ChatGPT: A brief narrative review

Article *in* Cogent Business & Managment · November 2023

DOI: 10.1080/23311975.2023.2275851

4 authors:

Bulbul Gupta
Jamia Hamdard University
6 PUBLICATIONS **85** CITATIONS
SEE PROFILE

Tabish Mufti
Jamia Hamdard University
28 PUBLICATIONS **194** CITATIONS
SEE PROFILE

Shahab Saquib Sohail
VIT Bhopal
126 PUBLICATIONS **1,371** CITATIONS
SEE PROFILE

Dag Øivind Madsen
University of South-Eastern Norway
209 PUBLICATIONS **2,082** CITATIONS
SEE PROFILE

Cogent Business & Management

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/oabm20

ChatGPT: A brief narrative review

Bulbul Gupta, Tabish Mufti, Shahab Saquib Sohail & Dag Øivind Madsen

To cite this article: Bulbul Gupta, Tabish Mufti, Shahab Saquib Sohail & Dag Øivind Madsen (2023) ChatGPT: A brief narrative review, Cogent Business & Management, 10:3, 2275851, DOI: 10.1080/23311975.2023.2275851

To link to this article: https://doi.org/10.1080/23311975.2023.2275851

Published online: 15 Nov 2023.

Gupta et al., *Cogent Business & Management* (2023), 10: 2275851
https://doi.org/10.1080/23311975.2023.2275851

cogent business & management

INFORMATION & TECHNOLOGY MANAGEMENT | REVIEW ARTICLE

ChatGPT: A brief narrative review

Bulbul Gupta[1], Tabish Mufti[1], Shahab Saquib Sohail[1] and Dag Øivind Madsen[2*]

Abstract: In this study, we present a brief narrative review focused on ChatGPT, a state-of-the-art conversational agent developed using OpenAI's Generative Pretrained Transformer (GPT) framework. Distinctive for its ability to generate text of high quality in real-time, ChatGPT has emerged as a leader among artificial intelligence chatbots, garnering interest from both commercial and scholarly circles. Our review explores the technological underpinnings of ChatGPT, examines its inherent features that support its performance, and analyzes existing research on its applications and impacts across several domains. Through this assessment, we delineate ChatGPT's strengths and limitations, offering informed recommendations for future investigations in this burgeoning research field.

Subjects: Artificial Intelligence; Information & Communication Technology (ICT); Internet & Multimedia - Computing & IT; Technology

Keywords: ChatGpt; artificial intelligence; generative artificial intelligence; machine learning; large language models

Received: 01 June 2023
Accepted: 23 October 2023

*Corresponding author: Dag Øivind Madsen, School of Business, University of South-Eastern Norway, 3511 Hønefoss, Norway
E-mail: dag.oivind.madsen@usn.no

Reviewing editor:
Balan Sundarakani, University of Wollongong Faculty of Business, United Arab Emirates

Additional information is available at the end of the article

1. Introduction

Modern technology relies heavily on Artificial Intelligence (AI), which operates covertly to mimic the human mind and assist us in different ways (Kaplan, 2016). Although AI has a long history, there have been significant advances in recent years (Haenlein & Kaplan, 2019). These advancements have materialized in the development and launch of AI-powered chatbots such as ChatGPT, demonstrating to the public how far AI has progressed (Susnjak, 2022).

ChatGPT-3 was developed using an upgraded form of GPT-3, an improved language-developing AI standard created by OpenAI (Sohail, 2023). The Deep Learning Neural Network (DLNN) utilized in GPT-3 has almost 175 billion Machine Learning (ML) parameters. To place things in context, the biggest acquired language model before GPT-3 was Microsoft's Turing-Natural Language Generation (T-NLG) framework, which includes 10 billion parameters. By the beginning of 2021, GPT-3 was the largest Neural Network (NN) ever built. So far as creating content that looks to have been written by a human, GPT-3 is better than all preceding versions (Khalil & Er, 2023).

The ChatGPT chatbot is built using the OpenAI GPT-3 language structure. It is intended to create text replies that sound like human answers to operator data entered in a chat setting. With the help of a vast database of human communications (training data), OpenAI ChatGPT was developed to provide replies to various subjects and cues. It has been pointed out that Generative AI language models' understanding are based on the patterns and structures they learned from the training data, and these models lack human contextual awareness and understanding (Bozkurt, 2023). Nevertheless, ChatGPT is able to provide useful responses in many different

languages. Some media articles note that it supports nearly 100 languages, and a research study evaluated the chatbot's performance in 37 languages (Lai et al., 2023). Therefore, ChatGPT can be highly useful for users worldwide, for example, in areas such as language translation, client support, and content development activities. The OpenAI API makes ChatGPT accessible, allowing programmers to use and incorporate it into their apps and devices (Gozalo-Brizuela & Garrido-Merchan, 2023).

ChatGPT has sparked a lot of interest, both in the business world and in academic circles (Farhat et al., 2023). It has received massive attention in both traditional and social media (Karanouh, 2023; Leiter et al., 2023). While many supporters have touted the great potential of Generative AI, some skeptics have noted that the discourse around ChatGPT is dominated by hyperbolic language. Some strong critics have sounded the alarm bells and argue that AI models such as ChatGPT can pose a threat to human civilization (Chomsky et al., 2023; Harari, 2023).

Figure 1 shows worldwide search interest for the term "ChatGPT" from 3 March 2022, to 3 March 2023, as measured by Google Trends. The figure shows that the search interest during this period was highest in China but that the interest was also relatively formidable in several large countries such as the United States, Canada, India, and Australia. At the same time, search interest was quite low in countries such as Mexico, Russia, Turkey, Chile, Peru, Argentina, and Iran. It is also notable that there was very little search activity in many of the African countries.

In recent months, numerous comprehensive and systematic reviews on various aspects of ChatGPT literature have emerged (e.g., Li et al., 2023; Ray, 2023; Sallam, 2023; Farhat et al., 2023b). Our paper sets itself apart by utilizing a narrative review approach, which involves an in-depth and critical examination of the existing literature on a specific subject (Ferrari, 2015). Although a narrative review may lack the objectivity and rigor of a systematic review, it provides considerable room for subjective insights and conjectures about future directions in the field of research.

In conducting this narrative literature review, we employed a snowballing type of methodology that combined both backward and forward snowballing techniques (Felizardo et al., 2016; Wohlin, 2014). For backward snowballing, we traced the references cited in recent ChatGPT papers to identify important early works. Concurrently, forward snowballing involved tracking citations of foundational ChatGPT papers to discover more recent studies that build upon or challenge their

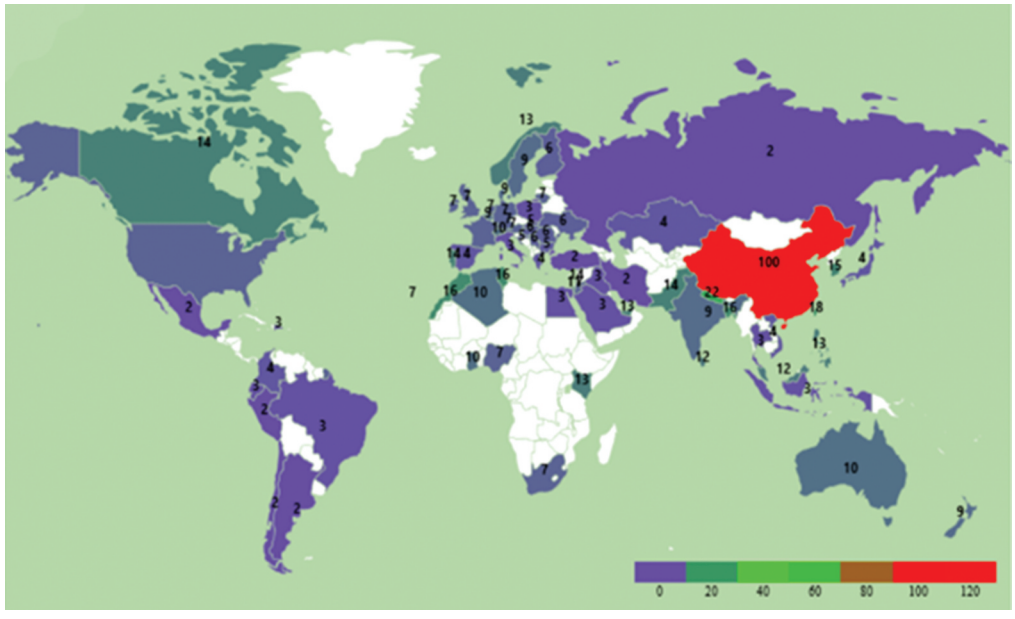

Figure 1. ChatGPT worldwide interest.

Source: Google Trends (trends.google.com/trends).

findings. This approach ensured a well-rounded exploration of the existing body of knowledge on ChatGPT.

In this brief narrative review of the ChatGPT literature, we will explore various facets of this rapidly developing research area. Topics covered will include the technical foundations of ChatGPT, its operational mechanisms, strengths, weaknesses, and the factors contributing to its popularity. Additionally, we will offer insights into potential future trends and research directions.

2. Background of ChatGPT

Silicon Valley has been the epicenter of the development of ChatGPT, and several of the most well-known business and technology figures have been involved in the development and financing of chatbot technology. OpenAI, the business that created ChatGPT, was launched as a charity in 2015 by Greg Brockman, Elon Musk, Ilya Sutskever, Wojciech Zaremba, Peter Thiel, and other technology developers. Its objective was to prevent the centralized control of AI by providing its work openly to the general population. According to information published on OpenAI's website on 11 December 2015, the company aims to develop artificial intelligence in a way that is most likely to benefit humanity (Khan et al., 2023).

Elon Musk resigned from the panel in 2018 because of a conflict of interest with Tesla AI. In 2019, OpenAI changed its status from a non-business entity, to "capped-gain," which would enable investors to earn 100× possible profits while still supporting non-profit endeavors with the leftover funds. In 2019, Microsoft invested $1 billion in OpenAI, and in the last few years, the company has made further investments in the partnership that allows Microsoft to compete with Google's AI business, DeepMind (Lehnert, 2023).

OpenAI has developed ChatGPT over several years. Figure 2 provides a simple overview of the development process of ChatGPT from GPT-3 to GPT-4. As shown, GPT-3 was introduced in 2020, and several GPT-3 models have been released. On 30 November 2022, OpenAI released a downloadable demo of ChatGPT (GPT-3.5). This AI-powered chatbot is able to interact with human communication and provides answers to queries within a couple of seconds. Within five days of its release, ChatGPT had already 1 million users. As we indicated in the introduction, ChatGPT quickly attracted much interest and attention due to its ability to generate thorough and precise replies to queries across various subject areas. It was the first time such a potent and accessible chatbot online interface had been freely accessible to the general public. As a result, OpenAI's projected valuation increased considerably. Although ChatGPT was presented as a free service, commentators quickly noted that it was doubtful that the free service would continue to be available in the future (Deng & Lin, 2022).

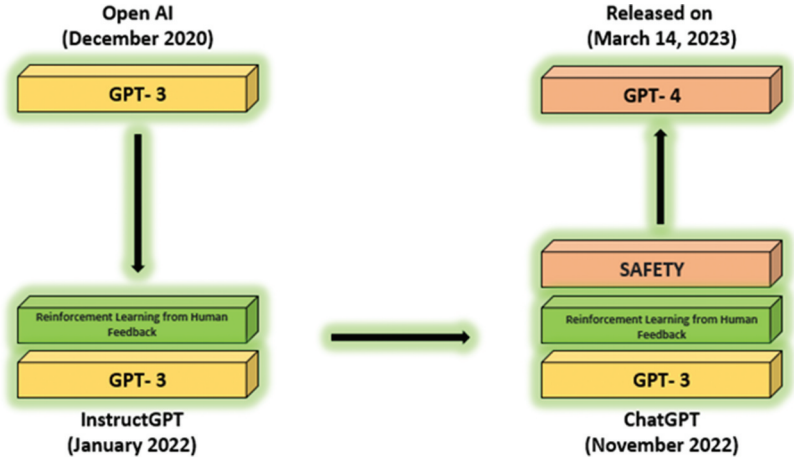

Figure 2. ChatGPT development process.

In March 2023, another key development in the history of ChatGPT took place. On 14 March 2023, ChatGPT-4 was made public through API and to paying ChatGPT+ subscribers. The GPT-4 (Generative Pre-Trained Transformer 4) is the 4th version in the GPT series, and it is a big structure LLM developed by OpenAI. Microsoft acknowledged that earlier iterations of its search engine Bing that utilized GPT actually did so before GPT-4 was formally released. GPT-4 was taught to anticipate the coming unit as a transformer implementing both public and private information and was then enhanced with RL (Reinforcement Learning) via user and AI input for quality management and human synchronization. The following are some potential improvements that GPT-4 offers:

- *Improved Language Modeling*: GPT-4 is anticipated to contain more parameters and to have been trained on a broader range of data sets, which might result in more accurate and reliable language modeling skills.
- *Multimodal Learning*: GPT-4 may be created to learn from a variety of modalities, including text, graphics, audio, and video, enabling it to comprehend and provide answers across several media types.
- *Better Contextual Understanding*: The contextual comprehension and reasoning capabilities of GPT-4 may be more sophisticated, enabling it to produce more logical and pertinent replies depending on the conversation's context.
- *Increased Efficiency*: GPT-4 may be quicker and more energy-efficient than its forerunners, opening it up to a broader variety of applications and devices.
- *Enhanced Creativity*: Beyond the facts and information it has been educated on, GPT-4 may have increased creativity and is able to produce more inventive and varied replies.

3. The mechanism supporting ChatGPT

Generative Pre-Training Transformer 3 (GPT-3) is a state-of-the-art AI system. It enables chatbots to interpret and develop normal language similar to humans with impressive precision and fluency. It is the broadest language standard created to date with 175 billion parameters and the potential to quickly action millions of texts (Ufuk, 2023).

A Deep Neural Network (DNN) has already been tested by OpenAI using a sizable sentence database, and its functionality has been enhanced for purposes like creating sentences or responding to queries. This is the core tech behind Chat GPT-3. The grid is built from several converter units that analyze the entered sentence and show results. In addition, the connection has intra-attention features that allow it to evaluate the significance of various words and terms about one another and the discussions as a whole. Generators also enable ChatGPT-3 to produce meaningful sentences even from minimal information (Gao et al., 2022).

A noteworthy development in Natural Language Processing (NLP) is ChatGPT-3, which utilizes a transformer-built structure to analyze massive volumes of information concurrently and create a language closer to what a human would interpret (Jeblick et al., 2022). This innovation has several applications, including text categorization services, bots, and automatic translation applications. Nevertheless, ChatGPT-3 cannot connect to the Web and can only function by utilizing the Internet it has learned during its development, which restricts its ability to acquire outside knowledge (Rudolph et al., 2023).

Figure 3 displays a word cloud for ChatGPT that is evidence of its vast lexicon and subject-matter expertise. It displays words from various fields, including technology, science, and current events. AI-related terms like "Machine Learning, "ChatGPT," "Neural Networks," and "Deep Learning" are included in the word cloud. It also contains words like "natural language processing," "language generation," and "text completion".

4. Merits of ChatGPT

Since its introduction, there has been an exponential increase in the number of studies on ChatGPT (Sohail et al., 2023b), some of which have even been co-authored with ChatGPT (e.g., Ali & OpenAI,

Figure 3. Word cloud of ChatGPT.

Inc, C., 2023; King & ChatGPT, 2023). Many of the studies have looked at ChatGPT's impact and implications in education (Farrokhnia et al., 2023; Zhai, 2022), business (George & George, 2023; Korzynski et al., 2023) or in the healthcare sector (Li et al., 2023; Sallam, 2023). In the following, we will briefly review the main findings about the merits of ChatGPT in two of these application areas: education and healthcare.

4.1. Education

In the field of education, ChatGPT presents substantial benefits. It can be a supplementary tool for teachers, providing them with resources and content to enhance their teaching methods. For students, ChatGPT can offer personalized tutoring, help clarify complex concepts, and encourage self-paced learning (Kasneci et al., 2023). Additionally, it can generate hypothetical scenarios for various subjects, aiding in practical learning. A comprehensive range of research studies provide insight into the multiple ways ChatGPT can be integrated into educational systems and the potential benefits and risks associated with its use, such as cheating and plagiarism (King & ChatGPT, 2023; Pavlik, 2023; Rudolph et al., 2023; Wang et al., 2022). Studies also show that ChatGPT performs increasingly well on different entrance and standardized exams and tests across academic subjects (Gilson et al., 2022; Huh, 2023; Kung et al., 2023; Wood et al., 2023). While there is still room for development and refinement, the potential of ChatGPT in enhancing educational experiences is vast.

4.2. Healthcare

Much research has also looked at the merits of ChatGPT in the healthcare sector (Cascella et al., 2023; Li et al., 2023; Sallam, 2023). ChatGPT can play a significant role in healthcare, mainly by enhancing accessibility to health information and streamlining health-related processes. For instance, it can serve as a first point of contact on digital health platforms, providing general health information, guiding users through symptom checkers, and referring them to appropriate healthcare resources (Hopkins et al., 2023; Javaid et al., 2023). It can also assist healthcare professionals by summarizing the latest medical research findings from large databases, aiding them in staying on top of current developments. However, it is important to be mindful of ChatGPT's limits, biases, and risks (Sajjad & Saleem, 2023). Therefore, it should not replace professional medical advice or consultation, as it may lack the specialized knowledge to provide direct medical advice.

5. Pros of ChatGPT

Since its launch, ChatGPT has grown in popularity among many demographic groups. However, the response has been relatively mixed. While some praise ChatGPT for its benefits and future potential, others remain more skeptical and criticize it for its shortcomings, constraints, and

possible disadvantages. In the following, we will examine some of the main advantages of ChatGPT (Srivastava, 2023).

5.1. Ability to mimic human dialogue

The primary role of ChatGPT is to mimic human dialogue based on operator-provided submissions or commands. It is similar to AI assistant innovations and system apps such as Alexa and Siri. It is created on more developed Reinforcement Learning (RL) and Supervised Learning (SL) methods implementing Large Learning models (LLL) algorithm and assessing its functionality, and it imitates real-world discussion.

5.2. Intelligent and adaptable language model

Generative Pre-Trained Transformer-3 (GPT-3) is a decoder and language prophecy structure designed by OpenAI. It is considered among the most powerful AI methods ever constructed (Donato et al., 2023). It is tough to decide whether a message is created by an individual due to the high standard of the messages it creates. Being trained on a sizable collection of text, GPT-3 is a very intelligent and adaptable language model. Consequently, ChatGPT is versatile enough to handle multiple tasks due to its extensive data range (Haque et al., 2022).

5.3. Broad-Variety Implementations

ChatGPT can perform multiple functions. It can generate text that compares to that of skilled Artificial Intelligence (AI) writers. Analyses have shown that it is even proficient in noting songs and forming imaginary works, such as novels. It can support technical developers or content supporters in creating a summary (Zhang et al., 2022). Therefore, further exploration of how ChatGPT can be utilized for such tasks is needed (Pardos & Bhandari, 2023).

5.4. Open to additional improvements

The foundation of ChatGPT is a machine learning model, which can be continually improved by being trained on fresh data. Through ChatGPT, the knowledge to make improvements in its responses and available implementation are other benefits. Depending on the presented LLMs, there is always a chance for development via an effective program utilizing SL and RL. An operator can offer additional information about whether they like or dislike a specific answer (Hosseini & Horbach, 2023).

5.5. Natural language understanding

ChatGPT is based on the GPT (Generative Pre-Trained Transformer) architecture, enabling it to comprehend real language's syntactic and grammatical structures. It has the ability to detect typical grammatical constructions and idioms after being trained on a vast corpus of textual data, which includes books, papers, and websites (Kocoń et al., 2023). This implies that even when the data it gets is not constructed correctly or includes faults, it may nevertheless provide replies that are grammatically accurate and semantically relevant (Wang et al., 2023).

5.6. Wide range of applications

Customer support, personal assistance, and content creation are just a few of the uses for ChatGPT. ChatGPT can assist organizations in automating their customer care assistance procedures, lowering the demand for human agents and enhancing response times. ChatGPT can aid users with personal assistance chores like making appointments or looking for information online (Dai et al., 2023). Finally, ChatGPT can create content, such as text for social media postings or marketing initiatives.

Moreover, ChatGPT is a vital tool for several applications due to its features. For example, it can be a useful tool for interacting with users and enhancing their experience because of its grasp of natural language, contextual awareness, and learning capability (Shahriar & Hayawi, 2023). Moreover, it can be useful for companies and organizations wishing to offer top-notch support or customer care due to its scalability and around-the-clock availability.

6. Cons of ChatGPT

The previous section showed that ChatGPT has extensive knowledge of content from various sources, including books, journals, and web pages. Its ability to recall and provide reliable information is critical for several sensitive applications and other essential AI technologies. However, it is not perfect, and its accuracy can be compromised, as it relies on a learning algorithm. Sometimes, ChatGPT may provide biased or fabricated information.

Therefore, ChatGTP is not without its shortcomings and struggles with some of the same problems as many other chatbots in the past. In the following, we will discuss some of the primary drawbacks identified in previous studies (Kasneci et al., 2023).

6.1. Lack of clarity and factual errors

The point that ChatGPT periodically can develop sentences that appear precise or effective but are incorrect or illogical is among the main faults and shortcomings (Wang et al., 2023). Sometimes, ChatGPT cannot completely comprehend a question due to a lack of context, which might result in confused or inaccurate answers. For instance, according to several studies (Farhat et al., 2023; Sohail, 2023; Sohail et al., 2023; Wang et al., 2023), if a user poses a question that depends on details from an earlier exchange, ChatGPT might not be aware of that context and might give an answer that is inaccurate or ambiguous. It is systematic in statistical language standards and is known as "commotion" and highlights the challenge of contextual comprehension in AI language models. Moreover, ChatGPT provides no sources or footnotes regarding where to discover the content. Therefore, it is not optimal to implement this chatbot by itself for digital tracking and study (Kuzman et al., 2023).

6.2. Poor understanding of recent developments

The version of ChatGPT introduced in November 2022 is limited to providing information on events that occurred up to 2021. As it continues to generate content based on text created by humans, it will eventually include references to more current events (Jiao et al., 2023). A notable downside of ChatGPT is its limited understanding of current events. This occurs because the system's training is based on a static text dataset, which may not include the most recent facts or developments (Cao et al., 2023). However, the recent developments related to web browsing in ChatGPT-4 may remedy this problem. Moreover, the introduction of extensions such as WebChatGPT, a web-based version of the technology, appears to reduce some of the errors by directing the queries to specific databases or sites.

6.3. Problems and questions of ethics

The use of ChatGPT also raised numerous ethical issues (Rahimi & Abadi, 2023; Zhuo et al., 2023). Numerous universities and schools have considered limiting access to ChatGPT or banning its use entirely (Ahmad et al., 2023; Hsu, 2023). Because its results rely on human-created sentences, academics and creators have worried about copyright violations (Cooper, 2023). Unintentionally spreading false information or fake news with ChatGPT might have negative repercussions, and this may occur if ChatGPT is not educated on trustworthy information sources or accuracy is not prioritized above interaction. This also raises questions about the appropriateness of using it in operations that require human association, including 24/7 help or psychological counseling (Antaki et al., 2023).

6.4. Possible legal issues

ChatGPT was developed using data from The Common Crawl database, which includes copyrighted content from publishers and works by individual authors and scholars (Sinha et al., 2023). Consequently, there is a possibility that guidance dispensed by ChatGPT in legal or financial matters may not be accurate or fully up-to-date. Individuals or businesses acting on such advice could find themselves liable for any resulting issues. Experts have also cautioned against the risk of using AI-generated services for illicit activities, including computer crime.

6.5. Limited domain expertise

As a general-purpose language model, ChatGPT has certain limitations when it comes to specialized domains (McGee, 2023). Although it is capable of generating responses that are grammatically correct and semantically coherent, it may lack the specialized expertise required to provide accurate responses to queries in specific fields. For example, when confronted with a user asking for a medical consultation, ChatGPT might fall short of providing an appropriate response (Halaweh, 2023). This is because it lacks the domain-specific medical knowledge that a qualified healthcare professional would possess. Despite its extensive training data, it cannot replace expert advice in fields that require specialized education and training.

6.6. Biased responses

Large volumes of text data, some of which may be skewed or problematic, are used to train ChatGPT. This means it may create replies containing prejudice or preconceptions, particularly if the training data have such biases (Xue et al., 2023). If ChatGPT was trained using biased data, it would pick up on such biases and may repeat them in its answers. For instance, ChatGPT may yield results that reflect prejudices or discrimination if the training data contains such biases. This is a well-known problem with many AI models, and work is being done to fix it by using more representative and varied training data (AlAfnan et al., 2023).

ChatGPT's drawbacks are attributed to its difficulties in comprehending specialized topics, propensity for producing biased replies, lack of emotional intelligence, and restricted comprehension of context. However, even though these drawbacks may be considerable, continuous work in the field of natural language processing is being done to find solutions (Zhu et al., 2023).

7. The future of ChatGPT

Currently, ChatGPT technology has gained traction in many areas of business and society (George & George, 2023; Haleem et al., 2023; Hassani & Silva, 2023). Figure 4 provides an overview and illustration of future applications of ChatGPT in different sectors of the economy. As we move forward, there is potential for this technology to be refined and streamlined, potentially revolutionizing the way humans create value. However, alongside these advancements, concerns are emerging about the technology's potential impact on employment, stirring long-standing debates about how AI might transform or even displace certain job roles (Bessen, 2018; Davenport & Westerman, 2018).

In the following, we will look at a few of ChatGPT's applications and speculate about ChatGPT's future development and trajectory. Moreover, we will develop several proposition and indicate how these can be tested in future research.

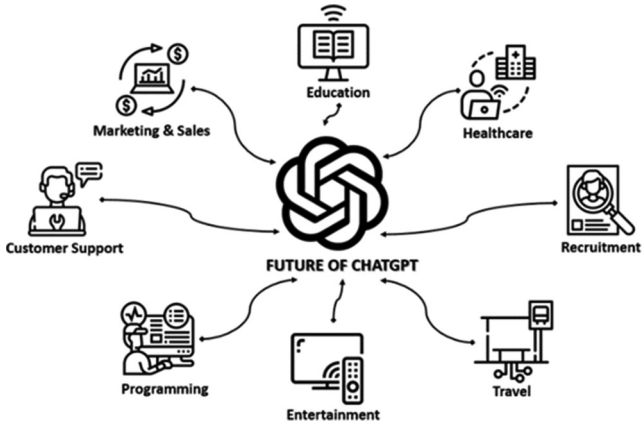

Figure 4. Overview of future applications of ChatGPT in different sectors.

7.1. Customer support

ChatGPT is also likely to affect how businesses interact and engage with consumers (Dwivedi et al., 2023; Paul et al., 2023). AI-based chatbots may respond to consumer inquiries quickly and provide round-the-clock client service. The enthusiasm that ChatGPT has generated is evidence of its ingenuity and growing significance in the AI industry. There is significant scope for ChatGPT to be connected with current interactive AI to enhance user support discussions as the technology develops, and many firms use AI innovations to enhance the customer experience. In the future, by responding to customers' wants and questions in a quicker and more personalized way, they may be able to dramatically enhance the level of customer service (Sanmarchi et al., 2023).

Proposition: *The integration of ChatGPT-powered chatbots in customer support processes will lead to a reduction in average response time and an improvement in customer satisfaction scores*. To test this proposition, researchers could conduct experiments or collect data from businesses that have implemented ChatGPT in their customer support operations. They can compare response times and customer satisfaction scores before and after ChatGPT integration to determine if there is a difference, providing valuable insights into the impact of ChatGPT on customer support efficiency and customer satisfaction.

7.2. Marketing and sales

ChatGPT has a multitude of applications in marketing and sales (Dwivedi et al., 2023; George & George, 2023; Rivas & Zhao, 2023). By helping clients in the purchasing process, chatbots can aid in information processing, outlook assessment, and proposed settlement. A catchy title is necessary for written material to do effectively on search engines, making this a crucial advantage of creative AI technologies like ChatGPT. Marketing professionals may also use this AI tool's power and ability to create intriguing headlines and content for articles, seminars, and conferences. Employers can use chatbots to simplify several steps in the hiring and recruitment process, boosting productivity and reducing costs and time (Korzynski et al., 2023). AI-powered chatbots can also assist employers in simplifying the hiring process by pre-screening applicants. Moreover, in the future, chatbots can likely compile key information about possible clients and offer parameterized testing recommendations to the marketing and sales teams, allowing them to customize their strategy.

Proposition: *The integration of ChatGPT-powered chatbots in marketing and sales processes will lead to an increase in lead conversion rates and a reduction in customer acquisition costs*. To test this proposition, researchers could analyze marketing and sales data from businesses that have integrated ChatGPT-powered chatbots into their processes. They can compare lead conversion rates and customer acquisition costs before and after ChatGPT implementation to determine if there is a difference. Such studies could shed light on the effectiveness of ChatGPT in enhancing marketing and sales outcomes.

7.3. Education

AI-based chatbots like ChatGPT have many applications in education (Baidoo-Anu & Owusu Ansah, 2023; Bozkurt, 2023; Bozkurt et al., 2023; Farrokhnia et al., 2023; Kasneci et al., 2023; Tlili et al., 2023) and have emerged as a useful tool for instructors to educate students and provide them with engaging and informative responses to their questions. Gill et al. (2023) argue that ChatGPT can have "transformative effects" on the learning environment. Among the educational applications of ChatGPT, one possibility is the creation of quizzes and tests that can help evaluate the learners' knowledge and progress. ChatGPT is known for its advanced capabilities and extensive data resources, which make it a powerful educational tool. However, it is essential to note that the dataset used to train ChatGPT is compiled from various online sources, some of which may contain

errors or inaccuracies. For example, several authors have noted that ChatGPT sometimes makes up facts and "hallucinates" (Alkaissi & McFarlane, 2023; Azamfirei et al., 2023), for example, by generating "ghost" bibliographic references that sound plausible but in reality are fake (Orduña-Malea & Cabezas-Clavijo, 2023). This indicates that students should utilize ChatGPT as a reference comparable to Wikipedia, which has also been criticized for inaccuracies (Holman Rector, 2008).

Therefore, it is crucial for instructors to carefully review and validate the responses provided by ChatGPT before incorporating them into their instructional materials. However, with the right precautions and monitoring, ChatGPT can be an effective tool for enhancing students' learning experience. In particular, ChatGPT can be a useful approach for a broad understanding and a preliminary step in the learning process (Cotton et al., 2023).

Proposition: *The integration of ChatGPT-powered virtual tutors in educational settings will lead to an improvement in student engagement, knowledge retention, and learning outcomes.* To test this proposition, researchers could carry out controlled experiments or longitudinal studies in educational settings where ChatGPT is used as a supplementary teaching tool. They can measure student engagement levels, knowledge retention, and learning outcomes, comparing the results of groups with and without ChatGPT assistance. This research can provide insights into the potential benefits of using ChatGPT in education.

7.4. Healthcare

Much research has looked at the prospects of ChatGPT in the healthcare context (Cascella et al., 2023; Javaid et al., 2023; Li et al., 2023; Sallam, 2023; Vaishya et al., 2023). AI-based chatbots can provide individualized health advice and assistance in identifying medical issues. Patients may find it difficult to remember to take their prescriptions on schedule and to adhere to their physician's dose recommendations, especially if they are taking many medications. Patients can utilize ChatGPT to handle their medication regimens, containing alerts, dose guidelines, and possible bad impacts. Medicine use, restrictions, and other vital factors impacting pharmacological intervention can also be discussed with patients via ChatGPT. Furthermore, ChatGPT can help patients have a better healthcare experience by automating organizational activities like consultation registration and treatment plan updates (Jeblick et al., 2022). However, it is important to keep in mind the chatbot's limitations since research has found that it sometimes gives erroneous responses to medical questions (Vaishya et al., 2023).

Proposition: *The integration of ChatGPT-powered virtual healthcare assistants into clinical workflows will lead to a reduction in healthcare administrative burden, improved patient engagement, and increased overall healthcare efficiency.* To test this proposition, researchers could conduct studies in healthcare settings where ChatGPT is used to assist healthcare professionals and interact with patients. Specifically, researchers could measure changes in administrative workloads, patient engagement levels, and overall healthcare efficiency, comparing the results of healthcare facilities that have integrated ChatGPT with those that have not. This research could yield insights into the potential benefits of using ChatGPT in healthcare.

7.5. Language translation

ChatGPT can be utilized for language translation problems since it has a comprehensive language model (Jiao et al., 2023). It can be trained on huge datasets of parallel text and text in two languages that mean the same thing. It can then be implemented to translate text from one language to another because of its capacity to produce a coherent text. By learning the

connections between vocabulary and grammatical conventions in both languages, ChatGPT, for instance, may produce a similar phrase in one language given a sentence in another language. It can generate appropriate translations by considering a sentence's context and meaning (Zarifhonarvar, 2023).

Proposition: *The utilization of ChatGPT for language translation will lead to improvements in the accuracy and efficiency of cross-language communication, making it a valuable tool for bridging language barriers*. To test this proposition, researchers could conduct experiments or evaluations comparing the accuracy and efficiency of ChatGPT-powered language translation with traditional translation methods or other machine translation systems. More specifically, researchers could collect data on translation quality, speed, and user satisfaction, comparing the results between the use of ChatGPT and other methods. Such research could yield valuable insights into the effectiveness of ChatGPT in improving language translation processes.

7.6. Travel

ChatGPT also has a multitude of applications in travel, tourism, and hospitality (Ali & OpenAI, Inc, C., 2023; Carvalho & Ivanov, 2023; Dwivedi et al., 2023; Gursoy et al., 2023; Iskender, 2023; Ivanov & Soliman, 2023). Chatbots have become increasingly popular in the tourism industry, providing visitors with a seamless and convenient way to book tickets, hotel rooms, and other accommodations. Additionally, AI-powered chatbots have the potential to revolutionize the tourism industry by offering real-time information on climate conditions, local events, and flight details, making it easier for travelers to plan their journeys and stay up to date on any changes or delays. Altogether, ChatGPT can revolutionize the tourism and hospitality sector by arranging trips in a better way, enhancing the guest experience, offering language translation services, enhancing promotional activities, and allowing for advanced analytics (Ali & OpenAI, Inc, C., 2023).

Proposition: *The integration of ChatGPT-powered virtual travel assistants in travel booking and planning services will lead to an increase in customer satisfaction, more personalized travel experiences, and improved operational efficiency for travel companies*. To test this proposition, researchers could conduct studies or surveys comparing the experiences and satisfaction levels of travelers who have used ChatGPT-powered virtual travel assistants with those who have not. More specifically, researchers could collect data on customer satisfaction, personalized travel recommendations, and operational efficiency improvements within travel companies. This type of research would provide insights into the potential benefits of using ChatGPT in the travel industry.

7.7. Entertainment

Creative writing is one area where ChatGPT does well (Taecharungroj, 2023), and therefore, it has various promising applications in the entertainment industry. For instance, AI-powered chatbots could offer personalized recommendations for TV shows, music albums, and various other forms of entertainment tailored to individual tastes and preferences. Additionally, they have the potential to generate complete scripts for movies or TV shows and even craft lyrics for songs. The possibility of AI in reshaping and enhancing the entertainment experience is vast and intriguing. Although some are skeptical (Bhandari, 2023), it is likely that ChatGPT will become a helpful technique for the film industry, providing various benefits, such as audience commentary and actionable insights into directing, writing, and personality creation. In this manner, directors may use AI to generate more interesting and popular movies while preserving the craftsmanship and innovation that have long been at the core of the movie industry (Haensch et al., 2023).

Proposition: *The integration of ChatGPT-powered virtual entertainment assistants in streaming platforms and gaming will lead to an increase in user engagement, personalized content recommendations, and overall entertainment satisfaction*. To test this proposition, researchers could conduct user studies or surveys comparing the engagement levels, content recommendations, and satisfaction of users who have interacted with ChatGPT-powered virtual entertainment assistants with those who have not. They could collect data on user preferences, content consumption, and user feedback to evaluate the impact of ChatGPT on entertainment experiences. This type of research would shed light on the potential benefits of using ChatGPT in the entertainment industry.

7.8. Programming

The emergence of AI programmers like ChatGPT will also result in a growth in the need for computer programmers knowledgeable in data science methods. For instance, developers proficient in Go, Python, and other advanced analytics tools and languages can develop, implement, and deploy applications. Moreover, programmers can write programs faster, more easily, and quickly by using ChatGPT, which can produce program clips depending on particular computer programming and patterns. Merow et al. (2023) found that ChatGPT could be highly useful for speeding up monotonous parts of coding, which allows users to free up time and energy to focus on the more challenging parts. Finally, ChatGPT can aid in the review process and troubleshooting (Sobania et al., 2023).

Proposition: *The integration of ChatGPT-powered code assistants in programming environments will lead to an improvement in developer productivity, code quality, and knowledge transfer among software development teams*. To test this proposition, researchers could conduct experiments or case studies involving software development teams using ChatGPT-powered code assistants and compare their productivity, code quality, and knowledge transfer experiences with those who do not have access to such tools. Data on code development metrics, error rates, and team dynamics can be collected and analyzed to evaluate the impact of ChatGPT on programming-related tasks and collaboration within development teams. This type of research would be able to cast light on the potential benefits of using ChatGPT in the field of programming.

7.9. Personal assistants

With its capacity to interpret natural language and produce coherent text, ChatGPT has demonstrated considerable promise as a personal assistant providing 24/7 communication, for example, for tourists (Wong et al., 2023). To give consumers even more in-depth support, in the future, it could be integrated with other software programs, such as email and calendar apps. To increase its precision and effectiveness over time, ChatGPT may employ machine learning techniques. It will learn from user input and interactions to better comprehend specific preferences and requirements. Therefore, ChatGPT may become a more potent tool for productivity and personal organizing as technology develops and natural language processing improves (Murk et al., 2023).

Proposition: *The integration of ChatGPT as a personal assistant will lead to an improvement in individual productivity, organization, and information retrieval, resulting in enhanced personal and professional effectiveness*. To test this proposition, researchers could conduct user studies or surveys comparing the productivity levels, organization, and information retrieval experiences of individuals who use ChatGPT as a personal assistant with those who do not. For example, researchers could collect data on task completion times, task management efficiency, and user satisfaction to evaluate the impact of ChatGPT on personal and professional effectiveness. Such research would be able to shed light on the potential benefits of using ChatGPT as a personal assistant.

8. Conclusion

According to this brief narrative review of ChatGPT, it is undeniable that AI technology has advanced significantly, and AI language tools like ChatGPT have a multitude of real-world applications. Furthermore, it is evident that ChatGPT stands out as a robust natural language processing system capable of generating text that closely mimics human-like speech and writing. By employing advanced AI technologies like ChatGPT, businesses and society at large can reap a host of benefits. These include increased operational efficiency, heightened accuracy in information delivery, and substantial cost reductions. These advantages make such technologies increasingly integral in a wide range of applications, from customer service to content generation. That said, it is important to consider the limitations, which include security issues and restricted capabilities. Despite these challenges, ChatGPT is a rapidly advancing AI platform capable of automating conversations and delivering more accurate responses. At the same time, it is important to note that human oversight is still required to ensure the generated content meets specific standards. Therefore, it cannot, for the time being, fully substitute for human authors.

The primary objective of this paper was to conduct a brief narrative review of ChatGPT, an AI-powered conversational chatbot. Given the nature and scope of a narrative review, as opposed to a systematic review or meta-analysis, there are several limitations that readers should keep in mind.

Firstly, the brevity of the review implies that not all aspects of ChatGPT could be covered exhaustively. The paper provides a high-level overview of ChatGPT research rather than an in-depth analysis, and as a result, some nuances or complexities might have been overlooked. Secondly, narrative reviews are inherently prone to author bias, as they often do not follow a strict methodological framework for selecting and evaluating the literature. Consequently, this review may only capture part of the spectrum of perspectives or findings related to ChatGPT. Thirdly, the rapidly evolving landscape of AI and conversational agents means that the information presented might quickly become outdated. Future versions of ChatGPT (e.g. GPT-5) or competing technologies such as Google Bard could offer features and capabilities not covered in this review, making the findings less applicable over time. Fourthly, the paper does not provide quantitative analysis or statistical evaluations, which would be more rigorous in assessing the merits or limitations of ChatGPT. This leaves our critique largely qualitative and interpretive in nature. Lastly, the review does not encompass all available research or documentation related to ChatGPT, including proprietary studies, which could offer further insights into its capabilities and limitations. Therefore, while this narrative review aims to provide a foundational understanding of ChatGPT, it is important to view its findings within the context of these limitations.

Author details
Bulbul Gupta[1]
Tabish Mufti[1]
Shahab Saquib Sohail[1]
ORCID ID: http://orcid.org/0000-0002-5944-7371
Dag Øivind Madsen[2]
E-mail: dag.oivind.madsen@usn.no
ORCID ID: http://orcid.org/0000-0001-8735-3332
[1] Department of Computer Science and Engineering, SEST, Jamia Hamdard, New Delhi, India.
[2] School of Business, University of South-Eastern Norway, Hønefoss, Norway.

Disclosure statement
No potential conflict of interest was reported by the author(s).

Citation information
Cite this article as: ChatGPT: A brief narrative review, Bulbul Gupta, Tabish Mufti, Shahab Saquib Sohail & Dag Øivind Madsen, *Cogent Business & Management* (2023), 10: 2275851.

References

Ahmad, N., Murugesan, S., & Kshetri, N. (2023). Generative Artificial intelligence and the education sector. *Computer*, *56*(6), 72–76. https://doi.org/10.1109/MC.2023.3263576

AlAfnan, M. A., Dishari, S., Jovic, M., & Lomidze, K. (2023). ChatGPT as an educational tool: Opportunities, challenges, and recommendations for communication, business writing, and composition courses. *Journal of Artificial Intelligence and Technology*. https://doi.org/10.37965/jait.2023.0184

Ali, F., & OpenAI, Inc, C. (2023). Let the devil speak for itself: Should ChatGPT be allowed or banned in hospitality and tourism schools? *Journal of Global Hospitality and Tourism*, *2*(1), 1–6. https://doi.org/10.5038/2771-5957.2.1.1016

Alkaissi, H., & McFarlane, S. I. (2023). Artificial hallucinations in ChatGPT: Implications in scientific writing. *Cureus*, *15*(2). https://doi.org/10.7759/cureus.35179

Antaki, F., Touma, S., Milad, D., El-Khoury, J., & Duval, R. (2023). *Evaluating the performance of chatgpt in*

ophthalmology: An analysis of its successes and shortcomings. medRxiv: 2023. 2001. 2022.23284882.

Azamfirei, R., Kudchadkar, S. R., & Fackler, J. (2023). Large language models and the perils of their hallucinations. *Critical Care*, *27*(1), 1–2. https://doi.org/10.1186/s13054-023-04393-x

Baidoo-Anu, D., & Owusu Ansah, L. (2023). Education in the era of generative artificial intelligence (AI): Understanding the potential benefits of ChatGPT in promoting teaching and learning. *SSRN Electronic Journal*. *Available at SSRN 4337484*. https://doi.org/10.2139/ssrn.4337484

Bessen, J. (2018). *AI and jobs: The role of demand*. National Bureau of Economic Research.

Bhandari, K. S. (2023). How ChatGPT could harm the film industry. *Entrepreneur India*. https://www.entrepreneur.com/en-in/news-and-trends/how-chat-gpt-could-harm-the-film-industry/444494

Bozkurt, A. (2023). Generative artificial intelligence (AI) powered conversational educational agents: The inevitable paradigm shift. *Asian Journal of Distance Education*, *18*(1). https://www.asianjde.com/ojs/index.php/AsianJDE/article/view/718

Bozkurt, A., Xiao, J., Lambert, S., Pazurek, A., Crompton, H., Koseoglu, S., Farrow, R., Bond, M., Nerantzi, C., Honeychurch, S., Bali, M., Dron, J., Mir, K., Stewart, B., Costello, E., Mason, J., Stracke, C., Romero-Hall, E., Koutropoulos, A., & Jandrić, P. (2023). Speculative futures on ChatGPT and generative artificial intelligence (AI): A collective reflection from the educational landscape. *Asian Journal of Distance Education*, *18*(1), 53–130. https://www.asianjde.com/ojs/index.php/AsianJDE/article/view/709

Cao, Y., Li, S., Liu, Y., Yan, Z., Dai, Y., Yu, P. S., & Sun, L. (2023). *A comprehensive survey of AI-Generated content (AIGC): A history of Generative AI from GAN to ChatGPT*. arXiv preprint arXiv:2303.04226.

Carvalho, I., & Ivanov, S. (2023). ChatGPT for tourism: Applications, benefits and risks. *Tourism Review*. https://doi.org/10.1108/TR-02-2023-0088

Cascella, M., Montomoli, J., Bellini, V., & Bignami, E. (2023). Evaluating the feasibility of ChatGPT in healthcare: An analysis of multiple clinical and research scenarios. *Journal of Medical Systems*, *47*(1), 33. https://doi.org/10.1007/s10916-023-01925-4

Chomsky, N., Roberts, I., & Watumull, J. 2023. Noam Chomsky: The false promise of ChatGPT. *The New York Times, 8*.

Cooper, G. (2023). Examining science education in ChatGPT: An exploratory study of generative artificial intelligence. *Journal of Science Education and Technology*, *32*(3), 444–452. https://doi.org/10.1007/s10956-023-10039-y

Cotton, D. R., Cotton, P. A., & Shipway, J. R. (2023). Chatting and cheating: Ensuring academic integrity in the era of ChatGPT. *Innovations in Education and Teaching International*, 1–12. https://doi.org/10.1080/14703297.2023.2190148

Dai, H., Liu, Z., Liao, W., Huang, X., Wu, Z., Zhao, L., Liu, W., Liu, N., Li, S., & Zhu, D. (2023). *ChatAug: Leveraging ChatGPT for text data augmentation*. arXiv preprint arXiv:2302.13007.

Davenport, T. H., & Westerman, G. (2018). Why so many high-profile digital transformations fail. *Harvard Business Review*, *9*. https://hbr.org/2018/03/why-so-many-high-profile-digital-transformations-fail

Deng, J., & Lin, Y. (2022). The benefits and challenges of ChatGPT: An overview. *Frontiers in Computing and Intelligent Systems*, *2*(2), 81–83. https://doi.org/10.54097/fcis.v2i2.4465

Donato, H., Escada, P., & Villanueva, T. (2023). A Transparência da Ciência com o ChatGPT e as Ferramentas Emergentes de Inteligência Artificial: Como se Devem Posicionar as Revistas Científicas Médicas? *The Transparency of Science with ChatGpt and the Emerging Artificial Intelligence Language Models: Where Should Medical Journals Stand?*. https://doi.org/10.20344/amp.19694

Dwivedi, Y. K., Kshetri, N., Hughes, L., Slade, E. L., Jeyaraj, A., Kar, A. K., Baabdullah, A. M., Koohang, A., Raghavan, V., Ahuja, M., Albanna, H., Albashrawi, M. A., Al-Busaidi, A. S., Balakrishnan, J., Barlette, Y., Basu, S., Bose, I., Brooks, L. … Wirtz, J. (2023). Opinion paper: "so what if ChatGPT wrote it?" multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI for research, practice and policy. *International Journal of Information Management*, *71*, 102642. https://doi.org/10.1016/j.ijinfomgt.2023.102642

Farhat, F., Silva, E. S., Hassani, H., Madsen, D. Ø., Sohail, S. S., Himeur, Y., Alam, M. A., & Zafar, A. (2023). *Analyzing the scholarly footprint of ChatGPT: Mapping the progress and identifying future trends*. Preprints.org doi:https://doi.org/10.20944/preprints202306.2100.v1.

Farhat, F., Sohail, S. S., & Madsen, D. Ø. (2023). How trustworthy is ChatGPT? The case of bibliometric analyses. *Cogent Engineering*, *10*(1), 2222988. https://doi.org/10.1080/23311916.2023.2222988

Farrokhnia, M., Banihashem, S. K., Noroozi, O., & Wals, A. (2023). A SWOT analysis of ChatGPT: Implications for educational practice and research. *Innovations in Education and Teaching International*, 1–15. https://doi.org/10.1080/14703297.2023.2195846

Felizardo, K. R., Mendes, E., Kalinowski, M., Souza, É. F., & Vijaykumar, N. L. 2016. *Using forward snowballing to update systematic reviews in software engineering. Paper presented at the Proceedings of the 10th ACM/IEEE International Symposium on Empirical Software Engineering and Measurement* (pp. 1–6). https://doi.org/10.1145/2961111.2962630.

Ferrari, R. (2015). Writing narrative style literature reviews. *Medical Writing*, *24*(4), 230–235. https://doi.org/10.1179/2047480615Z.000000000329

Gao, C. A., Howard, F. M., Markov, N. S., Dyer, E. C., Ramesh, S., Luo, Y., & Pearson, A. T. (2022). *Comparing scientific abstracts generated by ChatGPT to original abstracts using an artificial intelligence output detector, plagiarism detector, and blinded human reviewers*. bioRxiv: 2022.2012.2023.521610.

George, A. S., & George, A. H. (2023). A review of ChatGPT AI's impact on several business sectors. *Partners Universal International Innovation Journal*, *1*(1), 9–23.

Gill, S. S., Xu, M., Patros, P., Wu, H., Kaur, R., Kaur, K., Fuller, S., Singh, M., Arora, P., Parlikad, A. K., Stankovski, V., Abraham, A., Ghosh, S. K., Lutfiyya, H., Kanhere, S. S., Bahsoon, R., Rana, O., Dustdar, S. … Buyya, R. (2023). Transformative effects of ChatGPT on modern education: Emerging era of AI chatbots. *Internet of Things and Cyber-Physical Systems*, *4*, 19–23. https://doi.org/10.1016/j.iotcps.2023.06.002

Gilson, A., Safranek, C., Huang, T., Socrates, V., Chi, L., Taylor, R. A., & Chartash, D. (2022). *How well does ChatGPT do when taking the medical licensing exams? The implications of large language models for medical education and knowledge assessment*. medRxiv: 2022.2012. 2023.22283901.

Gozalo-Brizuela, R., & Garrido-Merchan, E. C. (2023). *ChatGPT is not all you need. A state of the art review of large Generative AI models*. arXiv preprint arXiv:2301.04655.

Gursoy, D., Li, Y., & Song, H. (2023). ChatGPT and the hospitality and tourism industry: An overview of current trends and future research directions. *Journal of Hospitality Marketing & Management*, *32* (5), 579–592. https://doi.org/10.1080/19368623.2023.2211993

Haenlein, M., & Kaplan, A. (2019). A brief history of artificial intelligence: On the past, present, and future of artificial intelligence. *California Management Review*, *61*(4), 5–14. https://doi.org/10.1177/0008125619864925

Haensch, A.-C., Ball, S., Herklotz, M., & Kreuter, F. (2023). *Seeing ChatGPT through students' eyes: An analysis of TikTok data*. arXiv preprint arXiv:2303.05349.

Halaweh, M. (2023). ChatGPT in education: Strategies for responsible implementation. *Contemporary Educational Technology*, *15*(2), ep421. https://doi.org/10.30935/cedtech/13036

Haleem, A., Javaid, M., & Singh, R. P. (2023). An era of ChatGPT as a significant futuristic support tool: A study on features, abilities, and challenges. *BenchCouncil Transactions on Benchmarks, Standards and Evaluations*, *2*(4), 100089. https://doi.org/10.1016/j.tbench.2023.100089

Haque, M. U., Dharmadasa, I., Sworna, Z. T., Rajapakse, R. N., & Ahmad, H. (2022). *"I think this is the most disruptive technology": Exploring sentiments of ChatGPT early adopters using Twitter data*. arXiv preprint arXiv:2212.05856.

Harari, Y. N. (2023). Yuval Noah Harari argues that AI has hacked the operating system of human civilisation. *The Economist*. https://www.economist.com/by-invitation/2023/04/28/yuval-noah-harari-argues-that-ai-has-hacked-the-operating-system-of-human-civilisation

Hassani, H., & Silva, E. S. (2023). The role of ChatGPT in data science: How AI-Assisted conversational interfaces are revolutionizing the field. *Big Data and Cognitive Computing*, *7*(2), 62. https://doi.org/10.3390/bdcc7020062

Holman Rector, L. (2008). Comparison of Wikipedia and other encyclopedias for accuracy, breadth, and depth in historical articles. *Reference Services Review*, *36*(1), 7–22. https://doi.org/10.1108/00907320810851998

Hopkins, A. M., Logan, J. M., Kichenadasse, G., & Sorich, M. J. (2023). Artificial intelligence chatbots will revolutionize how cancer patients access information: ChatGPT represents a paradigm-shift. *JNCI Cancer Spectrum*, *7*(2). https://doi.org/10.1093/jncics/pkad010

Hosseini, M., & Horbach, S. P. (2023). Fighting reviewer fatigue or amplifying bias? Considerations and recommendations for use of ChatGPT and other large language models in scholarly peer review. *Research Integrity and Peer Review*, *8*(1). https://doi.org/10.1186/s41073-023-00133-5

Hsu, J. (2023). Should schools ban AI chatbots? *New Scientist*, *257*(3422), 15. https://doi.org/10.1016/S0262-4079(23)00099-4

Huh, S. (2023). Issues in the 3rd year of the COVID-19 pandemic, including computer-based testing, study design, ChatGPT, journal metrics, and appreciation to reviewers. *Journal of Educational Evaluation for Health Professions*, *20*, 5. https://doi.org/10.3352/jeehp.2023.20.5

Iskender, A. (2023). Holy or unholy? Interview with open AI's ChatGPT. *European Journal of Tourism Research*, *34*, 3414–3414. https://doi.org/10.54055/ejtr.v34i.3169

Ivanov, S., & Soliman, M. (2023). Game of algorithms: ChatGPT implications for the future of tourism education and research. *Journal of Tourism Futures*, *9*(2), 214–221. ahead-of-print(ahead-of-print). https://doi.org/10.1108/JTF-02-2023-0038

Javaid, M., Haleem, A., & Singh, R. P. (2023). ChatGPT for healthcare services: An emerging stage for an innovative perspective. *BenchCouncil Transactions on Benchmarks, Standards and Evaluations*, *3*(1), 100105. https://doi.org/10.1016/j.tbench.2023.100105

Jeblick, K., Schachtner, B., Dexl, J., Mittermeier, A., Stüber, A. T., Topalis, J., Weber, T., Wesp, P., Sabel, B., & Ricke, J. 2022. *ChatGPT makes Medicine easy to swallow: An exploratory case study on simplified radiology reports*. arXiv preprint arXiv:2212.14882.

Jiao, W., Wang, W., Huang, J.-T., Wang, X., & Tu, Z. (2023). *Is ChatGPT a good translator? A preliminary study*. arXiv preprint arXiv:2301.08745.

Kaplan, J. (2016). *Artificial intelligence: What everyone needs to know*. Oxford University Press.

Karanouh, M. (2023). *Mapping ChatGPT in mainstream media: Early quantitative insights through Sentiment analysis and word frequency analysis*. arXiv preprint arXiv:2305.18340.

Kasneci, E., Seßler, K., Küchemann, S., Bannert, M., Dementieva, D., Fischer, F., Gasser, U., Groh, G., Günnemann, S., Hüllermeier, E., Krusche, S., Kutyniok, G., Michaeli, T., Nerdel, C., Pfeffer, J., Poquet, O., Sailer, M., Schmidt, A. … Kuhn, J. (2023). ChatGPT for good? On opportunities and challenges of large language models for education. *Learning and Individual Differences*, *103*, 102274. https://doi.org/10.1016/j.lindif.2023.102274

Khalil, M., & Er, E. (2023). *Will ChatGPT get you caught? Rethinking of plagiarism detection*. arXiv preprint arXiv:2302.04335.

Khan, R. A., Jawaid, M., Khan, A. R., & Sajjad, M. (2023). ChatGPT-Reshaping medical education and clinical management. *Pakistan Journal of Medical Sciences*, *39*(2). https://doi.org/10.12669/pjms.39.2.7653

King, M. R., & ChatGPT. (2023). A conversation on artificial intelligence, chatbots, and plagiarism in higher education. *Cellular and Molecular Bioengineering*, *16*(1), 1–2. https://doi.org/10.1007/s12195-022-00754-8

Kocoń, J., Cichecki, I., Kaszyca, O., Kochanek, M., Szydło, D., Baran, J., Bielaniewicz, J., Gruza, M., Janz, A., Kanclerz, K., Kocoń, A., Koptyra, B., Mieleszczenko-Kowszewicz, W., Miłkowski, P., Oleksy, M., Piasecki, M., Radliński, Ł., Wojtasik, K., Woźniak, S., & Kazienko, P. (2023). ChatGPT: Jack of all trades, master of none. *Information Fusion 99*, 101861. arXiv preprint arXiv:2302.10724. https://doi.org/10.1016/j.inffus.2023.101861

Korzynski, P., Mazurek, G., Altmann, A., Ejdys, J., Kazlauskaite, R., Paliszkiewicz, J., Wach, K., & Ziemba, E. (2023). Generative artificial intelligence as a new context for management theories: Analysis of ChatGPT. *Central European Management Journal*, ahead-of-print(ahead-of-print), *31*(1), 3–13. https://doi.org/10.1108/CEMJ-02-2023-0091

Kung, T. H., Cheatham, M., Medenilla, A., Sillos, C., De Leon, L., Elepaño, C., Madriaga, M., Aggabao, R., Diaz-Candido, G., Maningo, J., Tseng, V., & Dagan, A. (2023). Performance of ChatGPT on USMLE: Potential for AI-assisted medical education using large language models. *PLoS Digital Health*, *2*(2), e0000198. https://doi.org/10.1371/journal.pdig.0000198

Kuzman, T., Ljubešić, N., & Mozetič, I. (2023). *ChatGPT: Beginning of an end of manual annotation? Use case of automatic genre identification*. arXiv preprint arXiv:2303.03953.

Lai, V. D., Ngo, N. T., Veyseh, A. P. B., Man, H., Dernoncourt, F., Bui, T., & Nguyen, T. H. (2023). *Chatgpt beyond english: Towards a comprehensive evaluation of large language models in multilingual learning*. arXiv preprint arXiv:2304.05613.

Lehnert, K. (2023). *AI insights into theoretical physics and the Swampland program: A journey through the cosmos with ChatGPT*. arXiv preprint arXiv:2301.08155.

Leiter, C., Zhang, R., Chen, Y., Belouadi, J., Larionov, D., Fresen, V., & Eger, S. (2023). *ChatGPT: A meta-analysis after 2.5 months*. arXiv preprint arXiv:2302.13795.

Li, J., Dada, A., Kleesiek, J., & Egger, J. (2023). *ChatGPT in healthcare: A taxonomy and systematic review*. medRxiv: 2023.2003. 2030.23287899.

McGee, R. W. 2023. Who were the 10 best and 10 worst US presidents? The Opinion of chat GPT (Artificial intelligence). *The Opinion of Chat GPT (Artificial Intelligence)*. February 23, 2023.

Merow, C., Serra-Diaz, J. M., Enquist, B. J., & Wilson, A. M. (2023). *AI chatbots can boost scientific coding*. Nature Ecology & Evolution.

Murk, W., Goralnick, E., Brownstein, J. S., & Landman, A. B. (2023). *An opportunity to standardize and enhance Intelligent virtual assistant-delivered layperson cardiopulmonary resuscitation instructions*. medRxiv: 2023.2003.2009.23287050.

Orduña-Malea, E., & Cabezas-Clavijo, Á. (2023). ChatGPT and the potential growing of ghost bibliographic references. *Scientometrics*, *128*(9), 5351–5355. https://doi.org/10.1007/s11192-023-04804-4

Pardos, Z. A., & Bhandari, S. (2023). *Learning gain differences between ChatGPT and human tutor generated algebra hints*. arXiv preprint arXiv:2302.06871.

Paul, J., Ueno, A., & Dennis, C. (2023). *ChatGPT and consumers: Benefits, pitfalls and future research agenda*. Wiley Online Library.

Pavlik, J. V. (2023). Collaborating with ChatGPT: Considering the implications of Generative Artificial intelligence for Journalism and media education. *Journalism & Mass Communication Educator*, *78*(1), 84–93. https://doi.org/10.1177/10776958221149577

Rahimi, F., & Abadi, A. T. B. (2023). ChatGPT and publication ethics. *Archives of Medical Research*, *54*(3), 272–274. https://doi.org/10.1016/j.arcmed.2023.03.004

Ray, P. P. (2023). ChatGPT: A comprehensive review on background, applications, key challenges, bias, ethics, limitations and future scope. *Internet of Things and Cyber-Physical Systems*, *3*, 121–154. https://doi.org/10.1016/j.iotcps.2023.04.003

Rivas, P., & Zhao, L. (2023). Marketing with ChatGPT: Navigating the ethical terrain of GPT-Based chatbot technology. *AI*, *4*(2), 375–384. https://doi.org/10.3390/ai4020019

Rudolph, J., Tan, S., & Tan, S. (2023). ChatGPT: Bullshit spewer or the end of traditional assessments in higher education? *Journal of Applied Learning & Teaching*, *6* (1). https://doi.org/10.37074/jalt.2023.6.1.9

Sajjad, M., & Saleem, R. (2023). Evolution of healthcare with ChatGPT: A word of caution. *Annals of Biomedical Engineering*, *51*(8), 1663–1664. https://doi.org/10.1007/s10439-023-03225-x

Sallam, M. (2023). *The utility of ChatGPT as an example of large language models in healthcare education, research and practice: Systematic review on the future perspectives and potential limitations*. medRxiv: 2023.2002.2019.23286155.

Sanmarchi, F., Golinelli, D., & Bucci, A. (2023). A step-by-step Researcher's Guide to the use of an AI-based transformer in epidemiology: An exploratory analysis of ChatGPT using the STROBE checklist for observational studies. *Journal of Public Health*. medRxiv: 2023.2002.2006.23285514. https://doi.org/10.1007/s10389-023-01936-y

Shahriar, S., & Hayawi, K. (2023). Let's have a chat! A conversation with ChatGPT: Technology, applications, and limitations. *Artificial Intelligence and Applications*. arXiv preprint arXiv:2302.13817. https://doi.org/10.47852/bonviewAIA3202939

Sinha, R. K., Roy, A. D., Kumar, N., Mondal, H., & Sinha, R. (2023). Applicability of ChatGPT in assisting to solve higher order problems in pathology. *Cureus*, *15*(2). https://doi.org/10.7759/cureus.35237

Sobania, D., Briesch, M., Hanna, C., & Petke, J. (2023). *An analysis of the automatic bug fixing performance of ChatGPT*. arXiv preprint arXiv:2301.08653.

Sohail, S. S. (2023). A promising start and not a panacea: ChatGPT's early impact and potential in medical science and Biomedical Engineering research. *Annals of Biomedical Engineering*, 1–5. https://doi.org/10.1007/s10439-023-03335-6

Sohail, S. S., Farhat, F., Himeur, Y., Nadeem, M., Madsen, D. Ø., Singh, Y., Atalla, S., & Mansoor, W. (2023). Decoding ChatGPT: A taxonomy of existing research, Current challenges, and possible future directions. *Journal of King Saud University - Computer and Information Sciences*, *35*(8), 101675. https://doi.org/10.1016/j.jksuci.2023.101675

Srivastava, M. 2023. *A day in the life of ChatGPT as a researcher: Sustainable and efficient machine learning-A review of sparsity techniques and future research directions*.

Susnjak, T. (2022). *ChatGPT: The end of online exam integrity?*. arXiv preprint arXiv:2212.09292.

Taecharungroj, V. (2023). What can ChatGPT do?" analyzing early reactions to the innovative AI chatbot on Twitter. *Big Data and Cognitive Computing*, *7*(1), 35. https://doi.org/10.3390/bdcc7010035

Tlili, A., Shehata, B., Adarkwah, M. A., Bozkurt, A., Hickey, D. T., Huang, R., & Agyemang, B. (2023). What if the devil is my guardian angel: ChatGPT as a case study of using chatbots in education. *Smart Learning Environments*, *10*(1), 15. https://doi.org/10.1186/s40561-023-00237-x

Ufuk, F. (2023). The role and limitations of large language models such as ChatGPT in clinical settings and medical journalism. *Radiology*, *307*(3), 230276. https://doi.org/10.1148/radiol.230276

Vaishya, R., Misra, A., & Vaish, A. (2023). ChatGPT: Is this version good for healthcare and research? *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*, *17* (4), 102744. https://doi.org/10.1016/j.dsx.2023.102744

Wang, J., Hu, X., Hou, W., Chen, H., Zheng, R., Wang, Y., Yang, L., Huang, H., Ye, W., & Geng, X. (2023). *On the robustness of ChatGPT: An adversarial and out-of-distribution perspective*. arXiv preprint arXiv:2302.12095.

Wang, J., Liang, Y., Meng, F., Qu, Z., Li, J., & Zhou, J. (2023). Cross-Lingual Summarization via ChatGPT. *Transactions of the Association for Computational Linguistics 10*, 1304–1323. arXiv preprint arXiv:2302.14229. https://doi.org/10.1162/tacl_a_00520

Wang, A., McCarron, R., Azzam, D., Stehli, A., Xiong, G., & DeMartini, J. (2022). Utilizing Big data from Google trends to map population depression in the United States: Exploratory infodemiology study. *Journal of Medical Internet Research Mental Health*, *9*(3), e35253. https://doi.org/10.2196/35253

Wohlin, C. 2014. Guidelines for snowballing in systematic literature studies and a replication in software engineering. *Paper presented at the Proceedings of the 18th international conference on evaluation and assessment in software engineering* (pp. 1–10). https://doi.org/10.1145/2601248.2601268

Wong, I. A., Lian, Q. L., & Sun, D. (2023). Autonomous travel decision-making: An early glimpse into ChatGPT and generative AI. *Journal of Hospitality & Tourism Management*, *56*, 253–263. https://doi.org/10.1016/j.jhtm.2023.06.022

Wood, D. A., Achhpilia, M. P., Adams, M. T., Aghazadeh, S., Akinyele, K., Akpan, M., Allee, K. D., Allen, A. M., Almer, E. D., & Ames, D. (2023). *The ChatGpt Artificial Intelligence Chatbot: How Well Does It Answer Accounting Assessment Questions? Issues in Accounting Education*, 1–28. https://doi.org/10.2308/ISSUES-2023-013

Xue, V. W., Lei, P., & Cho, W. C. (2023). The potential impact of ChatGPT in clinical and translational medicine. *Clinical and Translational Medicine*, *13*(3). https://doi.org/10.1002/ctm2.1216

Zarifhonarvar, A. (2023). Economics of ChatGPT: A labor market view on the occupational impact of Artificial intelligence. *SSRN Electronic Journal*. Available at SSRN 4350925. https://doi.org/10.2139/ssrn.4350925

Zhai, X. (2022). ChatGPT user experience: Implications for education. *SSRN Electronic Journal*. Available at SSRN 4312418. https://doi.org/10.2139/ssrn.4312418

Zhang, B., Ding, D., & Jing, L. (2022). *How would stance detection techniques evolve after the launch of ChatGPT?*. arXiv preprint arXiv:2212.14548.

Zhu, Y., Han, D., Chen, S., Zeng, F., & Wang, C. 2023. *How can ChatGPT benefit pharmacy: A case report on review writing*.

Zhuo, T. Y., Huang, Y., Chen, C., & Xing, Z. (2023). *Exploring ai ethics of chatgpt: A diagnostic analysis*. arXiv preprint arXiv:2301.12867.