A CRITICAL ANALYSIS ON GOOGLE BARD AI

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Abstract—This paper investigates Google's revolutionary Natural Language Processing (NLP) technology: Bard AI. It talks about the architecture, training methods, and algorithms that Bard AI uses in Google's search engine. The analysis focuses on the potential applications and long-term impacts of Bard AI on HCI and NLP. The research also looks at Google's commitment to openness, data security, and ethical AI development. In summary, Bard AI is a transformative force that is transforming how people engage with technology and highlights the need for ongoing research in AI ethics and responsible development.

Keywords- Google Bard AI; NLP; HCI.

I.   INTRODUCTION

The March 21, 2023, launch of Google Bard AI [1]marks a paradigm-shifting advance in natural language comprehension within the shifting framework of AI legislation. To improve contextual knowledge and flexibility, Bard, which runs on the GPT-4[2] architecture, uses a special combination of unsupervised learning, reinforcement learning, and ongoing learning methodologies. Bard, the most recent language model in Google's lineage of language models, distinguishes itself as an experimental conversational AI chat service by gathering information from the web, much as ChatGPT.

This research study thoroughly examines Bard AI, illuminating its intricate architectural details, multiple powers, distinctive characteristics, and disruptive potential across various disciplines. The Language Model for Dialogue Applications (LaMDA)[3] from Google, which Sundar Pichai revealed on February 6[4], is the basis for Bard's works, according to the literature. Pre-trained on publicly available data, Bard is excellent at identifying language patterns, can retrieve information from emails, summarise information from papers, and deliver contextually accurate answers on a variety of subjects, including science, arithmetic, history, literature, and religion. Overall, Google Bard AI shows promise as a dynamic and revolutionary force that will advance both human-AI interaction and natural language processing.

II.   MECHANISM OF WORK

Google Bard is powered by the latest recent large language model (LLM) from Google, PaLM 2, which was unveiled at Google I/O 2023.

Credited to PaLM 2, an upgraded version of PaLM that was released in April 2022, Bard will be significantly more productive and effective. The first edition of Bard employed a lightweight

model version of LaMDA since it required less processing power and could accommodate more users. LaMDA was built on top of Transformer, an open-source neural network architecture created by Google and made available in 2017. It's noteworthy to note that GPT-3, the language model that serves as the foundation for ChatGPT, was developed using Transformer as well. Google took a bold decision by using its own LLMs: LaMDA and PaLM 2.

A.   PaLM and PaLM2

In August 2022, Google initially presented PaLM. Since then, developers have created a wide range of generative AI applications, such as chatbots and content creation, using its API. Building on the success of PaLM, Google has officially released PaLM 2, the much-anticipated upgrade with even more capabilities. This new large language model (LLM) nonetheless maintains a lightweight architecture to facilitate deployment while offering state-of-the-art technical capabilities. With the release of PaLM 2, Google's language modelling efforts have advanced significantly, and more sophisticated and adaptable generative AI applications are now possible.2.2Difference between paLM and paLM2.

•   Efficiency: PaLM 2 is claimed to be lightweight, which suggests that it might offer better deployment and computing resource efficiency. This could make it more useful for a greater range of instruments and applications.

•   Technical Advancements: The term "more advanced technical capabilities" implies that PaLM 2 will be able to outperform PaLM through the adoption of new designs, techniques, or training methods. It might be necessary to make improvements to the model architecture, processes, and training data.

•   Deployment Ease: The emphasis on PaLM 2's deployment simplicity points to a user-friendly design, which facilitates developers' ability to incorporate the model into various applications without facing major technical obstacles.

•   Utilisation of the PaLM API: The trend of developers utilizing the PaLM API for generative AI applications is probably something that PaLM 2 will help with. On the other hand, improvements in API performance or new functionality can be expected.

•   Release Timing: The fact that PaLM 2 was released subsequent to PaLM suggests that it integrates the deployment and usage knowledge from the earlier model. Models enhanced and made more practical as a result of this iterative approach.

III.   METHODOLOGIES

The groundbreaking LaMDA (Language Model for Dialogue Applications), which is built on the Transformer neural network architecture and is utilised by generative AI programmes such as ChatGPT's GPT-3, laid the foundation for Google Bard. Google Bard AI is the result of a clever blend of software engineering, natural language processing (NLP), and machine learning techniques.

•   Deep learning is based on two types of neural networks: transformers and recurrent neural networks (RNNs). The process begins with a comprehensive pre-training stage that uses

large text corpora to develop language representations. These representations are then optimized for specific tasks such as text completion or question answering.

- Important NLP approaches include tokenization for text processing, word embeddings for continuous vector representation, and attention mechanisms, especially in transformer models, to efficiently capture contextual information.

- Reinforcement learning is used to teach LLMs to accomplish activities like writing engaging text where it is hard to specify clear rewards or penalties. Bard's solutions are improved iteratively by continuous maintenance, observation, and integration of user feedback.

IV.   FEATURES

Our vast experience with LLMs has shown us how important it is to provide users with the tools they require in order to understand, control, and maximize the potential of an LLM.

A.   Multiple Drafts

As was already established, Bard can generate a diverse range of answers, even in response to the same or comparable prompts and queries. According to preliminary testing, users appreciate having access to some of these other answers, especially for creative prompts (e.g., poetry or short tales) or when there is more than one correct answer. By selecting "view other drafts," users can see multiple iterations of Bard's response and select their favourite.

B.   New Response

If users would rather see a different response, or group of responses, they can request that Bard provide a new response. This is useful if the user wants Bard to attempt answering the same prompt again for whatever reason—for example, because it didn't follow directions or didn't give high-quality responses—or for any other reason.

C.   Google It

Bard's "Google it" button makes it easy for users to look up online sources or verify its answers. Upon selecting "Google it," Bard provides potential Google Search phrases. After clicking a question to launch Google Search in a new tab, a user can examine Bard's results or carry out more investigation.

D.   Citations

Based on its core prediction technique, Bard is meant to generate distinct outcomes, just like other stand-alone LLM-based interfaces. Occasionally, its answers can contain allusions to previously published material. If Bard takes a lot of quotes from a webpage, it links to that page so that readers can simply go there to see more information.

E.   Limited Turns

Interactions that require multiple back-and-forth responses between a user and Bard, or multi-turn interactions, can be engaging but also more susceptible to some of the issues identified. Therefore, Bard's ability to retain context is deliberately limited for the time being to enable more relevant and advantageous interactions with him. As Bard learns more, it will get better at preserving context throughout protracted interactions.

V.   SIGNIFICANT GOOGLE BARD AI UPDATES

On April 10, 2023, Bard released the "Experiment updates" website, granting users access to the most recent features and improvements, such as an updated "Google it" function for topic investigation, improved logical and mathematical answers, and a platform for user testing and feedback. On April 21, Bard enhanced coding assistance, added creative choices, and broadened access for Google Workspace accounts to enable users to code in over 20 different programming languages and export and test Python work in Google Collab. Later May updates brought more language support, the ability to export text to Google Docs and Gmail, a Dark style, improved summary, image integration, and location-based answers. Table export and background code execution were added in June, and updates for July 13th, 2023, increased the number of languages available in Bard and integrated Google Lens and text-to-speech.

Bard's September 19, 2023, update made it more versatile for a range of activities by including features including response verification, coding help, multilingual collaboration, and real-time data access. Notably, there has been a noticeable improvement in logic and math skills, which addresses occasional errors. Additionally, Bard expanded the list of suggested search topics for its "Google it" feature, enabling users to go deeper into related topics and a larger variety of interests. Enhancing Bard's user experience, versatility, and reactivity was the main objective of these upgrades.

VI.   BARD AND USER PRIVACY

Bard will only have access to a user's personal information on Google Workspace with their consent. It is not used to read reviews written by people, show them ads, or improve Bard.

A.   Case Studies in Regulatory Compliance

This section's case studies show how Google Bard AI complies with local legislation and regulations pertaining to AI:

- Analyses Google Bard AI's compliance with the strict data protection laws of the European Union, taking into account rights to be forgotten, user consent, and data access requests.
- CCPA Compliance: This section examines Google's compliance with the California Consumer Privacy Act, including its handling, disclosure, and use of opt-out methods with regard to user data.
- AI Ethics Principles: Investigates Google's compliance with the UN, OECD, and IEEE AI ethics principles. It describes how Bard AI abides by the highest ethical standards for artificial intelligence thanks to these guiding principles.

B.   AI Guidelines in Different Regions: Customizing Bard AI

Google Bard AI understands the significance of cultural variances and geographically tailored AI standards. Bard AI is able to adjust its behaviour to accommodate different regions or user preferences while maintaining compliance. Among them are:

- Bard AI can change its language, replies, and cultural allusions in accordance with local tastes and sensitivities. This ensures a tailored and culturally relevant engagement that complies with regional regulations and meets the demands of diverse users.
- Content Filtering: Bard AI has features for content filtering where access to some sorts of content may be prohibited or illegal. This proactive approach honours regional restrictions while ensuring compliance with local regulations and promoting a favourable user experience.

VII.   EMPIRICAL EXPERIMENTS

A.   Answering questions

The answers to the questions that were asked for the applications are shown in Figure 1. The first Turkish ChatGPT user (48.09%) and the second Turkish Google Bard user (45.80%) both obtained the best results. The other users were, in order, Google Bard in English (41.98%), ChatGPT in English (44.27%), the first user of Google Bard in Turkish (45.03%), and Google Bard in Turkish (41.22%). Despite having all of the correct answers, none of them scored higher than 50%. When the overall results for each group were compared, no statistically significant variability was found (p>0.05).
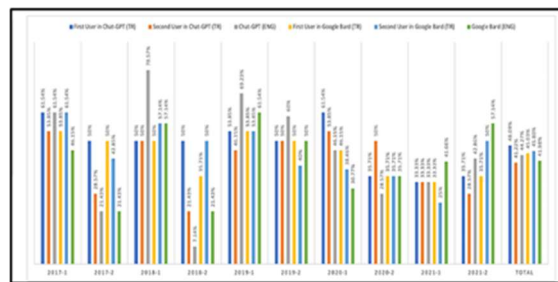

Figure1: Result of answering questions

B.   Question generating

The software was now supposed to prepare three example questions about the diencephalon, peritoneum, and facial nerve anatomy. The questions and answers produced by ChatGPT for the year 2023 are shown in Figure 2.A tiny difference was present (p>0.05).

Figure2: Questions and answers created by ChatGPT.

Figure3: Questions and answers created by google bard.

C.   Editing instruction

Although Bard lacks this functionality, the GPT allows us to modify instructions; we can utilize the prior instructions and update them with new language, condensed versions, and numerous other AI improvements. Bard adds extra information to help with the search.

Word for neglecting someone request in Urdu language:

Ignoring a request is called درخواست کو نظر انداز کرنا (darkhwast ko nazar andaaz karna).

Additional terms and expressions that can characterise this behaviour are: التوا کرنا (altawa karna) - to postpone; نظر انداز کرنا (nazar andaaz karna) - to disregard.

The meaning of ٹالنا (taalna) is to postpone; التفات نہ کرنا (iltifat na karna) is to ignore; غفلت کرنا (ghuflat karna) is to be careless.

These are a few sentences that demonstrate the usage of these terms and phrases:

•   درخواست کو نظر انداز کر دِیا (اس نے مُیری درخواست و نظر انداز کر دِیا) - He disregarded what I asked.

•   میری باتوں پر التفات نہُیں کرتی ہو (وہ میری باتوں پر التفات نہُیں کرتی ہو) - She doesn't listen to me.

•   مُیرا کام ٹال دیا (اس نے مُیرا کام ٹال دیا) He delayed my work.

•   وہ اپنا فرض کر غفلت کر رہی ہے (وہ اپنا فرض کر غفلت کر رہی ہے) - She is not doing her job well.

•   اسے اس معاملہ میں کوئی اعتنائ نہیں ہے (اسے اس معاملہ میں کوئی اعتنائ نہیں ہے) - He has no interest in this matter.

Nevertheless, GPT discovered that "اندراج کرنا" (Nazar andaaz karna) is the word for ignoring someone's request in Urdu. This term signifiesignoring or not paying attention to someone's request or plea.

VIII.   EMPIRICAL EXPERIMENTS: SUMMARY

It was discovered that the ChatGPT and Google Bard models have the same capacity to handle anatomical issues. In general, the answers to half of the anatomy-related inquiries on both chat boards were accurate. We used ChatGPT-3.5 to carry out our investigation. Another disadvantage of the study was the incapacity to conduct visual evaluations, which are crucial in the teaching of anatomy. It is imperative that further study be done on the use of 2D and 3D figures in human

anatomy instruction, in addition to other AI applications. The assessment of the generating questions revealed that ChatGPT and Google Bard performed remarkably well.

IX.   RESULTS

Deep Neural Network architectures were used to generate the Large Language Models: Bard and ChatGPT, which were then heavily trained on textual material. Google created Bard, whereas OpenAI produced ChatGPT. Both models can generate text replies that resemble those of a human being for a range of tasks and challenges, including conversational chat and creative writing.

The Large Language Models (LLM) that ChatGPT and Google Bard use are the main source of the difference between them.

A.   How is Google bard better than ChatGPT

Any research instrument that is employed needs to be ready to display articles or other content, especially when working with intricate subjects. This is where Bard excels now. The accuracy with which the contents are distilled into bullet points is astounding.

What is of utmost importance is that one can request a detailed summary from Bard of any research paper, medical journal, or webpage that addresses a difficult topic. One can even go the lengths toask more questions if there still things one is unsure about pertaining to the topic.

B.   Benefit-Harm analysis of Google Bard

Advantages:

- With Google Search built within the tool, Bard provides free internet access and delivers fast results.
- Bard does a better job at displaying relevant Google Search results, including picture results.
- Bard has a more user-friendly graphical user interface (UI), and its responses are well-formatted and human-like.

Disadvantages:

- Since Bard is prone to hallucinations, one should proceed with caution when accepting relevant answers.
- Processing power: Large transformer types demand a high processing capacity.
- Bard does not have any plugins or connectors; instead, it provides an isolated experience.

X.   PROBLEMS

- Factual errors: Bard occasionally produces writing that is factually inaccurate when requested to contribute original content or to address complex inquiries.
- Safety: At times, Bard may produce text that is dangerous or damaging. For example, it might be asked to provide instructions on how to create a bomb or harm someone.
- Scalability: Maintaining response times and making ensuring the infrastructure scales properly are harder as the model gets bigger. This challenge can be addressed with the aid

of distributed computing and optimization techniques. Anotherproblem faced by LLMs like as Bard

- is being duped into giving inaccurate or misleading information.
- Bias: Bard could show biases present in the training dataset. Because of this, Bard may write in a way that is unfair or harmful to specific social groups—a process called adversarial training.

XI. CONCLUSION

Google Bard AI is a fresh and exciting technology that has the ability to change the world. This is an incredible feat in the realm of natural language processing. It's a powerful tool that can revolutionize a lot of areas, like research, education, customer service, and the creative industries. Google Bard AI is still in the early stages of development, but it has already made great strides. It can now write text, perform language translations, reply to inquiries, produce a wide range of artistic output, and moderate complex discussions and dialogues.

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