

Version Control with Git and GitHub

Winter Institute in Data Science

Ryan T. Moore

2026-01-06

Introducing Git + GitHub

Workflow and Git Commands

Branches

Merging and Rebasing

Pull Requests and Forks

Introducing Git + GitHub

Git

“Git is a free and open source distributed version control system”

– <https://git-scm.com/>

Git

“Git is a free and open source distributed version control system”

– <https://git-scm.com/>

- ▶ Set of command-line tools for *version control*: explicit management of file history

Git

“Git is a free and open source distributed version control system”

– <https://git-scm.com/>

- ▶ Set of command-line tools for *version control*: explicit management of file history
- ▶ *Distributed*: full codebase (current and history) lives on every developer's machine

Git

“Git is a free and open source distributed version control system”

– <https://git-scm.com/>

- ▶ Set of command-line tools for *version control*: explicit management of file history
- ▶ *Distributed*: full codebase (current and history) lives on every developer's machine
- ▶ Originally written by Linus Torvalds (Linux)

GitHub

- A web-based repository for code

GitHub

- ▶ A web-based repository for code
- ▶ Utilizes `git` version control system for careful tracking of how files change

GitHub

- ▶ A web-based repository for code
- ▶ Utilizes `git` version control system for careful tracking of how files change
- ▶ Facilitates collaboration by organizing simultaneous editing, issue tracking, merging, conflict management, ...

GitHub

- ▶ A web-based repository for code
- ▶ Utilizes `git` version control system for careful tracking of how files change
- ▶ Facilitates collaboration by organizing simultaneous editing, issue tracking, merging, conflict management, ...
- ▶ (“Collaboration” includes your future self)

GitHub

- ▶ A web-based repository for code
- ▶ Utilizes `git` version control system for careful tracking of how files change
- ▶ Facilitates collaboration by organizing simultaneous editing, issue tracking, merging, conflict management, ...
- ▶ (“Collaboration” includes your future self)
- ▶ Think Dropbox/GDrive, but better, more deliberate.

GitHub

- ▶ A web-based repository for code
- ▶ Utilizes `git` version control system for careful tracking of how files change
- ▶ Facilitates collaboration by organizing simultaneous editing, issue tracking, merging, conflict management, ...
- ▶ (“Collaboration” includes your future self)
- ▶ Think Dropbox/GDrive, but better, more deliberate.
- ▶ Next steps: `renv`, Containers, Docker, Code Ocean

Examples

Screenshot of a GitHub repository page for "ryantmoore / r-data-science".

Repository details:

- Owner: ryantmoore
- Name: r-data-science
- Status: Private
- Unwatched (1)
- Starred (0)
- Forked (0)

Navigation tabs:

- Code
- Issues 5
- Pull requests 0
- Projects 0
- Wiki
- Security
- Insights
- Settings

Section: Introductory R for Data Science

Topics:

- Manage topics

Summary metrics:

- 267 commits
- 1 branch
- 0 releases
- 3 contributors
- GPL-3.0

Branch dropdown: master ▾

Action buttons:

- New pull request
- Create new file
- Upload files
- Find file
- Clone or download

Commit history:

Author	Commit Message	Time Ago
ryantmoore	Update PS6	Latest commit fd1ff6d 6 days ago
admin	Update PS6	6 days ago
code	Update pkg tests and building	6 days ago
data	Make laws data longer	last year
notes	Update pkg tests and building	6 days ago
ps_labs	ps05 Exam class	18 days ago
quiz	Initialize quiz pkg2	6 days ago
.gitignore	Create full gitignore	9 months ago
LICENSE	Initial commit	2 years ago
README.md	Fix typo	13 days ago
r-data-science.Rproj	Add Rproj file	8 months ago

Examples

ryantmoore / **blockTools** Private

Unwatch 10 ⚡

Code Issues 16 Pull requests 1 Projects 0 Insights Settings

Branch: master **blockTools / blockTools /** Create new file Upload file

ryantmoore Add tarball 0.6-2. Update all /blockTools/ files. Latest commi..

R Add tarball 0.6-2. Update all /blockTools/ files.

data Initial

demo Add tarball 0.6-2. Update all /blockTools/ files.

inst Copying directory blockTools/ from devel to master

man Add tarball 0.6-2. Update all /blockTools/ files.

src Add tarball 0.6-2. Update all /blockTools/ files.

CHANGELOG Add tarball 0.6-2. Update all /blockTools/ files.

COPYING Initial

DESCRIPTION Add tarball 0.6-2. Update all /blockTools/ files.

LICENSE Add tarball 0.6-2. Update all /blockTools/ files.

NAMESPACE Add tarball 0.6-2. Update all /blockTools/ files.

Examples

ryantmoore / **blockTools** Private

Unwatch 10 Star 0 Fork

Code Issues 16 Pull requests 1 Projects 0 Insights Settings

Optimal greedy randomly breaks ties. Can we set a seed to get same blocks? #57

Open ryantmoore opened this issue on Jun 14, 2017 · 3 comments

 ryantmoore commented on Jun 14, 2017

In `block()`, the optimal-greedy algorithm breaks ties randomly to create blocks. Can we set a seed so that we can replicate the blocks when a lot of ties exist? @keithschnak will this involve passing a new argument to `optgreed()` in `block()` to influence the underlying C code?

 ryantmoore added **enhancement** **question** labels on Jun 14, 2017

 ryantmoore assigned keithschnak on Jun 14, 2017

 keithschnak commented on Jun 14, 2017

I think I can make it pass the seed from R as an argument to the C function. I'll take a look this evening.

Assignees
 keithschnak

Labels
enhancement
question

Projects
None yet

Milestone
No milestone

Notifications

16s/159e

The Motivation

- ▶ Web resources: page, README, issue tracking and assignment

The Motivation

- ▶ Web resources: page, README, issue tracking and assignment
- ▶ Work simultaneously, large group, without fear of conflicts

The Motivation

- ▶ Web resources: page, README, issue tracking and assignment
- ▶ Work simultaneously, large group, without fear of conflicts
- ▶ Package sharing w/o CRAN or `tar.gz`

The Motivation

- ▶ Web resources: page, README, issue tracking and assignment
- ▶ Work simultaneously, large group, without fear of conflicts
- ▶ Package sharing w/o CRAN or `tar.gz`
- ▶ Gists: small stand-alone functions/code (e.g., <http://j.mp/2djpFON>)

The Motivation

- ▶ Web resources: page, README, issue tracking and assignment
- ▶ Work simultaneously, large group, without fear of conflicts
- ▶ Package sharing w/o CRAN or `tar.gz`
- ▶ Gists: small stand-alone functions/code (e.g., <http://j.mp/2djpFON>)
- ▶ Data science jobs: provide GitHub ID

Alternatives

Git:

- ▶ Mercurial
- ▶ Concurrent Versions System (CVS)
- ▶ Subversion (SVN)
- ▶ ...

Alternatives

Git:

- ▶ Mercurial
- ▶ Concurrent Versions System (CVS)
- ▶ Subversion (SVN)
- ▶ ...

GitHub:

- ▶ Bitbucket
- ▶ GitLab
- ▶ GitKraken
- ▶ SourceForge
- ▶ ...

Workflow and Git Commands

Git + GitHub

The General Workflow:

- ▶ Create/designate/find *repository* to track

Git + GitHub

The General Workflow:

- ▶ Create/designate/find *repository* to track
- ▶ Make changes to code

Git + GitHub

The General Workflow:

- ▶ Create/designate/find *repository* to track
- ▶ Make changes to code
- ▶ *Commit* changes: declare “save this snapshot”

Git + GitHub

The General Workflow:

- ▶ Create/designate/find *repository* to track
- ▶ Make changes to code
- ▶ *Commit* changes: declare “save this snapshot”
- ▶ Send commits to GitHub (*push*)

Workflow and Product

- ▶ Include elements of the work product

Workflow and Product

- ▶ Include elements of the work product
 - ▶ Code files

Workflow and Product

- ▶ Include elements of the work product
 - ▶ Code files
 - ▶ Documentation (how to use your code)

Workflow and Product

- ▶ Include elements of the work product
 - ▶ Code files
 - ▶ Documentation (how to use your code)
 - ▶ Metadata

Workflow and Product

- ▶ Include elements of the work product
 - ▶ Code files
 - ▶ Documentation (how to use your code)
 - ▶ Metadata
 - ▶ Compiled files? (.pdf, .tar.gz, ...)

Workflow and Product

- ▶ Include elements of the work product
 - ▶ Code files
 - ▶ Documentation (how to use your code)
 - ▶ Metadata
 - ▶ Compiled files? (.pdf, .tar.gz, ...)
- ▶ Exclude elements of the workflow

Workflow and Product

- ▶ Include elements of the work product
 - ▶ Code files
 - ▶ Documentation (how to use your code)
 - ▶ Metadata
 - ▶ Compiled files? (.pdf, .tar.gz, ...)
- ▶ Exclude elements of the workflow
 - ▶ Directory setting

Workflow and Product

- ▶ Include elements of the work product
 - ▶ Code files
 - ▶ Documentation (how to use your code)
 - ▶ Metadata
 - ▶ Compiled files? (.pdf, .tar.gz, ...)
- ▶ Exclude elements of the workflow
 - ▶ Directory setting
 - ▶ Package installation

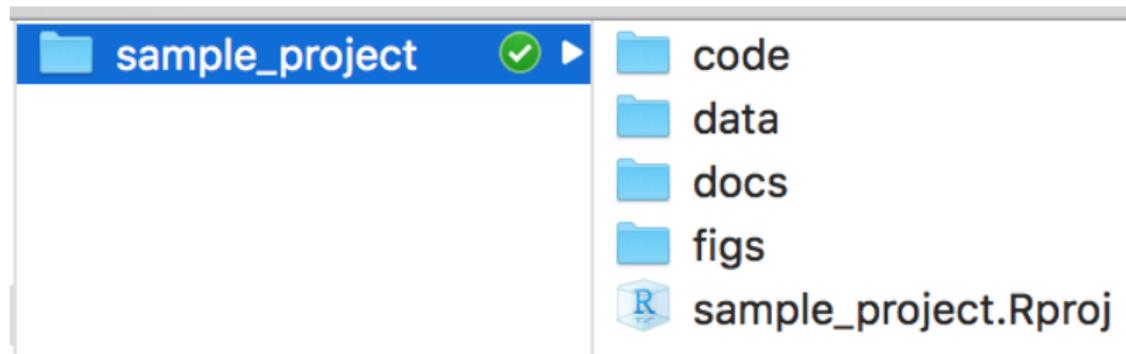
Workflow and Product

- ▶ Include elements of the work product
 - ▶ Code files
 - ▶ Documentation (how to use your code)
 - ▶ Metadata
 - ▶ Compiled files? (.pdf, .tar.gz, ...)
- ▶ Exclude elements of the workflow
 - ▶ Directory setting
 - ▶ Package installation
- ▶ Exclude sensitive files

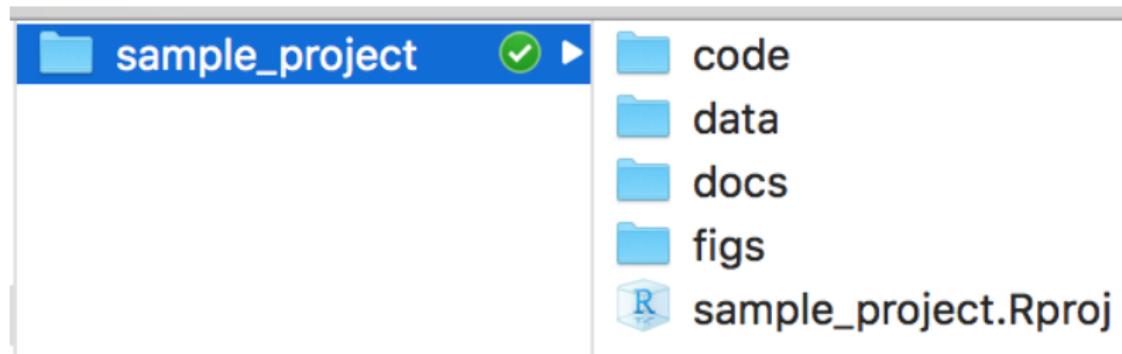
Workflow and Product

- ▶ Include elements of the work product
 - ▶ Code files
 - ▶ Documentation (how to use your code)
 - ▶ Metadata
 - ▶ Compiled files? (.pdf, .tar.gz, ...)
- ▶ Exclude elements of the workflow
 - ▶ Directory setting
 - ▶ Package installation
- ▶ Exclude sensitive files
 - ▶ Seriously. This is hard to undo.

Work Product: Directory Structure

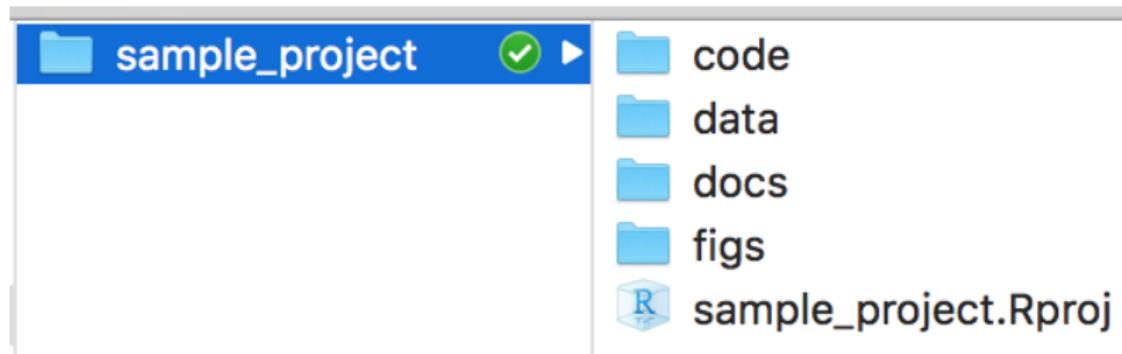


Work Product: Directory Structure



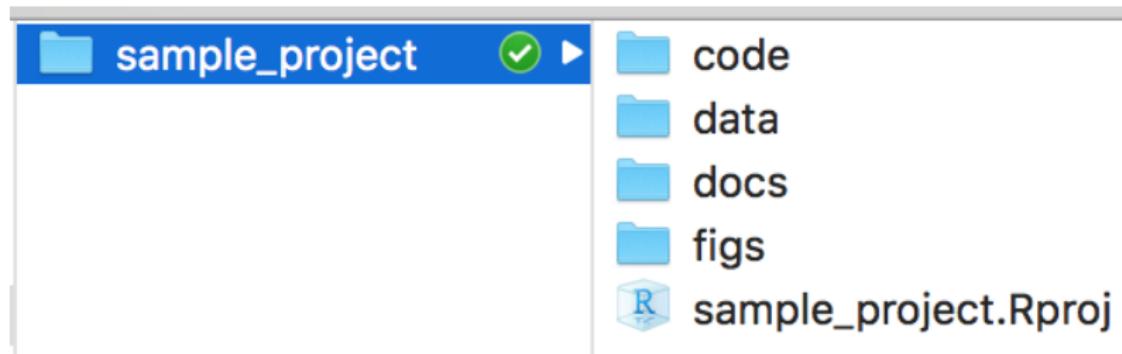
- ▶ Set up on your machine

Work Product: Directory Structure



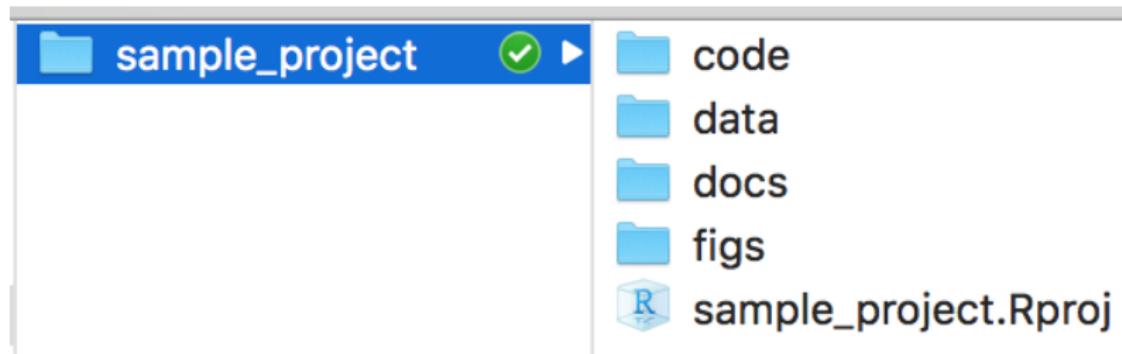
- ▶ Set up on your machine
- ▶ But git won't track empty directories

Work Product: Directory Structure



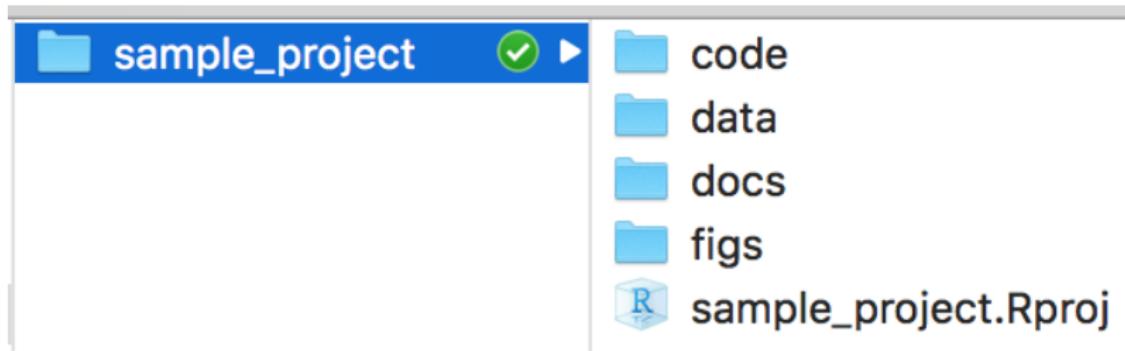
- ▶ Set up on your machine
- ▶ But git won't track empty directories
- ▶ Add, track an empty file

Work Product: Directory Structure

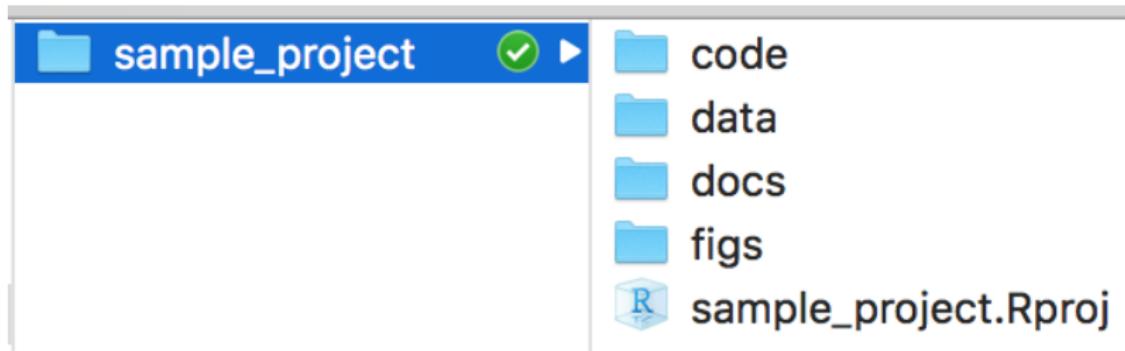


- ▶ Set up on your machine
- ▶ But git won't track empty directories
- ▶ Add, track an empty file
 - ▶ (How I make `ps` directories)

Work Product: Sensitive Data

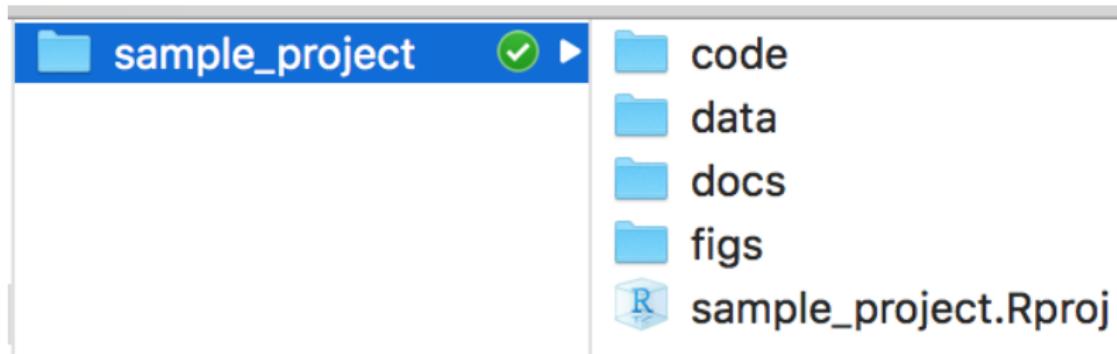


Work Product: Sensitive Data



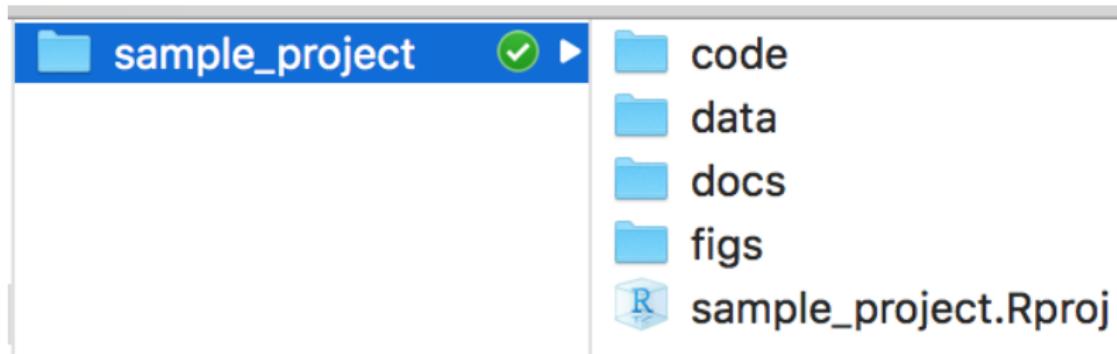
- ▶ Store sensitive data in local `sample_project/data/`

Work Product: Sensitive Data



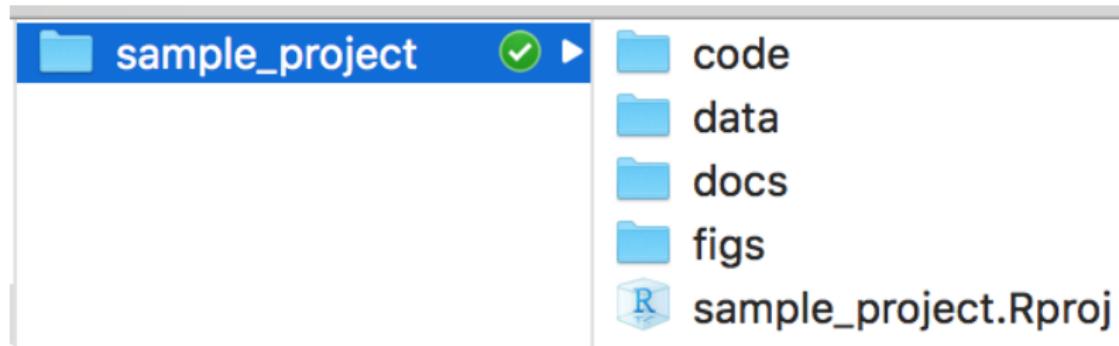
- ▶ Store sensitive data in local `sample_project/data/`
- ▶ But do not `git` track it

Work Product: Sensitive Data



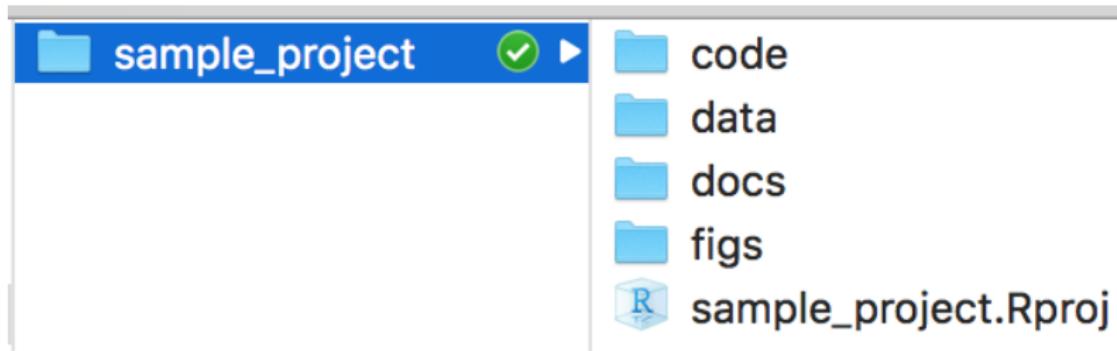
- ▶ Store sensitive data in local `sample_project/data/`
- ▶ But do not `git` track it
- ▶ Assume everything in public, even if “private” repo

Work Product: Sensitive Data



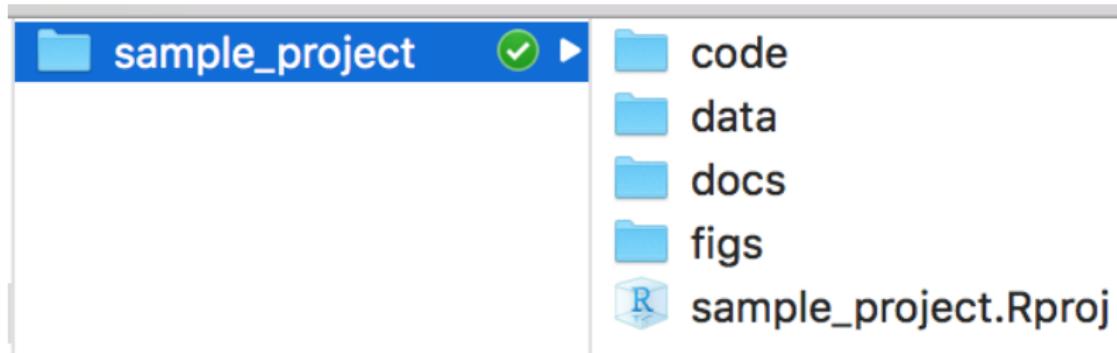
- ▶ Store sensitive data in local `sample_project/data/`
- ▶ But do not `git` track it
- ▶ Assume everything in public, even if “private” repo
 - ▶ federal laws (HIPAA, FERPA, etc.)

Work Product: Sensitive Data



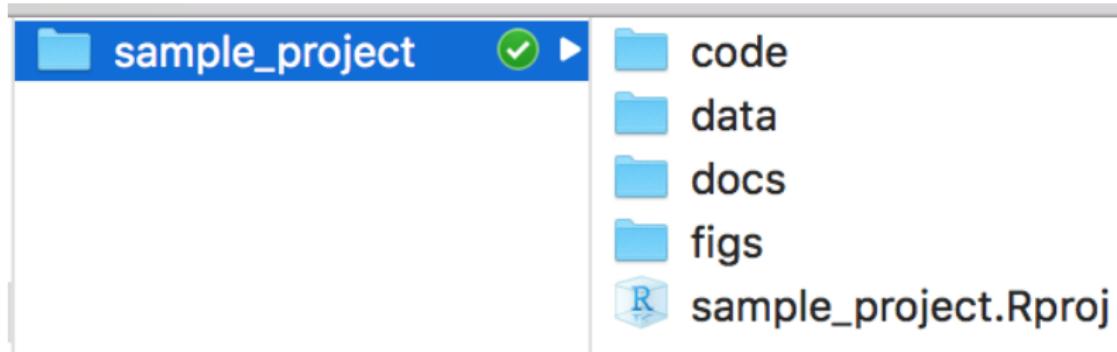
- ▶ Store sensitive data in local `sample_project/data/`
- ▶ But do not `git` track it
- ▶ Assume everything in public, even if “private” repo
 - ▶ federal laws (HIPAA, FERPA, etc.)
 - ▶ agreements with clients, employers, funders, partners, etc.

Work Product: Sensitive Data



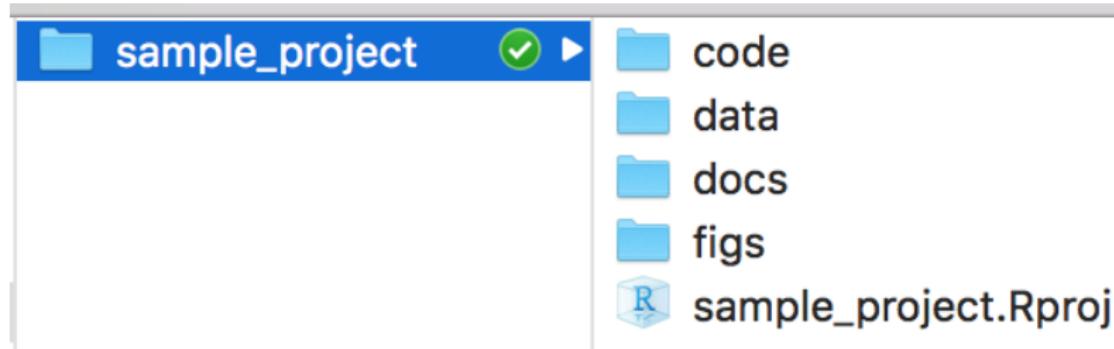
- ▶ Store sensitive data in local `sample_project/data/`
- ▶ But do not `git` track it
- ▶ Assume everything in public, even if “private” repo
 - ▶ federal laws (HIPAA, FERPA, etc.)
 - ▶ agreements with clients, employers, funders, partners, etc.
- ▶ Difficult to remove (the point of version control...)

Work Product: Sensitive Data



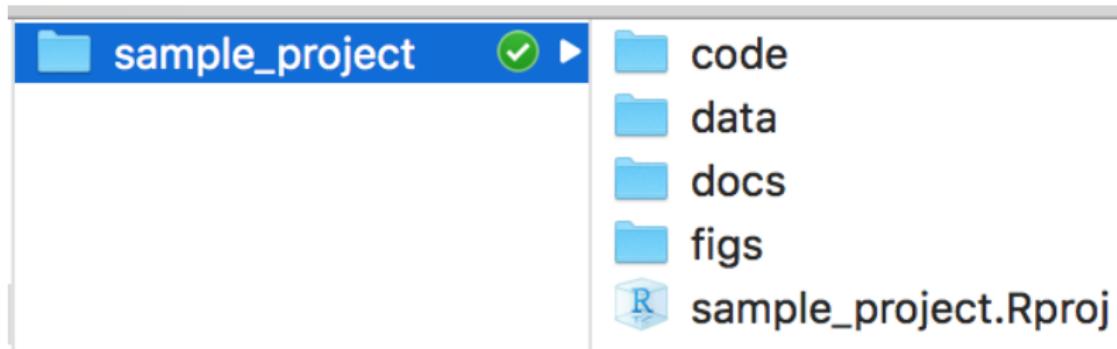
- ▶ Store sensitive data in local `sample_project/data/`
- ▶ But do not `git` track it
- ▶ Assume everything in public, even if “private” repo
 - ▶ federal laws (HIPAA, FERPA, etc.)
 - ▶ agreements with clients, employers, funders, partners, etc.
- ▶ Difficult to remove (the point of version control...)
 - ▶ First add to `.gitignore` (avoid future problem)

Work Product: Sensitive Data



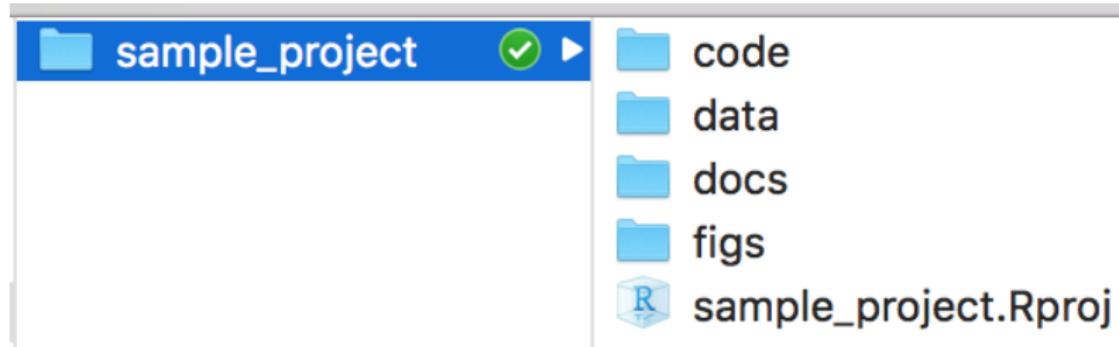
- ▶ Store sensitive data in local `sample_project/data/`
- ▶ But do not `git` track it
- ▶ Assume everything in public, even if “private” repo
 - ▶ federal laws (HIPAA, FERPA, etc.)
 - ▶ agreements with clients, employers, funders, partners, etc.
- ▶ Difficult to remove (the point of version control...)
 - ▶ First add to `.gitignore` (avoid future problem)
 - ▶ Then remove sensitive file from history’s dirty commits

Work Product: Sensitive Data



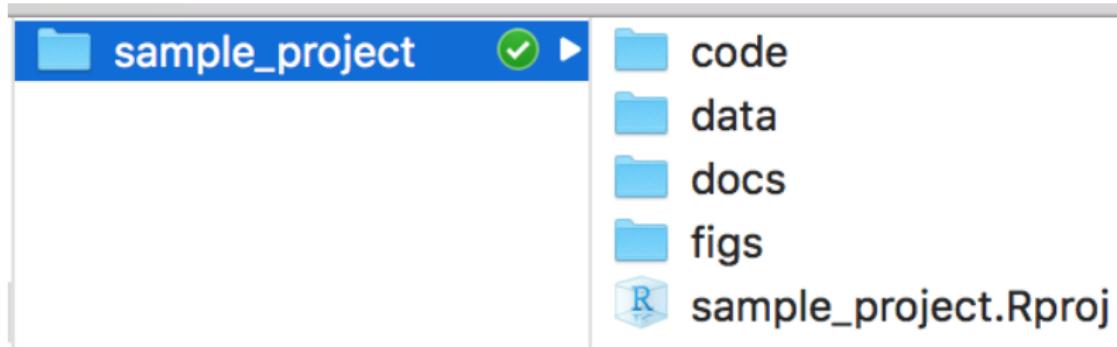
- ▶ Store sensitive data in local `sample_project/data/`
- ▶ But do not `git` track it
- ▶ Assume everything in public, even if “private” repo
 - ▶ federal laws (HIPAA, FERPA, etc.)
 - ▶ agreements with clients, employers, funders, partners, etc.
- ▶ Difficult to remove (the point of version control...)
 - ▶ First add to `.gitignore` (avoid future problem)
 - ▶ Then remove sensitive file from history's dirty commits
 - ▶ `git-filter-branch`

Work Product: Sensitive Data



- ▶ Store sensitive data in local `sample_project/data/`
- ▶ But do not `git` track it
- ▶ Assume everything in public, even if “private” repo
 - ▶ federal laws (HIPAA, FERPA, etc.)
 - ▶ agreements with clients, employers, funders, partners, etc.
- ▶ Difficult to remove (the point of version control...)
 - ▶ First add to `.gitignore` (avoid future problem)
 - ▶ Then remove sensitive file from history’s dirty commits
 - ▶ `git-filter-branch`
 - ▶ (Or `bfg` from BFG Repo Cleaner)

Work Product: Sensitive Data



- ▶ Store sensitive data in local `sample_project/data/`
- ▶ But do not `git` track it
- ▶ Assume everything in public, even if “private” repo
 - ▶ federal laws (HIPAA, FERPA, etc.)
 - ▶ agreements with clients, employers, funders, partners, etc.
- ▶ Difficult to remove (the point of version control...)
 - ▶ First add to `.gitignore` (avoid future problem)
 - ▶ Then remove sensitive file from history's dirty commits
 - ▶ `git-filter-branch`
 - ▶ (Or `bfg` from BFG Repo Cleaner)
 - ▶ Repeat for every branch

Work Product and .gitignore

To **not track**, list in `.gitignore` file.

You can `gitignore`

- ▶ a specific file

Work Product and .gitignore

To **not track**, list in `.gitignore` file.

You can `gitignore`

- ▶ a specific file
- ▶ an entire file type

Work Product and .gitignore

To **not track**, list in `.gitignore` file.

You can `gitignore`

- ▶ a specific file
- ▶ an entire file type
- ▶ an entire directory

Work Product and .gitignore

To **not track**, list in `.gitignore` file.

You can `gitignore`

- ▶ a specific file
- ▶ an entire file type
- ▶ an entire directory
- ▶ a file type within a directory

Work Product and .gitignore

To **not track**, list in `.gitignore` file.

You can `gitignore`

- ▶ a specific file
- ▶ an entire file type
- ▶ an entire directory
- ▶ a file type within a directory
- ▶ ...

Work Product and .gitignore

My `.gitignore` workflow:

- ▶ Initialize repo w/ `.gitignore`, choose R
- ▶ Immediately update via
<https://www.gitignore.io>

Work Product and .gitignore

My `.gitignore` workflow:

- ▶ Initialize repo w/ `.gitignore`, choose R
- ▶ Immediately update via
<https://www.gitignore.io>
- ▶ R
- ▶ L^AT_EX
- ▶ T_EX
- ▶ Python
- ▶ Data files, directories
- ▶ ...

How should I git?

There are many ways to git.

How should I git?

There are many ways to git.

Be familiar w/ command line git, even if you GUI.

How should I git?

There are many ways to **git**.

Be familiar w/ command line **git**, even if you GUI.

Each GUI defines its own “sync”, but **git** is more specific.

How should I git?

There are many ways to `git`.

Be familiar w/ command line `git`, even if you GUI.

Each GUI defines its own “sync”, but `git` is more specific.

If “sync” fails, was it `push`, `fetch`, `pull`, `merge`, . . . ?

How should I git?

There are many ways to `git`.

Be familiar w/ command line `git`, even if you GUI.

Each GUI defines its own “sync”, but `git` is more specific.

If “sync” fails, was it `push`, `fetch`, `pull`, `merge`, ...?

- ▶ GitHub's GUI
- ▶ GitKraken
- ▶ Tower
- ▶ RStudio
- ▶ ...

Some Command Line basics

Where to find the command line?

- ▶ Stand-alone programs:
 - ▶ MacOS **iTerm2**, Terminal ...
 - ▶ Windows **Cmder**, Git BASH, PowerShell
- ▶ RStudio Terminal
 - ▶ (next to Console)
 - ▶ (why not? Workflow.)
 - ▶ (Multiple windows, Cmd-tab, file mgmnt w/o RStudio)

Some Command Line basics

- ▶ `ls`: list files/dirs
- ▶ `pwd`: print working dir
- ▶ `mkdir subdir`: make new subdir
- ▶ `cd subdir`: change working dir (to `subdir`)
- ▶ `cd ..`: change working dir (to one above)
- ▶ `cp file.R file_copy.R`: copy file
- ▶ `mv file.R subdir/file.R`: move file
- ▶ `rm file.R`: delete file
- ▶ `touch file.R`: create new file
- ▶ `open file.R`: open extant file
(Win Git BASH: `start file.R`)
- ▶ `cat file.R`: print contents of file
- ▶ `man ls`: help file for `ls` (e.g.)

Let's Practice

Using only the command line,

1. Navigate to your Desktop
2. Make a directory called `cl_dir`
3. Navigate to `cl_dir`
4. Create an empty file here called `empty.txt`
5. Open `empty.txt`
6. Add a line of text; save the file
7. Change the filename to `notempty.txt`
8. Navigate up to the Desktop
9. Print contents of `notempty.txt`
10. List the files in `Desktop/cl_dir`
11. Delete `notempty.txt`

Some Command Line basics

This is how I navigate files/directories.

Some Command Line basics

This is how I navigate files/directories.

Git uses similar commands, prefaced with `git`.

Some Command Line intermediates

- ▶ `ps -u <username>`: view running processes
- ▶ `top`: view CPU hogs
- ▶ `kill <pid>`: kill process (given ID)
- ▶ `mail`
- ▶ `cal`

Some help

GitHub's Git Cheat Sheet:
<http://j.mp/2Y5HklD>

Creating a new repository

- ▶ On GitHub.com:
Profile > Repositories > New
- ▶ Name (`mytest`)
- ▶ Description (brief descr)
- ▶ README (yes, initialize it)
- ▶ `.gitignore`
(yes, choose R, then www.gitignore.io)
- ▶ license (yes, select one)

Contributing to a repository

On web directly:

- ▶ Click on README, pencil icon. Edit the .md file.

Contributing to a repository

On web directly:

- ▶ Click on README, pencil icon. Edit the .md file.
- ▶ Preview changes

Contributing to a repository

On web directly:

- ▶ Click on README, pencil icon. Edit the .md file.
- ▶ Preview changes
- ▶ Commit

Contributing to a repository

On web directly:

- ▶ Click on README, pencil icon. Edit the .md file.
- ▶ Preview changes
- ▶ Commit

Contributing to a repository

On web directly:

- ▶ Click on README, pencil icon. Edit the .md file.
- ▶ Preview changes
- ▶ Commit

README.md is “GitHub-flavored markdown”

Like .qmd, but not identical.

Contributing to a repository

On web directly:

- ▶ Update `.gitignore`: Don't ignore `.Rproj` files

Contributing to a repository

On web directly:

- ▶ Update `.gitignore`: Don't ignore `.Rproj` files
- ▶ Edit file, Preview changes

Contributing to a repository

On web directly:

- ▶ Update `.gitignore`: Don't ignore `.Rproj` files
- ▶ Edit file, Preview changes
- ▶ Commit

Contributing to a repository

On web directly:

- ▶ Upload files
- ▶ Commit

Contributing to a repository

Note: each commit is *complete* and *minimal*.

- ▶ Solve a problem, make an addition
- ▶ Addresses a **single** issue

Contributing to a repository

Note: each commit is *complete* and *minimal*.

- ▶ Solve a problem, make an addition
- ▶ Addresses a **single** issue

Different problem? Different commit.

Contributing to a repository

Using local version:

- ▶ Clone repo

Contributing to a repository

Using local version:

- ▶ Clone repo
- ▶ Edit files directly

Contributing to a repository

Using local version:

- ▶ Clone repo
- ▶ Edit files directly
- ▶ Send changes to GitHub

Contributing to a repository

Using local version:

- ▶ Clone repo
- ▶ Edit files directly
- ▶ Send changes to GitHub

Contributing to a repository

Using local version:

- ▶ Clone repo
- ▶ Edit files directly
- ▶ Send changes to GitHub

```
git status
```

```
git add
```

```
git commit -m "Commit Msg"
```

```
git push
```

Contributing to a repository

Using local version:

- ▶ Clone repo
- ▶ Edit files directly
- ▶ Send changes to GitHub

```
git status
```

```
git add
```

```
git commit -m "Commit Msg"
```

```
git push
```

Workflow: commit, commit, commit, ..., push

In Case of Emergency

In Case of Emergency



Cloning extant repository

```
git clone git@github.com:<username>/<reponame>.git
```

Workflow Commands

```
git status
```

Workflow Commands

```
git status
```

Neurotically.

Workflow Commands

`git status`

Neurotically.

`git status` will suggest what to do next.

Workflow Commands

When I start,

```
git fetch
```

to bring pushed changes to my local version.

Workflow Commands

When I start,

```
git fetch
```

to bring pushed changes to my local version.

If needed,

```
git pull
```

to merge version on GitHub into mine.

Workflow Commands

Make changes.

Workflow Commands

Make changes. Then git:

```
git add <file>
```

```
git commit -m "Commit msg"
```

```
git push
```

Clone an extant repository

At terminal prompt, `pwd` and `cd` to a dir
(Desktop, e.g.).

Clone an extant repository

At terminal prompt, `pwd` and `cd` to a dir
(Desktop, e.g.).

Then,

```
git clone git@github.com:<yourusername>/mytest.git
```

and `/mytest/` will appear in the dir.

Clone an extant repository

At terminal prompt, `pwd` and `cd` to a dir
(Desktop, e.g.).

Then,

```
git clone git@github.com:<yourusername>/mytest.git
```

and `/mytest/` will appear in the dir.

Now, edit `README` a bit.

Clone an extant repository

At terminal prompt, `pwd` and `cd` to a dir
(Desktop, e.g.).

Then,

```
git clone git@github.com:<yourusername>/mytest.git
```

and `/mytest/` will appear in the dir.

Now, edit `README` a bit.

Then, at terminal

```
git status
```

```
git commit -m "Commit Msg"
```

```
git push
```

Delete the local version

- ▶ Delete the local folders
- ▶ (Note: no `git` here, so truth unaffected.)
- ▶ Reclone

Remove a file from future commits

- ▶ git rm ps06/rtm.R

Remove a file from future commits

► `git rm ps06/rtm.R`

(Repeat: *future* commits)

Branches

Branches

During Git, you are always on *branch* of codebase.

Branches

During Git, you are always on *branch* of codebase.

By default, create and are on the **main** branch.

Branches

During Git, you are always on *branch* of codebase.

By default, create and are on the **main** branch.

Create other branches to make changes, commit them, etc., **without** touching the **main** branch.

Branches

During Git, you are always on *branch* of codebase.

By default, create and are on the **main** branch.

Create other branches to make changes, commit them, etc., **without** touching the **main** branch.

Then, recombine work on the branch back into **main** branch.

Branches

During Git, you are always on *branch* of codebase.

By default, create and are on the **main** branch.

Create other branches to make changes, commit them, etc., **without** touching the **main** branch.

Then, recombine work on the branch back into **main** branch.

Goal: **main** always works.

Branching Workflow

- ▶ Create branch

Branching Workflow

- ▶ Create branch
- ▶ Move to that branch

Branching Workflow

- ▶ Create branch
- ▶ Move to that branch
- ▶ Make edits to code

Branching Workflow

- ▶ Create branch
- ▶ Move to that branch
- ▶ Make edits to code
- ▶ Commit and push

Branching Workflow

- ▶ Create branch
- ▶ Move to that branch
- ▶ Make edits to code
- ▶ Commit and push
- ▶ Issue pull request at GitHub.com

Branching Workflow

- ▶ Create branch
- ▶ Move to that branch
- ▶ Make edits to code
- ▶ Commit and push
- ▶ Issue pull request at GitHub.com
- ▶ Someone reviews pull request, merges your branch in, deletes it

Branching Workflow

- ▶ git branch bugFix

Branching Workflow

- ▶ git branch bugFix
- ▶ git checkout bugFix

Branching Workflow

- ▶ `git branch bugFix`
- ▶ `git checkout bugFix`
- ▶ Make edits to code

Branching Workflow

- ▶ `git branch bugFix`
- ▶ `git checkout bugFix`
- ▶ Make edits to code
- ▶ `git add`, `git commit`, `git push`

Branching Workflow

- ▶ `git branch bugFix`
- ▶ `git checkout bugFix`
- ▶ Make edits to code
- ▶ `git add`, `git commit`, `git push`
- ▶ (`git status` keeps me on track)

Branching Workflow

- ▶ `git branch bugFix`
- ▶ `git checkout bugFix`
- ▶ Make edits to code
- ▶ `git add`, `git commit`, `git push`
- ▶ (`git status` keeps me on track)
- ▶ `git checkout main` to return

Branching Workflow

- ▶ `git branch bugFix`
- ▶ `git checkout bugFix`
- ▶ Make edits to code
- ▶ `git add`, `git commit`, `git push`
- ▶ (`git status` keeps me on track)
- ▶ `git checkout main` to return
- ▶ Eventually, `git merge bugFix`

Terminology for Branches, Forks, Commits

Recall: *distributed* version control.

Terminology for Branches, Forks, Commits

Recall: *distributed* version control.

- ▶ a *remote*: non-local version of repo

Terminology for Branches, Forks, Commits

Recall: *distributed* version control.

- ▶ a *remote*: non-local version of repo
- ▶ **origin**: standard name of your GitHub remote

Terminology for Branches, Forks, Commits

Recall: *distributed* version control.

- ▶ a *remote*: non-local version of repo
- ▶ *origin*: standard name of your GitHub remote
- ▶ *upstream*: source of your clone (usually *origin*)

Terminology for Branches, Forks, Commits

Recall: *distributed* version control.

- ▶ a *remote*: non-local version of repo
- ▶ *origin*: standard name of your GitHub remote
- ▶ *upstream*: source of your clone (usually *origin*)
- ▶ *main*: standard name of main branch

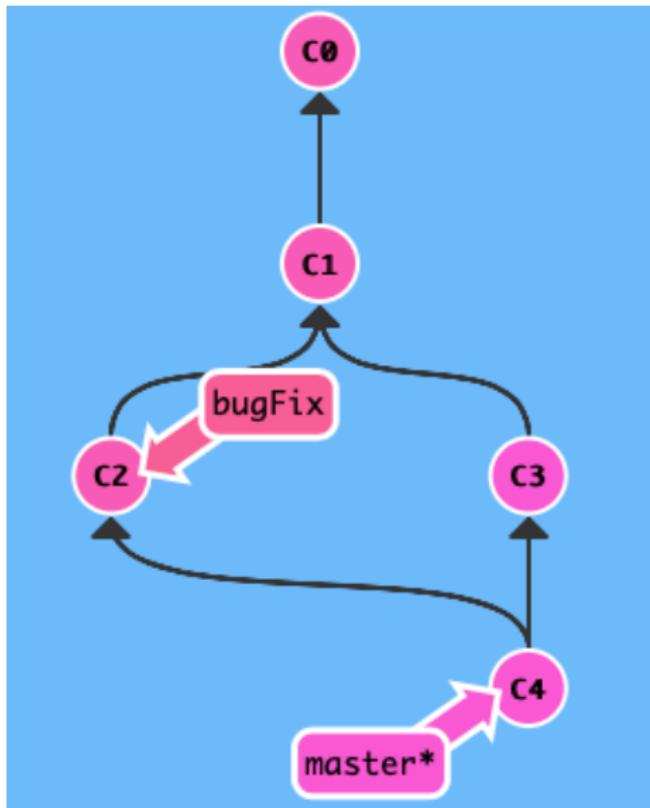
Terminology for Branches, Forks, Commits

Recall: *distributed* version control.

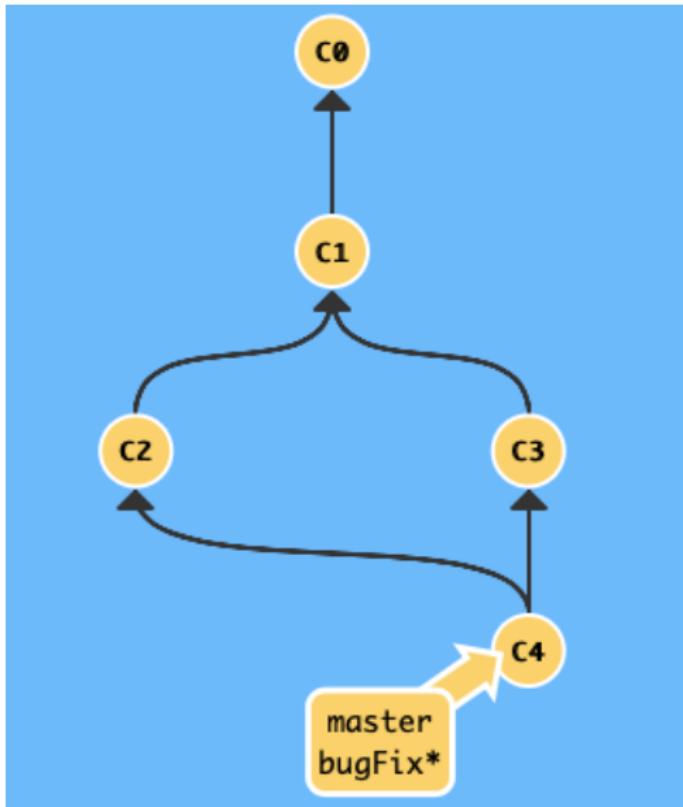
- ▶ a *remote*: non-local version of repo
- ▶ **origin**: standard name of your GitHub remote
- ▶ **upstream**: source of your clone (usually **origin**)
- ▶ **main**: standard name of main branch
- ▶ HEAD: most recent commit on **main** branch

Merging and Rebasing

Merging



Merging



Rebasing

Rebasing: another way to combine `main` and `subbranch`.

Rebase creates a linear (unbranched) history of commits.

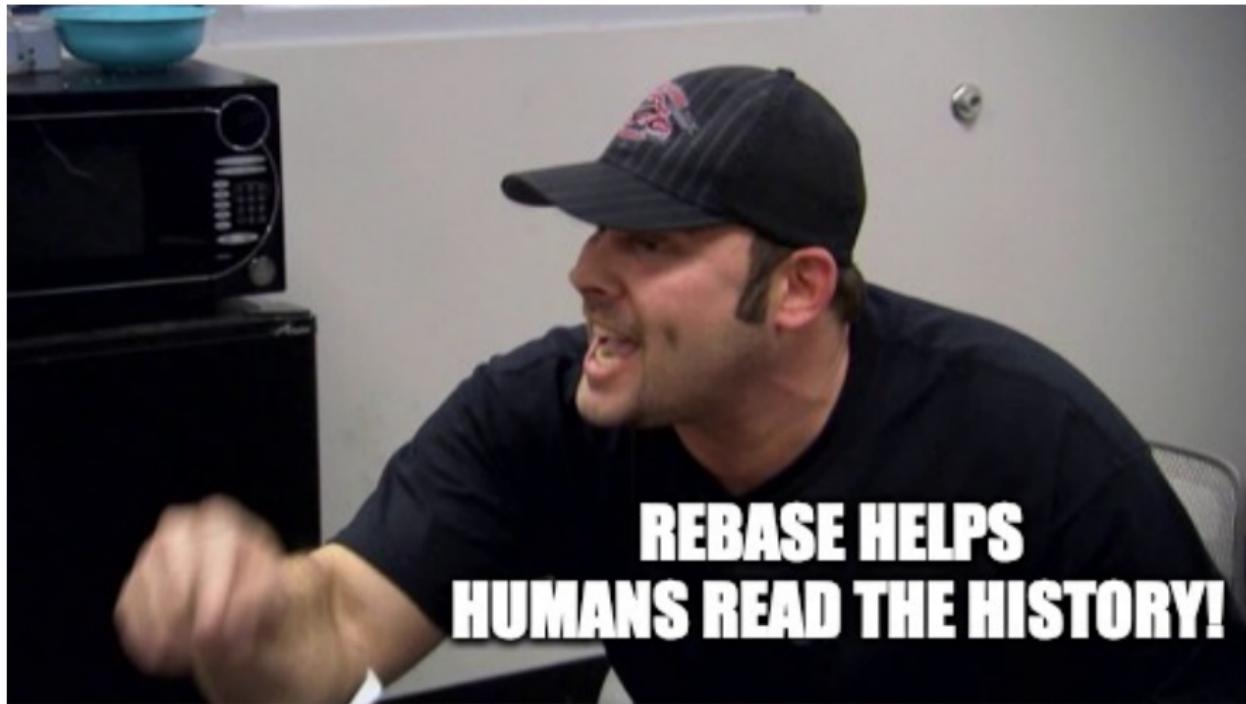
Rebasing

Rebasing: another way to combine `main` and `subbranch`.

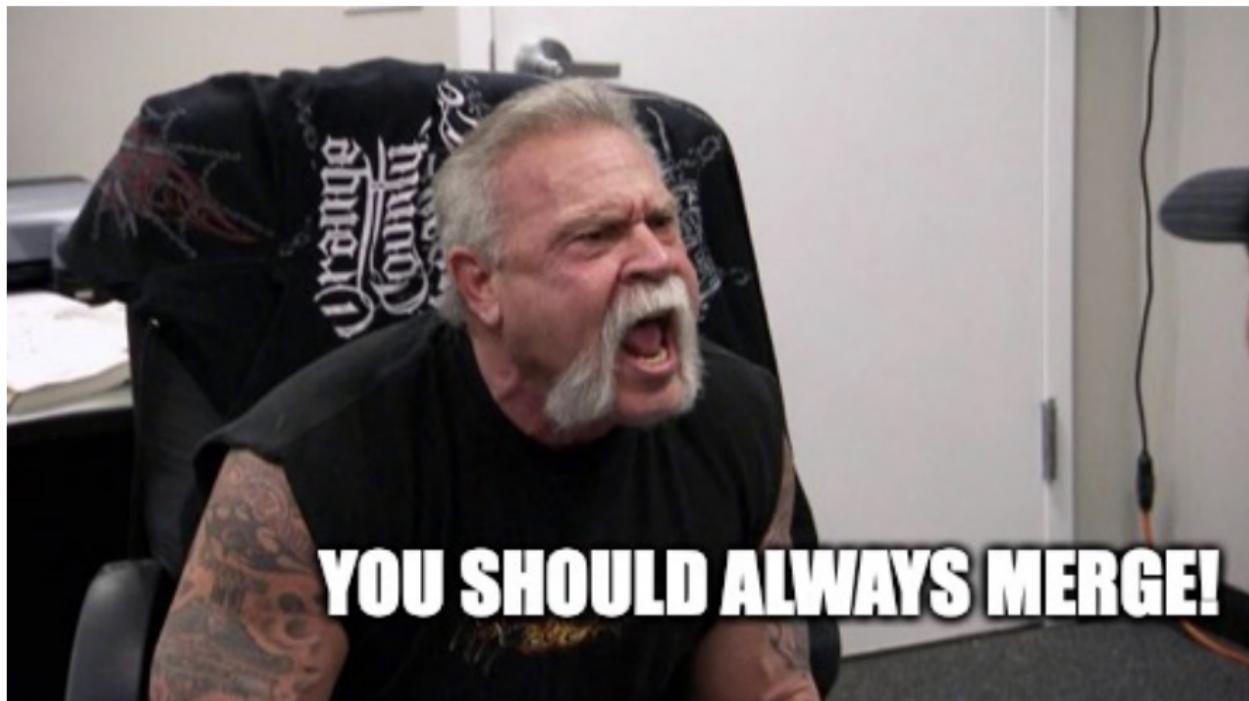
Rebase creates a linear (unbranched) history of commits.

This is a matter of some controversy.

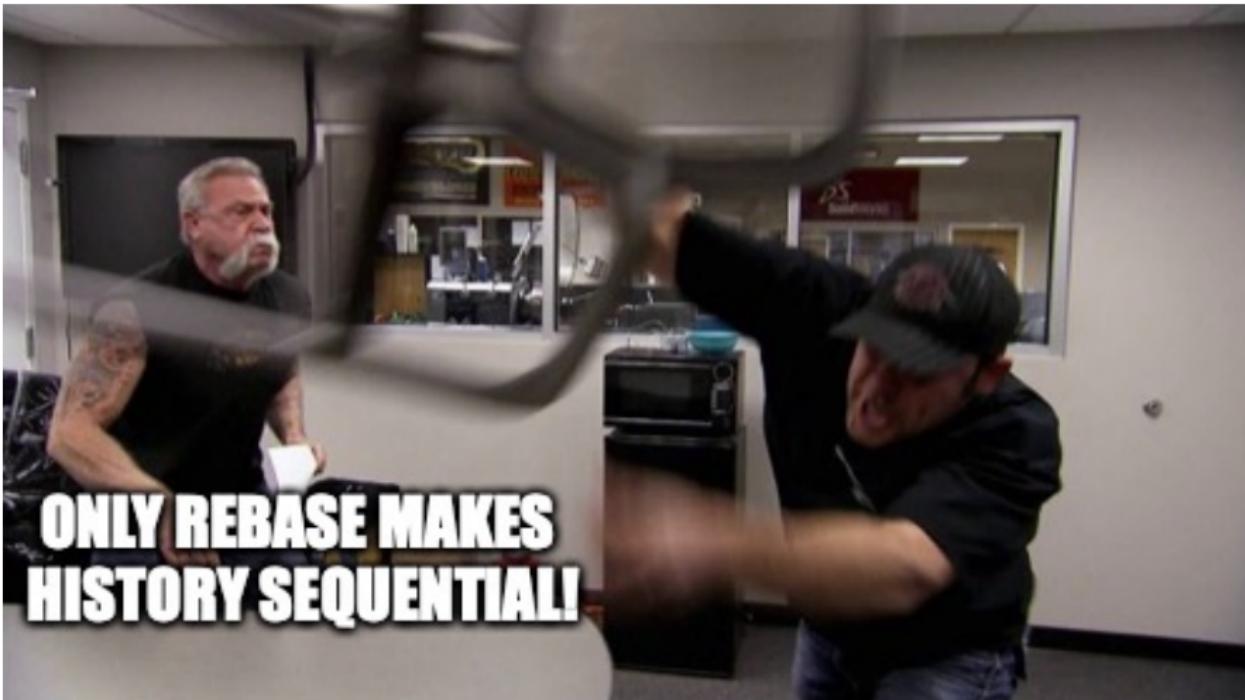




**REBASE HELPS
HUMANS READ THE HISTORY!**



YOU SHOULD ALWAYS MERGE!



**ONLY REBASE MAKES
HISTORY SEQUENTIAL!**



YOU'RE CHANGING THE HISTORY!

How to Merge

From **main** branch,

```
git merge subbranch
```

will merge the work done on **subbranch** into the **main** branch.

How to Rebase

From `subbranch`,

```
git rebase main
```

will add work of `subbranch` as a downstream commit of `main`.

How to Rebase

From `subbranch`,

```
git rebase main
```

will add work of `subbranch` as a downstream commit of `main`.

But then, update `main` by moving to `main`, then rebasing:

```
git checkout main
git rebase subbranch
```

How to Rebase

From `subbranch`,

```
git rebase main
```

will add work of `subbranch` as a downstream commit of `main`.

But then, update `main` by moving to `main`, then rebasing:

```
git checkout main
git rebase subbranch
```

Now, branches are in sync, same commit.

To learn branching,

<https://learngitbranching.js.org>

- ▶ Complete Intro Sequence 1-3 (*Intro, Branching, and Merging*)
- ▶ (Bonus: Get through level 4, *Rebasing*)
- ▶ Read every message terminal, in terminal, and file list each step.

Pull Requests and Forks

Pull Requests

Issues, focused on branches and merging.

Pull Requests

Issues, focused on branches and merging.

Three components:

- ▶ Conversation
- ▶ Commits
- ▶ Diffs

Forking

Fork: your *copy* of a repo you don't control

Forking

Fork: your *copy* of a repo you don't control

- ▶ Clone repo

Forking

Fork: your *copy* of a repo you don't control

- ▶ Clone repo
- ▶ Stay current with canonical version

Forking

Fork: your *copy* of a repo you don't control

- ▶ Clone repo
- ▶ Stay current with canonical version
- ▶ Create branch

Forking

Fork: your *copy* of a repo you don't control

- ▶ Clone repo
- ▶ Stay current with canonical version
- ▶ Create branch
- ▶ Edit

Forking

Fork: your *copy* of a repo you don't control

- ▶ Clone repo
- ▶ Stay current with canonical version
- ▶ Create branch
- ▶ Edit
- ▶ Issue pull request

Forking

Fork: your *copy* of a repo you don't control

- ▶ Clone repo
- ▶ Stay current with canonical version
- ▶ Create branch
- ▶ Edit
- ▶ Issue pull request
- ▶ (Then, later pushes update pull request)