**📘 Git and GitHub: A Complete Guide**

**🔹 What is Git?**

**Git** is a free and open-source **distributed version control system**. It helps developers track changes in their source code during software development. Git allows multiple developers to work on the same project simultaneously without interfering with each other's work.

**Key Features of Git:**

* Tracks changes in files over time
* Supports **branching and merging**, which allows developers to work on different features independently
* Enables **rollback** to previous versions
* Fully distributed: every developer has a full copy of the repository

**🔹 How to Install Git**

**🖥️ On Windows:**

1. Visit <https://git-scm.com/>
2. Click on “Download for Windows”.
3. Run the installer and choose the default options (unless you know what you're doing).
4. After installation, open **Git Bash** from the start menu.

**✅ Check Installation:**

Run the following command to check if Git is installed correctly:

git –version

**🔹 Why Git?**

* 🕒 **Version History**: Keeps track of every change made to your codebase.
* 👥 **Collaboration**: Allows multiple developers to work together efficiently.
* 🧪 **Experiment Safely**: You can create branches and experiment without affecting the main codebase.
* 🔄 **Backup**: Since it’s distributed, every user has a full copy of the project.
* ⏪ **Undo Mistakes**: You can easily go back to a previous state if something goes wrong.

**🔹 What is GitHub?**

**GitHub** is a **cloud-based platform** that uses Git for **version control** and provides a **web interface** for hosting and managing Git repositories. Think of Git as the engine, and GitHub as the garage where you store and work on your car with others.

**What GitHub Offers:**

* Remote storage for Git repositories
* Easy collaboration with teams
* Pull requests, issues, and project tracking
* Code review tools
* Integration with CI/CD pipelines

**🔹 Git vs GitHub**

|  |  |  |
| --- | --- | --- |
| **Feature** | **Git** | **GitHub** |
| Type | Version Control System | Hosting platform for Git projects |
| Function | Tracks changes in code | Hosts code repositories online |
| Installation | Installed locally | Accessed via web browser |
| Collaboration | Via manual commands | Built-in collaboration tools |
| Internet Needed | No (works offline) | Yes (for syncing repositories) |

In simple terms:

* **Git** = tool used on your machine
* **GitHub** = online platform to share Git repositories

**🔹 How to Use GitHub**

**Step 1: Create a GitHub Account**

Go to <https://github.com> and sign up.

**Step 2: Create a Repository**

* Click on **New** repository
* Give it a name, description (optional), and choose public/private
* Initialize with README (optional)

**Step 3: Clone the Repository**

Copy the repository URL and run:

**🔹 Push Code to GitHub**

**Step-by-Step:**

1. After editing or adding files, run:

git add .

1. After editing or adding files, run:

git commit -m "Add feature or fix bug"

1. F inally, push your changes to GitHub:

git push origin main

**🔹 Collaborators**

You can **add collaborators** to a GitHub repo so others can contribute.

**How to Add:**

1. Go to your repository on GitHub.
2. Click on **Settings** > **Collaborators**.
3. Invite by username or email.

Collaborators can clone, push, pull, and make pull requests (depending on their permissions).

**🔹 Pull Request (PR)**

A **Pull Request** is a way to propose changes to a repository without directly pushing to the main branch.

**Workflow:**

1. A developer forks or clones the repository.
2. They create a **new branch** and make changes.
3. They **push** the branch to GitHub.
4. Then, they open a **Pull Request**:
   * GitHub shows the changes (diff)
   * Other team members can **review**, **discuss**, and **approve**
5. Once approved, the PR is **merged** into the main branch.

**Why PRs are important:**

* Code review
* Testing before merging
* Better collaboration and transparency

Useful Links

Git and GitHub Cheat Sheet: https://education.github.com/git-cheat-sheet-education.pdf