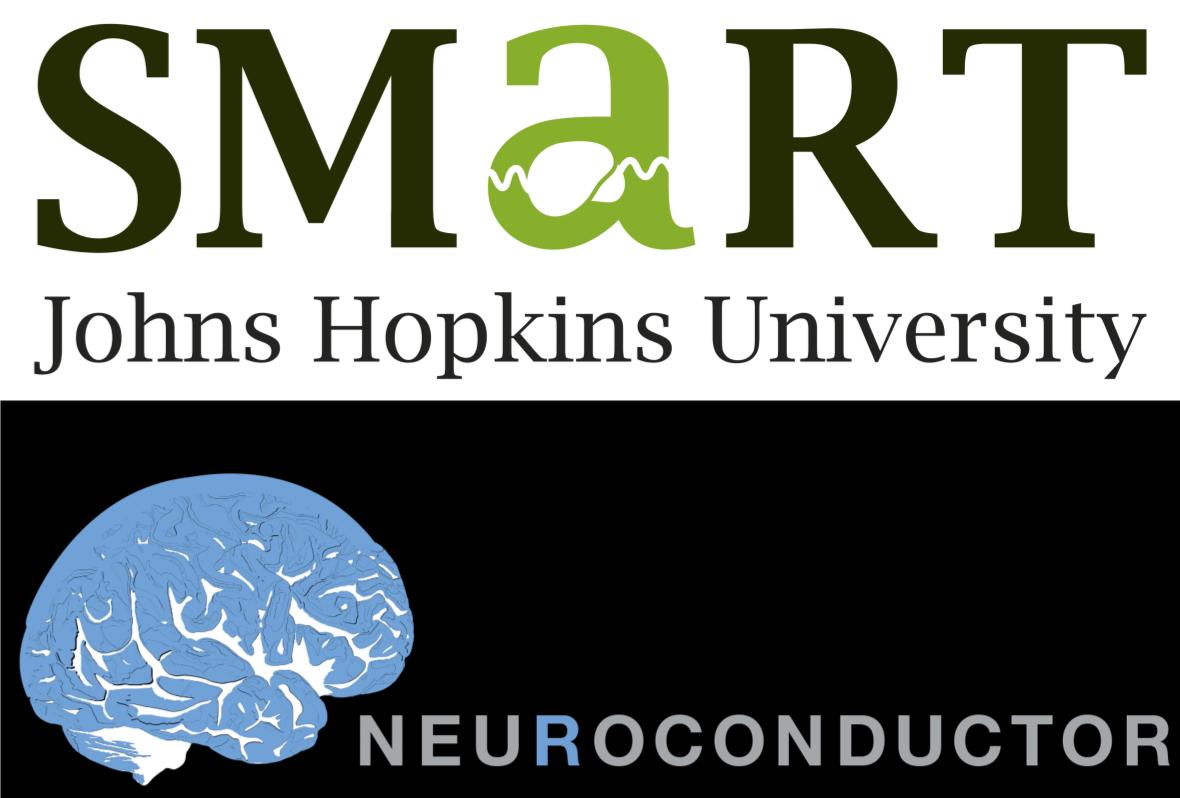


Neuroconductor: An R Platform for Medical Imaging Analysis

<https://neuroconductor.org/>



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What is Neuroconductor?



Neuroconductor (<https://neuroconductor.org/>) is a centralized repository of R software dedicated to medical image analysis.

Goals of Neuroconductor

- Disseminate quickly software updates
- Educate a large, diverse community of scientists using detailed tutorials and short courses
- Ensure quality via automatic and manual quality controls
- Promote the reproducibility of image data analysis

Benefits of Imaging in R

Allow medical imaging to use all R has to offer:



(Image from <http://rmarkdown.rstudio.com/images/RMarkdownOutputFormats.png>)

Current Neuroconductor Capabilities

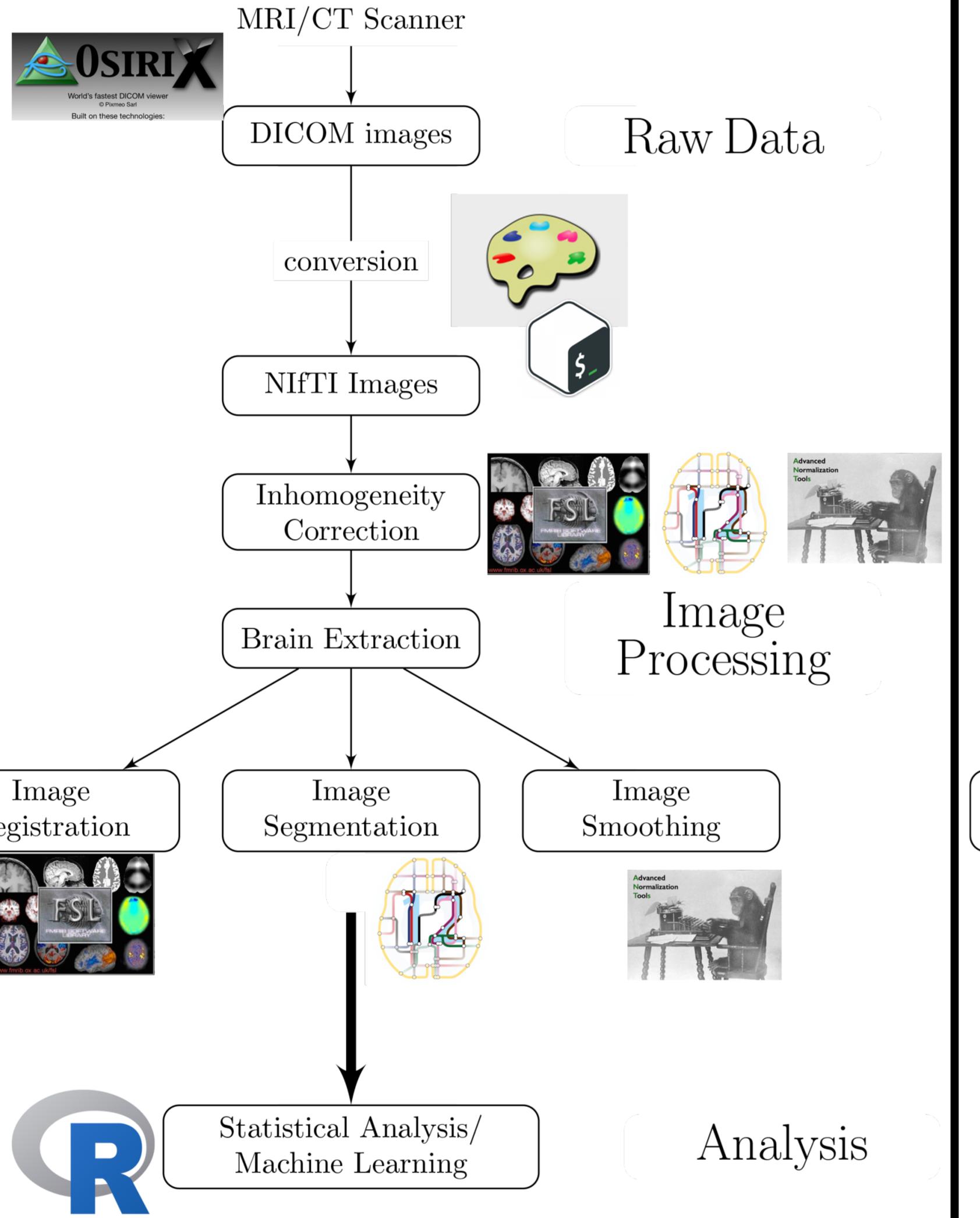
Capabilities	Packages
DICOM Images	oro.dicom, dcm2niir, divest, ANTsR
NIfTI Images	oro.nifti, RNifti, ANTsR
Image Registration	spm12r, fslr, ANTsR, freesurfer
Inhomogeneity Correction	spm12r, fslr, ANTsR
Brain Extraction	spm12r, fslr, ANTsR, extrantsr
Structure Segmentation	spm12r, fslr, ANTsR, extrantsr, freesurfer
Intensity Normalization	WhiteStripe, neurobase, ANTsR
3D Smoothing	ANTsR, spm12r, fslr
Temporal Filtering	spm12r, fslr, ANTsR
Slice-timing correction	spm12r, fslr
DTI models	rcamino, oro.dti, fslr

References

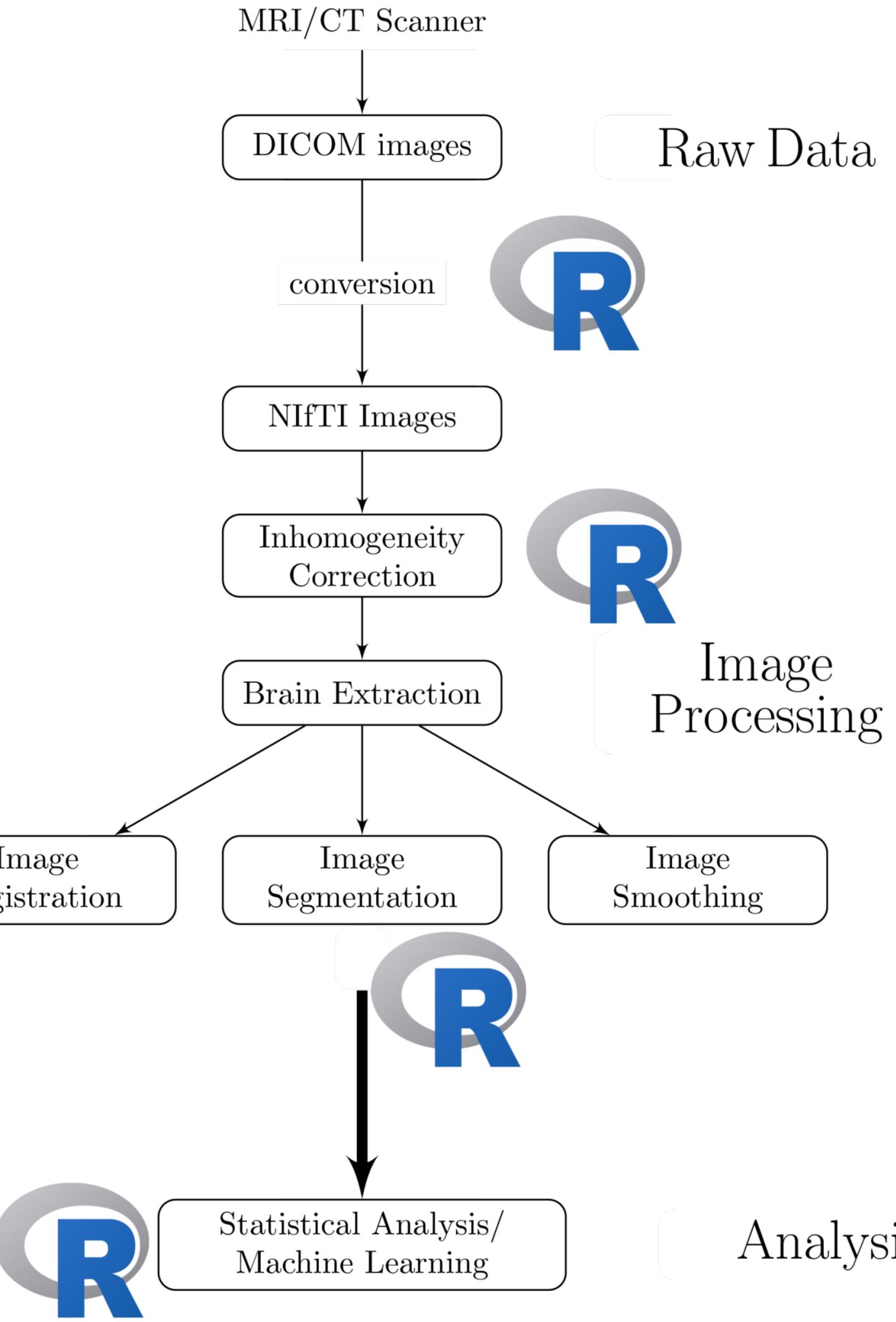
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- [2] Kenichi Oishi et al. "Atlas-based whole brain white matter analysis using large deformation diffeomorphic metric mapping: application to normal elderly and Alzheimer's disease participants". In: *Neuroimage* 46.2 (2009), pp. 486–499.
- [3] Vladimir Fonov et al. "Unbiased average age-appropriate atlases for pediatric studies". In: *Neuroimage* 54.1 (2011), pp. 313–327.
- [4] Vladimir S Fonov et al. "Unbiased nonlinear average age-appropriate brain templates from birth to adulthood". In: *Neuroimage* 47 (2009), S102.
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- [6] David C Van Essen et al. "The WU-Minn human connectome project: an overview". In: *Neuroimage* 80 (2013), pp. 62–79.

Example Imaging Workflow

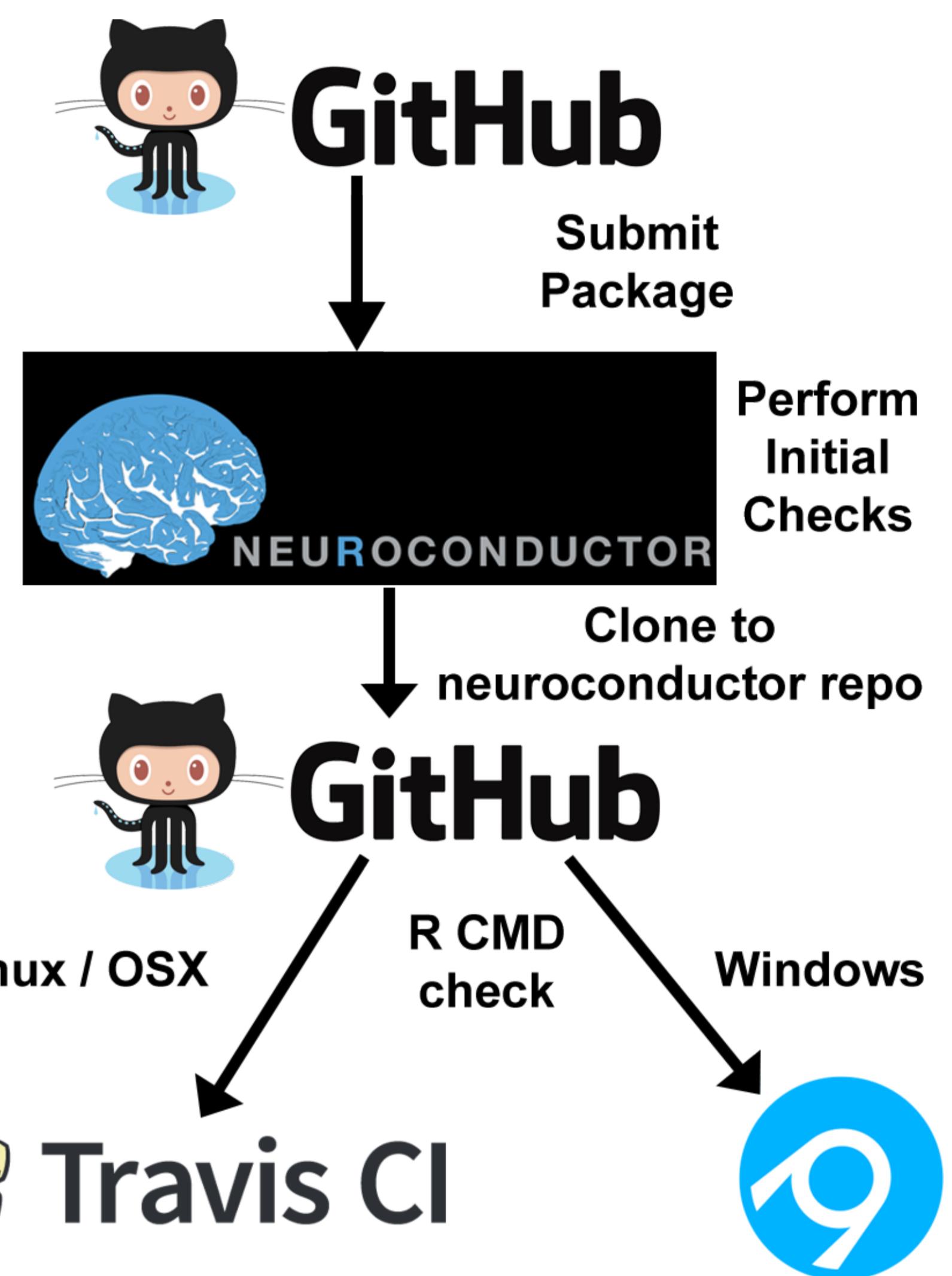
Typical Imaging Workflow



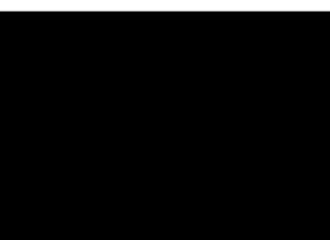
Neuroconductor Workflow



Neuroconductor Developer Workflow



GitHub - a online hosting service of git repositories. All Neuroconductor packages are hosted on GitHub.



Before uploading to GitHub, checks are performed, a confirmatory email is sent (reduce spam), and Travis/Appveyor configuration files are added



Travis CI (continuous integration) - an online service of Linux/Mac OSX virtual machines that build and check packages



AppVeyor - a similar CI service that builds and checks packages on Windows

Data Packages

Package	Description
kirby21	Scan-rescan data for 42 subjects with structural and functional MRI and diffusion data [1]
EveTemplate, MNITemplate	Templates for population-level analyses [2, 3, 4]
mafL.templates	Templates [5] for Multi-Atlas Label Fusion (MALF) and Skull Stripping
hcp	Download data from the Human Connectome Project [6]

Potential Downsides to Neuroconductor

- More control over the workflow = more work (e.g. for statisticians)
- Users need external software (versions/installation)
- No control over external software
 - if maintainer changes something, not much recourse
- Need the content (buy-in from the imaging/R/statistical communities)

Sources of Funding

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