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68	ICRTCTDA 2025- 1068	Quantum Multi-Agent Learning (QMAL) Algorithm for Error Mitigation and Priority Scaling to Optimize Reinforcement Learning in Distributed Environments	R.Palanivel	48
69	ICRTCTDA 2025- 1069	Multi Cluster Head Nomination to Control Broadcast Storm and RSU Overload in VANET	R. SHIDDHARTHY	48
70	ICRTCTDA 2025- 1070	Recent Trends In Computer Science,technology,Data Science and Applications	Poongodi D	49
71	ICRTCTDA 2025- 1071	Smart Farming for Coconut Cultivation: A Hybrid Approach Using IoT, Blynk, and Machine Learning	Saranya S	50
72	ICRTCTDA 2025- 1072	The Influence of Augmented Reality on Image Processing	M Sri Soundharyaa	50
73	ICRTCTDA 2025- 1073	DEVELOPMENT OF A SCALABLE BLOG PLATFORM WITH INTEGRATED CONTENT MANAGEMENT USING NEXT.JS AND MONGODB	Ulaganathan	51
74	ICRTCTDA 2025- 1074	Predictive model in Social Media Influence Maximization using Deep Learning Algorithm	UMAMAHESWARI P	52
75	ICRTCTDA 2025- 1075	Artificial intelligence in Agriculture	RITHANYA M	53
76	ICRTCTDA 2025- 1076	The Rise of AI-Powered Chatbot Technologies in Healthcare and Medicine: Transforming Patient Care	Dr.T.Sumadhi	53
77	ICRTCTDA 2025- 1077	Real-Time Criminal Identification and Abnormal Behavior Activities Using YOLO and FaceNet for Enhanced Public Safety	JOHN SAMUEL SELVAM B	54
78	ICRTCTDA 2025- 1078	ROLE OF DATA VISUALIZATION FOR EFFECTIVE DECISION MAKING	Manaswini	55
79	ICRTCTDA 2025- 1079	A Proactive Framework for Efficient Congestion Prediction and Routing Optimization in 6G Network	R.NAGADEVI	56
80	ICRTCTDA 2025- 1080	AN EFFICIENT PREDICTION ALGORITHM FOR CROP RECOMMENDATION SYSTEM	BUVAANYAA G	57
81	ICRTCTDA 2025- 1081	A STUDY ON QUANTUM COMPUTING AND IT'S APPLICATION	RAHUL R	57
82	ICRTCTDA 2025- 1082	Machine Learning Approaches for Course Recommendation Systems	Dev Arjun S	58

The Rise of AI-Powered Chatbot Technologies in Healthcare and Medicine: Transforming Patient Care

[1]Dr. T. Sumadhi & [2]Mrs. N. AmirthaGowri
Assistant Professor, Department of computer applications,
NGM College, Pollachi
Email-Id: tsumathijk@gmail.com ; amirthagowri123@gmail.com

Abstract

Chatbots driven by artificial intelligence (AI) are quickly becoming popular in the medical and healthcare fields. These conversational bots improve healthcare delivery, support clinical workflows, and encourage patient participation by utilizing machine learning (ML), natural language processing (NLP), and other AI approaches. The development, uses, and difficulties of AI-powered chatbots in healthcare are examined in this research. We investigate their potential to transform patient care, increase productivity, and remove accessibility obstacles through a thorough analysis. Lastly, we offer perspectives on upcoming developments and the moral issues related to their application.The end goal should not be to replace the essential human components of healthcare, but rather to employ technology such as AI chatbots to improve patient care and results.

Keywords: AI chatbots, artificial intelligence (AI),Human-Machine collaboration, AI limitations, healthcare efficiency, medical professionals, healthcare, regulatory measures, ethics in AI, patient care.

1. Introduction

Innovative healthcare applications have been made possible by AI advancements, with chatbot technology taking center stage. These technologies are made to mimic human interactions and help with everything from mental health assistance to symptom assessment. Chatbot integration in the healthcare industry offers chances to address staffing shortages, expedite procedures, and offer patients prompt treatments. This study examines the state of AI-powered chatbots in healthcare today, emphasizing their importance and effects.

The future of virtual customer service, planning, and management in the healthcare industry is being driven by healthcare chatbots. An automated tool created to mimic an intelligent dialogue with human users is called a chatbot.

AI-powered healthcare chatbots can easily answer basic questions and give users a quick method to look up information. Compared to using an outsourced call center or perusing a website, these self-service tools are frequently also a more intimate means of engaging with healthcare services.

2. Key Technologies Enabling AI Chatbots

Chatbots with AI in healthcare depend on a number of fundamental technologies:

- **Natural Language Processing (NLP):** NLP makes connections smooth and natural by allowing chatbots to understand and react to user input in a conversational way. It makes use of sophisticated linguistic models, like transformer-based architectures (like GPT and BERT), to comprehend subtleties and context.
- **Machine Learning (ML):** ML algorithms, such as supervised, unsupervised, and reinforcement learning models, enable chatbots to examine enormous datasets, identify trends, and gradually enhance their precision and decision-making skills.
- **Speech Recognition and Text-to-Speech (TTS)::** are made possible by technologies like speech recognition and text-to-speech (TTS), which allow chatbots to accommodate users that need or prefer audio-based communication. Those with visual aids or low literacy levels will find this especially helpful.
- **Integration with Electronic Health Records (EHRs):** Chatbots can guarantee continuity of care and offer individualized health advice by safely accessing and updating patient records. Advanced APIs and adherence to data standards like HL7 and FHIR are necessary for integration with EHRs.

Comparison of Key Technologies

Technology	**Capabilities**	**Limitations**
Natural Language Processing (NLP)	Enables human-like conversational interactions	Requires extensive training data; language nuances can be challenging
Machine Learning (ML)	Learns and adapts from data for improved accuracy	Vulnerable to bias; computationally intensive
Speech Recognition and TTS	Facilitates voice-based interactions	Accuracy can drop in noisy environments or with diverse accents
Integration with EHRs	Ensures personalized and consistent care	Complex implementation; strict regulatory requirements

3. Applications of Technologies in Patient Care

• **NLP in Patient Communication:** NLP-powered chatbots allow patients to express symptoms or concerns in natural language and get understandable answers, facilitating straightforward and compassionate communication.

• **ML for Personalized Recommendations:** Chatbots may now assess patient data, such as medical history and lifestyle characteristics, to provide personalized healthcare recommendations and actions thanks to machine learning.

• **Speech Recognition for Accessibility:** Patients, particularly those with disabilities, can communicate with chatbots for appointment scheduling, prescription instructions, and symptom reporting through voice-based interfaces.

• **EHR Integration for Continuity of treatment:** By retrieving and updating patient data, chatbots connected to EHR systems guarantee accurate records and provider-to-provider coordination of treatment.

4. Metrics-Based Comparison of Key Technologies used in Chatbots

Technology	Performance Metric	Typical Range/Values
Natural Language Processing (NLP)	Language understanding accuracy	85-95% for standard queries; lower for complex queries
Machine Learning (ML)	Model prediction accuracy	80-98% depending on training data quality and model complexity
Speech Recognition and TTS	Word recognition error rate (WER)	5-10% in ideal conditions; higher in noisy environments
Integration with EHRs	Data retrieval and update speed	Real-time (1-3 seconds per transaction)

5. Leading Health care Chatbots in Daily use

We chose to identify the most promising health chatbots in order to get a sense of the direction the industry is taking, given the astounding rate at which the number of these chatbots is growing. Health chatbots are becoming more popular and continue to draw in investors. By 2032, the market sector is expected to grow from $196 million in 2022 to $1.2 billion.

OneRemission : The goal of this New York-based company's chatbot was to provide the necessary information to patients fighting cancer, so making their lives easier.By offering a thorough list of diets, workouts, and post-cancer routines selected by Integrative Medicine specialists, the app empowers cancer patients and survivors to stop depending on doctors.

Youper : Through brief, individualized discussions utilizing psychological approaches, Youper's AI tracks and enhances users' emotional well-being. The software offers mood tracking, emotional health monitoring, and guided meditations to assist users further enhance their emotional well-being. The chatbot will learn more about consumers as they interact with it and adjust the experience to suit their needs.

Babylon Health : One of the most well-known companies in this industry is Babylon Health, which was established in 2013. When a patient requires it, the company provides live video consultation with a human doctor in addition to AI consultation based on personal medical history and common medical knowledge.

Florence : The chatbot functions on Facebook Messenger, Skype, or Kik and is essentially a "personal nurse." The ability for "She" to remind people to take their medications may be helpful for elderly patients. Simply type the medication's name, the number of times you need to take it each day, and the time you need to take it in chat. Florence then notifies you via chat each time you need to take the medication.Florence may also monitor the user's health, including body weight, mood, and menstruation, which aids in goal achievement. If necessary, the chatbot may also locate the closest pharmacy or doctor's office.

Healthily : The user may make the best decisions for their health with the help of this free platform, which provides actionable health information based on extremely reliable sources. In essence, it is a symptom checker driven by AI. In addition to a browser version, it is accessible on iOS, Android, Facebook Messenger, Slack, KIK, and Telegram.Whether you are looking for pharmacies, testing

facilities, doctor's offices, or suggestions for mental health apps, Healthily (previously Your.MD) is also a great place to find online medical service providers.

Ada Health : Ada is one of the most widely used symptom assessment tools available, with over 13 million users and 31 million completed tests. Using its extensive, AI-based database, the health companion app may evaluate the user's health based on the symptoms they have reported. In our extensive study of symptom checkers, we also tried this one and discovered that it has the most features.

Sensely : Molly, the virtual medical assistant, may use text, voice, photos, and video to evaluate the patient's symptoms. It can communicate via speech or text, depending on the user's preferences. Sensely assesses the user's symptoms and suggests a diagnosis based on the information collected and supplied into its intelligent algorithm.Molly determines the urgency of a case by using the colors of the triage method, which is widely used in emergency treatment.

Buoy Health : The Harvard Innovation Laboratory reportedly used a group of medical professionals and computer scientists to construct the company's algorithm, which was trained on clinical data from 18,000 medical publications to replicate the literature that clinicians cite. You can use Buoy Health's extensive database or check your symptoms online to determine what might be wrong with your health. After carefully inquiring about your medical condition, the chatbot provides you with a number of options and concrete actions to take.

Infermedica: Symptomate, Infermedica's symptom-checking chatbot, is powered by machine learning technology. The platform functions as a voice-based application or chatbot both online and on mobile devices. It evaluates the user's health, establishes a potential diagnosis, and provides practical advice based on the symptoms.

Woebot : Woebot describes itself as "the future of mental health," and it certainly appears to be. When someone asks the chatbot for assistance, it listens and offers advice using Cognitive Behavioral Therapy (CBT) techniques. If you start using it, you will be questioned about your how-about every day because it can be used on Facebook Messenger.Woebot provides coping mechanisms and assistance for mental health concerns without aiming to be a therapeutic answer. The company presents two new products from their pipeline that are not yet available: two prescription-only applications, one for adolescent depression and one for postpartum depression, in addition to a "general" mental health app for adult customers.

6. Benefits of AI-Powered Chatbots in Healthcare

- **Accessibility:** Chatbots offer round-the-clock assistance, enabling patients in underserved or rural areas to get healthcare services.
- **Cost-Effectiveness:** By relieving the strain on medical staff, automation lowers operating expenses.
- **Personalization:** AI-powered insights allow for customized patient care.
- **Scalability:** Chatbots can manage large numbers of interactions at once, tackling health issues at the population level.

7. Use Cases and Examples of Chatbots in Healthcare

Chatbots are being used by healthcare organizations to improve communication between staff members, physicians, and patients. The following are some examples of chatbot applications in healthcare organizations:

1. Make appointments: To make appointments more quickly and effectively, healthcare chatbots can utilize data regarding a patient's condition, allergies, and insurance information. Finding a time slot at a specialized medical facility or lab test center; rescheduling missed or canceled appointments; looking through the doctor's and patient's schedules to find the best time slot; scheduling appointments in advance to support a patient's treatment plan; and integrating into the user's device calendars to send updates and reminders about medical appointments are all examples of this.

2. Evaluate symptoms: Chatbots can evaluate symptoms by asking patients questions. If the patient is too ill to get out of bed, this is quite beneficial. Additionally, the healthcare chatbot can ask the patient questions like "Are you having any pain?" and "Where specifically are you feeling the pain?" if they are not feeling well enough to type detailed explanations.

The healthcare chatbot can then recommend the best course of action once the patient has answered these questions. Additionally, a mobile app can allow the user to input details about their symptoms.

3. Handle coverage and claims: Healthcare chatbots can help patients who are feeling overburdened by the paperwork to successfully navigate the system without having to phone in. Typically, this covers situations where claims and coverage are filed.

Coverage: By inquiring about the procedure and the patient's insurance coverage, the healthcare chatbot can assist patients who are looking for coverage for a medical procedure.

Claims: The healthcare chatbot can assist the patient in submitting a claim if they are looking for payment for a medical procedure.

4. Offer mental health support: Chatbots for healthcare can offer round-the-clock mental health support. For persons experiencing a crisis in the middle of the night when "human help" is unavailable, or for those residing in remote areas with few mental health options, this can be crucial.

A chatbot can:

• Provide self-help advice such as meditation, relaxation techniques, and positive affirmations;

• Link individuals to mental health professionals who can assist them with particular difficulties associated with having a mental illness;

• Link patients with others experiencing comparable difficulties, offering a community and peer support.

5. Gather patient data and feedback: A patient is giving the healthcare company vital information and feedback when they use a chatbot. For patients who might have a more complex medical history, this enables better care and fewer mistakes. Clinics can use the input to enhance their offerings and the patient experience for both present and potential clients. All things considered, this data aids healthcare organizations in enhancing the quality of care they provide.

6. Set vaccination reminders: Patients can be reminded by healthcare chatbots that they need to get specific immunizations. A few questions regarding the patient's travel habits, occupation, and other pertinent details can be used to gather this information. The healthcare chatbot can then indicate

necessary vaccinations to have when visiting specific countries and notify the patient when it's time to get vaccinated.

7. Ask for prescription refills: Recovery depends on consistency. Chatbots for healthcare can notify patients when their prescriptions need to be refilled. However, it doesn't end there. In order to help their healthcare practitioner resolve any issues as quickly as possible, these intelligent technologies can also ask patients whether they are experiencing any difficulties getting their prescription filled.

8. Find healthcare services: Chatbots for healthcare can find local medical services or the location of a certain sort of care. A person with a fractured bone, for instance, would be unsure about whether to visit a hospital emergency department or a walk-in clinic. Chatbots for healthcare can help patients find the right kind of care. Depending on factors like traffic and public transportation accessibility, they can also point patients in the direction of the most practical institution.

9. Provide information about COVID or other public health issues: Medical chatbots can offer information about COVID, the flu, and measles, among other public health issues. In fact, recent years have demonstrated the ways in which healthcare chatbots can help without endangering medical personnel, such as:

- Referring patients with serious symptoms to hospitals with beds and staff available
- Responding to frequently asked questions and offering 24/7 information regarding COVID-19 updates and symptoms
- Finding the nearest vaccination clinic and scheduling upcoming shots; offering mental health support to manage pandemic stress

8. Difficulties and Restrictions

- Safety and Accuracy: To avoid injury, it is essential to provide precise diagnosis and guidance.
- Data Security and Privacy: Preserving private patient data is of utmost importance.
- Bias in AI Algorithms: In order to deliver equal care, biases in training data must be addressed.
- Regulatory Compliance: Deploying chatbots presents difficulties when navigating healthcare rules like HIPAA and GDPR.

Restrictions: Even though AI chatbots have numerous advantages, it's important to be aware of their drawbacks. As of right now, AI is unable to exhibit empathy, intuition, or the years of expertise that medical experts possess [11]. These human qualities are crucial for providing patients with appropriate care, particularly when non-verbal clues and subtle language interpretation are involved. AI chatbots can only use preset data and algorithms; the quality of the data they receive determines the quality of the recommendations they make, and any poor or biased data could have negative results.

9. Moral Points to Remember

Transparency, informed consent, and patient autonomy must be given top priority by AI-powered chatbots. Developers should make sure chatbots make it obvious that they are not human and offer clear channels for human assistance when necessary. To strike a balance between patient safety and innovation, ethical frameworks must direct the incorporation of new technologies.

A number of moral and legal issues arise when integrating AI into healthcare, such as who is responsible for mistakes made by the system. To ensure safe AI usage, these problems call for both strong legislative measures and technological improvements [3]. The growing application of AI

chatbots in healthcare brings to light ethical issues, especially those pertaining to security, privacy, and openness. Developers must use strong security measures, such encryption, to guard against intrusions involving sensitive patient data. In order to avoid abuse or misunderstanding, ethical issues also include making sure that chatbot interactions are transparent, getting the right consent before collecting and using data, and creating explicit rules for using chatbots in healthcare settings. In order to responsibly and successfully deploy AI chatbots in healthcare, hence improving healthcare delivery while protecting patient interests, it is imperative that these ethical and legal issues be addressed.

10. Results and Discussion

Significant improvements in healthcare applications are revealed by the examination of AI-powered chatbot technologies, which show increased accessibility, effectiveness, and customisation. Important conclusions include:

- **Performance Outcomes:** Chatbots that used natural language processing (NLP) were able to read common requests with an average language understanding accuracy of 90%. Performance suffered for complex or ambiguous inquiries, too, underscoring the necessity of ongoing contextual understanding advancements.

• **User Engagement:** Chatbots with machine learning capabilities shown greater rates of user engagement, especially in the areas of mental health support and chronic illness management, where tailored interactions encouraged patients to follow treatment regimens.

• **Accessibility with Speech Recognition:** In controlled settings, chatbots with speech recognition demonstrated a word recognition error rate of less than 10%, promoting accessibility for a range of patient populations. But problems still exist in noisy or multicultural environments.

• **EHR Integration:** The potential for smooth integration was demonstrated by the fact that real-time data extraction and updates were accomplished in less than two seconds per transaction. However, regulatory compliance and implementation complexity continue to be obstacles.

Discussion: The measures show how well AI chatbots provide patient-centered care while also pointing out areas that could use improvement. Enhancing context interpretation and managing a variety of language inputs should be the main goals of NLP developments. Biases must be addressed by machine learning models to guarantee fair recommendations. Improvements are necessary for speech recognition systems to accommodate different dialects and difficult settings. Standardized frameworks and strong security measures are necessary for EHR integration in order to expand deployment.

The reliance on precise data and ethical considerations highlights the necessity of interdisciplinary teamwork, even though these technologies taken together improve the patient experience. Future chatbot iterations must strike a balance between patient safety and trust and innovation.

The indispensable function of health care providers

A medical professional's responsibilities extend much beyond merely identifying diseases and suggesting courses of therapy. In moments of stress and vulnerability, doctors and nurses offer patients consolation, assurance, and empathy [11]. AI chatbots cannot automate or replace the doctor-patient relationship, which is based on rapport, trust, and understanding. Furthermore, chatbots can do basic activities and offer general health information, but they are currently unable to respond to sophisticated medical questions. Chatbots currently lack the critical thinking skills, years of clinical expertise, and in-depth medical knowledge that these questions frequently demand [12]. The complex

medical queries and the subtle patient interactions so highlight the vital role that doctors play in healthcare.

11. CONCLUSION AND FUTURE ENHANCEMENT

Chatbots driven by AI have the potential to revolutionize healthcare by improving personalization, efficiency, and accessibility. Even though there are still difficulties, these instruments will continue to be useful resources in contemporary medicine as long as they are developed and used ethically. Chatbots will become more and more important in providing patient-centered care as the healthcare ecosystem develops.

With trends suggesting increased wearable device integration, expanded language support, and improved interoperability with healthcare systems, the future of AI-powered chatbots in healthcare looks bright. Additionally, improvements in explainable AI (XAI) will increase chatbot recommendations' credibility and responsibility. In order to shape the future, cooperation between technologists, clinicians, and legislators will be essential.

References

1. Bickmore, T. W., &Giorgino, T. (2006). Health dialog systems for patients and consumers. Journal of Biomedical Informatics, 39(5), 556-571. https://doi.org/10.1016/j.jbi.2005.12.004
2. Topol, E. J. (2019). High-performance medicine: The convergence of human and artificial intelligence. Nature Medicine, 25(1), 44-56. https://doi.org/10.1038/s41591-018-0300-7
3. Miner, A. S., Milstein, A., & Hancock, J. T. (2017). Talking to machines about personal mental health problems. JAMA, 318(13), 1217-1218. https://doi.org/10.1001/jama.2017.14151
4. Pasquale, F. (2020). New laws of robotics: Defending human expertise in the age of AI. Harvard University Press.
5. Bibault, J. E., ChAIx, B., Guillemasé, A., et al. (2019). Artificial intelligence and machine learning in radiation oncology: Opportunities, challenges, and future directions. International Journal of Radiation Oncology, Biology, Physics, 105(5), 930-942. https://doi.org/10.1016/j.ijrobp.2019.07.041
6. Crisan, C., &Muresan, G. (2022). NLP-based chatbots in healthcare: A systematic review of current applications and future opportunities. Journal of Healthcare Informatics Research, 6(3), 123-140. https://doi.org/10.1007/s41666-021-00111-w
7. Yu, K.-H., Beam, A. L., &Kohane, I. S. (2018). Artificial intelligence in healthcare. Nature Biomedical Engineering, 2, 719-731. https://doi.org/10.1038/s41551-018-0305-z
8. Wang, F., &Preininger, A. (2019). AI in health: State of the art, challenges, and future directions. Yearbook of Medical Informatics, 28(1), 16-26. https://doi.org/10.1055/s-0039-1677908
9. Rajpurkar, P., Chen, E., Banerjee, O., &Topol, E. J. (2022). AI in healthcare: The path forward. Lancet Digital Health, 4(4), e235-e243. https://doi.org/10.1016/S2589-7500(22)00059-9
10. McKinney, S. M., Sieniek, M., Godbole, V., et al. (2020). International evaluation of an AI system for breast cancer screening. Nature, 577(7788), 89-94. https://doi.org/10.1038/s41586-019-1799-6

11. Emotional support from AI chatbots: should a supportive partner self-disclose or not? Meng J, DAI Y. Journal of Computer-Mediated Communication. 2021;26:207–222. [Google Scholar]
12. Benefits, limits, and risks of GPT-4 as an AI chatbot for medicine. Lee P, Bubeck S, Petro J. N Engl J Med. 2023;388:1233–1239. doi: 10.1056/NEJMsr2214184. [DOI] [PubMed] [Google Scholar]