Chapter 2

AI and Academic Integrity Decussation: Implications for Higher Education

Nicky Tjano
Director of Teaching & Learning Strategy, Projects, and Portfolio Performance
University of South Africa
Pretoria, South Africa

Introduction

AI (artificial intelligence) refers to systems that display intelligent behaviour by analysing their environment and taking actions – with some degree of autonomy – to achieve specific goals. AI-based systems can be purely software-based, acting in the virtual world (e.g., voice assistants, image analysis software, search engines, speech, and face recognition systems) or AI can be embedded in hardware devices (e.g., advanced robots, autonomous cars, drones, or IoT [internet of things] applications). This definition was proposed by HLEG (the High-Level Expert Group on Artificial Intelligence) in 2019. Samoili, Cobo, Gómez, De Prato, Martínez-Plumed, & Delipetrev (2020:4) suggest that there are two broad categories that can be identified from this definition, namely the ability of machines to reason and make decisions and learn.

There is a transformative force in the era of rapid advancements in technology that is reforming various sectors, communities, political and educational landscapes, and so on. Nonetheless, this force is transforming the very foundation of human knowledge, and arguably human intelligence. Albert Einstein once stated that 'the true sign of intelligence is not knowledge but imagination' (Ganiev & Tashev 2021:3570). Einstein went further to argue that imagining is a far more

important skill than knowledge itself. This view implies that imagination is more important than knowledge thus emphasising the need for imagination alongside knowledge in fostering creativity. One would posit that AI's transformative agenda lies in changing the *status quo* on knowledge creation. Jean-Jacques Rousseau's views on contemporary education and the role of digital technologies as captured by Jergus (2018:395-396) and Carvalho and Yeoman (2021:28) respectively emphasise the significance of student's natural development in the learning journey and situate learning activity as an emergent process. With this evolution, technological advancement and digital revolution, spearheaded by AI, undoubtedly the longstanding and uncontested dominant status of IHEs (institutions of higher education), in particular universities, in the creation and dissemination of knowledge has now been challenged. Therefore, drawing from the views of both Einstein and Rousseau, it is undeniable that AI has reimagined the principle of the knowledge creation process, learning activity, as well as pedagogical and andragogical strategies. This assertion aligns with a point made by Eaton (2023:4 of 10) that with AI we have witnessed the era of post-plagiarism, where human creativity is enhanced rather than threatened.

The role of AI has been a subject of discussion both in the mainstream media and academic discourse. The developments in AI are fast changing the educational landscape as these advancements are intimately associated with improvements in computer capabilities, thus resulting in super-intelligent machines. This intelligence is actually the cornerstone of AI as its definition anchors ML (machine learning), whereby computers impersonate humans. Likewise, Trott, Jones, Chang, Michaelov, and Bergen (2023:2 of 21) expound on the human impressionist abilities LLMs (large language models) by asking if LLMs know what humans know. In that piece of work, the authors cite activities such as the ability to learn, adapt, synthesise, and self-correct to complete complex tasks. This happens through LPMs (language processing models). Without a doubt, advancements bring about a lot of opportunities, so there are challenges and associated risks (Neha 2020:308; Popenici & Kerr 2017:1 of 13).

AI's influence in education builds on and extends what the 4IR (fourth industrial revolution) has done as Oliver (2022b:27) affirms that 4IR alongside IoT, big data, the IIoT (industrial internet of things), and cloud computing cyber-physical systems, to mention a few, has taken the world by storm. Oliver (2022a:53), reflecting on Society 5.0 and Education 5.0, recommends that it is the responsibility of IHEs to lead in innovation incubators and be the cornerstone of 'sustainable and positive transformation and change.' This implies, argues Oliver (2022b:27), that IHEs should be instrumental in this era of development given the influence they have in shaping the lives of the youths, their beliefs, skills, future livelihoods, and expectations.

With the advent of ChatGPT (chat generative pre-trained transformer), there have been many other competing and complementary AI tools and systems focusing on computer-generated text, such as Claude, Google Bard, and DALE, to mention a few. These tools fall within the field of Gen-AI (generative artificial intelligence) and can also be used as AWAs (automated writing assistants), AWTs (automated writing tools), and APTs (automated paraphrasing tools) (Roe & Perkins 2022). Other groups of effective AI tools useful for the field of education fall within the realm of IESs (intelligent educational systems) including ITSs (intelligent tutoring systems), educational robotics, and automated grading tools for multimedia systems.

The emergence and launch of ChatGPT in late 2022 by OpenAI has catalysed a rapid rise in open AI technologies and has effectively created an almost instant technological panic about the impact of AI on the HE (higher education) space. There has been worries around technological advancements, while some of the fears centred around diminishing our ability to think (Eaton 2023:2 of 10). Drawing on the developments, (Eaton 2023:2 of 10) adds that the results of technological advancements and by extension AI, are evident in how AI has quickly redefined teaching, learning, and assessment practices.

From a research perspective, advancements in AI present an opportunity for a transformative wave that is reshaping the landscape of academic inquiry across diverse disciplines. Ongoing

debates surround the ethical use of AI, with protagonists citing the associated benefits such as enhanced adaptive teaching and assessment, personalised learning experiences, and improved virtual tutoring and support. Among these divergent debates, calls for transformative changes, the need to safeguard the integrity of assessments, and to strike a balance from an ethical viewpoint forms the basis of this chapter.

This chapter adopts a risk-oriented mindset and ethical lens to comprehend how advancements in AI intersect with academic integrity. By dissecting the AI decussation with academic integrity within a HE landscape, the chapter embarks on a journey through the evolving landscape of AI and its profound implications for academic integrity. First, the popularity and development cycles of AI are explored, digging into the hype surrounding Gen-AI and also projecting its future applications. Second, the transformative role of AI, particularly in the health sector is explored. The third section navigates the ongoing debate between AI and human capabilities.

The fourth section closely examines the decussation of AI and academic integrity from the global perspectives of academic dishonesty. This is followed by an exploration of challenges commanded by the rise of a repertoire of LLMs, with special attention to AI authoring tools. In this section, the costs and benefits of AI's authoring tools are discussed. The positive impacts of the tools such as supporting teaching and learning to negative costs like students' dependency on AI and plagiarism dangers as well as communication threats arising from reduced human interaction are detailed in the discussion.

The chapter then discourses the proposed strategies to strike a balance between AI benefits and how to maintain academic integrity. As we peer into the future, the second last section reflects on future evolving trends in the AI space in education with commitment challenges. This reflection offers valuable insights for educators, policymakers, and researchers who are constantly navigating the delicate cross paths between technological advancement, specifically AI and academic integrity. The last section provides concluding remarks on the chapter.

AI Popularity and Seasons of Development

AI paradigm shifts can be examined from three distinct but intertwined phases of development as described by Delipetrev, Tsinaraki, and Kostic (2020) in their 2020 AI-Watch report for the EU (European Union) Commission's JRC (Joint Research Centre) examining the evolution of AI. Delipetrev *et al*. (2020:3) regard the development of AI and its popularity as a seasonal change phenomenon emulating economic cycles as illustrated in Figure 2.1. These phases are referred to as AI's seasons of development and are characterised by sequential stages of upswings (springs for growth) and downswings (winters for decline) that happen over time. The latter stages are largely due to cuts in funding opportunities or budgets for development. The first phase is called AI foundations and occurred between 1950 and 1970. The instrumental pioneers during this primitive era include Alan Turing and John McCarthy. Turing published what would arguably and undoubtedly be his breakthrough seminal paper in the field of AI, that debated machines' ability to think (Turing 1950). The debate continued and was propelled by deliberations at Dartmouth's conference that took place six years later after Turing's paper on computing machinery and intelligence. At the conference, McCarthy presented his definition of AI, which he coined in 1955 as 'the science and engineering of making intelligent machines' (Delipetrev *et al*. 2020:7).

Since that conference, excitement about machines, specifically computers' ability to assist with human challenges, mathematical and science equations, and continued excellence in language translation abilities surged. Furthermore, a myriad of AI initiatives and developments were witnessed – from computer programming, the discovery of perceptron, the realisation of the ELIZA NLP (natural language processing) model to Shakey the Robot (Delipetrev *et al*. 2020:7). Likewise, Roberts (2016:14) affirms these developments by reflecting that 'despite the Dartmouth conference's failure to produce an intelligent machine,' the aftermath of the conference was nothing but a

success. Narrow programmes like the Logic Theorists[1] were born, overwhelmingly buying into McCarthy's optimism and dream, as the government was optimistic about smart machines' potential to 'analyze masses of geological data for oil and coal exploration' (Roberts 2016:14).

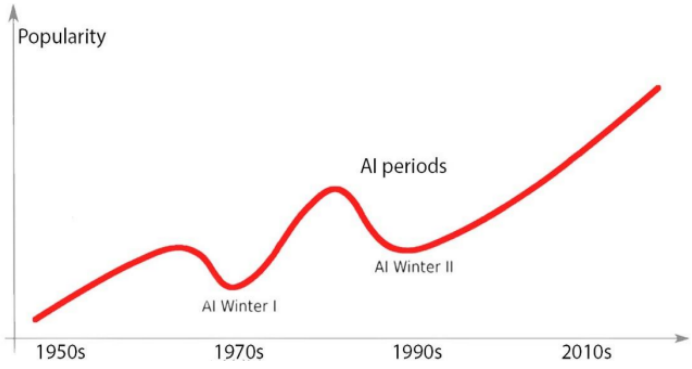

Figure 2.1: AI's seasons of development. (Source: Delipetrev *et al*. 2020:3)

The symbolic AI phase ensued between 1970 and 1990. In this era, the underlying discovery was the advent of expert and knowledge systems. The nervous part of these systems was the integration of human beings' expert knowledge through computer programming. The expert systems were able to perform blood disease diagnostics and prescriptions (Shortliffe & Davis 1975:11), the ID3 (iterative dichotomiser 3) which was able to generate decision trees (Quinlan 1986:82), and the ability for humans to have dialogue with computers (Winograd 1971:75).

The era between 1990 and 2020 indicates that the development of AI took an upward trajectory in an exponential form. The advent of ML and DL (deep learning) has characterised this era, and without a doubt, more is yet to come. The use of convolutional neural networks that read handwritten digits

1 Logic Theorists is a computer programme written in 1956 by Allen Newell and two colleagues, Simon and Shaw, engineered to perform automated reasoning, and has been described as the first artificial intelligence programme.

(LeCun, Boser, Denker, Henderson, Howard, Hubbard, & Jackel 1989:400), the rise of GANs (generative adversarial networks), and transformers in language modelling for the translation and answering of questions happened in this era. The other instance of AI capabilities surpassing humans includes the 1997 era when IBM (International Business Machines) supercomputer Deep Blue defeated Gary Kasparov in a chess game. No one would have predicted that to happen to the world-renowned world chess master. There is a high degree of uncertainty associated with the future directions of AI and its advancement; however, its maximum potential can only be realised if there is trust in how it is deployed, developed, and used (Thiebes, Lins, & Sunyaev 2021:447).

Notwithstanding all these developments in AI, and it being an important aspect of modern-day life, there are probabilities on the cards where winter seasons in AI development may follow. The same goes for seasons of greater AI spring. This, as Delipetrev *et al.* (2020:3) accentuate, signifies an uncertainty of the future of AI. Similarly, Schuchmann in his 2019 paper on prospects of an approaching AI winter earlier predicted that given critiques around AI, especially on DL approaches and variations in funding models through R&D (research and development). In fact, on funding R&D, the key role players as far as allocating substantial amounts of funds to AI are concerned, are the US (United States [of America]), China, European Commission through EU member states, India, South Korea, Canada, Japan, Israel, Russia, and Singapore (Samoili *et al.* 2020). Between 2009 and 2018, there were 34,000 role players globally with the US and China amassing this large concentration.

AI's Hype Cycles: Focus on Generative AI and Future Expectations

In the history of human evolution, AI is arguably the most intricate and beyond-belief invention where human creativity has been tested and will arguably continue to be tested. Epstein and Hertzmann (2023:1110) affirm this view by stating that new classes of AI tools, especially Gen-AI, have the capability to likely

and fundamentally turn around creativity and the idea generation – from conception to deployment.

AI's presumed 'godfather,' Geoffrey Hinton, a renowned computer scientist who is credited with having built influential and crucial AI tools has shared his crusade on the evolution of AI and the possibility of outsmarting the intelligence of humankind. This was reflected by Joshua Rothman is his article, *Why the godfather of AI fears what he's built*, after the intimate interview with Hinton (Rothman 2023). In his reflections, Rothman conveys, what worried Hinton is how humans would prevent AI machines from taking control. His reflection is that no one knows the answer. This evolution and subsequent successes have amplified the debate on machine's capability to outclass human beings.

Nonetheless, of the debates and successes of machines' capabilities, the AI field has experienced periods of hype cycles. The AI hype cycle 2023 sheds light on the path and evolution of innovations within AI space, and how they have influenced various sectors (Gartner 2023). Figure 2.2 depicts five phases of the hype cycle characterised by technology triggers, also known as innovation triggers, followed by a peak of an inflated expectation phase.

The third phase relates to the trough of disillusionment, where the 'hype' or interest in the innovation starts to wane due to experimental and implementation failures. It is at this stage where the technology fails to meet the expectations. The fourth phase is characterised by a slope of enlightenment where potential benefits of technology start to make sense. The last stage is referred to as a plateau of productivity, where the mainstream adoption of technology takes off and all previous efforts including R&D and marketing start to pay off as Chaffey and Ellis-Chadwick (2019:74) attribute this success to serving the niche market.

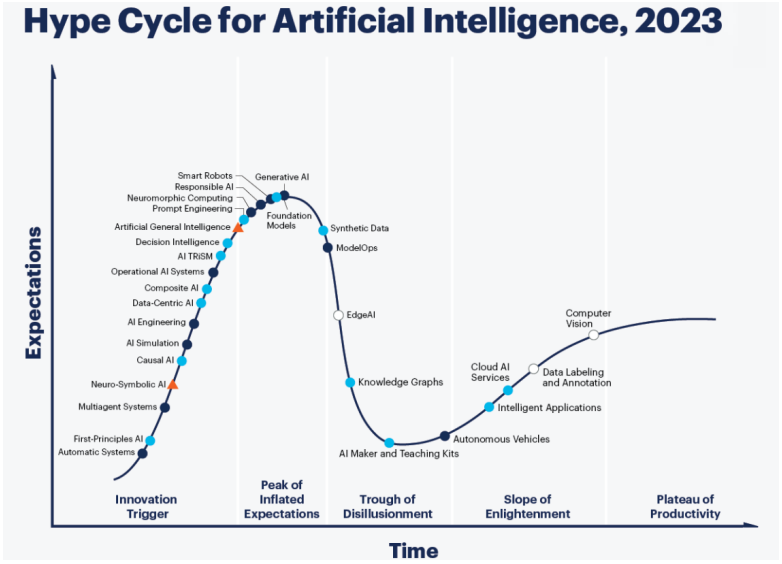

Figure 2.2: AI hype cycles. (Source: Gartner 2023)

Aligned with hype cycles, AI tools are expected to reach a plateau of productivity in four periodic phases. The Grand View Research (2023) report projects the global market size of AI to plateau at almost $2 trillion, a surge of 38.1%. In phase one, tools will reach a plateau in a period of less than two years. This period is followed by the next plateau phase, which is two to five years. In the third phase, a plateau is reached between five and 10 years, while the fourth phase constitutes a period of a decade or more. AI engineering, prompt engineering, AI simulation, and data-centric AI are selected AI fields whose productivity plateaus would mature within two years. Before the impact of AI on academic integrity is explored, Figure 2.3 illustrates how AI is applied and has benefited 11 major industries and sectors, and as Takyar (2022) asserts, AI continues to amass huge potential for the future expansion of these industries.

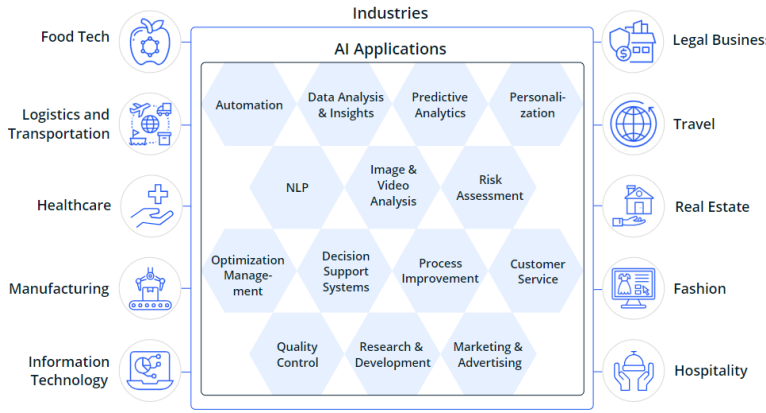

Figure 2.3: Application of AI in various industries. (Source: Takyar 2022)

Some of these breakthroughs have influenced and propelled the discovery of many AI tools in various other sectors, for example, various fields, like the food technology, real estate, health sector, hospitality, travel, and manufacturing (Takyar 2022). The next section selectively explores how AI has transformed the health sector. The choice of this sector is that the results are almost visible as the majority of the people interacts with the sector as patients to consult with their healthcare professionals. This discussion is then followed by a reflection on the big debate between AI and human capability.

Application of AI in the Health Sector

AI has cemented its place as a significant driver for economic development and has been dubbed an 'area of strategic importance' given its broader impact on society (Delipetrev *et al.* 2020:1). The growing influence of AI-driven capabilities in various sectors can be forgiven for making someone believe that they are in a world where they are watching sci-fiction. In this 'sphere,' one is experiencing AI algorithms' superpower and astonishing capabilities. These amazing capabilities include the ability of AI algorithms to compose a masterpiece, which by far outclasses the best classical symphonies of all time. If one thinks

of the age of the universe (Planck 2018) and the power of the universe, where Coutinho (2022) refers to the latter as 'a wonder ahead of medicine,' which has caught the attention of scientists and researchers and how AI has transcended into this space, the results are astonishing. To date, scientists are still trying to determine the age of the universe as Russ and his colleagues in 1997 concluded that the impact of the inhomogeneities on the global expansion factor was found to be miniature (Russ, Soffel, Kasai, & Börner 1997:2046). They went further to reveal that to use Hubble constantly in the usual way to determine the age of the universe produced an error that was negligible.

According to Manne and Kantheti (2021:78-80), some of the benefits of AI for the health industry include aiding in understanding the needs of patients, cost reduction, and most importantly, improved efficiency. At the heartbeat of this advancement is the availability and processing of healthcare data, which are often voluminous. PWC (2017) cautions that although it is undeniable that AI is gradually becoming more and more sophisticated in performing human activities, the sustainability and accessibility of quality healthcare need to be rethought, given the increasing costs associated with the new discoveries.

In diagnosis and treatment design, the application of and advancement in AI research have been growing and improving. In their 2008 paper, Eren, Subasi, and Coskun (2008) showcase the power of AI in telemedicine through the efficient use of mobile devices and reveal how medical decision support systems can be effective in the provision of quality healthcare services, especially in developing countries that are usually under-resourced and limited by advancement in technologies. Some of the interesting applications of AI in the sector include the deployment of mobile device apps to effectively diagnose pregnant women (Carter, Sandall, Shennan, & Tribe 2019:2) and monitoring nutritional triage for oncology patients (De Bruin, Schuh, Seeling, Luger, Gall, Hütterer, Kornek, Ludvik, Hoppichler, & Schindler 2018:34-35).

The increasing use of AI and robotics in redefining the health sector through examination, diagnosis, and treatment prescription has been witnessed. Exploration of AI chatbots to

assist in understanding depression and anxiety in patients (Manne & Kantheti 2021:80) and detecting psychiatric diseases (Erguzel & Ozekes 2014:52) are a few of the AI technologies being tested. Eren *et al.* (2008:32) suggest that AI techniques like computerised decision support system e.g., ANNs (artificial neural networks), decision trees, and support vector machines are also being used through mobile applications to diagnose and treat problematic diseases like cancer.

In the last decade, the focus was more on a differentiation strategy through explosive innovation in medical products such as newly developed pieces of equipment and consumables. Historical and evidence-based healthcare was influenced by an enormous amount of health data at the disposal of scientists, health practitioners, and regulatory bodies (Frost & Sullivan 2016). These data are in the form of the overwhelming volume of health records, research findings, and diagnosis data that are generated daily. For example, there were approximately 11,000 articles published annually in the field of skincare. One could imagine how this data have assisted dermatologists to more accurately diagnose skin care problems for millions of patients across the globe. In terms of data, the volume of healthcare data was reported to have reached 4 ZBs (zettabytes), considering that one ZB equates a trillion gigabytes. It was projected that these data would exponentially grow by 10 times (PWC 2017:3).

AI versus Humans: The Big Debate!

The field of AI is dynamic and evolving at a fast pace. With its dynamism comes many transformative opportunities. The same can be stated for threats. The latter attests to the need to closely monitor AI through regulatory frameworks, policies, and guidelines. The ample potential impact of AI on humanity is yet to be fully explored. Ironically, the 'intelligence' of AI has been debated, and the debate is still ongoing to have the capacity to supersede human intelligence in the near future. In almost affirming this claim, Arrieta, Díaz-Rodríguez, Del Ser, Bennetot, Tabik, Barbado, García, Gil-López, Molina, Benjamins, and Chatila (2020:82) explain that with the manner and speed with which AI-powered systems are sophisticated, the advancement

has led to a situation in which these systems can act or operate independently of human intervention, especially in their design and deployment.

For example, in the health sector, Manne and Kantheti (2021:78) are pondering whether the availability and use of AI tools in the future will replace physicians. The authors quickly respond by stating that practically, it is impossible. At most, however, these tools will enable physicians to achieve improved and accurate results. The vantage point lies in its ability to process enormous amounts of information a billion times faster, thus enabling it to decide much quicker than human beings can. Lu (2023), in an article headlined *How smart is ChatGPT*? reveals riveting results on how it is able to compete with humans in examinations. These results are worth reflecting on. In the latest release, ChatGPT 4 is reportedly capable of matching the human performance level in most of professional and academic assessments. Despite these breakthroughs, it is still struggling in subjects like English language and literature (Lundgren 2024; Nasrullah & Wahyu 2024). ChatGPT 4's performance in language tasks is still exhibiting inconsistencies, thus suggesting its insufficient grasp of language and literature intricacies. The subjects in which it is demonstrating high grading and comprehension accuracy and it is performing well are in the STEM (science, technology, engineering, and mathematics) field with subjects like physics, statistics, mathematics, and biology (Lundgren 2024; Ragolane, Patel, & Salikram 2024). This is particularly true when questions are objective i.e., multiple-choice or sort-answer.

The often mystic and evolving incredible capabilities of AI and its algorithms fuel the 'big debate' on intelligence about AI versus human intelligence, as discussed in this section. The question of whether AI can surpass human intelligence is explored with questions like the following:

- Is it possible to use technology (AI, modelling, or data science) for the good of humanity?
- Can a human mind keep up with AI?
- Can AI be humane and ethical?

The questions lean on the protagonists who are on the side of those arguing that AI will replace humans in their jobs. The debate is not new as advancements in technology and the prevalence of automated machines, robots, and production processes, especially in the automotive industries and huge supply chains have replaced human beings. In an attempt to respond to the first and last questions, I argue that the potential of technology, especially AI and data science, to benefit humanity is substantial, yet it is not without challenges. Various studies (e.g., Beduschi 2024; Thiebes *et al.* 2021) highlight how these technologies can contribute positively to societal goals, but they also caution against the risks of inequality and ethical concerns. Hence, there is a quest in some parts of the literature geared towards promoting responsible and sustainable AI in protection of human rights against bias and discrimination in algorithms, whether intentional or otherwise (Lamchek 2023; Yadav, Tudela, & Marco-Lajara 2024). With reference to the second question, sections 2 and 3 focused on the capabilities of AI and its impact in various sectors such as health, education and labour market among others.

It is undeniable that AI has transcended and has been transformative in enriching the human experience. Contemporary advancement in AI and its applications in various industries and sectors of the economy is unprecedented. In this section, the impact of AI in the health sector is highlighted. The healthcare sector experienced outstanding AI advancements that are on the brink of revolutionising patient care and outcomes. Advancing medical diagnostics through image recognition and predictive analytics, enabling early disease detection, and personalised treatment plans are some of the developments AI has advanced in the industry. The influence of AI in the health sector was evidenced in 2012 when Geoffrey developed a neural network at the University of Toronto with two of his students. The system they have built, was able to mimic humans' behaviour and function just like the human brain (Apperly & Butterfill 2009:953) where one could feed it with a large amount of data, and through ML it could learn how to identify objects with almost near perfect efficacy.

The working paper of the ILO (International Labour Organization) on the global analysis of jobs that are exposed to AI, specifically Gen-AI, projects that the effects vary across countries based on their income level (Gmyrek, Berg, & Bescond 2023). For example, countries with low-income levels have 0.4% of their total labour force exposed compared to 5.5% of countries in the upper bound. Administrative jobs that are clerical in nature are the most exposed at 24%. Meanwhile, other occupational groups vary between one and four percent (Gmyrek Berg, & Bescond 2023:1-10). Along the same lines, the OECD (Organisation for Economic Cooperation and Development) (OECD 2023:42) suggests that AI is changing the jobs landscape and estimates that 42% and 47% of automated jobs (AI adoption) in finance and manufacturing respectively, were motivated by reduction in staff costs.

The quote by Kevin Kelly, co-founder of Wired magazine in his book, *The inevitable* shares rather interesting views on the future of jobs in the world of AI: 'Your job won't be taken by AI, but it will be taken by someone who uses AI' (Kelly 2016:2). At the core of Kelly's view is that AI is not here to replace people in their jobs, however, there is a need for adaptability and an urge for self-fulfilment and motivation in one's career development. Likewise, in an interview with CNBC (2023), Elon Musk, the CEO of X, a leading social media platform previously known as Twitter, has advised people, youths in particular, to embark on a career journey that keeps them captivated and always satisfied. This background in a way opines that there are varied views on the pros and cons of AI evolution. Now that the impact of AI has been discussed alongside the great debate on AI versus humans, in the next section the decussation of AI and academic integrity is presented.

AI on Academic Integrity Decussation: Plausibility for Evolution of Academic Dishonesty and Academic Misconduct

There is no universal definition of academic dishonesty, just as there is none for plagiarism. Both the concepts of academic dishonesty and academic misconduct are often used

interchangeably, referring to the acts of violating academic integrity (Eaton 2017:272). Alongside plagiarism, the concepts have dominated ethical discourse in IHEs (Hua 2023:160). Eaton (2017:272) continues to suggest that academic dishonesty and misconduct are regarded as forms of an academic integrity antithesis. This affirms what the ICAI (International Centre for Academic Integrity) on the fundamental values of academic integrity stated, viewing both academic dishonesty and misconduct as compromising essential ethical principles and values of trust, honesty, responsibility, fairness, and respect (ICAI 2021:4-10). Tracey Bretag, the Australian scholar, who is popular for, and an avid advocate of academic integrity (cf. Marais 2022:57), borrows from the definition of APFEI (assessment of process for efficiency improvement) of academic integrity as follows: 'A commitment to key values of honesty, trust, fairness, equity, respect and responsibility, and the translation of these values into action' (Bretag 2016:28).

The popularity of the term 'academic integrity' is credited to Donald McCabe, Rutgers Business School's Professor of Management and global Business, who is dubbed to be its father and to some known as 'Dr. Ethics' (Rutgers Business School 2014). In his summer reflection on liberal education, McCabe (2005:26) writes that 'it takes a village: Academic dishonesty and educational opportunity [and argues that] if we truly believe in our role as educators, we would do better to view most instances of cheating as educational opportunities.' There are other prominent scholars who have made and some still are making an immense contribution to the field of academic integrity.[2] Enacting behavioural principles and values is the backbone of academic integrity, while the aim is to avoid acts of plagiarism and contract cheating, as Clarke and Lancaster (2006:19) as well as Eaton (2018) put it. In affirmation, Kirk (1996:16) continues to argue that maintaining academic integrity upholds high standards of honesty and rigour in academic research and publishing.

2 Examples are Tracey Bretag and Cath Ellis, both from Australia, Tricia Bertram Gallant from the US, Sarah Elaine Eaton from Canada, Thomas Lancaster from the UK, and Tomáš Foltýnek from the Czech Republic.

On the backdrop of proliferation in AI, the growing importance of protecting and maintaining the practice of a moral or principled code of ethical behaviour, which is the core value of academic integrity is concomitantly taking centre stage (Marais 2022:57). Since the COVID-19 (Coronavirus disease of 2019) pandemic, IHEs across the globe had to, willingly and unwillingly, transition to online assessments (Perkins 2023:1 of 24). Inevitably, this transition was accompanied by concerns on the rising prevalence of academic dishonesty. To comprehend the complexity of academic dishonesty, it is important to note the origins of assessments, which date back as far as the primitive era of the first tests[3] in the 18th century (Lang 2013:14). Time-honoured methods such as plagiarism, unauthorised collaboration, and exam cheating remain prevalent challenges. Students have, historically, sought to gain an unfair advantage through these means, raising concerns for educators and institutions globally. The use of crib sheets, copying from peers, and recycling assignments have been persistent issues, emphasising the need for ongoing vigilance in upholding academic integrity (Armstead 2001:10; Stevens 2013:17).

It has been argued that academic integrity tends to place the responsibility of good ethical conduct on the individual, which, according to Fishman (2015:13-16) in her book chapter on *Academic integrity as education concept: Concern, and movement in US institutions of higher learning* assumes that approach to be problematic. Other scholars point to the Chinese civil service over a millennium when the Chinese emperor in early 2200 BCE administered an elementary form of testing for his officials once every three years as a measure of assessing their fit-for-office (Bushway & Nash 1977:4). In the context of the US, Gregory (2004:59) documents the late 1800s to be the era during which tests were popularised. James McKeen Cattell was credited to have imported brass testing instruments to the US; hence he

3 According to Fishman (2015:7-8), the historical evolution of academic integrity shaped American approaches to academic integrity and can be traced back to the early conceptions, which were based on British higher education models. These models explicitly addressed ethical and moral lessons through explicit, religious beliefs and mandatory practices.

earned an accolade of being referred to as 'undisputed dean of American psychology' (Gregory 2004:60-61). This long and distinct period of history was preceded by the Francis Galton era (1822-1911). Galton who was reported to have been obsessed with measurements, devised the first battery of tests within the field of psychology in Great Britain. Akin to the introduction of any other system, administering the assessments was not without challenges, and this led to testing environments needing refinements and modifications over centuries. It was until this time that written exams were enacted in the Han dynasty. Some of the challenges relates to unnecessary demanding assessment practices and invalidated selections tests (Gregory 2004:57). Other challenges include cheating and bribing of examiners, which were popular despite these acts carrying the death penalty as a form of deterrent for both examiner and test taker should it be proven that they are guilty of misconduct (Bushway & Nash 1977:623; Gregory 2004:57-59; Zhang 2017:153). The next section takes a closer view on the contemporary challenges in academic integrity from the context of pre- and post-COVID-19 pandemic.

Global Perspectives on Academic Integrity

This section explores the contemporary issues surrounding the management of academic integrity, looking at both the conventional forms and evolving forms of academic dishonesty. Additionally, we examine this through contrasting the global and local perspectives on academic integrity. The focus of this exercise is on selected developed countries contrasted with emerging nations like Brazil, India, and South Africa. The aim of this comparative analysis is to shed light on the complex consequences of academic integrity issues in various learning environments and educational landscapes.

The challenges in maintaining are on the one hand precipitated by perspectives on the development of academic integrity measures, while on the other there is the role played by technology. On the former, Fishman (2015:8) attributes and relates challenges to the narrow view of academic integrity. Authors go further to suggest that there needs to be a paradigm shift away from students as possible threats on academic integrity, towards

focusing on educators and researchers, practices, and entrenched institutional ethical cultures. The shortcoming of this one-dimensional perspective rests on the responsibility of managing academic integrity on individual choices, hence the inefficiencies. Therefore, a multi-dimensional perspective of responsibility of managing academic integrity, a principle which this chapter is underpinned on, remains the effective and responsible way of managing academic integrity.

Developed nations like the US, UK (United Kingdom), Italy, and Australia often face challenges associated with technology-driven academic misconduct. For the longest time, academic integrity has been the anchor behind fair, valid, and reliable education system. The assurance of fair and honest representation of one's work in assessments underpins the basis for principles of academic integrity. Sadler (1989:119), in the theory of formative assessment, suggests that there are multiple criteria applied in judging the quality of students' assessments. It is the 'quality' in this assessment that is a beacon of hope when it comes to protecting academic integrity. However, owing to evolutions in the educational landscape, the course or journey to manage and maintain academic integrity, is by extension raddled with allied challenges.

Current Challenges in Academic Integrity

Using AI tools does not automatically constitute academic dishonesty. Eaton (2023:3 of 10) uses the six tenets of post-plagiarism by reflecting writing in the age of AI and argues that attempts to detect where the human ends and where the AI begins in this era is pointless. Examining academic integrity on a global scale reveals a spectrum of practices and attitudes. The proliferation of essay mills and the use of advanced cheating technologies pose threats to the integrity of assessment processes. On the other hand, developing countries such as Brazil, India, and South Africa grapple with issues rooted in resource constraints and varying levels of academic support. The implications for educational institutions in these diverse contexts are profound, necessitating tailored strategies to address the unique challenges each faces.

Academic integrity literature provides valuable insights into the implications and challenges in academic integrity, both in developed and developing nations. In both the US, Canada, and the UK, studies highlight the prevalence of contract cheating and the need for rigorous academic policies (Eaton 2018; Eaton, Rothschuh, Fernández Conde, Guglielmin, Otoo, Wilson, & Burns 2018:2; Eaton 2017:271; Lancaster 2020:1-2 of 14; Stone 2023:357). Perkins (2023:2 of 24) suggests that in Italy and Australia the focus has shifted towards the impact of cultural attitudes on academic honesty and considerations of academic integrity in the era of AI LLM models (Ellis, Van Haeringen, Harper, Bretag, Zucker, McBride, Rozenberg, Newton, & Saddiqui 2020:454; Bretag 2016:8-10). Conversely, in India and South Africa, the reviewed research underscores the role of socioeconomic factors in influencing academic misconduct (Marais 2022; Mwamwenda 2006; Vandana & Nagaveni 2019).

Key implications gleaned from the literature include the urgent need for standardised global frameworks that acknowledge the contextual differences between developed and developing nations. Institutions must not only adopt proactive measures to deter academic misconduct but also foster a culture of academic honesty through educational initiatives. As we navigate the post-COVID educational landscape, understanding these implications becomes paramount in crafting effective strategies to safeguard academic integrity worldwide.

The Costs of the Rise in AI's Large Language Models Authoring Tools on Academic Integrity

The advent of technology has ushered in a new era of challenges for academic integrity. While traditional forms of cheating persist, there is a notable evolution in the methods employed. According to Epstein and Hertzmann (2023:1110), the capability and influence of Gen-AI tools lead to reimagining the creativity, as such, posing a need to understand the impact as it cuts across many sectors of the society. The HE landscape, and by extension, academic integrity is no exception. For example, one of the concerns raised against LLMs is their ability to generate text

that may be difficult for academics to detect that it is machine-generated (Perkins 2023:8 of 24; Wahle, Ruas, Kirstein, & Gipp 2022:952). Another challenge is the difficulty with which to establish relevant policies if the use of LLMs as a tool for student cognitive offloading is considered. LLMs are transformer-based ML models characterised from language-based activities (Vaswani, Shazeer, Parmar, Uszkoreit, Jones, Gomez, Kaiser, & Polosukhin 2017). In this section, the key question under exploration is, 'To what extent does the rise in AI authoring tools compromise academic integrity?'

The evolution of AI academic authoring tools has its own 'the good and the bad' story. Much as there are benefits – intended or unintended – there are also associated consequences or costs. These costs are propelling the debates and arguments for and against embracing AI. Grappling with the challenges brought by the rise in AI authoring tools, universities and other IHEs around the world have recently developed (and are still developing, whilst others are yet to develop) their policy stances on the usage of AI authoring tools. On the backdrop of the downside of the rise in AI authoring tools, the likes of the AWG (Australian Writers' Guild) have in its response to this explosion, released a statement where the association vehemently affirms its stringent stance against the unregulated use of AI within Australia's creative industries (AWG 2023). Similarly, the WGA (Writers Guild of America) has tailed its concerns and issues they have on AI within the US screen industry, and this went as far as the protracted protests. The WGA ultimately won critical contract protections, although this victory was not enough, according to Winter (2023). Despite the critics, at the core of the settlement, it was agreed that AI would not be used to weaken writers' credits and compensation. In another prominent example of concerns against AI, the technology reporter of the BCC (British Broadcasting Corporation), Shiona McCallum wrote that 'ChatGPT [was] banned in Italy over privacy concerns' (McCallum 2023). Unexpectedly and ironically, the headline would coincide with the April fool's day, and uncertainly some would wonder if this was a gimmick. However, it was found to be a true story. As reported in the article, the data protection

authority in Italy was grimly concerned about privacy of the data on the chatbot's model (McCallum 2023).

To borrow from the economics literature, there is a popular phrase about the hidden or opportunity costs that states: 'There ain't no such thing as a free lunch', to which Safire William (1993) argues that it was popularised by the free market economist Milton Friedman in 1975 (Friedman 1975). This phrase puts meaning and understanding to the existence and impact of costs in any transaction. Brue and McConnell (2014:3) put it succinctly as they write that the phrase is 'at the core of economics.' It is undeniable that much as there are benefits brought by AI authoring tools, there are also concomitant costs. The impact of the LLMs on academic integrity is complex and is continuously evolving. This is partly attributed to unremitting development and deployment of new tools. For example, Poola (2023:16) states that with the development of new technologies and advancement in AI, the efficiency and effectiveness of LLMs such as ChatGPT is likely to be impacted. This is more of a paradox situation with positive and negative potential consequences and will be discussed in the next sections.

Positive Benefits of AI Authoring Tools

The rise of AI authoring tools represents a transformative wave that is reshaping the landscape of academic inquiry across diverse disciplines (Currie 2023:723). Notwithstanding the negative consequences of AI authoring tools which are discussed in the next section, the positive impact of AI on academic integrity leans towards supporting and enhancing the individual's learning experience. The focus of the next two sections is to demonstrate how AI can be positively used to support learning. This is followed by a discussion on how AI systems can collaborate with human beings.

AI Support for Teaching and Learning

Much of AI proliferation and transformation has simplified and made the job of educators in an efficient and effective way easy (Pokrivcakova 2019). The application of AI-related systems and

tools in education through an integration of VR (virtual reality) in mobile devices has also transformed the way in which these devices are used for learning. The added benefit of this transition is personalised and improved learning experiences for students. Robotic teaching, AWT, APT, reading and pacing tools, as well as automatic grading are some of the pioneering examples as to how AI has permeated the education space (Neha 2020:305). Ordinarily, AI tools and systems, especially AI authoring tools are imitating human behaviour, in particular human intelligence. Kaartemo and Helkkula (2018:212) hold a similar view as they state that AI machines and systems carbon copy humans' cognitive abilities, and their advantage is that their 'intelligence' is programmable to be able to execute quite complex tasks. For researchers, LLMs offer a variety of potential benefits. For example, they amass an influential potential to be valuable tools for organising literature reviews as they can aid finding relevant sources (e.g., Litmaps, perplexity.ai, and Connected Papers). In addition, these tools also offer the benefit of being able to understand complex concepts and stimulate the user's creativity process through idea-generation.

The launch of ChatGPT has catalysed a rapid rise in open AI technologies, mainly Gen-AI (Currie 2023:719). These capabilities have revolutionised and redefined teaching, learning, and assessment practices in HE space. Yeo (2023) puts it succinctly that ChatGPT is debatably the most erudite free-to-use AI authoring tool that affords the benefit of being able to generate large sums of text or write-up with less effort required of the author. Hellman (2019) points to augmented writing, denoting to academic writing tools that allow authors to basically pose a question or title, and the outcome is generated text or content. This process of simply posing a question and getting a response in the form of generated text relates to prompt engineering. Additionally, there are other AI tools with text completion features and the capability of writing a whole essay (Yeo 2023).

The sheer capability of Gen-AI tools and chatbots is founded on GPT 3 (generative pretrained transformer 3) models. AI writing tools and digital writing assistants like ChatGPT, Google Bard, and Claude POE have the capability to automate

or aid with ideas during the write-up process. These tools use ML algorithms to generate human-like text, responding to the users' text-based prompts. In line with the GIGO (garbage in, garbage out) metaphor, Poola (2023:16) cautions that the quality of ML algorithm responses is equally dependent on the quality of the prompts. The same sentiments are shared by Bouchard (2022) on the efficacy of ChatGPT who argues that its efficiency relies on the inputted prompt. With advancements in AI and the introduction of new tools, prompt engineering is regarded as the most after-sought skill. In support of this claim, Meskó (2023:2 of 6) narrates that one of the emergent skills requisites of medical professionals is that of prompt engineering. The strength of effective prompting models lies in DL capabilities, which are built on ML and NLP capabilities (Fan, Chen, Li, Sun, Feng, Hassanin, & Sareh 2021:3955).

To protect the academic integrity of assessments, especially at a postgraduate level, IHEs have turned their focus to plagiarism and AI-detection mechanisms. By doing this, they have considered increasing concerns and critics over threats to creativity and critical thinking, security, and ethical issues, and most importantly an overreliance on AI, specifically the use of AI authoring tools. Regardless of these developments, the effectiveness, ethical implications, and challenges attending to the use of these AI technologies in safeguarding academic honesty remain ambiguous. The measures that can be taken to strike a balance between the usage of AI authoring tools and maintaining academic integrity will be discussed below. In the next section, the possibility of human and AI co-creation is explored.

Potential for AI Systems and Machines Facilitating Co-Creation With Humans

Drawing from the earlier discussion above on the debate between AI and human intelligence, and the former standing to replace humans, the question that is explored in this section is whether co-creation between AI systems and human beings is possible. AI is known to have revolutionised the field of education, as it is known to have been applied in disciplines like physics, finance, mathematics, and English (Sharma, Kawachi, & Bozkurt 2019:1).

The distinctive key feature of AI lies in its intimate *intelligence* (Neha 2020:305-306), which previously has been exclusive to only humans until the prevalence of AI systems (Chassignol, Khoroshavin, Klimova, & Bilyatdinova 2018:16-17; Coppin 2004:45; Whitby 2008:28).

AI is considered to be one of the most debated subjects in the contemporary era (Korteling, Van de Boer-Visschedijk, Blankendaal, Boonekamp, & Eikelboom 2021) and its capabilities are undoubtedly beyond belief, thereby intensifying the discourse on the comparison between human and AI abilities. In relation to this debate, there have been reports on AI replacing humans (Neha 2020), thus ultimately/possibly causing human extinction. Despite these predictions, the literature on AI versus humans (Dong 2023; Mu 2023; Korteling *et al.* 2021; Venugopal & Mamatha 2023) suggests that this displacement is not conclusive, however, terms such as 'possible,' 'potential,' and 'might' are mentioned, thus signalling the existence of such likelihood of replacement. Mboti (2023:2) reflects on replacement perceptions by asking whether this is all in the name of hype. The author concludes that the sentience is rather mistaken, pointing to the fundamental misunderstanding of what it means to be human (Mboti 2023:2). This view corroborates Dong's point on AI capabilities in education that as much as it may sound plausible that AI stands to replace educators (Dong 2023), the AI's misgivings are that it does not possess similar emotions to those of human beings. Therefore, the possibility is co-creation where humans would add these emotions to enhance the performance of AI systems in the future.

Russell and Norvig (2021:1005) point out that as much as AI's superintelligence is potentially on the horizon, advancements in technology, in particular AI cannot be absolute exponential growth, thus exhibiting the S-shape. This mere shortcoming of AI suggests that coexistence with humans is still needed for it to be more perfected. This era of synchronicity may lead to transhumanism, a term which was initially predicted by Moravec in 1988 in his book titled *Mind children* (Moravec 1988). However, Julian Huxley, a biologist and philosopher is credited to have first used it in his 1957 academic work on directed improvements in human evolution (Huxley 1957:13). The tenets of transhumanism

can be traced to the work of the English professor, novelist, and non-fiction writer Robert Ettinger[4] and Fereidoun Esfandiary, who are touted as the 'early pioneers' (Kamiya 2023). Moravec is a renowned specialist for his work on robotics (cf. Moravec 1988). Thomas Fuchs in his transhumanism critique chapter titled *Beyond the human* states the following: 'While biological humanity is slowly dying out, humans will ensure the continued existence of their minds through computer simulation' (Fuchs 2021:49). Fuchs' view illustrates the possibility of human and machine merging and collaboration, which is the essence of co-creation.

With the talks of human extinction possibilities, AI protagonist leaders in the form of hundreds (more than 350) of AI experts and professors pledged their signatures on the *Statement on AI Risk* (Centre for AI Safety 2023). The statement was preceded by an open letter cautioning against the risks of AI. Roose (2023) reports that those who signed varied from top executives to the key role players of the leading AI corporates which include the CEOs of OpenAI, Google, and Anthropic. With these high profile individuals, this indicates the extent to which the AI threat is creating uncertainty on the future. The signatory pledge was driven by the Centre for AI Safety, which is a non-profit establishment (Centre for AI Safety 2023). These concerns delve into the responsible AI domain whereby ethical use and trust in AI are of paramount importance.

Wu, Ji, Yu, Zeng, Wu, and Shidujaman (2021), the proponents of AI co-creation, suggest an AI creativity and human-AI co-creation model after analysing more than 1,600 application cases of AI across 45 areas. By means of this model, the authors have coined and introduced the 'AI creativity' concept. The argument for their model is that it expounds the creative process in the AI era and that there are new opportunities and possibilities for collaboration with humans, enabled by AI.

4 Ettinger is the well-known father of cryonics, a process of preserving the dead in a frozen liquid nitrogen, with the goal of revival later. Amongst his published work, the two notable books related to his work on cryonics, are *The prospect of immortality* (Ettinger 1965) and *Man in superman: The startling potential of human evolution – and how to be part of it* (Ettinger 2005).

Within the IHE space, Robayo-Pinzon, Rojas-Berrio, Rincon-Novoa, and Ramirez-Barrera (2023:17 of 17) reflect on the relevance of AI creativity and value the co-creation process stating that this also garners support from students. They propose that more conceptual studies are necessary to understand and leverage the associated benefits. Other parts of AI and human interaction literature refer to HCI (human-computer interaction) to denote the merger and collaboration between humankind and machines. For example, Kurosu (2021:v) in his HCI theory, methods, and tools book comprised of conference papers reflects that the HCI field is gaining evolving attention and importance from both the scientific and industrial communities. Zaphiris and Ioannou (2021) further elaborate that in the 8th international conference held in 2021, over 5,000 individuals from various fields across 81 countries – academic sectors, research institutions, industry players, and public (government) sectors – submitted 1,276 papers and 241 posters.

Whereas AI is here to stay, it needs the human element to assist it, especially to develop and demonstrate empathy. This view resonates well with Dong's perspective on AI and emotions as stated earlier (Dong 2023). The other important consideration on human and AI collaboration is on understanding issues of explainability and interpretability. These two principles rest within XAI (explainable artificial intelligence), which is a branch of AI alongside Gen-AI and responsible AI, all explored further in this chapter on AI and big data in education. Therefore, as our everyday lives and activities are influenced by AI and we are slowly moving away to the digital space, away from the physical world, collaboration rather contestation between humans and AI is likely to influence the future, both of AI and humans. It is crucial that ethical boundaries in this development remain uncompromised above all.

The negative impacts of AI Authoring Tools

The global transformative power of the AI landscape across the various sectors of the economy cannot be ignored. The immense potential and transformative power of AI are shaping the future of education (Khan & Vivek 2022). The concomitant impact of AI's

transformation points to influencing the way we teach, learn, and do research (Takyar 2022). Gen-AI LLMs such as ChatGPT, Google Bard, Gemini, DALL, and Claude are arguably pioneers in this transformation (cf. Figure 2.4), and this is largely attributed to their text generation capability which is perceived to be better than that of the humans. These models have gone through various waves of AI development, of which the first wave was more on rule-based technologies, followed by the second wave which was characterised by the start of big data, ML, and Gen-AI. The last wave is sluggishly transcending from the era of cognitive AI into AGI (artificial general intelligence).

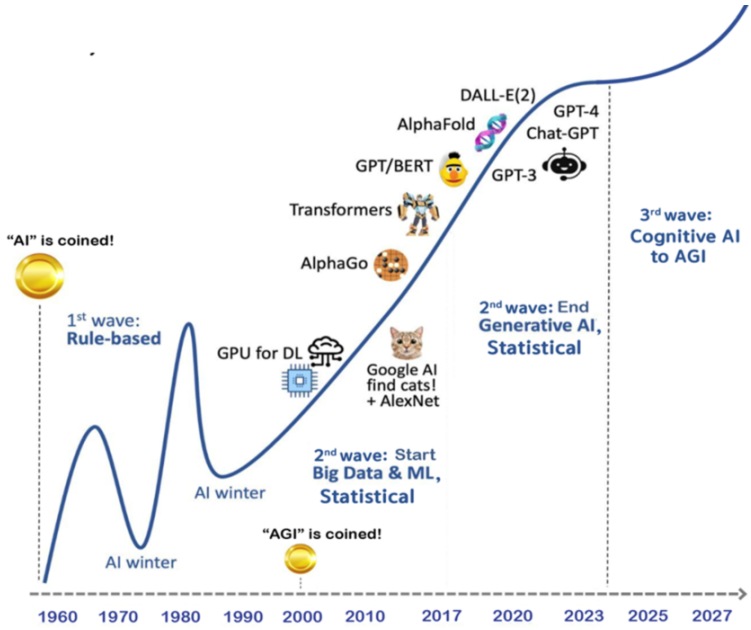

Figure 2.4: Growing capabilities of Gen-AI LLMs. (Source: Voss & Jovanovic 2023)

Given the prominence that AI and by extension LLMs, has gained over the last few years, contract cheating has been one of the major unethical behaviours that potentially compromise academic integrity within the HE space. With this form of academic dishonesty, students engage in transactional relationships in

return for tailored assignments (Medway, Roper, & Gillooly 2018:413). There is a growing body of academic literature discussing students' use of LLMs in their assessments and academic integrity, for example Eaton *et al*. (2018), Perkins (2023), and Stone (2023). The rise in essay mills and the easy access of online resources present new ethical dilemmas (Medway *et al*. 2018). This, therefore, calls for a new way of thinking regarding policy and guidelines, assessment methods and practices, as well as capacity development. The following two sections explore the concerns raised against the impact of AI authoring tools.

Students' AI Dependency and Plagiarism

The Covid-19 era (and afterwards) has evoked a massive and rapid transition to online learning by IHEs across the world. This inspired more and more use of digital technology tools to enhance teaching and learning as well as research activities. Just as educators are thought to be playing a crucial role in how educational technology tools are adopted and adapted to enhance quality in learning experiences and assessment practices (Fajet, Bello, Leftwich, Mesler, & Shaver 2005:717), more and more students are easily accessing these tools, whether in free-to-use or paid form. The cause for concern is that these students are increasingly becoming too dependent on AI, thus transferring the burden of responsibility to perform one's work to technology (AI). The concomitant alarms to this dependency among others are increasing incidents of plagiarism and other forms of academic dishonesty as described by Medway *et al*. (2018:393).

The blurred lines between collaboration and plagiarism in digital environments add layers of complexity to the landscape. As education increasingly embraces online platforms, IHEs ought to grapple with how to adapt their policies to address these emerging challenges effectively. Yeo (2023:2 of 18) points to the issues of equity and access which are being associated with the AI authoring tools proliferation. The paradox in these costs is that the outcome – intended or unintended (Motala 2018:15) – may be costly.

With electronic journals available in their plenitude, enhanced by the rise in AI tools, plagiarism can be supported

inadvertently as students can easily access papers online, use services of writing companies, thus enabling ghost-writing to thrive (Walker 2010:43). Signifying the students' dependency on AI, Perkins (2023:5 of 24) warns of inaccurate and falsified reference lists and citations, thus recommending the need to doublecheck and verify their veracity. According to Zhang (2020), most of AI AWE (automated writing evaluation) systems for providing students' feedback are equally gaining prominence in research writing space and are amassing clear benefits over human-geared reviews and assessments. AWEs like other AI authoring tools and systems such as DWAs (digital writing assistants), AAGs (automated article generators), and APTs (Roe & Perkins 2022) were initially geared for commercial enterprises for SEO (search engine optimisation) but were consequently adapted to support student learning (Perkins 2023:3 of 24).

While transition to online learning has brought some benefits, undue consequences, whether intended or otherwise have surfaced. On the downside, Stone (2023:358) underscores this point by stating that this transition has opened doors for more breaches and compromising of academic integrity, evidenced by an increasing reporting of acts of academic dishonesty. With LLMs within reach, students can easily put their reliance on AI for their thinking – argumentative and critical thinking. The usage of the AI authoring and LLM tools if not properly managed and regulated may increase chances of academic dishonesty, like plagiarism.

Plagiarism is a longstanding global ethical challenge troubling IHEs, given the disruptive behaviour it possesses on teaching and learning and knowledge transmission (Eaton 2017:271; 2023:2 of 10; Jones & Sheridan 2015:712; Thomas & De Bruin 2015:1-2 of 3; Walker 2010:42). Perkins, Gezgin, and Gordon (2019:5) define plagiarism as an act of misrepresentation of efforts carried out by the original authors. Another interesting definition of plagiarism is that of Sutherland (2008:11) who regards plagiarism as an act of using one's intellectual work by kidnapping their ideas without relevant sources of reference. Although some students plead ignorance or that they were unintentional in committing it (Stone 2023:258), academic integrity is threatened, and by extension IHEs, academic staff,

and students themselves suffer reputational damage (Currie 2023:720), with IHEs' programmes and qualifications under scrutiny (Perkins 2023:1 of 24; Stone 2023:358-359). This, according to Pecorari (2008:44; cf. Mahabeer & Pirtheepal 2019:2) may potentially lead to students' work and intelligibility being questioned and rejected. Plagiarism is assumed to be taking the edge off one's thinking, creative abilities, and originality (Jones & Sheridan 2015:715).

Reduced Human Interaction and Communication Threat

The non-debatable capacity of AI systems leans towards the ability of these systems to enhance individual experiences and to personalise digital services (Leslie 2019:6). Although these capabilities hold the potential, risks are potentially inherent. With more and more excessive automation, the dependency on AI systems and tools increases, thus threatening the need for human-to-human interaction. From a research perspective, a communication gap between educators and students is also a possibility, and this may well polarise social relationships. Leslie (2019:6) argues that 'well-ordered and cohesive societies are built on relations of trust, empathy, and mutual understanding.' Therefore, as AI systems become more and more available, it is vital for human beings to preserve these relations. Trilling and Fadel (2009:44-45) identify the following skills as key learning and innovation as well as life and career skills needed for the future:

- Critical thinking and problem solving;
- creativity and innovation;
- collaboration and communication;
- flexibility and adaptability;
- initiative and self-direction;
- social and cross-cultural; and
- leadership and responsibility.

These skills remain highly relevant in a contemporary and dynamic job market and education characterised by AI revolution (Almazroa & Alotaibi 2023; Timenko 2021). Furthermore, these skills are considered requisite competencies in a publication by

the WEF (World Economic Forum) reflecting 21st-century skills that every student needs (WEF 2016). The report goes further to state that SEL (social and emotional learning) is a crucial driver to the development of these skills and possessing them will enable students to be successful in an ever-evolving digital economy (WEF 2016). Therefore, with an over-reliance on technology and by extension, AI systems and tools, the development of these important skills is at stake, just like the economic inclusion and participation of students of the future.

Striking a Balance Between AI Usage and Maintaining Academic Integrity

Notwithstanding these revolutionary benefits amid the IHEs' endeavour to embrace and manage the abundance of AI technologies and related tools, preserving academic integrity remains a paramount ethical issue. Despite the potential prospects, this proliferation comes with associated risks and challenges. One of the challenges relates to the balance between creativity (ML/automation) and integrity (human interaction) in education. This is where ethics intersects creativity and advancements in technology.

This implies that AI advancement has concomitant significant ethical concerns, which if not well-managed or taken care of, will erode, if it does not compromise the integrity of the field – from assessments, teaching and learning methods, a governance process and policies, and most importantly the knowledge creation process. With this context in mind, the nuanced AI-driven ethical challenges on academic integrity are explored here, emphasising the need for a thoughtful and principled approach.

While there is a need to embrace AI given its benefits and the paradigm shift it has caused, there is a need to also strike a balance in an endeavour to maintain academic integrity. This should be done without suffocating the technology. Stone (2023:357), in her paper on student perceptions on academic integrity cites that academic integrity is increasingly becoming an important aspect for IHEs, however maintaining it, it has equally

become a serious issue. Without a doubt, advancements in AI have contributed to this struggle. The bottom line is that there should be a balance for safe usage. The AI governance, transparency and accountability, content ownership, fact-checking, and AI ethical usage as some of the principles that form the cornerstone of this balance are discussed below.

Future Trends: Evolution of AI and Related Challenges

The future of AI and its continuous advancements remain uncertain. This evolution is dynamic in nature and will undoubtedly continue to bring many surprises. In turn, the future of academic integrity stands at a crossroads, marked by the transformative influence of AI and the challenges it introduces. As we propel into an era characterised by reduced human interaction, communication threats, students' increasing dependency on AI, and ethical concerns stemming from heightened academic dishonesty, it becomes imperative to recalibrate our strategies and fortify the foundations of academic integrity.

The reduction in human interaction, exacerbated by the widespread adoption of digital platforms and automated assessment tools, poses a communication threat that widens the gap between educators and students. The traditional channels for guidance and mentorship may dwindle, necessitating innovative approaches to foster meaningful connections. Educators and institutions must proactively leverage technology to bridge this gap, establishing clear lines of communication, virtual support systems, and avenues for students to seek guidance and feedback, especially on clarifying the difference between plagiarism and poor referencing techniques (Stone 2023:372).

The growing dependency on AI among students raises concerns about diminishing capacities for critical thinking. As AI tools streamline processes and offer ready-made solutions, there is a risk of stifling the development of essential analytical and problem-solving skills. The future demands a recalibration of educational approaches to strike a balance between leveraging AI for efficiency and preserving the space for students to cultivate

critical thinking. Encouraging inquiry-based learning, complex problem-solving, and projects that require creative thought will be crucial in nurturing students' intellectual independence in attempting to overcome transparency issues in the current available LLMs, alternative open source LLMs known as OPTs (open pre-trained transformers) are being developed as they boost the advantage of a text generation ability and are more open to scrutiny (Perkins 2023:7 of 24).

Conclusion

In the face of changing educational environments and advancements in AI, the survival of academic integrity depends on the current and future generation's capacity to adjust, create, and preserve instead of subverting moral principles. To fully utilise AI's benefits while preserving the values that guide academic success, a deliberate effort is needed. There is a need to create an educational future that is both technologically advanced and morally sound. This involves tackling issues presented by a worryingly mounting students' dependency on AI, less human interaction, communication, and ethical gaps. The journey to maintaining academic integrity in the AI age remains a dynamic call that requires ongoing self-examination, adjustment, and a resolute dedication to the values that constitute the core of intellectual endeavours. Eaton (2023) thus argues that we need to be talking about post-plagiarism and reflects on ethics and integrity in the era of AI.

Equally so, the ethical threat posed by increased academic dishonesty in the digital age demands a proactive and multi-faceted response. IHEs must not only employ advanced technological tools for plagiarism detection, as they need to up their investment game as far as comprehensive educational programmes that instil a strong sense of academic ethical culture are concerned. Fostering a culture of integrity, emphasising the value of original thought, and equipping staff – students, educators, and management – with the skills to navigate the ethical challenges posed by AI are essential steps for mitigating the possible threat against academic integrity.

References

Almazroa, H. & Alotaibi, W. 2023. Teaching 21st century skills: Understanding the depth and width of the challenges to shape proactive teacher education programmes. *Sustainability* 15(9). 7365. 25 pages. https://doi.org/10.3390/su15097365

Apperly, IA. & Butterfill, SA. 2009. Do humans have two systems to track beliefs and belief-like states? *Psychological Review* 116(4):953-970. https://doi.org/10.1037/a0016923

Armstead, PK. 2001. What factors affect cheating in secondary school and why? PhD thesis, Department of Psychology, University of Plymouth, England.

Arrieta, AB., Díaz-Rodríguez, N., Del Ser, J., Bennetot, A., Tabik, S., Barbado, A., García, S., Gil-López, S., Molina, D., Benjamins, R., & Chatila, R. 2020. Explainable artificial intelligence (XAI): Concepts, taxonomies, opportunities and challenges toward responsible AI. *Information fusion* 58:82-115. https://doi.org/10.1016/j.inffus.2019.12.012

AWG (Australian Writers' Guild). 2023. Australian Writers' Guild rejects unregulated AI in the creative sector. 28 September 2023. Available at: https://www.awg.com.au/News-Details?newsId=893&title=Australian-Writers-Guild-rejects-unregulated-AI-in-the-creative-sector. (Accessed on 25 December 2023).

Beduschi, A. 2024. Synthetic data protection: Towards a paradigm change in data regulation? *Big Data & Society* 11(1):20-53. https://doi.org/10.1177/20539517241231277

Bouchard, L. 2022. Prompting explained: How to talk to ChatGPT. 12 December 2022. Available at: https://www.louisbouchard.ai/prompting-explained/. (Accessed on 2 January 2024).

Bretag, T. 2016. *Handbook of academic integrity*. Singapore: Springer. https://doi.org/10.1007/978-981-287-098-8

Brue, S. & McConnell, C. 2014. *Essentials of economics*. New York: McGraw Hill.

Bushway, A. & Nash, WR. 1977. School cheating behaviour. *Review of Educational Research* 47(4):623-632. https://doi.org/10.3102/00346543047004623

Carter, J., Sandall, J., Shennan, AH., & Tribe, RM. 2019. Mobile phone apps for clinical decision support in pregnancy: A scoping review. *BMC Medical Informatics and Decision Making* 19(1):1-13. https://doi.org/10.1186/s12911-019-0954-1

Carvalho, L. & Yeoman, P. 2021. Performativity of materials in learning: The learning-whole in action. *Journal of New Approaches in Educational Research* 10(1):28-42. https://doi.org/10.7821/naer.2021.1.627

Centre for AI Safety. 2023. Statement on AI risk: AI experts and public figures express their concern about AI risk. Centre for AI Safety. Available at: https://www.safe.ai/statement-on-ai-risk. (Accessed on 7 January 2024).

Chaffey, D. & Ellis-Chadwick, F. 2019. *Digital marketing*. Harlow: Pearson.

Chassignol, M., Khoroshavin, A., Klimova, A., & Bilyatdinova, A. 2018. Artificial intelligence trends in education: A narrative overview. *Procedia Computing Science* 136:16-24. https://doi.org/10.1016/j.procs.2018.08.233

Clarke, R. & Lancaster, T. 2006. Eliminating the successor to plagiarism? Identifying the usage of contract cheating sites. *Proceedings of 2nd international plagiarism conference, June 2006*, 19-21.

CNBC. 2023. Tesla CEO Elon Musk discusses the implications of A.I. on his children's future in the workforce. 16 May 2023. *Video*. Available at: https://www.cnbc.com/video/2023/05/16/tesla-ceo-elon-musk-discusses-the-implications-of-a-i-on-the-future-of-the-workforce.html. (Accessed on 3 January 2024).

Coppin, B. 2004. *Artificial intelligence illuminated*. Boston: Jones & Bartlett.

Coutinho, L. 2022. The power of the universe: How to make it work for you. *The Free Press Journal*. 9 April 2022. Available at: https://www.freepressjournal.in/weekend/the-power-of-the-universe-how-to-make-it-work-for-you. (Accessed on 9 December 2023).

Currie, GM. 2023. Academic integrity and artificial intelligence: Is ChatGPT hype, hero or heresy? *Seminars in Nuclear Medicine* 53(5):719-730. https://doi.org/10.1053/j.semnuclmed.2023.04.008

De Bruin, JS., Schuh, C., Seeling, W., Luger, E., Gall, M., Hütterer, E., Kornek, G., Ludvik, B., Hoppichler, F., & Schindler, K. 2018. Assessing the feasibility of a mobile health-supported clinical decision support system for nutritional triage in oncology outpatients using Arden Syntax. *Artificial Intelligence in Medicine* 92:34-42. https://doi.org/10.1016/j.artmed.2015.10.001

Delipetrev, B., Tsinaraki, C., & Kostic, U. 2020. *Historical evolution of artificial intelligence*. Luxembourg: Publications Office of the European Union.

Dong, Z. 2023. Research on the impact of artificial intelligence on the development of education. *Proceedings of the 2nd International Conference on Interdisciplinary Humanities and Communication Studies.*

Eaton, SE. 2017. Comparative analysis of institutional policy definitions of plagiarism: A Pan-Canadian university study. *Interchange* 48:271-281. https://doi.org/10.1007/s10780-017-9300-7

Eaton, SE. 2018. Contract cheating: A Canadian perspective. *BMC.* 24 July 2018. Available at: http://blogs.biomedcentral.com/bmcblog/2018/07/24/contract-cheating-a-canadian-perspective/. (Accessed on 29 November 2023).

Eaton, SE. 2023. Postplagiarism: Transdisciplinary ethics and integrity in the age of artificial intelligence and neurotechnology. *International Journal for Educational Integrity* 19(1). 23. 10 pages. https://doi.org/10.1007/s40979-023-00144-1

Eaton, SE., Rothschuh, S., Fernández Conde, C., Guglielmin, M., Otoo, BK., Wilson, J., & Burns, I. 2018. Understanding faculty perceptions and approaches to academic integrity in a Canadian school of education. Available at: https://files.eric.ed.gov/fulltext/ED581141.pdf. (Accessed on 4 January 2024).

Ellis, C., Van Haeringen, K., Harper, R., Bretag, T., Zucker, I., McBride, S., Rozenberg, P., Newton, P., & Saddiqui, S. 2020. Does authentic assessment assure academic integrity? Evidence from contract cheating data. *Higher Education Research & Development* 39(3):454-469. https://doi.org/10.1080/07294360.2019.1680956

Epstein, Z. & Hertzmann, A. 2023. Investigators of human creativity. In Akten, M., Farid, H., Fjeld, J., Frank, MR., Groh, M., Herman, L., Leach, N., & Mahari, R. (Eds.): Art and the science of generative AI. *Science* 380(6650):1110-1111. https://doi.org/10.1126/science.adh4451

Eren, A., Subasi, A., & Coskun, O. 2008. A decision support system for telemedicine through the mobile telecommunications platform. *Journal of Medical Systems* 32(1):31-35. https://doi.org/10.1007/s10916-007-9104-x

Erguzel, TT. & Ozekes, S. 2014. Artificial intelligence approaches in psychiatric disorders. *The Journal of Neurobehavioral Studies* 1:52-53. https://doi.org/10.5455/JNBS.1405259279

Ettinger, RCW. 1965. *The prospect of immortality*. London: Sidgwick and Jackson.

Ettinger, RCW. 2005. *Man in superman: The startling potential of human evolution – and how to be part of it.* New York: Routledge.

Fajet, W., Bello, M., Leftwich, SA., Mesler, JL., & Shaver, AN. 2005. Pre-service teachers' perceptions in beginning education classes. *Journal of Teaching Education* 21(6):717-727. https://doi.org/10.1016/j.tate.2005.05.002

Fan, W., Chen, Y., Li, J., Sun, Y., Feng, J., Hassanin, H., & Sareh, P. 2021. Machine learning applied to the design and inspection of reinforced concrete bridges: Resilient methods and emerging applications. *Structures* 33:3954-3963. https://doi.org/10.1016/j.istruc.2021.06.110

Fishman, T. 2015. Academic integrity as an educational concept, concern and movement in US institutions of higher learning. In Bretag, T. (Ed.): *Handbook of academic integrity*, 7-22. Singapore: Springer. https://doi.org/10.1007/978-981-287-098-8_1

Friedman, M. 1975. *There's no such thing as a free lunch.* Chicago: Open Court Publishing Company.

Frost, K. & Sullivan, B. 2016. Transforming healthcare through artificial intelligence systems. Artificial Intelligence in Health and Life Sciences. *DocPlayer*. 19 slides. Available at: https://docplayer.net/36848717-Transforming-healthcare-through-artificial-intelligence-systems.html. (Accessed on 30 December 2023).

Fuchs, T. 2021. Beyond the human? A critique of transhumanism. In Fuchs, T. (Ed.): *In defence of the human being: Foundational questions of an embodied anthropology*, 49-82. Oxford: Oxford University Press. https://doi.org/10.1093/oso/9780192898197.003.0003

Ganiev, AG. & Tashev, SN. 2021. The role of 'imagination' in the process of 'creative thinking' developing students' 'imagination' and 'creative thinking' skills in teaching physics. *Psychology and Education* 58(1):3569-3575. https://doi.org/10.17762/pae.v58i1.1309

Gartner, 2023. What's new in artificial intelligence from the 2023 Gartner hype cycle. 17 August 2023. Available at: https://www.gartner.com/en/articles/what-s-new-in-artificial-intelligence-from-the-2023-gartner-hype-cycle. (Accessed on 5 December 2023).

Gmyrek, P., Berg, J., & Bescond, D. 2023. *Generative AI and jobs: A global analysis of potential effects on job quantity and quality*. ILO Working Paper 96. Geneva: ILO. https://doi.org/10.54394/FHEM8239

Grand View Research. 2023. Digital transformation market to reach $4,617.78 billion by 2030. 8 August 2023. Available at: https://www.grandviewresearch.com/press-release/global-digital-transformation-market#. (Accessed on 7 December 2023).

Gregory, RJ. 2004. *Psychological testing: History, principles, and applications*. Boston: Allyn & Bacon.

Hellman, M. 2019. Augmented writing technology: A writer's friend or foe? *The Seattle Times*. 30 April 2019. Available at: https://www.seattletimes.com/business/technology/augmented-writing-technology-a-writers-friend-or-foe/. (Accessed on 30 December 2023).

Hua, JH. 2023. Beyond exams: Investigating AI tool impact on student attitudes, ethical awareness, and academic dishonesty in online college assessments. *International Journal of Educational Management and Development Studies* 4(4):160-185. https://doi.org/10.53378/353030

Huxley, J. 1957. *Transhumanism*. London: Chatto & Windus.

ICAI (International Centre for Academic Integrity). 2021. *The fundamental values of academic integrity.* 3rd ed. Albany: ICAI.

Jergus, K. 2018. Jean-Jacques Rousseau (1712-1778). In Smeyers, P (Ed.): *International handbook of philosophy of education*, 395-406. Part 1. Cham: Springer. https://doi.org/10.1007/978-3-319-72761-5_33

Jones, M. & Sheridan, L. 2015. Back translation: An emerging sophisticated cyber strategy to subvert advances in 'digital age' plagiarism detection and prevention. *Assessment & Evaluation in Higher Education* 40(5):712-724. https://doi.org/10.1080/02602938.2014.950553

Kaartemo, V. & Helkkula, A. 2018. A systematic review of artificial intelligence and robots in value co-creation: Current status and future research avenues. *Journal of Creating Value* 4(2):211-228. https://doi.org/10.1177/2394964318805625

Kamiya, A. 2023. Transhumanism: History, criticisms & future of humanity. *Study.com*. 8 March 2023. Available at: https://study.com/academy/lesson/transhumanism-overview-history-debates.html. (Accessed on 2 January 2024).

Kelly, K. 2016. *The inevitable: Understanding the 12 technological forces that will shape our future*. New York: Penguin.

Khan, MA. & Vivek, MA. 2022. Artificial intelligence and big data: The advent of new pedagogy in the adaptive e-learning system in the higher educational institutions of Saudi Arabia. *Education Research International* 2022. 10 pages. https://doi.org/10.1155/2022/1263555

Kirk, A. 1996. *Learning and the marketplace: A philosophical, cross-cultural (and occasionally irreverent) guide for business and academe*. Carbondale: Southern Illinois University Press.

Korteling, JH., Van de Boer-Visschedijk, GC., Blankendaal, RA., Boonekamp, RC., & Eikelboom, AR. 2021. Human- versus artificial intelligence. *Frontiers in Artificial Intelligence* 4. 622364. 13 pages. https://doi.org/10.3389/frai.2021.622364

Kurosu, M. (Ed.): *Human-computer interaction: Theory, methods and tools*. HCII 2021. Lecture Notes in Computer Science 12762. Cham: Springer. https://doi.org/10.1007/978-3-030-78462-1

Lamchek, JS. 2023. Ensuring data science and its applications benefit humanity: Data monetization and the right to science. *Human Rights Law Review* 23(3):1-23. https://doi.org/10.1093/hrlr/ngad018

Lancaster, T. 2020. Commercial contract cheating provision through micro-outsourcing web sites. *International Journal for Educational Integrity* 16(4). 14 pages. https://doi.org/10.1007/s40979-020-00053-7

Lang, JM. 2013. *Cheating lessons: Learning from academic dishonesty*. Cambridge: Harvard University Press.

LeCun, Y., Boser, B., Denker, JS., Henderson, D., Howard, RE., Hubbard, W., & Jackel, LD. 1989. Handwritten digit recognition with a back-propagation network. In Touretzky, D. (Ed.): *Advances in neural information processing systems*, 396-404. Part 5. NIPS Conference. Denver: Morgan Kaufmann.

Leslie, D. 2019. *Understanding artificial intelligence ethics and safety: A guide for the responsible design and implementation of AI systems in the public sector*. London: The Alan Turing Institute. https://doi.org/10.2139/ssrn.3403301

Lu, M. 2023. How smart is ChatGPT? *Visual Capitalism*. 26 April 2023. Available at : https://www.visualcapitalist.com/how-smart-is-chatgpt/#:~:text=ChatGPT%2C%20a%20language%20model%20developed,help%20them%20with%20their%20homework. (Accessed on 12 December 2023).

Lundgren, M. 2024. Large language models in student assessment: Comparing ChatGPT and human graders. *arXiv preprint*. https://doi.org/10.2139/ssrn.4874359

Mahabeer, P. & Pirtheepal, T. 2019. Assessment, plagiarism and its effect on academic integrity: Experiences of academics at a university in South Africa. *South African Journal of Science* 115(11-12):1-8. https://doi.org/10.17159/sajs.2019/6323

Manne, R. & Kantheti, SC. 2021. Application of artificial intelligence in healthcare: Chances and challenges. *Current Journal of Applied Science and Technology* 40(6):78-89. https://doi.org/10.9734/cjast/2021/v40i631320

Marais, IE. 2022. Institutionalisation of academic integrity: Experiences at a distance education university in South Africa during COVID-19. *Critical Studies in Teaching and Learning* 10(2):57-79. https://doi.org/10.14426/cristal.v10i2.585

Mboti, N. 2023. Artificial general intelligence, sentience, and replaceability of humans: Hype or not? A heated theoretical exchange between two University of the Free State professors. 1st Foundational Digital Capabilities Research Seminar, Tshwane, South Africa. Available at: https://www.researchgate.net/publication/271390398_Artificial_General_Intelligence_Concept_State_of_the_Art_and_Future_Prospects. (Accessed on 31 December 2023).

McCabe, DL. 2005. It takes a village: Academic dishonesty and educational opportunity. *Liberal Education* 91(3):26-31.

McCallum, S. 2023. ChatGPT banned in Italy over privacy concerns. *BBC News*. 1 April 2023. Available at: https://www.bbc.com/news/technology-65139406. (Accessed on 26 December 2023).

Medway, D., Roper, S., & Gillooly, L. 2018. Contract cheating in UK higher education: A covert investigation of essay mills. *British Educational Research Journal* 44:393-418. https://doi.org/10.1002/berj.3335

Meskó, B. 2023. Prompt engineering as an important emerging skill for medical professionals: Tutorial. *Journal of Medical Internet Research* 25. p.e50638. 6 pages. https://doi.org/10.2196/50638

Motala, S. 2018. Achieving 'free education' for the poor: A realisable goal in 2018? Introduction Part III. *Journal of Education* 68:15-29.

Moravec, H. 1988. *Mind children: The future of robot and human intelligence*. Cambridge: Harvard University Press.

Mu, C. 2023. Based on natural language processing, human-computer dialogue, image recognition, and machine learning analysis whether artificial intelligence will surpass the human brain. *Applied and Computational Engineering* 5(1):40-47. https://doi.org/10.54254/2755-2721/5/20230526

Mwamwenda, TS. 2006. Academic integrity: South African and American university students. *The Journal of Independent Teaching and Learning* 1(1):34-44.

Nasrullah, N. & Al Wahyu, T. 2024. The application of Chat GPT in English Language evaluation: A systematic literature review. *Futurity Education* 4(3):217-235. https://doi.org/10.57125/FED.2024.09.25.13

Neha, K. 2020. Role of artificial intelligence in education. *Alochana Chakra Journal* 9:305-309.

OECD (Organisation for Economic Co-operation and Development). 2023. The impact of AI on the workplace: Main findings from the OECD AI surveys of employers and workers. Available at: https://www.oecd.org/employment-outlook/2023/#ai-jobs. (Accessed on 12 December 2023).

Oliver, E. 2022a. Society 5.0 and Education 5.0 with reference to higher education. In Oliver, E. (Ed.): *Global initiatives and higher education in the fourth industrial revolution*, 53-68. Auckland Park: UJ Press. https://doi.org/10.36615/9781776405619-02

Oliver, WH. 2022b. Global initiatives within the 4IR and the role of higher education. In Oliver, E. (Ed.): *Global initiatives and higher education in the fourth industrial revolution*, 27-52. Auckland Park: UJ Press. https://doi.org/10.36615/9781776405619

Pecorari, D. 2008. *Academic writing and plagiarism: A linguistic analysis.* London: Bloomsbury.

Perkins, M. 2023. Academic integrity considerations of AI large language models in the post-pandemic era: ChatGPT and beyond. *Journal of University Teaching & Learning Practice* 20(2). 24 pages. https://doi.org/10.53761/1.20.02.07

Perkins, M., Gezgin, UB., & Gordon, RD. 2019. Plagiarism in higher education: Classification, causes and controls. *Pan-Pacific Management Science* 2:1-12.

Planck. 2018. From an almost perfect universe to the best of both worlds. 17 July 2018. Available at: https://sci.esa.int/web/planck/-/60499-from-an-almost-perfect-universe-to-the-best-of-both-worlds. (Accessed on 2 January 2024).

Pokrivcakova, S. 2019. Preparing teachers for the application of AI-powered technologies in foreign language education. *Journal of Language and Cultural Education* 7(3):135-153. https://doi.org/10.2478/jolace-2019-0025

Poola, I. 2023. Overcoming ChatGPT's inaccuracies with pre-trained AI prompt engineering sequencing process. *International Journal of Technology and Emerging Sciences* 3(3):16-19.

Popenici, SAD. & Kerr, S. 2017. Exploring the impact of artificial intelligence on teaching and learning in higher education. *Research and Practice in Technology Enhanced Learning* 12. 22. 13 pages. https://doi.org/10.1186/s41039-017-0062-8

PWC (Price Waterhouse Coopers). 2017. No longer science fiction, AI and robotics are transforming healthcare. Available at: https://pwc.to/2weGo5v. (Accessed on 12 December 2023).

Quinlan, JR. 1986. Induction of decision trees. *Machine Learning* 1:81-106. https://doi.org/10.1007/BF00116251

Ragolane, M., Patel, S., & Salikram, P. 2024. AI versus human graders: Assessing the role of large language models in higher education. *Asian Journal of Education and Social Studies* 50(10):244-263. https://doi.org/10.9734/ajess/2024/v50i101616

Robayo-Pinzon, O., Rojas-Berrio, S., Rincon-Novoa, J., & Ramirez-Barrera, A. 2023. Artificial intelligence and the value co-creation process in higher education institutions. *International Journal of Human-Computer Interaction*. 17 pages. https://doi.org/10.1080/10447318.2023.2259722

Roberts, J. 2016. Thinking machines: The search for artificial intelligence. *Distillations Magazine* 2(2):14-23.

Roe, J. & Perkins, M. 2022. What are automated paraphrasing tools and how do we address them? A review of a growing threat to academic integrity. *International Journal for Educational Integrity* 18. 15. 10 pages. https://doi.org/10.1007/s40979-022-00109-w

Roose, K. 2023. A.I. poses 'risk of extinction,' industry leaders warn. *The New York Times*. 30 May 2023. Available at: https://www.nytimes.com/2023/05/30/technology/ai-threat-warning.html. (Accessed on 7 January 2024).

Rothman, J. 2023. Why the godfather of A.I. fears what he's built. *The New Yorker*. 13 November 2023. Available at: https://www.newyorker.com/magazine/2023/11/20/geoffrey-hinton-profile-ai. (Accessed on 5 December 2023).

Russ, H., Soffel, MH., Kasai, MA., & Börner, G. 1997. Age of the universe: Influence of the inhomogeneities on the global expansion factor. *Physical Review* D56(4):2044-2050. https://doi.org/10.1103/PhysRevD.56.2044

Russell, SJ. & Norvig, P. 2021. *Artificial intelligence a modern approach*. 4th ed. London: Pearson.

Rutgers Business School. 2014. New academic integrity award will honor research of retiring Professor Donald L. McCabe. *Rutgers Newark*. 20 April 2014. Available at: https://www.newark.rutgers.edu/news/new-academic-integrity-award-will-honor-research-retiring-professor-donald-l-mccabe. (Accessed on 7 January 2024).

Sadler, DR. 1989. Formative assessment and the design of instructional systems. *Instructional Science* 18:119-144. https://doi.org/10.1007/BF00117714

Samoili, S., Cobo, ML., Gómez, E., De Prato, G., Martínez-Plumed, F., & Delipetrev, B., 2020. *AI watch. Defining artificial intelligence: Towards an operational definition and taxonomy of artificial intelligence*. JRC Technical Report. Luxembourg: Publications Office of the European Union.

Sharma, RC., Kawachi, P., & Bozkurt, A. 2019. The landscape of artificial intelligence in open, online and distance education: Promises and concerns. *Asian Journal of Distance Education* 14(20):1-2.

Shortliffe, T. & Davis, R. 1975. Some considerations for the implementation of knowledge-based expert systems. *ACM SIGART Bulletin* (55):9-12. https://doi.org/10.1145/1045253.1045254

Stevens, TN. 2013. Promoting a culture of integrity: A study of faculty and student perceptions of academic dishonesty at a large public Midwestern university. PhD thesis. University of Missouri-St. Louis. Available at: https://core.ac.uk/download/pdf/217322415.pdf. (Accessed on 5 January 2024).

Stone, A. 2023. Student perceptions of academic integrity: A qualitative study of understanding, consequences, and impact. *Journal of Academic Ethics* 21:357-375. https://doi.org/10.1007/s10805-022-09461-5

Sutherland, SW. 2008. *Plagiarism, the internet, and student learning: Improving academic integrity*. New York: Routledge.

Takyar, A. 2022. AI use cases & applications across major industries. *LeewayHertz-Software Development Company Publications*. Available at: https://www.leewayhertz.com/ai-use-cases-and-applications/. (Accessed on 12 December 2023).

Thiebes, S., Lins, S., & Sunyaev, A. 2021. Trustworthy artificial intelligence. *Electronic Markets* 31:447-464. https://doi.org/10.1007/s12525-020-00441-4

Thomas, A. & De Bruin, GP. 2015. Plagiarism in South African management journals. *South African Journal of Science* 111(1/2). 3 pages. https://doi.org/10.17159/sajs.2015/20140017

Timenko, M. 2021. 21st century skills in school education in the United Kingdom. *The Sources of Pedagogical Skills* 26:202-206. https://doi.org/10.33989/2075-146x.2020.26.227654

Trilling, B. & Fadel, C. 2009. *21st century skills: Learning for life in our times*. San Francisco: Jossey-Bass.

Trott, S., Jones, C., Chang, T., Michaelov, J., & Bergen, B. 2023. Do large language models know what humans know? *Cognitive Science* 47(7). p.e13309. 21 pages. https://doi.org/10.1111/cogs.13309

Turing, AM. 1950. Computing machinery and intelligence. *Journal of Mind* 59(236):433-460. https://doi.org/10.1093/mind/LIX.236.433

Vandana, KL. & Nagaveni, NB. 2019. University grants commission (promotion of academic integrity and prevention of plagiarism in higher educational institutions) regulations, 2018. *CODS-Journal of Dentistry* 9(2):iv-vi.

Vaswani, A., Shazeer, N., Parmar, N., Uszkoreit, J., Jones, L., Gomez, AN., Kaiser, Ł., & Polosukhin, I. 2017. Attention is all you need. In Guyon, I., Von Luxburg, U., Bengio, S., Wallach, H., Fergus, R., Vishwanathan, S., & Garnett, R. (Eds.): *Advances in neural information processing systems 30*. NeurIPS Proceedings. Available at: https://proceedings.neurips.cc/paper_files/paper/2017. (Accessed on 11 January 2024).

Venugopal, R. & Mamatha, V. 2023. Impact of artificial intelligence (AI) on teaching and learning in India's higher education sector. *IOSR Journal of Research & Method in Education* 13(5). 6 pages.

Wahle, JP., Ruas, T., Kirstein, F., & Gipp, B. 2022. How large language models are transforming machine-paraphrased plagiarism. In Goldberg, Y., Kozareva, Z., & Zhang, Y. (Eds.): *Proceedings of the 2022 Conference on Empirical Methods in Natural Language Processing (EMNLP) in Abu Dhabi, UAE*, 952-963. Available at: https://aclanthology.org/2022.emnlp-main.62/. (Accessed on 25 January 2024). https://doi.org/10.18653/v1/2022.emnlp-main.62

Walker J. 2010. Measuring plagiarism: Researching what students do, not what they say they do. *Studies of Higher Education* 35(1):41-59. https://doi.org/10.1080/03075070902912994

WEF (World Economic Forum). 2016. Future of work: Ten 21st-century skills every student needs. 10 May 2016. Available at: https://www.weforum.org/agenda/2016/03/21st-century-skills-future-jobs-students/. (Accessed on 9 January 2024).

Whitby, B. 2008. *Artificial intelligence: A beginner's guide*. Oxford: One World.

William, S. 1993. On language: Words left out in the cold. *The New York Times*. 14 February 1993. Available at: https://query.nytimes.com/gst/fullpage.html?res=9F0CE7DF1138F937A25751C0A965958260. (Accessed on 25 January 2024).

Winograd, T. 1971. Procedures as a representation for data in a computer program for understanding natural language. PhD thesis, Massachusetts Institute of Technology, Cambridge. Available at: https://apps.dtic.mil/sti/pdfs/AD0721399.pdf. (Accessed on 6 January 2024).

Winter, A. 2023. The Hollywood writers AI deal sure puts a lot of trust in studios to do the right thing. *Wired*. 28 September 2023. Available at: https://www.wired.com/story/writers-strike-hollywood-ai-protections/. (Accessed on 25 December 2023).

Wu, Z., Ji, D., Yu, K., Zeng, X., Wu, D., & Shidujaman, M. 2021. AI creativity and the human-AI co-creation model. In Kurosu, M. (Ed.): *Human-computer interaction: Theory, methods and tools*, 171-190. HCII 2021. Lecture Notes in Computer Science 12762. Cham: Springer. https://doi.org/10.1007/978-3-030-78462-1_13

Yadav, P., Tudela, LAM., & Marco-Lajara, B. 2024. The role of AI in assessing and achieving the sustainable development goals (SDGs). In Irfan, M., Hussainey, K., Bukhari, SAC., & Nam, Y. (Eds.): *Issues of sustainability in AI and new-age thematic investing*, 1-17. Hershey: IGI Global. https://doi.org/10.4018/979-8-3693-3282-5.ch001

Yeo, MA. 2023. Academic integrity in the age of artificial intelligence (AI) authoring apps. *TESOL Journal* 14(3). e716. 18 pages. https://doi.org/10.1002/tesj.716

Zaphiris, P. & Ioannou, A. (Eds.). 2021. Learning and collaboration technologies: New challenges and learning experiences. *8th International Conference, LCT 2021, held as part of the 23rd HCI International Conference, HCII 2021, Virtual Event, 24–29 July 2021. Proceedings Part I* (Vol. 12784). Cham: Springer Nature.

Zhang, Y. 2017. '*Type 20: Corruption in education.' The book of swindles: Selections from a late Ming collection*. New York: Columbia University Press. https://doi.org/10.7312/zhan17862

Zhang, ZV. 2020. Engaging with automated writing evaluation (AWE) feedback on L2 writing: Student perceptions and revisions. *Assessing Writing* 43. 100439. https://doi.org/10.1016/j.asw.2019.100439