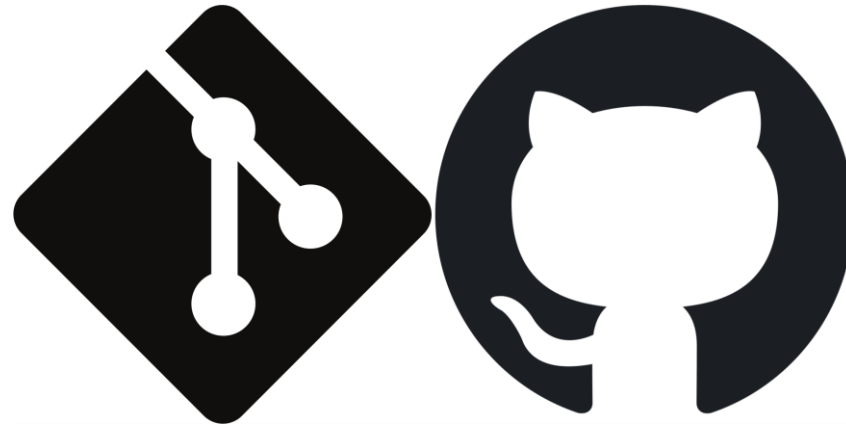


# Welcome!

Some initial course info:

- You can find links to our draft schedule and all our course materials through our wiki.
  - [https://github.com/CefasRepRes/Git\\_Training/wiki/Schedule](https://github.com/CefasRepRes/Git_Training/wiki/Schedule)
  - *We will take breaks during the day!*
- Feel free to interrupt and ask questions as we go.
- H&S...



# Introduction to Git & GitHub

Jennifer Graham

Tiago Silva

David Ryder

Session 1

23rd of June 2023

# Why use version control?

- How many people have directories that include files like this?

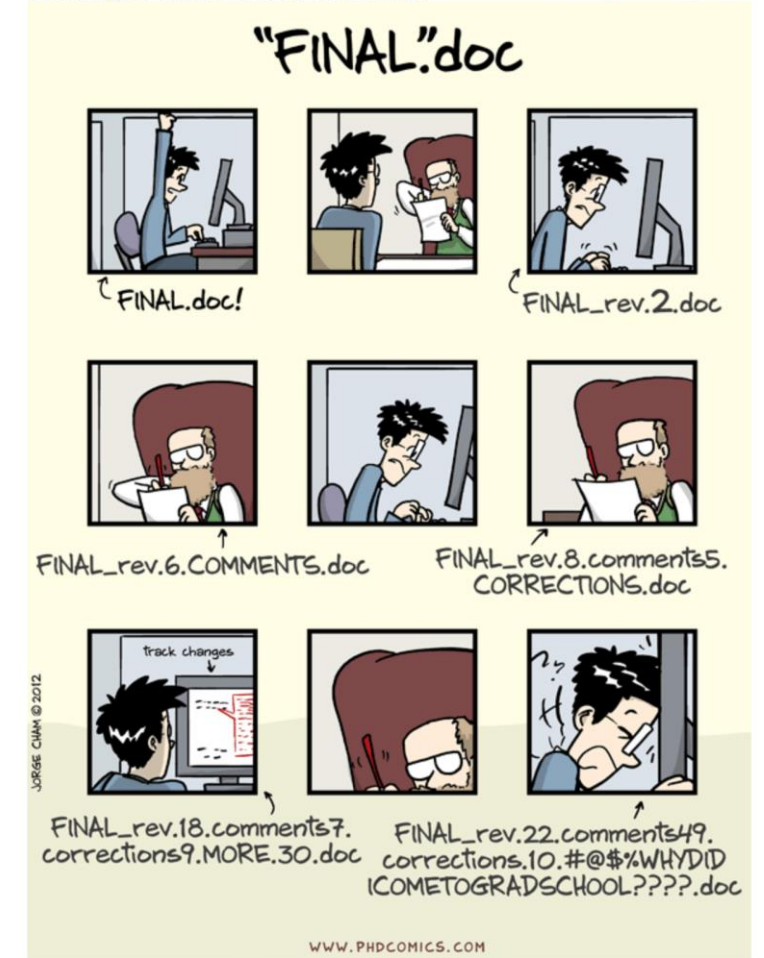
- `File_16062020.doc`, `File_30062020.doc`, ...
- `File_old.doc`, `File_new.doc`
- `File.doc.orig`
- `File.doc`, `File_test.doc`

- Version control allows you to:

- Back up your code.
- Keep track of changes.
- Share your code with others.
- Develop code with collaborators.

Piled Higher and Deeper by Jorge Cham

www.phdcomics.com



WWW.PHDCOMICS.COM

title: "notFinal.doc" - originally published 10/12/2012

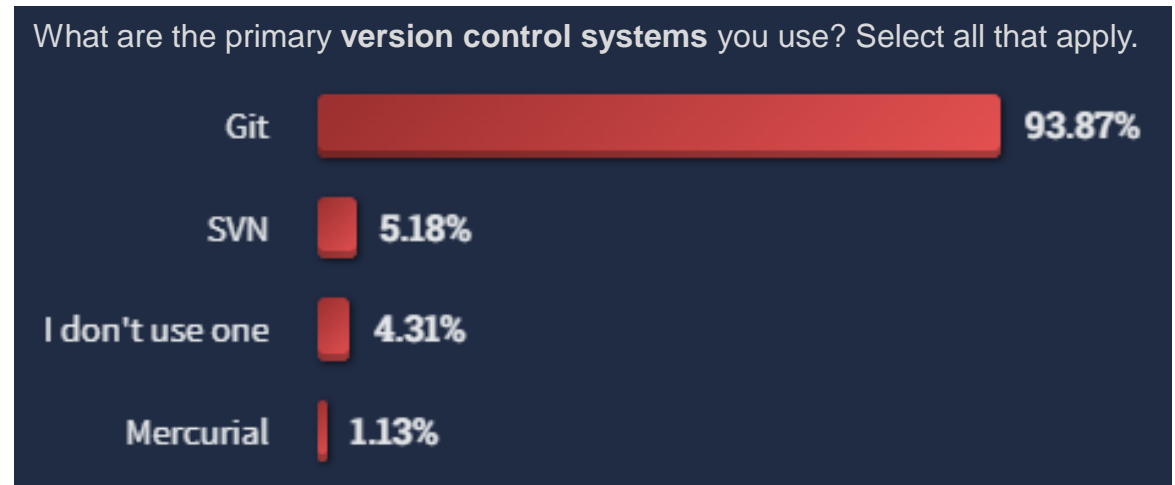
# Changes are documented

- As code is backed up, can be confident in testing new ideas.
- Version control software ensures that changes are attributable to individuals.
  - If the code breaks, you know why!
- Code can be shared along with the documentation and file history.
  - Documentation can explain how and why the code should be used.
  - Can create fixed versions/releases, along with [DOIs](#).
    - Sharing now often required for publication.
- All the above provides “quality assurance” in the final product.

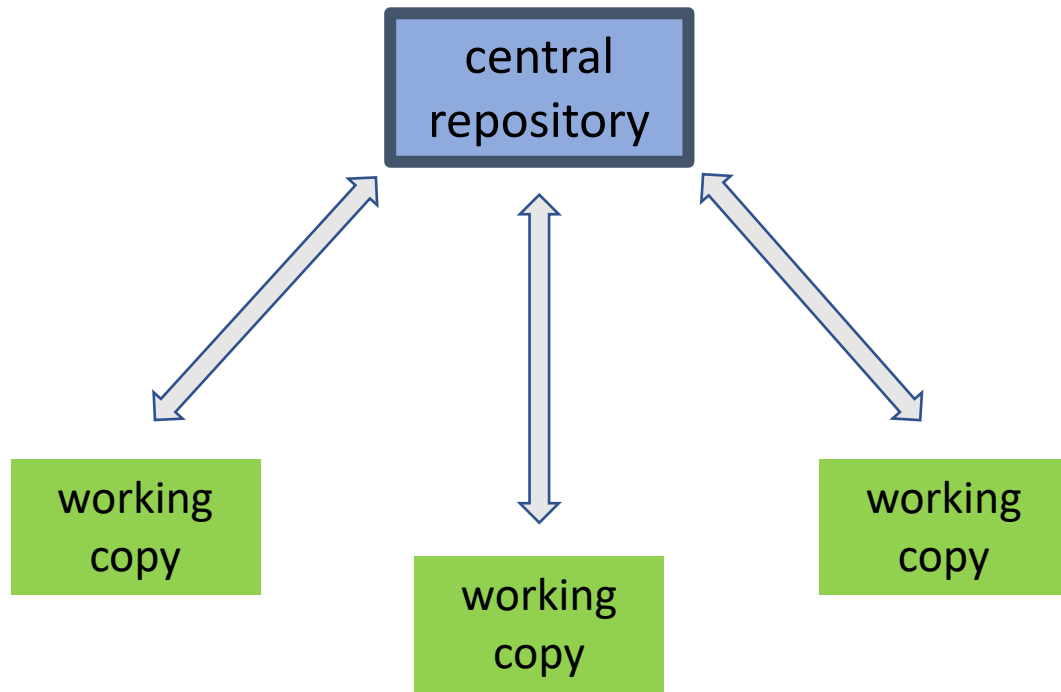
# Version control software

- Many options out there...
  - [https://en.wikipedia.org/wiki/List\\_of\\_version-control\\_software](https://en.wikipedia.org/wiki/List_of_version-control_software)
  - All are *agnostic* in terms of the programming language
- Client-server model :: all users share a single code repository.
  - e.g., SVN (subversion)
    - Legacy choice, depending on when project started (many now switching)?
- Distributed model :: all users have their own local repositories.  
Changes can be shared/merged as a separate step.

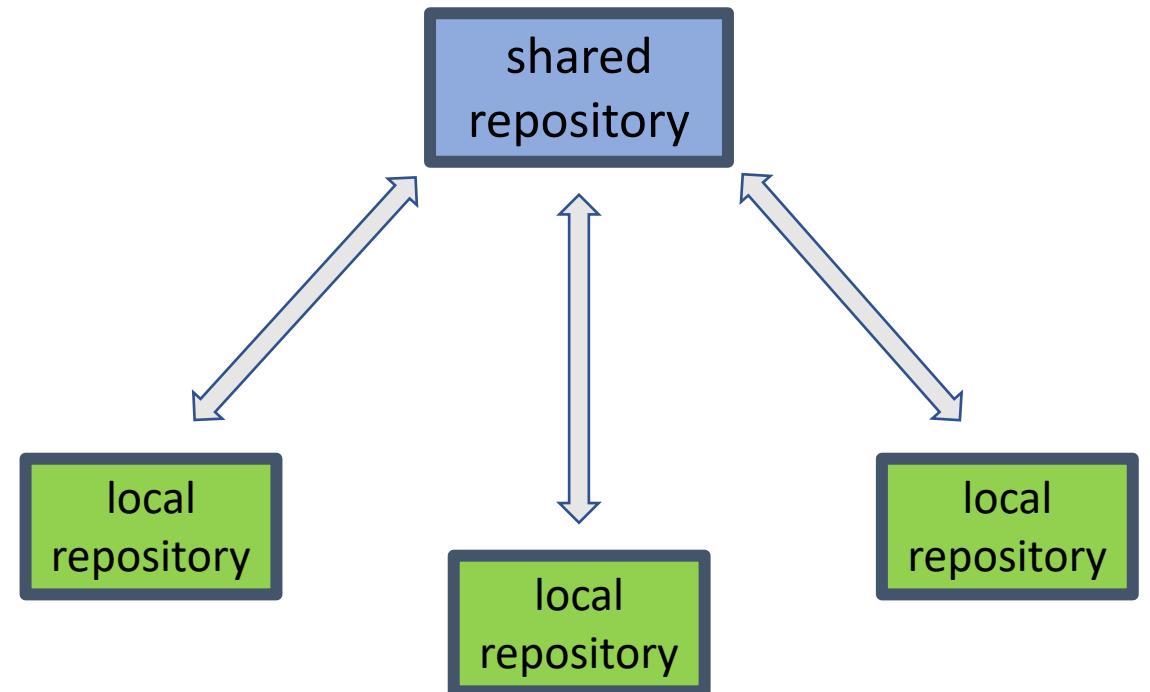
- e.g., **Git**
  - What we're using today!
  - Well supported, large user community, e.g.,  
From Stack Overflow user survey (2022),  
*"No other technology is as widely used as Git."*



# Central vs Distributed workflow?



Centralised/client-server model (e.g., SVN)



Distributed model (e.g., Git)

# So, what are Git & GitHub?

NB. These are two different things

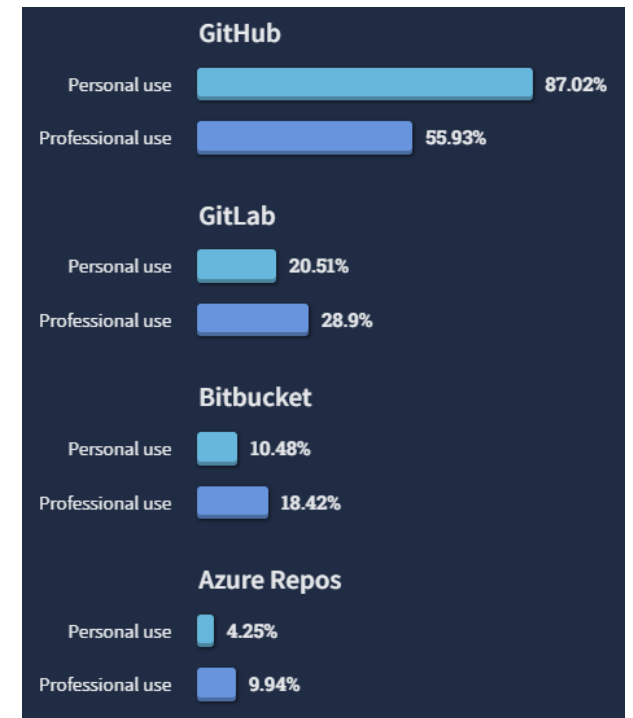
- Git = version control software.
- GitHub = web-based repository hosting service\*.

i.e. Git is the software behind the GitHub web service.

You can use Git without GitHub. However, GitHub provides useful tools (especially for sharing your code).



\* Other providers exist, but GitHub is the most popular, e.g.:



# Useful resources

Git and GitHub are widely used, so there are lots of useful websites, training videos, online courses etc. e.g.,

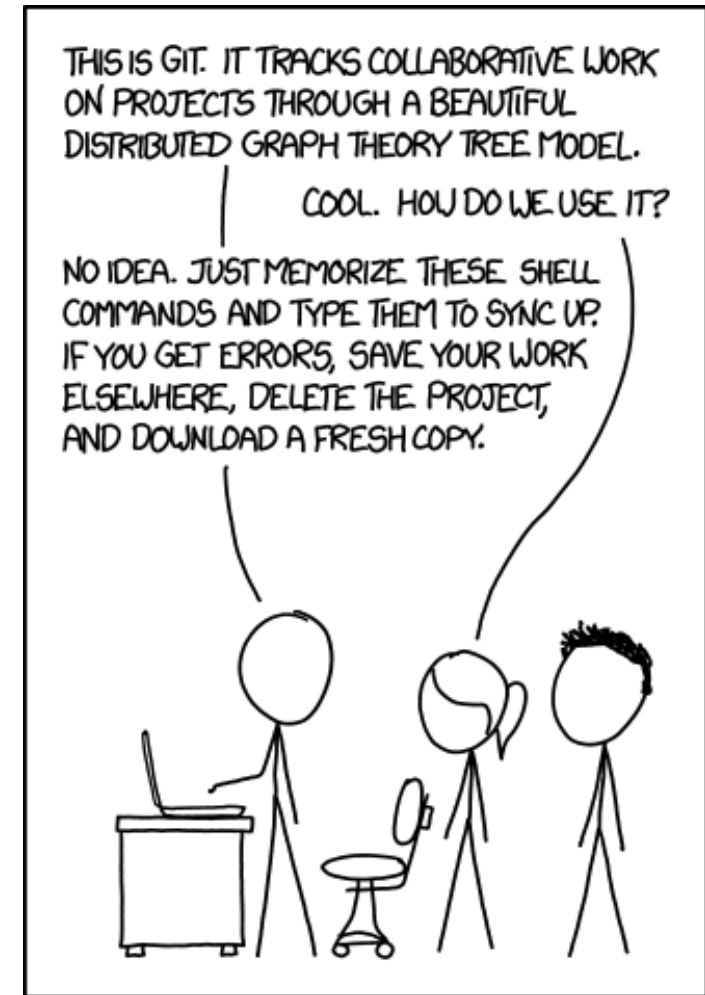
- GitHub guides & help:
  - <https://guides.github.com/>
- Git guides:
  - <https://git-scm.com/doc>
- Git cheat sheet:
  - <https://education.github.com/git-cheat-sheet-education.pdf>
- E-books:
  - <https://www.git-tower.com/learn/git/ebook/en/command-line/introduction>
- Webinars:
  - <https://www.youtube.com/watch?v=v3Y8c2KMay8>
  - <https://www.youtube.com/watch?v=ShH1g4l9A54>
- Internet searching!





# Using Git

- Various options depending on preference:
  - **Command line e.g., Git for windows** (bash shell or GUI)
    - Many command line interfaces available e.g., Windows 10 bash shell, HPC, Linux or Mac terminals.
  - GUI e.g., GitHub desktop
  - Rstudio or pycharm (some built-in functionality, similar to GUI)
  - *[NB. Admin rights not needed to install Git]*
- Whatever option you choose, all the above follow the same basic workflow.
  - Choose whatever works for you e.g., are you more comfortable with a GUI or command line?
  - Will initially take some practice, but using git can (should) become a regular activity.

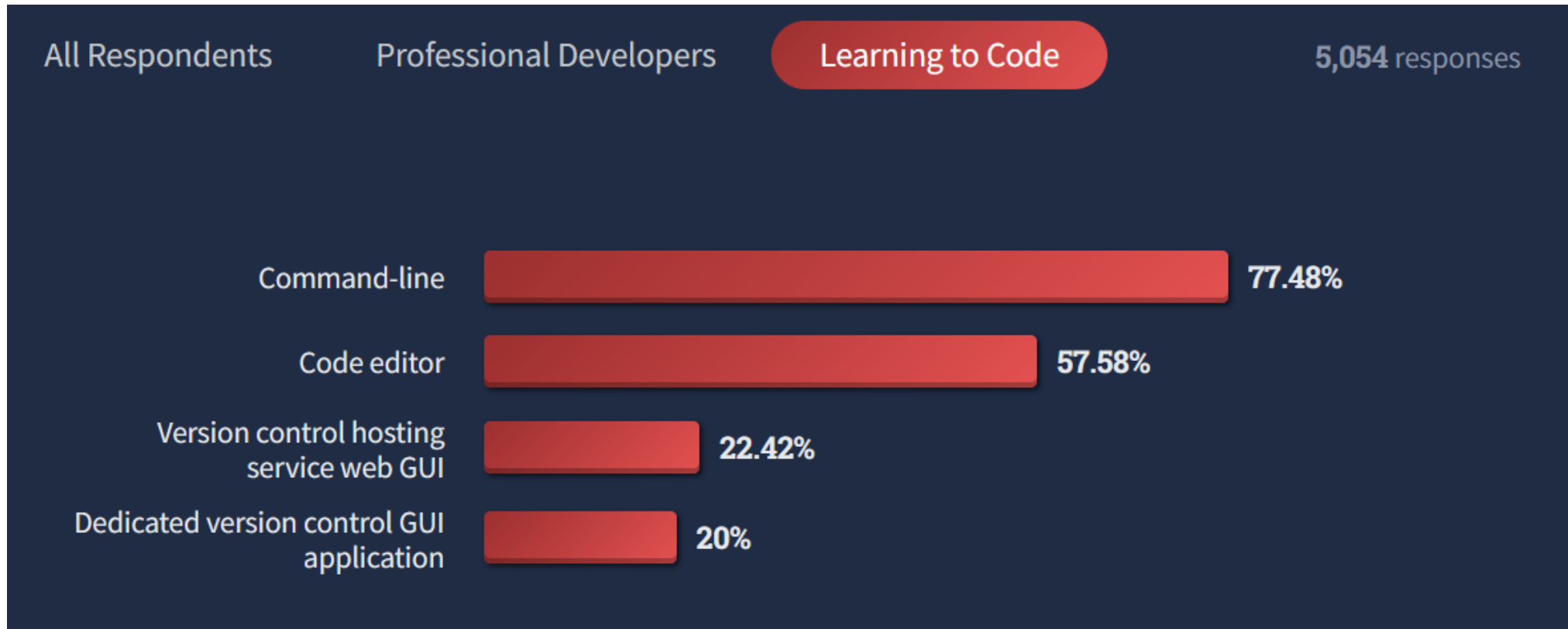


How not to use git... <https://xkcd.com/1597/>

# Why are we using the command line?

- **Clearly shows the commands being used at each step in the workflow.**
  - Command name matches exactly what is used on the command line.
- Can apply the workflow to a chosen GUI at a later date (e.g., Rstudio, pycharm, or GitHub Desktop).
- Not all commands are available in every GUI, so always have the option of moving back to the command line.

# Why are we using the command line?



<https://survey.stackoverflow.co/2022/#technology-version-control>

# Introduction to command line...

# Basic Git workflow

- Create a local repository (code directory).
- Add/edit a file.
- Commit your changes (i.e. document changes).
- Then repeat!

Optional (but recommended):

- Push changes to remote repository on GitHub (back-up/sharing).

# Creating a repository...

- I already have a folder, how do I start tracking my changes?

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world

\$ ls

hello\_world.py

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world

\$

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world

\$ ls

hello\_world.py

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world

\$ git init

git init  
:: turn current directory  
into git repository.



JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world

\$ ls

hello\_world.py

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world

\$ git init

Initialized empty Git repository in C:/Users/JG10/OneDrive - CEFAS/GitHub/Repos/hello\_world/.git/

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world

\$ ls

hello\_world.py

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world

\$ git init

Initialized empty Git repository in C:/Users/JG10/OneDrive - CEFAS/GitHub/Repos/hello\_world/.git/

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git status

git status

:: show which files have  
been tracked or modified.

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world

```
$ ls
hello_world.py
```

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world

```
$ git init
Initialized empty Git repository in C:/Users/JG10/OneDrive - CEFAS/GitHub/Repos/hello_world/.git/
```

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

```
$ git status
On branch main
```

No commits yet

Untracked files:

(use "git add <file>..." to include in what will be committed)

hello\_world.py

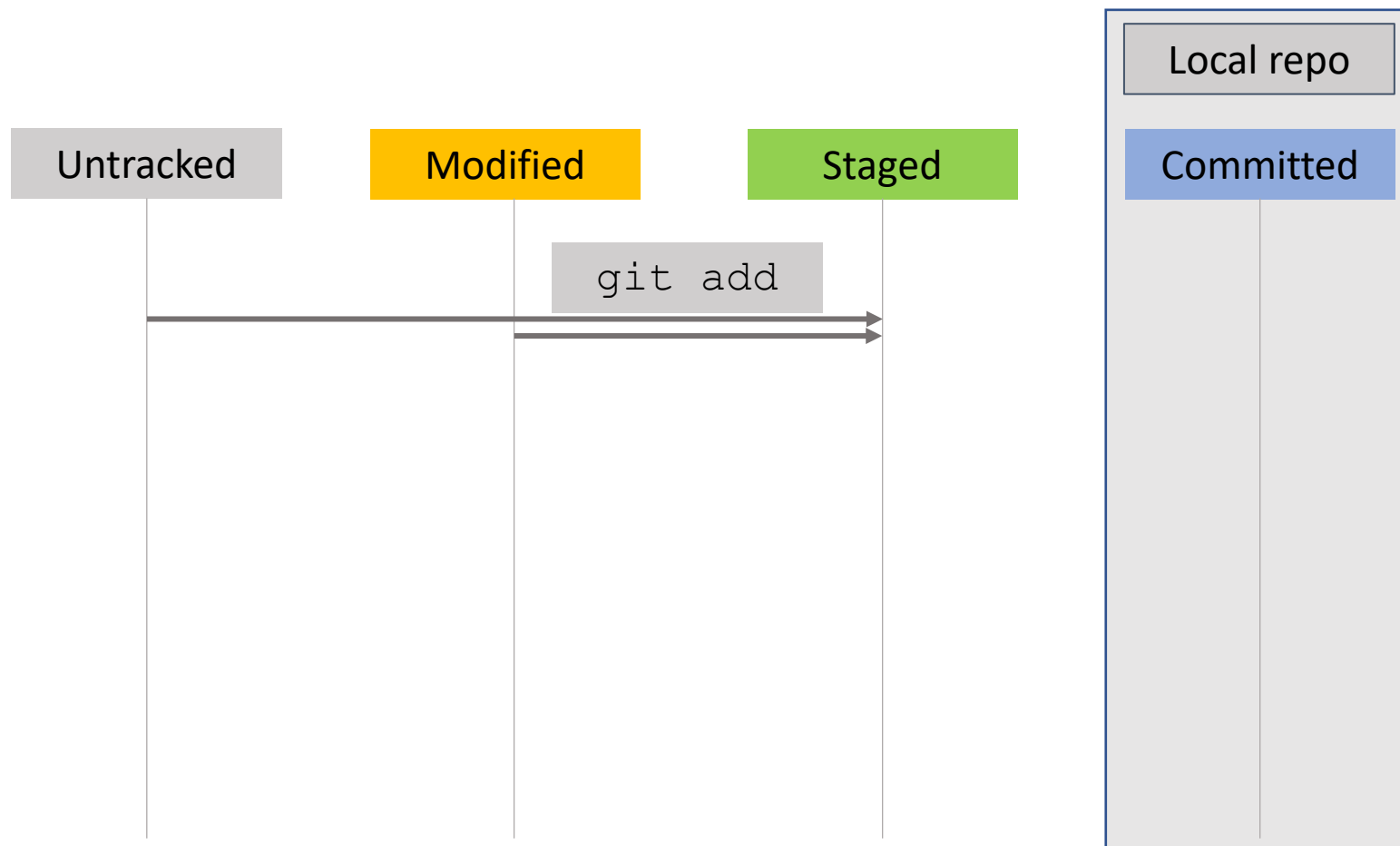
nothing added to commit but untracked files present (use "git add" to track)

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

```
$
```

# The “Staging area”

- Git doesn't have to track all files in a repository.
- There are three “states” of tracked files in a Git repository.
  - Working directory :: current version of files, containing any modifications.
  - Staging area :: snapshot of files/modifications that you plan to commit.
  - Repository/Git directory :: contains the commit history for all files in the repository.
- You can check the state of each file at any point using `git status`



JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world

```
$ ls  
hello_world.py
```

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world

```
$ git init  
Initialized empty Git repository in C:/Users/JG10/OneDrive - CEFAS/GitHub/Repos/  
/hello_world/.git/
```

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

```
$ git status  
On branch main
```

No commits yet

Untracked files:

(use "git add <file>..." to include in what will be committed)  
hello\_world.py

nothing added to commit but untracked files present (use "git add" to track)

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

```
$ git add hello_world.py
```

git add <file>  
:: stage the file for  
commit i.e. track changes.

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world

```
$ ls
hello_world.py
```

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world

```
$ git init
Initialized empty Git repository in C:/Users/JG10/OneDrive - CEFAS/GitHub/Repos/hello_world/.git/
```

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

```
$ git status
On branch main
```

No commits yet

Untracked files:

(use "git add <file>..." to include in what will be committed)

hello\_world.py

nothing added to commit but untracked files present (use "git add" to track)

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

```
$ git add hello_world.py
warning: LF will be replaced by CRLF in hello_world.py.
The file will have its original line endings in your working directory
```

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

```
$
```

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git add hello\_world.py

warning: LF will be replaced by CRLF in hello\_world.py.

The file will have its original line endings in your working directory

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git status

On branch main

No commits yet

Changes to be committed:

(use "git rm --cached <file>..." to unstage)

new file: hello\_world.py

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$



JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git add hello\_world.py

warning: LF will be replaced by CRLF in hello\_world.py.

The file will have its original line endings in your working directory

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git status

On branch main

No commits yet

Changes to be committed:

(use "git rm --cached <file>..." to unstage)

new file: hello\_world.py

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git commit

git commit

:: confirm changes with  
message/explanation.

\*COMMIT\_EDITMSG - Notepad

File Edit Format View Help

Adding first file to repository

```
# Please enter the commit message for your changes. Lines starting
# with '#' will be ignored, and an empty message aborts the commit.
#
# On branch main
#
# Initial commit
#
# Changes to be committed:
#   new file:   hello_world.py
#
```

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git add hello\_world.py

warning: LF will be replaced by CRLF in hello\_world.py.

The file will have its original line endings in your working directory

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git status

On branch main

No commits yet

Changes to be committed:

(use "git rm --cached <file>..." to unstage)

new file: hello\_world.py

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git commit

hint: waiting for your editor to close the file... unix2dos: converting file C:/Users/JG10/OneDrive - AS/GitHub/Repos/hello\_world/.git/COMMIT\_EDITMSG to DOS format...

dos2unix: converting file C:/Users/JG10/OneDrive - CEFAS/GitHub/Repos/hello\_world/.git/COMMIT\_EDITMSG to Unix format...

[main (root-commit) a59cb3f] Adding first file to repository

1 file changed, 9 insertions(+)

create mode 100644 hello\_world.py

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git add hello\_world.py

warning: LF will be replaced by CRLF in hello\_world.py.

The file will have its original line endings in your working directory

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git status

On branch main

No commits yet

Changes to be committed:

(use "git rm --cached <file>..." to unstage)

new file: hello\_world.py

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git commit

hint: waiting for your editor to close the file... unix2dos: converting file C:/Users/JG10/OneDrive - AS/GitHub/Repos/hello\_world/.git/COMMIT\_EDITMSG to DOS format...

dos2unix: converting file C:/Users/JG10/OneDrive - CEFAS/GitHub/Repos/hello\_world/.git/COMMIT\_EDITMSG to Unix format...

[main (root-commit) a59cb3f] Adding first file to repository

1 file changed, 9 insertions(+)

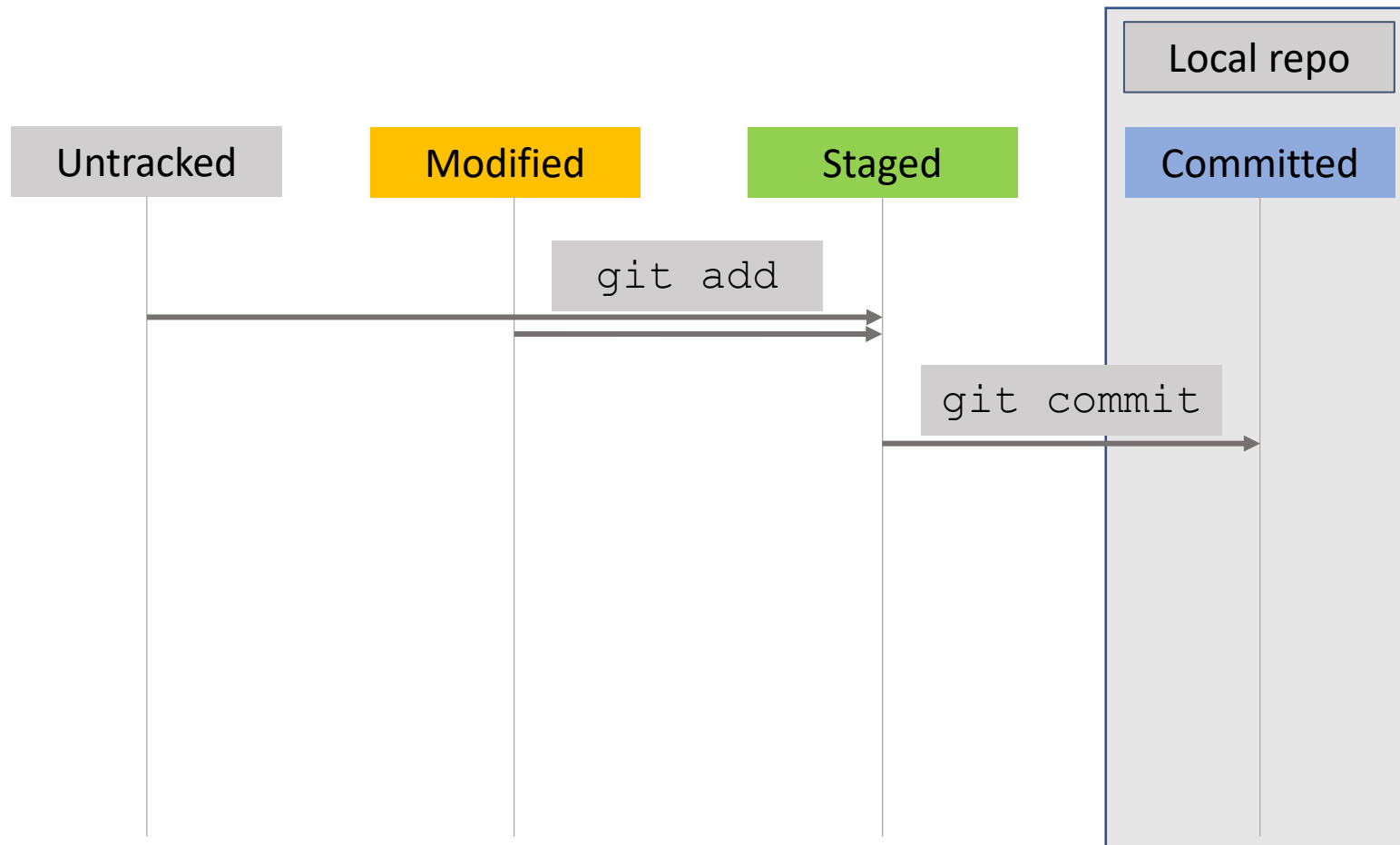
create mode 100644 hello\_world.py

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git status

On branch main

nothing to commit, working tree clean



# Committing changes

- Commit your change.
  - You will be prompted for a commit message.
  - Make a concise, meaningful description of the changes and why they were made.
  - Best practice is to stage only associated modifications in each commit.
- How often should you commit?
  - More often than you think - whenever you make a change that works?
  - The more often you commit, the easier it is to document (with short, meaningful messages), or roll-back if needed.
  - Avoid committing untested or unfinished modifications!



	COMMENT	DATE
○	CREATED MAIN LOOP & TIMING CONTROL	14 HOURS AGO
○	ENABLED CONFIG FILE PARSING	9 HOURS AGO
○	MISC BUGFIXES	5 HOURS AGO
○	CODE ADDITIONS/EDITS	4 HOURS AGO
○	MORE CODE	4 HOURS AGO
○	HERE HAVE CODE	4 HOURS AGO
○	AAAAAAA	3 HOURS AGO
○	ADKFJ\$LKDFJSDKLFJ	3 HOURS AGO
○	MY HANDS ARE TYPING WORDS	2 HOURS AGO
○	HAAAAAAAAAANDS	2 HOURS AGO

AS A PROJECT DRAGS ON, MY GIT COMMIT MESSAGES GET LESS AND LESS INFORMATIVE.

<https://xkcd.com/1296/>

```
git init          :: turn current directory into git repository.  
git add <file>    :: stage the file for commit i.e., track changes.  
git commit        :: confirm changes with message/explanation.  
  
git status        :: show which files have been tracked or modified.
```

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ ls

README.md hello\_world.py

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git status

On branch main

Untracked files:

(use "git add <file>..." to include in what will be committed)

README.md

nothing added to commit but untracked files present (use "git add" to track)

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git add README.md

warning: LF will be replaced by CRLF in README.md.

The file will have its original line endings in your working directory

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git commit

hint: Waiting for your editor to close the file... unix2dos: converting file C:/Users/JG10/OneDrive - CEFAS/GitHub/Repos/hello\_world/.git/COMMIT\_EDITMSG to DOS format...

dos2unix: converting file C:/Users/JG10/OneDrive - CEFAS/GitHub/Repos/hello\_world/.git/COMMIT\_EDITMSG to Unix format...

[main a5f1734] Adding README file

1 file changed, 1 insertion(+)

create mode 100644 README.md

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git status

On branch main

nothing to commit, working tree clean

Create a new file,  
add and commit ...



JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ ls

README.md hello\_world.py

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ vi hello\_world.py

Edit files and  
make changes ...

```
@author JGraham
created 11/06/21
'''
```

```
hello = 'Hello world'
print(hello)
```

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ ls

README.md hello\_world.py

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ vi hello\_world.py

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git diff hello\_world.py

```
git diff <file>
:: show difference between
current file and last
commit.
```

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ ls

README.md hello\_world.py

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ vi hello\_world.py

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git diff hello\_world.py

warning: LF will be replaced by CRLF in hello\_world.py.

The file will have its original line endings in your working directory

diff --git a/hello\_world.py b/hello\_world.py

index 0f33ce4..e779e75 100644

--- a/hello\_world.py

+++ b/hello\_world.py

@@ -5,5 +5,5 @@ My first code.

created 11/06/21

'''

-hello = 'Hello wold'

+hello = 'Hello world'

print(hello)

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$

git diff <file>  
:: show difference between  
current file and last  
commit.

```
-hello = 'Hello wold'  
+hello = 'Hello world'  
print(hello)
```

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ vi README.md

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git diff README.md

warning: LF will be replaced by CRLF in README.md.

The file will have its original line endings in your working directory

diff --git a/README.md b/README.md

index eb6d976..0d08e3c 100644

--- a/README.md

+++ b/README.md

@@ -1,1 @@

-This is my first repository.

+This is Jenny's first repository.

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$

```
-hello = 'Hello wold'  
+hello = 'Hello world'  
print(hello)
```

```
JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello_world (main)  
$ vi README.md
```

```
JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello_world (main)  
$ git diff README.md  
warning: LF will be replaced by CRLF in README.md.  
The file will have its original line endings in your working directory  
diff --git a/README.md b/README.md  
index eb6d976..0d08e3c 100644  
--- a/README.md  
+++ b/README.md  
@@ -1,1 @@  
-This is my first repository.  
+This is Jenny's first repository.
```

```
JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello_world (main)  
$ git status  
On branch main  
Changes not staged for commit:  
  (use "git add <file>..." to update what will be committed)  
  (use "git restore <file>..." to discard changes in working directory)  
        modified:   README.md  
        modified:   hello_world.py
```

no changes added to commit (use "git add" and/or "git commit -a")

```
JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello_world (main)  
$ |
```

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git add hello\_world.py

warning: LF will be replaced by CRLF in hello\_world.py.

The file will have its original line endings in your working directory

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$

```
JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello_world (main)
$ git add hello_world.py
warning: LF will be replaced by CRLF in hello_world.py.
The file will have its original line endings in your working directory
```

```
JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello_world (main)
$ git status
On branch main
Changes to be committed:
  (use "git restore --staged <file>..." to unstage)
        modified:   hello_world.py

Changes not staged for commit:
  (use "git add <file>..." to update what will be committed)
  (use "git restore <file>..." to discard changes in working directory)
        modified:   README.md
```

```
JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello_world (main)
$
```

Don't have to add  
all files to commit.



JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git add hello\_world.py

warning: LF will be replaced by CRLF in hello\_world.py.

The file will have its original line endings in your working directory

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git status

On branch main

Changes to be committed:

(use "git restore --staged <file>..." to unstage)

modified: hello\_world.py

Changes not staged for commit:

(use "git add <file>..." to update what will be committed)

(use "git restore <file>..." to discard changes in working directory)

modified: README.md

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git commit

hint: Waiting for your editor to close the file... unix2dos: converting file C:/Users/JG10/OneDrive - CEFAS/

Hub/Repos/hello\_world/.git/COMMIT\_EDITMSG to DOS format...

dos2unix: converting file C:/Users/JG10/OneDrive - CEFAS/GitHub/Repos/hello\_world/.git/COMMIT\_EDITMSG to Unix

format...

[main 832863d] Fixing typo

1 file changed, 1 insertion(+), 1 deletion(-)

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git status

On branch main

Changes not staged for commit:

(use "git add <file>..." to update what will be committed)

(use "git restore <file>..." to discard changes in working directory)

modified: README.md

no changes added to commit (use "git add" and/or "git commit -a")

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git status

On branch main

Changes not staged for commit:

(use "git add <file>..." to update what will be committed)

(use "git restore <file>..." to discard changes in working directory)

modified: README.md

no changes added to commit (use "git add" and/or "git commit -a")

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git log

```
git log <file>
:: show commit history
[for file]
```

```
JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello_world (main)
$ git status
On branch main
Changes not staged for commit:
  (use "git add <file>..." to update what will be committed)
  (use "git restore <file>..." to discard changes in working directory)
        modified:   README.md
```

no changes added to commit (use "git add" and/or "git commit -a")

```
JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello_world (main)
$ git log
commit 832863dd3215b30c3bb7d09eb6ffff229dbff113 (HEAD -> main)
Author: jenniferagraham <jennifer.graham@cefas.co.uk>
Date:   Fri Jun 11 15:47:28 2021 +0100
```

Fixing typo

```
commit a5f173410ae2855cddc0999d58c0e3dfca54a3cf
Author: jenniferagraham <jennifer.graham@cefas.co.uk>
Date:   Fri Jun 11 15:41:13 2021 +0100
```

Adding README file

```
commit a59cb3fc93e0b2efbe607c79340c13549a6cba6e
Author: jenniferagraham <jennifer.graham@cefas.co.uk>
Date:   Fri Jun 11 15:37:05 2021 +0100
```

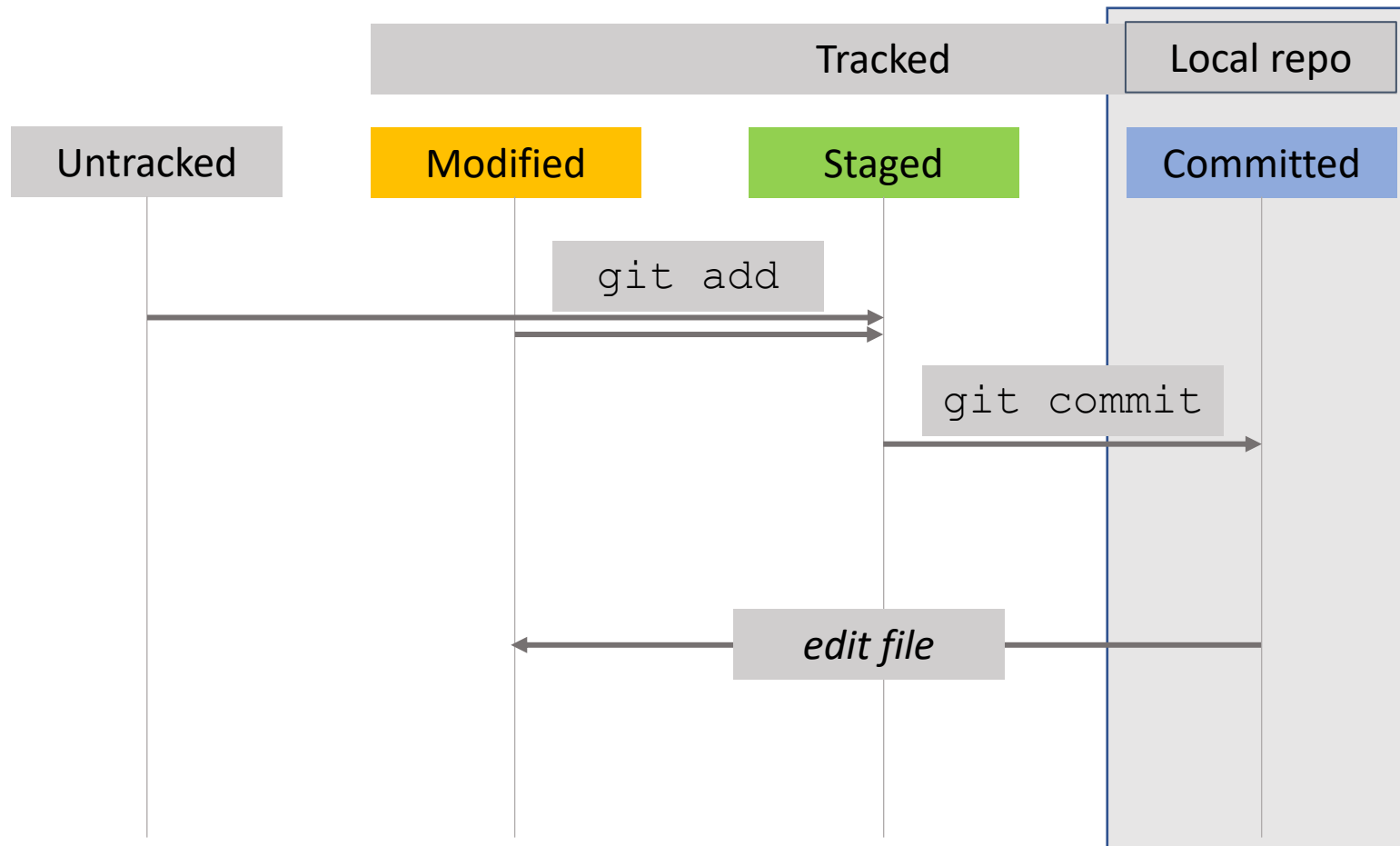
Adding first file to repository

```
JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello_world (main)
$ |
```

git log <file>  
:: show commit history  
[for file]

```
git init                :: turn current directory into git repository.
git add <file>          :: stage the file for commit i.e., track changes.
git commit              :: confirm changes with message/explanation.

git status              :: show which files have been tracked or modified.
git diff <file>         :: show difference between current file and last commit.
git log <file>          :: show commit history [for file]
```



# Aside: repository etiquette

- Git & GitHub are primarily for code/methods -> NOT data storage.
  - Wastes space in the repository, and changes to large files can't be tracked anyway!
  - However, paths/descriptions of data required should be included, either in the code or associated README files.
    - Example data files could be useful when sharing/releasing code.
  - Also, for *small* text or csv files, you may still find git & GitHub useful for version control.
- Give repositories a meaningful name.
  - Choosing meaningful and consistent names will help when searching for repositories.
  - Consider how many repositories could be called “Data\_Processing” or “python”?
    - What data is being processed and why? What is the code doing?
  - Consider adding initials as a prefix or suffix
    - Can distinguish between personal “working directories” vs. collaborative projects?
      - e.g. `jag_python_plotting` ?
  - Discuss with others to determine what scripts need to be included as collaborative, central repositories (avoid duplication).

# Try it yourself... [15 min]

1. Create your own repository locally:
  - Create a directory, e.g., named “My\_First\_Repo”.
  - Use “git init” to turn it into a repository.
2. Follow the basic workflow to add a simple txt file, make some edits, and then commit changes as you go...

```
git init          :: turn current directory into git repository.
git add <file>    :: stage the file for commit i.e. track changes.
git commit        :: confirm changes with message/explanation.

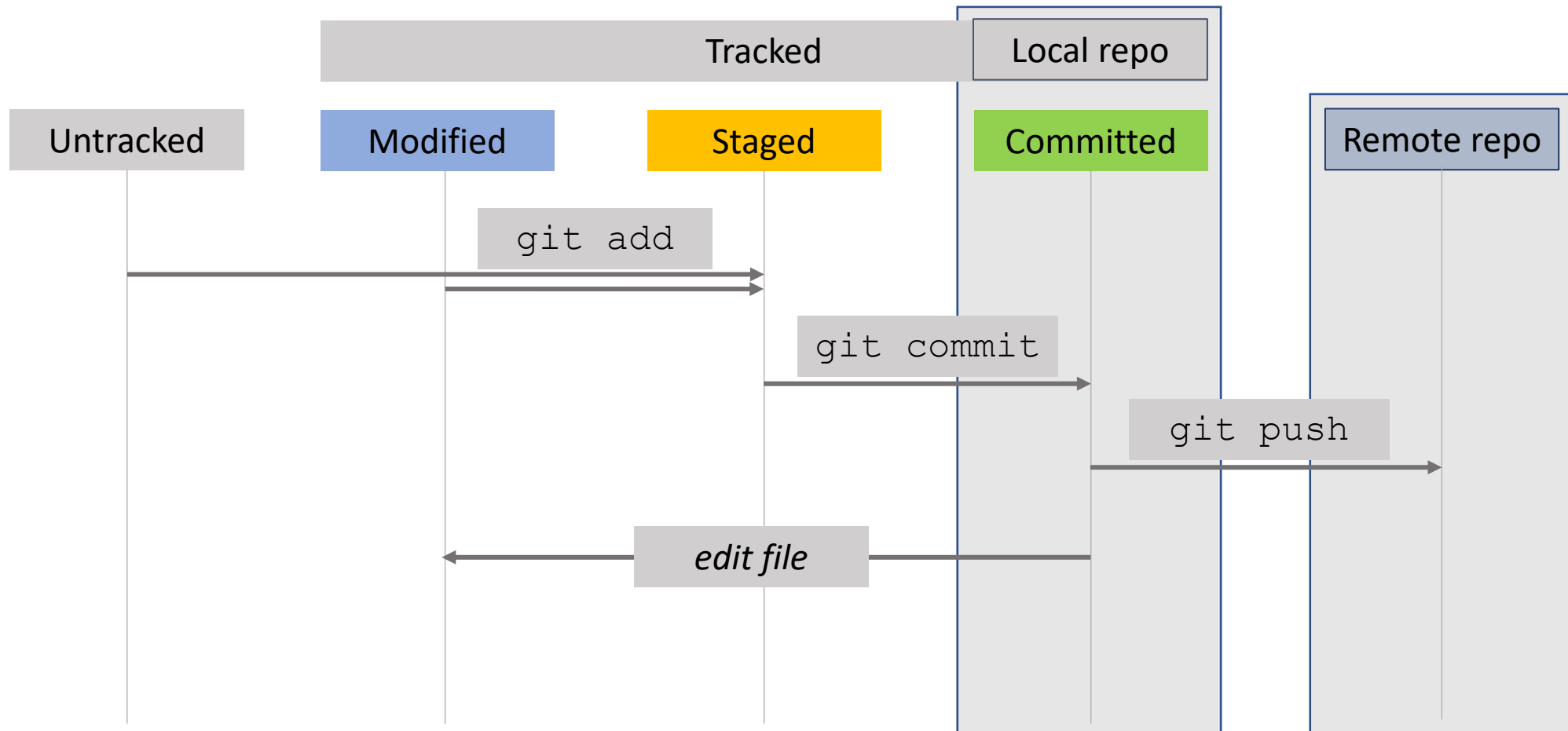
git status        :: show which files have been tracked or modified.
git diff <file>   :: show difference between current file and last commit.
git log <file>    :: show commit history [for file]
```



# Syncing/publishing changes

- Nothing will be visible on GitHub until you “push” your commits.
- You don’t need to “push” every commit (they are still recorded), but remember to do so regularly.
  - Make sure changes are visible for others to see & use.
  - Back-up your code.





JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git status

On branch main

Changes not staged for commit:

(use "git add <file>..." to update what will be committed)

(use "git restore <file>..." to discard changes in working directory)

modified: README.md

no changes added to commit (use "git add" and/or "git commit -a")

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git push

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git status

On branch main

Changes not staged for commit:

(use "git add <file>..." to update what will be committed)

(use "git restore <file>..." to discard changes in working directory)

modified: README.md

no changes added to commit (use "git add" and/or "git commit -a")

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git push

fatal: No configured push destination.

Either specify the URL from the command-line or configure a remote repository using

git remote add <name> <url>

and then push using the remote name

git push <name>

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$



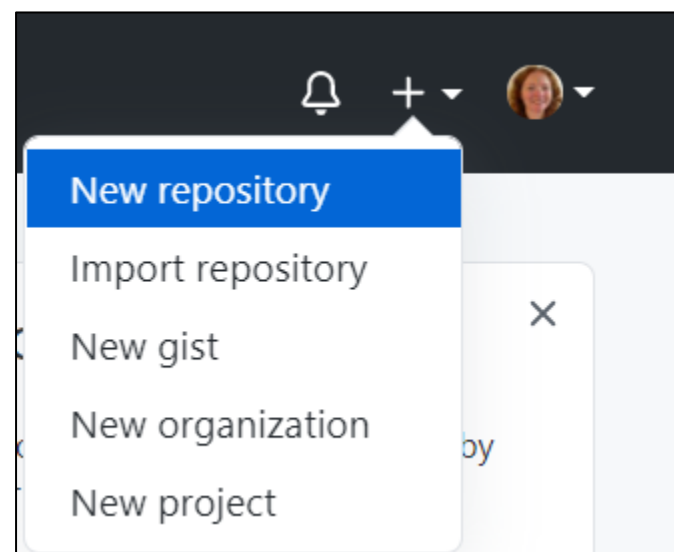
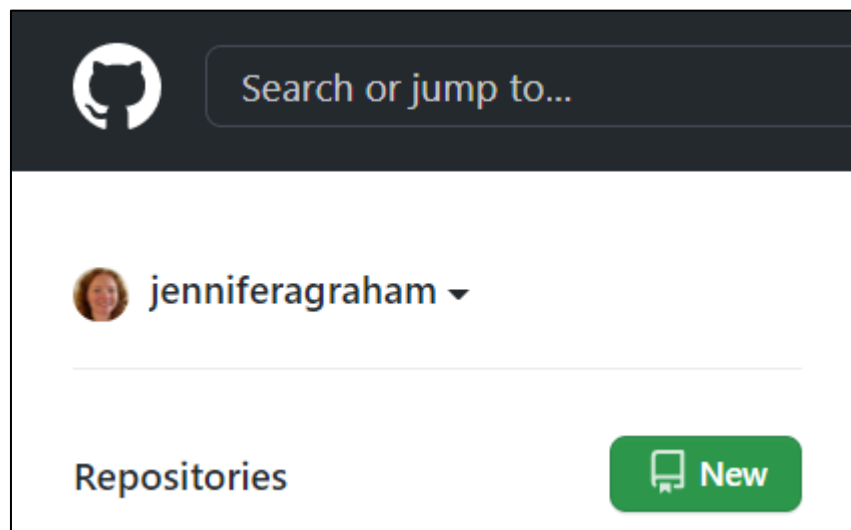
# Where the world builds software

Millions of developers and companies build, ship, and maintain their software on GitHub—the largest and most advanced development platform in the world.

Email address

Sign up for GitHub







🔍 Type / to search



## Create a new repository

A repository contains all project files, including the revision history. Already have a project repository elsewhere?

[Import a repository.](#)

*Required fields are marked with an asterisk (\*).*

Owner \*

Repository name \*



jenniferagraham



/

Filter...



jenniferagraham



CefasRepRes



ueapy

memorable. Need inspiration? How about [symmetrical-goggles](#) ?



Private

You choose who can see and commit to this repository.

Initialize this repository with:



Add a README file

This is where you can write a long description for your project. [Learn more about READMEs.](#)

Add .gitignore



🔍 Type  to search



## Create a new repository

A repository contains all project files, including the revision history. Already have a project repository elsewhere? [Import a repository.](#)

*Required fields are marked with an asterisk (\*).*

Owner \*



Repository name \*

hello\_world

✓ hello\_world is available.

Great repository names are short and memorable. Need inspiration? How about [vigilant-octo-doodle](#) ?

Description (optional)



Public

Anyone on the internet can see this repository. You choose who can commit.



Private

You choose who can see and commit to this repository.

Initialize this repository with:



Add a README file

This is where you can write a long description for your project. [Learn more about READMEs.](#)





🔍 Type / to search

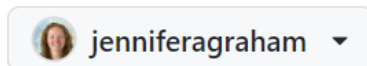


## Create a new repository

A repository contains all project files, including the revision history. Already have a project repository elsewhere? [Import a repository.](#)

*Required fields are marked with an asterisk (\*).*

Owner \*



Repository name \*

/ hello\_world

✔ hello\_world is available.

Great repository names are short and memorable. Need inspiration? How about **vigilant-octo-doodle** ?

Description (optional)



Public

Anyone on the internet can see this repository. You choose who can commit.



Private

You choose who can see and commit to this repository.



Initialize this repository with:

☐

Add a README file

This is where you can write a long description for your project. [Learn more about READMEs.](#)

Description (optional)

- ☐  **Public**  
Anyone on the internet can see this repository. You choose who can commit.
- ☒  **Private**  
You choose who can see and commit to this repository.

**DO NOT TICK**  
**OR ADD**  
**anything in this**  
**section**

Initialize this repository with:

- ☐ **Add a README file**  
This is where you can write a long description for your project. [Learn more about READMEs.](#)

Add .gitignore

.gitignore template: None ▼

Choose which files not to track from a list of templates. [Learn more about ignoring files.](#)

Choose a license



License: None ▼

A license tells others what they can and can't do with your code. [Learn more about licenses.](#)

 You are creating a private repository in your personal account.

Create repository

### Description (optional)

- ☐  **Public**  
Anyone on the internet can see this repository. You choose who can commit.
- ☒  **Private**  
You choose who can see and commit to this repository.

### Initialize this repository with:

- ☐ **Add a README file**  
This is where you can write a long description for your project. [Learn more about READMEs.](#)

### Add .gitignore

.gitignore template: None ▼

Choose which files not to track from a list of templates. [Learn more about ignoring files.](#)

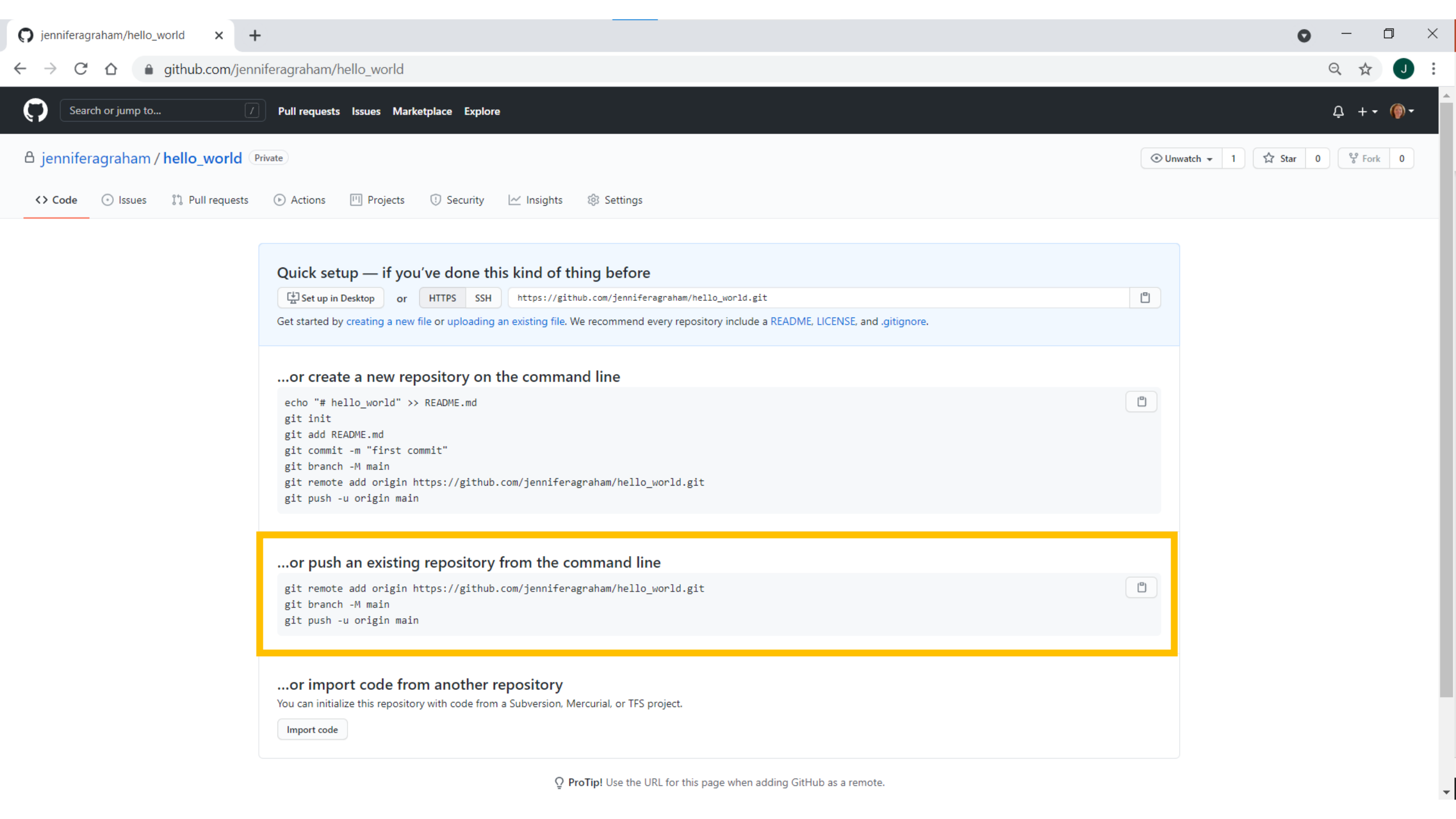
### Choose a license

License: None ▼

A license tells others what they can and can't do with your code. [Learn more about licenses.](#)

 You are creating a private repository in your personal account.

Create repository



JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git push

fatal: No configured push destination.

Either specify the URL from the command-line or configure a remote repository using

```
git remote add <name> <url>
```

and then push using the remote name

```
git push <name>
```

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git remote add origin https://github.com/jenniferagraham/hello\_world.git

git push -u origin main

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git branch -M main

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git push -u origin main

Enumerating objects: 9, done.

Counting objects: 100% (9/9), done.

Delta compression using up to 4 threads

Compressing objects: 100% (7/7), done.

Writing objects: 100% (9/9), 892 bytes | 297.00 KiB/s, done.

Total 9 (delta 1), reused 0 (delta 0), pack-reused 0

remote: Resolving deltas: 100% (1/1), done.

To https://github.com/jenniferagraham/hello\_world.git

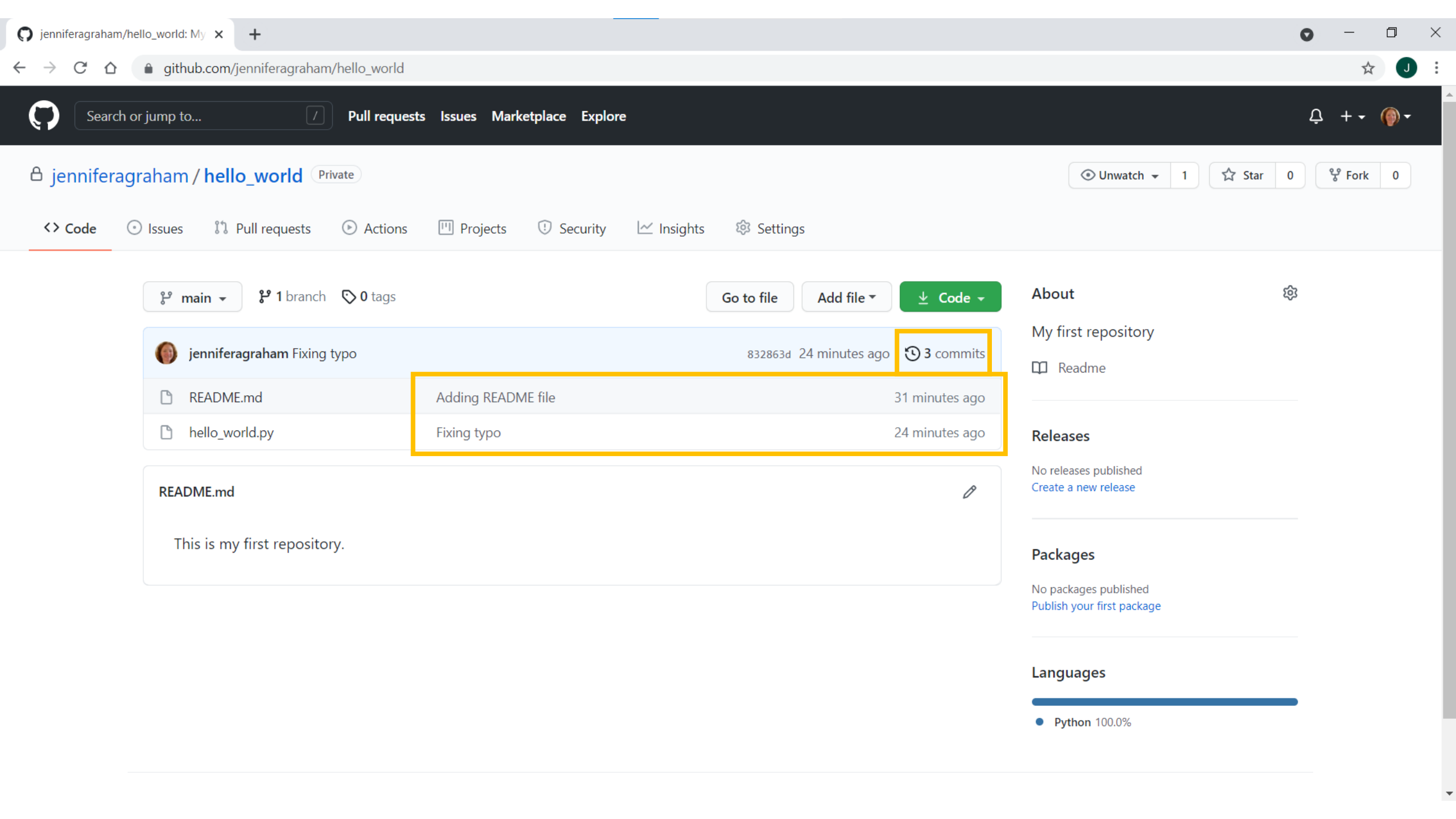
\* [new branch] main -> main

Branch 'main' set up to track remote branch 'main' from 'origin'.

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ |

Use commands shown  
on GitHub to set  
up link to remote  
repository.



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jenniferagraham / hello\_world Private

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1

Star

0

Fork

0

Code

Issues

Pull requests

Actions

Projects

Security

Insights

Settings

main

1 branch

0 tags

Go to file

Add file

Code



jenniferagraham Fixing typo

832863d 24 minutes ago

3 commits



README.md

Adding README file

31 minutes ago



hello\_world.py

Fixing typo

24 minutes ago

README.md



This is my first repository.

## About



My first repository

Readme

## Releases

No releases published

[Create a new release](#)

## Packages

No packages published

[Publish your first package](#)

## Languages

Python 100.0%

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git status

On branch main

Your branch is up to date with 'origin/main'.

Changes not staged for commit:

(use "git add <file>..." to update what will be committed)

(use "git restore <file>..." to discard changes in working directory)

modified: README.md

no changes added to commit (use "git add" and/or "git commit -a")

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$ git diff README.md

warning: LF will be replaced by CRLF in README.md.

The file will have its original line endings in your working directory

diff --git a/README.md b/README.md

index eb6d976..0d08e3c 100644

--- a/README.md

+++ b/README.md

@@ -1,1 @@

-This is my first repository.

+This is Jenny's first repository.

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello\_world (main)

\$

```
--- a/README.md
```

```
+++ b/README.md
```

```
@@ -1 +1 @@
```

```
-This is my first repository.
```

```
+This is Jenny's first repository.
```

```
JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello_world (main)
```

```
$ git add README.md
```

```
warning: LF will be replaced by CRLF in README.md.
```

```
The file will have its original line endings in your working directory
```

```
JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello_world (main)
```

```
$ git commit
```

```
hint: Waiting for your editor to close the file... unix2dos: converting file C:/Users/JG10/OneDrive - CEFAS/
```

```
Hub/Repos/hello_world/.git/COMMIT_EDITMSG to DOS format...
```

```
dos2unix: converting file C:/Users/JG10/OneDrive - CEFAS/GitHub/Repos/hello_world/.git/COMMIT_EDITMSG to Uni
```

```
format...
```

```
[main 5fa034d] Specify Jenny's repository
```

```
1 file changed, 1 insertion(+), 1 deletion(-)
```

```
JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello_world (main)
```

```
$ git push
```

```
Enumerating objects: 5, done.
```

```
Counting objects: 100% (5/5), done.
```

```
Delta compression using up to 4 threads
```

```
Compressing objects: 100% (2/2), done.
```

```
Writing objects: 100% (3/3), 333 bytes | 333.00 KiB/s, done.
```

```
Total 3 (delta 0), reused 0 (delta 0), pack-reused 0
```

```
To https://github.com/jenniferagraham/hello_world.git
```

```
832863d..5fa034d main -> main
```


```
JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello_world (main)
```

```
$
```



 main





 1 branch


 0 tags

Go to file


Add file

 Code


	jenniferagraham Specify Jenny's repository	5fa034d 2 minutes ago	 4 commits
	README.md	Specify Jenny's repository	2 minutes ago
	hello_world.py	Fixing typo	27 minutes ago

README.md 

This is Jenny's first repository.

About 

My first repository

 [Readme](#)

Releases

No releases published  
[Create a new release](#)

Packages

No packages published  
[Publish your first package](#)

Languages

● Python 100.0%



```
git init                :: turn current directory into git repository.
git add <file>          :: stage the file for commit i.e., track changes.
git commit              :: confirm changes with message/explanation.
git push                :: publish/back-up changes on GitHub (remote server).

git status              :: show which files have been tracked or modified.
git diff <file>         :: show difference between current file and last commit.
git log <file>          :: show commit history [for file]
```

# Try this yourself... [15 min]

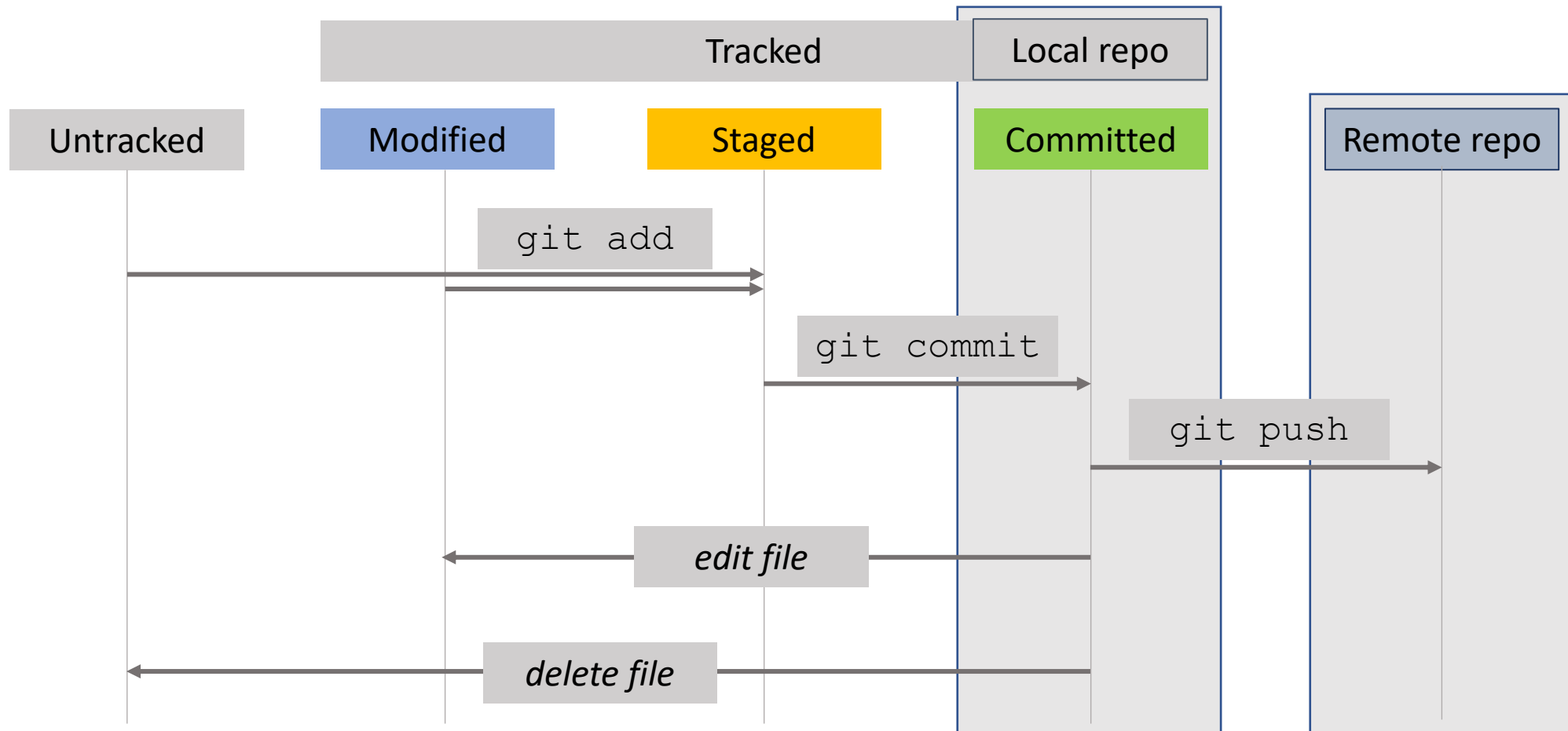
- Push your repository to GitHub, and view changes.
  - Create an *empty* repository on GitHub (with the name of your local repository).
  - Use the commands that GitHub provides to push your local repository up to the GitHub site.

```
git init          :: turn current directory into git repository.
git add <file>    :: stage the file for commit i.e., track changes.
git commit        :: confirm changes with message/explanation.
git push          :: publish/back-up changes on GitHub (remote server).

git status        :: show which files have been tracked or modified.
git diff <file>   :: show difference between current file and last commit.
git log <file>    :: show commit history [for file]
```

# Further useful commands...

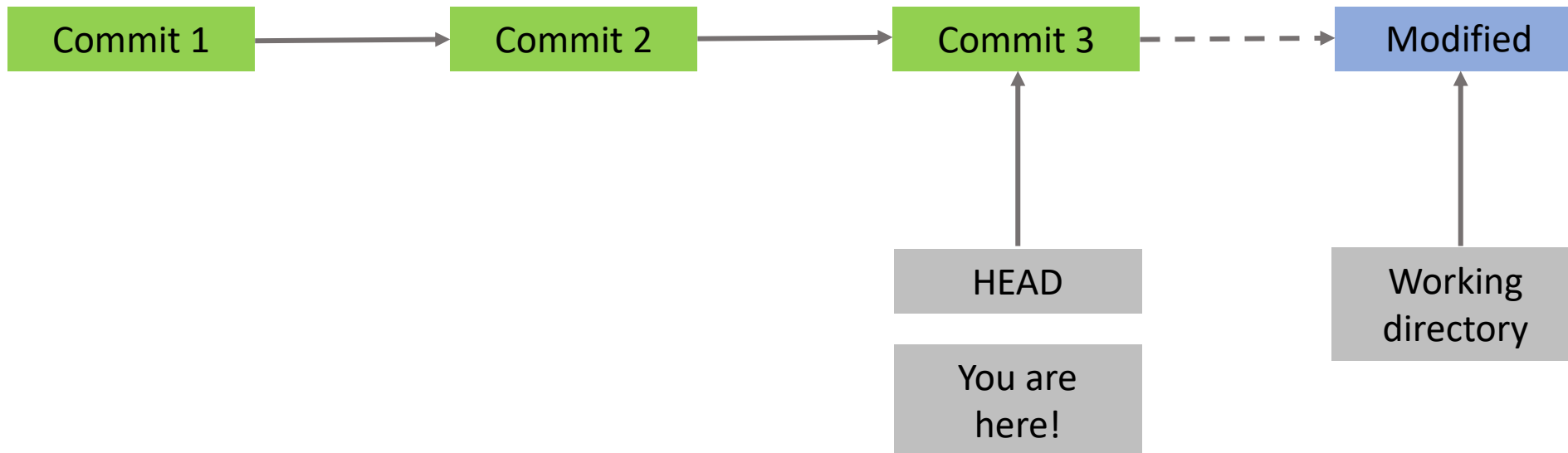
```
git rm <file> :: delete file and remove from repository.  
git rm --cached <file> :: delete file from repository, but keep  
local copy.  
  
git mv <file> <new_name> :: rename file, and keep tracking.  
  
git remote -v :: check url for tracked remote repository  
  
git <command> --help :: open help documentation for any command!
```



# Summary: Terminology

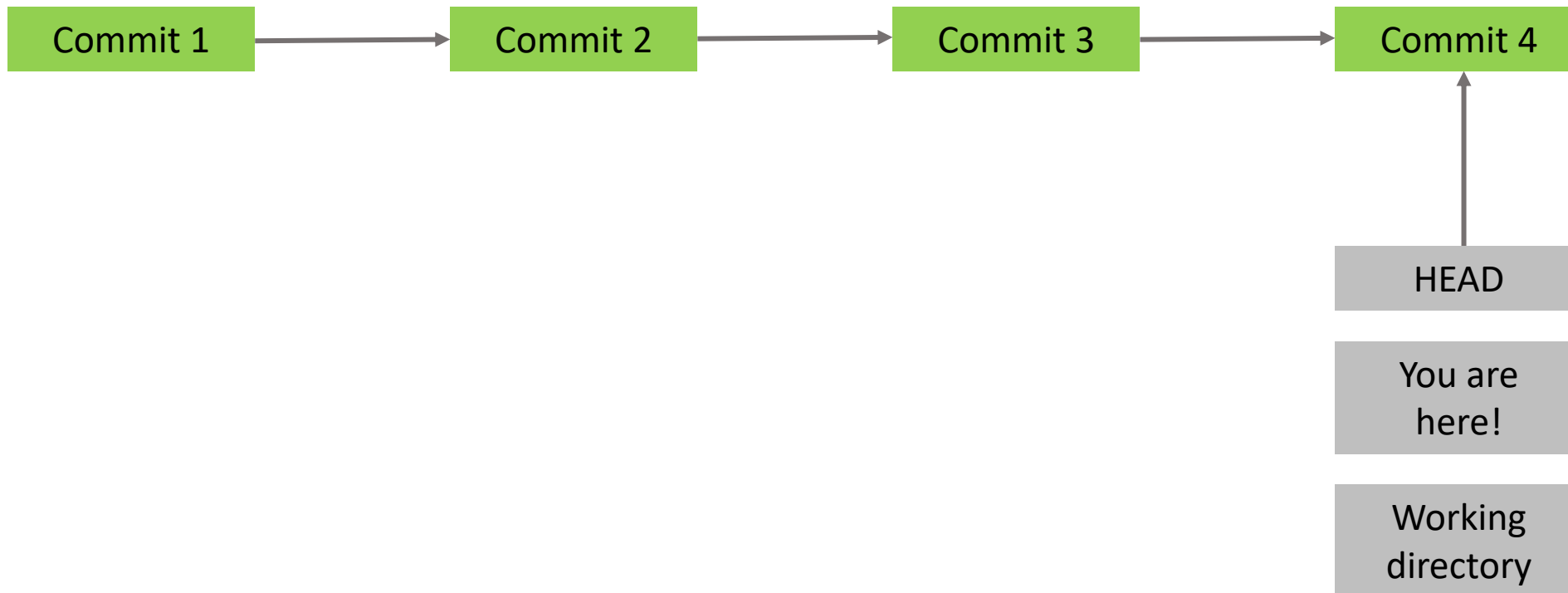
- Repository: Folder containing collection of files to be stored/tracked (any sort of text/code).
- Local repository: Repository being tracked on your local machine (i.e. desktop, hpc).
- Remote repository: a separate copy of your repository stored in a remote location e.g. on GitHub.
  
- Add: Tells git what files to track / stage files for commit.
- Commit: Saves a snapshot of files, with explanation for any changes.
- Push: Updates from your local machine synced to the remote location.
  
- Branch: Repositories can be branched into parallel copies, to safely test large developments to the code.
  - The default/central branch is named the “main” (or “master”) branch.
  - This central branch should always contain a working version of the code.
- Head: Latest commit made, tip of the branch in your local repository (current working revision)

# Where is my HEAD?





# Where is my HEAD?



More useful tips...

# Contents of .git folder

- When a repository is created, this creates a .git folder in the directory.
- .git contains e.g.:

```
JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello_world (main)
$ ls -a
./  ../  .git/  README.md  hello_world.py

JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello_world (main)
$ ls .git
COMMIT_EDITMSG  HEAD  config  description  hooks/  index  info/  logs/  objects/  refs/
```

- What are these files?
  - They contain everything that git needs to know about the repository!
  - Whenever you run a command, it will use and/or edit files here.

# .gitignore



- .gitignore files tell git what to ignore!
- Can ignore any file, directory, or file extensions...
  - e.g. executables, log files, data, figures... (any secrets)
  - Standard examples are provided on GitHub.
- Simple example file:

Name	Status	Date modified	Type
.git	✓	02/07/2019 14:55	File folder
.gitattributes	✓	27/06/2019 11:32	Text Document
.gitignore	✓	27/06/2019 11:46	Text Document
DATA.nc	✓	26/11/2018 16:36	NC File
Figure.PNG	✓	26/01/2018 15:54	PNG File
hello_world.py	✓	25/06/2019 14:07	Python File
README.md	✓	27/06/2019 12:11	MD File

```
C:\Users\JG10\OneDrive - CEFAS\GitHub\Repos\jag_hello_desktop\.gitignore
File Edit Search View Encoding Language Settings Macro Run Plugins
1 *.nc
2 *PNG
3
```

# git config

- Check global username and email settings: `git config --global -l`

```
JG10@G6W1YF2 MINGW64 ~  
$ git config --global -l  
filter.lfs.required=true  
filter.lfs.clean=git-lfs clean -- %f  
filter.lfs.smudge=git-lfs smudge -- %f  
filter.lfs.process=git-lfs filter-process  
user.name=jenniferagraham  
user.email=jennifer.graham@cefas.co.uk
```

- Change default editor?

```
JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello_world  
$ git config --get core.editor  
vi  
  
JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello_world  
$ git config --global core.editor notepad  
  
JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello_world  
$ git config --get core.editor  
notepad
```

# git config

- Check local repository settings e.g. path to remote repository

```
git config --local -l
```

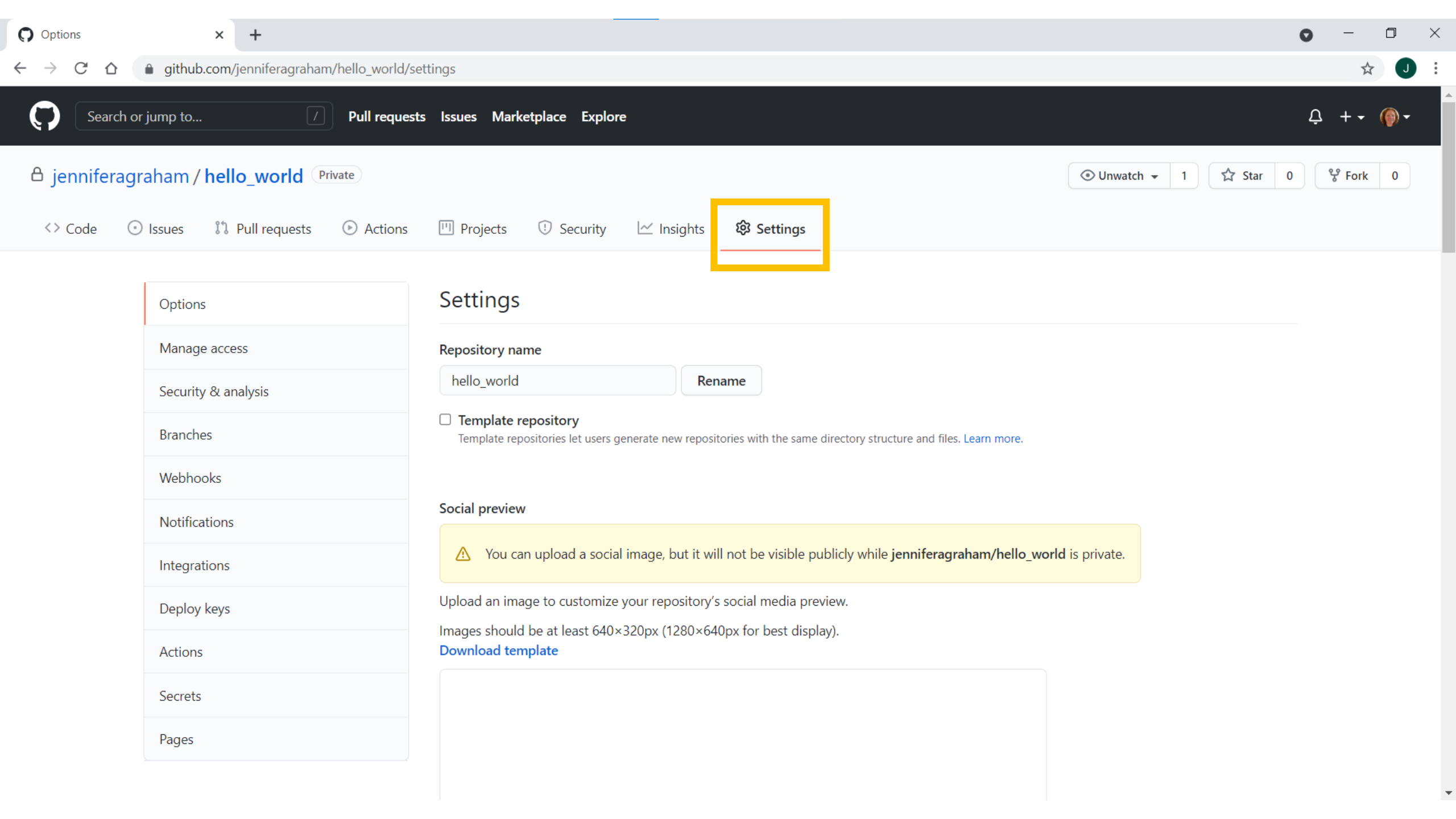
```
JG10@G6W1YF2 MINGW64 ~/OneDrive/GitHub/Repos/hello_world (main)
$ git config --local -l
core.repositoryformatversion=0
core.filemode=false
core.bare=false
core.logallrefupdates=true
core.ignorecase=true
remote.origin.url=https://github.com/jenniferagraham/hello_world.git
remote.origin.fetch=+refs/heads/*:refs/remotes/origin/*
branch.main.remote=origin
branch.main.merge=refs/heads/main
```

# GitHub settings

- Global settings
  - Your account details, notifications, organisation links, etc.
- Repository settings
  - Access, features, visibility, etc.

 Edit





Search or jump to...



Pull requests

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1

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0

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Options

Manage access

Security &amp; analysis

Branches

Webhooks

Notifications

Integrations

Deploy keys

Actions

Secrets

Pages

## Settings

### Repository name

hello\_world

Rename

### ☐ Template repository

Template repositories let users generate new repositories with the same directory structure and files. [Learn more.](#)

### Social preview

You can upload a social image, but it will not be visible publicly while [jenniferagraham/hello\\_world](#) is private.

Upload an image to customize your repository's social media preview.

Images should be at least 640×320px (1280×640px for best display).

[Download template](#)

# Adding documentation

- README
  - Automatically the front page of your repository.
  - [Markdown](#) formatting can be used
- Wiki
  - Broader information on use of repository.
  - Only available within public repositories or organisations.
  - e.g. [https://github.com/CefasRepRes/Git\\_Training/wiki/](https://github.com/CefasRepRes/Git_Training/wiki/)
- Issues
  - Flagging development stages or known problems.
- Projects
  - Organise work/issues on repositories?
- Some repository tracking info only available within organisations or paid accounts
  - More info here: <https://github.com/pricing>

# Issues

- Useful to flag development stages or known problems/bugs.
- Can be referred to elsewhere e.g. in commit messages.

The screenshot shows the GitHub interface for the 'numpy/numpy' repository. The top navigation bar includes links for 'Pull requests', 'Issues', 'Marketplace', and 'Explore'. Below this, the repository name 'numpy / numpy' is displayed along with statistics: 559 Watchers, 17.4k Stars, and 5.6k Forks. The 'Issues' tab is selected, showing 2.1k issues. A search bar at the top of the issue list contains the filter 'is:issue is:open'. The issue list itself shows 2,054 Open issues and 7,584 Closed issues. The first six issues are listed, each with a title, a label (e.g., '01 - Enhancement', '00 - Bug'), a component label ('component: numpy.core'), and a comment count. The issues are: 1. 'Modify .any() to return Null if all values are null' (2 comments), 2. 'deprecation warning for nonzero(0d\_array) not shown' (2 comments), 3. 'Compiler not found when specifying --fcompiler' (0 comments), 4. 'Broadcasting large arrays returns scalar instead of MemoryError' (5 comments), 5. 'array\_equal or testing.assert\_array\_equal does not compare NaNs as numbers when dtype is object' (1 comment), and 6. 'SciPy crash with nightly numpy wheel--possible f2py issue' (6 comments). The bottom of the list shows a partial view of an issue titled 'Test suite failure on non-AVX512 due to glibc (version-dependent) bug on f64 underflow' with 15 comments.

Issues · numpy/numpy

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Filters is:issue is:open Labels 86 Milestones 3 New issue

2,054 Open 7,584 Closed

Author Label Projects Milestones Assignee Sort

- Modify .any() to return Null if all values are null 01 - Enhancement component: numpy.core 2
- deprecation warning for nonzero(0d\_array) not shown component: numpy.core 2
- Compiler not found when specifying --fcompiler
- Broadcasting large arrays returns scalar instead of MemoryError 00 - Bug 5
- array\_equal or testing.assert\_array\_equal does not compare NaNs as numbers when dtype is object 1
- SciPy crash with nightly numpy wheel--possible f2py issue 6
- Test suite failure on non-AVX512 due to glibc (version-dependent) bug on f64 underflow 1 15