

fMRIprep

Methods Lunch

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Why use fmriprep

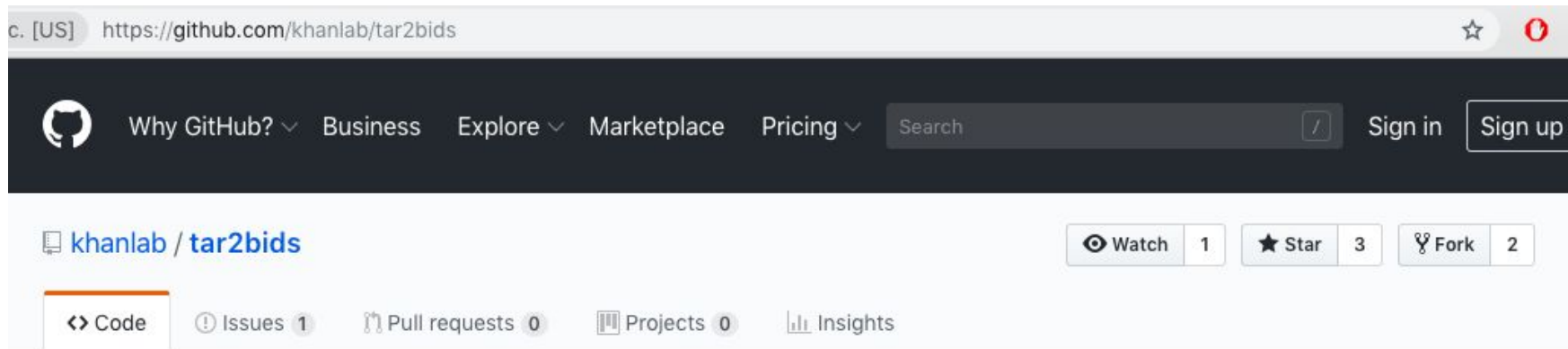
- Get the best of Freesurfer, FSL, ANTs, and AFNI tools
- Automation
 - Doesn't just save time but also removes user error
 - Constantly being updated to reflect state-of-the-art methods
- Many useful outputs
 - Freesurfer's surface-based cortical analysis tools and subcortical labelmaps
 - Many choices of noise regressors for fMRI
 - Easily imported into Matlab, other MRI software, or BIDS-Apps like prepDWI, SPM, etc.
 - <https://github.com/BIDS-Apps>
- Reproducibility and sharing made easy!

Why not use it?

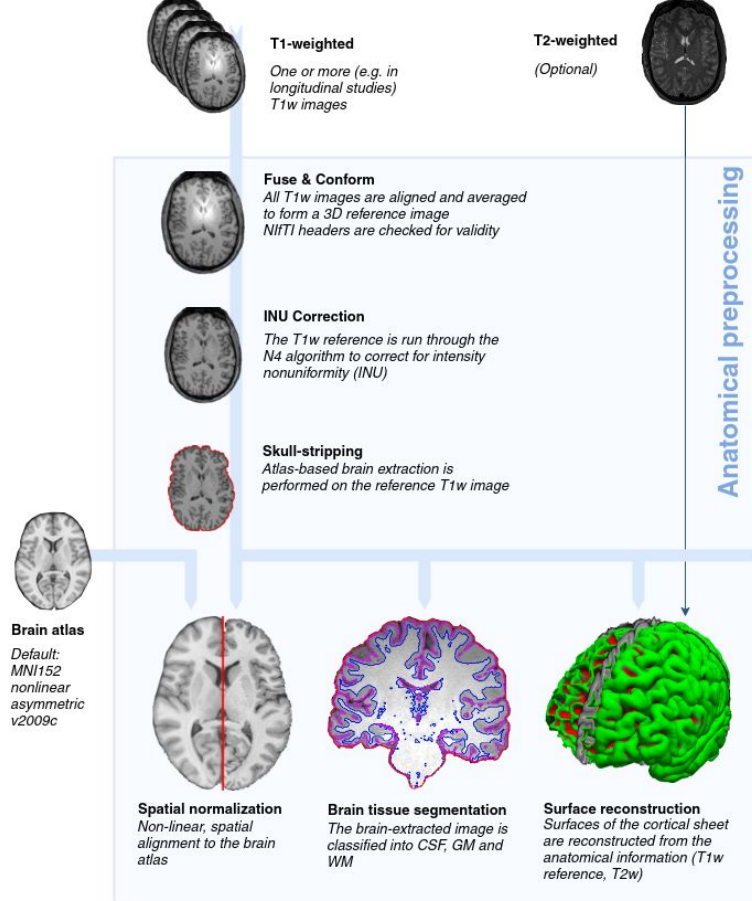
1. You have data with a narrow FOV
2. You have non-standard data (infant or NHP)
3. EPI-norm (EPI template to EPI registration) is not yet supported
4. You want unlimited flexibility
5. You want to learn or to teach how to build processing pipelines
6. If you are trying to reproduce some *in-house* lab pipeline.

Prerequisite: BIDS

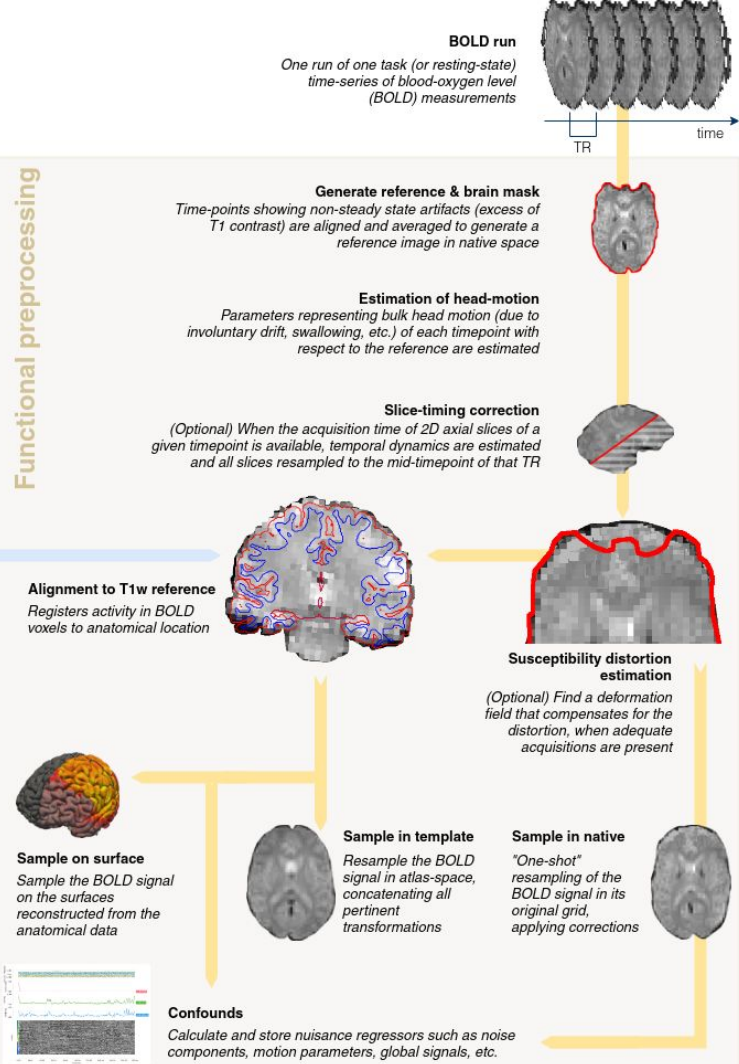
- fMRIPrep is a BIDS app
- Luckily people at Western have conversion options
 - Suzanne Witt can help you set up a continual conversion (switt@uwo.ca)
 - Tar2bids allows you to convert your data given a heuristic
 - You could manually convert your data

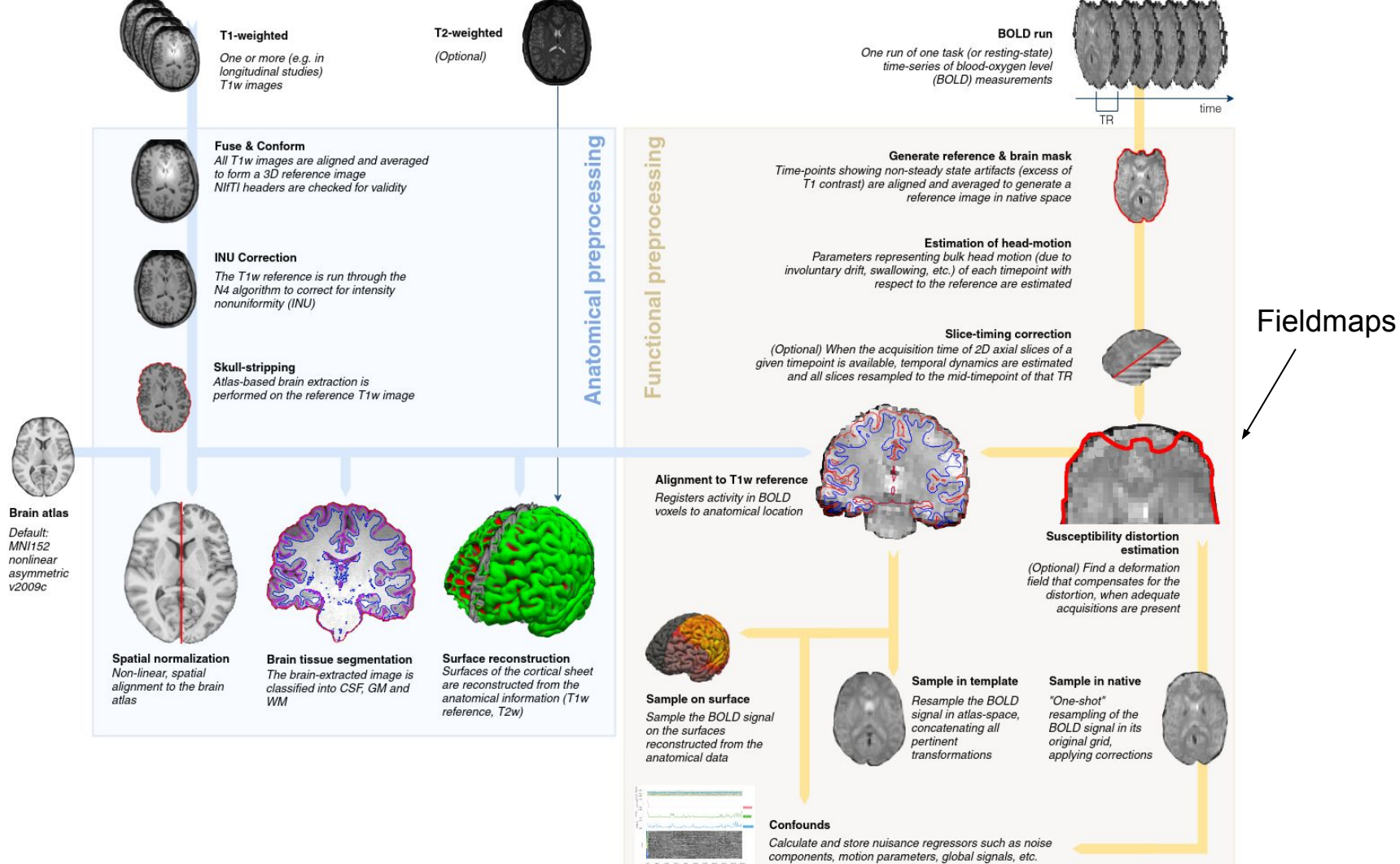


The screenshot shows a web browser window displaying the GitHub repository page for `khanlab/tar2bids`. The browser's address bar shows the URL `https://github.com/khanlab/tar2bids`. The GitHub navigation bar is visible, including the GitHub logo, links for "Why GitHub?", "Business", "Explore", "Marketplace", and "Pricing", a search bar, and "Sign in" and "Sign up" buttons. Below the navigation bar, the repository name "khanlab / tar2bids" is displayed. To the right of the repository name are buttons for "Watch" (1), "Star" (3), and "Fork" (2). Below these buttons is a horizontal menu with tabs for "Code", "Issues" (1), "Pull requests" (0), "Projects" (0), and "Insights".



Functional preprocessing



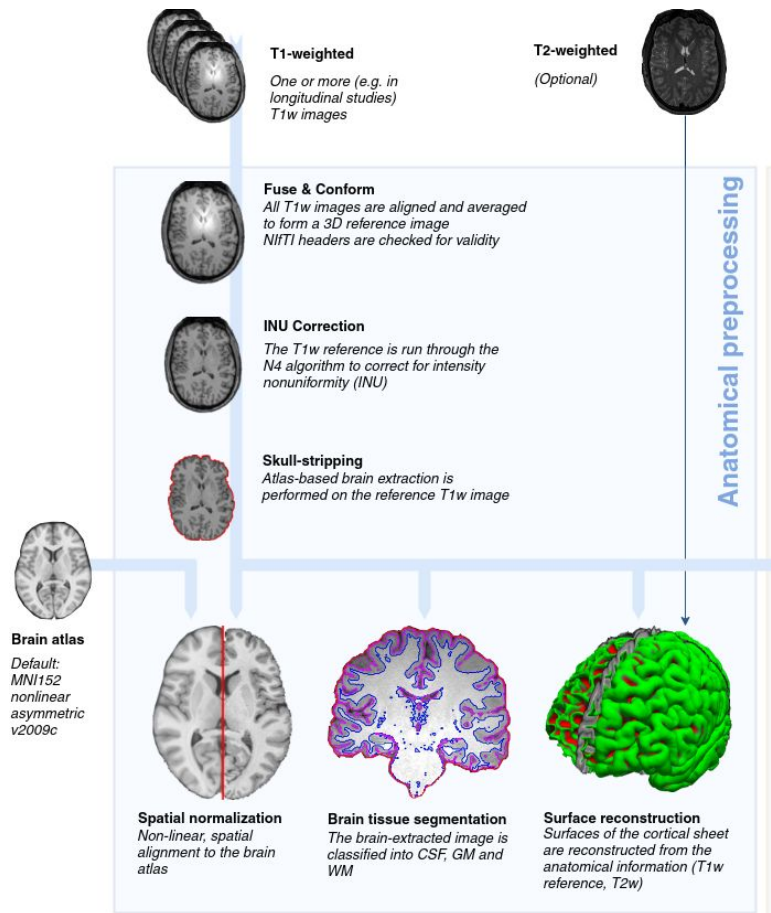


Starting Decisions

- Although fMRIprep will search through your data and make analysis decisions for you there are some choices you have to make
 - THIS SHOULD BE DONE BEFORE YOU RUN IT
- 1. Field map correction
 - a. Collected maps
 - b. Syn correction
- 2. Regressors
 - a. Compcors, D-VARS, etc
 - b. ICA-AROMA
- 3. Atlas Choice

Structural Outputs

- fmriprep/sub-01.html - easy quality control!
- fmriprep/sub-01/anat/
 - _T1w_preproc.nii.gz
 - _brainmask.nii.gz
 - _class-<CSF/WM/GM>_probtissue.nii.gz
 - _label-aparaseg_roi.nii.gz
 - _<pial/mid/WM>.<L/R>.surf.gii
 - transforms to and from MNI152
 - All of the above in (_space-MNI152)
- freesurfer/sub-01/
 - Other Freesurfer tools (e.g. logs, stats, surface-based labels, 2nd level analyses, group atlases etc.)

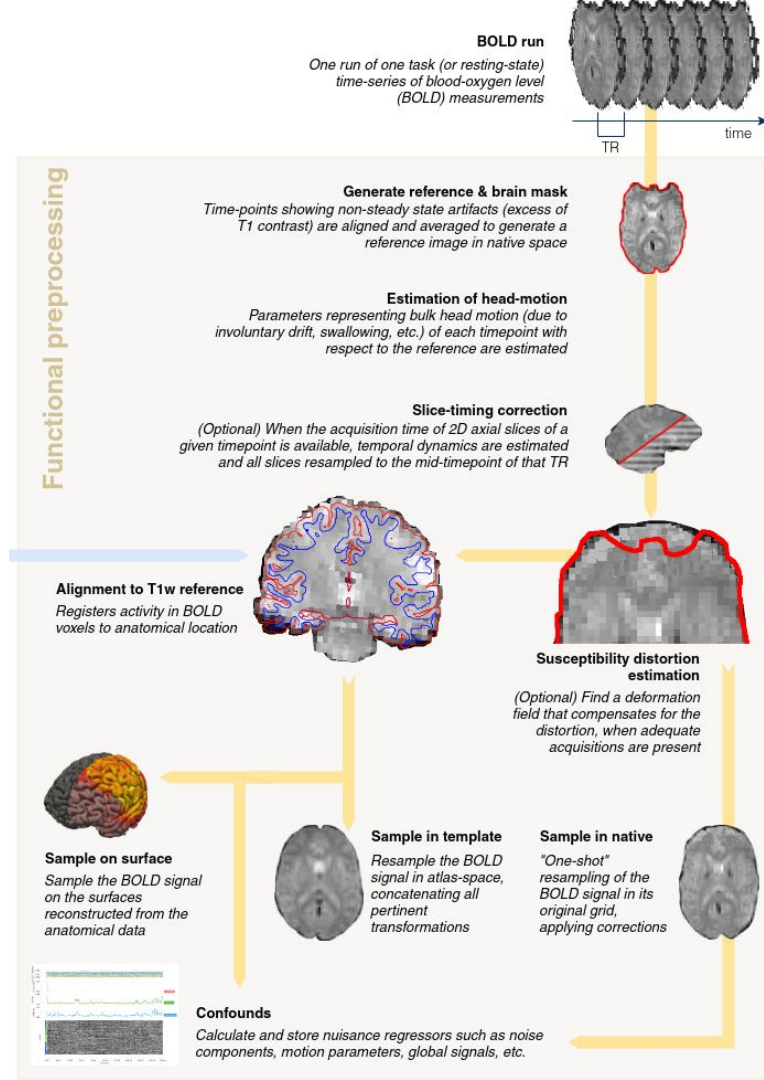


Structural Outputs Demo



Functional Outputs

1. Reports (sub-##.html)
2. Pre-processed BOLD Data
 - a. Native space
 - b. Volumetric Template Space
 - c. Surface Template Space
3. Confounds (confounds.tsv)
 - a. aCompCor/tCompCor
 - b. Framewise displacement
 - c. D-VARS
 - d. Motion parameters
 - e. ICA-AROMA regressors



Functional Outputs Demo



Installation demo

Via Docker



How to run it demo?

Via Docker



fMRIprep and Servers

- Can be run in a container on compute canada cluster
 - Need an account for the trainee and the PI (also for faster results an allocation)
 - Singularity is installed on graham (main cluster)
 - Need to download singularity image of fmripred (singularity pull or khanlab image)
 - Submit run as a job to graham (bidsBatch)
- Can be run in container on a local server
 - Requires >8 GB ram
 - Lots of storage (~4GB/subject depending on runs)
 - Requires singularity install
 - Need to download singularity image of fmripred (singularity pull or khanlab image)
 - Run in singularity container on server

Boilerplate Methods Generation

Conclusions

- fMRIPrep will use state of the art preprocessing on your data prior to GLM or resting state analysis
- fMRIPrep can be run locally or on the cloud
- Reports provide easy quality assurance
- People at Western are available to help with setting up and using fMRIPrep
- Reproducibility and sharing made easy!

Thank you for listening!

Any questions?

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