



Restoration of the Connectome as a Measure for Brain Surgery Outcome

NICARA™ for Neurosurgery

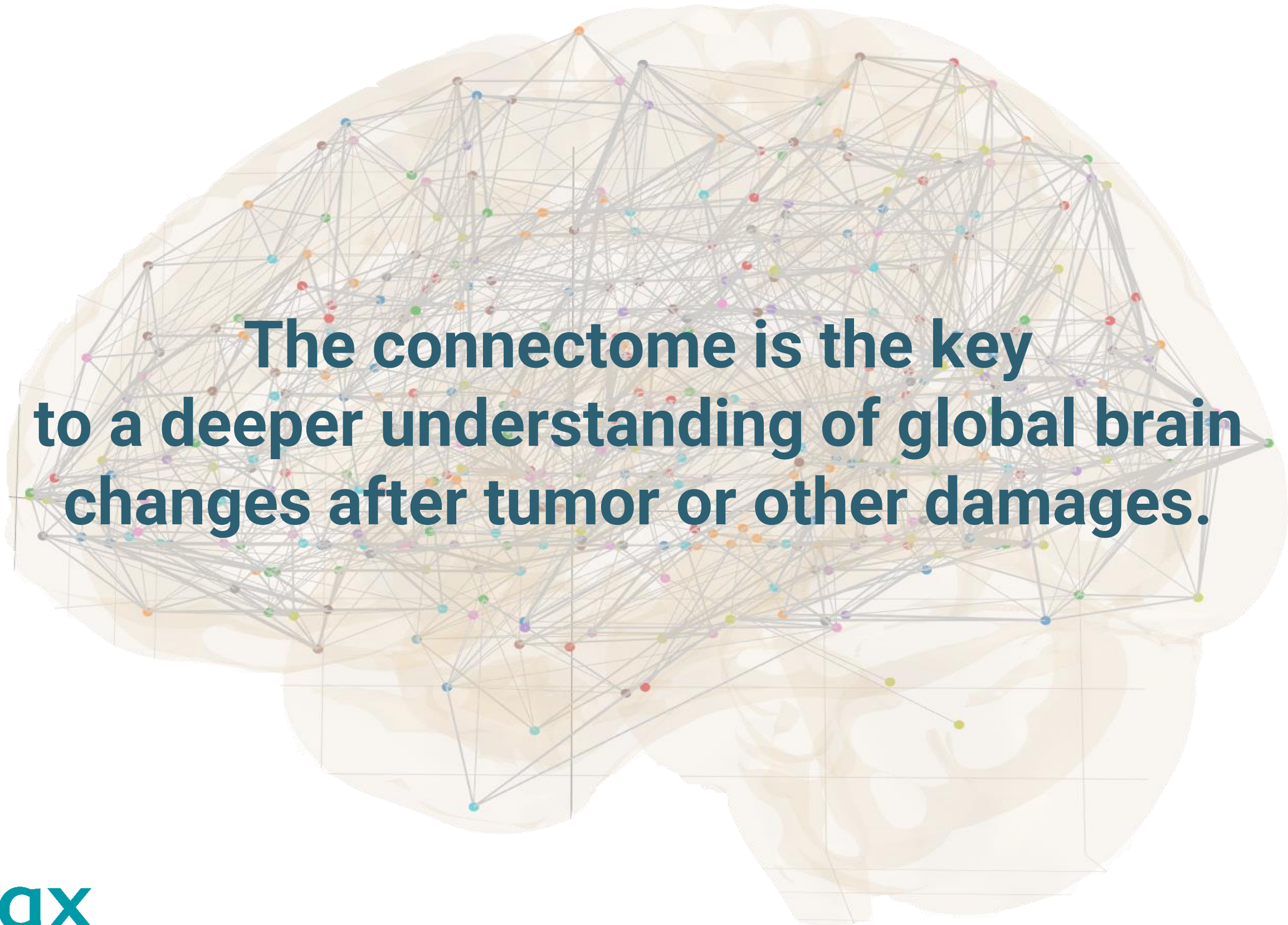
Is conventional MRI enough to discover brain tumors?



- > You think that conventional MRI does not tell you enough about your **tumor**, **TBI** or **pain disorder** patient?
- > You want to know more about the remote effects of brain damages, tumor growth and brain surgery?
- > You think cMRI alone is a weak predictor for disease progression?

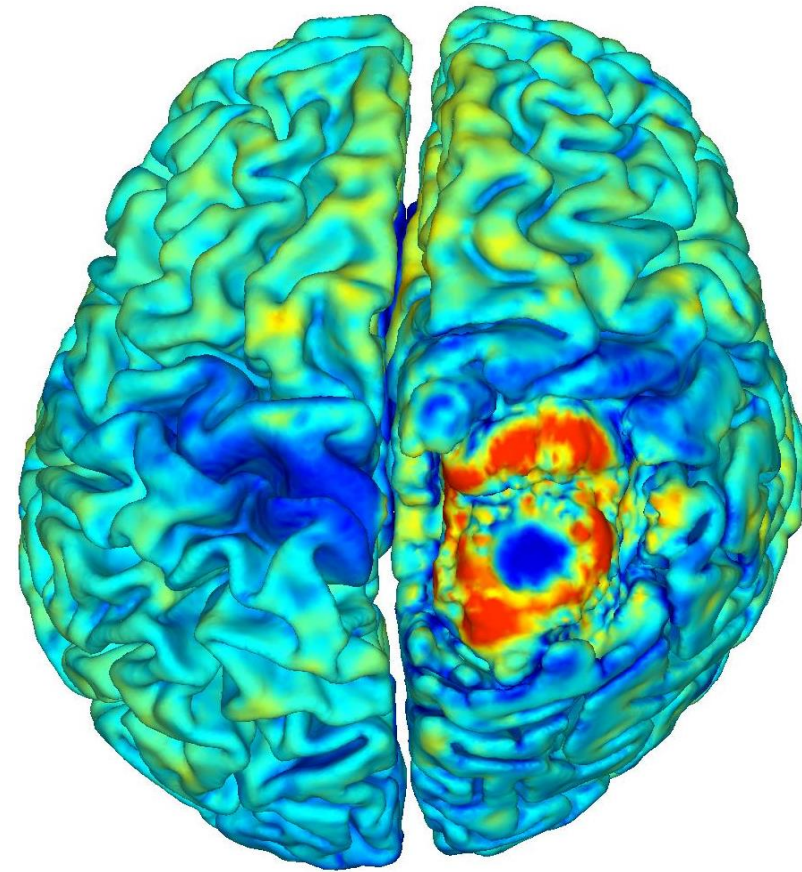


The analysis of the Connectome goes beyond...

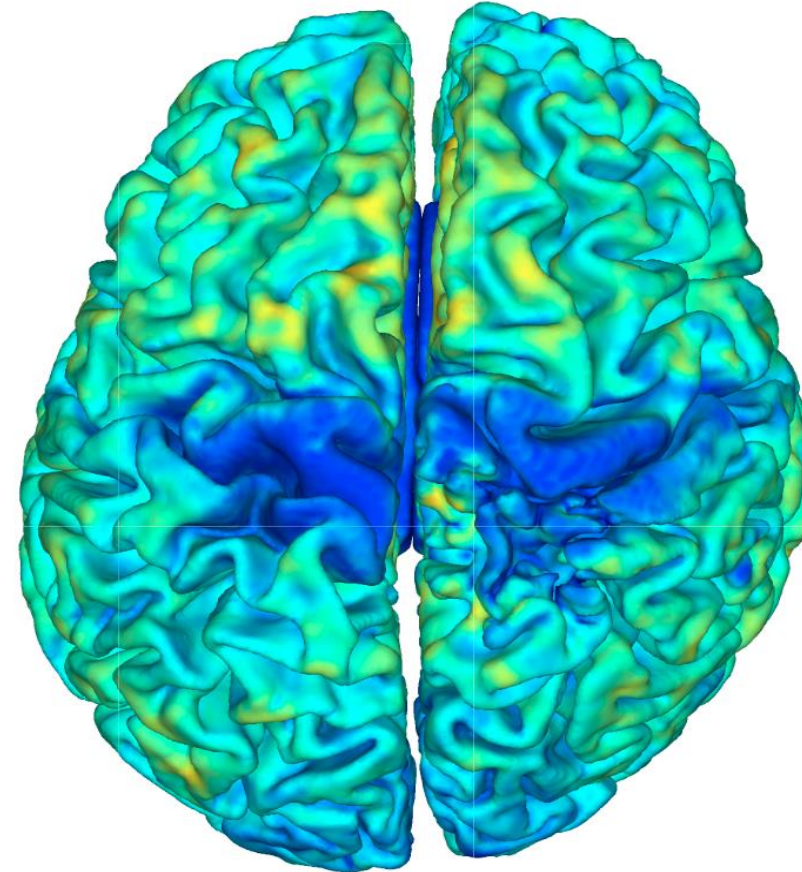
A semi-transparent 3D rendering of a human brain with a complex network of nodes and edges overlaid on it, representing the connectome. The nodes are small colored dots in various colors (red, blue, green, yellow, purple, orange), and the edges are thin grey lines connecting them. The brain is shown from a slightly elevated, lateral perspective.

**The connectome is the key
to a deeper understanding of global brain
changes after tumor or other damages.**

Pre-operation



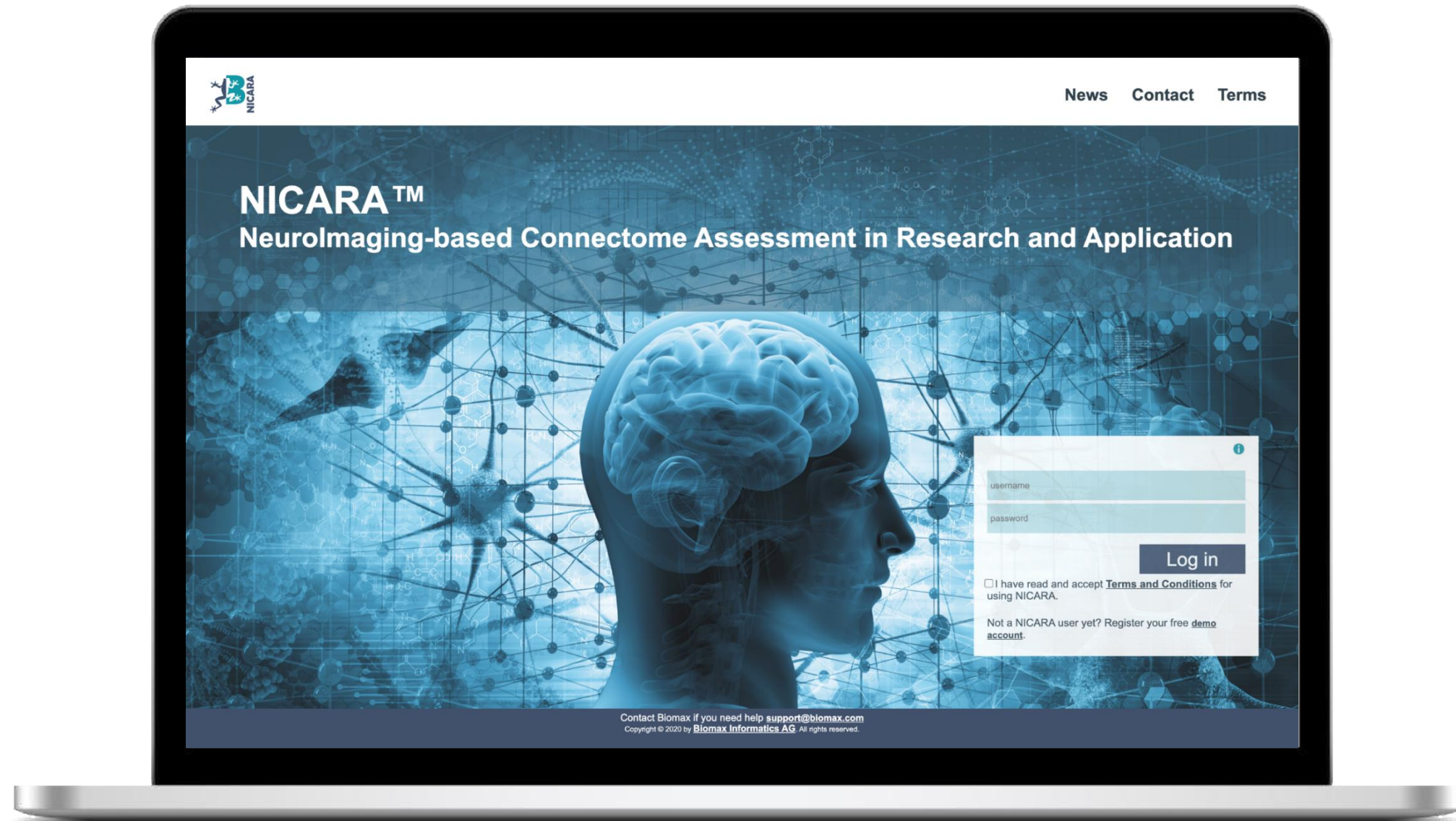
Post-operation



Cortical Thickness measured by NICARA
Connectome Builder

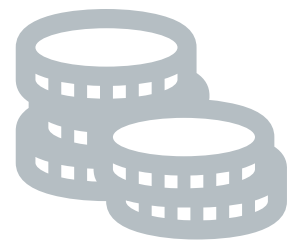
- > How does brain rewire in response to brain tumor?
- > How does the brain network change due to surgery?
- > How to predict changes on surgery outcome?
- > How does structural network associate to cognitive functions?

Our Solution for Connectomics: NICARA™



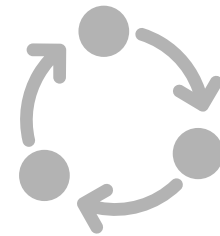
- > NICARA provides fully automated processing routines for structural and functional connectome extraction
- > NICARA allows fully integrated study management and catalog functions for connectome data
- > NICARA enables visualization, exploration and comparisons of multimodal connectome information and morphometry.

NICARA offers you many advantages...



...save time and money

...be more efficient



...profit from expert knowledge

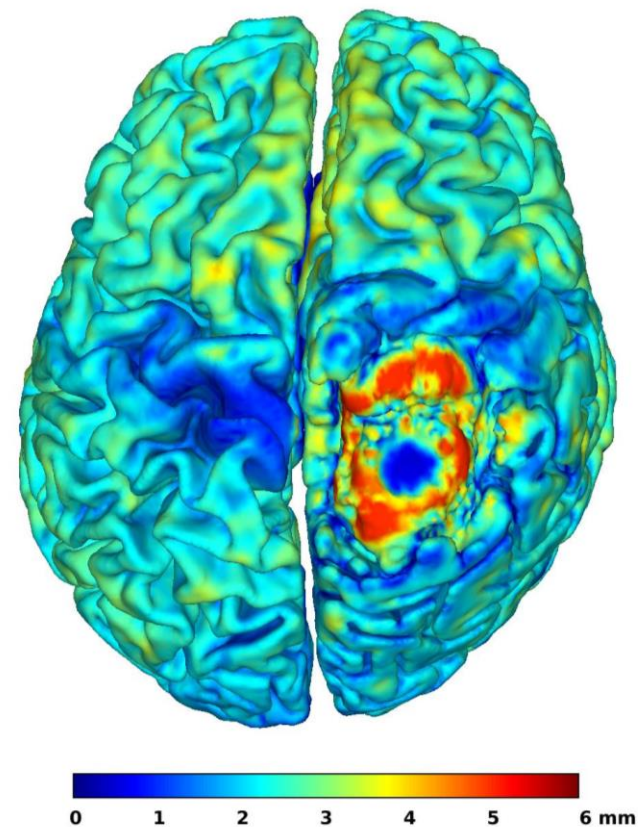
...use our hardware resources



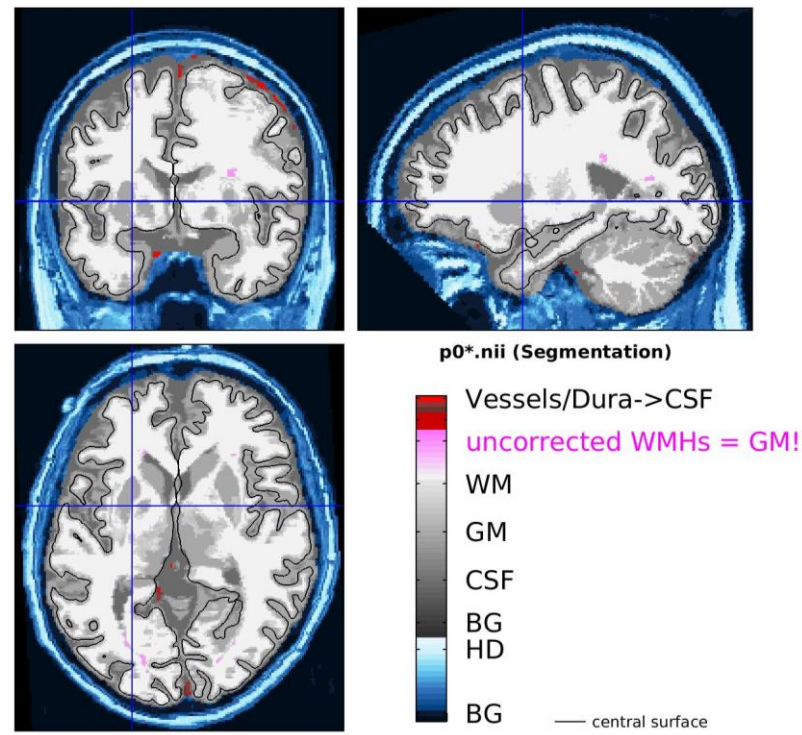
- > **one tool** for both, morphometry assessments and connectomics
- > running the most powerful **open source neuroimaging tools**
- > **validated** as open source tools are cited by hundreds of peer-to-peer publications
- > running **sophisticated pipelines** fully automatically
- > neither a **neuroimaging team** nor **large hardware resources** are required from your site

...and includes all computational anatomy tools

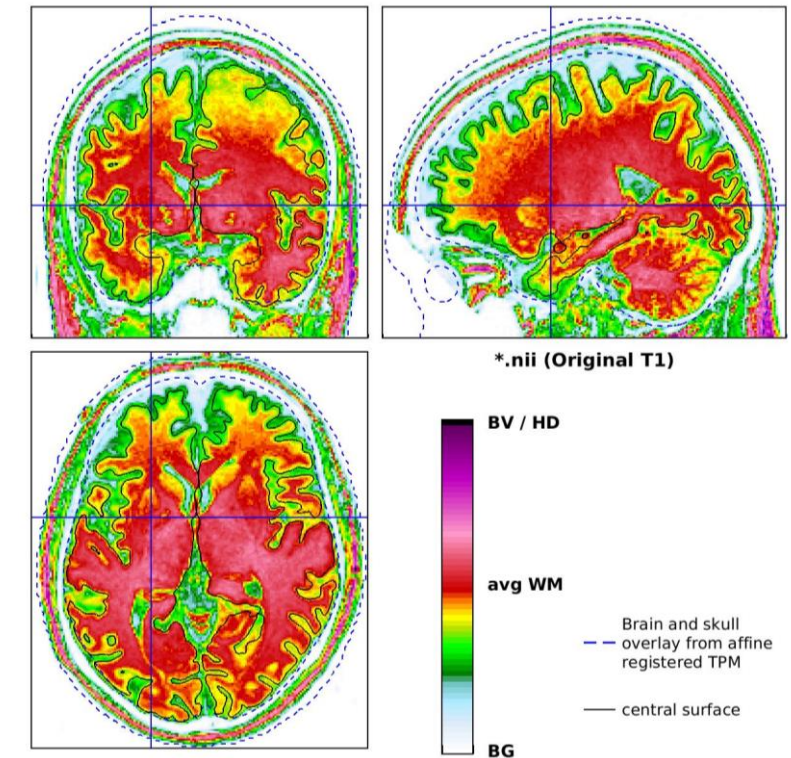
Cortical Thickness



Skull-stripping

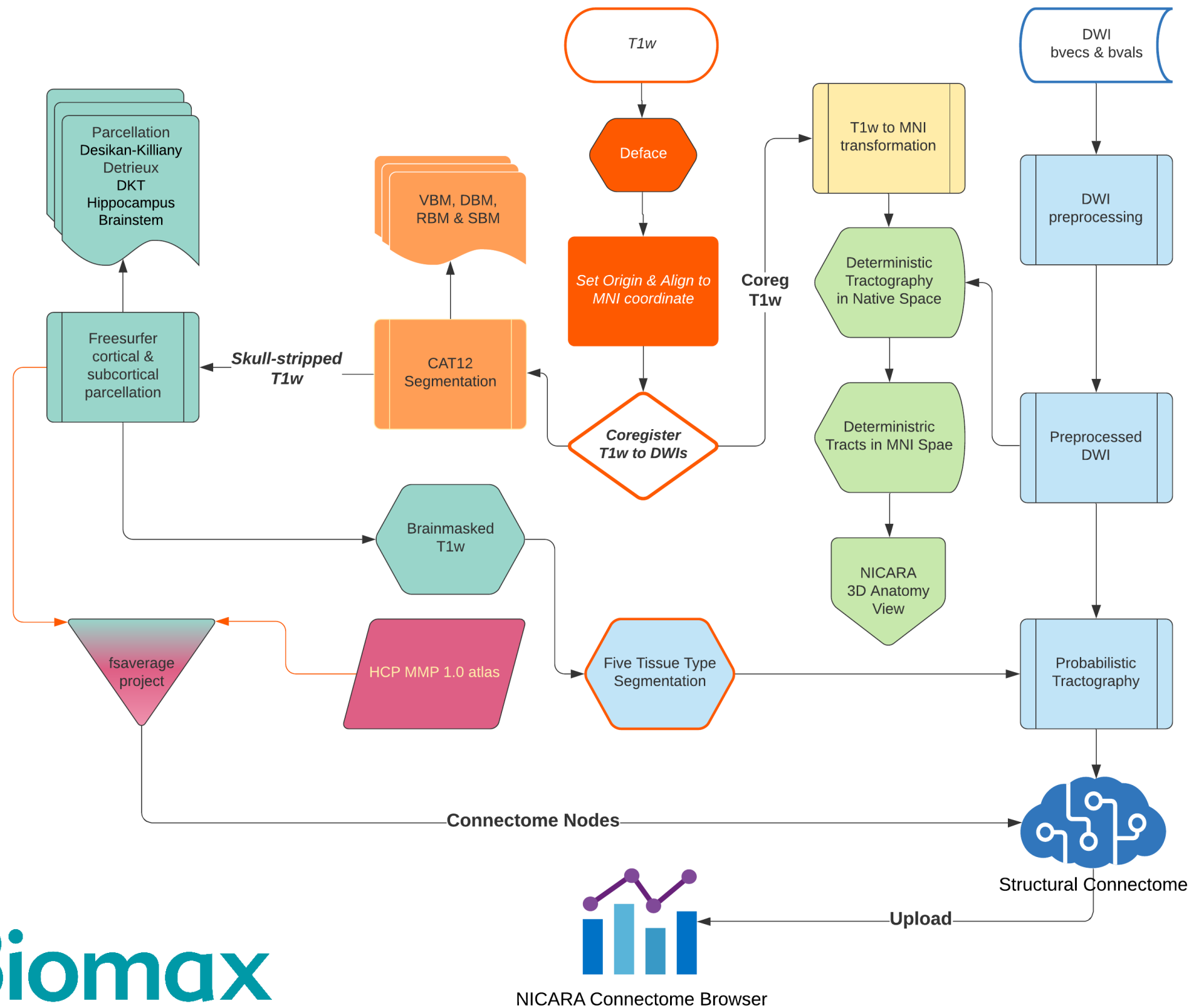


Segmentation



The Computational Anatomy Toolbox (CAT12: <http://www.neuro.uni-jena.de/cat/>) for SPM (Statistical Parametric Mapping software, <http://www.fil.ion.ucl.ac.uk/spm/>) is part of the automated processing pipeline executed by NICARA.

Look at the structural connectome pipeline at a glance



All pipeline tools executed by NICARA are...

- > open source
- > validated in hundreds of studies
- > suggested as preferred neuroimaging method for AD drug development*.

*in Falcon C, et al. Neuroimaging Methods for MRI Analysis in CSF Biomarkers Studies. Methods Mol Biol. In Biomarkers for Alzheimer's Disease Drug Development edited by Robert Perneczky (2018)



You can explore brain morphometry and connectivity



CONNECTOME BROWSER
Subject: 101107 Longitudinal Assessment: Day 0 Cohort: Control Study: HCP Young Adult

DTI, fMRI, EEG/MEG, Tabular Listing, 3D Lattice, 3D Anatomy, Threshold, Subnetwork, Seed

T1 weighted image, probabilistic fiber density maps and deterministic streamlines of 101107_DTI in MNI152 standard space.

Cingulum
 Frontal Aslant Tract
 Homotopic Contralateral Connections
 Inferior Fronto-Occipital Fasciculus
 Inferior Longitudinal Fasciculus
 Middle Longitudinal Fasciculus
 Superior Longitudinal Fasciculus
 Uncinate Fasciculus
 Vertical Occipital Fasciculus

Select all Unselect all

Color mode Fiber Density Maps

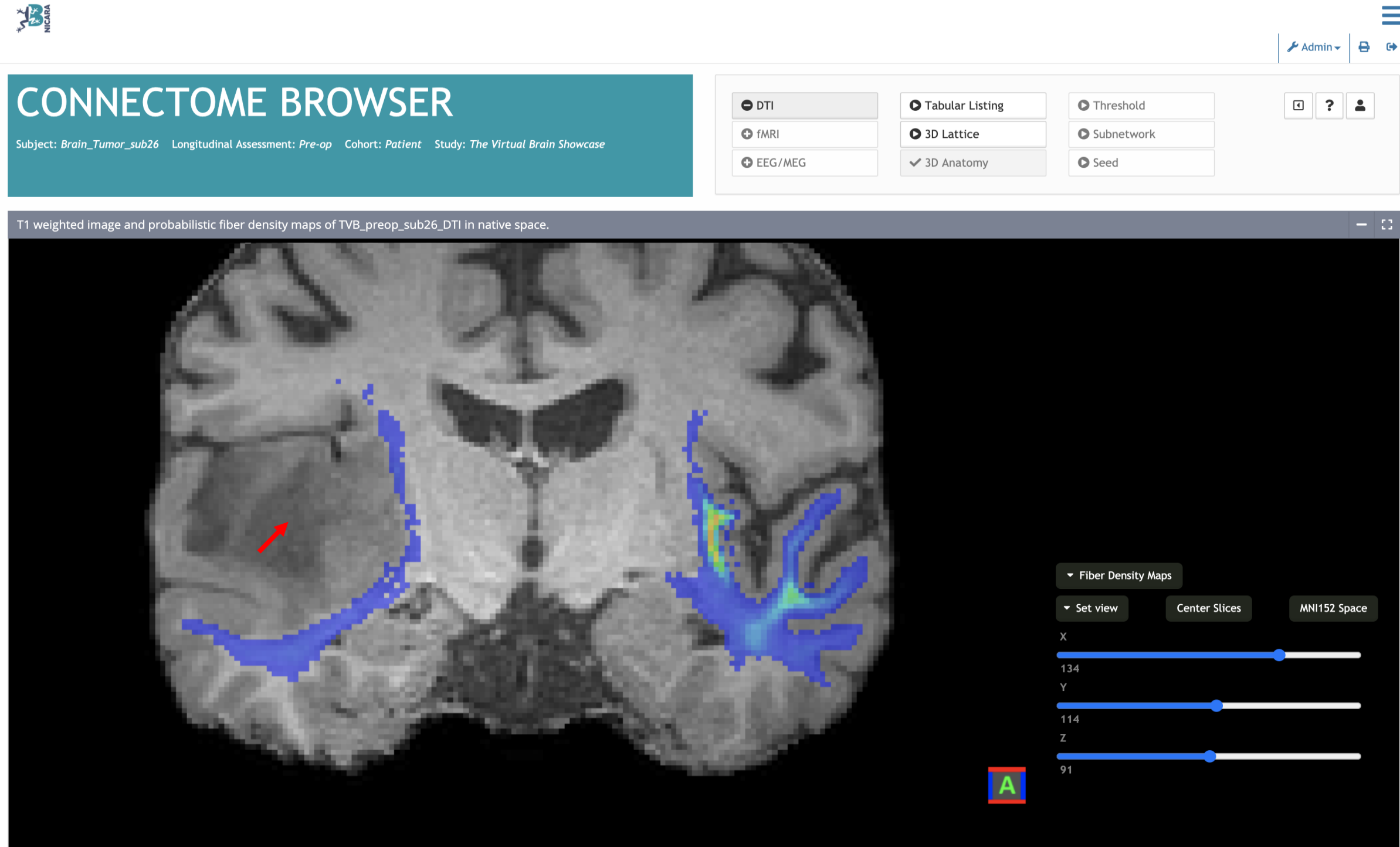
Select Atlas

Set view Center Slices Native Space

X: 130
Y: 155
Z: 130

ROIs related to cingulate white matter tracts according to HCP MMP 1.0 atlas

You can inspect tumor position and fiber densities

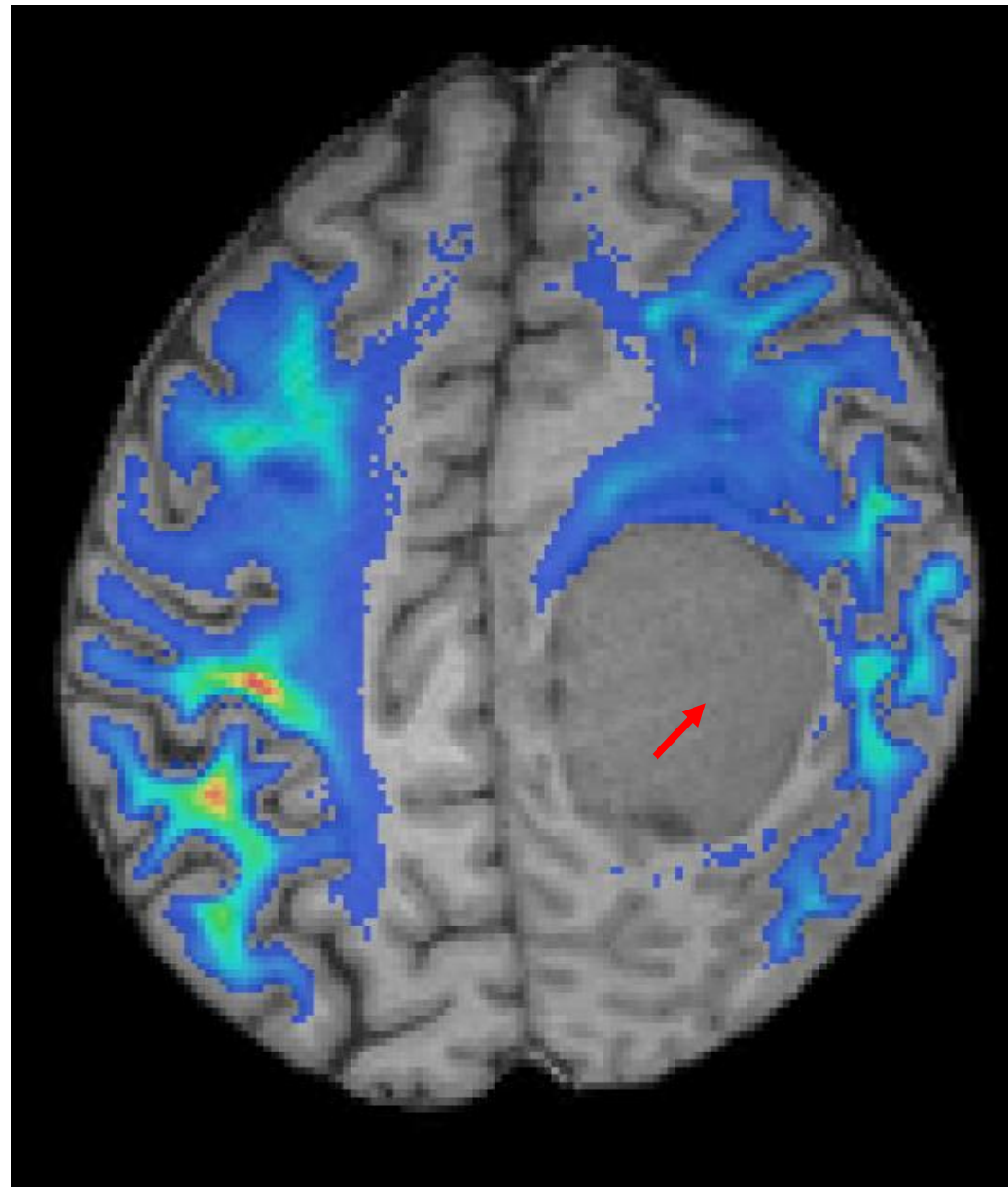


The screenshot displays the 'CONNECTOME BROWSER' interface. At the top left, the NICARA logo is visible. The main header area contains the title 'CONNECTOME BROWSER' and subject information: 'Subject: Brain_Tumor_sub26', 'Longitudinal Assessment: Pre-op', 'Cohort: Patient', and 'Study: The Virtual Brain Showcase'. On the right side, there is an 'Admin' dropdown menu and a hamburger menu icon. Below the header, a control panel offers various visualization options: DTI (selected), fMRI, EEG/MEG, Tabular Listing, 3D Lattice, 3D Anatomy (checked), Threshold, Subnetwork, and Seed. The main display area shows a T1-weighted axial brain slice with probabilistic fiber density maps overlaid in blue and yellow. A red arrow points to a dark region on the left side of the brain, likely representing a tumor. To the right of the brain image, there are controls for 'Fiber Density Maps', 'Set view', 'Center Slices', and 'MNI152 Space'. Below these are three sliders for X, Y, and Z coordinates, with values 134, 114, and 91 respectively. A small 'A' icon is located at the bottom right of the brain image.

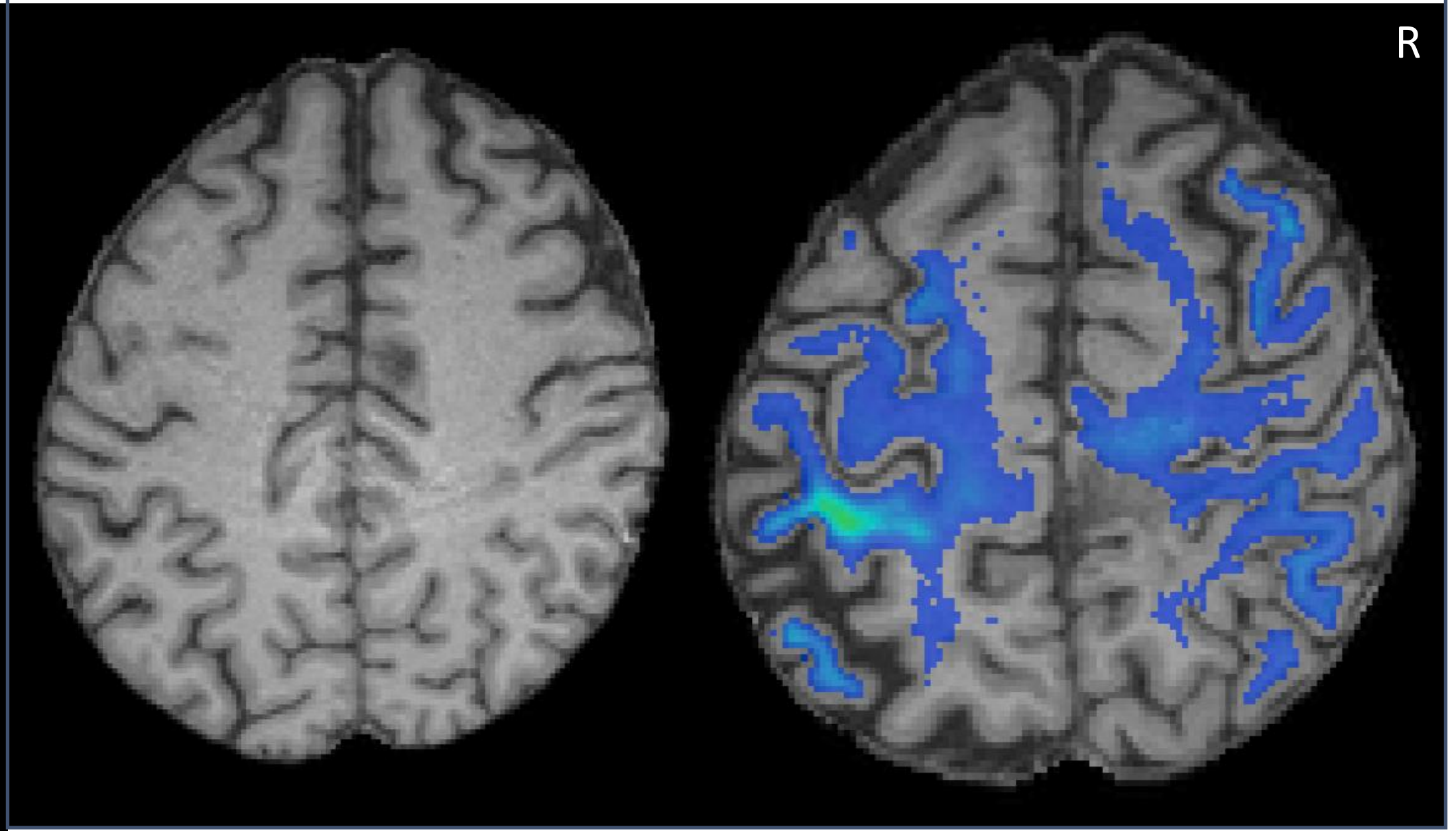
Probabilistic fiber density map of middle longitudinal fasciculus in tumor patient

You can reveal brain rewiring in your patient

Pre-op

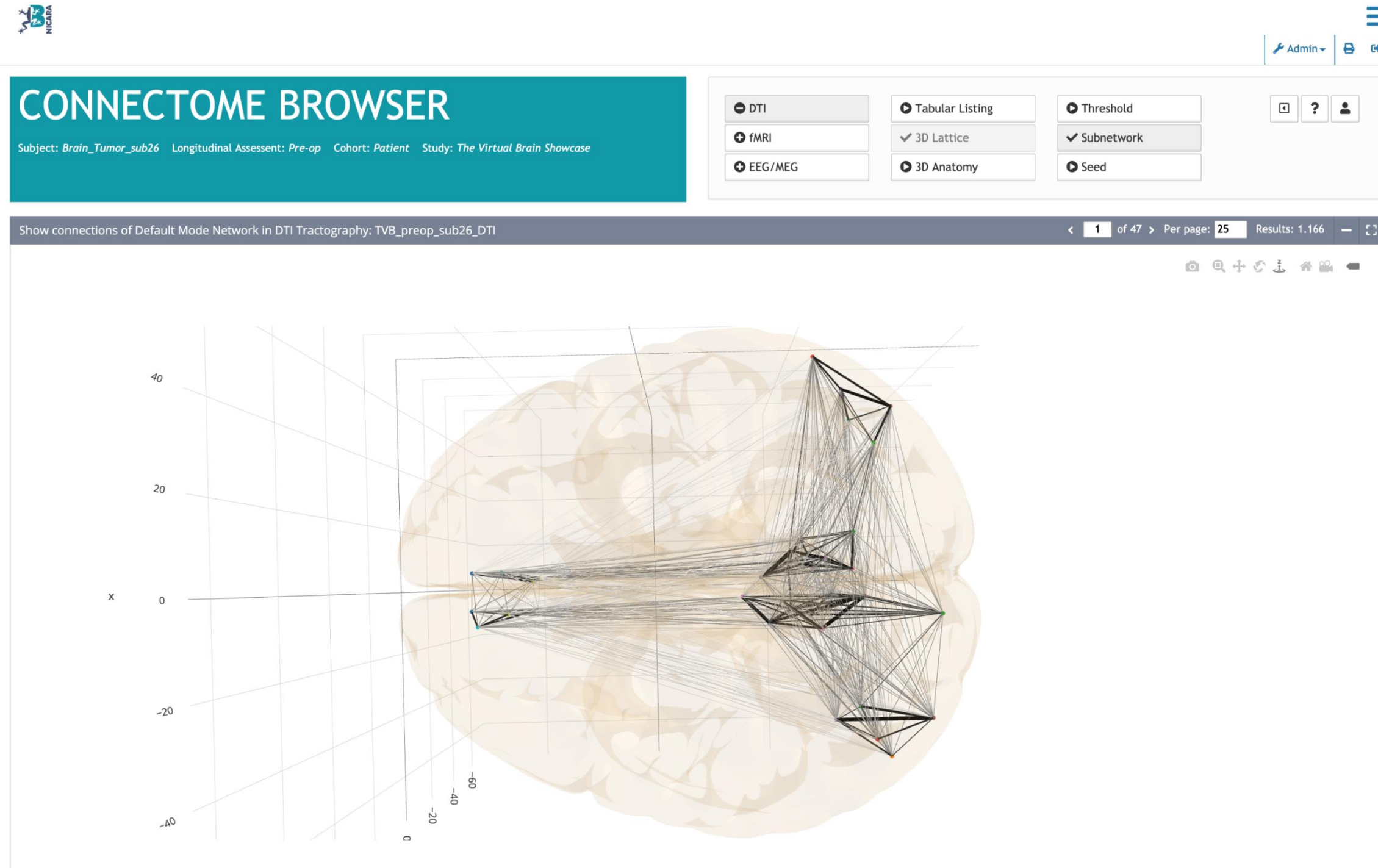


Post-op



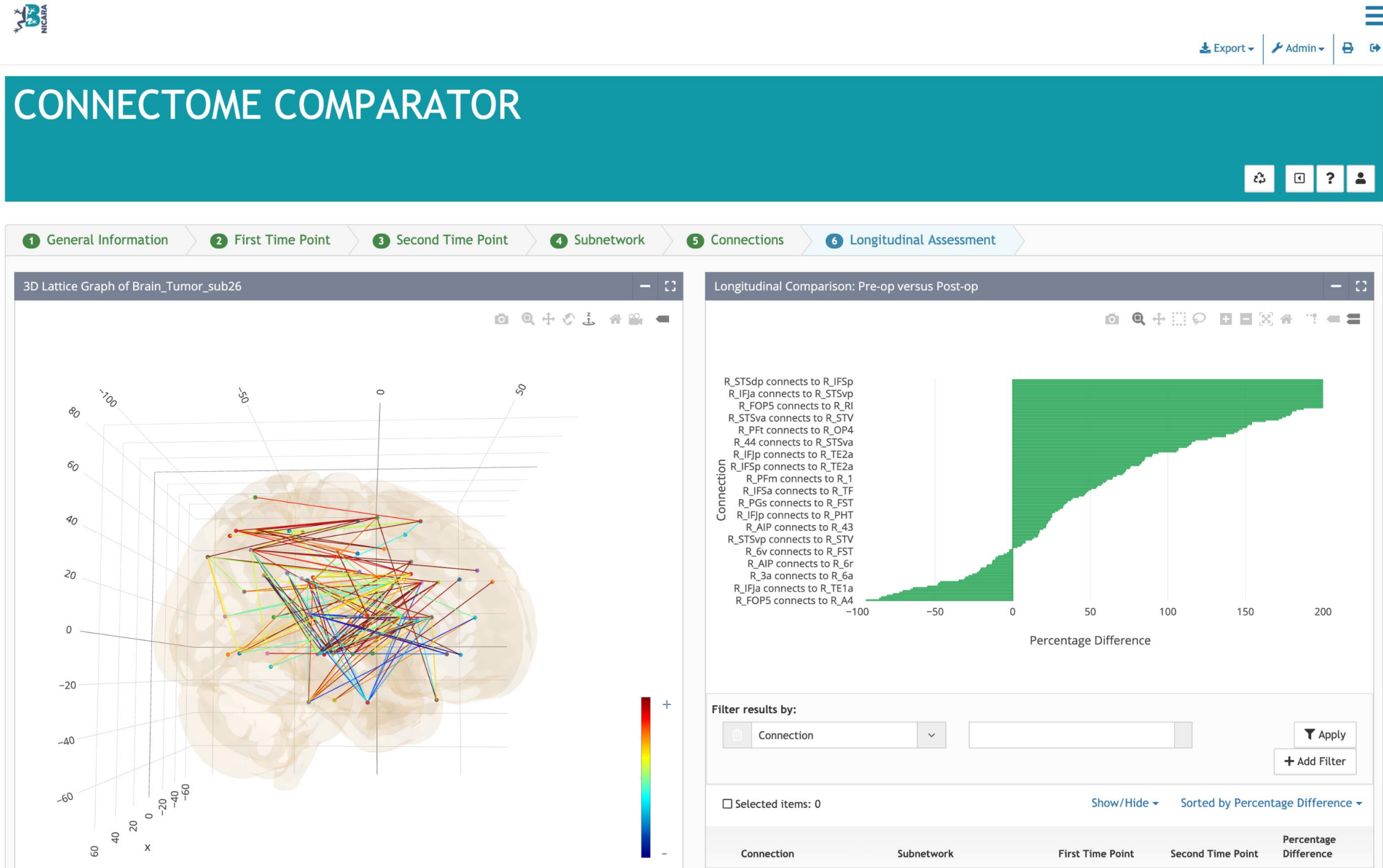
Fiber Density Maps: Superior Longitudinal Fasciculus before and after tumor resection

You can quantify brain connectivity



3D Lattice graphs: Structural connectivity of default mode network in a tumor patient

You can document your surgery outcome



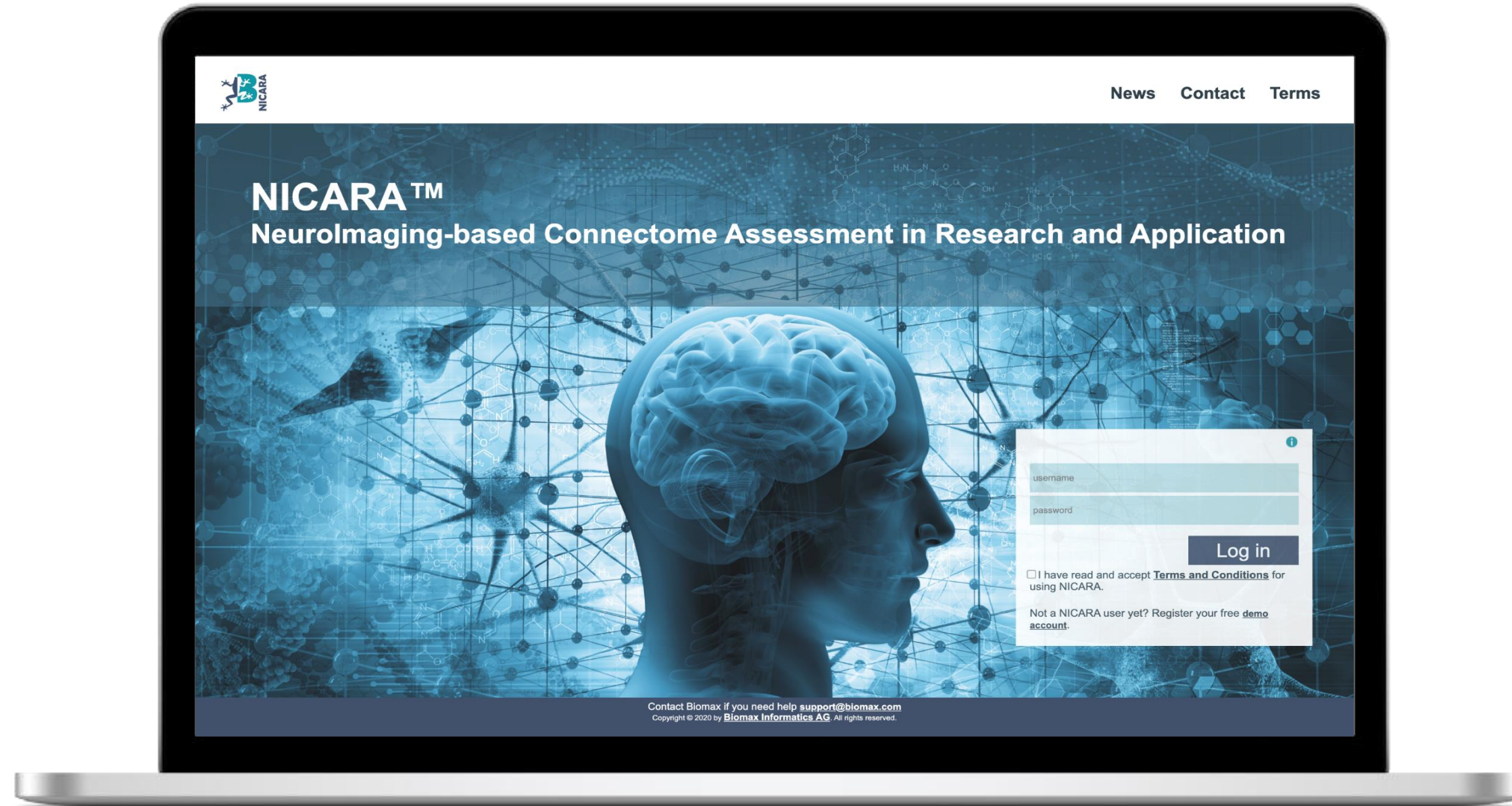
Increase of superior longitudinal fasciculus connectivity six months after tumor resection

NICARA is...



- > **The only tool you need** to do morphometry assessments and connectomics
- > **The most advanced tool you can get** running the most powerful open source neuroimaging tools
- > **Validated** as open source tools are cited by hundreds of peer-to-peer publications
- > **Most convenient for you** as it runs sophisticated pipelines fully automatically.
- > **Cost efficient** as you do not need a neuroimaging team nor large hardware resources to do connectomics

Take advantage from NICARA and test it today!



Register a free demo account at nicara.eu
or contact nicara@biomax.com for a free consultation!

