Problems Sheet 00 / Statistics 1 / TB 2 2017-2018

CA

Aim

- To become familiar with R Notebook.
- To learn how to implement statistical methods in R
- This is a template which shows you how to use knitr to prepare your answers to the homework R questions. Just replace the code and comments with your own
- Additional (and some more advanced) information is provided at the end of this file

It is a good idea to indicate which question you are answering

Q1

Q2 part (a)

First we load the course dataset and try the functions sort and stem

```
# INSERT YOUR CODE HERE ...

load(url("https://people.maths.bris.ac.uk/~maxca/stats1/stats1.RData"))
sort(quakes)
```

```
##  [1]    9   30   33   36   38   40   40   44   46   76   82   83   92   99
## [15]  121  129  139  145  150  157  194  203  209  220  246  263  280  294
## [29]  304  319  328  335  365  375  384  402  434  436  454  460  556  562
## [43]  567  584  599  638  667  695  710  721  735  736  759  780  832  840
## [57]  887  937 1336 1354 1617 1901
```

```
stem(quakes)
```

```
##
##   The decimal point is 2 digit(s) to the right of the |
##
##    0 | 133444445888902345569
##    2 | 01256890234788
##    4 | 034566678
##    6 | 0470124468
##    8 | 3494
##   10 |
##   12 | 45
##   14 |
##   16 | 2
##   18 | 0
```

- WRITE DOWN YOUR COMMENTS HERE...

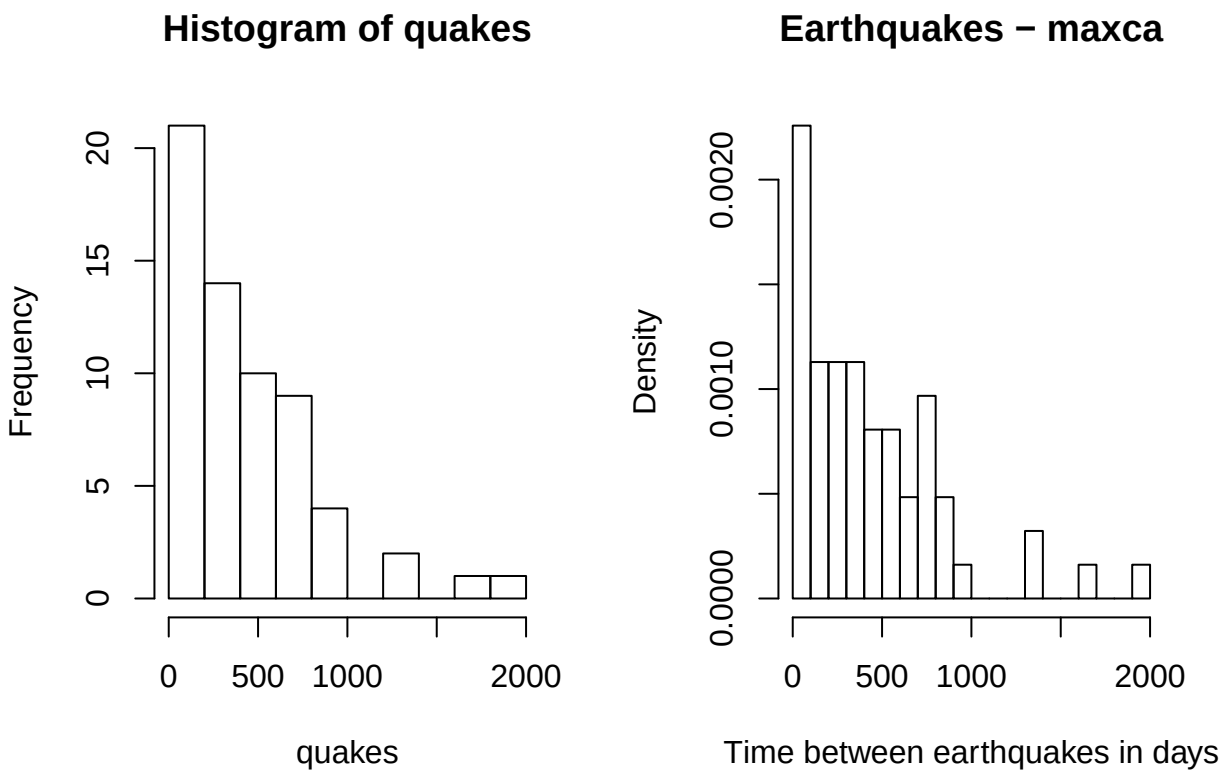
All fine up to here. As you can see the document produced after "knitting" this file contains your code, followed by the output produced by this code.

Now we answer the next question

Q2 part (b)

We follow what was suggested in the lecture notes in order to produce a histogram of the data

```
# INSERT YOUR CODE HERE ...
par(mfrow=c(1,2))
hist(quakes)
hist(quakes, breaks=seq(0,2000,100), freq=FALSE,
xlab="Time between earthquakes in days",
main="Earthquakes - maxca")
```



- WRITE DOWN YOUR COMMENTS HERE...

Q2 part (c)

Additional information about R Markdown Notebook–can be ignored initially

R Markdown Notebook allows us to create documents that contain explanatory text, mathematical equations, live code, and visualizations. It produces fully interactive documents that allow the readers to change the parameters underlying the analysis, and see the results immediately. It promises to provide an easy way

to produce (interactive) statistical reports that include data analysis, code, and results. For instance, the Applets used in the lectures were produced by using this software.

Creating documents with R Markdown Notebook, requires the user to create a .Rmd (script) file that contains a combination of Markdown code (that produced the explanatory text) and R code chunks (that produce plots, and data analysis outputs). Then the .Rmd file is processed automatically by the software in order to generate a document in a format such as: HTML (web page), PDF, MS Word document, slide show, handout, book, dashboard, package vignette, etc.

In this practical, we will not go into details about Markdown coding, although it has a simple syntax. We recommend the interested student to read the nice cheat-sheet available from [here].

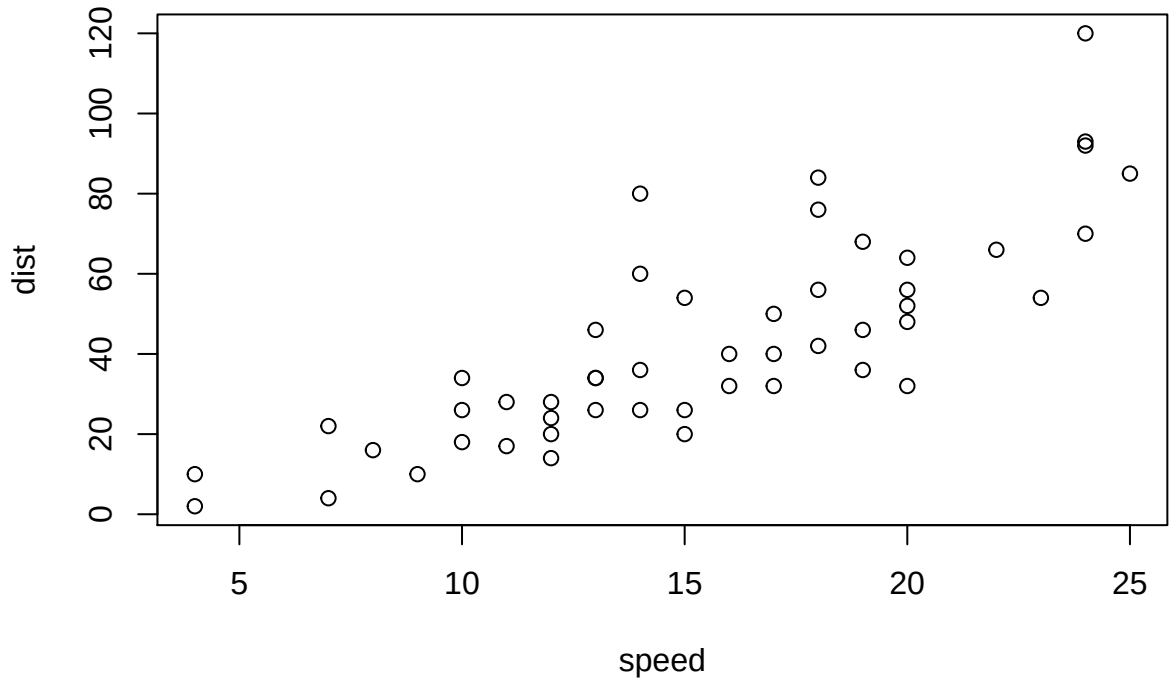
An R Notebook demo:

In what follows, we provide a simple demo to help you familiarise yourselves with the R Markdown Notebook environment.

This is an R Markdown Notebook. When you execute code within the Notebook, the results appear beneath the code.

Try executing this chunk by clicking the *Run* (the gren triangle) button within the chunk or by placing your cursor inside it and pressing *Ctrl+Shift+Enter* (Windows) of *Cmd+Shift+Enter* (MacOS)

```
summary(cars)
##      speed           dist
##  Min.   : 4.0   Min.   :  2.00
##  1st Qu.:12.0   1st Qu.: 26.00
##  Median :15.0   Median : 36.00
##  Mean   :15.4   Mean   : 42.98
##  3rd Qu.:19.0   3rd Qu.: 56.00
##  Max.   :25.0   Max.   :120.00
plot(cars)
```



The user can specify how the chunk will be executed, or how its output will be presented, by setting the appropriate flags inside {r, ...}. If time permits, use the following flags in the previous chunck. What is their effect?

- eval: (TRUE; logical) whether to evaluate the code chunk; it can also be a numeric vector to select which R expression(s) to evaluate, e.g. eval=c(1, 3, 4) or eval=-(4:5)
- echo: (TRUE; logical or numeric) whether to include R source code in the output file. Besides TRUE/FALSE which completely turns on/off the source code, we can also use a numeric vector to select which R expression(s) to echo in a chunk, e.g. echo=2:3 means only echo the 2nd and 3rd expressions, and echo=-4 means to exclude the 4th expression.

- results: ('markup'; character) takes these values
  - hold: hold all the output pieces and push them to the end of a chunk
  - hide: hide results; this option only applies to normal R output (not warnings, messages or errors)
  - markup: mark up the results using the output hook, e.g. put results in a special LaTeX environment.
- collapse: (FALSE; logical; applies to Markdown output only) whether to, if possible, collapse all the source and output blocks from one code chunk into a single block (by default, they are written to separate blocks)

More options can be found at https://yihui.name/knitr/options/.

You can use inline R code as inside a sentence. For example you can say that the average speed of the car is 15.4, with standard error 0.1057529. Now see the output document.

Do the following:

1. Add a new chunk by clicking the *Insert Chunk* button on the toolbar or by pressing *Ctrl+Alt+I* (Windows), *Cmd+Alt+I* (macOS).

2. Write a simple R command inside this chunk, just to experiment; E.g. write down hist(cars$speed).
3. Run this R chunk as described earlier.

Produce the document:

The document will be saved in the working directory.

- To produce and save the document as a Notebook: click the *Preview* button (or *Knit* button) or press *Ctrl+Shift+K* to preview the HTML file.
  - When you save the notebook, an HTML file containing the code and output will be saved alongside it.
- To produce and save the document in HTML, PDF or MS Word formats: select the option *Knit to HTML* (or PDF, or Word) available in the menu that appears when you click the little black arrow next to the *Preview* button (or *Knit* button).
  - This will produce the document in more standard / less functional formats.

Save me

Generate the document as a Notebook, PDF, Word, or HTML by choosing the relevant option (from the pop-up menu next to the Preview button). Then save your Markdown code by choosing the relevant option (from the task bar menu).

Save the *.Rmd script, so that you can edit it later.