Version control with git for Mathematicians

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

Gabriel Indurskis, based on slides by Max Joseph

January 23, 2020

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/teaching/life suffer if your workstation exploded right now? (scale from 1-10)

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- in principle a commandline tool, but can use convenient graphical interfaces and websites (GitHub/GitLab/BitBucket)
- many modern editors support it directly without the need of external software

Why use git

"Always remember your first collaborator is your future self, and your past self doesn't answer emails"

- Christie Bahlai

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2. GitHub Desktop: a simple & very convenient GUI

   Optionally, create yourself an account on GitHub and log in on GitHub Desktop. (We will actually use GitLab for most things, but having access to GitHub directly is nice as well.)

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

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  - in Git Bash, you can use the command

    ```
    cat ~/.ssh/id_ed25519.pub | clip
    ```

    to easily copy the relevant text.

Command line git

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Make a directory with a file:

```
mkdir test
cd test
echo "This is a fancy test!" > welcome.txt
```

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

```
git init
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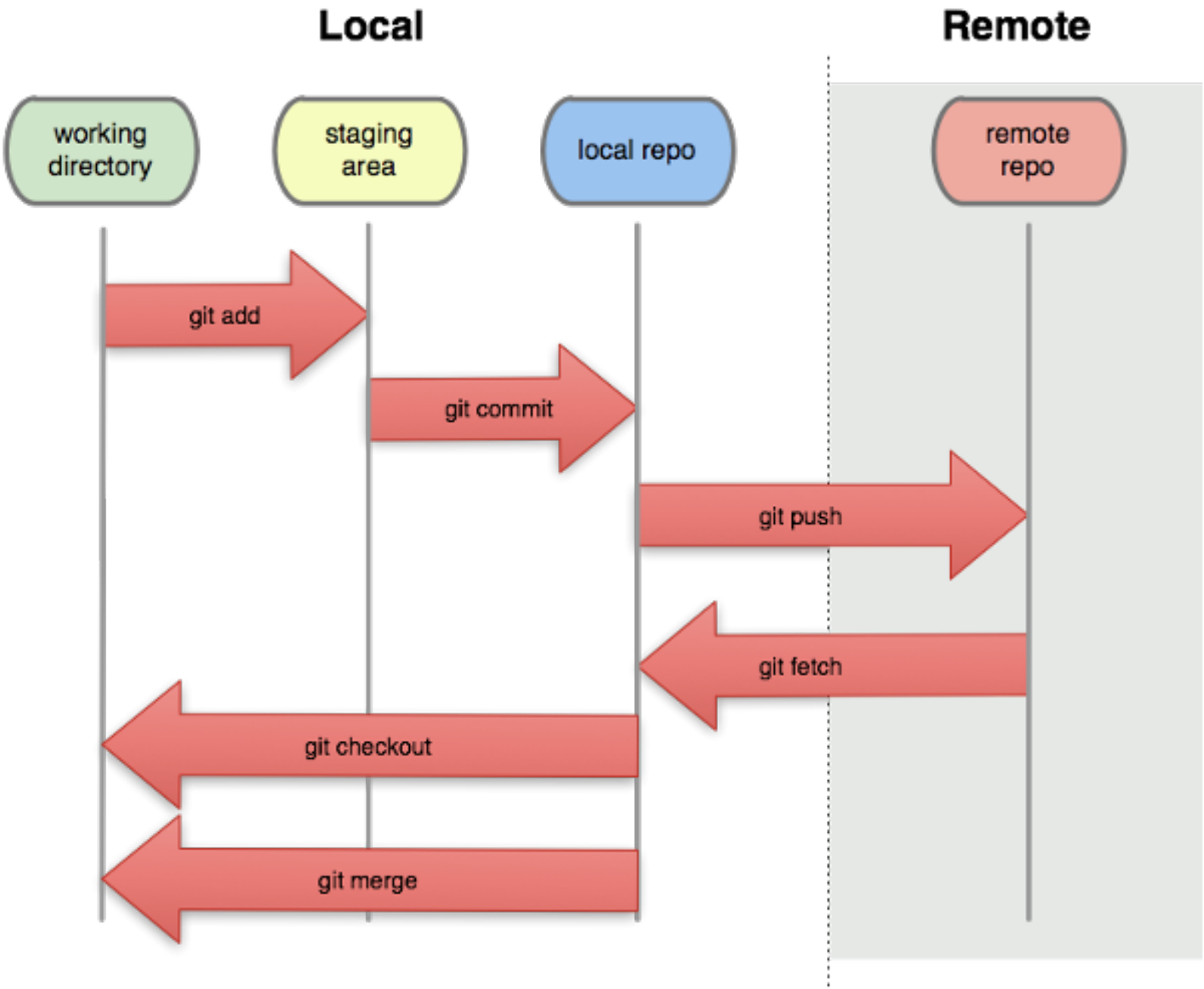
Adding your file to be tracked by git

```
git add welcome.txt
```

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

```
git add --all
```

Your changes are now "staged"



Committing

Changes aren't final until they're committed

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git status
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Committing

Once you're sure that your changes are worth saving
(THIS WILL GO ON YOUR PERMANENT RECORD)

```
git commit -m 'changed x, y, and z'
```

Commit messages

- Describe why and the what “in a nutshell”

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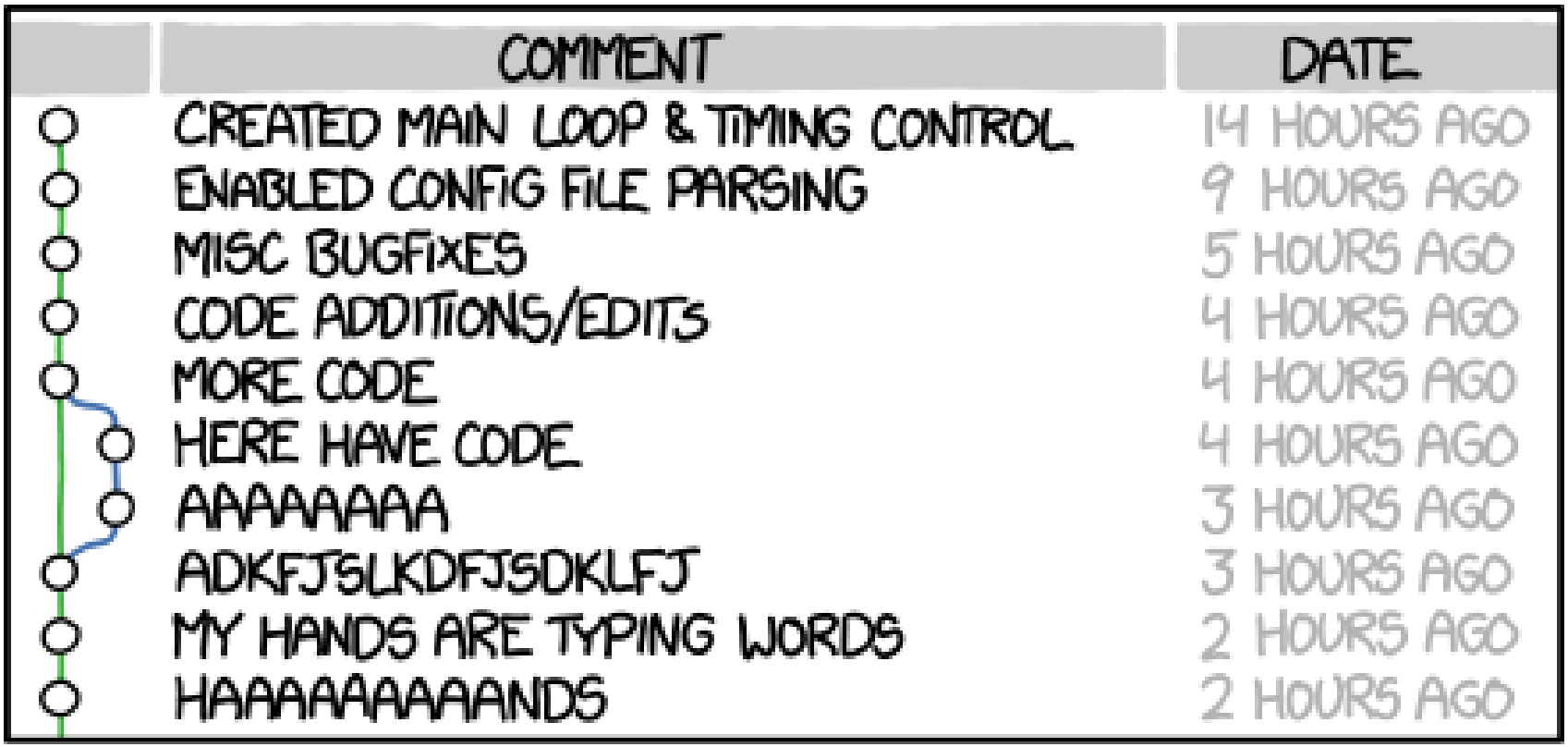

What did we do?

Commands to investigate changes

```
git status
git log
git diff
git diff file
```

Make another change

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4. View updated log

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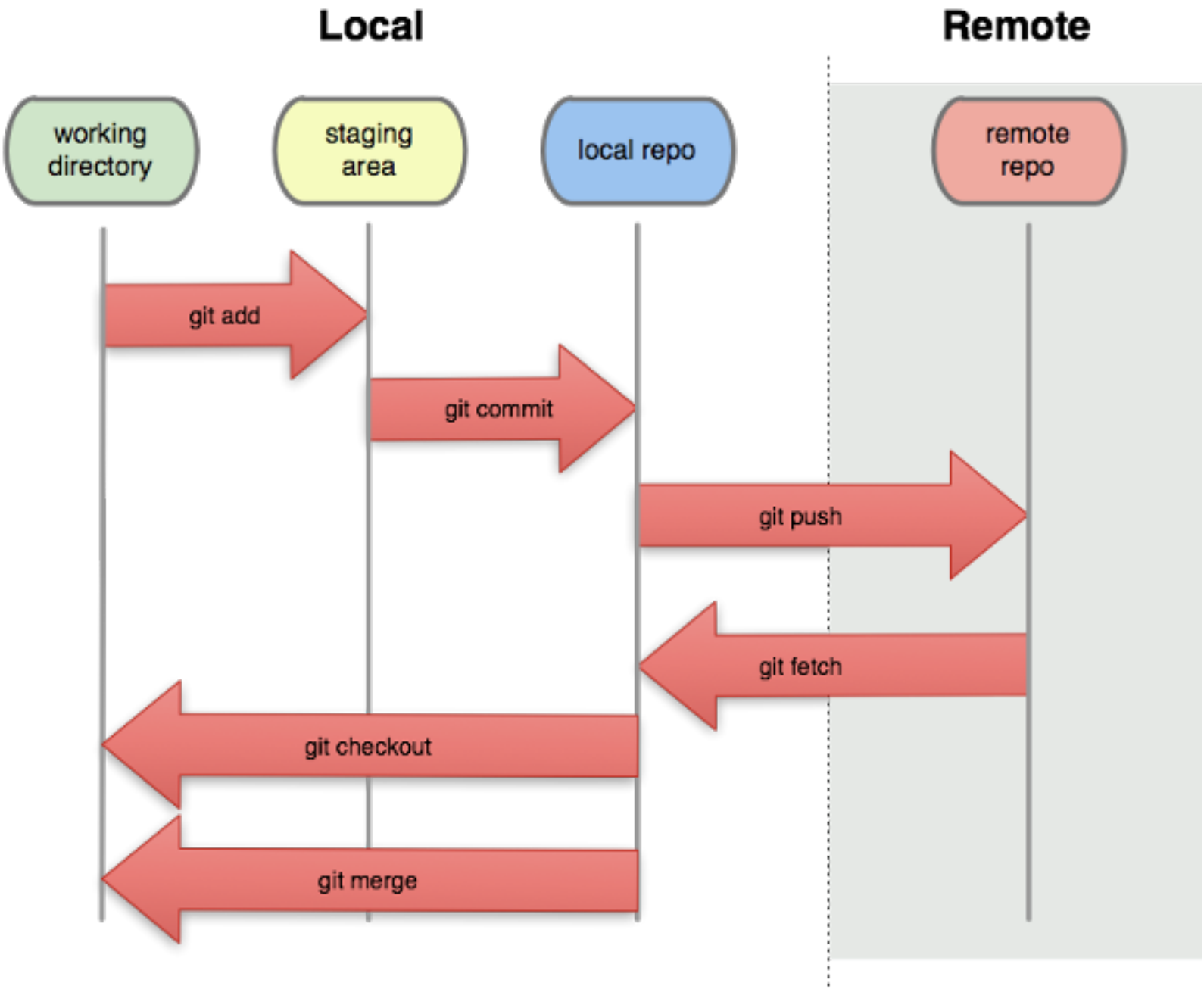
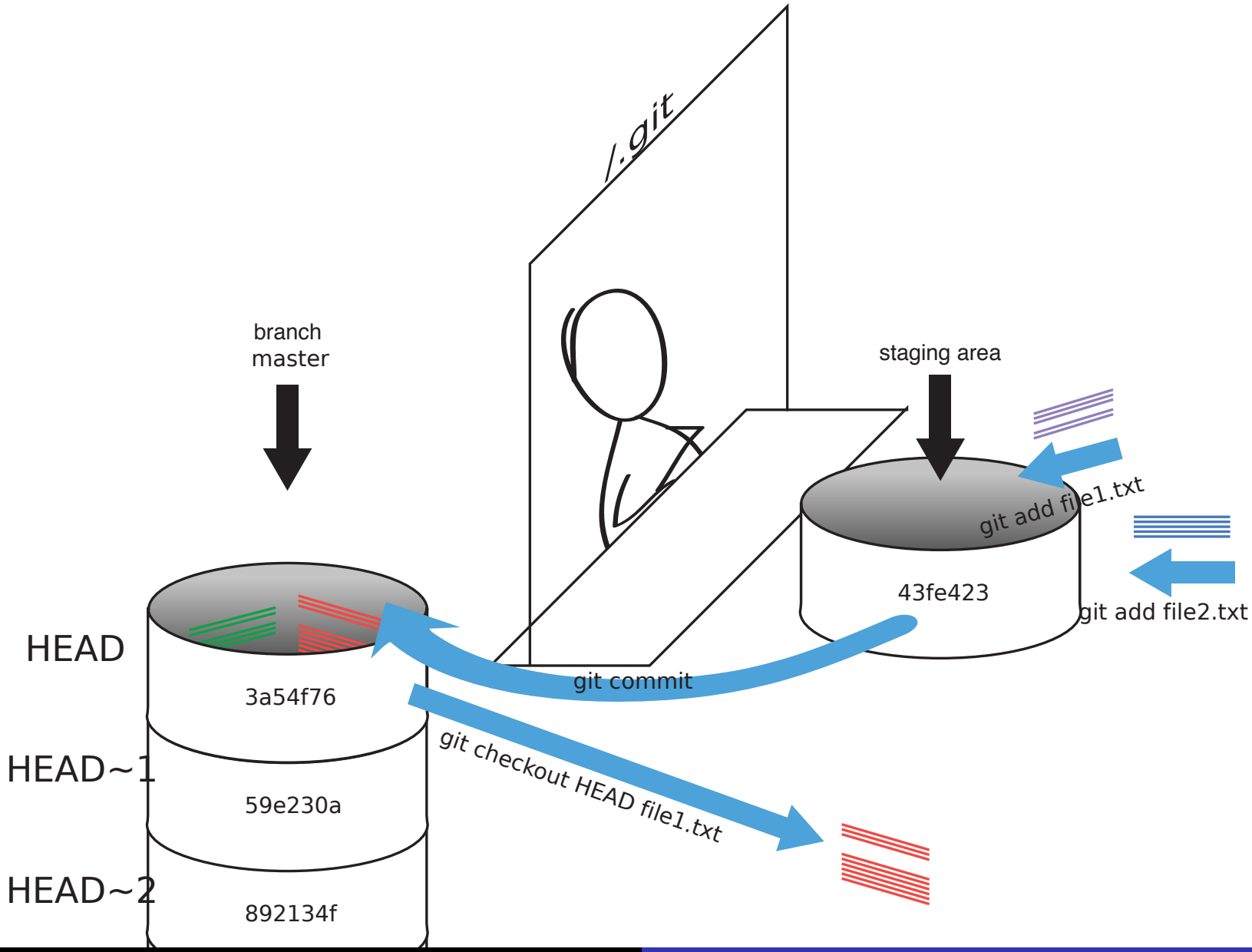
- Hang on, we do!

```
git diff
git checkout HEAD welcome.txt
```

What happened?



Wait, what does HEAD refer to?



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You can use all three if you want! (But I personally find GitLab the best free offer at the moment.)

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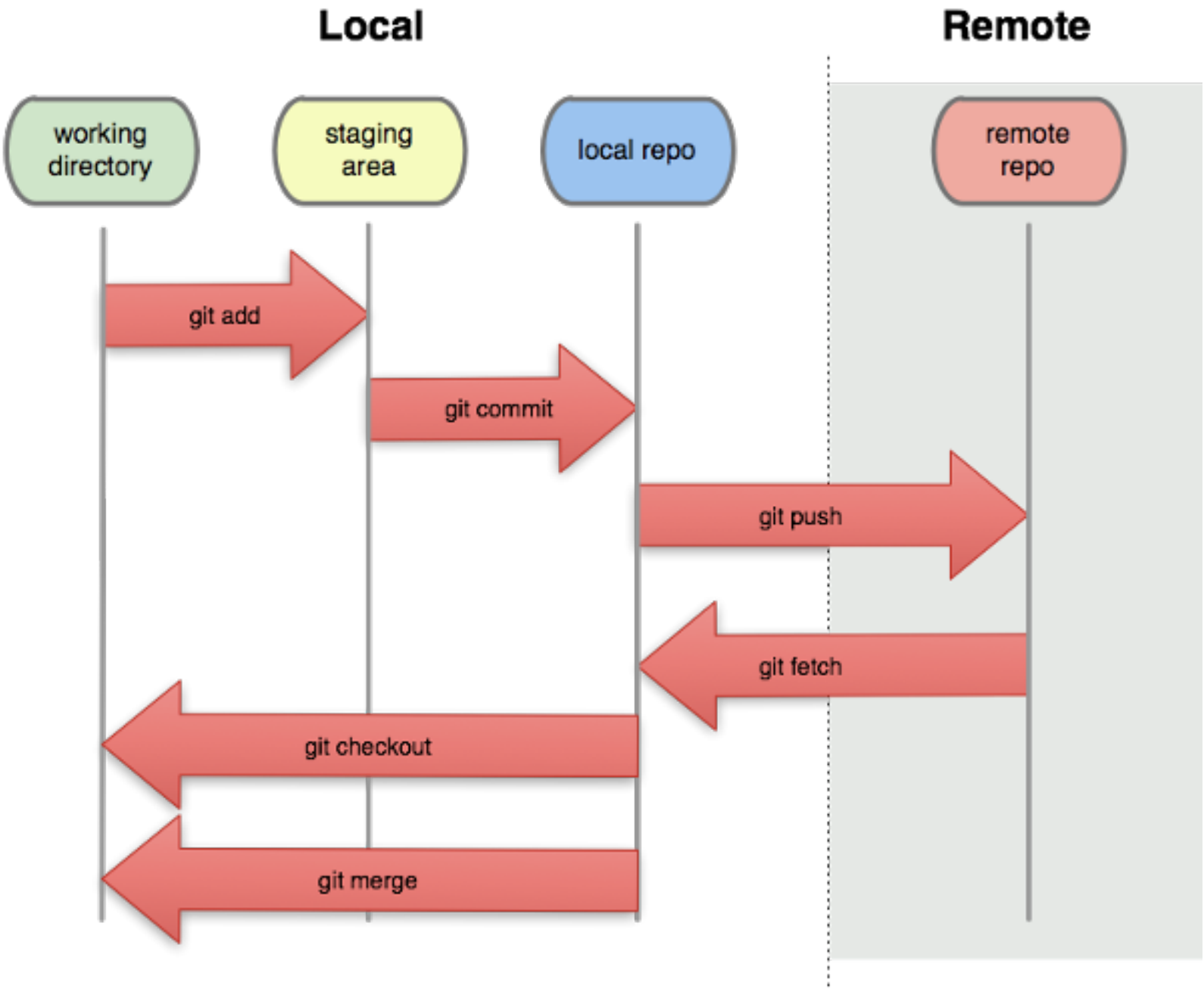
Check the remote website to see new changes.

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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- Technical detail: `git fetch` only checks the status of the remote, while `git pull` actually moves those changes into your working copy.

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- This automatically connects your new local repo with the remote, so you can directly use `git push` and `git pull`.

Branches

- Any repository has a default "branch" in which all files are stored, usually called "master". 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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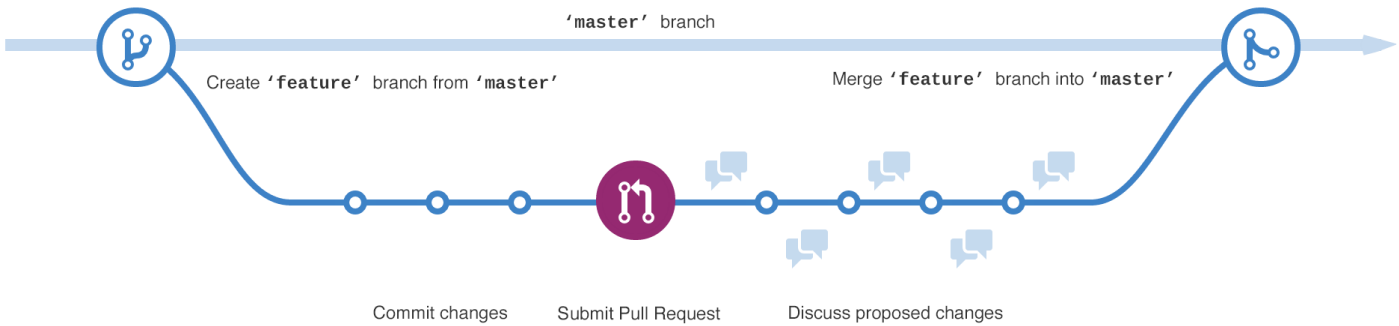
- But when working on new "features", it's usually not a good idea to immediately put those into the master branch!
- So, instead, you create a new branch, work in there without danger of destroying anything for others, and finally ask for the changes to be **merged** into the master branch:



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Ask for your changes to be merged into `master`

When you're satisfied with your work (and you pushed to the remote), it's time to "merge" it into the master branch. Usually, only the maintainer of the repository is allowed to do that, so you need to **create a "Pull Request"**, which is done on the website:

On GitLab:

- go to "Repository -> Branches", it should list all branches

Working in a branch

Create a local branch

- Create & checkout a new branch (for now, use your first name as the name for the branch): `git checkout -b branchname`
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- go to "Repository -> Branches", it should list all branches
- click on "merge request" next to your branch
- fill in some details in the form to explain what you did

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Slack.com

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- I've created a Slack group "CCSL Math Dept" for us, simply let me know if you'd like me to (re-)send an invitation.

Additional ressources

Motivation

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