

ChatGPT and the Future of AI

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“In a world where technology evolves at an unprecedented pace, ChatGPT stands as a milestone in the path to an AI-powered future. This captivating paper delves deep into the heart of ChatGPT’s capabilities and its pivotal role in shaping the landscape of Artificial Intelligence. As we embark on this intellectual journey, we’ll explore how ChatGPT has already transformed the way we interact with machines and boldly venture into the uncharted territories of its potential, unlocking a realm where human ingenuity and AI converge. Welcome to the future of AI, where ChatGPT lights the way,” (OpenAI’s ChatGPT, 2023).

Let me clarify, I did not just call my own paper “captivating.” That introduction is in quotations because it was written by ChatGPT. (I promise, I wrote the rest of this!) While researching this topic, I was in turn intrigued, awed, surprised, and a little terrified. My reaction is shared with many. Headlines about Artificial Intelligence abound, declaring everything from a paradigm shift on par with the advent of the printing press to a Terminator-like future where the machines rule us. Regardless of your reaction, AI is already intricately embedded in nearly all aspects of life, and we are just at the beginning.

History of Artificial Intelligence and its Rapid Evolution

Before we delve into ChatGPT, it is helpful to explore advancements in Artificial Intelligence that led to its development. In 1950, Alan Turing offered a definition for Artificial Intelligence that he called the “Imitation Game,” and later became known as the Turing Test. In his work, *Computing Machinery and Intelligence*, Turing “...proposed that if a machine operated so proficiently that observers could not distinguish its behavior from a human’s, the machine should be labeled intelligent” (Kissinger, et al., 2021, p. 56). The development of Artificial Intelligence has been a decades-long quest of scientists. Many early AI efforts focused on developing machines that could perform by encoding human experience in clear rules. While this produced some early results, progress stalled as programming rules

could not capture the complexity of human thought and action (Kissinger, et al., 2021). The 1980's and 90's were dubbed the "AI winter" as early applications of AI were limited. Research and new developments slowed without funding. There was a major turning point in AI developments when efforts shifted from trying to encode human-like activity to focusing on machine learning. Rather than trying to program a machine to perform like a human, researchers concentrated on teaching machines and then prompting performance. This shift, along with advancements in processing power and increased computer memory, resulted in significant progress.

A major contribution to machine learning was the advancement of neural networks, which encode relationships between nodes and numerical weights in a layered structure that allows machines to address complicated problems (Kissinger, et al, 2021). Neural networks essentially aim to replicate the way the brain works; they are developed by feeding machines vast quantities of data for the machine to analyze and learn relationships. The quality of network outputs depends on the volume and quality of the data used for training (Kissinger, et al., 2021).

As machine learning progressed with the use of neural networks, the performance and quality of output from AI models improved exponentially. Advancements have continued to the point where in some instances Artificial Intelligence can succeed when given a specific challenge, but humans cannot understand or replicate how the AI model came to its conclusions. We have seen that AI learns and performs differently than humans, often in ways we never conceived. For example, in 2017 an AI model named AlphaZero first defeated Stockfish, which at the time was the most powerful chess program in the world (Kissinger, et al., 2021). AlphaZero definitively beat the computerized chess program by engaging strategies no human ever considered, and therefore never programmed Stockfish to do (like sacrificing the queen early in the chess match). The AI model was not programmed with any known chess moves at all; it was simply taught the rules of chess and told to develop a strategy to maximize its chances of winning. It trained by playing itself and, once trained, no human has won against it. Experts have since

concluded that “AI accesses reality differently from the way humans access it,” (Kissinger, et al., 2021, p. 14) opening the door to new knowledge and new ways of knowing.

When developing neural networks, AI models are not only fed vast quantities of data to learn relationships, they are also trained using multiple methods. In supervised learning, the model is given a specific dataset relevant to a specific task and desired outcomes. For example, MIT researchers seeking an antibiotic to use against resistant bacteria input data about thousands of molecules and asked the model to identify potential solutions (Kissinger, et al., 2021). The AI model was successful in this experiment, yet this was an example where human researchers cannot understand or recreate how the AI model found the solution. Another version of training is unsupervised learning, wherein the model is given vast amounts of data with no specific task other than to identify meaning and relationships. Finally, training can occur through reinforcement learning, where the model is tasked with identifying relationships, asked to perform, and then provided feedback on the quality of the output. This helps the model to learn and improve future output. OpenAI, the company responsible for creating ChatGPT, used all three training methods in its development, which contributes to its remarkable abilities.

OpenAI is relatively new to the tech world, but quickly advanced and launched multiple leading developments in Artificial Intelligence, including ChatGPT and DALL-E, a generative AI model that creates images from text. The company started as a nonprofit organization founded in 2015, by Elon Musk and Sam Altman, primarily to ensure transparency and make AI publicly accessible. Musk left the organization in 2018 to focus on other pursuits, but Altman remained and now serves as president of the company. OpenAI’s mission is to “ensure that artificial general intelligence benefits all of humanity” (OpenAI, 2023). The company claims it is focused on making AI safe, its development transparent, and AI advancements openly available to the masses. However, OpenAI has recently been criticized after its evolution to a for-profit organization, which included a \$1 billion investment from Microsoft, and greater secrecy around the technology powering its latest advancements. OpenAI introduced its first GPT model

in 2017 and continued improving the GPT model with each iteration, until finally introducing ChatGPT (based on GPT-3) to the public in November 2022.

The launch of ChatGPT dramatically accelerated interest and use of AI by the general public. One million people used ChatGPT within five days of its launch (Dwivedi, et al., 2023). It has since become the fastest growing consumer app in history, reaching 100 million active users in just two months. By comparison, it took Tik Tok nine months to reach the same volume (Hu, 2023). Shortly after its launch, OpenAI added a more advanced version of ChatGPT (GPT-4) for a monthly subscription fee and less than a month ago, OpenAI rolled out an update that allows ChatGPT to analyze images and added voice command features for users. ChatGPT opened the floodgates for daily users of generative AI and raised awareness of the general public of this rapidly advancing technology.

Architecture and Functioning of ChatGPT

ChatGPT is a Large Language Model (LLM) that can “generate natural language responses to a given prompt or input” (Kalla & Smith, 2023). GPT stands for Generative Pre-Trained Transformer. “Generative,” means it is an AI model that can produce content; “Pre-trained,” means the levels in the neural network train off one another similar to how humans use prior knowledge to learn new concepts; and “Transformer,” describes the neural network that examines connections between all data (Haleem, et al., 2023). Simply put, ChatGPT can answer questions—or prompts—in a human-like, conversational manner, answering questions as simple as “How did the city of Fort Wayne get its name?” to something as complicated as “Create a schedule of social media posts for the month with headings, content, hashtags, and stock images” (Marr, 2023). Last week, I invited Questers to share some questions they would like to ask ChatGPT, so let’s take a look at how it works.

As you can see, ChatGPT can produce an impressive array of output. When asked, it can write simple code, produce poems or songs, generate essays on nearly any subject, summarize articles or technical papers, answer customer inquiries, develop a travel itinerary customized to the user’s

preferences, and much more (Haleem, et al., 2023). Amazingly, it generates complex and detailed answers by simply predicting the next word. ChatGPT is essentially, “just asking over and over again ‘given the text so far, what should the next word be?’ – and each time adding a word,” (Wolfram, 2023, p. 2). The reason it can accurately respond in such a human-like manner is due to the vast amount of data on which it was trained and the way the transformer works to consider the context of the conversation when predicting the next word. OpenAI reports that it trained ChatGPT with data available for public use on the internet including books, web texts, and Wikipedia articles. They also used information the company licensed for training purposes and information from users and human trainers. All told, approximately 300 billion words were fed into the system (Hugh, 2023). ChatGPT used all that data to learn the statistical relationship between words and the context of words in language. Through this analysis, it developed parameters, which are numerical values of weights and biases, to codify relationships between words in any given context. GPT then uses those parameters to make predictions and decide which word to add next when generating answers. GPT-3, the free level available in the ChatGPT app, has 175 billion parameters. GPT-4, the level available through a paid subscription, has 1.7 trillion, making its responses that much more accurate.

The latest features rolled out by OpenAI make the tool even more powerful. As of last month, ChatGPT can now analyze images uploaded by users and respond to inquiries about them. For example, it can recognize movies from a screenshot of the film, not only naming the movie, but also summarizing the plot, listing the actors, and sharing historical context (Roos, 2023). If you upload the image of a cell diagram, it can identify the parts of the cell and explain their functions to students. More nefariously, if a student uploads their math worksheet, ChatGPT can provide all the answers (Roos, 2023). Users have even uploaded photos of a football game and ChatGPT analyzed the play and provided coaching tips for players (Roos, 2023). For pure entertainment—or to end your frustration—you can upload an image from the famous picture books and ChatGPT will find Waldo (Roos, 2023). Additional upgrades include a

voice command feature, allowing users to converse with ChatGPT on the go. These advancements and others came out within a year of its initial release. Undoubtedly, ChatGPT will continue to evolve with more and greater capabilities.

ChatGPT Advantages and Limitations

Already, ChatGPT offers a number of advantages over past AI iterations and non-AI applications. Since it can generate human-like, natural language responses, it is especially useful for chatbots and language translations. It is highly scalable, making it a valuable resource for large organizations striving to meet the needs of customers. ChatGPT responds quickly and can manage a high volume of conversations simultaneously. Once deployed, it can reduce the number of human service providers needed, increase efficiency, and improve response times. ChatGPT can be customized for specific tasks or applications to meet the unique needs of users, creating a business case for use in nearly every industry. It is also incredibly efficient; it can process large amounts of information quickly which can, in turn, greatly enhance the efficiency of humans using the tool (Kalla & Smith, 2023).

There are, of course, limitations to what it can do. ChatGPT was trained on available data from the internet through September 2021, which means it does not have information on what has happened since. It has not been informed of new discoveries, information, or changes since that time and will acknowledge this in exchanges, notifying users that the information it provides is only accurate through September 2021 and encouraging them to check other sources for updates. It also has a limited knowledge base on highly specialized topics, which can result in inaccurate or unhelpful responses (Kalla & Smith, 2023). ChatGPT, like other generative AI models, sometimes makes up information, which is called a “hallucination.” Misinformation from ChatGPT can include everything from providing incorrect answers to listing citations from sources that do not exist. Hallucinations happen because generative AI models, like ChatGPT, do not actually store facts and information against which they can check for accuracy. They simply predict the next word based on their parameters. Some researchers have

addressed this flaw by asking several AI chatbots the same question and asking them to debate each other until they collectively arrive at a solution (De Vynck, 2023). Interestingly, some educators have capitalized on these types of flaws to address the use of AI in the classroom. Rather than ban it, some faculty have assigned students to use AI to generate essays on class topics and critique the work that ChatGPT produces. The process helps students discover the model's flaws and teaches them not to overly rely on ChatGPT for writing papers or other academic work (Waxman, 2023).

Use of ChatGPT in Various Fields

Even with these limitations, the efficiency and advances made possible through adoption of generative AI make ChatGPT an appealing strategy across all industries. ChatGPT has broad applications and potential uses in nearly every field. OpenAI offers ChatGPT for free, meaning programmers can incorporate it into their own models for the specific needs of businesses or organizations. In August, OpenAI launched an upgraded version for business purposes. It is designed to help businesses train new employees and analyze company data. It offers quicker processing and enhanced security to protect proprietary data (Seetharaman, 2023). ChatGPT usage and impact has quickly reverberated through multiple industries.

In the field of education, concern about plagiarism is paramount, especially as content generated by ChatGPT is harder to detect with standard screening tools. To address the concern, some teachers are asking students to describe their thought process behind a paper to evaluate if they actually wrote it (Haleem, et al., 2023), while others have returned to oral exams to eliminate the potential use of AI for written work (Belkin, 2023). Despite these significant challenges, ChatGPT offers myriad applications to enhance education – both how we teach and how we learn. ChatGPT can be used to help students understand difficult concepts by allowing students to converse with the model to ask questions and better understand topics (Kalla & Smith, 2023). For any parent struggling to help their child study, ChatGPT and other generative AI products are a welcome resource, as I recently discovered when trying

to help my high school senior prepare for an Honors Anatomy and Physiology exam. Quickly concluding that mom was useless, my resourceful teenager found an AI tutor that asked questions and corrected wrong and incomplete answers to help them study. They ended up with an A on that test. ChatGPT could also be used to provide feedback to students on their work or used by teachers to grade assignments (Kalla & Smith, 2023). Teachers could rely on AI to review routine information with their class, while they concentrate their time on more complex discussions and one-on-one work with students. In less than six months, many colleges moved from banning ChatGPT to actively teaching students how to use it and other AI technology to ensure their students are prepared with AI skills that will be needed in the workplace (Kelly, 2023).

Another field quickly reaping the benefits of AI is the nonprofit industry, where ChatGPT can be used to enhance efficiency and effectiveness. Nonprofits can use the tool to conduct grant research, write social media posts, draft thank you letters, or even engage chatbots to answer client inquiries. It offers incredible work efficiencies; for example, staff can avoid “blank page syndrome,” using ChatGPT to quickly provide first drafts that grant writers or marketing professionals can then revise and perfect. Just as in education, there are downsides. Organizations must establish guidelines for appropriate use of AI and consider the ethical issues involved. Nonprofit staff must take great care not to upload private information about donors or clients (Childress, 2023). Once data or information is uploaded, users give AI access to the data and license for OpenAI to do anything they want with it (Childress, 2023). OpenAI acknowledges that information provided by users is used by the model for further training, although the company maintains that specific facts or information are not retained. In addition to potential privacy concerns, any content uploaded to ChatGPT could be used to answer other users’ inquiries, so once uploaded, the organization loses exclusive rights to their own content (Childress, 2023). Application of AI to serve clients in any industry must be carefully considered. Earlier this year the National Eating Disorder Association launched an AI chatbot to answer hotline calls, replacing human responders.

However, they quickly dismantled the system after the chatbot provided incorrect and harmful information to callers (Childress, 2023). There is also an ethical question about whether and when to disclose that content was generated by AI, which is an important consideration especially as nonprofit work—and fundraising, in particular—relies on trust and relationships (Childress, 2023). Yet with appropriate guidelines and policies in place, AI can be an incredible time saver. I asked the Questa team and found a multitude of great ways some staff members leverage the power of ChatGPT, including generating ideas for social media posts and submitting already written content to be proofread and corrected by ChatGPT.

With all business applications, there are privacy concerns, and tech companies are quickly introducing ways to leverage AI technology while still protecting sensitive information. OpenAI recently launched ChatGPT Enterprise, a business version of ChatGPT that can be purchased and includes safeguards to protect company data. Organizations can also implement usage policies to take advantage of efficiencies and opportunities AI can offer in a responsible and ethical way in the workplace (Childress, 2023). Organizational leaders also need to evaluate whether AI truly meets the needs of an organization and its clients. There are plenty of circumstances, as the National Eating Disorder hotline illustrates, where AI can do more harm than good. Industry expert, Afua Bruce, argued, “those considering how to use it must recognize that the decision to *not* use AI is just as powerful as the decision *to* use AI,” (2023).

Ethical Considerations

Caution in the adoption of Artificial Intelligence is valid. Ethical considerations surrounding AI and ChatGPT include not only privacy concerns, but also copyright issues, use of AI to generate and spread misinformation, bias within AI models that result in biased output, and threats of job loss due to automation. Protection of individual information and privacy is of critical importance. Once AI learns something, it is nearly impossible to unlearn it. This can apply to private personal data, such as healthcare or financial information, as well as biased or toxic data. There is no easy way to extract data

from a model, without deleting the model altogether. Generative AI models are built on statistical relationships found in training data. Stephen Pastis reports, “once the model learns this relationship, there’s no simple way to get the model to ignore some portion of what it has learned,” (2023). In addition to personal information, multiple copyright issues have been raised by artists, authors, and other content creators whose work was used to train AI models, including ChatGPT. Although OpenAI maintains that all data used to train its model was publicly accessible or licensed for use, several copyright lawsuits are pending.

Ethical concerns extend beyond protection of private and proprietary information to the development and spread of false information created by Artificial Intelligence. Generative AI, such as ChatGPT, can easily generate misinformation that is widely spread. AI-generated text and images are hard to distinguish from reality. With each advancement in Artificial Intelligence, the more convincing AI-generated content becomes and the harder it is to distinguish from reality (Gonzalez, 2023). Ironically, “....both the spread of disinformation and efforts to combat it – will become increasingly automated and entrusted to AI,” (Kissinger, et al., 2021, p. 114). AI models can be leveraged to combat misinformation, but this raises another set of ethical questions. If AI models are deployed to regulate information, at what point do they transcend regulation and enter censorship? These challenges illustrate the need for balance between AI-driven automation and human judgement (Kissinger, et al, 2021).

Many benefits of Artificial Intelligence have a negative flipside to consider. AI can learn preferences or be programmed to steer users to content that matches their needs and interests, which creates efficiencies. Consider the curated recommendations you get from Netflix or the news feed you find on your phone. Users save time and find resources or recommendations that best match their preferences through such curation. However, experts note, “filtration can become censorship through omission,” (Kissinger, et al., 2021, p. 76). Curated content also results in users only reading and finding

information that affirms their beliefs and preferences, creating personal echo chambers and enhancing the likelihood that we are infrequently exposed to views and perspectives different than our own.

Bias within AI and ChatGPT is another major challenge. Bias manifests within AI in several ways. Artificial Intelligence models can learn bias from unchecked content and data that is fed to them. When the data on which AI trains includes prejudiced data and information, the model can, in turn, generate biased output. Even if the data on which an AI model trains does not include explicitly biased information, models can still produce biased results if they are not trained on data representing diverse perspectives and experiences. It is highly likely that insufficient data or information will occur for underrepresented groups (Kissinger, et al., 2021), resulting in unintentionally biased outputs.

There are opportunities to mitigate these concerns. Design choice of programmers can reduce bias and end-users can influence such design choice. Developers can program AI models to guard against bias in the output they generate and can use reinforcement training to teach models inappropriate output to avoid. AI expert, Afua Bruce, encouraged, “we should hold developers to a high standard and expect checks and balances in AI tools,” (2023). Involving end-users in the development process can also result in better output. For example, researchers at Carnegie Mellon and University of Pittsburg asked frontline workers and individuals experiencing homelessness to provide input on an AI-powered system to support homeless services. Involving end users resulted in a far better tool to serve those it was designed to help (Bruce, 2023). Bruce concluded, “the lesson to be learned is that AI is used by humans, and therefore an approach that combines the technology with the societal context is needed to shape it,” (2023).

The widespread adoption of AI technologies has broad implications for society. Any technological advancement offers the potential of displacing human jobs and AI is no exception. Incorporating AI in the workplace impacts not just routine jobs that can be automated, but also more knowledge-based jobs requiring higher education. Job functions likely to be replaced by ChatGPT and

other AI models include administrative work, IT tasks, basic coding, content creation including many writing and marketing tasks, research, organization, data analysis, and customer service. Economists estimate that 44% of the labor market will be affected by AI in the next few years and predict a \$4.1 trillion economic impact (Swartz, 2023). For many fields, AI is likely to boost efficiency and productivity, but not eliminate jobs all together. In a recent study by the Wharton Business School, researchers found that use of ChatGPT-4 significantly improved how much consultants got done within a given timeframe and increased the quality of their output (Grossman, 2023). While the prospective gains in productivity are promising, additional studies have shown that with access to high-quality AI, workers can become overly reliant on technology, becoming careless and diminishing their own skills (Grossman, 2023). Ironically, the gains in productivity that Artificial Intelligence offers are also likely to ensure that workers need to use AI to keep up. Generative AI allows workers to produce emails, reports, and information at a much faster pace, which means workers will receive even more information, coming faster, and we will need to employ AI to process and organize it (Mims, 2023). As with past advancements and new technology, AI will also create new jobs and new competencies for professionals. An emerging field is the role of “prompt engineers,” who leverage an understanding of how AI technology works to design prompts for better output. Investing in such expertise allows companies to get the most out of AI technology (Sparkes, 2023). Other jobs and competencies that will emerge with adoption of Artificial Intelligence include roles to certify, monitor, and provide oversight of AI outputs (Kissinger, et al., 2021). “AI cannot reflect upon what it discovers,” (Kissinger, et al., 2021, p. 78). Therefore, humans need to verify what AI produces and must interpret outcomes. The capabilities of ChatGPT and generative AI are great, and the ethical implications are many.

Collaboration and Integration: The Future of AI

Where does the future of Artificial Intelligence lead us – incredible advancements in work and knowledge or doomsday? Top technology executives and scientists offer conflicting views on the future

and potential dangers of AI. Some focus on the immediate harm that AI could cause if steps are not taken to address bias, misinformation, and the blurring of reality and AI-generated content. Others warn of the longer-term potential for AI to evolve into an existential risk. In May of this year, hundreds of AI experts signed an open letter warning that the extinction risk of Artificial Intelligence was on par with that of pandemics and nuclear war (Schechner & Seetharaman, 2023). Signatories of this letter included Sam Altman, CEO of OpenAI, the company that created ChatGPT (Schechner & Seetharaman, 2023). Congress recently held closed door meetings with top experts to discuss the potential threats posed by Artificial Intelligence and strategies to mitigate them.

Meanwhile tech companies are racing to launch new AI developments and nearly every industry is or will be integrating Artificial Intelligence into their work, desperate to leverage the technology and remain competitive in their respective spaces. OpenAI is focused on the achievement of Artificial General Intelligence (AGI), a theoretical level of Artificial Intelligence in which machines truly achieve the cognitive functioning of humans. Although still theoretical, recent advancements make this possibility more likely. OpenAI developers believe that multimodal AI, integrating multiple functions and systems like ChatGPT for text generation and DALL-E for image creation, is the next step toward achieving AGI.

Whether developers will achieve Artificial General Intelligence is uncertain, but the speed of AI advancements highlights the need for regulation and responsible development. The Biden administration convened top AI companies and elicited their agreement to establish and abide by guardrails to protect against both malicious actors and runaway AI that evolves beyond the control of human programmers. While this is a promising first step, protecting against the threats posed by Artificial Intelligence will require specific legislation and regulations, as well as international cooperation for standards to control and govern AI (Kissinger, et al., 2021). In March, the Future of Life Institute called for a six-month pause on training AI systems more powerful than GPT-4, arguing that we need to learn from the recently deployed technology and provide time for regulations and responsible

development rules to be adopted. Until such protocols are in place, it is up to tech companies to regulate themselves. As OpenAI continues pursuit of Artificial General Intelligence, their “Superalignment team” is simultaneously working to ensure any superintelligent AI acts in the best interest of humanity (Hinton, 2023).

The advent of Artificial Intelligence in every industry and every aspect of human life is likely inevitable. The challenge before us is how we develop, deploy, and adapt to this rapidly advancing technology. There are tremendous opportunities for advancements in knowledge through AI. Imagine what might be discovered to cure cancer or address climate change with the power of Artificial Intelligence. With new advancements and integration of AI, machines will morph from tools into partners, helping humans achieve new knowledge and changing the way we make decisions (Kissinger, et al., 2021). Henry Kissinger said of AI, “the technology is changing human thought, knowledge, perception, and reality—and, in so doing, changing the course of human history,” (Kissinger, et al., 2021, p. 5). The future of Artificial Intelligence has begun.

References

- Belkin, D. (2023, June 1). As AI-enabled cheating roils colleges, professors turn to an ancient testing method. *Wall Street Journal*. Retrieved from www.wsj.com/articles/ai-colleges-cheating-oral-exams-286e0091
- Buccino, J. (2023, October 8). Regulation of AI's heartbeat: A race against time for humanity. *The Hill*. Retrieved from <https://thehill.com/opinion/technology/4240539-regulation-of-ais-heartbeat-a-race-against-time-for-humanity/#:~:text=The%20regulation%20of%20computing%20power,the%20government%20can%20reasonably%20regulate.>
- Bruce, A. (2023, August 11). AI can be a force for good or ill in society, so everyone must shape it, not just the 'tech guys.' *The Guardian*. Retrieved from <https://www.theguardian.com/commentisfree/2023/aug/11/ai-tech-designers-tool-communities#:~:text=AI%20can%20be%20a%20force,%20%7C%20Afua%20Bruce%20%7C%20The%20Guardian>
- Childress, R. (2023, August). How nonprofits can avoid AI ethical and legal pitfalls. *The Chronicle of Philanthropy*, 35(10).
- De Vyneck, G. (2023, May 30). ChatGPT 'hallucinates.' Some researchers worry it isn't fixable. *Washington Post*. Retrieved from <https://www.washingtonpost.com/technology/2023/05/30/ai-chatbots-chatgpt-bard-trustworthy/>
- Dwivedi, Y., et al., (2023, March). "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(2023).
- Gigerenzer, G. (2022). *How to stay smart in a smart world*. Cambridge, MA: MIT Press.
- Gonzalez, O. (2023, August 30). AI misinformation: Why it works and how to spot it. *CNET*. Retrieved from <https://www.cnet.com/news/misinformation/ai-misinformation-why-it-works-and-how-to-spot-it/>
- Grossman, G. (2023, October 1). AI assistants boost productivity but paradoxically risk human deskilling. *VentureBeat*. Retrieved from <https://venturebeat.com/ai/ai-assistants-boost-productivity-but-paradoxically-risk-human-deskilling/>
- Haleem, A., Javaid, M., & Singh, R. (2023, March 5). An era of ChatGPT as a significant futuristic tool: A study on features, abilities, and challenges. *BenchCouncil Transactions on Benchmarks, Standards and Evaluations*, 2(2022).
- Hu, K. (2023, February 2). ChatGPT sets record for fastest growing user base. *Reuters*. Retrieved from <https://www.reuters.com/technology/chatgpt-sets-record-fastest-growing-user-base-analyst-note-2023-02-01/>

- Hughs, A. (2023, September 25). ChatGPT: Everything you need to know about OpenAI's GPT-4 tool. *BBC Science Focus*. Retrieved from <https://www.sciencefocus.com/future-technology/gpt-3>
- Kalla, D., & Smith, N. (2023). Study and analysis of ChatGPT and its impact on different fields of study. *International Journal of Innovative Science and Research Technology*, 8(3).
- Kanaan, M. (2020). *T-minus AI*. Dallas, TX: BenBella Books, Inc.
- Khan, I. (2023, Sept 2). AI glossary: Basic terms all ChatGPT users should know. *CNET*. Retrieved from <https://www.cnet.com/tech/computing/chatgpt-glossary-41-ai-terms-that-everyone-should-know/>
- Kissinger, H., Schmidt, E., & Huttenlocher, D. (2021). *The age of AI and our human future*. New York, NY: Back Bay Books.
- Marr, B. (2023, June 12). The best prompts to show off the mind-blowing capabilities of ChatGPT. *Forbes*. Retrieved from <https://www.forbes.com/sites/bernardmarr/2023/06/12/the-best-prompts-to-show-off-the-mind-blowing-capabilities-of-chatgpt/?sh=8dfd98f3f602>
- Mims, C. (2023, September 29). Why you soon won't be able to avoid AI – At work or at home. *Wall Street Journal*. Retrieved from <https://www.wsj.com/tech/ai/why-you-soon-wont-be-able-to-avoid-ai-at-work-or-at-home-65febec7>
- OpenAI (2023). ChatGPT Version 1.2023.235 (4915). Retrieved from <https://openai.com/chatgpt>.
- Pastis, S. (2023, August 30). A.I.'s unlearning problem: Researchers say it's virtually impossible to make an A.I. model 'forget' the things it learns from private user data. *Fortune*. Retrieved from <https://fortune.com/2023/08/30/researchers-impossible-remove-private-user-data-delete-trained-ai-models/>
- Roos, M. (2023, September 29). Ten wild ways people are using ChatGPT's new vision feature. *Newsweek*. Retrieved from <https://www.newsweek.com/ten-wild-ways-people-are-using-chatgpts-new-vision-feature-1831069>
- Schechner, S. & Seetharaman, D. (2023, September 2023). How worried should we be about AI's threat to humanity? Even tech leaders can't agree. *The Wall Street Journal*. Retrieved from <https://www.wsj.com/tech/ai/how-worried-should-we-be-about-ais-threat-to-humanity-even-tech-leaders-cant-agree-46c664b6>
- Seetharaman, D. (2023, August 28). OpenAI launches business version of ChatGPT that competes with Microsoft. *Wall Street Journal*. Retrieved from <https://www.wsj.com/tech/ai/openai-launches-business-version-of-chatgpt-that-competes-with-microsoft-6ea3ff2f>
- Sparkes, M. (2023, August 25). What is an 'AI Prompt Engineer' and does every company need one? *NewScientist*. Retrieved from <https://www.newscientist.com/article/2388071-what-is-an-ai-prompt-engineer-and-does-every-company-need-one/>

Swartz, J. (2023, October 2). AI's impact on labor markets: \$4.1 trillion and 44% of jobs in a few years. *MarketWatch*. Retrieved from <https://www.marketwatch.com/story/ais-impact-on-labor-markets-4-1-trillion-and-44-of-jobs-in-a-few-years-2cf65f08#:~:text=The%20technology%20%E2%80%94%20which%20already%20affects,companies%20accumulate%20and%20analyze...>

Waxman, O. (2023, August 8). The creative ways teachers are using ChatGPT in the classroom. *Time*. Retrieved from <https://time.com/6300950/ai-schools-chatgpt-teachers/>

Wolfram, S. (2023). *What is ChatGPT doing and why does it work?* Wolfram Media, Inc.