

Introduction to Git and Github

By Tobias Elsässer

24.10.2022

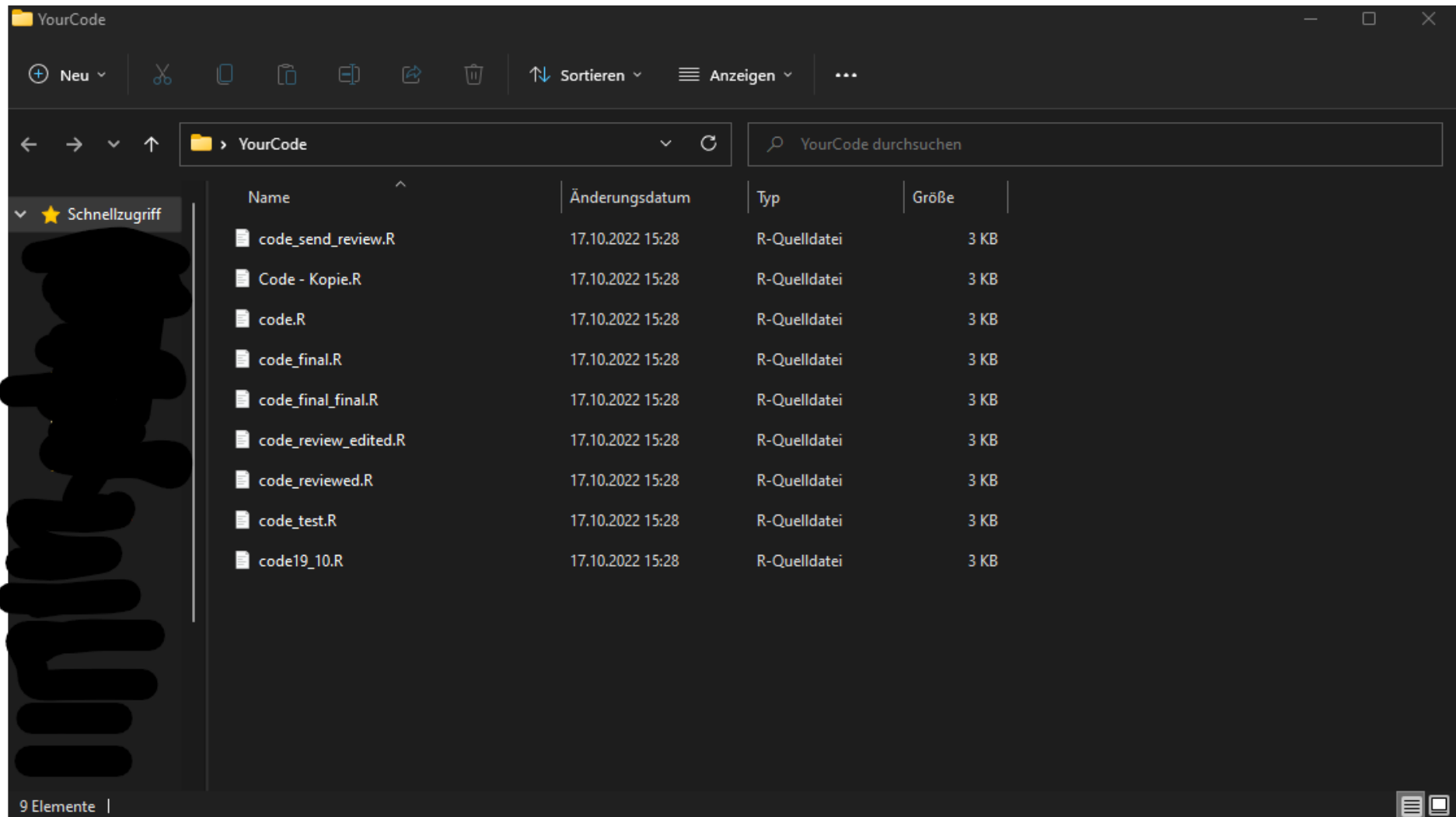
What is GIT?

- Version control software
→ track changes made in files
- Free and open source

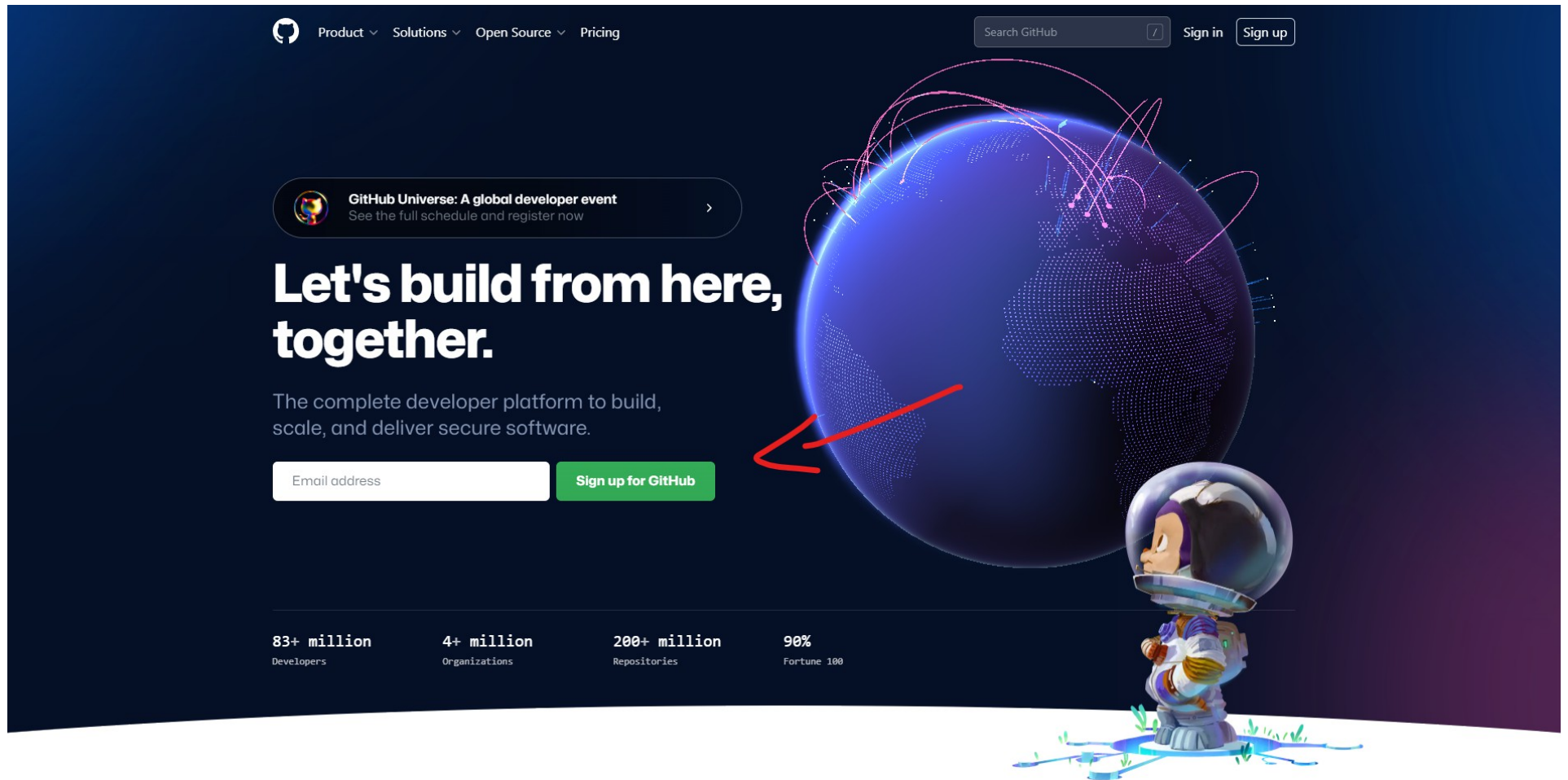
What is Github?

- Website where you can store your code
-
- Can be used to share your code or work on the same code with others

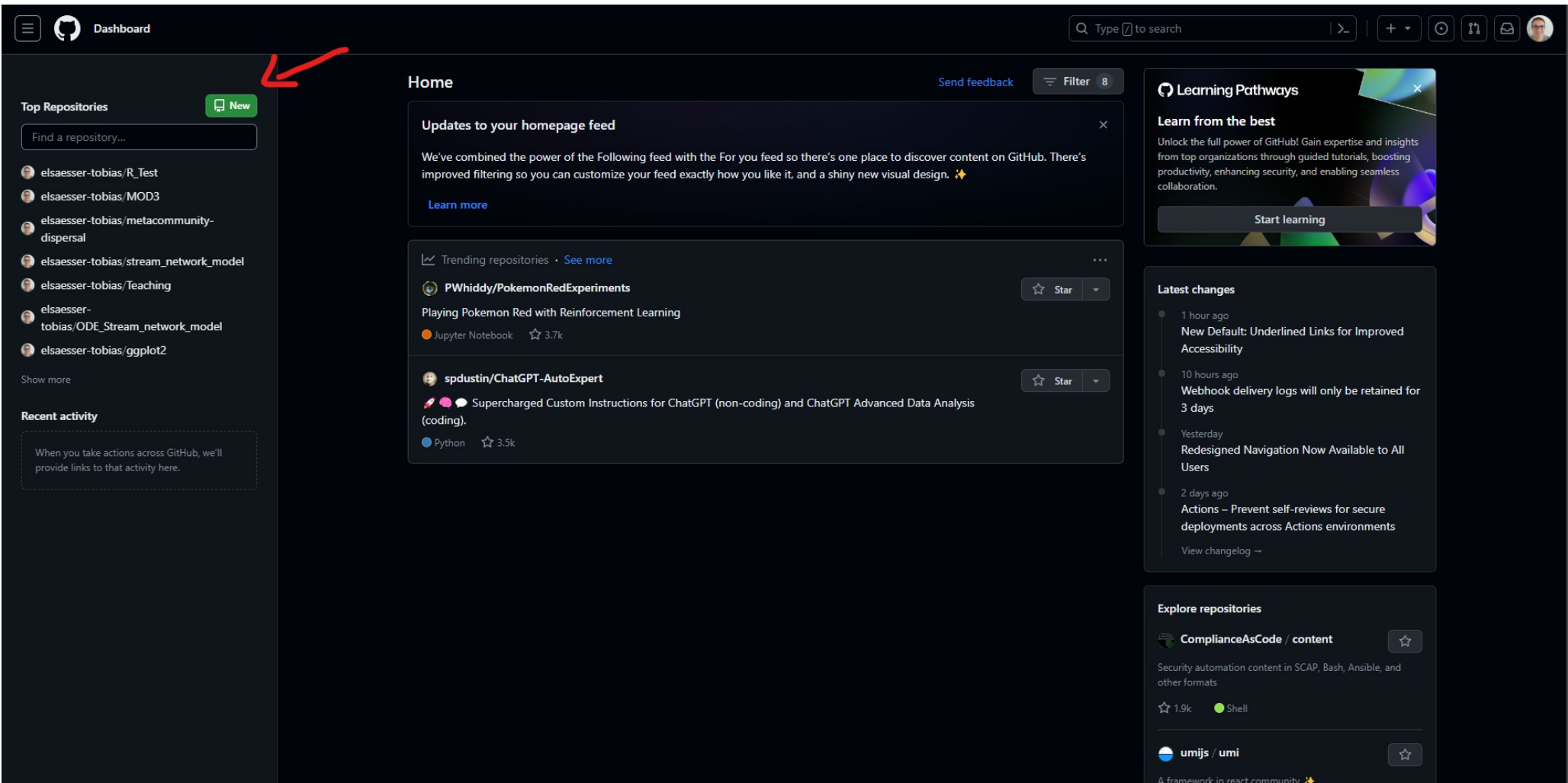
Why version control?



Github



Github – Create a Repository



The screenshot shows the GitHub Dashboard interface. A red arrow points to the 'New' button in the 'Top Repositories' section. The dashboard includes a search bar, a 'Dashboard' header, and several sections: 'Top Repositories' with a list of repositories, 'Recent activity' with a placeholder for activity links, 'Home' with updates to the homepage feed, 'Trending repositories' with a list of popular repositories, 'Learning Pathways' with a 'Start learning' button, 'Latest changes' with a list of recent updates, and 'Explore repositories' with a list of featured repositories.

Top Repositories

Find a repository...

- elsaesser-tobias/R_Test
- elsaesser-tobias/MOD3
- elsaesser-tobias/metacommunity-dispersal
- elsaesser-tobias/stream_network_model
- elsaesser-tobias/Teaching
- elsaesser-tobias/ODE_Stream_network_model
- elsaesser-tobias/ggplot2

Show more

Recent activity

When you take actions across GitHub, we'll provide links to that activity here.

Home

Send feedback Filter 8

Updates to your homepage feed

We've combined the power of the Following feed with the For you feed so there's one place to discover content on GitHub. There's improved filtering so you can customize your feed exactly how you like it, and a shiny new visual design. ✨

[Learn more](#)

Trending repositories · [See more](#)

- PWhiddy/PokemonRedExperiments** Star
Playing Pokemon Red with Reinforcement Learning
Jupyter Notebook 3.7k
- spdustin/ChatGPT-AutoExpert** Star
Supercharged Custom Instructions for ChatGPT (non-coding) and ChatGPT Advanced Data Analysis (coding).
Python 3.5k

Learning Pathways

Learn from the best

Unlock the full power of GitHub! Gain expertise and insights from top organizations through guided tutorials, boosting productivity, enhancing security, and enabling seamless collaboration.

[Start learning](#)

Latest changes

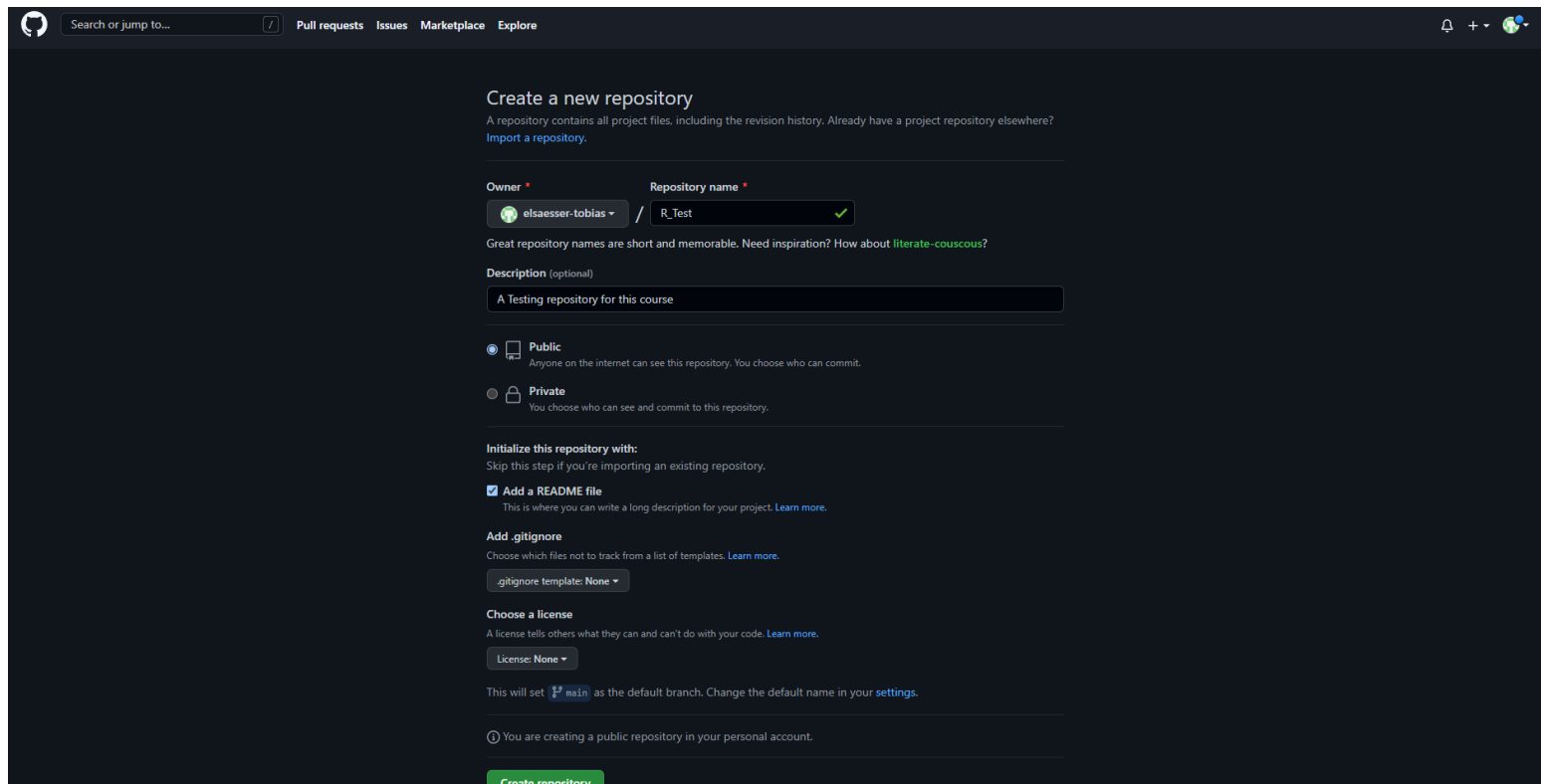
- 1 hour ago
New Default: Underlined Links for Improved Accessibility
- 10 hours ago
Webhook delivery logs will only be retained for 3 days
- Yesterday
Redesigned Navigation Now Available to All Users
- 2 days ago
Actions – Prevent self-reviews for secure deployments across Actions environments

[View changelog](#)

Explore repositories

- ComplianceAsCode / content** Star
Security automation content in SCAP, Bash, Ansible, and other formats
1.9k Shell
- umijs / umi** Star
A framework in react community ✨

Github – Create a Repository



The screenshot shows the GitHub 'Create a new repository' page. At the top, there's a navigation bar with the GitHub logo, a search bar, and links for 'Pull requests', 'Issues', 'Marketplace', and 'Explore'. The main heading is 'Create a new repository', followed by a subtext: 'A repository contains all project files, including the revision history. Already have a project repository elsewhere? [Import a repository.](#)'

The form fields include:

- Owner:** A dropdown menu showing 'elsaesser-tobias'.
- Repository name:** A text input field containing 'R_Test' with a green checkmark icon to its right.
- Description (optional):** A text input field containing 'A Testing repository for this course'.
- Visibility:** Two radio buttons. The 'Public' option is selected, with the description 'Anyone on the internet can see this repository. You choose who can commit.' The 'Private' option is unselected, with the description 'You choose who can see and commit to this repository.'
- Initialize this repository with:** A section with the text 'Skip this step if you're importing an existing repository.' and a checked checkbox for 'Add a README file' with the subtext 'This is where you can write a long description for your project. [Learn more.](#)'
- Add .gitignore:** A section with the text 'Choose which files not to track from a list of templates. [Learn more.](#)' and a dropdown menu showing '.gitignore template: None'.
- Choose a license:** A section with the text 'A license tells others what they can and can't do with your code. [Learn more.](#)' and a dropdown menu showing 'License: None'.

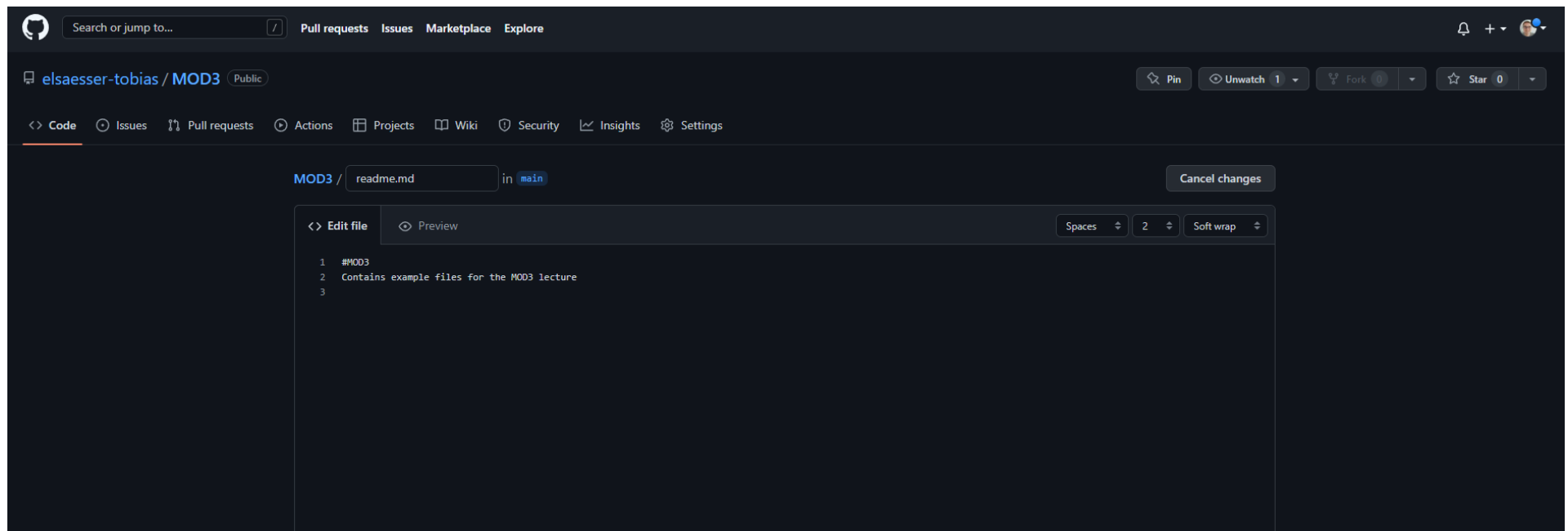
Below the form, there's a note: 'This will set `main` as the default branch. Change the default name in your [settings](#).'

At the bottom, there's a green button labeled 'Create repository'.

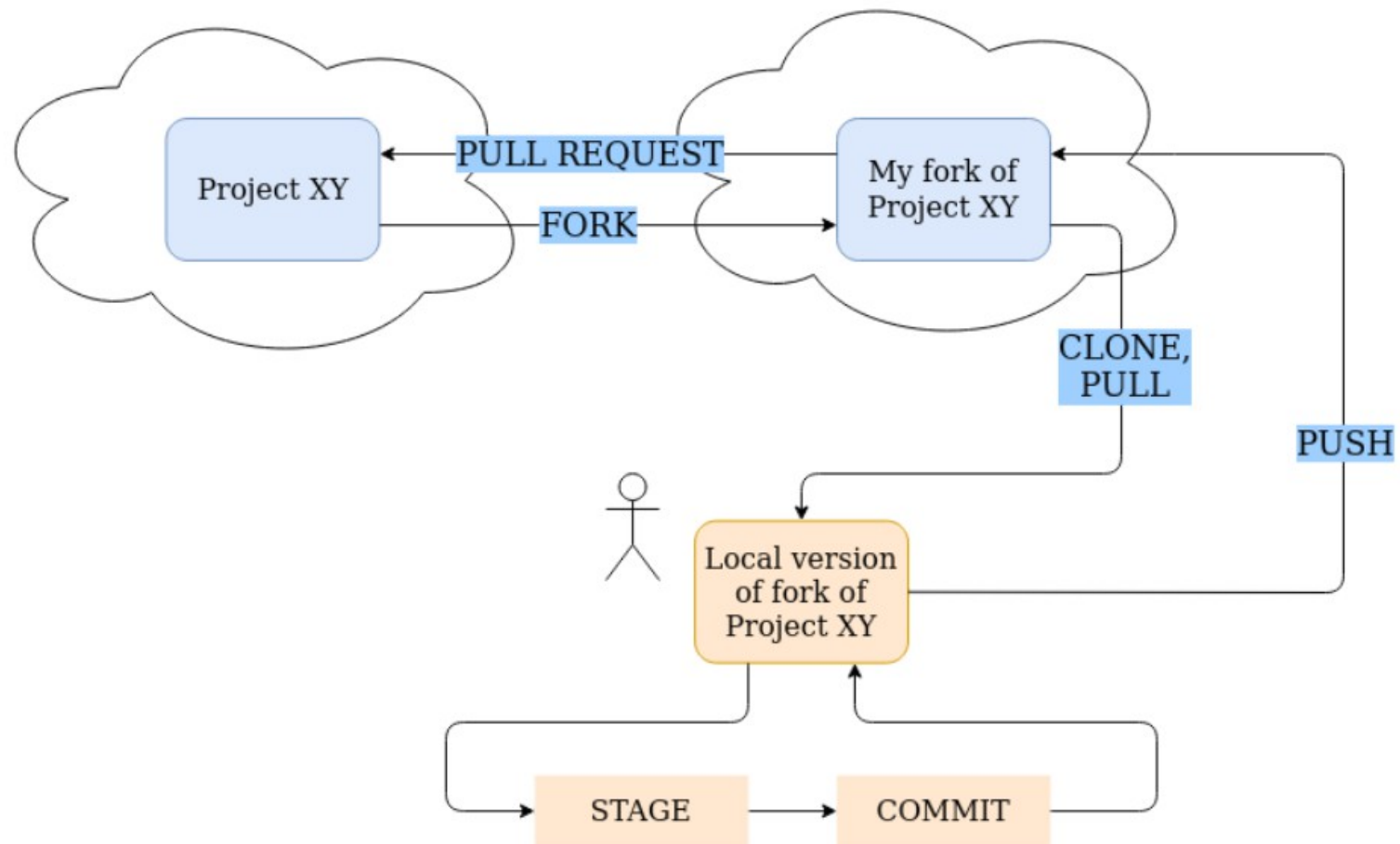
Github – readme.md

The screenshot displays the GitHub interface for a repository named 'MOD3' by the user 'elsaesser-tobias'. The repository is public and has 0 stars, 0 forks, and 1 watcher. The 'readme.md' file is highlighted, showing its content: '#MOD3 Contains example files for the MOD3 lecture'. A red arrow points to the edit icon (pencil) next to the file name 'readme.md' in the file list. The right sidebar shows the 'About' section with the description 'Example repo for MOD3 lecture' and the 'Releases' and 'Packages' sections, both indicating no published items.

Github – readme.md



Git/Github Workflow

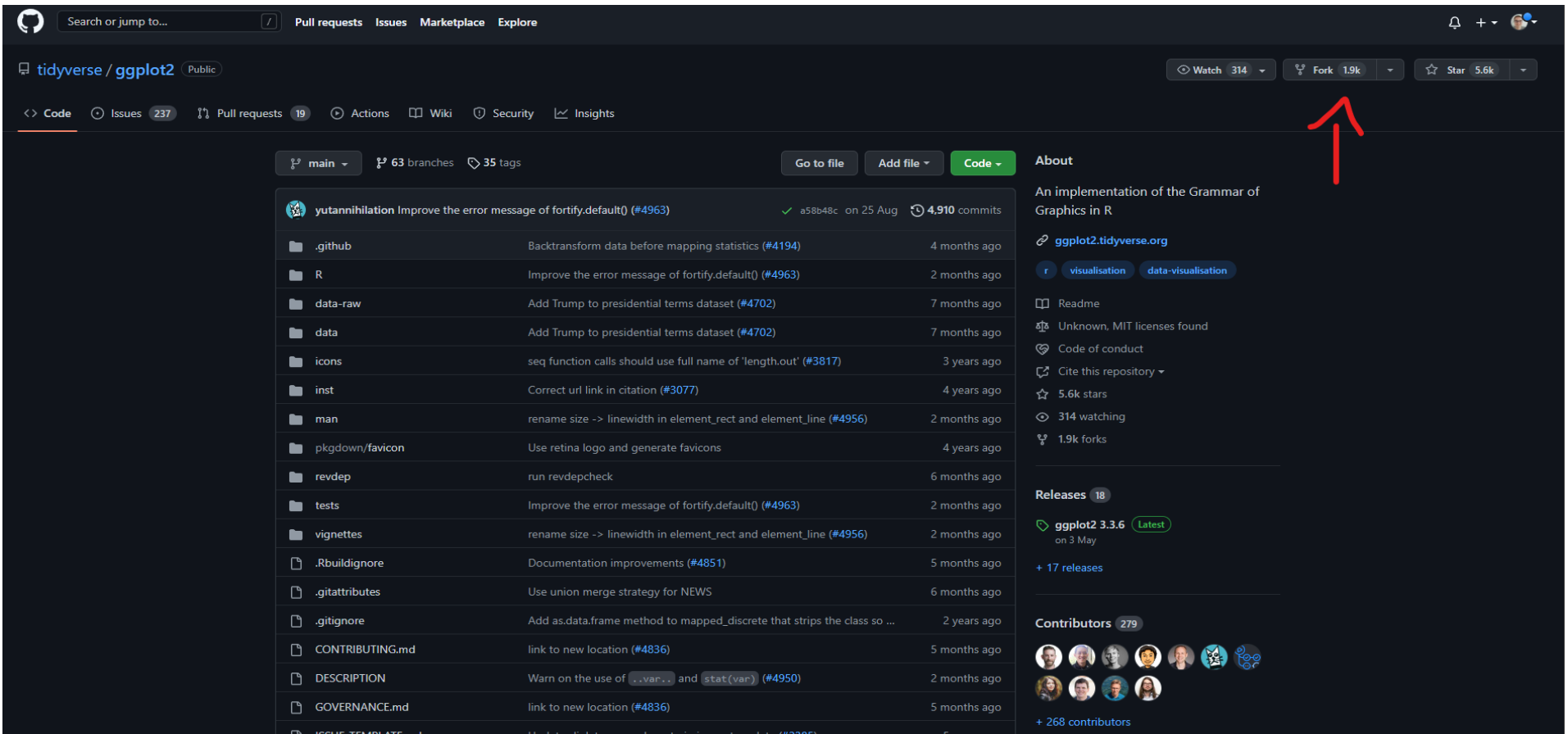


Git/Github commands

- Fork: copy someone else's repository and be able make changes on the copy

Git/Github commands

- Fork: copy someone else's repository and be able make changes on the copy



The screenshot shows the GitHub repository page for `tidyverse/ggplot2`. The repository is public and has 314 watchers, 1.9k forks, and 5.6k stars. The page includes tabs for Code, Issues (237), Pull requests (19), Actions, Wiki, Security, and Insights. The main content area displays a list of recent commits and a file explorer. A red arrow points to the 'Fork' button in the top right corner.

Search or jump to... Pull requests Issues Marketplace Explore

tidyverse / ggplot2 Public

Watch 314 Fork 1.9k Star 5.6k

Code Issues 237 Pull requests 19 Actions Wiki Security Insights

main 63 branches 35 tags

Go to file Add file Code

About

An implementation of the Grammar of Graphics in R

ggplot2.tidyverse.org

visualisation data-visualisation

Readme

Unknown, MIT licenses found

Code of conduct

Cite this repository

5.6k stars

314 watching

1.9k forks

Releases 18

ggplot2 3.3.6 Latest on 3 May

+ 17 releases

Contributors 279

+ 268 contributors

Commit	Message	Time
yutannihilation	Improve the error message of <code>fortify.default()</code> (#4963)	4 months ago
	Backtransform data before mapping statistics (#4194)	4 months ago
	Improve the error message of <code>fortify.default()</code> (#4963)	2 months ago
	Add Trump to presidential terms dataset (#4702)	7 months ago
	Add Trump to presidential terms dataset (#4702)	7 months ago
	seq function calls should use full name of 'length.out' (#3817)	3 years ago
	Correct url link in citation (#3077)	4 years ago
	rename size -> linewidth in <code>element_rect</code> and <code>element_line</code> (#4956)	2 months ago
	Use retina logo and generate favicons	4 years ago
	run revdepcheck	6 months ago
	Improve the error message of <code>fortify.default()</code> (#4963)	2 months ago
	rename size -> linewidth in <code>element_rect</code> and <code>element_line</code> (#4956)	2 months ago
	Documentation improvements (#4851)	5 months ago
	Use union merge strategy for NEWS	6 months ago
	Add <code>as.data.frame</code> method to <code>mapped_discrete</code> that strips the class so ...	2 years ago
	link to new location (#4836)	5 months ago
	Warn on the use of <code>..var..</code> and <code>stat(var)</code> (#4950)	2 months ago
	link to new location (#4836)	5 months ago
	Updates link to refer how to in issues template (#2385)	5 years ago

Git/Github commands

- Fork: copy someone else's repository and be able make changes on the copy

The screenshot shows the GitHub interface for a repository named 'elsaesser-tobias/ggplot2', which is a fork of 'tidyverse/ggplot2'. The repository is public and has 0 stars and 0 forks. The main branch is 'main', and it is up to date with the upstream repository. The repository contains 4,910 commits and 1 branch. The file list on the left includes .github, R, data-raw, data, icons, inst, man, pkgdown/favicon, revdep, tests, vignettes, .Rbuildignore, .gitattributes, .gitignore, and CONTRIBUTING.md. The right sidebar shows the repository's description, links to the README, license, and code of conduct, and a section for releases and packages.

Search or jump to...

Pull requests Issues Marketplace Explore

elsaesser-tobias / ggplot2 Public

forked from tidyverse/ggplot2

Pin Watch 0 Fork 1.5k Star 0

Code Pull requests Actions Projects Wiki Security Insights Settings

main 1 branch 0 tags

This branch is up to date with tidyverse/ggplot2:main. Contribute Sync fork

yutannihilation Improve the error message of fortify.default() (tidyverse#4963) a58b48c on 25 Aug 4,910 commits

.github	Backtransform data before mapping statistics (tidyverse#4194)	4 months ago
R	Improve the error message of fortify.default() (tidyverse#4963)	2 months ago
data-raw	Add Trump to presidential terms dataset (tidyverse#4702)	7 months ago
data	Add Trump to presidential terms dataset (tidyverse#4702)	7 months ago
icons	seq function calls should use full name of 'length.out' (tidyverse#3817)	3 years ago
inst	Correct url link in citation (tidyverse#3077)	4 years ago
man	rename size -> linewidth in element_rect and element_line (tidyverse#...	2 months ago
pkgdown/favicon	Use retina logo and generate favicons	4 years ago
revdep	run revdepcheck	6 months ago
tests	Improve the error message of fortify.default() (tidyverse#4963)	2 months ago
vignettes	rename size -> linewidth in element_rect and element_line (tidyverse#...	2 months ago
.Rbuildignore	Documentation improvements (tidyverse#4851)	5 months ago
.gitattributes	Use union merge strategy for NEWS	6 months ago
.gitignore	Add as.data.frame method to mapped_discrete that strips the class so ...	2 years ago
CONTRIBUTING.md	link to new location (tidyverse#4836)	5 months ago

About

An implementation of the Grammar of Graphics in R

ggplot2.tidyverse.org

Readme View license Code of conduct Cite this repository 0 stars 0 watching 1.9k forks

Releases

No releases published Create a new release

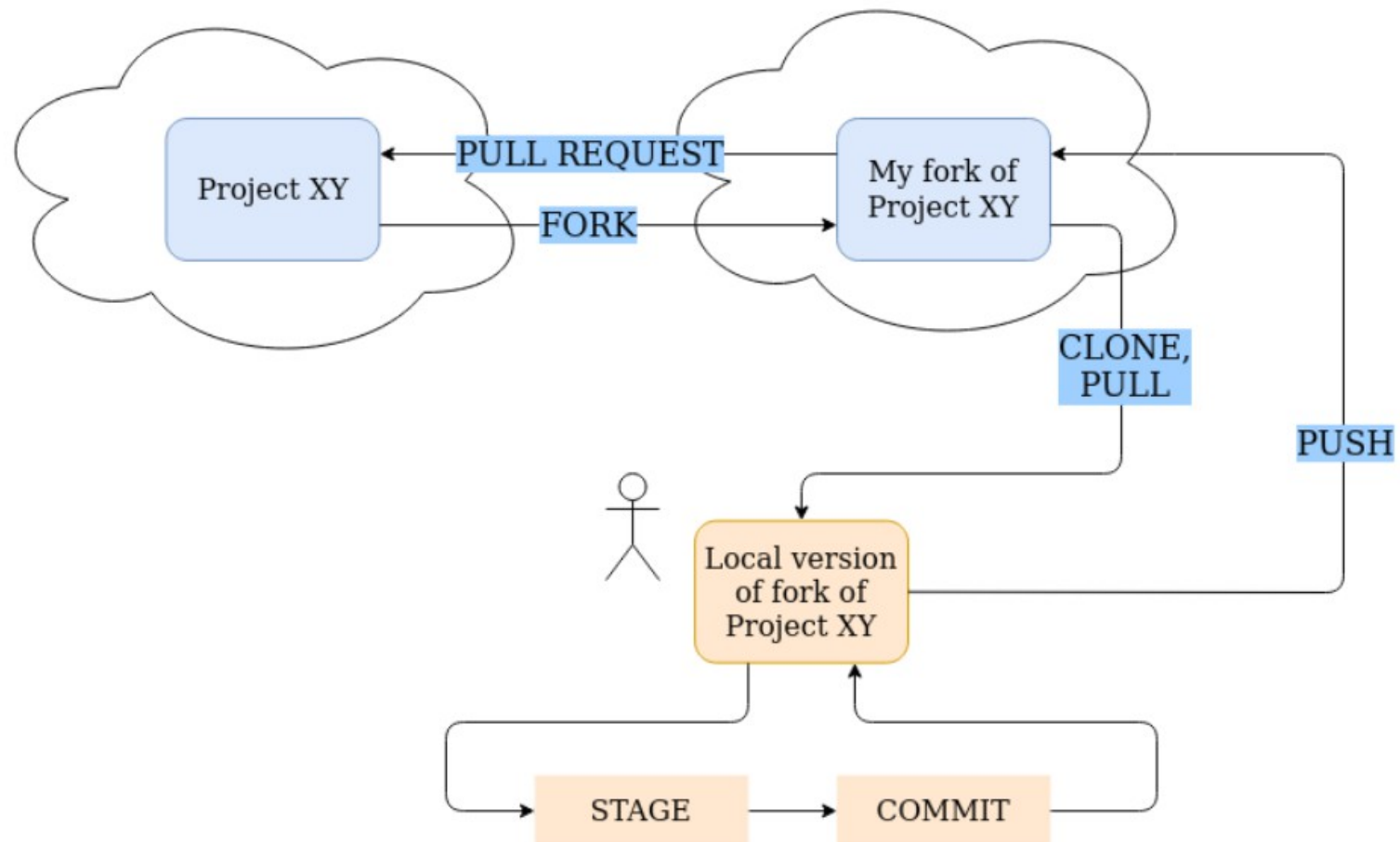
Packages

No packages published Publish your first package

Languages

R 100.0%

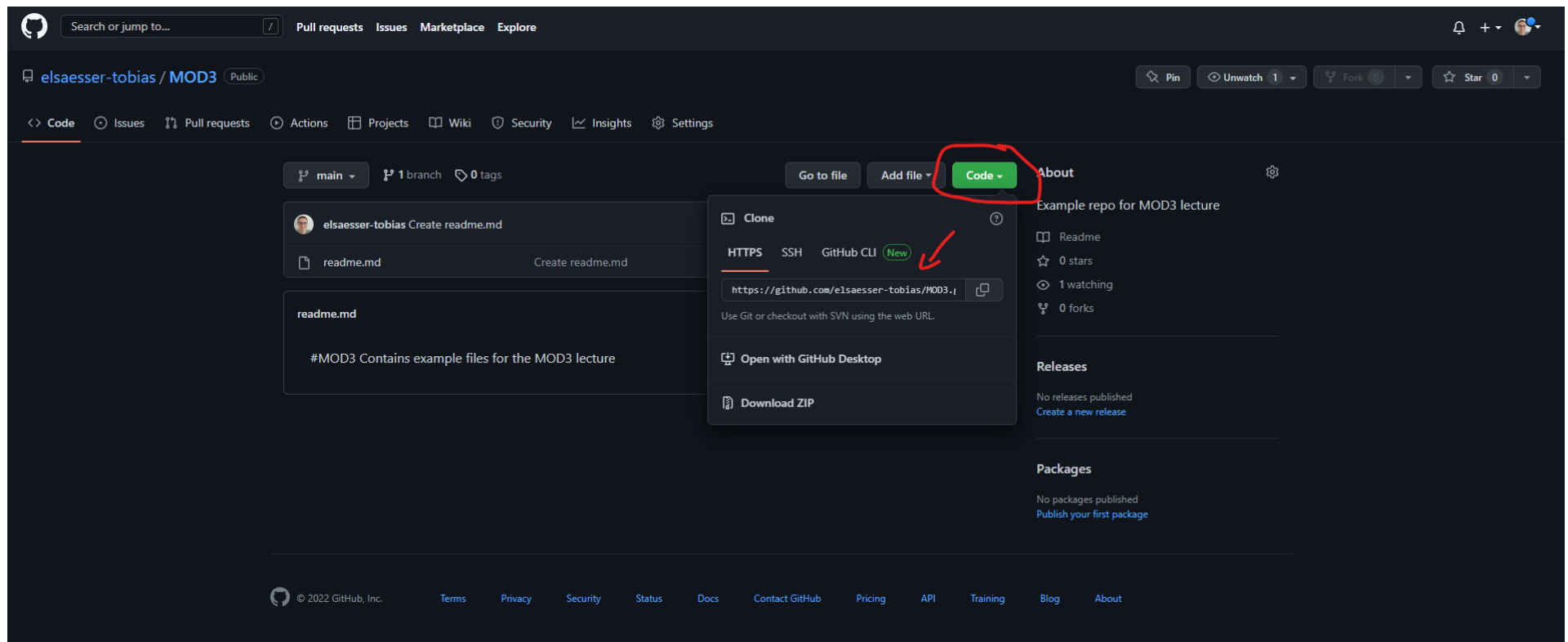
Git/Github Workflow



Git/Github commands

- Fork: copy someone else's repository and be able make changes on the copy
- Clone: bring a repository from Github to your local computer

Git clone



Git clone

```
elsae@Elsaesser-PC MINGW64 ~
$ cd C:/Users/elsae/Documents/GIT_Repo

elsae@Elsaesser-PC MINGW64 ~/Documents/GIT_Repo
$ ls

elsae@Elsaesser-PC MINGW64 ~/Documents/GIT_Repo
$ git clone https://github.com/elsaesser-tobias/MOD3.git
Cloning into 'MOD3'...
remote: Enumerating objects: 14, done.
remote: Counting objects: 100% (14/14), done.
remote: Compressing objects: 100% (7/7), done.
remote: Total 14 (delta 0), reused 0 (delta 0), pack-reused 0
Receiving objects: 100% (14/14), done.

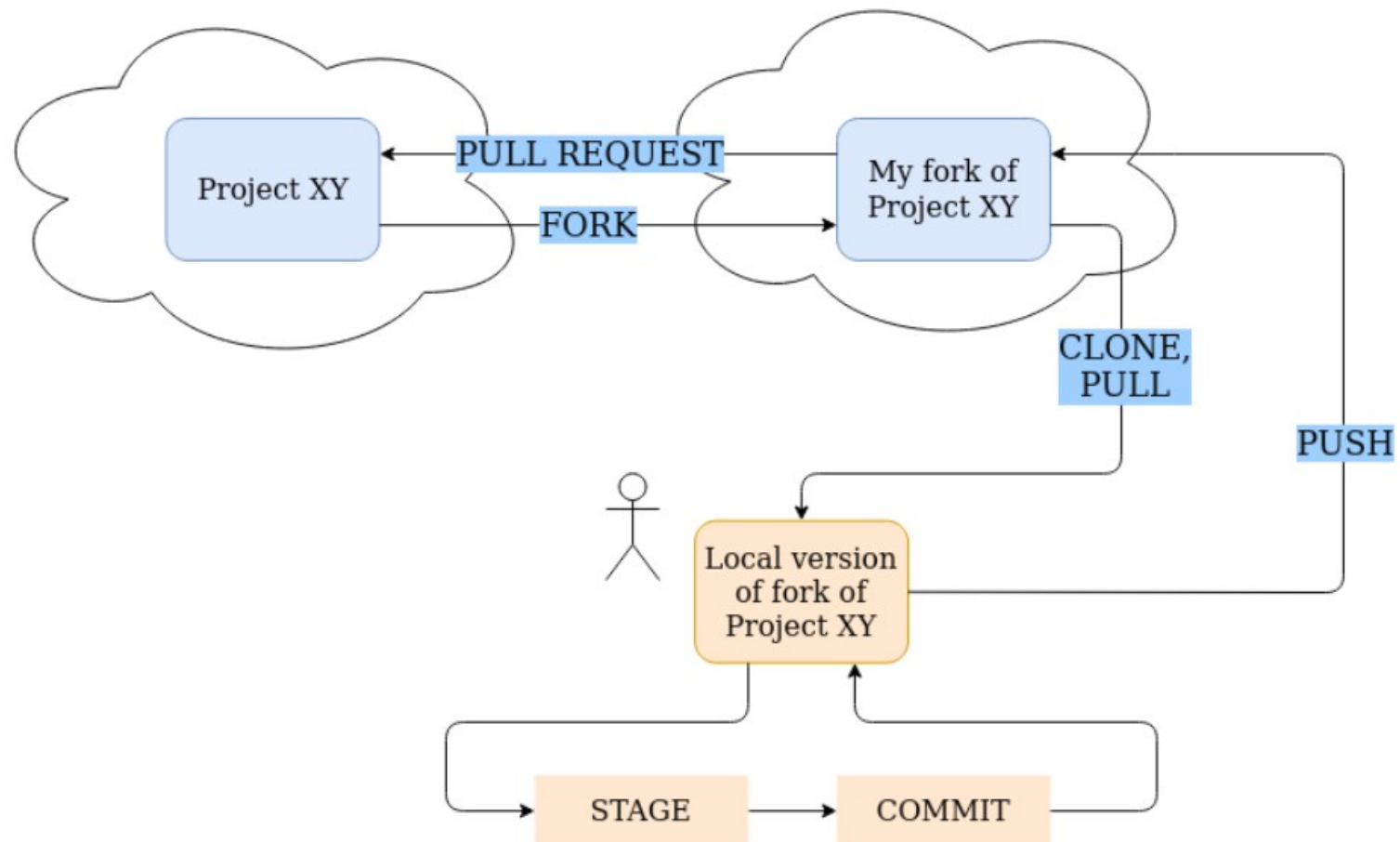
elsae@Elsaesser-PC MINGW64 ~/Documents/GIT_Repo
$ ls
MOD3/

elsae@Elsaesser-PC MINGW64 ~/Documents/GIT_Repo
$ cd MOD3/

elsae@Elsaesser-PC MINGW64 ~/Documents/GIT_Repo/MOD3 (main)
$ ls
readme.md

elsae@Elsaesser-PC MINGW64 ~/Documents/GIT_Repo/MOD3 (main)
$ ..
```

Git/Github Workflow



Git/Github commands

- Fork: copy someone else's repository and be able make changes on the copy
- Clone: bring a repository from Github to your local computer
- Add: used to stage your files
 - track your files and changes made
- Commit: commits the changes you have made

Git add

```
elsae@Elsaesser-PC MINGW64 ~/Documents/GIT_Repo/MOD3 (main)
$ git status
On branch main
Your branch is up to date with 'origin/main'.

Changes not staged for commit:
  (use "git add <file>..." to update what will be committed)
  (use "git restore <file>..." to discard changes in working directory)
        modified:   readme.md

no changes added to commit (use "git add" and/or "git commit -a")

elsae@Elsaesser-PC MINGW64 ~/Documents/GIT_Repo/MOD3 (main)
$ git add readme.md

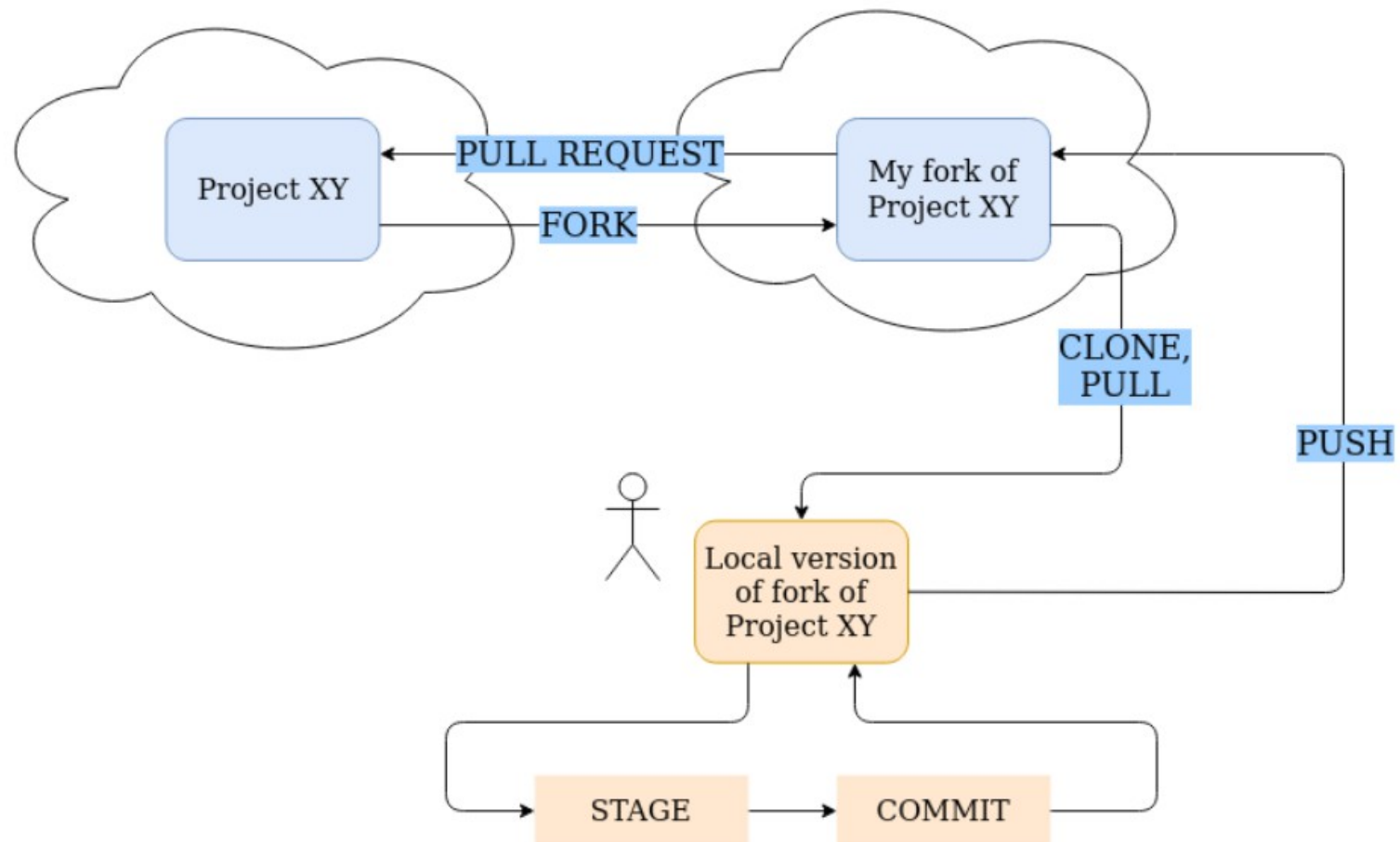
elsae@Elsaesser-PC MINGW64 ~/Documents/GIT_Repo/MOD3 (main)
$ git status
On branch main
Your branch is up to date with 'origin/main'.

Changes to be committed:
  (use "git restore --staged <file>..." to unstage)
        modified:   readme.md
```

Git commit

```
elsae@Elsaesser-PC MINGW64 ~/Documents/GIT_Repo/MOD3 (main)
$ git commit -m "Your meaningful message"
[main c088555] Your meaningful message
1 file changed, 1 insertion(+)
```

Git/Github Workflow



Git/Github commands

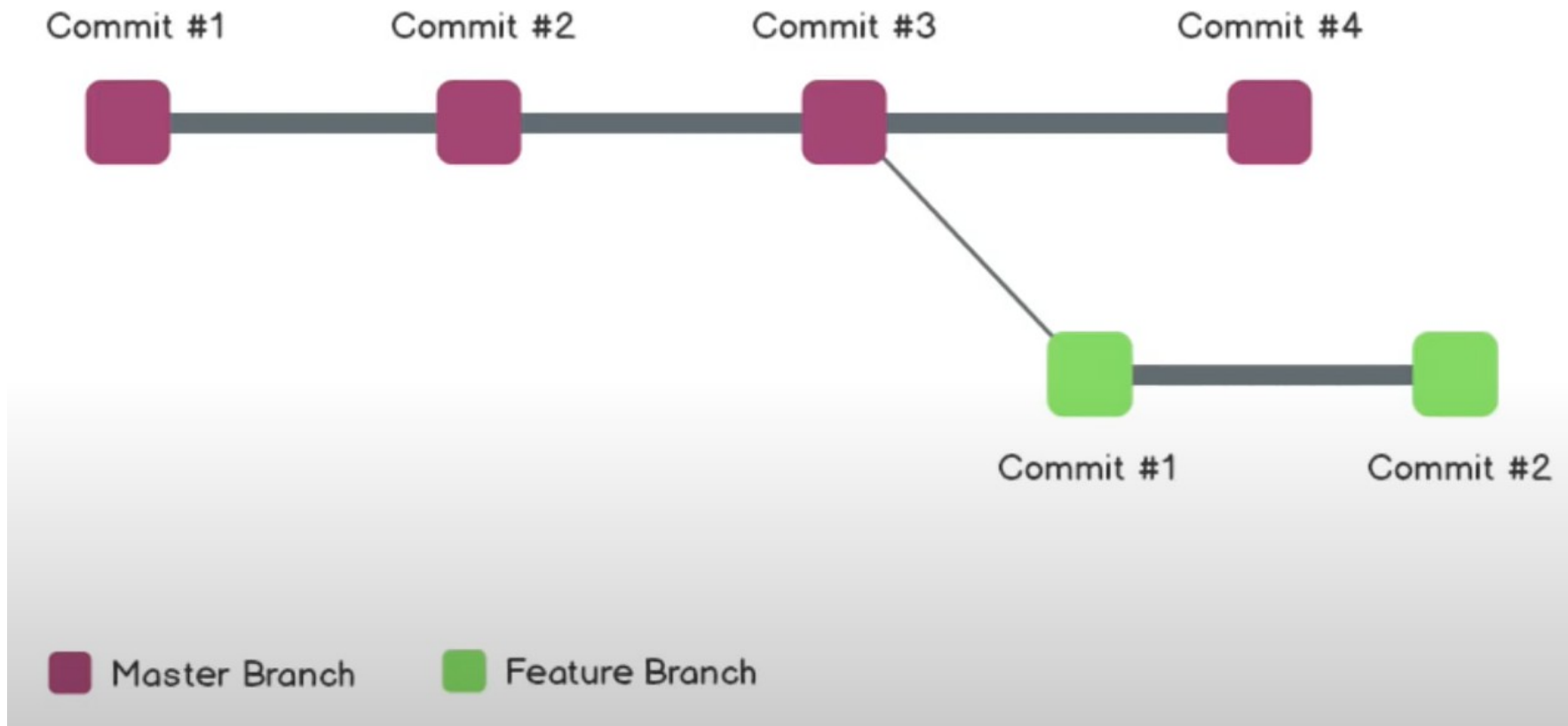
- Fork: copy someone else's repository and be able make changes on the copy
- Clone: bring a repository from Github to your local computer
- Add: used to stage your files
 - track your files and changes made
- Commit: commits the changes you have made
- Push: upload your changes to Github
- Pull: download changes from Github to your computer

Git Branching

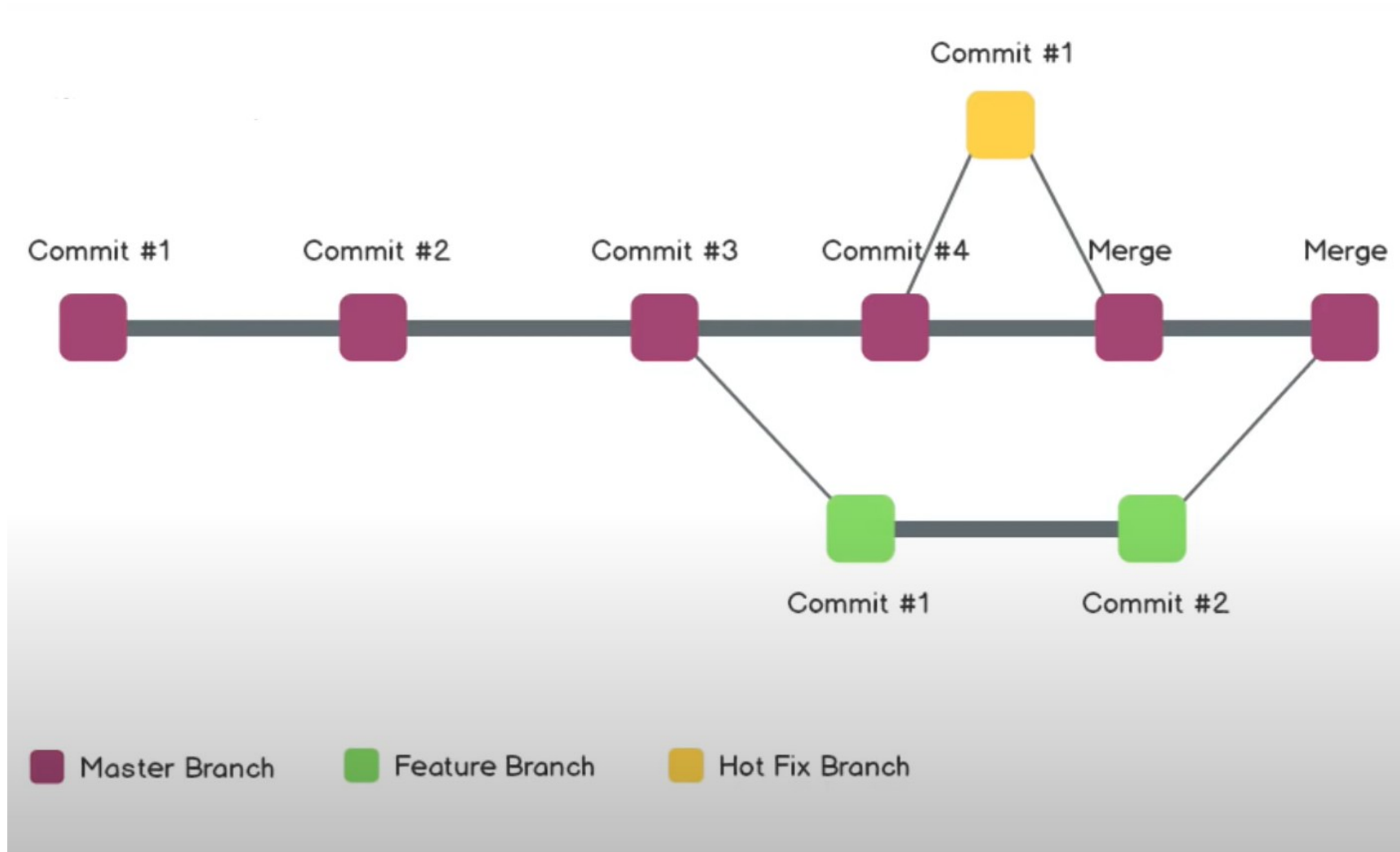


Git Branching

Git Branching



Git Branching



Git Branching

```
elsae@Elsaesser-PC MINGW64 ~/Documents/GIT_Repo/MOD3 (main)
$ git branch
* main

elsae@Elsaesser-PC MINGW64 ~/Documents/GIT_Repo/MOD3 (main)
$ git checkout -b new-feature
Switched to a new branch 'new-feature'

elsae@Elsaesser-PC MINGW64 ~/Documents/GIT_Repo/MOD3 (new-feature)
$ git checkout main
Switched to branch 'main'
Your branch is ahead of 'origin/main' by 1 commit.
  (use "git push" to publish your local commits)

elsae@Elsaesser-PC MINGW64 ~/Documents/GIT_Repo/MOD3 (main)
$ git branch
* main
  new-feature

elsae@Elsaesser-PC MINGW64 ~/Documents/GIT_Repo/MOD3 (main)
$ :
```

Git Branching

```
elsae@Elsaesser-PC MINGW64 ~/Documents/GIT_Repo/MOD3 (new_feature)
$ git diff main
diff --git a/readme.md b/readme.md
index 523e446..e9a41ca 100644
--- a/readme.md
+++ b/readme.md
@@ -1,6 +1,6 @@
 #MOD3
 This is an example readme file for the MOD3 lecture.

-The current date is 21.10.2022

 Please add your comment below:
+Any comment
```

Git merge

```
elsae@Elsaesser-PC MINGW64 ~/Documents/GIT_Repo/MOD3 (main)
$ git merge new-feature
Updating 137c306..93fba56
Fast-forward
 readme.md | 1 +
 1 file changed, 1 insertion(+)
```

Merge locally

```
elsae@Elsaesser-PC MINGW64 ~/Documents/GIT_Repo/MOD3 (new-feature)
$ git push --set-upstream origin new-feature
Enumerating objects: 15, done.
Counting objects: 100% (15/15), done.
Delta compression using up to 16 threads
Compressing objects: 100% (8/8), done.
Writing objects: 100% (11/11), 1.27 KiB | 1.27 MiB/s, done.
Total 11 (delta 2), reused 0 (delta 0), pack-reused 0
remote: Resolving deltas: 100% (2/2), completed with 1 local object.
remote:
remote: Create a pull request for 'new-feature' on GitHub by visiting:
remote:   https://github.com/elsaesser-tobias/MOD3/pull/new/new-feature
remote:
To https://github.com/elsaesser-tobias/MOD3.git
 * [new branch]      new-feature -> new-feature
branch 'new-feature' set up to track 'origin/new-feature'.
```

Create new branch on Github

Git undo changes

```
$ git log
commit 93fba56355cd7751004cb91a1196c93f70de75af (HEAD -> new-feature, origin/new-feature, main)
Author: Tobias Elsässer <elsaesser.tobias@web.de>
Date: Thu Oct 20 14:48:05 2022 +0200

    Added a line

commit 137c306c78c5a7c5db95fb2e0ee2808240946d18
Merge: ca8e8ca e80e5f2
Author: Tobias Elsässer <elsaesser.tobias@web.de>
Date: Thu Oct 20 14:42:16 2022 +0200

    Merge branch 'main' of https://github.com/elsaesser-tobias/MOD3

commit ca8e8ca5ba1538d90298ee36950e93522561ab71
Author: Tobias Elsässer <elsaesser.tobias@web.de>
Date: Thu Oct 20 14:42:07 2022 +0200

    Changed
```

Git undo changes

```
elsae@Elsaesser-PC MINGW64 ~/Documents/GIT_Repo/MOD3 (new-feature)
$ git reset HEAD

elsae@Elsaesser-PC MINGW64 ~/Documents/GIT_Repo/MOD3 (new-feature)
$ git reset c08855585e1b278a2b8f3ac8895a8978d9c06b6e
Unstaged changes after reset:
M      readme.md
```

Additional Information

- Git GUI: Many graphical user interfaces available
- Git integrated in a lot of coding platforms, i.e. VisualStudioCode, Rstudio
- R has the packages gert and usethis for easy Git usage

Thank you for your attention!

- Slides available at:
- <https://github.com/elsaesser-tobias/Teaching>

Tobias Elsässer

Quantitative Landscape Ecology, SystemLink

RPTU

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DFG Deutsche
Forschungsgemeinschaft
German Research Foundation



RPTU

Resources

- Youtube: freeCodeCamp.org
- <https://docs.github.com/en/get-started/quickstart/hello-world>
- <https://support.rstudio.com/hc/en-us/articles/200532077-Version-Control-with-Git-and-SVN>
- <https://ohshitgit.com/>
- <https://docs.github.com/en/authentication/connecting-to-github-with-ssh/adding-a-new-ssh-key-to-your-github-account>

Tasks 1 – Working with Github

- Create a Github account if you don't have one
- Create a new repository on your account
- Create a readme.md file
- Change the readme file on Github
- Commit the changes and inspect them

Tasks 2 – Working with Git

- Fork my Github repository:
<https://github.com/elsaesser-tobias/MOD3>
- Clone the repository to your local computer
- Change the date mentioned in the file to the correct one
- Stage and commit your changes

Tasks 3 – Working with Branches

- Create a branch for your local repository
- Add any comment to the readme file
- Stage and commit
- Inspect the difference between the 2 files
- Merge the branch to your local master branch
- Upload the branch as a new branch to Github (might cause some trouble)
- Merge your 2 branches on Github
- Create a pull request for against my original repo