

Introduction to R - Day 4

Lidiya Mishieva

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Intro

- Day 1: basic syntax, classes, objects, functions
- Day 2: base package, tidy programming & tidyverse
- Day 3:
 - Part 1: Summarizing data / tables
 - Part 2: Reporting with RMarkdown / Quarto
- **Day 4: Git & RStudio**
- *Still missing: further operations on vectors. graphs, referencing in rmd/qmd, citations and bibliography*

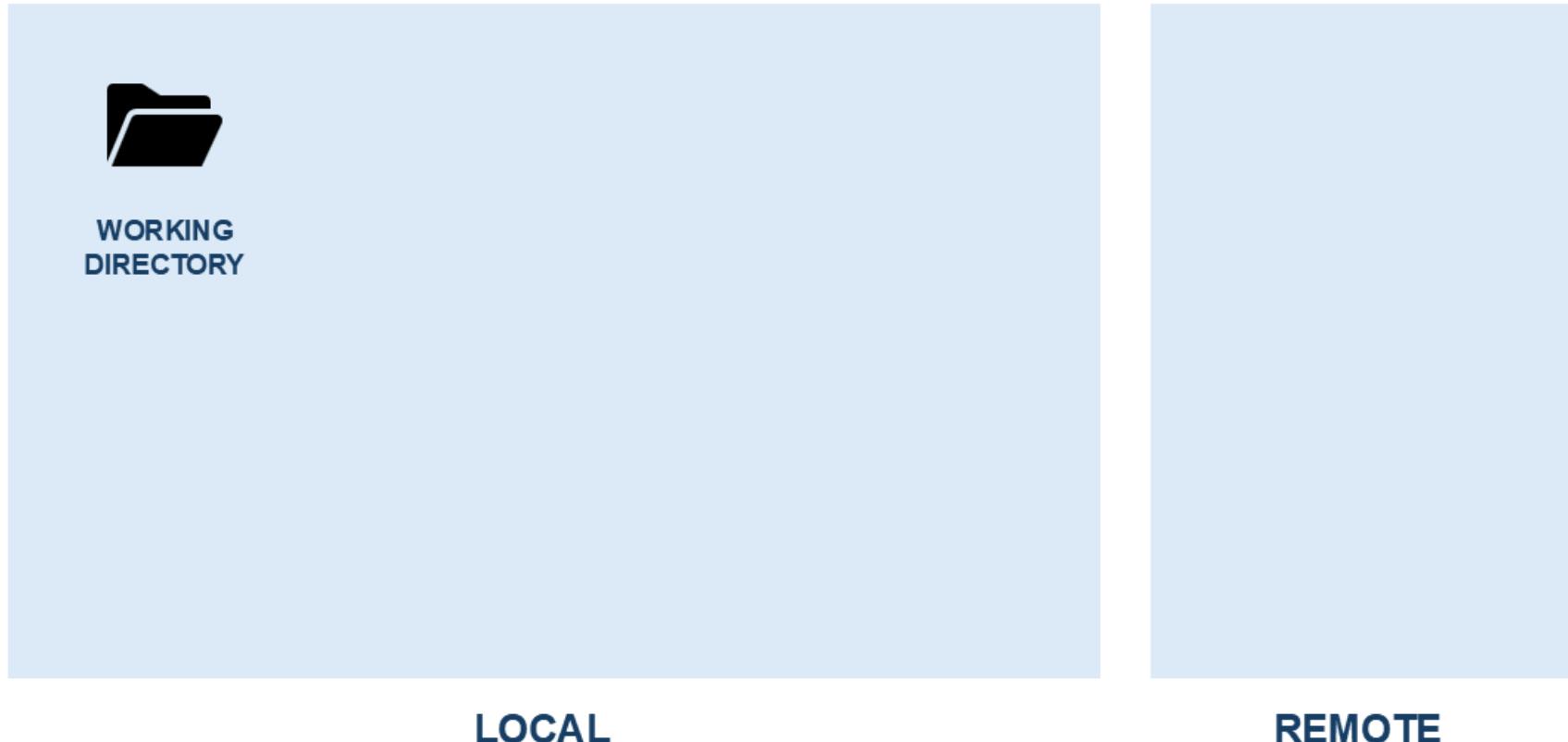
Today ...

- Git architecture
- Forking & branching
- Merging
- Change history
- Basic commands
- Discussion about procedures
- Hands on & exercises

Git architecture



Git architecture



Git architecture



Git architecture



Git architecture



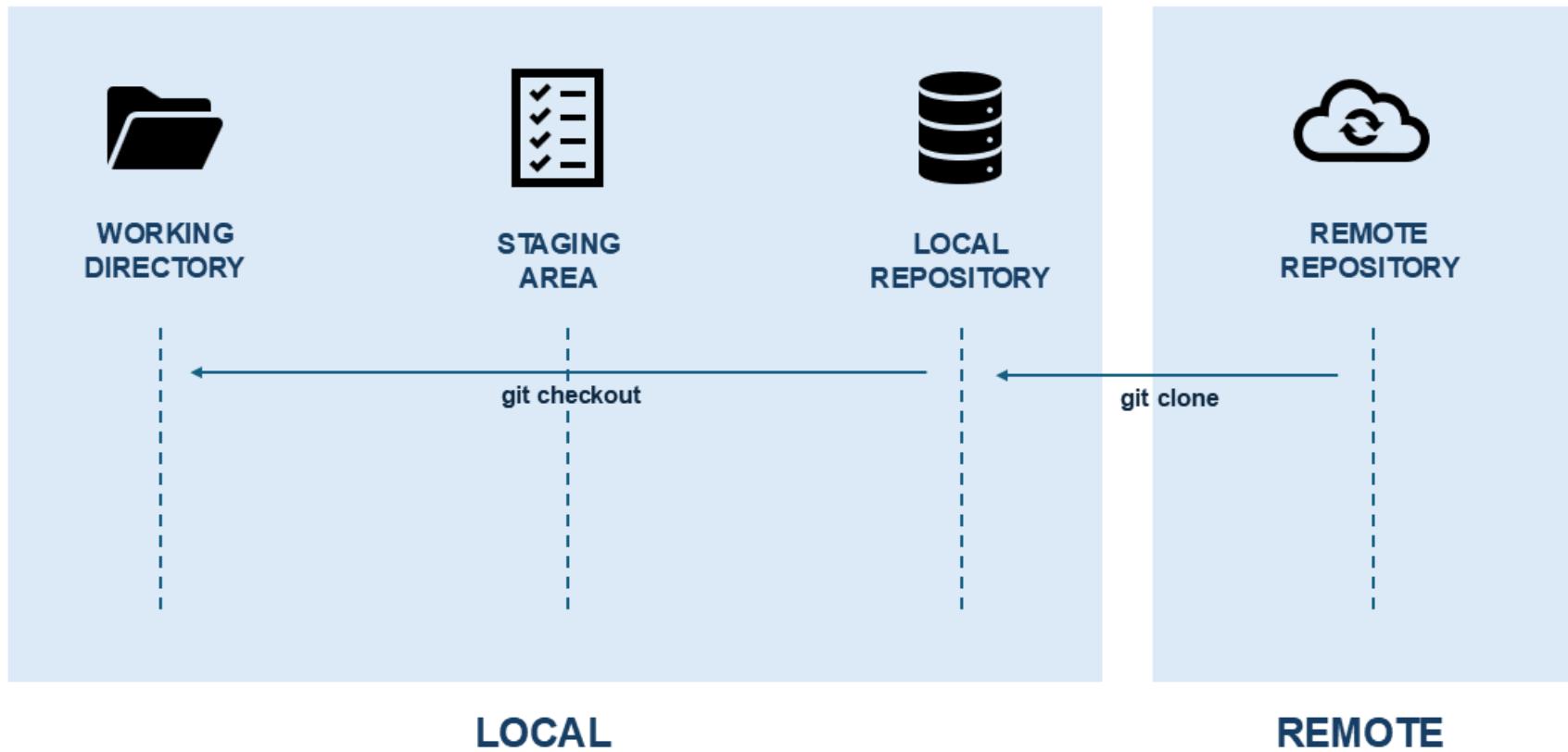
Git architecture



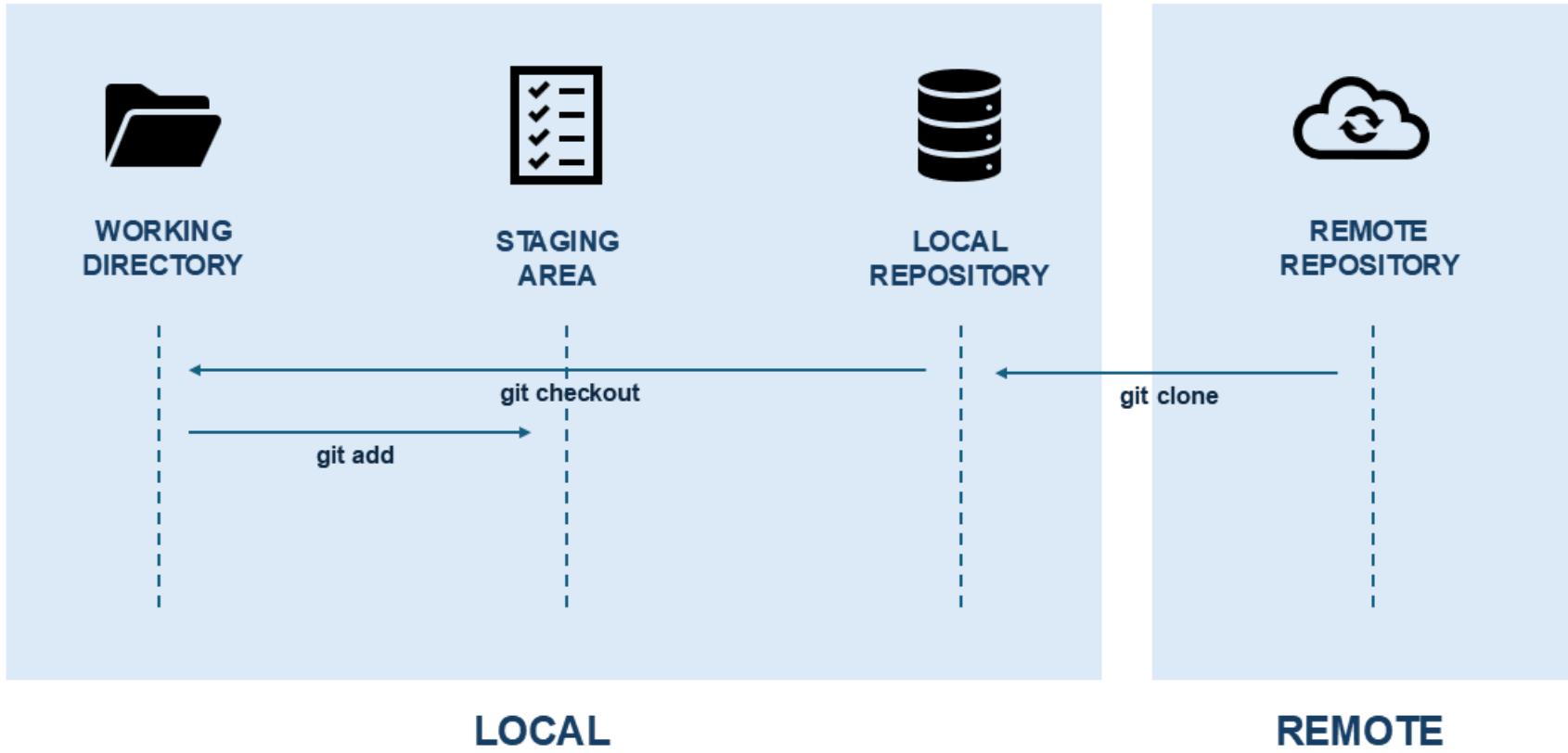
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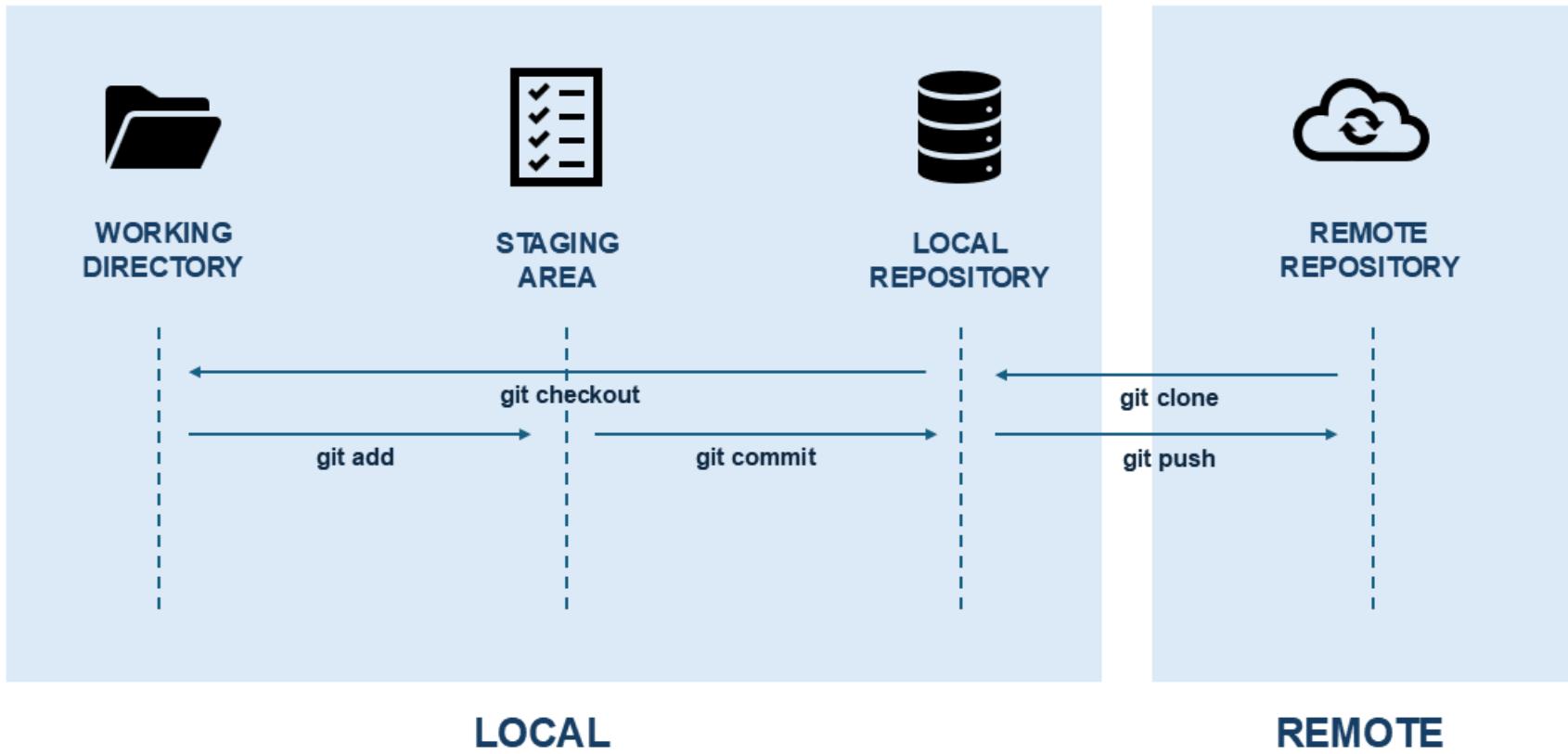
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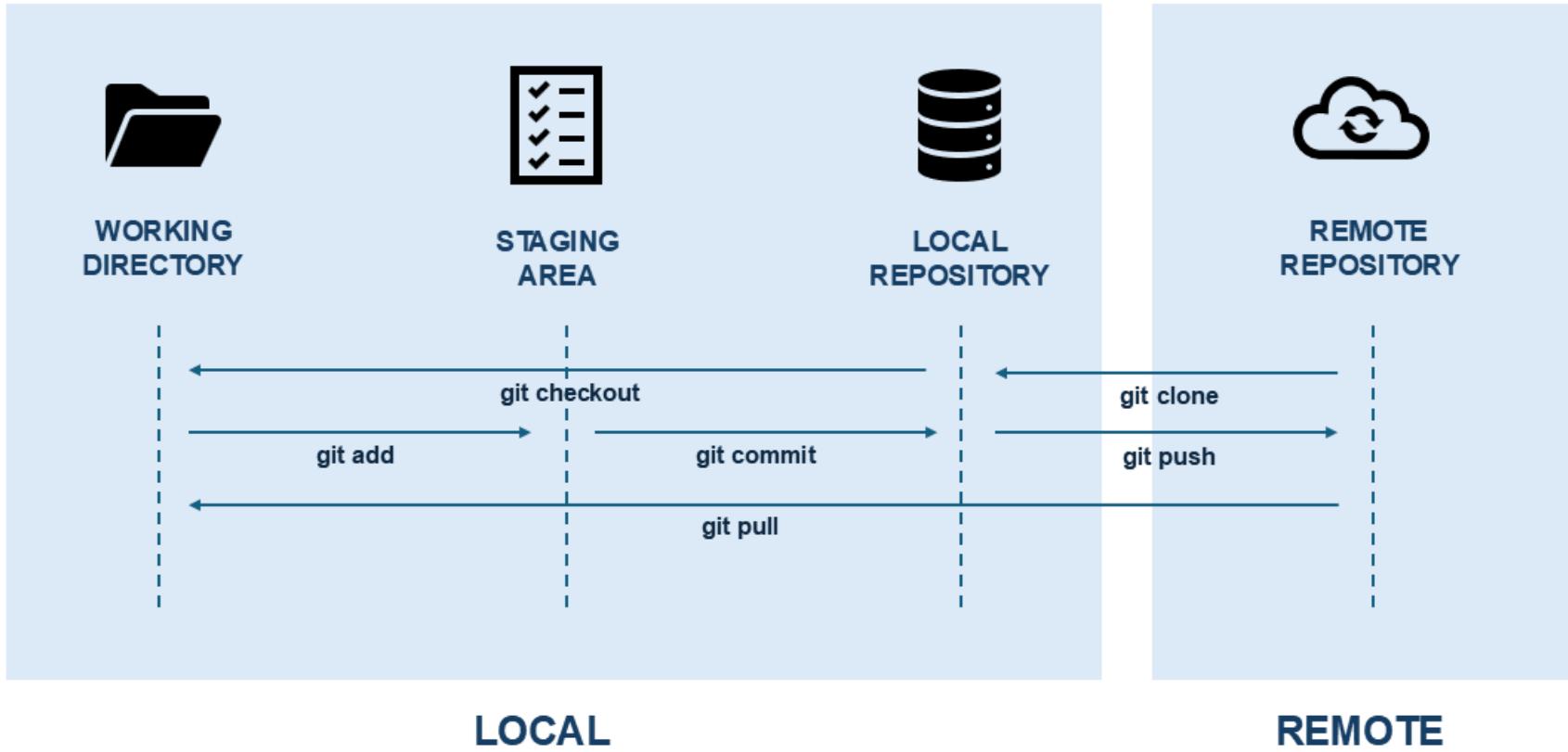
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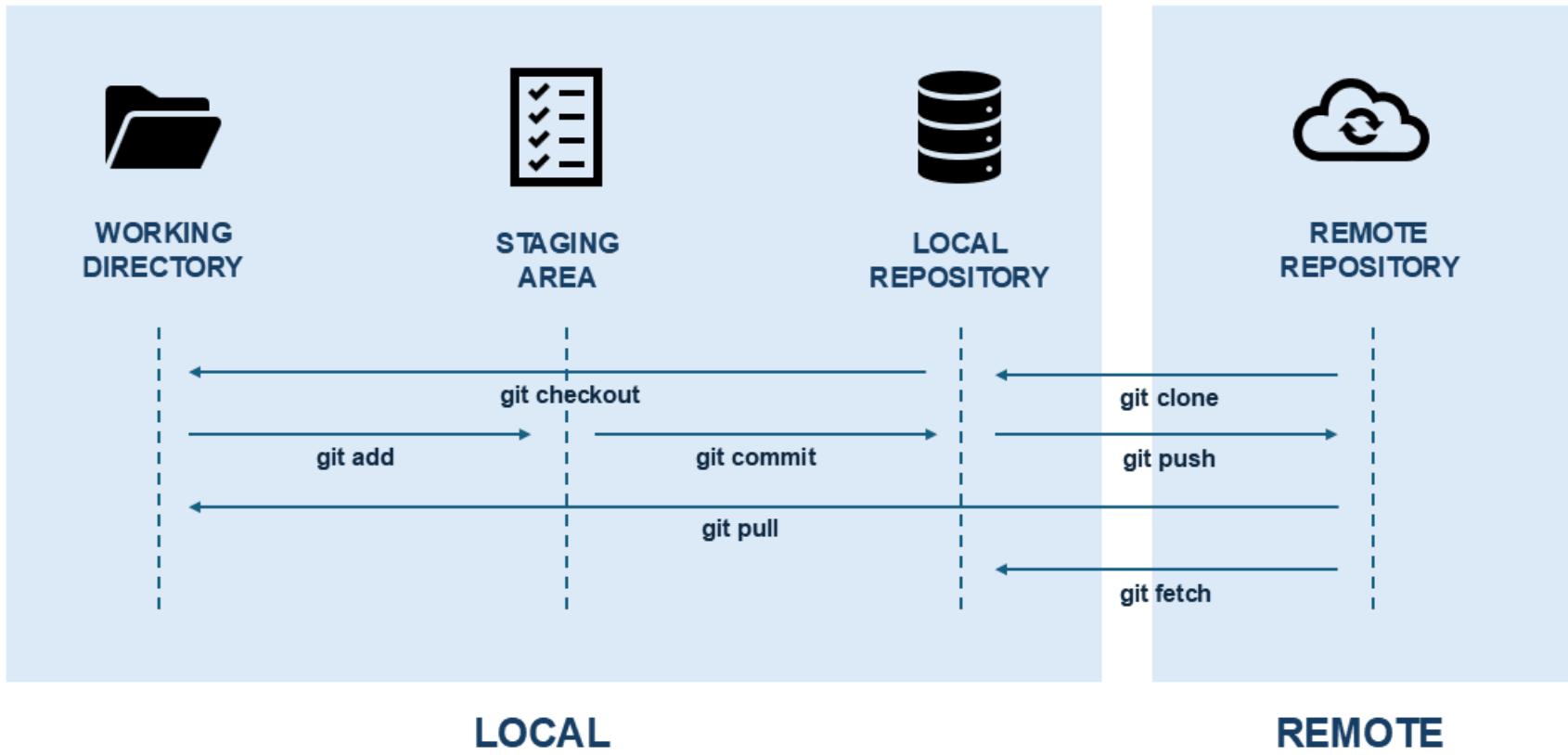
Git architecture



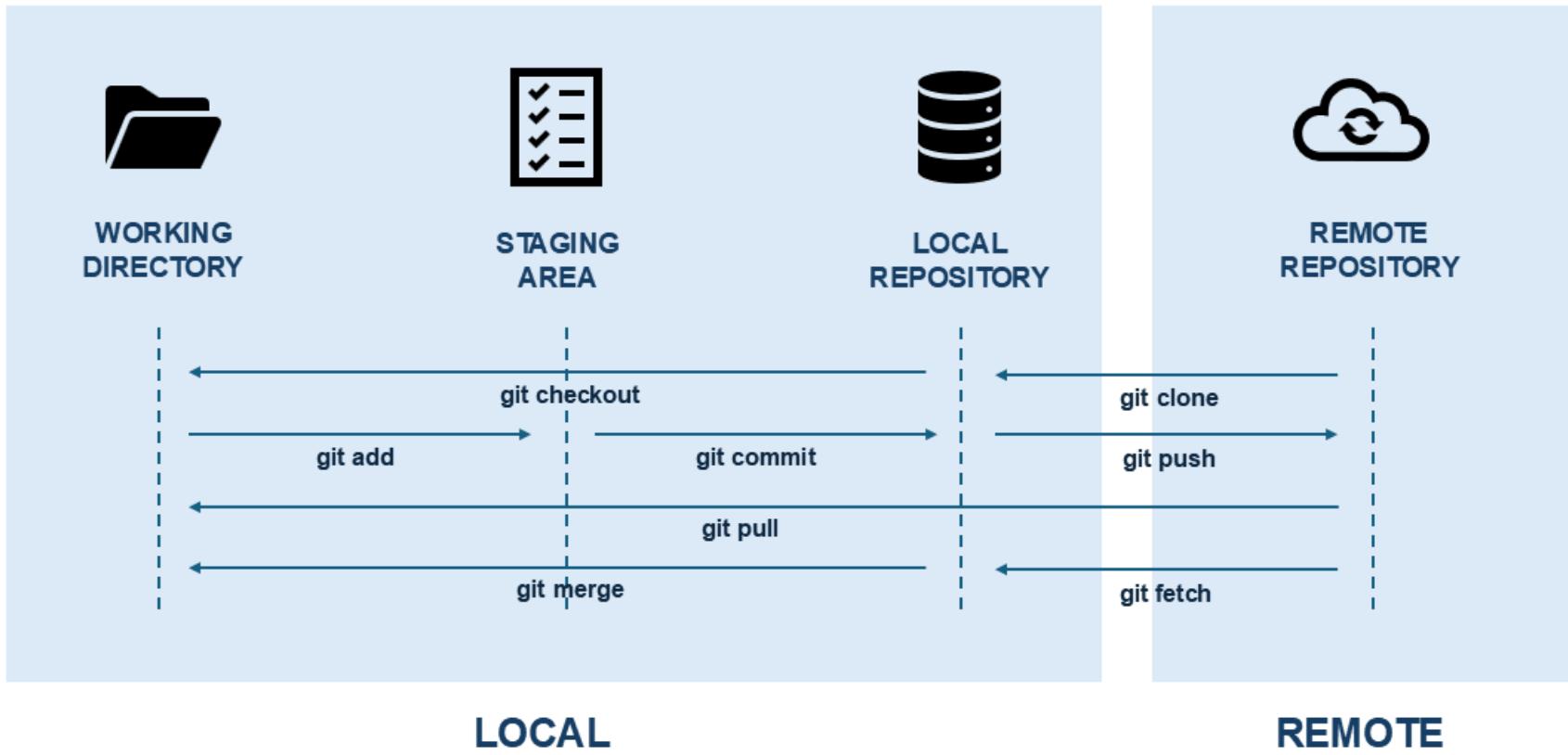
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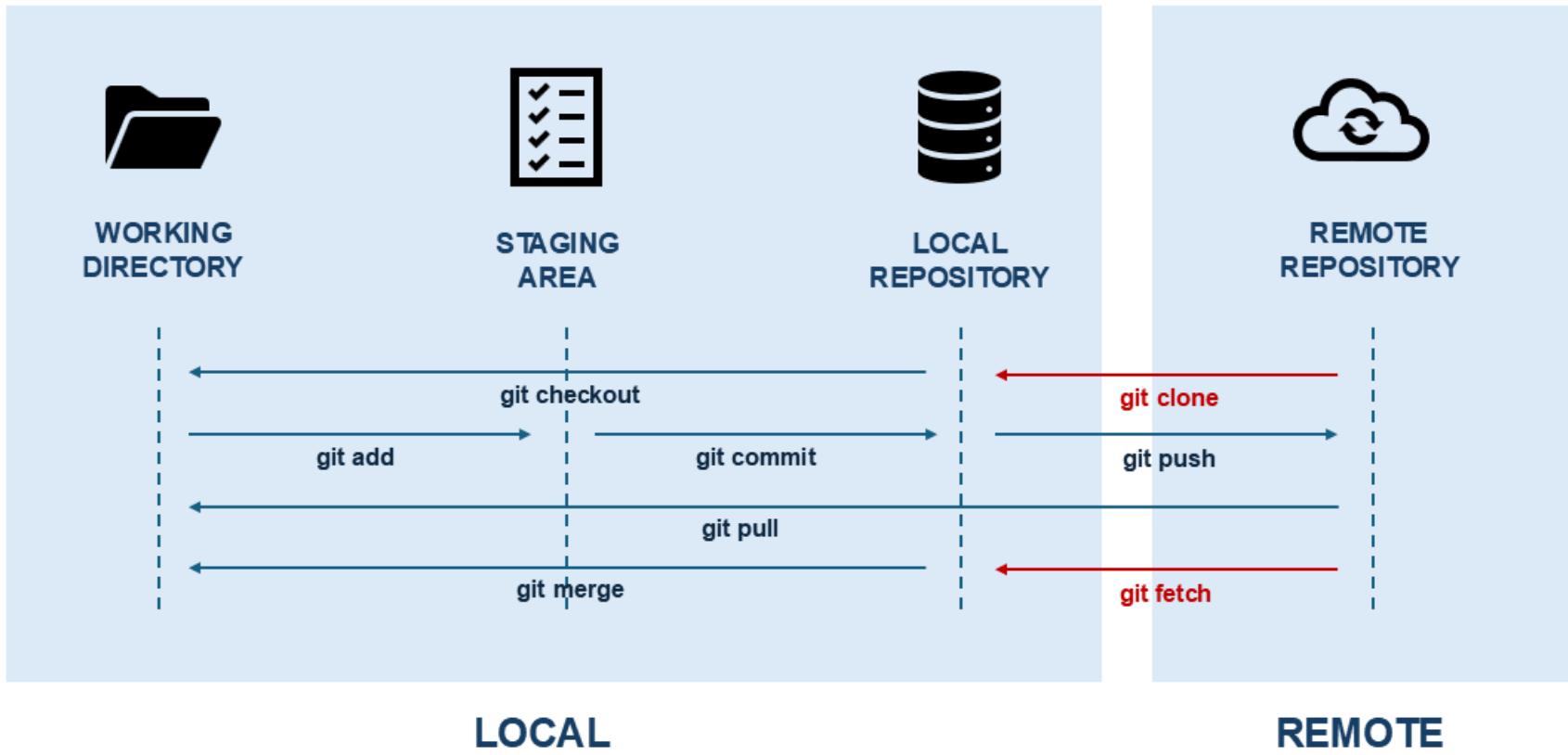
Git architecture



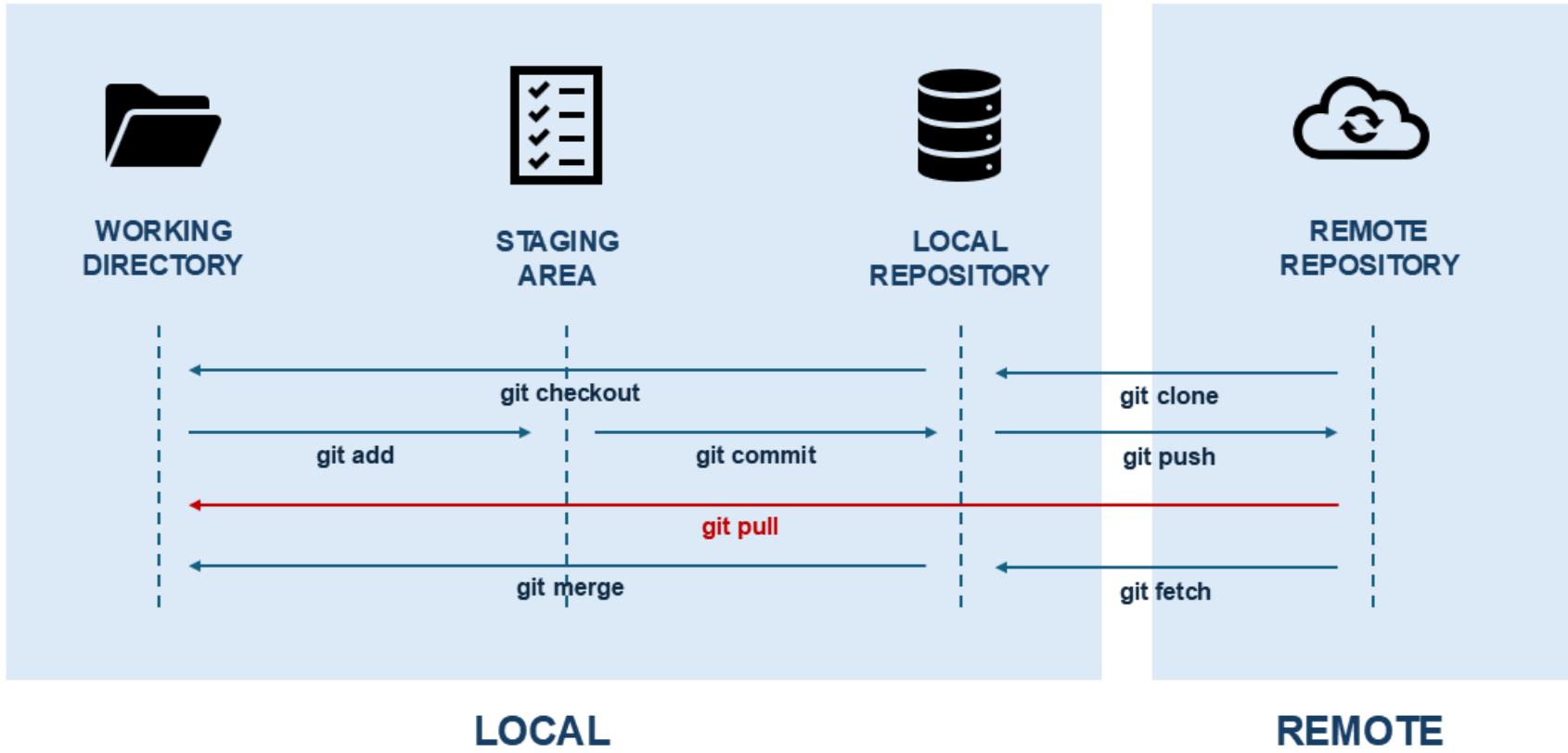
Git architecture



Git architecture



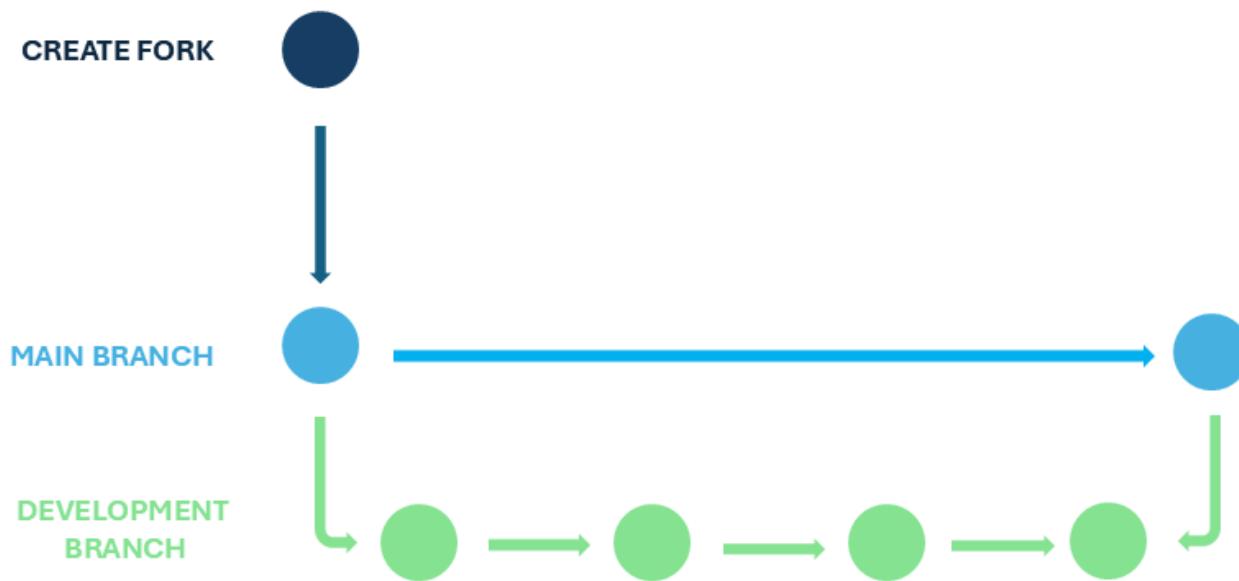
Git architecture



Forking and branching

- Fork:
 - a **copy of someone else's repository** in your own GitHub account
 - allows you to work independently without affecting the original project
- Branch:
 - a **separate line of development** within a repository
 - allows to work on features or fixes without changing the main branch

Forking and branching



Merging and merge conflict

- **Merging:**
 - combines changes from one branch into another
 - typically integrating a feature branch into main
 - but it could also be a fix within a branch
- **Merge conflict:**
 - Git cannot automatically combine changes because the same part of a file was edited differently in both branches
- **Resolving conflicts:**
 - manually editing the conflicting files, keeping the desired changes, then staging and committing the resolution

Merging and merge conflict

```
Line 1
Line 2
<<<<< HEAD
Main branch change
=====
Feature change
>>>> feature-branch
```



your current branch (the branch you are merging into)
old code
separates the two conflicting changes
new code

```
Line 1
Line 2
Main branch change
Feature change
|
```

Resolution: here - keep both lines

Change history - log & reflog

- `git log`:
 - shows the **history of commits** in your repository
 - includes commit hashes, author, date, and commit messages
 - only shows commits that are reachable
- `git reflog`:
 - shows the **history of HEAD movements**
 - includes commits, branch checkouts, resets, merges, rebases, etc.
 - even includes commits that are “lost” or not visible in `git log` anymore

Detached HEAD



<https://wolfmcnally.com/162/git-what-is-a-detached-head/>

- a state that happens when a specific *commit* is checked out instead of a *branch* (you switch to the state of a commit) e.g.: `git checkout 1b18a33`
- if you do changes from this state, they will not belong to any branch and can get lost
- instead, if you want to use it as a starting point, create a branch e.g.: `git checkout -b test-branch 1b18a33`

Basic commands

Command	Description
git clone repository_URL	create an initial local copy of a repository
git pull <i>remote_name</i>	pull changes from a remote repository
git fetch <i>remote_name</i>	fetch changes from a remote repository
git add <i>filename</i>	stage a specific file
git add .	stage all files
git commit -m “Initial commit”	commit and add a commit message
git push <i>remote_name</i> <i>branch_name</i>	pushes the changes to the remote repository
git status	check the status of the files
git log	view commit history
git log --graph --oneline	view the history tree (commits are shown in one line only)

Basic commands

Command	Description
git reflog	view the log of the head
git checkout HEAD@{2}	go to an older state of the head
git reset –hard HEAD@{2}	reset the head to an older commit
git checkout -b <i>branch_name</i> HEAD@{2}	create a branch from a specific state of the head
git checkout -b <i>branch_name</i> 1b18a33	create a branch from a specific commit
git checkout -b <i>branch_name</i>	create and switch to a new branch from where you currently are
git checkout <i>branch_name</i>	switch to an existing branch
git merge <i>source_branch</i>	merge changes from another branch (<i>source branch</i>)
git branch -d <i>test-branch</i>	delete a specific branch

General recommendations

- Always pull the current state of the repository before you start working (if others are working on it)
- Commit early and often, even after small tasks
- Write clear and meaningful commit messages
- Do not work directly on the `main` branch, always create a separate branch for development
- Merge only once your changes are complete and tested
- Push your changes frequently when working in a team

Hands on & discussion

How should we work with Git?

- There is 1 firm account responsible for creating and maintaining all the project repositories
- But everyone also has an account of their own
- Everyone forks the project repositories published by the firm accounts, and then:
 - works locally on the code, commits & pushes to the **own** forked remote repositories
 - sends out **pull requests** to the **main branch** of the **original** repositories
- The person responsible for maintaining the firm account:
 - will review the pull requests & incorporate them into the original code (if present)
 - or just accept that the file is stored in the original repository
 - **code releases** a produced from the main firm account

Setting up Git

1. Installing Git on your computer: <https://git-scm.com/install/>
2. Create a github account: <https://github.com/> -> sign up
3. Go to your github account & create a new repo called `myfirstrepo`
4. Create a directory on your computer called `myfirstrepo`
5. Go to RStudio
 - Create a new Rproject
 - *File -> New Project ... -> Version Control -> Git*
 - Add a repository URL
 - Choose the directory for your Rproject
 - Accept & RStudio will clone this repo for you!

Setting up Git (forking)

1. Go to the URL of the repo you want to clone: <https://github.com/LifeScienceStats/workshopR>
2. *Fork -> Create a new fork -> (Optional: Copy the main branch only) -> Create fork*
 - Now you have a copy of this repo on GitHub!
3. You can go back to the previous slide & go through the steps 4 & 5

Exercise 1 - pull request

- In your `workshopR` fork: find the file `.gitignore` and open it in RStudio.

Note

A `.gitignore` file tells Git which files or folders it should ignore (i.e., not track or commit). In other words: If something is listed in `.gitignore`, Git will pretend it doesn't exist.

- Change the file such that you:
 1. Suggest more data formats in the section `#Data`
 2. Add a new section `#Docs` and suggest common document formats (e.g. `.docx` ...)
- Save, stage, commit & push the changes to your fork
- Create a pull request:
 - Go to the URL of your fork, in the top bar find the button `pull requests`, and go on from there (make sure you choose the correct branches).

Exercise 2 - merging

- Part 1: merging without a conflict
 - Go to your R project associated with `myfirstrepo`
 - Create a new branch called `exercise2part1`
 - Create a `README.md` file (if not already present), open it and add a line of text (a sentence is enough).
 - Save changes, stage, commit & push
 - Now, go back to the main branch & merge the two branches together
 - Check whether it has worked (hint: you can look up the log tree)
 - Commit & push

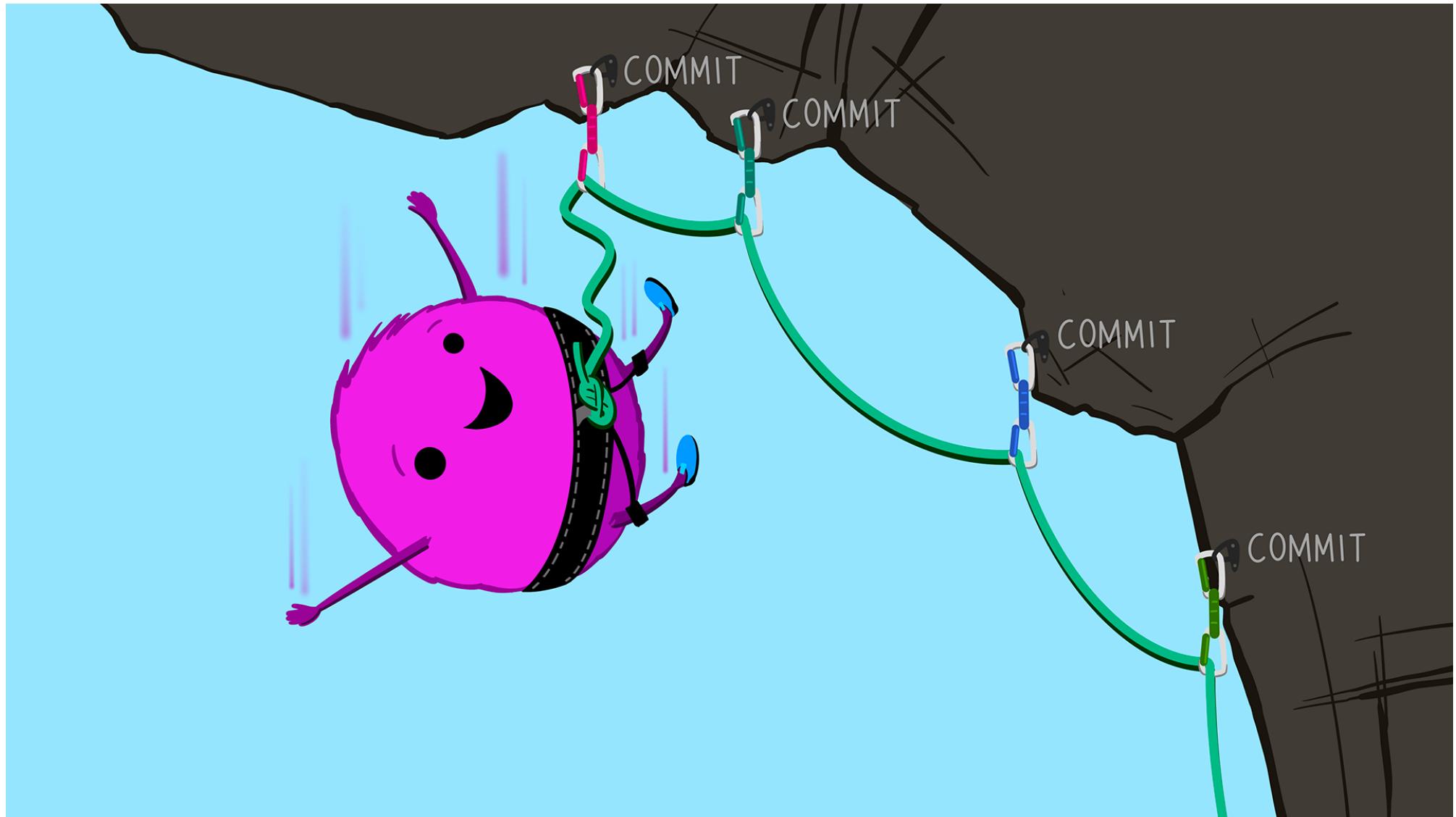
Exercise 2 - merging

- Part 2: solving a merge conflict
 - Create a new branch called `exercise2part2`
 - Add another sentence to your previously written one.
 - Save changes, stage, commit & push
 - Go back to the main branch & try to merge the branches.
 - Check whether it has worked. If not: resolve the conflict in a way you want your final text to look like.
 - Commit & push

Exercise 3 - code development with version control

- By now, you should have forked the repository [workshopRex](#), now pull the current version of it
- You will be able to find a pdf-file with some guidance on what you are expected to write your code for (the data will be provided via the internal cloud)
- But before you jump in:
 - Create a sub-directory [your-name-ex3](#) with a meaningful internal structure (e.g. subfolders for data, scripts, output ...)
 - Think about how to set up the `.gitignore` file, so nothing is shared on github that is strictly internal
 - Remember to work with branches & frequent commits
- Go through the exercise in the pdf-file, push all your changes to the forked repository & create a pull request

The end



<https://allisonhorst.com/git-github>