Meet the Toolkit

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STA 210

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Topics

- Reproducible data analysis
- R and RStudio
- R Markdown
- Git and GitHub

Reproducible data analysis

Reproducibility checklist

Near-term goals

✓ Are the tables and figures reproducible from the code and data?

✓ Does the code actually do what you think it does?

✓ In addition to what was done, is it clear **why** it was done?

Long-term goals

✓ Can the code be used for other data?

✓ Can you extend the code to do other things?

Toolkit

- **Scriptability** → R
- **Literate programming** (code, narrative, output in one place) → R Markdown
- **Version control** → Git / GitHub

R and RStudio

What is R and RStudio?

- R is a statistical programming language
- RStudio is a convenient interface for R (an integrated development environment, IDE)

- At its simplest:*
  - R is like a car's engine
  - RStudio is like a car's dashboard

R: Engine

RStudio: Dashboard

*Source: [Modern Dive]

R essentials (a short list)

- **Functions** are (most often) verbs, followed by what they will be applied to in parentheses:

```
do_this(to_this)
do_that(to_this, to_that, with_those)
```

- **Columns** (variables) in data frames are accessed with **`$`**:

```
dataframe$var_name
```

- **Packages** are installed with the **`install.packages`** function and loaded with the **`library`** function, once per session:

```
install.packages("package_name")
library(package_name)
```

tidyverse

- The tidyverse is an **opinionated** collection of R packages designed for data science.
- All packages share an underlying philosophy and a common grammar.

Image from Teaching in the Tidyverse 2020

R Markdown

R Markdown

- Fully reproducible reports -- the analysis is run from the beginning each time you knit
- Simple Markdown syntax for text
- Code goes in chunks, defined by three backticks, narrative goes outside of chunks

How will we use R Markdown?

- Every assignment / lab / project / etc. is an R Markdown document
- You'll always have a template R Markdown document to start with
- The amount of scaffolding in the template will decrease over the semester

R Markdown tips

Resources

- R Markdown cheat sheet
- Markdown Quick Reference:
  - **`Help -> Markdown Quick Reference`**

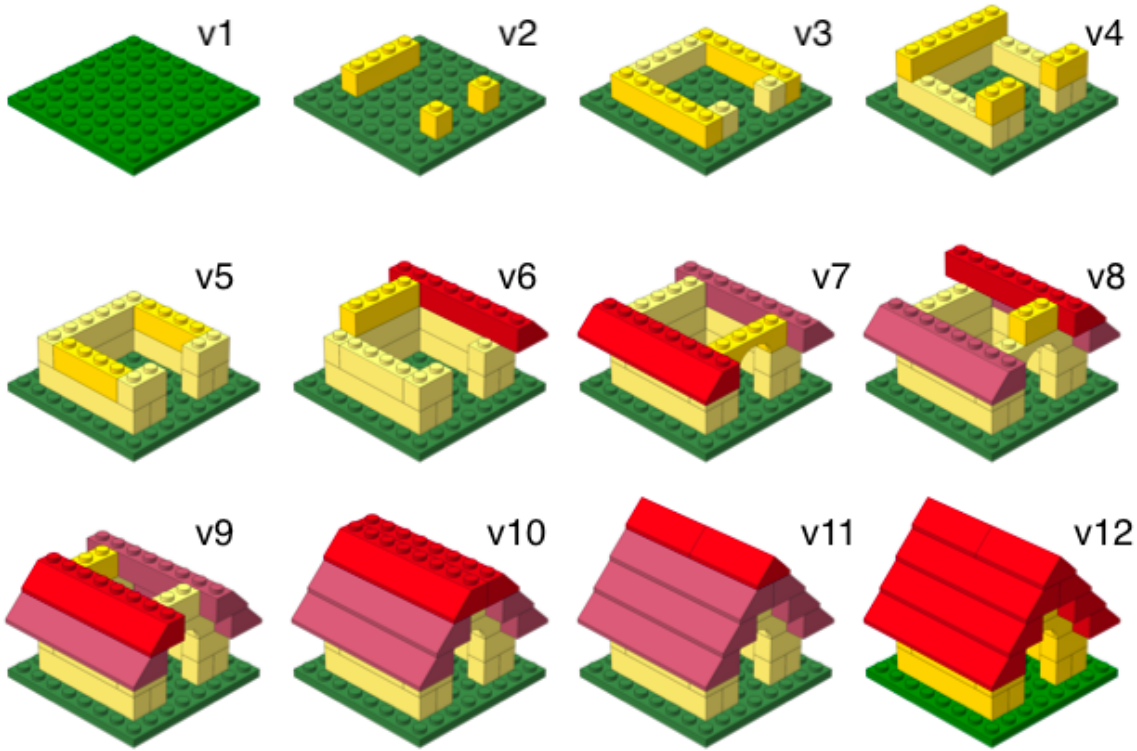
Remember: The workspace of the R Markdown document is separate from the console

Git and GitHub

Version control

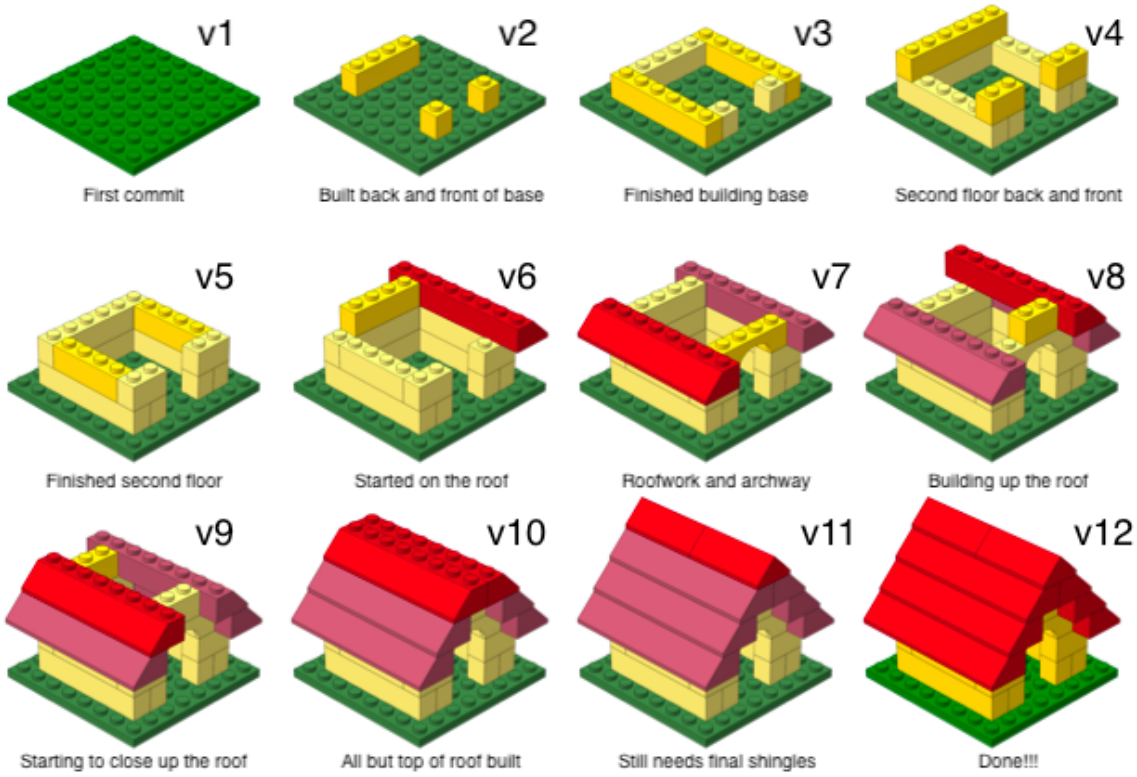
- We introduced GitHub as a platform for collaboration
- But it's much more than that...
- It's actually designed for version control

What is versioning?

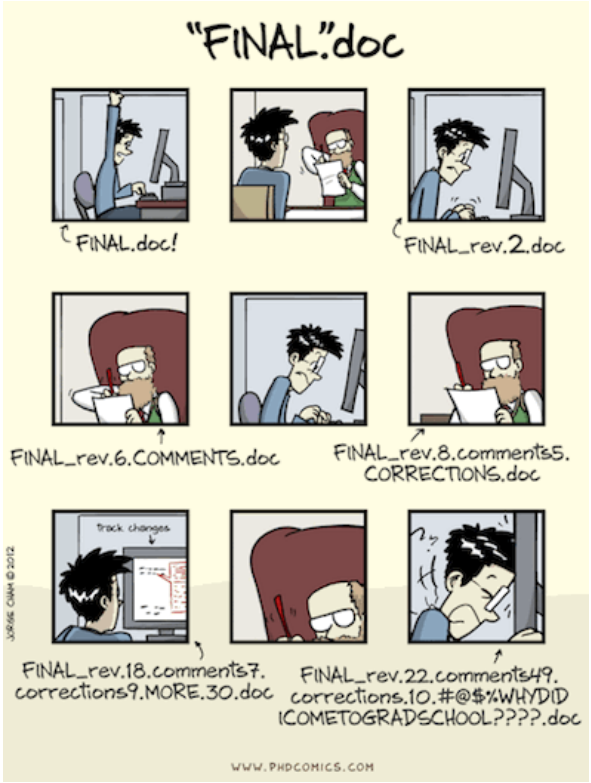


What is versioning?

with human readable messages



Why do we need version control?



- **Git** is a version control system -- like “Track Changes” features from Microsoft Word.
- **GitHub** is the home for your Git-based projects on the internet (like DropBox but much better).
- There are a lot of Git commands and very few people know them all. 99% of the time you will use git to add, commit, push, and pull.

Git and GitHub tips

- We will be doing git things and interfacing with GitHub through RStudio
  - If you Google for help, skip any methods for using git through the command line.
- There is a great resource for working with git and R: happygitwithr.com.
  - Some of the content in there is beyond the scope of this course, but it's a good place to look for help.

Recap

Can you answer these questions?

- What is a reproducible data analysis, and why is it important?
- What is version control, and why is it important?
- What is R vs. RStudio?
- What is git vs. GitHub?