

# Introduction to Git and GitHub

## GSND 5345Q, FDS

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2026-01-26

## Section 1

# Introduction to Git and GitHub

# Git and GitHub Introduction

Here we will provide some details on Git and GitHub, but we are only scratching the surface. Here are some resources to help you further:

- Codecademy: <https://www.codecademy.com/learn/learn-git>
- GitHub Guides: <https://guides.github.com/activities/hello-world/>
- Try Git tutorial: <https://try.github.io/levels/1/challenges/1>
- Happy Git and GitHub for the useR: <http://happygitwithr.com/>

# Git and GitHub Introduction

There are three main reasons to use Git and GitHub.

- Sharing: GitHub allows us to easily share code!
- Collaborating: Multiple people make changes to code and keep versions synched. GitHub has a special utility, called a **pull request**, that can be used by anybody to suggest changes to your code.
- Version control: Using git permits us to keep track of changes, revert back to previous versions, and create **branches** in to test out ideas, then decide if we **merge** with the original.

## Section 2

# GitHub Repositories

## GitHub accounts

After installing git, go get a GitHub account. Go to <https://github.com/>. You will see a link to sign up in the top right corner.

Pick a name carefully! Something short, related to your name, and professional. Remember that you will use this to share code with others. You might be sharing this with potential collaborators or future employers!

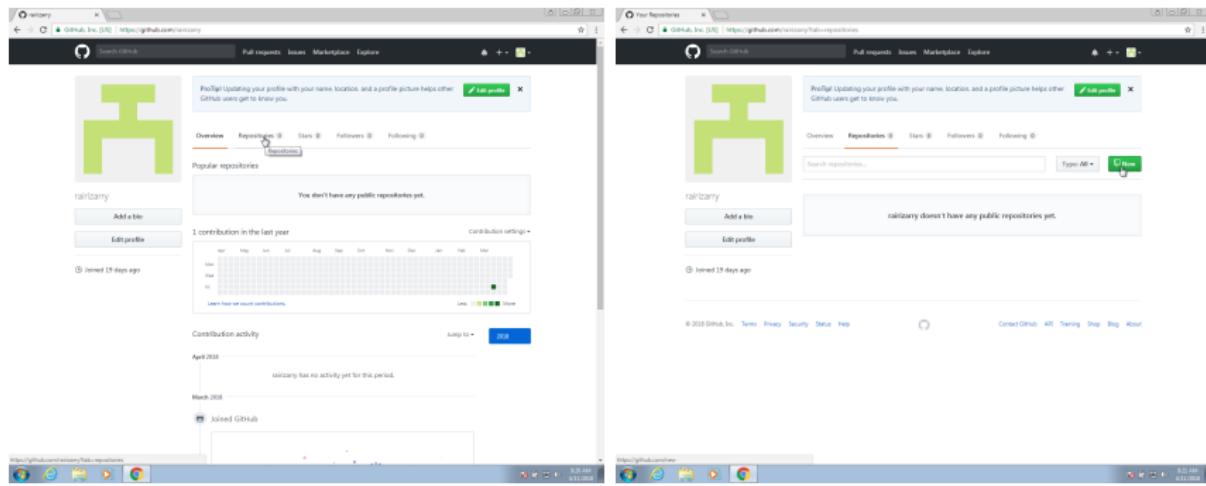
# GitHub repositories

A GitHub repository allows you to have two copies of your code: one on your computer and one on GitHub. If you add collaborators, then each will have a copy on their computer.

The GitHub copy is usually considered the **main** copy (previously called the **master**). Git will help you keep all the different copies synced.

# GitHub repositories

The first step is to initialize the repository on GitHub. You will have a page on GitHub with the URL: <http://github.com/username>. On your account, you can click on **Repositories** and then click on **New** to create a new repo:



# GitHub repositories

Choose a good descriptive name, for this example make a repo named “FDSLectures”. The next step will be to **clone** it on your computer using the terminal. Copy the link to connect to this repo for the next step.

The screenshot shows the GitHub interface for creating a new repository. At the top, there's a header with the GitHub logo and the URL <https://github.com/new>. Below the header, there's a search bar labeled "Search GitHub". The main area is titled "Create a new repository" with the sub-instruction "A repository contains all the files for your project, including the revision history." A form is present for entering repository details:

- Owner:** ralrizary (dropdown menu)
- Repository name:** homework-0 (input field with a green checkmark icon)
- Description (optional):** My first GitHub repo (text input field)
- Visibility:** Public (radio button selected) - Anyone can see this repository. You choose who can comment.  
Private (radio button) - Fewer people who can see and comment to this repository.
- Initialize this repository with a README:** (checkbox checked) This will let you immediately clone the repository to your computer. Skip this step if you're importing an existing repository.  
Add GitHub Readme (button) | Add a Browser Readme (button) |

The screenshot shows the GitHub repository page for "homework-0" owned by "ralrizary". The page includes the following elements:

- Header:** Shows the repository name "homework-0" and the owner "ralrizary / homework-0".
- Navigation:** Includes links for "Code", "Issues", "Pull requests", "Projects", "Wiki", "Insights", and "Settings".
- Repository Summary:** Displays "My first GitHub repo", "Add topics", and "Initial commit".
- Branches:** Shows "Branch master" and "New pull request".
- Commits:** Shows "1 commit" and "1 branch".
- Releases:** Shows "0 releases".
- Contributors:** Shows "1 contributor".
- Actions:** Buttons for "Create new file", "Upload files", "Find file", "Clone or download", "Open in Desktop", and "Download ZIP".
- Clone with HTTPS:** A link to "https://github.com/ralrizary/homework-0" with a copy icon.

# GitHub repositories

GitHub also allows you to **fork** others' repos. Go to  
<https://github.com/wewanjohnson/my.package>

The image displays two side-by-side screenshots of GitHub repository pages. The left screenshot shows the main repository page for 'wewanjohnson / my.package'. It includes sections for Code, Issues, Pull requests, Actions, Projects, Wiki, Security, Insights, and Settings. The repository has 1 master branch, 1 branch, and 0 tags. It contains 4 commits from 'wewanjohnson' with the message 'changed name for the last time' on Nov 21, 2019. The right screenshot shows the 'Fork my.package' process. It lists several repositories that have already forked this one, including 'Boston-University-Milestone-Initiative', 'complomed', 'PathoScope', 'ReFOINT-India', and 'NetREPORT-India-Database'. Both screenshots show a 'Create a new release' button at the bottom.

Click **fork** in the top right and this will create a fork of the repository in your GitHub account.

## Section 3

### Git Basics

# Git Setup

First let git know who you are—will make it easier to connect with GitHub. In a terminal window use the git config command:

```
git config --global user.name "My Name"  
git config --global user.mail "my@email.com"
```

# Git Setup

The main actions in git are to:

- ① **pull** changes from the remote GitHub repo
- ② **add** files, or as we say in the git lingo: **stage** files
- ③ **commit** changes to the local repo
- ④ **push** changes to the **remote** GitHub repo

# Git Setup

To effectively permit version control and collaboration in git, files move across four different areas:

Working  
Directory

Staging  
Area

Local  
Repository

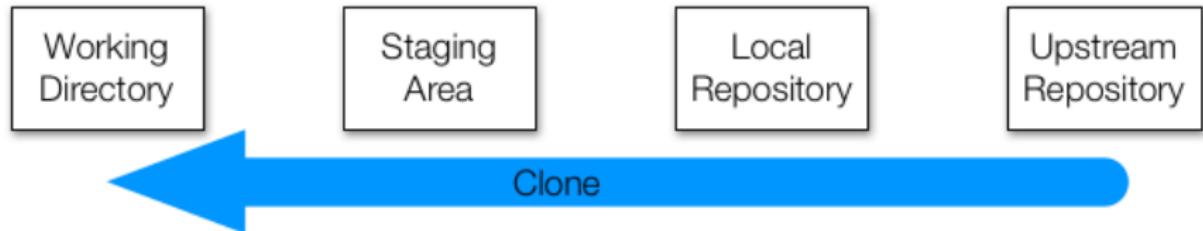
Upstream  
Repository

But how does it all get started? We can clone an existing repo or initialize one. We will explore cloning first.

# Cloning Git repositories

We will **clone** your existing `my.package` **upstream repository** to your local computer.

What does clone mean? We are going to actually copy the entire git structure, files and directories to all stages: working directory, staging area, and local repository.



# Cloning Git repositories

Open a terminal and type:

```
pwd  
mkdir git-example  
cd git-example  
git clone https://github.com/yourusername/my.package.git  
cd my.package  
ls
```

# Cloning Git repositories

Note: the **working directory** is the same as your Unix working directory. When you edit files (e.g., RStudio), you change the files in this directory. git can tell you how these files relate to the upstream directory:

`git status`



# Working with Git repositories

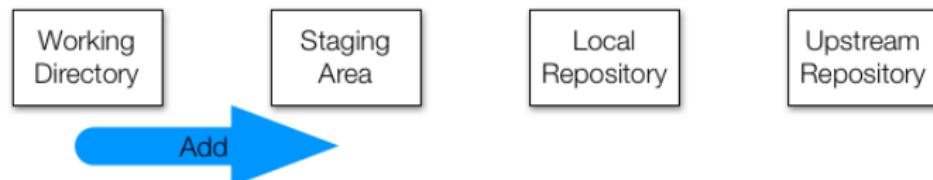
Now lets add some changes to the local repository, open the DESCRIPTION file in the my.package directory, and add your name as an author of the package.

And, as we will do this soon, change the description in the file to include multiplication.

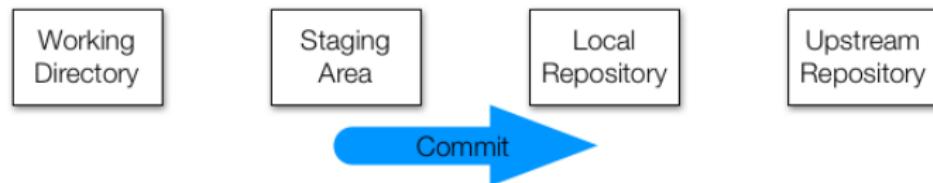
# Working with Git repositories

Now lets **add** the changes to the staging area and **commit** the changes to the local Git directory:

```
git add DESCRIPTION
```



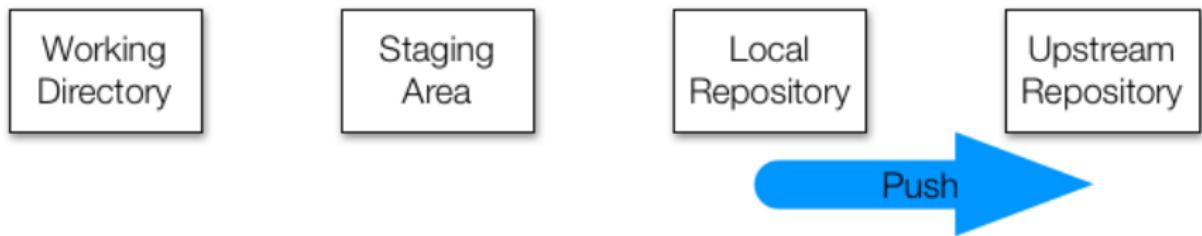
```
git commit -m "adding my name as an author"
```



# Working with Git repositories

Now we can **push** the changes to the remote repo:

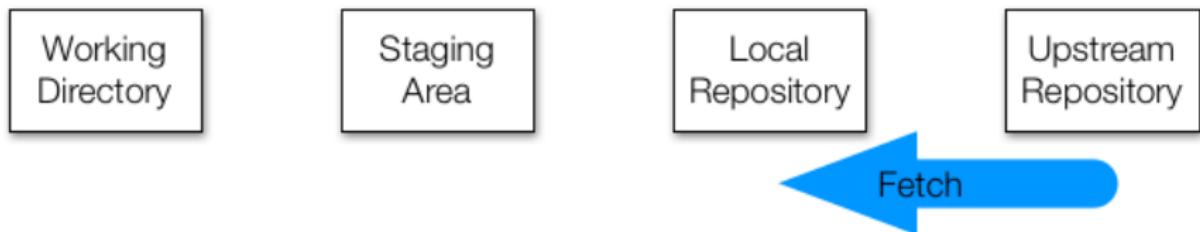
```
git push
```



# Working with Git repositories

We can also **fetch** any changes on the remote repo (how do you think this is different from `clone`?):

```
git fetch
```



# Working with Git repositories

And then we need to **merge** these changes to our staging and working areas:

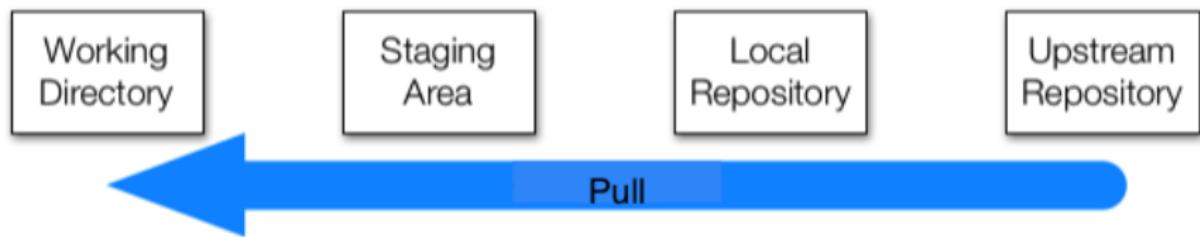
```
git merge
```



# Working with Git repositories

Often we want to change both with one command. For this, we use:

```
git pull
```



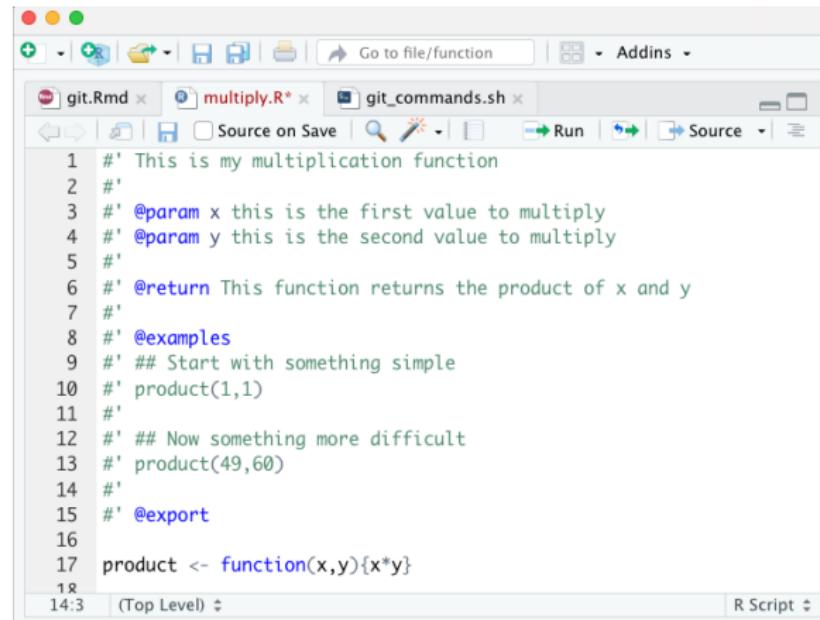
Important note: it is often a good idea to pull any changes when you start each day, so as to avoid **conflicts**.

# Working with Git repositories

Now lets do something more substantial.

Create a new file in the R directory named `multiply.R` to contain the code displayed at the right.

(Hint: you can copy the `add.R` file and change it)



The screenshot shows the RStudio interface with the multiply.R file open. The code in the editor is:

```
1 #' This is my multiplication function
2 #
3 #' @param x this is the first value to multiply
4 #' @param y this is the second value to multiply
5 #
6 #' @return This function returns the product of x and y
7 #
8 #' @examples
9 #' ## Start with something simple
10 #' product(1,1)
11 #
12 #' ## Now something more difficult
13 #' product(49,60)
14 #
15 #' @export
16
17 product <- function(x,y){x*y}
18
```

The status bar at the bottom indicates "14:3 (Top Level) R Script".

Now save the file and use the **add**, **commit**, **push** commands to move it to the local and remote repos.

## Section 4

### More on Git and GitHub

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# Initializing a Git directory (needed for your homework)

What if we already have a local directory and want to move it to a GitHub repository? See the following:

- ① Create a new GitHub repository (e.g., my\_fds\_homework)
- ② **Initialize** the local repository
- ③ Use the **add** and **commit** commands to add to the local repository
- ④ Connect the local and remote repos and push:

```
git remote add origin \
'https://github.com/username/my_fds_homework.git'
git push -u origin main
```

# Pull requests (needed for your Homework)

**Pull requests** enable sharing of changes from other branches/forks of a repo. Potential changes can be reviewed before merged into the main branch.

The screenshot shows a GitHub repository page for 'wevanjohnson / my.package'. The 'Pull requests' tab is selected, indicated by a red underline. The page displays a message encouraging new contributors to label issues and pull requests. Below this, there are filters for 'Filters' (set to 'is:pr is:open'), a search bar ('Q'), and buttons for 'Labels' (9), 'Milestones' (0), and 'New pull request'. A large central area is currently empty, showing a placeholder icon and the text 'Welcome to pull requests!'. At the bottom, a note explains that pull requests help collaborate on code, and a link to 'create a pull request' is provided.

## Next Lecture: Advanced R Programming

The next lecture will be on advanced R programming.  
You will need to have R and RStudio installed on your computer!

# Session info

```
sessionInfo()
```

```
## R version 4.5.1 (2025-06-13)
## Platform: aarch64-apple-darwin20
## Running under: macOS Tahoe 26.2
##
## Matrix products: default
## BLAS:    /Library/Frameworks/R.framework/Versions/4.5-arm64/Resources/lib/libRblas.0.dylib
## LAPACK:  /Library/Frameworks/R.framework/Versions/4.5-arm64/Resources/lib/libRlapack.dylib;  LAPACK version 3
##
## locale:
## [1] en_US.UTF-8/en_US.UTF-8/en_US.UTF-8/C/en_US.UTF-8/en_US.UTF-8
##
## time zone: America/Denver
## tzcode source: internal
##
## attached base packages:
## [1] stats      graphics   grDevices utils      datasets   methods    base
##
## loaded via a namespace (and not attached):
## [1] compiler_4.5.1    fastmap_1.2.0    cli_3.6.5       tools_4.5.1
## [5] htmltools_0.5.9   otel_0.2.0     rstudioapi_0.17.1 yaml_2.3.12
## [9] rmarkdown_2.30    knitr_1.51     xfun_0.55      digest_0.6.39
## [13] rlang_1.1.6      evaluate_1.0.5
```