Genowis

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Contents

Chapter 1

R github Stack Overflow

- R
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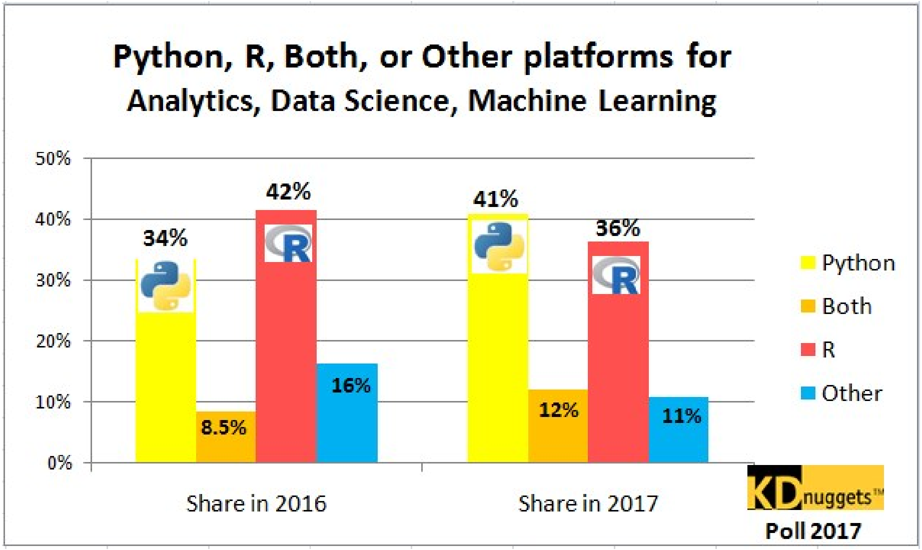
Chapter 2

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
-



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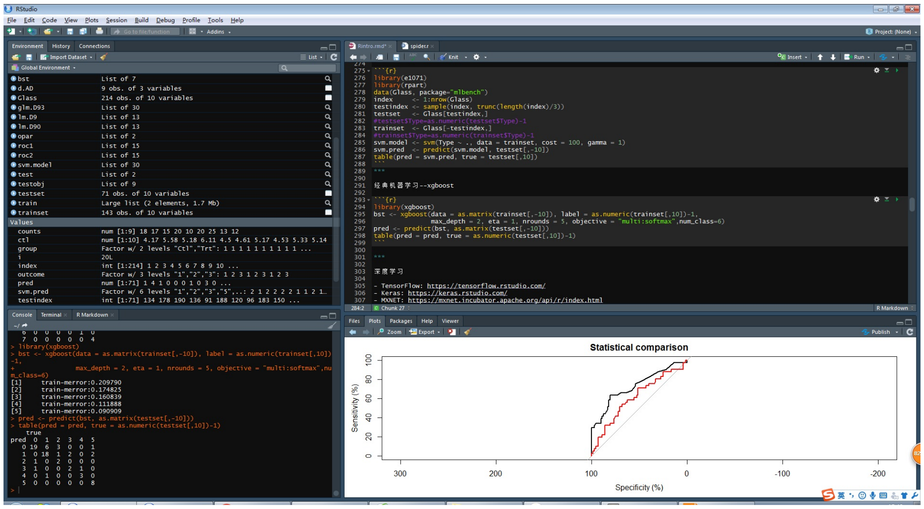
2.2

- Rstudio



```
bst          List of 7
d.AD         9 obs. of 3 variables
Glass        214 obs. of 10 variables
glm.D93      List of 30
lm.D9        List of 13
lm.D90       List of 13
opar         List of 2
roc1         List of 15
roc2         List of 15
svm.model    List of 30
test         List of 2
testobj      List of 9
testset      71 obs. of 10 variables
train        Large list (2 elements, 1.7 Mb)
trainset     143 obs. of 10 variables
Values
  counts     num [1:9] 18 17 15 20 10 20 25 13 12
  ctl        num [1:10] 4.17 5.58 5.18 6.11 4.5 4.61 5.17 4.53 5.33 5.14
  group      Factor w/ 2 levels "Ctl","Trt": 1 1 1 1 1 1 1 1 1 1 ...
  i          20L
  index      int [1:214] 1 2 3 4 5 6 7 8 9 10 ...
  outcome    Factor w/ 3 levels "1","2","3": 1 2 3 1 2 3 1 2 3
  pred       num [1:71] 1 4 1 0 0 0 1 0 3 0 ...
  svm.pred   Factor w/ 6 levels "1","2","3","5",..: 2 1 2 2 2 2 1 1 2 1…
  testindex  int [1:71] 134 178 190 136 91 188 120 96 183 150 ...
```

~~~
```{r}
library(e1071)
library(rpart)
data(Glass, package="mlbench")
index     <- 1:nrow(Glass)
testindex <- sample(index, trunc(length(index)/3))
testset   <- Glass[testindex,]
#testset$Type=as.numeric(testset$Type)-1
trainset  <- Glass[-testindex,]
#trainset$Type=as.numeric(trainset$Type)-1
svm.model <- svm(Type ~ ., data = trainset, cost = 100, gamma = 1)
svm.pred  <- predict(svm.model, testset[,-10])
table(pred = svm.pred, true = testset[,10])
~~~

***

经典机器学习--xgboost

```{r}
library(xgboost)
bst <- xgboost(data = as.matrix(trainset[,-10]), label = as.numeric(trainset[,10])-1,
               max_depth = 2, eta = 1, nrounds = 5, objective = "multi:softmax",num_class=6)
pred <- predict(bst, as.matrix(testset[,-10]))
table(pred = pred, true = as.numeric(testset[,10])-1)
```

***

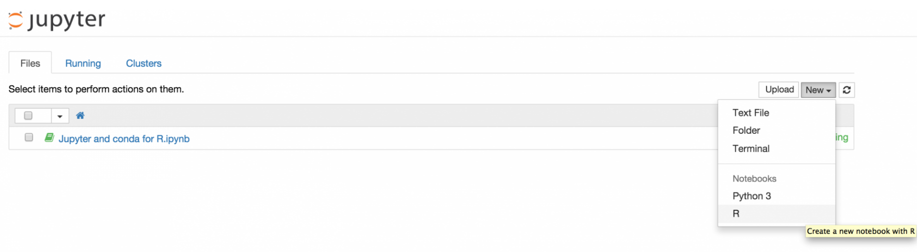
深度学习

- TensorFlow: https://tensorflow.rstudio.com/
- Keras: https://keras.rstudio.com/
- MXNET: https://mxnet.incubator.apache.org/api/r/index.html
```

```
    6  0  0  0  0  1  0
    7  0  0  0  0  0  4
> library(xgboost)
> bst <- xgboost(data = as.matrix(trainset[,-10]), label = as.numeric(trainset[,10])
-1,
+               max_depth = 2, eta = 1, nrounds = 5, objective = "multi:softmax",nu
m_class=6)
[1]     train-merror:0.209790
[2]     train-merror:0.174825
[3]     train-merror:0.160839
[4]     train-merror:0.111888
[5]     train-merror:0.090909
> pred <- predict(bst, as.matrix(testset[,-10]))
> table(pred = pred, true = as.numeric(testset[,10])-1)
    true
pred  0  1  2  3  4  5
   0 19  6  3  0  0  1
   1  0 18  1  2  0  2
   2  1  0  2  0  0  0
   3  1  0  0  2  1  0
   4  0  1  0  0  3  0
   5  0  0  0  0  0  8
> 
```

- Jupyter
```

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



Select items to perform actions on them.

Jupyter and conda for R.ipynb

2.3

-
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-

```
- 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. 
## -2.9157 -0.5992  0.1583  0.1017  0.9386  2.9625
```

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()

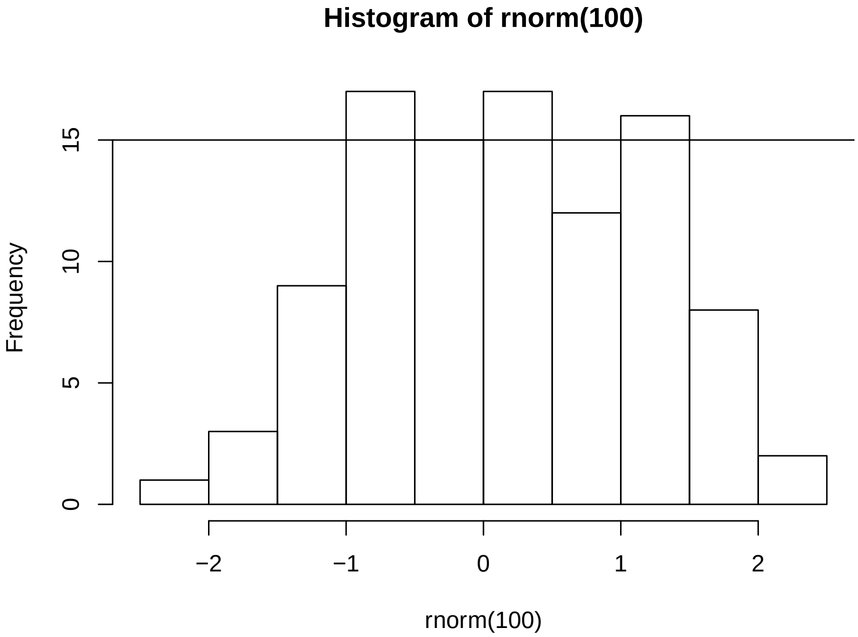
```
df=data.frame(x=1:10,y=rep("a",10),stringsAsFactors = F)
dim(subset(df,x>5))
```

```
## [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 χ^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

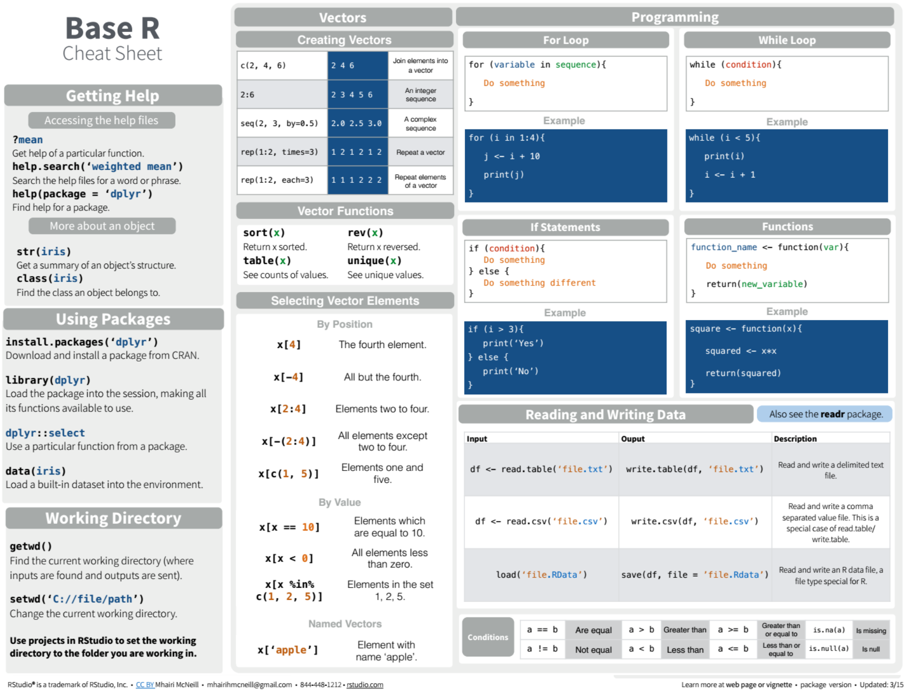
6.2.3 echats4r

Chapter 7

7.1 markdown

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.

`table(x)`
See counts of values.

`rev(x)`
Return x reversed.

`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

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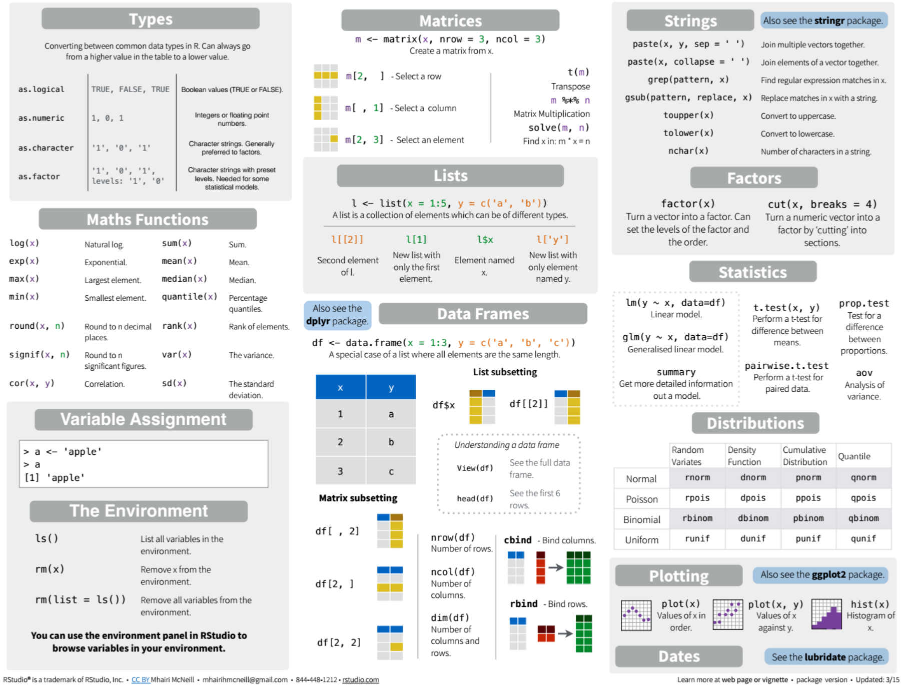

Types

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.

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