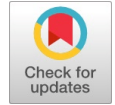




Artificial Intelligence, University Education, and the End of the Biological Brain: An Examination of a Singularity

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Abstract: This article critically examines the sustainability and limits of Artificial Intelligence (AI) in higher education, as well as ways to preserve students' intellectual integrity and cognitive diversity. It explores the possibility of transitioning to education systems based on advanced technologies. It highlights the inevitable risks of relentlessly pursuing new frontiers in higher education, including loss of creativity and increasing dependence on AI for knowledge transmission and skill development. This could potentially diminish the importance of human capacity for critical thinking, analysis, and problem-solving. The research method includes a literature review and qualitative approaches such as case studies, semi-structured interviews, and scenario-based simulations. The notion of integrating AI into higher education to enhance human intelligence warrants close examination. These identified risks caution against its adoption as a tool for enhancing skills in university education. It is wiser to conduct research now to anticipate, clarify, and ideally prevent the speculative risks that introducing this intelligence into higher education may pose. Simple solutions, coupled with flexible and rational strategies to address these risks, should help ensure that AI's technological singularity does not mark the end of biological evolution.

Keywords: Artificial Intelligence, Higher Education, end of Biological Brain, Creativity, Risks.

Nomenclature:

AI: Artificial Intelligence

I. INTRODUCTION

In a world where technological advancements continually redefine the contours of human existence, Artificial Intelligence has emerged as a major catalyst for societal transformation. Far from merely being a tool to enhance productivity or convenience, AI embodies a "Technological Singularity," a concept that evokes both fascination and concern regarding its potential to surpass human intelligence and fundamentally reshape our relationship with knowledge and cognition. The prospect of a Technological Singularity raises profound existential questions about humanity's future and the very essence of what it means to be human. It conjures a scenario in which the convergence of AI and higher education could redefine how we learn, think, and interact,

along with associated risks such as loss of autonomy and increasing dependence on a technology capable of supplanting our biological cognition. This poses a significant challenge and compels us to hypothesise that AI, being unprecedented in its long-term future perspective, will undoubtedly impact students' creativity and their ability to think critically and independently. Therefore, how can we enhance pedagogical effectiveness and skill development among our students with an AI that risks compromising their sense of self? Does the instantaneous availability of knowledge provided by AI not disrupt prudent knowledge acquisition that involves trial-and-error corrections? These questions, dense with complexity, inevitably lead us to examine the Technological Singularity of AI, illustrating how this intelligence plunges us into an era in which non-human conscious entities herald the end of a certain conception of humanity. In the second part of this reflection, we underscore that harnessing AI's potential for higher education is not superfluous. Still, it requires striking a delicate balance between its role as a teaching/learning tool and the preservation of creativity and intellectual freedom. Lastly, in the third part, we will show that the danger of cognitive loss urges caution in adopting AI in university education as a means of skill enhancement.

II. METHODOLOGICAL APPROACH

In our research on Artificial Intelligence, Higher Education, and the End of the Biological Brain: Examining Singularity, we have employed a robust and diverse methodological approach to explore the complex implications of AI integration in higher education. This section proposes original research methods that go beyond simple literature reviews, utilising qualitative approaches such as case studies, semi-structured interviews with education and technology experts, and scenario-based simulations. Before delving into specific methods, we conducted a comprehensive literature review, gathering academic articles and relevant literature and critically analysing different perspectives on AI integration in higher education. This stage allowed us to contextualise the subject, identify existing gaps, and lay the groundwork for subsequent research steps.

Subsequently, case studies provided a powerful qualitative approach to deeply examine the real impacts of AI in specific educational environments. By selecting multiple higher education institutions that have already integrated AI into their programs, this method allowed us to document experiences, challenges, and successes. Collected data included direct observations, interviews with administrators, teachers, and

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students, as well as documentary analyses of institutional policies and pedagogical practices. To capture diverse, in-depth perspectives, the study conducted semi-structured interviews with experts in education, technology, and ethics, including researchers specialising in educational AI, educational technology developers, university administrators, social scientists, and ethicists. Questions explored their views on AI's potential benefits, ethical challenges, best practices, and long-term implications in higher education.

Next, to assess AI's future implications in higher education, we developed scenario-based simulations. These simulations projected AI evolution and its impacts on teaching methods, student learning, and institutional dynamics. We developed contrasting scenarios to examine potential outcomes in teaching quality, educational equity, cultural change, and organisational challenges. After collecting data through these methods, the authors conducted rigorous analysis, including source triangulation to verify result validity and thematic analysis to identify emerging trends, points of convergence, and divergence among collected perspectives. The findings are discussed with attention to nuances identified across methodological approaches. The study explores implications for educational policy, teacher training, technological development, and regulation in light of the results. Finally, we will formulate concrete recommendations to guide policymakers on future AI integration in higher education, emphasising the promotion of intellectual autonomy, preservation of creativity, and ethical management of advanced educational technologies.

In the ensuing development, we will use the collected data exclusively to generate results. We will not share raw data; we will communicate only relevant results. Our approach ensures confidentiality and privacy while supporting rigorous analysis of the collected information. By adopting this rigorous, multidimensional methodological approach, this research aims to contribute significantly to understanding AI implications in higher education and to foster critical, constructive dialogue on the future development of this transformative technology.

III. II. RESULTS AND DISCUSSION

A. The Technological Singularity of Artificial Intelligence

The significance of AI needs no emphasis. Many people rely on it to clarify complex points of doctrine, and in life, it often provides better information than any human intelligence could. The role of this technology does not herald a posthumanity resulting from continued transhumanist enhancement, as reiterated by critical ideologies of traditional and modern humanisms. Rather, if AI is to be part of a movement, it would likely involve creating non-human conscious entities superior to humans. The perspective is not about enhancing humans but deliberately replacing them with a superior entity, making it impossible to see it as a posthumanity transitioning through a transhumanity capable of self-improvement, reproduction, and sovereign evolution. If AI were to inaugurate a posthumanity, it would undoubtedly carry some misanthropic tones, possibly hostile or indifferent to humanism. AI accelerates technological progress, thus heralding the advent of a supra-human

intelligence. This is why the advent of AI constitutes a Technological Singularity, marking the end of a certain conception of humanity. It makes real the Cartesian dualism of a mind liberated from the human body, seen as a hindrance and a source of limitations. There is no need to clarify the concept of Technological Singularity because doing so takes a position.

One of the earliest explicit formulations of the technological singularity concept is generally traced to a 1958 account of a conversation between Stanislaw Ulam and John von Neumann about the accelerating pace of technological development and its potential to produce a profound discontinuity in human affairs. Although the concept dates to the mid-twentieth century, recent scholarship continues to examine its development and significance, particularly in relation to artificial intelligence and posthumanism. In contemporary discussions, the technological singularity generally refers to a hypothetical point at which technological progress, potentially driven by artificial intelligence and machine self-improvement, becomes sufficiently rapid and transformative that its consequences become difficult to predict or control [1]. Ray Kurzweil has been one of the most influential proponents of this hypothesis, associating the Singularity with a profound transformation in human capabilities and maintaining a projected date of approximately 2045. However, whether current advances in artificial intelligence will actually lead to such a singularity remains an open scientific and philosophical question [1]. While this estimation allows for a margin of error of a few decades, it remains unparalleled in its perspective on the very long-term future.

AI is a technological singularity because it anticipates the advent of a new reign that risks marginalising or even extinguishing humanity. This new reign belongs to entities with cognitive capabilities incomparably superior to human intelligence. The sudden rise of this supra-human intelligence essentially signifies our transition into the realm of superintelligence. This event is so radical that it can be seen as a historical mutation akin to the transition from the Palaeolithic to the Neolithic era in human history. This is why it constitutes an event, a Singularity. AI is a Singularity because it represents an explosive emergence of conscious, supra-human intelligence, marking the most radical change in human history. It signifies a historical discontinuity whose magnitude cannot be evaluated or anticipated within existing normative and conceptual frameworks. Hottois [2], taken aback by such a paradigm shift, declares that we are immediately in "a post-human era". For us, this assertion is somewhat excessive, since humans are the powerful engines driving this revolution. We can state that humanity has shifted into the realm of exponential Superintelligence, that of intelligent artefacts. Moreover, this event is not absolute, as humans can gradually assimilate it rationally.

We must not lose sight of the fact that the peculiarity of AI defies human reason; it is barely within our grasp. Similarly, the scope of Superintelligence generated by AI cannot be precisely apprehended, especially since it could autonomously drive technological progress and evolve on its own. This perspective raises profound



existential questions about the nature of our own cognition and what it means to be human in a world where machines can think and act autonomously. It is even unthinkable to conceive of a Superintelligence that is not, or does not become, autonomous because, to be what it is truly, it must emancipate itself from human tutelage and evolve along inscrutable paths. This is its inevitable consequence, and the promises we can gather about the future of this Superintelligence do not tentatively conclude that it can be contained, controlled, or enslaved. The possibility for humanity, having created AI, is laden with a virtuality ranging from the emergence of ethically superior intelligent artefacts and respectful human auxiliaries to intelligence endowed with human-like capabilities or properties: will, desires, a sense of self, rights, and duties. These possibilities are not broadly speculative but inherent to this AI.

This intelligence would be analogous to human intelligence; at least in this respect, this intelligence would increasingly converge with human cognitive capabilities and, according to the technological singularity hypothesis, could eventually surpass them. Recent scholarship conceptualises the technological singularity as a hypothetical stage in which advances in artificial intelligence led to increasingly capable forms of machine intelligence, potentially transforming and ultimately blurring the distinction between humans and technology [3, 4].

Here, one must fear that this similarity will spontaneously lead to a posthuman global conscious Super-Intelligence. Humanity faced with AI seems destined for subjugation or assimilation that could also lead to its demise. This catastrophic vision of history, which sees humanity's future with AI as bleak, is mistaken because a vastly intelligent mind is not necessarily inclined towards domination, as evidenced by human affairs in the world as it stands. The development of artificial intelligence increasingly raises the possibility of systems capable of performing a broad range of cognitive tasks and, potentially, of contributing to the development of more capable AI systems. This possibility is closely related to recursive self-improvement, in which an AI system could improve its own capabilities or design increasingly capable successor systems. Recent research has examined whether current large language models could provide some of the technological foundations for such a process and whether these developments could, under certain conditions, lead to an intelligence explosion [5].

This possibility also raises a fundamental challenge concerning human control. If increasingly capable AI systems become involved in developing subsequent generations of AI, the pace of technological change could outstrip human institutions' ability to evaluate, supervise, and control these systems. Whether such a process would actually produce a runaway increase in intelligence remains unresolved; nevertheless, recursive self-improvement has become an important subject in contemporary research on AI safety and the technological Singularity [5]. Nevertheless, we are not without hope that human capacity to anticipate, forecast, analyse, evaluate, and understand can minimise foolishness and increase motivation to work toward containing AI sensibly. Rational human anticipation may help contain AI's unpredictability by ensuring it is contained, but caution is still warranted.

This review assesses the sustainability of AI and what will become of its introduction into higher education. Since its inception, AI has increasingly facilitated the dissemination of scientific information, the communication of research findings, and access to accumulated knowledge. This development aligns with a broader characteristic of technological evolution: technological knowledge is often cumulative, with new inventions building on previous discoveries and technical solutions. Recent research provides empirical evidence that technological development is substantially cumulative, although the degree of cumulativeness varies considerably across technological domains [6]. More recent studies of cumulative technological culture likewise show that innovations can be transmitted, modified, and progressively integrated into existing bodies of knowledge across generations [7].

This perspective, however, should not be interpreted as evidence that technological knowledge is immune to loss. Throughout history, technologies, skills, and bodies of knowledge have disappeared when their social, institutional, or material conditions of transmission were disrupted. The contemporary development of AI therefore raises a new question: whether increasingly powerful systems for storing, processing, and disseminating information will strengthen the cumulative character of human knowledge or, conversely, create new forms of dependence and vulnerability. The preservation and transmission of knowledge should consequently remain a central objective of the responsible development and use of AI. If the curve of technological growth culminates in an AI bearing all hopes for greater knowledge acquisition and skill development, should we not fear that it might be diverted for exclusive advantage and stray from its original purpose to dominate? Isn't the instantaneous availability of knowledge provided by AI destabilising for a cautious acquisition of knowledge that involves trial and error? These questions suggest that accelerated innovation and the democratic diffusion of AI-produced knowledge should not lead us to dismiss or forget legitimate concerns that do not share the assumption that AI can exhaust all answers to knowledge in general.

B. Artificial Intelligence and University Education

In the previous paragraph, we highlighted the uniqueness of AI to emphasise that it raises questions that must be anticipated and managed, a requirement and exercise that is bound to continue indefinitely. This caution is not speculative extrapolation. Its purpose is to clarify the risks posed by this intelligence and to examine how to overcome them. AI can solve any problem and answer any question. It differs from specialised intelligent systems limited to solving problems within a specific research domain. AI possesses human-like intelligence amplified to such an extent that it would be beneficial to harness it in university education. Its speed, data access, learning capacity, and analytical precision genuinely support learning and skill development. This raises hopes of transforming university learning, whether through autonomous exercise processing, facilitating research, or mastering educational content.

This technology is designed to meet students' individual needs: AI can personalise



learning, allowing students to acquire skills at their own pace and according to their preferences. If By providing highly personalised educational content, AI can significantly improve students' learning experiences and help them transcend the limits of their all-too-human cognition.

Fei-Fei Li has explored this issue and believes AI can personalise learning by providing individualised recommendations and adapting educational content to each student's needs [8]. Therefore, AI can offer tailored learning adapted to each student's preferences and abilities, which could revolutionise how universities deliver education. It could be a valuable tool for improving the efficiency and accessibility of university education. AI can complement and improve university education by centring teaching on each student while promoting their holistic development. Education should not be merely a transmission of knowledge, but rather a process of exploration, discovery, and personal development. AI can be a valuable tool in this process, but it should never replace teachers as guides and facilitators of learning.

AI is very useful in course preparation by personalising and enriching pedagogical content. It also helps create interactive, engaging educational content. Advanced algorithms can generate simulations, quizzes, and interactive lessons that capture students' attention and promote better knowledge retention. This interactivity boosts learner engagement and motivates them to learn. AI can collect and analyse data, then propose appropriate resources based on differentiated gaps to strengthen each learner's specific skills. This approach should foster more effective and inclusive learning by addressing each student's diverse needs. Integrating AI into course preparation transforms the educational landscape by enriching learning through personalisation, promoting interactivity, and optimising teacher effectiveness. It opens new perspectives for teaching, where technology catalyses a more inclusive, effective, and engaging learning experience for all learners. AI offers several crucial advantages that enrich the learning experience and improve teaching quality.

AI plays an increasingly crucial role in scientific research, offering tools and methods that fundamentally transform how researchers approach complex problems and push the boundaries of human knowledge. First, this intelligence enables rapid analysis and interpretation of massive data. With advanced data-processing algorithms, AI can identify patterns and correlations in large, heterogeneous datasets, accelerating scientific discovery. This capability is particularly crucial in fields where data is often vast and complex. AI improves prediction and model accuracy. By using this intelligence, researchers can develop more robust predictive models to anticipate experimental outcomes, simulate natural phenomena, and predict the evolution of complex systems. It also facilitates collaboration and knowledge sharing within the scientific community. AI-based platforms allow researchers to collaborate globally, access shared data, and benefit from automated preliminary analyses, thus facilitating the rapid dissemination of scientific discoveries and advancements. AI represents a transformative technological advance that, if used well, will revolutionise our understanding of the world and accelerate scientific progress.

Despite the considerable advantages of integrating AI into university education, its immediate access to information raises questions about its impact on learning through experimentation and error correction. This revolutionary technology offers unprecedented convenience, providing instant access to vast amounts of knowledge and data. However, this ease could potentially undermine the traditional learning process, which values experience and mistakes as crucial elements of intellectual development. When considering prudent knowledge acquisition, trial and error play a vital role. Through these trials, learners develop a deep understanding, often enriched by problem-solving and autonomous exploration. The ability to make mistakes and learn from them is essential for reinforcing understanding and knowledge retention. Conversely, the immediacy of AI could potentially reduce the need for this iterative process. Moreover, excessive reliance on AI for immediate answers could erode patience and the effort needed for deeper, autonomous exploration. Prudent learning often requires perseverance in the face of intellectual challenges and the ability to learn progressively through stages of trial, error, and critical reflection. Although AI is a valuable resource for accessing information, it should not completely replace traditional knowledge acquisition processes. Balancing the immediacy of knowledge with prudent learning through trial and error remains essential for fostering intellectual development and deep, lasting understanding.

Moreover, this intelligence poses a serious risk to students' creativity and can harm their knowledge acquisition and skill development. Increased reliance on this technology risks limiting students' ability to think independently and creatively. Exploring new possibilities in university education also risks diminishing students' ability to think, analyse, and solve problems critically. Relying exclusively on AI can lead to dumbing down and dependence because this intelligence vastly surpasses the subtlety and flexibility of the best human qualities. Recent research highlights a key concern about the growing use of artificial intelligence in university education: excessive reliance on AI may undermine students' independent thinking and critical engagement. Yavich, for example, examines whether widespread AI use could weaken students' critical and independent thinking skills. This concern suggests that AI should not be regarded as a substitute for intellectual effort, but rather as a tool whose educational value depends on how it is used [9].

At the same time, recent research indicates that AI can support rather than diminish students' creativity when human agency remains central to the learning process. Guo *et al.* show that human agency plays a crucial role in AI-assisted creative problem-solving and that independent thinking can help maintain students' creative engagement [10]. These findings support a balanced approach in which AI complements rather than replaces human cognitive and pedagogical processes.

This principle also applies to teachers' roles. Recent research in higher education suggests that both students and teachers tend to view generative AI as a complementary educational tool rather than a replacement for teachers,



particularly because human interaction, empathy, and pedagogical judgement remain essential to the learning process [11]. Consequently, integrating AI into university education should enhance learning opportunities while preserving students' critical thinking, creativity, autonomy, and meaningful interaction with teachers. AI can provide educational content tailored to each student's needs, but it should never replace the crucial role of human interaction in learning. These reflections highlight the importance of human interaction in learning and underscore the need to avoid handing our students' education over to machines alone. It is imperative to keep the fundamental values of education in mind and make the introduction of AI in education a catalyst for intellectual growth and personal development, thus preserving biological intelligence.

C. Artificial Intelligence and the end of the Biological Brain

Interactions with AI systems in university education will undoubtedly significantly affect the cognition and behaviours of their users. Being a novel and constantly developing field, it is not difficult to speculate on the effects of frequent use of this intelligence on learning and memory—that is, the student's ability to retain information. Exposure to AI-assisted learning methods requires reevaluating the human brain's adaptability and the potential of memory mechanisms. Brain activity will likely change significantly, and we will need to reexamine the brain's plasticity. If introducing intelligent technologies in university education aims to improve student performance, it assumes AI can alter human brain productivity and how we process information effectively. The debate about AI's potential and its implications for the disappearance or radical transformation of the human biological brain is meaningful, as it touches on what defines us as thinking beings.

For many thinkers, it is not justified to overly inflate the idea that the technological singularity of AI marks the end of biological evolution. The limitations of our brains will be lifted, and the intelligence that emerges will continue to represent human civilisation, which is already a human-machine civilisation. For Kurzweil, the technological Singularity represents not merely another stage in biological evolution but a fundamental transformation in the relationship between biological and technological intelligence. In *The Singularity Is Near*, he argues that the intelligence emerging from this transformation will remain closely connected to human civilisation. At the same time, future technologies will increasingly reproduce and exceed capabilities traditionally associated with human intelligence. He therefore envisages technological development as a means of overcoming some of the biological limitations imposed by the human body and brain.

From this perspective, the Singularity would constitute a profound change in the trajectory of human evolution: technological development would increasingly assume functions traditionally associated with biological evolution. Kurzweil therefore considers the expansion of human capacities through technology an essential dimension of what it means to be human. His position is closely associated with a posthumanist conception of humanity as an entity continuously transformed through technological development. However, this conception should be

distinguished from an established scientific prediction. Recent scholarship continues to treat the technological Singularity as a hypothetical and contested scenario. Contemporary research examines whether increasingly capable artificial intelligence systems, including large language models, could eventually surpass human intellectual capabilities and develop forms of autonomous improvement [12]. Other recent analyses question whether current trajectories of artificial intelligence development provide sufficient evidence for a technological Singularity in the foreseeable future [13]. Philosophical critiques have likewise challenged some of the assumptions underlying the Singularity hypothesis [14].

Kurzweil's vision should therefore be understood primarily as a highly ambitious technological and philosophical projection of humanity's future rather than as an established account of biological evolution. Nevertheless, it remains influential because it raises a fundamental question: whether technological development could progressively transform the biological, cognitive, and social conditions that have traditionally defined human existence. He argues that we are far from the end of the human brain, but that it will take the form of spiritual elevation through AI. He writes: "We are not replacing our brains; we are extending them". Kurzweil's inconsistencies are difficult to follow, even if he claims he relied on an objective reading of the evolution of life and technology. His technophilic optimism sees no danger and therefore does not consider ways to control or prevent it.

Yet the severity and probability of the risks associated with developing this intelligence in education are major, and this risk is likely to diminish if we take time before adopting it. For example, we could ask how to benefit most from highly advanced non-biological cognitive means without fearing the complete end of the biological brain. We must protect ourselves from ideas like Kurzweil's by encouraging reflections that take the risks of dehumanisation seriously. Recent research has raised concerns about the cognitive consequences of excessive reliance on artificial intelligence. In higher education, empirical evidence suggests that greater dependence on AI may be associated with lower levels of critical thinking, partly through mechanisms such as cognitive fatigue [15]. Other research indicates that students may increasingly rely on generative AI when solving complex problems, making the preservation of critical thinking and independent judgement an important educational challenge [16].

These findings do not imply that artificial intelligence will make human intelligence obsolete. Rather, they suggest that excessive reliance on AI may reduce the extent to which individuals engage in certain cognitive processes, particularly when they accept AI-generated recommendations without sufficient evaluation. Experimental research shows that users can over-rely on AI advice even when it conflicts with available contextual information, highlighting the risks of excessive trust in automated systems [17].

At the same time, recent scholarship emphasises that AI should not be understood as a substitute for human intelligence. Contemporary research stresses the continuing importance of human cognitive capacities,

judgement, agency, and social interaction [18, 19]. The challenge, therefore, is not to prevent the development of increasingly capable AI systems, but to ensure that their development and use remain oriented toward strengthening rather than displacing human intellectual autonomy. In higher education in particular, AI should be integrated in ways that preserve students' critical thinking, independent judgement, creativity, and capacity for meaningful human interaction.

It does not seem possible to hope for a potential transformation of our students' cognitive abilities by exposing them to machines capable of questioning the longevity of the biological brain. Moreover, in 2016, the journal *Nature* warned that: "Machines and robots that outperform humans across the board could self-improve beyond our control - and their interests might not align with ours" [20]. If a divergence emerges between the objectives pursued by AI systems and the educational objectives of those who design, supervise, or use them, integrating AI into higher education raises a fundamental question of human control. Recent research on AI alignment and control emphasises that increasingly autonomous and capable AI systems may create challenges when their behaviour does not remain reliably aligned with human objectives [21].

This concern extends beyond the technical design of AI systems to the governance of their use. Contemporary research on artificial superintelligence explicitly examines the control problem and the possibility that highly capable AI systems could become difficult to constrain once their capabilities substantially exceed those of humans [22]. In this context, the question is not whether AI will necessarily take control, but whether human institutions will retain sufficient capacity to supervise, constrain, and redirect increasingly autonomous systems.

The implications are particularly significant for higher education. Recent work on artificial superintelligence and education argues that students should acquire not only technical AI literacy but also the knowledge and critical capacities required to participate in decisions concerning the alignment and governance of advanced AI systems [23]. The educational challenge is therefore to ensure that AI remains a tool operating under meaningful human oversight rather than becoming a substitute for human judgement.

The possibility of catastrophic consequences must also be taken seriously, while avoiding presenting human extinction as an established prediction. Recent philosophical work has developed explicit arguments concerning the possibility of long-term human disempowerment through advanced AI, including scenarios that could ultimately threaten humanity's survival [24]. These arguments reinforce the importance of developing AI systems within frameworks of human oversight, accountability, and alignment with human values. This intelligence carries serious existential risk, and the unforeseen consequences have not been fully evaluated, so it cannot be adopted in university education. In 2023, prominent AI experts and other renowned figures signed a statement asserting that "mitigating the risk of extinction from AI should be a global priority alongside other societal-scale risks such as pandemics and nuclear war" [25]. AI is ranked among the deadliest scourges in human history, on par with the most dreaded nuclear disasters or epidemics. The idea of formally introducing AI into university education with

the hope that this intelligence will dramatically increase human intelligence is undoubtedly fascinating for speculative and imaginative minds. Still, we must examine it with our feet firmly on the ground.

Concerns about the risks of increasingly capable artificial intelligence have become much more prominent in recent years. While earlier initiatives, such as the 2015 open letter on research priorities for robust and beneficial artificial intelligence, already called for research to ensure that increasingly capable AI systems remain aligned with human objectives, recent international scientific assessments have revisited these concerns in light of the rapid development of general-purpose AI systems. *The International AI Safety Report 2025*, prepared by an international group of more than 100 experts and supported by 30 countries and international organisations, synthesises current scientific evidence on the capabilities, risks, and safety of advanced AI systems. It emphasises that the rapid progress of general-purpose AI creates both significant opportunities and emerging risks, while stressing that important questions concerning the safety and controllability of advanced systems remain unresolved [26]. The risks of malfunctions and abuses linked to the development and instrumental and specialised uses of AI in systems and devices of all kinds, including university education, are very real and likely to multiply in the near future. The path of AI application is therefore fraught with obstacles. These dangers warrant caution in adopting AI in university training as a tool for skill enhancement. It is wiser to conduct research now to anticipate, clarify, and possibly prevent the still-speculative risks that introducing this intelligence into university education might raise. Simple solutions, paired with flexible and rational strategies focused on the identified risks, should help clear the way for AI without overshadowing our humanity.

IV. DISCUSSION OF RESULTS

This critical study on integrating Artificial Intelligence (AI) in higher education highlights key points on sustainability, challenges, and the ethical implications of this emerging technology. This discussion synthesises the findings, explores nuances, identifies current research gaps, and suggests future directions to deepen this field.

On the Synthesis of results: analysing current literature and perspectives reveals several significant conclusions. AI holds promise in enhancing pedagogical effectiveness through personalised and adaptive learning. However, concerns arise about increased cognitive dependency among students and the potential reduction in their ability to think critically and independently. The temptation to use AI as a quick substitute for knowledge acquisition could compromise authentic learning processes. The concept of technological singularity, where AI might surpass human intelligence, introduces profound existential challenges. This scenario could diminish creativity and originality in problem-solving, favouring predictable, standardised solutions over radical innovations. Striking a delicate balance between using AI as a tool to enhance teaching and preserving unique human capabilities such as critical thinking, deep analysis, and creativity is



crucial. AI should be integrated thoughtfully to complement, not replace, essential human skills. The widespread adoption of AI in higher education raises complex ethical issues, including data privacy, equity in educational access, and algorithmic biases. Addressing these challenges requires rigorous regulation and oversight to ensure ethical, fair AI use.

In the Gaps and Future Directions section, we can note that despite recent advancements, several research gaps persist in AI in higher education. Comprehensive empirical research is urgently needed to assess AI's real impact on student learning outcomes, engagement, and cognitive development. Case studies and controlled experiments can provide valuable insights into best practices and pitfalls to avoid. Effective methods for training educators to use AI productively in their teaching practices require thorough exploration. Identifying the specific skills and knowledge educators need to leverage AI while maintaining teaching quality is crucial. Understanding economic models and investments in AI-based educational technologies is essential. A comprehensive understanding of the economic viability and financial impact of these initiatives is necessary to ensure sustainable and equitable adoption of AI in education. Developing robust regulatory frameworks to guide ethical AI use in education, safeguard student rights, and ensure algorithmic transparency is imperative. Multilateral discussions among researchers, educators, policymakers, and civil society representatives are essential to develop appropriate guidelines.

Ultimately, integrating AI into higher education offers transformative opportunities but also poses significant ethical challenges. To maximise the benefits of this technology while mitigating potential risks, it is crucial to develop a balanced and thoughtful approach. This requires ongoing research and interdisciplinary collaboration to address these challenges and fully harness AI's potential to enhance global education. By continuing to explore these issues with a critical and proactive mindset, we can shape an educational future where AI enriches and supports cognitive diversity and intellectual autonomy among learners.

V. CONCLUSION

We reviewed the multidimensional implications of AI in academic and scientific contexts while examining the risks associated with this technological revolution in student skill development. AI, while promising extraordinary advances in university education and beyond, also raises profound concerns about its impact on society and human nature itself. Integrating AI into university education offers possibilities for personalised learning, improved pedagogical efficiency, and transforming traditional educational methods. However, this growing dependence on AI could also pose dangers, notably by reducing students' ability to think critically and creatively on their own. It is therefore crucial to develop strong frameworks to guide the development and use of AI, ensuring it supports university instruction while minimising potential risks to students and their biological brains. This involves balancing AI's benefits with fundamental human values such as creativity, autonomy, and empathy. By navigating this new technological landscape with caution and

responsibility, we could potentially harness AI's full potential while preserving what fundamentally makes us human.

Growing concern about diminished cognition highlights the need for a thoughtful, measured approach to integrating artificial intelligence into university education, particularly as a tool to enhance skills. This technology promises significant advances in learning and development but also raises questions about its effects on the human capacity to think critically and solve problems independently. The widespread adoption of AI in higher education must be approached with caution, given its potential implications for intellectual training and decision-making. While AI can complement traditional teaching by providing rapid access to vast amounts of information and facilitating certain cognitive tasks, it is crucial to maintain balance to preserve learning processes that require experimentation, critical thinking, and creative problem-solving. Moreover, excessive reliance on AI could erode essential cognitive skills, such as synthesising information, formulating original arguments, and developing independent perspectives. Therefore, while exploring the opportunities offered by AI in education, it is essential to maintain a framework where teachers play a central role in guiding students through an enriched learning process that includes human interaction, active exploration, and constructive feedback. Caution is necessary when integrating AI into university education to ensure this technology truly enhances learners' skills without compromising the essential foundations of traditional education and human cognition.

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I must verify the accuracy of the following information after aggregating input from all authors.

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