

**Nurturing the Next
Generation of AI-Ready
Software Developers
Through Open Source
Contributions**

Tyler Menezes (me!)



- CEO @ CodeDay
- Former founder of Y Combinator & VC backed tech startup
- Formerly worked in AI R&D
- PI, CTCtoAI (NSF ExLENT)
- I don't have a degree!
- Associate Editor, ACM Transactions on Computing Education
- Organizing and Program Committees for several conferences



CodeDay[®]

CCBs: an accessible path to economic mobility and a stronger tech workforce.

- (CCB = Community College Baccalaureate)
- Over 120 CCB programs nationwide that are relevant to emerging tech.^[1]
- Average annual tuition under \$5,000.^[2]
- Students are lower-income, service industry jobs, etc.

[1] Love, Ivy, Debra Bragg, and Tim Harmon. 2021. "Mapping the Community College Baccalaureate." New America.
<http://newamerica.org/education-policy/briefs/mapping-the-community-college-baccalaureate/>.

[2] Meza, Elizabeth. 2025. "CCBs at a Competitive Price - Community College Daily." *Community College Daily* (blog). March 2, 2025.
<https://www.ccdaily.com/2025/03/ccbs-at-a-competitive-price/>.



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Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

ExLENT (Experiential Learning in Emerging Technologies)

1. The Problem
2. Education/Workforce Disconnect
3. The Open Source Internship
4. Results

The Problem

There's a global talent shortage.

4.8M

**Cybersecurity
Professionals**

4.2M

**AI
Developers**

2.1M

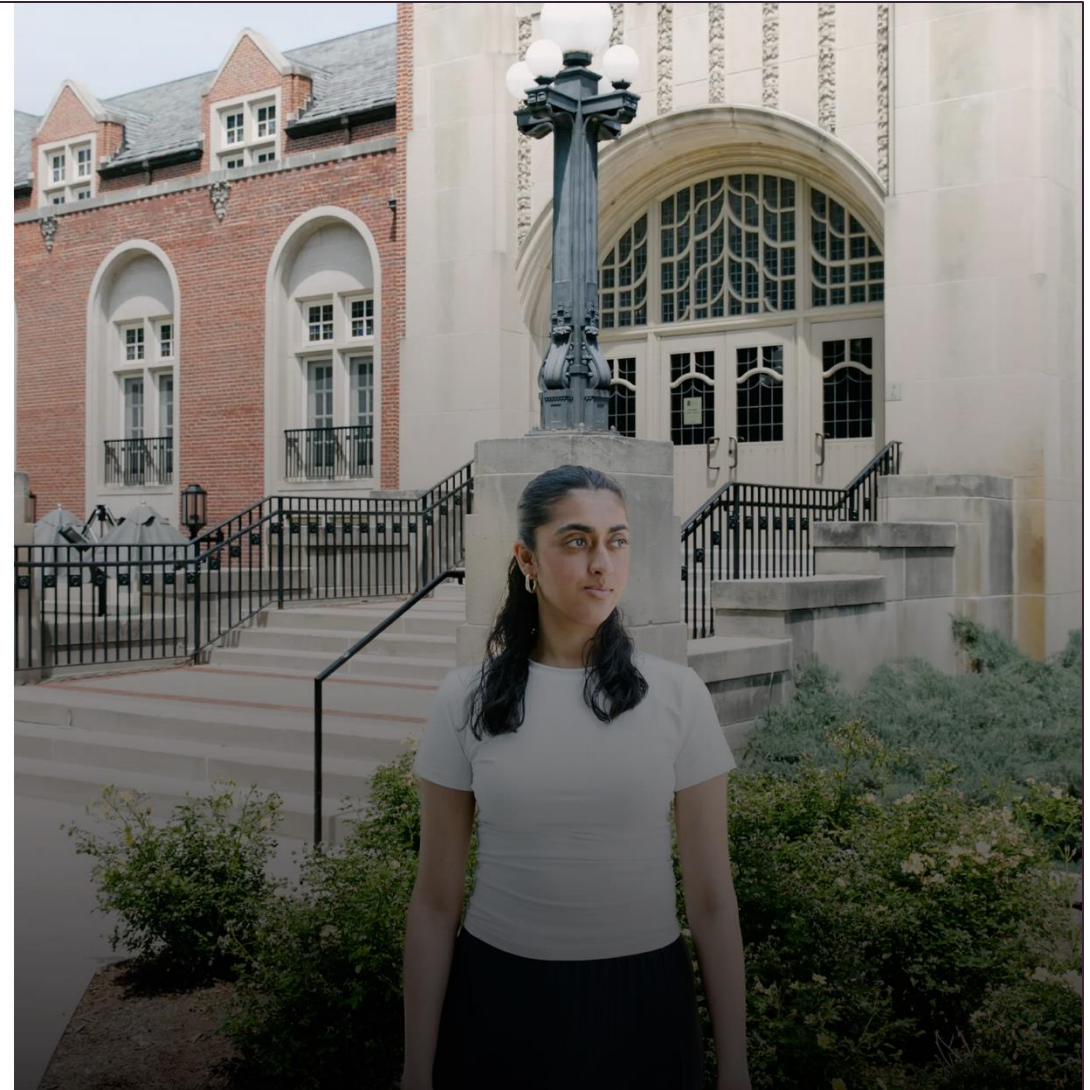
**Network
Engineers**

Marie Laure Esi Alorvor, Natasa Perucica, Sean Doyle, Tal Goldstein, and Akshay Joshi. 2024. *Strategic Cybersecurity Talent Framework*. World Economic Forum. <https://www.weforum.org/publications/strategic-cybersecurity-talent-framework/>.
The State of AI in Early 2024. 2024. McKinsey & Company. <https://www.mckinsey.com/capabilities/quantumblack/our-insights/the-state-of-ai-2024>.



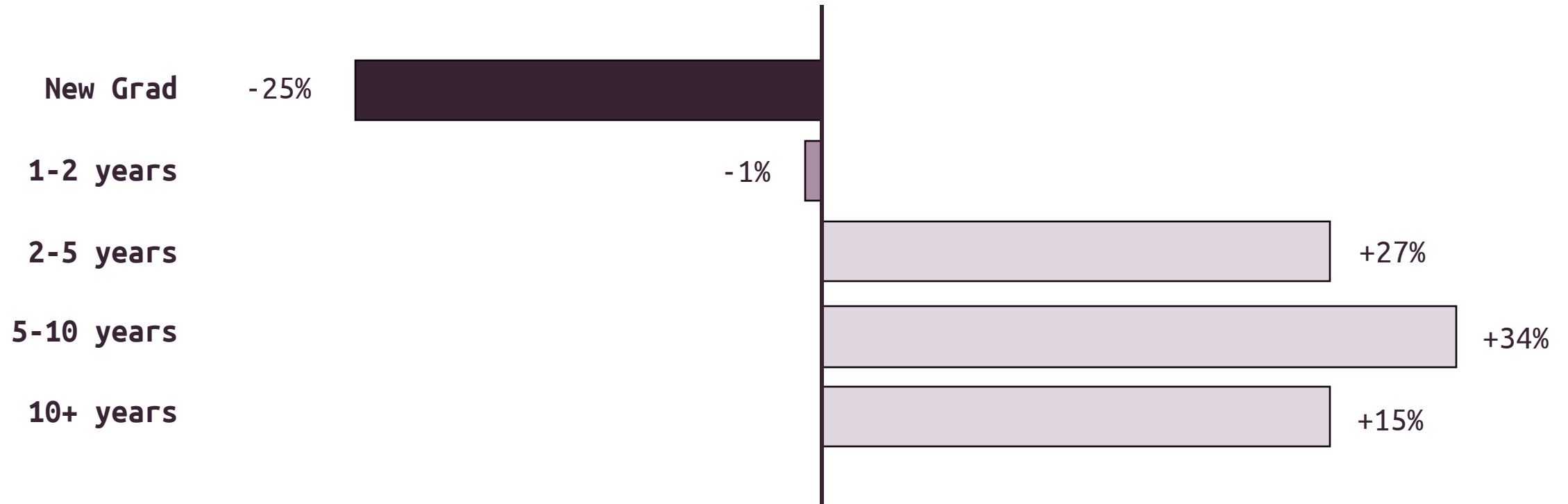
Goodbye, \$165,000 Tech Jobs. Student Coders Seek Work at Chipotle.

As companies like Amazon and Microsoft lay off workers and embrace A.I. coding tools, computer science graduates say they're struggling to land tech jobs.



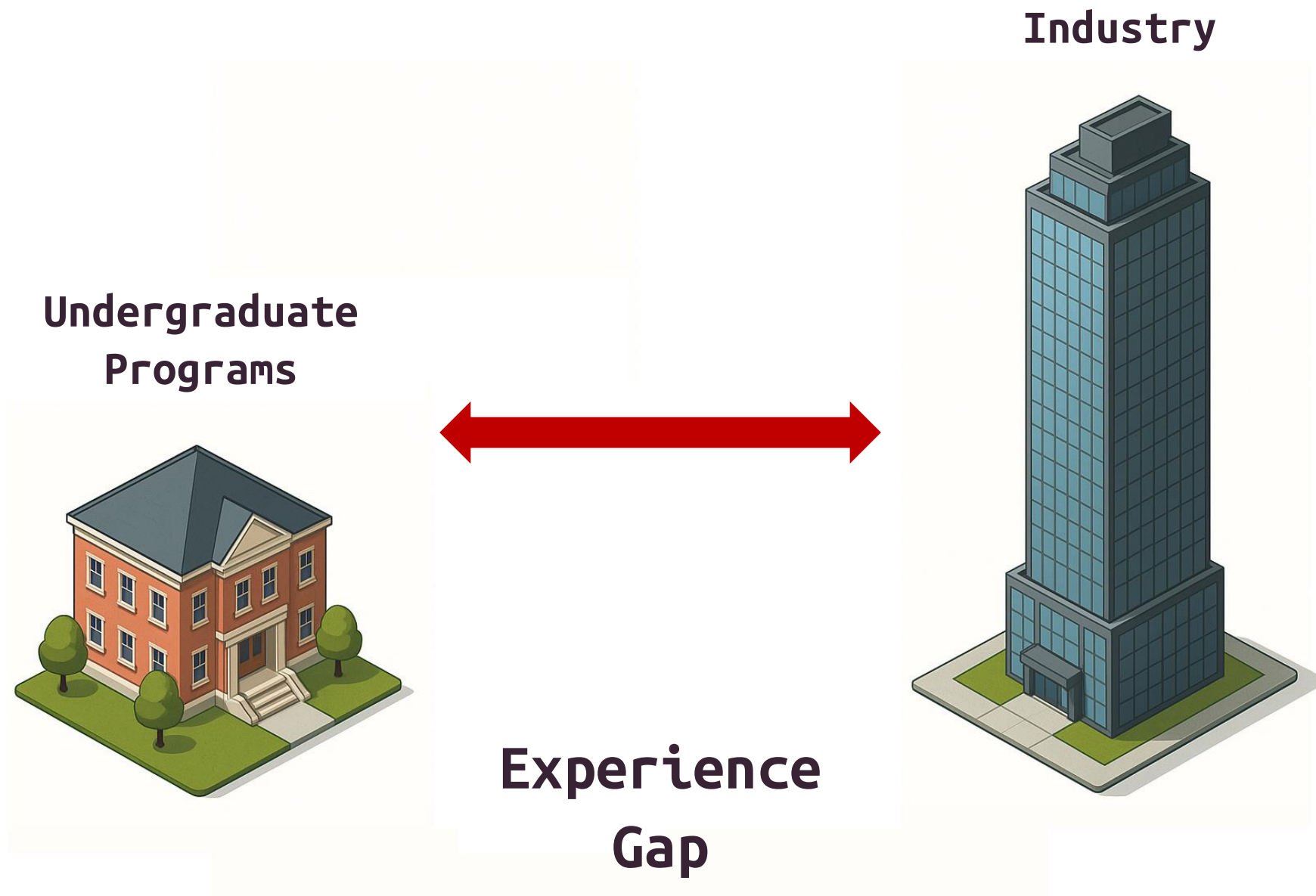
Natasha Singer. 2025. "Goodbye, \$165,000 Tech Jobs. Student Coders Seek Work at Chipotle." Technology. *The New York Times*, August 10. <https://www.nytimes.com/2025/08/10/technology/coding-ai-jobs-students.html>.

The paradox: new grads can't get jobs.

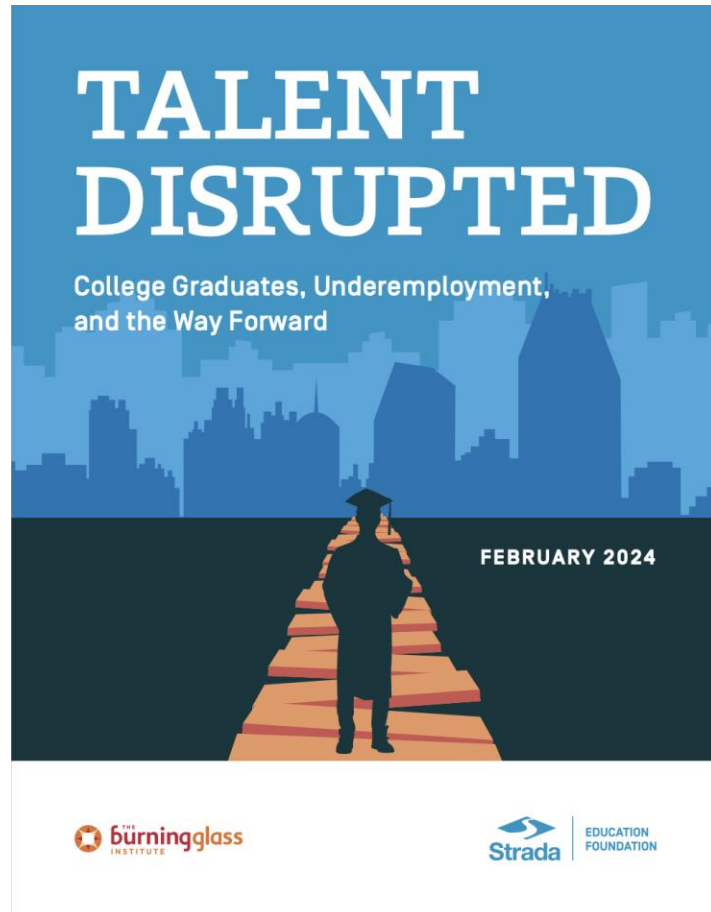


Big Tech Hiring by Years of Experience, Change Since 2019

Rya Jetha and Ezra Wallach. 2025. "Welcome to Silicon Valley's Entry-Level Job Recession." *The San Francisco Standard*, May 20.
<https://sfstandard.com/2025/05/20/silicon-valley-white-collar-recession-entry-level/>.



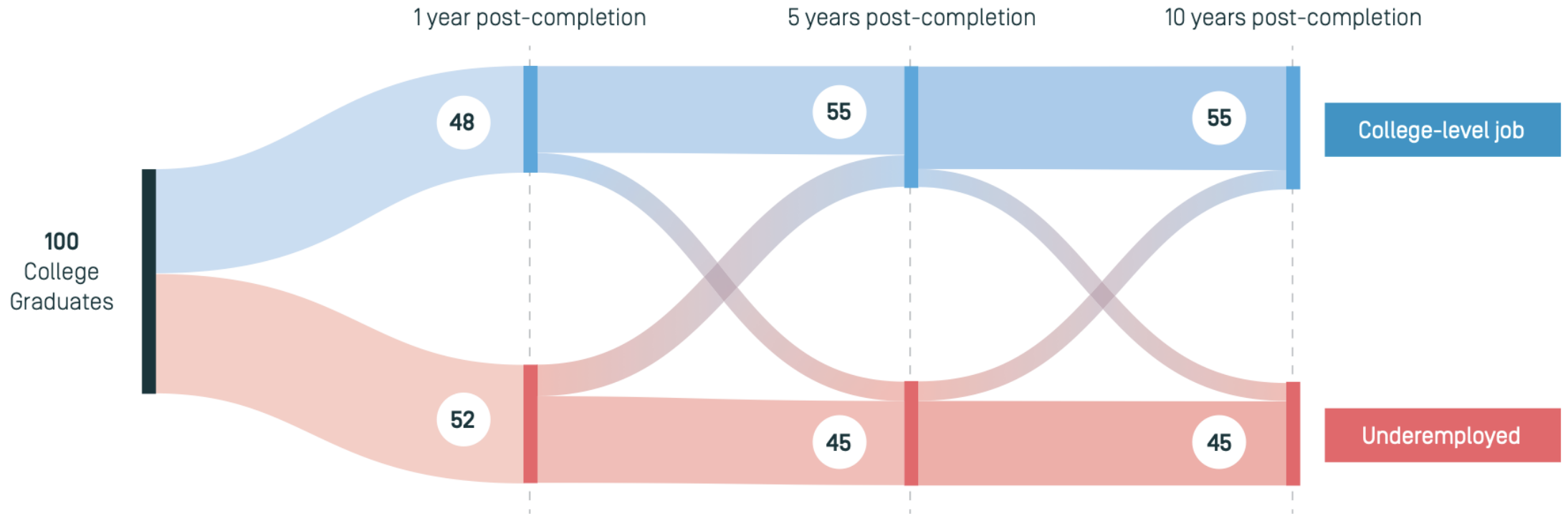
Underemployment carries a heavy financial cost.



- **New-grad, college-level job:**
earns 88% more than someone with no education beyond high school.
- **New-grad, underemployed:**
earns 25% more than someone with no education beyond high school.

“Talent Disrupted.” 2024. Burning Glass Institute and Strada Institute for the Future of Work. <https://www.strada.org/reports/talent-disrupted>.

Underemployment is sticky.



Source: Burning Glass Institute analysis of Lightcast Career Histories Database, 2022.
Calculated for workers with a terminal bachelor's degree.

≡ 🔍 BUSINESS The New York Times

An Engine of Upward Mobility Struggles to Capture Opportunities in Tech

Students at the City University of New York are increasingly graduating with degrees in technology. A new report details the obstacles they face in landing jobs.

Give this article ↗ 📌 💬 115



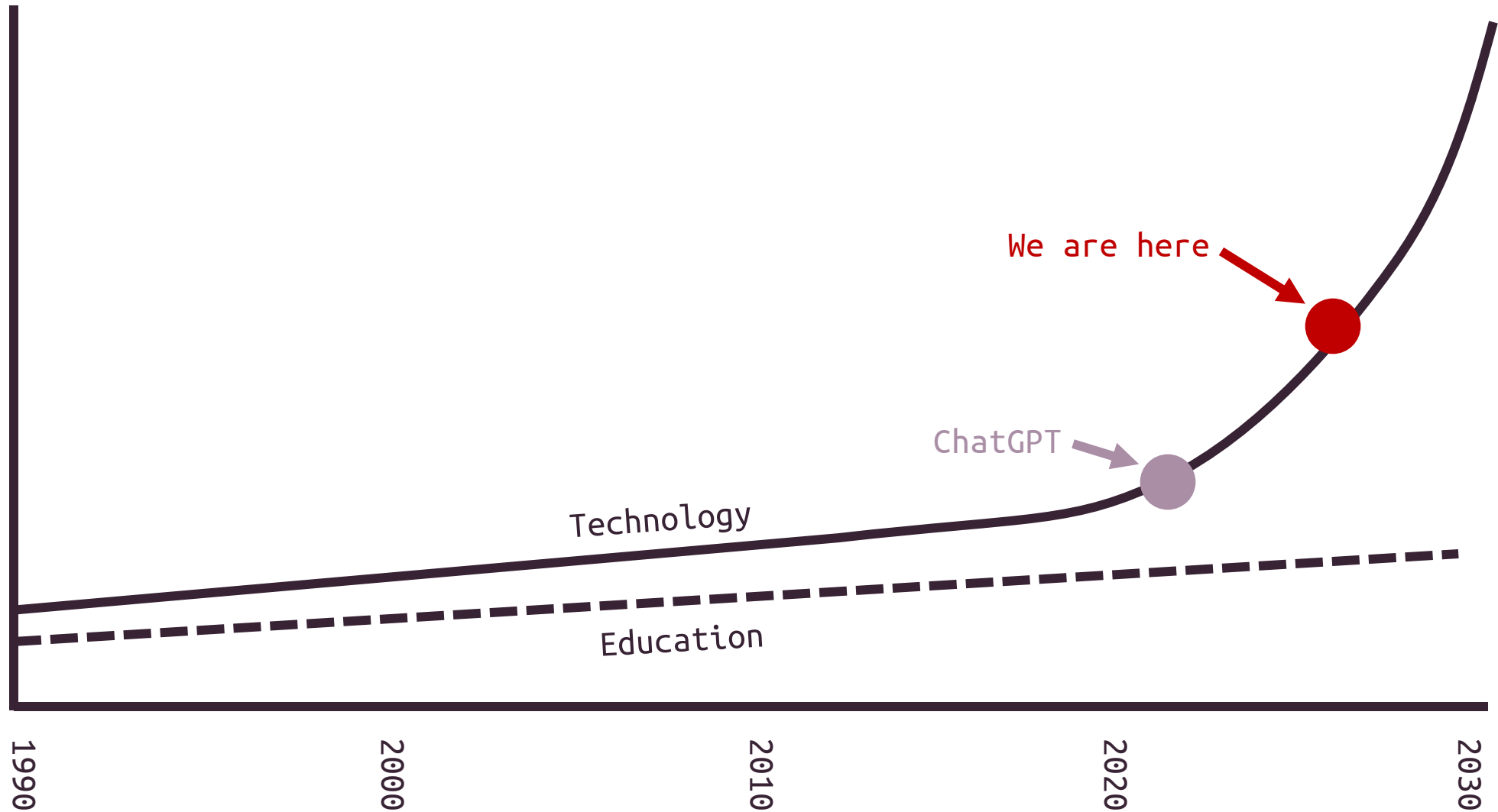
CUNY technology majors:

- 50% do not have a job in field one year after graduation
- Only 10% reported having an internship during college

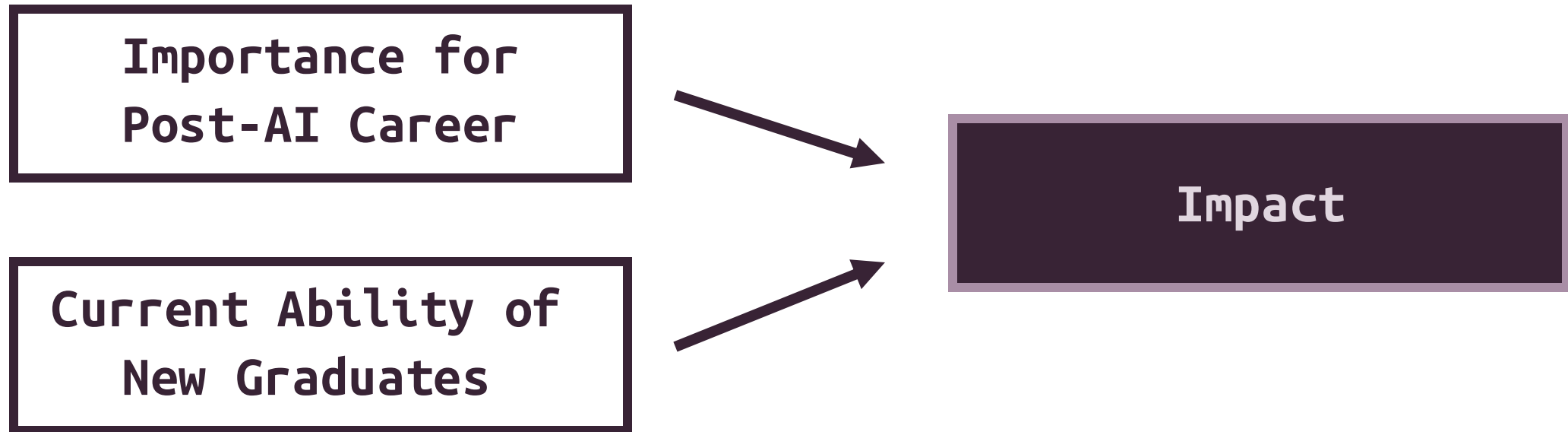
Lohr, Steve. 2022. "An Engine of Upward Mobility Struggles to Capture Opportunities in Tech." *The New York Times*, November 7, 2022, sec. Business.
<https://www.nytimes.com/2022/11/07/business/cuny-jobs-tech.html>.

What is the Experience Gap

Complexity is growing exponentially

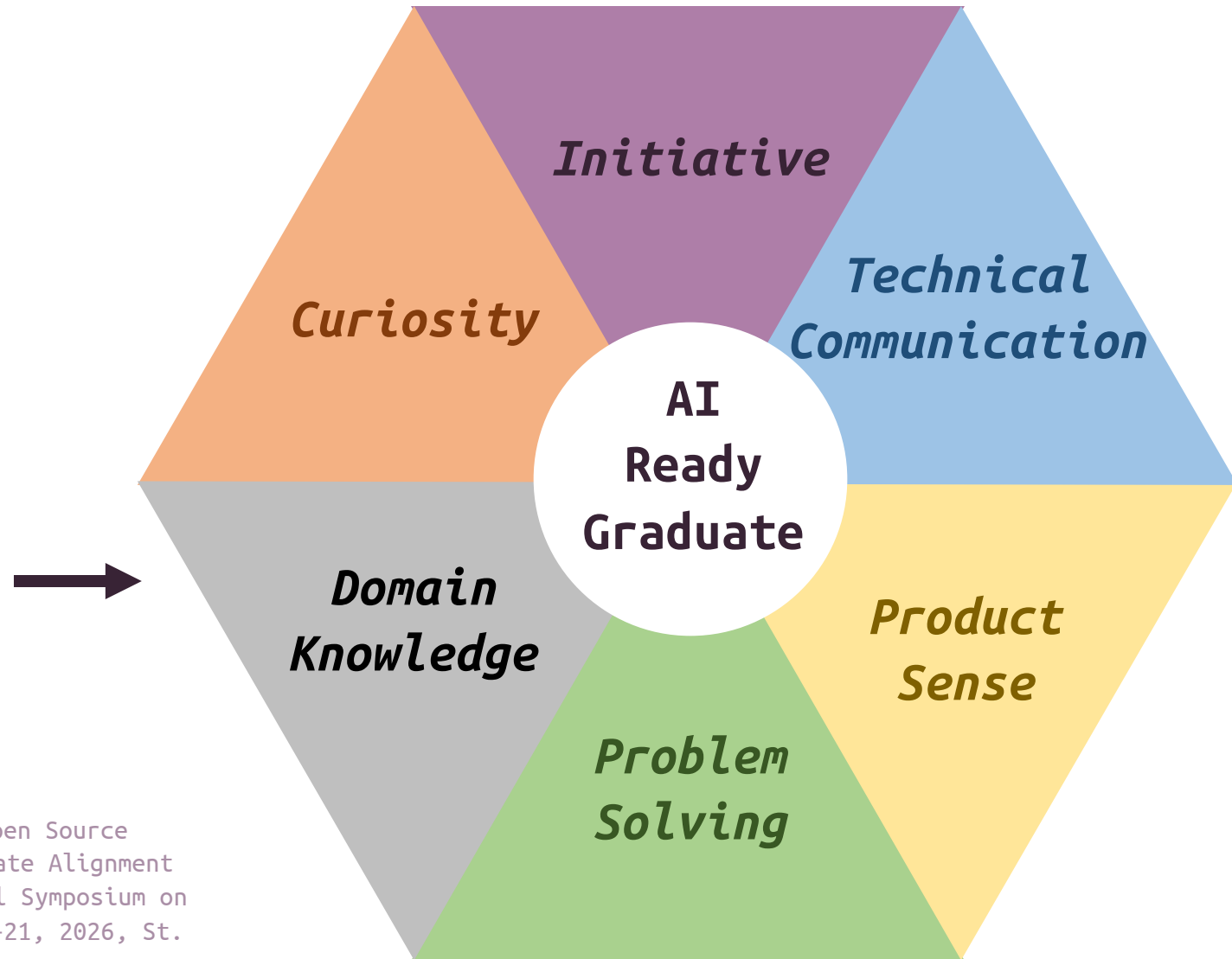
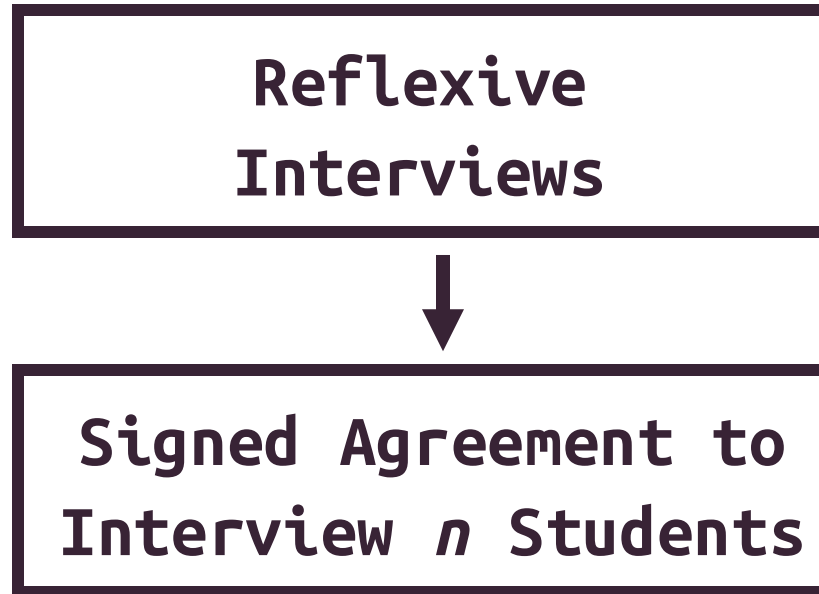


Polling of hiring managers



Menezes, Tyler. 2023. "What Skills Do CS Grads Need? Colleges And Employers Disagree." In *Proceedings of the 54th ACM Technical Symposium on Computer Science Education V. 2*, 1425. SIGCSE 2023. New York, NY, USA: Association for Computing Machinery.
<https://doi.org/10.1145/3545947.3576369>.

Hiring Manager Agreements



Utsab Saha, Jeffrey D'Andria, and Tyler Menezes. 2026. The Open Source Resume: How Open Source Contributions Help Students Demonstrate Alignment with Employer Needs. In Proceedings of the 57th ACM Technical Symposium on Computer Science Education V.1 (SIGCSE TS 2026), February 18-21, 2026, St. Louis, MO, USA. ACM, New York, NY, USA, 7 pages.
<https://doi.org/10.1145/3770762.3772529>

Internships help, but they're hard to get.

- <20% of rising sophomores, <50% of juniors/seniors [1,2]
- Why do so few students get internships? [3]
 - Primary caretaker for a family
 - Job they can't quit
 - Low self efficacy
 - Not preparing

[1] 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. ACM, Portland OR USA, 1103–1109. <https://doi.org/10.1145/3328778.3366844>

[2] Edwin Koc, Andrea Koncz, Kenneth Tsang, and Anna Longenberger. 2014. The Class of 2014 Student Survey Report. Technical Report. National Association of Colleges and Employers, Bethlehem, PA, USA. 12 pages. <https://www.nacweb.org/uploadedfiles/content/static-assets/downloads/executive-summary/2014-student-survey-executive-summary.pdf>

[3] Kapoor, Amanpreet, and Christina Gardner-McCune. 2020. “Barriers to Securing Industry Internships in Computing.” In *Proceedings of the Twenty-Second Australasian Computing Education Conference*, 142–51. Melbourne VIC Australia: ACM. <https://doi.org/10.1145/3373165.3373181>.

What skills are learned in internships to enable independence?

Menezes, Tyler, Alexander Parra, and Mingjie Jiang. 2022. “Open-Source Internships With Industry Mentors.” In *Proceedings of the 27th ACM Conference on on Innovation and Technology in Computer Science Education Vol. 1*, 365–71. ITiCSE '22. New York, NY, USA: Association for Computing Machinery. <https://doi.org/10.1145/3502718.3524763>.

1. "Expert" Fallacy

Many students don't know how to work independently.



I don't know what to do...

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

Asked today Viewed 3 times

Ask Question

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bare metal servers.

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bandwidth included.

Order today

IBM Cloud

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 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.defined;

  // 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.**

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JPMORGAN CHASE & CO.

Break out of the cycle.

**I don't know what to do..
but I can learn!**

2. Software Development Process

No one teaches you how to solve a totally new problem.

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

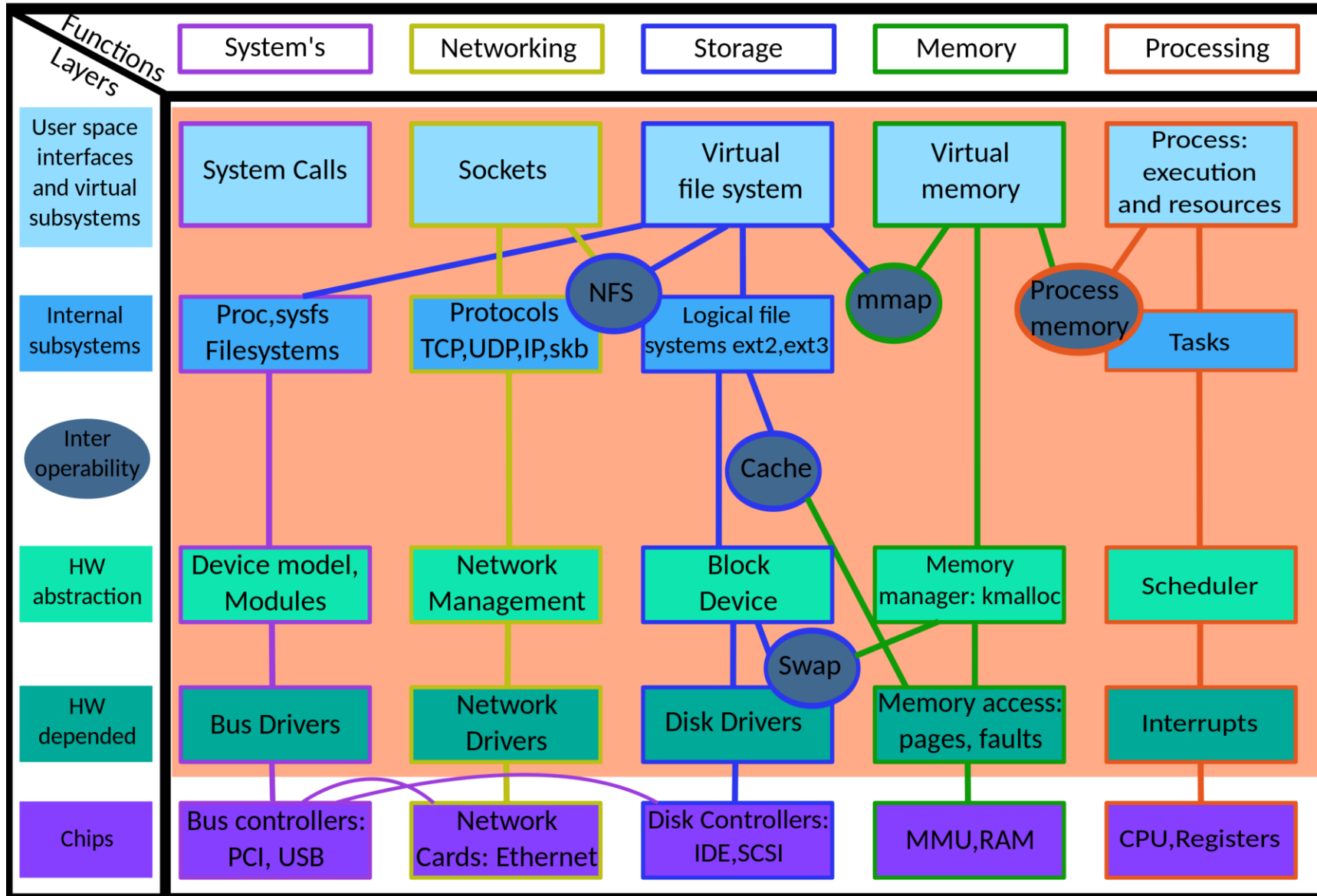
3. Navigating Real Codebases

Professionals have built decades of context.

Software Development Process

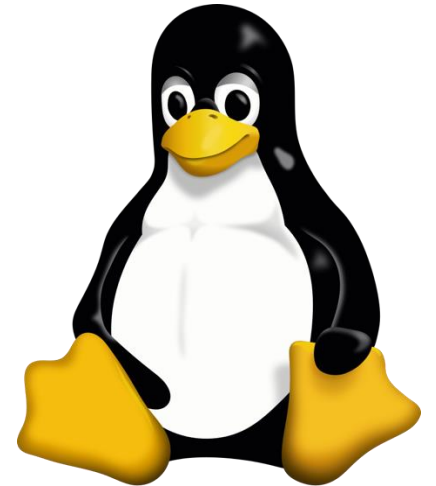
- *Identify and define the problem (debugging/etc)*
- Online/peer research to find existing solutions
- Experiment, learn by doing
- Evaluate proposed solutions
- Verify problem is solved
- Document solution

Simplified Linux kernel diagram in form of a matrix map



The Open Source Internship

First: what is open source?



Real Impact

p.c. Teemu Paananen

First: what is open source?



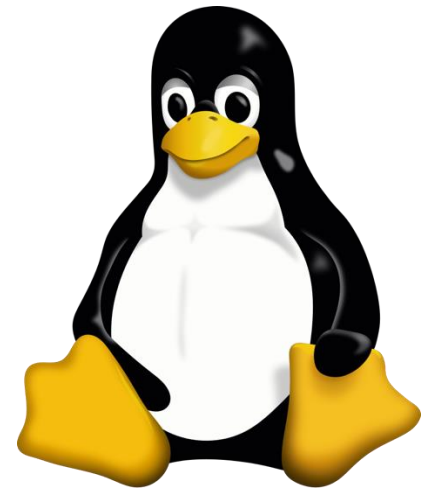
Powers 40% of the
world's websites



3 billion
active devices



Used by 70%
of web users



Powers 97% of
servers (among
many other things)

“Smallest” partner project has one user.



(But the one user is NASA, for their space hardware.)

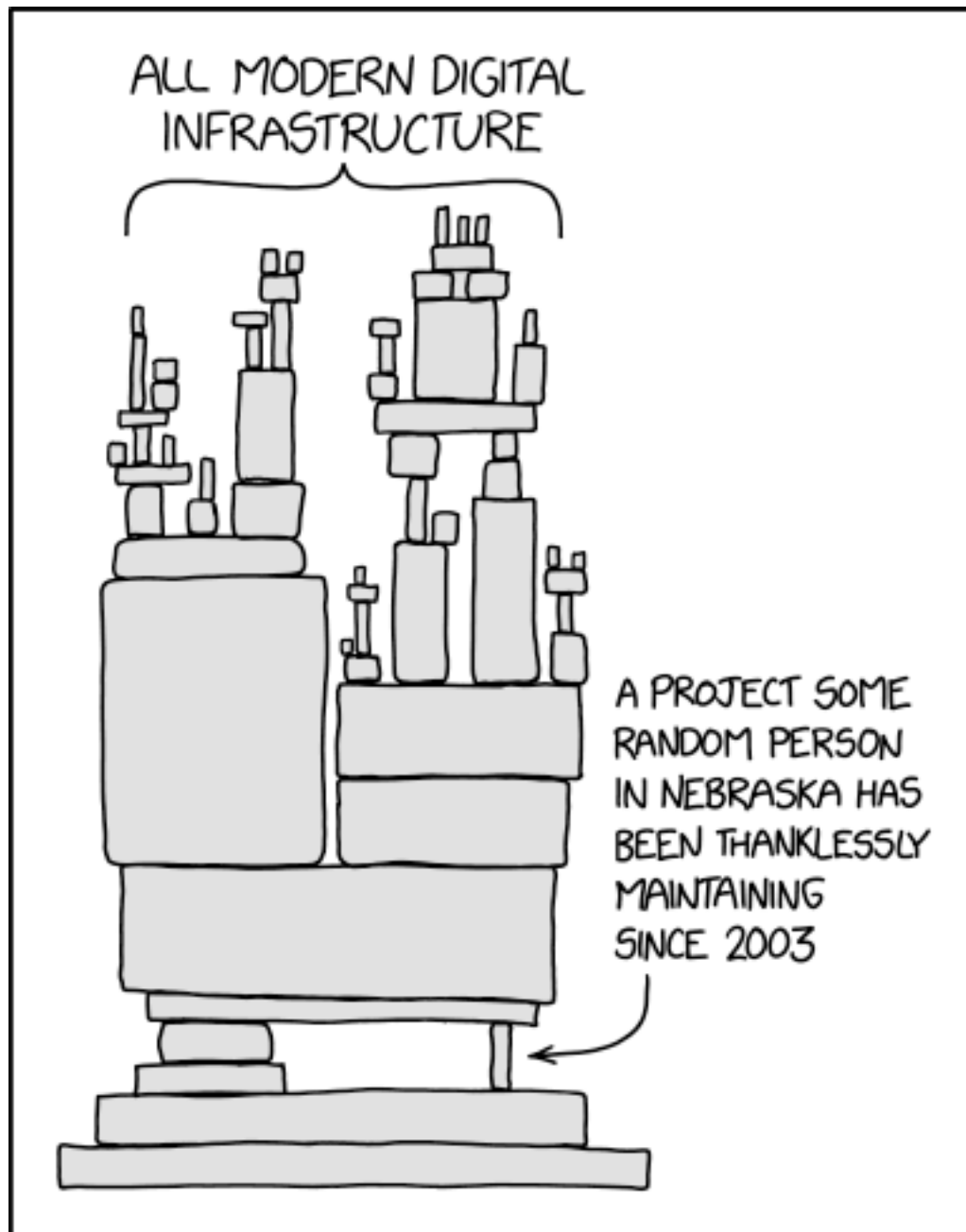
Good First Issue

Help Wanted

Projects are asking for help!

Up For Grabs

Simple Task



Randall Munroe. 2020. "Dependency." *Xkcd* (blog).
August 17, 2020. <https://xkcd.com/2347/>.

Students

- **Get:** Learning; Real Impact; Resume Entries

Maintainers

- **Get:** New, Creative, & Passionate Contributors

Contributors submit proposed changes as “Pull Requests”

The screenshot shows a GitHub Pull Request (PR) page for the repository 'tensorzero / tensorzero'. The PR title is 'Add support for replicated ClickHouse setups #2895'. It is an 'Open' PR by user 'virajmehta', who wants to merge 8 commits into the 'main' branch from the branch 'viraj/handle-replicated-clickhouse'. The PR has 0 conversations, 8 commits, 29 checks, and 24 files changed. The diff shows +1,022 lines and -142 lines. The PR is currently in progress, with at least 1 approving review required for merging. The PR description includes a list of changes and TODOs that block merging.

tensorzero / tensorzero

Q Type [f] to search

<> Code Issues 240 Pull requests 52 Discussions Actions Security Insights

Add support for replicated ClickHouse setups #2895

<> Code

Open virajmehta wants to merge 8 commits into main from viraj/handle-replicated-clickhouse

Conversation 0 Commits 8 Checks 29 Files changed 24 +1,022 -142

virajmehta commented 6 hours ago · edited

Member

This PR:

- adds a docker compose for replicated test setup for E2E tests `docker-compose.replicated.yml`.
- adds support throughout migration manager for replicated setups. This requires an `ON CLUSTER {cluster_name}` to be added to all create table and create function queries (not views). It also requires the table engine to be changed to be `Replicated{normal table name}({keeper_path}, {replica_name}, ... other args to table engine)`. I added helper functions for each of these but they still rely on string formatting by the query writer. I didn't want to add too many layers of abstraction in the migration writing but am open to suggestions on how to improve.
- Adds a test that only runs in a replicated setup that checks the other replica to see that the data lands.

Changes to gateway configuration:

- adds an environment variable `TENSORZERO_CLICKHOUSE_CLUSTER_NAME` that if set will get the gateway to use that cluster for replicated operations.

TODOs that block merging:

- add to CI. This should be easy but it is worth discussing when we need to run these tests (maybe just on merges?).
- add an equivalent argument to the python client in embedded gateway mode and maybe the OpenAI client hook?
- We should look closely at Migration 0020. It has an exchange table operation that I found concerning.

This PR closes #2228

Reviewers

- GabrielBianconi
- Aaron1011

At least 1 approving review is required to merge this pull request.

Still in progress? Learn about draft PRs

Assignees

No one assigned

Labels

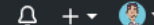
None yet

Projects

None yet

Milestone

No milestone

[Pull requests](#) [Issues](#) [Marketplace](#) [Explore](#)

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

[tjhorner](#) / [MakerbotWebUI](#) Archived

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[Code](#) [Issues](#) 8 [Pull requests](#) [Actions](#) [Projects](#) [Wiki](#) [Security](#) [Insights](#)

[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](#)

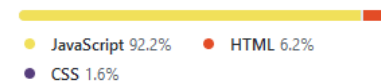
Releases

No releases published

Packages

No packages published

Languages



3 students



**1 OSS
issue**

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

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	Technology/Framework Onboarding (No Mentors)					
	Building & Finding “Starting Points”					
	Project Work					
	... (0-6 more weeks)					
	Finish “Pull Request” & Reflection					

No one knows the answer!

Industry mentor:

NOT a subject matter expert (SME)! Share advice on how they would approach problem solving.

TAs:

Ask leading questions and help students troubleshoot.

Project SME mentors:

Answer highly specific questions when all else fails.

Results

Knowing employer expectations motivates students!

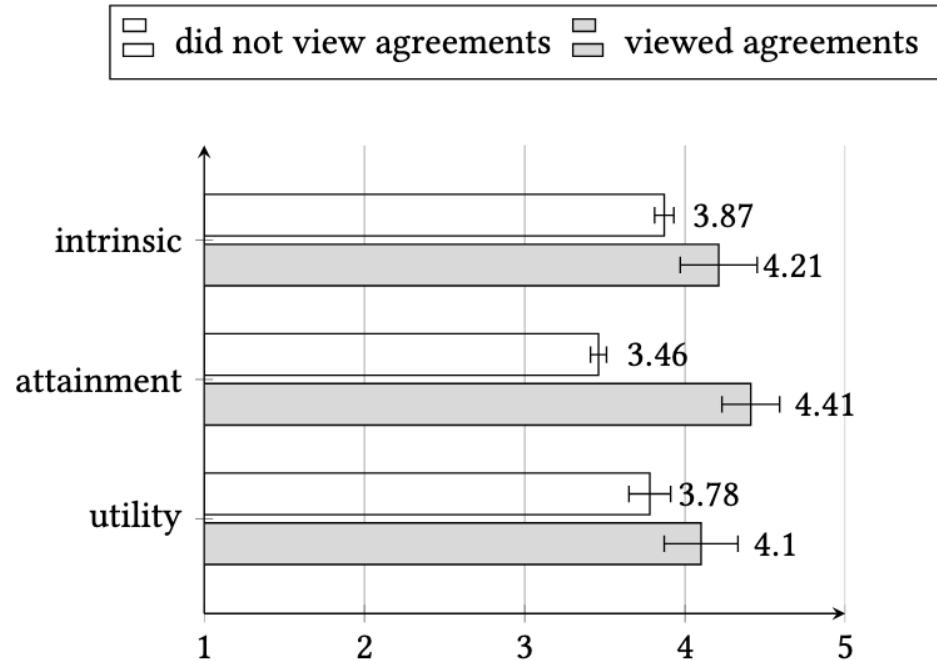


Figure 2: Comparison of motivational beliefs about value constructs by hiring manager agreement viewing status: higher indicates more motivated (99% C.I., $n = 650$)

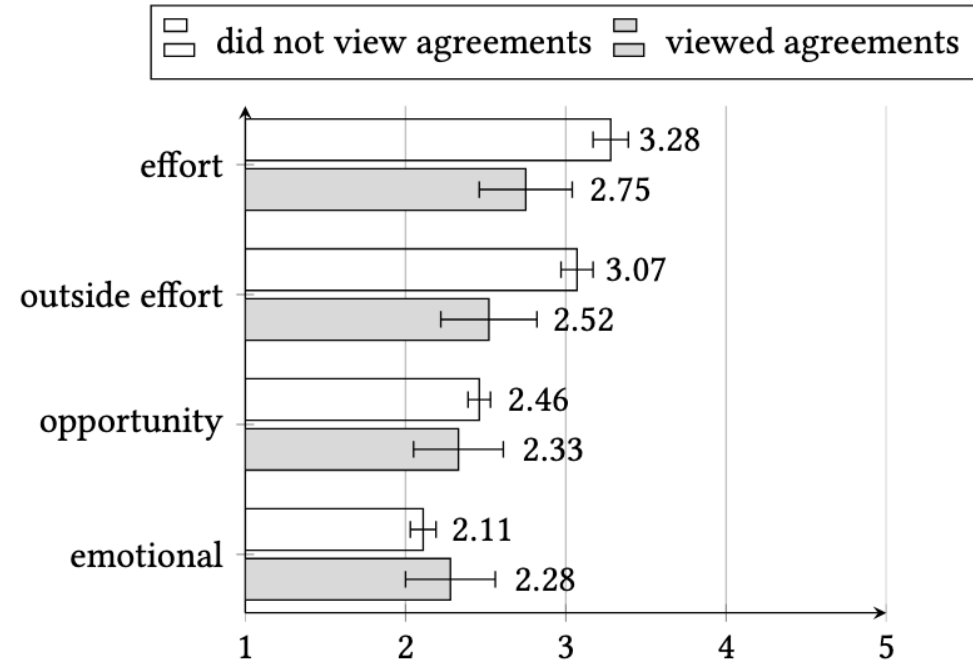


Figure 3: Comparison of motivational beliefs about cost constructs by hiring manager agreement viewing status: lower indicates more motivated (99% C.I., $n = 650$)

Employers excited to hire based on OSS!

Ideal Candidate for a SWE New Grad Role

This document outlines the key qualities that I, [REDACTED], value in an ideal candidate for a SWE New Grad Role. The document further outlines how these qualities can be measurably demonstrated in the context of a respected open source project (a medium/large project with an existing user base)

Quality	Metric (in the context of a respected open source project)
Problem-solving skills: Experience solving real-life engineering problems	- At least 10 issues solved. - There should be a sufficient variety of types of issues they tackle. The issues should touch on different parts of the technology stack or solve different kinds of problems. - At least one issue should be labeled as "medium" or "hard" level difficulty by the project maintainer
Initiative / enthusiasm	- Candidate is doing a <i>variety</i> of things within the project's ecosystem. In addition to contributing code, being active on the forums, answering questions posted by others, leaving comments/feedback on other people's pull requests, etc... - For example, 30 different comments on different parts of the project in a 3 month timespan
Experience with technologies that are relevant to Vishal's startup	Candidate contributes to a project that features one or more of the following: - Prompt engineering, integrations with a variety of LLM API's (as much AI background as possible) - Tools that SRE's might use: Data Dog, Grafana, Splunk, Prometheus - Other technologies: Jupyter notebooks (API's), Docker/Kubernetes, Node, Unix Shell

I would be happy to chat with any candidate that demonstrates the above qualities. If CTI sends me up to 3 such candidates (with verifiable proof of work), I can commit to talking to all of them. The end date for this agreement is [REDACTED].

I am of course under no obligation to hire any of these candidates, but I am willing to at least provide feedback to CTI on their hireability. This is not a legally binding agreement. Rather its primary purpose is to serve as a statement of intent.

[REDACTED]

 **Hiring Manager Agreement 001 Redacted**
001_Redacted.pdf

 **Hiring Manager Agreement 002 Redacted**
002_Redacted.pdf

 **Hiring Manager Agreement 003 Redacted**
003 Redacted.pdf

 **Hiring Manager Agreement 004 Redacted**
004_Redacted.pdf

 **Hiring Manager Agreement 005 Redacted**
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 **Hiring Manager Agreement 006 Redacted**
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 **Hiring Manager Agreement 007 Redacted**
007 Redacted.pdf

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011_Redacted.pdf

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 **Hiring Manager Agreement 019 Redacted**
019 Redacted.pdf

 **Hiring Manager Agreement 020 Redacted**
020_Redacted.pdf

Saha, Utsab, Jeffrey D’Andria, and Tyler Menezes. 2025. “Supplemental Files for ‘The Open Source Resume: How Open Source Contributions Help Students Demonstrate Alignment with Employer Needs.’” CodeDay Datasets, October 19.
<https://doi.org/10.69924/dkr1ysunc72wyzsdqtlrykdn>.

Students are excited to participate

- **General student contributions:**
 - 3,931 (mostly CTC) students became open source contributors
 - 1,557 open source contributions
 - 472,474 hours of career-connected learning
- **Mentorship Enhanced AI-focused program:**
 - 61 CTC students became open source contributors
 - 75 open source contributions
 - 7,930 hours of career connected learning
- **Industry engagement:**
 - 1,401 mentors / 20,198 hours of mentorship

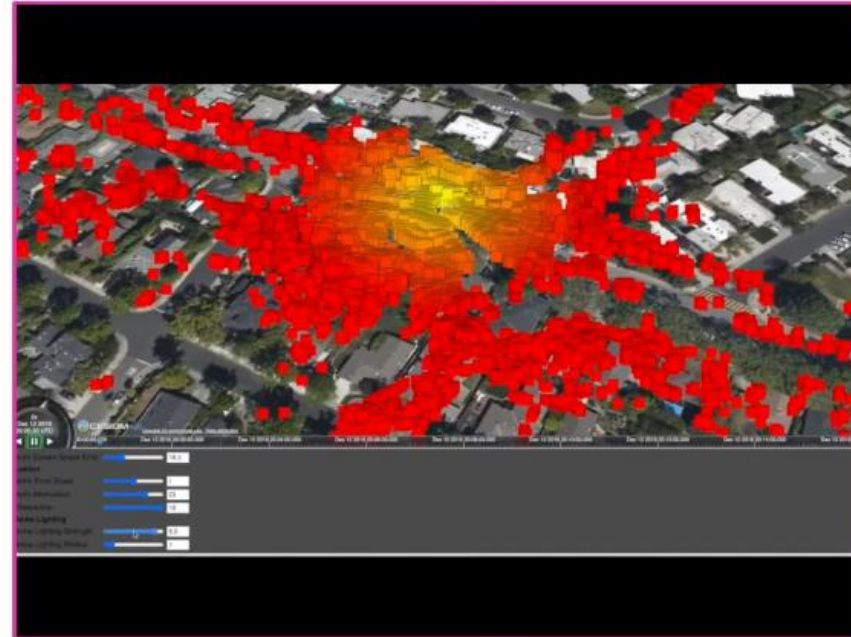
Visualizing Self-Driving Car Sensors

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



Example sandcastle:

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



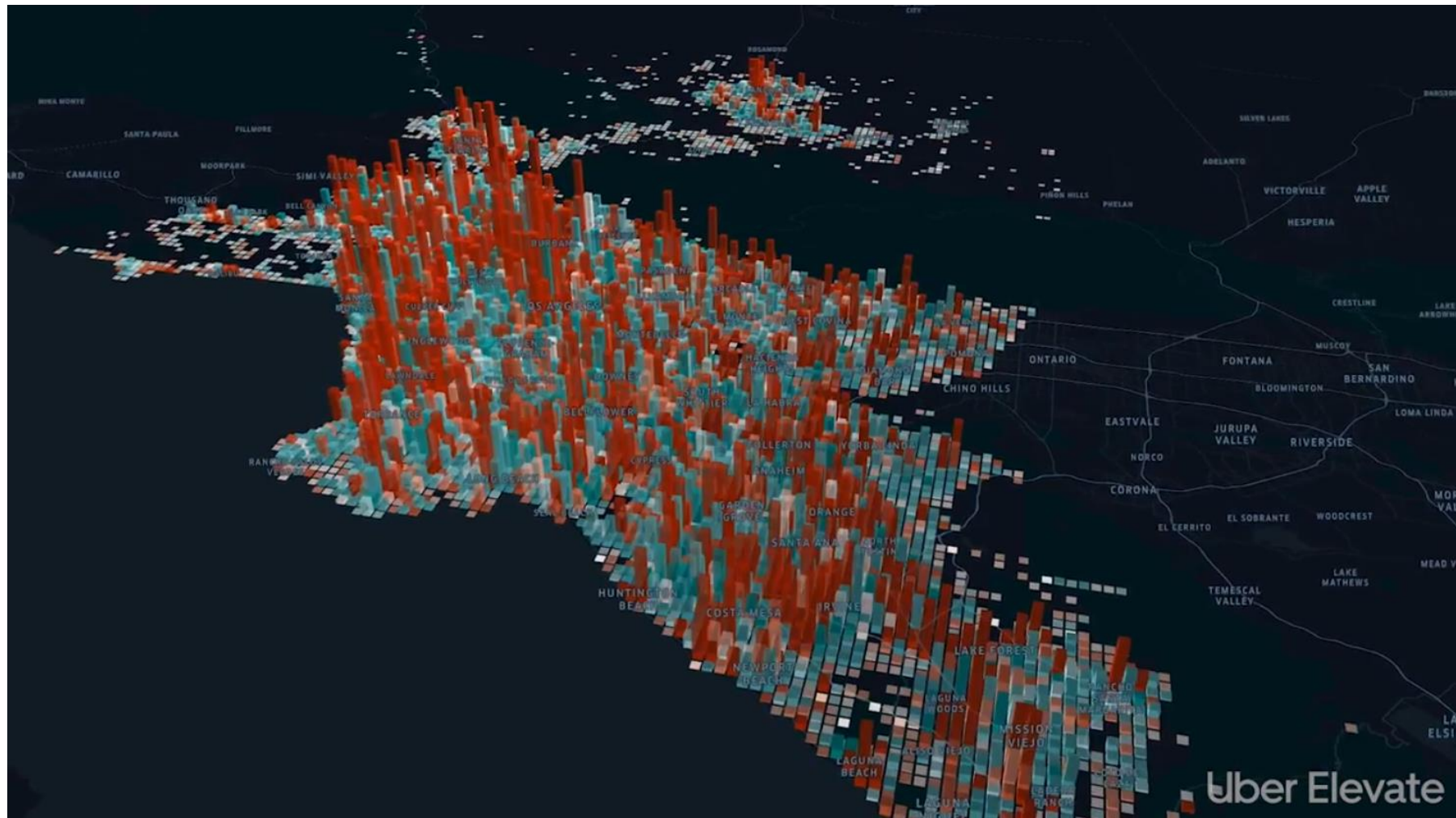
Goal: Visualize the point cloud data. Achieved by adding facets such as eye dome lighting to differentiate points and attenuation to change size.

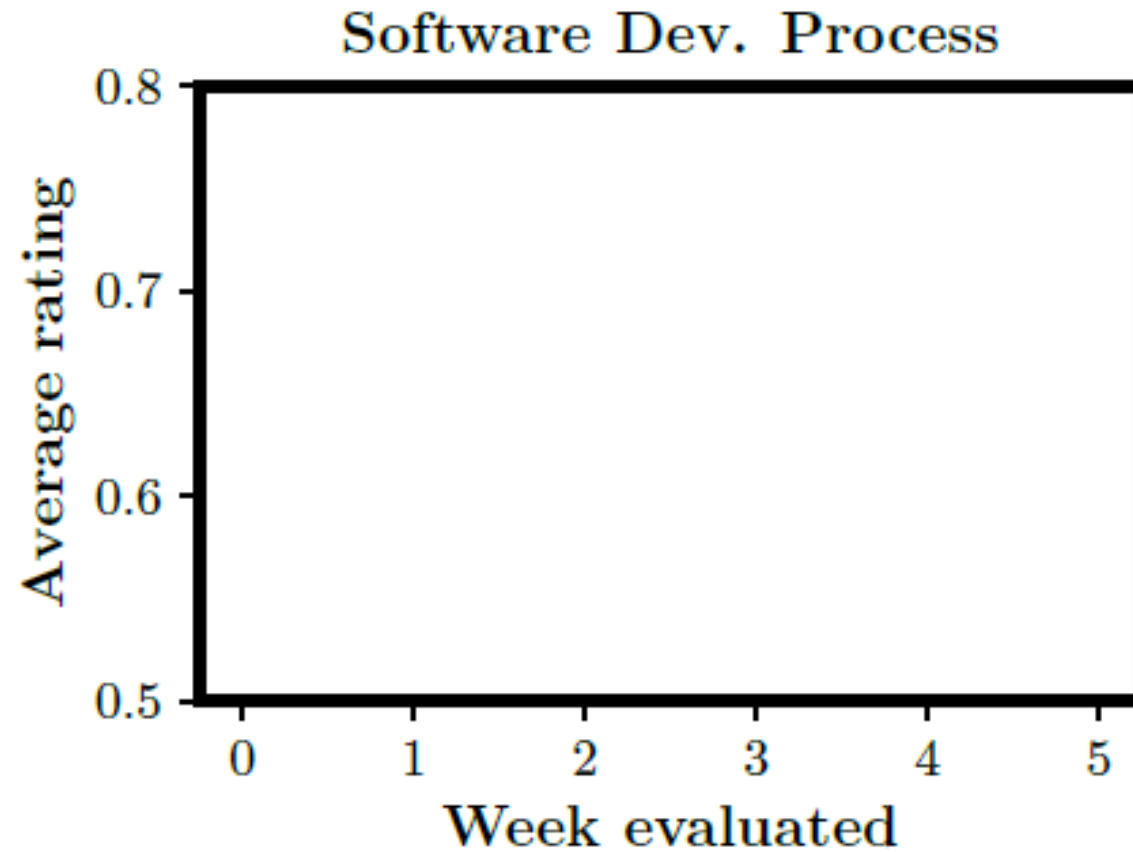
Improvements: Alterations in the toolbar only apply to the current frame. We would make any changes permanent in the future.

Point Cloud Shading

Exporting Movies from Hubble.gl

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

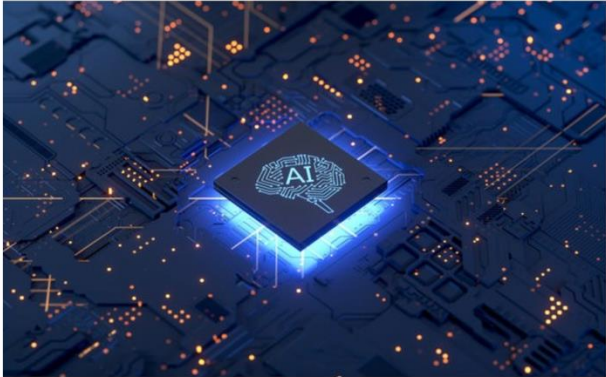




Menezes, Tyler, Alexander Parra, and Mingjie Jiang. 2022. "Open-Source Internships With Industry Mentors." In *Proceedings of the 27th ACM Conference on on Innovation and Technology in Computer Science Education Vol. 1*, 365–71. ITiCSE '22. New York, NY, USA: Association for Computing Machinery. <https://doi.org/10.1145/3502718.3524763>.



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My Summer Internship: Contributing To Microsoft's Semantic Kernel Project

**Alisha Maddy** 
Aspiring Software Engineer | MLH Fellow '23 and '24 | UC Santa Barbara CCS '19



August 14, 2023

This summer, I participated in an eight-week software engineering internship with CodeDay Labs in collaboration with CTI Accelerate. Through this opportunity I became a contributor to Microsoft's Semantic Kernel project, and learned a lot about large language models such as Chat-GPT. The program

Comments

 24 · 5 comments · 3 reposts

[Comment](#)[Share](#)



Most recent ▾

**James Ramos**  · 1st
Software Developer @ Strawbridge Studios

1y ...

Hey Alisha, I learned so much reading about the process you went through and the technicalities of your issue(s). Thanks for sharing the demo! Great writeup - I really felt like I went through the past few weeks with you!

[Like](#) ·  1 | [Reply](#) · 1 reply

**Alisha Maddy** ... **Author**
Aspiring Software Engineer | MLH F...

1y ...

Hi James, thank you for your feedback!

[Like](#) | [Reply](#)

**Alex Chao**  · 2nd
AI Research and Product | Ex-Uber ATG, ...

1y ...

Thank you so much for your contributions Alisha! Would certainly love to have you continuing to be a part of the Semantic Kernel community even after your internship!

[Like](#) ·  1 | [Reply](#) · 1 reply

Writing blog posts and talking with mentors from Mentors in Tech (MinT) helped students contextualize what they learned.

Utsab Saha, Ramiz Rahman, Lola Egherman, and Tyler Menezes. Writing Blog Posts Help Students Connect Experiential Learning to the Workplace. 2025.

How To Get Involved

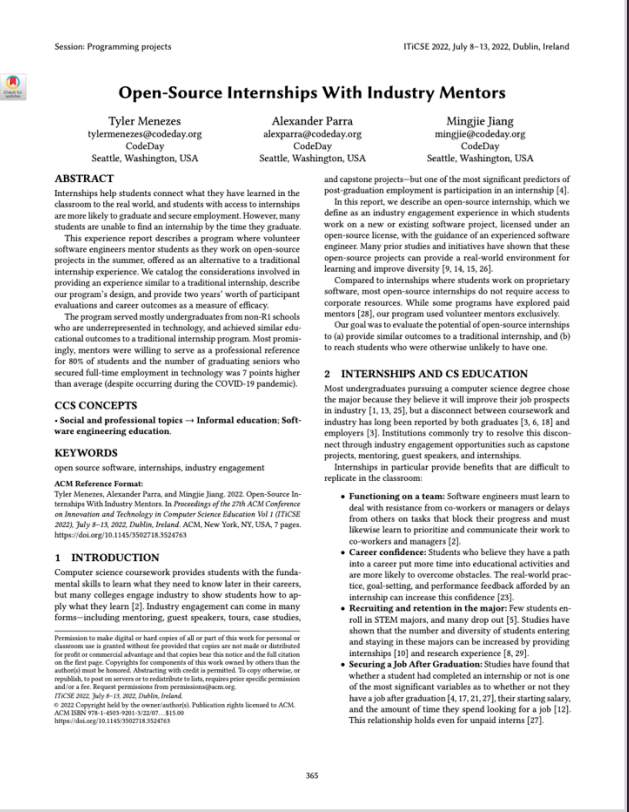
Join our community of practice!

A community supporting mentorship in open source. For educators, researchers, maintainers, program leaders, and more. Founded by CodeDay, UCSC OSP0, and NumFocus, w/ 50+ members!



Sign up for invites to
monthly calls:
email.flossmentoring.org

Collaborate on guides,
grants, and conferences:
discord.flossmentoring.org



Open-Source Internships With Industry Mentors

Menezes et al., ITiCSE 2022

Writing Blog Posts Help Students Connect Experiential Learning to the Workplace

Saha et al., Aiming for ITiCSE 2026

The Open Source Resume: How Open Source Contributions Help Students Demonstrate Alignment With Employer Needs

Saha et al., SIGCSE TS 2026 (Preprint on arXiv)

The Multifaceted Nature of Mentoring in OSS: Strategies, Qualities, and Ideal Outcomes

Feng et al., CHASE 2025

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

Hang et al., SIGCSE TS 2024



Tyler Menezes
tylermenezes@codeday.org
[linkedin.com/in/tylermenezes](https://www.linkedin.com/in/tylermenezes)

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