Managing and Manipulating Data Using R

Introduction, part 1

Ozan Jaquette

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2. About your instructors
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4. What is this course about?
5. Course logistics
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7. Create “R project” and directory structure

1 Student introductions

Student introductions

What we want to know about you

1. Preferred name
2. Pronouns
3. Academic program (and how far along) and/or job
4. What's something that you have observed or think is important that people in your field aren't paying attention to?

2 About your instructors

Ozan Jaquette, instructor

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

3 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.

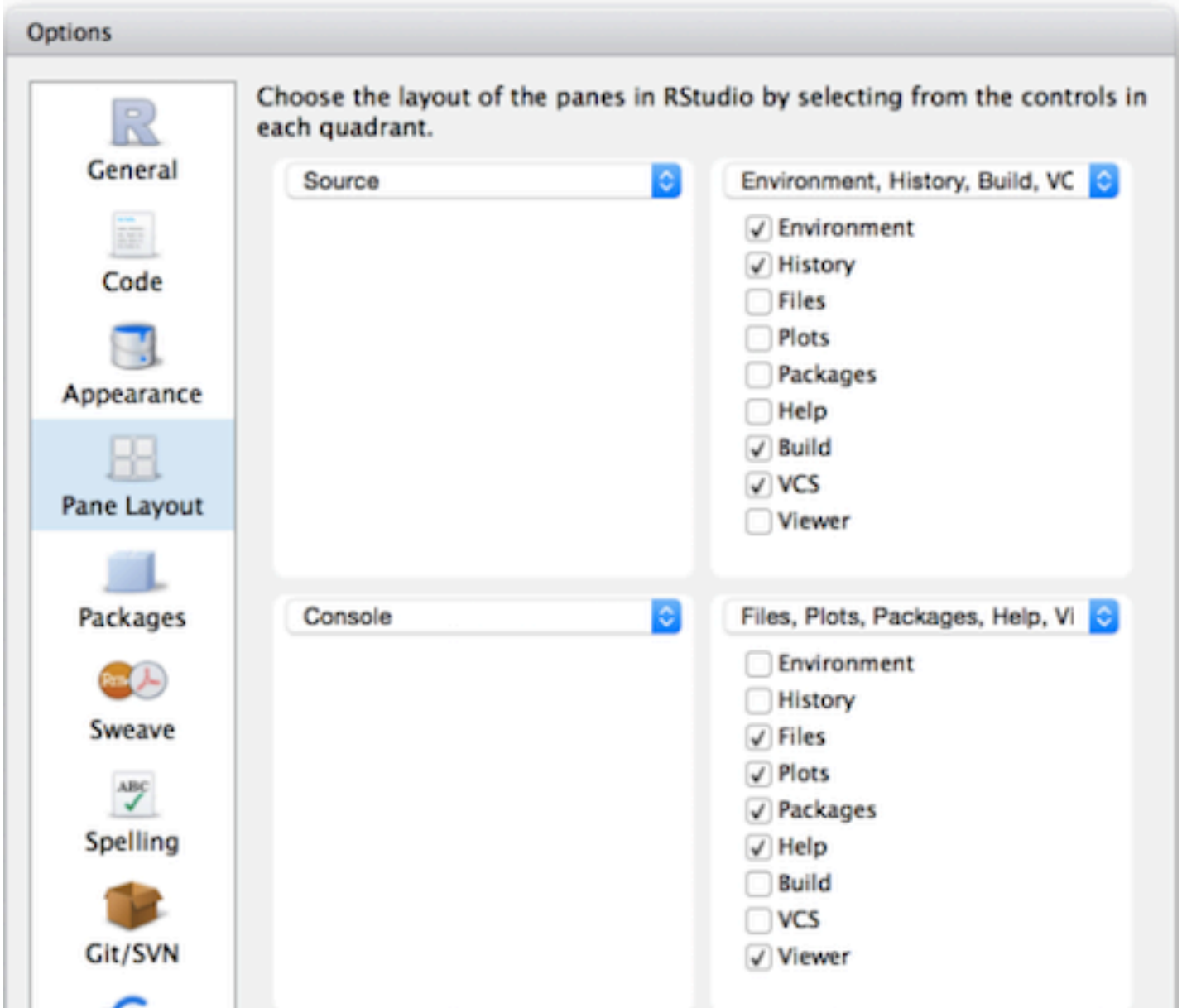
```
#install.packages("tidyverse")
```

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

```
library(tidyverse)
#> -- Attaching packages ----------------------------------------------- tid
#> v ggplot2 3.2.1     v purrr   0.3.2
#> v tibble  2.1.3     v dplyr   0.8.3
#> v tidyr   1.0.0     v stringr 1.4.0
#> v readr   1.3.1     v forcats 0.4.0
#> -- Conflicts -------------------------------------------------- tidyverse
#> 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."



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.

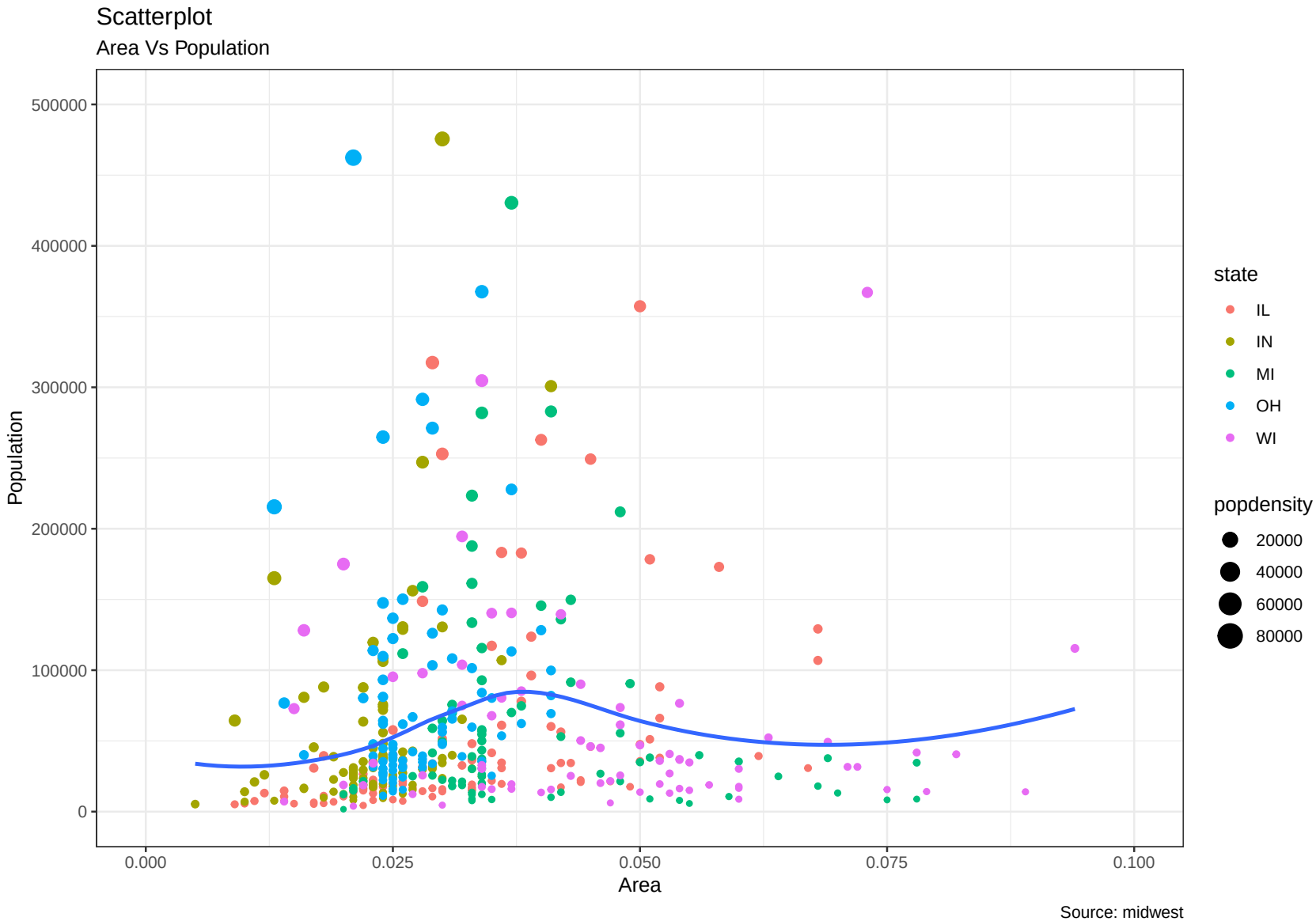
Why R? Capabilities of R

- 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

PLOS | SUBMISSION

Title of submission to PLOS journal

Alice Anonymous [1] *, Bob Security [2]

1 Department, Street, City, State, Zip
2 Department, Street, City, State, Zip

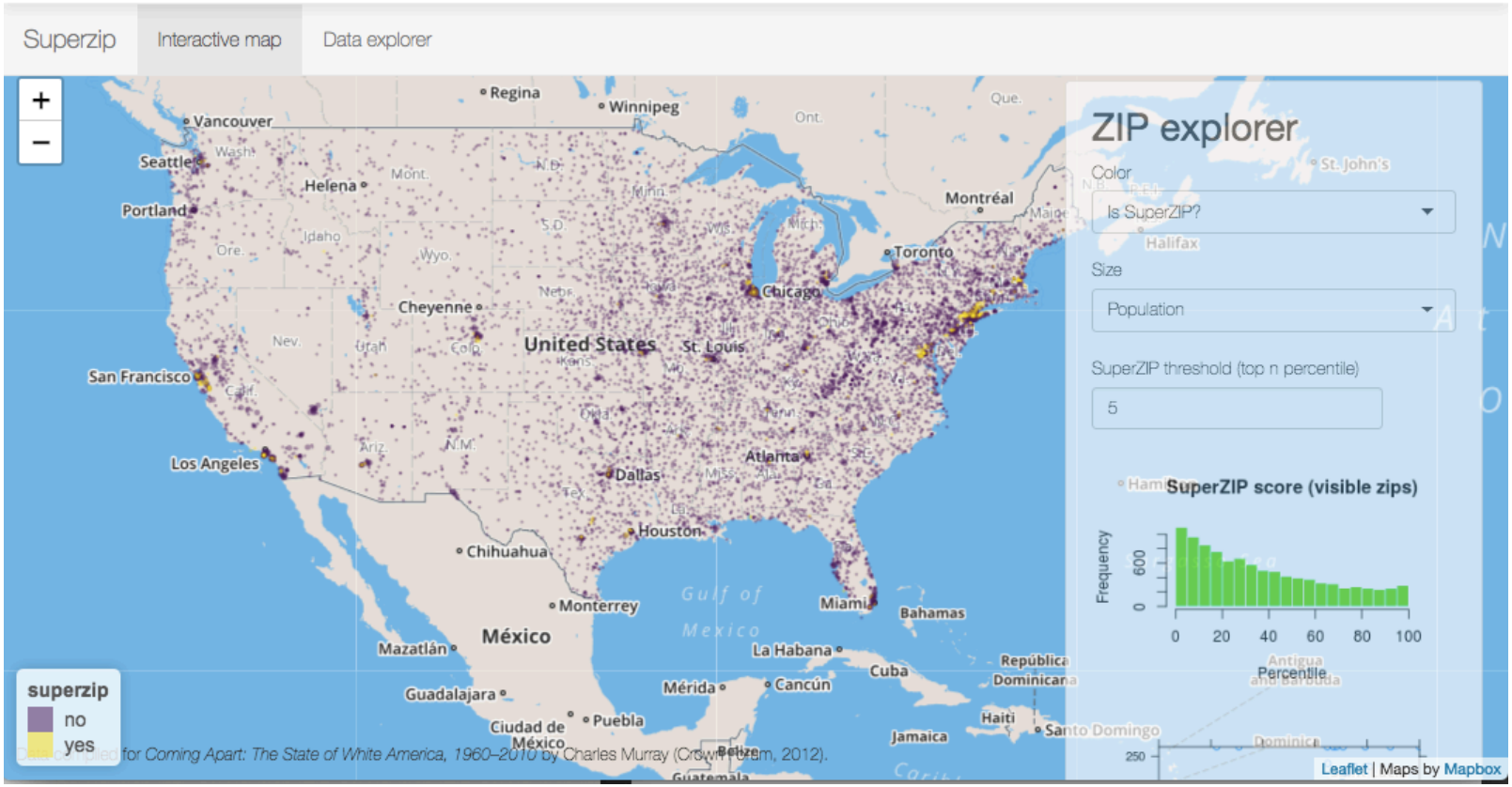
* Corresponding author: alice@example.com

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.

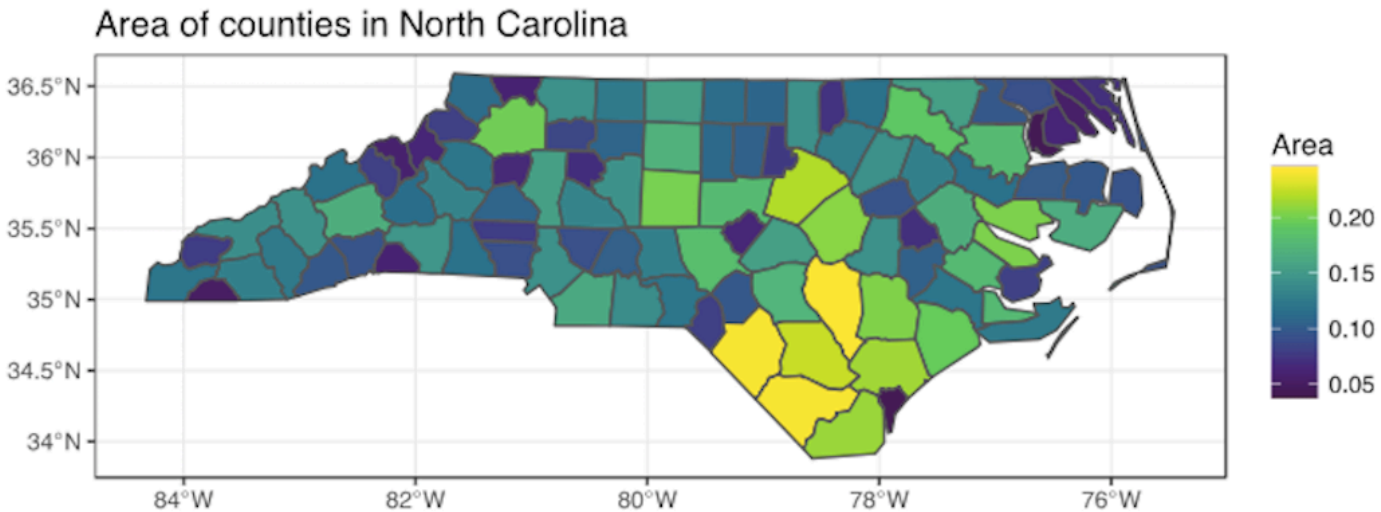
Interactive web apps

Interactive web apps with shiny package



Mapping

Mapping with sf package & ggplot



4 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”

5 Course logistics

Course logistics

follow the syllabus

6 Directories and filepaths

Working directory

(Current) Working directory

the folder/directory in which you are currently working

this is where R looks for files

Files located in your current working directory can be accessed without specifying a filepath because R automatically looks in this folder

Function `getwd()` shows current working directory

```
getwd()
#> [1] "C:/Users/ozanj/Documents/rclass/lectures/lecture1"
```

Command `list.files()` lists all files located in working directory

```
list.files()
```

Working directory, “Code chunks” vs. “console” and “R scripts”

When you run **code chunks** in RMarkdown files (.Rmd), the working directory is set to the filepath where the .Rmd file is stored

```
getwd()
#> [1] "C:/Users/ozanj/Documents/rclass/lectures/lecture1"
```

```
list.files()
```

When you run code from the **R Console** or an **R Script**, the working directory is:

- if you are working on an R “Project”, the working director is the main directory for the project

```
getwd()
```

Absolute vs. relative filepath

Absolute file path: The absolute file path is the complete list of directories needed to locate a file or folder.

```
setwd("/Users/pm/Desktop/rclass/lectures/lecture2")
```

Relative file path: The relative file path is the path relative to your current location/directory. Assuming your current working directory is in the "lecture2" folder and you want to change your directory to the data folder, your relative file path would look something like this:

```
setwd("../../data")
```

File path shortcuts

Key	Description
~	tilde is a shortcut for user's home directory (mine is my name pm)
../	moves up a level
../../	moves up two level

7 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. Download this zip folder: LINK HERE
   - this zip file contains the shell file directory you should use for this class
   - Unzip the folder
     - contains folder named “rclass”; this is the folder that will contain all materials for this course
     - ?SAME FOR MAC USERS?
   - Move “rclass” folder to your preferred location (e.g, documents, desktop, dropbox, etc)
2. In RStudio, click on “File” » “New Project” » “Existing Directory” » “New Project”
   - “Browse” to find “rclass” folder you just saved
   - Then click on Create Project
3. Save the following files in “rclass/lectures/lecture1”
   - lecture1.1.Rmd
   - lecture1.1.pdf
   - lecture1.2.Rmd
   - lecture1.2.Pdf
   - lecture1.2.R

Next,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/lecture1” you might add an additional document of notes you took