Git Tutorial

Version Control on Projects

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Why to Use git?

- Version control
- History of each modification (checkpoint)

```
unicorngundam@festivo ~/P/myProj> ls -1
train_v0.py
train_v1.py
train_v2.py
train_v3.py
train_v4.py
train_v5.py
utils
```

- Collaboration
- Developing new features

```
unicorngundam@festivo ~/P/myProj> ls -1
main_JT.py
main_WD.py
main_newFT.py
main_old.py
utils
utils_JT
utils_WD
```

Outline

1. Tracking Files & Making Checkpoints (commit)
2. Remote Repository Management
3. Branches

Tracking Files &

Making Checkpoint (commit)

On local Repository

Tracking Files

To use git to manage your project, you need to initialize a **git repository**

```
$ git init
```

After executing the command, a folder named `.git/` will be created

```
unicorngundam@festivo ~/P/myProj (master)> ls -1 .git/
HEAD
branches
config
description
hooks
info
objects
refs
```

Tracking Files

Tell git who you are

```
$ git config --local user.name "<user_name>"
$ git config --local user.email "<email_id>"
```

You can also make these setting global,

```
$ git config --global user.name "<user_name>"
$ git config --global user.email "<email_id>"
```

Tracking Files

Now you can check the status of the **git repository**

```
$ git status
```

```
unicorngundam@festivo ~/P/myProj (master)> ls -A1
.env
.git
.gitignore
.tmp
dataloader.py
main.py
models.py
notebooks
requirements.txt
utils
```

```
unicorngundam@festivo ~/P/myProj (master)> git status
On branch master

No commits yet

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

        .gitignore
        .tmp/
        dataloader.py
        main.py
        models.py
        notebooks/
        requirements.txt

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

Tracking Files

Ignoring some files or directories from tracking

```
$ vi .gitignore
```

Adding paths

```
# vim caches
**/*~
**/*.swp
**/*.swo
```

https://github.com/github/gitignore/blob/master/Python.gitignore

Tracking Files

Now you can track some important files

```
$ git add main.py
```

Note that git track the **modifications** (or changes) of the file instead, hence you need to execute the `git add` each time after editing.

```
unicorngundam@festivo ~/P/myProj (master)> git add main.py
unicorngundam@festivo ~/P/myProj (master)> git status
On branch master

No commits yet

Changes to be committed:
  (use "git rm --cached <file>..." to unstage)

        new file:   main.py
```

Making Checkpoints

Now you need to make the checkpoint of current status, or say **commit**

```
$ git commit -m “add main.py”
```

Now check the **commit history** by

```
$ git log
```

```
unicorngundam@festivo ~/P/myProj (master)> git commit -m "add main.py"
[master (root-commit) 854e7be] add main.py
 1 file changed, 5 insertions(+)
 create mode 100644 main.py
unicorngundam@festivo ~/P/myProj (master)> git log
commit 854e7beabfb64e8711d03c61a18e34e7bd137fcd (HEAD -> master)
Author: hankchen1728 <hankchen1728@gmail.com>
Date:   Wed Dec 9 07:03:28 2020 +0800

    add main.py
```

Making Checkpoints

Untrack some files

```
$ git rm --cached main.py
```

Warning: If the flag `--cached` is not attached, the file will be deleted directly

```
unicorngundam@festivo ~/P/myProj (master)> git rm --cached main.py
rm 'main.py'
unicorngundam@festivo ~/P/myProj (master)> git status
On branch master
Changes to be committed:
  (use "git reset HEAD <file>..." to unstage)

        deleted:    main.py
```

Tracking Files

Show all files in repo

```
$ git ls-tree --full-tree -r --name-only <commit hash>
```

Or

```
$ git ls-files
```

```
unicorngundam@festivo ~/P/myProj (master)>
git ls-tree --full-tree -r --name-only HEAD
.gitignore
dataloader.py
main.py
models.py
```

Tracking Files

Show all files (or files with modification) added in certain **commit**

```
$ git diff-tree -r --name-only <commit hash>
```

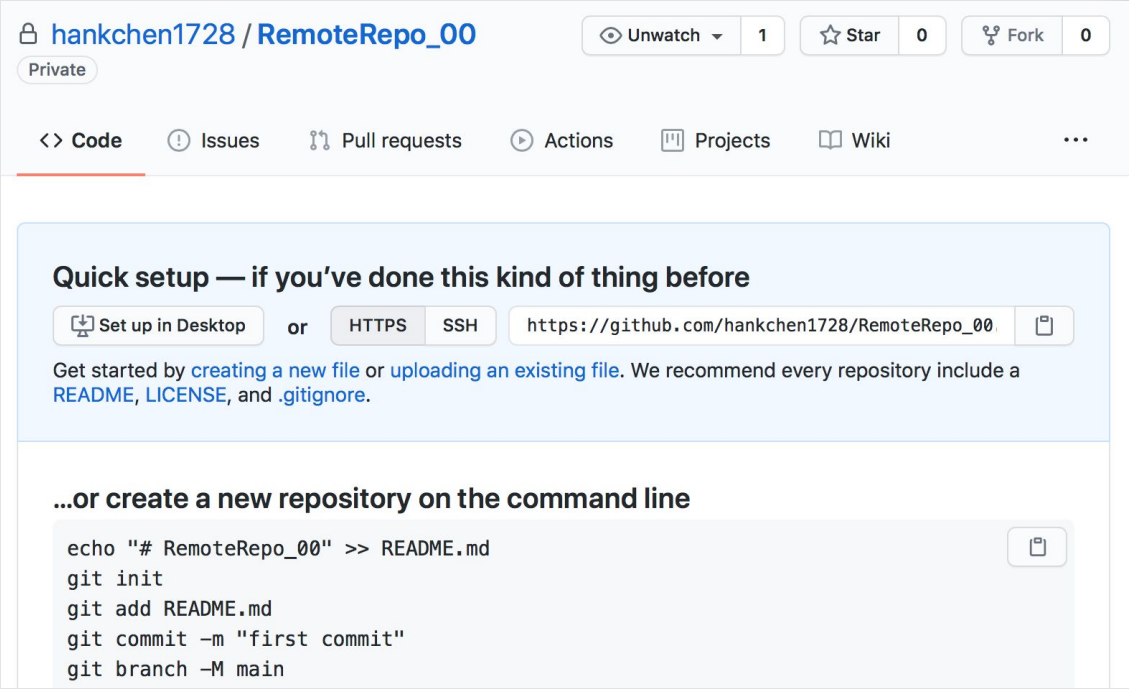
```
unicorngundam@festivo ~/P/myProj (master)> vim main.py
unicorngundam@festivo ~/P/myProj (master)> git add main.py
unicorngundam@festivo ~/P/myProj (master)> git commit -m "edit main.py"
[master df0b495] edit main.py
 1 file changed, 1 insertion(+)
unicorngundam@festivo ~/P/myProj (master)>
git ls-tree --full-tree -r --name-only HEAD
.gitignore
dataloader.py
main.py
models.py
unicorngundam@festivo ~/P/myProj (master)>
git diff-tree --no-commit-id --name-only -r df0b495
main.py
```

Remote Repository Connection

Connection with Github

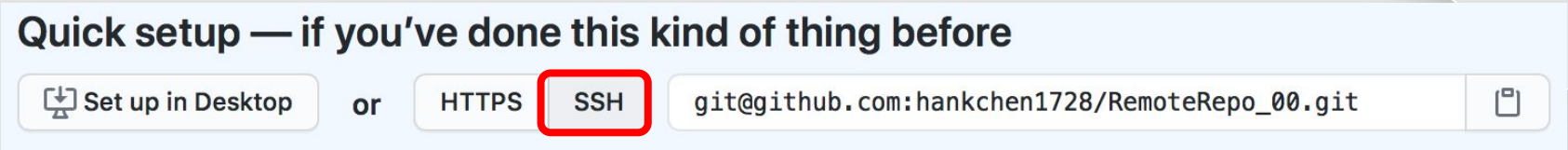
Remote Repository

Now consider that you want to push your repo to **Github**, and you have created new repository



Remote Repository

Take a look at the url link



Remote Repository

Add the **url** of the remote repo to git

```
$ git remote add <name> <remote_url>
```

```
unicorngundam@festivo ~/P/myProj (master)>
git remote add amazing git@github.com:hankchen1728/RemoteRepo_00.git
unicorngundam@festivo ~/P/myProj (master)> git remote -v
amazing git@github.com:hankchen1728/RemoteRepo_00.git (fetch)
amazing git@github.com:hankchen1728/RemoteRepo_00.git (push)
```

Remote Repository

You can also information of remote repository

```
$ git remote show <name>
```

```
unicorngundam@festivo ~/P/myProj (master)> git remote show amazing
Enter passphrase for key '/home/u/unicorngundam/.ssh/id_rsa_github':
* remote amazing
  Fetch URL: git@github.com:hankchen1728/RemoteRepo_00.git
  Push  URL: git@github.com:hankchen1728/RemoteRepo_00.git
  HEAD branch: (unknown)
```

Remote Repository

Reset the url of exist remote name

```
$ git remote set-url <name> <new url>
```

Get the url of exist remote

```
$ git remote get-url <name>
```

```
unicorngundam@festivo ~/P/myProj (master)>
git remote set-url amazing https://github.com/hankchen1728/RemoteRepo_00.git
unicorngundam@festivo ~/P/myProj (master)> git remote get-url amazing
https://github.com/hankchen1728/RemoteRepo_00.git
```

Remote Repository

Push the commit to remote repo

```
$ git push <remote name> <branch>
```

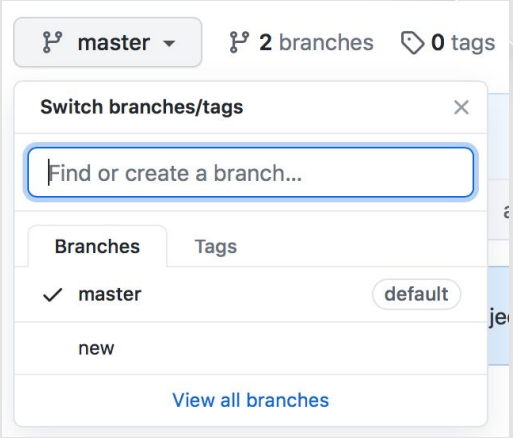
```
unicorngundam@festivo ~/P/myProj (master)> git push amazing master
Enter passphrase for key '/home/u/unicorngundam/.ssh/id_rsa_github':
Counting objects: 3, done.
Delta compression using up to 72 threads.
Compressing objects: 100% (2/2), done.
Writing objects: 100% (3/3), 263 bytes | 263.00 KiB/s, done.
Total 3 (delta 0), reused 0 (delta 0)
To github.com:hankchen1728/RemoteRepo_00.git
 * [new branch]      master -> master
```

Remote Repository

If we want the new created branch on remote has different name to local branch

```
$ git push <remote name> <local branch>:<remote branch>
```

```
unicorngundam@festivo ~/P/myProj (master)> git push amazing master:new
Enter passphrase for key '/home/u/unicorngundam/.ssh/id_rsa_github':
Total 0 (delta 0), reused 0 (delta 0)
remote:
remote: Create a pull request for 'new' on GitHub by visiting:
remote:      https://github.com/hankchen1728/RemoteRepo_00/pull/new/new
remote:
To github.com:hankchen1728/RemoteRepo_00.git
 * [new branch]      master -> new
```



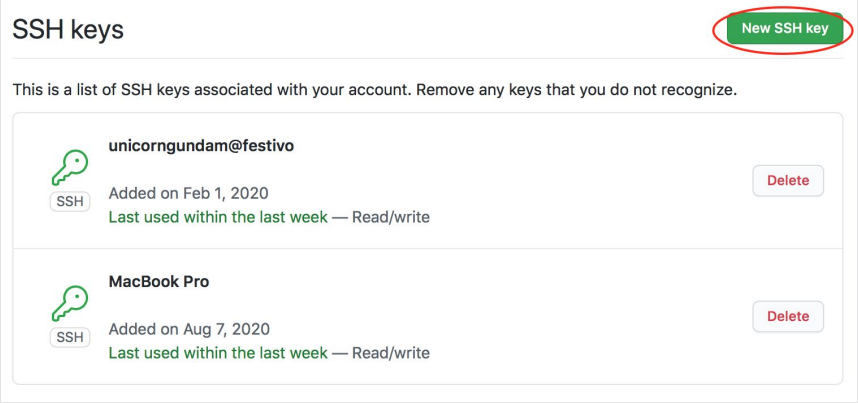
(Optional) Setup SSH Connection to Github

1. Generating a ssh key

```
$ ssh-keygen -t rsa -b 4096 -C [email]
```

2. Copy the content of your public key to setting page

```
$ cat ~/.ssh/id_rsa.pub
```



(Optional) Setup SSH Connection to Github

3. Add the SSH key to the **`ssh-agent`**

```
$ eval "$(ssh-agent -s)"
$ ssh-add ~/.ssh/id_rsa
```

4. [Optional] Configure the **`ssh`**

   If you use several keys, then you need to config your ssh as follow:

```
$ vi ~/.ssh/config
```

   Then paste the following content to the config file

```
Host github.com
    IdentityFile ~/.ssh/id_rsa
```

(Optional) Setup SSH Connection to Github

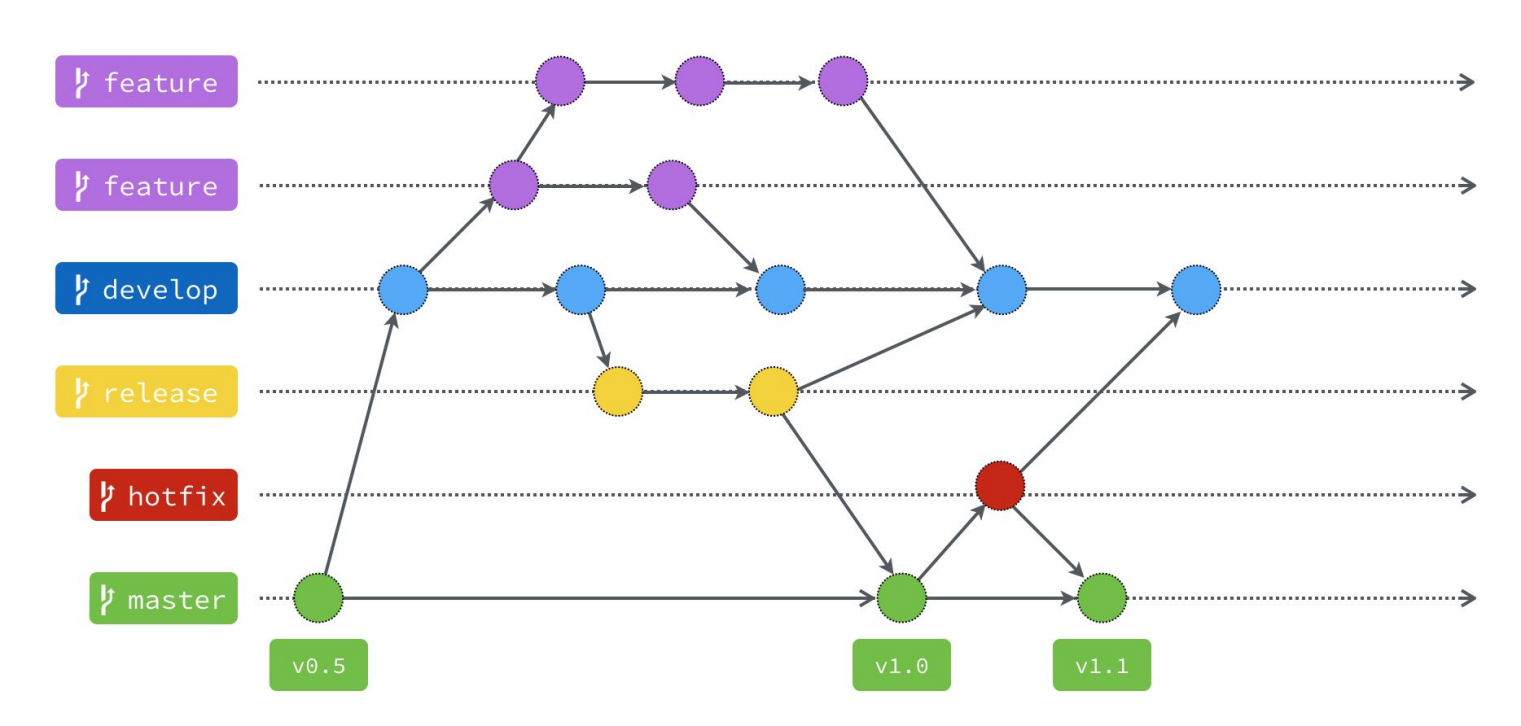
5. Testing the ssh connection

```
$ ssh -T git@github.com
```

```
unicorngundam@festivo ~/P/myProj (master)> ssh -T git@github.com
Enter passphrase for key '/home/u/unicorngundam/.ssh/id_rsa_github'
:
Hi hankchen1728! You've successfully authenticated, but GitHub does
 not provide shell access.
```

Branch Management

Branches



https://gitbook.tw/chapters/gitflow/why-need-git-flow.html

Branches

Show All the branches

```
$ git branch -a
```

```
unicorngundam@festivo ~/P/myProj (master)> git branch -a
* master
  remotes/amazing/master
  remotes/amazing/new
```

Branches

Create new branch

```
$ git branch dev
```

```
unicorngundam@festivo ~/P/myProj (master)> git branch dev
unicorngundam@festivo ~/P/myProj (master)> git branch -a
  dev
* master
  remotes/amazing/master
  remotes/amazing/new
```

Branches

Switch to new created branch

```
$ git checkout dev
```

```
unicorngundam@festivo ~/P/myProj (master)> git checkout dev
Switched to branch 'dev'
unicorngundam@festivo ~/P/myProj (dev)> git branch -a
* dev
  master
  remotes/amazing/master
  remotes/amazing/new
```

Show Current Branch in Shell Prompt

- Fish, zsh

```
unicorngundam@festivo ~/P/myProj (dev)> git branch -a
* dev
  master
  remotes/amazing/master
  remotes/amazing/new
```

- For Bash
  Paste the following code in your `.bashrc`

```
parse_git_branch() {
     git branch 2> /dev/null | sed -e '/^[^*]/d' -e 's/*
\(.*\)/(\1)/'
}
export PS1="\u@\h \[\e[32m\]\w
\[\e[91m\]\$(parse_git_branch)\[\e[00m\]$ "
```

Future Work

- Merge, Conflict
- Detached Head