Introduction to Git & Github

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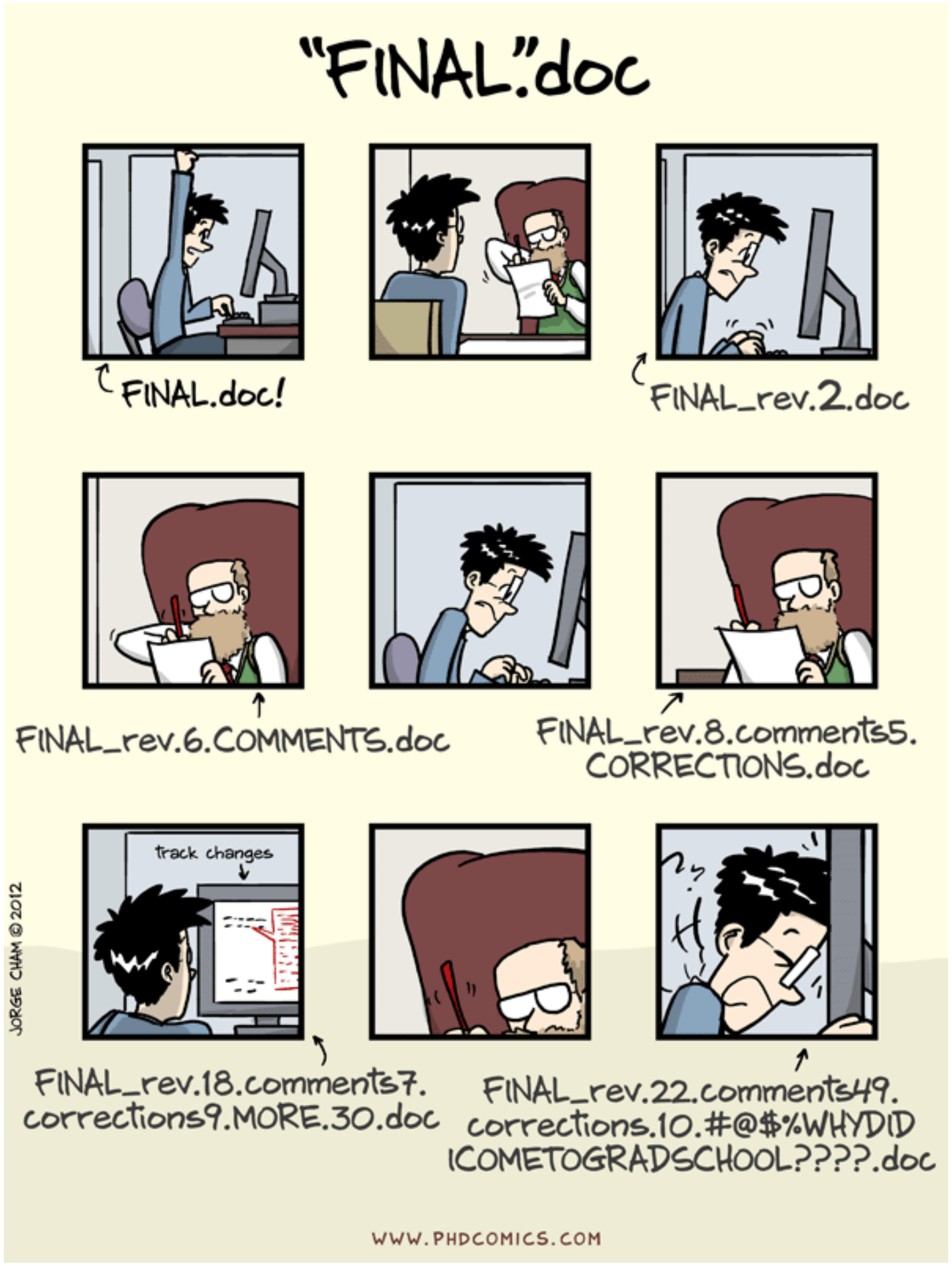
URPP
Evolution
in Action

Git is hard to learn (and teach)

- Git was not build for our exact usage (supports many workflows)
- Git commands are sometimes not intuitive
- The advantages are long-term
- Learning/using Git is sometimes frustrating

"Git has a real knack for making me feel stupid!"
Torsten Seemann

The problem


"FINAL".doc
FINAL.doc!
FINAL_rev.2.doc
FINAL_rev.6.COMMENTS.doc
FINAL_rev.8.comments5.CORRECTIONS.doc
track changes
FINAL_rev.18.comments7.corrections9.MORE.30.doc
FINAL_rev.22.comments49.corrections.10.#@$%WHYDID ICOMETOGRADSCHOOL????.doc
JORGE CHAM © 2012
WWW.PHDCOMICS.COM

Problem cont.

- You want to improve a script that works. After 2 hours of rewriting the new script still doesn't work. Unfortunately you overwrote the original version that worked and can't go back.
- You biked into the office only to realize that the USB key with last night's work is still on the kitchen table.
- Which version of the script/data did I use 3 years ago when I did the analysis?

You use Git to take snapshots of all the files in a folder (including subfolders).

This folder is called a repository or repo.

When you want to take a snapshot of a project (1 file or many files), you create a commit

`Boxplot.R`

`Boxplot-2.R`

`Boxplot-Elena-feedback.R`

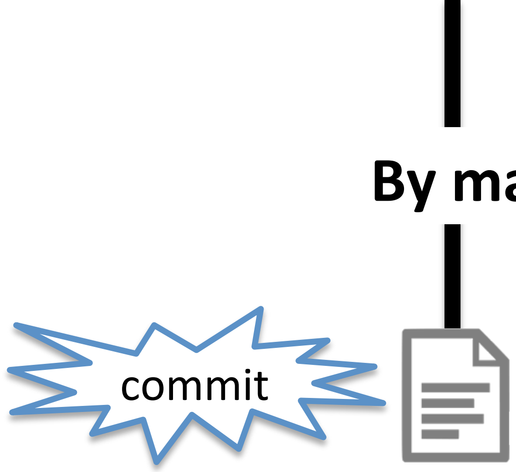
`Boxplot-Final.R`

`Boxplot-Final2.R`

By saving copies

`Boxplot.R`

By making commits



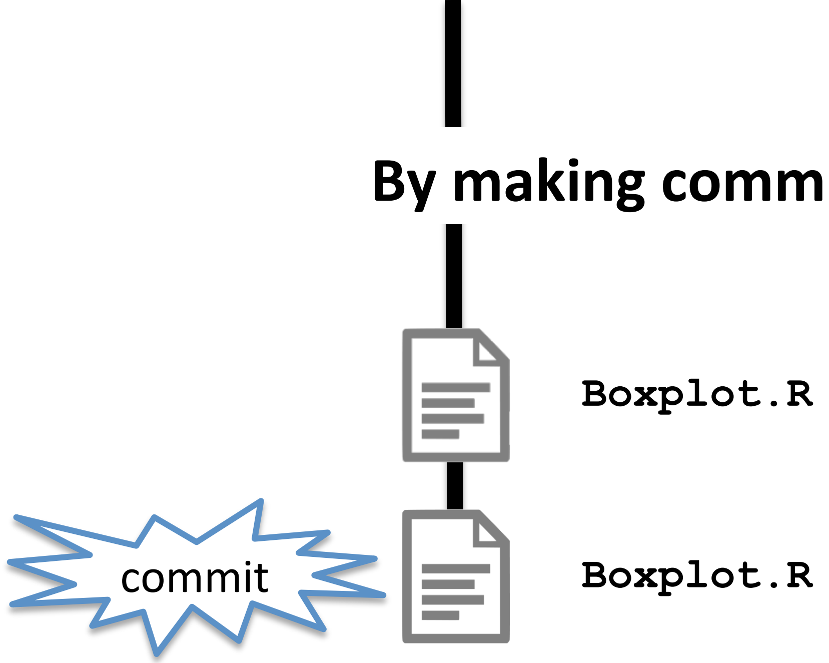
`Boxplot.R`

By saving copies

`Boxplot.R`

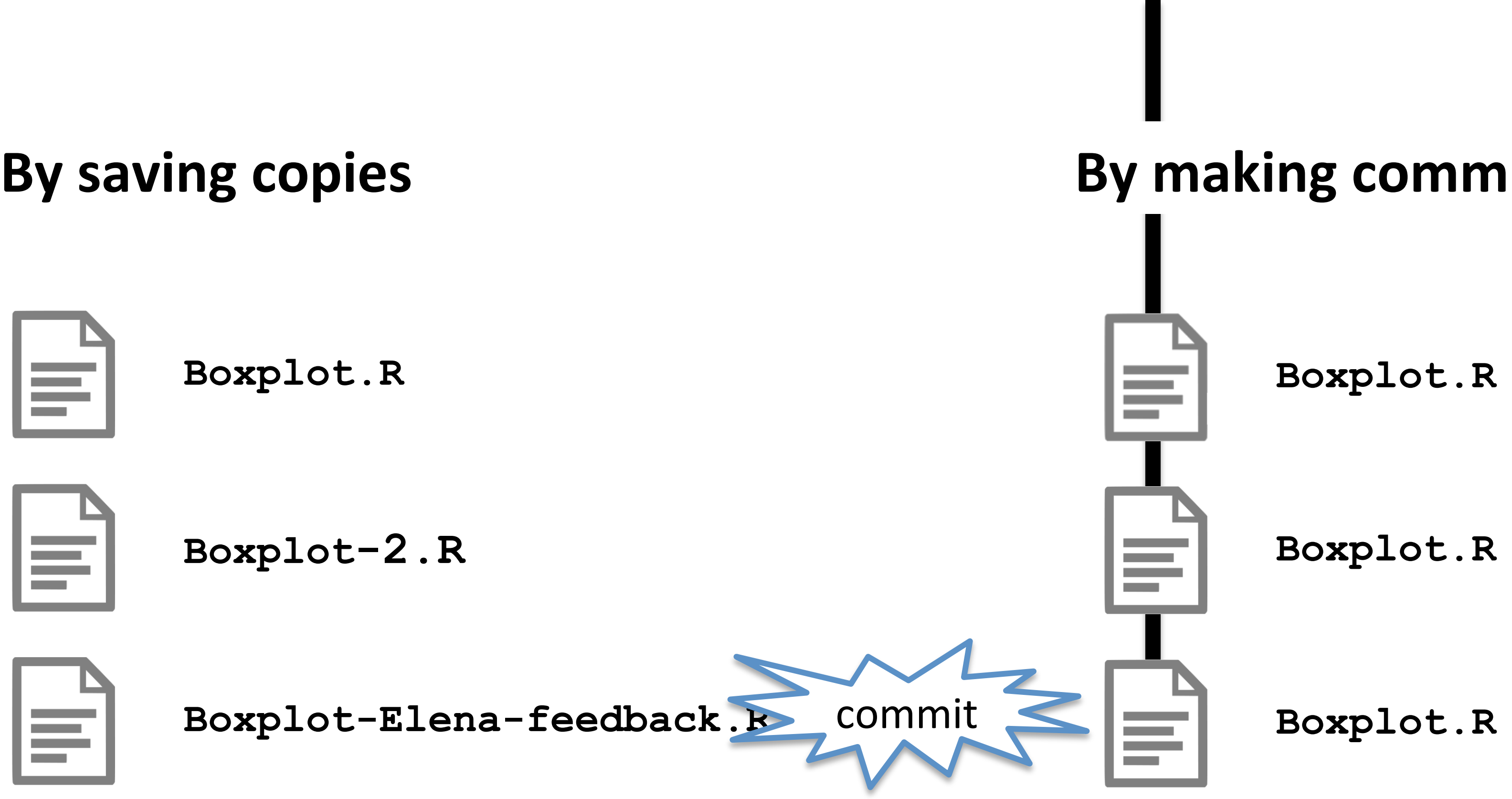
`Boxplot-2.R`

By making commits



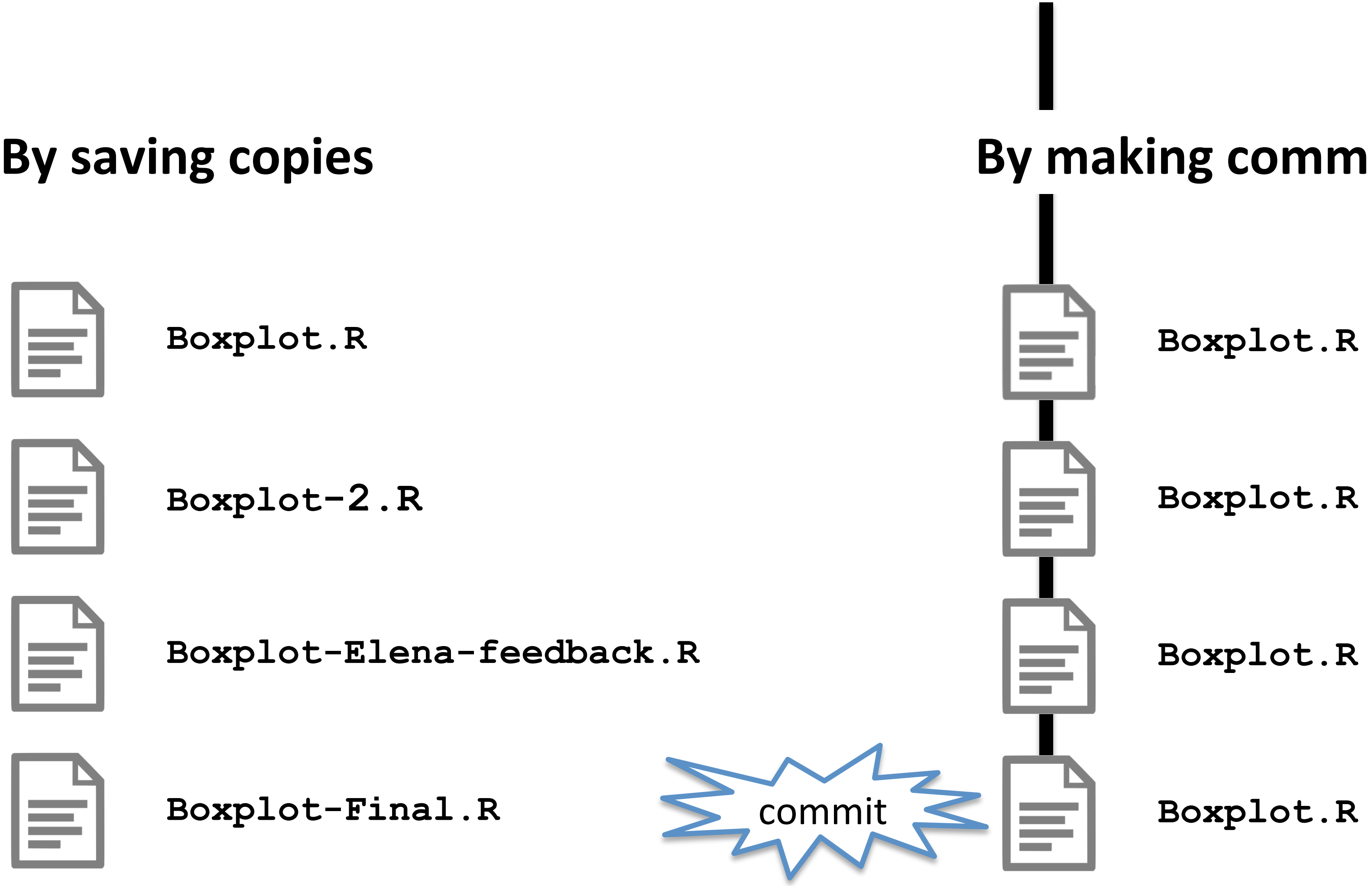
By saving copies

By making commits



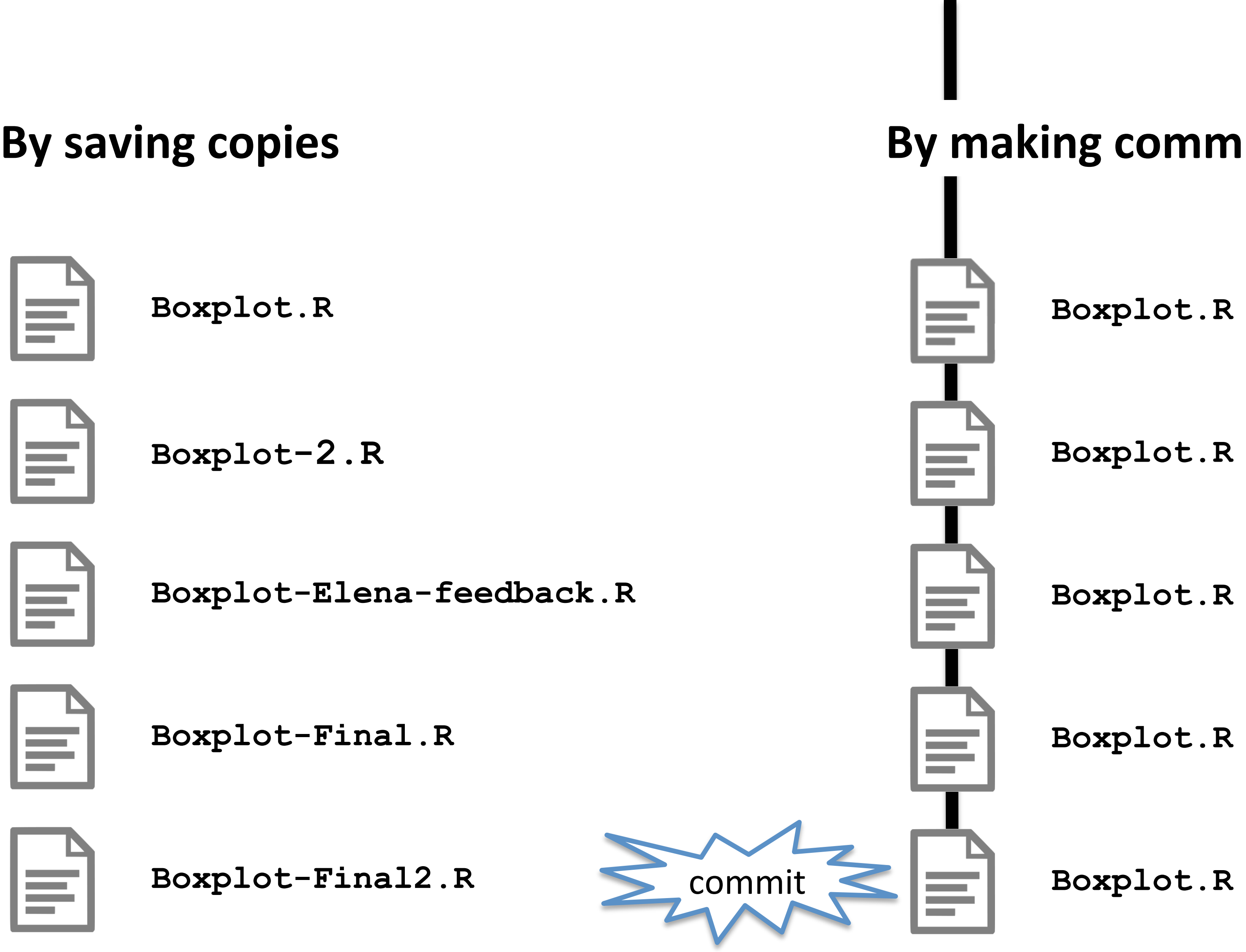
By saving copies

By making commits



By saving copies

By making commits



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By making commits

`Boxplot.R`

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`Boxplot.R`

When you commit a file or files, some information is along with the changes to the file

1. Who
2. When
3. commit message

You can add more information about the changes you've made in a commit message

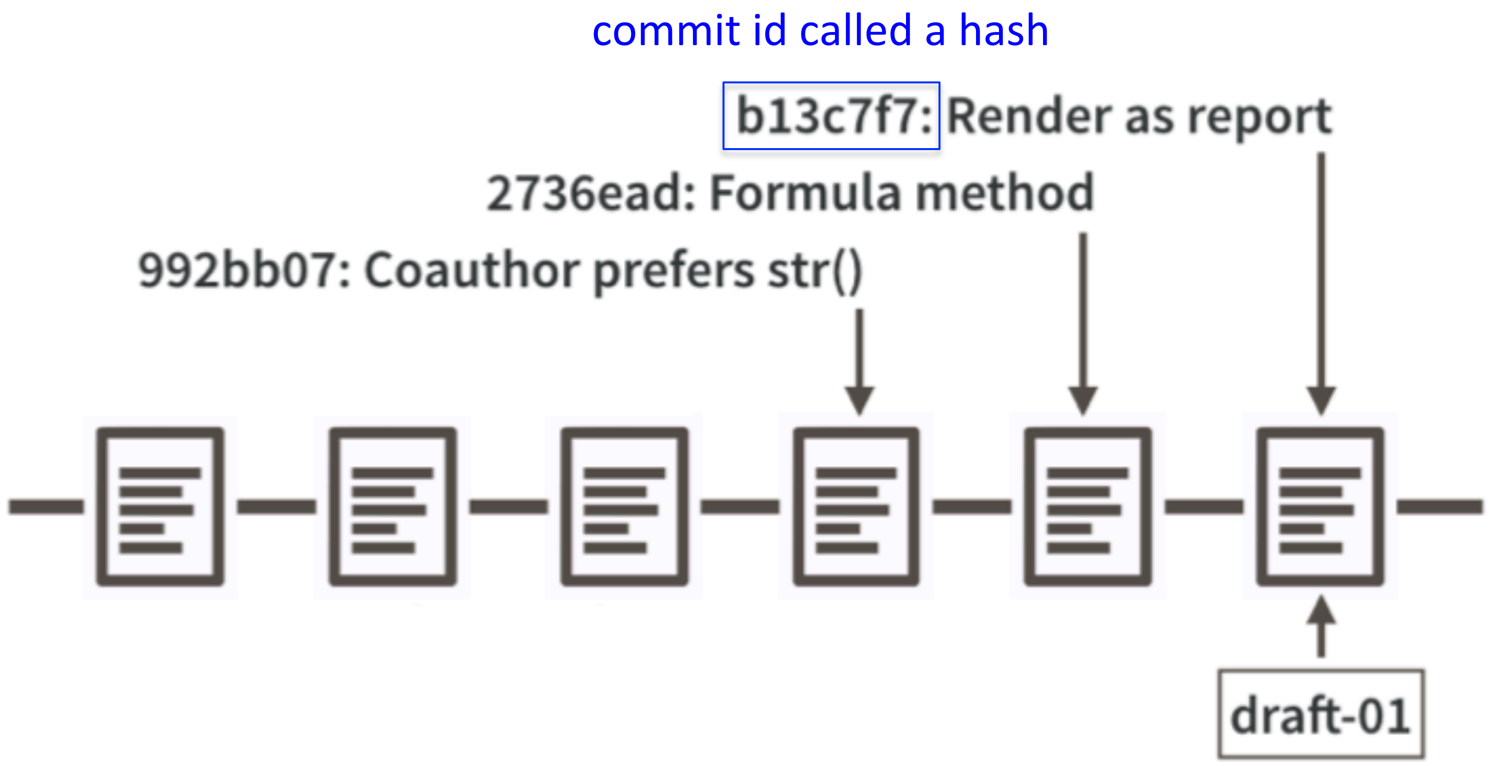
Stefan Wyder
2:25pm January 30th 2018

New colorblind-safe colors

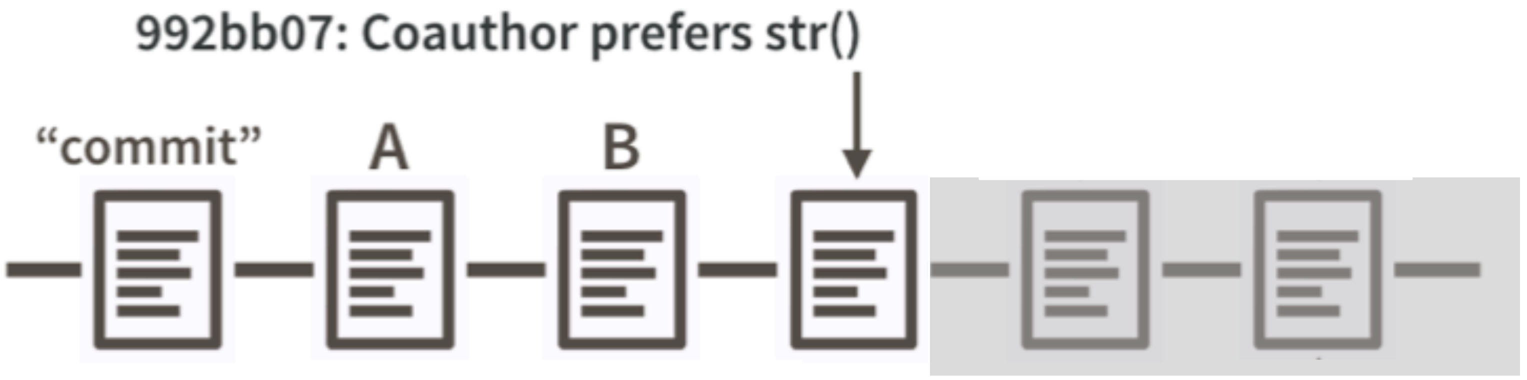
More detailed explanatory text, if necessary. Explain the problem that this commit is solving

explains what and why
~~how~~ (the diff explains)

Git stores the whole history of your project

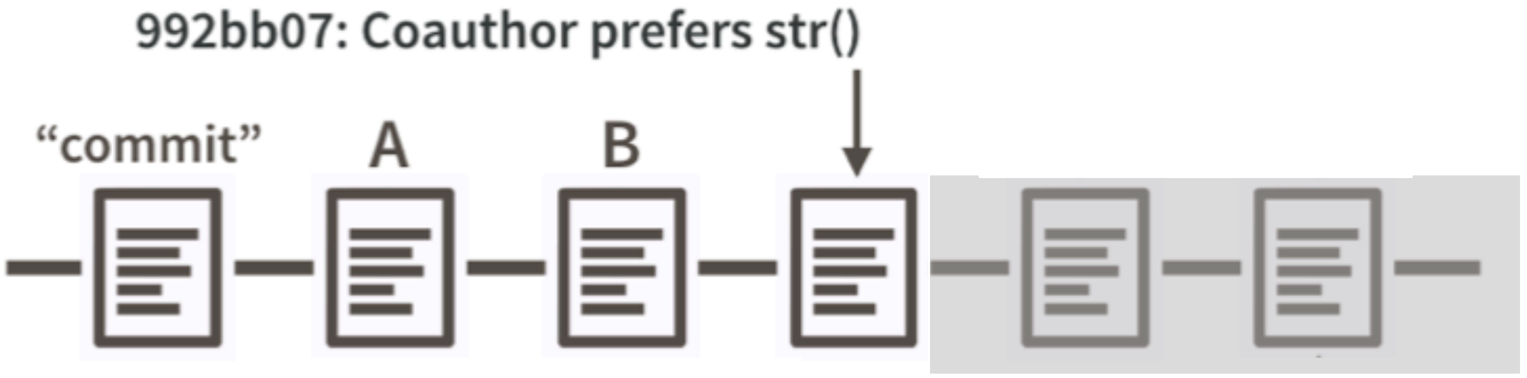


I can tell Git what commit I want to check out using the commit hash



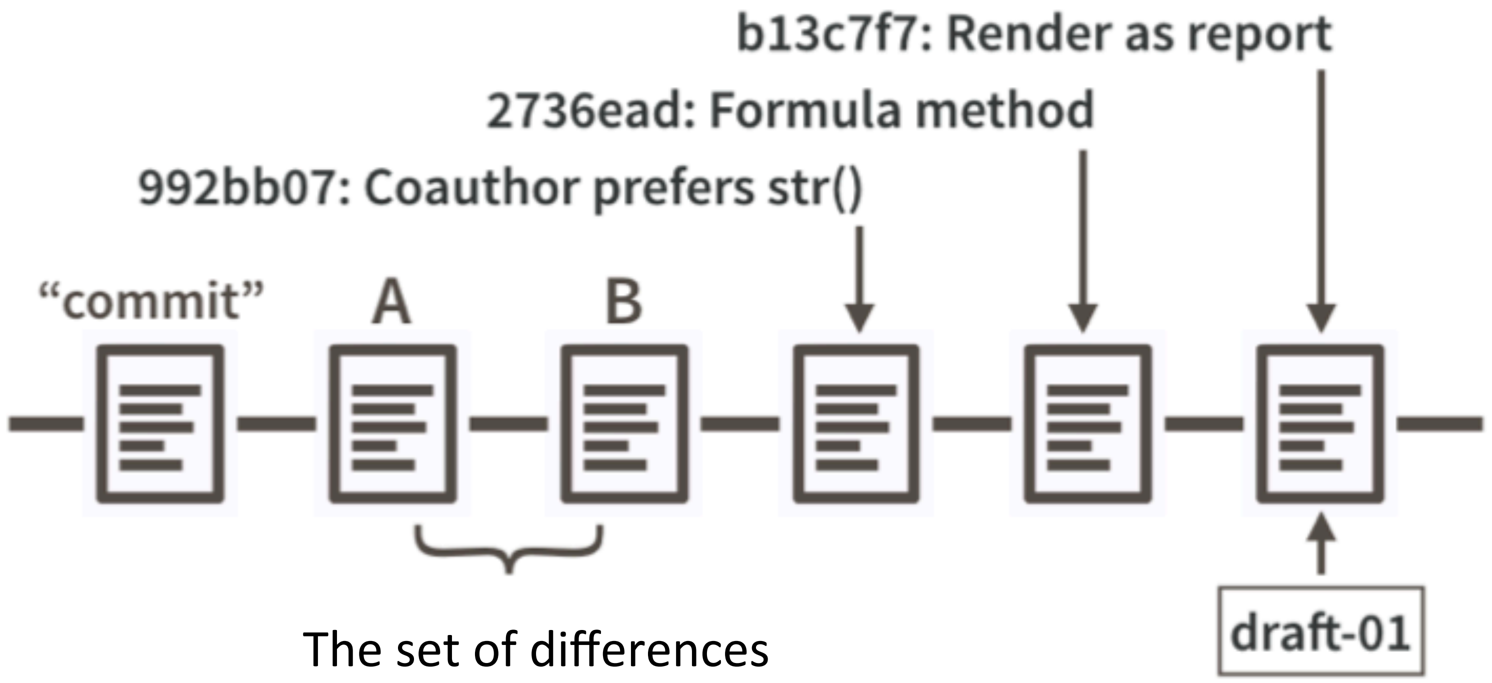
My other commits still exist, but when I look in my repo, it's as they never happened

I can tell Git what commit I want to check out using the commit hash



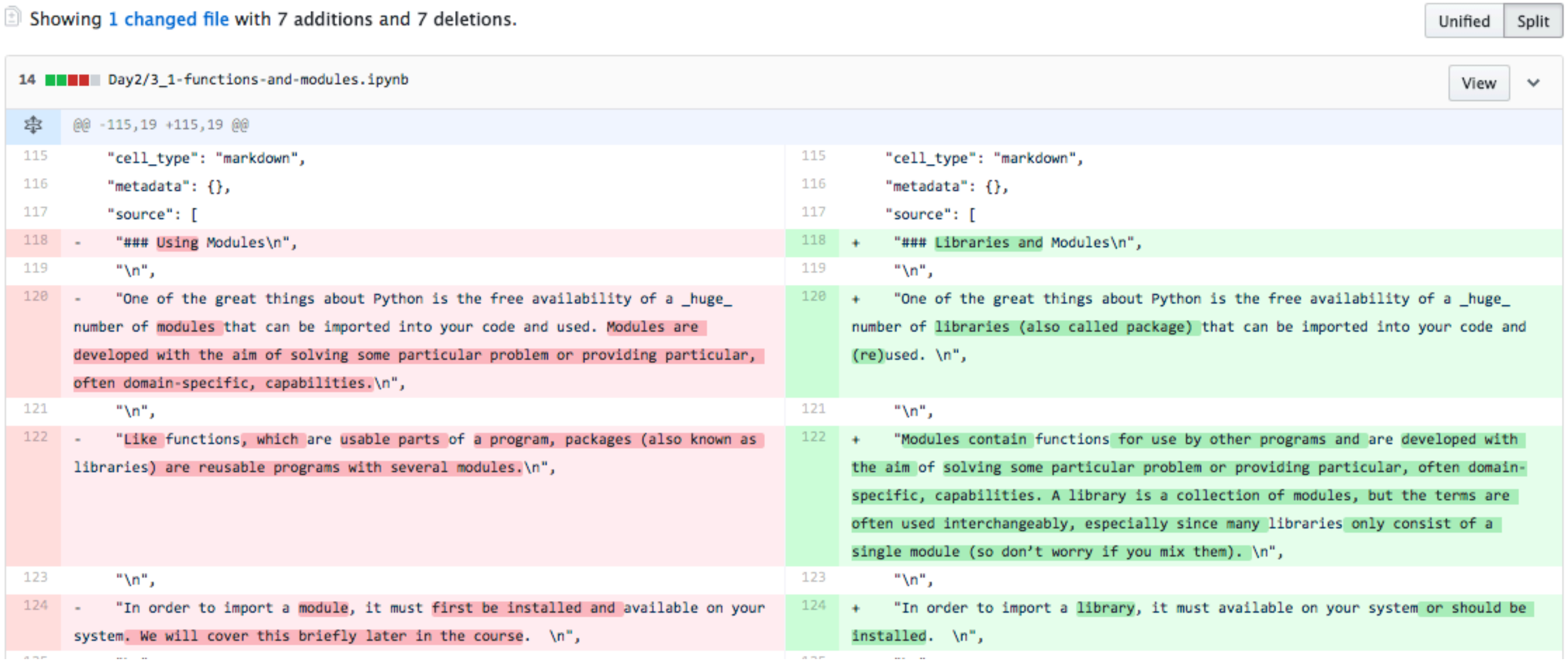
My other commits still exist, but when I look in my repo, it's as they never happened

The power of Git comes from the diff



The set of differences between A and B is called a "diff"

The diff



Showing 1 changed file with 7 additions and 7 deletions.

Unified | Split

14 Day2/3_1-functions-and-modules.ipynb

View

```
@@ -115,19 +115,19 @@
```

```
     "cell_type": "markdown",
     "metadata": {},
     "source": [
-     "### Using Modules\n",
      "\n",
-     "One of the great things about Python is the free availability of a _huge_ number of modules that can be imported into your code and used. Modules are developed with the aim of solving some particular problem or providing particular, often domain-specific, capabilities.\n",
      "\n",
-     "Like functions, which are usable parts of a program, packages (also known as libraries) are reusable programs with several modules.\n",
      "\n",
-     "In order to import a module, it must first be installed and available on your system. We will cover this briefly later in the course.  \n",
```

```
     "cell_type": "markdown",
     "metadata": {},
     "source": [
+     "### Libraries and Modules\n",
      "\n",
+     "One of the great things about Python is the free availability of a _huge_ number of libraries (also called package) that can be imported into your code and (re)used. \n",
      "\n",
+     "Modules contain functions for use by other programs and are developed with the aim of solving some particular problem or providing particular, often domain-specific, capabilities. A library is a collection of modules, but the terms are often used interchangeably, especially since many libraries only consist of a single module (so don’t worry if you mix them). \n",
      "\n",
+     "In order to import a library, it must available on your system or should be installed.  \n",
```

Version control works for any file format (code, pdfs, docs, xls, jpg, etc.)

... but works best for plain text-based files (txt, Markdown, Python, R, Matlab, any other code)

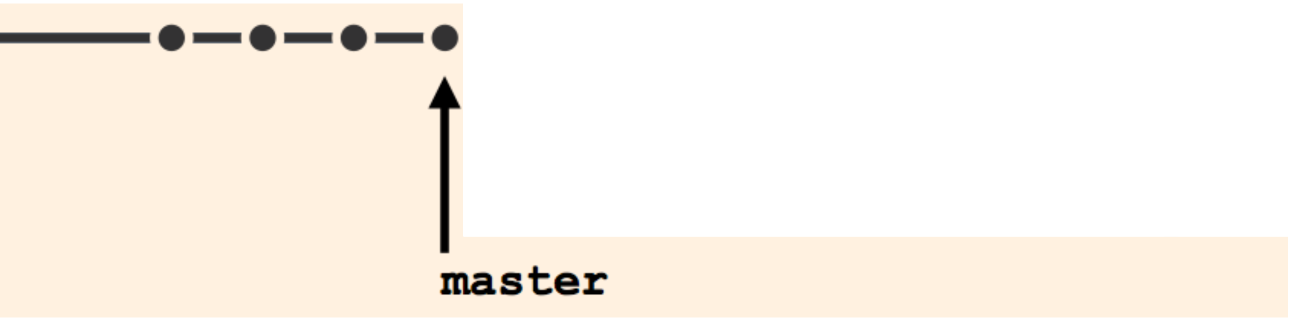
Git helps you experiment

So far, everything has been very linear and ordered.

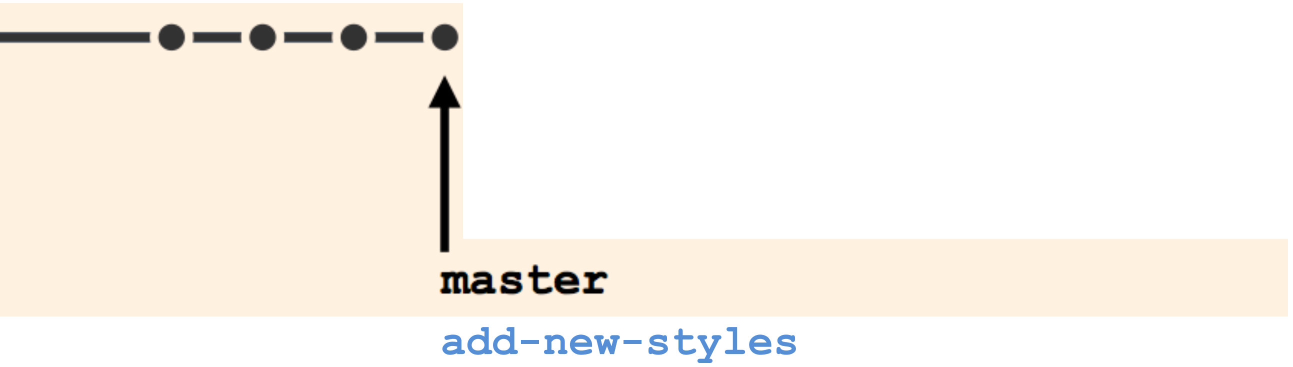
But sometimes you want to make easily discardable experiments

The way you do this in Git is with branches

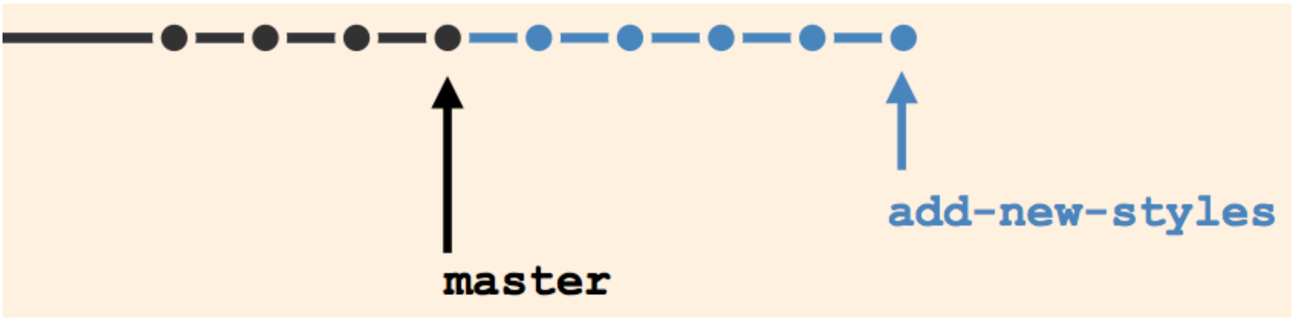
The default branch name in Git is master



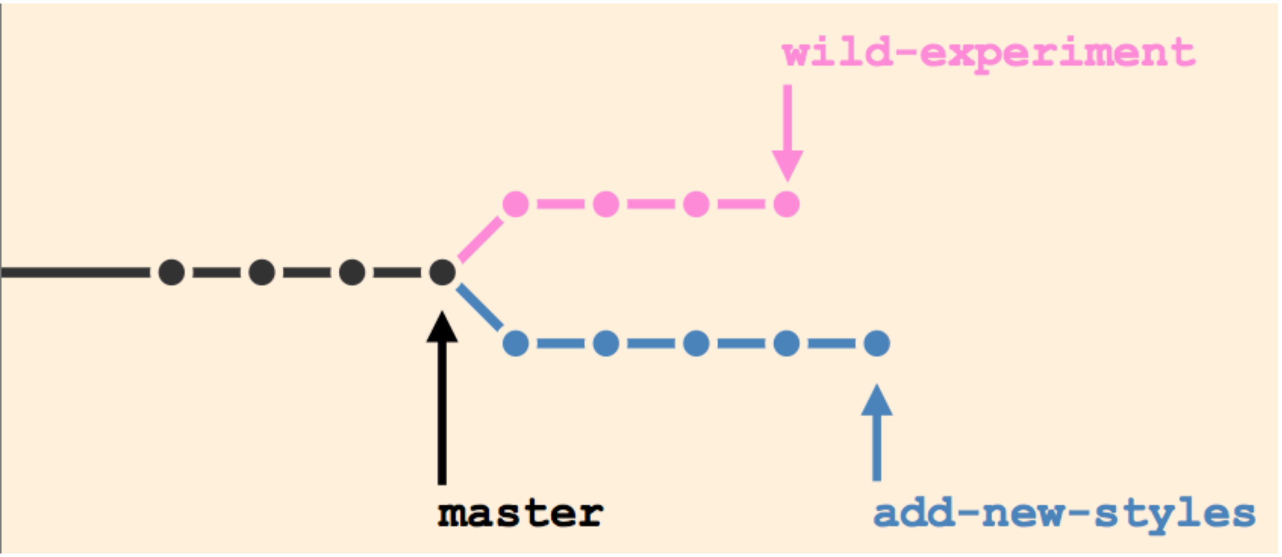
You can add your own branches too



and do lots of work on them

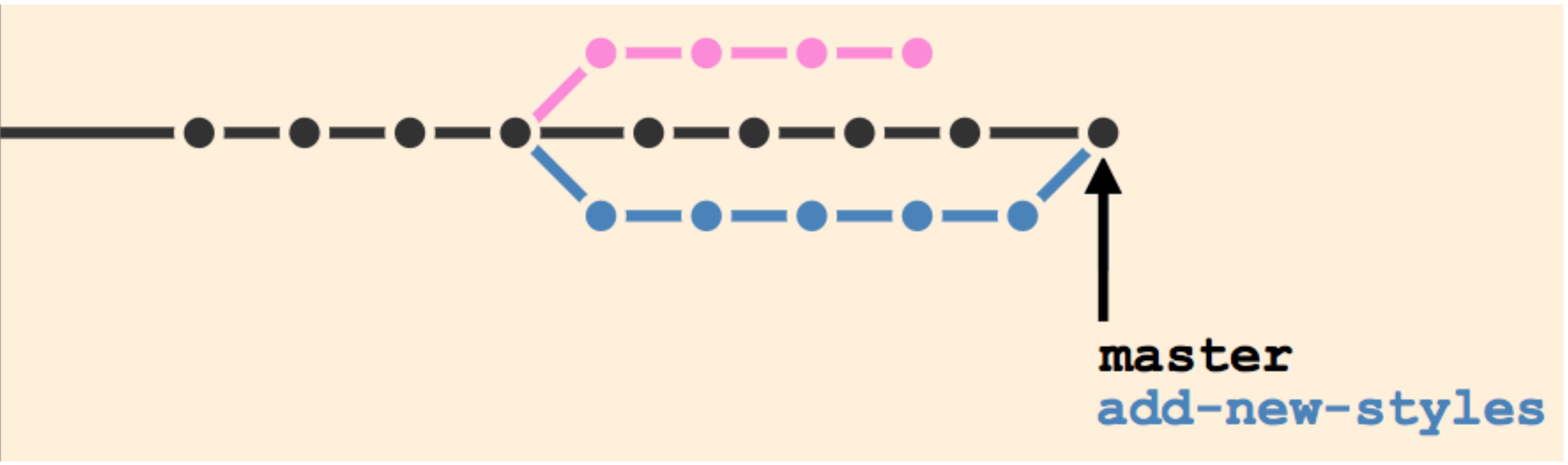


Branches are useful for trying out stuff



The master branch is often considered special (latest stable version) and other branches contain work in progress

Once you're happy with some work, you need a way to get it back to master



To get changes from one branch into another, you merge them

Advantages of Git/GitHub vs Google docs

git

1. Git lets you tell the story of your project (commit: take snapshots of files)

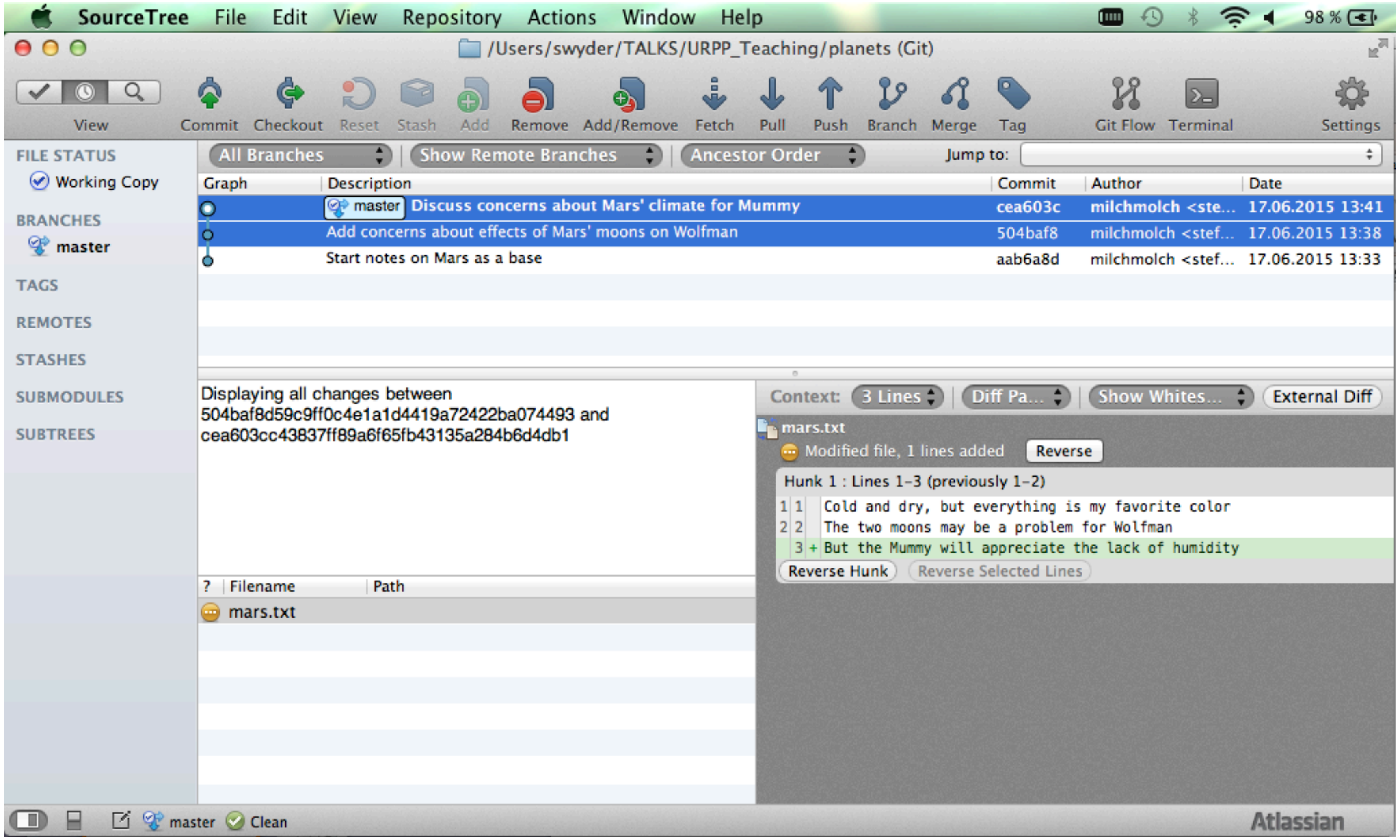
2. Git lets you time travel (check out)

3. Git helps you experiment (branch)

4. Git helps you backup your project

5. Git helps you collaborate across multiple computers/people (clone push pull merge)

Try out graphical interfaces



Graph	Description	Commit	Author	Date
	master Discuss concerns about Mars' climate for Mummy	cea603c	milchmolch <ste...	17.06.2015 13:41
	Add concerns about effects of Mars' moons on Wolfman	504baf8	milchmolch <stef...	17.06.2015 13:38
	Start notes on Mars as a base	aab6a8d	milchmolch <stef...	17.06.2015 13:33

Displaying all changes between 504baf8d59c9ff0c4e1a1d4419a72422ba074493 and cea603cc43837ff89a6f65fb43135a284b6d4db1

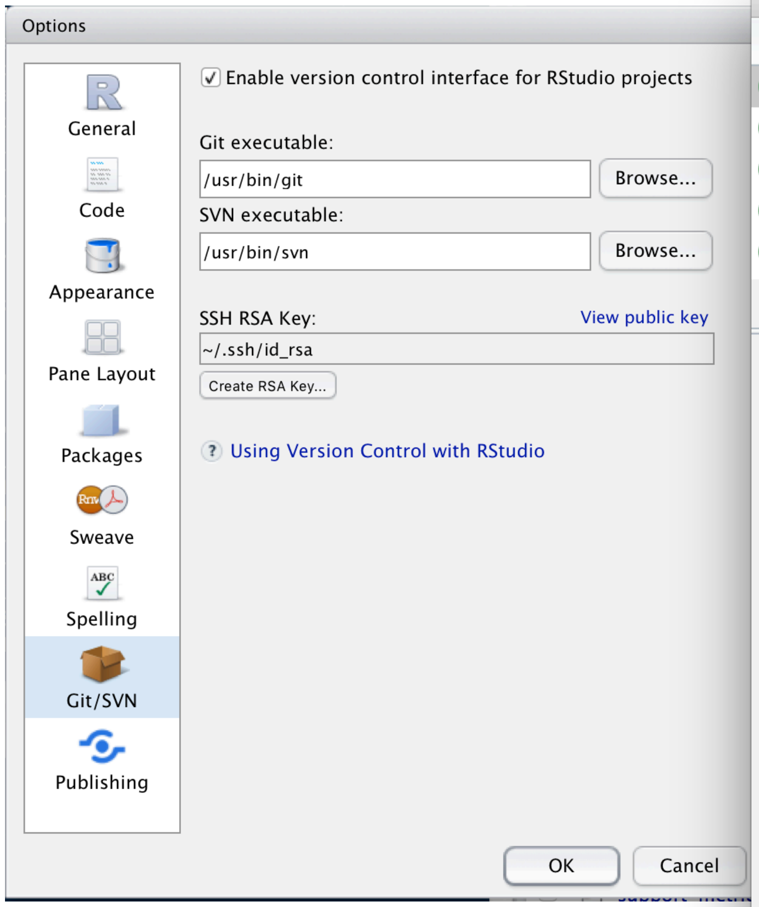
?	Filename	Path
	mars.txt	

mars.txt
Modified file, 1 lines added

```
Hunk 1 : Lines 1-3 (previously 1-2)
1 1   Cold and dry, but everything is my favorite color
2 2   The two moons may be a problem for Wolfman
  3 + But the Mummy will appreciate the lack of humidity
```

e.g. SourceTree or GitKraken

Basic git commands in Rstudio

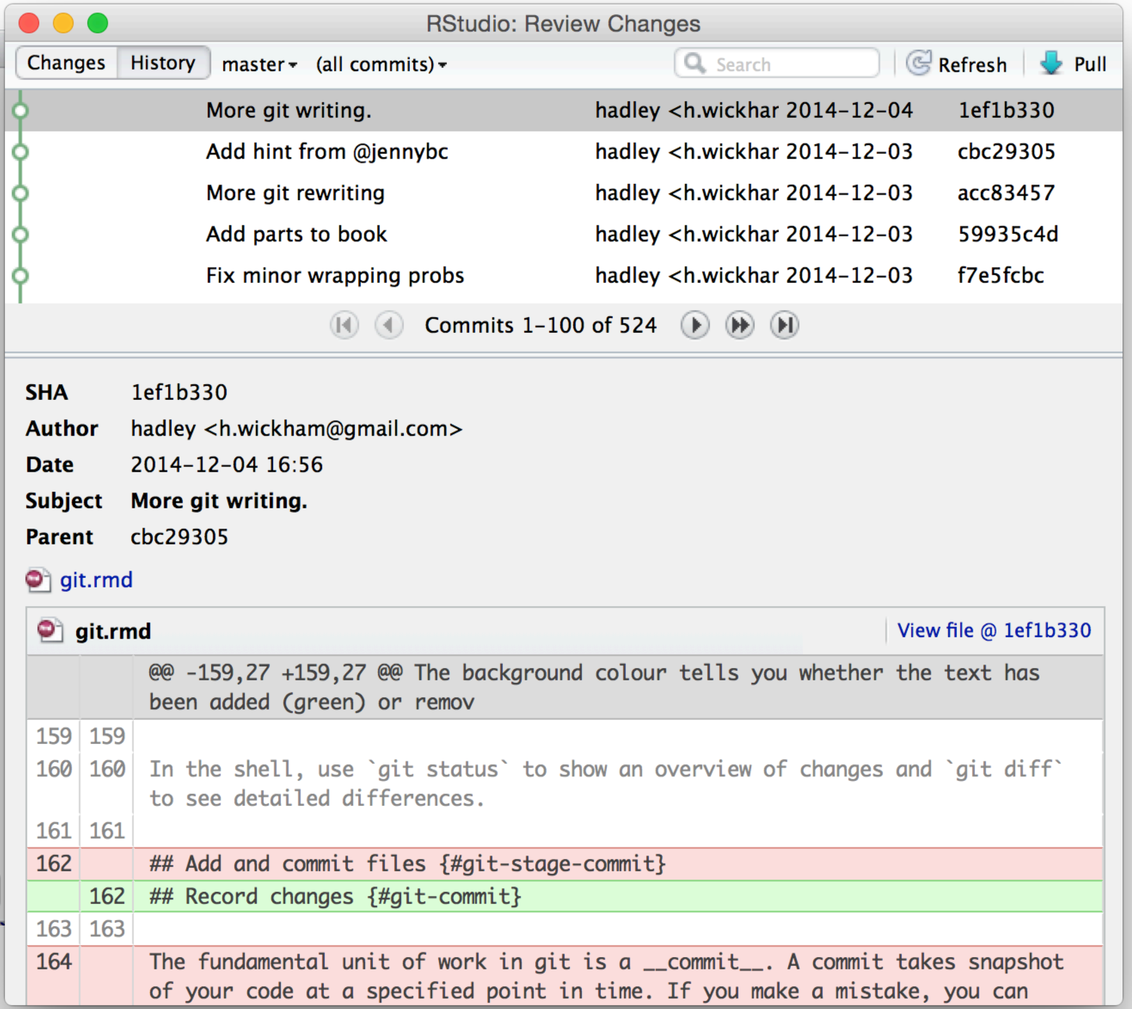


[✓] Enable version control interface for RStudio projects

Git executable: /usr/bin/git

SVN executable: /usr/bin/svn

SSH RSA Key: ~/.ssh/id_rsa



More git writing.	hadley <h.wickhar 2014-12-04	1ef1b330
Add hint from @jennybc	hadley <h.wickhar 2014-12-03	cbc29305
More git rewriting	hadley <h.wickhar 2014-12-03	acc83457
Add parts to book	hadley <h.wickhar 2014-12-03	59935c4d
Fix minor wrapping probs	hadley <h.wickhar 2014-12-03	f7e5fcbc

SHA	1ef1b330
Author	hadley <h.wickham@gmail.com>
Date	2014-12-04 16:56
Subject	**More git writing.**
Parent	cbc29305

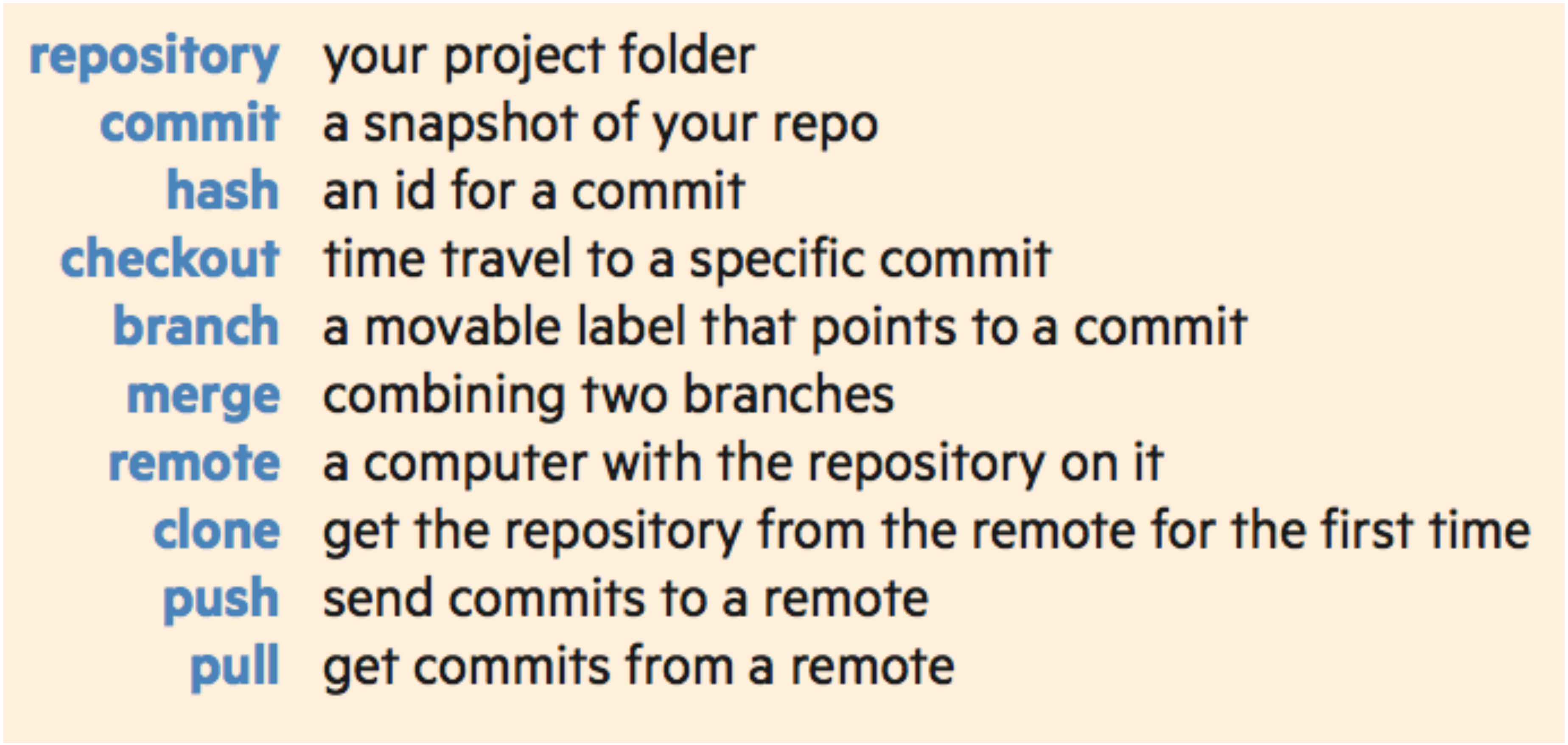
git.rmd

git.rmd

```
          @@ -159,27 +159,27 @@ The background colour tells you whether the text has
          been added (green) or remov
159  159
160  160  In the shell, use `git status` to show an overview of changes and `git diff`
          to see detailed differences.
161  161
162       ## Add and commit files {#git-stage-commit}
     162  ## Record changes {#git-commit}
163  163
164       The fundamental unit of work in git is a __commit__. A commit takes snapshot
          of your code at a specified point in time. If you make a mistake, you can
```

https://support.rstudio.com/hc/en-us/articles/200532077-Version-Control-with-Git-and-SVN
http://r-pkgs.had.co.nz/git.html

Git terms



repository	your project folder
commit	a snapshot of your repo
hash	an id for a commit
checkout	time travel to a specific commit
branch	a movable label that points to a commit
merge	combining two branches
remote	a computer with the repository on it
clone	get the repository from the remote for the first time
push	send commits to a remote
pull	get commits from a remote

Sources

- http://cdn.rawgit.com/luispedro/talk-git-intro/master/slides.html
- https://speakerdeck.com/alicebartlett/git-for-humans
- https://doi.org/10.7287/peerj.preprints.3159v2