Documentation and reproducibility with R and LaTeX

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Background & Motivation

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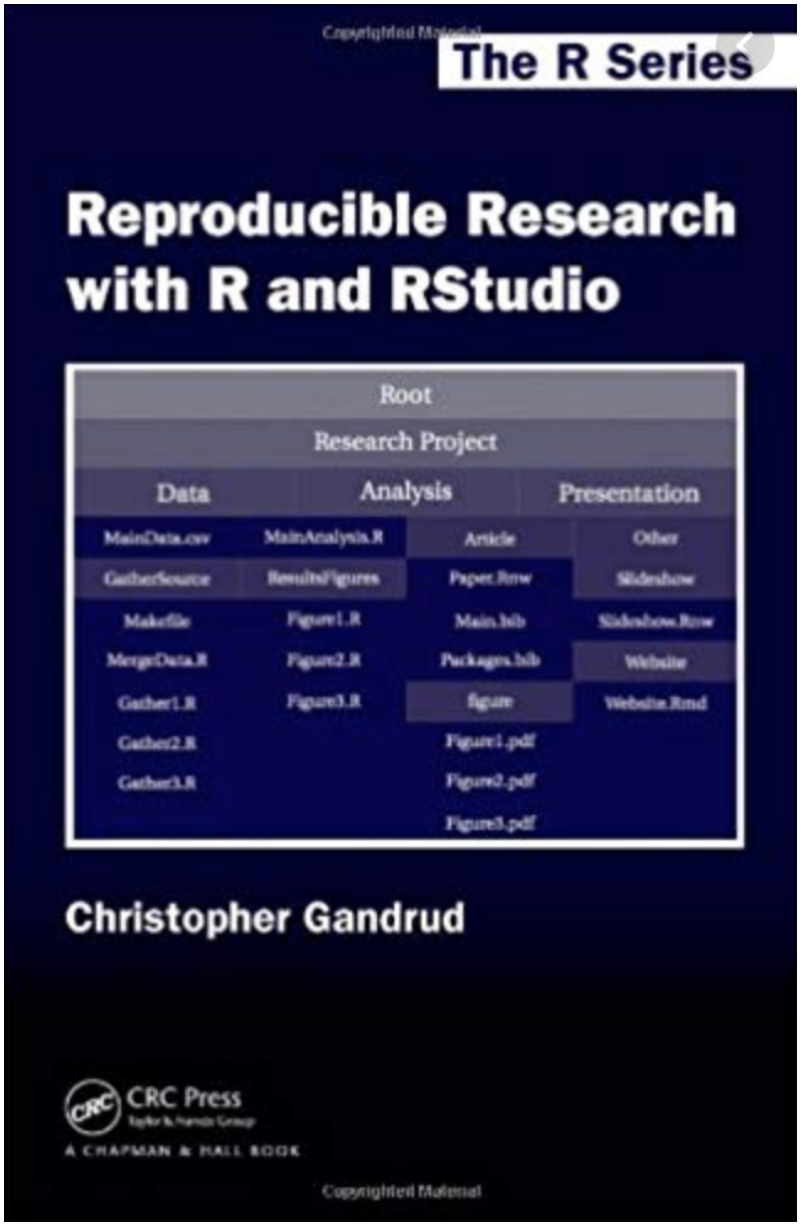

Background & Motivation

Research is often presented in very abridged packages

- Slide shows
- Journal articles
- Books
- Web sites

Background & Motivation

These presentation documents announce a project's findings

Background & Motivation

These documents are not necissarily the research

- Sometimes considered the "advertising"

- Especially true in computational and statistical sciences

Background & Motivation

The research also includes:

- Full software environment
- Code
- Data

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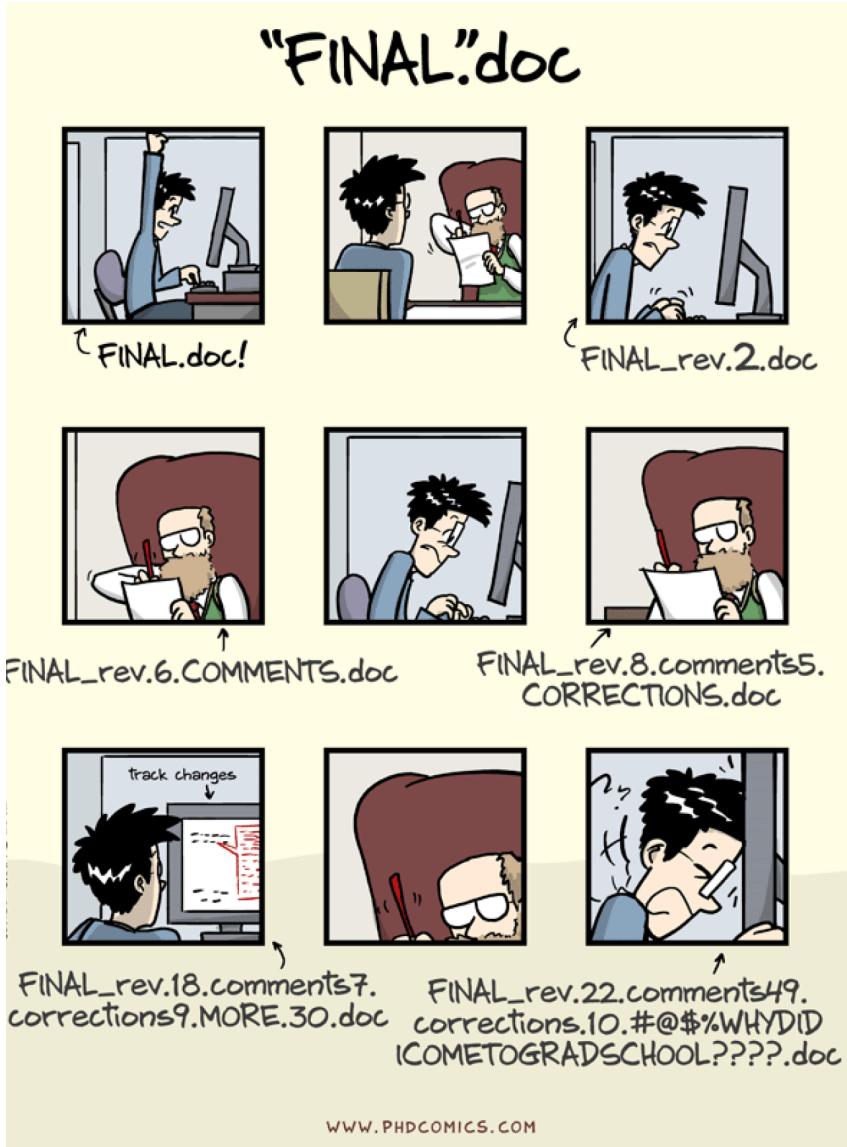

Background & Motivation

This workshop will introduce:

- The tools to dynamically combine research with presentation of findings,
- The `R` statistical language for data analysis,
- the LaTeX mark-up language for documents, slide shows, articles, books, and web-pages,
- the `knitr` package for `R`,
- **RStudio**, a program that brings all of these tools together in one place.

Objective

The objective of this workshop is to:

- Introduce the tools to develop a work-flow to maximize reproducible-ness, collaborations, and research impact.
- Provide templates that can be modified for your own research.

The objective of this workshop is NOT to:

- Become well-versed in `R`, `RStudio`, LaTeX, or `knitr` - that takes repetition (starting with the basic building blocks that are provided).

Background & Motivation

Additional topics include:

- Version control with Git hub,
- Data gathering,
- R markdown,
- File management,
- Projects in RStudio,
- Using LaTeXto make presentations with Beamer.

All are covered in the book: *Reproducible Research with R and RStudio*

Why R?

- Open Source and free
- Very active development community
- Interfaces with LaTeXor other mark-up languages
- Explicitly write down analyses steps as source code

Why `knitr`?

- Literate programming is a crucial part of reproducible quantitative research
- Highlights `R` code in presentation documents making it easier for readers to follow
- Provides control over inclusion of graphics
- Can cache (save output for later)

Why RStudio?

- Stand alone editor for TEXand Markdown
- Many shortcuts
- Works with C++, CSS, JavaScript, and a few other programming languages
- Integrated with version control of Git and SVN
- Simple compiling of .Rnw files
- **Easier to learn than Emacs or vi!**

What is Reproducible Research?

Research results are replicable if there is sufficient information available for independent researchers to make the same findings using the same procedures (King, 1995, 444).

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In computational sciences, this means:
The data and code used to make a finding are available and they are sufficient for an independent researcher to recreate the finding.