Implementation of Health Care Chat-Bot using Python

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Abstract— **A chatbot is an artificial intelligence computer program which performs communication using text, audio and video systems. A person can ask any questions and chatbot will answer accordingly. The main objective of this research work is to create a web UI HealthCare Chatbot, and also about sample web and text messaging interfaces that demonstrate the use of API.**
Keywords—Artificial Intelligence, ChatBot ,Natural Language Understanding.

I. INTRODUCTION

For a long time, researchers in artificial intelligence (AI) have been intrigued by the idea of developing a conversational agent that is capable of having a coherent conversation with humans. Recent breakthroughs in semantics and speech recognition have given rise to hopes for robust solutions to the problem. Major information technology companies have released digital assistants and chatbot frameworks to facilitate the building of conversational agents.

However, research studies on the user perception and expectations from users of chatbots indicate that the systems still require significant improvements in order to provide a meaningful experience. Also, demand analysis identified a need for specialized digital assistants in customer facing processes, in particular in the insurance sector. A promising approach to advance in this field is comprehensive knowledge engineering methodologies which back the chatbot and upgrade its conversational capabilities from small talk to domain expert.

Ever since the COVID-19 pandemic started there has been a drastic change in everyone's life. The pandemic has paved the way for new problems to arise. Among them, one is to visit the doctor's office without getting infected. Many times, many people fear going to the doctor for a normal checkup because of COVID-19. The coronavirus pandemic has made us use the virtual space more. WFH has been implemented, home delivery is increasing and the reasons that people have for going out has become considerably low. So why not create a robot which can help you diagnose your normal health related issues without physically going to hospital.

Chat has become the center of focus in this current era; thus, the bots are being utilized to deliver information engagingly and conveniently. A chatbot is standout amongst the most progressive and promising tools of communication among people and machines. Famous chatbots like Google Assistant, Amazon Alexa, Siri, Facebook, Slack, and many more are in trend. These are very helpful, but in this era of enhancing technology, day by day technology gets updated, and accordingly, user expectations also increase. A user wants more automation in the chatbot. Although every system is not perfect there is always a flaw in the system, so as in the chatbot there are some problems that the user has experienced while using a chatbot.

A bot is trained on and according to the training, based on some rules on which it is trained, it answers questions. It is called a ruled based approach. Using these ruled based approach, creation of these bots becomes relatively straight forward. But it is not sufficient for the bot to answer questions whose pattern does not match the rules on which it is trained. The language by which these bots can be created is Artificial Intelligence Markup

Language (AIML). It is a language based on XML which allows the developer to write the rules which bot will follow.

Motivation of research problem

This study centers on giving an ease to the people by creating a Healthcare Chatbot that will help the patient to get answers of the common questions using the symptoms given by the patient and chatbot will answers to the question accordingly. This will be beneficial to the following

- Patients – This will help them to get the solution to their symptoms without actually going to the hospital and making contact with the doctor.
- Doctor - This will help doctors as well. They don't need to waste their time seeing the normal symptoms of the patient and they can focus on other important patients and clients.

II. LITERATURE SURVEY

[1] An application of counseling chatbot, which provides conversational service for mental health care based on emotions recognition methods and chat assistant platform. This application doesn't consider the user's psychiatric status through continuous user monitoring.

[2] In this text-based healthcare chatbots can be designed to effectively support patients and health professionals in therapeutic settings beyond on side consultations. It does not have face to face care and where THCB are likely to fail.

[3] This paper reports a primary care chatbot system created to assist healthcare staff by automating the patient's intake process. In his paper they did not include more disease and also a symptom synonym thesauri also should be produced.

[4] This provides a text-to-text conversational age that asks the user about their health issue. The user can chat as if chating with a human. The bot then asks the user a series of questions about their symptoms to diagnose and gives suggestions about the different symptoms to clarify the disease. Doesn't give detailed information No features such
as duration, intensity of symptoms etc.

[5] The proposed method is a chatbot based mobile healthcare service that can immediately respond to the accidents that arise in everyday life and to the condition changes of chronic-disease patients. Also proposes a framework for the human-robot interaction that can endure an efficient implementation of the chatbot service. It is a text based bot irrespective of having all advanced features.

[6] Conversational agents have many technical, design and linguistic challenges. They introduced the nature of conversation user interface(CUI) for health and described UX design. Some technical limitations like voice message are not accurate, some corruptions are faced due to the network so the timing of bot remainders is corrupted.

[7] The Bot Transition program provides a framework and resources based on AAP, AFP and ACP recommendations to promote skill attainment in self-care. A scripted text messaging platform is feasible and appears to be well-received by patients and caregivers. It is designed only for people with special health needs transitioning into adolescents.

[8] The system uses a question and answer protocol in the form of a chatbot to answer users' queries. The complex questions and answers present in the database are viewed and answered by an expert. This chatbot is comparatively time consuming.

[9] This chatbot is an attempt to let users understand the symptoms they are facing and get a basic diagnosis about the disease they could be having. Complex interface, time consuming, high installation cost.

[10] A chatbot is an interactive software application to simulate natural user interactions based on AI modeling. We have proposed a dataset for the commonly occurring medical conditions together with a prototype model to provide quick assistance to the patients.It only gives solutions for the common medical conditions.

[11] Uses both KNN algorithm and decision tree classifier and from that more accurate one is taken and shows the output. As it uses both algorithms it is time consuming.

III. ANALYSIS OF PROBLEM

A. Research Problem identification

With the chatbot, one doesn't have to wait to talk to the customer helpline, they don't even have to search for shopping through Websites. A chatbot is used in many areas like ordering food, product suggestions, customer support, weather, personal finance assistance, scheduled a meeting, search and track flights, send money, and many more. The main objective that we will discuss in this paper is creating a web UI HealthCare Chatbot, and also about sample web and text messaging interfaces that demonstrate the use of API. In this research paper we are trying to understand these Chatbots and understand their shortcomings.

The technology at the core of the rise of the chatbot is natural language processing 'NLP'. Recent advances in machine learning have greatly improved accuracy and effectiveness natural language processing, making chatbots a viable option for many organizations. This improvement in NLP is firing a great deal of additional research which should lead to be improvement in the effectiveness of chatbots in the years to come. The datasets are taken online.

Most commercial chatbots are dependent on platforms created by the technology giants for their natural language processing. These include Amazon Lex, Microsoft service Services, Google Cloud Natural Language API, Facebook Deep Text, and IBM Watson. Platforms where chatbots are deployed include Facebook Messenger, Skype, and Slack, among many others. The objective of this work is to create a chatbot that can answer your health-related problems. It has an effective User Interface and answers your health-related questions efficiently.

In this Research work, focused on to
- Build a Healthcare Chatbot using Chatterbot and Flask.
- The Chatbot will be trained on the dataset which contains Categories (intents), pattern and responses.
- Chatterbot uses Pattern Matching and Naïve Bayes Classifier to differentiate which category the user's message belongs to and then will give the most probable response from the list of responses.
- The dataset will be in "YAML" format that contains the patterns we need to find and responses we want to return to the user.

B. Methodology identified

A CHATBOT is a normal application which has a database, it has an app layer and APIs to call the other external administrations. However, bots cannot comprehend what the customer has planned. It is a very common problem that must be tackled. Bots are generally trained according to the past information which is only available to them. So, in most of the organizations, chatbot maintains their logs of discussions so that they can understand their customers behavior. Makers utilize these logs to analyses what clients are trying to ask. Designers coordinate their client inquiries and reply with the best

appropriate answer with the blend of machine learning tools and models. Training a chatbot is very much faster and also on a large scale as compared to human beings. A Healthcare support chatbot is filled with a very large number of conversation logs which help the chatbot to understand what kinds of questions should be asked and answers should be given.

The working of chatbots is based on three classification methods:

1. **Pattern Matching** : The pattern matches to group the texts are utilized by the bots and it produces an appropriate response to the customers. The standard structured model of these patterns is "Artificial Intelligence Markup Language". A simple pattern matching example -

```
<aim l version="1.0.1"encoding="UTF-8"?>
<category>
<pattern>WHO IS ABRAHAM LINCOLN </pattern>
<template>Abraham Lincoln was the US President during American civil war. </template>
</category>
<category>
<pattern>DO YOU KNOW WHO*IS</pattern>
<template>
<srai>WHO IS <star/></srai>
</template>
</category>
</aiml>
```

The machine then gives and output:

Human: Do you know who Abraham Lincoln is?

Robot: Abraham Lincoln was the US President during the American civil war.

Chatbot knows the answer only because his or her name is in the associated pattern. Similarly, chatbots respond to anything relating to the associated patterns. But it cannot go beyond the related pattern.

2. **Natural Language Understanding (NLU)**: Finding the way to convert the user's speech or text into structured data is called Natural Language Processing. It is used to get relevant answers for the patients. To develop a chat bot, one must be very clear about what one wants from that chatbot. Often, they are developed for business platforms like Net Banking sites to handle customer Q&A. Another type of chatbots widely developed and used are smart assistants like SIRI, Google assistant, Alexa, Cortana etc. We are creating a health chatbot. So, the questions will be related to health, diseases only. The following is a simple class diagram of chatbot showing basic functionalities of it:
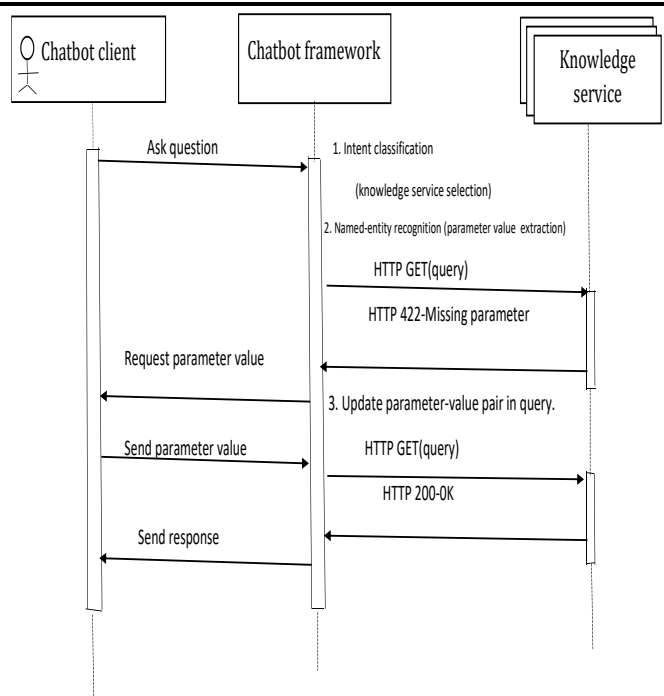

Figure : Natural Language Understanding(NLU)

3. **Naive Bayesian Classification Algorithm:** It is a classification technique based on Bayes' Theorem with an assumption of independence among predictors. In simple terms, a Naive Bayes classifier assumes that the presence of a particular feature in a class is unrelated to the presence of any other feature. For example, a fruit may be considered to be an apple if it is red, round, and about 3 inches in diameter. Even if these features depend on each other or upon the existence of the other features, all of these properties independently contribute to the probability that this fruit is an apple and that is why it is known as 'Naive'. Naive Bayes model is easy to build and particularly useful for very large data sets. Along with simplicity, Naive Bayes is known to outperform even highly sophisticated classification methods.

Chatterbot uses the Naive Bayes classifier to get the correct response for the patient. In this approach a closed domain dataset containing questions/user-responses and corresponding answers is made, in which each question/user-response is given a label, this label relates the question to its answer. Because multiple questions could have the same response, there can be multiple questions having the same answer. see instance

hi		there		1
hello	how	are	you	1
what	is	your	name	2
who	are	you		2
you	are	who		2
my	name	is		2
how	old	are	you	3
what	is	your	age	3
are you getting older 3				
what about your age				3

The labels/digits at the end are nothing but the index of answers in our answer's dataset.

Hi there, how are you!?
My name is etcetera, but you can call me etc.
I'm 22 years old.

IV. SYSYTEM DESIGN

Figure : Naïve Bayesian Algorithm

The notion here is that the Naive Bayes classifier will predict the label based on the input we give it. So when you say 'hi' our classifier will predict the label '1', which in return we can use to find a suitable answer. When the input is 'what's your age?' classifier will predict the label '3', which is an index of the answer 'I'm 22 years old'. The below figure will dissolve any misgivings you have about the notion.

Abbreviations and Acronyms

An untrained instance of ChatterBot starts off with no knowledge of how to communicate. Each time a user enters a statement, the library saves the text that they entered and the text that the statement was in response to. As ChatterBot receives more input the number of responses that it can reply to and the accuracy of each response in relation to the input statement increases.

The program selects the closest matching response by searching for the closest matching known statement that matches the input, it then chooses a response from the selection of known responses to that statement. Figure explains working flow.
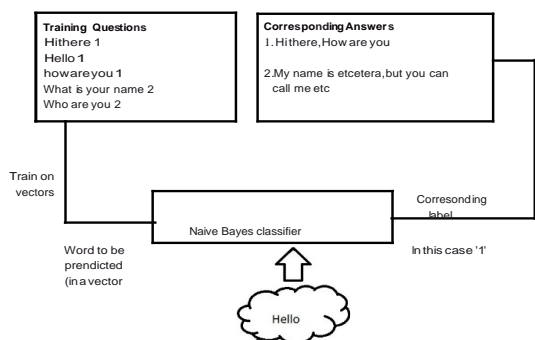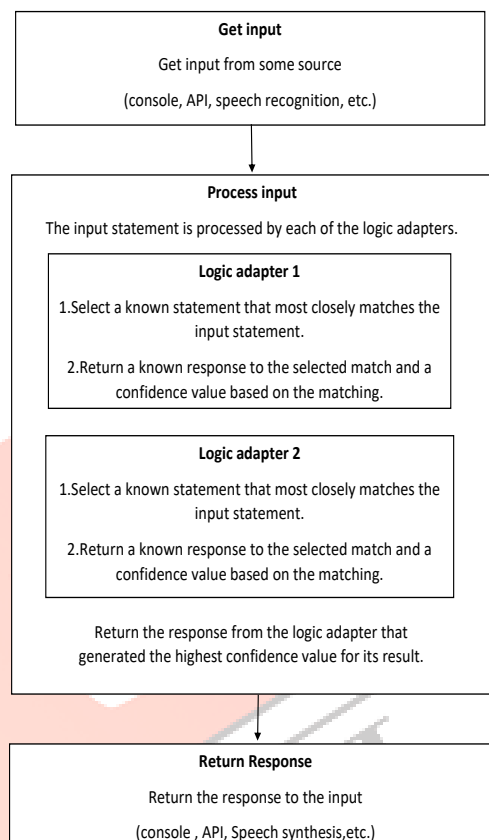

RESULT ANALYSIS

The proposed system is fully automated. The query or issue will be answered basis the question and knowledge base automatically. Hence there is no need to have a person (Doctor) to answer the queries and ease for the patients to interact with the queries. Patients can interact with the healthcare Chatbot in a very simple manner. The focus now is on developing the bot in a more intellectual way that it can even understand not so well grammatically defined sentences. Bot uses Chatterbot library, pattern matching and Naïve Bayers Technique to parse the patient's issues.
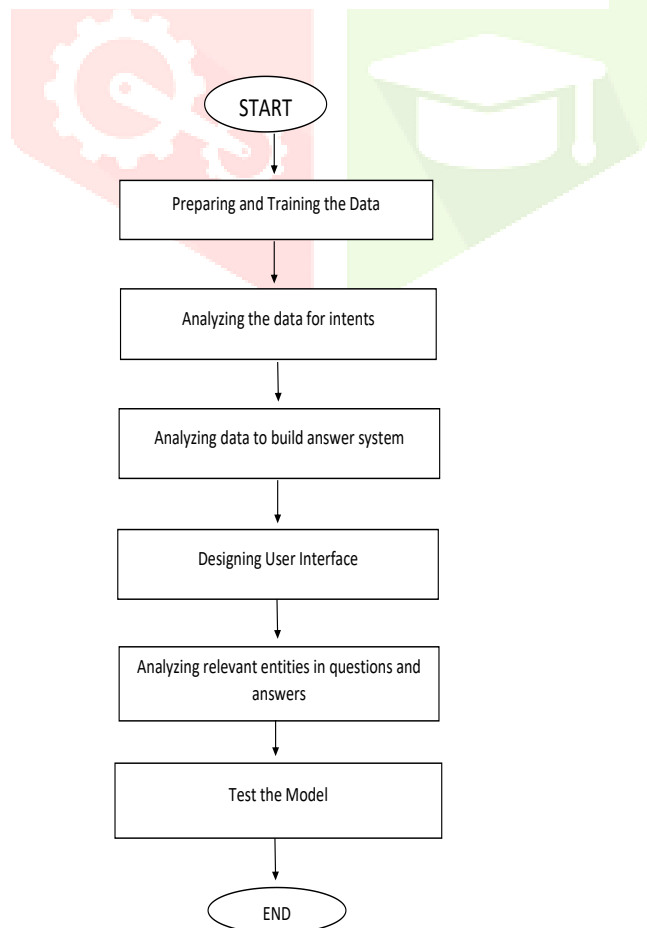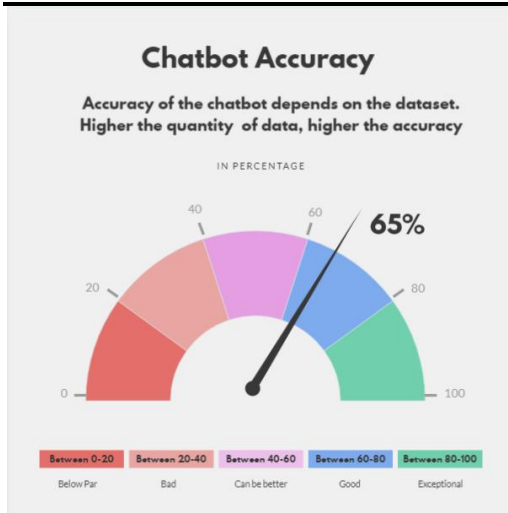
Figure: Chatbot Accuracy

V. CONCLUSION

From developing and implementation perspective, chatbots or smart assistants with artificial intelligence are dramatically changing businesses. Chatbots are the new resolution especially for college websites, and ecommerce websites etc. They will reduce the customer or user service and have a significant impact on time and saving money. Chatbots provides easy and quick information to the user. And resolve many issues and queries at same time.

There are many different aspects of the implementation of a chatbot and its working with many different conversational interfaces and data sets have been presented which included interaction, the user experience design and a general reusable software architecture of chatbots.

Some of the characteristics of chatbot application were viewed as appropriate for the given context, like "effectiveness" If the Healthcare chatbot is to be further developed, this could be something to draw upon. Through this prototype try to touched when making the chatbot which gives proper solution to healthcare.

Figures and Tables

Terminology Detection Test Using General Word Percentage Approach:

Using General Word Percentage analysis we would get a ratio of number of unrelated words used over the total number of words in a message [12]. This would give us an idea about how our Chatbot could deal with unrelated words mixed with medical terminologies. We would take some sample corpus to do this test. We would check whether our Chatbot detects medical terminologies messages for our sample corpus.

Sample Corpus:

1. Hello Chatbot! I am feeling good today! Also I am having a headache.

2. I can't handle this headache, also I feel like vomiting. My digestion is not okay.

3. Is brain cancer curable? I think I am suffering from it.

4. I think I have cancer. I am feeling like vomiting. I want remedies for typhoid.

5. I am feeling like vomiting

Corpus Number	GWP Ratio	Terms Present	Terms Detected	Term Detection
1	0.923	1	2	0.500
2	0.800	3	1	0.330
3	0.900	1	0	0.000
4	0.860	3	3	1.000
5	0.200	1	1	1.000
Average:	0.736	1.8	1.4	0.566

Ratio Calculation :

GWP Ratio= Total Number Of Unrelated Medical Words / Total Number Of Words Term Detection Ratio= Term Detected / Term Present

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