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The implications and effects of ChatGPT on academic scholarship and authorship: a death knell for original academic publications?

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ABSTRACT

ChatGPT, an artificial intelligence large language model, took the world by storm in November 2022. Its launch was met with excitement, and it garnered over 1 million users within the first five days of its release, surpassing social media giants like Facebook, Instagram, Twitter and even the top search engine, Google. Having been trained on volumes of data, ChatGPT has displayed the ability to produce human-like responses to questions. Concerns have been raised among members of the academic and research community regarding the ethical usage of ChatGPT and language models in education and academic/scientific research. This paper examines the development and rise of ChatGPT and similar AI tools, their pros and cons, their impact on academic research and possible intellectual property conflicts. It concludes that ChatGPT and language models are here to stay and makes recommendations for its ethical usage to prevent and detect plagiarism and protect intellectual property rights.

KEYWORDS

Chatgpt; artificial intelligence; academic research; intellectual property rights; large language models; education

I. Introduction

Academic research consists of a process involving methodologies such as doctrinal and non-doctrinal, with the precise purpose and objective of analyzing given findings and through deductive reasoning, reaching a logical and sensible conclusion.[1] Academic research is important to students and career academics alike. Writing research or term papers account for a significant portion of students' course grades, and doctoral candidates within some jurisdictions are expected to have a certain number of publications before completing their doctorate education. Many students drop out of courses and major specializations in colleges and universities as a result of the pressure of academic research[2] and student researchers sometimes resort to paying for services provided by online research sites and agencies. Research publications are an essential component of flourishing in academia, and within most higher education establishments, the quality and number of peer-reviewed publications by tenured academic staff is often

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[1]Adil E Shamoo and David B Resnik,. *Responsible Conduct of Research* (2nd edn Oxford University Press, 2009) 34.

[2]Mary Ellen Grasso, 'English the Research Paper: Life Centered' (1978) 40(83) College English <https://doi.org/10.2307/376178> accessed 3 February 2023.

one of the top yardsticks for career advancement.[3] Publishing academic or scientific articles in high impact factor journals is a much-coveted goal of every researcher especially within the highly competitive academic sector in which the mantra 'publish or perish' holds sway.[4]

Modern technological advances have made it possible for academic researchers to reach a vast range of audience both on domestic and international platforms. These advances have improved efficiency and precision and given authors invaluable pathways to accessing and gathering information.[5] The development of technological tools has also raised issues regarding ethical research. Originality, factual veracity, integrity and unimpeachable ethical standards form the bedrock of high-quality research,[6] and researchers across all fields of knowledge have an obligation not to plagiarize another individual's works.[7]

The release of the large language model ChatGPT late in 2022 has shown an early and swift impact on various sectors and jobs which utilize written literature. Garnering widespread excitement and praise, this model has proved popular with students, researchers and journalists.

This paper shall look at the development and rise of ChatGPT and analyze the impact of such artificial intelligence (AI) tools on education and academic research. It shall address the pros and cons of the language model as well as concerns about these models within the educational and scientific fields.[8] The issue of plagiarism and the infringement of the intellectual properties of third parties will also be covered, culminating in suggestions for a workable system in which language models like ChatGPT can be integrated into education and academic research.

II. The launch and release of ChatGPT

On the 30th of November 2022, OpenAI, an American artificial intelligence research and deployment company, launched the chatbot ChatGPT[9] which took the world by storm and garnered over one million users in a record five days.[10] ChatGPT is an Artificial Intelligence (AI) language processing model built using OpenAI's Generative Pre-Trained Transformer 3 (GPT-3) technology.[11] This technology is based on the AI language generative model trained by OpenAI.

[3]Imad A Moosa, *Publish or Perish Perceived Benefits Versus Unintended Consequences* (Edward Elgar Publishing, 2018) 3.
[4]ibid.
[5]Robert W. Taylor, Eric J. Fritsch and John Liederbach, *Digital Crime and Digital Terrorism* (3rd edn Pearson Inc. 2015) 1
[6]Nilamadhab Kar, 'Ethics In Research' (2011) The Odisha Journal of Psychiatry <https://www.researchgate.net/profile/NilamadhabKar/publication/224894197_Ethics_in_research/links/09e414fa422c458aa2000000/Ethics-in-research.pdf?origin=publicationDetail> accessed 14 March 2023.
[7]Shamoo (n 1) 5.
[8]Michael Liebrenz and others, 'Generating Scholarly Content with ChatGPT: Ethical Challenges for Medical Publishing' (2023) < https://doi.org/10.1016/S2589-7500(23)00019-5> accessed 20 February 2023.
[9]OpenAI, 'ChatGPT: Optimizing Language Models for Dialogue' (30 November 2022) *OpenAI* <https://openai.com/blog/chatgpt/> accessed 3 February 2023.
[10]Steve Mollman, 'ChatGPT Gained 1 Million Users in Under a Week. Here's Why the AI Chatbot is Primed to Disrupt Search as We Know It' (9 December 2022) *Yahoo! Finance* <https://finance.yahoo.com/news/chatgpt-gained-1-million-followers-224523258.html> accessed 3 February 2023. Also, Johan Moreno, 'OpenAI Positioned Itself as the AI Leader in 2022. But Could Google Supersede It in '23?' (29 December 2022) *Forbes* <https://www.forbes.com/sites/johanmoreno/2022/12/29/openai-positioned-itself-as-the-ai--leader-in-2022-but-could-google-supersede-it-in-23/> accessed 3 February 2023.
[11]ChatGPT was created using the improved GPT-3.5 version of GPT-3.

AI has been around for over seven decades, with its inception being traced to Alan Turing in 1950.[12] The twenty-first century has seen the rapid advancement of AI which has permeated all facets of human life, and the development and advancement of AI has affected and changed the manner humans interact with each other and the workings of even the most basic operations of their lives. The effect of AI on human existence runs the gamut from the modes of communication and information to commercial transactions and social relations and right through to education, learning and data retention.

There have been many attempts to define AI and this has resulted in varying definitions of what AI is. Generally, AI can be said to be the ability of machines or computer programs to simulate human intelligence. With AI, machines are programed or trained to remember or mimic human intelligence and thereby perform or complete tasks which only human beings could hitherto carry out. AI is 'the theory and development of computer systems that are able to perform tasks that normally require human intelligence … '[13] and, it 'is the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with human beings. It is technology with the ability to reason and solve problems'.[14] John McCarthy, one of the researchers who coined the term 'artificial intelligence', defined AI as 'the science and engineering of making intelligent machines, especially intelligent computer programs'.[15]

With the proliferation of its use and adoption in the last two decades, AI has become mainstream and has been deployed in a myriad of industries and sectors. AI is used within the health industry, the energy and financial industries, the transport industry, in education and a plethora of other industries. It is used for figures and calculations, images and photography, as well as language, learning and conversations.

AI is based on algorithms consisting of different applications for varied purposes.[16] It is used to assist humans in the performance of predetermined tasks (ranging from simple to complex) or for solving specific problems.[17]

ChatGPT is a large learning model (LLM) that seeks to provide communication which is both natural and conversational[18] and its emergence and launch has been heralded as a game changer with regards to the technique employed by people to search for and obtain information.[19] It has been called the tech industry's 'next big disrupter' and some have prophesised that ChatGPT and other similar chatbots to come in the future

[12]AM Turing, 'Computing Machinery and Intelligence' (1950) 59(236) Mind 433. <https://phil415.pbworks.com/f/TuringComputing.pdf> accessed 03 February 2023. This origin has been attributed to Turing's seminal work which introduced what is now known as the Turing test. Though the phrase 'Artificial Intelligence' was not used then, it is the origin of AI as we know it today.

[13]Ida Arlene Joiner, 'Artificial Intelligence: AI is Nearby' (2018) Emerging Library Technologies 1 at 2. <https://doi.org/10.1016/B978-0-08-102253-5.00002-2> accessed 6 February 2023.

[14]ibid.

[15]John McCarthy, 'What is Artificial Intelligence?' (1997) *Stanford University* <https://www-formal.stanford.edu/jmc/whatisai.pdf> accessed 6 February 2023.

[16]Andreas Kaplan, 'Social Media Powered by Artificial Intelligence, Violence and Nonviolence' in Lester R Kurtz (ed), *Encyclopedia of Violence, Peace, & Conflict* (3rd edn Academic Press, 2022) 253 at 254–6. <https://doi.org/10.1016/B978-0-12-820195-4.00033-9> accessed 6 February 2023.

[17]BJ Copeland, 'Artificial Intelligence', *Britannica* <https://www.britannica.com/technology/artificial-intelligence> accessed 6 February 2023.

[18]Hudaiba Soomro, 'Dissecting ChatGPT – Is This New AI Tool a Game Changer?' (2022) *Data Science Dojo* <https://datasciencedojo.com/blog/dissecting-chatgpt/> accessed 6 February 2023.

[19]Brian Gleeson, 'Microsoft's ChatGPT Investment Could Create 'Game-Changer' AI Search Engine' *Yahoo Finance* (11 January 2023) <https://uk.finance.yahoo.com/news/microsoft-chatgpt-investment-ai-search-engine-160455154.html> accessed 6 February 2023.

will usher in an era of insignificance and eventual demise of search engines such as Google.[20] Others are of the opinion that search engines and AI technology like chatbots and search engines will complement one another and make each other better, rather than chatbots engineering the death of search engines.[21]

III. The range and capabilities of ChatGPT

The excitement that followed the introduction of ChatGPT to the public was based on the uncharted possibilities that its technology offered. There have been debates on its impact on various jobs and on education, with some people predicting that journalists, writers, programmers, developers,[22] teachers,[23] etc.[24] might be replaced by the chatbot.

Being a large language model, ChatGPT is trained by OpenAI to perform a wide array of language tasks. Thus, ChatGPT can simulate human talk via chat and conduct conversation, communicating by providing responses and information on potentially millions of topics, ranging from writing academic abstracts, proposals and essays, to writing computer code,[25] composing poems and songs, creating and crafting stories,[26] and the provision of historical accounts of events.[27] According to OpenAI researchers in 2020, the GPT-3 language model[28] is trained on 175 billion parameters which is ten times more than any other language model.[29] The preceding GPT-2 comprised of only 1.5 billion parameters and thus, GPT-3 is a more efficient and sophisticated transformer model.

ChatGPT is a model 'that uses statistics, reinforcement learning, and supervised learning to index words, phrases, and sentences'.[30] OpenAI trained ChatGPT through reinforcement and programming to mimic speech patterns and writing styles and to learn from a user's previous question so that it can build and refine further answers thereon. In

[20]Cade Metz and Nico Grant, 'A New Chat Bot Is a 'Code Red' for Google's Search Business' *The New York Times* (21 December 2022) <https://www.nytimes.com/2022/12/21/technology/ai-chatgpt-google-search.html> accessed 6 February 2023.

[21]Shubham Agarwal, 'Search Engines and AI Will Make Each Other Better: The Tech in ChatGPT Can't Kill Google. Instead, They'll Join Forces" *Freethink* (2022) <https://www.freethink.com/robots-ai/chatgpt-search-engines> accessed 6 February 2023.

[22]Sabyasachi Karmaker, 'ChatGPT: Here to Replace the Writers and Coders?' *The Business Standard* (24 December 2022) <https://www.tbsnews.net/tech/chatgpt-here-replace-writers-and-coders-556934> accessed 6 February 2023.

[23]Sean McMinn, 'ChatGPT Killed the Classroom Star: AI's Rise Means It's Time to Rethink Teaching and Testing' *South China Morning Post* (15 January 2023) <https://www.scmp.com/comment/opinion/article/3206436/chatgpt-killed-classroom-star-ais-rise-means-its-time-rethink-teaching-and-testing> accessed 6 February 2023. Also, Jeffrey R Young, 'AI Tools Like ChatGPT May Reshape Teaching Materials – And Possibly Substitute Teach' (19 January 2023) <https://www.edsurge.com/news/2023-01-19-ai-tools-like-chatgpt-may-reshape-teaching-materials-and-possibly-substitute-teach> accessed 6 February 2023. Also, Suresh Prabhu and Shobhit Mathur, 'ChatGPT: Can Artificial Intelligence Really Replace Teachers?' *The Economic Times* (16 December 2022) <https://economictimes.indiatimes.com/opinion/et-commentary/chatgpt-can-artificial-intelligence-really-replace-teachers/articleshow/96286743.cms> accessed 6 February 2023.

[24]Amongst other professions.

[25]Oleg Kopachovets, 'What Are GPT-3 Chatbots, and How to Profit Implementing It For Your Project' (2023) < https://procoders.tech/blog/what-is-gpt-3-chatbot/#:~:text=A%20chat%20with%20GPT%2D3,can%20find%20for%20business%20use.> accessed 12 February 2023.

[26]Katie Metzler, and ChatGPT, 'How ChatGPT Could Transform Higher Education' (2022) *Social Science Space* <https://www.socialsciencespace.com/2022/12/how-chatgpt-could-transform-higher-education/> accessed 12 February 2023.

[27]Josh Bersin, 'Understanding Chat-GPT, And Why It's Even Bigger Than You Think' (2023) <https://joshbersin.com/2023/01/understanding-chat-gpt-and-why-its-even-bigger-than-you-think/> accessed 13 February 2023.

[28]The GPT model on which ChatGPT is based.

[29]Tom Brown and others 'Language Models Are Few-Shot Learners' (2020) 8 at 40. <https://arxiv.org/pdf/2005.14165.pdf> accessed 13 February 2023.

[30]Bersin (n 27).

addition, the language model has the capability to store or remember what it has learned from a user so that it can employ such knowledge for different chats by others.[31]

AI language models like ChatGPT use large amounts of data alongside computer programes and techniques which allows them to string words together in a meaningful way. They have access to an immense reservoir of information and vocabulary and are trained to understand words in context. All these aide the models in deploying their comprehensive arsenal of encyclopaedic knowledge in a manner that successfully mimics human speech patterns. ChatGPT's successful mimicking of human speech patterns has led to many being unable to convincingly and unequivocally determine if a particular article, proposal, abstract, etc. has been written by a human being or by an AI model.[32]

OpenAI released ChatGPT to the public for free in the hopes of using the public feedback to make the chatbot better.[33] The free access to the technology gave millions of users the opportunity to try out ChatGPT and this led to an avalanche of praises, anecdotes and even concern as well as scepticism on its role in the future and its effect on various sectors and jobs going forward.[34]

Whilst there are many impressive aspects applauded about ChatGPT, its use has revealed a number of glaring and serious shortcomings. OpenAI leads the way in coming forth about the limitations of the model with regards to information on the world/events after 2021 and the possibility of the chatbot to provide incorrect or inaccurate information occasionally.[35] Some users have reported that ChatGPT sometimes provides basic simplistic answers which lack substance and depth or which cannot be substantiated or supported by evidence or records.[36] The language model has also been stated to provide responses which mirror the biases and prejudices of the information and data it was trained on.[37] It must, however be borne in mind that ChatGPT and other similar language model chatbots are still in their infancy and companies working on such models continue to build on the existing framework and work on improving the technology as well as producing better and more advanced models.

Notwithstanding the foregoing acknowledged limitations and shortcomings, it is roundly acknowledged that ChatGPT's capabilities are very impressive and it sits at the cutting edge of AI technology. Many are of the opinion that technology like ChatGPT

[31]ibid.

[32]Catherine A Gao and others, 'Comparing Scientific Abstracts Generated by ChatGPT to Original Abstracts Using an Artificial Intelligence Output Detector, Plagiarism Detector, and Blinded Human Reviewers' (2022) *bioRxiv* <https://doi.org/10.1101/2022.12.23.521610> accessed 14 February 2023. Also, Holly Else, 'Abstracts Written by ChatGPT Fool Scientists' *Nature* (12 January 2023) <https://www.nature.com/articles/d41586-023-00056-7#ref-CR1> accessed 14 February 2023.

[33]Alex Hern, 'AI Bot ChatGPT Stuns Academics with Essay-writing Skills and Usability' *The Guardian* (4 December 2022) <https://www.theguardian.com/technology/2022/dec/04/ai-bot-chatgpt-stuns-academics-with-essay-writing-skills-and-usability> accessed 14 February 2023.

[34]Brian Frederick, 'Will ChatGPT Take Your Job?' *Search Engine Journal* (2023) <https://www.searchenginejournal.com/will-chatgpt-take-your-job/476189/> accessed 15 February 2023.

[35]OpenAI, 'ChatGPT: Limitations' (2022) <https://chat.openai.com/chat> accessed 14 February 2023.

[36]Ian Bogost, 'ChatGPT Is Dumber Than You Think' (2022) *The Atlantic* <https://www.theatlantic.com/technology/archive/2022/12/chatgpt-openai-artificial-intelligence-writing-ethics/672386/> accessed 15 February 2023. Also, Jeegar Dattani, 'Can ChatGPT Write Health and Medical Content?' *Medical Dialogues* (2023) <https://medicaldialogues.in/articles/can-chatgpt-write-health-and-medical-content-106367> accessed 15 February 2023.

[37]Sophia Yang, 'The Abilities and Limitations of ChatGPT' *Anaconda* (2022) <https://www.anaconda.com/blog/the-abilities-and-limitations-of-chatgpt> accessed 15 February 2023. Also, Garling Wu, '5 Big Problems With OpenAI's ChatGPT' *MUO* (2022) <https://www.makeuseof.com/openai-chatgpt-biggest-probelms/> accessed 15 February 2023.

will undoubtedly affect and change the way in which communication is carried out and the manner information is sourced in the twenty-first century.[38] Increasingly, AI is used by majority of the world's population in one form or the other, either deliberately or unintentionally where it is incorporated in mundane tasks.[39] Furthermore, when it comes to searching for information, many are of the opinion that chatbots come out tops compared to search engines because of their ability to provide more streamlined responses which save the users the time and energy of trawling through pages of unrelated and often unwanted webpages.[40]

Despite the accolades, excitement or even scepticism or criticisms that heralded its arrival and use, the performance and success of the generative language model has thrown up genuine concerns in the education sector about the future trajectory of academia, the ability of tutors or teachers to determine the originality and integrity of academic works submitted by their students or the ability of academic publishers and journals to successfully determine the true authorship of articles or pieces submitted to them.[41] Issues of plagiarism, cheating and intellectual property theft are being discussed as part of the downsides of AI language generation models like ChatGPT, as there have been accounts of a significant number of students using ChatGPT for essays, tests and assignments.[42] The next section will analyze and discuss concerns about the use of AI models like ChatGPT in education and research.

IV. Legal pitfalls and troughs: ChatGPT and intellectual property rights

Intellectual property rights encompass a range of intangible rights protected by jurisdictional laws. These rights include copyright, patents and trademarks, which enable individuals to receive recognition or financial benefit from their creations or inventions. The intellectual property systems provided by both domestic and international laws, seek to strike the right balance between the interests of innovators and those of the larger public and aim at creating an environment in which creativity and innovation can flourish. The implications of AI on intellectual property rights have been recognized by multilateral organizations such as the Organisation for Economic Co-operation and Development (OECD), and these are areas which continue to evolve as AI technology advances.[43]

[38]Amanda Kirby, 'Chat-GPT – Is This an Alert for Changes in the Way We Deliver Education?' *Fe News* (18 January 2023) <https://www.fenews.co.uk/exclusive/chat-gpt-is-this-an-alert-for-changes-in-the-way-we-deliver-education/> accessed 15 February 2023.

[39]E.g. when paying for an item or services electronically, making a booking, in transportation, in the health and medical sector, etc.

[40]Emmanuel Chinonso Opara, 'ChatGPT for Teaching, Learning and Research: Prospects and Challenges' (2013) *ResearchGate*, 15–16 <researchgate.net/publication/366808899_CHATGPT_FOR_TEACHING_LEARNING_AND_RESEARCH_PROSPECTS_AND_CHALLENGES> accessed 15 February 2023.

[41]Else (n 32).

[42]Chris Westfall, 'Educators Battle Plagiarism As 89% Of Students Admit To Using OpenAI's ChatGPT For Homework' *Forbes* (28 January 2023) <https://www.forbes.com/sites/chriswestfall/2023/01/28/educators-battle-plagiarism-as-89-of-students-admit-to-using-open-ais-chatgpt-for-homework/?sh=53a688fe750d> accessed 7 February 2023.

[43]Aldo Alvarez-Risco and Shyla Del-Aguila-Arcentales, 'A Note on Changing Regulation in International Business: The World Intellectual Property Organization (WIPO) and Artificial Intelligence' in Alain Verbeke, Rob van Tulder, R., Elizabeth L Rose and Yingqi Wei (eds), *The Multiple Dimensions of Institutional Complexity in International Business Research* (Progress in International Business Research, Vol. 15, Emerald Publishing, 2021) 363–71 <https://doi.org/10.1108/S1745-886220210000015020> accessed 20 February 2023.

In the past, intellectual authorship was relatively straightforward under many legal systems.[44] The elementary rule was that the person who wrote the text was generally considered to be the author.[45] The advent of AI systems and tools like ChatGPT has resulted in the blurring of the lines relating to intellectual property. ChatGPT is capable of generating text that is nearly indistinguishable from that written by a human, leading some to argue that it should be considered a legal author of the resulting work.[46]

The assertion that 'Original work of authorship' can only be associated with human presence suggests that AI-generated text is authorless and does not fulfill the requirement that a human conscious decision-making process is mandatory for a work of originality.[47] AI tools such as ChatGPT are based on pre-existing algorithms and data sets which lack 'the labour of the mind'[48] and while they can generate text that is coherent, grammatically correct, and semantically sound, they lack the capacity to engage in a meaningful creative process that is central to human authorship. Ginsburg and Budiardjo posit that ChatGPT is just an ordinary tool and the resulting output is the sole authorship of the promoter.[49]

The inclusion of ChatGPT as a co-author on academic papers has raised concerns among some major academic journal publishers and editors. While some have embraced the use of advanced AI tools such as ChatGPT to help with research, others have taken a more cautious approach. Some publishers and editors have outright precluded ChatGPT from being listed as an author on academic papers.[50] Their main argument is that a chatbot cannot be held accountable for the content and integrity of an academic research paper, and while ChatGPT may have helped generate the text and structure of the paper, it is not capable of making ethical judgments or taking responsibility for the accuracy of the research.

The rise of advanced AI tools has raised important legal questions around intellectual authorship. With the ability to generate high-quality text and even entire research papers, the issue regarding authorship of these outputs is emerging and as the use of these systems becomes more widespread, there are growing concerns around who should be considered the legal author owner of the resulting work. These concerns are rooted in intellectual property law, as legal authorship is a key determinant of copyright ownership. If ChatGPT is considered to be a legal author of a work, it could potentially claim ownership of the copyright of any texts it puts out and this could have significant consequences for both researchers and publishers who may find themselves in a legal battle over ownership of the resulting work. When ChatGPT was asked if it was an author, below is the response it generated –

[44]Each Jurisdiction across the globe has in place a legal framework for the protection of copyright on literary work within its territory.
[45]17 U.S. Code § 201 – Ownership of copyright.
[46]Ivan Neil Gomez, 'Should ChatGPT be Considered an Author in Scholarly Publications?' (February 2023) *ResearchGate* <10.36413/pjahs.0602.001> accessed 19 February 2023.
[47]Jane C Ginsburg and Luke Ali Budiardjo, 'Authors and Machines' <https://ssrn.com/abstract=3233885> accessed 19 March 2023.
[48]ibid 453.
[49]ibid.
[50]Ian Sample, 'Science Journals Ban Listing of ChatGPT as Co-author on Papers' *The Guardian* (26 January 2023) <https://amp.theguardian.com/science/2023/jan/26/science-journals-ban-listing-of-chatgpt-as-co-author-on-papers> accessed 20 February 2023.

> ChatGPT is not an author in the traditional sense of the term. As an AI language model, ChatGPT is a machine learning algorithm that has been trained on a large corpus of text to generate responses to users' questions and input. While ChatGPT can generate text and provide answers to questions, it does not have the ability to create original works of literature or other forms of creative writing on its own. The outputs generated by ChatGPT are based on statistical patterns in the input it has been trained on, and it is not capable of independent creative thought. Therefore, it cannot be credited as an author in the traditional sense.[51]

It is however important to note that OpenAI's stance on the ownership of the content created by its AI tool is that the user owns all the input (questions, prompts, etc.) entered into the model and all the rights, title and interest in and to the output generated by the model is assigned by OpenAI to the user.[52] The above response may put to rest the argument that ChatGPT is an author. Furthermore, the legal stand of many jurisdictions remains that only human beings can own certain intellectual property rights like copyrights and patents. Section 9(1) of the Copyright, Designs and Patents Act of UK provides, 'In this Part "author", in relation to a work, means the person who creates it'.[53] Also, Section 7(1) of the UK Patents Act states, 'Any person may make an application for a patent either alone or jointly with another'.[54] The courts have interpreted 'person' to mean a natural person.[55] In the United States of America, only 'the fruits of intellectual labor' that 'are founded in the creative powers of the mind'[56] are protected under copyright law, as protection is offered only to 'original intellectual conceptions of the author',[57] and where it is determined that a human being did not create the work, an application for registration will be refused by the US copyright office.[58] According to the European Commission's Intellectual Property Helpdesk, ' … under European (and US) law AI cannot own copyright, as it cannot be recognised as an author and does not have the legal personality which is a pre-requisite for owning (intangible) assets'.[59] The European Commission is further of the opinion that, ' … the question of ownership and authorship of AI-generated works is not fully settled by the law yet, and as a 'hot topic' may evolve in the years to come depending on regulatory changes and on case law'.[60]

In addition to the foregoing, there is also the intellectual property issue of AI tools infringing the copyright of third parties. Having been trained on 175 billion parameters, ChatGPT relies on accessing on a huge amount of data to generate its responses to user's prompts and questions. A significant amount of the texts and data utilized by the language model are the intellectual properties and copyrights of third parties totally distinct from OpenAI or even the user providing inputs and receiving output from the AI tool. In generating texts, ChatGPT could potentially infringe on the intellectual property rights of a third party if the response it provides includes

[51]OpenAI, 'ChatGPT' (2022) <https://openai.com/blog/chatgpt/> accessed 20 February 2023.
[52]OpenAI, 'Terms of Use' (14 March 2023) <https://openai.com/policies/terms-of-use> accessed 25 March 2023.
[53]Copyright, Designs and Patents Act 1988. < https://www.legislation.gov.uk/ukpga/1988/48/contents> accessed 25 June 2023.
[54]UK Patents Act 1977 <https://www.legislation.gov.uk/ukpga/1977/37/section/7> accessed 23 March 2023.
[55]University of Southampton's Applications [2005] RPC 220, 234.
[56]Trade-Mark Cases, 100 U.S. 82, 94 (1879).
[57]United States Copyright Office, *Compendium of U.S. Copyright Office Practices* (3rd edn United States Copyright Office, 2021) 7.
[58]*Burrow-Giles Lithographic Co. v Sarony*, 111 U.S. 53, 58 (1884).
[59]European Commission IP Helpdesk, 'Intellectual Property in ChatGPT' (23 February 2023) <https://intellectual-property-helpdesk.ec.europa.eu/news-events/news/intellectual-property-chatgpt-2023-02-20_en> accessed 23 March 2023.
[60]ibid.

copyrighted or trademarked material.[61] Users of the chatbot therefore also run the risk of infringing the copyright of third parties if they use the text generated by ChatGPT on a non-personal basis.[62]

In addition to concerns about legal authorship and ownership, there are also important questions around the accountability of AI tools like ChatGPT. As these systems become more advanced, there is a concern that they could be used to manipulate data or produce biased results based on prompts.[63] If ChatGPT is responsible for generating the text of a research paper, who is responsible for ensuring that the research is accurate and unbiased? This question becomes even more important in fields like law,[64] science, finance and engineering, where the stakes are high, and errors or biases can have serious consequences.[65] The legal implications of ChatGPT and intellectual authorship are complex and far-reaching and will need an equally complex and capable legal system to address them.

While many jurisdictions like the UK, the US and the EU have refused to recognize the intellectual property rights of works generated through AI, countries like South Africa are moving towards embracing AI inventors[66] and are taking steps to clarify the legal status of AI-generated works. Nevertheless, there is still much uncertainty around the legal use of these systems in research and it is envisaged that the legal regime and landscape on AI generated works will continue to expand and be reviewed.[67] As researchers, publishers and users continue to grapple with these legal issues, it is important to ensure that AI tools are used ethically and responsibly, and that they do not undermine the integrity of academic research.

V. Concerns about ChatGPT's impact on education and academic research

Since its release late in November 2022, many users have employed ChatGPT to do a number of language tasks. These range from writing stories, articles, poems or songs to coding and providing answers to a myriad of questions which cover both simple and complex topics.

The availability and use of the chatbot has also seen it being deployed to take on assignments given to students by their teachers, lecturers and tutors. This has resulted in students submitting assignments completed by ChatGPT instead of carrying out the work themselves. This trend has resulted in various educational institutions and teaching professionals analyzing the effects of this technology on education and how tests and assignments are given.

[61] Jed Tan Yeong Tat, 'Risks and Issues in Using AI Chatbot, Chat GPT' *Perspectives* (1 March 2023) <https://rajadarrylloh.com/risks-and-issues-in-using-ai-chatbot-chat-gpt/> accessed 23 March 2023.

[62] Daniel Healow, Sarah Shaedler, and Taylor Sullivan, 'Key Steps to Protect Your Intellectual Property and Reduce Risk if Your Employees are Using Artificial Intelligence Chatbots' *Orrick* (18 January 2023) <https://www.jdsupra.com/legalnews/key-steps-to-protect-your-intellectual-2135907/> accessed 23 March 2023. Also, Nathan-Ross Adams, 'ChatGPT: Legal Issues with the World's Latest Augmented AI' (09 December 2022) <https://www.michalsons.com/blog/chatgpt-legal-issues-with-the-worlds-latest-augmented-ai/62520> accessed 23 March 2023.

[63] Michael James Bommarito and Daniel Martin Katz, 'GPT Takes the Bar Exam' (December 29, 2022). Available at SSRN: <https://ssrn.com/abstract=4314839> accessed 20 February 2023.

[64] ibid 13.

[65] Boniphace Kutela and others, 'ChatGPT's Scientific Writings: A Case Study on Traffic Safety' (2023) <https://ssrn.com/abstract=4329120> accessed 18 February 2023.

[66] Healow (n 62).

[67] ibid.

After trying out and testing ChatGPT, Dan Gillmor, a professor of journalism at Arizona State University stated that, 'Academia has some very serious issues to confront'.[68] Gillmor had tested ChatGPT with an assignment he gives students and was impressed by the response the chatbot gave.[69]

Choi et al.[70] from the University of Minnesota Law School also tested the capability of ChatGPT by asking it to produce answers to four different final law school exams. When they analyzed ChatGPT's result, it passed all four exams with an average of a C + .[71] They found that ChatGPT performed better with essays and 'displayed a strong grasp of basic legal rules and had consistently solid organization and composition'.[72] They further identified that human law students could identify relevant issues and apply rules much better than ChatGPT.[73] However, they stated that ChatGPT's performance was good enough for it to graduate and earn a JD degree.[74] They concluded by stating as follows –

> Overall, ChatGPT's performance on law school exams, while currently uneven at best, suggests considerable promise and peril. We expect such language models to be important tools for practicing lawyers going forward; we also expect them to be very helpful to students using them (licitly or illicitly) on law school exams … . In an era where remote exam administration has become the norm, this could hypothetically result in a struggling law student using ChatGPT to earn a JD that does not reflect her abilities or readiness to practice law.[75]

When it comes to education in business, a similar exercise was performed at the Wharton School of the University of Pennsylvania. Christian Terwiesch, Andrew M. Heller Professor at the Wharton School, tested ChatGPT on a final exam of a Master of Business Administration (MBA) core course. According to Terwiesch, going by the results, ChatGPT would have scored a B to a B- on the exam if it had been enrolled on the course.[76]

Similarly, ChatGPT was evaluated on the United States Medical Licensing Exam (USMLE). The USMLE testing program is carried out on areas including 'basic science, clinical reasoning, medical management, and bioethics'.[77] The evaluation consisted of three medical examinations. It was reported that ChatGPT performed at or near the passing threshold for all three examinations without any specialized training or reinforcement.[78]

With the revelation of the adequate performance of ChatGPT in varied examinations, concerns arose about its use within the educational sphere, particularly as a medium of circumventing genuine academic scholarship and knowledge.

Prevailing negative sentiments about the language model center around issues of plagiarism and academic/intellectual dishonesty. Plagiarism could mean so many things in

[68]Hern (n 33).
[69]ibid.
[70]Jonathan H Choi and others, 'ChatGPT Goes To Law School' (2023) *Minnesota Legal Studies Research Paper No. 23-03*, 1–5 <https://dx.doi.org/10.2139/ssrn.4335905> accessed 7 February 2023.
[71]ibid 5.
[72]ibid 8.
[73]ibid.
[74]This was despite it performing mediocrely at the bottom of each class.
[75]Choi (n 70) 11.
[76]Christian Terwiesch, 'Would Chat GPT Get a Wharton MBA? A Prediction Based on Its Performance in the Operations Management Course' (2023) Mack Institute for Innovation Management at the Wharton School, University of Pennsylvania. <https://mackinstitute.wharton.upenn.edu/wp-content/uploads/2023/01/Christian-Terwiesch-Chat-GTP-1.24.pdf> accessed 16 February 2023.
[77]Tiffany H Kung and others, 'Performance of ChatGPT on USMLE: Potential for AI-Assisted Medical Education Using Large Language Models' (2022) *medRxiv*, 5. <https://doi.org/10.1101/2022.12.19.22283643> accessed 16 February 2023.
[78]ibid 3.

an academic manuscript, but most notable is the lack of originality in academic writing. Phrases such as 'literary theft',[79] 'fraudulence forgery',[80] and 'piracy practice'[81] have been used to describe plagiarism. Authors are clear on the distinguishing features of plagiarism, which are duplicating other authors' writings and publishing such writings as one's own.[82]

Historically, emerging technologies have been met with scepticism within the academic and scientific research community.[83] However, technological advancements have improved the academic forum, resulting in a significant shift in the imparting and disseminating of knowledge around the world. The similarity and plagiarism check on academic writing is one example of how emerging technology has played a significant role in setting standards in academic research. The text similarity detecting technology Turnitin, is a widely acknowledged illustration of how technology has been deployed to improve research outcomes and significantly deter outright plagiarism as it has established standards for academic publications on the global web. The burning question is whether producing academic research using emerging technology such as ChatGPT is ethical or if it will fall under the category of plagiarized academic manuscripts. Emerging technologies such as ChatGPT have attributes of 'radical novelty' with 'significant impact, uncertainty, ambiguity' and 'prominent impact'.[84]

The question that begs to be answered therefore, is the role played by emerging technologies such as ChatGPT in facilitating plagiarism in academic writing. When asked directly, ChatGPT had the following response:

> As an AI language model, I do not play any role in facilitating plagiarism in academic writing. Rather, the way in which technology like ChatGPT is used can have an impact on the issue of plagiarism.
>
> On one hand, AI language models like ChatGPT can be useful tools for students and researchers in generating ideas and producing written work. However, there is a risk that some users may abuse these tools by simply copying and pasting generated content without properly citing their sources. This can lead to plagiarism, which is a serious academic offense.
>
> It is important to note that AI language models are not inherently responsible for plagiarism – rather, it is the users who choose to plagiarise. As such, it's essential for students, researchers, and educators to use emerging technologies responsibly and ethically, by ensuring that any content generated by these tools is properly cited and attributed to its original sources. Additionally, academic institutions can take steps to educate students and promote academic integrity, such as providing clear guidelines and offering resources for detecting and avoiding plagiarism.[85]

Amid concerns about the potential of ChatGPT to disrupt learning patterns and to encourage students to take the lazy route of cheating with the model, some educational

[79]Kaveh Bakhtiyari and others, 'Ethical and Unethical Method of Plagiarism Prevention in Academic Writing' (2014) 7(7) International Education Studies 53.
[80]ibid.
[81]ibid.
[82]ibid.
[83]Junaid Qadir, 'Engineering Education in the Era of ChatGPT: Promise and Pitfalls of Generative AI for Education' (2022) 1 <https://doi.org/10.36227/TECHRXIV.21789434.V1> accessed 16 February 2023.
[84]Oleg Litvinski, 'Emerging Technology: Toward a Conceptual Definition' (2012) 9(6) International Journal of Trade, Economics and Finance 258.
[85]OpenAI (n 51).

regulators and institutions have taken the decision to ban the use of ChatGPT in schools and to prohibit students from using it for homework and assignments.

On the 4th of January 2023, Chalkbeat New York reported that the New York City Education Department had blocked access to ChatGPT on its network and devices, stating that it had 'negative impacts on student learning' amongst the reason for blocking it.[86] The Seattle Public Schools school district stated, 'Like all school districts, Seattle Public Schools does not allow cheating and requires original thought and work from students', when disclosing its ban of ChatGPT.[87] Los Angeles Unified School District cited the protection of academic honesty as the reason it blocked access to ChatGPT on all district networks and devices.[88] France's Sciences Po University also banned the use of ChatGPT. It expressly stated that, 'The use, without explicit mention, of ChatGPT or any other tool using AI at Sciences Po is … for the moment strictly forbidden for students producing written or oral assignments'. In addition, it has taken a harder stance stating that any discovery of the use of the model would be faced with ' … sanctions which can go as far as expulsion from the establishment or even from higher learning'.[89] Many other educational institutions have mirrored the foregoing bans in one form or the other.[90]

Issues of integrity are also of concern with regards to academic research and publications by professionals and faculty members in various academic fields. In December 2022 and January 2023, it was widely reported in various media that abstracts of research papers generated by ChatGPT had been successful in fooling scientists and experts.[91] According to the report in Nature Journal, 'Researchers cannot always differentiate between AI-generated and original abstracts'.[92]

In December 2022, Gao et al. conducted a research study using ChatGPT to produce abstracts for scientific medical papers.[93] In their study, they asked ChatGPT to generate research abstracts for fifty scientific medical papers and compared them with genuine original abstracts from five high impact journals and conducted a test of all the abstracts (both original and ChatGPT generated) to determine if human reviewers could detect the abstracts created by ChatGPT which were randomly given to them in a blind review. The study showed that the human reviewers,

[86]Michael Elsen-Rooney, 'NYC Education Department Blocks ChatGPT on School Devices, Networks' *Chalkbeat New York* (2023) <https://ny.chalkbeat.org/2023/1/3/23537987/nyc-schools-ban-chatgpt-writing-artificial-intelligence> accessed 16 February 2023.

[87]Taylor Soper, 'Seattle Public Schools Bans ChatGPT; District 'Requires Original Thought and Work From Students' *GeekWire* (16 January 2023) <https://www.geekwire.com/2023/seattle-public-schools-bans-chatgpt-district-requires-original-thought-and-work-from-students/> accessed 16 February 2023.

[88]Dan Rosenzweig-Ziff, 'New York City Blocks Use of the ChatGPT Bot in Its Schools' *The Washington Post* (5 January 2023) <https://www.washingtonpost.com/education/2023/01/05/nyc-schools-ban-chatgpt/> accessed 16 February 2023.

[89]Reuters, 'Top French University Bans Use of ChatGPT to Prevent Plagiarism' *Reuters* (27 January 2023) <https://www.reuters.com/technology/top-french-university-bans-use-chatgpt-prevent-plagiarism-2023-01-27/> accessed 16 February 2023. Also, L. Bonaventure, 'Top French University Bans Students From Using ChatGPT' *rfi* (27 January 2023) <https://www.rfi.fr/en/business-and-tech/20230127-top-french-university-bans-students-from-using-chatgpt> accessed 16 February 2023.

[90]Arianna Johnson, 'ChatGPT In Schools: Here's Where It's Banned – And How It Could Potentially Help Students' *Forbes* (31 January 2023) <https://www.forbes.com/sites/ariannajohnson/2023/01/18/chatgpt-in-schools-heres-where-its-banned-and-how-it-could-potentially-help-students/?sh=738c820f6e2c> accessed 16 February 2023.

[91]Else (n 32).

[92]ibid.

[93]Gao (n 32).

were able to correctly identify 68% of generated abstracts as being generated, and correctly identified 86% of original articles as being original. They incorrectly identified 32% of generated abstracts as being real, and 14% of original abstracts as being generated.[94]

Thus, though the human reviewers could successfully identify the ChatGPT-generated abstracts majority of the time, they still misidentified some of them as original abstracts by humans over 30% of the time.[95] Whilst the scope of this study was minute with a minuscule and limited number of reviewers, it does show that there is a genuine possibility oAI-generated research getting published as original pieces of academic research.

In academia, one of the major rules for academics is the 'publish or perish' rule. This rule puts pressure on researchers to produce high quality peer reviewed academic research if they want to succeed and progress on the tenure track, and the Gao finding highlights the problem that there are likely to be researchers who will unethically pass off AI generated work as their own.[96] Furthermore, in a study conducted using ChatGPT generated finance research, Dowling and Lucey concluded that 'ChatGPT can generate, even in its basic state, plausible-seeming research studies for well-ranked journals. With the addition of private data and researcher expertise iterations to improve output, the results are, frankly, very impressive'.[97]

In addition to the foregoing issue of the potential of academic researchers to abuse ChatGPT and the corresponding issue regarding academic integrity that this throws up, the penchant of researchers to use ChatGPT means that journals and publishers must wade through research generated by AI which though convincing and which maybe adequately or even well written, display some bias and which are likely to contain incorrect or inaccurate information.[98] In a study and research published in Cureus which is a part of Springer Nature, Manohar and Prasad acknowledged that 'ChatGPT is an innovative tool that can generate textual content quickly and without glaring errors'.[99] They however concluded that, 'it is far from being accurate and reliable enough to be used in academic publishing'.[100] They warned that the use of ChatGPT, 'must be discouraged because it can provide false information and non-existent citations, which may easily mislead both laypersons and healthcare professionals'.[101]

Manohar and Prasad's conclusion regarding the lack of accuracy of ChatGPT is not an isolated observation. Some researchers have stated that 'ChatGPT notoriously fabricates citations that seem plausible but do not point to real-world sources'.[102] AI language models rely on patterns to make predictions and it has been accurately said that GPT-3

[94]ibid.
[95]And this was despite the fact that the reviewers knew that some of the abstracts given to them were AI generated. It would make the tasks of reviewers even harder where they are reviewing random submissions from human researchers and have no inkling whether any of those submissions have actually been generated by AI.
[96]Michael Fire and ChatGPT, 'The Rise of ChatGPT and its Upcoming Impact on the Academic Publishing Industry' *ResearchGate* (2023) 1. <http://dx.doi.org/10.13140/RG.2.2.13575.68001> accessed 19 February 2023.
[97]Michael Dowling and Brian Lucey, 'ChatGPT for (Finance) Research: The Bananarama Conjecture' *Finance Research Letters* (2023) <https://doi.org/10.1016/j.frl.2023.103662> accessed 19 February 2023.
[98]Stephen Turban, 'How Will ChatGPT Change Research Paper Writing?' *Lumiere Education* (2022) <https://www.lumiere-education.com/post/how-will-chatgpt-change-research-paper-writing> accessed 19 February 2023.
[99]Naveen Manohar and Shruthi S Prasad, 'Use of ChatGPT in Academic Publishing: A Rare Case of Seronegative Systemic Lupus Erythematosus in a Patient With HIV Infection' (2003) 15(2) Cureus <https://doi.org/10.7759/cureus.34616> accessed 19 February 2023.
[100]ibid.
[101]ibid.
[102]Choi (n 70) 14.

models are only as good and accurate as their dataset. Thus, machines are only as good as the examples or data they have been trained on.[103] In the study conducted by Gao, et. al., it was discovered that ChatGPT had fabricated the actual numbers in its abstract.[104] OpenAI acknowledges these limitations of ChatGPT by warning that it occasionally generates and provides incorrect information and may produce biased content as well.[105]

The limitations of ChatGPT and the propensity of the model to be abused raises genuine concern as it has the capacity to cause harm as a result of the inaccurate information it provides[106] and opens a door which many might exploit for academic dishonesty.

Amidst the controversy of proclivity of many people to use the model illicitly to produce work and pass it off as their own,[107] as well as concerns regarding accuracy and bias, a number of publishers of academic and scientific journals have moved to ban the use of texts generated by ChatGPT and have also banned authors from listing ChatGPT as an author or co-author.[108] Science and Nature, two publishers of scientific journals recently updated their editorial policies and guide to authors respectively. Science's policy informed researchers and authors that text generated by AI tools (including ChatGPT) cannot be used in any work submitted to Science and cannot be an author,[109] and Nature's guide stipulates that large language model tools will not be accepted as credited authors in any research paper submitted to their journals and any use of LLM tools must be expressly documented.[110]

In addition to the ban by journals and publishers of the use of texts generated by AI tools, one of the most prestigious conferences on machine learning,[111] the International Conference on Machine Learning (ICML), through its program chairs, issued a ban which prohibited researchers/writers from using AI tools to write scientific papers. They explicitly stated, 'Papers that include text generated from a large-scale language model (LLM) such as ChatGPT are prohibited unless the produced text is presented as a part of the paper's experimental analysis'.[112]

The impact of ChatGPT is multifaceted, and serves various purposes for individuals within the academic community. As has been shown, some students employ the chatbot to generate term papers and coursework, which some professors have deemed

[103]Amy Cyphert, 'A Human Being Wrote This Law Review Article: GPT-3 and the Practice of Law' (2021) 55(1) UC Davis Law Review WVU College of Law Research Paper No. 2022-02, 404. <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3973961> accessed 19 February 2023. Also, Govind Chandrasekhar, 'The GIGO Principle in Machine Learning' (2017) <https://medium.com/datascience-semantics3/thoughts-on-the-gigo-principle-in-machine-learning-4fbd3af43dc4> accessed 19 February 2023.

[104]Gao (n 32).

[105]OpenAI, 'ChatGPT' (2022) <https://chat.openai.com/chat> accessed 19 February 2023.

[106]Liebrenz (n 8).

[107]Nature, 'Tools Such as ChatGPT Threaten Transparent Science; Here Are Our Ground Rules for Their Use' (18 January 2023) *Nature Editorial* <https://doi.org/10.1038/d41586-023-00191-1> accessed 19 February 2023.

[108]Sample (n 50).

[109]H Holden Thorp, 'ChatGPT is Fun, But Not an Author' *Science* (26 January 2023) <https://doi.org/10.1126/science.adg7879> accessed 19 February 2023.

[110]Nature (n 107).

[111]James Vincent, 'Top AI Conference Bans Use of ChatGPT and AI Language Tools to Write Academic Papers' *The Verge* (6 January 2023) <https://www.theverge.com/2023/1/5/23540291/chatgpt-ai-writing-tool-banned-writing-academic-icml-paper> accessed 28 February 2023.

[112]ICML 2023, 'ICML 2023 Call for Papers' (2023) <https://icml.cc/Conferences/2023/CallForPapers> accessed 28 February 2023. The ICML subsequently came out with a clarification and what could be termed as a modification of its earlier stance which was of total prohibition. ICML 2023, 'Clarification on Large Language Model Policy LLM' (2023) <https://icml.cc/Conferences/2023/llm-policy> accessed 28 February 2023.

as outright cheating.[113] Conversely, some students use it as a structural tool rather than a source of content for their written manuscripts and others utilize it as an editorial resource tool. Additionally, some academics view the Chabot's potential as a lesson planner for generating course content. These perspectives have been corroborated by Junaid's finding in his study on ChatGPT.[114] Certain publishers assert that the utilization of chatbots should be documented in the methods or acknowledgements sections, and failing to do so may constitute plagiarism.[115]

It is clear that though ChatGPT has resulted in a lot of excitement and praise, there are concerns about its ethical use by a cross section of society and the ability for potential misuse and harm. These concerns are further highlighted upon the consideration of the magnitude of dangers posed if texts generated by ChatGPT are relied on as scientific facts with the potential that might have for humanity. While the application of ChatGPT in academic research has undoubtedly altered the field, the ethical considerations surrounding the use of advanced language models such as ChatGPT remain unresolved as AI is still an area of active exploration and development. Thus, the move by academic and scientific publishers and journals to restrict, ban or ensure researchers explicitly declare the use of texts generated by LLM tools seem wise, as caution should always be the watchword with regards to research generated through such tools since reliance on such texts could result in harm if taken as scientific facts.

VI. Embracing ChatGPT in education and research

Opinions defer on whether ChatGPT should be seen as a form of a Pandora's box, unleashing all manner of problems, harm and evil to those who open and use it,[116] or could be likened to a genie released from a bottle, likely to grant wishes which might be beneficial, helpful and joyous if used thoughtfully and carefully.[117] Whatever opinions one has regarding ChatGPT, it is unequivocal that the future of LLMs and AI is here. AI is here to stay and will not be going anywhere. Instead, it is going to get better, more accurate and more sophisticated. What needs to be addressed are the parameters to be set for its use and the basic standards within which its operation will be allowed in various sectors.

On the back of the issuance of various bans on the use of ChatGPT by educational establishments and academic journals and publishers, there have been calls from a cross-section of society to embrace ChatGPT and other LLM tools in education and research instead of blacklisting or outrightly banning them.

[113]Emma Bowman, 'A New AI Chatbot Might Do Your Homework for You. But It's Still Not an A+ Student' *NPR Technology* (December 19, 2022) <https://www.npr.org/2022/12/19/1143912956/chatgpt-ai-chatbot-homework-academia> accessed 18 February 2023.
[114]Qadir (n 83).
[115]Chris Stokel-Walker, 'ChatGPT Listed as Author on Research Papers: Many Scientists Disapprove' *Nature* (18 January 2023) <https://www.nature.com/articles/d41586-023-00107-z> accessed 20 February 2023.
[116]Maureen Dowd, 'ChatGPT Opens a Pandora's Box of Existential Fears' *The Irish Times* (29 January 2023) <https://www.irishtimes.com/world/2023/01/29/maureen-dowd-chatgpt-opens-a-pandoras-box-of-existential-fears/> accessed 19 February 2023. Also, Nick Baily, 'Pandora's Box is Open: ChatGPT's Forceful Integration into Academia' *The Sewanee Purple* (2 February 2023) <https://thesewaneepurple.org/2023/02/02/pandoras-box-is-open-chatgpts-forceful-integration-into-academia/> accessed 28 February 2023.
[117]Sunil Manghani, 'WebChatGPT – Genie is Out of the Bottle!' *Medium* (10 January 2023) <https://medium.com/electronic-life/webchatgpt-genie-is-out-of-the-bottle-b1f6e26f1337> accessed 28 February 2023.

The University of California, Riverside, conducted a question-and-answer session on ChatGPT with thought leaders at the university. Most of those asked were generally of the opinion that there is a place for AI tools in education. Ward Beyermann[118] is of the view that, 'While there are many concerns that ChatGPT compromises academic assessment, it and better optimized versions may force us to shift our curriculum to higher levels of critical thinking'.[119] According to Morris Maduro,[120] 'It will be impractical to try to ban or prevent the use of ChatGPT. AI tools are here to stay. They will improve and become increasingly important across disciplines'.[121] Giving an excited answer about the use of ChatGPT, Matthew Lang[122] gave a positive spin on the use of the AI tool in education. He said,

> In a course like econometrics, where students are required to work with data throughout the course, ChatGPT can be particularly beneficial. It allows for a reduction in time spent on tedious tasks such as data loading and troubleshooting, which can be a source of frustration for students. This enables me as an educator to focus more on the critical analysis of empirical models, leading to a deeper understanding of the subject for my students.[123]

Yue Dong[124] however warned, 'While the ChatGPT platform has a wide range of applications related to text generation, outputs should be evaluated critically and used with caution, as they may contain false, biased, or outdated information'.[125]

ChatGPT can be employed in the educational and research process as a tool that heightens and enhances learning and research. LLMs like ChatGPT can assist teachers, students and researchers in various ways. If employed with the appropriate mindset, they can be deployed to assist in a plethora of ways. They can be utilized as effective teaching tools for educators and save them time for other important tasks.[126] They can also be used to assist with coding, literature reviews and data analysis and could be applied to polish up drafts of research papers.

Referring to ChatGPT, Marchandot et. al. are of the opinion that –

> … a researcher could use the model to analyze thousands of research papers in a fraction of the time it would take to read them manually. This can save researchers a significant amount of time and allow them to focus on other aspects of their research. Another advantage of using ChatGPT in academic research is its ability to assist with literature reviews. The model can be trained on a specific topic and then used to identify relevant papers, saving researchers time and effort in searching for relevant literature. Additionally, the model can also be used to summarize papers, making it easier for researchers to quickly understand the key findings of a paper.
>
> ChatGPT can also be used as a tool to assist in the revision of a scientific manuscript. The model can be trained on a specific field of study and can then be used to suggest changes

[118]Professor of physics and astronomy at the University of California.
[119]Iqbal Pittalwala, 'Is ChatGPT a threat to education? – UC Riverside Experts Share Thoughts on the AI-Powered Language Model that Understands and Responds to Natural Language'*UC Riverside News* (24 January 2023) <https://news.ucr.edu/articles/2023/01/24/chatgpt-threat-education> accessed 28 February 2023.
[120]Professor of biology at the University of California.
[121]Pittalwala (n 119).
[122]Professor of teaching in economics at the University of California.
[123]Pittalwala (n 119).
[124]Assistant Professor of computer science and engineering at the University of California.
[125]Pittalwala (n 119).
[126]Kevin Roose, 'Don't Ban ChatGPT in Schools. Teach With It' *The New York Times* (12 January 2023) <https://www.nytimes.com/2023/01/12/technology/chatgpt-schools-teachers.html> accessed 28 February 2023.

> to the manuscript. For example, the model can be used to identify and correct grammar and spelling errors, suggest alternative phrasing, and even suggest additional experiments or data analysis to support the manuscript's conclusions.[127]

Many have advocated that the best approach to using ChatGPT in writing within education should be to view it as an aide, as happened during the introduction of the calculator within the mathematics field. Like with ChatGPT, there was a lot of scepticism when the calculator was initially introduced within the educational space. There were concerns that the calculator would signal a death knell to computational abilities. It was argued that the calculator would encourage laziness amongst students and impair their abilities to calculate.[128] Today, calculators are instruments routinely used by students, educators, professionals and the society at large. They have made the ability to compute infinitely simpler, easier and faster and are regarded as aides which help in producing efficiency and accuracy instead of adversaries that impede progress, knowledge and learning.

The horse has already bolted from the stable. The future is here, and the release of ChatGPT to the public forces everyone to acknowledge that our modes of generating information and of communicating is changing and will change even more rapidly. LLMs and AI are here to stay. ChatGPT was trained using the GPT-3 model platform and is still in its infancy. As a model, it is continually being worked on and already, it is speculated that the GPT-4 model – which is expected to be a more versatile, sophisticated and efficient model – will be released in a few months,[129] so there is no going back.

It is envisaged that even more people will utilize LLMs on a more regular basis as it becomes more advanced and accurate. It is therefore imperative that educators, journals, publishers and any sectors that rely on scholarship, information generation and research start to ensure they are adept in the use and understanding of LLMs and their workings. It is also necessary to set the yardsticks and parameters within which these models can be used within each establishment, field or sector. This was done by the International Conference on Machine Learning (ICML) which seemed to modify its initial stance wherein it had issued a total prohibition of texts generated by LLMs. The ICML subsequently came out with a clarification and stated, 'The Large Language Model (LLM) policy for ICML 2023 prohibits text produced entirely by LLMs (i.e. "generated"). This does not prohibit authors from using LLMs for editing or polishing author-written text'.[130] Thus, it is clear from the clarification that the parameters for using LLMs had been set by the ICML for papers to be submitted for the 2023 ICML. The ICML further stated, 'The LLM policy applies to ICML 2023. We expect this policy may evolve in future conferences as we understand LLMs and their impacts on scientific publishing better'.[131] This makes it clear that the ICML organizers understand that there might be a need to further modify its parameters as

[127]Benjamin Marchandot and others, 'ChatGPT: The Next Frontier in Academic Writing for Cardiologists or a Pandora's Box of Ethical 1 Dilemmas' (2023) oead007 European Heart Journal Open 3. <https://doi.org/10.1093/ehjopen/oead007> accessed 28 February 2023.

[128]Audrey Watters, 'A Brief History of Calculators in the Classroom'*Hack Education* (12 March 2015) <http://hackeducation.com/2015/03/12/calculators> accessed 28 February 2023. Also, Kendall Lloyd, 'Calculators in the High School Classroom: Anxiety Levels and Attitudes Towards Mathematics' (2020) *Senior Independent Study Theses*. Paper 9043. <https://openworks.wooster.edu/independentstudy/9043> accessed 28 February 2023.

[129]Funmi Looi Somoye, 'GPT-4 release date prediction: When is the new model?' *PC Guide* (2023) <https://www.pcguide.com/apps/chat-gpt-4-release-date/> accessed 28 February 2023.

[130]ICML 2023, 'Clarification on Large Language Model Policy LLM' (2023) <https://icml.cc/Conferences/2023/llm-policy> accessed 28 February 2023.

[131]ibid.

time goes on and as the ability, capability, range, accuracy and effects of LLMs are better understood.

VII. Recommendations to checkmate cheating with ChatGPT in education and academic research

If the use of LLMs is to be embraced and encouraged within education and academic publishing, educators and other sectors must be on their toes to ensure that students, researchers, etc. are not cheating by taking the shortcut of using LLMs like ChatGPT to generate assignments, research papers, articles and other work that should be prepared by them.

It is undoubted that LLMs are here to stay and the task to be borne if academic and research integrity is to be maintained, is to establish a system which ensures that AI-generated texts are not abused within the educational and research process. Going by the research conducted by Gao et. al, it is clear that plagiarism and similarity detection tools like Turnitin are ineffective at catching texts generated by AI tools.[132] However, AI output text detector tools can often detect texts generated by AI tools.[133] The problem is that AI output text detector tools are not 100% accurate in catching and identifying AI-generated texts. In addition, the detectors sometimes misidentify genuine human texts as having been generated by an AI tool.[134]

It is therefore imperative that a system and process is developed to enable educators, reviewers of research articles and others with vested interests decipher if material submitted to them are the original work of the student/researcher or if it was generated using an AI tool.

Proffered below are some suggestions and recommendations that will aid in the detection of the use of texts generated by LLMs like ChatGPT.

- The first recommendation is that creators and hosts of AI tools/LLMs like ChatGPT can create a repository of all texts generated by their models. These can serve as a means of generating a different stream of income for them as they can create a subscription service which would be made available to educational institutions and boards, journals and academic publishers, news media, organizations and any other interested parties/bodies. Those who subscribe to the relevant creator's service will have access to that creator's repository and can conduct a search that lets them know almost instantly if the tool generated the texts they submitted to it. Similarly, various creators of LLMs can band together to create a single common repository of their texts and offer a subscription service to that single repository.

There have been suggestions that creators of LLMs like ChatGPT should provide access to the public to browse the codes they used in creating their models. According to a research scientist at Hugging Face, 'You're working with a black box . . . . Unless you really have [access to] these layers and how they're connected, it's really hard to create

[132]Gao (n 32).
[133]ibid.
[134]ibid.

a meaningful [cheating detection] tool'.[135] The problem with this suggestion is that many AI creators guard their codes diligently and are unwilling to share their trade secrets publicly, particularly in light of the fierce competition between the creators of AI tools, the vast amount of finances and resources invested and the race to create better, more capable, accurate and sophisticated models.[136] Therefore, it might be more acceptable for the creators of AI tools to collaborate on a common repository than to divulge and share their codes. It is possible that when the AI race to create a more capable model is over and these models become more established and common, creators will be willing to share their codes.

- The second recommendation is for creators of AI tools to embed a watermark via code within their generated text that would allow third parties to know that the text was generated by their model. These watermarks will not be discernible by the naked eye but will be hard to remove from generated texts. The watermark would involve hidden patterns buried within the texts generated by LLMs that let computers detect that the texts were AI generated and not the original work of the person or source passing them off as theirs.[137]

Tech researchers at the University of Maryland published a paper[138] in which they discussed their work studying the watermarking of the output of language models. They define a watermark for this purpose as, ' … a hidden pattern in text that is imperceptible to humans, while making the text algorithmically identifiable as synthetic'.[139] In their paper, it was stated that the type of watermark that can mitigate the potential harms of LLMs is one which –

(1) can be algorithmically detected without any knowledge of the model parameters or access to the language model API;
(2) can be generated using a standard language model without re-training;
(3) is detectable from only a contiguous portion of the generated text; and
(4) cannot be removed without modifying a significant fraction of the generated tokens.[140]

The use of watermarks within texts generated by LLMs will go a long way in preventing the use of such texts in a fraudulent or harmful way and aid in the quick detection of such texts when submitted by researchers and other users. It is apparent that this is a solution being seriously considered and explored by other tech researchers and developers as a

[135]Laura Meckler and Pranshu Verma, 'Teachers are on alert for inevitable cheating after release of ChatGPT' *The Washington Post* (28 December 2022) <https://www.washingtonpost.com/education/2022/12/28/chatbot-cheating-ai-chatbotgpt-teachers/> accessed 11 March 2023.
[136]S. Siddharth Sharma, "The AI Arms Race' *Medium* (2 February 2023) <https://medium.com/@siddrrsh/the-ai-arms-race-9c9a3268266d> accessed 11 March 2023.
[137]Melissa Heikkila, 'A Watermark for Chatbots Can Expose Text Written by an AI'*MIT Technology Review* (27 January 2023) <https://www.technologyreview.com/2023/01/27/1067338/a-watermark-for-chatbots-can-spot-text-written-by-an-ai/> accessed 11 March 2023.
[138]John Kirchenbauer and others, 'A Watermark for Large Language Models' (2023) *Arxiv* <https://doi.org/10.48550/arXiv.2301.10226> accessed 11 March 2023.
[139]ibid.
[140]Ibid.

guest researcher at OpenAI, which created ChatGPT, stated that OpenAI is 'studying hiding cryptographic signals, called watermarks, in ChatGPT results, so that they'll be more easily identifiable by [anti-cheating software] companies like Turnitin'.[141]

With the application of watermarks to AI-generated texts, the creators of language models do not have to fear third parties gaining access to their application modeling interface or having to divulge any of their trade secrets.

- The third recommendation is creating more capable AI output text detector tools. Most of the current detector tools are inadequate for accurately identifying texts generated through AI tools and this is made worse by the rapid improvement in the standard and capability of LLMs. Many AI text detector tools were trained using previous model platforms like GPT-2 and cannot match the range of the GPT-3 models, thus making detection not always successful.

After ChatGPT was released to the public, a Princeton student named Edward Tian was reported in early 2023 to have built an app called GPTZero that can detect if texts are written by a human being or generated through an AI tool like ChatGPT.[142] GPTZero when tested was almost always accurate. However, it was not proved to be a hundred percent accurate.[143] OpenAI also released what they term a classifier, which they state was trained 'to distinguish between text written by a human and text written by AIs from a variety of providers'.[144] The OpenAI classifier, like other AI text detector tools, is not accurate. OpenAI admits that its classifier is not fully reliable as it correctly identifies texts generated by AI tools twenty-six percent of the time and gives false positives by incorrectly identifying texts written by humans as being generated by AI tools nine percent of the time.

Since AI (and its tools) is a rapidly developing field, it is of the utmost importance that as far as practicable, the tools to detect texts generated via AI are developed with comparable speed as the versions of the language models they are created and trained to detect. Achieving an equilibrium between the capabilities and sophistication of the AI language models on one hand and the capabilities and sophistication of the detective tools to be used on such language models will go a long way in securing the integrity and confidence in the originality of written works handed into educators, journals, publishers, etc. by students, researchers, etc.

There might be other recommendations that may be made to ensure that whilst LLMs are deployed to assist in research, coding, translation, editing and revision of texts, they are not successfully used as a means to cheat, plagiarize or otherwise circumvent original research and work. It is hoped and anticipated that as LLMs become more perfected and

[141]Jason Wingard, 'ChatGPT: A Threat to Higher Education?'*Forbes* (10 January 2023) <https://www.forbes.com/sites/jasonwingard/2023/01/10/chatgpt-a-threat-to-higher-education/?sh=62c688f31e76> accessed 11 March 2023.
[142]M. Megan Cerullo, 'Princeton Student Says His New App Helps Teachers Find ChatGPT Cheats' *CBS News* (10 January 2023) <https://www.cbsnews.com/news/chatgpt-princeton-student-gptzero-app-edward-tian/> accessed 11 March 2023. Also, Margaret Osborne, 'Student Creates App to Detect Essays Written by AI' *Smithsonian Magazine* (17 January 2023) <https://www.smithsonianmag.com/smart-news/student-creates-app-to-detect-essays-written-by-ai-180981463/> accessed 11 March 2023.
[143]Osborne (n 142).
[144]Jan Hendrik Kirchner and others, 'New AI Classifier for Indicating AI-Written Text' *OpenAI* (31 January 2023) <https://openai.com/blog/new-ai-classifier-for-indicating-ai-written-text> accessed 11 March 2023.

the use of AI language models are inextricably intertwined with daily life, accurate and competent text output detection tools will become a routine commonplace accompaniment.

VIII. Conclusion

This work has looked at the rise and proliferation of AI language tools by focusing on OpenAI's ChatGPT. The release of ChatGPT at the end of November 2023 was met with a lot of excitement as the possibilities the language model provided seemed endless. The initial euphoria was followed by concerns about the ethical use of the model by a cross section of society. There are real concerns which have been raised about students and researchers passing off texts generated by AI language tools as being original work conducted by them. There are also concerns about the intellectual property infringements and also issues of plagiarism.

It is clear that the use of AI and LLMs in academic and scientific research is here to stay. This paper has addressed the issues raised particularly with regards to education and academic/scientific publishing and put forward recommendations which will hopefully ensure that future uses of LLMs are carried out with the appropriate ethical considerations and responsibility that will be necessary to ensure that reliance can be placed on the quality of education provided and academic research published.

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