

Mastering Git & GitHub: From Zero to Collaboration

A Comprehensive Hands-on Course

Abderrahman Bouanani && Houcine Gahboub

ENSAA

October 27, 2025

Course Overview

- Understand version control concepts
- Master Git commands and workflows
- Collaborate effectively using GitHub
- Handle real-world scenarios
- Learn best practices and troubleshooting

Course Structure

Learning Objectives

By the end of this session, you will be able to:

- Explain the importance of version control
- Set up and configure Git
- Create and manage repositories
- Track changes with commits



Why Version Control?

Scenario: The "One Small Change" Problem

- Your program is working perfectly.
- You change "just one little thing" ...
- Your program breaks.
- You try to change it back...
- **Your program is still broken!**

What is Version Control?

A system that records changes to files over time

Think of it as a **time machine** for your code!

Key Features

- **History:** See who changed what and when.
- **Backup:** Recover any previous version.
- **Collaboration:** Work with others seamlessly.

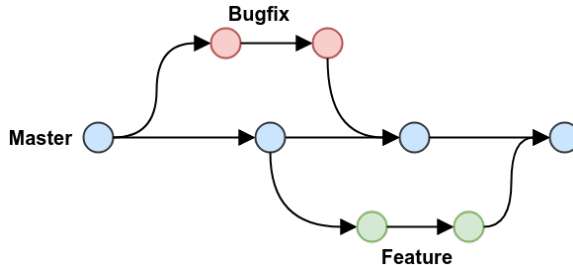
Analogy

Like "Track Changes" in a document, but supercharged for code.

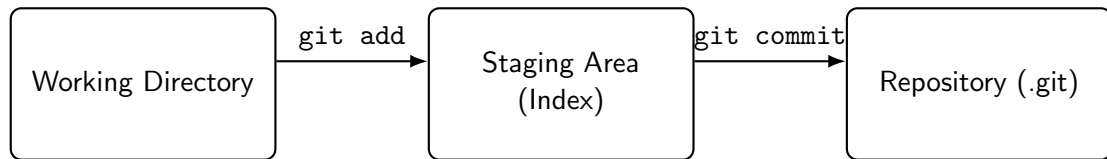
What is Git?

A distributed version control system

- Created by Linus Torvalds in 2005
- Initially developed for Linux kernel development
- Now the most widely used VCS in the world



Core Git Concepts: The Three Areas



- **Working Directory:** Files you actively modify.
- **Staging Area:** Draft of your next commit.
- **Repository:** Full history stored in .git.

Essential Git Commands

Basic Commands

`git init` Initialize a new repository
`git add` Stage changes for commit
`git commit` Save changes to the repository
`git log` View the commit history
`git status` Check the status of your files

Useful Options

`git status -s` Compact status view
`git log --oneline` Compact log view
`git commit -am` Add & commit in one step

Working with Branches

Scenario 2: The "Works on My Machine" Problem

- You want to add something new to your project,
- but you're afraid this small change might break everything,
- and you don't want to mess up the version that's already working well.
- **Branches to the rescue!**

Working with Branches

What are Branches?

Branches are independent lines of development. They let you work on features or fixes without affecting main.

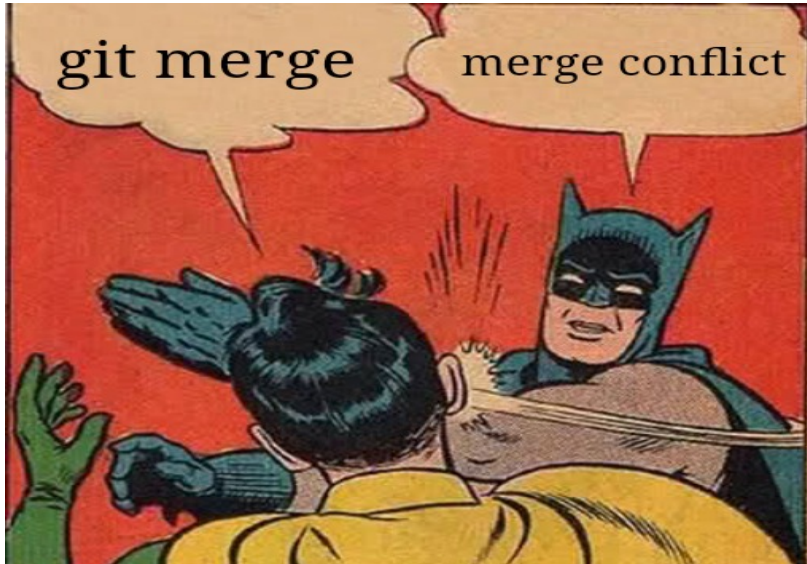
Branch Commands

```
git branch List all branches
git switch -c <name> Create a new
                    branch
git switch <name> Switch branches
git merge <name> Merge a branch
```

Branching Strategy

- **main**: Production code
- **develop**: Integration branch
- **feature/***: New features
- **hotfix/***: Urgent fixes

Merge Conflicts



How to Resolve Merge Conflicts

What is a Merge Conflict?

Happens when Git cannot automatically merge because two branches edit the **same line** or one deletes a file the other modified.

Step-by-Step Resolution

- 1 Open the conflicted file(s)
- 2 Look for conflict markers:
 - ▶ <<<<<< HEAD (your changes)
 - ▶ =====
 - ▶ >>>>>> branch-name (their changes)
- 3 Edit code to keep desired changes & remove markers
- 4 Save the file
- 5 Stage the resolved file: `git add <file>`

Example in a File

```
1  /* style.css */
2  .title {
3  <<<<<< HEAD
4      color: blue;
5  =====
6      color: red;
7  >>>>>> feature-new-color
8  }
```

Key Takeaways

What We've Learned

- Version control is essential for tracking changes
- Git provides a powerful way to manage project history
- Basic workflow: modify → stage → commit

End of Session 1

Next: Session 2 — Collaboration on GitHub

Session 2 Begins

Collaboration on GitHub

Session 2: What You'll Learn

GitHub Basics

- Creating repositories
- Pushing code
- Basic collaboration

[Space for GitHub screenshot]

Introduction to GitHub

What is GitHub?

- A cloud platform for hosting Git repositories
- A hub for developer collaboration
- The world's largest open-source community
- A professional portfolio for your work

Key Features

- Code hosting & version control
- Issue tracking
- Pull Requests
- GitHub Actions (CI/CD)
- GitHub Pages

The Git + GitHub Workflow

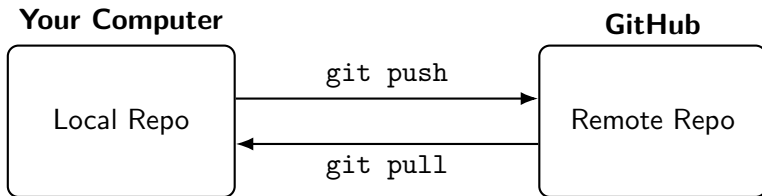
Essential Remote Commands

`git clone <url>` Download a repo from GitHub

`git push` Upload committed changes

`git pull` Download & merge changes

`git remote add origin <url>` Connect local repo to GitHub



Golden Rule

Always `git pull` before `git push` to avoid unnecessary conflicts!

Code Reviews

Reviewing Code: What to Look For

- Bugs and edge cases
- Adherence to code style
- Opportunities for improvement
- Presence of tests
- Clear documentation

Giving Good Feedback

- Be constructive and kind
- Explain the 'why' behind suggestions
- Ask questions instead of making demands
- Offer help if needed

Pull Requests (PRs)

What is a Pull Request?

A way to propose and discuss changes before merging them into the main project. PRs are the heart of collaboration on GitHub.

The PR Workflow

- 1 Push your feature branch to GitHub
- 2 Click "New Pull Request" on GitHub
- 3 Describe your changes clearly
- 4 Request reviews from teammates
- 5 Discuss, make more changes if needed
- 6 Merge!

End of Session 2

Next: Session 3 — Common Git Problems

Session 3 Begins

Common Git Problems

Common Git Problems & Fixes

"I committed to the wrong branch!"

- **Scenario:** Accidentally committed on 'main' instead of your feature branch
- **Fix:**
 - 1 Create the correct branch: `git branch feature-branch`
 - 2 Reset main back one commit: `git reset HEAD~ --hard`
 - 3 Switch to your branch: `git checkout feature-branch`
 - 4 Commit is now safely on the correct branch

"I need to undo my last commit!"

- Keep changes but undo commit: `git reset HEAD~`
- Permanently delete last commit: `git reset HEAD~ --hard` (caution!)

Conclusion & Next Steps

What You've Learned

- Git fundamentals & version control
- Using branches for parallel development
- Collaborating on GitHub via Pull Requests
- Handling merge conflicts & common issues

Your Journey Forward

- Practice Git commands daily
- Start a personal project on GitHub
- Contribute to open-source projects

Thank You!

Questions or feedback?