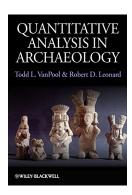
Coding in R

Reflection on the last week

Tidy data principles

Readings



Objectives

Today's goals...

- Notion of functions vs. objects.
- Intro on R data types (ie. what types of things are there).
- Intro on R types of objects (ie. how things are represented).
- Subsetting data frames.
- Reading data into R.

R is a smart calculator...

2 + 40		
[1] 42		
5^2		
[1] 25		
round(6.48 ²)		
[1] 42		
5 < 10		
[1] TRUE		
sqrt(1764)		
[1] 42		
8 * 10^10		
[1] 8e+10		
x <- 1		
x		
[1] 1		
y <- 41		
x + y		
[1] 42		

```
x > y
[1] FALSE
z \leftarrow x - y
[1] -40
(x + y)^2
[1] 1764
Functions and objects
Objects
   • Anything is an object.
   • Objects contain data (etc.)
   • Objects have names.
   • You choose the names.
   • Name your objects wisely.
x <- 1
X
[1] 1
рi
[1] 3.141593
pi + 1
[1] 4.141593
\leftarrow is an assignment operator
(use Alt + - in RStudio to write it).
```

Functions

- End with parentheses function(arguments).
- Arguments go in the parentheses.
- ullet Functions ${f do}$ something with the inputs you give them.

```
sqrt(x = 1764)

[1] 42

args(sqrt)

function (x)
NULL

round(pi)

[1] 3

args(round)

function (x, digits = 0)
NULL

round(pi, digits = 2)
```

[1] 3.14

Types of objects

Vector

- Basic data structure.
- Contains single data type.
- Created using function c() (combine, concatenate)

```
c("Fuu", "Bar")
[1] "Fuu" "Bar"
x \leftarrow c(1, 3, 5, 8)
[1] 1 3 5 8
x^2
[1] 1 9 25 64
is.vector(x)
[1] TRUE
x >= 4
[1] FALSE FALSE TRUE TRUE
length(x)
[1] 4
```

Types of objects

Data frame & tibble

- A table.
- Has rows and columns.
- Rectangular, ie. identical number of rows in each column.

dfr

```
x y z w
1 95 a TRUE 4.2
2 96 b FALSE 4.4
3 97 c FALSE 4.6
4 98 d TRUE 4.8
```

is.data.frame(dfr)

[1] TRUE

ncol(dfr)

[1] 4

nrow(dfr)

[1] 4

head(dfr, n = 2)

```
x y z w
1 95 a TRUE 4.2
2 96 b FALSE 4.4
```

Subsetting

• \$ operator returns a single column.

colnames(dfr)

```
[1] "x" "y" "z" "w"
```

dfr\$x

[1] 95 96 97 98

```
dfr$y
[1] "a" "b" "c" "d"
dfr$z
[1] TRUE FALSE FALSE TRUE
dfr$w / 2
[1] 2.1 2.2 2.3 2.4
dfr$x - dfr$w
[1] 90.8 91.6 92.4 93.2
str(dfr)
'data.frame': 4 obs. of 4 variables:
$ x: int 95 96 97 98
$ y: chr "a" "b" "c" "d"
$ z: logi TRUE FALSE FALSE TRUE
$ w: num 4.2 4.4 4.6 4.8
```

Data types

str(dfr)

```
'data.frame': 4 obs. of 4 variables:
$ x: int 95 96 97 98
$ y: chr "a" "b" "c" "d"
$ z: logi TRUE FALSE FALSE TRUE
$ w: num 4.2 4.4 4.6 4.8
```

Text strings

- Character data type, abbreviated as *chr*.
- Written in quotation marks (double or single).

```
"I am a string."
```

[1] "I am a string."

```
x <- 'I am also a string'
is.character(x)</pre>
```

- [1] TRUE
 - Functions with is. prefix: is.numeric(), is.double() etc.

Numbers

- Integers (whole numbers)
- **Doubles** (decimal numbers)
- Numeric (class for all numbers in general)

dfr\$x

[1] 95 96 97 98

```
is.numeric(dfr$x)
```

[1] TRUE

```
dfr$x + dfr$w
```

[1] 99.2 100.4 101.6 102.8

```
mean(dfr$x)
```

[1] 96.5

Data types

Dichotomies

- Logical data type.
- Binary/boolean values.
- As TRUE and FALSE in R.

Special values

- Missing values as NA, ie. not available.
- Inf and -Inf for infinities.
- NULL for an object of a zero length.

Reading data in CSV into R

Comma separated values (CSV)

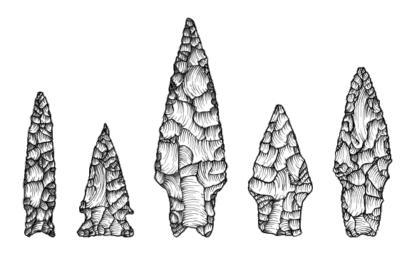
- Plain-text document.
- Practical **exchange** and **preservation** format for data sets.
- Most open and commercial softwares will allow export in CSV.
- Americas: separated by commas (,), period (.) as a decimal mark.
- Europe: separated by semicolon (;), comma (,) as a decimal mark.

Reading CSV into R

```
Comma separated:
read.csv(file = "path")
Semicolon separated:
read.csv2(file = "path")
Other delimiter:
read.table(file = "path", sep = "separator")
```

Practice

Dart points



 $Adapted\ from\ Carlson\ 2011$

Dart points

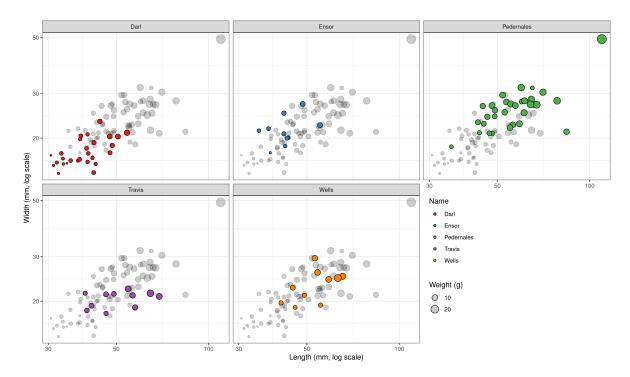


Figure 1: Scatter plot of dart points

Measurements on five types of dart points from Fort Hood in central Texas (Darl, Ensor, Pedernales, Travis, and Wells). The points were recovered during 10 different pedestrian survey projects during the 1980's and were classified and measured by H. Blaine Ensor...

Exercise

- 1. Download the dataset dartpoints.csv
- 2. Explore the dataset using spreadsheet editor
- 3. Save the dataset somwhere you can find it
- 4. Start **RStudio**
- 5. Create a script (Ctrl + Shift + n)
- 6. Read the dataset from the path where you saved it
- 7. Save it as darts object
- 8. What kinf of an object is it?
- 9. How many rows and columns does it have?

- 10. What columns does it have?
- 11. What data types are there? What is the structure?
- 12. Read details about the dataset using ?archdata::DartPoints Hints: read.csv(), ncol() and nrow(), str(), colnames()

Solution

```
url <- "https://petrpajdla.github.io/stat4arch/lect/w02/data/dartpoints.csv"
file.download(url)
darts <- read.csv("dartpoints.csv")
class(darts)
dim(darts)
nrow(darts)
ncol(darts)
colnames(darts)
head(darts)
str(darts)</pre>
```

Assignments

• Go through **R** Basics tutorials here.