

<http://tinyurl.com/MDW-Lesson1>

Intro to GitHub

An open community of software developers

Adapted from the full tutorial at:
http://www.tutorialspoint.com/git/git_tutorial.pdf

GitHub: <https://github.com/>

Distributed Version Control System (DVCS)

A copy of your software exists in two (or more) places - on your own computer, and on the GitHub server.

A copy also exists on any computer who has “cloned” your software - maybe another computer owned by you, maybe another person’s computer

Why Git?

Multiple people can work on the same code at the same time

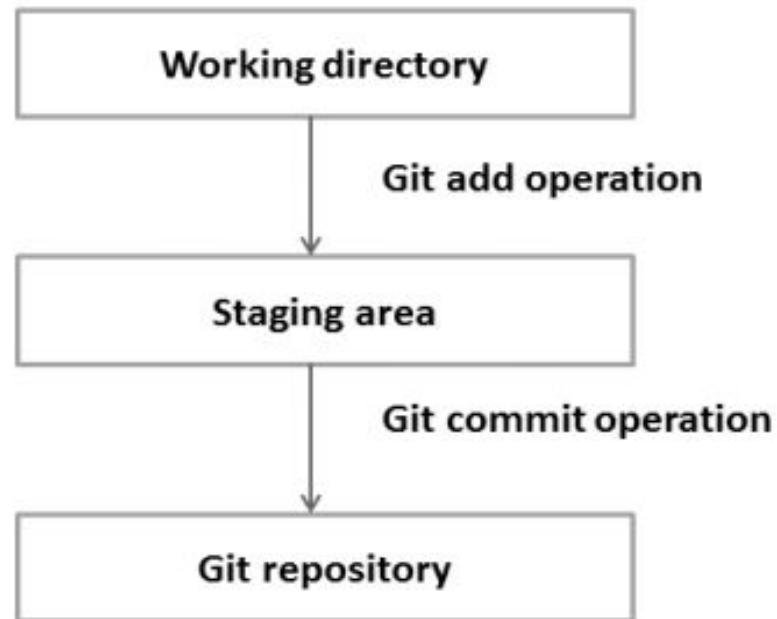
Conflicts are highlighted, and the owner of the code is made aware of them

All changes are recorded, and you can go back to old versions

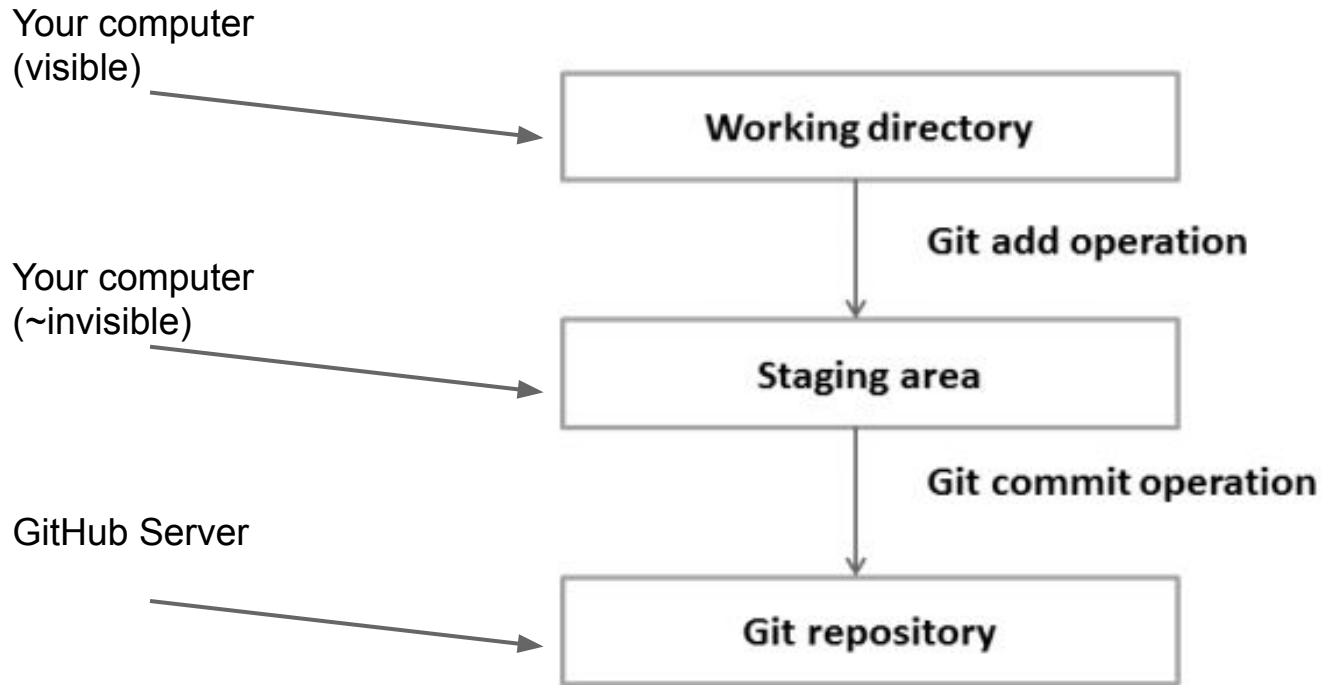
You can work on “new features” of a project, AND work on the main project, without conflicts (this is called “branching”)

When the new features are finished, you merge them into the main project (“merging”)

3 “layers” of Git

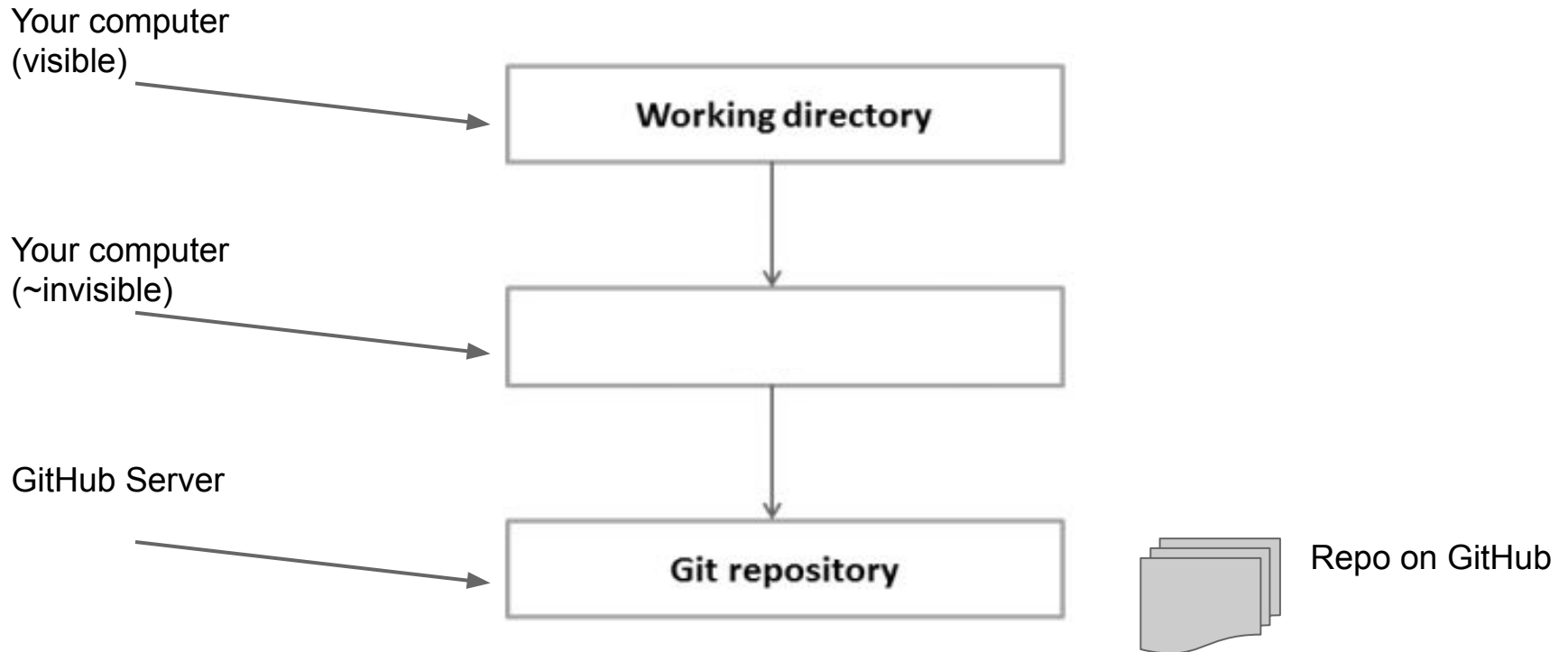


3 “layers” of Git



“Cloning” a repository

Your Action



“Cloning” a repository

Your Action

Your computer
(visible)

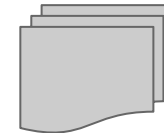
Working directory

Your computer
(~invisible)

GitHub Server

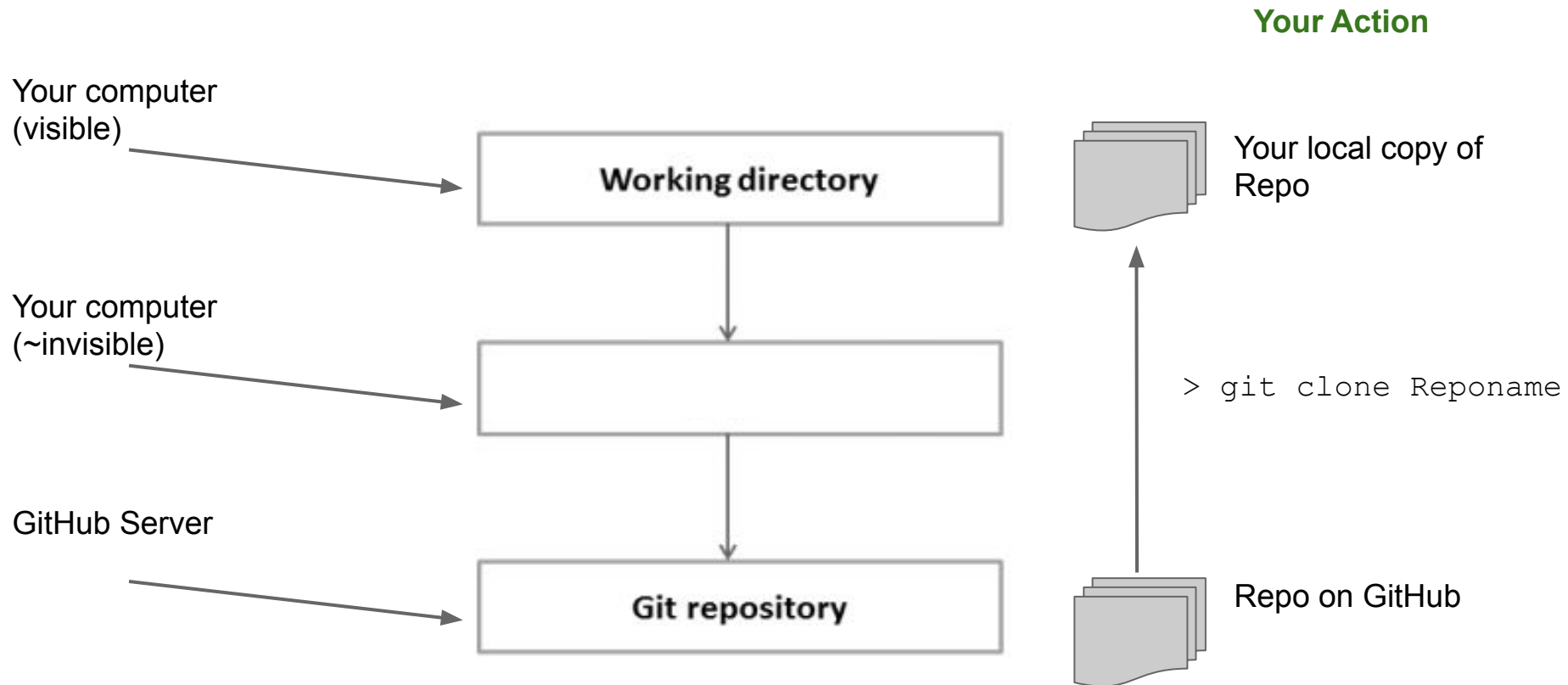
Git repository

```
> git clone Reponame
```



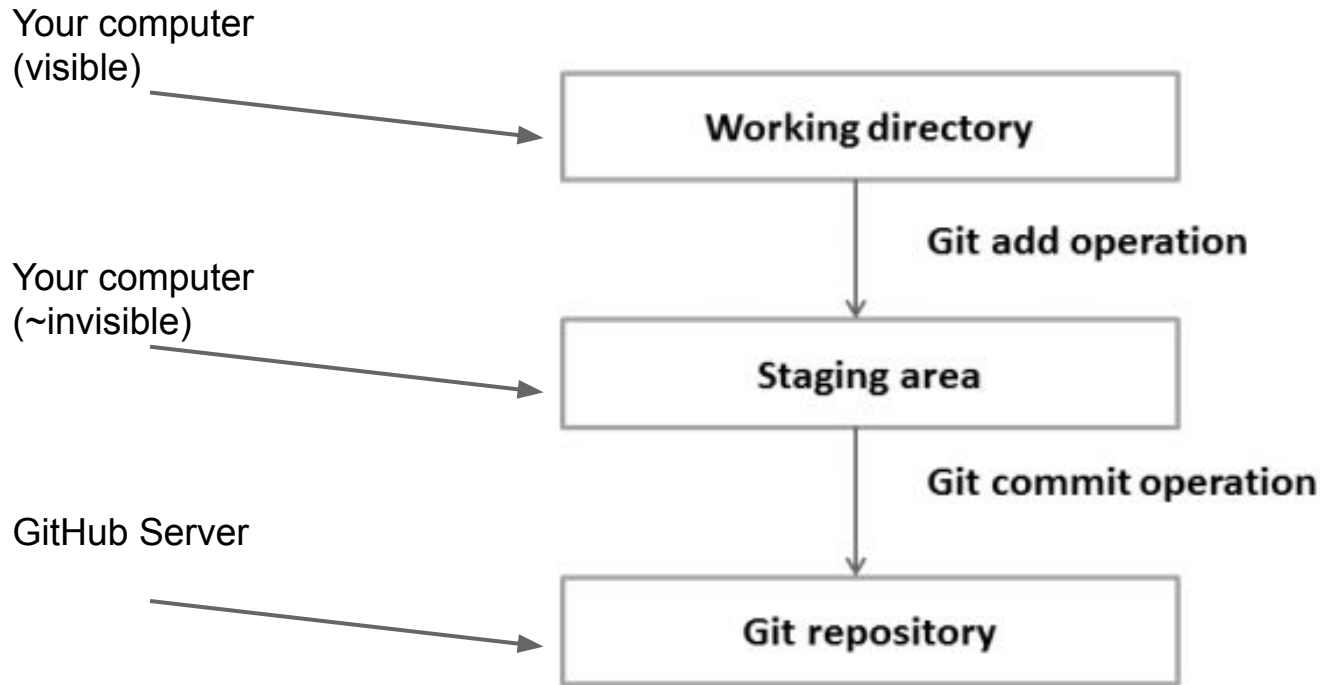
Repo on GitHub

“Cloning” a repository



3 “layers” of Git

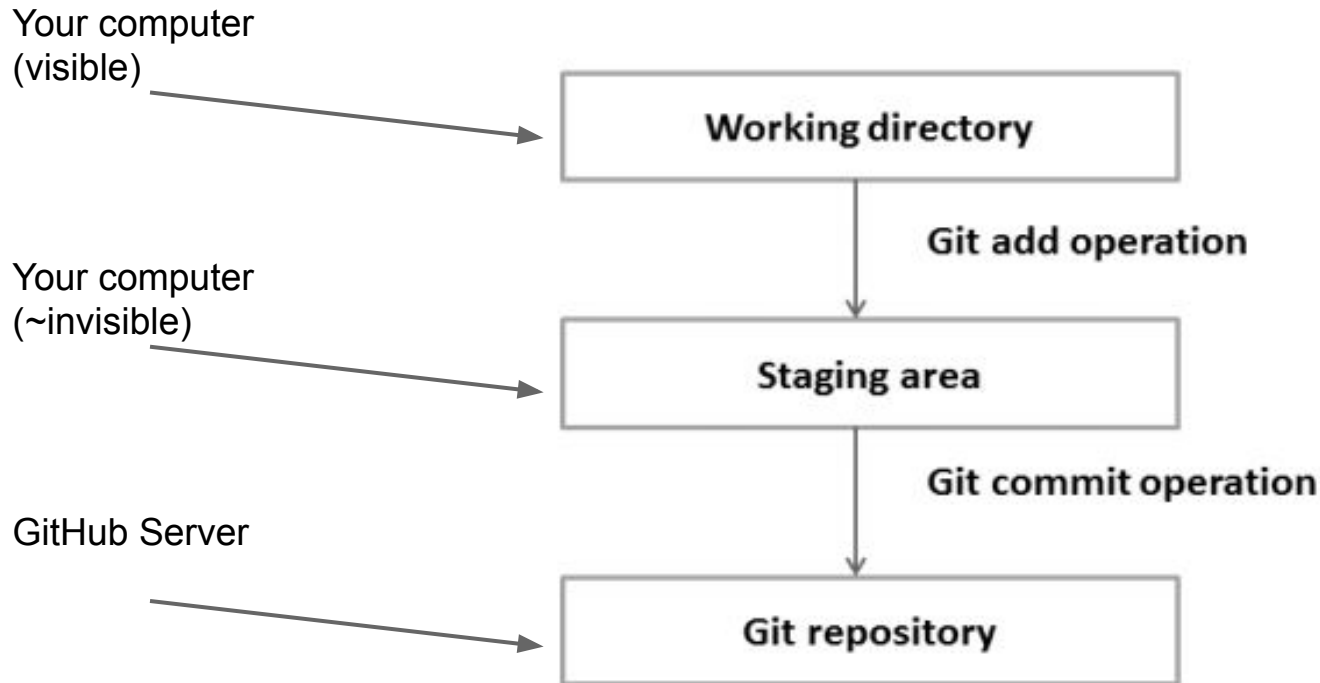
Your Action



3 “layers” of Git

Your Action

Create a file



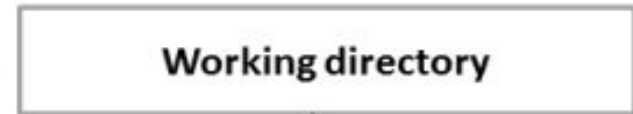
3 “layers” of Git

Your Action

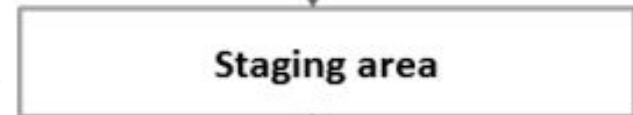
Your computer
(visible)

Your computer
(~invisible)

GitHub Server



Git add operation



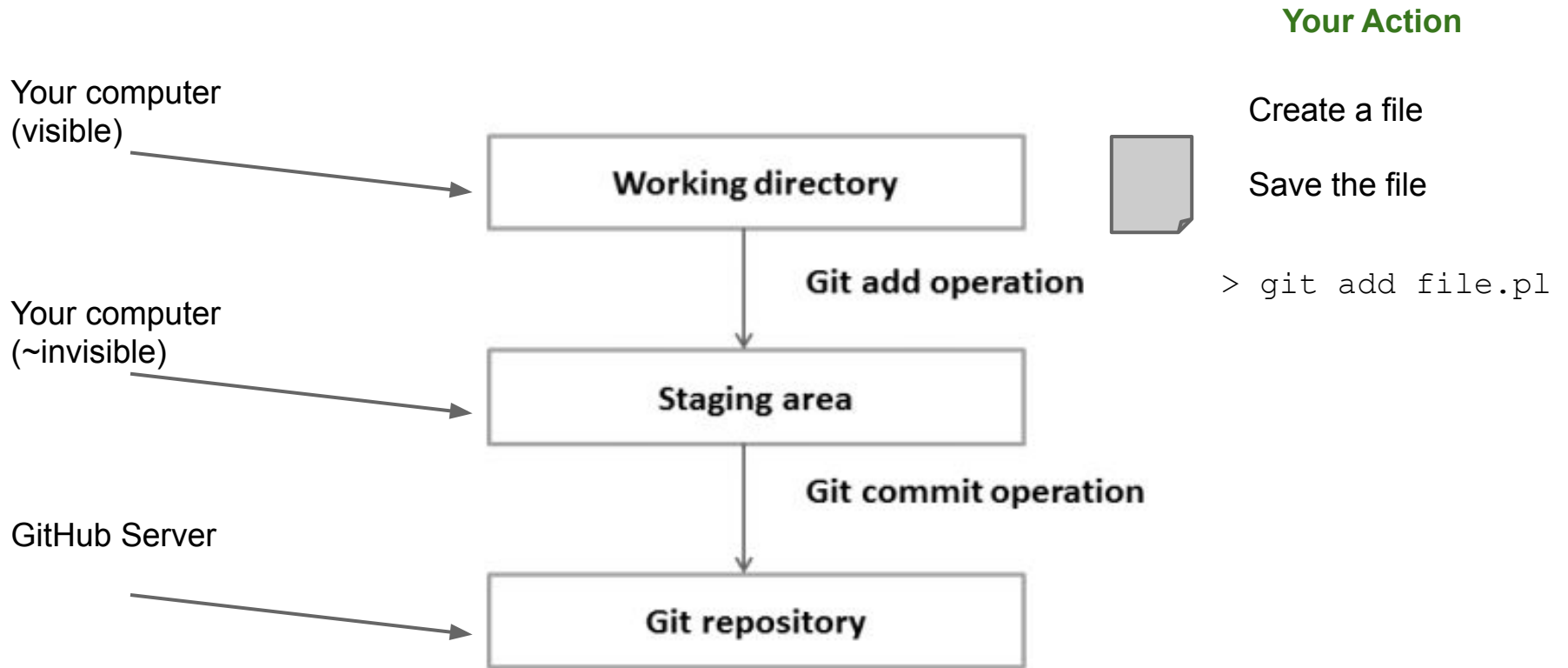
Git commit operation



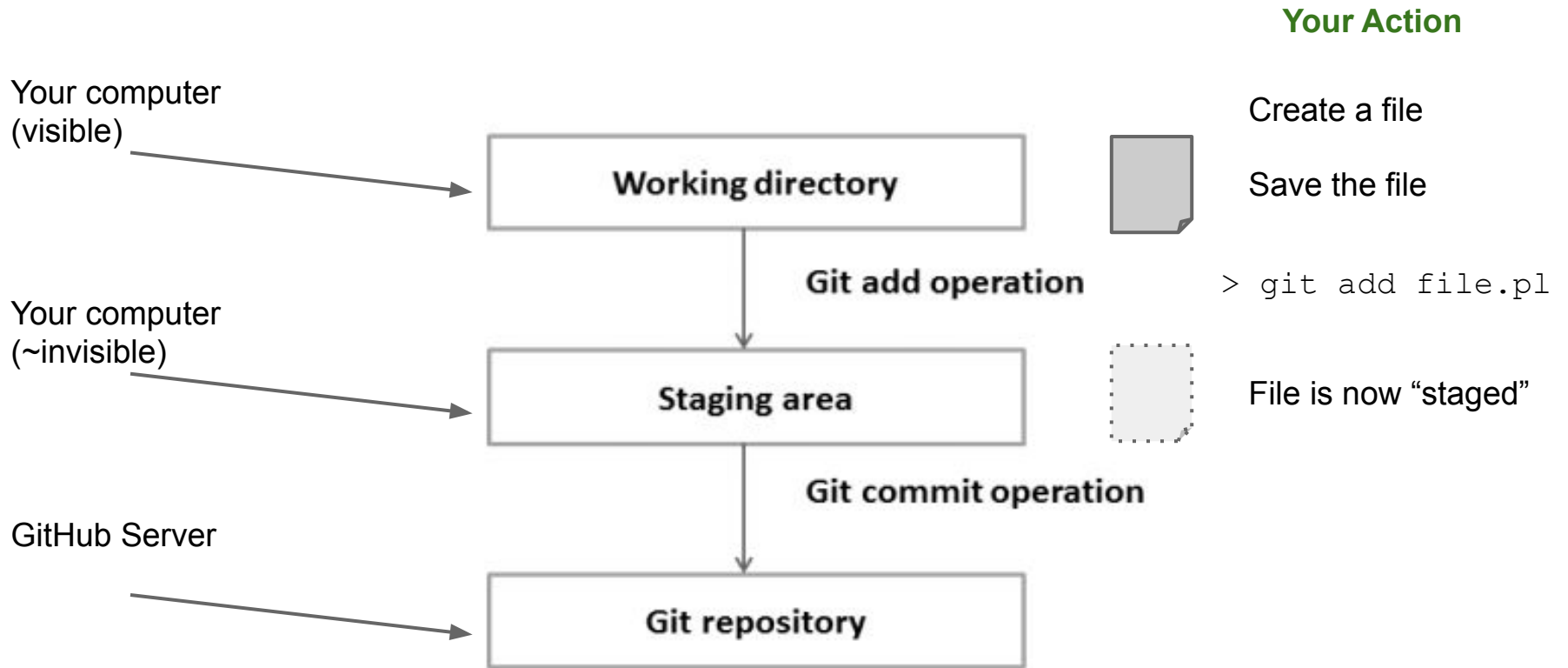
Create a file

Save the file

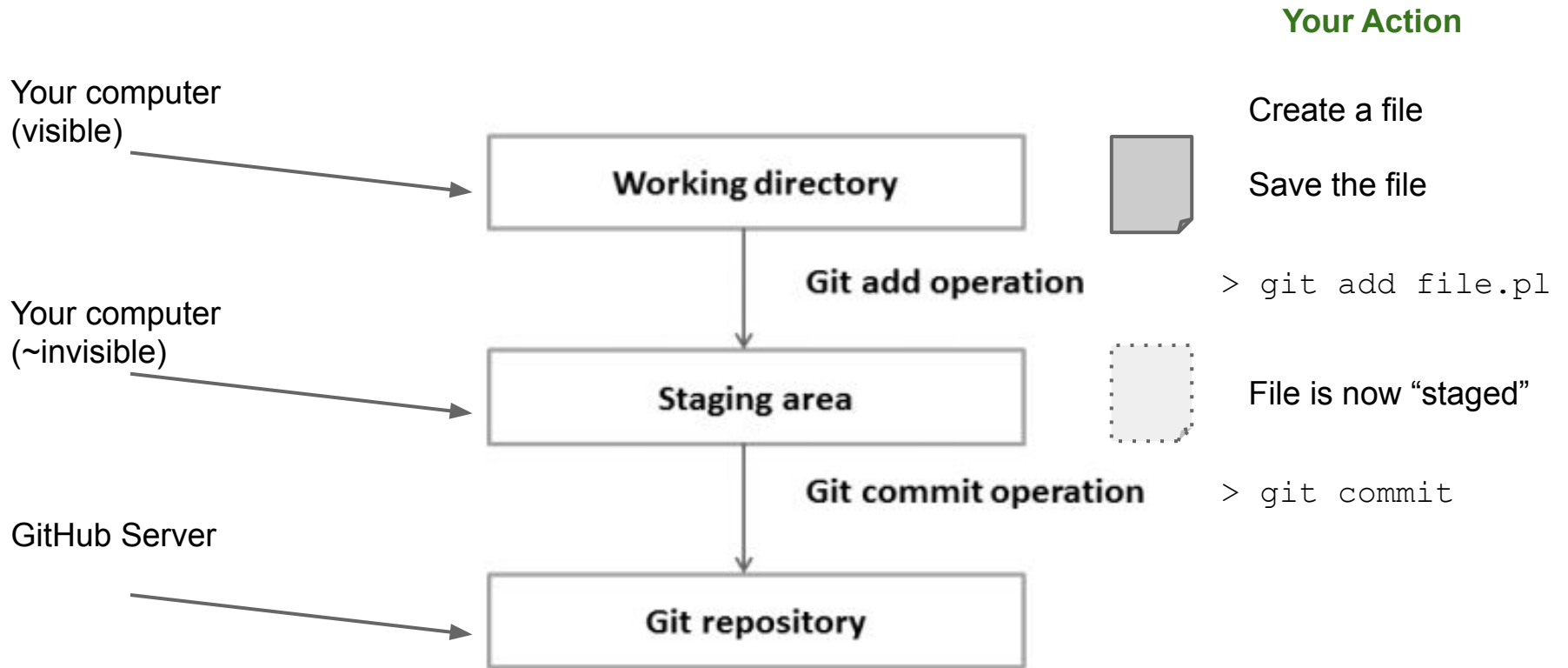
3 “layers” of Git



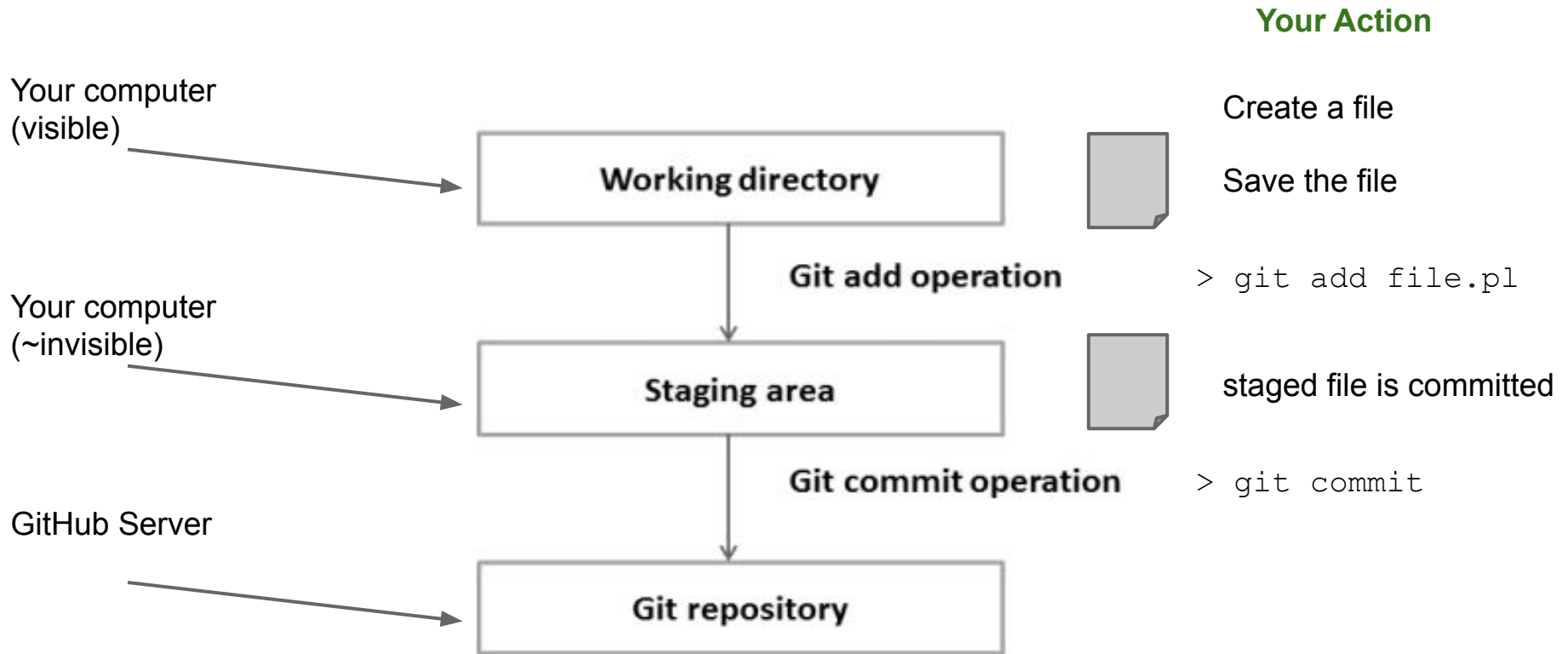
3 “layers” of Git



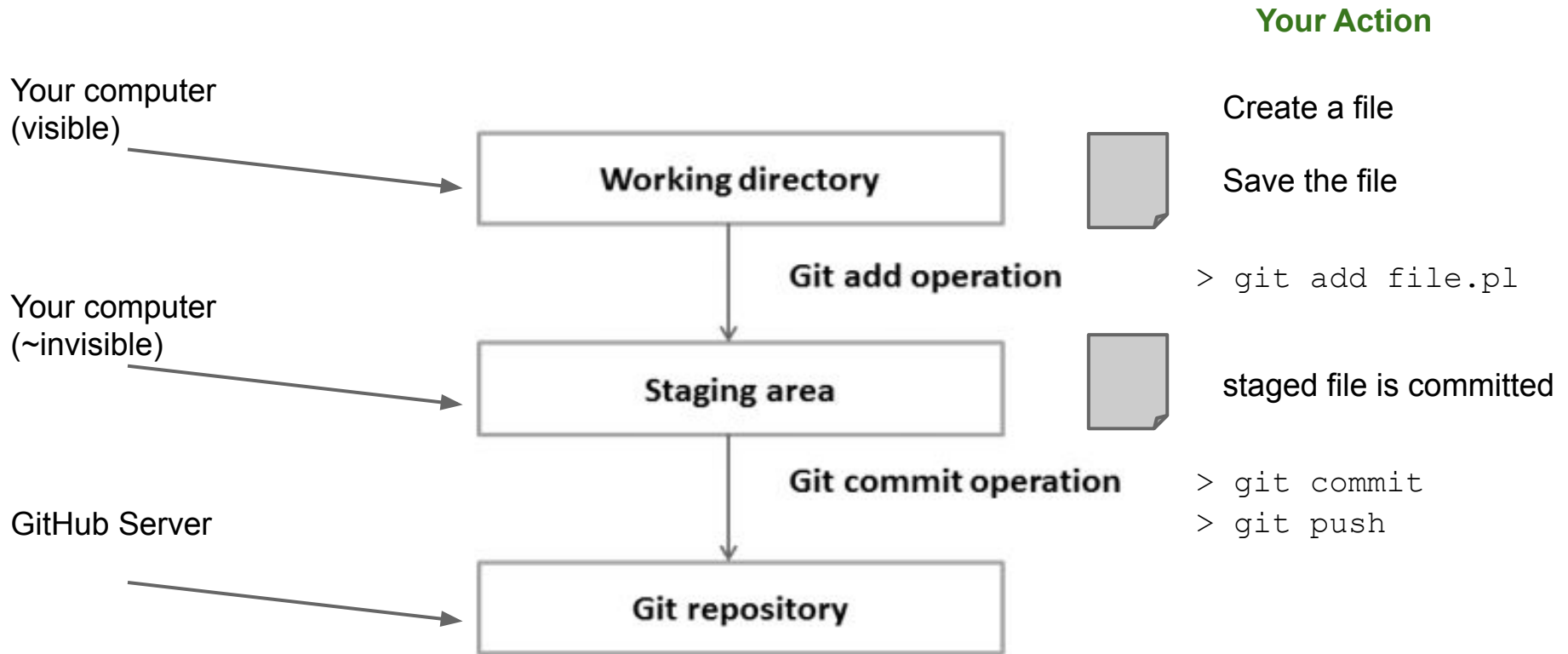
3 “layers” of Git



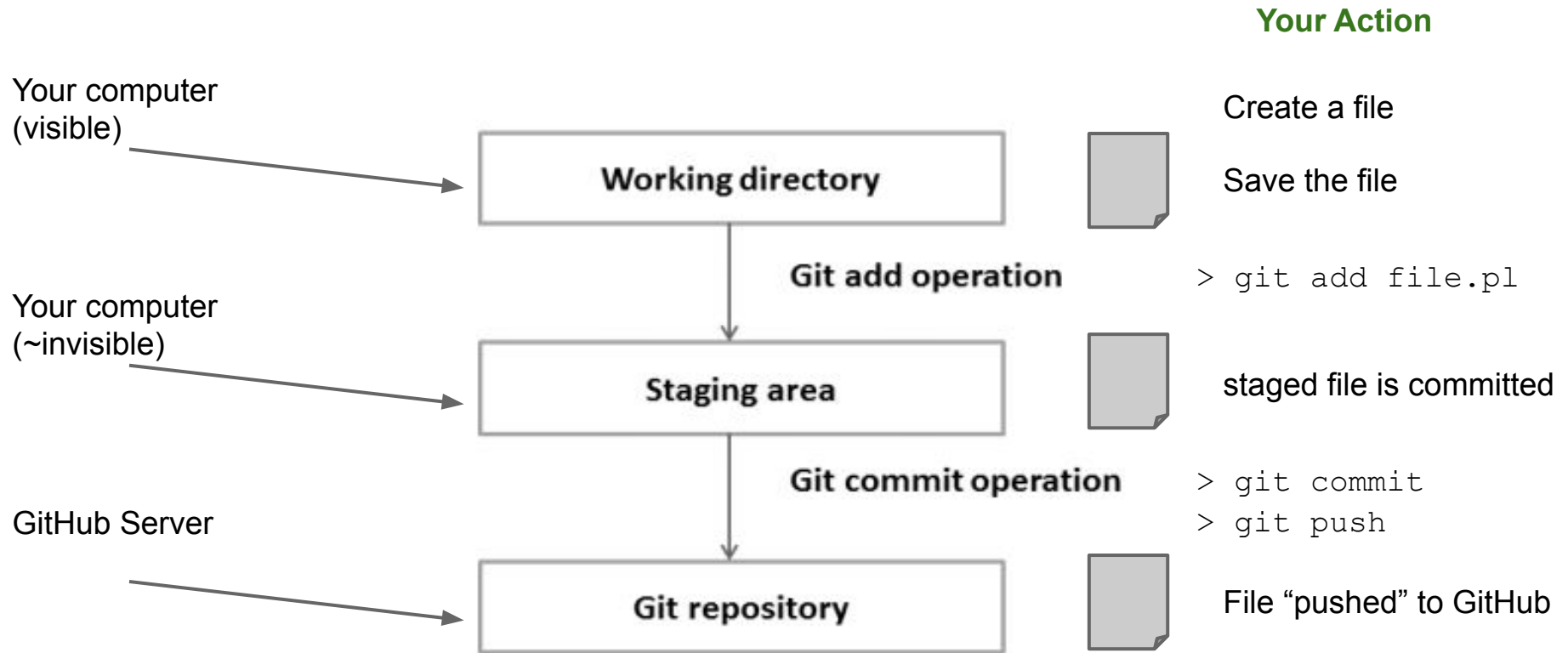
3 “layers” of Git



3 “layers” of Git



3 “layers” of Git



3 “layers” of Git

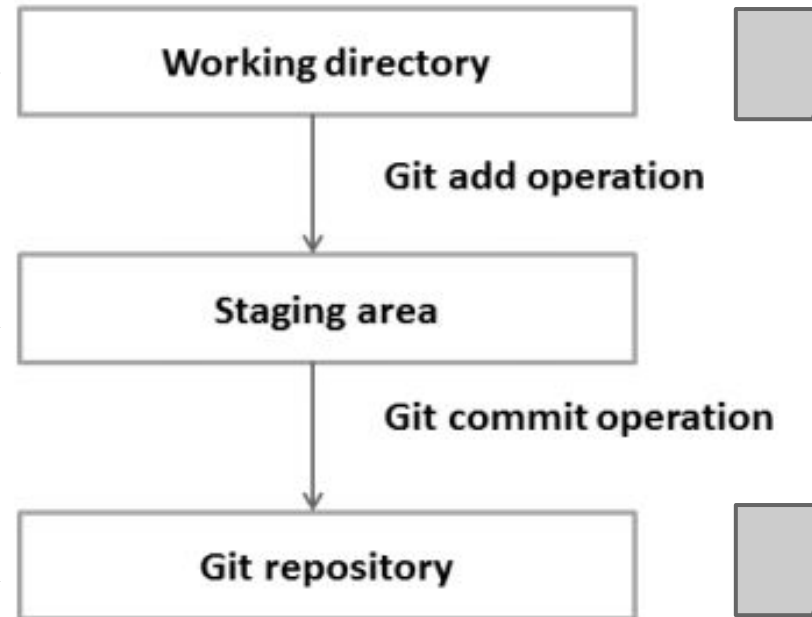
Your Action

Your computer
(visible)

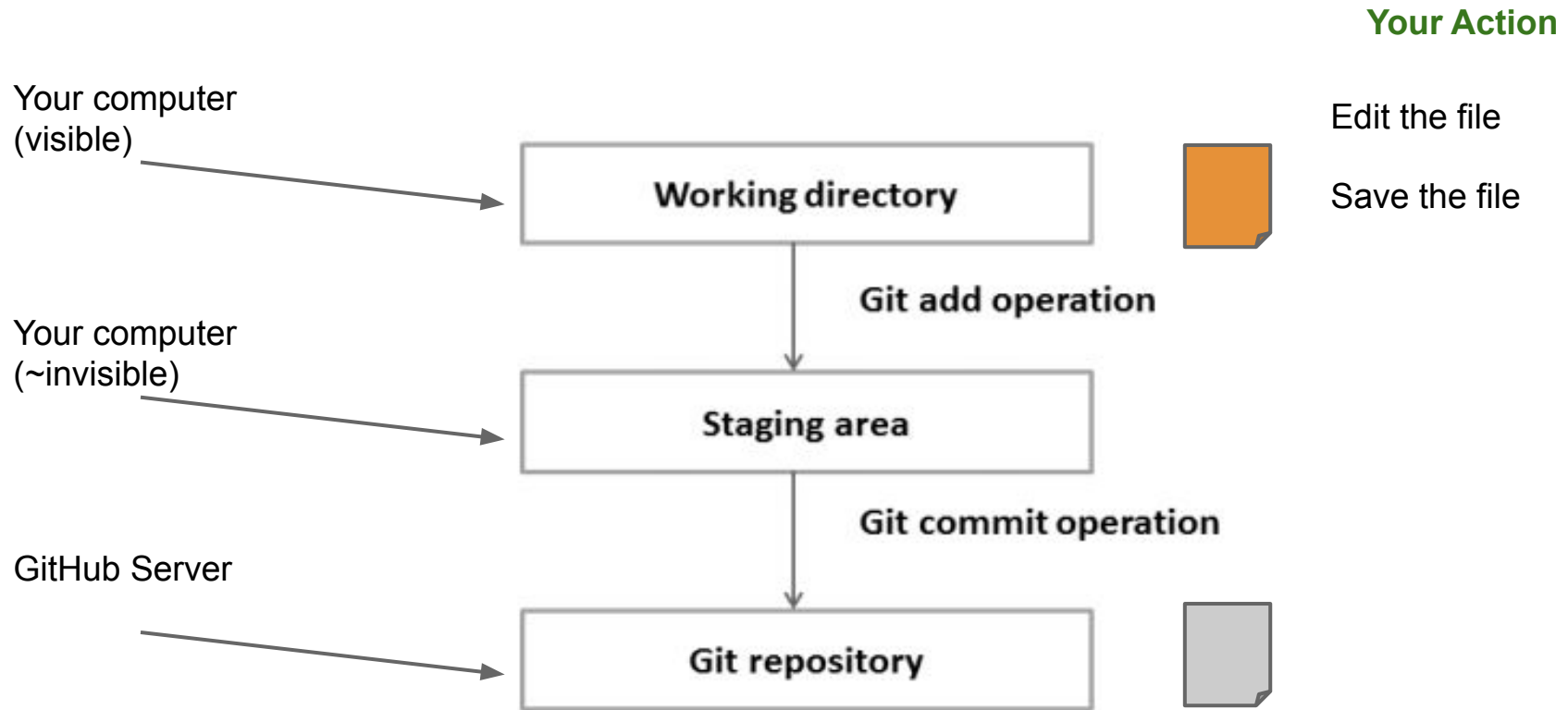
Your computer
(~invisible)

GitHub Server

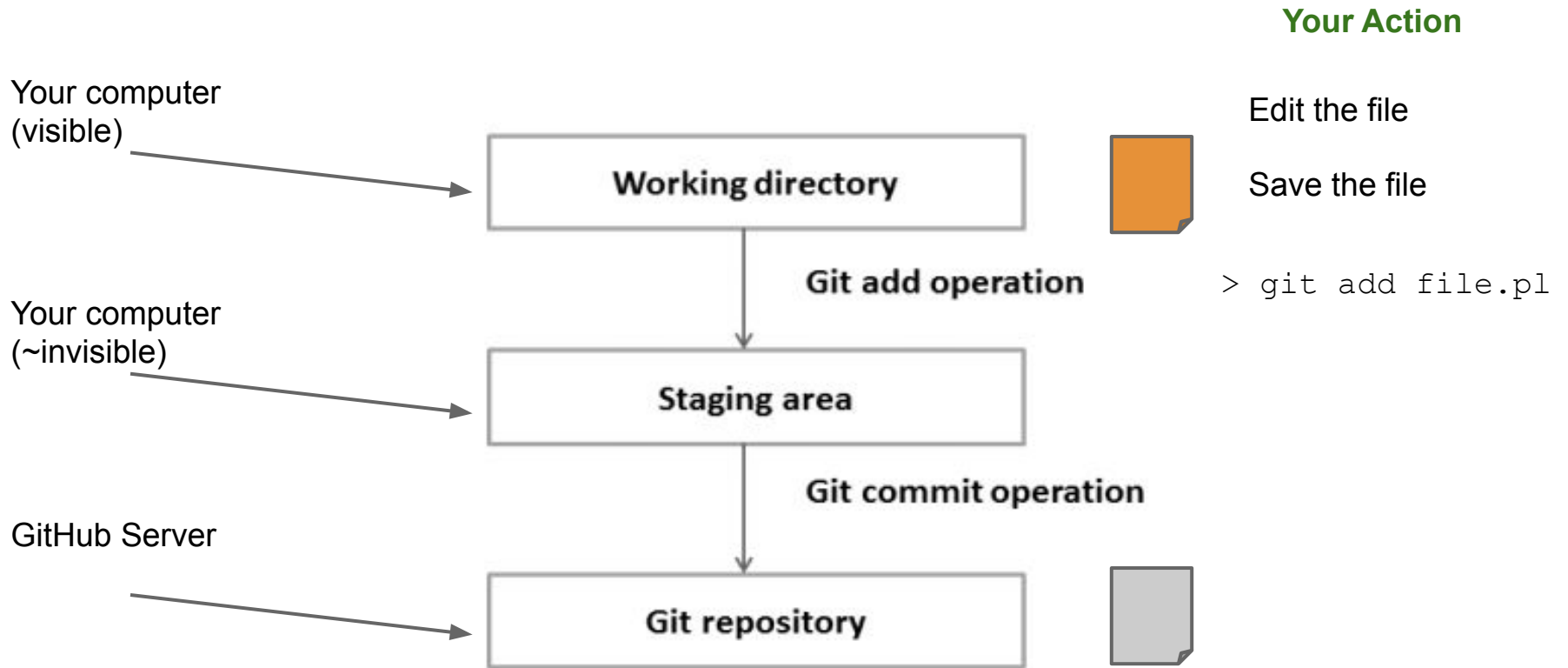
Edit the file



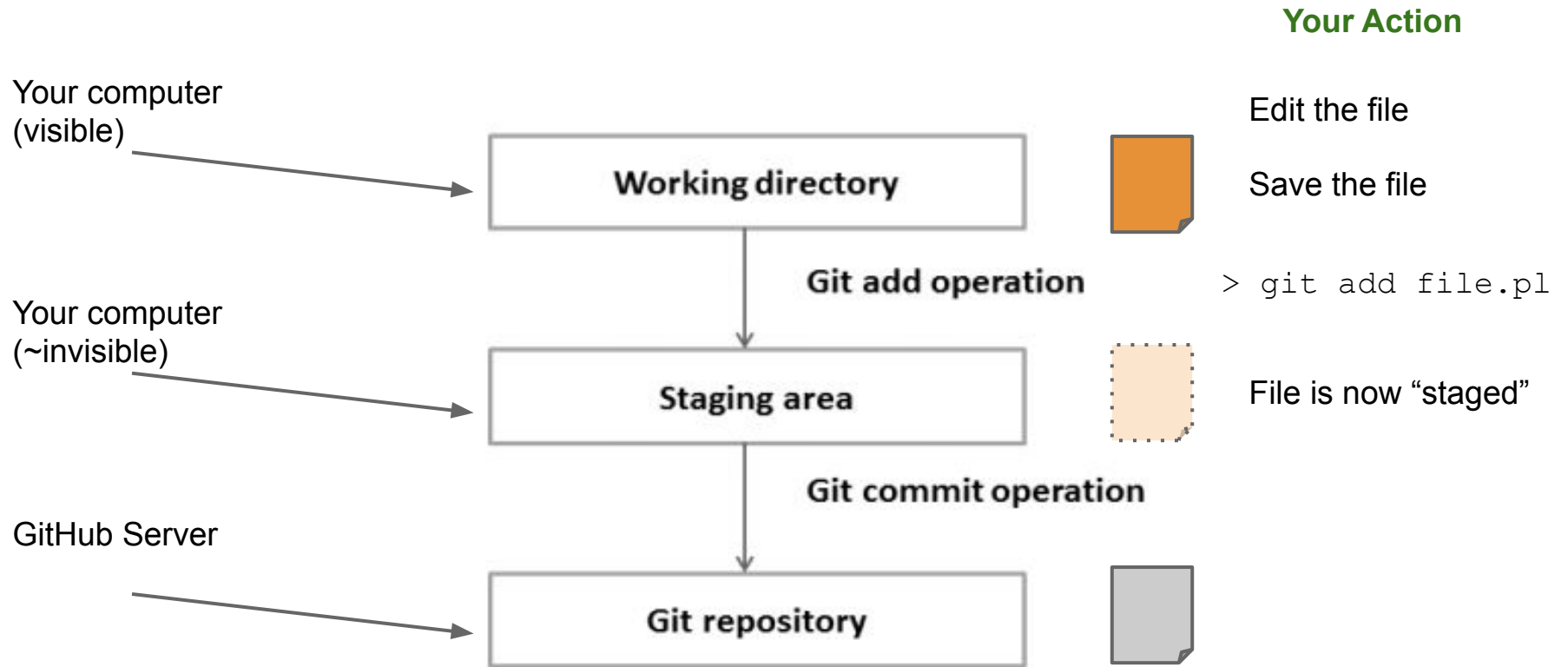
3 “layers” of Git



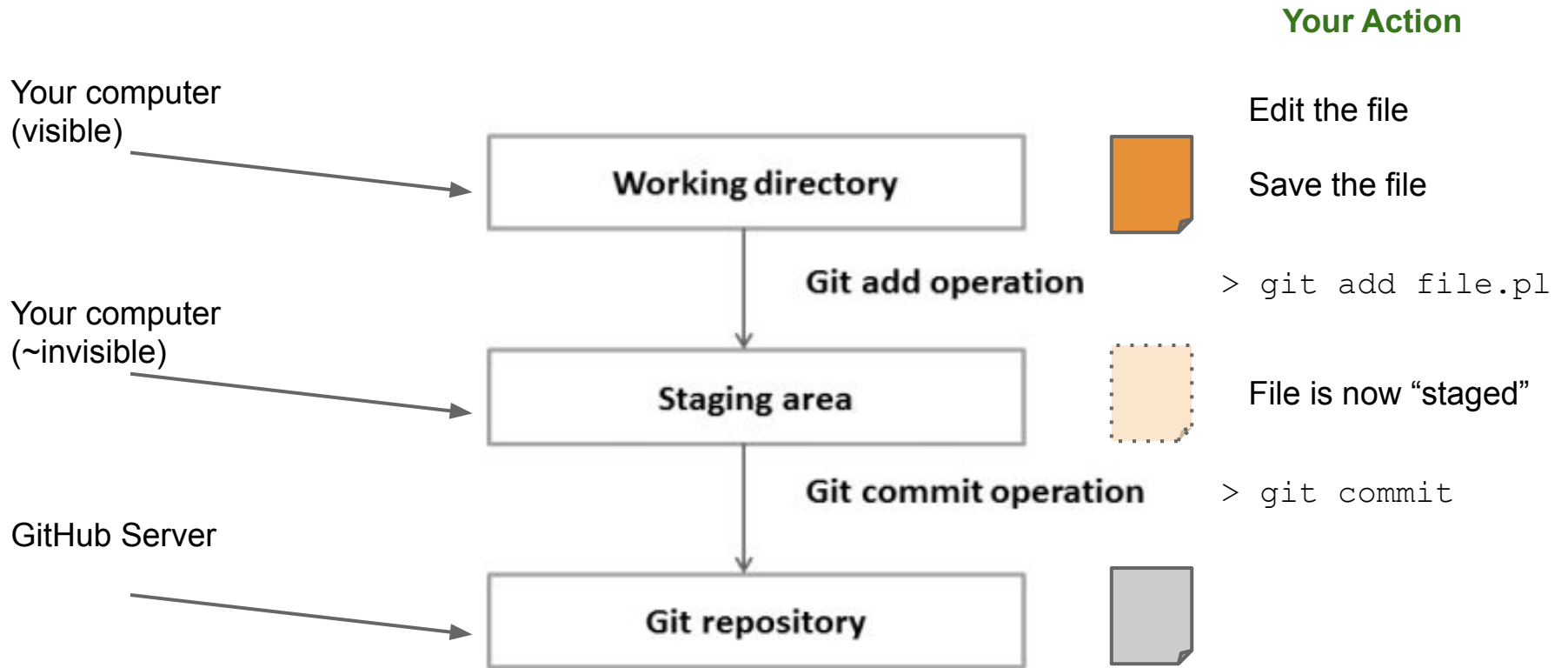
3 “layers” of Git



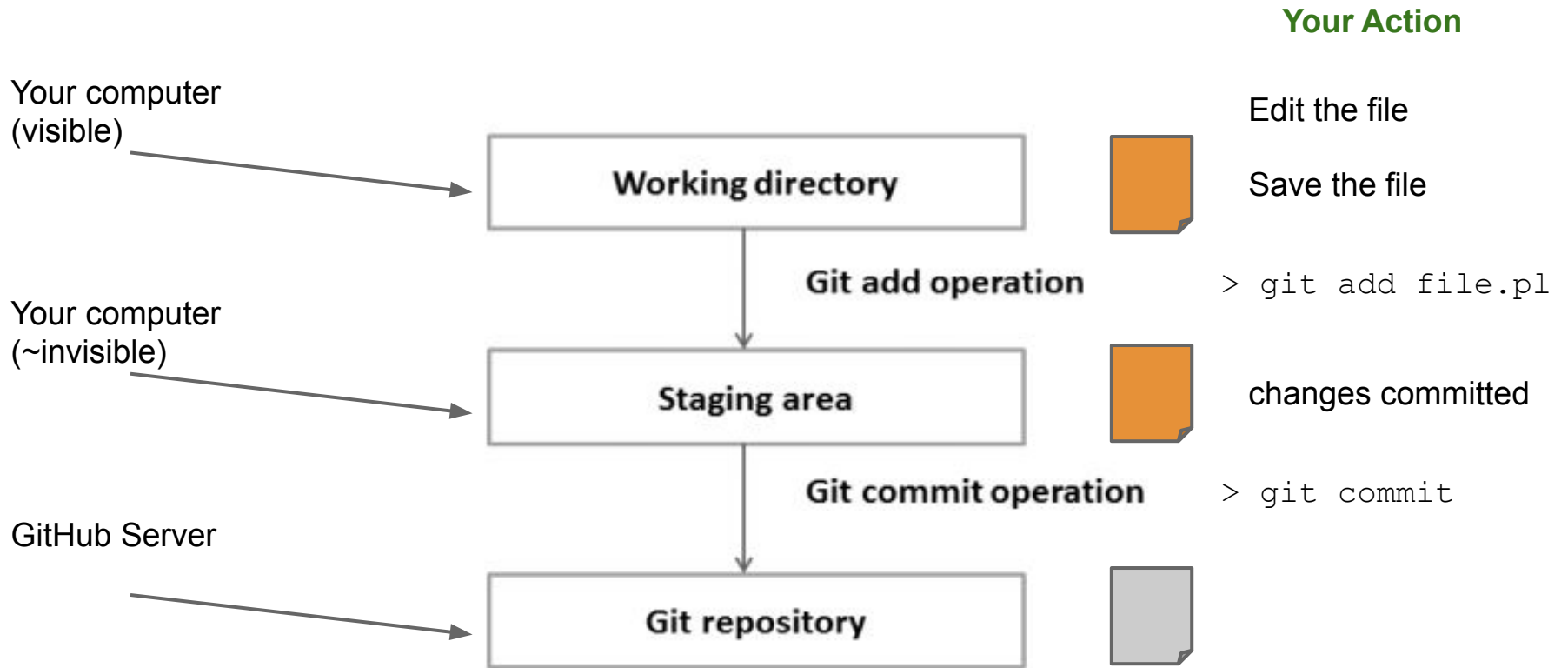
3 “layers” of Git



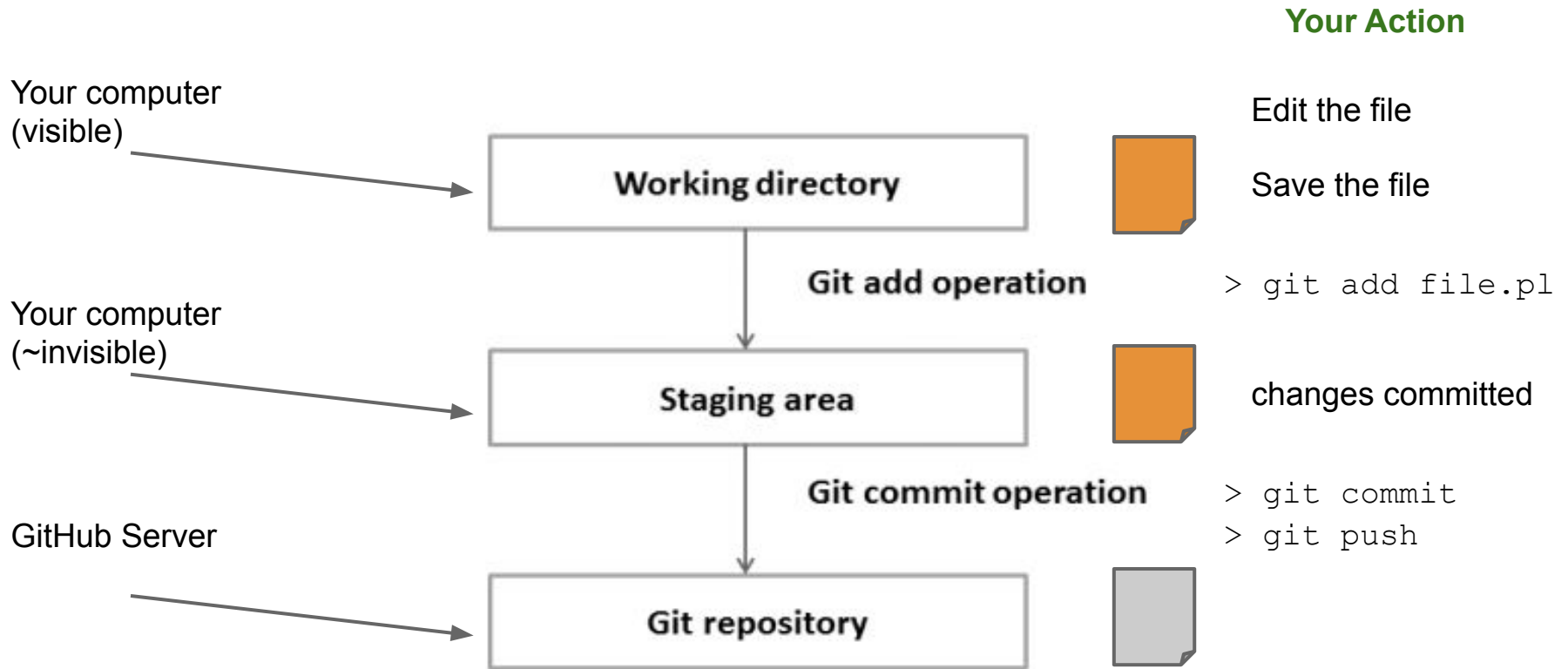
3 “layers” of Git



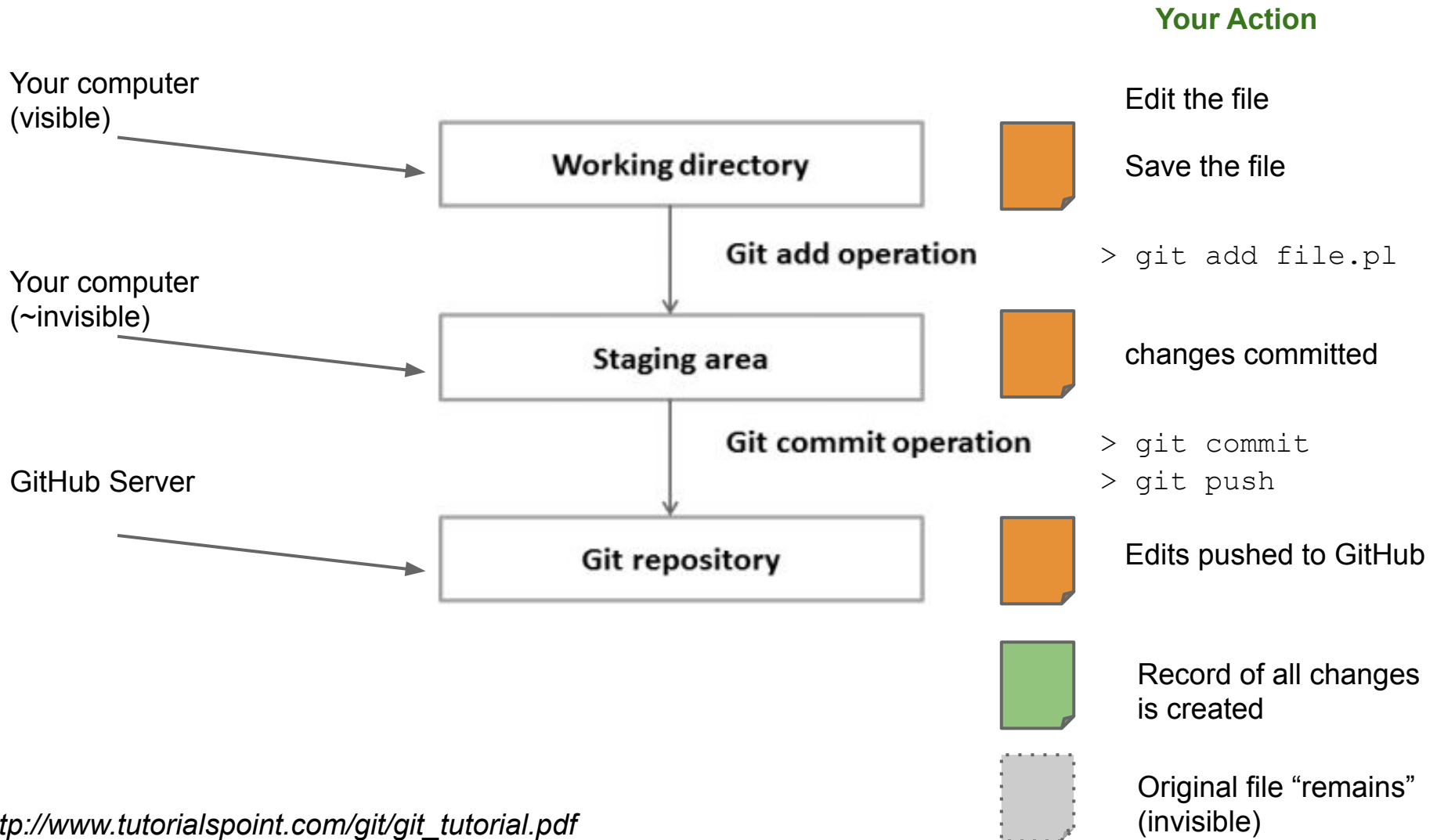
3 “layers” of Git



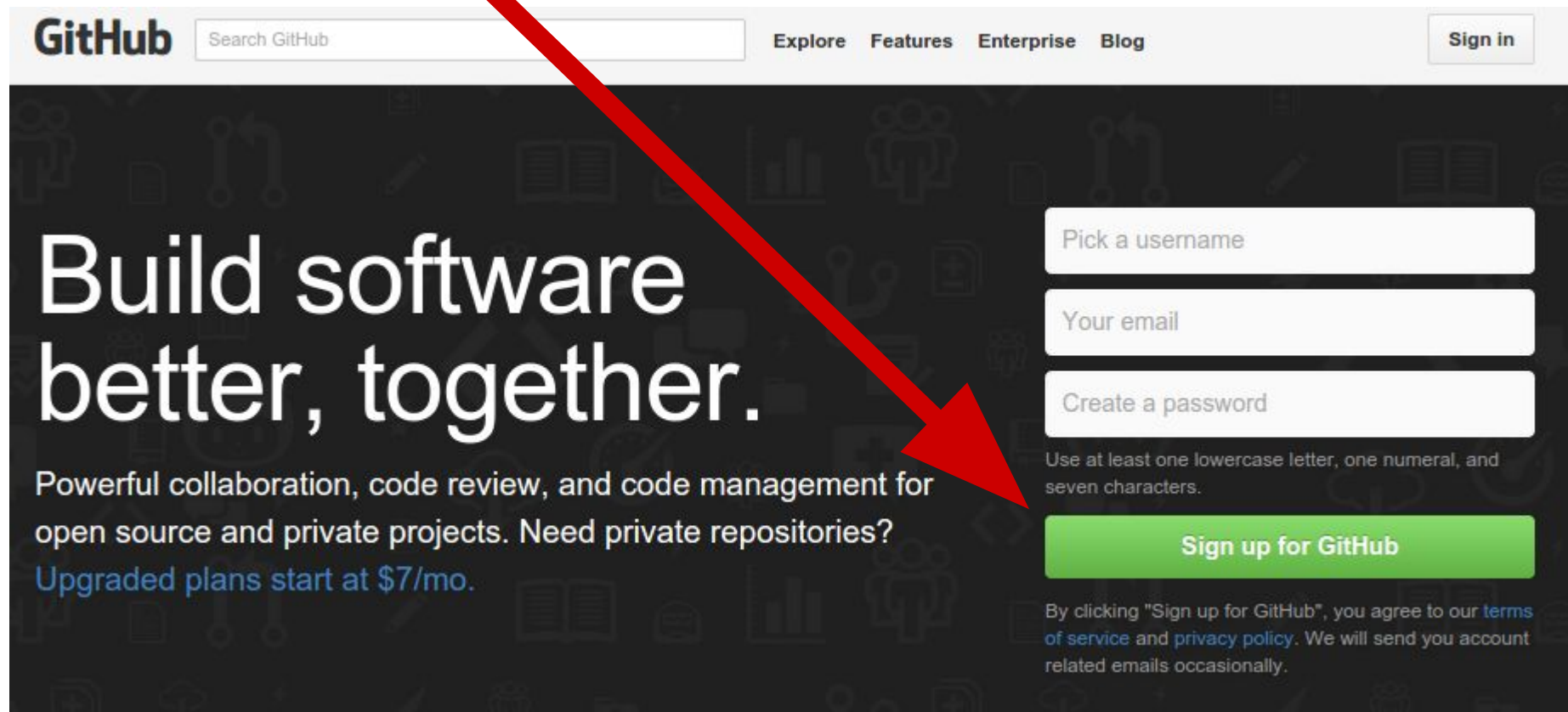
3 “layers” of Git



3 “layers” of Git



Create an account for yourself
<http://github.com>

A screenshot of the GitHub homepage. At the top, there is a navigation bar with the GitHub logo, a search bar, and links for Explore, Features, Enterprise, and Blog. A red arrow points from the text above to the 'Sign up for GitHub' button. The main content area has a dark background with the text 'Build software better, together.' and a description of GitHub's features. On the right side, there is a sign-up form with three input fields: 'Pick a username', 'Your email', and 'Create a password'. Below these fields is a green button labeled 'Sign up for GitHub'. At the bottom right, there is a small disclaimer about the terms of service and privacy policy.

GitHub Search GitHub Explore Features Enterprise Blog Sign in

Build software better, together.

Powerful collaboration, code review, and code management for open source and private projects. Need private repositories? Upgraded plans start at \$7/mo.

Pick a username

Your email

Create a password

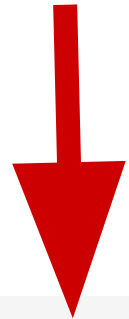
Use at least one lowercase letter, one numeral, and seven characters.

Sign up for GitHub

By clicking "Sign up for GitHub", you agree to our [terms of service](#) and [privacy policy](#). We will send you account related emails occasionally.

Create a new repository...

"create new"



Search GitHub

Explore Gist Blog Help

markwilkinson +

markwilkinson


News Feed Pull Requests Issues

GitHub Bootcamp

- 1 Set up Git**
A quick guide to help you get started with Git.
- 2 Create repositories**
Repositories are where you'll work and collaborate on projects.
- 3 Fork repositories**
Forking creates a new, unique project from an existing one.
- 4 Work together**
Send pull requests, follow friends. Star and watch projects.

Please name it using your name or initials so I can see that it is yours

Owner

 markwilkinson ▾



Repository name

/ MDW_BioinformaticsCourse ✓

Great repository names are short and memorable. Need inspiration? How about **finna-be-octo-cyril**.

Description (optional)

A code repository for the UPM Bioinformatics course

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

- ☒ **Initialize this repository with a README**
This will let you immediately clone the repository to your computer. Skip this step if you're importing an existing repository.

Add .gitignore: **None** ▾

Add a license: **None** ▾



Create repository



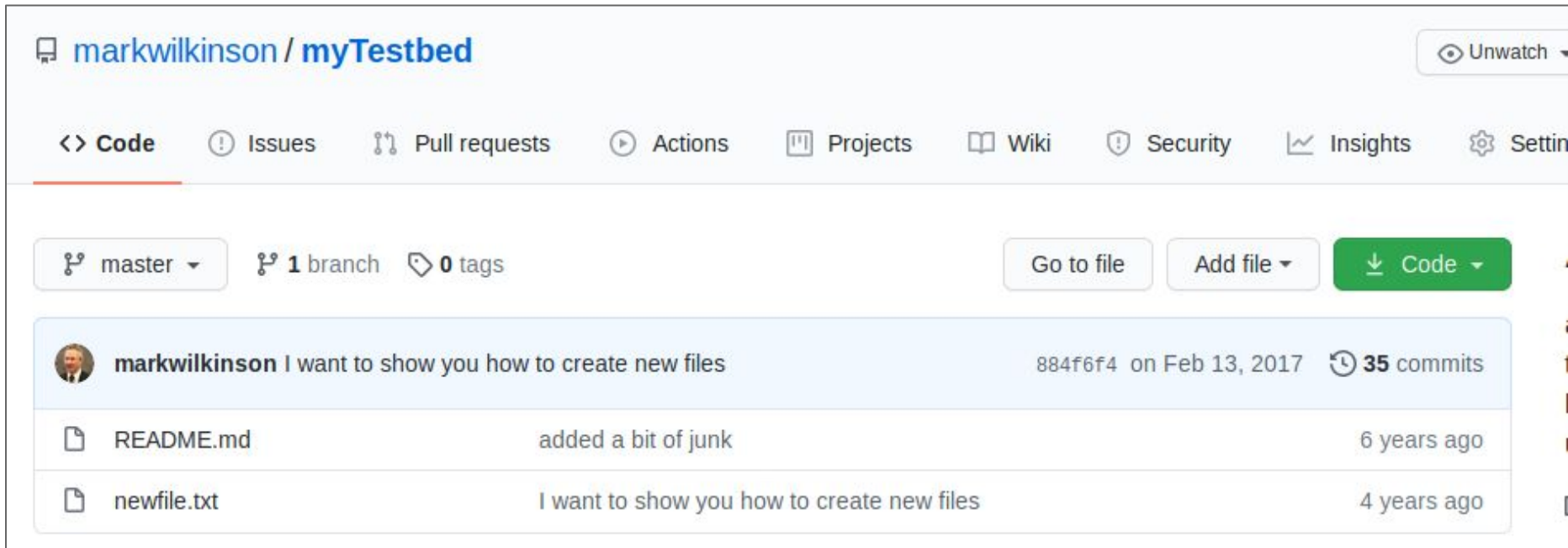
Your first repository!

Keep this page open on your browser, you will need it in 5 minutes...

Here's mine. I called it "myTestbed". Open a new browser window and go to:

[*https://github.com/markwilkinson/myTestbed*](https://github.com/markwilkinson/myTestbed)

We are going to "clone" my repository



The screenshot shows the GitHub interface for the repository **markwilkinson / myTestbed**. At the top, there are navigation tabs: **<> Code** (selected), **Issues**, **Pull requests**, **Actions**, **Projects**, **Wiki**, **Security**, **Insights**, and **Settings**. On the right, there is an **Unwatch** button. Below the tabs, the repository status is shown: **master** (selected), **1 branch**, and **0 tags**. To the right of this are buttons for **Go to file**, **Add file**, and a green **Code** button with a download icon. The main content area shows a commit by **markwilkinson** with the message **I want to show you how to create new files**, commit hash **884f6f4**, dated **on Feb 13, 2017**, and **35 commits**. Below the commit, there is a list of files: **README.md** (added a bit of junk, 6 years ago) and **newfile.txt** (I want to show you how to create new files, 4 years ago).

markwilkinson / myTestbed Unwatch

<> Code **Issues** **Pull requests** **Actions** **Projects** **Wiki** **Security** **Insights** **Settings**

master 1 branch 0 tags Go to file Add file Code

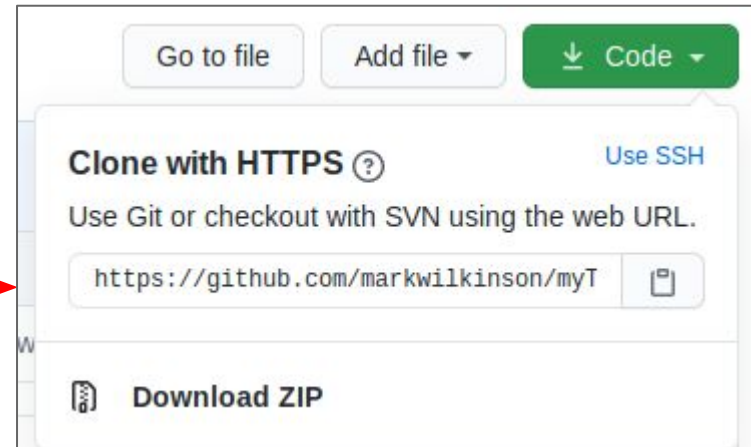
markwilkinson I want to show you how to create new files 884f6f4 on Feb 13, 2017 35 commits

| | | |
|-------------|--|-------------|
| README.md | added a bit of junk | 6 years ago |
| newfile.txt | I want to show you how to create new files | 4 years ago |

Prepare to make a local clone of myTestBed Repository from GitHub

Look at the right-hand side of the page

Ctrl-C the “HTTPS clone URL”



FIRST:

You need to configure your local Git software to know about you

```
$ git config --global user.email "you@example.com"  
$ git config --global user.name "Your Name"
```

```
> cd BioinformaticsCourseGit
```

```
> git clone https://github.com/markwilkinson/myTestbed.git
```

```
> cd BioinformaticsCourseGit
```

```
> git clone https://github.com/markwilkinson/myTestbed.git  
Cloning into 'myTestbed'...
```

```
WARNING: gnome-keyring:: couldn't connect to:  
/tmp/keyring-rFHr0v/pkcs11: No such file or directory
```

```
remote: Counting objects: 7, done.
```

```
remote: Compressing objects: 100% (4/4), done.
```

```
remote: Total 7 (delta 1), reused 5 (delta 1)
```

```
Unpacking objects: 100% (7/7), done.
```

```
>
```

```
> ls
```

```
myTestbed
```

```
> cd BioinformaticsCourseGit

> git clone https://github.com/markwilkinson/myTestbed.git
Cloning into 'myTestbed'...
WARNING: gnome-keyring:: couldn't connect to:
/tmp/keyring-rFHr0v/pkcs11: No such file or directory
remote: Counting objects: 7, done.
remote: Compressing objects: 100% (4/4), done.
remote: Total 7 (delta 1), reused 5 (delta 1)
Unpacking objects: 100% (7/7), done.
>
> ls
myTestbed
> cd myTestbed
> ls
README.md
>
```

Success! This is your repository cloned onto your local computer

Now, do exactly the same thing with the repository that YOU just created (the one that uses your name/initials).

1. Go to the web page of YOUR repository
2. Find the URL of your repository
3. Git Clone it

Now add something to your repository...

- 'cd' into the new folder created when you cloned your repository

for me, it is:

```
./BioinformaticsCourseGit/myTestbed
```

- Open your text editor and create a file (call it whatever you want, e.g. junk.txt)
- Save that file

Now add something to your repository...

```
> ls
junk.txt  README.md
> git add junk.txt
> git commit -m "learning how to add files to Git"
[master a415c1b] learning how to add files to Git
 1 file changed, 1 insertion(+), 1 deletion(-)
> git push
WARNING: gnome-keyring:: couldn't connect to:
/tmp/keyring-rFHr0v/pkcs11: No such file or directory
Username for 'https://github.com': markwilkinson
Password for 'https://markwilkinson@github.com':
```

Your Git
username

Refresh your browser window (or click here - on
YOUR repository)

The screenshot shows the GitHub interface for the repository 'myTestbed' by user 'markwilkinson'. At the top, there's a navigation bar with the GitHub logo, a search bar, and links for 'Explore', 'Gist', 'Blog', and 'Help'. The user profile 'markwill' is visible in the top right. Below the navigation bar, the repository name 'markwilkinson / myTestbed' is displayed, along with an 'Unwatch' button and a count of '1'. The repository description reads: 'a place for me to play with Git and try things, break things, and generally learn by error. There is NOTHING at all useful in this repository — Edit'. Below the description, statistics are shown: '2 commits', '1 branch', '0 releases', and '1 contributor'. A green 'fork' button is on the left, and a dropdown menu shows 'branch: master'. The file list shows two files: 'README.md' and 'junk.txt', both with the commit message 'added a bit of junk' and timestamp 'an hour ago'. A red arrow points to the 'junk.txt' file name.

This repository Search

Explore Gist Blog Help

markwill

markwilkinson / myTestbed

Unwatch 1

a place for me to play with Git and try things, break things, and generally learn by error. There is NOTHING at all useful in this repository — Edit

2 commits 1 branch 0 releases 1 contributor

branch: master myTestbed / +

added a bit of junk

markwilkinson authored an hour ago latest commit fa400e5bcc

| | | |
|-----------|---------------------|-------------|
| README.md | added a bit of junk | an hour ago |
| junk.txt | added a bit of junk | an hour ago |

your file has been added

Now go back to your local repository, and edit

Open your text editor and edit your junk.txt file, then save it again

```
> ls
junk.txt  README.md

> git add junk.txt

> git status
# On branch master
# Changes to be committed:
#   (use "git reset HEAD <file>..." to unstage)
#
#   modified:   junk.txt
#
> git commit -m "modified content of junk file"
[master 61953a9] modified content of junk file
1 file changed, 1 insertion(+), 1 deletion(-)
```

Now go back to your local repository, and edit

To see the difference between your local commit, and the GitHub repository

```
> git diff origin  
  
diff --git a/junk.txt b/junk.txt  
index 4621e09..0bc0c72 100644  
--- a/junk.txt  
+++ b/junk.txt  
@@ -1,1 @@  
-this is still just junk  
+This is the edit of my junk.txt file
```

Now go back to your local repository, and edit

now push the changes to GitHub

```
> git push
```

```
...
```

```
...
```

```
...
```

click the filename in GitHub



branch: master

myTestbed / +

added a bit of junk



markwilkinson authored 2 hours ago



[README.md](#)

added a bit of junk



[junk.txt](#)

added a bit of junk



README.md

branch: master ▾

myTestbed / junk.txt

Browse the history of the file



markwilkinson an hour ago modified content of junk file

1 contributor

2 lines (1 sloc) | 0.037 kb

Raw


Blame

History





1 This is the edit of my junk.txt file

branch: master ▾ myTestbed / junk.txt

 **markwilkinson** an hour ago modified content of junk file

1 contributor

2 lines (1 sloc) | 0.037 kb

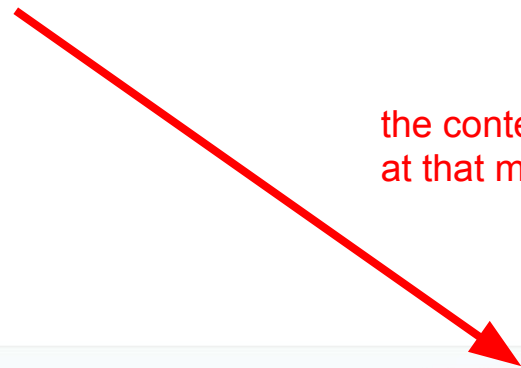
Raw Blame History  

```
1 This is the edit of my junk.txt file
```

Browse the history of the file



A record of everything you (or anyone!) did to the file between this version and the previous












the content of the file at that moment...



History for myTestbed / junk.txt

Commits on Jan 26, 2015

| | | |
|---|--|---|
|  | modified content of junk file markwilkinson authored an hour ago |  61953a9  |
|  | editing junk text file markwilkinson authored an hour ago |  a415c1b  |
|  | added a bit of junk markwilkinson authored 2 hours ago |  fa400e5  |

Try a few things on your own


making folders, making files




try deleting something!

```
> git rm filename.txt  
> git commit -m "removed"  
> git push
```


then see what happens in GitHub


Forking another person's project


 [Pull requests](#) [Issues](#) [Gist](#)


  

Search [Search](#)

 **Repositories** 3

 [Code](#) 7,195

 [Issues](#) 13

 [Users](#)

Languages

Perl 3

[Advanced search](#) [Cheat sheet](#)

[JJ/google-scholar-perl](#) Perl ★ 0 🔗 0

Automatically exported from code.google.com/p/google-scholar-perl

Updated on Mar 17, 2015

[Walckiers/google-scholar-perl](#) Perl ★ 0 🔗 0


Automatically exported from code.google.com/p/google-scholar-perl




Updated on Mar 28, 2015

[gukd/DancingPerlScholarship](#) Perl ★ 0 🔗 1

Updated on Feb 18, 2013


Forking another person's project


 Pull requests Issues Gist


  


Search

Search

 Repositories 3

 Code 7,195

 Issues 13

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Languages

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[Advanced search](#) [Cheat sheet](#)

[JJ/google-scholar-perl](#) Perl ★ 0 🍴 0

Automatically exported from code.google.com/p/google-scholar-perl

Updated on Mar 17, 2015

[Walckiers/google-scholar-perl](#) Perl ★ 0 🍴 0

Automatically exported from code.google.com/p/google-scholar-perl

Updated on Mar 28, 2015

[gukd/DancingPerlScholarship](#) Perl ★ 0 🍴 1

Updated on Feb 18, 2013



This repository Search

Pull requests Issues Gist



JJ / google-scholar-perl

Watch

3

Star

0

Fork

0

Code

Issues 2

Pull requests 0

Pulse

Graphs

Automatically exported from code.google.com/p/google-scholar-perl

34 commits

2 branches

0 releases

1 contributor

Branch: master

New pull request

New file

Find file

HTTPS

https://github.com/JJ/g



Download ZIP



JJ Small format changes

Latest commit 8f9ed67 on Mar 17, 2015

| | | |
|---------------|----------------------|---------------|
| examples | Cleaning up | 10 months ago |
| lib/My/Google | Cleaning up | 10 months ago |
| t | Cleaning up | 10 months ago |
| Changes | Cleaning up | 10 months ago |
| MANIFEST | Cleaning up | 10 months ago |
| Makefile.PL | Cleaning up | 10 months ago |
| README.md | Small format changes | 10 months ago |

README.md

My-Google-Scholar



This repository Search

Pull requests Issues Gist



JJ / google-scholar-perl

Watch 3

Star 0

Fork 0

Code

Issues 2

Pull requests 0

Pulse

Graphs

Automatically exported from code.google.com/p/google-scholar-perl

34 commits

2 branches

0 releases

1 contributor

Branch: master

New pull request

New file

Find file

HTTPS

https://github.com/JJ/g



Download ZIP




JJ Small format changes


Latest commit 8f9ed67 on Mar 17, 2015


| | | |
|---------------|----------------------|---------------|
| examples | Cleaning up | 10 months ago |
| lib/My/Google | Cleaning up | 10 months ago |
| t | Cleaning up | 10 months ago |
| Changes | Cleaning up | 10 months ago |
| MANIFEST | Cleaning up | 10 months ago |
| Makefile.PL | Cleaning up | 10 months ago |
| README.md | Small format changes | 10 months ago |


README.md


My-Google-Scholar


 **markwilkinson / google-scholar-perl**
forked from JJ/google-scholar-perl


 Unwatch 1


 Star 0


 Fork 1

 Code

 Pull requests 0

 Pulse

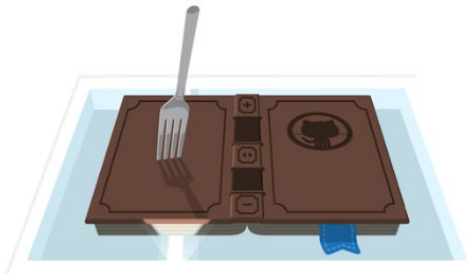
 Graphs

 Settings

Forking JJ/google-scholar-perl

It should only take a few seconds.

Refresh





This repository Search

Pull requests Issues Gist



markwilkinson / google-scholar-perl
forked from JJ/google-scholar-perl

Unwatch 1 Star 0 Fork 1

Code Pull requests 0 Pulse Graphs Settings

Automatically exported from code.google.com/p/google-scholar-perl — Edit

34 commits 2 branches 0 releases 1 contributor

Branch: master New pull request New file Find file HTTPS https://github.com/marki Download ZIP

This branch is even with JJ:master. Pull request Compare

JJ Small format changes Latest commit 8f9ed67 on Mar 17, 2015

| | | |
|---------------|----------------------|---------------|
| examples | Cleaning up | 10 months ago |
| lib/My/Google | Cleaning up | 10 months ago |
| t | Cleaning up | 10 months ago |
| Changes | Cleaning up | 10 months ago |
| MANIFEST | Cleaning up | 10 months ago |
| Makefile.PL | Cleaning up | 10 months ago |
| README.md | Small format changes | 10 months ago |

README.md

Now, do exactly the same as before

Create a local copy of the forked repository on your computer:

```
> git clone https://github.com/markwilkinson/google-scholar-perl.git
Cloning into 'google-scholar-perl'...
WARNING: gnome-keyring:: couldn't connect to:
/tmp/keyring-d0t0Gv/pkcs11: No such file or directory
remote: Counting objects: 267, done.
remote: Compressing objects: 100% (79/79), done.
remote: Total 267 (delta 96), reused 266 (delta 95), pack-reused 0
Receiving objects: 100% (267/267), 41.48 KiB, done.
Resolving deltas: 100% (96/96), done.
>
> cd google-scholar-perl
> ls
Changes  examples  lib  Makefile.PL  MANIFEST  README.md  t
```

```
$ git remote -v
```

```
origin      https://github.com/markwilkinson/google-scholar-perl.git (fetch)
```

```
origin      https://github.com/markwilkinson/google-scholar-perl.git (push)
```

```
$ git remote -v
```

```
origin  
origin
```

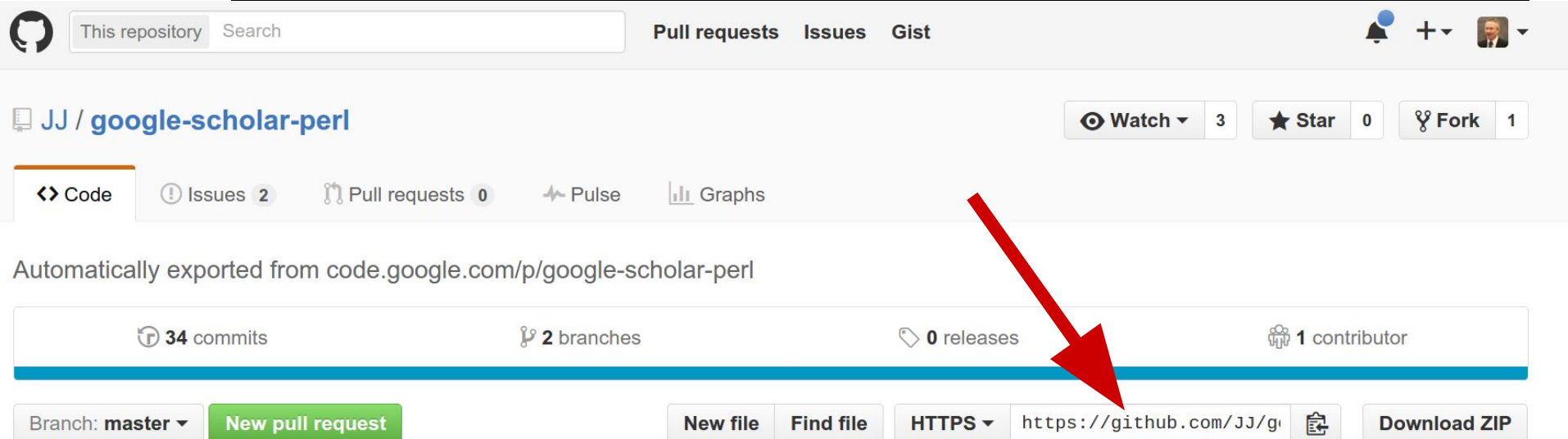
```
https://github.com/markwilkinson/google-scholar-perl.git (fetch)  
https://github.com/markwilkinson/google-scholar-perl.git (push)
```

This is the “designation” for the repository: a short label that Git uses to know which repository you are referring to

note that you are allowed to fetch and push ONLY from your own copy (“origin”)

If you want to collaborate with the original author, then you need to add a reference to THEIR repository

```
$ git remote -v
origin https://github.com/markwilkinson/google-scholar-perl.git (fetch)
origin https://github.com/markwilkinson/google-scholar-perl.git (push)
$
```



The screenshot shows the GitHub interface for the repository 'JJ / google-scholar-perl'. At the top, there's a navigation bar with 'This repository' and a search bar. Below that, the repository name is displayed along with 'Watch' (3), 'Star' (0), and 'Fork' (1) buttons. The 'Code' tab is selected, showing options for 'Issues' (2), 'Pull requests' (0), 'Pulse', and 'Graphs'. A red arrow points from the 'Pull requests' link to the 'HTTPS' button in the bottom right corner. The bottom right corner also features a 'New pull request' button, a 'New file' button, a 'Find file' button, an 'HTTPS' button, a text input field containing 'https://github.com/JJ/g', and a 'Download ZIP' button. The repository statistics bar shows '34 commits', '2 branches', '0 releases', and '1 contributor'.

GitHub repository page for **JJ / google-scholar-perl**. The page shows the repository name, a search bar, and navigation links for Pull requests, Issues, and Gist. The repository is public, with 34 commits, 2 branches, 0 releases, and 1 contributor. The 'Code' tab is selected, showing the repository URL: <https://github.com/JJ/google-scholar-perl>. A red arrow points to the 'HTTPS' button in the bottom right corner.

If you want to collaborate with the original author, then you need to add a reference to THEIR repository

```
$ git remote -v
origin      https://github.com/markwilkinson/google-scholar-perl.git (fetch)
origin      https://github.com/markwilkinson/google-scholar-perl.git (push)

$ git remote add upstream https://github.com/JJ/google-scholar-perl.git

$ git remote -v
origin      https://github.com/markwilkinson/google-scholar-perl.git (fetch)
origin      https://github.com/markwilkinson/google-scholar-perl.git (push)
upstream    https://github.com/JJ/google-scholar-perl.git (fetch)
upstream    https://github.com/JJ/google-scholar-perl.git (push)
```

If you want to collaborate with the original author, then you need to add a reference to THEIR repository

```
$ git remote -v
origin      https://github.com/markwilkinson/google-scholar-perl.git (fetch)
origin      https://github.com/markwilkinson/google-scholar-perl.git (push)

$ git remote add upstream https://github.com/JJ/google-scholar-perl.git

$ git remote -v
origin      https://github.com/markwilkinson/google-scholar-perl.git (fetch)
origin      https://github.com/markwilkinson/google-scholar-perl.git (push)
upstream    https://github.com/JJ/google-scholar-perl.git (fetch)
upstream    https://github.com/JJ/google-scholar-perl.git (push)
```

git fetch upstream

a way to synchronize with
any changes from the original author

```
$ git remote -v  
origin      https://github.com/markwilkinson/google-scholar-perl.git (fetch)  
origin      https://github.com/markwilkinson/google-scholar-perl.git (push)
```

```
$ git remote add upstream https://github.com/JJ/google-scholar-perl.git
```

```
$ git remote -v  
origin      https://github.com/markwilkinson/google-scholar-perl.git (fetch)  
origin      https://github.com/markwilkinson/google-scholar-perl.git (push)  
upstream    https://github.com/JJ/google-scholar-perl.git (fetch)  
upstream    https://github.com/JJ/google-scholar-perl.git (push)
```

```
$ git fetch upstream
```

```
WARNING: gnome-keyring:: couldn't connect to: /tmp/keyring-d0t0Gv/pkcs11: No  
such file or directory
```

```
From https://github.com/JJ/google-scholar-perl
```

```
* [new branch]      master    -> upstream/master  
* [new branch]      wiki      -> upstream/wiki
```

```
$ git checkout master  
Switched to branch 'master'  
  
$ git merge upstream/master  
Already up-to-date.
```

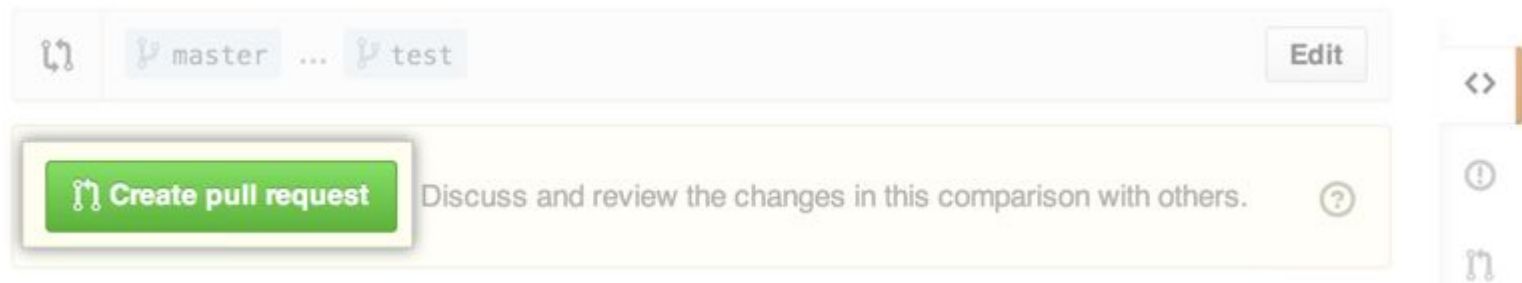
Now you - prove that you understand

The rest of this course is in a different repository:

https://github.com/CBGP-UPM-INIA-PUBLIC/Accelerated_Intro_to_CompBio_Part_2

- Fork that repository into YOUR github account
- Clone it to your local laptop
- Add the reference to the upstream (mine)
- Create a new file (whatever you want to call it)
- Commit and push the changes to your Github Fork

After you have committed to your Fork of myTestBed, go to your Github page on the Web, and refresh the page. You should see:



When you click this button, it begins the process of merging your changes into my original code.

First, it asks you to add a bit of additional information (just a short text message about what the changes are, and why)

Then you submit the request.

On my repository, I am notified that you have requested a code-merge. I can view the changes, and decide to accept, or reject, your changes

Stop your jupyter notebook

(CTRL-C twice)

Now you:

Now in your terminal window, cd into the folder called
“[Accelerated_Intro_to_CompBio_Part_2](#)”

\$ jupyter notebook

You are now looking at the Jupyter Notebooks we will use for the rest of this course.

NOTE:

Git Hub is completely open and public! Your code can be seen by anyone in the world, including the other students in this course.

Therefore, I will be watching very carefully for people who copy each other

You may collaborate with each other and share ideas or even pieces of code - this is normal in bioinformatics
(and in fact, it is the reason that GitHub exists!)

However, there are two rules:

- 1) ***You must document the code yourself*** - I want to see that you understand how the code works.
- 2) ***You must ****BOTH**** say, in your documentation, that you are collaborating:***
e.g. "I collaborated with my colleague Juan Nadie to write this portion of the code"

Finally: Prepare for the exam

The exam questions are in another Git folder

https://github.com/CBGP-UPM-INIA-PUBLIC/Accelerated_Intro_WilkinsonExams

- Fork that repository into YOUR github account
https://github.com/YourUsername/Accelerated_Intro_WilkinsonExams
- Clone it to your local laptop

This is the folder that you will use to submit the answers for your exams

For each exam:

- Create a new Jupyter Notebook
- Put your answers into that Notebook
- Commit your answers
- Push your answers to GitHub so that I can see them.