Merge conflicts

INTERMEDIATE GIT

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datacamp

Conflicts

- Conflict
  - Inability to resolve differences in the contents of one or more files between branches
- Edit the same file in two branches
- Try to merge
- Git doesn't know what version to keep
- Conflict!

Conflicting versions of README.md

`documentation` branch

```
# Contents and usage

This repo contains source code
for the DataCamp website.

It also contains source code for an
AI-Assistant (recommendation system)
that takes prompts from learners and
returns suggested content
that they might be interested in.

It is for internal use only,
external access is prohibited.
```

`main` branch

```
# Contents and usage

This repo contains source code
for the DataCamp website.

It is for internal use only,
external access is prohibited.
```

Merging

- From the `main` branch

```
git merge documentation
```

```
Auto-merging README.md
CONFLICT (add/add): Merge conflict in README.md
Automatic merge failed; fix conflicts and then commit the result.
```

Opening the file

```
nano README.md
```

```
# Contents and usage

This repo contains source code for the DataCamp website.

<<<<<<< documentation
It also contains source code for an AI-Assistant (recommendation system)
that takes prompts from learners and returns suggested content that they
might be interested in.

=======
>>>>>>> HEAD
It is for internal use only and external access is prohibited.
```

Git conflict syntax

In both branches

documentation branch

Current branch (main)

In both branches

```
# Contents and usage

This repo contains source code for the DataCamp website.

<<<<<<< documentation
It also contains source code for an AI-Assistant (recommendation system)
that takes prompts from learners and returns suggested content that they
might be interested in.

=======
>>>>>>> HEAD
It is for internal use only and external access is prohibited.
```

Resolving the conflict

```
# Contents and usage

This repo contains source code for the DataCamp website.

<<<<<<< documentation
It also contains source code for an AI-Assistant (recommendation system)
that takes prompts from learners and returns suggested content that they
might be interested in.

=======
>>>>>>> HEAD
It is for internal use only and external access is prohibited.
```

- Save: `Ctrl + O` (not `Ctrl + 0`), then `Enter`
- Exit: `Ctrl + X`

Merging the branches

- Merging now that the conflict is resolved

```
git add README.md
```

```
git commit -m "Resolving README.md conflict"
```

```
git merge documentation
```

```
Already up to date.
```

- Prevention is better than cure!

Let's practice!

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Introduction to remotes

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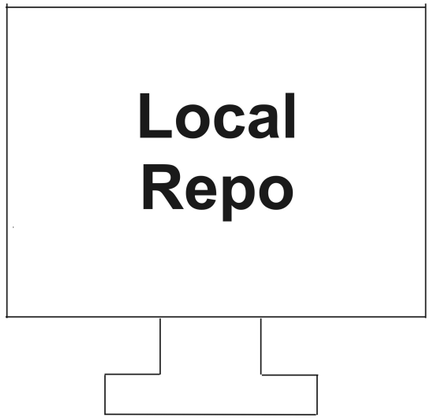
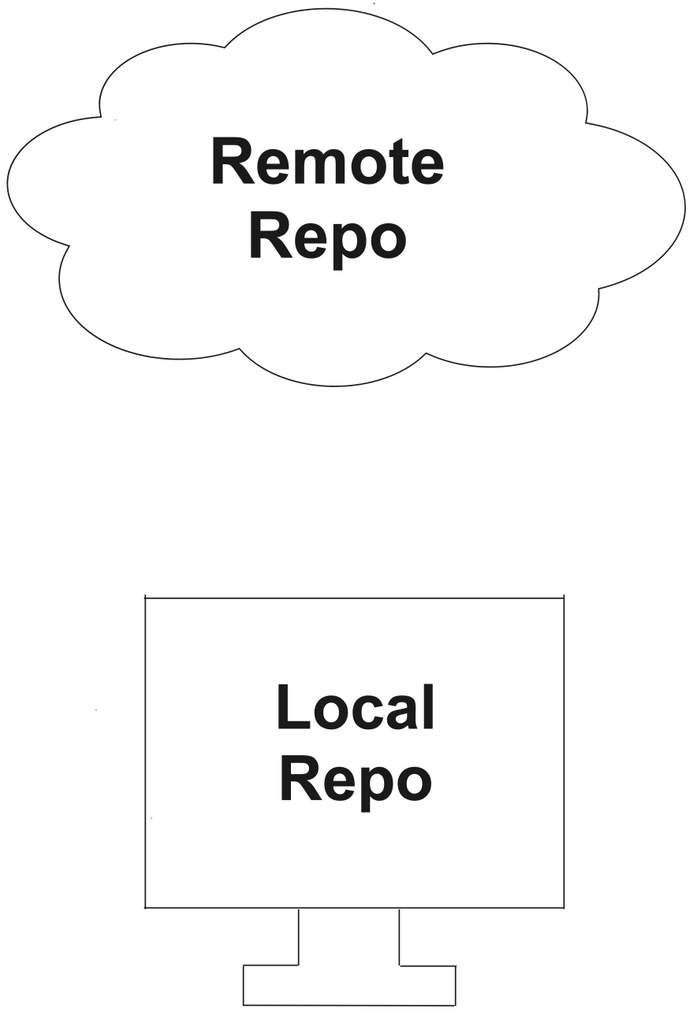
Local repo



Remote repo



Why use remote repos?

Benefits of remote repos

- Everything is backed up
- Collaboration, regardless of location

Cloning a repo

- Repo copies on our local computer = local remotes
- Making copies = cloning

```
git clone path-to-project-repo
```

- Cloning a local project

```
git clone /home/george/repo
```

- Cloning and naming a local project

```
git clone /home/george/repo new_repo
```

Cloning a remote

- Remote repos are generally stored in an online hosting service
  - e.g., GitHub, Bitbucket, or GitLab
- If we have an account:
  - We can clone a remote repo on to our local computer

```
git clone URL
```

```
git clone https://github.com/datacamp/project
```

Identifying a remote

- When cloning a repo
  - Git remembers where the original was
- Git stores a remote **tag** in the new repo's configuration
- List all remotes associated with the repo

```
git remote
```

```
datacamp
```

Getting more information

- Get more information about the remote(s)

```
git remote -v
```

```
datacamp    https://github.com/datacamp/project (fetch)
datacamp    https://github.com/datacamp/project (pull)
```

Creating a remote

- When cloning, Git will automatically name the remote `origin`

```
git remote add name URL
```

- Create a remote called `george`

```
git remote add george https://github.com/george_datacamp/repo
```

- Defining remote names is useful for merging

Let's practice!

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Pulling from remotes

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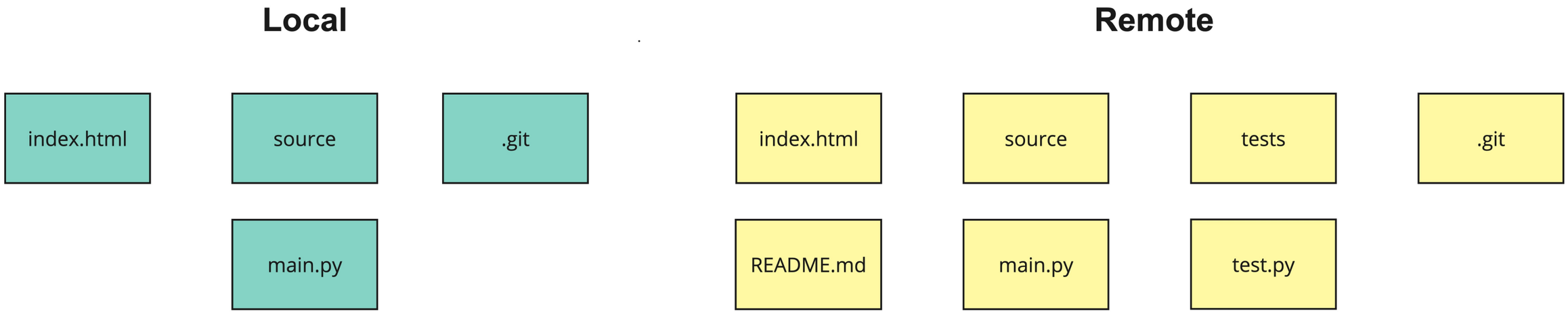
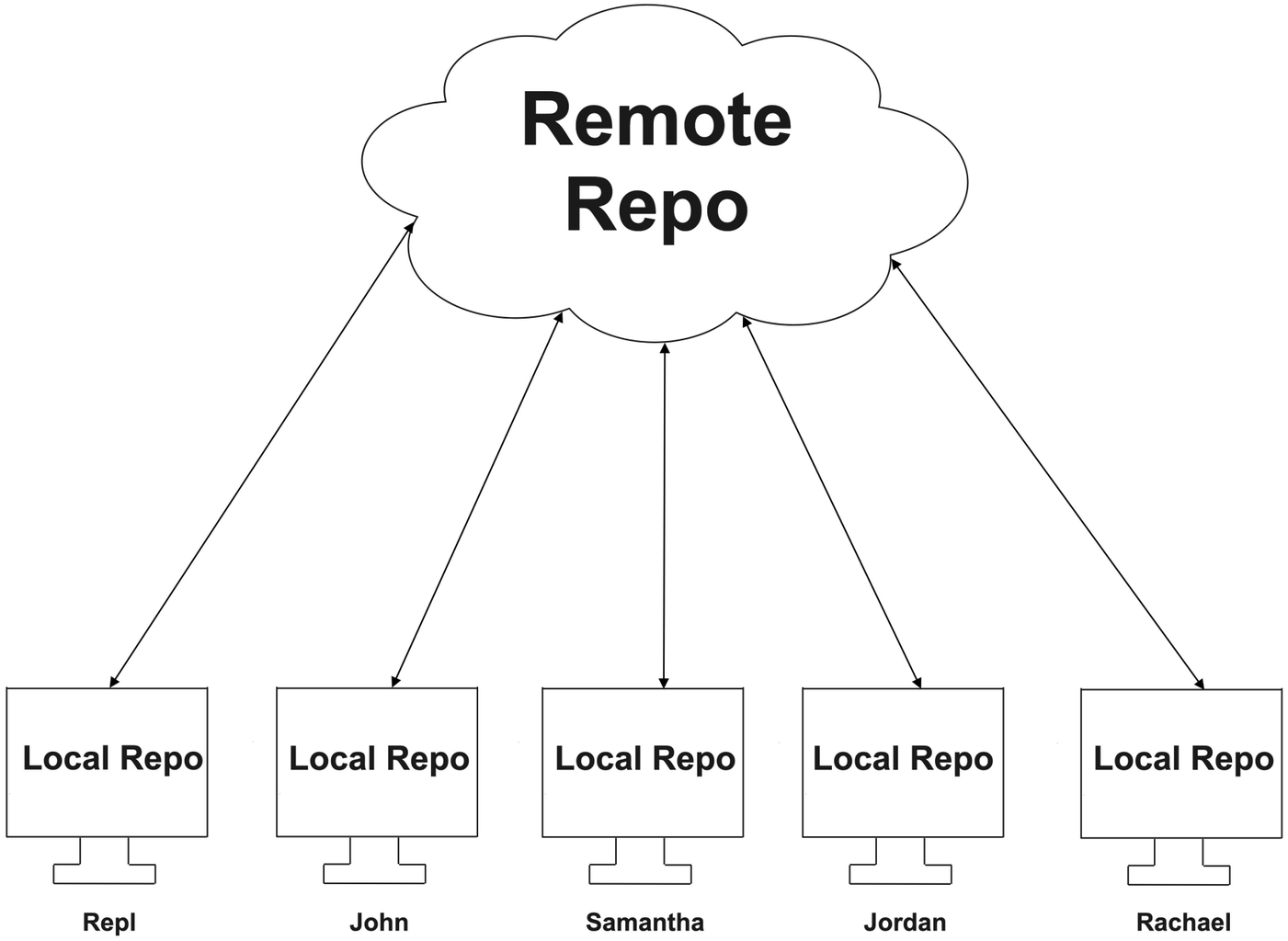
Remote vs. local



Collaborating on Git projects



Fetching from a remote

- Fetch from the `origin` remote

```
git fetch origin
```

- Fetch all remote branches
- Might create new local branches if they only existed in the `remote`
- Doesn't merge the remote's contents into local repo

Fetching a remote branch

- Fetch only from the `origin` remote's `main` branch

```
git fetch origin main
```

```
From https://github.com/datacamp/project
 * branch                main     -> FETCH_HEAD
```

Synchronizing content

- Merge `origin` remote's default branch (`main`) into the local repo's current branch

```
git merge origin
```

```
Updating 9dcf4e5..887da2d
Fast-forward
 tests/tests.py | 13 ++++++++++++
 README.md      | 10 ++++++++++
 2 files changed, 23 insertions (+)
```

Pulling from a remote

- Local and remote synchronization is a common workflow
- Git simplifies this process for us!
- Fetch and merge from the remote's default (`main`) into the local repo's current branch

```
git pull origin
```

Pulling a remote branch

- Pull from the `origin` remote's `dev` branch

```
git pull origin dev
```

- Still merges into the local branch we are located in!

Git pull output

```
From https://github.com/datacamp/project
 * branch                dev     -> FETCH_HEAD
Updating 9dcf4e5..887da2d
Fast-forward
 tests/tests.py | 13 ++++++++++++
 README.md      | 10 ++++++++++
 2 files changed, 23 insertions (+)
```

A word of caution

```
git pull origin
```

```
Updating 9dcf4e5..887da2d
error: Your local changes to the following files would be overwritten by merge:
       README.md
Please commit your changes or stash them before you merge.
Aborting
```

- Important to save locally before pulling from a `remote`

Let's practice!

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Pushing to remotes

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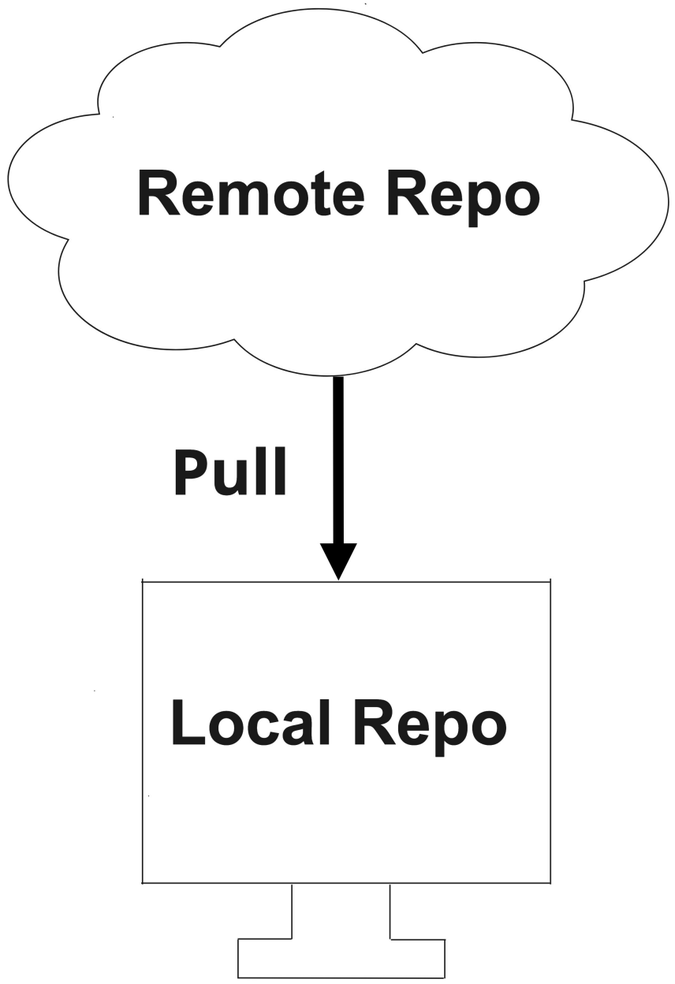
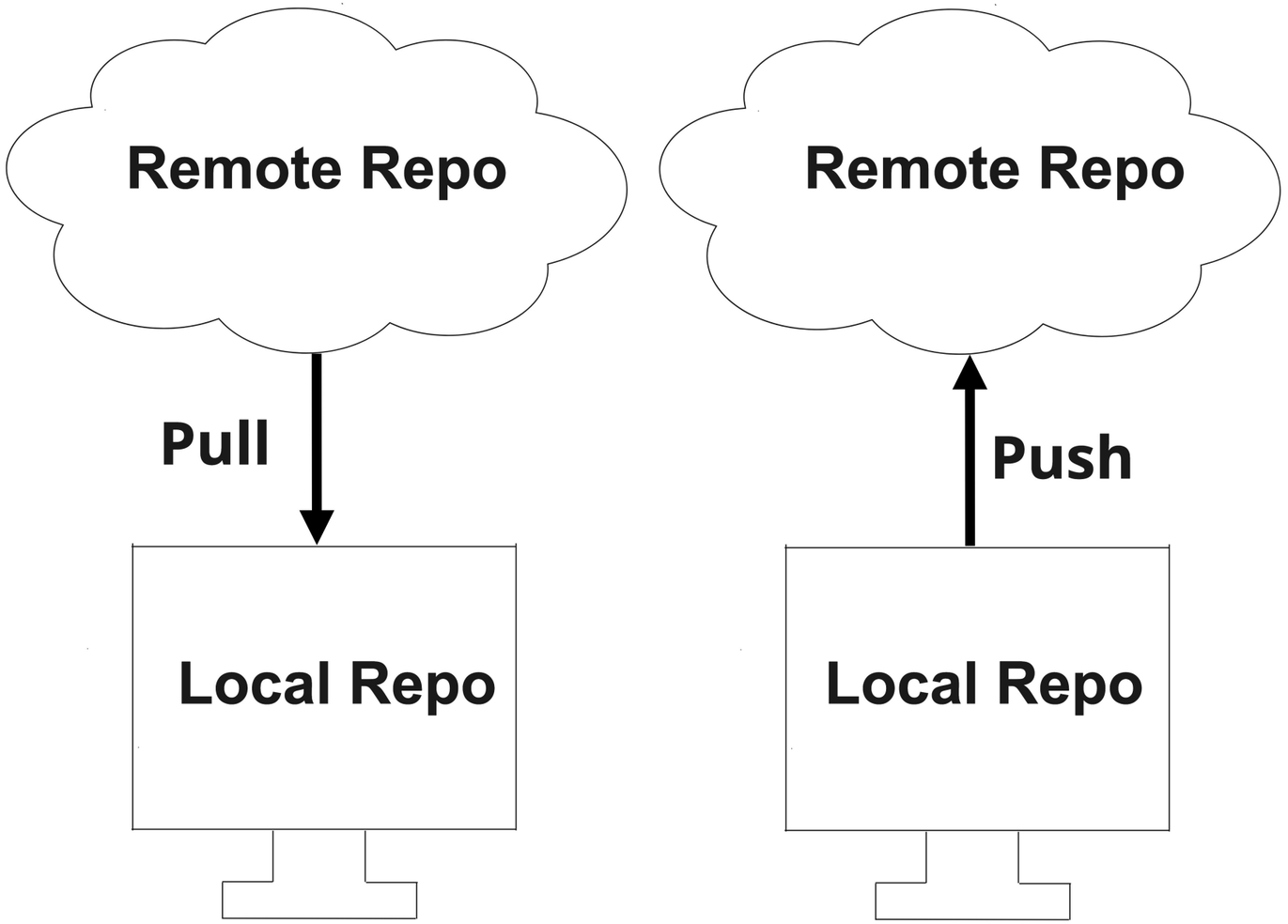
Pulling from a remote



Pushing to a remote



git push

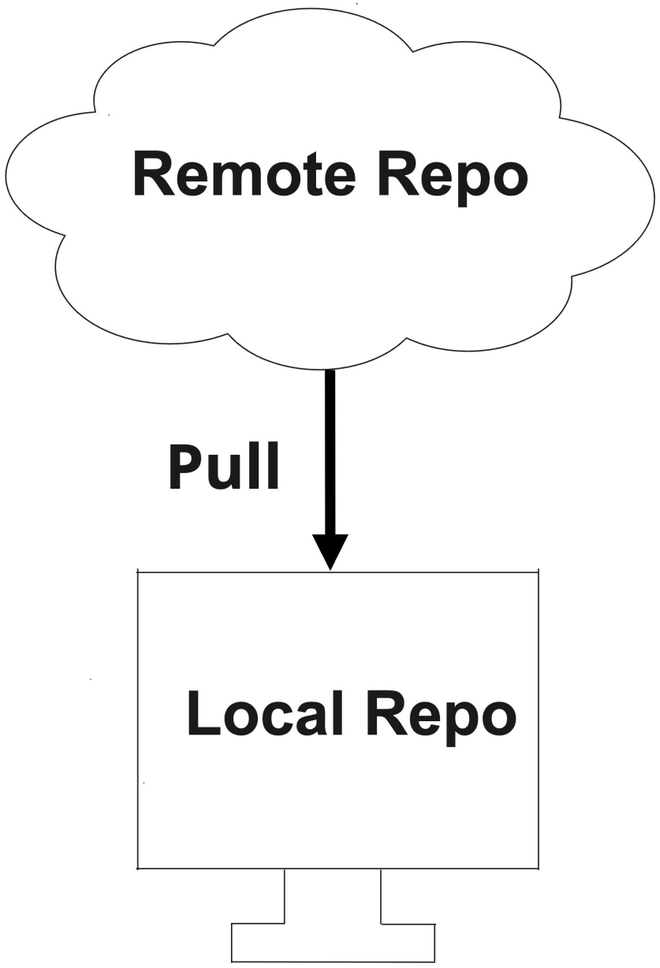
- Save changes locally first!

```
git push remote local_branch
```

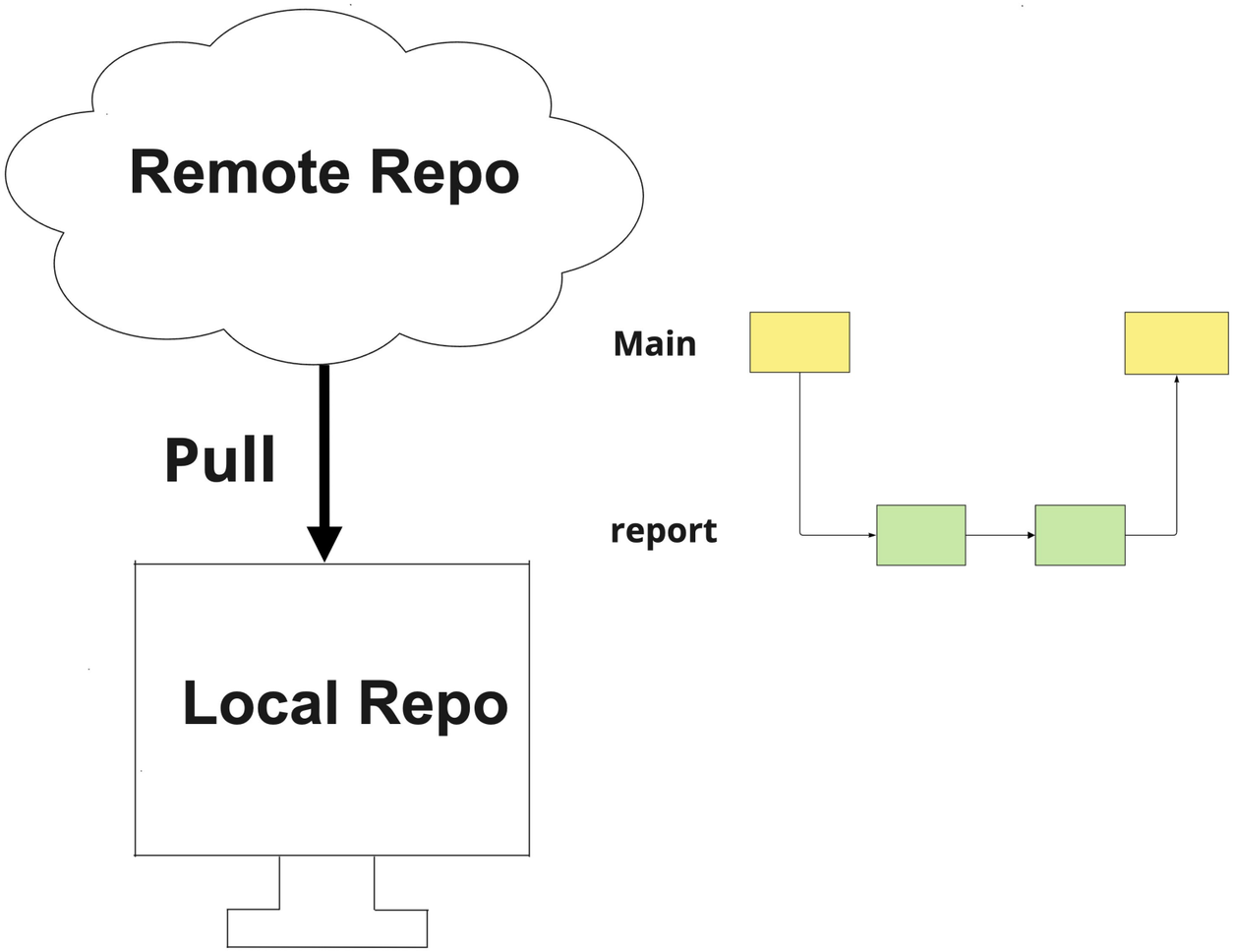
- Push *into* `remote` **from** `local_branch`
- Push changes into `origin` from the local repo's `main` branch

```
git push origin main
```

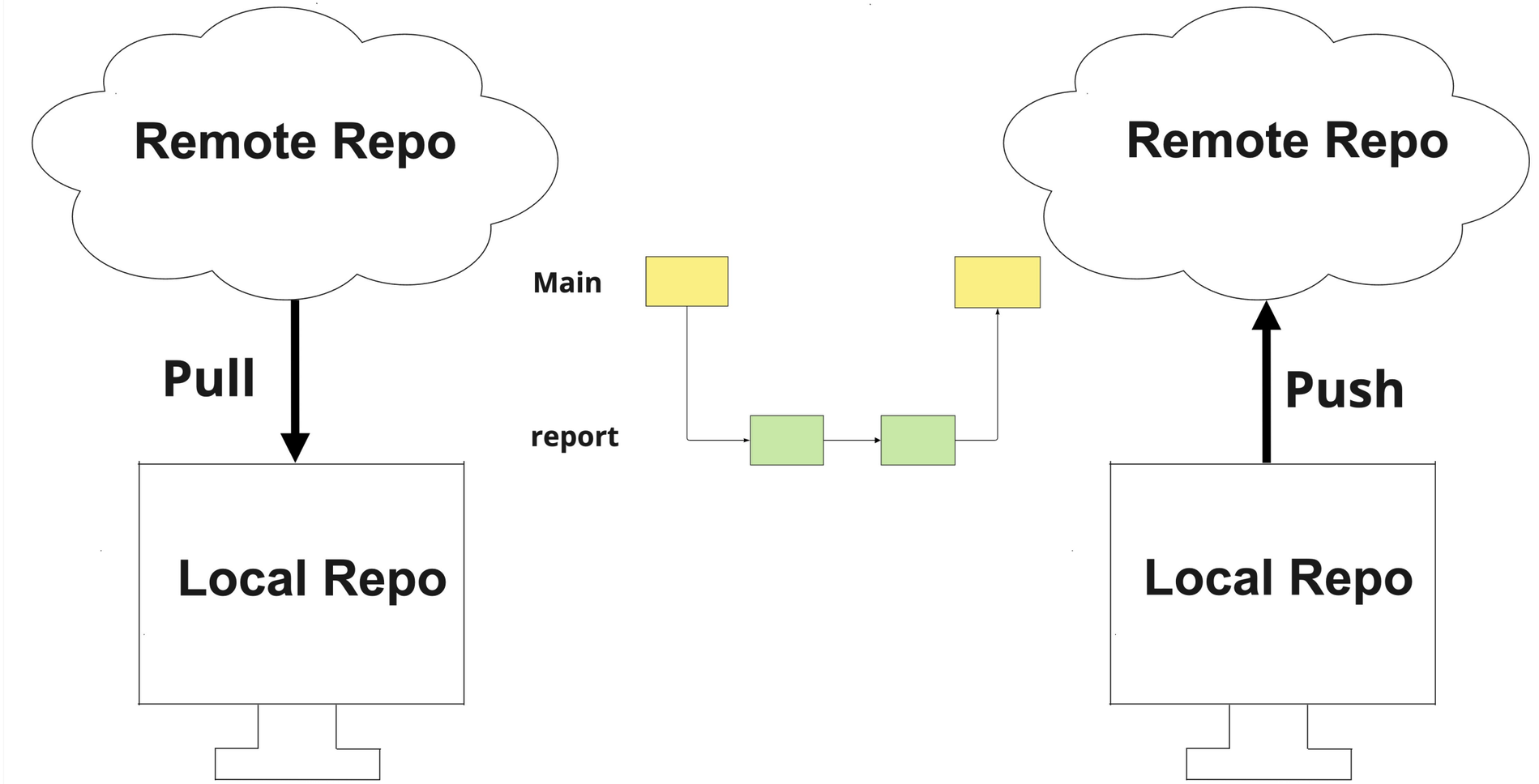
Push/pull workflow



Push/pull workflow



Push/pull workflow



Pushing first

- Pushing `main` to the remote before pulling

```
git push origin main
```

Remote/local conflicts

```
To https://github.com/datacamp/project
 ! [rejected]        main -> main (non-fast-forward)
error: failed to push some refs to 'https://github.com/datacamp/project'
hint: Updates were rejected because the tip of your branch is behind
hint: its remote counterpart. Integrate the remote changes (e.g.
hint: 'git pull ..') before pushing again.
hint: See the 'Note about fast-forwards' in 'git push --help' for details.
```

Remote/local conflicts

Remote

```
To https://github.com/datacamp/project
 ! [rejected]        main -> main (non-fast-forward)
error: failed to push some refs to 'https://github.com/datacamp/project'
hint: Updates were rejected because the tip of your branch is behind
hint: its remote counterpart. Integrate the remote changes (e.g.
hint: 'git pull ..') before pushing again.
hint: See the 'Note about fast-forwards' in 'git push --help' for details.
```

Remote/local conflicts

Outcome

```
To https://github.com/datacamp/project
 ! [rejected]        main -> main (non-fast-forward)
error: failed to push some refs to 'https://github.com/datacamp/project'
hint: Updates were rejected because the tip of your branch is behind
hint: its remote counterpart. Integrate the remote changes (e.g.
hint: 'git pull ..') before pushing again.
hint: See the 'Note about fast-forwards' in 'git push --help' for details.
```

Remote/local conflicts

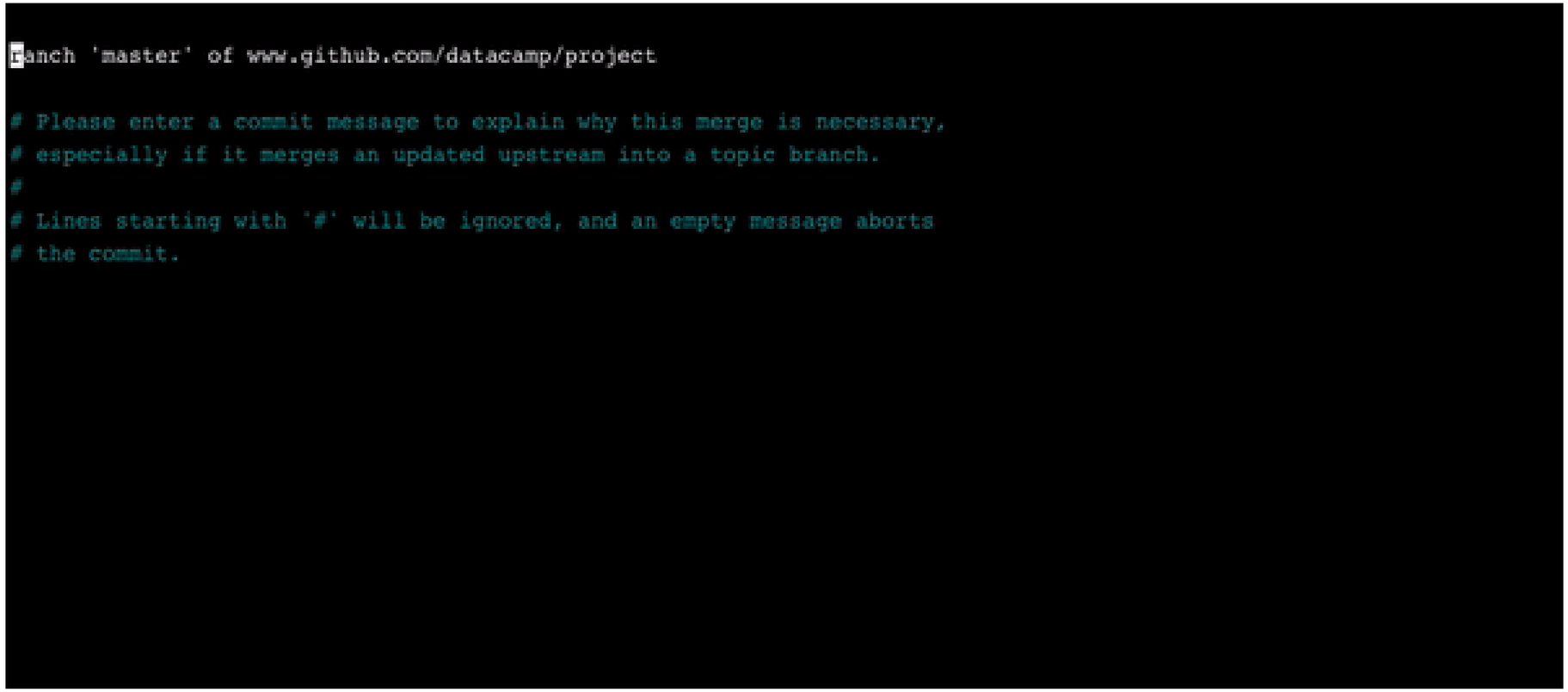
Reason(s) and suggestion(s)

```
To https://github.com/datacamp/project
 ! [rejected]        main -> main (non-fast-forward)
error: failed to push some refs to 'https://github.com/datacamp/project'
hint: Updates were rejected because the tip of your branch is behind
hint: its remote counterpart. Integrate the remote changes (e.g.
hint: 'git pull ..') before pushing again.
hint: See the 'Note about fast-forwards' in 'git push --help' for details.
```

Avoiding a conflict

- Pull from the remote first

```
git pull origin main
```



Pulling without editing

```
git pull --no-edit origin main
```

- Not recommended, unless we are very confident in the history of our project!

Pushing a new local branch

- Working in `hotfix` branch locally
- `hotfix` does not exist in the remote

Creating a new remote branch

- `hotfix` only exists locally

```
git push origin hotfix
```

```
Enumerating objects: 5, done.
Counting objects: 100% (5/5), done.
Delta compression using up to 8 threads
Compressing objects: 100% (2/2), done.
Writing objects: 100% (3/3), 349 bytes | 349.00 KiB/s, done.
Total 3 (delta 0), reused 0 (delta 0), pack-reused 0
remote:
remote: Create a pull request for 'hotfix' on GitHub by visiting:
remote:      https://github.com/datacamp/project/pull/new/hotfix
remote:
To https://github.com/datacamp/project
 * [new branch]      hotfix -> hotfix
branch 'hotfix' set up to track 'origin/hotfix'
```

Let's practice!

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Congratulations

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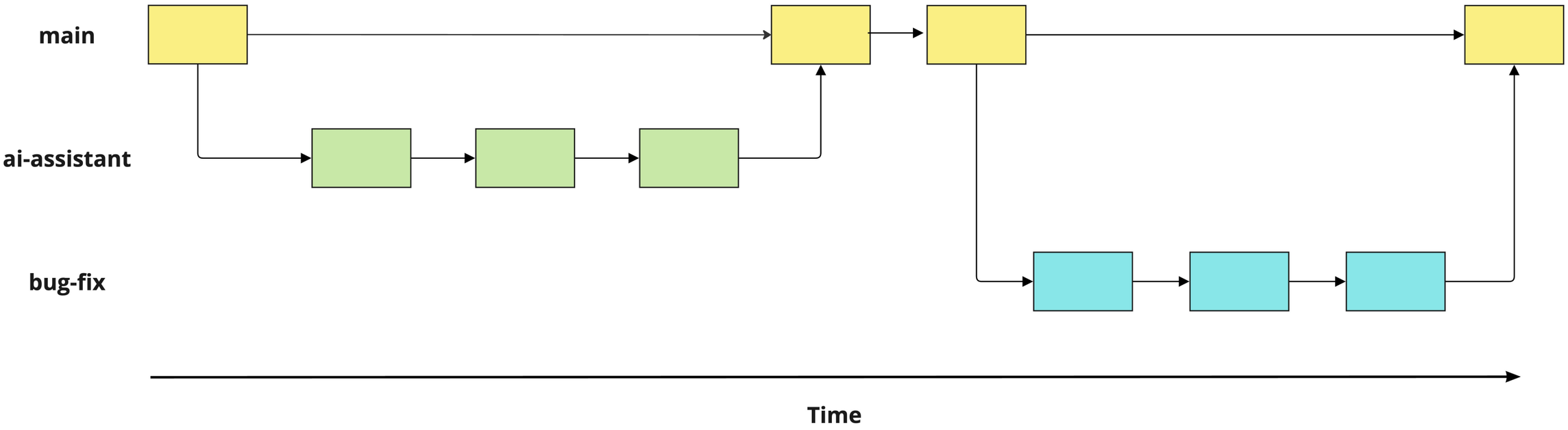
Branches



Working with branches

- See all branches

```
git branch
```

- Switch to an existing branch

```
git switch hotfix
```

- Create and switch to a new branch

```
git switch -c hotfix
```

- Compare two branches

```
git diff main hotfix
```

- Rename a branch

```
git branch -m hotfix bugfix
```

- Delete a branch

```
git branch -d hotfix
```

Merging branches

- From `main`, to merge `ai-assistant` into `main`:

```
git merge ai-assistant
```

- From another branch: `git merge source destination`

```
git merge ai-assistant main
```

- Handling merge conflicts

Working with remotes

- Clone a remote repo

```
git clone https://github.com/datacamp/project
```

- Get information about all remotes

```
git remote -v
```

- Add a new remote

```
git remote add george https://github.com/george_datacamp/repo
```

Synchronizing local and remote repos

```
git fetch origin
```

```
git pull origin
```

```
git push origin documentation
```

What next?

- **GitHub Concepts**
- **GitHub and Git Tutorial**
- Starting using Git for your software and data projects!

Let's practice!

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