

Git and GitHub (VCS)

Day 18 - Python Basics

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Agenda

Python Online Free Ramzan Course 2025
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1 Introduction to Version Control

2 Installing Git

3 Git Basics

4 Understanding Git Workflow

5 Branching

6 Remote Repos & Security

7 Advanced Git Commands

8 Best Practices

Introduction to Version Control

- What is version control?
- Why do developers need it?
- Advantages of using Git
 - **Version Control:** Tracks changes to code over time.
 - **Collaboration:** Facilitates teamwork and code sharing.
 - **Branching and Merging:** Enables parallel development and integration.
 - **Backup and Recovery:** Provides a safety net for lost work.
 - **History Tracking:** Allows review of past changes and debugging.
 - **Rollback Capability:** Easy to revert to previous versions.
 - **Open Source:** Free to use with a large community support.

Installing Git

- **Windows:**

- <https://git-scm.com/downloads/win>

- **MacOS**

- <https://git-scm.com/downloads/mac>

- **Debian/Ubuntu:**

- `sudo apt update && sudo apt install git`

- **Fedora:**

- `sudo dnf install git`

- **Verify Installation:**

- `git --version`

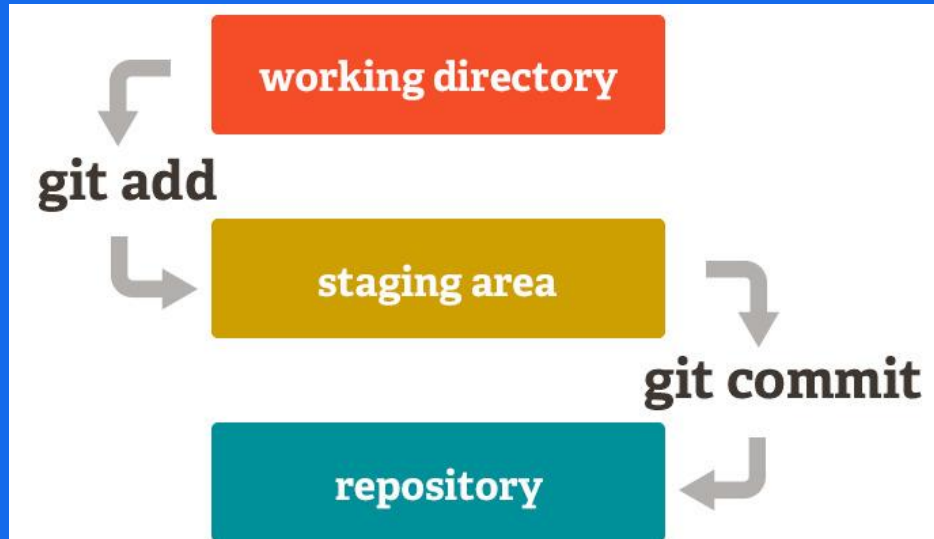
- **Configuring Git:**

- `git config --global user.name "Your Name"`

- `git config --global user.email "your.email@example.com"`

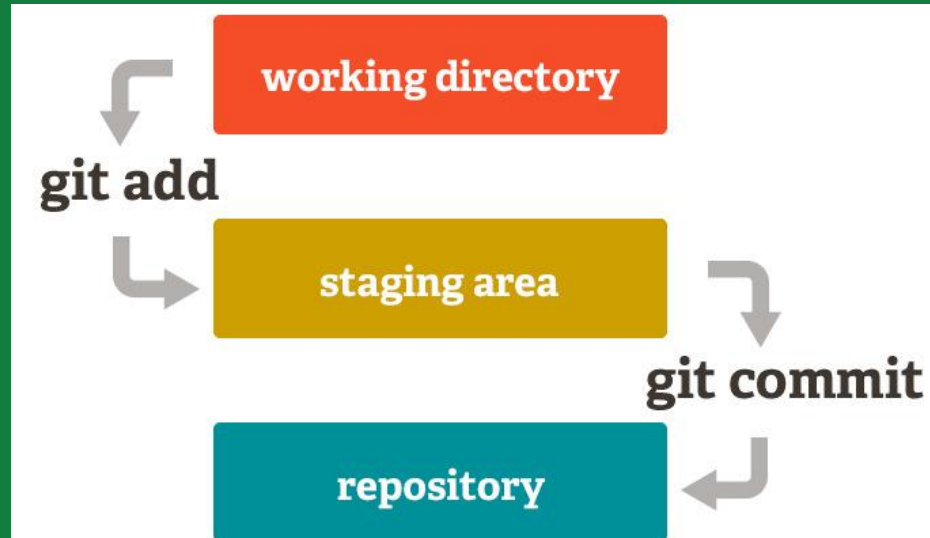
Git Basics

- Initializing a repository (`git init`)
- Checking repository status (`git status`)
- Adding files (`git add`)
- Committing changes (`git commit -m "message"`)
- Viewing commit history (`git log`)

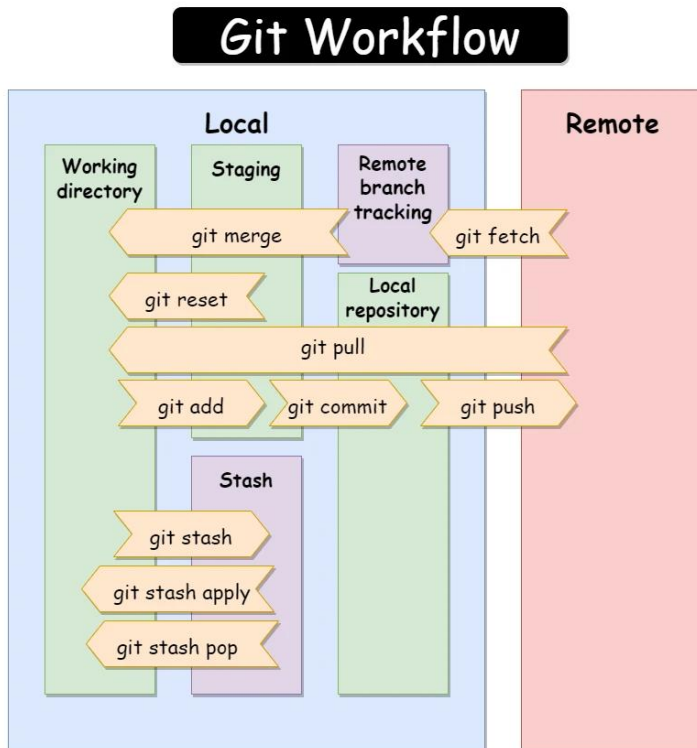


Understanding Git Workflow

- Working directory vs. Staging area vs. Repository
- How commits work.
- The role of `.git` folder



Workflow in Details



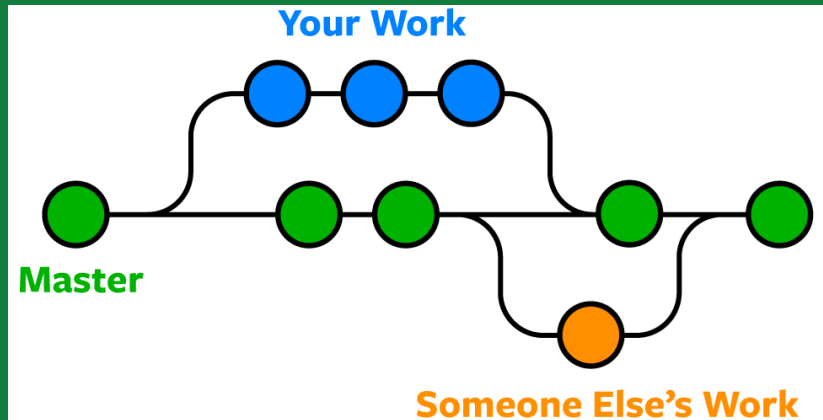
Branching in Git

- What are branches?

Creating a branch (`git branch feature-branch`)

Switching branches (`git checkout feature-branch` or `git switch feature-branch`)

Merging branches (`git merge`)



Remote Repositories & GitHub

- What is GitHub?
- Difference between Git and GitHub
- Creating a GitHub account
- Connecting a local repo to GitHub (`git remote add origin URL`)
- Checking remote origins (`git remote -v`)
- Pushing changes (`git push origin master`)

HTTPS with Personal Access Tokens (PAT)

- Why HTTPS authentication?
- Setting up a **Personal Access Token (PAT)**
- Using PAT for authentication:

```
git remote set-url origin  
https://<YOUR_USERNAME>:<YOUR_PAT>@github.com/<YOUR_USERNAME>  
/<YOUR_REPOSITORY>.git
```

- Security considerations for PAT
 - a. PAT can be accessed from .git/config
 - b. Limit Scopes
 - c. Use Credential Manager from git
 - d. Do not share PAT

SSH (Secure Shell) Authentication

- **Why use SSH over PAT?**

- **Generating SSH keys:**

```
ssh-keygen -t ed25519 -C "your_email@example.com" -f  
~/.ssh/id_github
```

- **Adding SSH key to GitHub:** `cat ~/.ssh/id_github.pub`

- **Add GitHub SSH Key:**

```
Host github.com  
  HostName github.com  
  User git  
  IdentityFile ~/.ssh/id_github
```

- **Testing SSH connection:** `ssh -T git@github.com`
- **Security advantages of SSH authentication**

Cloning & Forking

- Cloning a repository (`git clone URL`)
- Forking a repository
- Pulling latest changes (`git pull`)

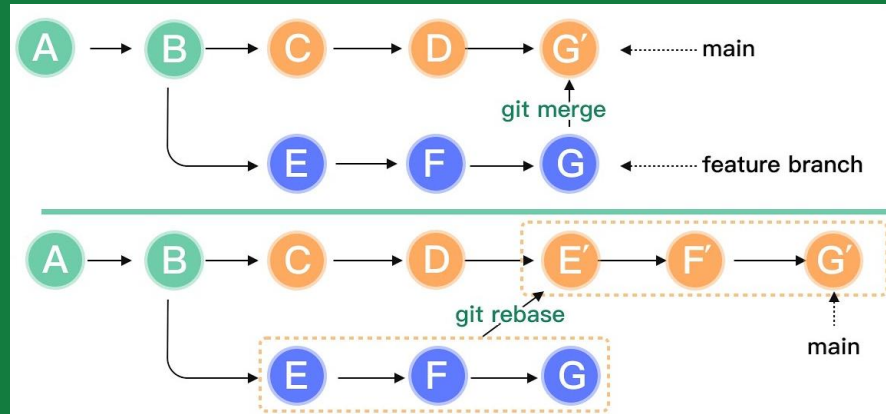
Handling Merge Conflicts

- What causes merge conflicts?
- Identifying conflicts (`git status` and `git diff`)
- Resolving conflicts manually
- Using `git merge --abort` and `git rebase --abort`
- Committing resolved conflicts
- Best practices for avoiding conflicts

Advanced Git Commands

- Stashing changes (`git stash`)
- Resetting changes (`git reset --hard` and `git reset --soft`)
- Reverting commits (`git revert`)
- Rebasing (`git rebase`)

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Best Practices in Git & GitHub

- Writing meaningful commit messages
- Using `.gitignore` effectively
- Keeping repositories clean
- Squashing commits before merging
- Security best practices

Q&A

- Do you have any questions?
- Share your thoughts.

Closing

Next class: Deployments of Python