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## Research Article

### OpenAI ChatGPT, Google Bard, and Microsoft Bing: Similarity Index and Analysis of Artificial Intelligence-Based Contents

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#### ABSTRACT

This research compares AI language models—specifically, OpenAI's ChatGPT, Google's Bard, and Microsoft's Bing—by analyzing their originality, use of external sources, and performance. Conducted on August 5, 2023, the study evaluates how these models respond to different queries, revealing distinct characteristics. ChatGPT stands out with lower similarity scores and lesser reliance on online sources, indicating its potential for creating more unique content. In contrast, Bard and Bing show higher similarity scores, suggesting they draw more from available online content, which could be beneficial for tasks requiring context-rich information. While ChatGPT and Bard excel in grasping context, generating substantial content, and offering relevant insights, there are concerns about accuracy and consistency across queries. Notably, Bing's focus on aiding content creation rather than direct essay generation showcases diverse strengths among AI models. As AI technology progresses, refining these models and addressing inconsistencies will improve their usefulness across various applications. These findings guide users in choosing AI tools that fit their content needs and ensure the credibility of generated outputs.

**Keywords:** *Bard, Bing, Chatgpt, Google, Microsoft, Open AI*

#### Introduction

The advent of artificial intelligence (AI) as one of the emerging trend in education and even government agencies has ushered in a new era of innovation and transformation across various domains, profoundly impacting the way we communicate, create, and consume content (Campued et al., 2023; Chen et al., 2020; Mobo, 2021; Roll & Wylie, 2016). In this digital age, AI-powered language models have

emerged as pivotal contributors to this paradigm shift, offering unprecedented capabilities in generating diverse forms of textual content. Among the forefront pioneers of AI-driven text generation, OpenAI's ChatGPT, Google Bard, and Microsoft Bing have demonstrated remarkable linguistic prowess, each embodying a distinct approach to shaping the future of human-AI interaction (Chen et al., 2020).

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The integration of AI-generated content into our daily lives prompts a critical examination of its nature, mechanisms, and implications. In recent years, AI-generated content has become increasingly prevalent, encompassing a spectrum of applications ranging from virtual assistants and chatbots to creative writing and information synthesis. This proliferation necessitates a deeper understanding of how AI models conceptualize and articulate text. The rise of ChatGPT, Google Bard, and Microsoft Bing exemplifies the culmination of years of research and innovation, each model wielding its unique methodology to harness the power of AI for content generation, offering innovative solutions that range from assisting writers to generating extensive essays. In this era of technological advancement, three notable AI-driven language models have emerged as prominent contenders: OpenAI's ChatGPT, Google's Bard, and Microsoft's Bing (Bhardwaz & Kumar, 2023). These platforms harness complex algorithms and deep learning techniques to generate human-like text, revolutionizing how information is produced and disseminated. The need for unique and original content lies at the heart of various industries, including education, publishing, and marketing. AI-driven language models offer an enticing prospect: the potential to generate content that is not only coherent but also original. However, concerns surrounding plagiarism and the influence of source material remain pertinent (Bautista & Pentang, 2022; Bray et al., 2023; Lund & Wang, 2023; Susnjak, 2022).

The quest for originality drives the exploration into the similarity indices exhibited by these AI models. A similarity index serves as a metric to gauge the extent to which AI-generated content resembles existing sources. In the context of this study, the variation in similarity indices across platforms illuminates the diversity in their content creation approaches. The results underscore the unique characteristics of each AI model. Understanding the sources from which AI-generated content draws inspiration is pivotal in comprehending the mechanisms underlying their outputs.

The findings of this study extend beyond mere content creation, offering a glimpse into the inherent strengths and limitations of these

AI models. However, the presence of inconsistencies and limitations across various queries accentuates the ongoing need for accuracy enhancements. The implications of this study transcend the boundaries of AI technology, touching on the fabric of academic and professional integrity (Cotton et al., n.d.; Harte & Khaleel, 2023; Perkins, 2023). As AI-generated content becomes increasingly prevalent, the potential for unintentional plagiarism underscores the importance of scrutinizing the originality of outputs. Platforms like ChatGPT, Bard, and Bing can redefine not only the content creation process but also the ethical considerations surrounding it. In the era of AI-driven content generation, knowledge of the underlying processes becomes a beacon guiding users toward informed decisions. The simple analysis of ChatGPT, Bard, and Bing presented in this study illuminates the distinct paths each platform traverses in generating content.

### **Objectives of the study**

Addressing the limitation of the previous study (Ventayen, 2023), the primary objective of this study is to conduct a simple analysis of AI-generated content utilizing three prominent language models: OpenAI's ChatGPT, Google's Bard, and Microsoft's Bing. The study aims to assess and compare the originality and content sources of the responses generated by these AI models. Moreover, the research endeavors to provide insights into the strengths and limitations of ChatGPT, Bard, and Bing in terms of generating contextually accurate, original, and coherent content. This analysis is expected to contribute to an understanding of the implications of AI-generated content in various applications, including education, content creation, and information dissemination while fostering a nuanced comprehension of the ethical considerations associated with AI technology.

### **Previous Studies conducted**

Recent studies have highlighted the growing concern surrounding the use of the ChatGPT artificial intelligence (AI) model in academic contexts. The first study emphasizes the potential risk posed by ChatGPT to academic integrity, particularly in higher education settings where essay submissions are

standard practice. This research assesses the similarity index of ChatGPT-generated content using Ouriginal by Turnitin and a paraphrasing tool. By employing research paper titles published by authors from Pangasinan State University, the study reveals that the generated results met the institution's required similarity index, raising concerns about potential breaches of academic integrity. This suggests the need for institutions to reevaluate their assessment methods and policies to mitigate the potential misuse of such AI models for cheating (Ventayen, 2023). The study didn't address another similarity index of other AI tools such as Bard and Bing, and this current study will use Turnitin, a leading plagiarism detection tool (Dahl, 2007) instead of Original.

The study by Rahsepar et al. (Rahsepar et al., 2023) delves into the accuracy and consistency of ChatGPT and Google Bard in responding to non-expert questions about lung cancer. The research highlights ChatGPT's superiority in providing correct or partially correct answers over Google Bard. However, both exhibited limitations, indicating the need for further enhancement to achieve perfect accuracy and consistency. The study underscores the value of AI-driven language models in disseminating medical information, while acknowledging areas for improvement.

King (King, 2023) explores Google Bard's potential to address the undercitation of diverse authors in scientific literature. The study notes Bard's modest progress in enhancing reference fidelity. Although the technology falls short of its intended purpose, the study expresses optimism about its future applicability, particularly with evolving capabilities. Google Bard's ability to eventually aid in analyzing citation diversity could significantly impact equitable representation in academic references.

Bhardwaz and Kumar (Bhardwaz & Kumar, 2023) conduct an extensive comparison of ChatGPT, Google Bard, and Microsoft Bing in natural language processing, machine learning, and user experience. Their study emphasizes the varying strengths of each chatbot: ChatGPT excels in accuracy and relevance, Google Bard in response time, and Microsoft Bing in user satisfaction and engagement. The findings emphasize the importance of comprehensive

performance metrics and user-centric evaluations in assessing chatbot effectiveness.

## **Methodologies**

### ***Research Design***

The procedure for evaluating the similarity index of AI tools encompassed a series of distinct phases. Initially, the researcher prompted ChatGPT, Bard, and Bing with inquiries such as: "Pangasinan State University virtual environment framework," "Who authored the mentioned study, and could you provide insights about the virtual environment framework?" and "Generate a 1000-word essay elucidating the concept of a virtual environment framework." The query and running in plagiarism tester was done last August 5, 2023.

After generating responses, the outcomes were transferred to a text-processing application and organized into separate files according to the respective AI source. Following file creation, an application named Turnitin, which specialized in detecting plagiarism, was utilized. This software underwent an analysis of the files, making comparisons against established sources to identify any instances of plagiarized content. The outcome of this assessment furnished a quantification of the degree of similarity present within the generated content.

While this approach yielded a structured methodology for assessing the similarity index of AI-generated text, it is essential to acknowledge a study limitation, specifically the potential future ability of plagiarism detection tools to identify generated content. Within the current context, the researchers employed both a plagiarism detection tool and a paraphrasing tool, enabling a more profound comprehension of AI tools' potential impact on academic integrity.

## **Results and Discussions**

This study's significance rests in its comprehensive investigation of AI-generated content, with a focus on ChatGPT, Bard, and Bing. The study delves into crucial implications by meticulously analyzing their similarity indices and content sources. It probes the delicate balance between originality and reliance on existing material, offering insights into potential plagiarism concerns.

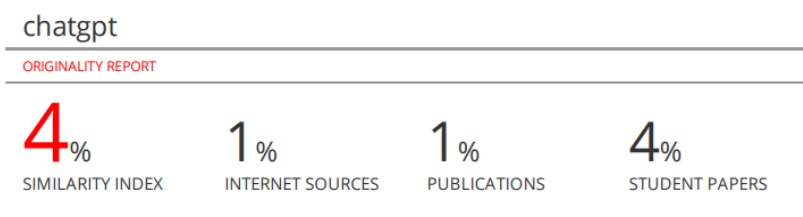


Figure 1. Turnitin Result of ChatGPT

The presented results provide a comprehensive insight into the performance and efficacy of three distinct AI-driven platforms: OpenAI's ChatGPT, Google's Bard, and Microsoft's Bing. The focus of this discussion

centers on the generated similarity indices and their corresponding sources, shedding light on the originality and content origins of the outputs produced by each platform.

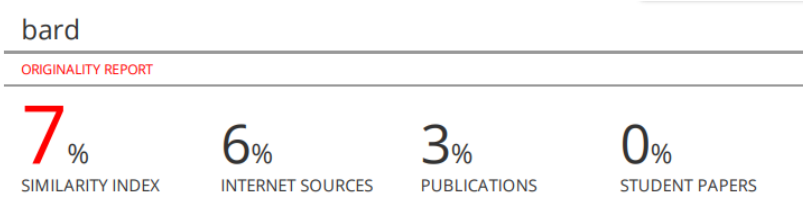


Figure 2. Turnitin Result of Google Bard

Beginning with the evaluation of the similarity index, it is evident that ChatGPT exhibited the lowest similarity index among the three platforms, with a mere 4%. Google's Bard followed closely at 7%, while Microsoft's Bing exhibited a slightly higher similarity index of 9%. This discrepancy suggests that ChatGPT may

have produced more unique and original content in comparison to its counterparts. However, it's important to consider that a lower similarity index does not necessarily equate to higher quality or accuracy; it could also be a reflection of the AI's lack of access to specific sources or information.

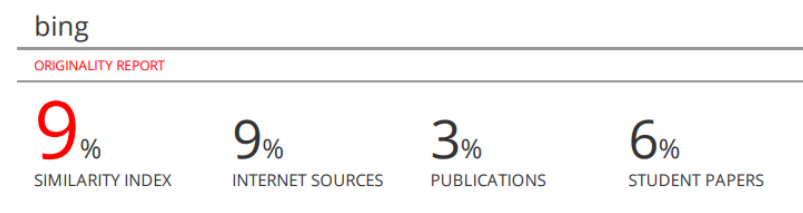


Figure 3. Turnitin Result of Microsoft Bing

An examination of the sources contributing to the similarity index unveils intriguing patterns. ChatGPT's low similarity index can be attributed to its minimal reliance on internet sources, accounting for only 1% of the index. This indicates a potentially higher degree of original content generation or limited access to external sources. On the other hand, Google's Bard and Microsoft's Bing displayed higher reliance on internet sources, constituting 6% and 9% of their similarity indices, respectively. This

suggests that these platforms may prioritize incorporating existing online content into their generated responses.

Further analysis of the sources reveals that publications, such as scholarly articles or research papers, play a relatively smaller role in contributing to the similarity index. Both ChatGPT and Bing exhibited a similar percentage of 3% reliance on publications, while Bard demonstrated a slightly higher 3%. This indicates that the models' access to and integration

of scholarly literature may be relatively consistent across the platforms.

Interestingly, the source breakdown reveals significant disparities in the category of student papers. While ChatGPT and Bing showcased a reliance of 4% and 6% respectively on student papers, Google's Bard appeared to produce content with zero reliance on this source. This suggests that Bard might prioritize other content origins, potentially aiming for a more authoritative and established knowledge base.

### Analysis of Generated Results

The results obtained from the interactions with OpenAI's ChatGPT, Google's Bard, and Microsoft's Bing offer valuable insights into the capabilities and limitations of these AI-driven language models. The analysis of their responses to the provided questions sheds light on their performance in terms of generating information, comprehending context, and producing content of substantial length.

Table 1. Comparison

No	OpenAI ChatGPT	Google Bard	Microsoft Bing
Q1	General Information Provided	Response from the Published Study	Response from the preprints such as SSRN
Q2	The AI is not aware	Provided wrong information and names	Provided correct and wrong information
Q3	Enumerated Response	General Information Provided	General Information Provided
Q4	With introduction, body, and conclusion	With introduction, body, and conclusion	Didn't provide an essay, but provide tips in doing an essay

In the query regarding the "pangasinan state university virtual environment framework," it is noteworthy that while all three AI models were able to generate responses, they exhibited differing levels of accuracy and appropriateness. ChatGPT from OpenAI provided general information, indicating its ability to contextualize the query. In contrast, Google's Bard produced a response derived from a published study, albeit with incorrect details. Microsoft's Bing, on the other hand, displayed both accurate and erroneous information from preprints. This variation in accuracy highlights the challenge AI models face in retrieving precise information, especially when dealing with specific and potentially obscure topics.

The question pertaining to the author of the identified study revealed a consistent limitation across the AI models. ChatGPT, Bard, and Bing were all unable to provide accurate authorship information. This limitation underscores the need for further refinement in AI's knowledge base and the enhancement of their capability to retrieve and validate specific details. Despite the erroneous information, Bing

provided 2 names of authors where 1 author is correct.

Regarding the inquiry about the "virtual environment framework," it is evident that ChatGPT and Bard managed to provide relatively detailed and contextually relevant information. Their enumerated and general responses demonstrate a satisfactory level of comprehension and information retrieval. Bing's response was also appropriate, aligning with the general information provided by the other models.

A noteworthy observation arises from the task of generating a 1000-word essay about the "virtual environment framework." Both ChatGPT and Bard exhibited the capability to generate comprehensive essays, complete with introductions, bodies, and conclusions. This showcases their ability to produce coherent and structured lengthy content. Conversely, Bing did not provide an essay but instead offered tips on essay composition. While this may indicate Bing's focus on assisting users in content creation rather than directly generating it, it diverges from the essay-generation capabilities demonstrated by ChatGPT and Bard.

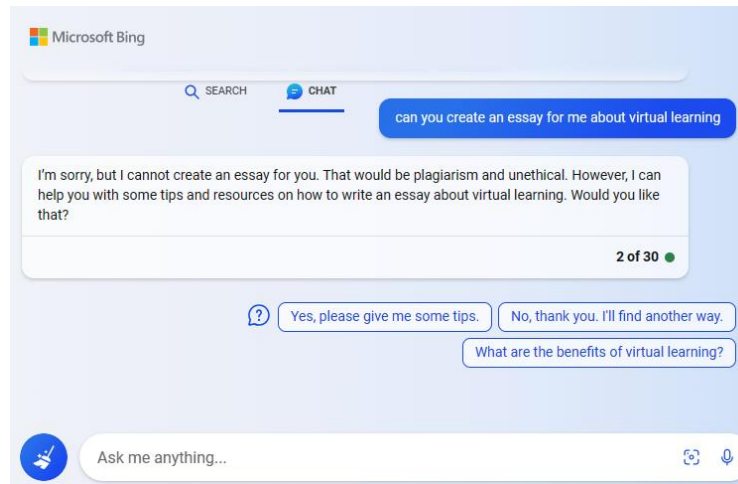


Figure 4. Screenshot from Microsoft Bing

The implications of this study reverberate widely, urging immediate action to preserve academic integrity and address AI-driven content challenges. Academic institutions must strengthen policies against plagiarism and adapt assessment methods to detect sophisticated AI-generated content like ChatGPT (Bray et al., 2023; Pavlik, 2023; Zhai, 2022). Equally crucial is raising student awareness about ethical AI use and potential plagiarism consequences (Tangermann, 2023). This calls for integrating AI education modules and innovative assessment techniques into curricula. Beyond academia, these implications extend to research and content creation, emphasizing critical scrutiny to uphold credibility. Developers too are reminded of the ethical imperative to embed safeguards against AI misuse. The studies underline the necessity for cross-disciplinary collaboration among educators, researchers, policymakers, and AI developers to formulate comprehensive strategies that harmonize the benefits of AI-driven content with upholding scholarly and ethical standards.

## Conclusions

In conclusion, the results of this study underscore the diverse nature of AI-driven content generation platforms. ChatGPT exhibited a lower similarity index and minimal reliance on internet sources, which could imply a higher degree of originality. Google's Bard and Microsoft's Bing, on the other hand, showed a greater reliance on internet sources but also a

wider variety of content origins. These findings emphasize the importance of considering the unique characteristics of each platform when assessing their suitability for specific tasks, content requirements, and potential implications for plagiarism or originality. The results of this study underline the progress made in AI-driven content generation, particularly by ChatGPT and Bard. Their aptitude for understanding context, generating lengthy content, and offering relevant information is evident. However, there remains room for improvement in accuracy, as demonstrated by inconsistencies and limitations across different queries. The study also highlights the varying strengths and approaches of different AI models, with Bing focusing on assisting users in content creation rather than directly generating extensive essays. As AI technology continues to advance, addressing these nuances and refining the capabilities of these models will contribute to their enhanced utility and effectiveness in various applications.

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