

Intro to R

RStudio

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](#)
- All R Studio snapshots are taken from <http://ayeimanol-r.net/2013/04/21/289/>



[[source](#)]

RStudio

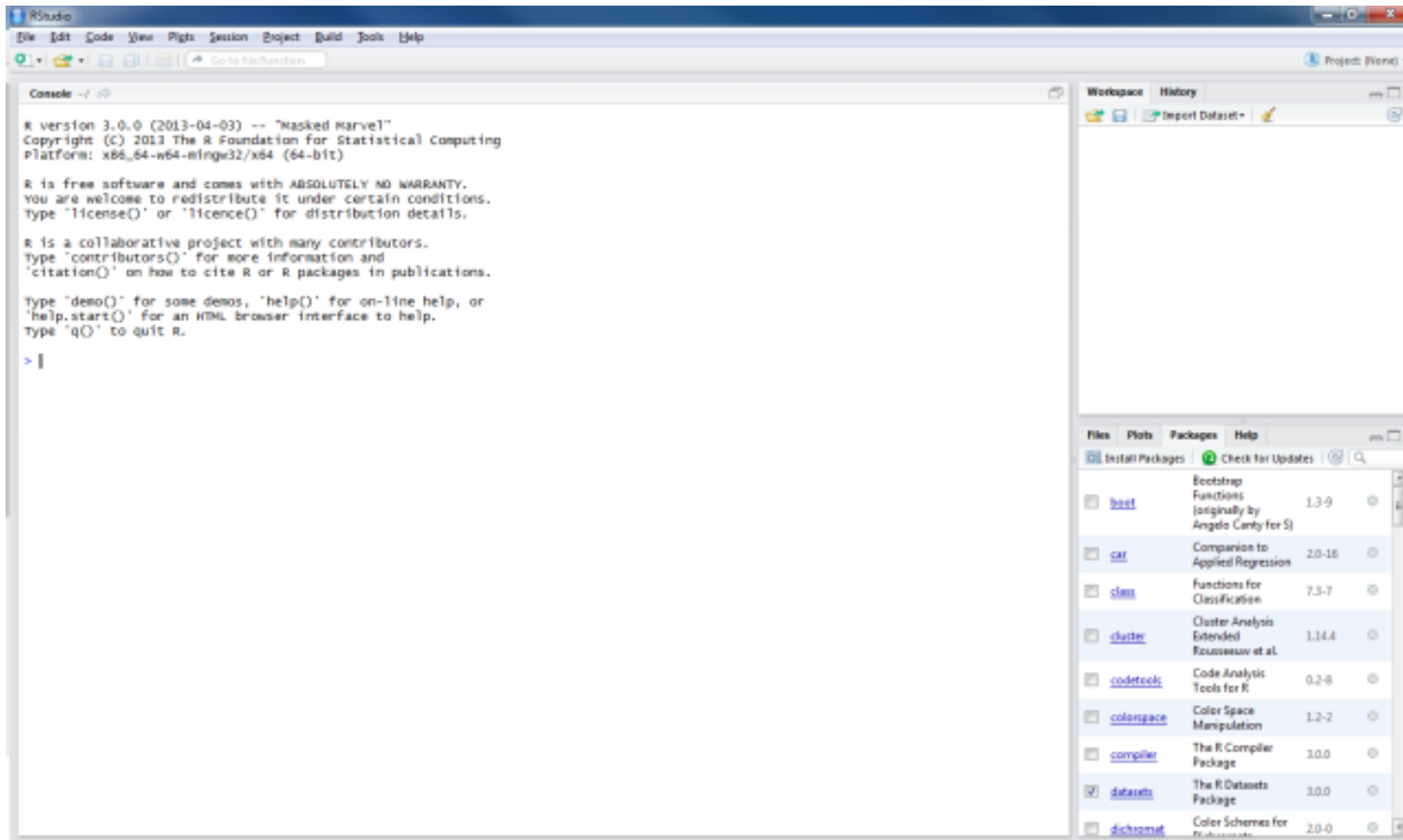
Easier working with R

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

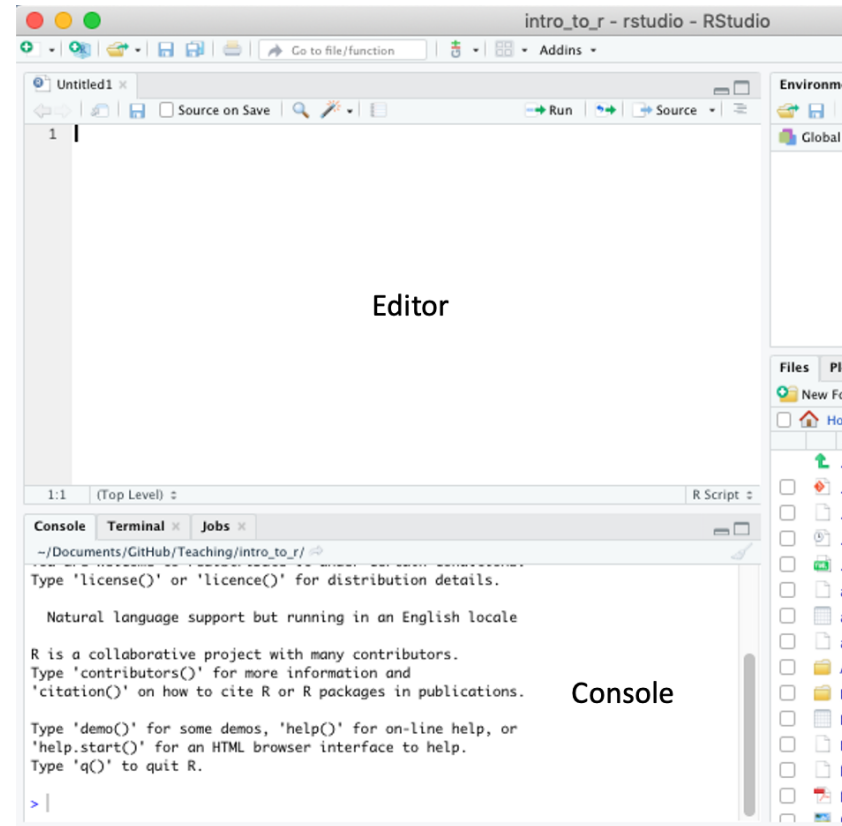
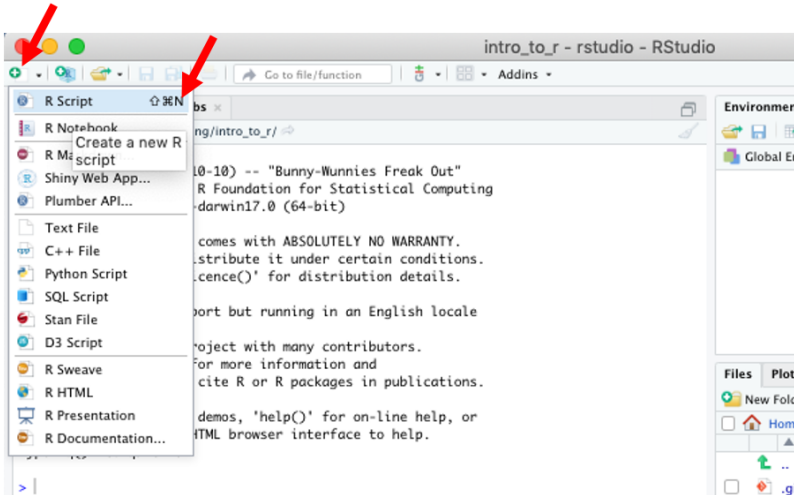
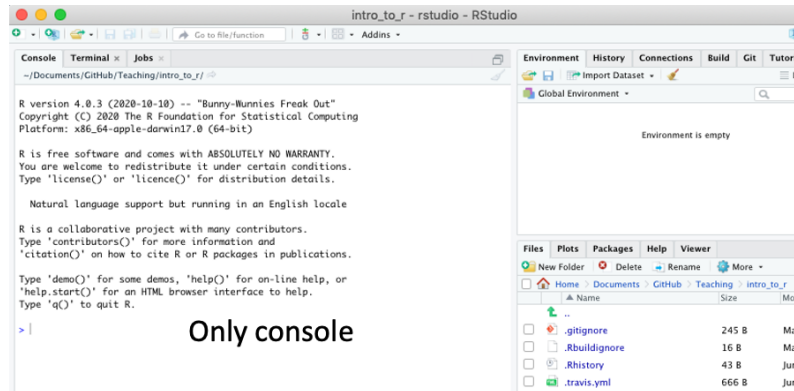
More information

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

RStudio



Getting the editor



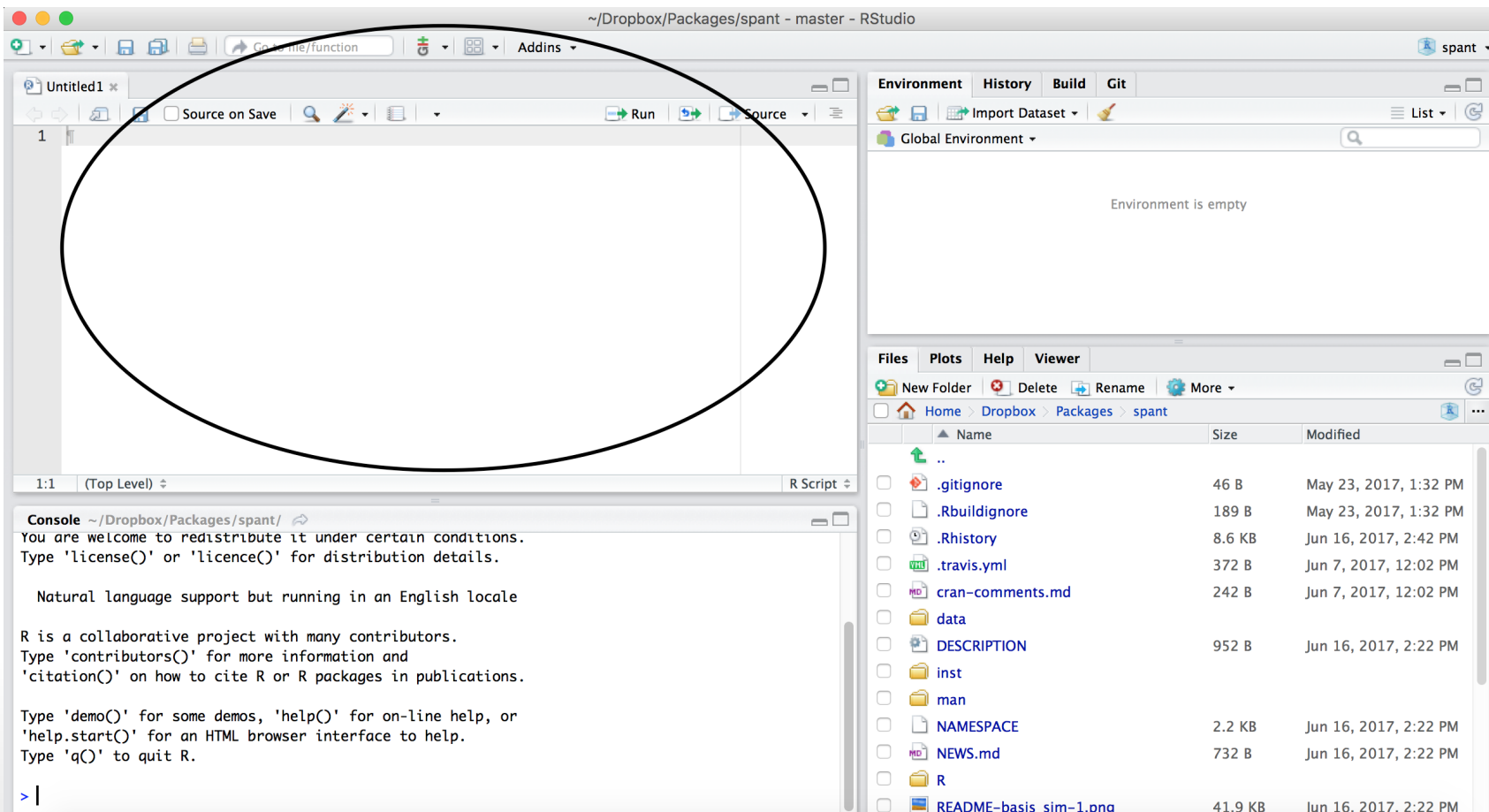
Working with R in R Studio - 2 major panes:

1. The **Source/Editor**: “Analysis” Script + Interactive Exploration
 - Static copy of what you did (reproducibility)
 - Try things out interactively, then add to your script
2. The **R Console**: “interprets” whatever you type
 - Calculator
 - Creating variables
 - Applying functions

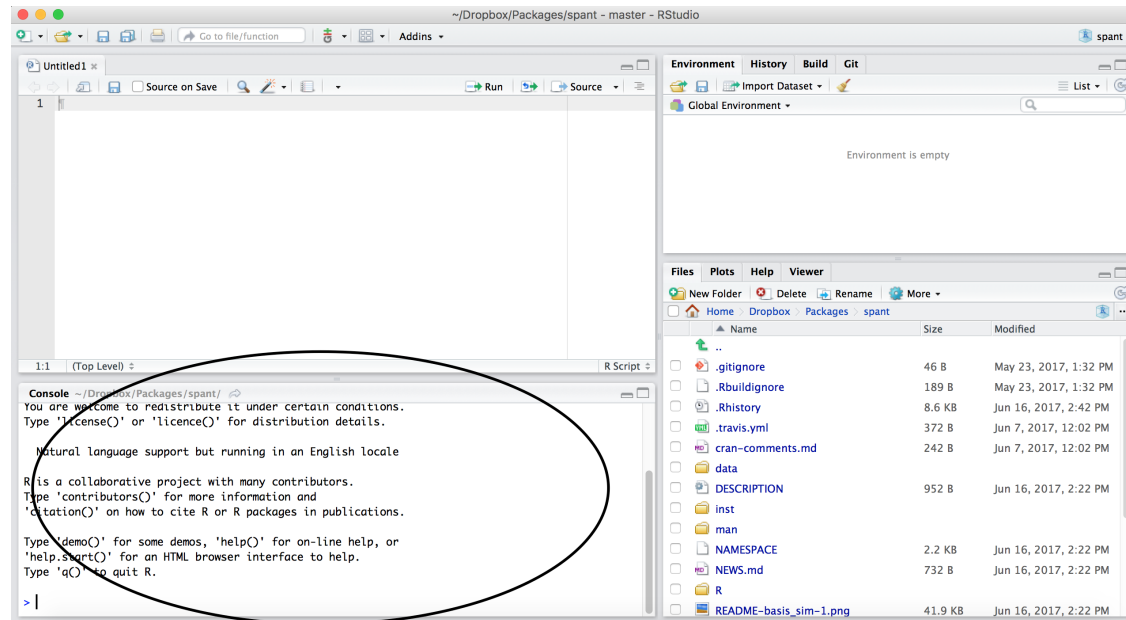
Source / Editor

- 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
- 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
- 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.
- Working Directory
- Maximize, minimize panes
- Press **↑** to see command history
- Drag pane boundaries

```
1 # Good Start...
2
3
4
5
6 "P0030001"
7 "P0030002"
8 "P0030003"
9 "P0030004"
10
11
12 get_digit <-function() {
13   ("num" %% (10 ^ n))
14   %/% (10 ^ (n - 1))
15 }
16
17 fo
18   for {snippets}
19   foo {,GlobalEnv}
20   force {base}
21
22
```

```
> Foo(1)
[1] 2
> Foo <- function(x) x + 1
> Foo(2)
[1] 3
> Foo(1)
```

More on Functions and Packages

- R revolves around **functions**
 - Commands that take input, performs computations, and returns results
- Functions are enclosed in **packages**
 - When you download R, it has a “base” set of functions/packages (**base R**)
 - You can install additional packages for your uses from [CRAN](#) or [GitHub](#)
 - These additional packages are written by RStudio or R users/developers (like us)
 - Think of them as “R Extensions”



Using Packages

- It helps to be somewhat familiar with base R - answers on Google commonly use it
- We will focus on newer and **more intuitive** ways to do things (tidyverse), not in base R
- RStudio (the company) makes a lot of great packages
- Not all packages available on CRAN or GitHub are trustworthy
- Who wrote it? **Hadley Wickham** is a major authority on R (Employee and Developer at RStudio)
- How to trust an R package: <http://simplystatistics.org/2015/11/06/how-i-decide-when-to-trust-an-r-package/>



(source: <https://twitter.com/hadleywickham>)

Let's take a look at R Studio
ourselves!

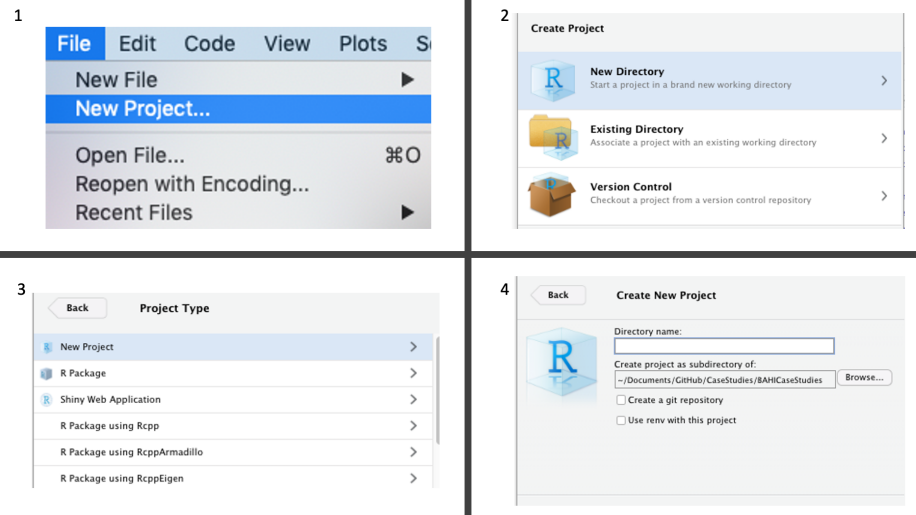
RStudio

Let's start by making an RStudio "Project".

1. Helps you organize your work.
2. Helps with working directories (discussed later).
3. Allows you to easily know which project you're on.

Go to File → New Project → New Directory → New Project

Call your Project "Intro_to_R"



R Markdown file

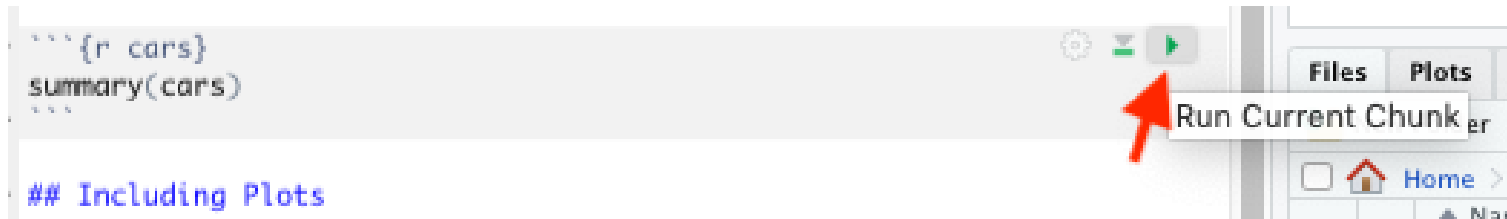
R Markdown files (.Rmd) help generate reports that include your code and output. Think of them as fancier scripts.

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

Code chunks

Within R Markdown files are code “chunks”

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

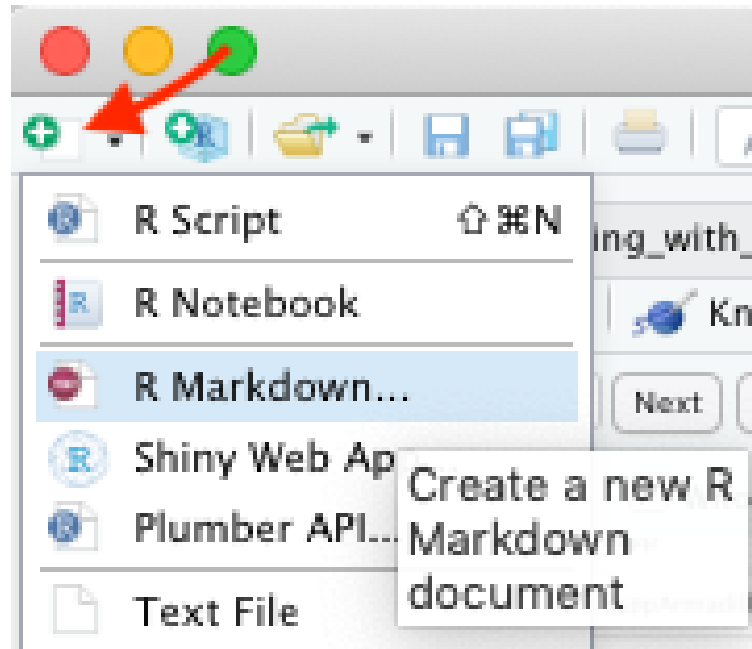


Knit

Create an R Markdown file

Go to File → New File → R Markdown

Call your file “first_markdown”



RStudio layout

The screenshot displays the RStudio interface with the following components:

- Code Editor:** Contains an R Markdown document with the following content:

```
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
```
- Environment Pane:** Shows "Global Environment" and "Environment is empty".
- Files Pane:** Shows a file explorer view of the directory `~/Documents/GitHub/Teaching/intro_to_r`. The file list includes:

Name	Size	Modified
..		
.gitignore	245 B	May 18, 2021, 10:00
.Rbuildignore	16 B	May 18, 2021, 10:00
.Rhistory	43 B	Jun 10, 2021, 10:00
.travis.yml	666 B	Jun 9, 2021, 12:00
all_functions.xlsx	13.4 KB	Jun 8, 2021, 3:00
all_the_functions.csv	57.3 KB	Jun 8, 2021, 3:00
all_the_packages.txt	211 B	May 18, 2021, 10:00
Arrays_Split		
Basic_R		
Best_Model_Coefficients.csv	587 B	May 18, 2021, 10:00
Best_Model_Coefficients.xlsx	3.8 KB	May 18, 2021, 10:00
bibliography.bib	599 B	May 18, 2021, 10:00
black_and_white_theme.pdf	45.1 KB	May 18, 2021, 10:00
bloembergen_small_horizont	25.4 KB	May 18, 2021, 10:00
- Console:** Shows the R startup message:

```
~/Documents/GitHub/Teaching/intro_to_r/
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.

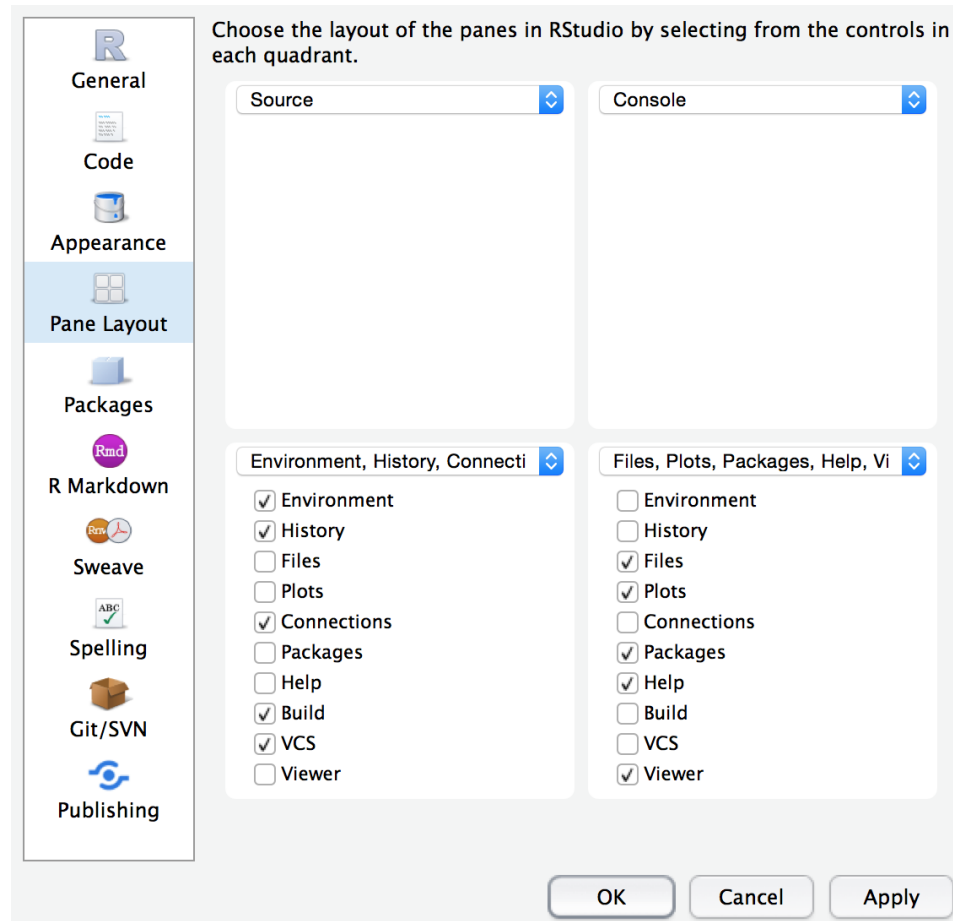
Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

> |
```

RStudio Layout

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

RStudio -> Preferences -> Pane Layout



Workspace/Environment

The screenshot displays the RStudio interface for a project named 'spant'. The main editor shows a blank R script file 'Untitled1'. The Environment pane, located in the top right, is circled in black and shows 'Global Environment' with the message 'Environment is empty'. The Files pane in the bottom right shows a directory listing for the 'spant' project. The Console in the bottom left shows 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
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.  
> |
```

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

Useful R Studio Shortcuts

- `Ctrl + Enter` (`Cmd + Enter` on OS X) 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

Viewing data

The `View` command allows you to view data in a spreadsheet format.

```
View(mtcars)
```

```
head(mtcars)
```

	mpg	cyl	disp	hp	drat	wt	qsec	vs	am	gear	carb
Mazda RX4	21.0	6	160	110	3.90	2.620	16.46	0	1	4	4
Mazda RX4 Wag	21.0	6	160	110	3.90	2.875	17.02	0	1	4	4
Datsun 710	22.8	4	108	93	3.85	2.320	18.61	1	1	4	1
Hornet 4 Drive	21.4	6	258	110	3.08	3.215	19.44	1	0	3	1
Hornet Sportabout	18.7	8	360	175	3.15	3.440	17.02	0	0	3	2
Valiant	18.1	6	225	105	2.76	3.460	20.22	1	0	3	1

```
tail(mtcars)
```

	mpg	cyl	disp	hp	drat	wt	qsec	vs	am	gear	carb
Porsche 914-2	26.0	4	120.3	91	4.43	2.140	16.7	0	1	5	2
Lotus Europa	30.4	4	95.1	113	3.77	1.513	16.9	1	1	5	2
Ford Pantera L	15.8	8	351.0	264	4.22	3.170	14.5	0	1	5	4
Ferrari Dino	19.7	6	145.0	175	3.62	2.770	15.5	0	1	5	6
Maserati Bora	15.0	8	301.0	335	3.54	3.570	14.6	0	1	5	8
Volvo 142E	21.4	4	121.0	109	4.11	2.780	18.6	1	1	4	2

Lab: Starting with R and RMarkdown

[Starting with R](#)

Website

Website