

## Workshop V

# Version Control with Git CLI

## **SECTION I**

# **Prerequisites and Background**

# Prerequisites

- GitHub Account
  - <https://github.com/join>
- Git
  - <https://git-scm.com/book/en/v2/Getting-Started-Installing-Git>
  - Make sure `git --help` works
- Text Editor
  - Vim, VSCode, etc...
  - I will be using Vim on the Git Bash on the Windows Operating System



# GitHub vs Git

- **GitHub** is where your code is stored online
- **Git** tracks changes to your code
- An analogy with Google Drive
  - **GitHub** is like **Google Drive**
  - Your **code and files** are individual **Google Docs**
  - **Git** is the **saving and version history functionality** of Google Docs



## SECTION II

# CLI and Cloning

# The “CLI”

- **CLI** stands for the **Command Line Interface**
  - Aka the **terminal**
- Enables you to run commands on your computer

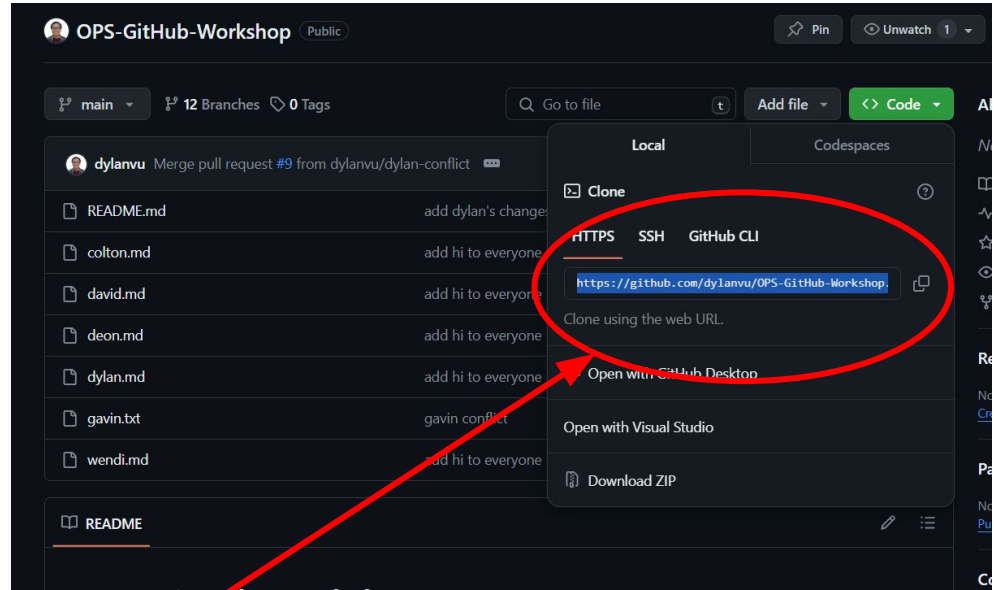


# Commands and Terminology

- A **directory** is a location in the computer where files are located
- **cd** is the command to change directory
- **ls** lists all files and directories at a location
- **mkdir** creates a folder
- A **repository** is where your code as well as its history is stored
  - Can have a local (on your computer) or remote (online on GitHub) repository

# Cloning

- **Cloning** is copying code from GitHub onto your computer
  - We call this creating a **local** copy
- The code is copied from a **repository**
- Done using the git clone command
  - Ex: `git clone https://github.com/dylanvu/OPS-GitHub-Workshop.git`
  - You'll make making your own repo next!



Example: Obtain the URL to clone your repository



# Follow Along

Create a repository and clone it!

1. Create a new repository on GitHub with a README.md
2. Open up the Git Bash CLI
3. Clone the repository
4. cd into the repository

# Adding Git to Existing Repositories

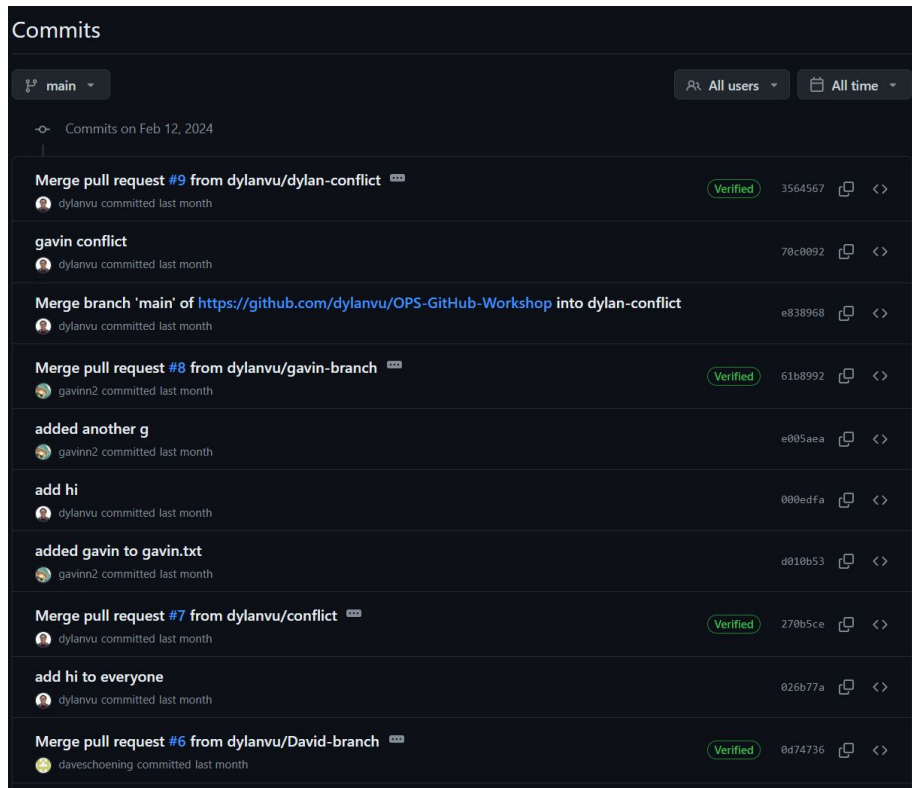
- Done using the `git init` command
- Once git is initialized, you can put it on GitHub

## SECTION III

# Git Workflow: Overview

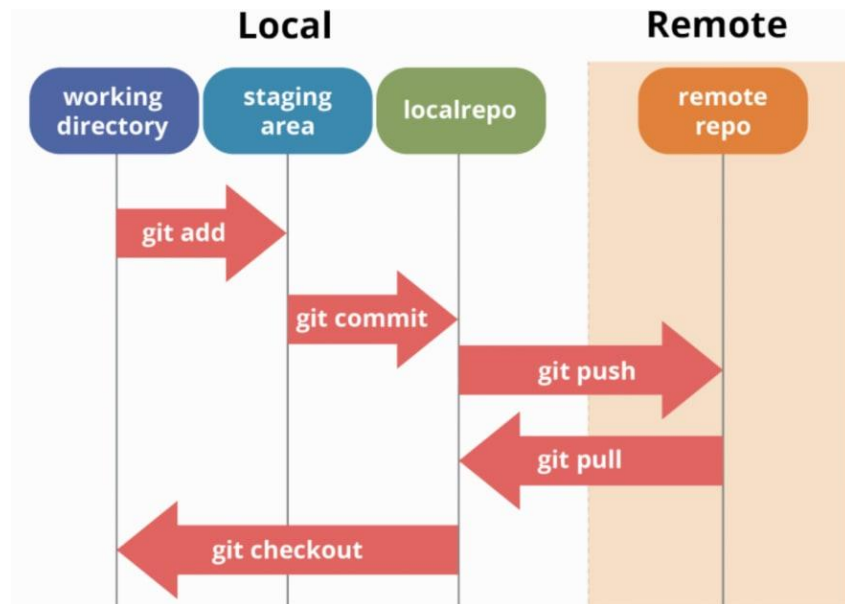
# How Git Remembers

- Git tracks what has changed between the current version and the last **commit**
  - A commit is like a **checkpoint**: you can go back to it
- A commit is identified by its **SHA**: a unique 40-character hexadecimal string



# The Git Workflow

- There are several steps to “save” your code changes
  - Add:** Tell git what files you want to save
    - `git add <files>`
  - Commit:** Create the checkpoint
    - `git commit -m “your commit message”`
  - Push:** Put the code on GitHub
    - `git push origin <branch>`



**Any Questions?**

## SECTION IV

# Git Commands

# Git Status

- Git status tells you the state of the repository
  - What files have changed
  - What files have been added
  - What files are not being tracked
  - What branch you are on
  - Etc...

```
Dylan@Dylan-ASUS-Laptop MINGW64 ~/VSCode/ops/OPS-GitHub-Workshop (main)
$ git status
On branch main
Your branch is behind 'origin/main' by 3 commits, and can be fast-forwarded.
(use "git pull" to update your local branch)

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.md

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

Dylan@Dylan-ASUS-Laptop MINGW64 ~/VSCode/ops/OPS-GitHub-Workshop (main)
$ |
```



# Git Add

- Git needs to be told what files to save
  - This is done through the `git add` command
- Without adding, you cannot save your files!
- Use `git status` to check what files have been added or not

```
Dylan@Dylan-ASUS-Laptop MINGW64 ~/VSCode/ops/OPS-GitHub-Workshop (main)
$ git status
On branch main
Your branch is behind 'origin/main' by 3 commits, and can be fast-forwarded.
(use "git pull" to update your local branch)

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.md

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



```
Dylan@Dylan-ASUS-Laptop MINGW64 ~/VSCode/ops/OPS-GitHub-Workshop (main)
$ git status
On branch main
Your branch is up to date with 'origin/main'.

Changes to be committed:
  (use "git restore --staged <file>..." to unstage)
        modified:   README.md

Dylan@Dylan-ASUS-Laptop MINGW64 ~/VSCode/ops/OPS-GitHub-Workshop (main)
$ |
```

# Git Commit

- Git needs to explicitly know when to make a commit
- `git commit -m "your message here"`
- Every commit needs a message
  - Specified in the command with a `-m` flag
  - Without a `-m` brings up an editor (usually in vim) to create a message

```
Dylan@Dylan-ASUS-Laptop MINGW64 ~/VSCode/ops/OPS-GitHub-Workshop (main)
$ git status
On branch main
Your branch is up to date with 'origin/main'.

Changes to be committed:
  (use "git restore --staged <file>..." to unstage)
        modified:   README.md

Dylan@Dylan-ASUS-Laptop MINGW64 ~/VSCode/ops/OPS-GitHub-Workshop (main)
$ git commit -m "update readme with to demonstrate committing"
[main c7c1a0a] update readme with to demonstrate committing
1 file changed, 3 insertions(+), 1 deletion(-)

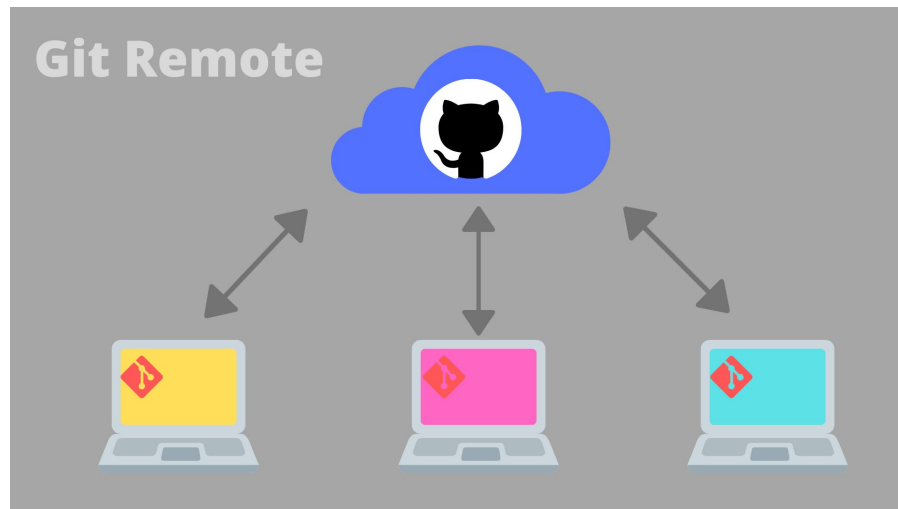
Dylan@Dylan-ASUS-Laptop MINGW64 ~/VSCode/ops/OPS-GitHub-Workshop (main)
$ git status
On branch main
Your branch is ahead of 'origin/main' by 1 commit.
  (use "git push" to publish your local commits)

nothing to commit, working tree clean

Dylan@Dylan-ASUS-Laptop MINGW64 ~/VSCode/ops/OPS-GitHub-Workshop (main)
$
```

# Git Push

- The code on your computer is all **locally saved**
- Use git push to “push” your code to GitHub
  - We call GitHub the **remote**
    - The **remote** is where versions of your project live on the internet or network somewhere
  - Useful for other teammates to view and obtain code change



**Any Questions?**

# Follow Along

Let's go through the Git workflow!

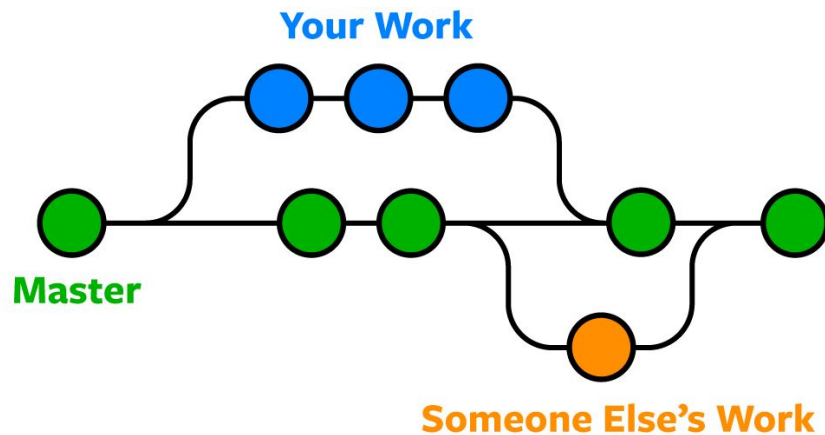
1. Create any change to the README.md file
2. Add, commit, and push the change
3. View the change on GitHub!

## **SECTION V**

# **Branches and Merging**

# Branches

- **Branches** are named pointers/copies to a specific commit
  - Modifying it is like working in a parallel world
- Typically holds one specific feature or fix
- Important
  - If something happens, you can delete/purge a branch without affecting other versions/parts of the codebase



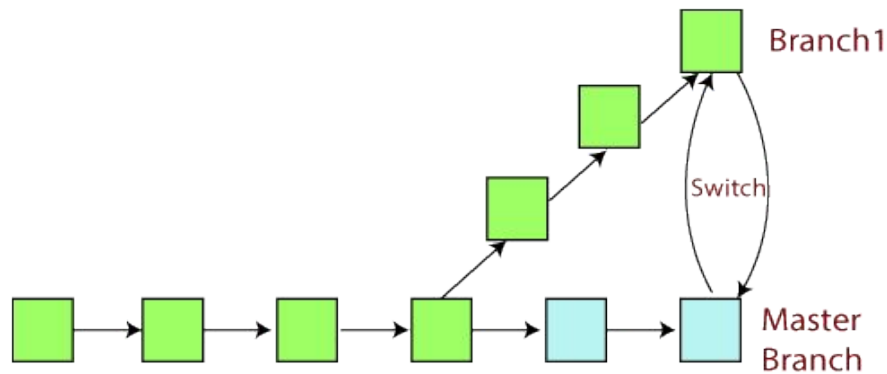
# Main/Master Branch

- Most repositories have a **main** or **master** branch
  - We call this the **default branch**
- All code is descended from the default branch
  - Breaking the default branch essentially breaks all branches
- The code on the default branch generally is what is in **production**
  - What other users will see



# Git Checkout

- Used to create new branches and/or swap to another branch
- `git checkout -b <new-branch-name>` to create a new branch
- `git checkout <existing-branch>` to switch to a new branch
- Check which branch you are on using `git status`



Git Checkout

# Follow Along

Let's go through Git branches!

1. Create a branch using the Git CLI named `branch-demo`
2. Create a change to the `README.md`
3. Push to the branch
4. View the new branch in GitHub!

# Merging

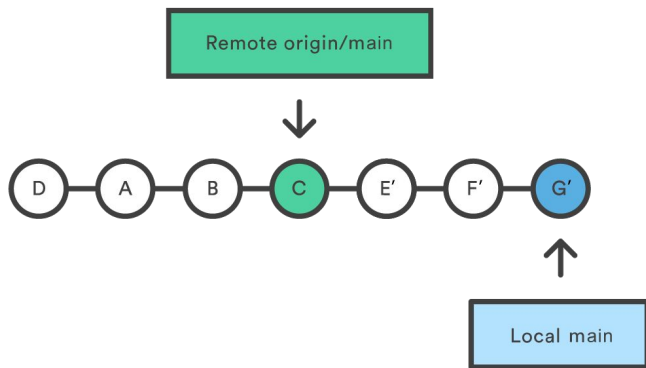
- Combines code together
- Command: `git merge <branch-name>`
- Example:
  - You write a function in a file, and your teammate writes a function
- Does not delete any branches!

# Deleting a Branch

- Delete it locally
  - `git branch -d <branch_name>`
- Delete it on remote
  - `git push origin -d <branch_name>`

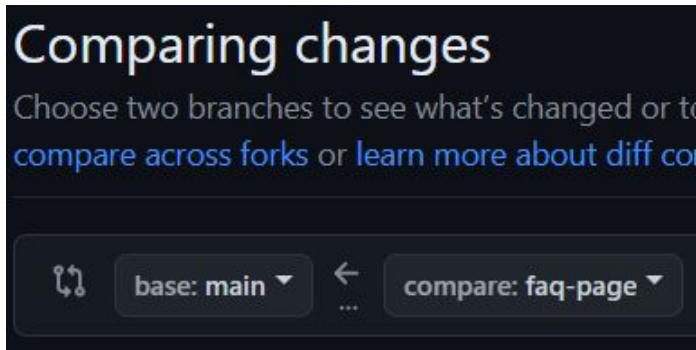
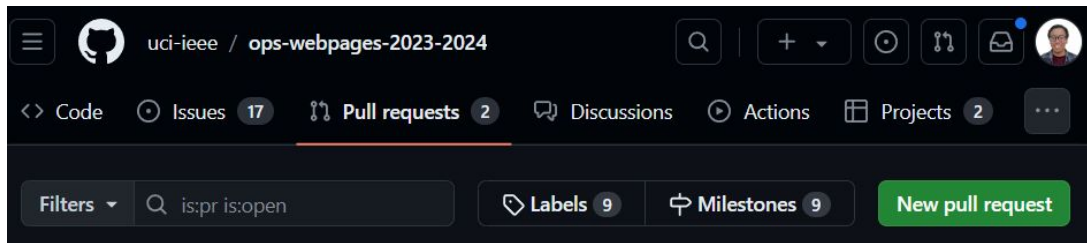
# Pulling

- Gets the latest code from GitHub and then combines it with your current code
- Command: `git pull origin <branch-name>`
- You must get the latest version on GitHub (pull) before you push



# Working with a Team: Pull Requests

- Git merge enables you to merge code to other branches without any reviews or restrictions
  - Putting bad, unreviewed code into main can be dangerous
  - The process of obtaining permission and awaiting code review is done through a **pull request**
  - Done through the GitHub website
  - The base is where the code will go into, and compare is where the code is coming from



**Any Questions?**

# Follow Along

Let's merge your code from  
**your** `branch-demo` **branch**  
into **main**!

1. Checkout to the main branch
2. `git merge branch-demo`
3. Push to remote and view the change on GitHub!

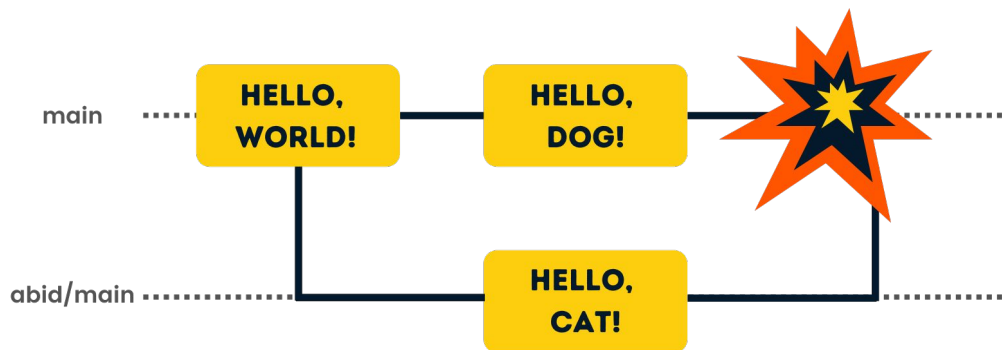


## SECTION VI

# Merge Conflicts

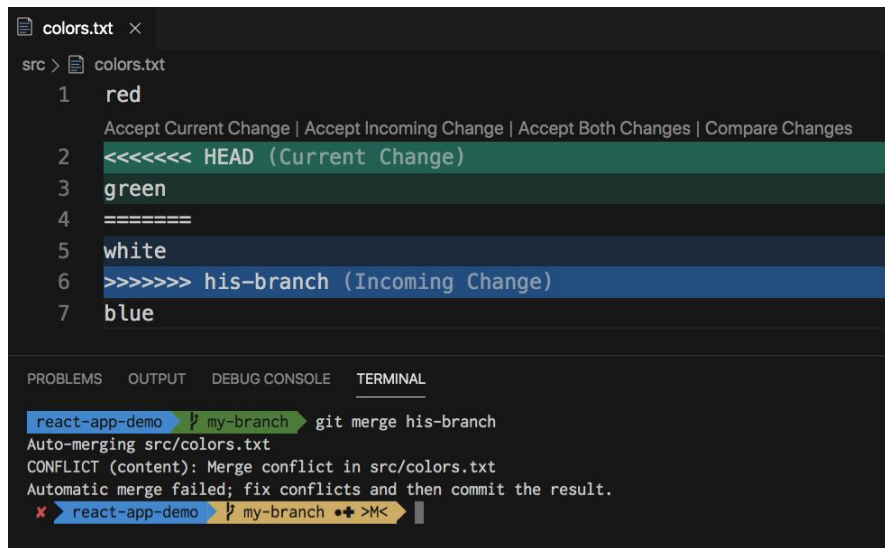
# Working in a Team

- Git is super useful for working in a team
  - Other people can modify the same file, and Git tries to merge it all together
- What happens if two people modify the same line of code at the same time?
- We get a **merge conflict**



# Merge Conflicts - Part 1

- Caused by simultaneous changes by two people
  - Same line of code modified
  - A file deleted while someone edited it
- Typically, conflicts are resolved by the one who triggers the conflict in the code
  - If conflict is too complex, both owners of the code are involved and resolve the conflict **together**.



```
colors.txt x
src > colors.txt
1 red
   Accept Current Change | Accept Incoming Change | Accept Both Changes | Compare Changes
2 <<<<<< HEAD (Current Change)
3 green
4 =====
5 white
6 >>>>>> his-branch (Incoming Change)
7 blue

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
react-app-demo my-branch git merge his-branch
Auto-merging src/colors.txt
CONFLICT (content): Merge conflict in src/colors.txt
Automatic merge failed; fix conflicts and then commit the result.
x react-app-demo my-branch >M<
```

A merge conflict on VSCode

# Merge Conflicts - Part 2

- Identified when you merge or pull code through a bunch of arrows
- After resolving the conflict, must add and commit again

```
# ops-dry-run
<<<<<<< HEAD
hello ops! main
=====
hello ops! conflict
>>>>>>> merge-conflict

branch-demo
~
~
~
~
~
~
~
~
~
~
```

A merge conflict on VIM

**Any Questions?**

# Follow Along

Let's create + resolve a merge conflict!

1. Create a new branch called merge-conflict
2. Modify a line in the README.md, commit, and push it
3. Checkout to main
4. Make an edit to the same line modified in step 2
5. Merge merge-conflict into main
6. Resolve the merge conflict through vim

## **SECTION VII**

# **Reverting Changes**

# Reverting a Commit

- Undoes the changes associated with a specific commit through another commit
- Example:
  - Say you create a commit A, then make 2 more commits (commit B and C) after
  - To revert to commit A, grab the SHA
  - `git revert <SHA>`
    - This reverts the changes associated with commit A only, and not commit B and C



# Reverting Multiple Commits

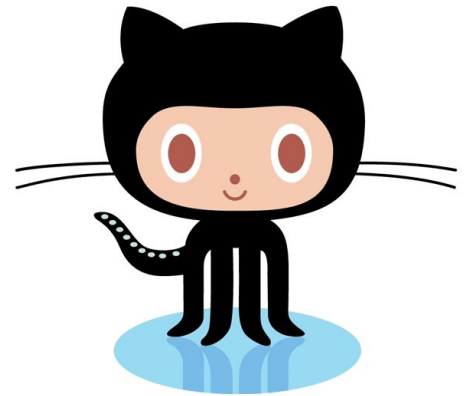
- What if you wanted to revert many commits?
- Example
  - $A \rightarrow B \rightarrow C$ , and you wanted to revert the commits from the current from C and B
- Many ways: [Stack Overflow post here](#)
  - Each method is not equivalent and varies in amount of work
    - Some don't work for merge conflict
    - Some don't work for new files created
  - Suggestion: git reset method

# Follow Along

Let's create a commit and  
revert it!

1. Modify a file
2. Commit and push it
3. Obtain the SHA and revert the change

# Any Final Questions?



# Becoming a Git Wizard

If we had more time...

- Educational Cheat Sheet:  
<https://education.github.com/git-cheat-sheet-education.pdf>
- Useful Additional Topics and Commands
  - .gitignore
  - Unstaging
  - Rebase
  - Stashing
  - Forcing your way through Git & permanently altering history
  - Git large file storage (LFS)

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