Report/ MS Extravaganza

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Abstract

Our study will rock your world...

First steps

Step 1: Install R studio

Step 2: Need to download the rmarkdown, knitr and pander packages – these are specific to the rmarkdown document making magic

Creating the rmarkdown script

1. Open R studio
2. File –> New File –> R markdown –> Create *file name* and choose the *type* of Document HTML, PDF, and MS Word)

3. The default anatomy of the document is created.

4. At the top of the document in the head you can make specifications, these will not all appear in the pdf (like in latex)

5. 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.

6. As you build the document, you can **Knit** for previews

Headings ranked by importance

This is the largest heading

This is the second largest heading: you would type "/##Your next subheader"

This is the third largest heading: you would type "/###Your next subheader"

This is the fourth largest heading: you would type "/####Smaller"

This is the fifth largest heading: you would type "/#####Even smaller" This is the sixth largest heading: you would type "/######You totally get this pattern"

Ways to get different text formats

1. For numbered lists you would write "1. The list thing" (no tab in front, but you DO need a space between the period and the text)
    - For a sub-section of the list, you would write "*tab* + The list thing", with a tab in front and a space between the plus (- or + also works in place of the *)

- For bulleted lists, you can use *, -, or + in (* your thing)
    - For a sub-bullet, you'd use "*tab* - the thing"

For *italics*, you can do *italics* or _italics_. For **bold**, you can do **bold** or __bold__.

Links

To do links you type "[the text] (the URL)" with no space in between.

Quotes

Let's quote some stuff:

> "Mathematics without natural history is sterile, but natural history without mathematics is muddled." *John Maynard Smith*

Footnotes

This is regular text[1].

Formulas and equations

Example 1: This summation expression $\sum_{i=1}^{n} X_i$ appears inline. This equation is also inline $E = mc^2$

Example 2:This summation expression is in display form.

$$\sum_{i=1}^{n} X_i$$

Example 3:

$$f(x, \mu, \sigma) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$$

Example 4: Numbering the equations

(1) $f(x) = \frac{1}{\pi(1+x^2)}$

The Cauchy distribution (with density given in Eq. (1)) is a special case of Student's t-distribution (Eq. (2)) with $\nu = 1$.

(2)

$$f(t;\nu) = \frac{\Gamma(\frac{\nu+1}{2})}{\sqrt{\nu\pi}\,\Gamma(\frac{\nu}{2})} \left(1 + \frac{t^2}{\nu}\right)^{-\frac{\nu+1}{2}}$$

[1] with a footnote

Example 5:

(3)

$$\Gamma(t) = \int_0^\infty x^{t-1} e^{-x} dx$$

Example 6:

(4)

$$\frac{dS}{dt} = x(\alpha - \beta y)$$

$$\frac{dy}{dt} = -y(\gamma - \delta x)$$

The system of ordinary differential equations given by Eq. (4) is commonly used to describe predator-prey systems. Any solution to this system of equations satisfies the equality in Eq. (5).

(5)

$$V = -\delta\, x + \gamma\, \log(x) - \beta\, y + \alpha\, \log(y)$$

Subscripts and superscripts

Example 1:

$$X_i$$

Example 2:

$$X_i$$

Example 3:

$$X_{i,j}^2$$

Example 4: To do$^{\text{superscripts}}$ in text you can also use typeˆsuperscriptˆ.

Square roots

Example:

$$\sqrt{b^2 - 4ac}$$

Fractions

Example:

$$\frac{4z^3}{16}$$

Summation expressions

Example:

$$\sum_{i=1}^{n} X_i^3$$

Parenthesis

Example:

$$\sum_{i=1}^{n} \left(\frac{X_i}{Y_i} \right)$$

Greek Letters

Example:

$$\alpha, \beta, \gamma, \Gamma$$

Special Symbols

Example 1:

$$a \pm b$$

Example 2:

$$x \geq 15$$

Example 3:

$$a_i \geq 0 \quad \forall i$$

Integrals and other functions

Example:

$$\int_0^{2\pi} \sin x \; dx$$

Matrices

Example:

$$\mathbf{X} = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

Making your code easily reproducible by your collaborators

Chunks of code

If in the middle of our text we need to do analysis or plots, we can insert *R* code can easily using what we called "chunks" of code. 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
```

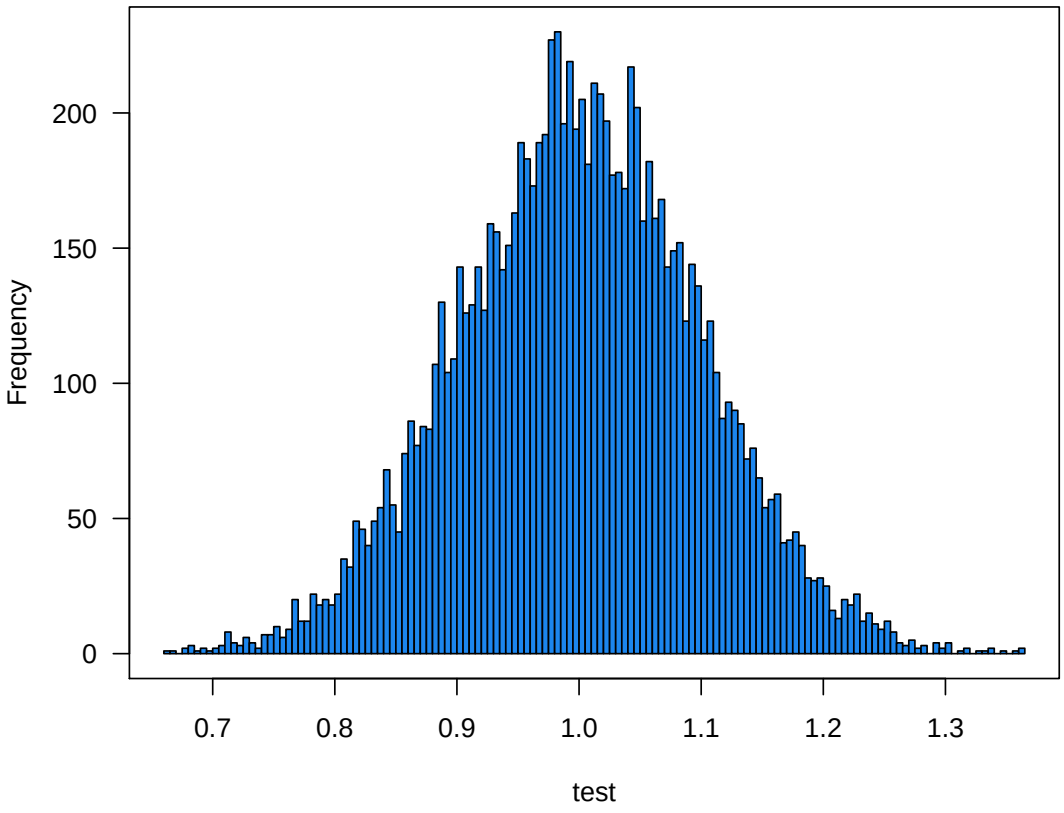
Analysis

```
set.seed(1234)
library(ggplot2)
library(lattice)
library(MASS)
test=rnorm(10000, 1,0.1)
```

Figures

By default there are no captions, if you dont specify dimensions it will plot default measures, if you don't want all code to be shown you need to add the follwing {r echo = FALSE}.

```
hist(test, col='dodgerblue2', las=1, breaks=200, main='')
box()
```



Control code chunks, figure size and adding captions

The following is an example of a smaller figure using `fig.width` and `fig.height` options. It also has fig.cap for captions. Note the {r echo=FALSE} to conceal the code chunks.

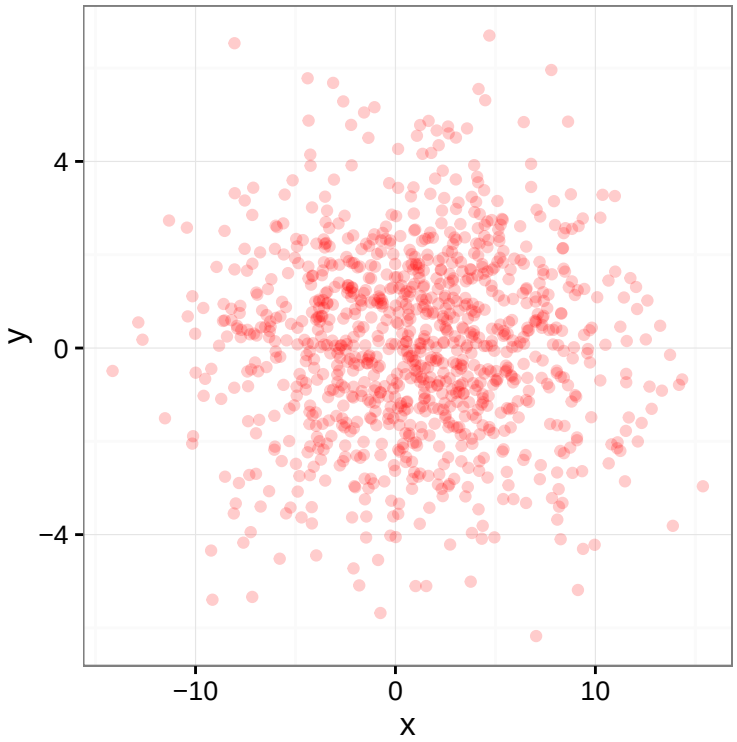


Figure 1: This figure will blow your mind

Inserting pre generated figures or images

You can also insert jpeg, pdf or png files

Figure 2: Lola

Generating multi figures

Like with any RScript, the use of par(mfrow=c(#,#)) will aloow you to generate multiple plots as a group. I have wrote a small loop here to allow for labelling of each subplot

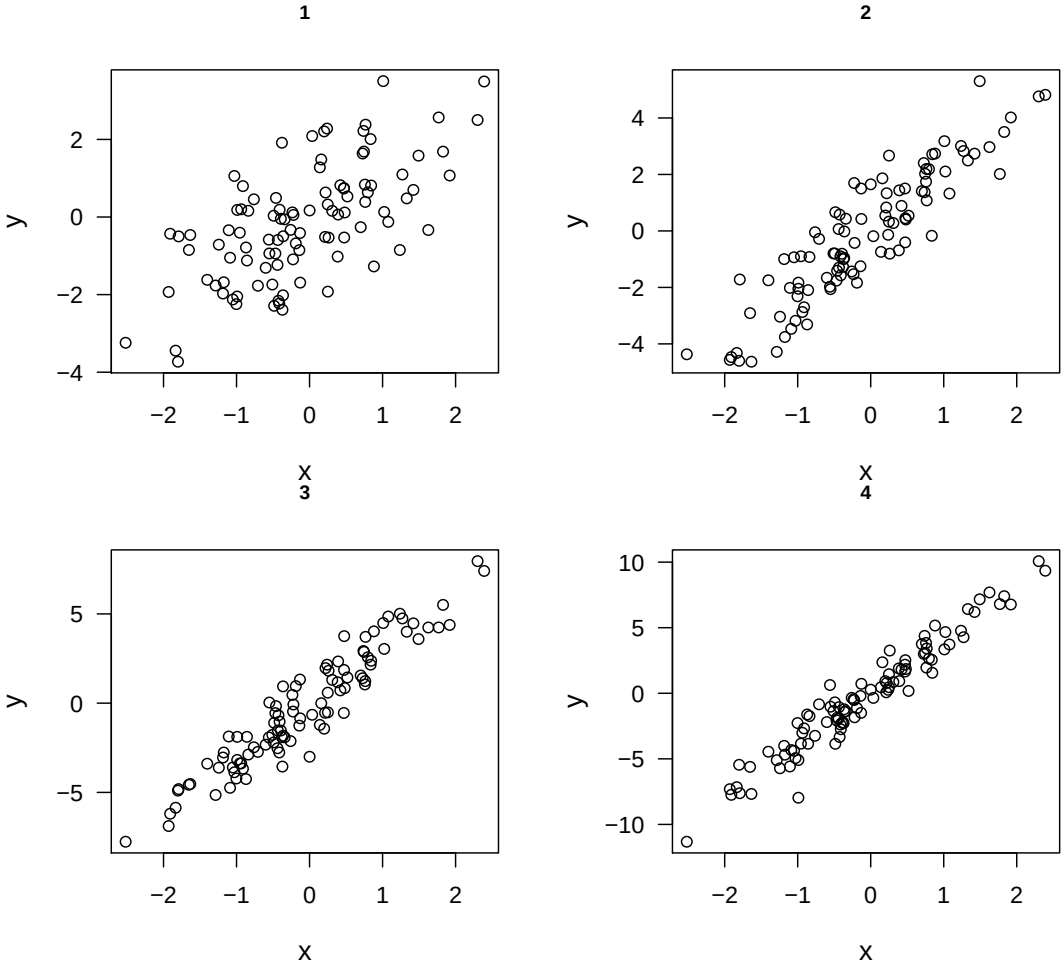


Figure 3: Multiple plots (1-4)

Tables

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

Table 1: Producing an output model as a table

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	0.05	0.09	0.49	0.62
x	2.04	0.08	24.13	0.00

Table 2: Custom table

Region	City
East Midlands	Lincoln
East Midlands	Nottingham
Eastern	Bedford
Eastern	Norwich

Using references: what you need

1. A *bib* file with your library or references.
2. A *cls* file that will indicate the journal style for the references. In this zotero link you can find hundreds of styles in *cls* format, that you need to define at the beggining of the rmarkdown document (above I'm using *plos-biology*)

Example: A study has shown blah [1]. Campbell [2] has show blah.

Spaces

Forcing spaces between figures or paragraphs with ("& nbsp;" with no spaces) or leaving a line blank between paragraphs.

Navideh likes frozen yoghurt.

Toby loves bananas.

Diego has a chia seeds' plantation.

Page breaks

Like in latex the command "forward slash newpage" will allow you to force a page break

Packages used, so your collaborators know what you used

- R version 3.2.2 (2015-08-14), `x86_64-pc-linux-gnu`
- Locale: `LC_CTYPE=en_US.UTF-8`, `LC_NUMERIC=C`, `LC_TIME=en_US.UTF-8`, `LC_COLLATE=en_US.UTF-8`, `LC_MONETARY=en_US.UTF-8`, `LC_MESSAGES=en_US.UTF-8`, `LC_PAPER=en_US.UTF-8`, `LC_NAME=C`, `LC_ADDRESS=C`, `LC_TELEPHONE=C`, `LC_MEASUREMENT=en_US.UTF-8`, `LC_IDENTIFICATION=C`
- Base packages: base, datasets, graphics, grDevices, methods, stats, utils
- Other packages: ggplot2 2.1.0, knitr 1.13, lattice 0.20-33, MASS 7.3-44
- Loaded via a namespace (and not attached): colorspace 1.2-6, digest 0.6.9, evaluate 0.9, formatR 1.4, grid 3.2.2, gtable 0.2.0, highr 0.6, htmltools 0.3.5, labeling 0.3, magrittr 1.5, munsell 0.4.3, plyr 1.8.3, Rcpp 0.12.5, rmarkdown 0.9.6, scales 0.4.0, stringi 1.1.1, stringr 1.0.0, tools 3.2.2, yaml 2.1.13

References

1. Adams J, Kimball A, Adams F. Early immunization against pertussis. American Journal Dis Child. 1947;74: 10–12.

2. Campbell H, Amirthalingam G, Andrews N. Accelerating control of pertussis in England and Wales. Emerg Infec Dis. 2012;18: 38–47.