git

and

GitHub

Python Training for NOAA GSL Interns

Summer 2022

What is git ?

…a version control system
It lets you manage changes you’ve made to files over time.

You can jump back and forth through different **versions** of code

Save checkpoints, or **commits**, with notes, or **messages**, about that version
Enables a handy project-level “undo” button.
And you can see how/when things change over time.

Save multiple versions of your code side-by-side in different **branches**
This is especially helpful when you want to make your own sandbox in a repo that was shared with you via GitHub

All the git docs: https://git-scm.com/docs

A few more helpful terms…

A **clone** is local copy of the entire repository

A git **hash** is a 40 character pseudo-random hexadecimal string that uniquely identifies each commit

A **remote** repository refers to a repository stored elsewhere, maybe on GitHub

A **fork** is a copy of a a GitHub repository that you save under your own GitHub account

An **authoritative repository** is a repository that a fork is based on

Install Git

```
$ conda activate <my_env>
$ conda install -c anaconda git
```

Reminder: See all your conda environments with

```
$ conda env list
```

Setting up Git

Tell Git who you are

```
$ git config --global user.name “Your Name”
$ git config –global user.email “your.email@...”
```

Tell git which editor you’d like to use:

```
$ git config --global core.editor <editor name>
```

for Notepad on Windows:

```
$ git config --global core.editor \
"'C:/Program Files/Notepad++/notepad++.exe’ \
-multiInst -notabbar -nosession -noPlugin"
```

Popular editors include:

- emacs
- vim
- nano
- notepad

Start a repository in a folder

```
$ mkdir my_work
$ cd my_work
$ git init
$ git branch -m main
```

Staging Files

This step tells git that you’d like to *track a file*, or modifications to a file, in the repository

Linux/Mac

```
$ touch README
$ git add README
```

Windows

```
$ type nul > README
$ git add README
```

Current Repo Status

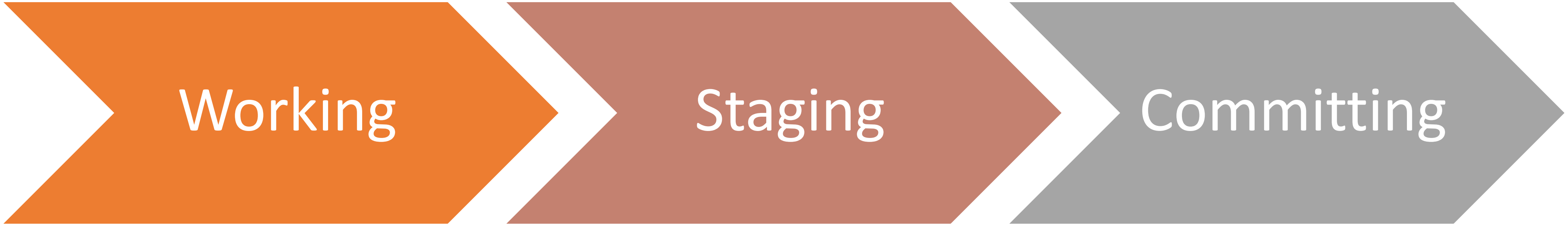
```
$ git status
On branch main

No commits yet

Untracked files:
  (use "git add <file>..." to include in what will
be committed)
     README

nothing added to commit but untracked files present
(use "git add" to track)
```

Git’s view of reality



Working

Staging

Committing

Files look like they did during last commit

After making a change, stage a file using the **`git add`** command

Add a new version of a file to the repo and update working state. Generates a new hash in history.

File States

Tracked

Git knows about a file and it exists in a snapshot of the repo

Cached

File has been staged for commit with "`git add`"

Untracked

File exists on disk, but git doesn't have information about its history

Tracked files may be in one of 3 states:

- Unmodified
- Modified
- Staged

Adding a new file

Puts a file into the *staging*, or *cached* state

```
$ git add README
```

Now what does `git status` look like?

```
$ git status
On branch main


No commits yet


Changes to be committed:
  (use "git rm --cached <file>..." to unstage)
new file:   README
```

Seeing modifications to files

Open and edit the README file to add some content.
Now check the status again.

```
$ git status
On branch main
Changes not staged for commit:
  (use "git add <file>..." to update what will be committed)
  (use "git restore <file>..." to discard changes in working directory)
      modified:   README


no changes added to commit (use "git add" and/or "git commit -a")
```

How are the files modified?

```
$ git diff
diff --git a/README b/README
index e69de29..24192d8 100644
--- a/README
+++ b/README
@@ -0,0 +1,2 @@
+# Description
+
```

If you’ve already staged a file, use the `--cached` flag with `git diff` to see differences

```
$ git diff --cached
```

Committing Files

This step saves the file in the history of the repository

```
$ git commit -m “A message about these changes”
```

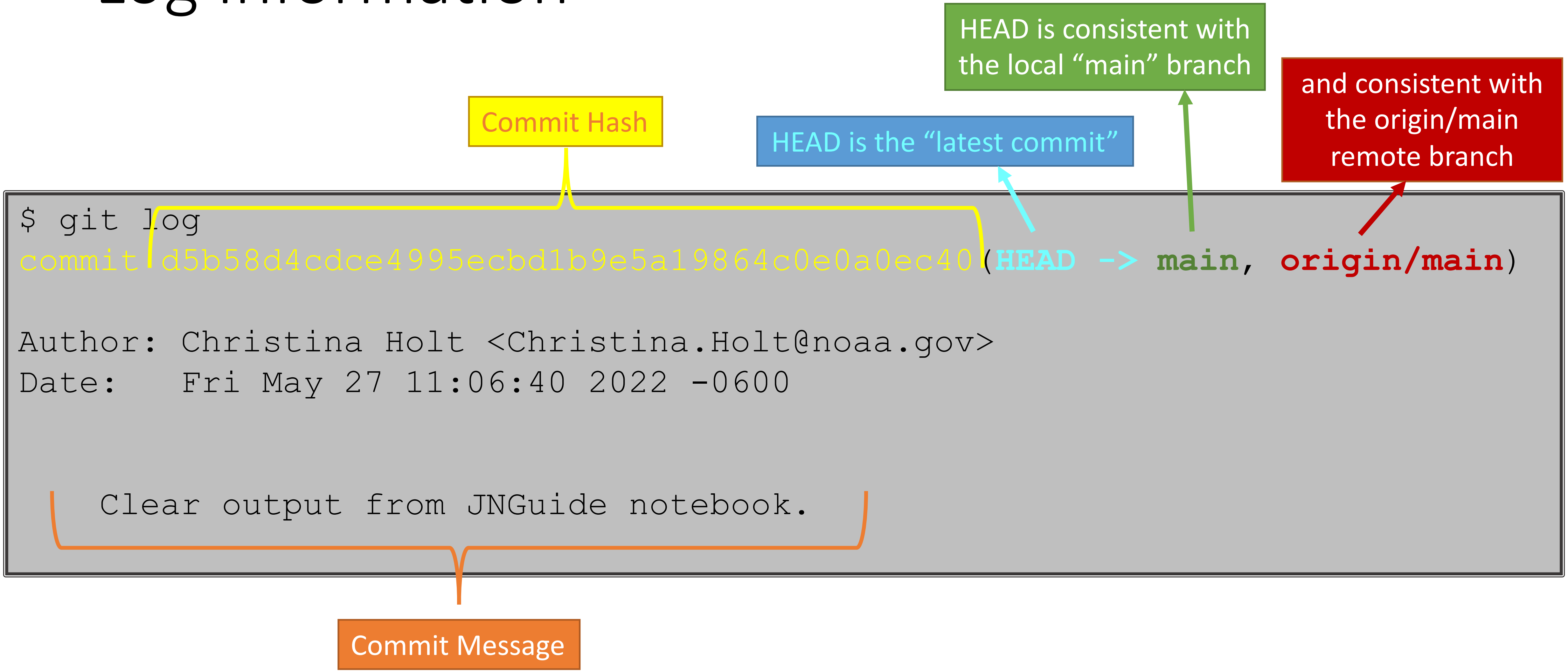
Without the −m flag, git will open your editor for you to add a message.

Repository history

```
$ git log
$ git log -p     # Shows the diffs in each commit
$ git log --stat # Shows the file changes in each commit
```

Output explained on next slide….

Log Information



Commit Hash

HEAD is the “latest commit”

HEAD is consistent with the local “main” branch

and consistent with the origin/main remote branch

```
$ git log
commit d5b58d4cdce4995ecbd1b9e5a19864c0e0a0ec40 (HEAD -> main, origin/main)

Author: Christina Holt <Christina.Holt@noaa.gov>
Date:   Fri May 27 11:06:40 2022 -0600


    Clear output from JNGuide notebook.
```

Commit Message

Git Branches

Show all branches in a repository and all remote repositories

```
$ git branch -a
```

Create a new branch that is an exact replica of the branch you are currently on

```
$ git checkout -b <new_branch_name>
```

Newer versions of git use “switch” command instead

```
$ git switch -c <new_branch_name>
```

Compare your branch with another branch

```
$ git diff <other branch name>
```

GitHub

A **cloud-based storage** service with an intuitive UI

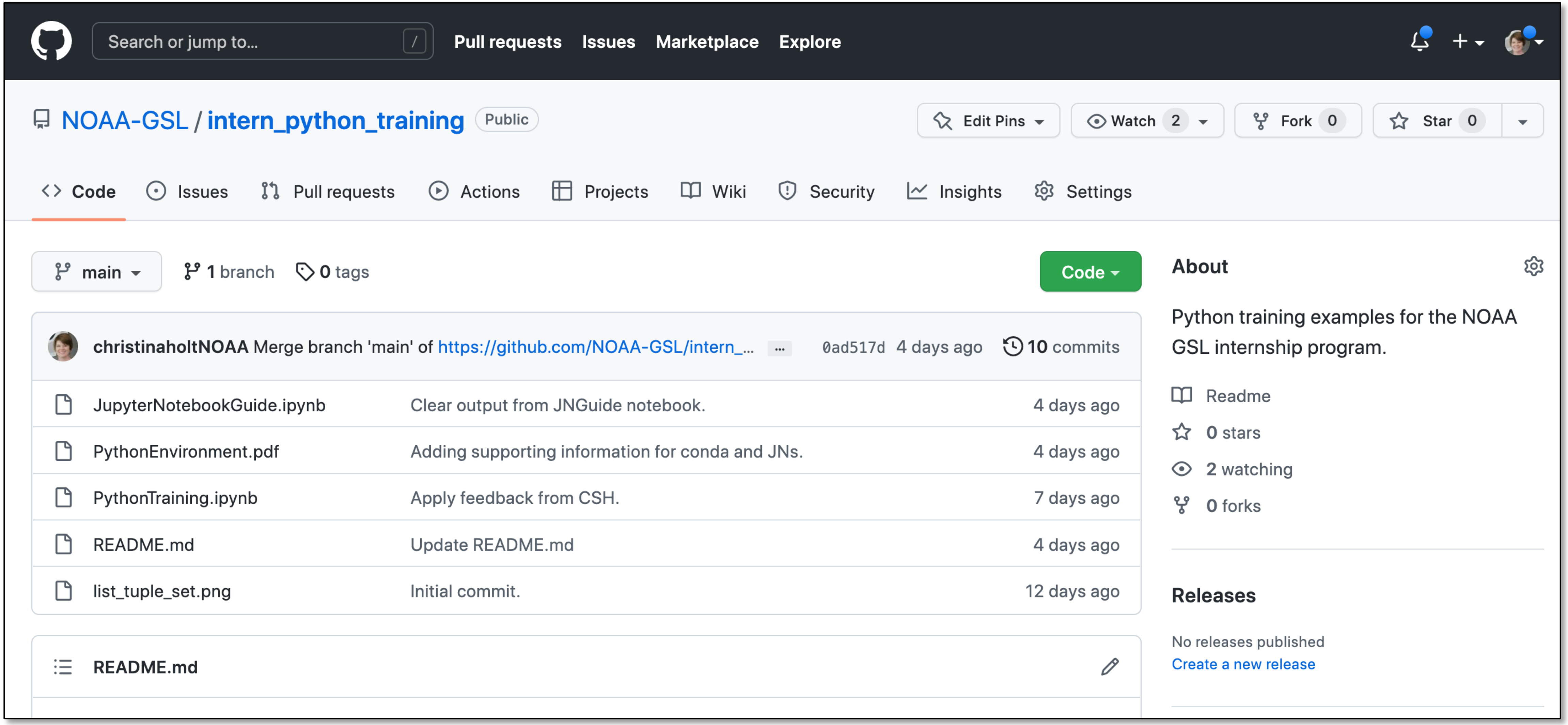
Use it as free backup for your code!

A **collaborative** service that enables teamwork

Share code with others

There are tons of other collaborative features and project management tools that we won’t discuss here…

Let’s take a look at the training repo
https://github.com/NOAA-GSL/intern_python_training



NOAA-GSL / intern_python_training Public

christinaholtNOAA Merge branch 'main' of https://github.com/NOAA-GSL/intern_... 0ad517d 4 days ago 10 commits

JupyterNotebookGuide.ipynb	Clear output from JNGuide notebook.	4 days ago
PythonEnvironment.pdf	Adding supporting information for conda and JNs.	4 days ago
PythonTraining.ipynb	Apply feedback from CSH.	7 days ago
README.md	Update README.md	4 days ago
list_tuple_set.png	Initial commit.	12 days ago

README.md

About

Python training examples for the NOAA GSL internship program.

Readme
0 stars
2 watching
0 forks

Releases

No releases published
Create a new release

Get a local copy of a GitHub repo

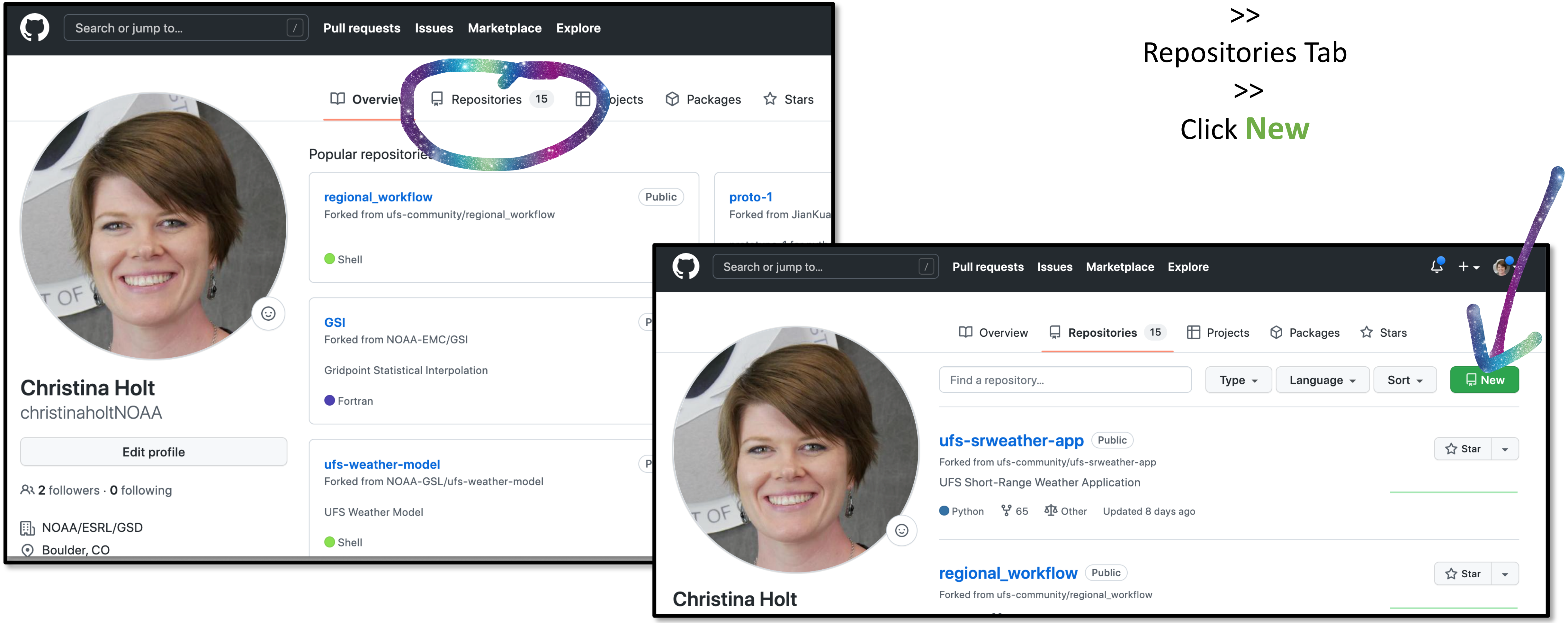
This will be a **clone** on disk

```
$ git clone <url> [local path]
$ git clone https://github.com/NOAA-GSL/intern_python_training
$ cd intern_python_training
```

All of the previous examples apply to this repo, too!

Create a new empty repository

Navigate to your GitHub Profile
>>
Repositories Tab
>>
Click **New**



Popular repositories

regional_workflow Public
Forked from ufs-community/regional_workflow
Shell

proto-1
Forked from JianKua

GSI
Forked from NOAA-EMC/GSI
Gridpoint Statistical Interpolation
Fortran

ufs-weather-model
Forked from NOAA-GSL/ufs-weather-model
UFS Weather Model
Shell

Christina Holt
christinaholtNOAA
Edit profile
2 followers · 0 following
NOAA/ESRL/GSD
Boulder, CO

Find a repository...
Type
Language
Sort

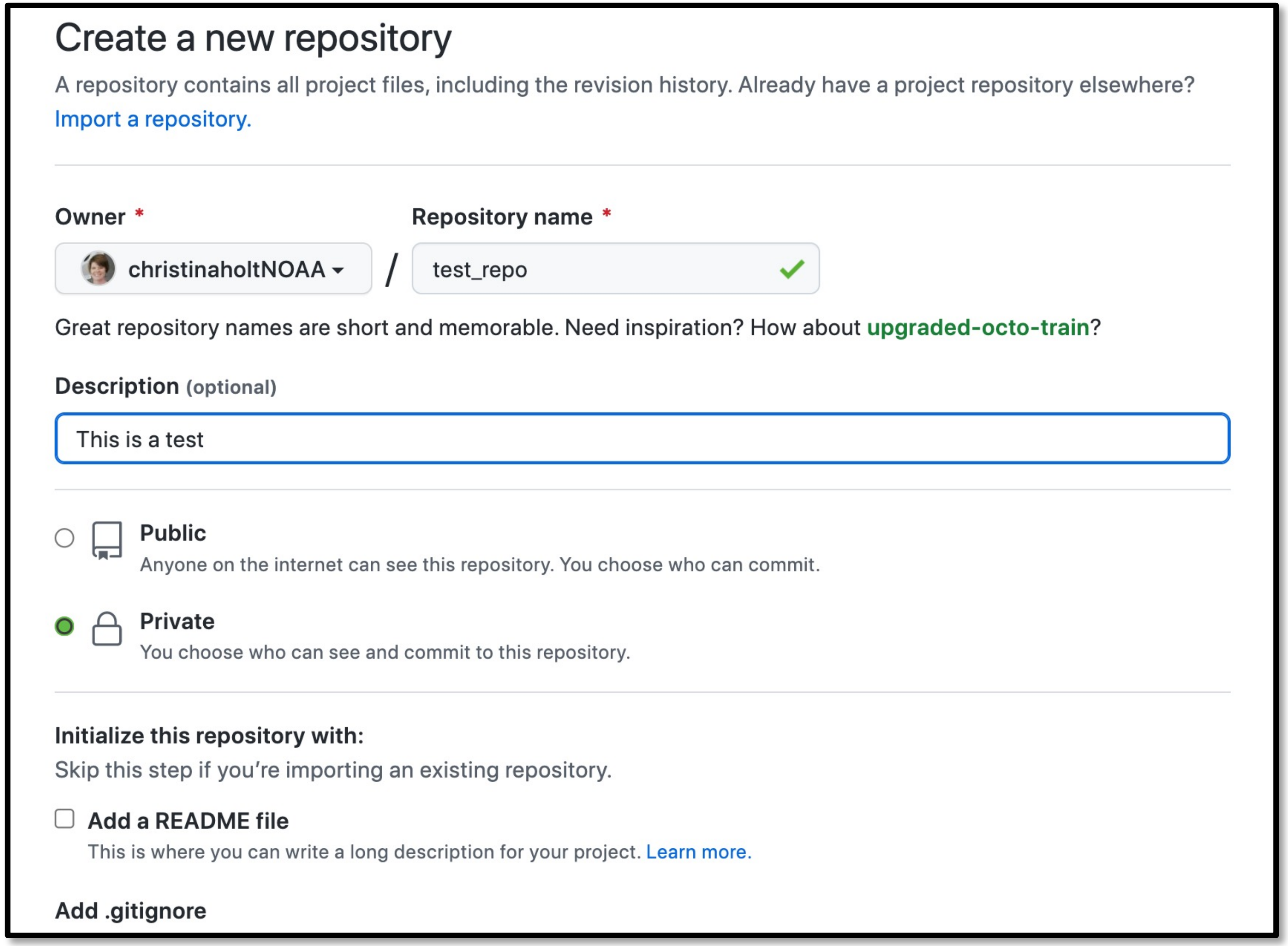
ufs-srweather-app Public
Forked from ufs-community/ufs-srweather-app
UFS Short-Range Weather Application
Python 65 Other Updated 8 days ago
Star

regional_workflow Public
Forked from ufs-community/regional_workflow
Star

Christina Holt

Fill in the form

Create a private repo for the tutorial walk-through



Create a new repository

A repository contains all project files, including the revision history. Already have a project repository elsewhere? Import a repository.

Owner * christinaholtNOAA / **Repository name** * test_repo ✓

Great repository names are short and memorable. Need inspiration? How about **upgraded-octo-train**?

Description (optional)

This is a test

○ **Public**
Anyone on the internet can see this repository. You choose who can commit.

● **Private**
You choose who can see and commit to this repository.

Initialize this repository with:
Skip this step if you're importing an existing repository.

□ **Add a README file**
This is where you can write a long description for your project. Learn more.

Add .gitignore

Click **Create Repository** and follow the directions

Connecting with GitHub

Connect your local repository on disk with GitHub by adding a **remote** repository

```
$ git remote add origin <url>
$ git remote –v    # To see the labels and urls
```

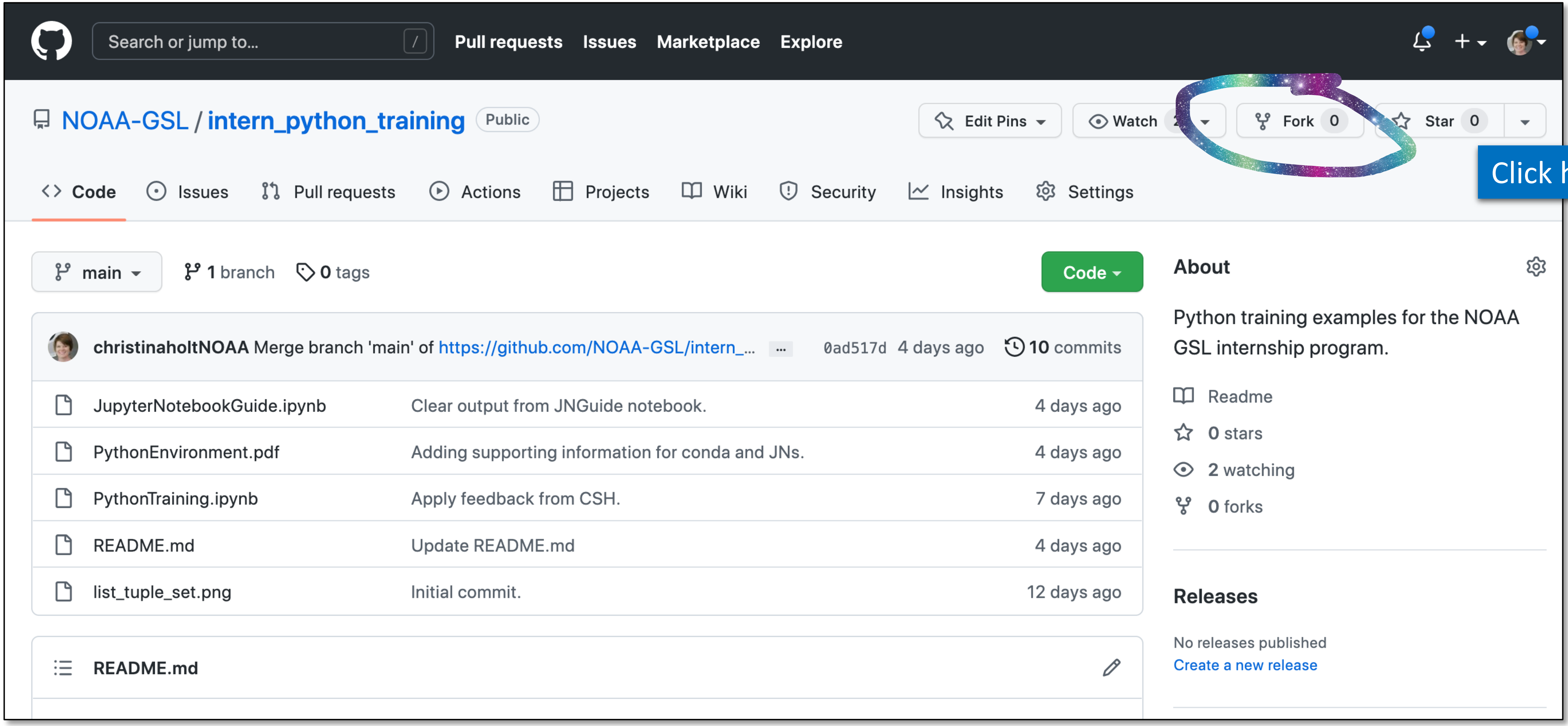
Push your local changes to GitHub

```
$ git push
$ git push –set-upstream-to origin/<branch-name>
```

Fetch/Pull changes from GitHub

```
$ git fetch  # Retrieve changes, but don’t
               apply them to the local code
$ git pull   # Retrieve changes and apply them
               to the local code
```

Fork a repository to have a copy of your own!



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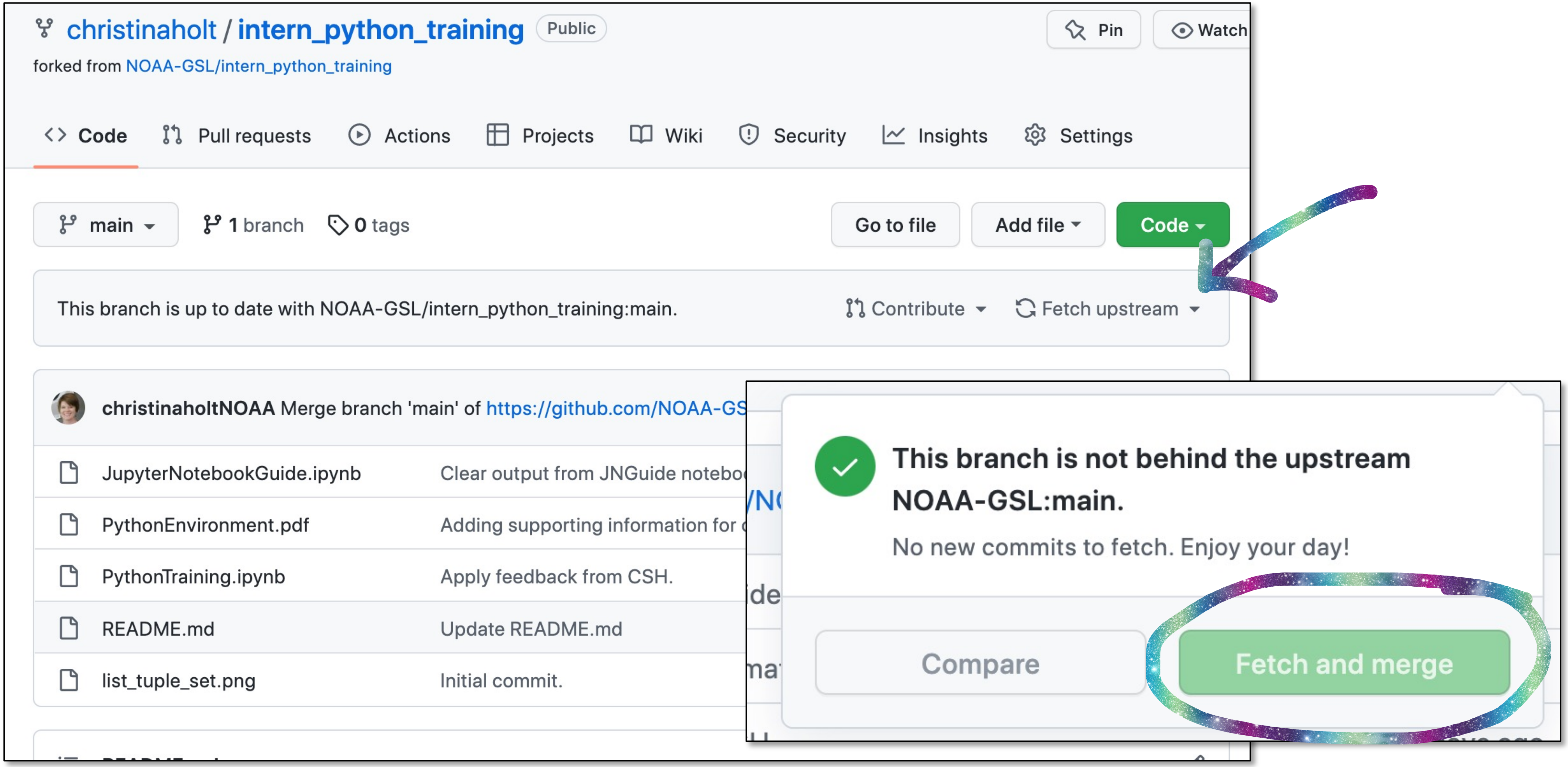
Releases

No releases published
Create a new release

Click here!

Pull in changes from your authoritative repo



christinaholt / intern_python_training Public

forked from NOAA-GSL/intern_python_training

This branch is up to date with NOAA-GSL/intern_python_training:main.

christinaholtNOAA Merge branch 'main' of https://github.com/NOAA-GS

JupyterNotebookGuide.ipynb	Clear output from JNGuide notebo
PythonEnvironment.pdf	Adding supporting information for
PythonTraining.ipynb	Apply feedback from CSH.
README.md	Update README.md
list_tuple_set.png	Initial commit.

This branch is not behind the upstream NOAA-GSL:main.

No new commits to fetch. Enjoy your day!

Some helpful Git and GitHub Resources

- The official git tutorial: https://git-scm.com/docs/gittutorial
- An more thorough explanation of how git and GitHub work: https://www.youtube.com/watch?v=DVRQoVRzMIY
- GitHub Learning Lab Introduction to GitHub
- GitHub Getting Started