

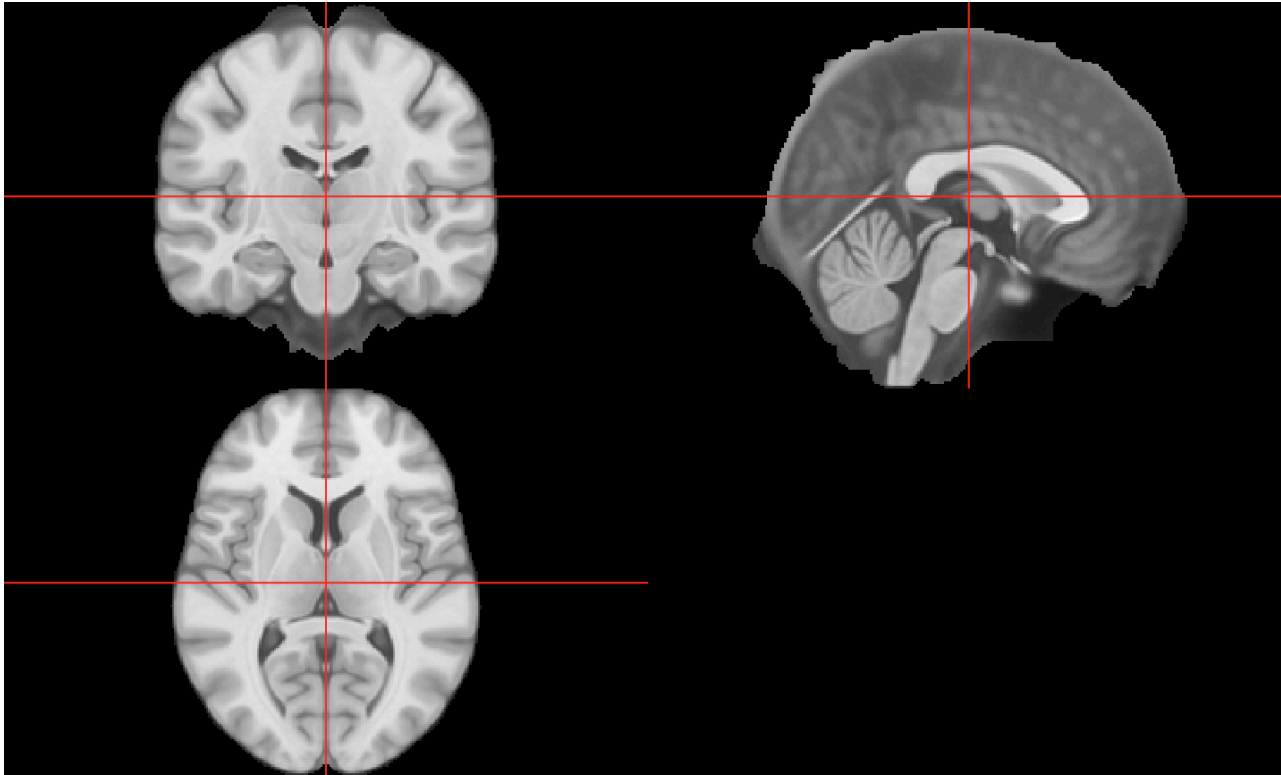
Papayar: An interactive neuroimage plotter with R

John Muschelli, @StrictlyStat Johns Hopkins University

presentation: http://johnmuschelli.com/JSM_2016

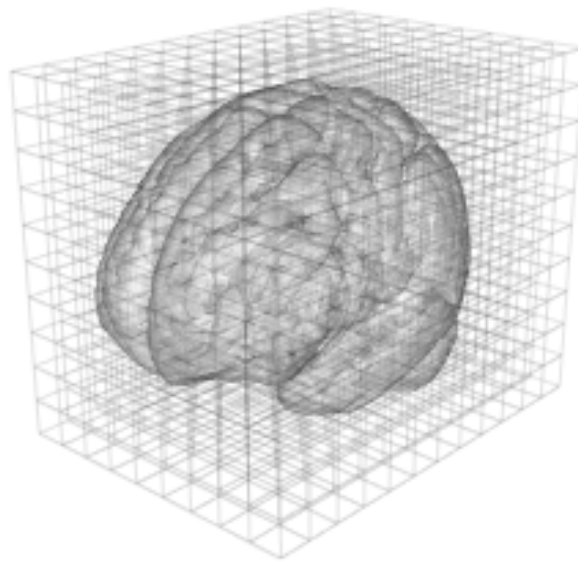
code: http://github.com/muschellij2/JSM_2016

Problem: Explore 3D images of brain (MRI)

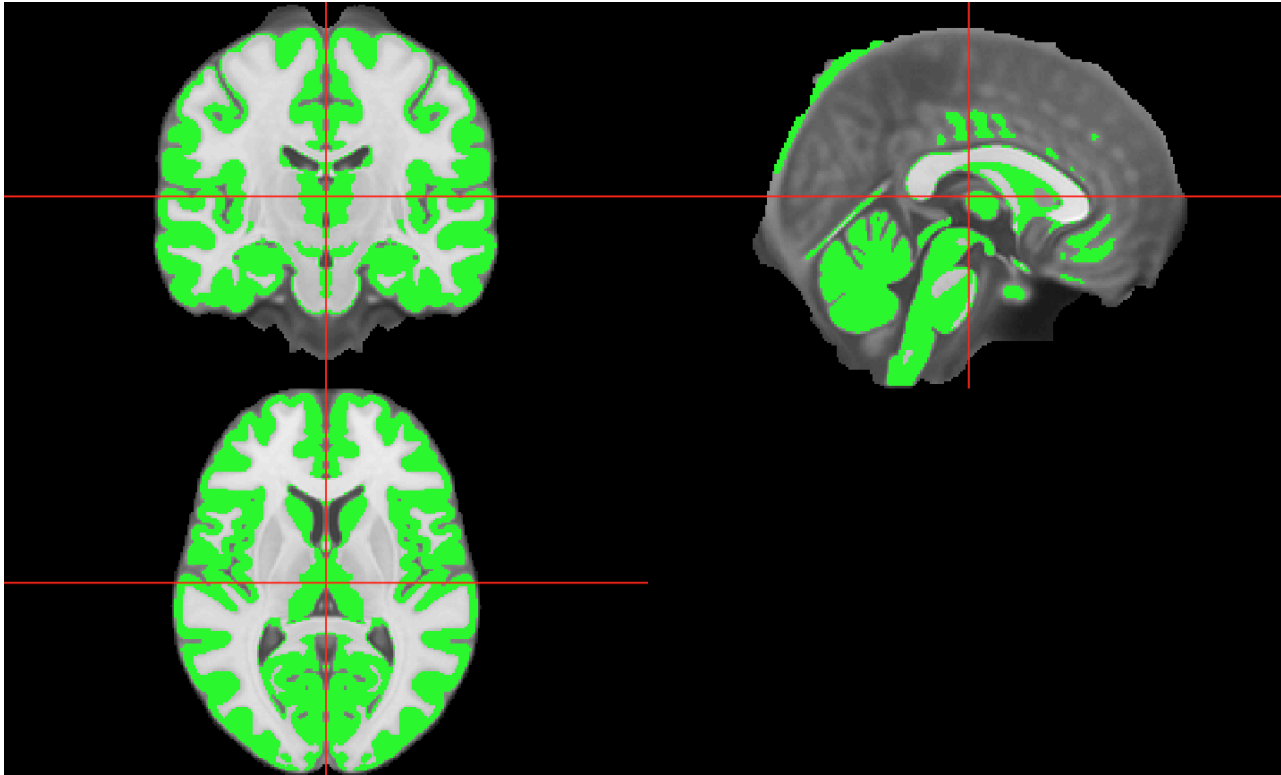


How big is a brain image?

- Images come from NIfTI files
 - comprised of 3D pixels called voxels
- Image dimensions are: $197 \times 233 \times 189$ (> 8 million voxels)



Explore results: e.g. gray matter classification



Let's make it interactive!

- Are static graphics (e.g. PDFs) good enough?



image from <http://cheezburger.com>

Let's make it interactive!

- Are static graphics (e.g. PDFs/GIFs) good enough?
- What step in the analysis does it come in? For me:
 - exploratory - looking at results of image processing
 - Asking: "Is this step working?"



http://www.natashaboyd.com/uploads/1/5/5/3/15536518/5572229_orig.gif

Let's make it interactive!

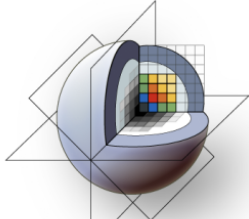
- Are static graphics (e.g. PDFs/GIFs) good enough?
- What step in the analysis does it come in? For me:
 - confirmatory - check model predictions
 - "That looks like gray matter to me"



http://media.tumblr.com/tumblr_inlszpEQo21qd8tfx.gif

But other (standalone) programs can do this!

Also known as "I can do that in X already"



3DSlicer

[Licensing Information](#) [Website](#) [Acknowledgments](#)


Slicer
4.4.0 r23774
[Download](#) a newer version
Slicer is NOT an FDA approved medical device.
Supported by: NA-MIC, NAC, BIRN, NCIGT and the Slicer Community.
Special thanks to the NIH and our other supporters.
This work is part of the National Alliance for Medical Image Computing (NA-MIC), funded by the National Institutes of Health through the NIH Roadmap for Medical Research, Grant U54 EB005149. Information on the National Centers for Biomedical Computing can be obtained from <http://nihroadmap.nih.gov/bioinformatics>.
Built on top of: [VTK](#), [ITK](#), [CTK](#), [QI](#), [Tcl/Tk](#), [Teem](#), [Python](#), [DCMTK](#), [JQPlot](#)

Mango
Version: 3.1.2 (772)
18 March 2014
Website: <http://rui.uthscsa.edu/mango/>
Jack L. Lancaster, Ph.D., Michael J. Martinez
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OSIRIX

World's fastest DICOM viewer
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Built on these technologies:



FSL
FMRIB SOFTWARE LIBRARY
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itk-SNAP

ITK-SNAP
Version 3.2.0
Oct 23, 2014
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Paul A. Yushkevich
Guido Gerig
This project is supported by grants R01 EB014346, R03 EB008200, and PO 467-MZ-202446-1 from the US National Institutes of Health

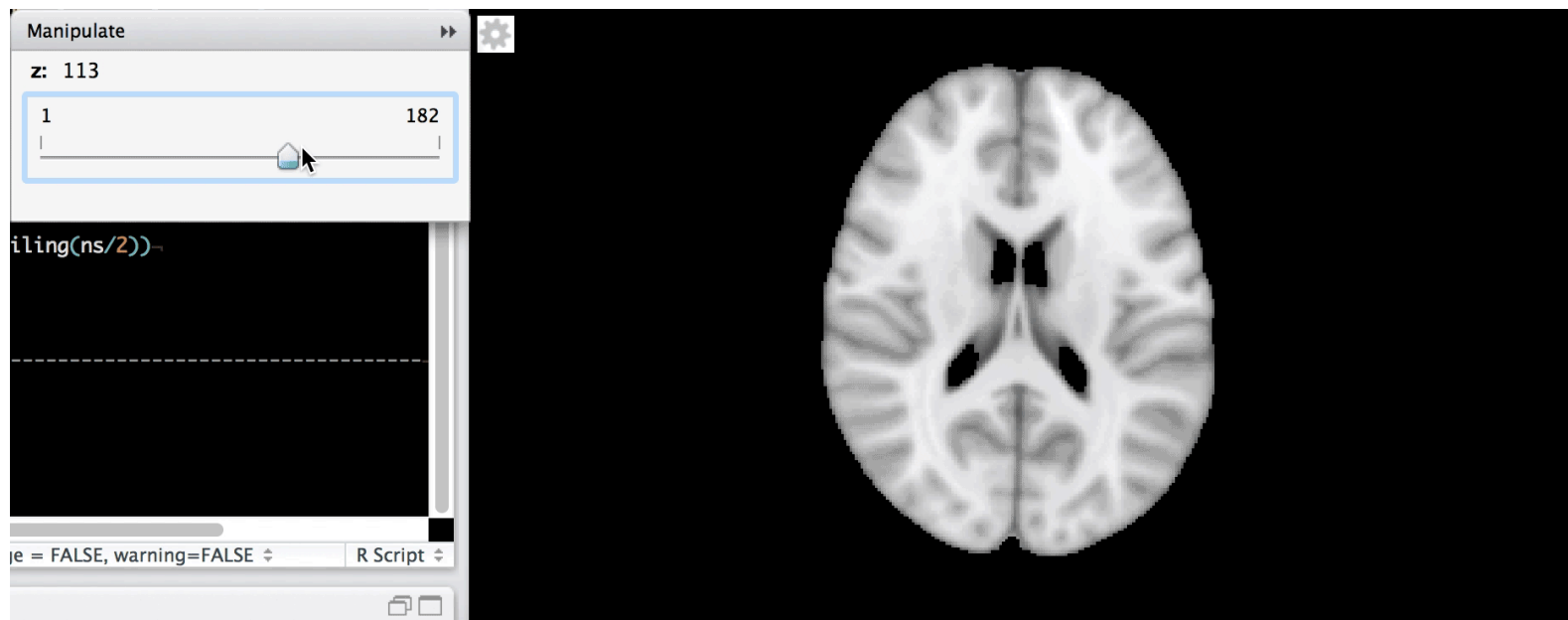
Some (of my) principles of interactivity

1. Should be scriptable to get the interactive graphic
 - still hard to script/reproduce the interaction
2. Within the analysis workflow
 - Others are just standalone viewers
 - Relies on fewer systems/dependencies
3. Easy to navigate for the user




First attempt: Use manipulate package

The `manipulate` package (Allaire 2014) from RStudio can add interactivity:



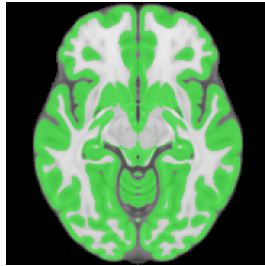
First attempt: Use manipulate package

The `manipulate` package (Allaire 2014) from RStudio can add interactivity, BUT:

- Images rendering was `slow`
 - due to the R plotting and viewer interaction
- Only works with  `Studio`
- Can't embed output in a document

Second attempt: set of PDFs or GIFs!

The `animation` package (Xie 2013, Xie et al. (2015)) can make GIFs:



Pros:

- Plotting with standard functions
 - Can be **embedded** into an html easily

Cons:

- Not really "interactive"
 - less choice on user's end
 - no other views

Papaya JavaScript library

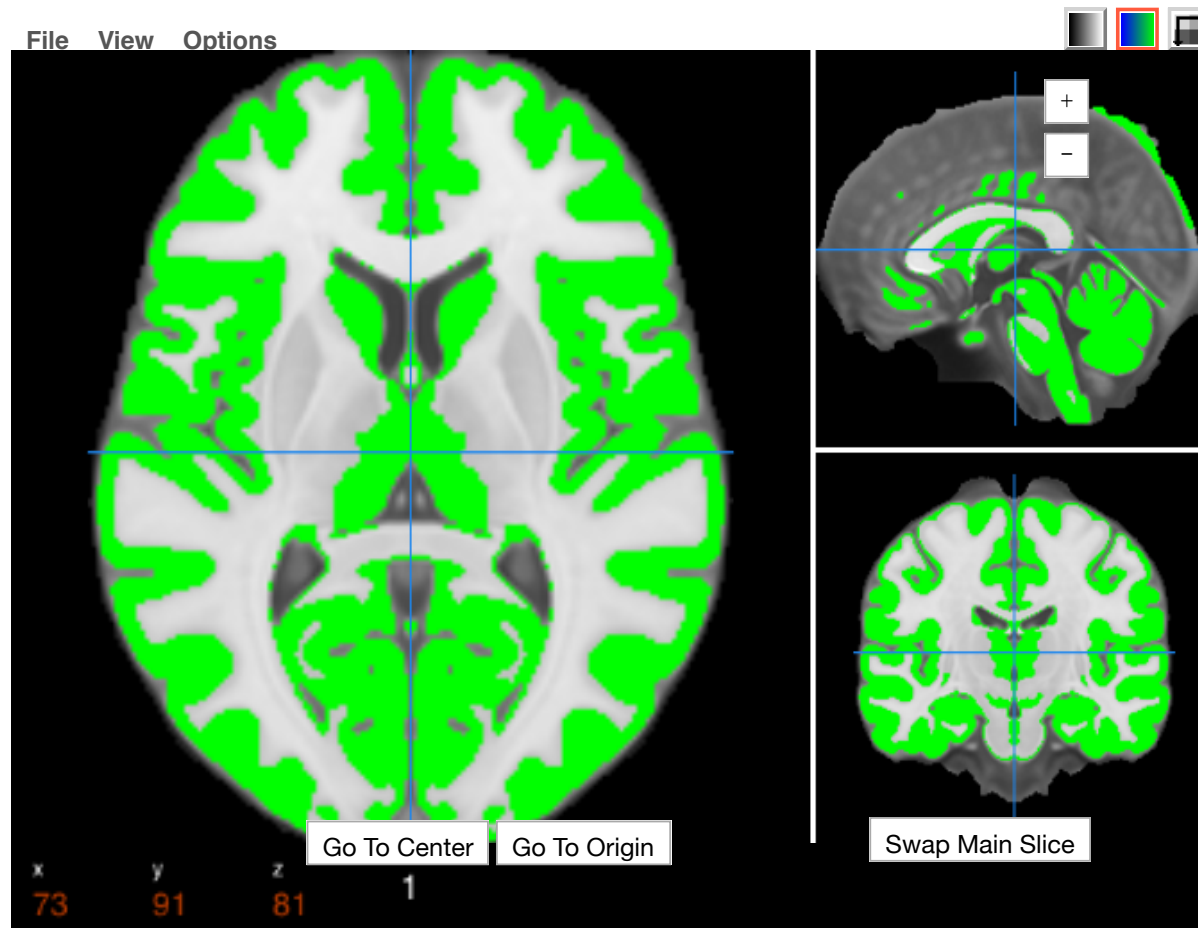
<https://github.com/rii-mango/Papaya>

"A pure JavaScript medical research image viewer."

- From makers of Mango (UT Health Science)

papayar R package, port of Papaya

```
library(papayar); papaya(image)
```



Is it an `htmlwidget`!?

No

Is it an `htmlwidget`!?

Not yet.

Lessons learned

- Borrow (heavily) other people's stuff
- htmlwidgets framework is great
 - some JS libraries have odd rules
- Porting to R can help the community
 - need some non-R knowledge, usually JavaScript
 - not always so straightforward
 - Functionality at the whim of the JS maintainer

Bibliography

Allaire, JJ. 2014. *Manipulate: Interactive Plots for RStudio*. <https://CRAN.R-project.org/package=manipulate>.

Xie, Yihui. 2013. "animation: An R Package for Creating Animations and Demonstrating Statistical Methods." *Journal of Statistical Software* 53 (1): 1–27. <http://www.jstatsoft.org/v53/i01/>.

Xie, Yihui, Christian Mueller, Lijia Yu, and Weicheng Zhu. 2015. *Animation: A Gallery of Animations in Statistics and Utilities to Create Animations*. <http://yihui.name/animation>.