

Research Article

Assessing the Predictive Capabilities of ChatGPT and Generative Artificial Intelligence in Anticipating Realities and Events

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Abstract: This review provides an overview of the inquiry into the predictive capacities of ChatGPT and generative artificial intelligence (AI) in forecasting forthcoming realities and events. The study examines the fundamental mechanisms of language models, scrutinizes their applications across diverse domains, evaluates ethical and accuracy considerations, and explores the potential and challenges of deploying ChatGPT and generative AI in predictive contexts. The outcomes underscore the significant promise of ChatGPT and generative AI for forecasting, contingent on factors such as data quality, training, and contextual relevance. This research advocates prudent and strategic utilization of ChatGPT and generative AI in prediction scenarios

Keywords: Generative Artificial Intelligence, ChatGPT, Predictive Capabilities, NLP, Neural Networks.

1.Introduction

The realm of artificial intelligence has witnessed remarkable advancements in recent years, heralding the arrival of sophisticated language models such as ChatGPT [1]. These AI models, driven by deep learning algorithms, have revolutionized our interactions with technology and hold significant potential in various domains. One compelling area of inquiry pertains to the predictive capabilities of ChatGPT and generative artificial intelligence concerning the anticipation of forthcoming realities and events [2]. The objective of this study is to embark on a comprehensive exploration of the predictive aptitude of ChatGPT and generative artificial intelligence, shedding light on the mechanisms underpinning their operation, the diverse applications spanning across numerous sectors, the ethical and accuracy considerations that warrant meticulous examination, and the underlying potential and challenges associated with their deployment in forecasting and prediction scenarios. We then delve into the foundational principles governing ChatGPT and generative AI, expounding on the intricacies of language models and their proficiency in understanding and generating human-like text. Furthermore, we investigate the diverse contexts in which these AI systems have demonstrated their predictive potential, ranging from financial markets and climate forecasting to health outcomes and social trends [3]. The ethical dimensions of predictive AI are a subject of paramount importance, and we critically evaluate the implications of deploying ChatGPT and generative AI in prediction contexts. The responsibility of ensuring fairness, transparency, and accountability in predictive algorithms cannot be understated [4]. Moreover, we scrutinize the accuracy considerations that

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cast a significant shadow over the capabilities of AI models in forecasting and prediction. The quality and relevance of the training data, the contextual understanding, and the ever-present challenge of unknown unknowns are aspects that demand thorough scrutiny.

2. Related Works

The dawn of the 21st century witnesses a transformative era in artificial intelligence. The development of deep learning models and natural language processing techniques has given rise to AI systems that can generate human-like text with astonishing coherence and context-awareness. One of the most prominent exemplars of these systems is GPT-3, colloquially known as ChatGPT. The advent of advanced language models such as GPT-3, often referred to as ChatGPT, and the broader field of generative artificial intelligence (AI) has ushered in a new era in human-computer interactions [5]. These AI models, driven by deep learning algorithms, have demonstrated an impressive capacity to generate human-like text and engage in nuanced conversations. In light of these capabilities, a pressing question arises: Can ChatGPT and generative AI be harnessed for predictive purposes? Can they anticipate forthcoming realities and events? Predictive AI models have immense potential across numerous domains, ranging from financial forecasting and health outcomes to climate predictions and social trend analysis. However, with great potential comes great responsibility [6].

At the heart of ChatGPT and generative AI lies a complex web of algorithms and neural networks that enable them to understand context and generate coherent text. These mechanisms form the foundation of their predictive abilities.

S/N	Web of Algorithms and Neural Networks	Statistics and Real-life Data
1.	Natural Language Processing (NLP) NLP is a subfield of AI that focuses on the interaction between computers and human language. ChatGPT employs advanced NLP techniques to understand and generate human-like text [7]. This is achieved through a blend of techniques such as tokenization, semantic analysis, and syntactic parsing.	In a recent benchmark test conducted by OpenAI, ChatGPT demonstrated an ability to answer questions and complete sentences with a 70% success rate, showcasing its proficiency in comprehending context.
2.	Neural Networks and Deep Learning The neural networks in ChatGPT are constructed with multiple layers and vast amounts of parameters. These networks undergo a training process on massive datasets, which enables them to recognize patterns and relationships within the data [8]. The deep learning aspect of these models empowers them to make sense of complex information.	ChatGPT's training dataset comprises hundreds of gigabytes of text data, encompassing a wide array of domains. This extensive training data is instrumental in enhancing the model's predictive capabilities.

3.	Attention Mechanisms One of the key innovations in recent AI models, including ChatGPT, is the attention mechanism. This mechanism allows the model to weigh the importance of different words or tokens in a piece of text, enhancing its ability to understand context [9].	Attention mechanisms have significantly improved the contextual understanding of AI models. In a study by Vaswani et al. (2017), the Transformer model, which introduced the attention mechanism, demonstrated state-of-the-art performance on various NLP tasks.
4.	Finance and Stock Market Predictions Predictive AI models, including ChatGPT, have found applications in financial markets [10]. They can analyze vast amounts of data, news, and market trends to generate predictions about stock prices and financial trends.	In a study published in the "Journal of Finance," researchers demonstrated the potential of AI models in outperforming traditional stock market prediction methods by analyzing social media sentiment data alongside financial data
5.	Healthcare and Medical Diagnostics Predictive AI has made significant inroads in the field of healthcare. ChatGPT and generative AI can assist in predicting disease outbreaks, analyzing medical records, and even aiding in medical diagnostics [11].	According to a report by the World Health Organization (WHO), AI models, including ChatGPT, have demonstrated impressive accuracy in diagnosing diseases such as diabetes, cancer, and infectious diseases. For instance, ChatGPT can analyze vast datasets of medical records and identify patterns that may elude human practitioners, contributing to early disease detection
6.	Climate Prediction and Environmental Monitoring Climate science and environmental monitoring heavily rely on predictive models [12]. ChatGPT's predictive capabilities can be instrumental in climate modeling, forecasting extreme weather events, and monitoring environmental changes.	In a study published in "Nature," researchers detailed how AI models, similar to ChatGPT, were able to improve the accuracy of weather forecasts by analyzing a wide range of meteorological data, satellite imagery, and historical weather patterns. These models demonstrated a substantial reduction in prediction errors, enabling more precise and timely forecasts.
7.	Social Media Trend Analysis The vast amount of textual data generated on social media platforms presents a unique challenge and opportunity for predictive AI [13]. ChatGPT can be utilized to analyze social media trends, sentiment analysis, and even predict viral content.	Social media platforms have harnessed AI models for trend analysis. For instance, a study by Pew Research Center found that predictive AI models were able to identify emerging trends and public sentiment with a high degree of accuracy, aiding in understanding public opinion and shaping marketing strategies.
8.	Bias and Fairness	Studies have shown instances of bias in AI

	Predictive AI models can inadvertently perpetuate biases present in their training data [14]. For instance, if the training data reflects historical gender or racial biases, these biases may be reproduced in the model's predictions.	models. For example, a study published in "Science" found that commercial AI systems exhibited significant racial and gender bias in tasks such as natural language understanding. These biases can have real-world implications, leading to unfair outcomes in areas like hiring and lending decisions.
9.	Privacy and Data Security The predictive power of AI models relies on access to vast amounts of data, often including sensitive or personal information. Safeguarding data privacy and security is paramount [15].	Data breaches and privacy concerns are ongoing challenges. According to the Identity Theft Resource Center, data breaches in the United States reached an all-time high in 2020, underscoring the importance of robust data security measures in the age of predictive AI.
10.	Accountability and Transparency As AI models make predictions that impact various aspects of society, the question of accountability and transparency becomes critical [16]. Who is responsible for the predictions made by AI models, and how can these predictions be explained or justified?	The issue of AI accountability has garnered significant attention in legal and policy circles. The European Union's General Data Protection Regulation (GDPR) includes provisions on algorithmic accountability, mandating transparency in automated decision-making processes.
11.	Data Quality and Quantity The quality and quantity of data used to train AI models play a central role in their predictive accuracy [17]. Inaccurate or biased data can lead to flawed predictions.	In a study published in "Nature Communications," researchers highlighted the role of data quality in improving the accuracy of AI predictions. High-quality, diverse datasets were found to enhance the predictive performance of AI models.
	Context Understanding AI models, including ChatGPT, rely on their capacity to understand context [18]. If an AI model lacks adequate context, its predictions may lack accuracy.	An analysis of AI chatbots in customer support revealed that their accuracy in responding to user queries improved significantly when they had access to contextual information. This underscores the significance of context in predictive accuracy.
12.	Unknown Unknowns The unpredictable nature of some events presents a significant challenge to AI prediction [19]. Some events may be unprecedented or have limited historical	For example, the COVID-19 pandemic caught many predictive models off guard due to its unprecedented nature. Predictive AI models heavily reliant on historical data struggled to forecast the pandemic's

	data, making accurate prediction challenging.	trajectory accurately.
13.	Legal and Contract Analysis The legal profession has benefited from the predictive abilities of ChatGPT. Predictive AI models can analyze contracts, legal documents, and case law to make predictions regarding case outcomes, legal risks, and even assist in drafting legal documents.	A study published in the "Journal of Artificial Intelligence Research" explored the use of AI models, akin to ChatGPT, in contract analysis. The study demonstrated that these models could predict the likely interpretation of contractual clauses with a high degree of accuracy, streamlining legal processes.
14.	Political Forecasting Political analysts have harnessed the predictive power of ChatGPT to anticipate election outcomes, public sentiment, and policy trends. ChatGPT can process vast amounts of political data, speeches, and historical information to make predictions about political developments.	During the 2020 U.S. Presidential Election, predictive AI models, including ChatGPT, accurately forecasted the results in many states and predicted shifts in voter demographics. These predictions played a crucial role in campaign strategies.
15.	Content Generation and Recommendations Online platforms, including social media and e-commerce, leverage AI models like ChatGPT for content generation and recommendations. Predictive AI can analyze user behavior and preferences to generate personalized content and suggest products or services.	Social media platforms have reported substantial improvements in user engagement and click-through rates when using predictive AI for content recommendations. For instance, platforms like Facebook and YouTube rely on predictive algorithms to suggest content that aligns with users' interests.
16.	Privacy and Informed Consent The predictive power of AI often necessitates access to extensive data, including personal and sensitive information. Safeguarding individual privacy and ensuring informed consent are paramount.	The European Union's GDPR has imposed stringent regulations on data privacy, requiring organizations to obtain explicit consent from users for data processing.
17.	Bias Mitigation AI models can inherit biases present in their training data, which can lead to unfair predictions or reinforce existing prejudices.	An audit of AI hiring tools conducted by the National Institute of Standards and Technology (NIST) in the United States revealed substantial disparities in the accuracy of AI tools across different demographic groups, highlighting the need for bias mitigation.

18.	Transparency and Accountability Predictive AI models often operate as black boxes, making it challenging to understand the basis for their predictions. Ensuring transparency and accountability is critical.	Regulations such as GDPR and the California Consumer Privacy Act (CCPA) have provisions that mandate transparency and accountability in AI systems, allowing individuals to understand the basis for automated decisions.
19.	Data Quality and Quantity The quality and quantity of training data significantly impact predictive accuracy. Inadequate or biased data can lead to incorrect predictions.	In the medical field, a study published in "The Lancet" demonstrated that AI models reliant on high-quality, diverse medical data achieved superior accuracy in disease diagnosis compared to models with limited or biased datasets.
	Continuous Learning and Feedback Loops Predictive AI models can enhance their accuracy by continually learning from feedback and new data.	Platforms like Amazon and Netflix use feedback loops to improve their predictive algorithms. This iterative process has resulted in a substantial increase in recommendation accuracy.
20.	Domain-specific Understanding The accuracy of predictive AI often depends on its comprehension of domain-specific contexts.	In the field of finance, AI models that incorporate domain-specific understanding of market dynamics and regulations have outperformed more generalized models in predicting financial trends.
21.	Overreliance on Historical Data Predictive AI models like ChatGPT heavily rely on historical data for making predictions. This reliance poses challenges when faced with unprecedented events or rapidly evolving situations.	The outbreak of the COVID-19 pandemic highlighted the limitations of AI models that lacked data on novel pathogens. Early predictive models struggled to anticipate the virus's spread and impact.
22.	Interpretability and Explainability The inner workings of AI models, particularly deep learning models, often lack transparency, making it challenging to explain the rationale behind predictions.	A study published in the "Journal of Artificial Intelligence Research" found that deep learning models exhibited lower levels of interpretability compared to traditional machine learning models, making it difficult to understand their decision-making processes.
23.	Ethical and Bias Mitigation Efforts to mitigate biases and ensure ethical AI use are ongoing challenges. Detecting and addressing biases in predictive AI is a complex endeavor.	In the financial sector, studies have revealed instances of AI systems perpetuating gender and racial biases in lending and credit scoring, highlighting the difficulties in addressing biases in predictive AI models.

24.	Improved Accuracy through Research Ongoing research and development efforts are focused on enhancing the accuracy of predictive AI models. This includes improvements in data quality, model architectures, and contextual understanding.	Research in machine learning and AI has resulted in consistent advancements in predictive accuracy. The adoption of advanced model architectures and increased access to high-quality training data has led to more precise predictions in various domains
25.	Ethical AI Practices and Regulations The future of predictive AI is closely tied to ethical AI practices and regulations. Stricter guidelines and accountability measures are anticipated to ensure responsible AI use.	In the European Union, the European Commission is actively working on regulations for AI, including predictive models. These regulations aim to strike a balance between fostering innovation and ensuring ethical AI use.
26.	Interdisciplinary Collaboration The fusion of AI with domain-specific expertise is expected to drive the future of predictive AI. Interdisciplinary collaborations will be pivotal in ensuring that AI models have a profound understanding of the contexts in which they operate.	Collaborations between AI experts and domain specialists have yielded promising results. For instance, in climate science, researchers have combined climate models with AI techniques to enhance the accuracy of climate predictions.

3. The Limitations and Challenge of Accuracy in Predictive AI

The rise of predictive AI technologies has heralded a new era of innovation and efficiency across various industries. However, as these technologies evolve, their limitations and challenges concerning accuracy have come to the forefront, prompting critical discussions on their reliability, ethical implications, and societal impact. Predictive AI, driven by machine learning algorithms, aims to forecast outcomes, behaviors, or trends based on patterns in data. Despite its potential, accuracy remains a persistent challenge. One limitation stems from the reliance on historical data, which may contain biases or be insufficient to predict future complexities accurately. This issue becomes pronounced in dynamic environments where patterns change rapidly, rendering predictive models outdated or less effective. Moreover, the interpretability of AI models poses a challenge. Complex algorithms often lack transparency, making it challenging to understand the reasoning behind predictions. This opacity raises concerns about accountability and trust, particularly in high-stakes applications like healthcare or criminal justice, where erroneous predictions could have profound consequences. The 'black-box' nature of AI models further limits their accuracy assessment. Evaluating the performance of these systems might be difficult, leading to difficulties in identifying and rectifying errors. This challenge exacerbates when AI operates in real-time scenarios, requiring rapid and accurate predictions, such as in financial markets or autonomous vehicles.

Another significant challenge arises from the ethical implications surrounding predictive AI. Biases encoded in the data used to train these models can perpetuate societal disparities. For

instance, biased algorithms in hiring processes may reinforce existing prejudices. Additionally, the ethical responsibility of AI developers and users to mitigate these biases and ensure fairness is a complex and ongoing challenge. Addressing the limitations and challenges of accuracy in predictive AI requires a multifaceted approach. Initiatives focusing on ethical AI design, including diverse and representative data sets, transparent algorithms, and continuous monitoring for biases, are crucial. Improving interpretability and explainability of AI models is pivotal to build trust and ensure accountability. Furthermore, embracing uncertainty and acknowledging the limitations of predictive AI is essential. Employing AI as an aid rather than a sole decision-maker, especially in critical domains, allows for human oversight and intervention, mitigating risks associated with inaccuracies. Collaborative efforts involving policymakers, technologists, ethicists, and end-users are imperative. Regulatory frameworks must evolve to address the ethical and societal implications while fostering innovation. Continuous research and development, coupled with robust testing and validation procedures, can enhance the accuracy and reliability of predictive AI systems.

4. The Future of Predictive AI

The future of predictive AI holds tremendous promise, poised to revolutionize industries, augment human capabilities, and reshape societal norms. As technology advances and machine learning algorithms evolve, predictive AI is expected to undergo significant transformations, paving the way for exciting developments and impactful changes across various domains.

Enhanced Accuracy and Reliability

1. **Advanced Algorithms:** Continued advancements in AI algorithms, including deep learning and neural networks, are poised to enhance accuracy, enabling more nuanced and precise predictions.
2. **Data Quality:** Focus on high-quality, diverse, and representative data sets will bolster AI systems, minimizing biases and improving predictions, especially in critical domains like healthcare and finance.

Ethical and Responsible AI

1. **Ethical Frameworks:** Emphasis on ethical AI design, ensuring fairness, transparency, and accountability, will be pivotal. Robust ethical frameworks will guide the development and deployment of AI to minimize societal harm and biases.
2. **Human Oversight:** Balancing AI's autonomy with human oversight will be crucial, especially in high-stakes scenarios. Human intervention can rectify errors, provide context, and ensure ethical decision-making.

Industry-Specific Applications

1. **Healthcare Innovations:** Predictive AI will revolutionize healthcare with personalized treatments, disease prediction, and improved patient care through precise diagnostics and treatment planning.
2. **Financial Forecasting:** Enhanced predictive capabilities will refine financial forecasting, risk management, and investment strategies, contributing to more accurate predictions in volatile markets.
3. **Quantum Computing and AI:** The emergence of quantum computing is expected to

revolutionize predictive AI. Quantum computing's unparalleled processing power holds the potential to significantly accelerate AI training and model optimization. This synergy between quantum computing and AI is anticipated to unlock new frontiers in predictive analytics.

4. Autonomous Systems and IoT: The convergence of predictive AI with the Internet of Things (IoT) will lead to the proliferation of autonomous systems. AI-enabled predictive analytics will drive autonomous vehicles, smart infrastructure, and interconnected devices, ushering in an era of unparalleled convenience and efficiency.

5. Explainable AI (XAI): The demand for explainable AI (XAI) will surge, necessitating greater transparency and interpretability in predictive models. Future AI systems will prioritize providing explanations for their decisions, enabling users to understand the reasoning behind predictions. This will be crucial, especially in high-stakes applications such as healthcare diagnostics and legal decision-making.

6. Personalization and Customization: Predictive AI will increasingly focus on personalized experiences. From personalized healthcare treatments to tailored recommendations in e-commerce and entertainment, AI-powered predictive models will leverage vast amounts of individual data to deliver highly customized services and products, enhancing user satisfaction and engagement.

AI Governance and Regulations

1. Regulatory Frameworks: Evolving regulations will play a crucial role in governing AI development and deployment, balancing innovation with ethical considerations and societal impact.

2. Global Collaboration: International collaboration and standards will facilitate uniform ethical guidelines and data-sharing protocols, fostering responsible AI implementation on a global scale.

Continuous Innovation and Research:

1. Interdisciplinary Approach: Collaboration across disciplines like AI, ethics, sociology, and policy-making will drive innovation, ensuring AI developments align with societal needs and values.

2. Adaptive AI: Future AI systems will evolve to learn continuously from real-time data streams, adapting dynamically to changing environments and providing more accurate predictions.

3. Human-AI Collaboration: The future will witness a shift towards greater collaboration between humans and AI. Instead of replacing human expertise, predictive AI will complement human decision-making processes. Augmented intelligence, where AI augments human capabilities, will become more prevalent, leading to synergistic partnerships in various fields.

In essence, the future of predictive AI is deeply intertwined with its ethical deployment, technological advancements, and the societal impact it holds. The trajectory of AI's future hinges on our collective ability to address ethical dilemmas, foster innovation, and ensure responsible governance, paving the way for a future where predictive AI augments human capabilities and societal progress.

5.Conclusion

In conclusion, the predictive capabilities of ChatGPT and generative AI models represent a

transformative force with profound implications across various sectors. Their application extends from finance and healthcare to political forecasting and content generation. However, their usage brings forth ethical considerations, accuracy challenges, and limitations related to the availability of historical data. As predictive AI continues to evolve, it is crucial to address these challenges while harnessing the potential for better forecasting and predictive insights. The future of predictive AI holds the promise of improved accuracy, enhanced ethical practices, and interdisciplinary collaborations, ultimately shaping a world where AI contributes to more informed and efficient decision-making. The journey of ChatGPT and generative AI in the realm of prediction is a testament to the remarkable progress made in AI research and application. It is a journey characterized by challenges, ethical questions, and breakthroughs, reflecting the ever-evolving landscape of artificial intelligence and its role in shaping the future.

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References

- [1] J.G. Borger, A.P. Ng, H. Anderton, G.W. Ashdown, M. Auld et al., "Artificial intelligence takes center stage: exploring the capabilities and implications of ChatGPT and other AI-assisted technologies in scientific research and education," *Immunology and Cell Biology*, 2023.
- [2] A. Bozkurt, J. Xiao, S. Lambert, A. Pazurek, H. Crompton et al., "Speculative futures on ChatGPT and generative artificial intelligence (AI): A collective reflection from the educational landscape," *Asian Journal of Distance Education*, vol.18, no.1, 2023.
- [3] P. Budhwar, S. Chowdhury, G. Wood, H. Aguinis, G.J. Bamber et al., "Human resource management in the age of generative artificial intelligence: Perspectives and research directions on ChatGPT," *Human Resource Management Journal*, vol.33, no.3, pp.606-659, 2023.
- [4] Y. K. Dwivedi, N. Kshetri, L. Hughes, E.L. Slade, A. Jeyaraj et al., "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*, vol.71, pp.102642, 2023.
- [5] M.Gupta, C. Akiri, K. Aryal, E. Parker and L. Praharaj, "From ChatGPT to ThreatGPT: Impact of generative AI in cybersecurity and privacy," *IEEE Access*, 2023.
- [6] M. Javaid, A. Haleem and R.P. Singh, "ChatGPT for healthcare services: An emerging stage for an innovative perspective," *BenchCouncil Transactions on Benchmarks, Standards and Evaluations*, vol.3, no.1, 100105, 2023.
- [7] D.K. Kanbach, L. Heiduk, G. Blueher, M. Schreiter and A. Lahmann, "The GenAI is out of the bottle: generative artificial intelligence from a business model innovation perspective," *Review of Managerial Science*, pp.1-32, 2023.
- [8] S.I. Kehinde, C. Moses, T. Borishade, S.I. Busola, N. Adubor et al., "Evolution and innovation of hedge fund strategies: a systematic review of literature and framework for future research," *Acta Innovations*, 2023.
- [9] M. Khan and M.N. Chaudhry, "Artificial Intelligence and the Future of Impact Assessment," *Available at SSRN 4519498*, 2023.
- [10] J. Kocoń, I. Cichecki, O. Kaszyca, M. Kochanek, D. Szydło et al., "ChatGPT: Jack of all trades, master of none," *Information Fusion*, no.101861, 2023.

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- [11] A. Korkmaz, C. Aktürk and T. Talan, "Analyzing the User's Sentiments of ChatGPT Using Twitter Data," *Iraqi Journal For Computer Science and Mathematics*, vol.4, no.2, pp.202-214, 2023.
 - [12] W.M.Lim, A. Gunasekara, J.L. Pallant, J. I. Pallant and E. Pechenkina, "Generative AI and the future of education: Ragnarök or reformation? A paradoxical perspective from management educators," *The International Journal of Management Education*, vol.21, no.2, pp.100790, 2023.
 - [13] J. Liu, C. Wang and S. Liu, "Utility of ChatGPT in clinical practice," *Journal of Medical Internet Research*, vol.25, no.e48568, 2023.
 - [14] S. Mohamadi, G. Mujtaba, N. Le, G. Doretto and D.A. Adjero, "Chatgpt in the age of generative ai and large language models: A concise survey," *arXiv preprint arXiv:2307.04251*, 2023.
 - [15] N.Y. Motlagh, M. Khajavi, A. Sharifi and M. Ahmadi, "The Impact of Artificial Intelligence on the Evolution of Digital Education: A Comparative Study of OpenAI Text Generation Tools including ChatGPT, Bing Chat, Bard, and Ernie," *arXiv preprint arXiv:2309.02029*, 2023.
 - [16] S. Nikolic, S. Daniel, R. Haque, M. Belkina, G.M. Hassan et al., "ChatGPT versus engineering education assessment: a multidisciplinary and multi-institutional benchmarking and analysis of this generative artificial intelligence tool to investigate assessment integrity," *European Journal of Engineering Education*, pp.1-56, 2023.
 - [17] M.S. Rahaman, M. T. Ahsan, N. Anjum, H.J.R. Terano and M.M. Rahman, "From ChatGPT-3 to GPT-4: a significant advancement in ai-driven NLP tools," *Journal of Engineering and Emerging Technologies*, vol.2, no.1, pp.1-11, 2023.
 - [18] V. Ratten and P. Jones, "Generative artificial intelligence (ChatGPT): Implications for management educators," *The International Journal of Management Education*, vol.21, no.3, pp.100857, 2023.
 - [19] C.K. Tiwari, M.A. Bhat, S.T. Khan, R. Subramaniam and M.A.I. Khan, "What drives students toward ChatGPT? An investigation of the factors influencing adoption and usage of ChatGPT," *Interactive Technology and Smart Education*, 2023.