

Practical Session Instructions

Stefano De Sabbata

24 October 2018

Libraries

This practical session will make use of the “Tidyverse” libraries. If not already installed, please install Tidyverse before cloning the repository, using the command below or via the *Tools > Install Packages* menu in RStudio.

```
install.packages("tidyverse")
```

Markdown

The main tool used to create this reproducible lecture and practical on reproducibility is RMarkdown. That is an R library that allows you to create scripts that mix the Markdown mark-up language and R, to create dynamic documents. RMarkdown script can be compiled, at which point, the Markdown notation is interpreted to create the output files, while the R code is executed and the output incorporated in the document.

The core Markdown notation used in this session is presented below and its interpretation when compiled is further below.

```
# Header 1
## Header 2
### Header 3
#### Header 4
##### Header 5
```

```
**bold**
*italics*
```

```
[This is a link to the University of Leicester](http://le.ac.uk)
```

- Example list
 - Main folder
 - Analysis
 - Data
 - Utils
 - Other bullet point
- And so on
 - and so forth

Header 1

Header 2

Header 3

Header 4

Header 5

bold *italics*

This is a link to the University of Leicester

- Example list
 - Main folder
 - * Analysis
 - * Data
 - * Utils
 - Other bullet point
- And so on
 - and so forth

R Markdown

R code can be embedded in RMarkdown documents as in the example below. That will result in the code chunk be displayed within the document (as *echo=TRUE* is specified), followed by the output from the execution of the same code.

```
```{r, echo=TRUE}
for (i in 1:4) {
 if (i %% 2 == 0){
 cat("even \n")
 } else {
 cat("odd \n")
 }
}
```
```

```
for (i in 1:4) {
  if (i %% 2 == 0){
    cat("even \n")
  } else {
    cat("odd \n")
  }
}
```

```
## odd
## even
## odd
## even
```

Part 1

To create an RMarkdown document in RStudio, select *File > New File > R Markdown* On the RMarkdown document creation menu, specify a title and your name as author, and select *PDF* as default output format. The new document should contain only the core document information, as in the example below.

```
---
title: "Practical Session Instructions"
author: "Stefano De Sabbata"
date: "24 October 2018"
output: pdf_document
---
```

Copy the following text below the document information and the click on the *Knit* button on the bar above the editor panel (top-left area) in RStudio, on the left side. Check the resulting *pdf* document. Try add some of your own code (e.g., from previous practical sessions) and Markdown text, and compile the document again.

```
# A nice heading
```

```
This is my first [RMarkdown](https://rmarkdown.rstudio.com/) document.
```

```
The code below will print:
```

```
- "even"
  - if the number is even
- "odd"
  - otherwise
```

```
```{r, echo=TRUE}
for (i in 1:4) {
 if (i %% 2 == 0){
 cat("even \n")
 } else {
 cat("odd \n")
 }
}
```
```

Part 2

Other necessary software

In order to compile the RMarkdown scripts to *.pdf* documents, RMarkdown requires a LaTeX compiler. If you are working on the University of Leicester Windows 10 computers, please close RStudio if open and install MiKTeX from the *Software Centre* (this might take a few minutes). Once the installation is completed, re-open RStudio. MiKTeX should work fine for any other Windows system. On Linux, please install a TeX distribution, e.g. `sudo apt-get install texlive-full` on Ubuntu. On Mac OS, please install a TeX distribution such as MacTeX.

Repository

The term “repository” refers to the whole collection of code, data, and other files that compose a project, stored on a version-control system. This project is available on my GitHub ReproducibleResearch repository. Download the zipped repository from BlackBoard or GitHub, or clone the repository using *git* if you are familiar with the tool.

Once downloaded and un-zipped in a folder of your choice, observe the structure of the folder and sub-folders. The *Data* folder contains two scripts that will download some data in the same folder. A back-up version of those data can be found in the *Backup* folder. The *Analysis* folder contains a simple analysis of those data. The *Materials* section contains the lecture and practical session materials, and some additional folders containing the IOSlides templates and the images. The *Utils* folder contains a script to update the git branch connected to the GitHub Pages for this project.

Load

In RStudio, click on *File > Open Project...* and navigate to the folder where the files have been unzipped. Select the file *ReproducibleResearch.Rproj* (the extension *.Rproj* might be hidden on Windows, the file type is *R Project*) and click *Open*. RStudio will load the whole project and set the directory where *ReproducibleResearch.Rproj* is located as working directory.

Build

The *Make.R* script in the main folder can be used to “build” all the scripts in the repository in the correct order. The *Make_Clean.R* script can be used to delete all the files created by the *Make.R*.

Build the project by running the *Make.R* script. That can be done by loading the file in RStudio and clicking on the *Source* button on bar above the editor panel (top-left area) in RStudio, right side.

Alternatively, you can run the *Make.R* file using the command below from the RStudio console.

```
source('Make.R')
```

Part 3

Once the project has been built, the *Reproducible_analysis_in_R.pdf* file will be available in the *Analysis* folder. Open the document, read and complete the exercise.

Close

Once completed the practical, click on the project name *ReproducibleResearch* in the top-left corner in RStudio and then *Close project* to close the project. RStudio might show a prompt asking whether to save the *.RData* file before closing, in which case you can select to close without saving.