

Large Language Processing Model ChatGPT and its Impact

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Qiaochu (Echo) He is a student at Skyline High School in Washington, United States. She was born and raised in China and moved to the United States in 2021. She became interested in business, specifically entrepreneurship after participating in a Washington state-based business education camp called Washington Business Week, where her team won first place. She also worked on a research project with Professor Howard Geltzer at New York University Stern School of Business. Because her dream is to become a young female entrepreneur, she wanted to learn more about the rise of AI technology and its applications and future impact, which is why she wrote this research paper. Outside of school hours, she loves to sing, draw, and read books. She also loves to write blogs and produce videos to record her life.

ABSTRACT

This research paper explores the transformative impact of ChatGPT, a Large Language Processing Model developed by OpenAI, on various facets of contemporary society. Through an extensive examination of academic literature and empirical research, the study delves into the capabilities, applications, limitations, and ethical considerations surrounding ChatGPT in the realms of education, healthcare, and business.

In the current world, Artificial Intelligence is playing an increasingly important role in different aspects of human society due to its rapid advancements. One of the classifications for AI is the Large Language Processing Models (LLMs), which are trained to have a massive dataset of text for dialogue with users through chatbots. ChatGPT, developed by the OpenAI company, has demonstrated impressive capabilities as an LLM. Through an analysis of data and research conducted about ChatGPT, we can see that the development of ChatGPT by OpenAI has already created significant impact and controversy in different aspects of human society. This is important because AI is likely to be the most influential technology of our time and will fundamentally change people's way of life. This paper aims to systematically review literature related to the impacts, and controversies, and discuss areas of future research.

Keywords: ChatGPT, Large language processing models, AI chatbots, Ethical AI, ChatGPT capabilities, ChatGPT controversies, ChatGPT impact on education, ChatGPT's applications and impact on healthcare, ChatGPT's applications and impact on Business, Limitations of ChatGPT, Future of AI technology.

INTRODUCTION

Artificial intelligence (AI) is the science and engineering of making intelligent machines to mimic human intelligence. AI research began after World War II when a number of independent researchers started to work on experiments to develop these intelligent machines. By the end of the 1950s, there were multiple research projects on AI carried out based on programming computers. As time progresses, nowadays, AI research and development has been divided into different areas of focus. Some common branches of evaluating AI program performance include logical AI, search, pattern recognition, inference, common sense knowledge, and reasoning (McCarthy, 2007).

As AI programs continue to advance, they have been actively injected into different aspects of human society; the high precision and low computation time make AI a cutting-edge technology that can be applied to almost all human activities. For example, one of the most common applications of AI is its use in the gaming industry, where its strong algorithms to scan positions every second have made it a strong opponent for chess. Additionally, AI robots are employed in jobs that are usually considered dangerous for humans such as the ones in heavy industries, where they have been shown to be more efficient and work without break. AI is also applied in weather forecasting, expert systems, data mining or knowledge extraction, and many other aspects of human society (Strong, 2016).

In recent years, the technology industry has made progress in the development of AI into chatbots, as a way to utilize the advantage of AI's natural language processing ability. One example is ChatGPT, an AI chatbot launched in late 2022 by the Company OpenAI. As a large learning processing model technology, ChatGPT is designed to be highly intelligent and

user-friendly. It utilizes natural language processing and machine learning functions to enable users to have conversational interactions with the chatbot, which has the ability to understand and respond to complex input from the users and respond in a way that is natural and human-like (King, 2023). Unlike the existing AI chatbots, what is unique about ChatGPT's functionality is that it has the ability to understand the given prompt with specific requirements and generate appropriate answers that fit the user's request. In many instances, the output is hardly different from the human authors. With a large corpus of text data in a dynamic manner including books, articles, and online conversations at its disposal, ChatGPT can generate answers with accurate information for difficult academic questions that are not easily found through web searchers. The unique utility of ChatGPT is also why it had over one million users within two months after its initial launch (Wang, 2023). The success of ChatGPT has created a debate about the future of AI technologies and content-based platforms overall (Naumova, 2023); ChatGPT's success has contributed to a nearly 200% increase in the searches for AI writing and a 139% rise in interest for AI content as people flock to see what is the functionalities and capabilities of current AI technologies (Cuming, 2023).

Therefore, this serves as a literature review of ChatGPT that summarizes the major research, and academic studies on the testing of ChatGPT's capabilities, including its strengths and limitations. Based on those capabilities, this paper will then critically examine how it affects different fields and areas of human society, from education to healthcare to multimodal cultural, and ethical concerns such as academic integrity and replacement of human job opportunities. Lastly, I'll conclude the literary review with the future implications of ChatGPT and similar language processing models.

ChatGPT and Education– Capabilities and applications

Soon after ChatGPT was launched, there were several studies that provided a first analysis of the capabilities of ChatGPT including its reliability and ethical concerns of its being massively applied. For example, a study published by Massey University in New Zealand on December 20, 2022, ChatGPT: *The End of Online Exam Integrity* evaluated ChatGPT's ability to perform high-level cognitive tasks and produce human-like answers. With the aim of examining the complexity of ChatGPT's reasoning and ability to answer university-level questions across different disciplines, researchers conducted an experiment by asking ChatGPT four university-level academic questions and evaluated the response. Some key factors in evaluating ChatGPT's level of critical thinking and quality of its logical reasoning in its responses are determined by the following criteria: "Relevance to the topic, clarity of the text, accuracy of the idea, precision, depth, breadth, logic, persuasiveness, and originality". In all the generated responses, ChatGPT demonstrated a strong clarity of language, it is straightforward and easy to understand for the intended audience. Subject experts from all the above four disciplines confirmed the accuracy of each response, and they have agreed upon a high precision of the responses as they are both specific and detailed. All answers demonstrated relevance to the prompts and were on target with both the subject matter concerning each discipline and the intent of the requests. The results also found that all the responses had a logical flow and consistent reasoning that showed breadth and persuasiveness. However, one aspect that ChatGPT's capability that was not mature enough was originality: ChatGPT is trained to store a vast amount of accumulated knowledge that is designed to generate human-like responses based on the patterns and data found in its system, therefore, the responses

contained the perspectives based on the established knowledge and practices in that specific field.

Overall, this study provided experimental evidence of ChatGPT's strong capabilities. It has developed an ability to produce responses with critical thinking, just as humans, rather than merely retrieve information. This ability far exceeds the current capabilities of search engines. Therefore, aiming to investigate the effect of ChatGPT on online exam integrity, the researchers proposed the risk that students could cheat on their online exams using ChatGPT without being noticed as the responses produced are nearly indistinguishable from human writing. This study raises a serious concern for every educator: How should online exams go forward with ChatGPT's strong capability in generating human-like responses? ChatGPT is particularly robust in doing human examinations– it already has the capability to pass the U.S. Medical Licensing Exam (USMLE) without special training or reinforcement (DePeau-Wilson, 2023). Kung (2022) found that ChatGPT's performance on USMLE scored a 50% accuracy across all the exams and achieved more than 60% in its analyses, researchers concluded them to have "demonstrates a high level of concordance and insights in its explanations", which suggests that the large language models like ChatGPT may have applications on medical education and potentially clinical decision-making process (Kung, 2022).

Meanwhile, ChatGPT is not solely used for the purpose of generating responses for exam questions in education. In the academic world, researchers began to use ChatGPT for their research papers and even listed ChatGPT as a co-author in a new research paper focused on testing the technology's usefulness in medicine (DePeau-Wilson, 2023). One study published by van Dis (2023) explores how using a large language model like ChatGPT for highly

specialized research is likely to add inaccurate, biased information to the paper, therefore putting the validity and professionalism of the research project at risk (van Dis, 2023). Susnjak (2020) holistically evaluated ChatGPT's capabilities in producing human-like texts with critical thinking and logical reasoning; his research tested its ability to summarize a systematic review and found its responses to have several severe issues, including factual errors, misinterpretations, and wrong data. In asking ChatGPT to summarize a study on the effectiveness of cognitive behavioral therapy published in JAMA Psychiatry, it wrongly stated the number of studies to be 69 when it was actually 46 studies. ChatGPT also exaggerated the effectiveness of CBT (Van Dis, 2020). The researchers concluded that such errors that existed in ChatGPT are highly relevant to the absence of relevant articles in ChatGPT's training system, resulting in the inability to distill relevant information or distinguish between credible and unreliable sources.

ChatGPT and its application in medical and the healthcare field

Large Language Processing Models, such as ChatGPT, can be huge factors of change in the medical field. ChatGPT has the ability to offer information on public health concerns encompassing infectious diseases, chronic illnesses, and environmental health hazards. This capacity enables it to address inquiries concerning health promotion and disease prevention strategies, providing practical examples such as guidance and information regarding healthy lifestyle choices, vaccinations, screenings, early detection methods, risk factor reduction, and environmental health measures (Biswas, 2023). Cascella and their colleagues undertook a study to assess the viability of incorporating ChatGPT into healthcare, particularly within clinical settings. The researchers tasked ChatGPT with composing a

medical report for a patient who was admitted to the intensive care unit (ICU), while providing details on "ongoing treatments, laboratory samples, blood gas analysis parameters, as well as respiratory and hemodynamic measurements". When asked to produce a structured note, ChatGPT demonstrated the ability to accurately classify the majority of these parameters into their respective sections, even when they were presented solely with abbreviations without accompanying information about their significance. Furthermore, ChatGPT exhibited a remarkable aptitude for self-correction, effectively rectifying the misplacement of parameters by simply inquiring about the appropriateness of their respective sections, without requiring additional prompts. Impressively, it demonstrated the capacity to offer insightful recommendations for subsequent treatments, drawing from the available information. ChatGPT's most notable performance manifested in its ability to summarize information succinctly, employing technical terminology for seamless inter-clinic communication, while seamlessly transitioning to plain language for effective communication with patients and their families (Cascella, 2023).

AI also has the potential to analyze medical images, detect diseases, and generate personalized treatment plans for patients. It is also predicted that Large Processing Models such as ChatGPT will be largely used in alleviating mundane responsibilities such as data entry and appointment scheduling, something that would need human employment to do (George, 2023). The integration of AI into healthcare systems is expected to witness a progressive surge in its implementation within medical care on a daily basis

ChatGPT's application in business—Capabilities, Impact, Concerns

The arrival of ChatGPT marks an AI revolution in the job market. Research has

shown that ChatGPT can serve as an adequate replacement for most jobs that exist in the market. Muhammad (2023) shows that 43% of employers are thinking of using ChatGPT to replace some workers because its product is comparable at a much lower cost. Looking at the big picture, more employers envision using AI to replace most human jobs is ultimately becoming an inevitable trend (Muhammad, 2023). As evidence shows, ChatGPT has very robust systematic functions for business purposes. A study published in Finance Research Letters, *ChatGPT for (Finance) Research: The Bananarama Conjecture* shows that ChatGPT has significantly assisted with finance research because of its capabilities in idea generation and data identification. With the focus on cryptocurrencies as the finance research topic, Dowling and Lucey, as cited in Cargill and O'Connor, 2021, started the empirical approach through the main four stages– “idea generation, prior literature synthesis, data identification and preparation, and testing framework determination and implementation” (Cargill and O'Connor, 2021). The empirical research findings demonstrate that ChatGPT has the ability to produce fundamental research studies suitable for prestigious journals, particularly enhanced through the utilization of private data and iterative refinements by experienced researchers. Dowling and Lucey also concluded that the results would be even stronger with the introduction of GPT-4 as the underlying generative model launching in 2023, which was said to be a “truly revolutionary language model due to advances in algorithms and over 600 times greater testing parameters” (Dowling, 2023). Similarly to its role in education and academics, ChatGPT has already influenced the future of business operations and it is predicted that AI will begin to reduce employment for college-educated workers in the next five years. Generative AI, such as ChatGPT, has the capability to harness user

inputs and prompts, as well as the knowledge acquired through interactions with users, to produce content that is perceived as a product of human creativity. This ability allows it to generate entirely novel content by incorporating learned information and creative insights. Even though generative AIs are still in their early days of scaling, businesses have already started utilizing ChatGPT as a tool across different functions in marketing and sales, operations, and HR to IT/Engineering, risk and legal, etc (Chui, 2022). For instance, ChatGPT can be a powerful tool to revolutionize digital marketing and e-commerce by using its natural language processing and machine algorithms. ChatGPT is also capable of efficiently and effectively utilizing analytic tools to develop digital marketing campaigns; it has been trained on extensive datasets from various industries and organizations, providing valuable insights that the company might not have otherwise invested in obtaining. For customers, ChatGPT will assist them by swiftly addressing their inquiries regarding products and services, eliminating the need to wait for a human representative or navigate convoluted menus to find the desired information. Moreover, its improved translation feature allows ChatGPT to understand user requests in various languages worldwide, granting companies enhanced access to new markets. This capability can potentially result in increased sales from previously inaccessible regions due to language barriers with potential buyers or customers abroad (George, 2023). Below in Figure 1 lists the use of ChatGPT in different categories of business functions.

There are many possible generative AI use cases across the business that could create early impact.

Example use cases¹ (not exhaustive)

Marketing and sales	Operations	IT/engineering	Risk and legal	HR	Utility/employee optimization
Write marketing and sales copy including text, images, and videos (eg, to create social media content or technical sales content)	Create or improve customer support chatbots to resolve questions about products, including generating relevant cross-sell leads	Write code and documentation to accelerate and scale developments (eg, convert simple JavaScript expressions into Python)	Draft and review legal documents, including contracts and patent applications	Assist in creating interview questions for candidate assessment (eg, targeted to function, company philosophy, and industry)	Optimize communication of employees (eg, automate email responses and text translation or change tone or wording of text)
Create product user guides of industry-dependent offerings (eg, medicines or consumer products)	Identify production errors, anomalies, and defects from images to provide rationale for issues	Automatically generate or auto-complete data tables while providing contextual information	Summarize and highlight changes in large bodies of regulatory documents	Provide self-serve HR functions (eg, automate first-line interactions such as employee onboarding or automate O&A or strategic advice on employment conditions, law, regulations, etc)	Create business presentations based on text prompts, including visualizations from text
Analyze customer feedback by summarizing and extracting important themes from online text and images	Streamline customer service by automating processes and increasing agent productivity	Generate synthetic data to improve training accuracy of machine learning models with limited unstructured input	Answer questions from large amounts of legal documents, including public and private company information		Synthesize a summary (eg, from text, slide decks, or online video meetings)
Improve sales force by, for example, flagging risks, recommending next interactions such as additional product offerings, or identifying optimal customer interaction that leads to growth and retention	Identify clauses of interest, such as penalties or value owed through leveraging comparative document analysis				Enable search and question answering on companies' private knowledge data (eg, intranet and learning content)
Create or improve sales support chatbots to help potential clients understand, including technical product understanding, and choose products					Automated accounting by sorting and extracting documents using automated email openers, high-speed scanners, machine learning, and intelligent document recognition

¹Given that generative AI is in the early stages of maturity, organizations will want to consider use cases and their implications carefully and determine the appropriate level of human oversight.

McKinsey & Company

Figure 1, ChatGPT's application in different categories of business functions (George, 2023).

As Figure I shows, ChatGPT has strong capabilities and wide application to many areas of business. Because of that, it also gives an opportunity for companies looking to cut costs by automating processes as ChatGPT can perform tasks that were previously thought to require a high level of education and professional knowledge. Figure 2, demonstrates that more than 32 percent of employers in the software and tech industry are willing to pay over \$250 for ChatGPT as it can possibly lower the cost of hiring technical engineers.

Top 5 industries willing to pay >€250 per month for ChatGPT

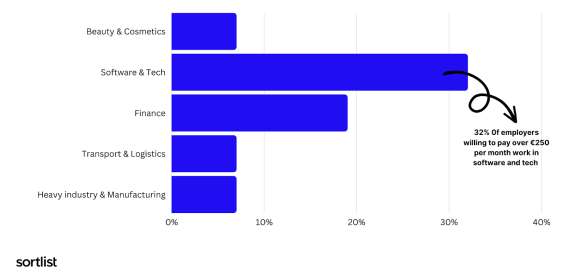


Figure 2, Top 5 industries that are willing to pay more than \$250 per month for ChatGPT (Muhhamad, 2023).

The rise of ChatGPT and AI in general could lead to a significant displacement of workers and alter the employment environment permanently: an Oxford study estimates 47% of US jobs will be at risk (Lowrey, 2023).

ChatGPT's limitations and areas of improvements

Even though ChatGPT has been proven to be a powerful tool and has affected different areas of human life such as the academic, healthcare, and business world, the relatively new technology still has a few functional limitations. Several researchers conducted experiments and discovered several capabilities that are still limited and contain errors. In Jiao (2023), Jiao and his colleagues conducted an experiment and reported on ChatGPT's ability to translate multilingual texts. Researchers compared the translation product with commercial translators already available in the market, namely Google Translate, Deep L translate, and Tencent TranSmart. The results have shown that ChatGPT performs competitively with commercial translation products on high-source European Languages, but lags significantly on low-source languages (Jiao, 2023). Moreover, ChatGPT's current maximum input is 5000 tokens. Although ChatGPT provides good responses in most circumstances, it is still limited in tasks such as text summarization that is over its maximum

capacity. Another limitation is that ChatGPT does not support uploading files, images, and audio, and it also can't produce the same responses when generating responses for the same input question (Bang, 2023). Moreover, ChatGPT's database can only fetch information about events and incidents prior to September 2021. It shows that the preprogramming is limited in accessing all sources of information needed to provide the latest news as they usually require a human touch to ensure accuracy and relevance (Geroge, 2023).

The limitations described above are some examples that show ChatGPT is not fully capable of applying to all three of the main fields of human society: the academy, healthcare, and business. ChatGPT's current level of sophistication lags significantly behind that of a real human being, who possesses the ability to think critically and creatively. Similarly, AI systems in general do not yet have any form of emotional intelligence which can make this technology inapplicable in areas where they need to understand subtle social situations and work with human beings outside of highly controlled environments like customer service chatbots. Within the realm of medicine, ChatGPT exhibits a notable constraint in addressing causal relationships among conditions (George, 2023). This limitation potentially stems from the incompleteness or lack of currency in its information sources, which hinders the establishment of precise causal connections. Furthermore, since ChatGPT is not tailored explicitly for medical applications or adept at addressing medical inquiries, it lacks the requisite medical expertise and contextual comprehension necessary to fully grasp the intricate interplay between various conditions and treatments (Cascella, 2023).

Future concerns, ethical considerations with ChatGPT and other Language Processing Models

The rise of ChatGPT and other language processing models is a significant transformation of human daily life, therefore, it is advised to use all AI tools and models with caution and further verification of their capabilities and limitations. Ethical considerations play a significant role in determining the boundaries of the technology used. Ray, (2023) points out several ethical considerations surrounding the use of ChatGPT in scientific research in the areas of data privacy and security, the misuse and abuse of the technology for malicious purposes, and potential bias and discrimination associated with the trained datasets. There were several cases associated with ChatGPT that raised further debate and deep controversies. One example from February 2023, a Colombian judge, Juan Manuel Padilla made headlines after he used ChatGPT in a legal ruling of a health insurance coverage related case. In another, a tech startup, Koko, used ChatGPT to generate content to facilitate mental-health-related conversations among users. Finally, the Sci-Fi magazine *Clarkesworld* was inundated with AI-generated story submissions (Ray, 2023). The production of scientific research with the assistance of ChatGPT also raises concerns over plagiarism, especially if ChatGPT is listed as a co-author of the paper. Organizations such as the influential Committee on Publication Ethics (COPE) and the World Association of Medical Editors (WAME) called for banning AI authorship, which has led to influential journals including *Nature* banning AI authorship. Ultimately, the researchers at *Nature* suggest staying away from “a futile arms race between AI chatbots and AI chatbot detectors”, and that researchers and the academic community should treat the use of LLMs like ChatGPT with “integrity, transparency and honesty.” The expert-driven fact-checking and verification processes,” are accountable for scientific practices (Van Dis, 2023).

Conclusion

ChatGPT has shown enormous impact and played a significant role in different aspects of human society, namely the education, health care, and business fields. As one of the cutting-edge developments that signifies the advancement of AI technology, ChatGPT exhibits remarkable capabilities, such as critical thinking, logical reasoning, and natural language understanding. In the education segment, academic integrity is at risk because of its high performance in human exams and its ability to produce responses that are highly indistinguishable from human writing. ChatGPT has significantly affected the medical field by working on clinical inquiries and offering insightful recommendations for patient treatments, even having the potential to analyze medical images and detect disease. Companies and businesses are increasingly applying the ChatGPT technology across multiple areas, namely finance, IT, and operations. They also seek out the opportunity to embrace technological advancement to lower people costs and replace limited jobs in the job markets with AI.

However, the journey with ChatGPT also brings to light its limitations and ethical considerations. While ChatGPT demonstrates impressive performance, it still lacks the depth of understanding and emotional intelligence inherent in human thinking. Its limitations include language and knowledge boundaries, an inability to process certain types of content, and potential biases embedded in its training data. These constraints underscore the importance of cautious and responsible use of such technology. The ethical concerns surrounding ChatGPT are significant. The potential for misuse, the blurring of lines between human and AI authorship, and the risk of generating biased or inaccurate information raise critical questions about its impact on scientific integrity, privacy,

and security. Addressing these ethical dilemmas and establishing clear guidelines for the use of AI tools in research, communication, and decision-making will be essential for navigating the evolving landscape of AI-powered technologies.

As we move forward, it is clear that ChatGPT and similar language processing models will continue to shape our interactions with technology and each other. Their deployment requires a balanced approach that combines human expertise with AI capabilities to ensure accurate, reliable, and ethical outcomes. Its strengths and limitations, its potential benefits and risks, underscore the need for ongoing research, collaboration, and ethical discourse. As society navigates the ever-expanding realm of artificial intelligence, it is imperative to harness the potential of ChatGPT while carefully considering its implications, thereby shaping a future where AI and human intelligence coexist in harmony and mutual benefit.

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