

Intro to R

RStudio

Help! Office hours

Poll: What times are best for you for office hours?

Today is different

Ava will hold office hours from 5:00pm - 6:00pm EST.

Office hours will always be held at the *same Zoom link*.

Working with R – RStudio

RStudio is an Integrated Development Environment (IDE) for R

- It helps the user effectively use R
- Makes things easier
- Is NOT a dropdown statistical tool (such as Stata)
 - See [Rcmdr](#) or [Radiant](#)



[[source](#)]

RStudio used to be the name of a company that is now called [Posit](#).

RStudio

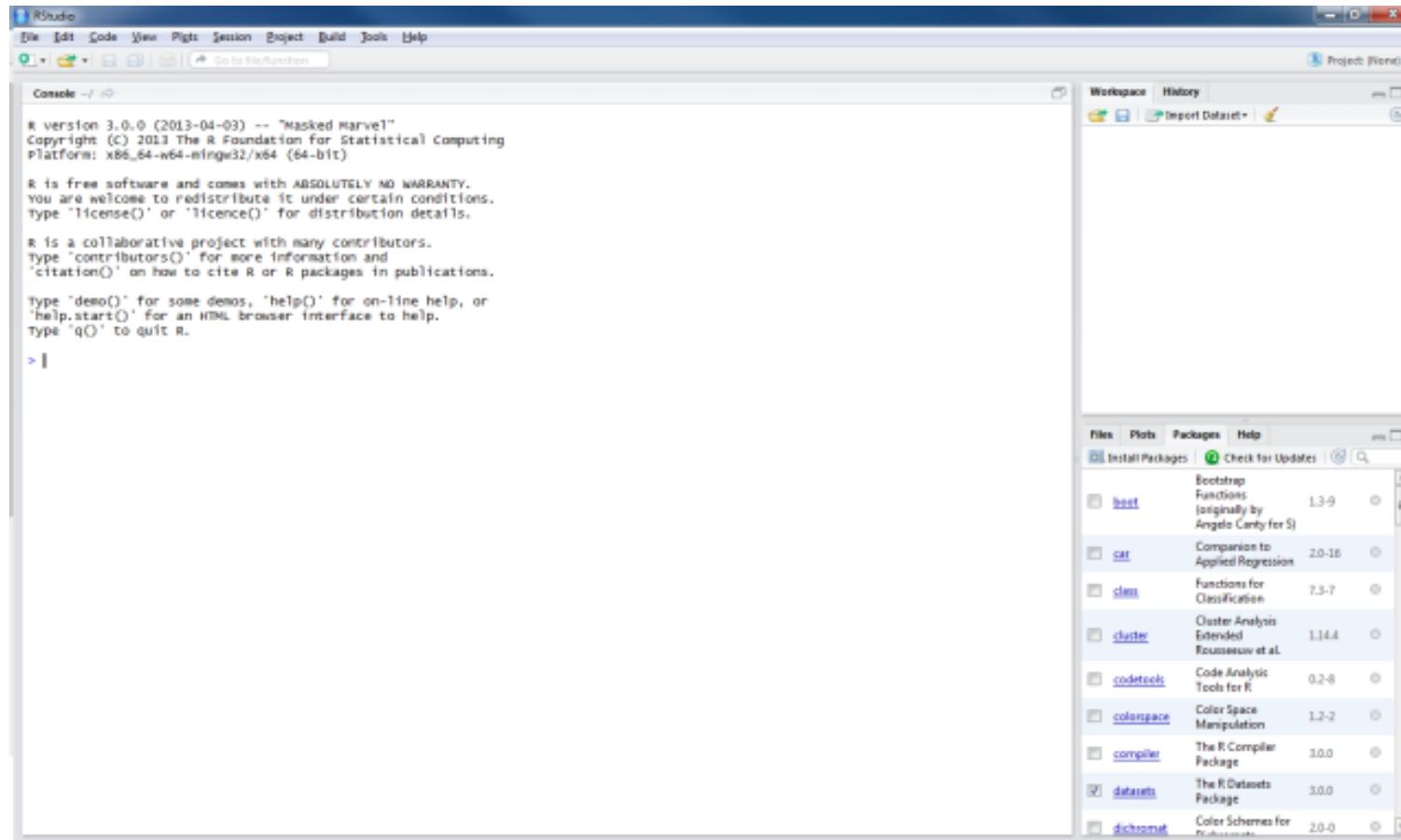
Easier working with R

- Syntax highlighting, code completion, and smart indentation
- Easily manage multiple working directories and projects

More information

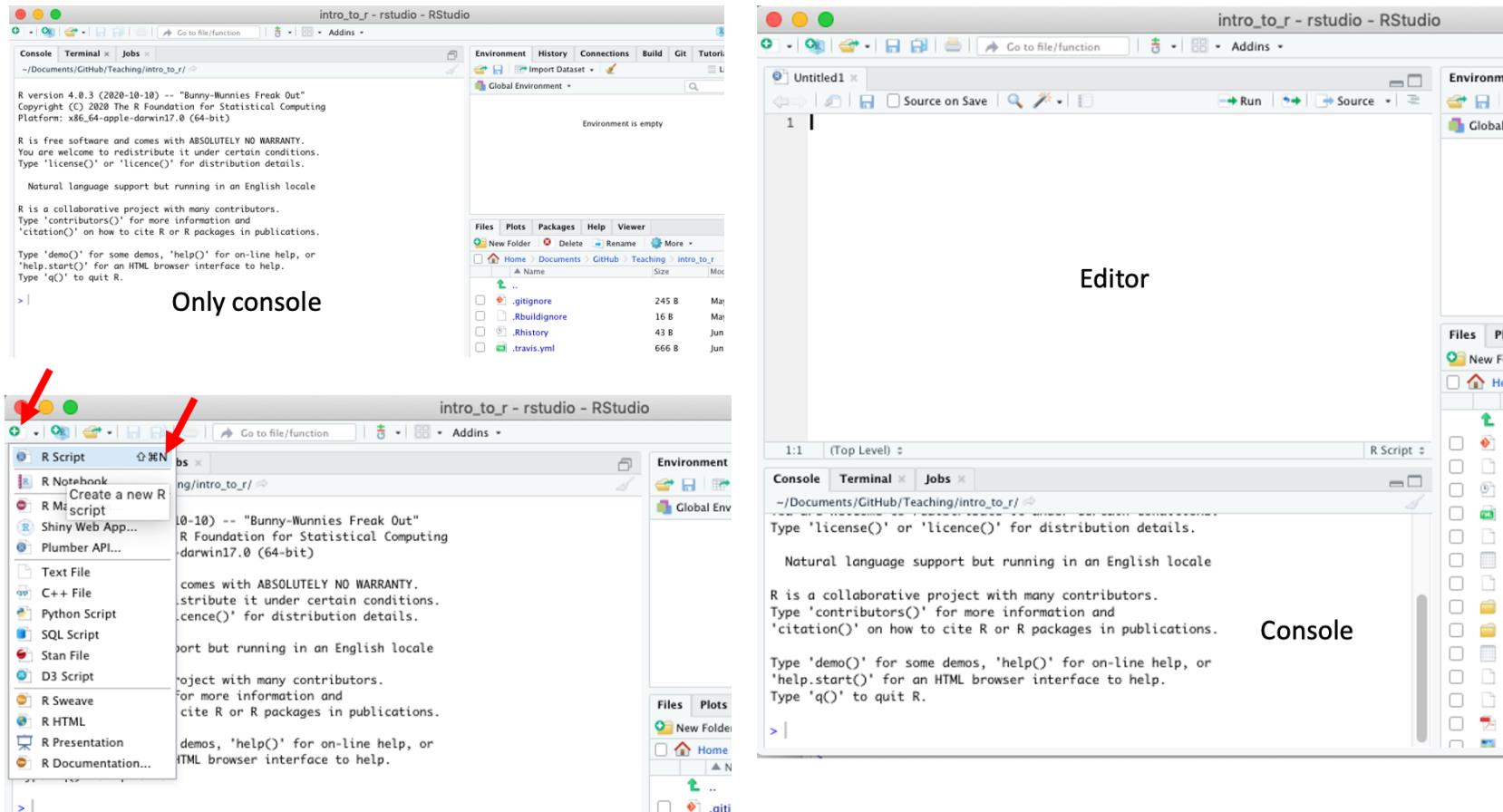
- Workspace browser and data viewer
- Plot history, zooming, and flexible image and file export
- Integrated R help and documentation
- Searchable command history

RStudio



Getting the editor

You must open a file first to save code to open the editor. These include for example R Scripts or R Markdown.



Working with R in R Studio - 2 major panes:

1. The **Source/Editor**: "Analysis" Script + Interactive Exploration

- Static copy of what you did (reproducibility)
- Top by default

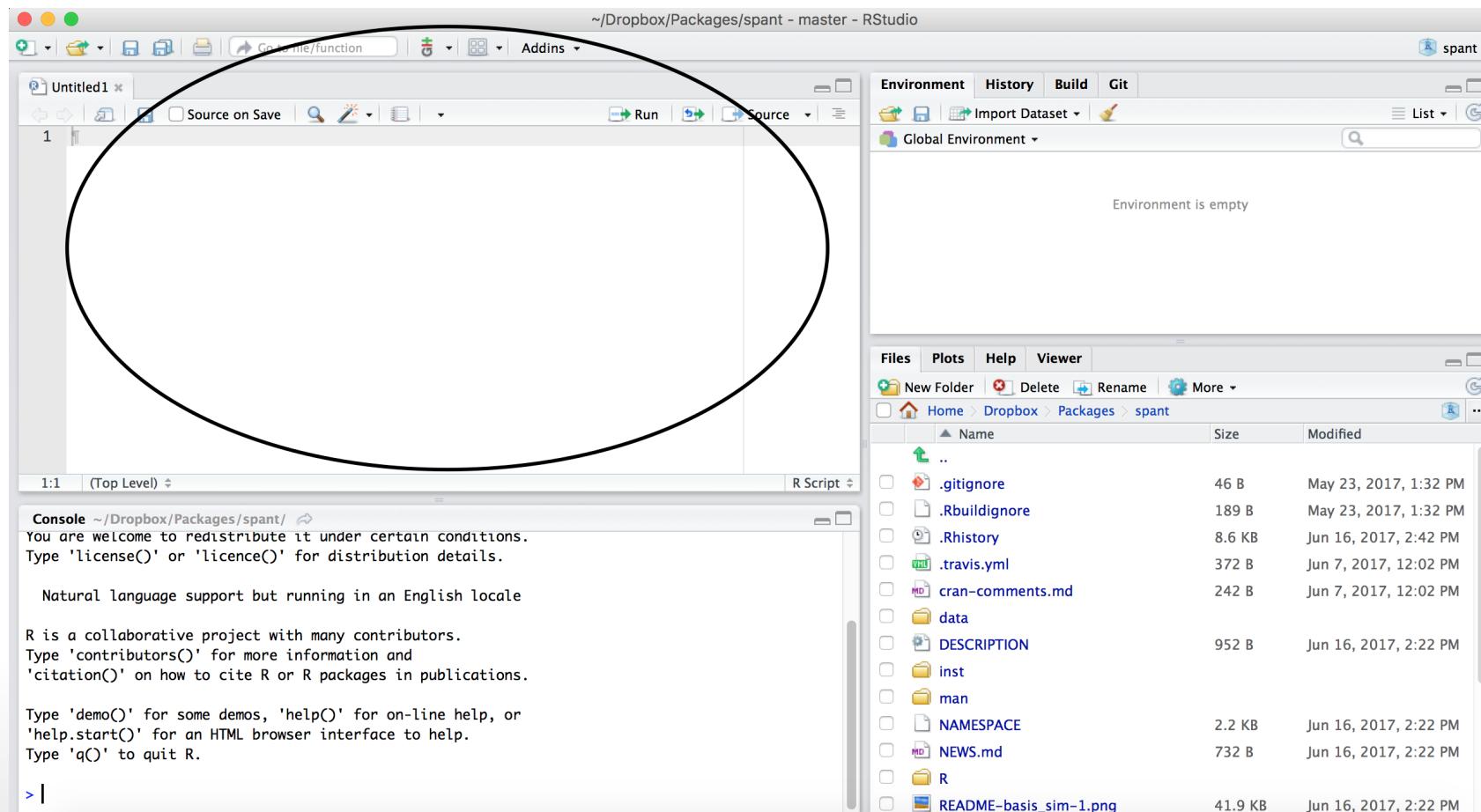
2. The **R Console**: "interprets" whatever you type

- Calculator
- Try things out interactively, then add to your editor
- Bottom by default

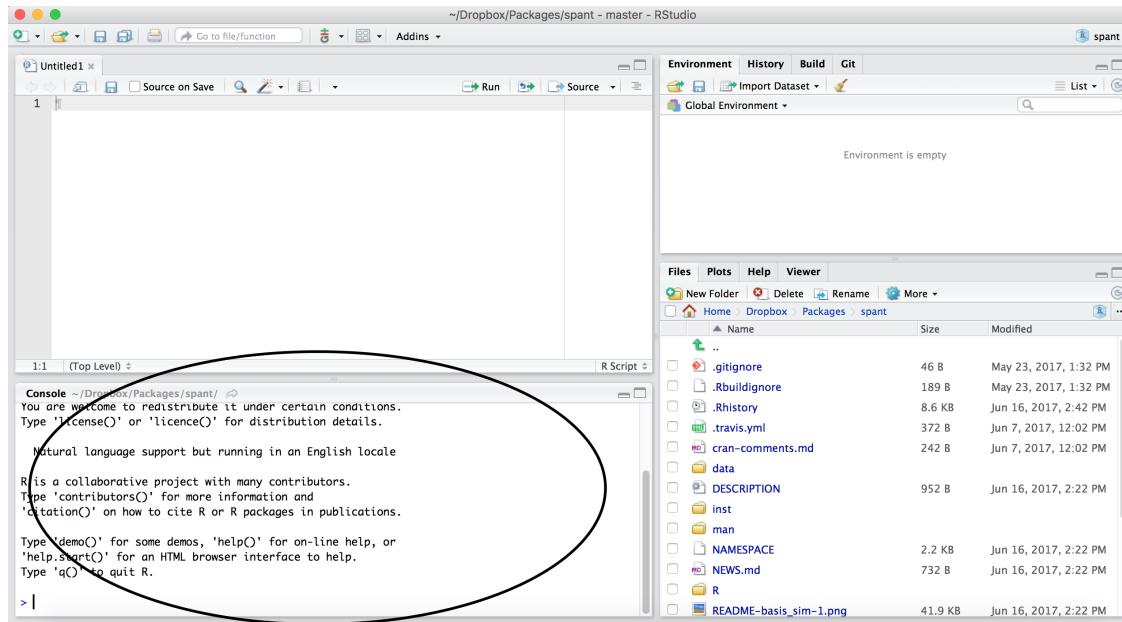
Source / Editor

- Where files open to
- Have R code and comments in them
- Can highlight and press (CMD+Enter (Mac) or Ctrl+Enter (Windows)) to run the code

In a .R file (we call a script), code is saved on your disk



R Console



- Where code is executed (where things happen)
- You can type here for things interactively to test code
- Code is **not saved** on your disk

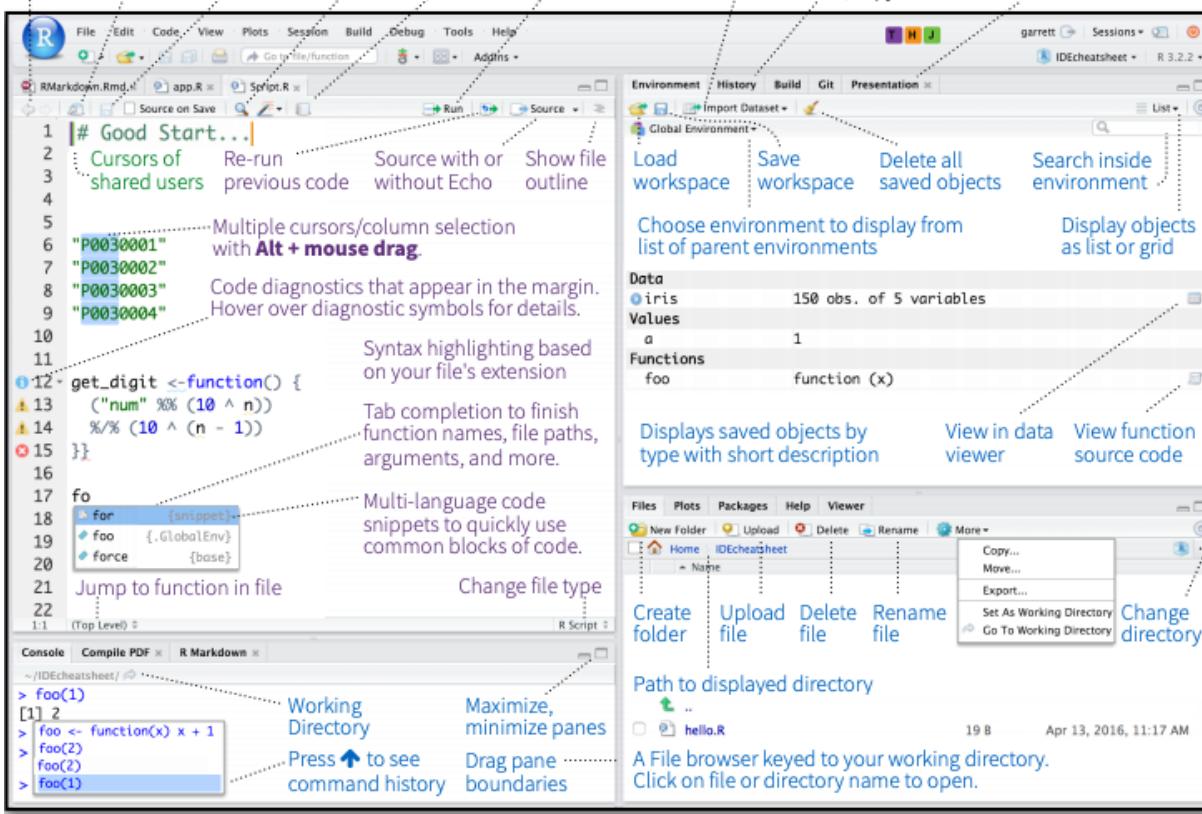
RStudio

Super useful “cheat sheet”:

<https://github.com/rstudio/cheatsheets/raw/master/rstudio-ide.pdf>

Write Code

Navigate tabs
Open in new window
Save
Find and replace
Compile as notebook
Run selected code



R Support

Import data with wizard
History of past commands to run/copy
Display .RPres slideshows
File > New File > R Presentation

RStudio layout

To make an R Markdown file: click the green plus button -> R Markdown. We will do this together soon! It will look like this with text in it, unlike a script.

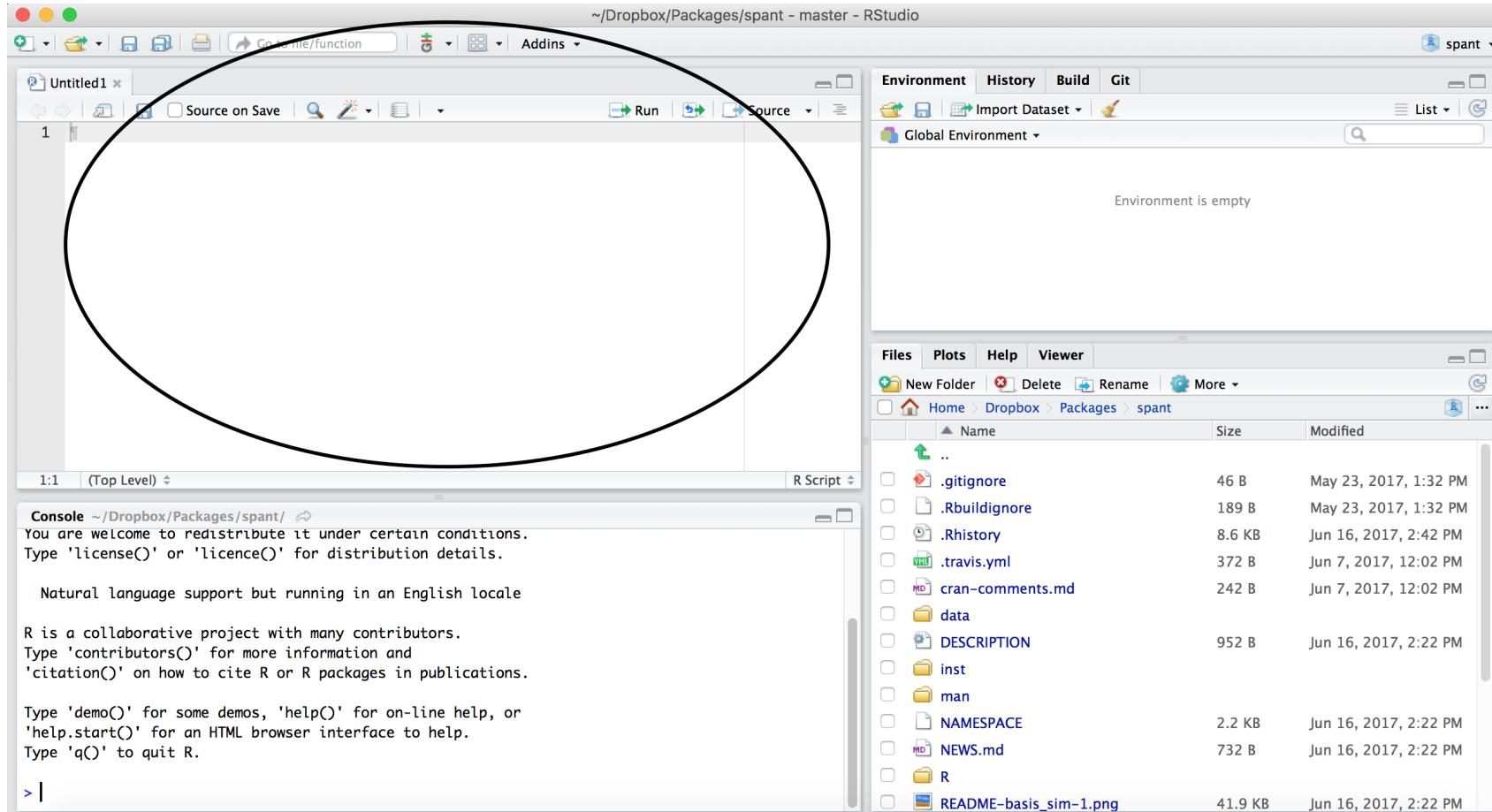
The screenshot shows the RStudio desktop application interface. The main window title is "intro_to_r - rstudio - RStudio".

- Code Editor:** The left pane displays an R Markdown document named "Untitled1". The code includes a YAML header and several R code chunks. A red box highlights the first few lines of the document.
- Global Environment:** The top right pane shows the Global Environment tab, which is currently empty.
- File Browser:** The bottom right pane shows the file structure under "GitHub > Teaching > intro_to_r".
- Console:** The bottom left pane shows the R console output, including R's welcome message and basic information about the R environment.

```
1 ---  
2 title: "first_markdown"  
3 output: html_document  
4 ---  
5  
6 ```{r setup, include=FALSE}  
7 knitr::opts_chunk$set(echo = TRUE)  
8 ```  
9  
10 ## R Markdown  
11  
12 This is an R Markdown document. Markdown is a simple formatting syntax for  
authoring HTML, PDF, and MS Word documents. For more details on using R  
Markdown see <http://rmarkdown.rstudio.com>.  
13  
14 When you click the **Knit** button a document will be generated that includes  
both content as well as the output of any embedded R code chunks within the  
document. You can embed an R code chunk like this:  
15  
16 ```{r cars}  
2:23 # first_markdown
```

Name	Size	Modified
..		
.gitignore	245 B	May 18, 2021, 1
.Rbuildignore	16 B	May 18, 2021, 1
.Rhistory	43 B	Jun 10, 2021, 1
.travis.yml	666 B	Jun 9, 2021, 12
all_functions.xlsx	13.4 KB	Jun 8, 2021, 3:1
all_the_functions.csv	57.3 KB	Jun 8, 2021, 3:1
all_the_packages.txt	211 B	May 18, 2021, 1
Arrays_Split		
Basic_R		
Best_Model_Coefficients.csv	587 B	May 18, 2021, 1
Best_Model_Coefficients.xlsx	3.8 KB	May 18, 2021, 1
bibliography.bib	599 B	May 18, 2021, 1
black_and_white_theme.pdf	45.1 KB	May 18, 2021, 1
bloomberg_logo_small_horizontal.png	254 KB	May 18, 2021, 1

Recall that a script was just empty



Scripts and R Markdown

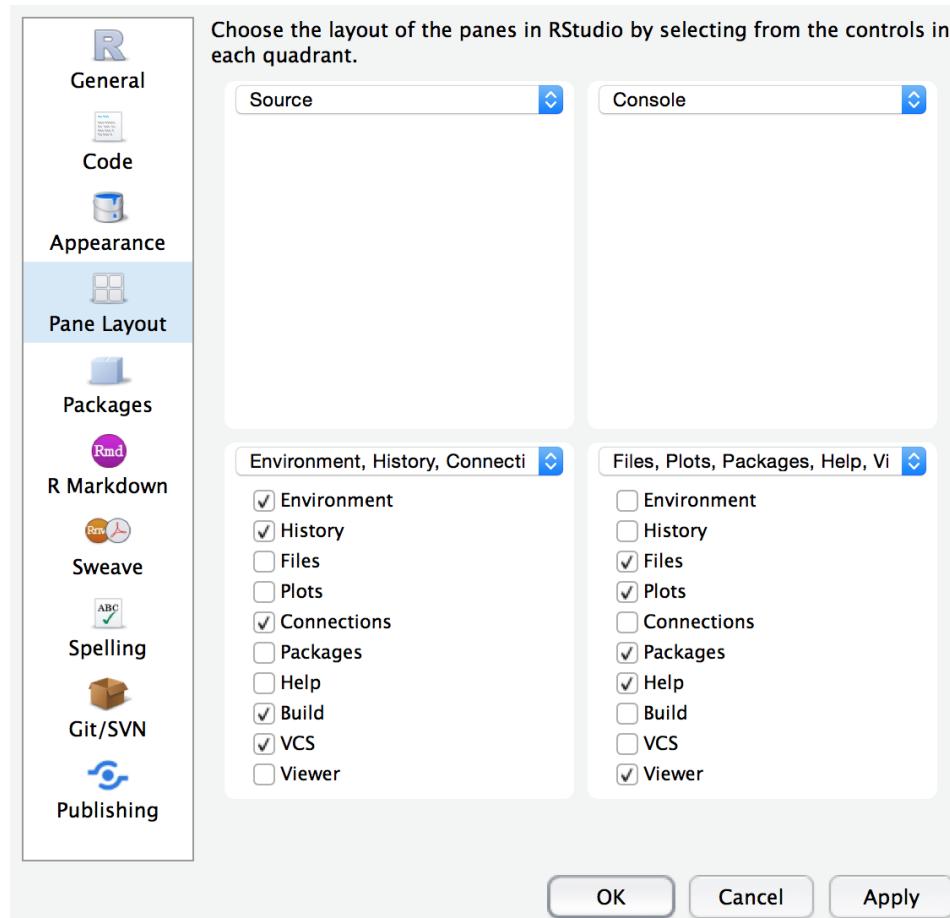
Although people will use scripts often, and they are good for more programmatic purposes, we generally don't recommend them for Public Health Researchers.

For data analyses, R Markdown files are generally superior because they allow you to check your code and write more info about your code.

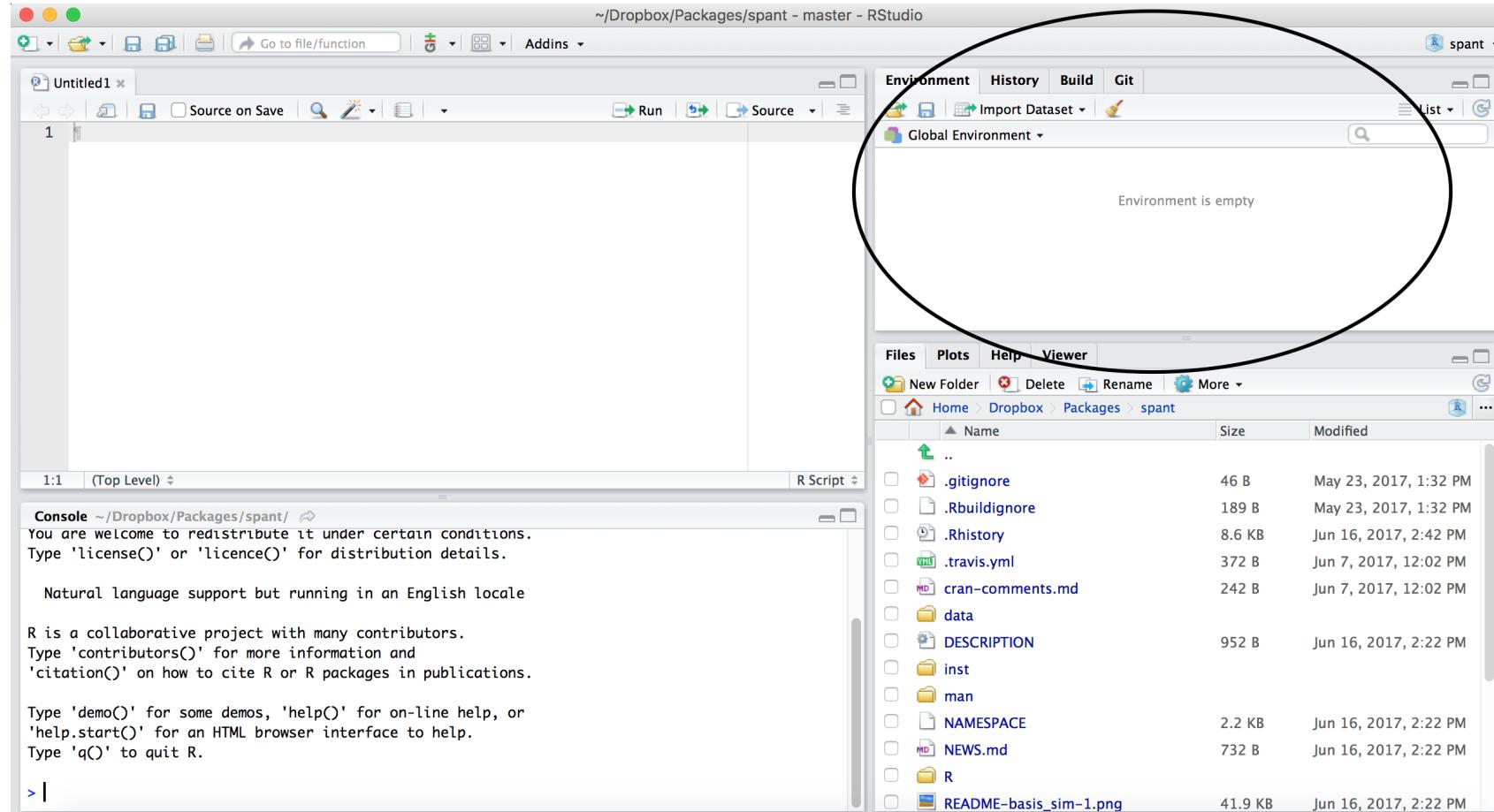
RStudio Layout

If RStudio doesn't look the way you want (or like our RStudio), then do:

RStudio → Preferences → Pane Layout



Workspace/Environment



Workspace/Environment

- Tells you what **objects** are in R
- What exists in memory/what is loaded?/what did I read in?

History

- Shows previous commands. Good to look at for debugging, but **don't rely** on it.
Instead use RMarkdown!
- Also type the “up” key in the Console to scroll through previous commands

Other Panes

- **Files** - shows the files on your computer or the directory you are working in
- **Viewer** - can view data or R objects
- **Help** - shows help of R commands
- **Plots** - pictures and figures
- **Packages** - list of R packages that are loaded in memory

Let's take a look at R Studio
ourselves!

Lab: Starting with R and RMarkdown

RStudio Lab

To do this lab we need to:

1. Download the file at the link above by clicking on the link or typing in:
https://jhudatascience.org/intro_to_r/modules/RStudio/lab/RStudio_Lab.Rmd

(Also on the [website](#) schedule page - Lab for day 1) 2) Find the downloaded file on your computer 3) Open the file in RStudio

This may require finding your downloads on your computer.

Recall that these videos can help:

If you have a PC: <https://youtu.be/we6vwB7DsNU>

If you have a Mac: <https://www.youtube.com/watch?v=Ao9e0cDzMrE>

You can find these on the resource page of the class website.

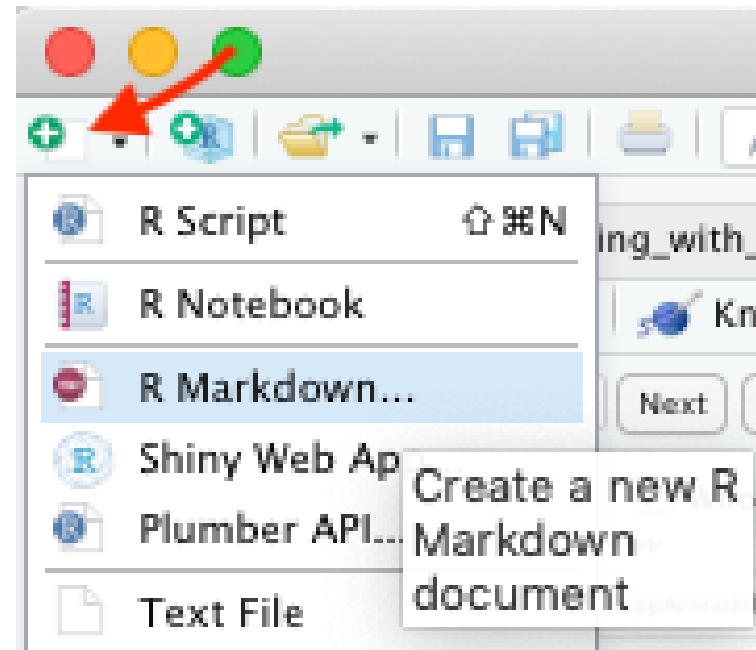
R Markdown file

R Markdown files (.Rmd) help generate reports that include your code and output. Think of them as fancier scripts.

1. Helps you describe your code
2. Allows you to check the output
3. Can create many different file types

Create an R Markdown file

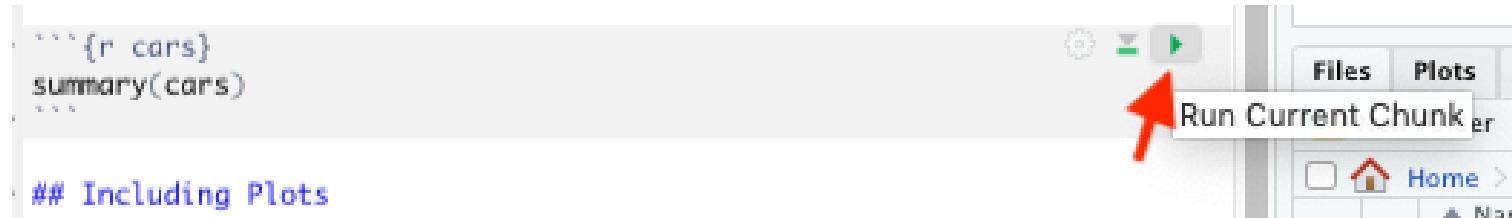
Go to File → New File → R Markdown or click the green add file button.



Code chunks

Within R Markdown files are code “chunks”

This is where you can type R code and run it!



The image shows a screenshot of the RStudio IDE. On the left, there is a code editor window containing R code. The code includes a code chunk indicator (three backticks) followed by `summary(cars)`, and then a comment `## Including Plots`. On the right, the RStudio toolbar is visible, featuring various icons for file operations like 'New File', 'Open', 'Save', and 'Run'. A red arrow points specifically to the 'Run' icon, which is a green square with a white play symbol. The menu bar at the top has 'File', 'Plots', and 'Help' options.

```
```{r cars}
summary(cars)
```

## Including Plots
```

Create Chunks

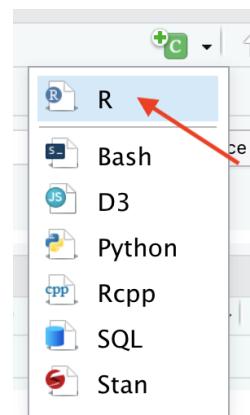
To create a new R code chunk:

Copy paste an existing chunk in the R Markdown file and replace the code **OR**

1. Use the insert code chunk button at the top of RStudio.



1. Select R (default) as the language:

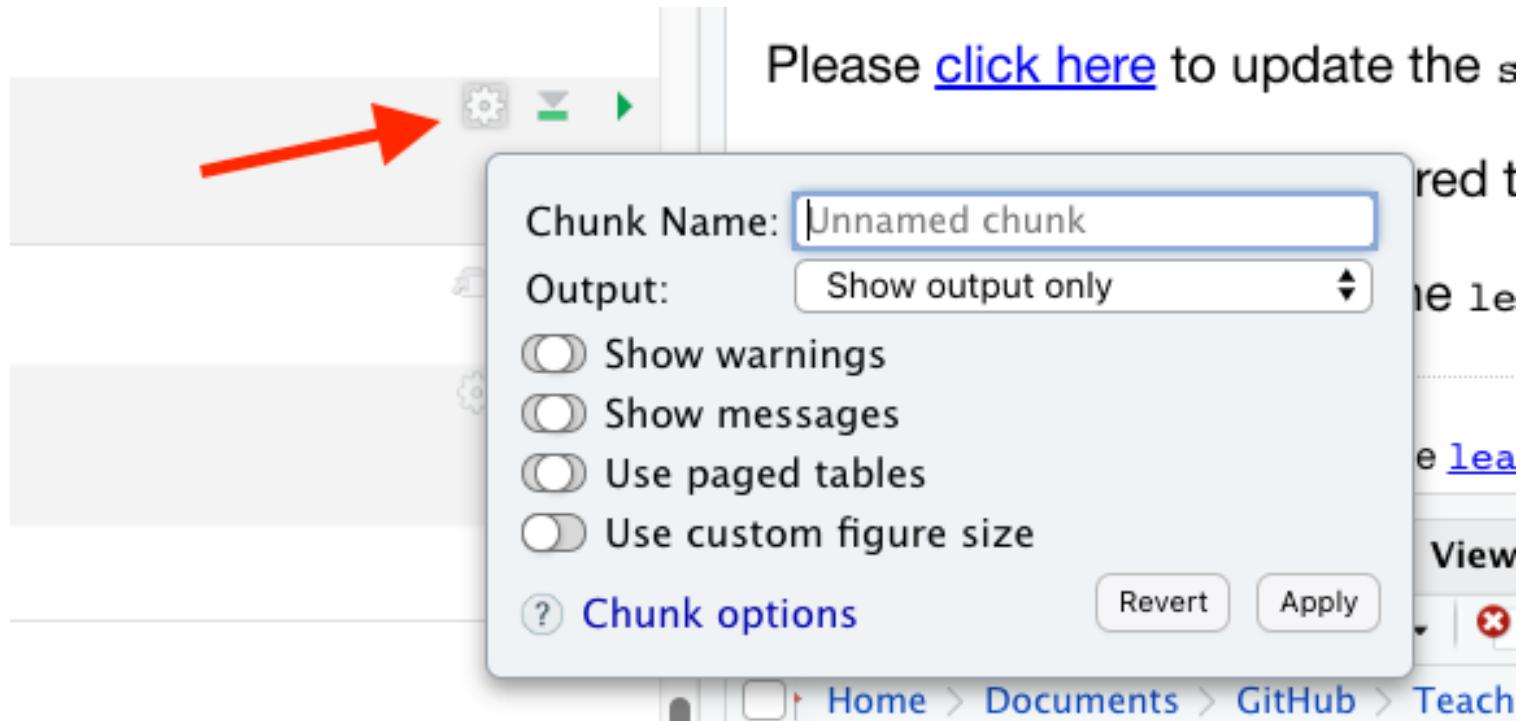


Run previous chunks button

You can run all chunks above a specific chunk using this button:

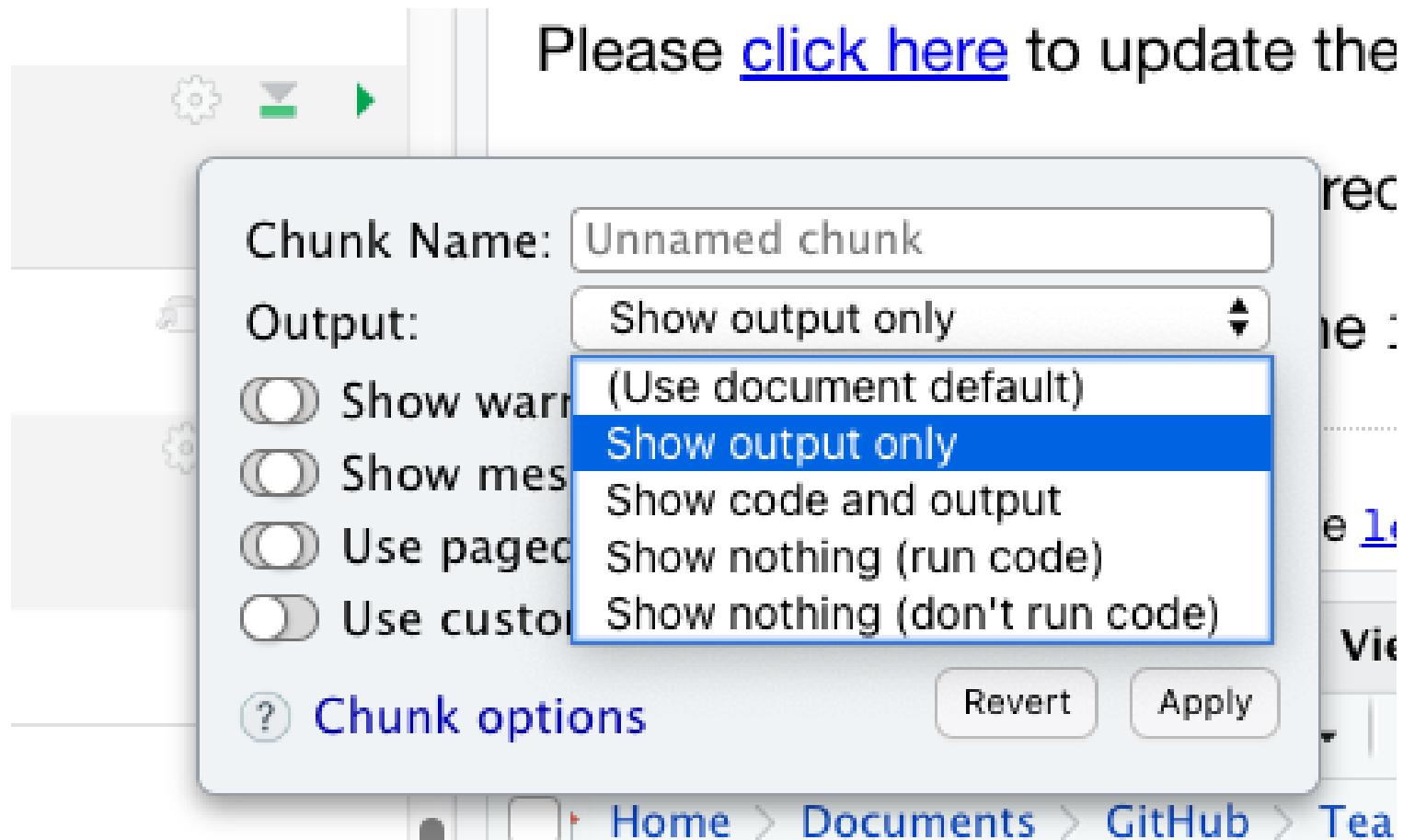


Chunk settings



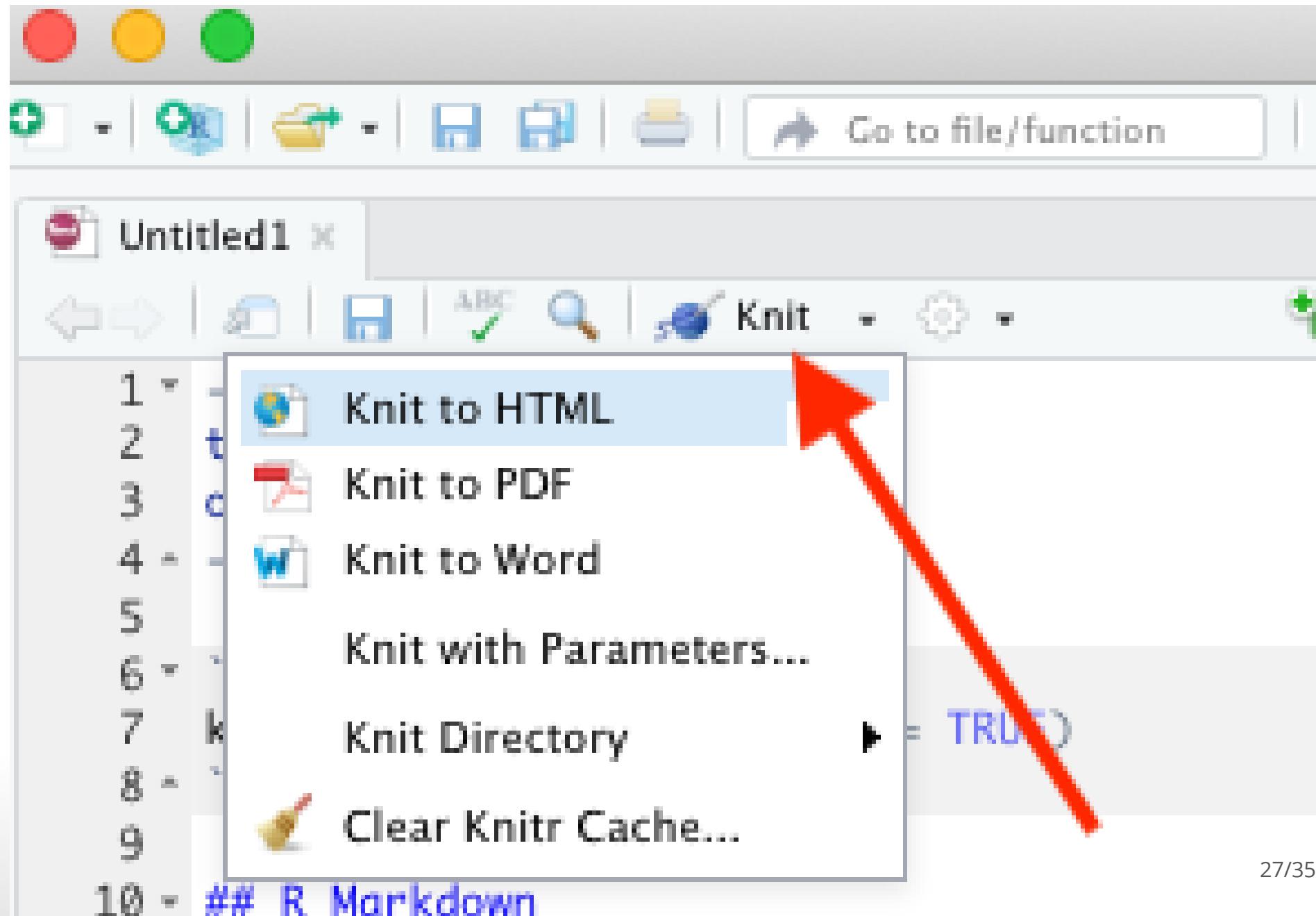
Chunk settings

You can specify if a chunk will be seen in the report or not.



Knit file to html

This will create a report from the R Markdown document!



Useful R Studio Shortcuts

- **Ctrl + Enter** in your script evaluates that line of code
 - It's like copying and pasting the code into the console for it to run.
- **Ctrl+1** takes you to the script page
- **Ctrl+2** takes you to the console
- http://www.rstudio.com/ide/docs/using/keyboard_shortcuts

If you get annoyed by inline code previews in Markdown files:

In RStudio Click the Edit tab → scroll down to Preferences... → R Markdown

Uncheck the following:

The screenshot shows the 'Options' dialog in RStudio. On the left, a sidebar lists various sections: General, Code, Console, Appearance, Pane Layout, Packages, R Markdown (which is selected and highlighted in blue), Python, Sweave, and Spelling. The main area has tabs at the top: Basic (selected), Advanced, Visual, and Citations. Under the 'R Markdown' section, there are several configuration options:

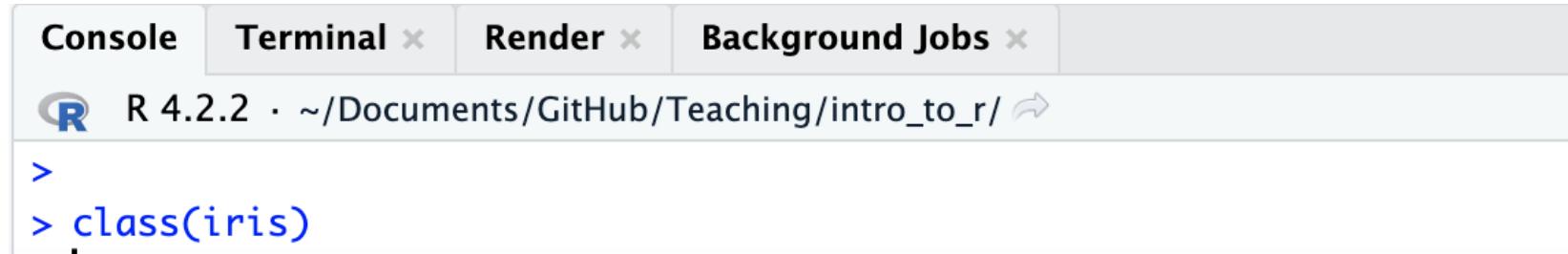
- Show document outline by default
- Soft-wrap R Markdown files
- Show in document outline:
- Show output preview in:
- Show output inline for all R Markdown documents (this option is highlighted with a red border)
- Show equation and image previews:
- Evaluate chunks in directory:

Below this, under 'R Notebooks', are two more options:

- Execute setup chunk automatically in notebooks
- Hide console automatically when executing notebook chunks

Recap of where code goes

- you can test code in the console



R 4.2.2 · ~/Documents/GitHub/Teaching/intro_to_r/ ↗

```
>
> class(iris)
.
```

- you can save code in a chunk in the editor (Markdown file)

```
## R Markdown
```

Code does not go here and instead goes within the grey chunks like this:

```
```{r}
summary(cars)
```
```



Getting help from the preview

When you type in a function name, a pop up will preview documentation to help you. It also helps you remember the name of the function if you don't remember all of it!

The screenshot shows two instances of RStudio's code editor interface. In the top instance, the user has typed 'class' and a tooltip is displayed over the first result, 'class(x)'. The tooltip contains the title 'Object Classes' and a brief description: 'R possesses a simple generic function mechanism which can be used for an object-oriented style of programming. Method dispatch takes place based on the class of the first argument to the generic function.' A note at the bottom of the tooltip says 'Press F1 for additional help'. In the bottom instance, the user has typed 'read_csv' and a tooltip is displayed over the first result, 'read_csv(file, col_names = TRUE, col_types = NULL, ...)'. The tooltip shows the function signature and a long list of parameters. Both instances show a vertical navigation bar on the right with tabs for 'Main' and 'Other'.

class(x)
Object Classes
R possesses a simple generic function mechanism which can be used for an object-oriented style of programming. Method dispatch takes place based on the class of the first argument to the generic function.
Press F1 for additional help

read_csv(file, col_names = TRUE, col_types = NULL, ...)
read_csv
read_builtin
read_chunk
read_csv2
read_csv2_chunked
read_csv_chunked
read_delim
read_

Get help with the help pane



The screenshot shows the R help pane interface. At the top, there is a navigation bar with tabs: Files, Plots, Packages, Help (which is selected), Git, Viewer, and Presentation. Below the navigation bar are several icons: a left arrow, a right arrow, a house icon, and a refresh/circular arrow icon. To the right of these icons is a search bar containing the text "class". Further to the right are icons for closing the window and a circular arrow. Below the navigation bar, the text "R: Object Classes" is displayed next to a dropdown arrow, and there is a "Find in Topic" button. The main content area shows the title "class {base}" on the left and "R Documentation" on the right.

class {base} R Documentation

Object Classes

Description

R possesses a simple generic function mechanism which can be used for an object-oriented style of programming. Method dispatch takes place based on the class of the first argument to the generic function.

Usage

```
class(x)
class(x) <- value
unclass(x)
inherits(x, what, which = FALSE)
isa(x, what)
oldClass(x)
```

Getting Help with ?

If you know the name of a package or function:

Type `?package_name` or `?function_name` in the console to get information about packages and functions.

For example: `?readr` or `?read_csv`.

The screenshot shows the RStudio interface with two main panes. The left pane is the Console, displaying the command `?class` entered by the user. The right pane is the Help viewer, showing the documentation for the `Object Classes`. The title bar of the Help viewer includes tabs for Files, Plots, Packages, Help, Git, Viewer, and Presentation. The main content area displays the `class` function's description and usage. The description states: "R possesses a simple generic function mechanism which can be used for an object-oriented style of programming. Method dispatch takes place based on the class of the first argument to the generic function." The usage section lists the following functions: `class(x)`, `class(x) <- value`, `unclass(x)`, `inherits(x, what, which = FALSE)`, and `isa(x, what)`.

Double Question Mark

If you haven't loaded a package yet into R than you may get a response that there is no documentation.

Typing in `??package_name` can show you packages that you haven't loaded yet.

The screenshot shows the RStudio interface. On the left, the R console window displays R code and its output. The user has run several commands related to the tidyverse package, including `?class`, `?tidyverse`, and `??tidyverse`. The output indicates that there is no documentation for 'tidyverse' in the specified packages and libraries, but suggests trying `??tidyverse`. The user then loads the tidyverse package using `library(tidyverse)`. The package documentation is shown on the right, titled 'tidyverse: Easily Install and Load the 'Tidyverse''. It describes the tidyverse as a set of packages designed to work in harmony. The maintainer is Hadley Wickham. A 'tidyverse' logo, which is a dark hexagon filled with small colored dots, is displayed. The RStudio menu bar at the top includes Console, Terminal, Render, Background Jobs, Files, Plots, Packages, Help, Git, Viewer, and Presentation.

```
>
>
>
>
>
>
> ?class
> ?tidyverse
No documentation for 'tidyverse' in specified packages and libraries:
you could try '??tidyverse'
> ??tidyverse
> library(tidyverse)
— Attaching packages ——————— tidyverse 1.3.2 —
✓ ggplot2 3.4.0   ✓ dplyr  1.0.10
✓ tibble  3.1.8   ✓ stringr 1.5.0
✓ tidyr   1.2.0   ✓forcats 0.5.1
✓ purrr   1.0.0
— Conflicts ——————— tidyverse_conflicts() —
✖ dplyr::filter() masks stats::filter()
✖ dplyr::lag()    masks stats::lag()
> ?tidyverse
> |
```

R: tidyverse: Easily Install and Load the 'Tidyverse'

tidyverse-package {tidyverse} R Documentation

tidyverse: Easily Install and Load the 'Tidyverse'

Description

The 'tidyverse' is a set of packages that work in harmony because they share common data representations and 'API' design. This package is designed to make it easy to install and load multiple 'tidyverse' packages in a single step. Learn more about the 'tidyverse' at <https://www.tidyverse.org>.

Author(s)

Maintainer: Hadley Wickham hadley@rstudio.com

Other contributors:



Summary

- RStudio makes working in R easier
- the Editor is for static code like scripts or R Markdown documents
- The console is for testing code
- R markdown documents are really helpful for lots of reasons!
- R code goes within what is called a chunk (the gray box with a green play button)
- Code chunks can be modified so that they show differently in reports

[Class Website](#)

[Lab](#)



Image by [Gerd Altmann](#) from [Pixabay](#)