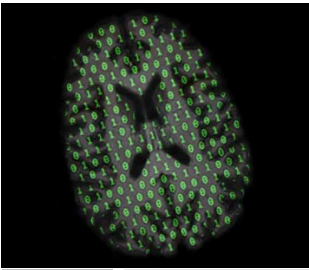




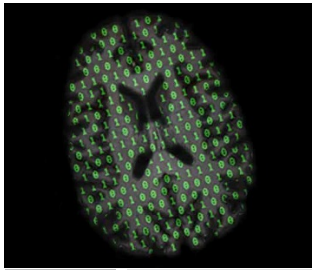
THEME 2/LECTURE 2: NIFTI



NIfTI

- NIfTI (Neuroimaging Informatics Technology Initiative) format
 - Standardized representation of images
 - Most commonly used type of analytic file
 - Developed to facilitate cross-platform, cross-software interpretability
 - 3-dimensional (3D) array: stacking individual slices on top of each other
 - DICOM: one sheet of paper, NIfTI: stack of papers

<http://nifti.nimh.nih.gov/>



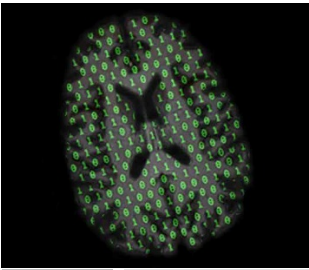
DICOM versus NiftI

	DICOM	NiftI
File extension	.dcm	.nii .nii.gz
File represents	One slice of the brain	3D image of the brain
Header contains	Many fields, protected health information, hospital-related meta-data	Image meta-data, no patient information
Storage	Different folders per subject, more complex data structures	Different files (can be in the same directory)



From DICOM to NifTI

- DICOM to NifTI using the `dicom2nifti` function in the `oro.dicom` package
- The `nifti` object becomes an R object
- After saving a file to a `nifti` file it can be used without R



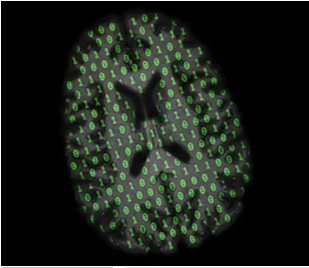
Recall: Loading Multiple DICOM Files

```
Neurohacking_data
  BRAINIX
    DICOM
      T1
        IM-0001-0001.dcm
        ...
        IM-0001-0022.dcm
      ROI
      FLAIR
      T2

setwd("~/Neurohacking_data/BRAINIX/DICOM")
all_slices_T1 = readDICOM("T1/")

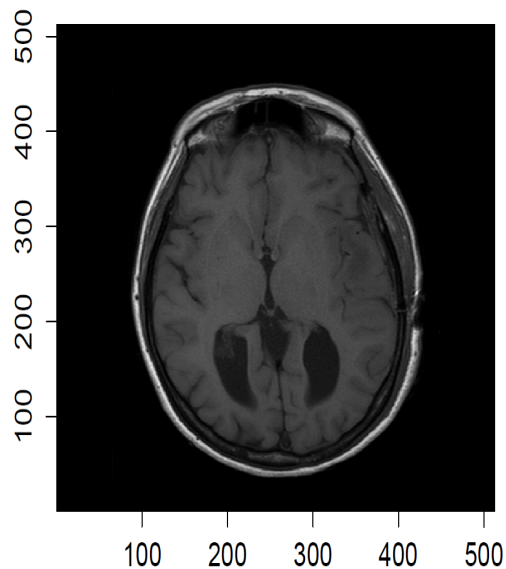
dim(all_slices_T1$img[[1]])
[1] 512 512

hdr=all_slices_T1$hdr[[1]]
hdr[hdr$name == "PixelSpacing", "value"]
[1] "0.46875 0.46875"
```



From DICOM to Nifti

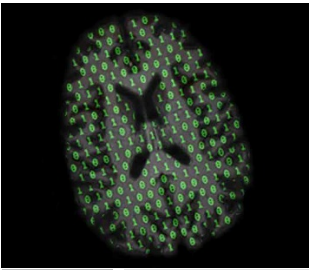
```
nii_T1=dicom2nifti(all_slices_T1)
d=dim(nii_T1); d; class(nii_T1)
[1] 512 512 22
[1] "nifti"
image(1:d[1],1:d[2],nii_T1[, ,
11],col=gray(0:64/64),xlab="",ylab="")
```





Write and Read NIfTI Files

- Use the `writeNIfTI`, `readNIfTI` functions in the `oro.nifti` package
- Writes, reads the `nifti` R object to a NIfTI file
- Default for `writeNIfTI` is to save compressed NIfTI files



Write and Read NIfTI Files

```
library(oro.nifti)
setwd("~/Neurohacking_data/BRAINIX/NIfTI")
fname="Output_3D_File"
writeNIfTI(nim=nii_T1,filename=fname)

list.files(getwd(), pattern = "Output_3D_File")
[1] "Output_3D_File.nii.gz"

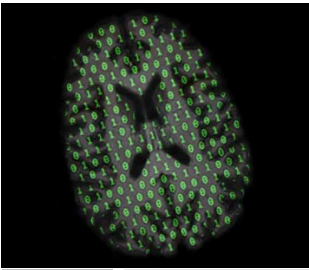
list.files(getwd(), pattern = "T")
[1] "T1.nii.gz" "T2.nii.gz"

nii_T2=readNIfTI("T2.nii.gz",reorient=FALSE)
dim(nii_T2)
[1] 512 512 22
```




Compressed Image Files

- ❑ Files are in compressed format with the extension `.nii.gz`
- ❑ Saves disk space, makes read/write data very fast
- ❑ Excellent for scripting, analysis of image population
- ❑ A non-compressed file can be obtained using the argument `gzipped=False` in the function `writeNifti`
- ❑ No extension for file name in `writeNifti`

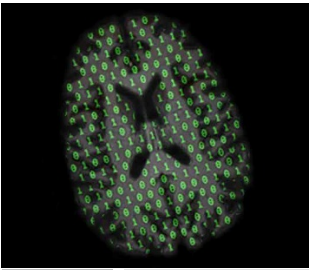


dcm2nii

- ❑ If you do not like R you can use the `dcm2nii` software as part of the `MRICron` platform
- ❑ Converts DICOM to NIfTI files
- ❑ Can handle multiple formats and file types
- ❑ But, if you do not R like then you should probably not take this course

<http://www.mccauslandcenter.sc.edu/mricro/mricron/dcm2nii.html>

<http://www.mccauslandcenter.sc.edu/mricro/mricron/>



Other Formats

- ❑ Files from Philips scanners are PAR/REC files (not DICOM)
- ❑ `r2a` can be used to convert PAR/REC files to NIfTI files
- ❑ NIfTI was based on the ANALYZE format: older, format header and image were in separate files
- ❑ We prefer NIfTI: one file, can be compressed
- ❑ NRRD (Nearly Raw Raster Data) is another, less common format: most neuroimaging software can read NRRD

<http://r2aui.sourceforge.net/>