

Review Article

Revolutionizing Healthcare: Exploring the Impact of AI Chatbots

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Abstract - Artificial Intelligence (AI) is increasingly becoming a transformative force in various industries, including healthcare. The recent advancements in AI are primarily driven by three key factors: improved processing power, easier access to vast amounts of data, and improved algorithms. Chatbots are software programs designed to simulate conversation with users, either through text-based or auditory interactions. They are particularly valued in healthcare for their ability to emulate human-like communication. This capability allows chatbots to perform various functions, such as helping to prioritize patients based on the severity of their condition, offering basic medical advice, and providing real-time alerts or reminders for medication and other health-related activities. Despite their potential benefits, integrating chatbots in healthcare also presents numerous challenges. These range from ethical and privacy concerns to technical limitations and issues of reliability. This paper aims to present a comprehensive review of recent research and developments related to AI chatbots in healthcare.

Keywords - Artificial Intelligence, Healthcare, Chatbots, Effectiveness, AI applications.

1. Introduction

Artificial Intelligence, referred to as AI, has become a trending term in today's digital age and continues to evolve with each passing day. Artificial Intelligence (AI) is the process of developing intelligent systems capable of sensing the environment and gathering information from it to achieve specific goals. It learns by experience, through examples, through findings from data, etc. [1]. Healthcare is one of those sectors where the challenge of access to medical services due to unavailability can be made easy with AI applications. Many such applications are rising in popularity and being used in healthcare. One such application is a chatbot.

Chatbots are computer programs usually designed to maintain human conversation with users through receiving voice commands, text-based inputs, or both. The first chatbot was ELIZA, developed by Joseph Weizenbaum from the Massachusetts Institute of Technology in 1996. It is one of the oldest conversation-simulating programs, like human talk. It has been observed in the last few years that AI chatbots are very supportive of health care. They inform the patients about the diseases, track their health records, and raise an alert or indication for any emergency. As to various experts dealing with health, these chatbots can help a person diagnose himself, including minor illnesses. However, this technology has not reached the position where it can be said to replace medical

professionals [2]. This research paper aims to comprehensively review and analyze existing literature, including papers and articles, on the utilization of AI chatbots in healthcare and evaluate their effectiveness. Second, it aims to delve into a comparative study of past chatbot developments across various healthcare applications. This comparative analysis will identify strengths and weaknesses, providing insights into areas where these technologies may have fallen short and opportunities for improvement. This paper focuses on the need for the healthcare system to use AI technology chatbots in uncertain situations, contacting exactly medical representatives or healthcare experts is becoming ambiguous. So, by using AI chatbots, the hurdle can be reduced, and human efforts can be reduced to attain the best and timely benefit from the medical system. In this paper, a literature survey is conducted and explains the need for the present system in Section II. The proposed research methodology is described in Section III, and finally, results and discussions are explained in Section IV after the practical implementation.

2. Literature Survey

There shall be an all-inclusive search in the databases, which shall be done in IEEE Xplore and Google Scholar. There will be the utilization of keywords such as "AI chatbots", "healthcare", "effectiveness", and "applications", among others. By using inclusion criteria, all the available related



studies are published in peer-reviewed journals, conference proceedings, or relevant articles that highlight the implementation of AI-based chatbots within the domain of healthcare applications. The study period will be used to limit

the research to 10 years because it always keeps the data relevant. Exclusion Criteria: Those studies that do not support healthcare applications, publications in languages other than English, and studies with low methodological rigour.

Table 1. Literature survey of related work

Authors	Contribution	Research Gap
Augustina O. Ugwu, et.al [1]	<ul style="list-style-type: none"> Provides insights into the causes and implications of healthcare data breaches and improving healthcare data security 	<ul style="list-style-type: none"> Limited scope to breaches reported to the US Department of Health and Human Services only
Seong-Gyeol Park et al. [2]	<ul style="list-style-type: none"> Improves communication in healthcare settings. Enhances medical education. 	<ul style="list-style-type: none"> Potential concerns regarding data privacy and security. Ethical considerations in AI-driven healthcare.
Poonam Tanwar, et al. [3]	<ul style="list-style-type: none"> Provides immediate responses to users' health-related questions. 	<ul style="list-style-type: none"> May not accurately diagnose complex medical conditions.
Ibrahim Alrashdi, et.al [4]	<ul style="list-style-type: none"> Improved efficiency and accuracy of risk management processes. Better patient outcomes. Reduction in costs. Potential for personalized medicine and tailored recommendations. 	<ul style="list-style-type: none"> Challenges include privacy and data security issues, biases in AI algorithms, implementation across different healthcare providers, and regulatory hurdles.
Avinash Kumar, et.al [5] Sujata Joshi	<ul style="list-style-type: none"> It enhances medical decision-making, improves service quality enables quick appointments and discharge, and facilitates early diagnosis. 	<ul style="list-style-type: none"> Slow adoption by practitioners and the need for more user-friendly AI applications.
Vincent Velasco, et.al [6]	<ul style="list-style-type: none"> Improves communication and user experience in healthcare. Enhances accuracy and quickness of disease diagnosis. 	<ul style="list-style-type: none"> Limited to studies published between 2018 and 2023. Potential biases in selected literature.
Deepali Sharma et. al. [7]	<ul style="list-style-type: none"> Enhances patient access to healthcare, provides diagnostic support, educates patients, offers counseling or therapy, aids in emergency management, provides companionship, and enables self. 	<ul style="list-style-type: none"> Faces challenge related to preserving privacy, confidentiality, and security; intent classification difficulties; handling uncertainty; loss of human element; improving.
Kevin et al. [8]	<ul style="list-style-type: none"> To monitor and facilitate data collection and learning from data. 	<ul style="list-style-type: none"> The system is used for a pertained medical word that improves learning.

3. Research Methodology

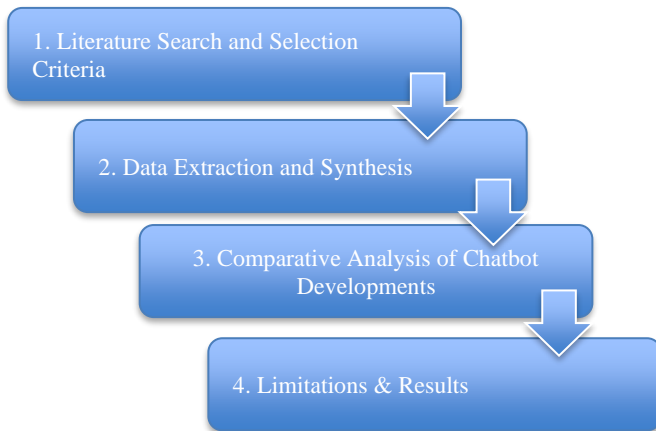


Fig. 1 Process of systematic literature review

This research has undertaken a systematic review approach to analyze the use and effectiveness of AI chatbots in healthcare. The steps involved are discussed below:

3.1. Data Extraction and Synthesis

Relevant data from selected articles will be extracted, including study objectives, methodologies, key findings, and conclusions regarding the effectiveness and applications of AI chatbots.

3.2. Comparative Analysis of Chatbot Developments

A comparative framework will be developed to analyze past chatbot developments across different healthcare applications.

Key aspects for comparison may include technological features, integration challenges, user feedback, and identified

limitations. This analysis aims to identify common trends, strengths, weaknesses, and areas for improvement in AI chatbot applications within healthcare settings.

3.3. Limitations

Limitations of this study include potential bias in the selected literature, variations in study methodologies across

different research articles, and the evolving nature of AI technologies in healthcare.

3.4. Future Directions

Finally, based on the findings of this review and comparative analysis, recommendations for future research directions and practical implications for deploying AI chatbots in healthcare will be proposed.

Table 2. Comparison of some existing chatbots

Chatbot	Purpose	Technology	Interaction Style	Application	Advantages	Disadvantages
ELIZA	Simulate conversation	Pattern Matching	Text-Based	Early exploration of AI in mental health	Pioneered AI chatbots, easy to implement	Does not follow the conversation with any real understanding
HealthTap	Medical advice, symptom checker	Machine Learning, NLP	Text-Based, Voice	Health advice, doctor consultations	Access to professional advice, extensive medical database	Requires internet connection, potential for information overload
Sensely	Patient monitoring, symptom checker	AI, ML, NLP	Text-Based, Voice, Avatar	Patient monitoring, health advice	Interactive avatar supports multiple conditions	Requires user engagement, potential privacy concerns
Babylon Health	Symptom checking, medical advice	Machine Learning, NLP	Text-Based, Voice	Symptom assessment, health advice	Accessible, provide quick medical advice	Relies on user-provided data, potential for misdiagnosis
Buoy Health	Symptom checker, triage	Machine Learning, NLP	Text-Based	Symptom assessment, triage	Personalized triage, guides to appropriate care	Relies heavily on input accuracy, the potential for incorrect triage
Ada Health	Symptom assessment, health advice	Machine Learning, NLP	Text-Based	Symptom checking	User-friendly, personalized health insights	Limited to symptom assessment, no direct medical consultation
Wysa	Mental health support, CBT techniques	NLP, ML	Text-Based	Mental health, CBT	AI-driven mental health support, anonymous	Limited scope, cannot handle severe mental health issues
Woebot	Mental health support, CBT techniques	NLP, ML	Text-Based	Mental health, CBT	Accessible mental health support, confidential	Not a substitute for professional therapy, limited to text
Florence	Health tracking, medication reminders	NLP, ML	Text-Based	Medication reminders, health tracking	Easy to use, improves medication adherence	Limited interaction capabilities, dependent on user input
Replika	Emotional support, conversation	Deep Learning, NLP	Text-Based	Emotional support, companionship	Provides emotional support, learns from interactions	Limited to emotional support, not a substitute for real therapy
K Health	Symptom checking, medical advice	Machine Learning, NLP	Text-Based	Symptom assessment, health advice	Uses real doctor data, personalized advice	Limited to available data, user-dependent accuracy

Youper	Mental health support, CBT techniques	AI, ML	Text-Based	Mental health, CBT	AI-driven, user-friendly, effective CBT tools	Not a replacement for professional therapy, limited scope
Buoy Assistant	Symptom checking, health triage	Machine Learning, NLP	Text-Based	Symptom assessment, health triage	Comprehensive symptom checker, personalized advice	Data accuracy reliance, potential for misdiagnosis
Safedrugbot	Drug safety information for breastfeeding	AI, NLP	Text-Based	Drug safety advice	Specialized focus on drug safety, accessible information	Limited to breastfeeding drug advice, not a comprehensive health tool
Healthily	Symptom checking, health advice	Machine Learning, NLP	Text-Based	Symptom checker, health library	Extensive health library, personalized health tips	User-dependent accuracy, the potential for incomplete advice
Gyant	Symptom checking, patient intake	AI, ML, NLP	Text-Based	Symptom assessment, patient triage	Improves patient intake process, personalized advice	Requires integration with healthcare systems, data privacy concerns

4. Results and Discussions

In this systematic review, researchers primarily created, evaluated or developed AI chatbots targeting specific health conditions. The majority of the studies are small case studies, and there are only a few detailed analyses. No comprehensive study is available except for studies [7-9]. This is especially true for countries or societies severely restricted in their access to healthcare due to hospitals or medical expenses and effort. Most chatbots communicate via text, and very few use speech as their primary method of communication. There are some applications for which chatbots seem to perform well, but this is not the case for all of them. An expert and mental health professional in a study [10] stated that chatbots may not make patients feel sufficiently connected to their providers. People and their families with mental illnesses may not be motivated to accept and trust human care if a chatbot is not capable of empathic conversations. The purpose of this tool is not to replace the advice of a healthcare provider, nor should it be used as a stand-alone intervention alone. Instead, AI chatbots could serve as facilitators in enhancing communication between healthcare providers and patients regarding their health conditions. By providing accessible and immediate responses to basic inquiries and concerns, chatbots can assist in clarifying medical information and preparing patients for more informed discussions during consultations. This intermediary role helps streamline information exchange and empowers patients to engage more actively in healthcare decision-making. However, it is crucial to recognize that chatbots should complement, rather than replace, direct interactions with healthcare professionals, ensuring comprehensive and personalized care delivery.

5. Conclusion

Artificial Intelligence (AI) chatbots represent a significant advancement in healthcare technology, offering promising opportunities to enhance patient care, accessibility, and operational efficiency. This systematic review has highlighted the evolution and current landscape of AI chatbots in healthcare, emphasizing their role in simulating human-like communication to assist patients with disease guidance, health monitoring, and timely alerts. Integrating AI chatbots in healthcare has shown notable benefits, particularly in improving patient engagement and providing accessible medical information.

However, the literature review also reveals several challenges that must be addressed for optimal implementation. These include ethical concerns surrounding patient privacy, the reliability of medical advice provided by chatbots, and limitations in their ability to foster empathetic interactions, especially in mental health contexts. Despite advancements, most studies remain small-scale and focused on specific health conditions, lacking comprehensive analyses across diverse healthcare settings or countries with varying healthcare access challenges. Notably, the preference for text-based interactions over speech limits accessibility for certain populations, such as the elderly or those with limited literacy. In conclusion, while AI chatbots show great promise in transforming healthcare delivery by facilitating communication and improving efficiency, they should be viewed as complementary tools rather than substitutes for human healthcare professionals. Addressing current limitations and leveraging their strengths, AI chatbots can be pivotal in augmenting healthcare services and improving patient outcomes globally.

5.1. Further Enhancement

In this research paper, a few advanced features like answering queries and expanding scope can be added, and

training for therapy and physical exercises can be suggested through chatbots.

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