



A Survey on chatbot in E-commerce

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Abstract: *E-commerce is one of the most important types of trading all over the world, especially after the spread of COVID-19 all over the world in 2019 caused many problems in all fields of life, such as e-commerce. E-commerce is considered the best choice for trading in some cases, such as the far distance for some customers that can't handle dealing with such issues, and also for some elderly and sick people who face health problems in obtaining the good product. For handling this new type of trade, many tools were used as a beginning: websites that cover products with each detail and provide a good way to buy and obtain products to your location, wherever you are. As the vast spread of these websites, applications, and some chats for selling goods and the problems of handling all these customers in a perfect way appeared, chatbots were developed to treat and solve these problems, introduce high customer service, and make customers feel that they were speaking to a person, not a robot. This paper will introduce different approaches to handling this research domain and how they impact the economy and society.*

Keywords: *E-commerce, chatbot, economy, society, covid-19.*

1. Introduction

Economy is the controller of the rise or fall of all countries around the world, as with increasing the economy of some countries, all other fields are affected, and it is the reason for making that country one of the best and producing a good living for humans who live in this country. On the other hand, decreasing the economy will change the performance of living in this country. There are many types of trading, such as buying from some places face-to-face, which is called the traditional way of trading, and the new way that deals with buying and selling goods over the internet in different ways, such as websites, Facebook, and such applications, called e-commerce (electronic commerce) [1].

E-commerce is considered a perfect way for trading all over the world, so as an important field, researchers are interested in it in all ways. There are many issues under study, such as handling customers that buy over the internet and companies that sell online products [2]. Here, there are traditional ways for handling these customers, such as employing some persons to cooperate with them over chats or mobile phones, and another way is to use a chatbot to handle these customers. Chatbots help the process of buying, which is so professional and cheap for the companies that use e-commerce in their businesses.

2. E-commerce

E-commerce is an electronic way of buying and selling products online or over the internet. [3, 4] Through text or voice conversation, e-commerce can reduce costs and boost economic growth. Therefore, the global rate of e-

commerce is increasing very fast, which has implications for the digital economy [5].

2.1 Analysis and Assessment of Evidence Gathered

E-commerce has an impact on many countries, including those in Europe, as well as various industries, including the retail industry. This argues that governments should support and execute e-commerce policies. Financial services, logistics availability, internet connectivity, and digital skill competency all contribute to the adoption of e-commerce. Furthermore, governments and higher authorities are accountable for raising public awareness of the benefits of e-commerce. Thus, governments should improve e-commerce's compliance with individual needs [5].

In [6], sales (employment) at nearby stores fell by 4% (2.1%). Exits are on the rise, particularly in young and small stores, while admittance is decreasing. The retail industry loses 938 jobs per county every quarter, whereas the transportation warehousing sector . (Food services sector) adds 256 (143) jobs. According to [7], the model accounts for 99.5% of the variation in labor market activity rates among adults aged 15 to 64 in the selected sample of states. This demonstrates that the expansion of commerce, as well as an increase in the percentage of technology-specialized human resources, lead to an increase in labor market activity. As a result, the labor market must be helped to stay up with technology by reforming the education system or establishing courses that promote competitiveness and continual development.

2.2 The Impact of COVID-19 on the E-commerce

The COVID-19 pandemic has significantly impacted the business operations and performance of micro-, small-, and medium-sized firms (MSMEs) around the world. MSMEs have had to embrace and implement a variety of methods to keep their businesses running, and their financial and sustainability performance has been influenced by their choice of e-commerce (EC) platforms and digital marketing (DM) techniques[8].

According to [9], stock returns for Chinese e-commerce enterprises were favorably associated to the number of new cases per day and COVID-19 deaths per day. We find that COVID-19 has a beneficial influence on Chinese e-commerce enterprises. According to [10], loneliness is a widespread problem that is acknowledged as a severe societal issue, and the current COVID-19 epidemic has brought loneliness to the forefront and raised concerns. They anticipated the emergence of a large number of 'lonely' consumers who are strongly immersed in the social isolation created by COVID-19. There is an urgent need to reexamine the phenomena of lonely customers in order to better prepare academic researchers, public policymakers, and commercial managers for life after COVID-19.

According to [11], Saudi Arabia is among the countries impacted by the coronavirus. It was discovered that the developing coronavirus (COVID-19) has a direct favorable impact on client behavior towards e-commerce in Saudi Arabia. Home quarantine has a good and direct effect on people's attitudes on e-commerce. Furthermore, movement constraints have a beneficial and direct impact on people's attitudes toward e-commerce. Finally, psychological worry has a favorable and direct effect on people's attitudes toward e-commerce.

3. Chatbot

Chatbot is one of the NLP (Natural Language Processing) branches that is considered the most difficult of them, so all problems and challenges that face NLP also face the chatbot, and will discuss some of them as follows and showing its architecture in figure 1.

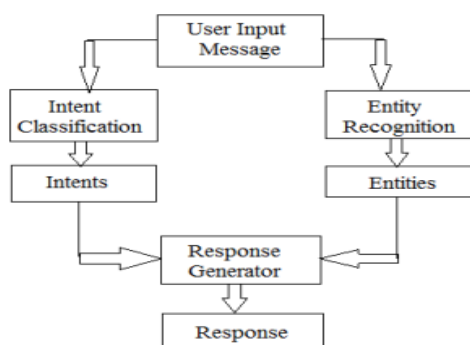


Figure 1. Architecture of Chatbot[12].

3.1 chatbot challenges

The rise of chatbots has enticed numerous businesses to offer their products via chat and bots. Although chatbots have garnered a lot of attention, little is known about how diverse usage settings affect chatbots' effectiveness in mobile commerce. Not all shopping scenarios are appropriate for chatbots due to their inherent differences [13]. Language and accent disparities are one of the most important issues.

[14] aimed to investigate ChatGPT and its powerful artificial intelligence program in natural language processing, which is considered to have one of its most impressive capabilities: generating human-like output after analyzing human inputs, beginning with language translation and text summarization to search and automation. The findings revealed that the application works by responding rapidly to consumer inquiries and demands; the more satisfied they are, the more likely they are to choose the company again and again. ChatGPT offers a substantially greater response rate than certain traditional marketing tools in terms of consumer connection, and it is always easier and faster to answer to customers in their native language. As a result, ChatGPT's engineers sought to train the program in multiple languages so that it could answer to customers in their native language and give a more personalized and efficient customer experience.

[15] agreed that chatbots may be utilized in marketing services to significantly improve the customer experience. Based on the cognitive appraisal theory. Their study used an event-related potential (ERP) approach to investigate consumers' emotional experiences and trust in passive interaction with chatbots versus humans, controlling for objective or subjective tasks in e-commerce, and found that chatbots had lower trust than humans.

With chatbots becoming increasingly widespread in e-commerce, [16] has raised worries about how Gen Z users perceive these virtual helpers. The results confirmed that there are issues with the chatbot's ability to grasp tough inquiries and deliver personalized replies.

3.2 Tools for Chatbot Development

There are many tools for developing chatbots, as described in Table 1.

Table 1. Tools for Chatbot Development.

Tool	Description
Dialogflow	Google created Dialogflow, a popular tool for creating conversational interfaces. It enables natural language processing and integrates with a variety of platforms [17, 18].
Microsoft Bot Framework:	Microsoft's broad architecture facilitates the construction of bots for a variety of channels, including Microsoft Teams, Skype, and more [12].
Botpress	An open-source platform for developing, managing, and deploying chatbots. [12].

Rasa	An open-source platform for developing conversational AI. Rasa offers capabilities for both NLU and dialogue management [19, 12].
IBM Watson Assistant:	As part of IBM's Watson platform, this tool enables developers to create, train, and deploy AI-powered chatbots [12].
Wit.ai:	Facebook acquired Wit.ai, a natural language processing technology that allows developers to create conversational applications [12].
Amazon Lex	is used to create colloquial helpers using text and speech. Amazon Lex is a service provided by Amazon Web Services. This solution uses a variety of technologies, including Amazon Cognito, to provide user authentication [20, 12].
Botkit	is an open-source chatbot development platform. Botkit is managed by Microsoft. It is used to create customized integrations, chatbots, and messaging platform apps. [12].
Botsify	is a popular chatbot creation tool. We can create bots using a drag-and-drop UI (user interface). Botsify is not a free platform [12].
Pandorabots	is a web service for developing and publishing chatbots. This utility includes open-source and free libraries. It also provides premium libraries for an extra monthly cost. Pandorabots [12] use Artificial Intelligence Markup Language (AIML) to script their chatbot conversations.

4. Outcomes of Undertaking Coursework

Customer service and electronic commerce. Users choose chatbots because they are quick, simple, and convenient [21]. Real-world products and uses include product suggestions, order fulfillment and shipping, intelligent chatbots, augmented reality, and sentiment analysis. The landscape for the deployment of AI-powered chatbots in the e-commerce industry has shifted dramatically recently [22].

[23] showed that constructing ChatGPT as a green evangelist (CGGE) may significantly forecast consumer equilibrium via green purchasing intentions at various brand confidence levels. Their approach advances the unified theory of acceptance and use of technology (UTAUT) and research, while also providing a significant tool for future empirical research on ChatGPT. Touchpoints, which largely comprise chatbots That refers to the points of contact or interactions between customers and businesses. These touchpoints, which occur before, during, and after the transaction, comprise the customer journey [1].

[24] Out of 3942 studies collected, 219 were examined. The key findings revealed that the technology acceptance model, social presence theory, and computers as social actors are the most influential hypotheses for explaining chatbot adoption. The majority of studies focused on analyzing chatbot usage intention, with little investigations into actual use or continuing intention.

Nearly 63% of the studies examined did not include moderators, and those that did typically focused on gender, chatbot/technical experience, and age. Their research looks on the implications of ChatGPT AI for businesses, such as its ability to increase productivity, lower costs, and boost competitiveness. Furthermore, ethical and legal concerns about the use of ChatGPT AI in corporate operations are addressed, including data privacy, bias, and transparency [25].

5. Literature Review

In this study work [25], 50 MBA students from the University of Asia Pacific, Bangladesh, were used as a dataset; 25 were female and the other 25 were male. The contestants' ages range from 23 to 35. Participants received a set of 15 questions. ChatGPT AI has boosted efficiency, improved customer happiness, and cut costs. However, there is a risk of bias in the data and algorithms used to train ChatGPT, which could result in biased conclusions. There is also a risk of data privacy and security breaches because ChatGPT may gather and keep sensitive client data.

After doing numerous studies on chatbots for business, [21] concluded that AI-powered chatbots transform enterprises by lowering expenses, increasing revenue, and improving the customer experience. People are increasingly using chatbots instead of phone calls, and everyone who can type in their language on their personal computers or mobile devices can use them directly. Chatbots are available in numerous applications and websites.

In this study paper [26], they built "Nabiha," a chatbot that supports discussion with Information Technology (IT) students at King Saud University in the Saudi Arabic dialect. They gathered 248 inputs and outputs from KSU IT students' accounts on Askme.com. Three of them were personal accounts, and the other was a general account for the IT department. We selected to collect our data from Askme because it contained students' opinions, complaints, most frequently asked questions, student-to-student chats, etc. They created two Java scripts to convert the readable text into an AIML chatbot format (category, pattern, template). They uploaded the files to the Pandorabots portal. They also generated more AIML files for the Pandorabots platform, including default and recursive categories. The dataset included 1104 categories. Results suggest that most students see Nabiha as an IT employee; some stated Nabiha is a graduating student; and just one said Nabiha is a robot, which is regarded a success for Nabiha. Nabiha has certain issues, such as people not understanding "كيفك؟" since there is no space between the word and the question mark. Therefore, Nabiha need further development to meet human needs.

In this study [27], ten general health questions were translated into Tunisian and Jordanian dialects of

Arabic by bilingual native speakers. The performance of two AI models, ChatGPT-3.5 and ChatGPT-4, in response to Tunisian, Jordanian, and English was assessed using the CLEAR tool, which is designed for assessing health information generated by AI models. ChatGPT-3.5 performance was rated as ordinary in Tunisian Arabic, with an overall CLEAR score of 2.83, as opposed to an above-average score of 3.40 in Jordanian Arabic. ChatGPT-4 followed a same pattern, with significantly better outcomes (CLEAR score of 3.20 in Tunisian, classed as average) and above-average performance in Jordanian (CLEAR score of 3.53). Using English as a reference, reactions to Tunisian and Jordanian accents were significantly poorer ($P < .001$). The findings reveal a crucial dialectal performance gap in ChatGPT, emphasizing the necessity to improve linguistic and cultural diversity in AI model development.

In this work [28], they present an artificial intelligence-powered chatbot for crisis communication that is omnichannel, multilingual, and multi-dialect. They gathered data from official sources. For example, Tunisian information was provided by the Ministry of Health, while Nigerian information was provided by local non-governmental organizations (NGOs). They discuss their work on modified StarSpace embedding adapted for African dialects for the question-answering job, along with the architecture of the proposed chatbot system and a description of the distinct layers. Languages and dialects spoken include English, French, Arabic, Tunisian, Igbo, Yoruba, and Hausa. We acquired quantitative and qualitative evaluation findings for our real-world COVID-19 chatbot. The results suggest that users are satisfied, and the communication with the chatbot meets their needs. Their solution digitalizes African institutions' services, allowing uneducated and vulnerable populations, such as rural women and persons in need of social inclusion and resilience, to have more dependable, official, and understandable information available at all times. For the Messenger channel, 8153 users engaged with their chatbot, ranging from 89 to 903 each day. The findings reveal that, in a crisis, consumers prefer to obtain information from official websites rather than non-official ones such as Messenger.

In this research paper [29], they picked texts from Wilson and Mihalcea's collection. The corpus contains short texts (extracted from tweets) in which users describe the actions they took. They employed a linguistically informed framework to generate sarcasm, allowing us to offer human judges with a variety of sarcastic responses in a number of contexts. Their findings indicated that sarcasm should not always be generated, but that the decision to generate sarcasm should be influenced by user preferences. Sarcasm is most commonly used in response to favorable statements and in situations where a joking environment has already been established. Furthermore, judges enjoyed sarcasm when they thought it was entertaining, and they frequently preferred general

sarcastic comments. Over half of the chosen comments were deemed nonsarcastic and nonhumorous by participants.

6. The Proposed Model

6.1 Dataset

The dataset used in the chatbot application is considered the first and most important step in the phases of building the model and, most of the time, is taken from different sources. The dataset may be text or voice, depending on the model that will be built. Organizing and preparing the dataset for the model takes time and effort, and in some cases, it also requires a cost to get these data. Our proposed dataset will be taken from the Kaggle dataset or Hugging Face website. After collecting data, it will be used in the next step of preprocessing, as shown in Figure 2.

6.2 The Software

Software that will be used to build the chatbot application is available and easy to use, such as Google Colab, which has the advantage of ChatGPT now and can ask it for specific code and reply perfectly, and it's free for limited capabilities. Python is the programming language used in building this model.

6.3 The Algorithm

The algorithms that are used in the building model are the most difficult phase in the proposed model, and they determine whether the model is perfect, intelligent, or weak. Unfortunately, not all algorithms are available, open source, or even for buying, but they're hidden from developers such as ChatGPT, who did not announce them until now. A powerful algorithm will be built in this study to overcome or reduce some of the challenges in the chatbot technique.

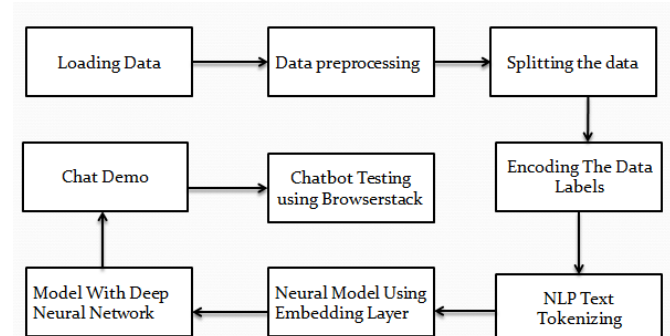


Figure 2. The proposed model for chatbot dialect challenge.

To improve the performance of the model, some proposed solutions will be offered in this paper, such as using different sources for the dataset and not depending on only one source, such as csv, text, video, audio, and documentation files. Also, questionnaire files can help in building a powerful model.

7. limitations

Chatbot is a new field that is under research, and a lot of challenges face researchers and developers, such as getting the suitable datasets or questions and answers that will be used in the model and how to introduce the information to the model. One of the big limitations is how to build intelligent algorithms that will be used to make the application effective and intelligent, and there aren't many open sources for that. One of the limitations is understanding and feeling the customer and letting him persuade him that he's speaking to a human, not a machine. Chatbot is a new research field, so we cannot cover its impact in many fields, especially since some of these applications are private and not available to all.

8. Conclusion and Future Work

E-commerce controlled and transferred the economy of the world to another place, changing the concept of commerce at all. Ecommerce played a great role in continuing trading in the time of Corona and facilitating the process on both sides (customers and traders), so for handling this type of trade, powerful tools are needed to manage it. Chatbots are the best and newest way to handle customers in a perfect way, handle many customers at the same time, and also save money on the large number of employees that handle these customers. This paper discusses the challenges, uses, and tools used in building chatbots and gives a look at the limitations that developers face in building chatbot apps. Many studies that took up this type of trade were discussed, and that led us to introduce handling video and image chatbots as future work. Also, as a future project, as oil is one of the most important fields in the world, we proposed a chatbot for the oil sector to handle all data about this sector for all people, especially trainee engineers, to help them learn how to deal with the new locations and tasks.

References

- [1] Anttu Weurlander, "Chatbots and online customer experience – Finnish consumers' perceptions towards chatbots in ecommerce retail", Aalto university, Master's Programme in Marketing, Master's thesis 2023.
- [2] Hatem Bugshan, Razaz Waheeb Attar , "Social commerce information sharing and their impact on consumers", *Technological Forecasting & Social Change*, 2020, <https://doi.org/10.1016/j.techfore.2019.119875>.
- [3] Travis Tokar, Robert Jensen, Brent D. Williams, "A guide to the seen costs and unseen benefits of e-commerce", *Business Horizons* (2021) 64, 323-332.
- [4] Jifeng Mu, Jonathan Z, Zhang, "Seller marketing capability, brand reputation, and consumer journeys on e-commerce platforms", *Journal of the Academy of Marketing Science* <https://doi.org/10.1007/s11747-021-00773-3>.
- [5] Hao Xie, Shuangshuang Chang, Yunfeng Wang, Anees Afzal, "The impact of e-commerce on environmental sustainability targets in selected European countries", *Economic Research-Ekonomska Istraživanja*, 2023, 36:1, 230-242, DOI: 10.1080/1331677X.2022.2117718.
- [6] Sudheer Chava, Alexander Oettl, Manpreet Singh, Linghang Zeng, "CREATIVE DESTRUCTION? IMPACT OF E-COMMERCE ON THE RETAIL SECTOR", *NATIONAL BUREAU OF ECONOMIC RESEARCH*, 1050 Massachusetts Avenue, Cambridge, MA 02138, May 2022.
- [7] Carmen-Elena Banescu , Emilia Titan and Daniela Manea, "The Impact of E-Commerce on the Labor Market", *Sustainability* 2022, 14, 5086, <https://doi.org/10.3390/su14095086>.
- [8] Gao, J.; Siddik, Khawar Abbas, S.; Hamayun, M.; Masukujjaman, M.; Alam, S.S, " Impact of E-Commerce and Digital Marketing Adoption on the Financial and Sustainability Performance of MSMEs during the COVID-19, Pandemic: An Empirical Study", *Sustainability*, 2023, 15, 1594. <https://doi.org/10.3390/su15021594>.
- [9] Wenchao Ji, Jianing Zhang, "The Impact of COVID-19 on the E-commerce Companies in China", *Review of Integrative Business and Economics Research*, Vol. 11, Issue 1 , 2022.
- [10] Xueqin Wang , Yiik Diew Wong, and Kum Fai Yuen, " Rise of 'Lonely' Consumers in the Post-COVID-19 Era: A Synthesised Review on Psychological, Commercial and Social Implications", *Int. J. Environ. Res. Public Health* 2021, 18, 404,
- [11] MEHDI ABID, HOUCINE BENLARIA, ZOUHEYR GHERAIA, "The Impact of the Emerging Coronavirus (COVID-19) on E-Commerce in the Kingdom of Saudi Arabia", *WSEAS TRANSACTIONS on BUSINESS and ECONOMICS*, 2022, DOI:10.37394/23207.2022.19.72.
- [12] Deshpande, B., & Chandak, M. B. (2022). A survey of designing tools for chatbot application. *International Journal of Health Sciences*, 6(S5), 1403-1413, <https://doi.org/10.53730/ijhs.v6nS5.8889>.
- [13] Hsu, PF., Nguyen, T.(., Wang, CY. et al. Chatbot commerce—How contextual factors affect Chatbot effectiveness. *Electron Markets* 33, 14

- (2023). <https://doi.org/10.1007/s12525-023-00629-4>.
- [14] Hassan, A. (2023). The Challenges Face E-Commerce Business by Using ChatGPT. In: El Khoury, R., Nasrallah, N. (eds) *Emerging Trends and Innovation in Business and Finance. Contributions to Management Science*. Springer, Singapore. https://doi.org/10.1007/978-981-99-6101-6_24.
- [15] Cuicui Wang, Yiyang Li, Weizhong Fu, Jia Jin, "Whether to trust chatbots: Applying the event-related approach to understand consumers' emotional experiences in interactions with chatbots in e-commerce", *Journal of Retailing and Consumer Services*, Volume 73, 2023, 103325, ISSN 0969-6989, <https://doi.org/10.1016/j.jretconser.2023.103325>.
- [16] Christania A. J. Tamara, Willem J. F. Alfa Tumbuan, Emilia Margareth Gunawan, "CHATBOTS IN E-COMMERCE: A STUDY OF GEN Z CUSTOMER EXPERIENCE AND ENGAGEMENT – FRIEND OR FOE?", *Jurnal EMBA* Vol. 11 No. 3 Juli 2023, Hal. 161-175.
- [17] Simon Prananta Barus, Evalien Suriyati, "Chatbot with Dialogflow for FAQ Services in Matana University Library", *International Journal of Informatics and Computation (IJICOM)*, Vol. 3, No.2, December 2021, ISSN: 2685-8711, E-ISSN: 2714-5263 DOI : 10.35842/ijicom.
- [18] Ajay Sah, "BUILDING A CHATBOT USING DIALOGFLOW", Lappeenranta-Lahti University of Technology LUT School of Engineering Sciences, Bachelor's Programme in Software and System Engineering, 2023.
- [19] ANNA PAPADOPOULOU, "Developing and Evaluating a Chatbot", ARISTOTLE UNIVERSITY OF THESSALONIKI FACULTY OF SCIENCES, SCHOOL OF INFORMATICS, THESSALONIKI, 2022.
- [20] Dr. Bala Dhandayuthapani V, "A Proposed Cognitive Framework Model for a Student Support Chatbot in a Higher Education Institution", *Int. J. Advanced Networking and Applications*, Volume: 14 Issue: 02 Pages: 5390-5395(2022) ISSN: 0975-0290.
- [21] Effah A. Kadasah, "Artificial Intelligence Powered Chatbots for Business", *Int. Journal of Information Technology and Business*, Vol. 4, No. 2(2023) 61-66.
- [22] Suryawanshi, S.K., Gohil, J.A. (2023). An Epistemology on Role of AI-Powered E-commerce Chatbot to Support CX. In: Kumar, S., Hiranwal, S., Purohit, S., Prasad, M. (eds) *Proceedings of International Conference on Communication and Computational Technologies. ICCCT 2023. Algorithms for Intelligent Systems*. Springer, Singapore. https://doi.org/10.1007/978-981-99-3485-0_9.
- [23] Muhammad Waqas Sadiq, Muhammad Waheed Akhtar, Chunhui Huo & Salman Zulfiqar (2023) ChatGPT-powered chatbot as a green evangelist: an innovative path toward sustainable consumerism in E-commerce, *The Service Industries Journal*, DOI: 10.1080/02642069.2023.2278463.
- [24] A. Alsharhan, M. Al-Emran and K. Shaalan, "Chatbot Adoption: A Multiperspective Systematic Review and Future Research Agenda," in *IEEE Transactions on Engineering Management*, doi: 10.1109/TEM.2023.3298360.
- [25] Md Armanr, Umama Rashid Lamiyar, "Exploring the Implication of ChatGPT AI for Business: Efficiency and Challenges", *Applied Quantitative Analysis (AQA)*, Vol. 3 No. 2 (2023) <https://doi.org/10.31098/quant.1385>.
- [26] Dana Al-Ghathban , Nora Al-Twairish, "Nabiha: An Arabic Dialect Chatbot", (*IJACSA*) *International Journal of Advanced Computer Science and Applications*, Vol. 11, No. 3, 2020.
- [27] Malik Sallam, Dhia Mousa, "Evaluating ChatGPT performance in Arabic dialects: A comparative study showing defects in responding to Jordanian and Tunisian general health prompts", *Mesopotamian Journal of Artificial Intelligence in Healthcare* Vol.2024, pp. 1–7 DOI: <https://doi.org/10.58496/MJAIH/2024/001>; ISSN :3005
- [28] Aymen Ben Elhaj Mabrouk, Moez Ben Haj Hmida, Chayma Fourati, Hatem Haddad, Abir Messaoudi, "A Multilingual African Embedding for FAQ Chatbots", arXiv:2103.09185v1 [cs.CL] 16 Mar 2021. <https://translatorswithoutborders.org/language-data-nigeria/> <https://www.worlddata.info/languages/hausa.php>.
- [29] Silviu Vlad Oprea, Steven R. Wilson, Walid Magdy, "Should a Chatbot be Sarcastic? Understanding User Preferences Towards Sarcasm Generation", *Proceedings of the 60th Annual Meeting of the Association for Computational Linguistics Volume 1: Long Papers*, pages 7686 - 7700 May 22-27, 2022 c 2022 Association for Computational Linguistics.