A Quick Intro to Version Control with git

https://github.com/gabindu/git-intro

Gabriel Indurskis, based on slides by Max Joseph

Nov. 12, 2025

Discuss

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1. How do you manage different file versions?

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2. How do you work with collaborators on the same files?
3. How much would your science/work/life suffer if your computer exploded right now? (scale from 1-10)

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- collaborate with yourself
- collaborate with other people
- in principle a commandline tool, but can be used conveniently via graphical interfaces (in particular in VS Code)
- various websites offer free remote storage (GitHub/GitLab/BitBucket)

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    - if you use Emacs, install `magit` package.

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    - Copy & Paste your **public** key, usually found in `~/.ssh/id_ed25519.pub` (or maybe `id_rsa.pub` if you already had an older key)
  - This enables a quicker way to up- and download files directly from the commandline, without the need of entering passwords.

Command line git

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Somewhere on your computer, create a new directory with a (text) file, e.g. `test.tex` or `test.txt`, and fill it with some example content (at least a few lines). (You could also just copy an already existing document.)

You can do this with your usual methods, or on the commandline, for example with:

```
mkdir my-first-git-repo
cd my-first-git-repo
echo "This is a fancy test!" > test.txt
```

You can also create other files, of whatever type you want (LaTeX, Markdown, HTML, Python scripts, ...) - binary files are ok as well!

Tell git to keep track of your files

Initializing a repository (only once)

On the commandline, make sure that you are inside the directory you created, then execute:

```
git init
```

If you call `ls -a`, you should now notice that a hidden `.git/` directory was created. This is where git does its magic, and you should therefore never touch this directory or its contents!

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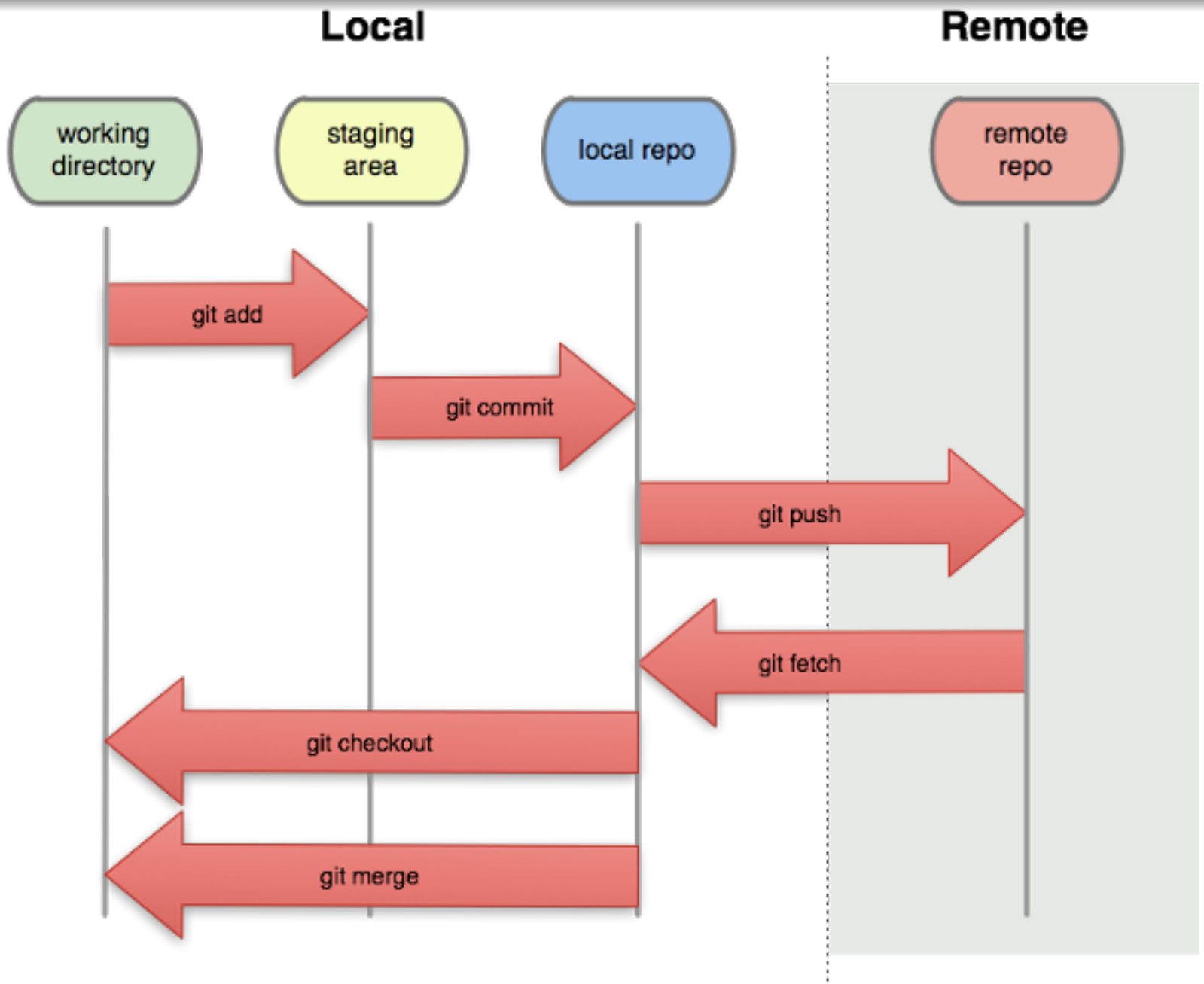
or, to add all changed/new files (careful, this might add undesired temporary files):

```
git add --all
```

For future reference: If you want to avoid adding temporary files (like LaTeX auxiliary files etc.), you can add a file `.gitignore` which tells git to *never* even propose to track these files. You can download an appropriate `.gitignore` file for whatever type of document you're working on at https://www.gitignore.io/

Your changes are now "staged"



Committing

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If you just use `git commit`, git will open an editor to ask you for a commit message. You can set the default editor by one of the following commands:

```
git config --global core.editor "atom --wait"
git config --global core.editor "emacs -nw"
git config --global core.editor "zile"
```

Commit messages

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5. View updated log with `git log`

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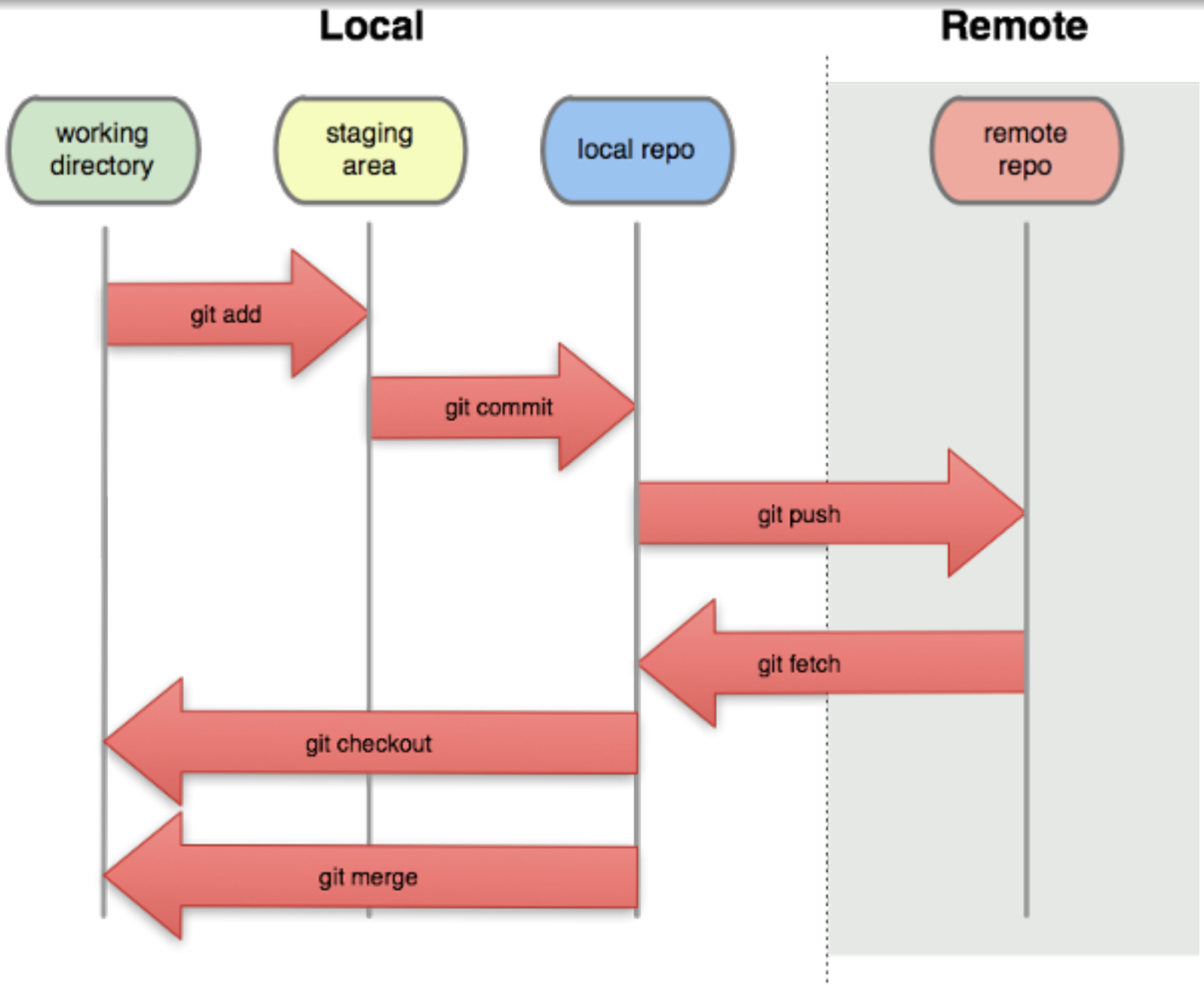
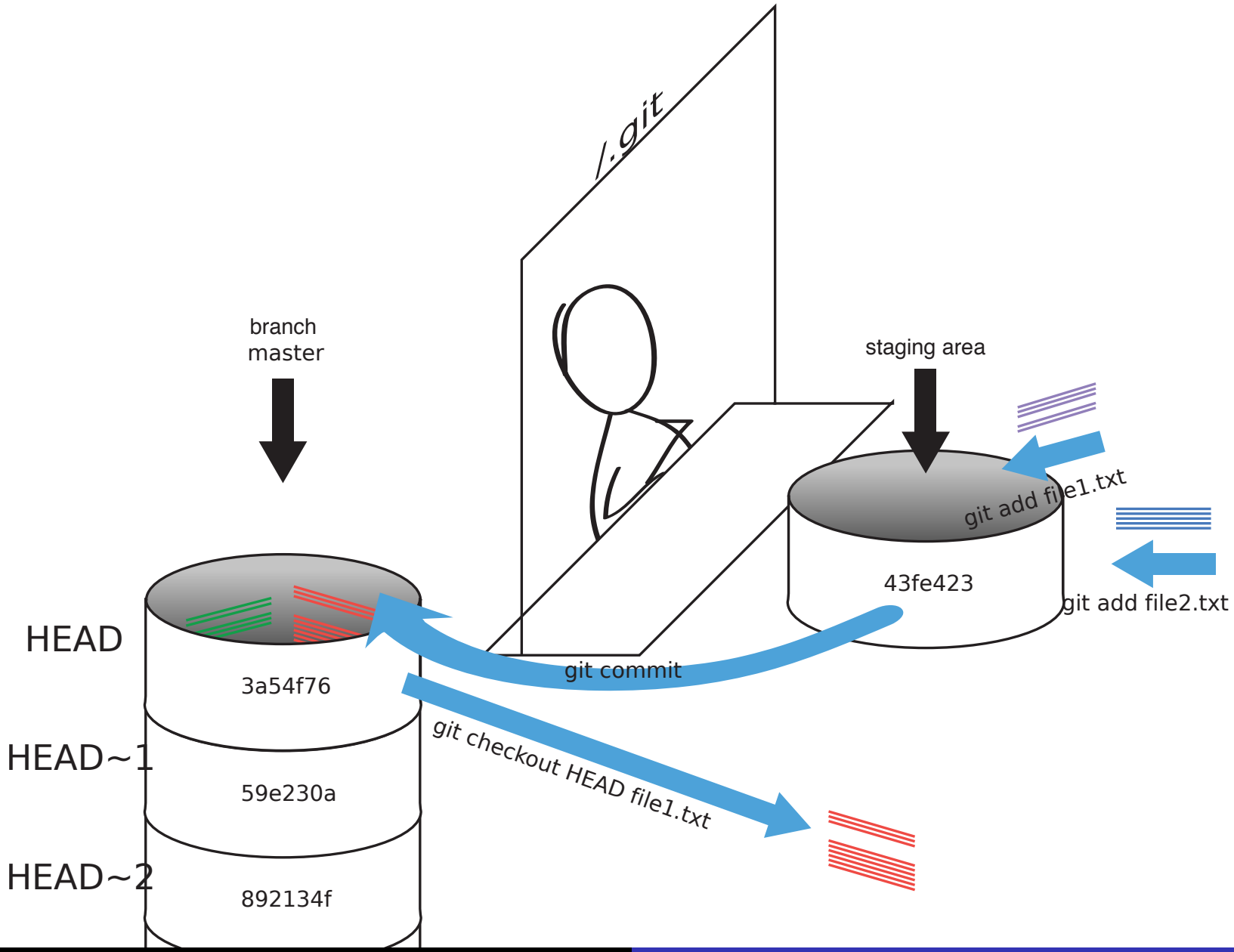
- Hang on, we do!

```
git diff
git checkout HEAD test.txt
```

What happened?



Wait, what does HEAD refer to?



Mirroring your repository on the internet

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3. Verify the path of the remote:

   ```
   git remote -v
   ```

Synchronizing with the remote

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Push (or "publish") your changes:

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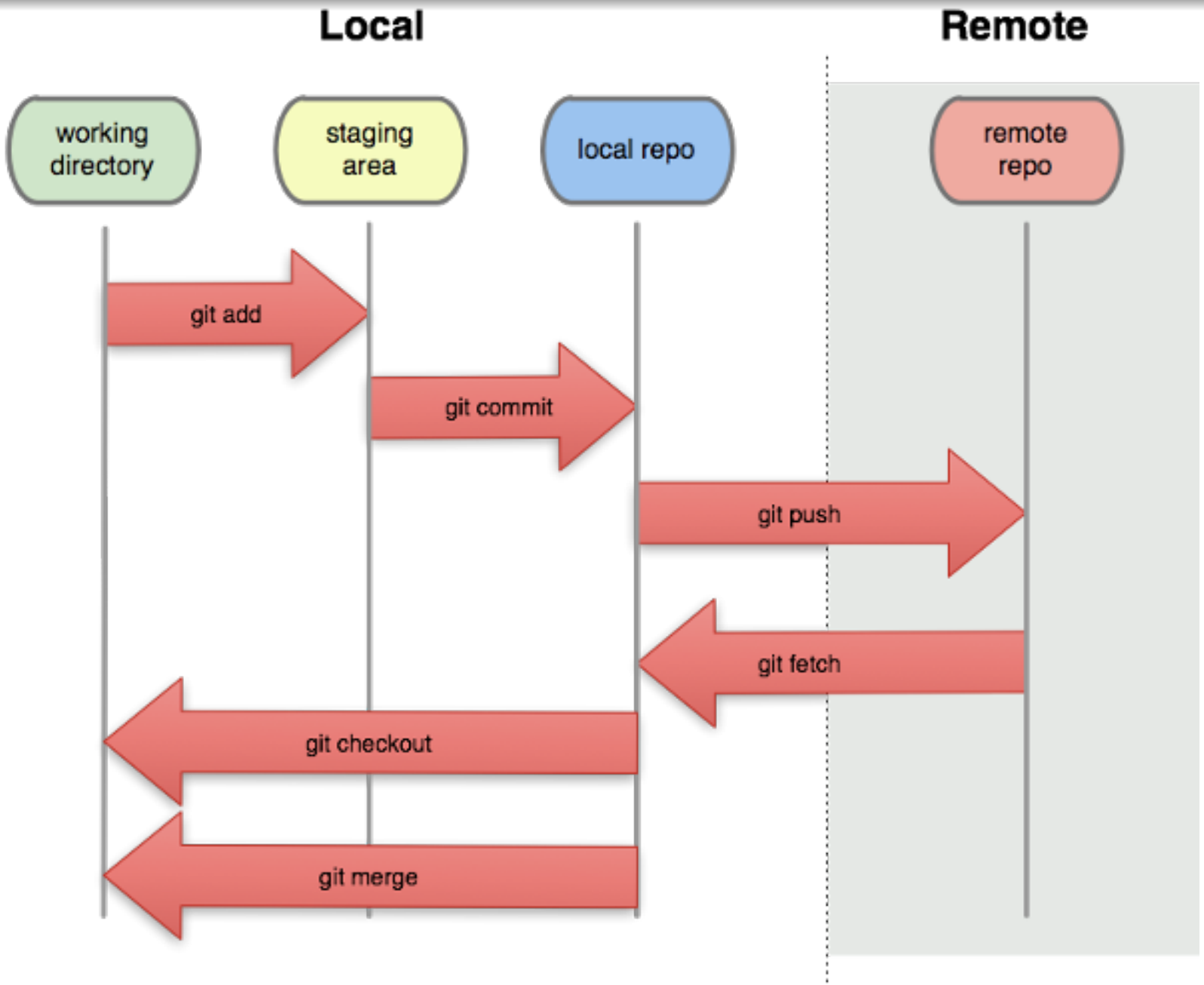
Technical detail: `git fetch` only checks the status of the remote, while `git pull` actually applies those changes in your working directory.

Overview


Local
Remote
working directory
staging area
local repo
remote repo
git add
git commit
git push
git fetch
git checkout
git merge

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- Collaborate with others!

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- Important rule to remember: Always `git pull` before starting to edit your local files!

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If you want to base your work on something somebody else already has created, you can create a “fork” of their online repository. We’ll use a repository I created on Github as an example:

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- This new repository is yours to do with as you please, it is independent of the original source repository. (But it still remembers where it came from, more on that later.)

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Now let's get the files onto your own computer:

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  - Open a new window (if necessary)
  - Click on "Clone Git Repository"
  - Paste the URL you copied earlier.
- This automatically connects your new local repo with the remote, so you can directly use `git push` and `git pull`.

Contributing back to the original repository

- Once you have made some changes and you have pushed them to (your) remote repository, you can ask the original author to "pull in" your changes (if you think they are worthy to be shared!).

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- This is the basic principle of how you can **contribute to an open-source project**!

Branches

- Any repository has a default "branch" in which all files are stored, usually called "main". This branch is usually reserved for the current most up-to-date, well-working production version (good example to keep in mind: the live files for a website, e.g. http://math.mychamplain.ca)

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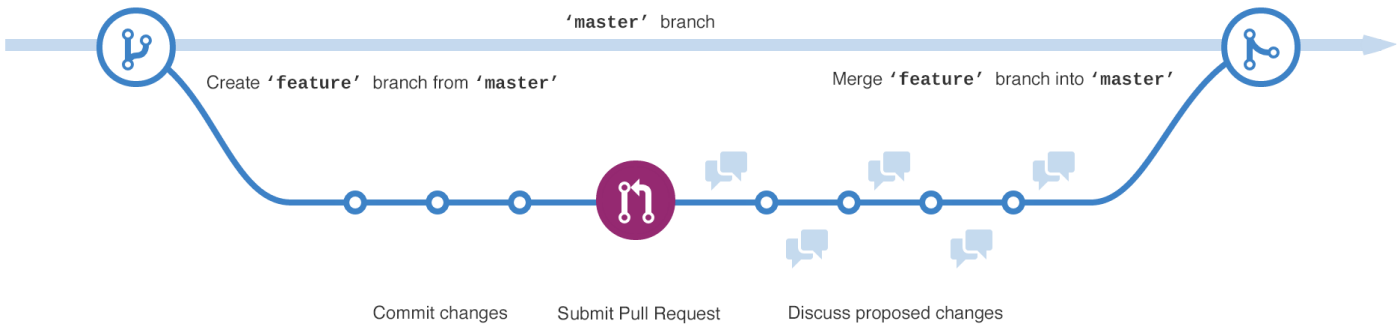
- But when working on new "features", it's usually not a good idea to immediately put those into the main branch!
- So, instead, you create a new branch (or fork!), work in there without danger of destroying anything for others, and finally ask for the changes to be **merged** into the main branch:



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Merge your changes into `main`

When you're satisfied with your work (and you pushed to the remote), it's time to "merge" it into the main branch. If you're the owner of both the original and the new branch, you can do this yourself, with the `git merge` command (or via the GUI in VSCode).

But if the original repository is owned by somebody else, you need to **create a "Pull Request"**, which is easiest done on the website, using "Contribute" - "Create Pull Request".

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- *Always* use `git pull` before you start editing. This pulls in any changes made by others (or yourself on another computer!) from the remote repository.

Using a graphical user interface (GUI) to git

Now that you're comfortable with the principles behind git, you are ready to do everything with a few clicks (instead of typing `git add`, `git commit`, etc. all the time)!

In Visual Studio Code

VS Code has `git` built-in, and you can access it using the (usually) third button on the left.

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