



CS 106S Week 6

Open Source & Web Software 🌤️

Ben Yan, Spring 2025 🌸

It's Week 6!

Wellness check – how are you doing?



Spring



Start of Spring

Add/Drop Deadline



Weather machine: OFF



CS106B/
107/109
Midterm

Midterms over!
unless Math,
Chem, Bio,
Psych, CS, ... :(



Summer!



Agenda for Today

1 What is this all about?

What is open-source software and how is it relevant to web applications?

2 How do I do it?

Tooling and technicalities. Your first pull request. Code review & merging.

3 How should I do it?

Conventions and etiquette. Open source licensing. Licensing case studies.

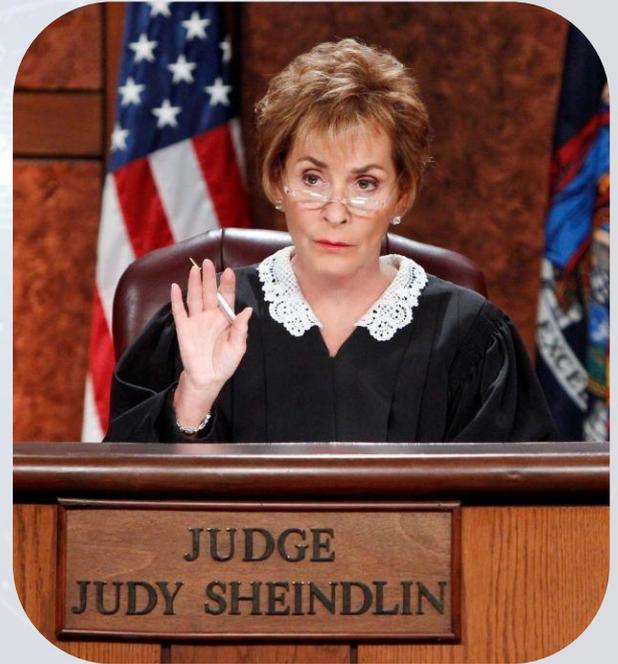




What is this all about?

What is Open Source Software?

“Open-source software (OSS) is computer software that is released under a license in which the copyright holder grants users the **rights to use, study, change, and distribute the software and its source code** to anyone and for any purpose. Open-source software may be developed in a collaborative public manner.”



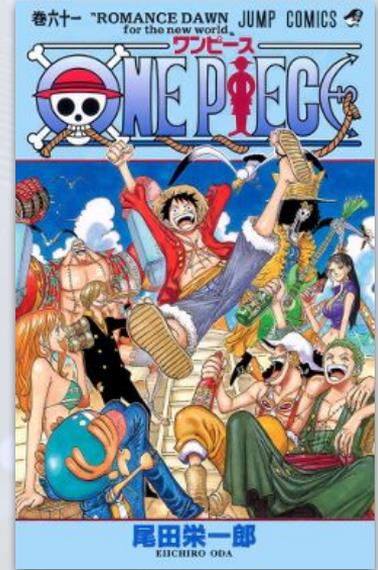
Is this all just about copyright?

Freedom to...

1. **run** it
2. **inspect** it
3. **change** it
4. **share** it

Usually that's piracy!

(Modified version of the FSF's "four freedoms.")





The unauthorized reproduction or distribution of this copyrighted work is illegal. Criminal copyright infringement including infringement without monetary gain, is investigated by the FBI and is punishable by up to 5 years in federal prison and a fine of \$250,000.

- Join TechCrunch+
- Login
- Search Q
- TechCrunch+
- Startups
- Venture
- Security
- Crypto
- Apps
- Events
- Advertise
- More

Security

UK police arrest teenager suspected of Uber, GTA 6 hacks

Carly Page @carlypage_ / 7:28 AM PDT • September 26, 2022

Comment



ARTIFICIAL INTELLIGENCE / TECH / REPORT

Meta's powerful AI language model has leaked online – what happens now?



Illustration: Alex Castro / The Verge

/ Meta's LLaMA model was created to help researchers but leaked on 4chan a week after it was announced. Some worry the technology will be used for harm; others say greater access will improve AI safety.

By James Vincent, a senior reporter who has covered AI, robotics, and more for eight years at The Verge.
Mar 8, 2023, 5:15 AM PST

[Link](#) [Facebook](#) [Twitter](#) [Comments \(4 New\)](#)

If you buy something from a Verge link, Vox Media may earn a commission. [See our ethics statement.](#)

A Brief History of Open-Source

- Software used to be included with hardware
- Expectation of **"knowledge sharing"** in academia (**sharing is caring**).
- First example: A-2 system by UNIVAC (1953)
 - Compiler-related tool (program linker) for converting subroutines → executable machine code.
- 1960s: **free software in decline**



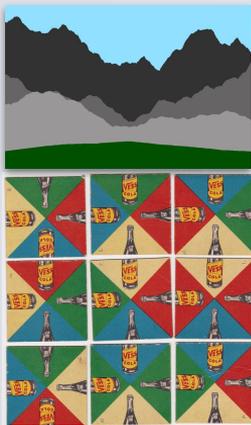
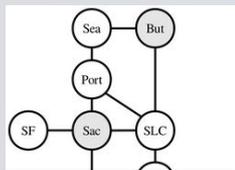
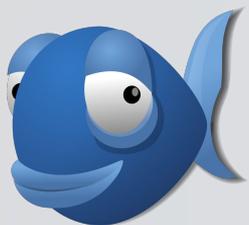
A Briefer History of Open-Source

- “Illegal” sharing of **proprietary** software in the 80’s.
- **GNU Project** to write completely free operating system launches (1983)
 - **GNU’s Not Unix!**
- Linux initially released (1991)
- **“Open source”** becomes a term (1998)
- Git created for Linux (2005)



Latest messages	
Borislav Petkov	Re: [PATCH 1/5] x86/mce/inject: Check if a bank is...
Christophe JAILLET	[PATCH] media: mtk-vpu: Remove redundant 'flush_wo...
Rob Herring	Re: [PATCH 1/2] Add ADV7610 support for adv7604 dr...
Dmitry Torokhov	Re: [PATCH] input/tty: Fix the keyboard led light ...
Florian Weimer	Re: [RFC PATCH] LKMM: Add ctrl_dep() macro for con...
Fox Chen	RE: [PATCH 5.10 00/22] 5.10.74-rc1 review
"Darrick J. Wong"	Re: [PATCH v7 5/8] fsdax: Introduce dax_lock_mappi...
Rob Herring	Re: [PATCH v2 2/3] dt-bindings: phy: phy-stm32-usb...
Christophe JAILLET	[PATCH] media: mtk-vcodec: Remove redundant 'flush...
Shuah Khan	[PATCH] module: fix elf_validity_check() warns see...
"Gustavo A. R. Silva"	Re: [gustavoars:for-next/cast-function 1/3] kernel...
Prasad Malisetty	Re: [PATCH v1] arm64: dts: qcom: sc7280: Add pcie ...
Christophe JAILLET	[PATCH] mtip32xx: Remove redundant 'flush_workqueu...
Mark Rutland	Re: [PATCH 6/7] arch: __get_wchan STACKTRACE_SU...
Prasad Malisetty	[PATCH v2] arm64: dts: qcom: sc7280: Add pcie cloc...

Open Source Software Today



WIKIPEDIA
The Free Encyclopedia



Most Stanford CS
assignments ...



(*Chromium, not
Google Chrome)



android



Java™



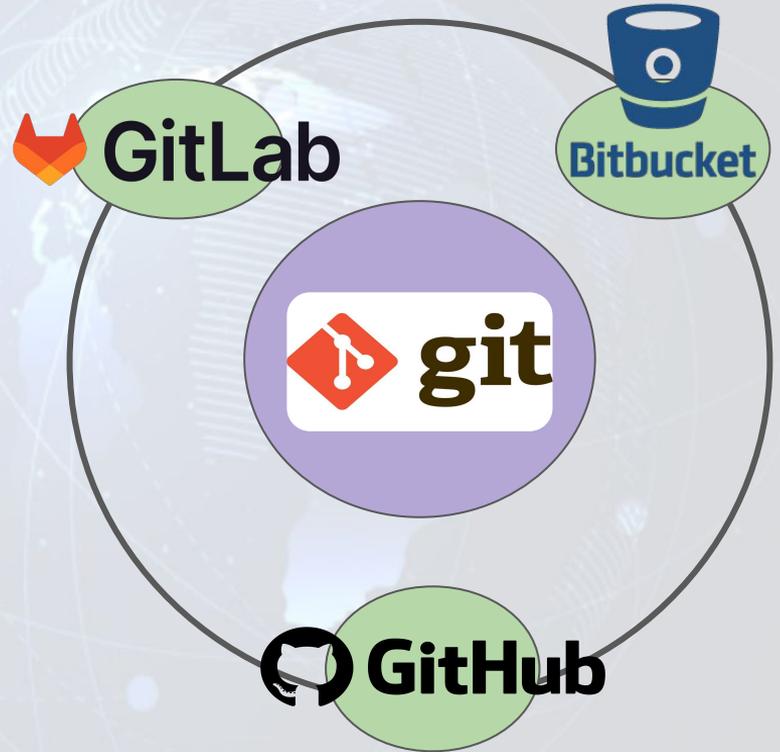
Why is open source *good*?



How can I do it?

Git

- **Version control** software
 - **Tracking and handling changes** across users and time.
- Everyone* uses it
- Created by Linus Torvalds to develop Linux.
- It's also open source
- **Streamlines collaboration** (but not quite like Google Docs)



Git: Tracking Changes

Oct 7-10

commit 9c200dfde4dcaa39a6ab6b2a42effd15960a9560 (HEAD -> main, origin/main, origin/HEAD)

Author: R. Miles McCain <oci@sendmiles.email>

Date: Sun Oct 10 05:24:44 2021 +0000

Introduce typo

commit 0bde9be30c0609a67c4abb28240c8937961306e4

Author: R. Miles McCain <oci@sendmiles.email>

Date: Thu Oct 7 23:43:21 2021 +0000

Post new solutions

commit 6e022f9aca6b600c70602fe0ed8c9861a40a4473

Author: R. Miles McCain <oci@sendmiles.email>

Date: Thu Oct 7 04:45:16 2021 +0000

Respond to AMAs

```
→ cs106s git:(main) git commit -m "Test commit"
```

On branch main

Your branch is up to date with 'origin/main'.

nothing to commit, working tree clean

```
→ cs106s git:(main) git push
```

Everything up-to-date

```
→ cs106s git:(main) git pull
```

Already up to date.

```
→ cs106s git:(main) █
```

Git Blame: Whodunit

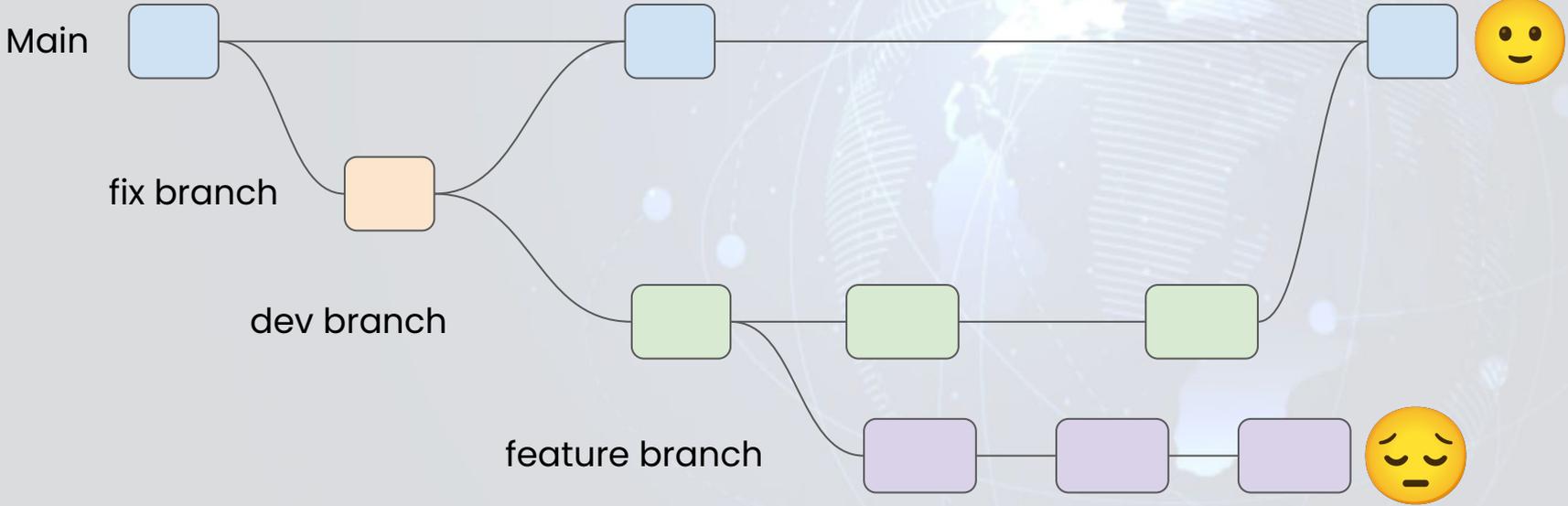
Code **Blame** 466 lines (450 loc) · 29.2 KB

Raw    

Older  Newer  Contributors 7

2 years ago	 Add initial content	1	<code><!doctype html></code>
		2	<code><html lang=en></code>
		3	<code><head></code>
		4	<code> <title>CS106S: Coding for Social Good</title></code>
		5	<code> <meta charset=utf-8></code>
		6	<code> <meta http-equiv=x-ua-compatible content="IE=edge"></code>
		7	<code> <meta name=viewport content="width=device-width,initial-scale=1"></code>
		8	<code> <meta name=description</code>
		9	<code></code>
last year	 Update for spring	 10	<code> content="CS 106S is a survey course on the applications of fundamental computer science conc</code>
2 years ago	 Add initial content	11	<code> <meta property="og:description"</code>
last year	 Update for spring	 12	<code> content="CS 106S is a survey course on the applications of fundamental computer science conc</code>
2 years ago	 Add initial content	13	<code> <meta property="og:site_name" content="CS106S"></code>
		14	<code> <meta property="og:type" content="website"></code>

Git Version Control

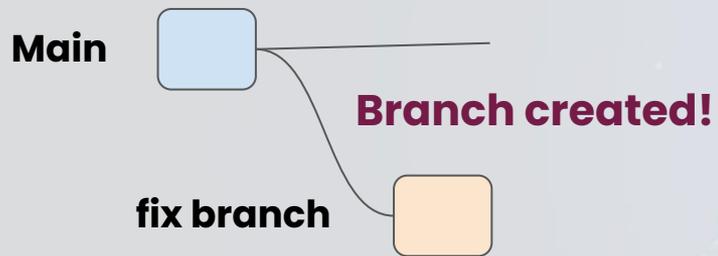


Git Version Control

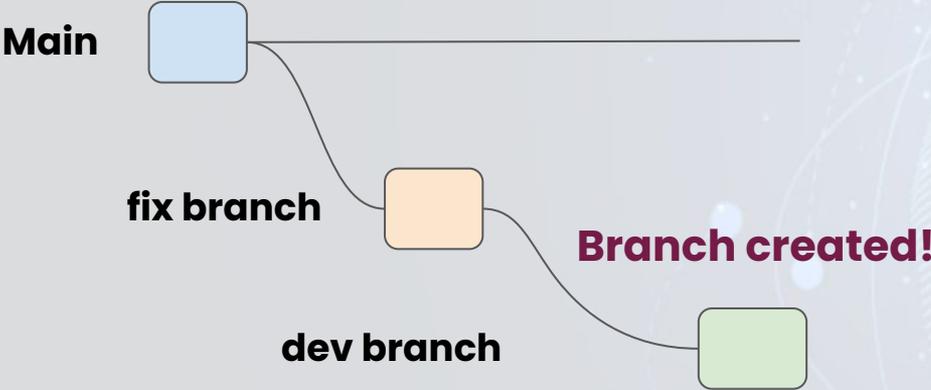
Main



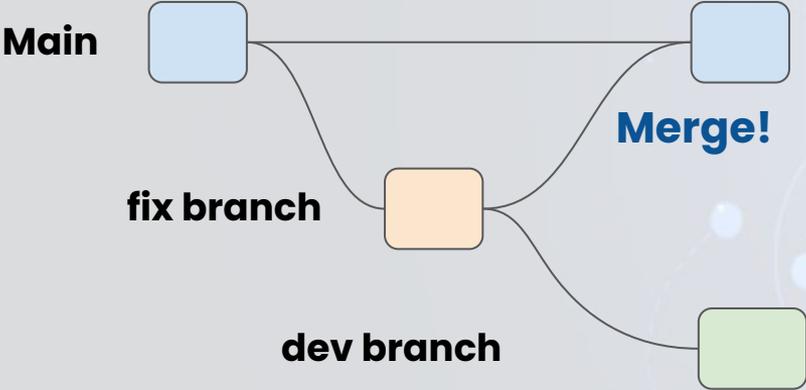
Git Version Control



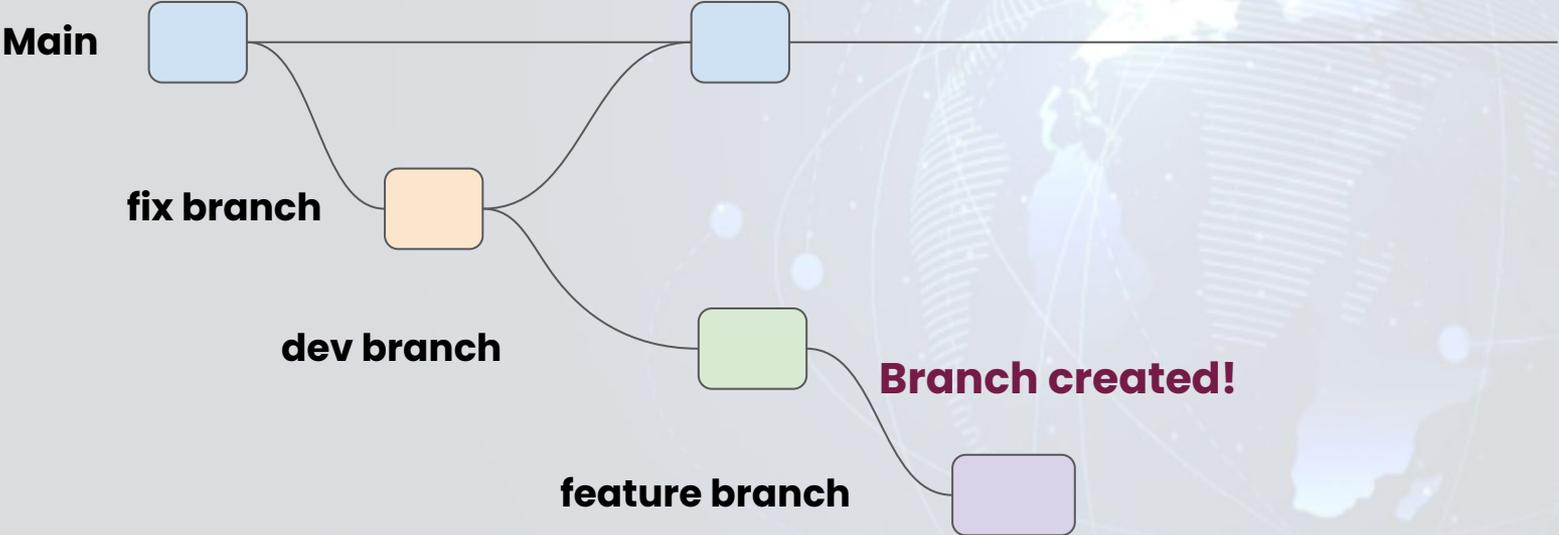
Git Version Control



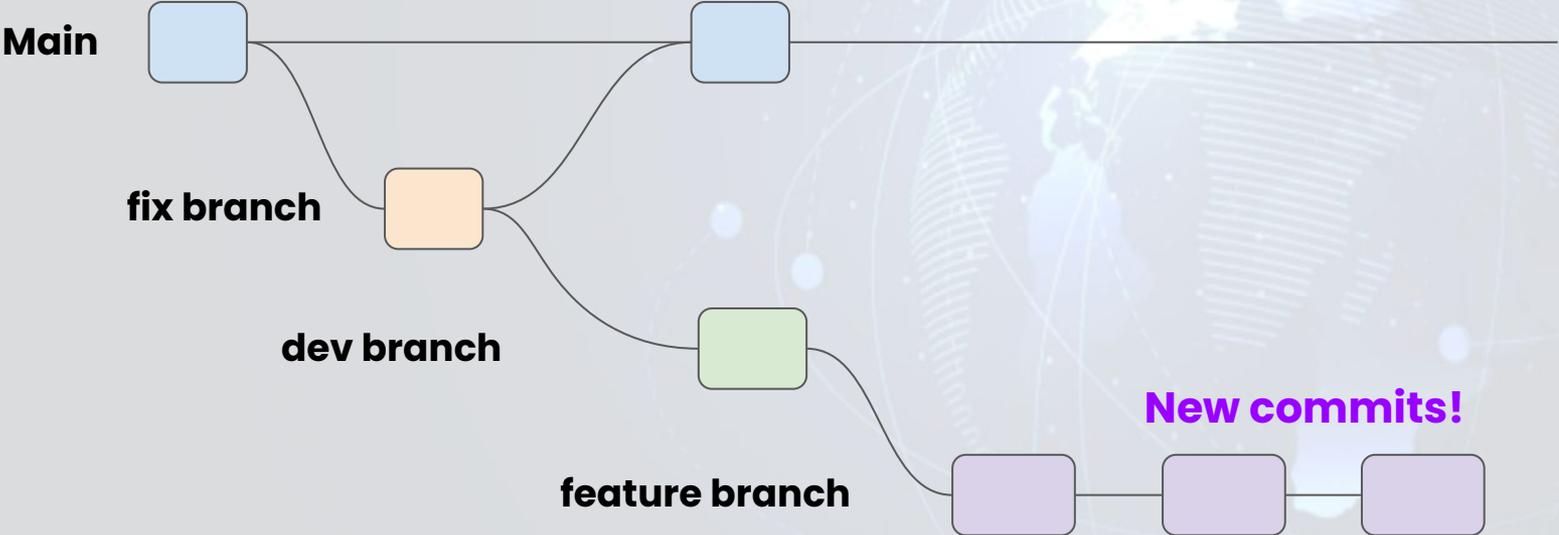
Git Version Control



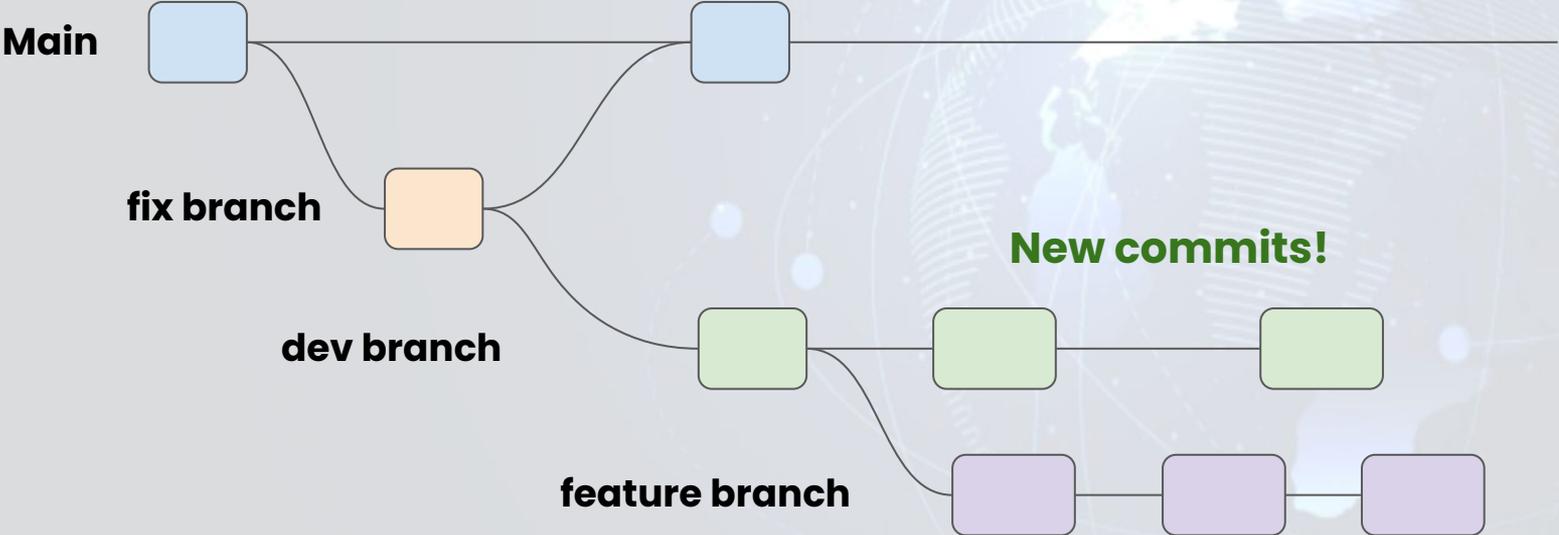
Git Version Control



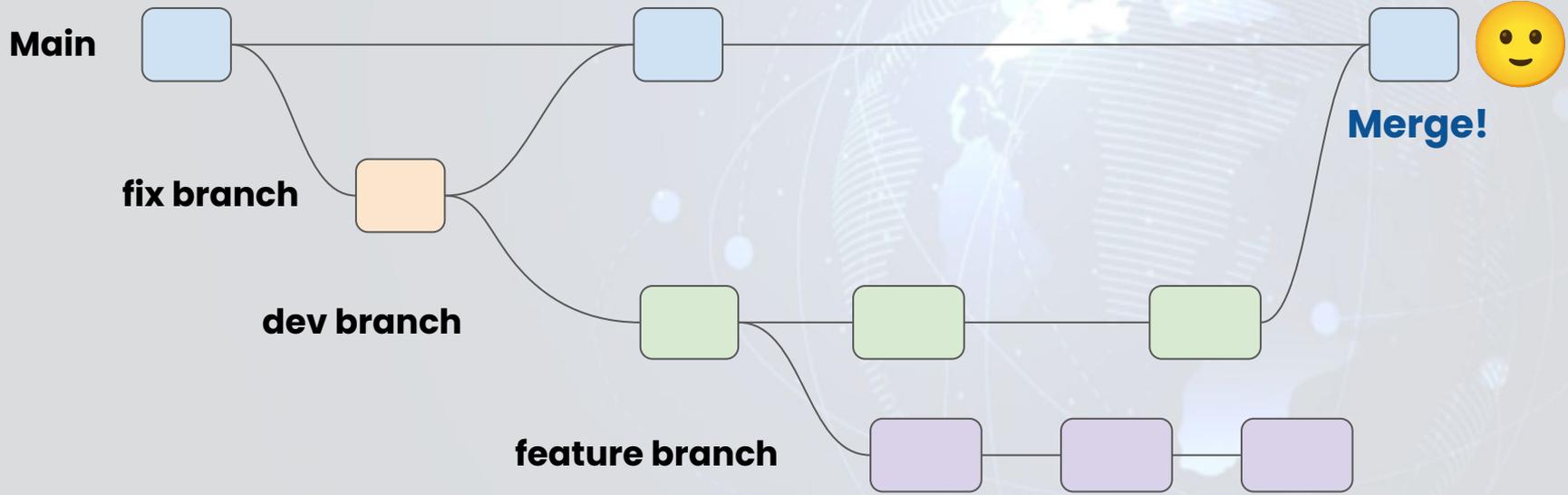
Git Version Control



Git Version Control

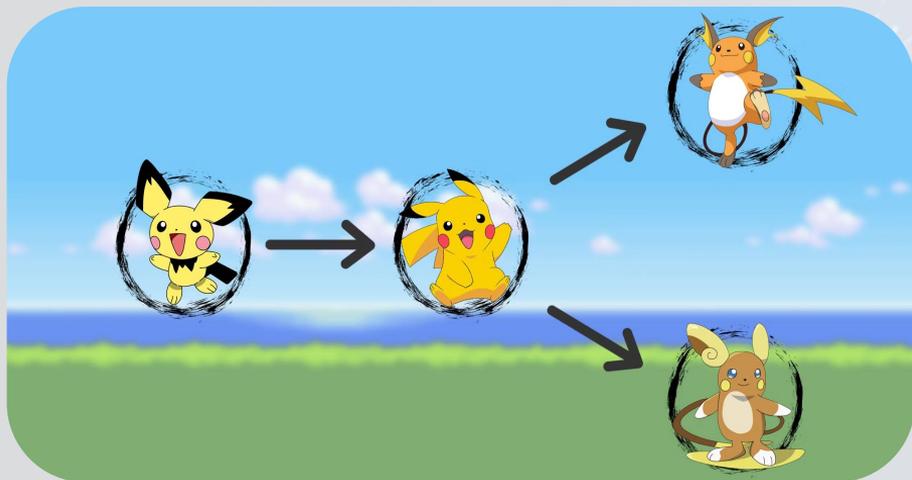


Git Version Control



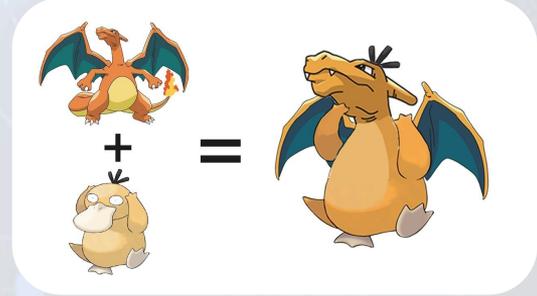
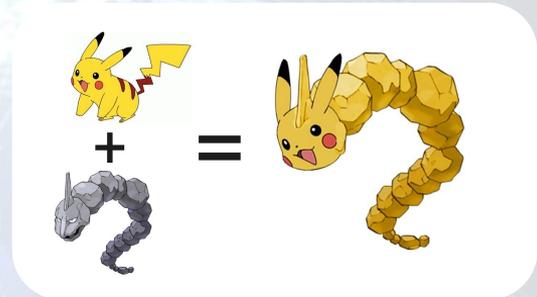
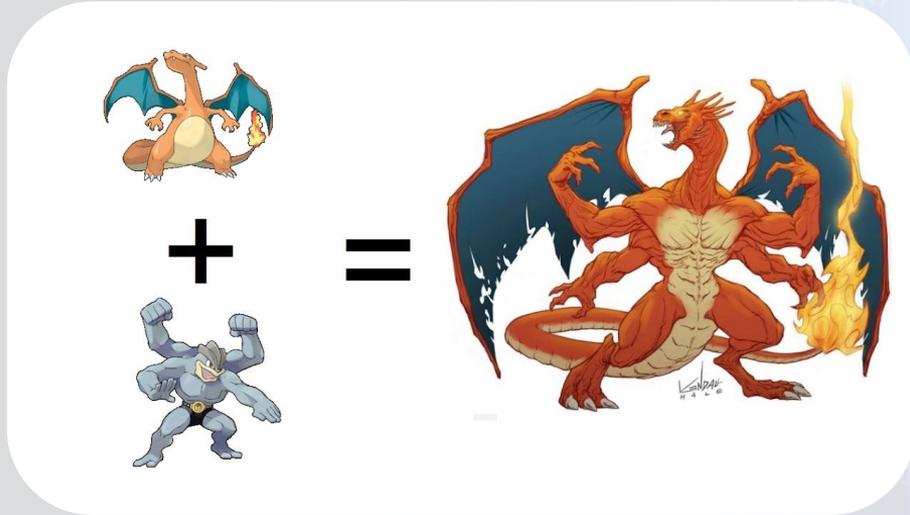
Version Control Metaphors

Branches + Commits



Version Control Metaphors

Merge (Fusion) Request!



This doesn't actually exist but ...

GitHub



- **Website that hosts Git repositories**
 - Public or private folders (with hidden **Git** files).
- Has additional features like *pull requests* and *issues*
- Not open source itself lol :(



Search or jump to... Pull requests Issues Marketplace Explore

facebook / react Public Watch 6.7k Star 176k Fork 35.5k

Code Issues 631 Pull requests 220 Actions Projects Wiki Security Insights

main 112 branches 138 tags Go to file Add file Code

jstejada [DevTools] Update Fiber logic in backend rende... ✓ a fcb9cd yesterday 14,557 commits

.circleci	Scrape warning messages in CI (#22393)	18 days ago
.codesandbox	Update Node.js to latest v14.17.6 LTS (#22401)	16 days ago
.github	Update PULL_REQUEST_TEMPLATE.md	last month
fixtures	[Fizz/Flight] pipeToNodeWritable(..., writable).startWritin...	4 days ago
packages	[DevTools] Update Fiber logic in backend renderer to m...	yesterday
scripts	[Fizz/Flight] pipeToNodeWritable(..., writable).startWritin...	4 days ago
.editorconfig	https link to editorconfig.org (#18421)	2 years ago
.eslintignore	Delete all but one build reference (#22391)	18 days ago

About

A declarative, efficient, and flexible JavaScript library for building user interfaces.

reactjs.org

react javascript library ui frontend declarative

Readme MIT License

Releases 96

17.0.2 (March 22, 20... Latest)

<https://github.com/facebook/react>

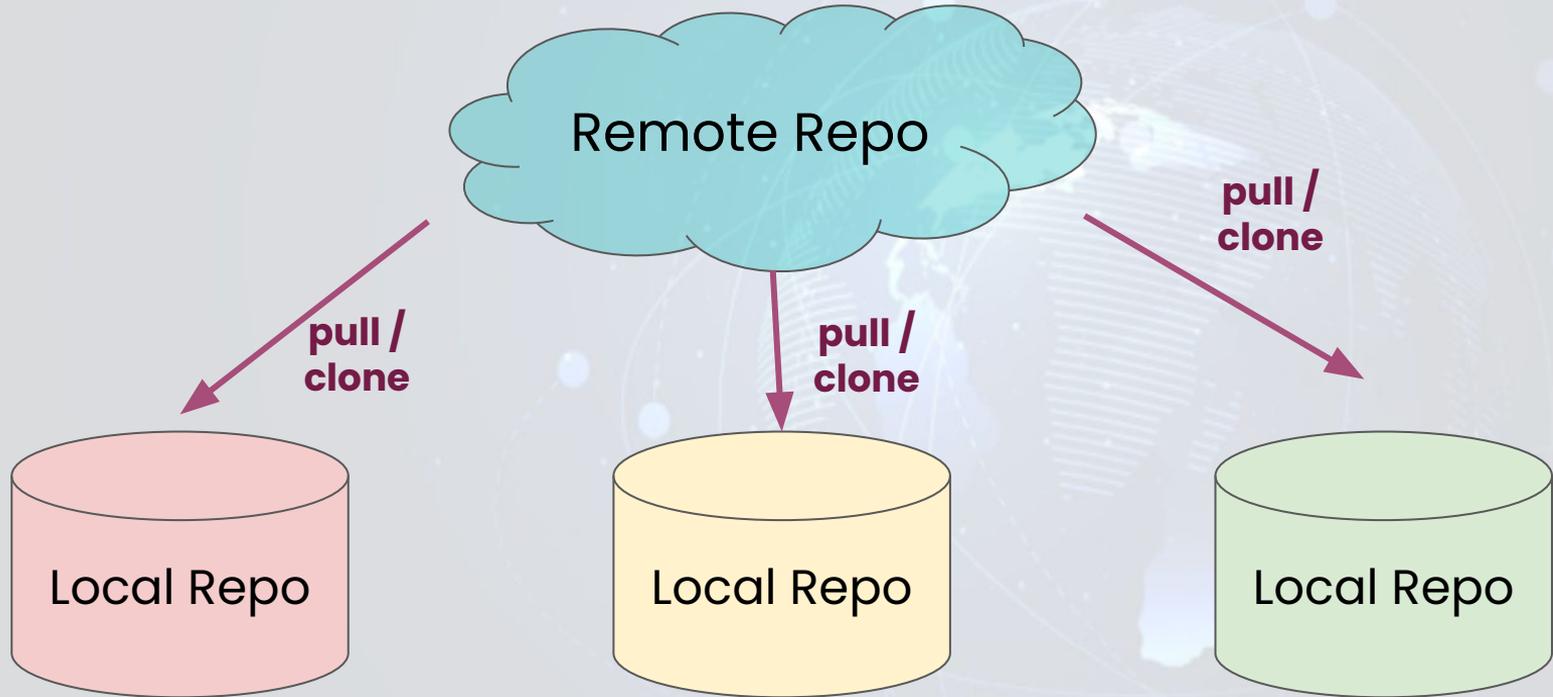
Managing Local and Remote Repos



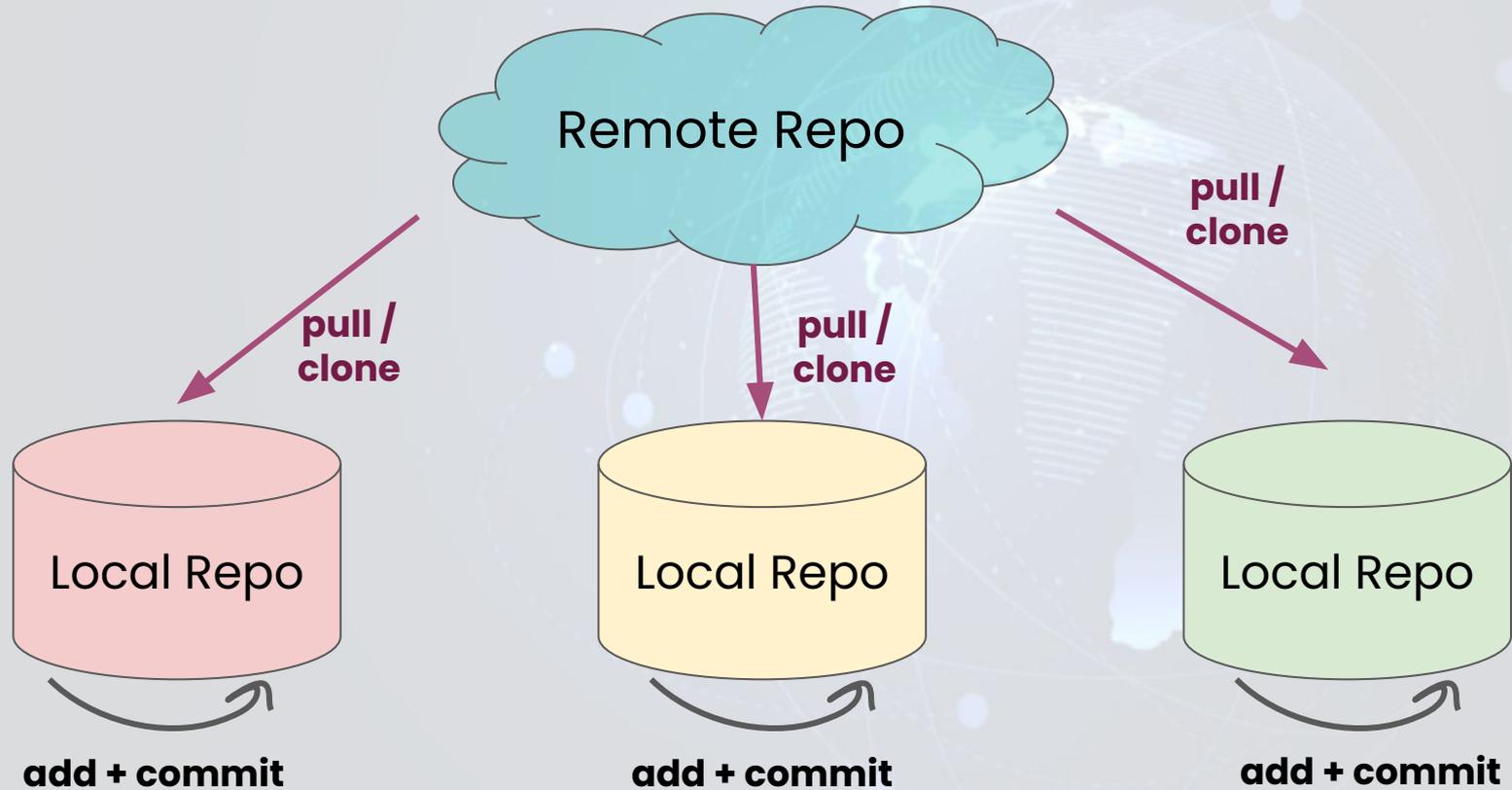
Remote Repo



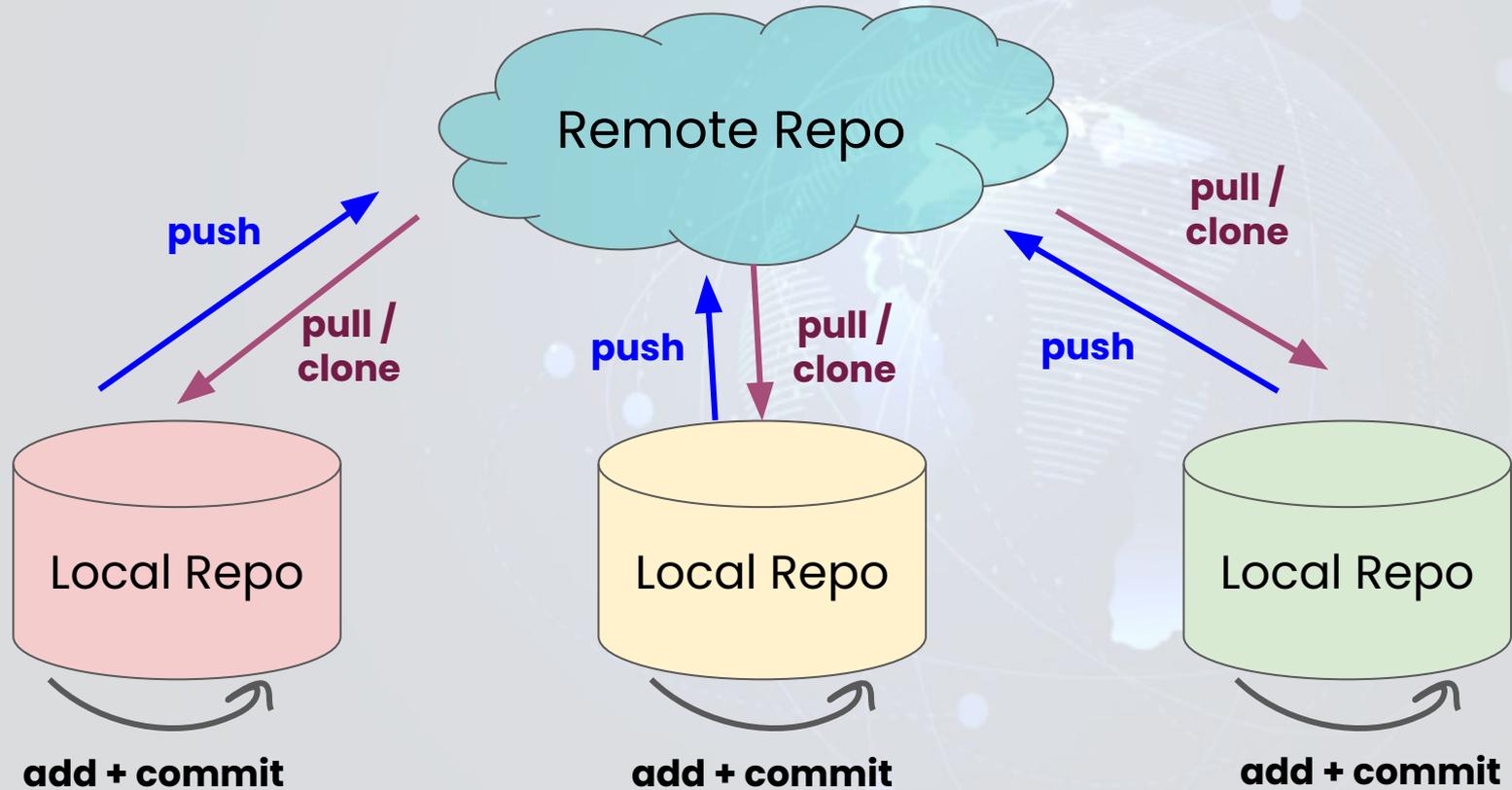
Managing Local and Remote Repos



Managing Local and Remote Repos



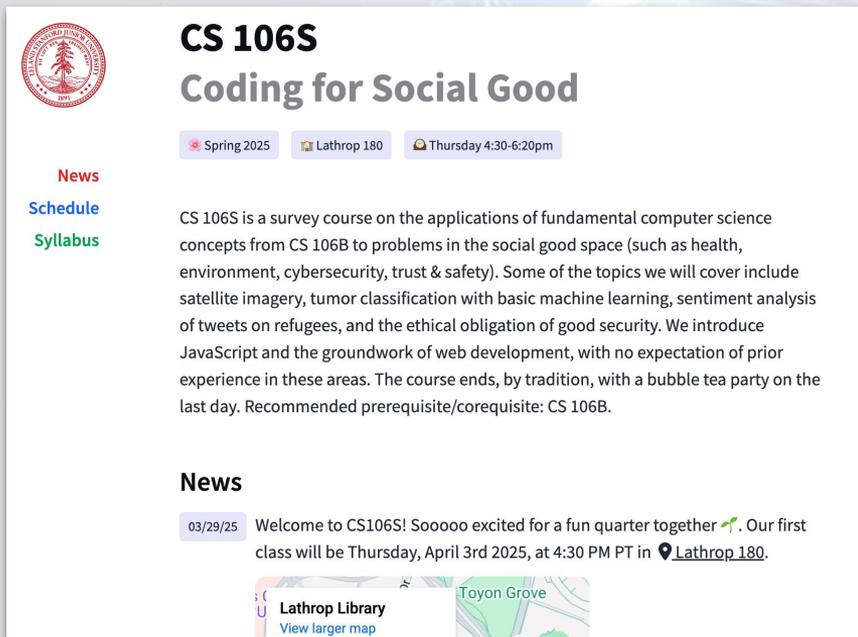
Managing Local and Remote Repos



CS 106S Website

Our website is **open source!**

Let's look at the code...



The screenshot shows the CS 106S website page. At the top left is the University of Washington logo. The main heading is "CS 106S Coding for Social Good". Below this are three tags: "Spring 2025", "Lathrop 180", and "Thursday 4:30-6:20pm". On the left side, there are links for "News", "Schedule", and "Syllabus". The main text describes the course as a survey course on the applications of fundamental computer science concepts from CS 106B to problems in the social good space (such as health, environment, cybersecurity, trust & safety). Some of the topics we will cover include satellite imagery, tumor classification with basic machine learning, sentiment analysis of tweets on refugees, and the ethical obligation of good security. We introduce JavaScript and the groundwork of web development, with no expectation of prior experience in these areas. The course ends, by tradition, with a bubble tea party on the last day. Recommended prerequisite/corequisite: CS 106B.

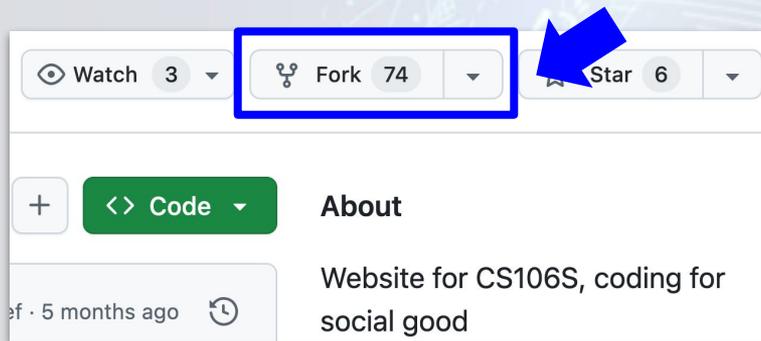
News

03/29/25 Welcome to CS106S! Sooooo excited for a fun quarter together 🌱. Our first class will be Thursday, April 3rd 2025, at 4:30 PM PT in 📍[Lathrop 180](#).

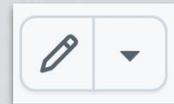
A small map snippet at the bottom of the page shows the location of Lathrop Library and Toyon Grove. The text "Lathrop Library" and "View larger map" is visible, along with "Toyon Grove" and a portion of a street name.

Your First Task

- Create a **GitHub account**, if you don't already have one
- Find our course website's GitHub page (link on previous slide), and make a fork (i.e. your own copy) of it.



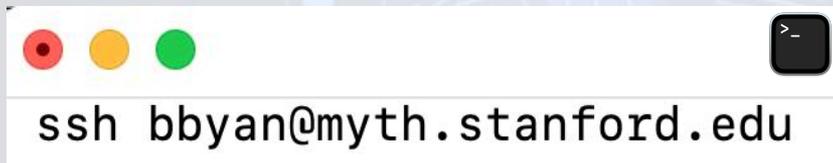
- Do your best to fix the issues in the **index.html** file
 - **Use the editor on GitHub** (click file, then pencil symbol)
- Submit a **pull request**





Stanford WWW

- **Everyone with a SUNET has a Stanford webpage** at *[https://stanford.edu/~\[SUNET\]](https://stanford.edu/~[SUNET])*, though you may not have configured it yet.
- To access it, you can use your computer's **Terminal**, and log into the myth machine (used in CS 107/111!)

A screenshot of a terminal window with a white background and a dark title bar. The title bar contains three colored window control buttons (red, yellow, green) on the left and a dark square icon with a white cursor on the right. The terminal text shows the command 'ssh bbyan@myth.stanford.edu'.

- There's a folder inside named **WWW**, which can store an **index.html** for your webpage, along with any ancillary HTML / CSS / JavaScript files.



Stanford WWW

Optional Demo: To access, use your computer's Terminal, and **log into the myth machine**

```
Terminal Window:  
$ ssh [SUNET]@myth.stanford.edu  
Duo 2-factor authentication for [SUNET]  
... Success – you've been logged in!  
bbyan@myth$ cd WWW  
bbyan@myth$ ls  
index.html  
website_img.jpg
```

Open Terminal! 🚀 (usually in Applications folder)

Login into myth ... may have to authenticate! 🔑

Via Unix commands (more here!), enter **WWW** folder

I recommend making the website files locally first, then copying them here.

This `index.html` file displays directly at **stanford.edu/~[SUNET]!**

```
benjaminyan — bbyan@myth61: ~/WW...
1 <!DOCTYPE html>
2 <html>
3 <body>
4 <h1>Hello World</h1>
5 <p>Hi! My name is Ben, and graphic
  design is my passion.</p>
6 <img src = "that_was_fun.jpg" width
  = 400>
7 </body>
8 </html>
```

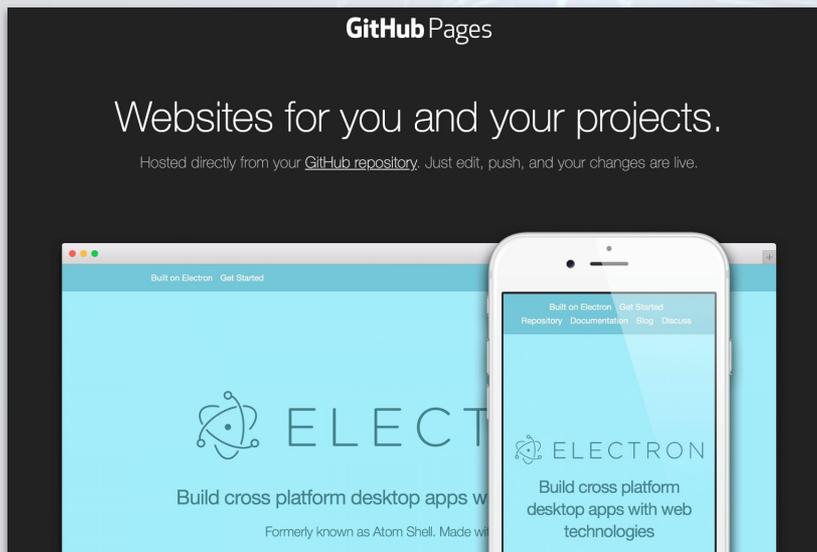
An example `index.html` file 🖱️🔥





GitHub Pages

- Another way (non-Stanford) to **deploy a web-page or mini web app directly from a GitHub repository** is through **GitHub Pages**. **[Link here](#)** for more details if you're interested!



The background features a stylized globe with a network overlay of lines and nodes, set against a light gray background. The globe is rendered in shades of blue and green, with a yellowish-green highlight on the top. The network overlay consists of several overlapping circles and lines, with small blue dots at the intersections, suggesting a global network or data flow.

Code Review & Merge

Search or jump to... Pulls Issues Marketplace Explore

rails / rails Public Watch 2.5k Unstar 49.2k Fork 19.8k

Code Issues 356 Pull requests 293 Actions Projects 2 Security 2 Insights

Remove broken responsive-tables JS, improving mobile readability & accessibility [ci skip] #39782

Merged rafaelfranca merged 1 commit into rails:master from milesmcc:master on Jul 6, 2020

Conversation 10 Commits 1 Checks 1 Files changed 4 +31 -92

milesmcc commented on Jul 2, 2020 • edited Contributor

Summary

Currently, tables in the guides are broken on mobile. The first column (usually the label of the row) is removed by the `responsive-tables.js` script, making them impossible to read. Here's a screenshot of the first table in the getting started guide in Chromium/Chrome/Edge (I've also replicated this issue in iOS Safari):

happen in the `app` folder, but here's a basic rundown:

Reviewers
jonathanhefner ✓

Assignees
No one assigned

Labels

<https://github.com/rails/rails/pull/39782>

Benji #56

[Edit](#)[Code](#)

Open yanbenjamin wants to merge 3 commits into `main` from `benji`

Conversation 0

Commits 3

Checks 0

Files changed 2

+1 -1

Changes from 1 commit File filter Conversations Jump to

[Review changes](#)

added ben profile to index.html

[< Prev](#) [Next >](#)

benji (#56)

Benjamin Yan authored and Benjamin Yan committed 2 minutes ago

commit 2e1e94923ac194d6060e2d148a2756bc6ec4d079

2 index.html

...

```
@@ -321,7 +321,7 @@ <h2 id="instructors">Instructors</h2>
321 321             <p class="font-semibold">Theo Baker</p>
322 322         </div>
323 323     <div class="text-center">
324 -         
324 +         
325 325     <p class="font-semibold">Ben Yan</p>
326 326     </div>
327 327 </div>
```

<https://github.com/milesmcc/cs106s/pull/56>

A stylized globe with a network overlay of lines and nodes, set against a light gray background. The globe is rendered in shades of blue and green, with a glowing yellow-green area on the top. The network overlay consists of thin white lines and small blue circular nodes, creating a sense of global connectivity and data flow.

How should I do open-source code?

Conventions / Etiquette

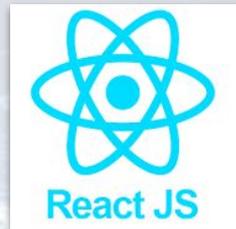
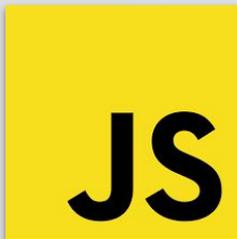
- **Be respectful!** You're dealing with real people!
- **Maintainers are volunteers.** They don't owe us anything.
- **Ask before you do.** Before making a big PR, check with the maintainers.
- **Report bugs!** But be descriptive and understanding in your bug reports.
- **Respect the license.** Licensing is a core part of open source software.





Licenses!

The MIT License



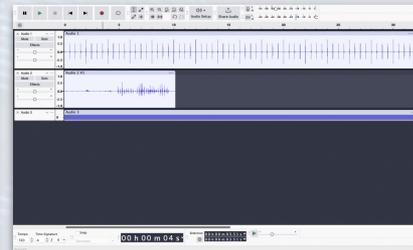
GPL v2/v3

```
emac@bluberry
File Edit Options Buffers Tools Emacs-Lisp Help
[Icons] Save Undo Find
(defun hash-table-empty-p (hash-table)
  "Check whether HASH-TABLE is empty (has 0 elements)."
  (zerop (hash-table-count hash-table)))

(defun hash-table-keys (hash-table)
  "Returns a list of keys in HASH-TABLE."
  (let ((keys '()))
    (maphash (lambda (k _v) (push k keys)) hash-table)
    keys))

(defun hash-table-values (hash-table)
  "Returns a list of values in HASH-TABLE."
  (let ((values '()))
    ...))

M-x ...
Emacs Editor
Emacs is the extensible, customizable, self-documenting real-time display editor. This manual describes how to edit with Emacs and some of the ways to customize it; it corresponds to GNU Emacs version 26.0.58.
If you are reading this in Emacs, type 'h' to read a basic introduction to the info documentation system.
URL: "safe" (emacs) Top_Top L9: [Info Narrow]
```



Apache 2.0



The MIT License (yes, really, the whole thing)

Copyright 2021 R. Miles McCain

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

The MIT License (yes, really, the whole thing)

Copyright 2021 R. Miles McCain

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

The MIT License (yes, really, the whole thing)

Copyright 2021 R. Miles McCain

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

The MIT License (yes, really, the whole thing)

Copyright 2021 R. Miles McCain

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

Comparison of Major Licenses

License	Use allowed in closed-source projects?	Explicit patent grant?	Liability protection?	Commercial use allowed?
MIT				
GPL v2/v3				
Apache 2.0				

Case Study #1

You're building an **open source note taking app** designed for people with visual impairments.

You want to make sure that your project is free to everyone. No one should be able to make their own version of it that isn't open source.

Which license do you choose?

Discuss!

MIT

GPL v2/v3

Apache 2.0

Case Study #1

You're building an **open source note taking app** designed for people with visual impairments.

You want to make sure that your project is free to everyone. No one should be make their own version of it that isn't open source.

Which license do you choose?

Discuss!

Use allowed in closed-source projects?



Explicit patent grant?



Commercial use allowed?



Case Study #1

You're building an **open source note taking app** designed for people with visual impairments.

You want to make sure that your project is free to everyone. No one should be make their own version of it that isn't open source.

Which license do you choose?

Discuss!

Use allowed in closed-source projects?



Explicit patent grant?



Commercial use allowed?



Case Study #1

You're building an **open source note taking app** designed for people with visual impairments.

You want to make sure that your project is free to everyone. No one should be make their own version of it that isn't open source.

Which license do you choose?

Discuss!

Use allowed in closed-source projects?



Explicit patent grant?



Commercial use allowed?



GPL v2/v3

Case Study #2

You're building a **tool for sentiment analysis** in order to help detect hate speech. Your tool is designed to be used inside other projects.

You want as many people – and companies – as possible to use your tool.

Which license do you choose?

Discuss!

MIT

GPL v2/v3

Apache 2.0

Case Study #2

You're building a **tool for sentiment analysis** in order to help detect hate speech. Your tool is designed to be used inside other projects.

You want as many people — and companies — as possible to use your tool.

Which license do you choose?

Discuss!

Use allowed in closed-source projects?



Explicit patent grant?



Commercial use allowed?



Case Study #2

You're building a **tool for sentiment analysis** in order to help detect hate speech. Your tool is designed to be used inside other projects.

You want as many people — and companies — as possible to use your tool.

Which license do you choose?

Discuss!

Use allowed in closed-source projects?



Explicit patent grant?



Commercial use allowed?



Case Study #2

You're building a **tool for sentiment analysis** in order to help detect hate speech. Your tool is designed to be used inside other projects.

You want as many people – and companies – as possible to use your tool.

Which license do you choose?

Discuss!

Use allowed in closed-source projects?



Explicit patent grant?



Commercial use allowed?



MIT / Apache

Before Departure: Check-Off Form

Fill out this week's attendance form on the website! (Week 6)



Tysm!! And best wishes for your midterms!