

# Introduction to R Markdown

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Find this presentation (made with R Markdown) and more here:

<https://github.com/ksauby/R-Markdown-Introduction>

# Overview



## .Rmd files

An R Markdown (.Rmd) file is a record of your research. It contains the code that a scientist needs to reproduce your work along with the narration that a reader needs to understand your work.



## Reproducible Research

At the click of a button, or the type of a command, you can rerun the code in an R Markdown file to reproduce your work and export the results as a finished report.



## Dynamic Documents

You can choose to export the finished report as a html, pdf, MS Word, ODT, RTF, or markdown document; or as a html or pdf based slide show.

## Workflow

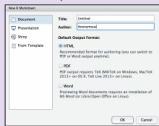
**1 Open a new .Rmd file** at File ► New File ► R Markdown. Use the wizard that opens to pre-populate the file with a template

**2 Write document** by editing template

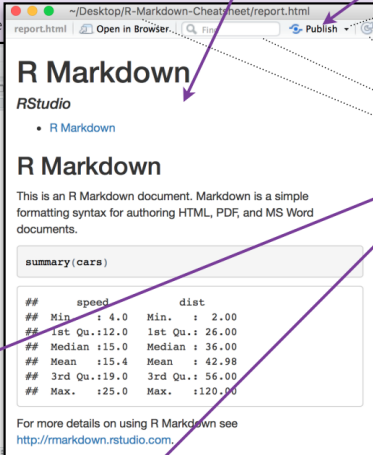
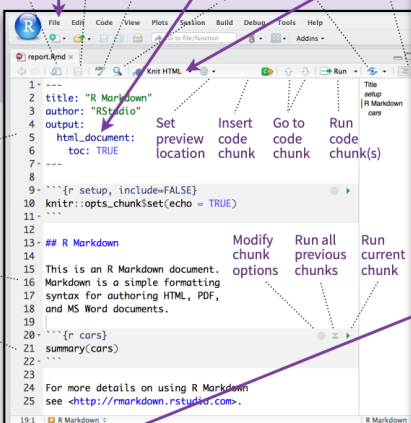
**3 Knit document to create report** Use knit button or **render()** to knit

**4 Preview Output** in IDE window

**5 Publish** (optional) to web or server



Open in window Save Spell Check Find and replace Publish Show outline



Synch publish button to accounts at  
• [rpubs.com](https://rpubs.com),  
• [shinyapps.io](https://shinyapps.io)  
• RStudio Connect  
Reload document  
Find in document  
File path to output document

**6 Examine build log** in R Markdown console

**7 Use output file** that is saved alongside .Rmd

### .Rmd structure

#### YAML Header

Optional section of render (e.g. pandoc) options written as key:value pairs (YAML).

- At start of file
- Between lines of ---

#### Text

Narration formatted with markdown, mixed with:

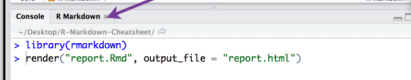
#### Code chunks

Chunks of embedded code. Each chunk:

- Begins with `{r}`
- ends with `}`

R Markdown will run the code and append the results to the doc.

It will use the location of the .Rmd file as the **working directory**



### render()

Use `rmarkdown::render()` to render/knit at cmd line. Important args:

**input** - file to render

**output\_format**

**output\_options** - List of render options (as in YAML)

**output\_file**

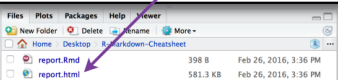
**output\_dir**

**params** - list of params to use

**envir** - environment to evaluate code chunks in

**encoding** - of input file

For more details on using R Markdown see <http://rmarkdown.rstudio.com>.




# Output to PDF

```
1 ---
2 title: A Sampling Strategy Designed to Maximize the Efficiency of Data
3       Collection of Secondary Information About Items of Interest
4 output:
5   pdf_document:
6     includes:
7       in_header: header.tex
8     number_sections: true
9 bibliography: experiment.bib
10 csl: methods-in-ecology-and-evolution.csl
11 ---
```

# Output to Word

```
1 ---
2 title: A Sampling Strategy Designed to Maximize the Efficiency of Data
3       Collection of Secondary Information About Items of Interest
4 author: Kristen E. Sauby and Mary C. Christman
5 output:
6   word_document:
7     reference_docx: "Manuscript_style.docx"
8 bibliography: experiment.bib
9 csl: methods-in-ecology-and-evolution.csl
10 ---
```

1 The Relative Importance of Herbivory and Abiotic Conditions to Demographic  
2 Rates of two Species of *Opuntia* Cacti in Florida [a1](#)

3 **Kristen E. Sauby, John Kilmer, Mary C. Christman, Robert D.**  
4 **Holt, and Travis D. Marsico** 

## 5 Introduction

## 6 Methods

## 7 Study System

8 Statistical Analysis

## 9 Relative Growth Rate

10 **Fruiting Probability and Abundance**

# Output to multiple formats

```
1 ---
2 title: A Sampling Strategy Designed to Maximize the Efficiency of Data
3       Collection of Secondary Information About Items of Interest
4 author: Kristen E. Sauby and Mary C. Christman
5 output:
6   word_document:
7     reference_docx: "Manuscript_style.docx"
8   pdf_document:
9     includes:
10      in_header: header.tex
11      number_sections: true
12 bibliography: experiment.bib
13 csl: methods-in-ecology-and-evolution.csl
14 ---
15
```



## Citations and Bibliographies

Create citations with .bib, .bibtex, .copac, .enl, .json, .medline, .mods, .ris, .wos, and .xml files

- 1 **Set bibliography file** and CSL 1.0 Style file (optional) in the YAML header

```
---  
bibliography: refs.bib  
csl: style.csl  
---
```

- 2 **Use citation keys in text**

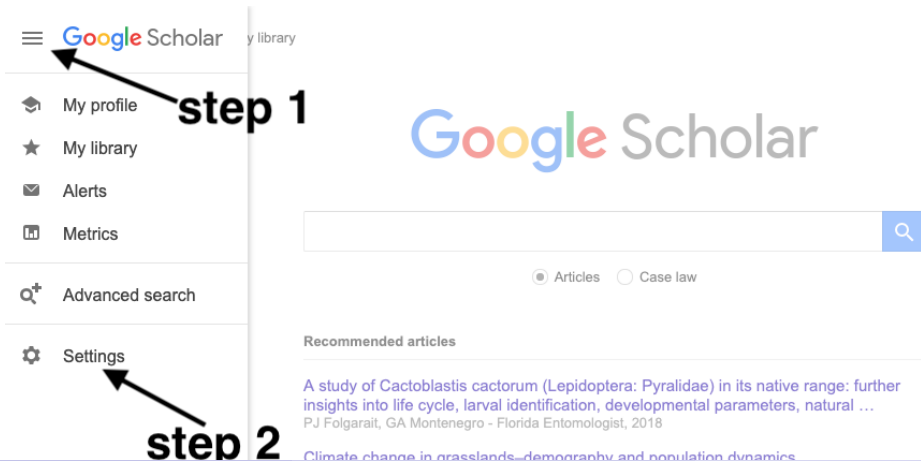
```
Smith cited [@smith04].  
Smith cited without author [-@smith04].  
@smith04 cited in line.
```

- 3 **Render.** Bibliography will be added to end of document



```
Smith cited (Joe Smith 2004).  
Smith cited without author (2004).  
Joe Smith (2004) cited in line.
```


# Set up Google Scholar, part 1

- Set up Google Scholar so that it shows your BibTeX formatting for each citation
- This assumes that you have a Google account



# Set up Google Scholar, part 2



 Settings

**Search results**  
Languages  
Library links  
Account  
Button

**Collections**  
☒ Search articles (☒ include patents).  
☐ Search case law.  
**Results per page**  
10 Google's default (10 results) provides the fastest results.  
**Where results open**  
☐ Open each selected result in a new browser window  
**Bibliography manager**  
☐ Don't show any citation import links.  
☒ Show links to import citations into BibTeX

SaveCancel

step 3

To retain settings, you must turn on [cookies](#)

# Example - Addition Citations to your .bib

- Now we can look up articles on Google Scholar and *copy and paste* the BibTeX citation to my “bibliography.bib” file
- Rarely do I have to write the BibTeX citation from scratch

The screenshot shows the Google Scholar interface with the search term "p hacking". The results list several articles. The first article, "Life after p-hacking" by JP Simmons, LD Nelson, and U Simonsohn (2013), is highlighted. A red box is drawn around the "Import into BibTeX" link for this article. Other articles listed include "The extent and consequences of p-hacking in science" and "Better P-curves: Making P-curve analysis more robust to errors, fraud, and ambitious P-hacking, a Reply to Ulrich and Miller (2015)".

Google Scholar search results for "p hacking". The interface shows a search bar with the query "p hacking" and a magnifying glass icon. Below the search bar, the results are displayed in a list format. The first result is "Life after p-hacking" by JP Simmons, LD Nelson, and U Simonsohn (2013). The article title is in blue, and the authors and year are in green. The abstract is in black text. To the right of the article title, there is a link to the PDF version of the article. Below the article title, there is a link to "Import into BibTeX", which is highlighted with a red box. The second result is "The extent and consequences of p-hacking in science" by ML Head, L Holman, R Lanfear, and AT Kahn (2015). The third result is "Better P-curves: Making P-curve analysis more robust to errors, fraud, and ambitious P-hacking, a Reply to Ulrich and Miller (2015)" by U Simonsohn, JP Simmons, and LD Nelson (2015). The fourth result is "P-curve and p-hacking in observational research" by SB Bruns, JPA Ioannidis, and PLoS one (2016).

# Why Use R Markdown for your Citations/Bibliography?

- formats citations according to format of your choosing
- compiles bibliography for you
- when you re-compile your R Markdown document, the bibliography will be recreated as well
  - ensures that bibliography is up-to-date
  - no extras, no missing references

# Citation Styles

← → ↻ 🔒 GitHub, Inc. [US] | https://github.com/citation-style-language/styles ☆ ABP ⓘ 🌈 📌 👤 ⚙️ 🏠 🟢 🍷 📁 📧 | 🖱️ ⋮

🐙 Search or jump to... / Pull requests Issues Marketplace Explore 🔔 + 👤

 [citation-style-language / styles](#)

 Watch ▼

78

★ Star

1.605

 Fork

2.200

&lt;&gt; Code

Issues 30

Pull requests 27

Projects 0

 Wiki

## Insights

Official repository for Citation Style Language (CSL) citation styles. <https://citationstyles.org/>

citation-style-language

## bibliography

citations

[citation-styles](#)

9,255 commits

8 branches

0 releases

 674 contributors

Branch: master ▼

New pull request

Create new file

Upload files

Find File

Clone or download ▼

adam3smith Merge pull request #3984 from anfourny/patch-1 ...

Latest commit 5e6ff65 7 hours ago

⚠ Sorry, we had to truncate this directory to 1,000 files. 941 entries were omitted from the list.

📁 .github

Update stale.yml

2 months ago

# Tables and Figures

## Table suggestions

Several functions format R data into tables

Table with kable

eruptions	waiting
3.600	79
1.800	54
3.333	74
2.283	62

eruptionswaiting

1	3.60	79.00
2	1.80	54.00
3	3.33	74.00
4	2.28	62.00

Table with xtable

Table with stargazer

eruptionswaiting		
1	3.600	79
2	1.800	54
3	3.333	74
4	2.283	62

```
data <- faithful[1:4, ]
```

```
```{r results = 'asis'}
knitr::kable(data, caption = "Table with kable")
```
```

```
```{r results = "asis"}
print(xtable::xtable(data, caption = "Table with xtable"),
      type = "html", html.table.attributes = "border=0")
```
```

```
```{r results = "asis"}
stargazer::stargazer(data, type = "html",
  title = "Table with stargazer")
```
```

Learn more in  
the **stargazer**,  
**xtable**, and  
**knitr** packages.

# Use Fancy LaTeX Code to Include Figure

```
1 <!-- %%%%%%%%%%% cluster sampling example %%%%%%%%%%% -->
2
3 \begin{figure}[!h]
4   \centering
5
6   \noindent
7   \includegraphics[width=\textwidth,height=\textheight,keepaspectratio]{/Users/KSauby/Documents/Projects/ACSampling_project/code/Manuscript/figures/RACS_figure.png}
8
9   \caption[Diagram of cluster sampling.]{Diagram of cluster sampling,
10    including A) secondary sampling around primary unit  $i$  for up to steps  $f=4$ ,
11    and B) the configurations of all clusters for which  $m$  is known where  $f_{\text{max}} = 2$ .}
12
13   \label{fig:ACS_diagram_cap}
14 \end{figure}
15 \clearpage
```

tell R Markdown where the image is


caption

- R Markdown will give the figure a number  
- reference this label in the text and the corresponding number will be included



# Numbering

- R Markdown numbers the tables and figures for you so you do not have to!

```
02_Methods.Rmd — ACSampling_project (git: master)
x  posterslides.tex  Manuscript.Rmd  header.tex  Figures.Rmd
49  The remaining units not satisfying  $C$  but w
.   the total number of which is  $a$ .
50  Thus, the total number of units in a cluster
51  Each primary unit  $i$  that does *not* satisf
.   assigned  $m=1$  and  $a=0$ 
52  (e.g. )
```

69

The HT estimator has variance  $\overline{y}_{HT}$

70

$\widehat{\text{var}}(\overline{y}_{HT}) = N$

.

$\sum_{j=1}^{\kappa} y_{i \cdot} y_{j \cdot}$

.

$\pi_{ij})$  [thompson1990adaptive].

71

The number of distinct networks include

.

$\kappa$ .

72

The total of the  $y$ -values in network

.

$\psi_i y_i$ .

# A Tool to Build Math Formulas

I just Google "online latex equation editor" to find website

https://www.codecogs.com/latex/eqnedit...

Clear Colors... Functions... Examples History


$\sum_{i}^{n} x \tfrac{1}{2}$


$\begin{bmatrix} \dots \\ \dots \end{bmatrix}$


gif Latin Modern (10pt) Normal 110 Transparent ☐ Inline ☐ Compressed


# Bookdown Dissertation!


<https://github.com/ksauby/thesisdownufl>


 **ksauby / thesisdownufl**  
forked from [ismayc/thesisdown](#)


 Unwatch ▾ 1


 Star 2


 Fork 122


 Code

 Pull requests 0

 Projects 0

 Wiki

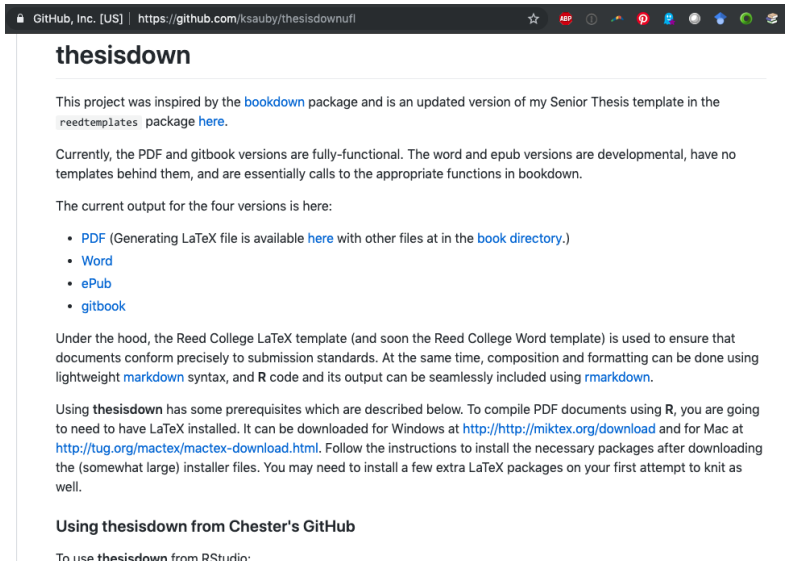
 Insights

 Settings

An updated R Markdown thesis template using the bookdown package; edited to work with the University of Florida dissertation template.

Edit

# Bookdown Dissertation!



The screenshot shows the GitHub repository page for 'thesisdown' by ksauby. The browser's address bar shows the URL 'https://github.com/ksauby/thesisdown'. The repository name 'thesisdown' is prominently displayed. The page content describes the project as an updated version of a Senior Thesis template, inspired by the 'bookdown' package. It lists available output formats: PDF, Word, ePub, and gitbook. It also provides instructions on how to use the template, mentioning the need for LaTeX and R, and provides links to download the necessary software. The page is titled 'thesisdown' and includes a description of the project's purpose and usage instructions.

thesisdown

This project was inspired by the [bookdown](#) package and is an updated version of my Senior Thesis template in the `reedtemplates` package [here](#).

Currently, the PDF and gitbook versions are fully-functional. The word and epub versions are developmental, have no templates behind them, and are essentially calls to the appropriate functions in bookdown.

The current output for the four versions is here:

- [PDF](#) (Generating LaTeX file is available [here](#) with other files at in the [book directory](#).)
- [Word](#)
- [ePub](#)
- [gitbook](#)

Under the hood, the Reed College LaTeX template (and soon the Reed College Word template) is used to ensure that documents conform precisely to submission standards. At the same time, composition and formatting can be done using lightweight [markdown](#) syntax, and R code and its output can be seamlessly included using [rmarkdown](#).

Using **thesisdown** has some prerequisites which are described below. To compile PDF documents using R, you are going to need to have LaTeX installed. It can be downloaded for Windows at <http://http://miktex.org/download> and for Mac at <http://tug.org/mactex/mactex-download.html>. Follow the instructions to install the necessary packages after downloading the (somewhat large) installer files. You may need to install a few extra LaTeX packages on your first attempt to knit as well.

### Using thesisdown from Chester's GitHub

To use **thesisdown** from RStudio:

# R Markdown Vs. Microsoft Word

## Pros of R Markdown

- incorporate code directly into your document
- you can hide text that you are ready to delete!

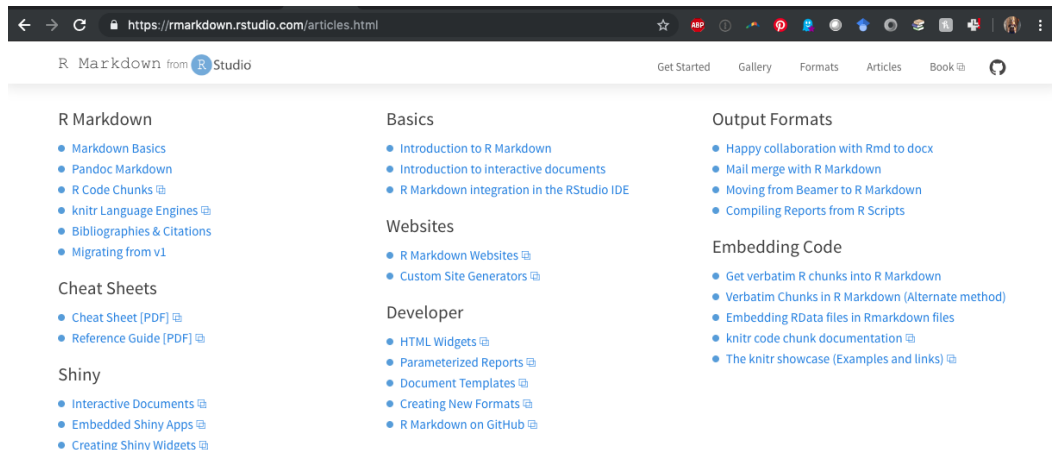
## Cons of R Markdown

- track changes - not as easy to implement changes when you have to do it in R Markdown

# Resources

<https://rmarkdown.rstudio.com/index.html>

<https://bookdown.org/yihui/rmarkdown/>

A screenshot of the R Markdown website. The browser address bar shows the URL 'https://rmarkdown.rstudio.com/articles.html'. The website header includes the title 'R Markdown from R Studio' and navigation links: 'Get Started', 'Gallery', 'Formats', 'Articles', 'Book', and a GitHub icon. The main content area is divided into three columns. The left column contains links for 'R Markdown' (including Basics, Pandoc, R Code Chunks, knitr, Bibliographies, and Migrating), 'Cheat Sheets' (including PDF guides), and 'Shiny' (including Interactive Documents, Embedded Apps, and Widgets). The middle column contains links for 'Basics' (Introduction, Interactive documents, R Markdown integration), 'Websites' (R Markdown Websites, Custom Site Generators), and 'Developer' (HTML Widgets, Parameterized Reports, Document Templates, Creating New Formats, R Markdown on GitHub). The right column contains links for 'Output Formats' (Happy collaboration, Mail merge, Moving from Beamer, Compiling Reports) and 'Embedding Code' (Get verbatim R chunks, Verbatim Chunks, Embedding RData files, knitr code chunk documentation, The knitr showcase).