GITting started with reproducibility: An introduction to git and knitr

Biostatistics Student Association Computing Workshop

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Why do I care about reproducibility?

Reproducible research is a hallmark of the scientific method, but we're pretty bad at it.

> *In 2012, a researcher then at the biotechnology company Amgen wrote in Nature that when his team tried to reproduce 53 landmark cancer studies, they could replicate just six. And according to a news report in Nature, a project aiming to reproduce the findings of 100 psychology papers has managed to replicate results for only 39 of them (the project's findings are still under peer review).*

"What Science Can Tell Us About Bad Science", *The Atlantic*, September 2015. `http://www.theatlantic.com/magazine/archive/2015/09/a-scientific-look-at-bad-science/399371/`

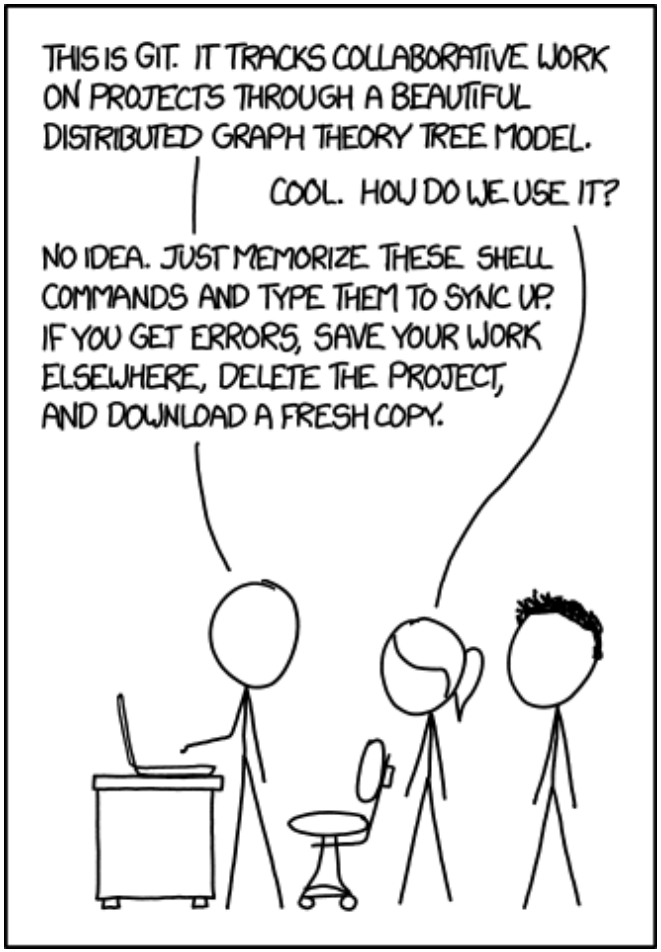
But I'm a Biostatistician!

- Reproducibility is important in both science AND statistics!
- As statisticians, we need to be able to reproduce our results on the same data set
  - This means we have to write reports in a way that minimizes error and write code so that we can get the same results years later.

Agenda

1. `Git`: A "version control" tool used for collaborating and maintaining different versions of a file, typically for code.
   - Great for collaborating, or just saving your own ass.
   - Often used in conjunction with *GitHub*, an online repository storage service.
2. `knitr`: An R package that lets you create documents containing R code and output.
   - Keep everything you need to generate a report (e.g., for research, homework, or 699) in one place!
   - My favorite part: Update code without having to re-create tables! (This is where errors creep in!)

A Brief Warning



Source: `https://xkcd.com/1597/`

Setup

Create a GitHub account, then download either Git or GitHub Desktop.

- Pure Git (i.e., just command-line tools): `https://git-scm.com/downloads`
- GitHub Desktop (GUI & command-line tools): `https://desktop.github.com/`

clone a Repository

- To create a local copy of an existing git repository, use `git clone [url] [directory-name]`.
- In a terminal (Mac, Linux) or the Git Shell (Windows), navigate to the folder you want to clone the repository into.
- **Exercise:** Clone my `bsa-computing` repository onto your computer. The URL is `https://github.com/nseewald1/bsa-computing.git`

Make Changes!

- You now have a copy of both the current version of `bsa-computing` *and* access to every previous version.
- This clone is NOT automatically synced, à la Dropbox
  - Anything you break is completely isolated from the pristine copy on GitHub and your previous "commits".
- **Exercise:** Add to `food-exercise.md`, and save your changes.

Making Commits

- Once you've accomplished a relatively small, but still significant task, you'll want to "commit" your code to the repository.
- This creates a labeled snapshot of the directory at the time of the commit.

What is knitr?

- knitr lets you embed code and output from R into LaTeX, HTML, RMarkdown, etc.