Example R Sweave Document for the LEC CEEDS Coding Group

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Abstract

Authoring publication-quality scientific documents with tools such as R Sweave provides a number of benefits relative to word document editors such as Microsoft Word by integrating LaTeX and R. This document represents a minimal example of a R Sweave document with key functionality demonstrated.

Keywords: LaTeX, R, Scientific Document, Sweave

1 Introduction

R Sweave (Leisch 2002) allows you to author documents in LaTeX with the added benefit of integrating R code to produce figures, tables, and other objects produced for in-line display. This integration will be familiar for those who have used R Markdown (Xie et al. 2019), which integrates R and the markdown, but is of particular use in authoring scientific documents by providing the full typesetting capabilities of LaTeX.

This document demonstrates the basic functionality of R Sweave and may be used as a template for new projects, allowing a user to navigate the many idiosyncrasies of R Sweave which can bemuse new users.

I use the `biblatex` (https://ctan.org/pkg/biblatex) LaTeX package for bibliography management, which I recommend in place of older less well-maintained alternatives such as `natbib`. As a compliment to `biblatex` I recommend using a reference manager such as Zotero (https://www.zotero.org/) with the Better BibTeX plugin (https://retorque.re/zotero-better-bibtex/).

The use of R Sweave requires a LaTeX distribution, I recommend using the r package `tinytex` (https://yihui.org/tinytex/), which can be used to install a lightweight LaTeX distribution with `tinytex::install_tinytex()`.

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2 Should you use R Sweave and/or Latex?

Before creating an R Sweave document it is worth considering the questions below in order to make a judgement on whether the time initially invested is likely to save time in the long-run.

- What is the purpose of the document? Is it a scientific article or equivelent document type requiring high-quality formatting?
- How many figures and tables do you need to produce, and how many times do you need to reproduce these?
- Does your target journal accept pdf documents or tex files?
- If you are rejected by the target journal does your back-up journal accept pdf or tex files?

- Are your co-authors comfortable:
    1. Collaborating using R Sweave and latex?
       or
    2. Commenting on pdf documents without the reviewing and editing functionality found in Word?

132 Words

3 Pros and Cons

3.1 Pros

R Sweave has three key advantages:

- Allows you to leverage the entire LaTeX ecosystem for document editing.
- Integration with R code, facilitating the development of figures and tables in the document without the need to manually copy and paste new figures, or run separate scripts to regenerate figures.
- Reference management. Bibtex references can be exported from a reference manager, placed in the bibliography file, and cited via a key. Changing the citation style is controlled by one parameter with no need to change the underlying biblatex entries.

If your analysis is well-structured and the R Sweave document sits at the end of a reproducible data pipeline, the document is also reproducible, and can be easily versioned.

120 Words

3.2 Cons

Despite the benefits outlined in Section 3.1 there are some disadvantages to using LaTeX and R Sweave

Converting a .tex document to word is possible using pandoc (https://github.com/jgm/pandoc), but the formatting is not perfect and will need manual adjustment, especially if you use complex tables. If a word document is a required as a key output I would consider using a different system.

The LaTeX ecosystem is old and very large, many LaTeX packages are not well-documented or well-maintained, there are also compatibility issues occassionally. I recommend carefully selecting the packages you use along with minimising the total number of packages.

As mentioned above creating a scientific document with R Sweave does involve an initial investment of time to set up, and a continued additional investment of time to author. The use of this document as a template will reduce some of this setup time, and experience will reduce the speed with which you can author R Sweave documents, but careful consideration must be given to whether the benefits of using R Sweave and efficiencies gained through the in-document production of figures, tables, and statistics outweigh this additional investment of time.

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4 Examples

Above we loaded and prepared the iris example dataset, below in Figure 1 we produce a publication-quality box plot which can be altered, re-sized, and re-positioned with any changes then automatically incorporated into the document when the document is re-rendered.

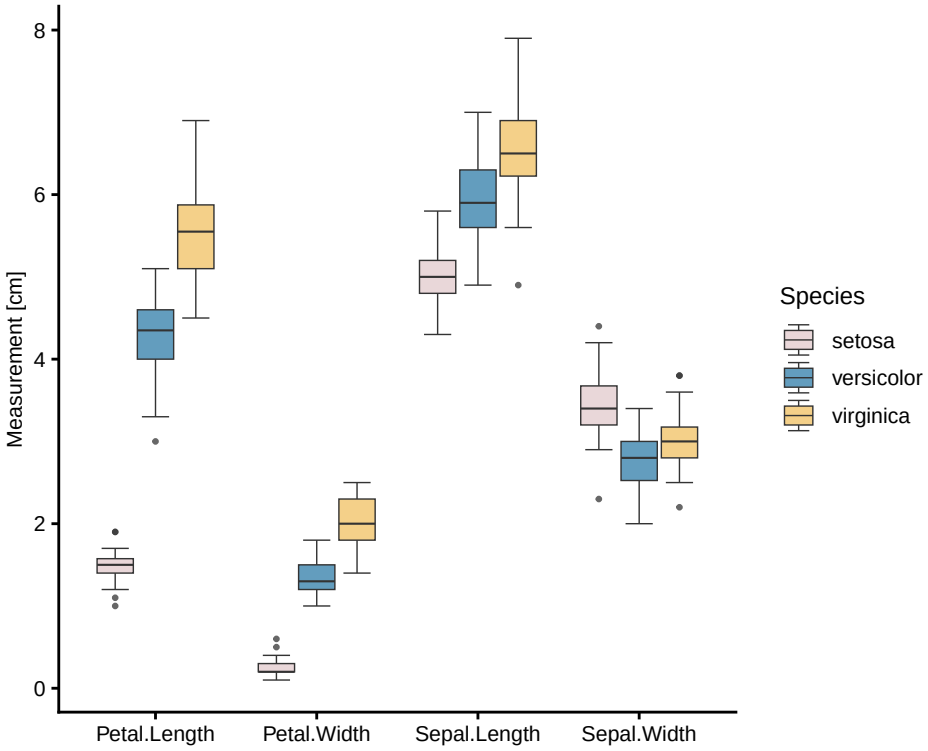

Figure 1: Box and whisker plots displaying the distribution of four anatomical flower measurements for three *Iris* species.

Data can also be easily displayed in publication-quality tables, as demonstrated in Table 1.

Table 1: The first 20 rows of the iris example dataset.

Species	Sepal.Length	Sepal.Width	Petal.Length	Petal.Width
setosa	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

We can also print summary statistics in-line using the `\Sexpr` LaTeX function, for example the maximum petal width is 2.5.

If you authoring a document in which you would like to display code, you can set the echo argument of a code chunk to TRUE, alternatively you can use the LaTeX package `minted` as follows, however you need to end the word counter before you use `minted`.

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```r
repo_data_path <- file.path("./data")

iris_raw <- read.csv(file = file.path(repo_data_path, "iris.csv")) |>
  tibble::as_tibble()

iris_summary <- summarytools::descr(x = iris_wide) |>
  as.data.frame() |>
  tibble::as_tibble(rownames = "metric")
```

5 Useful Resources

5.1 R Sweave and LaTeX

- The R Sweave manual is an essential guide (https://stat.ethz.ch/R-manual/R-devel/library/utils/doc/Sweave.pdf).
- Overleaf (https://www.overleaf.com/learn) contains documentation on the usage of LaTeX in a very accessible format.

5.2 Alternatives

- R Markdown (https://bookdown.org/yihui/rmarkdown/).
- Quarto (https://quarto.org/).
- Typst (https://typst.app/).

5.3 Other

- The `ggtext` R package allows you to modify text in ggplot2, of particular use is the `ggtext::element_markdown` function which can be used as a drop in replacement for `ggtext::element_text` with the added benefit of being able to italicise text etc (https://github.com/wilkelab/ggtext).
- `paletteer` contains an easy-to-use and comprehensive collection of color palettes compatible with `ggplot2` (https://pmassicotte.github.io/paletteer_gallery/).
- `gt` is a popular alternative to `knitr::kable` and `kableExtra`, though some features such a 'long' tables which span multiple pages with repeated headers are not supported, I advise picking one package with the features you need per project (https://github.com/rstudio/gt/).

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6 Conclusion

This document demonstrates the basic functionality provided by R Sweave and acts as a template for new documents.

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Author Contributions

Redacted for anonymity.

I would recommend using the CRediT Contributor Roles Taxonomy (NISO CRediT Working Group 2022) for reporting author contributions.

Acknowledgments

Redacted for anonymity.

Conflict of interest

The authors declare no potential conflict of interests.

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