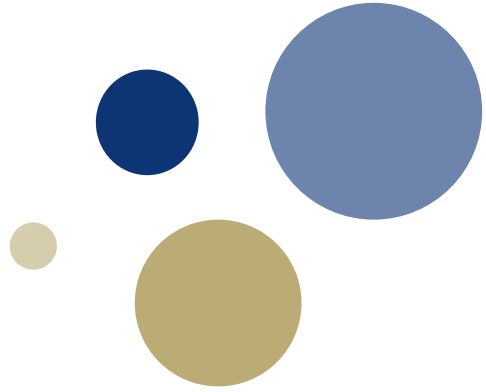


Version control for researchers

Sigurd Hofsmo Jakobsen

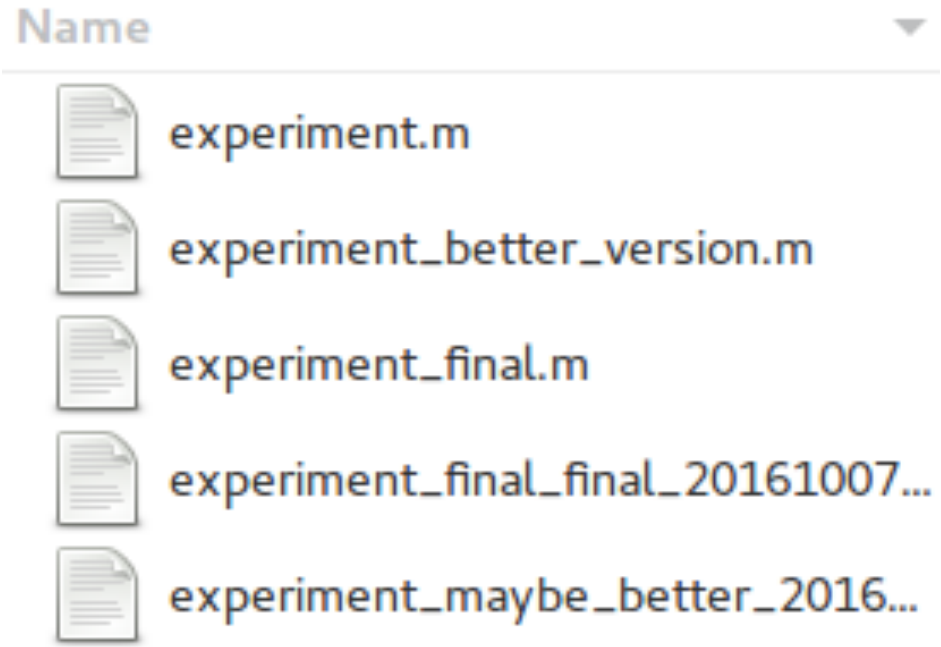
Department of electric power engineering

October 6, 2016

Outline

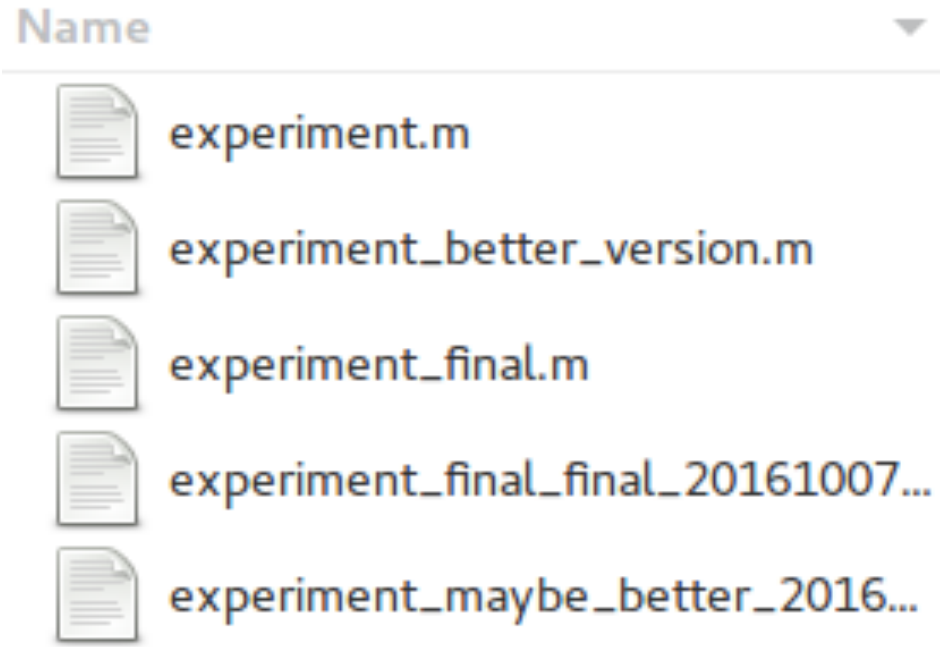
A basic example

— Only one person can work on a file at a time



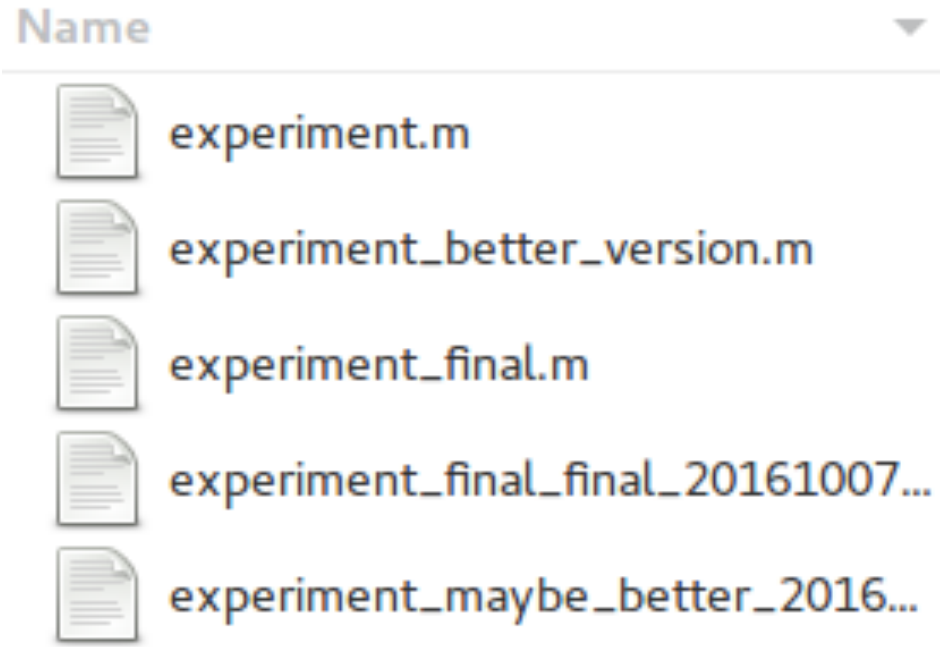
A basic example

- Only one person can work on a file at a time
- Difficult to keep track on which file to use



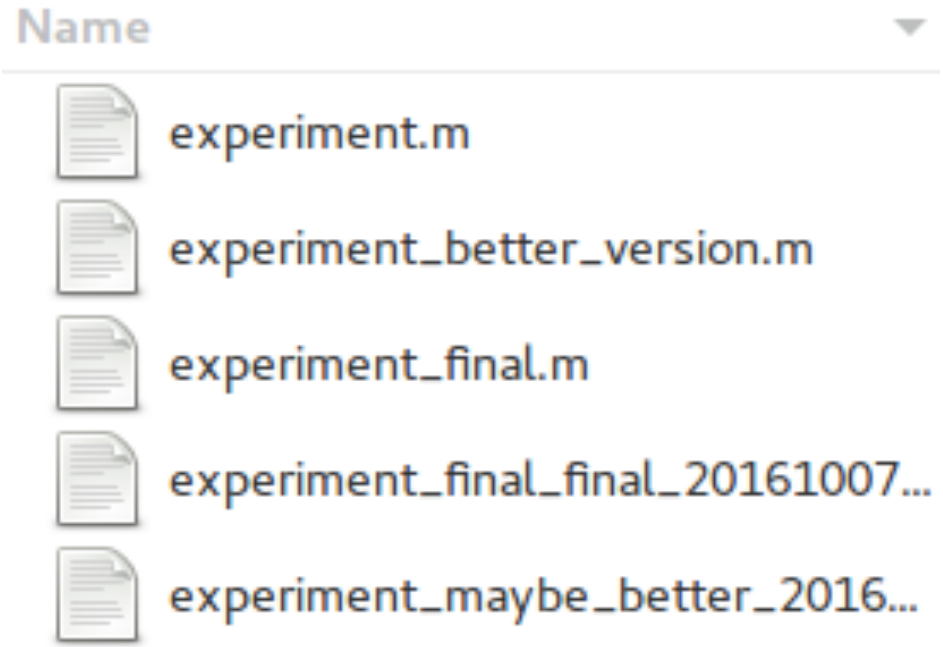
A basic example

- Only one person can work on a file at a time
- Difficult to keep track on which file to use
- Difficult to compare the files



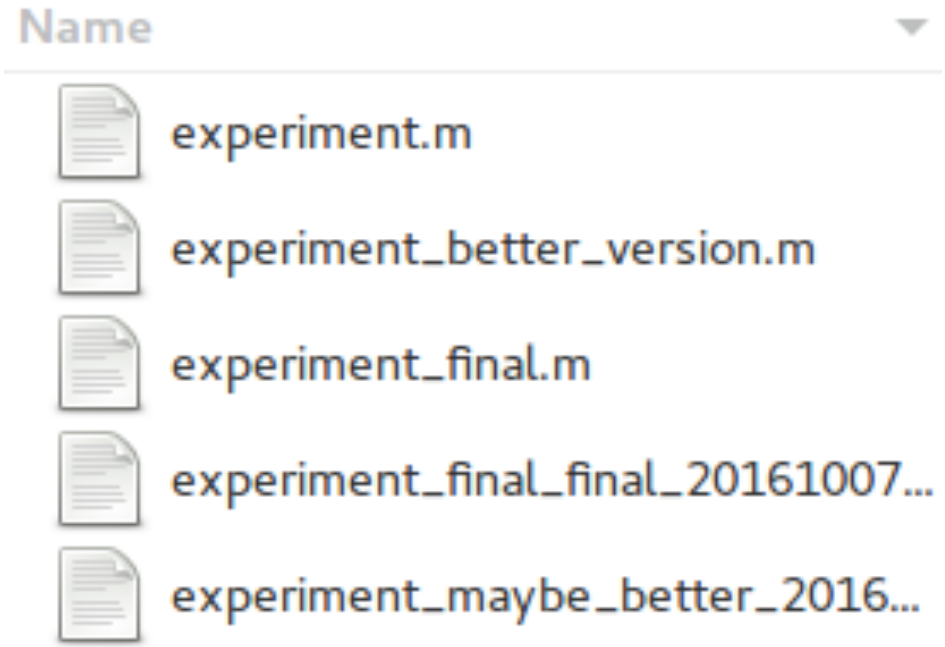
A basic example

- Only one person can work on a file at a time
- Difficult to keep track on which file to use
- Difficult to compare the files
- Do you have back up?



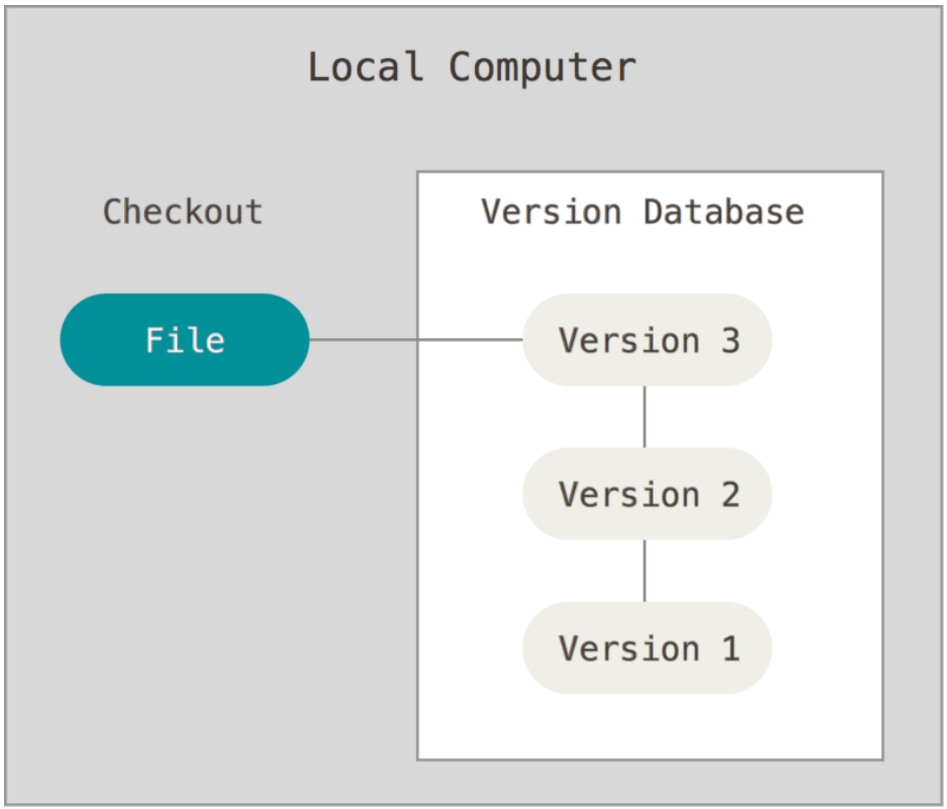
A basic example

- Only one person can work on a file at a time
- Difficult to keep track on which file to use
- Difficult to compare the files
- Do you have back up?
- Probably more issues



Smarter way of doing it

— Equivalent of storing your stuff on M



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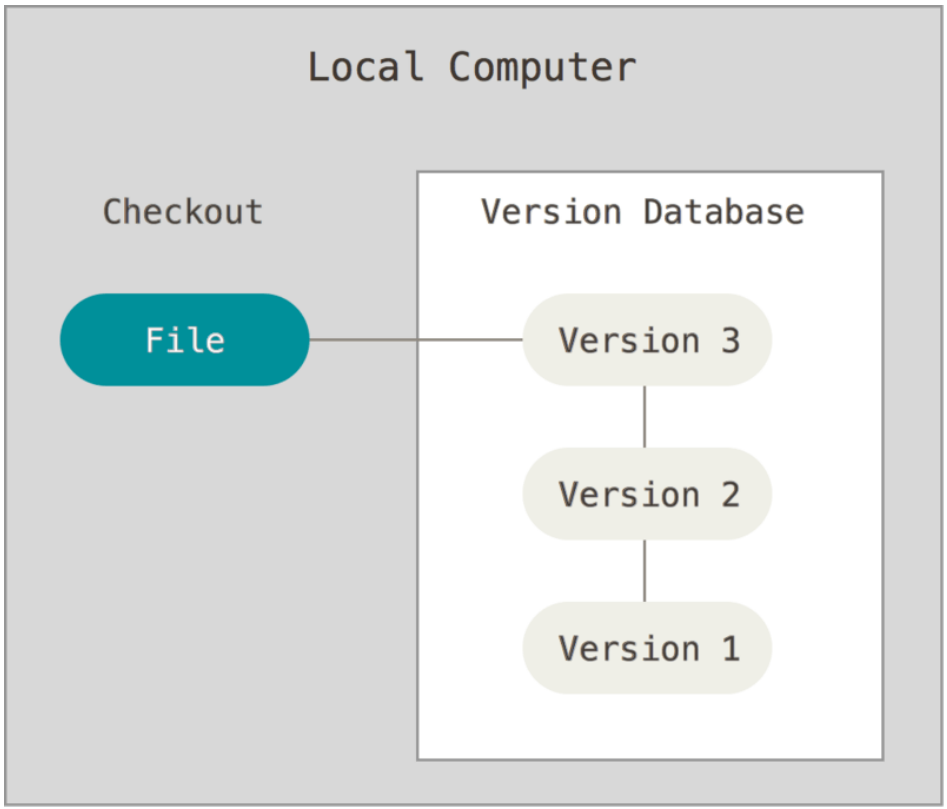
- Equivalent of storing your stuff on M
- Included in MAC



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- Equivalent of storing your stuff on M
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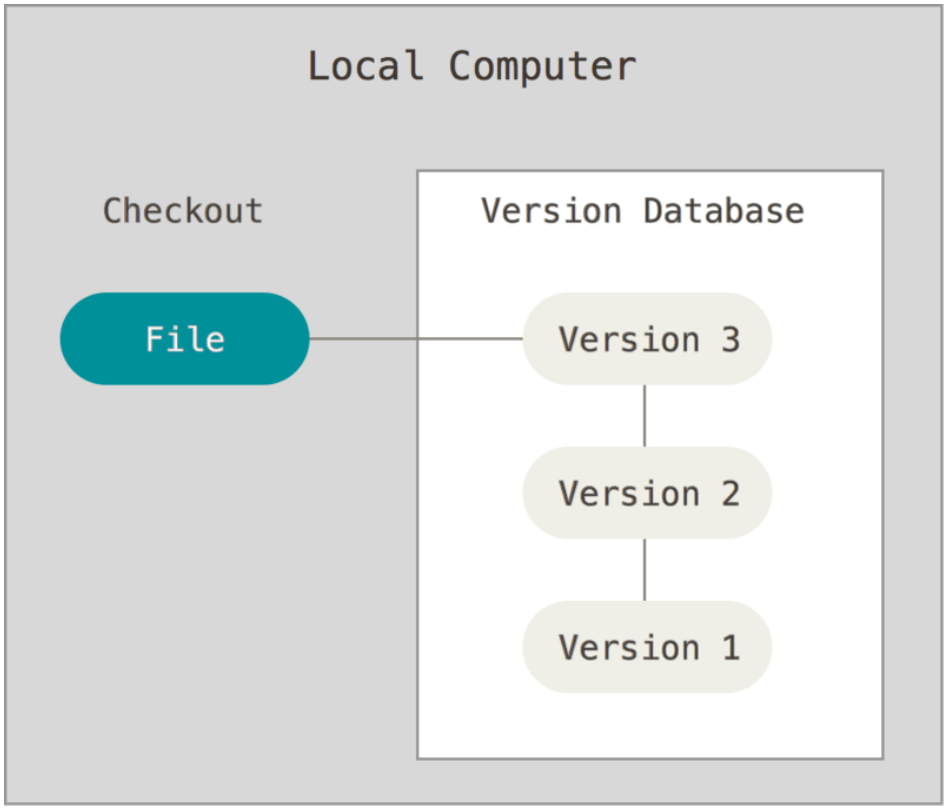
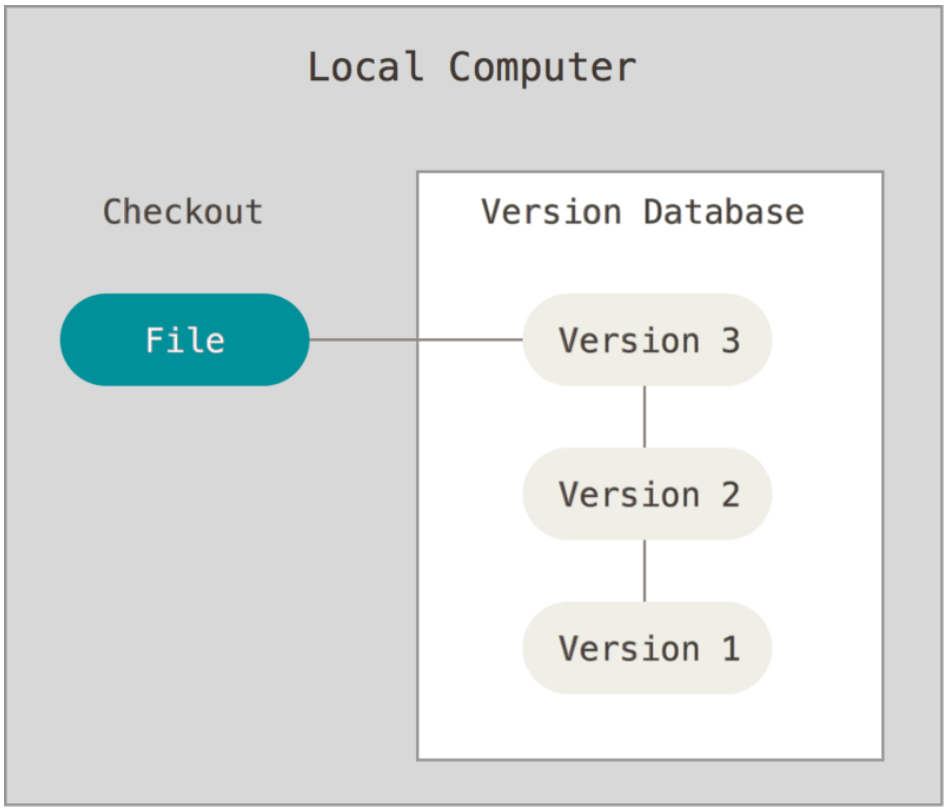


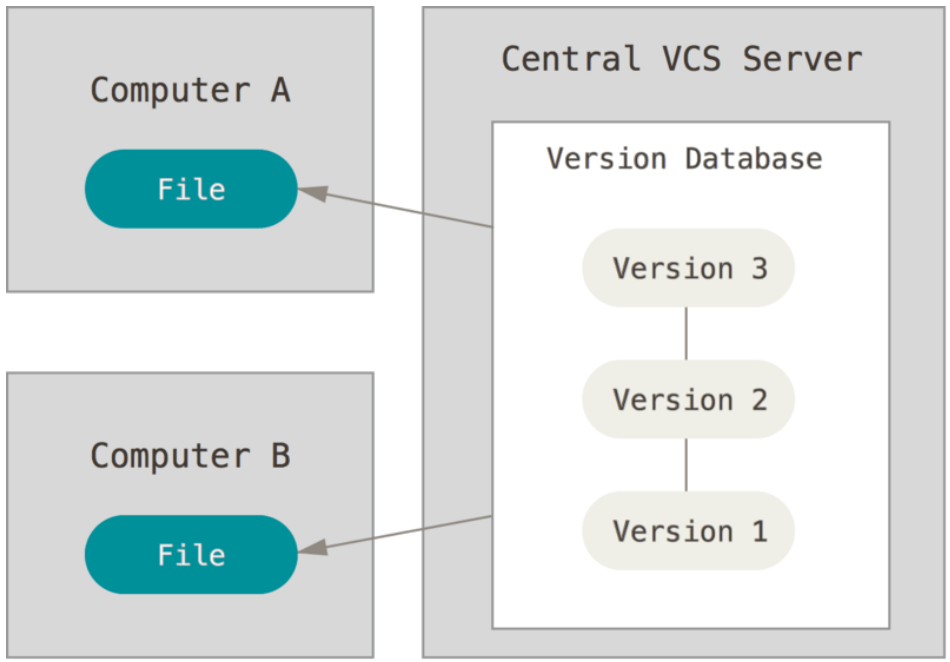
Smarter way of doing it

- Equivalent of storing your stuff on M
- Included in MAC
- Easy to set up
- Still difficult to collaborate



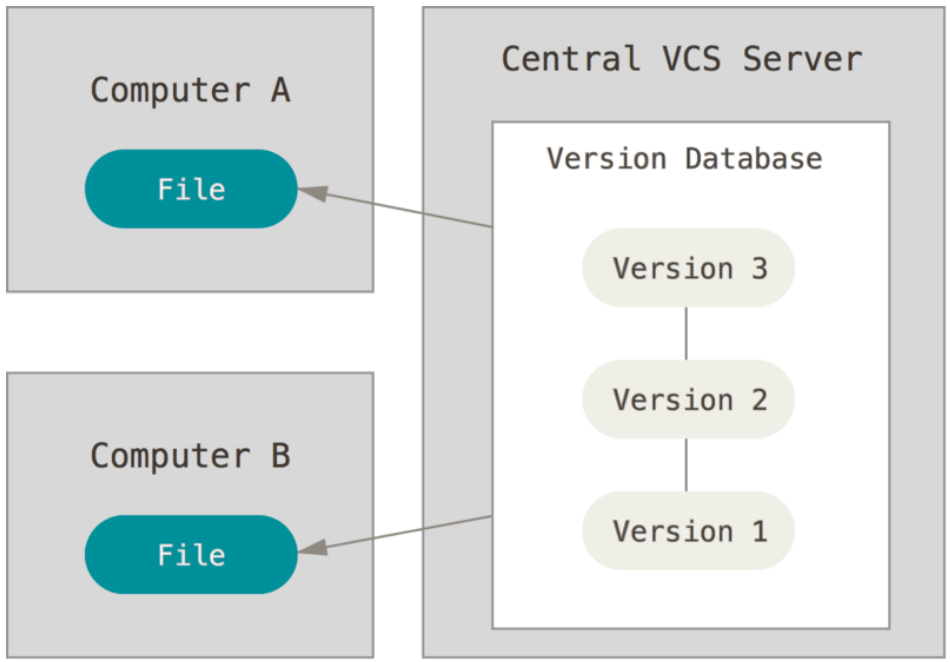
Centralized version control

— Examples:



Centralized version control

— Examples:
  - CVS



Centralized version control

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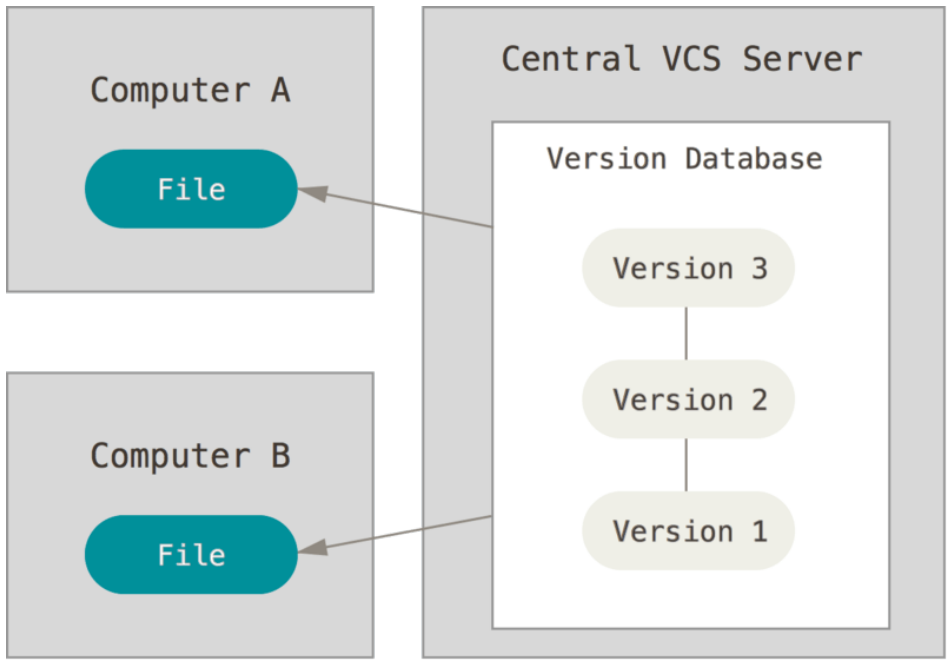

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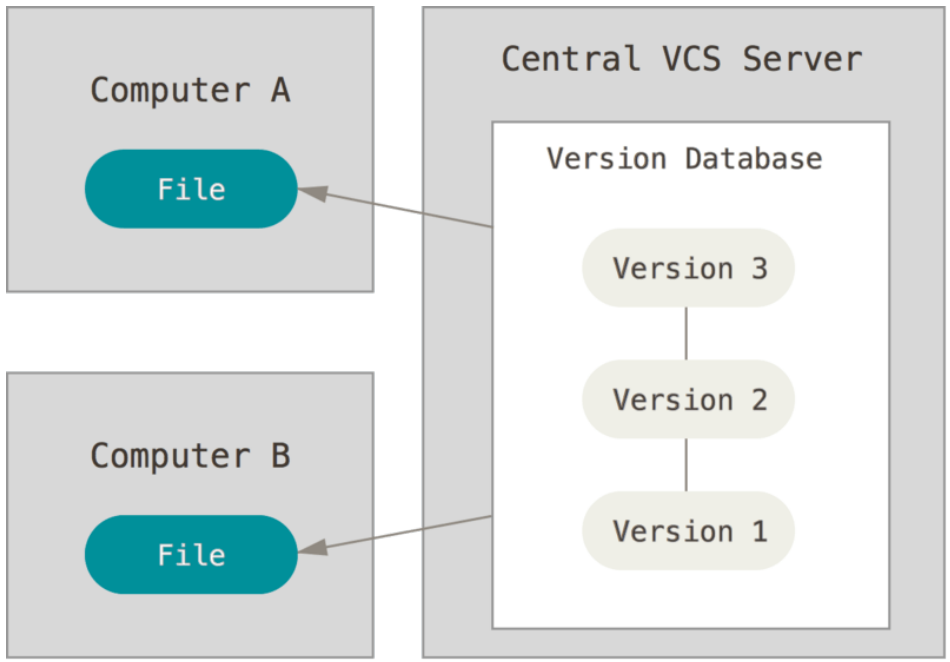

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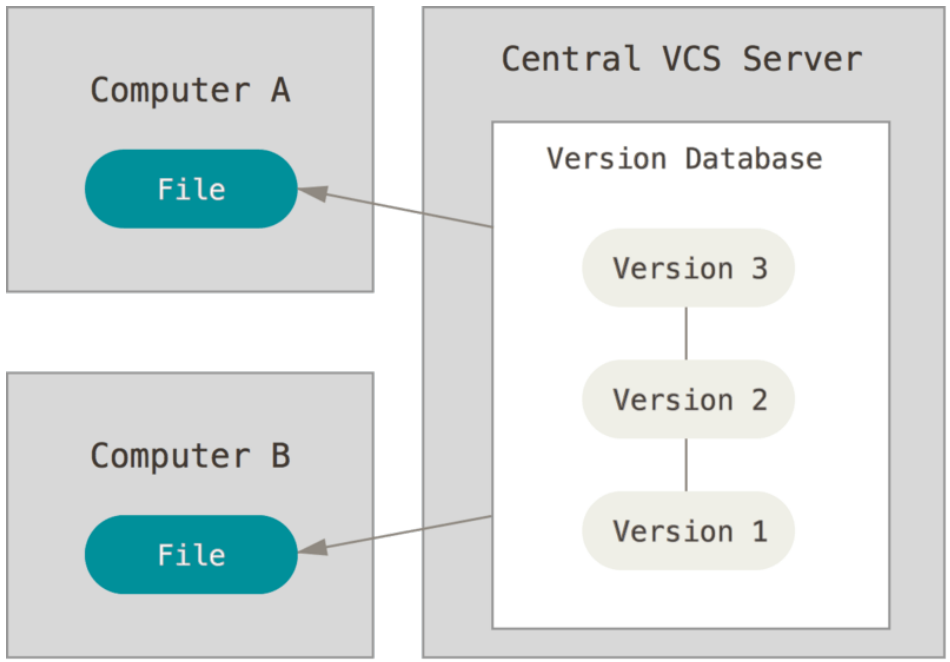

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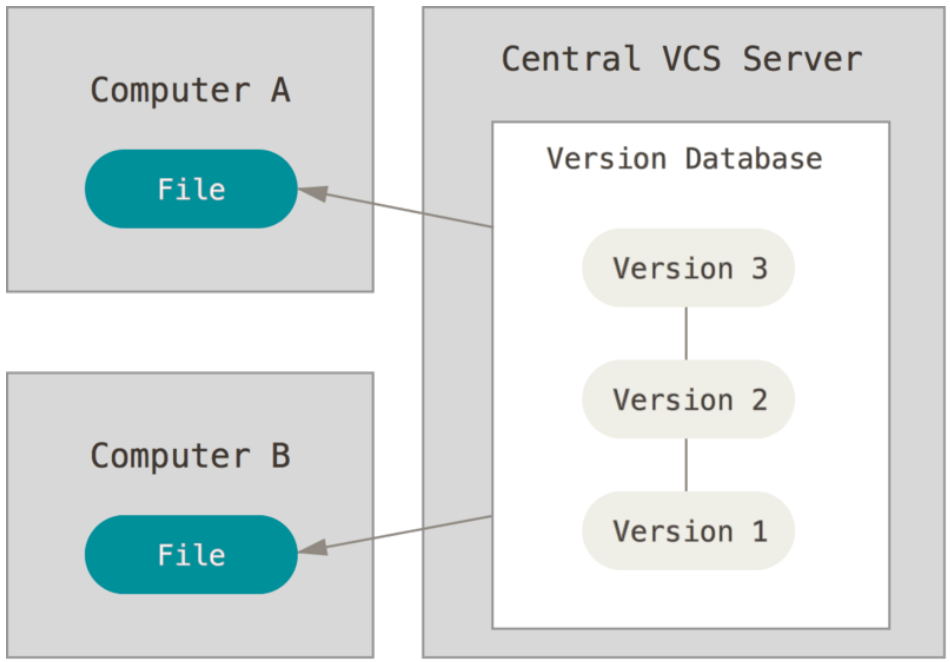

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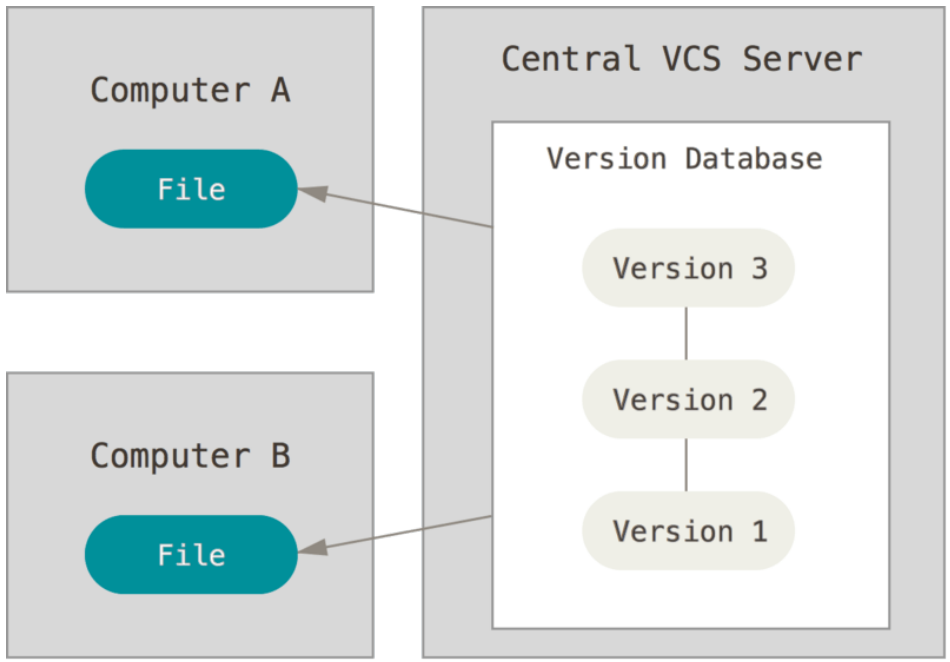

Centralized version control

- Examples:
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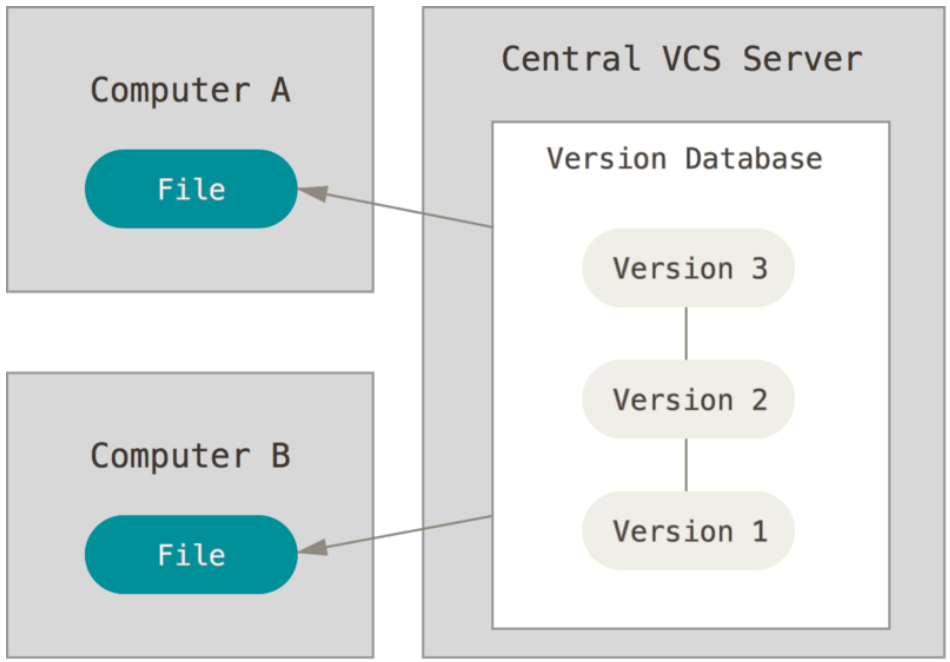
- Easy to collaborate
- Check out specific versions
- Single point of failure (N-0)
- If the server dies only checked out versions can be saved



Distsributed version control

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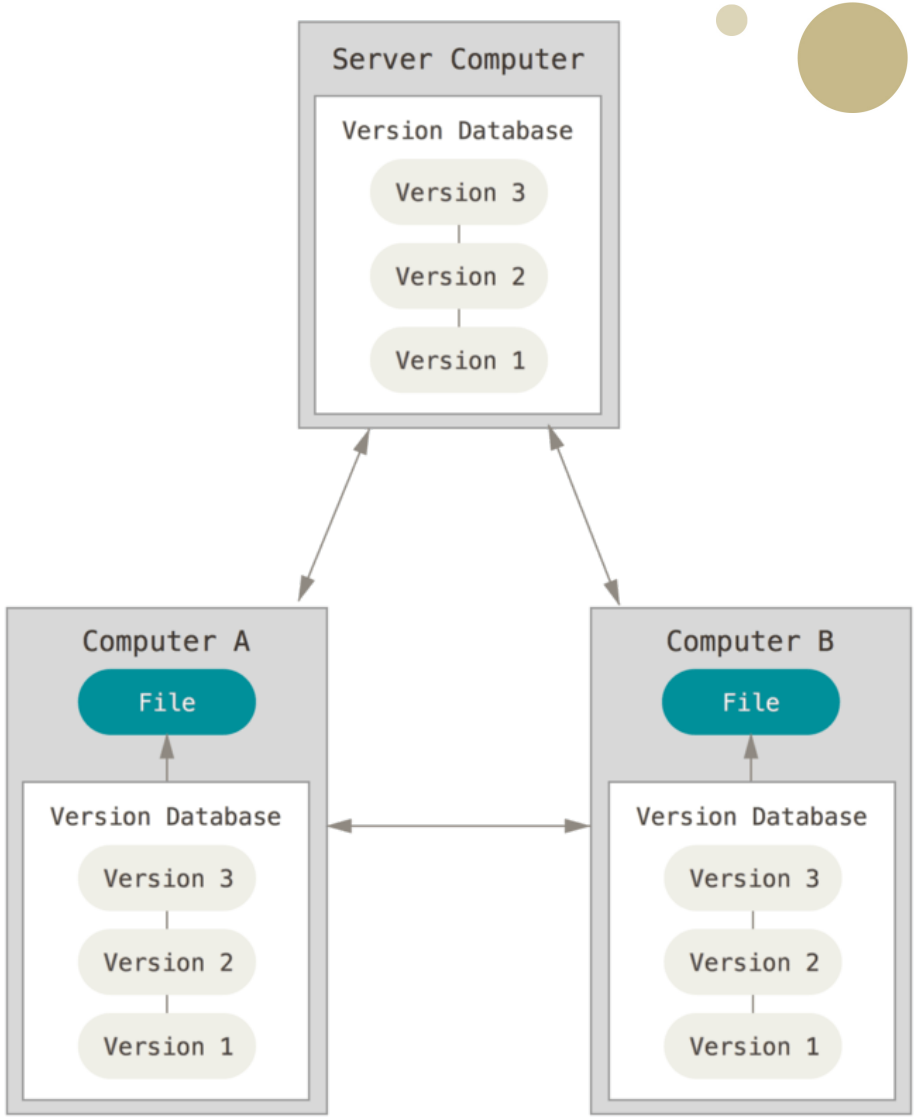
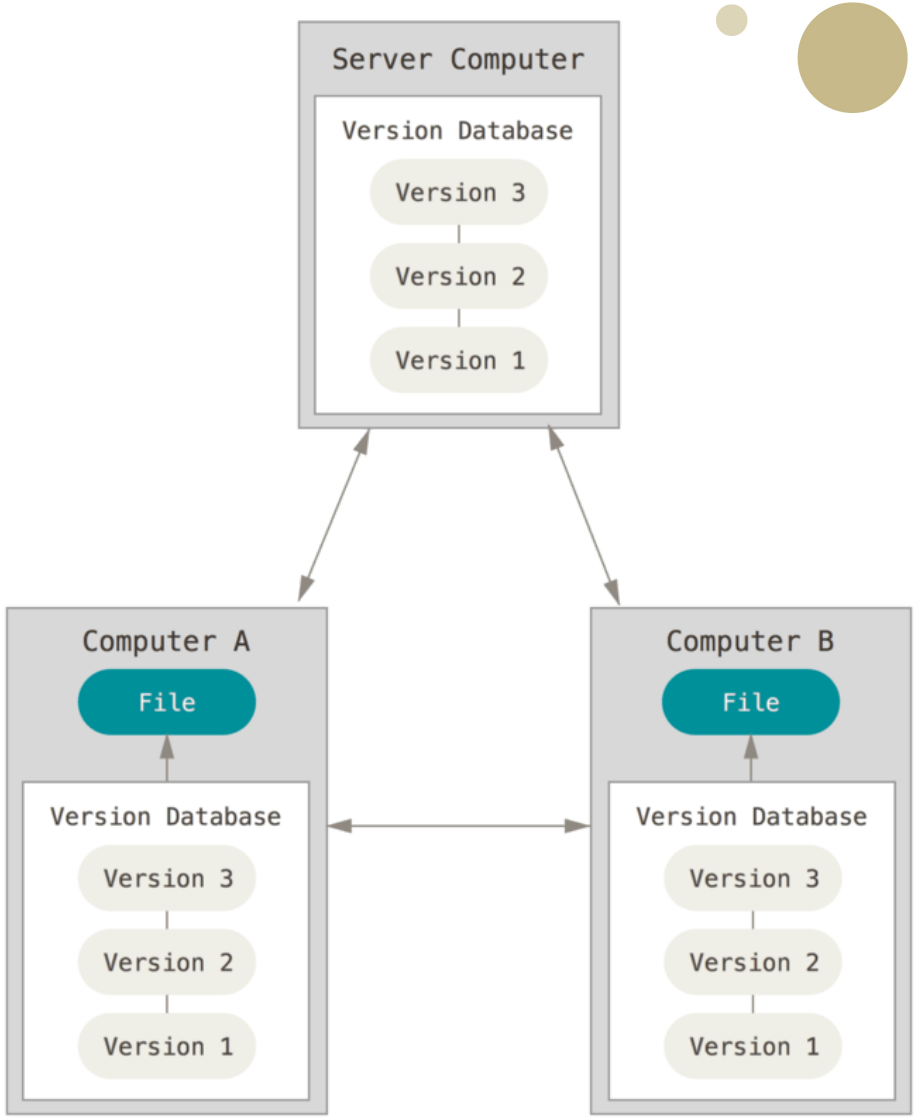


Distsributed version control

— Examples:
- Git



Distsributed version control

— Examples:
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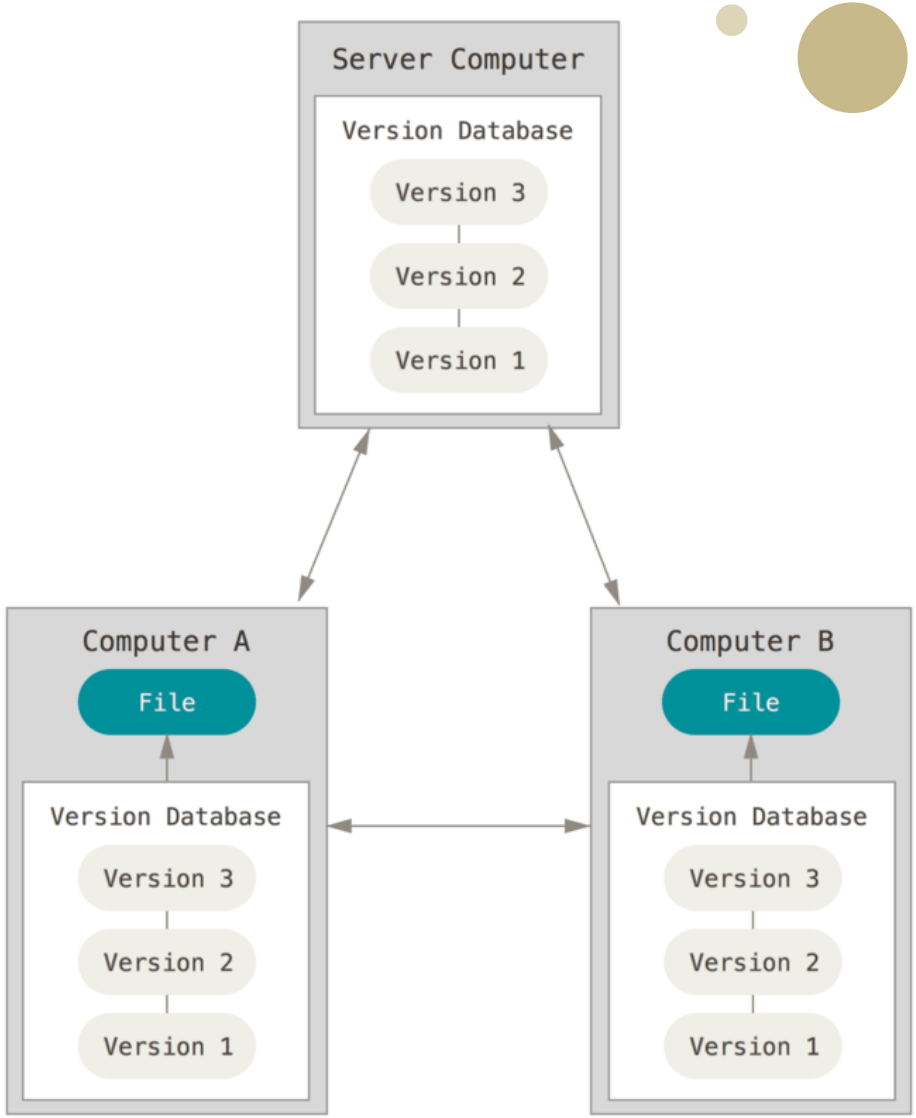

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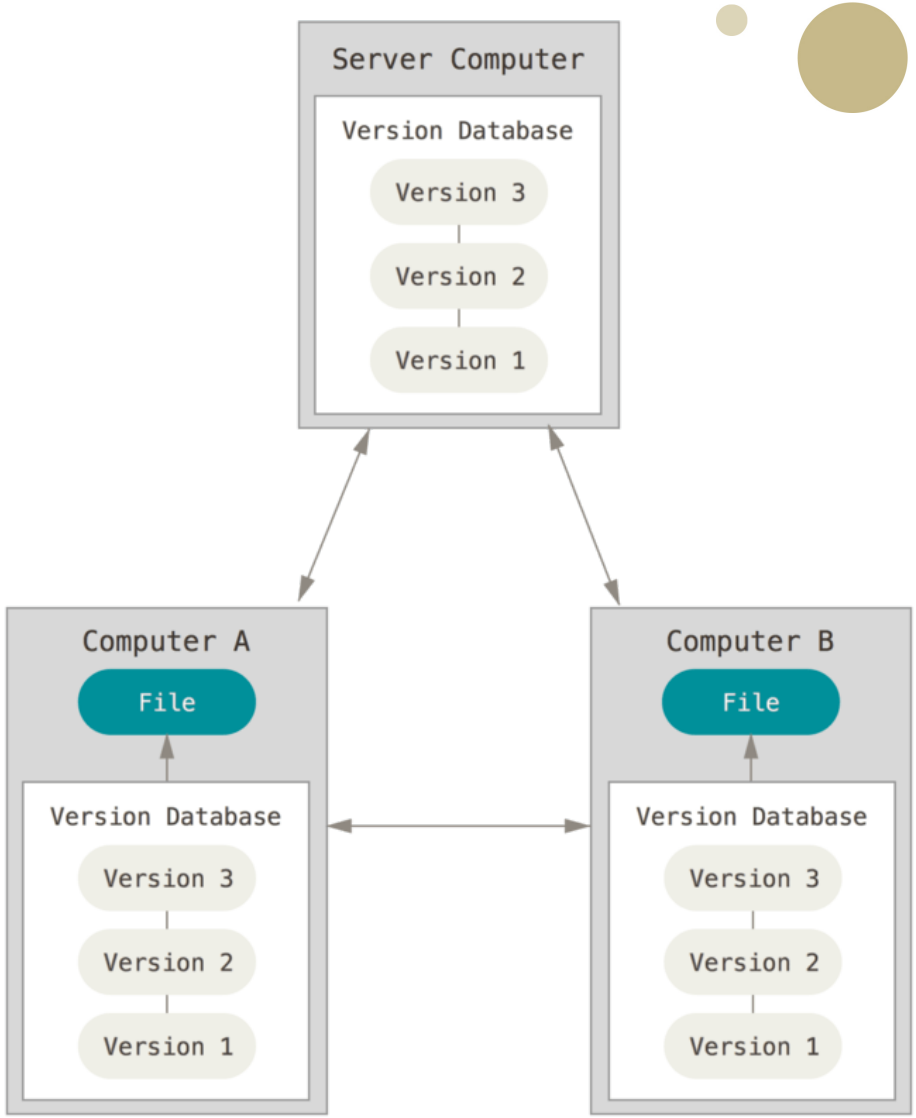

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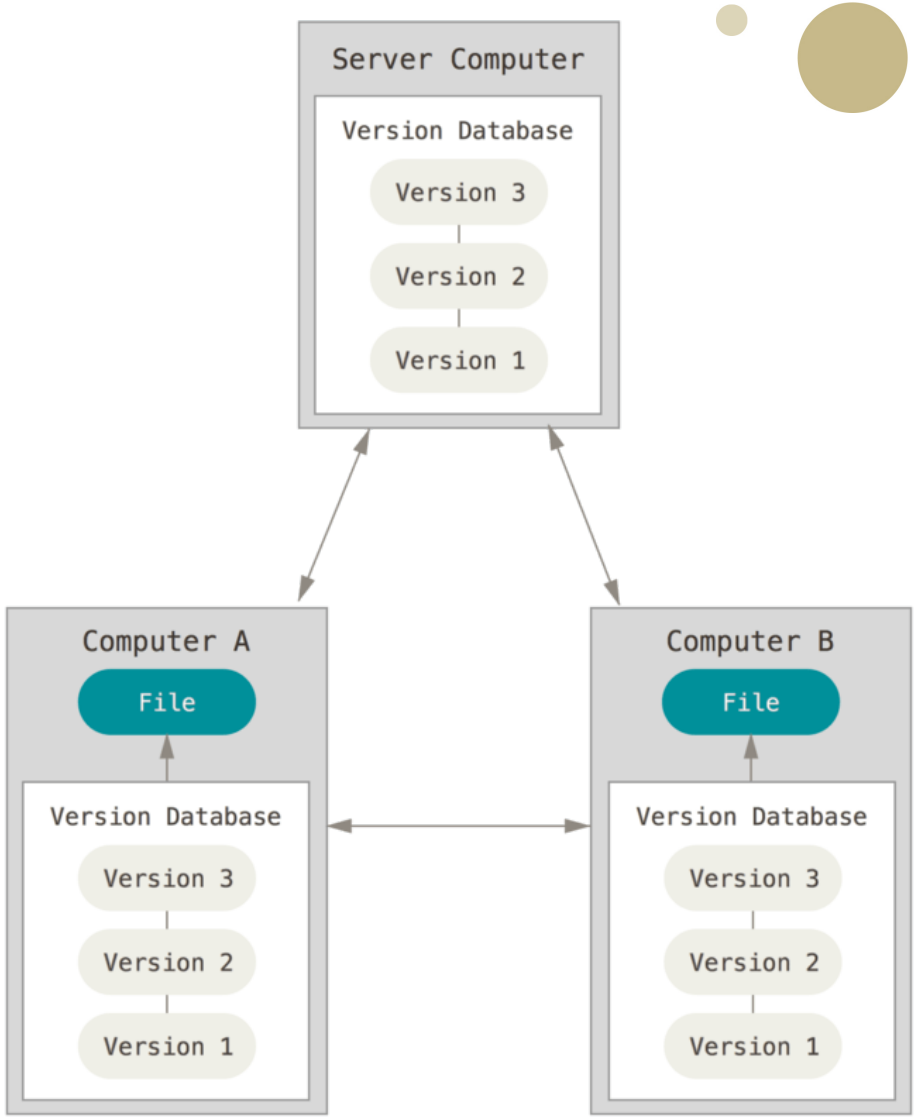

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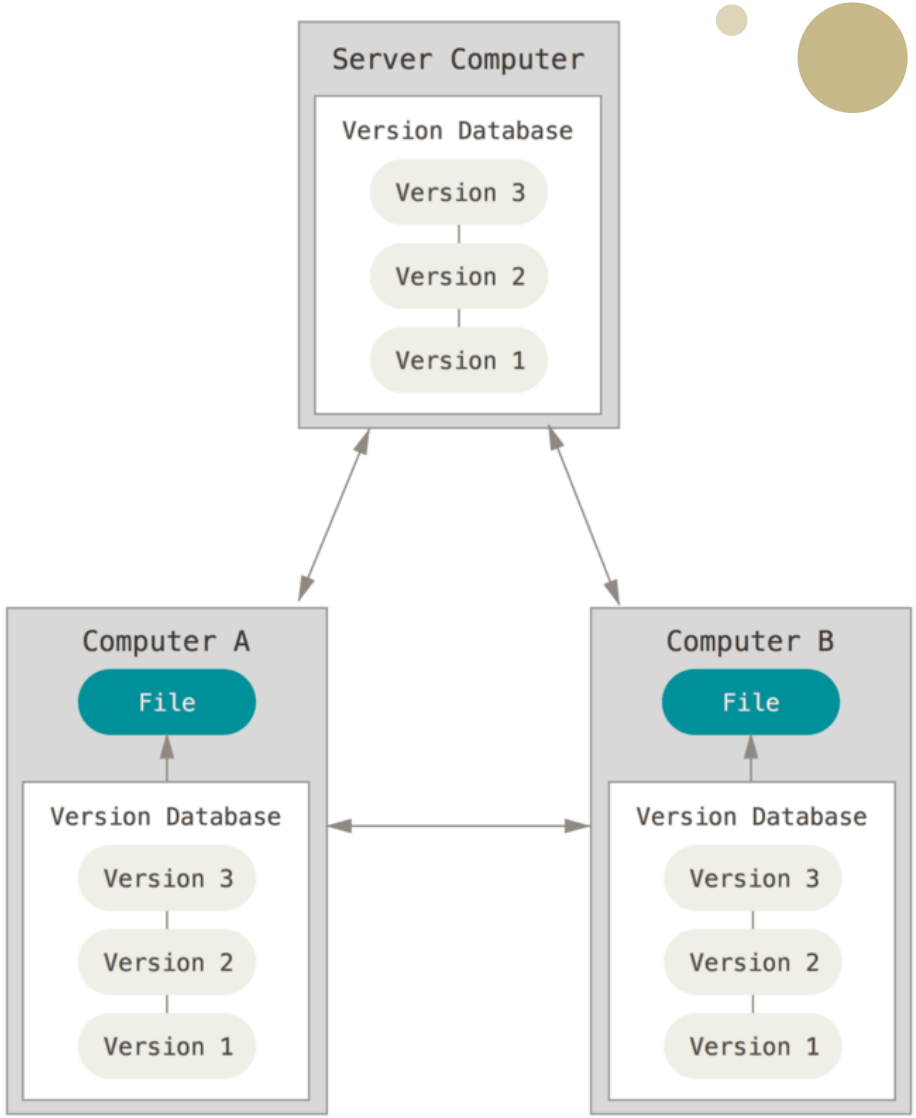
— Same advantages as centralized version control



Distsributed version control

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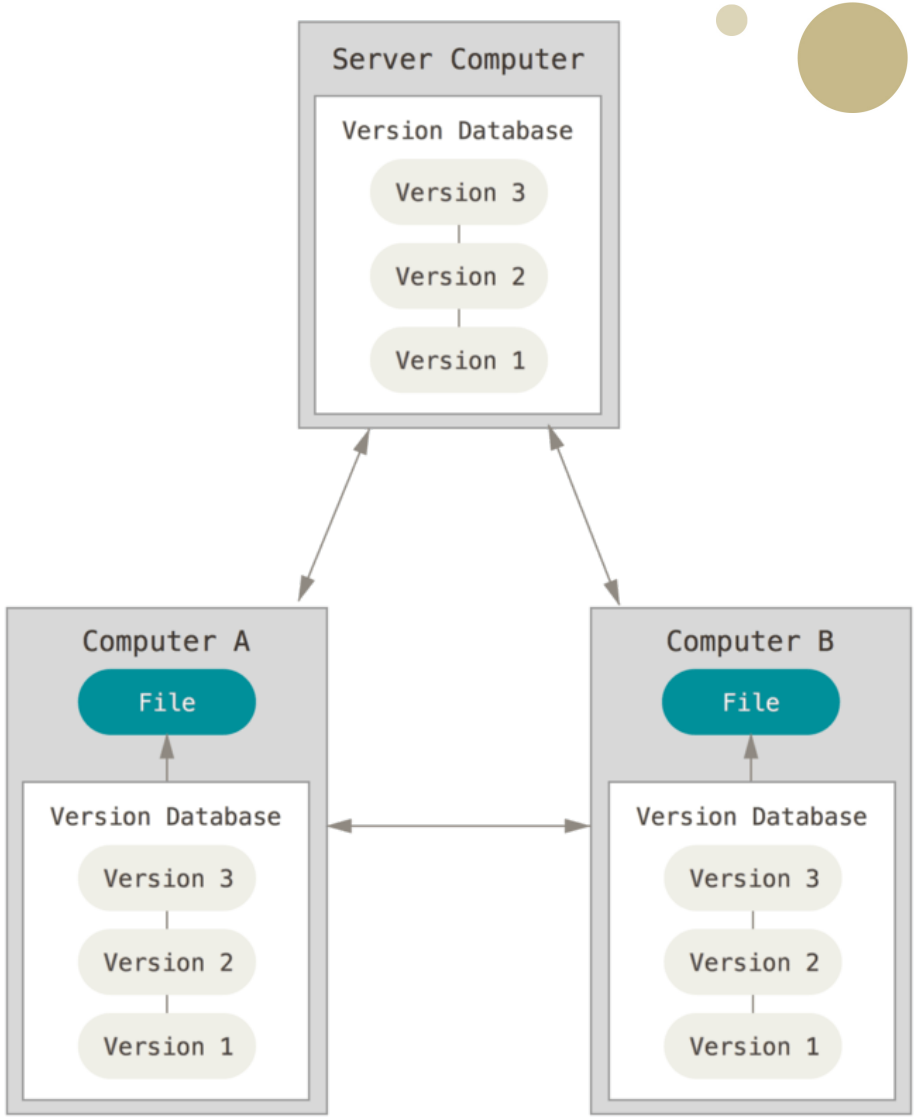

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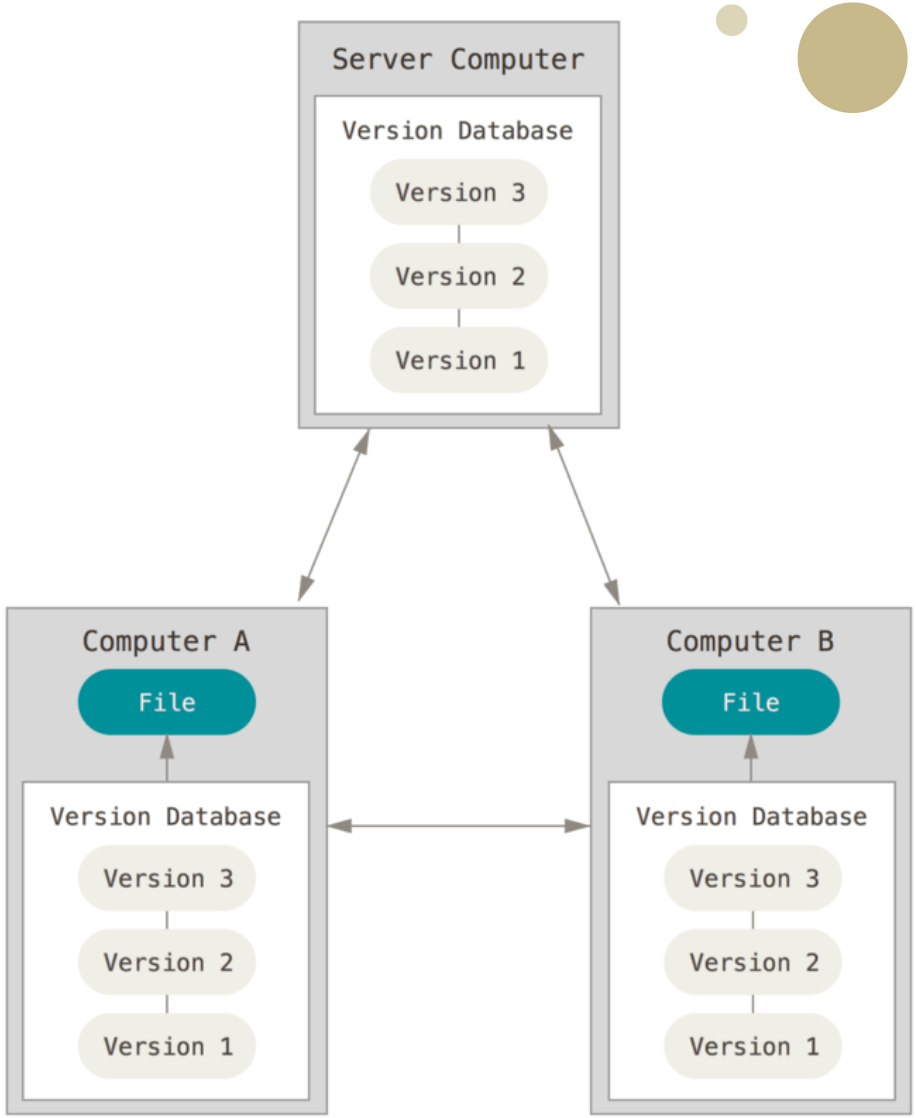
- Easy to work against multiple servers



Should you use version control?

— Do you write code?

Dont do this:

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% Read data set 1
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- Remember code is a virtual laboratory
- Versions can for instance be tagged with name of publication(reproducability for review)

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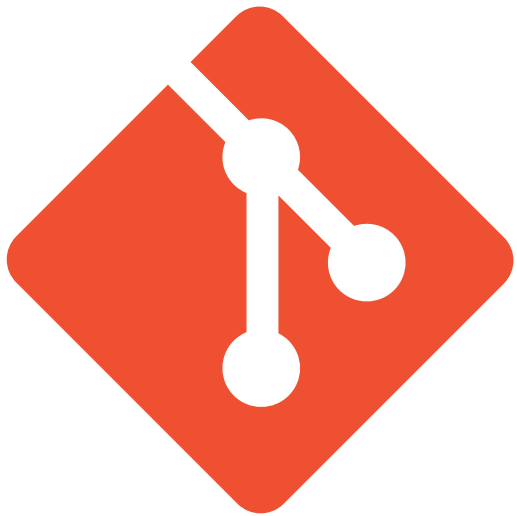
Outline

About git

— Developed by the team behind Linux



About git

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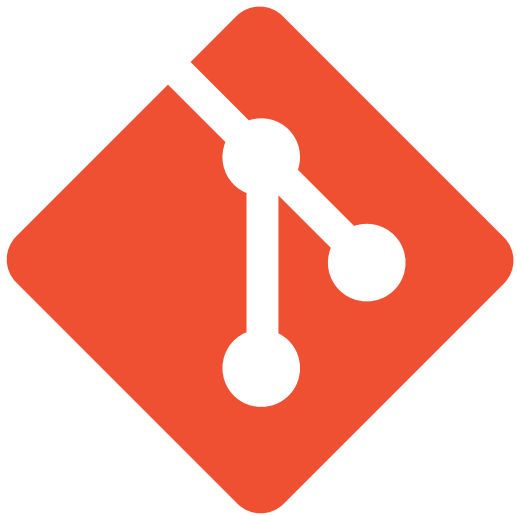
— used by companies such as:



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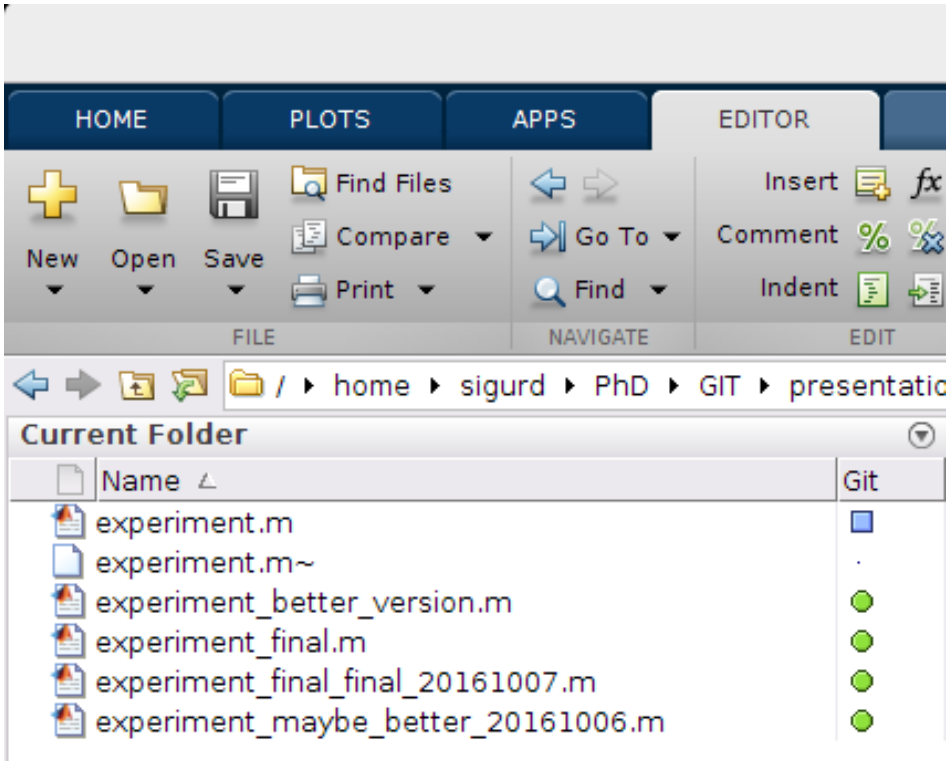
Getting started with git

— Download git



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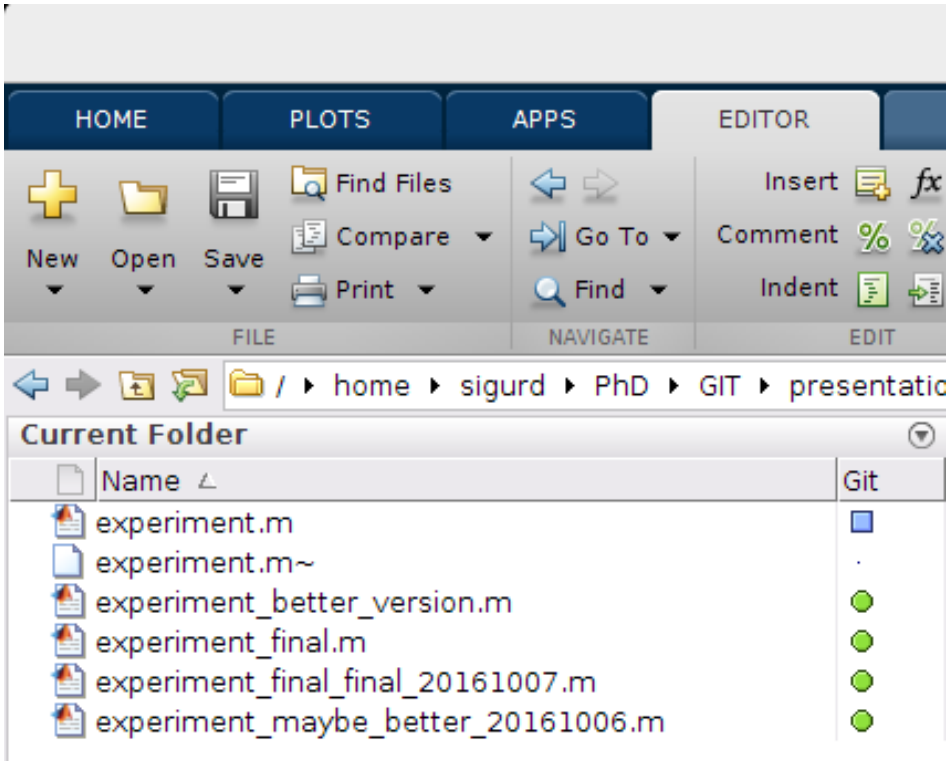
- `www.git-scm.com`



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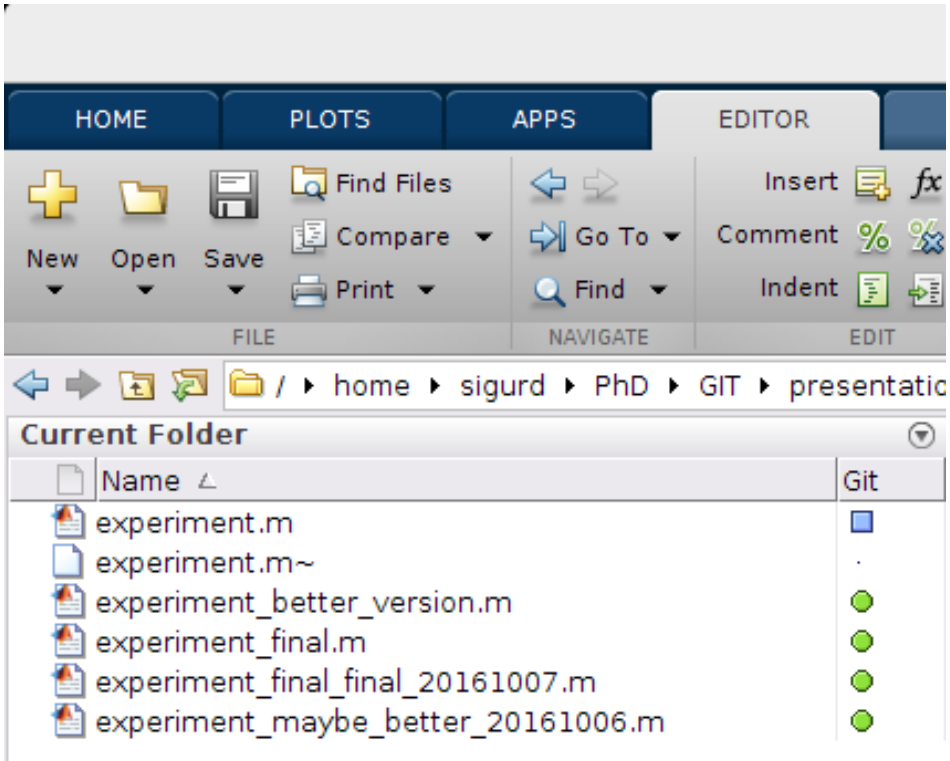

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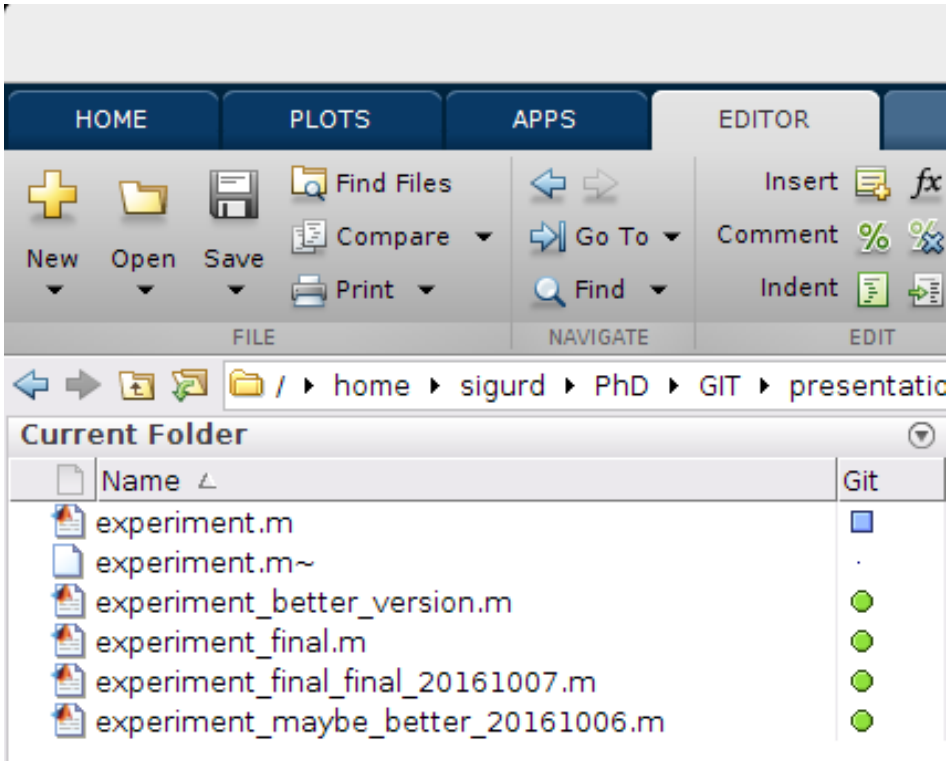

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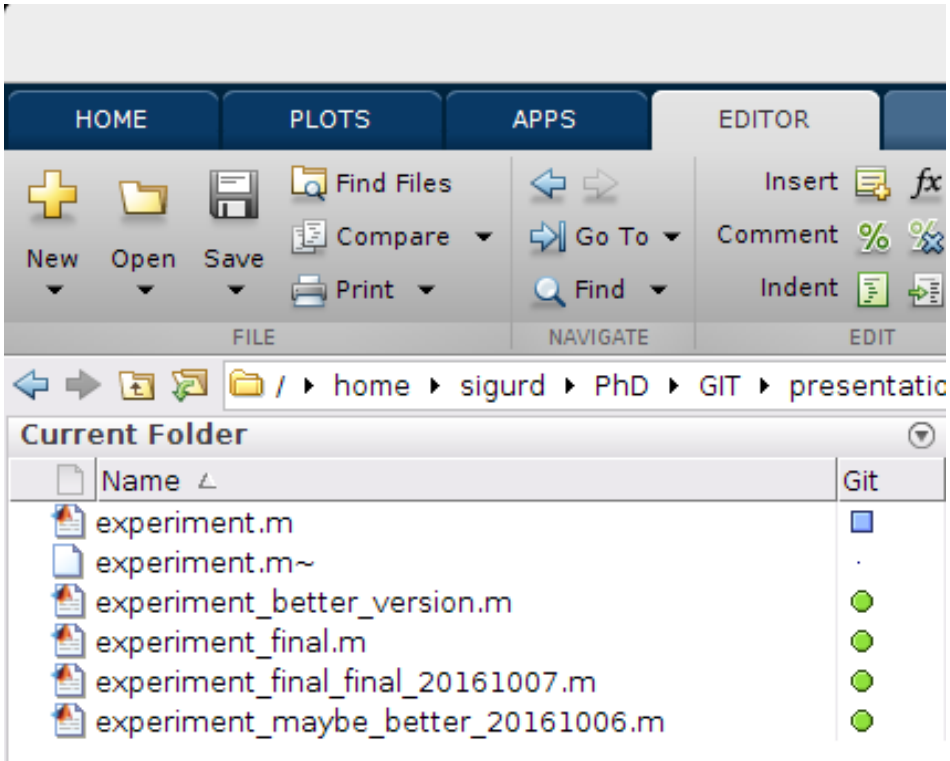

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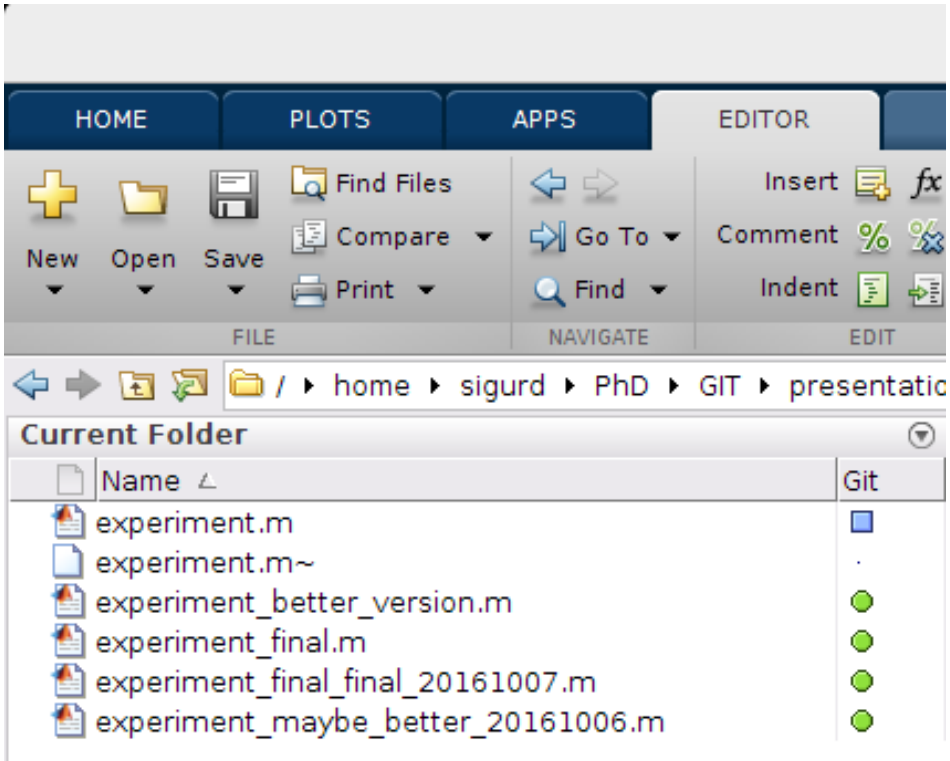

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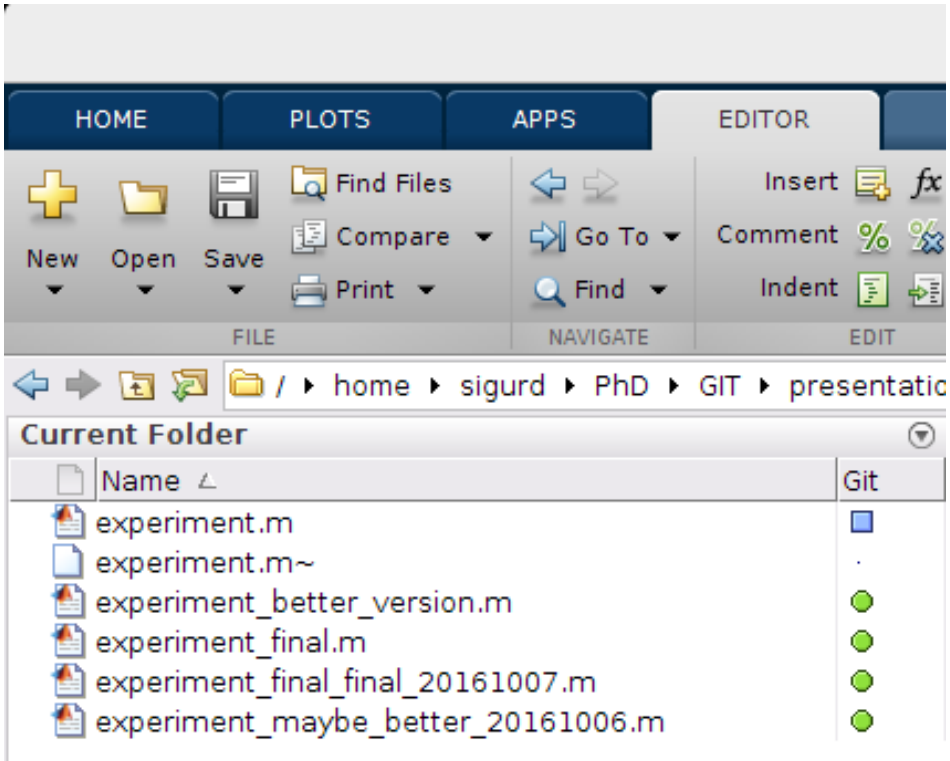

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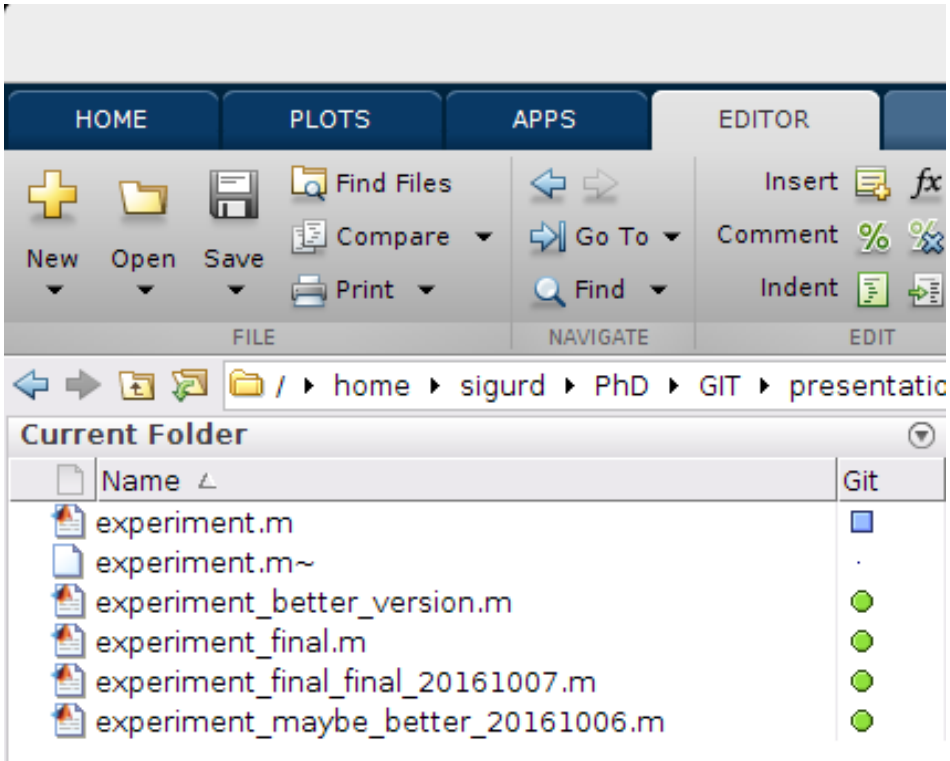

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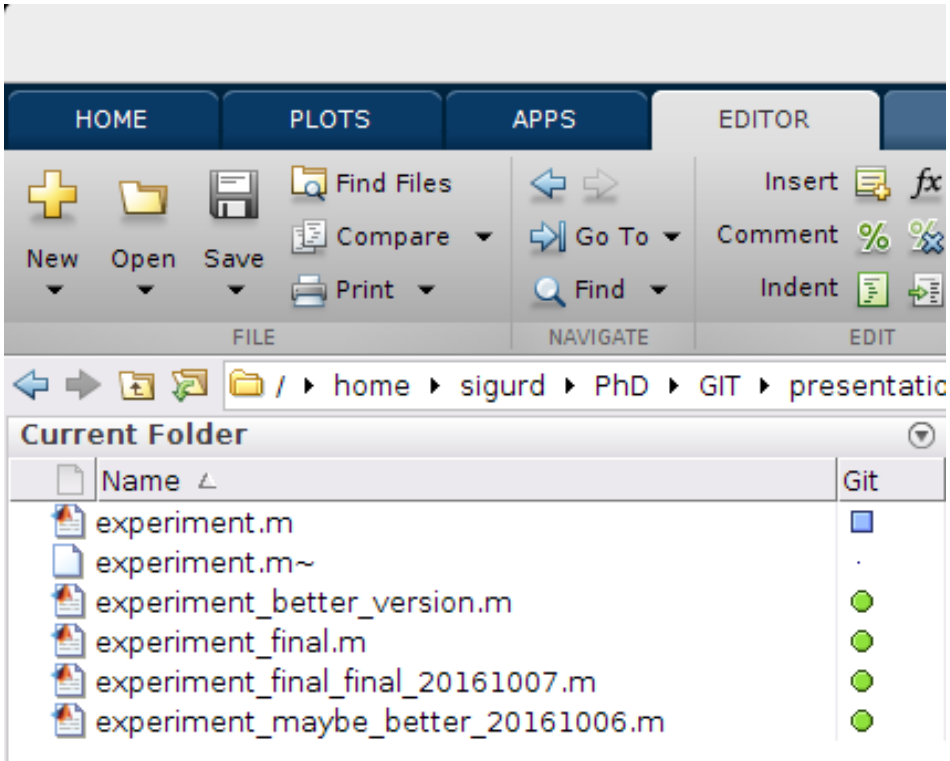

Getting started with git

- Download git
  - `www.git-scm.com`
  - Your favourite package manager
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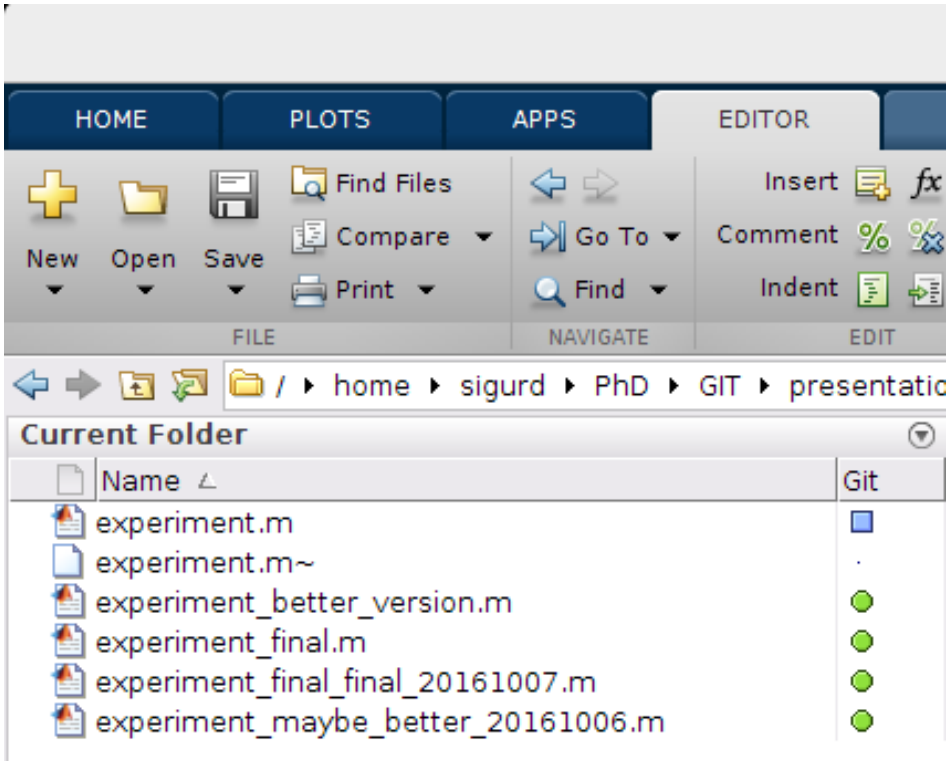

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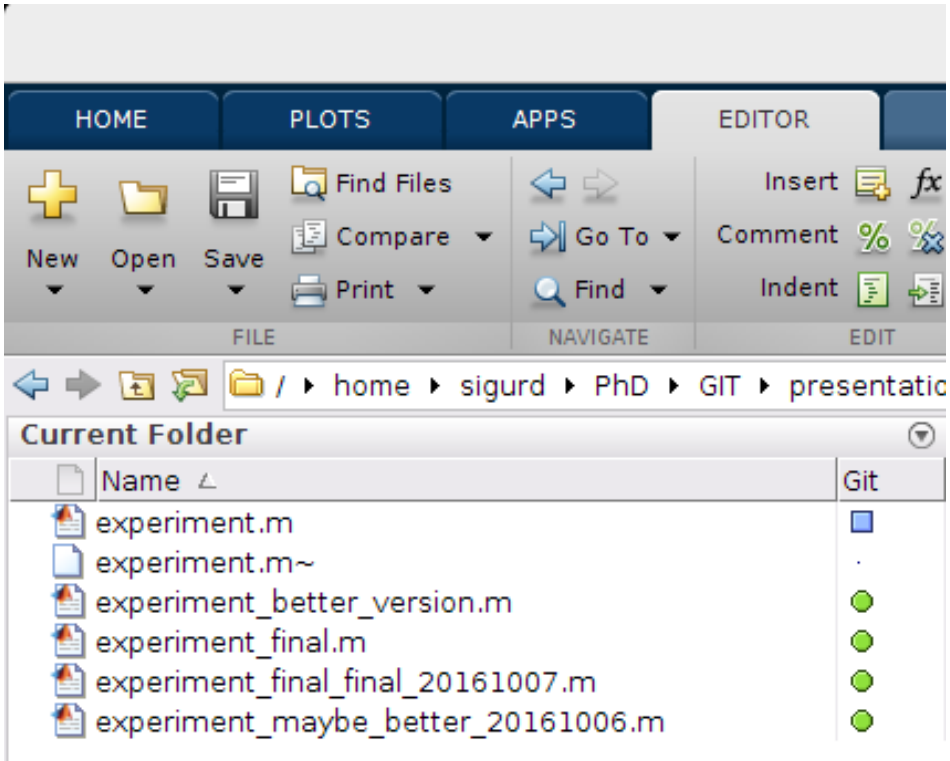

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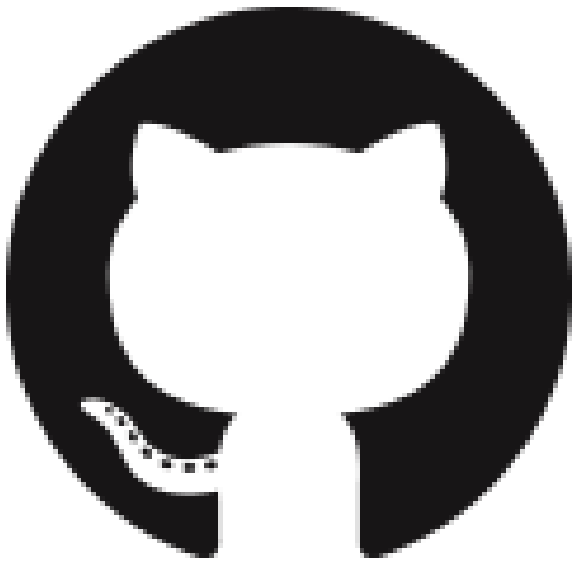

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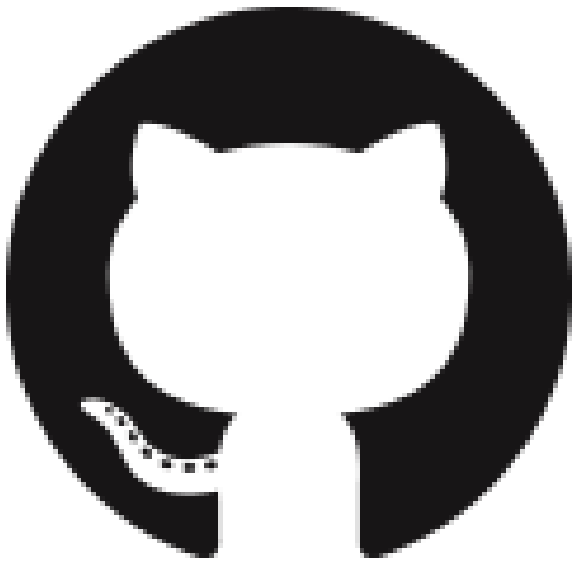

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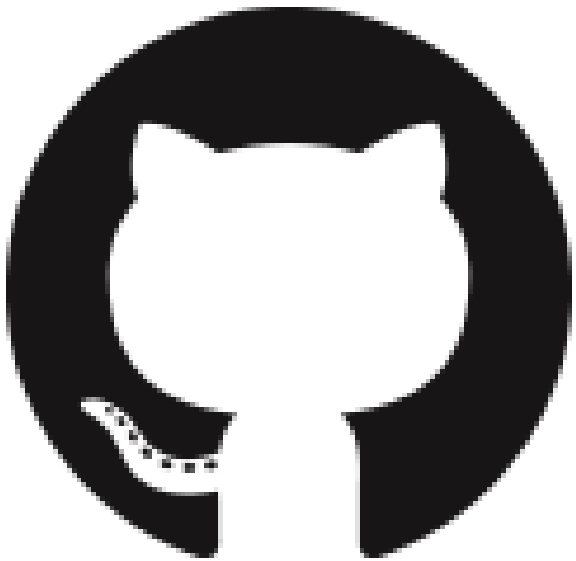

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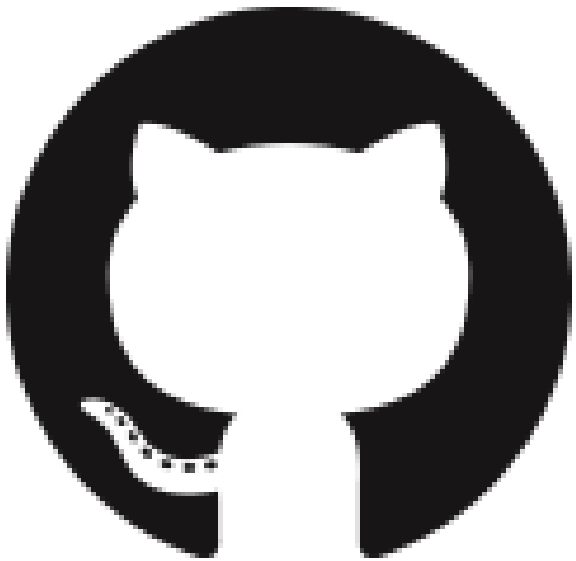

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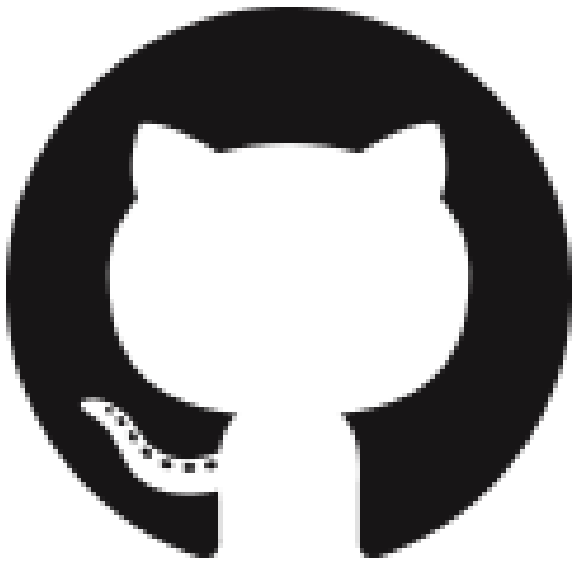

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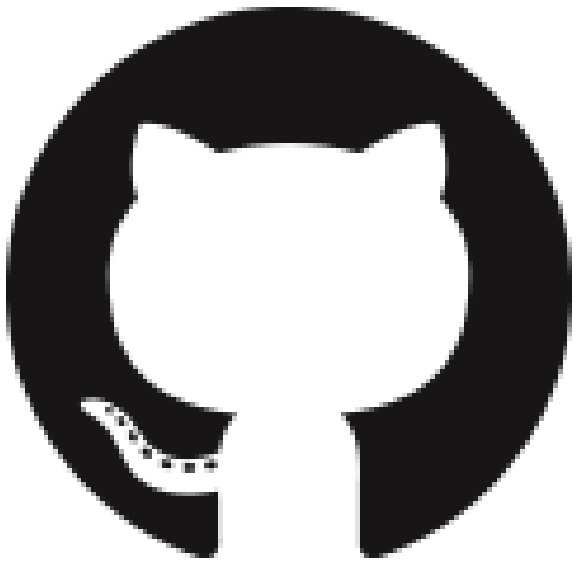

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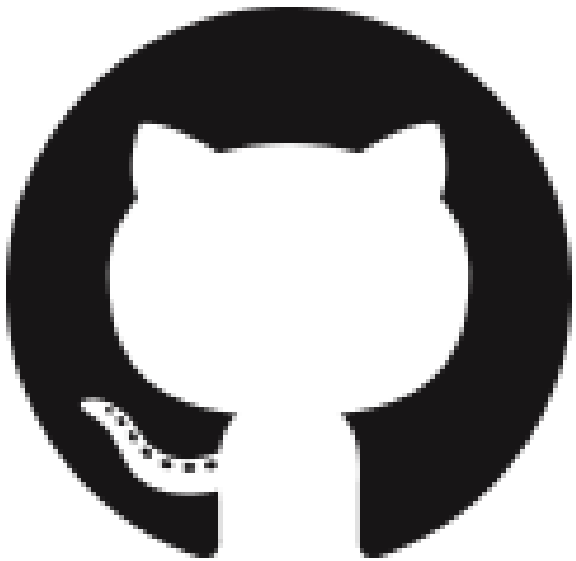

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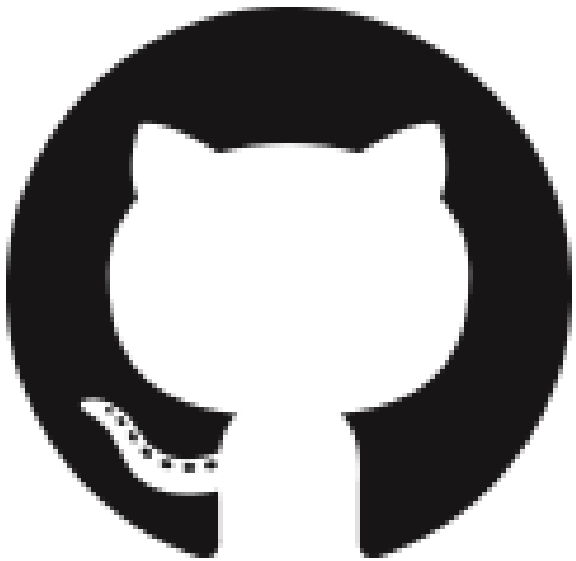

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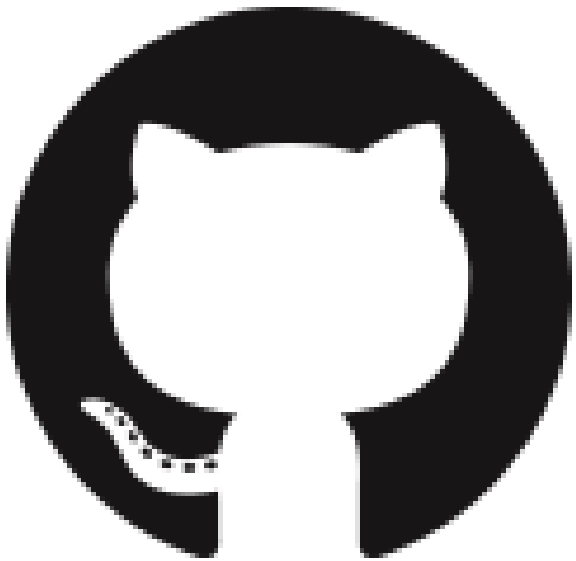

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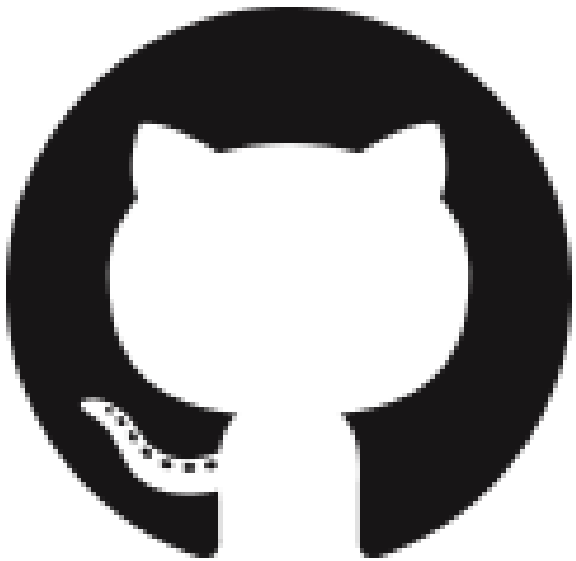
- Wiki for your project
- Place to discuss your project and fill bug reports
- Integrates with many cool services



BitBucket

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— Free closed source repositories

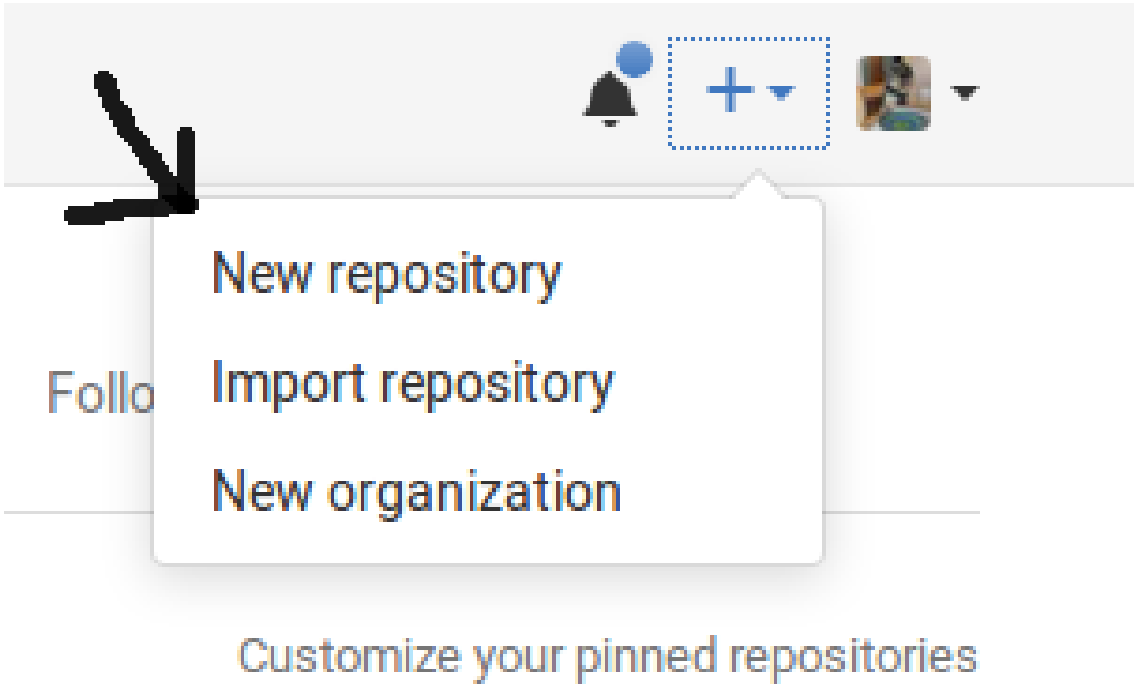
BitBucket

- More or less same features as GitHub
- Wiki, bug reporting etc. different integrated services
- Free closed source repositories
- With git it is easy to change the remote, try both GitHub and BitBucket

Outline

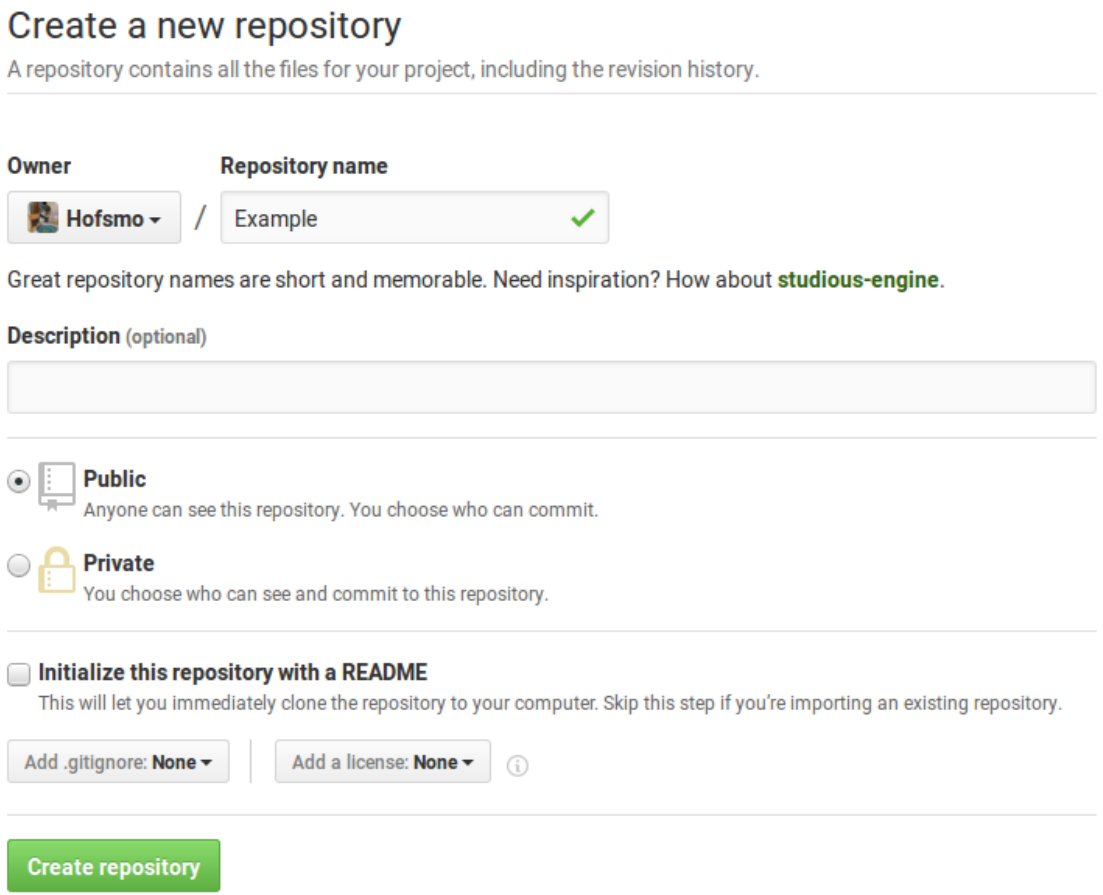
Creating a git repository

— New repository button



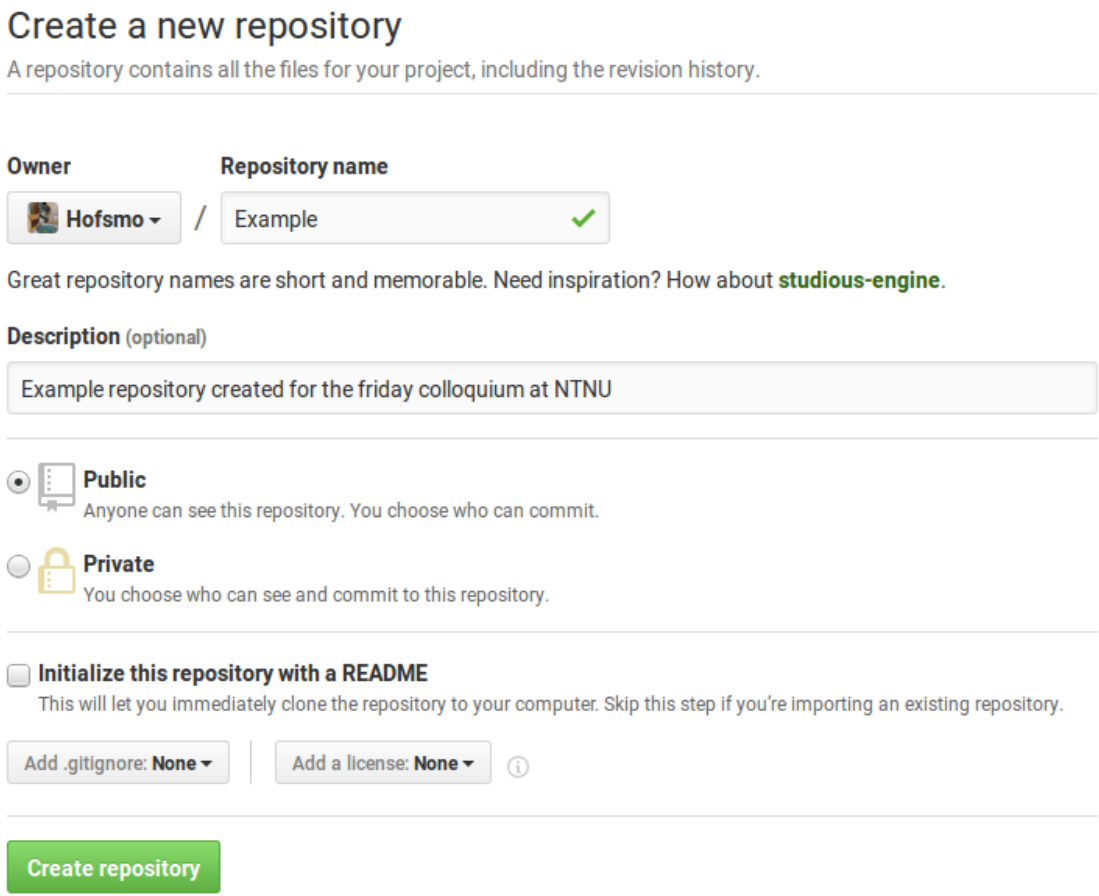
Creating a git repository

- New repository button
- Create the name



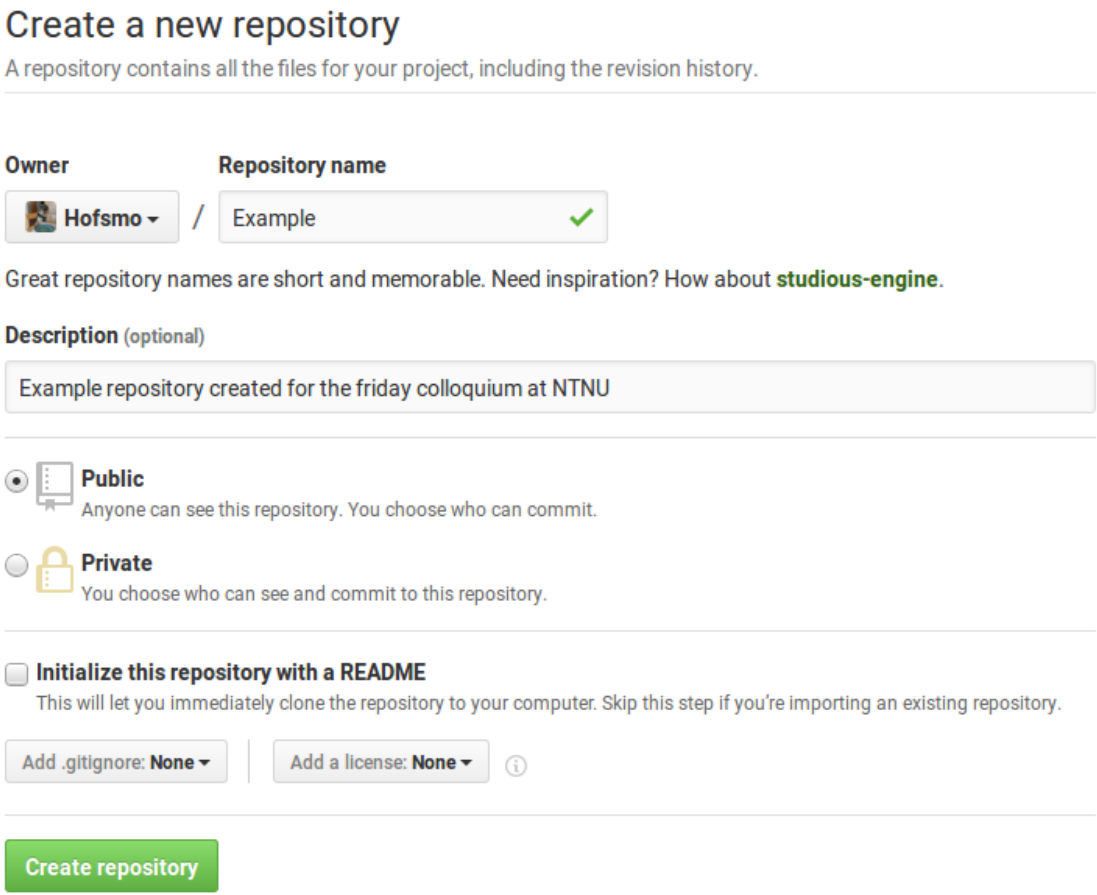
Creating a git repository

- New repository button
- Create the name
- Create a description



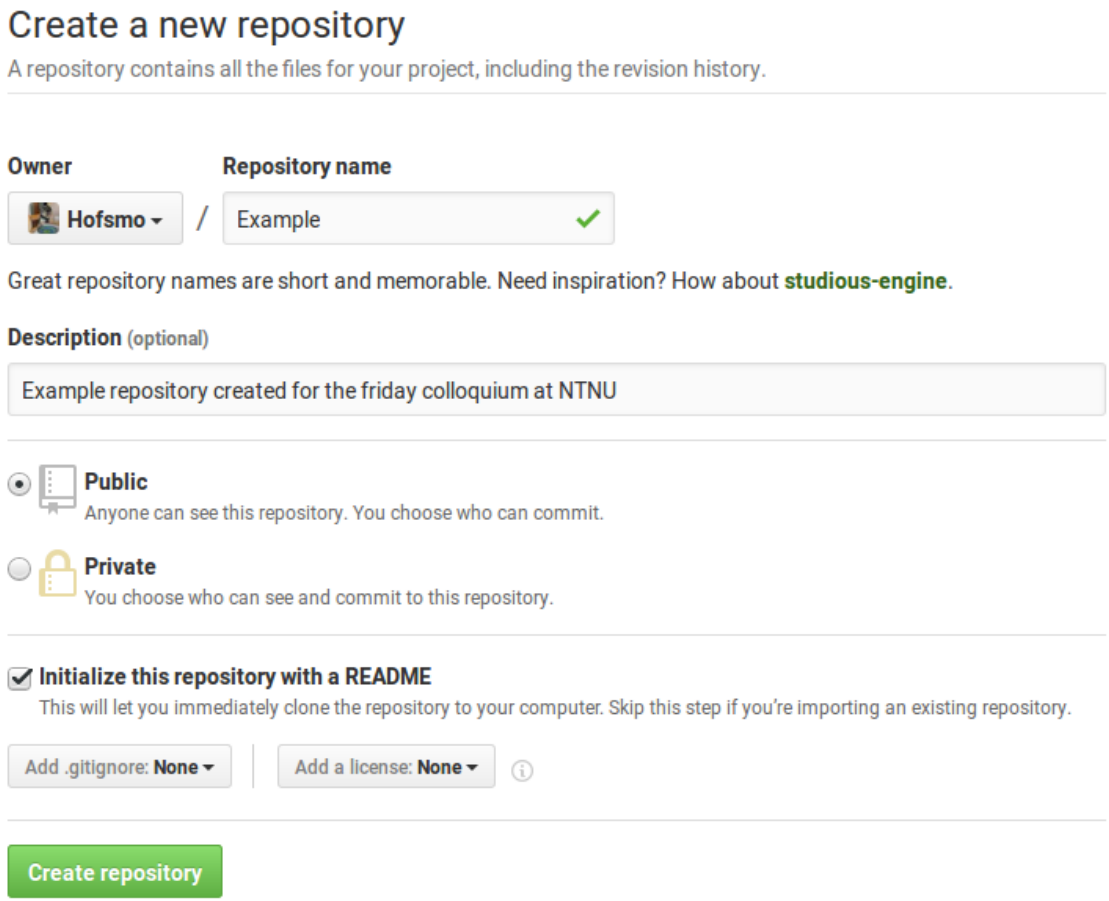
Creating a git repository

- New repository button
- Create the name
- Create a description
- Open or public?



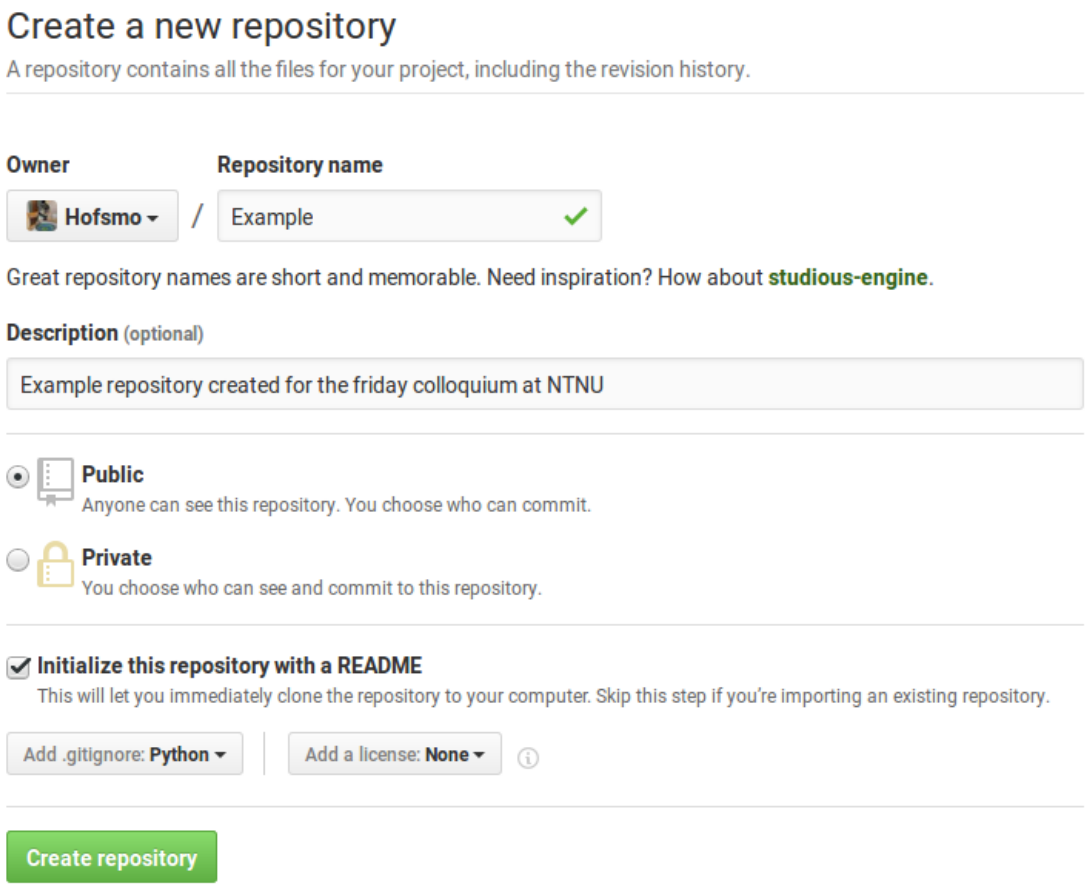
Creating a git repository

- New repository button
- Create the name
- Create a description
- Open or public?
- READMEs are cool



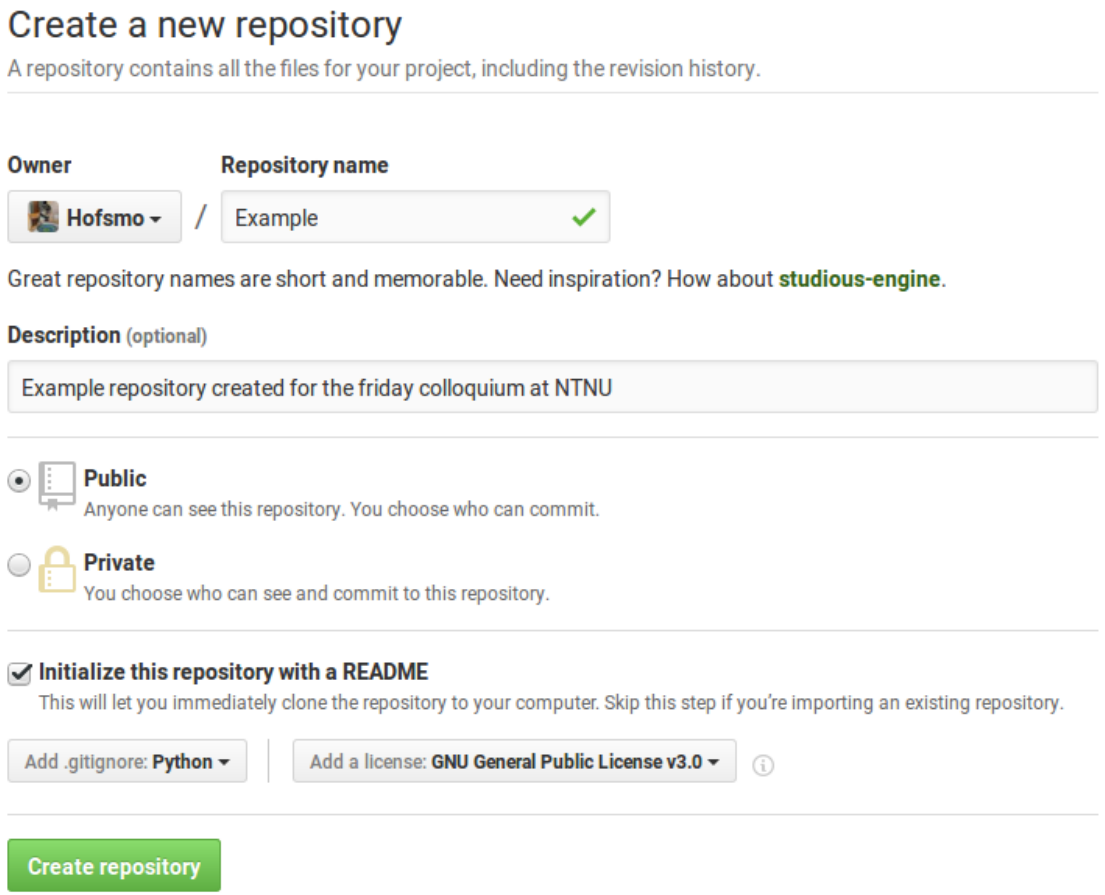
Creating a git repository

- New repository button
- Create the name
- Create a description
- Open or public?
- READMEs are cool
- Gitignore is useful

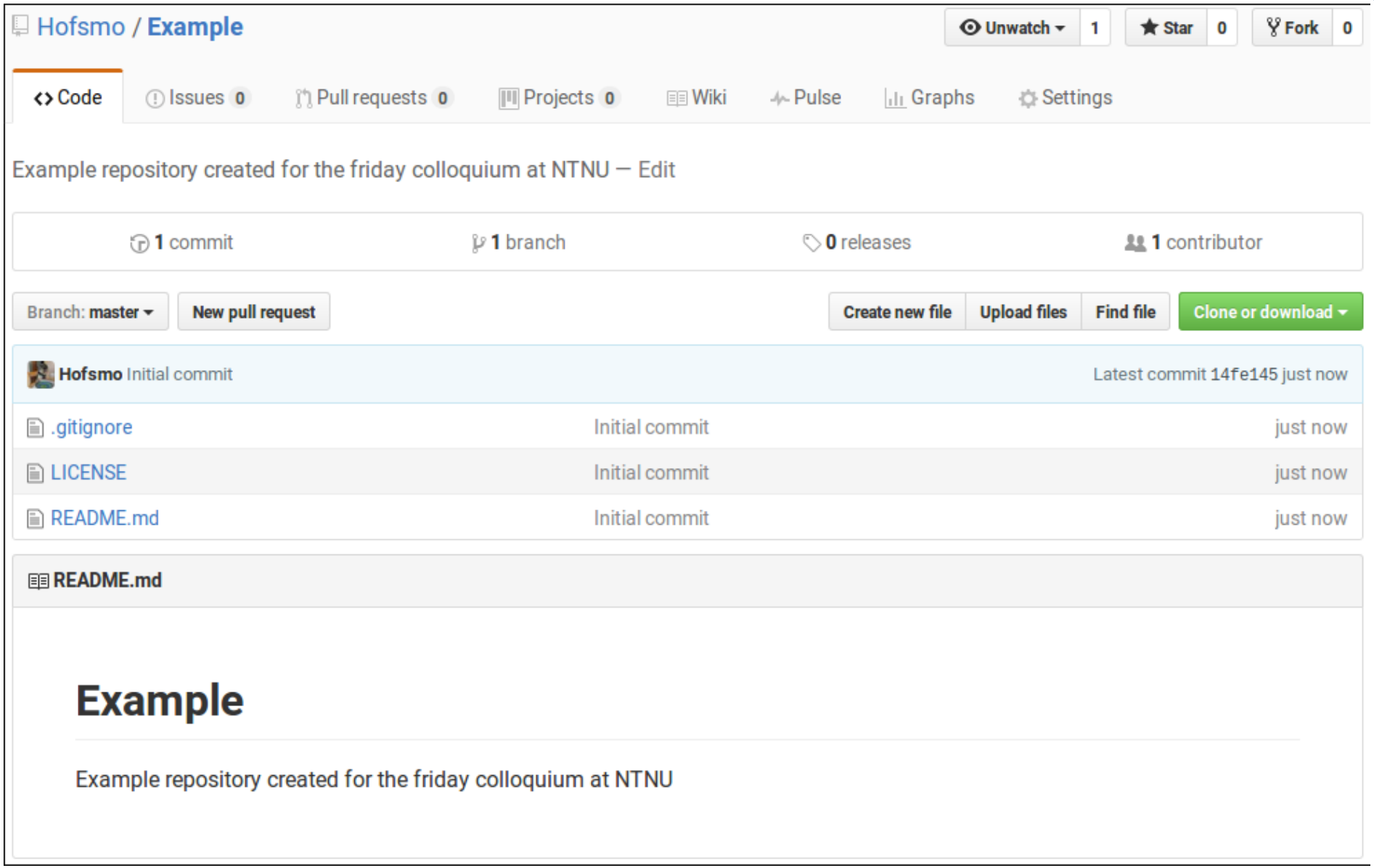


Creating a git repository

- New repository button
- Create the name
- Create a description
- Open or public?
- READMEs are cool
- Gitignore is useful
- Add license

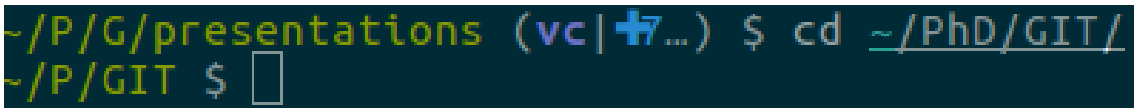


Resulting repository



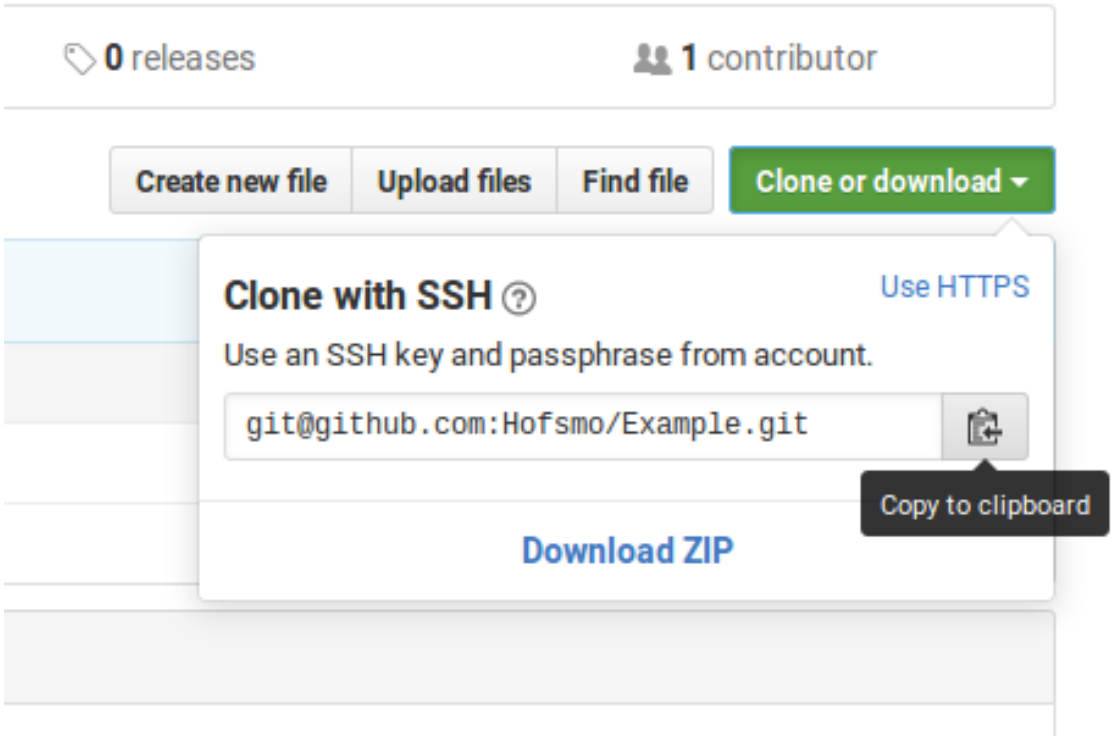
Cloing the repository

- using the terminal



Cloing the repository

— using the terminal
  - Copy the url



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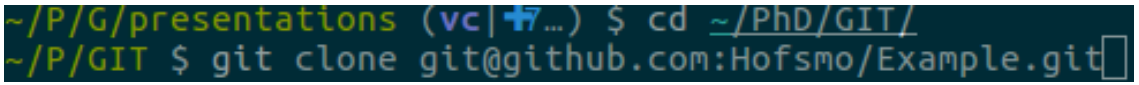


— using the terminal
  - Copy the url
  - Run command

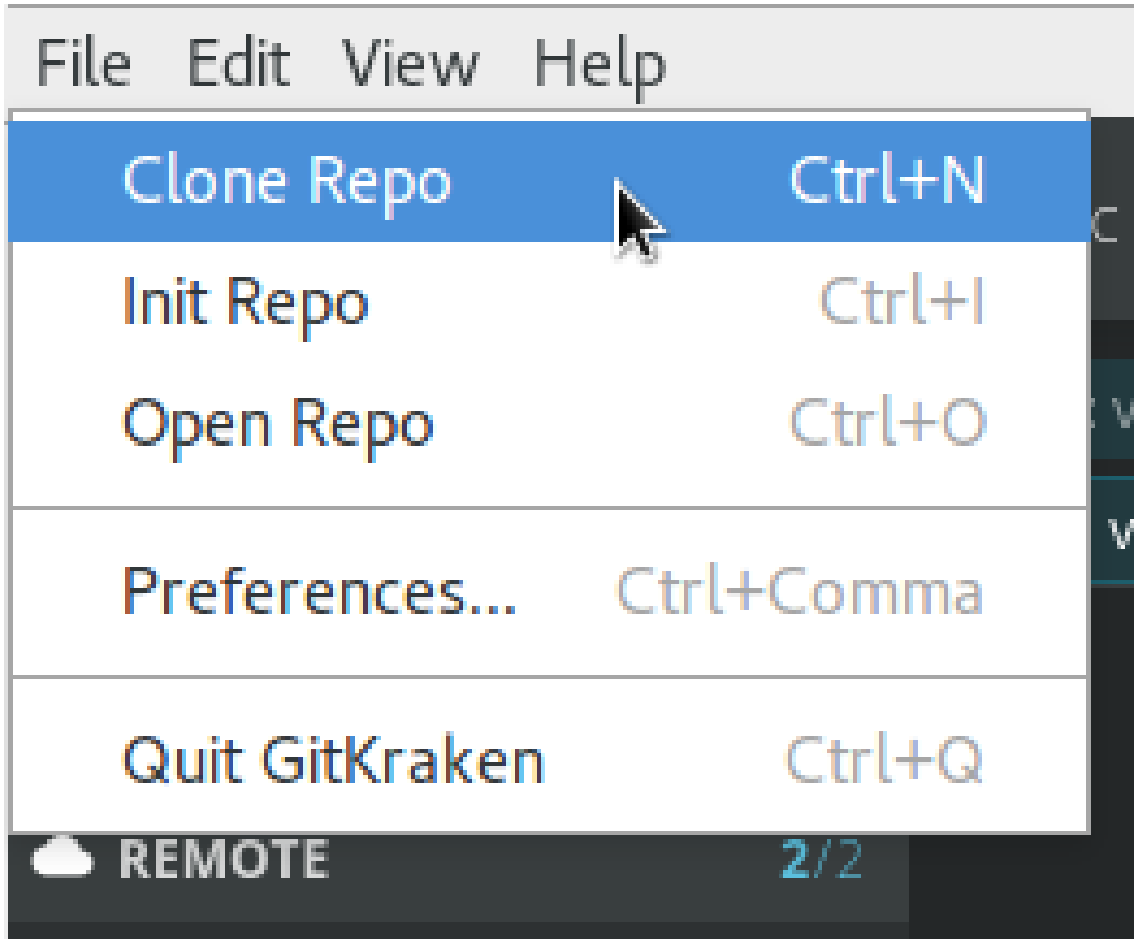
Cloing the repository

— using the terminal
  - Copy the url
  - Run command
  - Done

```
~/P/G/presentations (vc|✚7…) $ cd ~/PhD/GIT/
~/P/GIT $ git clone git@github.com:Hofsmo/Example.git
Cloning into 'Example'...
Enter passphrase for key '/home/sigurd/.ssh/id_rsa':
remote: Counting objects: 5, done.
remote: Compressing objects: 100% (5/5), done.
remote: Total 5 (delta 0), reused 0 (delta 0), pack-reused 0
Receiving objects: 100% (5/5), 12.78 KiB | 0 bytes/s, done.
Checking connectivity... done.
```

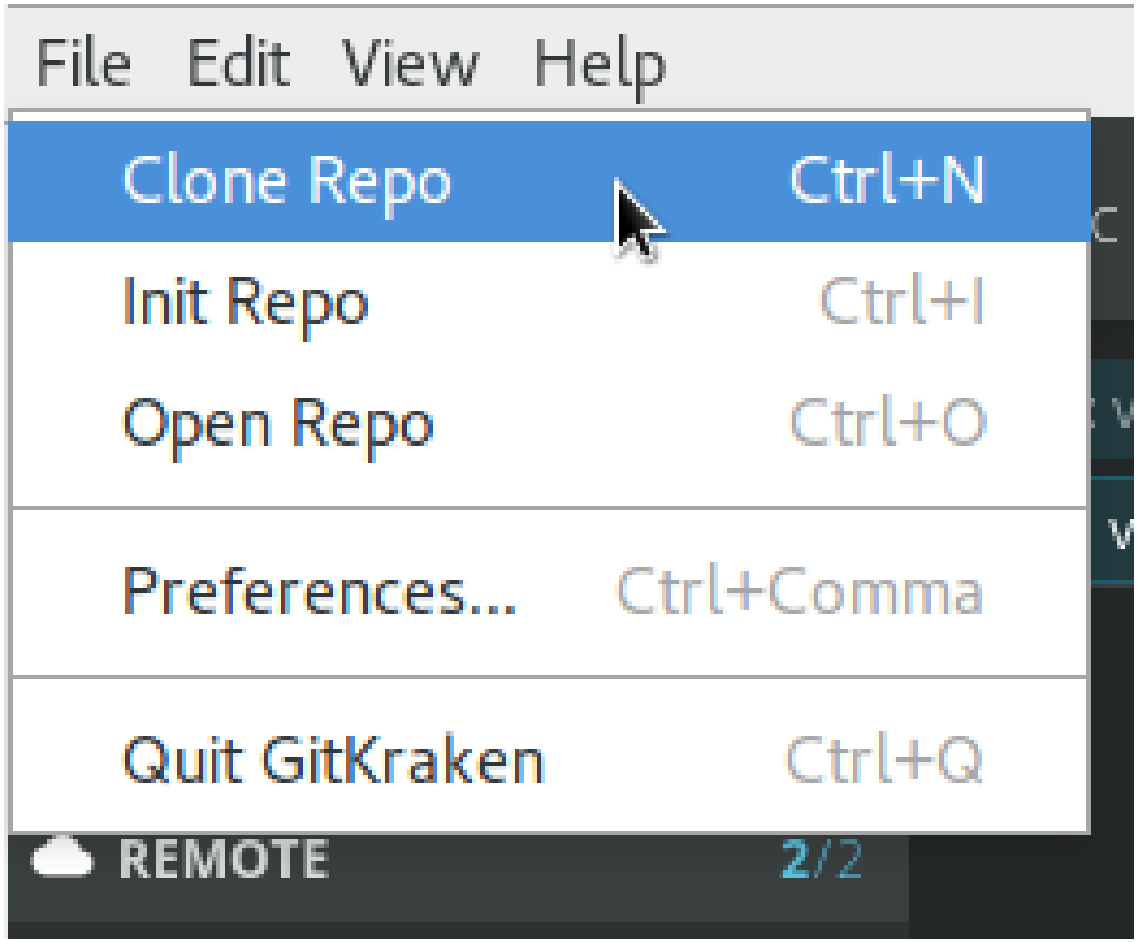
Cloing the repository

- using the terminal
  - Copy the url
  - Run command
  - Done
- Using a GUI(GitKraken in this case)



Cloing the repository

- using the terminal
  - Copy the url
  - Run command
  - Done
- Using a GUI(GitKraken in this case)
  - Find clone repo button



Cloing the repository

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  - Copy the url
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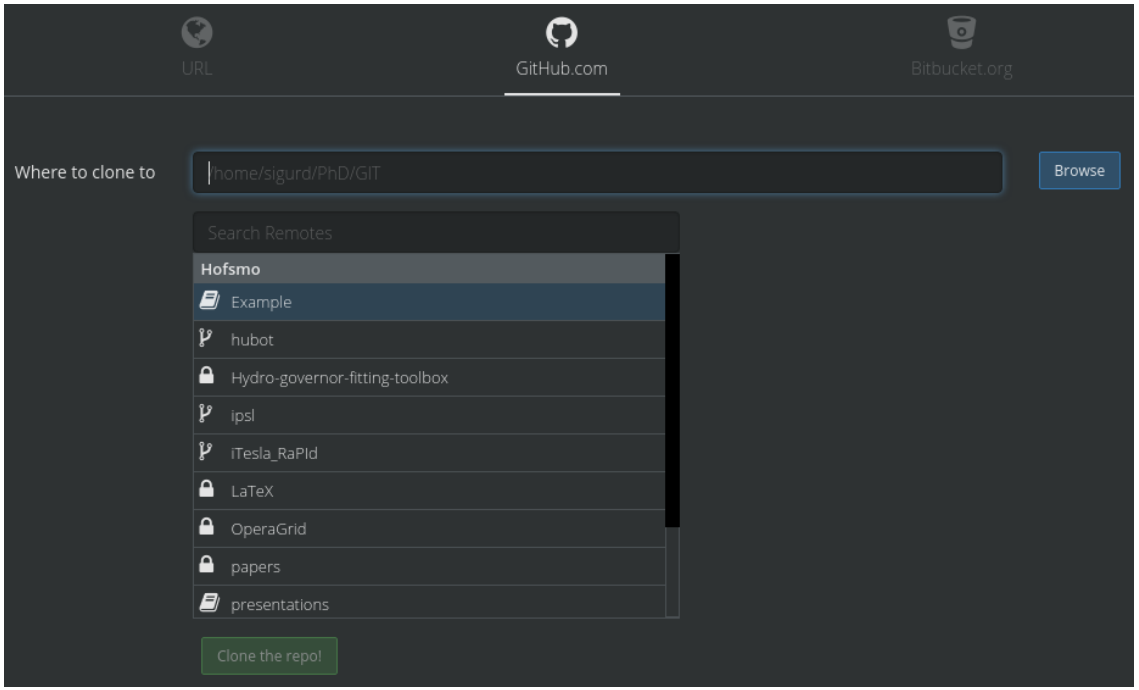
  - Done
- Using a GUI(GitKraken in this case)
  - Find clone repo button
  - Select repository



Cloing the repository

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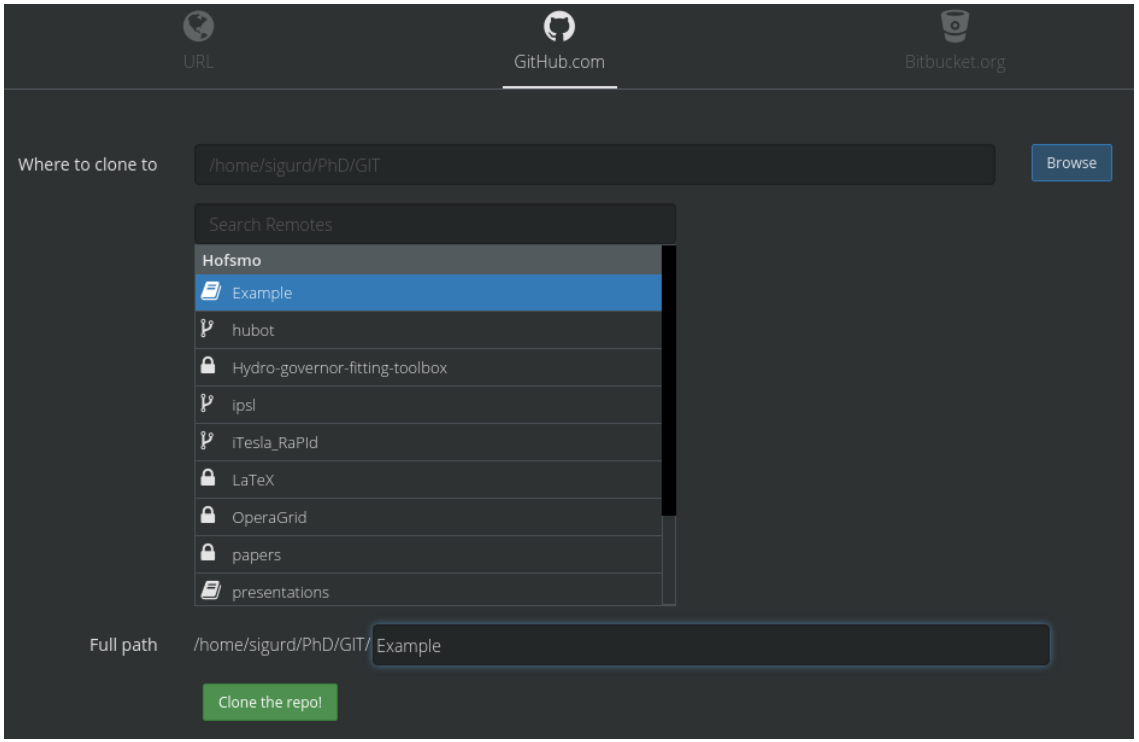
  - Find clone repo button
  - Select repository
  - Decide where to put it and clone



Staging our first file

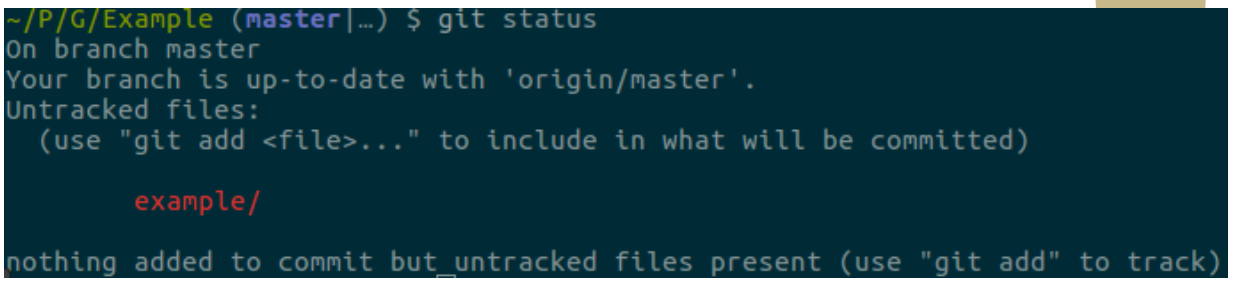
```
~/P/G/Example (master|…) $ git status
On branch master
Your branch is up-to-date with 'origin/master'.
Untracked files:
  (use "git add <file>..." to include in what will be committed)

        example/

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

— In the terminal

Staging our first file



— In the terminal
  - git status

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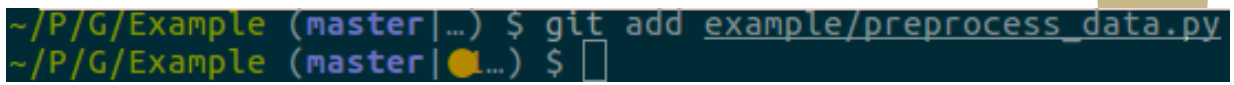
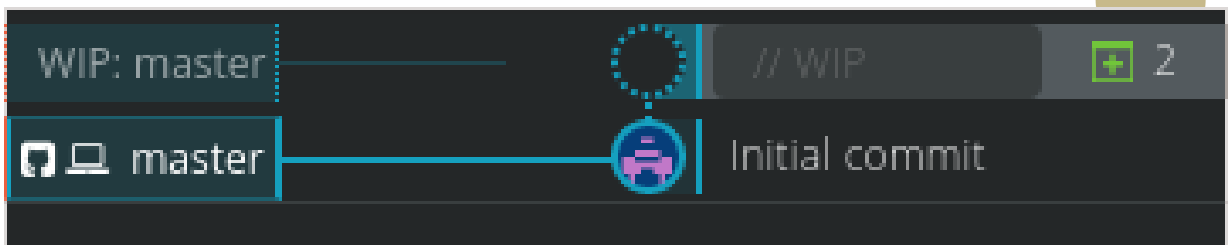


— In the terminal
  - git status
  - stage file using git add

Staging our first file



- In the terminal
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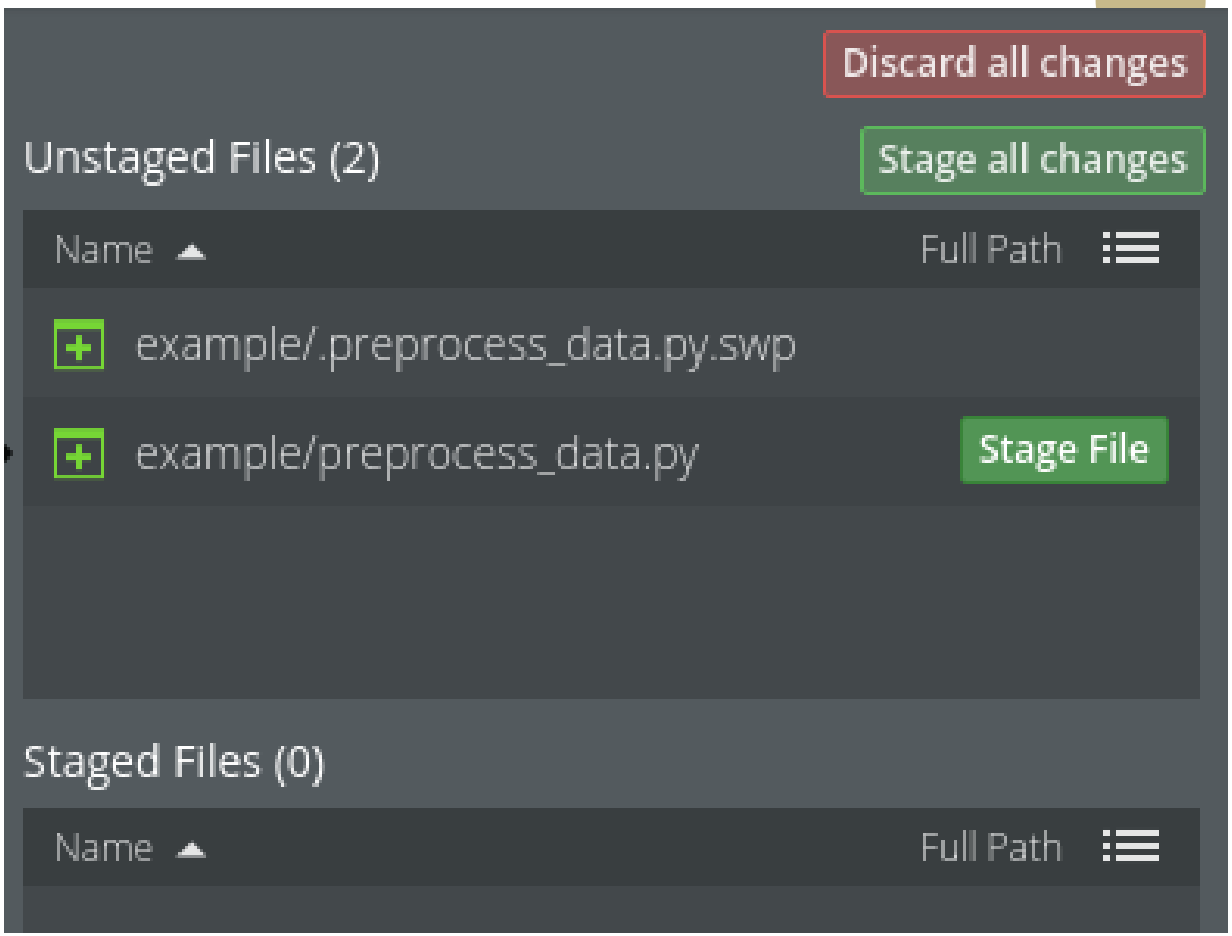
  - stage file using git add
- In the GUI

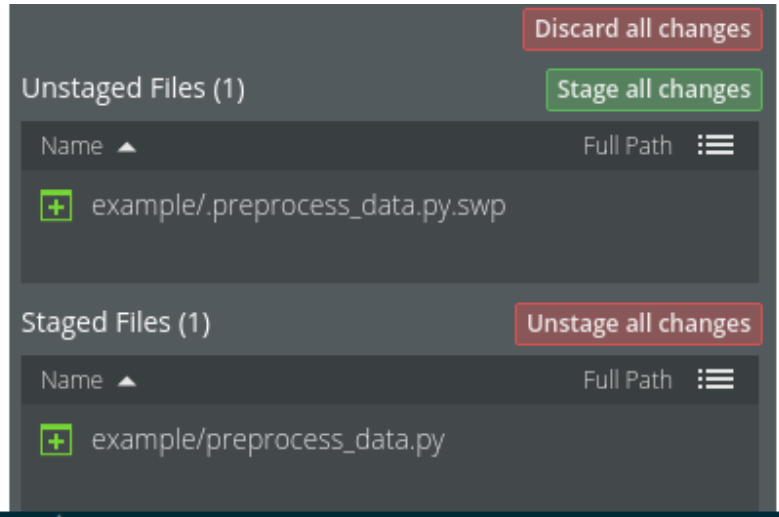
Staging our first file



- In the terminal
  - git status
  - stage file using git add
- In the GUI
  - Push "Stage File" button

Ignoring editor generated file

— Remember the second file?




```
On branch master
Your branch is up-to-date with 'origin/master'.
Changes to be committed:
  (use "git reset HEAD <file>..." to unstage)

        new file:   example/preprocess_data.py

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

        example/.preprocess_data.py.swp
```

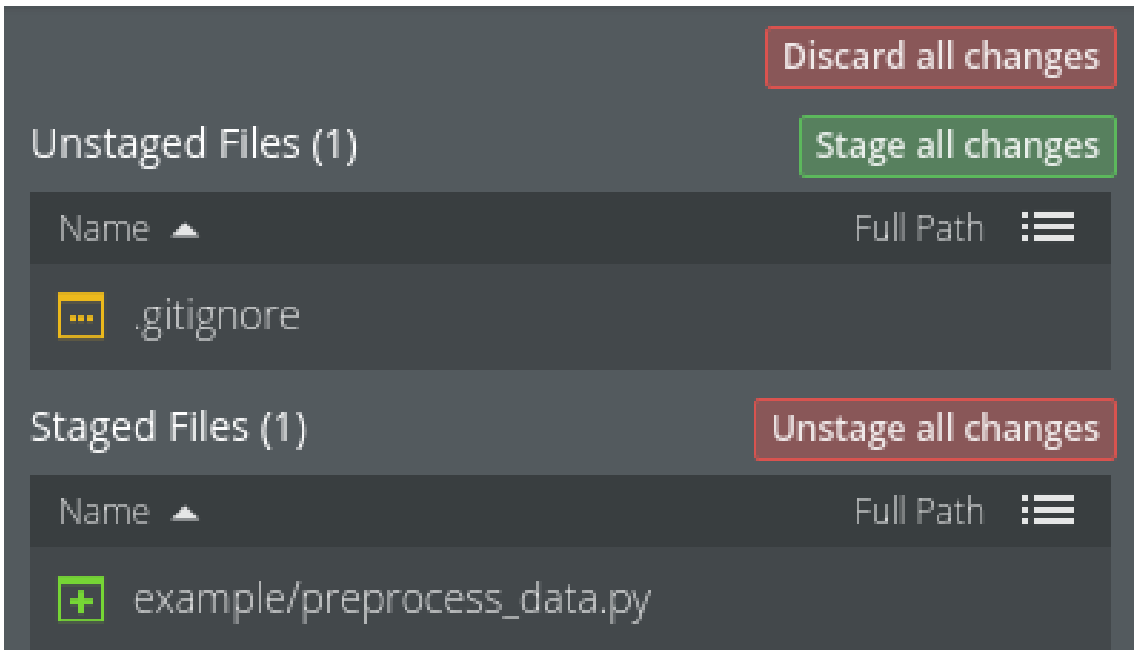
Ignoring editor generated file

- Remember the second file?
- Tell git to ignore it

```
 1
 2 # Spyder project settings
 3 .spyderproject
 4
 5 # Rope project settings
 6 .ropeproject
 7
 8 # Ignore vim stuff
 9 *.swo
10 *.swp
NORMAL > master > .gitignore
```

Ignoring editor generated file

- Remember the second file?
- Tell git to ignore it
- Git ignores it



Ignoring editor generated file

- Remember the second file?
- Tell git to ignore it
- Git ignores it
- Stage the modified .gitignore

Our first commit

— In terminal:

```
On branch master
Your branch is up-to-date with 'origin/master'.
Changes to be committed:
  (use "git reset HEAD <file>..." to unstage)

        modified:   .gitignore
        new file:   example/preprocess_data.py
```

Our first commit

— In terminal:
  - Enter git commit

```
~/P/G/Example (master|●2) $ git commit
```

Our first commit

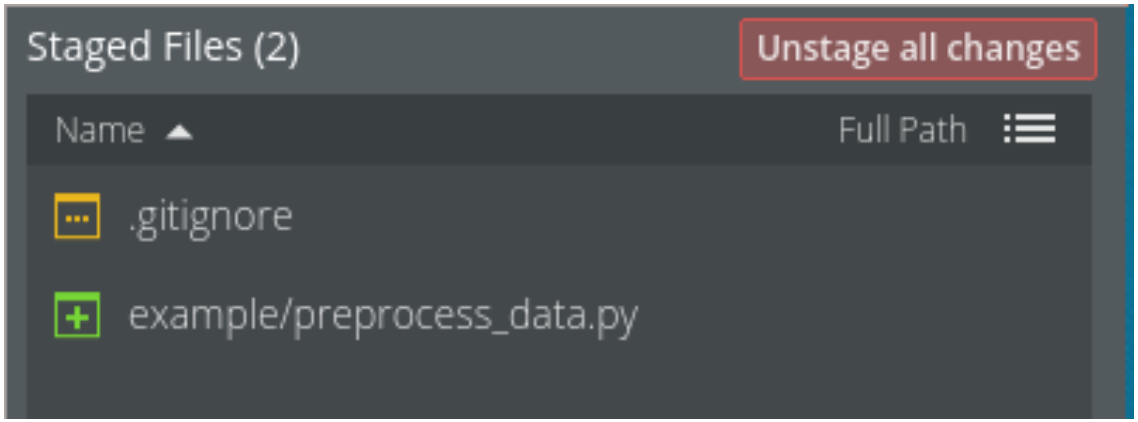
— In terminal:
  - Enter git commit
  - Write and save commit message

```
# Please enter the commit message for your changes. Lines starting
# with '#' will be ignored, and an empty message aborts the commit.
 On branch master
 Your branch is up-to-date with 'origin/master'.

 Changes to be committed:
        modified:   .gitignore
                Added swp and swo to gitignore
        new file:   example/preprocess_data.py
                First implementation of function
```

Our first commit

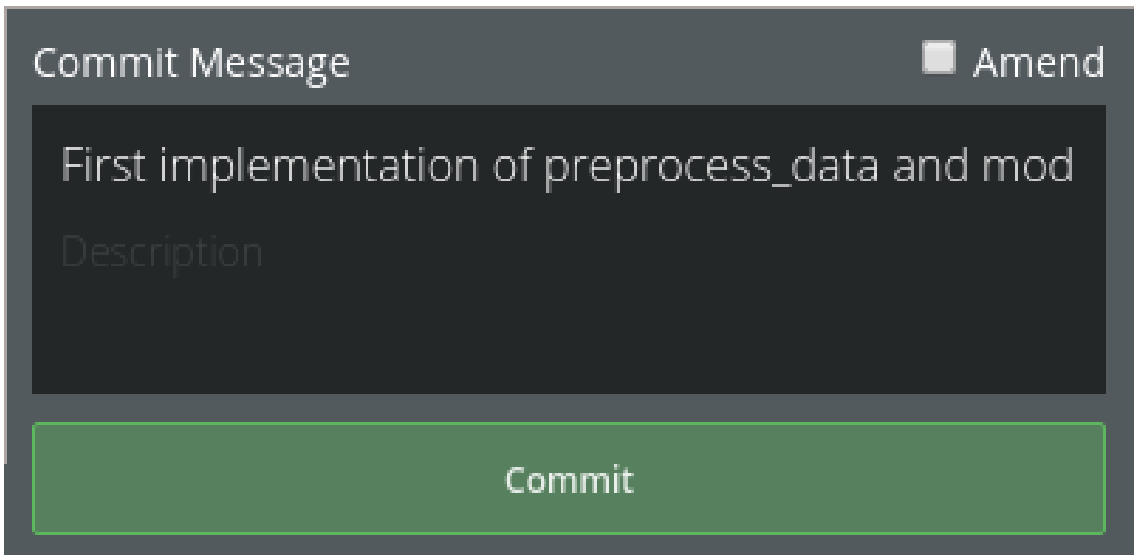
- In terminal:
  - Enter git commit
  - Write and save commit message
- In GUI:



Our first commit

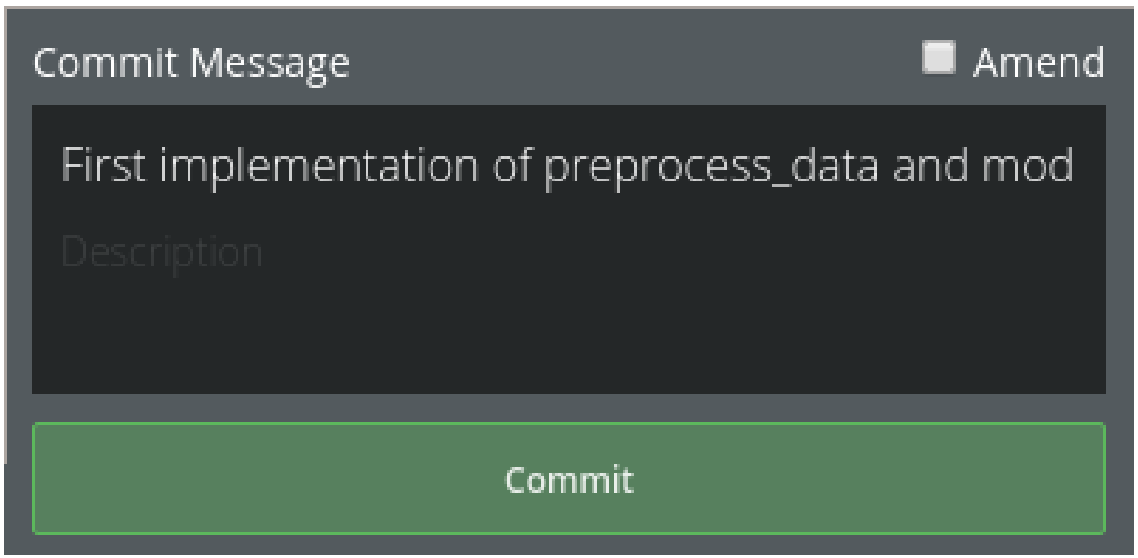
— In terminal:
  - Enter git commit
  - Write and save commit message

— In GUI:
  - Write commit message



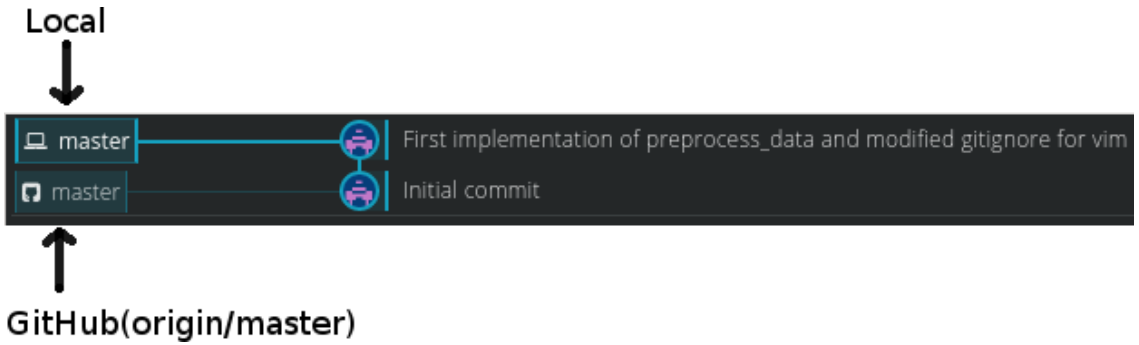
Our first commit

- In terminal:
  - Enter git commit
  - Write and save commit message
- In GUI:
  - Write commit message
  - Push commit button



Push the changes to GitHub

— GitHub (remote) is now behind our local copy



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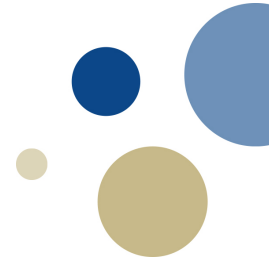

- GitHub (remote) is now behind our local copy
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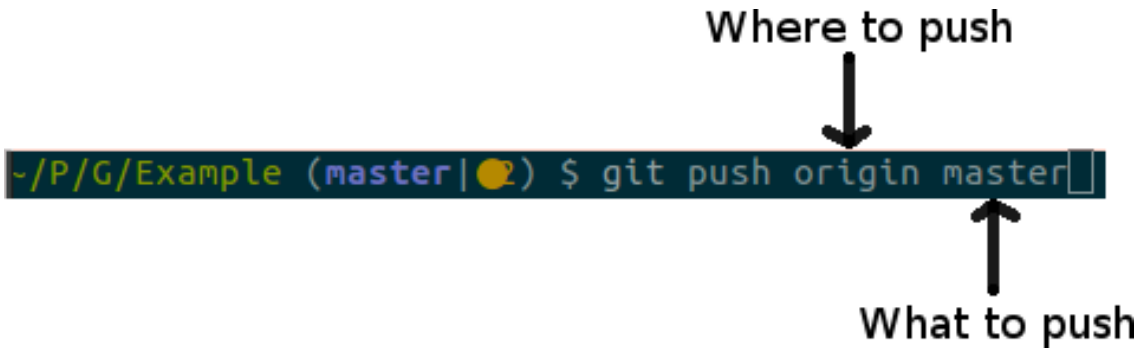
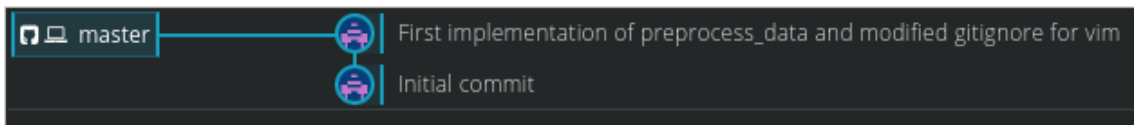


Push the changes to GitHub

- GitHub (remote) is now behind our local copy
- Push changes to GitHub
- GitHub and local copy are now equal



Outline

Introducing a git work flow

— Working directly on the master branch is not reccommended

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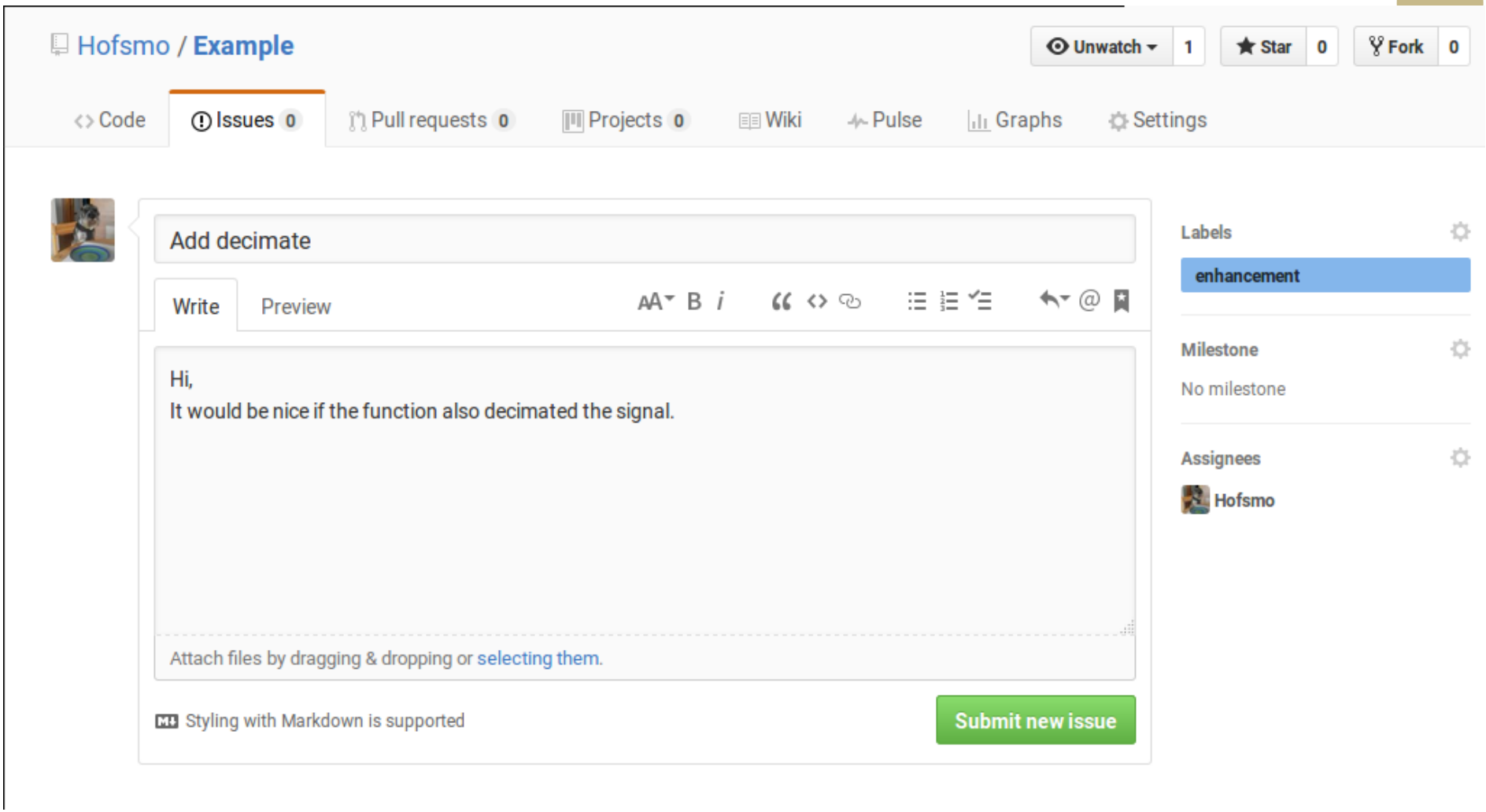
- Example will follow

Create an issue



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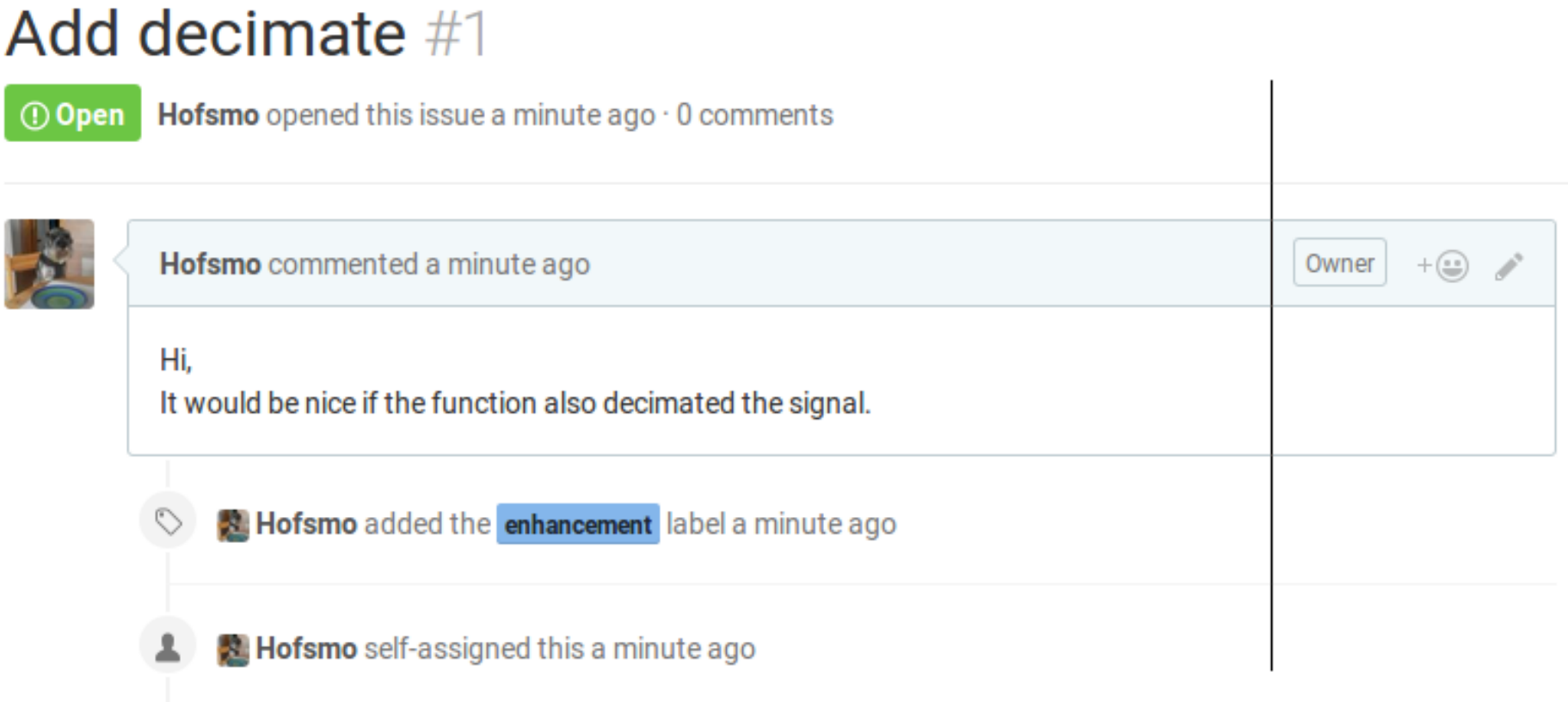


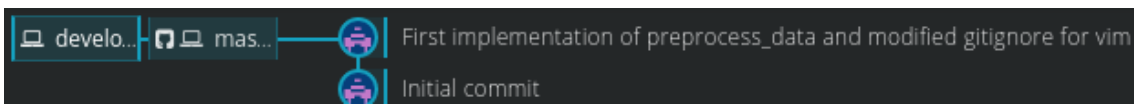
Create the feature branches

— Branch the develop branch from master

```
~/P/G/Example (master|✔) $ git checkout -b develop
Switched to a new branch 'develop'
~/P/G/Example (develop|✔) $
```

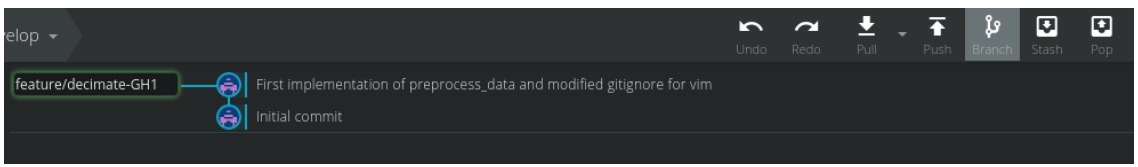
Create the feature branches

- Branch the develop branch from master
- Develop and master point to the same commit

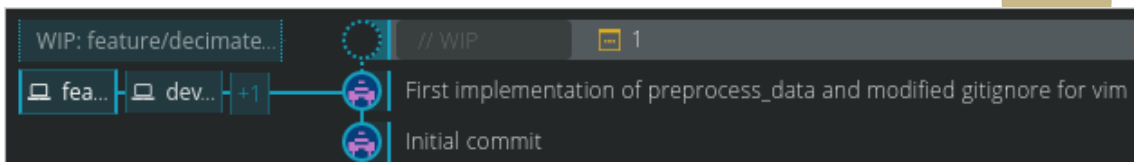


Create the feature branches

- Branch the develop branch from master
- Develop and master point to the same commit
- Branch the feature branch from develop



Create a pull request



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- Now we can see that we have unstaged changes
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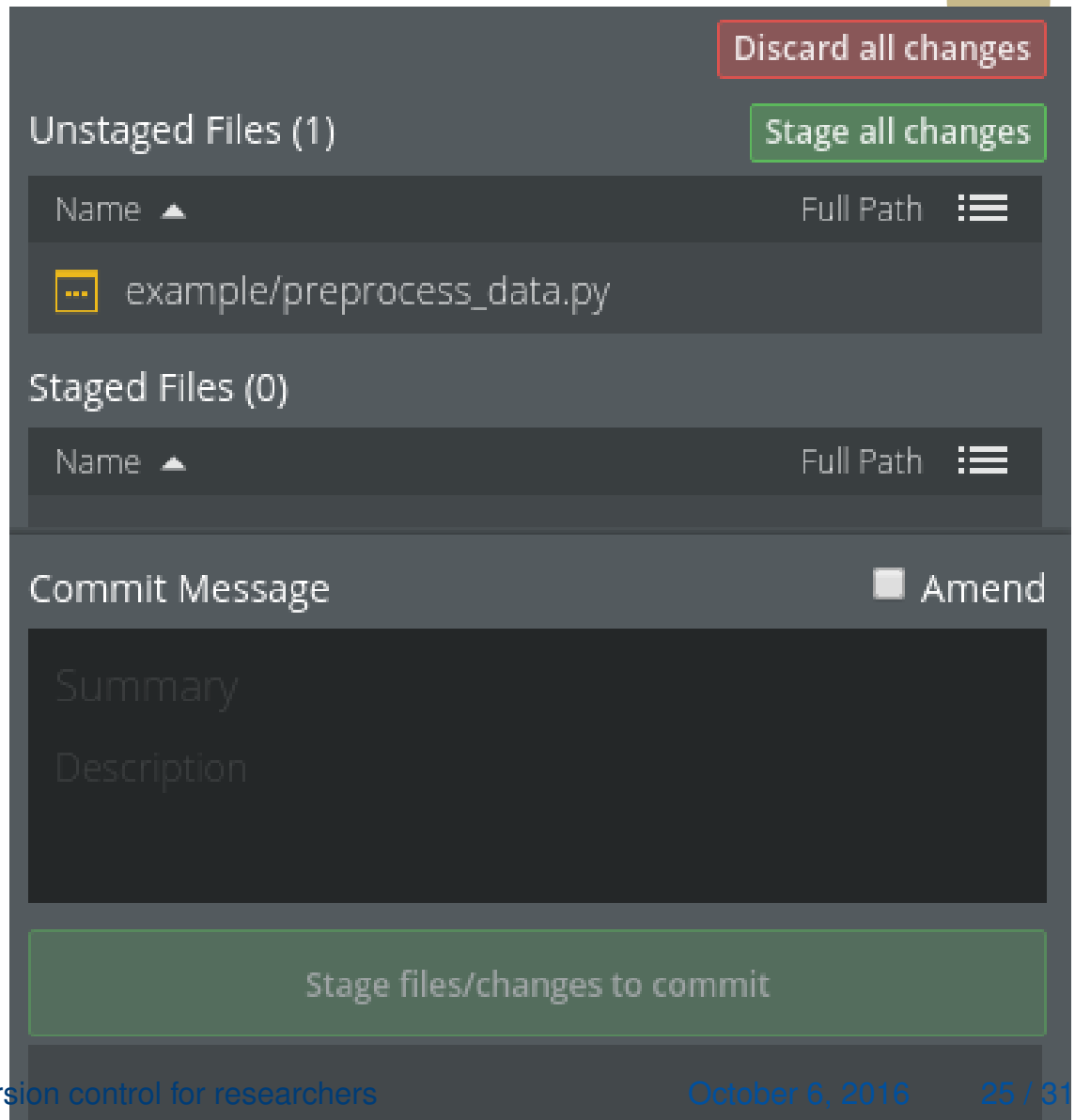
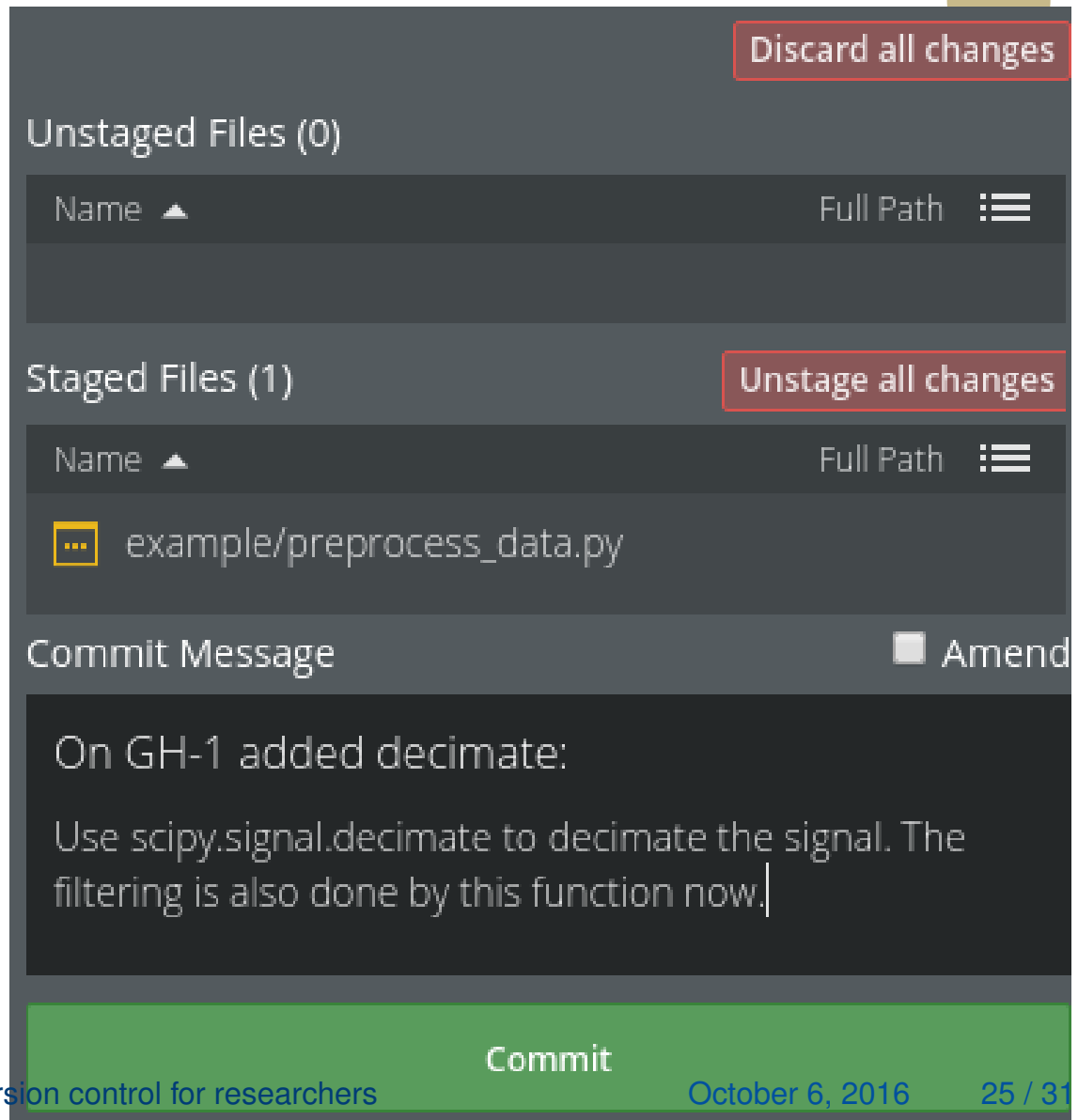


Create a pull request

- Now we can see that we have unstaged changes
- Stage the changes
- Commit the changes



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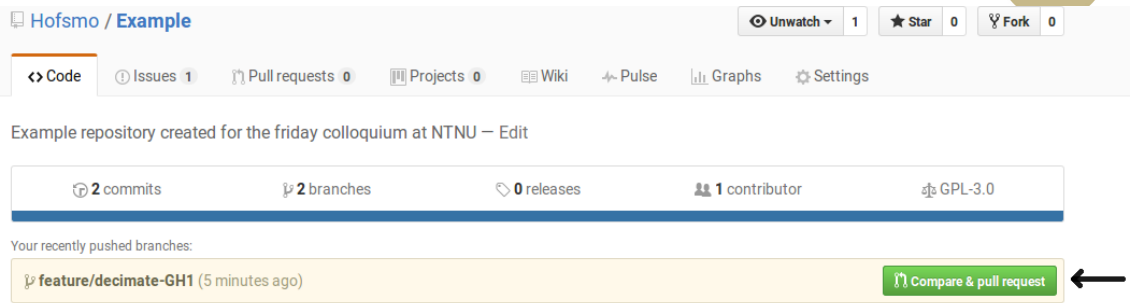
- Now we can see that we have unstaged changes
- Stage the changes
- Commit the changes
- GH-1 is a reference to the issue

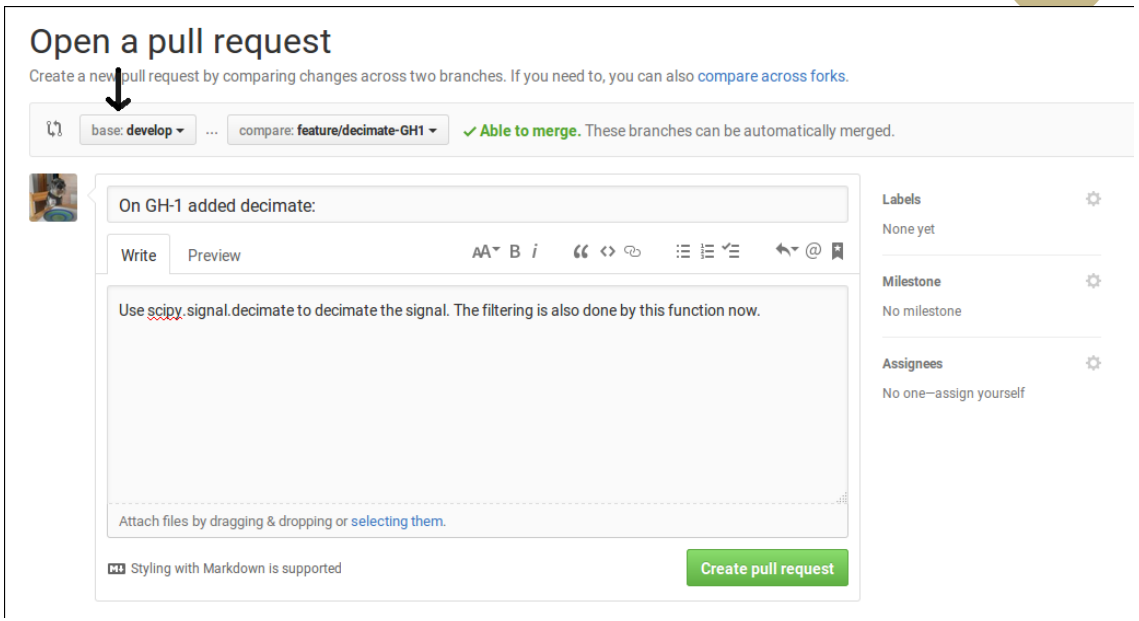
Create pull request

— Create a pull request



Create pull request

- Create a pull request
- Choose develop as base



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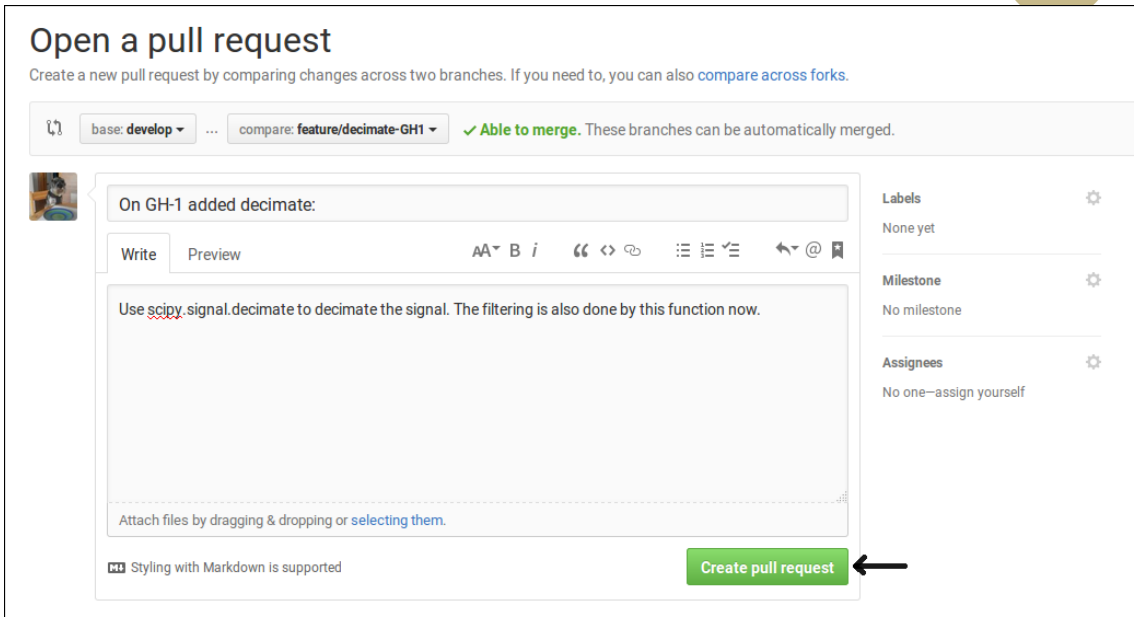
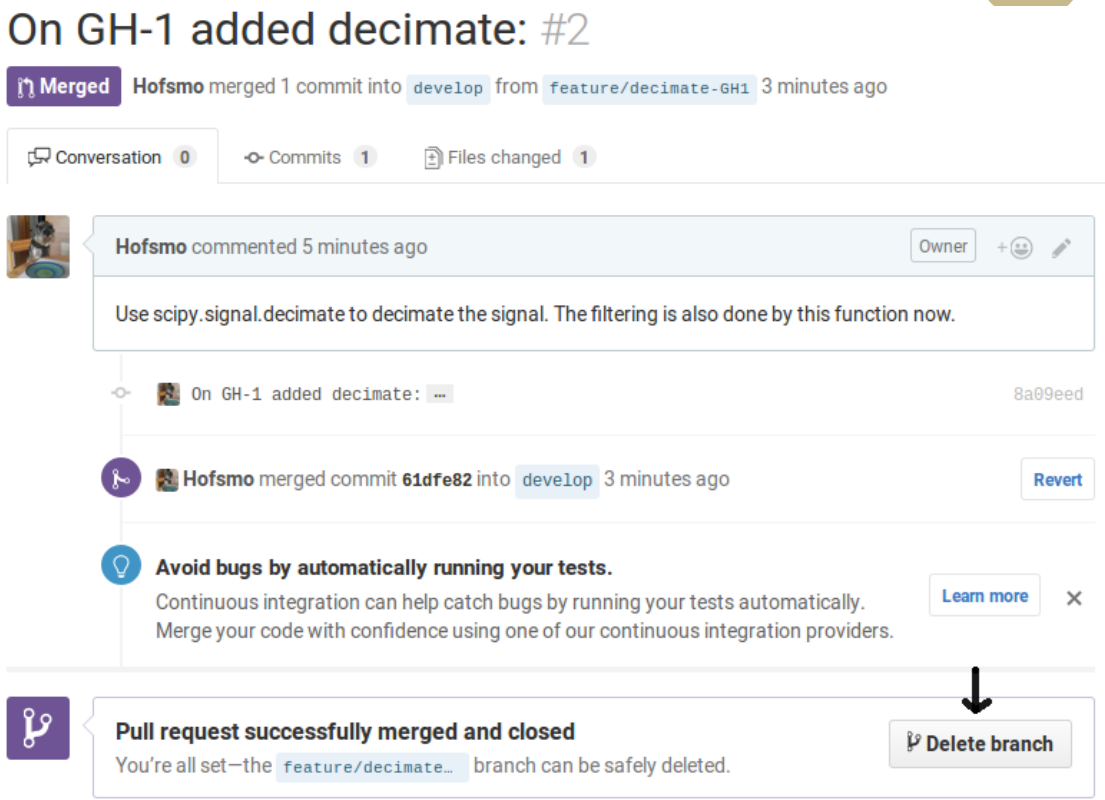


Create pull request

- Create a pull request
- Choose develop as base
- Create the pull request
- Delete the branch



Create pull request

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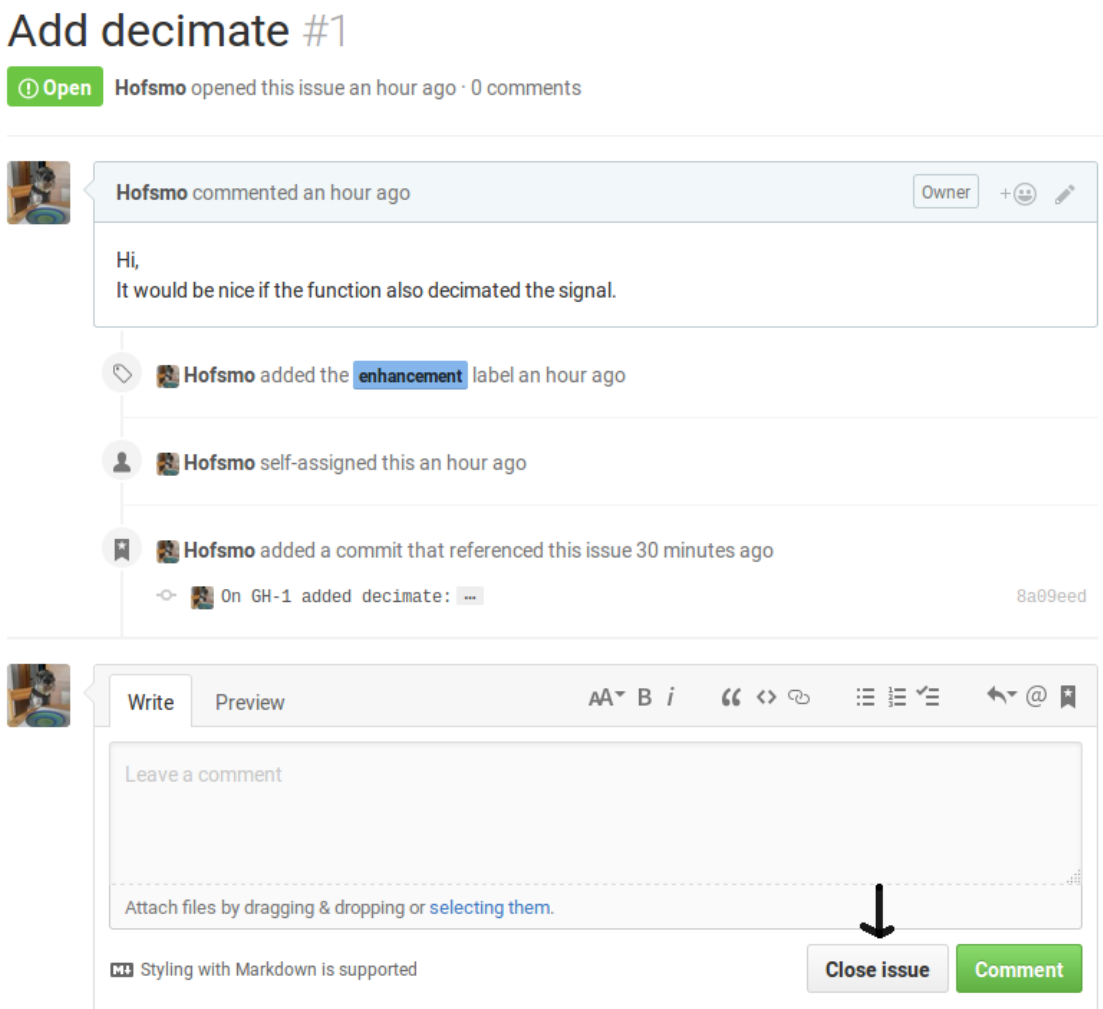
- Create the pull request
- Delete the branch
- Close the issue (Could also have written "close GH-1" earlier to do this



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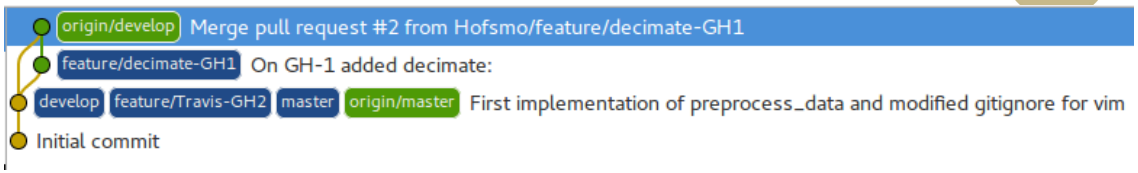

- Create a pull request
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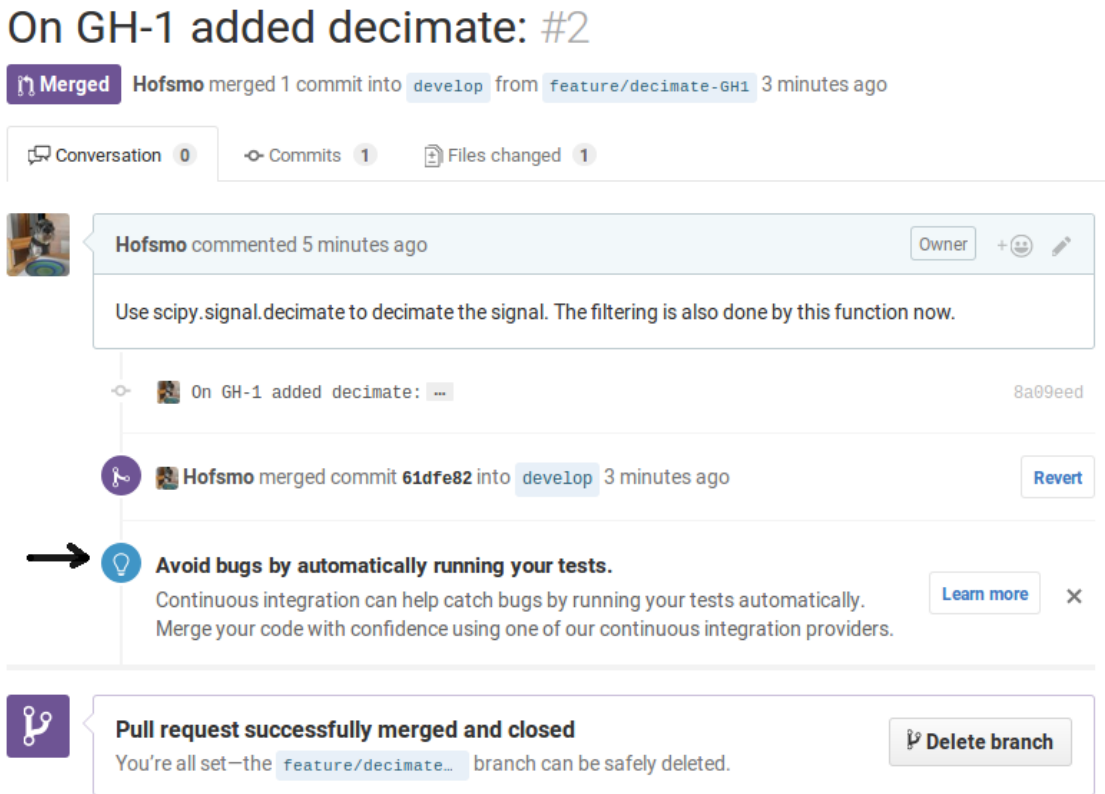
- The git tree

Outline

Continuous integration

— Did anyone notice?



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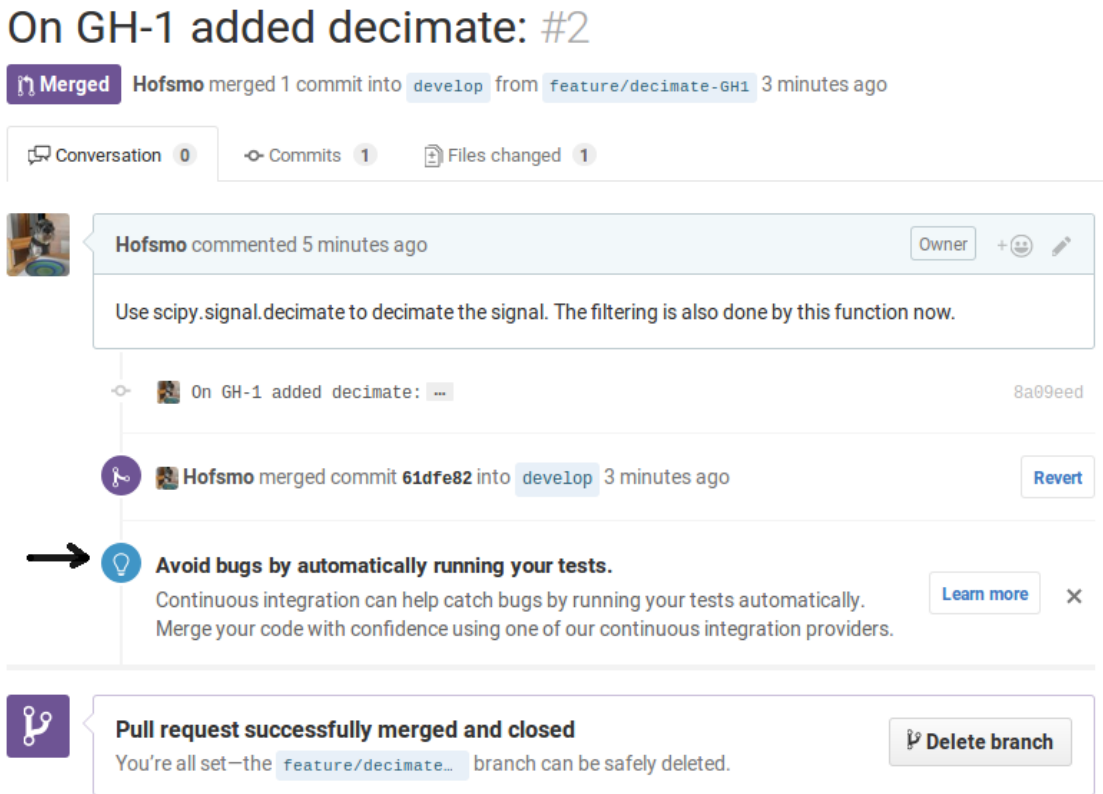

Continuous integration

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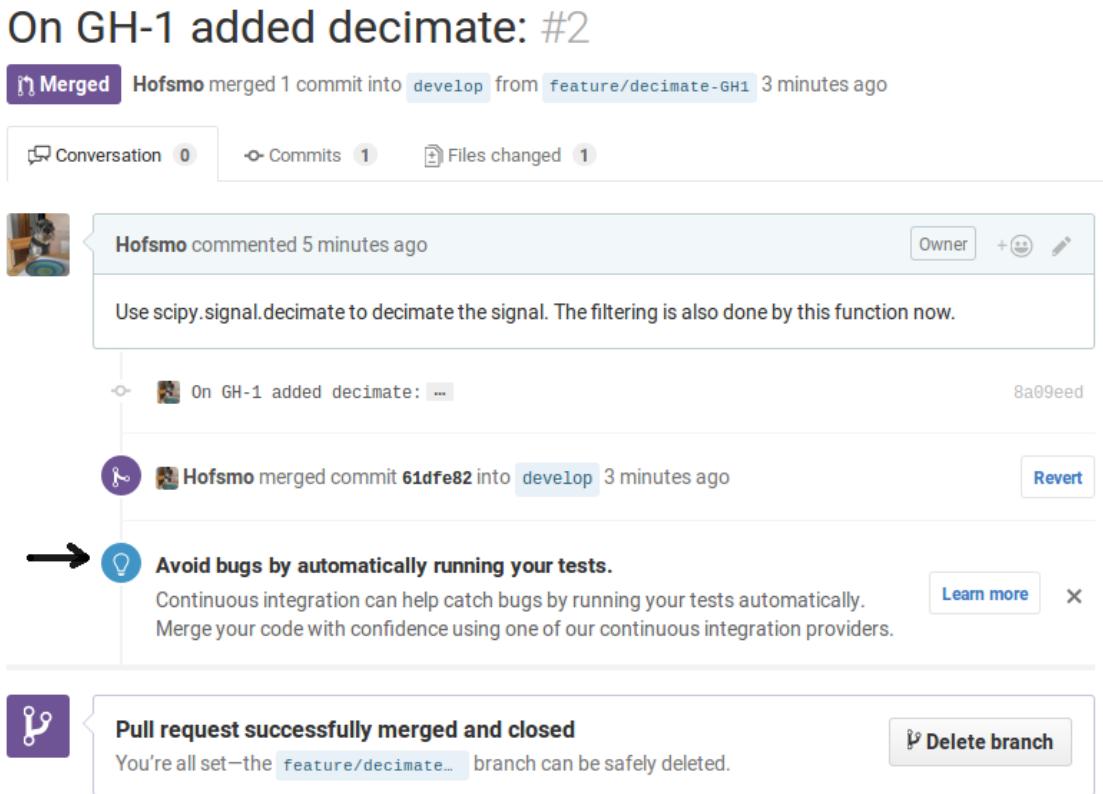
- For GitHub travis is a good alternative
- Jenkins also works with GitHub and supports MATLAB unlike travis



Continuous integration

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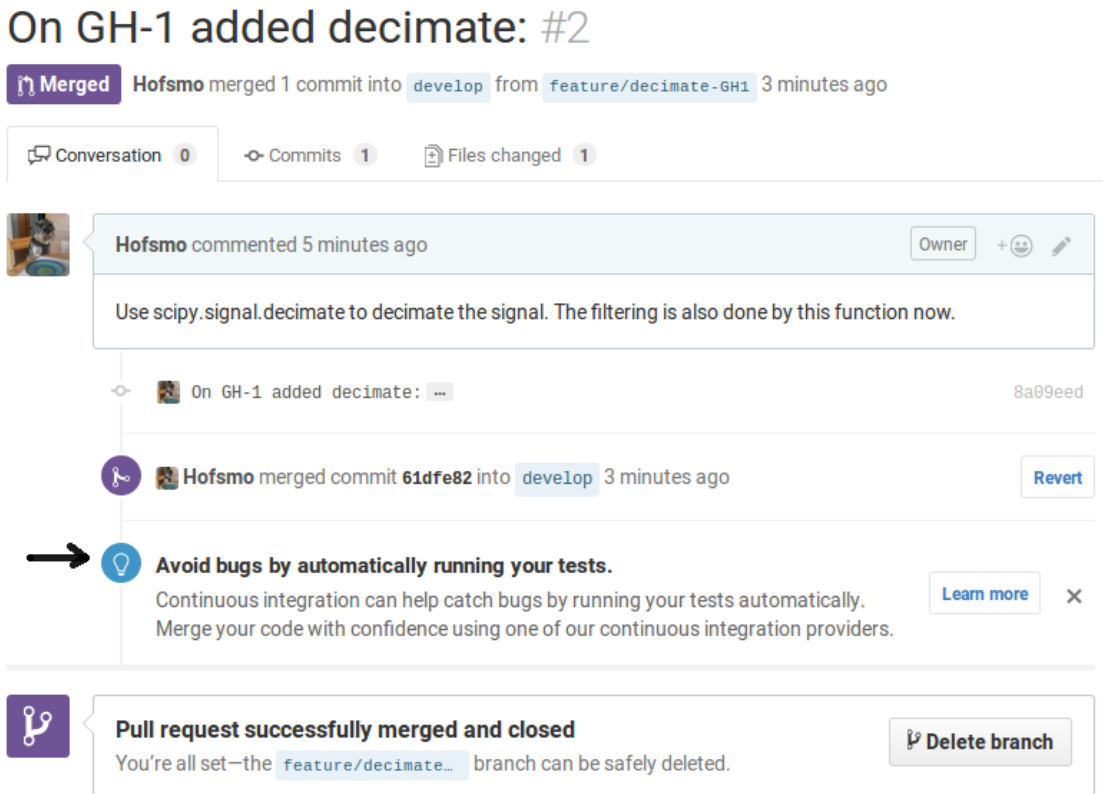
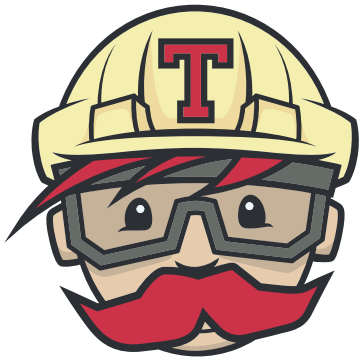
- For GitHub travis is a good alternative
- Jenkins also works with GitHub and supports MATLAB unlike travis
- BitBucket has bamboo, but may cost money



Travis

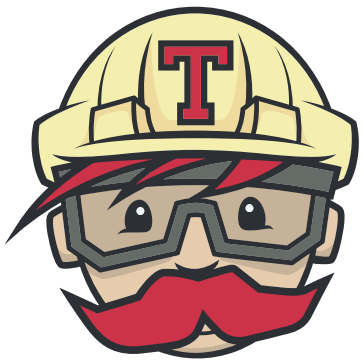
— Travis is free for open repositories



Travis CI

Travis

- Travis is free for open repositories
- It is controlled through a configuration file named .travis.yml



Travis CI

Travis

- Travis is free for open repositories
- It is controlled through a configuration file named .travis.yml
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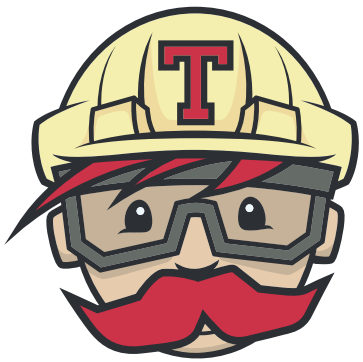

Travis CI

Outline

References

- Most pictures and a lot of information from:
  `www.git-scm.com/book/en/v2/`
- `www.github.com`
- `www.bitbucket.org`
- This presentation:
  `https://github.com/Hofsmo/presentations/tree/vc`
- `https://github.com/Hofsmo/Example`