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Chatbot for Medical Assistance: A Review

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***Abstract*: An NLP based chatbot is a computer software that simulates human-to-human dialogue, particularly via the internet. Sentiment analysis allows a chatbot to comprehend the emotions and state of mind of the users. The main purpose of the review paper is to analyse the existing approaches and methods. Chatbot is able to function as a virtual doctor. It is a cost-effective way to handle a vital aspect of the healthcare process. This paper examines AI Chatbots for medical support that communicate with users, attempt to interpret their conversations, and deliver suitable responses based upon which the ailment is detected.**

***Keywords*: Chatbot, depression, Entity extraction, Intent classification, Medical, Mental health, NLP**

1. Introduction

A text-based dialogue system, often known as conversational combat these issues, mental health experts have turned to agent or chatbot, is a text-based interaction system technology, notably Artificial Intelligence-based chatbots, as a that is incorporated into mobile applications or web sites. By first line of defense in addressing the needs of those suffering providing the user with relevant textual replies in a language from mental illness. An NLP based chatbot is a computer software that simulates human-to-human dialogue, particularly via the internet. Sentiment analysis allows a chatbot to comprehend the emotions and state of mind of the users. The main purpose of the review paper is to analyse the existing approaches and methods. Chatbot is able to function as a virtual doctor. It is a cost-effective way to handle a vital aspect of the healthcare process. This paper examines AI Chatbots for medical support that communicate with users, attempt to interpret their conversations, and deliver suitable responses based upon which the ailment is detected esses. When dealing with a mental health that he or she understands, the chatbot replicates a genuine patient, it's critical to recognize their emotional condition and conversation partner. In marketing, chatbots were primarily respond with easy micro-interventions like suggestions for employed to improve consumer experiences. Sentiment anal deep breathing exercises or a nice discussion. The fundamental is the systematic identification, extraction, quantification, benefit of these bots is that they give a realistic, evidence-based, and study of emotional states and subjective information and appealing digital option for rapidly filling a professional using natural language processing, text analysis, computational void. linguistics, and biometrics. Sentiment analysis is commonly

2. Methodology

Used in marketing, customer service, and clinical medicine to analyse consumer voice materials such as reviews and survey. There are 6 main subsystems: replies, as well as online and social media and healthcare Front End Application: It is a web/mobile app which resources. Sentiment analysis allows a chatbot to comprehend receives question from the user and talks to the Chatbot API the emotions and state of mind of the users. Chatbots can use Service to give the answer. This data to better direct discussions and offer the appropriate.

Generic Question Construction: It takes the question from replies. Sentiment research is also a big part of getting people to utilize enterprise chatbots. An emerging subject of research the user and creates a generic question template by replacing certain nouns with generic representations. is the use of conversational bots with unrestricted natural Generic Answer *Construction*: It takes in a generic question template and outputs a generic answer template.

Generic Answer Population: It takes a generic answer template and populates it with information from the database to form an answer.

Database: It stores information about needed by generic question construction and generic answer population.

Information Extraction: It finds information through structured or unstructured websites, and stores that information into the database. This is separate from the other subsystems, as it must be running before the others to populate the database.

The front-end application receives user's questions and communicates with the Chatbot API Service to provide a response. This query is sent to the generic question construction which generates generic question template. This is done using two processes entity extraction and intent classification. Entity extraction, also known as entity name extraction or entity identification, is a technique for extracting important parts from text and categorizing them into specified categories. Intent classification refers to the process of classifying user's intent

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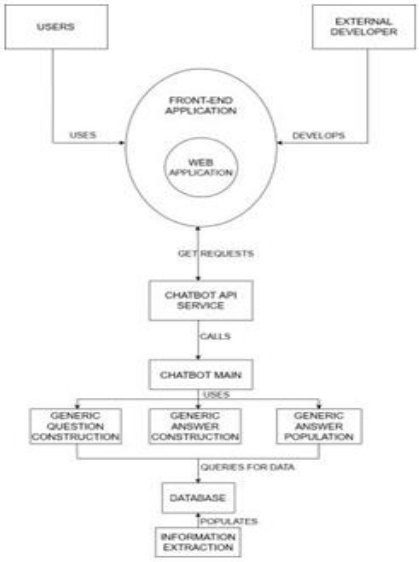
based on the language they use. For this template a generic answer template is created by the generic answer construction, which is further populated with proper nouns and verbs to give an answer by the generic answer population. Finally, the Chatbot API Service presents the final answer on the front-end application. The information extraction process collects data from structured and unstructured websites and saves it in the database if in case the database does not have the required information, for future use.



3. Related Work

Conversational Bot for Pharmacy: A Natural Language Approach: [1] Sharifah Nur Pharmacy provides medical and nutrition advice, a patient profile management system, and healthcare programmed to its customers in addition to providing health items and supplements. The suggested pharmacy chatbot is a quick and efficient method that allows the public to learn more about the many sorts of drugs available for their ailments. As a result, it's likely that the chatbot will be favorably accepted by customers. Users and medication kinds are the two elements that make up the system, which provides a variety of functional modules. Apart from that, two things drove the creation of the chatbot: (1) the elimination of the need for consumers to visit the pharmacy in person, and (2) the use of natural language. A user will be advised about the sorts of acceptable medicine to take by using the system.

Automatized Medical Chatbot (Medibot): [2] This indicates that a medical chatbot may offer a patient with a reasonably correct diagnosis using simple symptom analysis and a conversational approach, implying that a practical spoken language medical bot is possible. Furthermore, the bot's relative effectiveness suggests that as time goes on, more automated medical goods may grow, allowing them to play a larger part in healthcare

Florence- A Health Care Chatbot: [3] The main purpose of this research article is to make people's life easier and healthier for those who do not have enough time to care for themselves. A chatbot can perform the role of a virtual doctor. The chatbot functions as a server. The user of this application will describe their symptoms to the chatbot, and the chatbot will respond by describing the closest potential illness and the measures to take for health care. Because the dataset contains broad information about symptoms and illnesses, the chatbot example will provide the user with health-related information. The user is eventually able to forecast the condition and propose a parameter where the specific needs are met after studying the symptoms of many users.

Supervised Machine Learning Chatbots for Perinatal Mental Healthcare: [4] This article highlights the significance of paying attention to perinatal women's mental health before proposing a robot model that can monitor perinatal women's mental health and provide supportive suggestions. SVM's trained model examines the risks of depression, anxiety, and hypomania in perinatal women. In order to give users with spiritual care and medical counselling, the user's mental health data is collected and evaluated in real time through the interaction of humans and robots, paired with the psychological test scale for further diagnosis.

CareBot: A Mental Health ChatBot: [5] Mental illnesses such as depression, anxiety, and stress, to mention a few, affect a large proportion of pupils. Many students do not seek professional aid or contact a college counsellor due to a lack of willingness or financial means. The suggested solution seeks to alleviate this problem by providing students with a chatbot that would give the necessary help in the same way that a counsellor or therapist would. In terms of machine learning, the recent usage of technology to assist with Mental Health rehabilitation has shown to be very successful. Surveys, questionnaires, data analysis, and natural language processing are all part of the technique. The goal is to provide an internet platform on which the tool may run.

A Proposal for Virtual Mental Health Assistant: [6] A significant number of students suffer from mental diseases such as depression, anxiety, and stress, to name a few. Due to a lack of willingness or financial resources, many students do not seek professional assistance or contact a college counsellor. The proposed approach aims to address this issue by providing students with a chatbot that can provide the essential assistance in the same way that a counsellor or therapist can. In terms of machine learning, the recent use of technology to aid in mental health rehabilitation has proven to be quite effective. The technique includes surveys, questionnaires, data analysis, and natural language processing. The purpose is to provide a web platform for the tool to run on.

EMMA: *An Emotion-Aware Wellbeing Chatbot*: [7] EMMA, the first emotionally intelligent and expressive mHealth agent, delivers wellness ideas in the form of micro-interventions, is described in this study. Over the course of two weeks, they examined EMMA quantitatively and qualitatively in a human-subject experiment with N=39 participants. They demonstrated that our system can identify a user's mood using passive smartphone sensor data, and that employing automatically predicted emotional states to drive emotional dialogue and intervention choice had no effect on people's perceptions of the agent as compared to manual EMI entry. As a result of this

discovery, we may be able to lessen the user's burden of reporting their emotions and make EMMA more scalable.

A Chatbot for Psychiatric Counseling in Mental Health-care Service Based on Emotional Dialogue Analysis and Sentence Generation: [8] This paper presents a chatbot for mental healthcare in this study. In conversations, the chatbot supports psychiatric counselling. The service engages in communication with the user and provides mental counselling. The service uses a variety of emotional intelligence techniques to understand the dialogues and recognize the user's emotion, including multi-modal emotion recognition from conversation content, intonation, and facial expression, intelligent corresponding such as psychiatric case-based reasoning and long-term monitoring, and ethics judgement, among others. The procedures allow for sensitive continuous observation of the user's emotional fluctuations. As a result, the effectiveness of therapy improves, and users who require mental health treatment are more satisfied.

A Mental Health Chatbot for Regulating Emotions (SERMO) - Concept and Usability Test: [9] SERMO, a mobile application with an integrated chatbot that uses cognitive behavior therapy (CBT) approaches to help mentally ill persons regulate their emotions and deal with their thoughts and feelings, is presented in this study. On a daily basis, SERMO quizzes the user on current events and emotions. Based on the mood, SERMO proposes appropriate assessments, such as activities or mindfulness exercises. Additional features include an emotion diary, a list of fun activities, mindfulness exercises, and facts about emotion.

A novel approach for medical assistance using trained chatbot: [10] For a range of illnesses, there are different therapy available. The chatbot will act as a single point of contact for anyone seeking information about diseases or treatments. It will then aid us in resolving the issue and confirming the solution. The proposed notion is to create a system based on artificial intelligence that can meet the requirements. AI can diagnose diseases and provide therapies based on the symptoms. The System can also provide details on the medications' constituents as well as their intended use. It allows them to obtain the care they require. People will have a better awareness of their health as a result, and they will be better protected.

Medical Chatbot Techniques: A Review: [11] Now a days People get addicted to internet for every problem they face and not only general topics but also related to health. So, based on the needs people have started developing several technologies to get accurate result of their disease. One of the methods is a yes/no questionnaire system. This method helps but some disease has same symptoms and the result can be inaccurate so the better method is to create chatbot. The main idea to create a chatbot is to replicate persons discussion. This helps to learn more about disease and have the accurate result.

Using Health Chatbots for Behavior Change: A Mapping Study: [12] This study is survey of health chatbot on the basis of three research questions: What illness are chatbots tack-ling? What patient competences are chatbot aimed at? Which chatbot technical enables are of most interest in the health domain? This information provides a preliminary look into chatbot-mediated behavior modification in the health area. The primary takeaways include: nutritional and neurological problems as the most common ailment areas being addressed," affect" as the human capacity most perused by chatbots in order to influence behavior, and" personalization" and" consumability" as the most valued technology enablers. On the other hand, major drawbacks include a lack of adherence to proper case-study reporting methods and a deeper look at the broader sociological implications brought by this technology.

Intelligent Chatbot for Prediction and Management of Stress: [13] This is a Stress Management and Prediction application is an end user support and consultation project. This application allows user to share their stress related issues. In this we use neural network and machine learning technique like decision tree to train the data and guess the most accurate stress level of the patient and according to that it will show the measure to take place.

PRERONA: Mental Health Bengali Chatbot for Digital Counselling: [14] We can no longer rely only on human-based health-care systems. The contemporary era of digitization delivers medical advancements and new prospects. Existing chatbots, such as Woebot, Wysa, and Moodkit, provide medical support but do not allow users to express themselves. PRERONA, on the other hand, is developed to assist depressed people, particularly Bengali users. All of the user's queries and concerns are addressed by this chatbot. To make it more user-friendly, this chatbot supports a variety of languages, including Bengali, English, and Korean. This bot also uses a type of adaptive learning. The question is recorded in the database for future use if the bot is unable to reply.

A review of mobile chatbot apps for anxiety and de-pression and their self-care features: [15] In this paper, they have conducted a search to find existing chatbot apps for anxiety and depression, in the App Store and Google Play Store using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) approach. Two people evaluated eligibility based on predetermined eligibility criteria. Two reviewers retrieved meta-data and features of the featured chatbots from their descriptions and post-installation. The mHONcode principles were used to assess the quality of the data. Only 11 chatbots (out of a total of 1000) were chosen from an initial search of 1000 to provide a substitute for human-human interaction and clearly had a therapeutic human substitute purpose in mind. The majority of the apps assessed had a large number of downloads, indicating that they were popular. Based on our evaluation of the apps using the mHONcode principles, we found them to be of generally good quality.

AI-Powered Health Chatbots Toward a general architecture: [16] They propose a general Architecture of an AI-Powered Health Chatbot with Four Components to Achieve Two Goals, which integrates dialogue and communication parts in natural language understanding (NLU) and natural language generation (NLG), and the expert part based on deep learning whose function is to give appropriate response from pre-formatted data in this paper.

Behavioral therapy using conversational chatbot for depression treatment using advanced RNN and pretrained word

embeddings: [17] In this paper, they constructed a chatbot that engages in conversation with the user in order to obtain further information about the user's present state of mind. From user inputs, its algorithm can recognize seven different sorts of emotions. They passed on two major deep learning classifiers, Recurrent Neural Network (RNN) and Long-Short-Term-Memory (LSTM), as well as a pre-trained weighted word index known as glove2, for feeling distinguishing proof. Hyperparameter tuning was used to improve model preparation and avoid overfitting the model. The results were visible, with an 88 percent training accuracy and an 84 percent testing accuracy. Specifically, the proposed chatbot strategy is spatially explicit, in which the chatbot would aim to prevent sceptical actions by using the clients' connection to redirect more helpful thoughts. Design and Development of Diagnostic Chabot for supporting Primary Health Care Systems: [18] A diagnostic is needed to make the healthcare system more participatory. The chatbot was conceived and developed utilizing the most up-to-date machine learning methods, including the decision tree algorithm, to assist users in making a diagnosis of their ailment based on their symptoms. The system will be supplied knowledge about various diseases, and it will be able to interpret the user inquiry and respond appropriately using natural language processing (NLP).

Dialogue Systems for Intelligent Human Computer Interactions: [19] This paper provides a summary of avail-able methods for dialogue manager training, as well as their benefits and drawbacks. Dialogues involving speech, gesture, semantic, and pragmatic knowledge are the most basic communication method for interaction. In the Out of Vocabulary setting of the Facebook bAbI Task 1 dataset, a new image-based technique is applied. In comparison to Memory Net-works, the results suggest that employing dialogue as an image performs well and aids the dialogue manager in expanding out of vocabulary dialogue assignments.

Efficacy of mobile app-based interactive cognitive behavioral therapy using a chatbot for panic disorder: [20] They ran pilot research to explore if employing a newly built chatbot to temporarily reduce panic symptoms is feasible and useful. For a period of four weeks, forty-one patients were randomly allocated to either a chatbot group (n=21) or a control group (n=20). The chatbot group was instructed on how to utilize the chatbot application, whereas the control group was given a panic disorder book. The key finding of this study is that in the chatbot group, the severity of panic disorder was greatly reduced, but not in the control group. When comparing the chatbot group to the control group, the social phobia score was much lower and the control helplessness level was significantly higher.

Microservice chatbot architecture for chronic patient support: [21] In this research paper they provide a chatbot architecture for chronic patient assistance based on three pillars: microservices for scalability, HL7 FHIR for standard data sharing models, and AIML for standard conversation modelling. They've also proposed a novel automation approach for converting FHIR resources into AIML files, making it easier to interface with and collect medical and personal data for patient health records. They suggest these similar channels for the chatbot patient interaction to align the way individuals engage with each other via messaging platforms with the chatbot design, paying specific attention to security and privacy considerations. Finally, they present a monitored-data study in various chronic diseases, as well as a proto-type implementation tailored for one specific chronic disease, psoriasis, demonstrating how this new architecture allows for the dynamic and flexible change, addition, or improvement of different parts of the chatbot, resulting in a significant improvement in the development of chatbots used as virtual assistants for chronic patients.

Web-based chatbot for Frequently Asked Queries (FAQ) in Hospitals: [22] They propose a framework and capabilities for a chatbot built with web technologies in this study. The following are the methods that were employed in this study: Several machine learning methodologies, such as gradient descent (GD) and natural language processing (NLP) algorithms, were used to build the bot engine. The bot's trained data was divided into mini word batches, and the GD algorithm was applied to each mini-batch in turn. The NLP approaches used to transform a word to its stem from a text result in a text that is less understandable by humans. The used machine learning methods were successfully implemented to manage the synchronization of text and audio messages.

Natural Language Processing based Human Assistive Health Conversational Agent for Multi Users: [23] The health assistant system in this paper was built using the Dialog flow application programming interface (API), which is based on Google's Natural language processing algorithm and is available on Google Assistant, Telegram, Slack, Facebook Messenger, as well as a website and mobile app. A user can send health requests/questions by text messaging to this web application, and it may also provide relevant health suggestions/recommendations. The end result is a chatbot that is both instructive and conversational. This chatbot delivers medical information, such as symptoms and remedies for diseases. Patients' personal and medical information is stored in a database for further study, and patients receive real-time advice from experts.

Chatbot for Healthcare System Using Artificial Intelligence: [24] The data is saved in the database so that the chatbot can recognize the sentence keywords, make a query choice, and respond to the question. The n-gram, TFIDF, and cosine similarity are used to calculate ranking and sentence similarity. From the given input sentence, the score will be calculated for each sentence, and additional similar sentences will be found for the query. The third party, the expert soft-ware, deals with any questions that the bot doesn't understand or that aren't in the database.

4. Conclusion and Future Perspective

We can no longer rely only on human-based health-care systems. Patients suffering from mental illnesses face social stigma and apprehension when seeking professional care. Furthermore, countries are experiencing a mental health practitioner deficit. It is challenging to provide one-on-one

support to a patient with a mental health issue because of the cur-rent COVID-19 situation. Chatbots are artificial intelligence-based systems that use a range of written, spoken, facial, and/or physical expressions to encourage a discussion with users and provide an accurate response. Chatbots have been shown to have potential psychoeducational and adherence benefits. However, there are a number of limitations and ethical problems to consider, including the impact on the patient-therapist connection, the risk of over-reliance, and chatbots' limited capacities and emotional intelligence, which may limit their application. If these points are addressed, bots can give a practical, evidence-based, and appealing digital solution to help fill the professional gap effectively.

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