Workshop on using Git and GitHub

Pieter Barendrecht

KAUST, November 12, 2020

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- A repository can be shared (online, external HDD, ...) to facilitate *collaboration* and/or to *back-up* your data
- Mainly used for source code (C++, Python, ...), but works well for most *plain-text file formats* (e.g. `.tex`, `.svg`)

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- Check the current status of your repository using `git status`

The interior of Git (somewhat technical, but essential!)

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- The filenames of these *blob*, *tree* and *commit* objects are SHA1-hashes based on their contents (40 hexadecimal digits). Note that fewer digits suffice to refer to a hash (4+)

Demo time!

Overview of other Git commands we used (1)

- `git cat-file [hash]` to check the type (`-t`), size (`-s`) and contents (`-p`) of an object (blob, tree, commit)
- `git config section.variablename "value"` to configure Git (e.g. `user.name "Pieter Barendrecht"` or `core.editor "nano"`). Useful flags include `--global`
- `git diff` to check differences between working directory and latest commit (or differences between two commits)
- `git log` to look at the commit history. Useful flags include `--oneline` and `--graph`. Tip, create an alias using e.g. `git config alias.graph "log --all --oneline --graph"`

Overview of other Git commands we used (2)

- `git branch` to list the current branches. A new branch can be created using `git branch [branchname]`
- `git checkout [branchname]` to switch to a different branch. Alternatively, use `git checkout -b [branchname]` to create a new branch and check it out directly
- `git merge [branchname]` to merge a branch into the *current* branch. It is a special type of commit, so use `-m` to add a description (why/what you are merging)
- `git help [command]` to get more information on using `[command]`, e.g. `git help merge`

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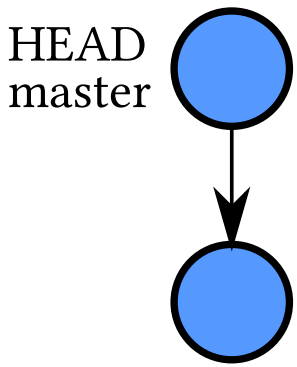

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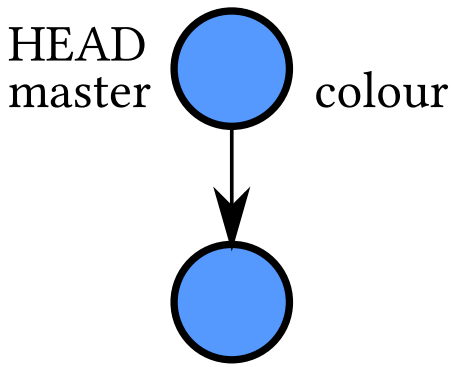

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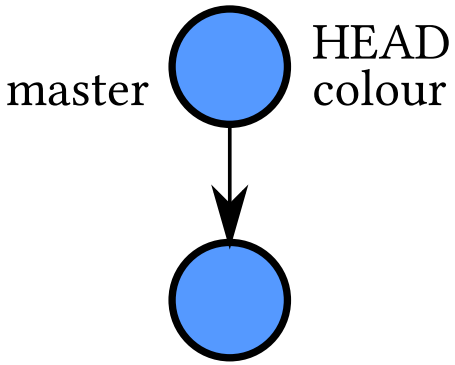

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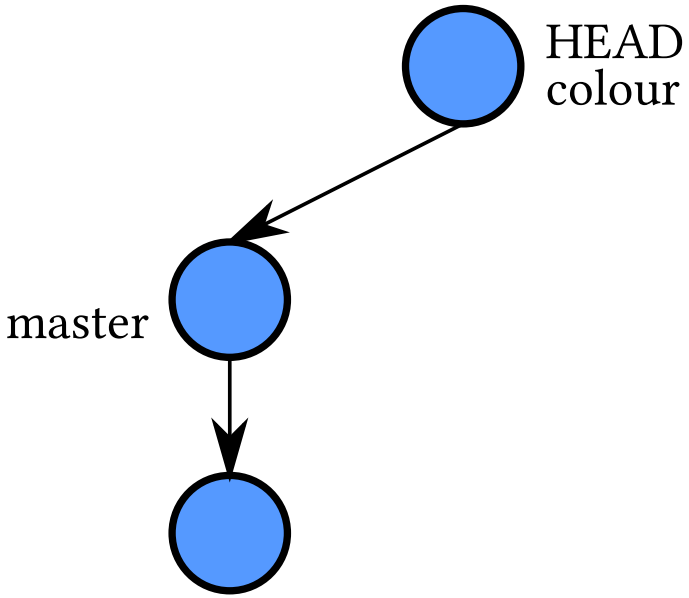

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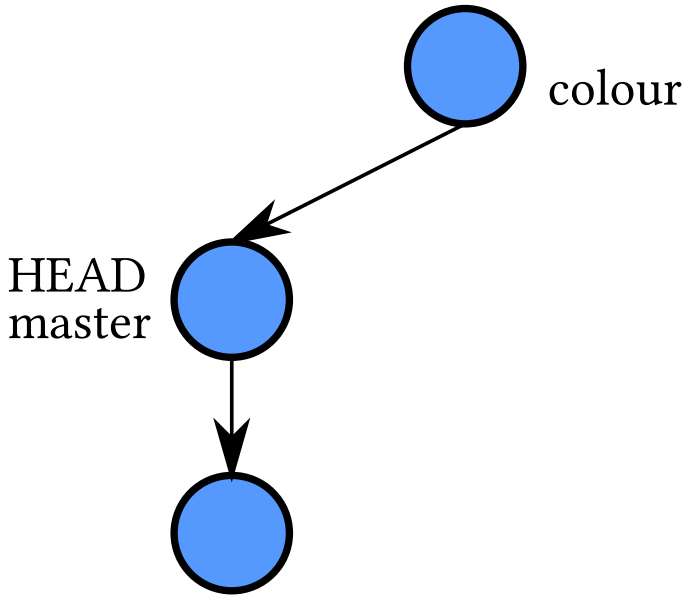

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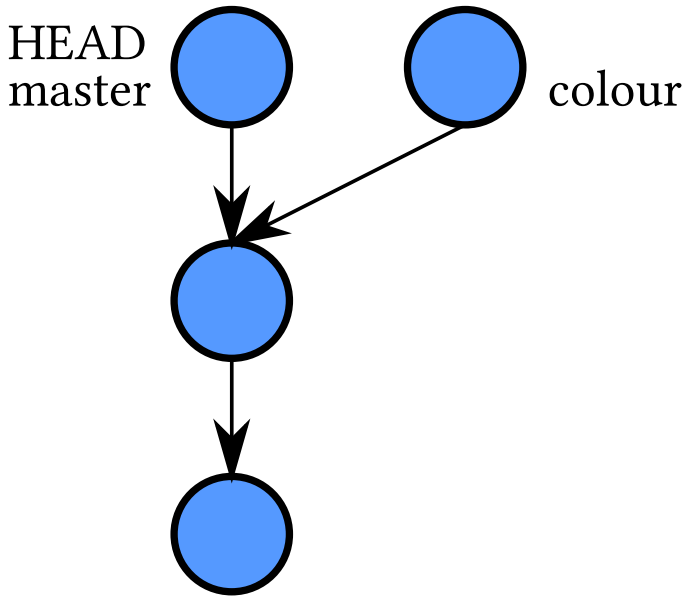

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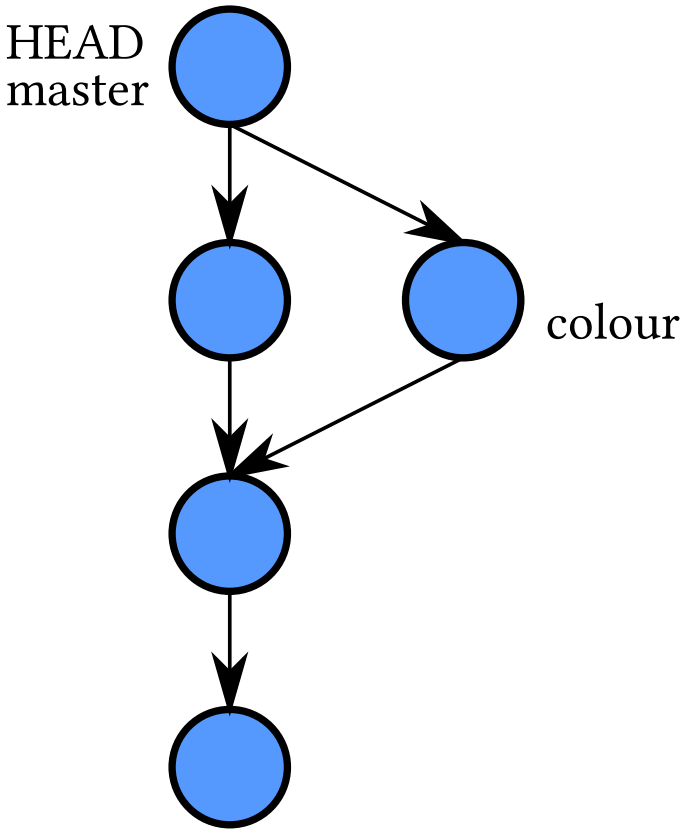

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- These are powerful commands. Experiment in a local setting, be careful in a shared setting! `git (ref)log` is your friend :)

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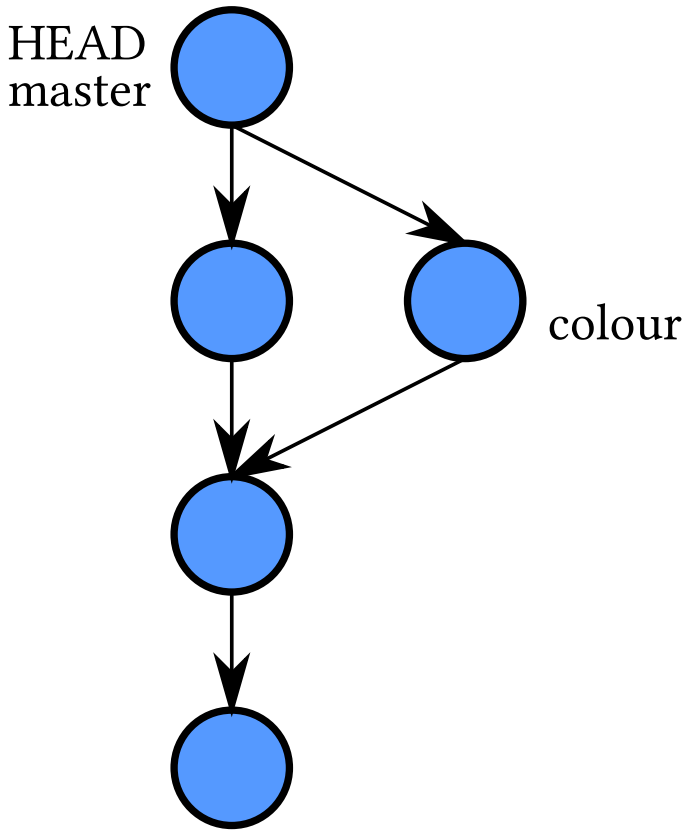
- Example of `git checkout [hash]` that does not point to a branch tip



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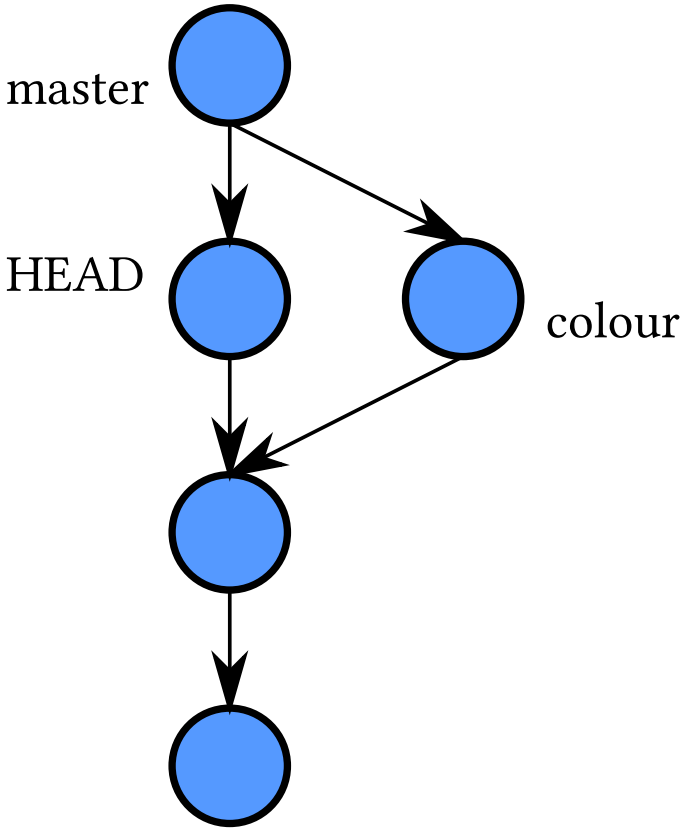

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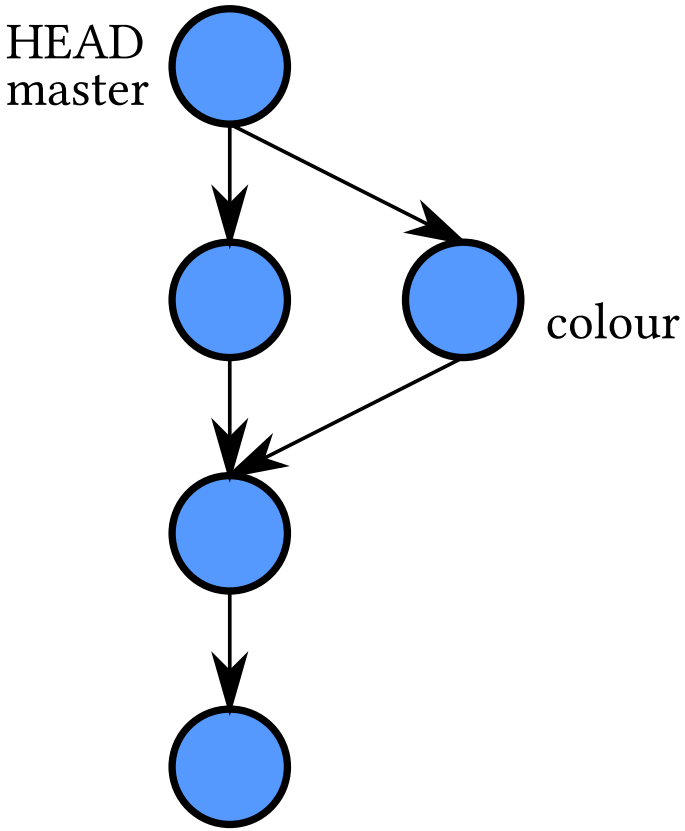

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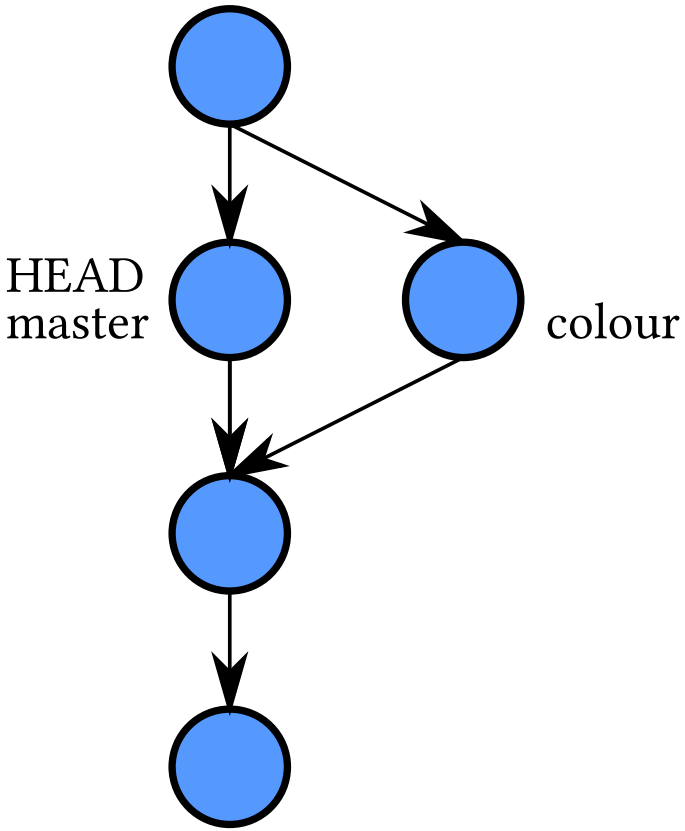

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- Related: there is also `git difftool`, which allows you to look at differences in an editor of your choice

Demo time!

Other tips and tricks

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- Many other useful *commands* (e.g. `git cherry-pick [hash]`, `git tag [hash]`) and *flags*, see documentation!

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- Synchronise a local branch to the remote repo using `git push [remote reference] [local branch]`. Adding the `-u` flag sets up a tracking reference (more on next slide)
  - Note that `git push (...)` requires your GitHub username and password. Tip, add an SSH key to your GitHub account

Interacting with remote repositories: GitHub (2)

- Receive updates from a branch on the remote repo using `git pull [remote reference] [remote branch]` and merge them
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- List available local branches using `git branch`, use the `-r` flag to list the remote ones, or `-a` to list all of them

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- You can refer to specific commits using their hash, and there are certain keywords (e.g. "fixes") that automatically handle aspects of an issue (e.g. closing it)

More on GitHub: pull requests

- If you want to contribute to a repository on GitHub, but you are not (yet) a collaborator, you can *fork* it on GitHub (i.e. become the owner of an online copy of the repo you can then clone and work on locally)

More on GitHub: pull requests

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- Make your changes in a separate branch, which you then push to your fork. Afterwards, you can create a *pull request*, which allows the collaborators of the original repository to merge your changes in their code (if they decide to do so)

Demo time!