

Statistical Analysis of Structural MRI Data

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Setup

Before this course begins...

- 1 Install R (<http://cran.r-project.org>)
- 2 Install R Studio (<http://www.rstudio.com>)
- 3 Open R Studio and install devtools package in R:

```
>install.packages('devtools')  
>library(devtools)  
>install_github(?muschellij2/ENARSC2015?)
```

Setup

Once ENARSC2015 installs, run...

```
> library(ENARSC2015)
> copy_data(OUTPUTDIRECTORY)
# where OUTPUTDIRECTORY is the output directory you want data
# to be copied to. All analysis will be done in this directory.
```

Course Deliverables

- 1 Knowledge of fsIR in R
 - 1 Interactively explore data with the imaging software Medical Image Processing, Analysis, and Visualization (MIPAV)
 - 2 Image preprocessing with MIPAV
 - 3 Reading, writing, plotting and manipulation of imaging data in R

Course Deliverables

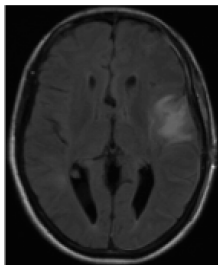
Subtract the a follow-up T1-w volume from a baseline T1-w volume.



Course Deliverables

Perform a template-based analysis.

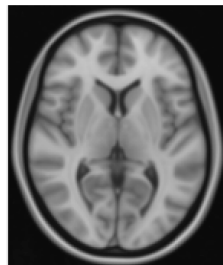
Warped FLAIR image



Warped ROI image



MNI T1 Template

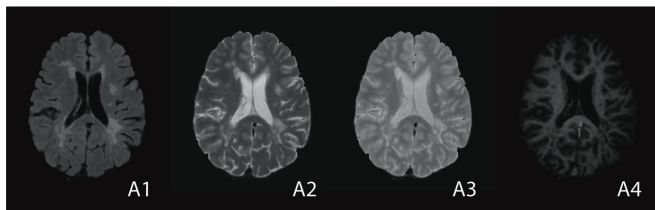


Outline

- 1 Structural MRI Data
- 2 Public MRI Data
- 3 Opening Images in R
- 4 Image Preprocessing
- 5 fsLR and ANTsR: R packages for Image preprocessing
- 6 Image Pre-processing in R with fsLR
- 7 Image Analysis in R

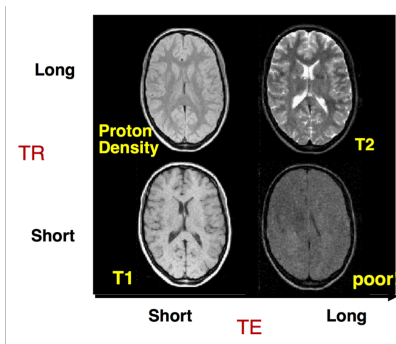
Structural MRI Data

- (A1) Fluid-attenuated inversion recovery (FLAIR)
- (A2) T2-weighted (T2-w)
- (A3) Proton density (PD)
- (A4) T1-weighted (T1-w)



Structural MRI Data

MRI Signal Intensities



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Structural MRI Data

MRI Signal Intensities

	T2WI	PD/FLAIR	T1WI
Solid mass	Bright	Bright	Dark
Cyst	Bright	Dark	Dark
Subacute blood	Bright	Bright	Bright
Acute & chronic blood	Dark	Dark	Gray
Fat	Dark	Bright	Bright