

Google's Bard and Open AI's ChatGPT: Revolutionary AI Technologies and Their Impact on Education

Shaikh Zikra Riyaz and Shaikh Suvaid Salim

Students, Department of Masters of Computer Applications

Late Bhausaheb Hiray S. S. Trust's Hiray Institute of Computer Application, Mumbai, India

shaikhzikra7666@gmail.com and shaikhsuvaidd318@gmail.com

Abstract: *This research paper explores the impact of Google's Bard and OpenAI's ChatGPT on education, two revolutionary AI technologies that have gained significant attention in recent years. Bard, developed by Google, focuses on natural language generation and understanding, while ChatGPT, created by OpenAI, excels in conversational AI and language processing. These AI technologies offer personalized and interactive learning experiences, transforming education in profound ways. The paper investigates the capabilities of Bard and ChatGPT and their application in educational settings. These AI technologies provide learners with dynamic conversations, instant feedback, and personalized learning materials. By catering to individual needs and learning styles, Bard and ChatGPT enhance learner engagement and motivation. They also enable continuous learning beyond traditional classrooms, empowering students to explore diverse subjects and expand their knowledge. Furthermore, the paper examines the impact of Bard and ChatGPT on educators. These AI technologies serve as valuable tools for optimizing instruction. They can automate administrative tasks, generate instructional materials, and deliver personalized feedback to students. By harnessing the power of Bard and ChatGPT, educators can individualize their teaching approach, adapt to diverse student needs, and create more engaging learning environments*

Keywords: ChatGPT, Bard, Google, OpenAI, Education, Artificial Intelligence, Learning, LaMDA

I. INTRODUCTION

The rapid pace of change in our world is undeniable, driven by continuous advancements in technology [1]. Each day brings new surprises and innovations that captivate people globally. It wasn't long ago that the idea of a device connecting individuals worldwide and enabling them to perform a multitude of tasks in an instant seemed like a far-fetched notion. Yet, technology has evolved to the point where we now carry such devices in our pockets, effortlessly capturing moments and organizing our lives. These technological advancements have significantly enhanced the human experience.

Among the remarkable developments shaping our modern world are the World Wide Web and Artificial Intelligence. These marvels continue to push boundaries and leave us in awe of their capabilities. Recently, ChatGPT, an AI-powered chatbot, has emerged as a prominent player in the tech community, attracting substantial attention and generating buzz online. People are fascinated by its conversational abilities and the potential it holds for various applications.

However, in a landscape dominated by tech giants, Google stands out as an industry leader. Instead of merely observing the progress made by others, Google is proactively developing its own AI chatbot named Bard, which will be powered by LaMDA, a language model technology. This move showcases Google's commitment to innovation and its determination to stay at the forefront of technological advancements.

The tech community and the general public are closely following this exciting development, envisioning a competition between Google's Bard, OpenAI's ChatGPT, and other players in the industry. The comparison and

anticipation surrounding these AI chatbots exemplify the enthusiasm and curiosity that arise when new technologies promise to reshape our interactions and experiences.

1.1 AI in Education:

In the field of education, AI technologies have the potential to transform traditional teaching and learning methods. AI-powered virtual assistants can answer student questions and offer guidance, while AI-generated content can provide tailored learning materials. AI technologies like ChatGPT and Bard are revolutionizing education by offering new opportunities for learning and teaching. This personalized approach enhances student engagement, promotes deeper understanding, and fosters self-directed learning. AI technologies also enable adaptive instruction, where the learning content and pace can be adjusted based on individual student needs, maximizing learning outcomes.

II. UNDERSTANDING THE UNDERLYING TECHNOLOGY BEHIND CHATGPT AND BARD

2.1 What is OpenAI's ChatGPT?

OpenAI's ChatGPT is an advanced language model developed by OpenAI, a leading artificial intelligence research organization. It is designed to engage in interactive and dynamic conversations with users, providing human-like responses to text-based inputs. ChatGPT is built on the GPT (Generative Pre-trained Transformer) architecture, which is a state-of-the-art deep learning model for natural language processing tasks.

The training of ChatGPT involves exposing the model to a vast amount of text data from diverse sources on the internet. This pre-training phase enables the model to learn the statistical patterns and linguistic structures of human language. By leveraging this knowledge, ChatGPT can generate coherent and contextually relevant responses to various prompts.

One of the notable features of ChatGPT is its ability to hold meaningful and extended conversations. Unlike traditional chatbots that operate on fixed scripts, ChatGPT has a more dynamic and flexible approach. It can handle a wide range of topics and provide engaging responses that simulate natural human conversations.

OpenAI has also implemented techniques to control the behaviour and output of ChatGPT. They have introduced a concept called "prompt engineering" where users can provide specific instructions or guidelines to shape the responses of the model. This allows users to guide the conversation and achieve more desired outcomes.

It is important to note that ChatGPT has certain limitations. Sometimes, it may produce plausible-sounding but incorrect or nonsensical responses. It can also be sensitive to input phrasing and might generate inconsistent answers to slight variations of the same question. OpenAI acknowledges these limitations and continues to work on refining the system to address them.

OpenAI has made ChatGPT available to the public to gather user feedback and improve the system. They aim to ensure that the deployment and use of AI models like ChatGPT are done responsibly and with proper safeguards to prevent malicious use.

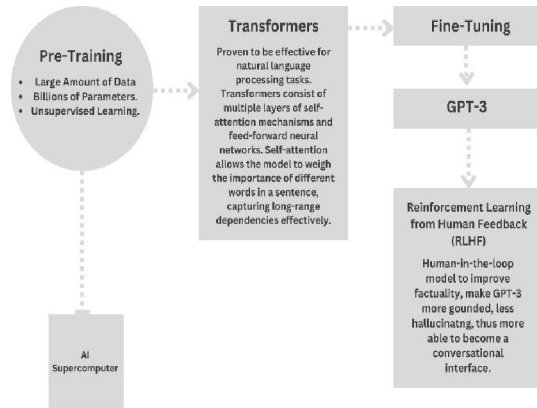
Overall, OpenAI's ChatGPT represents a significant advancement in natural language processing and conversational AI. It showcases the potential of language models to simulate human-like interactions and has implications for various applications, including customer support, virtual assistants, and educational tools.

2.2 How it Works?

Here's a detailed explanation of how ChatGPT works:

- **Pre-training:** ChatGPT goes through a pre-training phase where it learns from a massive amount of publicly available text data. It is trained to predict the next word in a sentence using a technique called unsupervised learning. During pre-training, the model develops an understanding of grammar, context, and relationships between words.
- **Transformer Architecture:** ChatGPT is built on the Transformer architecture, which has proven to be effective for natural language processing tasks. Transformers consist of multiple layers of self-attention mechanisms and feed-forward neural networks. Self-attention allows the model to weigh the importance of different words in a sentence, capturing long-range dependencies effectively.
- **Fine-tuning:** After pre-training, ChatGPT undergoes a fine-tuning process. This involves training the model on a more specific dataset that is carefully generated with human reviewers. These reviewers follow guidelines provided by OpenAI to review and rate possible model outputs for different inputs. The model learns from this reviewer feedback, enabling it to produce more accurate and appropriate responses.
- **Contextual Understanding:** ChatGPT excels at understanding and generating responses in

context. It takes into account the preceding conversation and uses context windowing to limit the history of the conversation it considers. The context is essential for generating coherent and relevant responses.



- **Inference and Response Generation:** When a user interacts with ChatGPT, the input text is tokenized and processed by the model. The model then generates a probability distribution over the possible next words, taking into account the context and the previous conversation. Sampling techniques like top-k or nucleus sampling are used to choose the actual word to be generated.
- **Prompt Engineering:** OpenAI has introduced the concept of prompt engineering to help users guide the model's responses. Users can provide specific instructions or guidelines to shape the behaviour of the model and achieve more desired outcomes. Prompt engineering is a way to control and influence the generation process.

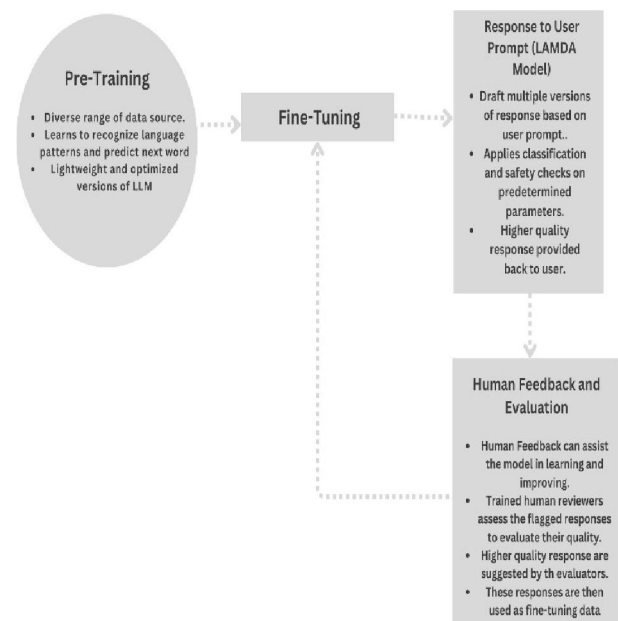
2.3 What is Google's Bard?

Bard is an innovative interface, designed to facilitate collaboration between users and generative AI through a Large Language Model (LLM) [2]. The overarching goal of LLM-based technologies like Bard is to unlock human potential and empower individuals in various aspects of their lives. As an ongoing experiment, Bard is being introduced with careful consideration and adherence to relevant guidelines and regulations. To ensure its responsible development and address potential risks and limitations, Google is actively engaging with industry experts, educators, policymakers, civil rights leaders, content creators, and other stakeholders. This collaborative approach aims to explore the diverse applications of Bard, understand its implications, and identify opportunities for improvement.

Already, Bard has demonstrated its utility in supporting productivity, creativity, and curiosity. In terms of productivity, Bard acts as a creative and helpful collaborator, enabling users to make the most of their time. For example, when planning a party, Bard can assist with generating a comprehensive to-do list and even provide an outline for the invitation, freeing up the user's cognitive resources for more complex tasks. In the realm of creativity, Bard serves as an invaluable tool for bringing ideas to life and igniting inspiration. Whether it's outlining a blog post or generating poems, short stories, or taglines, Bard provides users with a starting point, eliminating the daunting task of facing a blank page and encouraging creative expression.

Moreover, Bard nurtures curiosity and serves as a gateway to exploration. It simplifies complex concepts, making them more accessible, and surfaces relevant insights on various topics. By offering concise explanations and thought-provoking information, Bard fuels users' curiosity, motivating them to delve deeper into areas of interest and expand their knowledge.

It is important to note that the aforementioned categories of productivity, creativity, and curiosity are just a subset of Bard's potential applications. Google is eager to learn from the innovative ways in which people utilize Bard and actively seeks feedback from users to further enhance its capabilities. By leveraging Bard's collaborative features and its ability to support productivity, foster creativity, and fuel curiosity, individuals can unlock new possibilities and tap into the transformative power of generative AI.



2.4 How it works?

Pre-training:

Bard is built upon a lightweight and optimized version of LLM (Language Models for Dialogue Applications). Like most LLMs, Bard undergoes pre-training using a diverse range of publicly available data sources. During this pre-training phase, the model learns to recognize language patterns and predict the most probable next word or words in a sequence. For instance, as the LLM learns, it can anticipate that "jelly" is more likely to follow "peanut butter and ___" compared to "shoelace." However, solely relying on the most probable next word might limit the model's creativity. Hence, LLMs are designed with the flexibility to select from reasonable, though slightly less probable, choices to generate more interesting and diverse responses.

2.5 Factual Understanding and Generation

While LLMs can perform well on factual prompts and give the impression of retrieving information, it's important to note that they are not information databases or deterministic retrieval systems. Unlike a database query that consistently retrieves the same stored information, an LLM's response to the same prompt may vary each time. This variation is a consequence of the LLM's mechanism of predicting the next word. Consequently, LLMs can generate responses that sound plausible but may include factual errors. While this may not be ideal in situations where factuality matters, it can be useful for generating creative or unexpected outputs.

2.6 Responses to User Prompts:

When a user provides a prompt, Bard utilizes the context and the ongoing interaction with the user to draft multiple versions of a response. Subsequently, Bard applies classification and safety checks to its responses based on predetermined parameters. The responses that pass through these technical guardrails are then re-ranked according to their quality, with the higher-quality responses being provided back to the user.

2.7 Human Feedback and Evaluation:

The early work on instruction fine-tuning has demonstrated that incorporating human assistance, feedback, and additional engineering in various forms can assist the model in learning and improving. Trained human reviewers assess the flagged responses in Bard to evaluate their quality in relation to the input prompt. They determine if Bard's response is low-quality, inaccurate, or

requires improvement. Based on this assessment, trained evaluators suggest higher-quality responses aligned with predefined policies. These suggestions are then used as fine-tuning data to enhance Bard's dataset, enabling it to produce improved responses in the future. Additionally, the technique of Reinforcement Learning on Human Feedback (RLHF) is employed to further refine Bard by leveraging human preference feedback. While significant progress has been made through previous efforts and programs, gathering feedback and evaluation from a wider range of experts and users is the next crucial step in meaningfully improving Bard's capabilities.

III. COMPARISON BETWEEN OPEN AI'S CHATGPT AND GOOGLE'S BARD

Competition is a fundamental characteristic of the market, driving innovation, progress, and growth. In the dynamic landscape of the tech industry, rivalries between major companies have been prevalent across various sectors. These rivalries have shaped the market and influenced the direction of technological advancements.

Throughout history, we have witnessed iconic battles between tech giants in industries such as cellular phones, operating systems, automobiles, and aviation. Companies like Samsung and Apple have competed fiercely for dominance in the cellular phone industry, constantly introducing new features, improving performance, and capturing consumer attention. Similarly, the rivalry between iOS and Android has led to significant advancements in mobile operating systems, offering users diverse options and driving competition in the app ecosystem.

In the automobile industry, the competition between Ferrari and Ford symbolizes the clash of innovation and tradition. These companies have pushed the boundaries of performance, design, and engineering, aiming to captivate the hearts of car enthusiasts around the world. The aviation industry has witnessed a longstanding rivalry between Airbus and Boeing, as they strive to develop cutting-edge aircraft with enhanced safety, efficiency, and passenger experience.

From these rivalries, one crucial observation emerges: successful companies are those that can adapt quickly to new changes in the market. They recognize the evolving needs and preferences of consumers, embrace emerging technologies, and respond promptly to stay ahead of the competition. These companies understand that innovation and flexibility are key to maintaining their position and relevance in the ever-changing market landscape.

In the present era, we are witnessing another noteworthy competition unfolding in the realm of AI-based conversation tools/models. Google's Bard and OpenAI's ChatGPT represent the latest contenders in this rapidly evolving field. Both companies are investing significant resources and expertise to develop conversational AI technologies that can understand and generate human-like responses.

The competition between Bard and ChatGPT signifies the growing demand for advanced conversational AI solutions. These models have the potential to revolutionize various aspects of human-computer interaction, ranging from customer service chatbots to virtual assistants. Companies that can deliver the most accurate, engaging, and effective conversational experiences will likely gain a competitive edge in this emerging market.

The success of Bard and ChatGPT will depend on their ability to adapt to evolving user expectations, incorporate advancements in AI research, and continuously enhance their capabilities. This competition has far-reaching implications, as the outcome will shape the future of conversational AI and influence its applications across industries.

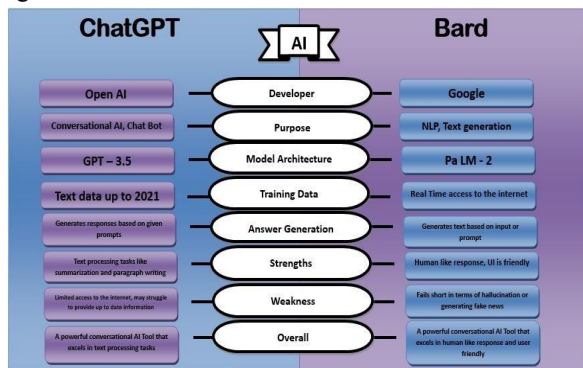
Overall, the rivalry between Bard and ChatGPT reflects the dynamic nature of the tech industry and the constant quest for innovation. It underscores the importance of adaptability and responsiveness to meet the evolving needs of users and remain at the forefront of technological progress.

contexts and even incorporate first responses to enhance the authenticity of discussions[3]. However, it lacks the specific focus on conversational agents that Bard possesses. Bard, on the other hand, was purpose-built for chatbots and conversational agents. While both models have undergone pre-training with large volumes of text data, Bard has been designed from the ground up to provide contextually appropriate responses to a wide range of questions. It boasts the ability to generate text in different voices and registers, making it a versatile content-generation tool. Unlike ChatGPT, Bard excels at quickly adapting to its surroundings and responding to user inquiries with the highest level of correctness and veracity. It avoids drawing erroneous inferences or making poor judgments based on assumptions.

Another notable difference is the underlying technology powering the models. Bard utilizes LaMDA (Language Model for Dialogue Applications), which enables it to excel in conversational scenarios. In contrast, ChatGPT is built on GPT (Generative Pre-trained Transformer) and lacks some of the specific conversational capabilities of Bard. Additionally, Bard, being a part of Google's suite of AI tools, integrates seamlessly with Google Search options, allowing users to access standard search results while utilizing Bard's AI assistance.

While Bard has a larger model size with 1.37 billion parameters and an extensive vocabulary base, ChatGPT is no slouch either, with 175 billion parameters. This indicates that ChatGPT has an advantage in terms of model size and complexity, which can impact its overall performance and text generation capabilities.

Lastly, in terms of availability and pricing, Bard is currently free to use, while OpenAI has introduced a premium edition of ChatGPT with additional features and benefits. OpenAI's accessible version of ChatGPT has been in use since November 2022.



ChatGPT and Bard are two AI-based conversational tools/models that offer distinct features and capabilities. ChatGPT, developed by OpenAI, is renowned as one of the most sophisticated language models. It has demonstrated exceptional accuracy and efficiency in processing natural language, making it a highly successful conversational tool. With a vast training corpus, ChatGPT can generate text in various

IV. HOW CHATGPT AND BARD CAN BE USED IN EDUCATION

4.1 How ChatGPT and Bard can be used by teachers:

ChatGPT and Bard, two AI technologies developed by OpenAI and Google respectively, have the potential to be valuable tools for teachers in the field of education. Here is a detailed explanation of how ChatGPT and Bard can be used by teachers to enhance the educational experience:

Personalized Instruction: ChatGPT and Bard can assist teachers in providing personalized instruction to students. These AI technologies can understand and respond to student queries and provide explanations, guidance, and

clarifications on various subjects. Students can interact with ChatGPT or Bard, ask questions, and receive instant feedback, allowing for individualized learning experiences tailored to their specific needs.

- **Support for Lesson Planning:** ChatGPT and Bard can aid teachers in developing lesson plans and creating engaging educational content. Teachers can utilize these AI technologies to brainstorm ideas, generate creative writing prompts, or explore different teaching strategies. By leveraging the language generation capabilities of ChatGPT and Bard, educators can access a vast repertoire of educational material and inspiration to enhance their teaching materials.
- **Virtual Tutors and Mentors:** ChatGPT and Bard can serve as virtual tutors or mentors, providing students with additional support outside of the classroom. Students can seek assistance from these AI technologies to reinforce their understanding of concepts, revise for exams, or receive study tips. This virtual mentorship can supplement teacher-student interactions and provide students with continuous learning support.
- **Creativity and Critical Thinking Exercises:** Bard, with its specialization in creative writing, can inspire students to think critically and engage in imaginative exercises. Teachers can leverage Bard's ability to generate unique storylines, plot twists, or character descriptions to spark students' creativity and encourage them to develop their storytelling skills. Such activities can enhance students' critical thinking, problem-solving, and communication abilities.

However, it is important to note that while ChatGPT and Bard offer valuable benefits, they are not substitutes for human interaction and expertise. Teachers play a crucial role in guiding students' learning journeys, providing nuanced explanations, and cultivating critical thinking skills. Therefore, the integration of ChatGPT and Bard in the classroom should be done in a thoughtful manner, balancing the advantages of AI technologies with the invaluable contributions of human educators.

V. HOW CHATGPT AND BARD CAN BE USED BY STUDENTS

ChatGPT and Bard, two innovative AI technologies developed by OpenAI and Google respectively, offer numerous possibilities for student engagement and learning

in the field of education. Here is a detailed explanation of how students can utilize ChatGPT and Bard to enhance their educational experience:

- **Homework Assistance:** Students can use ChatGPT and Bard as virtual study partners to seek help with their homework. These AI technologies can provide explanations, examples, and step-by-step guidance on challenging concepts across various subjects. Students can ask questions and receive instant responses, enabling them to clarify doubts and deepen their understanding of the material.
- **Research and Information Gathering:** ChatGPT and Bard can assist students in conducting research and gathering information for their assignments and projects. By providing relevant facts, figures, and explanations, these AI technologies can help students access a wide range of resources quickly and efficiently. They can also generate topic-specific ideas, references, and suggestions to enhance the quality and depth of students' research.
- **Creative Writing and Storytelling:** Bard's expertise in creative writing can inspire students to develop their storytelling abilities. Students can engage with Bard to generate story ideas, character descriptions, or plot developments. This can foster creativity, imagination, and critical thinking skills among students, enabling them to explore different narrative styles and enhance their own creative writing endeavours.
- **Study Tools and Flashcards:** ChatGPT and Bard can serve as study companions, helping students review and memorize information. Students can create interactive flashcards and quiz themselves using AI technologies. This active learning approach can enhance retention and reinforce understanding of key concepts across various subjects.
- **Personal Development and Guidance:** ChatGPT and Bard can act as virtual mentors, offering guidance on personal development and life skills. Students can seek advice on time management, goal setting, stress management, and decision-making. AI technologies can provide suggestions, resources, and practical tips to support students in their overall growth and well-being.

It is important to note that while ChatGPT and Bard can be valuable resources, they should not replace the guidance

and expertise of teachers. Students should use these AI technologies as supplements to their learning, complementing their interactions with educators and peers. Responsible and thoughtful integration of ChatGPT and Bard in education can empower students, promote independent learning, and broaden their educational horizons.

VI. DRAWBACKS OF USING CHATGPT AND BARD IN EDUCATION

While ChatGPT and Bard offer numerous benefits, it is important to acknowledge some of the potential drawbacks associated with their use in education. Here is a detailed exploration of the drawbacks:

- **Lack of Emotional Intelligence:** ChatGPT and Bard lack emotional intelligence, as they are primarily text-based AI models. They may struggle to understand and respond appropriately to the emotional and social needs of students. Human teachers possess the ability to empathize, connect, and provide emotional support, which may be missing when relying solely on AI technologies.
- **Misinformation and Bias:** ChatGPT and Bard learn from vast amounts of data available on the internet, which can include biased or inaccurate information. They may unintentionally provide incorrect or misleading answers to student queries. It is crucial to ensure that AI models are trained on diverse and reliable sources of information to mitigate the risk of perpetuating misinformation or bias.
- **Limited Contextual Understanding:** AI models like ChatGPT and Bard may struggle to grasp the broader context of a conversation or understand nuanced topics. They primarily rely on statistical patterns in data and may provide answers that are technically correct but lack depth or critical analysis. This limitation can hinder their effectiveness in addressing complex educational inquiries.
- **Overreliance and Loss of Human Interaction:** Excessive reliance on ChatGPT and Bard may result in reduced human interaction in the learning process. The presence of human teachers is essential for nurturing social and emotional skills, facilitating discussions, and promoting critical thinking. Students may miss out on the value of face-to-face interactions and

personalized guidance that human educators provide.

- **Technical Limitations and Technical Support:** AI models like ChatGPT and Bard may face technical limitations such as system failures, errors in responses, or inability to understand certain queries. This can lead to frustration among students and educators. Adequate technical support and maintenance are necessary to address these challenges and ensure the smooth usage of AI technologies in educational settings.
- **Equity and Accessibility:** The use of ChatGPT and Bard may exacerbate existing inequalities in education. Access to technology and reliable internet connections may not be equitable among all students, creating a digital divide. Additionally, students with disabilities may face challenges in utilizing AI technologies without proper accommodations and accessibility features.

VII. CONCLUSION

In conclusion, Google's Bard and OpenAI's ChatGPT are revolutionary AI technologies with significant implications for education. Bard's focus on contextually appropriate responses and ChatGPT's versatility in generating coherent text make them valuable tools for personalized and interactive learning experiences. Educators can leverage these AI models to provide individualized instruction, support lesson planning, and act as virtual mentors. However, the lack of emotional intelligence and potential biases require careful consideration. Striking a balance between AI integration and human interaction is essential to maximize their benefits in education. As the competition between Bard and ChatGPT unfolds, their advancements will shape the future of conversational AI and its impact on learning.

REFERENCES

- [1]. The AI Race is On! Google's Bard and OpenAI's ChatGPT Head to Head: An Opinion Article, Md. Saidur Rahaman, M. M. Tahmid Ahsan, Nishath Anjum, Md. Mizanur Rahman, Md. Nafizur Rahman
- [2]. An overview of Bard: an early experiment with generative AI, James Manyika, SVP, Technology and Society.
- [3]. ChatGPT vs Google Bard (2023): An in depth comparison.

