

Introduction to Git and GitHub

Model-Based Decisions — Week 1 Practical

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Motivation: Why Version Control?

- Research and code evolve — we need a record of changes over time.
- Collaboration: work safely with others without overwriting each other's files.
- Reproducibility: recover previous versions and ensure results can be traced.
- Backup: your work is stored remotely (e.g., on GitHub) as well as locally.

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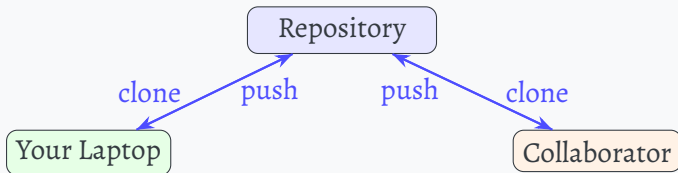
- Research and code evolve — we need a record of changes over time.
- Collaboration: work safely with others without overwriting each other's files.
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Without version control

final_report_v2_fixed_final_FINAL.docx

What is Git?

- **Git** is a distributed version control system.
- It records snapshots (“commits”) of your project over time.
- Every developer has a complete copy of the repository — no central lock-in.



Key Concepts or Terms

<i>Repository (repo)</i>	A project folder tracked by Git.
<i>Commit</i>	A snapshot of your project at a specific point in time.
<i>Branch</i>	A line of development (default is <code>main</code>).
<i>Remote</i>	A copy of the repo hosted elsewhere (e.g., GitHub).
<i>Clone / Push / Pull</i>	Commands to sync local and remote copies.

Creating and Initializing a Repository

Step 1: Create a new folder for your project

```
mkdir my_project  
cd my_project
```

Step 2: Initialize Git

```
git init
```

This creates a hidden folder `.git/` that stores all version history.

Step 3: Check status

```
git status
```

This creates a repository **locally**, on your machine only.

Tracking and Committing Changes

```
git add my_notebook.ipynb  
git commit -m "Initial commit: added notebook"
```

- `git add`: This adds the file `my_notebook.ipynb` to the staging area. The staging area is where you put changes and new files that you want to include in the next commit.
- `git commit`: permanently records the snapshot with a message specified after `-m`. This message should describe the changes made in this commit.

Good commit messages:

- “Added visualization for cellular automaton”
- “Fixed bug in update rule”

Connecting to GitHub

1. Create a free account at github.com.
2. On GitHub: “New Repository” → copy the HTTPS link.
3. In your terminal:

```
git remote add origin https://github.com/username/my_project.git  
git branch -M main  
git push -u origin main
```

4. You can now push updates with:

```
git push
```


The Basic Git Workflow



In short

Edit → Add → Commit → Push

Getting Updates from GitHub

If others have updated the remote repository (i.e., on GitHub), use:

```
git pull
```

This downloads and merges changes from the remote repository.

- Always `pull` before starting new work.
- Resolve any merge conflicts carefully — Git will mark conflicting lines.

Graphical Interfaces (Optional)

You do *not* need to use Git only via terminal — several excellent GUI tools exist:

- **GitHub Desktop** — free, simple interface for beginners <https://desktop.github.com>
- **VS Code** — built-in Git integration (source control tab).
- **Sourcetree** — Atlassian's free visual Git client.

All of these show:

- File differences before committing.
- Commit history and branches visually.
- Push/pull buttons instead of typing commands.

Common Pitfalls and Tips

- Remember to `git add` before committing — otherwise changes aren't saved.
- Never commit large data files or secrets (API keys, passwords).
- Use `.gitignore` to exclude unnecessary files (e.g., `.ipynb_checkpoints/`).
- Write descriptive commit messages — your future self will thank you.

Summary

- Git keeps a history of your work — like a time machine for your code.
- GitHub lets you share and collaborate safely.
- Learn the core cycle: `add` → `commit` → `push` → `pull`.
- Use GUI tools if you prefer a visual workflow.

Next: Practice by pushing your extended cellular automaton notebook to GitHub.