Using Git, GitHub Desktop, and GitHub for novice and experienced users

Yi Liu and Tom Palmer 1st December 2023

Learning outcomes

- Novice users: be able to make and commit into a repo on GitHub
- Experienced users: how to avoid some common pitfalls

- Understand that Git and GitHub can be used in different ways for different projects
- Understand that Git provides certain features and GitHub provides additional features
- Be able to use a graphical Git GUI, e.g., GitHub Desktop, VS Code extension
- Be able to use Git, GitHub Desktop/VS Code and GitHub with confidence
- Be able to competently contribute to other Git repositories

Why Git

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WWW. PHDCOMICS. COM



https://xkcd.com/1597/

Installation links

- GitHub Desktop <u>https://desktop.github.com/</u>
- Git for Windows https://gitforwindows.org/
- macOS install with homebrew: brew install git

3 researcher use cases

- Helena
- Des
- Dom

Helena

- Wants to make code/supplementary material available online for her journal article
- Does not need either Git nor GitHub Desktop installed on computer
- Doesn't need her code folders initialised as Git repos
- Simply drag and drop files from computer into GitHub web interface, commit message: "Add files via upload"
- Recommend turning off GitHub repository features such as Issues, Releases, Discussions, etc (through About pane | settings). If someone wants to contact her they can email



Des

- Coding an R package
- Essentially working alone, occasionally might receive a pull request from a supervisor/interested user
- Needs GitHub Desktop installed (which has a version of Git within it)
- Needs project folders initialised as Git repos
- Needs to take care to write meaningful commit messages
- Does it really matter if he always works on the main branch?
- Question: Why might you want to send a PR to your own repo even if you are the only contributor?
- Helpful to make Releases in the GitHub repo (and/or use Git tags)

Dom

- Coding R packages and additionally wants to send pull requests to other people's projects on GitHub
- Needs both Git and GitHub Desktop installed
- Needs to understand
 - How to fork a repo
 - Never send a PR from his own main/master/default branch why??
 - Needs to understand how to rebase a branch
 - When is it acceptable/required to force push (i.e., rewrite Git history) a branch??
 - Will need to understand some Git Terminal commands (git cmdname)
 - Needs to know how to resolve Git merge conflicts

A scenario

- Dom starts work on his home PC on a new branch (pushes it up to GitHub)
- Goes to work, works on the branch on his work PC but at some point force pushes to the branch (up to GitHub)
- When he goes home, how does he get the updated version of his branch?
- At home in GitHub Desktop in top right box he will see both arrows be careful when you see these!!



• (For show) Expanding the dropdown arrow - in this box **do not** select either option

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				Pull 3 comm The current b GitHub that c	its from the orig pranch (make-vi lo not exist on yo	i } !	collaborators working on this branch will need to reset their own local branch to match the history of the remote.

• git reset is your friend

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• GitHub Desktop is happy again

Current Repository	· ~ ·	Current Branch #45 - C Fetch origin make-v0.0.29 #45 - C Last fetched 3 minutes ago	
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Squashing and reordering commits

- Select commits and reorder/squash
- Occasionally GitHub Desktop can hang and fail to complete such operations
- In which case open a terminal in your repo and run: git rebase -- abort



Reordering example (select commits | drag and drop where you want)



Git features versus GitHub features

- GitHub provides alot of features on top of Git features
- E.g., Git has the concept of tags (for a version release), GitHub extends this with its Releases
 - This is why alot of projects which are mailing list based only use Git features, e.g., Git itself <u>https://github.com/git/git/</u>

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My R package is on CRAN - what's my workflow?

• Once you have made a release to CRAN and release/tag in your repo you can continue committing on the default branch e.g.,

https://github.com/yihui/knitr



My R package is not on CRAN - what's my workflow?

- Users are (likely) installing your package from the latest commit on the main branch, e.g., remotes :: install_github("TwoSampleMR")
- Should you declare a new version with each commit onto main/master??
- We could instruct users to install the latest release, i.e.,

remotes::install_github("MRCIEU/TwoSampleMR@*release")

Under what circumstances do merge conflicts occur?

https://docs.github.com/en/pull-requests/collaborating-with-pull-requests/addressin g-merge-conflicts/about-merge-conflicts

• Editing same line of same file (or editing a file that someone else deletes)

Renaming a file to retain its Git history: git mv

- Do not just commit in deletion of old file and creation of new one
- git mv existing-filename new-filename



Gotcha: Windows (CRLF) versus macOS/Linux/Unix (LF) line endings

- Secretly Git wants text files to have LF line endings, and this is how they are stored on GitHub
- Include a .gitattributes file in your repo to be safe

Auto detect text files and perform LF normalization
* text=auto

- <u>https://grpehr.github.io/training/01-08-common-errors.html#no-content-change</u> <u>s-found</u>
- Be careful if all text files in a repo show as changed give away you might be about to make this mistake

Perhaps the best worst error/warning message

You are in 'detached HEAD' state. You can look around, make experimental changes and commit them, and you can discard any commits you make in this state without impacting any branches by switching back to a branch.

If you want to create a new branch to retain commits you create, you may do so (now or later) by using -c with the switch command. Example:

git switch -c <new-branch-name>

Or undo this operation with:

git switch -

Turn off this advice by setting config variable advice.detachedHead to false

How can we improve the commits in this PR?

https://github.com/MRCIEU/TwoSampleMR/pull/419

added steiger sensitivity for unmeasured confounding #419



explodecomputer wants to merge 1 commit into master from 418-add-extra-mr-steiger-sensitivity



- Try to make sure each commit does a specific thing so that it could be reverted later if necessary
- (Arguably this should be 3 PRs)
 - the addition of the new Steiger code
 - ggplot2 size to linewidth argument
 - mr_keep fix

GitHub message ... but couldn't find those commits

Replace Gitpod with GitHub Codespaces #1398



R

We went looking everywhere, but couldn't find those commits.

Sometimes commits can disappear after a force-push. Head back to the latest changes here.

Empty subdirectories ... don't show up in Git

- Git tracks file contents
- If a new subdirectory of your repo is empty it will not show as a change in Git (nor in GitHub Desktop)
- If you want to keep a subdirectory add a blank text file named .gitkeep and check that in

git concepts: working tree

A git repository (or repo) is a directory tracked by git, and the version control information is stored under the ./.git directory. This external directory is called the **working tree**.





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	- man
	– pkgdown
	- tests
	- vignettes

git concepts: commits, branches

Your source version history consists of **commits** as basic units

A **branch** is a collection of commits.

As a convention, for a big repo, extensive changes should be first done in their own branches, e.g. a branch involving development for a big feature. After the development reaches a good level of maturity, this branch gets **merge**d back to the default **master** / **main** branch.



Develor

Feature

git concepts: the **remote** repository

git is a *decentralised* system -- your **local** repo contains all source history already.

Nevertheless you can pair your local repo with an **upstream** remote repo to use it as a

- Backup
- *Centralised* source for collaboration between multiple colleagues, or yourself across multiple machines

Your local repo can be synced with a remote via git pull (fetch & rebase) and git push.

GitHub is one of the platforms to host your remote repos.



Common git operations

- View git history
 - repo
 - file
- See what has been changed (git diff)
- Try make some changes (git add, git commit)
- Reset those changes (git reset)!
 - NB: git revert is a different command
- Branches
- Remote

Tips for starters:

- 1. Billions of tutorials on git out there
- 2. Use a graphical client for those git commands

Here I use the Visual Studio Code text editor as my git client. Extra extension: Git History



https://github.com/YiLiu6240/TwoSampleMR-test-git

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Create a new fork

A fork is a copy of a repository. Forking a repository allows you to freely experiment with changes without affecting the original project. View existing forks.

Required fields are marked with an asterisk (*).



X YiLiu6240 - / TwoSampleMR-test-git

S TwoSampleMR-test-git is available.

By default, forks are named the same as their upstream repository. You can customize the name to distinguish it further.

Description (optional)

R package for performing 2-sample MR using MR-Base database

Copy the master branch only

Contribute back to MRCIEU/TwoSampleMR by adding your own branch. Learn more.

(1) You are creating a fork in your personal account.



git history

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Make some changes and commit



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Commits on Nov 30, 2023			
A test commit ViL469240 committed 2 minutes age		@ s23985s	
Commits on Nov 16, 2023			
Merge pull request MRCEU#456 from remlapmot/tweaks-oct-2023	Verified	🖓 cbd83e6	i o
Add urt to HMG article	Verified	@ 986d34b	0
devtools:::document() fig remlapmot conneited 3 weeks app.	Werified	@ 3214835	0
Fix pubmed http URL to doi URL import committed 2 weeks ago	Verified	CP 7fd8867	0
Fix biorxiv http URL to doi URL	Verified	10 17de853	100

Commit

A test commit					Browse files	
₽ git-b	ranch-	est				
Ø YILI	lu6240	committed 3 minutes ago		l parent cbd83e6	connit	aZ388ba
howing	1 chan	ged file with 2 additions and 0 deletions.	Whitespace	Ignore whitespace	Split	Unified
~ 2		R/Anit.R 🗇				
111		00 -1,3 +1,5 00				
	1 2	• # Some test changes				
1	3	#" Knit report using working environment				
2	.4	**				
3	- 5	π^* Marning: It is guite likely that this will be called within an Rød file				
14						

Resources

- Tutorials
 - <u>https://swcarpentry.github.io/git-novice/</u>
 - Training material for Electronic Health Records group https://grpehr.github.io/training/
- Technical details on Git
 - Linus Torvalds Google Tech Talk <u>https://youtu.be/4XpnKHJAok8?si=4NNxxajwhbohJ3Wl</u>
 - Git Rev News <u>https://git.github.io/rev_news/</u>
 - Many excellent blog posts
 - Derrick Stolee https://github.blog/author/dstolee/
 - Elijah Newren https://blog.palantir.com/optimizing-gits-merge-machinery-1-127ceb0ef2a1
- Git clients
 - GitHub Desktop, Tower, GitKraken (GitLens VSCode Extension)
- ... and a million tutorials about Git on Youtube and other platforms
- Nothing can replace your trial by error don't be afraid to make mistakes

Summary

- Are you a Helena, Des, or Dom?
- Or maybe you'll have different use cases on different projects
- Any questions/problems working with Git and GitHub?