

RStudio

Working with R – RStudio

RStudio is an Integrated Development Environment (IDE) for R

- Helps you write code - makes suggestions
- Helps you view the output of your code
- Helps you find errors
- 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

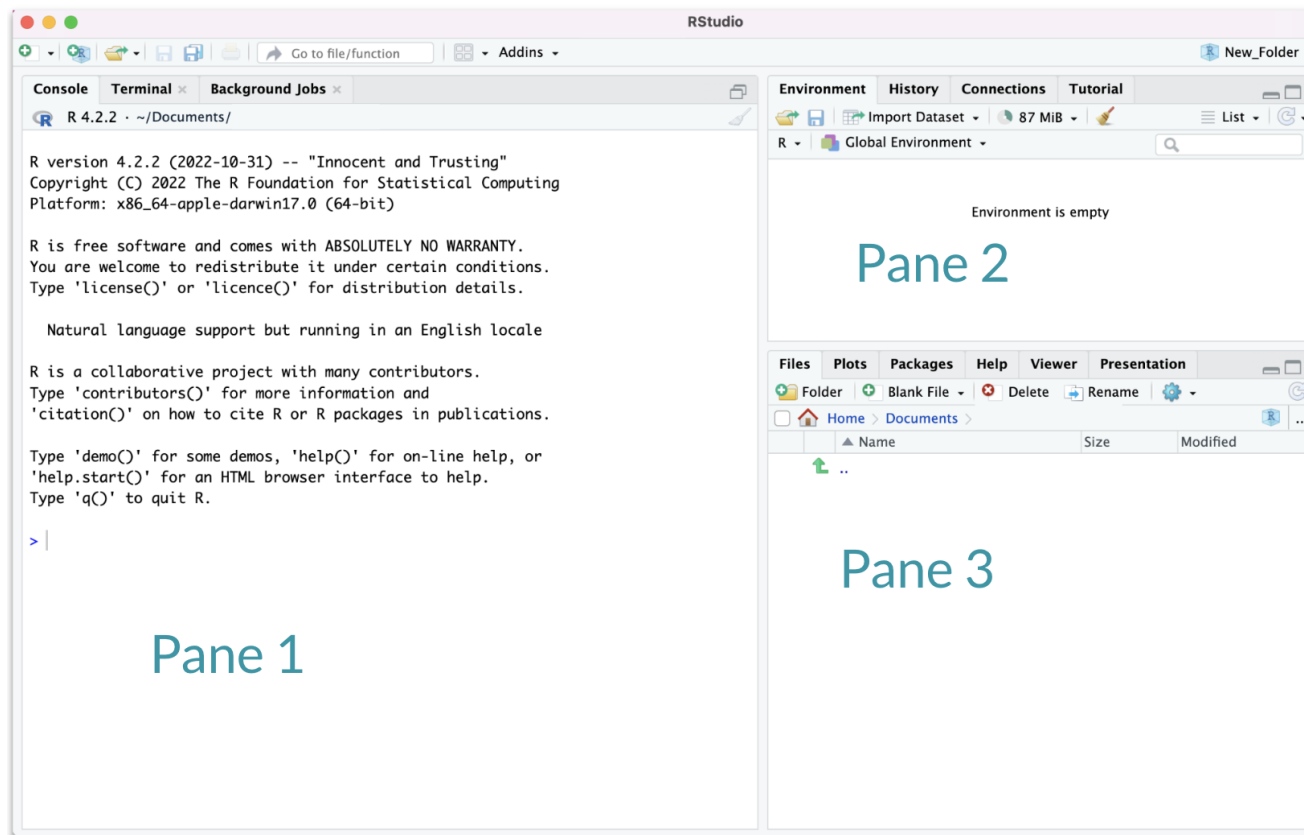
- Syntax highlighting, code completion, and smart indentation
- Easily manage multiple working directories and projects

More information

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

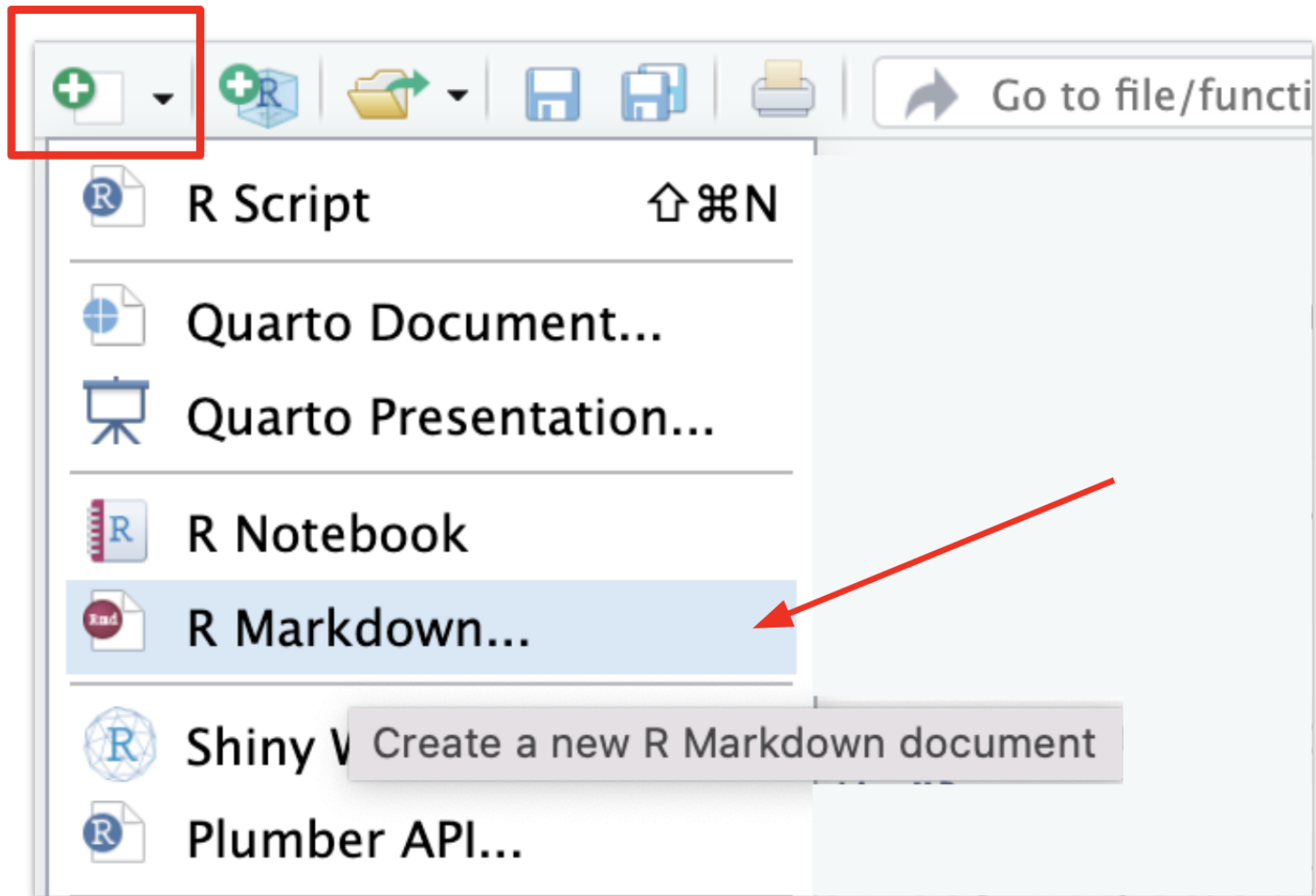
RStudio

First it is important to be familiar with the layout. When you first open RStudio, you will see 3 panes.



Hidden Pane

To save a copy of your code. You must open a file first - this will open a 4th pane. These files include Scripts or what are called R Markdown files.

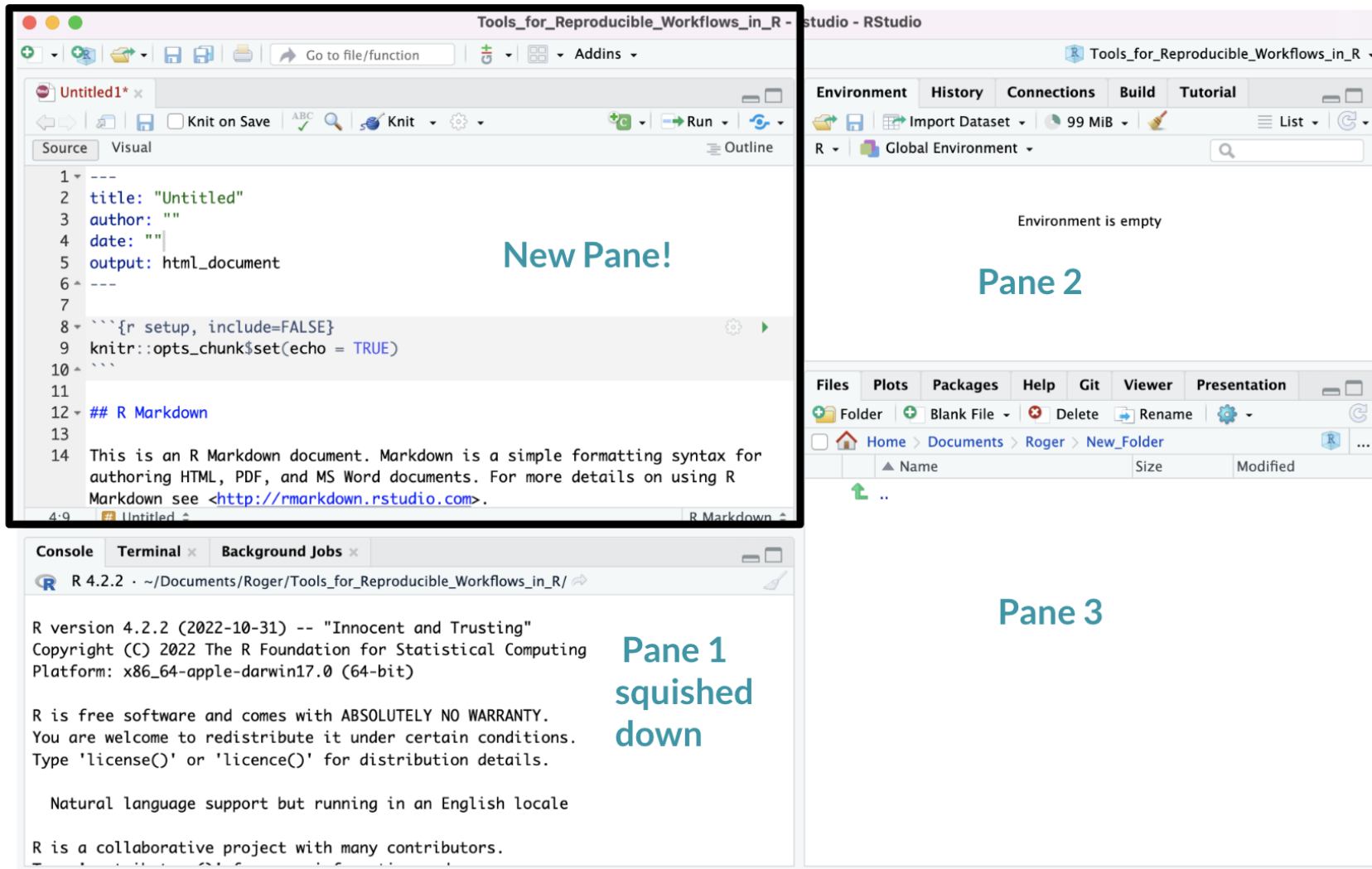


Hidden Pane

You will see a popup that you can just say "OK" to for now.

Hidden Pane

Nice! now we have a place to save code! This is where we will mostly be working.



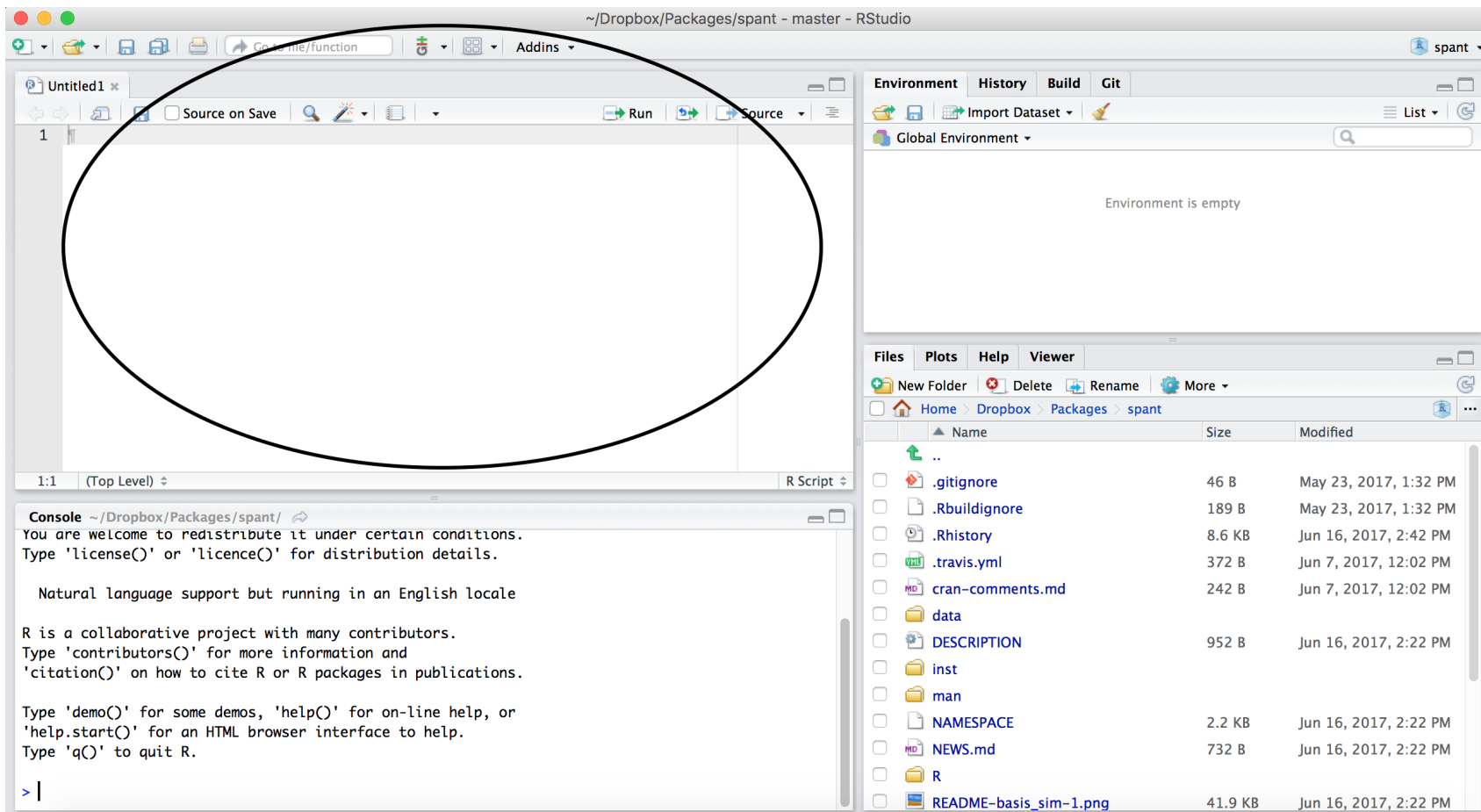
Working with R in R Studio - 2 major panes:

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



The screenshot displays the RStudio interface. The main window is titled "Untitled1" and shows a blank R script editor. A large black oval is drawn around the editor area. The top toolbar includes icons for "Run" and "Source". The right-hand side of the interface is divided into three panes: "Environment" (showing "Global Environment" and "Environment is empty"), "Files" (showing a file browser for the "spant" directory), and "Console" (showing the R startup message).

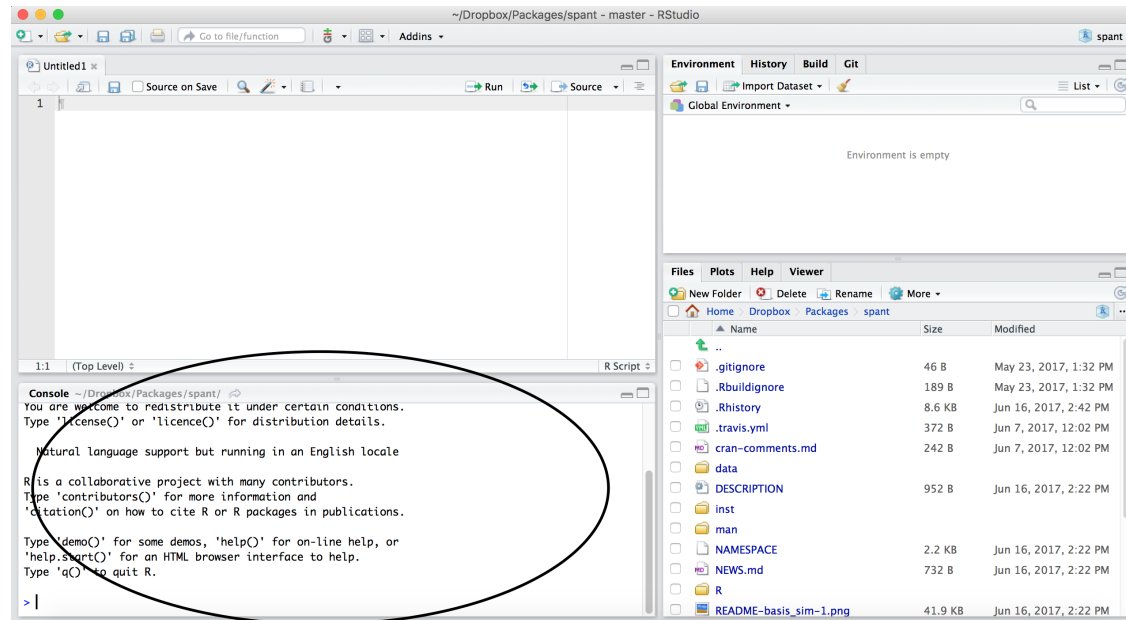
Files pane:

Name	Size	Modified
..		
.gitignore	46 B	May 23, 2017, 1:32 PM
.Rbuildignore	189 B	May 23, 2017, 1:32 PM
.Rhistory	8.6 KB	Jun 16, 2017, 2:42 PM
.travis.yml	372 B	Jun 7, 2017, 12:02 PM
cran-comments.md	242 B	Jun 7, 2017, 12:02 PM
data		
DESCRIPTION	952 B	Jun 16, 2017, 2:22 PM
inst		
man		
NAMESPACE	2.2 KB	Jun 16, 2017, 2:22 PM
NEWS.md	732 B	Jun 16, 2017, 2:22 PM
R		
README-basis_sim-1.png	41.9 KB	Jun 16, 2017, 2:22 PM

Console:

```
> |  
You are welcome to redistribute it under certain conditions.  
Type 'license()' or 'licence()' for distribution details.  
  
Natural language support but running in an English locale  
  
R is a collaborative project with many contributors.  
Type 'contributors()' for more information and  
'citation()' on how to cite R or R packages in publications.  
  
Type 'demo()' for some demos, 'help()' for on-line help, or  
'help.start()' for an HTML browser interface to help.  
Type 'q()' to quit R.  
> |
```

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”: [LINK](#)

Write Code

- Navigate tabs
- Open in new window
- Save
- Find and replace
- Compile as notebook
- Run selected code
- Cursors of shared users
- Re-run previous code
- Source with or without Echo
- Show file outline
- Multiple cursors/column selection with **Alt + mouse drag**.
- Code diagnostics that appear in the margin. Hover over diagnostic symbols for details.
- Syntax highlighting based on your file's extension
- Tab completion to finish function names, file paths, arguments, and more.
- Multi-language code snippets to quickly use common blocks of code.
- Jump to function in file
- Change file type

R Support

- Import data with wizard
- History of past commands to run/copy
- Display .RPres slideshows **File > New File > R Presentation**
- Load workspace
- Save workspace
- Delete all saved objects
- Search inside environment
- Choose environment to display from list of parent environments
- Display objects as list or grid
- Displays saved objects by type with short description
- View in data viewer
- View function source code
- Create folder
- Upload file
- Delete file
- Rename file
- Change directory
- Path to displayed directory
- A File browser keyed to your working directory. Click on file or directory name to open.

Console

```
> foo(1)
[1] 2
> foo <- function(x) x + 1
> foo(2)
foo(2)
foo(2)
foo(1)
```

Environment

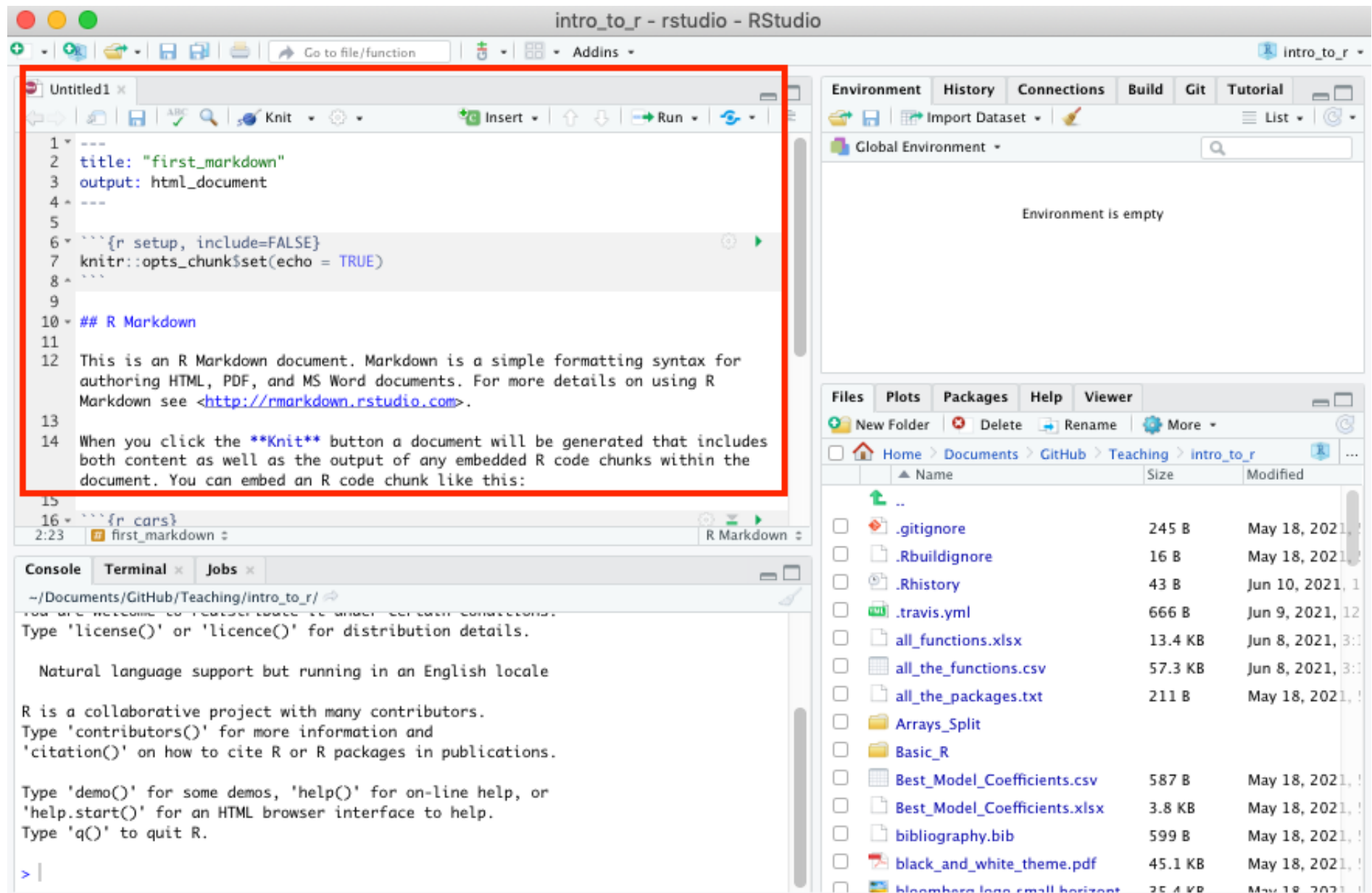
Data	Values	Functions
iris	150 obs. of 5 variables	
a	1	
foo		function (x)

Files

Name	Size	Modified
..		
hello.R	19 B	Apr 13, 2016, 11:17 AM

R Markdown files look different from scripts

It will look like this with text in it, unlike a script.



The screenshot displays the RStudio interface. The main editor window shows an R Markdown file named 'Untitled1'. The file content is as follows:

```
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
13 authoring HTML, PDF, and MS Word documents. For more details on using R
14 Markdown see <http://rmarkdown.rstudio.com>.
15
16 When you click the Knit button a document will be generated that includes
17 both content as well as the output of any embedded R code chunks within the
18 document. You can embed an R code chunk like this:
19
20 ```{r cars}
21
```

The terminal window at the bottom shows the R prompt and the output of the R setup code chunk:

```
~/Documents/GitHub/Teaching/intro_to_r/
>
You are welcome to redistribute this under certain conditions.
Type 'license()' or 'licence()' for distribution details.

Natural language support but running in an English locale

R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

>
```

The right-hand side of the RStudio interface shows the Environment pane (empty), the Files pane (listing files in the current directory), and the Plots, Packages, and Help panes.

Recall that a script was just empty

The screenshot shows the RStudio interface for a project named 'spant'. The main editor window, titled 'Untitled1', is empty and circled in black. The environment pane on the right shows 'Global Environment' with the message 'Environment is empty'. The file browser at the bottom right displays the project's file structure.

Name	Size	Modified
..		
.gitignore	46 B	May 23, 2017, 1:32 PM
.Rbuildignore	189 B	May 23, 2017, 1:32 PM
.Rhistory	8.6 KB	Jun 16, 2017, 2:42 PM
.travis.yml	372 B	Jun 7, 2017, 12:02 PM
cran-comments.md	242 B	Jun 7, 2017, 12:02 PM
data		
DESCRIPTION	952 B	Jun 16, 2017, 2:22 PM
inst		
man		
NAMESPACE	2.2 KB	Jun 16, 2017, 2:22 PM
NEWS.md	732 B	Jun 16, 2017, 2:22 PM
R		
README-basis_sim-1.png	41.9 KB	Jun 16, 2017, 2:22 PM

Console ~/Dropbox/Packages/spant/

```
You are welcome to redistribute it under certain conditions.  
Type 'license()' or 'licence()' for distribution details.  
  
Natural language support but running in an English locale  
  
R is a collaborative project with many contributors.  
Type 'contributors()' for more information and  
'citation()' on how to cite R or R packages in publications.  
  
Type 'demo()' for some demos, 'help()' for on-line help, or  
'help.start()' for an HTML browser interface to help.  
Type 'q()' to quit R.  
  
> |
```

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.

Workspace/Environment

The screenshot displays the RStudio interface for a project located at `~/Dropbox/Packages/spant - master`. The Environment pane, located in the top right, is circled in black and shows the Global Environment, which is currently empty. The Files pane, located in the bottom right, shows the project's file structure. The Console, located in the bottom left, displays the R startup message.

Environment Pane: Global Environment (Environment is empty)

Files Pane:

Name	Size	Modified
..		
.gitignore	46 B	May 23, 2017, 1:32 PM
.Rbuildignore	189 B	May 23, 2017, 1:32 PM
.Rhistory	8.6 KB	Jun 16, 2017, 2:42 PM
.travis.yml	372 B	Jun 7, 2017, 12:02 PM
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NEWS.md	732 B	Jun 16, 2017, 2:22 PM
R		
README-basis_sim-1.png	41.9 KB	Jun 16, 2017, 2:22 PM

Console:

```
~/Dropbox/Packages/spant/
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.

Natural language support but running in an English locale

R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

> |
```

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

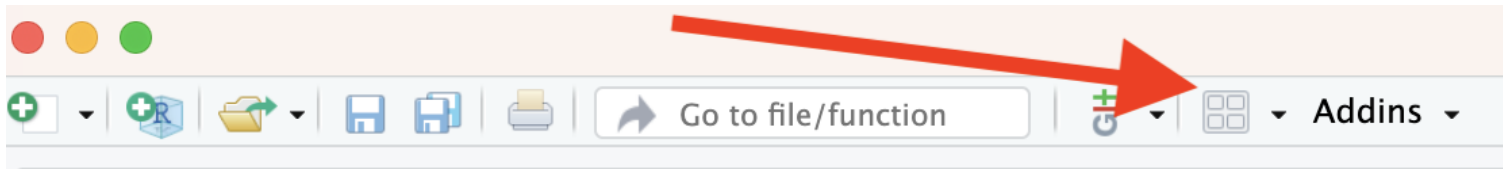
Other Panes

- **Files** - shows the files on your computer of 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

RStudio Layout

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



Click on the pane button, which looks like a waffle with 4 indentations. Scroll down to "Pane Layout".



Default Layout

Options

Choose the layout of the panels in RStudio by selecting from the controls in each panel. Add up to three additional Source Columns to the left side of the layout. When a column is removed, all saved files within the column are closed and any unsaved files are moved to the main Source Pane.

 Add Column |  Remove Column

Panel	Content
Source	<ul style="list-style-type: none"><input checked="" type="checkbox"/> Environment<input checked="" type="checkbox"/> History<input type="checkbox"/> Files<input type="checkbox"/> Plots<input checked="" type="checkbox"/> Connections<input type="checkbox"/> Packages<input type="checkbox"/> Help<input checked="" type="checkbox"/> Build<input type="checkbox"/> VCS
Console	<ul style="list-style-type: none"><input type="checkbox"/> Environment<input type="checkbox"/> History<input checked="" type="checkbox"/> Files<input checked="" type="checkbox"/> Plots<input type="checkbox"/> Connections<input checked="" type="checkbox"/> Packages<input checked="" type="checkbox"/> Help<input type="checkbox"/> Build<input checked="" type="checkbox"/> VCS

OK Cancel Apply

**Let's take a look at R Studio
ourselves!**

Lab: Starting with R and RMarkdown

▯ [RStudio Lab](#)

To do this lab we need to:

- Download the file at the link above by clicking on it or go to the [website](#) schedule page
- Find the downloaded file on your computer
- Open the file in RStudio (double clicking the file name typically works)

These videos can help if you aren't sure where your downloads are:

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.

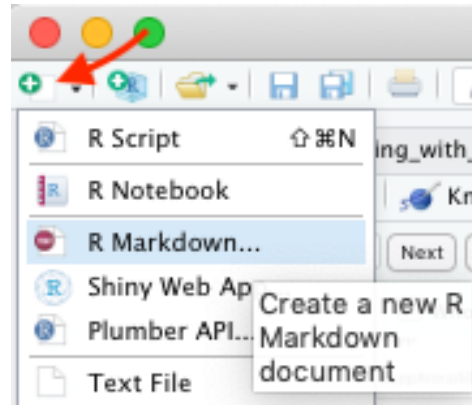
R Markdown file

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

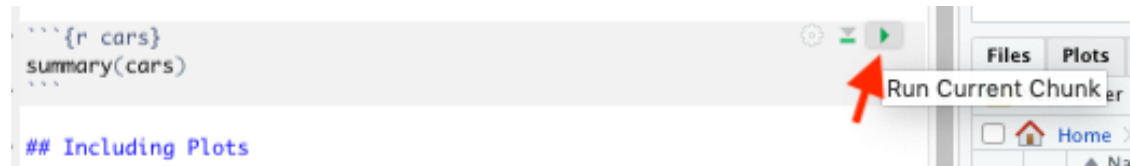
Within R Markdown files are code “chunks”.

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



Run code in a chunk

Clicking the run (play) button runs the code in the chunk.



Ctrl + Enter on Windows or Command + Enter on Mac in your script evaluates that line of code

Running a chunk executes the code

- generally see a preview of the output of the code just below the chunk
- see the code in the console

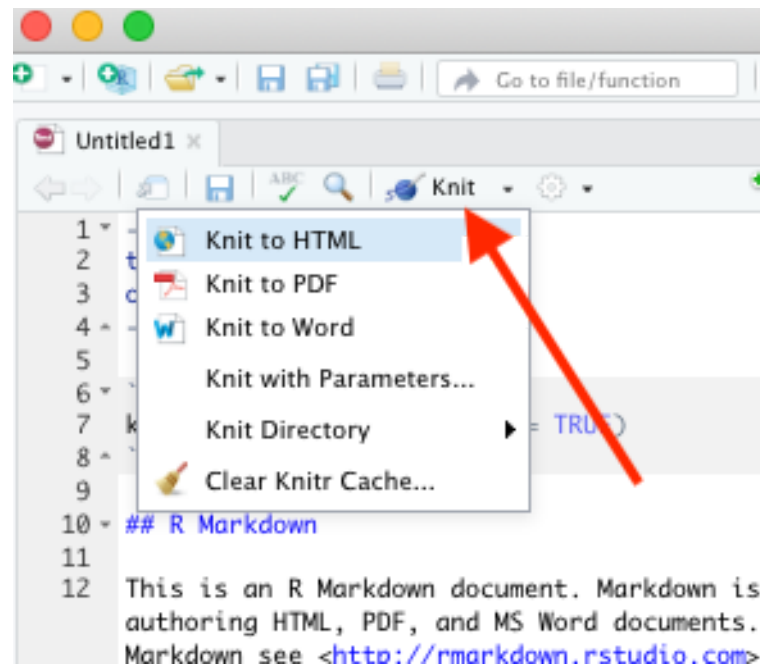
If you get annoyed by code previews in Markdown files...

See the [Help page](#) of the website. You can adjust this and change your RStudio settings:

Tools > Global Options > R Markdown

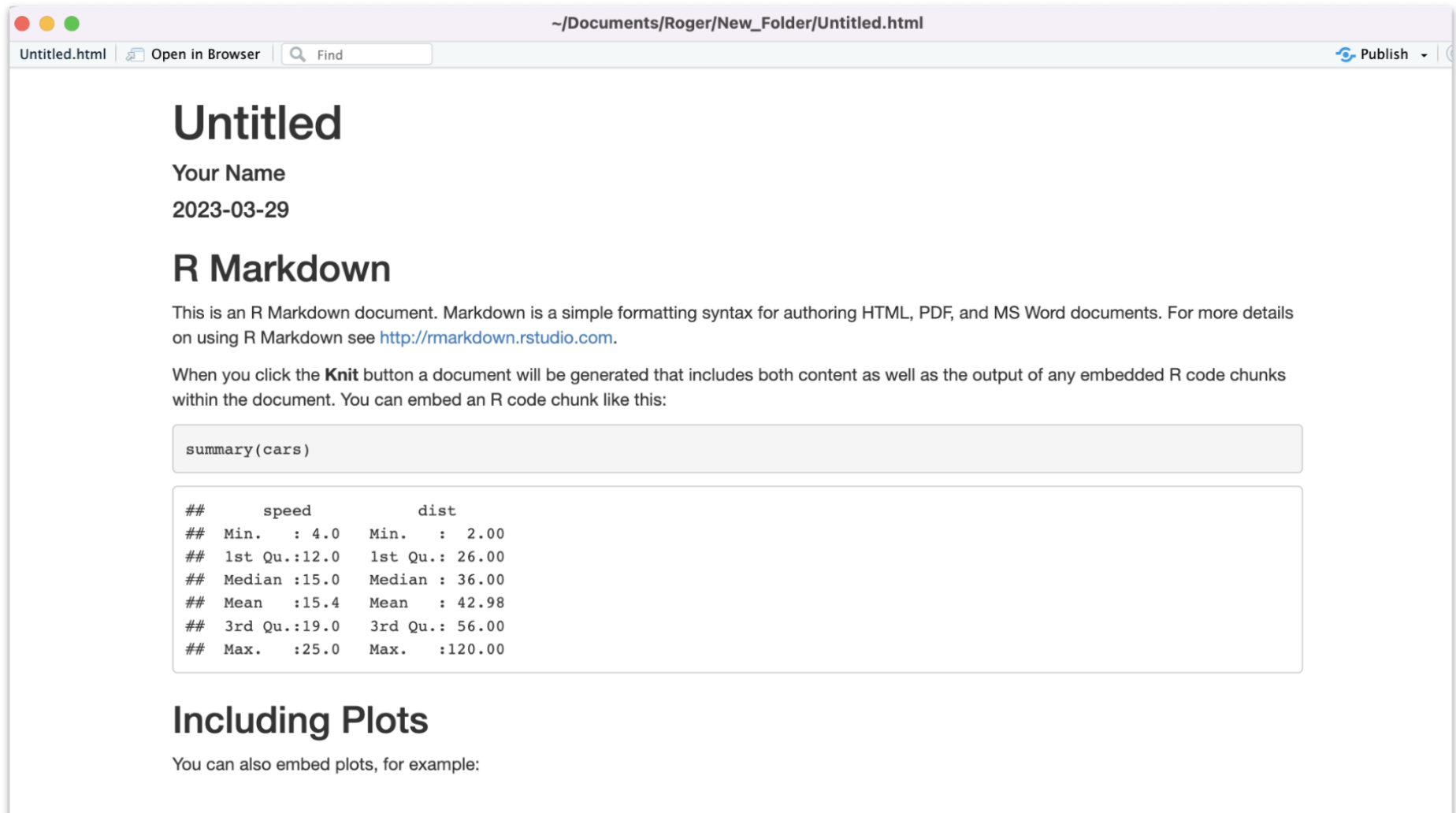
Knit file to html

Running all chunks - this will create a report from the R Markdown document!



Nice report!

This generates a nice report that you can share with others who can open in any browser.



The screenshot shows a web browser window with the address bar displaying `~/Documents/Roger/New_Folder/Untitled.html`. The browser tab is titled "Untitled.html" and includes "Open in Browser" and "Find" options. A "Publish" button is visible in the top right corner. The main content of the page is as follows:

Untitled

Your Name
2023-03-29

R Markdown

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>.

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:

```
summary(cars)
```

```
##      speed      dist
## Min.   : 4.0   Min.   : 2.00
## 1st Qu.:12.0   1st Qu.: 26.00
## Median :15.0   Median : 36.00
## Mean   :15.4   Mean    : 42.98
## 3rd Qu.:19.0   3rd Qu.: 56.00
## Max.   :25.0   Max.    :120.00
```

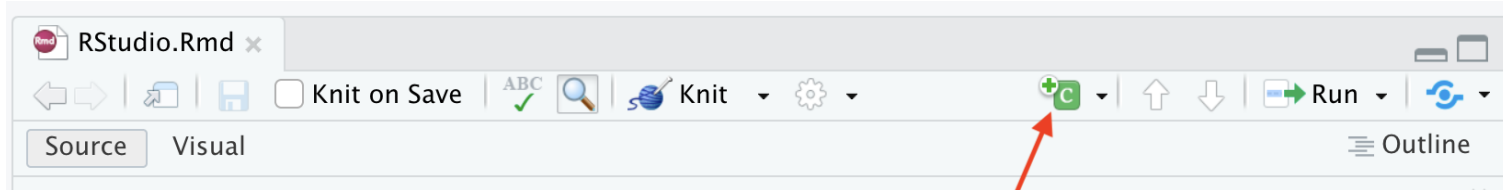
Including Plots

You can also embed plots, for example:

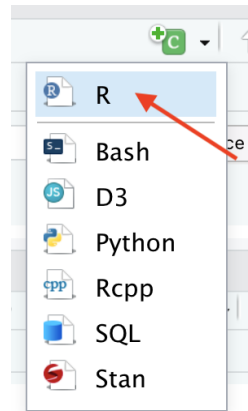
Create Chunks

To create a new R code chunk:

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



- Select R (default) as the language:



Create Chunks

If you like keyboard shortcuts:

- Windows & Linux use Ctrl+Alt+I
- Mac use Command+Option+I

I is for insert.

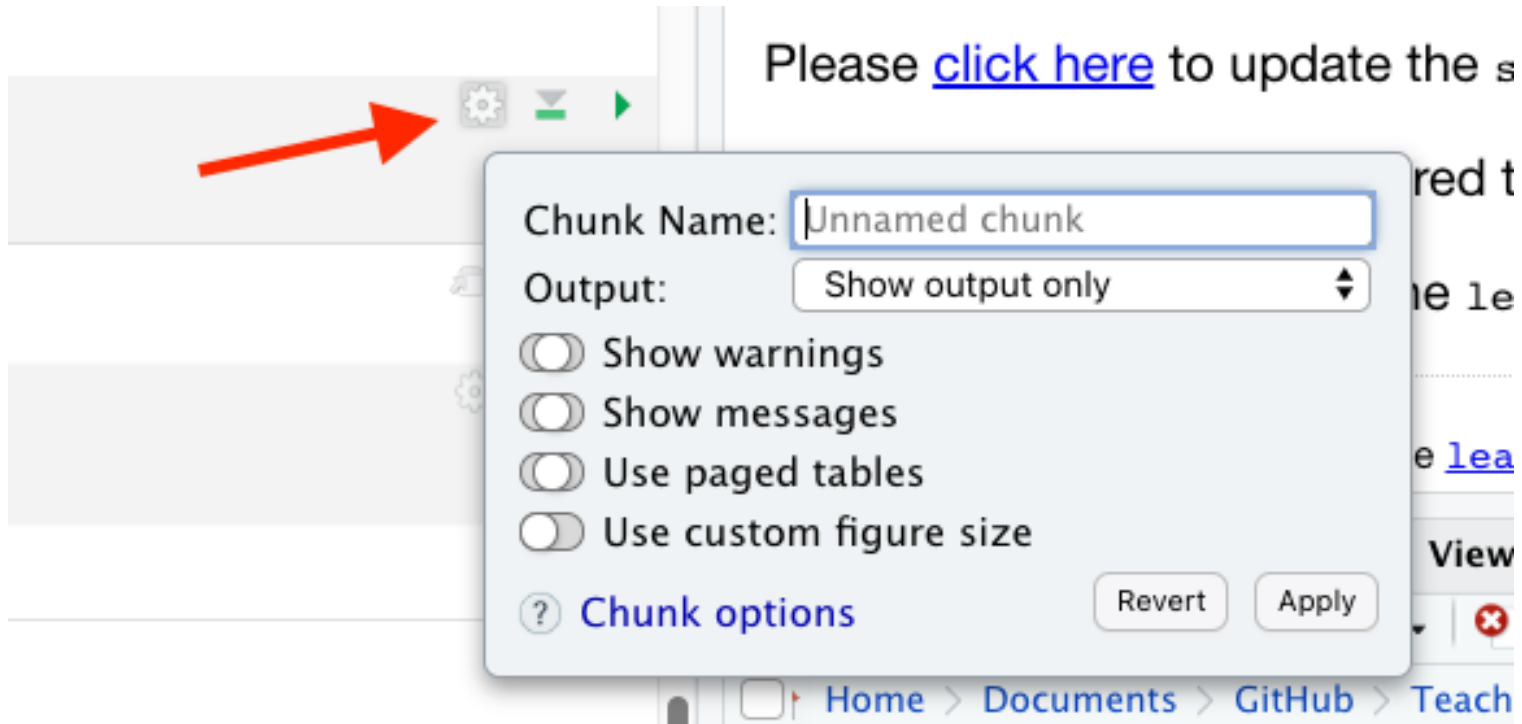
Run previous chunks button

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

```
``{r, out.width = "80%", echo = FALSE, fig.align='center'}  
knitr::include_graphics("images/chunk.png")  
``
```



Chunk settings



Chunk settings

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

Please [click here](#) to update the

Chunk Name:

Output:

Show warnings (Use document default)

Show output only

Show code and output

Show nothing (run code)

Show nothing (don't run code)

? [Chunk options](#)

Home > Documents > GitHub > Tea

Errors

R studio can help you find issues in your code. Note that sometimes the error occurs earlier than RStudio thinks.



The screenshot shows a snippet of R code in a text editor. Line 305 contains `print(x, ...)` with a yellow highlight. Line 306 contains `{r}`. Line 307 contains `print(x))|` and is marked with a red 'x' icon. A tooltip box is open over line 307, displaying the error message: `unexpected token ')'` and `unexpected end of document`. The editor interface includes a gear icon, a dropdown arrow, and a green play button on the right side.

```
305 print(x, ...)  
306 {r}  
307 print(x))|  
308 ``````  
3 unexpected token ')'  
3 unexpected end of document
```

Rainbow Parentheses

Tools -> Global Options -> Code -> Display -> Use rainbow parentheses

Press enter to save this setting and get out of this menu.

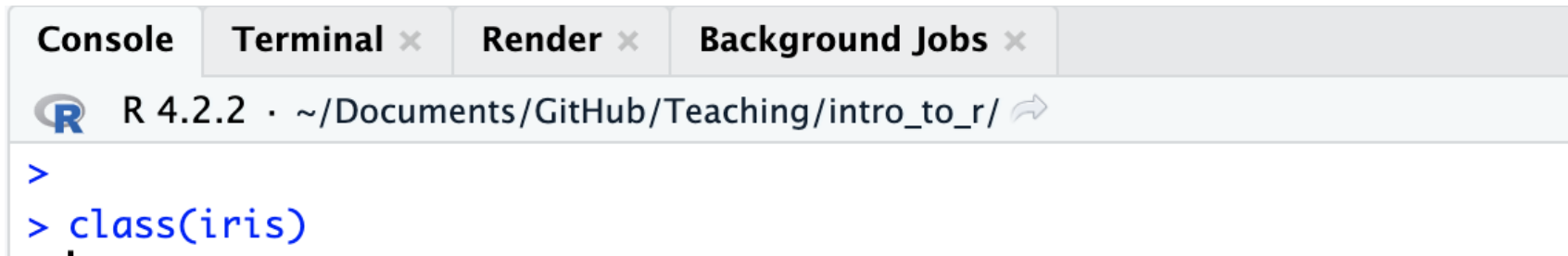
(((((({{{{[[[[[[Enjoy your colorful code!]]]]}}}})))))

Useful R Studio Shortcuts

- `Ctrl + Enter` on Windows or `Command + Enter` on Mac 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` on Windows or `Command + 1` on Mac takes you to the script page
- `Ctrl+2` on Windows or `Command + 2` on Mac takes you to the console
- http://www.rstudio.com/ide/docs/using/keyboard_shortcuts

Recap of where code goes

- you can test code in the console



The screenshot shows an R console window with tabs for 'Console', 'Terminal', 'Render', and 'Background Jobs'. The console title bar indicates 'R 4.2.2 · ~/Documents/GitHub/Teaching/intro_to_r/'. The prompt is '>' and the command 'class(iris)' is entered, with a cursor at the end of the line.

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

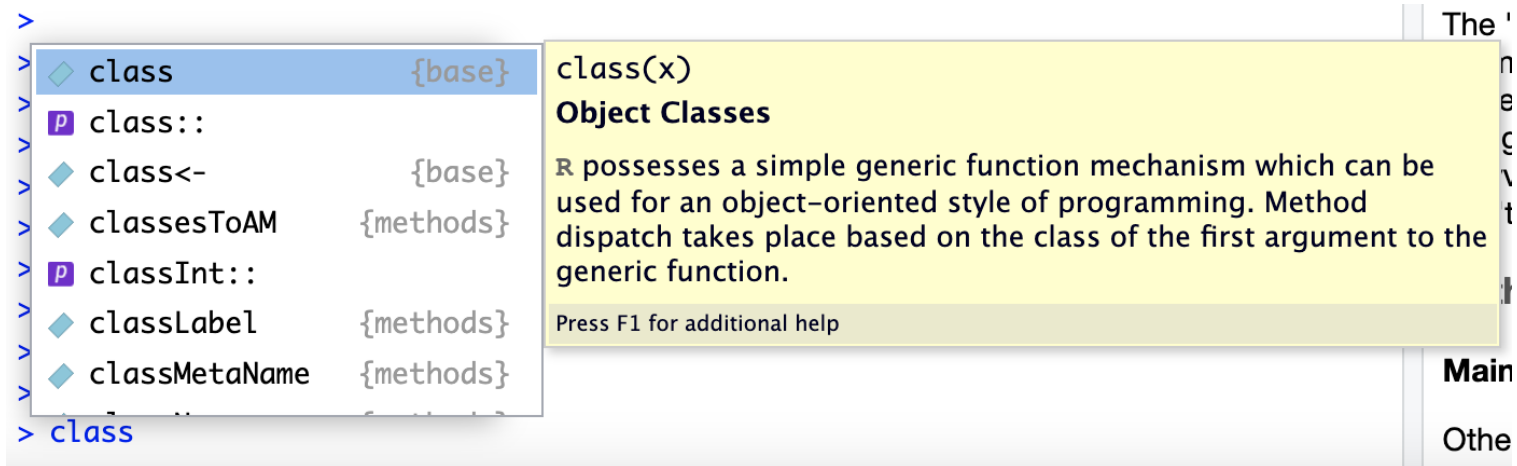
R Markdown

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

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

Getting help from the preview

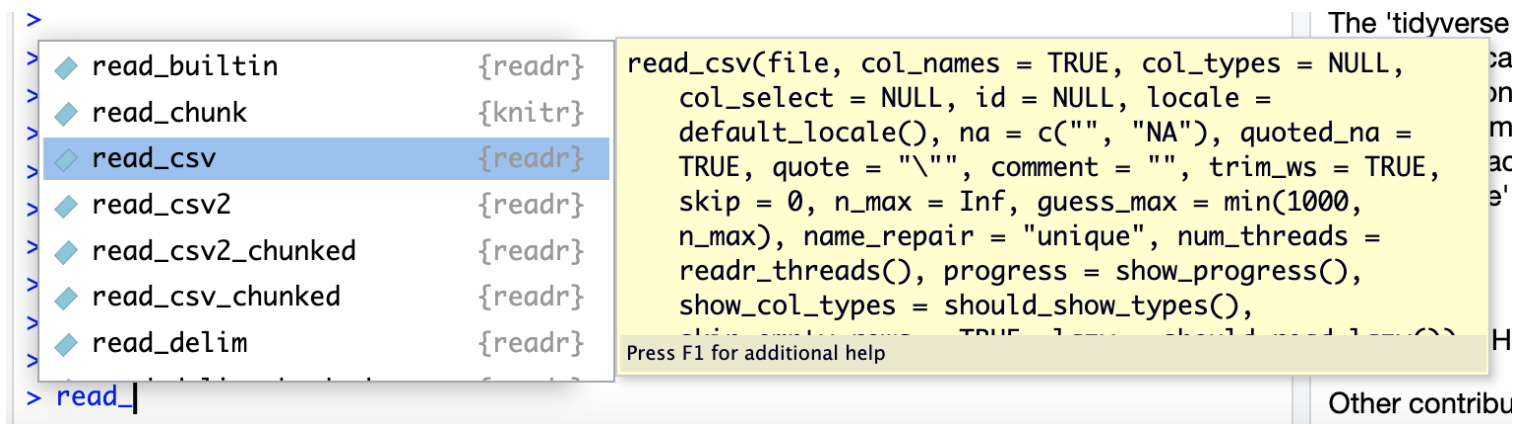
When you type in a function name, a pop up will preview documentation to help you. It also helps you remember the name of the function if you don't remember all of it!



The screenshot shows an R console with a list of functions. The 'class' function is selected, and a help popup is displayed. The popup contains the following text:

```
> class {base}
> class::
> class<- {base}
> classesToAM {methods}
> classInt::
> classLabel {methods}
> classMetaName {methods}
> class
```

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



The screenshot shows an R console with a list of functions. The 'read_csv' function is selected, and a help popup is displayed. The popup contains the following text:

```
> read_builtin {readr}
> read_chunk {knitr}
> read_csv {readr}
> read_csv2 {readr}
> read_csv2_chunked {readr}
> read_csv_chunked {readr}
> read_delim {readr}
> read_
```

read_csv(file, col_names = TRUE, col_types = NULL, col_select = NULL, id = NULL, locale = default_locale(), na = c("", "NA"), quoted_na = TRUE, quote = "\"", comment = "", trim_ws = TRUE, skip = 0, n_max = Inf, guess_max = min(1000, n_max), name_repair = "unique", num_threads = readr_threads(), progress = show_progress(), show_col_types = should_show_types(), skip_comments = TRUE, skip_empty_lines = TRUE)
Press F1 for additional help

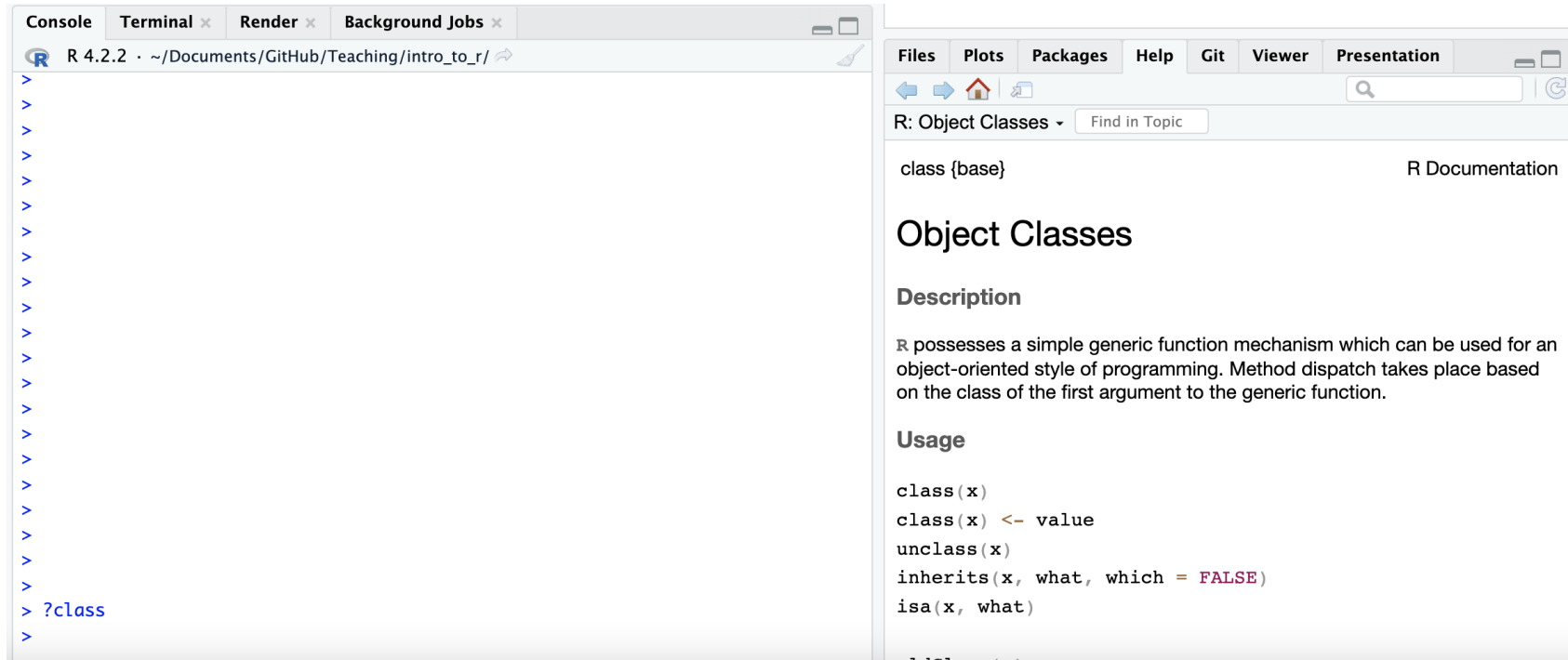
Get help with the help pane

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 R Studio interface. On the left, the Console window displays a series of prompt characters (>) and the command `?class`. On the right, the Help window is open, showing the documentation for the `class` function. The documentation includes the following sections:

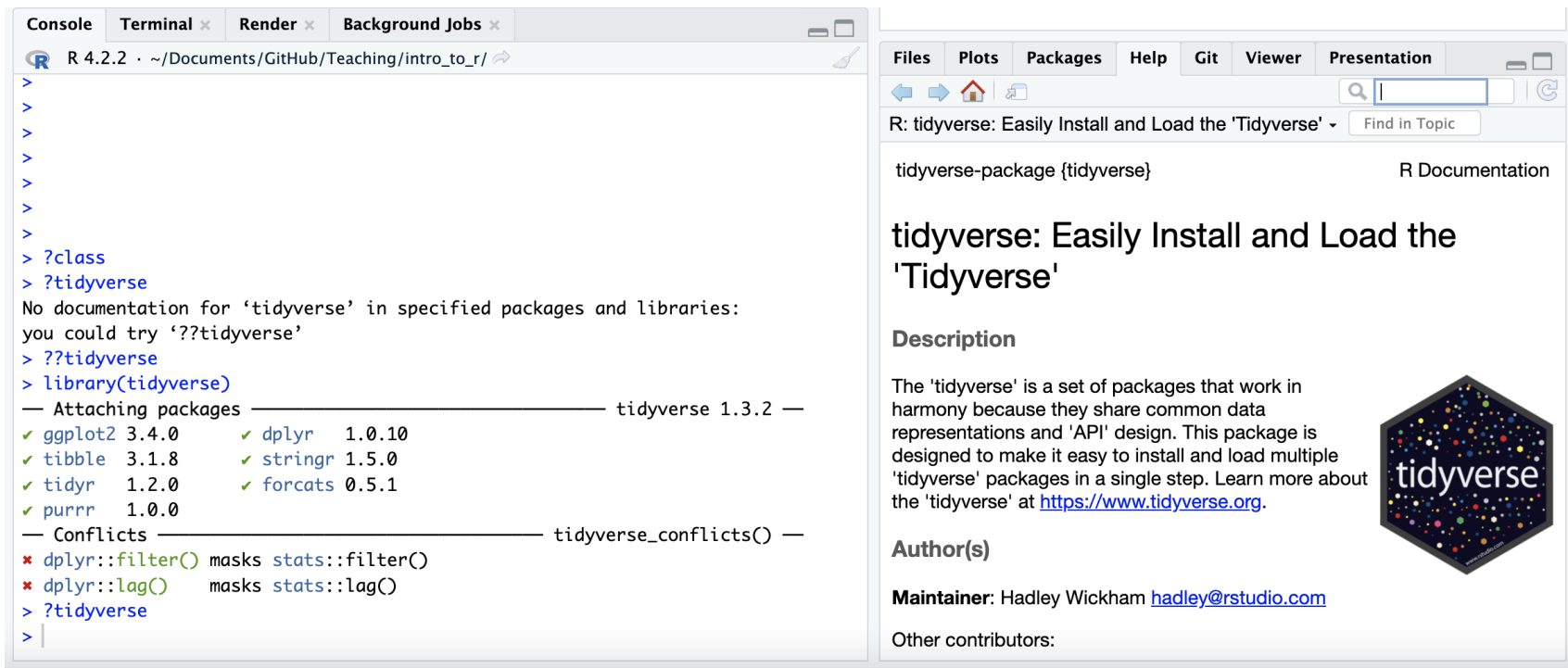
- Object Classes**
- Description**: R possesses a simple generic function mechanism which can be used for an object-oriented style of programming. Method dispatch takes place based on the class of the first argument to the generic function.
- Usage**:

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

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 image shows two side-by-side windows from an R environment. The left window is the R console, and the right window is the R documentation viewer.

R Console Output:

```
>
>
>
>
>
>
>
> ?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 Documentation Viewer:


R: tidyverse: Easily Install and Load the 'Tidyverse' - Find in Topic

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 (top) is for static code like scripts or R Markdown documents
- The console is for testing code (bottom) - best to save your code though!
- 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](#)

Extra Slides

Sometimes you want to hide your code

If you want to keep your code so people can see it if they want to there is a nice option called code folding - check it out here:

<https://stackoverflow.com/questions/69326576/show-output-but-hide-code-when-sending-rmd-to-other-people>