Olivier Gimenez

Bayesian Analysis of Capture-Recapture Data with Hidden Markov Models – Theory and Case Studies in R

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Preface

This short book introduces an R package, **bookdown**, to change your workflow of writing books. It should be technically easy to write a book, visually pleasant to view the book, fun to interact with the book, convenient to navigate through the book, straightforward for readers to contribute or leave feedback to the book author(s), and more importantly, authors should not always be distracted by typesetting details.

Why read this book

Structure of the book

To sum it up, this book is a comprehensive reference of the **bookdown** package. You can follow the 80/20 rule when reading it. Some sections are there for the sake of completeness, and not all sections are equally useful to the particular book(s) that you intend to write.

[1] http://creativecommons.org/licenses/by-nc-sa/4.0/

Software information and conventions

This book is primarily about the R package **bookdown**, so you need to at least install R and the **bookdown** package. However, your book does not have to be related to the R language at all.

The R session information when compiling this book is shown below:

```
sessionInfo()
```

```
## R version 4.0.2 (2020-06-22)
## Platform: x86_64-apple-darwin17.0 (64-bit)
## Running under: macOS Catalina 10.15.7
##
## Matrix products: default
## BLAS:  /Library/Frameworks/R.framework/Versions/4.0/Resources/lib/libRblas.dylib
## LAPACK: /Library/Frameworks/R.framework/Versions/4.0/Resources/lib/libRlapack.dylib
##
## locale:
## [1] fr_FR.UTF-8/fr_FR.UTF-8/fr_FR.UTF-8/C/fr_FR.UTF-8/fr_FR.UTF-
8
##
## attached base packages:
## [1] stats     graphics  grDevices utils     datasets
## [6] methods   base
##
## loaded via a namespace (and not attached):
##  [1] bookdown_0.22        digest_0.6.27
##  [3] magrittr_2.0.1       evaluate_0.14
##  [5] rlang_0.4.10.9002    stringi_1.5.3
##  [7] cli_2.4.0            rstudioapi_0.13
##  [9] rmarkdown_2.7        tools_4.0.2
## [11] stringr_1.4.0        glue_1.4.2
## [13] xfun_0.22            yaml_2.2.1
```

```
## [15] fastmap_1.1.0        compiler_4.0.2
## [17] htmltools_0.5.1.9002 knitr_1.31
```

We do not add prompts (`>` and `+`) to R source code in this book, and we comment out the text output with two hashes `##` by default, as you can see from the R session information above. This is for your convenience when you want to copy and run the code (the text output will be ignored since it is commented out). Package names are in bold text (e.g., **rmarkdown**), and inline code and filenames are formatted in a typewriter font (e.g., `knitr::knit('foo.Rmd')`). Function names are followed by parentheses (e.g., `bookdown::render_book()`). The double-colon operator `::` means accessing an object from a package.

Acknowledgments

CNRS. Jean-Do. Roger. Rémi. My students. Chloé, Sarah, Perry, Daniel. Rob Chapman & Hall/CRC. Workshop attendees. Feedback from. Proofreading by. My family.

Olivier Gimenez Montpellier, France

About the Author

Yihui Xie (http://yihui.org) is a software engineer at RStudio (http://www.rstudio.com). He earned his PhD from the Department of Statistics, Iowa State University. He is interested in interactive statistical graphics and statistical computing. As an active R user, he has authored several R packages, such as **knitr**, **bookdown**, **blogdown**, **animation**, **DT**, **tinytex**, **tufte**, **formatR**, **fun**, **mime**, **highr**, **servr**, and **Rd2roxygen**, among which the **animation** package won the 2009 John M. Chambers Statistical Software Award (ASA). He also co-authored a few other R packages, including **shiny**, **rmarkdown**, and **leaflet**.

In 2006, he founded the Capital of Statistics (https://cosx.org), which has grown into a large online community on statistics in China. He initiated the Chinese R conference in 2008, and has been involved in organizing R conferences in China since then. During his PhD training at Iowa State University, he won the Vince Sposito Statistical Computing Award (2011) and the Snedecor Award (2012) in the Department of Statistics.

He occasionally rants on Twitter (https://twitter.com/xieyihui), and most of the time you can find him on GitHub (https://github.com/yihui).

He enjoys spicy food as much as classical Chinese literature.

Part I

Theory

1

Bayesian statistics & MCMC algorithms

You can label chapter and section titles using `{#label}` after them, e.g., we can reference Chapter 1. If you do not manually label them, there will be automatic labels anyway, e.g., Chapter **??**.

Figures and tables with captions will be placed in `figure` and `table` environments, respectively.

```
par(mar = c(4, 4, .1, .1))
plot(pressure, type = 'b', pch = 19)
```

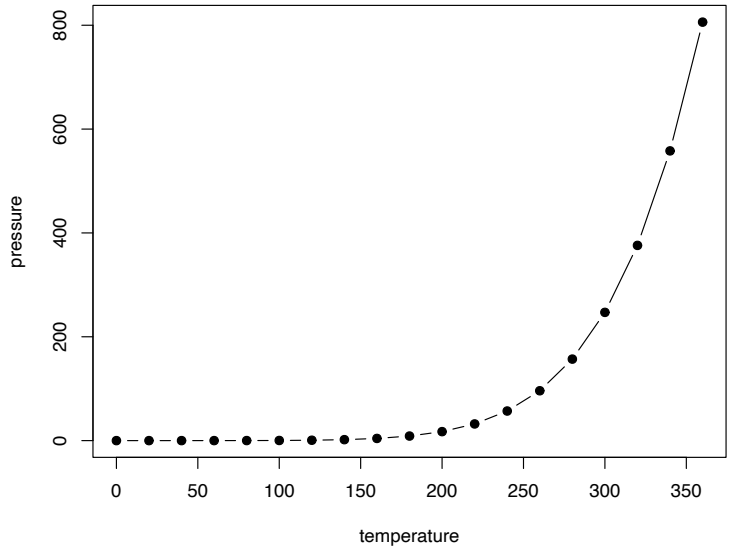

FIGURE 1.1: Here is a nice figure!

Reference a figure by its code chunk label with the `fig:` prefix, e.g.,

TABLE 1.1: Here is a nice table!

Sepal.Length	Sepal.Width	Petal.Length	Petal.Width	Species
5.1	3.5	1.4	0.2	setosa
4.9	3.0	1.4	0.2	setosa
4.7	3.2	1.3	0.2	setosa
4.6	3.1	1.5	0.2	setosa
5.0	3.6	1.4	0.2	setosa
5.4	3.9	1.7	0.4	setosa
4.6	3.4	1.4	0.3	setosa
5.0	3.4	1.5	0.2	setosa
4.4	2.9	1.4	0.2	setosa
4.9	3.1	1.5	0.1	setosa
5.4	3.7	1.5	0.2	setosa
4.8	3.4	1.6	0.2	setosa
4.8	3.0	1.4	0.1	setosa
4.3	3.0	1.1	0.1	setosa
5.8	4.0	1.2	0.2	setosa
5.7	4.4	1.5	0.4	setosa
5.4	3.9	1.3	0.4	setosa
5.1	3.5	1.4	0.3	setosa
5.7	3.8	1.7	0.3	setosa
5.1	3.8	1.5	0.3	setosa

see Figure 1.1. Similarly, you can reference tables generated from `knitr::kable()`, e.g., see Table 1.1.

```
knitr::kable(
  head(iris, 20), caption = 'Here is a nice table!',
  booktabs = TRUE
)
```

You can write citations, too. For example, we are using the **bookdown**

package (**?**) in this sample book, which was built on top of R Markdown and **knitr** (Xie, 2015).

2

Literature

Here is a review of existing methods.

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Literature

Here is a review of existing methods.

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Part II

Case studies

12

Literature

Here is a review of existing methods.

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FAQ

Below is the *complete* list of frequently asked questions (FAQ). Yes, there is only one question here. Personally I do not like FAQs. They often mean surprises, and surprises are not good for software users.

1. Q: Will **bookdown** have the features X, Y, and Z?

   A: The short answer is no, but if you have asked yourself three times "do I really need them" and the answer is still "yes", please feel free to file a feature request to `https://github.com/rstudio/bookdown/issues`.

   Users asking for more features often come from the LaTeX world. If that is the case for you, the answer to this question is yes, because Pandoc's Markdown supports raw LaTeX code. Whenever you feel Markdown cannot do the job for you, you always have the option to apply some raw LaTeX code in your Markdown document. For example, you can create glossaries using the **glossaries** package, or embed a complicated LaTeX table, as long as you know the LaTeX syntax. However, please keep in mind that the LaTeX content is not portable. It will only work for LaTeX/PDF output, and will be ignored in other types of output. Depending on the request, we may port a few more LaTeX features into **bookdown** in the future, but our general philosophy is that Markdown should be kept as simple as possible.

The most challenging thing in the world is not to learn fancy technologies, but control your own wild heart.

Bibliography

Xie, Y. (2015). *Dynamic Documents with R and knitr*. Chapman and Hall/CRC, Boca Raton, Florida, 2nd edition. ISBN 978-1498716963.