Reproducible Research: The R Ecosystem, Github, Etc.

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What is research?

- In short, writting papers

Many processes involved

- Code development
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The review comes, after 6 months

- ... you must repeat an experiment
- ... or change a figure or ...

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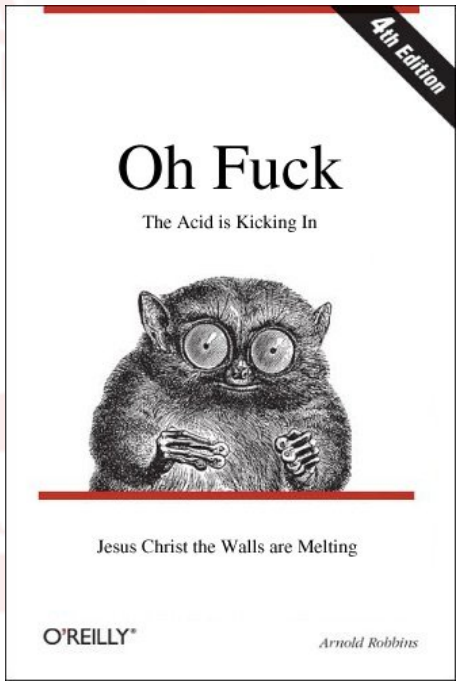


Introduction
The practice of research (II)

Even worse: Imagine you need to reproduce other's experiments

- Or any one else reproduce your experiments ... in teams

Need of many assets

- Experiment run
- Data analysis
- Experiment documentation
- Paper authoring
- On-line publication

Need of procedures and tools to handle this

Our objective

Formalize the whole publishing *collaborative* process

Introduction
Reproducible research

> "Reproducible research is the idea that data analyses, and more generally, scientific claims, are published with their data and software code so that others may verify the findings and build upon them."
> `http://reproducibleresearch.net/`

Reproducible research is a cornerstone of research

- Science **must** be reproducible
- Repetible $\neq$ reproducible

Reproducible research is good

- For science
- For you

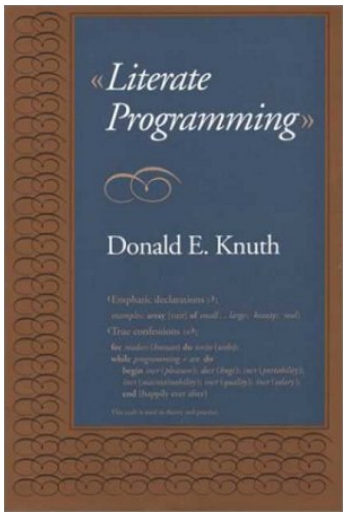
Introduction

Components of reproducible research

Task	**Tool**
Code development	`SVN`, `Git`
Collaboration	`Redmine`, `GitHub`
Data format	`CSV`, `YAML`, `JASON`
Experiment run	`Python`, `Lua`
Statistical analysis	`R`, `RStudio`
Documentation	`Markdown`
Results writting	`Bookdown`, `Knitr`, `Swave`
Assets publishing	`GitHub`

Literate Programming

Literate programming is an approach to programming introduced by D. Knuth in which a program is given as an explanation of the program logic in a natural language, such as English, interspersed with snippets of macros and traditional source code, from which a compilable source code can be generated.



- `https://en.wikipedia.org/wiki/Literate_programming`

TeX

TeX(= tau epsilon chi, and pronounced similar to "blecch", not to the state known for 'Tex-Mex' chili) is a computer language designed for use in typesetting; in particular, for typesetting math and other technical (from Greek "techne" = art/craft, the stem of 'technology') material.
(More info)

- It has been around for many years...
-

TeXand LaTeX

LaTeX, which is pronounced «Lah-tech» or «Lay-tech» (to rhyme with «blech» or «Bertolt Brecht»), is a document preparation system for high-quality typesetting. It is most often used for medium-to-large technical or scientific documents but it can be used for almost any form of publishing.
`http://www.latex-project.org/about/`

- It also has been around for many years...
-

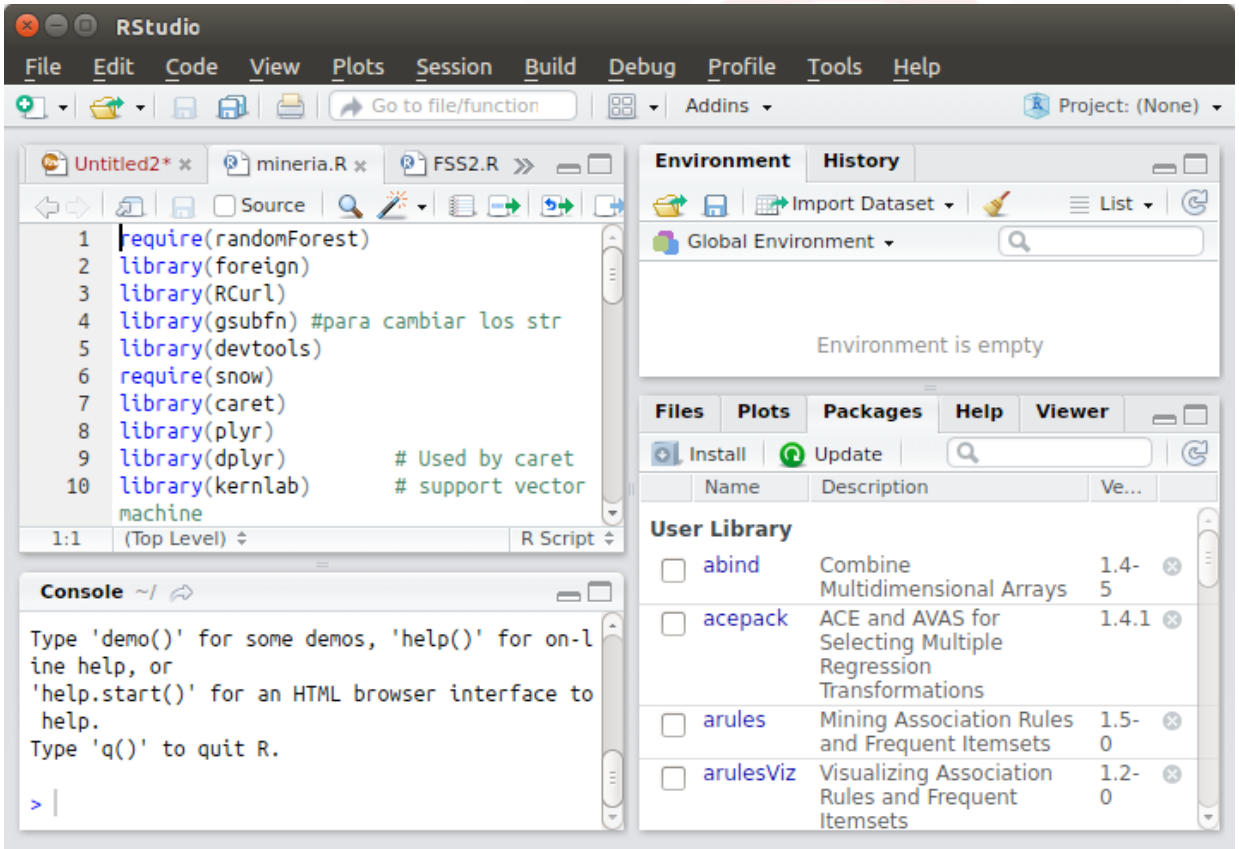
What is R?

R is a programming language and software environment for statistical computing and graphics supported by the R Foundation for Statistical Computing.The R language is widely used among statisticians and data miners for developing statistical software and data analysis.
Wikipedia:

`https://en.wikipedia.org/wiki/R_(programming_language)`

What is RStudio?

Popular IDE for R.



https://www.rstudio.com/

RStudio?

Well known package authors work for RStudio.

Markdown

Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents.
Extremely easy to learn and extensively used in RStudio.

knitr

knitr is an engine for dynamic report generation with R. It is a package in the statistical programming language R that enables integration of R code into LaTeX, LyX, HTML, Markdown, AsciiDoc, and reStructuredText documents.
`https://en.wikipedia.org/wiki/Knitr`
knitr extracts R code in the input document, evaluates it and writes the results to the output document
Rnw, Markdown, HTML and LaTeX
`http://yihui.name/knitr/`
`http://yihui.name/knitr/demo/minimal/`

Bookdown

It is way of authoring books with RMarkdown generating PDF, handouts and slides automatically.
`https://www.rstudio.com/resources/webinars/introducing-book`

Rnw

Inserts R into Latex documents.

Git and GitHub

Git

Git

`https://en.wikipedia.org/wiki/R_(programming_language)`

GitHub

GitHub

`www.github.com`

Publish Websites, etc.

Conclusions

- Learn Bash and other tools for it: awk, make, sort,
- Learn Git, R or Python.
- If you use R/Python for your research automate as much as possible. It is much easier to modify.
- Try to stick to Open/libre software GNU/Linux, R, Python, etc.