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A Survey on Chatbots in Healthcare

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***Abstract*: Chat bots are clean to apply and simulate a human communique through textual content or voice through smartphones or computers. The present-day wave of studies has taken up the assignment of selling wholesome life with advances in synthetic intelligence (AI). In the sphere of fitness, chat bots can enhance affected person information, monitoring, or remedy adherence. This paper offers a complete assessment on AI chat bots as a revolutionary technique providing greater simplicity and facilitating long-time period adherence to fitness advertising interventions. Additionally, this assessment offers a state of affairs wherein chat bots are powerful and safe, they may be prescribed like a drug to enhance affected person information, monitoring, or remedy adherence.**

***Keywords*: Artificial Intelligence (AI), Chat bots, NLP, Naïve Bayes, Health care.**

1. Introduction

Chat bots are software program that interacts with customers with the aid of using the usage of an algorithm, without human back-cease intervention. In the sector of healthcare, chat bots are a brand-new virtual communique channel, similar to web sites and cellular applications. They are clean to apply and simulate a human communique via textual content or voice thru smartphones or computers. One of the primary features of chat bots is to reply human requested questions. A lot of sicknesses may be cured if recognized properly in advance. A chat bot is a human-gadget interface which interacts or communicates via textual or speech mechanisms. Today Chat bots are developing at a tempo what web sites had been in past due 1990's and 2000.

2. Literature Survey

Divya S, Indumathi V, Ishwarya S, Priyasankari M, Kalpana Devi S [1] stated that NLP is used for interpreting the user input and generating the response.

Chat bots can provide low costs and improved treatments. NLP and pattern matching algorithms are useful in development of chat bots.

Symptoms are extracted using string searching algorithm. More features like location, duration and intensity of symptoms can be added.

Abdullah Faiz Ur Rahman Khilji, Sahinur Rahman Laskar, Partha Pakray [2] stated that A dataset is prepared first the analysed by the experts. Pre-processing like removal of stop words, tokenization and stemming. Personally, speaking to doctors and their intervention is very important. Easier set of questions should be asked to avoid confusion and for proper diagnosis by representing user's message as a Bag of Words (BOW), we can create feature vectors. Take advantage of a user experience survey to measure the healthcare domain's performance.

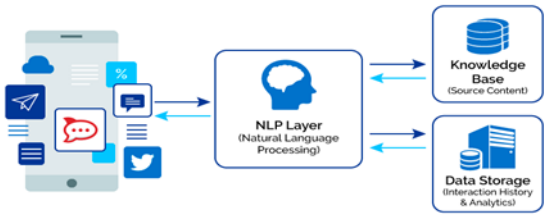

Fig. 1. Overview of working of chat bot model

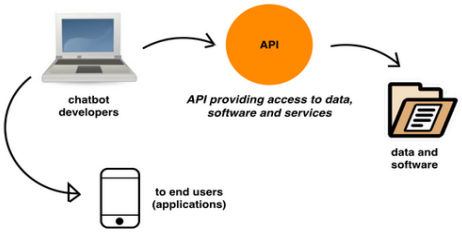

Fig. 2. Working of Chat bot APIs

Chethana R. Murthy, Kavitha B. R. [3] stated that to reduce healthcare cost and time. RDBMS is used to store the input. Ranking and sentence similarity are implemented using N-grams, the TF-IDF, and cosine similarity. Question and answer protocols are used to determine ranking.

It concentrates on text and uses question and answer protocol.

The emotions in text are captured using RNN, deep learning, convolutional neural network.

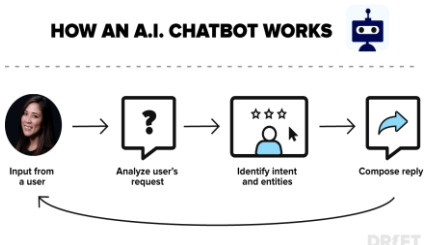

Fig. 3. AI chat bot working

Tamizharasi B., Jenila Livingston L.M. and S. Rajkumar [4] In the article, the authors discuss the use of medical chat bots that use machine learning to forecast disease. The scientific

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field has developed many machine learning algorithms to predict diseases. Using Support Vector Machines, one can achieve precise prediction and enhance the predictive model's efficiency. The system achieves the casual chat style using Natural Language Processing (NLP). People can utilize this approach to reduce hospital stays and receive low-cost or free healthcare services.

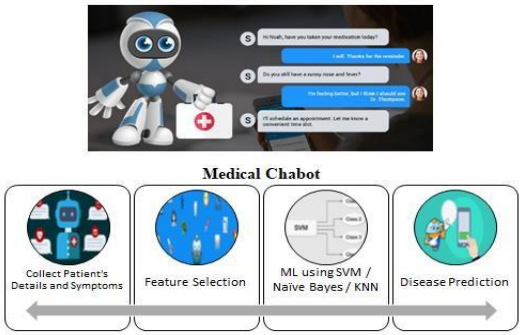


Fig. 4. Medical chat bot

Tom Nadarzynski, Oliver Miles, Aimee Cowie and Damien Ridge [5] stated that most net customers could be receptive to the usage of fitness chat bots, AI has been carried out in medication and numerous healthcare offerings inclusive of diagnostic imaging and genetic diagnosis, in addition to medical laboratory, screening, and fitness communications. Chat bots, as a part of AI devices, is herbal language processing structures performing as digital conversational agent mimicking human interactions.

3. Proposed Approach

We will use python in our project as it makes coding a lot easier with its already defined libraries and models. To construct a talk bot in Python, we need to import all of the vital applications and initialize the variables we need to apply on your chat bot project. Also, we ought to take into account that after running with textual content facts, we want to carry out facts preprocessing on our dataset earlier than designing an ML model.

Fig. 5. Steps to make chat bot with python

NLP-Engine:

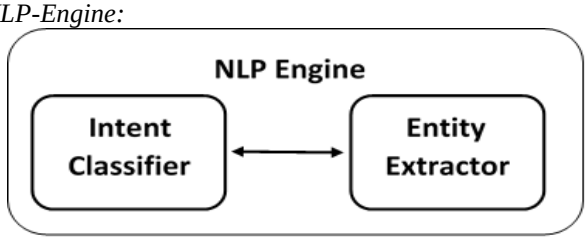


Fig. 6. NLP Engine

It' more sensible to use in-house chat larvas once you're conducting a context-based chat. For example, suppose customers raise a specific question like: "Show me the main points of the orange product." a talk bot is unlikely to be ready to retrieve the data concerning what the orange product was within the database. Context is a key consideration in this scenario and moreover, these scenarios are dynamic. Cloud-based providers do not fit the bill here because they are built for generic target market use cases. This is where in-house NLP can be prized possessions. This NLP Engine elucidate natural language and transmogrify it into constructed language.

The architecture of this Engine is composed of two parts:

1) Intent classifier
2) Entity extractor

1) Intent Classifier

The intent classifier takes the user's input, deciphers its meaning, and associates it with one of the chat bot's supported intents. This is known as intent classification. A classifier is a tool for categorizing data - in this case, a text - into multiple categories. Chat bots will classify each piece of a sentence into broken down categories to comprehend the intention behind the input it has received, similar to how people classify objects into sets, such as a violin is an instrument, a shirt is a type of apparel, and happiness is an emotion. Developers have a number of alternatives in this regard:

- Pattern Matching: Pattern matching is the process of identifying patterns in incoming text and categorizing it into various intentions.
- Machine Learning Techniques: Creates a multi-class classification using a variety of machine learning algorithms.
- Neural Networks: These networks use fine word embedding to learn from text.

2) Entity Extractor

Entity extractor is what extracts key data from the consumer’s query. It extracts unique data like:

- Type of dish consumer desires to have
- Time of the order
- Type of the difficulty consumer is facing
- Customer’s name, tele cell, smartphone number, deal with and different details

Even with a voice chat bot or voice assistant, the voice instructions are translated into textual content and once more the NLP engine is the key. So, the structure of the NLP engines may be very vital and constructing the chatbot NLP varies primarily based totally on consumer priorities. There are a whole lot of components, and every element works in tandem to satisfy the consumer’s intentions/problems.

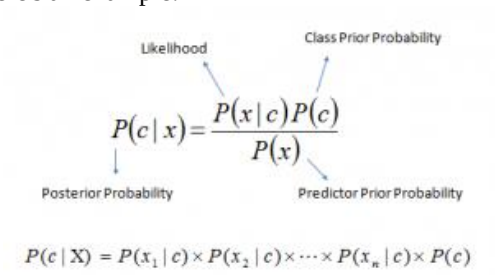
- Understanding Speech: When the consumer says something, the chat bot ought to be capable of depict what he's announcing and what his aim is. Based on this, the chat bot has to act accordingly.
- Maintaining Context: Chat bots have to be smart sufficient to recognize what consumer context is. At times, the consumer might also additionally use the equal phrases in unique contexts. This aspect is a not unusual place requirement.

Custom Question and Answer System: Let's say the consumer is looking a few questions associated with a dynamic expertise bank. Where the query requested with the aid of using the consumer calls for the chat bot to look throughout agency documents, policies, CRMs, ticketing info, and so on.

Naive Bayes algorithm:

Naïve Bayes is any other green set of rules used for chat bot. In this set of rules step, one is tokenization after which stemming. In tokenization, the complete sentence is split into phrases known as tokens Essentially, this is a Bayesian method of classifying data that assumes that each predictor is independent with regard to others. Naive Bayes assumes that the presence of a particular feature in a class has no effect on other features in that class.

For example, a red, round, and about 3-inch diameter apple may be considered an apple if it has these characteristics. The fact that all of these traits are independent of each other or the existence of a particular feature increases the probability that this fruit is an apple, and for this reason it is called 'Naive'. Tokens are then stemmed. The Bayes theorem describes how to calculate posterior probabilities P(c|x) from P(c), P(x), and P(x|c). Here's an example:



Above,

- P(c|x) is the posterior probability of class (c, target) given predictor (x, attributes).
- P(c) is the prior probability of class.
- P(x|c) is the likelihood which is the probability of the predictor given class.

P(x) is the prior probability of the predictor.

Technologies used in chatbots:

Artificial intelligence (AI), natural language processing (NLP), and machine learning are chatbot underlying technologies. They bring chatbot innovation, hence brand communication, to an entirely new personalized level.

Artificial intelligence (AI), herbal language processing (NLP), and device mastering are chatbot underlying technologies. They deliver chatbot innovation, therefore logo communication, to a wholly new customized level. Artificial Intelligence offers a human contact to each communique chatbot strikes. The bot is familiar with the user's question and triggers a correct reaction. The manner human beings are capable of recognize every other's subject and provide a reaction accordingly.

Chatbot with AI powers makes your bot successful and wise to reply complicated queries. The interplay is engaging, conversational, and lively. Chatbot learns from each communique it has with the customers. It is going via the preceding interplay to enhance the modern-day reaction. This hobby enables to enhance the performance of bot reaction.

Smart interactions shop customer's time with the aid of using assisting them to discover the proper facts and cope with their queries. Artificial intelligence has greater to serve us as a technology. And chatbot is one of the factors below it. A chat bot without AI is only a FAQ answering bot. Artificial Intelligence makes use of vital factors that assist the chatbot to strike correct responses.

Machine Learning:

Machine gaining knowledge of is a set of rules that facilitates the chatbot to analyze from queries and the facts furnished with the aid of using you in the course of bot training. When a question is triggered, Machine gaining knowledge of facilitates the bot to first reveal the beyond communique it had with the consumer and deliver a reaction accordingly.

NLP:

Natural Language Processing is popularly called NLP, which affords help to the bot to apprehend and interpret the statistics closely. With NLP, you teach your chatbot with diverse intents that the person will kind at some point of the communication and those intents will streamline the reaction to the query. NLP works with special Intent and Entity.

Chat bot APIs:

A chat bot API is an API that gives functions for inventors to make chat bots. Chat bot APIs assist integrate herbal language processing (NLP) to make a powerful chat bot — they take with inside the request, prize the purpose or that means of the communication, and supply the reaction. An API, additionally referred to as a utility programming interface, is essentially a "ground" that lets in operations to speak to at least one another. An API essentially is a bridge of request and reaction obtained among the packages running together.

So, for any precise request or assertion being stated with the aid of using the consumer, the API essentially facilitates in turning it into a few forms of action (informing the consumer approximately the rainfall, putting an order, or certainly answering a widespread question).

These are two chat bot APIs used to build efficient and powerful chat bots:

1) Wit.ai API
2) Brainshop.ai API

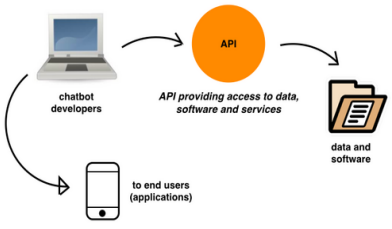


Fig. 7. Working of API Chat Bots

Table 1
Comparative analysis

Authors	Date	Dataset	Methods	Accuracy
Abdullah Faiz Ur Rahman Khilji, Sahinur Rahman Laskar [2]	2020	162 questions were considered as dataset (evaluated on the scale of 3)	RASA Framework	46.50%
Sagar Badlani, Tanvi Aditya, Meet Dave [6]	2021	Disease dataset (75% for training and 25% for testing)	SVM, KNN, Naïve Bayes	SVM 94.66% KNN 88.66% Naïve Bayes 80%
Soufyane Ayanouz, Boudhir Anouar Abdelhakim [7]	2020	Public datasets on healthcare	SMF (Sequential matching framework)	80%
Divya, Indumathi, Ishwarya, Priyasankari, Kalpana Devi [1]	2018	Dataset extracted from patient's inputs.	String searching algorithm	80%
Manish Bali, Samahit Mohanty, Subarna Chatterjee [8]	2019	Pima Indian Diabetes Dataset	Random Forest, K-nearest, Naïve Bayes	Random Forest 80%, K-Nearest Neighbor 73%

4. Conclusion

From the evaluate of various journals, its miles concluded that, using Chat bot is person pleasant and can be hired through any man or woman who is aware of the manner to kind of their personal language in cellular app or computing device model. A clinical chat bot affords customized diagnoses supported symptoms. In our work, we have got supplied a dataset appropriate for education a Healthcare Chat bot. We additionally supplied the prototype model of our system. Within the future, the bot's symptom reputation and prognosis overall performance is probably significantly advanced through including help for extra clinical features, which includes location, duration, and depth of symptoms, and extra unique symptom description.

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