DATA SCIENCE INDONESIA

Sentiment Analysis with R

DSI Jatim Camp #3, 29 September 2018

Outline

- Overview Sentiment Analysis
- **Intro to R Programming Language**
- Intro to Text Analysis
- Preprocessing
- Visualize
- Sentiment

Introduction to R

Introduction to R

R and R Studio

R is a language and environment for statistical computing and graphics. Available at https://cran.r-project.org/

RStudio allows the user to run R in a more user friendly environment. It is open source (i.e. free) and available at http://www.rstudio.com/

Introduction to R

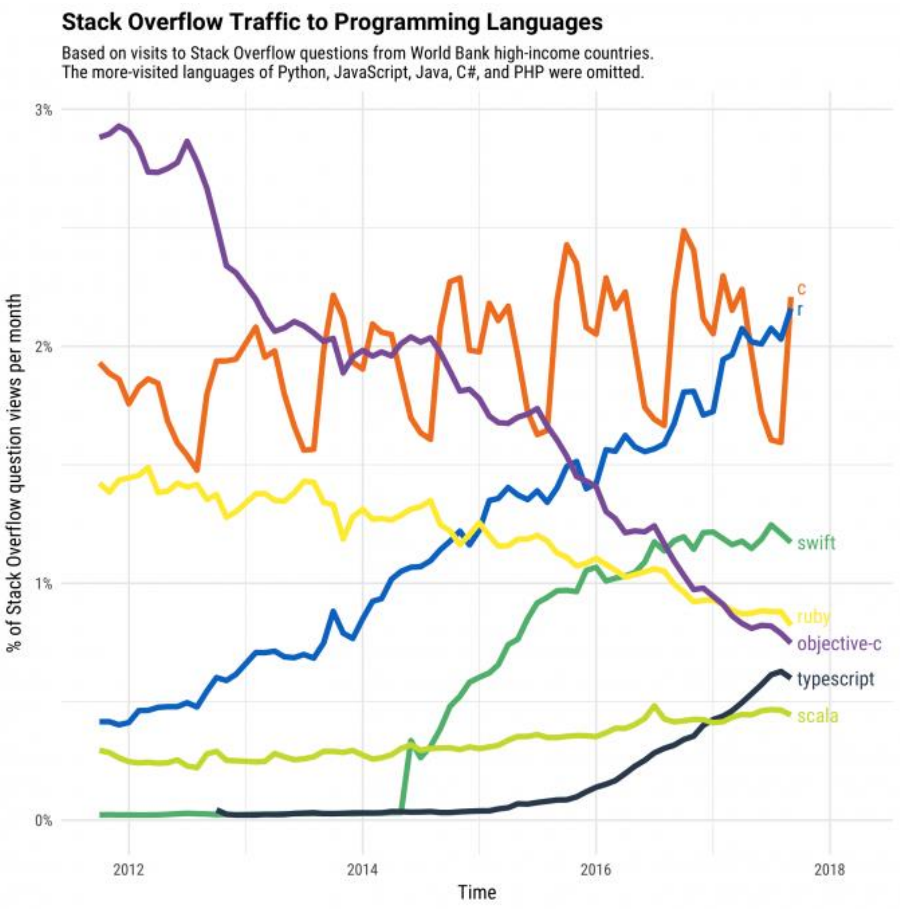
Why use R?

- **Data analysis software:** R is s data analysis software. It is used by data scientists for statistical analysis, predictive modeling and visualization.
- **Statistical analysis environment:** R provides a complete environment for statistical analysis. It is easy to implement statistical methods in R. Most of the new research in statistical analysis and modeling is done using R. So, the new techniques are first available only in R.
- **Open source:** R is open source technology, so it is very easy to integrate with other applications.
- **Community support:** R has the community support of leading statisticians, data scientists from different parts of the world and is growing rapidly.

Source : https://www.eduonix.com/blog/bigdata-and-hadoop/why-r-is-important-for-data-science-professionals/

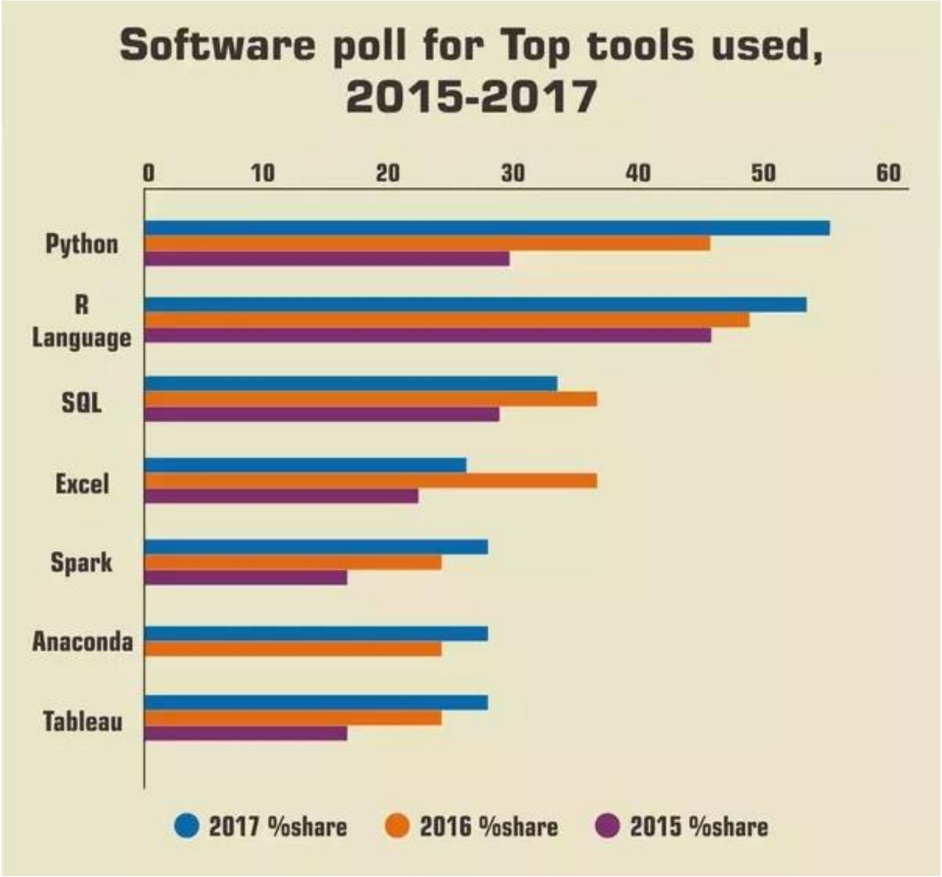
Introduction to R

Why use R?



Stack Overflow Traffic to Programming Languages

Based on visits to Stack Overflow questions from World Bank high-income countries.
The more-visited languages of Python, JavaScript, Java, C#, and PHP were omitted.



Software poll for Top tools used, 2015-2017

Basic Calculation

Aritmathic Operation

```
5+6+3
[1] 14
5+6-3
[1] 8
(7+15)/2
[1] 11
2^3
[1] 8
2^(2*3)
[1] 64
5 %/% 2  #integer division
[1] 2
5 %% 2  #modulo division
[1] 1
```

Assignment Variable

```
a <- 2
b = 2
2 -> c
d = e = f = 3
```

- names are case sensitive.
- pi is a constant, but still can be used as variable name.
- print(x) prints content of x

Basic Calculation

Mathematical Function

Function	**Meaning**
log(x)	log to base e of x
exp(x)	antilog of x (=2.7818x)
log(x,n)	log to base n of x
log10(x)	log to base 10 of x
sqrt(x)	square root of x
factorial(x)	x!
choose(n,x)	binomial coefficients n!/(x! (n – x)!)
gamma(x)	Γ.x.(x – 1)! for integer x
lgamma(x)	natural log of gamma(x)
floor(x)	greatest integer < x

Basic Calculation

Mathematical Function

Function	**Meaning**
ceiling(x)	smallest integer > x
trunc(x)	closest integer to x between x and 0: trunc(1.5) =1, trunc(-1.5) = -1
trunc	is like floor for positive values and like
ceiling	for negative values
round(x, digits=0)	round the value of x to an integer
signif(x, digits=6)	give x to six digits in scientific notation
runif(n)	generates n random numbers between 0 and 1 from a uniform distribution
cos(x)	cosine of x in radians
sin(x)	sine of x in radians
tan(x)	tangent of x in radians
acos(x), asin(x), atan(x)	inverse trigonometric transformations of real or complex numbers.
acosh(x), asinh(x), atanh(x)	inverse hyperbolic trigonometric transformations on real or complex numbers
abs(x)	the absolute value of x, ignoring the minus sign if there is one

Data dan Variable

Main Structures

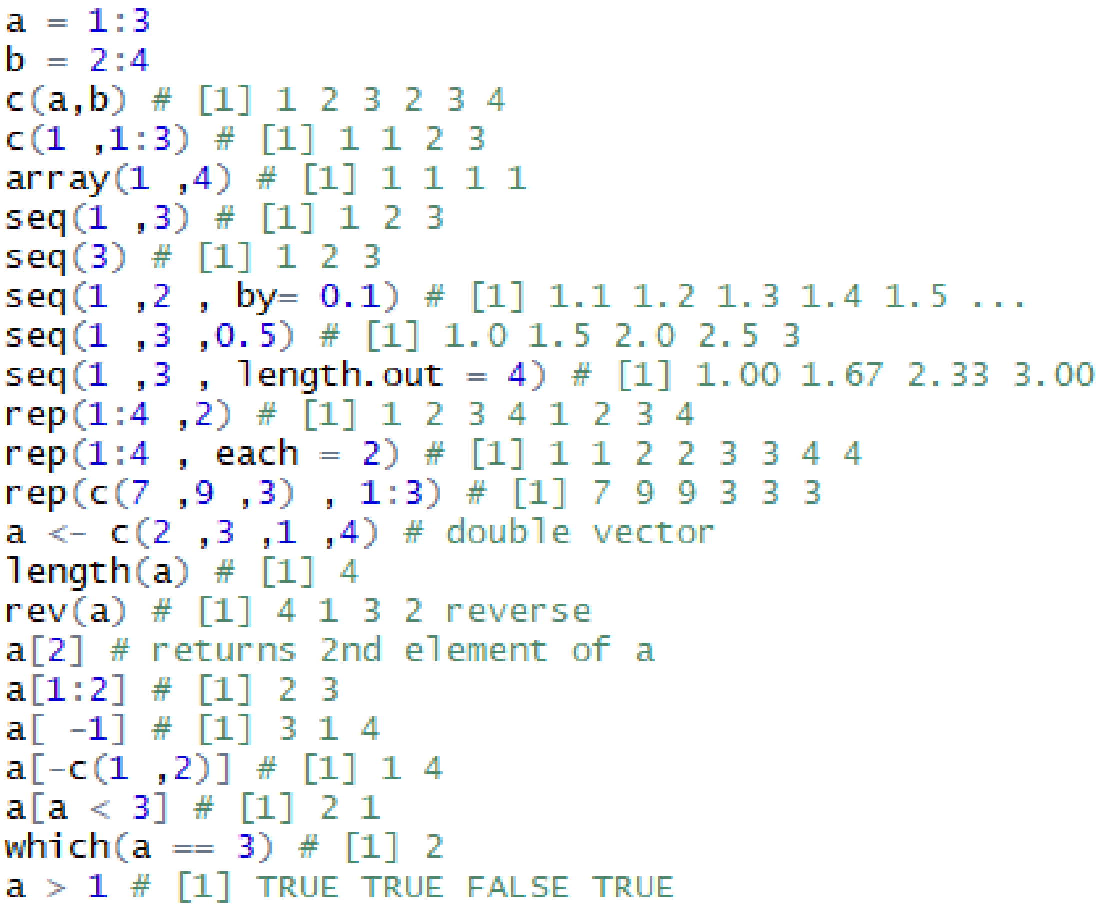
Vector array 1 dimensi dengan ukuran m (1 tipe data)
Matrix array 2 dimensi dengan ukuran m × n (1 tipe data)
Dataframe seperti matrix, namun bisa menampung lebih dari 1 tipe data

Class

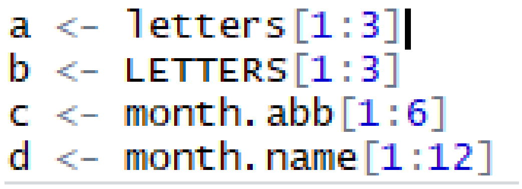
character vector of strings
numeric vector of real numbers
integer vector of signed integer
logical vector of boolean (TRUE or FALSE)
complex vector of complex numbers
list vector of R objects
factor sets of labelled observations, pre-defined set of labels
NA not available, missing value

Data dan Variable

Vector



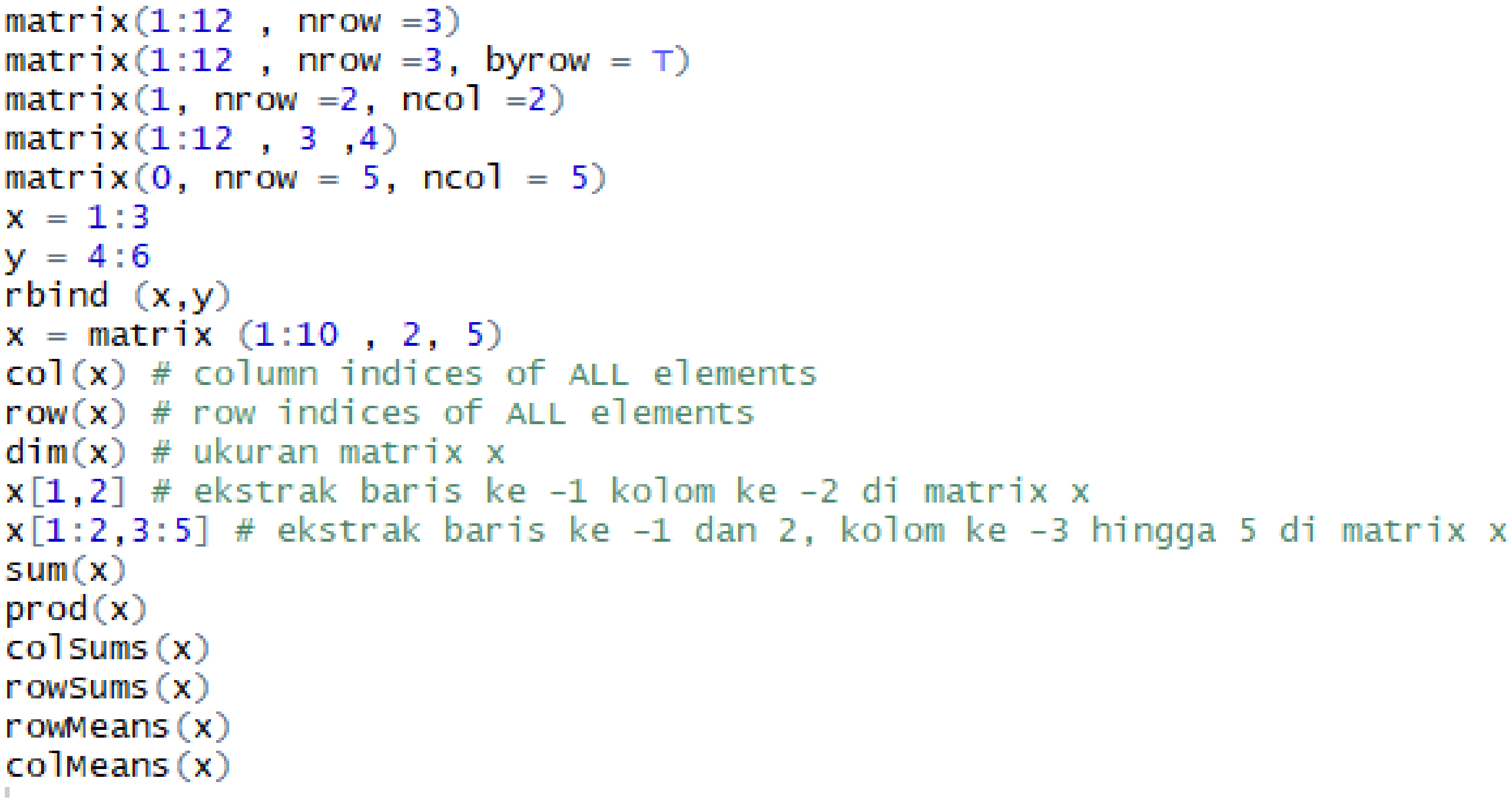
```
a = 1:3
b = 2:4
c(a,b) # [1] 1 2 3 2 3 4
c(1 ,1:3) # [1] 1 1 2 3
array(1 ,4) # [1] 1 1 1 1
seq(1 ,3) # [1] 1 2 3
seq(3) # [1] 1 2 3
seq(1 ,2 , by= 0.1) # [1] 1.1 1.2 1.3 1.4 1.5 ...
seq(1 ,3 ,0.5) # [1] 1.0 1.5 2.0 2.5 3
seq(1 ,3 , length.out = 4) # [1] 1.00 1.67 2.33 3.00
rep(1:4 ,2) # [1] 1 2 3 4 1 2 3 4
rep(1:4 , each = 2) # [1] 1 1 2 2 3 3 4 4
rep(c(7 ,9 ,3) , 1:3) # [1] 7 9 9 3 3 3
a <- c(2 ,3 ,1 ,4) # double vector
length(a) # [1] 4
rev(a) # [1] 4 1 3 2 reverse
a[2] # returns 2nd element of a
a[1:2] # [1] 2 3
a[ -1] # [1] 3 1 4
a[-c(1 ,2)] # [1] 1 4
a[a < 3] # [1] 2 1
which(a == 3) # [1] 2
a > 1 # [1] TRUE TRUE FALSE TRUE
```



```
a <- letters[1:3]
b <- LETTERS[1:3]
c <- month.abb[1:6]
d <- month.name[1:12]
```

Data dan Variable

Matrix



```
matrix(1:12 , nrow =3)
matrix(1:12 , nrow =3, byrow = T)
matrix(1, nrow =2, ncol =2)
matrix(1:12 , 3 ,4)
matrix(0, nrow = 5, ncol = 5)
x = 1:3
y = 4:6
rbind (x,y)
x = matrix (1:10 , 2, 5)
col(x) # column indices of ALL elements
row(x) # row indices of ALL elements
dim(x) # ukuran matrix x
x[1,2] # ekstrak baris ke -1 kolom ke -2 di matrix x
x[1:2,3:5] # ekstrak baris ke -1 dan 2, kolom ke -3 hingga 5 di matrix x
sum(x)
prod(x)
colSums(x)
rowSums(x)
rowMeans(x)
colMeans(x)
```

Data dan Variable

Matrix

```
x1 = c(2,5)
x2 = c(4,7)
x=cbind (x1,x2)
t(x) #matrix transpose
solve(x) #inverse matrix
 [,1]       [,2]
x1 -1.1666667  0.6666667
x2  0.8333333 -0.3333333
det(x) #determinant matrix
[1] -6
diag(x) #diagonal matrix
[1] 2 7
```

```
y1 = c(3,6)
y2 = c(1,4)
y=cbind (y1,y2)
x*y
     x1 x2
[1,]  6  4
[2,] 30 28
x%*%y
     y1 y2
[1,] 30 18
[2,] 57 33
```

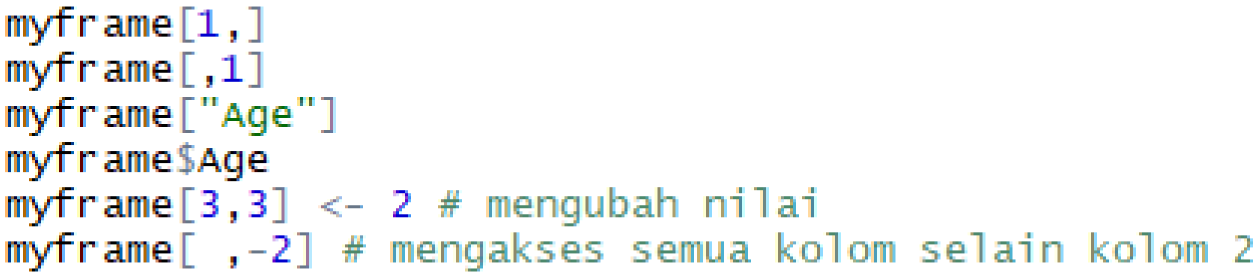
Data dan Variable

Dataframe

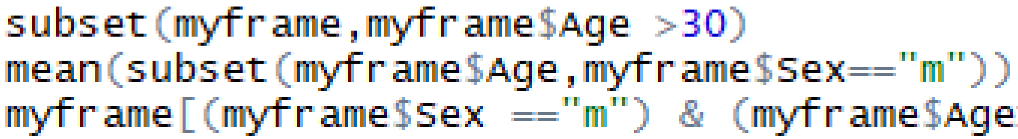
```
Age <- c(10 ,20 ,15 ,43 ,76 ,41 ,25 ,46)

Sex <- factor (c("m","f","m","f","m","f","m","f"))

Sibblings <- c(2 ,5 ,8 ,3 ,6 ,1 ,5 ,6)

myframe <- data.frame(Age, Sex, Sibblings)

myframe
  Age Sex Sibblings
1  10   m         2
2  20   f         5
3  15   m         8
4  43   f         3
5  76   m         6
6  41   f         1
7  25   m         5
8  46   f         6
```

Data dan Variable

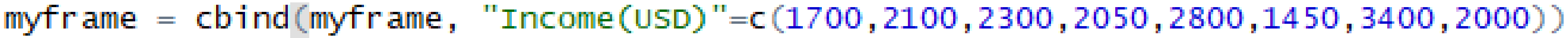
Dataframe



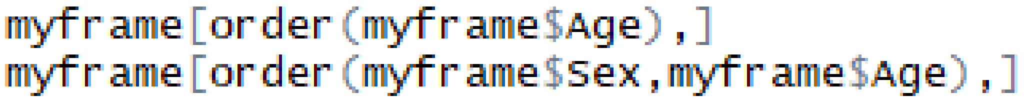
```
myframe[1,]
myframe[,1]
myframe["Age"]
myframe$Age
myframe[3,3] <- 2 # mengubah nilai
myframe[ ,-2] # mengakses semua kolom selain kolom 2
```



```
subset(myframe,myframe$Age >30)
mean(subset(myframe$Age,myframe$Sex=="m"))
myframe[(myframe$Sex =="m") & (myframe$Age>30),]
```

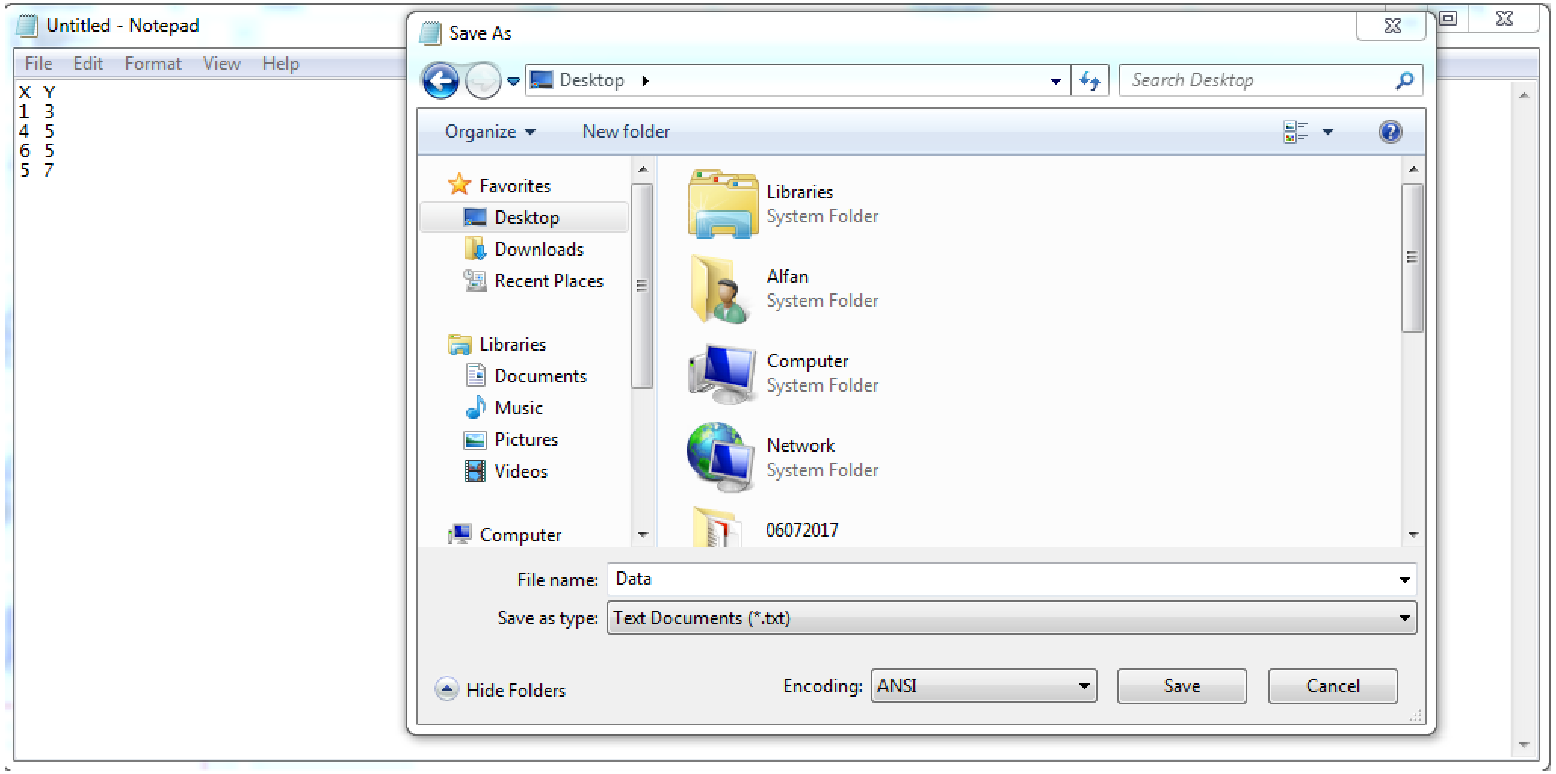


```
myframe = cbind(myframe, "Income(USD)"=c(1700,2100,2300,2050,2800,1450,3400,2000))
```



```
myframe[order(myframe$Age),]
myframe[order(myframe$Sex,myframe$Age),]
```

Read and Write Data



```
X  Y
1  3
4  5
6  5
5  7
```

File name: Data

Save as type: Text Documents (*.txt)

Encoding: ANSI

For example we create data in notepad

Read and Write Data

```
#Function read.table
read.table(file, header = TRUE, sep = ",", quote = "\"",
           dec = ".“, ...)
```

`File` the name of the file which the data are to be read from

`header` a logical value indicating whether the file contains the names of the variables as its first line

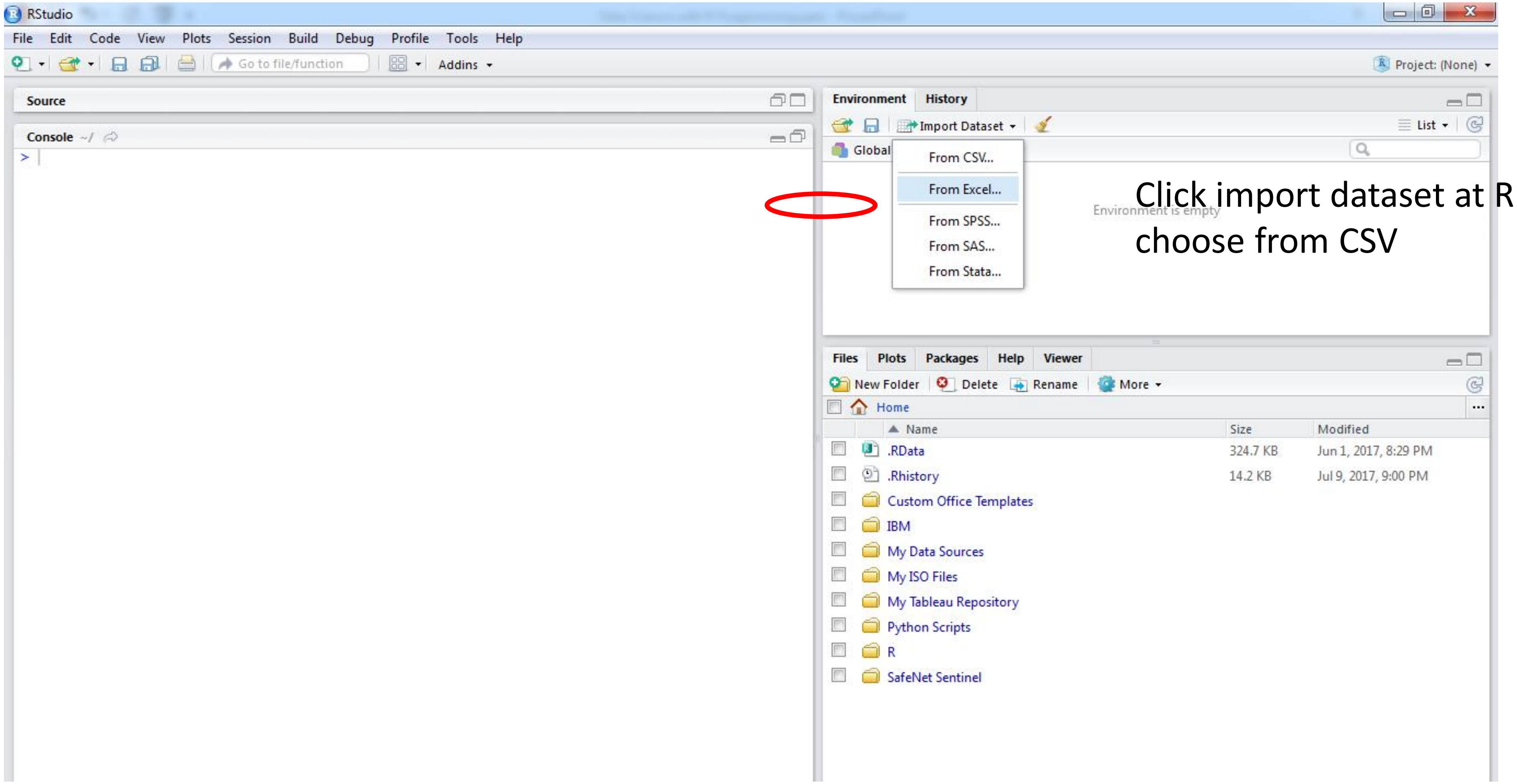
`sep` the field separator string. Values within each row of `x` are separated by this string.

`quote` the set of quoting characters

`dec` the string to use for decimal points in numeric or complex columns: must be a single character.

```
read.table("E:/Data.txt",header = T)
```

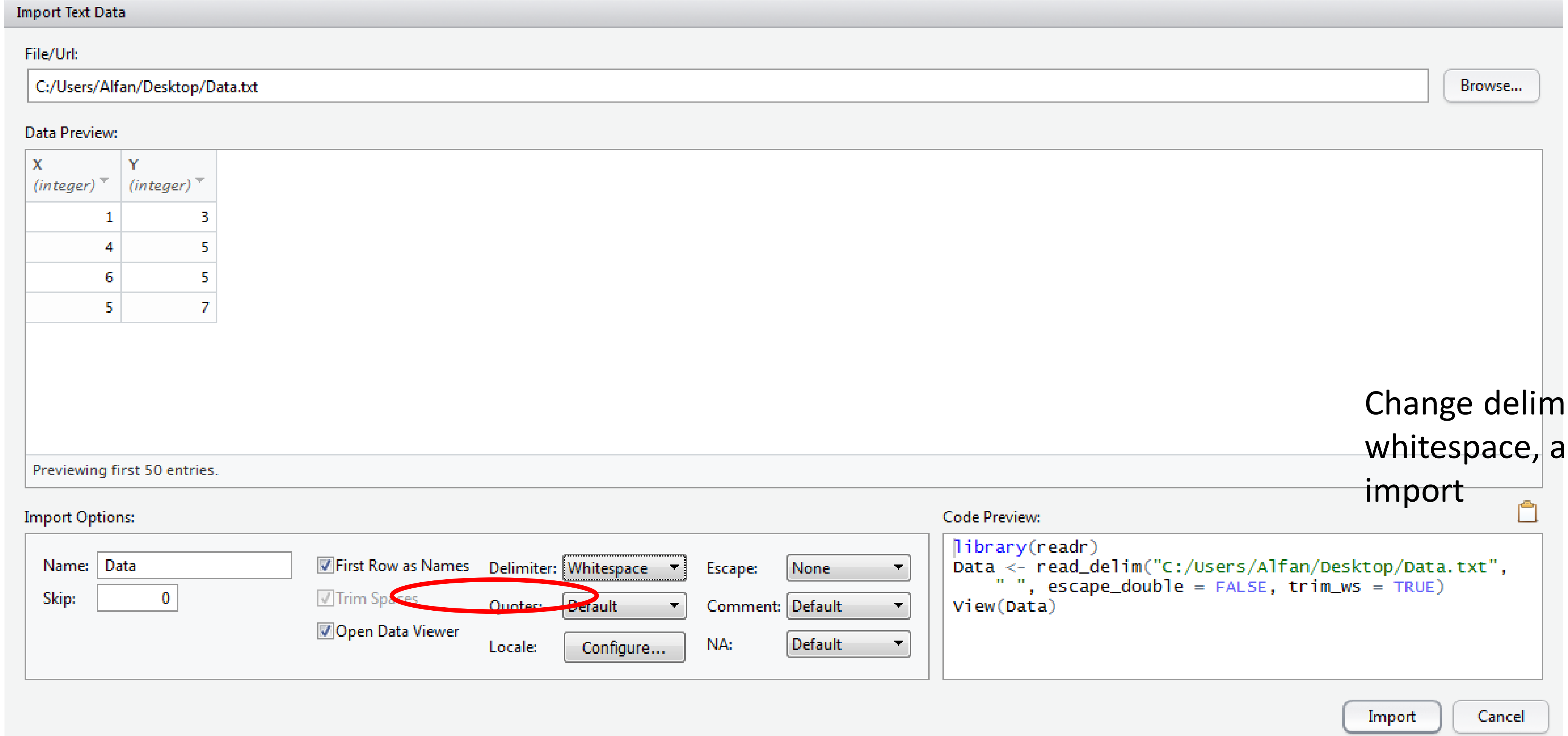
Read and Write Data



Name	Size	Modified
.RData	324.7 KB	Jun 1, 2017, 8:29 PM
.Rhistory	14.2 KB	Jul 9, 2017, 9:00 PM
Custom Office Templates		
IBM		
My Data Sources		
My ISO Files		
My Tableau Repository		
Python Scripts		
R		
SafeNet Sentinel		

Click import dataset at R Studio, choose from CSV

Read and Write Data



Import Text Data

File/Url: C:/Users/Alfan/Desktop/Data.txt

Data Preview:

X (integer)	Y (integer)
1	3
4	5
6	5
5	7

Previewing first 50 entries.

Import Options:

Name: Data

Skip: 0

☑ First Row as Names

☑ Trim Spaces

☑ Open Data Viewer

Delimiter: Whitespace

Quotes: Default

Locale: Configure...

Escape: None

Comment: Default

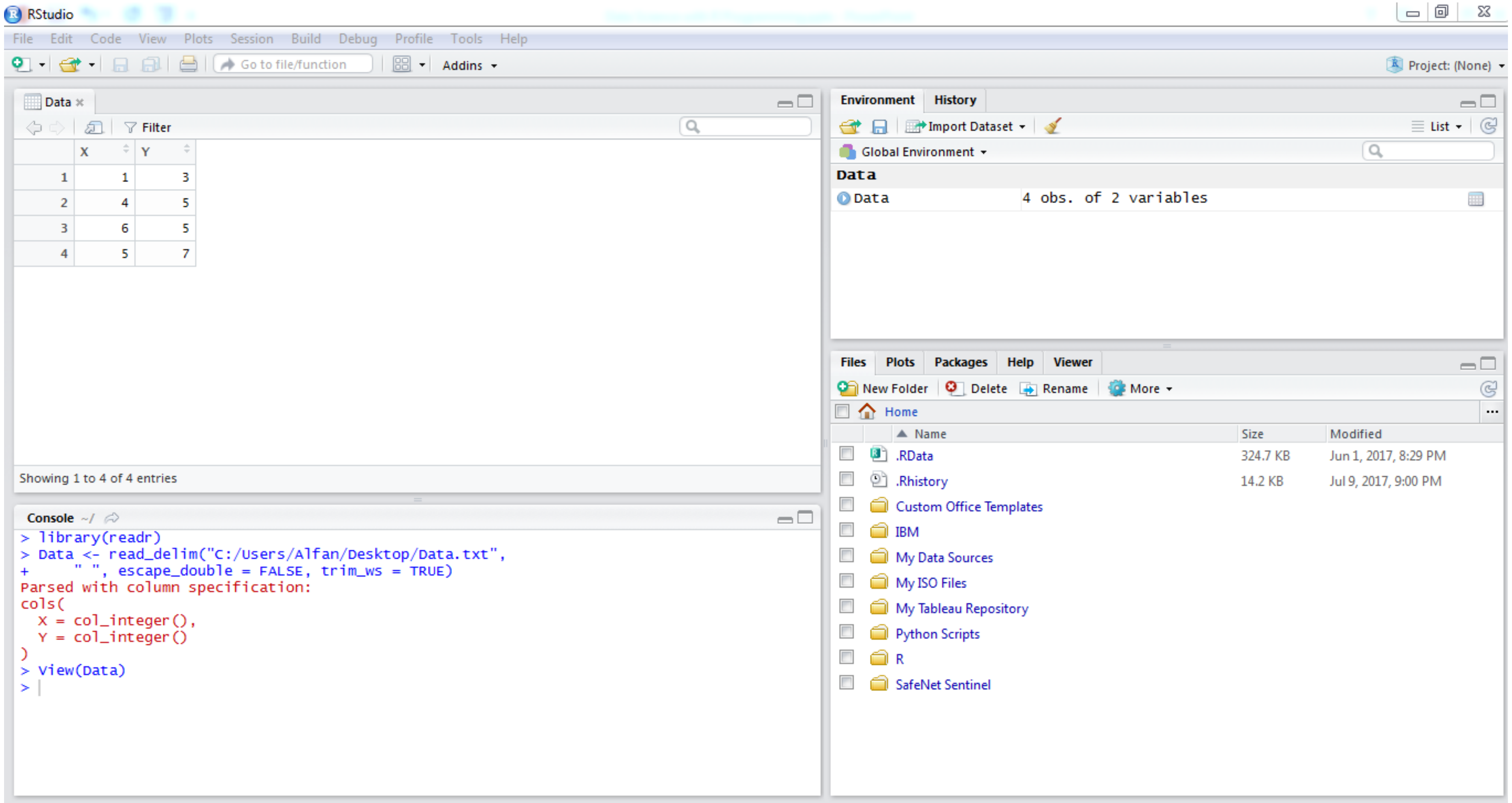
NA: Default

Code Preview:

```
library(readr)
Data <- read_delim("C:/Users/Alfan/Desktop/Data.txt",
    " ", escape_double = FALSE, trim_ws = TRUE)
View(Data)
```

Change delimiter with whitespace, and click import

Read and Write Data



	X	Y
1	1	3
2	4	5
3	6	5
4	5	7

Showing 1 to 4 of 4 entries

```
> library(readr)
> Data <- read_delim("C:/Users/Alfan/Desktop/Data.txt",
+     " ", escape_double = FALSE, trim_ws = TRUE)
Parsed with column specification:
cols(
  X = col_integer(),
  Y = col_integer()
)
> View(Data)
> 
```

```
Data
Data                4 obs. of 2 variables
```

Name	Size	Modified
.RData	324.7 KB	Jun 1, 2017, 8:29 PM
.Rhistory	14.2 KB	Jul 9, 2017, 9:00 PM
Custom Office Templates		
IBM		
My Data Sources		
My ISO Files		
My Tableau Repository		
Python Scripts		
R		
SafeNet Sentinel		

Read and Write Data

```
#Function write.table
write.table(x, file = "", , quote = TRUE, sep = " ", na = "NA", dec = ".",
row.names = TRUE, col.names = TRUE)
```

`x` the object to be written, preferably a matrix or data frame. If not, it is attempted to coerce `x` to a data frame.

`file` either a character string naming a file or a connection open for writing. `""`indicates output to the console.

`quote` a logical value (`TRUE` or `FALSE`) or a numeric vector. If `TRUE`, any character or factor columns will be surrounded by double quotes. If a numeric vector, its elements are taken as the indices of columns to quote. In both cases, row and column names are quoted if they are written. If `FALSE`, nothing is quoted.

`sep` the field separator string. Values within each row of `x` are separated by this string.

`na` the string to use for missing values in the data.

`dec` the string to use for decimal points in numeric or complex columns: must be a single character.

`row.names` either a logical value indicating whether the row names of `x` are to be written along with `x`, or a character vector of row names to be written.

`col.names` either a logical value indicating whether the column names of `x` are to be written along with `x`, or a character vector of column names to be written. See the section on ‘CSV files’ for the meaning of `col.names = NA`.

Read and Write Data

```
#Function write.csv
write.csv(x, file = "", , quote = TRUE, sep = " ", na = "NA", dec = ".",
row.names = TRUE, col.names = TRUE)
```

`x` the object to be written, preferably a matrix or data frame. If not, it is attempted to coerce `x` to a data frame.

`file` either a character string naming a file or a connection open for writing. `""`indicates output to the console.

`quote` a logical value (`TRUE` or `FALSE`) or a numeric vector. If `TRUE`, any character or factor columns will be surrounded by double quotes. If a numeric vector, its elements are taken as the indices of columns to quote. In both cases, row and column names are quoted if they are written. If `FALSE`, nothing is quoted.

`sep` the field separator string. Values within each row of `x` are separated by this string.

`na` the string to use for missing values in the data.

`dec` the string to use for decimal points in numeric or complex columns: must be a single character.

`row.names` either a logical value indicating whether the row names of `x` are to be written along with `x`, or a character vector of row names to be written.

`col.names` either a logical value indicating whether the column names of `x` are to be written along with `x`, or a character vector of column names to be written. See the section on ‘CSV files’ for the meaning of `col.names = NA`.

Read and Write Data

Name of file

```
#Example
write.table(Data, "D:/Folder/Data.txt", sep=" ", col.names=TRUE, row.names=TRUE,
quote=FALSE, na="NA")

write.csv(Data, "D:/Folder/Data.csv", sep=" ", col.names=TRUE, row.names=TRUE,
quote=FALSE, na="NA")
```

Location file will be saved

Conditional Statement

```
#simple if
x <- 1
if (x==2){ print ("x=2") }

# if - else
x <- 1
if (x==2) {print ("x = 2")} else {print ("x != 2")}
```

Logical Function

```
<    #smaller
<=   #smaller or equal
>    #bigger
>=   #bigger or equal
!=   #unequal
```

```
==   #logical equal
!    #logical NOT ( unary )
&    #logical AND ( vector )
|    #logical OR ( vector )
&&   #logical AND (no vector )
||   #logical OR (no vector )
```

Looping

for

```
for (i in 1:4) {print(i)}
for (i in letters[1:4]) {print(i)}
```

while

```
i <- 0
while (i<4) {
  i <- i+1
  print(i)
}
```

repeat

```
i <- 0
repeat {
  i <- i+1
  print (i)
  if (i==4) break
}
```

Function

simple

```
myfun <- function(x){
  a=x^2/pi
  return(a)
  }
myfun(2)
```

Multiple input and return

```
myfun5 <- function (x, a){
  r1 <- a* sin (x)
  r2 <- a* cos (x)
  return ( list (r1 ,r2))
}
myfun5 (2,4)
```

DATA
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Thank You