

Introduction to R: Session 05

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1 R markdown

R markdown (Allaire et al. [2021], Xie et al. [2018], Xie et al. [2020]) offers an environment to combine the analysis / manipulation / ... of data with an immediate production of a document in one step (all materials of this course were created with a variant of R markdown).

With a single R markdown file, you can:

- save an evaluate R code, and
- generate a report (article, presentation slides, ...) containing the results of the evaluation of the R code.

R markdown documents are completely reproducible and support a variety of static and dynamic output formats (docx, pdf, html, ...).

1.1 Structure

An R markdown file is essentially divided into three areas:

- Title:

```
---
title: "Estimating Potential for Late-Frost-Events in Goettingen"
author: "Holger Sennhenn-Reulen"
date: "June 26, 2024"
output: word_document
---
```

- R code 'chunks':

```
```{r}
summary(frost)
```
```

- and, embedded in between, text with (reduced) formatting:

This sentence will be given as ordinary text in the output document,
with words in *italics* or **bold**.

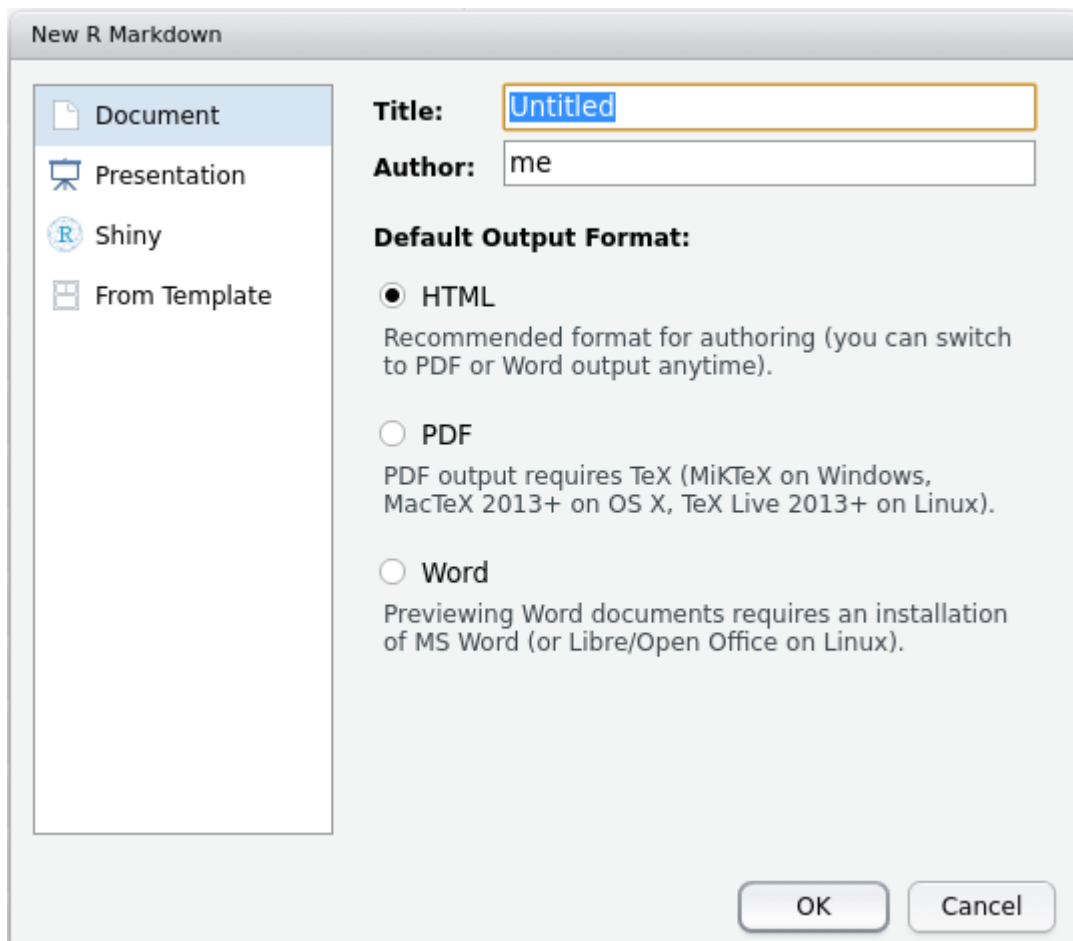
1.2 Installation

A connection to the internet is required for the following steps:

- Create a new folder `markdown files` in your favorite working directory.

| <u>F</u> ile | <u>E</u> dit | <u>C</u> ode | <u>V</u> iew | <u>P</u> lots | <u>S</u> ession | <u>B</u> uild |
|----------------------------------|--------------|--------------|--------------|---------------|-----------------|------------------|
| New <u>F</u> ile | | | | | | |
| New <u>P</u> roject... | | | | | | |
| <u>O</u> pen File... | | | | | | Ctrl+O |
| Reopen with <u>E</u> ncoding... | | | | | | |
| <u>R</u> ecent Files | | | | | | |
| Open <u>P</u> roject... | | | | | | |
| Open Project in New Session... | | | | | | |
| Recent Projects | | | | | | |
| <u>I</u> mport Dataset | | | | | | |
| <u>S</u> ave | | | | | | Ctrl+S |
| Save <u>A</u> s... | | | | | | |
| Save with <u>E</u> ncoding... | | | | | | |
| <u>S</u> ave All | | | | | | Ctrl+Alt+S |
| <u>K</u> nit Document | | | | | | Ctrl+Shift+K |
| <u>C</u> ompile Report... | | | | | | |
| <u>P</u> rint... | | | | | | |
| <u>C</u> lose | | | | | | Ctrl+W |
| C <u>l</u> ose All | | | | | | Ctrl+Shift+W |
| Close All <u>E</u> xcept Current | | | | | | Ctrl+Alt+Shift+W |
| Close <u>P</u> roject | | | | | | |
| <u>Q</u> uit Session... | | | | | | Ctrl+Q |

- Start RStudio and click on File → New File → R Markdown:
- After clicking on 'R Markdown' you will be asked whether you want to install some R packages . After confirmation, with subsequent installation, the following window should open:



The image shows a 'New R Markdown' dialog box. On the left is a sidebar with four options: 'Document' (selected), 'Presentation', 'Shiny', and 'From Template'. Each option has a small icon. To the right of the sidebar, there are two text input fields: 'Title:' with the text 'Untitled' and 'Author:' with the text 'me'. Below these fields is the 'Default Output Format:' section, which contains three radio button options: 'HTML' (selected), 'PDF', and 'Word'. Each option has a descriptive text block below it. The 'HTML' option is described as the recommended format for authoring. The 'PDF' option notes that it requires TeX (MiKTeX on Windows, MacTeX 2013+ on OS X, TeX Live 2013+ on Linux). The 'Word' option notes that previewing Word documents requires an installation of MS Word (or Libre/Open Office on Linux). At the bottom right of the dialog are 'OK' and 'Cancel' buttons.

New R Markdown

Document
Presentation
Shiny
From Template

Title: Untitled

Author: me

Default Output Format:

☒ **HTML**
Recommended format for authoring (you can switch to PDF or Word output anytime).

☐ **PDF**
PDF output requires TeX (MiKTeX on Windows, MacTeX 2013+ on OS X, TeX Live 2013+ on Linux).

☐ **Word**
Previewing Word documents requires an installation of MS Word (or Libre/Open Office on Linux).

OK Cancel

- Enter a title and your name and mark the selection 'Word'. Click on 'OK'.
- The following document is generated (in this example, the output is still set on the default

```

1 ▾ ---
2 |title: "Untitled"
3 author: "me"
4 date: "9 11 2021"
5 output: html_document
6 ---
7
8 ▾ ```{r setup, include=FALSE}
9 knitr::opts_chunk$set(echo = TRUE)
10 ```
11
12 ▾ ## R Markdown
13
14 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>.
15
16 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:
17
18 ▾ ```{r cars}
19 summary(cars)
20 ```
21
22 ▾ ## Including Plots
23
24 You can also embed plots, for example:
25
26 ▾ ```{r pressure, echo=FALSE}
27 plot(pressure)
28 ```
29
30 Note that the `echo = FALSE` parameter was added to the code chunk to prevent
    printing of the R code that generated the plot.
31

```

html_document):

- Save this file in the markdown files folder: The file has the extension .Rmd, for R-Markdown.
- Finally: click on the blue 'Knit' button.
- A Word / OpenOffice Writer file with R commands, graphics and results should open.

1.3 Links & misc

- Get started!
- R markdown cheat sheet
- R markdown reference guide
- Click Help → Markdown Quick Reference
- Include template file:

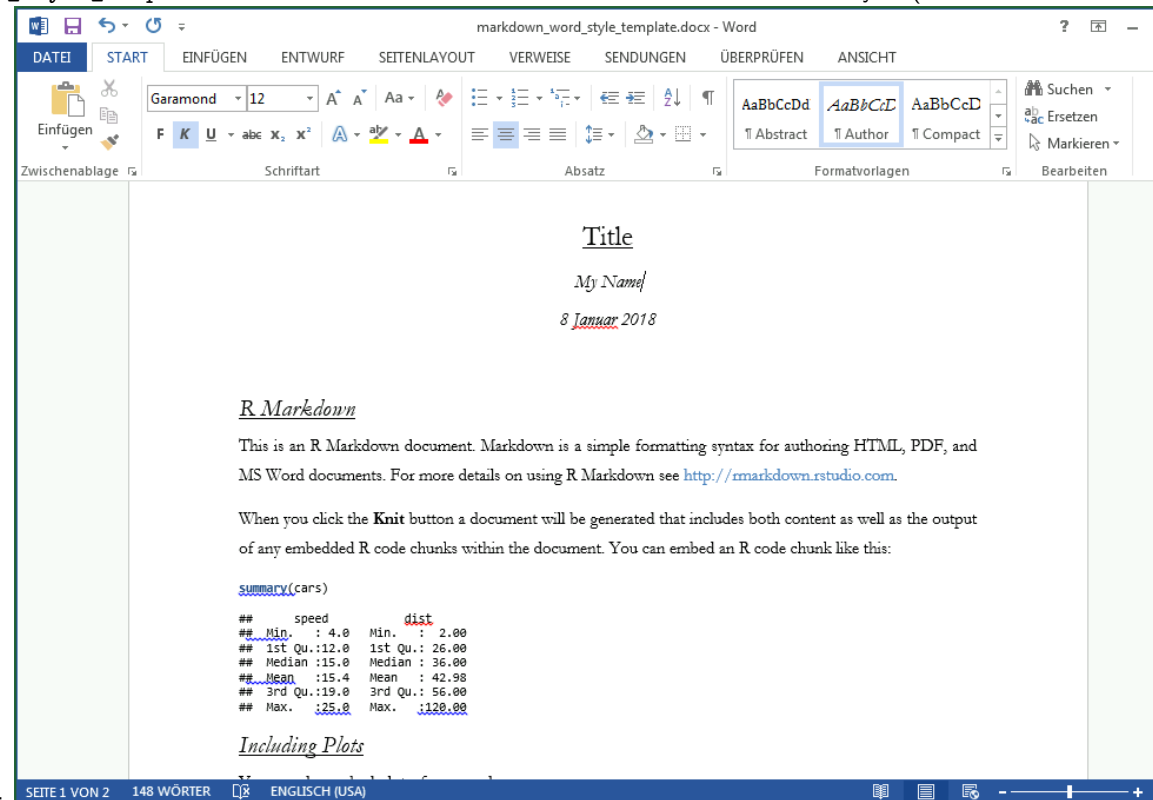
output:

```

word_document:
  highlight: null
  toc: yes
  reference_docx: markdown_word_style_template.docx
---

```

where `markdown_word_style_template.docx` is a file that stores built-in Microsoft Office Word styles (Ger-



man: *Formatvorlagen*):

2 Other topics

2.1 Citation

Give credit to package authors and maintainers by citing R packages:

```
citation("mgcv")
```

2.2 R-Code Structure

I usually use the following **six sections structure for applied statistics on real data**:

- *1st section*: Organize R session (Load packages, set working directory, ...)
- *2nd section*: Data management (Load data, manipulate and organize data, hold your global environment clean using `rm()`)
- *3rd section*: Descriptive analysis (Plots, plots, plots, ...)
- *4th section*: Statistical modelling
- *5th section*: Visualization (is better than tabulation) of results
- *6th section*: Show the outcome of `sessionInfo()`

Note: If this is your markdown structure, then whatever you show in section 5 is fully reproducible (given you don't make excessive use of `save` and `load`).

2.3 Dput

The R function `dput(...)` comes handy here and there:

```
dput(names(drought))
```

```
## c("bair", "elev", "species")
```

References

- JJ Allaire, Yihui Xie, Jonathan McPherson, Javier Luraschi, Kevin Ushey, Aron Atkins, Hadley Wickham, Joe Cheng, Winston Chang, and Richard Iannone. *rmarkdown: Dynamic Documents for R*, 2021. URL <https://github.com/rstudio/rmarkdown>. R package version 2.9.
- Yihui Xie, J.J. Allaire, and Garrett Golemund. *R Markdown: The Definitive Guide*. Chapman and Hall/CRC, Boca Raton, Florida, 2018. URL <https://bookdown.org/yihui/rmarkdown>. ISBN 9781138359338.
- Yihui Xie, Christophe Dervieux, and Emily Riederer. *R Markdown Cookbook*. Chapman and Hall/CRC, Boca Raton, Florida, 2020. URL <https://bookdown.org/yihui/rmarkdown-cookbook>. ISBN 9780367563837.