

Getting started with R Markdown

497 / 597 Reproducible Research



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Tasks to complete before starting a report file



installed locally

GitHub



obtained an account, created a project 1 repo



created an R Project for project 1



created your directory for project 1



pushed to the repo

Plan to create separate Rproj/repos for each project

497 students

```
me497_reproducible_research
|-- practice_work/
|-- project_1/
`-- project_2/
```

- ▶ the top level is the course folder
- ▶ each project folder is an Rproj/repo

597 students

```
me597_reproducible_research
|-- practice_work/
|-- project_1/
|-- project_2/
`-- project_3/
```

```
practice_work/
project_1/
project_2/
project_3/
```

Launch your Rproj and open a new Rmd file

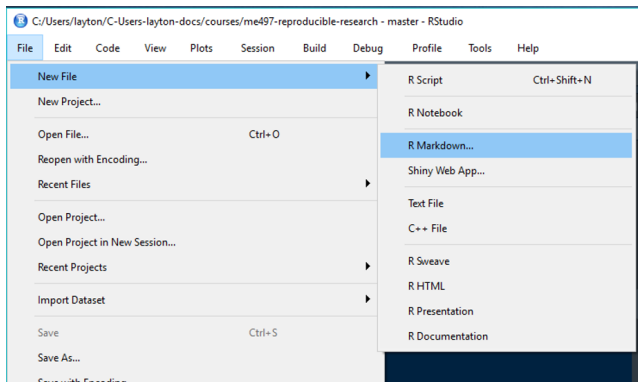


R Markdown is
installed with RStudio

In RStudio, launch the
project, for example,
project_1.Rproj

Open an new Rmd file:

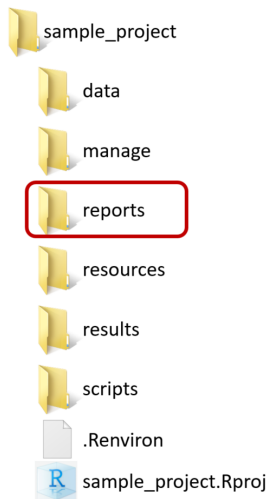
File > New File > R Markdown > OK



Save the Rmd file to your reports directory

Select a file name consistent with your file naming scheme, e.g.,

301_report_2018-09-04.Rmd



An R Markdown script has three types of text

- ▶ YAML header, surrounded by ---

```
---  
title: "Sample report"  
author: "Richard Layton"  
date: "September 1, 2016"  
output: word_document  
---
```

- ▶ Prose mixed with markup text, e.g.,

```
# Section heading  
Prose with markup for italics, bold, `inline R code`, etc.
```

- ▶ Chunks of R code surrounded by ```

```
```{r setup, echo=FALSE}  
a hashtag in a R code chunk is a comment
library(ggplot2)
library(dplyr)
smaller <- diamonds %>% filter(carat <= 2.5)
```
```

The default Rmd file illustrates common mark-ups

- ▶ YAML header
- ▶ knitr setup
- ▶ section heading
- ▶ URL active link
- ▶ **bold**
- ▶ code chunks
- ▶ ``inline code``

```
---
title: "Untitled"
output: html_document
---

{r setup, include=FALSE}
knitr::opts_chunk$set(echo = TRUE)

## R Markdown

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:

{r cars}
summary(cars)

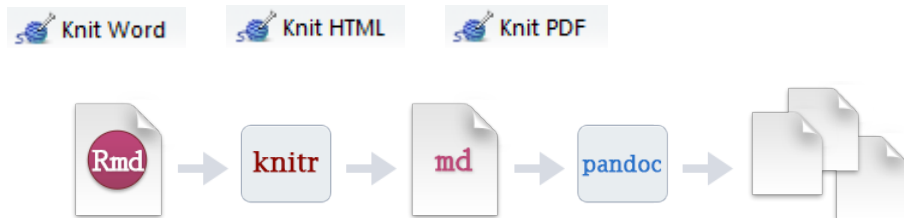
## Including Plots

You can also embed plots, for example:

{r pressure, echo=FALSE}
plot(pressure)

Note that the echo = FALSE parameter was added to the code chunk to prevent
printing of the R code that generated the plot.
```

Knit the document any time



- ▶ R Markdown sends the .Rmd file to knitr
- ▶ knitr executes the code chunks and creates a markdown (.md) document that includes the code and its output
- ▶ pandoc process the .md file to create the output file

Writing an R Markdown script...

script

```

---
title: "Sample report"
author: "Richard Layton"
date: "September 1, 2016"
output: word_document
---

```{r setup, include=FALSE}
knitr::opts_chunk$set(echo = TRUE)
```

## R Markdown

```

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>.

Writing an R Markdown script...and knitting to Word

script

output

```

---
title: "Sample report"
author: "Richard Layton"
date: "September 1, 2016"
output: word_document
---

```{r setup, include=FALSE}
knitr::opts_chunk$set(echo = TRUE)
```

## R Markdown

```

Sample report

Richard Layton

September 1, 2016

R Markdown

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>.

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>.

Add a code chunk

script

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:

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

Add a code chunk

script

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:

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

output

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
##  Min.   : 4.0      Min.   : 2.00
## 1st Qu.:12.0      1st Qu.: 26.00
##  Median :15.0      Median : 36.00
##   Mean  :15.4      Mean   : 42.98
## 3rd Qu.:19.0      3rd Qu.: 56.00
##   Max.  :25.0      Max.    :120.00
```

Add a graph

script

```
## Including Plots
```

You can also embed plots, for example:

```
` `{r echo=FALSE}  
plot(pressure)  
` }
```

Note that the ``echo = FALSE`` parameter was added to the code chunk to prevent printing of the R code that generated the plot.

Add a graph

script

```
## Including Plots
```

You can also embed plots, for example:

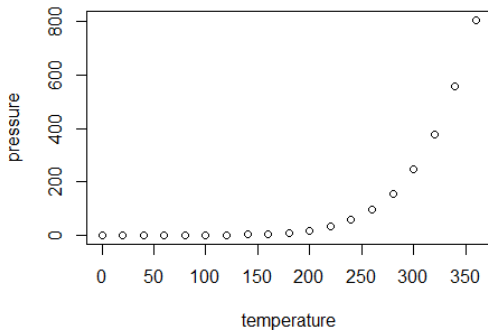
```
```{r echo=FALSE}  
plot(pressure)
```
```

Note that the ``echo = FALSE`` parameter was added to the code chunk to prevent printing of the R code that generated the plot.

output

Including Plots

You can also embed plots, for example:



Note that the `echo = FALSE` parameter was added to the code chunk to prevent printing of the R code that generated the plot.

We typically write our code in stand-alone R scripts

sample_project

data

manage

reports

resources

results

scripts

.Renvron

sample_project.Rproj

401_data-tidy.R

reads raw data, writes it in tidy format

402_data-wide.R

reads tidy data, writes it in wide format

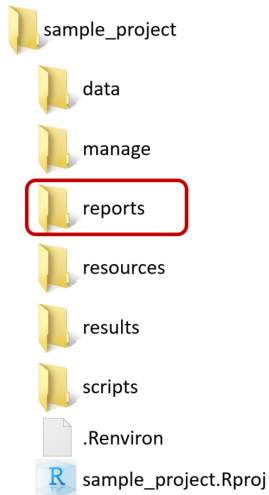
403_data-graph.R

reads tidy data, edits it for graph

404_calibr-graph.R

reads graph data, creates the figure

Then execute those scripts from the Rmd script



```
---  
output: word_document  
---  
  
```${r echo=FALSE}  
library(knitr)
opts_knit$set(root.dir="../")
```${br/>  
# Introduction  
Prose to explain the context of the report  
  
# Data  
Prose to explain the data  
  
```${r echo=FALSE}  
create the data in its 3 forms
source("scripts/401_data-tidy.R")
source("scripts/402_data-wide.R")
source("scripts/403_data-graph.R")
```${br/>  
More prose
```


Rmd script (continued)

Prose to discuss the data table

```
```${r echo=FALSE}
import and print tabulated data
df <- readRDS("results/402_data-wide.rds")
kable(df)
```
```

Results

Prose to explain the results

```
```${r echo=FALSE}
create the graph
source("scripts/404_calibr-graph.R")

import the graph
knitr::include_graphics("../results/404_calibr-graph.png")
```
```

Conclusion

Prose to explain the conclusions

File paths are relative to the R working directory



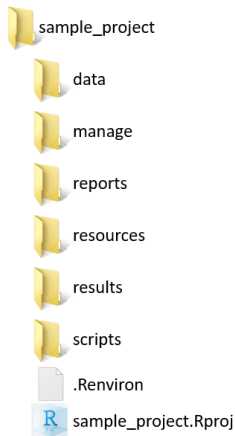
The *working directory* is where R, by default,

- ▶ looks for files you ask it to run
- ▶ saves file you write to disk

When you run an RStudio Project,

- ▶ the project directory is the working directory
- ▶ file paths are relative to the working directory

Relative file paths support reproducibility



- ▶ Cloning your repo to my computer, I can run your code because all file paths are relative
- ▶ Absolute file paths are non-reproducible

Relative file paths are how we link files explicitly

The Rmd script includes code chunks that run other R scripts, for example,

- ▶ read the raw data file, tidy the data, and save it to file,

```
```{r}  
source("scripts/401_data-tidy.R")
```
```

- ▶ read the tidy data, manipulate it for graphing, and write it to file,

```
```{r}  
source("scripts/403_data-graph.R")
```
```

- ▶ read the graph-ready data, create the graph, and write it to file,

```
```{r}  
source("scripts/404_calibr-graph.R")
```
```

Some tools assume the file folder is the working directory

- ▶ *YAML* arguments: from Rmd, up to project directory, down to the file

```
---  
bibliography: "../resources/portfolio.bib"  
---
```

- ▶ *knitr*: reset the knitr root directory one level up

```
```{r}  
knitr::opts_knit$set(root.dir="../")
```
```

- ▶ importing graphics using knitr syntax

```
```{r}  
include_graphics("../results/404_calibr-graph.png")
```
```

- ▶ importing graphics using Rmd syntax

```

```

Next steps for your project

From your GitHub repo, invite me (graphdr) to be a collaborator

The screenshot shows the GitHub repository settings page. The top navigation bar includes tabs for Code, Issues (0), Pull requests (0), Projects (0), Wiki, Insights, and Settings (1). The left sidebar contains a list of settings categories: Options, Collaborators (2), Branches, Webhooks, Integrations & services, Deploy keys, and Moderation. The main content area is titled 'Collaborators' and includes a link to 'Push access to the repository'. A message states: 'This repository doesn't have any collaborators yet. Use the form below to add a collaborator.' Below this is a search section with the heading 'Search by username, full name or email address' and a note: 'You'll only be able to find a GitHub user by their email address if they've chosen to list it publicly. Otherwise, use their username instead.' A search input field contains the text 'graphdr' (3). Below the input field, a dropdown menu shows a search result for 'graphdr Richard Layton' with a profile picture. To the right of the search field is an 'Add collaborator' button (4).

<> Code Issues 0 Pull requests 0 Projects 0 Wiki Insights Settings 1

Options
Collaborators 2
Branches
Webhooks
Integrations & services
Deploy keys
Moderation

Collaborators [Push access to the repository](#)

This repository doesn't have any collaborators yet. Use the form below to add a collaborator.

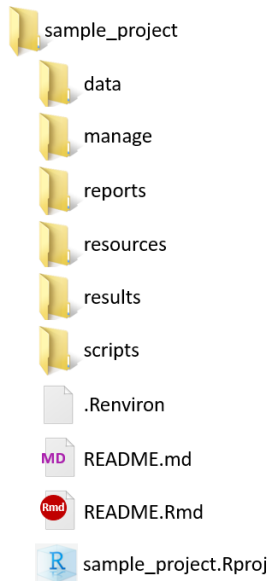
Search by username, full name or email address
You'll only be able to find a GitHub user by their email address if they've chosen to list it publicly. Otherwise, use their username instead.

graphdr 3

graphdr Richard Layton

4 Add collaborator

Edit the README file



- ▶ README is the landing page of your repo
- ▶ README introduces the reader to the project
 - project context and summary
 - what the project looks like in action
 - how the reader might use the project
- ▶ README.Rmd resides at the top level of the directory
- ▶ Knit README.Rmd using YAML GitHub output
output: github_document
- ▶ Stage, commit, push