A PAPER ON CHATBOT FOR MEDICAL DIAGNOSIS

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ABSTRACT

Work on a chatbot for medical diagnosis by asking the symptoms and to get help from doctors who can provide remedy. The model can also prescribe over the counter drug but do not give prescription based medicine on the basis of disease. It will have the function of connecting to a doctor, if need arises. It can also predict the seriousness of the disease and diagnosis. With the communication technology improving swiftly, users wanting to get a telehealth check will grow many-folds in a post-pandemic world. The technologies on which this chatbot is based such as Machine Learning and AI will drive the new industrial revolution.This will reduce the digital divide between the urban and rural areas.Consultations with doctors can be difficult to obtain especially in remote areas for non-life threatening diseases. This will reduce the costs associated with treatment and improve the medical knowledge. People will become more aware regarding their health and sanitation. Also, in a serious disease it connects you with the Doctor. Such methods are beneficial for the Administration to survey hotspots of diseases and can help in eradicating diseases like TB and improving human capital.

Keywords : Chatbot, Health,Telehealth.

1. INTRODUCTION

ChatBot is based on a machine learning conversational dialogue engine which is coded in Python Language[1].Chatbot generates the responses on the basis of collections of already known conversations. Hence,it undergoes supervised learning testing method.[7] It learns from each conversation with the user and relies on

Medical API like Infermedica.[44] Another advantage of chatbot is that it is language independent.[2] It is designed in such a way that allows Chatbot to be trained to speak any language.Chatbots are becoming popular each passing day and shown tremendous growth over in 2010s.[32] Some researchers say in the year of 2025, VPAs(virtual personal assistants) will be having a major impact and will alter how patients use the medical devices.[16] Some had drawn similarity in chatbots gaining popularity and the advancement of social media and instant messaging applications.Messages became the primary mode of communication for many people specially for the youths.This also results in the growth of Chatbot Ecosystem.[30]For Ex, Customer Service is an important part of any Company.[50] MSM Enterprises especially startups find it very difficult to afford a customer care executive. Hence they have now incorporated chatbots which reduces the cost significantly. When chatbots are making such conventions, they engage in ways that users are already comfortable with.[19]

The suggested Medical Chatbot can interconnect with users and gives them the same virtual realistic experience of visiting a Medical Professional.[12] This Chatbot firstly uses the text classification to detect the intent of the user also known as intent classification and then detects the pattern of the response by the user using AIML (Artificial Intelligence Markup Language) technology[41]. AIML is the markup language which is based on XML.AIML is used to build AI applications. AIML first reduces the message to the few keywords in that message.[43] It retrieves them from the initial messages and then know about the possible health issue/problems that unconfirmed patient might be having,based on the symptoms shown by the user.[3]

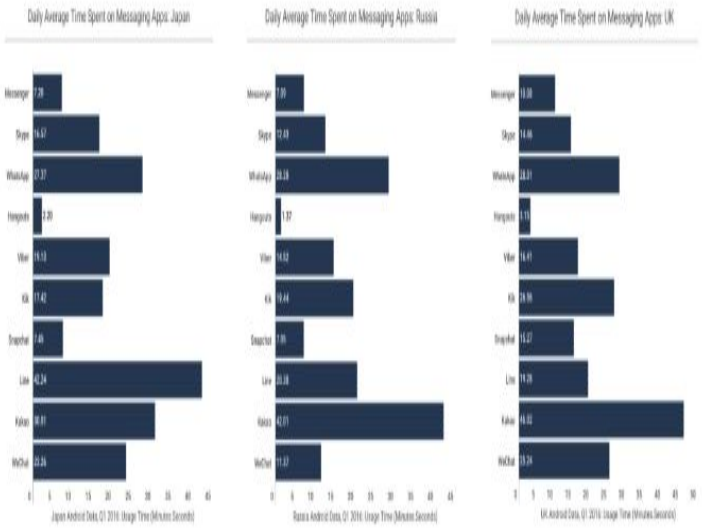

Fig 1. Data showing increasing use of chatbots

The existing medical chatbots do not provide the users with the required Active pharmaceutical Ingredients or Generic Medicines to any illness.[39]Instead most connect with a Medical Q&A platform Forum and related questions are provided previously answered by doctors which is an less useful method to the one proposed in this paper.[33]

2. Related Work

This field of technology has seen many medical Chatbot designs in the past few years. Most of them are with the objective to give users medical diagnosis,recommending

medicines after asking the information from the user and the database of the medical knowledge using Medical APIs such as Infermedica.[17]

One group designed the Chatbot with the use of MS Access and Visual C#.[4] This was a traditional method which was useful only till the emergence of better technologies like ML and AI .[5] Also such traditional methods provide very low efficiency and accuracy when compared to new technologies.[31] This is possible for this using the suggested design, mainly because the user has to go through four options provided in the system.[46] That design's objective methodology was by changing conversational input by the user into a SQL query and execution of the query was done on MS Access to retrieve back the remedies,medication,solution to the illness. Another paper stressed more on the designing for AIML based Medical Chatbot.[48] First a JAVA based AML interpreter called Chatterbean was made and the Chatbot design was implemented. One made a similar chatbot and named it chatterbot. To use this suggested design, the user needs to type the message containing illness and hence detecting what is the illness using AIML patterns. Once the illness is detected, chatterbot used to provide necessary solutions.[49]

None of the existing designs tried to calculate severity of the illness,stage of chronic diseases etc.[36] This part is where the new model improves on and has the first mover advantage. Doing this will require asking more questions to the user until the probability to detect the probable illness that the user is having gets very high.[47] Also this chatbot has the feature of contacting the doctor in case the disease is life threatening or in emergency situations or the severity is high. The system calls it as a threshold level.[38]

3. Functionality

The focus of the system is on the conversation with the user by decoding the messages it provides during the conversation. Initially,focus is on initiation of the conversation to guess what is the need of the user.[13]

On receiving enough keywords from the conversation as to detect the purpose, it then asks questions from the user to lead the messages and conversation. Purpose in this step is on trying to find and reduce the list to a few disease(s) that the user may be suffering through. The next logical step for the system is to calculate the probability of all the diseases and finally for better understanding sorting of the data is processed,thus ranking is assigned to all possible disease.[23] After making the list, the Chatbot starts another round of questioning the user about how the user is feeling to pinpoint the diseases.[37]Upon receiving the enough amount of data, the chatbot tries to accurately predicts which disease user may be have.[34] One unique feature is that after the Chatbot has found the disease,it has another step to determine severity of the disease the user is suffering through. It then acts accordingly i.e. call a doctor for life threatening disease and for others, either by suggesting home made remedies and medication or by connecting

to the pharmacist if the user wants to order medicines instantly.[27]

4. Method

4.1 Chatbot Dialogue Design

The very first task of the chatbot is to find the intent of the user while conversation.[11] The designed chatbot is able to classify intend of the user to 4 possible use cases which are as follows:

1. Chatbot provides general information about itself and if the chatbot is associated with some medical institution or hospital then the details about that.[26]
2. Asking for the general information about the patient so that it can suggest the way to prevent the sickness.[28]
3. Asking for more detailed information about the patient so that it can evaluate the possibility of specific medication requirements.
4. Chatbot can book the appointment with the associated medical centre.[22]

Therefore , to fulfil above cases chatbot would require the possible intents :

1. Greeting intent : This intent is used at the start of the chat with the user.
2. Appoint intent: This intent is used when the user wants to book an examination with the doctor.[29]
3. Get intent: This is used when the chatbot wants to know the detail of the user's symptoms so that it can provide medication to the user.
4. Put intent: This is used to receive the information entered by the user and feed it to the system.[21]

```
#PATTERN MATCHING
<category>
   <pattern>MAY I KNOW THE PRICE FOR *</pattern>

   <template>
      <srai>THE PRICE OF <star/></srai>
   </template>

</category>


-------------------------------------------------
#PRE_STORED PATTERNS


<category>
   <pattern>THE PRICE OF iPhone X?</pattern>
   <template>iPhone X Costs $1500.</template>
</category>


<category>
   <pattern>THE PRICE OF Kindle Paperwhite?</pattern>
   <template>The all-new kindle paperwhite costs $100. Yay!! You
            have got an offer!! You can get it for $85 if you apply
            the coupon MyGoodBot
   </template>
</category>
```

Fig.2 NLP explained

Along with the intents shown above the chatbot need to have some entities which stores the detail of the users like address , sex , age , height , weight , Blood pressure , etc.[45]

4.2 The machine Learning Algorithms

We used NLP(natural language processing) to make chatbot understand the user language . In NLP , we use **bag of words** to extract all the words from text and then use those words as a feature for training a classifier , **Tokenization** to break the text into words and remove the punctuations from the text , **Lemmatization** to reduce the words to its base form so that we group together the forms of word.[14]To provide this ability to chatbot we use " chatterbot " which is a python library.[24]

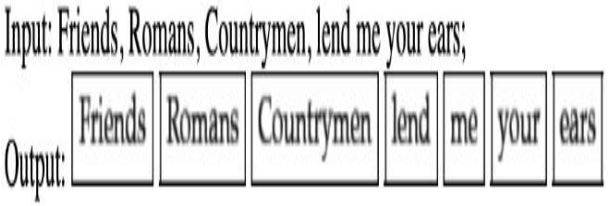

Fig. 3 Tokenization

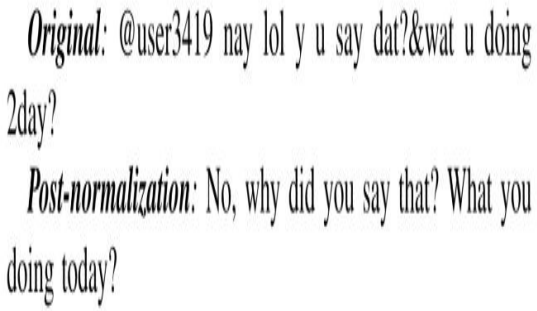

Fig 4. Normalization

Fig 5. Recognising Entities

After providing the ability to chatbot to understand the natural language now we need to make it able to provide medical advice. So , for that we design a machine learning algorithm .[20] This algorithm gets the input from the chatbot and does some processing and gives the output to the chatbot which in turn writes it in a natural language and outputs the text to the user. To provide the user interface we use flask which is microweb framework in python.[15]

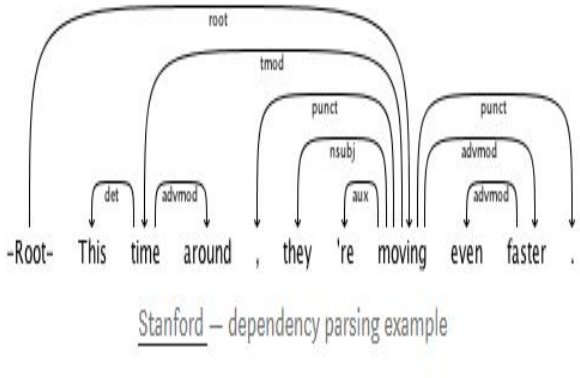

Fig 6. Dependency Parsing

5. Conclusion

Our chatbot is based on deep learning because of which it is able to provide advanced human-machine interaction.[35] The user can easily communicate with it without any problem.[25] The chatbot has no language barrier .The chatbot can adapt to different clinical scenarios and medical tasks. It is highly scalable that chatbots have the ability to extend easily to new knowledge bases .[18]

The medical chatbot will impact the life of its users positively. The medical chatbot is like a virtual doctor in the pocket of a doctor.. The user can anytime ask a chatbot by providing its symptoms.[10] Also the user can book an appointment with the doctor and visit the healthcare centre if it's needed.Elder and physically disabled person will be the one that would get the most benefit from it.[8]

The health care centre would also benefit from the chatbot as it helps them to increase their user base.[42] It would also save costs

and provide many other benefits to both the users and healthcare industry. More the people associated with the chatbot, the more data and large data improves the accuracy of the chatbot.[6]

6. Future Work

Future works will focus on further improving the human machine interaction and make it capable to adapt to specific users. Presently,only the allopathic medications and connectivity to the doctor is provided using the chatbot. The upgradation would be to extend this to AYUSH (Ayurvedic,Yoga&Naturopathy,Unani,Siddha and Homeopathy) medications and doctors practicing AYUSH medications.[9]

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