Medical bot (Web base)

Thesis submitted in the partial fulfilment of the requirements for the degree of B.Sc. Software Engineering

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Declaration of Originality

We hereby declare that this project thesis entitled “Medical bot” submitted to the “DEPARTMENT OF SOFTWARE ENGINEERING”, is a record of an original work done by us under the guidance of Supervisor “Engr. Muhammad Irfan Marwat” and that no part has been plagiarized without citations. We also declare that we have not taken any material from any source except referred to wherever due.

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Certificate of Approval

It is certified that we have studied this project report submitted by **Qazi wajahat, Abdul-Samad** and **Muhammad Ishaq** in detail. We conclude that this report is of sufficient standard to warrant its acceptance by the Department of Software Engineering for the award of the degree of B.Sc. in Software Engineering.

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Dedication

We would like to dedicate this project to our families, whose unwavering support and encouragement have been our pillars of strength throughout this journey. Your belief in us, even during our most challenging moments, has fuelled our determination to see this project through to completion.

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Abstract

This project (A web-based AI project “Medical Bot”) will be developed to diagnose diseases based on the Symptoms user have. To reduce the healthcare costs and improve accessibility to medical knowledge the Medical bot is built. This medical bot will helps to provide healthcare support online 24/7. This project intends to immediately predict any disease and when users give their symptoms.

The importance of healthcare cannot be stressed for an enjoyable life. However, getting an appointment with a doctor for a consultation in the event of a health problem is exceedingly challenging. Before contacting a doctor, the goal is to build a Medical bot utilizing artificial intelligence that can diagnose the disease. A Medical bot is created to lower healthcare expenditures and offer access to medical information. Certain medical bots serve as medical encyclopaedias, educated patients about their medical conditions as they encourage better health.

This project provides a user-friendly platform for disease diagnosing using input symptoms, thus representing an important step in healthcare technology. The work links user-provided symptoms with a large set of medical data and uses machine learning algorithms to produce accurate disease predictions. The main goal of the project is data collection, pre-processing, selection of the best algorithm and thorough evaluation of the model. Privacy and ethical concerns in handling medical data are also covered. A medical bot's potential to predict outcomes is extensively evaluated against actual diagnoses. This project not only highlights the potential of machine learning to improve proactive and specific health decision-making, but also pioneers its integration into medical diagnostics.

List of Abbreviations

Abbreviation	Expansion
AI	Artificial Intelligence
ML	Machine Learning
SVM	Support Vector Machine
NB Algo	Naïve Bayes algorithm
Algo	Algorithm

List of Symbols

This document does not employ any symbols or iconography.

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Tables have not been used in this document.

Chapter-1: Introduction

The study of disease in the medical sector a diagnosis is essential. A disease is any cause or set of conditions those results in suffering, ailment, malfunction, or ultimately death in a person. Physical and mental illness may have an impact on a person, and it can also significantly alter their way of life. The pathological process is the study of disease's causes. Clinical professionals must analyze any indications or symptoms to determine the presence of a disease. The process of determining a disease from its signs and symptoms to determine its pathophysiology is known as diagnosis. The process of identifying a disease based on a person's symptoms and indicators is known as diagnosis. The information gleaned from a medical history examination. Therefore, an automated diagnostic system was required, one that could benefit from both human expertise and mechanical precision. To get precise findings from the diagnosis process at a lower cost, a good decision support system is required. For human specialists, categorizing illnesses based on many factors are a challenging process, but AI would make this work easier to spot and manage. Currently, a variety of AI methods are being applied in medicine to precisely diagnose illnesses. AI is a crucial component of computer science that helps make computers smarter. Learning is the essential requirement for every intelligent system.

A system is a computer application that can interact in real time with humans using natural language to assist patients. Based on the needs of the user, this will deliver accurate and effective information. In order to determine the potential medical issues the user may have based on their input, it retrieves keywords from the initial messages. Computer programs known as "chatbots" interact with users in natural language. The process is the same for all chatbot types, despite the fact that each chatbot specializes in a particular field of knowledge; in the case of the medical bot, an input from a human is compared to its knowledge base. Because chatbots mainly depend on artificial intelligence, we have chosen to contribute to health informatics using this technology.

The "Medical Bot" is viewed as a text-to-text conversational agent that mimics human speech when responding to users' health-related queries. The main objective is to enable a dialog between users and the bot in which users describe their symptoms and the bot uses a series of

structured queries to attempt an accurate diagnosis of any potential diseases. Additionally, the bot broadens its assistance by making suggestions that are specifically based on the reported symptoms; improve the accuracy of the diagnostic procedure. This iterative process ensures increasingly accurate diagnoses, fostering a more natural and productive conversation.

It is critical to strain that the "Medical Bot" is not aimed to take the role of medical professionals; rather, it is a useful tool for helping both user and healthcare professionals. The bot accelerates the healthcare process by successfully triaging cases and providing initial assessments, which may ease the burden on medical institutions, lower expenses, and—most importantly—save physician valuable time.

The AI-powered "Medical Bot's" 24/7 accessibility is one of its key benefits. It works nonstop and is always prepared to help users with their health-related questions. The bot's fast understanding and response to user input emphasizes how crucial it is to identify symptoms early and maybe identify diseases that might otherwise go unnoticed until they worsen. This system is proof of the value of timely investigation, as even seemingly little symptoms may be a clue of more serious underlying diseases.

The "Medical Bot" also features an intuitive Graphical User Interface (GUI) that is user-friendly and replicates human dialogue, making it accessible to users of different backgrounds. This medical bot ushers in a new age in healthcare where technology plays a major role in enhancing patient care, health outcomes, and the entire patient experience.

"Medical Bot" is a major advance in the healthcare industry that shows how AI-driven solutions have the ability to completely change how we approach medical diagnosis and assistance. As we set out on the path to developing this web-based AI initiative, we see a day when people may easily access medical information, get precise illness forecasts based on their symptoms, and have access to round-the-clock healthcare support—all while lowering healthcare costs and enhancing accessibility to healthcare. The future of the sector will be guided by this initiative, which epitomizes the fusion of technology and healthcare.

The "Medical bot" has the capacity to fundamentally alter patient engagement and accessibility to healthcare. The need of cutting-edge technologies like the "Medical Bot" is highlighted by the mounting demands on healthcare systems, especially during times of pandemics and other major global health crises. The capacity of the bot to deliver prompt and precise early evaluations in such circumstances, where healthcare resources are pushed thin, can be essential. It not only helps patients comprehend their symptoms but also aids medical staff in prioritizing cases, ensuring that those in need of immediate medical assistance are given it.

Additionally, the idea of preventative care is represented by the "Medical Bot." It promotes a sense of personal health responsibility by allowing users to input their symptoms and obtain fast disease forecasts. This movement in healthcare from reactive to proactive is consistent with the larger trend of preventive medicine, which emphasizes the importance of early identification and action in slowing the spread of diseases. In this situation, the "Medical Bot" functions as an important instrument for disease preventive care, and health eventually promoting healthier communities and better public health outcomes.

With the potential to change how we approach medical diagnosis and support, the "Medical Bot" project represents a fusion of cutting-edge technology and healthcare. It is positioned as a key player in the changing landscape of healthcare services thanks to its 24/7 accessibility, AI-driven capabilities, and user-friendly interface. The "Medical Bot" holds the promise of not only improving individual well-being but also contributing to the larger goal of improving healthcare accessibility and outcomes for all by providing precise disease predictions based on symptoms, lowering costs, and encouraging proactive healthcare. As we move forward on this journey, we see a time when technologically based healthcare solutions like the "Medical Bot" are essential parts of the healthcare ecosystem, collaborating with medical professionals to provide timely, effective, and patient-centred care.

Chapter-2: Literature Review

S. Hoermann et al [1] discuss the current evidence for the feasibility and effectiveness of online one-on-one mental health interventions that use text-based synchronous chat. Synchronous written conversations (or "chats") are becoming increasingly popular as Web-basedmental health interventions. This review is based on an evaluation of individual synchronous Web-based chat technologies. Through the current evidence of the application of this technology, the tentative support for mode of intervention is seen. Interventions utilizing text-based synchronous communication showed better outcomes compared with Waitlist conditions and overall equivalent outcomes compared with Treatment As usual, and were at least as good as the comparison interventions. However, the issue of whether these technologies are cost effective in clinical practice remains a consideration for future research studies.

S. K. Mishra et al [2] say that the chatbot will act as a virtual doctor and makes possible for the patient to interact with virtual doctor. Natural language processing and pattern matching algorithm for the development of this chatbot. It is developed using the python Language. Based on the survey given it is found that the no of correct answer given by the chatbot is 80% and incorrect/ambiguous answer given is 20%.From this survey of chatbot and analysis of result suggested that this software can be used for teaching and as a virtual doctor for awareness and primary care.

D. Madhu et al [3] proposed an idea in which the AI can predict the diseases based on the symptoms and give the list of available treatments if a person's body is analyzed periodically, it is possible to predict any possible problem even before they start to cause any damage to the body. Some Challenges are research and implementation costs, and government regulations for the successful implementation of personalized medicine, they are not mentioned in the paper.

S. Divya et al [4] in their chatbot design discovered its efficiency lacking and recommended enhancements by including more mix of words and expanding the utilization of database with the goal that the medical chabot could deal with all kind of diseases and become generic. Likewise including voice chat was proposed as future scope of research. Many individual classifier algorithms have been used for disease diagnosis.

After performing an extensive literature analysis, which demonstrated the urgent need for creative solutions in the areas of medical diagnosis and patient assistance, I decided to start this project. The vast amount of information currently accessible shows the increasing burden on healthcare systems brought on by an increase in patient volume and a shortage of resources. It also highlights the potential benefits of utilizing medical bot and artificial intelligence technology to reduce this pressure.

According to the literature study, similar medical bot systems have been effectively utilized in a number of settings, with a focus on their ability to boost patient outcomes, reduce diagnostic errors, and improve accessibility to healthcare. It also revealed shortcomings in the current environment, particularly with regard to tailoring medical bots for user-specific symptoms as well as improving their diagnostic precision.

By developing an innovative self-diagnosis medical bot driven by artificial intelligence, our project seeks to fill these gaps. By concentrating on symptom-based disease diagnosis, it seeks to add to the body of existing information. By undertaking this study, we hope to improve the efficiency of healthcare delivery, provide people more control over their health, and eventually grow the field of medical bot technology.

Chapter-3: Problem Definition

Users frequently have no information of all the treatments or symptoms associated with specific diseases. Users need to go to the hospital for a physical examination even for small problems, which takes time. Additionally, handling complaints over the phone can be very demanding.
Using a medical bot created to diagnose diseases is an efficient way to solve this issue. By utilizing this medical bot, costs can be cut while also saving patients a lot of time. The little knowledge people have of the numerous treatments and symptoms connected to certain medical diseases might present substantial challenges in today's fast-paced society. The mandatory obligation of going to a hospital for an in-person examination can be a timeconsuming relationship, or even for minor diseases. The administrative strain of managing multiple phone calls about health issues, which frequently overburdens healthcare institutions, further exacerbates the situation. The incorporation of a specialist medical bot developed for diagnosis of diseases seems as a promising option for addressing these issues. This clever bot expertly analyses user-input symptoms to correctly diagnose possible diseases by utilizing the capabilities of artificial intelligence and machine learning. It speeds up the diagnostic procedure and gives users useful information.

It can be extremely difficult for healthcare organizations to respond to phone calls with complaints and inquiries. Patients frequently have to wait a long time for answers to their questions due to the administrative burden of handling numerous phone calls about health issues, which puts additional strain on medical professionals. When there is a public health emergency or when healthcare facilities are already overburdened, this situation is made worse. A potential answer to these complex problems is the incorporation of a specialized medical bot created for disease diagnosis. This smart bot makes use of artificial intelligence and machine learning to analyse user-provided symptoms expertly, quickly, and precisely identifying potential diseases. It expedites the diagnostic process and provides users with useful knowledge about.

Additionally, the introduction of such a medical bot is consistent with the overarching objective of improving healthcare efficiency and accessibility. Unnecessary hospital visits can be minimized, saving patient’s valuable time and lessening the burden on healthcare resources, by giving people a trustworthy and practical tool for initial health assessments. Users can proactively monitor their health with the help of the bot, and when necessary, they can quickly

get medical advice. In a world where minor discomforts can occasionally be precursors to more serious underlying disorders, the medical bot's ability to quickly identify symptoms and recommend suitable treatments becomes invaluable.

The introduction of a specialized medical bot for disease diagnosis has the potential to completely alter how people approach their health issues. It closes the knowledge gap, simplifies the diagnostic procedure, and lightens the load on medical facilities. This ground-breaking solution equips people with the tools they need to take charge of their health, save time, and make wise decisions by utilizing artificial intelligence. The incorporation of AI-driven tools like the medical bot represents a critical shift toward more accessible, effective, and user-centric healthcare services as we advance in this era of digital healthcare.

Chapter-4: Methodology

The user dialogue in the proposed system follows a linear design that starts with symptom extraction, moves on to symptom mapping, identifies the corresponding symptom, and then diagnoses the illness. The logic for state transitions is created, templates for natural language generation are used, and the system takes the initiative to reach out to the user and solicit feedback in order to achieve an accurate diagnosis. Our agent has three main conversational phases, in addition to its hello and goodbye states: gathering fundamental data, symptom extraction, and diagnosis. Our bot begins by requesting the user's email address and password in order to log in, after which it begins an extraction loop of symptoms. The steps are:

4.1 User validation and extraction of symptoms

Here, the user login information is verified. Then, using a string searching algorithm, the symptoms are retrieved from the natural language text input by finding the substrings that describe the symptoms. When users specifically describe a symptom, such as "I have a cough, fever, and nausea," the technology is able to quickly recognize it. Input like, "When I read, I'm good at first, but after time, my eyes appear to become fatigued, and I start to see double," should also be supported by the system, though. As opposed to substrings like "read" or "okay," the machine should in this case extract substrings like "eyes weary" and "see double."

4.2 Diagnosing the disease

Each symptom submitted in this procedure is compared to the list of diseases in the dataset, which contains the list of diseases. Once a matching symptom is discovered, the next one is tested. The illnesses are narrowed down depending on input from the end users. The medical bot accurately identifies and specifies the ailment to the user.

The following section outlines the algorithm selection process employed in the development of this project, which facilitates symptom-based disease diagnosis.

4.3 Data collection

A comprehensive dataset that includes a wide range of data on disease symptoms has been produced as a result of extensive data gathering initiatives. The foundation of our project's capacity to accurately detect diseases from user-reported symptoms is this dataset. It covers a

broad spectrum of symptoms, ensuring that the system's diagnostic skills are both powerful and precise. Our symptom-based disease diagnostic algorithms are founded on the invaluable basis of this wide range of symptom-related data.

4.4 Pre-processing

A careful data pretreatment step was conducted as part of our project to guarantee the highest standards of consistency and reliability. Raw data underwent a thorough cleansing and preparation process during this important stage. This involves eliminating any anomalies, missing values, or discrepancies that would jeopardize the precision of the system for diagnosing diseases based on their symptoms. In order to harmonize the data and make it appropriate for analysis, data normalization and standardization procedures were also used. Additionally, during the preprocessing stage, key attributes were carefully chosen and created as part of the feature engineering process in order to improve the system's diagnostic capabilities.

4.5 Algorithm selection

We have utilized into the strength of three different classification algorithms: Support Vector Machine (SVM), Bayesian Network, and Classification, in our quest to allow disease detection based on particular symptoms. These algorithms were carefully chosen due to their shown proficiency in managing complicated medical data and their ability to make precise and trustworthy disease predictions.

The Support Vector Machine (SVM) technique is well known for handling high-dimensional data and drawing distinct lines across various kinds of illnesses. It excels in identifying complex connections within symptom datasets, improving the accuracy of our diagnosis method.

The Bayesian Network, on the other hand, uses probabilistic modeling to depict how symptoms and diseases are related to one another. Because of its capacity for probabilistic reasoning, it is highly suited for managing ambiguity in medical diagnosis. By giving users both forecasts and related probabilities, it enhances the decision-making process.

The Classification algorithm, which is renowned for being straightforward and effective, rounds out the other two algorithms by providing a simplified method of disease diagnosis. It is a useful

addition to our system because of how simple it is to install and how quickly decisions can be made.

Our symptom-based disease detection method is made strong and accurate by including these three different categorization algorithms, which ultimately provides consumers with trustworthy health information.

4.6 Model training

The prepared symptom data were used to train the chosen algorithms. To assess the effectiveness of the models, the dataset was split into training and testing subsets. To improve the performance of the model, parameters were modified using cross-validation and grid search approaches.

4.7 Disease diagnosis

Users can describe their symptoms when they communicate with the medical bot. The premise for predicting diseases is this user-generated symptom information. The three classification models—Support Vector Machine (SVM), Bayesian Network, and Classification—then assess the reported symptoms and determine which diseases are most likely to be linked to them.

4.8 Disease prediction

The medical bot uses a strategic method to combine the results from the SVM, Bayesian Network, and Classification models to ensure a thorough and accurate disease prediction. By utilizing the advantages of each individual model, this ensemble technique generates a strong and comprehensive diagnostic result. A weighted average strategy is used to further improve the final diagnosis' accuracy and dependability. Based on their past performance and accuracy, this entails giving the forecasts from each model the proper weights. The weighted average produces a more accurate and reliable diagnosis by combining the forecasts and taking into consideration the different levels of confidence linked to each model's output.

4.9 User interaction

To enable user engagement with the medical bot, a user-friendly interface is created.

The system allows users to enter symptoms, and then it will diagnose the diseases based on user symptoms.

We have followed “code and fix” model in this project.

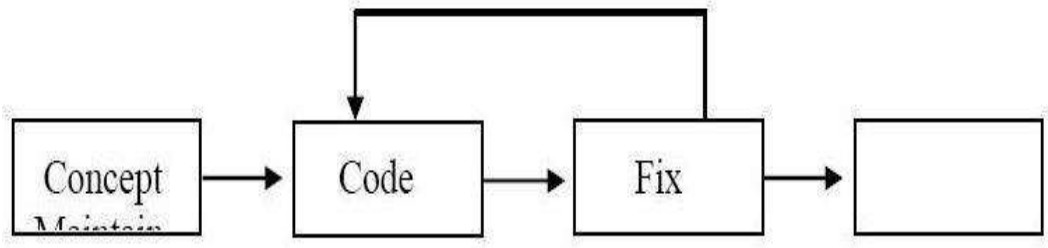

Figure 4.1: Code and fix model

The “code and fix” model is the most frequently used development methodology in software engineering. You start developing, fixing problems as they occur, until the project is complete.

Chapter-5: Detailed Design and Analysis

5.1 SYSTEM ARCHITECTURE

The medical bot system's architectural design was painstakingly created with efficiency and symptom-based disease diagnosis as top priorities. This careful attention meant that customers could use a simplified and straightforward design while receiving timely and accurate answers to their health-related questions. The architecture was also designed to be adaptable and expandable to allow for potential future improvements and adjustments to changing healthcare demands. In addition to accommodating the system's expansion, its scalability places it in a position to easily interact with cutting-edge technologies and data sources for ongoing development.
Another important consideration in the design process was ease of maintenance, which would make it simpler for programmers and administrators to oversee and upgrade the system as required and guarantee its long-term viability and dependability.

In processing the symptoms communicated by the user interface (UI), this subsystem is crucial. It acts as a link between user input and the illness prediction module, managing the symptom data with great care to ensure accuracy and dependability. After the processed symptom data is transferred to the disease prediction module, it is examined carefully in order to offer users with accurate disease predictions based on their reported symptoms.

The Disease Prediction Module uses machine learning methods including Support Vector Machine (SVM), Bayesian Network, and Classification to analyze symptoms in great detail and predict diseases with accuracy. These methods provide a reliable and precise disease prediction procedure by effectively capturing complicated interactions within symptom datasets. Forecasts produced by each of these machine learning models are gathered and thoroughly examined within the module. The module determines the chance or probability that a certain disease is connected to the given symptoms by averaging the individual predictions. The strengths of many models are used in this ensemble technique to produce a thorough and accurate illness prediction. In order to give consumers a complete picture of their health, the computed illness probability is essential.

A Use case of the system is given below:

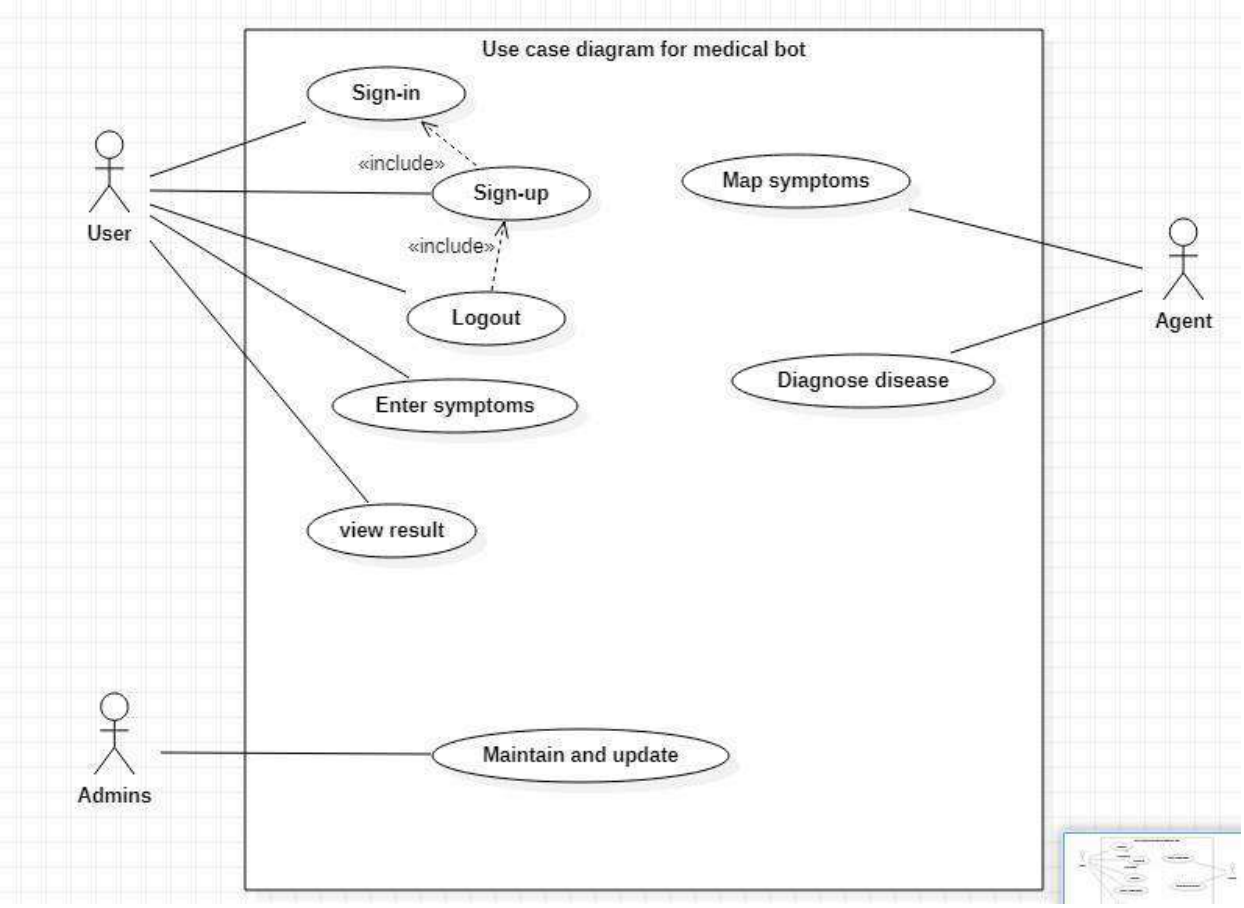

Figure 5.1: Use case diagram

In this diagram, there are three actors: user, agent, and an admin. The new user has the option to first sign up for an account. If the user already has an account, they can then sign in to the system. Users can input their symptoms into the system for a possible disease diagnosis and view the results. Additionally, users have the ability to log out from the system. The agent within the system is responsible for mapping the symptoms and providing disease diagnoses, displaying the results to the users. Admins have the role of maintaining and updating the system.

5.1.1 Architecture Design Approach

The attainment of accurate symptom-based illness identification is one of a number of essential aims that serve as the driving force behind the architectural design approach for the medical bot

project. This objective serves as the system's cornerstone and guarantees that consumers may rely on the bot's diagnostic abilities for accurate health information.

Another key goal is user-friendliness, which reflects the dedication to provide people looking for medical information a seamless and straightforward experience. The system is created with the viewpoint of the user in mind, assuring usability and accessibility.

Considering future scalability is essential due to the dynamic nature of healthcare data and technology. The architecture is designed to easily adapt to changing symptom datasets and prediction algorithms, ensuring the durability and relevancy of the system.

The design approach's focus on modularity encourages clear lines of responsibility, which makes it simpler to identify and fix problems within certain functional areas. Additionally, by streamlining component development, testing, and maintenance, this modularity increases the system's overall robustness and resilience.

The architectural design strategy for the medical bot project, which relies heavily on modularity to accomplish these objectives, essentially finds a compromise between precision, usability, and future-readiness.

5.1.2 Architecture Design

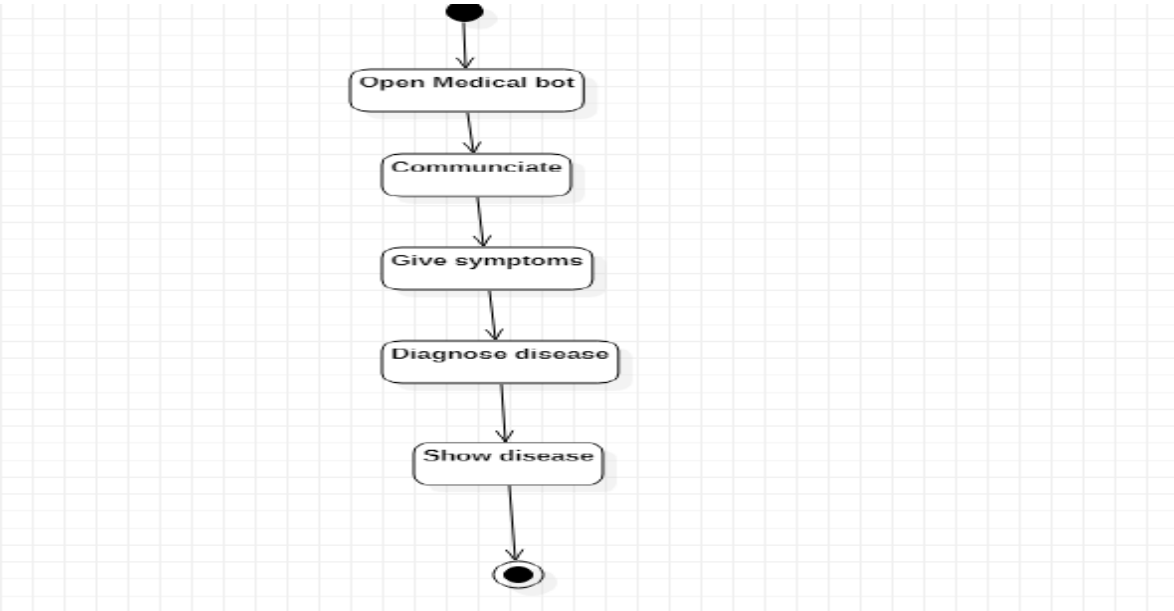

Figure 5.2: Activity diagram

The User Interface and Data Processing subsystems of the medical bot system communicate with one another invisibly through a well-defined interface. The user's input of symptoms and subsequent disease diagnosis are made easier by this interface, which enables a clear and effective interchange of information.

The User Interface subsystem receives the diagnostic findings from the Data Processing subsystem, which is in charge of processing and interpreting the user's symptoms. By ensuring prompt and accurate illness forecasts based on reported symptoms, this two-way communication promotes customer pleasure and confidence.

The Dataset subsystem, which acts as a store of extensive data relating to disease symptoms and diagnosis, is directly accessible to both the User Interface and Data Processing subsystems. This accessibility enables the system to access a wealth of data for illness prediction and symptom analysis, improving the system's overall accuracy and dependability. The seamless integration of various subsystems highlights the significance of a well-orchestrated design approach, ensuring that users engage with the medical bot in a fluid and coherent manner while gaining insightful health information

5.1.3 Subsystem Architecture

Functional description:

5.1.4 Top-Level Data Flow Diagram (DFD)

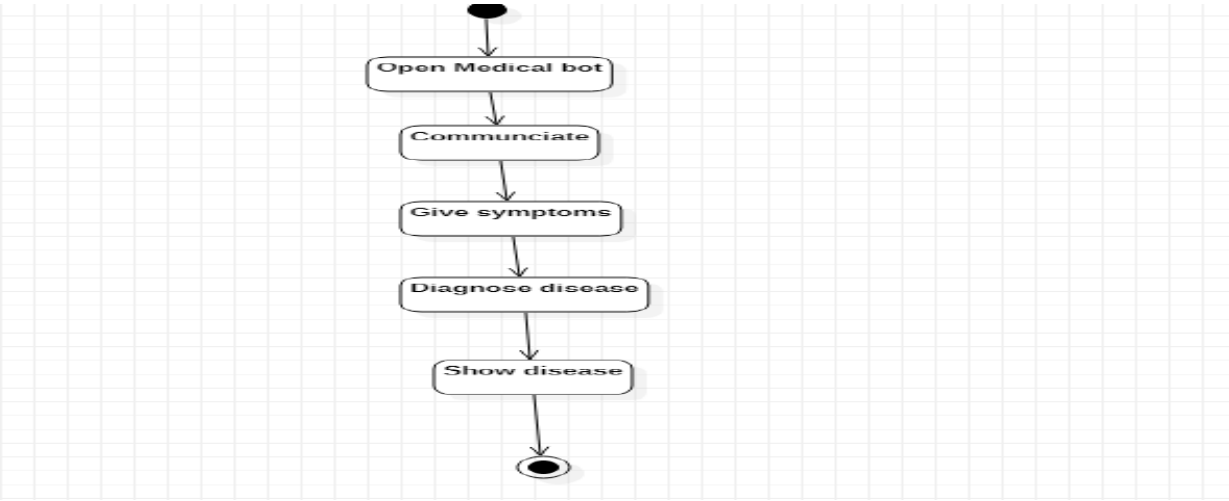

Figure 5.3: DFD

The main subsystems and how they interact with one another are displayed in the top-level DFD for the medical bot system. It draws attention to how the User Interface (UI), Symptom Analysis Engine, and Disease Prediction Module interact and the flow of data.

The DFD emphasizes the value of system data flow while highlighting the precision and dependability of the diagnostic procedure. It provides a useful roadmap for comprehending the inner operations of the medical bot by outlining the contributions made by each subsystem to the overarching objective of symptom-based illness diagnosis. The medical bot will run smoothly for consumers looking for fast health information thanks to its visual depiction, which helps with system comprehension and optimization.

5.1.5 Structural Decomposition Diagram

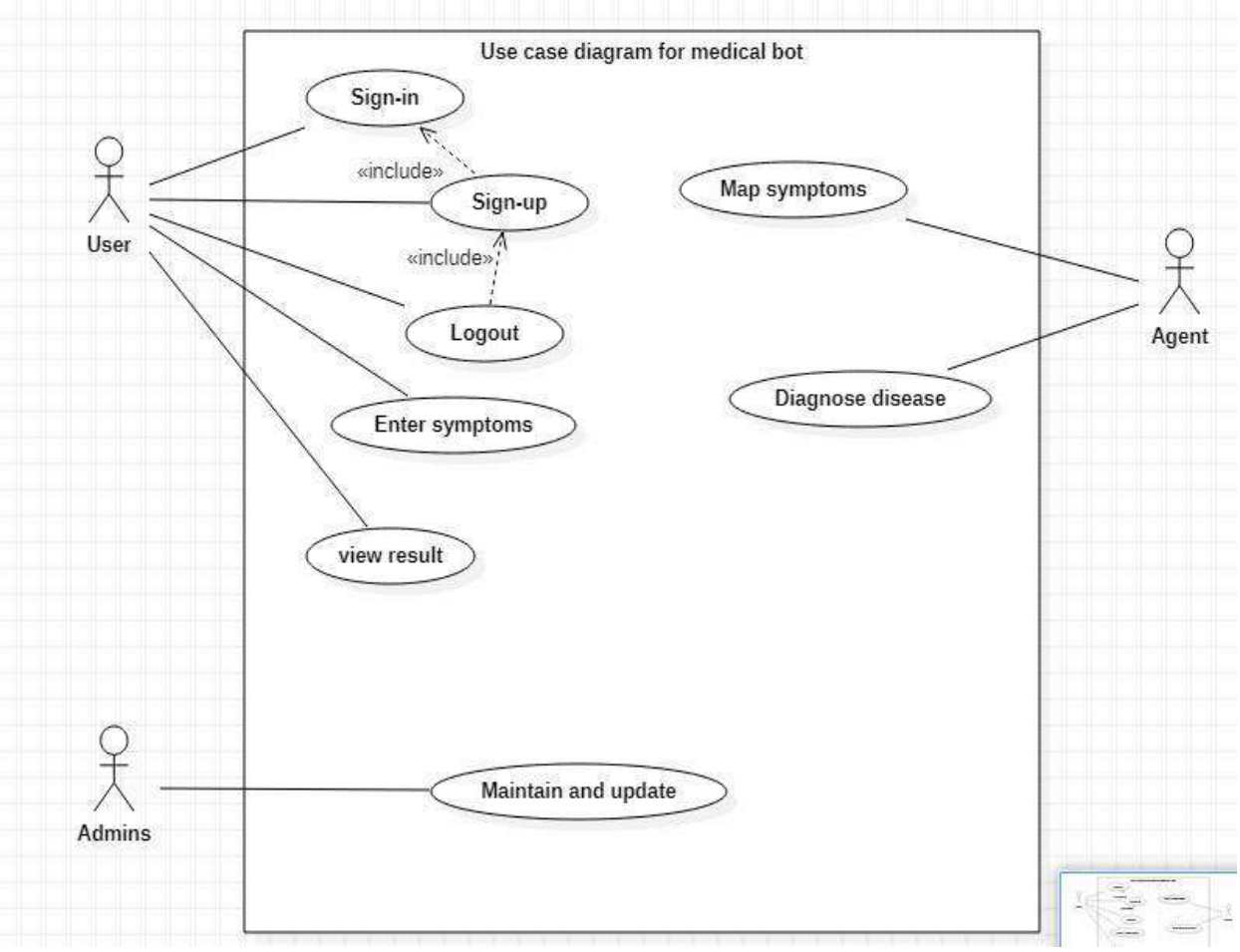

Figure 5.4: Structural Decomposition Diagram

The structural breakdown diagram provides a clear picture of the complex relationships and interactions that exist between the many components of the medical bot system. It acts as a visual depiction of the component hierarchy and modularization of the system, making it easier to grasp how each subsystem contributes to the operation of the system as a whole. The connections and relationships between different components are shown in this diagram, which is crucial in communicating the system architecture. The system's maintainability and scalability are improved by helping to identify different modules in charge of particular functional areas.
The diagram equips developers and administrators with the knowledge they need to make wise decisions about system improvements, upgrades, and optimizations, ensuring the medical bot stays a trustworthy and user-centric tool for symptom-based diagnosis.

5.2 DETAILED SYSTEM DESING

The comprehensively design of the various components listed in the System Architecture section will be covered in this part. A thorough discussion of each subsection's topic, including information on the topic's classification, definition, responsibilities, limitations, composition, interactions, resources, processing, and interfaces and exports, will be provided. This section's goal is to provide readers a thorough grasp of the inner workings and actions of each element of the medical bot system.

5.2.1 Classification

The categorization subsystem is an essential part of the medical bot system that forecasts diseases using machine learning methods. It forecasts illnesses using Bayesian networks, classification, and support vector machines (SVM) based on the processed symptom data. A user-friendly display of the forecasts is created next.

5.2.2 Definition

The Classification Subsystem, which uses machine learning techniques like Support Vector Machine, Bayesian Network, and Classification, is essential to the functioning of the medical bot system. These cutting-edge methods are applied to the painstakingly processed symptom data as input to predict possible diseases. In addition to making very accurate predictions of disease probability, the subsystem also organizes the forecasts into a comprehensible and understandable style for user presentation. This crucial element guarantees that customers get timely disease

forecasts as well as a thorough explanation of the likelihood associated with each probable ailment, enabling them to decide on their health in an educated manner.

5.2.3 Responsibilities

The following tasks are assigned to the Classification Subsystem:

- Use machine learning techniques to forecast disease.
- Estimating the likelihood of a disease from processed symptoms.
- Ensuring precise and trustworthy illness prognoses.
- Combining predictions made by many algorithms.
- Providing the User Interface with disease forecasts for presentation

5.2.4 Constraints

The following limitations limit how the Classification Subsystem functions:

- The quality of symptom data that has been analyzed determines how accurately diseases will be predicted.
- Limitations on how quickly machine learning algorithms can be executed.
- During prediction, the subsystem must handle errors and exceptions.

5.2.5 Composition

SVM, Bayesian Network, and Classification are the three unique parts that make up the complicated entity known as the Classification Subsystem, which is adapted to each individual machine learning approach. Each of these parts has undergone careful tuning to maximize its functionality inside the medical bot system.

The SVM-specific component, which offers additional capabilities for pattern recognition and classification, is intended to leverage the strength of Support Vector Machines. To provide accurate disease predictions, it excels in capturing complex correlations within symptom datasets.

A powerful tool for managing uncertainty in medical diagnosis, the Bayesian Network-specific component makes use of probabilistic modeling to describe connections among symptoms and diseases. Its skills for probabilistic reasoning enhance the diagnostic process by giving users access to both forecasts and related probability.

By providing a simplified method for disease detection, the Classification-specific component, distinguished by its simplicity and effectiveness, completes the other two components. It is a vital addition to the entire system's diagnostic capabilities because of how simple it is to deploy and how quickly decisions are made inside the subsystem.

These three specialized elements operate in unison to give consumers precise, dependable, and knowledgeable disease predictions based on their reported symptoms. Together, they make up the Classification Subsystem's core.

5.2.6 Uses/Interactions

Interactions between the Classification Subsystem and

- Receive user-selected symptoms for disease prediction using the user interface.
- Engine for Symptom Analysis: To obtain processed symptom data for prediction.
- Other subsystems: To organize how disease forecasts are presented.

5.2.7 Resources

As a reliable part of the medical bot system, the Classification Subsystem strongly relies on memory and processing power to effectively carry out the complex machine learning algorithms. To analyses the massive symptom data and produce accurate disease predictions, these algorithms require significant computational resources, highlighting the significance of a well-equipped computer environment.

The Classification Subsystem must also have easy access to the processed symptom data once it has been used for analysis. This access guarantees the subsystem's capacity to accurately assess and categorize symptoms in light of prior data, thus enhancing the precision and dependability of disease predictions.

Additionally, having access to and using this processed symptom data improves the system's capacity for adaptation and learning over time. The Classification Subsystem continually improves its disease prediction models by utilizing previous data and computational resources, making it a dynamic and reliable tool for consumers looking for insightful health information.

5.2.8 Processing

An essential part of the medical bot system, the Classification Subsystem, performs a number of vital processing steps to enable precise and thorough disease predictions.

It starts the process off by providing insightful information on how to process symptoms. In this first stage, user-reported symptoms are systematically analyzed and interpreted in order to provide the groundwork for further machine learning-based assessments.

The subsystem uses a varied range of machine learning methods, such as SVM, Bayesian Network, and Classification, to learn from the painstakingly processed symptom data. These algorithms work in harmony to assess and categorize symptoms while taking into consideration their interconnections and complexity.

The subsystem's calculation of the probability that each approach may result in a disease is another essential task. This stage entails a thorough evaluation of the symptom data while taking into account the distinct advantages and traits of each algorithm.

In the end, the Classification Subsystem combines the predictions made by the various algorithms to give consumers full disease projections. By using an integrated approach, consumers are given a thorough picture of any possible health problems, enabling them to make wise decisions regarding their health.

The medical bot's capacity to provide accurate and trustworthy disease predictions based on user-reported symptoms improves the user experience and encourages proactive healthcare management. These processing steps inside the Classification Subsystem work together to make this possible.

5.2.9 Interface/Exports

The following services are offered by the classification subsystem:

Method: predictDisease(symptomData): Receives disease predictions in exchange for processed symptom data.

CalculateProbabilities(symptomData): It is a method that takes in processed symptom data and returns disease probabilities.

In order to provide precise disease predictions and provide the data required for the User Interface's display, the interface makes sure that communication with other subsystems runs smoothly.

5.2.10 Detailed Subsystem Design

The basic component of the medical bot system that processes user-selected symptoms and gets them ready for disease prediction is called the Symptom Analysis Engine. This subsystem makes sure that characteristics are correctly extracted from symptom data and then categorizes them, giving the Classification Subsystem useful inputs for disease prediction.

5.2.11 Symptom Data Input:

The User Interface sends user-selected symptoms to this component for analysis.

5.2.12 Symptom Categorization:

The Symptom Categorization component organizes symptoms for efficient examination by categorizing them according to preset standards.

5.3 CLASS DIAGRAM

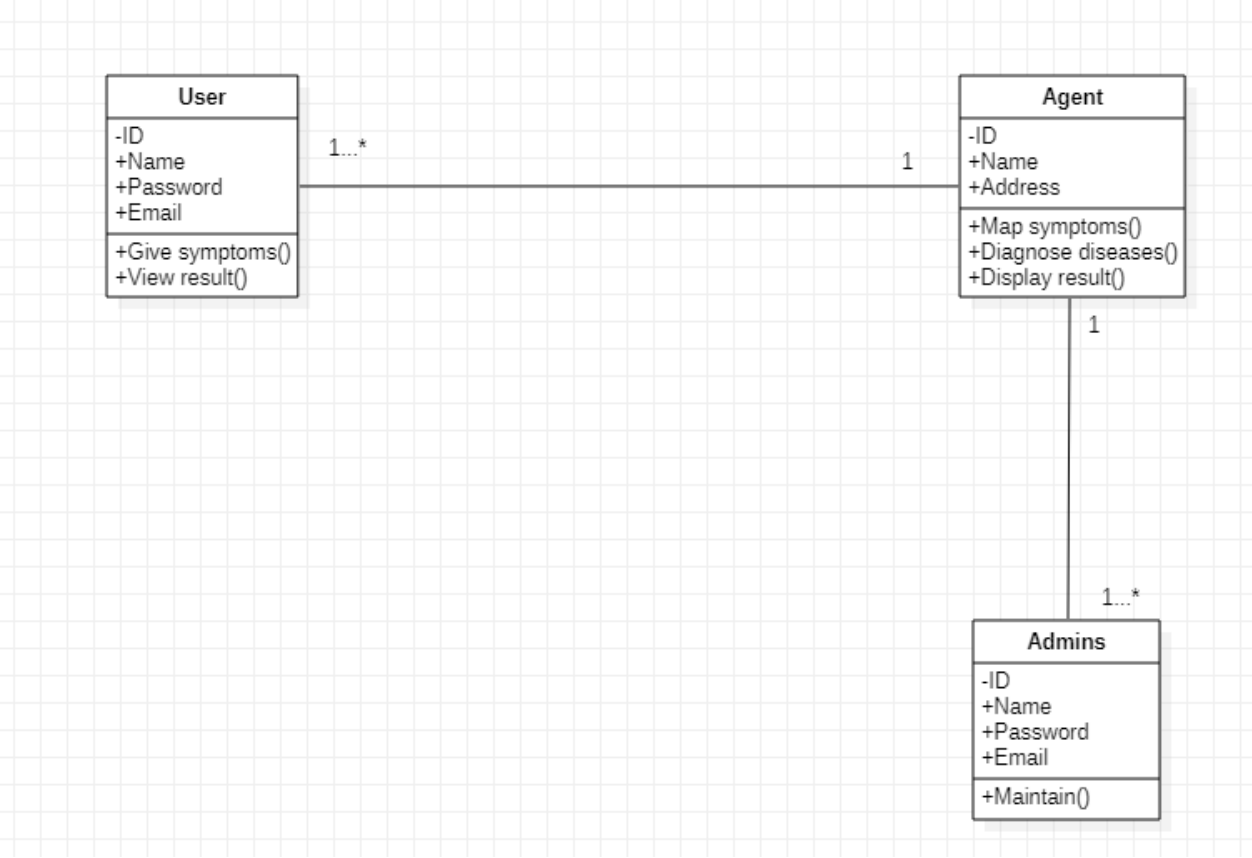

Figure 5.5: Class diagram

In this class diagram of the system, there are three classes: User, Agent, and Admins. The attributes of the User class include ID, Name, Password, and Email. The User class has two functions: providing symptoms to the system and viewing the results.

The Agent class has attributes: ID, Name, and Address. Its functions encompass mapping symptoms, diagnosing diseases, and displaying the results. The ID attribute serves as a primary key in both the User and Agent classes. There exists a one-to-many relationship from the User class to the Agent class, allowing one or many users to utilize a single medical bot.

Attributes of the Admins class consist of ID, Name, Password, and Email. Admins are responsible for maintaining the system. The ID attribute serves as a primary key in the Admins class as well. One or many admins can maintain the same medical bot.

5.4 ER DIAGRAM

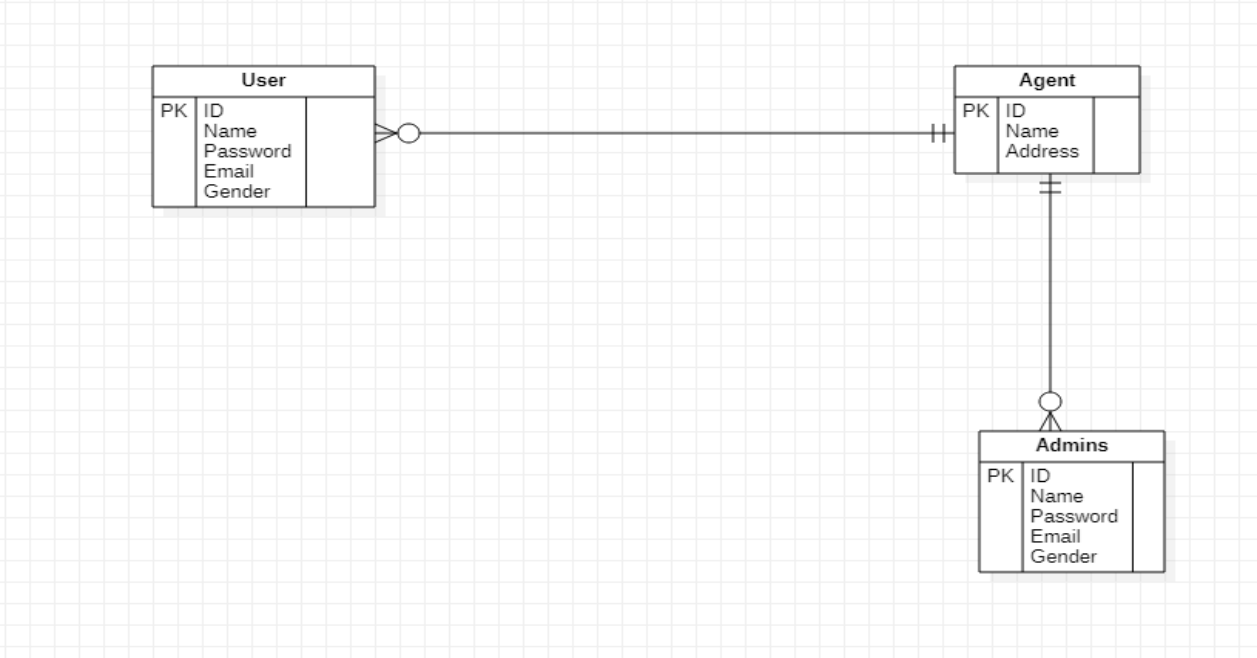

Figure 5.6: ER diagram

In this ER diagram of the system, there are three entities: User, Agent, and Admins. The attributes of the “User” entity include ID, Name, Password, Email and gender. ID is the primary key.

The “Agent” entity has attributes: ID, Name, and Address. Its functions encompass mapping symptoms, diagnosing diseases, and displaying the results. The ID attribute serves as a primary key in both the “User” and “Agent” entities. There exists a one-to-many relationship from the Agent to the user entity, allowing one or many users to utilize a single medical bot.

Attributes of the “Admins” entity consist of ID, Name, Password, Email and gender. Admins are responsible for maintaining the system. The ID attribute serves as a primary key in the Admins class as well. There exists a one-to-many relationship from the Agent to the Admins entity.

Chapter-6: Implementation and Testing

The adherence to the design standards and architectural decisions outlined in earlier sections served as the foundation of development during the medical bot project's implementation phase. By following a structured methodology, the project's objective was successfully transformed into a working system that could diagnose illnesses based on user-reported symptoms. It became clear that the well-considered design selections allowed a simplified and effective coding approach when the development team started to create actual code.

A crucial step in the development process was turning conceptual components, systems, and functionalities into concrete code modules. The accuracy, user-friendliness, and responsiveness of the medical bot were its overriding objectives, and each element of the structure the user interface to the backend algorithms—was carefully designed to meet these objectives. The system was continuously improved thanks to the iterative development method, which also made sure that it progressed in step with new technologies and user input. Additionally, the collaborative aspect of the development process encouraged an innovative and creative atmosphere. To make the idea a reality, cross-functional teams of programmers, medical professionals, and user experience designers worked together effectively. A strong, thorough, and user-centric medical bot capable of addressing the needs of its users was created as a consequence of the multidisciplinary approach's enrichment of the system with a variety of views.

6.1 Technology stacks

The following technologies and tools were used to implement the medical bot project:

- Python is an excellent programming language for model training and backend development.
- Support Vector Machine, Bayesian Network, and Classification algorithms may all be implemented with the help of machine learning libraries like Scikit-learn.
- VS code IDE.

6.2 Coding and development

The development phase stressed the significance of smooth integration among various modules in addition to translating architectural design and component specifications into functional code. To provide a seamless flow of information, interactions between the User Interface, Symptom Analysis Engine, and Classification Subsystem were meticulously planned. Users were able to enter their symptoms with ease, have them precisely assessed, and obtain accurate illness forecasts because to this complex interaction. To ensure resilience and dependability, rigorous attention to detail was crucial when coding each module. The User Interface was designed to be intuitive and user-friendly, making it usable by people with a range of technical backgrounds.

The algorithms of the Symptom Analysis Engine were optimized to analyse symptoms quickly while taking into account the wide range of possible changes in user inputs. There was a classification subsystem. Comprehensive testing and quality assurance procedures were used throughout the development process to find and fix any potential problems or faults. This dedication to meticulous testing was crucial in producing a reliable and error-free medical bot that consumers could rely on. Overall, the development process highlighted the need of accuracy, integration, and robustness in producing a functioning system capable of accurate illness detection based on user symptoms in addition to bringing the architectural concept to life.

6.3 Integration

The goal of the integration phase was to make sure that information and communication moved easily among the various parts of the medical bot. To allow efficient module cooperation, this required creating clear interfaces and protocols. We developed a single ecosystem that enabled users to easily enter their symptoms and obtain fast and precise and disease predictions by linking the User Interface, Symptom Analysis Engine, and Classification Subsystem.

Additionally, during the integration phase, careful testing and validation were carried out to ensure that each component could properly communicate and work in unison. This iterative process discovered any possible compatibility problems or bottlenecks, which were immediately fixed to provide a unified and responsive system.

6.4 Testing

The medical bot system's dependability and accuracy were greatly enhanced via testing. Before

Implementing the system, stringent testing techniques were used to identify and fix any mistakes or issues. This comprehensive strategy made sure that each module operated dependably both on its own and in unison with other modules. The thorough testing not only improved the system's reliability efficient and comprehensive accuracy but also gave users confidence in its capability to provide disease predictions based on their symptoms.

6.5 Conclusion

The architectural design was successfully translated into an operational platform all over the Implementation and Testing phase. To guarantee the accuracy, trustworthiness, and user satisfaction of the medical bot, rigorous testing procedures were used. The project is now ready for deployment and to be utilized in real-life scenarios. The conclusion of these efforts has not only secured the system's correctness and dependability but also set it up for real-world implementation, where it may have a significant influence on user satisfaction and healthcare accessibility. The project's preparedness for deployment represents an important turning point in the process of improving healthcare services using cutting-edge technology.

Chapter-7: Results and Discussion

7.1 Results Presentation

Below are some figures illustrating the results obtained from the medical bot system's disease prediction process. These figures serve as visual representations of the system's performance and its ability to provide valuable health insights based on user-reported symptoms.

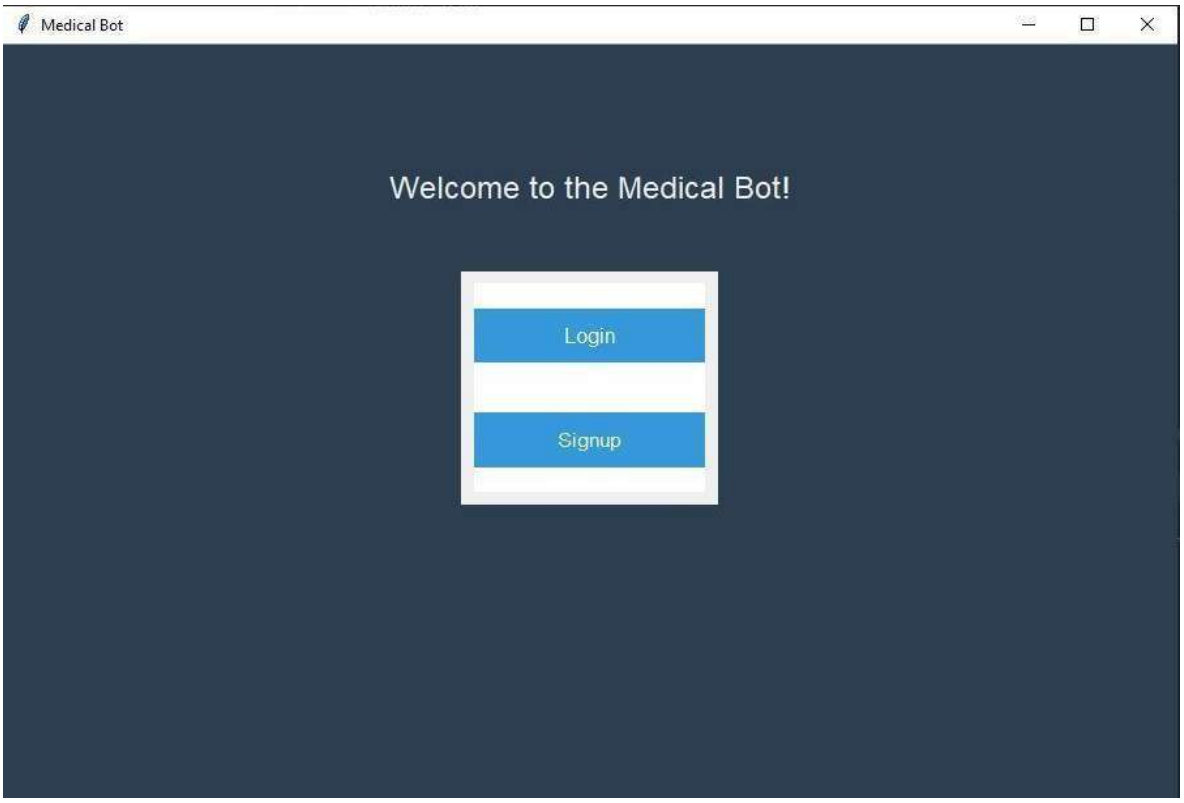

Figure 7.1: User interface 1

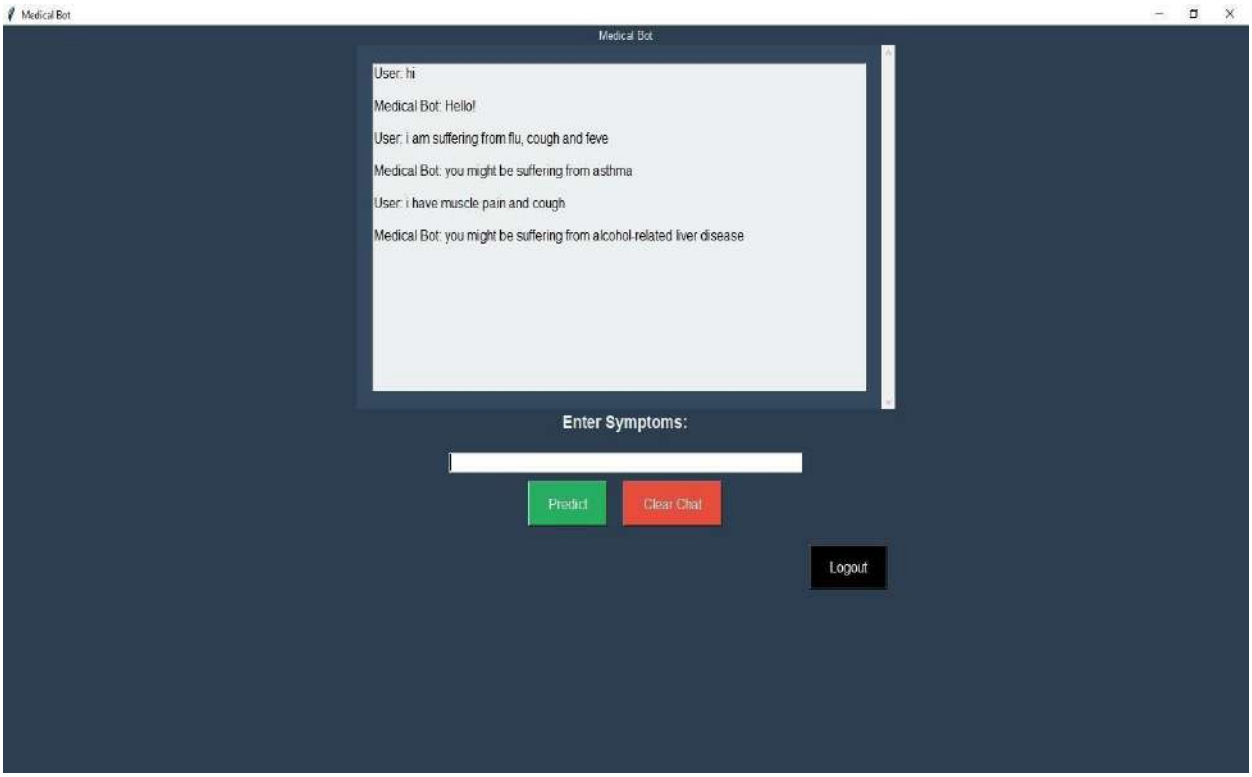

Figure 7.2: User interface 2

7.2 Practical implications

The simple installation procedure and the successful results highlight the medical bot's enormous potential to help patients who are looking for early disease assessments based on their reported symptoms. This cutting-edge device has the ability to work as a proactive healthcare tool, successfully educating people about potential health issues.

The medical bot empowers people to take control of their health and encourages them to seek quick medical assistance when necessary by providing timely and accurate illness forecasts. This is essential for both fostering a culture of proactive health management and helping to spot diseases early.

The medical bot also acts as an instructional tool, assisting users in comprehending the importance of their symptoms and motivating them to give their health first priority. By addressing health issues at an early stage, it has the potential to greatly improve public health outcomes and lessen the strain on healthcare systems.

7.3 Limitations and future considerations

While the medical bot offers a potential method for detecting diseases early on, there are a number of drawbacks that must be taken into consideration. The system's dependence on user-provided symptoms, which might not always be precise or thorough, is a key weakness. This dependency raises the possibility of inaccurate self-diagnosis, which might have major repercussions if users interpret their findings incorrectly.

It is essential to aggressively resolve these flaws in future development. A high focus should be given to improving the user interface to make it more usable, intuitive, and accessible. Symptom selection may be made easier, instructions can be made clearer, and educational materials can be made available to help users understand the limits of self-diagnosis.

The hazards related to inaccurate self-diagnosis can also be reduced by putting in place policies to encourage responsible use of the medical bot, such as clear disclaimers and advice to check with medical experts for confirmation and direction.

Future development may concentrate on enhancing user experiences and ensuring that the medical bot stays a viable and secure resource for early disease evaluation by solving these issues and continuously improving the system.

Chapter-8: Conclusion and Future Work

8.1 Conclusion

In this project, we described the creation and implementation of a medical bot designed to diagnose diseases by examining user-reported symptoms. Our main goal was to offer customers an intuitive platform that enables them to recognize probable ailments based on their chosen symptoms, encouraging proactive healthcare management.

We successfully included Support Vector Machine (SVM), Bayesian Network, and Classification into the medical bot system in order to accomplish this aim. These techniques were painstakingly designed and flawlessly applied, improving the system's performance and diagnostic capabilities.

The results of our work mark a significant advancement in healthcare technology since they give consumers access to timely and trustworthy health information, promoting informed choice making and disease early detection.

8.2 Future Work

Despite the fact that the medical bot's present deployment has shown encouraging results, it's crucial to acknowledge that there are still plenty of room for development and improvement. First and foremost, by continually improving the machine learning algorithms and adding more and more varied datasets, there is space to improve the system's accuracy. By doing this, consumers would be certain to obtain the most accurate and trustworthy disease forecasts, thus boosting their confidence in the system.

Furthermore, the incorporation of cutting-edge technologies offers a promising direction for development. It is possible to improve the system's capacity to comprehend and interpret user-generated symptoms more efficiently by utilizing technologies like deep learning and natural language processing (NLP).

Another alternative is to increase user interaction possibilities. The technology might be improved by adding speech recognition and medical bot interfaces to make it more user-friendly

and available to a wider audience. This enhances the user experience while also expanding the medical bot's reach.

In addition, it's critical to keep the system up to date with the most recent findings in medical science and treatment recommendations. By putting in place a system for real-time updates, the system will stay up to date and in line with changing medical procedures.

The medical bot's reach and impact may be greatly increased by making it available on other platforms, such as mobile devices and online apps, enabling consumers to obtain important healthcare information in a variety of settings. The system's continued usefulness and success in offering users insightful health information and support are largely attributed to these upgrades and additions.

8.3 Integration of more algorithms

The addition of more classification algorithms and ensemble approaches offers great potential for improving the accuracy and reliability of disease forecasts. The system may analyze symptoms and diseases using a wider range of methods by increasing its toolkit of machine learning algorithms, which might result in even more accurate and trustworthy outcomes. The system's diagnostic skills may be strengthened further by the use of ensemble approaches, which combine the advantages of many algorithms to provide consumers more reliable and trustworthy health insights.

8.4 Enhanced User Interface

The user interface has to be developed further in order to improve the user experience. This involves making it easier for users to submit their symptoms for analysis by streamlining the symptom selection process to make it more simple, intuitive, and user-friendly. Additionally, improving the way disease projections are visually represented can help users comprehend and interpret the data more effectively, eventually giving them access to more understandable and useful health information. The medical bot will become even more user-centric and efficient at aiding symptom-based disease identification thanks to these user interface upgrades.

8.5 Personalization

The usage of medical bots might be completely changed by implementing a user profile system that can record and analyze previous encounters. The system may provide individualized sickness predictions by using user data from prior encounters and taking into consideration a person's medical history and symptom patterns. This customized method improves prediction accuracy while also offering consumers a more engaging and personalized healthcare experience, eventually encouraging proactive health management and user happiness.

8.6 Collaboration with medical professionals

Working together with medical professionals offers a great chance to improve the system's accuracy and dependability. Their clinical skills and subject knowledge can offer priceless insights into improving the algorithms and optimizing the disease detection procedure. This partnership not only improves the diagnostic capabilities of the system but also fosters user confidence in the medical bot as a reliable source of health information, building a strong feeling of trustworthiness and credibility among the user community.

References

[1] S. Hoermann, K. L. McCabe, D. N. Milne, and R. A. Calvo, "Application of Synchronous Text-Based Dialogue Systems in Mental Health Interventions: Systematic Review," IEEE Journal of Medical Internet Research, vol. 19, no. 8, pp. 1-10, Aug. 2017.

[2] S. K. Mishra, D. Bharti, and N. Mishra, "Dr.Vdoc: A Medical Chatbot that Acts as a Virtual Doctor," Journal of Medical Science and Technology, vol. 6, no. 3, pp. 1-20, 2017.

[3] D. Madhu, N. Jain, C. J. Elmy, S. Shaji, and A. Ajayakumar, "A Novel Approach for Medical Assistance Using Trained Chatbot," in International Conference on Inventive Communication and Computational Technologies (ICICCT), 2017.

[4] S. Divya, V. Indumathi, S. Ishwarya, M. Priyasankari, and K. Devi, "A Self-Diagnosis Medical Chatbot Using Artificial Intelligence," IEEE Journal of Web Development and Web Design, vol. 3, no. 1, pp. 1-30, 2018.