

A Novel Approach to Understand the Future of Chatbots for Medical Assistance

Gayatri Nair, Soumya Johnson, Akshit Verma, S. Aarthi

Abstract: Chatbots usually work as an optimizer of customer service. Chatbots are created in a way that the person using it are technically believing that they are conversing to an actual human being and not to a machine. The main advantage of this characteristic of a chatbot is that it is possible for it to have a virtual personality of its own just like a definite person of a distinct occupation. This paper proposes the idea of an artificially intelligent chatbot that can help you with the right medicine, dosage and usage of medicines in or away from your hometown. Many times certain medicines that are available in one country may not be available in another country. During such times this medobot can help you with information regarding a medicine's availability, its dosage and also the symptoms all according to one's age. This bot will help you to cure basic fever, cold, cough and headaches. As almost 80% of the people are equipped with high end smartphones this is a foolproof way to ensure medical aid to the users. Also in the future it can even be modified further to assist surgeries and curing deadly diseases. The chatbot will converse with the client with the help of natural language processing and AIML files.

Keywords: Artificial Intelligence, Chatbot, Medical Assistant, Natural language processing.

I. INTRODUCTION

A chatbot is also known as a talkbot, IM bot, Bot, chatterbot, or an Artificial Conversational Entity. Chatbot is a computer application program that helps clients to have a conversation with the help of text messages. They are formulated to impersonate human behavior. They can reproduce exactly how a human would act as a conversational partner.

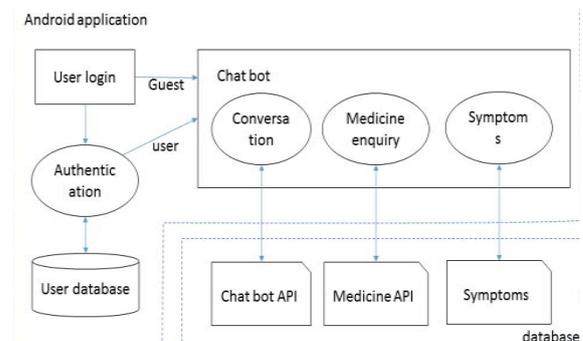
Software tools have been created for nearly as long as developers have been writing code. Today, myriad tools exist ranging from large, complex and powerful to small, simple yet still highly useful. While, the first tools were usually standalone, many current tools appear as plug-ins into software development environments or are entirely web-based. In the fast running world people don't even have enough time to attend to their medical needs in a proper and systematic manner. Some people also hesitate to see a doctor due to the increasing medical cost even for the simplest of

issues like cold, fever, etc. It's also not possible to take a doctor's appointment and get immediate medical assistance because the doctor to people ratio in a particular area is very small and due to this people experience delays at hospitals and clinics or prefer not to attend to their medical needs which eventually leads to various health issues. While the medical costs and issues are increasing, we are in an era which has seen a heavy increase in the use of smartphones. Every other person is equipped with at least one smartphone and has access to everything at just a click/touch of a button. Technology-based self-service channels and digital health interventions have the potential to support patients in their everyday life and health professionals likewise.[3] Although there are many scalable and highly efficient self-service channels in the form of digital voice assistants and chatbots like Siri, Alexa, Google Assistant, Cortana or Bixby they cannot yet be applied in the healthcare sector. So this paper aims on helping the user to provide basic healthcare at the tip of your fingers anytime and anywhere.

II. OVERVIEW OF PROPOSED SYSTEM

In this paper we highlight the positive aspects of a medical chatbot. In many regions medicines available in one country may not be available in other countries. Certain regions ban the use of some medicines due to various reasons. This leads to difficult situations if you are caught with the banned medicines. Also if you fall sick in a different country the expenses to visit a doctor also increase so with the help of this medical chatbot you can help curb these expenses. This chatbot not only gives information about basic diseases but it can also help you with its dosage. It keeps a check on the symptoms you entered and compares it with the ones already existing in the database. After comparing all the details it prescribes the medicine along with the elaborate description of the disease. This helps the user to get a lucid view on the same. The proposed system is based on the concept of natural language processing and pattern matching.

III. SYSTEM ARCHITECTURE



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A. User login

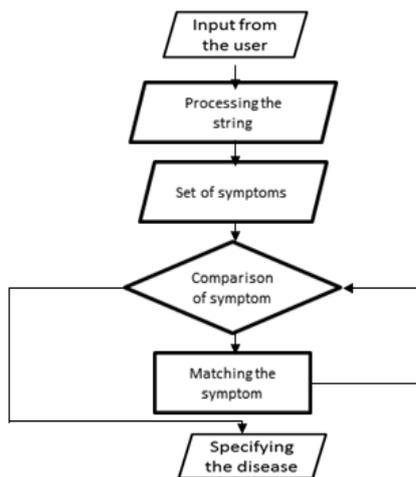
First the user is required to login into the chatbot application. After login the user will get a welcome message along with a question asking what is your query or question. After that the user has to answer accordingly and specify the problems he/she is suffering from. These inputs will be taken as a symptom set that will be further used for disease recognition.

B. Chabot Body

In this the inputs will be taken in recognition and the inputs will be processed using Natural Language Processing and Pattern Matching Techniques. Chabot or the medobot can be made readily using any chatbot making tools or can be made from scratch. Our medo bot is made by a chatbot building tool called botsify.

C. Database

This is the place where all the details about the user will be stored and all the intents will be stored. Intents are the keywords that are used in Natural Language Processing. These intents are matched with the user input to generate a proper output. The output generated will be a proper medicine name that will be available at the current location of the user.



IV. DESIGN CONCEPT

A. Natural Language Processing

The first step of chatot design is question analysis. In this it carries out different natural language processing methods to sort out the required text by using various techniques like shallow parsing, deep parsing, semantic role labeling, conference relations, and named-entity recognition. [1] Deep parsing technique is a technique in which the Chatbot takes an input statement from the user and performs tokenization and segmentation. The next step involves a series of linguistic analyses. The tokens from the user input are transformed into single word phrases, and then are converted into a chain of multiple phrases carrying some meaning. This process helps the Chatbot to break a sentence and give it as input into its subsequent parts and understand the functional, operational, systematical and grammatical importance of every response generated. [4]

B. Response Generation

Hypothesis Generation or Response Generation is the second step in Chatbot design. In this step Based on its understanding of the question, Chatbot looks into its knowledge base or system database for an appropriate response , and produces all the responses that possibly can be the answer. This phase can be termed as “primary search” phase which is concentrated on increasing a fact, and assumptions on the later methodological work can be finished to trace the accurate reply. [4] The third step is hypothesis and evidence scoring. In this phase the system an algorithm which is used to find out the most appropriate response. Scoring functions are usually present to measure the degree of matching, the argument statements, reliability of source, the structure of the arguments, to check the location, to generate taxonomical classification, to understand the lexical and semantic relations, the candidates correlations and so on. The fourth step is ranking and confidence estimation. Machine learning approach is used in this phase. The above mentioned dimensions are take as features and a classifier is trained that knows the correct answers. There are various classifiers that are applicable to each which are based on a different variety of dimensions. This problem is solved by training each classifier to handle sub-sets of features. Then the Chatbot uses this group of classifiers to produce a final ranking.[4]

C. Knowledge Base

Chatbots are only as smart and perspicacious as the inputs they have or the amount of knowledge they can have proper access to. Chatbot achieves human-like interaction by gathering all the data that is required to train machine learning classifiers to generate a proper response. There are many advanced algorithms that can convert human-annotated texts into AXML files. These algorithms involve four basic steps:

- (i) read the texts given as input by the user.
- (ii) remove all unwanted texts and fillers
- (iii) process the remaining text.
- (iv) convert these texts to AXML files, or any other chatbot-compatible form which can be used to build the knowledge base.

V. IMPLEMENTATION

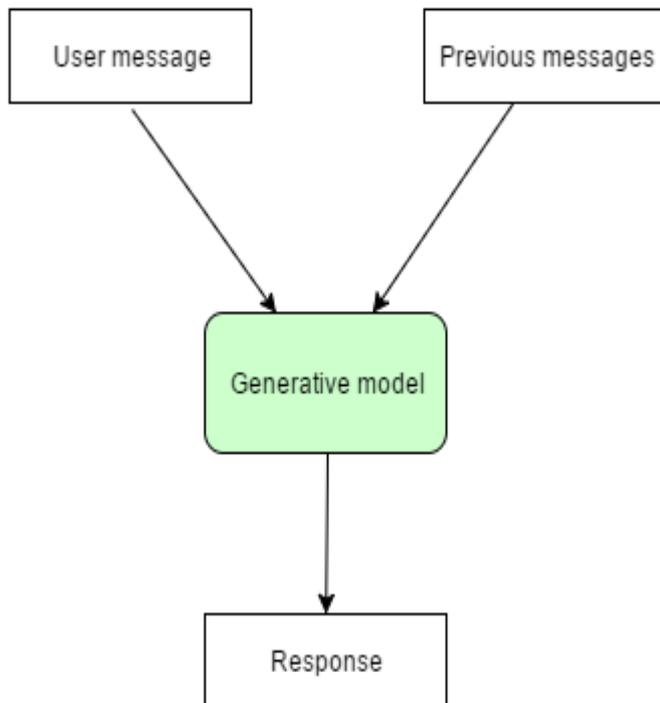
There can be two types of chatbots: entertainment chatbots and business chatbots. Chatbot should be intelligent enough to produce responses and keep the conversation on between the user and the Chabot. Business Chatbots are generally related to sales ad money transactions. The conversation is mostly focused centered on needs of the users. Likewise, travel chatbot gives the user details about the available flights ad hotels, and best tour packages according to the user’s needs and wishes. The conversation between the Chatbot ad the user are typically short, mostly not more than 10-15 minutes. The chatbot can either engineer riposte from scratch which will be based on machine learning model or manoeuver some heuristic trial and error methods to select a response from the library files of predefined set of responses that are present.



Generative models are harder to build and train. Typically it requires millions of examples to train a deep learning model to get decent quality of conversation, and still you can't be totally sure what responses the model will generate. Microsoft Tay is in this category.

A. Generative models

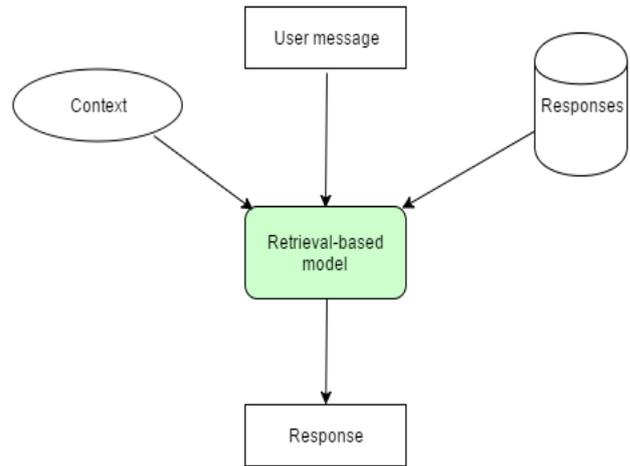
Generative models are nothing but the next generation of chatbots. They have the ability to make chatbots smarter. But this approach is usually used in laboratories. Chatbot developers no longer widely use this route. These chatbots have the ability to learn from scratch as it uses a procedure called deep learning. In deep learning instructions can be supervised and unsupervised. In some cases it can even be semi-supervised. These algorithms run the given data through layers and layers of networks. These networks are called neural network algorithms. They can also extract the properties and features and then feed them to other algorithms.



B. Retrieval-based models

Retrieval based representations are much straightforward and unchallenging to create. They also contribute to the presentation of more predictable outputs. The user will not necessarily obtain 100% accurate responses. But they can make sure that all the possible grammatical errors can be corrected.

Retrieval-based models are more feasible at the present moment. Many algorithms and APIs are available for the designers to use.



A chatbot makes use of the messaging method for initiating conversations and then selects the appropriate responses from a predetermined set of responses from the library. The various contexts include its current position in the dialog tree and all of the previous conversations that are saved in the database. Eg : name

C. Pattern-based heuristics

Heuristics for determining a response can be organized in various distinct ways, from conditional if-else statement logic to machine learning classifiers. The easiest technology is using a set of procedures with all the patterns as constraints for the rules. These chatbot models are highly desired for entertainment bots. AIML coding language is used for executing patterns and making response templates. Chatbot creators develop code in AIML language these codes can include multiple components like this:

```

<category>
<pattern>Hello I am medobot and you are?</pattern>
<template>My name is Olive.</template>
</category>
  
```

When the chatbot receives a message it goes through all the patterns present in the library and then tries to match it to develop a score. It searches which one matches with the user's message. If there is a match that is found then the chatbot uses the template and generates a suitable response. ChatScript is the latest application of this concept. It is an open source bot engine that allows to define a chatbot in a regulation based language. Each regulation or rule contains a distinct pattern.

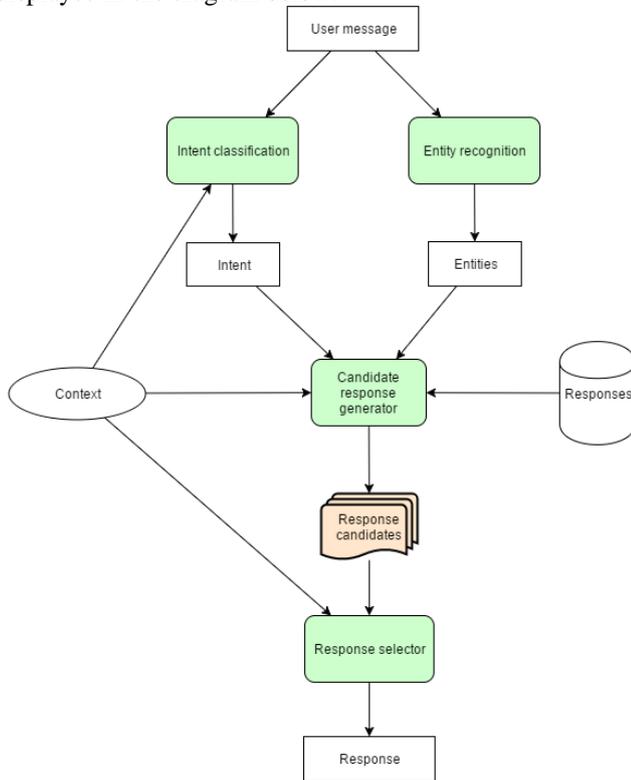
D. Response creation mechanism

Patterns and machine learning classification algorithms help in understanding what the user's message actually means. When the chatbot attains the goal of the message it will generate the desired output or result. The easiest way to do so is to riposte with a fixed response, usually one for each intent or target. Or even get a diagram that is based on the intents and add some more variables.

ChatScript based bots and other modern day bots are using this technique. Response creation mechanisms are usually depended on the assignment. A medical chatbot is likely to use a statistics model of conditions for deciding which questions to ask for clarifying a doubt.

E. Architecture with response selection module

The chatbot can indicate the exact same messages using various different terms. For example a weather monitoring bot can state that “It is rainy today” or “The probability of rain today is 80%”. It can even send messages like “Please remember to carry an umbrella today”. The bot can thus analyze all the previous chats and messages and also the duration of the conversation, rating and level of customer satisfaction to tailor responses for the user. Chatbots can have isolated response generation and selection modules, as displayed in the diagram below.



Message handling commences from interpreting what the user is messaging. Classification of intent modules recognizes the objectives of the user’s message. Typically it is used to select one out of the number of predetermined intents from a given message. Intent classification uses subjective information such as intents of the former messages, profiles and user preferences. The modules that recognize the entity extracts the information bit by bit. The candidate response model does all calculations for processing the request of the user. It uses different external APIs and algorithms to generate the output required. The result of it is a list of candidates. All the results must be correct based on the various domain specific reasoning. It should not be just a ton of different responses. The response generator should use conditions and intents extracted from the previous user messages so it can assist multiple message conversations. The response selector should score the responses and then select the optimal one for the user.

VI. ALGORITHMS

Pseudocode: chat_bot (keywords)

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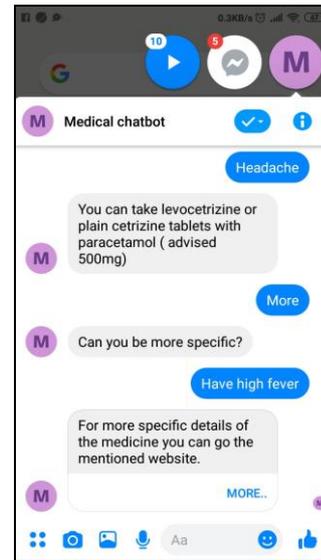
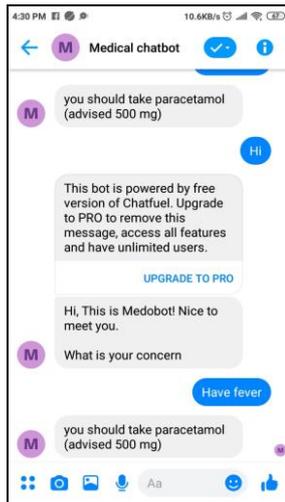
{
  Read input
  Recognize the keywords.
  Search for matching keywords in the database
  If found, then
  Call function choose_chat (keywords)
  Else
  Print default response
}
Pseudocode: choose_chat (keywords)
{
  Group the keywords.
  Choose groups of keywords based on category.
  Search for keywords in chat using keyword category.
  Flag chats if categorize and matching keyword.
  Choose highest flagged chat
  If multiple choose most used
  Return result.
}
Pseudocode: symptoms (keywords)
{
  Read symptoms.
  Search database for matching symptoms.
  Create groups.
  Repeats till end of the symptoms
  Choose clusters with probability > threshold in database.
  Print results.
}[2]
    
```

VII. RESULTS AND DISCUSSION

The proposed chatbot was created named ”MEDOBOT”. The medobot is linked with a facebook page called medical chatbot. The medobot uses messenger API to work. It runs on messenger app and you can access the chatbot anytime from anywhere. Since the chatbot is linked to a facebook page it accesses your location along with your name and details and prescribes you medicine accordingly. Moreover, the chatbot contains a “more..” button that contains a URL that directs the user to an online medical store for further assistance. This chatbot can be of great use who are not willing to step out and buy medicines or go to a doctor. The chatbot can also make you talk to a doctor if the user wants using the button “doctor”.

Sr.No.	Input	Reply
1	default	Can you be more specific?
2	hi	Hi, This is Medobot! Nice to meet you. What is your concern
3	I have fever cold headache	You can take levocetirizine or plain cetirizine tablets with paracetamol (advised 500mg)
4	High fever	You can take levocetirizine or plain cetirizine tablets with paracetamol (advised 500mg) with “more..”
5	Contact doctor	“doctor”

VIII. SCREENSHOTS



IX . CONCLUSION

Therefore, a chatbot can be used to not only to chat and get information but it takes artificial intelligence in a whole new light. The main advantage of a chatbot is that it can provide services at any given rate. The project is based on a digital medical aid through a smart bot using machine learning. There is a desperate need of a chatbot that helps a user at any time and at any place with their fundamental medical needs. Every time a person gets uneasy or has any sort of illness or disorder, that person can just chat with the bot. In this way the user can get to know what the possible causes and effects of their particular symptoms are and then determine the illness and take appropriate actions. Basically, the purpose of this bot is to act as a friendly healthcare assistant that helps users with their medications. It can also help in assisting surgeries in the near future.

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