UC Berkeley
CYPLAN255
Spring 2022

Getting Started with GitHub

1. Configuring Git

    1.1. Tell git who you are (replace “Mona Lisa” with your own name):

    ```
    git config --global user.name "Mona Lisa"
    ```

    1.2. Tell git what your e-mail address is (replace e-mail address with your own):

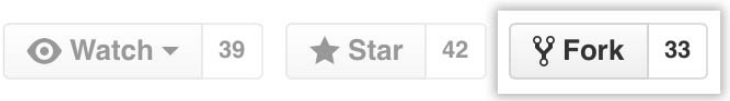
    ```
    git config --global user.email "mlisa@berkeley.edu"
    ```

    1.3. Double check that git got all that right

    ```
    git config --list
    ```

2. Forking the class repo

    2.1. Go to https://github.com/mxndrwgrdnr/CYPLAN255
    2.2. On the top right of the page, click the button labeled “Fork”

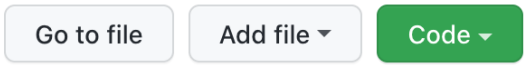


    2.3. Now, instead of seeing this at the top left of your screen

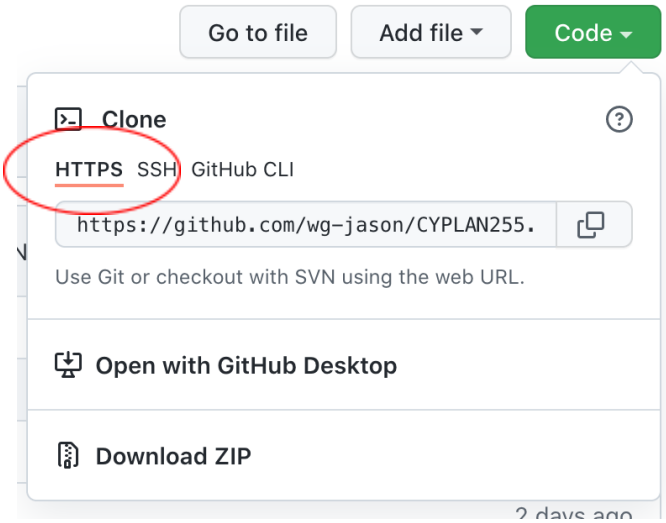
    you should see something like this:

3. Cloning your fork

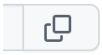
    3.1. From your fork, click the green button labeled “Code”



3.2. In the drop-down menu, make sure you have HTTPS selected



3.3. Click the copy button to copy the URL to your clipboard:



3.4. Open up a terminal/bash shell/command prompt and type:

```
pwd
```

This is the location on your local computer to which you are about to copy the repo. Take note. If this is not where you want the repo to be stored on your computer, either `cd` to the right location before continuing, or you can simply move the project (repo) directory afterwards.

3.5. Now in the same terminal type

```
git clone <paste the URL you copied here>
```

and hit `<Enter>`.

3.6. To check that you did everything correctly, now do

```
git remote -v
```

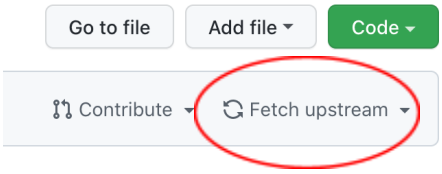
and you should see something that looks like this:

```
origin    <URL of your fork.git> (fetch)
origin    <URL of your fork.git> (push)
```

If instead of the URL of *your* fork, you see the URL of the main repo ("https://github.com/mxndrwgrdnr/CYPLAN255.git"), then you have cloned the main repo rather than your fork. Delete the folder you're in, return to step 3.1, and try again with the right URL.

4. Syncing your fork

4.1. Navigate to your GitHub fork in a browser and click the button labeled "Fetch upstream" under the green "Code" button



and then click "fetch and merge" when prompted. Do this as often as you like.

4.2. Now that your *remote* is synced, you need to copy those changes to your *local* copy. To do that, all you need to do is

```
git pull
```

5. Submitting assignments

5.1. As mentioned in the assignment README, assignments should be submitted on the "assignments" branch. To change branches do

```
git checkout assignments
```

5.1.1. If you get an error telling you that no such file or branch exists, that's because you created and cloned your fork before the assignments branch was created on the *upstream* repo. That means your fork is behind or "stale", and needs to be updated. Go back to Step 4 and try fetching from upstream again.

5.1.1.1. If you do that and still see the same error, then your best bet is to fetch the upstream changes from the command line. This is the shortcut I mentioned in lecture and illustrated on slide 18.

Do the following steps in order, copying the commands exactly:

- `git remote add upstream https://github.com/mxndrwgrdnr/CYPLAN255.git`
- `git fetch upstream`

- `git checkout assignments`

Continue on to step 5.1.2

5.1.2. If you get an error that says:

```
fatal: 'assignments' could be both a local file and a
tracking branch.
Please use -- (and optionally --no-guess) to disambiguate
```

then try doing exactly what Git suggests:

```
git checkout assignments --
```

I probably shouldn't have created a branch with the same name as a directory in the repo 🤦.

To confirm that you are now on the right branch, do

```
git branch
```

5.2. Remember, do not do your work in a file with the same name as a file that you find in the repo. You may use existing files as a template by creating a copy, renaming that copy with a unique identifier (first and last name, or last 4 digits of your student ID). For example:

```
cp assignment_0.txt assignment_0_max_gardner.txt
```

Or just create a brand new file and do your work there.

5.3. When you are ready to push your changes from local to remote, you must first tell Git which files contain the changes you want to push:

```
git add assignments_0_max_gardner.txt
```

5.4. Then you are ready to *commit* those changes. No going back now!

```
git commit -m "mandatory descriptive message goes here"
```

5.5. OK so we're about to push the changes, but we have a few options for how to do that. The easiest, foolproof way to do it is to be as explicit as possible by telling Git exactly where you want to push to. by specifying the name of the remote and the branch on the remote where you want your commits to go:

```
git push origin assignments
```

This is useful because sometimes your local copy might be tracking multiple remotes. In fact, if you followed step 5.1.1.1 that's exactly what you did (try `git remote -v` and you'll see what I mean). But if your Git project has multiple

remotes to choose from, it might not know which one you want to push to, and it might actually push to the wrong one by mistake if you're not careful. The other way to avoid pushing to the wrong remote is to *set the default*:

```
git branch --set-upstream-to origin/assignments
```

and now you can simply do

```
git push
```

and Git will know exactly where to push to.

5.6. At this point, if you cloned your repo with HTTPS, Git should prompt you to enter your github username and password in the terminal. Go ahead and do that.

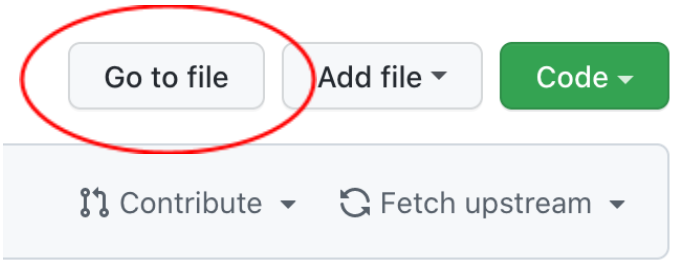
5.6.1. If you find it cumbersome to have to enter your username and password every time you want to make a commit, there are other authentication options that you can try, although they can be a bit trickier to set up. See the official GitHub docs here for more details.

~~5.6.2. If instead of asking for your username and password, Git asks you for a token or a key or something else, you probably did not clone your fork via HTTPS. Your safest bet would be to delete your project directory on your computer, and go back to step 3.1. If you've done that a few times and are still having the same issue, please reach out to Max or Irene.~~

5.6.2.1. ADDENDUM (2/4/22) GitHub no longer allows password authentication. Instead, you must use an "authentication token". See the official GitHub docs here for instructions on how to generate an authentication token.

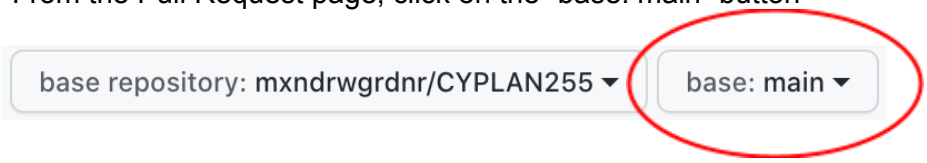
5.7. Once you've pushed, go back to the browser and look at your fork. You should see your commit message at the top of the page along with a note that says changes were pushed "a few seconds ago".

5.8. When you're ready, click the button labeled "Contribute", just to the left of the "Fetch upstream" button you used to sync your fork:



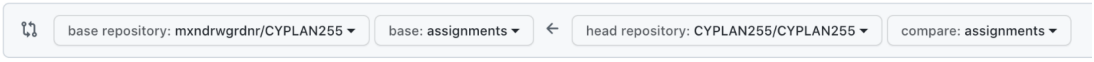
and click "Open Pull Request" when prompted.

5.9. From the Pull Request page, click on the “base: main” button

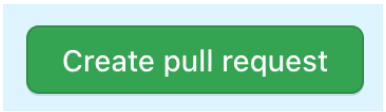


and change it to “base: assignments”.

5.10. Then do the same thing for the “head” repository (your fork), by clicking on the “compare: main” button, and selecting the “assignments” branch. You should now see something like this:



5.11. When you’re ready, click the green “Create pull request” button:



5.12. Lastly, give your pull request a descriptive title, and a helpful comment or two. The title does NOT need to be unique. Then click the green button once more and give yourself a pat on the back :)

APPENDIX

A. Handling Merge Conflicts

Before reading on, please read about merge conflicts on the official GitHub docs here.

Git is usually pretty good about automatically merging different versions of files together, but sometimes it needs help. These are called merge “conflicts”, and sometimes they are minor enough that you can fix them directly in the GitHub UI, but other times you’ll need to use the command-line. Which is the best approach will depend on the type of conflict that has occured. Below I describe just *some* of the ways to resolve the kinds of conflicts that you are most likely to encounter throughout the course of the semester

1. *PULLING FROM REMOTE*

Whenever you use the `git pull` command to copy changes from a remote repo to your local version, Git is actually doing a **fetch** and a **merge** behind the

scenes. Here are two reasons you might encounter merge conflicts during this process:

a. As mentioned above, Git is usually pretty good about merging different versions of files on its own. But remember, Git doesn't really know about anything you've done until you **commit** your work. This means that if you have made changes to a local copy of a file, but have not yet *committed* them, then Git can't incorporate them into the merge step of the pull. As a result, even though Git technically *can* do this merge, it will instead throw an error to let you know that the merge would have overwritten your local changes:

```
error: Your local changes to the following files
would be overwritten by merge:
my_directory/my_file.foo
Please, commit your changes or stash them before you
can merge.
```

Git has also provided us with a couple suggestions for how to proceed. Which we choose depends on whether or not we want to preserve the local changes. Let's go through each scenario:

I. If you don't care about overwriting your local changes, the simplest thing to do is `git stash`. This will literally stash your changes away in a temporary location to allow you to avoid triggering the previous error message when you try the git pull again. NOTE: Git normally keeps your stashed changes around for ~90 days, so it is possible to recover them if later on you realize that you actually needed them. Otherwise, just `git pull` and forget about it.

II. If you do care about saving your changes, now is a good time to say "Thank you Git! You have spared me from the unthinkable horror of deleting important work that I spent hours on!". Then, simply add and commit the changes and re-try the pull. You might not be out of the woods yet, as the changes from remote could still conflict with the changes you just committed, but at least you won't have to worry about losing your work!

III. What if you want to preserve your changes, but you also don't want to commit them? Maybe you have code in which you've temporarily hardcoded a password, and you don't want that password committed to the Git history for all eternity. Here you can do (in order):

```
git stash;
```

```
git pull;
git stash pop;
```

The first two lines are exactly the steps you would take if you didn't care about preserving your changes. But here we are just using them to avoid the error and successfully complete the pull. Once the pull is complete, the third command will take the changes you stashed and slap them on top of the changes you just pulled from the remote. This might still raise merge conflicts which will need to be resolved, but at least you don't have to worry about losing your work! And you haven't committed anything!

IV. What if you're not sure about whether your local, uncommitted changes are important or not? You can use

```
git diff <filename>
```

in your terminal, and Git will show you exactly what changes you have made to the file in question. Then you can decide for yourself whether to stash or commit.

b. Sometimes there are merges which are simply too complicated for Git to resolve on its own. When this happens, Git will temporarily create a version of the file in question containing *both sets of changes* (remote and local). Obviously you will encounter issues if you try to run this mutant file. From here you typically have two options:

I. What Git expects you to do is to open the mutant file in a text editor and manually resolve the conflicts, which it has highlighted for you, line by line. If the file in question is a normal, human-readable file that can be opened in a text editor and made sense of (e.g. .txt or .py) then this is the way to go. It's actually quite painless, and the official GitHub documentation has an excellent guide to walk you through this process here.

II. If the file in question is something messier, like (you guessed it) a Jupyter Notebook, then opening the mutant file in a text editor isn't going to be very helpful – if you don't believe me give it a try and you'll see what I mean. Typically, the easiest thing to do here is to pick one version of the file and tell Git to keep all of the changes from that version:

i. To keep all of the changes from remote do

```
git checkout --theirs <filename>
```

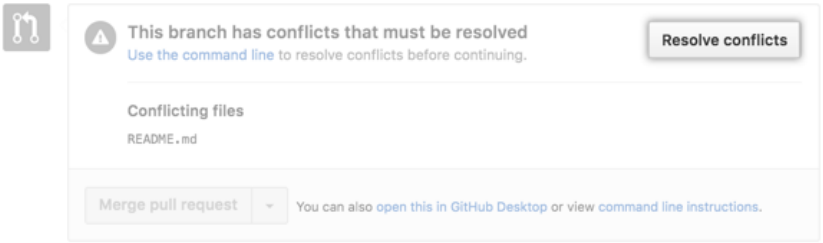
ii. To keep all of your local changes do

```
git checkout --ours <filename>
```

NOTE: Third party tools do exist that allow you to merge Notebook conflicts just like you would any other file, but I've never used them and so I can't offer an informed opinion. For what it's worth nbdime looks pretty cool.

2. *SYNCING A FORK FROM THE GITHUB UI*

The GitHub UI gives you a nice way to sync your fork with the upstream repo directly from a browser (see Step 4 on Page 3 of this guide). Unfortunately, the convenience of this approach disappears as soon as merge conflicts show up. If merge conflicts are found, you'll see this message:



From here there are two possibilities for how to proceed:

a. If the file(s) in question are human-readable and capable of being opened in a text editor (e.g. .txt, .py, .md), GitHub will allow you to resolve the conflicts directly in the browser. Please see the official GitHub docs here for a step-by-step guide to completing this process.

b. If the "Resolve conflicts" button is deactivated, then GitHub has determined that your conflicts are too complex to be resolved in the browser. You'll have to use the command line instead. Refer to the official GitHub docs here for a step-by-step guide for syncing your local fork with an upstream repository. When you encounter the merge conflicts (and you will) refer to Section 1 of Appendix A above for how to resolve them.