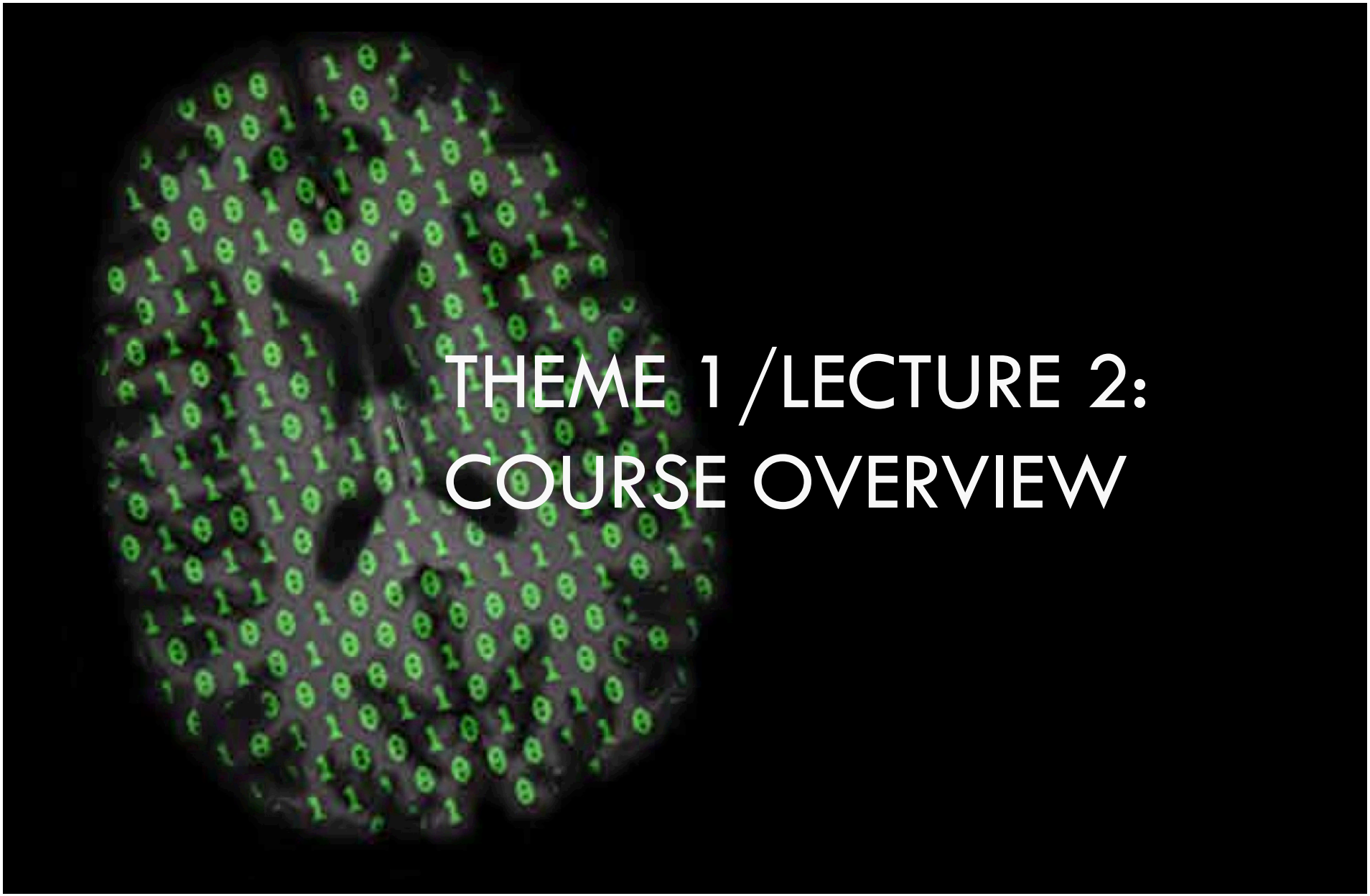
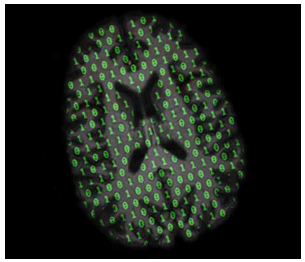
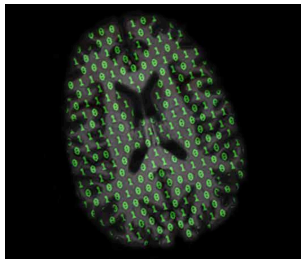


THEME 1 /LECTURE 2: COURSE OVERVIEW



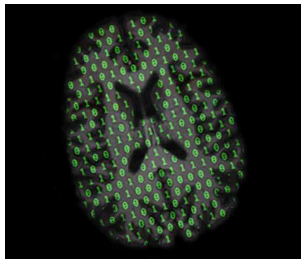
Overview

- Why R?
- Why structural MRI?
- Set up



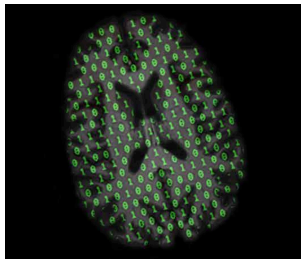
Why R?

- Hackable
- Free, open source
- One platform for processing/analysis
- Developed for data analysis
- Large number of user-developed packages
- Easy interaction with state-of-the art neuroimaging software (FSL, ANTS)

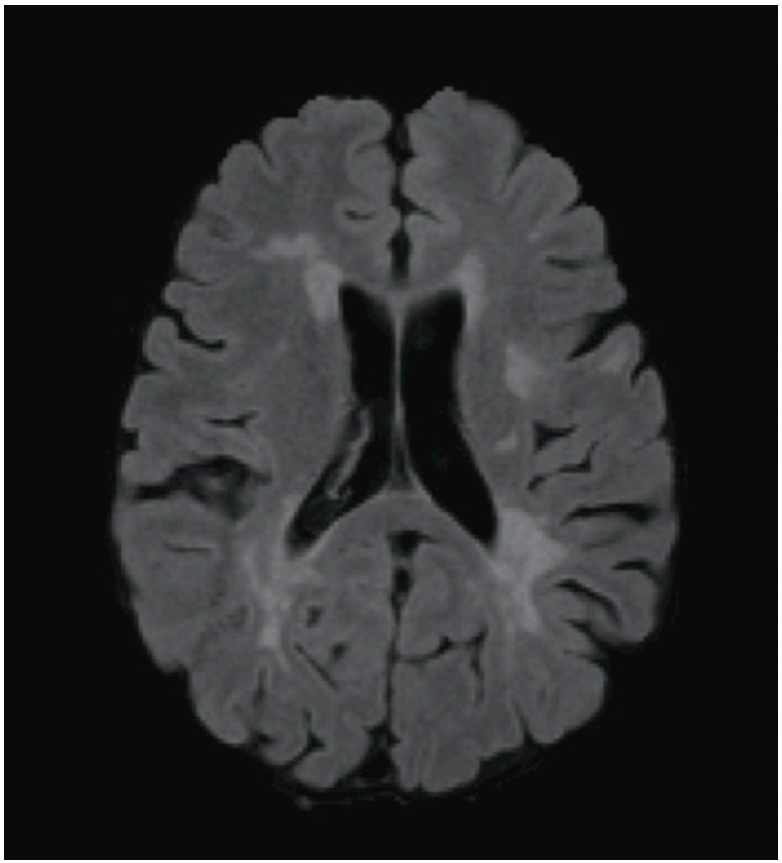


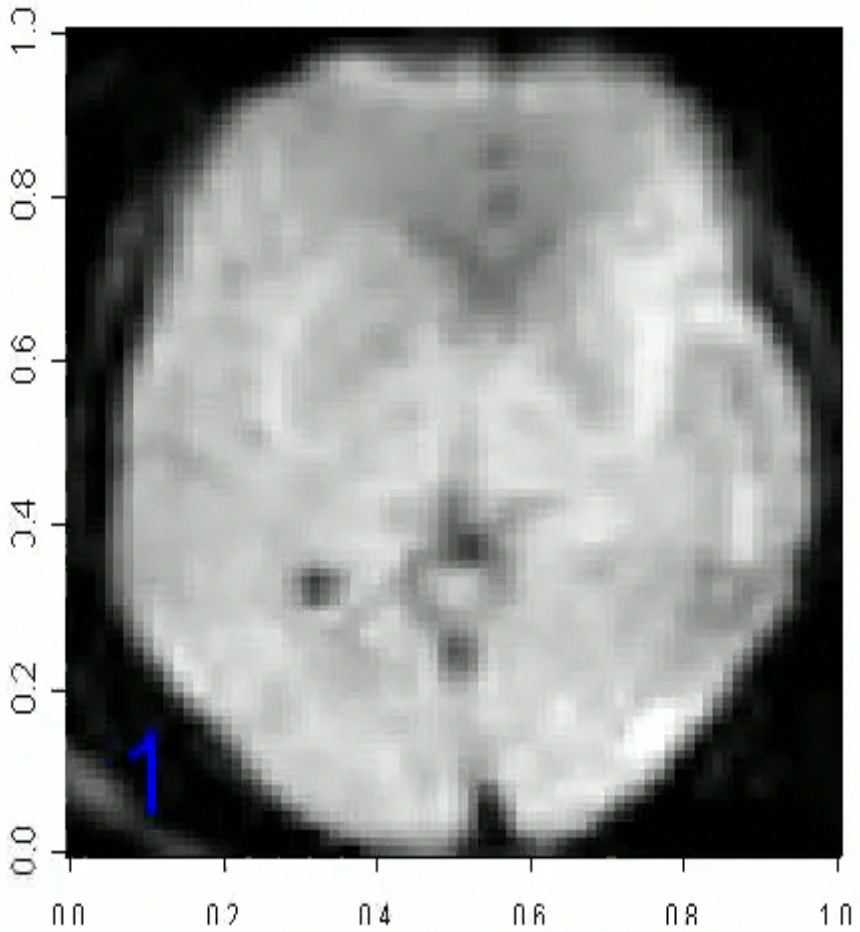
Why structural MRI?

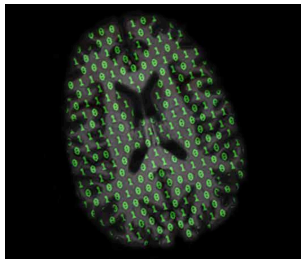
- High spatial resolution
- Reveals the anatomic structure of soft tissues
- Used extensively in clinical and research practice
- Versatile: different contrasts can target different tissue types
  - FLAIR, T1, T2, PD, …
  - DTI, …
  - DCE, …
- Sensitive to pathology (e.g. brain cancer, Multiple Sclerosis lesions)



Structural MRI vs. fMRI



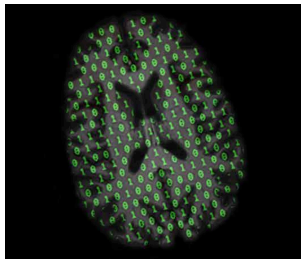




Set up

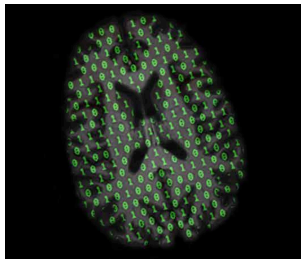
- Install R (http://cran.r-project.org)
- Install R Studio (http://www.rstudio.com)
- Download data: https://github.com/muschellij2/Neurohacking_data/archive/v0.0.zip
  - Copy into a directory on your computer
  - For example `~/Neurohacking_data`
- Open R Studio and install the devtools package in R

```
install.packages("devtools")
library(devtools)
```



Data Used

```
Neurohacking_data
    BRAINIX
        DICOM
            T1
                IM-0001-0001.dcm
                …
                IM-0001-0022.dcm
            ROI
            FLAIR
            T2
        NIFTI
            T1.nii.gz
            ROI.nii.gz
            FLAIR.nii.gz
            T2.nii.gz
    Kirby21
        113
            visit_1
                113-01-FLAIR.nii.gz
                113-01-MPRAGE.nii.gz
                113-01-T2w.nii.gz
            visit_2
                113-02-FLAIR.nii.gz
                113-02-MPRAGE.nii.gz
                113-02-T2w.nii.gz
    Template
        MNI152_T1_1mm_brain.nii.gz
        JHU_MNI_SS_T1_brain.nii.gz
        …
```



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                113-01-T2w.nii.gz
            visit_2
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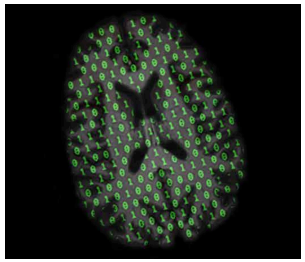
                113-02-MPRAGE.nii.gz
                113-02-T2w.nii.gz
    Template
        MNI152_T1_1mm_brain.nii.gz
        JHU_MNI_SS_T1_brain.nii.gz
        …
```



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```

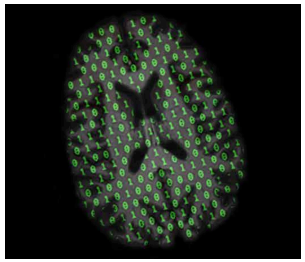

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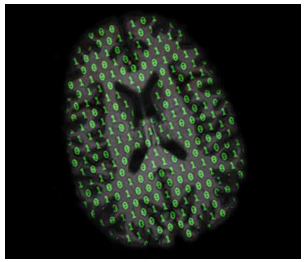

Data sources

- **OsiriX:** A number of open source DICOM imaging datasets of various parts of the body

  www.osirix-viewer.com/datasets/

- **NITRC:** Kirby 21, Multi-Modal MRI reproducibility Resource

  https://www.nitrc.org/projects/multimodal

- **MNI-ICBM:** Various atlases, we are using MNI-ICBM 152-linear

  http://www.bic.mni.mcgill.ca/ServicesAtlases/HomePage

- **Eve:** Single-subject white matter atlas

  http://cmrm.med.jhmi.edu/