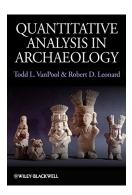
Coding in R

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 <- c(1, 3, 5, 8)
x

[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)

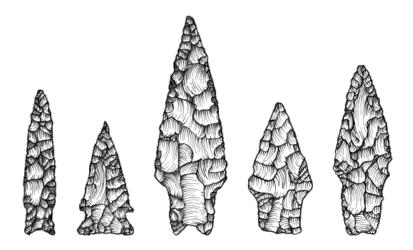
- Plain-text document.
- Practical **exchange** and **preservation** format for data sets.
- Most open and commercial softwares will allow export in CSV.
- Americas: separated by commas (,), period (.) as a decimal mark.
- Europe: separated by semicolon (;), comma (,) as a decimal mark.

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

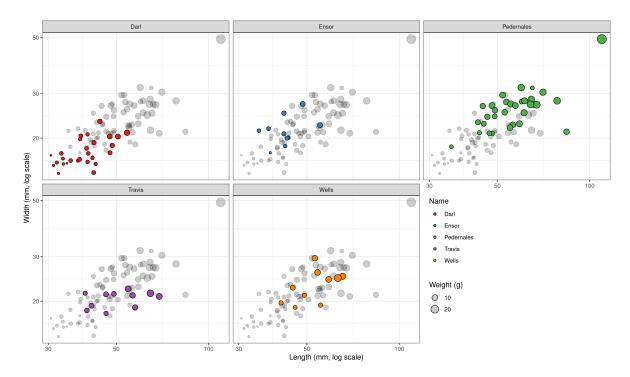


Figure 1: Scatter plot of dart points

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 kind 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"
download.file(url, "./dartpoints.csv")
darts <- read.csv("./dartpoints.csv")
class(darts)
dim(darts)
nrow(darts)
ncol(darts)
colnames(darts)
head(darts)
str(darts)</pre>
```