Introduction to Git and GitHub

Version Control for Research and Data Analysis

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Who Am I?

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Why Am I Here?

- started an interdisciplinary side project on research narratives in AI papers with Johanna
- gave a short Git introduction for our project
- This lecture expands that introductory workshop

Before We Start

Please make sure you have:

- A GitHub account: `https://github.com/signup`
- Git installed:
  - Windows: `https://git-scm.com/download/win`
  - macOS: `https://git-scm.com/download/mac`
  - Linux: `https://git-scm.com/download/linux`

What We Will Do Today

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

- Explain what Git and GitHub are
- Create a local Git repository
- Make commits
- Push your work to GitHub
- Understand the basic collaboration workflow

The Problem

Many research projects eventually look like this:

- `analysis_final.do`
- `analysis_final_v2.do`
- `analysis_final_v2_revised.do`
- `analysis_FINAL_really_final.do`

This creates problems:

- Which version is correct?
- What changed?
- Who changed it?
- Can we recover an older version?

What Is Git?

Git is a version control system.

It records:

- What changed
- When it changed
- Who changed it
- Why it changed

Think of Git as a complete history of your project.

What Is GitHub?

GitHub is an online platform for Git repositories.

- Git tracks changes on your computer
- GitHub stores and shares your repository online
- GitHub supports collaboration, review, and publication

Git is the tool. GitHub is the online platform.

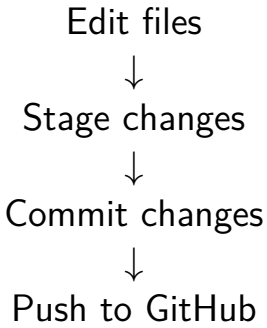
Why This Matters for Economics and Social Science

Git and GitHub are useful for:

- Replication packages
- Data cleaning scripts
- Statistical analysis
- Collaborative research papers
- Policy analysis
- Transparent and reproducible workflows

The Basic Workflow

The basic Git workflow is:



Key Concepts

- **Repository**: a project folder tracked by Git
- **Commit**: a saved snapshot of changes
- **Branch**: an alternative line of work
- **Remote**: an online copy of the repository
- **Push**: upload changes to GitHub
- **Pull**: download changes from GitHub

Check That Git Works

Open Terminal, Git Bash, or another command line and type:

```
git --version
```

You should see something like:

```
git version 2.xx.x
```

Configure Git

Set your name and email address:

```
git config --global user.name "Your Name"
git config --global user.email "the-email-you-use-on-github@example.com"
```

Check your settings:

```
git config --global --list
```

Create a Project Folder

Create a new folder for today's exercise:

```
mkdir github-workshop
cd github-workshop
```

Create a README file:

```
echo "# My First GitHub Repository" > README.md
```

Initialise a Git Repository

Turn the folder into a Git repository:

```
git init
```

Check the status:

```
git status
```

Git now tracks this folder.

Make the First Commit

Stage the file:

```
git add README.md
```

Commit the file:

```
git commit -m "Initial commit"
```

A commit is a saved snapshot of your project.

Create a Repository on GitHub

Now go to GitHub:
`https://github.com`

Click:

New repository

Use this repository name:

`github-workshop`

Important:

- Do not add a README on GitHub
- Keep the repository public or private as you prefer

Connect Local Git to GitHub

GitHub will show you a repository URL. Use the HTTPS URL.
Add it as the remote:

```
git remote add origin https://github.com/YOUR_USERNAME/github-workshop.git
```

Rename the main branch:

```
git branch -M main
```

Push to GitHub:

```
git push -u origin main
```

First push

When you push to GitHub for the first time, GitHub may ask you to sign in. A browser window or Git Credential Manager prompt may appear. Follow the prompts and sign in to GitHub.

Milestone

You now have:

- A Git repository on your computer
- A GitHub repository online
- Your first commit uploaded to GitHub

Refresh your GitHub page and check that your README file appears.

Make a Second Change

Open `README.md` and add one sentence, for example:

```
This repository was created during the Git and GitHub workshop.
```

Then check what changed:

```
git status
```

Commit and Push Again

Stage the changed file:

```
git add README.md
```

Commit the change:

```
git commit -m "Add workshop description"
```

Push the change:

```
git push
```

View Project History

To see your commit history:

```
git log
```

A shorter version:

```
git log --oneline
```

Git keeps a complete record of the project.

Good Commit Messages

Good commit messages are:

- Short
- Clear
- Specific

Good examples:

- `Add data cleaning script`
- `Fix typo in README`
- `Update regression table`

Bad examples:

- `stuff`
- `changes`
- `final version`

Graphical Interfaces

You do not always need to use the command line.

Two common graphical options are:

- **Visual Studio Code**: editor with built-in Git tools
- **GitHub Desktop**: simple graphical app for GitHub workflows

However, the command line has many advantages.

Collaboration on GitHub

GitHub supports collaborative work through:

- Shared repositories
- Issues
- Branches
- Pull requests
- Code review

This is useful for research teams, teaching projects, and replication packages.

What Is a Pull Request?

A pull request is a proposal to add changes to a project.

Typical workflow:

1. Someone makes a change
2. They open a pull request
3. Others review the change
4. The change is accepted and merged

Branches

A branch is a separate line of work.
Create a new branch:

```
git switch -c new-feature
```

Make a change, then commit:

```
git add README.md
git commit -m "Add new feature description"
```

Branches are useful for experiments.

Return to Main Branch

Return to the main branch:

```
git switch main
```

Merge the branch:

```
git merge new-feature
```

Push the result:

```
git push
```

Common Problems

- Git is not installed correctly
- The wrong folder is open
- The repository URL was copied incorrectly
- GitHub asks for authentication
- A file was changed but not staged

Useful command:

```
git status
```

When in doubt, check the status.

Best Practices

- Commit often
- Use clear commit messages
- Keep one project per repository
- Always include a README file
- Push regularly
- Do not upload confidential or sensitive data

What You Can Use GitHub For

GitHub is useful for:

- Research code
- Data documentation
- Teaching materials
- Reproducibility packages
- Collaborative writing support
- Public project portfolios

Takeaways

Today you learned how to:

- Create a Git repository
- Track file changes
- Make commits
- Push work to GitHub
- Understand branches and pull requests
- Use GitHub for research collaboration

Thank you.