rstudio::conf
from RStudio

What They Forgot to Teach You About R

rstudio::conf 2018 San Diego

Training Days

https://www.rstudio.com/conference/

Wed Jan 31 & Thurs Feb 1, 2018

- 8am registration & light breakfast
- 9am We start!
- 10:30-11am snacks and coffee
- 12-1pm lunch
- 3-3:30pm snacks and coffee
- 5pm We stop!

rstd.io/forgot

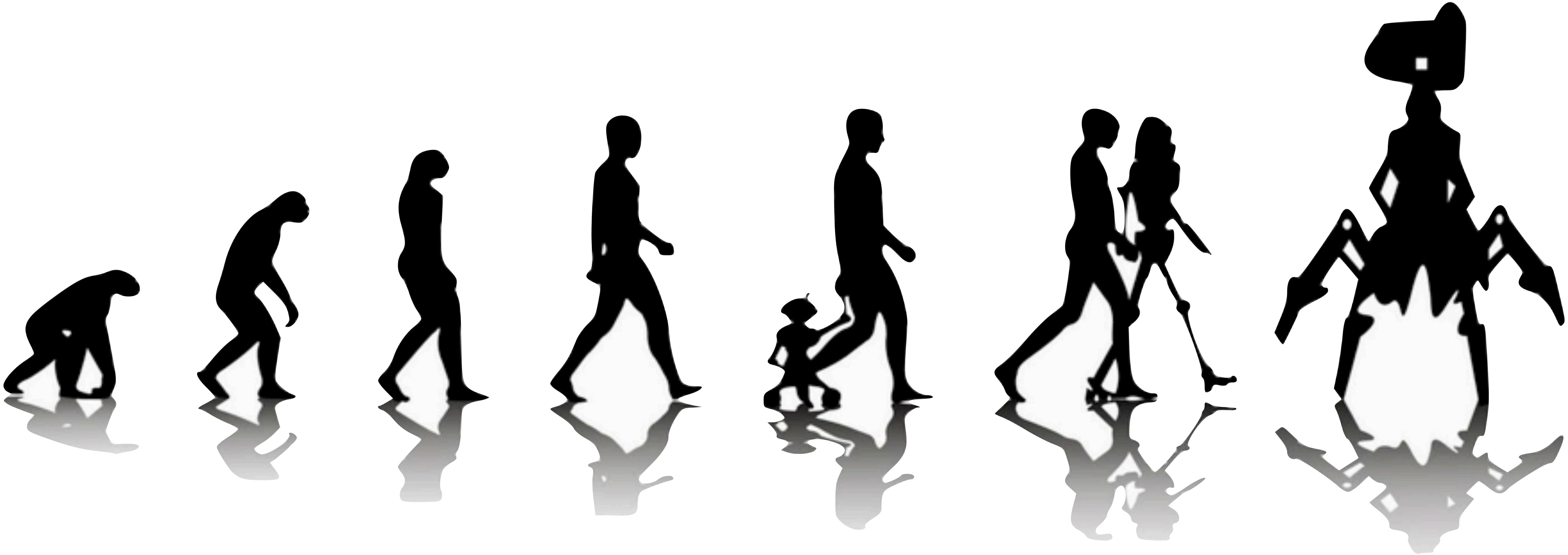
Meet your helpers

Day 1, afternoon

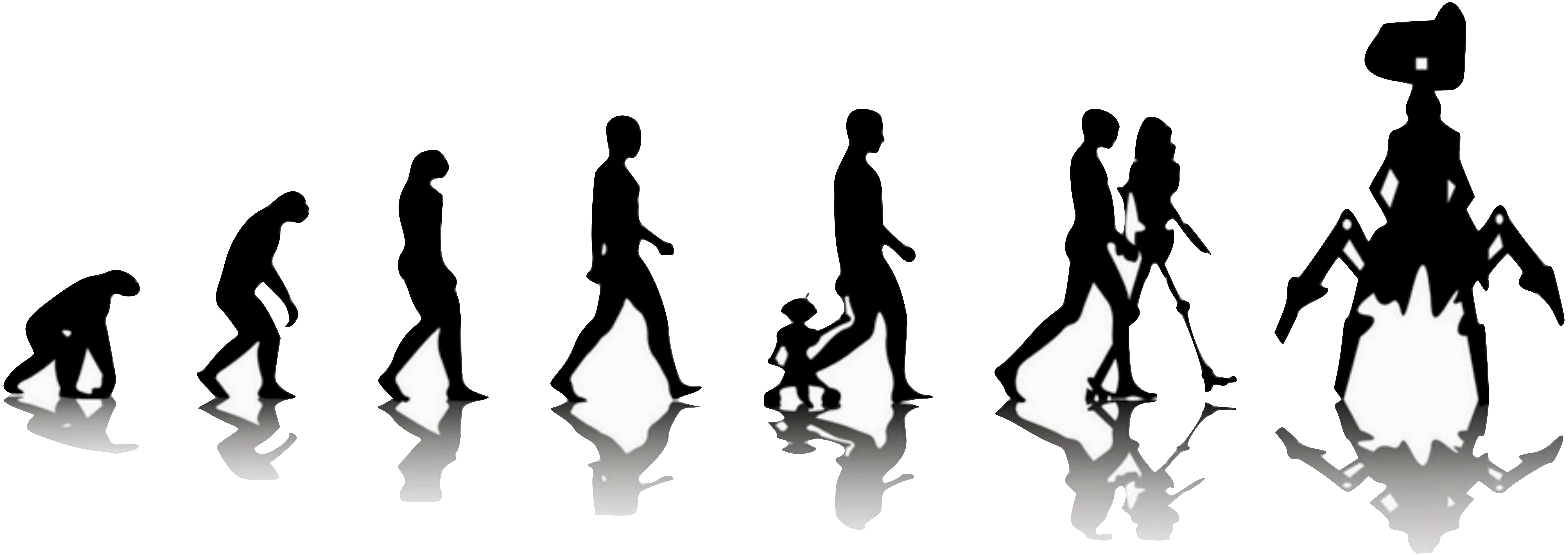
Jennifer Bryan
RStudio, University of British Columbia

@jennybc
@JennyBryan

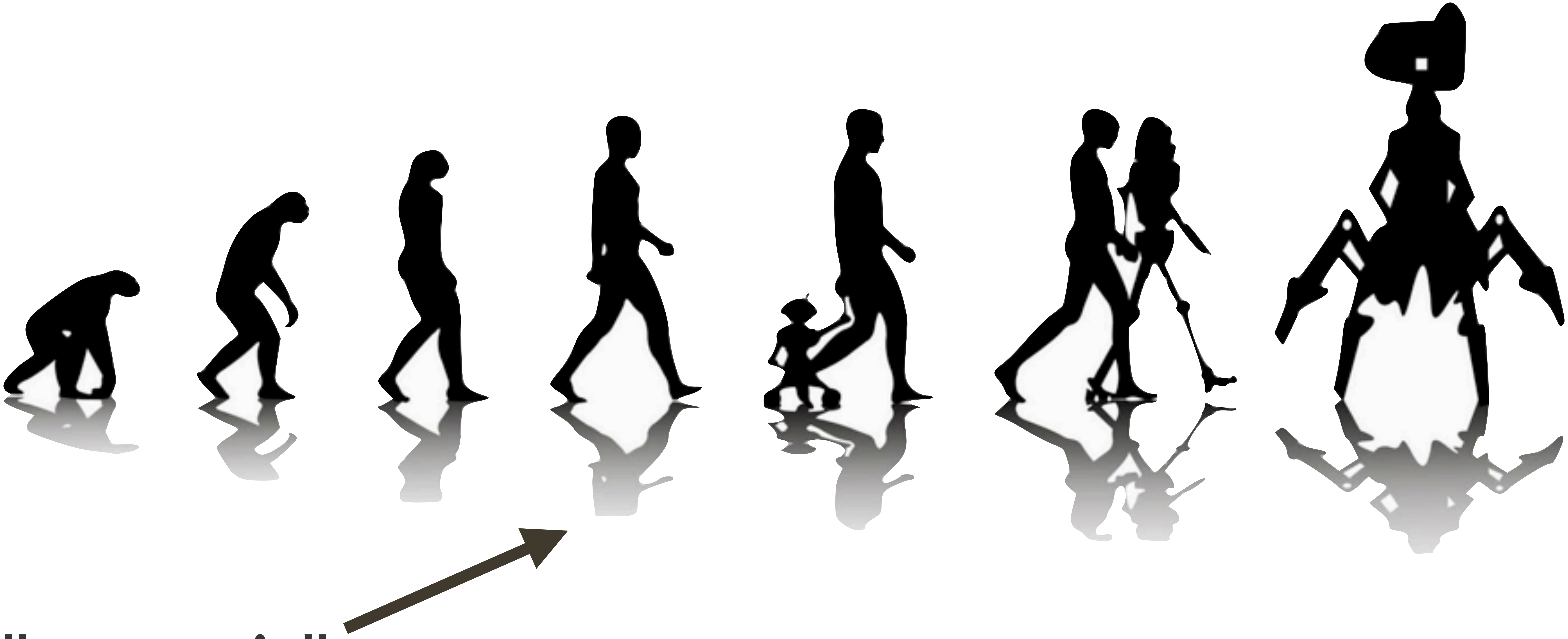
Deep Thoughts



use version control



we teach Git + GitHub



"commit"

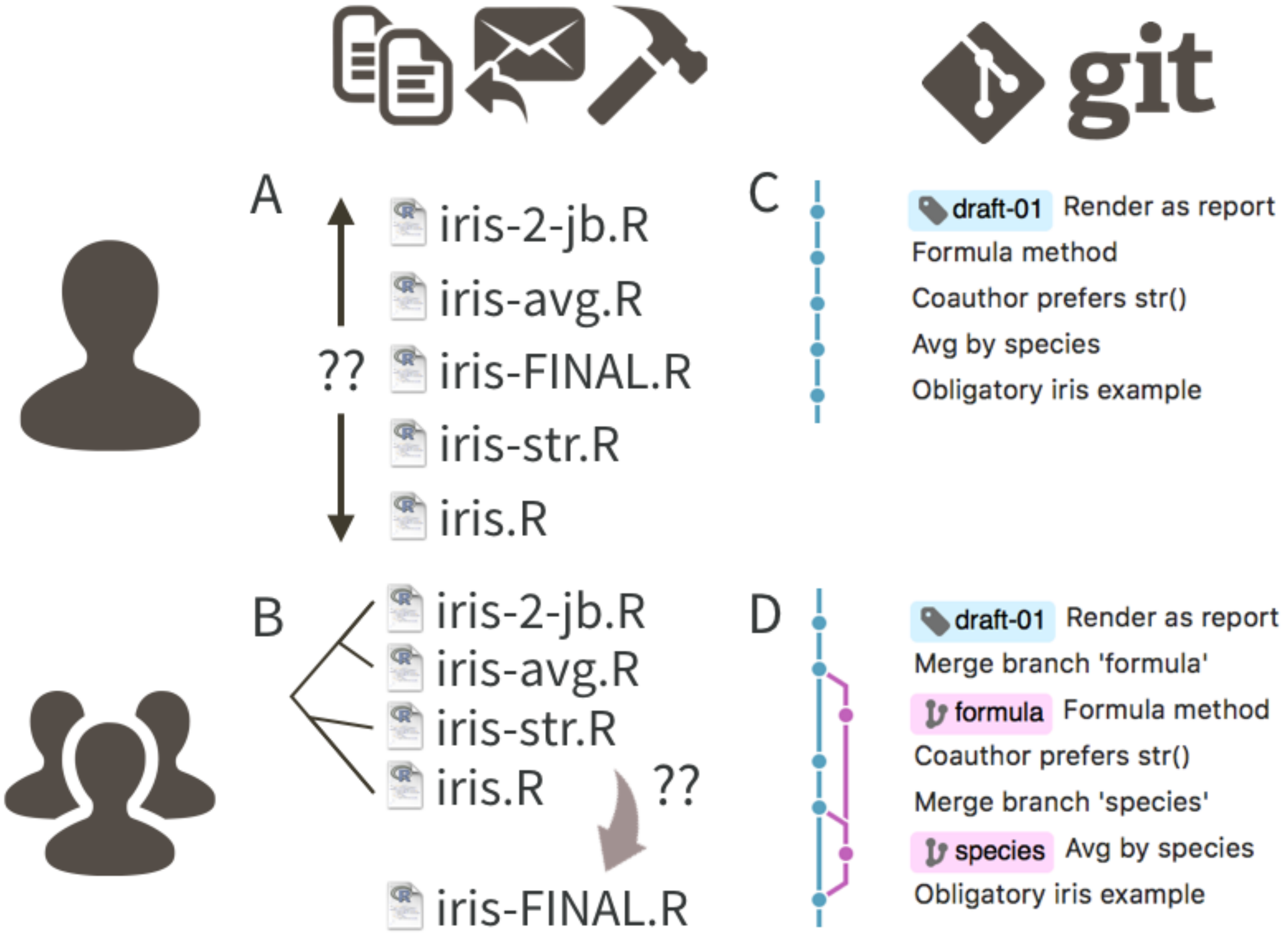
a file or project state that is **meaningful to you**

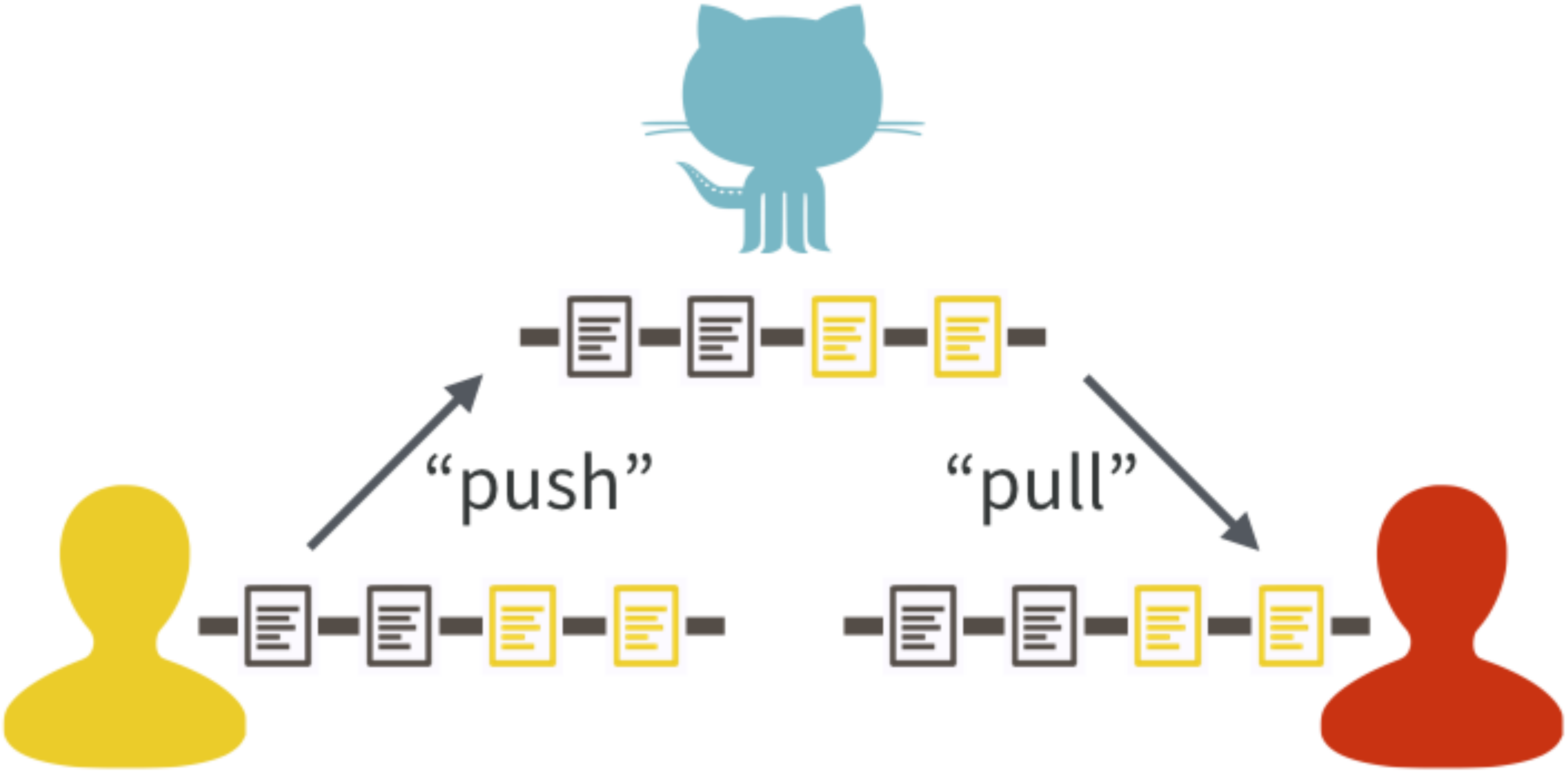
for inspection, comparison, restoration

Δ

"diff"

What changed here?
Why?

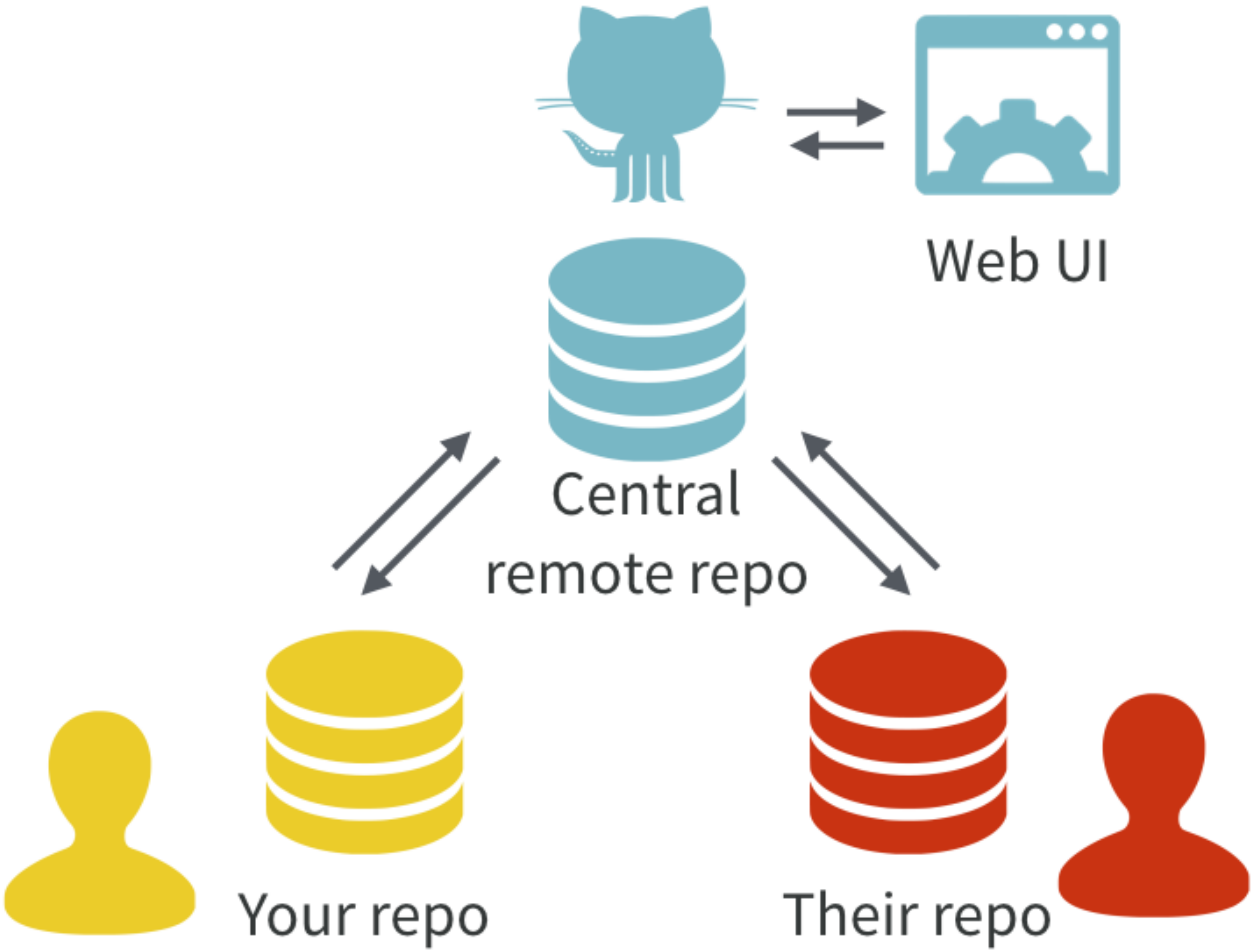

git
A
iris-2-jb.R
iris-avg.R
??
iris-FINAL.R
iris-str.R
iris.R
B
iris-2-jb.R
iris-avg.R
iris-str.R
iris.R
??
iris-FINAL.R
C
draft-01
Render as report
Formula method
Coauthor prefers str()
Avg by species
Obligatory iris example
D
draft-01
Render as report
Merge branch 'formula'
formula
Formula method
Coauthor prefers str()
Merge branch 'species'
species
Avg by species
Obligatory iris example



collaboration

Excuse me, do you have a moment to talk about version control?

https://doi.org/10.7287/peerj.preprints.3159v2



happygitwithr.com

Why version control?

- experiment without fear
- explore cause and effect
- embrace incrementalism
- collaborate
- expose your work

how git feels

get off the beach!

agony : flow

agony : flow

agony reduction

Use a Git client, if you like

No one is giving out Hard-core Git Nerd Badges

I like RStudio + SourceTree

http://happygitwithr.com/git-client.html

Project initiation: the remote case

Make Your remote copy of Their remote repo = "fork"

Make a local Project from a remote repo, Yours or Theirs = "clone"

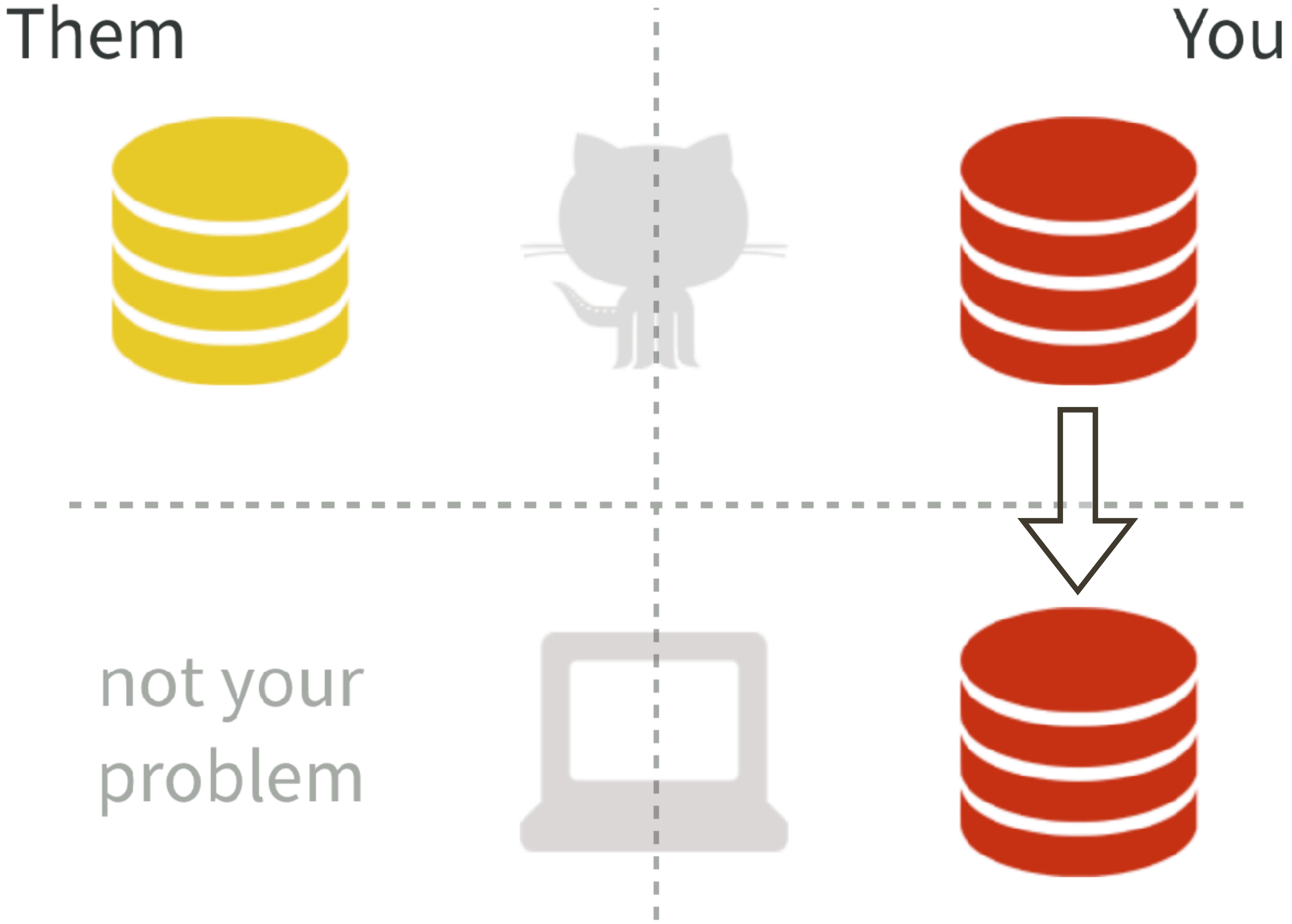
Make Your remote repo from a local Project ... a bit fiddly

Project initiation strategies, the remote case

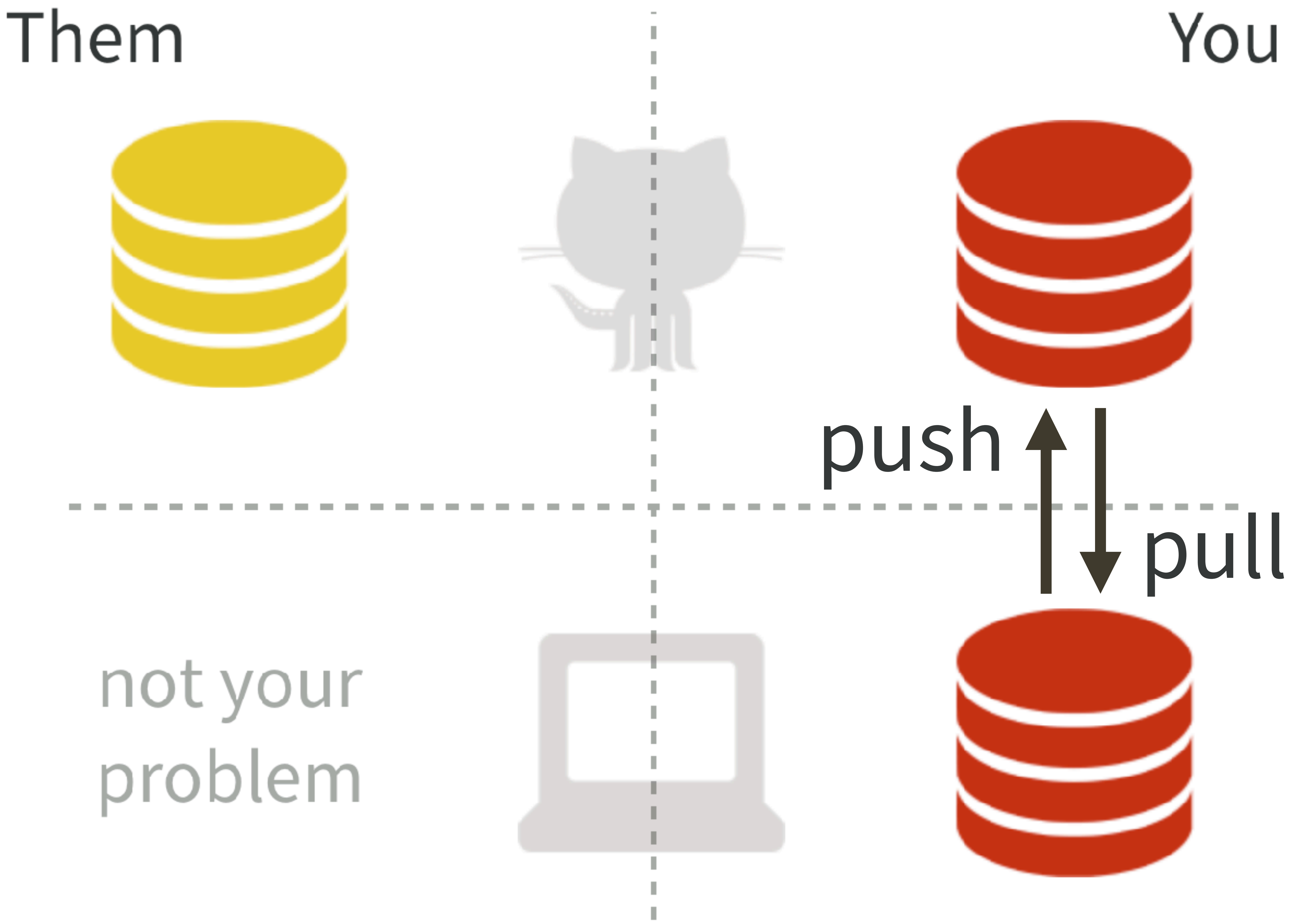
Make Your remote copy of Their remote repo = "fork"

Make a local Project from a remote repo, Yours ~~or Theirs~~ = "clone"

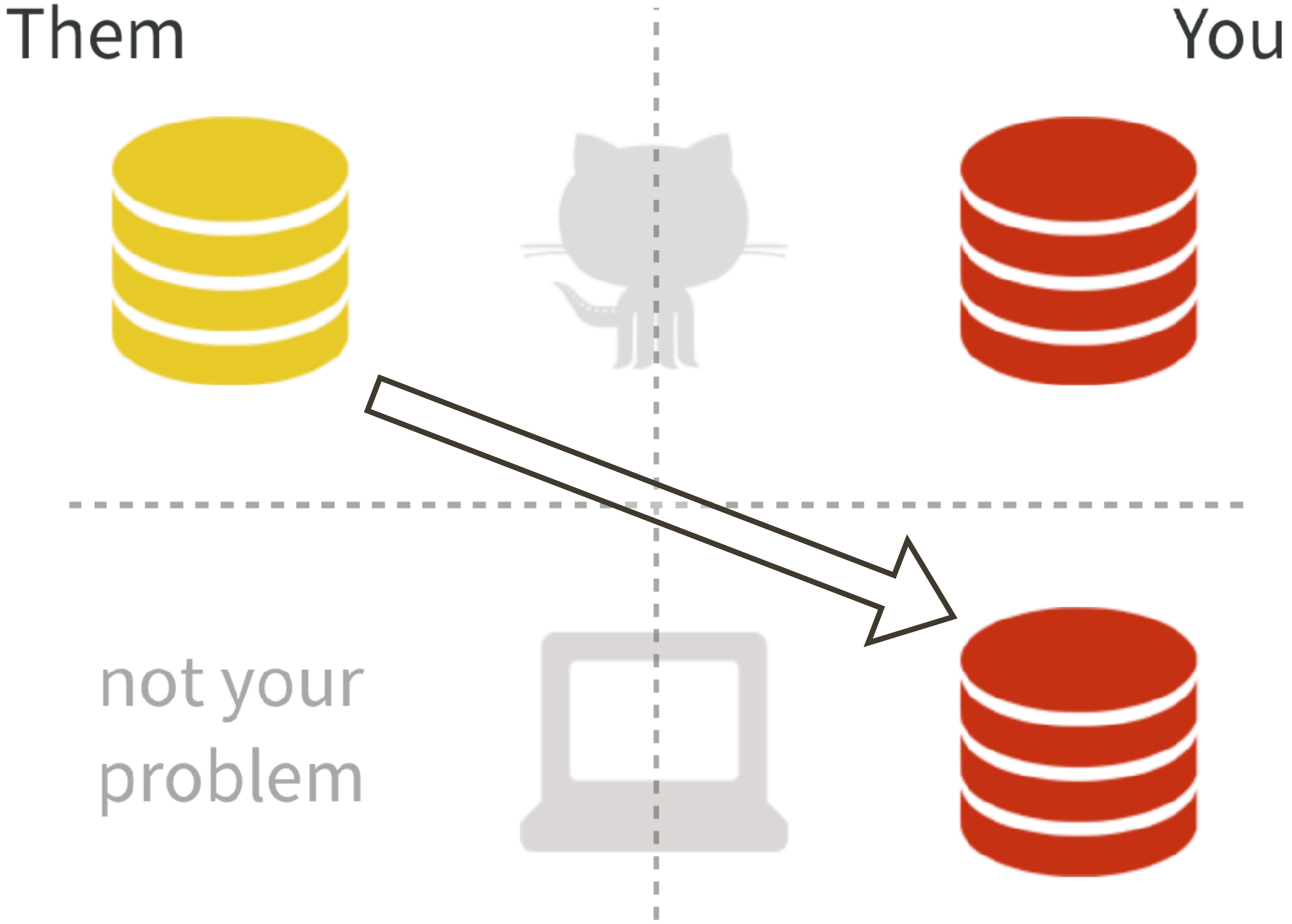
Make Your remote repo from a local Project ... a bit fiddly



"clone"

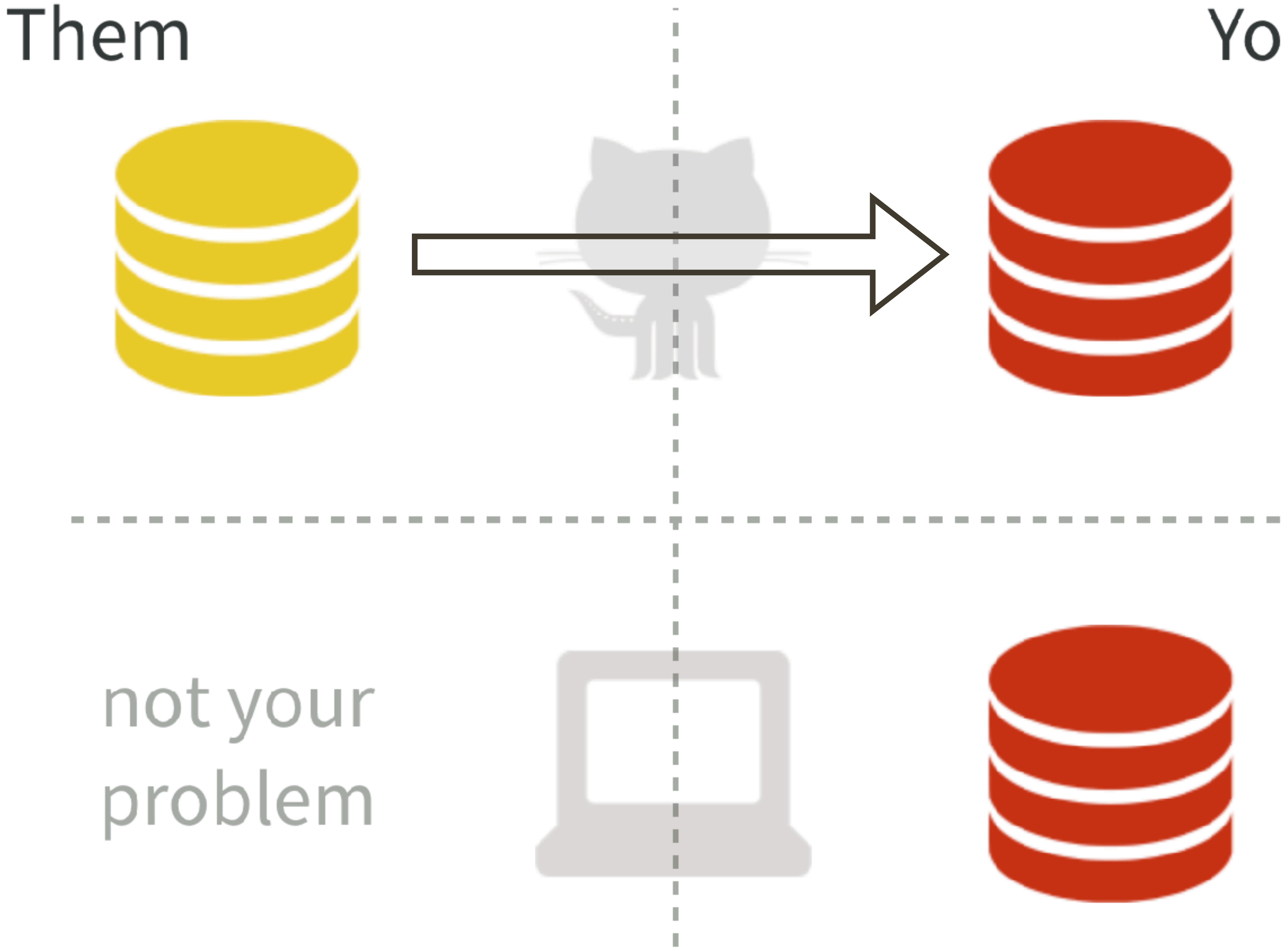


daily work, your stuff

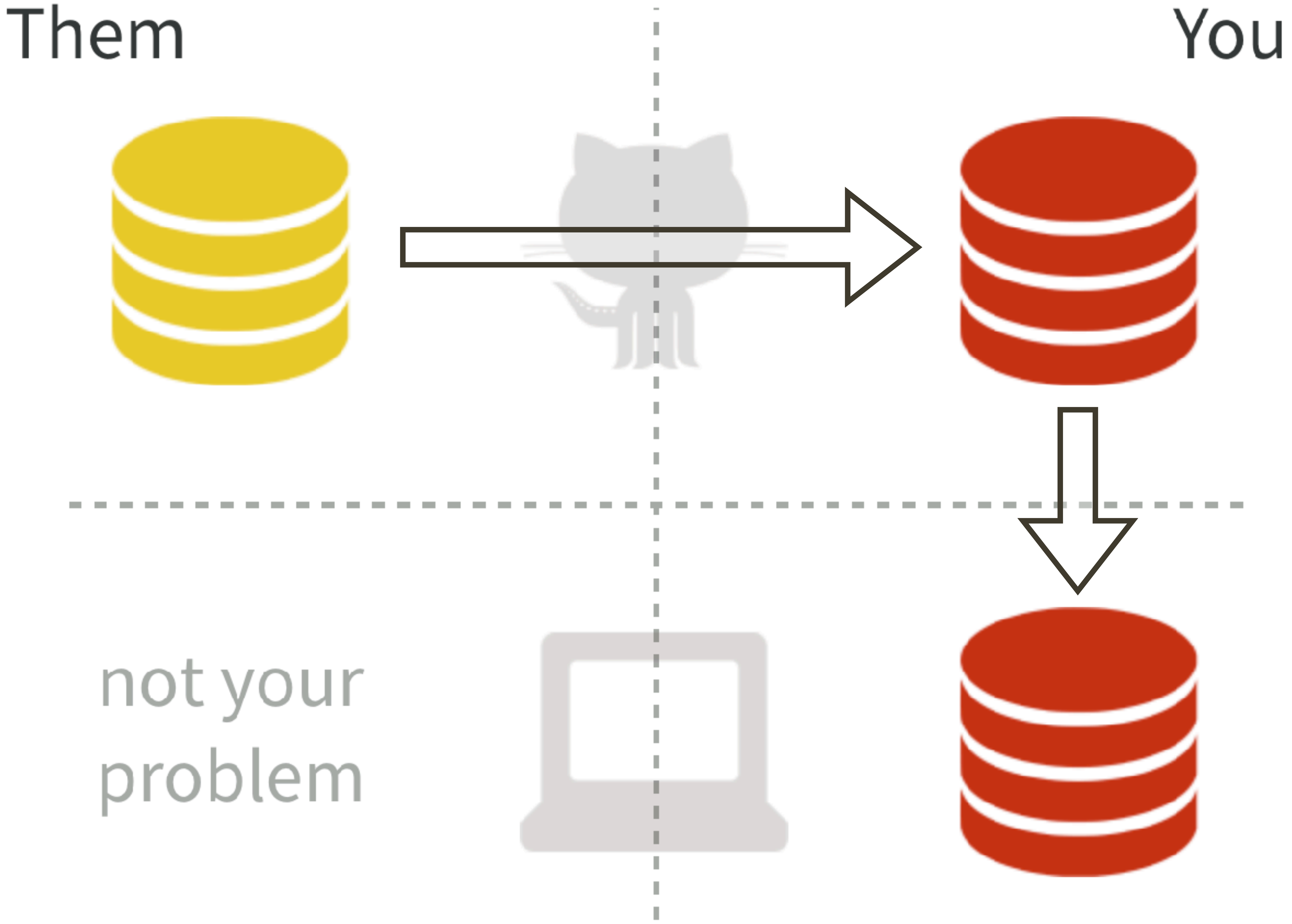


"clone"

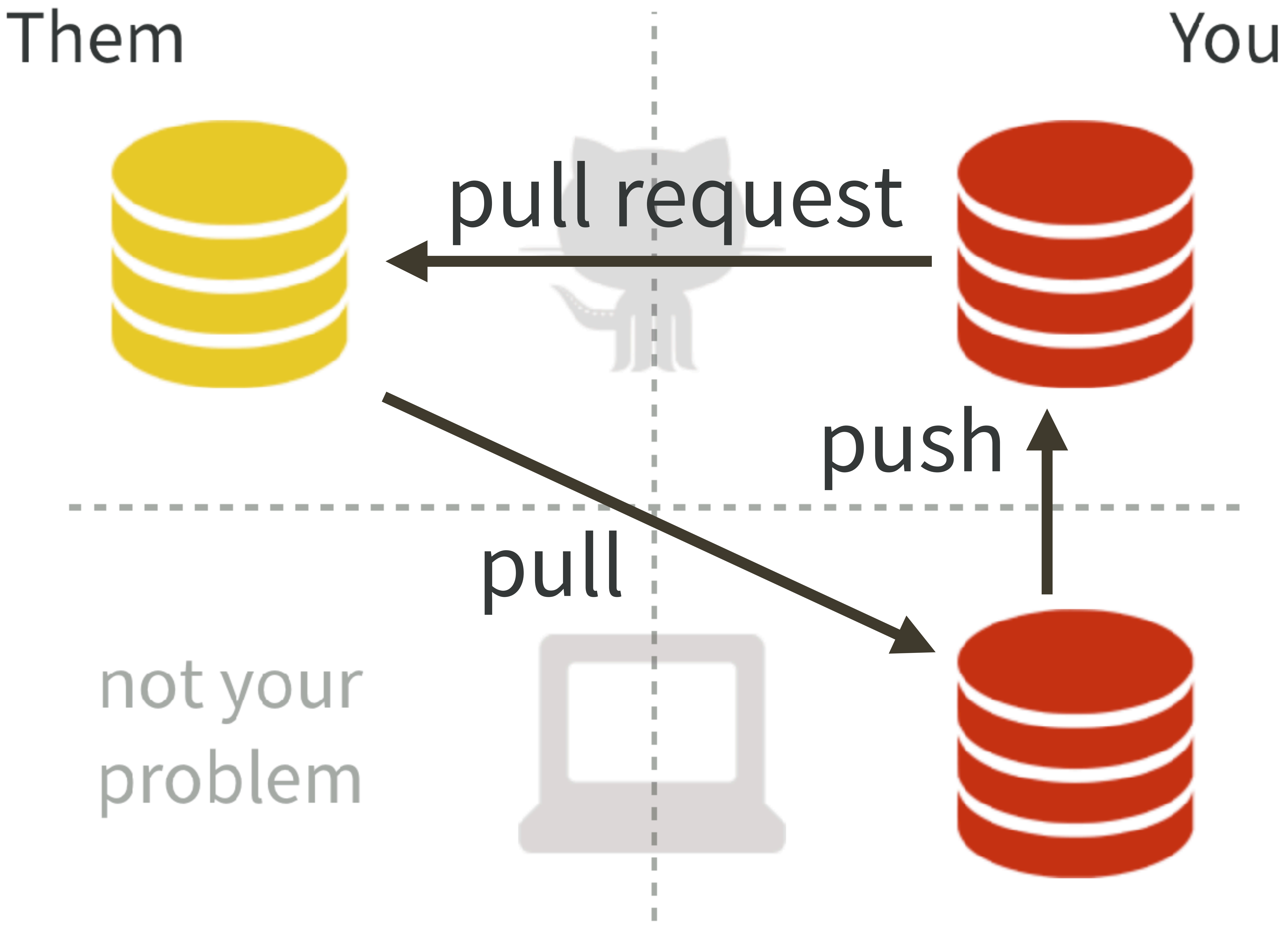
*not as useful as you might think



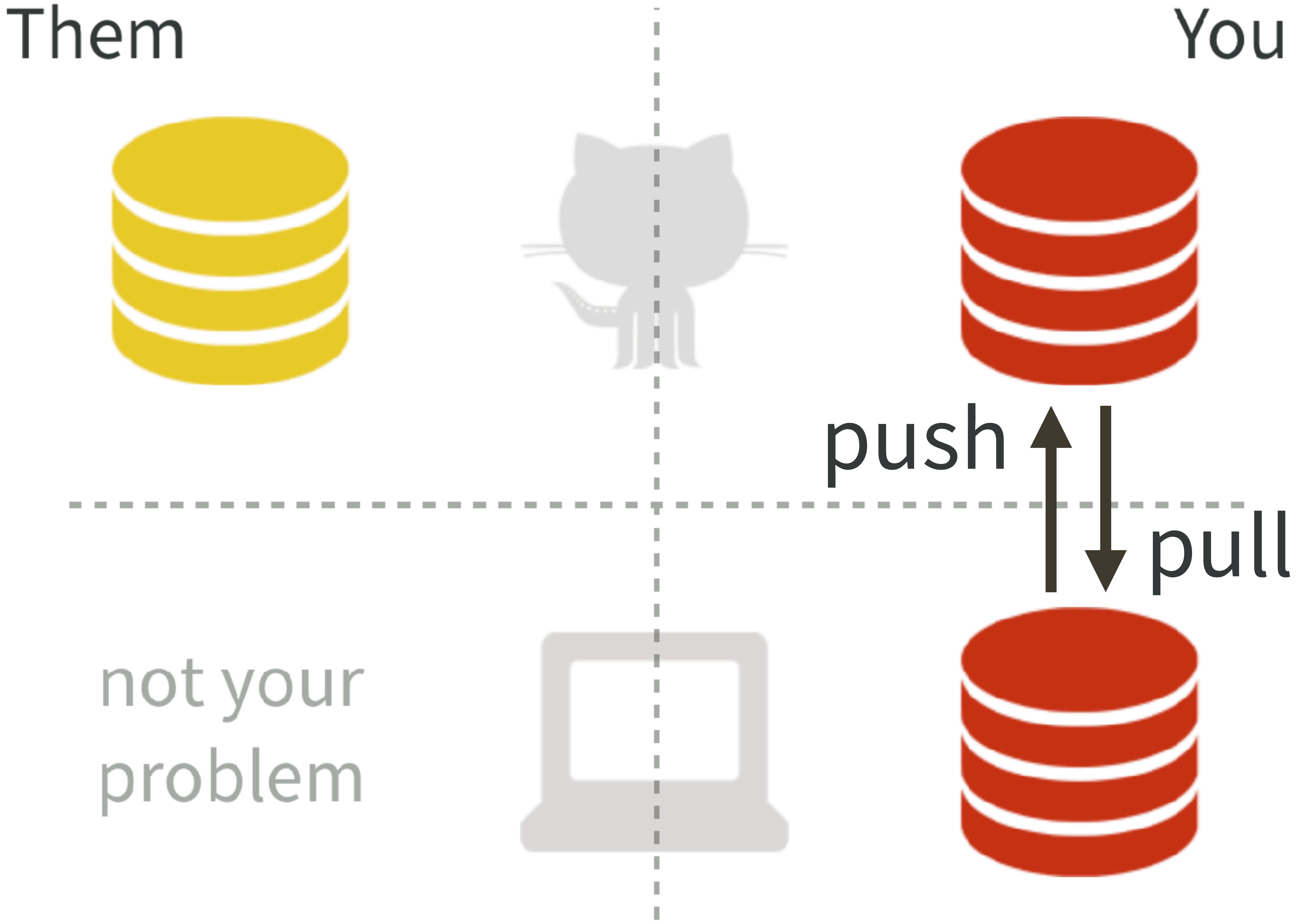
"fork"



"fork and clone"



contribute to other people's stuff



Them

You

push

pull

not your problem

daily work, your stuff

"GitHub first, then RStudio"
Why do I emphasize this?

My diagrams omit two big technical points:

- remotes
- branches

I want you to get off the beach before fannying around with remotes and branches.

New Project:
"GitHub first, then RStudio" workflow

http://happygitwithr.com/new-github-first.html

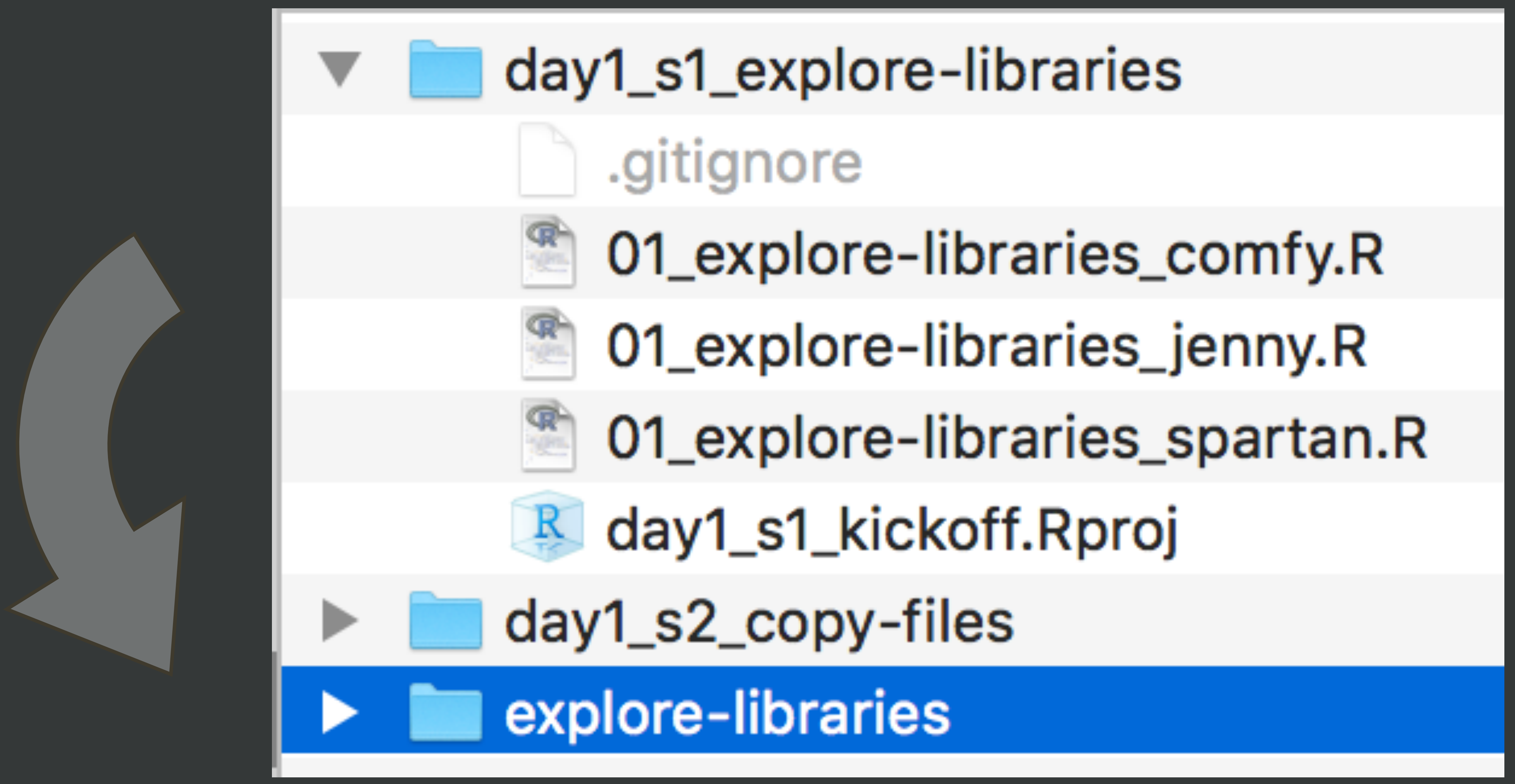
I suggest:

- repo / Project / folder name = "explore-libraries"
- locate as sibling to folders/Project created earlier

coordinated work through this:

http://happygitwithr.com/new-github-first.html

Copy your main .R file from earlier into the explore-libraries directory/Project/repo.



- ▼ day1_s1_explore-libraries
  - .gitignore
  - 01_explore-libraries_comfy.R
  - 01_explore-libraries_jenny.R
  - 01_explore-libraries_spartan.R
  - day1_s1_kickoff.Rproj
- ▶ day1_s2_copy-files
- ▶ explore-libraries

What changed in Git pane?

Inspect the diff.

Stage.

Commit.

Push.

Verify the .R file is now on GitHub.

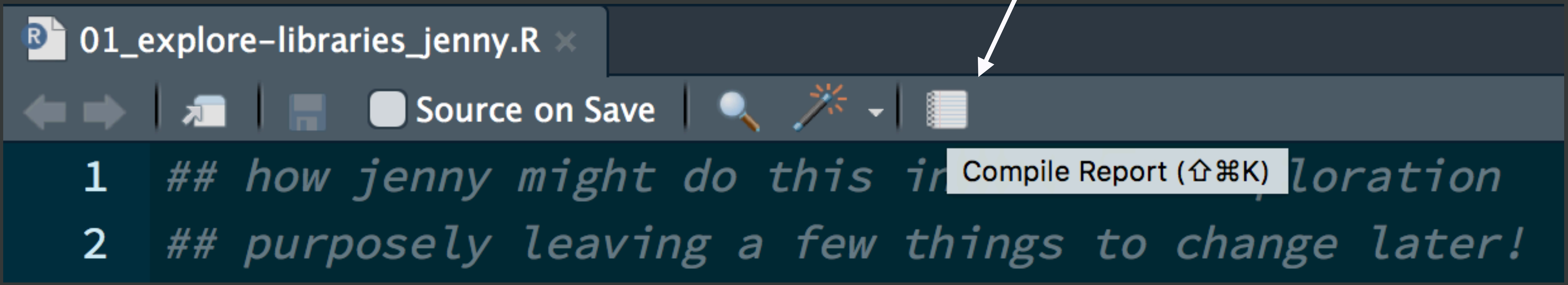
Wait ... is a .R file all I want to share?

what you need to write → what people like to read

`foo.R`
`foo.Rmd`

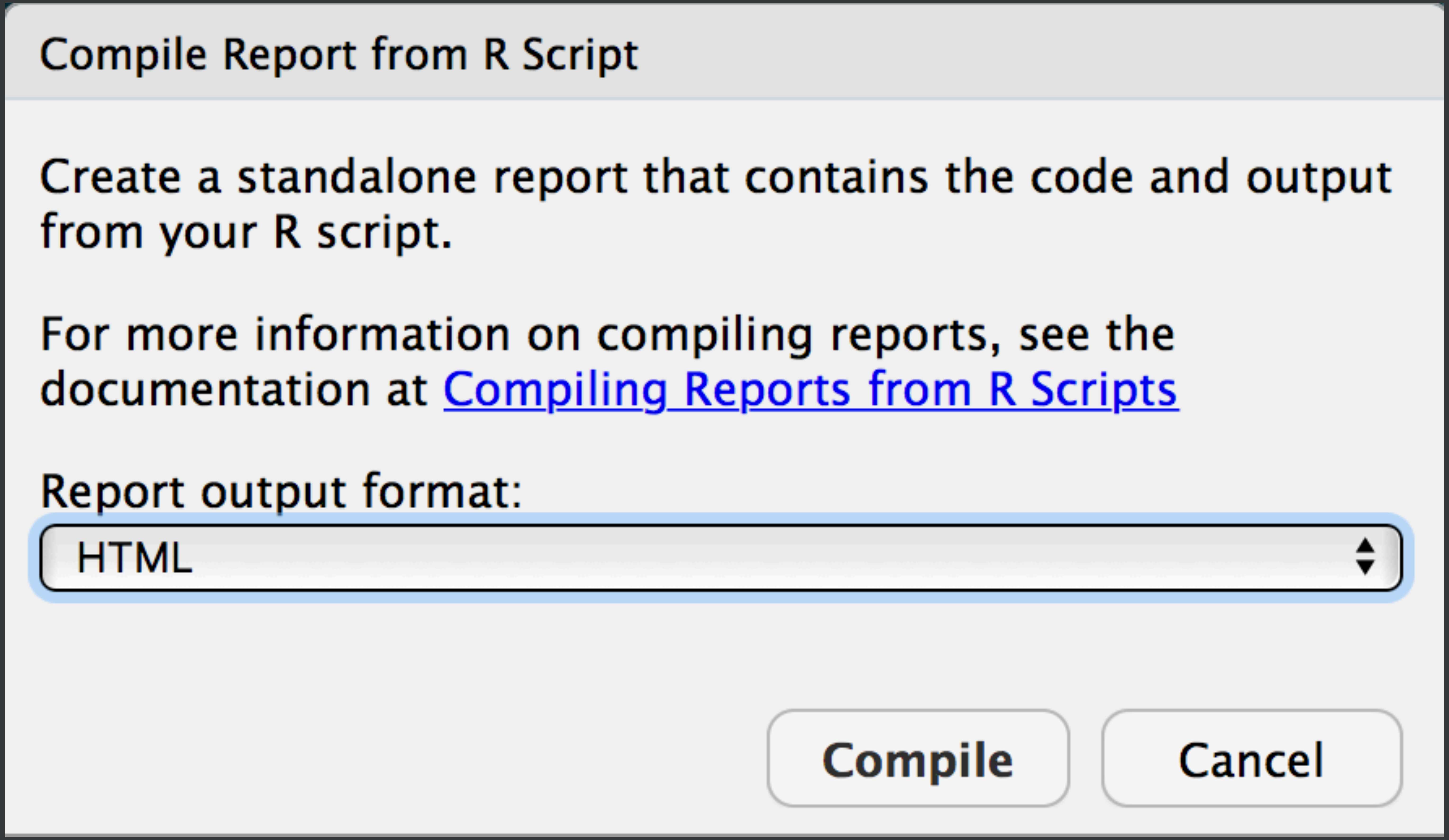
`foo.md`
`foo.html`

Compile Report



```
## how jenny might do this ir                          loration
## purposely leaving a few things to change later!
```

≈ `rmarkdown::render("whatever.R")`



Compile Report from R Script

Create a standalone report that contains the code and output from your R script.

For more information on compiling reports, see the documentation at Compiling Reports from R Scripts

Report output format: HTML

Sure, HTML is fine ... for now.

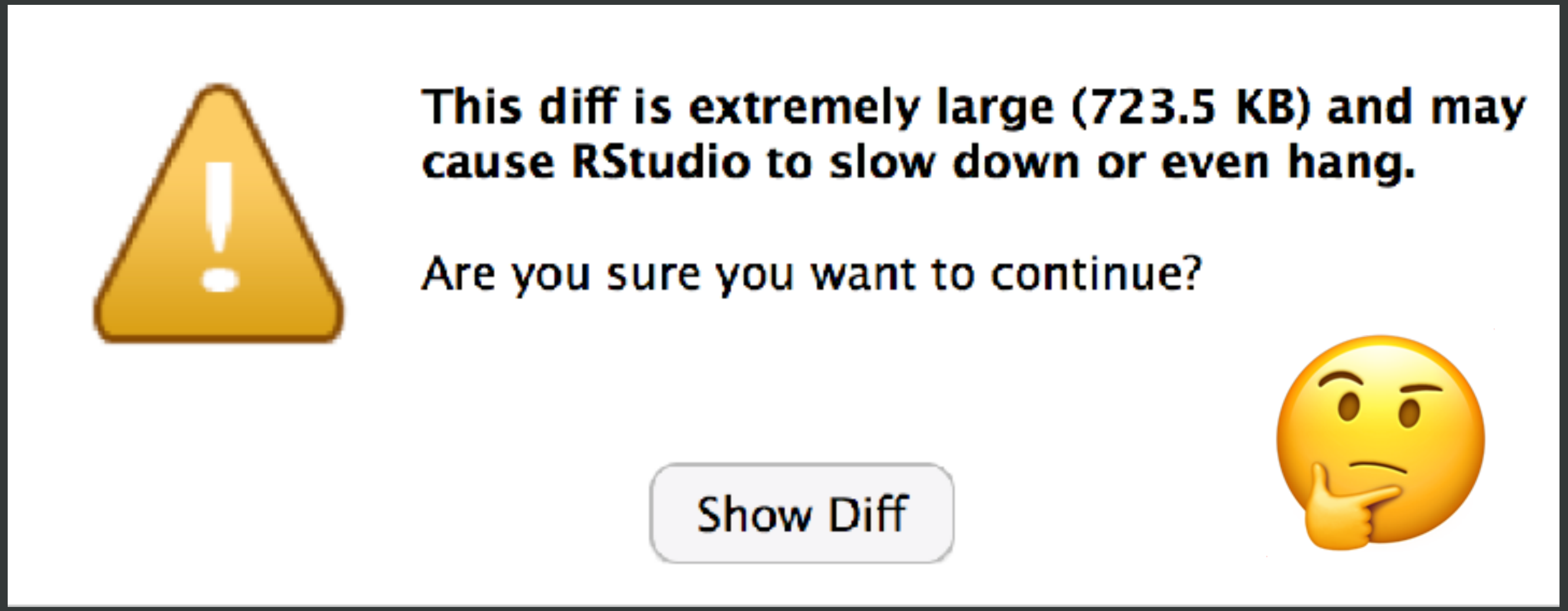
What changed in Git pane?

Inspect the diff. Or not.

Stage.

Commit.

Push.

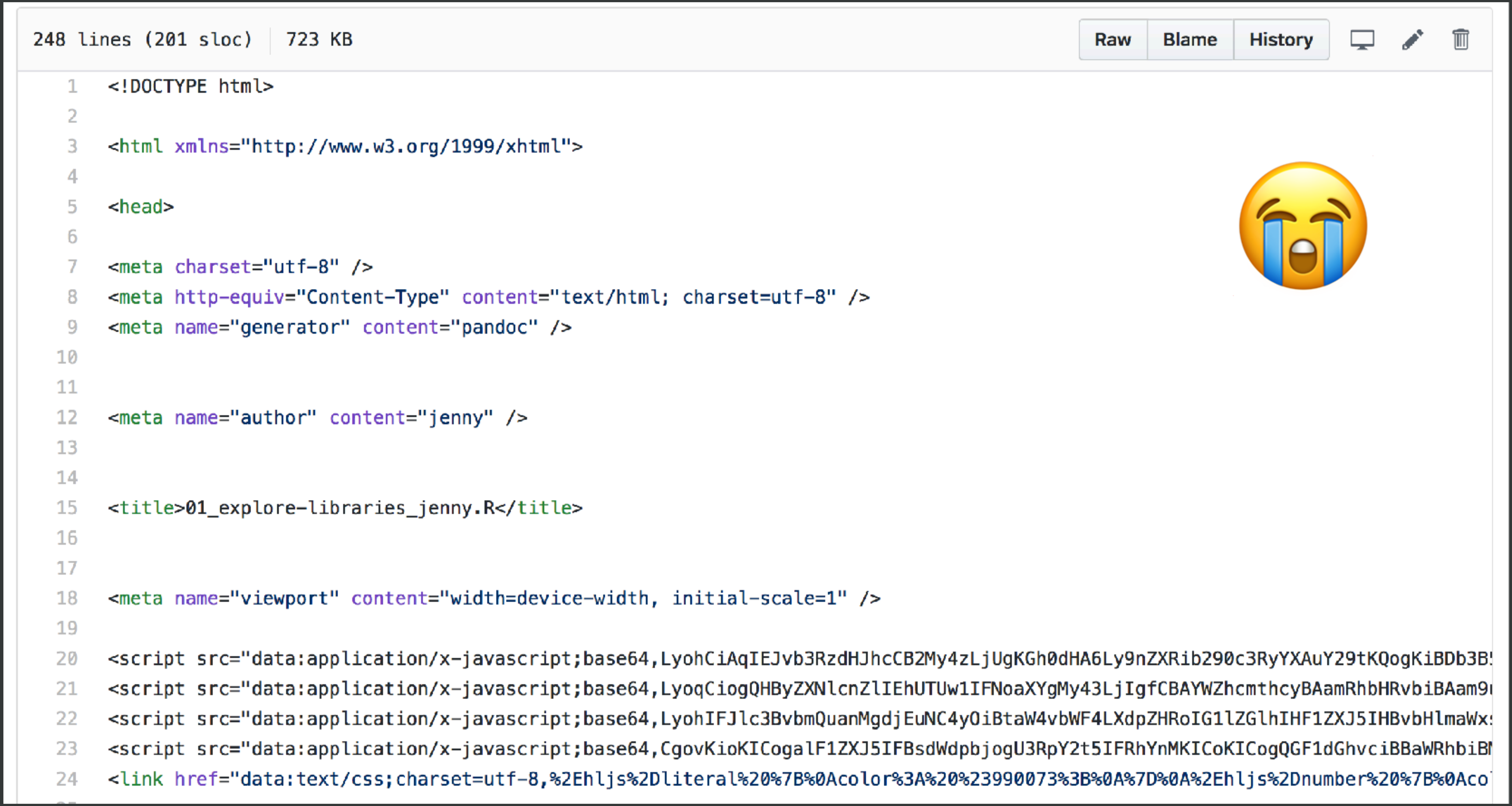


This diff is extremely large (723.5 KB) and may cause RStudio to slow down or even hang.

Are you sure you want to continue?

Verify the `.html` file is now on GitHub.

Wait ... is `.html` immediately useful on GitHub?



248 lines (201 sloc) | 723 KB

```html
<!DOCTYPE html>

<html xmlns="http://www.w3.org/1999/xhtml">

<head>

<meta charset="utf-8" />
<meta http-equiv="Content-Type" content="text/html; charset=utf-8" />
<meta name="generator" content="pandoc" />


<meta name="author" content="jenny" />



<title>01_explore-libraries_jenny.R</title>



<meta name="viewport" content="width=device-width, initial-scale=1" />

<script src="data:application/x-javascript;base64,LyohCiAqIEJvb3RzdHJhcCB2My4zLjUgKGh0dHA6Ly9nZXRib290c3RyYXAuY29tKQogKiBDb3B
<script src="data:application/x-javascript;base64,LyoqCiogQHByZXNlcnZlIEhUTUw1IFNoaXYgMy43LjIgfCBAYWZhcmthcyBAamRhbHRvbiBAam9
<script src="data:application/x-javascript;base64,LyohIFJlc3BvbmQuanMgdjEuNC4yOiBtaW4vbWF4LXdpZHRoIG1lZGlhIHF1ZXJ5IHBvbHlmaWx
<script src="data:application/x-javascript;base64,CgovKioKICogalF1ZXJ5IFBsdWdpbjogU3RpY2t5IFRhYnMKICoKICogQGF1dGhvciBBaWRhbiB
<link href="data:text/css;charset=utf-8,%2Ehljs%2Dliteral%20%7B%0Acolor%3A%20%23990073%3B%0A%7D%0A%2Ehljs%2Dnumber%20%7B%0Aco
```

NO, raw `.html` is NOT immediately useful* on GitHub.

But Markdown = `.md` is useful.

Let's render `.R` to `.md` instead of `.html`!

* it CAN BE useful in actual web publishing workflows

foo.R → foo.html

```
#' ---
#' title: "Untitled"
#' output: html_document
#' ---
```

foo.R → foo.md → foo.html

```
#' ---
#' title: "Untitled"
#' output:
#'   html_document:
#'   keep_md: yes
#' ---
```

foo.R → foo.md

```
#' ---
#' output: md_document
#' ---
```

foo.R → foo.md

```
#' ---
#' output: github_document
#' ---
```

foo.R → foo.html

```
#' ---
#' title: "Untitled"
#' output: html_document
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foo.R → foo.md → foo.html

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#' title: "Untitled"
#' output:
#'   html_document:
#'   keep_md: yes
#' ---
```

foo.R → foo.md

```
#' ---
#' output: md_document
#' ---
```

foo.R → foo.md

```
#' ---
#' output: github_document
#' ---
```

Add this YAML frontmatter

```
#' ---
#' output: github_document
#' ---
```

Re-Compile Notebook

What changed?

This is what I mean by "explore cause and effect" and "experiment without fear".

What changed in Git pane?

Inspect the diff.

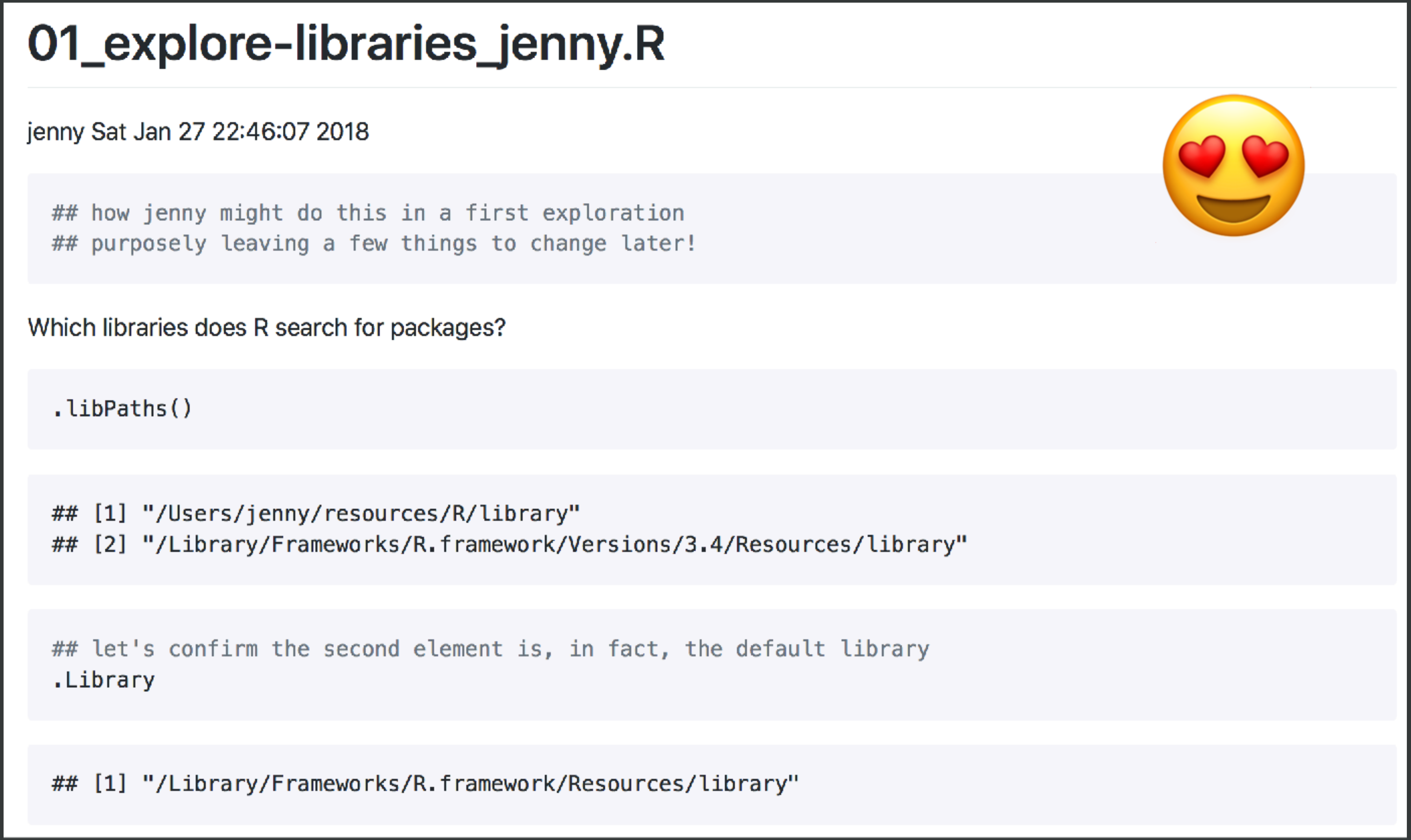
Stage.

Commit.

Push.

Verify the `.md` file is now on GitHub.

Revel in how nice the `.md` looks!



01_explore-libraries_jenny.R

jenny Sat Jan 27 22:46:07 2018

```
## how jenny might do this in a first exploration
## purposely leaving a few things to change later!
```

Which libraries does R search for packages?

```
.libPaths()
```

```
## [1] "/Users/jenny/resources/R/library"
## [2] "/Library/Frameworks/R.framework/Versions/3.4/Resources/library"
```

```
## let's confirm the second element is, in fact, the default library
.Library
```

```
## [1] "/Library/Frameworks/R.framework/Resources/library"
```

This is what I mean by "expose your work".

Take away #1:

Consider putting rendered products on GitHub.

Just because someone can fork, clone, install all necessary packages, then run your code, it doesn't mean they want to or will.

Be kind. Be realistic.

Take away #2:

For consumption on GitHub, Markdown (.md) is vastly more useful than .html, .docx, .pdf, etc.

Binary formats like .docx and .pdf are also a reliable source of merge conflicts. Think carefully before you track them with Git.

Resources re: which files to commit & how to make your repo browsable

Excuse Me, ... section re: "Which files to commit"

Make a GitHub repo browsable
http://happygitwithr.com/repo-browsability.html

Refine your "explore libraries" R script.

After each meaningful change, re-render.

What changed? Look at the diffs.

Stage. Commit. Push. Check result on GitHub.

This is what I mean by "embrace incrementalism".

independent work on challenge

ideas:

- move `library()` calls to top
- more insightful observations in prose
- make code cleaner, more portable, less hacky
- add `devtools::session_info()` at the end or `sessionInfo()` if no devtools

How to finish the day? Game time decision! Possibilities:

Equivalence between R and Rmd.

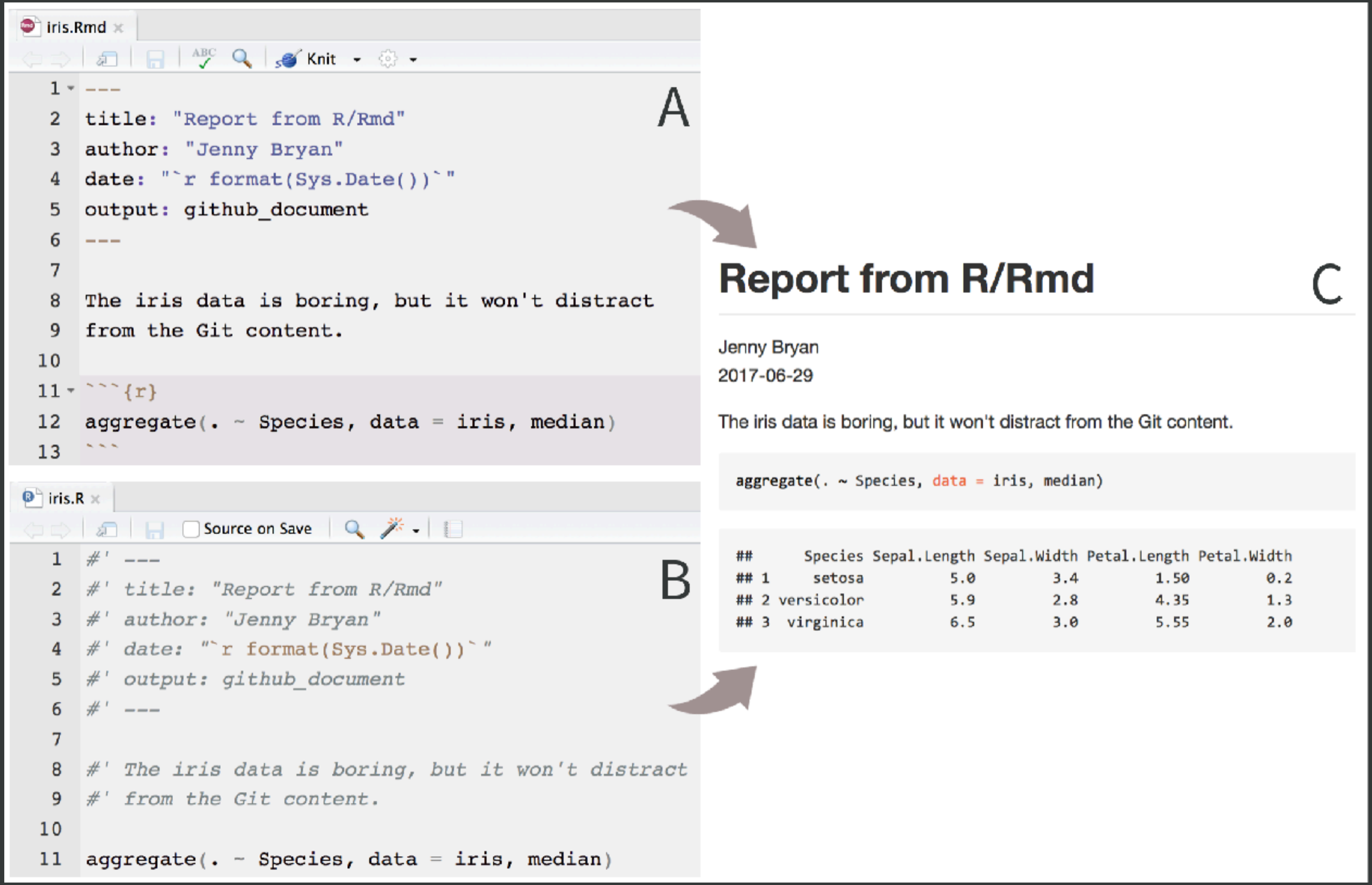
GitHub Pages, the Simple Version.

Make a change on Github, fail on push, pull (& merge), then push.

Make a change both places. Resolve the merge conflict.

Make a change both places. BURN IT ALL DOWN.

Equivalence between .Rmd and .R



~~~
---
title: "Report from R/Rmd"
author: "Jenny Bryan"
date: "`r format(Sys.Date())`"
output: github_document
---

The iris data is boring, but it won't distract
from the Git content.

```{r}
aggregate(. ~ Species, data = iris, median)
```
~~~

```
#' ---
#' title: "Report from R/Rmd"
#' author: "Jenny Bryan"
#' date: "`r format(Sys.Date())`"
#' output: github_document
#' ---

#' The iris data is boring, but it won't distract
#' from the Git content.

aggregate(. ~ Species, data = iris, median)
```

Report from R/Rmd

Jenny Bryan
2017-06-29

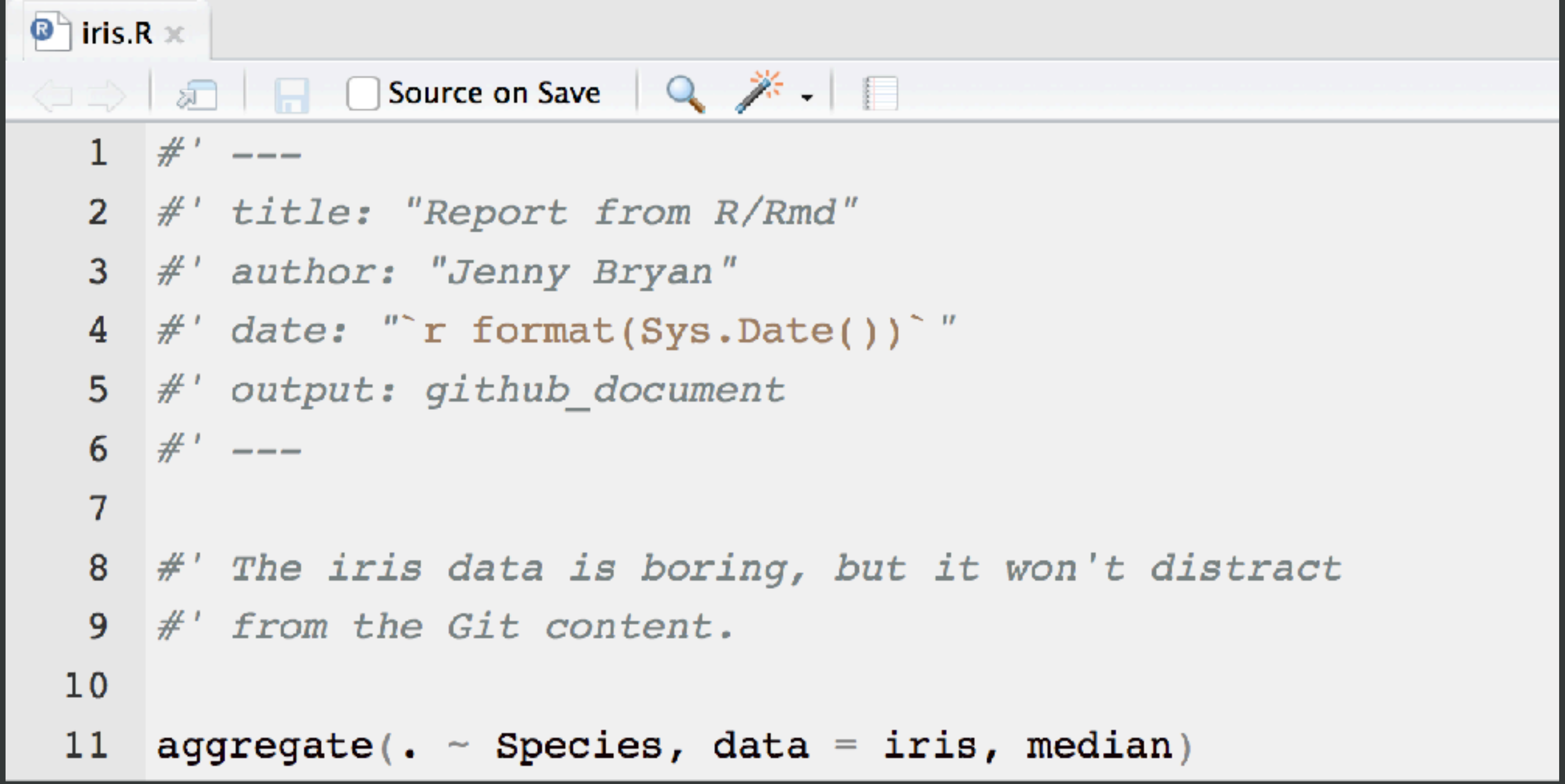
The iris data is boring, but it won't distract from the Git content.

```
aggregate(. ~ Species, data = iris, median)
```

```
##      Species Sepal.Length Sepal.Width Petal.Length Petal.Width
## 1     setosa          5.0         3.4         1.50         0.2
## 2 versicolor          5.9         2.8         4.35         1.3
## 3  virginica          6.5         3.0         5.55         2.0
```

From "Excuse Me, ..." article

.R



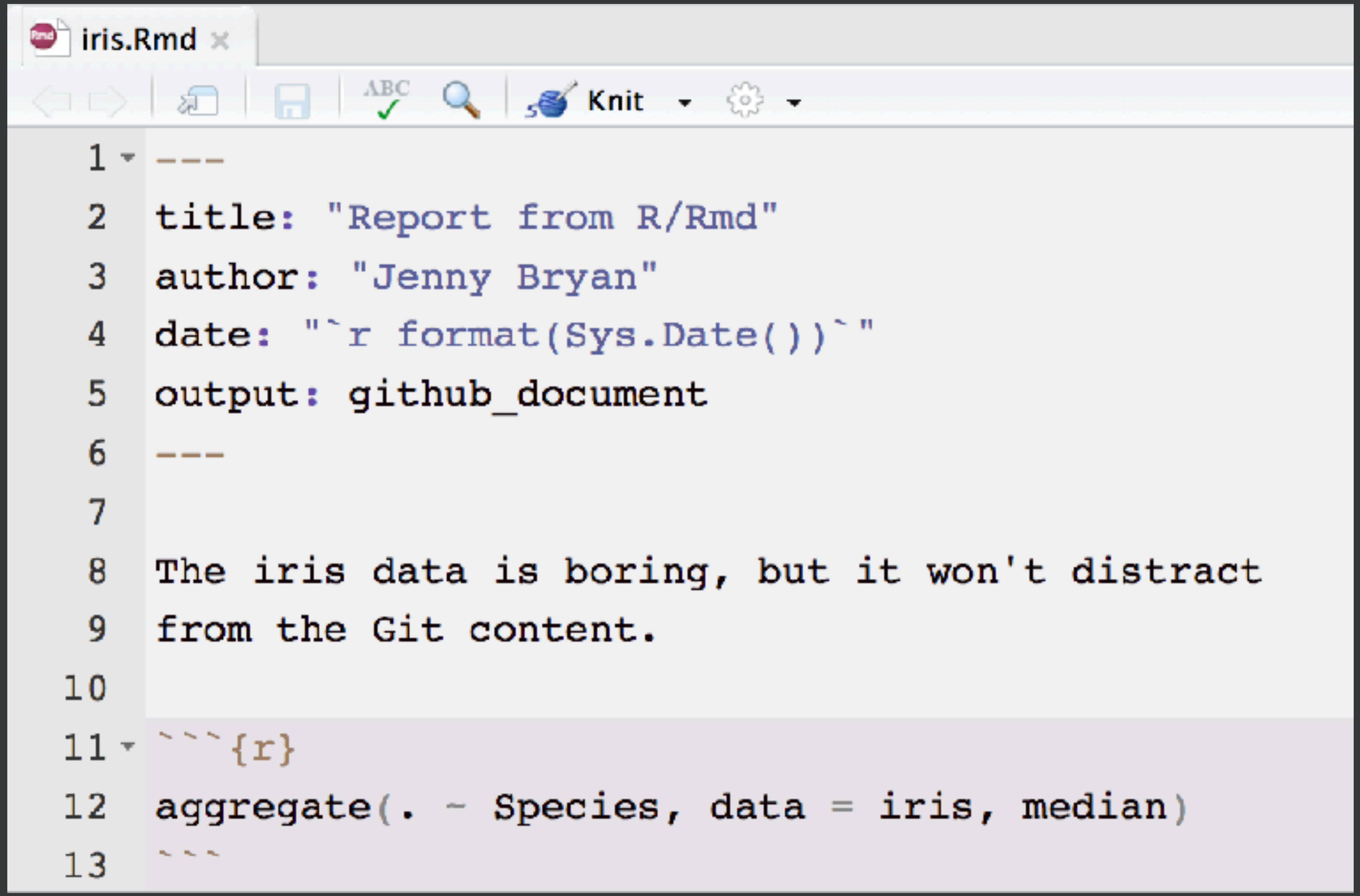
```
#' ---
#' title: "Report from R/Rmd"
#' author: "Jenny Bryan"
#' date: "`r format(Sys.Date())`"
#' output: github_document
#' ---

#' The iris data is boring, but it won't distract
#' from the Git content.

aggregate(. ~ Species, data = iris, median)
```

R code is top-level

Use #' comment for prose

#+ for chunk header

.Rmd



~~~
---
title: "Report from R/Rmd"
author: "Jenny Bryan"
date: "`r format(Sys.Date())`"
output: github_document
---

The iris data is boring, but it won't distract
from the Git content.

```{r}
aggregate(. ~ Species, data = iris, median)
```
~~~

Prose is top-level

Put R code in chunks

Nice defaults for global chunk options

```r
knitr::opts_chunk$set(
  collapse = TRUE,
  comment = "#>",
  out.width = "100%"
)
```

foo.Rmd → foo.html

```
---
title: "Untitled"
output: html_document
---
```

foo.Rmd → foo.md → foo.html

```
---
title: "Untitled"
output:
  html_document:
    keep_md: yes
---
```

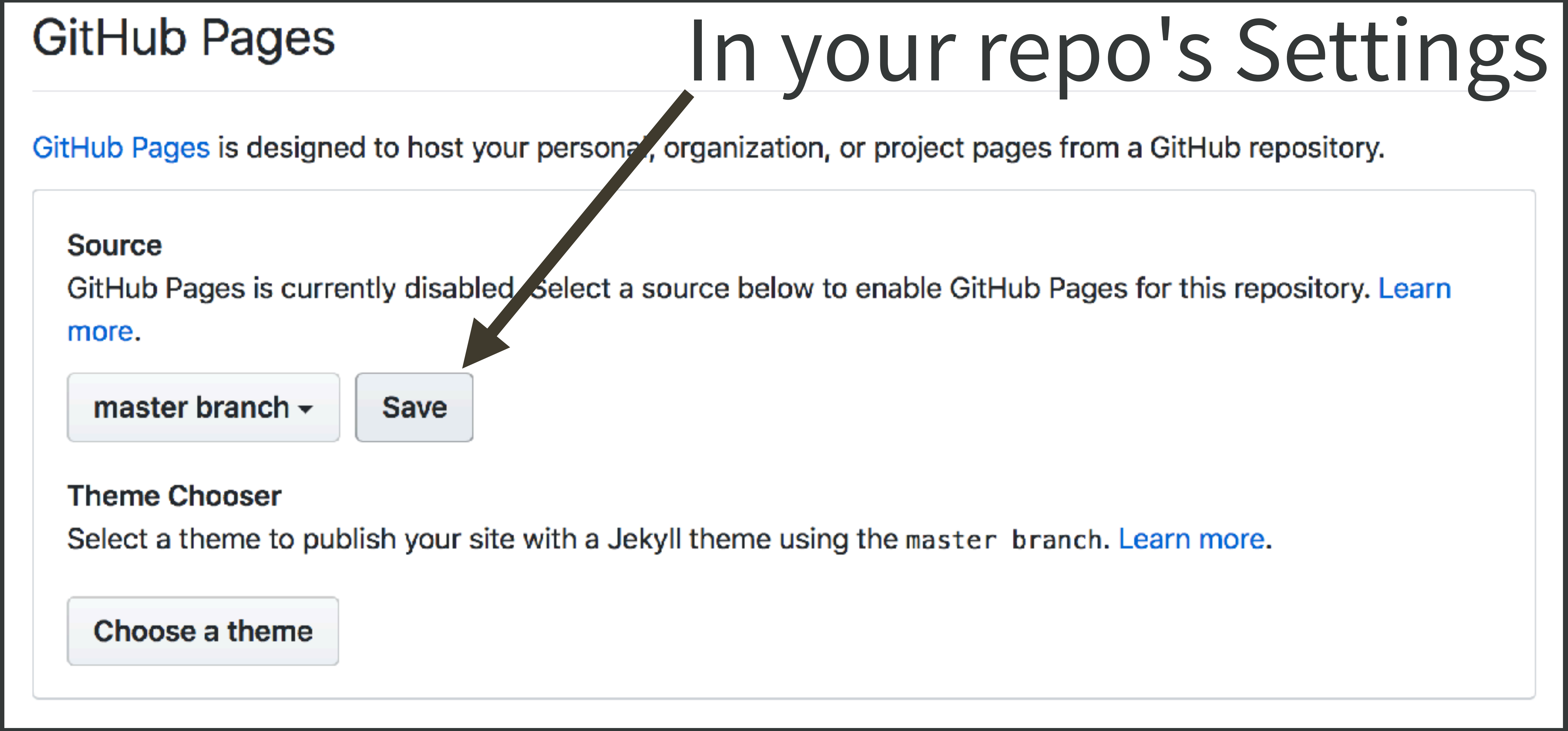
foo.Rmd → foo.md

```
---
output:
  md_document
---
```

foo.Rmd → foo.md

```
---
output:
  github_document
---
```

Simplest use of GitHub Pages = Project webpage



In your repo's Settings

GitHub Pages

GitHub Pages is designed to host your personal, organization, or project pages from a GitHub repository.

Source

GitHub Pages is currently disabled. Select a source below to enable GitHub Pages for this repository. Learn more.

Theme Chooser

Select a theme to publish your site with a Jekyll theme using the `master branch`. Learn more.

https://github.com/blog/2289-publishing-with-github-pages-now-as-easy-as-1-2-3

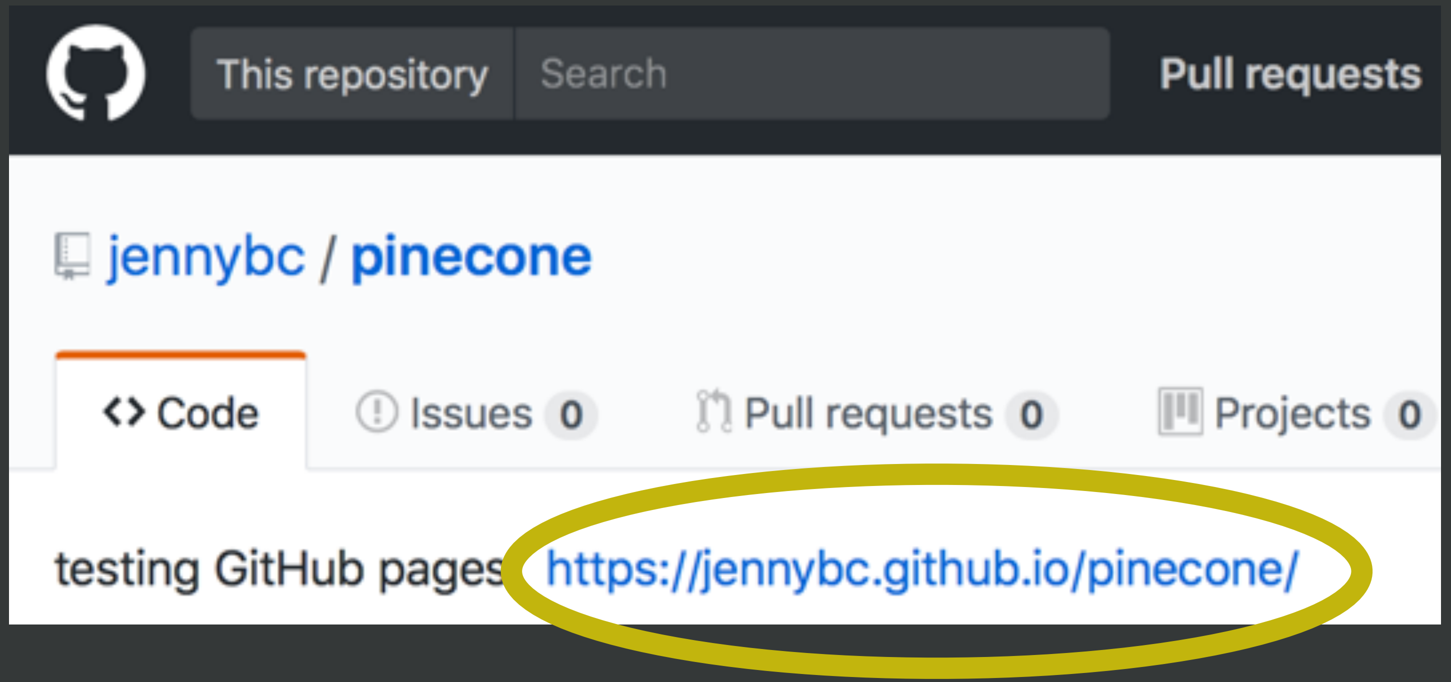
Hot tips for simple GitHub Pages

`README.md` becomes `index.html`, by default

Given that foo.md exists, these internal links work (trial & error):

👍 `[foo](foo)`, `[foo](foo.md)`, `[foo](foo.html)`

Record your site URL as your repo's website



testing GitHub pages https://jennybc.github.io/pinecone/

Recovering from Git(Hub) failure

Scenario: You try to push and cannot

What's the problem?
There are changes on GitHub that you don't have.

Pull. If the gods smile upon you, merge works. Now push.

Let's create this situation.

Make sure local Git pane is clear.
Make sure local and remote are synced (push, pull).

Edit & commit to file A locally.
Edit & commit to file B remotely.

Try to push. You will fail.

```
jenny@2015-mbp bunny-scarf $ git push
To github.com:jennybc/bunny-scarf.git
 ! [rejected]        master -> master (fetch first)
error: failed to push some refs to 'git@github.com:jennybc/bunny-scarf.git'
hint: Updates were rejected because the remote contains work that you do
hint: not have locally. This is usually caused by another repository pushing
hint: to the same ref. You may want to first integrate the remote changes
hint: (e.g., 'git pull ...') before pushing again.
hint: See the 'Note about fast-forwards' in 'git push --help' for details.
```

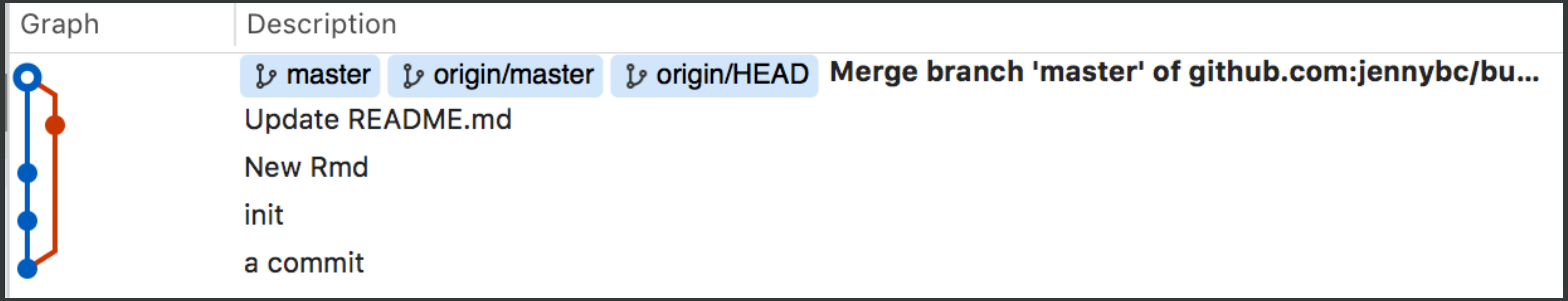
Remedy? Do what it says!

pull, then push ... pull, then push ... pull, then push

Look at your Git history.

You will see a merge commit, where the local and remote changes were reconciled.

This is best case scenario and is likely with good Git habits (lots of small frequent commits and merges, no binary files in repo).



Graph	Description
	master origin/master origin/HEAD **Merge branch 'master' of github.com:jennybc/bu...**
	Update README.md
	New Rmd
	init
	a commit

Recovering from Git(Hub) failure

Scenario: You pull and get a merge conflict.

What's the problem?

GitHub can't figure out how to reconcile diffs.

Resolve the conflicts.

Or abort ... and come back later.

Let's create this situation.

Make sure local Git pane is clear.
Make sure local and remote are synced (push, pull).

Edit & commit to file A locally.
Make conflicting edit & commit to file A remotely.

Try to push. You will fail. Try to pull. You will fail. All is fail.

```
From github.com:jennybc/bunny-scarf
   958548f..3357952  master     -> origin/master
Auto-merging README.md
CONFLICT (content): Merge conflict in README.md
Automatic merge failed; fix conflicts and then commit the result.
```

```
<<<<<<< HEAD
Wingardium Leviosaaaaaaaa

=======
Wing-GAR-dium Levi-O-sa
>>>>>>> 33579525d88af071268b0a0c64c54f357712589a
```

```
<<<<<<< HEAD
Wingardium Leviosaaaaaaaa

=======
Wing-GAR-dium Levi-O-sa
>>>>>>> 33579525d88af071268b0a0c64c54f357712589a
```

Git inserts markers at each locus of conflict and shows you both versions.

You must form a consensus version and delete the markers, at each locus. Commit. Push. Carry on.

```
<<<<<<< HEAD
Wingardium Leviosaaaaaaaa

=======
Wing-GAR-dium Levi-O-sa
>>>>>>> 33579525d88af071268b0a0c64c54f357712589a
```

If you're just not up for this right now, do `git merge --abort` to back out.

You can keep working locally. But you must deal with this problem before you can resume syncing with GitHub.

Recovering from Git(Hub) failure

Scenario: You have a huge mess you cannot fix.

Official answer: git reset.

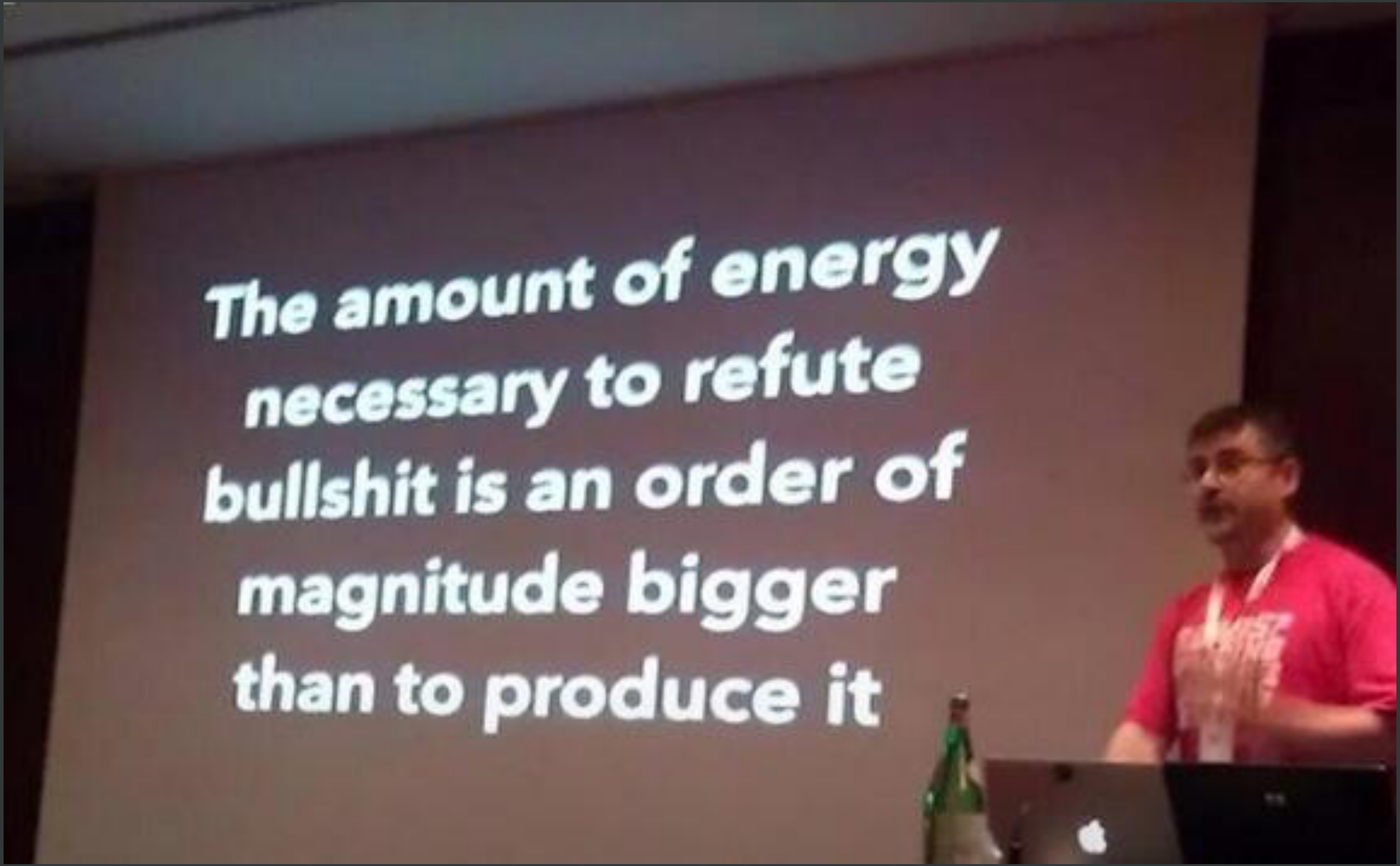
Unofficial answer: burn it all down 🔥

So I can face Jim Hester once he arrives:

`git reset` (mixed and hard) is genuinely worth learning.

SourceTree, for example, makes it easy to do hard or mixed resets to previous states.

After you reset to a non-broken state, have another go at whatever you were doing.



The amount of energy necessary to refute bullshit is an order of magnitude bigger than to produce it

- Alberto Brandolini

The amount of Git skilz necessary to fix a borked up repo is an order of magnitude bigger than to bork it.

- Me

BURN IT ALL DOWN

🔥 requires you have a remote repo in a decent state!
Commit early, commit often! And push! It's your safety net.

Rename local repo to, e.g. "foo-borked".

Re-clone to a new, clean local repo, "foo".

Copy any files that are better locally from "foo-borked" to "foo".
Commit. Push. Carry on.

THIS IS GIT. IT TRACKS COLLABORATIVE WORK ON PROJECTS THROUGH A BEAUTIFUL DISTRIBUTED GRAPH THEORY TREE MODEL.
COOL. HOW DO WE USE IT?
NO IDEA. JUST MEMORIZE THESE SHELL COMMANDS AND TYPE THEM TO SYNC UP. IF YOU GET ERRORS, SAVE YOUR WORK ELSEWHERE, DELETE THE PROJECT, AND DOWNLOAD A FRESH COPY.

Sidebar re: tracking branches

Hopefully won't come up

typical .git/config with "Github first, then RStudio" = git clone

```
[core]
  repositoryformatversion = 0
  filemode = true
  bare = false
  logallrefupdates = true
  ignorecase = true
  precomposeunicode = true
[remote "origin"]
  url = git@github.com:jennybc/bunny-hat.git
  fetch = +refs/heads/*:refs/remotes/origin/*
[branch "master"]
  remote = origin
  merge = refs/heads/master
```

YAASSS

typical .git/config after

```
git init
git remote add
```

```
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   filemode = true
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   url = git@github.com:jennybc/bunny-scarf.git
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```

😢

typical .git/config after

```
git init
git remote add
git push --set-upstream origin master
```

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🤓

GitHub Issues for bugs and features
e.g., https://github.com/tidyverse/dplyr/issues
Talk: Contributing to the tidyverse, Mara Averick

Search R code on GitHub
http://happygitwithr.com/search.html
Jim Hester will cover