

# An R Markdown template

An RMarkdown that does lots of stuff!

Tiago A. Marques

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## Introduction

This document was created as a gentle introduction to the use of RMarkdown for generating dynamic reports, embedded in a paradigm of reproducible research. For easier use one assumes that R Studio is being used.

The document was created by Tiago A. Marques and it's intended use is to be shared with others, providing them a quick learning experience of some fundamental tips and tricks of things one often wants to do in a dynamic report by having an example template.

By knitting this template one can see how the different features of RMarkdown are set up.

If you use this template drop me a line at [tiago.marques@st-andrews.ac.uk](mailto:tiago.marques@st-andrews.ac.uk). If you have any suggestions, please keep them coming.

## Basic RMarkdown tricks

First, we load the `knitr` package that can be of help:

```
library(knitr)
```

## Finding help online

There are so many resources online that it is hard to list just a few, but just in case:

- An RStudio course on RMarkdown is here: <https://rmarkdown.rstudio.com/lesson-1.html>

At the corresponding RMarkdown cheat sheets are here:

- Here is the [link](#)

As you can see, these are two different ways of providing links in RMarkdown!

## It is dynamic

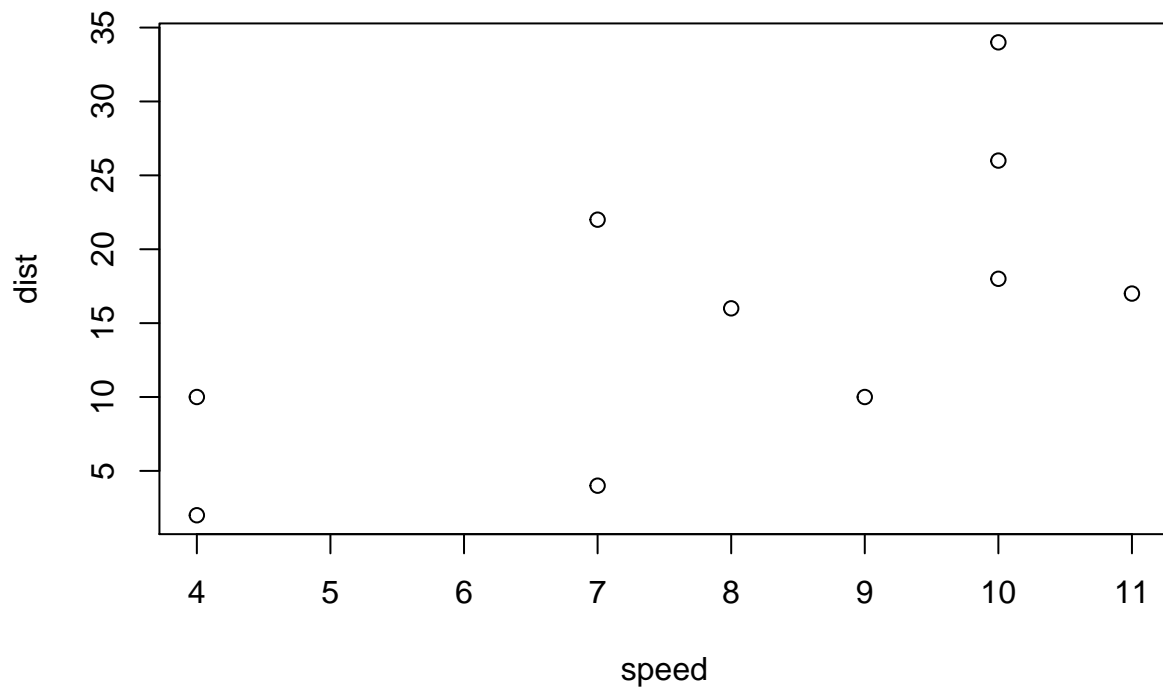
To get us going we first generate two datasets in this folder, using an existing R data set.

```
write.table(file="cars1to10.txt", cars[1:10,])  
write.table(file="cars11to20.txt", cars[11:20,])
```

This allows us to confirm that the exact same code will produce different dynamic results, as a consequence of changing the data we are using.

The plot below will use the object `mydata` to make a plot.

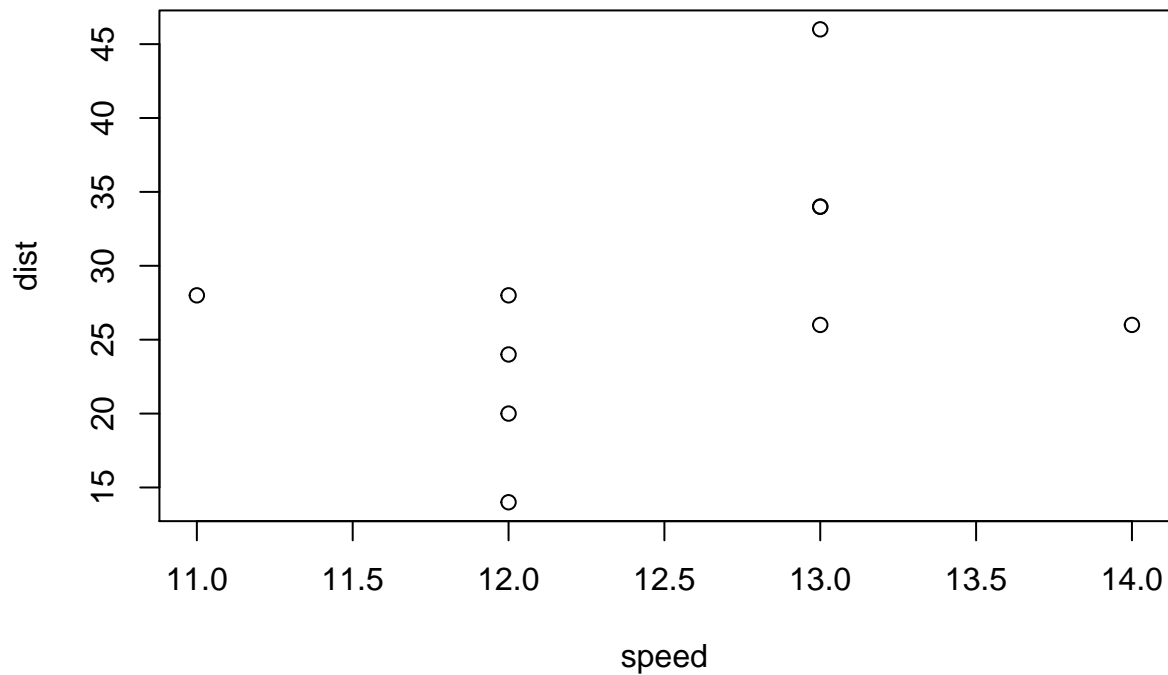
```
mydata <- read.table(file="cars1to10.txt")  
plot(mydata)
```



The maximum value for `speed` in this file is 11. Note this is a dynamic value, we have not really written that number in the `.Rmd` text. Check the `.Rmd` to see how that is done,

Now, if after a while your collaborator sends you a new data set, in the non-reproducible research world you would have to repeat it all. Not here. You just have to read the new data in and the exact same code can be used, now producing different results.

```
mydata <- read.table(file="cars11to20.txt")
plot(mydata)
```



The maximum value for `speed` in this file is now 14. Dynamic values rock!

## Hyde and seek

We might want to show code and then the output of it

```
a <- 3
b <- 4
a+b
```

```
## [1] 7
```

but we might also just want to show code and no output

```
a <- 3
b <- 4
a+b
```

or vice versa, just the output

```
## [1] 7
```

Note there are many such parameters that you can tweak in the code chunk headers, and you can find them in the cheat sheet I provided a link above for.

## Adding References

One of the big dramas of large reports and thesis are generating references, properly formatted.

That is straightforward in RMarkdown. This template shows you a way to do so, but you might consider exploring other alternatives.

You need a file that contains the references (a bib file) and optionally a file that formats the references (I provide the mee.cls as an example). So here we use:

- biblio.bib
- mee.cls

Then, each time you want to cite a reference, you need to have it in the .bib file. For that I recommend using JABREF (<https://www.jabref.org/>), but any reference manager that can generate bibtex files will do. Each reference has associated with it a “BibtexKey”. Then you just use that with an “@” in front to cite that reference.

As an example, here is a citation, a great resource for GLMs is Faraway (2006), and a good introduction to GAMs is Wood (2006). Ecological regression examples can be found in Zuur *et al.* (2009).

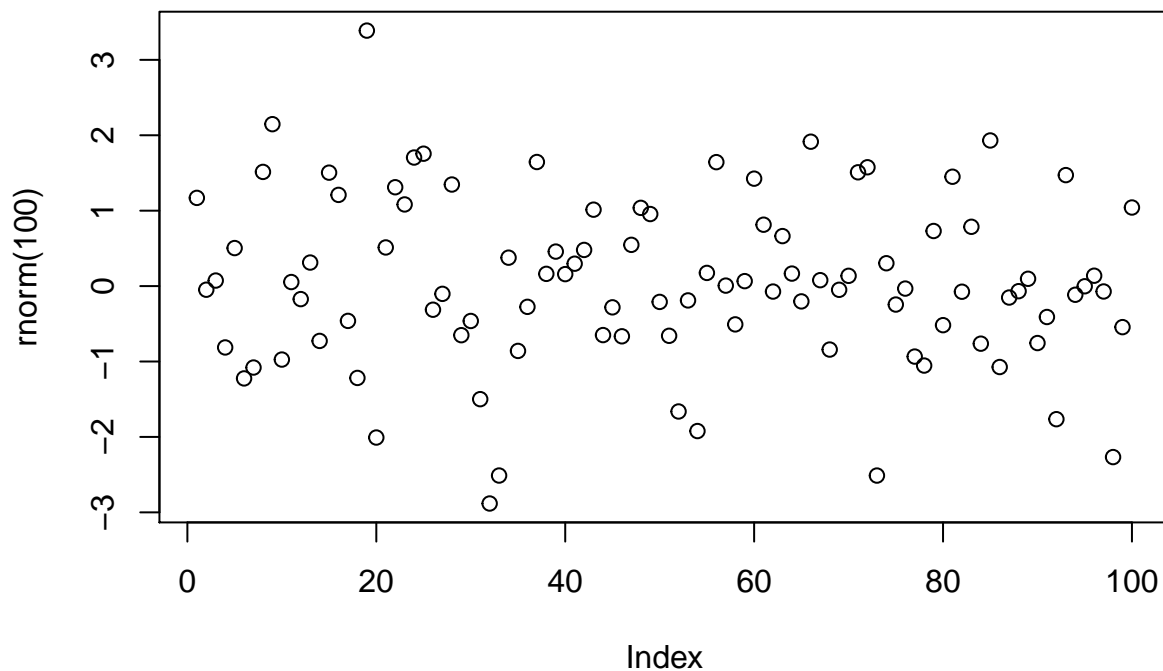
As you will see, these references will be present at the end of the document, in a suitably named sections (I used “References”).

Note that if there are funny characters in the .bib file you might face compiling problems!

## Figures and Tables

As you have seen above, we can include figures easily as outputs from R

```
plot(rnorm(100))
```



However, we can actually include external images easily:

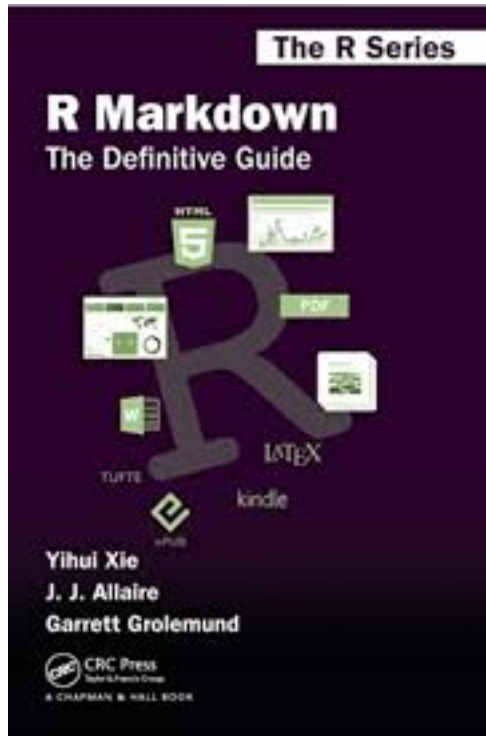


Figure 1: A legend if needed, here, an RMarkdown book!

also, if you want to include a table, you might use the `kable` fuction to format it

```
kable(cars,caption="A table with the dataset cars")
```

Table 1: A table with the dataset cars

speed	dist
4	2
4	10
7	4
7	22
8	16
9	10
10	18
10	26
10	34
11	17
11	28
12	14
12	20
12	24
12	28
13	26
13	34
13	34
13	46
14	26
14	36

speed	dist
14	60
14	80
15	20
15	26
15	54
16	32
16	40
17	32
17	40
17	50
18	42
18	56
18	76
18	84
19	36
19	46
19	68
20	32
20	48
20	52
20	56
20	64
22	66
23	54
24	70
24	92
24	93
24	120
25	85

There are much fancier table types, and additional packages for table formatting. Take a peak e.g. here:  
<https://rfortherestofus.com/2019/11/how-to-make-beautiful-tables-in-r/>

## About output format

This template can be knitted into an html, a pdf or word document.

For pdfs you might need additional software installed like a Latex system.

We are currently it is optimized for html, so it might require minor tweaking for rendering pdf and word with optimal format. As an example of minor formatting differences depending on the compiling considered, in the pdf the date of compilation is outputted by default in the header, while that does not happen in the html.

The header of an .Rmd file contains yaml that allows one to control the document. There are many many features that you can costumize.

Just as an example, try to add a line that says `code_folding: hide` and then try `code_folding: show`, so go from this

to this

and then compare what happens to the code in the html.

```

1 ---
2 title: "An R Markdown template"
3 author: "Tiago A. Marques"
4 date: \today
5 output:
6   html_document:
7     fig_caption: yes
8     force_captions: yes
9     highlight: pygments
10    number_sections: yes
11    theme: cerulean
12    toc: yes
13    toc_depth: 3
14    toc_float: yes
15  word_document:
16    toc: yes
17    toc_depth: '3'
18  pdf_document:
19    toc: yes
20    toc_depth: '3'
21 csl: mee.csl
22 subtitle: An RMarkdown that does lots of stuff!
23 bibliography: biblio.bib
24 urlcolor: blue
25 ---
26
27 *****
28
29 *****
30
31
32 \newpage
33
34 # Introduction
35
36 This document was created as a gentle introduction to the use of RMarkdown

```

Figure 2: Header without code folding!



```

1- ---
2 title: "An R Markdown template"
3 author: "Tiago A. Marques"
4 date: \today
5 output:
6   html_document:
7     code_folding: hide
8     fig_caption: yes
9     force_captions: yes
10    highlight: pygments
11    number_sections: yes
12    theme: cerulean
13    toc: yes
14    toc_depth: 3
15    toc_float: yes
16  word_document:
17    toc: yes
18    toc_depth: '3'
19  pdf_document:
20    toc: yes
21    toc_depth: '3'
22 csl: mee.csl
23 subtitle: An RMarkdown that does lots of stuff!
24 bibliography: biblio.bib
25 urlcolor: blue
26 ---
27
28 *****
29
30 *****
31
32
33 \newpage
34
35- # Introduction
36
37 This document was created as a gentle introduction to the use of RMarkdown

```

Figure 3: Header with code folding!

Note that you can control the output of each of the html, pdf and word documents separately, by changing arguments under the sub-headings under the `output:` heading, `html_document`, `word_document` and `pdf_document`, respectively.

## Contributors

Many folks have provided inputs and requests that have improved this document.

If you have sent me inputs your name should be listed here. If it is not, please complain!

## References

Faraway, J.J. (2006). *Extending the linear model with r*. Chapman & Hall / CRC.

Wood, S.N. (2006). *Generalized additive models: An introduction with r*. CRC/Chapman & Hall.

Zuur, A.F., Ieno, E.N., Walker, N., Saveliev, A.A. & Smith, G.M. (2009). *Mixed effects models and extensions in ecology with r*. Springer.