Productive Workflow

An Introduction to Git and GitHub

Luc Clair

l.clair@uwinnipeg.ca

University of Winnipeg

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Preliminaries

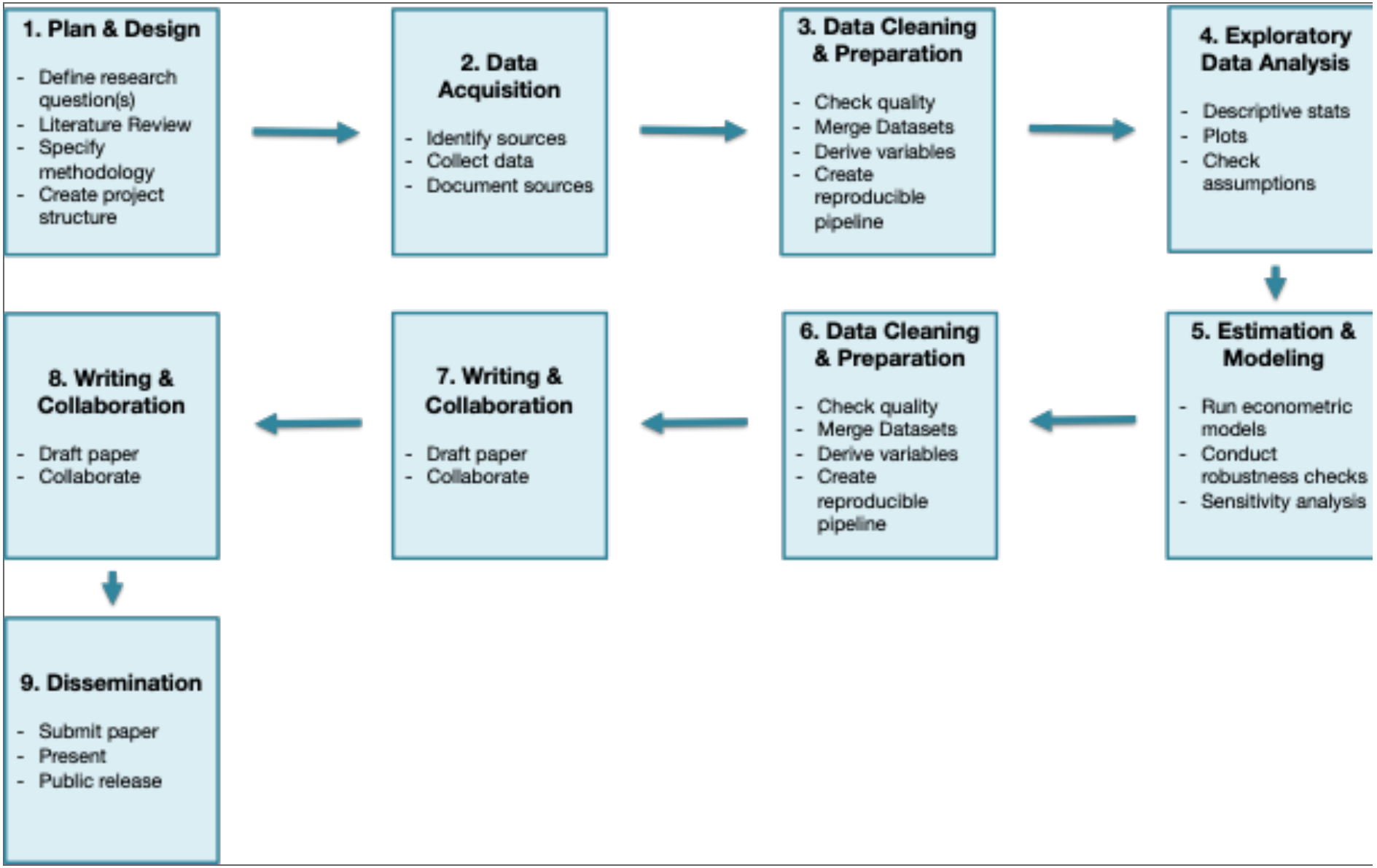
- The necessary software to follow this lecture are
  - → **R**
  - → **RStudio**
  - → **Git**
  - → Created an account on **GitHub**
  - → **GitHub Desktop**

Introduction

What is a Workflow?

- Structured sequence of steps, tasks, and decisions that guide how a project moves from start to finish
- A good workflow is organized, repeatable, and transparent
  - → Helps reduce errors
  - → Makes work reproducible and easier to follow

Workflow Example: Applied Economic Research



Version Control

- Version control software (VCS) is a system that helps people manage and track changes to their files over time (e.g., text documents and code files)
- It keeps track of every modification made to files, who made those changes, and when they were made
- Changes can be reverted, previous versions of files can be restored, and conflicts between different versions can be resolved

Git and Github

Git

What is Git?

- Git is a popular VCS
- Allows multiple collaborators to work on the same project simultaneously, manage changes, and share work effectively
- Git's greatest strength is its facilitation of collaboration
- It has been described as "track changes on steroids" or as "a marriage between Dropbox and Microsoft Word's 'Track Changes' feature"

Git Repository

- Git tracks the changes of a set files in a Git enabled folder or **directory**
- The Git enabled directory is known as a **repository** (repo)
- One uses Git to flag any saved changes made to files in the repository

Git Repository (cont'd)

Changes and Checkpoints

- Git can then save a version (snapshot) of repository files at a given moment in time
- This is known as a **commit**
- Each commit has a message explaining what was changed, keeping track of the project's progress

Branches

- Git allows you to create **branches**, which are akin to an alternate version of the repository to experiment with new ideas
- Once you're happy with the changes, you can **merge** these branches back into the main project
- A branch is a separate line of development
- The main branch is usually called main or master

Collaboration

- You can store your repository on a remote server (e.g., GitHub) and everyone can access it
- When someone makes changes, you can **pull** those changes into your local repository (folder on your computer)
- Similarly, when you make changes, you can push them to the remote server so your team can see and use them

Track and Undo Changes

- Git tracks every change you make
- If you realize you made a mistake or want to revisit an earlier version of your work, you can easily go back to previous commits
- This helps ensure you don’t lose valuable work and can always correct errors

GitHub

- GitHub is a web-based platform that helps researchers manage, share, and collaborate on code projects using Git
- It provides a cloud-based space where you can store your Git repositories and interact with other developers' projects
- GitHub has become one of the most popular platforms for open-source and private software development

Git and Workflow

- Version control is a critical component of a productive workflow
- A recommended first-step of any workflow is to set up a Git-enabled repository for your project files and link this repository to **GitHub.com**

Creating a Git Repository

Creating a Git Repository

- Three main ways
  1. Create repository on **GitHub.com**
  2. Add new repository using GitHub Desktop
  3. Create a new folder on your local computer and enable Git

Create Git Repository on GitHub

1. Go to **github.com** and sign in

- On your home page, click the
  button

Create Git Repository on GitHub (cont'd)

2. Enter the name of the repository

Create Git Repository on GitHub (cont'd)

3. Choose whether you want the repository to be public or private

Create Git Repository on GitHub (cont'd)

4. Add a README file, which gives a description of your project

Create Git Repository on GitHub (cont'd)

5. Choose a license, then press **Create**
    - For more on open source licensing, please visit **ChooseALicense.com**

Create Git Repository on GitHub (cont'd)

- Your repository has been created
- Here are a few things to notice

Create Git Repository on GitHub (cont'd)

- Git defaults to the `main` branch

Create Git Repository on GitHub (cont'd)

- The commit message and commit ID

Create Git Repository on GitHub (cont'd)

- Two files were created: LICENSE and README.md
- Note the files created have the same Git message

Create Git Repository on GitHub (cont'd)

- LICENSE refers to the license chosen when creating the repository

Create Git Repository on GitHub (cont'd)

- README.md is the landing page for your repository
- It is where you describe your repository

Clone GitHub Repository in GitHub Desktop

- Open GitHub Desktop and log in (if you are currently logged out)

Clone GitHub Repository in GitHub Desktop (cont'd)

- On the left-hand-side, you will notice a list of your GitHub repositories
- Choose the repository you wish to make a copy to your local computer
- Then select "Clone **username/repo**", where **username/repo** is your GitHub username and repo is the name of the repository
- In this example it is **clairl/demo**

Clone GitHub Repository in GitHub Desktop (cont'd)

- Choose the location for the clone of the GitHub repo on your local computer and click **Clone**

Clone GitHub Repository in GitHub Desktop (cont'd)

Create a Git Repository from Existing Folder

- Say we already have a folder with files that we want to connect to GitHub?
- First, we have to enable Git
- To do this, we have to use the Terminal

Create a Git Repository from Existing Folder (cont.)

- In the terminal, navigate to the project folder

Create a Git Repository from Existing Folder (cont.)

- Use the following commands:

```
git init
git add .
```

- The first command enables git, while the second command stages files for the next commit
- The `.` means “the current directory and all its contents”

Application: Creating a Webstie Using Quarto and GitHub Pages

Workflow

- The workflow we will be using to create our website is:
  - → Create a new Quarto project in R Studio
  - → Connect our project directory to GitHub through Github Desktop
  - → Publish the newly created website via GitHub Pages
  - → Create new pages for the website
  - → Add a blog to the website
  - → Customize the website

R Projects

R Projects

- To begin, create a new Quarto project in R Studio
  - → Click *File->New Project…*

R Projects (cont.)

- Select *New Directory*

R Projects (cont.)

- Select *Quarto Website*

R Projects (cont.)

- Name the directory. I named mine **demo**.
- Choose a path for the new project and click *Create Project*

Quarto Website Files

- R Studio creates a project with a number of files

Quarto Website Files (cont.)

- **_quarto.yml**: key configuration file for the Quarto website.
  - → Defines the overall structure and settings for the website project, `project:`
  - → Defines metadata for the website, e.g., title, author(s), and other descriptive info, `title:` and `description:`
  - → Controls the structure of the website, `navbar:`
  - → Specifies themes, `format:`, `theme:`, `css:`

Quarto Website Files (cont.)

- **index.qmd**: home page of your Quarto website
  - → Defines the content and layout for the main landing page of the site
  - → Can add Markdown and Quarto-specific content
  - → Defined as *Home* in the **_quarto.yml** file
- **.gitignore**: configuration file used in Git repositories to specify intentionally untracked files or directories that Git should ignore.

Quarto Website Files (cont.)

- **about.qmd**: Quarto Markdown file that is typically used to create an *About* page for a Quarto website.
  - → This page provides information about the website's purpose, the author(s), or the organization behind it.
  - → Not mandatory
  - → Appears as another page on the navigation bar
- **style.css**: Cascading Style Sheets (CSS) file used to define and customize the visual appearance of a Quarto website or document.
  - → allows you to override or extend the default styles provided by Quarto's themes

Building the Website

- To build the website, click the *Render* button at the top of the **index.qmd** file.
- Alternatively, you can also click *Build*, then *Render Website* in the top right pane.

Building the Website (cont.)

Connecting R Project to GitHub

Connecting R Project to GitHub

- Before we can publish our website, we need to connect our R project to a GitHub repository
- Be sure that you are signed into your GitHub account in GitHub Desktop.
- Open GitHub Desktop and add the R project Directory
  - → Select *Add Existing Repository*
  - → Choose the R project directory

Connecting R Project to GitHub (cont.)

Connecting R Project to GitHub (cont.)

- Commit changes
  - → Write a summary (E.g., “Created Quarto website”)

Connecting R Project to GitHub (cont.)

- Publish repository to **GitHub.com**

Connecting R Project to GitHub (cont.)

- Go to **GitHub.com** to confirm that the repository has been published.

Connecting R Project to GitHub (cont.)

- Check to see that the project files are now available in your repository

Publishing Your Website

Publishing Your Website

- Return to R Studio and open the **_quarto.yml** file.
- Under `project:` include the code `output-dir: docs` and render the website. This will save the website files in a newly created **docs** folder.

Publishing Your Website (cont.)

- We no longer need the **_site** folder, so we can delete it.

Publishing Your Website (cont.)

- Return to GitHub Desktop, commit the changes, and push them to **GitHub.com**.
  - → Remember to leave a summary

Publishing Your Website (cont.)

- Return to **GitHub.com**.
  - → Note that the **docs** folder has replaced the **_site** folder.

GitHub Pages

- Click *Settings* from the top menu.

GitHub Pages (cont.)

- Choose *Pages* from the menu on the left-hand-side

GitHub Pages (cont.)

- Set the branch to **main**

GitHub Pages (cont.)

- Set the folder to **docs**

GitHub Pages (cont.)

- Note the message saying that the website is being built

GitHub Pages (cont.)

- Wait a about a minute, then refresh the page. You should see a message that the site is live at a given URL.
    - → The URL is typically *https://username.github.io/repository_name*

Publishing Your Website (cont.)

- Follow the link to view your website

Adding Pages to Your Website

Adding Pages to Your Website

- To add a webpage, create a new **.qmd** file and save it in your project directory.

Adding Pages to Your Website (cont.)

Adding Pages to Your Website (cont.)

- Add the new Quarto file to the navigation bar in the **_quarto.yml** file
  - → `href:` adds the listing page file to the navigation bar
  - → `text:` is the text that will display on the navigation bar.

Adding Pages to Your Website (cont.)

Add File to a Webpage

Add File to a Webpage

- You may want to include downloadable file formats on your website
- Add the file to your project directory and reference it within your Quarto document.
- It is helpful to create sub directories to store your files,e.g.,
    - → Figures: store figures
    - → Data: datasets
    - → Files: pdf documents

Add File to a Webpage (cont.)

- Reference the file using the syntax `![text](files/filename.pdf)`
- E.g.,

Add File to a Webpage (cont.)