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THE TRAJECTORY OF AI EDUCATION: TRENDS, CHALLENGES, AND THE ROAD AHEAD

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ABSTRACT

Artificial Intelligence (AI) has quickly transformed from a specialized field of study to a fundamental technology that propels innovation in almost every industry, including public policy, healthcare, and finance. The need for thorough, easily available, and morally sound AI education has never been greater as AI systems affect people's lives, careers, and interactions more and more. This article explores the evolution of AI education over time, from its origins in early computer science programs to its current spread into interdisciplinary fields. It examines how many nations and regions are incorporating AI into official and informal learning contexts, as well as current trends in elementary, secondary, university, and vocational training. The study emphasizes the increasing focus on ethical and responsible AI education, the development of personalized and adaptive learning tools, and the global movement to democratize AI knowledge. Additionally, it highlights enduring issues including unequal access, a lack of uniformity, and a scarcity of trained teachers. The paper presents a forward-looking framework for AI education by combining these ideas and giving ethical literacy, career preparedness, and global inclusion top priority. This paradigm emphasizes how crucial it is for governments, educational institutions, business partners, and civil society to work together to develop scalable and just AI education ecosystems. The paper concludes by arguing that the direction of AI education will be crucial in determining future technological advancement and job markets, as well as the larger societal values and governance frameworks in an AI-driven world.

Keywords: Trajectory; AI Education; Trends; Challenges; Road Ahead.

Introduction

Artificial Intelligence (AI) has quickly evolved from computer science which is a specialized field of study to a major factor in modern technological development. Though once limited to specialist research labs and theoretical computer science (Elliott, 2019; Haenlein & Kaplan, 2019), AI is applicable to several fields such as healthcare, transportation, finance, education, agriculture, and public administration are just a few of the many industries it has an impact on (Gohil, 2023; Challoumis, 2024a). It is becoming more obvious that AI technologies have the ability to change labor markets, economies, and social norms as they grow in

strength and prevalence (Boyd & Holton, 2018; Tanveer, Hassan, & Bhaumik, 2020). Given how quickly AI is developing, it is imperative that everyone, including computer scientists, engineers, educators, legislators, and the general public, have a basic grasp of AI systems. To guarantee that people can interact with, assess, and use AI technology in a meaningful way, comprehensive and inclusive AI education is necessary (Miao et al., 2021; Fabunmi, Hananiya, & Adelaja, 2025). Education becomes a crucial tool for promoting agency, accountability, and public confidence when AI starts to arbitrate decisions that impact social justice, individual liberties, and resource allocation (Ayanwale et al., 2024; Shiohira, 2021).

This article traces the development of AI teaching at different educational levels and in different regions, from early K–12 projects to sophisticated postgraduate research programs. It looks at how multidisciplinary AI courses that combine ethics, policy, and domain-specific expertise are becoming more and more popular, as well as how informal and lifelong learning platforms like MOOCs, bootcamps, and corporate training are becoming more and more popular. Examined are global differences in access to AI education, emphasizing structural obstacles in underprivileged areas (Liu, Zhou, & Li, 2024; Jambol et al., 2025).

The creation of fair and efficient AI education is hampered by a number of issues, despite increased interest and funding. These include unequal access to learning resources, a lack of consistent curricula, inadequate ethical foundation, and inadequate teacher preparation (Cain, 2023). However, these difficulties also offer chances for creativity. International partnerships provide avenues for exchanging best practices, resources, and pedagogical models (Southworth et al., 2023; Lytras et al., 2024), and artificial intelligence (AI) itself can be used to develop personalized and adaptable learning experiences (Tedre et al., 2021; Yue et al., 2025).

A forward-looking framework that aligns AI education with workforce readiness, ethical imperatives, and global inclusivity is proposed in the article to address these changing demands (Challoumis, 2024b; Hutson, 2024). This vision calls for coordinated action among governments, educational institutions, industry leaders, and civil society organizations (Tanveer, Hassan, & Bhaumik, 2020; Miao et al., 2021). By promoting open-access resources, encouraging interdisciplinary learning, and emphasizing ethical literacy, AI education can prepare people to not only thrive in a digital economy, but also to shape the future of AI in ways that are just, inclusive, and sustainable (Ayanwale et al., 2024; Fabunmi, Hananiya & Adelaja, 2025).

The Origins of AI Education

Formally, AI education began to take shape in the middle of the 20th century in the computer science and mathematics departments of top research universities. AI

served as the foundation for early courses that focused on formal languages, knowledge representation, search algorithms, and logical reasoning (Haenlein & Kaplan, 2019; Doroudi, 2023). These courses reflected the dominant research objectives of the day, which were centered on attempts to use deductive reasoning and rule-based systems to mimic human intelligence (McCalla, 2023; Hutson, 2024). Universities like Carnegie Mellon, Stanford, and MIT developed as centers for cutting-edge AI research, producing a generation of academics who established the foundation for contemporary AI theory and applications (Guan, Mou & Jiang, 2020; Ye, Sun & Li, 2021).

Shifts with the Rise of Machine Learning

As machine learning gained popularity in the late 1980s and early 1990s, there was a significant change in AI research and education. A more empirical approach to AI was introduced by this subfield, which prioritizes statistical models and pattern recognition over hand-coded rules (Haenlein & Kaplan, 2019; Doroudi, 2023). Curricula started to include subjects like neural networks, decision trees, support vector machines, and probabilistic reasoning as interest in learning from data grew (Guan, Mou & Jiang, 2020; McCalla, 2023). This change was a reflection of a larger methodological shift that called for multidisciplinary input from neurology, cognitive science, and statistics as well as new instructional approaches (Hutson, 2024; Liu, Zhou & Li, 2024).

The Big Data Era and Deep Learning Revolution

Deep learning, a class of techniques, emerged in the 2010s as a result of the explosion of digital data and improvements in computer power. This led to breakthroughs in image identification, natural language processing, and AI that plays games (Haenlein & Kaplan, 2019; Hutson, 2024). This sparked a spike in corporate and academic demand for AI education. Courses in deep learning frameworks, GPU computing, data engineering, and ethics were quickly added to university curricula (Southworth et al., 2023; Liu, Zhou & Li, 2024). At the same time, online platforms like Coursera, edX, and Udacity emerged in response to the need for easily accessible AI training, democratizing access to high-quality education (Guan, Mou, & Jiang, 2020; Jambol et al., 2025).

Industry Involvement and Public Discourse

As AI technologies started to show real promise in commercial applications, like recommendation engines, virtual assistants, and driverless cars, industry participants became more involved in forming AI education (Boyd & Holton, 2018; Tanveer, Hassan & Bhaumik, 2020). Tech firms established their own training ecosystems, formed partnerships with academic institutions to co-develop courses, and started certification programs (McCalla, 2023; Jambol et al., 2025). As AI became more widely discussed, calls for more AI literacy increased, particularly in relation to issues

like algorithmic bias, privacy, and job displacement (Elliott, 2019; Shiohira, 2021). As a result of this cultural change, AI education now encompasses ethical, legal, and sociological aspects in addition to technical instruction (Miao et al., 2021; Lytras et al., 2024).

Ongoing Transformation and Future Prospects

As technology advances quickly and societal demands alter, AI education is still developing today. These days, interdisciplinary programs that integrate AI with disciplines including business, law, health, and the arts are typical (Southworth et al., 2023; Lytras et al., 2024). Project-based learning, experiential labs, and AI-assisted teaching tools are being tried out more and more by educational institutions (Ye, Sun & Li, 2021; McCalla, 2023). Inclusion, localization, and ethical awareness are being emphasized more as the need for AI fluency increases on a worldwide scale (Miao et al., 2021; Tanveer, Hassan, & Bhaumik, 2020). In order to serve the various futures, it seeks to mold, the field of AI education must continue to be flexible and introspective, as evidenced by its historical trajectory (Guan, Mou & Jiang, 2020; Fabunmi, Hananiya & Adelaja, 2025).

Current Trends in AI Education

This is presented in the following manner.

Integration Across Educational Levels

K-12 Education: As educators and policymakers see the value of educating kids early for a future shaped by intelligent technologies, AI education is becoming more and more prevalent in K–12 schools worldwide (Wong et al., 2020; Tedre et al., 2021). In addition to teaching fundamental programming skills, these early treatments foster higher-order cognitive capabilities like algorithmic reasoning, problem-solving, and critical thinking—all of which are necessary for comprehending and interacting with AI systems (Boyd & Holton, 2018; Yue et al., 2025). Promoting computational thinking, which teaches children to approach issues in an organized, logical manner and mimics the mechanisms that underpin intelligent machine behavior, is a crucial part of this early education (Wong et al., 2020; McCalla, 2023). Many curricula now highlight the ethical aspects of AI in addition to technical skills, urging young students to think about the societal ramifications of automation, data use, and machine decision-making (Miao et al., 2021; Southworth et al., 2023). The goal of this all-encompassing strategy is to produce a generation of socially conscious and tech-savvy people (Ayanwale et al., 2024; Ye, Sun, & Li, 2021).

When it comes to nationalizing AI education, a number of nations are setting the standard. As part of a larger plan to become a global leader in AI, China, for instance, has incorporated AI-related subjects into its curriculum (Challoumis, 2024a). Meanwhile, Singapore has created age-appropriate AI literacy modules for primary and secondary school pupils (Yue et al., 2025). These efforts

represent a move toward formalizing AI education as a fundamental skill, on par with language arts or mathematics (Tedre et al., 2021; Jambol et al., 2025). Early adoption of AI principles can help close the skills gap of the future, lessen digital divisions, and enable students to become knowledgeable producers and stewards of intelligent technology rather than only consumers (Shiohira, 2021; Liu, Zhou, & Li, 2024).

Higher Education: The increasing need for knowledge in both the fundamental and practical areas of artificial intelligence is reflected in the quick expansion of AI-related education programs offered by universities worldwide (Haenlein & Kaplan, 2019; Lytras et al., 2024). Specialized degrees in robotics, data science, machine learning, and natural language processing have been added to the traditional computer science departments' curricula (Guan, Mou & Jiang, 2020; Boyd & Holton, 2018). More significantly, multidisciplinary programs that combine AI with many fields like biology, economics, psychology, philosophy, and public policy have become more prevalent (Southworth et al., 2023; Jambol et al., 2025). These courses seek to give students the contextual knowledge and technical expertise needed to use AI in particular industries in a meaningful and responsible way (Tanveer, Hassan, & Bhaumik, 2020; Fabunmi, Hananiya, & Adelaja, 2025). To assist advances in precision medicine and drug development, for example, AI is being taught alongside bioinformatics and genomics in the biological sciences (Miao et al., 2021; Ye, Sun, & Li, 2021). AI is being investigated as a tool and a topic of criticism in the social sciences; in economics, it is being used to simulate human behavior, while in philosophy and law, it is being investigated for its ethical and societal implications (Wong et al., 2020; Lytras et al., 2024). Through labs, research initiatives, and industry collaborations, universities are also placing a greater emphasis on experiential learning by enabling students to use AI to solve real-world problems (Southworth et al., 2023; Jambol et al., 2025;). A change in educational philosophy is reflected in this interdisciplinary and applied approach, which views AI as a foundational competency for future leaders, researchers, and professionals in all fields rather than as a discrete technical field (Tedre et al., 2021; McCalla, 2023). Higher education is changing, to generate graduates who are both technically proficient and socially conscientious as AI continues to influence every aspect of society (Miao et al., 2021; Shiohira, 2021).

Vocational and Lifelong Learning: Short courses, Massive Open Online Courses (MOOCs), boot camps, and reskilling initiatives have become crucial channels for providing people with the skills they need to prosper in an AI-driven world, as the need for AI-literate professionals continues to grow across industries (Tanveer, Hassan & Bhaumik, 2020; Miao et al., 2021). From entry-level employees looking to advance

their skills to seasoned experts hoping to move into AI-related roles, these adaptable, frequently shorter-term educational programs offer a more accessible route to AI knowledge (Shiohira, 2021; Jambol et al., 2025). Global access to state-of-the-art knowledge on subjects like machine learning, deep learning, and data science is made possible by MOOCs, which are provided by platforms like Coursera, edX, and Udacity and offer top-notch AI education from prestigious universities (Elliott, 2019; McCalla, 2023). With an emphasis on practical training, bootcamps, which usually last a few weeks to months, give participants the chance to practice coding, data analysis, and creating AI applications (Guan, Mou, & Jiang, 2020; Southworth et al., 2023). In addition to providing job placement services, several bootcamps aim to expedite learning and prepare participants for the workforce (Lytras et al., 2024; Tanveer, Hassan, & Bhaumik, 2020). Furthermore, reskilling programs supported by governments, businesses, or nonprofit organizations are becoming more and more common. These programs are designed to retrain employees whose jobs are in danger because of automation or artificial intelligence (AI) technology (Haenlein & Kaplan, 2019; Jambol et al., 2025). These educational models democratize access to AI education and promote a broad talent pool in industries like marketing, finance, and healthcare by providing a variety of formats that accommodate various learning styles and career needs (Boyd & Holton, 2018; Southworth et al., 2023). These short-term educational programs are becoming an essential component of the global endeavor to guarantee that professionals have the skills necessary to thrive in an AI-enhanced economy as AI permeates many sectors (McCalla, 2023; Fabunmi, Hananiya & Adelaja, 2025).

Interdisciplinary Emphasis

As the necessity for multidisciplinary approaches that integrate viewpoints from the humanities, ethics, law, and public policy becomes more widely acknowledged, AI education is moving beyond its conventional foundations in computer science (Boyd & Holton, 2018; Lytras et al., 2024). The influence of AI technologies on societal structures, ethical standards, and legal frameworks goes much beyond their technological capabilities as they become increasingly ingrained in daily life (Gohil, 2023; Jambol et al., 2025). As a result, academic institutions are creating curricula that integrate AI with these crucial domains, stressing the significance of contextually aware, socially conscious AI systems (Tanveer, Hassan, & Bhaumik, 2020; Southworth et al., 2023). For example, students can investigate the ethical ramifications of machine learning algorithms, including bias, fairness, and privacy issues, by combining AI with ethics (Miao et al., 2021; Shiohira, 2021). The changing legal environment pertaining to data protection, intellectual property, and the responsibility of autonomous systems is the

main topic of AI law courses (Miao et al., 2021; Challoumis, 2024). Conversely, public policy initiatives tackle the governance issues raised by AI, including regulating AI-powered devices and reducing any possible threats to society (Wong et al., 2020; Guan, Mou, & Jiang, 2020). These multidisciplinary courses seek to equip students with both technical know-how and the capacity to critically consider the ways in which AI systems impact human lives (McCalla, 2023; Fabunmi, Hananiya & Adelaja, 2025). This fusion's increasing momentum reflects the understanding that engineers cannot be the only ones responsible for the development of AI; input from a variety of disciplines is needed to ensure that AI technologies are developed and applied in ways that are morally righteous, inclusive, and consistent with larger societal values (Haenlein & Kaplan, 2019; Southworth et al., 2023). As a result, the field of AI education is becoming more comprehensive and multidimensional, better able to address the intricate problems brought about by the growing use of intelligent systems (Tedre et al., 2021; Ayanwale et al., 2024).

Global Expansion and Disparities

The widespread adoption of AI learning is hampered by major systemic impediments in many low- and middle-income countries, even if developed nations continue to dominate in AI education infrastructure and innovation (Tanveer, Hassan, & Bhaumik, 2020; Jambol et al., 2025). Limited access to dependable internet and digital technologies, which are essential for providing contemporary AI curriculum, particularly in rural or isolated places, is one of the most urgent issues (Gohil, 2023; McCalla, 2023). Online resources, MOOCs, and AI tools that could otherwise aid in closing the educational gap are inaccessible in many areas due to erratic or sluggish internet connectivity (Southworth et al., 2023; Ayanwale et al., 2024). Furthermore, there is a serious lack of skilled teachers with the necessary training to teach AI principles. Educational disparities are made worse in these nations by teachers who frequently lack the specialized knowledge needed to teach difficult subjects like data science and machine learning (Shiohira, 2021; Fabunmi, Hananiya, & Adelaja, 2025).

The quality and breadth of AI education in these areas continue to be restricted due to a lack of adequate professional development opportunities for educators (Boyd & Holton, 2018; Lytras et al., 2024). Again, a lot of low- and middle-income nations don't have strong curriculum frameworks to incorporate AI into regular education, which leads to disjointed and occasionally out-of-date training programs (Challoumis, 2024; Ye et al., 2021). Students in these areas might thus lose out on the chance to acquire the necessary skills to engage in the global AI-driven economy (Miao et al., 2021; Guan, Mou, & Jiang, 2020). In order to overcome these obstacles and guarantee more equitable access to AI education globally, these discrepancies highlight the necessity of

international cooperation, focused infrastructure investments, and the creation of contextually relevant curricula (Wong et al., 2020; Jambol et al., 2025).

Challenges in AI Education

The challenges in applying AI to education include the following:

- **Ethical and Responsible AI**

Integrating ethics into technical instruction is a significant difficulty in AI education. AI systems have the potential of reinforcing preexisting biases and exacerbating societal disparities as they become more prevalent in decision-making, especially in fields like criminal justice, healthcare, and employment (Haenlein & Kaplan, 2019; Tanveer, Hassan & Bhaumik, 2020). AI education needs to cover more ground than just technical skills in order to reduce these hazards. To enable students to create AI systems that put justice, openness, and social responsibility first, it is crucial to integrate ethical reasoning, critical thinking, and sociopolitical awareness into the curriculum (Boyd & Holton, 2018; Miao et al., 2021). These ethical elements are essential for developing a new generation of AI professionals who possess both technical expertise and the capacity to evaluate the social impact of their work (Shiohira, 2021; Fabunmi, Hananiya, & Adelaja, 2025). Teachers must stress the societal ramifications of AI systems as they become more and more integrated into decision-making processes (Southworth et al., 2023; Gohil, 2023).

- **Curriculum Standardization and Accreditation**

For educational institutions trying to maintain the relevance of their curricula, the quick development of AI technology poses a serious issue. It is become harder to make sure that academic programs incorporate the newest discoveries, instruments, and techniques as AI develops at an unprecedented rate (Challoumis, 2024; Lytras et al., 2024). Furthermore, this problem is made worse by the absence of internationally accepted standards and accreditation procedures for AI education, which results in variations in the caliber and subject matter of AI programs throughout universities (Guan, Mou, & Jiang, 2020; Ye et al., 2021). This lack of uniformity leads to differences in graduates' knowledge and abilities, making it more difficult to evaluate the preparedness of AI professionals globally and making it more difficult to match educational outputs with business demands (McCalla, 2023; Miao et al., 2021). In order to sustain educational quality in the face of the rapid advancement of AI technologies, it is imperative that coordinated efforts be made to create global standards, guarantee curriculum relevance, and set up strong accrediting systems (Wong et al., 2020; Jambol et al., 2025).

- **Faculty Development and Capacity Building**

One of the biggest obstacles to expanding AI education globally is the lack of trained teachers who can instruct in the subject.

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Many universities find it difficult to find and keep faculty members with the specific training and experience needed to effectively teach complicated AI topics as the demand for AI expertise rises (Guan, Mou, & Jiang, 2020; Jambol et al., 2025). Significant funding for faculty development, including chances for current instructors to receive training and upskilling, as well as incentives for professionals from industry to enter academia, will be necessary to address this deficit (Haenlein & Kaplan, 2019; Fabunmi, Hananiya, & Adelaja, 2025). Furthermore, to promote AI-focused educational programs and keep institutions at the forefront of the field, more financing for research is necessary (Challoumis, 2024; Lytras et al., 2024). Additionally, encouraging global partnerships among academic institutions, research centers, and business associates might aid in closing the gap by promoting information sharing, cooperative curriculum development, and resource sharing (Miao et al., 2021; Southworth et al., 2023). These initiatives will be essential to guaranteeing a continuous supply of trained teachers who can deliver top-notch AI training to satisfy the expanding demand worldwide (Wong et al., 2020; McCalla, 2023).

The Future of AI Education

These include the following:

- **Personalized and Adaptive Learning**

Platforms driven by AI have the potential to completely change education by altering how knowledge is imparted and experienced. By customizing content to each student's particular requirements and interests, these systems have the ability to provide highly personalized learning experiences (McCalla, 2023; Miao et al., 2021). AI platforms may adjust in real-time to different learning styles, such as kinesthetic, visual, or auditory, by assessing learning patterns. This ensures that the content is delivered in the most efficient manner for each individual (Wong et al., 2020; Jambol et al., 2025). AI is also capable of monitoring students' progress over time, pinpointing their areas of strength and need for development and providing focused interventions to help them overcome obstacles (Haenlein & Kaplan, 2019; Southworth et al., 2023). These technologies' real-time feedback can improve the educational process even further by allowing students to swiftly modify their methods and expand their comprehension (Shiohira, 2021; Ye et al., 2021). AI-powered platforms provide a glimpse of the future of education by enhancing its adaptability and responsiveness. In this future, each student will receive a personalized learning experience that optimizes their potential and equips them for success in a world increasingly driven by artificial intelligence (Gohil, 2023; Fabunmi et al., 2025).

- **Open and Inclusive Ecosystems**

Initiatives must give priority to community-based learning methods, open-access resources, and multilingual content in order to democratize AI education and make AI knowledge available to a wide range of

people (Boyd & Holton, 2018; Miao et al., 2021). Learners from all backgrounds can interact with cutting-edge AI concepts without financial restrictions thanks to open-access platforms that offer free or inexpensive instructional materials (Shiohira, 2021; Jambol et al., 2025). Equally crucial is multilingual content, which makes AI education globally inclusive by preventing language barriers for non-native English speakers (Wong et al., 2020; Tanveer et al., 2020). Local study groups and online peer-to-peer platforms are examples of community-based learning strategies that can promote cooperative learning settings and close gaps in traditional educational systems (Challoumis, 2024; Doroudi, 2023). Collaborations between governments, academic institutions, and business are crucial to achieving these objectives (Guan et al., 2020; Southworth et al., 2023). While academic institutions can design curriculum that cater to the requirements of various learners, governments can assist in providing funding and establishing policies that promote fair access to AI education (Gohil, 2023; Ye et al., 2021). Conversely, industry partners can help by providing practical applications, mentorship opportunities, and current information on AI trends (Haenlein & Kaplan, 2019; Lytras et al., 2024). Together, these stakeholders may build sustainable and inclusive AI education environments that enable people from all backgrounds to interact with AI and make socially responsible contributions to the creation of future technologies (Liu et al., 2024; Fabunmi et al., 2025).

- **Preparing for the Unknown**

Education must change its emphasis as AI develops from merely imparting technical skills to cultivating critical thinking, creativity, and adaptability—all of which are key soft skills (Brynjolfsson & McAfee, 2014; Dede, 2017). The future of work will require people who can think critically about difficult problems, tackle obstacles with imaginative solutions, and swiftly adjust to changing technology environments, even while skill with AI tools and technologies is vital (Susskind & Susskind, 2015; Schwab, 2016). Because AI and other emerging technologies are changing so quickly, job functions will also change over time, necessitating lifelong learning (Arntz et al., 2016; Frey & Osborne, 2017). As a result, educational systems should prioritize not only knowledge acquisition but also the capacity for ongoing learning and adaptation. Instilling a mindset that values curiosity, self-directed learning, and resilience in the face of uncertainty is essential to preparing children for lifelong learning (Rotherham & Willingham, 2010; Saavedra & Opfer, 2012). This strategy guarantees that graduates are not only ready for today's occupations, but also capable of navigating the rapidly evolving professional and technical landscapes of the future (Chui et al., 2016; Bessen, 2019). Accordingly, education will be essential in preparing people to prosper in an AI-driven society where success will

depend on one's capacity to learn, unlearn, and relearn (Christensen et al., 2011; Koller et al., 2020).

Conclusion

Significant progress has been achieved in incorporating AI into academic curricula and increasing access to learning resources, resulting in a dynamic and diverse trajectory for AI education. AI is becoming a more and more important subject in schools and colleges, educating students for a world dominated by intelligent technologies. Despite these advancements, there are still significant gaps, especially in the fields of global inclusion, equity, and ethics. In order to support the responsible development of these technologies, many AI education programs currently do not fully address the ethical concerns of AI, including prejudice, privacy, and justice. Furthermore, there are still disparities in access to high-quality AI education, with many areas—especially those in low- and middle-income nations faced with obstacles such inadequate curricula, a lack of qualified teachers, and inadequate infrastructure. The future of AI and society at large depends on how well we train the next generation of intelligent system designers, thinkers, and stewards as AI develops and becomes more pervasive in daily life. This calls for a change in AI education toward a more inclusive, globally-minded approach that stresses interdisciplinary cooperation, ethical reasoning, and social responsibility in addition to providing students with technical capabilities. In order to guarantee that AI is created and applied in ways that are fair, just, and advantageous to everyone, a coordinated, inclusive, and progressive approach to AI education is not only a desirable objective it is a must.

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