

Reproducible Research – practical

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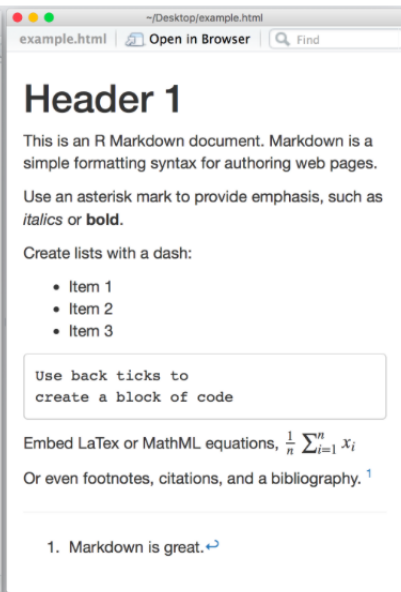
RMarkdown



Markdown is a simple formatting language designed to make authoring content easy for everyone. Rather than write in complex markup code (e.g. HTML or LaTeX), you write in plain text

Markdown

```
example.Rmd x
1 # Header 1
2
3 This is an R Markdown document. Markdown is a
4 simple formatting syntax for authoring webpages.
5
6 Use an asterisk mark to provide emphasis, such
7 as *italics* or **bold**.
8
9 Create lists with a dash:
10
11 - Item 1
12 - Item 2
13 - Item 3
14
15 Use back ticks to
16 create a block of code
17
18 Embed LaTeX or MathML equations,
19  $\frac{1}{n} \sum_{i=1}^n x_i$ 
20
21 Or even footnotes, citations, and a
22 bibliography. [^1]
23
24 [^1]: Markdown is great.
```



- Header
- Text
- Inline R code
- Code chunks

Header

- R Markdown documents can contain a metadata section that includes title, author, and date information
- As well as options for customizing output

```
---  
title: "Wheat infected by Xanthomonas protein analysis"  
author: "University of Insubria - Dept. of Biotechnology and Life Science"  
output:  
  pdf_document:  
    includes:  
      in_header: header.tex  
  number_sections: yes  
  toc: yes  
  toc_depth: 4  
  fig_caption: true  
  fig_width: 10  
  fig_height: 8  
---
```

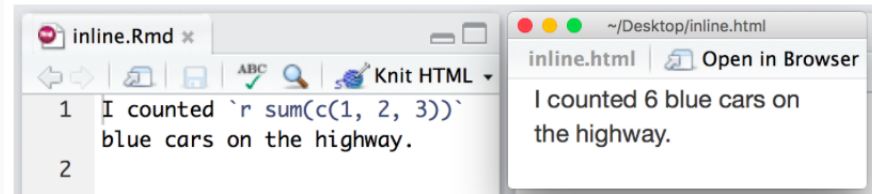
Text

- Text can be added to comment you code
- Text can be added to comment your outputs

```
\section{Root protein analysis}  
Analysis of proteins identified in wheat control samples vs wheat samples infected with \textit{Xanthomonas}   
The analysis has been conducted in parallel for roots and leaves. Samples have been collected   
\textit{Xanthomonas} inoculation. Each replicate is a pool of 2 plants.
```

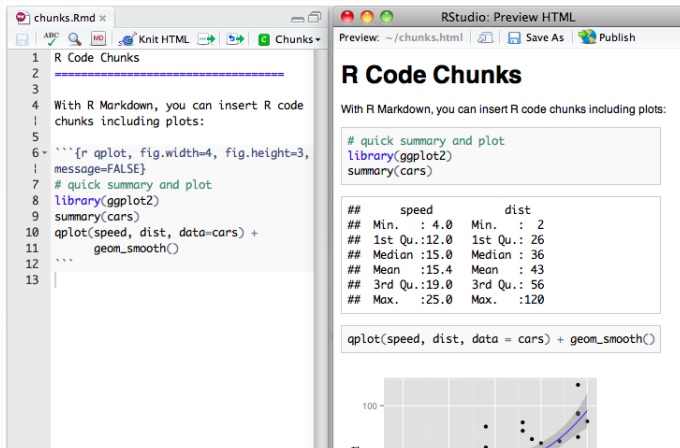
Inline R code

- R expressions can be evaluated inline
- Enclosing the expression within a single back-tick qualified with r.



R chunk

- R Code Chunks can be embedded with the native Markdown syntax for fenced code regions



The screenshot displays the RStudio interface with two windows. The left window, titled 'chunks.Rmd', shows an R Markdown document with the following content:

```
1 R Code Chunks
2 =====
3
4 With R Markdown, you can insert R code
5 chunks including plots:
6
7 ```{r qplot, fig.width=4, fig.height=3,
8   message=FALSE}
9 # quick summary and plot
10 library(ggplot2)
11 summary(cars)
12 qplot(speed, dist, data=cars) +
13   geom_smooth()
```

The right window, titled 'RStudio: Preview HTML', shows the rendered HTML output. It includes the title 'R Code Chunks', a paragraph explaining R code chunks, a code block for a quick summary and plot, a table of summary statistics for the 'cars' dataset, and a plot command.

R Code Chunks

With R Markdown, you can insert R code chunks including plots:

```
# quick summary and plot
library(ggplot2)
summary(cars)
```

##	speed	dist
## Min.	: 4.0	Min. : 2
## 1st Qu.	:12.0	1st Qu.: 26
## Median	:15.0	Median : 36
## Mean	:15.4	Mean : 43
## 3rd Qu.	:19.0	3rd Qu.: 56
## Max.	:25.0	Max. :120

```
qplot(speed, dist, data = cars) + geom_smooth()
```

The plot at the bottom shows a scatter plot of distance versus speed for the 'cars' dataset, with a blue smoothed regression line.

R chunk options [few of them]

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- **source code**: use chunk option 'echo', e.g. `echo=FALSE` hides the R code
- **normal text output**: use option `results` ('markup' marks up the results; 'asis' return texts as-is; 'hide' hides the results)
- **messages**: option `message` ('FALSE' hides messages in the output)

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- **errors**: option error ('FALSE' will make R stop if an error occurs; 'TRUE' will show the error messages in the output)
- **plots**: option 'fig.keep' ('none' discards all plots; 'all' for all plots including low-level plots; 'high' for high-level plots)

Exercise 1

GOAL: CREATE A DEFAULT MINIMAL DOCUMENT

- Open RStudio

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- Open RStudio
- Select File > New file > R Markdown

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GOAL: CREATE A DEFAULT MINIMAL DOCUMENT

- Open RStudio
- Select File > New file > R Markdown
- Create an HTML document

Exercise 1

Untitled1 *
Untitled.Rmd

Run Knit HTML Chunks

```
1- ---
2 title: "Untitled"
3 author: "Marco Chiapello"
4 date: "11 June 2016"
5 output: html_document
6- ---
7
8 This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word
9 documents. For more details on using R Markdown see <http://rmarkdown.rstudio.com>.
10
11 When you click the Knit button a document will be generated that includes both content as well as the
12 output of any embedded R code chunks within the document. You can embed an R code chunk like this:
13
14 ```{r}
15 summary(cars)
16 ```
17
18 You can also embed plots, for example:
19
20 ```{r, echo=FALSE}
21 plot(cars)
22 ```
23
24 Note that the 'echo = FALSE' parameter was added to the code chunk to prevent printing of the R code that
25 generated the plot.
```

Viewer

Untitled

Marco Chiapello

11 June 2016

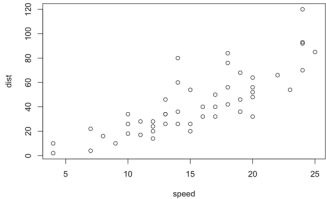
This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents. For more details on using R Markdown see <http://rmarkdown.rstudio.com>.

When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:

summary(cars)

```
##      speed      dist
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##  Median :15.0   Median : 36.00
##  Mean   :15.4   Mean   : 42.98
##  3rd Qu.:19.0   3rd Qu.: 54.00
##  Max.   :25.0   Max.   :120.00
```

You can also embed plots, for example:



12

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- Suppress the printing of the R code

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- Open RStudio
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- Suppress the printing of the R code
- Suppress the printing of the R results

Exercise 1

GOAL: CREATE A DEFAULT MINIMAL DOCUMENT

- Open RStudio
- Select File > New file > R Markdown
- Create an HTML document
- Suppress the printing of the R code
- Suppress the printing of the R results
- Suppress the printing of the plot

Exercise 2

GOAL: CREATE A DEFAULT MINIMAL DOCUMENT

- Create a pdf document
- Create a docx document

Exercise 3

GOAL: CREATE A RMARKDOWN DOCUMENT

- Using the dataset4.csv
- Create a document containing analysis, plots and comments