



AI-Driven Patient Medicine Assistance And Depression Analysis

¹Dr C Nandini, ²Deepika V D, ³Deepika Nivedana B, ⁴Harshitha B C, ⁵K V Bhuvana

¹Vice Principal, Professor & Head of Computer Science & Engineering, ²Student, ³Student, ⁴Student, ⁵Student

¹Computer Science & Engineering,

¹ Dayananda Sagar Academy of Technology & Management, Bengaluru, India

Abstract: With the use of AI and NLP, the patient medication assistance system extends the healthcare management communication for the patients. This alerts patients when they need to take their medication and allows them to tap an “OK” button to confirm that they have done so. If a tap has not been performed, their friend or caregiver receives an alert. The system then automatically recalls the medication supply when it determines that the supply is too low. A chatbot function is implemented to provide information about the types of available medicines. Patients are also subjected to depression analysis within the system, based on their behaviors and interactions. If in the course of the analysis depression symptoms are noticed, the system recommends watching movies, changing the diet, going out, and so forth, in order to try to bring the symptoms down. If however the depression symptoms are severe, the system issues an alert to the patient's friend or caregiver. The uses and applications of the advanced system seek to encourage medication compliance, support mental wellness, and predictably optimize medication stock levels.

I. INTRODUCTION

In the age of technology and smartphones, assisting a patient's adherence to the prescribed medication is a routine practice but not as easy as it may sound. Such gaps in medication prescribed may render the treatment useless and orchestrate adverse health situations promoting increased expenditure on medical attention. In response to these problems, this paper suggests an AI-enabled Patient Medication Assistance System, this solution is the answer to many issues related to provisioning of patient care, mental health and medication management. The system has a number of distinguishing components. It incorporates medicine dosage reminders to help reduce the chance of drugs being missed. acknowledge Patients reminders are due unable to to either forgetfulness or unavailability, in which case escalation mechanisms come into play and prompt care givers. Automatic reorder notifications are sent to suppliers to ensure that medications are continuously available. Making it possible to answer patient questions via an integrated conversational chatbot within the system, which strengthens the bond between the healthcare provider and the patient while creating better understanding of the prescribed treatment. One key unique aspect of the system also includes assessment of depression through the depression module which analyses patients with the help of AI and NLP, this module is the primary center for patients' mental health focused relief. In giving care to patients, the system advocates a multidisciplinary philosophy by allowing the system to recommend activities, food, or movies to ease depression anxiety and alert caregivers when the situation is urgent. This radically enhances the urgency for cost effective but creative solutions as the need for technologically driven health care continues to transform and evolve.

II. Literature Review

The integration of natural language processing (NLP) and artificial intelligence (AI) has transformed chatbot technology, enabling more sophisticated interactions with users. Modern AI-driven chatbots can analyze not only the content of user queries but also the context, intent, and emotional tone behind them [8, 9]. This marks a significant advancement over earlier systems that relied on simple keyword recognition. As a result, chatbots can now handle a broader range of tasks—from answering simple inquiries to managing more complex interactions, such as troubleshooting technical issues or providing personalized advice. Despite these advancements, challenges remain, particularly in handling ambiguous inputs and maintaining consistent accuracy across diverse user scenarios. These challenges continue to be a focus of ongoing research and development. In healthcare, chatbots have emerged as essential tools, utilizing sophisticated algorithms to simulate human-like conversations through text or voice interactions [1,2]. Studies highlight their growing role in automating tasks such as retrieving health information, offering digital health support, and providing therapeutic care [3]. Additionally, healthcare chatbots help with practical functions, including scheduling medical appointments, identifying clinics, and delivering health education [4][5]. While these applications demonstrate the potential of chatbots to enhance healthcare delivery, their ability to address complex medical needs or sensitive issues effectively is still under active investigation. One notable limitation of healthcare chatbots is the risk of biased outputs. This issue arises primarily when the datasets used for training are not representative or contain inherent biases [6]. Such biases can adversely affect chatbot responses, potentially leading to inequitable or inaccurate outcomes. To address this, researchers emphasize the importance of validating chatbot outputs and minimizing biases in training data. By adopting these strategies, it is possible to develop high-quality, user-friendly chatbots that promote equitable and effective healthcare solutions [7]. Depression is a widespread mental health issue affecting millions of people worldwide. Common mental health disorders include anxiety, restlessness, sleep disturbances, eating disorders, addiction, depression, trauma, and stress-related conditions [10]. The World Health Organization reports that approximately 322 million individuals were affected by depression in 2015, with nearly 788,000 of these cases resulting in suicide [13]. To detect and manage depression early, researchers are turning to innovative solutions. Sethi et al. [11] proposed a depression prevention model that focuses on strengthening social networks and implementing educational programs to address risks associated with life changes, such as job changes, relocations, and shifts in lifestyle. These programs also aim to reduce malnutrition and infections. Moreover, a recent review suggests that religiosity may offer protective benefits against depression [12]. Case studies are a common research approach to exploring the relationship between text variables and mood disorders like depression [14]. For example, Demjén (2014) analyzed the writings of Sylvia Plath, revealing the use of metaphors related to loss and separation, and the frequent use of the second-person singular when describing conflicts [14, 15]. A broader analysis also showed that writers with depression tend to use negative language and extreme quantifiers. A similar pattern emerged in the works of Henry Hellyer, an explorer who also died by suicide. Hellyer's texts revealed frequent use of the first person singular and negative language. Additionally, Pennebaker and Chung (2007) explored shifts in pronoun usage in texts by Al Qaeda figures, showing connections between pronoun choices, depression, and identity shifts [14, 16, 17]. Facial recognition technologies, such as Principal Component Analysis (PCA), can be used to analyze emotional expressions and detect signs of depression. These methods, when integrated into AI-driven chatbots, can enhance emotional awareness by recognizing facial cues alongside text-based inputs. By combining facial expression and text analysis, chatbots can offer more accurate depression detection and personalized support. This multi-modal approach provides a robust tool for mental health monitoring[22].

III. Proposed Methodology:

The system proposed encompasses a variety of technologies and approaches that help in facilitating medication adherence, depression detection, and real-time interaction with patients. The methodology can be further divided into a few key components below:

1. Medication Reminder System

The first step is the development of a strong medication reminder system that would remind the patient to take medication. The system is made to send the alerts during the set time based on the patient's medication schedule. The reminder system uses an application on mobile, through which it will send a push notification as well as an SMS alert that will help the patient obtain the reminder even if not actively using the mobile phone. If the patient does not respond to the reminder by pressing the "OK" button, the system sends a secondary reminder to a designated friend or family member, ensuring accountability and encouraging adherence. If the patient's medication is running out, the system will automatically send a reorder prompt to the supplier so that the patient will not run out of their required medications [2]. Moreover, points out that the

system allows real-time monitoring of medication compliance through mobile-based interfaces, by ensuring that alerts are personalized based on patient-specific schedule and requirements[4] .

2.Self-Reorder of Medicines

The system has an option for self-reorder medicines. When the stock is low for a particular drug, the system automatically orders the drug from the supplier based on predefined thresholds. This will avoid running out of essential medicines for the patients and thus avoid missing doses. The system keeps track of the consumption rate of the patient and accordingly adjusts reorder prompts by taking into account the remaining medication and the prescribed dosage. emphasizes that this feature is especially helpful in chronic conditions, where uninterrupted access to medication is very important. The system helps patients avoid any gaps in their treatment by automating the ordering process based on realtime data .

3.AI-Powered Chatbot

The system has an AI-powered chatbot that acts as an interactive interface for the patient to ask about their drugs. Compared to human agents, chatbots can efficiently respond to a large number of users simultaneously, conserving human effort and time while still providing users with a sense of human interaction .The chatbot uses NLP techniques to understand and respond to patients' queries. It can give out the dosages of medications, side effects, and administration schedule. The chatbot also provides the patient with additional support during treatment in case he/she has questions or concerns. It is through AI that makes sure the chatbot continuously learns from the patients while interacting with them and, overtime, improves the quality as well as relevance of their responses . Moreover, also points out the worth of adaptive learning models to the chatbot in providing customized answers for patients depending on the past interactions with a patient. This helps increase its potential to meet needs and anxieties.

4.Depression Detection and Mood Analysis

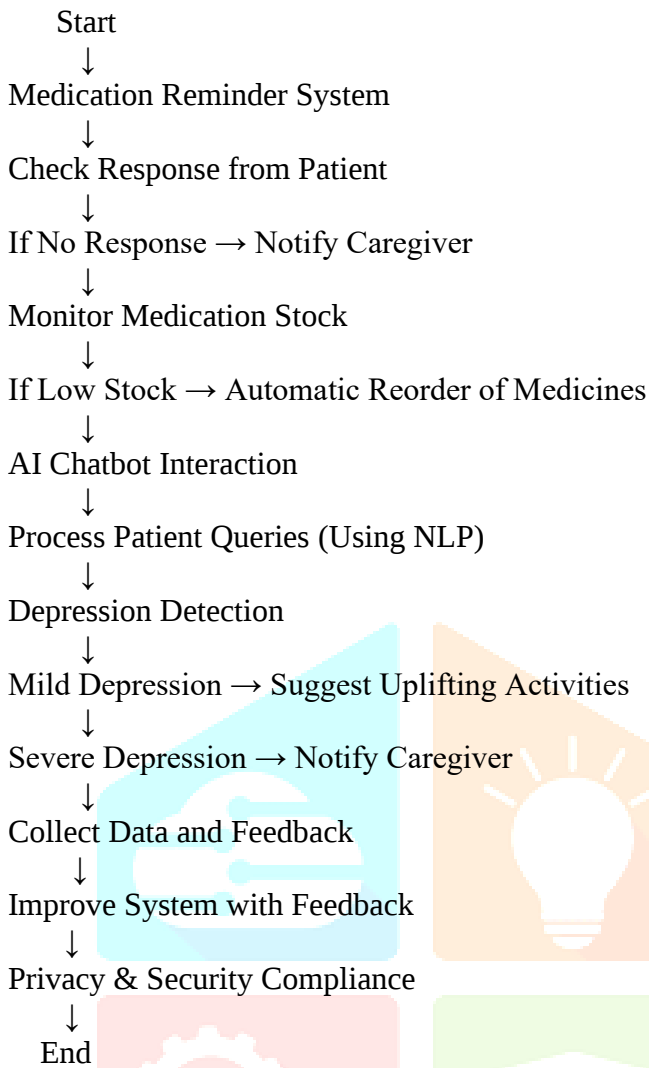
A key reason for the patient to neglect their medication is due to depression. The algorithm provided with the system tracks the depression status of the patient's interaction with the chatbot. It monitors the language the patient uses for negative sentiments and sad or hopeless sentiments which can point to depression. Through NLP techniques, it analyzes the input given by the patient and proceeds to look for key emotional markers of the text. Upon deducing depression, it doesn't just remind the patient but advises them on what they might be able to do to pick their spirits up, like seeing a movie or going around town. In the case of extreme depression, it escalates the situation with a notification to the friend or caregiver of the patient as well, warning them about the potential mental health conditions [19]. This section is in line with, which mentions that detection algorithms for emotions are inevitable in offering instant psychological help through alert notifications and suggested activities that can be helpful in mood improvement[21]. These activities are meant to give patients relief immediately in addition to the ongoing medical treatment.

5.Data Collection and Feedback Loop

The system collects data throughvarious channels, which include the patient's interactions with reminders, the chatbot, and the depression detection mechanism. This data is used to improve the system's performance over time. For example, the AI-based chatbot improves over time by learning from earlier conversations, and the depression detection model improves its ability to detect emotional states based on patient feedback. Continuous feedback from patients and caregivers is also incorporated into the system in order to ensure continuous improvement and personalization of the service [19]. Points out that continuous monitoring of data is crucial, especially in health care applications where the system requires real-time feedback to enhance the accuracy of predictive models and evolve in response to changing patient needs[20].

6.Privacy and Security

The system has robust privacy and security since the nature of the health-related data is sensitive. All patient data are encrypted for security purposes to avoid exposing sensitive information. The system conforms to relevant data protection legislations like HIPAA, on the confidentiality of patient interactions. It also has clear consent forms in user interface where the patients are aware and agree to the use of their data [18]. In addition, highlights the importance of data anonymization and secure channels for data exchange to comply with international standards for patient confidentiality, ensuring that the system meets the highest standards for privacy and security[20]. This methodology describes how the system integrates different technologies, which include medication reminders, AI-driven chatbots, depression detection, and automatic medicine reordering, with the goal of providing an allaround solution for better medication adherence and mental health management. Every component of the system can contribute to its overall effectiveness while addressing both the physical and emotional needs of patients.

Steps involved in methodology :**Conclusion**

In summary, the proposed patient medication assistance system offers a comprehensive approach to improving medication adherence and supporting mental health management through the integration of advanced technologies such as AI, Natural Language Processing (NLP), and real-time reminders. The system automates reminders and reorders medications so that patients never miss a dose and always have access to the necessary medications. In addition, the chatbot, being AI-powered, provides immediate access to information, and this clears all doubts in the mind of the patient regarding the treatment, thus enhancing their understanding and compliance. Adding depression detection is an important layer for emotional support, which offers patients timely interventions who may need such help due to psychological conditions, thus enhancing better well-being. Leveraging real-time patient feedback means the system dynamically evolves, changing to their needs as the system gets more relevant to the use of that tool in handling health care management. The system's design on patient privacy and security handles all interactions, including all the data, and ensures its safe handling against data protection regulations. This method will stand as the starting point to a future where technology could be maximally utilized to support patients not only in their drug administration but also in monitoring and improving their mental health. With the emergence of further progressions in AI and NLP, this system can extend its capabilities toward offering even more personalized support to patients who need to be accompanied by adaptive systems.

References:

- [1] Kate B, Scardina J. What is a chatbot? Techtarget. 2019. [2021-09-01]. <https://searchcustomerexperience.techtarget.com/definition/chatbot>
- [2] Peng ML, Wickersham JA, Altice FL, Shrestha R, Azwa I, Zhou X, Halim MAA, Ikhtiaruddin WM, Tee V, Kamarulzaman A, Ni Z. Formative evaluation of the acceptance of HIV prevention artificial intelligence Chatbots by men who have sex with men in Malaysia: focus group study. *JMIR Form Res.* 2022;6(10):e42055. doi: 10.2196/42055. <https://formative.jmir.org/2022/10/e42055/v6i10e42055>
- [3] Mesko B. The top 12 health Chatbots. *The Medical Futurist.* 2021. [2021-11-18]. <https://medicalfuturist.com/top-12-health-chatbots/>
- [4] Palanica A, Flaschner P, Thommandram A, Li M, Fossat Y. Physicians' perceptions of Chatbots in health care: cross-sectional web based survey. *J Med Internet Res.* 2019;21(4):e12887. doi: 10.2196/12887. <https://www.jmir.org/2019/4/e12887/v21i4e12887>
- [5] Koman J, Fauvelle K, Schuck S, Texier N, Mebarki A. Physicians' perceptions of the use of a Chatbot for information seeking: qualitative study. *J Med Internet Res.* 2020;22(11):e15185. doi: 10.2196/15185. <https://www.jmir.org/2020/11/e15185/v22i11e15185>
- [6] Wang X, Sanders HM, Liu Y, Seang K, Tran BX, Atanasov AG, Qiu Y, Tang S, Car J, Wang YX, Wong TY, Tham YC, Chung KC. ChatGPT: promise and challenges for deployment in low- and middle-income countries. *Lancet Reg Health West Pac.* 2023;41:100905. 10.1016/j.lanwpc.2023.100905. doi: [https://linkinghub.elsevier.com/retrieve/pii/S2666-6065\(23\)00223-7](https://linkinghub.elsevier.com/retrieve/pii/S2666-6065(23)00223-7)
- [7] Ni Z, Peng ML, Balakrishnan V, Tee V, Azwa I, Saifi R, Nelson LE, Vlahov D, Altice FL. Implementation of Chatbot Technology in Health Care: Protocol for a Bibliometric Analysis. *JMIR Res Protoc.* 2024 Feb 15;13:e54349. doi: 10.2196/54349. PMID: 38228575; PMCID: PMC10905346.
- [8] Nuruzzaman M, Hussain OK. A survey on chatbot implementation in customer service industry through deep neural networks. In: *Proceedings of the 2018 IEEE 15th International Conference on e-Business Engineering.* 2018. Presented at: ICEBE '18; October 12-14, 2018:54-61; Xi'an, China. URL: <https://ieeexplore.ieee.org/document/8592630>
- [9] Kumar VM, Keerthana A, Madhumitha M, Valliammai S, Vinithasri V. Sanative chatbot for health seekers. *Int J Eng Comput Sci.* Mar 29, 2016;5(03):16022-16025.
- [10] H.-N. Le, R.C. Boyd Prevention of Major Depression: Early Detection and Early Intervention in the General Population (2006), p. 23 2022
- [11] Sethi BB, Sharma M, Chaturvedi PK. A model for prevention and treatment of depression in developing nations. *Indian J Psychiatry.* 1984;26:393–402. J
- [12] Verghese A. Spirituality and mental health. *Indian Psychiatry.* 2008;50:233–7. doi: 10.4103/0019-5545.44742.
- [13] World Health Organization. Depression and Other Common Mental Disorders: Global Health Estimates Geneva: World Health Organization; 2017.
- [14] Havigerová JM, Haviger J, Kucera D and Hoffmannová P (2019) ~ Text-Based Detection of the Risk of Depression. *Front. Psychol.* 10:513. doi: 10.3389/fpsyg.2019.00513
- [15] Demjén, Z. (2014). Drowning in negativism, self-hate, doubt, madness: linguistic insights into Sylvia Plath's experience of depression. *Commun. Med.* 11, 41–54. doi: 10.1558/cam.v11i1.18478
- [16] Baddeley, J. L., Daniel, G. R., and Pennebaker, J. W. (2011). How Henry Hellyer's use of language foretold his suicide. *Crisis* 32, 288–292. doi: 10.1027/0227-5910/a000092
- [17] Pennebaker, J. W., and Chung, C. K. (2007). "Computerized text analysis of Al-Qaeda transcripts," in *A Content Analysis Reader*, eds K. Krippendorff and M. Bock (Thousand Oaks, CA: Sage), 2007.
- [18] Yan, W.-J.; Ruan, Q.-N.; Jiang, K. Challenges for Artificial Intelligence in Recognizing Mental Disorders. *Diagnostics* 2023, <https://doi.org/10.3390/diagnostics13010002>
- [19] Ayain John, Abhigna G, Adithi K V, Harusha R, Kavaya A S. HEALTHCARE CHATBOT (2022). Department of Information Science and Engineering, AMC Engineering College, Bangalore.
- [20] Shin D, Kim H, Lee S, Cho Y, Jung W. Using Large Language Models to Detect Depression From User-Generated Diary Text Data as a Novel Approach in Digital Mental Health Screening: Instrument Validation Study. *J Med Internet Res* 2024;26:e54617. doi: 10.2196/54617 PMID: 39292502 PMCID: 11447422.
- [21] M Noetel. Effect of exercise for depression: systematic review and network meta-analysis randomised controlled trials. 2024.
- [22] "Multi-biometrics approach for of facial recognition" by C. Nandini and C. N. RaviKumar (2007)