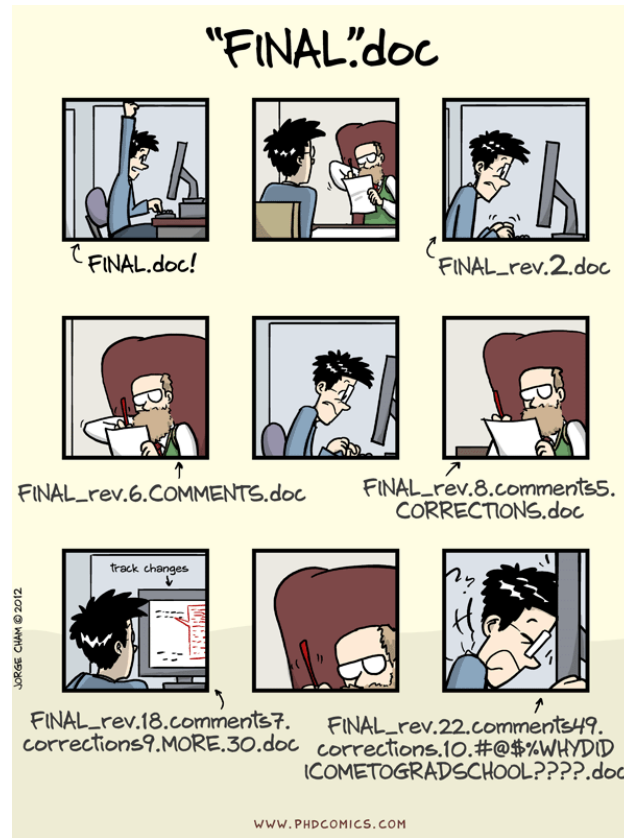


Notes on how to use Git

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May 2, 2016

What is Git and Github and why is it usefull to use them for version controlling of our projects?



situation 1

You have written a paper. You think it is finished and name it "final". After a while you make some changes to the paper and name it to "final_new". Then again you realize that you need to add a new experiment, so you edit the paper and name it to "final_really". You keep doing this for a while until it is really finalized.

Someone asks you a year later that if he can view your paper to learn from it. You open your folder and cannot remember which file was actually the final version of the paper!¹

situation 2

You are working on your project. The project is now in a good state. You have an idea and you want to implement your idea in the project. You add new codes and chang some parts of the project. At some point the project gets so messy with lots of errors that you don't know how to solve them and you wish if you could just go back to the previous state the project was in before you change it!

¹situation 1 is from : <http://r-bio.github.io/intro-git-rstudio/>

You can always save a copy of the good state project somewhere in your computer and then make changes to the original version. But the project may take a year to be completed and you have to do this process many times and save different versions of it with different names.

situation 3

You and your teammate are working on the same project. You make some changes to the project. Your teammate also makes some changes. You will notify your teammate of the changes you made and she will notify you of the changes she made. Now both of you have to manually find the changes and add them to your codes. This is frustrating!

What is the solution to avoid these situations?

Git is a software that you install locally on your computer and you can handle **version control** of your files easily. Version control means to take a snapshot of your files everytime you edit them. Your files will be updated to the latest version while you always have access to previous versions whenever you need them. This solves the problems in situation 1 and 2.

When you start a Git project on your computer, you are going to store the entire history of the project locally. The storage of your project and its history is called a **repository**.

Every time you save your work, you can **commit** your changes to Git. A commit is a snapshot of all your files at a point in time. If a file has not changed from one commit to the next, Git uses the previously stored file. Commits create links to other commits, forming a graph of your development history . You can revert your code to a previous commit, inspect how files changed from one commit to the next, and review information such as where and when changes were made.²



Github is a remote server where you can save your project and all the history of changes that Git has made for you in your local history. Once you commit something to repository, you can **push** them to Github. Now everything is updated locally and also on the server. This is useful because if something happens to your computer you will not lose your data.

Pushing the changes to Github has another benefit too. It lets you to work on a project with a team easily. Your teammate make some changes to the project. She commits the changes on her local repository. Then she pushes the changes to Github server. Now you want to work on the project. First you need to **pull** the new changes from Github and update your project to the latest changes and then start working on it. This solves the problem in situation 3.

Each time someone wants to work on the project has to pull first, then edit the file, commit his changes and push them to server.

²figure and the paragraph from <https://www.visualstudio.com/learn/what-is-git/>

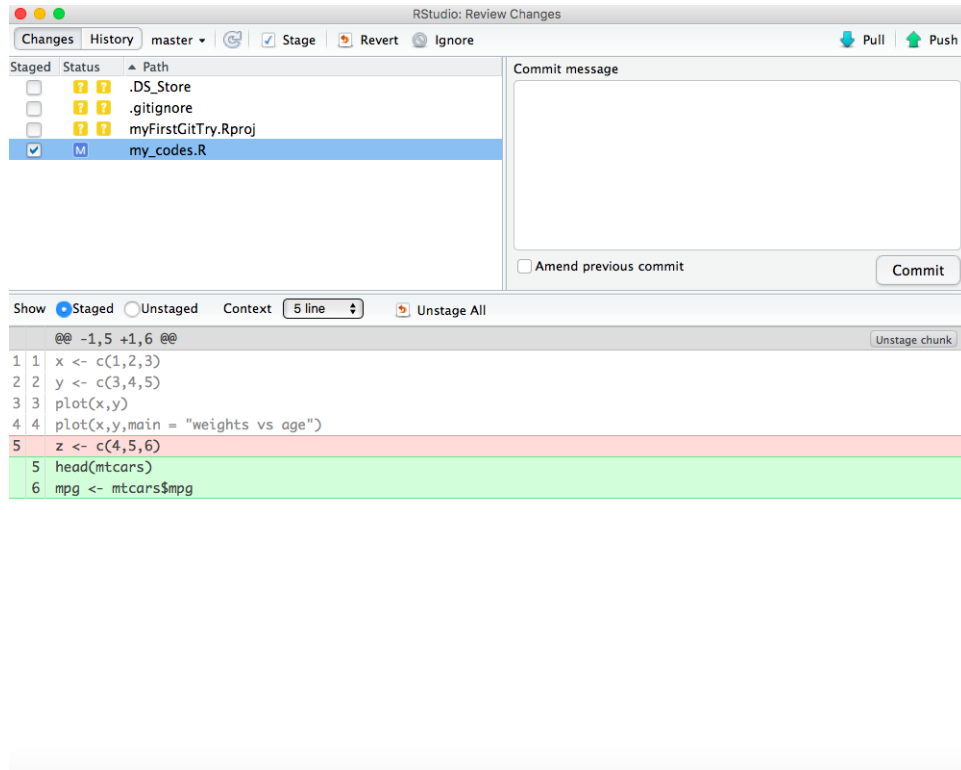
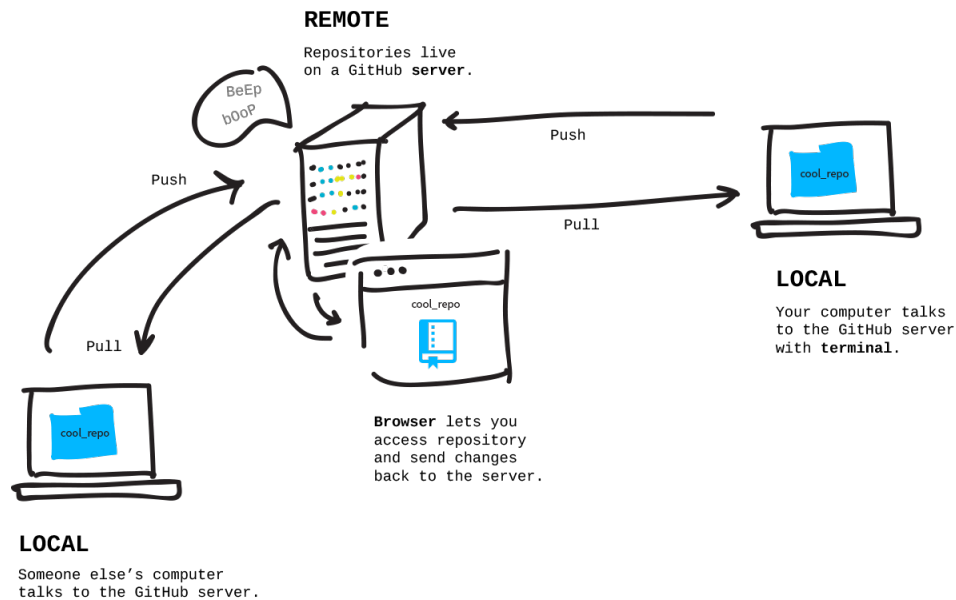


Figure 1: The red line is the line that was deleted and the green lines are the ones that are added to the file.



(From <https://github.com/Rafase282/My-FreeCodeCamp-Code/wiki/Lesson-Save-your-Code-Revisions-Forever-with-Git>)

Now let's see what we have learned so far in practice.

Install and set up Git

Mac: Download Git from [here](#)

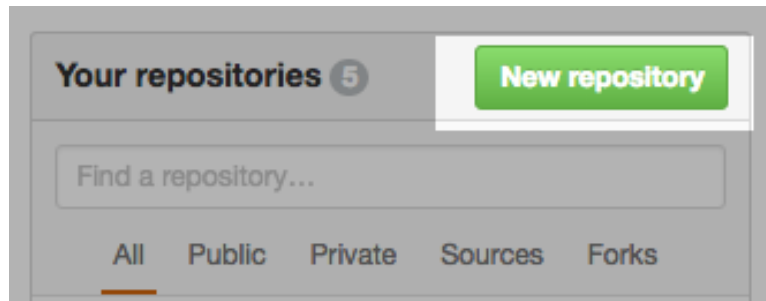
Windows: Download Git from [here](#)

Debian/Ubuntu: `sudo apt-get install git-core`.

Other Linux distros: Download Git from [here](#).


How to start using Github

- Register for a free Github account : <https://github.com>
- Create a new repository. Name it “myFirstGitTry”.
- Write a brief description (For example : “I am trying to learn git.”)
- Choose “public”
- Check the box “Initialize this repository with a README”
- Click “create repository”
- Click on “clone and download”
- Copy the “web URL”



Create a new repository


A repository contains all the files for your project, including the revision history.


Owner
 **srtaheri** ▾

Repository name
 ✓

Great repository names are short and memorable. Need inspiration? How about **redesigned-robot**.

Description (optional)

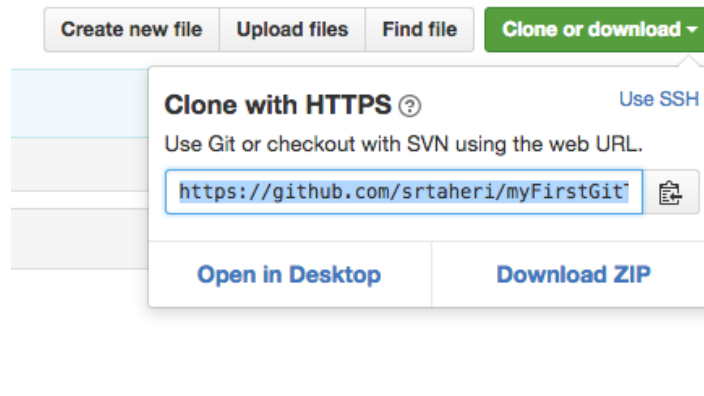
☒  **Public**
Anyone can see this repository. You choose who can commit.

☐  **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.

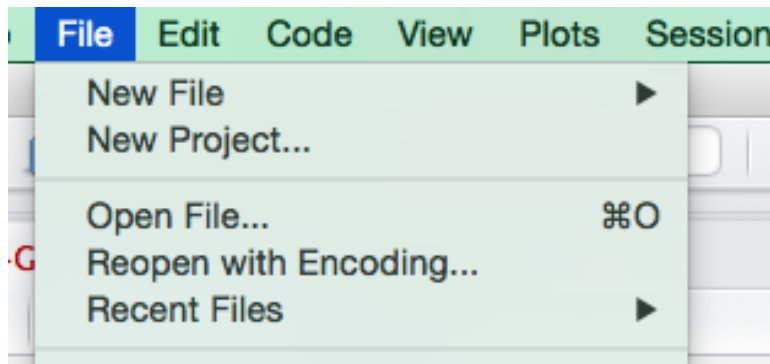
ⓘ

Create repository




Cloning the repository through R Studio


- Go to RStudio
- File -> new project
- Click on “version control”
- Click on “Git”(Clone a project from a repository)
- Paste the web URL in “Repository URL”.
- Browse the “Create as a subdirectory of” and create a new folder called “May_Short_Course_NEU_2017”
- Choose “open in new session”
- Click on “create project”




New Project

Create Project

 **New Directory**
Start a project in a brand new working directory >


 **Existing Directory**
Associate a project with an existing working directory >


 **Version Control**
Checkout a project from a version control repository >

Cancel

New Project

Back **Create Project from Version Control**


 **Git**
Clone a project from a Git repository >

 **Subversion**
Checkout a project from a Subversion repository >

Cancel

New Project

Back **Clone Git Repository**



Repository URL:

Project directory name:

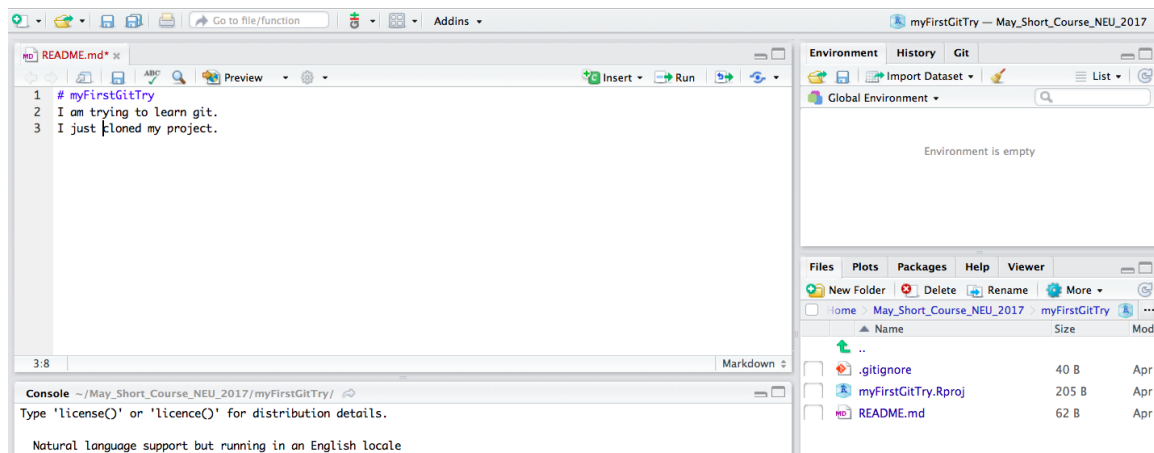
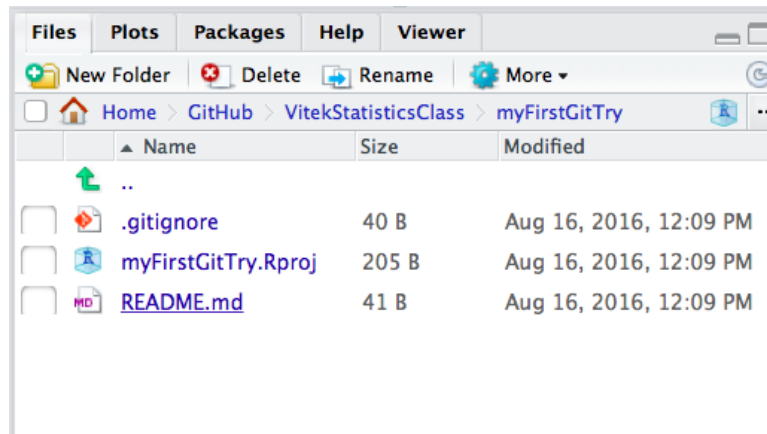
Create project as subdirectory of:
 Browse...

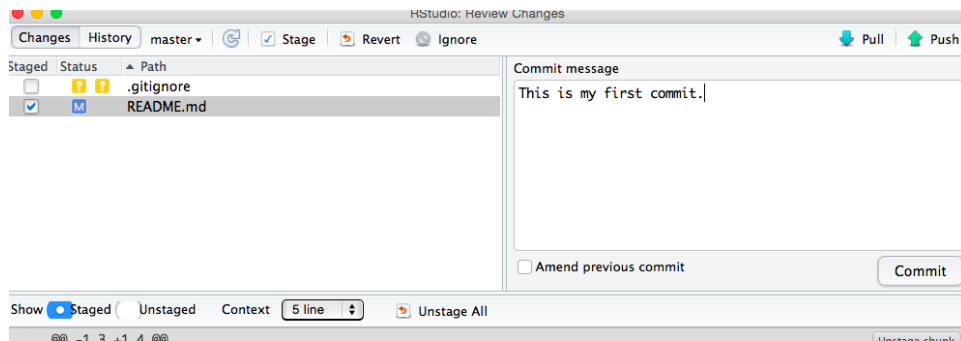
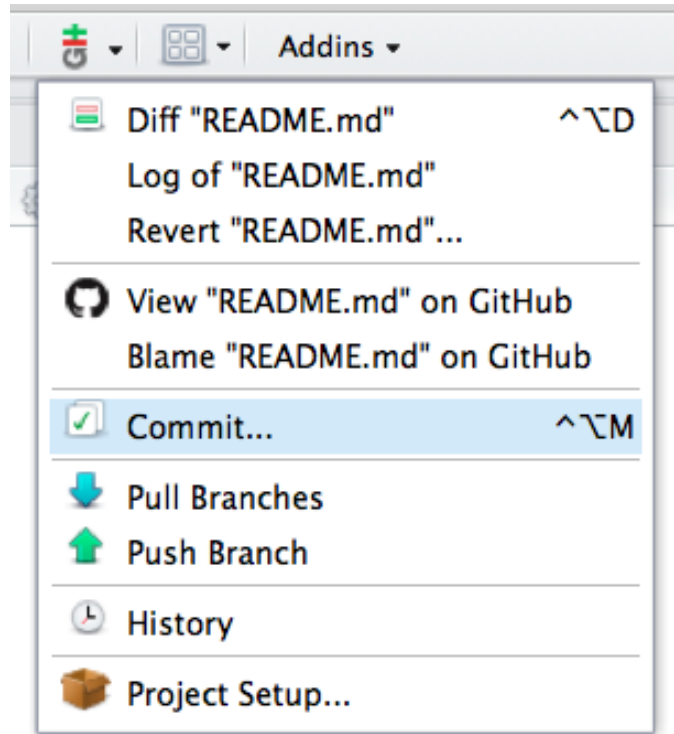
☐ Open in new session

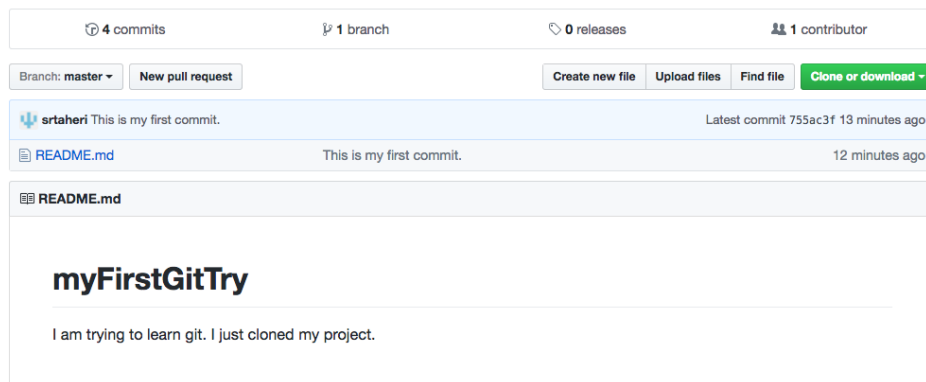
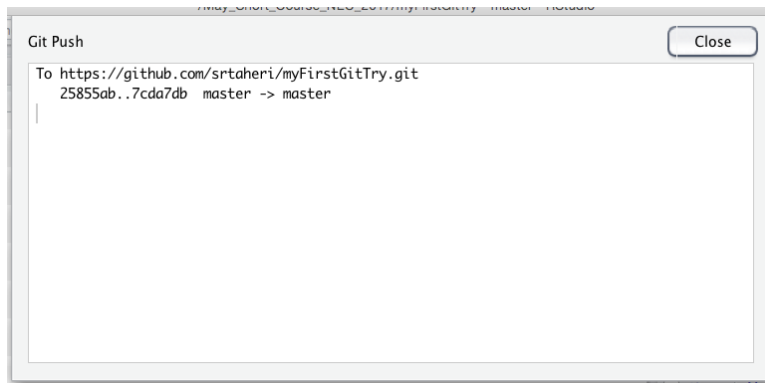
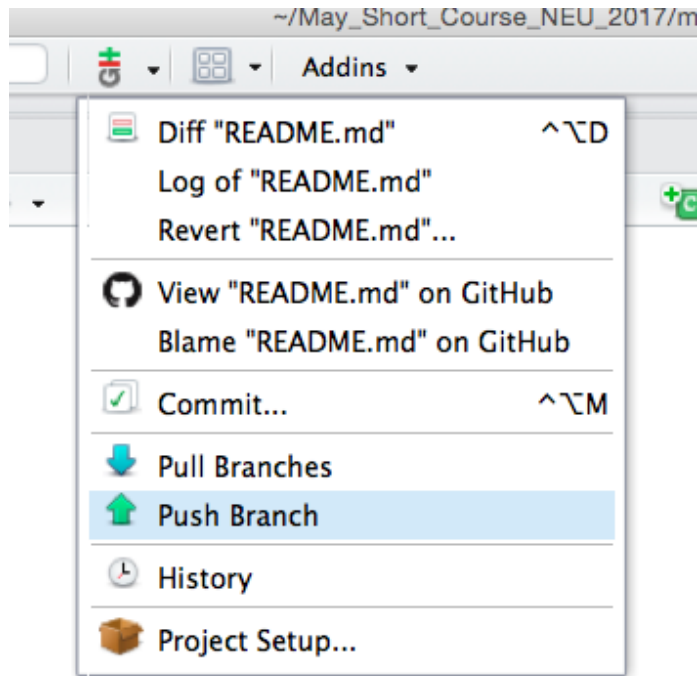
Create Project **Cancel**

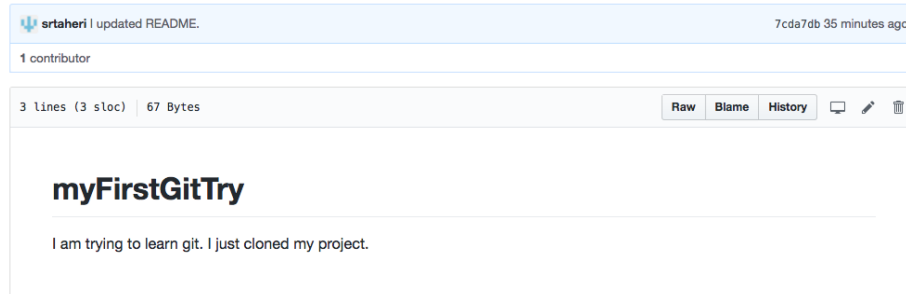
Commit a change and push it to Github server

- Click on “README.md”
- Write another line of message (For example : “I cloned my project.”)
- Save it (command+s in mac or Ctrl+s in windows)
- Click on the small GIT icon and choose “Commit”
- Check the icon “README” on left.
- Write a short message of what you have done so far. Click on “commit”. Close the window.
- Again click on the small GIT icon and choose “Push Branch”. Then close the window that appears.
- Go to the github website <https://github.com>, sign in and choose “myFirstGitTry” repository from bottom right.
- Your first commit is there!
- Click on README.md. You can see that your changes are successfully pushed to Github server.



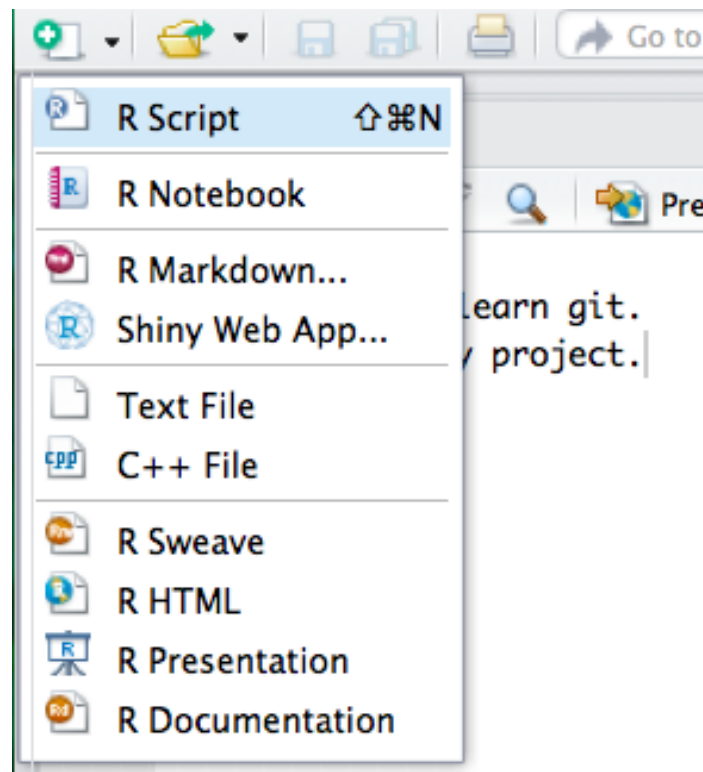


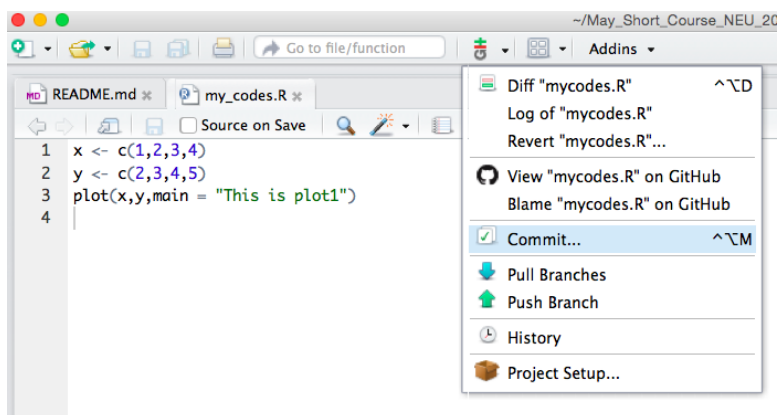
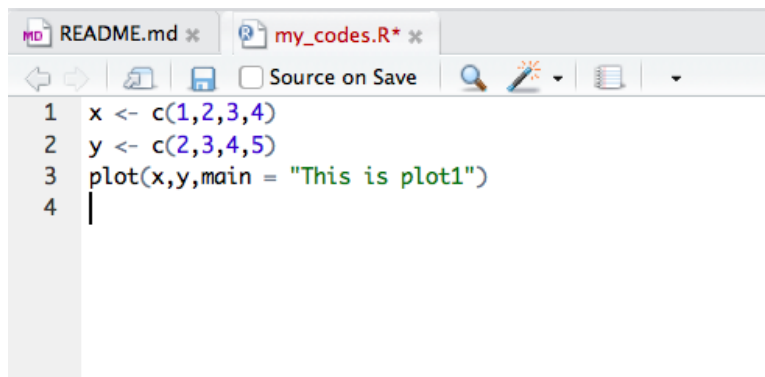
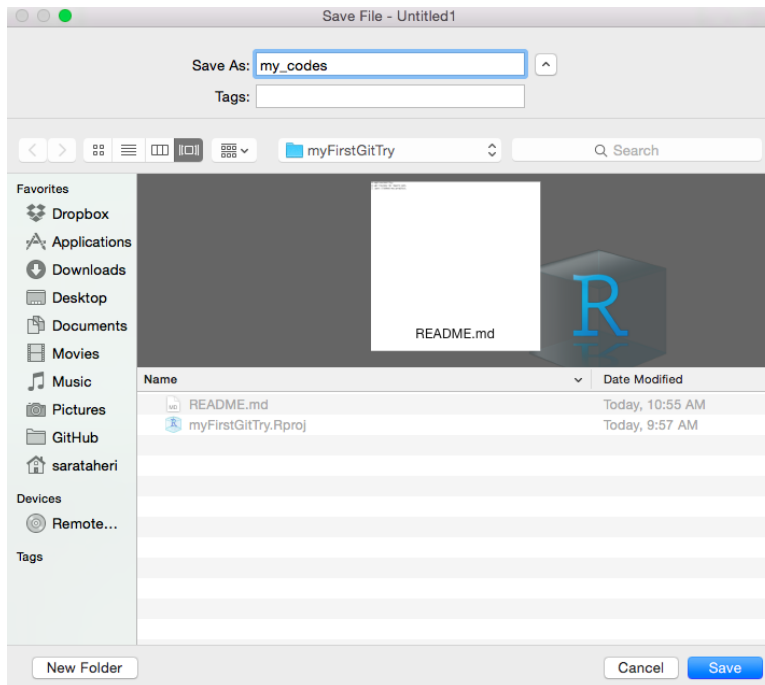


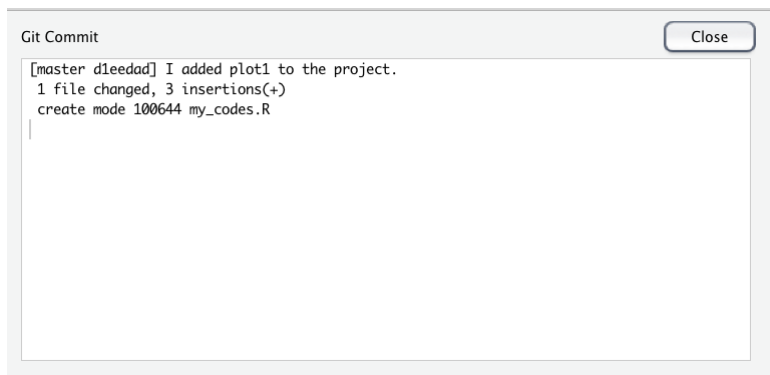
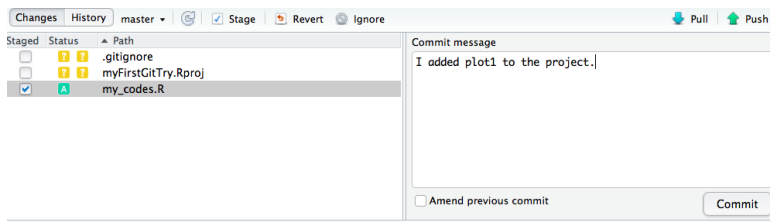
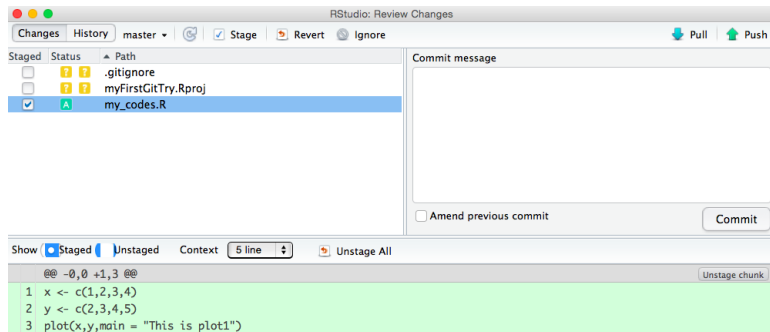


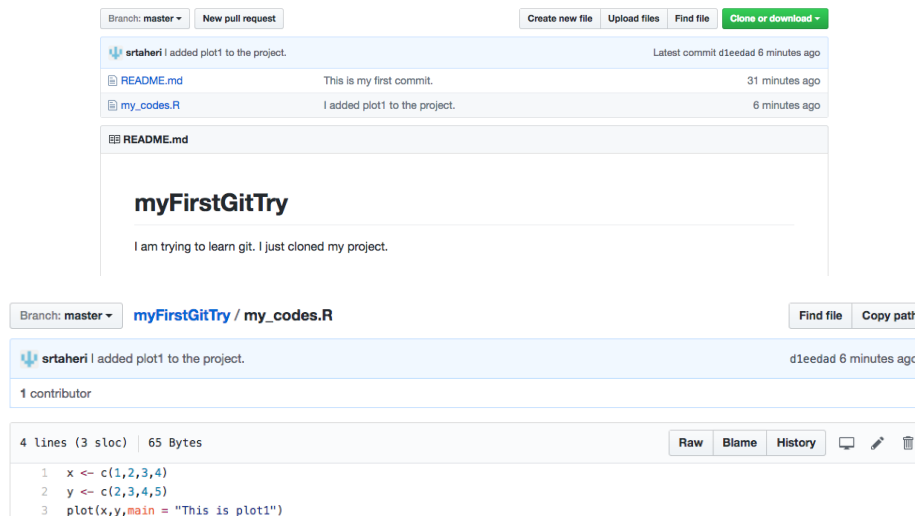
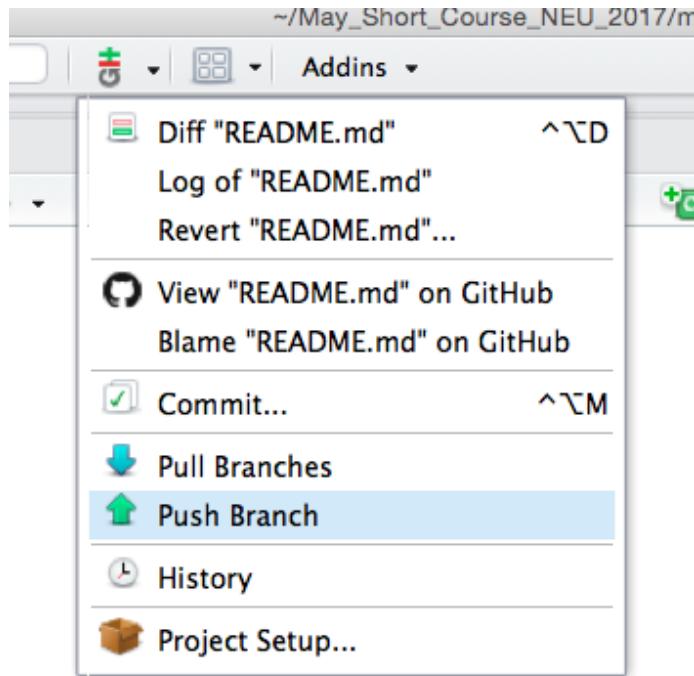
Creat a new R script

- Creat a new R script and save it with the name “my_codes” in the “myFirstGitTry” folder.
- Try writting some simple code. Save them (command+s in mac or Ctrl+s in windows).
- Click on the small GIT icon and choose “Commit”
- Check the icon “my_codes” on left.
- On the right, write some comments. For example say, “I added plot1 to the project.”
- Click on the *commit* button.
- Close the 2 windows related to committing.
- Click on the small GIT icon and choose “Push Branch”. Then close the window that appears.
- Go to the github website <https://github.com>, and choose “myFirstGitTry” repository from bottom right.
- Your second commit (“I added plot1 to the project”) is there!
- Click on “my_codes.R”. You can see that your changes are successfully pushed to Github server.
- Try adding more lines to your code and then practice to committ your changes and push them to github server. Do this several times.









remember!

always try to commit regularly and don't forget to push!

read this and this articles for a more description about working with Git through RStudio.

Working in a team and using Git

- Go to github website, log in, and choose your project “myFirstGitTry”
- Click on “Setting”.

- In the Options column at the left, click on “Collaborators”.
- It may ask you to confirm your password to continue adding a collaborator.
- Write down the github username (usually email address) of your collaborator to add him/her to this project.
- Click on “Add collaborator”.
- An invitation will be emailed to your collaborator. Ask him/her to check his/her inbox and accept the invitation.

The screenshot shows a GitHub repository named 'myFirstGitTry' by user 'srtaheri'. The repository has 5 commits, 1 branch, 0 releases, and 1 contributor. The commit history shows a commit by 'srtaheri' adding 'plot1' to the project, with files 'README.md' and 'my_codes.R' added. The 'Settings' tab is selected, showing the repository name 'myFirstGitTry' and the 'Features' section with 'Wikis' enabled. The 'Collaborators' section is also visible, showing that the repository currently has no collaborators and providing a form to add one by searching for a GitHub user by username, full name, or email address.

Assume you and your collaborator are working on your class project. You make some changes in the project, commit the changes and “push” them to github server. Your collaborator wants to start working on the project. The first thing he/she should do is to “pull” from server. By clicking on “pull branches”, he will receive all the changes that has been made so far and his files will be updated to the latest changes. Then he can work on the project and edit it. At each step, when he/she has done an important change, he/she should “commit” the change and then “push” to server. Next time you want to start working on your project, first you should “pull”, to get the latest updates and then start making your own changes. After you are done, you should “commit”, and “push” to server. This process should happen at all the time that you and your

collaborators are working on the project.

When Merge conflicts happen

Merge conflicts may occur when your collaborator changes a line of the file and then committed and pushed the changes to Github and then you change exactly the same line of the file and try to commit and push your changes to Github. In this case you will receive an error. It may also occur if a file is deleted that another person is attempting to edit. The person who receives conflict error is responsible to resolve it.

Solving conflicts

We will create a scenario in which a conflict will happen and we will solve it together.

- On Github website <https://github.com>, choose your repository (myFirstGitTry), then click on “my_codes.R”. Click on the icon that looks like a pen to edit your code. Add a line of code (like `z <- c(3,4,5,6)`).
- Go to the bottom of the page. Write your comments and then click on “commit changes” button.
- In R Studio, also edit “my_codes.R” and write a line of different code exactly in the same line number that you wrote a message in “my_codes.R” on github website.
- Commit your changes.
- Try pushing the change you made in “my_codes.R” in R.

You will receive an error! That’s because you made changes in exactly two same places of “my_codes.R”. Now git cannot understand which edit is correct and will be confused!

- Now try pulling.

Again an error!

- You will see a sign like this in your my_codes.R:

```
<<<<<<< HEAD
some codes

=====

some codes

>>>>>>> 6b501e627cb2927056a04c05d80df9c9ea64f9ae
```

lines between these signs are the source of conflict. You can decide whether to keep the both lines or to delete one of them. Then you should delete all those signs and commit that you have solved the conflicts and then push it to server.

Add topics

5 commits

1 branch

0 releases

1 contributor

Branch: master

New pull request

Create new file

Upload files

Find file

Clone or download

srtaheri

I added plot1 to the project.

Latest commit d1eedad 5 hours ago

README.md

This is my first commit.

5 hours ago

my_codes.R

I added plot1 to the project.

5 hours ago

README.md

myFirstGitTry

I am trying to learn git. I just cloned my project.

Branch: master

myFirstGitTry / my_codes.R

Find file

Copy path

srtaheri

I added plot1 to the project.

d1eedad 5 hours ago

1 contributor

Edit this file

4 lines (3 sloc) | 65 Bytes

Raw

Blame

History

```
1 x <- c(1,2,3,4)
2 y <- c(2,3,4,5)
3 plot(x,y,main = "This is plot1")
```

Commit changes

variable z is defined

I defined the variable z and add it to the project.

☒ Commit directly to the master branch.

☐ Create a new branch for this commit and start a pull request. [Learn more about pull requests.](#)

Commit changes

Cancel

Go to file/function

Addins

README.md

my_codes.R

Notes-on-Git...

Source on Save

Diff "mycodes.R"

Log of "mycodes.R"

Revert "mycodes.R"...

View "mycodes.R" on GitHub

Blame "mycodes.R" on GitHub

Commit...

Pull Branches

Push Branch

History

Project Setup...

```
1 x <- c(1,2,3,4)
2 y <- c(2,3,4,5)
3 plot(x,y,main = "This is plot1")
4 plot(x = c(5,6),y = c(7,8))
5
```

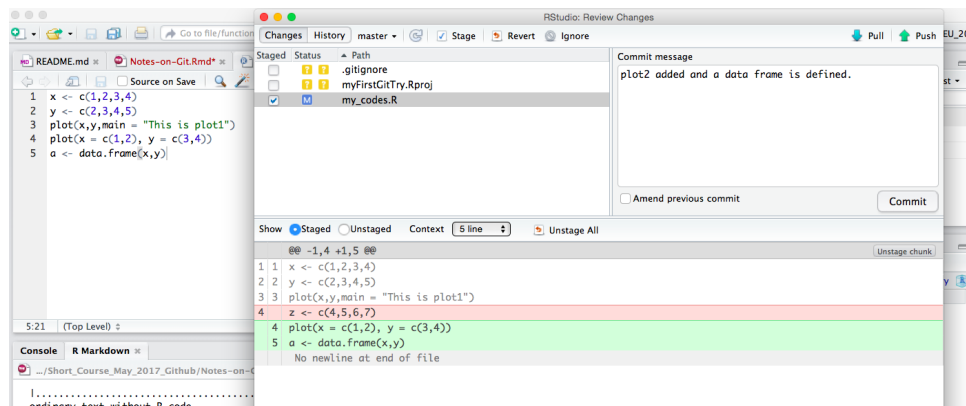


```
Git Push

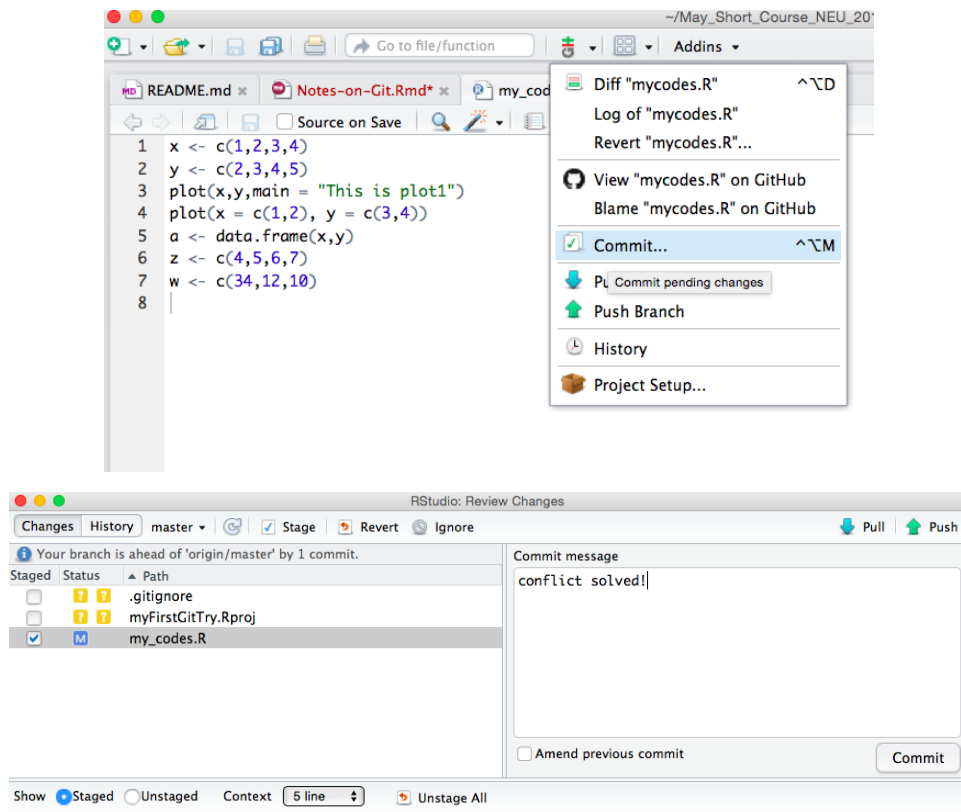
To https://github.com/srtaheri/myFirstGitTry.git
! [rejected]        master -> master (fetch first)
error: failed to push some refs to 'https://github.com/srtaheri/myFirstGitTry.git'
hint: Updates were rejected because the remote contains work that you do
hint: not have locally. This is usually caused by another repository pushing
hint: to the same ref. You may want to first integrate the remote changes
hint: (e.g., 'git pull ...') before pushing again.
hint: See the 'Note about fast-forwards' in 'git push --help' for details.
```

```
Git Pull

From https://github.com/srtaheri/myFirstGitTry
565f197..b28b7c9  master -> origin/master
error: Your local changes to the following files would be overwritten by merge:
    my_codes.R
Please, commit your changes or stash them before you can merge.
Aborting
Updating 565f197..b28b7c9
```



```
1 x <- c(1,2,3,4)
2 y <- c(2,3,4,5)
3 plot(x,y,main = "This is plot1")
4 <----- HEAD
5 plot(x = c(1,2), y = c(3,4))
6 a <- data.frame(x,y)
7
8 z <- c(4,5,6,7)
9 w <- c(34,12,10)
10 >>>>> b28b7c910983d4058050386a3a44675bfeaf987
11
```



The other way of working with git is by using **github desktop**. It has a beautiful and friendly environment. you can download it here.

References

- <https://www2.stat.duke.edu/courses/Fall15/sta112.01/post/slides/deck2.html#22>
- <https://jahya.net/blog/git-vs-github/>
- <http://r-bio.github.io/intro-git-rstudio/>