



VERSION CONTROL

Using Git, GitHub and RStudio

"FINAL".doc



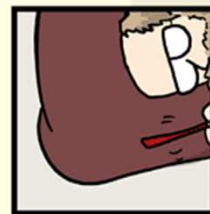
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CORRECTIONS.doc



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corrections9.MORE.30.doc
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corrections.10.##%WHYDID
COMETOGRADSCHOOL???.doc

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Learning objectives



USE VERSION CONTROL TO
TRACK CHANGES IN WORK



CREATE, SHARE AND MERGE
CONTENT WITH GITHUB



INTEGRATE GITHUB WITH
RSTUDIO



VERSION CONTROL

What is version control and what does it do?

Version control

- **Think about a recent group assignments that you have done prior to today ...**
 - How does your group keep track of who has written / edited what?
 - How does your group keep track of which is the most up to date version?
 - How does your group manage with accepting/rejecting then merging changes made by different people?
 - What happens if the group loses access to the server?

Version control

- **Now imagine if you had to manage a large data science or epidemiology research project, with multiple team members and large amounts of data ...**
 - The data, the analysis and the models might all be changing over time
 - Not just one document but multiple documents and very many code fragments
 - Complex and critical dependencies between functions, packages, etc
 - Your client demands all work to be fully auditable and always verifiable

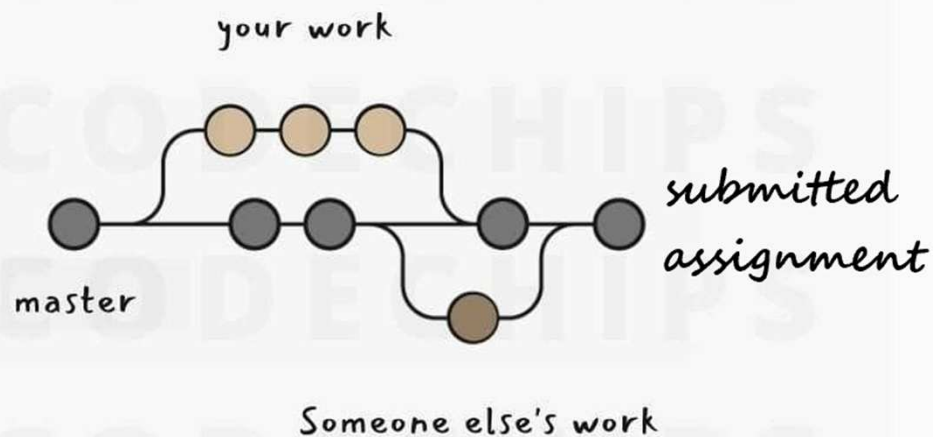
What is version control?

- Version control is a class of “quality management” system that is responsible for documenting all changes to computer code, documents, web sites, ...
- i.e. any form of information collection (data version control), AND
- any means of processing that information collection in order to yield new information (analysis version control).
- Originally developed for teams of software developers but it is now widely used in data science.
- A good version control system must enable many people to simultaneously collaborate on the same piece of analysis.

No version control for me - I work alone!



Yes, this is in the exam!



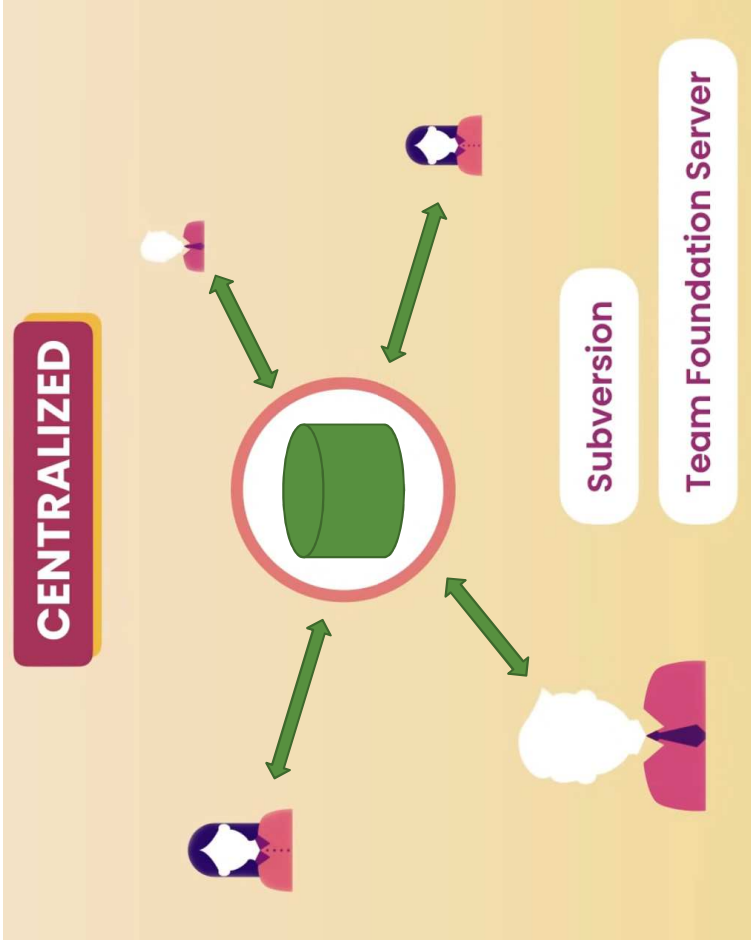
@codechips

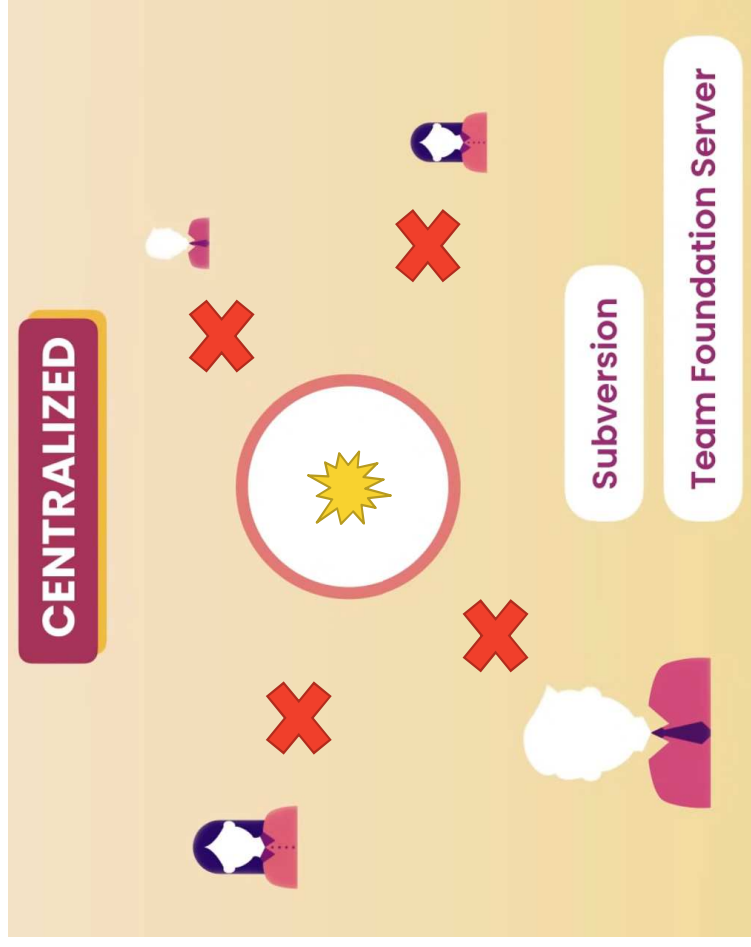


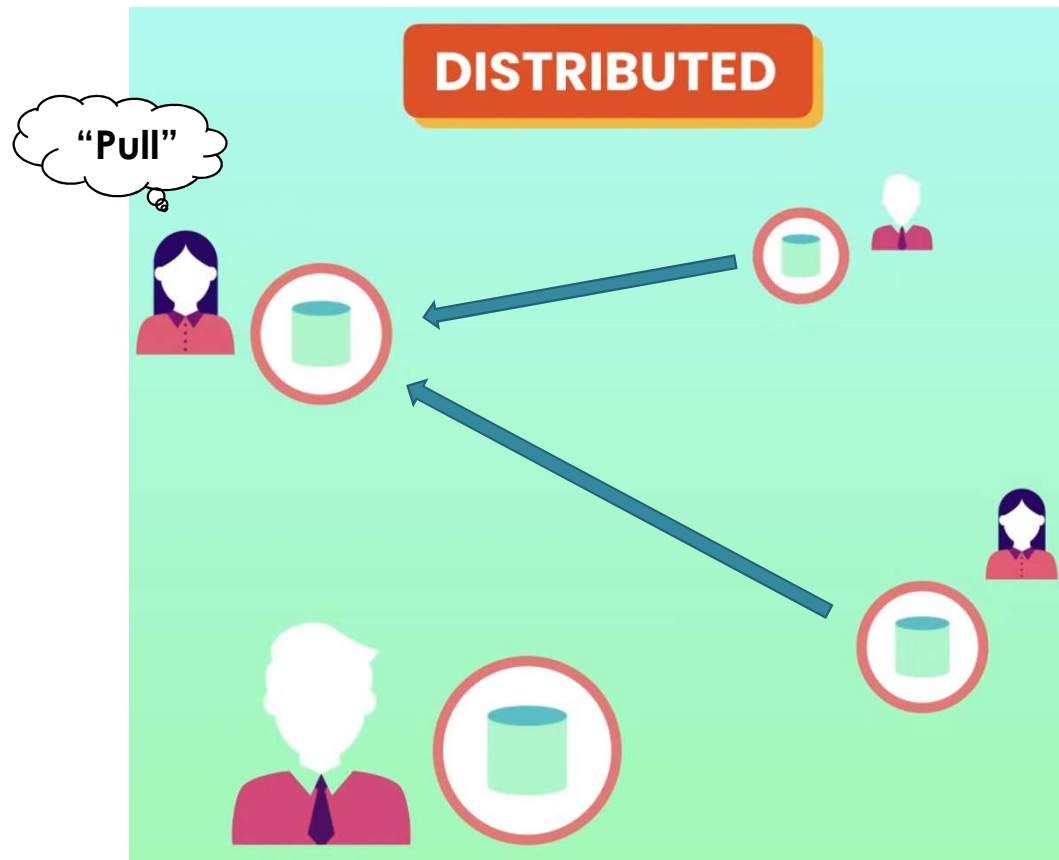


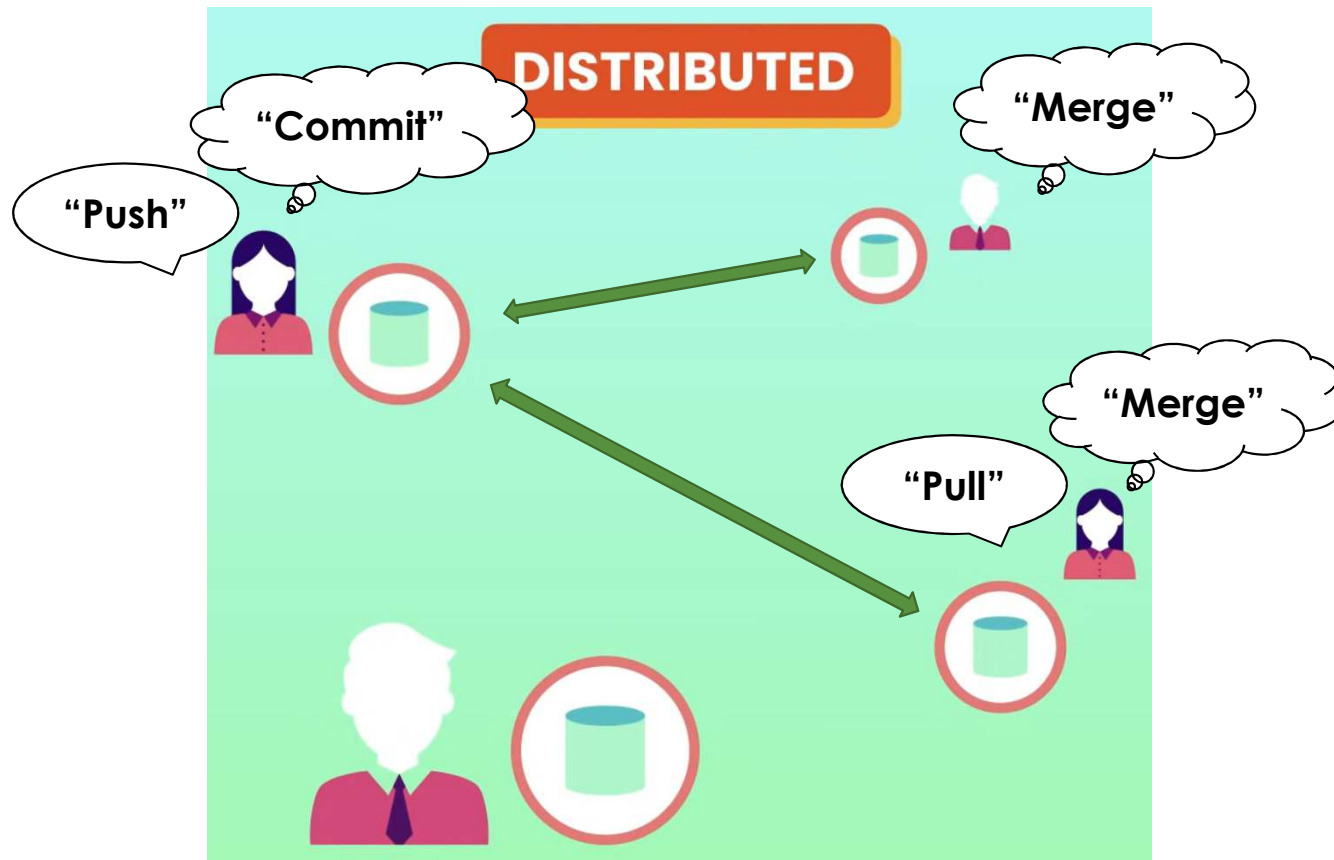
GIT & GITHUB

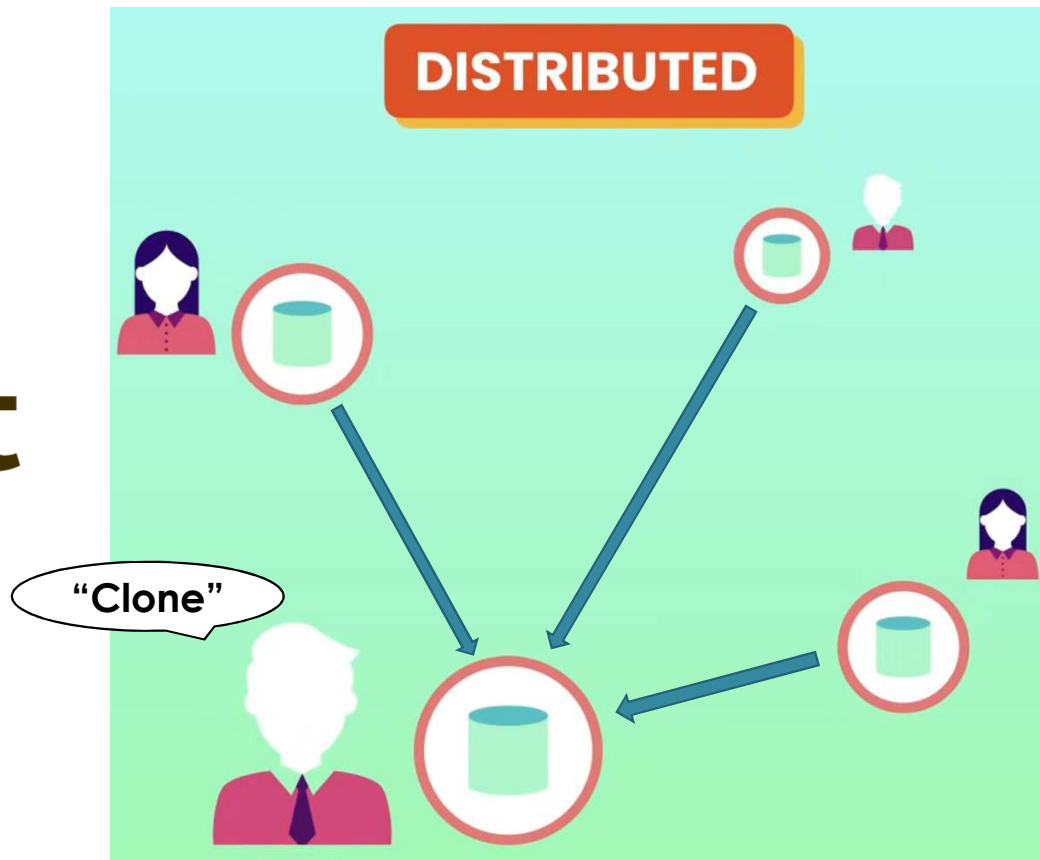
What are these and what is the difference?











Trick question:

Where is “the project”
being saved?



Search entire site...

Git is a **free and open source** distributed version control system designed to handle everything from small to very large projects with speed and efficiency.

Git is **easy to learn** and has a **tiny footprint with lightning fast performance**. It outclasses SCM tools like Subversion, CVS, Perforce, and ClearCase with features like **cheap local branching**, convenient **staging areas**, and **multiple workflows**.



- **Free**
- **Open source**
- **Fast**
- **Cheap to locally merge/branch**
- **Scalable**
- **Distributed**
- **Complex workflows allowed**
- **Extremely popular**



- **Web-based hosting** platform (mirror) for files you choose to share from your local device
- **Packages all of git's version control features** with graphical user interface, user account levels etc
- Adds **extra project and team management features**, such as issues board, notifications, etc etc
- Opportunities for forming groups, networking and social coding.

- Point your favourite web browser to GitHub : <https://github.com/join>
- Set up a FREE and personal account in your own name
- Make note of your GitHub username or “handle”
- **Tell the teaching team your Github username so we can assign you to the EPI4932 repository.**



- Find a release for your personal device OS : <https://git-scm.com/download/>
- **Follow the installer instructions.**
- **[MacOS test if works]** Terminal window, type : git version
- **[Windows test if works]** Command line or powershell window, type : git version



CONNECTING RSTUDIO TO GITHUB

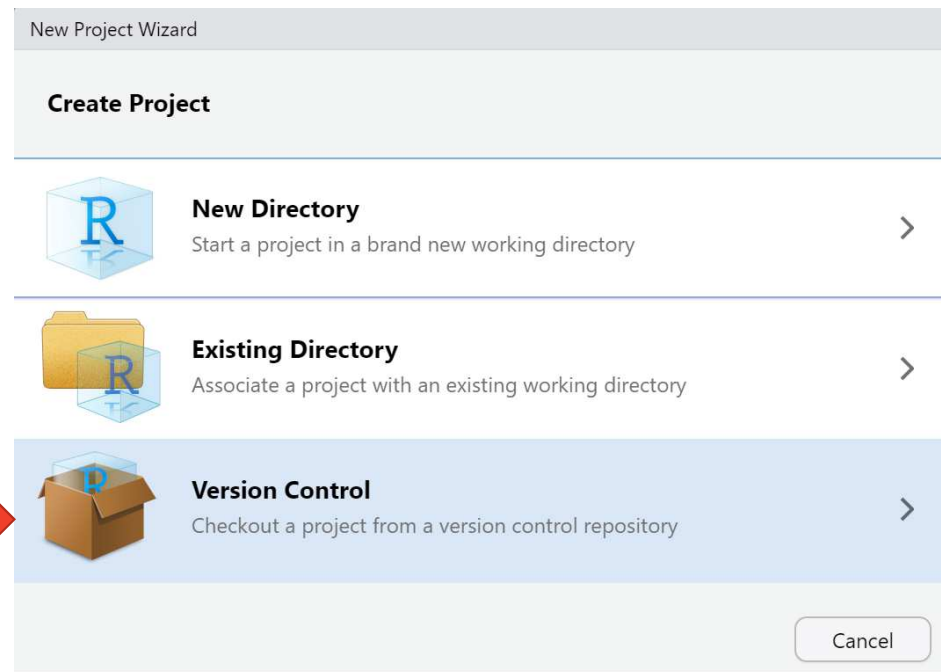
How to work with GitHub

- ❑ **First pull from a main version** or clone a project
- ❑ **Checkout a branch** of the main repo to do some edits
- ❑ Make your edits
- ❑ **Commit and push to the branch** version
- ❑ Review **changes**, **pull request** and **merge** back into main version.
- ❑ **Close down all the merged branches**
- ❑ **Pull from the main repo again** before starting a new cycle of work



**ACTION
TIME!**

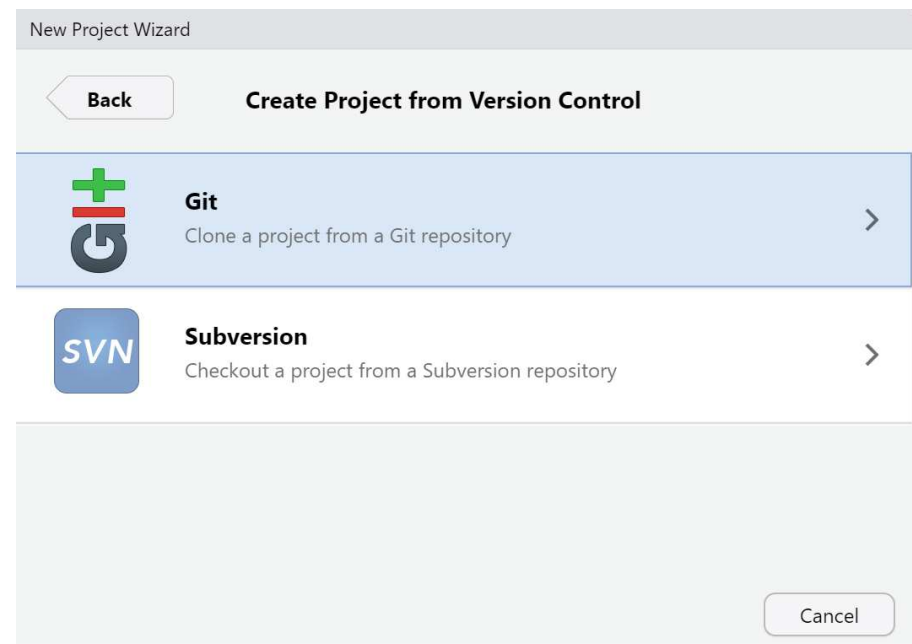
- Start up your local Rstudio app
- **File >> New project**
- **Create project using Version Control option**





**ACTION
TIME!**

- **Clone an existing project from a Git repository.**





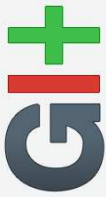
**ACTION
TIME!**

- Enter the github web link that your teaching team provides.
- Click the “Browse” button, please note well where you save this project.
- Check Open in “New Session”
- RStudio will ask for your Github username and password*

- *If you set **multi-factor authentication** in GitHub, all next steps will ask for a Personal Access Token instead of password – ask the teaching team for help with this!

New Project Wizard

Back Clone Git Repository



Repository URL:

Project directory name:

Create project as subdirectory of:
 Browse...

☒ Open in new session

Create Project Cancel



**If you turned
on Multi-
Factor Auth!**

Personal access token setup (!)

- Read the docs
- <https://docs.github.com/en/authentication/keeping-your-account-and-data-secure/creating-a-personal-access-token>
- Personal settings -> Dev settings
- Personal Access Token (PAT) -> make a “classic” token
- Save the PAT as a text object somewhere safe – you’ll need to copy-paste it!
- Github username as usual
- Paste in the PAT in place of your password!

How to work with GitHub

- ✓ **First pull from a main version** or clone a project
- ❑ **Checkout a branch** of the main repo to do some edits
- ❑ Make your edits
- ❑ **Commit and push to the branch** version
- ❑ Review **changes**, **pull request** and **merge** back into main version.
- ❑ **Close down all the merged branches**
- ❑ **Pull from the main repo again** before starting a new cycle of work

Setting up a branch

- Terminal tab in RStudio
- Can you see that you are working in “main” branch at the moment?
- **git checkout -b** [choose_name_for_new_branch] (eg Len_18012022)
- Note that you just switched to your “branch” of the repo
- **git branch**
- Warning! I do not trust Rstudio entirely to tell me which branch I am on ... I always use “git branch” to double check before I start working.

Group_Sander_Maike_Len - main - RStudio

File Edit Code View Plots Session Build Debug Profile Tools Help

Go to file/function

Knit on Save

Knit

Run

Up

Down

Refresh

Close

Close All

git_basics_dummy_test.Rmd

1
2 title: "test assignment"
3 author: "Jason Doe (11111111)" #insert authors including first and last name, and uw student number please
4 output: html_document
5
6
7
8 ***{r setup, include=FALSE}
9 knitr::opts_chunkset(echo = TRUE)
10 library(ggplot2)
11 library(dplyr)
12
13 Date: "r Sys.Date()
14
15
16
17
18 {r dataset, include = FALSE}
19 smaller <- diamonds %>%
20 filter(carat <= 2.5)
21
22 we have data about `r nrow(diamonds)` diamonds. only `r nrow(diamonds) - nrow(smaller)` are larger than
23 2.5 carats. The distribution of the remainder is shown below:
24
25 ## Including Plots
26 You can also embed plots, for example:
27
28 {r, echo = FALSE}
29 smaller %>%
30 ggplot(aes(carat)) +
31 geom_freqpoly(binwidth = 0.14)
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Environment
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Files
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Clinical_Data_Science_Elective
Group_Sander_Maike_Len
Name
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gitignore
git_basics_dummy_test.Rmd
Group_Sander_Maike_Len.Rproj
README.md

Terminal 1

MINGW64/C:/Users/leonard.wee/OneDrive - Maastrro - Clinic/Documents/Clinical_Data_Science_Elective/Group_Sander_Maike_Len
\$ git version
git version 2.33.1.windows.1
\$ git branch
* main
\$

Console

Terminal 1
MINGW64/C:/Users/leonard.wee/OneDrive - Maastrro - Clinic/Documents/Clinical_Data_Science_Elective/Group_Sander_Maike_Len
\$ git version
git version 2.33.1.windows.1
\$ git branch
* main
\$

7°C

Bewolkt

10:50

ENG

30-1-2022

```
1 #---
2 title: "test assignment"
3 author: "Jason Doe (11111111)" #insert authors including first and last name, and uw student number please
4 output: html_document
5 #---
6
7 #---{r setup, include=FALSE}
8 knitr::opts_chunkset(echo = TRUE)
9
10 library(ggplot2)
11 library(dplyr)
12
13 Date: "r Sys.Date()"
14
15
16 #---{r dataset, include = FALSE}
17 # smaller <- diamonds %>%
18 #   filter(carat <= 2.5)
19 #---
20
21 we have data about `r nrow(diamonds)` diamonds. only `r nrow(diamonds) - nrow(smaller)` are larger than
22 2.5 carats. The distribution of the remainder is shown below:
23
24 ## Including Plots
25
26 You can also embed plots, for example:
27
28 #---{r, echo = FALSE}
29 # smaller %>%
30 #   ggplot(aes(carat)) +
31 #     geom_freqpoly(binwidth = 0.14)
32 #---
33 # test assignment
```

```
Terminal x Jobs x
Terminal 1 | MINGW64/C:/Users/leonard.w... - Maastro - Clinic/Documents/Clinical_Data_Science_Elective/Group_Sander_Maike_Len
leonard.wes@l-12659 MINGW64 ~/onedrive - Maastro - Clinic/Documents/Clinical_Data_Science_Elective/Group_Sander_Maike_Len (main)
$ git version
git version 2.33.1.windows.1
leonard.wes@l-12659 MINGW64 ~/onedrive - Maastro - Clinic/Documents/Clinical_Data_Science_Elective/Group_Sander_Maike_Len (main)
$ git branch
* main
leonard.wes@l-12659 MINGW64 ~/onedrive - Maastro - Clinic/Documents/Clinical_Data_Science_Elective/Group_Sander_Maike_Len (main)
$ git checkout -b len_18012022
Switched to a new branch 'len_18012022'
leonard.wes@l-12659 MINGW64 ~/onedrive - Maastro - Clinic/Documents/Clinical_Data_Science_Elective/Group_Sander_Maike_Len (len_18012022)
$ git branch
* len_18012022
  main
leonard.wes@l-12659 MINGW64 ~/onedrive - Maastro - Clinic/Documents/Clinical_Data_Science_Elective/Group_Sander_Maike_Len (len_18012022)
$
```

Environment | History | Connections | Git | Tutorial
R | Global Environment | Import Dataset | 119 MiB | List | Search

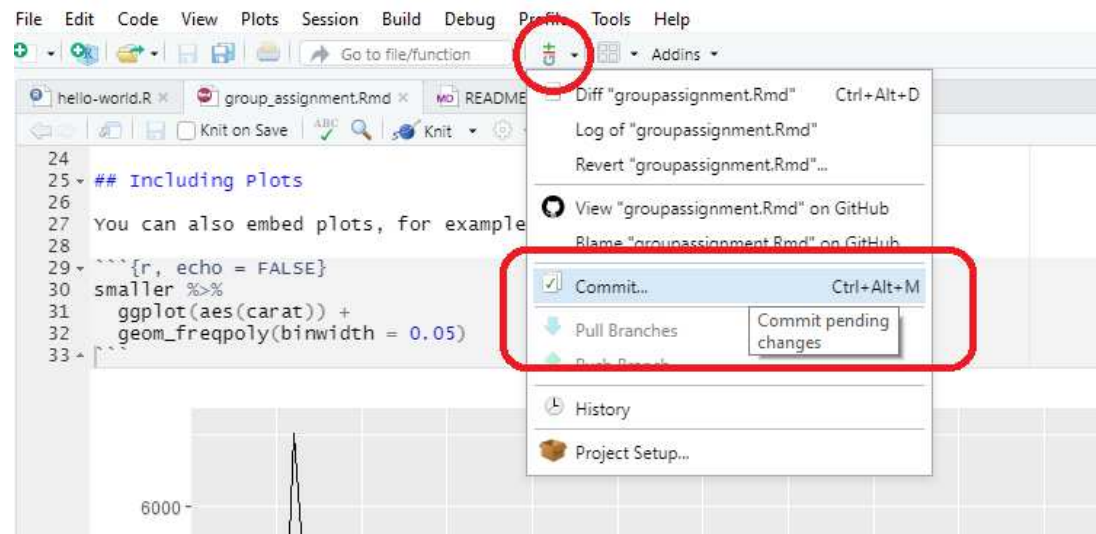
Environment is empty

Files	Plots	Packages	Help	Viewer	More
New Folder		Delete	Rename		
Home					
Clinical_Data_Science_Elective					
Group_Sander_Maike_Len					
..					
gitignore					44 B Jan 30, 2022, 10:49 AM
git_basics_dummy_test.Rmd					736 B Jan 30, 2022, 10:49 AM
Group_Sander_Maike_Len.Rproj					218 B Jan 30, 2022, 10:49 AM
README.md					76 B Jan 30, 2022, 10:49 AM



**ACTION
TIME!**

- Make some edits in your branch of `git_basics_dummy_test.Rmd`
 - Eg Change the name at the top
- Committing your changes :
 - Stage a file for commit (checkbox)
 - Incl a decent comment on edits
 - Click “commit” below
 - **`git push --set-upstream origin [the_name_of_your_branch]`**





RStudio Review Changes

File Edit Code View Plots Session Build Debug Profile Tools Help

Changes History Staged Status Patch

len-test-branch

group_assignment.Rmd

Staged Status Patch

Commit message

changed the binwidth in the first plot

Commit

Amend previous commit

@@ -27,11 +27,11 @@ we have data about `r nrow(diamonds)` diamonds. only `r nrow(diamonds)` - nrow(s

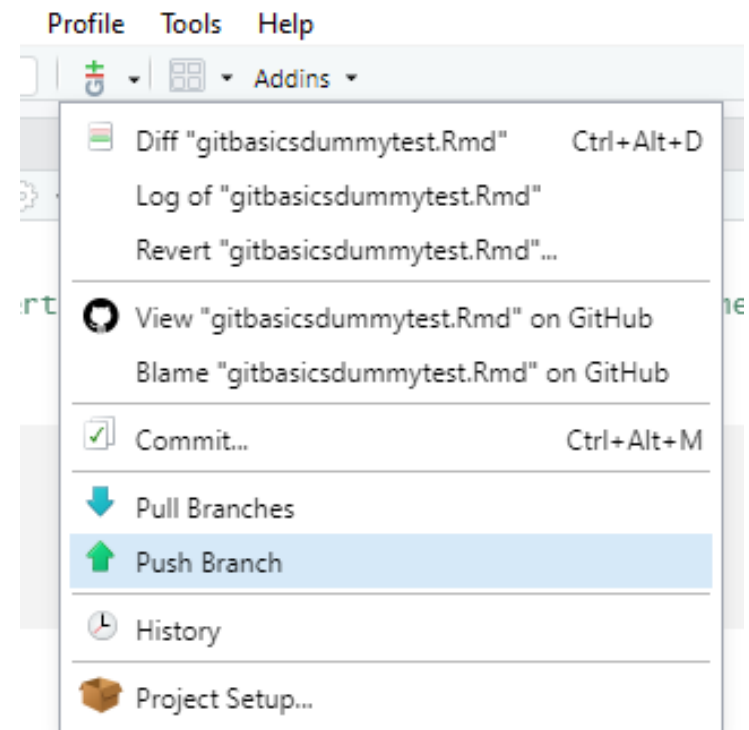
```
7. ...{r setup, include=FALSE}
8 knitr::opts_chunk$set(echo = TRUE)
9
10 library(ggplot2)
11 library(dplyr)
12 ...
13
14 Date: `r Sys.Date()`
15
16
17 ...{r dataset, include = FALSE}
18 smaller <- diamonds %>%
19 filter(carat <= 2.5)
20 ...
21
22 we have data about `r nrow(diamonds)` diamonds.
23 2.5 carats. The distribution of the remainder is
24
25 ## Including Plots
26
27 You can also embed plots, for example:
28
29 ...{r, echo = FALSE}
30 smaller %>%
31 ggplot(aes(carat)) +
32 ...geom_freqpoly(binwidth = 0.04)|
33
34
35
36
37
38
```

32333 Chunk 3



**ACTION
TIME!**

- **Make MORE edits in your branch of the file : group_assignment.Rmd**
 - Change the bin width in the plot
- **Or add a new script file, or anything!**
- **Committing and push your changes :**
 - Stage a file for commit (checkbox)
 - Incl a comment on edits
 - Click commit
 - **(shortcut now available) click green up-arrow for "PUSH"**



Group_Sander_Maike_Len - len_18012022 - RStudio

File Edit Code View Plots Session Build Debug Profile Tools Help

Go to file/function

Knit

git_basics_dummy_test.Rmd

Environment: Global Environment

123456789101112131415161718192021222324252627282930313233

1 title: "test assignment"

2 author: "Jason DOE (11111111)" #insert authors including first and last name, and uw student number please

3

4 output: html_document

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8 knitr::opts_chunk\$set(

9

10 library(ggplot2)

11 library(dplyr)

12

13 Date: Sys.Date()

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18 smaller <- diamonds %>%

19 filter(carat <= 2.5)

20

21

22 we have data about 'nrow(diamonds)' diamonds. only 'nrow(diamonds) - nrow(smaller)' are larger than

23 2.5 carats. The distribution of the remainder is shown below:

24

25 ## Including Plots

26

27 You can also embed plots, for example:

28

29

30 smaller %>%

31 ggplot(aes(carat)) +

32 geom_freqpoly(binwidth = 0.04)

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How to work with GitHub

- ✓ **First pull from a main version** or clone a project
- ✓ **Checkout a branch** of the main repo to do some edits
- ✓ Make your edits
- ✓ **Commit and push to the branch** version
- ❑ Review **changes**, **pull request** and **merge** back into main version.
- ❑ **Close down all the merged branches**
- ❑ **Pull from the main repo again** before starting a new cycle of work

len_18012022 had recent pushes 1 minute ago

main 2 branches 0 tags

Switch branches/tags

Find or create a branch...

Initial commit

first commit

649709d 27 minutes ago 2 commits

31 minutes ago

27 minutes ago

Go to file

Add file

Code

Compare & pull request

Group_Sander_Maike_Len

group repository for "students" Sander Maike Len



len-test-branch 2 branches 0 tags

Go to file Add file Code

Switch branches/tags

Find or create a branch...

Branches Tags

main default

✓ len-test-branch

View all branches

group_assignment.Rmd	test one more edit	2 minutes ago
group_assignment.html	test commit to main	2 days ago
hello-world.R	test commit to main	2 days ago
teachers-sandbox.Rproj	test commit to main	2 days ago

Confirm
what you
pushed
here





main 2 branches 0 tags

Switch branches/tags

Find or create a branch...

Branches Tags

✓ main default

len-test-branch

View all branches

hello-world.R

teachers-sandbox.Rproj

Initial commit

test commit to main

test one more edit

test commit to main

test commit to main

test commit to main

- **View all branches**
- **Review changes you made**
- **Create a pull request to merge these changes to MAIN.**

Open a pull request

Create a new pull request by comparing changes across two branches. If you need to, you can also [compare across forks](#).

base: main ← compare: len-test-branch ✓ **Able to merge.** These branches can be automatically merged.



1 commit

1 file changed

1 contributor

Commits on Jan 22, 2022

blah

weeleon committed 3 minutes ago

Copy icon

e53de39

Compare icon

Showing 1 changed file with 1 addition and 1 deletion.

2

group_assignment.Rmd

Copy icon

↑

.....

@@ -29,7 +29,7 @@ You can also embed plots, for example:

29 29 `{r, echo = FALSE}

30 30 smaller %>%

31 31 ggplot(aes(carat)) +

32 - geom_freqpoly(binwidth = 0.04)

32 + geom_freqpoly(binwidth = 0.03)

33 33 `

34 34

35 35

.....

↓

Split

Unified



Open a pull request

Create a new pull request by comparing changes across two branches. If you need to, you can also compare across forks.



base: main ▾



compare: len_18012022 ▾



✓ Able to merge. These branches can be automatically merged.



Len 18012022

Write

Preview

I changed the author's name and edited the plot bin width

H B I ≡ < > @ ↺ ↻

Attach files by dragging & dropping, selecting or pasting them.

Create pull request

ⓘ Remember, contributions to this repository should follow our GitHub Community Guidelines.



Reviewers

No reviews



Assignees

No one—assign yourself



Labels

None yet



Projects

None yet



Milestone

No milestone



Linked issues

Use [Closing keywords](#) in the description to automatically close issues

Len 18012022 #1

 weeleon wants to merge 2 commits into `main` from `len_18012022` 

 Conversation 0  Commits 2  Checks 0  Files changed 3




+19 -2



weeleon commented now

I changed the authors name and edited the plot bin width



weeleon added 2 commits 17 minutes ago



Len changed the bin width



Name change

e3ae04f

41e48dd

Add more commits by pushing to the `len_18012022` branch on `EPI4932-Clinical-Data-Science-Elective/Group_Sander_Maike_Len`.



Continuous integration has not been set up
GitHub Actions and several other apps can be used to automatically catch bugs and enforce style.



This branch has no conflicts with the base branch
Merging can be performed automatically.

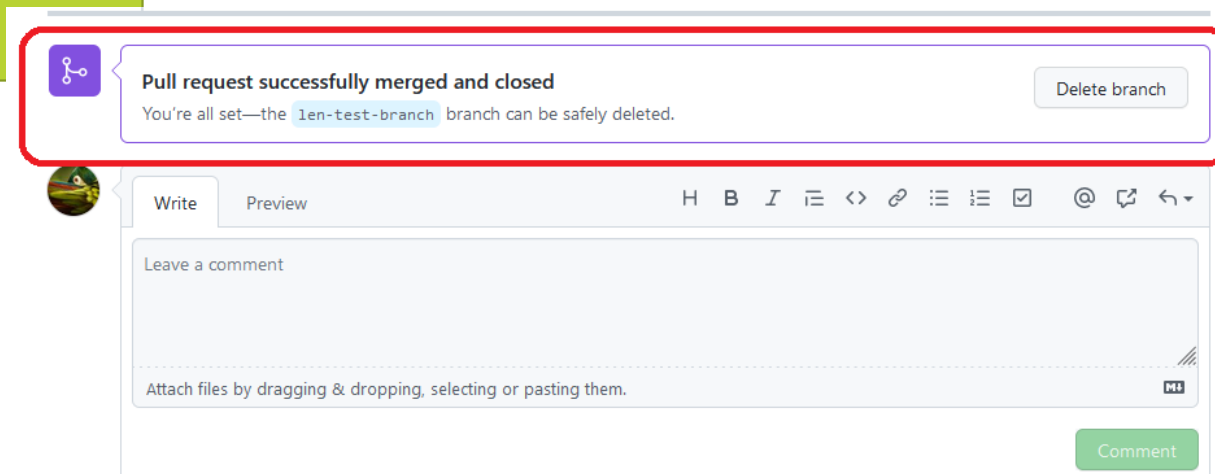
 Merge pull request 

You can also open this in GitHub Desktop or view command line instructions.

Reviewers	No reviews
Assignees	No one—assign yourself
Labels	None yet
Projects	None yet
Milestone	No milestone
Linked issues	Successfully merging this pull request may close these issues.
	None yet



- Check and resolve differences
- Merge branches into main
- **DELETE** the merged branches from GitHub!



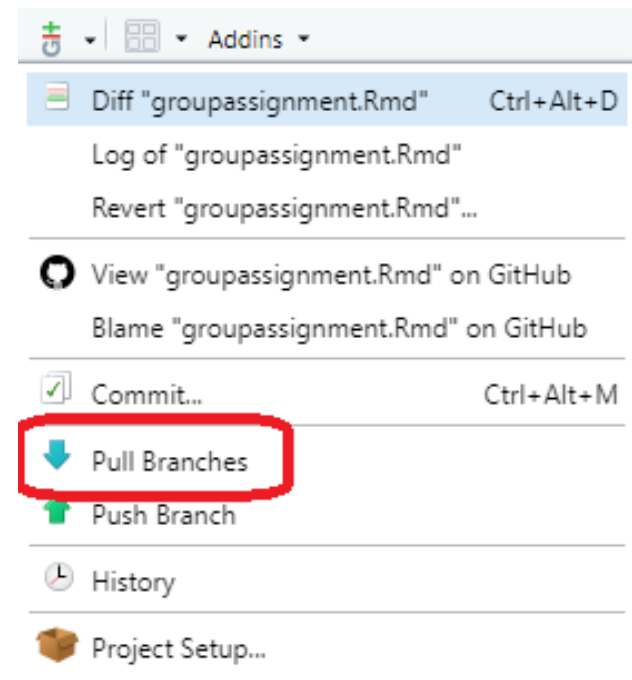
How to work with GitHub

- ✓ **First pull from a main version** or clone a project
- ✓ **Checkout a branch** of the main repo to do some edits
- ✓ Make your edits
- ✓ **Commit and push to the branch** version
- ✓ Review **changes**, **pull request** and **merge** back into main version
- ✓ **Delete obsolete branches in GitHub and on RStudio**
- ❑ **Pull from the main repo again** before starting a new cycle of work



**ACTION
TIME!**

- **git checkout main**
- **Git button -> blue arrow**
- **PULL** the recently solved main
- **git branch -d [your_obsolete_branch]**
- **git checkout -b [a_new_branch]**
- **Make changes to your project!**
- **Rinse repeat etc.**



How to work with GitHub

- ✓ **First pull from a main version** or clone a project
- ✓ **Checkout a branch** of the main repo to do some edits
- ✓ Make your edits
- ✓ **Commit and push to the branch** version
- ✓ Review **changes**, **pull request** and **merge** back into main version
- ✓ **Delete obsolete branches in GitHub and on Rstudio**
- ✓ **Pull from updated MAIN again** when starting a new cycle of work

Remember the git cycle

- 1. RStudio : **git checkout main** (if first time on a project, get new project from GitHub)
- 2. RStudio : First PULL (blue down arrow) from the MAIN branch, unless cloning new project
- 3. RStudio : **git branch -d [a_old_merged_branch]** (delete obsolete old branch, if any)
- 4. RStudio : **git checkout -b [the_new_branch]** (makes a new branch for current round of edits)
- 5. RStudio : Make whatever changes as you wish, commit and push (green up arrow)
 - **git push --set-upstream origin [the_new_branch]** (first time push of new branch, the green arrow may be greyed out)
- 6. GitHub : Create a pull request to merge your changes into main.
- 7. GitHub : Discuss and review changes in each branch then merge into the main.
- 8. GitHub : Delete all branches from GitHub leaving ONLY THE MAIN.
- 9. Repeat again from Step 1.

Some DO's and DON'Ts

- **DO use branches**
 - It seems like a chore until something goes wrong and then you wished you used branches
- **DON'T edit in main branch directly!**
 - It seems like a pain until something goes wrong and you badly mess up your colleagues
- **DO develop the habit of working in RStudio with GitHub version control**
 - RStudio integration with GitHub seems a little weird at times, but it is improving
 - **Group Git repo MUST SHOW AN AUDIT TRAIL of individual contribution(s) plus group abstract.**
- **DO keep things relatively simple for now**
 - We have not touched on reverts and many other (quite complicated) git actions.
- **DO look up the internet and ask for help**
 - GitHub and R are very popular, so someone somewhere knows how to do what you want



KNOWLEDGE CHECK

(1)



**USE VERSION CONTROL TO
TRACK CHANGES IN WORK**



CREATE, SHARE AND MERGE
CONTENT WITH GITHUB



INTEGRATE GITHUB WITH
RSTUDIO

(2)



**USE VERSION CONTROL TO
TRACK CHANGES IN WORK**



**CREATE, SHARE AND MERGE
CONTENT WITH GITHUB**



**INTEGRATE GITHUB WITH
RSTUDIO**

(3)



**USE VERSION CONTROL TO
TRACK CHANGES IN WORK**



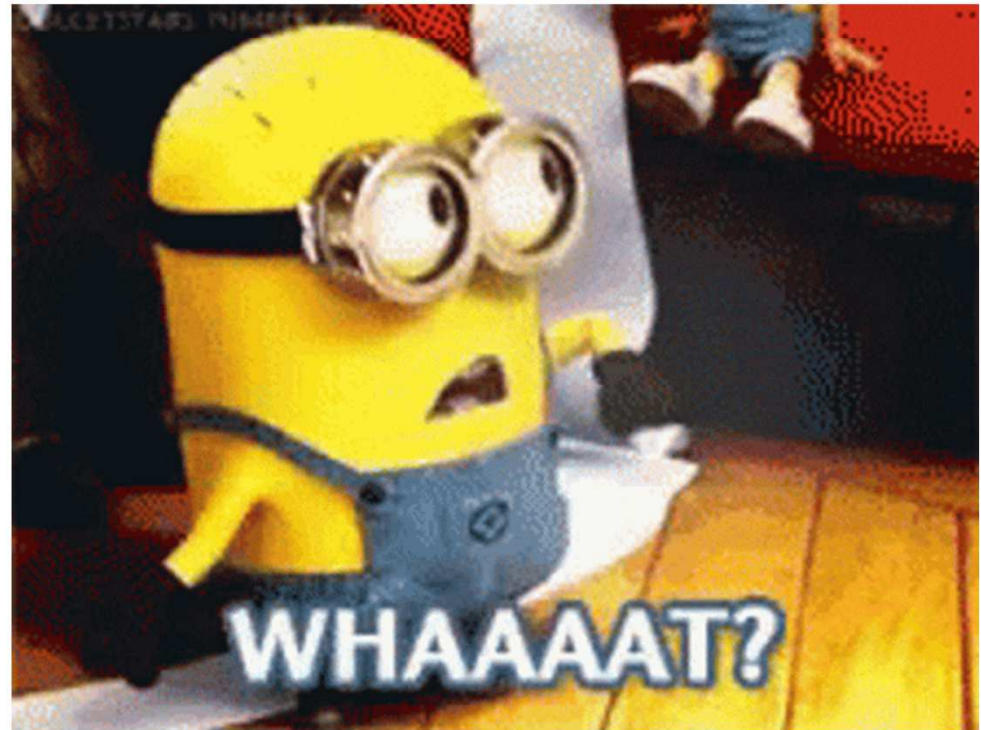
**CREATE, SHARE AND MERGE
CONTENT WITH GITHUB**



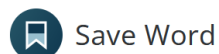
**INTEGRATE GITHUB WITH
RSTUDIO**

Questions??

**You will be using GitHub
and RStudio to complete
your group assignment.**



git noun



\ 'git \

Definition of *git* (Entry 1 of 2)

British

: a foolish or worthless person

git

Definition of *git* (Entry 2 of 2)

dialectal variant of GET

Synonyms for *git*

Synonyms: Noun

berk [*British*], booby, charlie (*also* charley) [*British*], cuckoo, ding-a-ling, ding-dong, dingbat, dipstick, doofus [*slang*], featherhead, fool, goose, half-wit, jackass, lunatic, mooncalf, nincompoop, ninny, ninnyhammer, nit [*chiefly British*], nitwit, nut, nutcase, simp, simpleton, turkey, yo-yo

Extra lesson:
**English slang for
non-native
speakers**

Just for fun only ...

Thank you for
your attention
today!