*Genowis*

*2019-09-24*

# Contents

# Chapter 1

R github Stack Overflow

- R
-

1.
2.
3. R

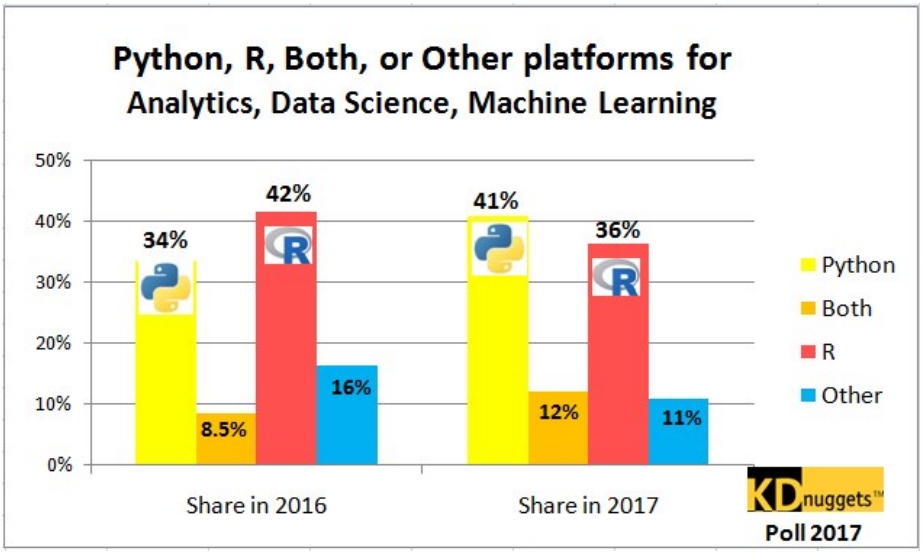
# Chapter 2

# R

## 2.1

R is a language and environment for statistical computing and graphics. It is a GNU project which is similar to the S language and environment which was developed at Bell Laboratories (formerly AT&T, now Lucent Technologies) by John Chambers and colleagues.

- 1980 S
-

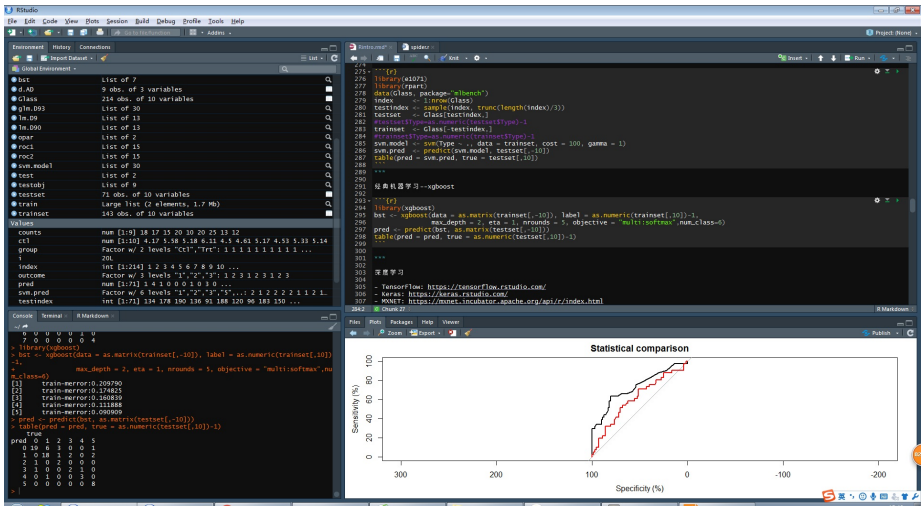


- 
- 
- 
- 
- 
- 

- 
- 
- 

## 2.2

- Rstudio




- Jupyter

```
conda install -c r r-essentials
```


## 2.3

- 
- 
- 
- 
- 

```
- character: "a", "1", "apple", "@"

- numeric: 1, 3.14, 100, 2e10

- integer: 1, 2, 500

- factor:    1     2

- logical: TRUE, FALSE

- date: 2018-01-19, 19/1/2018
```

## 2.4

- 
- 
- 
- 
- 

- vector: c(1,2,3) c("a","b","c"), 1:10

- list: list(1,2,3) list(a="A",b="B",c="C",d=1)

- / matrix/array: matrix(c(1,2,3,4),ncol=2)

- data.frame: data.frame(ID=c(1,2,3),  =c("A","B","A"))

## 2.5

- for

```
for ( i in 1:20) {

  if (i %% 2==0){
    print(paste(i,"  ",sep=""))
  }
  else {
    next
  }
}
```

```
## [1] "2  "
## [1] "4  "
## [1] "6  "
## [1] "8  "
## [1] "10  "
## [1] "12  "
## [1] "14  "
## [1] "16  "
## [1] "18  "
## [1] "20  "
```

- if... else
- while...
- repeat
- break
- next

## 2.6

- mean(), get_IHC()

- : body( )

- get_IHC(x, y) x y IHC

## 2.7

```
 =function( ){

}
```

```
func=function(x,y){
  return(x/(y+1))
}

func(1,1)
```

```
## [1] 0.5
```

## 2.8

## 2.9 base

### 2.9.1

- + * /

```
1:10+2
```

```
##  [1]  3  4  5  6  7  8  9 10 11 12
```

```
9/(1:3)-0.5
```

```
## [1] 8.5 4.0 2.5
```

### 2.9.2

- mean() max() min() quantile() sum() summary()

```
summary(rnorm(100))
```

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -2.847280 -0.586939  0.006539  0.098599  0.883060  4.062509
```

### 2.9.3

- &, |, !

```
!(2>1 | 2>3)
```

```
## [1] FALSE
```

### 2.9.4

- paste(), grep() grepl(), strsplit() strsub()

```
tmp=paste(c(1:10),"163.com",sep="@")
unlist(strsplit(tmp,split="@"))[seq(1,20,2)]
```

```
##  [1] "1"  "2"  "3"  "4"  "5"  "6"  "7"  "8"  "9"  "10"
```

### 2.9.5

- subset(), merge(), dim(), names()

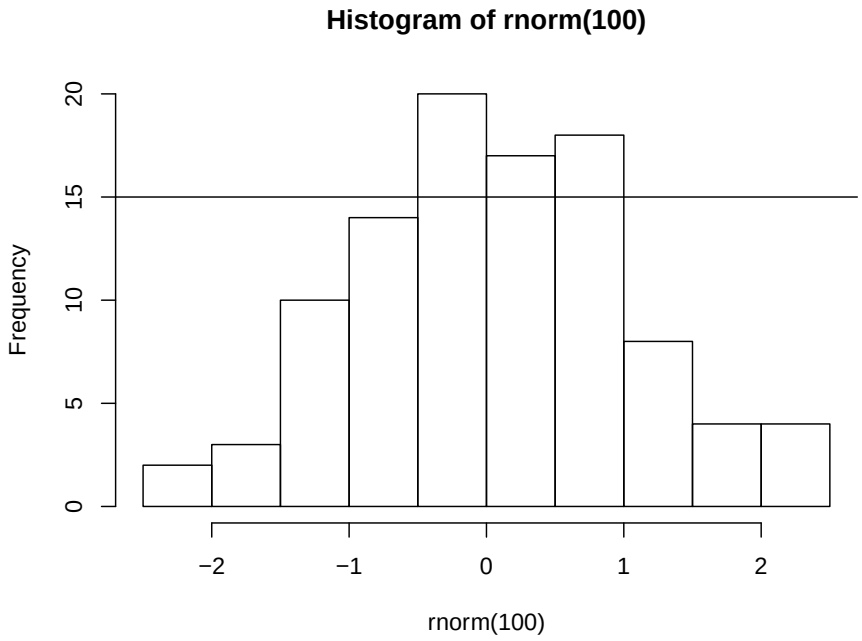
```
df=data.frame(x=1:10,y=rep("a",10),stringsAsFactors = F)
dim(subset(df,x>5))
```

```
## [1] 5 2
```

### 2.9.6

- plot() adline() hist()

```
hist(rnorm(100))
abline(a=15,b=0)
```



# Chapter 3

## 3.1

## 3.2 json

## 3.3 html

Here is a review of existing methods.

# Chapter 4

## 4.1

### 4.1.1

### 4.1.2

### 4.1.3

## 4.2

### 4.2.1

### 4.2.2 $\chi^2$

## 4.3

### 4.3.1 P

### 4.3.2

## 4.4

## 4.5

# Chapter 5

## 5.1

### 5.1.1

### 5.1.2 /

### 5.1.3 json

### 5.1.4 xml

## 5.2

### 5.2.1 data.table

### 5.2.2 plyr/dplyr

### 5.2.3 magrittr

# Chapter 6

## 6.1

## 6.2

### 6.2.1 ggplot2

### 6.2.2 plotly

### 6.2.3 echats4r

# Chapter 7

## 7.1 markdown

[TOC]

### 7.1.1

#### 7.1.1.1

#### 7.1.1.1.1

### 7.1.2

### 7.1.3

- 
- 
- 

1. 
2. 
3. 3.1 3.2
4. 

☐
☒

### 7.1.4

$1 + 2 + \cdots + 100$

$$1 + 2 + \cdots + 100$$

### 7.1.5

==sd==

== == ——, , .
1

### 7.1.6

| | |
|---|---|
| $1600 | 5 |
| $12 | 12 |
| $1 | 234 |

### 7.1.7

```
graph LR
A[Hard edge] -->B(Round edge)
    B --> C{Decision}
    C -->|One| D[Result one]
    C -->|Two| E[Result two]
```

### 7.1.8

[1] sdfedf

```
@requires_authorization
class SomeClass:
    pass

if __name__ == '__main__':
    # A comment
    print 'hello world'
```

#### 7.1.9

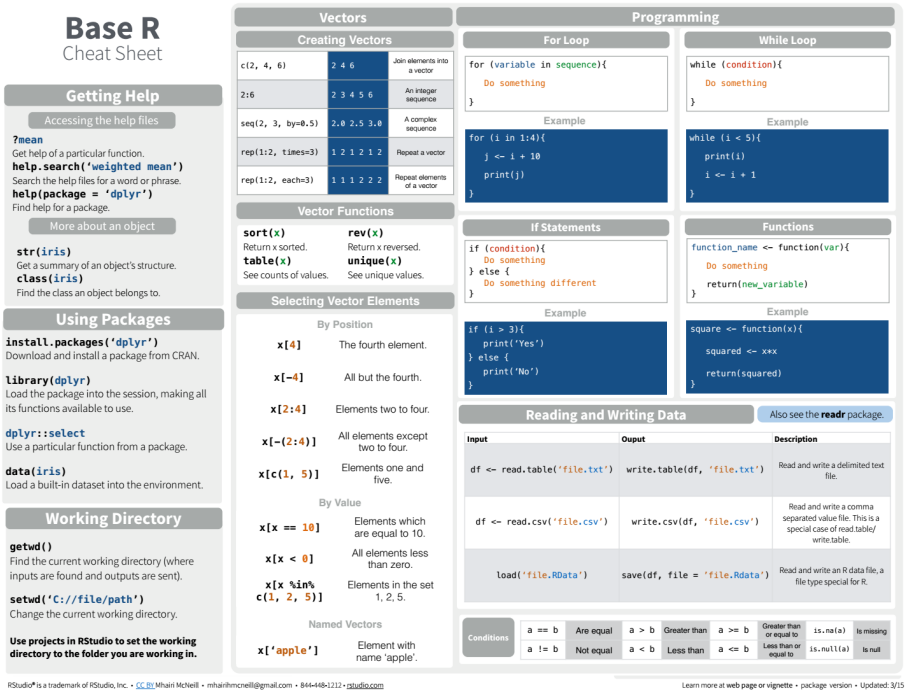
---

#### 7.1.10 emoji( )

:smile: :cry: :angry: :coffee: :computer: :calendar: :email: :kiss: :key:

## 7.2 Rmarkdown

# Chapter 8



## Base R
Cheat Sheet

### Getting Help

Accessing the help files

**?mean**
Get help of a particular function.
**help.search('weighted mean')**
Search the help files for a word or phrase.
**help(package = 'dplyr')**
Find help for a package.

More about an object

**str(iris)**
Get a summary of an object's structure.
**class(iris)**
Find the class an object belongs to.

### Using Packages

**install.packages('dplyr')**
Download and install a package from CRAN.

**library(dplyr)**
Load the package into the session, making all its functions available to use.

**dplyr::select**
Use a particular function from a package.

**data(iris)**
Load a built-in dataset into the environment.

### Working Directory

**getwd()**
Find the current working directory (where inputs are found and outputs are sent).

**setwd('C://file/path')**
Change the current working directory.

**Use projects in RStudio to set the working directory to the folder you are working in.**

### Vectors

#### Creating Vectors

| | | |
|---|---|---|
| c(2, 4, 6) | 2 4 6 | Join elements into a vector |
| 2:6 | 2 3 4 5 6 | An integer sequence |
| seq(2, 3, by=0.5) | 2.0 2.5 3.0 | A complex sequence |
| rep(1:2, times=3) | 1 2 1 2 1 2 | Repeat a vector |
| rep(1:2, each=3) | 1 1 1 2 2 2 | Repeat elements of a vector |

#### Vector Functions

**sort(x)** Return x sorted.
**rev(x)** Return x reversed.
**table(x)** See counts of values.
**unique(x)** See unique values.

#### Selecting Vector Elements

By Position

| | |
|---|---|
| x[4] | The fourth element. |
| x[-4] | All but the fourth. |
| x[2:4] | Elements two to four. |
| x[-(2:4)] | All elements except two to four. |
| x[c(1, 5)] | Elements one and five. |

By Value

| | |
|---|---|
| x[x == 10] | Elements which are equal to 10. |
| x[x < 0] | All elements less than zero. |
| x[x %in% c(1, 2, 5)] | Elements in the set 1, 2, 5. |

Named Vectors

| | |
|---|---|
| x['apple'] | Element with name 'apple'. |

### Programming

#### For Loop

```
for (variable in sequence){
   Do something
}
```

Example

```
for (i in 1:4){
   j <- i + 10
   print(j)
}
```

#### While Loop

```
while (condition){
   Do something
}
```

Example

```
while (i < 5){
   print(i)
   i <- i + 1
}
```

#### If Statements

```
if (condition){
   Do something
} else {
   Do something different
}
```

Example

```
if (i > 3){
   print('Yes')
} else {
   print('No')
}
```

#### Functions

```
function_name <- function(var){
   Do something
   return(new_variable)
}
```

Example

```
square <- function(x){
   squared <- x*x
   return(squared)
}
```

#### Reading and Writing Data

Also see the **readr** package.

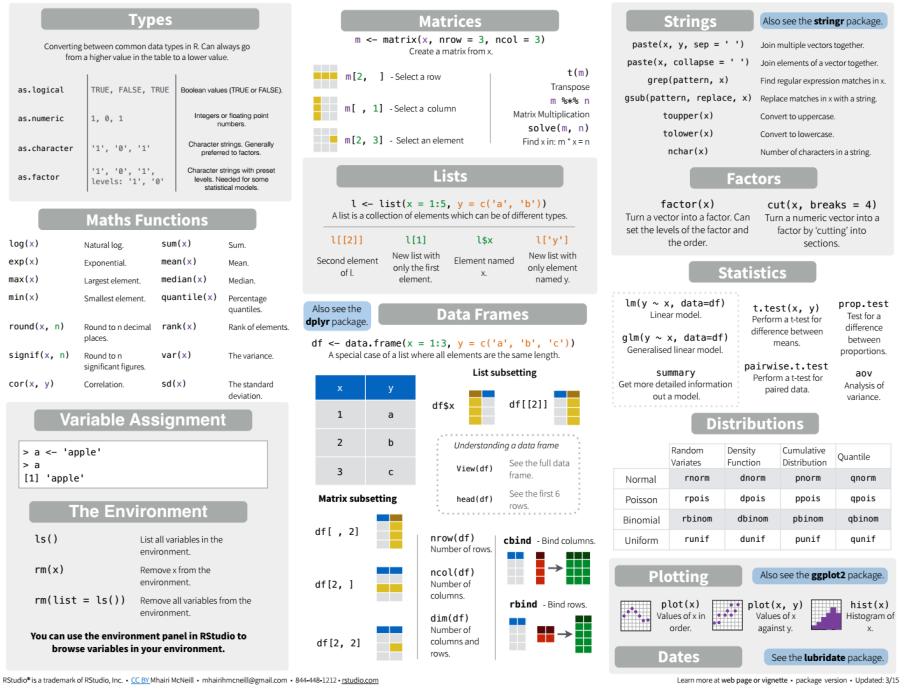
| Input | Ouput | Description |
|---|---|---|
| df <- read.table('file.txt') | write.table(df, 'file.txt') | Read and write a delimited text file. |
| df <- read.csv('file.csv') | write.csv(df, 'file.csv') | Read and write a comma separated value file. This is a special case of read.table/ write.table. |
| load('file.RData') | save(df, file = 'file.Rdata') | Read and write an R data file, a file type special for R. |

Conditions

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| a == b | Are equal | a > b | Greater than | a >= b | Greater than or equal to | is.na(a) | Is missing |
| a != b | Not equal | a < b | Less than | a <= b | Less than or equal to | is.null(a) | Is null |

RStudio® is a trademark of RStudio, Inc. • CC BY Mhairi McNeill • mhairihmcneill@gmail.com • 844-448-1212 • rstudio.com

Learn more at web page or vignette • package version • Updated: 3/15



## Types

Converting between common data types in R. Can always go from a higher value in the table to a lower value.

| | | |
|---|---|---|
| `as.logical` | `TRUE, FALSE, TRUE` | Boolean values (TRUE or FALSE). |
| `as.numeric` | `1, 0, 1` | Integers or floating point numbers. |
| `as.character` | `'1', '0', '1'` | Character strings. Generally preferred to factors. |
| `as.factor` | `'1', '0', '1', levels: '1', '0'` | Character strings with preset levels. Needed for some statistical models. |

## Maths Functions

| | | | |
|---|---|---|---|
| `log(x)` | Natural log. | `sum(x)` | Sum. |
| `exp(x)` | Exponential. | `mean(x)` | Mean. |
| `max(x)` | Largest element. | `median(x)` | Median. |
| `min(x)` | Smallest element. | `quantile(x)` | Percentage quantiles. |
| `round(x, n)` | Round to n decimal places. | `rank(x)` | Rank of elements. |
| `signif(x, n)` | Round to n significant figures. | `var(x)` | The variance. |
| `cor(x, y)` | Correlation. | `sd(x)` | The standard deviation. |

## Variable Assignment

```
> a <- 'apple'
> a
[1] 'apple'
```

## The Environment

| | |
|---|---|
| `ls()` | List all variables in the environment. |
| `rm(x)` | Remove x from the environment. |
| `rm(list = ls())` | Remove all variables from the environment. |

**You can use the environment panel in RStudio to browse variables in your environment.**

## Matrices

`m <- matrix(x, nrow = 3, ncol = 3)`
Create a matrix from x.

`m[2, ]` - Select a row
`m[ , 1]` - Select a column
`m[2, 3]` - Select an element

`t(m)` Transpose
`m %*% n` Matrix Multiplication
`solve(m, n)` Find x in: m * x = n

## Lists

`l <- list(x = 1:5, y = c('a', 'b'))`
A list is a collection of elements which can be of different types.

| `l[[2]]` | `l[1]` | `l$x` | `l['y']` |
|---|---|---|---|
| Second element of l. | New list with only the first element. | Element named x. | New list with only element named y. |

Also see the **dplyr** package.

## Data Frames

`df <- data.frame(x = 1:3, y = c('a', 'b', 'c'))`
A special case of a list where all elements are the same length.

| x | y |
|---|---|
| 1 | a |
| 2 | b |
| 3 | c |

**List subsetting**

`df$x` `df[[2]]`

*Understanding a data frame*

`View(df)` See the full data frame.
`head(df)` See the first 6 rows.

**Matrix subsetting**

`df[ , 2]`
`df[2, ]`
`df[2, 2]`

`nrow(df)` Number of rows.
`ncol(df)` Number of columns.
`dim(df)` Number of columns and rows.

`cbind` - Bind columns.
`rbind` - Bind rows.

## Strings

Also see the **stringr** package.

| | |
|---|---|
| `paste(x, y, sep = ' ')` | Join multiple vectors together. |
| `paste(x, collapse = ' ')` | Join elements of a vector together. |
| `grep(pattern, x)` | Find regular expression matches in x. |
| `gsub(pattern, replace, x)` | Replace matches in x with a string. |
| `toupper(x)` | Convert to uppercase. |
| `tolower(x)` | Convert to lowercase. |
| `nchar(x)` | Number of characters in a string. |

## Factors

`factor(x)` Turn a vector into a factor. Can set the levels of the factor and the order.

`cut(x, breaks = 4)` Turn a numeric vector into a factor by 'cutting' into sections.

## Statistics

`lm(y ~ x, data=df)` Linear model.
`glm(y ~ x, data=df)` Generalised linear model.
`summary` Get more detailed information out a model.

`t.test(x, y)` Perform a t-test for difference between means.
`pairwise.t.test` Perform a t-test for paired data.

`prop.test` Test for a difference between proportions.
`aov` Analysis of variance.

## Distributions

| | Random Variates | Density Function | Cumulative Distribution | Quantile |
|---|---|---|---|---|
| Normal | `rnorm` | `dnorm` | `pnorm` | `qnorm` |
| Poisson | `rpois` | `dpois` | `ppois` | `qpois` |
| Binomial | `rbinom` | `dbinom` | `pbinom` | `qbinom` |
| Uniform | `runif` | `dunif` | `punif` | `qunif` |

## Plotting

Also see the **ggplot2** package.

`plot(x)` Values of x in order.
`plot(x, y)` Values of x against y.
`hist(x)` Histogram of x.

## Dates

See the **lubridate** package.