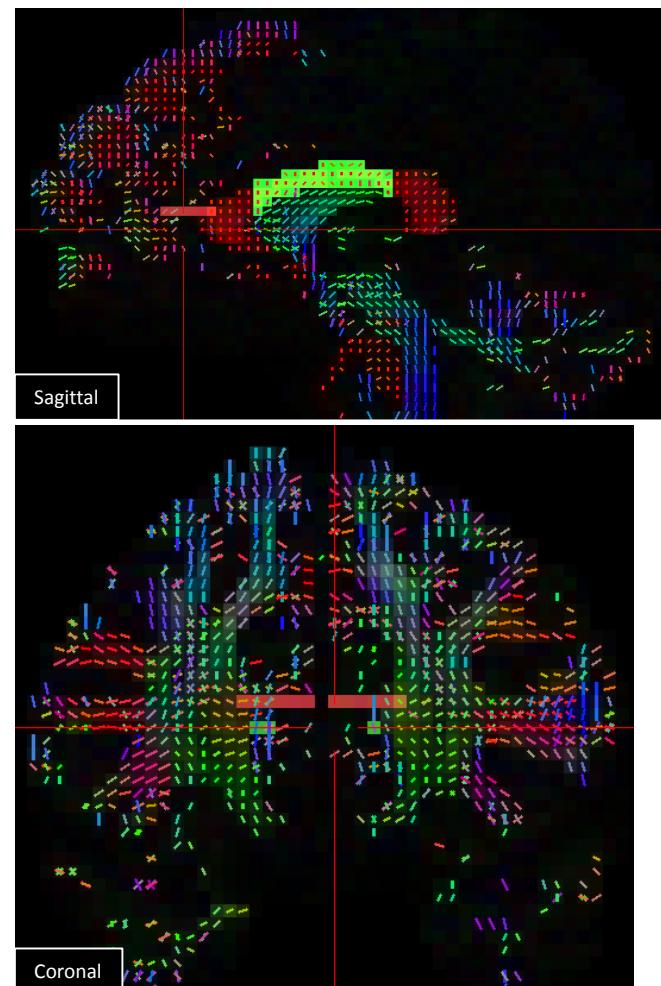
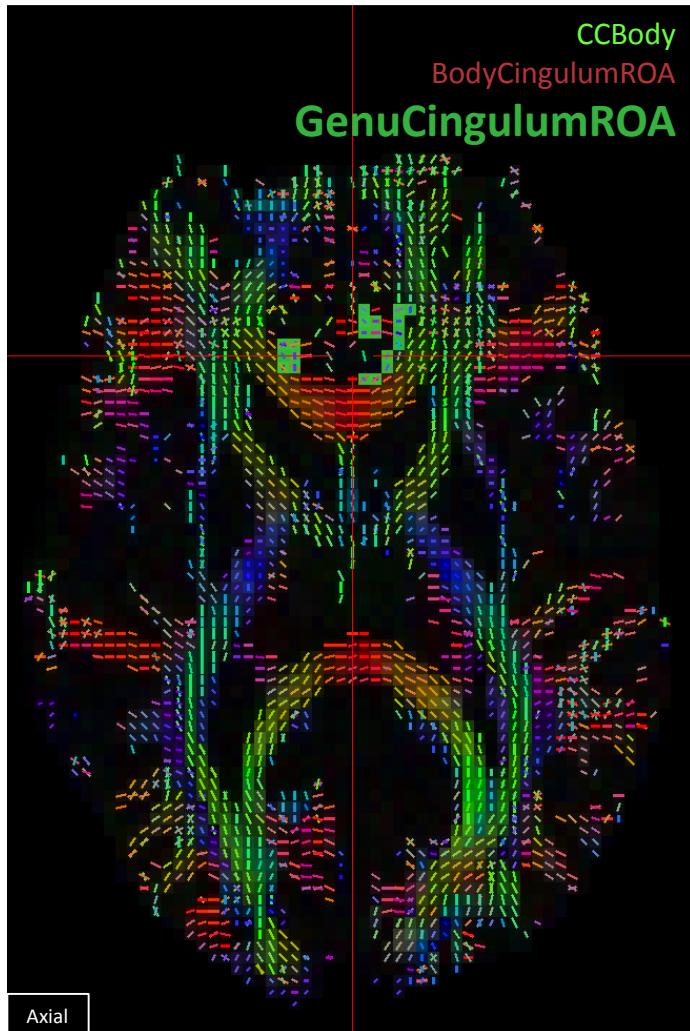
Purpose: Prevent Cingulum false continuations when tracking the Body (posterior end)

Instructions

- In the sagittal slice of the CCBody, identify the inferior-most voxel in the CCBody's posterior-most column, move axial slice to that level
- In that axial slice, highlight **blue-green** voxels of the Cingulum on the posterior end, bilaterally

GenuCingulumROA

Code: GC



Plane: Axial, 2D

Coverage: Conservative

Purpose: Prevent Cingulum false continuations in the Genu, as a NAND region

Instructions

- Axial slice 2 slices below the anterior portion of the BodyCingulumROA
- Highlight **blue-green** voxels of the anterior segment of the Cingulum,

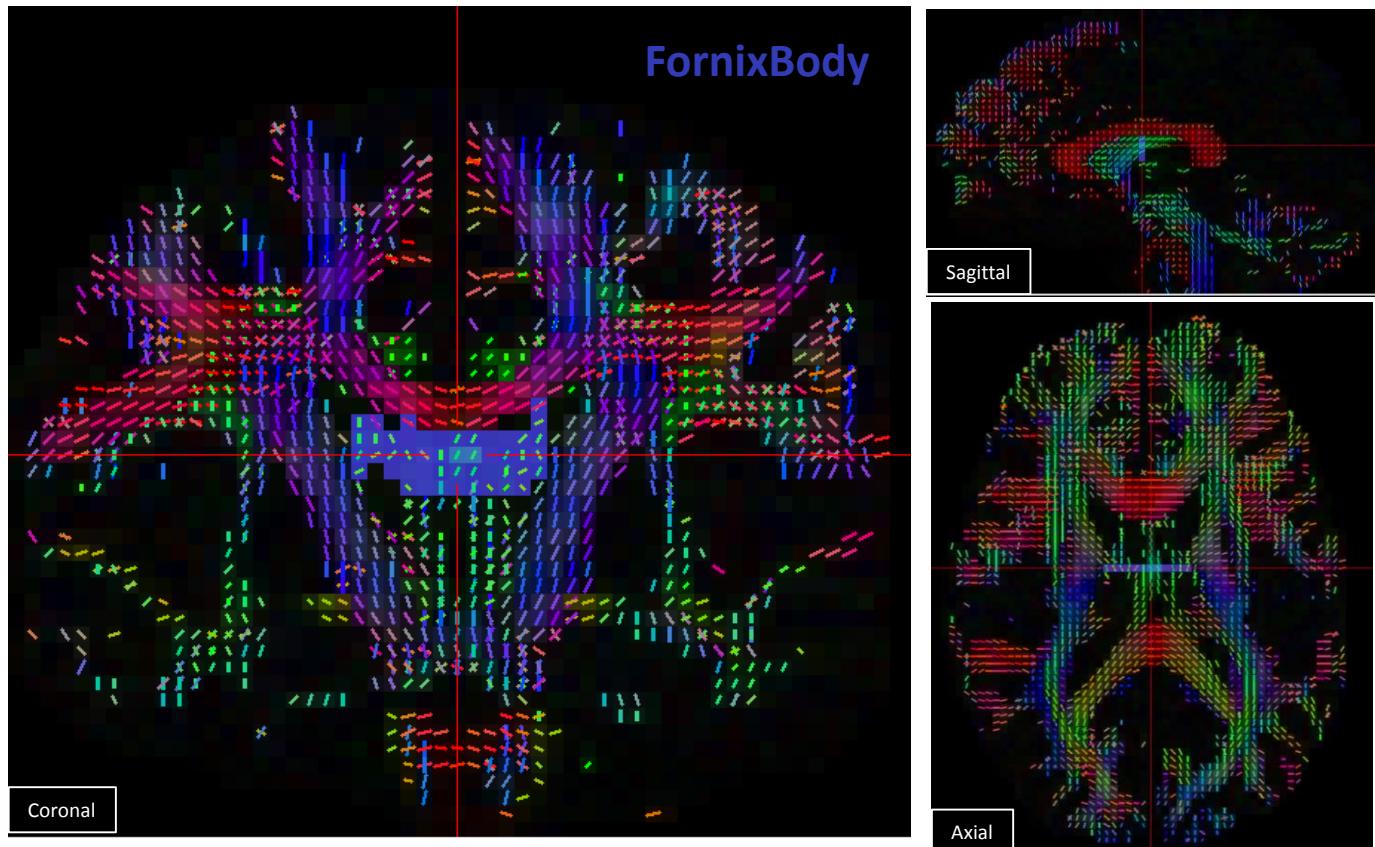
FornixBody

Code: FB

Tracts

ROI: Fornix

ROA: Splenium, Corona Radiata, Thalamic Radiations, CST, External Capsule, FOF, ILF, Frontal Aslant



Plane: Coronal, 2D

Coverage: Moderate

Purpose: One of two ROIs for the fornix

Instructions

- In a sagittal slice, identify the anterior pillar of the fornix. It may be the mid-sagittal slice or else nearby
- Move to a coronal slice 2 slices behind the anterior pillar
- Highlight **green** fornix fibers inferior to the corpus callosum, including fornix voxels that intersect with the corpus callosum
- Highlight green fibers lateral to the fornix body as well, but do not go so far lateral as to interfere with the (blue) internal capsule voxels
- Do not go significantly further inferior than the fornix body

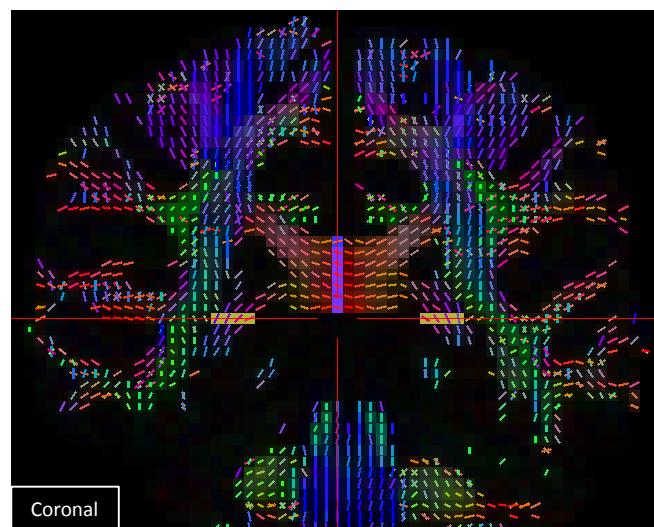
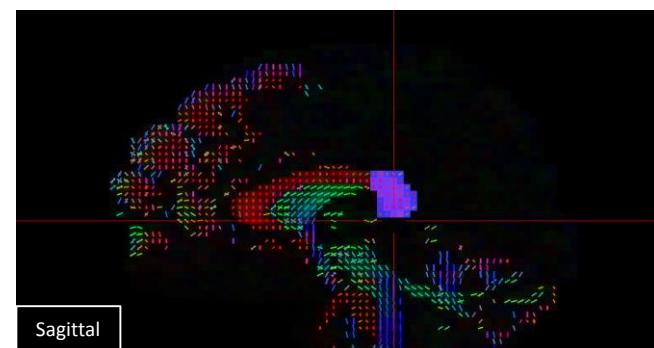
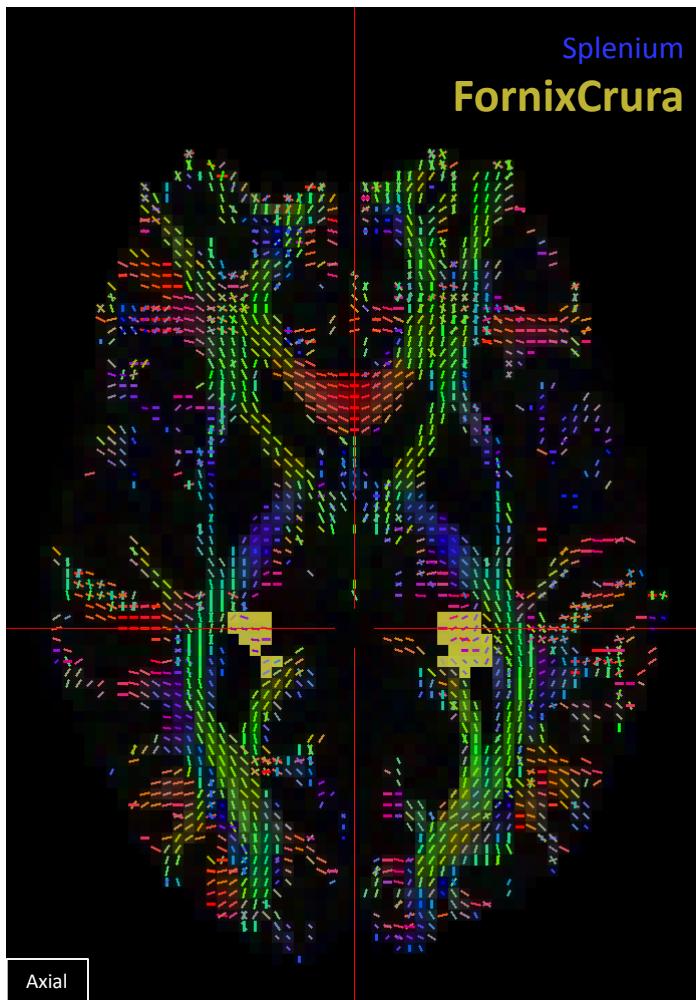
FornixCrura

Code: FC

Tracts

ROI: Fornix

ROA: Splenium, Corona Radiata, Thalamic Radiations, CST, External Capsule, FOF, ILF, Cingulum, Optic Radiations



Plane: Axial, 2D

Coverage: Conservative

Purpose: One of two ROIs for the fornix

Instructions

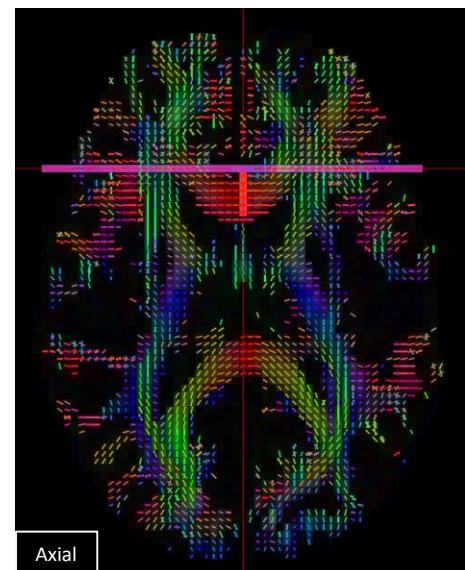
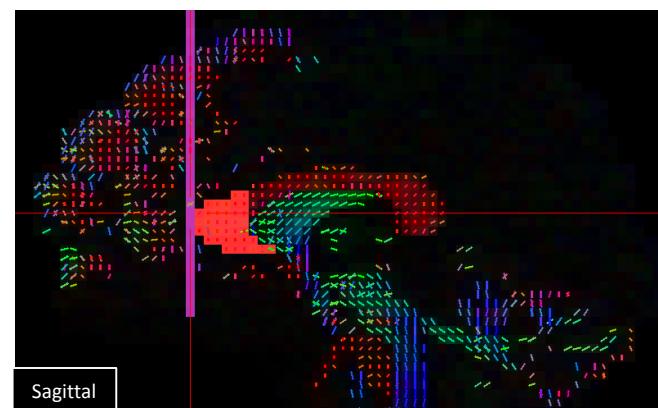
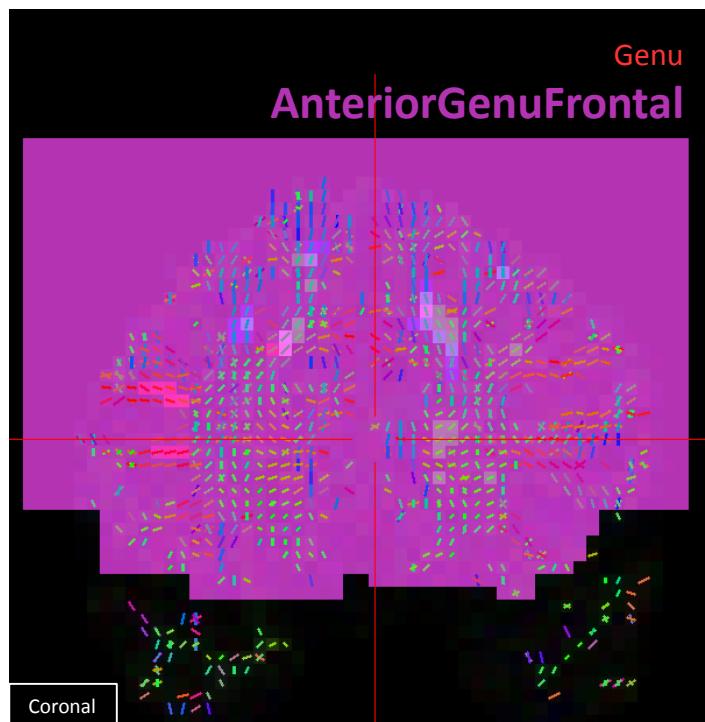
- In an axial slice directly inferior to the Splenium region
- Highlight the **purple** voxels of the fornix, between the splenium tract and internal capsule
- Only highlight voxels that have only fornix diffusion data
 - Do not highlight voxels within the splenium tract or internal capsule

AnteriorGenuFrontal

Code: AG

Tracts

ROA: Fornix, ILF, Frontal Aslant



Plane: Coronal, 2D

Coverage: Liberal

Purpose: Act as an ROA against streamlines entering
into the prefrontal cortex

Instructions

- In a coronal slice directly anterior to the Genu region
- Highlight all voxels in the frontal lobe
- Do not highlight voxels of the temporal lobe, if visible

PosteriorGenu

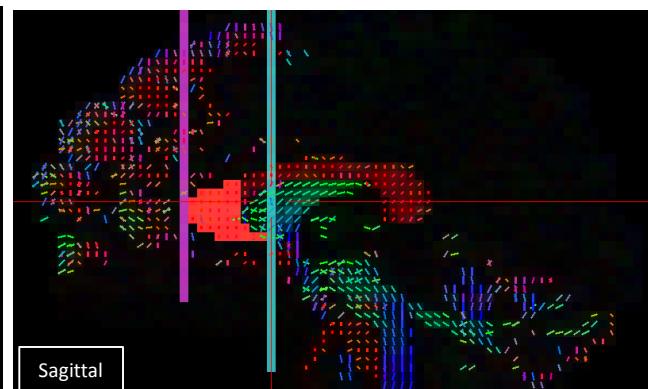
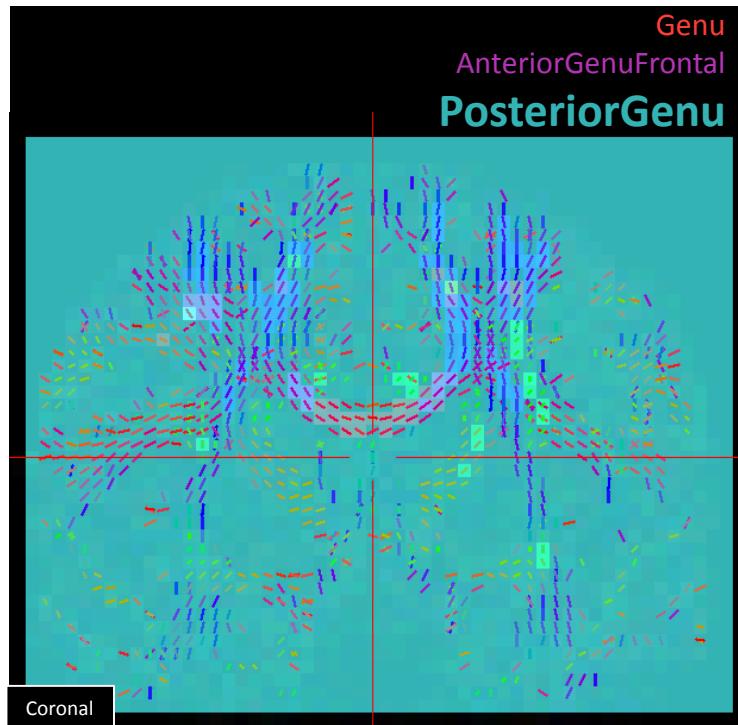
Code: PG

Tracts

ROA: Genu

ROI: SLF-A⁵

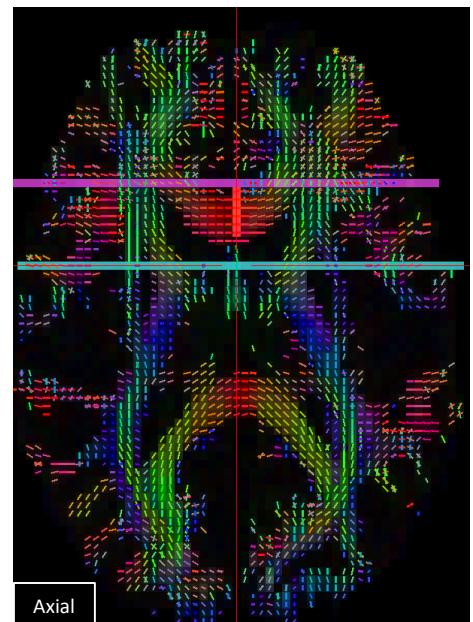
NAND¹: Body (w/ ArcuateCoronal)



Plane: Coronal, 2D

Coverage: Liberal

Purpose: Act as an ROA for the Genu against streamlines leading posteriorly



Instructions

- In a coronal slice directly posterior to the Genu region
- Highlight the entire slice

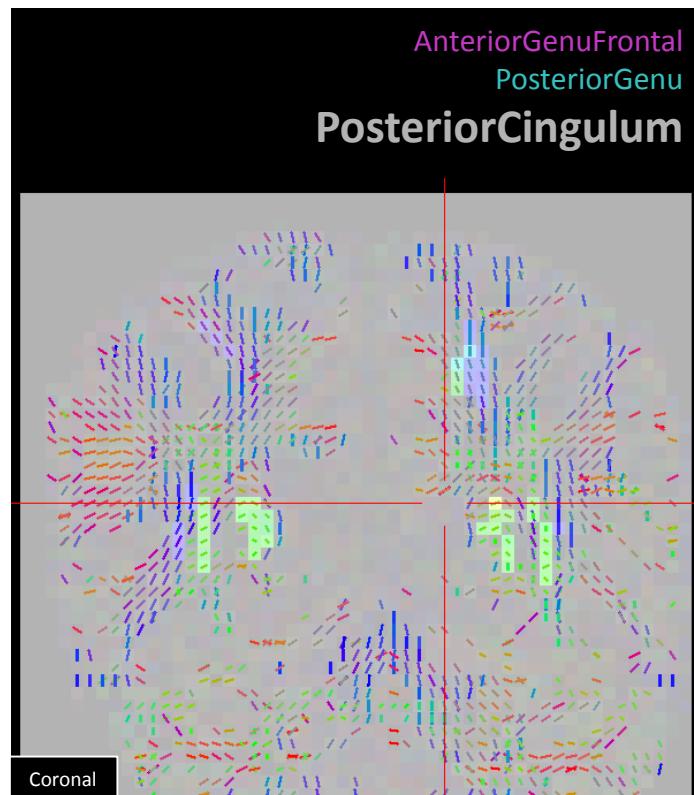
PosteriorCingulum

Code: PC

Tracts

ROI: FOF, SLF-P⁵

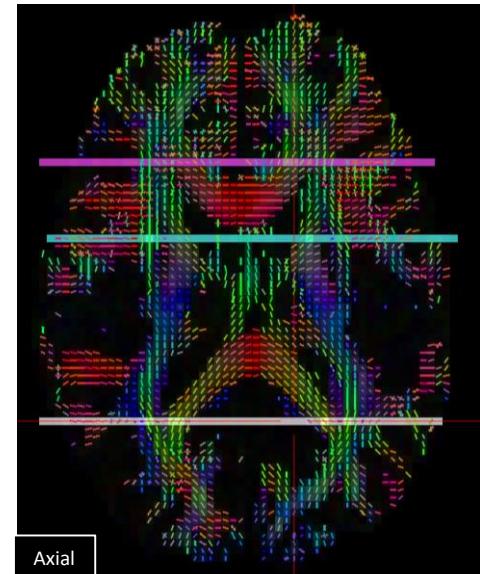
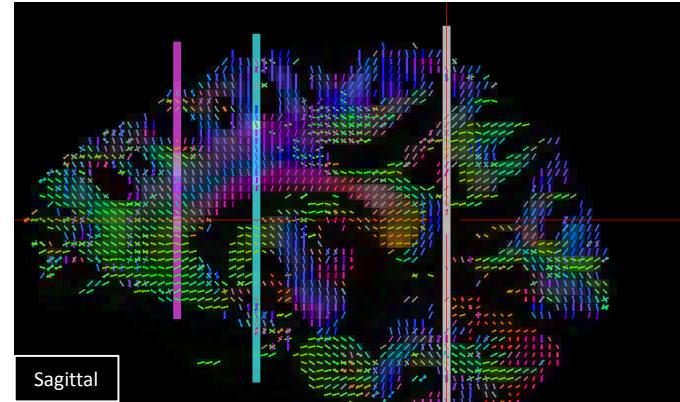
ROA: Fornix, Externak Capsule,
SLF-A, Frontal Aslant



Plane: Coronal, 2D

Coverage: Liberal

Purpose: Capture streamlines leading to the posterior end of the brain



Instructions

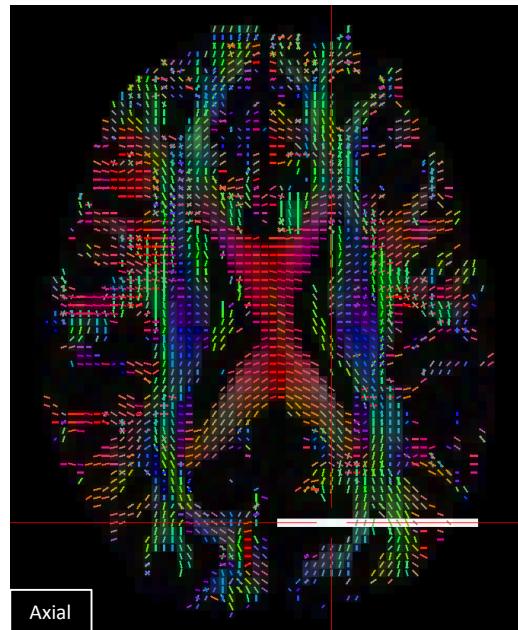
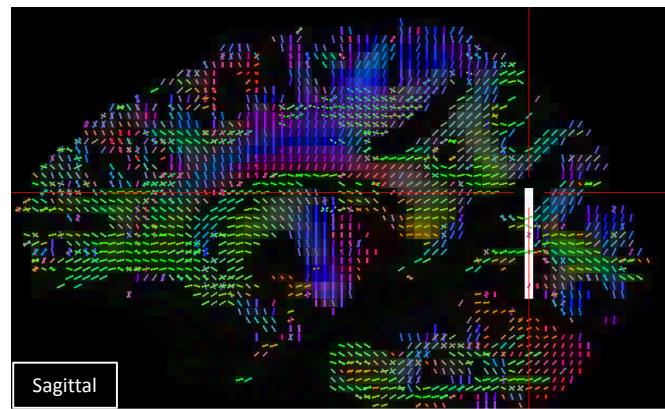
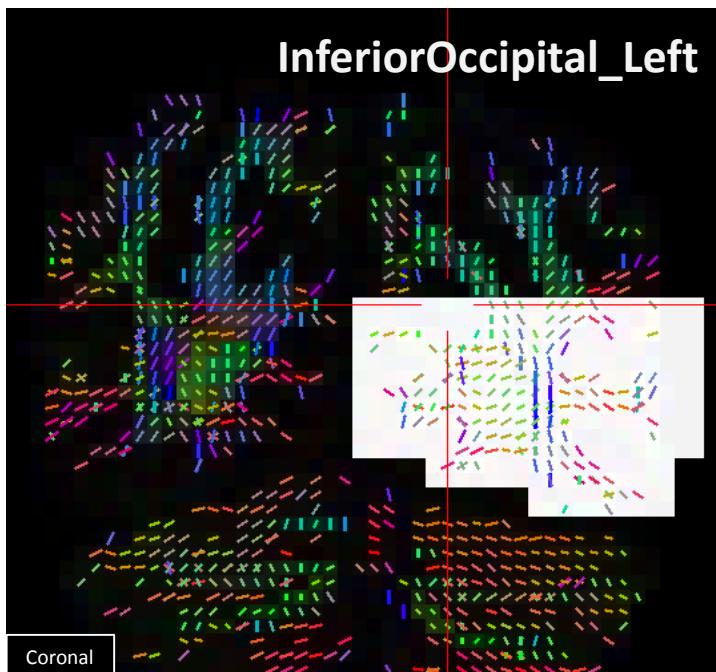
- Start by locating a mid-sagittal slice
- Move the sagittal slice slightly laterally, until the posterior descending curve of the cingulum tract is visible, posterior to the splenium
- In that view, select a coronal slice directly posterior to the cingulum tract
- In that coronal slice, highlight entire slice

InferiorOccipital_SIDE³

Code: IO

Tracts

ROI: ILF, Optic Radiations

ROA: Arcuate, SLF-A⁵, SLF-P

Plane: Coronal, 2D

Coverage: Liberal

Purpose: Capture streamlines leading to the inferior occipital cortex (mostly V1), mostly as an ROI for the ILF and Optic Radiations

Instructions

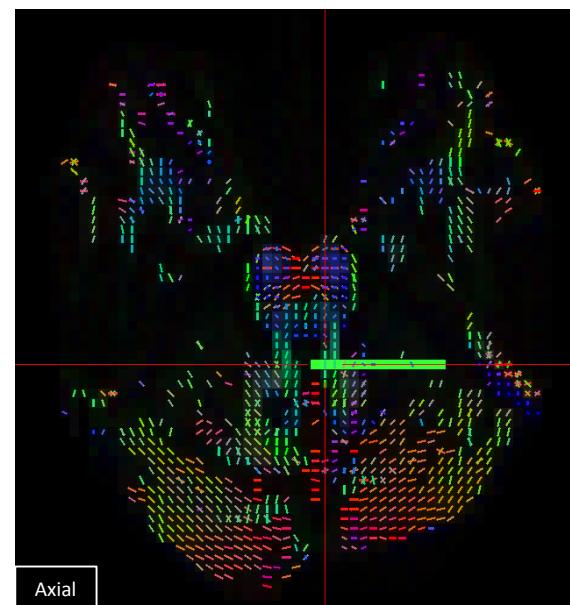
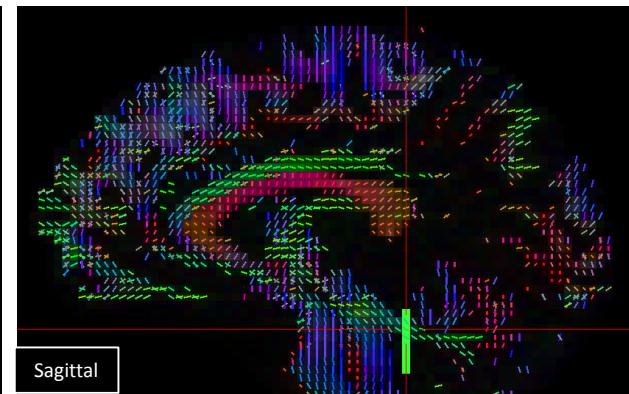
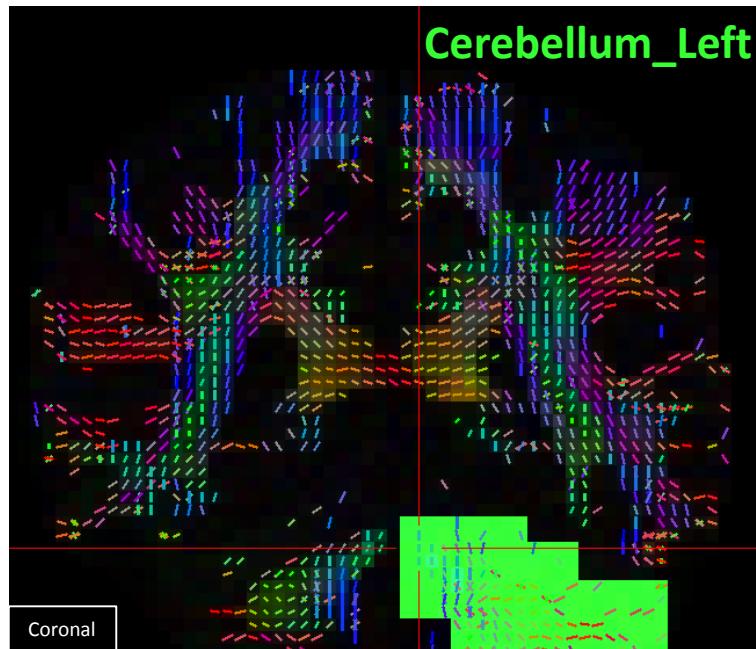
- Start at a mid-sagittal slice, and move slightly laterally to the target hemisphere until the Parieto-Occipital sulcus is visible
- Place the cross-hairs in the middle of the sulcus, halfway between the splenium and the exterior of the brain
- Switch to the coronal view
- Highlight all occipital voxels inferior to the axial slice of the crosshairs, in the respective hemisphere

Cerebellum_SIDE³

Code: Ce

Tracts

ROA: CST, FOF, ILF, Optic Radiations,
Corona Radiata (opposite), Thalamic
Radiations (opposite)



Plane: Coronal, 2D

Coverage: Liberal

Purpose: Used as an ROA to remove cerebellar streamlines from the CST

Instructions

- Start at the mid-sagittal, and move the sagittal slice slightly lateral until a definitive green bridge is visible between the brainstem and the cerebellum
- Target this bridge with the crosshairs and switch to the coronal slice
- Highlight the cerebellum voxels
- Do not highlight blue brainstem voxels, which may also appear inferior to the cerebellum depending on the brain's pitch

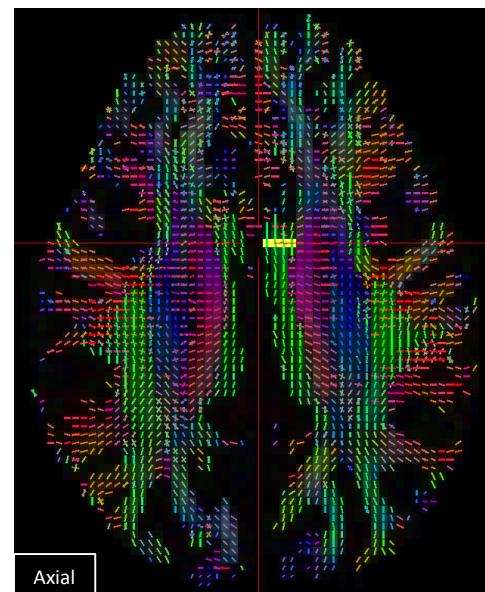
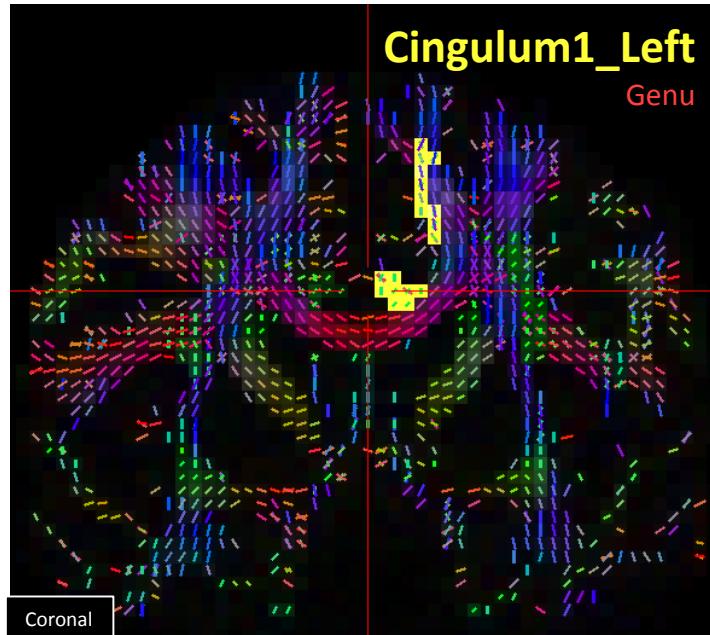
Cingulum1_SIDE³ (1 of 4)

Code: C1

Tracts

ROI: Cingulum

ROA: Optic Radiations, Fornix

NAND¹: Splenium (w/ Cingulum2)*Plane:* Coronal, 2D*Coverage:* Conservative*Purpose:* Primary ROI for the Cingulum, capturing anterior main bundle fibersInstructions

- In a coronal slice directly posterior to the Genu region
- Highlight the **green** cingulum fibers in the respective hemisphere
- Extend coverage as superior as needed
 - Include SLF-I fibers
- Do not include green fibers from the SLF-II or SLF-III
- Overlap with the corpus callosum tract or the corona radiata tract is acceptable

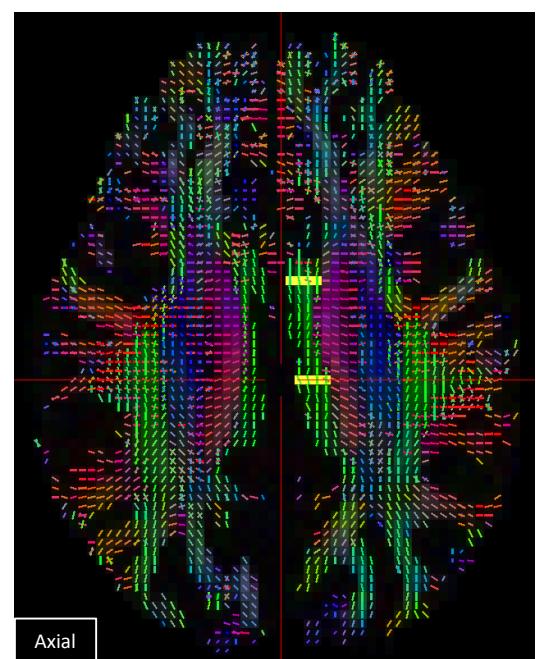
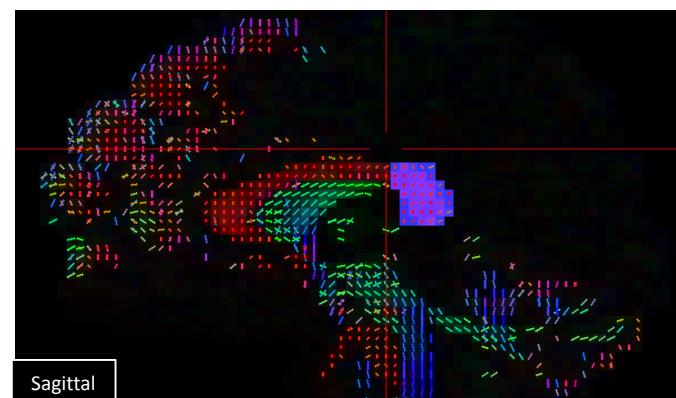
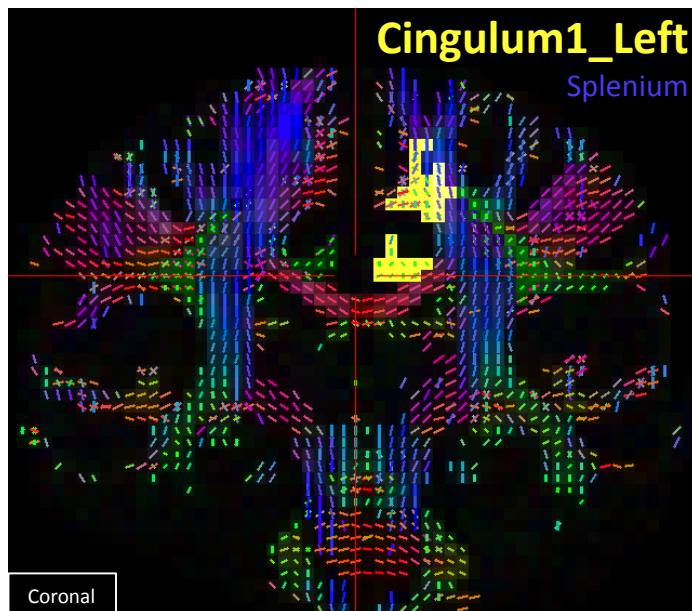
Cingulum1_SIDE³ (2 of 4)

Code: C1

Tracts

ROI: Cingulum

ROA: Optic Radiations, Fornix

NAND¹: Splenium (w/ Cingulum2)

Plane: Coronal, 2D

Coverage: Conservative

Purpose: Primary ROI for the Cingulum, capturing posterior main bundle fibers

Instructions

- In a coronal slice directly anterior to the Splenium region
- Highlight the **green** cingulum fibers in the respective hemisphere
- Extend coverage as superior as needed
 - Include SLF-I fibers
- Do not include green fibers from the SLF-II or SLF-III
- Overlap with the corpus callosum tract or the corona radiata tract is acceptable

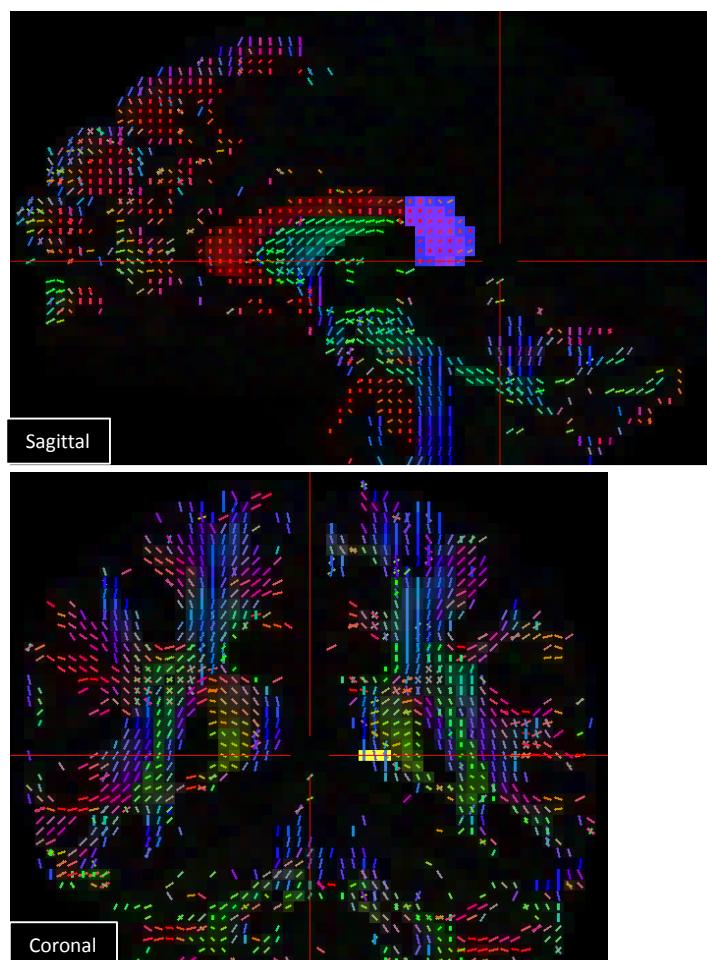
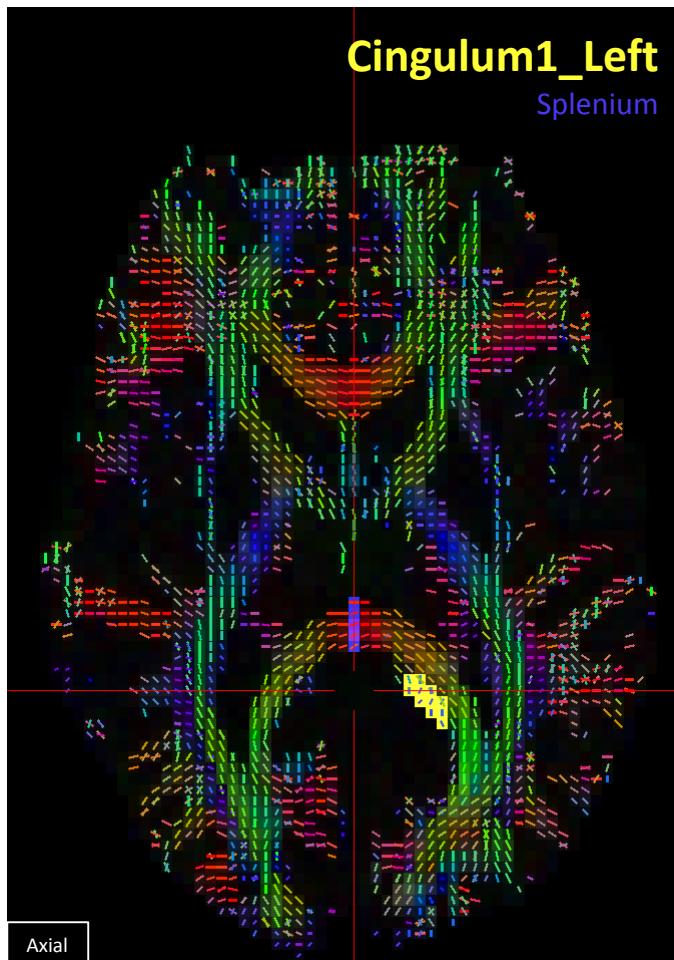
Cingulum1_SIDE³ (3 of 4)

Code: C1

Tracts

ROI: Cingulum

ROA: Optic Radiations, Fornix

NAND¹: Splenium (w/ Cingulum2)

Plane: Axial, 2D

Coverage: Conservative

Purpose: Primary ROI for the Cingulum, capturing superior descending fibers

Instructions

- In an axial slice in the inferior-most slice of the Splenium region
- Highlight the **blue** voxels of the cingulum in the respective hemisphere
- Should be along the medial edge of the forceps major

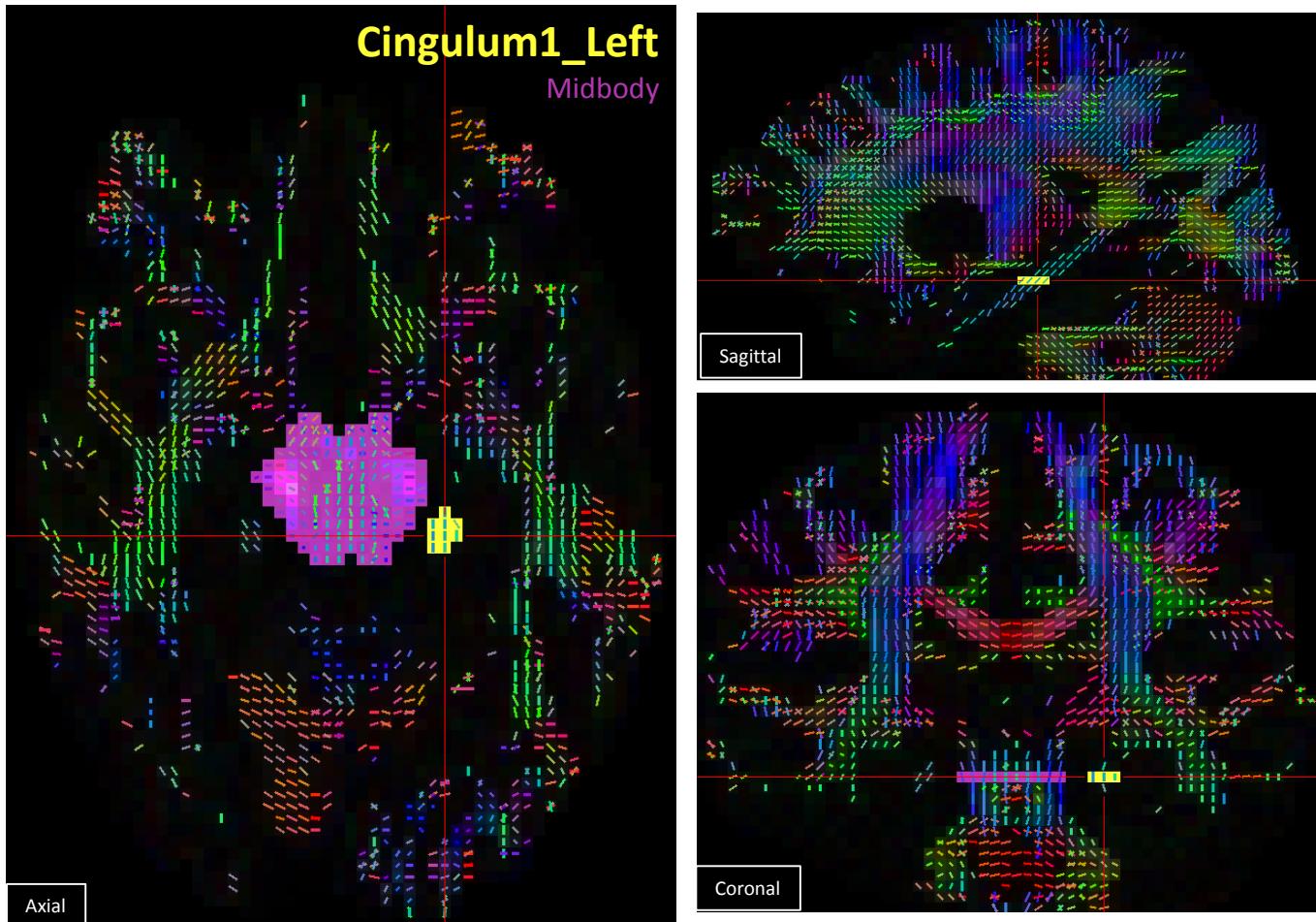
Cingulum1_SIDE³ (4 of 4)

Code: C1

Tracts

ROI: Cingulum

ROA: Optic Radiations, Fornix

NAND¹: Splenium (w/ Cingulum2)*Plane:* Axial, 2D*Coverage:* Conservative*Purpose:* Primary ROI for the Cingulum, capturing inferior descending fibers**Instructions**

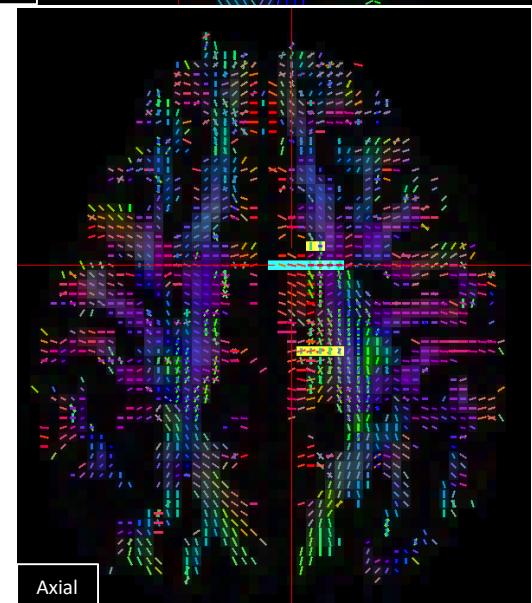
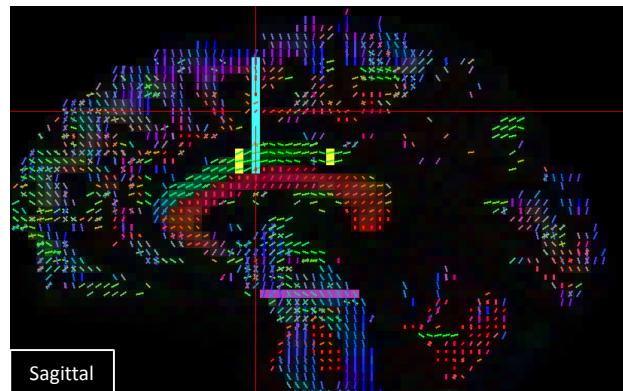
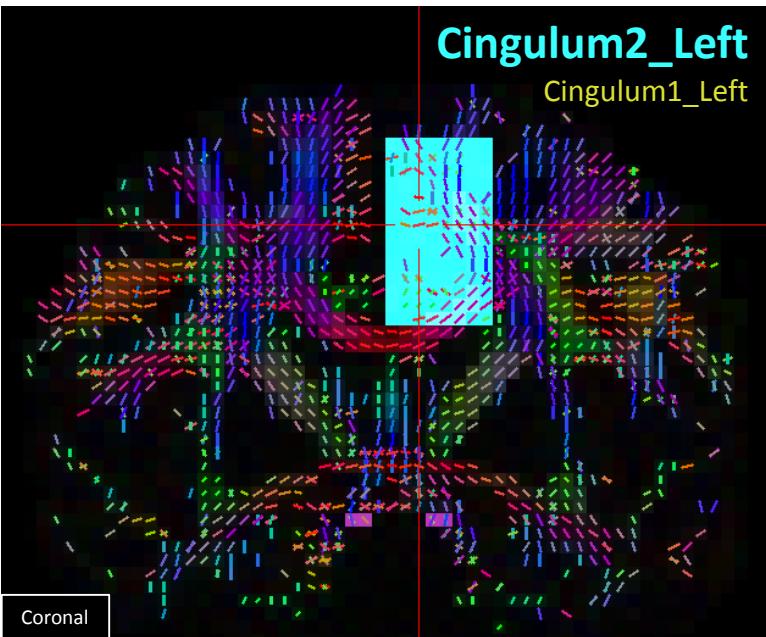
- Find an axial slice in which the cerebral peduncle is visible, between the internal capsule and middle cerebellar peduncle.
 - Same slice as the Midbody region
- Highlight the **blue-green** voxels of the Cingulum
- The Cingulum should appear directly lateral to the Midbody in this view in a small cluster of voxels
- Move the slices inferior and superior to follow the Cingulum and verify it moves anteriorly as you go inferior, and posteriorly as you go superior

Cingulum2_SIDE³ (1 of 4)

Code: C2

Tracts

ROI: Cingulum

NAND¹: Splenium (w/ Cingulum1)

Plane: Coronal, 2D

Coverage: Liberal

Purpose: Secondary ROI for the Cingulum, ensuring the fibers from the anterior main bundle are travelling in the Y direction

Instructions

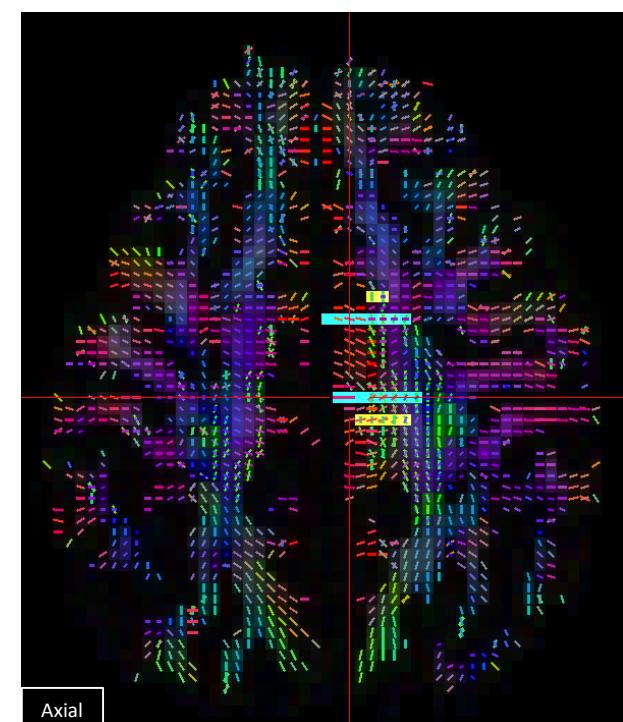
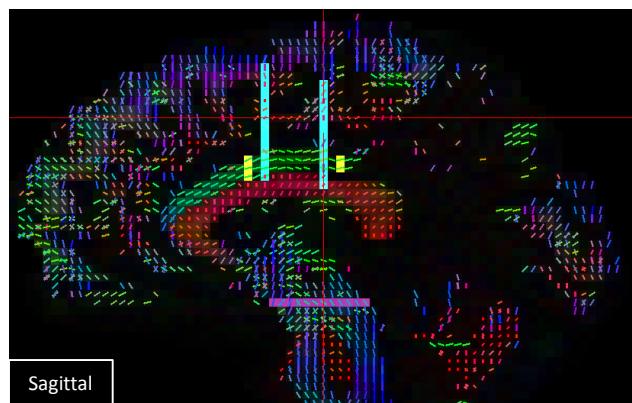
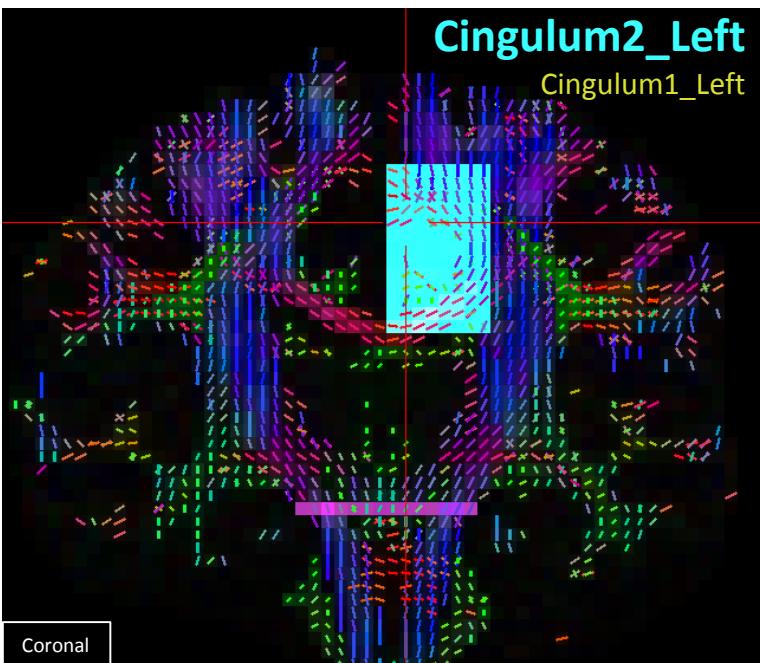
- Coronal slice 2 slices posterior to the 1st segment of Cingulum1
- In the respective hemisphere, cover the cingulum with a liberal rectangle
 - **Green** voxels along the main body of the cingulum as well as superior into the SLF-I

Cingulum2_SIDE³ (2 of 4)

Code: C2

Tracts

ROI: Cingulum

NAND¹: Splenium (w/ Cingulum1)

Plane: Coronal, 2D

Coverage: Liberal

Purpose: Secondary ROI for the Cingulum,
ensuring the fibers from the posterior main
bundle are travelling in the Y direction

Instructions

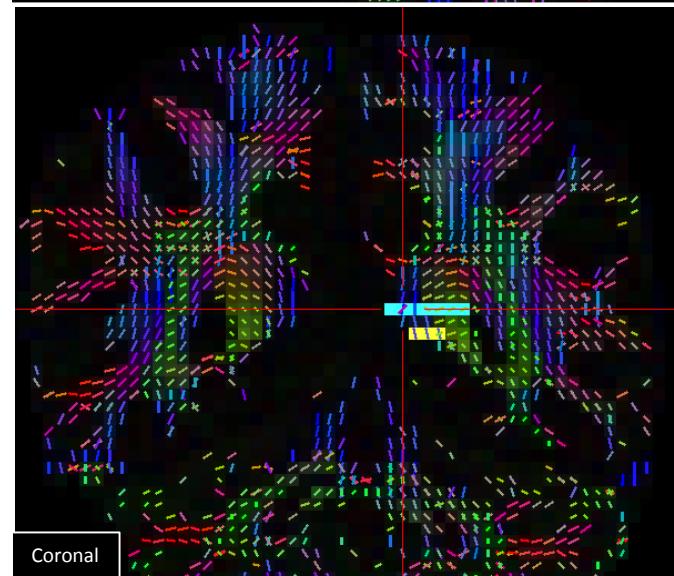
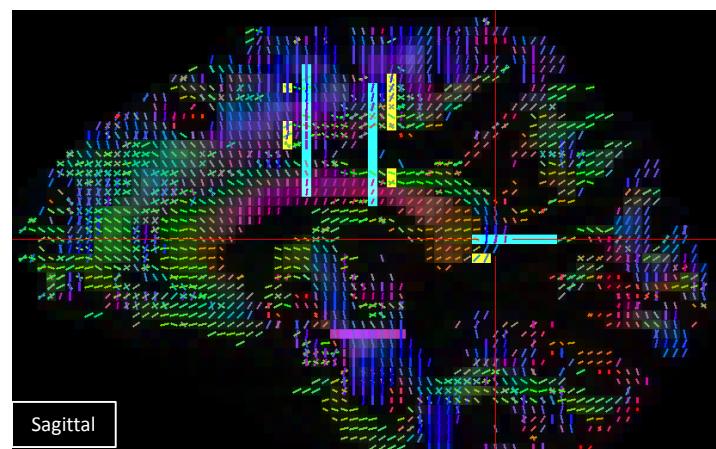
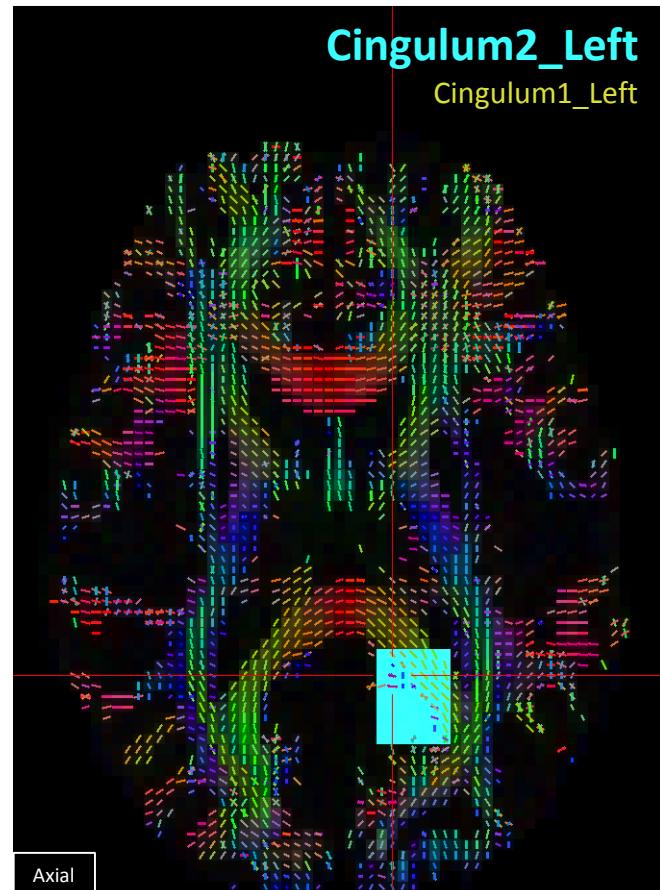
- Coronal slice 2 slices anterior to the 2nd segment of Cingulum1
- In the respective hemisphere, cover the cingulum with a liberal rectangle
 - **Green** voxels along the main body of the cingulum as well as superior into the SLF-I

Cingulum2_SIDE³ (3 of 4)

Code: C2

Tracts

ROI: Cingulum

NAND¹: Splenium (w/ Cingulum1)

Plane: Axial, 2D

Coverage: Liberal

Purpose: Secondary ROI for the Cingulum, ensuring the fibers from the superior descending bundle are travelling in the Z direction

Instructions

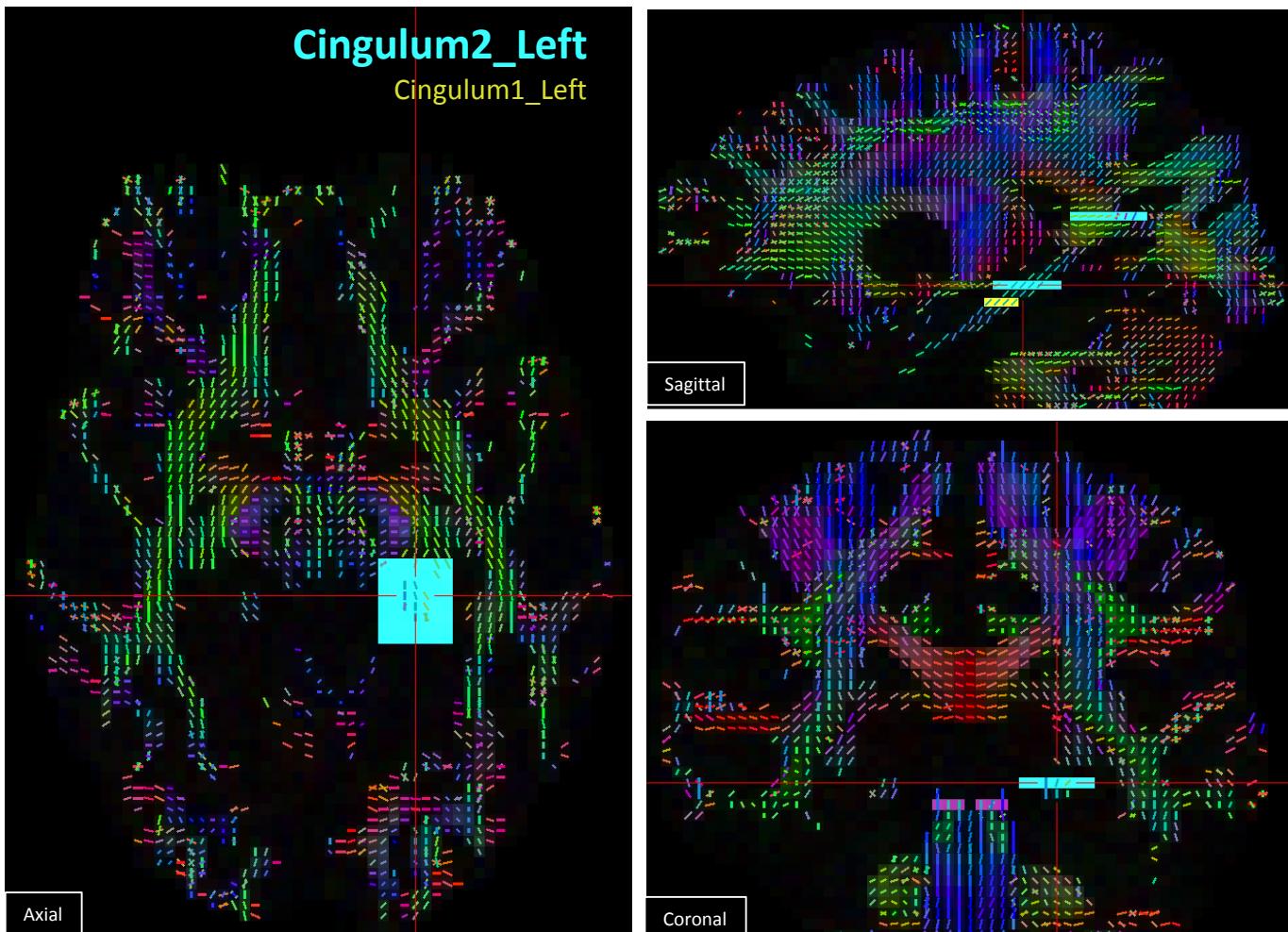
- In an axial view 2 slices superior to the 3rd segment of Cingulum1
- Highlight the **blue** cingulum fibers in a liberal rectangle

Cingulum2_SIDE³ (4 of 4)

Code: C2

Tracts

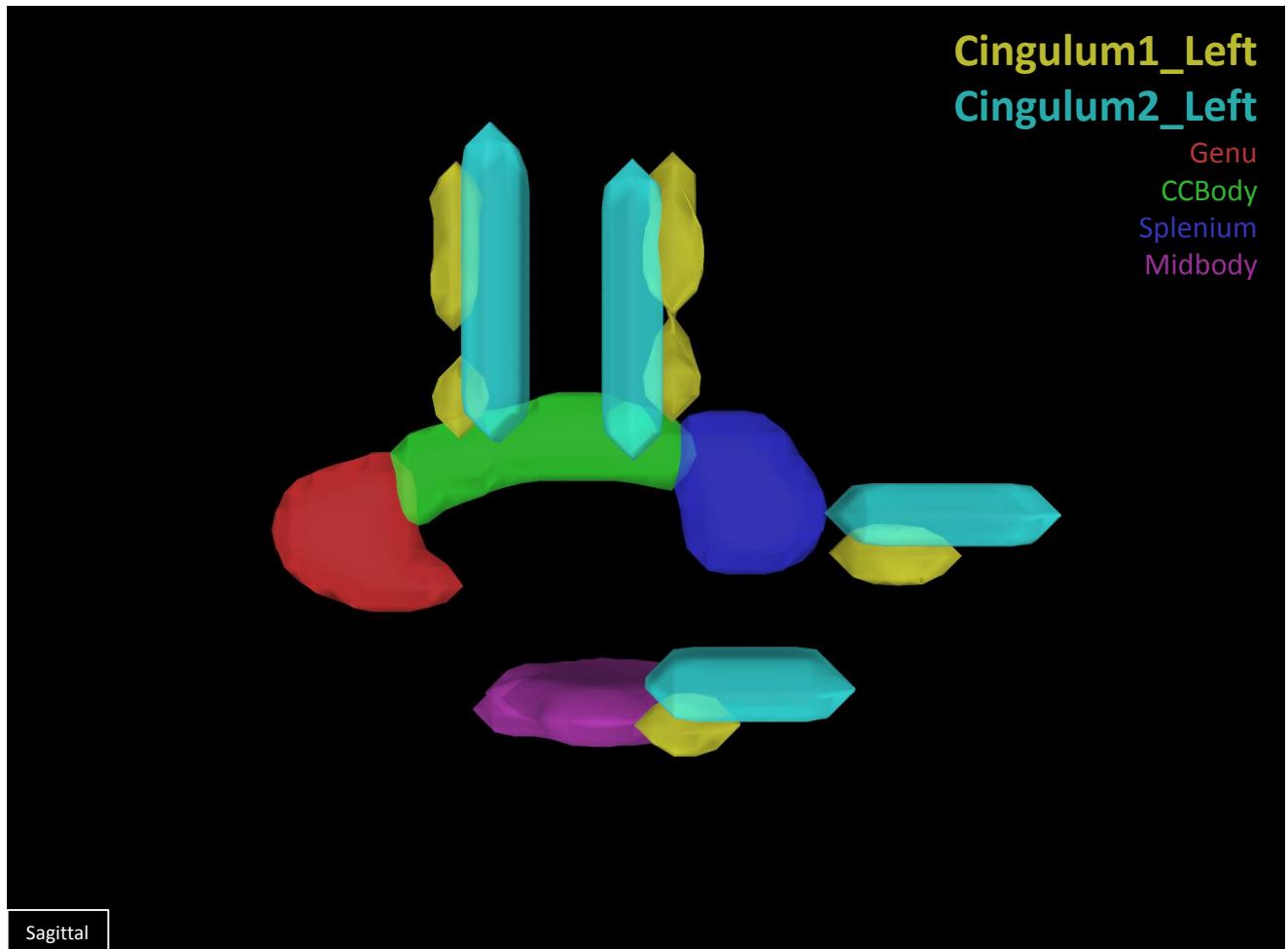
ROI: Cingulum

NAND¹: Splenium (w/ Cingulum1)**Plane:** Axial, 2D**Coverage:** Liberal**Purpose:** Secondary ROI for the Cingulum, ensuring the fibers from the superior descending bundle are travelling in the Z direction**Instructions**

- In an axial view 2 slices superior to the 4th segment of Cingulum1
- Highlight the **blue-green** cingulum fibers in a liberal rectangle

Cingulum1 and Cingulum2

3-Dimensional View



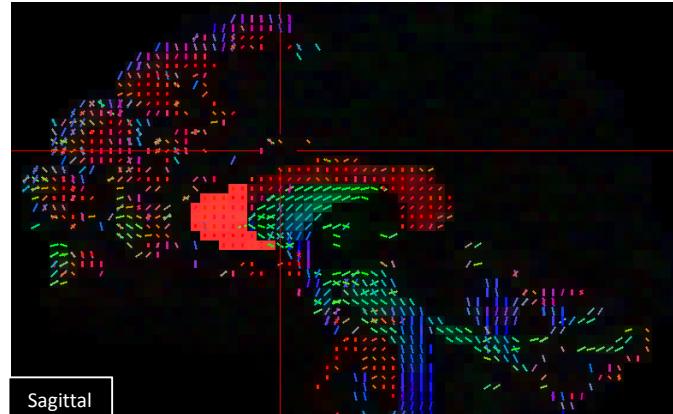
CingulumROA_SIDE³ (1 of 2)

Code: CR

TractsROA: Corona Radiata, Thalamic
Radiations, CST, External Capsule

CingulumROA_Left

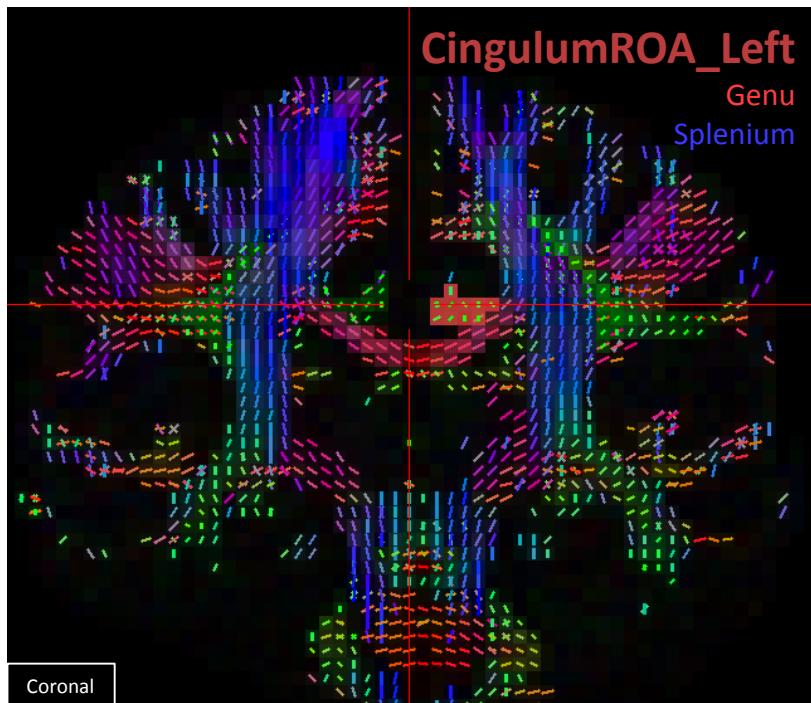
Genu

**Plane:** Coronal, 2D**Coverage:** Conservative**Purpose:** Used as an ROA against the Cingulum (anterior main bundle), that is drawn so it does not interfere with the Corona Radiata**Instructions**

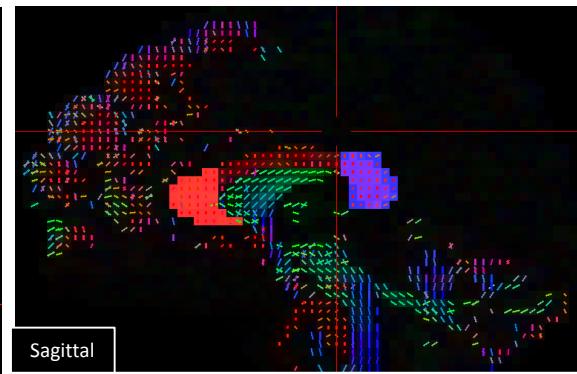
- Same slice as the 1st segment of Cingulum1
- Highlight only the **green** voxels of cingulum main body
 - Do not highlight the superior voxels
 - Do not overlap with the blue voxels of the corona radiata
 - Overlap with the corpus callosum tract is ok

CingulumROA_SIDE³ (2 of 2)

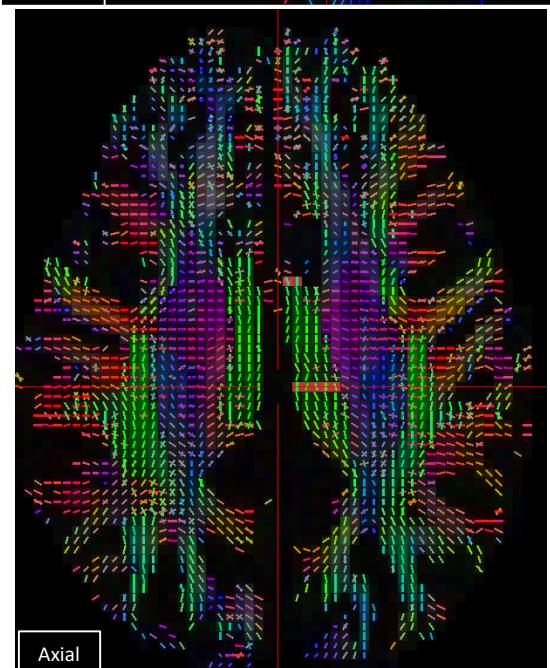
Code: CR

TractsROA: Corona Radiata, Thalamic
Radiations, CST, External Capsule

Coronal



Sagittal



Axial

Plane: Coronal, 2D*Coverage:* Conservative*Purpose:* Used as an ROA against the Cingulum (posterior main bundle), that is drawn so it does not interfere with the Corona Radiata

Instructions

- Same slice as the 2nd segment of Cingulum1
- Highlight only the **green** voxels of cingulum main body
 - Do not highlight the superior voxels
 - Do not overlap with the blue voxels of the corona radiata
 - Overlap with the corpus callosum tract is ok

UncinateCoronal_SIDE³

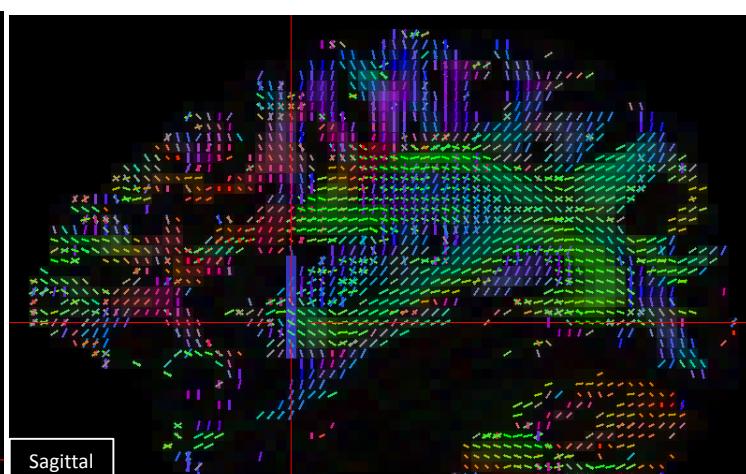
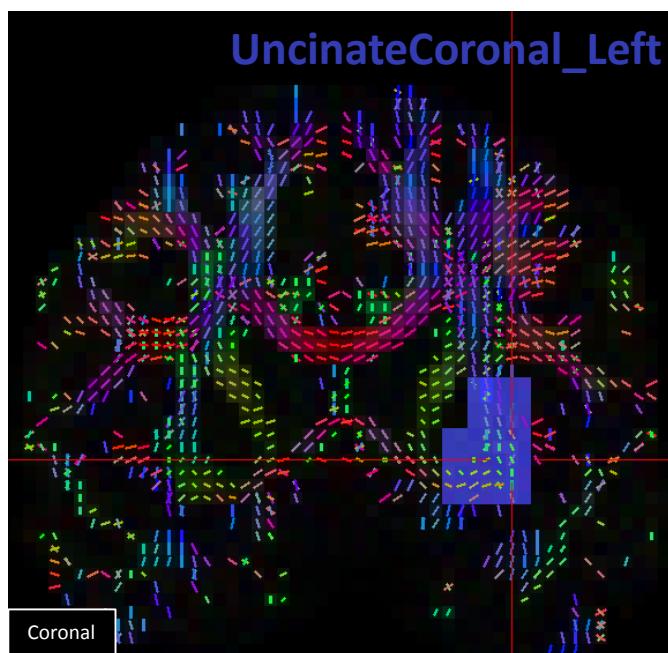
Code: UC

Tracts

ROI: Uncinate, FOF

ROA: ILF

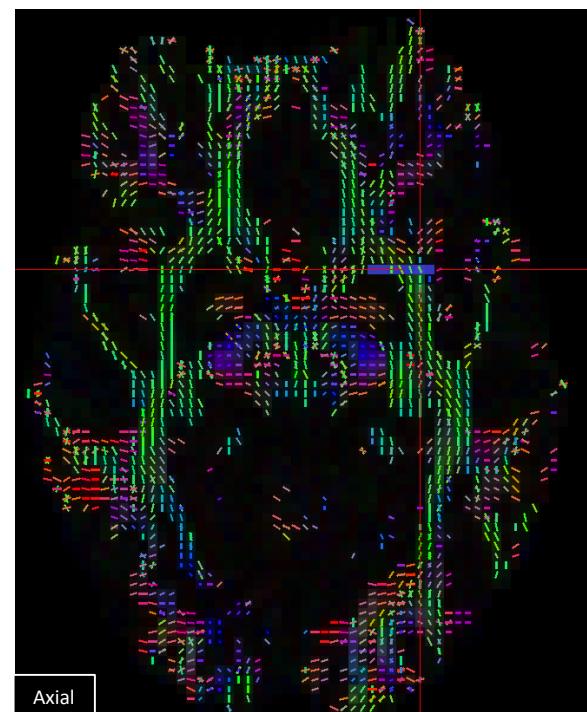
UncinateCoronal_Left



Plane: Coronal, 2D

Coverage: Liberal

Purpose: One of two ROIs for the Uncinate, as well as the FOF

Instructions

- Move the sagittal slice laterally into the target hemisphere until the “C” shaped curve of the uncinate is visible
 - You may need to adjust the slice left and right to see it
- Place the crosshairs within the superior horizontal green region (Y-direction) of the Uncinate curve so that the coronal line is fully anterior to the blue vertical descending portion
- Switch to the coronal slice, and ensure that the blue descending portion is not visible from this slice, otherwise move anterior more
- Highlight the **green** voxels at the crosshairs, extending along the lateral and inferior edges of the putamen.

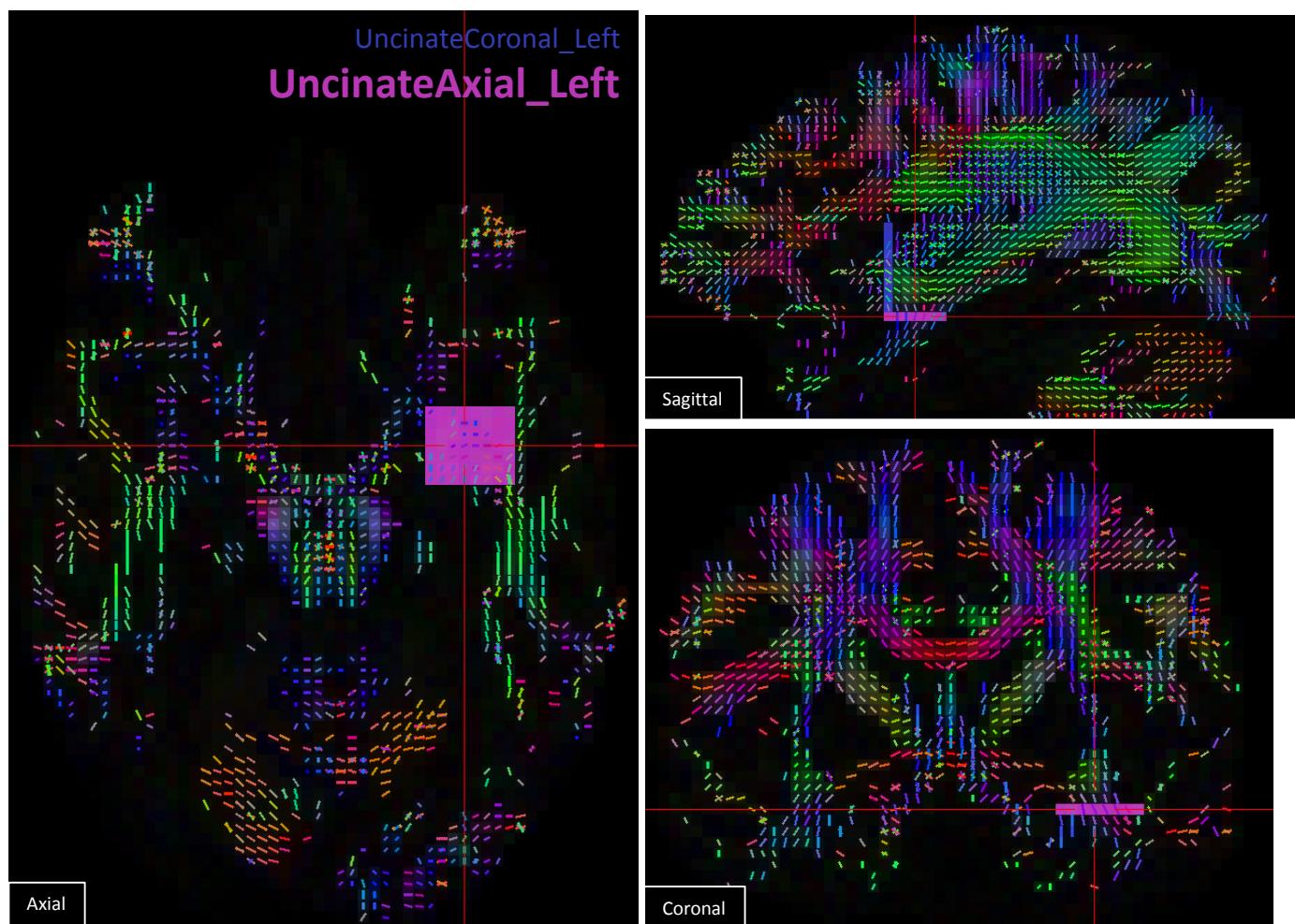
UncinateAxial_SIDE³

Code: UA

Tracts

ROI: Uncinate

ROA: ILF, External Capsule



Plane: Axial, 2D

Coverage: Liberal

Purpose: One of two ROIs for the Uncinate

Instructions

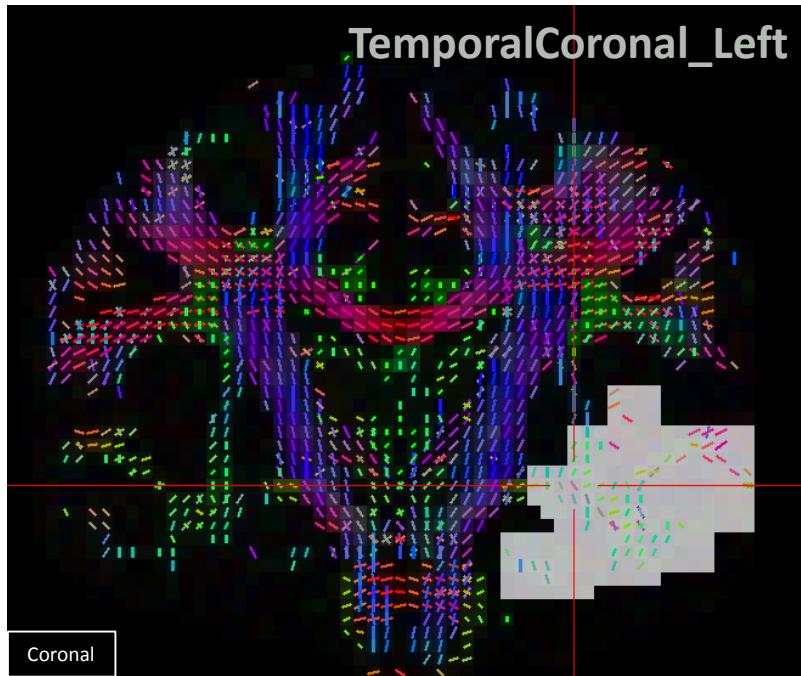
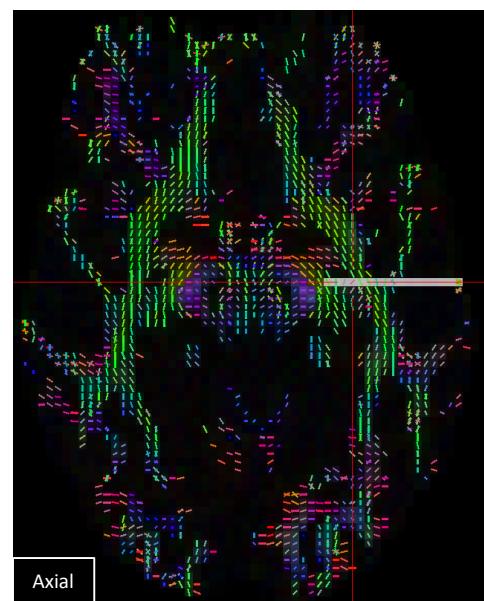
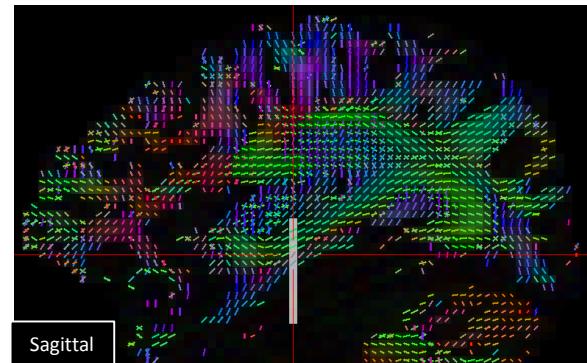
- In the same sagittal slice in which you identify the UncinateCoronal, place the crosshairs over the blue descending curve of the uncinated
- Switch to the axial view
- Highlight the **blue-purple** voxels at the center of the crosshair

TemporalCoronal_SIDE³

Code: TC

Tracts

ROI: FOF, ILF

ROA: Uncinate, Splenium, Arcuate, SLF-A⁵,
SLF-P, Corona Radiata, Thalamic
Radiations, CST, External Capsule*Plane:* Coronal, 2D*Coverage:* Liberal*Purpose:* Captures fibers passing through the temporal lobe. Immediately posterior to the Uncinate, it acts as a differentiating ROI/ROA for the FOF/Uncinate (respectively).Instructions

- Starting from the coronal slice in which the target hemisphere's UncinateCoronal is drawn, move posteriorly
 - You will observe the uncinate's horizontal (green) and vertical (blue-purple) segments merge, keep moving posteriorly
 - At the first slice in which you no longer see blue-purple voxels of the vertical segment of the uncinate, stop
 - The temporal lobe should be mostly green, and you should see the triangle shape of the putamen
- Highlight all voxels of the temporal lobe in the target hemisphere, extend medially up to the internal capsule
 - Extend into the external capsule only so far as the voxels remain green and not blue

InternalCapsule_SIDE³

Code: In

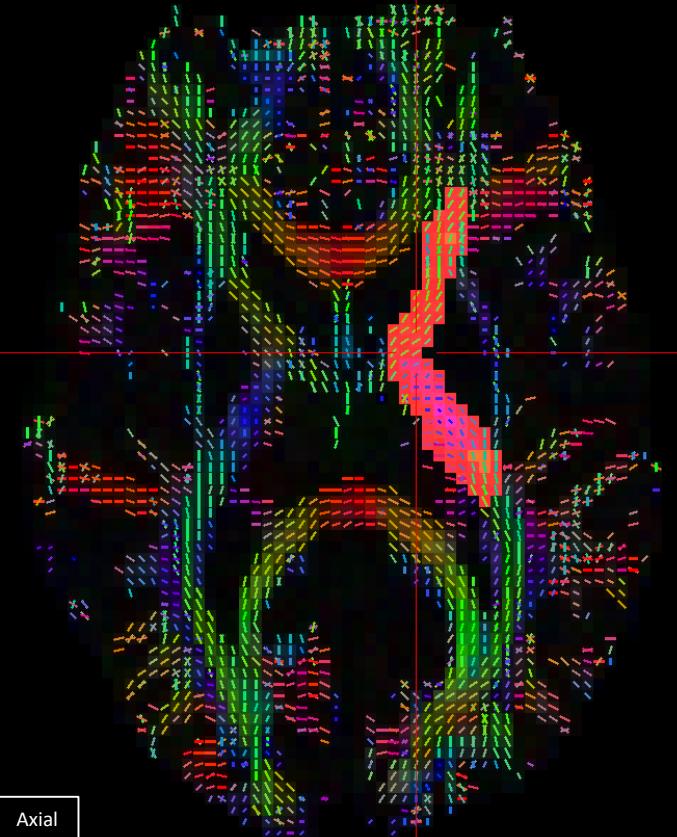
Tracts

ROI: Corona Radiata, CST, Thalamic Radiations

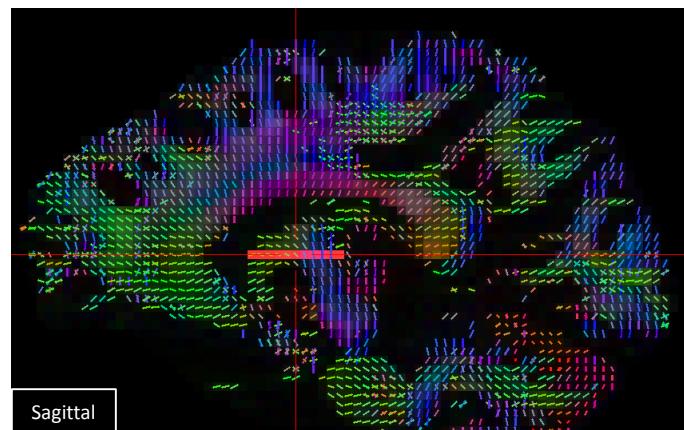
ROA: External Capsule, Arcuate, Genu, SLF-A⁵,

SLF-P, Corona Radiata (opposite), Thalamic Radiations (opposite), CST (opposite)

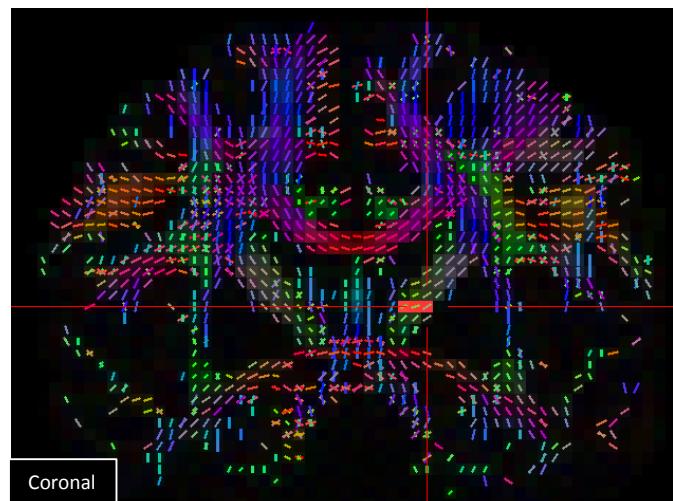
InternalCapsule_Left



Axial



Sagittal



Coronal

Plane: Axial, 2D

Coverage: Conservative

Purpose: Sole ROI for the Corona Radiata

Instructions

- Locate an axial slice displaying the target hemisphere's internal and external capsule separated by the putamen, in a "X" surrounded by "(" shape, like (X)
- Highlight the hemisphere's internal capsule
 - Anteriorly, cover all green voxels of the anterior limb, but do not extend into the flow of the forceps minor
 - Posteriorly, cover up to the bottleneck observed shortly posterior to the connection of the internal and external capsule
- At the border of the internal and external capsule, green fibers belong to the internal capsule, blue to the external

ExternalCapsule_SIDE³

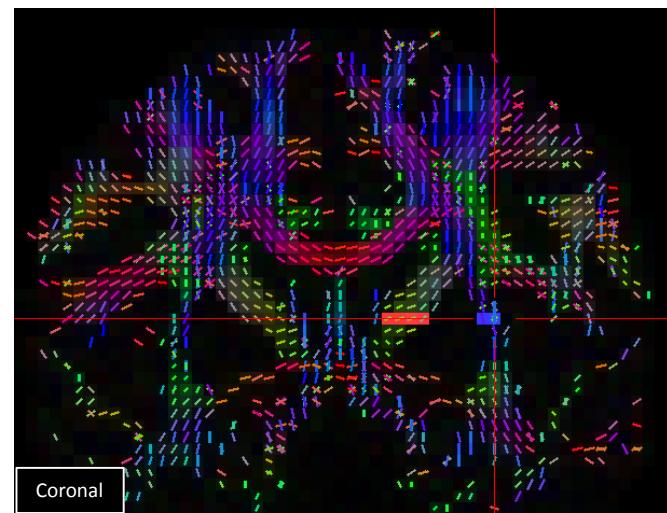
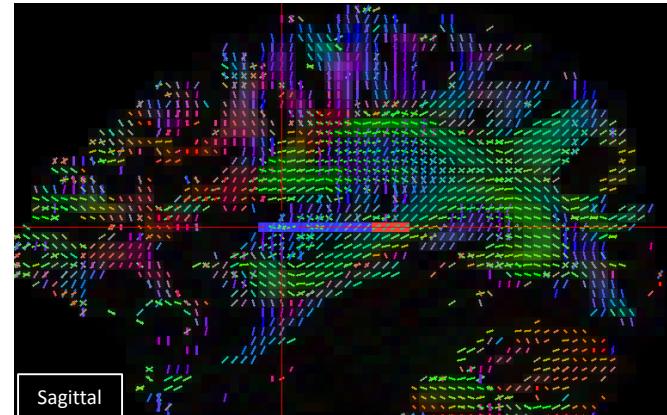
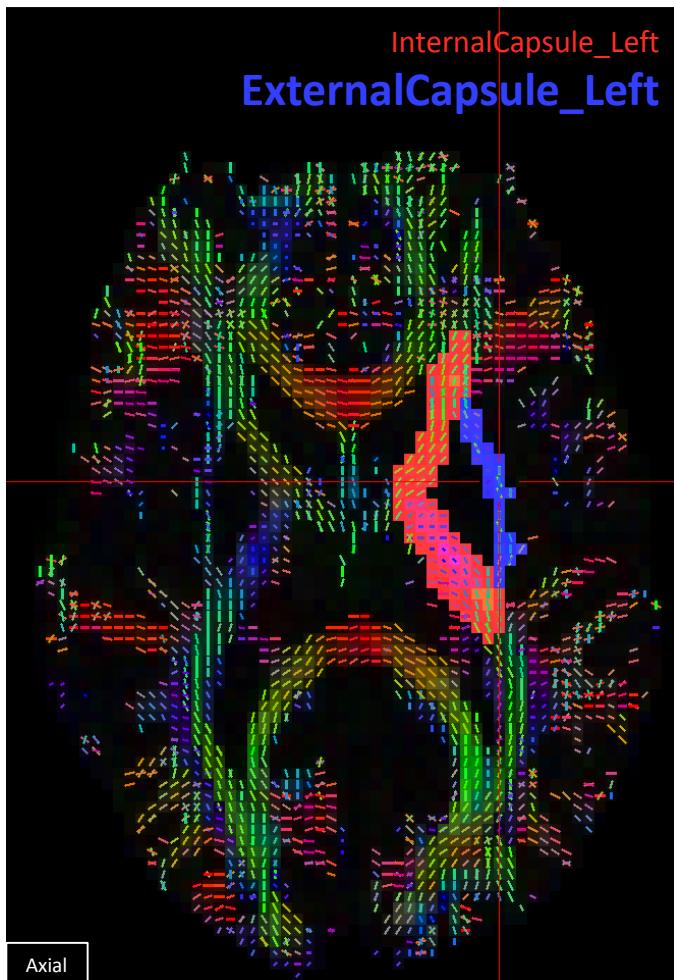
Code: Ex

Tracts

ROI: External Capsule

ROA: Corona Radiata, Arcuate, ILF,

Thalamic Radiations, CST, SLF-A⁵, SLF-P



Plane: Axial, 2D

Coverage: Conservative

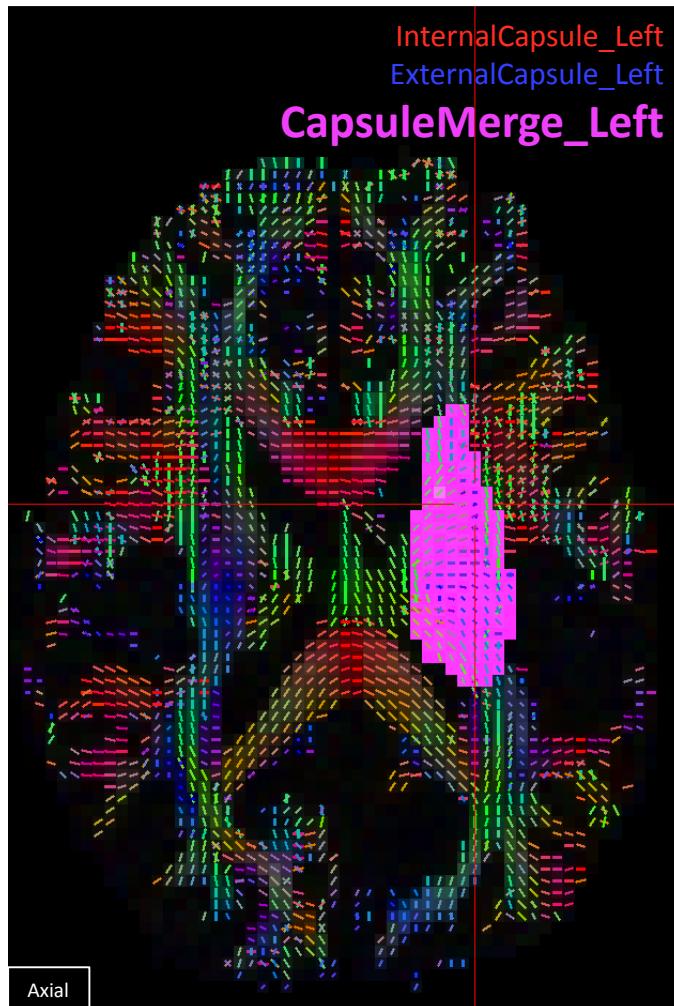
Purpose: Primary ROI for the External Capsule tract, ROA for several other tracts

Instructions

- Locate the same axial slice as the Internal Capsule region
- Locate the narrow band of diffusion data laterally linking the anterior and posterior limbs of the internal capsule
- Highlight the **green-blue** voxels of the external capsule region
- This region is mutually exclusive with the Internal Capsule region, do not overlap voxels between these regions
 - Green voxels in the anterior and posterior limb should belong to the Internal Capsule region, blue to the external

CapsuleMerge_SIDE³

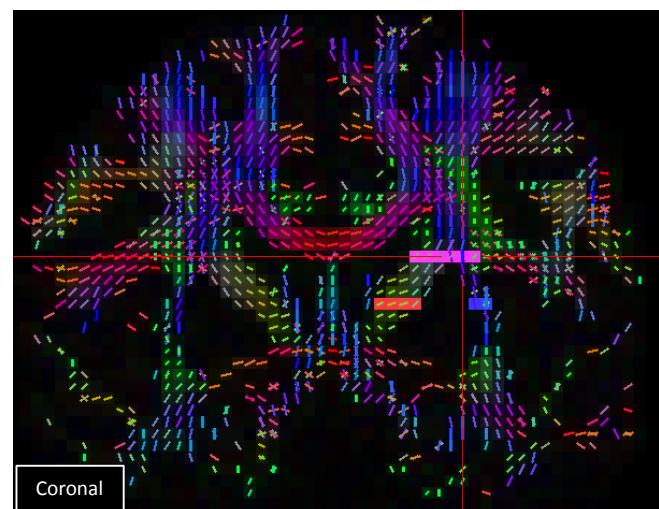
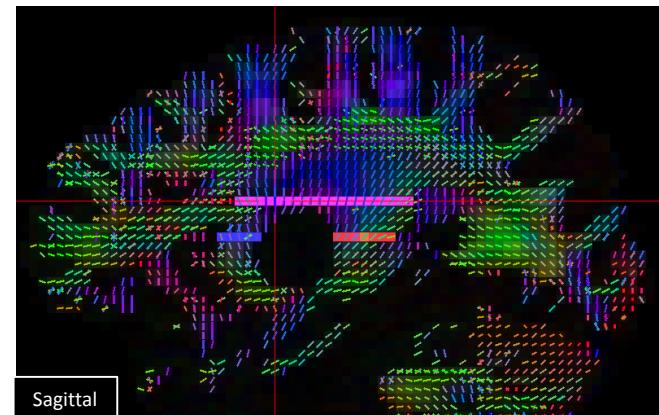
Code: CM



Tracts

ROI: External Capsule

ROA: Body, Cingulum, Frontal Aslant



Plane: Axial, 2D

Coverage: Moderate

Purpose: Secondary ROI for the External Capsule, ROA against Internal/External Capsule streamlines for other tracts

Instructions

- Start at the axial slice of the internal/external capsule
- Move superiorly until the internal and external capsule merge in the target hemisphere
- Not including red voxels, highlight the **blue-green** voxels of the merged capsules
- There will be bottle necks anterior and posterior to this merger, stop there
- Make sure this regions is at least 2 above the Internal/External Capsule, otherwise move superior more

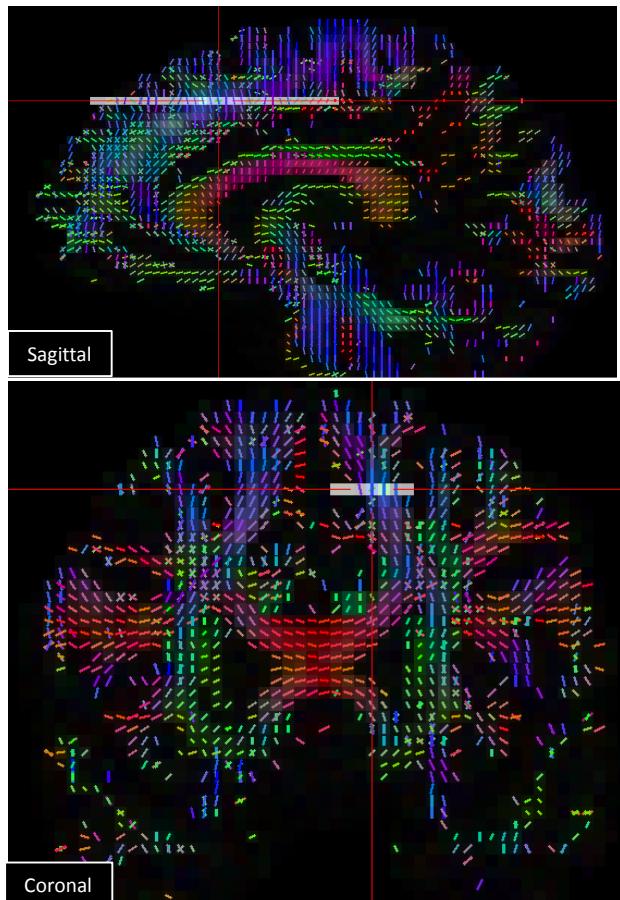
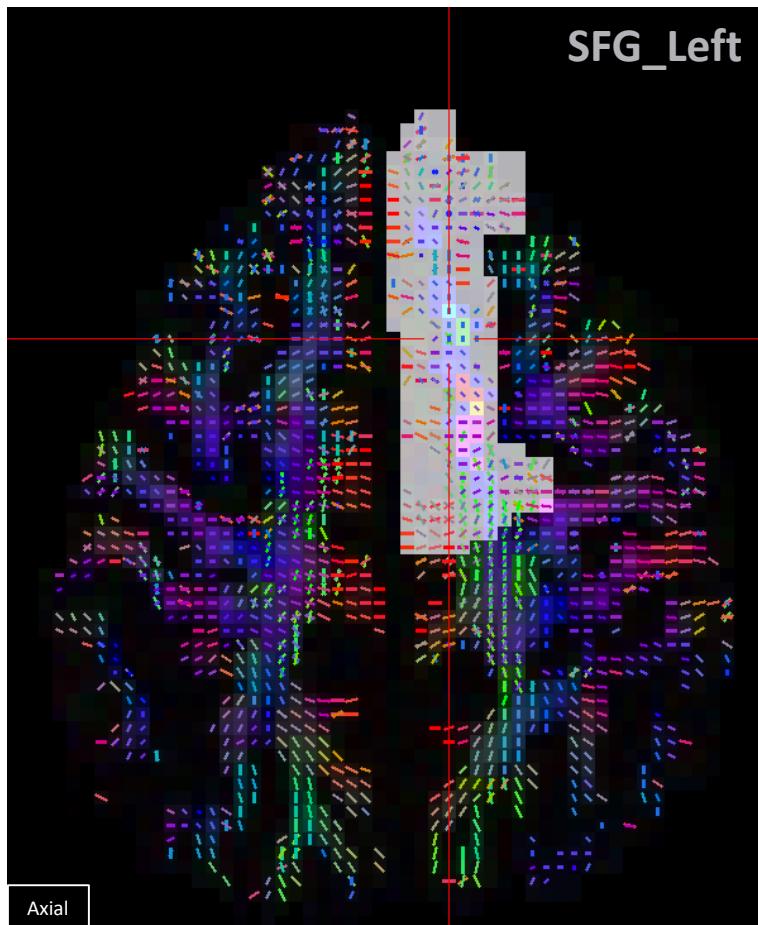
SFG_SIDE³ (1 of 2)

Code: SF

Tracts

ROA: Arcuate, Splenium, Uncinate

ROI: Frontal Aslant



Plane: Axial, 2D

Coverage: Liberal

Purpose: ROA against fibers going to the Superior Frontal Gyrus

Instructions

- Start with an axial slice around the CapsuleMerge region
- Move the slice superiorly until the superior frontal gyrus appears distinctly from other gyri in the target hemisphere
- Highlight the SFG in that hemisphere, going posteriorly up to the precentral gyrus

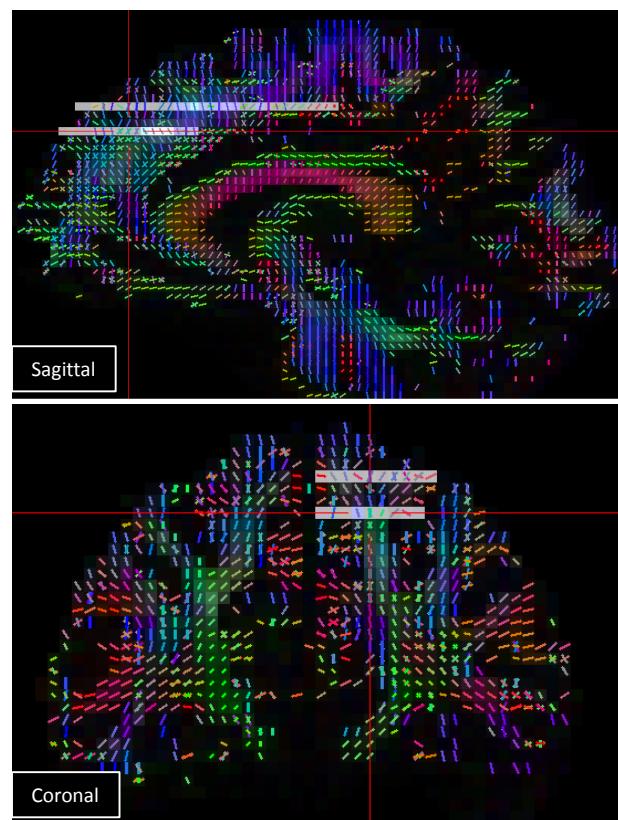
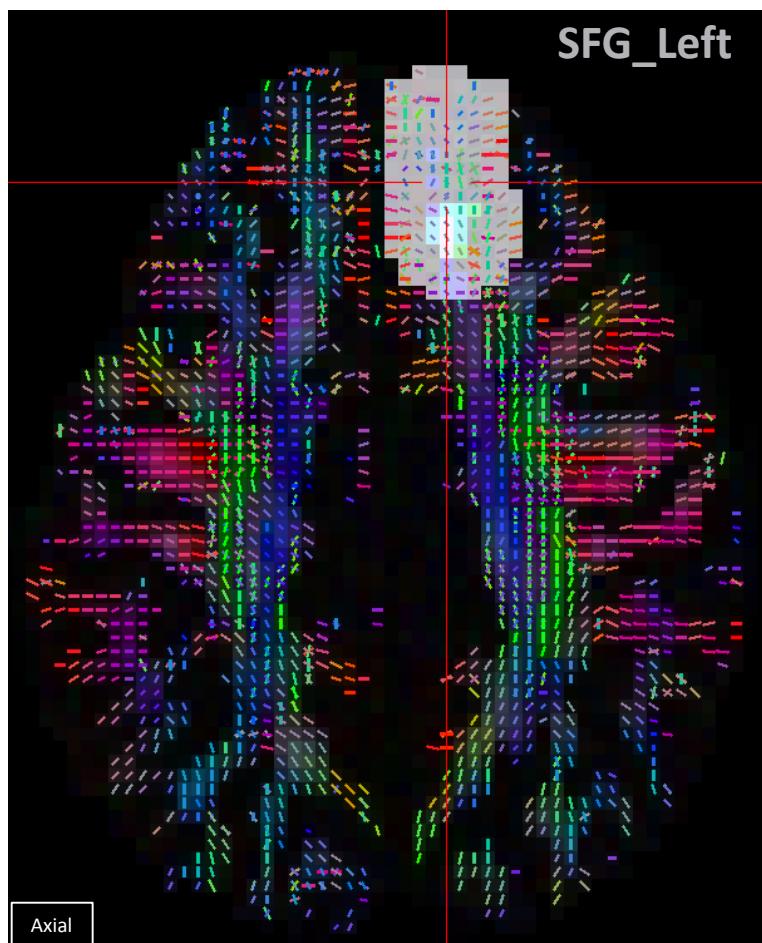
SFG SIDE³ (2 of 2)

Code: SF

Tracts

ROA: Arcuate, Splenium, Uncinate

ROI: Frontal Aslant

*Plane:* Axial, 2D*Coverage:* Liberal*Purpose:* Because the Superior Frontal Gyrus is a curved structure, this second portion must be placed more inferior to the first to capture the anterior segment of the SFGInstructions

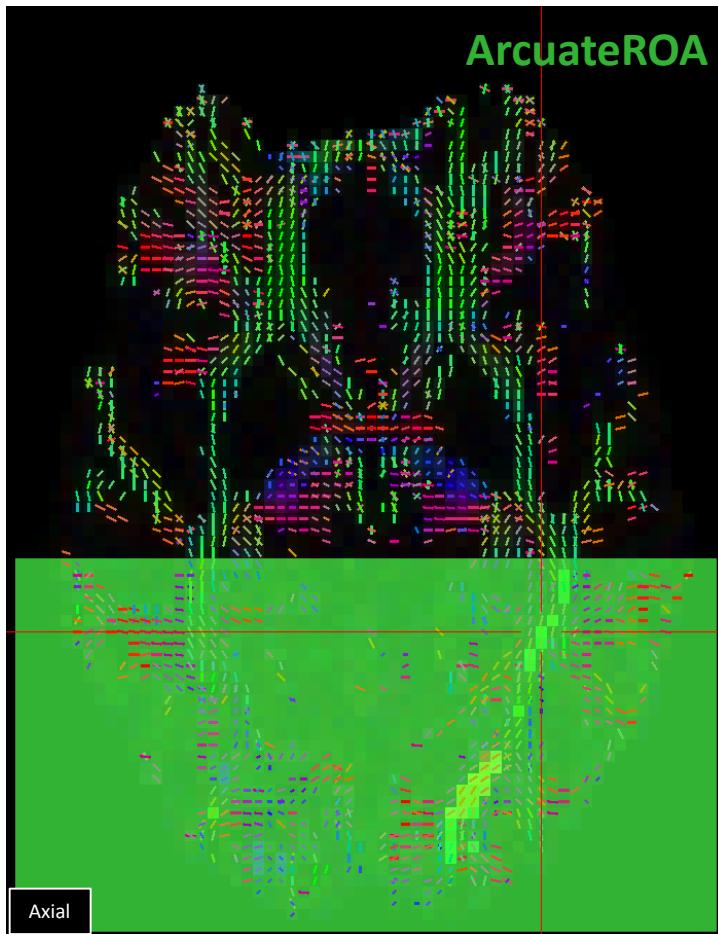
- Axial slice 3 slices inferior to the 1st part of the SFG region for the target hemisphere
- Highlight the anterior portion of the SFG, taking it posteriorly to the first natural bottleneck

ArcuateROA

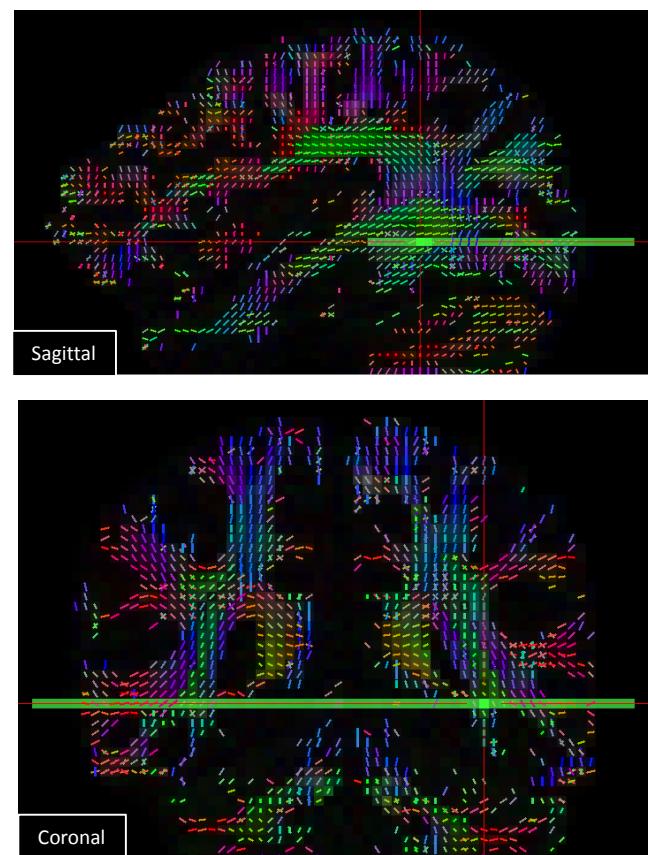
Code: Ar

Tracts

ROA: Corona Radiata, Thalamic Radiations, CST, External Capsule, Body, SLF-A⁵, SLF-P



Axial



Plane: Axial, 2D

Coverage: Liberal

Purpose: ROA to help remove some (mostly posterior) arcuate streamlines from various tracts, drawn so it does not interfere with Capsule tracts

Instructions

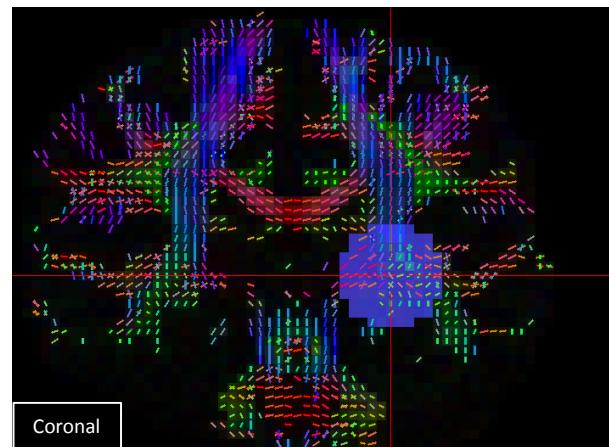
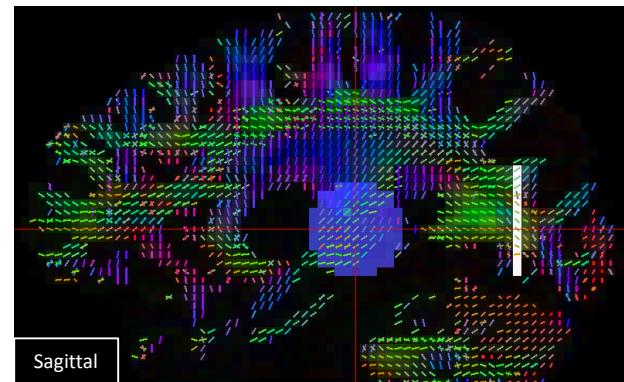
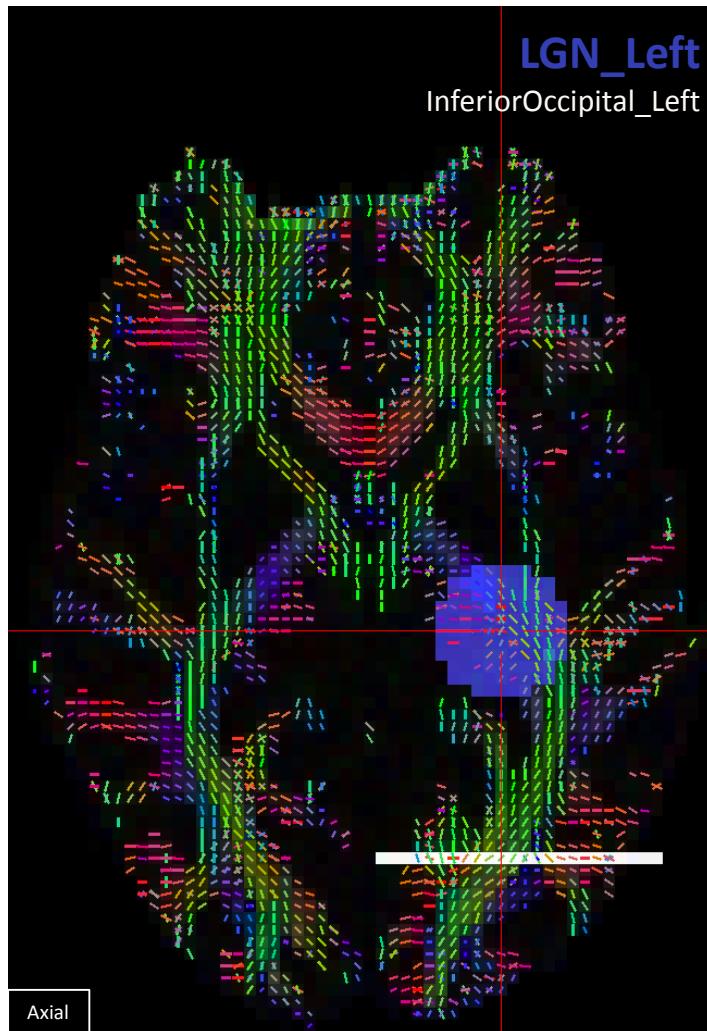
- Start from an axial slice showing the Internal/External Capsule regions
- Move inferior until a significant portion of the posterior limb of the internal capsule becomes red and the posterior border flattens out into a relatively straight line
- Highlight a large rectangle posterior to the posterior limb, at least 2 voxels behind posterior border of the posterior limb in each hemisphere

LGN SIDE³

Code: LG

Tracts

END: Optic Radiations



Plane: Axial, 3D

Coverage: Liberal

Purpose: A large, 3-dimensional sphere to serve as an endpoint ROI around the Lateral Geniculate Nucleus for the Optic Radiations

Instructions

- In an axial slice, near the slice for the ArcuateROA, locate the **red** fibers just posterior to the posterior limb of the internal capsule
- Look for the “hook” of Meyer’s Loop
- Place a 3-dimensional sphere region over the endpoints of the red Meyer’s Loop voxels, large enough to accommodate for reasonable uncertainty

Midbody

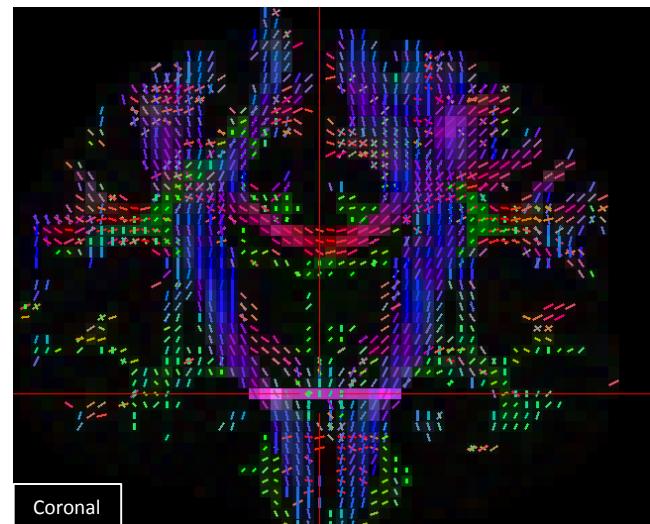
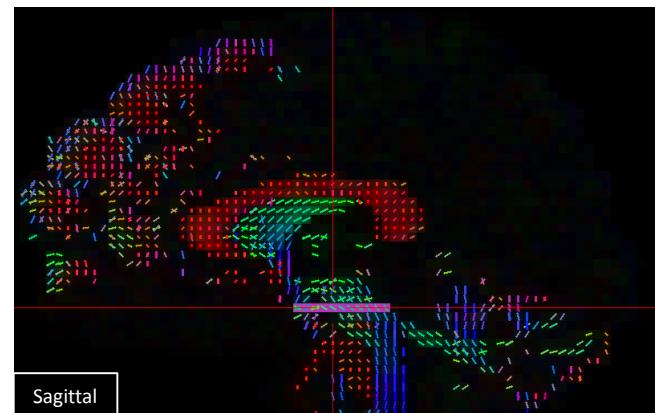
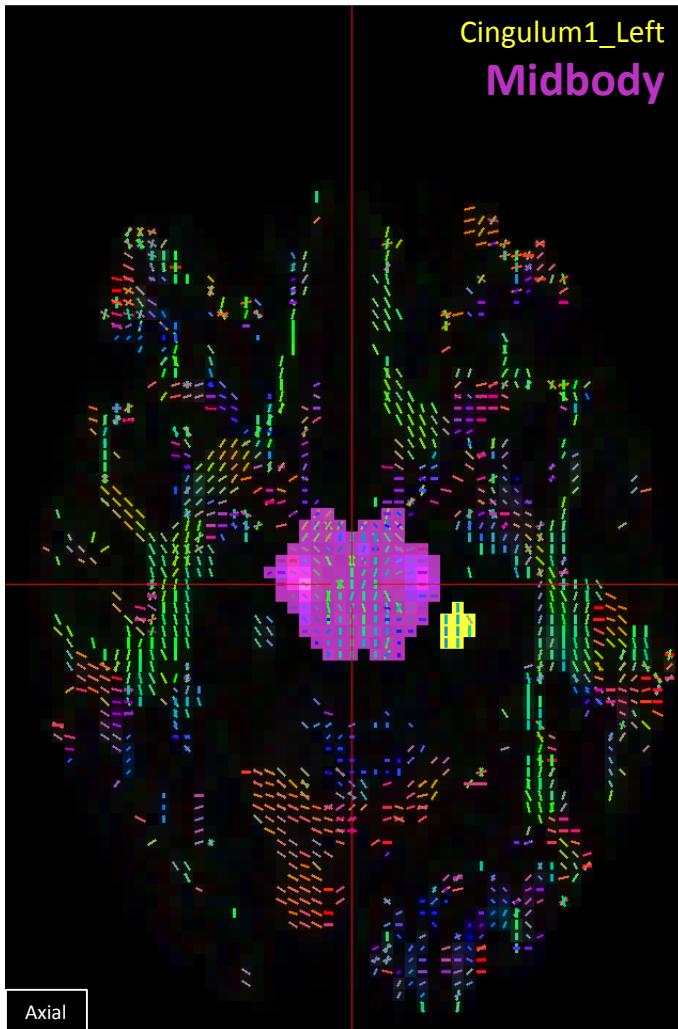
Code: Mb

Tracts

ROA: Thalamic Radiations, Body, Splenium, Fornix, FOF, ILF, Arcuate,

SLF-A⁵, SLF-P, Cingulum, Optic Radiations, Frontal Aslant

ROI: CST



Plane: Axial, 2D

Coverage: Conservative

Purpose: ROA against streamlines entering the brainstem, used for most tracts

Instructions

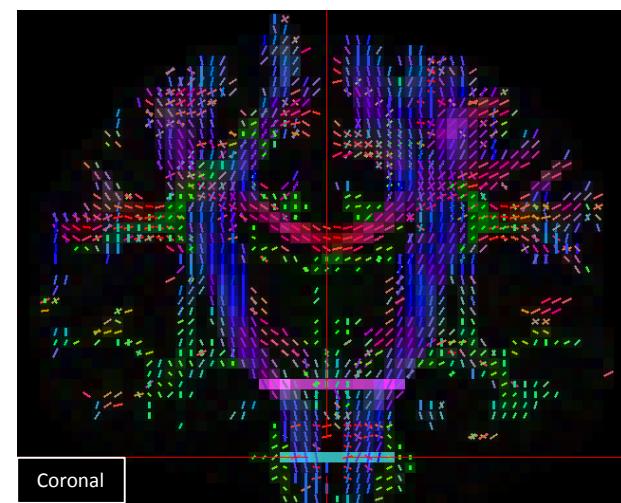
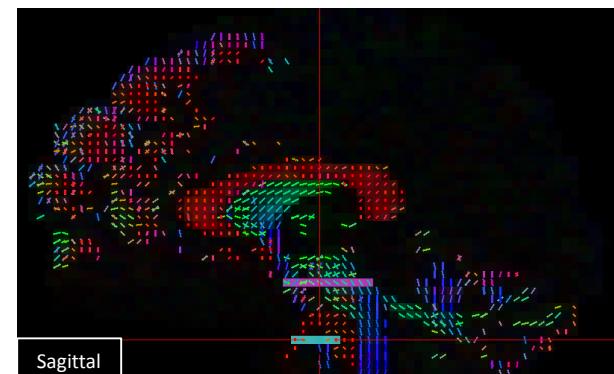
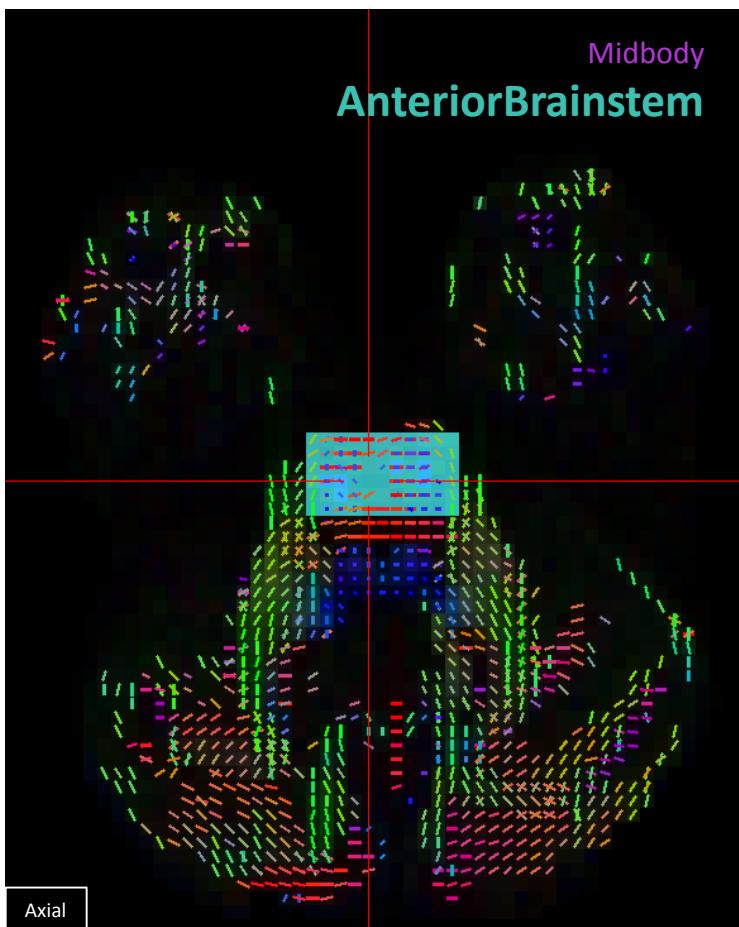
- Find an axial slice in which the cerebral peduncle is visible, between the internal capsule and middle cerebellar peduncle.
 - Same slice as the 4th segment of the Cingulum1 region
- Highlight the brainstem voxels
- Be mindful of the cingulum voxels nearby, do not highlight these

AnteriorBrainstem

Code: AB

Tracts

ROI: CST



Plane: Axial, 2D

Coverage: Liberal

Purpose: Additional ROI for the CST to select for the anterior brainstem pathway

Instructions

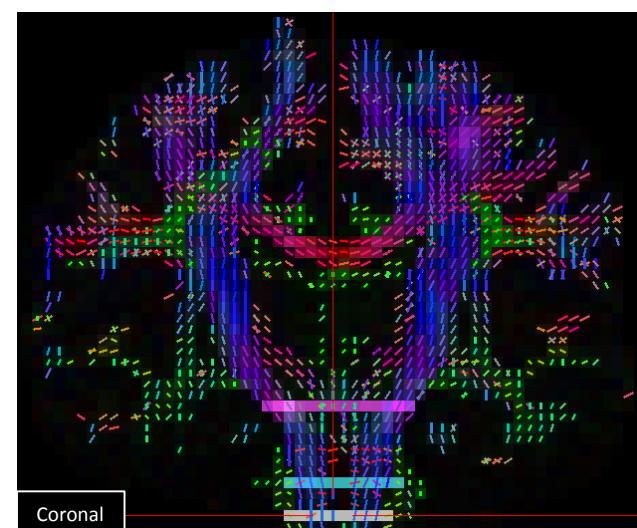
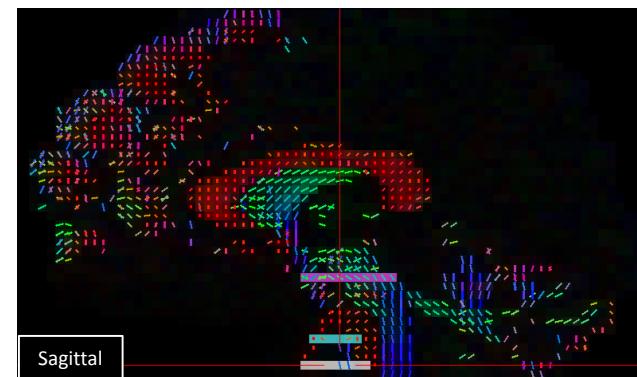
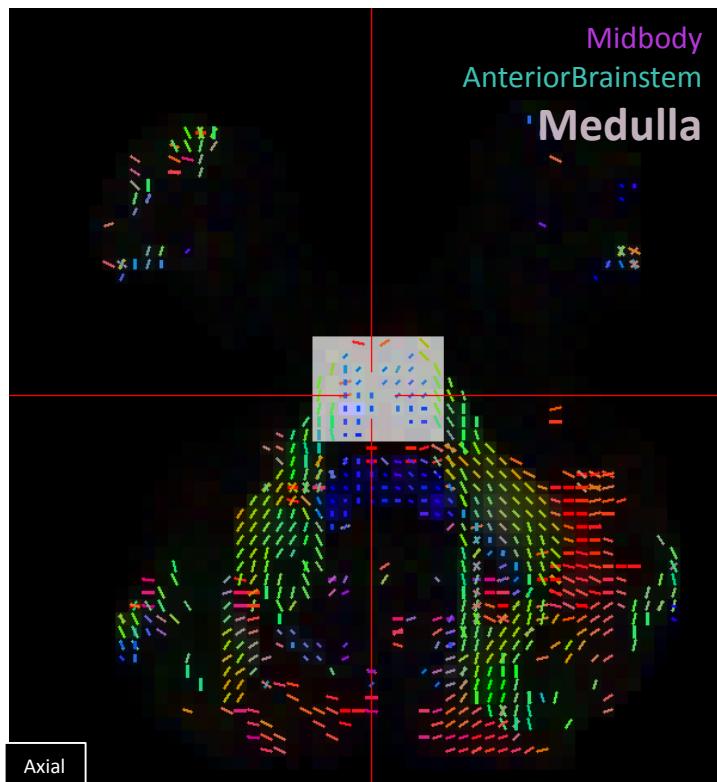
- Find an axial slice in which the middle cerebellar peduncle (red band in the brainstem) is separating a blue anterior and blue posterior brainstem pathway
- Highlight the **blue** anterior brainstem pathway
- At least 1 voxel off the inferior floor of the middle cerebellar peduncle
- Do not include the posterior blue pathway

Medulla

Code: Me

Tracts

ROI: CST



Plane: Axial, 2D

Coverage: Liberal

Purpose: Inferior-most ROI for the CST

Instructions

- Select an axial slice immediately inferior to the middle cerebellar peduncle
 - This slice should be at least 2 slices superior to the bottom-most slice
 - If it is not, this takes precedence over the middle cerebellar peduncle rule
- Highlight the **blue** fibers of the medulla
- Do not highlight further posterior than necessary

ArcuateCoronal_SIDE³

Code: AC

Tracts

ROI: Arcuate, SLF-A⁵, SLF-P

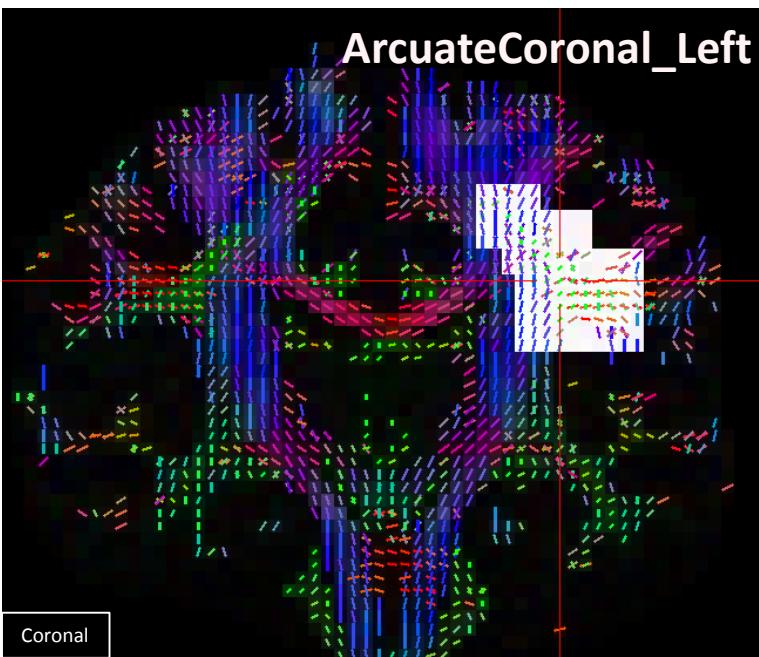
NAND¹: Corona Radiata (w/ ArcuateAxial),

Thalamic Radiations (w/ ArcuateAxial), CST

(w/ ArcuateAxial), External Capsule (w/

ArcuateAxial), Body (w/ PosteriorGenu)

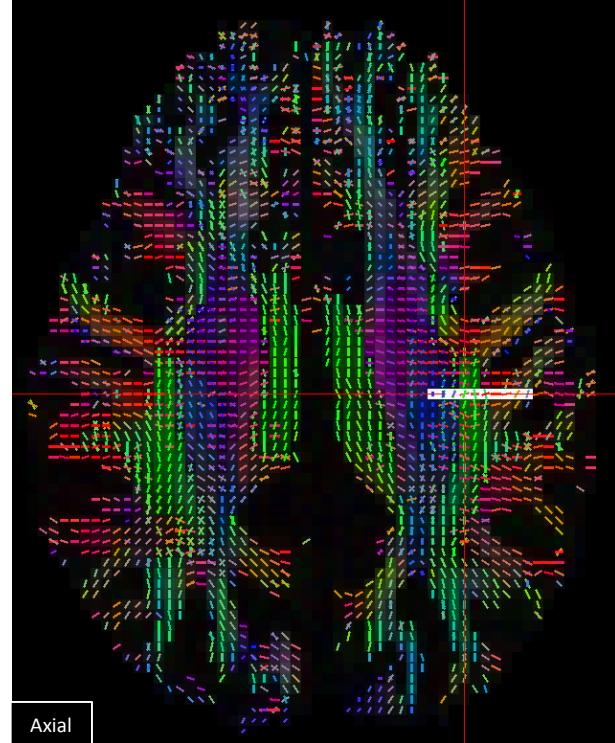
ROA: FOF, ILF, Splenium, Frontal Aslant



Plane: Coronal, 2D

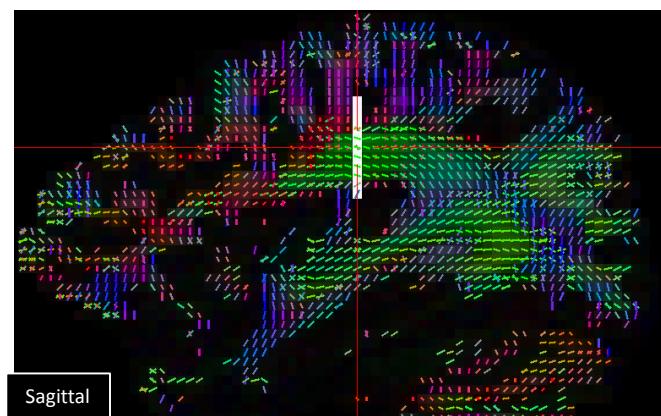
Coverage: Moderate

Purpose: One of two ROIs for the Arcuate, often used as a NAND to exclude arcuate streamlines



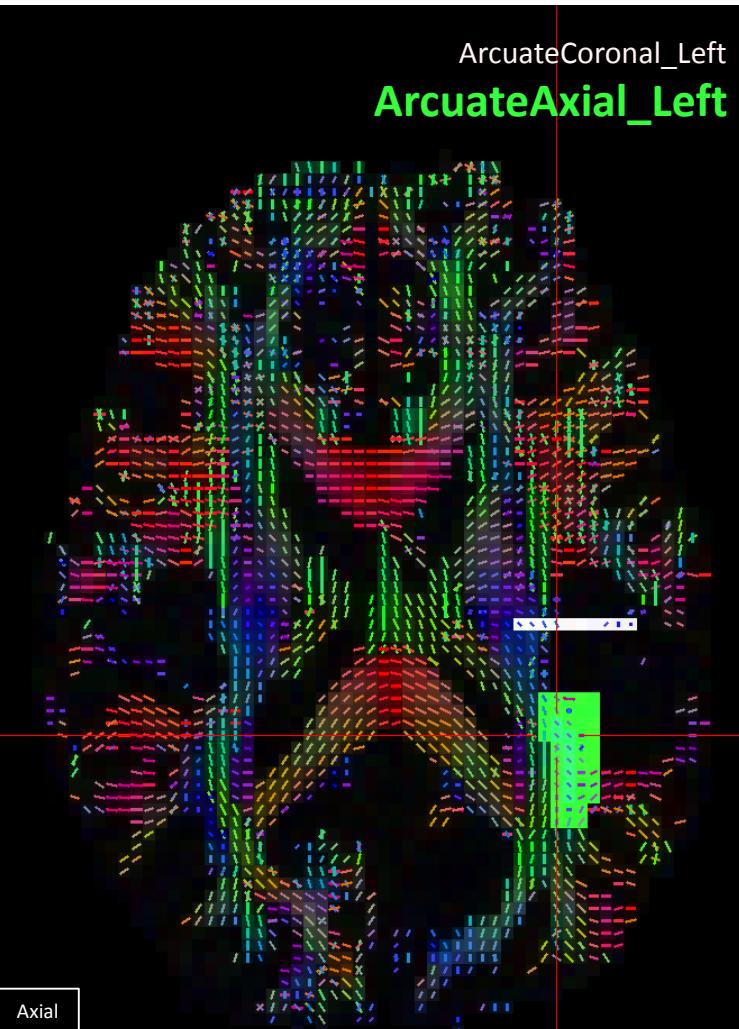
Instructions

- Identify the “C” shape of the Arcuate in the respective hemisphere, in a sagittal view
- Place the crosshairs over the green, horizontal, anterior segment, directly under the central sulcus from this view
 - Central sulcus is typically the first sulcus encountered when following the vertical segment to the horizontal segment, once the horizontal segment levels out
- Switch to the coronal view, and highlight the **green** fibers of the SLF near the crosshairs
 - Do not extend so far medially as to capture the SLF-I
 - Do not extend so far inferiorly as to “NAND” interfere with the ArcuateAxial in the corona radiata



ArcuateAxial_SIDE³

Code: AA

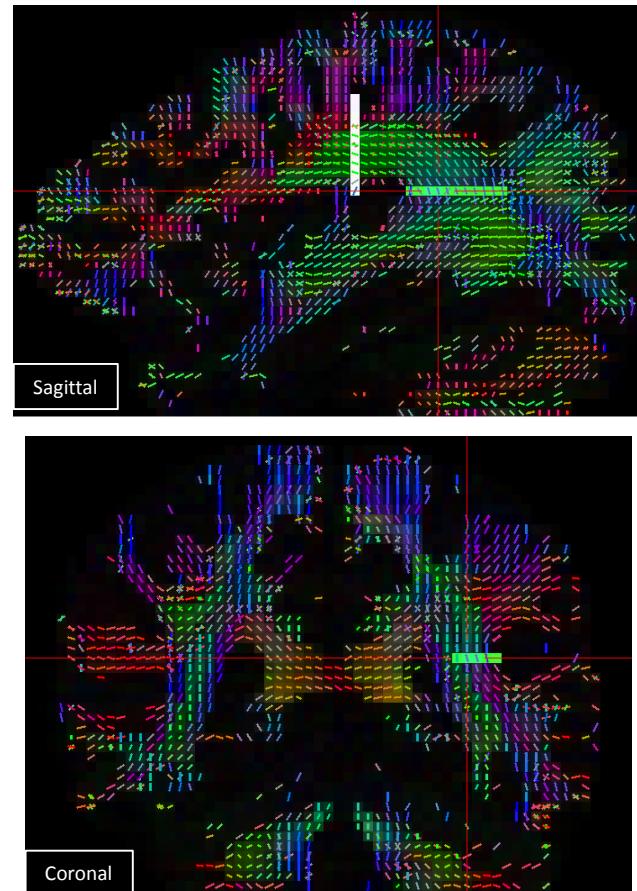


Tracts

ROI: Arcuate

*NAND*¹: Corona Radiata (w/ ArcuateCoronal), Thalamic Radiations (w/ ArcuateCoronal), CST (w/ ArcuateCoronal), External Capsule (w/ ArcuateCoronal)

ROA: Body, SLF-A⁵, Cingulum



Plane: Axial, 2D

Coverage: Moderate

Purpose: One of two ROIs for the Arcuate, often used as a NAND to exclude arcuate streamlines

Instructions

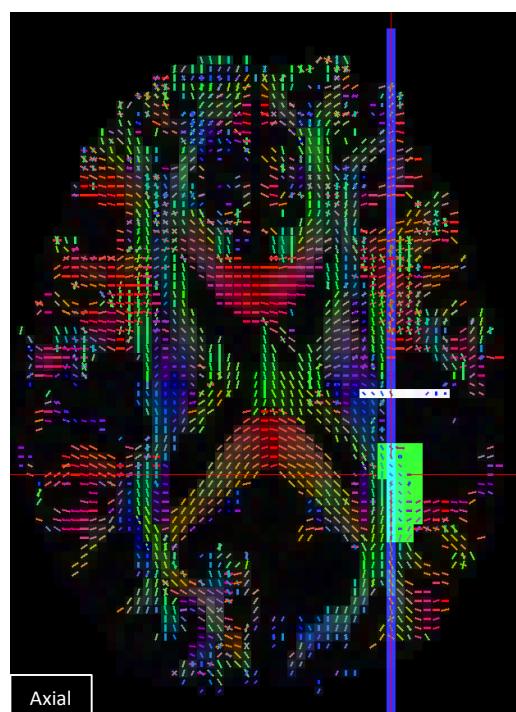
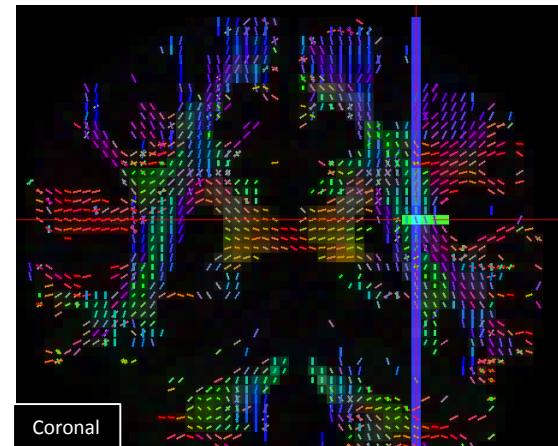
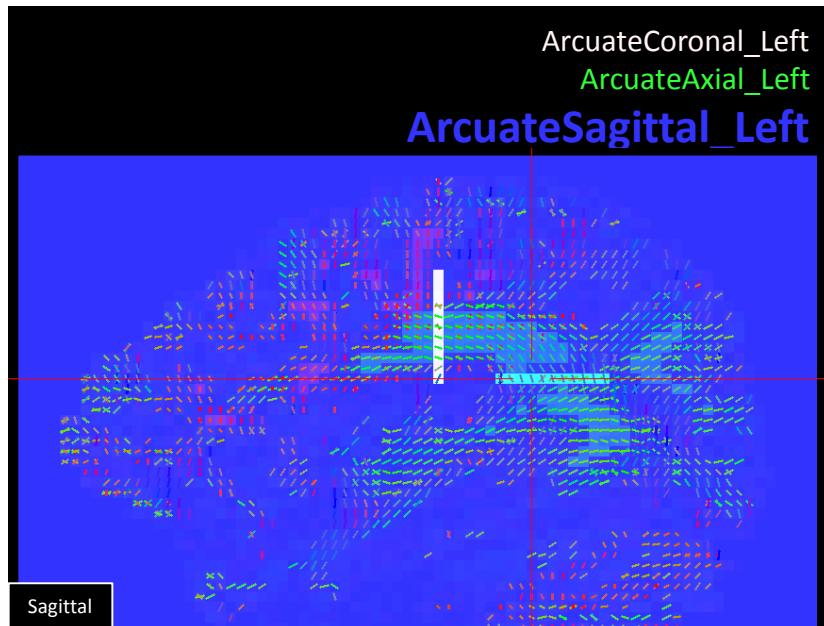
- In the sagittal slice in which you identified the ArcuateCoronal, place the crosshairs over the descending vertical (blue) segment
- Switch to the coronal view, highlight the **blue** fibers lateral to the posterior limb of the internal capsule
- Do not draw region so large that it “NAND” interferes with the ArcuateCoronal in the corona radiata

ArcuateSagittal_SIDE³

Code: AS

Tracts

ROA: Cingulum



Plane: Sagittal, 2D

Coverage: Liberal

Purpose: Used as an ROA for the Cingulum against lateral streamlines

Instructions

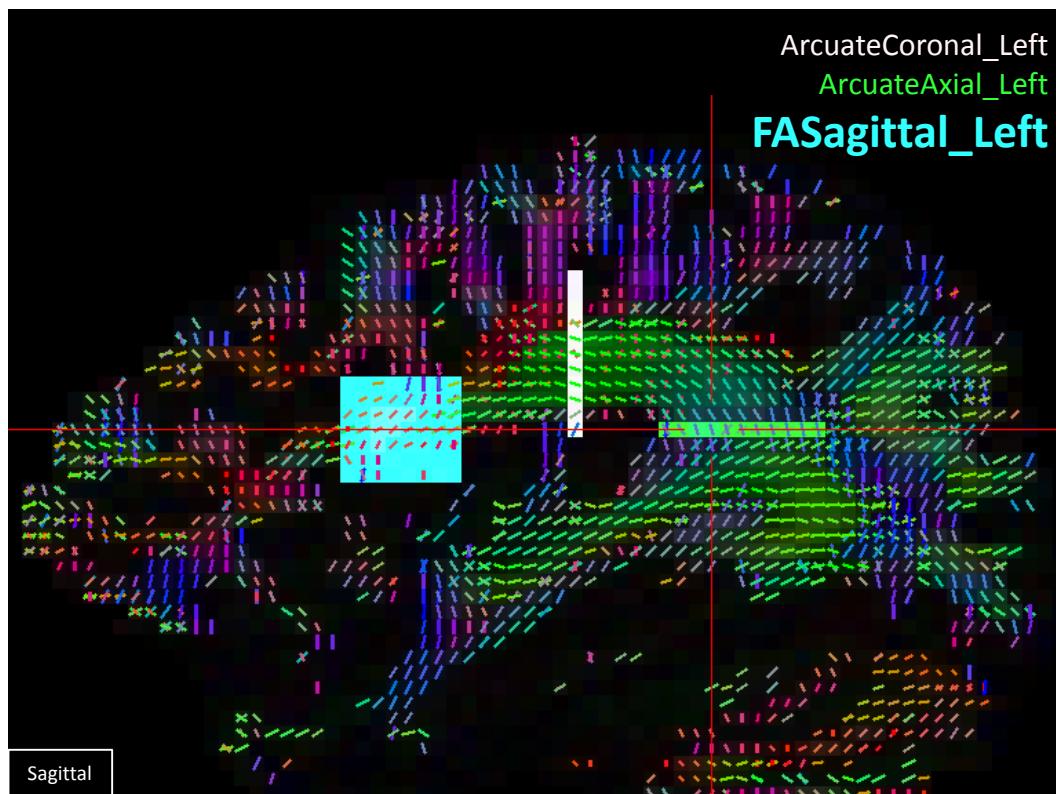
- In the sagittal slice used to locate the ArcuateCoronal/Axial
- Cover the whole slice

FASagittal_SIDE³

Code: FS

Tracts

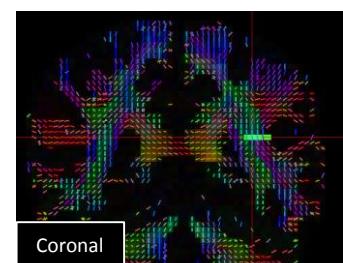
ROI: Frontal Aslant



Plane: Sagittal, 2D

Coverage: Liberal

Purpose: Used as an ROA for the Cingulum against lateral streamlines

Instructions

- In the same sagittal slice in which the ArcuateCoronal/Axial were identified
- Identify the opercularis and highlight the **red-purple** voxels
- You may need to move the sagittal slice left and right slightly to find the opercularis
 - It should be immediately anterior to the green horizontal segment of the arcuate, in a red area where the diffusion data begins to turn purple at its inferior edge

