The Potential of Artificial Intelligence (AI) and ChatGPT for Teaching, Learning and Research

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Abstract: Artificial Intelligence (AI) started in the mid-20th century with the work of the British logician and computer pioneer Alan Turing. It continued with the Logic Theorist, a program simulating a human's problem-solving skills. Since then, technology has travelled so fast, especially in recent years, with virtual assistants, chatbots, and ChatGPT launched in November 2022, an extensive language model developed by OpenAI. This engine received a large amount of text data as training, which includes books, articles, and websites, and has been fine-tuned on specific tasks to improve its performance. ChatGPT can generate coherent and relevant responses using Machine Learning and Neuronal Networks. This paper aims to provide an overview of ChatGPT, its features and drawbacks and its potential to disrupt and transform teaching, learning and research.

Keywords: ChatGPT, Artificial Intelligence, natural language processing, machine learning, teaching and learning.

Introduction

Many applications across different industries use Artificial Intelligence (AI). Virtual assistants such as Google, Apple's Siri, Samsung Bixby, and Alexa use Machine Learning (ML) algorithms to predict and respond to user queries (Brill, Munoz, & Miller, 2019). Another widespread use of AI is recommendation systems built-in into platforms such as Netflix, Amazon, eBay, and Spotify (Altaweel, 2021; Anderson, Gil, Gibson, Wolf, Shapiro, Semerci, & Greenberg, 2021; Verganti, Vendraminelli, & Iansiti, 2020; Zwakman, Pal, & Arpnikanondt, 2021). These systems analyse user preferences and behaviour to suggest personalised video content, products, music or services.

Natural Language Processing (NLP) and AI are used to interpret and understand human language in chatbots, language translation services, voice assistants, and social media data sentiment analysis. For instance, customer service uses AI-powered chatbots and virtual assistants to respond instantly to customer queries and support. These AI systems can handle routine inquiries, freeing humans for more complex tasks that require higher-order thinking, such as problem-solving, hypothesising and applying creativity (Chowdhary & Chowdhary, 2020).

AI plays a crucial role in self-driving cars in the automobile industry by processing sensor data, making real-time decisions, and controlling vehicle functions. Companies like Tesla, Waymo, and Uber have been actively developing AI-powered autonomous vehicles (J.-W. Hong, Cruz, & Williams, 2021).

Financial trading uses AI algorithms to analyse market data, identify patterns, and make rapid trading decisions (Njegovanović, 2018). AI can process large amounts of financial data, execute trades quickly, and scale beyond human capabilities. In fraud detection, AI algorithms can analyse large volumes of data to detect patterns and anomalies that may indicate fraudulent activities. Banks and credit card companies use AI to identify potential fraud and prevent financial losses.

In the healthcare industry, AI has been used in medical imaging to aid in diagnosing diseases such as cancer. Machine Learning algorithms can analyse medical images like X-rays, MRIs, and CT scans to identify abnormalities and assist radiologists in making accurate diagnoses and providing adequate treatments (Bourdon, Ahmed, Urruty, Djemal, & Fernandez-Maloigne, 2021).

In Education, AI has been used for a while in learning analytics that identifies students at risk and triggers alerts to educators. These systems are integrated into Learning Management Systems (LMSs) and offer customisations such as dashboards where students can see their journey across their courses. Other AI solutions were integrated to create teaching content, manage administrative tasks related to enrollments, and manage lecture theatres.

For students and professionals, Grammarly (Fitria, 2021) and ProWritingAid (Rahma & Zen, 2023) are other examples of how AI can help them write better content and receive instant feedback on common grammar mistakes. These applications are becoming more sophisticated with each update and are used worldwide with more than 30 million daily active users and generated a revenue of 8.8 million US dollars in 2022 (Harris, 2023).

In photography, AI-powered applications allow users to manipulate images without sophisticated

software like Adobe Photoshop or Gimp and image manipulation techniques (e.g., adjustment layers, masking, brushes). Tasks that took hours or even days can be completed with a few clicks and achieve professional quality. Examples of automatised imaging processing applications include FaceApp (Wirth, 2023), which converts ordinary portraits into outstanding studio-quality images and PerfectMe (Fried, Jacobs, Finkelstein, & Agrawala, 2020), which can manipulate body shape. The requisite is high-resolution images rich in details and good lighting. There are even applications that can reconstruct poor-resolution or damaging photos (e.g., Remini). Even mobile phone software offers AI tools to erase undesirable content from the background (e.g., object erasers on Samsung Galaxy phones).

Many apps on Google Play and Apple Store take advantage of AI, such as NatureID, which identifies plants and their health status and recommends how to maintain them. Lensa, which generates artwork; Duolingo or ELSA to learn languages; FitnessAI and many more.

These examples are just some uses of AI in different industries, from large organisations to everyday people. AI-powered tools are rapidly evolving, and their applications continue to expand across various industries and domains, including education. This paper discusses the rise of AI and ChatGPT, its potential, and its drawbacks in the context of teaching, learning and academic research.

The rise of ChatGPT

ChatGPT is an extensive language model developed by OpenAI based on the GPT (Generative Pre-trained Transformer) architecture. ChaGPT aims to generate human-like responses to natural language inputs, making it suitable for various Natural Language Processing (NLP) tasks such as text completion, translation, and conversation (Van Dis, Bollen, Zuidema, van Rooij, & Bockting, 2023).

The ChatGPT engine has been guided on a large amount of text data, which includes books, articles, and websites, and has been fine-tuned on specific tasks to improve its performance. It can understand the context in many cases and generate coherent and relevant responses, making it an effective tool for various applications, including chatbots, language translation services, and question-answering systems.

The GPT architecture is an Artificial Neuronal Network that mimics the brain's structure and uses self-attention mechanisms to process input text and generate output text (Krogh, 2008). The network uses three layers: an input, a hidden and an output layer. The input layer is the query (e.g., is this picture of a dog?), while the hidden layer is the processing of the system trying to predict the context and the meaning of the query to come up with the output in this case, yes or no. ChatGPT has achieved state-of-the-art performance on several NLP benchmarks, including language modelling, text generation, and translation. It was launched on 20 November 2022 by OpenAi, and by 04 December 2022, the platform had 1 million users and is evolving rapidly.

From the educational technology perspective, ChatGPT is an Intentional Technology Proxy (ITP) that performs a task on behalf of the user (Hanham, Ullman, Orlando, & McCormick, 2014). This task can summarise the knowledge, debug a piece of code, provide suggestions to address challenges in real life, make calculations, help users to address selection criteria for job applications, explain complex topics, and write music. It also can write content in different languages, writing assignments, and even create original jokes (Haleem, Javaid, & Singh, 2022).

The potential of ChatGPT

ChatGPT has many potentials uses due to its ability to understand and generate human-like responses in natural language. It can power conversational agents and virtual assistants, enabling them to engage in more realistic and meaningful conversations with users. It can provide information, answer questions, assist with tasks, and offer customer support (Taecharungroj, 2023). Integrating ChatGPT as a customer service tool can give instant responses and assist customers with everyday issues. Its use can alleviate employees' workload to focus on more important tasks that require critical thinking, discussion, and consideration of ideas. As a result, the business can cater faster for more clients and improve customer satisfaction (Paul, Ueno, & Dennis, 2023).

In language translation, ChatGPT can enable real-time translation between different languages. Its use can extend to various scenarios, such as multilingual communication, content localisation, and language learning applications (Jiao, Wang, Huang, Wang, & Tu, 2023). Also, ChatGPT can generate human-like text and be useful for content creation. It can create articles, blog posts, product descriptions, social media updates, creative writing, and narratives based on prompts. It can also summarise long pieces of text, extracting critical information and providing concise summaries (Q. Chen, Sun, Liu, Jiang, Ran, Jin, Xiao, Lin, Niu, & Chen, 2023).

In social sciences, language preservation is crucial to maintaining cultural diversity and identity. Due to globalisation and urbanisation, many indigenous and minority languages risk disappearing (e.g., Taiwan's indigenous languages) (Todd, 2021). ChatGPT can support these languages and cultures, and researchers can

create comprehensive databases of these languages, including their grammar, vocabulary, and syntax. With this information, the next step will be to develop educational materials. Furthermore, ChatGPT can facilitate communication between speakers of endangered languages and the rest of the world. Training the AI engine to translate between endangered and widely spoken languages can help bridge the gap between different cultures and promote understanding. This intervention can increase interest in and appreciation for these languages, ultimately contributing to their survival.

ChatGPT can understand user preferences and generate tailored responses leading to personalised recommendations. It can be used in e-commerce platforms, streaming services, or news aggregators to suggest relevant products, content, or articles based on individual user interests.

In the field of education and training, ChatGPT can help to build a virtual tutor. It can answer student questions, explain concepts, provide examples, and offer guidance, making learning more interactive and accessible (Lo, 2023). As a result, it could increase student motivation to learn (Muñoz, Gayoso, Huambo, Tapia, Incaluque, Aguila, Cajamarca, Acevedo, Rivera, & Arias-Gonzáles, 2023).

Researchers and academics can benefit from ChatGPT by using it as a tool for knowledge discovery. It can help explore and summarise large amounts of information, assist in literature reviews, or provide insights on specific topics (Aydın & Karaarslan, 2022).

In the medical field, ChatGPT can potentially enhance patient health outcomes (Sallam, 2023). For instance, it could analyse vast amounts of data from the scholarly literature to identify patterns that could inform the discovery and development of new medications. It can help to predict the efficacy and safety of potential drugs, reducing the time and cost of the drug discovery process. It can also help communicate effectively with patients and promote medication adherence.

ChatGPT has many potential uses in different disciplines to save time, increase productivity, help educators, researchers, and learners, and address severe societal issues.

The drawbacks of ChatGPT

It is essential to mention that while ChatGPT has excellent potential, it also has limitations (Ray, 2023). It may sometimes generate incorrect or nonsensical responses, be sensitive to input phrasing, or exhibit biases in the training data (Ufuk, 2023). Careful consideration and oversight are necessary when deploying AI models like ChatGPT to ensure responsible and ethical use. Like any technology, ChatGPT has some drawbacks to consider, such as (i) biases; (ii) lack of real-world knowledge; (iii) unable to understand the context in many cases; (iv) limited creativity; (v) language limitations; (vi) resource intensive, and; (vii) unable to reflect on experiences.

Programmers trained ChatGPT using a large amount of text data, which could contain inaccurate and biased data (Ferrara, 2023). As a result, ChatGPT can produce responses that reflect and reinforce these biases, leading to confusion or misleading users. While ChatGPT can generate human-like responses, it lacks real-world knowledge. This fact means it may sometimes provide responses that need to be more factually correct or illogical. Also, it cannot understand the context in all cases as it processes input text on a sentence-by-sentence basis, which means it may not fully understand a conversation or the intended meaning of a user's message. Lack of context will result in irrelevant or nonsensical responses (Biswas, 2023).

The ChatGPT outputs are generated based on the patterns and examples it has learned from the training data. While it can be creative to some extent, it may need help generating truly original or novel responses. Its performance can vary across different languages, depending on the training data and the quality provided. For instance, languages with complex grammatical structures can be challenging for the application (Jiao et al., 2023).

The engine is resource intensive, requiring significant computational resources to train and run, making it inaccessible to some users or organisations with limited resources. Soon, emerging NLP platforms, whose main objective is profits, may accentuate the digital divide in the world. Poor economies could be disadvantaged as they may need access to paid services.

Also, ChatGPT is different from human intelligence, which can reflect on experiences and develop new ideas, strategies, and solutions. It cannot beat human creativity; at the end of the day, ChatGPT depends on human input and monitoring. The American philosopher John Searle is widely noted for contributions to the philosophy of language and believes that AI is not intelligent but works on matching patterns based on symbols.

The more severe ChatGPT drawback may be the inability to identify the user's age and context, providing unethical responses (e.g., minors asking adult questions) (Zhuo, Huang, Chen, & Xing, 2023).

Acknowledging these limitations and taking appropriate steps to mitigate their impact when utilising ChatGPT or any other AI technology is essential. Addressing these limitations implies careful monitoring, bias detection and correction, and user education to promote responsible and ethical use. Educational institutions, government agencies and corporations will need to develop a policy around the ethical use of ChatGPT.

Bringing the Theory of Embedding AI and ChatGPT into Education

Before discussing how ChatGPT could disrupt and transform teaching, learning and research, the author considers it pertinent to discuss Connectivism, the learning theory for the digital age. Connectivism emphasises the importance of networks and connections and the need to use technology in learning. It suggests that learning is no longer solely an individual activity but a process of making connections between people, information sources, and technology. According to Connectivism, knowledge is not fixed or absolute; instead, it is constantly changing and evolving through the connections made by learners. Learning is about acquiring knowledge and developing the ability to find, assess, and apply information effectively in a rapidly changing world (Siemens, 2017).

Connectivism sees learning as creating and navigating networks of people, information sources, and technology. It emphasises the importance of understanding the connections between different pieces of information and the ability to navigate and use networks effectively. Technology facilitates learning in a connected world (Downes, 2022).

Connectivism recognises the value of diverse perspectives and opinions in the learning process. It encourages learners to seek out and engage with various perspectives to develop a more nuanced and holistic understanding of a topic. It sees knowledge as constantly evolving and adapting to changing circumstances. It emphasises the importance of learning and adapting to new situations and contexts rather than relying on fixed or static knowledge (Duke, Harper, & Johnston, 2013). According to the Connectivism theory, the ability to learn and unlearn is an essential attribute for learners in the digital age.

Connectivism and AI share similarities and synergies, as they emphasise the importance of networks, connections, and technology in learning and problem-solving. AI can be seen as a tool for facilitating Connectivism learning by providing learners access to diverse sources of information, personalised recommendations, and adaptive learning experiences. For example, AI-powered educational platforms can use algorithms to analyse learner data and personalise learning experiences based on individual needs, preferences, and progress (Spiess, Salcher, & Dilger, 2021).

This theory also emphasises the importance of social interaction and collaboration in learning, which AI-powered collaboration tools and social media platforms can facilitate. AI can help learners connect with their peers and with experts from diverse backgrounds and geographies, exchange ideas, and co-create knowledge. However, it could potentially isolate learners if AI handles most tasks and the learning design does not promote group work and collaboration. This isolation could be evident in dry disciplines such as mathematics or physics, especially if the learning activities do not follow an evidence-based learning design approach.

In summary, due to the features of the Connectivism theory, it can be a suitable theoretical framework to look at AI and ChatGPT in the design of teaching and learning interventions.

How AI and ChatGPT could transform teaching and learning

AI and ChatGPT can help educators and students in a variety of ways, including (i) genuinely personalised learning experiences; (ii) automated grading and feedback; (iii) intelligent tutoring; (iv) curriculum development; (vi) development of lesson plans; (vii) making exam invigilation redundant, and; (viii) enhance learning design.

Genuinely Personalised Learning

Personalised learning is an approach to education that shapes the learning experience to each student's needs, interests, and abilities (Kem, 2022). Instead of a one-size-fits-all approach, personalised learning recognises that each student has unique strengths, weaknesses, and preferences and seeks to provide them with customised learning opportunities for their needs. Personalised learning can help students to take greater ownership of their learning, improve engagement and motivation, and achieve better learning outcomes. However, it also requires careful planning and implementation to ensure it is effective and equitable for all learners (Becker, Kehoe, & Tennent, 2007).

Over two decades ago, personalised learning was possible with the implementation of online and blended learning. However, not until now, with the aid of AI and ChatGPT, it can be truly personalised. AI-powered engines can track in detail student patterns and engagement with content and learning activities, pull specific questions to test their knowledge and comprehension and offer a unique branch of additional resources and activities for the learner to master the content. Although branching has been possible since the introduction of e-learning software creation tools in the early 2000s, it has limitations (Reyna, 2023). Developing those resources was time-consuming for educators, and they will not cover the wide range of learners and situations. AI-

powered tools have the potential of analysing student journeys in their learning experience and compiling data and identifying troublesome knowledge, and helping educators to focus on these aspects of the curriculum.

Automatic grading

AI could help educators save time by automatically grading assessments and providing student feedback. This feature has been available since the first online Multiple-Choice Questions in the earliest Learning Management Systems (LMSs) versions in the 1990s (Reyna, 2023). However, with the potential of Natural Language Processing, AI systems will be able to analyse information that students submitted in their assignments and identify similarities, the quality of writing, critical appraisal and level of reflection (González-Calatayud, Prendes-Espinosa, & Roig-Vila, 2021). Also, AI could read and transcode the audio and analyse the text if the assessment is in a video format (e.g., students completing assessment tasks in front of the camera with higher-order thinking oral questions). Nevertheless, an essential aspect would be the ability to provide targeted feedback to learners (Kiyasseh, Laca, Haque, Miles, Wagner, Donoho, Anandkumar, & Hung, 2023). This feedback will make the learning experience highly personalised to the needs of the students.

AI can make automated examinations possible by automating the process of exam creation, grading, and feedback (Babitha & Sushma, 2022). AI-powered systems can use natural language processing, machine learning, neuronal networks, and other techniques to analyse exam questions and create content appropriate for the exam's level and subject matter. AI can also automate the grading process using machine learning algorithms to evaluate exam responses and provide scores and feedback. Also, AI can help to develop appropriate marking rubrics that will make the grading process more objective and fair to the students. This feature can save educators and examiners significant time and effort and reduce the potential for human error and subjectivity in grading.

Automated examinations can also benefit learners, such as faster feedback and more personalised learning experiences. AI can provide learners with real-time feedback on their exam responses and offer personalised recommendations for further study and practice based on their performance.

However, there are also some limitations and challenges associated with automated examinations. For example, AI-powered systems may struggle to evaluate certain types of exam responses, such as open-ended questions or creative assignments. They may also introduce biases and inaccuracies in grading, negatively affecting learner outcomes and fairness. Eventually, with Machine Learning, these limitations will be addressed in the coming years.

Intelligent tutoring

AI can provide individualised tutoring and support for students by using adaptive learning algorithms that adjust the difficulty level based on their performance. For instance, this can be done in formative assessments, providing additional questions to test knowledge and just-in-time instruction like having the tutor next to the student. This feature could be highly effective in enhancing the student learning experience. The research will be required to confirm this hypothesis.

AI can help educators identify at-risk students and provide early interventions to prevent academic failure. Analysing various data sources, such as attendance records, academic performance, and behaviour data and asking the students critical questions about their progress could provide an accurate picture of student progress. According to that, the system could trigger an alert that can trigger an action such as connecting the student with their tutors or discussing this with peers who are struggling similarly. AI can connect students with other students willing to practice peer teaching. The engine could assign rewards to those students willing to help their peers, such as getting additional marks. This system of rewards could motivate students to help their peers struggling.

A virtual tutor is an AI-powered system that provides learners with personalised learning experiences and support in an online environment—designed to emulate the role of a human tutor by providing feedback, guidance, and instruction based on student learning needs, preferences, and progress (Hemachandran, Verma, Pareek, Arora, Rajesh Kumar, Ahanger, Pise, & Ratna, 2022). Virtual tutors can take many forms, such as chatbots, virtual assistants, or adaptive learning systems. Educational settings such as K-12 schools, universities, vocational education training and corporate training programs can take advantage of virtual tutors.

Virtual tutors use machine learning algorithms and natural language processing to analyse learner data and provide personalised feedback and instruction. They can track learners' progress, identify knowledge gaps, and provide targeted interventions to help learners overcome challenges and ensure they reach the learning outcomes (Afzal, Dempsey, D'Helon, Mukhi, Pribic, Sickler, Strong, Vanchiswar, & Wilde, 2019).

Virtual tutors can also provide learners access to various educational resources, such as videos, simulations, and interactive activities. They can use gamification techniques like badges and rewards to motivate and engage learners. One of the advantages of virtual tutors is that they can provide personalised

support to learners at scale, which can be especially valuable in settings with large class sizes or limited access to human tutors. They can also provide learners with immediate feedback, which can help them to identify and correct errors more quickly.

However, virtual tutors also have some limitations. They may lack human tutors' empathy and social skills, which can be essential for building trust and rapport with learners. They may also struggle to handle complex or ambiguous tasks that require human judgement and reasoning. Therefore, virtual tutors complement, rather than replace, tutors.

Curriculum development

AI can assist educators in developing and updating curricula by analysing data on student performance and knowledge gaps, identifying new skills required by the industry, and suggesting new content (Hodhod, Wang, & Khan, 2018). However, the most exciting potential will probably be simplifying the curriculum to ensure educators teach content relevant to real life. The invisible devices are small pieces of technology that will fit in a small pocket (not available yet but speculated) (Chaudhri, 2023). These invisible devices could decommission content from the curriculum. Students can use their invisible devices everywhere they go as virtual tutors to ask specific questions, especially content that requires memorisation. For instance, if educators provide students with scenarios where this content needs to be applied, it will likely help them memorise. It will be a form of active learning that is highly effective in writing knowledge in long-term memory (Reyna, 2022). Educators can focus more on developing students' critical thinking and knowledge applicability, especially in first-year science courses where rote learning is typical. As Connectivism postulates, storage of knowledge on devices for retrieval as required is possible. AI could positively affect cutting content in disciplines with overcrowded curricula, such as medical education.

AI can simplify the curriculum by identifying key concepts and relationships between topics and presenting information in a personalised and adaptive way tailored to student needs and preferences (Lee, 2023). For instance, AI-powered systems can analyse learner performance data and identify areas where learners may struggle or require additional support. Based on this analysis, the system can provide personalised learning resources and activities focused on each learner's most essential and relevant topics.

Developing lesson plans

AI can help educators prepare lesson plans by suggesting relevant teaching materials, assessments, and activities (Hong, 2023). Educators could customise the learning activities according to the characteristics of the student cohorts. That will save educators much time and use it to learn new ways of embedding AI to enhance their practice and the student learning experience. Having a vast repertoire of learning activities, educators could identify the best ones and gain insight into what is more effective for achieving the intended learning outcomes. Additionally, educators can work with students to co-create learning activities using AI and ChatGPT. This practice will give the student agency, likely boosting their motivation to learn and succeed in their subjects.

Exam invigilation becomes redundant.

Invigilation software, or proctoring software, monitors online exams or assessments to prevent academic misconduct in higher education. It is often used in distance or online learning environments, where learners take exams remotely and are not physically present in a supervised exam room (Dawson, 2021). Invigilation software uses various methods to monitor learners during an exam, such as video monitoring, audio monitoring, screen sharing, and keystroke logging. The software typically records the exam and captures data on learners' activity and behaviour, such as how often they look away from the screen, how long they answer questions, and whether they are accessing external resources (Lilley, Meere, & Barker, 2016).

The goal of invigilation software is to discourage learners from academic misconduct and ensure the integrity of the exam. It can provide content originality reports, collusion, or other forms of academic misconduct that might compromise the validity and reliability of the exam. Invigilation software may not be effective in detecting all forms of academic misconduct, and it may create a hostile learning environment that undermines trust and mutual respect between learners and educators.

AI can sometimes make invigilation software less necessary or even redundant (Colonna, 2021). AI-powered solutions can identify faces and voices, detect cheating, and ensure the integrity of online exams in more sophisticated and nuanced ways than traditional invigilation software (Sridhar & Rajshekhar, 2022). For example, AI can be a tool to analyse learner behaviour during an exam, such as eye movements, typing patterns, and response times, to identify potential instances of cheating. AI can also analyse exam responses to detect

patterns of plagiarism or collusion that may not be detectable through manual or rule-based methods. Moreover, AI can be used to personalise exams and assessments based on individual learner needs and preferences, which can help to reduce the incentive for cheating and increase learner engagement and motivation. Students in higher education need to develop the ability to become a lifelong learner. When they finish their degrees, they must take responsibility for their learning in the workplace to succeed as professionals.

Enhancing learning design

An interface combining Natural Language Processing platforms like ChatGPT and learning design templates could enhance the student experience. AI could help educators to formulate measurable learning outcomes and align them to learning activities. The system can have agnostic learning design templates relevant to any discipline. These templates must follow sound learning design principles, such as promoting active learning, logical flow of activities, providing levels of feedback, connecting learners with their peers, and using relevant examples that resonate with students.

Integrating AI-powered tools into learning design will speed content development and enhance its quality, especially in an inconsistent field such as learning design that means different things to different industries (Reyna, 2022). The first step towards automating learning design could be to develop a taxonomy of learning interactions to train the AI engine. Educators who need to develop a learning object or activity can browse a collection of templates. Each template should have instructions and explain which disciplines will work best. Also, the engine should be programmed to generate learning outcomes from lower to higher-order thinking. With this approach, no more guesswork will be allowed, and it could be possible to conduct evaluation and research on the massive amount of data the AI engine could yield by recording student interactions with learning tasks. As a result, the field of learning design will become a robust evidence-based discipline, and institutions will hire learning designers that can demonstrate to be across these principles.

Finally, AI can automatise the production of a visual interface that is usable and accessible to learners by applying universal design principles. Text that uses legible fonts applies a hierarchy of information on the content presented, using colours and images to engage learners and make content readable by screen readers.

AI and ChatGPT implications for researchers

Artificial Intelligence and ChatGPT offer many advantages when applied to academic research. For instance, it can help researchers to transcribe interviews, run data analysis quickly, search and summarise research, and support writing and publishing research.

Interview transcription

AI-powered tools can help with interview transcriptions to convert audio recordings into text. AI can use automatic speech recognition (ASR) technology to transcribe audio recordings into text. ASR technology can accurately transcribe spoken language into text, which humans can review and edit to ensure accuracy (Aldarmaki, Ullah, Ram, & Zaki, 2022). This feature can save significant time and effort, as manually transcribing interviews is time-consuming. AI can also help differentiate between multiple speakers in an interview using speaker diarisation algorithms. These algorithms can identify and label each speaker's speech, making it easier to follow the conversation and attribute quotes to specific speakers. For instance, the latest version of Adobe Premiere Pro has a feature to transcribe video into text with 90-95% accuracy.

AI can help analyse interviewees' sentiments using sentiment analysis algorithms (Wankhade, Rao, & Kulkarni, 2022). These algorithms can identify the emotional tone of each speaker, making it easier to understand their opinions and perspectives. Using keyword extraction algorithms, AI can help extract keywords and key phrases from interview transcriptions. These algorithms can identify the most important and relevant words and phrases in the transcription, making it easier to analyse and summarise the interview. As AI is not 100% accurate, it will require manual review and editing to ensure accuracy.

Data analysis

AI can help with data analysis for research purposes, including data cleaning and preprocessing. AI-powered tools can detect and correct errors, fill in missing values, and transform data into a suitable format for analysis (Babu & Kanaga, 2022). AI algorithms can identify patterns and relationships in large and complex data sets. These algorithms can discover hidden insights, such as correlations between variables, trends, and anomalies. Also, AI can develop predictive models that can forecast future trends or events based on historical data. These models can help researchers to make data-driven decisions and identify areas for further investigation.

AI-powered tools can help researchers to analyse unstructured data such as text, audio, and video. These tools can identify themes and sentiments in qualitative data or extract information from large amounts of text data. It can also help researchers to present complex data more intuitively and understandably. These tools can create charts, graphs, and other visualisations that make it easier to communicate findings to stakeholders, decision-makers and the general public.

Search and summarise research.

AI can help researchers seek and summarise information by using natural language processing (NLP) techniques. One way AI can assist in seeking information is through chatbots or intelligent agents that can help researchers to navigate databases and search engines to find relevant information. These tools can be programmed to understand natural language queries and provide relevant results (Salvagno, Taccone, & Gerli, 2023).

Once the relevant information is retrieved, AI can help researchers summarise it using text summarisation techniques. Text summarisation involves extracting the essential information from a document and presenting it in a condensed form (Alkaissi & McFarlane, 2023). There are two main approaches to text summarisation: extractive and abstractive. Extractive summarisation involves selecting and combining the original text's most important sentences or phrases. In contrast, abstractive summarisation involves generating new sentences that convey the original text's meaning more concisely.

AI-powered tools can help researchers quickly and efficiently summarise large amounts of information, allowing them to focus on the most important and relevant findings (T.-J. Chen, 2023). For instance, AI can help researchers undertake a systematic review by automating time-consuming and repetitive tasks (Blaizot, Veettil, Saidoung, Moreno-Garcia, Wiratunga, Aceves-Martins, Lai, & Chaiyakunapruk, 2022). Systematic reviews involve identifying, analysing, and synthesising research studies to answer a specific research question. This application will be highly valuable, especially in topics with a vast amount of published research in several languages.

Helping with the writing and publication of research

AI can help researchers to publish quicker by automating tedious tasks involved in the research and publication process. AI can help researchers quickly identify relevant literature for their research by using NLP and machine learning algorithms to search databases and repositories (Chen, 2023). AI can make the task more manageable on topics where the literature is vast.

AI-powered tools can help researchers to write faster and more efficiently by suggesting sentence structure, grammar, and vocabulary. This editing aid can help to reduce the time and effort required for writing and editing (Hosseini, Rasmussen, & Resnik, 2023). AI can help to speed up the peer review process by automatically assessing the quality of manuscripts based on various criteria, such as readability, relevance, and novelty. The feature can help to reduce the time and effort required for the peer review process.

Ideally, AI can help researchers to publish their research in different languages by automatically translating manuscripts from one language to another. AI's process can help reach a broader audience and increase the impact of the research measured by citations and H-Index. Also, it can translate manuscripts from other languages to maternal languages giving researchers opportunities to access research worldwide without language barriers.

Conclusion

Examples presented in this paper showcased that AI and ChatGPT have great potential in teaching, learning, and academic research. Although AI and ChatGPT have drawbacks, it is the early stages and will be fine-tuning in the following years. These are tools that will make society progress quickly but potentially can create new paradigms and problems. The Industrial Revolution caused a massive shift from manual to automatised work mediated by machines. It led to increased production and efficiency, lower prices of goods, and migration from rural areas to urban areas. It also created horrible living conditions for workers, poor nutrition, stressful and unsatisfying lifestyle, dangerous workplaces, environmental harm, child labour and discrimination against women. The AI revolution, especially with Natural Language Processing (NLP), can potentially disrupt the economy and employment, increase productivity, create opportunities for innovative businesses to make large profits, and further accentuate the digital divide between developed and developing countries. AI, like any other technology, has a value-laden. It can be used in favour or against humanity. Technology companies should work closely with governments and organisations to ensure that the future development of AI includes a code of ethics and complies with current legislation.

Artificial intelligence alone cannot do anything. It requires supervised learning by programmers and

content provided by experts. AI could predict answers based on extensive data input and probabilities by making neuronal connections. AI cannot think critically, be empathetic, be creative and reflect on non-numerical experiences. These skills are features of the human brain, and AI is unlikely to be capable of doing that.

The future

The future of AI in teaching, learning and research is bright. However, it could also be frightening, especially the late technology adopters who perceive technological advances with scepticism. Education can become genuinely personalised, automatised and probably isolated, with learners engaging more with IA-powered tools than their peers in face-to-face settings. AI-powered tools could be programmed to train people and test their knowledge without the need to be under a surveillance system (e.g., invigilation software). The rise of *virtual professors* in critical disciplines for society sounds like a science fiction movie, but it could be possible in the next decade. The human brain cannot compete with AI data processing, but AI cannot compete with the human brain as it cannot be critical, reflective or creative.

We could see the rise of discipline-specific AI engines that offer evidence-based and accurate content. These AI engines will be capable of learning taught by programmers and Subject Matter Experts in different disciplines. For instance, an expert in the medical field could develop a management algorithm that could train an AI-powered engine. This algorithm can design a systematic approach for diagnosing and treating a condition. This technology will appeal to registrars and their medical and health sciences supervisors.

AI engines could be programmed to detect facial expressions and moods in users and provide 'emotional' support. AI could help people with disabilities and provide opportunities to study and integrate into society. This feature can considerably narrow the bridge between humans and computers. Users could develop a close relationship with their devices as they feel they care about them and provide adequate support to their needs. Somehow, the technology will be integrated into human life seamlessly. For instance, the *invisible device*, a small device that goes into the pocket, answers every question humans may have. This technology could potentially create psychological issues like dependence.

AI-powered engines could identify the person, such as age and sex, and provide information accordingly. This feature will be required to avoid unethical information delivery (e.g., adult conversations with people under age). Also, AI engines should not provide information that could damage someone or put society at risk.

AI and ChatGPT applied in educational settings will open a fertile field of research as these applications will handle a large amount of data on how students engage with content. It is necessary to develop theoretical models to embed these new technologies in teaching and learning. We are living in exciting times, and changes are on the way that will disrupt and create new possibilities for society. As citizens of the digital age, we need to be able to learn and unlearn and move career pathways to be relevant; nothing stays static anymore. As long as the purpose of AI is to help humanity, we all be safe.

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