

BRAINHACK SCHOOL 2020 PROJECT DIFFUSION MRI

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June 4th, 2020

GOALS & PROJECT STEPS

Learning:

1. Data organization/ management
2. Preprocessing diffusion MRI data
3. Local fiber tracking (tractography reconstruction)
4. Data visualization

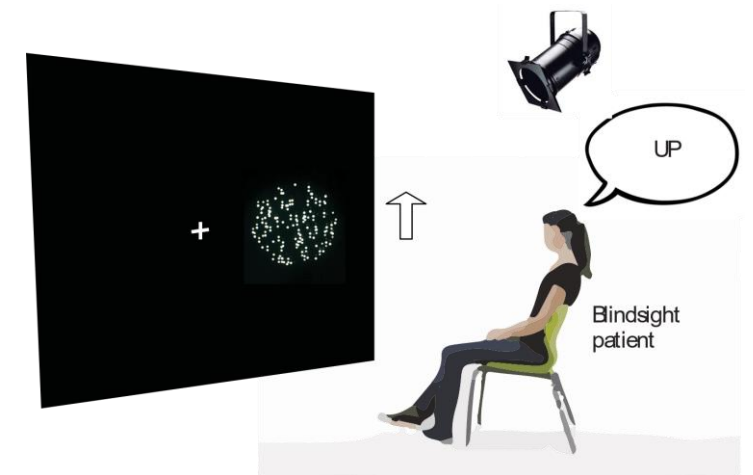
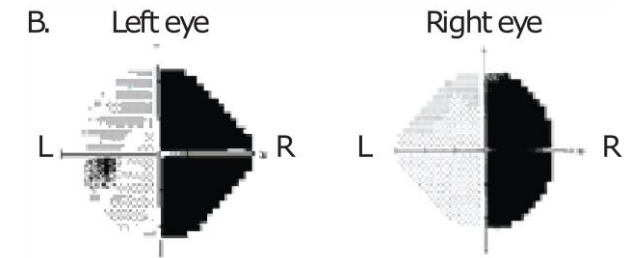
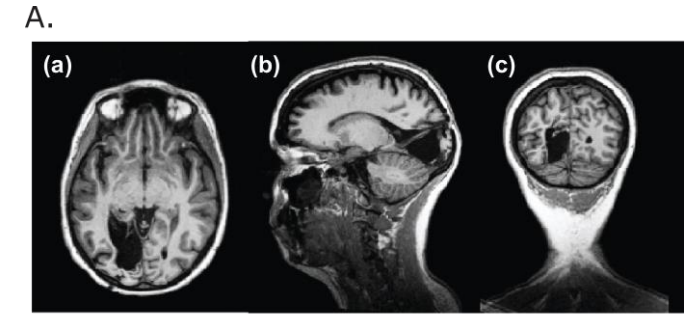
- WITH NEW TOOLS!



DATASET BACKGROUND

MRI data
Blindsight individuals & Neurotypical controls

Explore diffusion MRI!



Blindsight Scenario

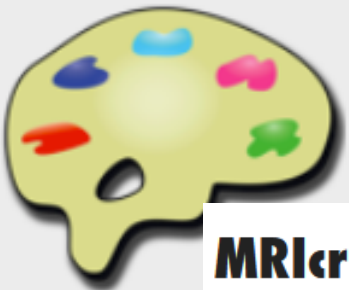
DATA ORGANIZATION/ MANAGEMENT

Goal:

- Convert dicoms into a BIDS valid dataset

Apply the 'Tutorial Series:Automate the Introductory Walkthrough'

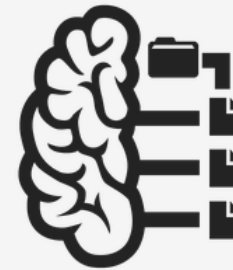
- Automated Custom Solution for my MRI data



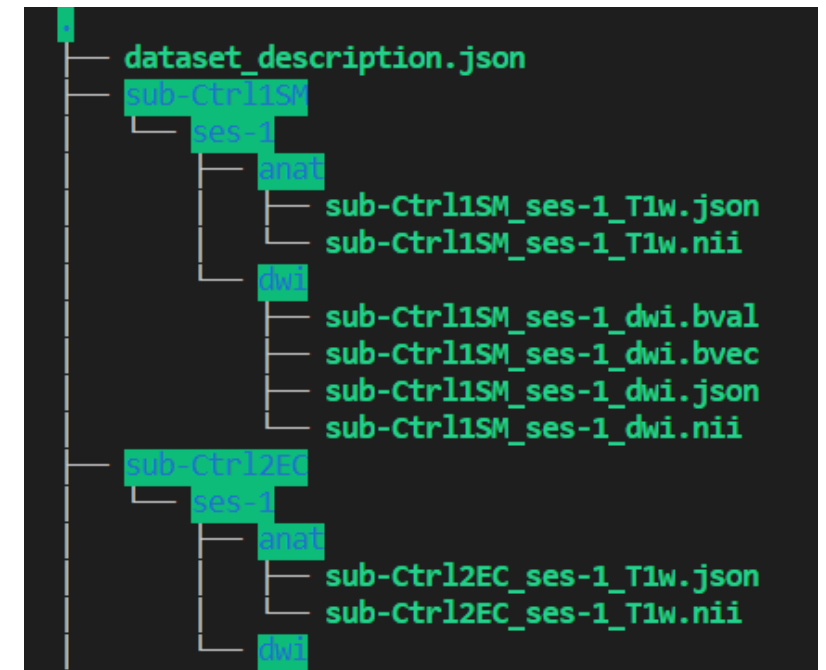
MRIcroGL



Visual Studio Code



BIDS
BRAIN IMAGING DATA STRUCTURE





DWI PREPROCESSING PIPELINE

- 1) Incorporate my dataset (now in BIDS format)
- 2) Extract b0 volumes
- 3) Perform brain extraction
- 4) Apply eddy correction
- 5) Registration to template
- 6) Apply registrations to anatomical and template images
- 7) Tissue segmentation on anatomical images in DWI space
- 8) Transform parcellations into DWI space

gkiar/dwipreproc_fsl-5.0.11_minified



DIPY



DIPY TRACKING

First: Generate a seed mask using a python script

1) Load preprocessing data (in BIDS format) & labels

2) Fit the data to a Constant Solid Angle Orientation Distribution Function (ODF) Model

3) Threshold on the generalized fractional anisotropy (GFA)

4) Specify seed mask

5) Generate streamlines

6) Output streamlines & connectivity matrix for visualization

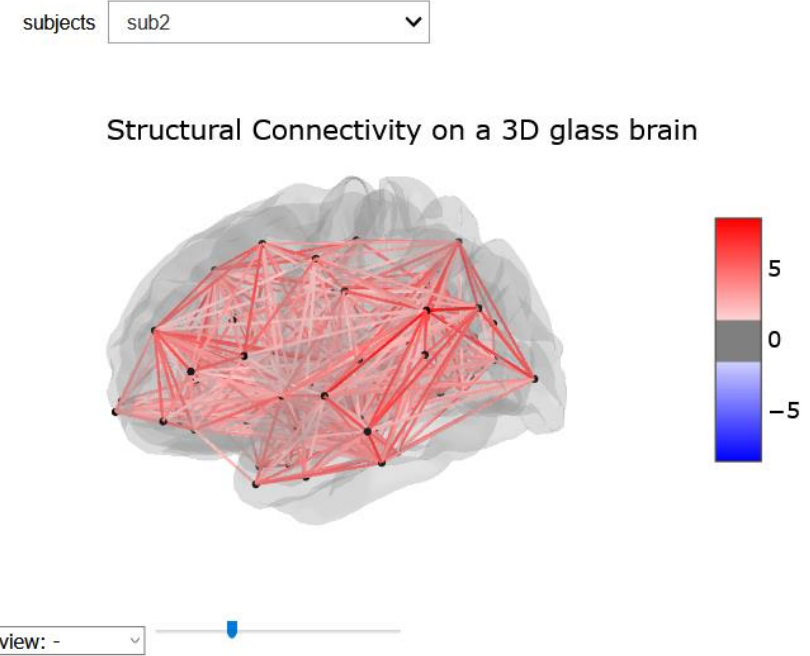
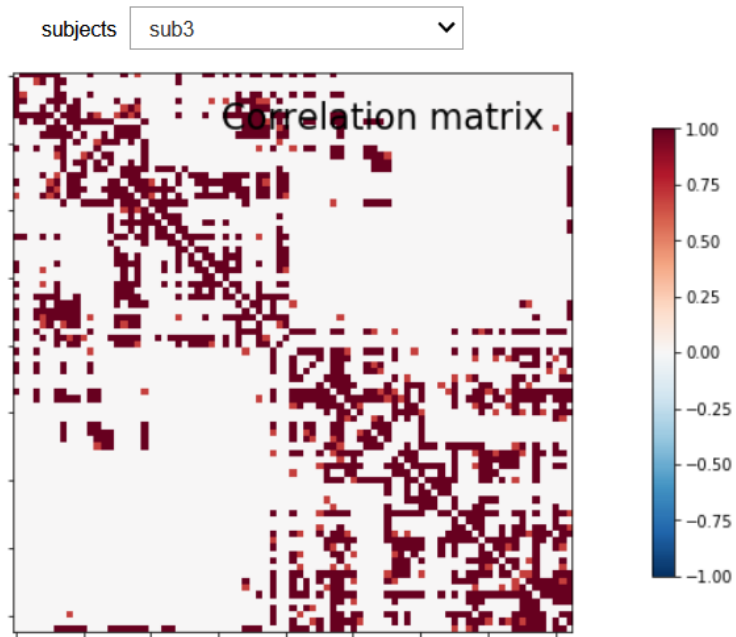


DIPY



DATA VISUALIZATION





DATA VISUALIZATION

TOOLS

Tools I used before:

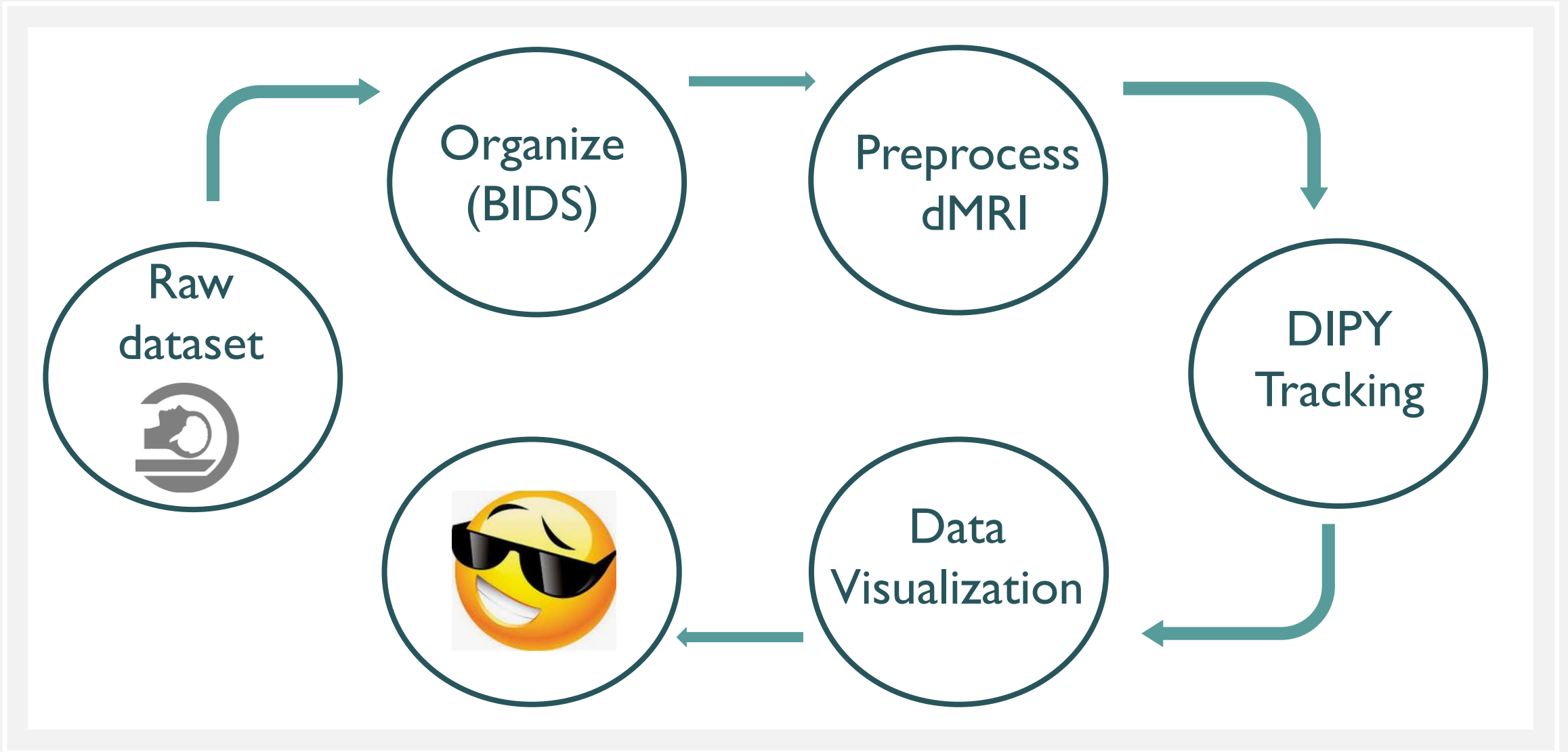
- MATLAB
- Spm12 for fMRI
- Inkscape & Adobe Illustrator

Tools I used for this project:

- Bash terminal
- GitHub
- BIDS
- Python scripts
- Docker containers to run a preprocessing pipeline
- DIPY for preprocessing and basic tracking of diffusion weighted images (DWI)
- Jupyter Notebook
- Visual Studio Code
- & more!

STARTED FROM THE BOTTOM NOW WE'RE.....HERE

Conclusion



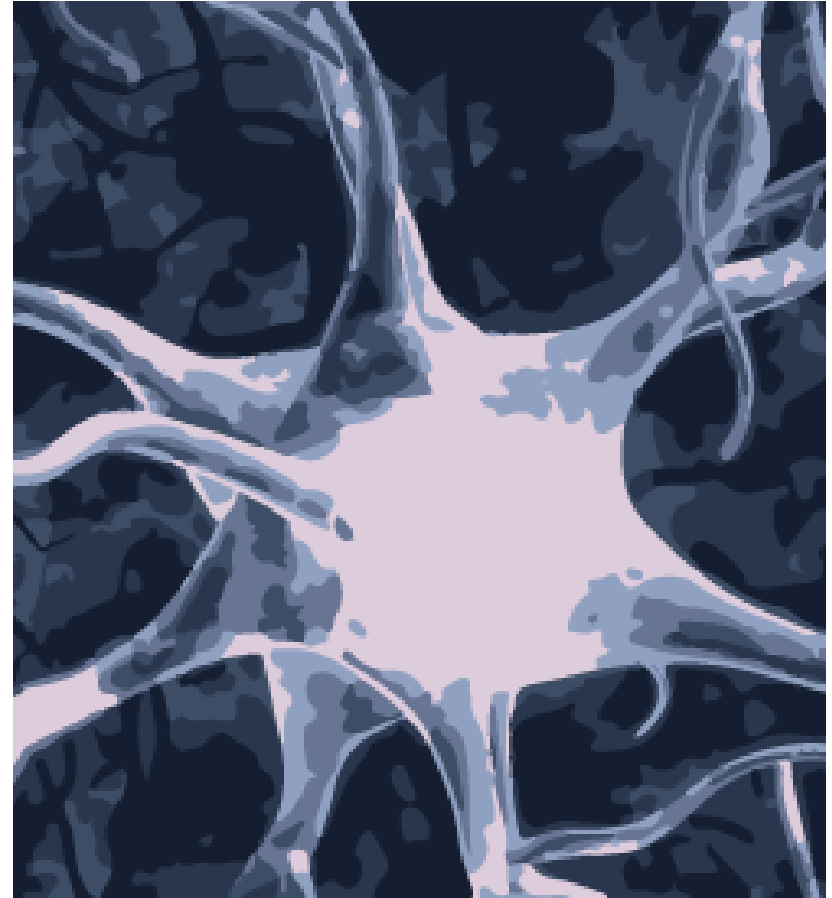
PERSPECTIVES

Next steps:

Increase number of subjects

Account for the brain injuries

Compare controls & blindsight individuals



THANKS BRAINHACK SCHOOL!

