

ACADEMICS IN THE ERA OF CHATGPT: EXPLORATION OF CAPABILITIES AND LIMITATION

Nikita Gupta*
Neelam Sunda**
Dr. Neha Agarwal***

ABSTRACT

“ChatGPT”, the fastest growing app of all the time. A Natural Language Processing tool driven by Artificial Intelligence allowing human like conversations is expected to impact every aspect of society. The impact of this tool on education is enormous. It can bring a lot of change in learning, assessment and evaluation. It will help the scholars to become cognizant of the AI technologies that will play an important role over the course of their careers to a great extent. The teachers can well organize their lessons and provide their students wide information. Inadequate originality, the risk of plagiarism and dependency on the model are major challenges for students conducting research. Educators must guide the students to make right use of this application. It is going to be a boon. It has the potential to create realistic virtual simulations for hands-on learning and offer personalized and effective learning experiences by providing students with customized feedback and explanations. There can be adoption of the strategies to ensure that chat APIs are used ethically and responsibly, including creating the policies and procedures, providing training and support, and using different methods to detect and prevent cheating. Technology usually disrupts conventional approaches, requiring people to adapt and consider the possible advantages and drawbacks of new technologies. ChatGPT and AI systems’ other generative are only good as their training data and can preserve biases or even create and spread misinformation. Ethical concerns are raised by the use of AI generative in education like the potential for unethical or dishonest use by the students and the possibilities of unemployment that are made redundant by technology. The current state of ChatGPT is quite impressive but flawed, it is simply a preview of what is to come. It is important for the educators to understand the implications of this technology and study how to adapt the education ecosystem to ensure that the next generation can be benefitted by generative AI while minimizing any negative consequences. This paper examines the opportunities and challenges of using ChatGPT in education, with a focus on the potential risks and rewards of these tools and the ways in which universities can address the challenges they pose. However, these tools also raise a number of challenges and concerns, in relation to academic honesty and plagiarism.

Keywords: ChatGPT, GPT 3, Language Model, AI, Transformer Architecture.

Introduction

Artificial intelligence (AI) and Natural Language Processing (NLP) technologies are transforming the way we live and work, with potential applications in fields as diverse as healthcare, finance, and entertainment. One area where AI and NLP are rapidly transforming many aspects of society, and have the potential to make a significant impact is in academia, where they can be used to support research,

* Faculty, Department of Computer Science, S.S. Jain Subodh P.G. Mahila Mahavidyalaya, Jaipur, Rajasthan, India.

** Assistant Professor, Department of Computer Science, Kanoria P.G. Mahila Mahavidyalaya, Jaipur, Rajasthan, India.

*** Assistant Professor, Department of Computer Science, Maheshwari Girls P.G. College, Jaipur, Rajasthan, India.

writing, and collaboration. ChatGPT, a language model developed by OpenAI, using the GPT-3.5 architecture has gained increasing attention as a tool that can support academic research and writing tasks. It is designed to generate human-like responses to text-based inputs, including questions, prompts, and conversations. As of December 5, 2022, the bot had attracted a tremendous amount of attention and had already attracted over 1 million users (Kirmani, 2022). As a language model, it has been trained on a vast corpus of text data from the internet, books, and other sources. This training has allowed it to learn the patterns, structures, and nuances of human language, enabling it to generate coherent, natural-sounding responses to a wide range of queries and topics. It can assist us with a variety of tasks, from answering factual questions to engaging in philosophical debates. Its ability to understand context and generate coherent, natural-sounding responses has made it a popular tool for a wide range of applications, including language translation, chatbots, and content creation. ChatGPT is specifically trained to respond to user inputs in a conversational context, making it well suited for chatbot applications. The model can be fine-tuned for various tasks such as answering questions, generating responses to prompts, and providing recommendations. With its large size and high-quality training data, ChatGPT can produce informative and engaging responses to a wide range of inputs.

The ML community has been working hard over the last few weeks discussing and showcasing the extensive capabilities of GPT-3. ChatGPT is based on the GPT, which has become a state-of-the-art model for natural language processing tasks. Generative Pretrained Transformer (GPT) is a deep learning model for natural language processing (NLP) that has been developed by OpenAI. The model is based on the Transformer architecture, which was introduced in the 2017 paper "Attention is All You Need" (Vaswani et al. 2017). Since then, it's been widely adopted in the NLP community.

Since the introduction of the Transformer, there have been numerous research articles that have further developed and improved the model. (Li et al. 2020) published the paper "DeBERTa: Decoding-enhanced BERT with Disentangled Attention" which proposed a new training method for Transformer models that improved performance on a variety of NLP tasks.

In the academic field, ChatGPT has the potential to support a variety of tasks, such as generating ideas for research projects, assisting with literature reviews, and providing feedback on writing. It strives to be informative, helpful, and entertaining in its responses, and it is always learning and improving its abilities as it interacts with more people. However, there are also concerns about the accuracy, bias, and ethical implications of using ChatGPT in academia. For example, there is a risk that ChatGPT could perpetuate existing biases in academic research or generate inaccurate or misleading results.

This tool has a huge effect on education. It has the potential to significantly alter learning, assessment, and evaluation. It will assist the scholars in better understanding the AI technologies that will substantially impact their jobs throughout time. The teachers are skilled at planning classes and giving their students access to a wealth of knowledge. While it has been widely reported that students in schools and universities are using the new AI-based technology to compose their assignments, academic papers, and essays, the use of ChatGPT has come under scrutiny in academic circles. The ChatGPT can scroll through a large number of servers in a very short amount of time, and the algorithm it uses to create content makes the output unique. Chat GPT is a powerful tool with all of its amazing AI features, but it can also be misused in various ways.

Given the potential benefits and drawbacks of using ChatGPT in the academic field, it is important to explore its capabilities and limitations in more detail. This research paper aims to do just that, by examining the ways in which ChatGPT can be used to support academic research and writing, as well as the challenges and limitations that must be taken into account.

Literature Review

Kim, S., & Lee, K. (2022), explored the potential of ChatGPT to enhance accessibility in higher education for students with disabilities. It examines studies that have used ChatGPT to provide real-time captioning, voice recognition, and other assistive technologies. The review also discusses the ethical considerations and challenges of using ChatGPT for accessibility.

Hu, X., & Liu, H. (2021), explored how ChatGPT, as a language model that can generate human-like responses, can be utilized for language learning. It examines various studies that have used ChatGPT to improve language proficiency, including its effectiveness in providing personalized feedback and correcting errors.

Jaschik, S. (2021), examined the ethical and legal implications of using ChatGPT for academic writing, particularly in regards to plagiarism and authorship. It analyzes the current state of the debate around the use of ChatGPT in academic writing and highlights the need for clear guidelines and regulations.

Vassallo, M. T., & Rizzi, E. (2021), examined the potential impact of ChatGPT on academic discourse communities, particularly in terms of language use and norms. It explores how ChatGPT can facilitate communication and collaboration among researchers from different linguistic and cultural backgrounds, as well as its potential to challenge traditional academic writing conventions. The review also highlights the need for further research on the implications of ChatGPT on academic discourse communities.

Lipton, Z. C., & Steinhardt, J. (2018), explored the potential uses of ChatGPT in academic research, particularly in qualitative research methods. It examines how ChatGPT can be used to generate interview questions or responses, simulate scenarios, and aid in data analysis. The review also discusses the limitations and challenges of using ChatGPT in research.

Methodology

ChatGPT is a language model that uses a neural network architecture known as a transformer to generate responses to input text. The transformer architecture was introduced in a 2017 paper by Vaswani et al., and has since become widely used in natural language processing tasks such as language translation and text generation.

The basic methodology of ChatGPT involves training the transformer neural network on large amounts of text data, such as books, articles, and web pages. The network learns to predict the next word in a sentence based on the previous words, using a technique known as language modeling. Once the network is trained, it can be used to generate responses to input text by predicting the most likely continuation of the input based on the language model it has learned.

In more technical terms, the transformer architecture uses self-attention mechanisms to allow the network to attend to different parts of the input text when making predictions. It also uses multi-head attention, where the network attends to multiple representations of the input text at once, to improve the accuracy of predictions. The transformer network is typically trained using a variant of the backpropagation algorithm known as stochastic gradient descent.

Overall, the methodology of ChatGPT involves training a neural network on large amounts of text data using the transformer architecture, and then using the trained network to generate responses to input text based on the language model it has learned.

How ChatGPT actually works?

ChatGPT works by processing input text through a series of self-attention mechanisms and fully connected layers to generate an output response. ChatGPT is based on the GPT (Generative Pre-trained Transformer) series of models, which are a family of language models developed by OpenAI. The GPT models are built using the transformer architecture, which is a type of neural network that is designed to handle sequential data, such as text.

The following are some of the GPT models used in ChatGPT:

- **GPT-1:** This was the first model in the GPT series, and it was released in 2018. It was trained on a large corpus of text data using unsupervised learning techniques, and it has 117 million parameters.
- **GPT-2:** This model was released in 2019 and is larger than GPT-1, with 1.5 billion parameters. It was also trained on a larger corpus of text data and is capable of generating more coherent and diverse text.
- **GPT-3:** This is the most recent and largest model in the GPT series, with 175 billion parameters. It was released in 2020 and is currently one of the largest language models in existence. It is capable of generating highly coherent and diverse text, and it has achieved state-of-the-art performance on a wide range of language tasks.

ChatGPT is based on a smaller version of GPT-3, with fewer parameters and a smaller number of layers. However, it still uses the same basic architecture and training techniques as the larger GPT models, which allows it to generate high-quality text. Additionally, ChatGPT may incorporate other models or algorithms to handle specific tasks, such as image or speech recognition, depending on the specific application.

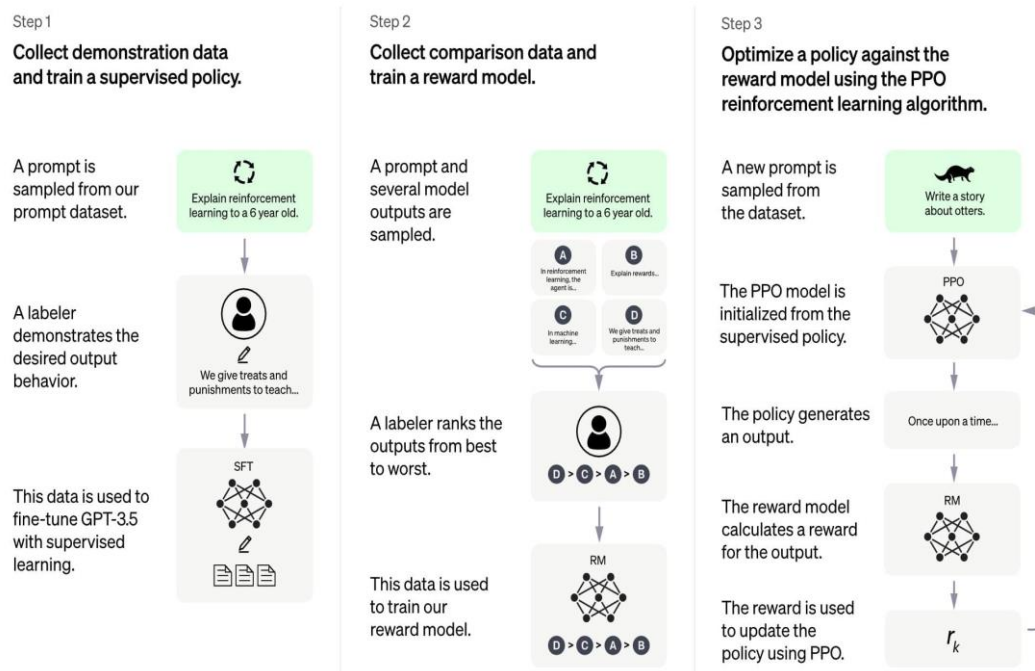


Image source: <https://www.atriainnovation.com/en/how-does-chat-gpt-work/>

Benefits of ChatGPT in Academics

By giving students individualised feedback and explanations, it has the ability to produce lifelike virtual simulations for hands-on learning and give personalised and successful learning experiences. It can write rough draughts based on pre-existing content, produce summaries of articles and YouTube videos, spot coding faults, work out math issues, generate course syllabi, assessment themes, and rubrics, produce phoney references, and may even grade exams. Rather than serving as the main tool for making decisions, ChatGPT can support alternative approaches to identifying the source of the text.

- **Research Assistance:** ChatGPT can assist researchers in finding relevant information for their studies. With its ability to understand natural language and its vast database of knowledge, ChatGPT can quickly provide answers to research queries.
- **Personalized Learning:** ChatGPT can be used to create personalized learning experiences for students. It can adapt to the individual needs of each student and provide them with custom explanations and feedback, which can improve their understanding and retention of the material.
- **Language Learning:** ChatGPT can help learners improve their language skills by engaging them in conversation and providing instant feedback on their language use. It can also provide vocabulary lists, grammar rules, and practice exercises.
- **Writing Assistance:** ChatGPT can help students with writing tasks such as essay composition, report writing, and creative writing. It can suggest sentence structures, provide synonyms, and help with brainstorming ideas.
- **Time-saving:** ChatGPT can save time for both students and teachers by providing quick answers to common questions, grading assignments, and providing feedback to students.
- **Accessibility:** ChatGPT can be accessed anytime and anywhere, making it a convenient tool for students and teachers. It can be used to answer questions, provide feedback on assignments, and offer suggestions for further learning.
- **Collaboration:** ChatGPT can facilitate collaboration among students and teachers. It can be used as a platform for group discussions, peer review, and feedback.
- **Personal Development:** ChatGPT can help students develop their writing, communication, and critical thinking skills. It can provide feedback on written assignments, help students improve their writing, and challenge them to think more deeply about the topics they are studying.

Limitations of ChatGPT in Academics

The use of AI generative in education raises ethical issues, including as the possibility of students using it in an unethical or dishonest manner and the possibility of job loss due to technological redundancy. Although ChatGPT is still in the developmental stage, issues about plagiarism detection will still exist. Although though ChatGPT has been trained on a vast amount of data and is capable of producing meaningful and cohesive responses, its accuracy can occasionally be restricted. As a result, particularly in areas of expertise where the model has not been educated, erroneous information may be presented in academic settings. The ChatGPT technology is not faultless. It might, for instance, struggle with tasks requiring intricate reasoning or in-depth understanding of a subject, and it might not always provide outcomes of a high standard.

- **Lack of domain-specific knowledge:** While ChatGPT has access to a vast amount of general knowledge, it may lack specific knowledge related to a particular academic domain. This can be a disadvantage in academic settings where specialized knowledge is required, such as in technical or scientific fields.
- **Inability to understand context:** ChatGPT may not always be able to understand the context in which a question is being asked, leading to irrelevant or incorrect responses. This can be a significant limitation in academic and educational settings where accurate and relevant information is crucial.
- **Limited ability to reason and infer:** Although ChatGPT has impressive natural language processing capabilities, it may lack the ability to reason and infer information in the same way that a human would. This can lead to incorrect conclusions or interpretations.
- **Potential for bias:** ChatGPT is trained on a vast amount of data, and this data may contain biases that can influence its responses. This can be problematic in educational settings where objective and unbiased information is necessary.
- **Lack of emotional intelligence:** ChatGPT may not be able to detect and respond appropriately to emotional cues in communication. This can be a disadvantage in academic settings where emotional intelligence is crucial for effective communication and collaboration.
- **Dependence on training data:** ChatGPT is dependent on the quality and quantity of the training data it receives. This can be a disadvantage in educational settings where new and emerging topics may not have enough training data available.
- **Lack of personal experience:** ChatGPT does not have personal experience or expertise, unlike human academics. It may not be able to provide practical advice or guidance on complex academic issues.
- **Limited access to current research:** Although ChatGPT can access vast amounts of information on the internet, it may not be able to access the most recent academic research that requires access to academic journals or databases.

Conclusion

In this paper, we have explored the capabilities and limitations of ChatGPT in the context of academia. Our review of the literature suggests that ChatGPT has the potential to significantly impact various aspects of academic work, including language learning, academic writing, research, accessibility, and academic discourse communities. However, there are also several limitations and ethical concerns associated with the use of ChatGPT in academia that need to be addressed.

One of the main advantages of ChatGPT is its ability to generate human-like responses, which can be used to provide personalized feedback, correct errors, and facilitate communication among researchers from different linguistic and cultural backgrounds. ChatGPT can also be used to enhance accessibility in higher education for students with disabilities, by providing real-time captioning, voice recognition, and other assistive technologies.

However, there are also several limitations and challenges associated with the use of ChatGPT in academia. For example, there are concerns around the ethical and legal implications of using ChatGPT for academic writing, particularly in regards to plagiarism and authorship. There are also limitations to the accuracy and reliability of ChatGPT, as it can sometimes produce nonsensical or offensive responses. To address these limitations and concerns, it is important for academic institutions and researchers to develop clear guidelines and regulations around the use of ChatGPT in academic work. This includes guidelines for using ChatGPT for research, as well as guidelines for using it as a tool

for language learning and accessibility. Additionally, there needs to be ongoing research and evaluation of the impact of ChatGPT on academia, both in terms of its benefits and limitations. ChatGPT has impressive language processing capabilities, it still has several limitations and disadvantages in academic and educational settings.

The role of a teacher could be in jeopardy for the Robots if they get a sense. Because of this, I believe that rather than simply giving a lecture, a teacher's job in the modern world is to pique students' interest in a subject. On the off chance that educators neglect to make it happen, our pertinence will be at serious risk. The creation of policies and procedures, the provision of training and support, and the application of various methods to detect and prevent cheating are some of the strategies that can be adopted to guarantee the ethical and responsible use of chatAPIs. Above all else, we need to make sure that the development of effective assessment design, as well as academic and critical thinking skills that will make students less likely to use artificial intelligence, remains the primary focus of our curriculum.

Overall, ChatGPT has the potential to significantly impact the field of academia, but it is important to approach its use with caution and awareness of its limitations and ethical implications. As the technology continues to develop and be implemented in various fields, ongoing research and evaluation will be necessary to ensure that it is being used in a responsible and beneficial way.

References

1. Kirmani, A. R. (2022). Artificial intelligence-enabled science poetry. *ACS Energy Letters*, 8,574-576.
2. Vaswani, A., Shazeer, N., Parmar, N., Uszkoreit, J., Jones, L., Gomez, A. N., ... & Polosukhin, I. (2017). Attention is all you need. *Advances in neural information processing systems*, 30, 5998-6008.
3. Li, D., Lv, Q., Sun, M., Liu, B., & Huang, X. (2020). DeBERTa: Decoding-enhanced BERT with Disentangled Attention. *arXiv preprint arXiv:2006.03671*.
4. Johar, S. (2020). How to code the Transformer in PyTorch. *Towards Data Science*.<https://towardsdatascience.com/how-to-code-the-transformer-in-pytorch-24db27c8f9ec>
5. <https://www.atriainnovation.com/en/how-does-chat-gpt-work/>
6. <https://doi.org/10.48550/arXiv.1706.03762>
7. Hu, X., & Liu, H. (2021). The Impact of GPT-3 on Language Learning: A Systematic Review. *IEEE Access*, 9, 49774-49785.
8. Jaschik, S. (2021). Using Artificial Intelligence in Academic Writing Raises Ethical Questions. *Inside Higher Ed*. Retrieved from <https://www.insidehighered.com/news/2021/05/17/using-artificial-intelligence-academic-writing-raises-ethical-questions>
9. Lipton, Z. C., & Steinhardt, J. (2018). Troubling trends in machine learning scholarship. *arXiv preprint arXiv:1807.03341*.
10. Kim, S., & Lee, K. (2022). Enhancing Accessibility in Higher Education Using GPT-3: Opportunities and Challenges. *Journal of Educational Technology & Society*, 25(1), 29-40.
11. Vassallo, M. T., & Rizzi, E. (2021). From writing aid to epistemological shift? The role of AI in academic discourse communities. *Frontiers in Education*, 6, 761537.
12. 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.
13. Lund, B. D., & Wang, T. (2023). Chatting about ChatGPT: how may AI and GPT impact academia and libraries?. *Library Hi Tech News*.
14. 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. *Available at SSRN 4337484*.