Memorial Sloan Kettering Cancer Center

Git/GitHub Training Part 2

Working Collaboratively With Git & Github

March 7, 2022
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Agenda

Review Git & Github Basics

- Git
- Github
- Repositories

New Concepts

- Branching
- Forking
- Pull Requests

Example Collaborative Workflow

- Concepts in Practice

5 Min Break + Breakout Rooms

Part 2 Training Goals

- Add new terms to your git vocabulary to facilitate collaborative work:
  - –Branching
  - –Forking
  - –Pull Requests
- **Understand in what contexts these concepts are useful**

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Review Part 1

What is Git?

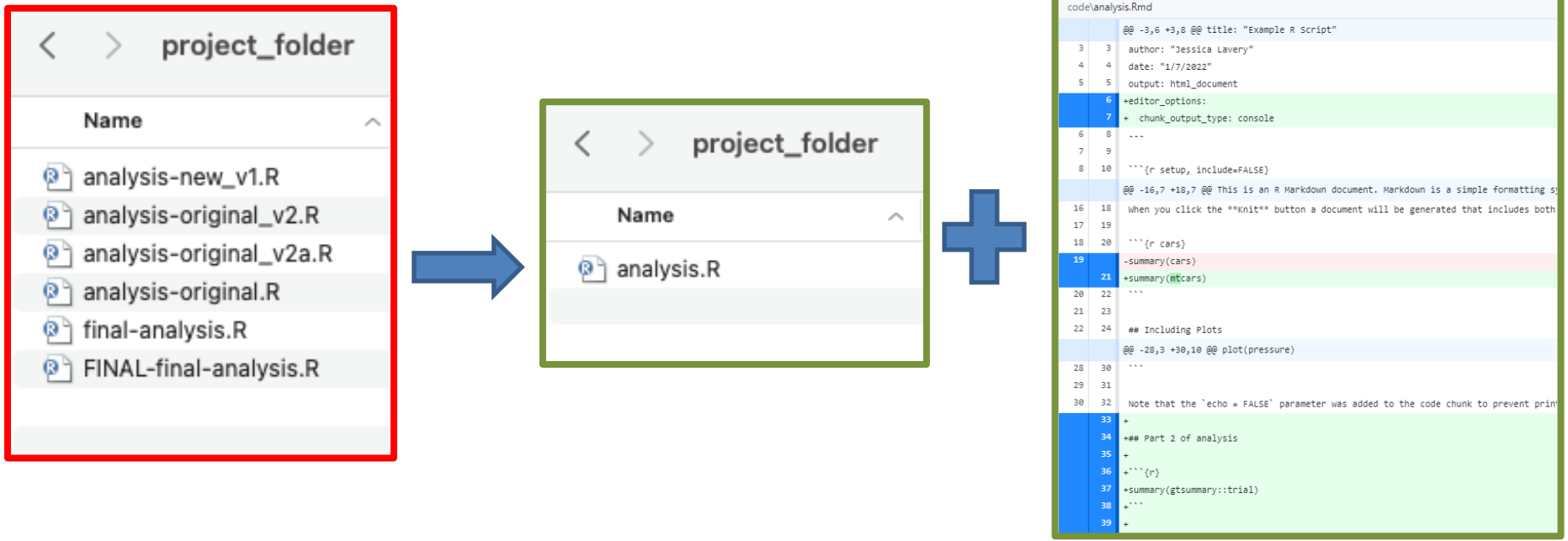
- **Git** is a free, open-source software
- Allows you to set up **version control** systems attached to your projects that can be used to **track changes** across project files and lines of code

Why Use Git?

- More formal **version control system** to better understand when and why you made specific changes to a project
- **Reproducibility-** revert to old version of the code/project as needed
- **Collaboration** & code review

> "In every project you have at least one other collaborator; future-you. You don't want future-you to curse past-you."
> - Hadley Wickham

Why Use Git?


project_folder
Name
analysis-new_v1.R
analysis-original_v2.R
analysis-original_v2a.R
analysis-original.R
final-analysis.R
FINAL-final-analysis.R
project_folder
Name
analysis.R
code\analysis.Rmd
@@ -3,6 +3,8 @@ title: "Example R Script"
author: "Jessica Lavery"
date: "1/7/2022"
output: html_document
+editor_options:
+ chunk_output_type: console

```{r setup, include=FALSE}
@@ -16,7 +18,7 @@ This is an R Markdown document. Markdown is a simple formatting s
When you click the **Knit** button a document will be generated that includes both
```{r cars}
-summary(cars)
+summary(mtcars)
```
Including Plots
@@ -28,3 +30,10 @@ plot(pressure)
Note that the `echo = FALSE` parameter was added to the code chunk to prevent prin
+## Part 2 of analysis
+
+```{r}
+summary(gtsummary::trial)
+```
+
```

What is GitHub?

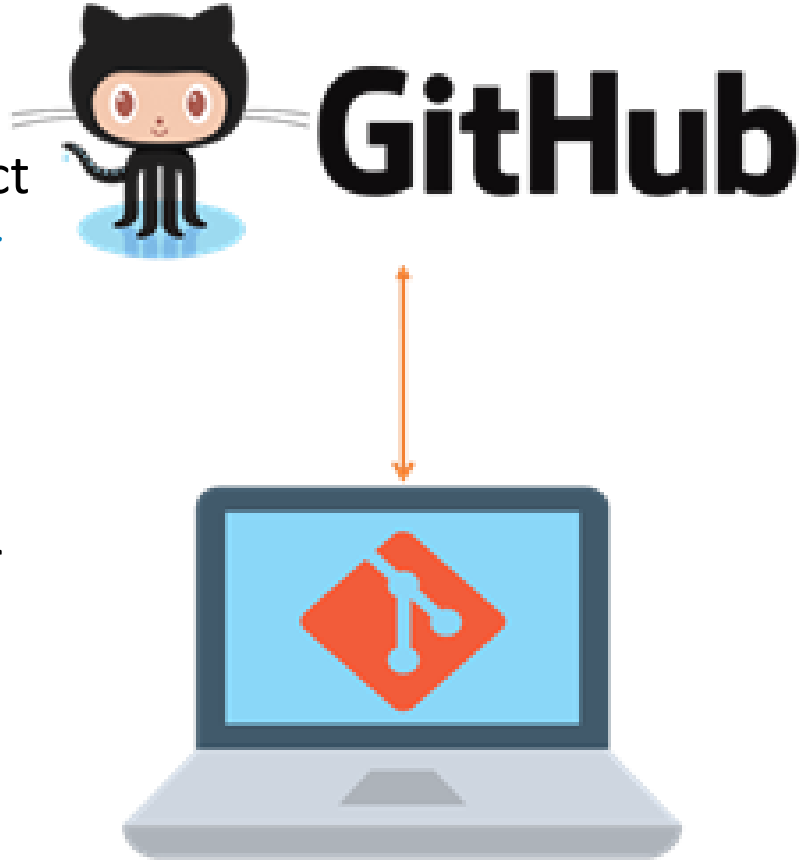
- **Git** (“local”) - software installed on your local computer to track changes
- **GitHub** (“remote”)- a home for your git-based projects on the internet
  - Similar to Google Drive or Dropbox/Box
  - Work on your project locally on your computer but you Sync them to Drive/Dropbox/Box on the cloud
  - Files can be accessed via those websites and shared with others

What's a Repository?

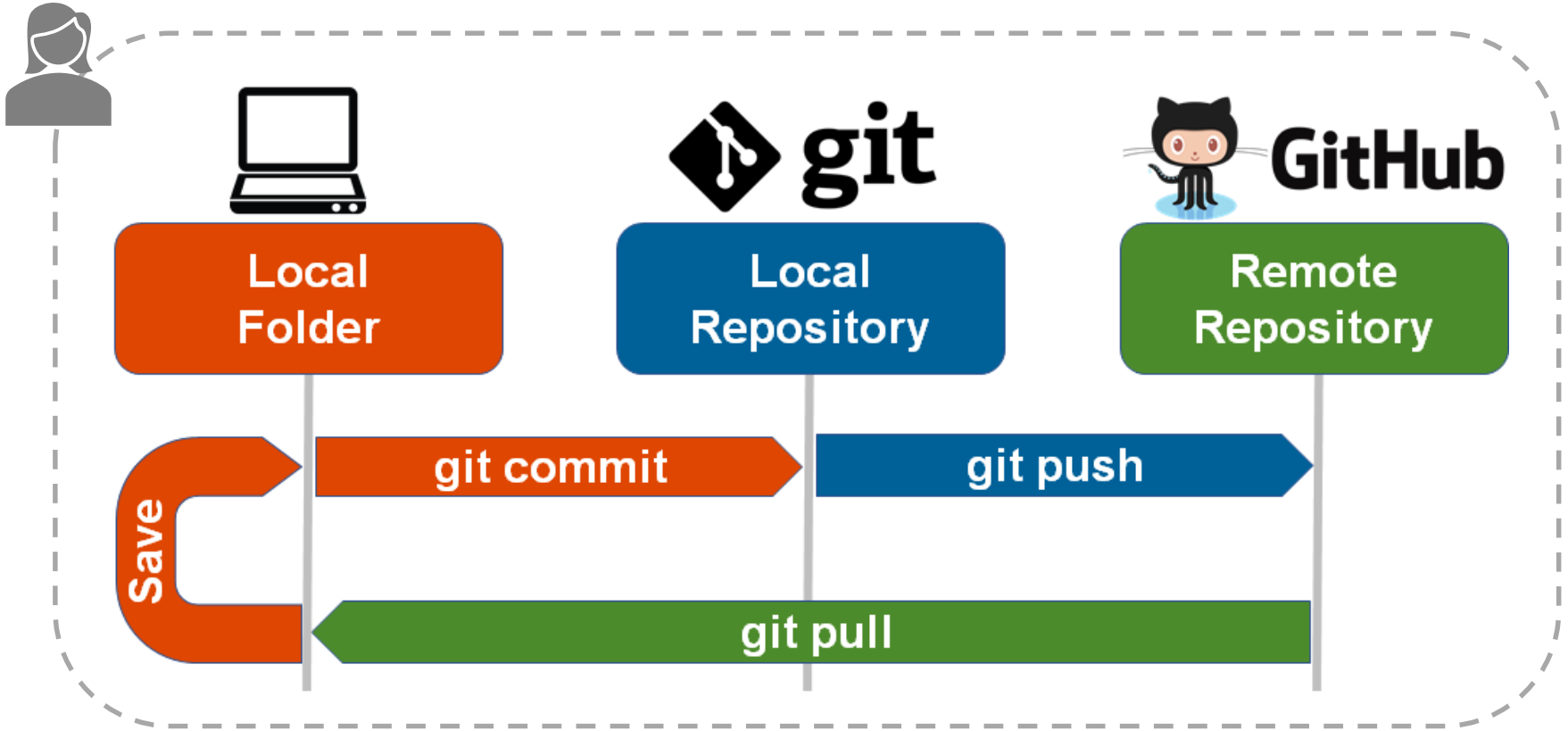
- A repository is essentially a project folder that you have enabled git to track.
- Therefore, it consists of both the project files themselves, as well as records of the files' version histories.

Repo Locations

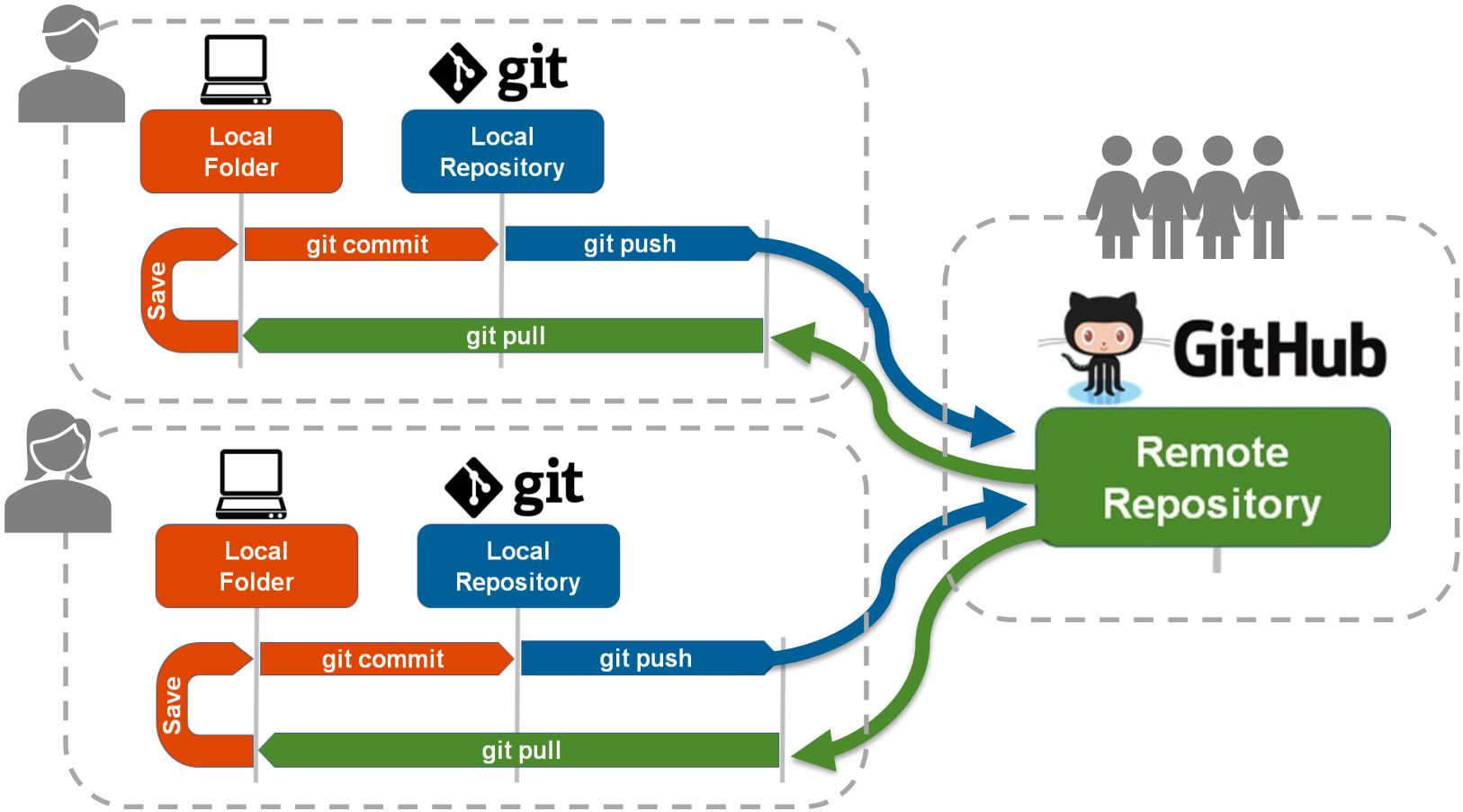
- **Local repository** - Version of your project that lives on your local computer. *This is the version you make edits to.*
- **Remote repository** - Version that lives remotely on GitHub.
  - GitHub offers a suite of features for managing, organizing and searching your project code.



Review: Git & GitHub Workflow



Expanded Git & GitHub Workflow



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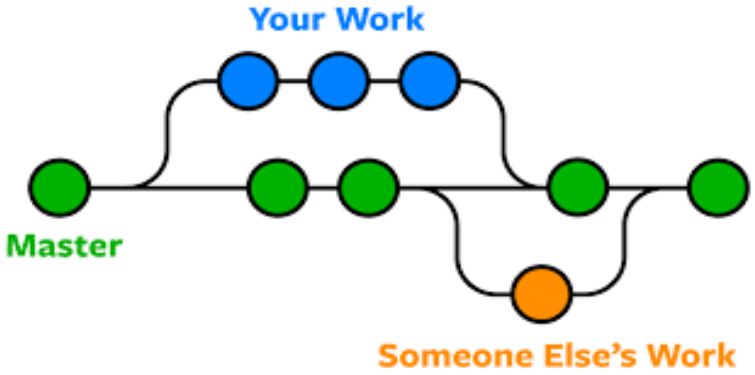
Branching

What is a Branch?

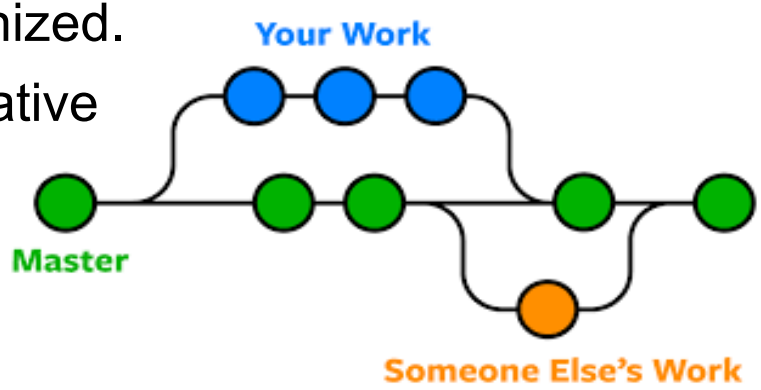
- **Branches** are a copy of your code that you keep separate from the main project code
- On a branch, you can experiment with changes safely as these changes are made **in isolation of the main project code**
- This allows you to develop features, fix bugs, and safely experiment with new ideas in a contained area
- It **remains linked** with the main project



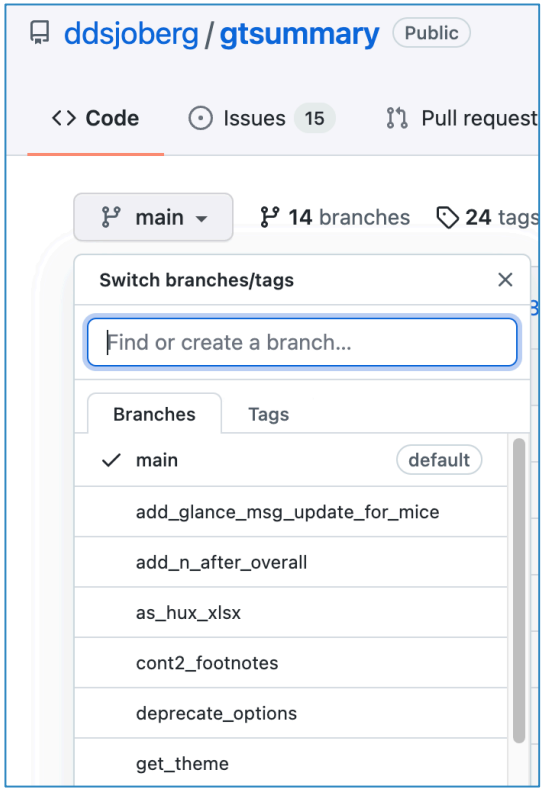
Branches are useful for collaborations

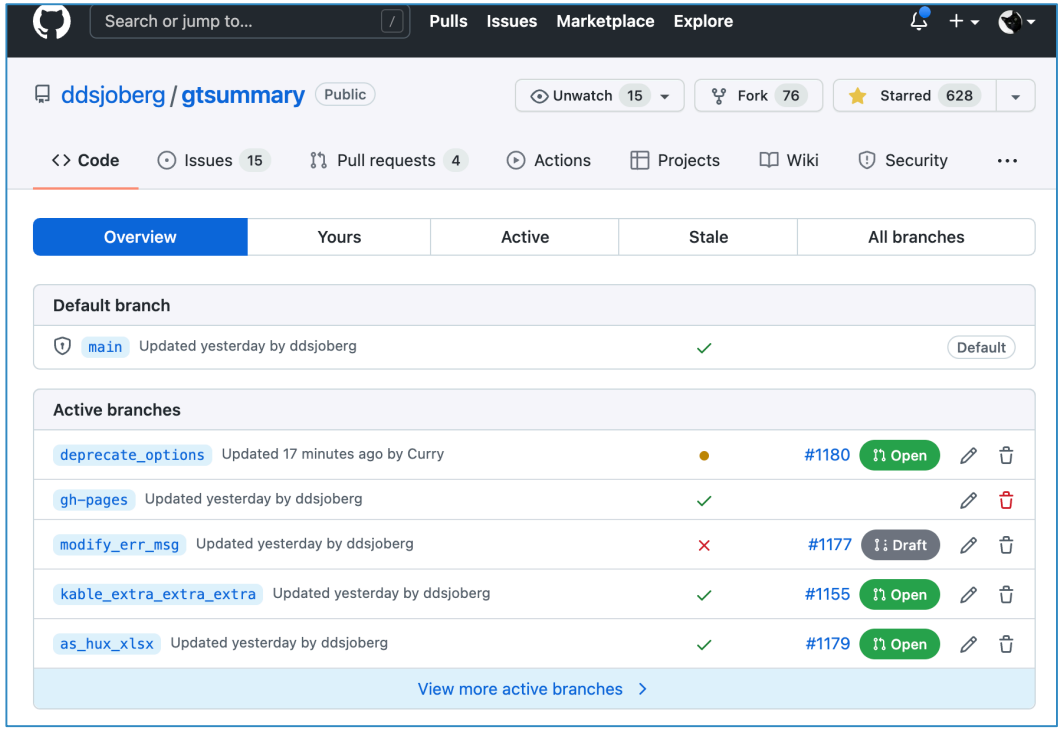
- **Problem:** If everyone makes changes directly to the main code of project at the same time, this may create conflicts or and we may break each other's code.
- **Solution:** Each member works on their own branch and each branch is QA-ed before merging into the main project
- **Bonus**: Branches help you keep organized.

  Give your branch a unique and informative name.



Example of Branching In Action



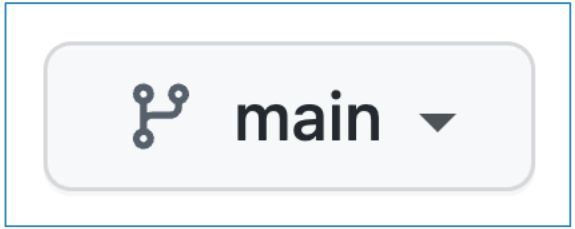


Branches can be useful for individual projects too

- Specific project versions for journal submission/review
- Try a complex new analysis - easy to abandon
- Maintain stable versions of dashboards/automated reports/ shiny apps

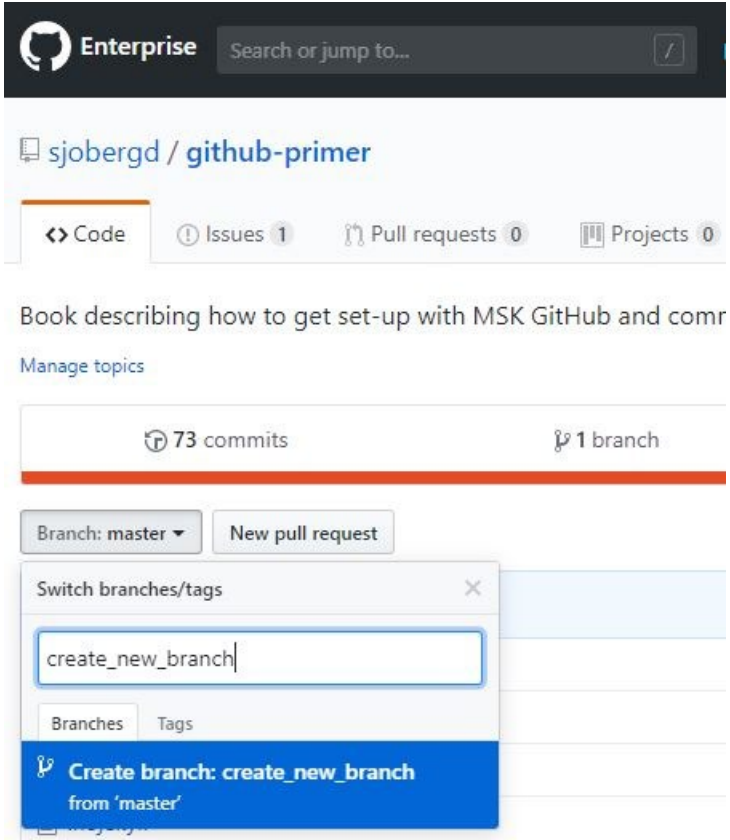
Main (Default) Branch

- You've actually been working with branches already!
- So far, we've been committing and pushing changes to the default branch called **Main** (sometimes also called **Master** branch)
- This is created by default when you create a repository



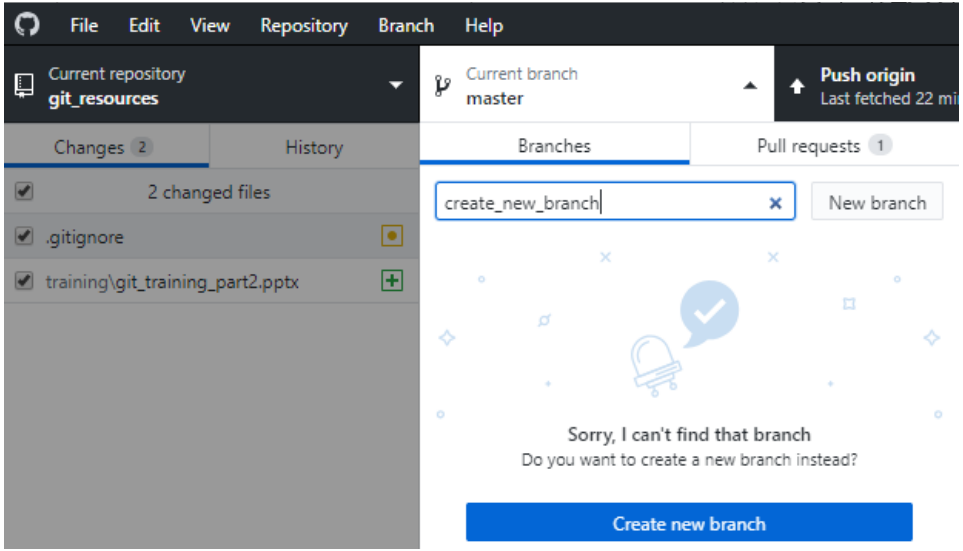
Create New Branch (in GitHub)

1. Go to https://github.mskcc.org
2. Navigate to repository
3. Click “Branch: master” button
4. Type name of new branch
5. Click “Create Branch”

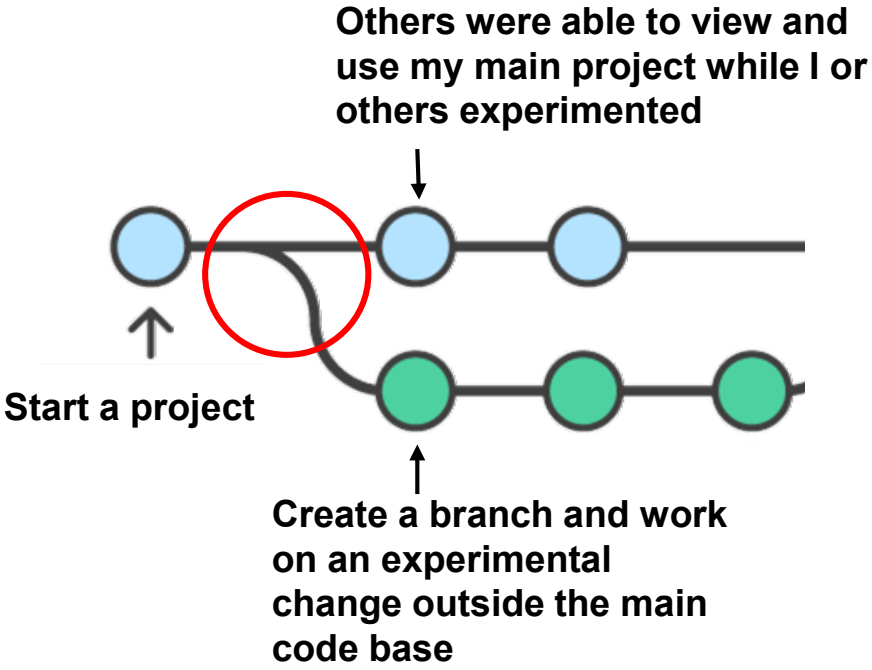


Create New Branch (in GitHub Desktop)

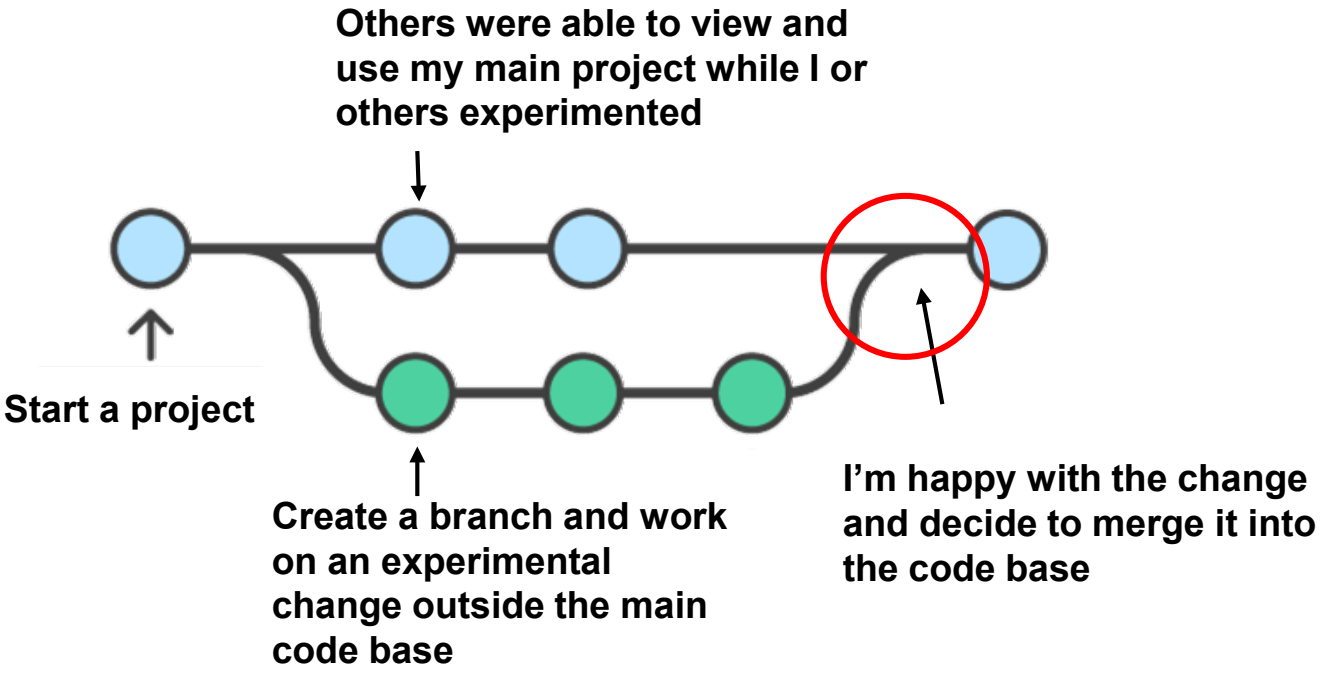
1. Open GitHub Desktop
2. Open repository
3. On the branch selection tab, type name of new branch
4. Click “Create New Branch”



Create New Branch



Merge Changes Into Main Project



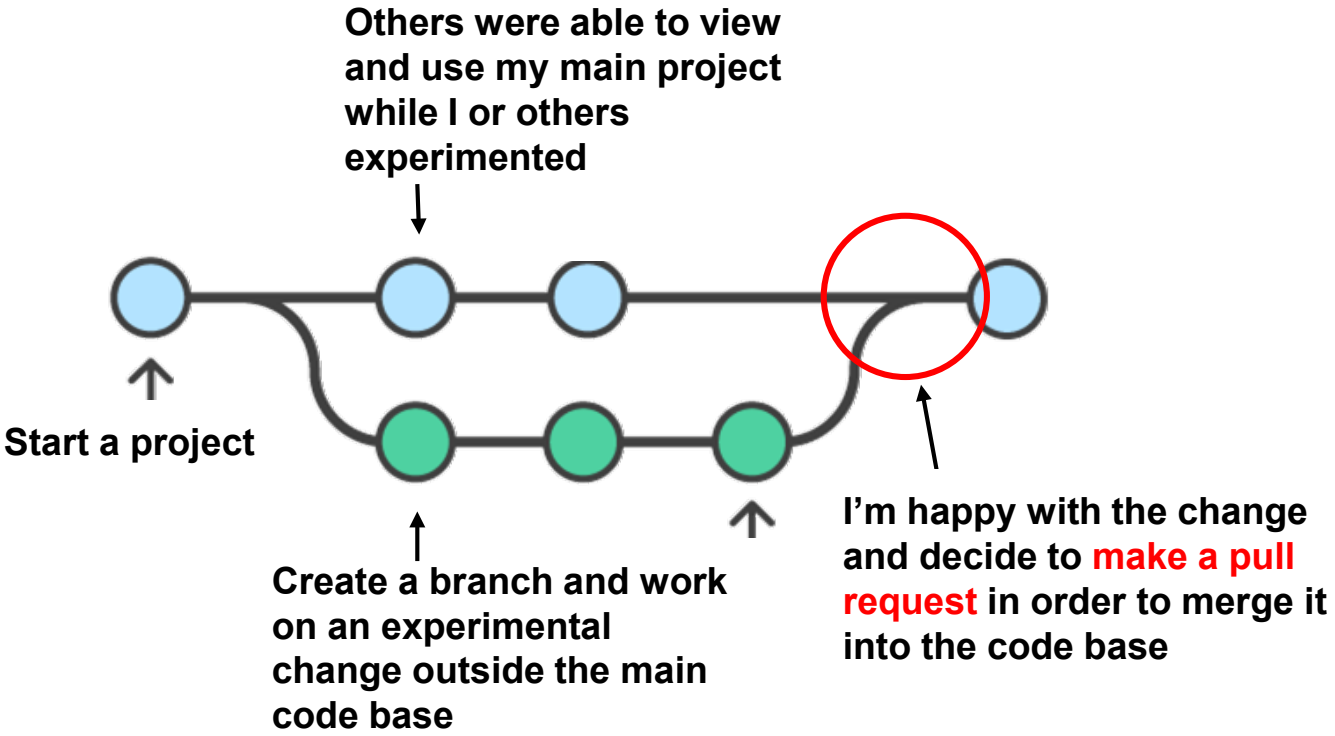
Pull Requests

What is a Pull Request?

- **Pull Request** = A Code Review + A Merge Into Main Code

- Pull Requests are how you get changes from a branch into the main project ("main" branch).

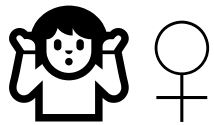
Pull Request



Why “Pull Request” Not “Push Request”

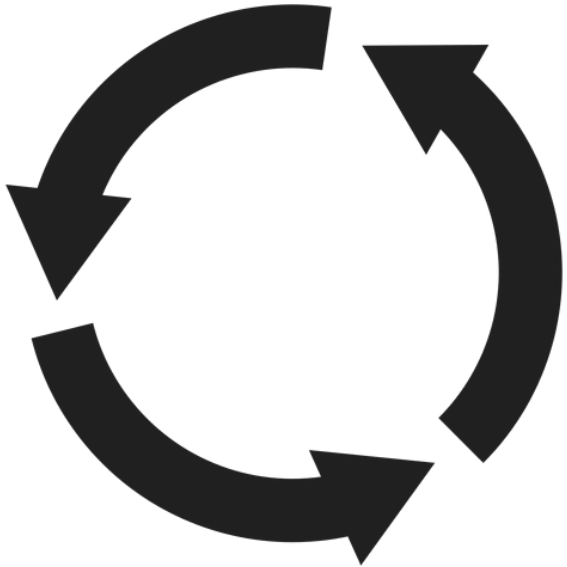
- If you are trying to “push” your new changes into the main repository why is it called a “pull request”?!

Why “Pull Request” Not “Push Request”

- If you are trying to “push” your new changes into the main repository why is it called a “pull request”?!
- Because it’s more polite?  ♀

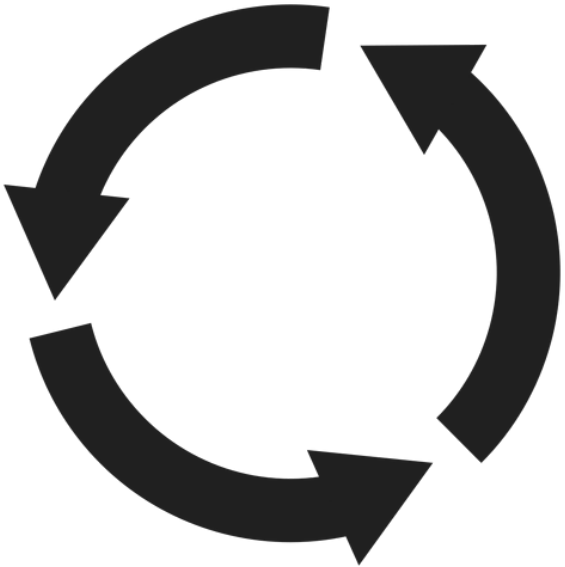
Workflow Steps

1. Create a new GitHub repo or decide to work on an existing one
2. **Clone** repo with GitHub Desktop
3. Work on the project, make changes locally, **save, and commit**
4. **Push** local changes to GitHub remote repo
5. Repeat steps 3-4 as you update code



Workflow Steps

1. Create a new GitHub repo or decide to work on an existing one
2. **Clone** repo with GitHub Desktop
3. **Create a branch to house the new changes**
4. Work on the project, make changes locally, save, and commit **to that branch**
5. Push local changes to GitHub remote repo **on that new branch**
6. Repeat steps 3-4 as you update code
7. **Create a pull request to integrate branch into the main project**



Forking

Forking

- **Forking** creates a copy of someone else's Github repository on your Github account

- This gives you ownership of a separate and completely independent copy to edit in whatever way you chose.

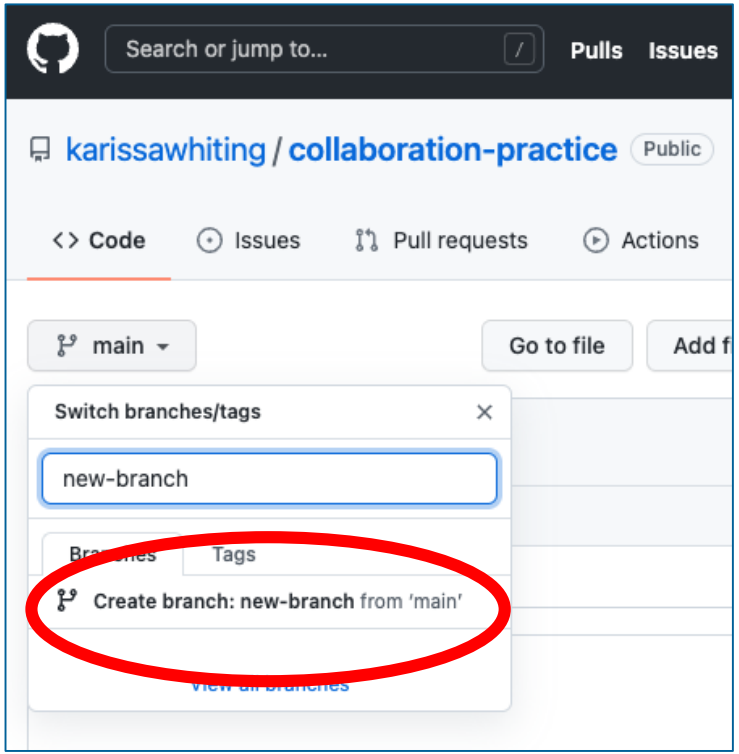
Why Create a Fork?

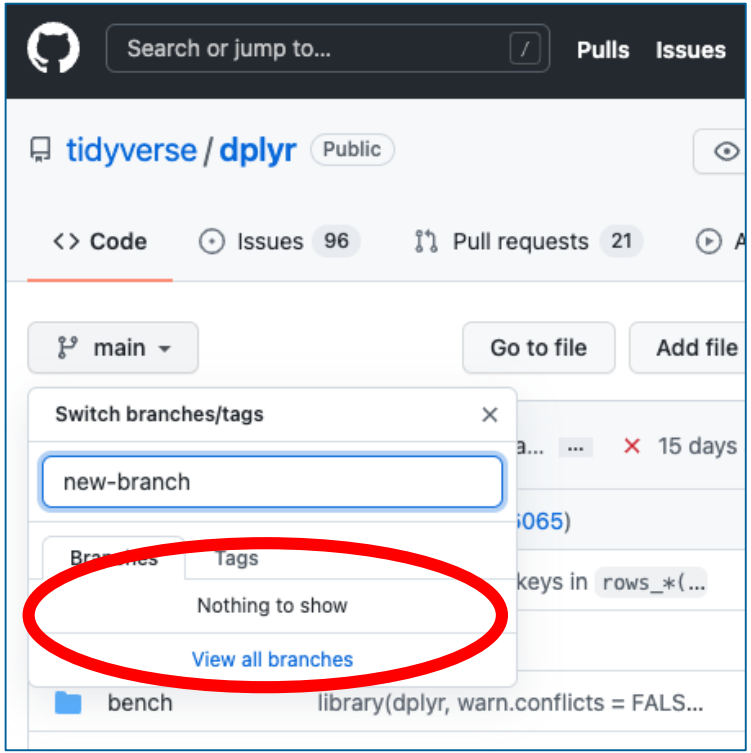
- **Permissions** - Collaborators may not let you branch directly from their main repository. You may need to fork first, then branch.

- **Protects the main code base** in collaborative work. (it's another degree of separation between you and the main repository code)

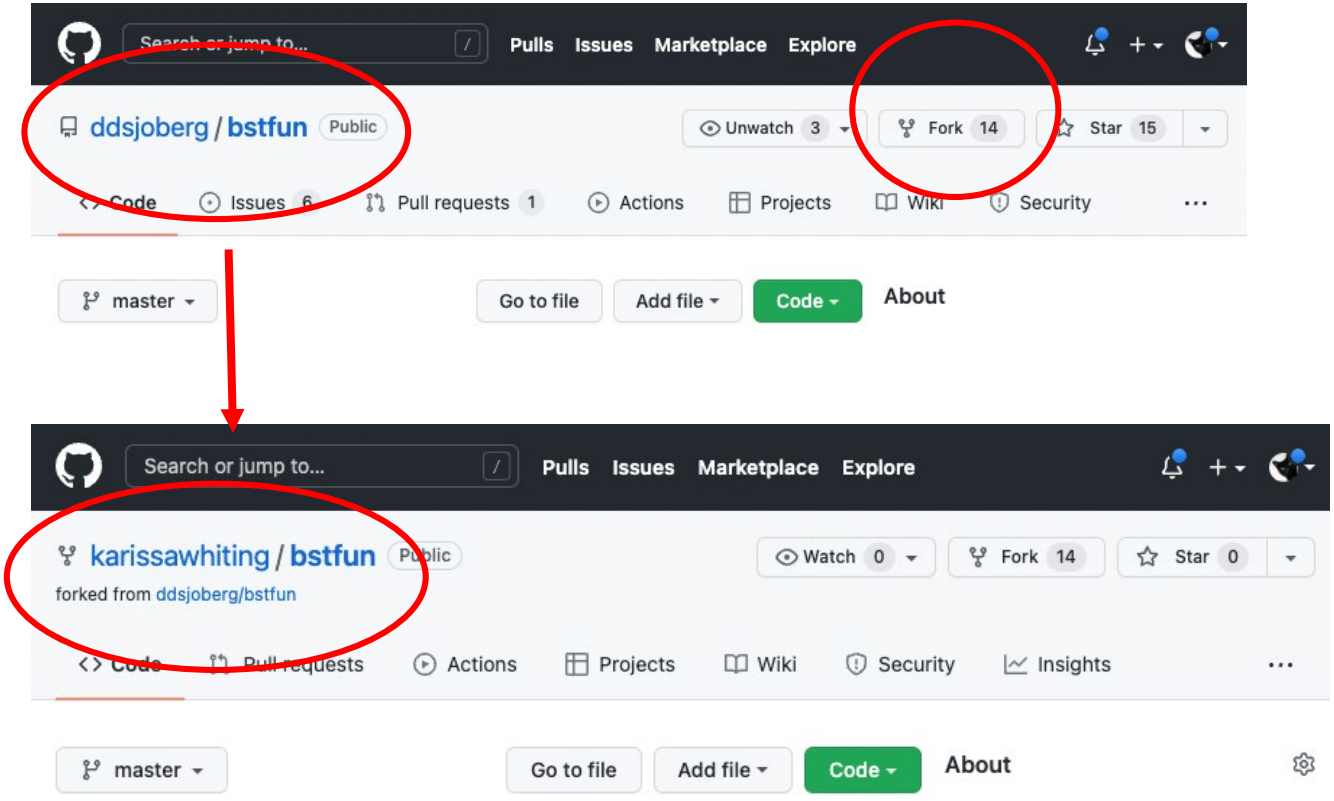
- Forking and branching often used together in larger collaborative projects

Why Create a Fork?



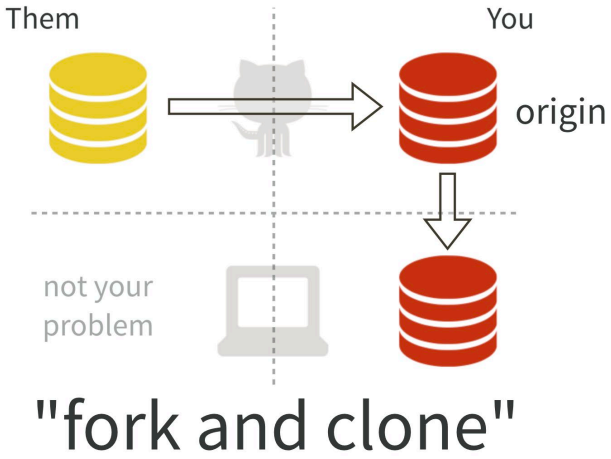


Create a Fork



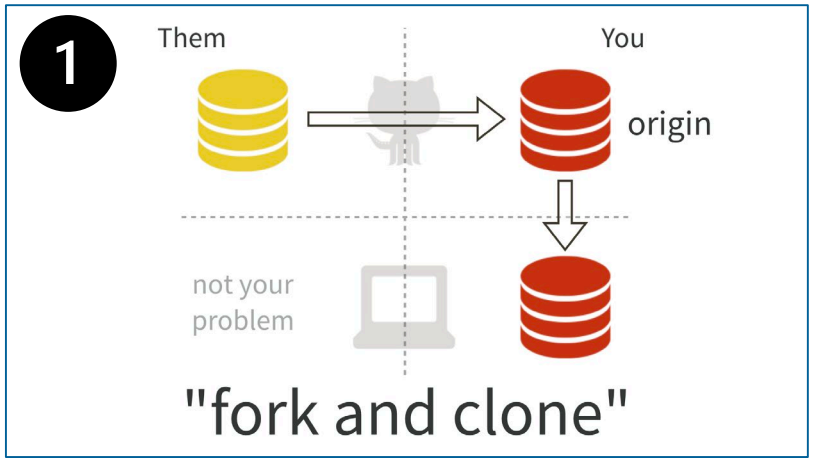
Fork vs. Clone

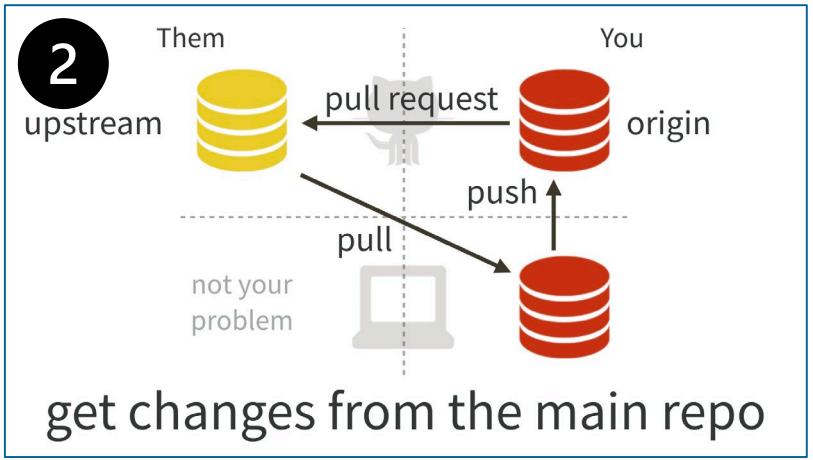
- Unlike **cloning** (which brings a copy of a remote repo down to your local computer), **forking is entirely on Github** (remote).



Merging Fork With Main Repo

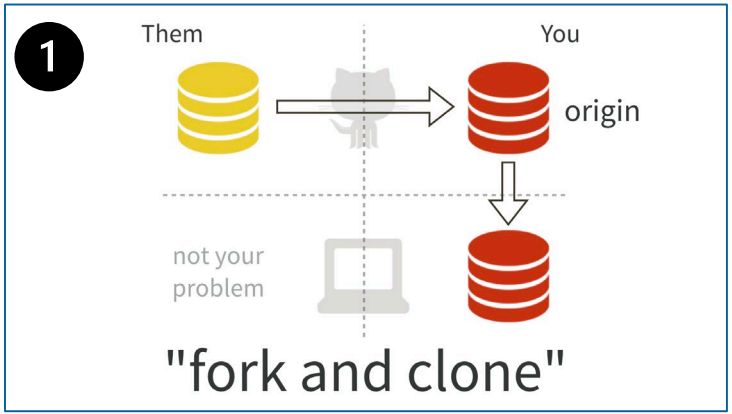
- **Pull Requests** – Like with branches, you can merge your changes from your fork into the main project with a pull request

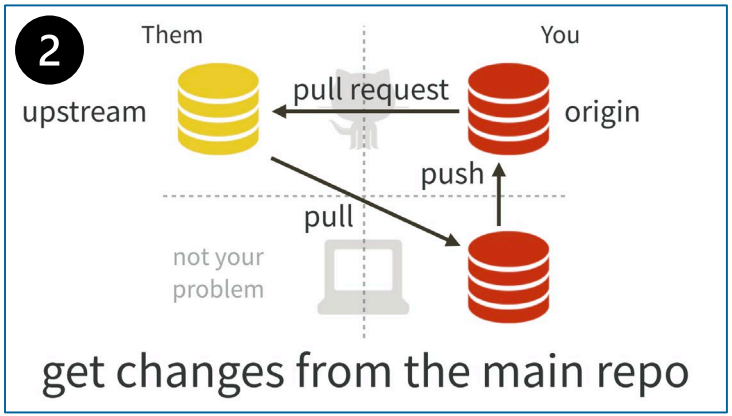




Fork + Clone + Branch + Pull Request

1) **Fork** the project onto your Github account
2) **Clone** your fork onto your local computer
3) Make a **branch** to house unique set of changes
4) **Commit** and **push** changes to your remote fork on Github
5) Eventually make **a pull request** asking repository owner merge your changes into main project.





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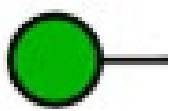
A Tale of Two Contributors

(Inspired by true events)

1



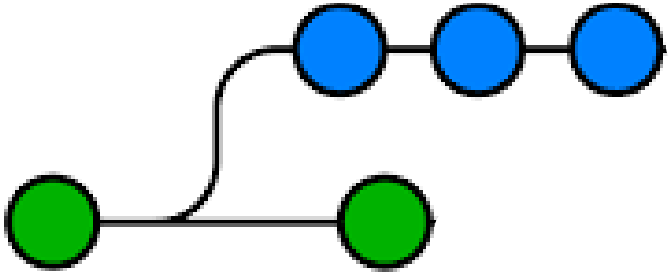
Dan created the {bstfun} R package

(Green = Master/Main Project Branch)

2

Meier wanted to contribute cumulative incidence risk table functions

1) Forked the repo
2) Created a branch called (cuminc-update)
3) Added a feature and commit code to branch
4) Created a pull request for Dan to review to incorporate changes into the package



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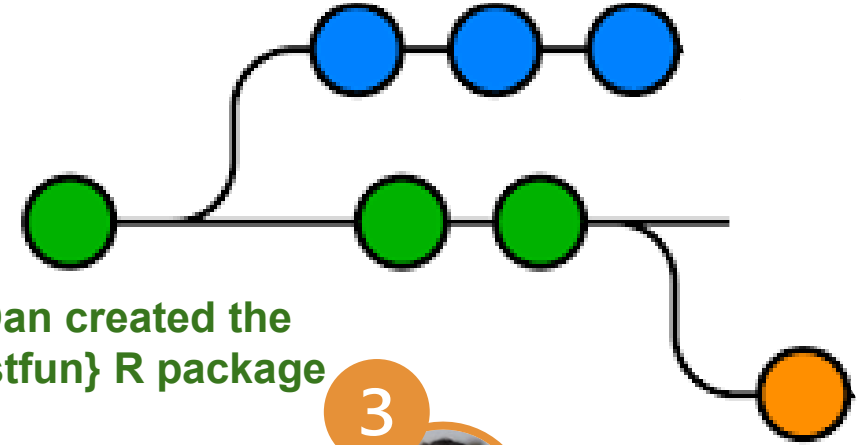

1

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3

While Meier worked, Jasme decided to work on project templates in the package. She created a fork and a designated branch for her change

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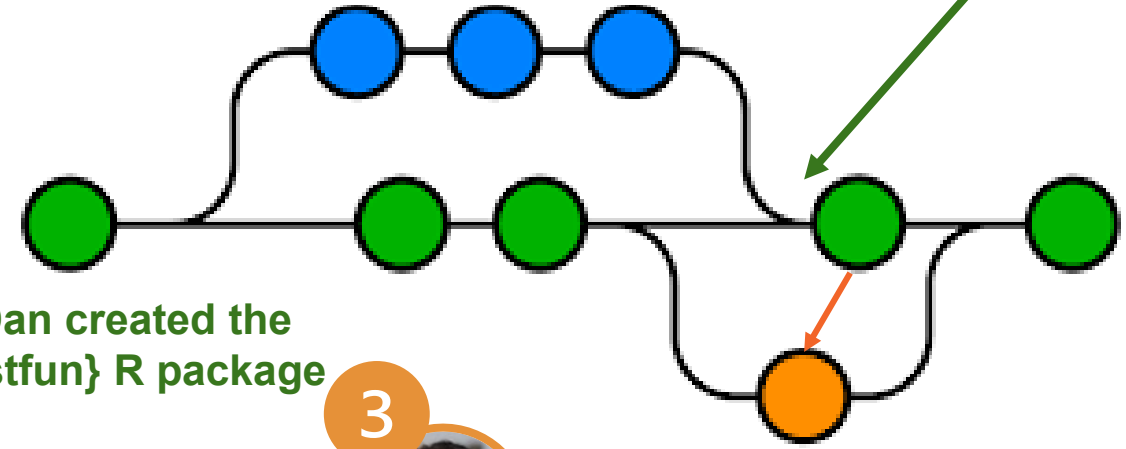


3

While Meier worked, Jasme decided to work on project templates in the package. She created a fork and a designated branch for her change

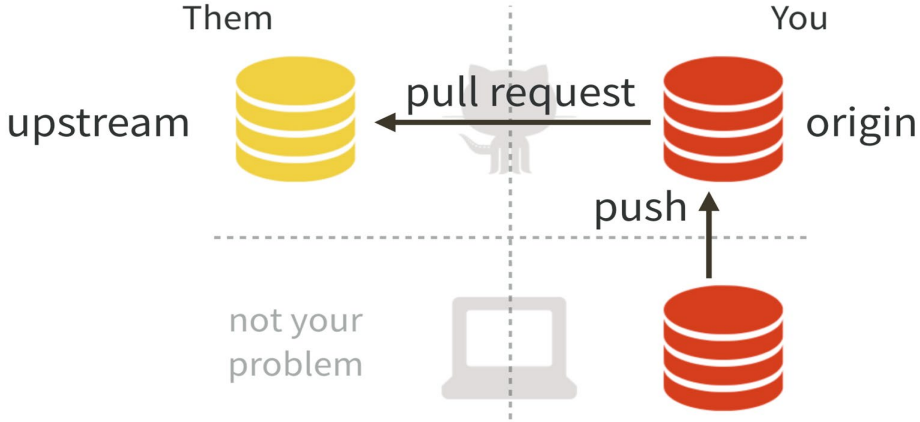
4

While Jasme worked, Dan reviewed and accepted Meier's pull request. Her contribution is now part of the main branch of the project.

Jasme will likely want to pull these new updates into her branch so she is working off the latest copy

Pulling From “Upstream”

- Jasme will likely want to keep her fork/branch up to date with the main project
- She will have to **pull** from the updated **upstream repository**



Code Conflicts Between Contributors

- What happens to Jasme's code when she pulls in Meier's changes?
- If any of her code conflicts with the changes Meier made, github will ask her to review and decide which version of the code she want to keep

Thank You!

Questions?

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5 Min Break + Breakout Rooms

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Git/GitHub Training Part 2

Breakout Rooms

March 21, 2022

Karissa Whiting, Epi-Bio
Jessica Lavery, Epi-Bio
Daniel D. Sjoberg, Epi-Bio
Caroline Kostrzewa, Epi-Bio
Shannon Pileggi, PCCTC
Karolyn Ismay, Strategy & Innovation

Goals

- **Fork A Remote Repo –** Make a copy on your Github Enterprise account of the '**group-leader/gh2-collaboration-practice'** Repository
- **Bring It Local** by cloning your fork into a local repository/folder on your computer
- **Make A Branch** on your local repository using Github Desktop to organize your future changes
- **Make Changes to Project Files** – You will create a new .txt file and name it with your initials, e.g. kaw.txt
- **Commit the Changes Locally** to the branch on your local repository using Github Desktop
- **Publish the Branch and Push the Committed Changes** to your remote fork on Github Enterprise
- **Create a Pull Request** to merge your new file into the main branch of the original repo on Github (**group-leader/ gh2-collaboration-practice)**

Fork Your Group Leader's Remote Repository

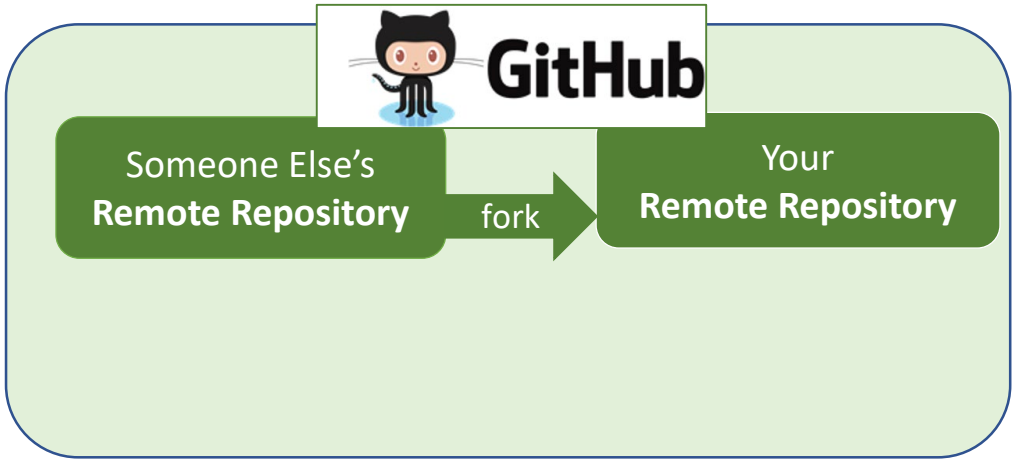
REMOTE

LOCAL

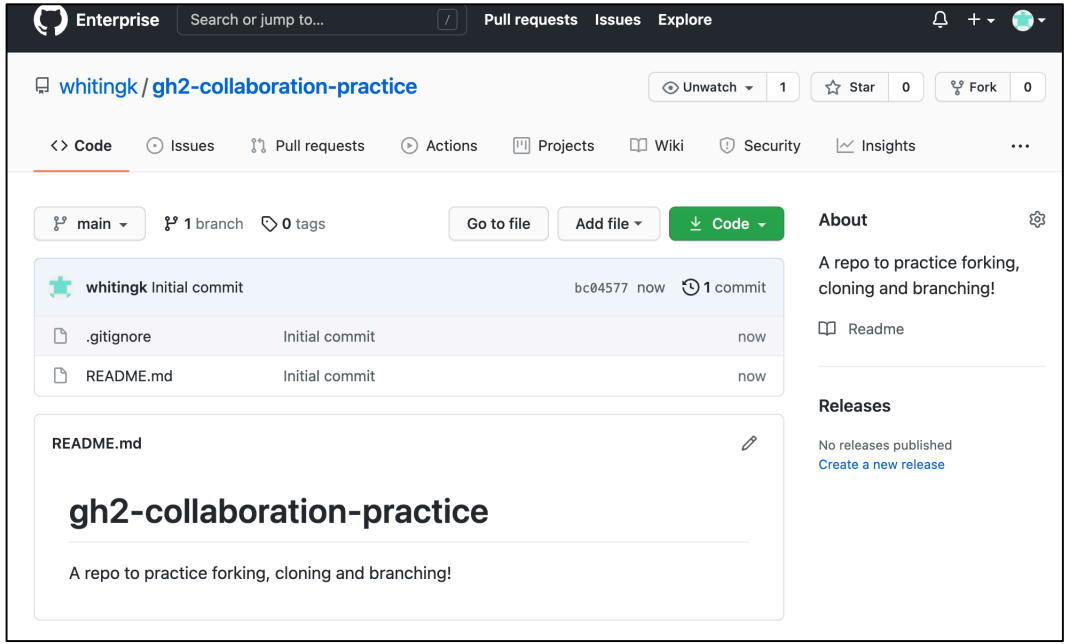
Someone Else's
Remote Repository

REMOTE

LOCAL


GitHub
Someone Else's
Remote Repository
fork
Your
Remote Repository

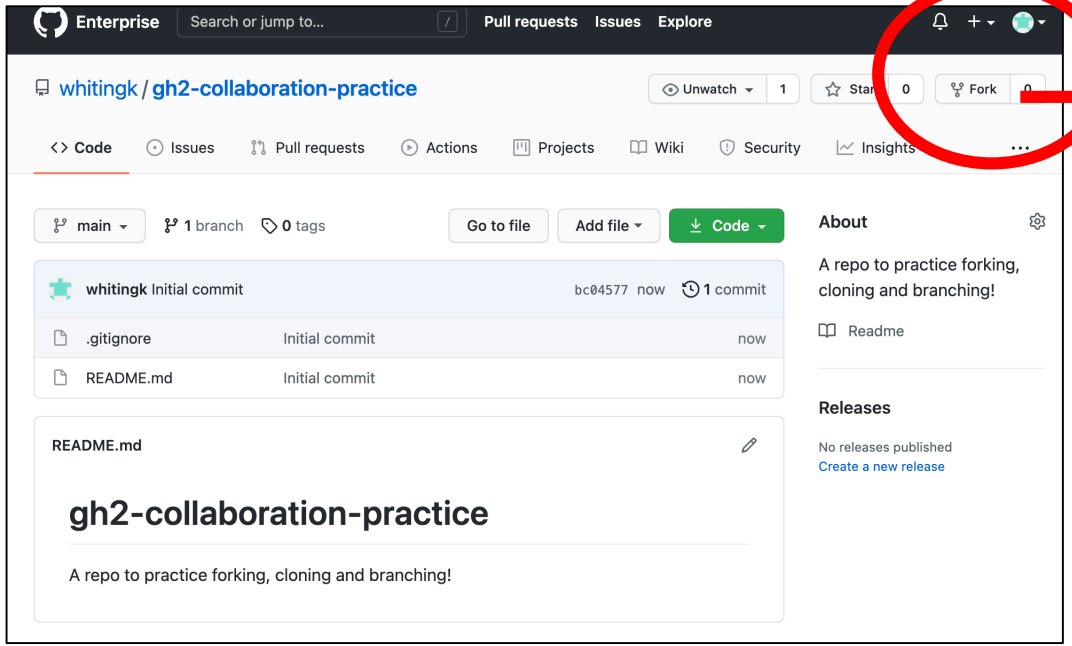
Find The Remote Repo To Fork



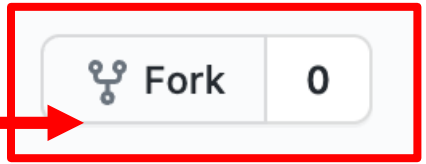
1. Sign into Github Enterprise https://github.mskcc.org/

2. Find Your Breakout Room Leader's Repository
https://github.mskcc.org/<your-leader-username>/gh2-collaboration-practice

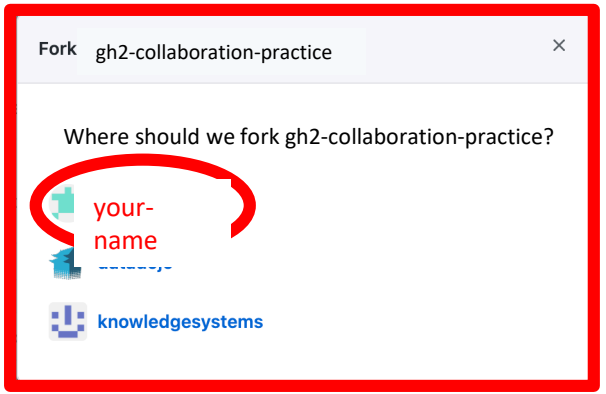
Fork The Repo



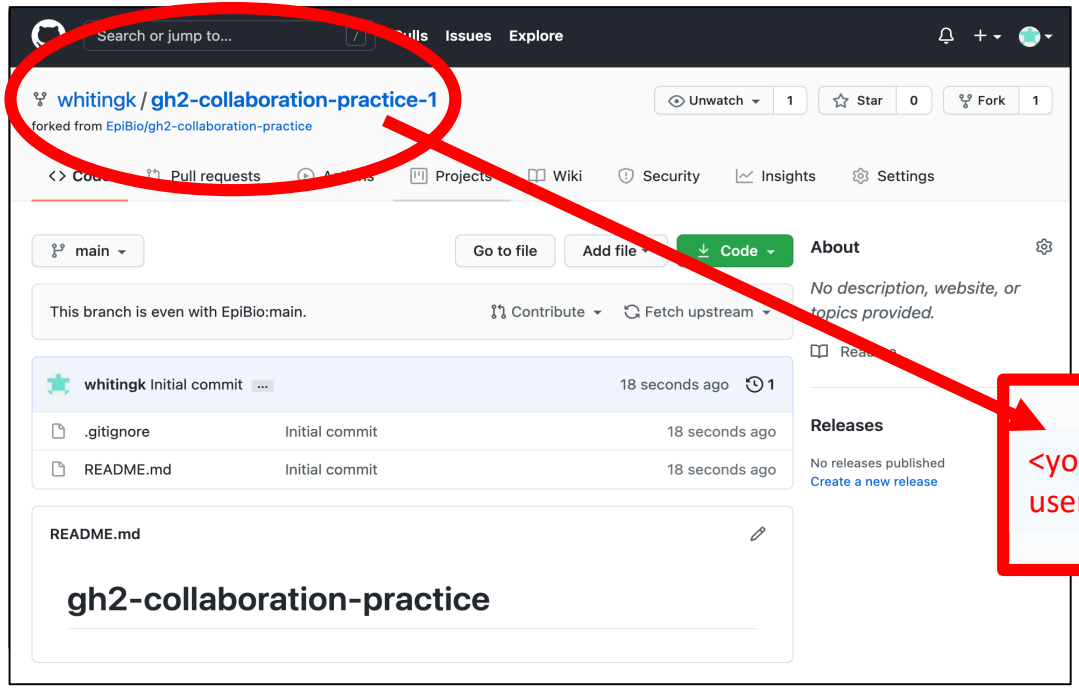
3. Click



You may get a pop-up asking you where to fork. If so, click your username

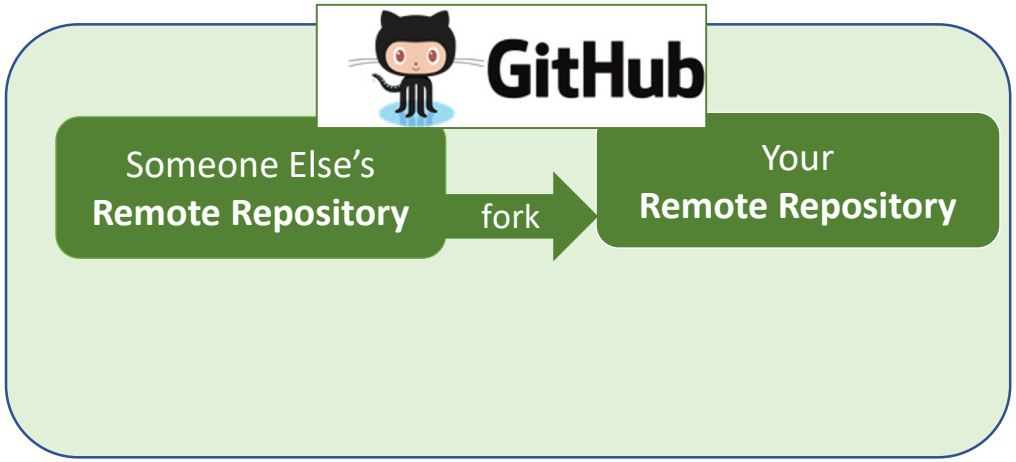


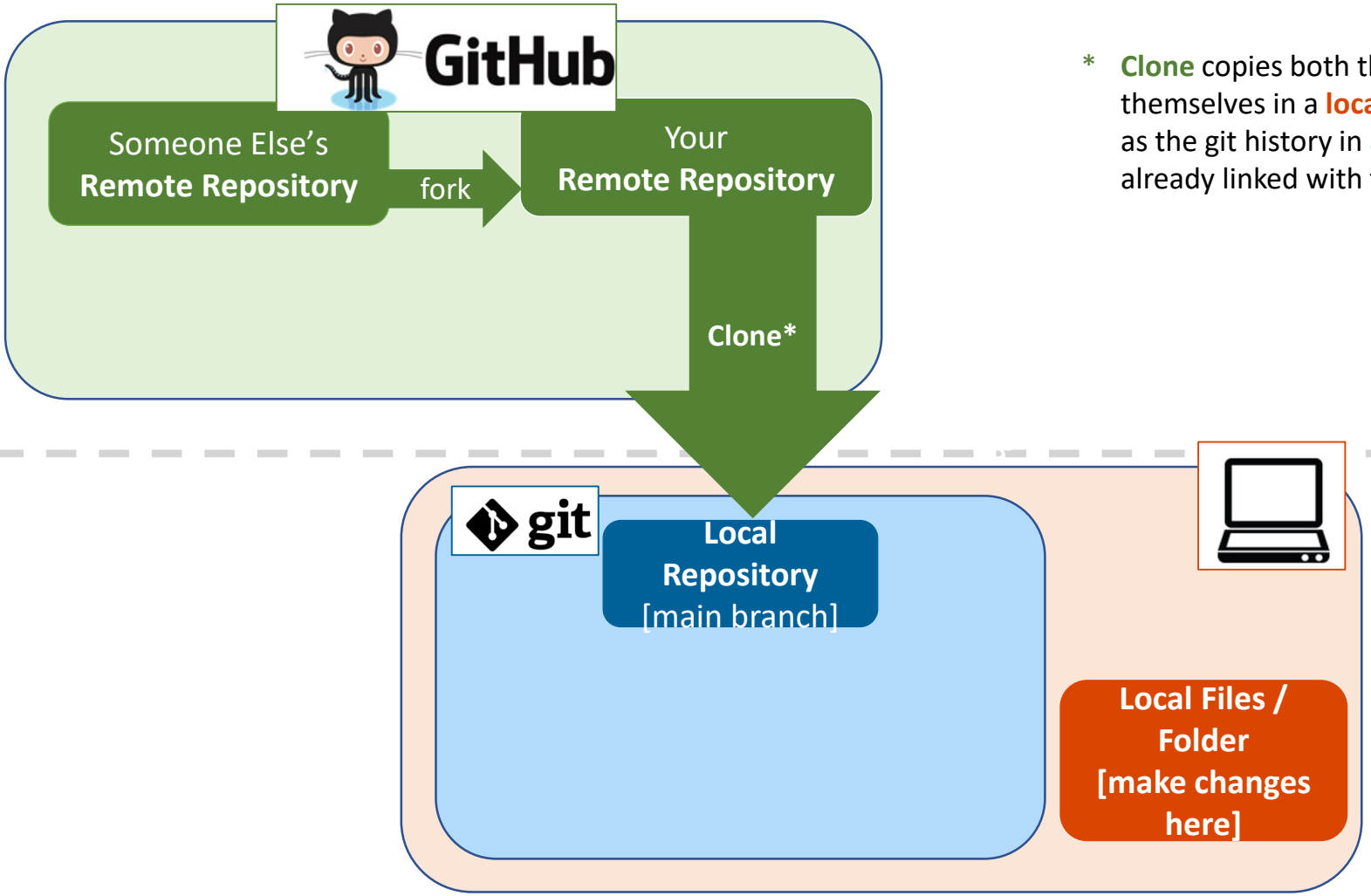
Fork The Repo



Now you have your very own version of the repo in your github account!

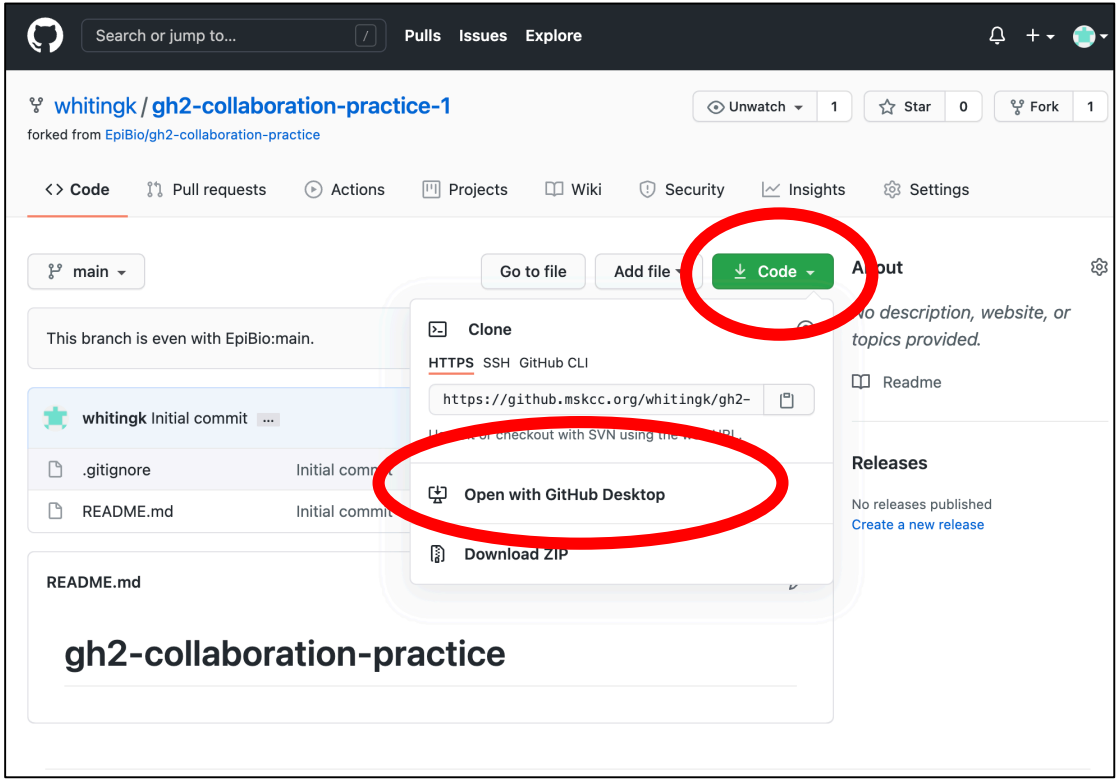
Clone Your Fork Onto Your Local Machine


GitHub
Someone Else's
Remote Repository
fork
Your
Remote Repository



* **Clone** copies both the project files themselves in a **local folder** as well as the git history in **a local git repo** already linked with the folder

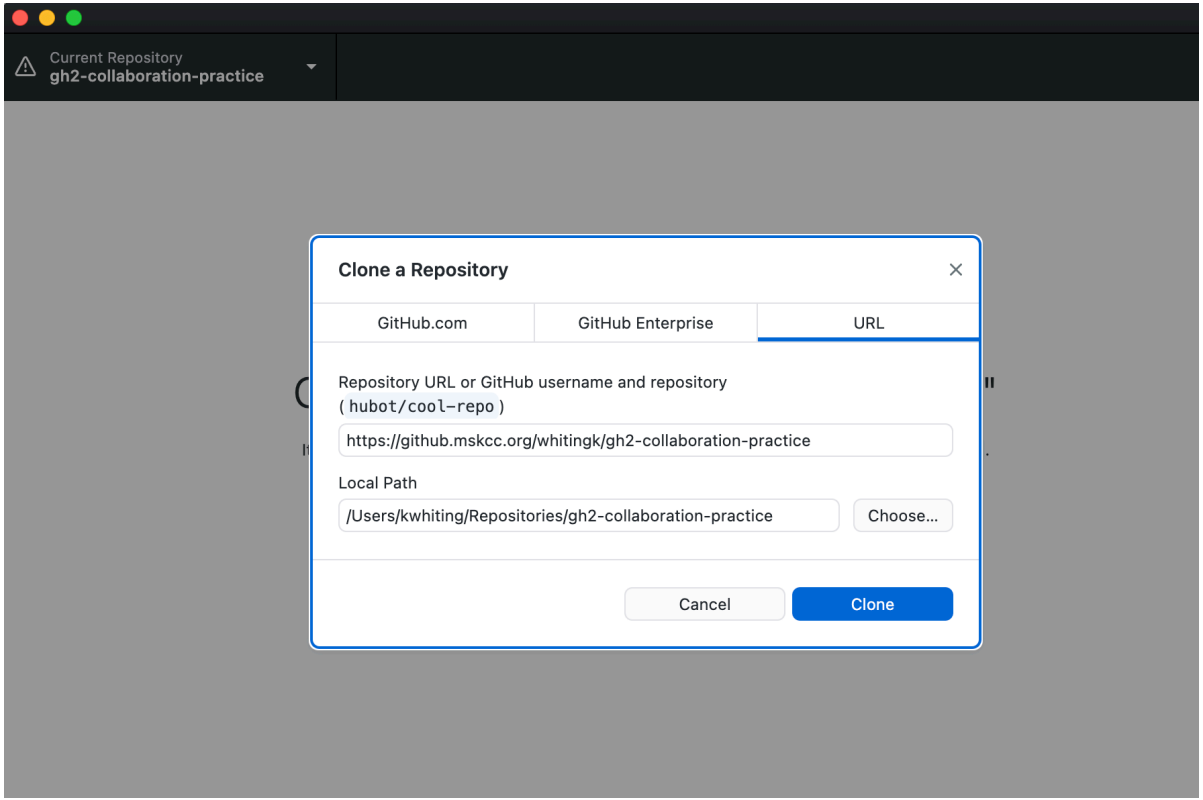
Clone Your Forked Repo



4. Click 

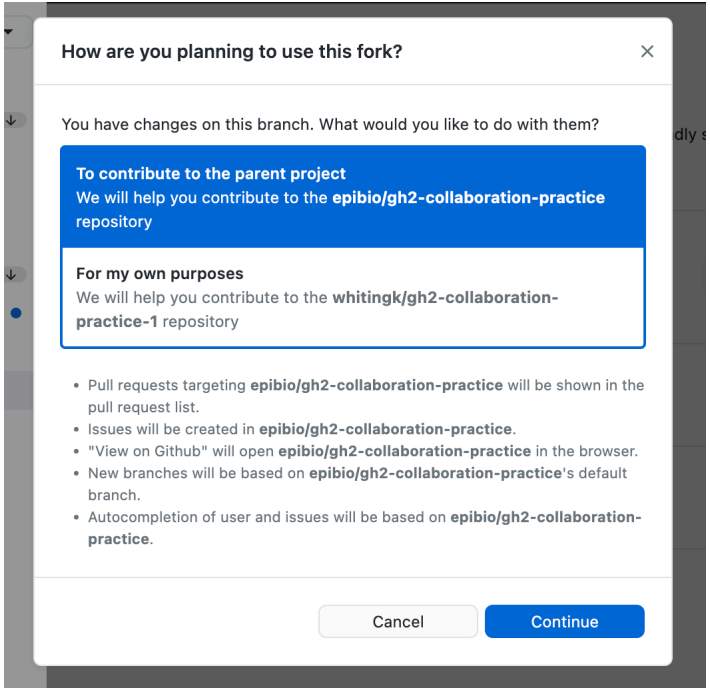
5. Click “Open with Github Desktop”

Clone Your Forked Repo



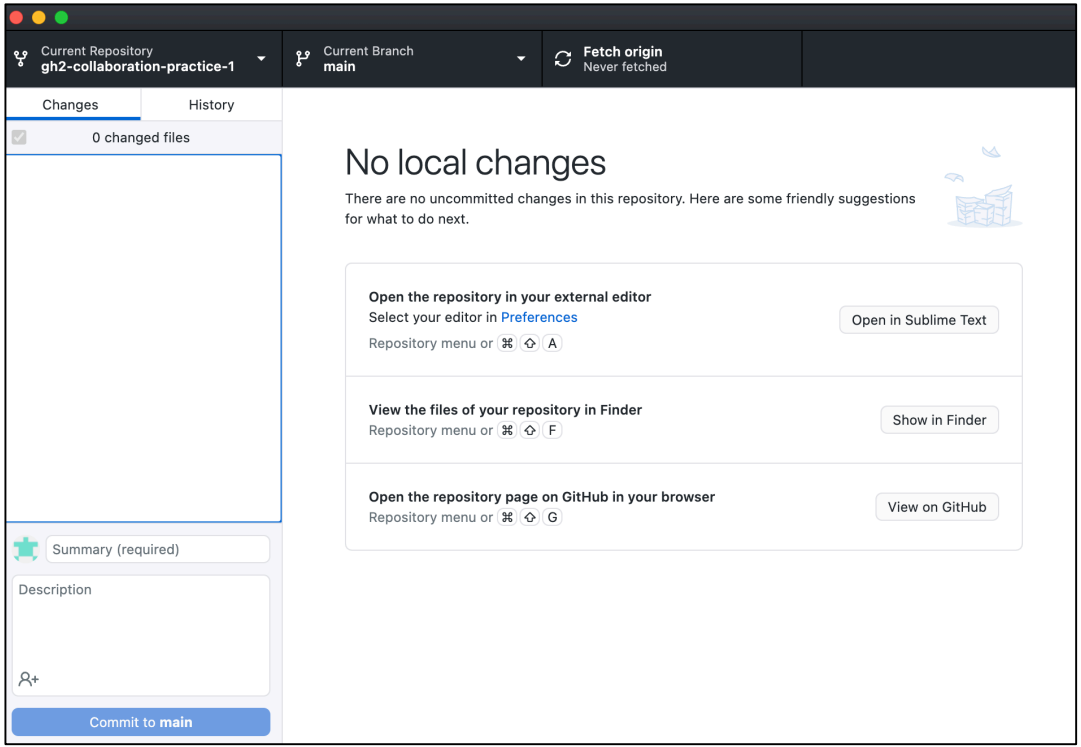
5. Select local folder location where you want to clone the forked repo

Clone Your Forked Repo



6. You will be asked the purpose of your fork. Click “contribute to the parent project”

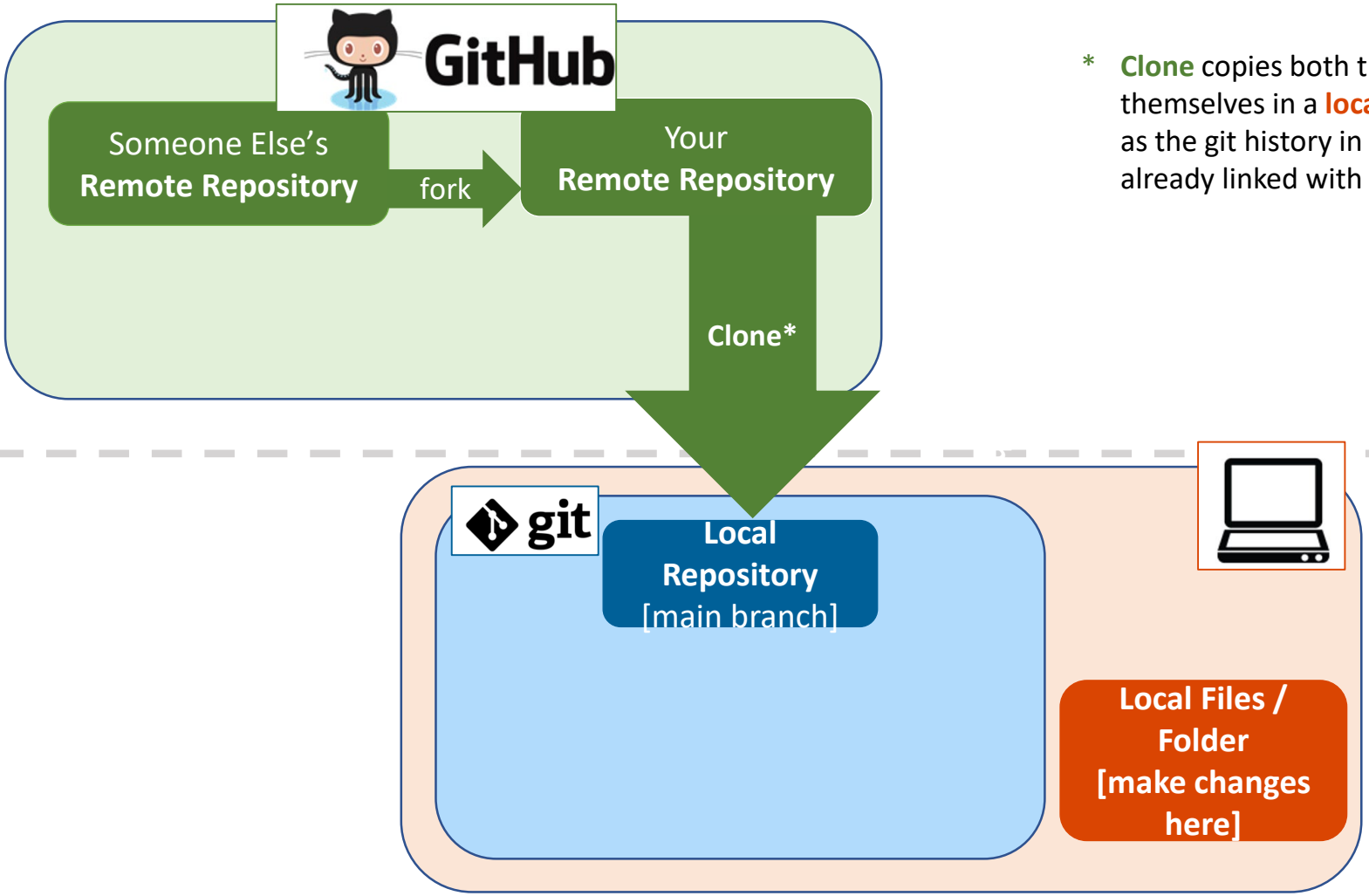
Clone Your Forked Repo



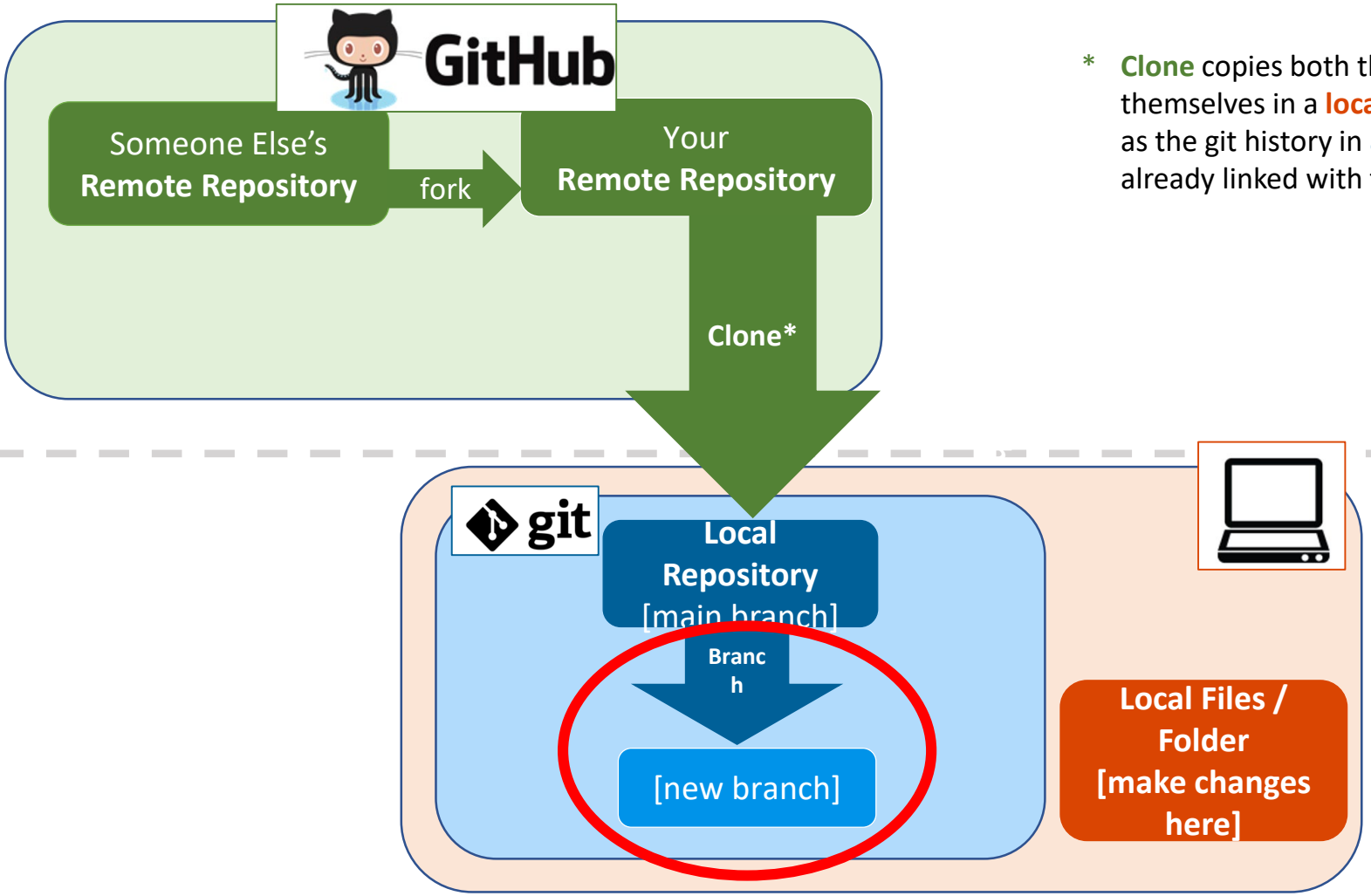
Now you should have your remote fork successfully cloned on your local computer.

Future changes to the project folder will be automatically tracked by git

Make a Branch

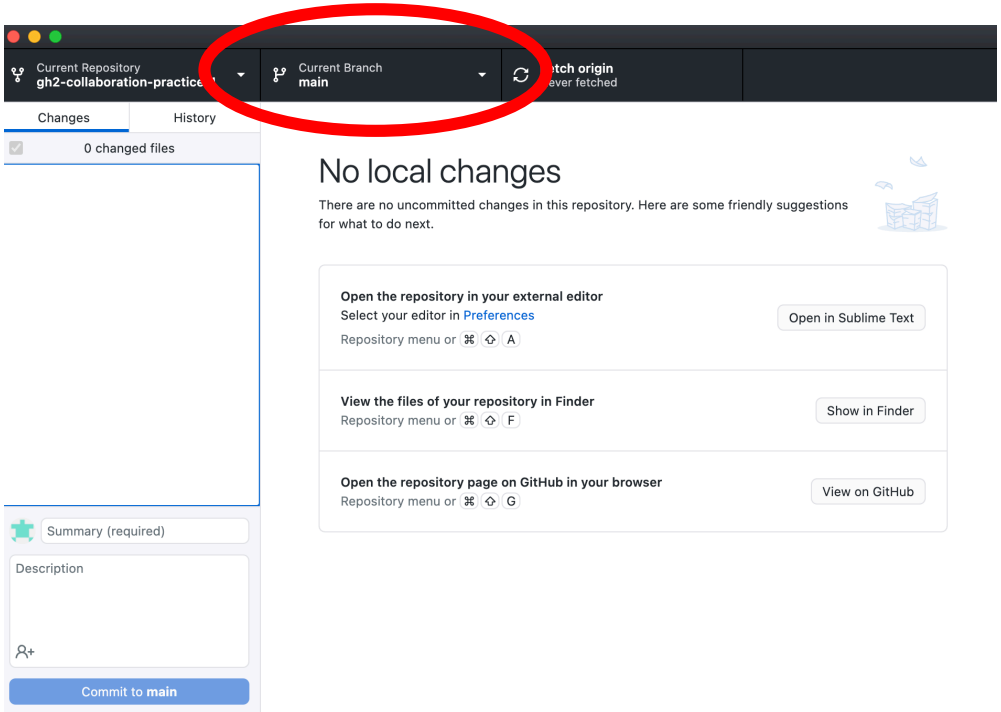


* **Clone** copies both the project files themselves in a **local folder** as well as the git history in **a local git repo** already linked with the folder

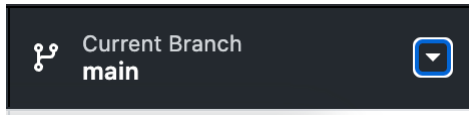


* **Clone** copies both the project files themselves in a **local folder** as well as the git history in **a local git repo** already linked with the folder

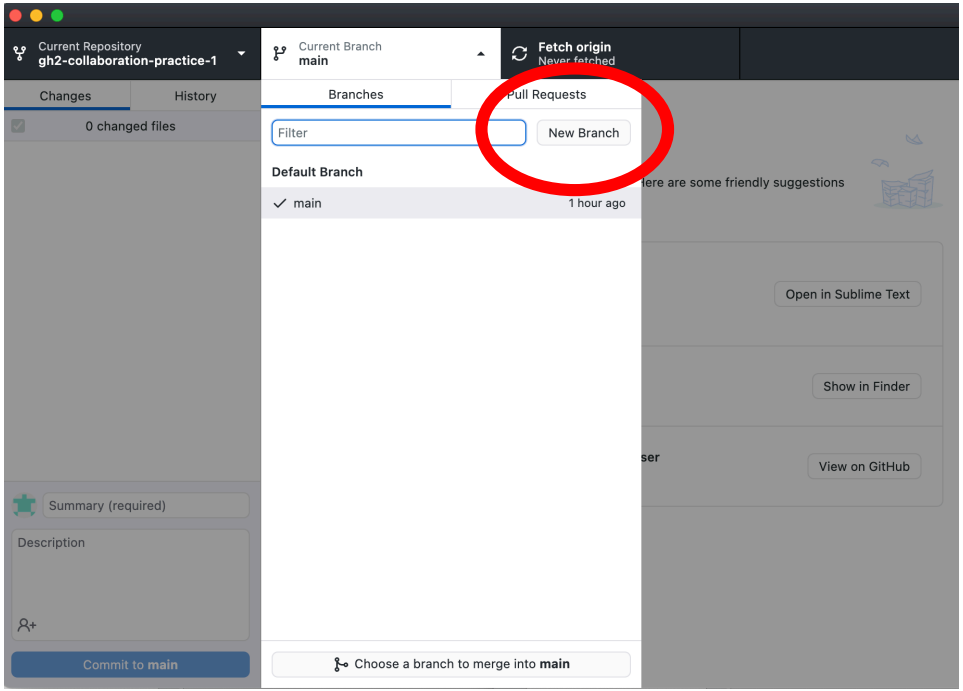
Create a Branch on Your Local Repo using Github Desktop



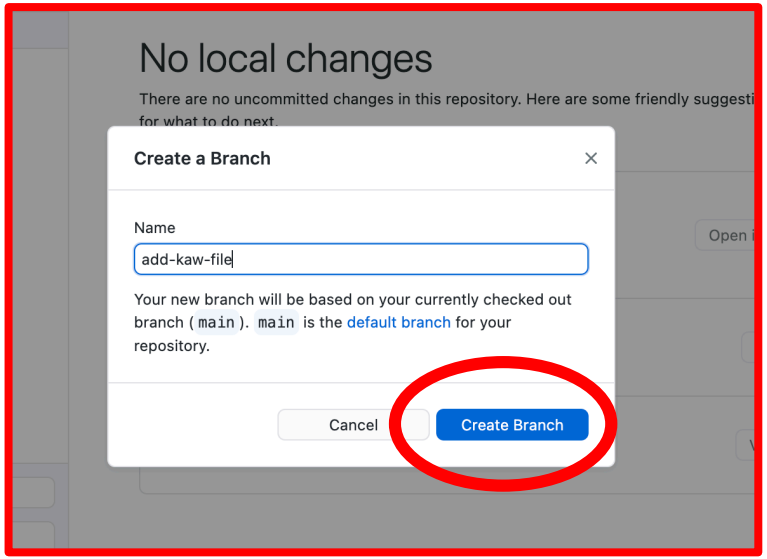
7. Click



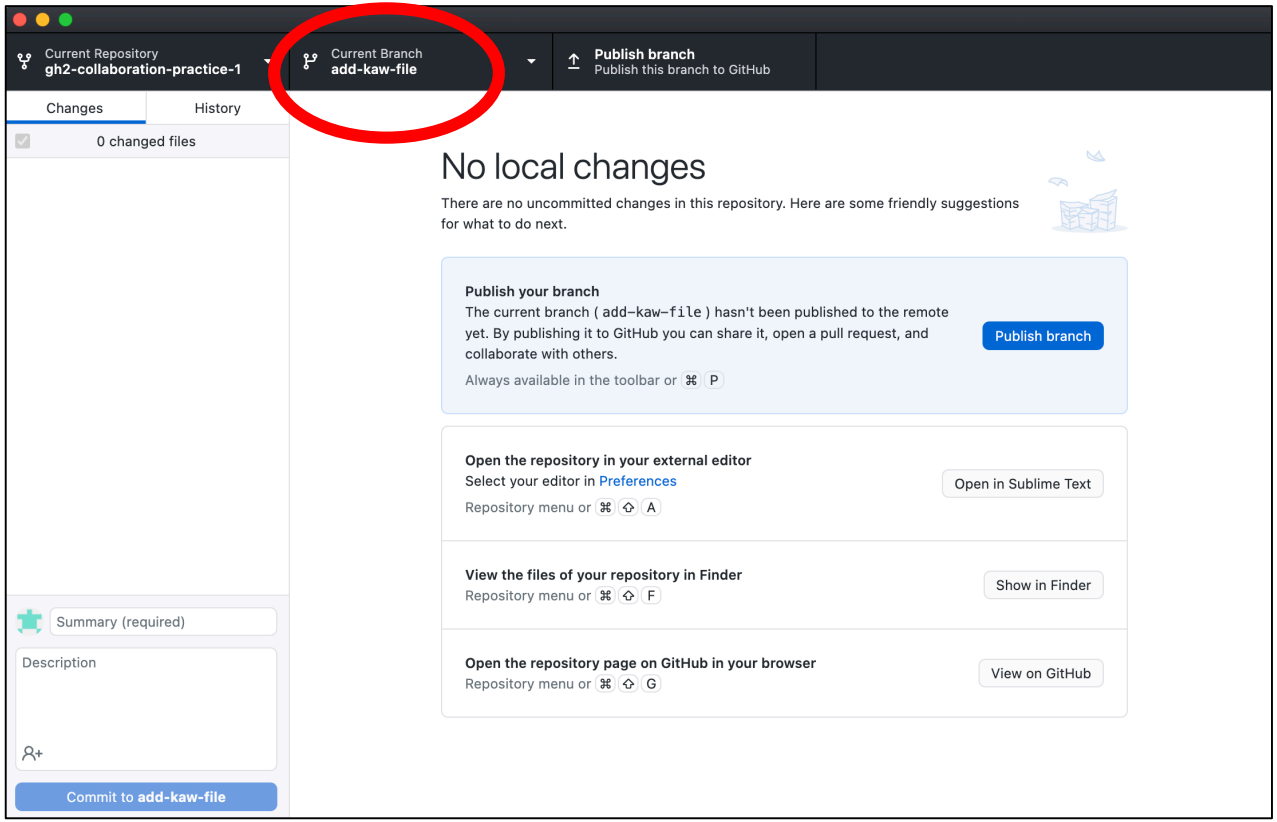
Create a Branch on Your Local Repo Using Github Desktop

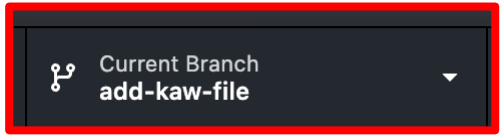


8. Click **Create Branch**



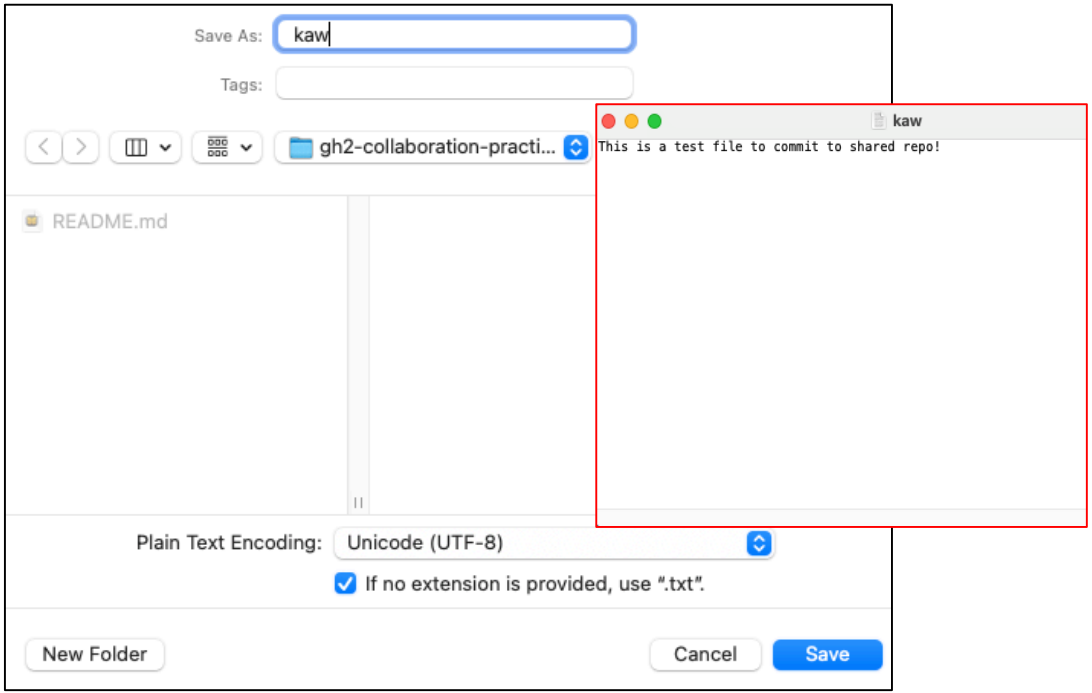
Confirm You Are on The New Branch





Add a New File To Your Project

Create A New File In Any Text Editor and Save



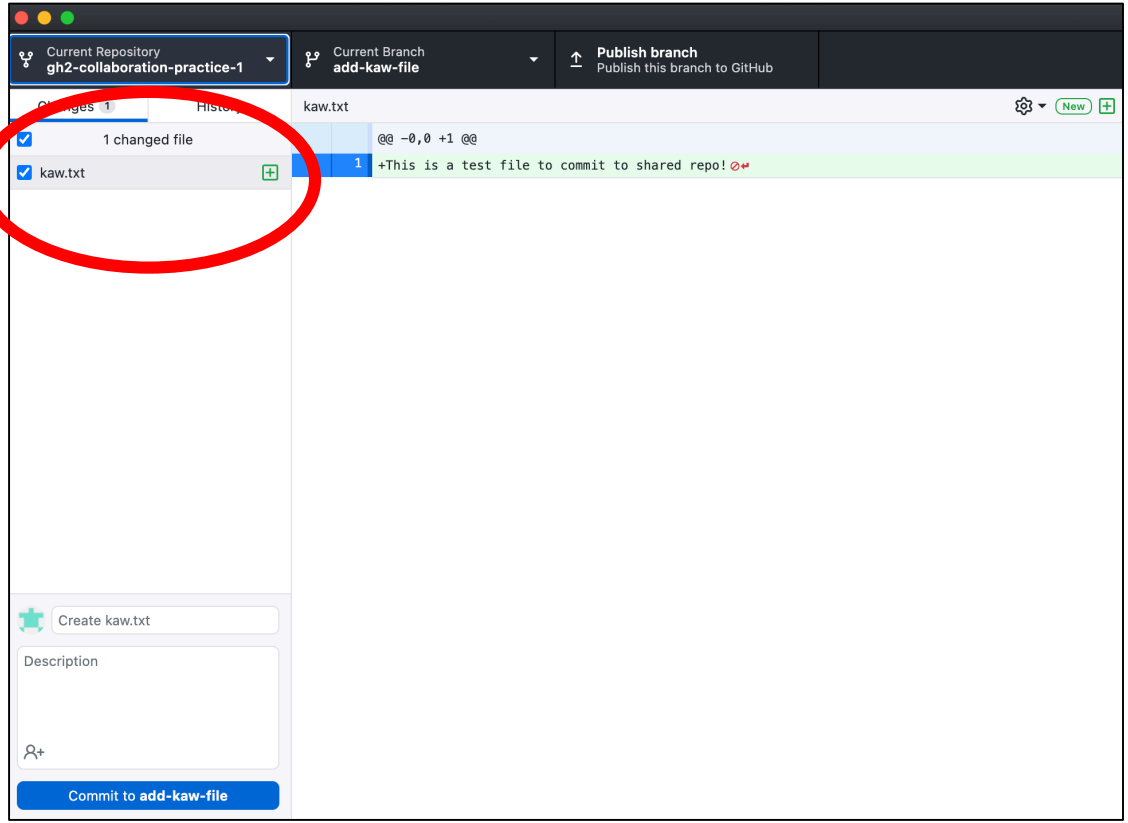
9. Create File in any text editor (e.g. TextEdit or Notepad)

10. Save file in the local folder where your repository is located

if you forgot where that is you can go to GitHub Desktop and click:

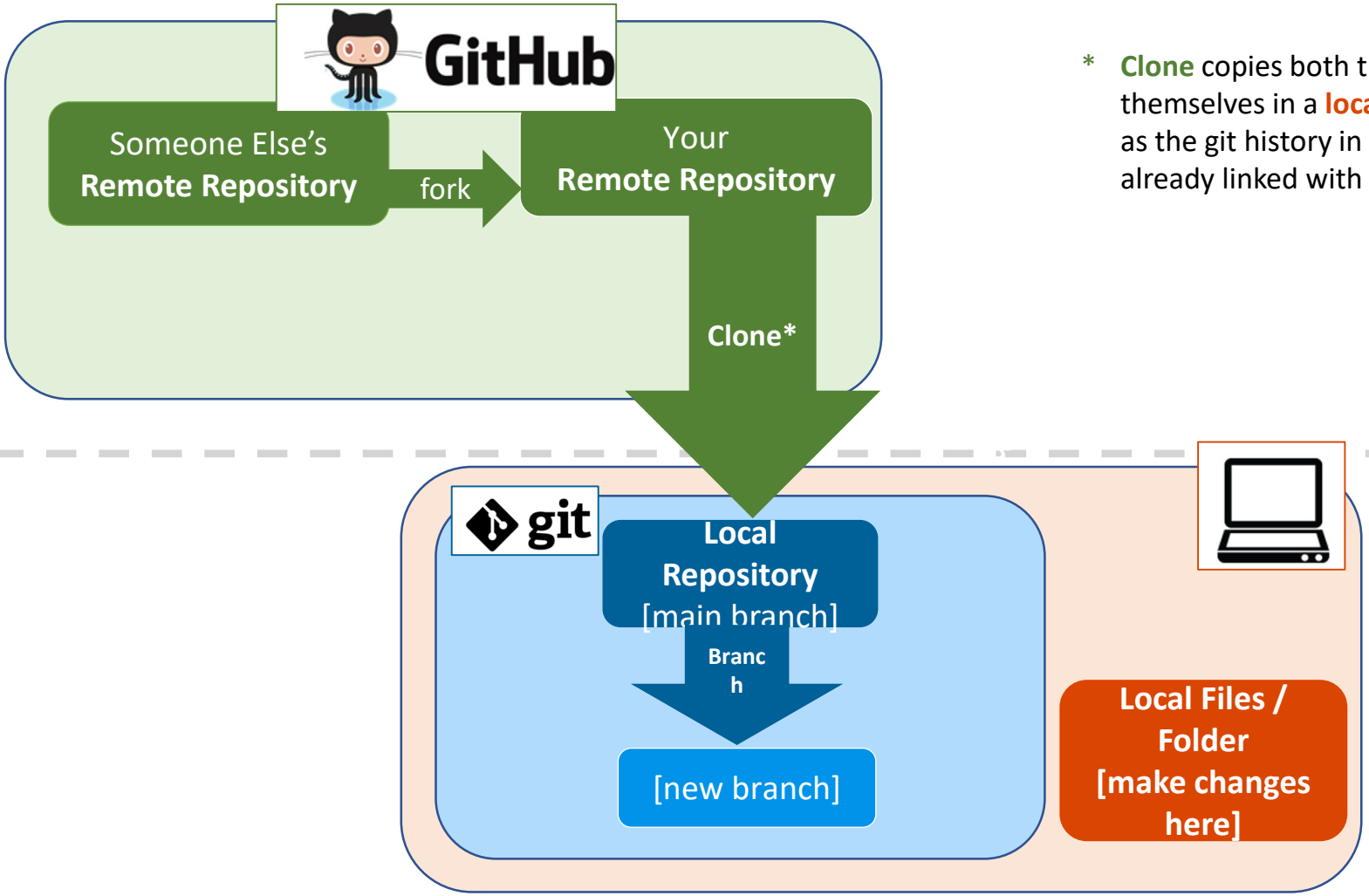
Show in Finder

Change will show in Github Desktop

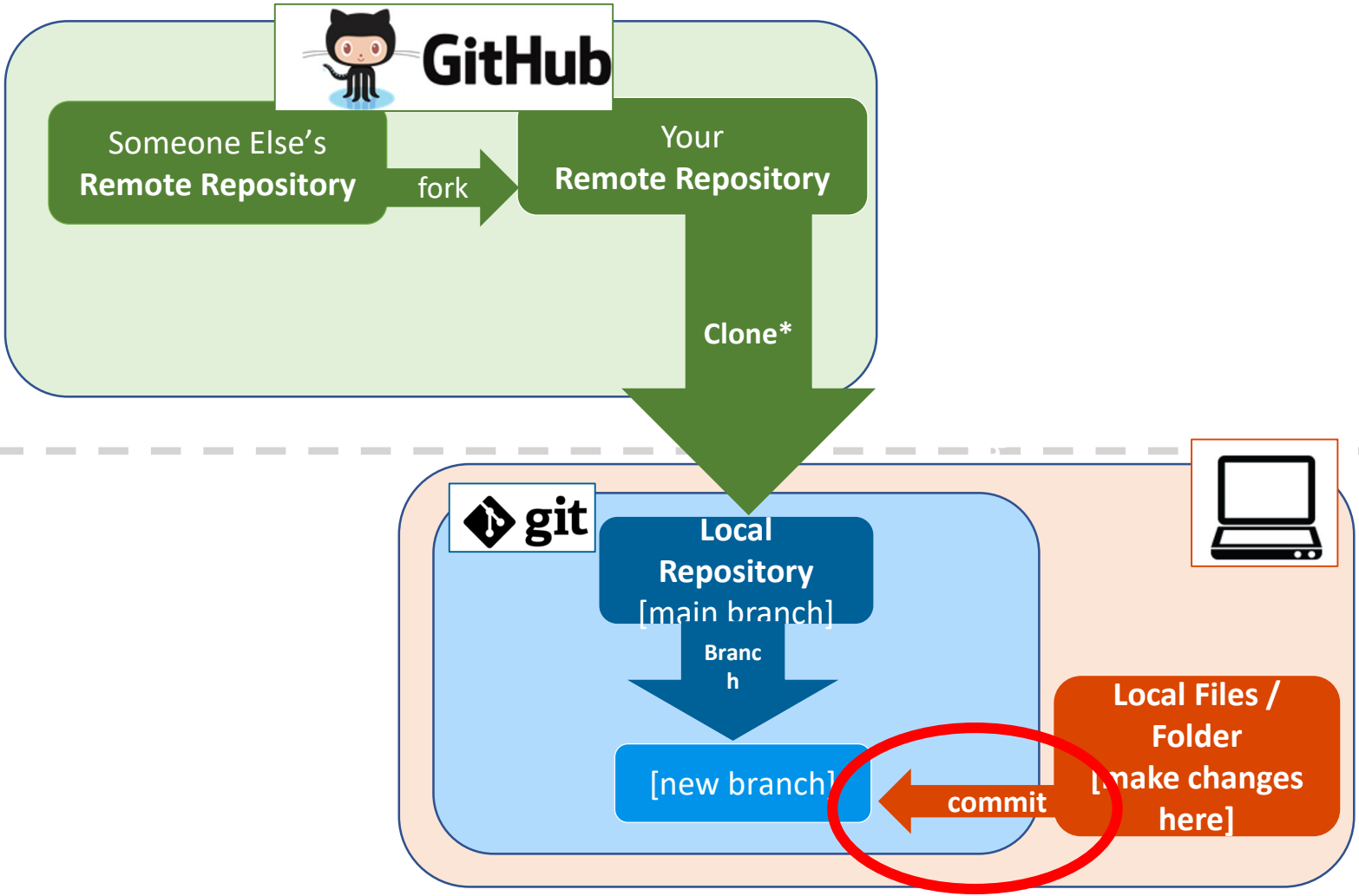


Commit Change we made in Local Folder

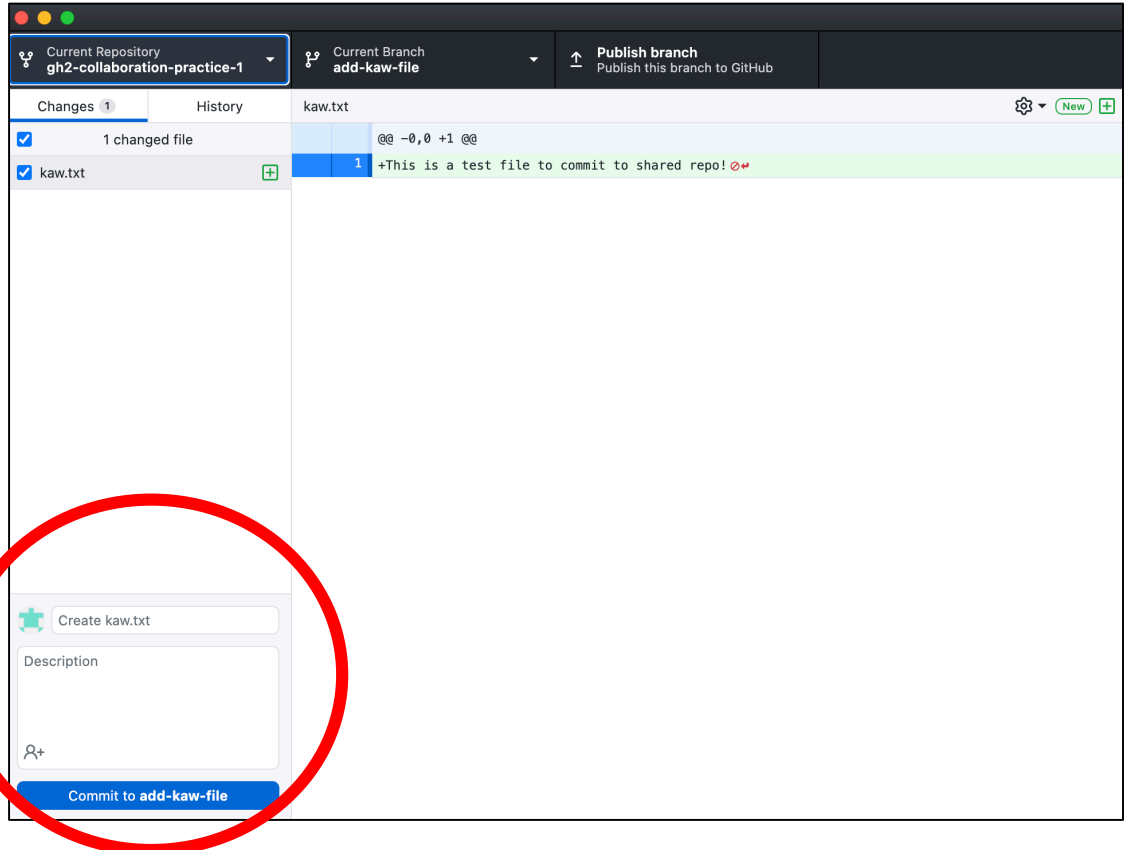
To Local Repository



* **Clone** copies both the project files themselves in a **local folder** as well as the git history in **a local git repo** already linked with the folder


GitHub
Someone Else's
Remote Repository
fork
Your
Remote Repository
Clone*
git
Local
Repository
[main branch]
Branc
h
[new branch]
commit
Local Files /
Folder
[make changes
here]

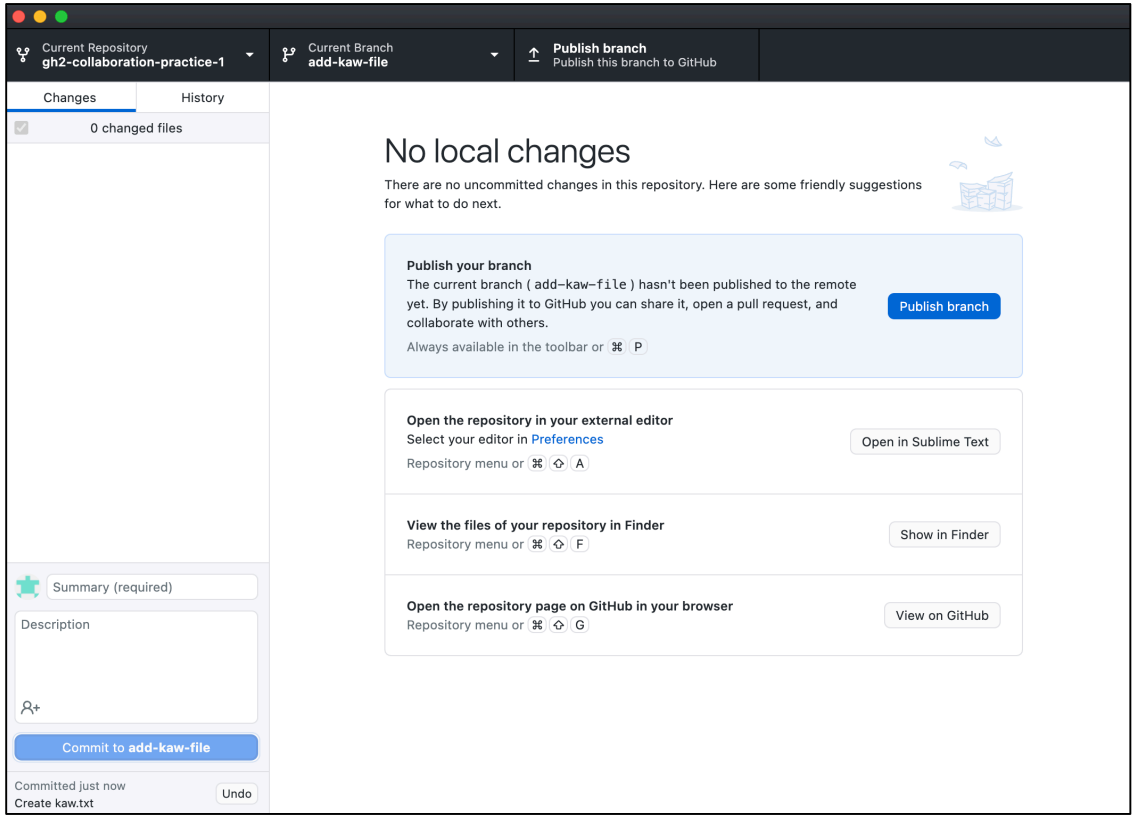
Commit Change (new file) to git



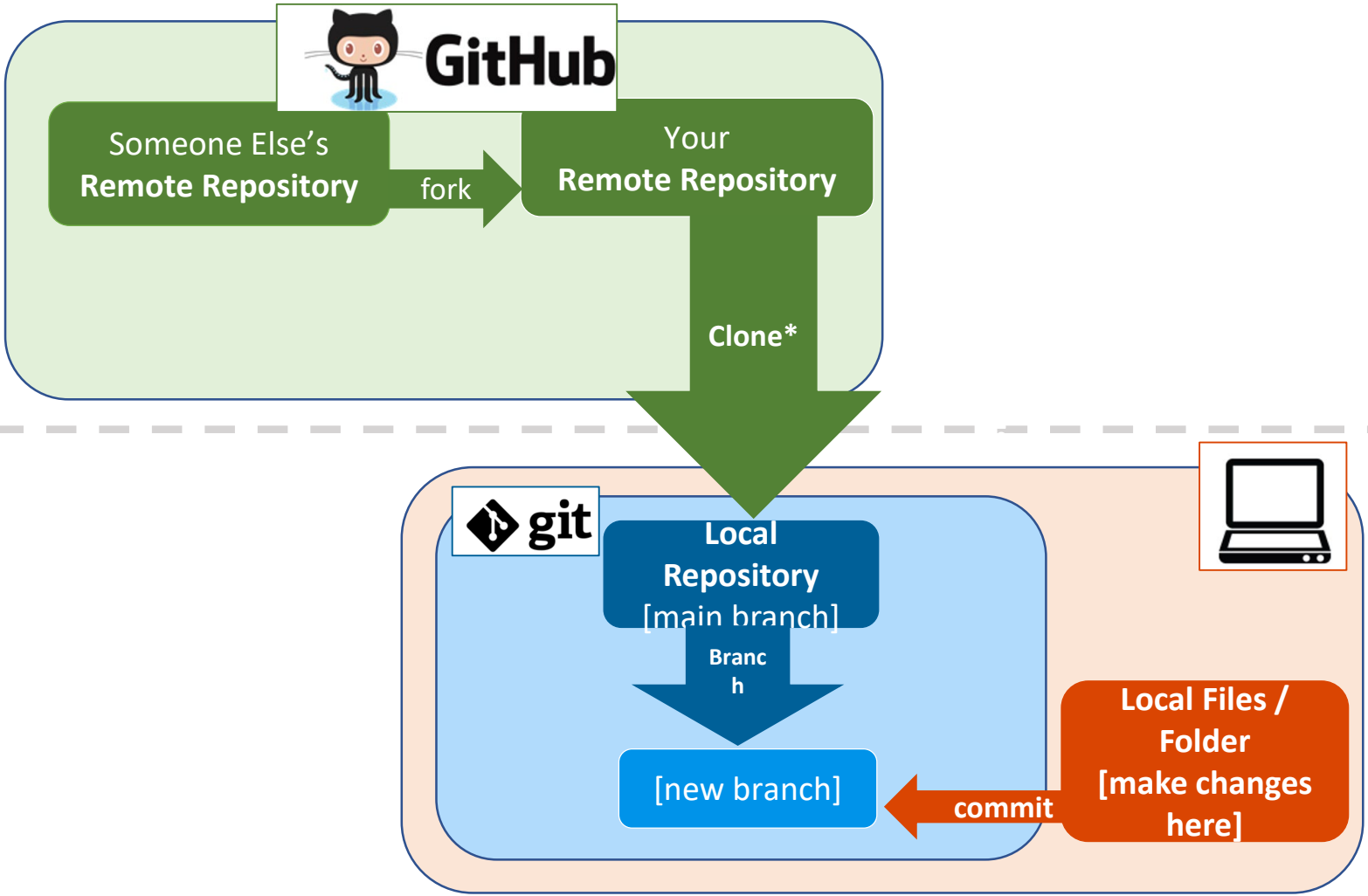
11. Commit change to git (still local) on our new branch

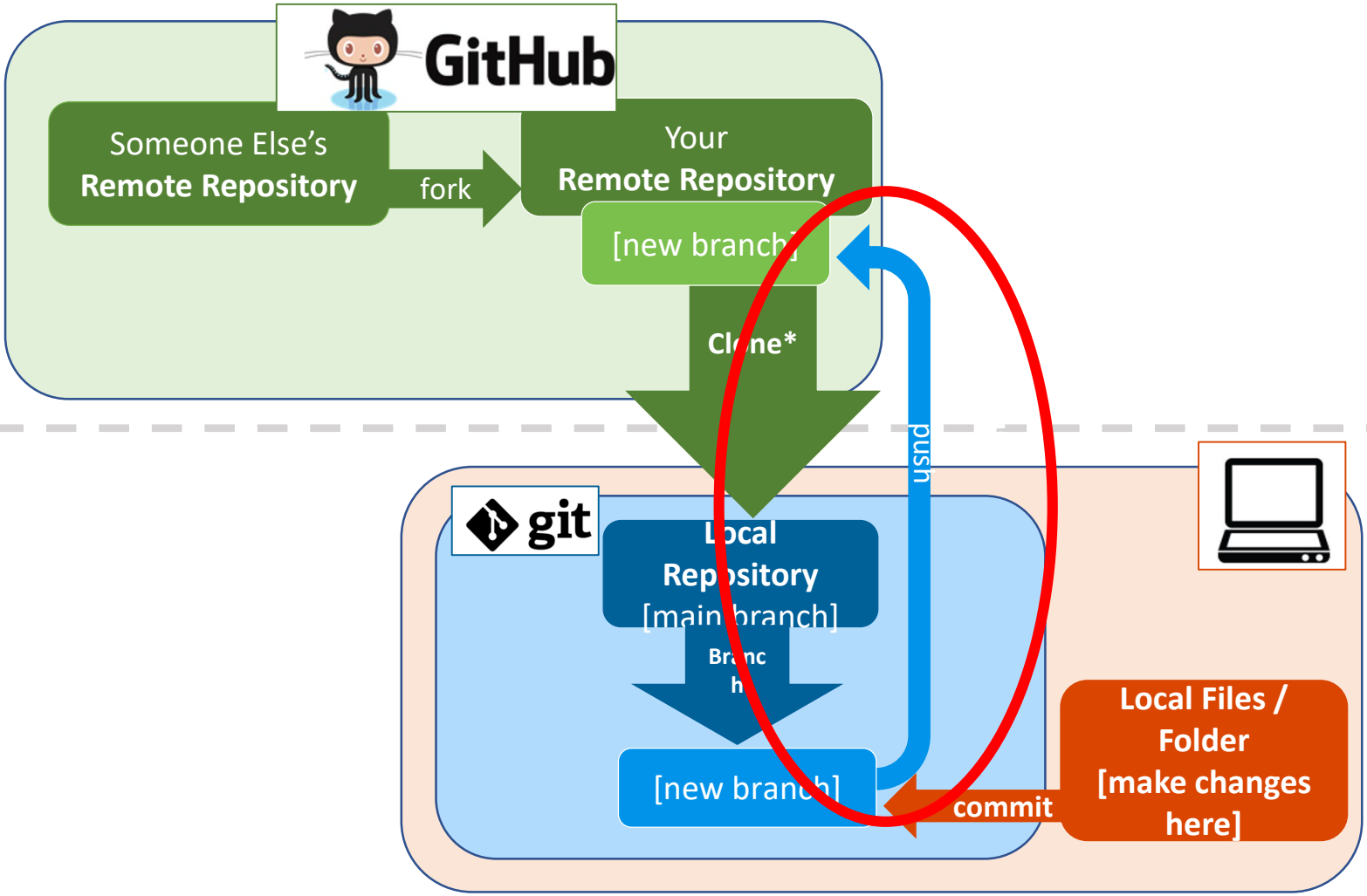
Commit to **add-kaw-file**

Commit Change (new file) to git

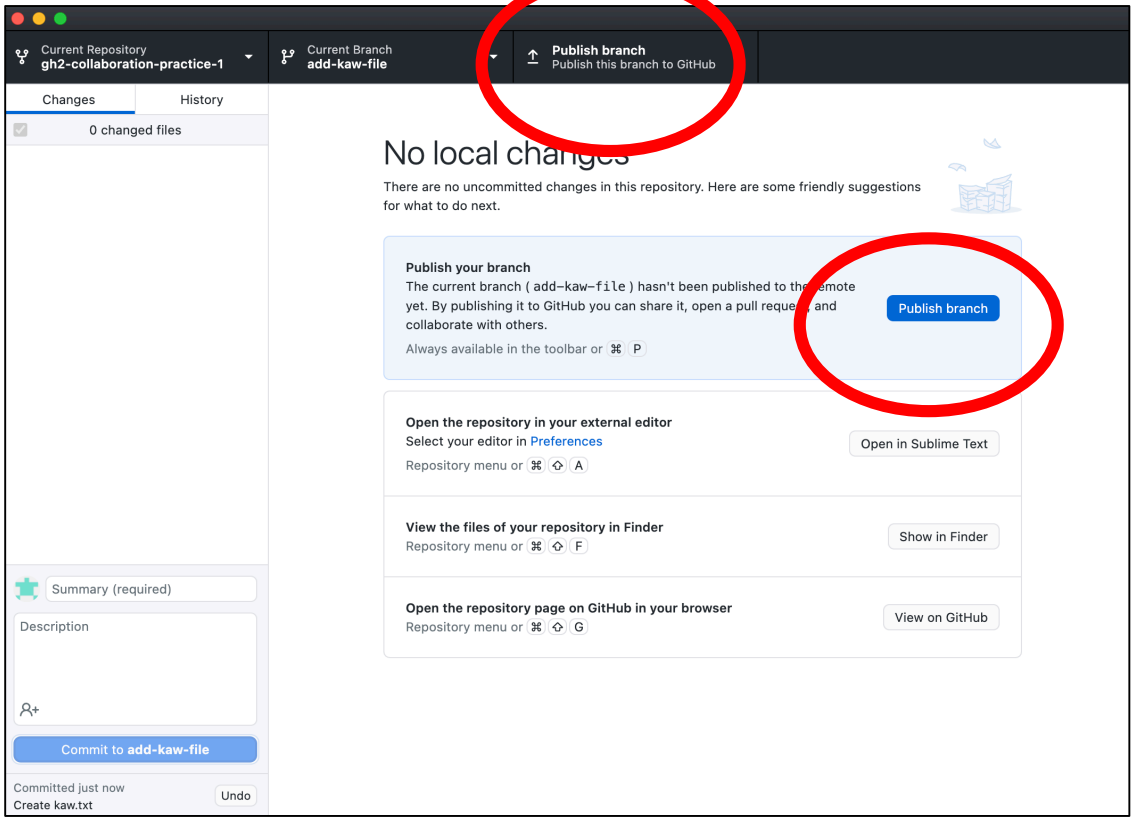


Push Your New Branch to Your Remote Fork on Github Enterprise


GitHub
Someone Else's
Remote Repository
fork
Your
Remote Repository
Clone*
git
Local
Repository
[main branch]
Branc
h
[new branch]
commit
Local Files /
Folder
[make changes
here]


GitHub
Someone Else's
Remote Repository
fork
Your
Remote Repository
[new branch]
Clone*
push
git
Local
Repository
[main branch]
Branch
[new branch]
commit
Local Files /
Folder
[make changes
here]

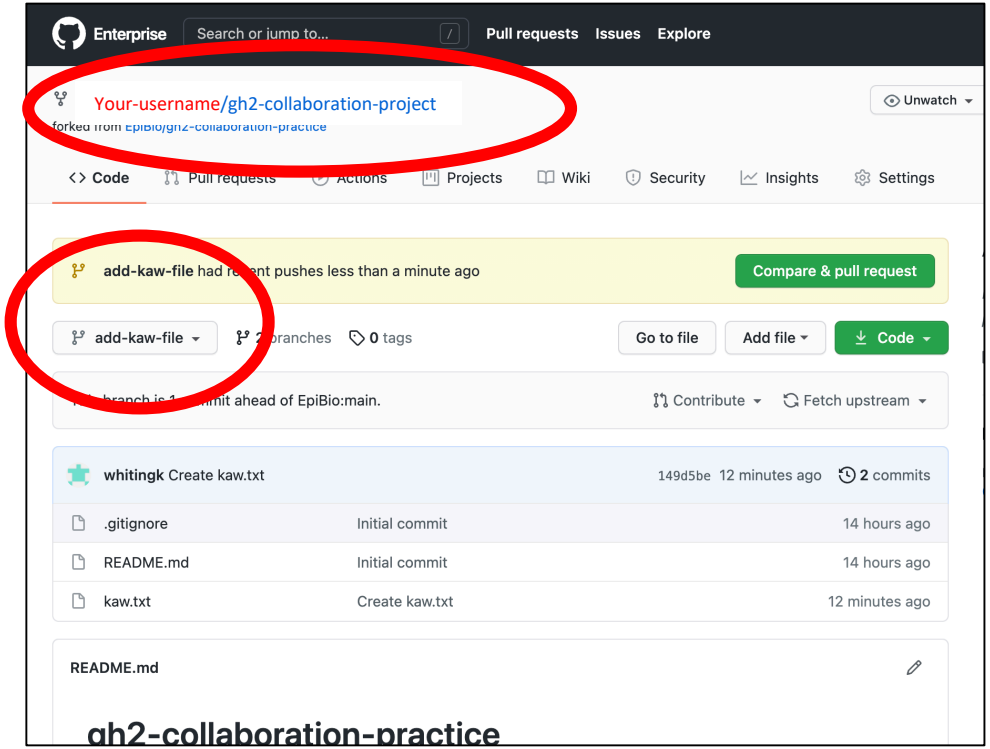
Push Change & Publish Branch on Remote Fork



12. Publish the new branch on our remote fork along with our pushed changes

Note: We could first publish branch on the remote, then make changes > commit changes > push, but here we are doing it in all one step

Confirm New Changes in Remote Fork on Github



Take a minute to click around your fork (yourname/gh2-collaboration-practice)

Click branches and confirm there is both a main branch as well as your newly published branch

Also click around the original repo from which you forked (your-group-leader/gh2-collaboration-practice)

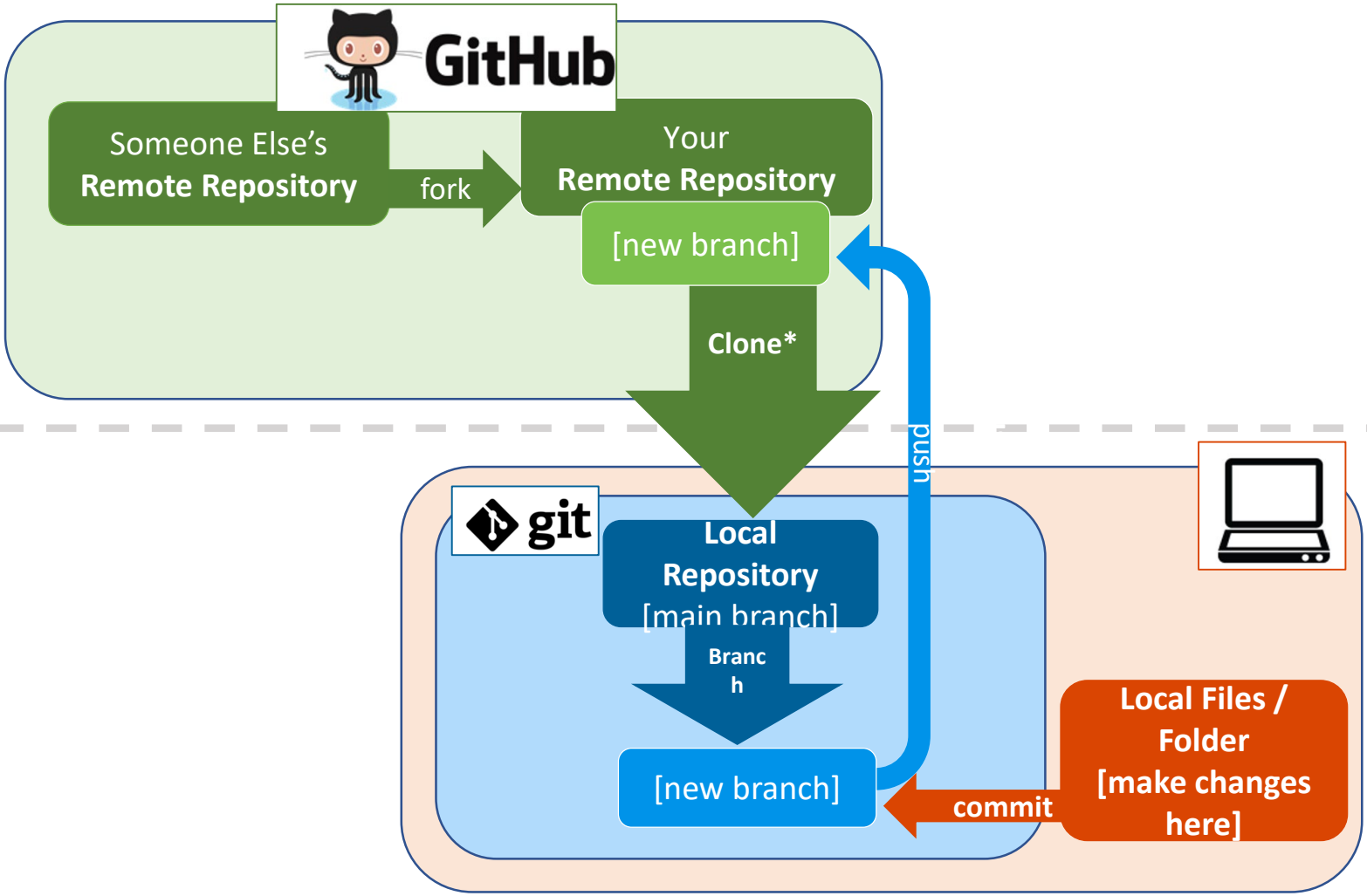
Your branch isn't there yet

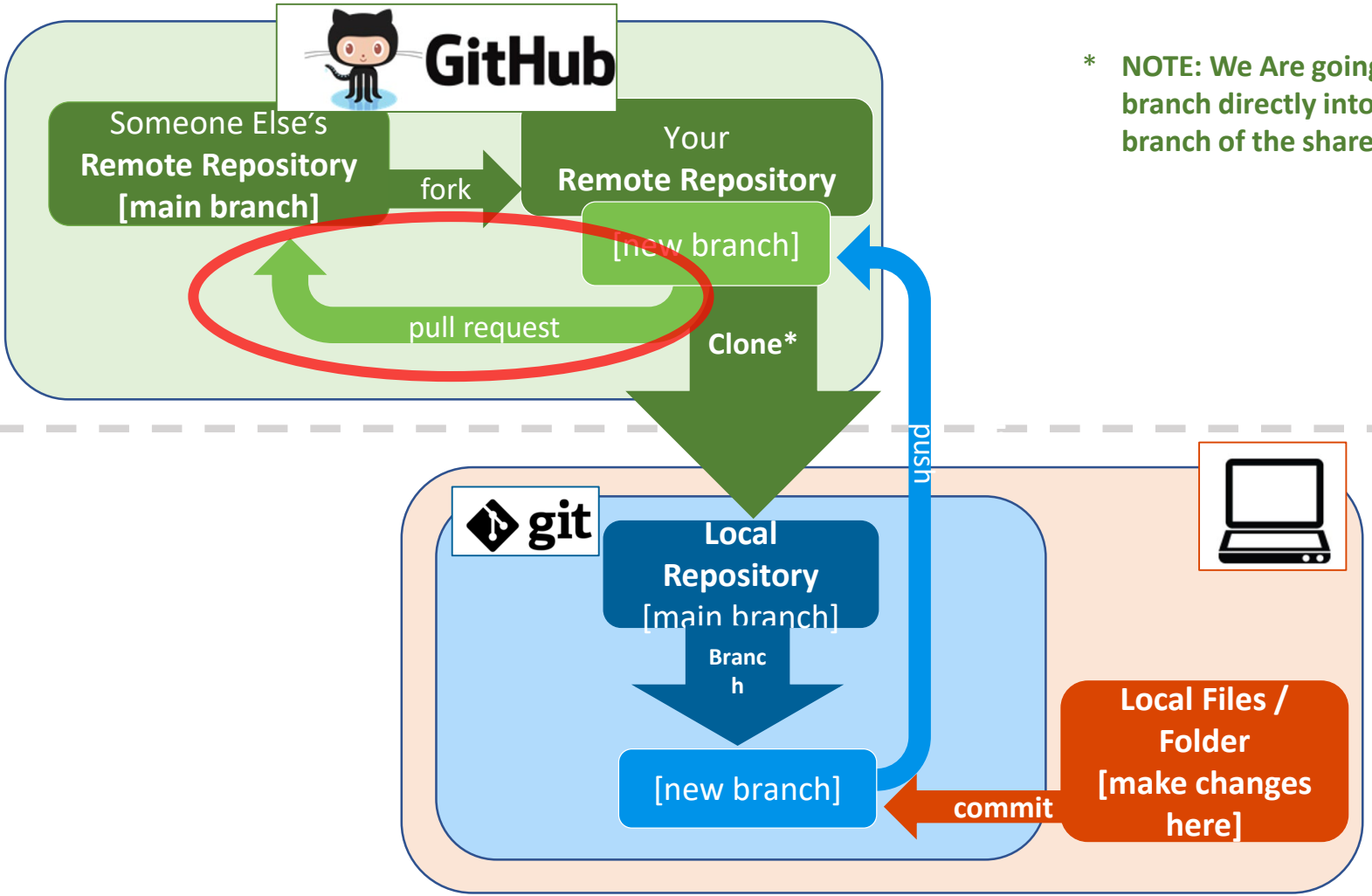
We Are Happy With Our Changes And Ready To Merge Our Updates With The Main Project

We Now Need to Request Our Changes be Reviewed and Pulled Into Main Shared Repo (your group leader's repo)

We Now Need to Request Our Changes be Reviewed and Pulled Into Main Shared Repo
(your group leader's repo)

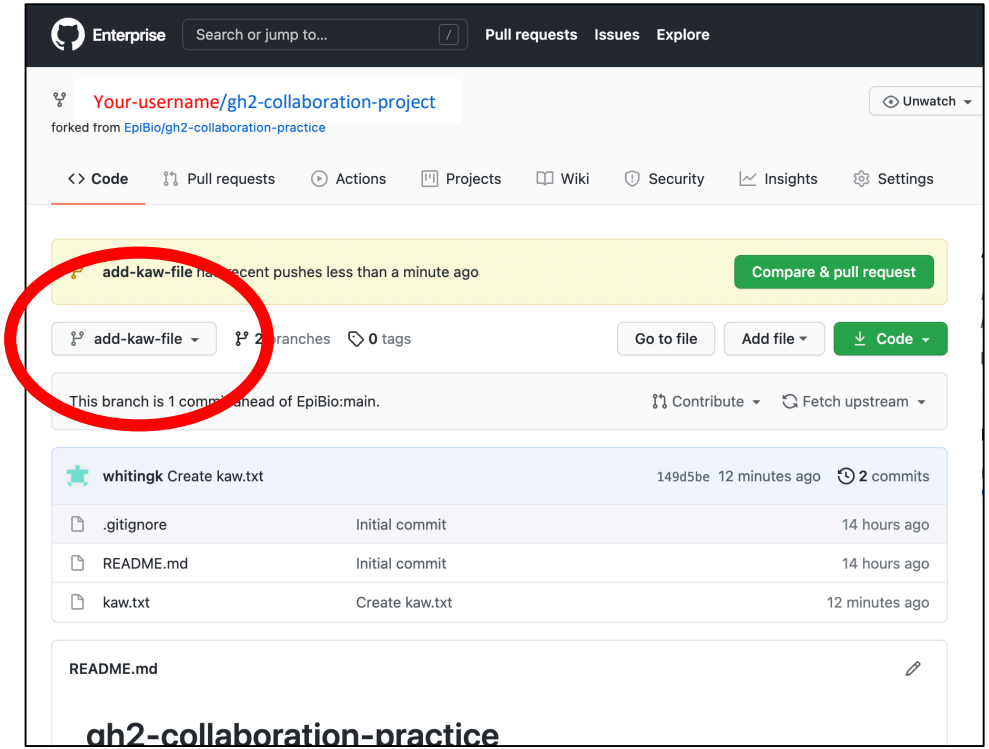
Let's Make a Pull Request


GitHub
Someone Else's
Remote Repository
fork
Your
Remote Repository
[new branch]
Clone*
push
git
Local
Repository
[main branch]
Branc
h
[new branch]
commit
Local Files /
Folder
[make changes
here]



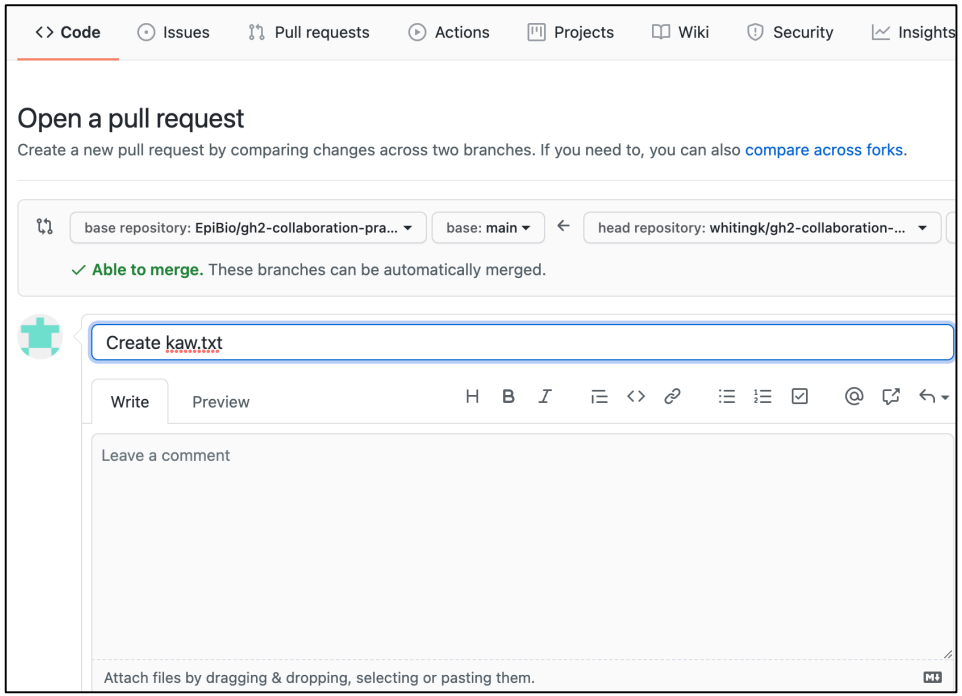
* NOTE: We Are going to merge our branch directly into the [Main] branch of the shared repo.

Open a Pull Request on Github



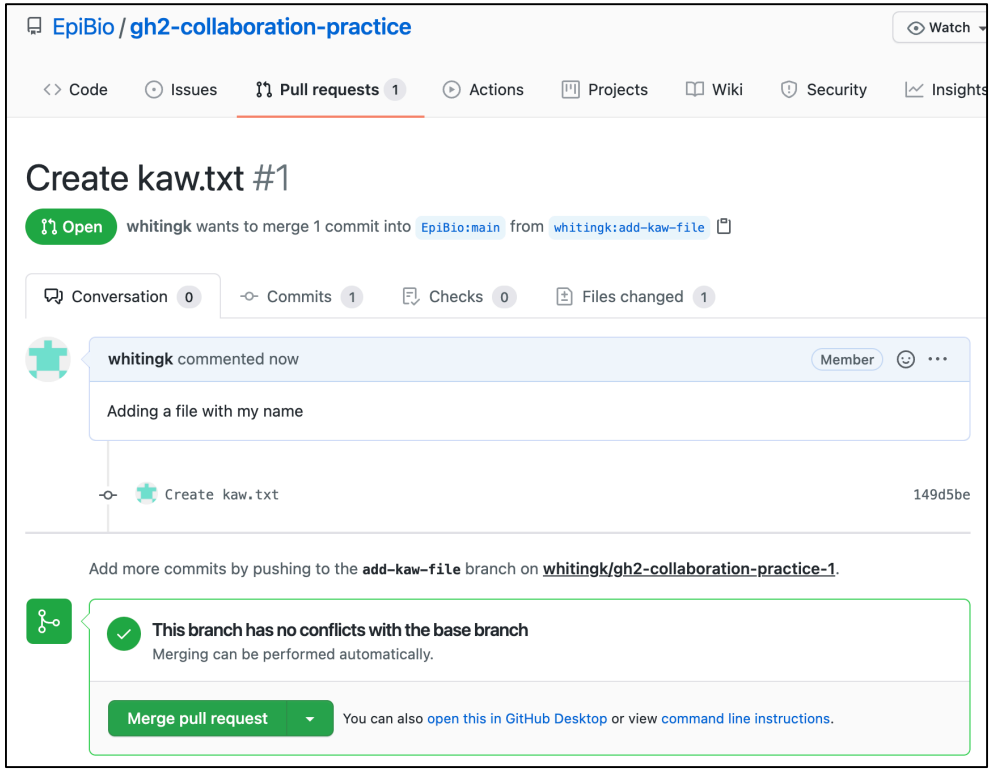
13. From github, navigate to your new branch on your fork and click

Open a Pull Request on Github

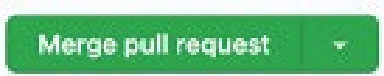


14. Describe the changes you wish to incorporate

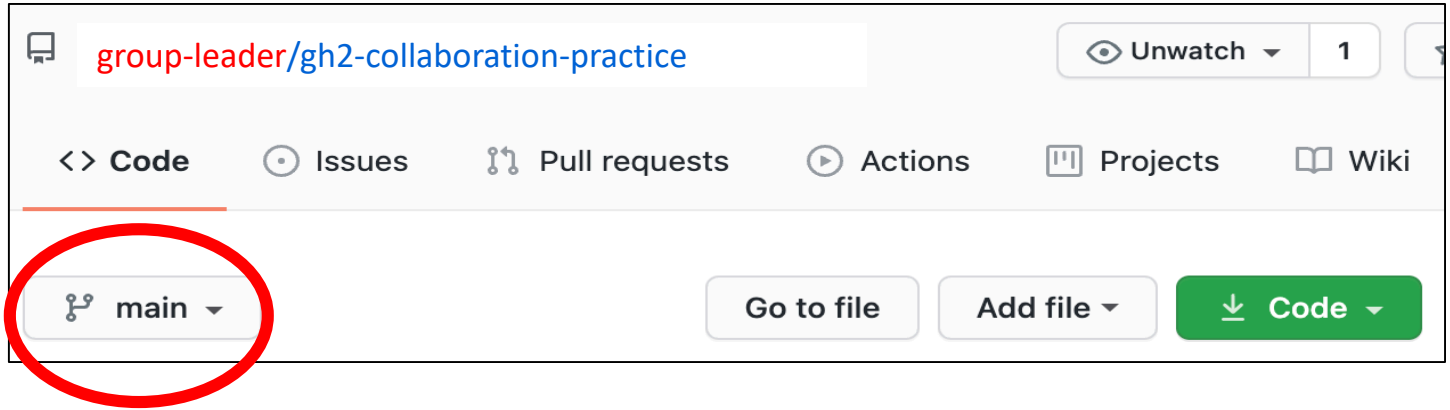
Merge Pull Request



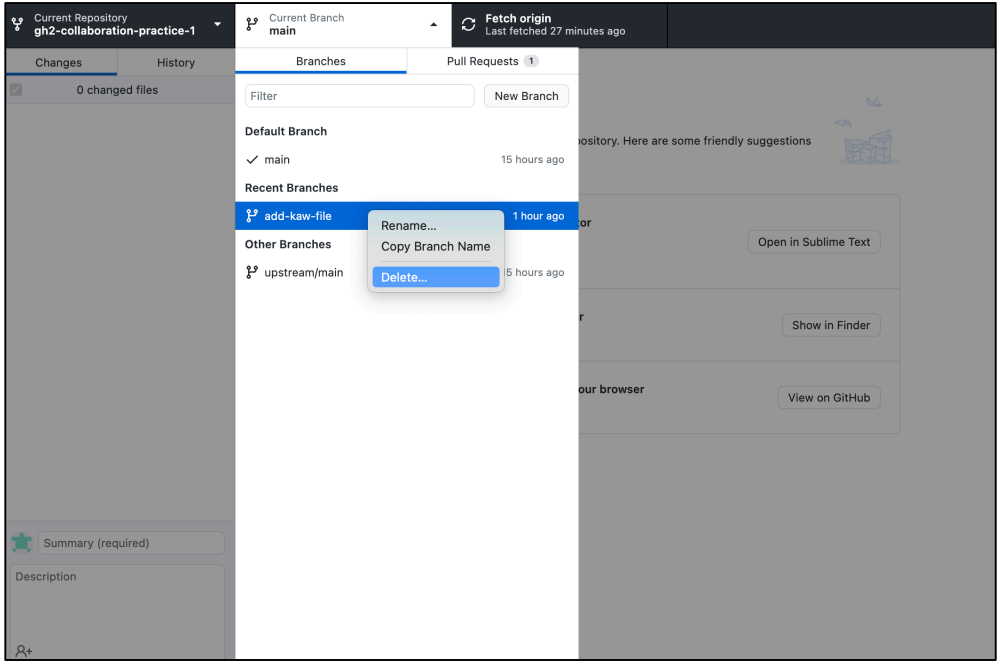
15. Your ‘Code’ will be reviewed and either you or your group leader will merge your changes



Confirm Your Changes on Your Group Leader's Remote Repo

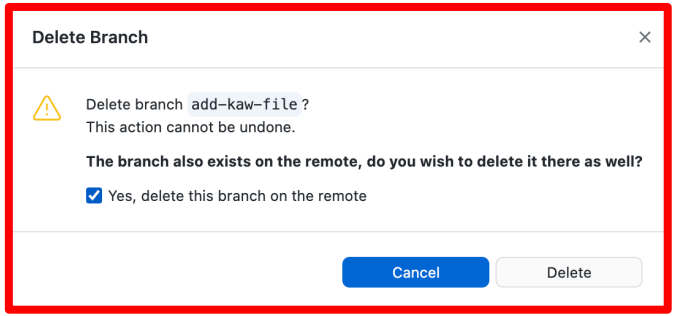


Delete The Branch (optional)



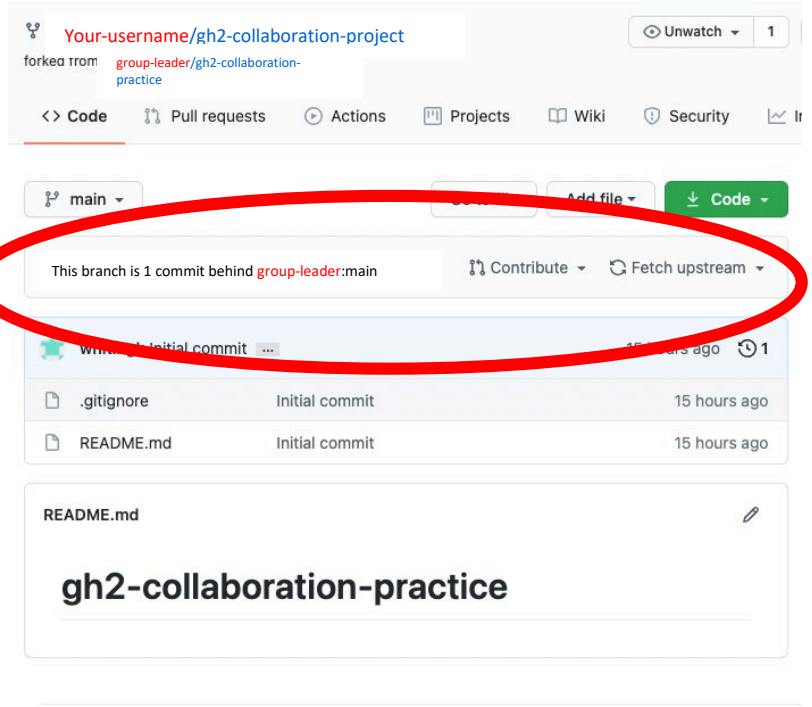
16. Once your changes are merged into the main project, it may be a good idea to delete the branch.

You can do this from Github Desktop

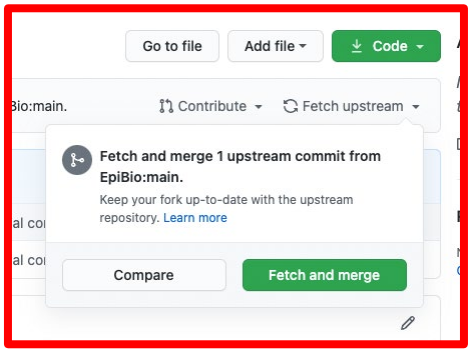


Lastly, Let’s Update Our Fork With Recent Changes Others Have Made To The Original Repo (Upstream)

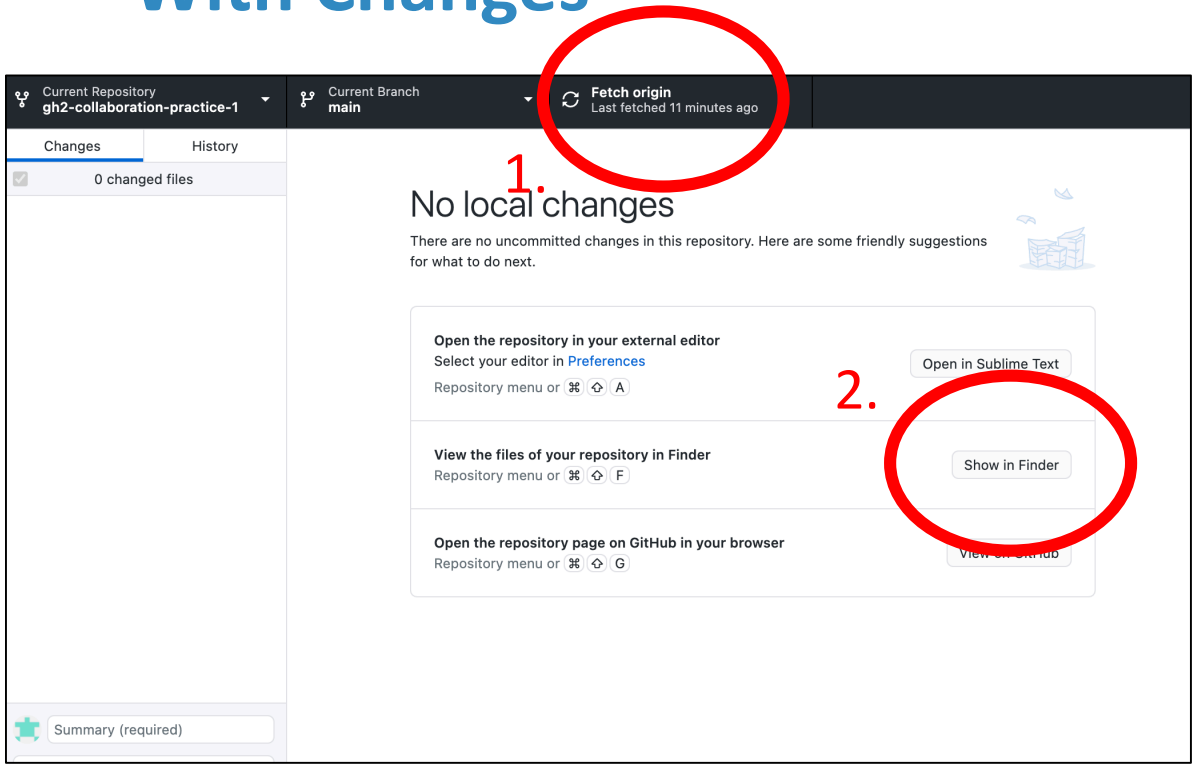
Update Our Remote Fork on Github With Upstream Changes



16. There are several ways you can do this. Its easy to do on Github by clicking “Fetch Upstream”



Then Update Our Local Repository and Folder With Changes

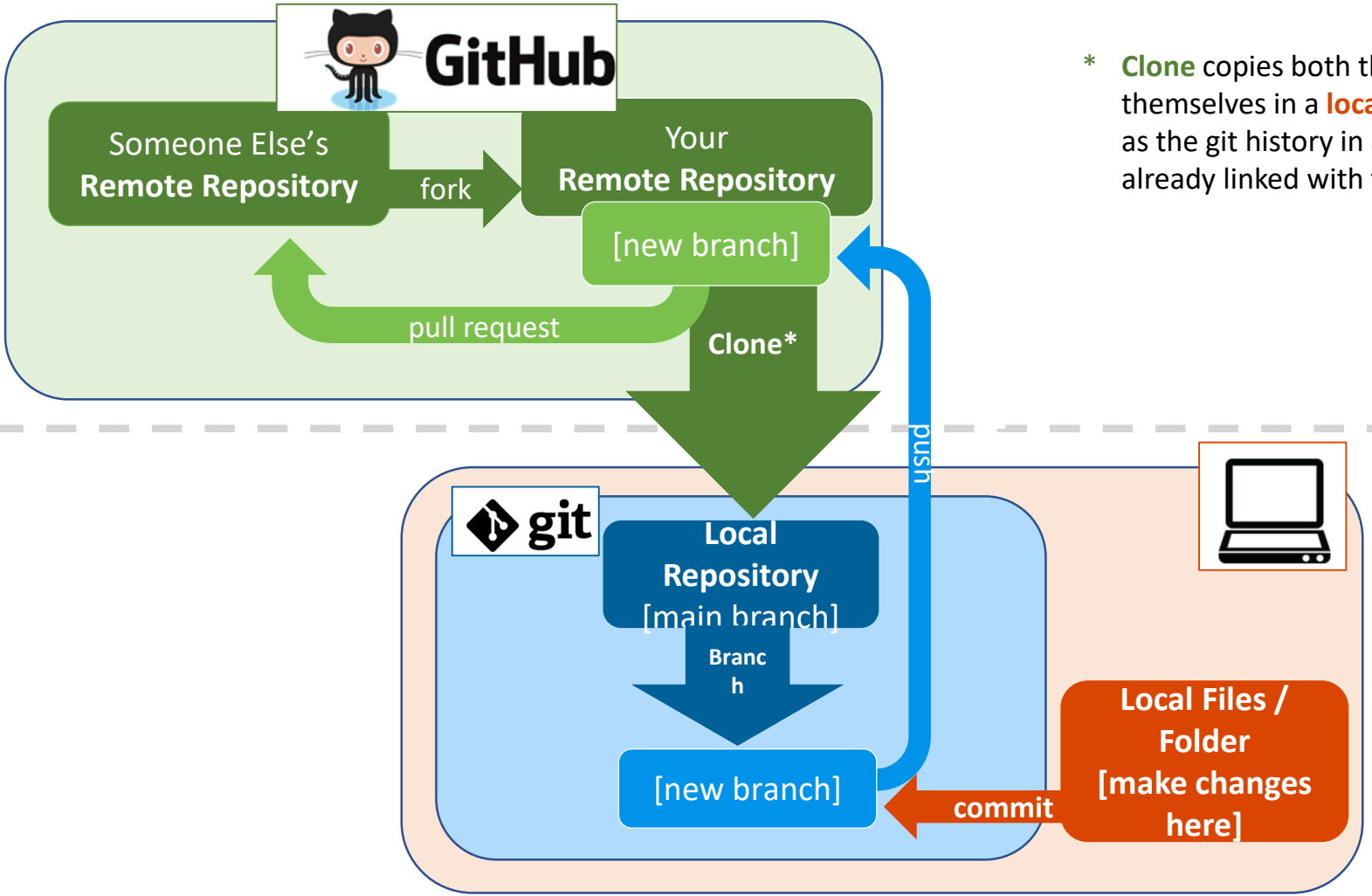


17. Go to Github Desktop and “Fetch Origin”.

Now you should have everyone else’s changes in in your local folder/local repository!

Questions?

Thank You!



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