Managing and Manipulating Data Using R

Introduction, part 1

Ozan Jaquette

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2. What is R

3. What is this course about?

4. About your instructors

5. Course logistics

6. Create “R project” and directory structure

1 Student introductions

Student introductions

What we want to know about you

1. Preferred name
2. Preferred pronouns
3. Enrolled in course or auditing?
4. Academic program (and how far along) and/or job
5. Tell us about your name (e.g., what is the origin story?)

2 What is R

What is R

According to the Inter-university consortium for political and social research (ICPSR):

> *R is "an alternative to traditional statistical packages such as SPSS, SAS, and Stata such that it is an extensible, open-source language and computing environment for Windows, Macintosh, UNIX, and Linux platforms. Such software allows for the user to freely distribute, study, change, and improve the software under the Free Software Foundation's GNU General Public License."*

- For more info visit R-project.org

Base R vs. R packages

There are “default” packages that come with R. Some of these include:

- `as.character`
- `print`
- `setwd`

And there are R packages developed and shared by others. Some R packages include:

- `tidyverse`
- `stargazer`
- `foreign`

more about these in later weeks. . .

Installing and Loading R packages

You only need to install a package once. To install an R package use `install.package()` function.

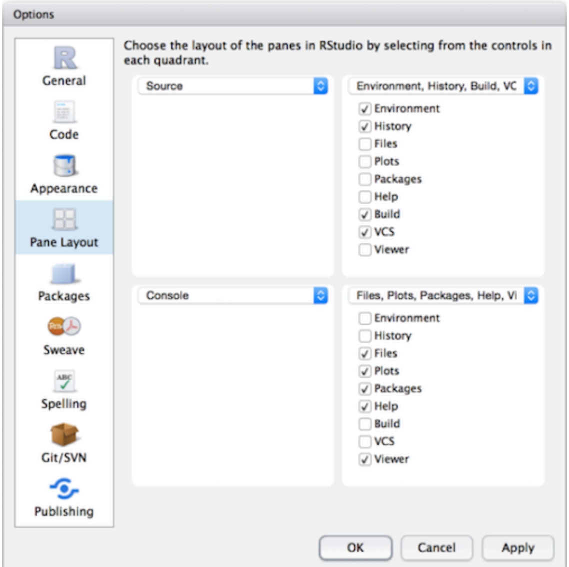
```r
#install.packages("tidyverse")
```

However, you need to load a package everytime you plan to use it. To load a package use the `library()` function.

```r
library(tidyverse)
#> -- Attaching packages --------------------------------------------------------
#> v ggplot2 3.0.0     v purrr   0.2.5
#> v tibble  1.4.2     v dplyr   0.7.6
#> v tidyr   0.8.1     v stringr 1.3.1
#> v readr   1.1.1     v forcats 0.3.0
#> -- Conflicts -----------------------------------------------------------------
#> x dplyr::filter() masks stats::filter()
#> x dplyr::lag()    masks stats::lag()
```

RStudio

"RStudio is an integrated development environment (IDE) for R. It includes a console, syntax-highlighting editor that supports direct code execution, as well as tools for plotting, history, debugging and workspace management."



Choose the layout of the panes in RStudio by selecting from the controls in each quadrant.

Source

Environment, History, Build, VC

☑ Environment
☑ History
□ Files
□ Plots
□ Packages
□ Help
☑ Build
☑ VCS
□ Viewer

Console

Files, Plots, Packages, Help, Vi

□ Environment
□ History
☑ Files
☑ Plots
☑ Packages
☑ Help
□ Build
□ VCS
☑ Viewer

R Markdown

R Markdown produces dynamic output formats in html, pdf, MS Word, dashboards, Beamer presentations, etc.

- We will be using R Markdown for lectures and homeworks.

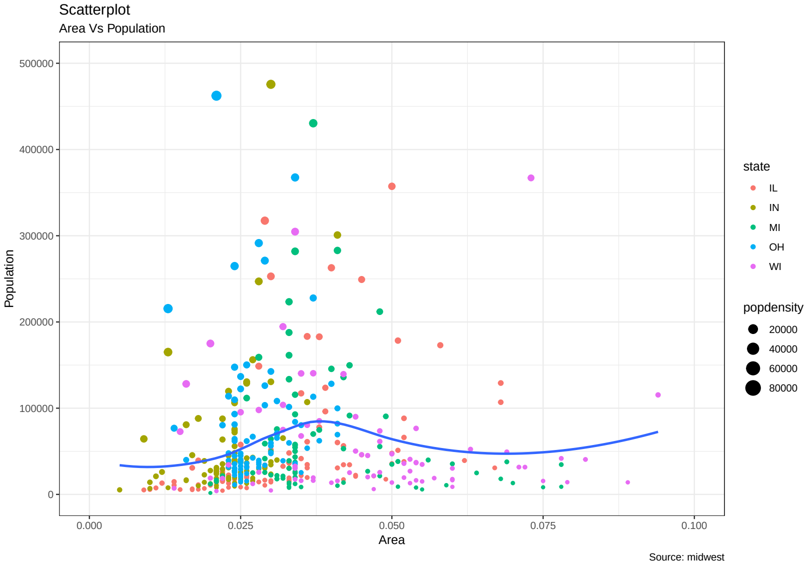
Why R? Capabilities of R

- Graphs
- Presentation
- Websites
- Journals
- Interactive tutorials
- Web apps
- Dashbaords
- Books
- Web scraping
- Maps

For more info visit

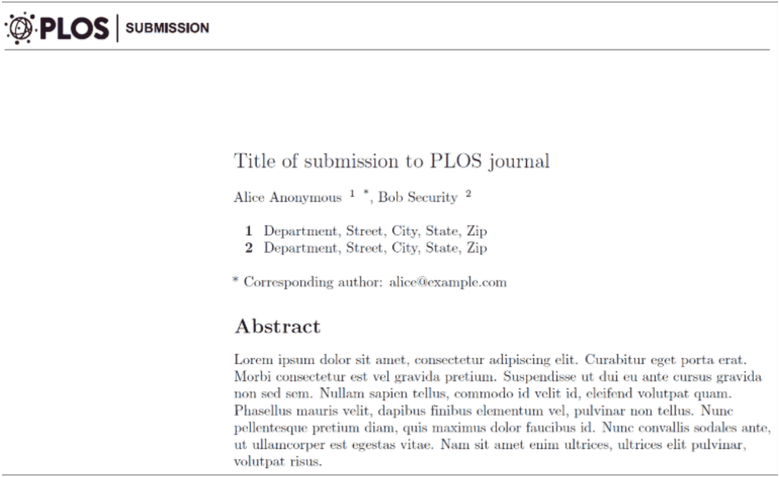
Graphs

- Create graphs with ggplot2 package



Journal articles

- Journal articls with rticles package



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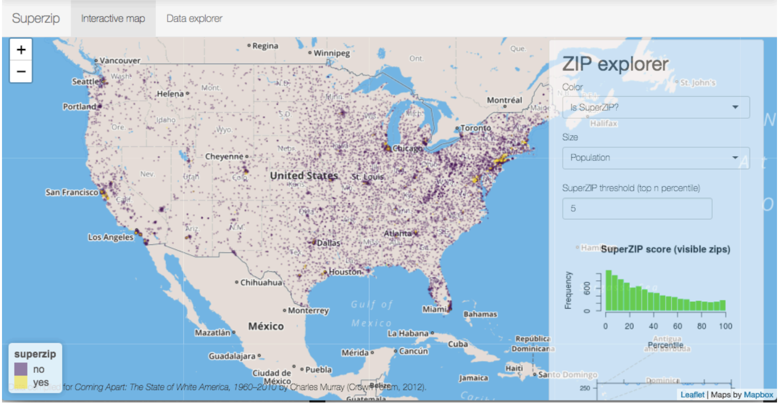
Abstract

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Curabitur eget porta erat. Morbi consectetur est vel gravida pretium. Suspendisse ut dui eu ante cursus gravida non sed sem. Nullam sapien tellus, commodo id velit id, eleifend volutpat quam. Phasellus mauris velit, dapibus finibus elementum vel, pulvinar non tellus. Nunc pellentesque pretium diam, quis maximus dolor faucibus id. Nunc convallis sodales ante, ut ullamcorper est egestas vitae. Nam sit amet enim ultrices, ultrices elit pulvinar, volutpat risus.

Interactive web apps

- Interactive web apps with shiny package



ZIP explorer

Color: Is SuperZIP?

Size: Population

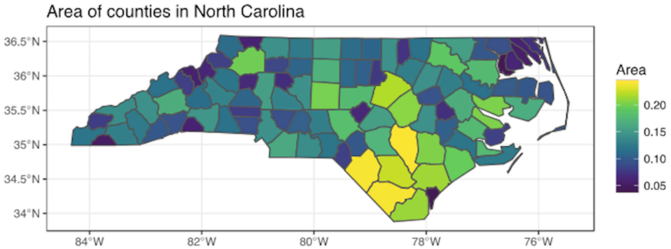
SuperZIP threshold (top n percentile): 5

SuperZIP score (visible zips)

Data compiled for *Coming Apart: The State of White America, 1960–2010* by Charles Murray (Crown Forum, 2012).

Mapping

- Mapping with sf package & ggplot



3 What is this course about?

What is data management?

- All the stuff you have to do to create analysis datasets that are ready to analyze, e.g.:
  - collect data
  - read/import data into statistical programming language
  - clean data
  - integrate data from multiple sources (e.g, join/merge, append)
  - change organizational structure of data so it is suitable for analysis
  - create “analysis variables” from “input variables”
  - Make sure that you have created analysis variables correctly

Why I don’t call this class “R for data science”

Learn to walk before you can run!

- “data science” implies doing fancy, sexy things like mapping, network analysis, web-scraping, etc.
- But if you don’t know how to clean data, these sexy analyses and visualizations will be useless
- “80% of data science is data cleaning”
- The skills you learn in this data management oriented class will be usefull for fancy data science stuff down the road!

Who is this class for?

This class is for anyone who wants to work with data, that is peiple who want to be:

- researchers working with survey data and doing traditional statistical analyses
- researchers who want to do “data science” oreinted research involving
- analysts working at think tanks or non-profits
- journalists who create interactive data visualizations
- “Data scientists”

4 About your instructors

Patricia Martin, teaching assistant

Ozan Jaquette, instructor

A middle aged man trying to learn new tricks

My background in data management/statistical analysis

- Started with SAS [ugh]
  - administrative data on welfare records
  - student-level data on English "further education colleges"
  - created single analysis dataset from high school longitudinal surveys from seniors in 1972, 1982, 1992, 2004
- Moved to Stata
  - Used loops and user-defined functions to create longitudinal datasets of university characteristics/behaviors from 1969 to present
- served on several federal committees tasked with making recommendations about changes to what data the federal govt collected

I thought I was pretty hot stuff!

- But the game changed on me

Recruiting research program and “data science”

Got sick of the limitations of survey data

- didn’t ask questions I was interested in
- I didn’t believe the survey responses

Wanted to figure out ways to collect data on university recruiting behavior

- we realized “data science” methods could create concrete data from publicly available data sources

The off-campus recruiting project

- LINK HERE

5 Course logistics

Course logistics

- follow the syllabus

6 Create “R project” and directory structure

What is an R project? Why are you doing this?

What is an “R project”?

- helps you keep all files for a project in one place
- When you open an R project, the file-path of your current working directory is automatically set to the file-path of your R-project

Why are we asking you to create R project and download a specific directory structure?

- We want you to be able to run the .Rmd files for each lecture on your own computer
- Sometimes these .Rmd files point to certain sub-folders
- If you create R project and create directory structure we recommend, you will be able to run .Rmd files from your own computer without making any changes to file-paths!

Follow these steps to create “R project” and directory structure

1. In RStudio, click on “File” >> “New Project” >> “New Directory” >> “New Project”
   - In “Directory name”, type “rclass”
     - this will be the folder where you save all files related to this class
   - In “Create project as subdirectory of”:
     - You decide where you want to save the folder “rclass”; choose somewhere easy to find
2. Download this zip folder: LINK HERE
3. Place zip folder in the “rclass” folder you created in Step 1
4. Unzip zip folder. you should have the following file-paths
   - “rclass/lectures”
   - “rclass/data”
5. Save the following files in “rclass/lectures/lecture1”
   - lecture1.1.Rmd
   - lecture1.1.pdf
   - lecture1.2.Rmd
   - lecture1.2.Pdf
   - lecture1.2.R

After you follow these steps

- you can add any additional sub-folders you want to the “rclass” folder
  - e.g., “syllabus”, “resources”
- You can add any additional files you want to the sub-directory folders you unzipped
  - e.g., in “rclass/lectures/lecture`1`” you might add an additional document of notes you took