Gitting Good at GitHub

An interactive introduction to working with Git and GitHub

Alex Antonison

Agenda

- Module 1 - Introduction to Version Control and Git
- Module 2 - Basic Git Operations
- Module 3 - Branching and Merging
- Module 4 - Collaboration on GitHub
- Module 5 - Simulated Project
- Module 6 - Advanced Git and GitHub Features

Module 1 - Introduction to Version Control and Git

- What is Version Control
  - What are the benefits of Version Control?
- What is Git
  - Key Git Concepts
- What is GitHub
  - Setting up Git with GitHub

What is Version Control?

- Version control is a tool that allows you to track changes to files over time.
- This is most effective when working with text files but also works with other files.

What are the benefits of Version Control?

- **Track Changes.** You can see who changed what to files over time.
- **File History.** Ability to revert back to previous versions of a file.
- **Collaboration.** Supports collaborating in files.

What is Git?

- Git is a distributed version control system used to track changes.
- Changes are tracked locally on your computer and then synchronized with a remote repository (like GitHub).
- Each change is saved as a snapshot, not just differences.
- Enables offline work and syncing changes when you're ready.

Key Git Concepts

- **Repository (repo).** A directory where Git stores the history of your project.
- **Commit.** A snapshot of your changes, along with a message describing what was done.
- **Branch.** A branch lets you work on changes separately from the main code.
- **Merge.** Combines commits from one branch into another.
- **Tracks Files.** Git tracks files and their file paths, not directories.

What is GitHub?

- An online platform to store, manage, and track changes to code using Git.
- A **communication** platform.
- Has features like GitHub Actions for running and deploying code.
- Supports blogs via GitHub Pages
- Productivity tools like Issue tracking, project management, and a wiki.

Setting up Git with GitHub

- Install GitHub Desktop at https://github.com/apps/desktop
- Authenticate with GitHub.
- Let's git started!

Module 2 - Basic Git Operations

- Getting started working with Repositories
- Ignoring Files
- Staging and Committing Changes
- When to Commit
- Undoing Changes
- Removing Files

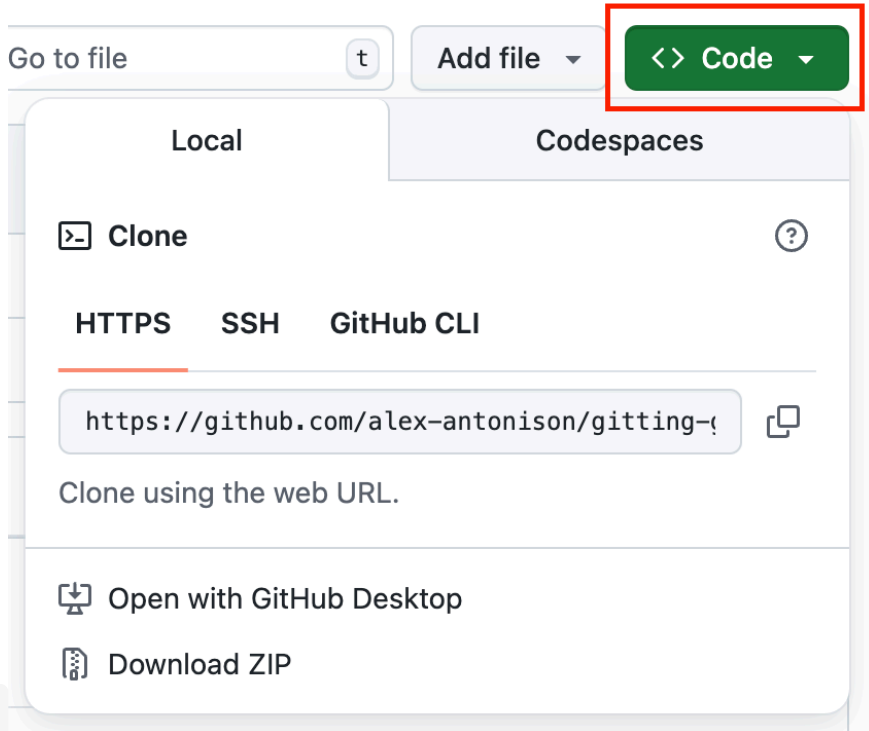
Getting started working with Repositories

1. Creating a repository
2. Forking a repository

github.com/alex-antonison/gitting-good-at-github

Once a repository has been created or forked, you can then clone a repository with

```
git clone {repository link}
```



Ignoring Files

- A `.gitignore` file is used to ignore files that you do not want to manage in source control. Some examples are:
  - Files containing secrets (passwords, API keys, etc.)
  - Locally installed package files like `.venv/`
  - Large data files (aka 2 GB csv files)

Ignoring Files (Activity)

1. Create a directory `new_folder`
2. Create a file `new_file.txt` in the `new_folder` directory.
3. Add `new_folder/` to the `.gitignore` file in the root project.
4. To the root project, add a file called `new_file.csv`
5. Add `*.csv` to the `.gitignore` file.

Staging and Committing Changes

- You can either add all files with `git add -A` or `git add path/to/filename`
  - Tools like GitHub Desktop and VS Code's Source Control Panel are helpful to see all files
- Once a file is staged, you can then `commit` the changes with
  - `git commit -m"{insert message here}"`
- To commit all tracked files that have been modified, you can use the `-a` argument:
  - `git commit -am"{insert message here}"`

Committing Changes (Activity)

1. Make changes to the `existing_file.txt`
2. Create a file in `exercises` directory called `new_file.txt` and add text to it
3. `git commit -am "{insert your descriptive message here}"`
4. `git status`
5. `git add exercises/new_file.txt`
6. `git status`
7. `git commit -m "{insert your descriptive message here}"`
8. Check **Commit History.** You can use `git log` but GitHub Desktop or VS Code is easier

When to Commit?

- When do you commit?
  - Committing too often leads to noisy commits
  - Committing too infrequently makes it hard to find changes
- *The best time to commit is when you have completed a "thought"*
  - This could be when you finish a function, update some business logic, etc.

Undoing Changes

- `git reset HEAD~1`
  - This simply undoes the last commit with files intact
- `git checkout origin/main path/to/filename`
  - This will reset the file to what is in the main branch

Undoing Changes (Activity)

1. To undo your last commit, run `git reset HEAD~1`

You can explore other ways of changing history, but suggest using GitHub Desktop.

- git commit --amend
- git revert

Removing Files

- In the event a file gets added that you want to remove, you can use the `git rm` command:
- If you want to completely remove the file, you can do:
  - `git rm path/to/file`
- If you want to just stop tracking it in source control you can do:
  - `git rm --cached path/to/filename`
  - Add the file to your `.gitignore`
- If you want to remove an entire directory:
  - `git rm -r path/to/directory`
- Last, you need to commit the removal change using `git commit`

Removing Files (Activity)

1. Remove `new_folder` from `.gitignore`
2. Stage the `new_folder/new_file.txt` file.
3. Commit the `new_folder/new_file.txt` file.
4. Remove the whole folder `git rm -r new_folder/`
5. Commit the removal `git commit -m"Remove new_folder"`

Removing Files (Activity Part 2)

1. Add a `.secrets` folder to the project.
2. Add a `.env` file to the `.secrets` directory.
3. Add and commit the `.env` file.
4. Add `.secrets/` to the `.gitignore` file.
5. Remove the `.env` file from git cache
    1. `git rm --cache .secrets/.env`

Module 3 - Branching and Merging

- What are Branches
- Working with Branches
- Merging Branches
- Merge Conflicts

What are Branches?

- A branch lets you work on changes separately from the main code.
  - For individual projects, working in `main` is "okay"
  - It is a good habit to always work in branches
  - For team based projects, always need to work in branches

Working with Branches

- Create a branch and then checkout that branch:
  - Create a branch `git branch {insert-descriptive-branch-name}`
  - To checkout a `git checkout {insert-descriptive-branch-name}`
- Create and checkout a branch:
  - `git checkout -b {insert-descriptive-branch-name}`
- To delete a branch
  - `git checkout main`
  - `git branch -D {insert-descriptive-branch-name}`

Working with Branches (Activity)

1. Create a branch `git checkout -b my-new-branch`
2. Delete the branch:
    1. `git checkout main`
    2. `git branch -D my-new-branch`

Merging Branches

- To merge a branch locally, you do `git merge {insert-branch-name}`
- It is common to need to merge `main` into current branch because:
  - In your Pull Request, you have merge conflicts you need to address
  - Code has been merged into main that you need for your work
- To merge main into your current branch
  - `git checkout main` (swap to main)
  - `git pull` (update main branch)
  - `git checkout {insert-branch-name}` (swap back to your branch)
  - `git merge main` (merge main into your branch)

Merging Branches (Activity)

1. Create a branch `git branch add-feature`
2. Go back to main `git checkout main`
3. Commit a new file to main
4. Checkout `add-feature` branch
5. Merge main into `add-feature` branch
    1. `git merge main`

Merge Conflicts

- Occurs when changes in two branches **affect the same part of a file** and Git can't automatically decide which change to keep, requiring manual resolution.

```
<<<<<<< HEAD
This is the version from the main branch.
=======
This is the version from the test-sample-branch.
>>>>>>> test-sample-branch
```

Merge Conflict (Activity)

1. Checkout `add-feature` branch
2. Make a change to the first line in `exercises/existing_file.txt`
3. Commit that change
4. Checkout `main` branch
5. Make a different change to the first line in `exercises/existing_file.txt`
6. Commit that change
7. Checkout out the `add-feature` branch again
8. Run `git merge main`

Module 4 - Collaboration on GitHub

- Branching Strategies
- Creating Pull Requests
- Reviewing Pull Requests
- Merge Types

Branching Strategies

- **Git Flow.** A branching model that uses feature, develop, release, and hotfix branches to manage complex release cycles with multiple environments.
- **Trunk-Based Development.** A streamlined approach where developers work in short-lived branches to enable continuous integration and rapid delivery.

Creating Pull Requests

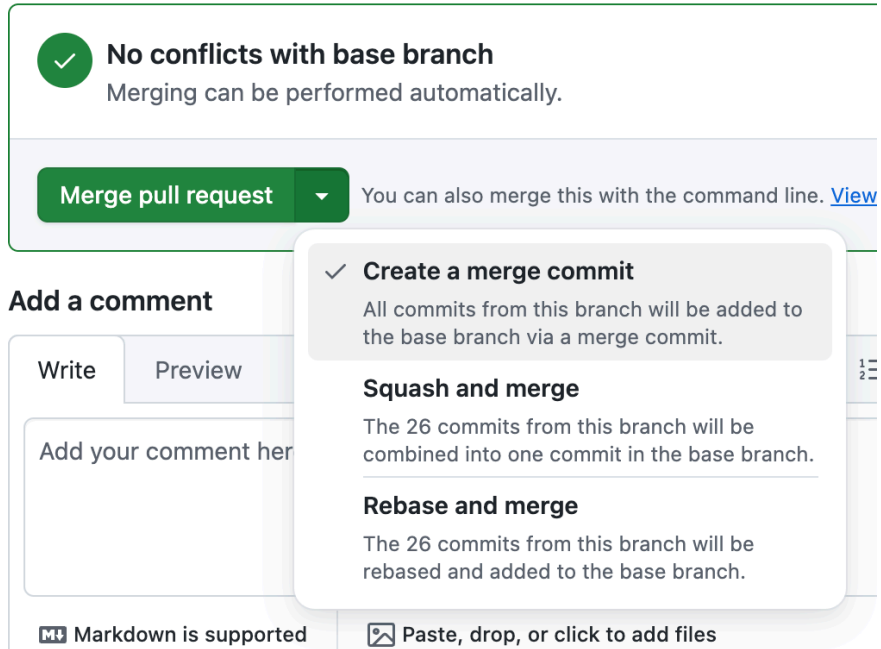
- To create a successful Pull Request, it should convey the following:
  - **Context.** Why are these changes being made to the code base?
  - **Description.** You should include a summary of the changes being made.
  - **Tests + Documentation.** You should include any required tests or documentation.
  - **Pull Request Template.** Streamlines organizing Pull Request descriptions.
  - **Draft Pull Request.** Create a "draft" pull request indicating a PR is still in progress.

Reviewing Pull Requests

- When reviewing a Pull Request, you can do a couple of things:
  - **In-line Code Comments.** Making in-line comments helps direct someone directly to a bit of code.
  - **Suggested Changes.** Add a suggested change to help improve a Pull Request.
  - **Pull Request Comments.** These can be helpful if there is a high level comment about a Pull Request.

Merge Types

- Merge
- Squash and merge (squerge)
- Rebase and merge



Module 5 - Simulated Project

TODO: Create repository with some tasks

Module 6 - Advanced Git and GitHub Features

- pre-commit
- GitHub Actions
- Rebasing

pre-commit

- pre-commit is a framework for managing and running automated Git hooks to catch and fix issues (like formatting, linting, or security checks) before code is committed, ensuring consistent code quality across teams.
- Some common pre-commit hooks are the following:
  - SQL - sqlfluff pre-commit
  - Python - ruff pre-commit
  - dbt Osmosis - docs pre-commit
  - git secrets checker

GitHub Actions

- GitHub Actions is a Continuous Integration/Continuous Deployment (CI/CD) automation tool built into GitHub that lets you automatically build, test, and deploy code based on events like pushes, pull requests, or schedule triggers.
- While GitHub Actions was built for CI/CD, it can also be used to run dbt projects as at its core, it is no different than running a serverless server. This can be done on a schedule or it can be done manually (via a workflow dispatch).

Git Rebasing

- Git Rebasing is a Git operation that moves or combines a sequence of commits to a new base commit, creating a cleaner, linear project history by integrating changes without merge commits.
- While git rebasing can create a cleaner history, it is also a destructive in that you are merging multiple commits together.
- You should avoid doing `git rebase` unless you are in a team environment where that is their standard approach.