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Research Article

Exploring Public Sentiment Toward Artificial Intelligence Apps: A Case Study of ChatGPT, Gemini, and DeepSeek in Google Apps

Muh. Subhan[1], Tri Septianto[2], Ahmad Chafid Alwi[3], Aan Nurfahrudianto[4], Teguh Arie Sandy[5], Mia Aina[6]

[1]*Politeknik Negeri Fakfak, Indonesia*
[2]*Politeknik Negeri Madiun, Indonesia*
[3]*Universitas Negeri Yogyakarta, Indonesia*
[4]*Universitas Nusantara PGRI Kediri, Indonesia*
[5]*Ahli Media Consultant, Indonesia*
[6]*Universitas Jambi, Indonesia*
Email: subhan@polinef.id, triseptianto@pnm.ac.id, ahmadchafidalwi@uny.ac.id, aan@unpkediri.ac.id, teguharies@ahlimedia.com, mia.aina@unja.ac.id

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ABSTRACT

Introduction: Artificial intelligence (AI) has witnessed rapid advancements in recent decades, impacting various sectors such as business, education, and entertainment. AI-based applications have become integral to daily interactions, with platforms like Google hosting popular applications such as ChatGPT, Gemini, and DeepSeek. These AI applications offer distinct approaches to technology but have the potential to influence public sentiment toward AI broadly. However, public perception remains diverse, with some embracing AI for its potential, while others express concerns regarding its implications, such as job displacement and privacy issues.

Objectives: This study aims to explore the factors that shape public sentiment toward three AI applications—ChatGPT, Gemini, and DeepSeek. Specifically, it addresses the following research questions: (1) What factors influence public sentiment toward these AI applications? (2) How do the sentiments differ between these applications? (3) To what extent is public sentiment reflective of broader perceptions of AI technology?

Methods: The research employs a case study approach, collecting user reviews from Google Play Store for ChatGPT, Gemini, and DeepSeek. Data preprocessing includes removing null entries, normalizing text, and performing tokenization. Sentiment classification is conducted using the Ekman's Six Basic Emotions model, and sentiment analysis is enhanced using machine learning models, specifically Naive Bayes (NB) and Logistic Regression (LR). The models' performance is evaluated based on AUC, Classification Accuracy (CA), F1 Score, Precision, Recall, and Matthews Correlation Coefficient (MCC).

Results: The analysis reveals that User Interaction and App Performance are the primary factors influencing public sentiment. ChatGPT receives the highest level of positive sentiment, particularly for its interactive capabilities. While Gemini also receives favorable reviews, its focus on intelligent search results in slightly less positive sentiment compared to ChatGPT. DeepSeek displays a more mixed sentiment, with some users appreciating its depth in data analysis, but many expressing dissatisfaction with its user interaction. Sentiment analysis further demonstrates that Joy and Surprise were the dominant emotions for ChatGPT, whereas Fear and Disgust were less prevalent across all applications.

Conclusions: This study concludes that user interaction and performance significantly drive public sentiment toward AI applications. While concerns over security and privacy exist, they are less influential compared to the experience users have with the application's functionality. The findings highlight the importance of enhancing user experience and performance for AI adoption. Additionally, the research provides insights into the need for further transparency regarding data privacy and the ethical use of AI.

Keywords: Artificial intelligence, public sentiment, sentiment analysis, ChatGPT, Gemini, DeepSeek.

INTRODUCTION

Artificial intelligence (AI) has undergone rapid advancements in recent decades, leading to significant impacts across various sectors of human life [1]. In the context of digital technology, AI-based applications have become an integral part of daily interactions, spanning business, education, entertainment, and personal applications [2]. The widespread implementation of AI on platforms, particularly those used by millions of people, has given rise to intriguing phenomena worthy of deeper examination, one of which is public sentiment toward this technology [3]. Popular examples of AI applications include those integrated with Google, such as ChatGPT, Gemini, and DeepSeek. These applications represent different approaches to AI technology but all possess the potential to influence how users perceive AI more broadly.

ChatGPT, a product developed by OpenAI, has garnered global attention as an AI-driven chatbot capable of generating human-like text [4]. With its ability to understand and produce natural language, ChatGPT has captured the interest of a wide range of users, from professionals to casual individuals [5]. In contrast, Gemini, an AI-based application developed by Google, provides search services and integrates information through a more focused approach on faster and smarter data processing [6]. Meanwhile, DeepSeek is an application that leverages AI to help users find more in-depth and detailed information, combining search capabilities with advanced analysis [7]. Each of these applications has distinct characteristics, contributing significantly to the public's perception of AI.

Although these applications hold the potential to transform how we interact with technology, public perception of them remains diverse. Some view AI applications as groundbreaking innovations that enhance efficiency and accessibility to information, while others express concerns about the potential negative impacts, such as job displacement, privacy issues, and the misuse of technology [8]. Therefore, understanding how society perceives AI technology, particularly with applications like ChatGPT, Gemini, and DeepSeek, is crucial. This study aims to explore and analyze public sentiment regarding these three applications, hoping to provide a deeper insight into the acceptance and rejection of this technology in daily life.

This research adopts a case study approach focusing on the three aforementioned AI applications, all integrated with Google platforms. This approach allows the researcher to examine in greater detail how public sentiment is shaped by direct interactions with different technologies, despite being within the same ecosystem. By focusing on ChatGPT, Gemini, and DeepSeek, the study seeks to uncover the various factors influencing user perceptions of each application, and how these factors contribute to shaping public opinion about AI in general.

Public sentiment is a critical element in determining the success or failure of adopting new technologies [9]. The sentiment can be influenced by various factors, ranging from privacy concerns and fears of job replacement to optimism about the efficiency that technology offers [10]. Sentiment analysis studies have also shown that social media platforms and user reviews play a significant role in shaping public perceptions [11]. Therefore, it is important to explore how these elements interact and influence society's views on increasingly prevalent AI-based applications.

OBJECTIVES

In this context, the study attempts to answer several in-depth research questions. The first question to be addressed is: "What factors influence public sentiment toward AI applications such as ChatGPT, Gemini, and DeepSeek used on Google platforms?" This question aims to understand the elements that underpin users' views on these applications, whether shaped by direct experience, received information, or even societal anxieties regarding the long-term impacts of AI technology.

The second question to be explored is: "How do the sentiments differ among these three AI applications?" While these applications exist within the same ecosystem—Google—they offer very different functionalities. ChatGPT is focused on natural language processing, Gemini prioritizes intelligent search and information integration, while DeepSeek provides in-depth search and complex data analysis. These functional differences may lead to variations in user sentiment toward each application. Thus, understanding how these differences influence perceptions and interactions with each application is essential.

The third central question is: "To what extent is public sentiment related to broader perceptions of AI technology in general?" Assessing user sentiments toward specific applications can provide a broader understanding of public attitudes toward AI as a whole. This will offer deeper insights into the potential acceptance or rejection of AI technology in everyday life and its future trajectory.

The novelty of this study lies in its combination of three key aspects. First, this research examines three leading AI applications—ChatGPT, Gemini, and DeepSeek—that differ in characteristics but all exist within the same major platform (Google). While many studies analyze public perception of AI, this research is unique in comparing applications that not only belong to the same ecosystem but also have different functions and approaches. Second, the study combines sentiment analysis from various data sources, including user surveys and social media data, to provide a more comprehensive picture of public sentiment. Third, by focusing on AI applications within the Google context, this research opens up avenues to understand how a major platform can influence the acceptance of new technologies, particularly in a highly distributed ecosystem with millions of users.

Additionally, it is worth noting that this study holds significant practical relevance. The findings may offer valuable insights for AI technology developers and other stakeholders in designing products that better align with user needs and concerns. Understanding public sentiment toward AI applications can also inform more thoughtful policymaking regarding technology regulations and help foster greater acceptance and trust in the use of AI in the future.

METHODS

This study aims to explore public sentiment toward artificial intelligence (AI)-based applications, specifically ChatGPT, Gemini, and DeepSeek, by utilizing user reviews from the Google Play Store. The research process consists of five main stages: data collection, data preprocessing, sentiment classification using Natural Language Processing (NLP), analysis using machine learning models, and model performance evaluation.

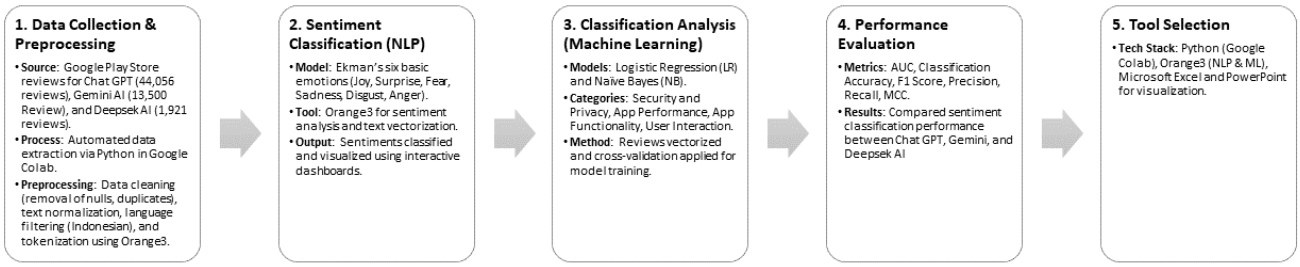

Figure 1. Research workflow

In the first stage, data collection was conducted by downloading user reviews of the ChatGPT, Gemini, and DeepSeek applications available on the Google Play Store. A total of 44,056 reviews were used for ChatGPT, 13,500 for Gemini, and 1,921 for DeepSeek. The data collection process was automated using Python on the Google Colab platform to ensure efficiency and accuracy in data retrieval. Once the data was collected, the next step was data preprocessing, which involved cleaning the data by removing null or duplicate entries and normalizing the text by converting all characters to lowercase to maintain consistency. Additionally, reviews not written in Indonesian were removed, as the focus of this study is on sentiment analysis in the Indonesian language [12]. Finally, tokenization was performed to break the text into smaller words or tokens, which are ready for further analysis.

After data preprocessing, the next stage was sentiment classification using Natural Language Processing (NLP) techniques [13]. The model used for this purpose was **Ekman's Six Basic Emotions**, which classifies sentiment into six basic emotional categories: Joy, Surprise, Fear, Sadness, Disgust, and Anger. This model was chosen for its ability to capture a broad range of emotional nuances in user reviews. The sentiment of each review was classified and analyzed using **Orange3**, an open-source platform that provides data visualization and interaction tools, enabling effective classification and text processing. The results of the classification offered an initial overview of how users felt about the applications under study.

Once the sentiment was classified, the next step was to perform analysis using machine learning techniques, utilizing two primary models: **Logistic Regression (LR)** and **Naive Bayes (NB)** [14]. These models were chosen for their

proven effectiveness in text classification. Logistic Regression was used to model the relationship between text features and the identified sentiment categories, while Naive Bayes served as a probabilistic model that is highly effective for handling text data. The processed and categorized data were then vectorized to convert it into a numerical form understandable by machine learning models. Cross-validation was applied to ensure that the trained model did not overfit, with the aim of producing a more robust model capable of handling unseen data [15].

After the models were trained, the next stage was performance evaluation. This study used several evaluation metrics to assess the performance of the models in predicting user sentiment. The metrics used include **AUC (Area Under the Curve)**, accuracy, precision, recall, F1 score, and **Matthews Correlation Coefficient (MCC)**. The evaluation aimed to compare the performance of Logistic Regression and Naive Bayes models in classifying sentiment for each of the applications: ChatGPT, Gemini, and DeepSeek. These evaluation metrics were also used to assess how well the models could predict sentiment accurately and balancedly, considering the challenges in classifying diverse text data.

Finally, to ensure the smooth progression of the research process, several supporting tools were used, such as **Python on Google Colab** for data extraction, **Orange3** for NLP and machine learning analysis, and **Microsoft Excel and PowerPoint** for visualizing the evaluation results and creating presentations that comprehensively display model performance comparisons and sentiment analysis [12], [16], [17]. The use of these tools allowed the research to be conducted efficiently while producing outputs that are easily understandable and visually presentable.

Overall, this methodology aims to provide a deeper understanding of public sentiment toward three popular AI-based applications on the Google platform and uncover the factors influencing user perceptions. By employing this approach, the study is expected to provide valuable insights for technology developers and other stakeholders in designing and developing AI applications that better align with user expectations and needs.

RESULTS

This study aimed to explore public sentiment toward artificial intelligence (AI)-based applications—ChatGPT, Gemini, and DeepSeek—by analyzing reviews collected from the Google Play Store. Using the Naive Bayes and Logistic Regression models, the following results emerged regarding sentiment classification, emotional analysis, and application ratings.

1. Sentiment Classification with Naive Bayes

In the sentiment classification stage using the Naive Bayes model, it was found that the **User Interaction** aspect was the primary focus in the reviews provided by users. ChatGPT received the highest number of reviews (38,377) in this category, indicating a high level of interaction between users and the application. Gemini and DeepSeek followed with 12,125 and 1,517 reviews in the same category, respectively. This reflects how user interaction with AI applications, especially in the form of conversational interactions like ChatGPT, is more prominent compared to other applications focused on information search or data analysis.

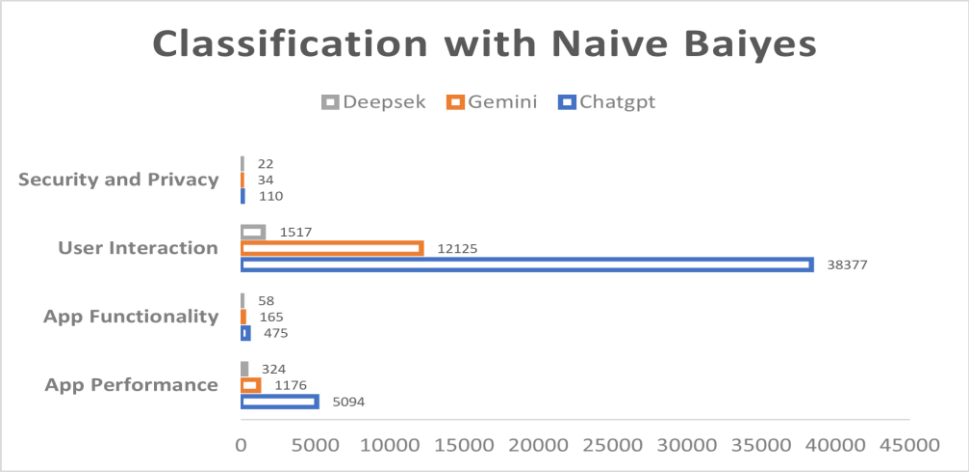

Figure 2. Classification result with Naïve Baiyes model

In the **App Performance** category, ChatGPT again received significantly more reviews (5,094) compared to Gemini (1,176) and DeepSeek (324). This suggests that users paid greater attention to the performance of the applications,

particularly in terms of speed and the ability to deliver relevant and accurate results. Meanwhile, the **Security and Privacy** category received fewer reviews, with ChatGPT receiving 103 reviews, Gemini 34, and DeepSeek 22. This could indicate that security and privacy concerns were less prominent in the context of these applications.

2. Sentiment Classification with Logistic Regression

The analysis using Logistic Regression provided more detailed insights into how users rated each application across various categories. Once again, ChatGPT dominated the **User Interaction** category with 42,539 reviews, followed by Gemini with 12,987 and DeepSeek with 1,752. This dominance of ChatGPT in this category highlights how the AI chatbot application facilitates more active and engaging interactions with users, compared to Gemini, which focuses on intelligent search, and DeepSeek, which emphasizes deep data searches.

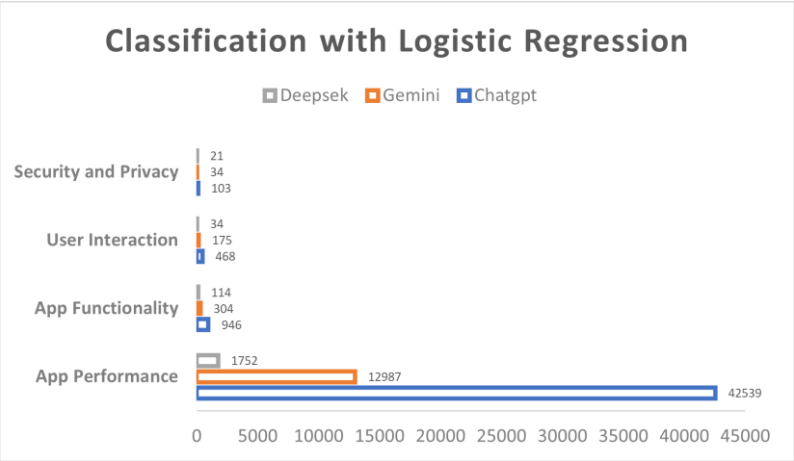

Figure 3. Classification result with Logistic Regression model

In terms of **App Functionality**, both ChatGPT and Gemini received higher numbers of reviews than DeepSeek, with ChatGPT receiving 946 reviews and Gemini 304, while DeepSeek garnered only 114 reviews. This indicates that users might consider ChatGPT and Gemini more functional and useful in their daily lives, compared to DeepSeek, which has a more specialized application.

3. Emotion Classification in User Reviews

In the emotion classification stage, where user sentiment was categorized according to Ekman's Six Basic Emotions, the results showed that the **Joy** (happiness) emotion dominated reviews for all three applications. ChatGPT received the highest number of **Joy** reviews (22,347), followed by Gemini with 6,827 reviews, and DeepSeek with 857 reviews. This indicates that users were more satisfied and pleased with their experience using ChatGPT compared to the other applications.

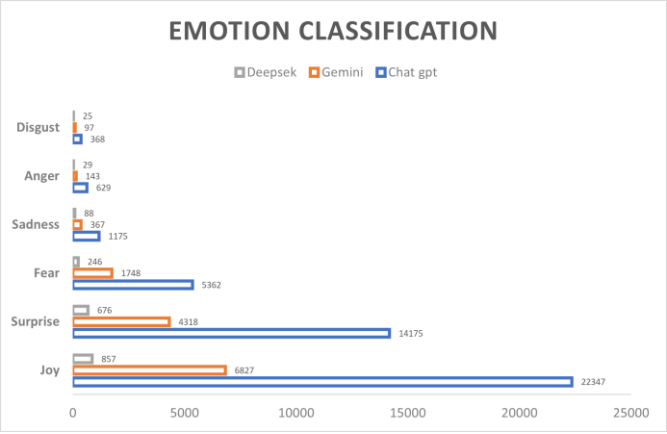

Figure 4. Emotion classification result (Eckman class)

The **Surprise** emotion also showed significant numbers, with ChatGPT receiving 14,175 reviews, followed by Gemini with 4,318 reviews and DeepSeek with 676 reviews. This surprise could be related to the applications providing unexpected or smarter answers than users anticipated.

Conversely, **Disgust** and **Fear** emotions showed lower numbers overall. ChatGPT received 368 reviews in the **Disgust** category, while Gemini and DeepSeek had 97 and 25 reviews, respectively. In the **Fear** category, ChatGPT received 5,362 reviews, Gemini 1,748, and DeepSeek 246. While there were some concerns among users about these applications, negative emotions were still less prevalent compared to positive emotions like **Joy** and **Surprise**.

4. Application Rating Evaluation

It is also crucial to examine how users rated these applications. Based on the distribution of application ratings, ChatGPT received the highest number of 5-Star ratings (35,594 reviews), reflecting a very high level of user satisfaction with the application. Gemini also received a significant number of 5-Star ratings (10,981 reviews), though fewer than ChatGPT. DeepSeek, while having a much smaller number of reviews, received 1,074 5-Star ratings, indicating that some users were satisfied with this application despite its lower total.

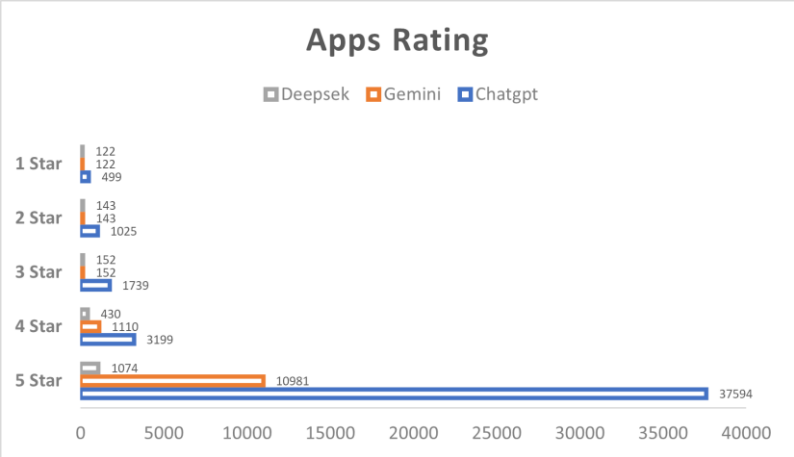

Figure 4. Apps rating comparation

In the **1-Star** rating category, ChatGPT received 499 reviews, Gemini 122 reviews, and DeepSeek 122 reviews, which suggests that although there were some negative reviews, the proportion of 5-Star ratings was much higher. This indicates that overall, users were more likely to give positive ratings to these AI-based applications.

5. Comparison of Model Performance between Naive Bayes and Logistic Regression

The performance comparison between the Naive Bayes (NB) and Logistic Regression (LR) models reveals interesting insights into the effectiveness of each model in classifying sentiment for the ChatGPT, Gemini, and DeepSeek applications. Based on evaluation metrics such as AUC, Classification Accuracy (CA), F1 Score, Precision (Prec), Recall, and Matthews Correlation Coefficient (MCC), both models exhibit strong performance; however, there are notable differences worth discussing [18], [19].

Table 1. Model performance result

Platform	Model	AUC	CA	F1	Prec	Recall	MCC
Deepseek	LR	0.722	0.944	0.928	0.929	0.944	0.586
	NB	0.716	0.952	0.938	0.936	0.952	0.658
Gemini	LR	0.688	0.976	0.969	0.964	0.976	0.611
	NB	0.688	0.976	0.969	0.964	0.976	0.611
Chatgpt	LR	0.699	0.978	0.971	0.968	0.978	0.604
	NB	0.7	0.978	0.971	0.968	0.978	0.604

For **DeepSeek**, Naive Bayes (NB) slightly outperforms Logistic Regression (LR) in several key metrics, particularly in **F1 Score** (0.938 vs 0.928) and **MCC** (0.658 vs 0.586). This indicates that NB is better balanced in handling both precision and recall, as well as more effective in dealing with imbalanced sentiment classes. Although LR has a marginally higher **AUC** (0.722 vs 0.716), NB delivers superior overall predictive performance for DeepSeek.

For both **Gemini** and **ChatGPT**, the results from the two models are nearly identical in terms of **AUC**, **Classification Accuracy**, **F1 Score**, **Precision**, and **Recall**, with values very close to one another. Both models were able to classify sentiment with high accuracy for these two applications, achieving **Classification Accuracy** of 0.976 for Gemini and 0.978 for ChatGPT. While there is a slight difference in AUC (0.688 for LR and 0.688 for NB for Gemini, 0.699 for LR and 0.7 for NB for ChatGPT), these differences are negligible and indicate that both models perform very well on applications with larger and more balanced datasets.

Overall, while **Logistic Regression (LR)** excels in **AUC** and **Classification Accuracy** for applications with larger and more balanced datasets like Gemini and ChatGPT, **Naive Bayes (NB)** demonstrates its advantage in applications with smaller and more imbalanced datasets such as DeepSeek, due to its ability to better balance precision and recall. Therefore, the choice between LR and NB should be tailored to the characteristics of the application's dataset. NB is more suitable for imbalanced data, whereas LR is better suited for larger, more structured datasets.

DISCUSSION

This study aims to explore public sentiment toward three artificial intelligence (AI)-based applications—ChatGPT, Gemini, and DeepSeek—using sentiment analysis approaches based on Natural Language Processing (NLP) and Machine Learning (ML). Based on the results of the research, several key factors influence public sentiment toward these applications, which also address the research questions posed. These factors include **User Interaction**, **App Performance**, and **Security and Privacy**.

First, the main findings of this study reveal that **User Interaction** plays a very significant role in shaping public sentiment, particularly for ChatGPT, which received overwhelmingly positive sentiment in this category. Users expressed high satisfaction with the application's ability to provide a responsive and natural interactive experience. Second, **App Performance**, which involves the speed and accuracy of the application's responses, is also a primary factor influencing user perception. ChatGPT excelled in this category, followed by Gemini and DeepSeek, which showed lower performance in delivering fast and effective results.

Although **Security and Privacy** concerns were raised by some users, the findings of this study indicate that these concerns did not significantly affect sentiment when compared to **User Interaction** and **App Performance**. This suggests that, while security and privacy are important issues, users prioritize interactive experience and app performance when evaluating AI-based applications [20]. In this regard, ChatGPT received the most reviews and the most positive sentiment, with a dominance of positive emotions such as **Joy** and **Surprise**, indicating that users felt happy and surprised by their interaction with the application. Meanwhile, Gemini received positive reviews, particularly regarding **App Performance**, although the level of positive sentiment was not as high as ChatGPT. On the other hand, DeepSeek displayed more mixed sentiment, with some negative reviews related to **User Interaction** and **App Performance**, although the application was still appreciated by some users who required deep search functionalities.

This study also successfully addressed the question of the differences in sentiment between the three applications. Overall, ChatGPT received extremely positive reviews from users due to its ability to create more human-like and relevant interactions, while Gemini and DeepSeek showed lower results in terms of **User Interaction**. However, Gemini was still valued for its ability to provide efficient intelligent search, although the overall user experience was not as interactive as ChatGPT's. DeepSeek, with its functionality more focused on deep data analysis, has a smaller user base and more divided sentiment, with some users expressing dissatisfaction with the user experience.

In terms of sentiment toward AI technology in general, the findings suggest that, although there are concerns about data security and privacy, most users tend to perceive the positive benefits of AI-based applications that provide enjoyable **User Interaction** and effective **App Performance** [21]. This indicates that, despite the concerns AI technology often raises, public acceptance of the technology increases when applications meet user expectations in terms of speed, interactivity, and ease of use [22], [23]. These findings align with existing literature, which shows

that positive user experiences in interacting with technology often mitigate concerns about issues such as privacy and data misuse.

This study introduces several novelties that differentiate it from previous research. One of the main contributions is the comparative approach between different AI applications within one large ecosystem (Google)—namely, ChatGPT, Gemini, and DeepSeek—which possess varying functionalities. The study reveals that more interactive applications like ChatGPT receive more positive sentiment compared to applications that focus more on search and data analysis, such as Gemini and DeepSeek. Furthermore, this study integrates sentiment analysis based on NLP with Machine Learning (Naive Bayes and Logistic Regression), providing a more holistic and accurate result regarding public sentiment toward AI applications. The study also adds a new dimension by using Indonesian-language data, expanding our understanding of user perceptions of AI technology beyond the English language, which is more commonly used in similar research.

Based on these findings, several practical implications can be drawn for AI application developers. Developers should prioritize **User Interaction** and **App Performance**, as both factors have been shown to significantly influence user satisfaction and application acceptance [24]. ChatGPT serves as an excellent example of how applications that prioritize natural and responsive user interaction can successfully attract users. While security and privacy remain important concerns, the findings suggest that the primary focus in improving AI applications should be on enhancing the user experience and application performance [25]. Developers should also increase transparency about how user data is managed and protected to alleviate privacy concerns.

Overall, this study provides important contributions to understanding the factors influencing public sentiment toward AI-based applications. By introducing an approach that compares AI applications with different functionalities within a single platform, as well as combining sentiment analysis based on NLP and machine learning, this research offers new insights that can be used for further development in creating applications that are more liked and accepted by the public.

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