Using Git for Science

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PSY6422

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Find this at: https://github.com/ABRG-Models/GitTutorial/tree/psy6422_lecture

Introduction

- This session is about a command-line tool called Git.
- Git is a tool for managing text, so these slides are naturally text heavy!
- We'll use it with the help of a website built around Git: github.com
- I'll give an overview of Git, including its jargon (clone,commit,checkout...) and why it's such a useful tool, then we'll go through some example tasks together.

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1. Revision control allows you to have different versions of a single file without having to explicitly make copies
2. Most revision control tools allow several people to work on the same files

File versions

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With revision control, you only have

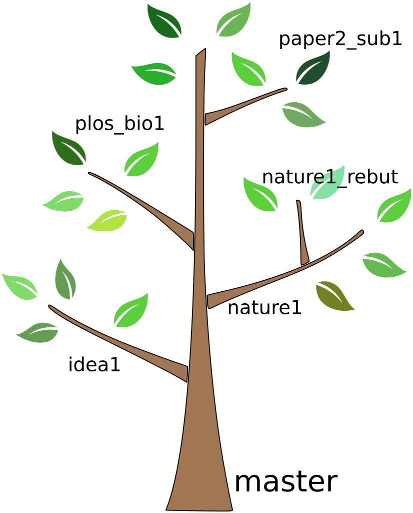
- Project1/myProgram.r

Branches instead of file versions

When you use git, you use branches to work with different file versions. There's one central branch, which is usually called **master**.

Clone

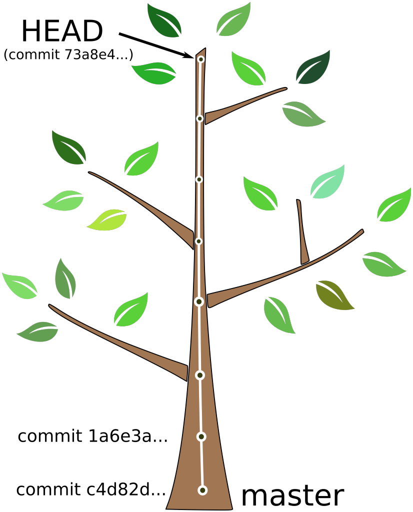
- When you clone a repository from github, you'll get all the files as they exist on the **master** branch
- Also you get all the information needed to see the files on any of the other branches (each has a name)



A sequence of changes on master

Commits

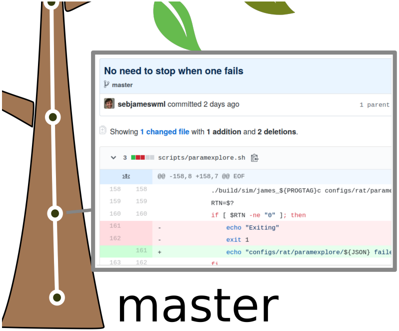
- There can be different versions of myProgram.r available on **master**; but it's a sequence of changes.
- Each change is a commit to master.
- Each commit has a universally unique identifier.
- When you first clone, you'll see the files at the HEAD of **master**



What's in a commit?

Commits contain changes

- One commit can include the changes to one file
- One commit can also include changes to multiple files
- Each commit has a commit message



No need to stop when one fails

master

sebjameswml committed 2 days ago 1 parent

Showing 1 changed file with **1 addition** and **2 deletions**.

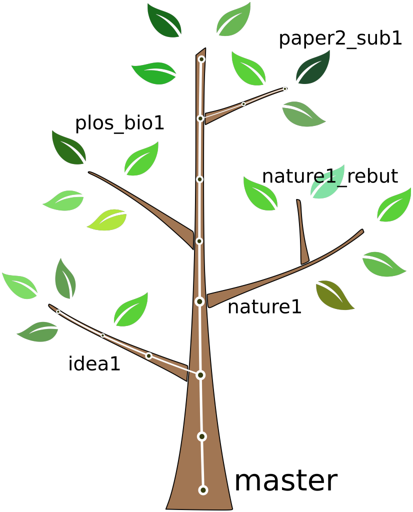
```
3 scripts/paramexplore.sh
@@ -158,8 +158,7 @@ EOF
              ./build/sim/james_${PROGTAG}c configs/rat/parame
              RTN=$?
              if [ $RTN -ne "0" ]; then
-                 echo "Exiting"
-                 exit 1
+                 echo "configs/rat/paramexplore/${JSON} faile
              fi
```

Checkout a branch

Checkout

When you checkout a branch, it updates your file to the content it has on that particular branch

- Checkout **idea1**; get myProgram.r with the code for your first idea.
- Checkout **paper2_sub1**; get myProgram.r as it was when you submitted your second paper based on the project.



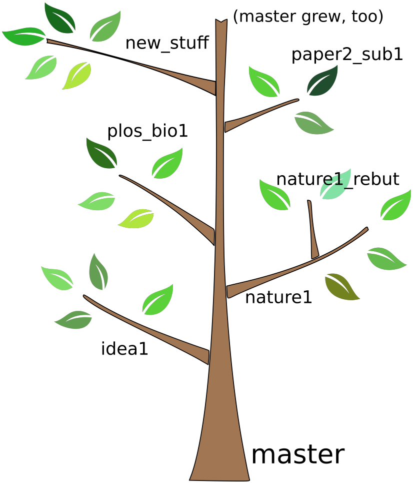
Fetch and pull

So far, so local. Now imagine there is a shared tree living at github.com.

Fetch

When you fetch new changes to the repo, information about new branches and commits that were added are copied into your local copy of the repo.

- Any of the existing branches could have extended
- New branches could have appeared
- You can pull a branch and that will always do a fetch first



Push your commits

You worked on a new feature, using a new branch. You changed some existing files and added some new ones. You're ready to copy that back to github.com.

Push

The process of copying new commits and branches as achieved with git push.

- You make sure you have committed your changes to your branch
- You push your branch to the online repository (i.e. github)
- If there are changes on your branch on the online repository that you don't have yet, then you'll have to pull first, merge changes and <u>then</u> push.

Working with other people

This is 'main feature 2'. Now, rewind a little, forget the trees, and think about working with a set of plain files on your computer.

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- Just after you emailed them, you find an error in your fix, and you have to send another email...
- Now imagine that one of your colleagues found a separate fix in the same file and emails that around. Which fix is more important? Who is going to merge the two fixes together?

Hopefully you can see how the tree with all its branches is going to help here (also, the clever code to merge changes that you make with those that your colleagues have made)

Other revision control systems

Git is not the only game in town. Others include:

- RCS (Revision Control System)
- SCCS (Source Code Control System)
- CVS (Concurrent Versions System)
- Subversion
- Tons of proprietary systems
- Bazaar
- BitKeeper
- Mercurial

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Git is not the first revision control system, and its developers could draw on a lot of collective knowledge when designing it.

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- In 2005 Linus fell out with BitMover Inc., and Git was created to replace it (and so all was well again in the world of free software OS development - git is fully free).
- The name git doesn't really mean anything.

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- That means you can work on your code, making incremental commits even when you don’t have internet access.
- And every copy of the repo is a backup!

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- It's now a big business; it was acquired by Microsoft in 2018

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- You can include your paper (and your data) alongside your model code in a single, public repository
- Use of Github is a very effective way to share your published models with your peers

The Git Tutorial

The rest of these pages have been put together from material taken from the Software Carpentry project, which emphasises the use of Git.

Head over to:

http://sebjameswml.github.io/git-novice/

And start on the lesson “A better kind of Backup”