4. Even More Data structures in R

Principles of Data Science with R

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PSTAT 10

Summary:

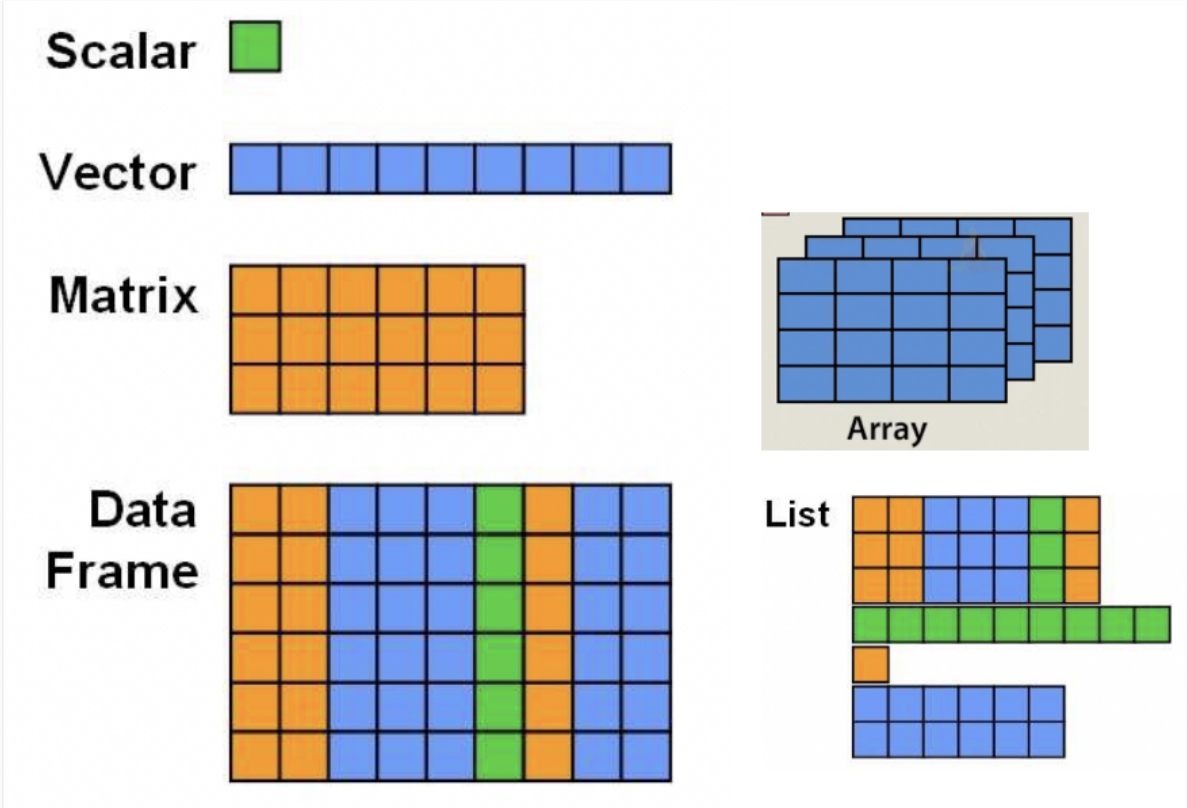
More data structures

- matrices and arrays. (Textbook Ch3)
- Factors (Textbook Chapter 4)
- Working with Logical datatye, string (Non-numeric values Textbook Chapter 4)

Maintain a glossary of functions used.

Next we will see. . .

- Even more Data structures
  - list
  - data frame



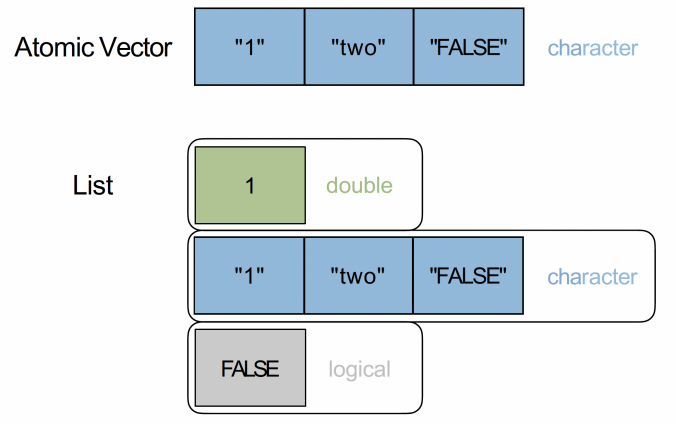
Dimensions

Homogeneity

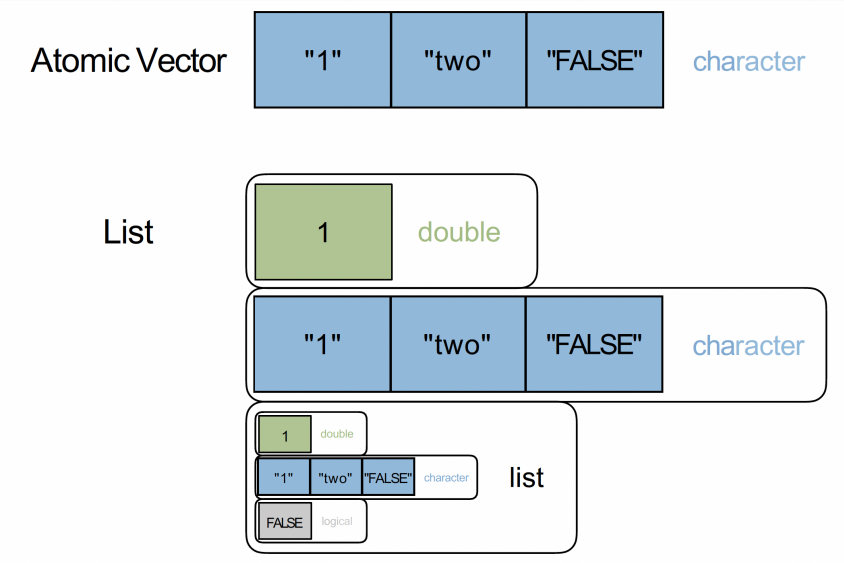
	1 D	2 D	Multi-D
Homogeneous	Vector	Matrix	Array
Heterogeneous	List	Dataframe	

Lists : most versatile data structure in R

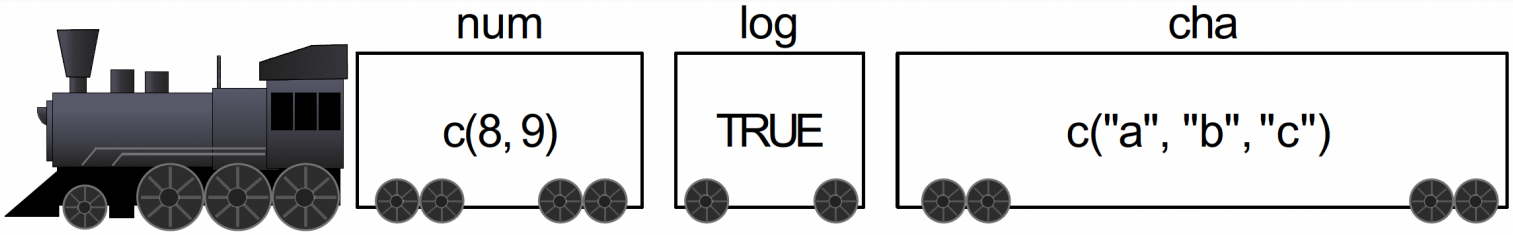
- allows for different data types to be included



- allows for different data structures (even lists!) to be included



List




```
lst <- list(num = c(8,9), log = TRUE, cha = c("a", "b", "c"))
```

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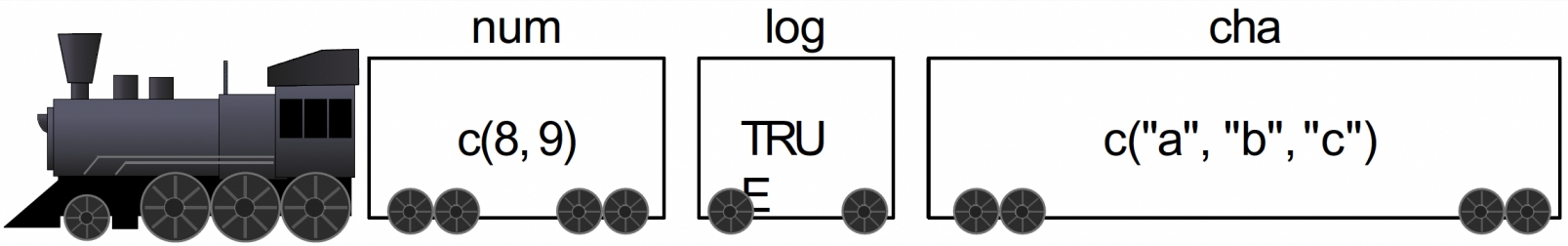
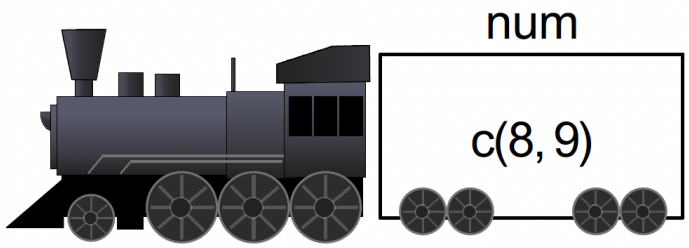
One R Tip a Day
@RLangTip

If the #rstats list "x" is a train carrying objects, then x[[5]] is the object in car 5; x[4:6] is a train of cars 4-6. bit.ly/p6epvV

7:32 AM · Nov 13, 2012 · TweetDeck

Accessing objects and members/items of a list






```
lst["num"]
```

```
lst[["num"]]
```

c(8, 9)

```
lst$num
```

c(8, 9)

What we did

- create using `list()` function
- Access list objects, item/member
  - `[[ ]]` or `$`
    - pull out a single object of the list using index or name.
    - can't be used for extracting multiple objects
    - for list x: x[[y]] or x$y
  - `[ ]`
    - returns members/items in the list
    - returns a list
    - can be used for extracting multiple members in the list
    - `mylist[2:4]`
- Assigning new values to list objects
- working with lists

Data frames

- natural way of representing a data set.
  - data is in rows(observations of the data set) and columns (variables of the data set)
  - each column is a vector (could be a factor for categorical data)
  - all columns are of same length
  - each column can be of a different type

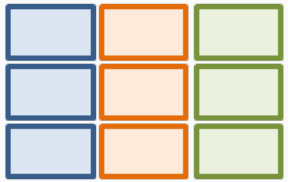
Vector

- 1 column or row of data
- 1 type (numeric or text)

Matrix

- multiple columns and/or rows of data
- 1 type (numeric or text)

Data Frame



- multiple columns and/or rows of data
- multiple types

Creating, extracting, assigning

- `data.frame()`
- `[ , ] , $`
- `<-`
- other functions

Special values in R

- Inf : Infinity

```
100/0
```

```
## [1] Inf
```

- NaN : Not a number

```
Inf - Inf
```

```
## [1] NaN
```

- NA : Not applicable (`is.na()`, `na.rm()`)

```
a_vec <- c("a", 1, NA, 2, "cat", NA, 100)
a_vec
```

```
## [1] "a"   "1"   NA    "2"   "cat" NA    "100"
```

```
is.na(a_vec)
```

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

```r
any(is.na(a_vec))
```

```
## [1] TRUE
```

```r
any(a_vec == 2 )
```

```
## [1] TRUE
```

```r
which(a_vec == 2)
```

```
## [1] 4
```

```r
all(is.na(a_vec ))
```

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

```r
b <- seq(-5 , 5, 1)
b
```

```
##  [1] -5 -4 -3 -2 -1  0  1  2  3  4  5
```

```r
all(b > 2)
```

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

```r
any(b > 2)
```

```
## [1] TRUE
```

```r
which(b > 2 )
```

```
## [1]  9 10 11
```

```r
b[b>2]
```

```
## [1] 3 4 5
```

- NULL : an empty entity

```
x <- c()
x
```

```
## NULL
```

```
is.null(x)
```

```
## [1] TRUE
```

questions you should be able to answer

- What are the different data types in R?
- What are the different data structures in R?
  - Which data structures require elements to be of same data type and which allow for elements of different data types?
- How do I create, access(retrieve, subset), update data within the various data structures?
- What functions are available to work with the different data structures?

Post-Lecture To DO

1. Review the lecture again
2. Write down a summary of today's lecture. Include all functions we went over and a short description of what each function does.

You will be asked to do this to your homework.

Summary:

- Factors (Textbook Chapter 4)
- Logical values (Textbook Chapter 4)

Even More data structures

- Lists and Data frames (Textbook Chapter 5)
- Special values (Textbook Chapter 6)

Maintain a glossary of functions used.

Learning Programming is HARD!

E. Kale Edmiston PhD
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A friend/colleague who is an excellent programmer offhandedly told me the other day that coding is 90% googling error messages & 10% writing code. Until this point, I thought that all the time I spent googling error messages meant I was bad at coding. What a perspective change!

8:12 AM - 4 Jan 2019

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