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"Utilizing Chatbot Technology to Enhance Patient Outcomes"

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ABSTRACT

Machine learning (ML) and artificial intelligence (AI) are now pervasive in our lives. There are several cutting-edge gadgets that will make our life easier and more convenient. The technology behind virtual assistants like chat bots is improving in this regard. A chat bot may be able to accurately diagnose a user's problem based on their replies; while in the past assistants were confined to a small set of frequently asked questions (FAQs). A large and accurate database of medical diseases and their symptoms will be used to train the algorithm. The proposed model uses a decision tree approach to assess the patient's complexity and provide a result. In response to the user's inquiries, a desired and highly accurate diagnosis is created. Machine learning (ML) and artificial intelligence (AI) are two technologies that are quickly developing and finding widespread use in modern society.

These innovations might tremendously aid us and make our lives much easier. The creation of chat bots and other forms of virtual assistance are a prime example of this phenomenon in action. Previously, these assistants could only respond to a small set of FAQs, but now they can provide precise diagnoses depending on user input. To train this cutting-edge chat bot technology, the system would be fed a comprehensive and accurate database of medical diseases and their associated symptoms, according to the model presented. The system uses a decision tree algorithm to analyze the patient's state and come up with a diagnosis. In response to user input, the system provides a personalized and precise diagnostic. This innovation may completely alter the healthcare system, making it more user-friendly and cost-effective for everyone. Patient outcomes and the quality of treatment as a whole may both benefit from the use of AI and ML.

INTRODUCTION

In today's knowledge-based economy, only the most well-informed businesses will succeed. When information is entered into a computer more efficiently with the aid of artificial intelligence (AI), it has a positive impact on people's lives. The chat bot is nothing more than a bunch of code executed by some piece of software that is intended to simulate human conversation for the purpose of gathering data. Depending on the user's answers, diagnostic questions designed to assist pinpoint a specific illness or health issue will be posed. The patient's search for a suitable physician will be facilitated by this. For instance, if the chat bot diagnoses the patient with heart issues, the patient may decide to consult a cardiologist for additional testing. The catboat's quick and accurate diagnosis is a result of its personalized approach to each individual user. Chat bots powered by AI can expedite the decision-making process and improve the quality of data on which people and businesses rely. By making initial diagnosis and referring patients to the right experts, they may also help doctors save time. Patients may benefit from quicker therapy as a result. Overall, we may be able to make better choices and have higher quality of life thanks to the advent of AI and chat bots. Only the most well-informed businesses can hope to succeed in today's knowledge economy. When information is entered into a computer more efficiently with the aid of artificial intelligence (AI), it has a positive impact on people's lives. The chat bot is nothing more than a bunch of code being executed by some piece of software that is meant to simulate human conversation for the purpose of gathering information. Based on the user's answers, the app will try to diagnose a disease or health issue. The patient will be helped in their search for the right physician. For instance, if the chat bot diagnoses the patient with heart issues, the patient may decide to consult a cardiologist for additional testing. The catboat's quick and accurate diagnosis is a result of its personalized approach to each individual user.

LITERATURE SURVEY

In our research, we considered a number of existing, high-quality chat bots for the healthcare industry. Our model, which interacts with the user via questions and answers, is the main emphasis of this study. The chat bot will seem more like a real person talking to the user. Our catboat's diagnosis will be more precise than that

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of competing algorithms since our data collection is more complete and accurate. Our data allows for precise inferences and improved outputs based on precise diagnosis. The catboat's algorithm, a decision tree classifier, ensures accurate diagnosis. The results from the algorithm are faster and more accurate.

[1] An implementation of a counseling chat bot, which uses emotion detection techniques and a chat assistant platform to provide a conversational solution for mental health treatment. This program does not take into account the user's mental health by constantly monitoring their behavior.

[2] Beyond bedside consultations, this environment enables the development of text-based healthcare chat bots that may provide useful assistance to patients and healthcare workers in a variety of therapeutic contexts. Where THCB are likely to fail, it does not provide face-to-face treatment.

[3] This article details the development of a primary care chat bot system intended to facilitate the work of healthcare professionals by automating the patient intake procedure. Not all diseases and symptoms were covered; therefore a thesaurus of symptoms is needed in addition to this document.

PROPOSED SYSTEM

Our proposed design has a chat window aimed at the patient, giving them the impression that they are communicating with a real person. The chat bot displays a question-and-answer format, in which the user is prompted to describe their symptoms and the intensity and duration of their symptoms. The app tells the user how bad their ailment is and recommends an appropriate specialist.

OBJECTIVE

The goal is to create diagnostic software in the form of a chat bot or virtual assistant that can accurately parse user input. The model will use a decision tree approach to identify the patient's complexity and deliver a result, and it will be trained using a broad and accurate database of medical disorders and their related symptoms.

Overview

Artificial intelligence and machine learning (ML) are pervasive in our modern lives. There are several cutting-edge gadgets that will make our life easier and more convenient. The technology behind virtual assistants like chat bots is improving in this regard. A chat bot may be able to accurately diagnose a user's problem based on their replies, while in the past assistants were confined to a small set of frequently asked questions (FAQs).A large and accurate database of medical diseases and their symptoms will be used to train the algorithm. The proposed model uses a decision tree approach to assess the patient's complexity and provide a result.

METHODOLOGIES

MODULES NAME:

1. User Interface Design
2. Python
3. chat bot
4. User

User Interface Design

There have been several alterations to our regular routines as a result of technological development. One such shift is the rise of automated helpers like chat bots and virtual assistants. Previously, these assistants could only respond to a small set of FAQs, but now they can provide precise diagnoses depending on user input.

The catboat's user interface should be designed with the end user in mind. The user should be able to quickly and easily enter their symptoms and be led through the diagnostic procedure with the help of a straightforward UI and helpful hints. The design should also accommodate users of varying skill levels, making the UI user-friendly for everyone. A decision tree methodology might be used in the development of this catboat's user

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interface. The chat bot has to be taught about medical disorders and their symptoms from a complete and reliable database. The chat bot may then utilize this data to diagnose the patient correctly, regardless of the severity of their disease.

Fig 1; User Interface Design

Python

What Is a Script?

So far, I have mostly discussed Python's ability to be utilized in an interactive setting. This is a fantastic tool that enables you to write code and see it execute in a live, interactive setting.

Scripts are reusable:

The statements that make up a Python program are kept in a text file called a script. The script may be used again and over again once it has been written.

Scripts are editable:

Chat bot

The goal of this project is to create a chat bot that can provide reliable medical diagnosis in response to user questions. A large database of medical illnesses and symptoms will be used to train the chat bot, which will then use a decision tree approach to assess the patient's complexity and respond accordingly. Over time, chat bots have progressed from being able to answer basic FAQs to being able to provide unique solutions. Based on the user's symptoms, the chat bot will make an accurate diagnosis. A chat bot that may enhance patient outcomes can be developed by combining a thorough database with a decision tree approach.

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User

This is the fourth and final phase of the project. The user must first report symptoms and answer health-related questions in this section. The chat bot will then use the user's reported symptoms to identify potential health threats and advise the user on how to proceed.

REQUIREMENT SPECIFICATION

User-centered design using a graphical user interface.

Operating Systems supported

- Windows 7
- Windows XP
- Windows 8

Technologies and Languages used to Develop

- Python

Debugger and Emulator

Any Browser (Chrome in Particular)

FUNCTIONAL REQUIREMENTS

A software system's or its part's functionality is specified by its functional requirements. Inputs, actions, and outcomes all go into defining a function. That begin, this is the first attribute-based de-duplication solution that use the gold-standard concept of semantic security to protect user privacy.

(Artificial Intelligence)

The human race has always, and will always, be hungry for new ways to improve their quality of life. What a human mind is capable of doing has always amazed me. Artificial intelligence (AI) is one such ground-breaking innovation. What if robots have the capacity for thought? To put it simply, AI is that. We people are intelligent only by nature. It would be artificial if robots could think, however. Therefore, AI refers to any and all intelligent devices.

Here are some applications of AI currently in use. The first thing that enters my head is a robot. They are artificial entities designed to seem like people. They have the ability to reason and make critical choices without guidance from a human being. Artificial intelligence (AI) is the study and development of computer

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systems capable of performing activities normally requiring human intellect. The purpose of artificial intelligence is to provide computer programs and systems with the ability to acquire knowledge, reason, anticipate outcomes, and act accordingly. There are two broad classifications of artificial intelligence systems: weak AI and strong AI. Narrow AI is programmed to carry out one or a small number of specified tasks, such as recognizing images or voices or learning to play a game. However, generic artificial intelligence (AI) can learn and solve problems much like a person.

HARDWARE REQUIREMENTS

- Operating System: Windows 10
- Processor : Intel Core i3-2348M
- CPU Speed : 2.30 GHz
- Memory : 2 GB (RAM)

SOTWARE REQUIREMENTS

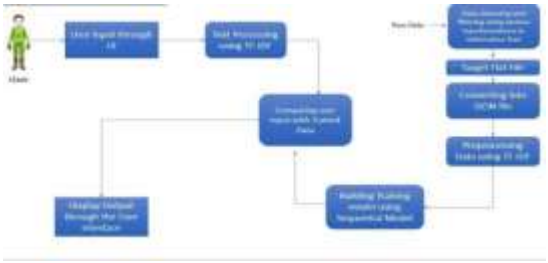
- Tensor Flow, NumPy, Pandas, Matplotlib, Scikit-learn, etc. are all Python packages.
- Python 3.7 as a Tool

PROPOSED WORK

Our proposed design has a chat window aimed at the patient, giving them the impression that they are communicating with a real person. The chat bot displays a question-and-answer format, in which the user is prompted to describe their symptoms and the intensity and duration of their symptoms. The user is provided an assessment of the severity of their ailment and recommended next-level care providers.

SYSTEM DESIGN

SYSTEM ARCHITECTURE



Creating a machine learning or deep learning model from text/string data requires a number of pre-processing steps.Term frequency and inverse document frequency, or TF-IDF, is an analysis technique. It is one of the most widely-used methods in the field of information retrieval, and it is used to quantify the significance of a particular word or phrase inside a given text. A three-layer deep neural network is required for response prediction at this time.

INTERFACE PROTOTYPING (UI)

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Figure 2 User Interface Prototype for Chat bot

The user interface (UI) is the interface between the device and the user. Screens, keyboards, mice, and the overall desktop aesthetic may all fall under this category. It's also the method through which a person uses a computer program or the Internet.

DATA FLOW DESIGN

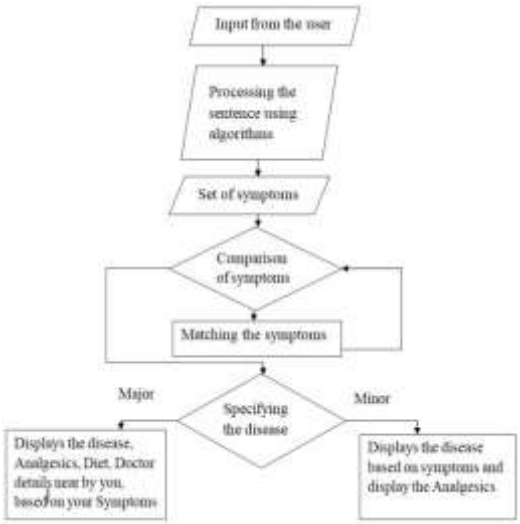

Figure 3: Data Flow Diagram

A data flow diagram is a visual representation of the movement of data inside a system or procedure. It consists of the data's many sub processes, its storage locations, and its inputs and outputs.

USE CASE DIAGRAM

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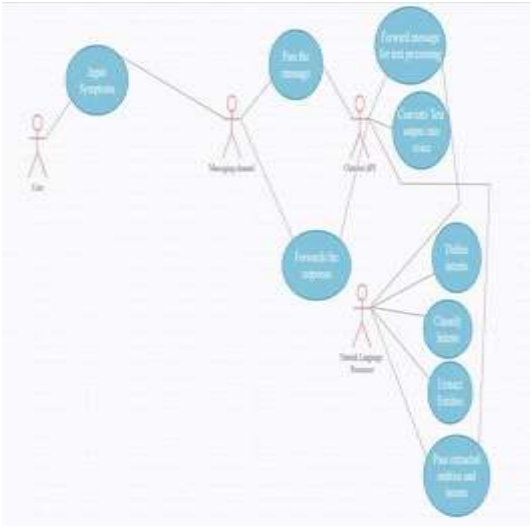

Figure 4: Use Case Diagram

The many ways in which a user could interact with a system are graphically represented in what is called a use case diagram. Often supported by other diagram kinds, a use case diagram displays the system's many use cases and user categories. Use case diagrams are shown as rounded or elliptical shapes.

SEQUENCE DIAGRAM

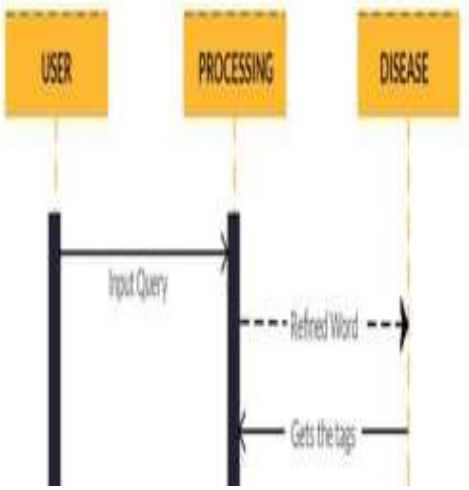

Figure 5 Sequence Diagram

A sequence diagram is a form of interaction diagram because it shows the relationships between things and the order in which they interact. Software engineers and business analysts use these diagrams to better comprehend user needs while designing a new system or documenting an existing procedure.

CLASS DIAGRAM

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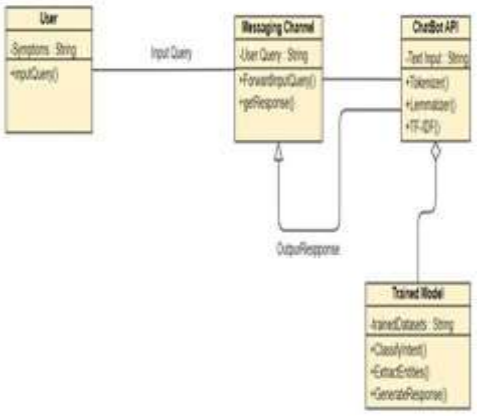

Figure 6 Class Diagram

In object-oriented modeling, the class diagram serves as the fundamental foundational document. Both high-level conceptual modeling of the application's structure and low-level modeling, in which the models are translated into code, may benefit from their utilization. Data modeling is another use of class diagrams.

INTERACTION DIAGRAM

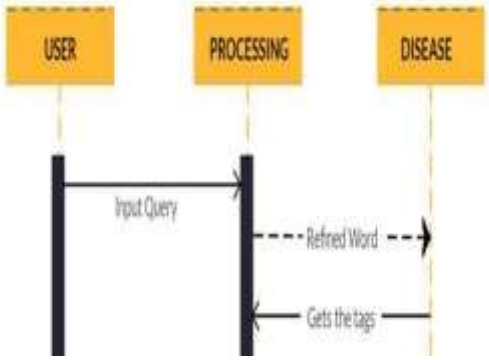

Figure 7 Interaction Diagram

Models describing how a set of things behave together (usually for a specific use case) are called interaction diagrams. Several sample objects and the communications exchanged between them are shown in the diagrams.

STATE/ACTIVITY DIAGRAM

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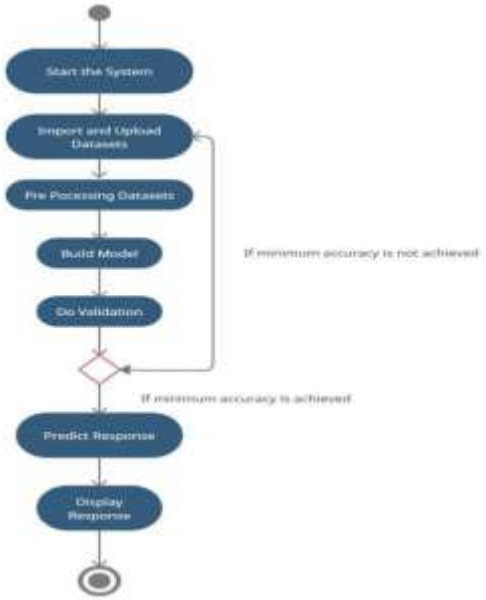

Figure 8 State/Activity Diagram

In computer science and related subjects, one common method of depicting system behavior is via the use of state diagrams. Sometimes this is the case, and other times it is a valid abstraction, but state diagrams require that the system depicted be formed of a limited number of states.

COMPONENT & DEPLOYMENT DIAGRAM

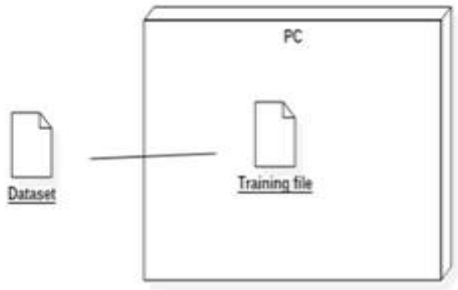

Figure 9 Component & Deployment Diagram

The word "Deployment" tells you all you need to know about the diagram's function. In order to describe the hardware upon which software components are installed, deployment diagrams are drawn. There is a strong relationship between component diagrams and deployment diagrams. Deployment diagrams indicate how the components are implemented in hardware, whereas component diagrams are used to describe the components themselves.

IMPLEMENTATION

The Healthcare chat bot will be built using Python and its associated libraries. Python will be used for the catboat's coding. The chat bot will be updated with a disease symptom mapping datasets to help the learning algorithm provide accurate responses based on the user's reported symptoms.

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The best Python libraries for putting the learning strategy into action include Sickest learn, matplotlib, NumPy, pandas, etc. With the help of these tools, we get the data set ready for in-depth examination. The data analysis module is followed by training the learning model using the cleaned and analyzed data.

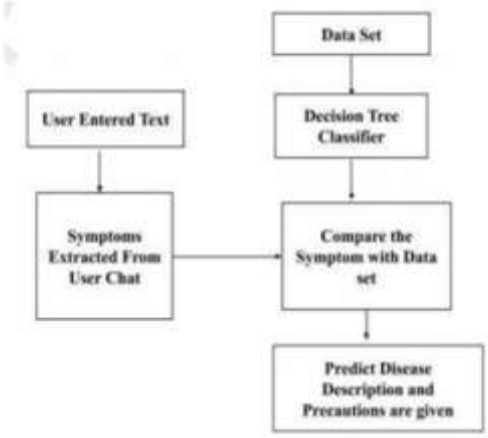

Figure -12 Target Flat File in WinSCP

A decision tree classifier is used to train the model. We also have a mechanism that will pair the patient with the most appropriate doctor depending on the specifics of their condition.

Figure – 10 Software Development Life Cycle

Testing

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S no	User Input	Final Output
1	I have breathing problem	predicted disease: Asthma, analgesics: Metered dose inhalers, nebulizers, treatment scans: Asthma therapy; diet: Fruits and vegetables ——> Enter your pincode to see available doctors near by you
2	I am suffering from server headache	predicted disease: 'fever', analgesics: 'paracetemol or aspirin', treatment scans: 'tylenol, ibuprofen to treat stomach irritation', diet: 'fluid intake like gatorage, fruitjuices or milk' ——> enter your pincode to see available doctors near byyou.
3	I am having high body temperature	predicted disease: 'fever', analgesics: 'paracetemol or aspirin', treatment scans: 'tylenol, ibuprofen to treat stomach irritation', diet: 'fluid intake like gatorage, fruitjuices or milk' ——> enter your pincode to see available doctors near byyou.
4	I am sad, feeling very low	predicted disease: Depression, analgesics: 'Prozac, Zoloft or Celexa', treatment scans: 'Constantly praise him, teach skills, and give selfdevelopment talks', diet: 'Fish and whole grains'.
5	Chest pain	predicted disease: 'cardiovascular disease', analgesics: 'Levofloxacin', treatment scans: 'Chest CT scan', diet: 'Citrus fruits, Oily fish and Leafy greens' ——> Enter your pincode to see available doctors near by you.
6	slow healing of bruises	predicted disease: 'Diabetes', analgesics: 'Tylenol or Aspirin', treatment scans: 'Insulin Treatment', diet: 'Brown rice or cereals with two eggs daily'.

RESULT ANALYSIS

Table 6.2 Result Parameters

Input	Precision	Recall	F1 Score	Accuracy
1	89.9	82.5	88.1	91.2
2	89.7	82.6	88.4	91.5
3	89.6	83.1	88.6	92.2
4	89.7	82.5	87.8	92.5
5	88.3	82.7	88.3	92.7
6	88.6	81.9	87.5	91.2

CONCLUSION

A chat bot might improve the accuracy of medical diagnoses and treatment plans for distressed patients. By offering an immediate deterrent to patients in life-threatening situations, this effort will help the medical

community. We may try to increase the system's intelligence by conducting more studies and tweaking the datasets over time.

Future Scope

Due to the fact that individuals spend more time in messaging applications than any other kind of app, this sector of technology is poised to dominate the future. Many lives might be saved and medical literacy could increase with the introduction of tailored treatment. People will have this health-related discussion no matter how far apart they are.

It's possible that all they need is access to the internet and a computer or Smartphone.
In order for a medical Chat bot to be able to deal with all types of ailments, it is necessary to increase the efficiency of Chabot by adding more combination terms and boosting the use of database.

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