

Sweaving R and L^AT_EX

Maria Bekker-Nielsen Dunbar

The main demographic of this student publication is based in the Department of Mathematical Sciences at UCPH, as such this article assumes familiarity with R and L^AT_EX and will attempt to introduce Sweave from that vantage point.

One of the first questions I ever considered regarding R is answered in the FAQ part of the R-project webpage:

2.12 Why is R named R?

The name is partly based on the (first) names of the first two R authors (Robert Gentleman and Ross Ihaka), and partly a play on the name of the Bell Labs language, S

You can now either continue to point 3.1³ *What is S?* in that same FAQ or take this at face value: S is the statistical programming language upon which R is based. The idea behind Sweave is to *weave* R (S) analyses with L^AT_EX documents, hence the name Sweave which to the best of my knowledge is pronounced S-weave (that is /es-wi:v/ for the phonologically inclined).

Baby's first sweaves

First things first – how to obtain this mystical Sweave creature: This part is painless and takes hardly any time; if you have R, you already have Sweave seeing as Sweave is part of R's `utils` (base) package. Next up, you will need a T_EXeditor for the L^AT_EX

³At time of writing

part of this operation. Choice of such a programme is laced with personal preference and thus you are left to choose by your own accords. Alternatively go to one of the computer rooms and use T_EXworks⁴.

Famous last sweaves

I feel it is easiest to illustrate Sweave by example, so I went with what is genuinely the simplest example I could think to do off the top of my head:

Example 1 (WD) Say you wanted to explain how to change the working directory, you could write something like

```
\documentclass[a4paper]{article}
\usepackage{Sweave}

\begin{document}
Before you change the working directory, henceforth
  referred to as WD, you might want to check what it
  currently is. To do so you run
<<>>=
  getwd()
@
which gives the location of the WD. If it is not where
you want it you can run something similar to
<<>>=
  setwd("/users/mdunbar/Desktop/famos")
@
where you replace the path with your own desired location.
\end{document}
```

As you may have been able to decipher, in our document R code and L^AT_EX code are preceded by <<...>>= resp. @. All such prece-

⁴The author is partial to using T_EXmaker with either MiK_TTeX or MacTeX as the distributor and may or may not be able to help set up Sweave for one of these combinations

dence goes at the beginning of a line. You save this chunk of code in your T_EXeditor as an .Rnw-file, **not** a .tex-file.⁵ This example is saved as famos.Rnw.

This is because any Sweave file goes through the following procedure: It is written as an .Rnw, which is then turned into a .tex, which in turn is compiled to .pdf.

In order to turn the .Rnw file to a .tex file you execute the following command in R:

```
Sweave("famos.Rnw")
```

which produces something you can then compile from your T_EXeditor or take the 'sweavecut', which is the following R code:

```
system("pdflatex famos.tex")
```

followed by

```
system("open famos.pdf")
```

to see if everything looks the way you would like it to.

Please note, you will probably have to move the Sweave.sty file from your R directory to your L^AT_EXfiles in order to compile the .tex-file. Alternatively you can do what I refer to as 'the FAMØS way' and put the style file in the same folder as the .tex-file.

A sweave and a half

As R is used for more than just changing the working directory, here is another example:

⁵If this seems very scary you could also choose the option 'New R Sweave' in RStudio, which produces a .Rnw-file. This file can be compiled from RStudio by clicking the button 'Compile PDF'

Example 2 (Tables, plots and embedded R code) This time we might not want the R code to be its own paragraph. We add the following code to our .Rnw-file:

```
We create the variable \verb+Simple+ by
<<>>=
Simple <- c(3,1,4,1,5,9,2,6,5,3,5,8,9,7,9,3,2,3,
8,4,6,2,6,4,3)
@
and we calculate the mean by \verb+mean(Simple)+,
which is \Sexpr{mean(Simple)}
<<>>=
mean(Simple)
@
Likewise a histogram is obtained by \verb+hist(Simple)+
<<fig=true>>=
hist(Simple)
@

Finally we can get a frequency table by \verb+table(Simple)+,
which produces
<<echo=false>>=
table(Simple)
@
If we want it in \LaTeX\ format we use the R package
\verb+xtable+ instead
<<>>=
install.packages("xtable")
library(xtable)
@
<<results=tex>>=
xtable(table(Simple))
@
```

There is a option for figures given by `fig=`, `<<fig=true>>=`, informs Sweave that we would like to have the figure produced by the R code inserted into our .tex file. Another option concerns the look of the output. If the results should be formatted in L^AT_EX you type `<<results=tex>>=` (the default option is `results=verbatim`). If you only want the results and

not the R code, you use the `echo=` option. What happens is `<<echo=true>>=` will ensure that both the R code and the result is printed, while `<<echo=false>>=` only produces the result.

A combination of the two could then be something like:

```
<<echo=false,results=tex>>
```

Producing only the result mid-sentence is done by inserting R code into `\Sexpr{}`.

Happy sweaving!

Now, if you have to run your entire analysis on a different dataset or have to run similar codes over and over again with miniscule differences, you have the tools and the opportunity to avoid abundant copy-pasting of your R code and figures into your $\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}$ files. Isn't that just dandy?

References

- [1] *R FAQ - The Comprehensive R Archive Network*,
cran.r-project.org/doc/FAQ/R-FAQ.html
- [2] Friedrich Leisch, *Sweave: Dynamic generation of statistical reports using literate data analysis*, Compstat 2002 - Proceedings in Computational Statistics, pp. 575-580. Physica Verlag

Before you change the working directory, henceforth referred to as WD, you might want to check what it currently is. To do so you run

```
> getwd()

[1] "/Users/mdunbar/Desktop/famos"
which gives the location of the WD. If it is not where you want it you can run something similar to

> setwd("~/users/mdunbar/Desktop/famos")
where you replace the path with your own desired location.

We create the variable Simple by

> Simple <- c(3,1,4,1,5,9,2,6,5,3,5,8,9,7,9,3,2,3,8,4,6,2,6,4,3)
and we calculate the mean by mean(Simple), which is 4.72

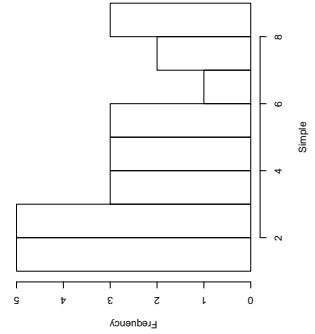
> mean(Simple)

[1] 4.72
```

Likewise a histogram is obtained by hist(Simple)

> hist(Simple)

Histogram of Simple



Finally we can get a frequency table by table(Simple), which produces

```
Simple
1 2 3 4 5 6 7 8 9
2 3 5 3 3 1 2 3
```

If we want it in L^AT_EX format we use the R package xtable instead

> install.packages("xtable")

The downloaded binary packages are in
/var/folders/r_/s3flmp196f17s9r3mh840w0000gn/T//RtmpfHPyLE/downloaded_packages

> library(xtable)

> xtable(table(Simple))

	Simple
1	2
2	3
3	5
4	3
5	3
6	3
7	1
8	2
9	3