VERİ BİLİMİ DERGİSİ
www.dergipark.gov.tr/veri

The Evolution and Impact of Large Language Model Chatbots in Social Media: A Comprehensive Review of Past, Present, and Future Applications

Emre SADIKOĞLU[1]*, Murat GÖK[1], Maad M. MIJWIL[3], İrfan KÖSESOY[4]

[1]Yalova University, Computer Engineering, Yalova, TÜRKİYE
[2]Baghdad College of Economic Sciences University, Computer Techniques Engineering, Baghdad, IRAQ
[3]Kocaeli University, Software Engineering, Kocaeli, TÜRKİYE

Abstract

Chatbots are computer programs using artificial intelligence and natural language processing (NLP) developed for written communication with humans. They can be designed with varying levels of sophistication, from basic keyword scanning to advanced AI Technologies based Large Language Model (LLM). Chatbots have a long history, with early examples dating back to the mid-20th century. Recent advancements in AI have made LLM Chatbots smarter and more functional, allowing them to be used in a variety of industries. LLM Chatbots have become increasingly popular in social media, providing businesses and organizations with an efficient way to engage with customers and followers. In social media, LLM Chatbots utilize NLP technology to understand and respond to user inquiries, providing personalized and immediate support. They can be used for a variety of purposes, including customer service, marketing, and sales, and can offer a range of services, from answering basic questions to completing transactions. With the ability to interact with users in real-time, LLM Chatbots can help businesses improve customer satisfaction and increase engagement, making them an important tool for social media strategy in social media. The aim of this paper is to offer a thorough and nuanced comprehension of the current and past utilization of LLM Chatbots in social media, as well as to provide insights into potential future trends and developments.

Makale Bilgisi

Başvuru:
05/12/2023
Kabul:
15/12/2023

Keywords: *Chatbot, Social media, Twitter, Instagram, Facebook, Natural language processing*

Büyük Dil Modelli Sohbet Robotlarının Sosyal Medyadaki Gelişimi ve Etkisi: Geçmiş, Günümüz ve Gelecekteki Uygulamalara İlişkin Kapsamlı Bir Derleme

Özet

Sohbet robotları, insanlarla yazılı iletişim için geliştirilmiş yapay zeka ve doğal dil işleme (NLP) tabanlı bilgisayar programlarıdır. Temel anahtar kelime tabanlı yanıtlardan gelişmiş büyük dil modelli (LLM) yapay zeka teknolojilerine kadar çeşitli gelişmişlik düzeylerinde tasarlanabilirler. Sohbet robotlarının uzun bir geçmişi vardır ve ilk örnekleri 20. yüzyılın ortalarına kadar uzanmaktadır. Yapay zeka alanındaki son gelişmeler, LLM sohbet robotlarını daha akıllı ve işlevsel hale getirerek çeşitli sektörlerde kullanılmalarına olanak sağlamıştır. LLM sohbet robotları, sosyal medyada giderek daha popüler hale gelerek işletmelere ve kuruluşlara müşteri ve takipçilerle etkileşim kurmanın etkili bir yolunu sunmaktadır. Sosyal medyada LLM sohbet robotları, kullanıcı sorularını anlamak ve yanıtlamak için NLP

* İletişim e-posta: emre.sadikoglu@yalova.edu.tr

teknolojisini kullanır. İsteğe göre kişiselleştirilmiş olup anında destek sağlar. Müşteri hizmetleri, pazarlama ve satış dahil olmak üzere çeşitli amaçlar için kullanılabilirler ve temel soruları yanıtlamaktan işlemleri tamamlamaya kadar birçok çeşit hizmet sunabilirler. Kullanıcılarla gerçek zamanlı olarak etkileşime girebilme özelliğiyle LLM sohbet robotları, sosyla medyada işletmelerin müşteri memnuniyetini artırmasına ve etkileşimi olumlu biçimde yönetmesine yardımcı olabilir ve bu da onları sosyal medya stratejisi için önemli bir araç haline getirir. Bu derlemenin amacı, LLM sohbet robotlarının sosyal medyadaki mevcut ve geçmiş kullanımına ilişkin kapsamlı ve incelikli bir kavrayış sunmanın yanı sıra gelecekteki potansiyel eğilimler ve gelişmeler hakkında içgörü sağlamaktır.

Anahtar Kelimeler: *Sohbet robotu, Sosyal medya, Twitter, Instagram, Facebook, Doğal dil işleme*

1 Introduction

Chatbots are software programs that operate automatically and are capable of communicating with people [1]. They have a wide range of potential uses, from providing customer service to gathering information or directing requests [2]. Different types of chatbots employ varying levels of sophistication in their design, with some incorporating extensive classification algorithms, NLP, and cutting-edge artificial intelligence (AI) techniques, while others rely on simpler strategies like scanning for frequently used keywords and generating basic responses from a predetermined set of phrases stored in a library or database [3].

The technology used in LLM Chatbots allows them to recognize patterns in language and identify the most relevant information in a query, allowing them to generate responses that are specific to the individual user's needs. By using NLP, LLM Chatbots can mimic human conversation, making interactions more natural and seamless [4]. This means that LLM Chatbots can hold conversations with users, understand their requests, and provide appropriate responses that meet their needs, all without human intervention. NLP technology has greatly expanded the capabilities of chatbots, enabling them to understand the nuances of language and provide accurate, useful responses in real-time. As such, LLM Chatbots are becoming increasingly popular in a variety of contexts, from customer service to healthcare, as they offer a cost-effective and efficient way to provide assistance and support to users [5].

The concept of chatbots has been around for a long time, dating back to the mid-20th century [6], but it's only recently that chatbots have become more popular and widespread. The development of AI technologies has played a significant role in this resurgence of chatbots. With the advancements in machine learning, NLP, and other AI technologies, LLM Chatbots have become smarter, more accurate, and more functional than ever before. They can now understand and respond to complex questions and commands, and can even recognize and interpret human emotions to provide a more personalized and human-like conversation [7]. This has led to chatbots being increasingly used in a variety of industries, including customer service, healthcare, finance, and more [5]. As AI technology continues to evolve, it's likely that LLM Chatbots will become even more advanced and widespread in the future.

Chatbots have a rich history that dates back to the mid-1960s, where they were originally created to improve communication between computers and humans. One of the earliest chatbots was ELIZA [6] a program developed by Joseph Weizenbaum in 1966. ELIZA was a chatbot designed to simulate a therapist, and it used a series of predefined answers based on the user's input. Despite its simplistic approach, ELIZA was a huge success, with many users convinced that they were talking to a real therapist. ELIZA had a significant impact on Weizenbaum's ideas about AI and its potential to mimic human conversation [8].

In 1972, Kenneth Colby developed another groundbreaking chatbot called Parry [9]. Unlike ELIZA, which focused on predefined answers, Parry modeled the thoughts and behavior of a paranoid schizophrenic in real-time, providing a glimpse into the potential of using AI technology to model human behavior and psychological states [10]. Parry was a landmark case in the use of AI in the field of psychology and psychiatry and laid the foundation for the technologies used in the development of today's chatbots. Colby's work highlighted the

potential of chatbots to simulate human personalities, thoughts, and emotions and paved the way for further advancements in the field of AI.

During the 1980s, chatbots made significant strides in their development and began to evolve into more complex systems [11]. This progress was facilitated by advances in computer technologies and an increase in the number of people using computers. With the rising popularity of chatbots, businesses began to utilize them for various purposes, such as customer service and information gathering. As chatbots became more widespread, their capabilities also increased.

Fast forward to the 2010s, and chatbots experienced a resurgence in popularity due to the development of AI technologies. Virtual assistants such as Siri and Alexa increased people's familiarity with chatbots, and businesses began to recognize the value of incorporating chatbots into their operations [12]. With the use of advanced machine learning algorithms and NLP, chatbots were able to learn and understand human language, making them much more efficient and useful for customer service, sales, and other applications [13].

Today, chatbots continue to improve and become more sophisticated. They are being used for a wide range of purposes, including language learning, personal finance management [14], and even mental health therapy [15]. As chatbot technology advances, they are able to interact with people in increasingly natural ways, making them more effective and valuable tools for businesses and individuals alike [16]. With the growing use of chatbots, it is clear that they are poised to become an even more integral part of our daily lives in the years to come.

For example Peer [17] examines the effects of incorporating emojis into a pedagogical chatbot, aiming to determine if emojis can elicit perceptions that resemble those experienced in human interactions and foster engagement. Through experimentation involving a group of adult students, it was discovered that the inclusion of emojis in chatbot responses positively influenced participants' perceptions of the chatbot as more human-like. This finding contributes to the acceptance of synthetic learning tools as instructional resources that emulate human characteristics, as perceived by students. Consequently, the effectiveness of emojis in enhancing students' social presence and facilitating effective online learning becomes evident.

The primary objective of this research is to conduct a narrative review of relevant scholarly research pertaining to the utilization of chatbots in social media [18]. Narrative reviews are a type of literature review that summarizes the current state of knowledge on a specific topic, providing an overview of key findings and trends. In order to identify relevant sources for this review, we employed a selective search approach that targeted literature and evidence that were readily available and accessible to the researchers [19].

The rest of this paper is organized as follows. In Chapter 2, general information about the chatbot types and their differences are given. In Chapter 3, Use of chatbots on social media is discussed in detail. In Chapter 4, the conclusion of the article is summarized.

2 ChatBot Types and Differences

Chatbots have been one of the most significant advancements in the field of AI in recent years. As people and businesses recognize the potential benefits of efficient communication, the number of LLM Chatbots available on the market has grown consistently. Some examples of these chatbots are ChatGPT [20], Bing AI [21], Jasper, YouChat [22], Chatsonic, and Google Bard [23][24].

2.1 ChatGPT

ChatGPT, an AI LLM Chatbot developed by OpenAI, is a NLP model that can engage in text-based conversations with users. The model is developed using both supervised and reinforcement learning methods [20], and it was launched on November 30, 2022 [25]. Since its release, ChatGPT has gained tremendous popularity, reaching 100 million users in just two months [26]. With its ability to provide human-like responses, ChatGPT can act as a personal assistant, helping users with a wide range of tasks, such as accessing information, getting advice, solving math equations, writing texts, translating, summarizing, correcting texts, debugging, and writing and translating code [27]. ChatGPT also supports various languages and understands the language in which the user writes, generating responses in the same language. Overall, ChatGPT has revolutionized the way people access information, providing a more conversational and natural approach to information retrieval.

Microsoft incorporated the ChatGPT 4.0 model into the Bing search engine, introducing LLM Chatbot named BingChat On February 7, 2023 [28]. In addition, early December, Microsoft announced in a blog post that new features will be added to Copilot [29]. The latest models of OpenAI will be included in Copilot. So that, Copilot will gain GPT-4 Turbo and DALL-E 3 support and a new code interpretation feature, while Deep Search functionality will be released in Bing.

Copilot will be able to utilize the GPT-4 Turbo model in its responses. Thus, Copilot will expand its context window to 128,000 tokens. Thanks to the wider context window, Copilot will be able to better understand queries and provide better responses.

According to Microsoft, DALL-E 3 is taking its place in Bing Image Creator and Copilot. From now on, users will be able to produce AI-supported images via Copilot.

There are also some innovations in Microsoft Edge, which has the Copilot sidebar. Microsoft Edge now has the ability to create text within the text input of websites. Users will can use Copilot in Microsoft Edge to summarize videos you watch on YouTube.

Furthermore, AutoGPT [30], conceived by a computer programmer named Significant Gravitas, automates the initiation of prompts. Through Auto-GPT, the user merely furnishes the LLM Chatbot with the objective, requiring no further action. Auto-GPT formulates self-directed commands to attain the specified goal and autonomously executes the entire procedure by leveraging internet resources and ChatGPT APIs.

Pros:

- The training database is very large.
- It can generate human-like responses.
- It can generate images of the entered text. (Paid version)

Cons:

- The data in the database covers 2021 and earlier (Free version)
- It is not connected to the internet, it does not have the ability to transmit instant information.
- Sometimes he hallucinates and presents fictitious and wrong information.

2.1.1 GPT-4 Turbo

OpenAI published its latest significant language model, GPT-4 Turbo, on November 6, 2023. This advanced model boasts an increased capacity for processing longer inputs compared to its predecessor. Unlike previous versions of ChatGPT, which could handle inputs of 8K and 32K, the GPT-4 Turbo version now accommodates inputs of up to 128K, equivalent to 365 pages of text [31]. Notably, this updated model can provide information spanning up to April 2023, surpassing the limitations of the prior version, which was confined to information up to September 2021. GPT-4 Turbo integrates the DALL-E 3 model, enabling the inclusion of visuals directly in the chat box for queries. This enhancement allows the model to undertake tasks such as generating image captions and providing explanations of visual content. Furthermore, the latest version supports text-to-speech conversion requests, and users can directly upload documents for analysis by ChatGPT.

2.2 Jasper

Jasper is a powerful artificial copywriting tool that can assist with various writing processes, such as generating blog post topics, writing advertising and marketing copy, and crafting blog posts, among others [32]. Similar to ChatGPT, Jasper is built on GPT-3, which allows it to generate high-quality content based on user input. However, Jasper offers a wider range of tools to help users produce better content. For instance, Jasper enables checking plagiarism and grammar for documents. Also, it generates content which blog posts, tweets for Twitter, Youtube scripts, and more using over 50 different templates. This makes it an incredibly versatile tool for content creation and can help businesses and individuals streamline their writing processes while producing high-quality content.

Pros:

- It has more than 50 writing templates.
- Built-in plagiarism checker.
- Can access the internet.

Cons:

- Does not support live chat.
- Sometimes it can create content about an irrelevant product.

2.3 Claude 2

Developed by the startup Anthropic with the goals of offering helpful, honest, and harmless, Claude 2 sets itself apart through heightened logical reasoning, practical judgment, and safety features. Its primary objective is to engage in conversations with users, addressing inquiries that span a diverse

range of subjects. Utilizing a combination of NLP and ML methodologies, Claude AI comprehends user input, formulating responses accordingly. Notably, Claude possesses the ability to absorb knowledge from user interactions, facilitating continuous improvement of its responses. Claude stands out for its ability to furnish accurate and beneficial responses to user queries, showcasing a significant proficiency even in the face of occasional challenges when addressing complex or nuanced questions. Another remarkable aspect of the Claude 2 AI LLM Chatbot has 100,000 tokens or approximately 75,000 words. This feature empowers users to seamlessly insert or upload extensive documents, including entire books, enabling them to pose questions based on the content [33].

Pros:

- Focused on safety, steering clear of potentially harmful or unethical responses.
- Acknowledges lack of knowledge instead of presenting false information.
- Utilizes informed judgment and logical reasoning.

Cons:

- Has less natural conversation ability.
- Sometimes it can create content about an irrelevant content.
- Overly cautious in some answers.

2.4 Google Bard

Google Bard is an innovative conversational AI LLM Chatbot created by Google [34], utilizing the LaMDA [35] family of LLMs. Although it is currently only available to a limited group of users, it holds great potential in several areas. While Bard's coding and search functions are not yet fully developed, it excels in tasks such as text editing, summarization, and document counting. Additionally, Bard can access instant information via Google, making it a valuable tool for generating high-quality text.

Also Google announced Gemini LLM model, which it describes as "our largest and most capable AI model" [36]. Gemini is optimized to work in 3 different formats "Ultra, Pro and Nano" and is designed to work on everything from data centers to mobile devices. The first version of the model, Gemini 1.0, is developed for three different sizes: Gemini Ultra, the most capable and largest model for highly complex tasks, Gemini Pro for scaling a wide range of tasks, and Gemini Nano, the most efficient model for on-device tasks. For now, the most basic version of Gemini can work with text input and output. But when Ultra is released, it will be able to work with photos, video and audio. Gemini will also be very capable at writing code. The model uses a code generation system called AlphaCode 2. In tests, it performed 85% better than its competition participants. Among the languages it is good at are Python, Java, C++ and Go.

Pros:

- Can Access instant information via Google.
- High text generation skills.

Cons:

- Does not give sources.
- It is limited in coding.

2.5 YouChat

YouChat is a powerful AI LLMchatbot developed using OpenAI's GPT-3 technology, similar to ChatGPT and Jasper [37]. One of its standout features is the ability to transcribe any input provided to it. It can respond to a diverse range of queries, from solving complex mathematical equations and coding and programming to translation and typing. As it has access to the internet, it can fetch instant information from Google, making it an incredibly useful tool for users. Additionally, it provides users with references to the information it receives, ensuring that they have access to reliable and verifiable sources. Overall, YouChat is a versatile and efficient LLM Chatbot that can help users in various fields.

Pros:

- It can provide instant information with Google access.
- It shows the sources from which it gets the data with references.
- It has a built-in image generator.

Cons:

- Sometimes it stops itself and fails to respond.
- The references it gives can be fictitious.

2.6 ChatSonic

ChatSonic is a cutting-edge LLM Chatbot developed by WriteSonic that is based on the ChatGPT-4 platform [38]. This advanced LLM Chatbot has several notable features that set it apart from other

similar tools in the market. One of its most significant advantages is its ability to access instant information via Google, including data from after 2021. This capability enables ChatSonic to generate ideas, provide coding assistance, offer translation services, and perform text summarization with unparalleled speed and accuracy. ChatSonic also supports visual content creation and voice input, allowing users to enter information through speech instead of traditional keyboard input. This feature is particularly useful for people who prefer to use voice commands or who have disabilities that make it difficult to type on a keyboard. Moreover, ChatSonic stands out from other LLM Chatbots by creating footnotes for all the information sources it uses. This feature makes it easier for users to verify the accuracy of the information presented by ChatSonic and to access the original sources if needed.

Pros:

- Shows data sources.
- Can access up-to-date information.

Cons:

- It cannot perform mathematical problems.
- It can repeat itself and present the same suggestions again.
- Most of the time, it cannot produce images related to the text entered.

3 Use of LLM Chatbots on Social Media

3.1 Twitter

LLM Chatbots have emerged as a powerful tool for enhancing user engagement on social media platforms, and Twitter is no exception. By leveraging the capabilities of LLM Chatbots, users can generate tweets that are specifically tailored to their needs. LLM Chatbots can help users create tweets on a specific topic with precise words and hashtags that will maximize their exposure to a wider audience. These bots offer users various options and alternatives for tweet generation. Tweets can also be used to analyze authors and text.

In the literature, Haque et al. [39] sentiment analysis was conducted on the initial tweets about ChatGPT in their study. The researchers collected and categorized 10,732 tweets into topics and found that most users had a positive perception of ChatGPT for software development, entertainment, and creativity. However, a minority expressed concerns about its potential misuse, especially in education. Taecharungroj [40] collected 233,104 English tweets within a month of ChatGPT's launch and categorized them into five topics using Latent Dirichlet Allocation to answer the question of what ChatGPT can do. Results revealed that users had positive perceptions of creative writing, essay writing, generating code, and answering questions but negative perceptions, with concerns around education. Jeong and Seo [41] proposed the Response using Twitter (RuT) method to improve LLM Chatbot accuracy and capacity. Their method involved collecting tweet-reply pairs to expand the LLM Chatbot's data volume, leading to a more human-like response rate. In their study, Mathur et al. [42] proposed the Bot Intelligence Score approach to evaluate LLM Chatbot intelligence, utilizing text categorization, frequency analysis, and cosine similarity techniques. They tested their approach on Microsoft's Twitter bot Tay [43] and found that the Thai LLM Chatbot had a higher Bot Intelligence Score, demonstrating better learning with tweet interactions, despite being online for only 16 hours. Hu at al. [44], conducted a study focused on the influence of LLM Chatbots functioning as customer service representatives on social media. Their research involved the development of a LLM Chatbot capable of generating responses imbued with various tones, including Empathetic, Passionate, Satisfied, Polite, Sad, and others, as opposed to delivering the plain and straightforward speech. This approach aimed to provide customers with a more emotionally engaging interaction, rather than solely providing factual answers. Through the utilization of a dataset comprising over 1.5 million customer service tweets, the LLM Chatbot, trained using deep learning techniques, was observed to elicit greater empathy from customers compared to human agents. Consequently, this enhanced emotional connection positively impacted customers' perceptions of the company.

One of the key advantages of using a LLM Chatbot on Twitter is that it can serve as a customer service representative for any brand. This means that it can automatically respond to customer inquiries via tweets, which saves a lot of time and effort. Moreover, a LLM Chatbot can interact with followers in various ways, such as answering questions and sending birthday messages, thus, improving brand engagement and customer loyalty. Overall, by using a LLM Chatbot on Twitter, users

can enhance their presence on the platform and improve their social media marketing strategy.

3.2 Instagram

LLM Chatbots can play an essential role in boosting interactions on Instagram. They can help users increase engagement by generating appropriate tags and descriptions for their photos, after being provided with the relevant information. LLM Chatbots have become an increasingly popular tool for customer service on social media platforms, such as Instagram.

In the literature, Farell and Ferreras [45] emphasize significance of instant access to information with in application. Instant accessibility is recognized as a advantage of LLM Chatbots for users, as illustrated in the digital marketing strategy. They employed a LLM Chatbot to provide customer support via Instagram Direct Messages, replacing physical employees and enabling users to obtain information promptly and conveniently. Further studies have indicated that a notable proportion of users are more inclined to purchase products or services from companies that offer instant messaging services [46].

Moreover, LLM Chatbots can create lists of Instagram posts, which can be analyzed based on their metadata, including description and tags, to determine the mood of the user who shared it. Additionally, LLM Chatbots can analyze comments on photos and videos, detect any controversies among them, and bring them to the attention of the user. This feature can be helpful for individuals and businesses to manage their Instagram presence and identify areas for improvement in their content strategy.

3.3 Facebook

Facebook is an online social media platform used by most users. It is preferred for activities such as communication, games, education, and entertainment. Facebook's Messenger application has many LLM Chatbots. Some of them are education, gaming, customer service, and smart home automation.

In the literature, Smutny and Schreiberova [47] analyzed educational LLM Chatbots in Facebook Messenger by conducting experiments on 47 tutorial and educational LLM Chatbots. They found that the LLM Chatbots based on decision trees, rather than artificial intelligence, had not yet produced satisfactory results. Balasudarsun et al. [48] conducted a survey among Facebook Messenger LLM Chatbot users to examine the impact of the platform on marketing. The survey showed that daily updates, visuals, smart conversations, and emojis were the most important factors, while the platform provided strong support for email marketing. Parthornratt et al. [49] developed a smart home automation system that utilizes a Facebook LLM Chatbot. This system allows users to access and control their home appliances remotely, regardless of their location, via Facebook Messenger. Licapa-Rodriguez et al. [50] developed a Facebook Messenger-based LLM Chatbot called EcoBot for an ecological brick company, which automated functions such as showing the manual, managing the cart, user registration, and displaying reviews, making management and user-side operations easier. As a result, the company obtains a 14% increase in the volume of transactions and a 15% increase in sales. Also, a survey of 42 includes customers indicated a positive user experience.

Facebook is a popular social media platform, especially among older adults, but it is also a common target for scams and fraud. A LLM Chatbot can play a crucial role in preventing these types of abuses by analyzing chat content and detecting potential fraud or ransom attempts. By examining the text of conversations, LLM Chatbots can identify suspicious activity and alert users before they fall victim to a scam. Moreover, LLM Chatbots can assist companies that advertise on Facebook by helping them reach a larger audience through targeted advertising. By analyzing user data and engagement patterns, LLM Chatbots can recommend specific user groups to target, as well as the best times and content to use for ads. This can ultimately lead to more effective advertising campaigns and increased ROI for businesses.

4 Conclusion

Chatbots have come a long way since their inception in the mid-20th century, and they have become increasingly sophisticated with the development of artificial intelligence Technologies [6]. LLM Chatbots are now capable of holding natural conversations with humans, understanding the nuances of language, and providing personalized and accurate responses [4]. They are being used in a wide range of industries, including customer service [51], healthcare [5], finance, and social media. In the realm of social media, LLM Chatbots have become an essential tool for businesses to

engage with customers and provide personalized support. As users increasingly turn to social media for customer service, LLM Chatbots provide a convenient and efficient way for businesses to interact with customers and address their needs. LLM cChatbots can also help businesses automate sales, marketing, and customer service on social media platforms, improving business efficiency, productivity, and profitability.

With their ability to provide instant assistance and support, LLM Chatbots have revolutionized customer service in social media platforms, leading to improved customer experiences and increased brand loyalty [52]. As AI technology continues to advance, LLM Chatbots are likely to become even more advanced, providing more personalized and human-like interactions with users. As NLP, machine learning, and voice recognition technologies continue to advance, LLM Chatbots will be able to handle more complex tasks and engage in more human-like conversations with users [53]. This will further enhance user engagement, satisfaction, and loyalty, as well as improve business-customer interactions on social media platforms.

Additionally, LLM Chatbots are likely to expand their applications to new domains and use cases on social media platforms. For example, LLM Chatbots could be used to provide educational content, conduct surveys, or even facilitate e-commerce transactions. With the ability to integrate with other devices and platforms, such as smart speakers and wearables, LLM Chatbots could also extend their reach beyond social media and become more ubiquitous in our daily lives. Overall, the future of LLM Chatbots for social media platforms looks promising, with many exciting possibilities for enhancing user experiences and improving business outcomes.

References

[1] Jia, J. (2004). The study of the application of a web-based chatbot system on the teaching of foreign languages. In Society for Information Technology & Teacher Education International Conference (pp. 1201-1207). Association for the Advancement of Computing in Education (AACE).

[2] Kumar, R., & Ali, M. M. (2020). A review on chatbot design and implementation techniques. Int. J. Eng. Technol, 7(11).

[3] Ayanouz, S., Abdelhakim, B. A., & Benhmed, M. (2020, March). A smart chatbot architecture based NLP and machine learning for health care assistance. In Proceedings of the 3rd international conference on networking, information systems & security (pp. 1-6).

[4] Go, E., & Sundar, S. S. (2019). Humanizing chatbots: The effects of visual, identity and conversational cues on humanness perceptions. Computers in Human Behavior, 97, 304-316.

[5] Bhirud, N., Tataale, S., Randive, S., & Nahar, S. (2019). A literature review on chatbots in healthcare domain. International journal of scientific & technology research, 8(7), 225-231.

[6] Weizenbaum, J. (1966). ELIZA—a computer program for the study of natural language communication between man and machine. Communications of the ACM, 9(1), 36-45.

[7] Zhou, L., Gao, J., Li, D., & Shum, H. Y. (2020). The design and implementation of xiaoice, an empathetic social chatbot. Computational Linguistics, 46(1), 53-93.

[8] Dillon, S. (2020). The Eliza effect and its dangers: From demystification to gender critique. Journal for Cultural Research, 24(1), 1-15.

[9] Güzeldere, G., & Franchi, S. (1995). Dialogues with colorful "personalities" of early AI. Stanford Humanities Review, 4(2), 161-169.

[10] Boden, p. 370 (2006)

[11] Feigenbaum, E. A. (1980). Knowledge Engineering: The Applied Side of Artificial Intelligence. STANFORD UNIV CA DEPT OF COMPUTER SCIENCE.

[12] Weber, P., & Ludwig, T. (2020). (Non-) Interacting with conversational agents: perceptions and motivations of using chatbots and voice assistants. In Proceedings of Mensch und Computer 2020 (pp. 321-331).

[13] Ahmad, N. A., Che, M. H., Zainal, A., Abd Rauf, M. F., & Adnan, Z. (2018). Review of chatbots design techniques. International Journal of Computer Applications, 181(8), 7-10.

[14] Khan, S., & Rabbani, M. R. (2020, November). Chatbot as Islamic finance expert (CaIFE) When finance meets artificial intelligence. In proceedings of the 2020 4th international symposium on computer science and intelligent control (pp. 1-5).

[15] Vaidyam, A. N., Wisniewski, H., Halamka, J. D., Kashavan, M. S., & Torous, J. B. (2019). Chatbots and conversational agents in mental health: a review of the psychiatric landscape. The Canadian Journal of Psychiatry, 64(7), 456-464.

[16] Rapp, A., Curti, L., & Boldi, A. (2021). The human side of human-chatbot interaction: A systematic literature review of ten years of research on text-based chatbots. International Journal of Human-Computer Studies, 151, 102630.

[17] Peer Jr, W. L. (2023). Chatbot Pedagogical Agent Social Presence Effectiveness with Emojis: An Experiment (Doctoral dissertation, Grand Canyon University).

[18] Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. Journal of business research, 104, 333-339.
[19] Davies, P. (2000). The relevance of systematic reviews to educational policy and practice. Oxford review of education, 26(3-4), 365-378.
[20] OpenAI (2023). GPT-4 Technical Report. ArXiv, abs/2303.08774.
[21] Roose, K. (2023). A Conversation With Bing's Chatbot Left Me Deeply Unsettled.
[22] Garon, J. (2023). A Practical Introduction to Generative AI, Synthetic Media, and the Messages Found in the Latest Medium. Synthetic Media, and the Messages Found in the Latest Medium (March 14, 2023).
[23] Rahaman, M., Ahsan, M. M., Anjum, N., Rahman, M., & Rahman, M. N. (2023). The AI Race is On! Google's Bard and OpenAI's ChatGPT Head to Head: An Opinion Article. Mizanur and Rahman, Md Nafizur, The AI Race is on.
[24] Koubaa, A., Boulila, W., Ghouti, L., Alzahem, A., & Latif, S. (2023). Exploring ChatGPT Capabilities and Limitations: A Critical Review of the NLP Game Changer.
[25] Open AI. (2022, November 30). Introducing chatgpt. Introducing ChatGPT. Retrieved April 11, 2023, from https://openai.com/blog/chatgpt
[26] Milmo, D. (2023, February 2). CHATGPT reaches 100 million users two months after launch. The Guardian. Retrieved April 11, 2023, from https://www.theguardian.com/technology/2023/feb/02/chatgpt-100-million-users-open-ai-fastest-growing-app
[27] Mijwil, M., Aljanabi, M., & Ali, A. H. (2023). ChatGPT: Exploring the Role of Cybersecurity in the Protection of Medical Information. Mesopotamian journal of cybersecurity, 2023, 18-21.
[28] Peters, J. (2023, March 14). The bing AI bot has been secretly running GPT-4. The Verge. Retrieved April 11, 2023, from https://www.theverge.com/2023/3/14/23639928/microsoft-bing-chatbot-ai-gpt-4-llm
[29] Medhi Y. (2023 December 5), Celebrating the first year of Copilot with significant new innovations. Retrieved December 8 2023 from https://blogs.microsoft.com/blog/2023/12/05/celebrating-the-first-year-of-copilot-with-significant-new-innovations/
[30] Gravitas, S. (n.d.). Auto-GPT: An experimental open-source attempt to make GPT-4 fully autonomous. GitHub. Retrieved April 17, 2023, from https://github.com/Significant-Gravitas/Auto-GPT
[31] M. Schade (2023 November 6), GPT-4 Turbo. Retrieved November 15 2023 from https://help.openai.com/en/articles/8555510-gpt-4-turbo
[32] Doyle, K. (2022, December 10). Chatgpt vs. Jasper: How it's different from Jasper Chat. RSS. Retrieved April 11, 2023, from https://www.jasper.ai/blog/what-is-chatgpt
[33] Anthropic Introducing Claude. Anthropic Blog 2023, March 14. Retrieved November 15 2023 from https://www.anthropic.com/index/introducing-claude
[34] Pichai, S. (2023, February 6). An important next step on our ai journey. Google. Retrieved April 11, 2023, from https://blog.google/technology/ai/bard-google-ai-search-updates/
[35] Collins, E., Ghahramani, Z. (2021, May 18). LAMDA: Our breakthrough conversation technology. Google. Retrieved April 11, 2023, from https://blog.google/technology/ai/lamda/
[36] Pichai S., Hassabis D. (2023 December 6). Introducing Gemini: our largest and most capable AI model. Google. Retrieved December 8 2023 from https://blog.google/technology/ai/google-gemini-ai/
[37] You.com. (2021, December 9). You.com: The search engine that puts you in control. Medium. Retrieved April 11, 2023, from https://blog.you.com/you-com-the-search-engine-that-puts-you-in-control-6f5d43519532
[38] Garg, S. (2023, March 22). What is ChatSonic and how to use it. The Writesonic Blog - Making Content Your Superpower. Retrieved April 11, 2023, from https://writesonic.com/blog/what-is-chatsonic/
[39] Haque, M. U., Dharmadasa, I., Sworna, Z. T., Rajapakse, R. N., & Ahmad, H. (2022). " I think this is the most disruptive technology": Exploring Sentiments of ChatGPT Early Adopters using Twitter Data. arXiv preprint arXiv:2212.05856.
[40] Taecharungroj, V. (2023). "What Can ChatGPT Do?" Analyzing Early Reactions to the Innovative AI Chatbot on Twitter. Big Data and Cognitive Computing, 7(1), 35.
[41] Jeong, S. S., & Seo, Y. S. (2019). Improving response capability of chatbot using twitter. Journal of Ambient Intelligence and Humanized Computing, 1-14.
[42] Mathur, V., Stavrakas, Y., & Singh, S. (2016, December). Intelligence analysis of Tay Twitter bot. In 2016 2nd International Conference on Contemporary Computing and Informatics (IC3I) (pp. 231-236). IEEE.
[43] Hu, T., Xu, A., Liu, Z., You, Q., Guo, Y., Sinha, V., ... & Akkiraju, R. (2018, April). Touch your heart: A tone-aware chatbot for customer care on social media. In Proceedings of the 2018 CHI conference on human factors in computing systems (pp. 1-12).
[44] Lee, P. (2016, March 25). Learning from Tay's introduction. The Official Microsoft Blog. Retrieved April 11, 2023, from https://blogs.microsoft.com/blog/2016/03/25/learning-tays-introduction/

[45] Farell Danés, A., & Ferreras Ferreras, J. (2021). L'Evocative. Creation of a digital marketing agency based on Instagram Chatbots.
[46] BARIŞ, A. (2020). A new business marketing tool: chatbot. GSI Journals Serie B: Advancements in Business and Economics, 3(1), 31-46.
[47] Smutny, P., & Schreiberova, P. (2020). Chatbots for learning: A review of educational chatbots for the Facebook Messenger. Computers & Education, 151, 103862.
[48] Balasudarsun, N. L., Sathish, M., & Gowtham, K. (2018). Optimal ways for companies to use Facebook Messenger Chatbot as a Marketing Communication Channel. Asian Journal of Business Research, 8(2), 1.
[49] Parthornratt, T., Kitsawat, D., Putthapipat, P., & Koronjaruwat, P. (2018, July). A smart home automation via facebook chatbot and raspberry pi. In 2018 2nd International Conference on Engineering Innovation (ICEI) (pp. 52-56). IEEE.
[50] Licapa-Rodriguez, R., Gomez-Ramos, J., & Mauricio, D. (2021, October). EcoBot: Virtual assistant for e-commerce of ecological bricks based on Facebook Messenger. In 2021 IEEE Engineering International Research Conference (EIRCON) (pp. 1-4). IEEE.
[51] Adam, M., Wessel, M., & Benlian, A. (2021). AI-based chatbots in customer service and their effects on user compliance. Electronic Markets, 31(2), 427-445.
[52] Xu, A., Liu, Z., Guo, Y., Sinha, V., & Akkiraju, R. (2017, May). A new chatbot for customer service on social media. In Proceedings of the 2017 CHI conference on human factors in computing systems (pp. 3506-3510).
[53] Suta, P., Lan, X., Wu, B., Mongkolnam, P., & Chan, J. H. (2020). An overview of machine learning in chatbots. International Journal of Mechanical Engineering and Robotics Research, 9(4), 502-510.