

COVER SHEET FOR PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION

PROGRAM ANNOUNCEMENT/SOLICITATION NO./ DUE DATE NSF 23-507 09/14/2023		☐ Special Exception to Deadline Date Policy		FOR NSF USE ONLY NSF PROPOSAL NUMBER 2347311	
FOR CONSIDERATION BY NSF ORGANIZATION UNIT(S) (Indicate the most specific unit known, i.e. program, division, etc.) ITE - ExLENT					
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NAME OF ORGANIZATION TO WHICH AWARD SHOULD BE MADE STUDENT RESEARCH & DEVELOPMENT			ADDRESS OF Awardee Organization, including 9 digit ZIP code 425 15TH AVE E SEATTLE, WA 98112-4504 US		
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IS Awardee Organization (Check All That Apply)		☐ SMALL BUSINESS ☐ FOR-PROFIT ORGANIZATION		☐ MINORITY BUSINESS ☐ WOMAN-OWNED BUSINESS	
					☐ IF THIS IS A PRELIMINARY PROPOSAL THEN CHECK HERE
TITLE OF PROPOSED PROJECT Enabling access for overlooked and underserved community college computer science students in artificial intelligence with micro internship and industry mentorship (CTCtoAI)					SHOW LETTER OF INTENT ID IF APPLICABLE
REQUESTED AMOUNT \$ 999,900	PROPOSED DURATION (1-60 MONTHS) 36 months	REQUESTED STARTING DATE 01/01/2024		SHOW RELATED PRELIMINARY PROPOSAL NO. IF APPLICABLE	
THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW					
☒ TYPE OF PROPOSAL Research ☒ COLLABORATIVE STATUS Collaborative from one organization ☐ BEGINNING INVESTIGATOR ☐ DISCLOSURE OF LOBBYING ACTIVITIES ☐ PROPRIETARY & PRIVILEGED INFORMATION ☐ HISTORIC PLACES ☐ LIVE VERTEBRATE ANIMALS IACUC App. Date _____ PHS Animal Welfare Assurance Number _____			☒ HUMAN SUBJECTS Human Subjects Assurance Number _____ Exemption Subsection _____ or IRB App. Date pending ☐ FUNDING OF INT'L BRANCH CAMPUS OF U.S. IHE ☐ FUNDING OF FOREIGN ORGANIZATION OR FOREIGN INDIVIDUAL ☐ INTERNATIONAL ACTIVITIES: COUNTRY/COUNTRIES INVOLVED _____ ☐ POTENTIAL LIFE SCIENCES DUAL USE RESEARCH OF CONCERN ☐ OFF-CAMPUS OR OFF-SITE RESEARCH		
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CERTIFICATION PAGE**Certification for Authorized Organizational Representative(or Equivalent)**

By electronically signing and submitting this proposal, the Authorized Organizational Representative(AOR) is:(1)certifying that statements made here in are true and complete to the best of the individual's knowledge; and(2)agreeing to accept the obligation to comply with NSF award terms and conditions if an award is made as a result of this proposal. Further, the proposer is hereby providing certifications regarding conflict of interest, flood hazard insurance, responsible and ethical conduct of research, organizational support,and safe and inclusive working environments for off-campus or off-site research, as set forth in the NSF Proposal & Award Policies & Procedures Guide(PAPPG).Willful provision of false information in this application and its supporting documents or in reports required under an ensuing award is a criminal offense(U.S.Code,Title 18,Section§1001).

Certification Regarding Conflict of Interest

The AOR is required to complete certifications stating that the organization has implemented and is enforcing a written policy on conflicts of interest (COI), consistent with the provisions of PAPPG Chapter IX.A; and that, to the best of the individual's knowledge, all financial disclosures required by the conflict of interest policy were made; and that conflicts of interest, if any, were, or prior to the organization's expenditure of any funds under the award, will be, satisfactorily managed, reduced or eliminated in accordance with the organization's conflict of interest policy. Conflicts that cannot be satisfactorily managed, reduced or eliminated and research that proceeds without the imposition of conditions or restrictions when a conflict of interest exists, must be disclosed to NSF via use of the Notifications and Requests module with Research.gov

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- (1) for NSF awards for the construction of a building or facility, regardless of the dollar amount of the award; and
- (2) for other NSF awards when more than \$25,000 has been budgeted in the proposal for repair, alteration or improvement (construction) of a building or facility.

Certification Regarding Responsible and Ethical Conduct of Research (RECR)

(This Certification applies to proposals submitted prior to July 31, 2023, and is not applicable to proposals for conferences, symposia, and workshops.)

By electronically signing the Certification Pages, the Authorized Organizational Representative is certifying that, in accordance with the NSF Proposal & Award Policies & Procedures Guide, Chapter IX.B., the institution has a plan in place to provide appropriate training and oversight in the responsible and ethical conduct of research to undergraduates, graduate students and postdoctoral researchers who will be supported by NSF to conduct research. The AOR shall require that the language of this certification be included in any award documents for all subawards at all tiers.

Certification Regarding Responsible and Ethical Conduct of Research (RECR)

(This Certification applies to proposals submitted on or after July 31, 2023, and is not applicable to proposals for conferences, symposia, and workshops.)

By electronically signing the Certification Pages, the Authorized Organizational Representative is certifying that, in accordance with the NSF Proposal & Award Policies and Procedures Guide, Chapter IX.B., the institution has a plan in place to provide appropriate training and oversight in the responsible and ethical conduct of research to undergraduate students, graduate students, postdoctoral researchers, faculty, and other senior personnel who will be supported by NSF to conduct research. As required by Section 7009 of the America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science (COMPETES) Act (42 USC 1862o–1), as amended, the training addresses mentor training and mentorship. The AOR shall require that the language of this certification be included in any award documents for all subawards at all tiers.

Certification Regarding Organizational Support

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) is certifying that there is organizational support for the proposal as required by Section 526 of the America COMPETES Reauthorization Act of 2010. This support extends to the portion of the proposal developed to satisfy the Broader Impacts Review Criterion as well as the Intellectual Merit Review Criterion, and any additional review criteria specified in the solicitation. Organizational support will be made available, as described in the proposal, in order to address the broader impacts and intellectual merit activities to be undertaken.

Certification Regarding Dual Use Research of Concern

By electronically signing the certification pages, the Authorized Organizational Representative is certifying that the organization will be or is in compliance with all aspects of the United States Government Policy for Institutional Oversight of Life Sciences Dual Use Research of Concern.

Certification Requirement Specified in the William M.(Mac)Thornberry National Defense Authorization Act for Fiscal Year 2021, Section 223(a)(1) (42 USC 6605(a)(1))

By electronically signing the Certification Pages, the Authorized Organizational Representative is certifying that each individual employed by the organization and identified on the proposal as senior personnel has been made aware of the certification requirements identified in the William M.(Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021, Section 223(a)(1) (42 USC 6605(a)(1)).

Certification Regarding Safe and Inclusive Working Environments for Off-Campus or Off-Site Research

(This certification applies only to proposals in which data/information/samples are being collected off-campus or off-site, such as fieldwork and research activities on vessels and aircraft.)

By electronically signing the Certification Pages, the Authorized Organizational Representative is certifying that, in accordance with the NSF Proposal & Award Policies and Procedures Guide, Chapter II.E.9, the organization has a plan in place **for this proposal** regarding safe and inclusive working environments.

AUTHORIZED ORGANIZATIONAL REPRESENTATIVE		SIGNATURE	DATE
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PROJECT SUMMARY

Overview

This **ExLENT Beginnings Track** proposal will create an experiential pathway for Computer Science (CS) students interested in the **emerging technology field of Artificial Intelligence and Machine Learning (AI/ML)** to work toward a career through micro-internships and structured mentoring. The program elements will ultimately help **150 diverse and under-represented students from Community and Technical Colleges (CTCs)** in 3 annual cohorts navigate and launch careers in AI/ML through:

1. **Engagement with AI/ML employers** to recruit mentors and align the program to workforce needs.
2. **Creation of AI/ML Open Source micro-internship.** Students will complete 1-2 “micro-internships” working on real-world contributions to open source AI software under the guidance of industry mentors.
3. **Structured AI/ML career mentorship.** Students will be matched with two industry mentors, meet virtually monthly with each, and submit structured reflections.
4. **Cohort activities.** Students will participate in training, attend monthly workshops, and be coached to apply to 3 job opportunities each month.

Intellectual Merit

Coursework enables students to learn the skills needed for a career, but industry engagement through internships has been shown to help students understand how to apply what they have learned, ultimately improving graduation and job placement rates. Internships are limited by industry engagement and most students never obtain one, especially the diverse, low-income students who attend CTCs. This proposal will provide CTC students with two one-month micro-internships working on open-source AI/ML software supervised by industry mentors. In addition to mentor engagement with projects, students also receive wrap-around career mentoring throughout the school year. Mentoring is common for new entrants to many fields, and studies have shown improvements to retention, academic success, and employment after graduation, but mentoring is still uncommon in emerging technology fields, and even more so for underserved CTC students. This proposal will contribute by implementing a fully-fledged program informed by this research.

Broader Impacts

Although most students pursue a degree to improve their job prospects, many graduates report feeling unprepared for a career, especially those in emerging tech fields. Likewise, AI/ML employers have reported that new graduates lack the skills to succeed. While internships and mentorship have been shown to close this gap, these programs are expensive to scale due to the large upfront commitments from both industry and colleges, so few students can access them. CTCs are especially disadvantaged due to limited industry relationships and under funding. This proposal provides 150 diverse students at CTCs with internships and wrap-around mentoring, and creates an AI/ML career pathway previously not available to CTC students. A sustainable, scalable program and published details for replication will provide these experiences to thousands of future CTC students in the long-term.

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*Proposers may select any numbering mechanism for the proposal. The entire proposal however, must be paginated. Complete both columns only if the proposal is numbered consecutively.

PROJECT OVERVIEW, RATIONALE AND IMPORTANCE

The “CTCtoAI” ExLENT **Beginnings Track** project from Student Research and Development (dba CodeDay) and Mentors in Tech (MinT) will build a diverse Artificial Intelligence and Machine Learning (AI/ML) workforce by providing 150 diverse students from Community and Technical Colleges (CTCs) with practical skills through micro-internships and mentoring, ensuring they are well-prepared for AI/ML careers. This initiative addresses the need for a more inclusive and skilled workforce in these rapidly evolving fields, enhancing our nation’s competitiveness and innovation in the emerging technology of AI/ML.

The proposed program will accept 3 annual cohorts of 50 students each (150 total) into a guided AI/ML pathway. Each cohort will complete 1-2 Open Source Micro-Internships, meet monthly with two assigned career mentors for 8 months, and participate in cohort workshops and meetings. Students will be paid a stipend of \$3,300 (approximately \$25 per hour for the total estimated time commitment of 130 hours). Alignment with the ExLENT program’s solicitation-specific criterion is detailed in “Experiential Learning Activities” and “Building an Inclusive and Diverse STEM Workforce”.

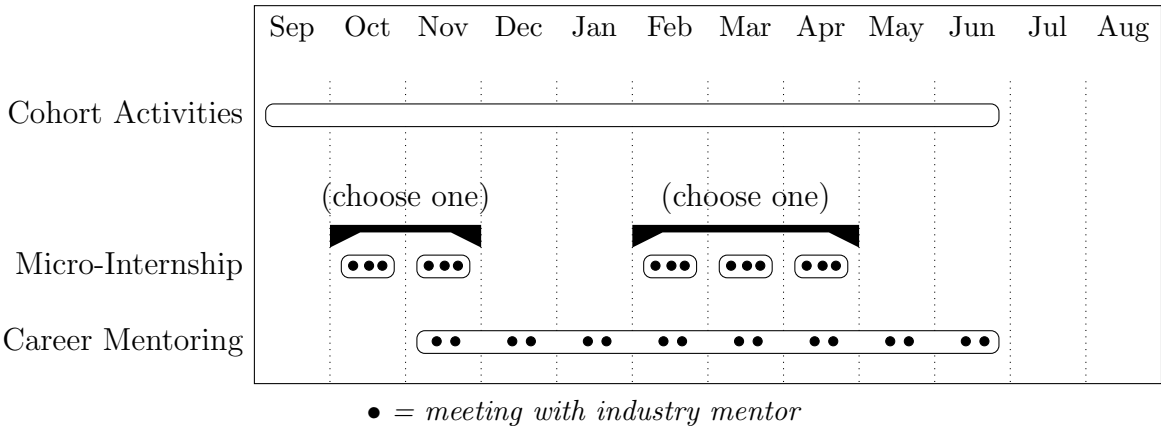


Figure 1: Calendar for each of the three yearly cohorts.

The objectives of this project are:

- Create an experiential learning opportunity in AI/ML using micro-internships.
- Instill a career-oriented outlook in students through cohort activities and a central focus on industry mentorship.
- Develop a talent pipeline in partnership with academia and industry which comprises coursework, experiential learning, mentorship, and career opportunities.
- Promote a diverse STEM workforce through programs tailored to the needs of the diverse and under-served students attending America’s CTCs.

Motivation

Artificial Intelligence and Machine Learning are rapidly evolving technologies that have already found broad applications in most industries. Developing a skilled workforce in these fields is crucial because they have the potential to address many of the most complex challenges our nation faces, from climate change to digital security. At the same time, many in academia and the industry have raised concerns about bias, as these technologies can inadvertently perpetuate or even exacerbate existing societal prejudices; to address this issue effectively, it is crucial to incorporate diverse voices and perspectives into this emerging technology.

Washington State is well-positioned to become a leader in the AI/ML sector, but the labor supply does not meet the demand. Washington State is home to companies like Microsoft and Amazon, some of the largest investors in AI/ML technologies, as well as leading research hubs and incubators like AI2. However, technology industry leaders report significant difficulty finding a local workforce to fill jobs in this emerging technology. [1]

CTCs have the highest percentage of students from diverse and underrepresented backgrounds: Black, Indigenous and People Of Color (BIPOC), women, low-income, and non-traditional (adults, veterans, working). [2,3] Unfortunately, these nontraditional students are the furthest from opportunities in AI/ML, and tech in general, [4,5] compared to their peers attending traditional 4-year college programs. [6] Most CTC students have no experience with the tech hiring process and have no preparation on how the technology sector does hiring — the unspoken rules, expectations, norms, and how to navigate the landscape successfully to land a high-paying job in emerging tech that enables their and their families' economic and social mobility.

Expected Outcomes

This project will combine experiential learning through micro-internships with virtual mentorship to build a diverse workforce in the emerging technology field of Artificial Intelligence (AI).

The project will deliver the following measurable outcomes over three years:

1. Recruit 150 students who do not have access to traditional internships, and/or connections to the emerging tech industry of AI.
2. Recruit and train industry mentors for micro-internships and career mentorship.
3. 90% of students complete 2 micro-internships (contributing to AI open source software).
4. 90% of students attend at least 12 one-on-one meetings with assigned industry mentors.
5. Establish a peer cohort among students.
6. Conduct a series of professional development workshops for cohorts.
7. Collaborate with CTC faculty to identify opportunities to award academic credit to students for experiential learning.

8. Identify and disseminate promising practices through conference presentations and publications.

Project Leadership Team

PI **Tyler Menezes** is the founder and Executive Director of CodeDay, a worldwide nonprofit which has been featured in NPR, TechCrunch, Geekwire, Readwrite, and Forbes Magazine. The program has served more than 60,000 students and launched more than 40,000 tech and tech-adjacent careers since its founding in 2009. Before CodeDay, Tyler was the founder and VP of Engineering of a Y Combinator and venture-backed startup, and previously worked in AI/ML at several companies. His work on CodeDay has led to his recognition on Forbes Magazine's "30 Under 30" and as Tech&Learning Magazine "Most Innovative in EdTech".

Co-PI **Kevin Wang** is a lifelong educator and engineer. He previously founded the Microsoft Philanthropies TEALS program that, over the past 12 years, has partnered with over 1,000 high schools across the country, a majority of which are low-income, to build and grow successful, sustainable, and diverse CS programs. TEALS taught over 100,000 high school students CS with thousands of industry volunteers investing millions of hours in the classroom. Kevin is able to bring his experience and best practices in building TEALS and working with an incredibly diverse set of schools and students as well as working with a multitude of industry partners and mentors into the MinT program. His work on TEALS has been featured in The New York Times, CNN, USA Today, Geekwire, Harvard Graduate School of Education Magazine, Univision, and was the subject of a Yale School of Management case study.

Information about the project's independent evaluator can be found under "Evaluation".

EXPERIENTIAL LEARNING ACTIVITIES

This project will address the the needs of community college students and the AI workforce through open source micro-internships as experiential learning.

Internships are one of the most important forms of experiential learning students can undertake. They help students learn to deal with resistance and teammates, do research, manage their time, make sound decisions, and gain confidence in their abilities. [7] From the point of view of a student, internships make the biggest impact on how likely they are to be hired, [8–12] as well as being a deciding factor when competing for others for a job. [13] From the point of view of employers, internships help students understand how to apply what they have learned. [7]

Addressing Time, Skill, and Knowledge Barriers with Micro-Internships

CTC students face several practical barriers to participating in traditional internships:

1. Many CTC students may not have completed enough coursework to meaningfully participate in a traditional internship.

2. Many CTC students are unable to commit the time necessary to participate in an internship. 34% of 4-year university students cited time conflicts with higher life priorities as the reason for not securing an internship in a 2020 study. [14] This number is likely even higher for CTC students, who are more likely to have caregiving responsibilities for family members and rely on a job for year-round financial support. [2, 3]

To address these barriers, this project will use micro-internships. These are internships with a shorter timeframe (under 40 hours of work) and a simplified task. [15] Like traditional internships, micro-internships are a form of work-based, experiential learning where students perform relevant and meaningful tasks under the guidance of a mentor, with a focus on training and feedback. [16] CodeDay will create these micro-internships working on open source AI projects under the guidance of AI industry mentors.

Students who participate in micro-internships receive many of the same benefits as traditional internships: more knowledge and experience, improved confidence to pursue a degree, and an increased enjoyment of their degree. [17] Companies have also become interested in micro-internships as a way to build skills, get early access to talent, and support diversity and inclusion. [18]

Developing the Knowledge, Skills, and Proficiency in AI Through Micro-Internships

In a paper accepted for publication at IEEE Frontiers in Education in October 2023, CodeDay partnered with California State University, Monterey Bay to offer micro-internships for 175 students attending CTCs and state colleges, and found that the format proposed for this project can be successful for general Computer Science students. [19] In that group, 90% of students completed a micro-internship by successfully contributing to an open-source project. The proposed project will adapt this successful model for the emerging technology of AI, and offer it exclusively to CTC students.

Can an early-stage micro-internship meaningfully build knowledge and skills that CTC students need for an AI career? When considering recent computer science graduates, employers report that they are unconcerned with the level of specific technical knowledge of today's graduates but find that graduates are lacking in the ability to work independently without step-by-step direction (the "core software engineering process") and soft skills. [17] Micro-internships help students start to build these skills. A majority of students who completed micro-internships as part of the aforementioned study continued to make contributions to open source software, where they likely gained additional skills. Overall, students were nearly twice as likely to get a traditional internship or job as compared to their peers. This responds to the ExLENT program's criterion that the project must develop the interests, motivations, skills, knowledge, and/or proficiencies of workers in emerging technology.

Micro-Internship Format

In order to participate in micro-internships, students will need to meet baseline knowledge requirements by taking classes in their school: a demonstrated knowledge of functions, classes, and variables, and the ability to design and run a CS101-level application; the ability to read

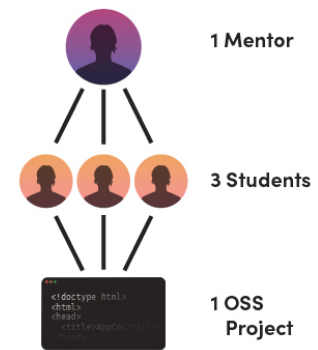
and understand code written by others; at least some experience doing independent research to solve a problem; and basic knowledge of collaboration tools such as Git.

Each student will participate in at least one, and up to two micro-internships in each cohort. Two opportunities will be available in the fall, and an additional three opportunities will be available in the winter/spring. (See Figure 1.) Most students who register to participate in this project are expected to be eligible by the November deadline for session 2. All additional prerequisites will be provided during the onboarding week.

Mentor/Project Recruiting and Matchmaking

Mentors with experience in AI will be recruited from the employer constituents of project collaborator WTIA (see “Partnerships”), from advertising on LinkedIn, and through CodeDay and MinT’s existing pool of mentors (see “Facilities, Equipment, and Other Resources”).

During the micro-internship, students will make contributions to an assigned task in an AI-focused open source project. Open source projects are collaborative initiatives in which an application’s source code is made freely available online, and maintainers invite contributions from a global community of volunteers. CodeDay has already built partnerships with many AI open source projects for its summer internship program [20] and will select student tasks from the pool collected for that purpose. (See “Facilities, Equipment, and Other Resources”.) Students will be grouped into teams of 2-3 students + 1 mentor based on availability, and projects will be assigned at random.



Tasks selected for the micro-internship, while a meaningful first introduction to contributing to an AI project, are expected to be very simple. An experienced developer could solve each selected task in under one hour.

Mentors are not expected to have any experience with the project they are assigned. An important feature of the micro-internship design is for mentors to act as a near-peer with regard to the selected issue and to model learning behavior, rather than acting like an instructor who knows the answers.

Onboarding

The first week of each micro-internship will prepare students to work on their project. Students will complete educational modules to learn about contributing to open-source software, and then begin preparing for their first mentor meeting. This content has already been created (see “Facilities, Equipment, and Other Resources”). However, a module to better prepare students for AI projects is anticipated in response to student feedback:

1. *Introduction to Open Source:* Describe what it means for something to be open source and how it’s used to collaborate on software; use Git to commit and push code changes; open a Pull Request.

2. *Introduction to AI/ML*: [Module will be created in this project, but is expected to result in: explain how and why data is split into training and test data; describe the basic ideas behind machine learning without requiring math; define common terms used in AI/ML codebases.]
3. *Software Engineering Process*: Read an unfamiliar line of code and create a written brainstorm of what it may do; read an unfamiliar class or file and brainstorm the purpose of the class; create a codebase diagram tracing which files may be related to an assigned task; identify potential “starting points” in a codebase for an issue.
4. *Collaboration*: Identify the difference between building in development and installing a project; conduct a pair programming meeting.

After completing education modules, students will fill out a template to learn about their project and prepare for their mentor meeting. In the first mentor meeting, the mentor will review the students’ answers:

- Explain what the project does in your own words.
- Explain what the issue you’ve been assigned is asking you to do in your own words.
- Identify two ways to get support from the maintainers or the community.
- Identify three written documentation sources or support resources provided by the project which may be helpful in your issue.
- Identify two frameworks that seem important for the project.
- Identify three potential “starting points” for your work on the issue.
- List at least one specific question you have for your mentor.

Project Work

In weeks 2-4, student teams will collaborate using synchronous calls, synchronous in-person meetings, asynchronous chat programs, issue tracking software, and online code reviews. Each team’s assigned mentor will meet with the team virtually in one 90-minute meeting each week. The agenda for the first meeting will be driven by the student agendas submitted in “Mentor Meeting Preparation” on the LMS, while the following two meetings will be driven directly by student questions. Students can book time with CodeDay’s TAs, a team of more advanced students who are available to provide assistance with identifying and debugging code (see “Facilities, Equipment, and Other Resources”).

Students will provide twice-weekly updates, and mentors will provide feedback each week and at the end of the program. (See “Evaluation”.)

Project Reflection

Students will complete a project reflection in the form of a blog post and/or a 10 minute technical talk video, which can be shared with potential employers. The reflection will include

a background of the project and the assigned issue, high-level overview of the relevant parts of the codebase, description of the changes the student made, and lessons learned.

PARTNERSHIPS

Partner	Advisory	CTCs (Students)	Industry (Mentors)	Dissemination
CCSF/UCSF BIL	•			
AppConnect NW	•	•		
SBCTC	•	•		•
WTIA	•		•	
WTB				•
CCBA				•

Figure 2: Overview of CTCtoAI partnerships

Partnership Vision and Goals

A Washington State-wide collaboration between CTCs, the AI industry, and workforce development representatives will work together to provide students with accessible experiential learning opportunities and career mentorship which are tied cohesively to college curriculum and workforce needs. Dissemination partners, communities of practice, and collaborations with other NSF-funded projects will help ensure that the work is grounded in best practices and that results are shared broadly to make a larger impact.

The partners share a vision for an end-to-end pathway that takes students from school, to experiential learning, to mentorship, to the AI/ML workforce.

Partner Roles, Responsibilities, and Benefits

City College of San Francisco (CCSF) & University of California, San Francisco (UCSF), Building Inclusive Labs (BIL) Collaborative Project (DUE#2055735/2055309)

Building Inclusive Labs (BIL) is a collaborative initiative between a community college biotechnology program (CCSF) and a top-tier research university and technician employer (UCSF) whose goal is to build more inclusive workplace environments for community college students pursuing biotechnology careers. **Responsibilities:** The BIL project has committed to: providing their Workplace Navigation Training to students participating in CTCtoAI; providing their Mentor-Manager Training to industry mentors; and serving in an advisory role by fostering an experiential learning community of practice. **Benefits to Partner:**

BIL is partnering with the CTCtoAI project as a way to disseminate their learnings and collaborate to expand their learnings in biotech into the new field of AI.

AppConnect NW (DUE#1700629)

AppConnect NW is a consortium of nine Community and Technical Colleges in Washington State, created to bridge the gap between community colleges and the technology industry. **Responsibilities:** AppConnect NW will connect the project with educators and students at its member CTCs. The organization will also serve as the day-to-day implementation collaborator. AppConnect NW Faculty Associate Kendrick Hang is an unfunded collaborator for this project. **Benefits to Partner:** AppConnect NW is partnering with CTCtoAI because of the direct benefit to their students. AppConnect NW's constituent CTCs have difficulty finding experiential learning activities such as internships for their students.

Washington State Board for Community & Technical Colleges (SBCTC)

SBCTC is the Washington State board that advocates, coordinates, and directs Washington State's system of 34 public community and technical colleges. **Responsibilities:** SBCTC will connect the project with educators and students at its member CTCs; coordinate efforts between the project and the Equity in CS workgroup; and foster a STEM community of practice for CS instructors. **Benefits to Partner:** This project will help SBCTC in its goals of helping existing CTC students gain employment in CS and emerging technologies, and enabling more CTCs across the state to start successful CS degrees.

Washington Technology Industry Association (WTIA)

WTIA is a consortium serving more than 1,000 employers in Washington State that rely heavily on a Computer Science and Information Technology workforce. **Responsibilities:** WTIA and its constituent companies will provide advice on the design and implementation of the program in order to align the experiential learning component with industry needs and to align the career mentoring component with industry hiring practices. Additionally, WTIA will assist in recruiting mentors for the program. **Benefits to Partner:** WTIA is motivated to work with CTCtoAI because its constituent companies have expressed a need for a workforce trained in AI/ML in order to remain competitive.

Washington State Workforce Training and Education Coordinating Board (WTB)

The WTB is a state agency based on a partnership of business, labor, and government dedicated to helping Washington residents succeed in family-wage jobs while meeting employer needs for skilled workers. **Responsibilities:** WTB will disseminate resources and reports to other emerging technology sectors and broader audiences (such as rural areas, tribal colleges, and formerly incarcerated individuals) within Washington State. **Benefits to Partner:** The project will help WTB accomplish its goals to help employers build their workforce and to help Washington State workers become more competitive candidates for high-paying jobs and drive an inclusive economic recovery.

Community College Baccalaureate Association (CCBA)

CCBA is a national organization that hosts conferences, conducts research, and provides support and resources to community colleges that build and sustain career-focused baccalaureate degrees. **Responsibilities:** CCBA will provide a venue for the PIs to disseminate the results from the initiative each year at their annual conference. **Benefits to Partner:** CCBA aims to get more CTCs to start successful career-connected CS degrees, including in emerging technologies, and this project will provide valuable resources that CTCs nationwide can implement.

Communication Plan

Planning and Advisory Meetings: AppConnect NW, as the primary implementation collaborator for this project, will meet bi-weekly with the PIs in order to coordinate logistics, troubleshoot individual student issues, and provide advice and feedback. Advisory meetings with BIL, SBCTC, and WTIA in order to share best practices, and align with workforce and CTC needs, will be conducted both ad-hoc and quarterly. The project will report back to all partners on results in the summer.

Student Recruitment from CTCs: CTCtoAI will work with CTCs in the fall to recruit students for the program. Recruitment of 50 students annually is not expected to be a concern: student interest in such a program from AppConnect NW schools alone already exceeds the number of spots this project will make available.

Mentor Recruitment from Industry Partners: Program staff will communicate with WTIA ad-hoc in the Fall in order to recruit mentors for career mentorship and the first micro-internship, and again in the winter to recruit mentors for the second internship. Any shortfall in the number of mentors can be made up by CodeDay and MinT's existing network of mentor volunteers with AI experience (documented in Facilities, Equipment, and Other Resources).

Dissemination Partners: CCBA, WTB, and SBCTC will receive an annual report, as well as publications, reports, and resources as they are created, for dissemination to CTCs. The PIs will share results each year at the CCBA conference. (More details are provided in the dissemination plan provided in "Generation of Knowledge".)

BUILDING COMMUNITY VIA A COHORT MODEL FOR PARTICIPANTS

Promoting a sense of belonging is an important feature of this project's strategy to retain students and ultimately guide them into the AI/ML workforce. When students feel a sense of belonging, they are more likely to engage actively and persist in the face of challenges. This project is built as a virtual-first program where student onboarding, training, mentoring, meetings, reflections, and community mostly take place online. Because all students come from the same set of partner colleges, many will already be familiar with each other from classes. We extend and merge those existing communities with the following additional program elements:

- A closed LinkedIn discussion group where students, mentors, staff, alumni, and faculty

will share learnings, ask questions, and post job opportunities.

- Monthly online workshops and panels where students from across the program will engage with industry experts on a particular topic where interactions and Zoom chats are encouraged and lively.
- Employer information sessions and monthly student office hours that will offer students additional opportunities to engage with the larger community outside of their 1:1 monthly meetings with mentors.
- Online group chat “Slack” where students will collaborate in real-time, and where work on micro-internships will be coordinated.

BUILDING AN INCLUSIVE AND DIVERSE STEM WORKFORCE

The US and local tech industries have had a long history of only recruiting from elite institutions, and many CTC students are put in a place of outsiders looking in. This is especially true when it comes to highly paid, in-demand technical positions. For example, Black and African Americans account for 5.7% of technical roles at Microsoft, Hispanic and Latinx accounts for 6.8%, and 25.8% for women, [21] all three severely short of the US population as a percentage and more so in the context of CTC students. This project specifically and exclusively works with highly diverse CTCs. Nationwide, students who attend CTCs are: 56% students of color, 55% female, 25% first-generation immigrants, 33% receiving Pell grants, 15% parents, and 10% veterans. [2,3]

Creating On-Ramps for Diverse Individuals Into Careers in Emerging Technology Fields

Internships are the single largest factor in whether students obtain a job post-graduation [8–12], their starting salary and time spent looking for a job. [22] Despite their importance, access to internships is unequal. Studies find that half as many low-income students find internships, [4, 23] that race and gender likely also play a role, and that students attending community colleges have additional difficulties because their schools lack brand name recognition. [6, 20] In one large CTC system, less than 10% of college CS majors were able to secure an internship. [6] By using paid micro-internships as the method of experiential learning, and offering them to diverse students who are least likely to be offered an internship, we can give these students the same powerful boost to learning [24–27] and careers [11]. This responds to the ExLENT program’s criterion that the project must create on-ramps for diverse individuals into careers in emerging technology fields.

Reducing Barriers for Groups Historically Underrepresented in STEM

A majority of historically underrepresented students are unable to participate in internships because of competing life priorities, specifically: because they are a primary caretaker for a family member, and/or because they need to work to earn money for their family. [14] This proposal removes both barriers by requiring a limited time commitment — 5 hours per month for mentor meetings and cohort activities + 8-10 hours per week during the one-month micro-internship — and by providing an industry-competitive wage for all time

spent in the program, including mentor meetings and cohort activities. This responds to the ExLENT program's criterion that the project must reduce barriers so that members of groups historically underrepresented or under-served in STEM can acquire the training and learning needed for careers in emerging technology.

Open Source Work Increases Diversity

The proposed model solves another problem for driving more students from underrepresented groups to pursue AI careers: many of these students are disinterested in technical careers because they view technical work as not contributing to society. Studies suggest that asking students to make contributions to open source software can avoid this problem, improving retention and career outcomes. [24, 28, 29]

Provide Participants With a Path Beyond the ExLENT Program

Another reason students have difficulty finding employment is not adequately preparing to find a job because they do not know what to do. One study found that only 45% of students prepare applications, 44% work on projects outside of schoolwork, and 27% practice interviewing. 23% of students reported doing absolutely nothing, believing doing well in school was all that was important. [23] The mentoring component of the pathway created by this program pairs each student with two mentors from the technology industry, and the curriculum addresses these common career misunderstandings, in order to improve the chances that each student is hired. Students with mentors are also twice as likely as their peers to complete their degree. [30–32] This responds to the ExLENT program's criterion that the project must provide participants with a path beyond the ExLENT program.

SUSTAINABILITY AND SCALABILITY

Sustainability has already been demonstrated by CodeDay, which has been operating since 2009, and Mentors in Tech, which is operating in its fourth academic year. At scale, long-term sustainability will come from four sources, which will be developed as part of this project:

- Partner colleges have been contributing to part of the operating costs for similar programs operated by CodeDay and MinT by re-purposing existing and new internal funding sources.
- Public and private-based grant funding in the near future, as the partner colleges and diverse nontraditional student populations served are severely underfunded compared to their traditional public and private counterparts. Both organizations have shown successful proposals to fund one-off program enhancements, scale, and development so far. Multi-year grants that can ensure long-term program planning and implementation will build a foundation for sustainability post-grant funding.
- Earned revenue from industry partners to sponsor student program fees, capstone and micro-internship projects, as well as employer recruiting services. CodeDay and MinT have had initial success in earned revenue in these areas in the past 3 years and will

continue to invest in building relationships with private and corporate partners who will ultimately benefit from having more job-ready candidates for open emerging tech and AI positions.

- Earned revenue by extending the model and services to early career mentorship for industry partners to help with internal employee growth, development, and retention. After hiring new graduates, this is the next problem that many companies are been concerned with in order to develop their workforce.

EVALUATION

Figure 3 shows CTCtoAI's logic model: an overview of the project's theory of change, major activities, short-term outcomes, mid-term outcomes, and long-term impacts. Figure 4 shows the project's evaluation questions and data collection.

Evaluation Question	Indicator	Data	Timing
To what extent does the combination of micro-internships and structured school-year-long mentorship meet the needs of students?	Student satisfaction and confidence in their abilities in AI/ML	Attitudinal survey/reflections, surveys, and interviews.	Monthly; start/end of cohort.
To what extent does the project increase the awareness of the emerging technology of AI/ML?	Students' interest in, and intent to pursue, careers in AI/ML.	Attitudinal survey/reflections and self-reported internship/job applications.	Monthly.
To what extent do students understand the hiring process in AI/ML?	Student confidence and actions taken to prepare for internships/jobs.	Student reflections and self-reported internship/job applications.	Monthly.
To what extent is the project impacting retention and degree completion rates?	Students who stay enrolled or graduate.	Number of cohort students who remain enrolled/graduate.	End of cohort; post-cohort.
To what extent are students getting more interviews and entry-level employment?	Application to interview rate; interview to offer rate;	Self-reported internship/job applications, interviews, and offers.	Monthly
To what extent have mentor perceptions of CTC students changed?	Change in mentor perception of CTC student skills and employability.	Attitudinal pre/post survey.	Start/end of cohort.

Figure 4: CTCtoAI evaluation questions and data collection

Activities	Short-Term	Mid-Term	Long-Term
Work with CTCs to recruit students without access to AI internships/connections	Students have an increased sense of belonging in AI	Students persist to graduate with an academic credential at a high rate	Increased diversity and inclusion in AI workforce
Hold industry mentor training sessions to teach CTC student backgrounds and inclusive mentoring	Students have a high rate of satisfaction with their micro-internship experience	Students have increased confidence to navigate AI specific hiring processes	Increased responsiveness to AI workforce needs
Provide 2x industry mentored micro-internship experiences	Students have a high rate of satisfaction with their experience working with industry mentors	Students get more interviews due to AI work experience documented in their resumes	Improved industry perception of CTC students and graduates (largely under-represented)
Provide one-on-one career mentoring to students (two industry mentors per student)	Students have increased awareness of the variety of roles that are accessible to them in AI/ML.	Students have relevant AI/ML work experience that they can communicate in interviews	Strengthened and/or increased partnership between employers, intermediaries, and community colleges
Establish student peer cohort, host events, and facilitate connections and conversations between peers and mentors	Students have increased awareness of how the hiring process works in AI/ML	Increased number of students/graduates securing an offer of entry-level employment in AI/ML roles	Program replicability at the national level and transferability to other emerging and novel technology domains
Conduct a series of professional development workshops for cohorts that include technical and career development topics.	Students learn and apply technical skills and employability skills	Increased number of industry mentors, with mentors having positive perception of CTC students (mentees)	
Collaborate with CTC faculty to identify opportunities where academic credit can be awarded for experiential learning	CTC faculty have increased awareness of accessible experiential learning opportunities and refer students to the program		
Promising practices are identified and disseminated through conferences and publications			

Figure 3: CTCtoAI evaluation logic model

The project’s independent evaluator is Emilia Gan. Emilia is a current Ph.D. candidate at the University of Washington who is studying patterns of programmatic skills development and behavior in Computer Science under the guidance of Dr. Benjamin Mako Hill. She expects to graduate with her Ph.D. prior to the start of this project and will work as a consultant. Emilia and Dr. Hill have previously collaborated with CodeDay and one of the PIs on a publication demonstrating the effect of presenting CS work on long-term retention and are currently working on a study related to student experience in micro-internships. A full biographical sketch of Emilia is included in the supplementary materials for this proposal.

GENERATION OF KNOWLEDGE

Dissemination activities for CTCtoAI involve sharing results of project and project evaluation activities and practical implementation “lessons learned”. The expected dissemination activities are detailed in Figure 5. Dissemination is targeted to the following audiences:

- State and national CTC programs across all emerging technology sectors, CTC leaders, and CTC researchers with the help of SBCTC and CCBA (see “Partnerships”).
- The broader statewide workforce development community with the help of the WTB (see “Partnerships”) to share results across other emerging technology sectors in our state and across a network of state agencies.
- Industry leaders and potential partners at organizations that develop or use AI technologies as well as the broader open source software community.

When	Activity/Event	Target Audience
Bi-Weekly	Meet with AppConnect NW CTC faculty	CTCs
Quarterly	Meet with all partners	Industry, workforce, CTCs
Yearly	Share at ExLENT PI Conference	CTCs
	Presentation at CCBA Conference	CTCs
	Share student blog posts on LinkedIn	Industry
	Share student write-ups and tech talks with partners	Industry, workforce, CTCs
Conclusion	Share at ACM SIGCSE	CTCs

Figure 5: Planned dissemination activities

CTCtoAI project staff will submit project-generated data, project reports, and other materials to the Washington State Center of Excellence in Information & Computing Technology and the AppConnect NW network for possible inclusion in these agencies’ resource libraries, in accordance with the project’s Data Management plan.

BROADER IMPACTS

Although most students pursue post-secondary education to improve their job prospects, [33–35] many new graduates report they are unprepared for a career, especially those in the fast-evolving emerging tech fields. [36–38] Likewise, employers in the emerging field of AI/ML have reported that new graduates lack the skills to succeed. [36] Industry engagement programs such as mentorship and internships have been shown to close these skill gaps, as well as increase familiarity with the field and improve long-term retention. [7, 30–32, 39–42] However, traditional models for these programs are expensive to scale due to the large upfront commitments required for companies as well as colleges. As a result, only elite universities [43] and very large tech companies offer these experiences to few students.

These problems are larger for students enrolled in CTCs, which have fewer resources, industry relationships, and alumni base. This proposal gives access to an incredibly diverse CTC student population wrap-around mentoring and internship support, which previously only been widely available to their traditional 4-year counterparts and builds a pathway to successful AI/ML career pathways previously not available to most CTC students.

Over three years, the project will provide mentorship and internships to 150 students as well as highly competitive wages (which are likely higher than what many students earn in their day jobs). A sustainable program at scale and published details enabling others to replicate the program will provide these experiences to thousands of students in the long term.

Developing a Globally Competitive Workforce

Internships provide critical hands-on experience that helps students understand how to apply what they have learned and prepare to join the workforce. They are also the largest factor in determining whether students find a job post-graduation. [8–12] This project’s micro-internships will prepare students for AI work and build their resume to obtain jobs.

Likewise, career mentoring helps students stay engaged and take the next steps to get a job. MinT’s mentoring program has been described as a “critical ingredient to high-quality programs that produce equitable education, employment, and life outcomes for students and graduates.” [44] Students who receive the mentoring provided in this project will be left with a clear path into AI jobs.

Driving Full Participation of Underrepresented Populations in AI

This program specifically targets the exceptionally diverse and under-represented group of students who attend CTCs. As discussed in the “Building an Inclusive and Diverse STEM Workforce” section, these students are otherwise very unlikely to obtain internships and have difficulty obtaining any technology jobs. This project will provide these under-represented students a path to upward mobility through highly in-demand AI careers.

RESULTS FROM PRIOR NSF SUPPORT

Not applicable.

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SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION STUDENT RESEARCH & DEVELOPMENT				FOR NSF USE ONLY			
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Tyler Menezes				PROPOSAL NO. 2347311	DURATION (months)		
				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Tyler Menezes - Principal Inv				2.0			20,000
2.							
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.0			0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				2.0			20,000
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.0			0
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.0			0
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (1) OTHER							28,000
TOTAL SALARIES AND WAGES (A + B)							48,000
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							7,200
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							55,200
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. U.S. POSSESSIONS)							3,000
2. INTERNATIONAL							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ 165,000							
2. TRAVEL							0
3. SUBSISTENCE							0
4. OTHER							0
TOTAL NUMBER OF PARTICIPANTS (50) TOTAL PARTICIPANT COSTS							165,000
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							0
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							25,000
4. COMPUTER SERVICES							0
5. SUBAWARDS							80,000
6. OTHER							0
TOTAL OTHER DIRECT COSTS							105,000
H. TOTAL DIRECT COSTS (A THROUGH G)							328,200
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC 10% (Rate: 10.0, Base:51000)							
TOTAL INDIRECT COSTS (F&A)							5,100
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							333,300
K. FEE							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							333,300
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME Tyler Menezes				FOR NSF USE ONLY			
ORG. REP. NAME* Tyler Menezes				INDIRECT COST RATE VERIFICATION			
				Date Checked	Date Of Rate Sheet	Initials - ORG	

*ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 2

ORGANIZATION STUDENT RESEARCH & DEVELOPMENT				FOR NSF USE ONLY			
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Tyler Menezes				PROPOSAL NO. 2347311	DURATION (months)		
				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Tyler Menezes - Principal Inv				2.0			20,000
2.							
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.0			0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				2.0			20,000
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.0			0
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.0			0
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (1) OTHER							28,000
TOTAL SALARIES AND WAGES (A + B)							48,000
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							7,200
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							55,200
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. U.S. POSSESSIONS)							3,000
2. INTERNATIONAL							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ 165,000							
2. TRAVEL							0
3. SUBSISTENCE							0
4. OTHER							0
TOTAL NUMBER OF PARTICIPANTS (50) TOTAL PARTICIPANT COSTS							165,000
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							0
2. PUBLICATION COSTS/DOCUMENTATION/DISEMINATION							0
3. CONSULTANT SERVICES							25,000
4. COMPUTER SERVICES							0
5. SUBAWARDS							80,000
6. OTHER							0
TOTAL OTHER DIRECT COSTS							105,000
H. TOTAL DIRECT COSTS (A THROUGH G)							328,200
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC 10% (Rate: 10.0, Base:51000)							
TOTAL INDIRECT COSTS (F&A)							5,100
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							333,300
K. FEE							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							333,300
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Tyler Menezes				FOR NSF USE ONLY			
ORG. REP. NAME* Tyler Menezes				INDIRECT COST RATE VERIFICATION			
				Date Checked	Date Of Rate Sheet	Initials - ORG	

*ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION STUDENT RESEARCH & DEVELOPMENT				FOR NSF USE ONLY			
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Tyler Menezes				PROPOSAL NO. 2347311	DURATION (months)		
				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Tyler Menezes - Principal Inv				2.0			20,000
2.							
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.0			0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				2.0			20,000
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.0			0
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.0			0
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (1) OTHER							28,000
TOTAL SALARIES AND WAGES (A + B)							48,000
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							7,200
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							55,200
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. U.S. POSSESSIONS)							3,000
2. INTERNATIONAL							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ 165,000							
2. TRAVEL							0
3. SUBSISTENCE							0
4. OTHER							0
TOTAL NUMBER OF PARTICIPANTS (50) TOTAL PARTICIPANT COSTS							165,000
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							0
2. PUBLICATION COSTS/DOCUMENTATION/DISEMINATION							0
3. CONSULTANT SERVICES							25,000
4. COMPUTER SERVICES							0
5. SUBAWARDS							80,000
6. OTHER							0
TOTAL OTHER DIRECT COSTS							105,000
H. TOTAL DIRECT COSTS (A THROUGH G)							328,200
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC 10% (Rate: 10.0, Base:51000)							
TOTAL INDIRECT COSTS (F&A)							5,100
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							333,300
K. FEE							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							333,300
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Tyler Menezes				FOR NSF USE ONLY			
ORG. REP. NAME* Tyler Menezes				INDIRECT COST RATE VERIFICATION			
				Date Checked	Date Of Rate Sheet	Initials - ORG	

*ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET

Cumulative

ORGANIZATION STUDENT RESEARCH & DEVELOPMENT				FOR NSF USE ONLY			
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Tyler Menezes				PROPOSAL NO. 2347311	DURATION (months)		
				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Tyler Menezes - Principal Inv				6.0			60,000
2.							
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)							
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				6.0			60,000
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL SCHOLARS				0.0			0
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.0			0
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (3) OTHER							84,000
TOTAL SALARIES AND WAGES (A + B)							144,000
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							21,600
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							165,600
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. U.S. POSSESSIONS)							9,000
2. INTERNATIONAL							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ 495,000							0
2. TRAVEL							0
3. SUBSISTENCE							0
4. OTHER							0
TOTAL NUMBER OF PARTICIPANTS (150) TOTAL PARTICIPANT COSTS							495,000
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							0
2. PUBLICATION COSTS/DOCUMENTATION/DISEMINATION							0
3. CONSULTANT SERVICES							75,000
4. COMPUTER SERVICES							0
5. SUBAWARDS							240,000
6. OTHER							0
TOTAL OTHER DIRECT COSTS							315,000
H. TOTAL DIRECT COSTS (A THROUGH G)							984,600
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
TOTAL INDIRECT COSTS (F&A)							15,300
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							999,900
K. FEE							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							999,900
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Tyler Menezes				FOR NSF USE ONLY			
ORG. REP. NAME* Tyler Menezes				INDIRECT COST RATE VERIFICATION			
				Date Checked	Date Of Rate Sheet	Initials - ORG	

*ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

BUDGET JUSTIFICATION - CODEDAY

A. Senior Personnel

Approximately 2 calendar person-months (\$20,000, base annual salary \$120,000) is requested each year of the project for Tyler Menezes, PI. He will be responsible for overseeing all activities related to this project, financially managing the project activities, directing the development of all program materials in collaboration with subawardees, collaborating with the evaluator to collect, analyze, and disseminate results, and building partnerships with industry to ensure the success of the project. He will deliver annual and final reports to the NSF program officer.

B. Other Personnel

\$28,000 per year is requested for 40% time of a program manager (base annual salary of \$70,000), who will be responsible for screening students, recruiting mentors, matching mentors with projects, troubleshooting student participation issues, and other day-to-day program operations for the micro-internships. The remainder of the Program Manager's time will be allocated to, and funded by, other projects. This position will be hired at the beginning of the grant.

C. Fringe Benefits

Fringe benefits are calculated at the rate of 15% for all full-time employees.

D. Equipment

No equipment is necessary.

E. Travel

\$3,000 of domestic travel is requested each year to support travel for PIs to the annual ExLENT conference, and for PIs and/or the evaluator to SIGCSE, FIE, or other relevant conferences.

F. Participant Support Costs

\$165,000 each year (total of \$495,000) is requested for student stipends. This represents a payment of \$25 per hour for each student, with an anticipated workload of 130 hours over the year between career mentorship meetings (40 hours), micro-internships (80 hours) and other cohort activities (10 hours). CodeDay will distribute stipends for all students. Total per-student support is \$3,300.

G. Other Direct Costs

Consultant Services

\$25,000 per year is requested for the external evaluator, Emilia Gan, as detailed in the “Evaluation” section of the proposal. As Emilia is expected to graduate with a PhD prior to the start of the project, she will be working as a consultant.

Subawards

A subaward of \$240,000 is requested for Mentors in Tech (dba MinT). The PI for this subcontract is Kevin Wang. The subcontract funds will enable MinT to develop and run a year-long career mentoring and cohort program for participating students as described in the program description. The subcontract also provides for travel and conference registrations to disseminate results. A separate cost justification for the subcontract is provided.

I. Indirect Costs

Indirect costs are calculated using the de minimis rate of 10% of modified total direct costs (MTDC; base total = \$51,000 per year).

FACILITIES, EQUIPMENT, AND OTHER RESOURCES

Resource	Description
Facilities	
Staff Offices	The PI, co-PI, and other project staff have furnished offices/workspaces which are appropriate to their positions.
Major Equipment	
Student Computers	Students who participate in the program are expected to use their own computers, but it is likely that some students may not have a computer, their computer may break during the program, or their computer may not be of adequate performance to attend meetings or perform development work. CodeDay has a supply of approximately 200 laptops (Intel Core i5 with 16GB RAM, 16GB of RAM, a 256GB SSD, 13 in. display) which can be given to students, to keep.
Computers	
Canvas Learning Management System (LMS)	Canvas is an open-source LMS with automated task management, on-campus IT support, goal/outcome measurement, graphic analytics reporting, iOS/Android app center, and multimedia storage. CodeDay has a Canvas deployment available for students to complete any lessons needed for program or project onboarding and training.
Slack	Slack is a cloud-based group messaging platform which will be used for cohort announcements and student/mentor peer communication. CodeDay owns a license to use Slack for any number of students.
LinkedIn	LinkedIn is a professional social networking platform. CodeDay and MinT have established member groups for program participants to participate in discussions and connect with mentors and job opportunities.

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¹Letter of collaboration is enclosed.

²Biographical sketch, Current and Pending (Other) Support, and Collaborators and Affiliations are enclosed.

Resource	Description
Zoom	Zoom is an electronic meeting platform. Both CodeDay and MinT have Zoom licenses which can be used for cohort activities and mentor meetings.
CodeDay Program Management Software	CodeDay uses a custom, open-source software suite to manage student participation in micro-internships. The software is capable of: receiving student applications to participate in the program; collecting application reviews and conducting admissions; collecting student preferences and matching students to projects; conducting surveys and collecting upward, downward, and peer feedback; collecting daily “stand-up” updates from students; and scoring and flagging at-risk students automatically based on AI.
MinT Program Management Software	MinT uses an in-house software suite to manage student career mentorship and cohort activities. The software is capable of: collecting student preferences and matching students to mentors; tracking mentor meetings; collecting structured reflections from students and mentors; advertising cohort activities; and flagging of at-risk students for staff follow-up.

Institutional Collaborators

Note: Only those partners that will routinely contribute to project activities are listed.

AppConnect NW (DUE#1700629) ¹	AppConnect NW is a consortium of nine Community and Technical Colleges in Washington State, created to bridge the gap between community colleges and the technology industry. AppConnect NW has committed to connecting the project with educators and students at its member CTCs, and will work closely with the PIs in an advisory role.
Washington State Board for Community & Technical Colleges (SBCTC) ¹	The SBCTC is the Washington State board which advocates, coordinates and directs Washington State’s system of 34 public community and technical colleges. SBCTC has committed to: connecting the project with educators and students at its member CTCs; coordinating efforts between the project and the Equity in Computer Science workgroup; and fostering a STEM community of practice for CS instructors.

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Resource	Description
Community College Baccalaureate Association (CCBA) ¹	CCBA is a national organization that hosts conferences, conducts research, and provides support and resources to community colleges that build and sustain career-focused baccalaureate degrees. CCBA has committed to supporting dissemination efforts within CTCs by having MinT and CodeDay present project findings to researchers and college administrators, faculty, and leaders.
Washington Technology Industry Association (WTIA) ¹	WTIA is a consortium serving more than 1,000 employers in Washington State that rely heavily on a Computer Science and Information Technology workforce. WTIA has committed to providing advice in the design and implementation of the project, and to connect the project with companies and industry experts focused on AI.
Washington State Workforce Training and Education Coordinating Board (WTB) ¹	The WTB is a state agency based on a partnership of business, labor, and government dedicated to helping Washington residents succeed in family-wage jobs, while meeting employer needs for skilled workers. The WTB has committed to sharing the model with other emerging technology sectors in Washington State and to broader audiences (including rural areas, tribal colleges, and formerly incarcerated individuals).
City College of San Francisco (CCSF) University of California, San Francisco (UCSF) Building Inclusive Labs Collaborative Project (DUE#2055735/2055309) ¹	Building Inclusive Labs (BIL) is a collaborative initiative between a community college biotechnology program (CCSF) and a top-tier research university and technician employer (UCSF) whose goal is to build more inclusive workplace environments for community college students pursuing biotechnology careers. BIL has committed to: providing opportunities for community college students to participate in their Workplace Navigation Training; providing opportunities for industry partners to participate in their Inclusive Mentor-Manager Training; and fostering an experiential learning community of practice to share practices across emerging technology sectors.

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Resource	Description
Employees (Personnel)	
Open Source Partnership Staff	CodeDay employs a team to build partnerships with open source maintainers and develop a portfolio of issues for its open source summer internships. Issues which are too simple for the summer internship program will be matched with mentors and students during the micro-internship.
TA Staff	CodeDay employs a team of TAs who provide technical advice and debugging help to students in its community; this team can provide help to students participating in a micro-internship.
Administrative staff	CodeDay and MinT employ administrative, bookkeeping, and legal staff with experience managing grants.
Unfunded Collaborators	
<i>Note: Only collaborators that will significantly contribute to project activities are listed.</i>	
Kendrick Hang Instructor at Green River College and Faculty Associate in AppConnect NW (DUE#1700629) ^{1,2}	Kendrick Hang is a full-time teaching faculty member at Green River College, teaching Information Technology and Computer Science, and also serves as a Faculty Associate in The Northwest Network for Application Development and Technology Connections (AppConnect NW), a consortium of nine community and technical colleges in Washington State offering baccalaureate degree programs in software development and computer science. Kendrick will serve as a liaison to community and technical college faculty members and administrators, assisting in project efforts: recruiting students, identifying curriculum alignment opportunities, collaborating on program design and improvement, advising on evidence-based inclusive practices, supporting data collection/evaluation needs, and contributing to project dissemination activities.
Other	
Mentors	CodeDay and MinT have an existing pool of 178 active mentors who have experience in AI/ML who could serve as mentors for the program in addition to those recruited through WTIA.

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Resource	Description
Micro-Internship Onboarding Curriculum	CodeDay has developed an onboarding curriculum to prepare introductory CS students for micro-internships which may be used or adapted for the CTC AI micro-internships proposed by this project.
CS Career Mentoring Outlines	MinT has developed meeting and topic outlines for career mentor meetings which may be used or adapted for the mentoring proposed by this project.

¹Letter of collaboration is enclosed.

²Biographical sketch, Current and Pending (Other) Support, and Collaborators and Affiliations are enclosed.

Effective 01/30/2023

NSF BIOGRAPHICAL SKETCH

OMB-3145-0058

IDENTIFYING INFORMATION:

NAME: Menezes, Tyler

ORCID iD: <https://orcid.org/0000-0002-7975-2533>

POSITION TITLE: Executive Director

PRIMARY ORGANIZATION AND LOCATION: Student Research and Development (dba CodeDay), Seattle, Washington, United States

Professional Preparation:

ORGANIZATION AND LOCATION	DEGREE (if applicable)	RECEIPT DATE	FIELD OF STUDY
University of Washington, Seattle, Washington, United States	N/A	06/2012	Computer Science
Y Combinator, San Francisco, California, United States	Other training	09/2012	Technical Entrepreneurship

Appointments and Positions

2013 - present Executive Director, Student Research and Development (dba CodeDay), Seattle, Washington, United States

2013 - present Executive Director, CodeDay, Seattle, Washington, United States

2012 - 2013 Founder and VP Engineering, Framebase, San Francisco, California, United States

2011 - 2012 Software Engineer, eNotes, Seattle, Washington, United States

2010 - 2011 Intern, Machine Learning and Applied Statistics, Microsoft Research, Redmond, Washington, United States

2009 - 2009 Intern, AI and Machine Learning, Atigeo, Bellevue, Washington, United States

Products**Products Most Closely Related to the Proposed Project**

1. Menezes T. What Skills Do CS Grads Need?. Proceedings of the 54th ACM Technical Symposium on Computer Science Education V. 2. SIGCSE 2023: The 54th ACM Technical Symposium on Computer Science Education; 15 0 23; Toronto ON Canada. New York, NY, USA: ACM; c2023. Available from: <https://dl.acm.org/doi/10.1145/3545947.3576369> DOI: 10.1145/3545947.3576369
2. Narayanan S et al. A scalable approach to support computer science students in their learning and preparation as software engineers. FIE; ; c2023.
3. Gan E, Menezes T, Hill B. How Gender, Ethnicity, and Public Presentation Shape Coding Perseverance after Hackathons. Proceedings of the 22nd Koli Calling International Conference on Computing Education Research. Koli 2022: 22nd Koli Calling International Conference on Computing Education Research; 17 1 22; Koli Finland. New York, NY, USA: ACM; c2022. Available from: <https://dl.acm.org/doi/10.1145/3564721.3564727> DOI: 10.1145/3564721.3564727
4. Menezes T, Parra A, Jiang M. Open-Source Internships With Industry Mentors. Proceedings of the 27th ACM Conference on on Innovation and Technology in Computer Science Education

Vol. 1. ITiCSE 2022: Innovation and Technology in Computer Science Education; 08 0 22; Dublin Ireland. New York, NY, USA: ACM; c2022. Available from: <https://dl.acm.org/doi/10.1145/3502718.3524763> DOI: 10.1145/3502718.3524763

5. Parra A, Jiang M, Menezes T. Closing The Gap Between Classrooms and Industry With Open-Source Internships. Proceedings of the 52nd ACM Technical Symposium on Computer Science Education. SIGCSE '21: The 52nd ACM Technical Symposium on Computer Science Education; 13 0 21; Virtual Event USA. New York, NY, USA: ACM; c2021. Available from: <https://dl.acm.org/doi/10.1145/3408877.3439576> DOI: 10.1145/3408877.3439576

Other Significant Products, Whether or Not Related to the Proposed Project

1. Menezes T, Kirvoski D. A Few Simple Guidelines Related to Image CAPTCHAs. 2011 IEEE International Conference on Acoustics, Speech and Signal Processing; ; c2011. Available from: <https://tyler.vc/0001892.pdf>

Synergistic Activities

1. 2019 to present: Independent consulting and presentations on mentorship for college graduates.
2. 2023: Talk - "Getting Students Into Open Source Software" at PyCon
3. 2022: Talk - "From Hack to Hire" at HPCC Systems Big Data Conference
4. 2016 to present: Maintainer of 14 open source projects, two in AI.
5. 2013 to 2020: High school CS teacher through Microsoft TEALS program.

Certification:

When the individual signs the certification on behalf of themselves, they are certifying that the information is current, accurate, and complete. This includes, but is not limited to, information related to domestic and foreign appointments and positions. Misrepresentations and/or omissions may be subject to prosecution and liability pursuant to, but not limited to, 18 U.S.C. §§ 287, 1001, 1031 and 31 U.S.C. §§ 3729-3733 and 3802.

Certified by Menezes, Tyler in SciENcv on 2023-09-12 15:03:40

Effective 01/30/2023

NSF BIOGRAPHICAL SKETCH

OMB-3145-0058

*NAME Kevin Wang

*Required fields

ORCID ID (Optional) 0009-0003-4227-7745

*POSITION TITLE Founder and Program Director

*PRIMARY ORGANIZATION & LOCATION Mentors in Tech, Bellevue, WA

*PROFESSIONAL PREPARATION - (see [PAPPG Chapter II.D.2.h.i.a.3](#))

PREVIOUS ORGANIZATION(S) & LOCATION(S)	DEGREE (if applicable)	RECEIPT DATE* (MM/YYYY)	FIELD OF STUDY
Harvard Graduate School of Education	EdM	06/2006	Education
University of California, Berkeley	BS	05/2002	Electrical Engineering and Computer Science

Note - For Fellowship applicants only, please include the start date of the Fellowship.

*APPOINTMENTS AND POSITIONS - (see [PAPPG Chapter II.D.2.h.i.a.4](#))

Start Date - End Date	Appointment or Position Title, Organization, and Location
2020 - Present	Founder and Program Director, Mentors in Tech, Bellevue, WA
2020 - Present	Board member, Washington State Board of Education, Olympia, WA
2009 - 2019	Founder, Microsoft TEALS Program, Redmond, WA
2006 - 2011	Program Manager, Microsoft Office365, Redmond, WA
2005 - 2006	Curriculum Designer, Massachusetts Institute of Technology, Cambridge, MA
2005 - 2006	Teaching Fellow, Harvard University CS1, Cambridge, MA
2002 - 2005	Computer Science Teacher, Woodside Priory School, Portola Valley, CA

***PRODUCTS - (see [PAPPG Chapter II.D.2.h.i.a.5](#)) Products Most Closely Related to the Proposed Project**

Reflections of a Diversity, Equity, and Inclusion Working Group based on Data from a National CS Education Program

Proceedings of the 49th ACM Technical Symposium on Computer Science Education

2018-02-21 | Conference paper | DOI: 10.1145/3159450.3159594

CONTRIBUTORS: Nwannediya Ada Ibe; Rebecca Howsmon; Lauren Penney; Nathaniel Granor; Leigh Ann DeLyser; Kevin Wang

Preparing and Supporting Industry Professionals as Volunteer High School Computer Science Co-Instructors

Proceedings of the 2017 ACM SIGCSE Technical Symposium on Computer Science Education

2017-03-08 | Conference paper | DOI: 10.1145/3017680.3017743

CONTRIBUTORS: Anthony Papini; Leigh Ann DeLyser; Nathaniel Granor; Kevin Wang

TEALS Teacher Professional Development Using Industry Volunteers

Proceedings of the 47th ACM Technical Symposium on Computing Science Education

2016-02-17 | Conference paper | DOI: 10.1145/2839509.2844589

CONTRIBUTORS: Nathaniel Granor; Leigh Ann DeLyser; Kevin Wang

Other Significant Products, Whether or Not Related to the Proposed Project (see [PAPPG Chapter II.D.2.h.i.a.5](#))

United States Patent US 9026623 B2

Layered Architectures for Remote Dynamic Administration of Distributed Clients Configurations

2015-05-05 | US Patent

CONTRIBUTORS: Kevin Wang; Cameron Stillion; Vijaysundar Srirangam; Edward Wu, David Gorbet

3D game design with programming blocks in StarLogo TNG

ICLS '06: Proceedings of the 7th international conference on Learning sciences

2006-06 | Conference poster

CONTRIBUTORS: Kevin Wang; Corey McCaffrey; Daniel Wendel; Eric Klopfer

***Synergistic Activities - (see [PAPPG Chapter II.D.2.h.\(i\)\(a\)\(6\)](#))**

2021 - Present | University of Washington Bothell | Computing & Software Systems Technical Advisory Board Member

***Certification:**

When the individual signs the certification on behalf of themselves, they are certifying that the information is current, accurate, and complete. This includes, but is not limited to, information related to domestic and foreign appointments and positions. Misrepresentations and/or omissions may be subject to prosecution and liability pursuant to, but not limited to, 18 U.S.C. §§287, 1001, 1031 and 31 U.S.C. §§3729-3733 and 3802.

Signature
(Please type out full name): Kevin Wang

Date:09/12/2023

Effective 01/30/2023

NSF BIOGRAPHICAL SKETCH

OMB-3145-0058

IDENTIFYING INFORMATION:

NAME: Gan, Emilia

ORCID iD: <https://orcid.org/0000-0002-7127-5939>

POSITION TITLE: Graduate Student

PRIMARY ORGANIZATION AND LOCATION: University of Washington, Seattle, Washington, United States**Professional Preparation:**

ORGANIZATION AND LOCATION	DEGREE (if applicable)	RECEIPT DATE	FIELD OF STUDY
University of Washington, Seattle, Washington, United States	MS	03/2020	Computer Science
University of Washington, Seattle, Washington, United States	PHD	03/2024	Computer Science
University of Washington, Seattle, Washington, United States	MS	06/2016	Pathobiology
University of Massachusetts Medical School, Worcester, Massachusetts, United States	MD	06/1998	Medicine
Massachusetts Institute of Technology, Cambridge, Massachusetts, United States	BS	06/1990	Materials Science & Engineering

Appointments and Positions

2016 - present	Graduate Student, University of Washington, Paul G. Allen School of Computer Science & Engineering, Seattle, Washington, United States
2021 - 2021	Data Science Intern , ABB, Ladenburg, Not Applicable, N/A, Germany
2017 - 2017	Summer Intern, Code.org, Seattle, Washington, United States
2015 - 2016	Adjunct Faculty, Bellevue College, Bellevue, Washington, United States
2015 - 2015	Adjunct Faculty, Seattle Central College, Seattle, Washington, United States
2014 - 2023	Adjunct Faculty, South Seattle College, Seattle, Washington, United States
2011 - 2016	Graduate Student, University of Washington, Seattle, Washington, United States
2010 - 2011	Adjunct Faculty, Bellevue College, Bellevue, Washington, United States
1998 - 2000	Family Practice Resident, Family Health Center of Worcester, Worcester, Massachusetts, United States
1990 - 1992	Process Engineer , GTE Government Systems, Needham, Massachusetts, United States
1989 - 1989	Summer Intern, Intel Corporation, Chandler, Arizona, United States
1988 - 1988	Summer Intern, GE Aircraft Engines, Lynn, Massachusetts, United States

Products**Products Most Closely Related to the Proposed Project**

1. Gan E, Hill B, Dasgupta S. Gender, Feedback, and Learners' Decisions to Share Their Creative

Computing Projects. Proceedings of the ACM on Human-Computer Interaction. 2018 November; 2(CSCW):1-23. Available from: <https://dl.acm.org/doi/10.1145/3274323> DOI: 10.1145/3274323

2. Gan E, Menezes T, Hill B. How Gender, Ethnicity, and Public Presentation Shape Coding Perseverance after Hackathons. Proceedings of the 22nd Koli Calling International Conference on Computing Education Research. Koli 2022: 22nd Koli Calling International Conference on Computing Education Research; 17 1 22; Koli Finland. New York, NY, USA: ACM; c2022. Available from: <https://dl.acm.org/doi/10.1145/3564721.3564727> DOI: 10.1145/3564721.3564727
3. Sharif A, Gan E, Wei M. Styx++: Reliable Data Access and Availability Using a Hybrid Paxos and Chain Replication Protocol. CHI Conference on Human Factors in Computing Systems Extended Abstracts. CHI '22: CHI Conference on Human Factors in Computing Systems; 29 0 22; New Orleans LA USA. New York, NY, USA: ACM; c2022. Available from: <https://dl.acm.org/doi/10.1145/3491101.3519635> DOI: 10.1145/3491101.3519635

Other Significant Products, Whether or Not Related to the Proposed Project

1. Bruce A, Barcy S, DiMaio T, Gan E, Garrigues H, Lagunoff M, Rose T. Quantitative Analysis of the KSHV Transcriptome Following Primary Infection of Blood and Lymphatic Endothelial Cells. Pathogens. 2017 March 19; 6(1):11-. Available from: <http://www.mdpi.com/2076-0817/6/1/11> DOI: 10.3390/pathogens6010011

Synergistic Activities

1. Currently conducting a mixed-methods research project on CodeDay Lab's online summer internship program. This research project is for my PhD dissertation (degree expected in spring, 2024) and is not funded by a grant.

Certification:

When the individual signs the certification on behalf of themselves, they are certifying that the information is current, accurate, and complete. This includes, but is not limited to, information related to domestic and foreign appointments and positions. Misrepresentations and/or omissions may be subject to prosecution and liability pursuant to, but not limited to, 18 U.S.C. §§ 287, 1001, 1031 and 31 U.S.C. §§ 3729-3733 and 3802.

Certified by Gan, Emilia in SciENCv on 2023-09-12 19:55:25

Effective 01/30/2023

NSF BIOGRAPHICAL SKETCH

OMB-3145-0058

IDENTIFYING INFORMATION:

NAME: Hang, Kendrick

ORCID iD: <https://orcid.org/0009-0005-3515-2121>

POSITION TITLE: Instructor, Information Technology and Computer Science

PRIMARY ORGANIZATION AND LOCATION: Green River College, Auburn, Washington, United States

Professional Preparation:

ORGANIZATION AND LOCATION	DEGREE (if applicable)	RECEIPT DATE	FIELD OF STUDY
Seattle University, Seattle, Washington, United States	N/A	05/2013	Supporting New Faculty Success (Community and Technical College Teaching)
University of Maryland Global Campus, Adelphi, Maryland, United States	MOTH	05/2008	Software Engineering
University of Virginia, Charlottesville, Virginia, United States	BS	05/2000	Computer Science

Appointments and Positions

2012 - present	Instructor, Information Technology and Computer Science, Green River College, Technology Division, Auburn, Washington, United States
2014 - present	Program Director, Bachelor of Applied Science in Software Development, Green River College, Auburn, Washington, United States
2006 - 2012	Senior Software Engineer, Rockwell Collins, Inc., Sterling, Virginia, United States
2002 - 2004	Software Engineer, Rockwell Collins, Sterling, Virginia, United States
2002 - 2004	Software Developer, Paltech: Planning and Learning Technologies, Arlington, Virginia, United States
2001 - 2002	Managing Partner, Radiant Software LLC, Chantilly, Virginia, United States
2000 - 2001	Software Engineer, Pragma Systems Corporation, Reston, Virginia, United States

Products**Products Most Closely Related to the Proposed Project**

1. Hang K, Ostrander T, Orr A, Archer J, Uland S. A Five-Year Retrospective on an Applied Baccalaureate Program in Software Development. Proceedings of the 51st ACM Technical Symposium on Computer Science Education. SIGCSE '20: The 51st ACM Technical Symposium on Computer Science Education; 11 0 20; Portland OR USA. New York, NY, USA: ACM; c2020. Available from: <https://dl.acm.org/doi/10.1145/3328778.3366803> DOI: 10.1145/3328778.3366803
2. Hang K, Rockenstire B, Vaschillo A. AppConnect NW: A Collaborative Network of Seven Community and Technical College Programs in Software Development. Proceedings of the 51st ACM Technical Symposium on Computer Science Education. SIGCSE '20: The 51st ACM Technical Symposium on Computer Science Education; 11 0 20; Portland OR USA. New York, NY, USA: ACM; c2020. Available from: <https://dl.acm.org/doi/10.1145/3328778.3372555>

DOI: 10.1145/3328778.3372555

3. Hang K, Mason T, Orr A. Building an Ecosystem of Strategic Partners for New Baccalaureate Programs in Information Technology. Proceedings of the 20th Annual SIG Conference on Information Technology Education. SIGITE '19: The 20th Annual Conference on Information Technology Education; 03 1 19; Tacoma WA USA. New York, NY, USA: ACM; c2019. Available from: <https://dl.acm.org/doi/10.1145/3349266.3351370> DOI: 10.1145/3349266.3351370
4. Meza Elizabeth, Blume Grant, Rubin Zachary, Balhan Krystle, Zumeta William, Hang Kendrick, Bragg Debra D.. The Landscape of Career and Technical Education Faculty Data Use for Decision-Making and Program Improvement in National Science Foundation Advanced Technical Education Programs in Washington State. Career and Technical Education Research. 2021 September; 46(2):42-58. Available from: <https://www.ingentaconnect.com/content/acter/cter/2021/00000046/00000002/art00005>

Other Significant Products, Whether or Not Related to the Proposed Project

Synergistic Activities

1. 2021 to present: Faculty Mentor, Puget Sound Alliance. DUE #2009170.
2. 2019 to present: Co-Principal Investigator, Toward data-driven ATE program improvement: Leveraging statewide longitudinal data to create faculty-inspired tools for decision making. DUE #1902019
3. 2017 to present: Faculty Associate, The Northwest Network for Application Development and Technology Connections (AppConnect NW). DUE #1700629.
4. 2016 to 2019: Principal Investigator, Expanding Career and Educational Learning in Information Technology. DUE #1400688.

Certification:

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Certified by Hang, Kendrick in SciENCv on 2023-09-07 15:59:46

Other Personnel Biographical Information

Data Not Available

CURRENT AND PENDING (OTHER) SUPPORT INFORMATION

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person.

*NAME: Menezes, Tyler

PERSISTENT IDENTIFIER (PID) OF THE SENIOR/KEY PERSON: <https://orcid.org/0000-0002-7975-2533>

*POSITION TITLE: Executive Director

*ORGANIZATION AND LOCATION: Student Research and Development (dba CodeDay), Seattle, Washington, United States

Projects/Proposals

*Project/Proposal Title: CodeDay 2024

*Status of Support: current

Proposal/Award Number:

*Source of Support: LexisNexis Risk Solutions / HPCC

*Primary Place of Performance: Seattle, WA

*Project/Proposal Support Start Date: (MM/YYYY): 01/2024

*Project/Proposal Support End Date: (MM/YYYY): 12/2024

*Total Award Amount: \$50,000

* Person Months (Calendar/Academic/Summer) per budget period Committed to the Project:

Year	Person Months
2024	2

*Overall Objectives: This grant funds the development and roll-out of AI and big data processing workshops for high school students at hackathon style events around the world.

*Statement of Potential Overlap: N/A

*Project/Proposal Title: CodeDay Career Connect

*Status of Support: current

Proposal/Award Number:

*Source of Support: Employment Security Division, Washington State

*Primary Place of Performance: Seattle, WA

*Project/Proposal Support Start Date: (MM/YYYY): 03/2023

*Project/Proposal Support End Date: (MM/YYYY): 04/2024

***Total Award Amount:** \$138,826

*** Person Months (Calendar/Academic/Summer) per budget period Committed to the Project:**

Year	Person Months
2023	2
2024	2

***Overall Objectives:** This project will develop a series of "hackathon" events for high school students to introduce them to general computer science principals and emerging technologies in the State of Washington, in collaboration with an alliance of technology industry partners.

***Statement of Potential Overlap:** N/A

***Project/Proposal Title:** Beginnings: Enabling access for overlooked and underserved community and technical college computer science students in artificial intelligence with micro internship and industry mentorship (CTCtoAI)

***Status of Support:** pending

Proposal/Award Number:

***Source of Support:** National Science Foundation (NSF)

***Primary Place of Performance:** Seattle, WA

***Project/Proposal Support Start Date: (MM/YYYY):** 01/2024

***Project/Proposal Support End Date: (MM/YYYY):** 12/2026

***Total Award Amount:** \$999,900

*** Person Months (Calendar/Academic/Summer) per budget period Committed to the Project:**

Year	Person Months
2024	2
2025	2
2026	2

***Overall Objectives:** This ExLENT Beginnings Track proposal will create an experiential pathway for Computer Science students interested in the emerging technology field of Artificial Intelligence and Machine Learning (AI/ML) to work toward a career through micro-internships and structured mentoring. The program elements will ultimately help 150 diverse and under-represented students from Community and Technical Colleges (in 3 annual cohorts) navigate and launch careers in AI/ML.

***Statement of Potential Overlap:** N/A

Certification:

When the individual signs the certification on behalf of themselves, they are certifying that the information is current, accurate, and complete. This includes, but is not limited to, information related to current, pending, and other support (both foreign and domestic) as defined in 42 U.S.C. §§ 6605. Misrepresentations and/or omissions may be subject to prosecution and liability pursuant to, but not limited to, 18 U.S.C. §§ 287, 1001, 1031 and 31 U.S.C. §§ 3729- 3733 and 3802.

Certified by Menezes, Tyler in SciENcv on 2024-04-02 12:16:40

CURRENT AND PENDING (OTHER) SUPPORT INFORMATION

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person.

*NAME: Wang, Kevin

PERSISTENT IDENTIFIER (PID) OF THE SENIOR/KEY PERSON: <https://orcid.org/0009-0003-4227-7745>

*POSITION TITLE: Founder and Program Director

*ORGANIZATION AND LOCATION: Mentors in Tech, Bellevue, Washington, United States

Projects/Proposals

*Project/Proposal Title: Mentors in Tech Role Prep

*Status of Support: current

Proposal/Award Number: K8133

*Source of Support: Career Connect Washington

*Primary Place of Performance: Mentors in Tech

*Project/Proposal Support Start Date: (MM/YYYY): 12/2023

*Project/Proposal Support End Date: (MM/YYYY): 03/2025

*Total Award Amount: \$161,435

* Person Months (Calendar/Academic/Summer) per budget period Committed to the Project:

Year	Person Months
2023	1
2024	3.6
2025	0.9

*Overall Objectives: The MinT Role Prep (MinTRP) proposal will add up to ten (10) tech role preparation modules that will enhance and broaden the understanding and preparation of multiple roles in tech that very few students have heard of. Students will learn about these additional roles and prepare for opportunities that will play a critical part in their employment seeking process. In each module, students will hear interviews with tech professionals in role and provided resources to explore and prepare for each role.

*Statement of Potential Overlap: N/A

*Project/Proposal Title: Enabling access for overlooked and underserved community and technical college computer science students in artificial intelligence with micro internship and industry mentorship (CTCtoAI)

***Status of Support:** pending

Proposal/Award Number:

***Source of Support:** National Science Foundation

***Primary Place of Performance:** Mentors in Tech

***Project/Proposal Support Start Date: (MM/YYYY):** 01/2024

***Project/Proposal Support End Date: (MM/YYYY):** 12/2026

***Total Award Amount:** \$999,900

*** Person Months (Calendar/Academic/Summer) per budget period Committed to the Project:**

Year	Person Months
2024	2
2025	2
2026	2

***Overall Objectives:** This ExLENT Beginnings Track proposal will create an experiential path- way for Computer Science (CS) students interested in the emerging technology field of Artificial Intelligence and Machine Learning (AI/ML) to work toward a career through micro-internships and structured mentoring. The program elements will ultimately help 150 diverse and under-represented students from Community and Technical Colleges (CTCs) (in 3 annual cohorts) navigate and launch careers in AI/ML through employer engagement, micro-internships, career mentoring, and cohort activities.

***Statement of Potential Overlap:** N/A

Certification:

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Certified by Wang, Kevin in SciENCv on 2024-04-02 15:16:13

CURRENT AND PENDING (OTHER) SUPPORT INFORMATION
Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person.

*NAME: Gan, Emilia

PERSISTENT IDENTIFIER (PID) OF THE SENIOR/KEY PERSON: <https://orcid.org/0000-0002-7127-5939>

*POSITION TITLE: Graduate Student

*ORGANIZATION AND LOCATION: University of Washington, Seattle, Washington, United States

Projects/Proposals

*Project/Proposal Title:

Enabling access for overlooked and underserved community college computer science students in artificial intelligence with micro internship and industry mentorship (CTCtoAI)

*Status of Support:

pending

Proposal/Award Number:

*Source of Support:

NSF

*Primary Place of Performance:

Seattle, Washington

*Project/Proposal Support Start Date: (MM/YYYY):

01/2024

*Project/Proposal Support End Date: (MM/YYYY):

12/2026

*Total Award Amount:

\$999,900

* Person Months (Calendar/Academic/Summer) per budget period Committed to the Project:

Year	Person Months
2024	0.68
2025	0.68
2026	0.68

*Overall Objectives:

This ExLENT Beginnings Track proposal will create an experiential pathway for Computer Science (CS) students interested in the emerging technology field of Artificial Intelligence and Machine Learning (AI/ML) to work toward a career through micro-internships and structured mentoring. The program elements will ultimately help 150 diverse and under-represented students from Community and Technical Colleges (CTCs) (in 3 annual cohorts) navigate and launch careers in AI/ML through: 1. Engagement with AI/ML employers to recruit mentors and align the program to workforce needs. 2. Creation of AI/ML Open Source micro-internship. Students will complete 1-2 "micro-internships" working on real-world contributions to open source AI software under the guidance of industry mentors. 3. Structured AI/ML career mentorship. Students will be matched with two industry mentors, meet monthly with each for 8 months, and submit structured reflections. 4. Cohort activities. Students will participate in training, attend monthly workshops, and be coached to apply to 3 job opportunities each month.

*Statement of Potential Overlap:

N/A

Certification:

When the individual signs the certification on behalf of themselves, they are certifying that the information is current, accurate, and complete. This includes, but is not limited to, information related to current, pending, and other support (both foreign and domestic) as defined in 42 U.S.C. §§ 6605. Misrepresentations and/or omissions may be subject to prosecution and liability pursuant to, but not limited to, 18 U.S.C. §§ 287, 1001, 1031 and 31 U.S.C. §§ 3729- 3733 and 3802.

Certified by Gan, Emilia in SciENCv on 2023-09-13 23:47:23

Effective 01/30/2023

NSF C&P(O)S

OMB-3145-0058

CURRENT AND PENDING (OTHER) SUPPORT INFORMATION

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person.

*NAME: Hang, Kendrick

PERSISTENT IDENTIFIER (PID) OF THE SENIOR/KEY PERSON: <https://orcid.org/0009-0005-3515-2121>

*POSITION TITLE: Instructor, Information Technology and Computer Science

*ORGANIZATION AND LOCATION: Green River College, Auburn, Washington, United States

Projects/Proposals

*Project/Proposal Title: TechConnect Capstone (TCC) Extension

*Status of Support: current

Proposal/Award Number:

*Source of Support: Strada Education Network

*Primary Place of Performance: Green River College, Auburn, WA

*Project/Proposal Support Start Date: (MM/YYYY): 12/2022

*Project/Proposal Support End Date: (MM/YYYY): 12/2024

*Total Award Amount: \$388,367

* Person Months (Calendar/Academic/Summer) per budget period Committed to the Project:

Year	Person Months
2023	1.2
2024	1.2

***Overall Objectives:** Green River College in Auburn, Washington, will partner with a technology industry consortium that includes: Washington Technology Industry Association, Computing for All, and Mentors in Tech, a local social good venture led by Microsoft alumni. With the ultimate goal to guide and support more students into successful technology careers, this consortium will create an employer-guided capstone course for students in the software development program and related applied science degrees. The college will offer a capstone course in which students pitch solutions for projects with local technology employers; employers will evaluate pitches, select teams, and provide stipends for student work; and Mentors in Tech will coordinate relationships with employers and provide guidance to student teams. This multidimensional model of facilitated, employer-engaged capstone projects will be replicated first at Lake Washington Institute of Technology, a partner college in Kirkland, Washington, and potentially scaled to similar programs in AppConnect NW, a regional coalition of nine community and technical colleges offering similar programs in software development.

*Statement of Potential Overlap: N/A

***Project/Proposal Title:** Enabling access for overlooked and underserved community college computer science students in artificial intelligence with micro internship and industry mentorship (CTCtoAI)

***Status of Support:** pending

Proposal/Award Number:

***Source of Support:** National Science Foundation

***Primary Place of Performance:** Seattle, WA

***Project/Proposal Support Start Date: (MM/YYYY):** 01/2024

***Project/Proposal Support End Date: (MM/YYYY):** 12/2026

***Total Award Amount:** \$999,900

*** Person Months (Calendar/Academic/Summer) per budget period Committed to the Project:**

Year	Person Months
2024	0.68
2025	0.68
2026	0.68

***Overall Objectives:** This ExLENT Beginnings Track proposal will create an experiential pathway for Computer Science (CS) students interested in the emerging technology field of Artificial Intelligence and Machine Learning (AI/ML) to work toward a career through micro- internships and structured mentoring. The program elements will ultimately help 150 diverse and under-represented students from Community and Technical Colleges (CTCs) (in 3 annual cohorts) navigate and launch careers in AI/ML through: 1. Engagement with AI/ML employers to recruit mentors and align the program to workforce needs. 2. Creation of AI/ML Open Source micro-internship. Students will complete 1-2 "micro-internships" working on real-world contributions to open source AI software under the guidance of industry mentors. 3. Structured AI/ML career mentorship. Students will be matched with two industry mentors, meet monthly with each for 8 months, and submit structured reflections. 4. Cohort activities. Students will participate in training, attend monthly workshops, and be coached to apply to 3 job opportunities each month.

***Statement of Potential Overlap:** N/A

Certification:

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Certified by Hang, Kendrick in SciENCv on 2023-09-13 18:51:17

DATA MANAGEMENT PLAN

Types of Data

- **Planning Materials:** This will include calendars for activities to be undertaken in the proposed project, literature reviews, information about curricula from partner colleges, etc. which are generated by both the PIs and the evaluator.
- **Program Materials:** Mentor training courses, student training and on-boarding courses, meeting agenda outlines, and cohort workshops will be created by the PIs.
- **Open-Source Contributions:** Students will create code and other work products during each micro-internship in which they participate. Students will share their contributions back to the original open-source project licensed with the original project's OSI-approved license.
- **Participant Data:** Qualitative and quantitative data will be collected by the PIs and the evaluator through surveys, systematic observation, and interviews with faculty, students, mentors, and other industry representatives. The evaluator and PIs will collaborate to develop appropriate measures of student skills and employability and to determine survey and interview protocols. Standard quantitative analysis methods will be used for surveys and systematic observation data while qualitative methods will be used for interviews.
- **Analysis, Reports, and Publications:** One method of distribution this project will use is by sharing analyses, reports, and publications. Additionally, such reports may be shared internally to improve the program.

Data Formats

- **Planning Materials, Program Materials, Analysis, Reports, and Publications:** Text documents will be shared as PDFs, Word (.docx) files, and/or L^AT_EXcode. Multimedia will be made available as .mp4 video files and video edit sources will be stored as OpenTimelineIO (.otio) files.
- **Participant Data:** Datasets will either be stored directly as spreadsheets/CSVs or JSON files, or stored in a live PostgreSQL/MySQL database and archived in one of the above formats. Qualitative observations will be archived as PDFs, Word (.docx) files, and/or L^AT_EXcode. The evaluation code will be in Python notebooks or source code (.py, .ts, etc.).
- **Open Source Contributions:** Students will submit open source contributions as "Pull Requests" or "Merge Requests" directly on an open-source hosting platform; they can be downloaded as complete source code archives or as Git .patch files.

Data Access and Confidentiality

- **Planning Materials, Program Materials, Analysis, and Reports:** Final copies of all such materials generated as part of the proposed program will be made available

for free use, modification, and redistribution under an OSI-approved open source license (for code) or a Creative Commons Attribution/Attribution-ShareAlike/Attribution-NonCommercial-ShareAlike license (for non-code). Program materials that were not created as part of this program and which constitute MinT's existing IP may not be shared. All of CodeDay's existing IP is already available under an OSI or Creative Commons license.

- **Publications:** The PIs and/or the evaluator will publish all final copies open access. Preprints may be shared on ArXiv or a similar preprint archive.
- **Participant Data:** Live electronic data will be stored in PostgreSQL or MySQL databases, which are backed up regularly and secured in compliance with industry-standard SOC 2 security requirements. Databases are only accessible from an internal network with a password which is only available to production software running in the same security environment; neither PIs nor the evaluator will not have direct access to data. Code that accesses production data will be subject to code reviews prior to deployment to production. Hard copy data containing PII will be stored by either the PI or evaluators in locked filing cabinets in locked offices. Anonymized datasets will be made freely available to the research community for analysis and redistribution, subject to IRB approval.
- **Open Source Contributions:** Students will make their completed contributions available publicly under an OSI-approved open source license and will be viewable from an open-source hosting platform (such as GitHub, Gitea, Gitlab, Bitbucket, etc.) selected by the students or the associated project.

Long-Term Preservation

- **Planning Materials, Program Materials, Analysis, and Reports:** Copies will be archived for at least five years following the completion of the project on CodeDay's secure archive infrastructure. Copies will be sent to Washington State Center of Excellence in Information & Computing Technology and the AppConnect NW network for possible inclusion in these agencies' resource libraries.
- **Publications:** One long-term strategy for archiving the outcomes of this project will be through publication in journals and conference proceedings. Publications will be available indefinitely in the journal in which they are published, and preprints may be archived indefinitely in ArXiv or a similar preprint archive.
- **Participant Data:** All data will be electronically archived on CodeDay's secure archive infrastructure for at least five years following the completion of the project. Publicly released data will be archived indefinitely on the Center for Open Science's OSF Storage, and data relevant to publications will also be included in the journal's data repository, when available.
- **Open Source Contributions:** Student contributions will be archived by the open-source hosting platform and to other mirroring platforms.

MENTORING PLAN

The project will expand Mentors in Tech (MinT)'s existing mentoring program and curriculum by incorporating students served by this project. MinT offers a structured program and a tailored curriculum that closes the student support and social capital gap to larger, more established and well-known CS programs. MinT builds meaningful long-term industry mentor relationships and offers resources, industry connections, and an inclusive community of students and industry mentors. MinT is able to help the diverse student population equitably, and inclusively, gain access to experienced industry mentors and industry opportunities.

The end goal for the MinT program is for students to be able to successfully prepare a student's transition from a student to a technology professional within 6 months of graduation, and land a role in tech.

Because the diversity of MinT students is important, the MinT curriculum for students is flexible and includes 12 monthly modules that the student and mentors can self-pace depending on where the student is in their process of entering emerging tech. Student-facing program elements totalling 40 hours annually per student:

- Each student is trained in how to be a mentee in the MinT program and then matched with two trained industry mentors based on student preference, and mentors and student background match.
- Each student meets with each mentor 1:1 once a month from November to June, and writes a structured reflection for each meeting afterwards.
- MinT provides a curriculum and resources for each meeting including mock technical interviews, LinkedIn, behavioral interviews, etc. for the whole academic year.
- Students attend a monthly MinT workshop and optional office hours with experienced industry recruiters.
- Students submit 3 job applications every month.

Orientation and Networking

Both mentors and mentees are trained before the start of the program and the mentor-mentee matching process. Topics in training include:

- *Mentorship goals:* What the mentee would like to get out of the program and what their definition of success looks like. Ultimately, with the help of their mentors, they are able to launch their careers in emerging tech.
- *Expectations* of the programs are set as well as the roles of a mentor and mentee, what the mentor-mentee relationship in the context of the program entails, the successful completion of components of the program that will help the mentees reach their career goals in tech.
- *Communications norms:* the structure and curriculum for the program and how

mentees and mentors will communicate, establish regular recurring one-on-one mentorship meetings virtually. How to ask the right questions and type of questions.

- *Conflict resolution:* How to listen, especially to each other with different backgrounds and experiences. MinT program code of conduct, and support from MinT staff.
- *Confidentiality:* a range of scenarios that mentors and mentees might face when interacting in the course of the program.

The networking component of mentorship is included in their 16 one-hour one-on-one meetings that take place online, as well as in cohort activities: the online LinkedIn discussion group, monthly workshops and panels, and employer information sessions.

Individual Development Plan and Competencies for a Successful Career

The IDP is jointly managed by the mentor and mentee depending on where the mentee is in their career journey as well as their year in school. There are 3 tracks of curriculum topics that the mentor-mentee team can select. They can also build their own plan and monthly calendar depending on what is happening in the mentee job search process. For example, they can move up the Mock Interview meetings if they get an interview or skip ahead to offer and negotiations if they have an offer in progress.

Meeting topics include: Tech lay of the land, how tech hires, the job search process, resume review, tech interviews, managing your network, culture and conflict at work, offers and negotiation, working as an employee and managing up, planning your next career step, managing money, and final commitments and next steps after MinT program.

After each mentorship meeting, both the mentor and mentee will have an opportunity to write a reflection and fill out a structured reflection form and status which is reviewed by MinT staff as well as partner faculty.

As a part of the IDP and the 16 one-hour one-on-one mentor meetings, students are able to develop competencies for a successful career in emerging technologies including career and self-development, critical thinking (including technical and behavioral interviews), Equity and Inclusion (working as an employee and culture at work), leadership, professionalism, teamwork, and technology used in industry.

One-on-One Meetings

One-on-one mentor-mentee meetings are the core of the MinT program. There are 16 of them from November to June. A student has two (2) mentors that they choose that will be with them for the entirety of the school year. Having two mentors that they can meet one-on-one each month with different backgrounds and experiences exposes the student mentee to different aspects and points of view in a wide variety of roles, companies, and experiences that mentors can share even on the same meeting topic. This contributes to the overall preparation for the students to step into a very wide career field in emerging tech.



September 7, 2023

Rebecca Shearman, Nina Maung-Gaona, and Mary Crowe
National Science Foundation
2415 Eisenhower Ave
Alexandria, VA 22314

Technology Division

12401 SE 320th Street
Auburn, WA 98092-3622

(253) 833-9111
Fax: (253) 288-3419

greenriver.edu

Dear Drs. Shearman, Maung-Gaona, Crowe and ExLENT Review Panelists:

I am a faculty member at Green River College in Information Technology and Computer Science and the program director for the Data Analytics and Software Development program writing this Letter of Collaboration on behalf of my college and program for Tyler Menezes and Kevin Wang's NSF ExLENT proposal entitled "Beginnings: Enabling access for overlooked and underserved community and technical college computer science students in artificial intelligence with micro internship and industry mentorship (CTCtoAI)".

Green River College is a community college with roughly 7,000 students, designated as a minority serving institution (MSI, AANAPISI), received recognition for advancing equity and success in STEM and for community college – employer partnerships, and is located in the Kent Valley / South King County region of Washington State. The city of Kent, WA is in the college's service area and has been recognized as one of the most diverse cities in the U.S. and as a center for advanced manufacturing and the college also serves students who live in South King County and currently work in or intend to work in the Seattle tech hub, roughly 25 miles north of the college, where artificial intelligence technologies are developed and applied.

In addition, I serve as a Faculty Associate on the AppConnect NW project (NSF Award 1700629), a collaborative network of faculty at nine community and technical colleges with similar programs and shared vision, including Lake Washington Institute of Technology (MSI/AANAPISI), North Seattle College (MSI/AANAPISI), Renton Technical College, Cascadia College, Bellevue College, Centralia College, Edmonds College (MSI/AANAPISI), Skagit Valley College, and Green River College.

In my existing roles, I have worked with both PIs, Tyler Menzes and Kevin Wang, for over five years to connect our community and technical college students with their respective organizations, CodeDay and Mentors in Tech. In the CTCtoAI project, I will serve as an unfunded collaborator to support the following efforts in their project:

- Connecting and referring community and technical college students to the micro-internship and mentorship opportunities offered by the CTCtoAI project team
- Serving as a liaison to community and technical college faculty members in the AppConnect NW network of nine colleges to help broaden student participation across the Puget Sound region in Washington State and to help identify curriculum alignment opportunities
- Providing input and feedback on program design and improvement in the CTCtoAI project
- Supporting data collection activities in the project evaluation effort
- Contributing to project dissemination activities that target educators in the region and across the nation



Thank you for considering this proposal and I look forward to supporting the project PIs and staff in this important work to connect students with experiential learning opportunities in emerging technologies. Please do not hesitate to contact me at khang@greenriver.edu if you have any questions or if there is anything else I can do to advocate.

Sincerely,



Kendrick (Ken) Hang
Instructor in Information Technology and Computer Science
Program Director for Data Analytics and Software Development



September 11, 2023

Rebecca Shearman, Nina Maung-Gaona, and Mary Crowe
Experiential Learning for Emerging and Novel Technologies (ExLENT) Program
National Science Foundation

Dear Drs. Shearman, Maung-Gaona, and Crowe,

Building Inclusive Labs (BIL), is a collaborative initiative between a community college biotechnology program (Community College of San Francisco, CCSF) and a top-tier research university and technician employer (University of California, San Francisco, UCSF), supported by NSF's Advanced Technological Education (ATE) program, whose overall goal is to build more inclusive workplace environments for community college (CC) students pursuing biotechnology education and careers.

Over the past seven years, this initiative has: 1) trained 800+ scientists from industry and academia in tools to operationalize inclusivity in the lab, 2) developed a parallel training for CC students to navigate barriers to inclusivity in the workplace in which 150+ students have participated, and 3) created a novel Inclusive Mentoring Fellows program, in which internship mentors are coached as they apply inclusive workplace practices while mentoring CC interns. These trainings have been adapted and tested for industry and academic labs and have increasingly gained national recognition.

If the CTCtoAI proposal submitted to the ExLENT program by Tyler Menezes and Kevin Wang is selected for funding by NSF, it is our intent to collaborate as detailed below for the duration of our NSF ATE project funding:

- Providing opportunities for community college students and faculty related to this proposal to participate in BIL's Workplace Navigation Training, especially those engaged in experiential (work-based) learning and/or getting ready to enter the technical workforce
- Providing opportunities for industry partners and/or faculty members related to this proposal to participate in BIL's Inclusive Mentor-Manager Training
- Fostering an experiential learning community of practice to share practices across emerging technology sectors: from biotechnology to artificial intelligence

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The BIL project team looks forward to sharing our evidence-based practices with the C2AI project team with the goal of transferring and applying our lessons learned from the biotechnology sector to another emerging technology sector: artificial intelligence.

Sincerely,
James Lewis, Karen Leung and Naledi Saul

James Lewis
Project Director/Bridge to Biosciences/CCSF CIRM Internship Program
jlewis@ccsf.edu

Karen Leung
Research Internship/Mentorship Director, CCSF
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Naledi Saul
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September 12, 2023

To Whom It May Concern:

I am writing in support of the proposal Tyler Menezes and Kevin Wang submitted entitled "Beginnings: Enabling access for overlooked and underserved community and technical college computer science students in artificial intelligence with micro internship and industry mentorship (CTCtoAI)."

Serving as a leading resource for institutions seeking to redefine their higher education practices and offerings, the Community College Baccalaureate Association (CCBA) aims to promote affordable access to community college baccalaureate degrees to close the nation's racial, ethnic, and economic gaps.

Today, with the support of the CCBA, 24 states allow their community colleges to offer baccalaureate degrees at approximately 170 institutions. The CCBA and its members will continue redefining higher education to benefit students, their communities, the national workforce, and the global marketplace.

One of CCBA's roles is to foster the development of IT, CS, artificial intelligence, and emerging technology field baccalaureate degree programs at community and technical colleges nationwide. One of our key activities and commitment also includes research and dissemination on Community College Baccalaureate (CCB) policy and program implementation, including housing the nation's most current and comprehensive inventory of CCB degree programs.

Emerging Technology programs represent one of the fastest growing segments in the community college baccalaureate space as community colleges can respond to rapidly changing industry workforce needs.

Mentors in Tech and CodeDay presented on experiential learning at our 2023 CCBA Conference, and we recognized their work in our publication 20 Promising Practices to Advance Quality, Equity, and Success in Community College Baccalaureate Degree Programs.

In collaboration on the CTCtoAI project, we will support dissemination efforts by having Mentors in Tech and CodeDay present project findings to community college administrators, faculty, and leaders, as well as researchers who study community colleges at future CCBA national conferences for the duration of the project.

If you have any questions, please feel free to contact me at akersenbrock@accbd.org.

Sincerely,

Angela Kersenbrock

Dr. Angela M. Kersenbrock
President/Executive Director
Community College Baccalaureate Association
(407) 463-2201

September 12, 2023

To Whom It May Concern:

If the proposal submitted by Tyler Menezes and Kevin Wang entitled "Beginnings: Enabling access for overlooked and underserved community and technical college computer science students in artificial intelligence with micro internship and industry mentorship (CTCtoAI)" is selected for funding by NSF, it is my intent to collaborate as detailed below.

The Washington State Board for Community and Technical Colleges — led by a nine-member governor-appointed board — advocates, coordinates and directs Washington state's system of 34 public community and technical colleges.

Each year, about 262,000 students train for the workforce, prepare to transfer to a university, gain basic math and English skills, or pursue continuing education. Our students, graduates and community partners increase the state's quality of life and economic vitality as entrepreneurs, employees, consumers, and taxpayers.

One of SBCTC's roles is to facilitate the development of baccalaureate degree programs at the community and technical colleges in Washington State as authorized by our state legislature. With Senate Bill 5401 Authorizing community and technical colleges to offer bachelor's degrees in computer science passing in 2021, there is a new opportunity for our community and technical colleges to collaborate with industry partners to obtain valuable feedback and to foster career-connected learning opportunities. Through CTCtoAI, CodeDay and Mentors in Tech serve as both industry partners and as intermediaries to other industry partners to connect our students with experiential learning opportunities in emerging and novel technologies like artificial intelligence.

In collaboration with CTCtoAI, SBCTC is committed to connecting project PIs with educators and students at our community and technical colleges (CTCs) to help expand and broaden participation. SBCTC leads an Equity in CS Workgroup representing 34 Washington State CTCs with IT / CS and emerging technology degree programs working together to close equity gaps in tech and we will coordinate efforts between our Equity in Computer Science Workgroup and CTCtoAI staff to ensure faculty in all of our programs across the state are aware of experiential learning opportunities provided by this project.

In addition, SBCTC is committed to fostering an environment of co-learning between our program faculty and CTCtoAI staff to help identify promising practices and support educational research efforts. From 2017 through 2022, we collaborated with The Northwest Network for Application Development and Technology Connections (AppConnect NW) project, NSF Award DUE-1700629, which involved nine of our CTCs, the Washington Technology Industry Association (representing the tech sector) and included CodeDay and Mentors in Tech working together to pilot some of the foundational components in CTCtoAI with students in community college baccalaureate programs.

If you have any questions, please feel free to contact me at jhammer@sbctc.edu

Sincerely,



Joyce Hammer, PhD
Deputy Executive Director
WA State Board for Community and Technical Colleges



STATE OF WASHINGTON
WORKFORCE TRAINING AND EDUCATION COORDINATING BOARD

128 - 10th Avenue, S.W. • PO Box 43105 • Olympia, WA 98504-3105
Phone: (360) 709-4600 • Fax: (360) 586-5862 • Web: www.wtb.wa.gov • Email: workforce@wtb.wa.gov

September 12, 2023

To Whom It May Concern:

Please accept this letter of support and partnership for the proposal submitted by Tyler Menezes and Kevin Wang entitled “Beginnings: Enabling access for overlooked and underserved community and technical college computer science students in artificial intelligence with micro internship and industry mentorship (CTCtoAI).” There is great potential for collaboration between this project and the state’s workforce development system. The Washington State Workforce Board, the planning and oversight body for this system, is a state agency based on a partnership of business, labor and government dedicated to helping Washington residents succeed in family-wage jobs, while meeting employer needs for skilled workers. Our vision is that every Washington community is thriving, inclusive and economically resilient.

The Workforce Board published the Washington State’s Workforce Economic Recovery Plan in September 2020 and the recommendations in the plan align strongly with the proposed project. The state’s economic recovery must include preparing the workforce for the high-demand, high-skill jobs in emerging technology fields like artificial intelligence (AI) that offer stable growth and future advancement, and the state must focus on equity of opportunity.

Most of the participating students in the project proposal have part-time and full-time jobs in addition to school. They often have little to no experience using emerging technology in real-world workplace situations and are unable to leave their jobs to take traditional summer internships. They rarely have established contacts in emerging tech fields, which puts them at a huge disadvantage during job interviews and the job application process.

We learned that being around emerging technology and AI —seeing it used regularly, and within social networks, are important aspects of choosing an emerging tech-based career path, getting a job, and being promoted in the tech industry. But such visibility and social capital is absent in many of our student communities. Without family and friends working in technology-based jobs, it is difficult to imagine oneself being successful in these careers, knowing what careers exist, or seeking out education and training programs to prepare for high demand tech-based careers.

This proposal aligns well with the Workforce Board’s recommendation for inclusive economic recovery by providing students with opportunities to engage with technology industry professionals on meaningful real-world emerging technology and AI projects, while enhancing the ability to support themselves and their families with a stipend. This program will help participating students become more competitive candidates in emerging tech as they complete their course of study and transition from students to professionals. We believe micro-internship projects using emerging technology solving real world problems with tech industry mentors is a vital next step for these students in their career development.



STATE OF WASHINGTON
WORKFORCE TRAINING AND EDUCATION COORDINATING BOARD

128 - 10th Avenue, S.W. • PO Box 43105 • Olympia, WA 98504-3105
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While CTCtoAI is focused on artificial intelligence (AI) and the computing sciences, the Workforce Board can help broaden the impacts of this project by sharing this project and model with other emerging technology sectors in Washington state including advanced manufacturing, cybersecurity, wireless and advanced communication technologies, biotechnology and to broader audiences: rural areas, tribal colleges, formerly incarcerated individuals, and helping students from a variety of backgrounds into education opportunities that will lead to entry into the state workforce. Many of the individuals targeted by this program come to the community colleges from our state's WorkSource Centers—part of the America's Job Centers network.

If you have any questions, please feel free to contact me at eleni.papadakis@wtb.wa.gov.

Sincerely,

Eleni Papadakis

Executive Director

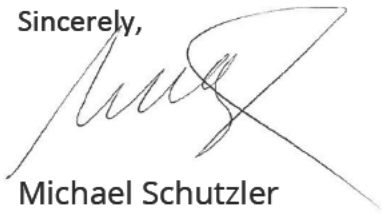
eleni.papadakis@wtb.wa.gov; 128 10th Avenue SW, Olympia, WA, 98501; (360) 709-4600





mschutzler@washingtontechnology.org

Sincerely,

A handwritten signature in black ink, appearing to read "Michael Schutzler", is written over a white rectangular background.

Michael Schutzler

List of Suggested Reviewers

Data Not Available

List of Reviewers Not to Include

Data Not Available

PANEL SUMMARY

PANEL RECOMMENDATION: Highly Competitive

Through experiential, mentored learning in Artificial Intelligence and Machine Learning, and through microinternships, the investigators plan to increase the partnership among higher education, workforce preparation credentialling, and AI/tech industry in Washington State through an annual ten-month program, of which eight months will be mentored. In so doing they hope to create a talent pipeline and launch the careers of 150 students from community and technical colleges (CTCs) in three annual cohorts.

Intellectual Merit

Strengths

The team of investigators has tried out the microinternship format successfully through PI Menezes' CodeDay effort, and draws on their businesses' experience in building the proposed project. Particular strengths:

- The feedback loop created by the mentoring sessions, and the flexibility of the formats for these, promised a well-supported experience for all.
- Methods of education and training are pedagogically supported.
- Appropriate remuneration for the time commitment required of the students is budgeted. The fact that the majority of the budget is designated to support students resonated with the RFP.
- Not only the students, but the career mentors (based on protocols developed by P.I. Wang's Mentors in Tech (MinT) program), are trained and know what they are doing. Moreover, the students are accorded time to reflect and change before reaching the end of the program. One reviewer noted that this proposal does well at fulfilling the eight principles put forth by the Society of Experiential Education. <https://www.nsee.org/standards-and-practice>

Concerns

The microinternship model proposed here relies on open source projects, which the investigators say promotes diversity. Concern was expressed that open source might not be as welcoming as anticipated, and that this would need to be monitored more closely than is indicated. P.I. Menezes' company, CodeDay, has built partnerships with AI Open Source projects for these internships, but which open source projects would be included in this project? The level of tasks that students would contribute to open source was also questioned. The investigators describe these as simple, but the panel was concerned that student work might not be important and complex enough to prove their competency to future employers. More details about the open source tasks or an example of one or two would have strengthened the proposal.

The panel also expressed concern about the difficulty of locating authentic open source projects that students could both learn from and contribute to, suggesting that the issue represents a disconnect between the project's goals and the way industry works. More details about the tasks or an example of tasks would have strengt disconnect between them.

While the investigators state they have other programs that will help them recruit enough students, they don't say how they will deal with getting too many. What will their criteria be for choosing among them? If, for instance, they began to look at GPAs, that could represent a barrier to the students they wish to attract.

Another concern: the investigators say they expect 90% participation from their selected cohort. We wondered whether there was a contract for participation – and why a more ambitious 100% wasn't required. Do the investigators feel they are taking a risk? Or is this expectation based on their prior experience with this format?

In terms of the required number of mentors, the statement is made that students will be grouped in twos and threes with their mentor based on mentor availability. We weren't sure how this would work out in practice, and were concerned about the investigators' ability to ensure this intended ratio of mentor to students.

Broader Impacts

Strengths

The intention is to train 150 students representing diverse backgrounds from community and technical colleges. The investigators intend to expand learning opportunities for their students while enlarging their current curriculum programs. They are already working with many state and regional programs and will use and expand on these as they develop their proposed project. Particularly compelling was the projection that the planned experiential learning might sustain engagement that might lead to further education and credentialing for these students. The ExLENT section is proposed as an enlargement and iteration of what has been achieved on a smaller scale, but the new proposal is specific to AI/ML, and the previous project was not.

Concerns

The stipend allotted for students did not take into account the potential need for personal computers, a potential barrier to participation in this program. The panel was concerned that, without addressing this issue, the project might not be able to assure that students would attain the necessary practical training.

Solicitation Specific Review Criteria

To what extent does the project create on-ramps for diverse individuals into careers in emerging technology fields and to what extent does the project provide participants with a path beyond the ExLENT program?

Through structured mentoring and microinternships, this program will support and train 150 underrepresented students from community and technical colleges with the goal of launching their careers.

To what extent does the project reduce barriers so that members of groups historically under-represented or underserved in STEM can acquire the training and learning needed for careers in emerging technology?

The project will match students with two independent mentors, with whom they will make monthly structured reflections on the scheduled workshops, trainings, job applications, and other aspects of the program.

To what extent does the project develop the interests, motivations, skills, knowledge, and/or proficiencies of workers in emerging technology?

The proposal incorporates coursework, personal mentoring, and best practices concerning job training and engagement with industrial partners.

Additional Areas of Evaluation

Data Management Plan

The panel reviewed the proposal's data management plan and found it to be adequate, although one panel member wondered whether the open source licenses involved would be permissive enough to be useful to students.

Postdoc Mentoring Plan

N/A

Results From Prior NSF Support

N/A

Summary Statement

The panel ranked this proposal highly competitive. The panel believed that the issues raised above could be properly addressed. The primary concern to be addressed is the quality and content of the microinternships and how employers will view the relevance to future careers. Such a program, which takes into account the diversity of background, experience, education, and skill levels of community college and technical students, without imposing barriers to participation, has the potential to transform the working lives of those involved, as well

as to fill growing needs for those with AI/ML abilities as those fields expand. The funds requested for mentoring through the Mentor in Tech organization is appropriate; the plan is well-detailed, with a strategy for orientation, networking, individual plans, and one-on-one mentoring. Additionally, the program meets the RFP goal of bringing non-higher education organizations to the table. The summary was read by the panel, and the panel members concurred that the summary accurately reflects the panel discussion.

REVIEW 1

Rating: Excellent

Intellectual Merit

The project aims to build a diverse AI/ML workforce by training students from community and technical colleges. The training enables students to become enablers and developers of AI/ML and provides practical skills in application of AI/ML tools for real-world applications in academia and industry. Success of the training is measured through experiential learning in terms of micro-internship, industry mentoring, and diverse career opportunities in both academia and industry. The evaluation plan has necessary elements to be successful and based on the PI team expertise, the project has high likelihood of being successful.

The budget is about evenly distributed across PI and clerical support and the participant support cost. The students – especially minority, underserved, or underrepresented – may not have access to personal resources to acquire personal computers (or laptops) for training and internship activities or knowhow for such activities. Lack of access to suitable computing will limit their success irrespective of the intellectual merits of the proposed activities.

Broader Impacts

Up to 150 students will be trained across three cohorts during the project period. The program aligns with various state and regional workforce development arms for broadening participation and impact. Moreover, the program leverages products from recently completed grants (eg. AppConnect NW: DUE1700629). In summary, the project has high likelihood of success. The recipe is scalable and can help developing globally competitive workforce. For example, the key ingredients currently lacking in any training are convergence thinking, adapting AI/ML tools across applications, and coding experience.

The students may not have access to personal computers or have financial resources to secure them for the training. The stipend (\$25/hr) may motivate them to buy their own device or may become undue burden on them as a part of the program requirement.

Solicitation-Specific Review Criteria

The project evaluation and mentoring plans are adequate. The training in AI/ML, open-source software use and development, and coding experience in direct context with real-world applications provide students on-ramps for diverse careers in AI/ML tool development and applications and path beyond ExLENT program. Experiential learning via micro-internships provide access to widespread opportunities while reducing the learning and engagement barriers for disadvantaged groups including minorities and underrepresented or underserved communities. The connection between AI/ML tools and their real-world applications established through industry mentoring assists in motivating and skill building opportunities among the trainees, provides new networking opportunities for academic and professional success pathways.

Summary Statement

The project aims to enable, build, and develop future domestic workforce in AI/ML technologies for industry and academia. The trainees will be drawn from community and technical colleges and represent minority, underserved, or underrepresented communities. They will engage in experiential learning through micro-internships and mentorship with industry. A total of 150 trainees will be prepared during the project. The model leverages results from federal grants, state and regional programs for broadening participation and impact. The project is unique in terms of addressing skills shortage in translating application needs into AI/ML technologies through open-source software development. The project has potential for enabling globally competitive workforce. However, the students engaged through this program are assumed to have access to computers for programming and engagement in the project goals. In reality, the underserved groups may not have resources to maintain personal computers or have understanding of the scope of these capabilities for their job readiness.

REVIEW 2

Rating: Excellent

Intellectual Merit

For this proposal, the primary intellectual merit applies to the beneficiaries of the project, the 150 Community/Technical College students who will be recruited to take part. While they will be brought up to speed in terms of skills and their understanding of Artificial Intelligence/Machine Learning, emphasis will be placed upon experiences that will build their sense of the role of related industries, and, just as vital, of their own potential to contribute to them. Their identities as current and future contributors will be developed in concrete and emotional terms, as they learn not only how their attributes can benefit these fields, but also how to go about building relationships and confidence, allowing them to move forward independently.

Broader Impacts

The broader impacts benefits of this project apply to the industries that report a struggle to find candidates from underrepresented minorities to hire as they attempt to increase the new perspectives needed, as well as to the CTC students who heretofore have had difficulty finding the pathways into these industries or fields. The scale at which the project is projected suggests its potential to change the impact as well as the image of CTCs by more firmly establishing them as resources to the AI/ML industries.

Summary Statement

I find no weaknesses.

Strengths

- The development of a broader and more impactful talent pipeline based on existing processes. The principal investigators and their collaborator at the CTC level know what they are doing, and support it with their own research and understanding of how to proceed, as well as the bigger picture of other's research into career education and pathways. Thus their project will involve implementing a "fully-fledged" program informed by best practices that have already been proved effective.
- Their plan is concise, specific, and sustainable. The proposal conveys a vivid understanding of the barriers faced by the students it addresses, lays out a plan involving precise time demand and compensation, and sites the work in an environment formed by an appropriate number of industrial partners prepared to provide the needed mentorship – and includes a plan B. The investigators demonstrate that they know how to scale and sustain this project in order to impact thousands of students, well beyond the initial cohorts.

- The proposal is specific about the objectives micro internships can foster or achieve, and will be intentional about reaching their goals.
- The plan for evaluation is direct, demonstrating not only criteria but how to measure it and at what phase in the project. Their independent evaluator is competent.
- The PIs are established in this work and well experienced to create what they propose. Each has already guided many students through this kind of program. For example, CodeDay has already built partnerships with AI open source projects for internships. This project will further the current work of both PIs.

REVIEW 3

Rating: Excellent

Intellectual Merit

Strengths

The proposal for this program is very well written and thought out with the required details being provided along with the support of the partnerships that are mentioned. The Experiential Learning activities that are mentioned are participation in micro-internships and career mentoring. Through the internship, there is a low level of time commitment and the stipends provided to those involved which helps with some of the barriers that are identified in the community college and technical college student body. Not only does the micro-internship provide these students with a hands-on real-world experience as they will be working on an open-source AI project, but it allows them to interact with an industry mentor during the project. It is mentioned that the industry mentor is not made aware of the project ahead of time so that the students in the micro-internship and the mentors are able to consider each other colleagues versus having a mentor that would be “teaching” the students in the micro-internship. This is highly important because research shows that a successful experiential learning internship is one where the person who provides the experience, in this case, Career mentoring, becomes a co-learner with those who are participating in the experiential learning activity. With the aspect of not making the mentors aware of the projects ahead of time, this allows for them to be co-learners with the students which provides the students the experience of working with someone.

The proposal also focuses on the training that takes place as an onboarding process for both the students going through the program and those who are mentors in the program. This allows everyone to have the appropriate training to fully understand their expectations and goals of the project and be able to work through the micro-internship. Second, there is a period of reflection for the students that go through the program and the focus of the reflection is discussed based on how students should complete the reflection, blog, or video, and those reflections will be shared with industry partners.

The evaluations and assessment of the program have key questions being asked that are not only focused on the learning of AI/ML concepts from the students but also in association with their skills and views of the workforce, which is important as there is a career-mentoring piece associated with this project.

The PI and Co-PI for this project are with organizations that have had successes with other endeavors and they also have the background and experience to lead this project into success.

Concerns

Within the proposal, it is mentioned and a timeline is provided that the program is an 8-month program. The proposal documents what will occur during the first 4 weeks, which is when the students will have completed their first micro-internship. The remaining time is

shown on their timeline as the place where students complete their second micro-internship and continue their Career mentoring, but outside of the image there are not any details provided so one is left to assume that the program continues similar to what was set up during the first 2 months.

The PIs also mention that due to other programs that they have had they are certain that they will not have any issues in being able to recruit the 150 students for the program, however, the selection process if more than 150 students apply is not discussed.

It is not mentioned if the program will have student earn any type of course credit toward their community college or technical college curriculum. It also does not state if there is a certificate or participation or some other way that the participation in the micro-internship will be recognized.

Broader Impacts

Strengths

The proposal highlights the barriers that students in community colleges and technical colleges face. Keeping the time commitment to a minimal requirement and providing a stipend addresses the challenges faced by these students. The proposed structure for their program also seems to be scalable and adaptable. This makes it so that it may be replicated by other organizations/institutions with the appropriate partnerships. The PIs have also partnered with significant organizations within Washington state that can assist in expanding the program throughout the state.

Concerns

The only concern with the broader impact is the fact that the proposal mentions that there are over 150 students who are predicted to be interested in the program. There are no details associated with how the selection of students will be made for the program if there are over 50 students interested each year.

Solicitation-Specific Review Criteria

To what extent does the project create on-ramps for diverse individuals into careers in emerging technology fields and to what extent does the project provide participants with a path beyond the ExLENT program?

The program will begin with community college and technical college students. The project can extend beyond the program as students can then go on to four-year degrees. While there is no connection to the 4 year schools, through the project students will meet industry partners through the career mentoring program and their reflections. These opportunities may allow them to make connections that can be valuable once they are ready to enter the workforce.

To what extent does the project reduce barriers so that members of groups historically under-represented or underserved in STEM can acquire the training and learning needed for careers in emerging technology?

The PIs have taken into consideration the demographic and the barriers faced by community college and technical college students. Through the minimal time requirement and the stipend provided by the project, they are assisting to reduce the barriers for the students who will participate.

To what extent does the project develop the interests, motivations, skills, knowledge, and/or proficiencies of workers in emerging technology?

The project develops interests, motivations, skills, knowledge, and proficiencies throughout. From the beginning training that participants receive, being able to work on an open source project that contributes to the AI project, and then having the mentoring from a career professional and ability to work with them on the given projects. The participants are able to learn while doing, and at the same time learn about the workforce from their mentor. At the same time, the mentor has the opportunity to learn from the students, not just because they are working on the projects together but because the students are essentially having the opportunity to showcase themselves to the career mentors.

Summary Statement

I am very much supportive of this proposal. The PIs have taken into consideration all aspects of the items being requested and have considered the barriers for the students that they are attempting to recruit to the program.

The only parts of concern that I have with this proposal, budget, etc. is that it is not mentioned if this program is essentially an “extra-curricular” opportunity for students if it will count towards their degree somehow, or how the selection will be made if more than 50 students apply for the project per year.

Otherwise, I am very confident in the proposal and that the PIs will have success with the proposal. They have “key” organizations that are listed as partners and have provided letters of support for the proposal.

REVIEW 4

Rating: Very Good

Intellectual Merit

Strengths

- The team and the partner institutions (CodeDay, MinT, CTC associations, Washington State industry associations etc.) have the background/expertise to carry out the work essential to the project/proposal and the plan seems to have a likelihood of being successful. The team has a background that highlighted the efficacy of micro-internships as an instrument for general computer science students from CTCs and state colleges. It is likely that with suitable modifications for emerging AI technologies, a similar approach (as proposed) might successfully guide CTC students towards careers in emerging technology fields.
- The project identifies and tackles a critical issue with CTC students getting a technology job post-graduation — internships or lack thereof. CTC students find it challenging to overcome issues related to time commitment required for an internship. The micro-internship format is very promising: with the flexibility of asynchronous feedback / mentoring built into the project plan and a decent wage for the time-commitment, it has the potential to elicit student interest and make student recruitment quite easy.

Concerns

- The authors claim that open-source work increases diversity and cite references that contributions to open-source projects can impart the students with a sense of contributing to society. While the latter may indeed be true, open-source projects have a long history of being unwelcoming (even spectacularly successful projects like Linux), and despite the presence of “code of conduct” for many open-source projects, online feedback from community members can often be off-putting to put it mildly. Thus, the choice of open-source projects that the student cohorts will contribute to, as well as the selection of mentors is crucial (and challenging). There is also a chance that the experience of contributing to the open-source project can vary based on the student’s background.
- The proposal mentions that the tasks selected for the micro-internship (i.e. open-source AI/ML projects) are expected to be very simple. It might be challenging to present the work completed in the micro-internship to potential employers and claim its significance. Related to the point above, the choice of the open-source project affects this as well. The authors point us towards reference #20 for open source AI-projects/partnerships that are in place but that reference points to an ITiCSE paper that gives Crates.io as an exemplar open-source project and that does not really work as an AI/ML project.

Broader Impacts

Strengths

The project focuses on an underrepresented group in emerging technology careers, namely CTC students. Additionally, the substantial number of direct learners (150) enhances the project's impact. The knowledge produced, including curricular and instructional materials, has the potential to extend beyond the project's intended geographic scope in Washington State. The micro-internships can facilitate connections between academia and industry. The project addresses concerns about time commitments and remuneration for CTC students that can potentially be adopted/adapted for CTC students across the country.

Concerns

N/A

Solicitation-Specific Review Criteria

1. To what extent does the project create on-ramps for diverse individuals into careers in emerging technology fields and to what extent does the project provide participants with a path beyond the ExLENT program?

The project creates experiential learning opportunities for at least 150 CTC students from diverse backgrounds and provides them an on-ramp to emerging AI and AI-assisted fields. Components like community building, mentoring and interview preparation for CTC students can extend well beyond the ExLENT program.

To what extent does the project reduce barriers so that members of groups historically under-represented or underserved in STEM can acquire the training and learning needed for careers in emerging technology?

By alleviating concerns regarding time commitment for CTC students wrt internships, the project reduces significant barriers to learner adoption. The work on open-source AI/ML projects should also help the students build self-sufficiency, and reduce the barrier to finding industry/career opportunities.

To what extent does the project develop the interests, motivations, skills, knowledge, and/or proficiencies of workers in emerging technology?

This proposal aligns well with this particular aspect of the solicitation. The micro-internships involve mentoring sessions, practice interviews etc. that are very pertinent to developing learner interest, motivations and skills with respect to AI and AI-assisted technologies.

Summary Statement

Strengths of the proposal include the team's expertise, background, and the potential success of micro-internships as catalysts for CTC students being successful in emergent technology

careers. This proposal seems to align itself well with the goals of the ExLENT program with few caveats (e.g. choice of open source projects).

a. Provide more details regarding your recruitment and selection plans.

How will your project ensure that it will serve a diverse set of participants, especially individuals from groups historically and currently underrepresented or underserved in STEM?

To serve diverse students, the project will (1) partner with colleges who serve diverse students who are underrepresented and underserved in STEM, (2) engage in targeted outreach at those schools, (3) ensure our selection process is fair, (4) design the program around their unique needs, and (5) work with partners for inclusive support and community-building.

- (1) To ensure we reach a diverse group of students, the project will partner with a group of CTCs which serve highly diverse participants. Our partner community and technical colleges typically serve a broader and more diverse student population compared to traditional four-year institutions. According to the Washington State Board for Community and Technical Colleges data, 46% of Washington state's CTC population are students of color, 55% women, 36% receiving Pell grants, and 3% veterans. (Nationwide, these numbers are 56% students of color, 55% female, 25% first-generation immigrants, 33% receiving Pell grants, 15% parents, and 10% veterans.)
- (2) We will work with partner college faculty and staff at these institutions to engage in targeted outreach to recruit students from groups who are underrepresented and/or underserved in STEM. For example, at one of our partner colleges in the AppConnect NW network, Green River College, an Asian American and Native American Pacific Islander Serving-Institution (AANAPISI) / Minority Serving Institution (MSI), we may work with faculty and staff to recruit students who have engaged in a STEM support program such as the Louis Stokes Alliances for Minority Participation (LSAMP) program, TRiO Student Support Services - STEM, and the Math, Engineering, Science Achievement (MESA) program. In addition, we can recruit students who may not have formally declared a STEM major/pathway by working with college offices such as the Indigenous Student Success Center; AANAPISI Program; and Office of Diversity, Equity and Inclusion.
- (3) The selection process is designed to (a) find students who can meet the commitment and technical bar to successfully complete the program and (b) prioritize those furthest from opportunity. Recognizing that students have faced a variety of barriers to get to where they are, our goal is to offer a variety of pathways to demonstrate that technical competence (see answer to a.i. below). Once we have a list of eligible students, we prioritize those who are furthest from opportunity (e.g., without prior internships, closer to graduation, receive need-based financial aid).
- (4) We recognize that recruiting these students is only the first step in the journey. The micro-internship format was originally designed to meet the needs of the diverse student population at CTCs, who often have competing commitments (such as being a caretaker or breadwinner). Most Work-Based Learning opportunities have large time commitments and a rigid schedule which cannot fit into these students' lives, while the micro-internships are designed to require a small weekly time commitment and allow for significant flexibility in scheduling meetings with teammates, TAs, and mentors. The paper "Open-Source Internships with Industry Mentors" (Menezes, Parra, and Jiang, 2022) provides a more thorough analysis of the issues faced by the students and how an open-source internship format can address them.
- (5) Finally, the grant heavily focuses on providing the needed wrap-around support to participants. After removing participant support costs, 47% of the grant funds are requested for Mentors in Tech (MinT)'s wrap-around mentoring and community-building program, which served hundreds of students in the target demographic. (More specifics of this support are described in the proposal.) The Building Inclusive Labs project (DUE#2055735/2055309) will provide some additional support, as documented in the proposal and response to question b.

a.i. If you plan to use GPA as a selection criteria, how will you ensure that you do not create additional barriers of entry for the students you are trying to reach?

A major goal of selection is to ensure students have adequate technical abilities and commitment to take advantage of the program. GPA is ONE of the ways students can do that, but not the primary way most students do that. Students apply through in-house software (<https://github.com/codeday/labs-gql>), through which they are invited to provide:

- Resume/LinkedIn
- Classes taken and GPA
- Records of participation in hackathons and CS activities
- Passion projects
- Personal essays
- Professor recommendations

Students may demonstrate competency using ANY of these methods. They do not need to have a good GPA to participate, they need to demonstrate that they are committed and have the necessary technical skills. Most students demonstrate their ability through professor recommendations.

Professor recommendations are sufficient on their own. Otherwise, each piece of evidence is evaluated by multiple industry professional volunteers who have previously mentored in our programs, and are provided with a rubric. These evaluations are reviewed by program staff. If a student demonstrates competency by any method, they are eligible to participate, even if they have a low GPA. We then prioritize students as described in the first part of this response.

b. Please provide more details on how you will support DEIA support/instruction with all stakeholders.

To build a program which centers DEIA support and instruction, the proposal (1) brings together organizations with a history of success, (2) trains students and mentors in DEIA topics, (3) centers the needs of diverse students and Universal Design for Learning principles in program design, (4) uses tools which meet accessibility needs, and (5) includes partners in the grant to help us grow and better support our students.

- (1) Institutional history of DEIA success: Building DEIA supports is core to the mission of both organizations, so all program staff have years of knowledge and experience to draw on.

CodeDay is an organization with a 14-year history of working with diverse, under-represented, marginalized, under-resourced, and disabled students; more than 75% of CodeDay's 70,000 alumni fit into one or more of these categories. CodeDay's positive outcomes for under-represented students are documented in several peer-reviewed publications, such as "Open Source Internships with Industry Mentors" (<https://dl.acm.org/doi/10.1145/3502718.3524763>).

MinT has four years of experience training over 1,000 students and mentors. Most identify with one or more historically minoritized groups. MinT's program was recognized by the Community College Baccalaureate Association (CCBA) in its 2023 list of "Promising Practices to Advance Quality, Equity, and Success in Community College Baccalaureate (CCB) Degree Programs" (<https://www.accbd.org/wp-content/uploads/2022/07/CCBA-Ebook.pdf>)

- (2) Student and mentor training programs: Because of the demographic differences between the students we serve and their mentors who are currently working in industry, allyship is a large component of mentor training. Over many iterations, both CodeDay and MinT have created training materials and operations guides for students and mentors which help mentors and students recognize and celebrate their unique strengths and backgrounds, find common ground, build a successful mentoring relationship, and achieve success together. (Examples of previous training materials: <https://www.youtube.com/watch?v=cdGBcmxsZgQ>, https://www.youtube.com/watch?v=gRUVX2Cb_I0, https://drive.google.com/file/d/1VvKTzFg23pK3_20QufD_4K43FIVIEvm8/view)
- (3) Program design: The program is designed to center students' needs for a Work Based Learning opportunity that is accessible to students who face multiple challenges that prevent them from taking part in traditional internships:

e.g., lack of time due to being a caretaker, inability to quit another job which pays for school, and lack of employer interest due to attending a smaller school. More information on this is detailed in our response to question a, and in the paper “Open Source Internships with Industry Mentors” (<https://dl.acm.org/doi/10.1145/3502718.3524763>).

Micro-internships are designed around Universal Design for Learning to make the experience accessible to a wide number of students:

- (a) **Multiple means of representation:** before the program begins, students participate in onboarding assignments which provide an option of videos, self-guided work, or written work. During open-source project work, students can acquire information through self-guided work, conversations with their mentors/teammates/TAs, or through written documentation.
 - (b) **Multiple means of action and expression:** participants can demonstrate knowledge in conversations with their mentor, through opening a Pull Request on a project, by writing a blog post about their contribution, (e.g., <https://www.linkedin.com/pulse/sustainability-through-testing-open-energy-dashboard-alexis-guzman-9gdwe/>) and/or by creating a tech talk video about their contribution with their team (e.g., <https://www.linkedin.com/feed/update/urn:li:activity:7168995571108622338>).
 - (c) **Multiple means of engagement:** CodeDay recruits a wide variety of open-source projects related to different potential interests. For example, we have previously worked with AI projects related to healthcare, video, and music. At the start of the program, students have the opportunity to express which projects they are most interested in through our technical platform, they are then matched with a project/teammates/mentor based on their preferences and availability. (More info: <https://www.youtube.com/watch?v=i3SyCxuXTtg>)
- (4) Accessibility: CodeDay and MinT have both created in-house dashboard software which meets Web Content Accessibility Guidelines (WCAG) 2.2 to ensure the program can support users with disabilities. Students and mentors have successfully previously participated in similar CodeDay programs while deaf, blind, or neurodiverse.
- (5) Additional supports from partners: Faculty consultant Kendrick Hang (Green River College / AppConnect NW project) has shared out resources (publicly available via Creative Commons licensing) that can our help mentors engage in inclusive practices, particularly around helping student-mentees set goals, offering constructive/critical feedback, and creating a psychologically safe collaboration environment.

Additionally, in collaboration with the Building Inclusive Labs (BIL, DUE#2055735/2055309, refer to letter of collaboration, <https://sites.google.com/view/buildinginclusivelabs/home>) project based out of the Community College of San Francisco School of Science and Mathematics and the University of College San Francisco's Office of Career and Professional Development, we can offer DEIA instruction as follows:

- (a) Mentors who already received onboarding training will receive additional support via BIL's Inclusive Mentor-Manager training. The BIL team has made resources available for our project to include in our onboarding training and has offered our mentors opportunities to participate in upcoming Inclusive Mentor-Manager training workshops.
- (b) Students will have an opportunity to participate in BIL's Workplace Navigation Training which is focused on helping students prepare to enter the technical workforce by making workplace norms explicit and visible, and providing students with strategies on how best to engage in a mentee-mentor relationship and empowering students to foster more inclusive workplaces. While all students in our program have onboarding activities that already include some of these topics, BIL has made materials available for us to use and supplement our work with students.

c. How might your project be sustained and scalable without NSF support?

We expect the program will be sustained in large part by support from partnerships with industry. Most companies already expect to pay 20%+ of the first-year salary to recruit a software engineer. CodeDay and MinT have had preliminary success in capturing some of this value. The data gathered as part of this project will be helpful in making the case that this can be a successful recruiting strategy for companies, particularly with respect to AI talent. We expect this can ultimately provide revenue of \$10,000-20,000 per student hired.

Partner colleges can also directly fund this program through their own program budgets or through state-level appropriations. CodeDay and MinT have both created similar programs targeted at general CS which are successfully funded largely by school program fees of \$500-1,500 per student. Earlier this year, the Washington State Legislature demonstrated preliminary interest in sustaining these similar programs by including them in an early draft of a bill (HB2360). The data collected by this project will help make the case that this program makes economic sense and lead to its inclusion in these budgets.

Growth costs can also be funded through public and private grants. Both CodeDay and MinT have demonstrated an ability to secure expansion funding, having secured funding for their other programs from organizations such as Strada Education Foundation, Infosys Foundation, SAP Foundation, LexisNexis Risk Cares, and Splunk4good.

d. The panel pointed out that students will need quality laptops to be successful in the proposed program but the stipends provided will not be adequate for them to purchase personal computers. Please describe how participants will access high quality personal computers to be successful in your program.

We're happy the panel recognizes this is a common issue for our target demographic. CodeDay has an existing program which provides participants in all our programs with high quality laptops. (cf. Facilities, Equipment & Other Resources, Major Equipment, Participant Laptops). At the time of submission, we had 200 laptops in this program, and as of March 15 we have 350. This would be sufficient for all proposed participants to receive a laptop if necessary, and we regularly receive more donations. (e.g., <https://www.linkedin.com/feed/update/urn:li:activity:7042510085691990016/>)

Additionally, because the program targets students at CTCs, they will have access to computer labs and other resources. For example, at one of our partner community colleges, Green River College, students enrolled at the college who do not have access to laptops or wi-fi will be able to check out laptops, wi-fi hotspots, webcams, and headsets from the campus library (<https://libguides.greenriver.edu/technology/laptops>).

Finally, many companies provide college students with free access to industry-standard cloud computing resources, which are designed to allow AI/ML developers to perform their job without using high-performance computers. The most popular in industry are Google CoLab, Amazon Sagemaker, and Paperspace; all companies provide free access to students.

e. While they bring some benefits, the panel raised concerns about the use of open-source materials and projects. Please clarify the following:

e.i. Provide additional details about the open-source task, including 1-2 examples;

This project doesn't focus on one particular open source task, but partners with existing open-source projects to find a variety of real-world tasks. There are many such open-source AI/ML projects, and each of them has dozens-to-hundreds of tasks to which students can be assigned. CodeDay has a team which builds partnerships with these projects and selects issues for students to complete (Facilities, Equipment, and Other Resources, Personnel, Open Source Partnerships Staff). The team has already built partnerships with some of these projects and will continue to build more.

Students have completed several hundred tasks with open-source partner projects. Some past success stories where students have made contributions specifically to AI projects in our program:

- Making improvements to an AI for kidney cancer prognosis. (results presented here: <https://showcase.codeday.org/project/ckqtyhpb891694810qugtdmlp91>)

- Making improvements to the React Mediapipe library, used for implementing ML on live video in the web and applications. (currently ongoing project)

These two examples are representative of the sorts of AI tasks students will be assigned in this AI-focused program, but you can see many non-AI tasks students have completed with our partner projects here: <https://showcase.codeday.org/projects/labs/featured>)

e.ii. Describe how you will ensure that the open-source tasks are representative of leading industry tasks, including how you will ensure that your program components prepare students to meaningfully participate in real industry jobs (i.e. how you will guarantee that the training is relevant to leading employers);

- Mentors, who are experts who work in the industry, are involved in selecting tasks. For example, the AI for Kidney Cancer Prognosis project above was mentored by an Associate Director for AI at Thrive Earlier Detection Corp. We currently have 70 volunteers with professional experience working in AI, so we do not anticipate problems finding enough mentors.

- Tasks are chosen from open-source projects which are used by industry. For example, the React Mediapipe project was created by Google and is downloaded 133,000 times each week. As noted in the previous answer, there are many such open-source AI projects (e.g., <https://github.com/ai-collection/ai-collection>) which are used in industry.

f. Please describe how participation in the micro-internship will be recognized. Will students earn any type of course credit towards their community college or technical college curriculum? Will they receive a certificate for participation?

- Students can receive course credit; CodeDay and MinT have already piloted this with our partner institution Green River College via Academic Credit for Prior Learning (ACPL, <https://www.greenriver.edu/students/academics/academic-credit-for-prior-learning/>).

- CodeDay issues a certificate for completion of the open-source project, and MinT also issues a LinkedIn certification badge for students on LinkedIn.

- In the technology industry, it is very common to include selected open-source contributions on a resume, and mentors will work with students to represent their contribution there. Being able to demonstrate they have contributed to open-source projects is viewed as a positive by employers.

- Students who made a positive impression often receive a recommendation from their mentor for schools/jobs.

g. Particularly compelling was the projection that the planned experiential learning will sustain engagement and lead to further education and credentialing for these students. Please elaborate on your plan to measure these outcomes.

This program works with students enrolled at Career and Technical Colleges, and a key goal for this program is that students will persist in their education to graduate with an AI/ML relevant academic credential at a high rate. Our evaluation question is to what extent is the project impacting retention and degree completion rates? Data collection methods will involve a combination of administrative data retrieval from our partner schools (as most students will complete a 4-year Community College Baccalaureate degree at the same institution) and national data clearinghouses,

longitudinal surveys, and participant tracking systems to monitor college students' progress through the program toward degree completion or further credential acquisition. Key Performance Indicators will include the rate of ongoing participation, percentage of participants who enroll in ML/AI credentials, and completion rates of these credentials and degrees.

(As most of our students are pursuing an education to secure a job, the ultimate measure of our educational success is the number of students who obtain employment in AI/ML fields. We will measure job placement 6 months after program completion. Data will be collected and combined from student self-reported data, from an automated tool we have created which collects data from students' LinkedIn profiles, and from third-party data such as Lightcast. In the past, 75% of students land a technical role after graduation.)

These are long-term outcomes, so we plan to measure a number of short-term outcomes which we believe will contribute to the number of students who are engaged in further education and credentialing (and ultimately entering the workforce in AI/ML). These short-term outcomes are: a high rate of satisfaction with their experience working with industry mentors, a high rate of satisfaction with their experience in the micro-internship, increased awareness of the variety of roles that are accessible to them in AI/ML, and an increased sense of belonging in AI.

We will use a variety of methods to collect these data as the program progresses:

- Attitudinal reflections and surveys monthly during the program. Surveys will be conducted using MinT's and CodeDay's existing technical tools (e.g., <https://github.com/codeday/labs-gql>). We require students to complete these surveys as part of the program, and even though some questions will be collected anonymously, the technical tools will track whether a student has completed the survey and send reminders by email and text.
- Survey once the program is completed on their experience and engagement. For example, in similar programs we collected data which found that 94% of mentees feel confident in their ability to successfully transition from student to tech professional and 92% of mentee respondents said that their mentor interactions met or exceeded their expectations. (Example of a previous survey we have used for a similar program: <https://www.cognitoforms.com/Codeday1/StudentPostEventReflection>)
- Interviews at the beginning and end of the program. (Example of an interview script we have used for a similar program: https://docs.google.com/document/u/1/d/1A8ATWv_qTuUzvf6h8UDyGtcYbG1-WNHp/edit)
- Finally, as our programs have matured, alumni of the program who are now in industry can come back to the program as mentors. Our system can correlate these mentors with their previous participation, and we will track that as an indicator of the engagement and importance of the program to the students.

We will work with our external evaluator to finalize the survey questions and interview protocols prior to the start of the program. Together we will conduct ongoing reviews of results so we can improve the program iteratively.

Enabling Access to Artificial Intelligence Careers for Overlooked and Underserved Community College Computer Science Students Using Micro-Internships and Industry Mentorships

Artificial Intelligence and Machine Learning (AI/ML) are rapidly evolving technologies that have already found broad applications in most industries, but technology employers report a lack of recent graduates with experience in AI/ML. Although internships and mentorship can help students break into this field, their scalability is hindered by the level of commitment demanded of participants. This expectation denies access to these opportunities for many students, especially non-traditional students enrolled at Career and Technical Colleges (CTCs). This project addresses the need for a more skilled AI/ML workforce by creating micro-internships combined with career mentorship from industry professionals, focused on AI/ML, and integrated with CTC Computer Science programs.

The project will build a diverse AI/ML workforce by providing 150 CTC students with practical AI/ML skills. The project will accept three annual cohorts of 50 students each into a guided AI/ML pathway. Each cohort will complete 1-2 micro-internships wherein each student will contribute to an industry-relevant AI/ML open source project, meet monthly with two assigned career mentors over an eight-month period, and attend in cohort workshops and meetings. Project researchers will collaborate with CTC faculty to award academic credit to students as applicable for their participation in experiential learning activities. The project includes a research component that will generate new knowledge on the use and effectiveness of open-source micro-internships and mentoring in AI/ML fields, CTC student job placement assistance in AI/ML, and the perceptions held by industry professionals of CTC students pursuing careers in AI/ML. The interventions developed by this project may be used more broadly to improve workforce readiness for non-traditional, overlooked, and underserved students with unique strengths and backgrounds.