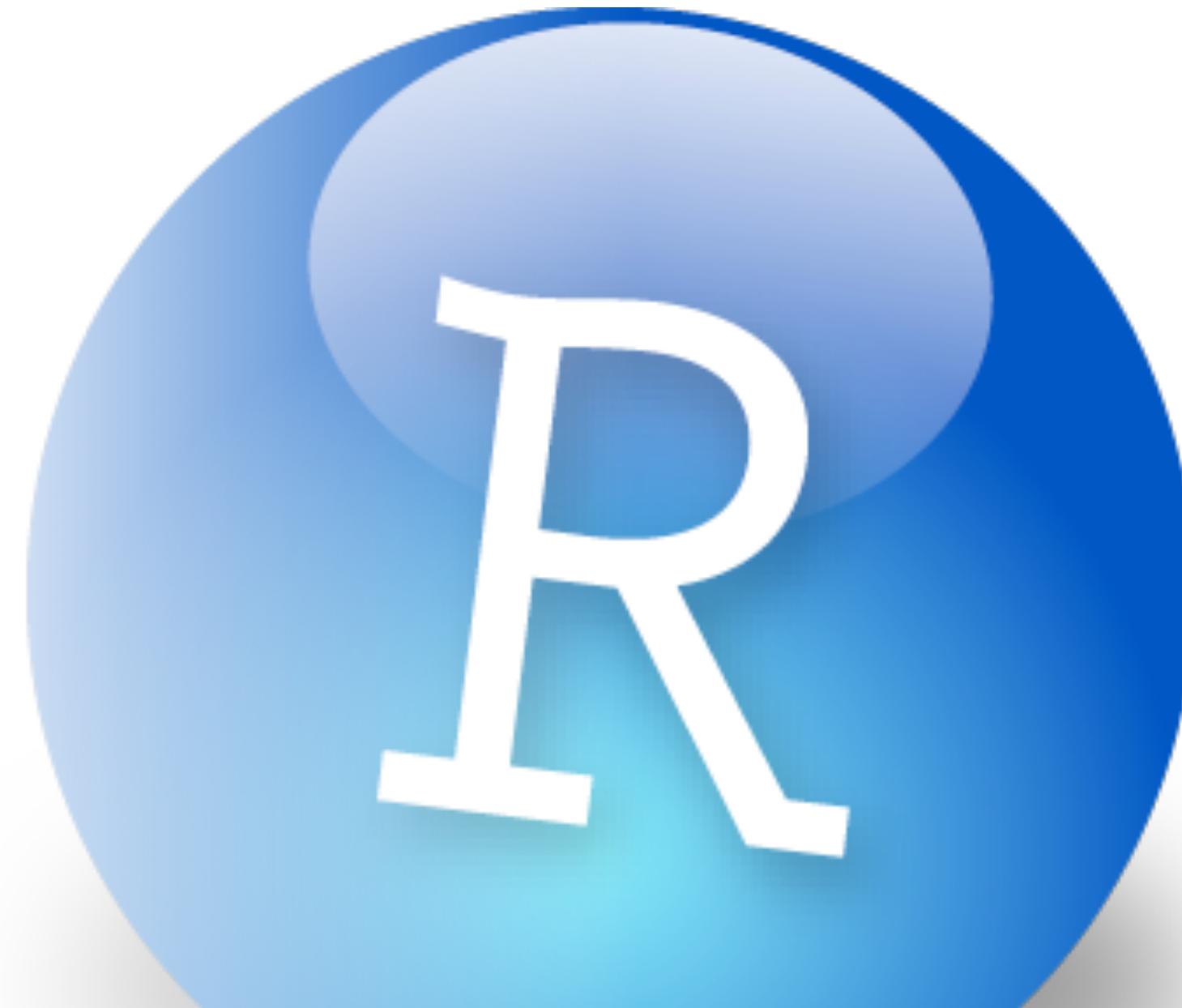


All Training materials are provided "as is" and without warranty and RStudio disclaims any and all express and implied warranties including without limitation the implied warranties of title, fitness for a particular purpose, merchantability and noninfringement.

# Introduction

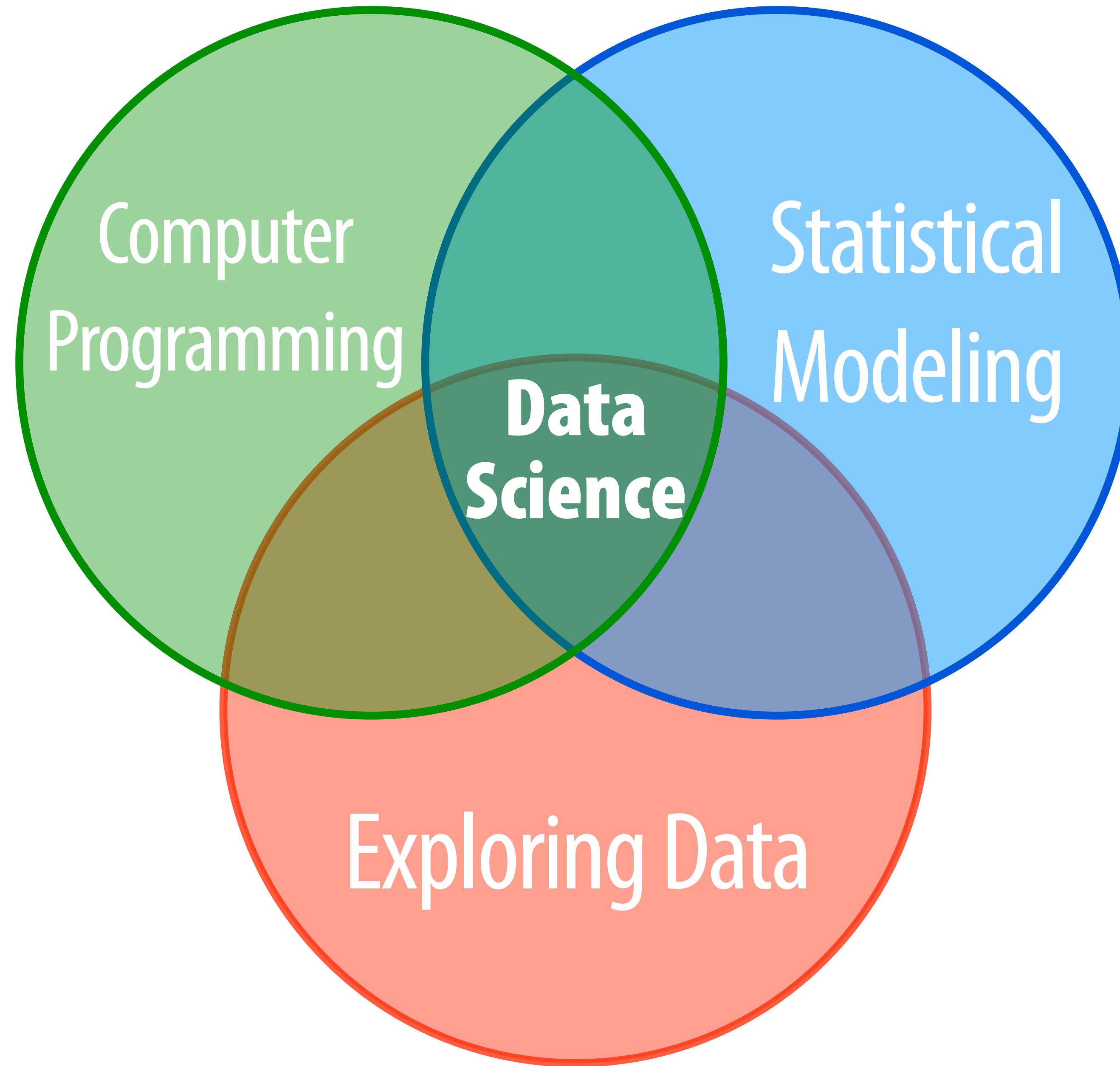
Learn to create and run  
programs in R



**Garrett Grolemund**

Master Instructor, RStudio

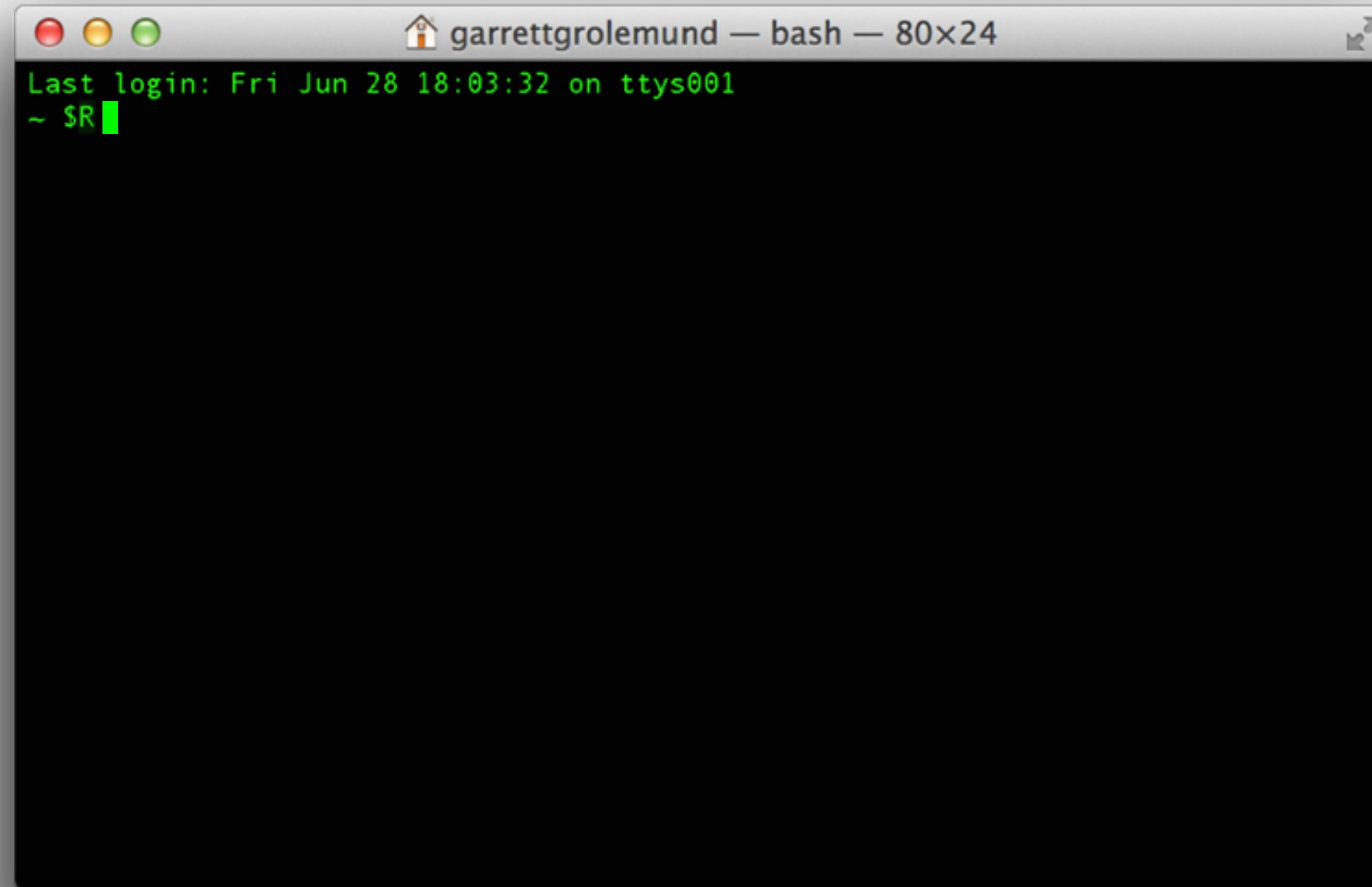
**August 2014**



R &  
RStudio

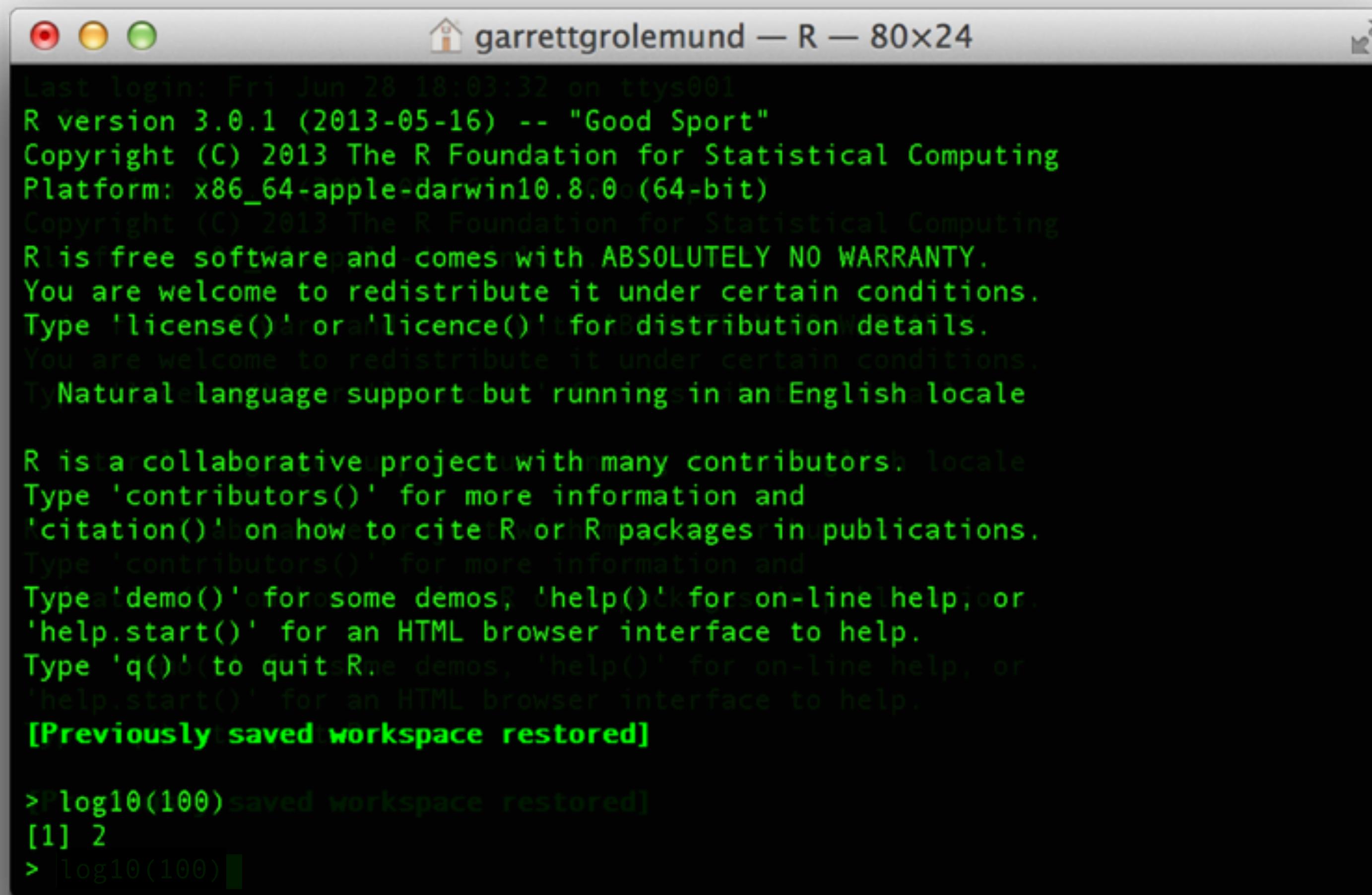


# R: a computer programming language



```
Last login: Fri Jun 28 18:03:32 on ttys001
~ $R
```

# R: a computer programming language



The screenshot shows the RStudio interface with the R console window open. The title bar reads "garrettgrolemund — R — 80x24". The console displays the standard R startup message, including the last login date, version information, copyright notice, and licensing details. It also mentions natural language support and the collaborative nature of the project. A message at the bottom indicates "[Previously saved workspace restored]". Below this, a command is entered: > log10(100), followed by its output: [1] 2.

```
Last login: Fri Jun 28 18:03:32 on ttys001
R version 3.0.1 (2013-05-16) -- "Good Sport"
Copyright (C) 2013 The R Foundation for Statistical Computing
Platform: x86_64-apple-darwin10.8.0 (64-bit)

R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.
You are welcome to redistribute it under certain conditions.
Type 'Natural language support but running in an English locale

R is a collaborative project with many contributors.  locale
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.
Type 'contributors()' for more information and
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 or 'demos()' for on-line help, or
'help.start()' for an HTML browser interface to help.
[Previously saved workspace restored]

> log10(100)
[1] 2
> log10(100)
```

# R: a computer programming language

1. Descends from S, Bell Laboratories
2. Evolved in university environment
3. Full scripting language
4. ...but can be used as a simple application

&gt; mpg

	manufacturer	model	displ	year	cyl	trans	drv	cty	hwy	fl	class
1	audi	a4	1.8	1999	4	auto(l5)	f	18	29	p	compact
2	audi	a4	1.8	1999	4	manual(m5)	f	21	29	p	compact
3	audi	a4	2.0	2008	4	manual(m6)	f	20	31	p	compact
4	audi	a4	2.0	2008	4	auto(av)	f	21	30	p	compact
5	audi	a4	2.8	1999	6	auto(l5)	f	16	26	p	compact
6	audi	a4	2.8	1999	6	manual(m5)	f	18	26	p	compact
7	audi	a4	3.1	2008	6	auto(av)	f	18	27	p	compact
8	audi	a4 quattro	1.8	1999	4	manual(m5)	4	18	26	p	compact
9	audi	a4 quattro	1.8	1999	4	auto(l5)	4	16	25	p	compact
10	audi	a4 quattro	2.0	2008	4	manual(m6)	4	20	28	p	compact
11	audi	a4 quattro	2.0	2008	4	auto(s6)	4	19	27	p	compact
12	audi	a4 quattro	2.8	1999	6	auto(l5)	4	15	25	p	compact
13	audi	a4 quattro	2.8	1999	6	manual(m5)	4	17	25	p	compact
14	audi	a4 quattro	3.1	2008	6	auto(s6)	4	17	25	p	compact
15	audi	a4 quattro	3.1	2008	6	auto(s6)	4	17	25	p	compact

```
> mean(mpg$hwy)
```

```
[1] 23.44017
```

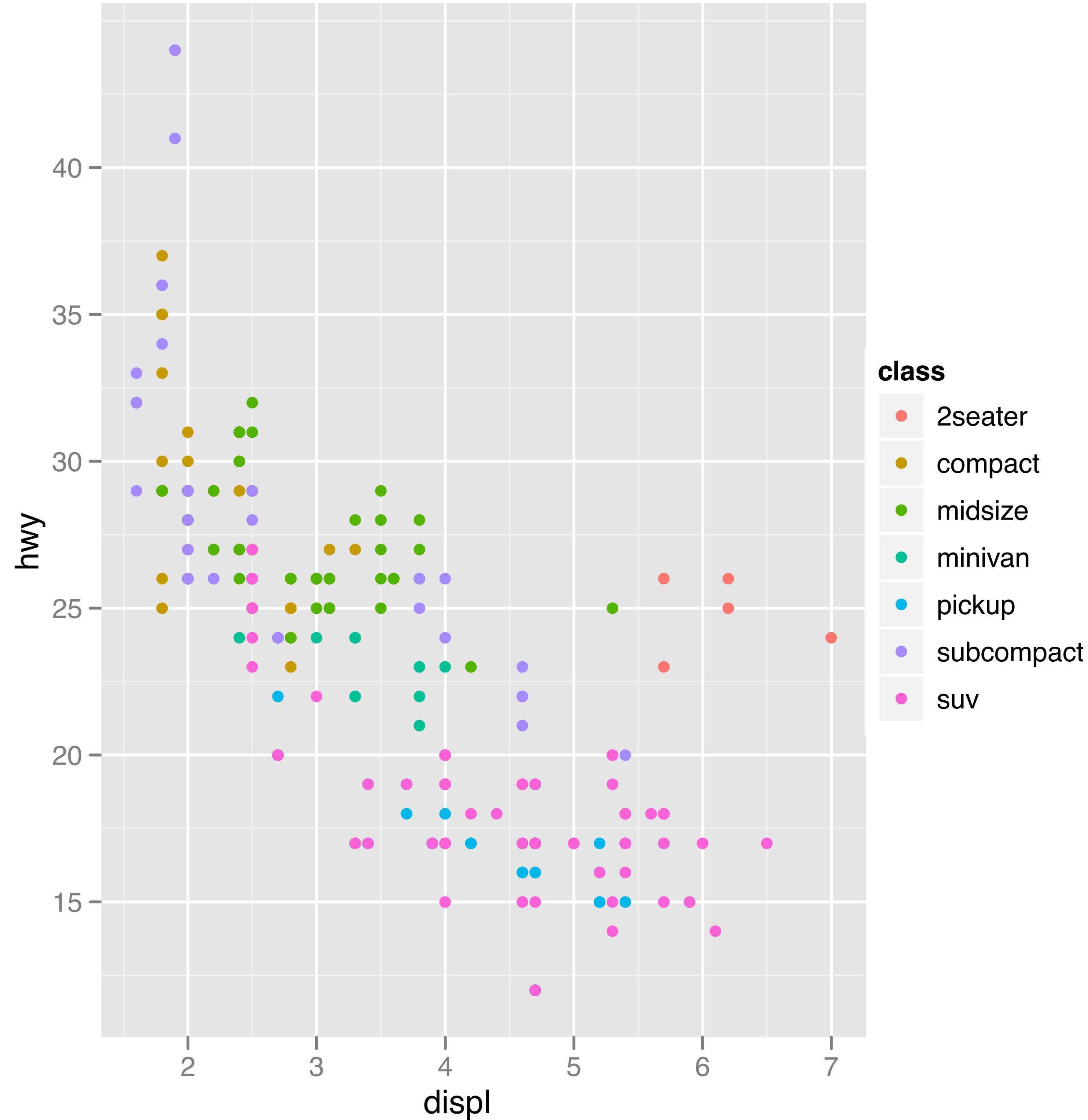
```
> summary(mpg$hwy)
```

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
12.00	18.00	24.00	23.44	27.00	44.00

```
> table(mpg$class)
```

2seater	compact	midsize	minivan	pickup	suv
5	47	41	11	33	62

```
> qplot(displ, hwy, data = mpg, color = class)
```



```
> lm(hwy ~ displ, data = mpg)
```

Call:

```
lm(formula = hwy ~ displ, data = mpg)
```

Residuals:

Min	1Q	Median	3Q	Max
-7.1039	-2.1646	-0.2242	2.0589	15.0105

Coefficients:

	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	35.6977	0.7204	49.55	<2e-16 ***
displ	-3.5306	0.1945	-18.15	<2e-16 ***

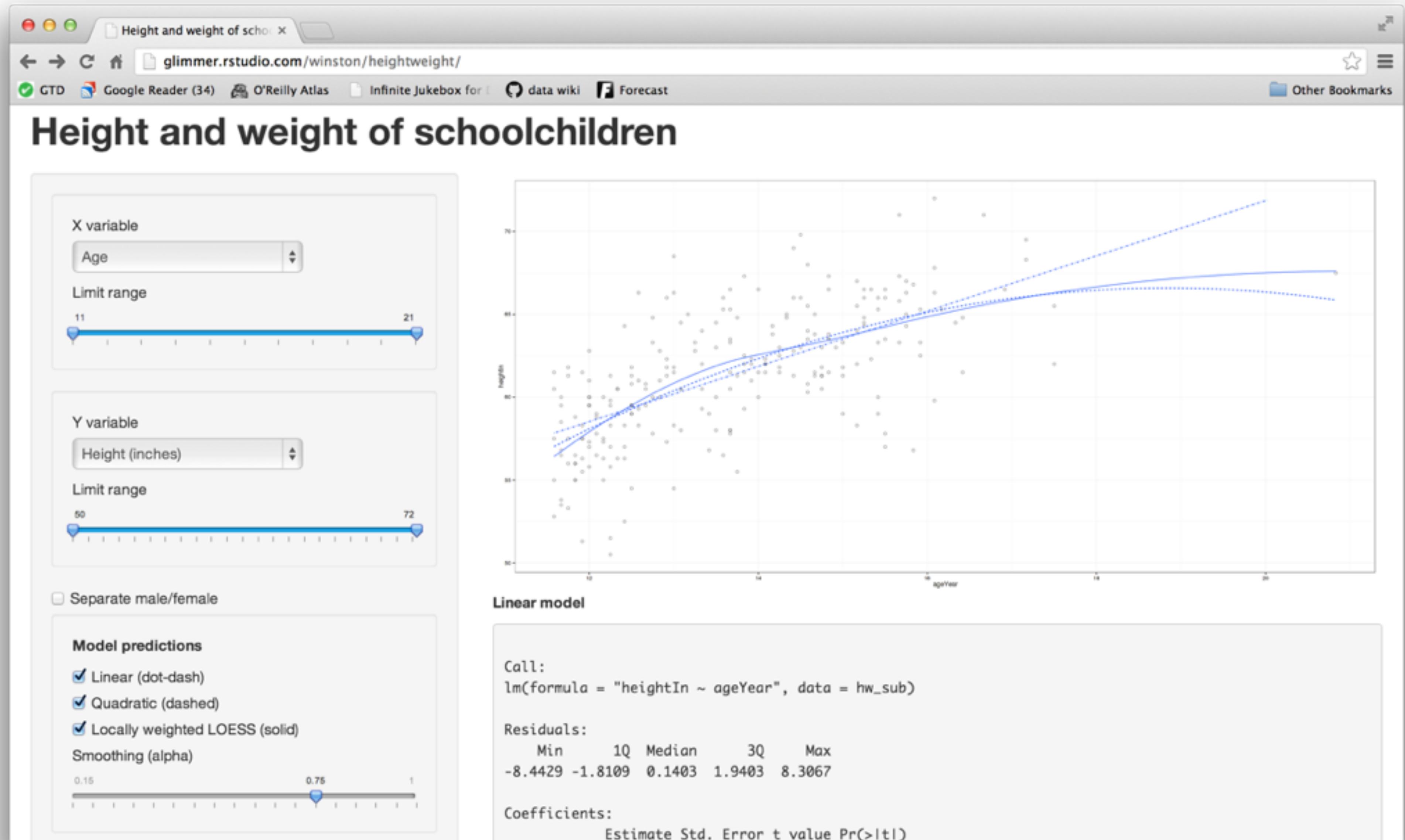
---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

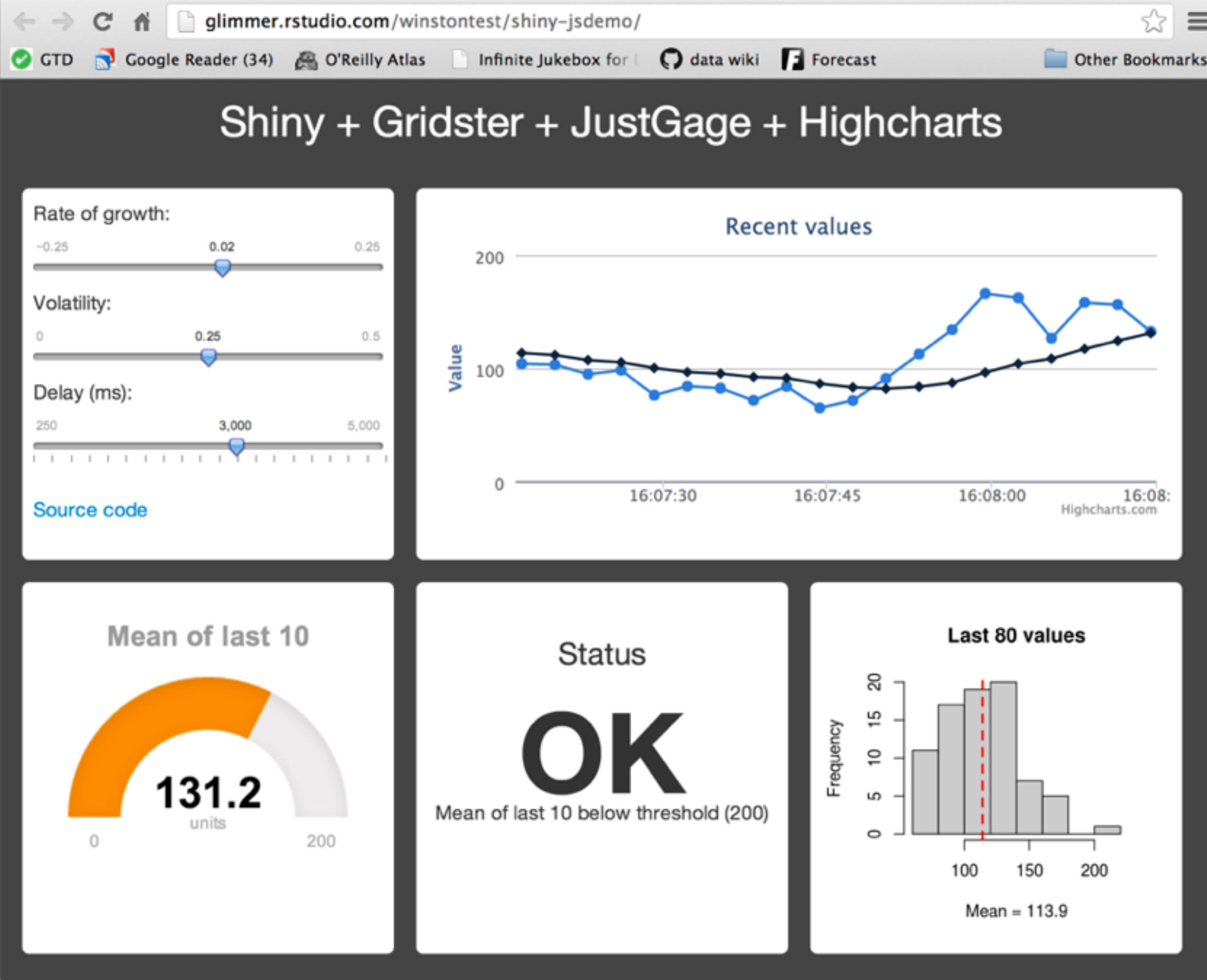
Residual standard error: 3.836 on 232 degrees of freedom

Multiple R-squared: 0.5868, Adjusted R-squared: 0.585

F-statistic: 329.5 on 1 and 232 DF, p-value: < 2.2e-16

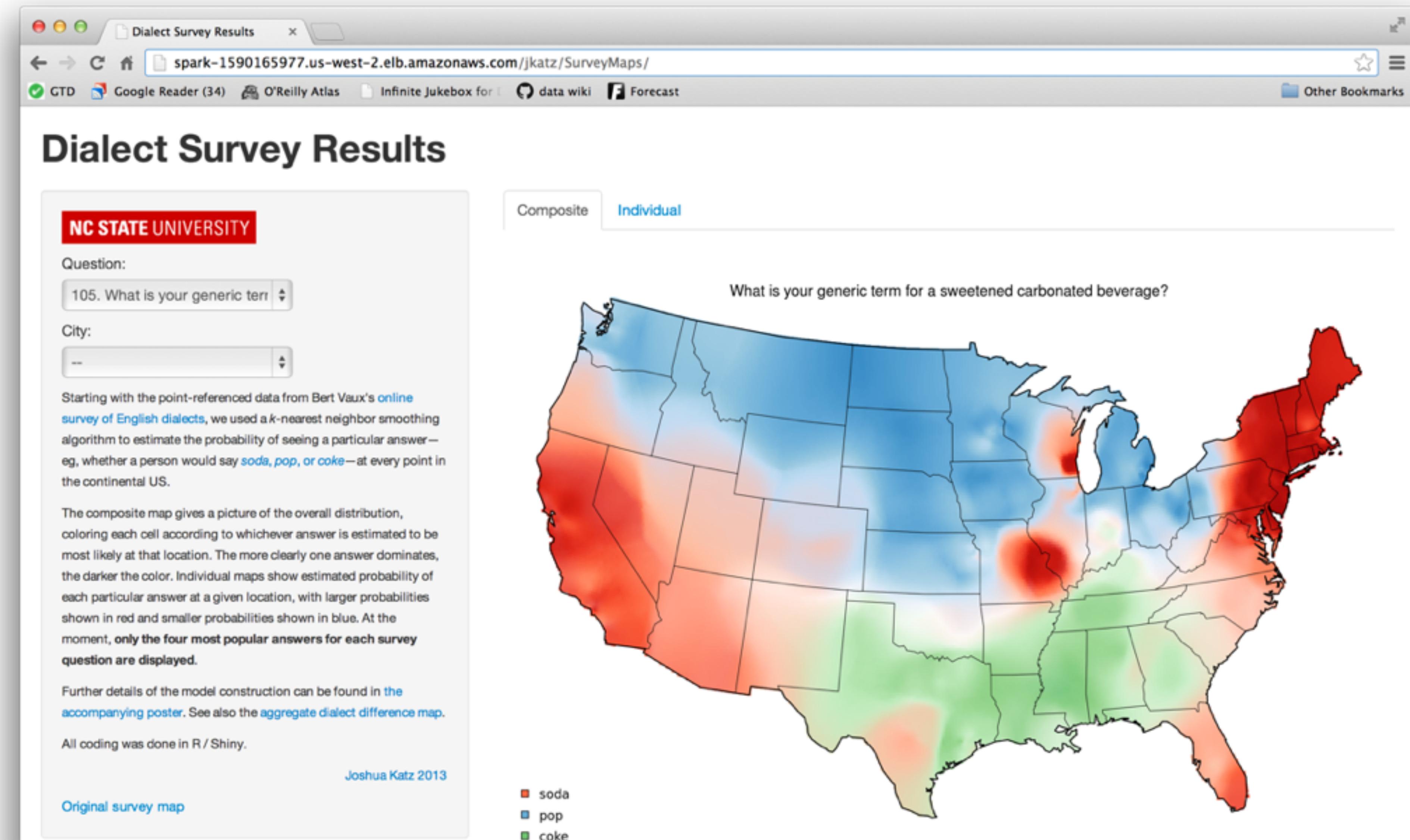


<http://glimmer.rstudio.com/winston/heightweight/>

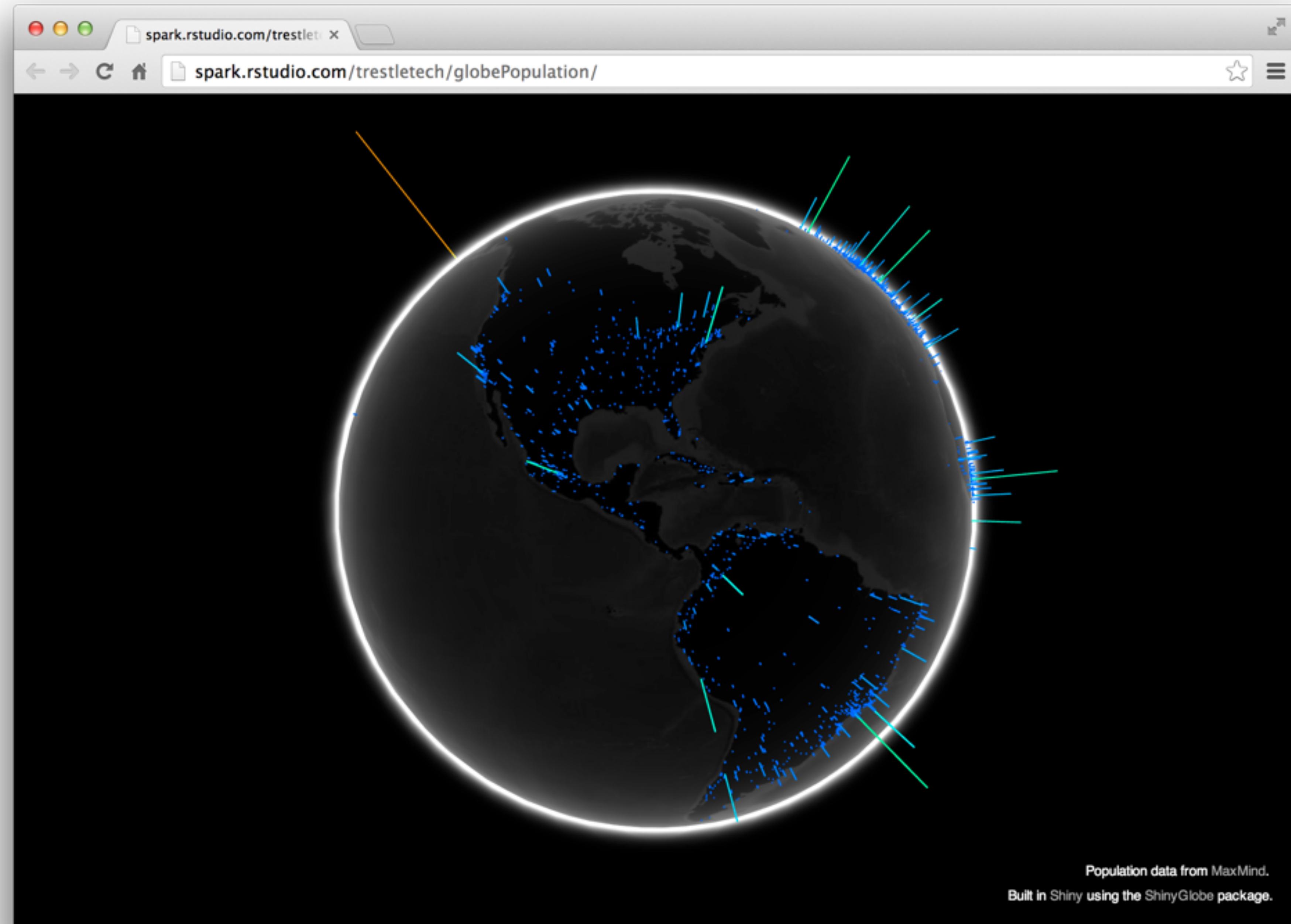


<http://glimmer.rstudio.com/winstontest/shiny-jsdemo/>

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<http://spark-1590165977.us-west-2.elb.amazonaws.com/jkatz/SurveyMaps/>



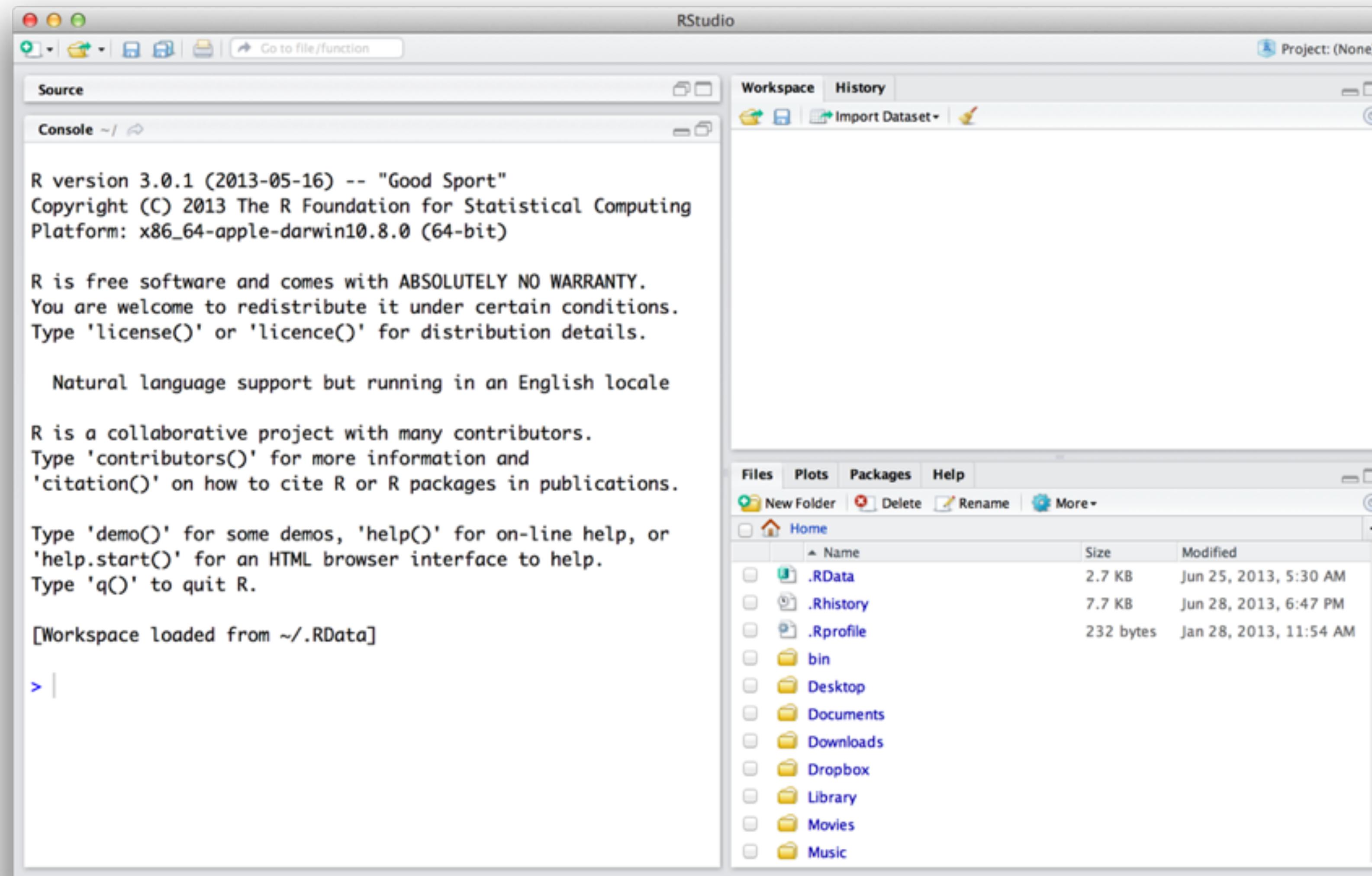
<http://spark.rstudio.com/trestletech/globePopulation/>



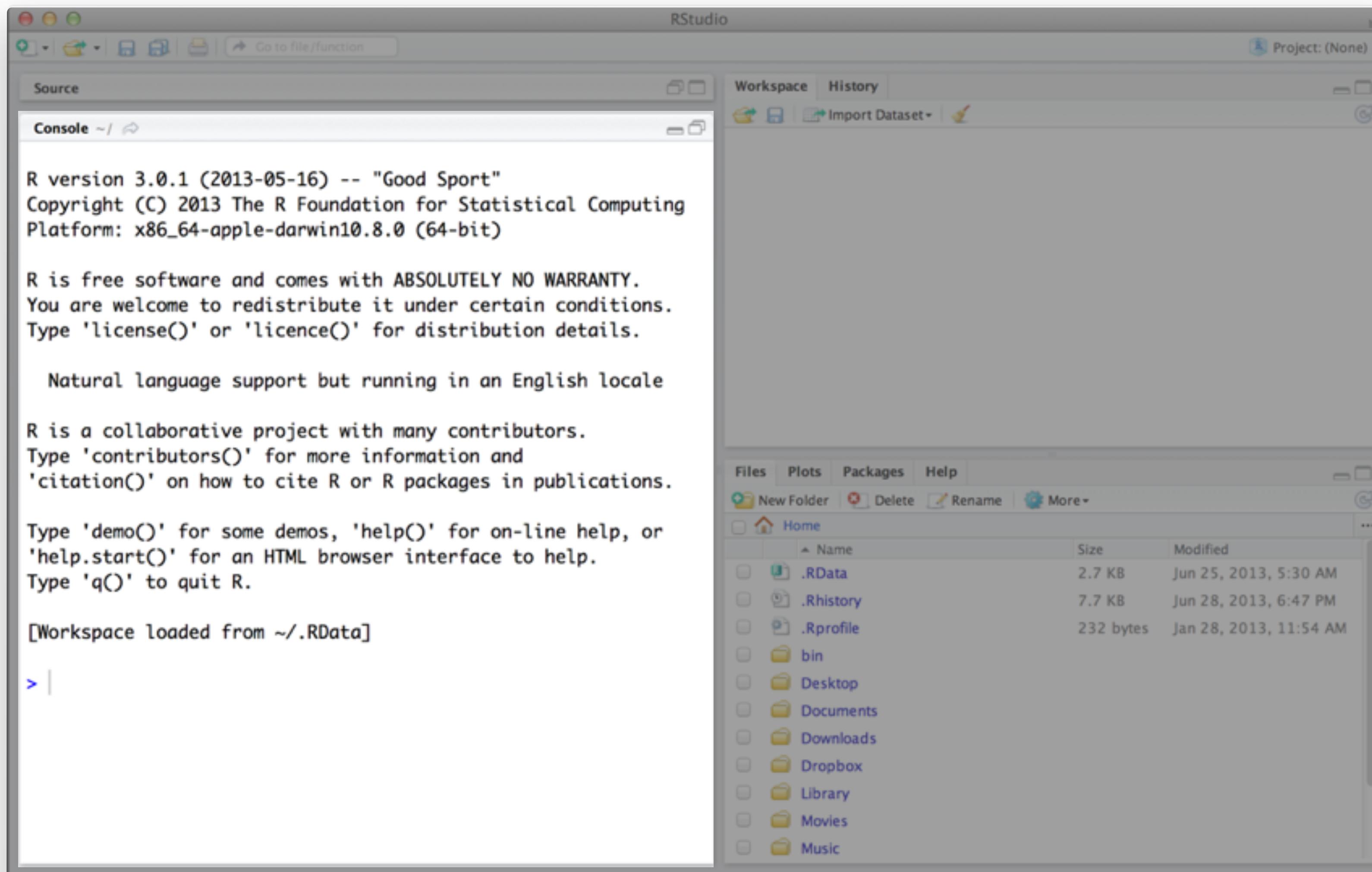
# RStudio: a software program

1. like Microsoft Word, Excel, etc.
2. built to help you write R code, run R code, and analyze data with R
3. text editor, version control, latex integration, keyboard shortcuts, debugging tools, and much more

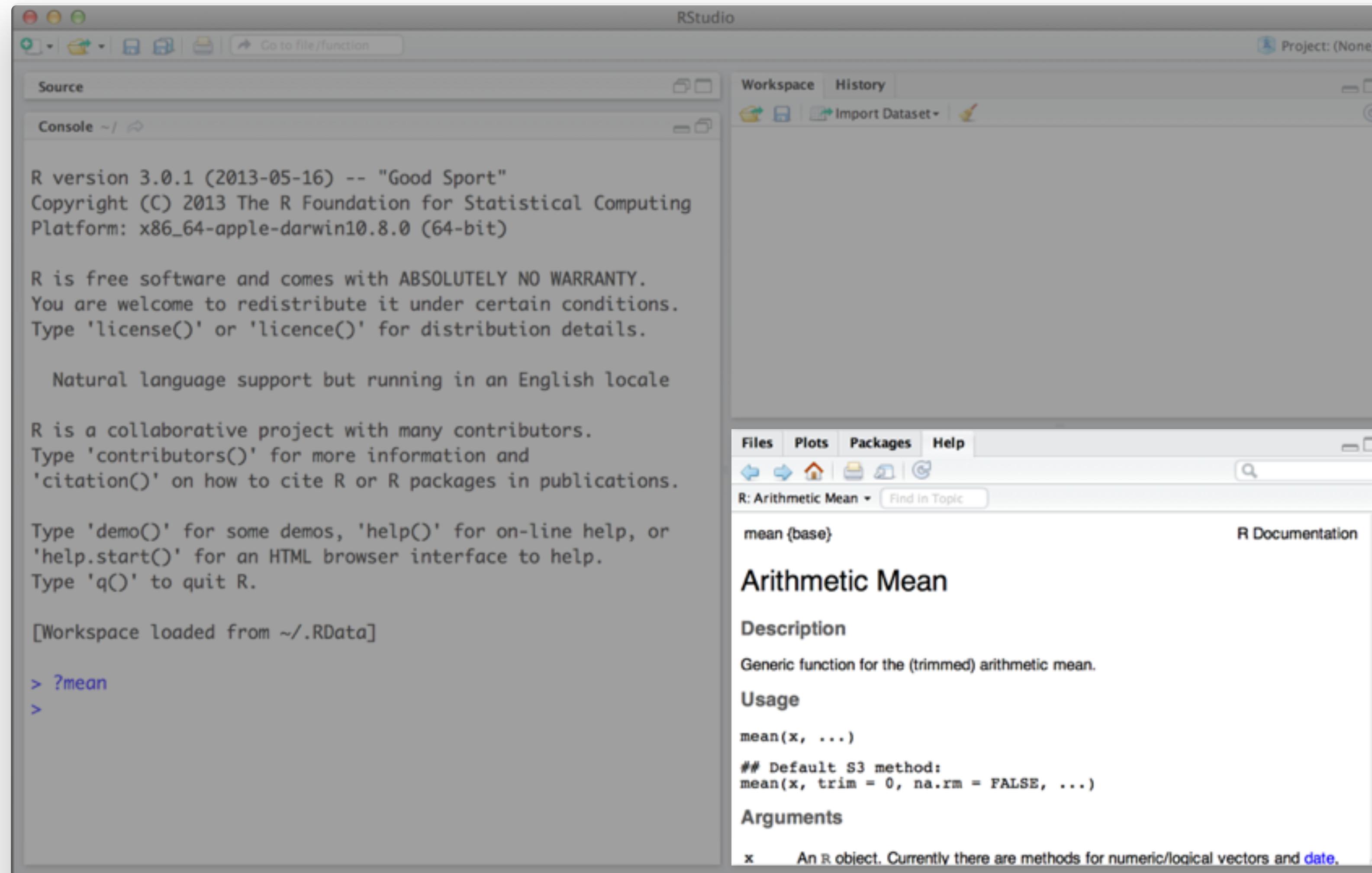
# RStudio: a software program



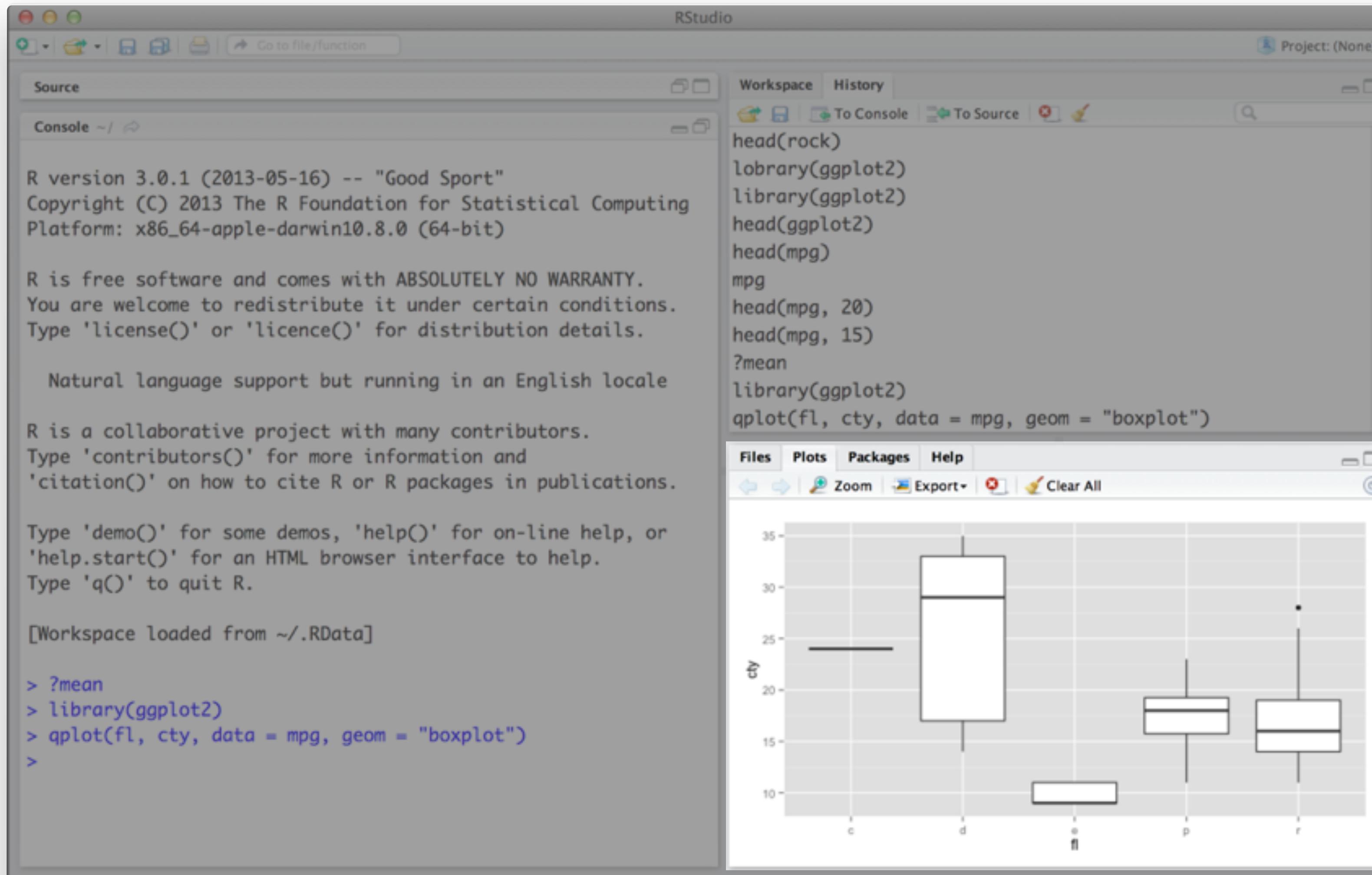
# RStudio: a software program



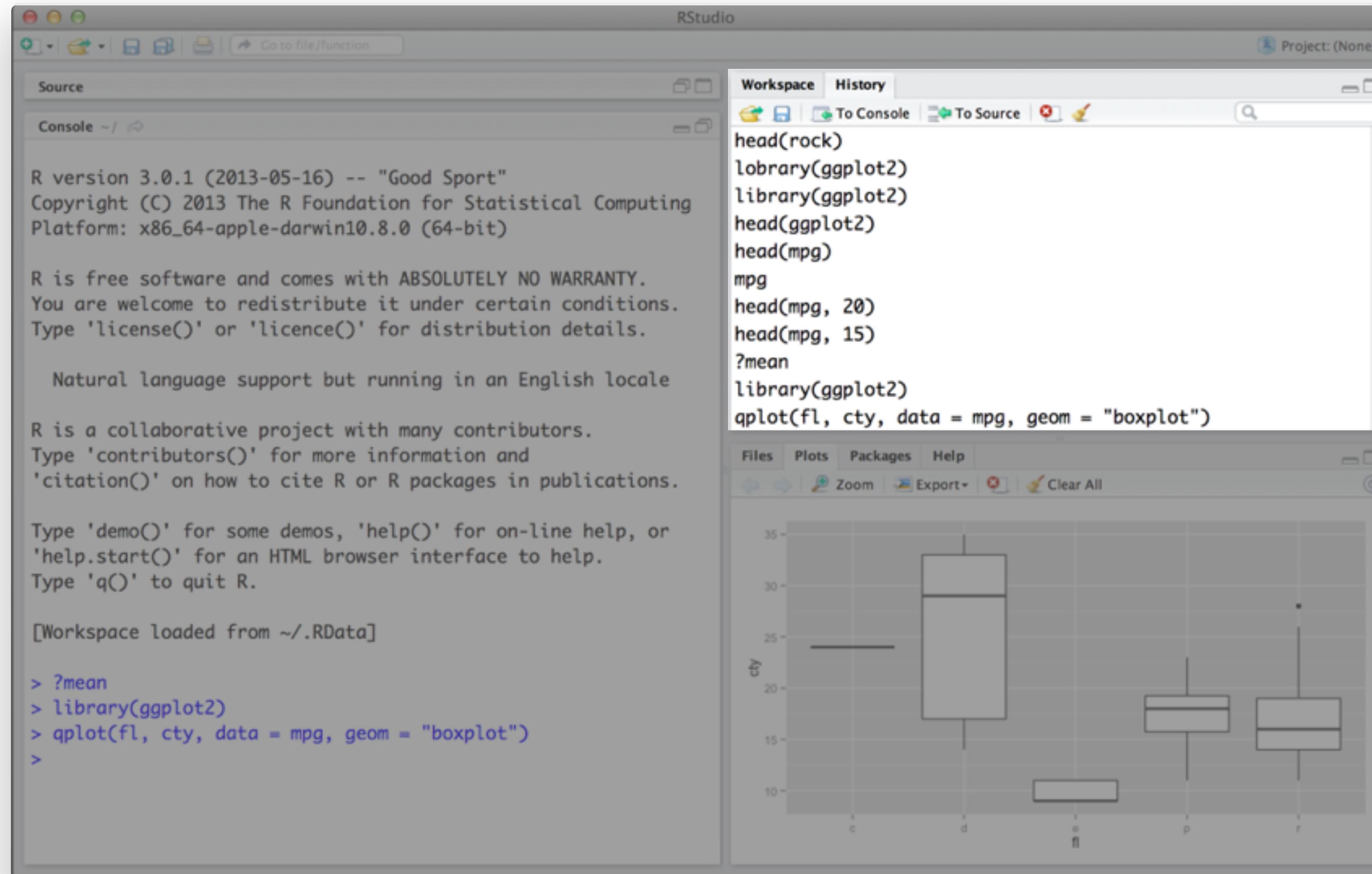
# RStudio: a software program



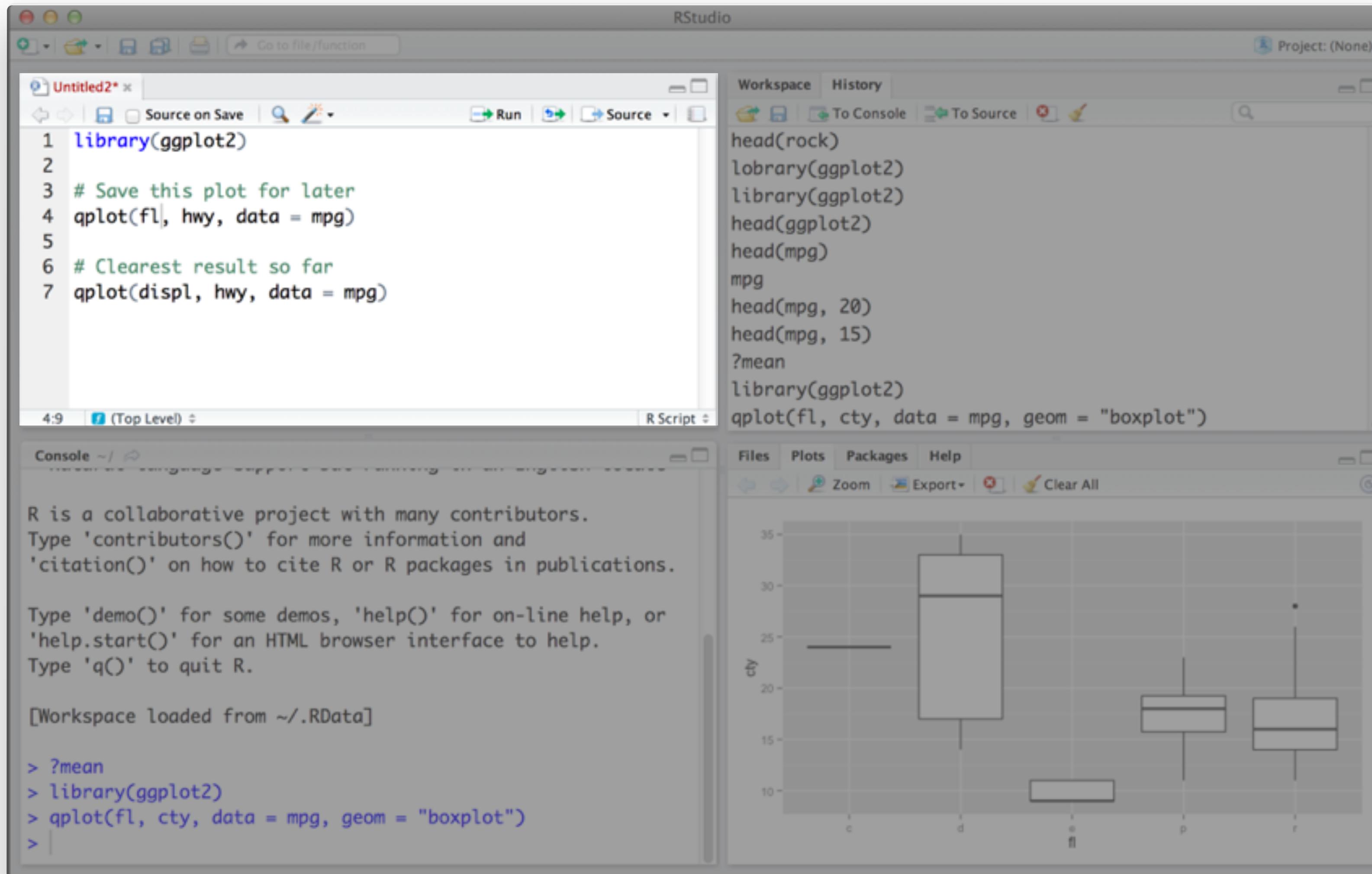
# RStudio: a software program



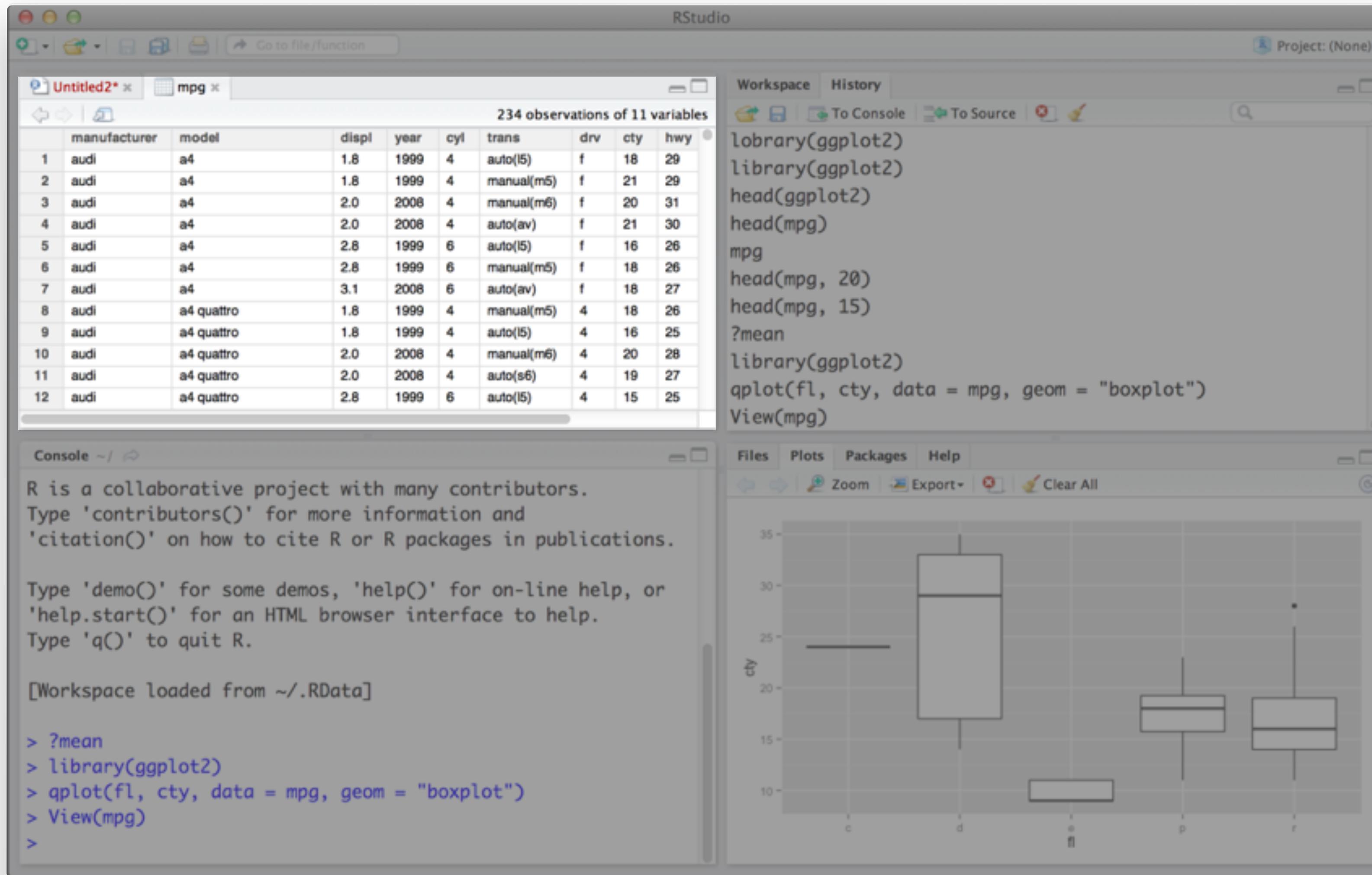
# RStudio: a software program



# RStudio: a software program



# RStudio: a software program



# Tips

Ask yourself questions.

Work with frustration.

Practice!

And practice consciously: make a prediction, then test it, then reflect.

# warm ups

# Your turn

Which of these are numbers? Which are words? How can you tell?

1

"1"

"one"

# Your turn

How many dimensions does a vector have?

- 1
- 2
- 3
- 4
- 5
- 6

# Your turn

How many dimensions does a vector have?



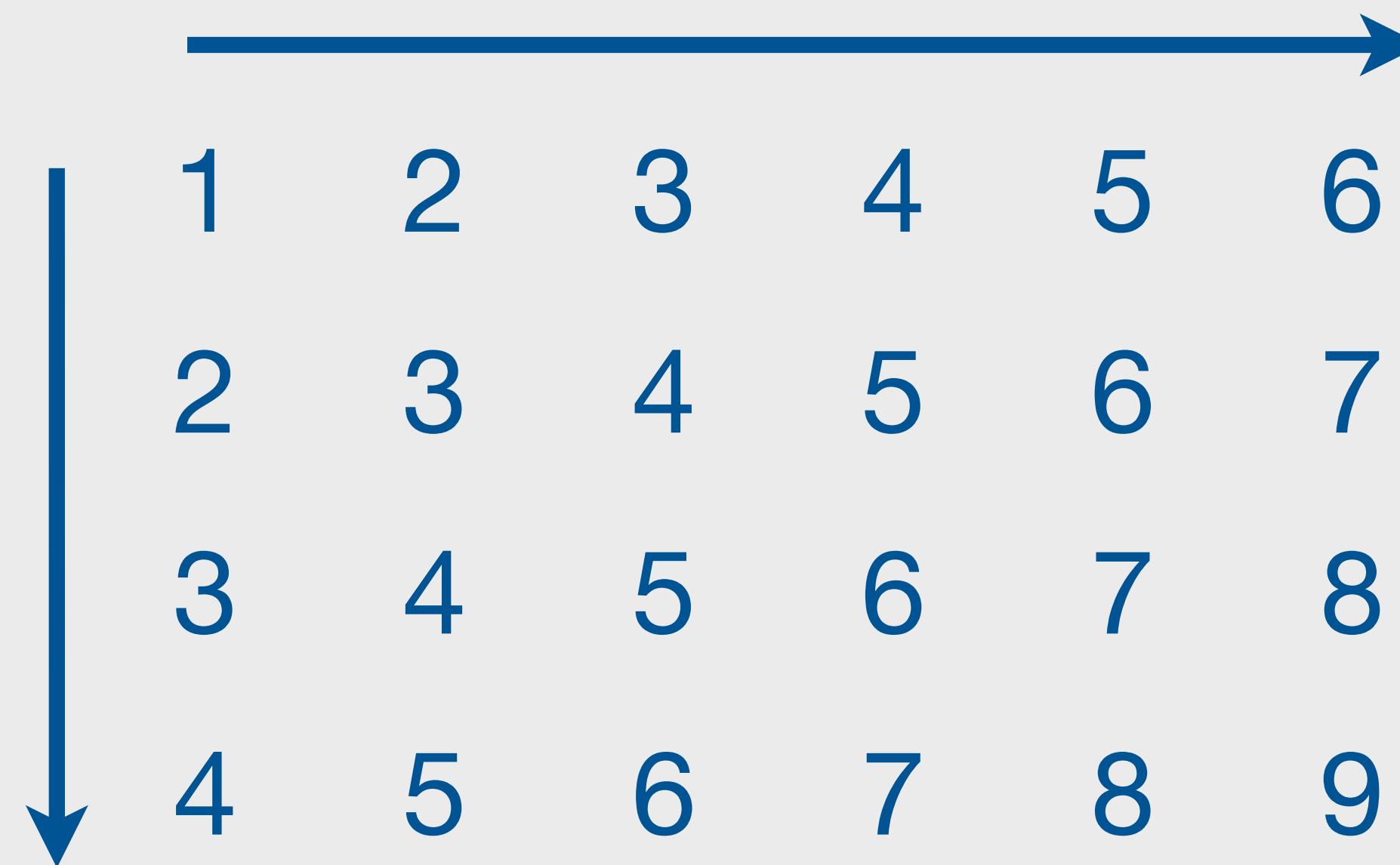
# Your turn

How many dimensions does a matrix have?

1	2	3	4	5	6
2	3	4	5	6	7
3	4	5	6	7	8
4	5	6	7	8	9

# Your turn

How many dimensions does a matrix have?



1	2	3	4	5	6
2	3	4	5	6	7
3	4	5	6	7	8
4	5	6	7	8	9

# Your turn

The matrix below is named **M**. What is the value of **M<sub>34</sub>**?

0	1	2	3	4	5
6	7	8	9	10	11
12	13	14	15	16	17
18	19	20	21	22	23

# Your turn

The matrix below is named **M**. What is the value of **M<sub>34</sub>**?

	0	1	2	3	4	5
6	7	8	9	10	11	
12	13	14	15	16	17	
18	19	20	21	22	23	



# Your turn

The matrix below is named **M**. What is the value of **M<sub>34</sub>**?

	0	1	2	3	4	5
	6	7	8	9	10	11
↓	12	13	14	15	16	17
	18	19	20	21	22	23

# Your turn

The matrix below is named **M**. What is the value of **M<sub>34</sub>**?

0	1	2	3	4	5
6	7	8	9	10	11
12	13	14	15	16	17
18	19	20	21	22	23