Intro to Git for Version Control

Hunter Wade York

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  - There are a lot of tutorials out there that won't be useful to you because they primarily teach the collaborative part of git as opposed to the version control part of git. This collaborative part is what holds up entire tech platforms: facebook, google, etc. all use a version of git.
- If you have questions or want a demonstration during the presentation, STOP ME! No question is too simple, and I can do a few examples on the fly.

Useful Links

- Git for Novices

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Questions?

Outline

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  - Collaboration/tweaking an existing project

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- Git can be used in the terminal or with some GUIs. I have no experience with these, but this workflow will be generalizable to them. RStudio also has a git GUI that many people find useful, but again I don’t know how to use it.

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  - No potential for branching

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  - Stackexchange is your friend!

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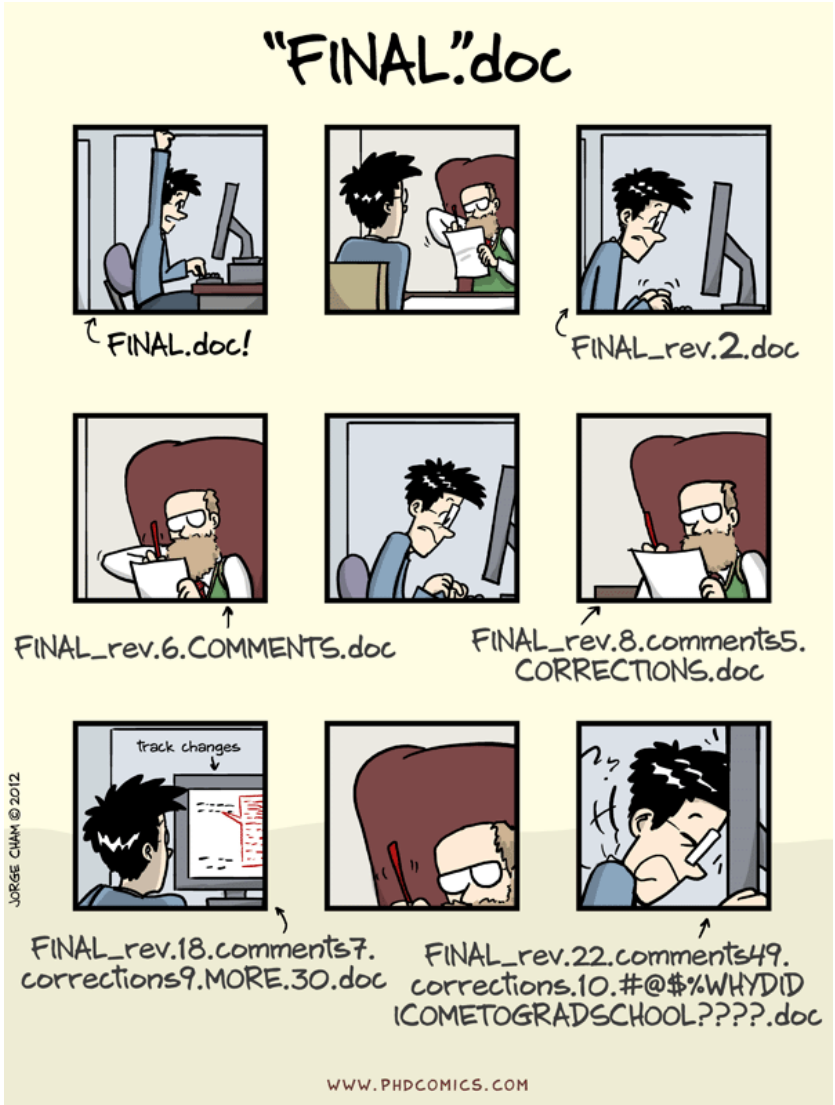

www.phdcomics.com

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- Allows permanent record of code (for publishing papers for example)

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Designing a workflow around Git

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  - This is another major strength of Git. When a

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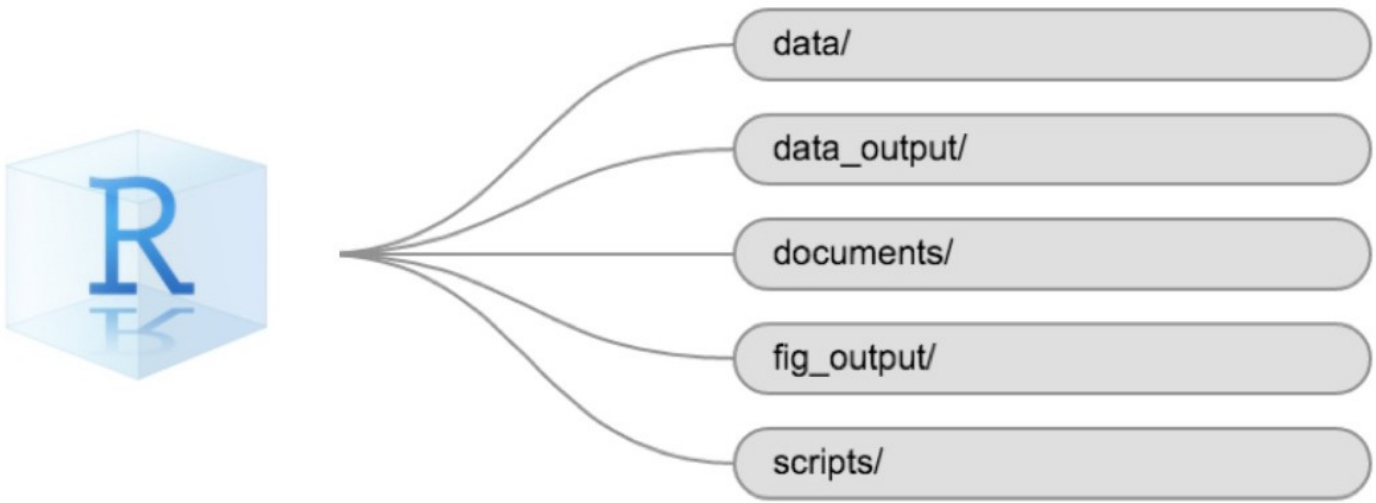
- I almost always start it in the parent directory and then only `git add` (I'll teach this in a second) the code subdirectory. This gives me the flexibility to also keep track of "/ref" in case my codebase ends up relying heavily on it.

Workflows



Another Example Directory Setup

Questions?

Git overview - Starting a repo

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- Under the hood, this command creates an invisible subdirectory (`/code/.git`) which git uses to keep track of all my files.

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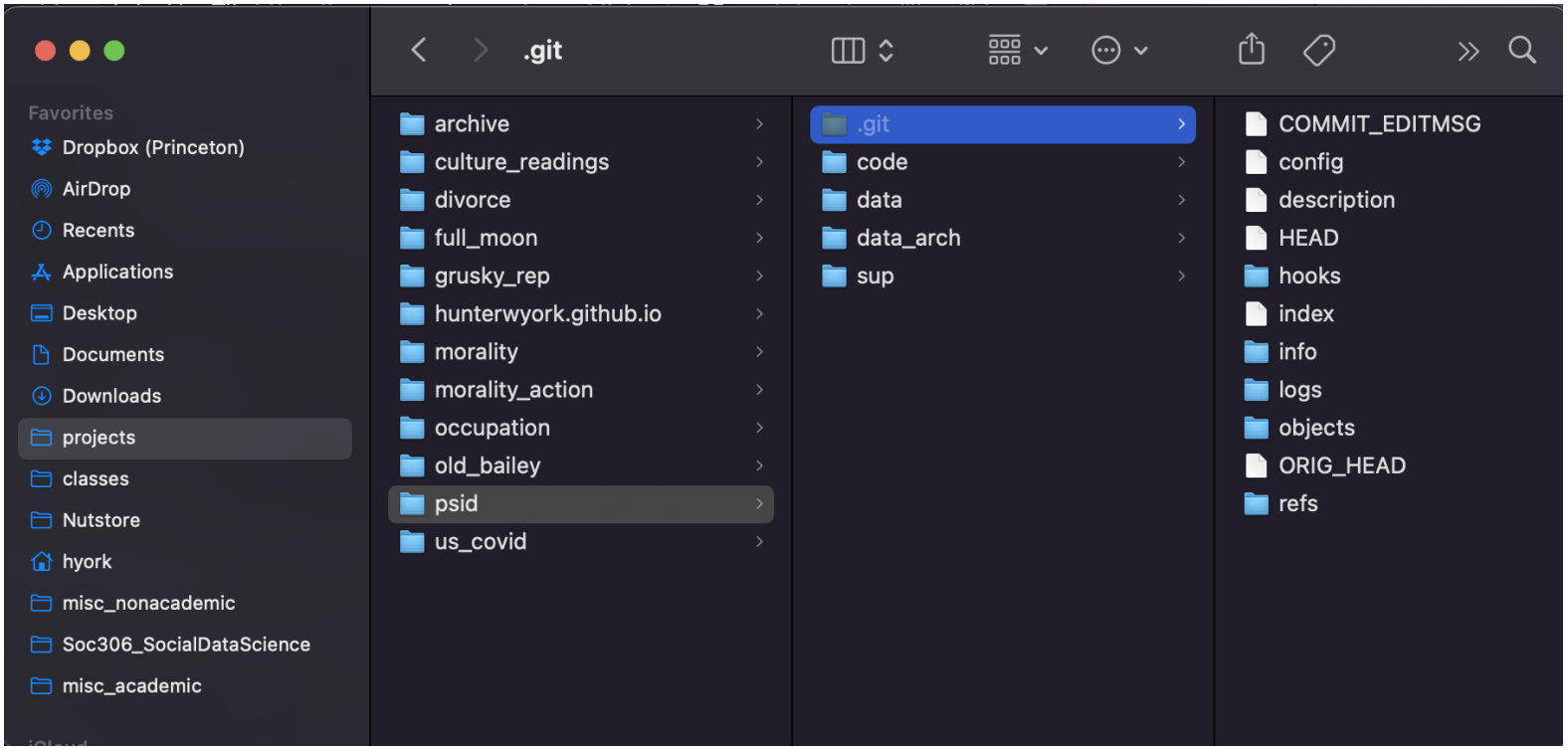

File Structure Showing .git folder

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- The below output shows what it might look like.
- Here I have some unsaved changes in my "/code" subdirectory, including some changes in an RMarkdown file, and some associated file changes from knitting to pdf.

```
occupation — -zsh — 134×47
Last login: Wed Jun  1 16:18:38 on ttys001
hyork@opr-hyork-mbpro ~ %       cd /Users/hyork/Documents/projects/archive
hyork@opr-hyork-mbpro archive % cd ..
hyork@opr-hyork-mbpro projects % ls
archive                 grusky_rep              occupation
culture_readings        hunterwyork.github.io   old_bailey
divorce                 morality                psid
full_moon               morality_action         us_covid
hyork@opr-hyork-mbpro projects % cd occupation
hyork@opr-hyork-mbpro occupation % git status
On branch master
Your branch is up to date with 'origin/master'.

Changes not staged for commit:
  (use "git add/rm <file>..." to update what will be committed)
  (use "git restore <file>..." to discard changes in working directory)
        modified:   code/.DS_Store
        modified:   code/.Rhistory
        modified:   code/analysis_XV_mobility_occ1950.Rmd
        modified:   code/analysis_XV_mobility_occ1950_cache/latex/__packages
        deleted:    code/analysis_XV_mobility_occ1950_cache/latex/unnamed-chunk-1_814fb63066e1e04dd9876225c1102b21.RData
        deleted:    code/analysis_XV_mobility_occ1950_cache/latex/unnamed-chunk-1_814fb63066e1e04dd9876225c1102b21.rdb
        deleted:    code/analysis_XV_mobility_occ1950_cache/latex/unnamed-chunk-1_814fb63066e1e04dd9876225c1102b21.rdx
        modified:   code/analysis_XV_mobility_occ1950_files/figure-latex/unnamed-chunk-1-1.pdf
        modified:   code/analysis_v_composition_changes_and_cps_skills_files/.DS_Store
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- You can also set files to be ignored every time, so that you can use `git add .` without having it actually pay attention to unimportant files. Just google "gitignore" to learn this trick!

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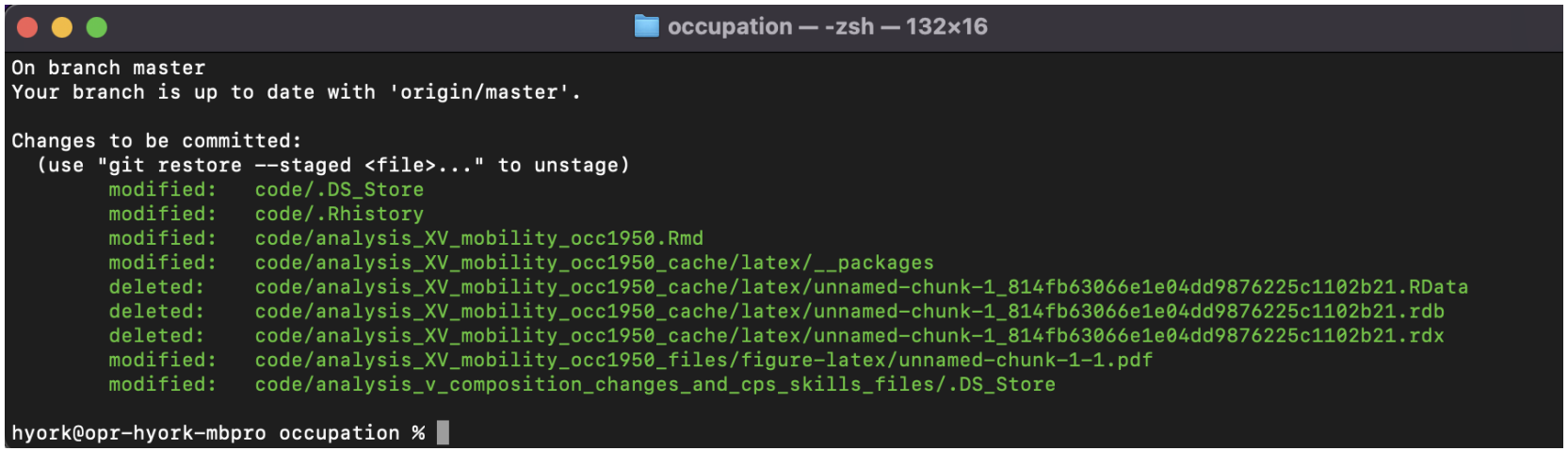
- Here we can see that once I've run `git add .`, all the unstaged changes are now staged for a commit.



Example output

Git Commit & Push

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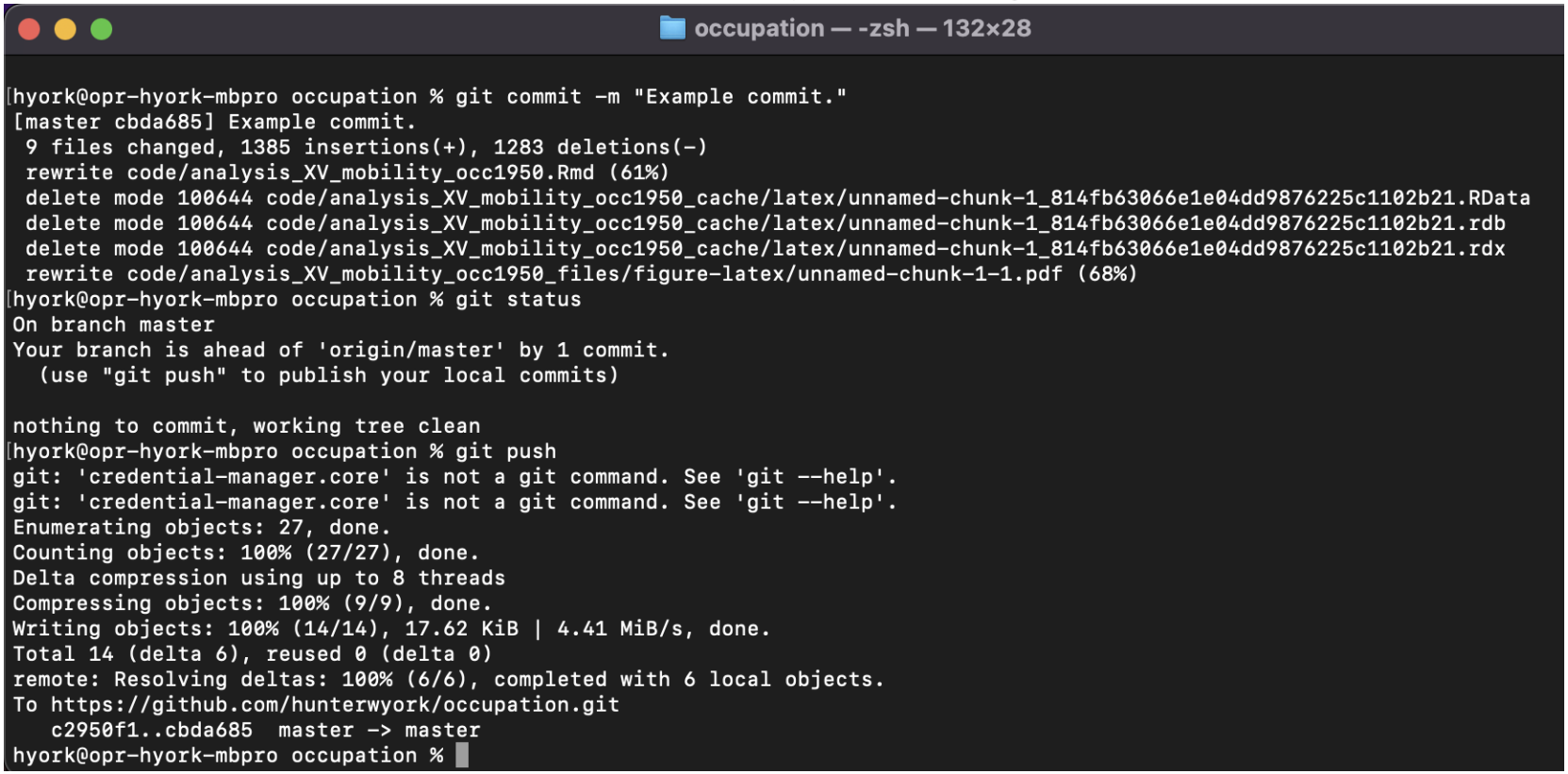
- Git push finalizes the commit by pushing local commits.



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- However, if I delete the hidden `.git` folder, my computer dies, or something else happens, all previous changes will be lost forever.
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- You can set up SSH keys so you don't have to enter you github username and password every time. THIS IS WORTH IT!

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- `git status` allows you to check what's going on re: unstaged, staged, commited, and up-to-date files
- By now, you have all that you need to have a basic, single-user version control system for keeping track of a project.

Questions?

Git overview - Backtracking, Branching

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- This is where `git checkout` and `git branch` enter the picture.

Backtracking

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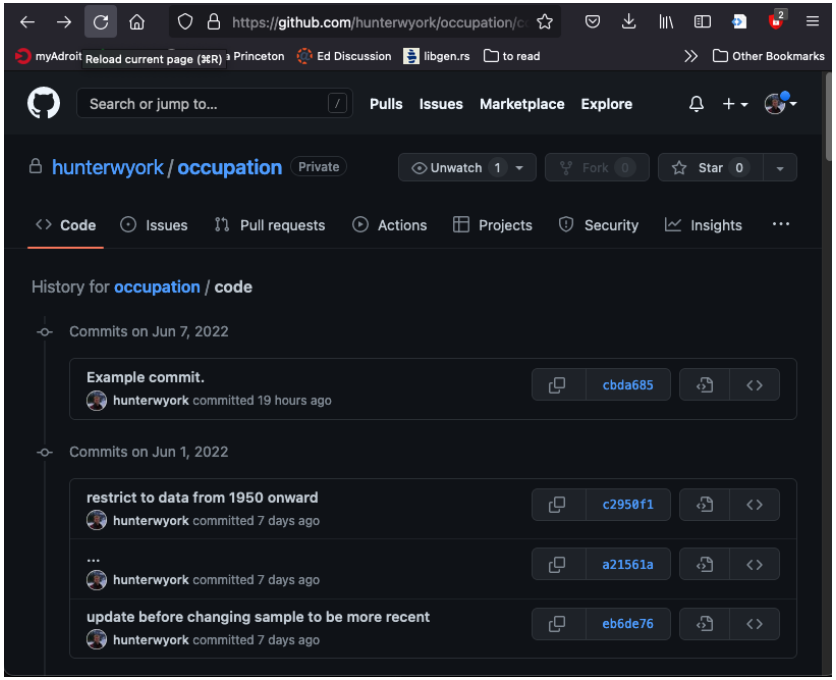

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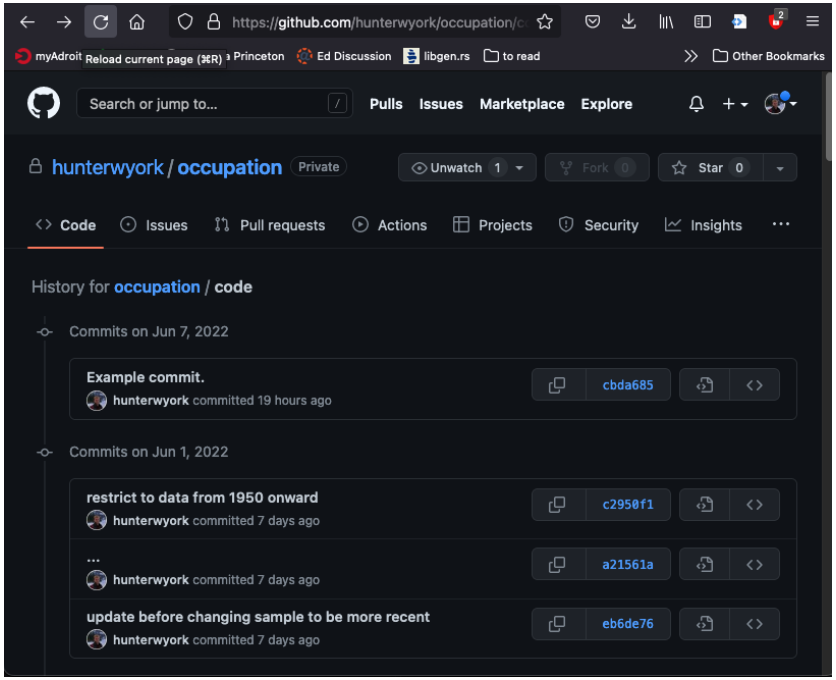

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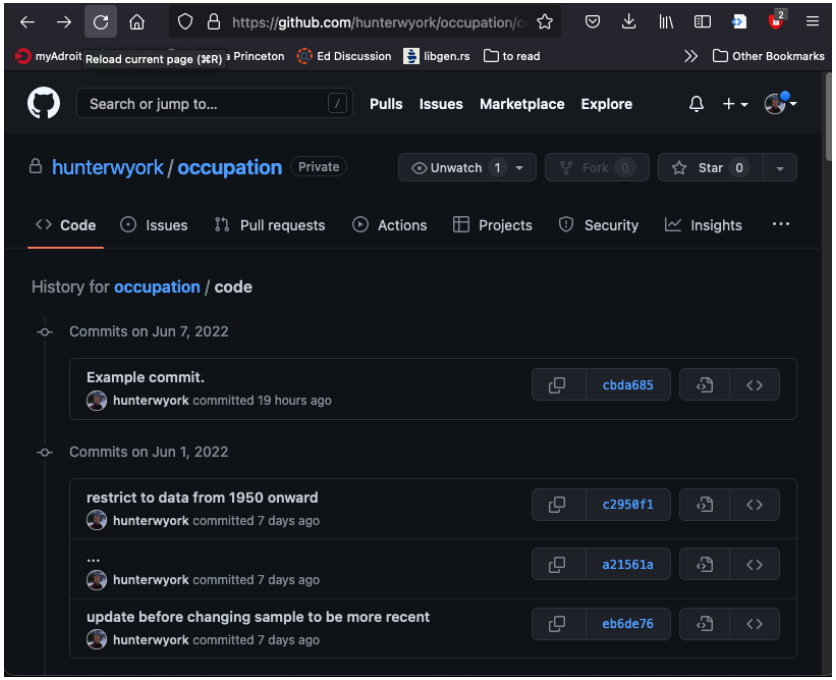

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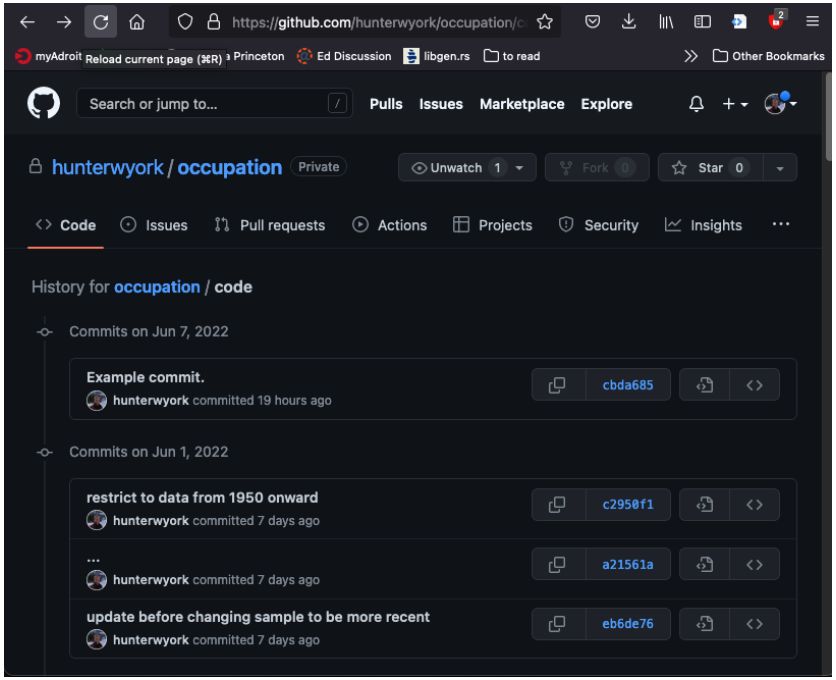
- You can also see these manually using `git log`

Backtracking

- Each commit is associated with a hash.



- Clicking the copy button copies the hash string onto your clipboard.
- You can also see these manually using `git log`
- `git checkout COPIED_HASH` allows you to rollback the repo to the state it was in when you committed that commit.

Git overview - Backtracking

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- You can do that using `git diff` in the terminal or by using github within your repo.
  - This looks like https://github.com/github/occupation/compare/c3a414e..faf7c6f
- This is a major utility of the GUI of github! Visually inspecting changes between commits allow you to see why your results might have totally changed without you remembering.

Online example Link

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- Example

Git overview - Collaboration

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- Keys: norms, coordination, and communication.

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- Also, if you think a change you've made is wort incorporating into the master branch, you can initiate a pull request!

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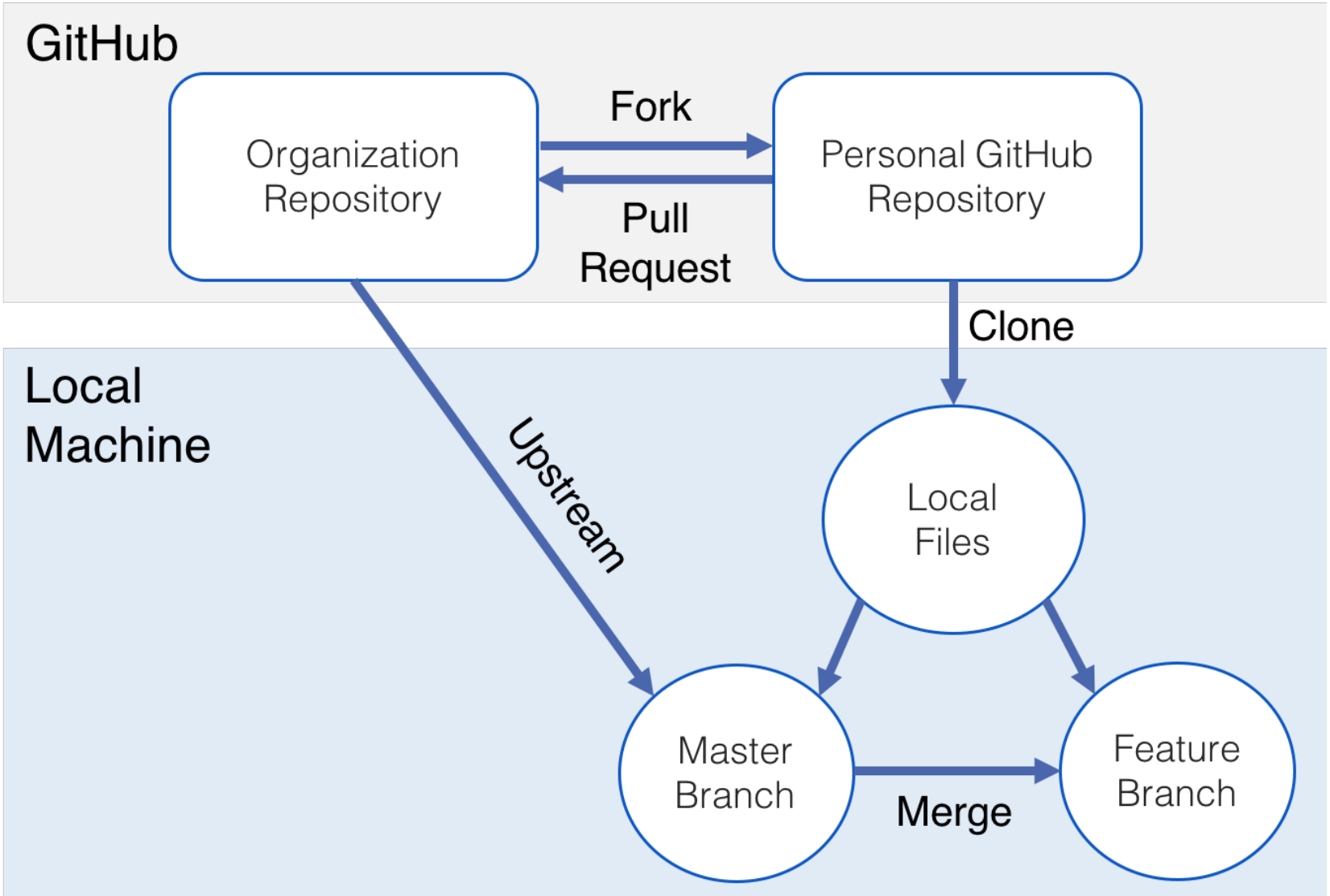

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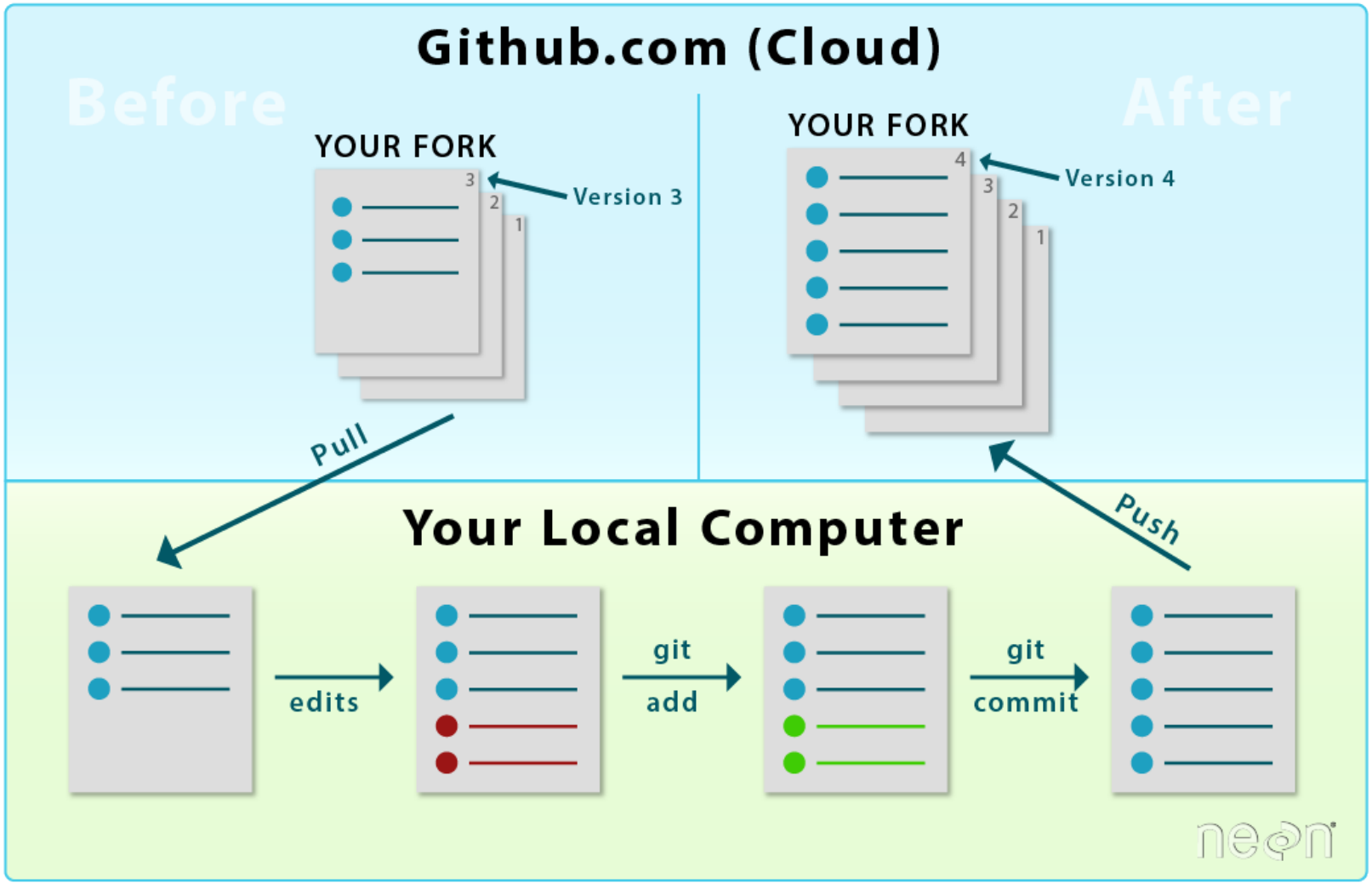

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Code Tips

1. Break down large projects into smaller chunks.

- For me, this usually looks something like having a "processing.R", "anlaysis.R", and a "figures.R" script.
  - Tailor these to your specific project. If you have many lines of data acquisition and many lines of data processing, break that up!
- Real programmers, data scientists working to make reproducible pipelines, etc. will all have drastically different standards of coding. Don't listen to them. Unless you're making a package to put on CRAN, you don't need a script for helper functions, etc.
- That said, if one of your files exceeds 1,000 lines, or you have a very time-consuming step in the middle of a script, consider breaking it up.
- I love to save intermediate files in my scripts. Later, these form a natural place for me to break a script up if it gets too long.

Questions?

Questions, comments?

Thank you!

- I can be reached at hyork@princeton.edu

Thank you!

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- Check out my website hunterwyork.com

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