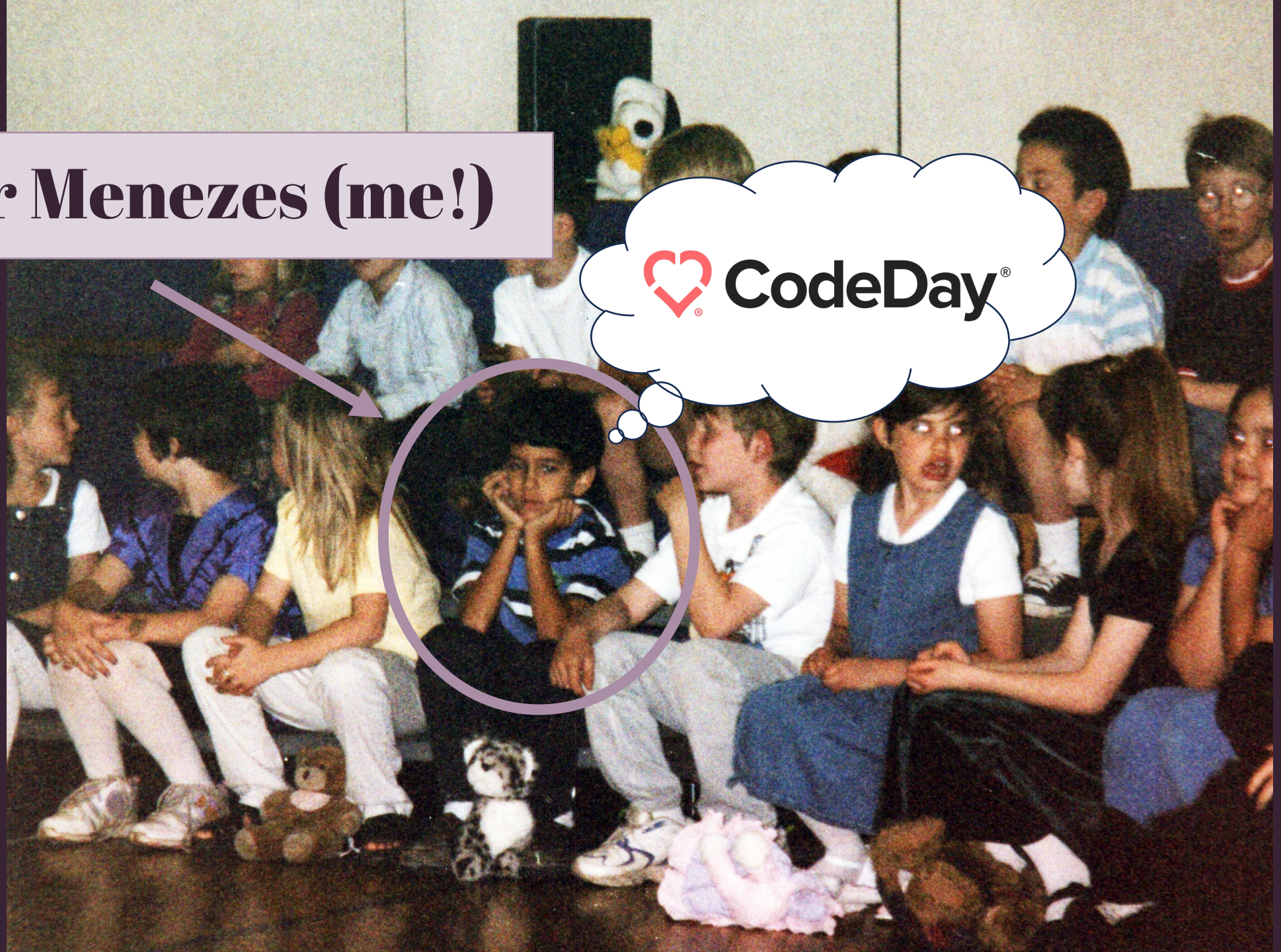
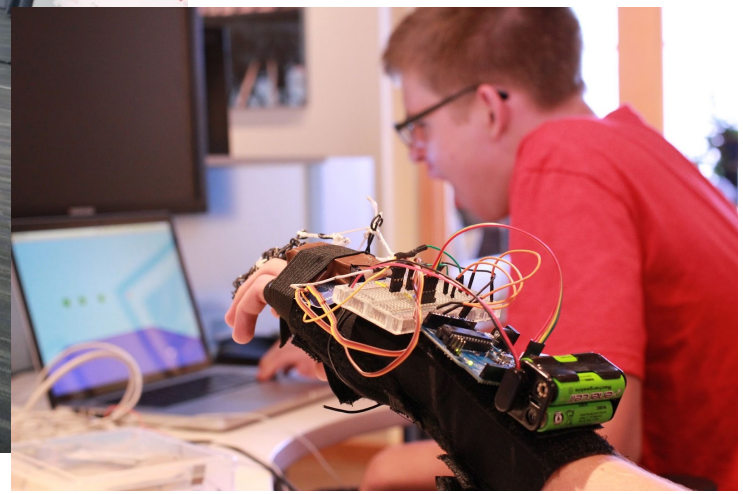
Nurturing the Next Generation of Open Source Contributors

Tyler Menezes (me!)



- Why is open source good for students?
- What problems do students face when trying to contribute to Open Source?
- What can maintainers do to make their projects easier for students?

“There’s a place in tech for everyone.”



p.c. Teemu Paananen

Creativity
Valery
I've been trying to become stronger as an artist...

codeday.sh/thorns

codeday.sh/witch-hazel

codeday.sh/pocket-frog

70,456

CodeDay Alumni

50,024

Underrepresented in CS

Community Colleges?

- Did you know they can give out Bachelors degrees?
- $5k/yr tuition!
- Students are lower-income, service industry jobs, etc
- Recruiters don’t come to community colleges!

Only [redacted] of students thought they needed to learn outside of class to get an internship.

Only **45%** of students thought they needed to learn outside of class to get an internship.

[redacted] did nothing to prepare at all, because they thought coursework and GPA would lead to an internship or job.

23% did nothing to prepare at all, because they thought coursework and GPA would lead to an internship or job.

Amanpreet Kapoor and Christina Gardner-McCune. 2020. Exploring the Participation of CS Undergraduate Students in Industry Internships. In Proceedings of the 51st ACM Technical Symposium on Computer Science Education (SIGCSE '20).

23% did nothing to prepare at all, because they thought

GPA was not correlated with success in finding an internship.

Amanpreet Kapoor and Christina Gardner-McCune. 2020. Exploring the Participation of CS Undergraduate Students in Industry Internships. In Proceedings of the 51st ACM Technical Symposium on Computer Science Education (SIGCSE '20).

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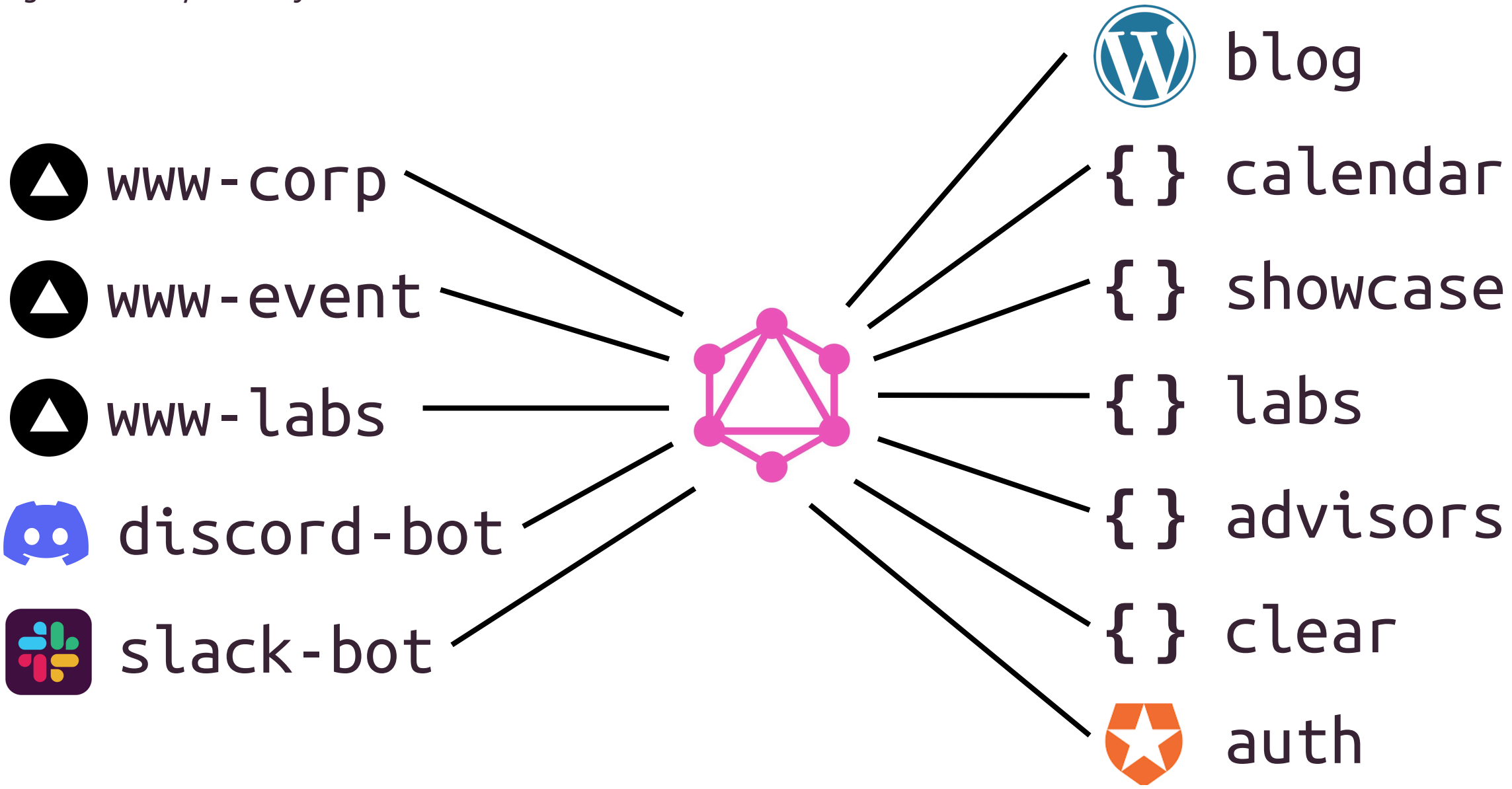
www-corp
www-event
www-labs
discord-bot
slack-bot
blog
{ } calendar
{ } showcase
{ } labs
{ } advisors
{ } clear
auth

This repository has been archived by the owner. It is now read-only.

tjhorner / MakerbotWebUI

Archived

Watch 2 | Star 9 | Fork 1

master | 1 branch | 0 tags | Go to file | Add file | Code

tjhorner readme — 782c70d on Aug 15, 2019 — 2 commits

database	Merge	3 years ago
lib	Merge	3 years ago
public	Merge	3 years ago
routes	Merge	3 years ago
views	Merge	3 years ago
.DS_Store	Merge	3 years ago
.bithoundrc	Merge	3 years ago
.gitignore	Merge	3 years ago
.jshintrc	Merge	3 years ago
CODE_OF_CONDUCT.md	Merge	3 years ago
CONTRIBUTING.md	Merge	3 years ago
LICENSE	Merge	3 years ago
README.md	readme	15 months ago
index.js	Merge	3 years ago
package-lock.json	Merge	3 years ago
package.json	Merge	3 years ago
screenshot.png	Merge	3 years ago

README.md

About

Self-hosted website to make managing public MakerBot printers easy

3d-printing node-js

Readme

GPL-3.0 License

Releases

No releases published

Packages

No packages published

Languages

JavaScript 92.2% HTML 6.2%
CSS 1.6%

Good First Issue

Help Wanted

Projects are asking for help!

Up For Grabs

Simple Task

TESLA
Jason
I ♥ CODE
CodeDay
VAIO
SAMSUNG

<!doctype html>
<html>
<head>
<title>AppCo</title>
</head>

Why aren't students already contributing to OSS?

1. ”Expert” Fallacy

Many students don’t know how to work independently.

p.c. Joshua Hoehne

Test... Study... Test... Study... Test... Study... Test...
Study... Test... Study... Test... Study... Test... Study...
Test... Study... Test... Study... Test... Study... Test...
Study... Test... Study... Test... Study... Test... Study...
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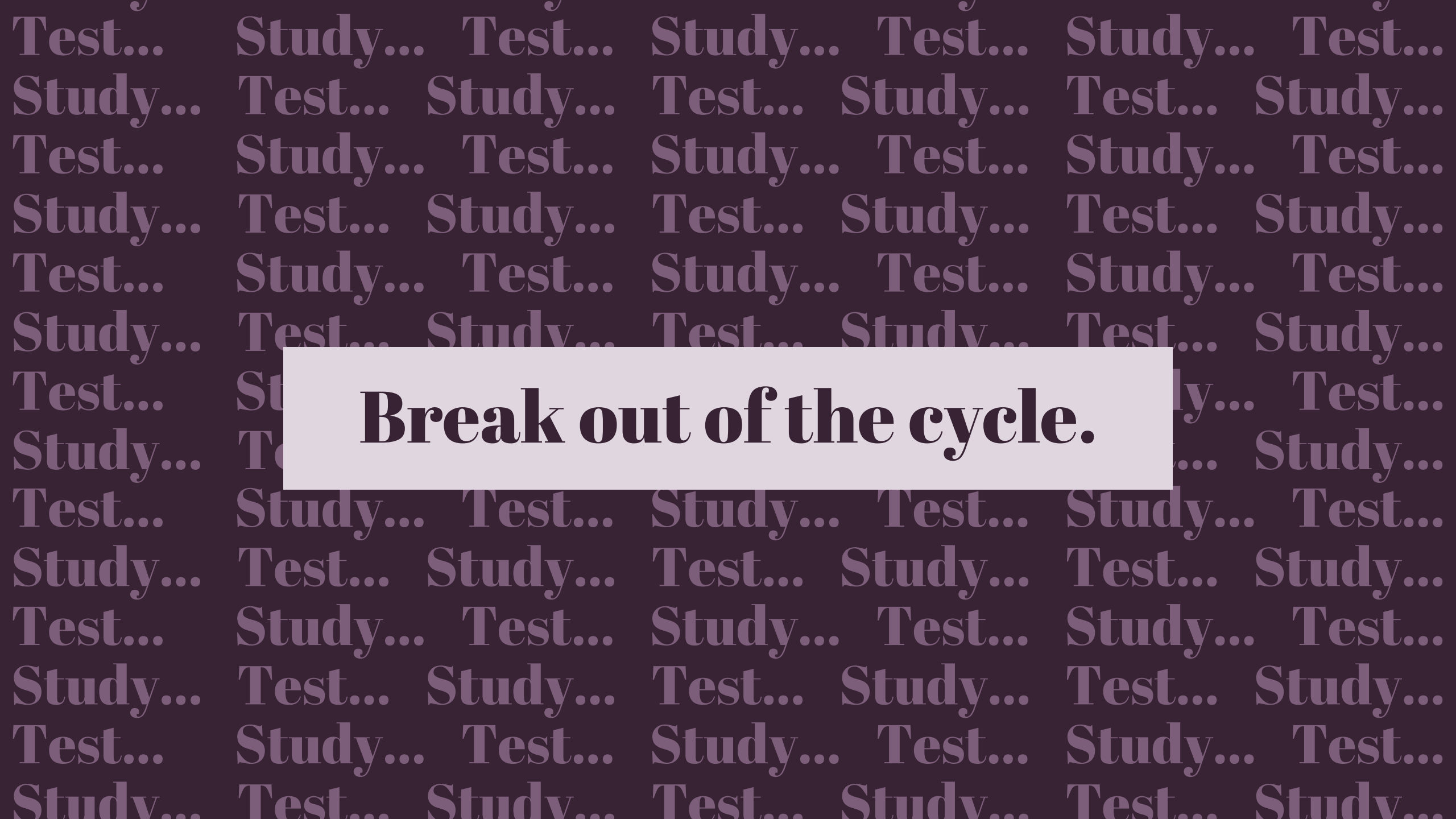
I don’t know what to do…

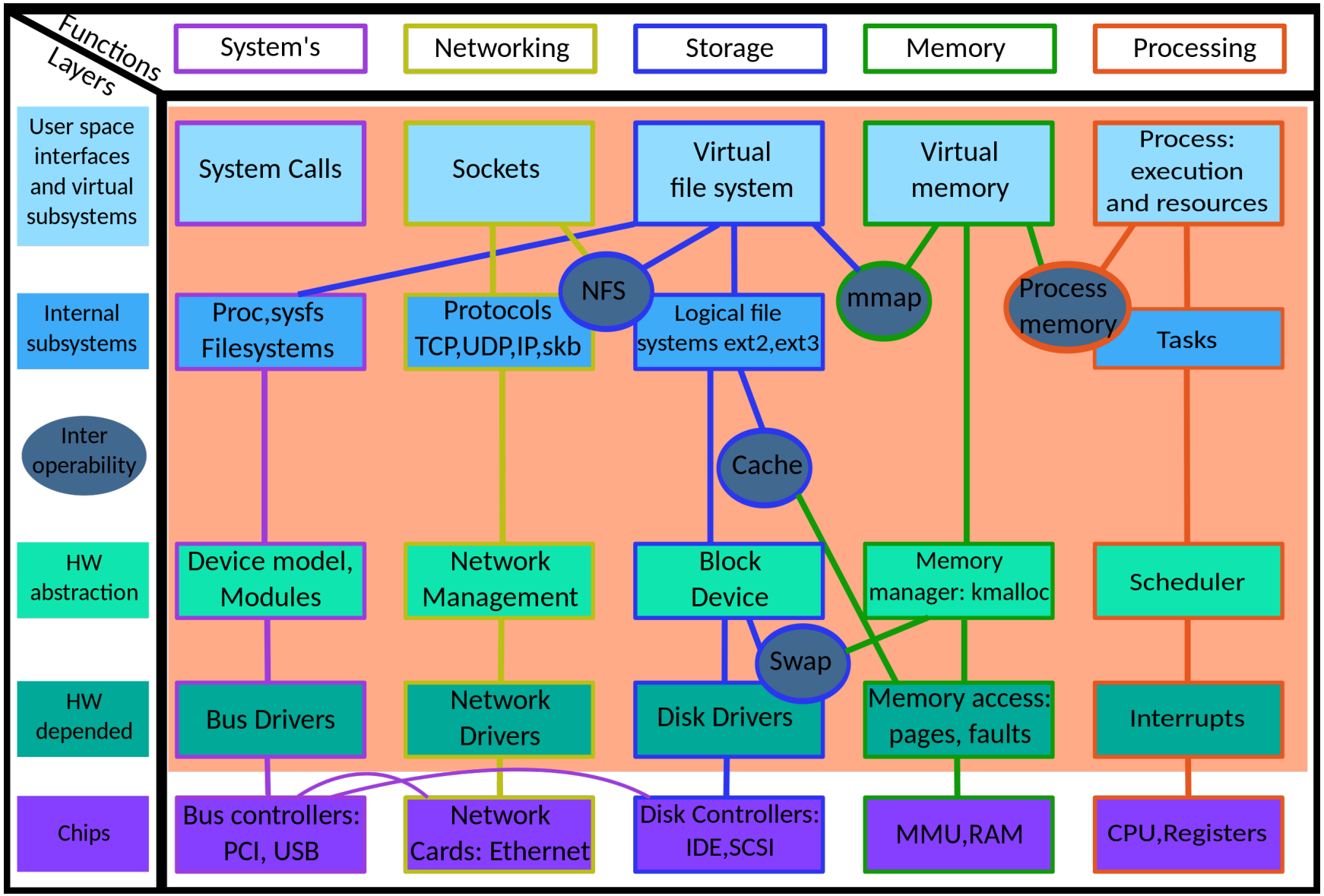

Break out of the cycle.

I don’t know what to do…
but I can learn!

2. Finding Starting Points

Without much context, navigating a codebase is hard.

Simplified Linux kernel diagram in form of a matrix map



Kuzux on Wikimedia, CC-BY-SA 2.5

3. “Stupid Questions” & Embarassment

Asking for help is a high barrier to clear.

Home

PUBLIC

Stack Overflow

Tags

Users

Jobs

TEAMS What's this?

Free 30 Day Trial

Mocha - Multiple async calls inside one test leads to timeout error

Ask Question

Asked today Viewed 3 times

Save $200 on bare metal servers. Now up to 20TB bandwidth included. Order today IBM Cloud

0

So I have a nodeJS backend and I'm trying to add integration tests.

The problem is, it is always exceeding the 2seconds timeout. Mocha documentation is telling me to call "done()" at the callback of promise or return the promise. Manually setting the timeout time is not an option for me, I don't like it and it an elegant solution.

I cannot use both because it will throw another error. I have multiple async calls in a single test so I don't know where to call done().

```
it('should return a working presigned upload URL', async () => {
    let objectFromS3;

    // get the presigned url, try if we can upload to S3 using this url
    const uploadUrl = async module.getPresignedUploadUrl();

    // upload a sample file using the uploadUrl
    await axios.put(uploadUrl, sampleVideoFile);

    // Directly get the object from S3 to check if its really uploaded there
    // s3Params contains the Bucket and Key(file name)
    objectFromS3 = await s3.getObject(s3Params).promise();

    expect(objectFromS3).to.not.undefined;

    // Delete the uploaded object (I can put this inside afterEach)
    await s3.deleteObject(s3Params).promise();
})
```

As you can see I have multiple async calls in a single test so I don't know which promise to return or in where to use done();

node.js mocha integration-testing

Blog

The live coding language that lets you be an actual rock star

Micro-interactions with react-spring: Part 3

Featured on Meta

Planned Maintenance scheduled for Wednesday, February 5, 2020 for Data Explorer

In case you missed it: Shog9 and Robert Cartaino are no longer staff members…

CEO's 2020 Kickoff Blog: Where do you see Stack Overflow going?

Revolutionize cybersecurity. Not to mention your career.

Apply now JPMorgan Chase & Co.

Software Development Process

- Identify and define the problem (debugging/etc)
- Online/peer research to find existing solutions
- Experiment, learn by doing
- Evaluate proposed solutions
- Verify problem is solved
- Document solution

How can maintainers help?

1. CONTRIBUTING.md

Resources, coding conventions, styles, CoC, etc

2. Dev environment!

How do you get it running? (For Linux/Mac… && Windows!)

3. CI w/ Linting & Tests

Help students avoid easy pitfalls!

4. ARCHITECTURE.md

How the pieces fit together & information flows through files

5. good-first-issue

Speaking of which…

5a. Self-contained

Solved in one file, minimal tracing around the codebase

5b. Clear

Enough detail that they don’t have to ask for clarification

5c. Decided

Doesn’t require a maintainer discussion to move forward

5d. Recent

It’s not obvious if old issues (~6-12mo+) are still valid

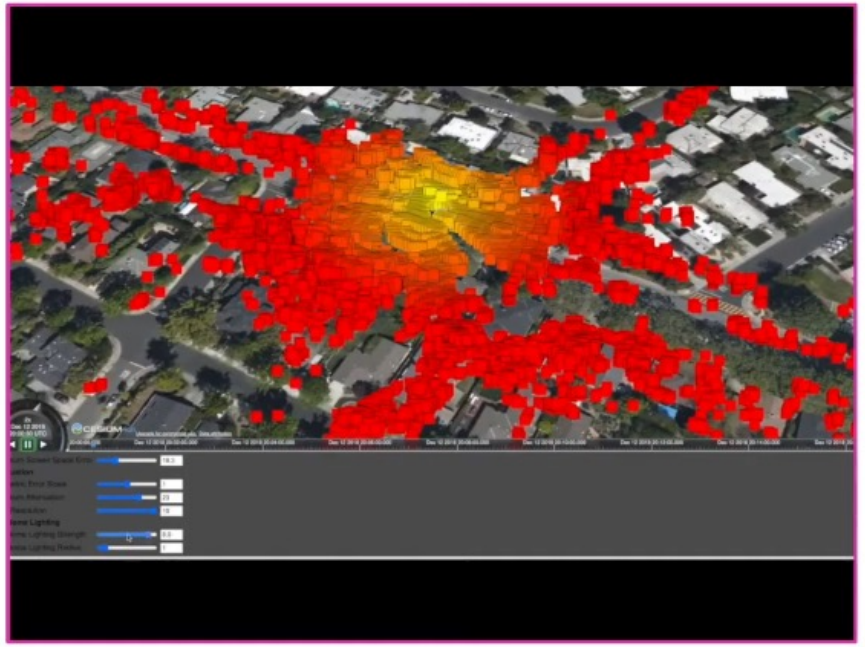
- CONTRIBUTING.md
- Dev environment
- CI w/ Linting & Tests
- ARCHITECTURE.md
- good-first-issue
  - Self-contained
  - Clear
  - Decided
  - Recent

Results

Visualizing Self-Driving Car Sensors

Mehrab H., Shania D., Yen L. / Omar Shehata (Cesium)

Example sandcastle:
https://sandcastle.cesium.com/index.html?src=3D%20Tiles%20Point%20Cloud%20Shading.html



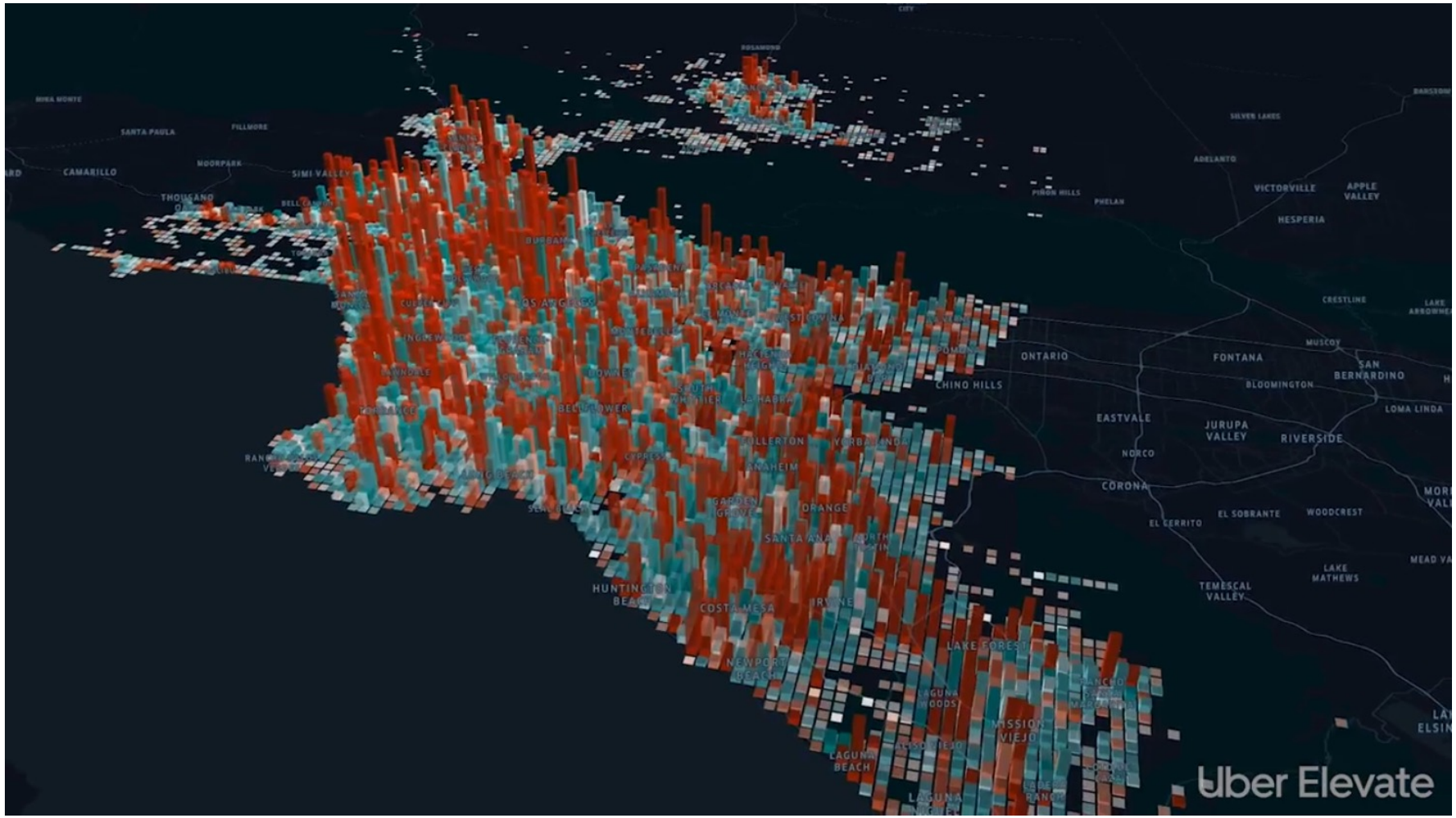
Goal: Visualize the point cloud data. Achieved by adding facets such as eye dome lighting to differentiate points and attenuation to change size.

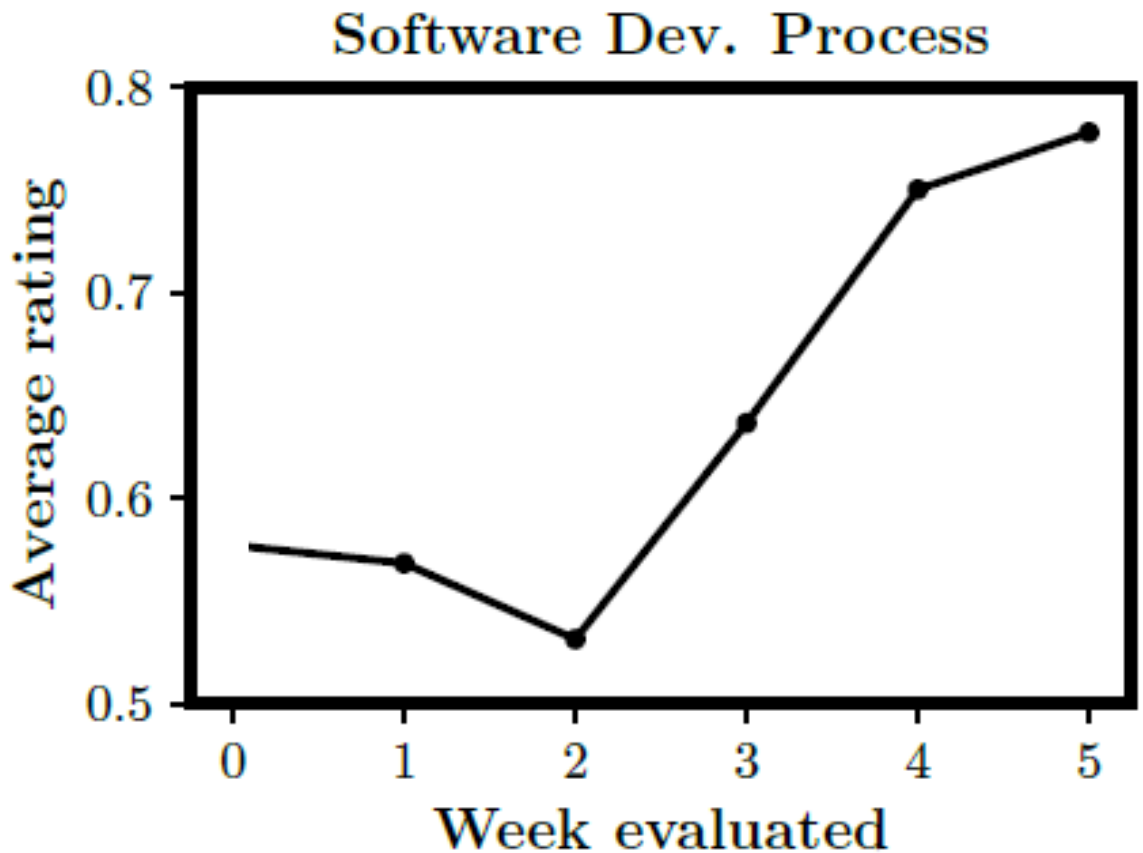
Improvements: Alterations in the toolbar only apply to the current frame. We would make any changes permanent in the future.

Point Cloud Shading

Exporting Movies from Hubble.gl

Raymond W., Elisa M., Kent Z. / Chris Gervang (Uber Elevate)




Software Dev. Process
Average rating
0.8
0.7
0.6
0.5
0
1
2
3
4
5
Week evaluated

Open-Source Internships With Industry Mentors

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ABSTRACT

Internships help students connect what they have learned in the classroom to the real world, and students with access to internships are more likely to graduate and secure employment. However, many students are unable to find an internship by the time they graduate.

This experience report describes a program where volunteer software engineers mentor students as they work on open-source projects in the summer, offered as an alternative to a traditional internship experience. We catalog the considerations involved in providing an experience similar to a traditional internship, describe our program's design, and provide two years' worth of participant evaluations and career outcomes as a measure of efficacy.

The program served mostly undergraduates from non-R1 schools who are underrepresented in technology, and achieved similar educational outcomes to a traditional internship program. Most promisingly, mentors were willing to serve as a professional reference for 80% of students and the number of graduating seniors who secured full-time employment in technology was 7 points higher than average (despite occurring during the COVID-19 pandemic).

CCS CONCEPTS

• **Social and professional topics** → **Informal education**; **Software engineering education**.

KEYWORDS

open source software, internships, industry engagement

ACM Reference Format:

Tyler Menezes, Alexander Parra, and Mingjie Jiang. 2022. Open-Source Internships With Industry Mentors. In *Proceedings of the 27th ACM Conference on Innovation and Technology in Computer Science Education Vol 1 (ITiCSE 2022), July 8–13, 2022, Dublin, Ireland.* ACM, New York, NY, USA, 7 pages. https://doi.org/10.1145/3502718.3524763

1 INTRODUCTION

Computer science coursework provides students with the fundamental skills to learn what they need to know later in their careers, but many colleges engage industry to show students how to apply what they learn [2]. Industry engagement can come in many forms—including mentoring, guest speakers, tours, case studies, and capstone projects—but one of the most significant predictors of post-graduation employment is participation in an internship [4].

In this report, we describe an open-source internship, which we define as an industry engagement experience in which students work on a new or existing software project, licensed under an open-source license, with the guidance of an experienced software engineer. Many prior studies and initiatives have shown that these open-source projects can provide a real-world environment for learning and improve diversity [9, 14, 15, 26].

Compared to internships where students work on proprietary software, most open-source internships do not require access to corporate resources. While some programs have explored paid mentors [28], our program used volunteer mentors exclusively.

Our goal was to evaluate the potential of open-source internships to (a) provide similar outcomes to a traditional internship, and (b) to reach students who were otherwise unlikely to have one.

2 INTERNSHIPS AND CS EDUCATION

Most undergraduates pursuing a computer science degree chose the major because they believe it will improve their job prospects in industry [1, 13, 25], but a disconnect between coursework and industry has long been reported by both graduates [3, 6, 18] and employers [3]. Institutions commonly try to resolve this disconnect through industry engagement opportunities such as capstone projects, mentoring, guest speakers, and internships.

Internships in particular provide benefits that are difficult to replicate in the classroom:

- **Functioning on a team:** Software engineers must learn to deal with resistance from co-workers or managers or delays from others on tasks that block their progress and must likewise learn to prioritize and communicate their work to co-workers and managers [2].
- **Career confidence:** Students who believe they have a path into a career put more time into educational activities and are more likely to overcome obstacles. The real-world practice, goal-setting, and performance feedback afforded by an internship can increase this confidence [25].
- **Recruiting and retention in the major:** Few students enroll in STEM majors, and many drop out [5]. Studies have shown that the number and diversity of students entering and staying in these majors can be increased by providing internships [10] and research experience [8, 29].
- **Securing a Job After Graduation:** Studies have found that whether a student had completed an internship or not is one of the most significant variables as to whether or not they have a job after graduation [4, 17, 21, 27], their starting salary, and the amount of time they spend looking for a job [12]. This relationship holds even for unpaid interns [27].

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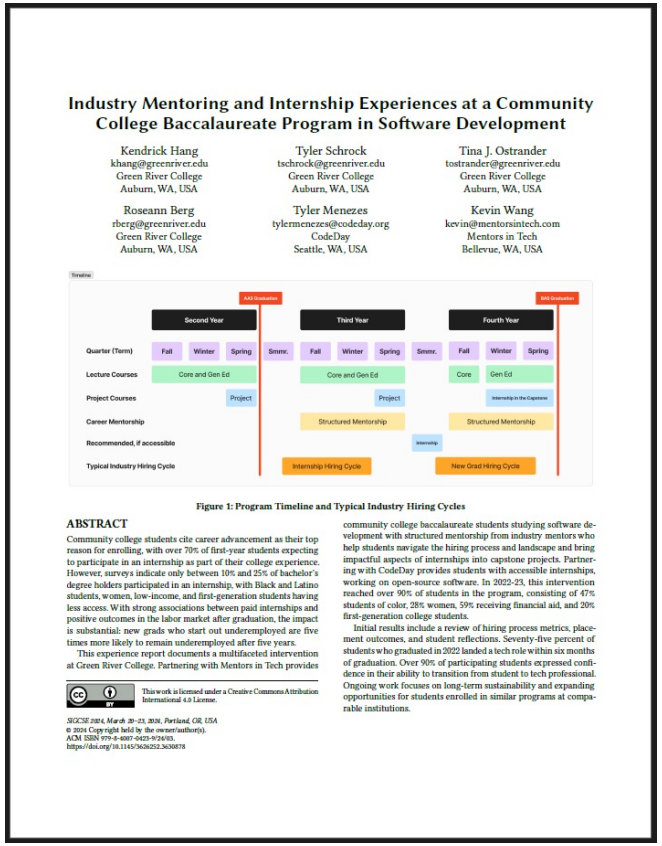

Industry Mentoring and Internship Experiences at a Community College Baccalaureate Program in Software Development

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Figure 1: Program Timeline and Typical Industry Hiring Cycles

ABSTRACT

Community college students cite career advancement as their top reason for enrolling, with over 70% of first-year students expecting to participate in an internship as part of their college experience. However, surveys indicate only between 10% and 25% of bachelor's degree holders participated in an internship, with Black and Latino students, women, low-income, and first-generation students having less access. With strong associations between paid internships and positive outcomes in the labor market after graduation, the impact is substantial: new grads who start out underemployed are five times more likely to remain underemployed after five years.

This experience report documents a multifaceted intervention at Green River College. Partnering with Mentors in Tech provides community college baccalaureate students studying software development with structured mentorship from industry mentors who help students navigate the hiring process and landscape and bring impactful aspects of internships into capstone projects. Partnering with CodeDay provides students with accessible internships, working on open-source software. In 2022-23, this intervention reached over 90% of students in the program, consisting of 47% students of color, 28% women, 59% receiving financial aid, and 20% first-generation college students.

Initial results include a review of hiring process metrics, placement outcomes, and student reflections. Seventy-five percent of students who graduated in 2022 landed a tech role within six months of graduation. Over 90% of participating students expressed confidence in their ability to transition from student to tech professional. Ongoing work focuses on long-term sustainability and expanding opportunities for students enrolled in similar programs at comparable institutions.

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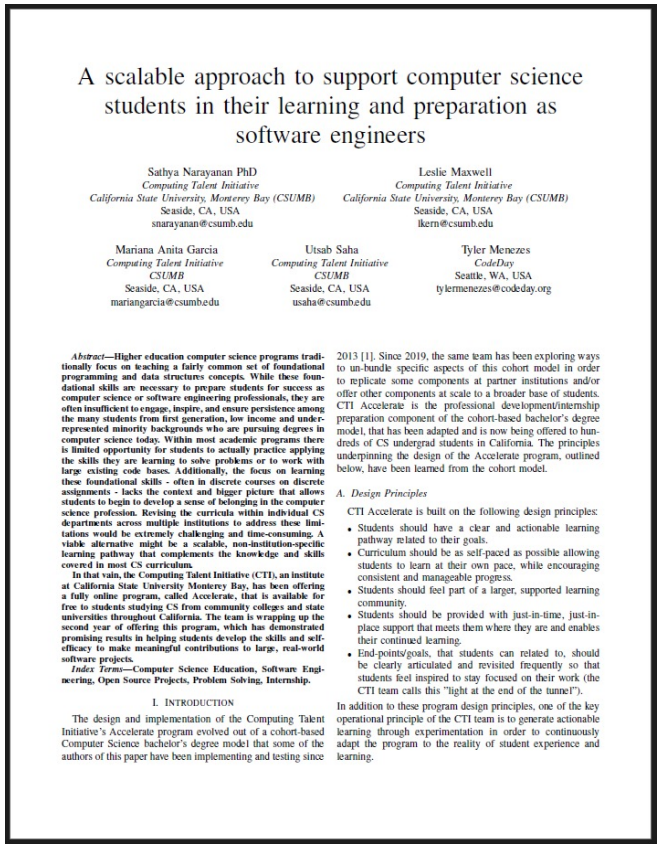

A scalable approach to support computer science students in their learning and preparation as software engineers

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***Abstract*—Higher education computer science programs traditionally focus on teaching a fairly common set of foundational programming and data structures concepts. While these foundational skills are necessary to prepare students for success as computer science or software engineering professionals, they are often insufficient to engage, inspire, and ensure persistence among the many students from first generation, low income and underrepresented minority backgrounds who are pursuing degrees in computer science today. Within most academic programs there is limited opportunity for students to actually practice applying the skills they are learning to solve problems or to work with large existing code bases. Additionally, the focus on learning these foundational skills - often in discrete courses on discrete assignments - lacks the context and bigger picture that allows students to begin to develop a sense of belonging in the computer science profession. Revising the curricula within individual CS departments across multiple institutions to address these limitations would be extremely challenging and time-consuming. A viable alternative might be a scalable, non-institution-specific learning pathway that complements the knowledge and skills covered in most CS curriculum.**

In that vain, the Computing Talent Initiative (CTI), an institute at California State University Monterey Bay, has been offering a fully online program, called Accelerate, that is available for free to students studying CS from community colleges and state universities throughout California. The team is wrapping up the second year of offering this program, which has demonstrated promising results in helping students develop the skills and self-efficacy to make meaningful contributions to large, real-world software projects.

***Index Terms*—Computer Science Education, Software Engineering, Open Source Projects, Problem Solving, Internship.**

I. INTRODUCTION

The design and implementation of the Computing Talent Initiative's Accelerate program evolved out of a cohort-based Computer Science bachelor's degree model that some of the authors of this paper have been implementing and testing since 2013 [1]. Since 2019, the same team has been exploring ways to un-bundle specific aspects of this cohort model in order to replicate some components at partner institutions and/or offer other components at scale to a broader base of students. CTI Accelerate is the professional development/internship preparation component of the cohort-based bachelor's degree model, that has been adapted and is now being offered to hundreds of CS undergrad students in California. The principles underpinning the design of the Accelerate program, outlined below, have been learned from the cohort model.

A. Design Principles

CTI Accelerate is built on the following design principles:

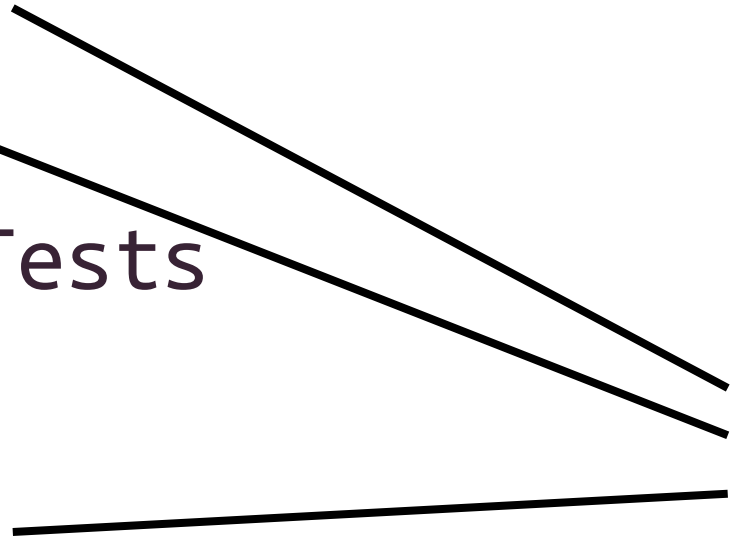
- Students should have a clear and actionable learning pathway related to their goals.
- Curriculum should be as self-paced as possible allowing students to learn at their own pace, while encouraging consistent and manageable progress.
- Students should feel part of a larger, supported learning community.
- Students should be provided with just-in-time, just-in-place support that meets them where they are and enables their continued learning.
- End-points/goals, that students can related to, should be clearly articulated and revisited frequently so that students feel inspired to stay focused on their work (the CTI team calls this "light at the end of the tunnel").

In addition to these program design principles, one of the key operational principle of the CTI team is to generate actionable learning through experimentation in order to continuously adapt the program to the reality of student experience and learning.

Sathya Narayanan, Leslie Maxwell, Mariana Anita Garcia, Utsab Saha, and Tyler Menezes. 2023. A Scalable Approach to Support Computer Science Students in Their Learning and Preparation as Software Engineers. In Proceedings of the Frontiers in Education Conference (FIE). Institute of Electrical and Electronics Engineers, New York, NY, USA. https://doi.org/10.1109/FIE58773.2023.10343322

Working Together to Help Students

- ***CONTRIBUTING.md***
- ***Dev environment***
- CI w/ Linting & Tests
- ARCHITECTURE.md
- ***good-first-issue***
  - Self-contained
  - Clear
  - Decided
  - Recent



We can help!
CodeDay.to/labs-oss

CodeDay.to/labs-oss

CodeDay.to/labs-mentor

tyler@codeday.org