An Introduction to R Markdown

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Overview

What is Markdown

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Markdown

And yet – another language

- Markdown is a lightweight markup language
- plain text formatting syntax designed
- it can be converted to HTML and many other formats
- it is very easy, so we will begin immediately

Configuration RStudio (for PDF)

- go to Tools
- then Global Options
- Sweave
- choose knitr for `Weave Rnw files using`
- press Apply and OK

The first R Markdown file

- in RStudio go to the New file menu
- choose R Markdown
- in the dialog box type a title and your name in the respective fields
- choose HTML
- choose Document from the list in the left-hand side
- press ok
- now save the file via the menu or clicking on the disc symbol

The First Page

- what you get is a little example Markdown document
- and you can produce a nice formatted html page by clicking on knit HTML

Change Output Format

- you can change the export format to word or pdf by clicking on the arrow next to knit HTML
- for producing PDFs you need a working LaTeXinstallation
- there are LaTeXdistributions for Windows, Linux and MacOS
- `http://latex-project.org/ftp.html`
- LaTeXis big, so the installation takes a while

The Example Document

If you have a look at the markdown in the example

- the header information are enclosed by ---

```
---
title: "My first markdown document"
author: "Mandy"
date: "22. August 2015"
output: word_document
---
```

The Example Document

If you have a look at the markdown in the example

- keywords: `title`, `author`, and `date`
- the output format is specified by `output` (automatically done by RStudio)
- for producing PDFs the dot contained in the date should be removed or escaped

```
---
title: "My first markdown document"
author: "Mandy"
date: "22 August 2015"
output: word_document
---
```

The Example Document

- in line 8 you see how to insert a link using angle brackets

```
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>.
```

Links

- similarly you can create links, e.g. the word `RStudio` with a link to the Rstudio website:

```
This service is provided
by [RStudio](https://www.rstudio.com/)
```

The Example Document

- one or two stars (or underscores) can be used to produce italics or bold like in the next line

  ```
  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:
  ```

The Example Document

- Try to add the following lines and rerun Knit HTML

```
*italics* or _italics_

**bold** or __bold__

superscript^2^

~~strike through~~
```

Code Chunks

- the next you see is

  ```
  ```{r}
  summary(cars)
  ```
  ```

- if you look in the produced html page you see that code as well as the result
- you can insert such chunks by typing

  ```
  ```{r}

  ```
  ```

  or by clicking Insert Chunks in the Code menu or the Chunks drop down in the upper right corner of the editor window
- or by typing `Ctrl+Alt+i`

Inline Code

- inline code is insert with a pair of single back tick:

```
The **cars** data frame contains `r nrow(cars)`
rows and `r ncol(cars)` columns.
```

Pander

- So. The result is OK, but not pretty.
- there is a R package called pander
- install the package
- and add the following lines to your Rmd file

````
```{r}
require(pander)
pander(summary(cars))
```
````

Pander

- the pander package contains mainly just one command: `pander()`
- `pander()` tries to format the output of R commands nicely for plotting

Pander

Exercise:

1. add a section to your Rmd file. You can do this using #

   ```
   # Linear Model
   ```

2. add a new code chunk to your Rmd file
3. use `lm()` to build a model of `dist` dependend on `speed` with the data from the `cars` data frame
4. use `summary()` and `pander()` to add the output to your document

Pander

- if you do not want to include the R code itself in your document add the option `echo = F` to the markdown file

````
```{r  echo = F}
m <- lm(dist ~ speed, data = cars)
pander(summary(m))
```
````

Hide R Output

- you can hide R code and results by using `results = 'hide'`

````
```{r  echo = F, results = 'hide'}
m <- lm(dist ~ speed, data = cars)
pander(summary(m))
```
````

- the output of messages, warnings and errors can be suppressed by
  - `message = F`
  - `warning = F` and
  - `error= F` respectively

Plots

Exercise: The next part of the examples contains a graphic

1. insert a section above the plot

   ```
   # Graphics
   ```

2. and a subsection

   ```
   ## using plot
   ```

3. now insert a new subsection and try to build the same plot using `ggplot()`
4. do not forget to load the package
5. for the scatter plot you need the `geom_point()`
6. add the line corresponding to the linear model (`geom_line()` and you have to specify the method!)

Plots

- you can change the width and height of the plot by using `fig.width` and `fig.width` (not supported for word export)
- `fig.align` can be used to change the alignment

````
```{r fig.align='center', fig.width=6}
require(ggplot2)
ggplot(cars,aes(x=speed, y=dist)) +
  geom_point() +
  geom_smooth(method = "lm")
```
````

Lists

- there are ordered and unordered lists

```
# Lists
## unordered list
* first item
* next item
    + sub-item
    + sub-item

## ordered list
1. first item
4. forgotten item
2. second item
2. third item
    + sub item
    + sub item
```

Tables

```
Table Header 1 | Table Header 2
---------------|-----------------
cell 1|cell 2
cell 3|cell 4
```

Images

```
![R logo](img/Rlogo.jpg)
```

Exercise

Create a new Rmarkdown document with the title Wood-boring beetle or something like this. We want to make a document containing some summary statistics and a logistic regression. The data set we wanna use is contained in the `asbio` package.

1. load the package and the data `beetle`
2. there is a pdf with the name woodboring.pdf. Try to reproduce it!
   - the first paragraph is taken from wikipedia (the link is contained in the document)
   - the second from the help page of the data set
   - use the Markdown Quick Reference in RStudio (via the Help menu)
   - `https://www.rstudio.com/wp-content/uploads/2015/02/rmarkdown-cheatsheet.pdf`
   - Find the error!