Introduction to R

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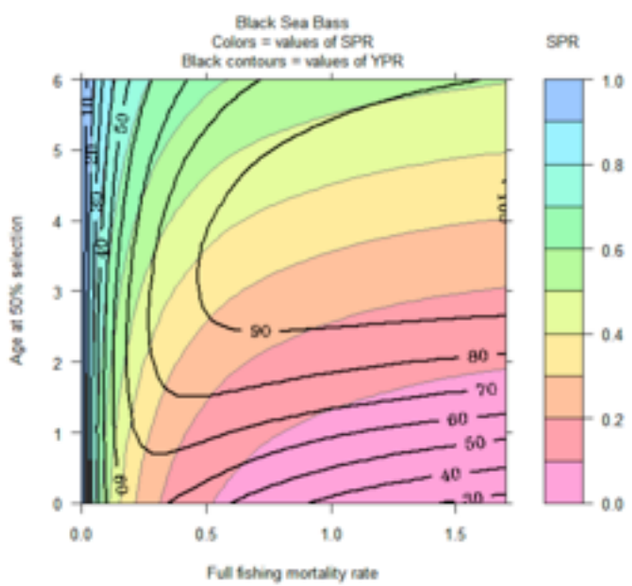
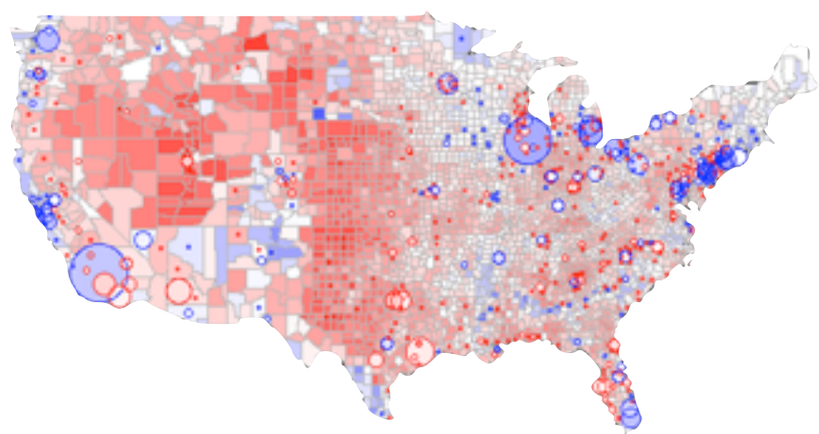




What is R?

"*A free programming language and software environment for statistical computing and graphics*"

- Manipulate data
- Statistical analysis
- Mathematical modeling, simulation
- Plot figures, animations
- Write scripts and functions for own analysis

Installing R and R-studio

Go to: http://mirrors.dotsrc.org/cran/

MS Windows - select "*base*" and "*Download R 3.0.1 for Windows*". This downloads the installer "*R-3.0.1-win.exe*". Run this to install the program.

Apple OSX 10.6 and later - Download the installer package "R-3.0.1.pkg" and double click it to install the program.

Installing R and R-studio

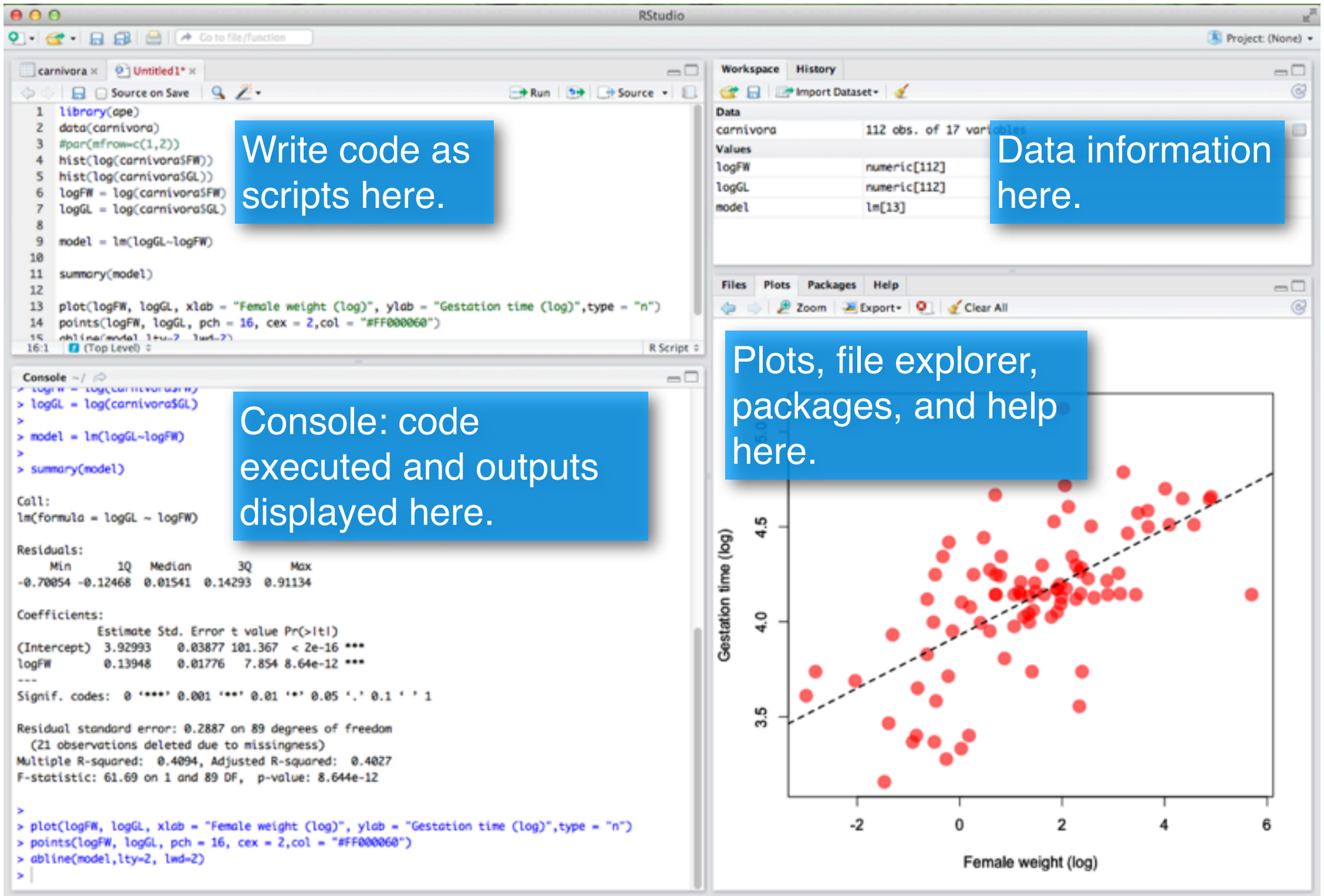
Go to: http://www.rstudio.com/ide/download

Click on: 

Click to download the recommended version.

Follow the instructions!

R Studio


RStudio
Write code as scripts here.
Data information here.
Plots, file explorer, packages, and help here.
Console: code executed and outputs displayed here.
Gestation time (log)
Female weight (log)

R Studio

- Data entry in Excel
- Explore data in R to find errors

- Do analysis and exploration in R, not Excel
- Be lazy and use scripts (don’t just type everything into the console!)
- Scripts: programs allowing you to repeat, edit, correct your work

The R language

Object oriented programming language

- Objects - numbers, variables
- Functions - manipulations of objects

The R language

Basic operations

- Arithmetic (`+, -, *, /, ^, sqrt`)
- Matrix maths (`t, *, %*%`)
- Assignment (`=, <-`)

Getting help (e.g. for the "`lm`" function).

- `?lm`, `??lm`
- `help("lm")`, `help.search("lm")`

“Objects” in R

- Vectors and elements
- Data frames
- Lists
- Matrices

```
> x <- c(9, 23, 2, 8, 5, 3)
> x
[1]  9 23  2  8  5  3
> x[2]
[1] 23
> x[2]-x[6]
[1] 20
> sum(x[c(2,4,6)])
[1] 34
```

“Objects” in R

- Vectors and elements
- Data frames
- Lists
- Matrices

```
> Fruit
        Name Colour Quantity
1     banana yellow        5
2       kiwi  green        8
3 strawberry    red       20
> Fruit$Price = c(10,12,17)
> Fruit
        Name Colour Quantity Price
1     banana yellow        5    10
2       kiwi  green        8    12
3 strawberry    red       20    17
> Fruit$Colour
[1] yellow green  red
Levels: green red yellow
```

“Objects” in R

- Vectors and elements
- Data frames
- Lists
- Matrices

```
> n = c(2, 3, 5)
> s = c("aa", "bb", "cc", "dd", "ee")
> b = c(TRUE, FALSE, TRUE, FALSE, FALSE)
> x = list(n, s, b, 3)
> x
[[1]]
[1] 2 3 5

[[2]]
[1] "aa" "bb" "cc" "dd" "ee"

[[3]]
[1]  TRUE FALSE  TRUE FALSE FALSE

[[4]]
[1] 3

> x[[2]]
[1] "aa" "bb" "cc" "dd" "ee"
> x[[2]][3]
[1] "cc"
```

“Objects” in R

- Vectors and elements
- Data frames
- Lists
- Matrices

```
> A = matrix(c(5, 9, 10, 2, 5, 7), nrow=3, ncol=2)
> A
     [,1] [,2]
[1,]    5    2
[2,]    9    5
[3,]   10    7
> t(A)
     [,1] [,2] [,3]
[1,]    5    9   10
[2,]    2    5    7
> A * c(1,2,3)
     [,1] [,2]
[1,]    5    2
[2,]   18   10
[3,]   30   21
>
> A[1,]
[1] 5 2
> A[,2]
[1] 2 5 7
> A[1,1]
[1] 5
```

“Classes” in R

- “**Class**” defines the type of object and can influence what functions do.
- Common classes

  `data.frame`
  `list`
  `matrix`
  `integer`
  `numeric`
  `factor`
  `character`

Model objects: `lm`, `glm`, `aov` etc.

Importing data from Excel

- Create a folder/directory for analysis and set it to be R's working directory

```
setwd("PATH")
```

- Save Excel file out as a *.csv file
- Import using the `read.csv` function

```
A <- read.csv("PATH", header = TRUE)
```

Manipulating dataframes

- Subsetting data using logical operators (==, <, >, <=, >=)

- By row/column

```
x[1:5, ], x[ ,6:10]
```

- `subset` function

```
> Fruit
        Name Colour Quantity Price
1     banana yellow        5    10
2       kiwi  green        8    12
3 strawberry    red       20    17
>
> subset(Fruit,Price<15)
    Name Colour Quantity Price
1 banana yellow        5    10
2   kiwi  green        8    12
```

Export data from R

- Export using the `write.csv` function

```
write.csv(myData, file = "myData.csv", header
= TRUE, row.names = FALSE)
```

- This file can be opened in Excel

- Save the entire workspace

```
save.image("myWorkspace.RData")
```

- Save the parts of the workspace

```
save(A,B,C,'myWorkspace.RData")
```

Objects you want to save

Graphics in R