

### Language itself

R is a free software environment for statistical computing and graphics.

It's a compiled language.

R is a dynamically-typed, that means the type of a variable is determined at runtime, and that variables do not have to be explicitly declared with a specific type.

R is weakly-typed, which means that it will automatically convert between types when necessary, without the need for explicit type casting.

R is a garbage-collected language. This means the R runtime system automatically manages the memory used by the program.

R is both a functional and object oriented language but it doesn't support inheritance, polymorphism, and encapsulation.

In R, functions call by value. This means that when a function is called, the values of the arguments passed to the function are passed to the function's local scope, and any changes made to the arguments within the function do not affect the original values of the arguments outside the function.

### Language environment

To code in R you can install the extension in your IDE like VSC or install its own IDE *R Studio* :

R for Windows

R for Linux

Then to run it you can run it with the IDE if you don't have one you can use R Studio server, which is a web-based version of R Studio that can be accessed through a web browser. The command for R Studio is `Rscript myscript.R`.

When installed R Studio it would have a minimal impact on the local machine but if you runs large R scripts or using R for data analysis and machine learning tasks, which require a lot of memory, it may have a bigger impact on the local machine. But in the end it does not modify something in your machine that would block you in its use.

### Library

#### Code

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

`library(dplyr)` : Load the package into the file.

`dplyr::select` : Use a function from the package

#### Commonly used library

*stringr* for string manipulation

*dplyr* for data frame manipulation

*ggplot2* for plotting graphs

*lubridate* for date

### To go further

R is an integrated suite of software facilities for data manipulation, calculation and graphical display. It includes:

-An effective data handling and storage facility,

-A suite of operators for calculations on arrays, in particular matrices,  
-A large, coherent, integrated collection of intermediate tools for data analysis,

-Graphical facilities for data analysis and display either on-screen or on hardcopy, and

-A well-developed, simple and effective programming language which includes conditionals, loops, user-defined recursive functions and input and output facilities.

The people who mainly use R are data scientist / engineer

### Syntax and data structures

#### Variable Assignment

`a <- 'bonjour' : string`

`a <- 6 : integer`

#### Loop

For loop :

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

While loop :

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

#### Condition

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

`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

#### Functions

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

#### 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

### Syntax and data structures (cont)

#### Lists

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

`l[[2]]` : second element of l

`l[1]` : new list with only the first element

`l$x` : element named x

`l['y']` : new list with only element named y

#### String

`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.

#### Matrixes

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

`df[, 2]` : Select a column .

`df[2, ]` : Select a row.

`df[2, 2]` : Select an element.

#### 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.

`View(df)` : See the full data frame.

`head(df)` : See the first 6 rows.

`nrow(df)` : Number of rows.

`ncol(df)` : Number of columns.

`dim(df)` : Number of columns and rows.

As the same sub settings as matrixes and lists

#### Plotting

`plot(x)` : plot values of x in order

`plot(x, y)` : plot values of x against y

#### Reading and writing data

`df <- read.table('file.txt') / df <- read.csv('file.csv')` / Read a file text or a csv

`write.table(df, 'file.txt') / write.csv(df, 'file.csv')` / Write a file text or a csv

