Increasing Diversity in Lifelong AI Education: Workshop Report

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Abstract

AI is rapidly emerging as a tool that can be used by everyone, increasing its impact on our lives, society, and the economy. There is a need to develop educational programs and curricula that can increase capacity and diversity in AI as well as awareness of the implications of using AI-driven technologies. This paper reports on a workshop whose goals include developing guidelines for ensuring that we expand the diversity of people engaged in AI while expanding the capacity for AI curricula with a scope of content that will reflect the competencies and needs of the workforce. The scope for AI education included K-Gray and considered AI knowledge and competencies as well as AI literacy (including responsible use and ethical issues). Participants discussed recommendations for metrics measuring capacity and diversity as well as strategies for increasing capacity and diversity at different level of education: K-12, undergraduate and graduate Computer Science (CS) majors and non-CS majors, the workforce, and the public.

Introduction

This paper summarizes a detailed report from an NSF-funded workshop titled "Expanding Capacity and Diversity in Lifelong AI Education" (Maher et al. 2023). The workshop convened thought leaders to address the challenges and opportunities presented by recent developments in AI, with a focus on shaping the future of lifelong AI education across various sectors, including K-12, higher education, adult workforce, and public education. The goal was to develop strategies to broaden the scope, capacity, and diversity of AI education in the context of lifelong learning. The workshop's structure involved three sessions, each centered around a specific discussion topic and set of questions. Participants engaged in a charrette format, facilitating iterative small group discussions that built upon the insights and ideas from earlier sessions. This paper highlights the strategies discussed for enhancing diversity and expanding the capacity of AI education.

Session 1: Components of AI Education In this session, participants discussed the topics, knowledge areas, and skills covered in AI education across various levels, including community colleges, undergraduate and graduate CS majors, undergraduate non-CS majors, and the adult workforce. Major topics in AI education were identified, along with the importance of including ethical, responsible, and trustworthy AI knowledge areas. Participants explored how AI is taught differently at various levels and majors, as well as the goals for AI education in each context.

Session 2: Quality and Inclusion in AI Education Participants explored guidelines ensuring quality and inclusion in AI education across different levels. They discussed the rigor, theory, knowledge, and skills required for quality AI education, along with the information necessary for accreditation. Metrics for assessing quality AI education and diversity in AI education were discussed, alongside guidelines for fostering inclusion. The session also examined how the use of AI in education and professions may impact the balance between learning theory and skill acquisition.

Session 3: Expanding Capacity in AI Education In this session, strategies for expanding the capacity of AI education across different levels were explored. Participants identified challenges for increasing capacity and discussed various models and strategies to overcome these challenges. Metrics for assessing capacity, including infrastructure, people, courses, and diversity, were considered, along with the need for rapid capacity expansion (Tadimalla and Maher 2024). The session concluded with discussions on target areas and approaches to effectively increase capacity in AI education.

The remainder of this paper summarizes the recommendations that emerged in these sessions in the following categories:

- Distinguishing the goals for AI education at the different levels of education.

- Identifying metrics as the basis for strategies to increase the diversity of people in AI education.

- Metrics for measuring and comparing capacity in AI education.

- Guidelines for inclusion in AI education.

- Challenges for increasing capacity in AI education.

- Strategies and Models to Increase Capacity in AI education.

Developing Goals for AI Education at Different Levels of Education

A key to encouraging broader participation in AI education is formulating distinct goals for AI education across various educational levels, emphasizing the importance of equitable access, learning outcomes, societal impact, benefits, capacity building, and cross-level synergies. The participants identified the following goals for each level.

K-12 AI Education Goals: In pursuit of equitable access to AI education, the primary goal is to ensure that K-12 students of all demographic backgrounds can engage with AI concepts aligned with standard learning objectives. Investing in comprehensive teacher training programs is essential for equipping educators with the skills needed to teach AI methodologies and concepts effectively. It's crucial to foster a sense of belonging and interest among students from diverse backgrounds to cultivate a future AI workforce reflective of our society's diversity. The curriculum should emphasize foundational AI principles, such as decision-making in data clustering, and provides hands-on experiences with AI artifacts, like Scratch programs with AI extensions, to spark interest in AI among middle school students. Integrating critical thinking skills into the curriculum helps students responsibly approach AI technology, considering its implications and biases. Ethics education, with practical examples of ethical considerations and biases in AI, is a key component. Enhancing students' understanding of probability and statistics is a priority for them to apply AI concepts in real scenarios. Recognizing diverse learning styles, multiple pathways for AI education should be offered to ensure it is accessible and inclusive for all learners.

Post-Secondary AI Education Goals: Objectives for post-secondary AI education are to equip Computer Science (CS) majors and students from diverse disciplines with the competencies and ethical frameworks necessary for engaging with artificial intelligence (AI). For CS majors, the focus is on developing AI competence and preparing them for research and development in AI, while also fostering an understanding of its societal implications. For non-CS majors, the goal is to integrate AI into their curricula, highlighting its relevance across various domains and enabling them to leverage AI within their fields. Ethical expertise is a key aspect, emphasizing education on trustworthy AI practices, including security, privacy, safety, fairness, and bias mitigation. An important goal is to hone critical thinking skills in the context of AI use and equip students with AI skills essential for their future careers. Auditing for bias in AI systems is emphasized to promote transparency and fairness in AI deployment. In addition, addressing domain-specific risks, ensuring that students are aware of potential AI-related risks within their areas of specialization, such as medical decision-making, is essential to foster informed and responsible AI utilization across disciplines.

Adult Workforce AI Education Goals: The objectives for adult workforce AI education focus on adapting to the evolving work landscape and empowering adults with the knowledge and skills for responsible and effective AI engagement. Emphasisis is needed for promoting responsible AI use, equipping adults with an understanding of ethical considerations and best practices, especially as they navigate career transitions or enter AI-related fields. Skills enhancement is prioritized, offering training on using and evaluating AI applications in current job roles to address fears and misconceptions about AI technology. The aim is to empower adults with the ability to make informed decisions regarding the impact of AI on their career paths. Ensuring widespread accessibility to AI education to adult learners, considering their self-directed learning preferences and varied educational backgrounds, is crucial. Additionally, the challenges and support needs arising from AI-induced job transformations and productivity shifts, helping adults adapt effectively need to be considered. These goals aim to prepare the adult workforce to succeed in an AI-driven world.

Public AI Education Goals: The objectives for public AI education are centered around fostering informed citizenship, promoting responsible engagement with AI technologies, and highlighting their potential for positive societal impact. A primary focus is on enhancing public understanding of AI tools and systems, empowering individuals to participate meaningfully in the societal discourse surrounding AI. To achieve this, there is a need to prioritize initiatives aimed at mitigating fear and bias by educating the public about AI risks and biases while also highlighting the positive contributions AI can make to various sectors such as sustainability, health, and education. Additionally, there is a need to promote ethical AI use, ensuring that the public is aware of the importance of ethical safeguards and bridging the digital divide to ensure equitable access to AI benefits for all members of society. Inter-generational engagement is also a key goal, in order to facilitate discourse between generations, fostering understanding of AI's implications and capabilities across diverse age groups. Through these efforts, the goal is to empower the public to navigate the increasingly AI-driven world with confidence and foresight.

Identifying Metrics as the Basis for Strategies to Increase the Diversity of People in AI Education

The workshop participants explored strategies, metrics, and approaches to enhance diversity and inclusivity in AI education across various educational settings. The discussion underscored the need for public access to infrastructure, accessible resources, adaptability in technology acceptance, and the relevance of AI education to diverse life situations, aiming to make AI education relatable and accessible to all. Emphasizing the need for research, data collection, and continuous assessment, the participants advocated for a data-driven approach to track progress and pinpoint areas for improvement across all levels of AI education. This approach supports evidence-based decision-making and highlights the importance of intersectional analysis to understand the multifaceted experiences and needs of individuals. Inclusive de-

sign and curriculum development were identified as key to creating equitable learning environments, with a strong focus on diversity metrics to ensure AI education benefits individuals from a wide range of backgrounds.The participants contributed a set of references that can inform further exploration of metrics (Bowers and Choi 2023) (Massey 2012) (Pielou 1966) (White 1983). Such metrics are intended to assess the diversity of learners, educators, data, and content, considering intersectional factors such as race, gender, disability, socioeconomic status, and ESL.

Several metrics and approaches were identified as relevant across all educational levels. These included: Tracking and ensuring that learners and educators reflect the diversity of their respective populations. Evaluating the inclusivity of AI course content, including diverse examples, cultures, and languages. Ensuring that AI materials and platforms are accessible to all, including those with disabilities. Conduct regular equity audits to align educational practices with diversity outcomes. Preparing educators to create and deliver culturally responsive AI materials. Incorporating qualitative research to understand students' and educators' experiences. Considering the intersection of multiple demographic factors in the analysis.

Metrics for diversity in AI that are specific to the levels of education included:

- **K-12 Education:** For K-12 education, the participants discussed metrics related to teacher training, resource access, geographical disparities, and the inclusion of diverse materials. There was a focus on ensuring that AI education is inclusive and accessible to students from various backgrounds.
- **CS Majors:** The discussion at this level centered on metrics related to faculty and student demographics, interdisciplinary collaborations, representation in AI clubs, and the impact of non-CS faculty teaching AI courses. The goal is to make AI education more inclusive for CS majors.
- **Non-CS Majors:** For non-CS majors, the participants emphasized measuring enrollment, outcomes, and the impact of AI courses on non-majors. They also explored the impact of interdisciplinary collaboration between non-CS and CS faculty.
- **Adult Workforce:** In the context of the adult workforce, the participants discussed the contextualization of training materials, differential impacts, and the technology acceptance adaptability model. These approaches aim to make AI education relevant and adaptable for adult learners.

This discussion addressed the challenge of enhancing diversity and inclusivity in AI education across different educational levels. Strategies and metrics covered demographic representation, accessibility, teacher training, interdisciplinary collaboration, and the contextualization of materials. The main goal is to develop inclusive AI education that meets the diverse needs and backgrounds of learners and educators, considering the intersecting factors that influence their experiences. A holistic and data-driven approach is crucial for promoting diversity and equity in AI education, ensuring it is accessible and beneficial to everyone.

Metrics for Measuring and Comparing Capacity in AI Education

The key metrics in assessing the capacity for AI education encompass infrastructure, people, courses, and diversity.

- **K-12 Education:** In K-12 education, key factors influencing AI implementation include: the perception of school district administrators and teachers regarding the importance and readiness for AI education, the presence of AI curriculum guidelines, awareness of AI frameworks and learning objectives, access to AI-focused professional development for teachers, funding for curriculum implementation, policy implications for AI integration in learning objectives and teacher evaluations, metrics such as trained teachers, integrated lessons, standalone courses, student enrollment, and retention rates, details about schools offering AI courses, student demographics, and AI-focused student clubs, and the promotion of a culture that recognizes and supports educators fostering equitable and inclusive AI learning.
- **CS Majors:** For post-secondary CS majors, important considerations include: the number of instructors with current AI training both within and outside computing units, infrastructure details such as computing power, storage, and support staff availability, the availability of courses and programs covering core AI and its applications, data on datasets produced and deployed apps/models, diversity in graduates and their retention rates, interdisciplinary collaborations including funding, publications, and joint appointments, metrics related to AI courses such as enrollment rates, waitlists, and alignment with ACM Curricular guidelines, the presence of specialized AI degrees and credentials, faculty data regarding AI teaching, research, and grant applications, participation in AI-related competitions and projects, and the provision of faculty incentives, resources, and sustainability measures for AI courses.
- **Non-CS Majors:** For post-secondary non-CS majors, critical factors to consider include data on student and faculty participation in AI courses, the availability of AI offerings across different types of institutions, opportunities for dual majors, certifications, and credentials in AI for non-CS students, metrics such as learning gains, student completion rates, and the prevalence of cross-disciplinary positions, and tracking accomplishments of alumni in leadership roles and their contributions to the field.
- **Adult Workforce:** For the adult workforce, key considerations include: metrics tracking the number of adults undergoing AI reskilling/upskilling, leading indicators reflecting the demand for AI education about job skills and growth trends, available resources for lifelong learning including tools, workshops, micro-credentials, and certifications tailored for the AI workforce, and data on military personnel receiving AI training, participation in online courses, and age demographics of learners engaging in AI education initiatives.
- **Public Education:** For the public, important considerations include: infrastructure metrics regarding AI re-

sources available at libraries, public talks, and forums on AI, access to professional development for librarians and staff on AI concepts, public utilization of online courses such as MOOCs or YouTube-based tutorials, diversity metrics capturing different demographics including gender, race, military involvement, and more, availability and accessibility of AI learning resources in community spaces including libraries, community centers, and senior centers, and public awareness and literacy initiatives including media announcements and AI resource downloads.

Guidelines for Inclusion in AI education

Inclusion in AI education necessitates an environment that accommodates all students, leveraging guidance from the Universal Design for Learning (CAST), ADA, and WCAG standards. It involves translating inclusion findings into actionable strategies in alignment with organizations like NCWIT and BPC Alliances and understanding student diversity to develop culturally responsive leadership principles. Soliciting feedback from various stakeholders is critical for improvement. Integrating AI learning throughout all classrooms and supporting diverse learning needs are fundamental. Ensuring development team diversity minimizes bias and encourages broad involvement in software development. Adhering to ADA and WCAG standards through Universal Design principles ensures equitable learning opportunities. Utilizing diverse examples and accommodating different backgrounds and preferences in classroom settings are key. Infusing inclusion practices into AI education and curriculum-wide AI integration fosters a more inclusive atmosphere. Recruitment strategies aimed at underrepresented groups and interdisciplinary approaches make AI accessible to all fields of study. Workforce development initiatives, practical case studies, and promoting public awareness about AI inclusively increase engagement and transparency.

The strategies for inclusion in AI education vary by education levels include:

- **K-12 Education:** Create diverse pathways to engage all students, including English Language Learners and students with varying capabilities in the same classrooms. Foster collaboration between special education and content teachers. Encourage competent students to support their peers. Assign different tasks to accommodate diverse capabilities. Utilize tools like neural sandboxes and AI-generated problems tailored to students' interests. Aim for inclusivity in AI education, including those with non-technical backgrounds, using less technical language. Integrate AI concepts into various K-12 courses. Use diverse sets of data in AI applications to pique students' interest.

- **CS Majors:** Develop guidelines for recruiting students with specific goals, such as increasing female enrollment and offering professional development opportunities for industry employees. Collaborate with industry stakeholders to clarify AI's role in data science and as an interdisciplinary field. Promote AI as a unique and interdisciplinary discipline. Incorporate AI into various courses. Advertise

AI programs broadly, emphasizing context, potential impact, and interdisciplinary integration.

- **Non-CS Majors:** Provide different integration levels (e.g., single class, minor, dual major) for non-CS majors. Customize AI content to align with students' major disciplines.

- **Adult Workforce:** Include bootcamp schools and workforce development organizations in funding opportunities for quality AI education. Recognize domain expertise as an asset, not a barrier. Establish guidelines for accessing AI materials. Identify field-specific training to upskill workers for career transitions. Deliver AI education in a less intimidating manner for teacher professional development.

- **Public Education:** Offer practical and impact-driven case studies of AI opportunities and risks, with pathways for professional development and formal higher education. Use messaging that is inclusive, avoids condescension, and seeks input from diverse audiences. Increase transparency about where and how AI is applied, similar to recent efforts to raise public awareness about data collection practices.

Enhanced engagement and inclusion in AI education can be achieved through various strategies, including creating multiple pathways to AI, collaborating with Special Ed Teachers, nurturing peer support, varying tasks, utilizing diverse tools, tailoring problems to students' local interests, considering the appropriate scope of inclusivity for the learning context, simplifying the introduction of AI concepts by avoiding technical terms, and incorporating diverse data sets. These approaches aim to make AI education more accessible and engaging for a wide range of students, including those from diverse backgrounds and abilities. Leaders must champion and align with these values and practices to ensure universal inclusion in AI education, continuously assessing and adjusting current practices to better reflect these goals.

Challenges for Increasing Capacity in AI Education

The discussions on increasing capacity were guided by the disaggregation of factors that need to be considered that impact capacity in CS education shown in Figure 1. Challenges and recommendations for achieving an increase in both capacity and diversity were discussed for each level of education.

- **K-12 Education:** In K-12, several challenges hinder the effective implementation of AI education. One such obstacle is the difficulty in attracting teachers proficient in AI, largely due to the scarcity of pre-service programs that recruit from CS backgrounds. However, exploring partnerships with local industries for AI education and leveraging resources like CSforALL's CSforED programs can help address this shortage. Additionally, ensuring alignment between policies and educational practices is paramount, with resources such as the CS Policy to Practice report offering valuable insights. Another challenge lies in the lack of data regarding specific AI concepts taught, even

within courses labeled as CS. Moreover, while out-of-school (OST) learning holds immense potential in nurturing long-term interest in AI among students, effectively mapping this space poses a considerable challenge. Addressing these hurdles will be pivotal in fostering a robust AI education ecosystem in K-12 settings.

- **CS Majors:** In CS major programs, several challenges impact the effective integration of AI education. One significant obstacle is the difficulty in attracting faculty for AI-related courses, as industry positions often offer more lucrative compensation compared to educational institutions. Additionally, there exists a mismatch between the increasing number of CS undergraduates and the available faculty, leading to reliance on adjunct faculty, as observed in institutions like UNC Charlotte where a substantial portion of CS courses is managed by adjuncts. Moreover, assessing student competence for real-world AI tasks necessitates a delicate balance between foundational AI knowledge and domain-specific understanding. Furthermore, addressing the needs of large class sizes requires funding to develop crowdsourced resources that can be rapidly updated to keep pace with advancements in the field. Overcoming these challenges will be essential in ensuring the quality and relevance of AI education in postsecondary CS major programs.

- **Non-CS Majors:** In non-CS major programs, key challenges include the necessity to integrate AI expertise into domain-specific courses, the importance of university leadership acknowledging AI education as integral to a liberal arts education, and the establishment of support mechanisms for non-tech departments to develop AI expertise rather than mandating AI courses for non-CS

- **Adult Workforce:** For the adult workforce, key strategies include: offering domain-specific certificate programs or coursework in collaboration with industry partnerships, establishing mechanisms to keep professionals informed and prepared for emerging job roles, and educating the workforce about existing AI resources to mitigate fear associated with AI-driven job losses.

- **Public Education:** In the public sphere, effective AI education initiatives involve: leveraging K-12 education as a vital platform for public learning about AI, decoupling AI from complex math to prevent AI-phobia, utilizing engaging media to educate through entertainment and popular culture portrayals of AI, collaborating with non-educational institutions to promote AI awareness and combat public resistance due to a lack of knowledge, and implementing innovative strategies such as AI-based games to educate diverse age groups positively and counter narratives of AI replacing jobs.

Strategies and Models to Increase Capacity in AI Education

This section presents practical strategies to boost AI capacity, informed by collective principles and identified challenges. To enhance capacity in AI education, cross-cutting recommendations include:
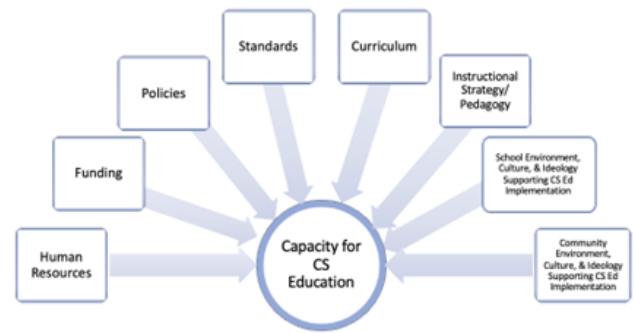

Figure 1: Disaggregation of capacity

- Updating policies to support interdisciplinary growth,
- Reframing the AI narrative to emphasize societal benefits and academic unity,
- Fostering substantive academia-industry partnerships,
- Developing innovative funding models to address faculty challenges in institutions with limited resources.

Recommendations to enhance capacity in AI education at different levels of education include:

K-12 Education: The foundation for building capacity in AI starts at the K-12 level. Here, the emphasis lies not just in introducing AI as a subject but in seamlessly integrating it into existing curricula. The idea is to democratize access to AI, ensure state standards resonate with the AI goals, and more practically, align policy frameworks. Innovative tools, such as AI-powered robots, are being brought to the fore to spark curiosity and align with STEM orientations. But success here requires orchestrated efforts from a range of stakeholders, from educators to guidance counselors to policymakers.

- Integrate AI into existing curricula, ensuring foundational AI exposure for all students.
- Enhance pre-service teacher training with AI components.
- Address teacher attrition, recognizing its impact on consistent AI education and aiming for long-term stability.
- Use curated digital platforms and AI-enhanced tools to support instruction and student engagement.
- Align educational policies to reflect current and future AI developments.

CS Majors: For CS majors, the nuances multiply for specializing in AI and diversifying the students that choose AI as a specialization. While the challenge remains to increase capacity for AI learning, the environment becomes multifaceted. Encouraging specialized tracks within AI ensures that students have the flexibility to explore areas aligning with their interests and future aspirations. Furthermore, building partnerships with industry and academia becomes pivotal. Yet, challenges are tangible. Especially for lower resource universities, faculty allocation presents difficulty in managing existing academic demands. The recommendations discussed include:

- Introduce specialized AI tracks enabling students from diverse fields to engage with AI relevant to their career/academic interests.
- Strengthen academia-industry collaborations to offset faculty shortages, exploring mutual benefits and potential resource sharing.
- Engage with university leadership to underscore AI's relevance and its need in reshaping modern academic structures.

Non-CS Major: For non-CS majors, the approach necessitates a different touch. AI's promise is its versatility, which means it has relevance even outside traditional tech disciplines. The emphasis is on alternative preparation methods for faculty tasked with integrating AI in the curriculum. AI should not be considered as an alien entity, but as a tool and an enabler across disciplines, whether it's in arts, literature, or policy studies. The recommendations discussed include:

- Support integration of AI into other STEM disciplines, e.g., "AI for Mechanical Engineering".
- Incorporate AI principles into liberal arts education, emphasizing its interdisciplinary significance and real-world applications.
- Evaluate the CAE (Centers for Academic Excellence) model used in cybersecurity education for comprehensive AI integration across various faculties.

Adult Workforce: For the adult workforce, the AI journey is a blend of awareness, adaptation, and advancement. As industries undergo transformation, the onus lies in ensuring that the workforce isn't left behind. Upskilling emerges as a priority, but so does the need to understand the current state of AI capacity. Incentivizing companies to support professional development becomes crucial, as does crafting targeted micro-credentials and certification programs. The recommendations discussed include:

- Promote AI upskilling opportunities, integrating micro-credentials to keep pace with evolving job requirements.
- Provide AI-specific professional development resources, tailored to cater to a wide range of career trajectories.

Public Engagement: AI is a cultural phenomenon and AI education should not be limited to formal education venues. To ensure the public not only understands but also appreciates this, the strategy leans towards immersion. This involves deploying applications for experimentation, offering clear, trusted insights on AI's implications, and integrating AI education into popular culture. But this is more than just creating awareness—it's about fostering an understanding of responsible use of AI. The recommendations discussed include:

- Offer accessible AI experimentation platforms to demystify the technology and foster understanding.
- Establish a centralized AI information hub, communicating its societal and vocational impacts without jargon.
- Use popular culture to raise AI awareness, leveraging endorsements and diverse media platforms.
- Emphasis the responsible use of AI technologies.

Enhancing AI capacity requires a combination of revised educational approaches, informed partnerships, and a commitment to fostering an inclusive and adaptable AI understanding across disciplines.

Recommendations to Increase Capacity Quickly

A comprehensive strategy for promoting artificial intelligence (AI) education and awareness across various educational levels is needed to increase capacity quickly. A range of initiatives and strategies can be employed to enhance education and awareness of AI across different sectors of society. The recommendations were discussed for each level of education.

- **K-12 Education:**
  - Identify resources and capacities for creating new educational materials.
  - Provide scalable computing resources and support such as Tuva labs.
  - Foster AI clubs for collaborative learning. Offer easy-to-implement lesson plans.
  - Organize competitions, hackathons, and summer programs that engage students in learning about AI.
  - Allocate additional funding for teacher training.
  - Partner with public television programs for all age groups, such as Cocomelon, Bluey, PBS Kids, PBS News Hour Student Reporting Labs, PBS LearningMedia, to introduce AI topics at an age-appropriate level.
  - Establish, promote, and integrate achievement tracking mechanisms such as badging.

- **CS Majors:**
  - Showcase AI's role in various fields, e.g., arts, medicine, business, communications, liberal arts, and animation. Create compendiums of examples and AI toolboxes in textbooks to provide practical insights.
  - Utilize real world data sets to encourage students to become involved.
  - Offer integrated year-long programs allowing students to pursue AI-focused undergraduate and master's degrees in non-AI disciplines.
  - Identify externally-subsidized funding opportunities to expand AI faculty positions in educational institutions that are subsequently sustained through other resources.
  - Implement professional development for faculty in CS departments to teach AI-related courses.
  - Collaborate with existing AI Institutes and AI hubs, such as those funded by NSF.
  - Collaborate with technology firms, industry, and AI institutions to develop AI-related internships and workshops.

- **Non-CS Majors:**
  - In addition to the strategies noted for post-secondary CS majors, implement professional development courses for faculty in non-CS and non-engineering departments and schools to teach AI-related courses.

- **Adult Workforce:**
  - Increase the availability of modular and micro-AI courses.
  - Establish trusted information sources to raise awareness of AI and assess the reliability of AI-generated data.
  - Draw on the summer school program model for AI professional development of university professors and K-12 instructors, possibly in collaboration with NSF-funded AI institutes and hubs.
  - Develop university partnerships for workforce development.

- **Public Education:**
  - Allocate public library budgets for AI-related adult learning. Utilize low-tech or no-tech methods, such as unplugged AI and picture books, to teach AI concepts and raise awareness of issues related to the use of AI.
  - Secure funding for museums and collaborate with groups like AARP to educate the public in general and retirees specifically on AI-related issues.

Easily accessible trusted sources for AI and technology in general are becoming more widely available, such as e-books, code sources, interactive texts, and sample problems, i.e., Jurafsky and Martin, AIMA code repository, How to Think Like a Computer Scientist: Interactive Edition, Nifty Assignments, AAAI Model AI Assignments. A trusted repository of AI tools, techniques, and issues for public education that is endorsed by respected educational institutions is needed. Coupled with community engagement, this has the potential for a synergistic effect on expanding the capacity of the AI workforce. One repository example is the AAAI AI Topics website. A general course exemplar is the University of Helsinki's Elements of AI course. Promotion of these resources would make a valued contribution. To ensure that these resources align well with the changing topography of AI, business, community, and industry needs related to AI need to be continually assessed. Partnering with chambers of commerce and other bodies that act across levels would be advantageous to prioritizing capacity building and implementation.

Strategies Specific to Different Levels of Education:

- **K-12 Education:** To promote AI literacy at the K-12 level, the participants emphasized the importance of inclusion, after-school activities, clubs, and summer programs, especially targeting underrepresented groups. Externships for K-5 teachers with AI companies were highlighted as a way to equip educators with AI knowledge. Challenges identified included the perception of AI as a job loss threat, the need to prioritize AI education in K-12 settings, and the importance of sustainable implementations.

- **CS Majors:** The participants discussed the need for qualified instructors, teacher training, and interdisciplinary integration of AI. It also suggested the creation of up-to-date learning resources and AI-maker spaces to support hands-on learning.

- **Non-CS Majors:** The discussion emphasized creating awareness and interest in AI applications relevant to non-CS majors. This can be achieved through interdisciplinary Gen-Ed courses and workshops for faculty training.

- **Adult Workforce:** For adults transitioning to AI-related jobs, retraining programs and online education were seen as effective strategies. The participants also suggested identifying top AI-related job opportunities and offering certifications and micro-credentials.

Conclusion

Increasing capacity in artificial intelligence (AI) requires a comprehensive approach to AI education, including curricular development, teacher training, and public awareness initiatives across various educational levels. The implementation of these strategies, along with adequate funding support, will enhance AI knowledge and skills among learners of all ages and backgrounds and help promote widespread adoption and understanding of AI in education and society. Creating trusted information sources and utilizing public resources and organizations to share information is essential. It is important to note that rapid advancement is often fragile. Consideration of how efforts can be sustained over time is critical. The findings from the workshop are grouped into 4 categories:

Quality AI Education: The workshop acknowledges that guidelines for quality AI education across all levels of education are being addressed by organizations such as TeachAI.org and the ACM/AAAI Committees for curriculum guidelines. The updates to the Knowledge Areas for AI are in the early stages (August 2023) and should be widely distributed for feedback. There is a gap in the development of coordinated curriculum guidelines for adult AI education that serves to develop AI competencies and/or reskill the workforce to increase the capacity for AI professionals.

Increasing Capacity in AI Education: Increasing the capacity of institutions to teach AI to more people requires a combination of revised educational approaches, informed partnerships, and a commitment to fostering an inclusive and adaptable approach to teaching AI across disciplines. Short-term returns on increasing capacity are enabled by increasing AI education in adult learning and higher education.

Increasing Diversity in AI education: A holistic and data-driven approach is essential for fostering diversity and equity in AI education and ensuring that it is accessible and beneficial to all. The key themes raised for increasing diversity in the people who choose AI education include collaboration between academia and industry, the inclusion of hands-on experiences, the incorporation of real-world contexts, and the inclusion of ethical considerations in the development and deployment of AI technologies.

AI in education: The integration of AI in education and the profession is poised to provide personalized support for any time learning. AI in education will also redefine the equilibrium between theoretical understanding and skill acquisition. As AI automates certain tasks and challenges traditional learning pathways, the educational community must reassess the primary objectives of learning to ensure the

holistic development of learners in this new paradigm.

Acknowledgments

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