

## Designing Inclusive AI Certifications

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### Abstract

For decades, the route to familiarity in AI was through technical studies such as computer science. Yet AI has infiltrated many areas of our society. Many fields are rightfully now demanding at least a passing familiarity with machine learning: understanding the standard architectures, knowledge on how to use them, and addressing common concerns. A few such fields look at the standard ethical issues such as fairness, accountability, and transparency. Very few fields situate AI technologies in sociotechnical system analysis, nor give a rigorous foundation in ethical analysis applied to the design, development, and use of the technologies. We have proposed an undergraduate certificate in AI that gives equal weight to social and ethical issues and to technical matters of AI system design and use, aimed at students outside of the traditional AI-related disciplines. By including social and ethical issues in our AI certificate requirements, we expect to attract a broader population of students. By creating an accessible AI certification, we create an opportunity for individuals from diverse experiences to contribute to the discussion of what AI is, what its impact is, and where it should go in the future.

### Introduction

AI education is at an inflection point. With the emergence of publicly available large language models, the cultural awareness of the power and potential of AI is crossing many barriers. Students and faculty alike are discussing how AI is shifting the landscape of the world in which we live. And this is not limited to technical fields. Is AI generated artwork the same as human generated artwork? Does AI more accurately diagnose disease? Which news articles should AI write? What jobs will AI replace? The questions surrounding AI are endless. As people discover what AI has done, interest in what it can do grows.

With AI's popularity growing rampantly across many disciplines, the AI community has a unique opportunity to attract and retain a more diverse group of individuals than ever before. Rather than having to put in substantial effort to reach out to underrepresented communities, those communities are coming to us. However, if we do not make intentional choices to keep barriers down and respect the benefits that all individuals can bring to our community, we will miss out on this opportunity to strengthen our discipline.

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Coming from a technical background, it is easy for the computer science community to narrowly focus on and emphasize the technical, coding aspects of AI in AI education. It is where our collective expertise is strongest. It is the knowledge we have that others usually lack. It is what we are often most comfortable teaching. It is also what we have historically done. However, if we do this, it should be expected that we will see similar diversity issues with the study of AI as we have with computer science as a whole (Sax 2017; Zweben and Bizot 2020; Code.org 2020). The benefits of diversity are well documented (Smith-Doerr, Alegria, and Sacco 2017; on Prospering in the Global Economy of the 21st Century U.S.; Lungeanu and Contractor 2015). We know that diverse groups create higher quality products (Ehrenmann and Warschat 2013), and if we are intentional in how we structure our educational opportunities, we could shift our demographics to the benefit of all.

Groups that have been traditionally less present in computer science often have a stronger pull to ethical problems and social good initiatives — two topics that are prevalent with AI. AI has much potential to benefit society. It has helped diagnose diseases, personalized customer experiences, strengthened the economy through fraud detection, and much more. AI has also faced many documented bias incidence and ethical dilemmas such as harsher punishments for black offenders, propagating stereotypes, and prioritizing male applicants (Boutin 2022; Manyika and Silberg 2019; Leffer 2023; Team, IBM Data and AI 2023). The people most often marginalized by these experiences are also the least likely to complete technical studies such as computer science (Manyika and Silberg 2019; Barker, McDowell, and Kalahar 2009; Biggers, Brauer, and Yilmaz 2008). For an area of study that has and will continue to greatly impact our society, we have a duty to take advantage of this opportunity to increase the representation of the individuals we serve. If we can attract and keep these individuals in the field of AI, we will reduce the number of issues AI creates in the future. However, in order to increase the diversity of people in the field, we will need to reduce barriers to entry and create pathways to success.

An AI certificate should be designed to address issues of digital inequality and improve accessibility. It must situate the technical studies in social reality and make the technical studies accessible to those who were not guided into tech-

nical fields from an early age. Long prerequisite chains and intense programming courses need to be minimized or removed. Long held assumptions of what AI educational looks like should be challenged. After all, the progression of AI tools is impacting our field as well.

In this paper we describe an AI Certificate that is explicitly designed to draw in people in non-technical majors, with foci on the use of current AI tools, AI’s role in work and society, and on the challenges AI causes. The certificate is defined around five key principles: a zero-background entry point, a non-programming pathway, a focus on ethics, a discipline specific context, and an invitation to go deeper. The paper describes how these principles are integrated into our proposed certificate and concludes by sharing some details about push-back we received and how we addressed it.

## Background

Computer science has a history of lacking diversity. The percentage of women earning a bachelor’s degree in computer science decreased from 27.0% in 1998 to 19.9% in 2018 (National Center for Science and Engineering Statistics Directorate for Social Behavioral and Economic Sciences and National Science Foundation 2021). The percentage of underrepresented minorities only increased 3% over 15 years, rising from 15% in 2003 to 18% in 2018 (Code.org 2020). This lack of diversity has been a constant struggle over the past several decades, but the evolution of AI has made it a more critical issue. “The lack of diversity in AI is not merely a social or cultural concern. It’s really a life or death safety issue,” Carol Reiley states (Reiley 2016).

Some of this disproportionate demographic is likely the result of certain populations not being encouraged to pursue technical fields (Wang et al. 2015). While programs such as Girls Who Code, Black Girls Code, and Women in Technology are working to rectifying this imbalance, the widespread interest from the general popularization of generative large language models is drawing in more diverse populations to the study of AI specifically. If programs are ready to meet these individuals where they are, we could potentially see a large shift in demographics.

It is important to have programs that welcome people of all different backgrounds. This is not necessarily easy to do. Many computer science departments are struggling with a combination of rising enrollments and difficulties with hiring new faculty. With increasing work loads to meet the demand, faculty may not feel they have the bandwidth to research and implement new procedures. Sometimes new policies get added without understanding their consequences. For example, one “solution” to booming enrollment in computer science was preferential class registration based on students’ major status — a policy that at the time seemed very reasonable. What the community found was that this resulted in students from diverse backgrounds, especially diverse socioeconomic backgrounds with less access to technology and technology courses, were being barred from the opportunity to study computer science (Barker, McDowell, and Kalahar 2009). These students were more likely to register for introductory courses to “try out” the field before enrolling as a major. Without the major status, this policy

Principle	Explanation
A zero-background entry point	Students should feel capable of learning about AI, regardless of their background.
A non-programming option	Students should be able to learn about AI even if they have no interest in learning to program.
A surety of ethics	A study of AI should include an understanding of common ethical issues that surround AI, and a framework upon which to have ethical discussions.
A discipline specific application	After studying AI, students should be able to apply AI concepts in different fields.
An invitation to go deeper	Students studying AI should understand that there is more to learn and have confidence that they can explore AI further.

Table 1: The five principles that we built our AI certificate around to promote diversity, equality, and inclusion

often prevented them from taking the course. Barriers such as this happen from ignorance and are difficult to avoid. That just makes it more critical that when we are aware of barriers, we act to prevent them. Long prerequisite chains that prevent later adoption of study, early intense programming courses, and a lack of inclusion of topics such as ethics and social good are all known barriers that we can address. Only then can we hope to benefit from this upsurge in interest in a way that will result in a more robust and diverse work force.

One intervention that has aided in increasing diversity and accessibility to computer science is the CS Principles course, often referred to as either CS-0 or CSP (Barker, McDowell, and Kalahar 2009). This course assumes no prior knowledge of computer science and often limits, or even eliminates, the requirement of programming, making it more accessible to students from different socioeconomic backgrounds. These courses tend to include content to show how computer science has ethical and social good implications in addition to covering technical aspects of computer science (Goldweber et al. 2022; Fisher et al. 2018). This increases the attraction of computer science for students that tend to be underrepresented in the field (Hanson 2004; Hill, Corbett, and St Rose 2010; Johnson 2007). These styles of courses demonstrate how we can modify our curriculum to improve accessibility and diversity in our field.

## Principles of the Certificate

There are many different ways to design curricula, and they each bring unique benefits and challenges. For example, a whole degree program in AI gives the most time and flexibility to tailor as many facets of AI education during the student’s college experience. However, it is the most resources intense to implement, would have significant overlap with programs such as computer science, and be more difficult to recruit students into due to the intensity and length of such

a program. It would also be susceptible to long prerequisite chains that can prevent some students from joining the major — especially those demographics that generally do not consider studying computer science upon entry into college.

A concentration within a discipline removes some of the flexibility but reduces resource requirements to establish the program, adds a built-in community from which to recruit, and allows for an assumed basic level of certain skills such as programming. However, it limits participation to those in the pre-determined majors that allow the AI concentration.

Certificates and minors often have the least amount of content but are available to the broadest audience. We argue that for a discipline that is impacting so many people in society, it is integral to have an option for a broader audience to learn about AI. The importance of this is magnified when the AI program is contained within a computer science discipline which already lacks the desired diversity. For this reason, we designed an AI certificate, and we designed it to promote diversity, equity, and inclusion.

Our AI certificate has five key principles: a zero-background entry point, a non-programming option, a surety of ethics, a discipline specific application, and an invitation to go deeper. These pieces combine in ways that allow for technical competency regardless of the student’s background, ensure an ethical and social good focus, and still does not require significant focus on programming. These principles are summarized in Table 1.

### A Zero-Background Entry Point

It is important to have a place for people to start learning about AI that is not blocked by prerequisites. When we place prerequisites in front of a course, we are inherently stating you are only welcome to the discussion if you can prove yourself in these other areas. However, we need to have people with diverse skill sets, diverse backgrounds, diverse perspectives, and diverse values in AI discussions. As addressed in the background, we know that AI and machine algorithms have bias issues. Only by having a diversity of voices are we likely to increase awareness and reduce the appearance of such biases. This diversity will lead to stronger and more robust algorithms. Therefore, we need a place to begin regardless of the student’s background. To that end, we are incorporating AI Principles course.

An AI Principles course takes a similar approach to the CS Principles course. It is a high-level overview of what AI is, what it is not, what it can do, and challenges it creates. The course covers a wide range of topics including different categories of AI, non-programming understanding of how AI functions, AI uses for social good, ethical issues posed by AI, and ethical frameworks that can be used to have such discussions. This course’s main objective is to build a solid foundation on which students can continue to build their knowledge and understanding of AI either formally or informally. Table 2 lists the learning outcomes of the course. Potentially most importantly, this course has no prerequisites to bar people from taking it. Additionally, to help incentivize students to take it, we have ensured that the qualities of this course successfully fulfill a common core requirement for our university. We anticipate that some students will sign

Learning Objectives for the AI Principles Course	
1.	Define current categories of AI (e.g., expert systems, supervised vs. unsupervised machine learning, multi-agent systems) and their limitations and advantages.
2.	Understand differences between human reasoning and AI.
3.	Apply ethical frameworks or notions of bias and fairness in machine learning to reason about current uses of AI.
4.	Analyze current AI in the language of sociotechnical systems.
5.	Evaluate social and legal policies about AI in terms of implicit and explicit value systems, and in terms of effectiveness.
6.	Create work aided by appropriate AI tools.

Table 2: Learning Objectives for the AI Principles Course, “AI in the World”

up for this course as a way to meet that requirement, even if they have never considered studying AI before. Sadly, a combination of unconscious bias from advisors or mentors and a lack of role models in tech careers can prevent students from specific demographics from considering a technical field of study (Hall et al. 2011; Dökme, Açıksöz, and Koyunlu Ünlü 2022; Hamilton, Malin, and Hackmann 2015; Sjaastad 2012). It is only after they have exposure to the topic through something like a common core requirement that they then uncover a passion for it.

With a wider range of students enrolled in the AI Principles course, we have the opportunity to invite students to continue their study of AI through the certificate, many of whom may not have considered it otherwise (Holanda et al. 2021; Blaney 2020). This structure has shown promise as a way of increasing diversity within computer science.

### A Non-Programming Option

Programming is not a skill that interests everyone. It is hubris to think that someone needs to be able to program to be interested in AI, understand AI, apply AI, or contribute to the dialog around AI. Therefore, we deemed it important to have a pathway through the certificate that did not require any programming. To be clear, the program is still very technical. However, the technical details do not require that students implement the AI structures. We ensure that every category of requirements within the certificate has at least one option for a non-programming course. This pathway is openly discussed to affirm students recognize its existence.

It is also worth noting that we do not preclude the opportunity to implement AI structures. Students completing the certificate with prior programming experience through computer science or other programs should do some implementations of AI. Computer science students are incentivized to take courses that involve implementation of AI, as those courses will double count for both the computer science major and the AI certificate.

## A Surety of Ethics

One of the most critical pieces of making AI education accessible to everyone is to bring a diverse set of voices to discussions about ethical issues within technology. However, these very same voices that we hope to add to the conversation are the voices that are most likely to be silenced by others. By integrating ethics into the certificate requirements, we are acknowledging the need for all students to understand how ethics and computer science are integrated; a desire that is growing amongst our community and supported by ABET accreditation and the Computer Science Curricula 2023 (Smith and Lapan 2023; Garrett, Beard, and Fiesler 2020; Jarzemsky, Paup, and Fiesler 2023; Tommasi et al. 2021). How to best integrate ethics into a curriculum — and finding faculty who are comfortable teaching it — continues to be a struggle. While most computer scientists are fast to agree to its importance, the practical reality is its often relegated to “if there is time” during the semester. Even when faculty include it, students may brush off the assignments, deeming them to be less significant than their technical counterparts. By establishing a class specifically for ethics, we are mandating significant time and attention be given to the topic.

An ethics course creates the opportunity to develop a common vocabulary around which to have ethical discussions. A challenge of discussing a topic that crosses so many socioeconomical lines as AI does is that the way people in the various groups approach and dialog about the topic can be vastly different. This can make for rich debates, but it can also make communication difficult. An ethics course becomes a place to establish some common vocabulary and build appreciation for the difference in terminology and perspective that these various groups inherently have.

Ethical debates are one place where culture influences become rapidly visible. While there are whole fields of study for building frameworks for ethical rhetoric, it is common for students to not know or use them. A consequence of sprinkling ethical discussions throughout the curriculum is that time is rarely dedicated to learning such frameworks. By having a dedicated ethics course, significant time can be used to establish these frameworks for the students. The frameworks will act as a foundation for not only discussing current ethical dilemmas but also discussing the unknown future dilemmas that AI will undoubtedly cause.

Finally, by integrating an ethics course into the certificate we are increasing awareness and creating advocates. Similar to how it is difficult to get faculty to teach ethics because they feel unqualified to do so, it can be difficult for students and the AI community as a whole to engage in these challenging conversations. By providing students with the skills needed to manage these discussions and a safe place to practice these skills, we are preparing them to lead these debates in the future. Students will be able to identify potential problems and champion potentially opposing perspectives.

Clearly, we believe in the importance of having an ethics course. However, a single ethics course does not remove the burden of teaching ethics in other courses. Rather the course establishes skills that will enrich the conversations held in all other classes and in future careers.

## A Discipline Specific Application

This AI certificate is designed with the intent of improving access to AI education for those not necessarily coming from a technical background. A key point of this is to allow AI knowledge to permeate into many different areas of studies. We want the students to take the knowledge they have learned and apply it into a discipline area. A student studying economics may take a course on machine learning algorithms that predicate economic fluctuation. An artist might study AI algorithms that produce paintings or music. An engineer might take a course on implementing AI into robotics. Ideally, these courses will be taken later in the certificate so that students can observe how AI is discussed from the perspective of their area of study, and they can bring the technical knowledge obtained from the certificate back into those disciplines. This cross pollination of studies can creating bridges between the silos we sometimes unintentionally construct in academia.

It is worth acknowledging that a goal of the certificate is to bring technical knowledge into other disciplines. It is not necessarily to make a large quantity of AI focused scientists — although this could happen too. By requiring a discipline specific application, students see evidence that we want an understanding of AI for a wide breath of backgrounds.

Another benefit of having a discipline specific application requirement includes potentially making the AI certificate more appealing to women, minority groups, and those from lower socioeconomical backgrounds. Research shows that individuals from these groups tend to put more emphasis on social activist goals (Holanda et al. 2021; Sax 2017; Sax, Lehman, and Zavala 2017; Smith and Lapan 2023). Their numbers tend to be greater in majors that have direct and obvious social good impact. By having them apply their AI knowledge in their area of study, they are directly exploring the social good aspects to AI.

Finally, the discipline specific application requirement makes the certificate more accessible to students discovering an interest later in their college career. A student who takes the discipline specific application course as part of their major requirements and finds a budding interest in AI has the option of then adding the AI certificate with one course requirement already met. This allows the student to more easily fit the remaining AI certificate requirements into their course schedule. In computer science, it is common to have students from less represented groups discover an interest in the technical field later in their college career (Blaney 2020). We suspect that a similar pattern will be discovered with AI.

## An Invitation to Go Deeper

Continuing education is a standard part of any vocation. It would be impossible to impart all knowledge about a subject throughout a college career. Therefore, it is an important part of any study to understand how to learn more and continue ones own growth in an area of expertise.

In the case of a certificate, the lack of content coverage is exasperated by the inherent limited scope of a certificate. It is critical to encourage – and require – that students acknowledge the additional depth and breath they could bring

to their expertise in AI. Just as the AI principles course acts as an invitation to study more about AI, a requirement of one depth focused AI course becomes an invitation to explore many other topics in more depth. During the act of choosing which course to take for this requirement, students will be exposed to a myriad of topics within the field of AI. While the certificate does not allow time to explore them all, the inclusion of one highlights what students might do later. For example, an introductory data science course may act as an invitation to explore implementing AI algorithms. Other students might choose to further explore the statistics that impact AI algorithms, which could lead to the desire to learn about optimization algorithms. Others might do a deeper dive into large language models, which could lead to discovering deep learning concepts. This invitation to explore further allows students the freedom to discover a technical aspect of AI that they have yet to learn. It also forces them to see both the breadth and depth of study that they could explore as they continue to learn about AI.

### **Our Proposed Certificate**

Certificate requirements at our university are 12 credit hours, which generally equates to 4 courses that are 3 credit hours each. Within this structure, we wanted to ensure that we implemented the five principles discussed in the prior section of this paper: a zero-background entry point, a non-programming option, a surety of ethics, a discipline-specific application, and an invitation to go deeper. The certificate also needs to satisfy many different individuals. The computer science student who wishes to specialize in AI after graduation needs a pathway that will push their technical skills while still giving coverage to the ethical discussions and framework. The student with no technology background who is learning about AI in order to apply it appropriately in their future vocation but has no desire to implement it needs an option that is not hindered by programming. The student who takes the AI principles course to meet a common core requirement and finds themselves intrigued needs an option to explore AI topics further. The student that wants to try implementing AI after the first course but has never programmed before needs an option that will let them delve into some basic implementation. Our goal from the start has been to create a certificate that would be inclusive and accessible. To be that to all students interested in AI, it also has to have a reasonable amount of flexibility. To that end, we have proposed a certificate that is divided into the four categories summarized in Table 3: an introduction to AI, an AI/technology ethics course, a deeper exploration into AI or machine learning, and an application or practicum in their preferred domain.

#### **An Introduction to AI**

Our certificate needs an entry point. What that entry point looks like will vary depending on if the individual is coming from a computer science (or similar) technical background or from a different field of study. For the computer science student, they will take a more traditional introduction to AI upper level course with several prerequisites. While nothing

officially prevents these students from taking the AI principles course, the students will not receive credit towards their degree completion for the AI principles course; they will receive that credit for upper level course. Being an upper level course, this introductory course will include the opportunity to implement some AI structures.

Students who do not meet the prerequisites for the upper level introduction to AI course will take AI in the World — an AI principles course. This course is a zero-background entry point that all students are able to take. It will form the foundation upon which the students are able to finish the remainder of the AI certificate. Being a course that meets a common core requirement, this course will have a variety of students with different backgrounds and with differing levels of interest in learning about AI. The variety of students in this course should make it a rich environment to learn ethical frameworks and sociotechnical systems in addition to the other outcomes outlined in Table 2.

The separation of students into these two groups has some added benefits. One revolves around the ethics courses and will be discussed in that section. Another is the reduction of the intimidation factor. In courses that have a combination of computer science majors and non-majors, sometimes the computer science students who have a technical background will talk about topics at levels that leave novice learners feeling inadequate (Aries and Seider 2005; Moudgalya et al. 2021; Zavaleta Bernuy et al. 2022; Rosenstein, Raghu, and Porter 2020). Faculty members recognize that this is often due to opportunities, or lack thereof, provided at different high schools and has little to do with a student's ability to learn the material. Nevertheless, novice students who experience this situation often feel a sense of not belonging and disincline to continue studying computer science. By separating the students into two different introductory courses, students from other disciplines are able to explore their interest in AI without dealing with this peer pressure.

#### **An AI/Technology Ethics Course**

In the section “A Surety of Ethics”, we outlined an argument for including an ethics course. To ensure that all students receive a solid background in ethics and the appropriate frameworks needed for these discussions, we do indeed require an ethics course. The interesting dichotomy for this category is that some students will have had AI principles course where these ethical frameworks are introduced. Other students will have had the Introduction to AI course which does not cover these frameworks. We believe that this disjoint will actually prove beneficial to this class. Often a challenge of real world ethical discussion is the differences in perspectives, experiences, and vocabulary. Some of those real world differences will be captured in this course. Additionally, in counter to the intimidation factor discussed in the prior section, students from a non-technical background will have a slight advantage in this class. Optimistically, this will give both sets of students some appreciation for what the others bring to the discussion.

<b>Certificate Category</b>	<b>Course Examples</b>	<b>Purpose of Category</b>
An introduction to AI	AI in the World – an AI principles course Introduction to AI — an upper-level computer science course	These courses provide a basis upon which to build further AI knowledge.
An AI/technology ethics course	Computer Ethics Issues in Information and Communication Technology Policy	These courses provide insight into ethical issues surrounding AI and technology. Students develop and re-enforce frameworks for exploring ethical issues further.
A deeper exploration into AI or machine learning	Generative AI Machine Learning	These courses provide students an opportunity to take their technical understanding deeper.
An application or practicum in domain	Business Data Mining Statistics and Data Science in Context	These courses provide students with the opportunity to see how AI is used in a specific domain.

Table 3: The four categories in our AI certificate. To complete the certificate students must take one class in each category.

### A Deeper Exploration into AI or Machine Learning

The third requirement expects students to explore some technical AI topic at a deeper level. This grants students the ability to delve into something that they have found interesting. It also forces students to acknowledge the breath of topics within AI, and it challenges students to think about what parts of AI might be most impactful in their future career.

The challenge for this requirement was discovering how to teach a heavy technical topic while also not having to program. While courses existed that gave a depth of knowledge, all of them required some level of implementation. As we wanted our AI certificate to still be a technical certificate, we did not want to make this an optional category. However, it did mean that we had to create a course specifically designed to teach technical knowledge without programming.

We designed the course “Introduction to Generative Artificial Intelligence Techniques”, to both fit this category and meet the current upsurge in demand; however, other topics could be chosen. The course provides students with an understanding of how to formulate generative problems, how to utilize generative machine learning tools to formulate solutions, and how to evaluate said solutions. Precluding the possibility of programming made designing such a technical course a unique challenge. The key was the use of generative AI tools. These tools provide a convenient means for introducing some foundational machine learning concepts, without needing an extensive programming background. For example, many generative AI tools still require that users tune hyperparameters. Students can discover how hyperparameters affect model output without needing to know how to program them. Students also need to understand how to associate certain inputs and outputs with different machine learning models to enable them to run and interpret the results. The use of such AI tools allow students to explore many machine learning concepts and their impacts without having to learn a programming language first. By focusing on tool usage, students will get an idea of how powerful and, in many cases, accessible these systems are. This provides an excellent opportunity to discuss the many growing ethical concerns associated with the use and potential misuse of

generative AI systems.

Through the use of AI tools, we are able to design a technical machine learning course that includes elevated ethical discussions as the students technical expertise in AI continues to grow. This course does not preclude individuals do to a lack of programming skills. Instead the course maintains technical depth while increasing accessibility.

### An Application or Practicum in Domain

The final requirement for the certificate is an application or practicum in domain. This is a chance for students to take what they have learned in their other AI courses and bring it back to their discipline of study. This requirement challenges students to apply what they have learned. It is also a place to potentially explore AI in different domains. For example, a student who wants to try some basic implementation, might choose to take an introductory to data science course. A pre-med student might take a course in AI diagnostics. When proposing the certificate, we did make a point of stating that the courses in this category would be amended as more disciplines design courses around AI — something we anticipate happening regularly over the next decade.

### Push-Back

While overall the proposed certificate has been well received, colleagues were most likely to question the no programming pathway and the technical depth for computer science students. In this section we will outline how we addressed these two critiques of the certificate.

*Is it okay to have an AI certificate that has no programming?* There are multiple professional AI certificates available (from, e.g., MIT, Stanford) for coders. One concern that has been raised is that, by calling our program an AI certificate, we are promising similar credentials, and that the existence of (say,) liberal arts students with an AI certificate weakens claims of our students who code to knowledge of technical aspects of machine learning. We argue that, given multiple software packages for machine learning and tools for code generation, there are other more important skills

and areas of knowledge, such as the ability to consider technical projects in broad social and ethical terms.

Further, we argue that the breadth of knowledge that our non-programming-focused students bring to the field is essential to a society that will be using the technology discussed. Further, our students who end up using, implementing, and designing AI technologies will not necessarily be hampered by the engineering mindset, and will thus enrich our communal design and use process.

*Will a certificate that is designed to be accessible to all be technical enough for computer science majors?* We have just argued that non-programming students will benefit from our certificate and enrich the AI user and developer communities. Having a non-programming track does *not* preclude the option of having coding options. We argue that these courses are still needed and should be taken by the parties interested in them. They simply should not be required for the certificate. Students with a computer science or related background can be incentivized to take these courses by allowing them to double count towards their degree requirements in addition to the certification completion. Alternatively, multiple certification options may be an appropriate choice for an institution. However, we do caution against the latter. If you have two certifications, both need to be treated with equal respect, prioritization, and resources. This can be difficult to maintain long term.

## Conclusion

There is unprecedented interest AI due to the popularization of generative large language models. This offers us a unique opportunity to increase the diversity of those studying AI. However, if we wish to capitalize on this opportunity, we will need to build AI educational experience that remove barriers and create pathways to success. To which we propose a certificate that is built upon five principles: a zero-background entry point, a non-programming pathway, a focus on ethics, a discipline specific context, and an invitation to go deeper.

The zero-background entry point is done through an AI Principles course. This high-level overview course provides a framework for understanding and discussing both types of AI and the ethical issues raised by AI. It provides a foundation for all individuals regardless of background to use as they move further into the certificate. CS Principles has aided in increasing diversity in Computer Science; we anticipate a similar result for AI. The non-programming pathway ensures that individuals with little interest in computer science are not excluded from AI. There are many professions that will benefit from understanding AI even if they never implement it: lawmakers, economists, business owners, medical clinicians, etc. The focus on ethics ensures that individuals who complete the program can make logical arguments around AI, determine the appropriateness of the use of AI in given situations, and knowledgeably contribute to discussions about where AI should go in the future. Providing a discipline specific context for the AI certificate aids in students discovery of the versatility of AI, provides students with direct skills relevant to their future, and ensure students

that the AI certificate is meant for people from many different backgrounds. The invitation to go deeper encourages students to decide what they might want to do with their knowledge of AI in the future and invites students into the more technical aspects of AI for those interested. All these principles combine to make an accessible and inclusive AI certificate.

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