



Restoration of the Connectome as a Measure for Brain Surgery Outcome

NICARA™ for Neurosurgery

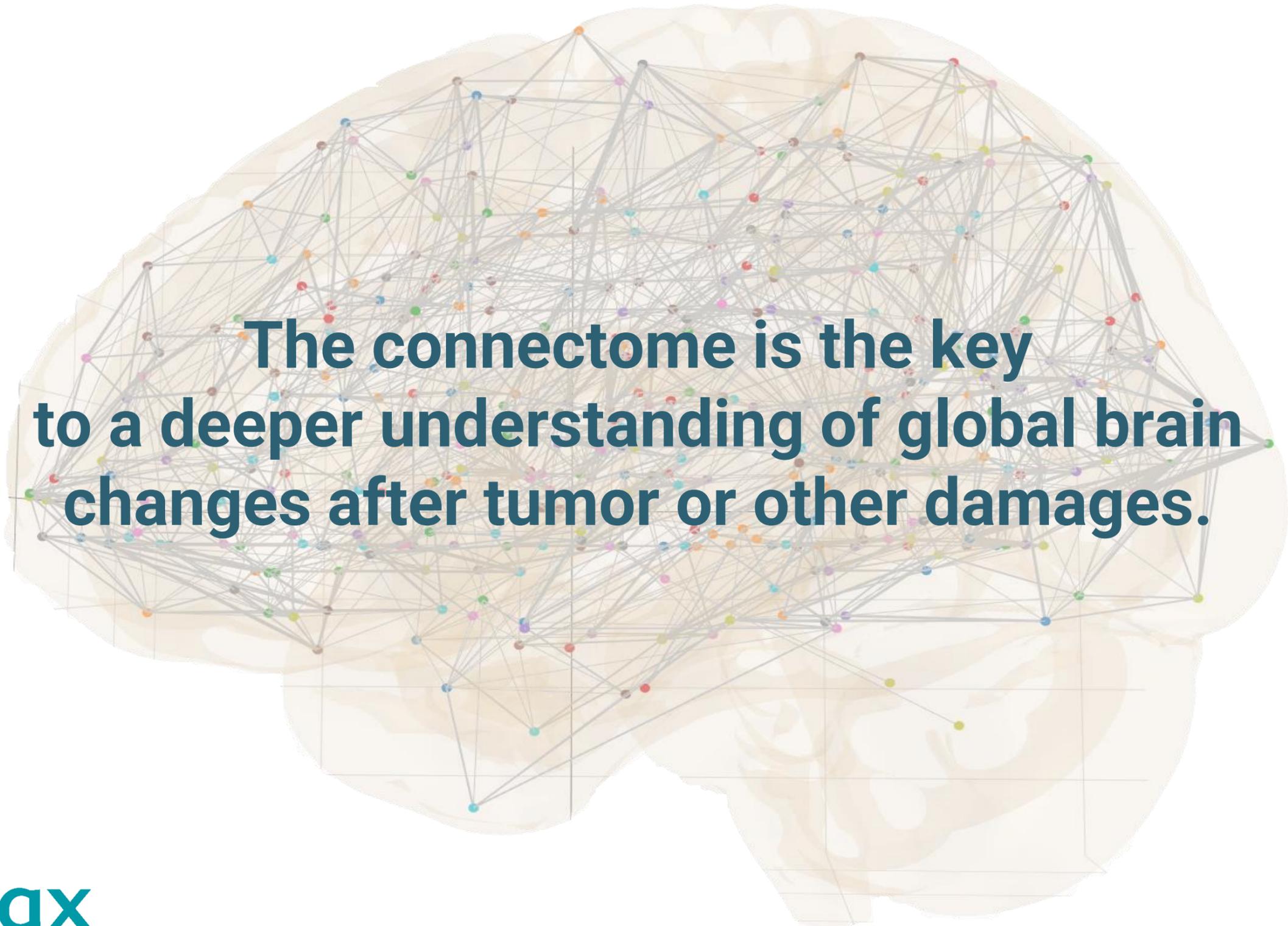
Is conventional MRI enough to discover brain tumors?



- > 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?

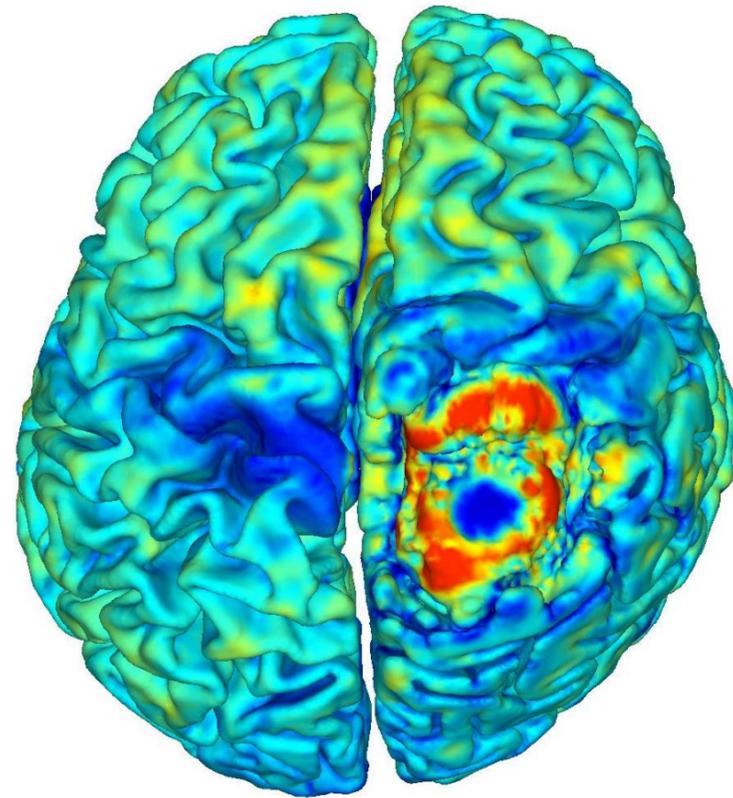


The analysis of the Connectome goes beyond...

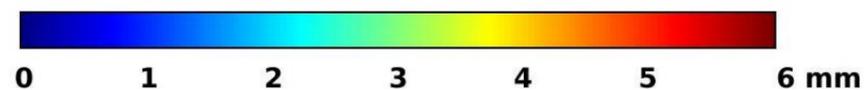
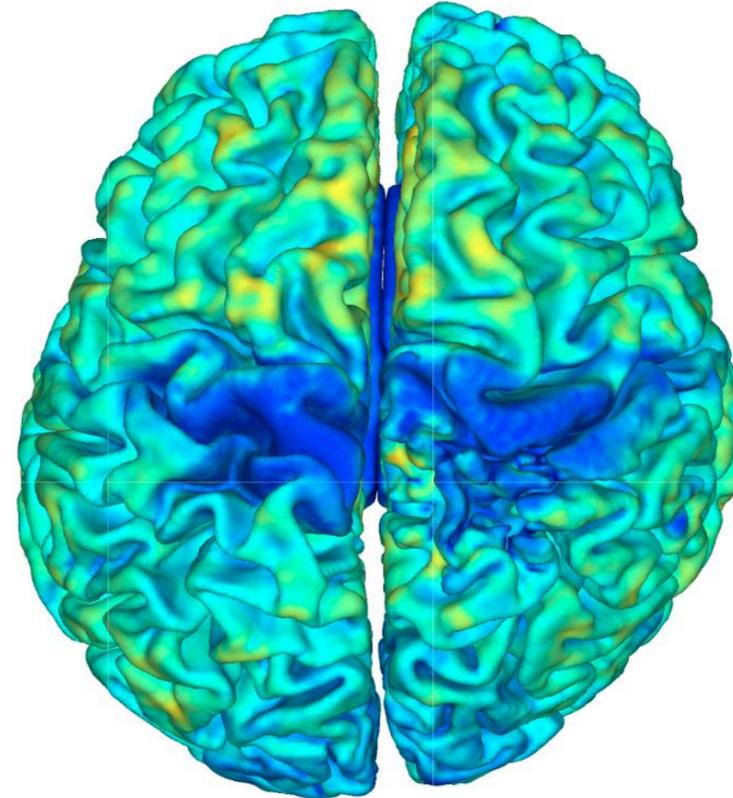
A detailed visualization of a brain connectome. It shows a semi-transparent, light-colored brain model with a dense network of grey lines (edges) connecting numerous small, multi-colored dots (nodes) scattered across the brain's surface and interior. The nodes are colored in various shades including red, blue, green, yellow, and purple. The overall structure is complex and interconnected, representing the neural pathways of the brain.

**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

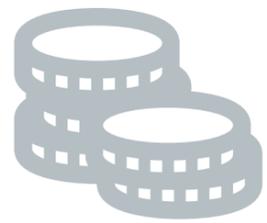
- > How does brain rewire in response to brain tumor?
- > How does the brain network change due to surgery?
- > How to predict changes on surgery outcome?
- > How does structural network associate to cognitive functions?

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

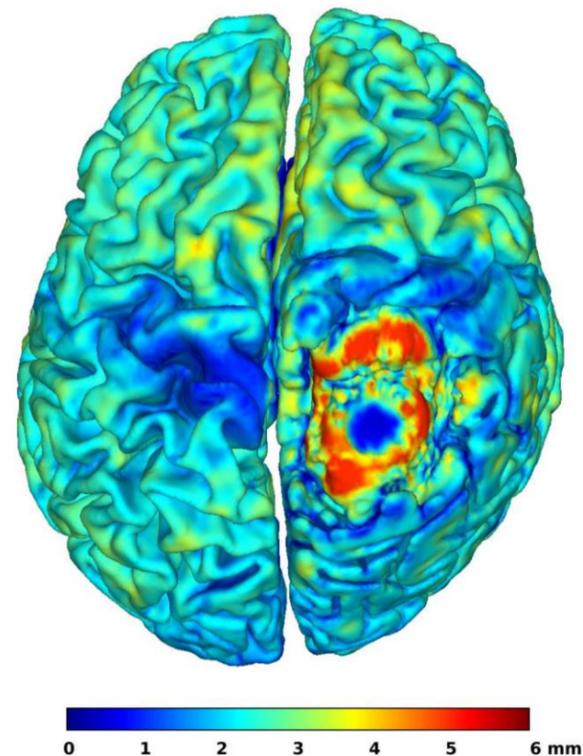
...use our hardware resources



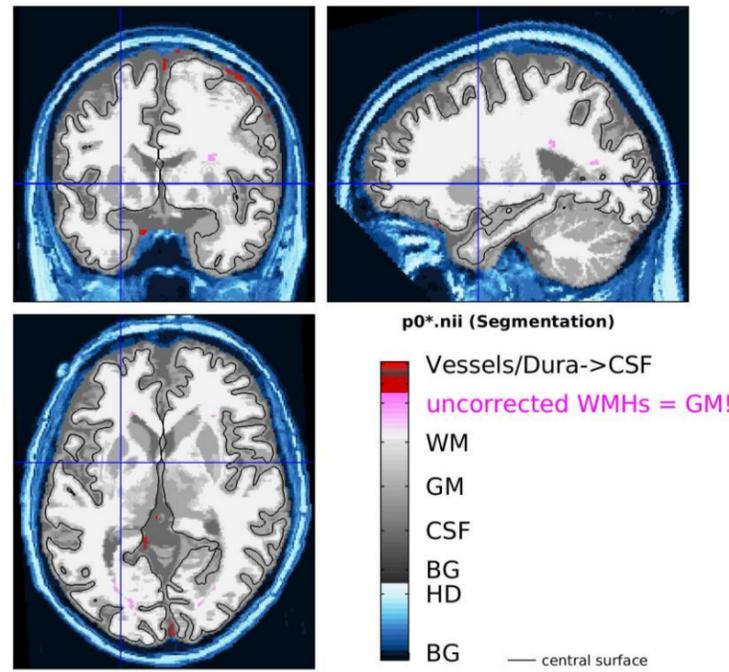
- > **one tool** for both, morphometry assessments and connectomics
- > running the most powerful **open source neuroimaging tools**
- > **validated** as open source tools are cited by hundreds of peer-to-peer publications
- > running **sophisticated pipelines** fully automatically
- > neither a **neuroimaging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

...and includes all computational anatomy tools

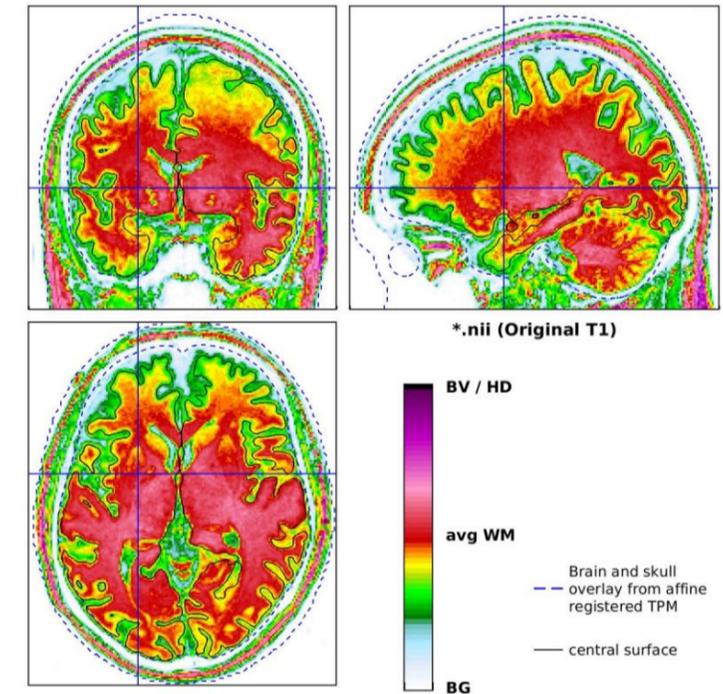
Cortical Thickness



Skull-stripping

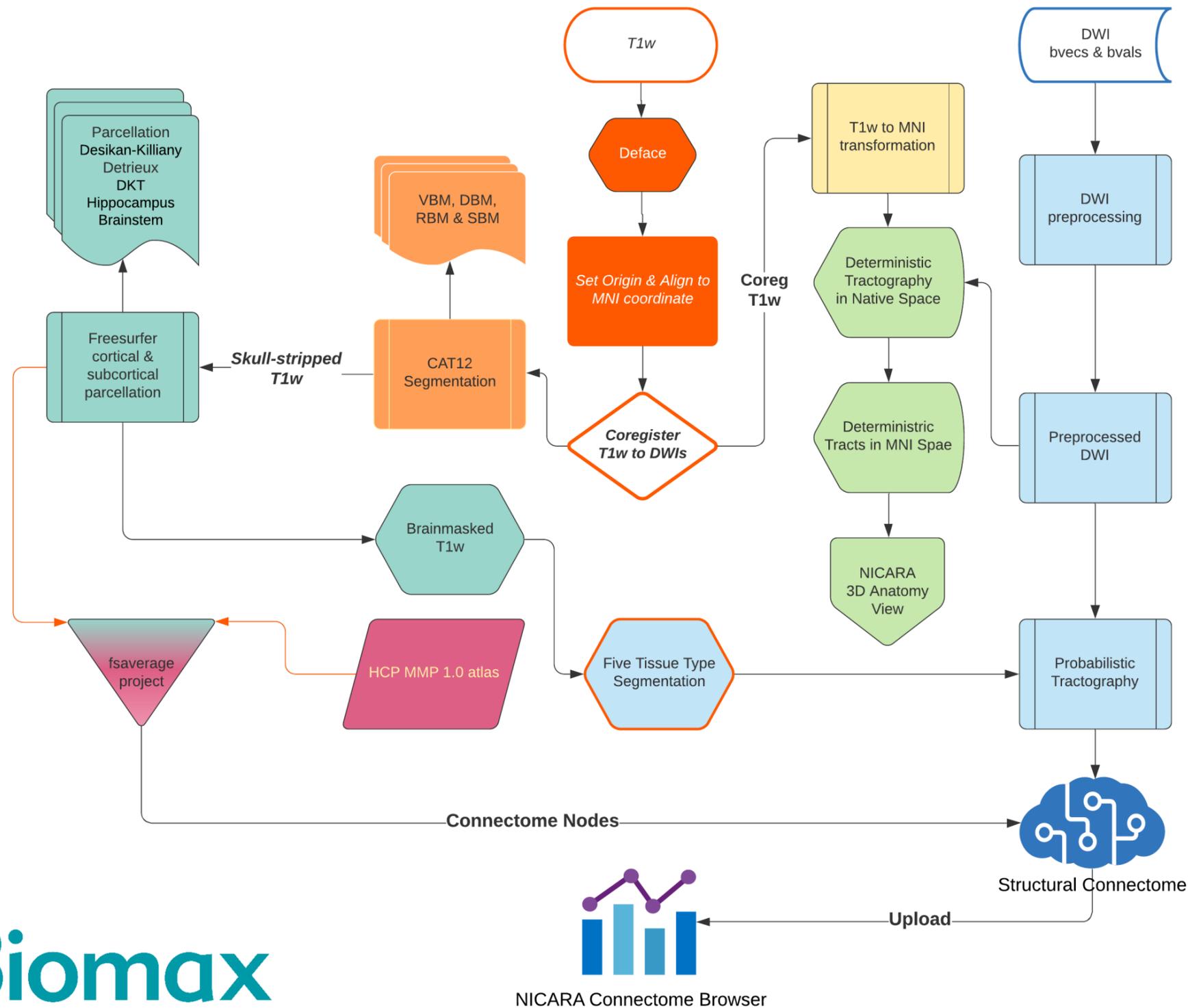


Segmentation



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

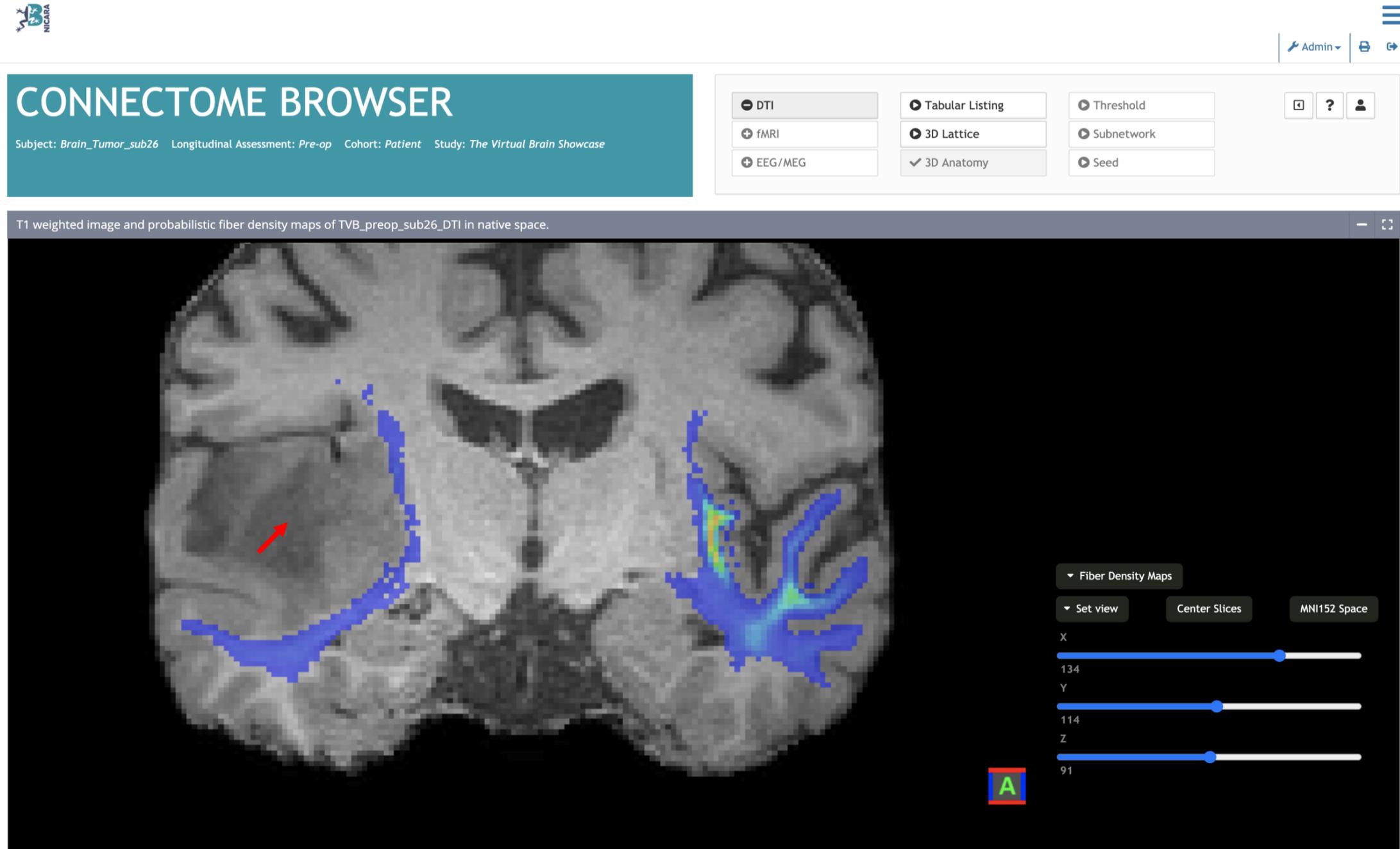
Select Atlas

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

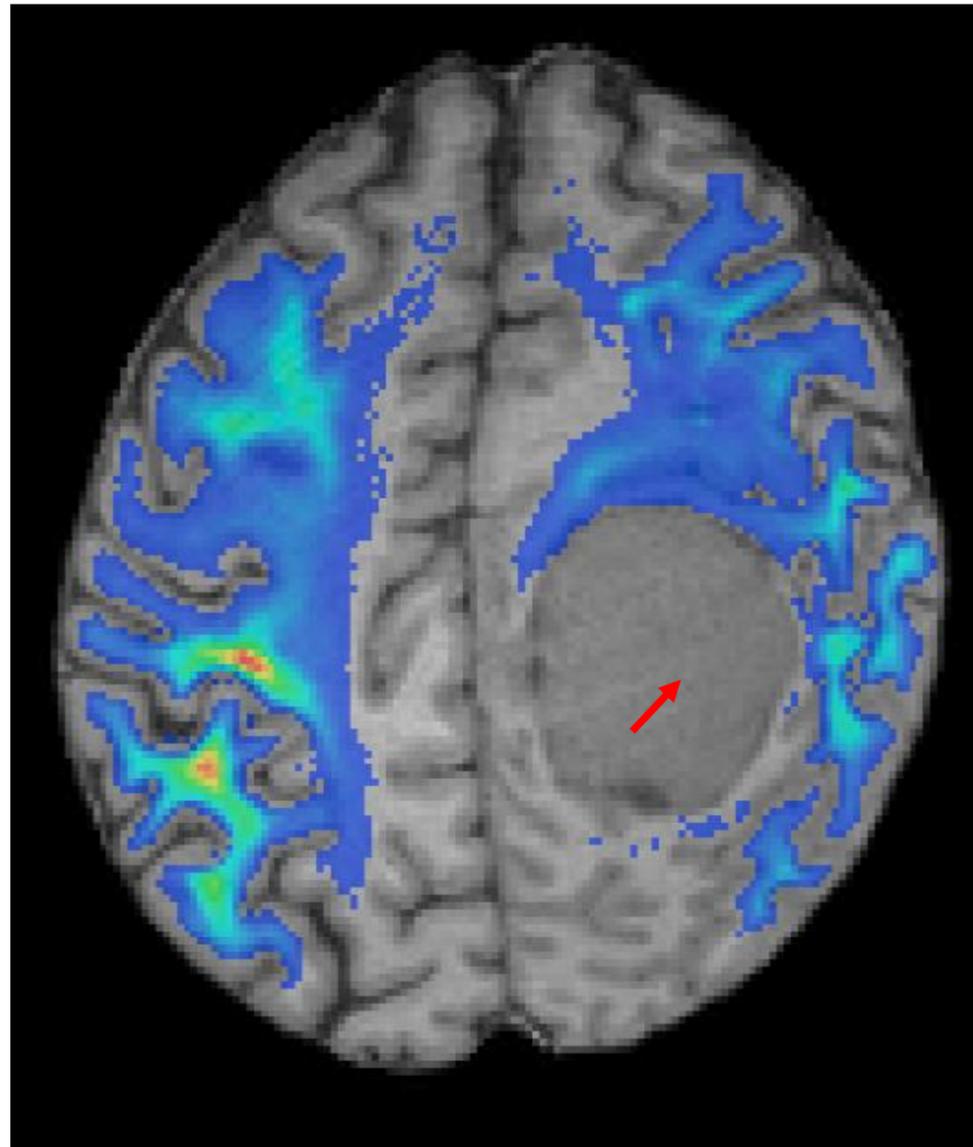


The screenshot displays the 'CONNECTOME BROWSER' interface. At the top left, the NICARA logo is visible. The main header area contains the title 'CONNECTOME BROWSER' and subject information: 'Subject: Brain_Tumor_sub26', 'Longitudinal Assessment: Pre-op', 'Cohort: Patient', and 'Study: The Virtual Brain Showcase'. A navigation bar includes 'Admin' and a menu icon. Below the header, there are several control panels: 'DTI', 'fMRI', and 'EEG/MEG' on the left; 'Tabular Listing', '3D Lattice', and '3D Anatomy' in the middle; and 'Threshold', 'Subnetwork', and 'Seed' on the right. A central window titled 'T1 weighted image and probabilistic fiber density maps of TVB_preop_sub26_DTI in native space.' shows an axial brain slice. A red arrow points to a dark region on the left side of the brain, representing a tumor. Blue and yellow fiber density maps are overlaid on the brain, showing the middle longitudinal fasciculus. On the right side of the image, there are control panels 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 image area.

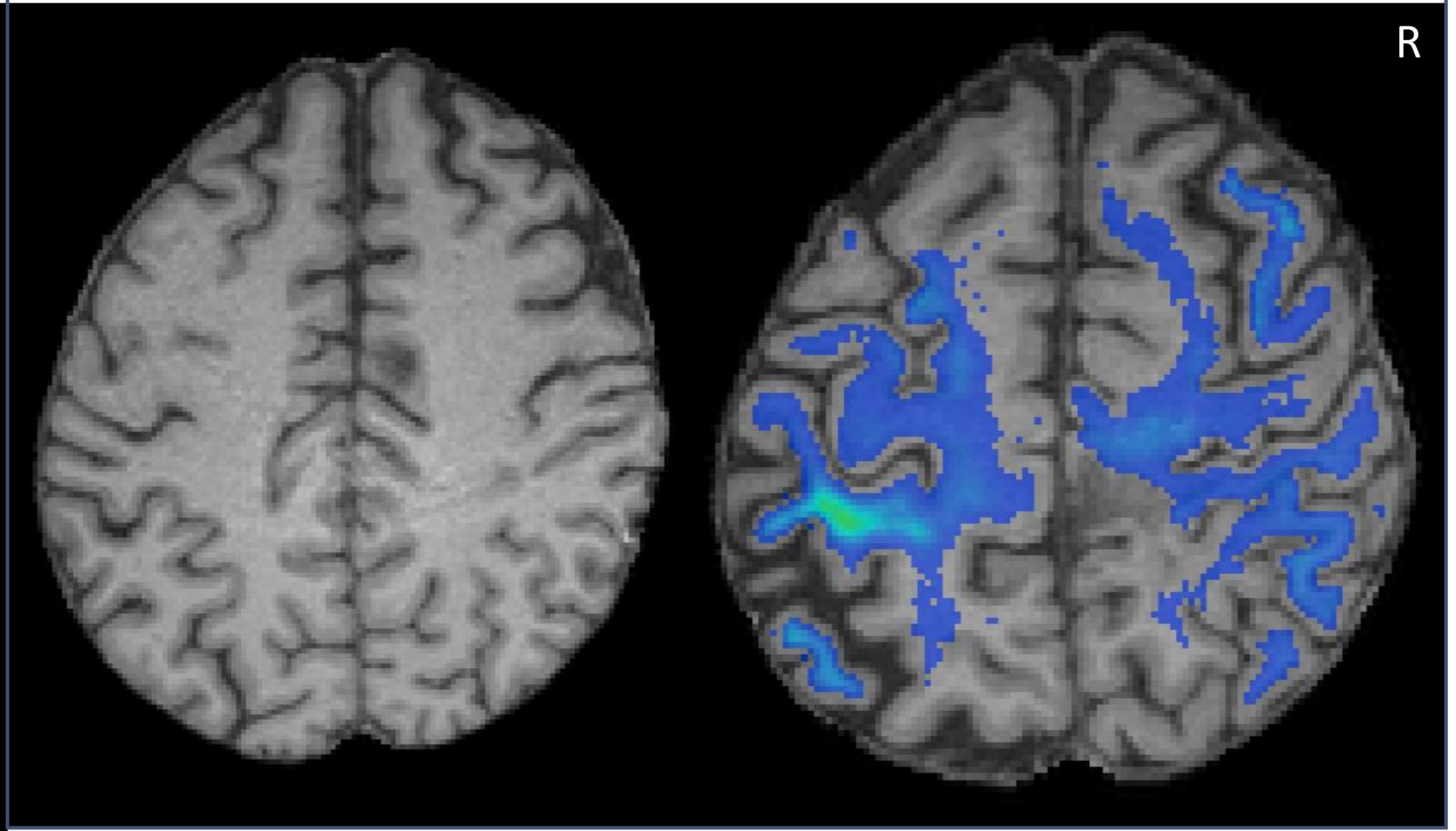
Probabilistic fiber density map of middle longitudinal fasciculus in tumor patient

You can reveal brain rewiring in your patient

Pre-op

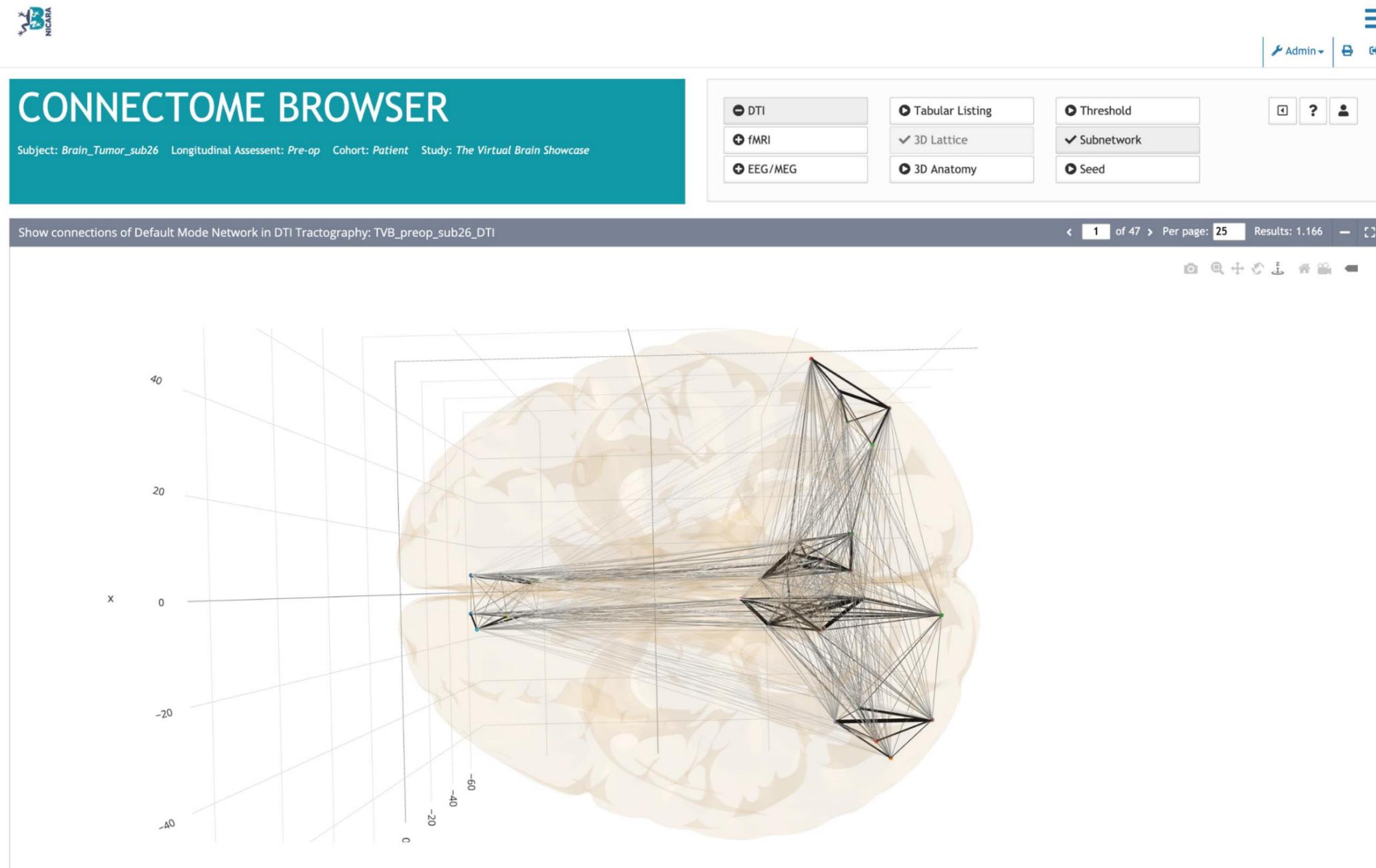


Post-op



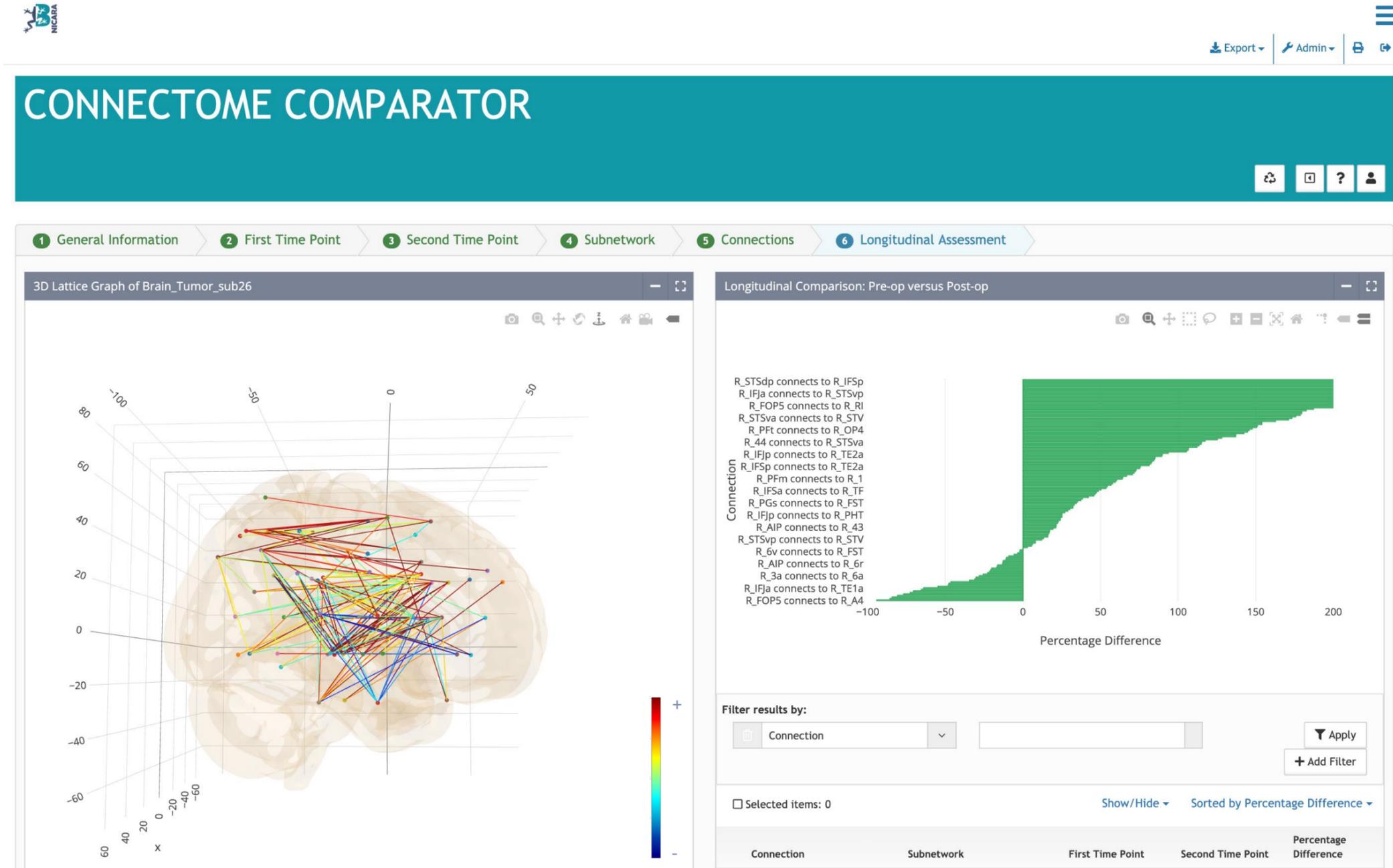
Fiber Density Maps: Superior Longitudinal Fasciculus before and after tumor resection

You can quantify brain connectivity



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

You can document your surgery outcome



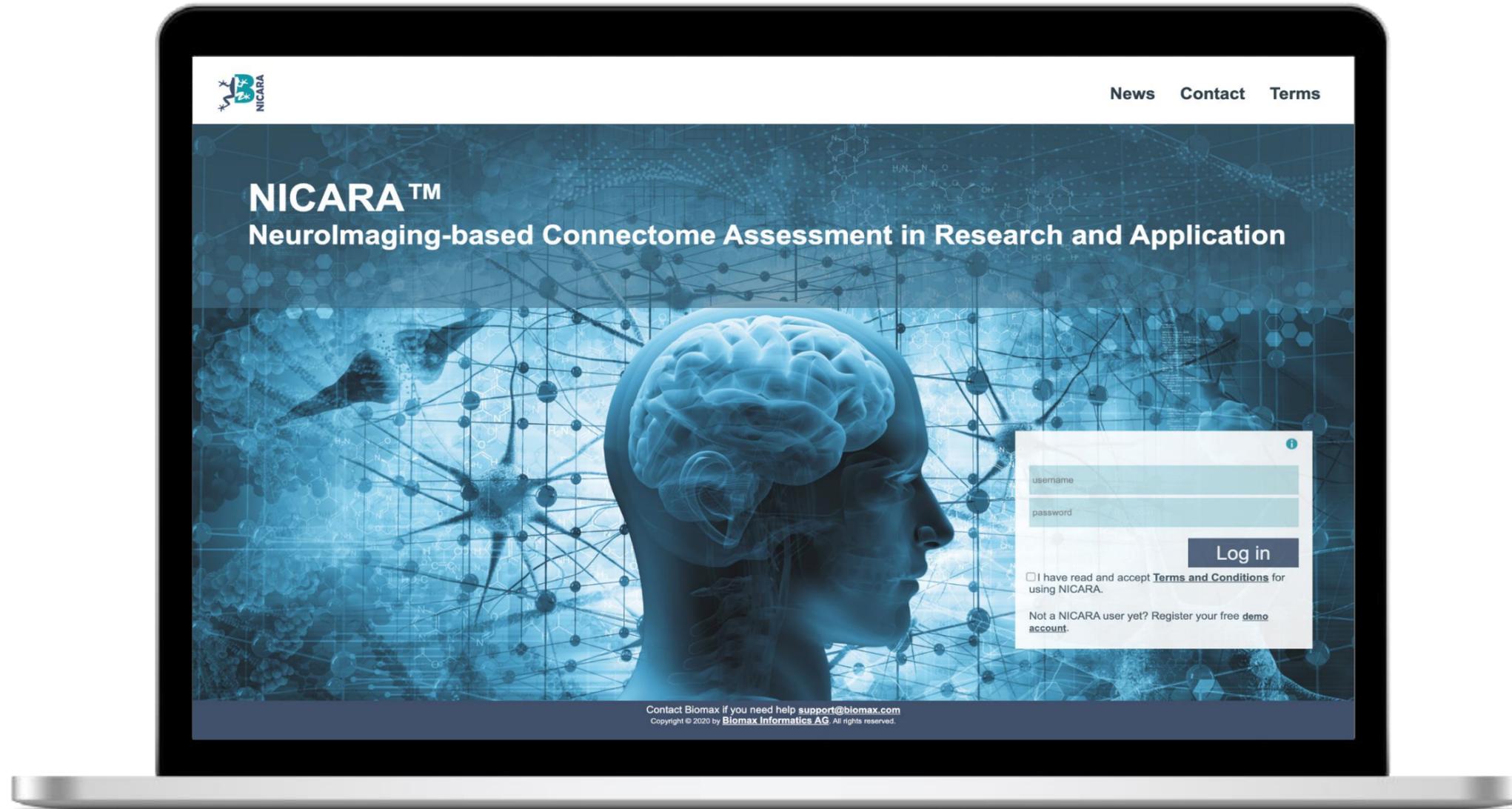
Increase of superior longitudinal fasciculus connectivity six months after tumor resection

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!