PERSONAL HEALTHCARE CHATBOT FOR MEDICAL SUGGESTIONS USING ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

R Jegadeesan[1], Dava Srinivas[2], N Umapathi[3], G Karthick[4], N Venkateswaran[5]

Abstract

Medical services is a lot of significant in each individual's life. In any case, counseling a specialist for every single medical problem is an extremely challenging errand. Before speaking with a doctor, we want to develop an AI-powered healthcare chatbot system that can identify a disease and provide basic information about it. We use Natural Language Processing (NLP) algorithm. Our chatbot uses NLP, a program that applies AI, to analyze and comprehend natural human language. The system provides text-text assistance to communicate with bot in a user-friendly manner. The chat bot also provides medical suggestions that can cure the disease based on user symptoms. Based on the symptoms Chatbot classifies the disease into a severe or negligible health problem. If it is a severe health problem the user will be advised to consult a doctor for a better treatment and if it is a negligible disease, it provides the medical assistance. The Chatbot can also give you medical prescriptions for health problems. Along with the medicines, the Chatbot can also provide you with Ayurvedic Remedies and Homeopathy treatments for related health problems. The chatbot stores all the data in the database which helps in identifying keywords and to make a decision to give response to the user.

keywords: Healthcare chatbot, KNN-Machine Learning, NLP-Artificial Intelligence, Retrieval-based algorithm

[1]Professor and Head, Department of CSE, Jyothishmathi Institute of Technology and Science, Karimnagar, Telangana.

[2]Assoc.Professor, Department of CSE, Jyothishmathi Institute of Technology and Science, Karimnagar, Telangana.

[3]Professor& Head Department of ECE, Jyothishmathi Institute of Technology and Science,Karimnagar,Telangana.

[4]PAssoc.Professor, Department of ECE, Jyothishmathi Institute of Technology and Science,Karimnagar,Telangana.

[5]Assoc.Professor, Department of CSE Jyothishmathi Institute of Technology and Science,Karimnagar,Telangana.

Email: [1]ramjaganjagan@gmail.com,[2]dr.dsrinivas@jits.ac.in,[3]nrumapathi@gmail.com, [4]karthick.sgs@gmail.com,[5]venkywn@gmail.com

Eur. Chem. Bull. 2023, 12 (S3), 6004 – 6012

6004

1. Introduction

Clinical registering examination is a recent fad for social occasion clinical insight and applying it to future expectations. Large information is the following enormous thing for medical care frameworks. Medical intelligence can be extracted from huge amounts of clinical data and used to build a proactive healthcare system that puts patient care first while cutting costs and lowering hospital readmissions. On the off chance that identified sufficiently early, numerous infections are reparable. Chatbot is a human-machine interface that talks or communicates with clients through text or voice. Medical chatbots can be used for a variety of purposes, including patient care, deep diagnosis of any specific condition, and the diagnosis of general diseases. Similar to how we have general practitioners and specialists in medicine, In this study, we mimic a similar condition using advanced NLU and ML algorithms to first diagnose a common disease using a text-to-text conversational Diabot, then that extended this research to the specialty of predicting diabetes [2].

People have been working so hard for so long that they frequently neglect their health as a result of their constant toil. Long-term, this issue puts people's quality of life in critical. Nonetheless, thanks to artificial intelligence, we can now facilidate peoplewith health care servi ces at times that work for them and at prices they can go. A healthy body is one of the top most benefits we have. Every one of us aspires to a healthy constitution and an advanced quality of life. This paper's main ideal is to offer these services in order to achieve the st ated thing. Technical biases have substantially taken over our life and it's unsolvable to fantasize a time without them.

Because of its wide range of research-related applications, artificial intelligence is a growing discipline. One of the main goals of researchers using big data analytics is to predict diseases, which improves the accuracy of risk classification using huge volumes of data. [3][5].

This century belongs to computer intelligence. Advanced technologies to help people are being developed. An example of that advancement is artificial intelligence (AI) based chatbots. An AI-based chatbot is a software application primarily used to mimic human conversations and provide solutions to user-provided queries. As new businesses grow using the latest technology, the use of chatbots in consumers' daily lives is increasing rapidly. They can be used for a variety of purposes such as customer service, request routing, or information retrieval. One such example is the use of chatbots in the healthcare sector. The significance of chatbots in the healthcare industry has been covered by the paper's author. They noted that healthcare chatbots may be used for a variety of tasks, including scheduling appointments, creating reminders, and taking medications [4].

E-health facilities are generally an important resource for developing countries, but they are often difficult to set up due to lack of knowledge and lack of infrastructure development. Many Internet users rely on it to find answers to their health questions. In an effort to help doctors, we have created a platform for people to access medical services online. Users can more easily get medical advice and familiarize themselves with the different disorders and diagnoses available. We implemented a chatbot for disease prediction to improve communication [3][5].

Over the past few years, hospitals and healthcare systems have undergone many changes. Due to the rapid advances of artificial intelligence, more and more people are choosing to communicate with robots and virtual assistants. Doctor Recommendation chatbot, a chatbot is a tool that people can use to get physician suggestions. In this method, the patient can explain his problem to the chatbot and the chatbot will use its algorithm to refer a certain doctor to him to solve his problem. When a patient raises their concern to the chatbot, the chatbot will run through algorithms to discover the best answer, then recommend the right doctor. The response box will be used by the chatbot when interacting with the patient. Patient sends chatbot his problem by SMS and chatbot then uses request to solve his problem [6].

Related Work

Athulya N, Jeeshna K, S J Aadithyan, U Sreelakshmi, Hairunizha Alias Nisha Rose in 2021, proposed "Healthcare Chatbot". They create a medical chatbot that can diagnose

Eur. Chem. Bull. 2023, 12 (S3), 6004 – 6012

6005

diseases and provide basic information about the disease before consulting a doctor. Healthcare costs will be reduced, and more people will have access to medical information, by adopting a medical chatbot. Chatbots are computer programs that communicate with users using natural language. In this system, the user can communicate with the chatbot by SMS and the chatbot will reply to him by speech and text. If the user chats with the chatbot, the bot will recognize the illness related to the user's queries. The bot recommends experts who specialize in solving user problems and offers suggestions to solve them. Multiple users can use this system simultaneously without lag. The goal of this project is to quickly and accurately predict diseases from their symptoms to consumers. For disease prediction, a decision tree algorithm is used. By providing predictive diagnosis, chatbots can significantly contribute to the transformation of the healthcare sector.

Sagar Badlani, Tanvi Aditya, Meet Dave, Sheetal Chaudhari in 2021, describes a multilingual health chatbot application that can perform disease diagnoses based on a user's symptoms. Additionally, it responds to user queries by selecting the most pertinent answer from its knowledge database after determining Sentence similarity using TF-IDF and Cosine Similarity. Due to its multilingual capabilities, perfect chatbot system for use in rural India. English, Hindi and Gujarati are the three languages currently supported by the chatbot program. The chatbot program engages in a natural language processing based conversation with the user and supports both text conversion and speech to text and text to speech for audio communication as well. supported in charge. In an attempt to predict disease, five alternative machine learning algorithms were examined. The random forest classifier has the highest accuracy (98.43%) and gives the best results. Accordingly, it serves as the main classifier of the system. They are affordable and on-demand and provide first guidance over one-on-one discussions. Doctors can utilize healthcare chatbots to keep tabs on their patients. They noted that healthcare chatbots may be used for a variety of tasks, including scheduling appointments, creating reminders, and taking medications.

LekhaAthota, Vinod Kumar Shukla, Nitin

Pandey, Ajay Rana in 2020, presented the presentation "Chatbot for healthcare system using artificial intelligence". Computers provide us with information; they engage us and help us in many ways. A chatbot is a computer program designed to mimic intelligent voice or text conversation. However, this essay focuses only on the text. Conversational virtual assistants or chatbots that automate user interactions. Artificial intelligence is used to power chatbots that use machine learning to understand natural language. The main purpose of the magazine is to help readers with basic health information. When visitors first use the website, they must register before they can ask the chatbot questions. If the answer is not found in the database, the system will use an expert system to answer the query. Domain experts are also required to register by providing certain information. Chatbot data is saved as a template in the database. Here the database is managed by SQL.

Hiba Hussain, Komal Aswani, Mahima Gupta, Dr. G.T.Thampi in 2020, introduced the "Implementation of Disease Prediction Chatbot and Report Analyzer using the Concepts of NLP, Machine Learning and OCR". This study aims to provide consumers with rapid and precise disease prediction based on symptoms and comprehensive pathology report analysis. Machine learning and natural language processing methods are used to create the disease prediction chatbot. We have employed the Decision Tree and KNN (k-nearest neighbors) classification algorithms for the disease prediction. The efficiency of different methods is evaluated, and The best model is selected based on its accuracy. Our results show that Decision Trees and KNNs have accuracy rates of 92.6% and 95.74%, respectively.. Additionally, this project anticipates offering medical advice on the anticipated disease. The idea of OCR is used to analyze pathology reports. The free and open source OCR engine is called Tesseract. Language adopted from the report is used to simplify the interpretation of results and to present a graphical breakdown of test results.

Proposed Work

In our proposed system idea, the user first enters a message in the chatbot's prompt. This user's utterances follow a linear pattern from

Eur. Chem. Bull. 2023, 12 (S3), 6004 – 6012

6006

symptom extraction to cause identification. With this the bot identifies the corresponding symptom provided by the user, checks for its accuracy and then diagnosis the disease and classifies it into a serious or negligible disease. Only if the symptom accuracy level is greater than 80% then it displays its corresponding disease. If it is a negligible disease the chatbot predicts the name of the disease and gives medical suggestions to the patient. If it is a serious disease the chatbot will suggest the patient consult a doctor and suggested doctor details will be referred to the patient which are extracted from the database.

This analysis by the chatbot is done by using the NLP algorithm in artificial intelligence. Using natural language such as English to communicate with intelligent systems is called natural language processing (NLP). Whether you want robots or other intelligent systems to follow instructions, clinical expert systems that use dialogue to make decisions, and so on, you need natural language processing. The focus of the NLP field is on getting computers to perform meaningful activities using natural human-spoken language. Speech and text can be used as both input and output for NLP systems. To provide a better user experience, these AI-powered chatbots leverage a branch of AI known as Natural Language Processing (NLP). Also known as virtual agents or intelligent virtual assistants, these NLP chatbots complement human agents by undertaking long, repetitive conversations. Security is provided because chatbots can access user data only after login. This login page helps chatbots identify you. Our chatbot has four main conversational phrases: basic information gathering, symptom extraction, diagnosis, and medical.

First, to have access to the chatbot a person should be registered. A registered user can login with an email id and password. A non-registered user must register and create an account to login and have access to the chatbot. After login the user enters into a website where the user can see the chatbot application. The chatbot can be initiated by the user. The bot asks the user a series of questions until it has enough information to make a diagnosis. Users can also consult their doctor for other symptoms after receiving the initial diagnosis. Users can also see a history of previous chats about what they discussed when they were first diagnosed. Users can also see.

The proposed system has the following advantages:
- Accurate
- User friendly
- Time Saving
- Secured
- Availability around the clock
- Quickresponse to common queries
- Reduced Waiting Times
- Schedule Appointments

Natural language processing(nlp):
A strategy for interfacing with a canny framework utilizing a characteristic language, like English, is known as normal language handling (NLP). At the point when you believe a robot or other insightful framework should adhere to your guidelines, at the point when you keep up with that a clinical expert structure that uses trade ought to just choose, etc. Normal language handling is required. Making computers do meaningful activities using the natural language we use as humans is the focus of the field of LP. An NLP system can have the following input and output-
- Speech
- Written Text

These Al-controlled chatbots utilize a part of Al called normal language handling (NLP) to give a superior client experience. Frequently alluded to as virtual specialists or clever remote helpers, these LP chatbots help human specialists by taking over dull and tedious correspondences.

Retrieval-based algorithm:
Based on the user's input, this method selects the most appropriate response from a pre-defined set.. These bots have been taught a set of questions and potential answers. The bot is made to analyze the sets of all possible replies for each question, select the most pertinent ones, and then output the results to the user. Retrieval-based chatbots operate according to the graph or directed flow theory. From an information base of arranged reactions, the chatbot is customized to convey the most ideal reaction. The reactions depend on information that is as of now accessible. The best not set in stone by recovery based chatbots utilizing techniques like watchword coordinating, AI,

Eur. Chem. Bull. 2023, 12 (S3), 6004 – 6012

6007

or profound learning. No matter how they are implemented, these chatbots only provide predefined responses and do not create new content.
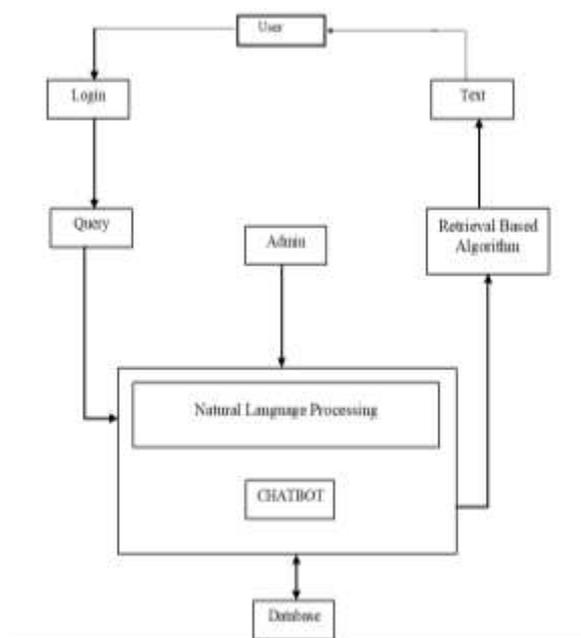

Fig 1: Block Diagram

The System architecture depicts the relationship and functionality of the system components. The input data is sent to the chatbot by the user using a mobile or laptop having a chatbot application in it. The chatbot detects the user input with the help of NLP algorithm. In order for a chatbot to produce accurate responses from the data set it is trained with, it needs to be able to understand human language, which is where NLP comes into play. The chatbot classifies the disease into a major or minor disease according to the symptoms and the output is displayed to the user. If it is a minor disease the chatbot also gives medical suggestions or else, it suggests the user to consult a doctor.

2. Result And Analysis

Result

In the proposed solution, the main aim is to enhance disease prediction by introducing a threshold for symptom reporting confidence. Our approach ensures that disease predictions are provided only when the user's symptoms are reported with a confidence level exceeding 80%. As a result, the accuracy of our approach reaches approximately 82%, which is significantly higher compared to the low accuracy levels observed in existing systems. This improvement highlights the effectiveness and reliability of our suggested approach in accurately predicting diseases based on user-reported symptoms.

Once the user login, Chatbot asks for user details like enter user name. In our developed chatbot system, the user is prompted to enter their name and subsequently asked about any symptoms they may be experiencing, such as fever, cold, cough, and others. These entered details are then sent for processing, where advanced algorithms are employed to analyze and identify the specific type of disease that the user may be potentially facing.

Based on the symptoms user entered, chatbot finds the disease and explains problems caused by that particular disease. The chatbot utilizes the symptoms provided by the user to determine the potential disease. Upon analysis, if the identified disease is deemed major, the chatbot recommends that the user consult a doctor. This decision-making process enables the chatbot to provide tailored advice and guidance based on the severity of the identified disease, ensuring appropriate and personalized recommendations for the user's specific health situation.
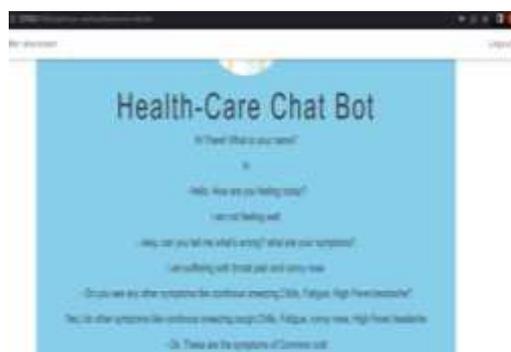
Eur. Chem. Bull. 2023, 12 (S3), 6004 – 6012

6008

Fig 2: Healthcare Chatbot
Result Page – 1

Fig 3: Healthcare Chatbot
Result Page – 2

Fig 4: Healthcare Chatbot
Result Page – 3

Eur. Chem. Bull. 2023, 12 (S3), 6004 – 6012

6009
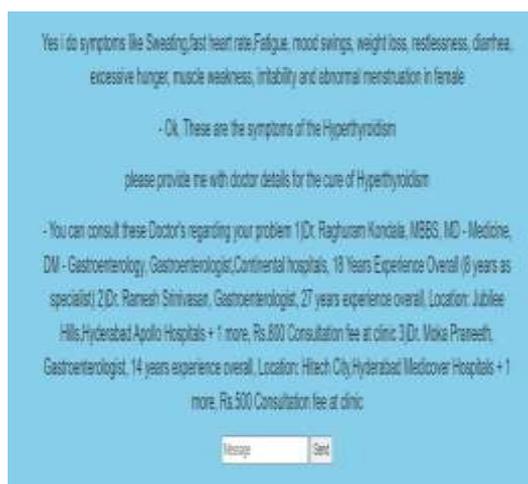
Analysis

The performance of the proposed medical chatbot is evaluated by comparing it to existing chatbot systems, including:

1. Dr.Vdoc: A Clinical Chatbot that Goes about as a Virtual Specialist
2. Med Chatbot: An UML based Chatbot for Medical Students
3. Chatbot: A Virtual Medical Assistant
4. Medical Assistance Using Trained Chatbot

This comparative analysis is conducted to know the effectiveness, accuracy, and user-friendliness of the proposed chatbot in relation to these existing systems.This evaluation allows for a comprehensive understanding of the advancements and improvements offered by the proposed medical chatbot model in the field of healthcareassistance & disease prediction.

Name of Chatbot Model	Limitations	Accuracy
Dr.Vdoc: A Clinical Chatbot that Goes about as a Virtual Specialist	It is intended to recommend and give data on conventional drugs. It doesn't give a quick reaction.	65%
Med Chatbot: An UML based Chatbot for Clinical Understudies	It is designed in such a way that it can predict only a smaller number of diseases.	70%
Chatbot: A Virtual Medical Assistant	It is designed to cure people suffering with health interventions.	68%
Medical Assistance Using Trained Chatbot	It can foresee the infection in view of the side effects however doesn't give exact outcomes.	75%

Table 1: Details of existing chatbots with their limitation and accuracy.

A variety of chatbot systems are available to provide medical advice to users. One popular chatbot, Dr.Vdoc, acts as a virtual doctor but is restricted to prescribing generic medications and has slower response times, achieving an accuracy of 65%. Another existing chatbot,"Med Chatbot," is designed for medical students and can only predict a limited number of diseases, achieving an accuracy of 70%. Another chatbot, referred to as "a virtual medical assistant," focuses on health interventions with an accuracy of approximately 68%. Lastly, the "Medical Assistance Using Trained Chatbot" can predict diseases based on symptoms, but its accuracy is not consistently reliable, reported at 75%. These descriptions provide an overview of the limitations and reported accuracies of each chatbot system, highlighting their respective strengths and areas for improvement in the field of medical assistance & disease prediction. The summarized information can be found in the above Table 1.

In comparison to these existing chatbot models, our proposed chatbot demonstrates faster response times, aiming to predict various diseases within a limited timeframe. Notably, our chatbot excels in disease prediction by employing a confidence threshold of 80% or higher when considering symptoms, effectively mitigating incorrect diagnoses. Achieving an accuracy of 82%, our chatbot outperforms the existing systems. The performance comparison of our proposed model with the existing systems is presented in Table 2.

Chatbot Name	Accuracy %
Dr.Vdoc - a virtual doctor	65
Med Chatbot	70
A virtual medical assistant	68
Medical Assistance Using Trained Chatbot	75

Eur. Chem. Bull. 2023, 12 (S3), 6004 – 6012

6010

Proposed Chatbot	82

Table 2: The performance comparison of proposed model with existing medical chatbots

The chart below depicts the graphical representation of our research on a healthcare chatbot designed for providing medical Table 2, have been plotted in the graph for visual analysis. suggestions. The accuracies of various healthcare chatbots, as presented in
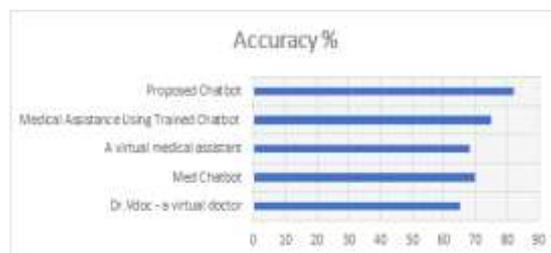

Fig 5: Comparison of Accuracy of Medical Chatbots

The comparative analysis presented in Figure 5, showcases a bar graph illustrating the accuracies of both existing systems and the suggested system. The accuracy of the 'Chatbot for mental health' is recorded at 65, followed by the 'Chatbot for Diabetic Patients' at 70, the 'Pediatric Generic Medicine Consultant Chatbot' at 68, and the 'Medical Prediction System' at 75. In contrast, the suggested system achieves an accuracy of 82, indicating the highest level of performance and accuracy among all systems evaluated. These results highlight the superior performance of the suggested system. Experimental findings consistently demonstrate the suggested system's accuracy at 82, positioning it as the best-performing system, surpassing the accuracy of the 'Chatbot for mental health', which represents the worst-case scenario in terms of accuracy.

With our proposed solution, disease prediction is provided only when the user's symptoms are reported with a confidence level exceeding 80%. As a result, our suggested approach achieves an accuracy close to 82%, surpassing the lower accuracies observed in existing systems. This improvement underscores the effectiveness of our approach in accurately predicting diseases based on symptom reporting, offering a more reliable and precise solution compared to current systems.

3. Conclusion

Health care is the most important aspect of human life. But due to their busy lives people are unable to take care of their health which is leading to the major health diseases which are also causing death of the people. To resolve this problem our proposed system is to create a chatbot which can predict the disease depending on the symptoms provided by the user and also classifies the disease into minor or major based on their severity. The chatbot also provides medical suggestions in the case of minor disease and it refers to a doctor in the case of major disease.

Based on a review of various papers, it is hypothesized that Chatbot usage is straightforward and accessible to anyone who knows how to type in their native language in either a portable application or a workplace version. A clinical chatbot provides individualized side effect analysis. Later on, the bot's aftereffect affirmation and assurance execution could be altogether improved by including support for progressively clinical features, for instance, region, length, and power of signs, and dynamically distinct secondary effect portrayal. The utilization of Customized Clinical partner strongly relies upon simulated intelligence estimations similarly as the planning data. At last, the execution of tweaked drug would successfully save various lives and make a clinical care among the people.

4. References

[1] Takeshi Kamita, Tatsuya Ito,Atsuko Matsumoto, TsunetsuguMunakata, and Tomoo Inoue, "A Chatbot System for Mental Healthcare Based on SAT

Eur. Chem. Bull. 2023, 12 (S3), 6004 – 6012

6011

Counseling Method", Hindawi Mobile Information Systems Volume 2019, Article ID 9517321, 11 pages.

[2] Manish Bali, Samahit Mohanty, Subarna Chatterjee, Manash Sarma, Rajesh Puravankara, "Diabot: A Predictive Medical Chatbot using Ensemble Learning", International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-8 Issue-2, July 2019.

[3] Athulya N, Jeeshna K, S J Aadithyan, U Sreelakshmi, Hairunizha Alias Nisha Rose, "Healthcare Chatbot", © 2021 IJCRT | Volume 9, Issue 10 October 2021 | ISSN: 2320-2882.

[4] Sagar Badlani, Tanvi Aditya, Meet Dave, Sheetal Chaudhari, "Multilingual Healthcare Chatbot Using Machine Learning", 2021 2nd International Conference for Emerging Technology (INCET) Belgaum, India. May 21-23, 2021.

[5] Hiba Hussain, Komal Aswani, Mahima Gupta, Dr. G.T.Thampi, "Implementation of Disease Prediction Chatbot and Report Analyzer using the Concepts of NLP, Machine Learning and OCR", International Research Journal of Engineering and Technology (IRJET) Volume: 07 Issue: 04 | Apr 2020 e-ISSN: 2395-0056 p-ISSN: 2395-0072.

[6] Umar Jameel, Hashim Khan, Aqib Anwar, "Doctor Recommendation Chatbot: A research study", Journal of Applied Artificial Intelligence 2021 Volume 2, Issue 1: 1 – 8 ISSN: 2709-5908.

[7] LekhaAthota, Vinod Kumar Shukla, Nitin Pandey, Ajay Rana, "Chatbot for Healthcare System Using Artificial Intelligence", 2020 8th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO) Amity University, Noida, India. June 4-5, 2020.

[8] NavidaBelgaumwala, Dr. Rajashekarappa,"Chatbot: A Virtual Medical Assistant", (IJRASET) ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177 Volume 7 Issue VI, June 2019.

[9] Simon Oermann, Kathryn L McCabe, David N Milne, Rafael A Calvo1, "Application of Synchronous Text- Based Dialogue Systems in Mental Health Interventions: Systematic Review", Journal of Medical Internet Research, volume: 19, issue 8,August 2017.

[10] R Jegadeesan, Ishank Vasania2, Baha Ur Rehaan3, Anuj Goyal, 2021 & September, "Covid-19 Future Forecasting Using Exponential Smoothing", Strad Research, Volume 8, Issue 8, 2021, ISSN No: 0039-2049, page No. 724-737, https://doi.org/10.37896/sr8.8/072 (UGC Care Group II Journal and Web Of Science Group)

[11] PavlidouMeropi, Antonis S. Billis, Nicolas D. Hasanagas, CharalambosBratsas, Ioanni s Antoniou, Panagiotis D. Bamidis," Conditional Entropy Based Retrieval Model in PatientCarer Conversational Cases",2017 IEEE 30th International conference on Computer-Based Medical System.

[12]HameedullahKazi,B.S.Chowdhry,Zeeshan Memon," Med Chatbot: An UML based Chatbot for Medical Students", International Journal of Computer Applications (0975 – 8887)Volume 55– No.17, October 2016.

[13] Abbas SaliimiLokman, JasniMohamadZain, FakultiSistemKoputer, KejuruteraanPerisian," Designing a Chatbot for Diabetic Patients", ACM Transactions on Management Information Systems (TMIS), Volume 4, Issue 2, August 2015.

[14] R. Jegadeesan,A. Beno,S. P. Manikandan,D. S. Naga Malleswara Rao,Bharath Kumar Narukullapati,5T. Rajesh Kumar,Batyrkhan Omarov,Areda Batu, "Stable Route Selection for Adaptive Packet Transmission in 5G-Based Mobile Communications", "Wireless Communications and Mobile Computing 2022 "Research Article | Open Access Volume 2022 | Article ID 8009105 | https://doi.org/10.1155/2022/8 009105.

[15] Saurav Kumar Mishra, Dhirendra Bharti, Nidhi Mishra," Dr.Vdoc: A Medical Chatbot that Acts as a Virtual Doctor", Journal of Medical Science and Technology, Volume: 6, Issue 3,2017.

Eur. Chem. Bull. 2023, 12 (S3), 6004 – 6012

6012