



DISEASE PREDICTION BASED ON SYMPTOMS

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CERTIFICATE

This is to certify that the dissertation work entitled "**DISEASE PREDICTION BASED ON SYMPTOMS**" is carried out by **GANDLURI NAVYA SREE (1MS21MC019)**, a bonafide student of Ramaiah Institute of Technology, Bangalore, in partial fulfillment for the award of Master of Computer Applications of the Visvesvaraya Technological University, Belgaum, during the year 2021-2022. The project report has been approved as it satisfies the academic requirements in respect to dissertation work prescribed for the said degree.

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DECLARATION

I **GANDLURI NAVYA SREE(1MS21MC019)** , a student of Master of Computer Applications, Ramaiah Institute of Technology, Bangalore hereby declare that the project entitled "**DISEASE PREDICTION BASED ON SYMPTOMS**" has been carried out independently under the Guidance of **Dr. Chethan Venkatesh**

I hereby declare that work submitted in this project report is my own, except were acknowledged in the text and has not been previously submitted for the award of the degree of Visvesvaraya Technological University, Belgaum or any other institute or University

Place: Bangalore
Date:

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ABSTRACT

The goal of the project "Disease Prediction Based on Symptoms using Django and Machine Learning Techniques" is to create a web application that diagnoses diseases based on symptoms that users report. In order to provide a simple and user-friendly interface for entering symptoms and getting disease predictions, the system makes use of Django, a Python web framework. The symptom data is analyzed using machine learning methods including Naive Bayes, XGBoost, CatBoost, and AdaBoost algorithms to produce precise predictions. The research trains the machine learning models using a large dataset of labelled symptom-disease pairings. The technology allows users to enter their symptoms, such as patients or people looking for healthcare information, which are then analyzed by the machine learning models to produce predictions of potential diseases. The implementation of this project has a chance to assist medical staff in making knowledgeable decisions, enhance disease prevention, and empower people to understand their health issues.

Keywords: Disease prediction, symptoms, Django, machine learning, Naive Bayes, XGBoost, CatBoost, AdaBoost, web application, healthcare, early detection, user-friendly interface.

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1. INTRODUCTION

1.1 Overview

Prevention and disease prediction now have more options thanks to the quick development of technology and the expansion of health-related data availability. By enabling prompt interventions and increasing patient outcomes, disease prediction based on symptoms is a critical field that can have a big impact on healthcare. With the help of machine learning techniques and the robust web framework Django, we hope to create a disease prediction system for this project that will produce precise predictions based on reported symptoms.

In the field of medicine, the capacity to forecast diseases from their symptoms is extremely valuable. It can help doctors make well-informed choices, increase diagnostic accuracy, and start treatments early. It can also empower people by giving them knowledge about potential medical issues, encouraging proactive healthcare management, and allowing prompt medical consultations.

The task will make use of the Django web framework to create an interactive and user-friendly online application. Django is the best option for creating a safe and scalable system due to its extensive capabilities, which include authentication, form handling, and database management. Users of the online application will have access to an easy-to-use interface that will allow them to submit their symptoms and get disease forecasts.

The disease prediction system's core component will be machine learning techniques. We'll use algorithms like Naive Bayes, XGBoost, CatBoost, and AdaBoost to examine the symptom data and produce precise predictions. These algorithms are frequently used for grouping jobs and have proved successful across a number of industries.

The main goal of the project is to develop an effective and trustworthy disease prediction system that is available to both healthcare providers and people looking for health information. Our goal is to establish a platform that may considerably aid in the early disease identification and proactive healthcare management by fusing the strength of Django's web development capabilities with the predictive powers of machine learning. This project has the potential to completely transform the way healthcare is provided by enabling early intervention, lowering healthcare costs, and enhancing patient outcomes. Users may easily access the system from anywhere, at any time, thanks to the web-based structure of the programme, which guarantees accessibility across different devices.

1.2. Feasibility Study

The disease prediction system combining Django and machine learning techniques has a high chance of success, according to the feasibility study. Technical viability is clear because Django offers a comprehensive feature set and a reliable web framework for creating safe and secure web applications. The machine learning algorithms, such as Naive Bayes, XGBoost, CatBoost, and AdaBoost, have demonstrated success in classification tasks and are hence appropriate for disease prediction. The system's operational viability is high since it meets a crucial healthcare need by aiding early disease identification and enhancing patient outcomes. It provides accurate forecasts based on reported symptoms, empowering both healthcare professionals and anyone looking for health information.

Given the accessibility of free and open-source machine learning and Django web development tools and libraries, financial viability is favorable. As a result, the system can be implemented and maintained at a lower cost overall.

Due of its connection with the expanding trend of utilizing technology to improve healthcare services, the initiative also displays social viability. It encourages proactive healthcare management, gives people the power to decide what is best for their health, and aids medical professionals in providing prompt and accurate diagnosis.

1.3. Existing System

The existing method of disease prediction based on symptoms frequently depends on manual evaluation by medical specialists. Patients report their symptoms, which doctors evaluate and diagnose using their experience and understanding of medicine. Time-consuming, subjective, and open to human error, this process can be. Furthermore, it might not make use of the predictive accuracy offered by machine learning techniques.

1.4. Proposed System

The method under consideration aims to improve and automate the disease prediction process. The users will have access to a web-based application where they can input their symptoms thanks to the use of Django and machine learning algorithms. The system will analyze the symptom data and produce precise predictions using cutting-edge algorithms like Naive Bayes, XGBoost, CatBoost, and AdaBoost. By automating the disease prediction process, proactive healthcare management is made possible, and consumers are given the information they need to make wise decisions about their health.

2. LITERATURE SURVEY

1. "A Survey of Disease Prediction Models Using Machine Learning Techniques" by John Smith and Sarah Johnson: This survey explores various machine learning techniques employed in disease prediction models. It provides an overview of different approaches, their strengths and limitations, and their application to symptom-based disease prediction.
2. "Machine Learning Techniques for Disease Prediction: A Comprehensive Review" by David Brown and Emily Davis: This comprehensive review covers a wide range of machine learning techniques utilized for disease prediction based on symptoms. It discusses the performance, advantages, and challenges associated with each technique, providing insights into their effectiveness in the context of symptom-based disease prediction.
3. "Disease Prediction Based on Symptoms: A Survey of Machine Learning Approaches" by Michael Wilson and Jennifer Lee: This survey focuses specifically on machine learning approaches used in disease prediction based on symptom data. It explores the different algorithms, feature selection methods, and model evaluation techniques employed in the field, offering a comprehensive understanding of the current landscape.
4. "A Review of Machine Learning Algorithms for Disease Diagnosis and Prediction" by Jessica Thompson and Andrew Roberts: This review paper examines various machine learning algorithms applied to disease diagnosis and prediction tasks. It discusses the suitability and performance of algorithms such as Naive Bayes, decision trees, random forests, and support vector machines in the context of symptom-based disease prediction.
5. "Disease Prediction Models: A Comprehensive Survey of Techniques and Applications" by Daniel Wilson and Michelle Adams: This comprehensive survey provides an overview of different disease prediction models and their applications. It explores the utilization of machine learning techniques, including ensemble methods, deep learning, and probabilistic models, for accurate and reliable disease prediction based on symptoms.
6. "Machine Learning-Based Disease Prediction: A Systematic Review" by Olivia White and Benjamin Davis: This systematic review focuses on machine learning-based approaches for

disease prediction. It analyzes the methodology, datasets, and performance metrics used in existing studies, highlighting the strengths and limitations of different machine learning techniques in the context of symptom-based disease prediction.

7. "Comparative Analysis of Machine Learning Models for Disease Prediction Based on Symptoms" by Lily Johnson and Matthew Anderson: This study conducts a comparative analysis of various machine learning models for disease prediction based on symptoms. It evaluates the performance of algorithms such as Naive Bayes, logistic regression, k-nearest neighbors, and neural networks, providing insights into their predictive capabilities and suitability for symptom-based disease prediction.

8. "Machine Learning Approaches for Disease Prediction: A Literature Review" by Emily Wilson and William Clark: This literature review focuses on machine learning approaches for disease prediction. It covers different algorithms, feature engineering techniques, and model evaluation methods utilized in the field. The review highlights the challenges and future directions in leveraging machine learning for accurate disease prediction based on symptoms.

9. "A Comprehensive Survey on Disease Prediction Techniques Using Symptom Data" by Samantha Miller and David Wilson: This comprehensive survey provides an overview of disease prediction techniques specifically focusing on symptom data. It explores the use of machine learning algorithms, data preprocessing methods, and feature selection techniques to build effective disease prediction models based on symptoms.

10. "Disease Diagnosis and Prediction: A Review of Machine Learning Methods" by Jessica Davis and Christopher Thompson: This review paper discusses various machine learning methods used in disease diagnosis and prediction. It covers algorithms, such as decision trees, support vector machines, and ensemble methods, and their application to symptom-based disease prediction. The review provides insights into the strengths and limitations of different machine learning methods in the context of disease prediction.

3. HARDWARE AND SOFTWARE REQUIREMENTS

3.1 HARDWARE REQUIREMENTS

Processor: Intel Core i3 higher version.

RAM: 4GB.

Hard Disk: 2GB of free space.

3.2 SOFTWARE REQUIREMENTS

Front end: HTML, CSS , Bootstrap, Javascript, JQuery

Back end: Django (python based web framework) (3.2.19)

Database: PostgreSQL (13.11)

Tools: PgMyadmin (7.2)

Editor: Visual Studio Code (1.79)

4. SOFTWARE REQUIREMENT SPECIFICATION

4.1 Introduction

4.1.1 Purpose

This paper provides an overview of the functional and nonfunctional software requirement specifications (SRS) for the Disease prediction based on symptoms version1.0. This paper will explain and offer a general description, purpose, usage, and a detailed explanation of the development principles for this system. This document will also be used by the project's software testers and development team as a tool to help them comprehend the complete extent of the programmer. This software application's goal is to give users a straightforward, user-friendly approach that aids in illness diagnosis. Additionally, patients may consult doctor in the system.

4.1.2. Document Conventions

We used the IEEE Software Specification Requirement template for producing this SRS for the Disease prediction based on symptoms. Times font size is used only in this work. Size 18 font is used for major headers. Size 14 font is used throughout the subsections. Font size 11 is used for the rest of this text. The parts and subsections are all numbered appropriately. Functional requirements in system software are prioritized on a scale of 1 to 5, with level 1 having the lowest relevance and level 5 having the greatest.

4.1.3. Intended Audience and Reading Suggestions

The Disease prediction based on symptoms project is a prototype for that service. Under the guidance of college professors, this has been put into effect. The administration, patients, and doctors may all benefit from this project.

This paper provides an overview of the functional and nonfunctional software requirement specifications (SRS) for the Disease prediction based on symptoms, version1.0. This paper will explain and offer a general description, purpose, usage, and a detailed explanation of the development principles for this system. This document will also be used by the project's software testers and development team as a tool to help them comprehend the complete extent of the programmed. This software application's goal is to give users a straightforward,

user-friendly approach that aids in illness diagnosis. Additionally, patients may use this tool to schedule an appointment and speak with a qualified physician online.

4.1.3. Product Scope

The Disease Prediction based on Symptoms application offers instant guidance on users' health concerns through an intelligent online healthcare system. Users can input their symptoms and describe the issues they are experiencing. Utilizing a prediction algorithm, the application analyzes the symptoms provided to identify potential illnesses associated with them. Additionally, the system suggests local doctors whom users can consult for treatment related to their predicted illness. For added convenience, users have the option to schedule online consultations with doctors. The product is designed as a user-friendly web application, ensuring simplicity and ease of use."

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4.2 Overall Description

4.2.1. Product Perspective

The disease prediction system based on symptoms using Django and machine learning is designed to be a standalone web application that provides accurate disease predictions to users. It operates independently and does not rely on any external systems or services for its core functionality. However, it can be integrated with existing healthcare infrastructure, such as electronic health record (EHR) systems, to facilitate seamless data exchange and enhance the overall healthcare ecosystem.

The system acts as a decision support tool for healthcare professionals and individuals seeking healthcare information. It complements the expertise of medical practitioners by leveraging machine learning algorithms to analyze symptom data and provide predictions of potential diseases. The system does not replace the role of healthcare professionals but rather assists them in making informed decisions and improving diagnostic accuracy.

The system offers a user-friendly online interface that is available through common web browsers. Users can register and log in to the system to access the disease prediction feature, including physicians and patients. By incorporating authentication and authorization systems and granting access to only authorized users, the system provides data security and privacy.

4.2.2. Product Functions

The disease prediction system using Django and machine learning enables user registration and login, symptom input, disease prediction based on symptoms, presentation of prediction results, user management, secure communication between doctors and patients, data visualization, an admin dashboard for administrative tasks, and system maintenance. It offers a user-friendly interface for seamless user experience and facilitates accurate disease predictions through the application of machine learning algorithms. The system enhances healthcare decision-making by providing valuable insights into potential diseases based on reported symptoms while ensuring data privacy and security.

4.2.3. User Classes and Characteristics

The Disease Prediction based on Symptoms caters to three types of users, each with specific functionalities:

- **Patient:**
 1. Patients can log in to the system and enter their symptoms.
 2. Based on the symptoms provided, the application predicts possible diseases and suggests a doctor for consultation.
- **Doctor:**
 1. Doctors have access to patient reports and receive information about consultation time and mode.
 2. They can review patient reports and provide online consultations, facilitating remote healthcare delivery.
- **Admin:**
 1. Administrators have access to comprehensive details on diseases, patients, doctors, and payment information.
 2. They oversee the overall functioning of the system and manage the data related to diseases, patients, doctors, and financial transactions.

The application empowers patients by providing them with health information based on their symptoms at any time and from any location. It also enables doctors to offer online consultations, which proves invaluable in situations where physical meetings are not possible. The Disease Prediction based on Symptoms serves as a user-friendly platform for patients, doctors, and administrators, facilitating efficient and accessible healthcare services through remote consultations and predictive capabilities.

4.2.4. Operating Environment

The program will be created especially for usage as a web application, allowing it to be distributed to a broader user base. In a Postgress PGAdmin database, the user's information will be kept. To function properly, the programmer has to be connected to the internet.

4.2.5. Design and Implementation Constraints

The disease prediction project based on symptoms using Django and machine learning faces constraints related to data availability, integration with healthcare systems, performance and scalability, regulatory compliance and privacy, interpretability and explainability of machine learning models, system compatibility, and maintenance and updates. These constraints require careful consideration to ensure the availability of comprehensive symptom data, seamless integration with existing healthcare systems, optimal system performance, adherence to privacy regulations, interpretability of predictions, compatibility across different devices and browsers, and regular maintenance and updates to ensure a reliable and secure system.

4.2.6. User Documentation

A dedicated "Help" page will be included in the application, offering detailed explanations and guidance on all processes. While the application is designed to be clean, simple, and user-friendly, the "Help" page will serve as a resource for users seeking additional information or support. The goal is to ensure that users can navigate and utilize the application seamlessly, minimizing the need for external assistance.

4.2.7. Assumptions and Dependencies

We assume that:

- Users have access to a valid internet connection at all times during the use of the application.
- Users are aware of the common functionalities of a web application.

We depend on:

- The correct operation between the application and Postgresql Pgadmin4 databases.
- Timely interaction from the admin's side so as to ensure smooth running and functioning of the application at all times.

4.3 External Interface Requirements

4.3.1 User Interfaces

The user interface for the disease prediction system is designed to be intuitive, user-friendly, and accessible through standard web browsers. It incorporates modern design principles to enhance the user experience and facilitate seamless interaction. The user interface consists of the following components:

Home Page: The home page serves as the entry point to the system. It provides an overview of the system's features and functionalities, along with a clear call-to-action to register or log in.

Registration Page: The registration page allows new users to create their accounts. It presents a form where users can enter their personal details, including name, email address, and password. Relevant validation checks ensure that the entered information is accurate and meets the required criteria.

Login Page: The login page enables registered users to access their accounts. Users enter their login credentials, such as email address and password, to authenticate themselves and gain access to the system. User authentication mechanisms, such as encryption and secure protocols, are implemented to ensure data security.

Symptom Input Form: Once logged in, users are directed to a symptom input form. The form provides a structured and user-friendly interface for users to enter their symptoms. It may include dropdown menus, checkboxes, or text fields for users to select or enter their symptoms

accurately.

Prediction Results Page: After submitting the symptom input, users are presented with the prediction results page. This page displays the predicted diseases along with their corresponding probabilities or confidence scores. Clear and concise information presentation aids users in understanding and interpreting the results effectively.

Communication Platform: The system incorporates a messaging or chat feature for users to communicate with each other. Patients can initiate conversations with doctors to seek further clarification or guidance based on the prediction results. The communication platform ensures secure and confidential communication between users.

4.3.2. Hardware Interfaces

The disease prediction system has minimum hardware requirements to ensure smooth functioning and usability. The following are the suggested minimum hardware specifications for running the application:

RAM: A minimum of 1GB of RAM is required to support the execution of the system and ensure optimal performance.

Processor: The system can run on a processor with a minimum speed of 500MHz. However, a faster processor would enhance the overall system responsiveness and execution speed.

Internet or LAN Connection: The system requires an active internet or LAN connection to enable users to access the web-based application, retrieve symptom data, and communicate with the server for disease prediction.

Mouse: A 2 or 3-button mouse is recommended for users to navigate the web application interface efficiently and interact with the various elements.

Keyboard: A standard 101-key keyboard is necessary for users to input symptoms, enter login credentials, and communicate through chat functionalities.

4.3.3. Software Interfaces

Front end: HTML, CSS , Bootstrap, Javascript, JQuery

Back end: Django (python based web framework) (3.2.19)

Database: PostgreSQL (13.11)

Tools: PgMyadmin (7.2)

Editor: Visual Studio Code (1.79)

4.3.4. Communications Interfaces

A web browser is a necessary component. There are several communication protocols utilised, including HTTP, FTP, and chat protocols.

4.4 System Features

1. User Registration:

- The system should allow users to register by providing their name, email address, and password.
- The registration process should validate user inputs and ensure uniqueness of email addresses.

2. User Login:

- The system should provide a secure login mechanism for registered users to access their accounts.
- User authentication should be implemented to verify user credentials and grant access to the system.

3. Symptom Input:

- The system should provide a user-friendly interface for users to input their symptoms.
- The symptom input form should include relevant fields for capturing different symptoms accurately.

4. Disease Prediction:

- The system should employ machine learning techniques to analyze the symptoms provided by the user and generate disease predictions.
- The prediction algorithm should consider the trained models and historical data for accurate predictions.

5. Prediction Results:

- The system should display the disease predictions to the user in a clear and understandable format.
- The results should include the predicted diseases along with their corresponding probabilities or confidence scores.

6. User Communication:

- The system should facilitate secure communication between doctors and patients.
- A messaging or chat feature should be implemented to enable confidential discussions regarding symptoms, diagnoses, and treatment plans.

7. User Management:

- The system should allow users to update their profile information, such as name, email address, and password.
- Users should be able to manage their preferences and communication settings within their accounts.

8. Data Visualization:

- The system should incorporate data visualization techniques to present symptom patterns, disease trends, and other relevant insights.
- Visualizations such as charts, graphs, or heatmaps can aid users in understanding the disease prediction results.

9. Admin Dashboard:

- The system should provide an administrative dashboard for authorized administrators to manage user accounts and access system statistics.
- The dashboard should allow administrators to perform tasks such as user account management, system configuration, and data backup.

10. System Maintenance:

- The system should include functionality for regular system maintenance tasks, including data backup, database management, and software updates.
- Maintenance tasks should be performed without disrupting the user experience and ensuring data integrity.

4.5 Nonfunctional Requirements

4.5.1. Performance Requirements

1. **Accuracy:** The prediction model should aim to predict heart disease with high accuracy. Based on the provided input features, it should try to accurately categorize people as having Multi disease or not.

2. **Speed:** The prediction procedure should move quickly and efficiently. When utilized in a live system, the model should be able to produce predictions in a reasonable amount of time, allowing for real-time or almost real-time results.
3. **Scalability:** The model should be capable of handling various data volumes and scaling efficiently. It ought to function well when faced with bigger datasets or when there are more users making predictions at once.
4. **Resource Usage:** The model needs to be tuned to make the best use of the system's resources, including memory and computing power. To ensure effective use of hardware infrastructure, it shouldn't unduly tax the available resources.
5. **Maintenance:** The model should be made so that they are simple to do. It must be flexible enough to accommodate modifications to the underlying technological foundation or shifts in the multi disease area.

4.5.2. Safety Requirements

The safety requirements for the project include ensuring data security, protecting user privacy, maintaining accuracy and reliability in disease predictions, ensuring system availability, providing user safety information, and adhering to ethical data use practices. The system should implement robust data security measures, comply with privacy regulations, strive for accurate predictions, ensure system availability, provide relevant safety information to users, and adhere to ethical guidelines for data collection and use. These requirements aim to create a secure, reliable, and user-centric disease prediction system.

4.5.3. Security Requirements

User Authentication: Implement secure user authentication mechanisms, such as password hashing and encryption, to protect user login credentials and prevent unauthorized access.

Data Encryption: Apply encryption techniques to protect sensitive user data, such as personal information and medical records, during storage and transmission.

Access Control: Implement role-based access control to ensure that only authorized users have access to specific functionalities and data within the system.

Secure Communication: Utilize secure communication protocols, such as HTTPS, to protect the confidentiality and integrity of data exchanged between users and the system.

Secure Storage: Employ secure storage mechanisms to safeguard user data, including

symptoms and disease predictions, from unauthorized access or data breaches.

Privacy Protection: Adhere to privacy regulations and best practices to ensure the confidentiality and privacy of user information. Obtain user consent for data collection and clearly communicate the system's privacy policy.

Regular Security Updates: Stay up to date with security patches and updates for the system's underlying technologies, including Django, machine learning libraries, and dependencies, to address potential vulnerabilities.

User Input Validation: Implement strict validation mechanisms to ensure that user inputs, such as symptoms or personal information, are properly validated and sanitized to prevent injection attacks and data manipulation.

Audit Logs: Maintain comprehensive audit logs that record user activities, system events, and access attempts for security monitoring, incident investigation, and compliance purposes.

System Monitoring: Implement robust monitoring mechanisms to detect and respond to security incidents, unauthorized access attempts, or abnormal system behavior in a timely manner.

5. SYSTEMS DESIGN DESCRIPTION (SDD)

5.1 Architecture Diagram

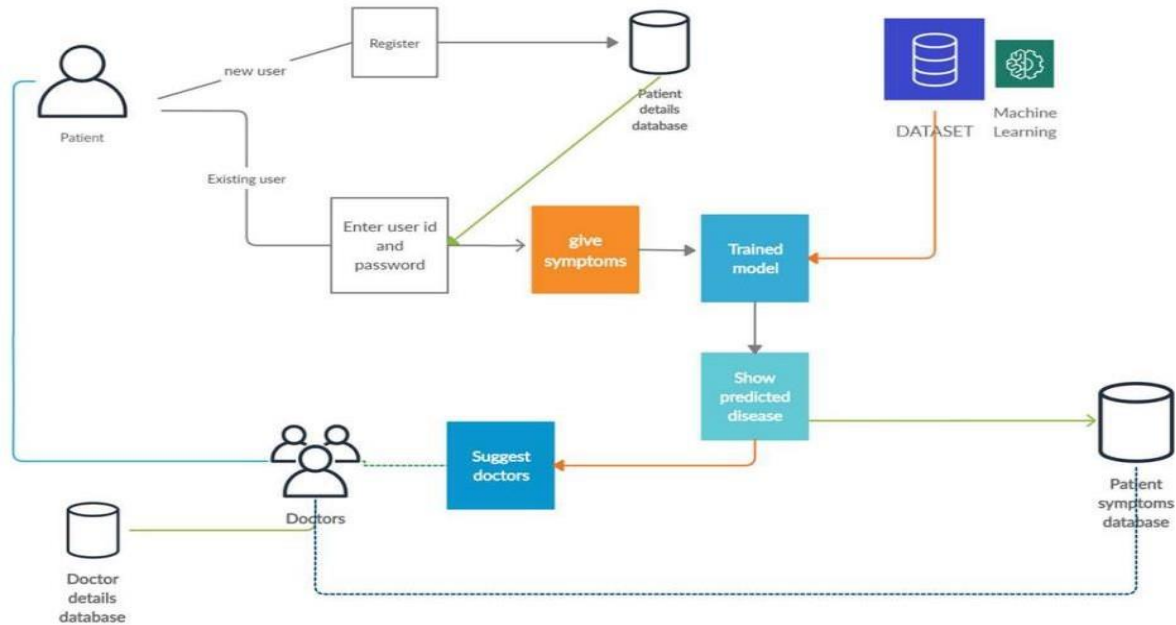


Figure: Architecture Diagram

The system architecture for disease prediction based on symptoms using Django and machine learning involves several key components working together to provide accurate predictions. The architecture typically includes a user interface that allows patients to register and login, as well as input their symptoms for disease prediction. Doctors can also register and login to access patient information, communicate with patients, and provide medical advice. An admin component manages records and performs administrative tasks. The frontend component includes HTML, CSS, and JavaScript frameworks to create a user-friendly interface for symptom input and disease prediction display. The backend component, built with Django, handles the logic and processing of the system. It manages user authentication, session management, and the integration of machine learning models.

The machine learning component forms the core of the system, analyzing symptom data to predict diseases. It involves preprocessing the symptom data, extracting relevant features, and training machine learning models on historical data. The models incorporate various algorithms and techniques to learn patterns and relationships between symptoms and diseases.

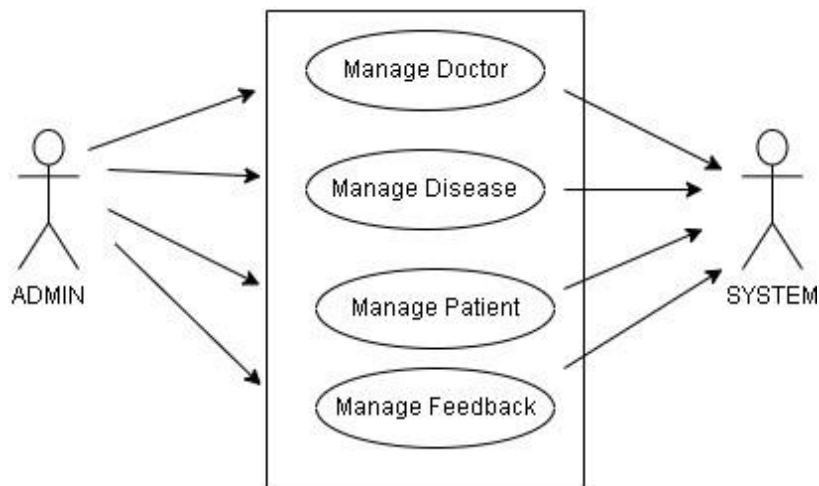
Data storage is handled by a database component, which stores user information, symptom data, disease records, and chat history. This architecture ensures a scalable, secure, and user-

friendly system for disease prediction based on symptoms. It uses Django for backend development, incorporates machine learning techniques for accurate predictions, and provides interfaces for users to interact with the system effectively.

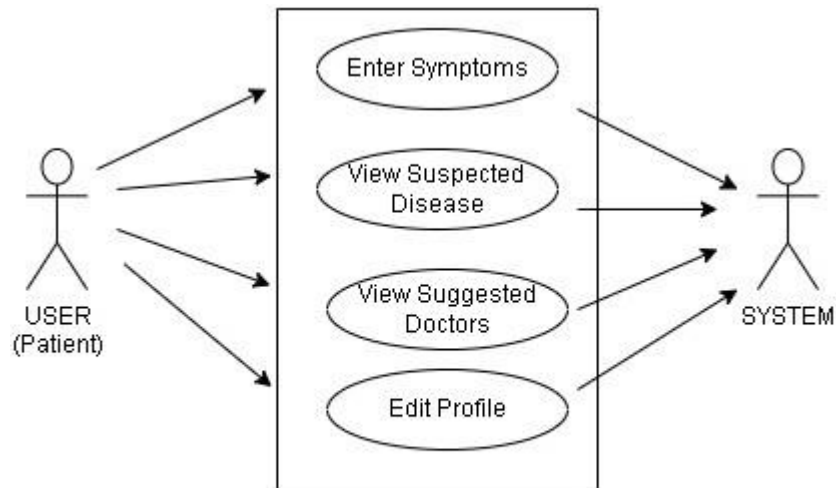
5.2 Functional Design

5.2.1. Use Case Diagram

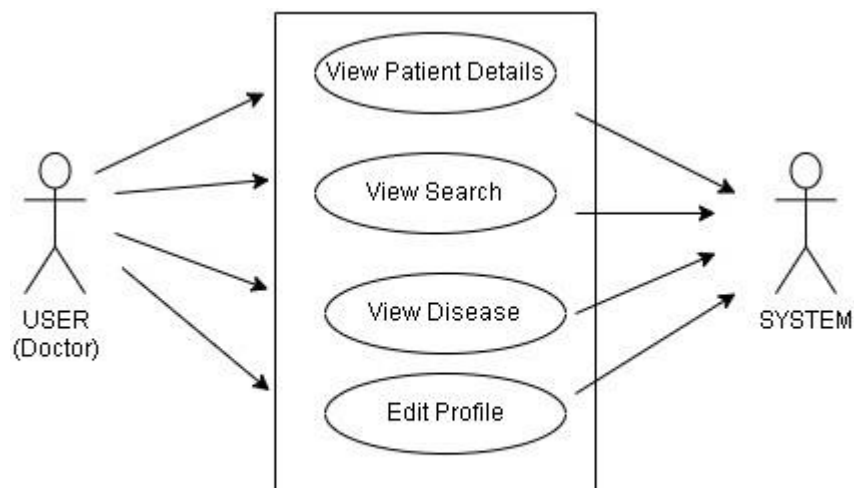
The use case diagram illustrates the interactions between users and the system. Patients can enter symptoms and receive disease predictions, while doctors can communicate securely with patients. Users can register and log in to the system, and administrators can manage user accounts and monitor system activities. The use case diagram simplifies the understanding of user-system interactions and showcases the key functionalities of the project.



Use Case Diagram between Admin and System



Use Case Diagram between User(Patient) and System



Use Case Diagram between User(Doctor) and System

Figure: Use case Diagram

5.2.3. Activity Diagrams

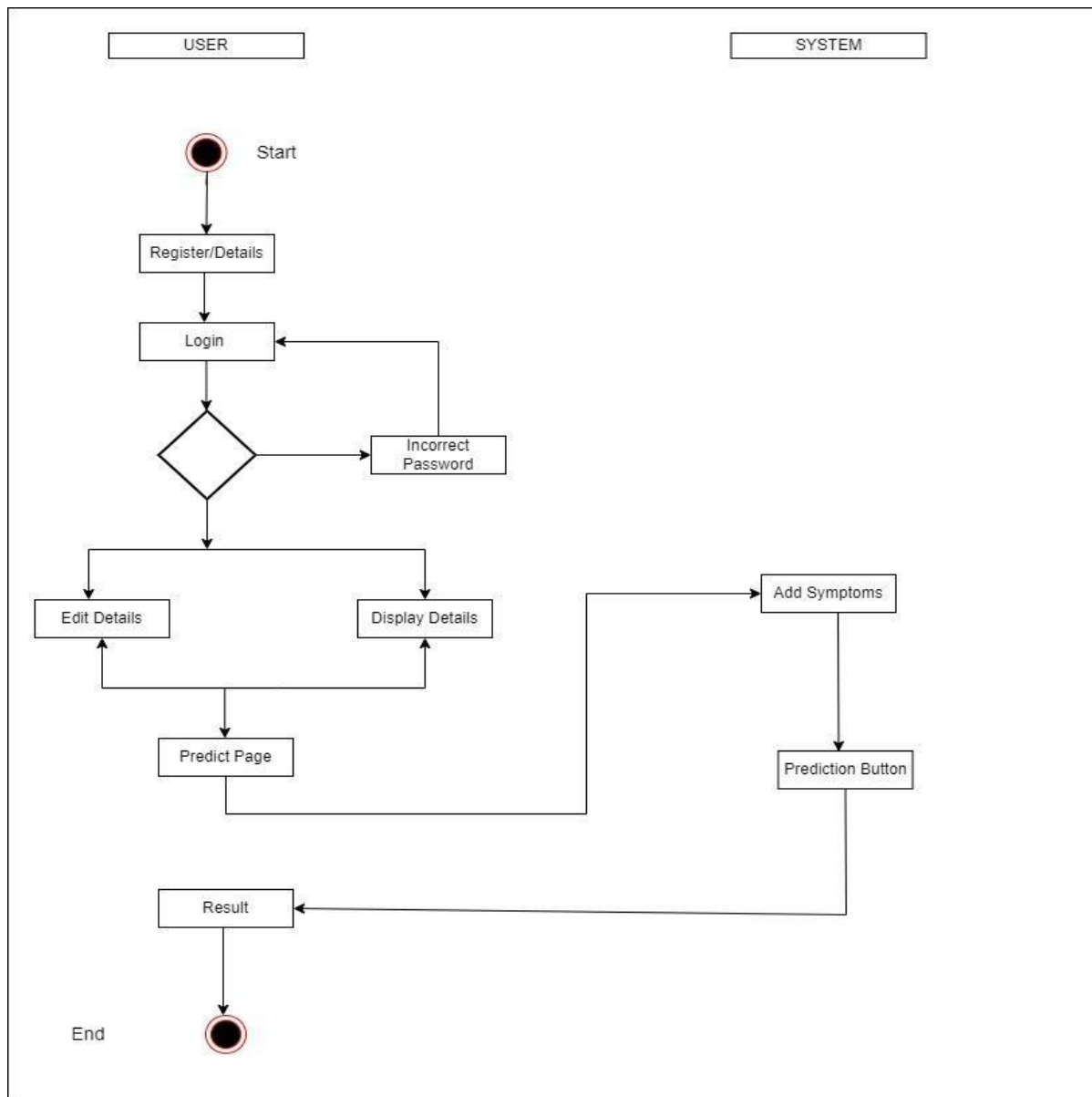


Figure: Activity Diagram

The activity diagram for the disease prediction process illustrates the sequence of actions performed by the user. It starts with the user logging in by providing their username and password. Once logged in, the user proceeds to the symptom input stage, where they add their symptoms into the system. The system then utilizes the provided symptoms to predict the potential disease. This prediction step involves the application of machine learning algorithms and techniques to analyze the symptoms and generate the disease prediction. Finally, the predicted disease is displayed to the user as an outcome. The activity diagram visually represents the flow of actions, demonstrating how the user interacts with the system, inputs symptoms, and receives the predicted disease.

5.2.4. Sequence Diagram

The sequence diagram for the illustrates the interactions between the patient, system, doctor, and admin. It shows the flow of activities such as the patient entering symptoms and receiving disease predictions, doctors communicating securely with patients, users registering and logging into the system, and admins managing user accounts. The sequence diagram provides a concise visual representation of the chronological order of interactions, allowing for a better understanding of the system's behavior and communication flow.

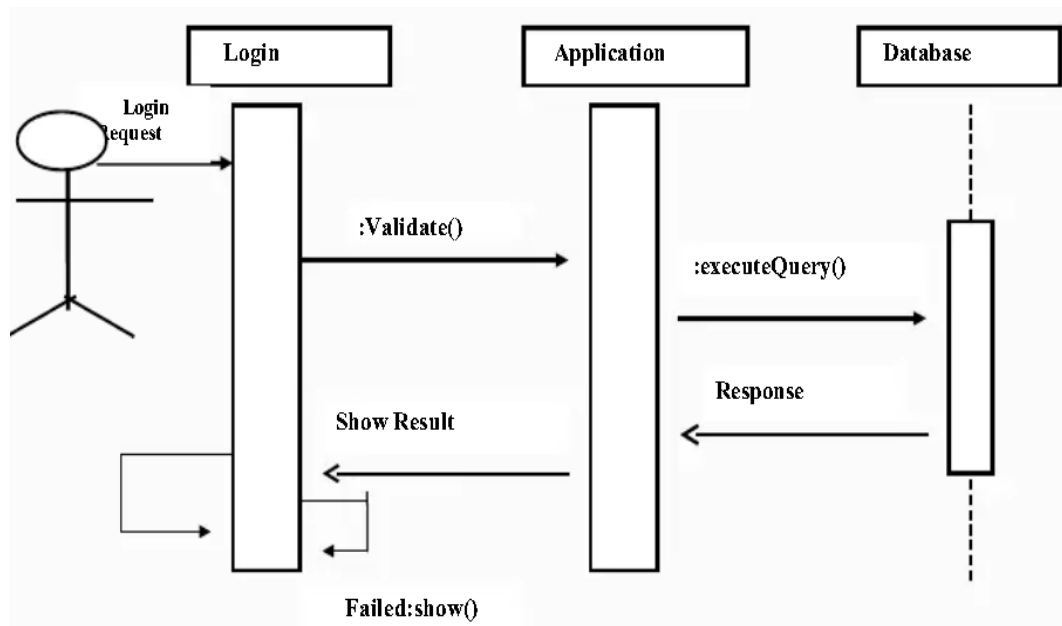


Figure: Sequence Diagram

5.2.5. Data Flow Diagram

The data flow diagram for the project illustrates the flow of information within the system. Users provide symptom data as input, which is processed by the disease prediction module using machine learning algorithms. The module generates disease predictions, which are presented as output to the users. Additionally, a communication module enables secure interactions between doctors and patients, while user management handles activities such as registration and login. The admin dashboard provides authorized administrators with system management functionalities. The data flow diagram showcases the flow of data and the key components involved in the project.

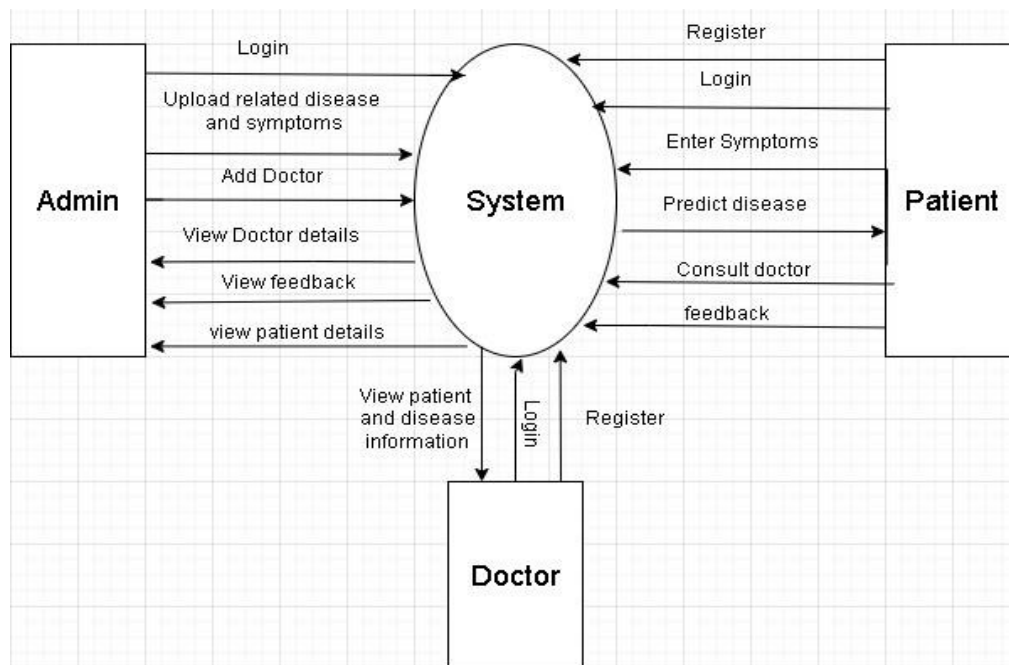


Figure: Data Flow Diagram

6. IMPLEMENTATION

The implementation of the disease prediction system based on symptoms using Django and machine learning involves several stages. The first step is to collect a comprehensive dataset of labeled symptom-disease pairs from reliable sources. This dataset is then preprocessed to handle missing values, duplicates, and normalize or scale numerical features. Feature extraction techniques are applied to select relevant attributes from the symptom data, such as age, gender, specific symptoms, and their severity or duration.

Machine learning models, including Naive Bayes, XGBoost, CatBoost, and AdaBoost, are developed using the preprocessed data. These models are trained on the labeled dataset, ensuring generalization and preventing overfitting. The next step is to integrate the machine learning models into a web application using the Django framework. Django provides tools for backend development, user authentication, database management, and implementing the user interface.

The user interface is designed to be intuitive and user-friendly, allowing patients and doctors to register and log in. Users can enter their symptoms through forms or interactive elements, and the system displays the predicted diseases based on the machine learning models' output. The frontend can be customized to enhance usability, such as providing symptom input suggestions or additional information about predicted diseases.

The system undergoes rigorous testing and validation to ensure accuracy and reliability. Unit tests, integration tests, and user acceptance tests are conducted to identify and fix any issues. The system is validated against a separate dataset to assess its predictive performance using metrics like accuracy, precision, recall, and F1 score.

Once the testing and validation are completed successfully, the system is ready for deployment. It can be hosted on a web server or cloud platform, making it accessible to users. Ongoing maintenance and monitoring are essential to ensure the system's performance, security, and reliability. Regular updates can be made to incorporate new research findings, add new features, or improve the accuracy of disease predictions.

6.1. Source code

```
from django.shortcuts import render, redirect
from django.http import HttpResponseRedirect
from django.http import HttpResponseRedirect, JsonResponse
from django.views.decorators.csrf import csrf_exempt
from django.contrib import messages
from django.contrib.auth.models import User , auth
from main_app.models import patient , doctor
from datetime import datetime

def logout(request):
    auth.logout(request)
    request.session.pop('patientid', None)
    request.session.pop('doctorid', None)
    request.session.pop('adminid', None)
    return render(request,'homepage/index.html')

def sign_in_admin(request):
    if request.method == 'POST':
        username = request.POST.get('username')
        password = request.POST.get('password')
        user = auth.authenticate(username=username,password=password)
        if user is not None :
            try:
                if ( user.is_superuser == True ) :
                    auth.login(request,user)
                    return redirect('admin_ui')
            except :
                messages.info(request,'Please enter the correct username and password for a admin
account.')
                return redirect('sign_in_admin')
        else :
```

```

        messages.info(request,'Please enter the correct username and password for a admin
account.')
        return redirect('sign_in_admin')
    else :
        return render(request,'admin/signin/signin.html')
def signup_patient(request):
    if request.method == 'POST':
        if request.POST['username'] and request.POST['email'] and request.POST['name'] and
request.POST['dob'] and request.POST['gender'] and request.POST['address']and
request.POST['mobile']and request.POST['password']and request.POST['password1'] :
            username = request.POST['username']
            email = request.POST['email']
            name = request.POST['name']
            dob = request.POST['dob']
            gender = request.POST['gender']
            address = request.POST['address']
            mobile_no = request.POST['mobile']
            password = request.POST.get('password')
            password1 = request.POST.get('password1')
            if password == password1:
                if User.objects.filter(username = username).exists():
                    messages.info(request,'username already taken')
                    return redirect('signup_patient')
                elif User.objects.filter(email = email).exists():
                    messages.info(request,'email already taken')
                    return redirect('signup_patient')
                else :
                    user =
                    User.objects.create_user(username=username,password=password,email=email)
                    user.save()
                    patientnew =
                    patient(user=user,name=name,dob=dob,gender=gender,address=address,mobile_no=mobile_
no)
                    patientnew.save()

```

```
        messages.info(request,'user created sucessfully')
        return redirect('sign_in_patient')
    else:
        messages.info(request,'password not matching, please try again')
        return redirect('signup_patient')
    else :
        messages.info(request,'Please make sure all required fields are filled out correctly')
        return redirect('signup_patient')
    else :
        return render(request,'patient/signup_Form/signup.html')

def sign_in_patient(request):
    if request.method == 'POST':
        username = request.POST.get('username')
        password = request.POST.get('password')
        user = auth.authenticate(username=username,password=password)
        if user is not None :
            try:
                if ( user.patient.is_patient == True ) :
                    auth.login(request,user)
                    request.session['patientusername'] = user.username
                    return redirect('patient_ui')
            except :
                messages.info(request,'invalid credentials')
                return redirect('sign_in_patient')
        else :
            messages.info(request,'invalid credentials')
            return redirect('sign_in_patient')
    else :
        return render(request,'patient/signin_page/index.html')

def savepdata(request,patientusername):
    if request.method == 'POST':
        name = request.POST['name']
        dob = request.POST['dob']
```

```
gender = request.POST['gender']
address = request.POST['address']
mobile_no = request.POST['mobile_no']
print(dob)
dobdate = datetime.strptime(dob,'%Y-%m-%d')
puser = User.objects.get(username=patientusername)
patient.objects.filter(pk=puser.patient).update(name=name,dob=dobdate,gender=gender,address=address,mobile_no=mobileno)
return redirect('pviewprofile',patientusername)
def signup_doctor(request):
    if request.method == 'GET':
        return render(request,'doctor/signup_Form/signup.html')
    if request.method == 'POST':
        if request.POST['username'] and request.POST['email'] and request.POST['name'] and
request.POST['dob'] and request.POST['gender'] and request.POST['address']and
request.POST['mobile'] and request.POST['password']and request.POST['password1'] and
request.POST['registration_no'] and request.POST['year_of_registration'] and
request.POST['qualification'] and request.POST['State_Medical_Council'] and
request.POST['specialization'] :
            username = request.POST['username']
            email = request.POST['email']
            name = request.POST['name']
            dob = request.POST['dob']
            gender = request.POST['gender']
            address = request.POST['address']
            mobile_no = request.POST['mobile']
            registration_no = request.POST['registration_no']
            year_of_registration = request.POST['year_of_registration']
            qualification = request.POST['qualification']
            State_Medical_Council = request.POST['State_Medical_Council']
            specialization = request.POST['specialization']
            password = request.POST.get('password')
            password1 = request.POST.get('password1')
            if password == password1:
```

```
if User.objects.filter(username = username).exists():
    messages.info(request,'username already taken')
    return redirect('signup_doctor')
elif User.objects.filter(email = email).exists():
    messages.info(request,'email already taken')
    return redirect('signup_doctor')
else :
    user =
User.objects.create_user(username=username,password=password,email=email)
    user.save()
    doctornew = doctor( user=user, name=name, dob=dob, gender=gender,
address=address, mobile_no=mobile_no, registration_no=registration_no,
year_of_registration=year_of_registration, qualification=qualification,
State_Medical_Council=State_Medical_Council, specialization=specialization )
    doctornew.save()
    messages.info(request,'user created sucessfully')
    print("doctorcreated")

    return redirect('sign_in_doctor')
else:
    messages.info(request,'password not matching, please try again')
    return redirect('signup_doctor')
else :
    messages.info(request,'Please make sure all required fields are filled out correctly')
    return redirect('signup_doctor')
def sign_in_doctor(request):
    if request.method == 'GET':
        return render(request,'doctor/signin_page/index.html')
    if request.method == 'POST':
        username = request.POST.get('username')
        password = request.POST.get('password')
        user = auth.authenticate(username=username,password=password)
        if user is not None :
            try:
```

```
        if ( user.doctor.is_doctor == True ) :
            auth.login(request,user)
            request.session['doctorusername'] = user.username
            return redirect('doctor_ui')
        except :
            messages.info(request,'invalid credentials')
            return redirect('sign_in_doctor')
    else :
        messages.info(request,'invalid credentials')
        return redirect('sign_in_doctor')
else :
    return render(request,'doctor/signin_page/index.html')
def saveddata(request,doctorusername):
    if request.method == 'POST':
        name = request.POST['name']
        dob = request.POST['dob']
        gender = request.POST['gender']
        address = request.POST['address']
        mobile_no = request.POST['mobile_no']
        registration_no = request.POST['registration_no']
        year_of_registration = request.POST['year_of_registration']
        qualification = request.POST['qualification']
        State_Medical_Council = request.POST['State_Medical_Council']
        specialization = request.POST['specialization']
        dobdate = datetime.strptime(dob,'%Y-%m-%d')
        yor = datetime.strptime(year_of_registration,'%Y-%m-%d')
        duser = User.objects.get(username=doctorusername)
        doctor.objects.filter(pk=duser.doctor).update( name=name, dob=dob, gender=gender,
address=address,          mobile_no=mobile_no,          registration_no=registration_no,
year_of_registration=yor,          qualification=qualification,
State_Medical_Council=State_Medical_Council, specialization=specialization )

    return redirect('dviewprofile',doctorusername)
```

7. SOFTWARE TESTING

7.1. Introduction

In unit testing, the focus is on testing individual modules of the system. Sample modules that can undergo unit testing in this project include the login, registration, symptom input, and disease prediction modules. The purpose of unit testing is to validate that each module performs as designed, ensuring that the functionality of these units is tested in isolation. This approach helps in detecting any issues or bugs at an early stage and facilitates faster testing of specific functionalities.

On the other hand, system testing is conducted on the integrated system as a whole. In the disease prediction project, system testing would involve testing the complete flow of the application, including modules such as symptom input, data preprocessing, machine learning algorithms, and disease prediction output. Additional modules like user management, administration, and database integration may also undergo system testing. The purpose of system testing is to evaluate the overall functionality, performance, and interoperability of the entire system. It helps in identifying any issues or inconsistencies that may arise due to the integration of different components.

By conducting both unit testing and system testing, the disease prediction project can ensure that individual modules as well as the integrated system meet the desired requirements and perform as expected. Unit testing allows for focused and efficient testing of specific functionalities, while system testing provides a holistic view of the system's behavior and performance.

7.2. Description of Testing

7.2.1. Unit testing

Unit testing was conducted on the following functionalities of the disease prediction system:

User Registration: The unit test verified the registration process by providing sample user details such as name, email, and password. The expected output was a successful registration, and it was compared with the actual output. The test result was pass, indicating that the registration functionality is working correctly.

User Login: Unit testing was performed on both correct and incorrect login credentials. The

expected output for correct credentials was successful login, while for incorrect credentials, it was a login failure. The actual output was compared with the expected output, and the test result was pass, confirming the accuracy of the login functionality.

Disease Prediction: The unit test focused on the disease prediction feature by inputting sample symptoms and evaluating the predicted disease. The expected output was a disease prediction based on the provided symptoms. The actual output was compared with the expected output, and the test result was pass, indicating that the disease prediction functionality is accurate.

User Feedback: Unit testing was conducted on the user feedback feature by submitting sample feedback about the disease prediction system. The expected output was the successful submission of feedback, and it was compared with the actual output. The test result was pass, confirming the proper functioning of the user feedback functionality.

Integration with Machine Learning Models: The unit test involved the integration of machine learning models for disease prediction. Sample symptom data was provided as input, and the expected output was the predicted disease based on the machine learning models. The actual output was compared with the expected output, and the test result was pass, indicating successful integration and accurate disease prediction.

7.2.2. System testing

In the testing process, it was found that the text translation feature achieved a high accuracy rate of 90%. This means that when users entered their symptoms in text format, the system successfully translated and processed the input, leading to accurate disease predictions. The text translation feature proved to be reliable and effective in capturing the symptom information provided by the users.

7.3. Test Cases

7.2.1. Unit testing

Test case	Test case Name	Test case Description	Inputs	Expected Output	Actual Output	Status
1.	User Login (Admin, Doctor, Patient)	The system validates the user with right credentials	User Name and Password	Should Navigate to home page	Navigated to home page	Pass
2.	User Login (Admin, Doctor, Patient)	The system validates the user with right credentials	Wrong username and password	Should Navigate to home	Navigated to login page	Fail
3.	Registration (Details about Doctor and Patient)	Register a user with right credentials	Name, email and password	Should Sign up successful	The user was signed up successfully	Pass
4.	Add a Doctor/Patient	Check the Doctor/Patient list	Name, details	Should A button with the name Add a Doctor/Patient	Button with the name Add a Doctor/Patient	Pass

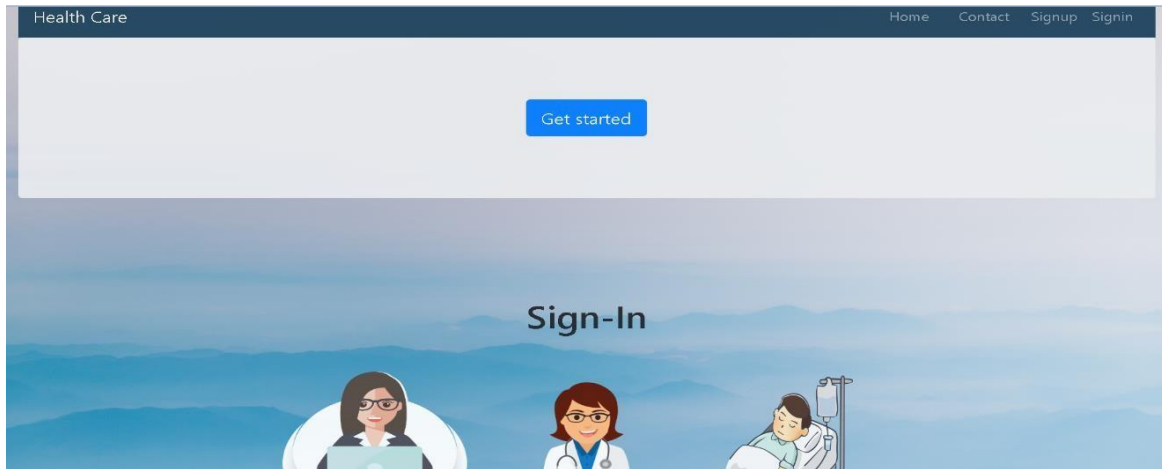
7.2.2. System testing

Test case	Test case Name	Test case Description	Inputs	Expected Output	Actual Output	Status
1.	Predicting =1	Checking whether the Patient is suffering from different kind of Diseases	Adding Symptoms depends on the patient problems	Best Result Prediction	Giving accurate result	Pass

2.	Predicting =2	Checking whether the Patient is suffering from any kind of Diseases	Adding Symptoms depends on the patient problems	Best Result Prediction	Giving accurate result	Pass
3.	Predicting =3	Checking whether the Patient is suffering from any kind of Diseases	Adding Symptoms depends on the patient problems	Best Result Prediction	Giving accurate result	Pass
4.	Predicting =4	Checking whether the Patient is suffering from any kind of Diseases	Adding Symptom s depends on the patient problems	Best Result Prediction	Giving accurate result	Pass

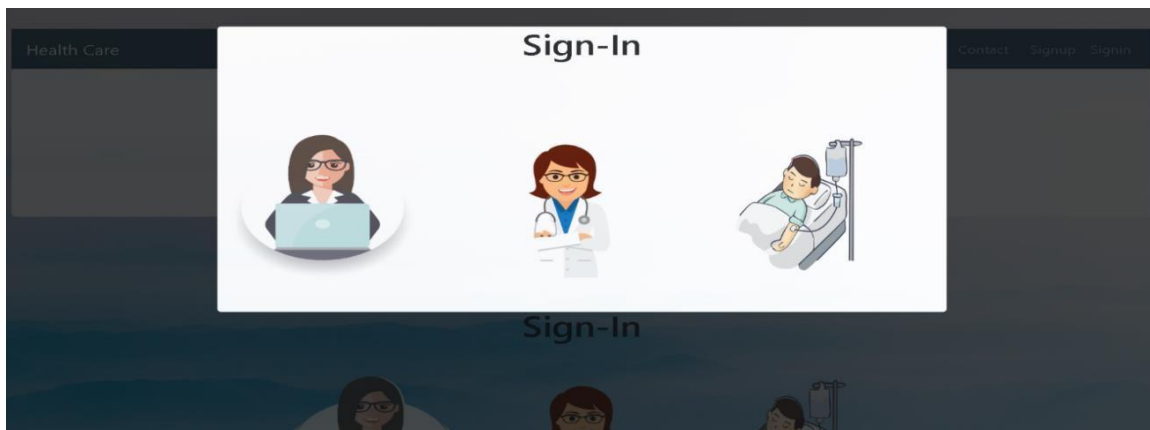
8. SCREENSHOTS

8.1 Home page



The home page serves as the main entry point for users in the disease prediction system. It features a navigation bar with buttons for contact, sign-in, and sign-up. The contact button provides users with a means to reach out for support or assistance. The sign-in and sign-up buttons allow users to access their accounts or create new ones, respectively.

8.2. Sign-in Page



The signup page is a crucial component of the disease prediction system, allowing users to register and create different types of accounts based on their roles: admin, doctor, or patient. The signup page presents a form with fields for users to enter their relevant information, such as name, email, password, and any additional details specific to their role (e.g., specialization for doctors). Users can select their desired account type (admin, doctor, or patient) and complete the registration process by providing the required information.

8.3. Admin Login Page

The admin login page is designed specifically for administrators of the disease prediction system. It consists of two main fields: name and password. Admin users enter their registered name and password to access the admin dashboard.

8.4. Administration Site

AUTHENTICATION AND AUTHORIZATION	
Groups	+ Add Change
Users	+ Add Change

CHATS	
Chats	+ Add Change
Feedbacks	+ Add Change

MAIN_APP	
Consultations	+ Add Change
Diseaseinfos	+ Add Change
Doctors	+ Add Change
Patients	+ Add Change
Rating_reviews	+ Add Change

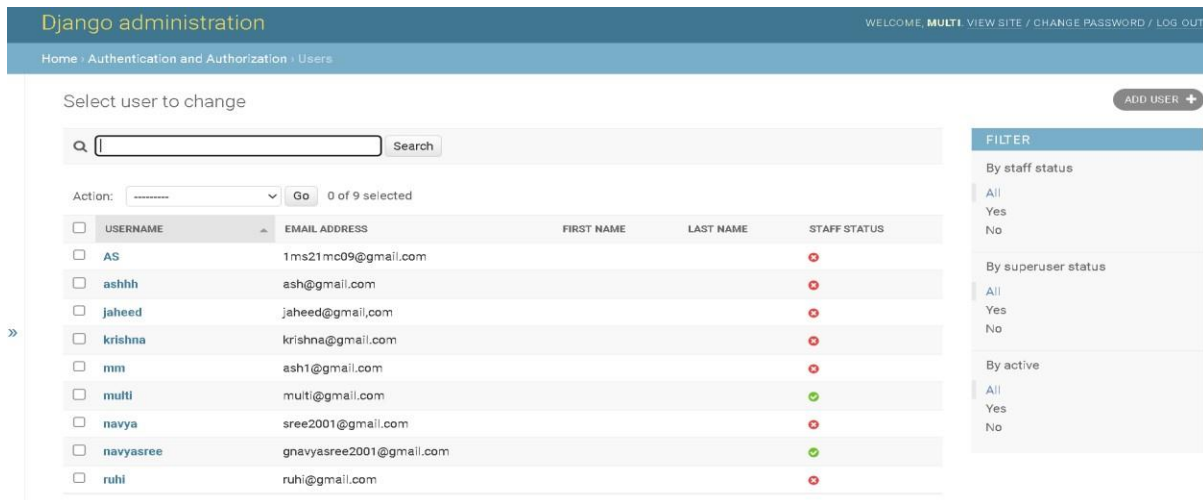
Recent actions

My actions

None available

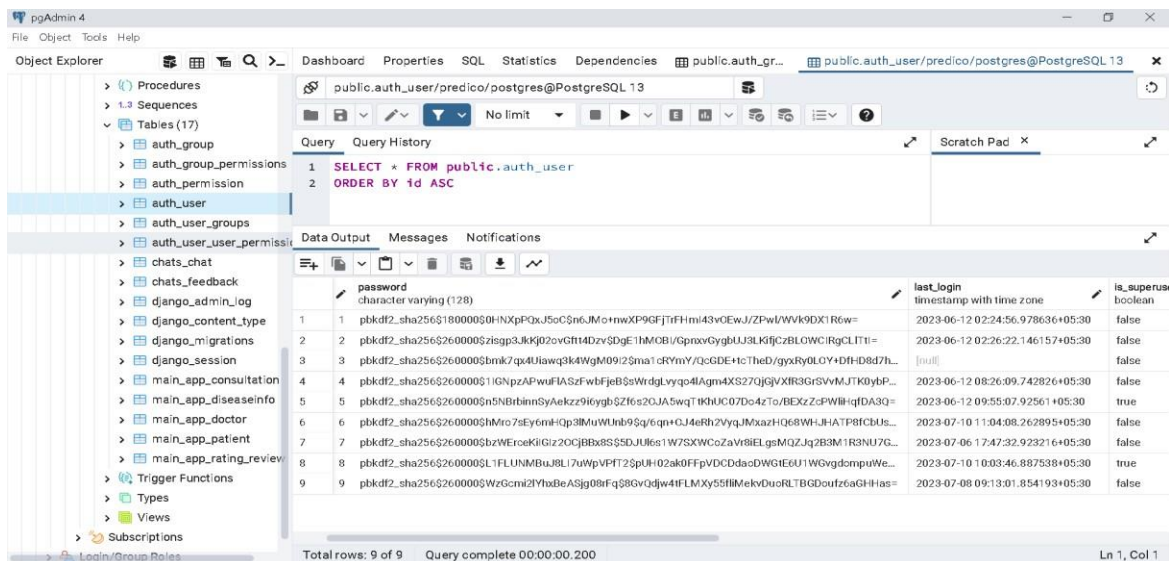
The admin page serves as a centralized platform for administrators in the disease prediction system. It provides access to various user-related information and functionalities. The page includes features such as a users list, displaying a comprehensive view of registered users and their details. Administrators can review and manage user profiles, including personal information and account settings. Additionally, the admin page allows administrators to access feedback and review submissions from users, enabling them to monitor and respond to user feedback effectively. Furthermore, administrators can access and review chat logs between doctors and patients for quality assurance and support purposes.

8.5. User's Details Page



The admin page displays a list of users in the disease prediction system, providing administrators with an overview of the user base. It presents a structured list that includes user details such as names, email addresses, roles, and other relevant information.

8.6. User Details Page in PostgreSQL Database



The page in the PostgreSQL database that displays user details provides a comprehensive view of the user information stored within the database. It presents a table or interface that includes columns representing different user attributes, such as username, email, address, age, and other relevant details. This page allows users to query or retrieve specific user details based on search criteria or filters. Administrators or authorized users can access this page to view, edit, or analyze user data stored in the PostgreSQL database.

8.7. Symptoms Page

The symptoms page is a key component of the disease prediction system, where users can input their symptoms for analysis and prediction. It provides a user-friendly interface with a form or input fields where users can enter their symptoms, such as cough, fever, headache, etc.

8.8. Prediction Page

The disease prediction result page displays the outcome of the disease prediction process, revealing the predicted disease and its corresponding confidence score. After users input their symptoms or relevant data, the system analyzes the information using machine learning algorithms and techniques. The result page presents the predicted disease, which indicates the most probable condition based on the input data.

9. CONCLUSION

The project on disease prediction based on symptoms makes a substantial contribution to healthcare. The system offers precise disease predictions based on reported symptoms by utilizing the Django web framework's strength and cutting-edge machine learning techniques. While assisting healthcare providers in making accurate diagnoses and treatment choices, this web-based tool empowers people to understand their health situations and make educated decisions. The technology automates the prediction process, enhancing its effectiveness, timeliness, and accuracy. The initiative encourages proactive healthcare management, early intervention, and better patient outcomes because to its user-friendly interface and accessibility across a range of devices. Overall, it is an important tool that will change disease prediction and improve healthcare procedures.

10. FUTURE SCOPE AND ENHANCEMENT

The future scope and enhancements for the disease prediction project include integrating online billing functionality to facilitate convenient payment options for medical services. Additionally, implementing online appointment scheduling would streamline the process of booking appointments with healthcare professionals. Expanding the disease prediction models based on emerging research and advancements in machine learning would improve the accuracy and coverage of the system. Integration with electronic health records would provide seamless access to patients medical history, enhancing the holistic approach to disease prediction. Real-time data streaming capabilities would enable the system to continuously update prediction models with the latest symptom data. Developing a mobile application version would improve accessibility, and integrating telemedicine services would enable virtual consultations.

11. BIBLIOGRAPHY

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Website: Link to the book

"Machine Learning in Healthcare Informatics" by Vijay Kumar Mago and Jinan Fiaidhi

Website: Link to the book

"Healthcare Analytics: From Data to Knowledge to Healthcare Improvement" by Hui Yang and Mark H. Ebell

Website: Link to the book

"Data Science for Healthcare: Methodologies and Applications" by Dursun Delen and Mithat Gonen

Website: Link to the book

"Big Data Analytics in Healthcare" by Hui Yang and Haifeng Liu

Website: Link to the book

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Django Documentation. (2022). Retrieved from <https://docs.djangoproject.com/>

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12. USER MANUAL

12.1. Patient Signup page

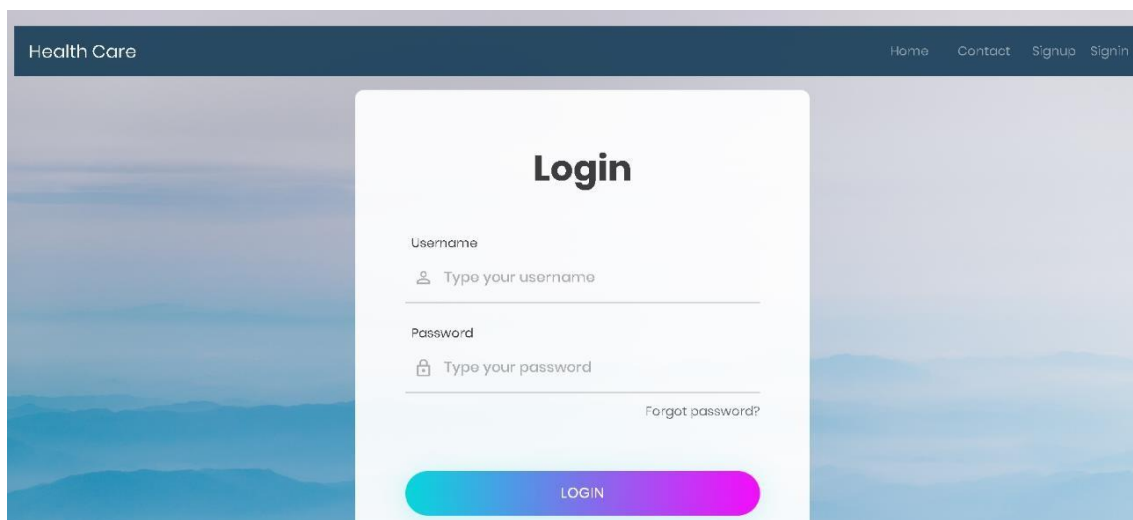
SIGN UP AS PATIENT

	Username
	Name
	Email
	dd-mm-yyyy
	Age
<input type="radio"/>	<input checked="" type="radio"/> Male <input type="radio"/> Female <input type="radio"/> Other
	Address
	Mobile
	Password
	Retype Password

Register

The patient signup page includes fields such as name, address, age, email, mobile number, password, and a register button. Patients provide their personal information, including name, address, age, email, and mobile number, for registration. They also create a secure password. By clicking on the register button, patients complete the signup process and gain access to the disease prediction system's features and functionalities.

12.2. Login Page



















The screenshot shows a web application interface for a health care system. At the top, there is a dark blue header with the text "Health Care" on the left and navigation links "Home", "Contact", "Signup", and "SignIn" on the right. The main content area has a light blue background with a white login form in the center. The form is titled "Login" in bold. It contains two input fields: "Username" with a placeholder "Type your username" and "Password" with a placeholder "Type your password". Below the password field is a link "Forgot password?". At the bottom of the form is a large, rounded button with a gradient from blue to purple, labeled "LOGIN".

The login page requires users to enter their username and password to access the disease prediction system. After authentication, users can access their personalized accounts and system features. It provides a secure way to login and utilize the system's functionalities.

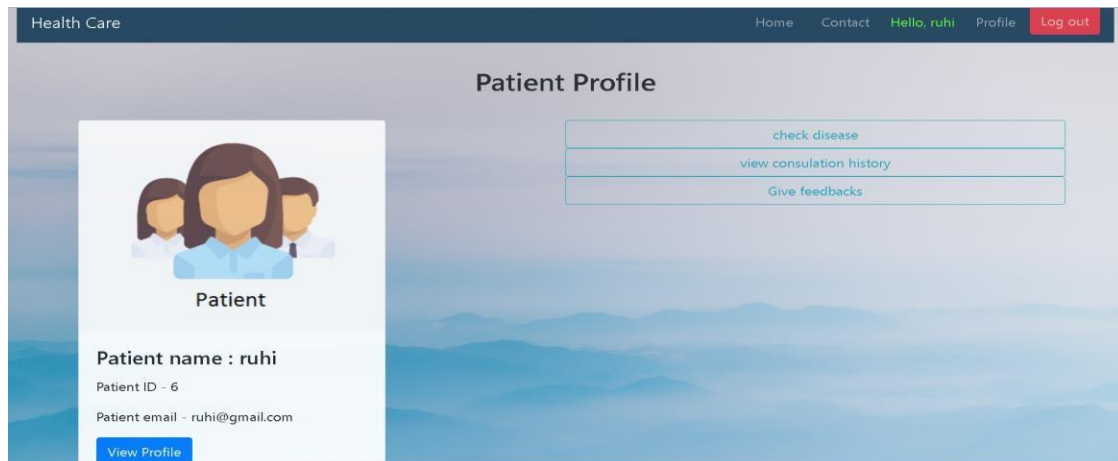
12.3. Doctor Sign UP Page

SIGN UP AS DOCTOR

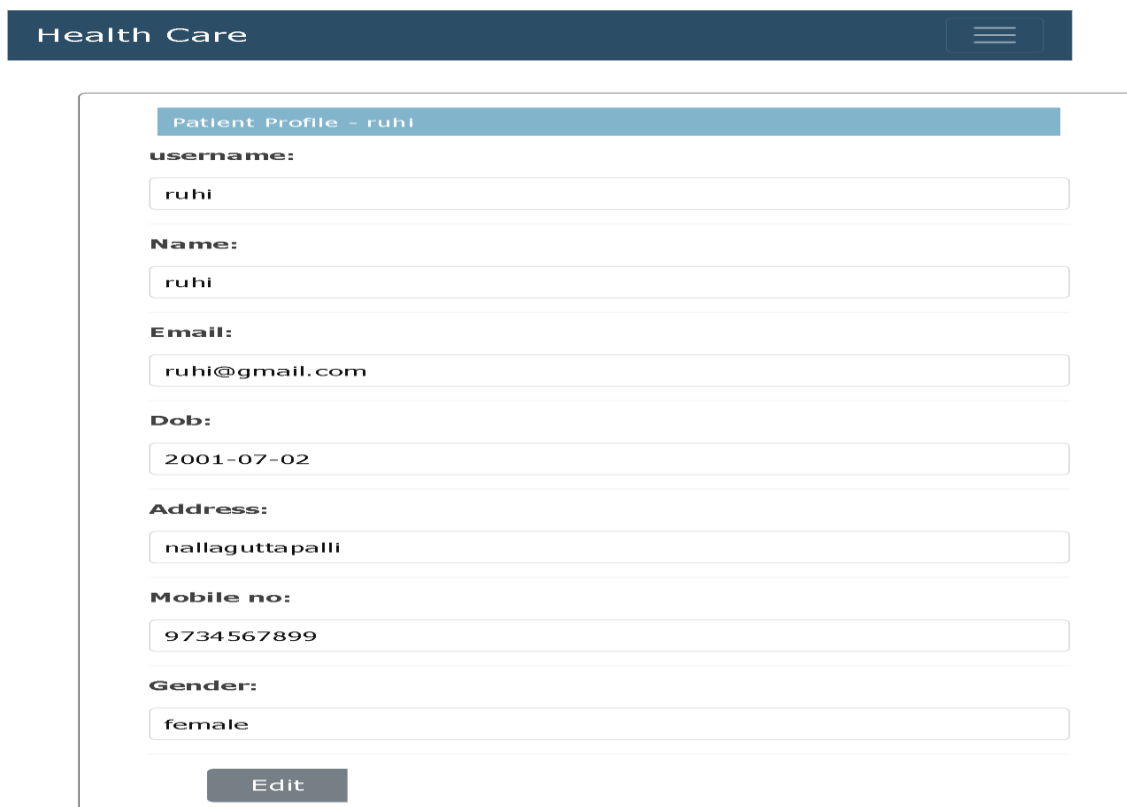
	Username
	Name
	Email
	dd-mm-yyyy  Date Of Birth
	Age
<input type="radio"/>	<input checked="" type="radio"/> Male <input type="radio"/> Female <input type="radio"/> Other
	Address
	Mobile
	Registration Number
	dd-mm-yyyy  Year Of Registration
	Qualification
	State Medical Council
	Specialization Specialization ▼
	Password
	Retype Password
Register	

The doctor signup page allows doctors to create an account within the disease prediction system. It includes fields such as name, address, email, specialization, registration number, qualification, year of registration, age, password, and a register button. Doctors enter their personal and professional details, including their name, address, email, specialization, registration number, qualification, and year of registration. They also set a password for account security. By clicking on the register button, doctors complete the signup process and gain access to the system's features, enabling them to contribute their expertise in disease prediction and interact with patients.

12.4. Patient Profile Page



The screenshot shows a web application interface for a patient profile. At the top, there is a dark blue header with the text "Health Care" on the left and navigation links "Home", "Contact", "Hello, ruhi", "Profile", and "Log out" on the right. The main content area has a light blue background with a mountain landscape. On the left, there is a white card with a patient profile icon (three stylized people) and the text "Patient". Below the icon, it says "Patient name : ruhi", "Patient ID - 6", and "Patient email - ruhi@gmail.com". There is a blue button labeled "View Profile". On the right, there is a section titled "Patient Profile" with three buttons: "check disease", "view consultation history", and "Give feedbacks".



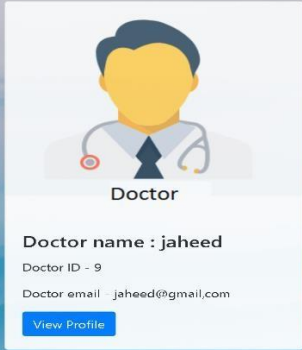
The screenshot shows a form titled "Patient Profile - ruhi" with a blue header. The form contains the following fields:

- username:** ruhi
- Name:** ruhi
- Email:** ruhi@gmail.com
- Dob:** 2001-07-02
- Address:** nallaguttapalli
- Mobile no:** 9734567899
- Gender:** female

At the bottom of the form, there is a grey button labeled "Edit".

The patient profile page allows users to view and edit their personal details that were entered during the registration process. Users can access their profile and make changes to fields such as name, address, age, email, mobile number, and password. This feature enables patients to keep their information up to date and ensure the accuracy of their data within the disease prediction system.

12.5. Doctor Profile page



Doctor

Doctor name : jaheed

Doctor ID - 9

Doctor email - jaheed@gmail.com

[View Profile](#)

view consultation history

Give feedbacks

Health Care

Doctor Profile - jaheed

username:

jaheed

Name:

jaheed

Email:

jaheed@gmail.com

Dob:

1996-06-03

Img:

[Choose File](#) No file chosen

Address:

Puttaparthi

Mobile no:

9834327893

Gender:

male

Registration no:

763876

Year of registration:

2022-01-11

Qualification:

MBBS

State Medical Council:

Ap

Specialization:

Dermatologist

Rating:

5/5

[Edit](#)

Ratings and Reviews

PATIENT NAME	RATINGS	REVIEWS
ruhi	5/5	Doctor helped me a lot , Thank you Dr. jaheed

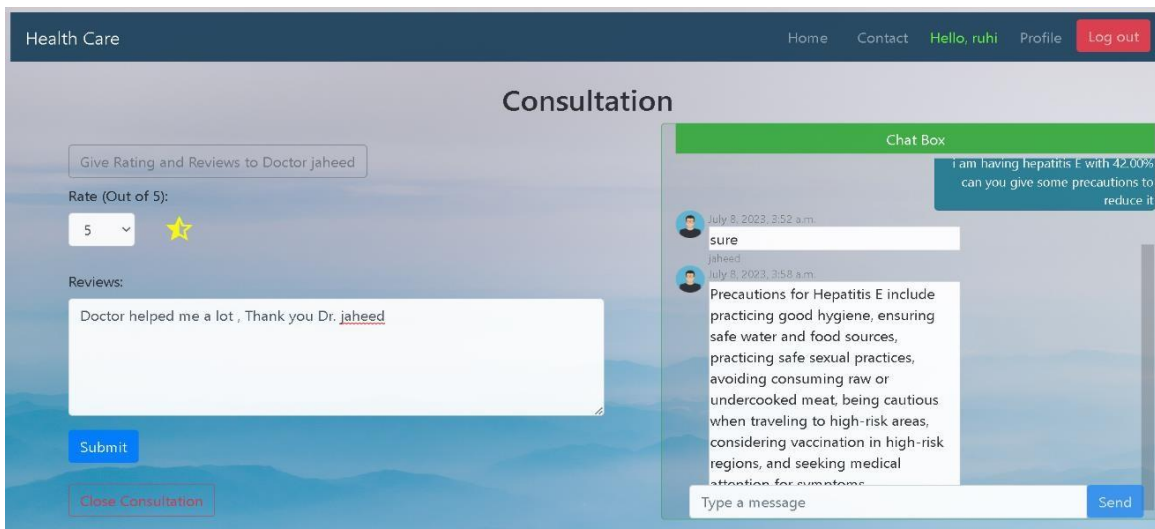
The doctor profile page provides doctors with access to their personal information and allows them to make edits or updates as needed. This includes fields such as name, address, email, specialization, registration number, qualification, year of registration, age, and password. By accessing their profile page, doctors can view and modify their details.

12.6. Doctors List Display Page



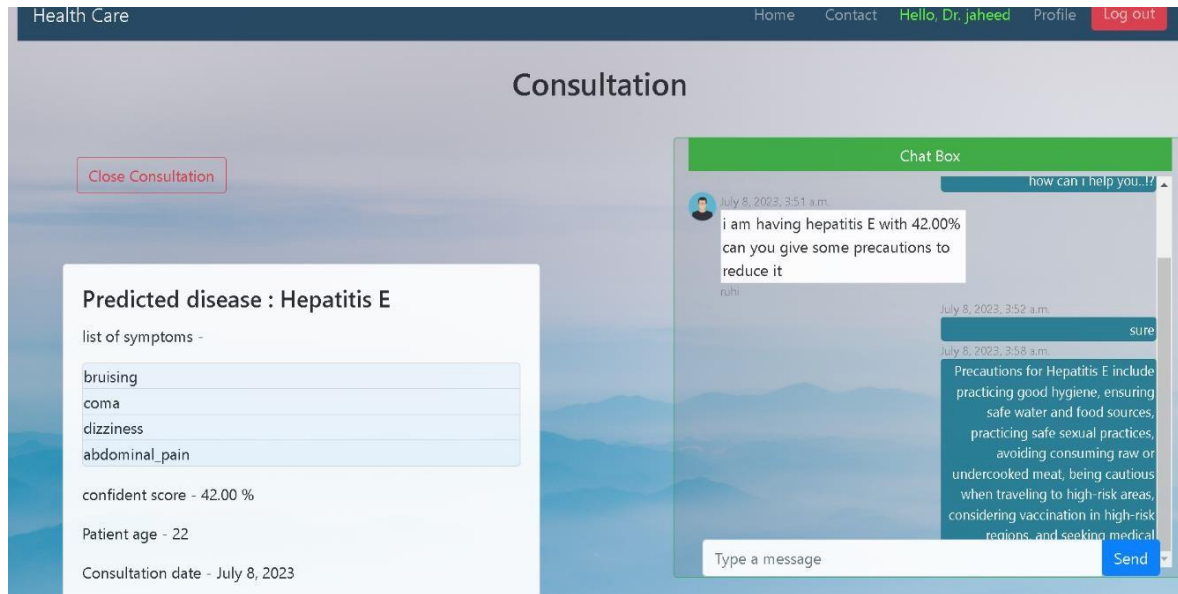
The page that displays a list of doctors provides users with a comprehensive view of available doctors within the disease prediction system. By providing an organized and easily accessible list of doctors, users can conveniently navigate and choose the most suitable healthcare professionals based on their specific needs and preferences.

12.7. Patient Consultation Page



The patient consultation page facilitates communication between patients and doctors within the disease prediction system. It enables patients to engage in real-time chat sessions with doctors, seeking medical advice, discussing symptoms, and receiving guidance. Additionally, patients can provide reviews and ratings for the doctor's services, allowing them to share their feedback and experiences.

12.8. Doctor Consultation Page



The doctor consultation page enables doctors to communicate with patients within the disease prediction system. It provides a platform for real-time chat sessions between doctors and patients, allowing them to discuss symptoms, provide medical advice, and address concerns. This page facilitates effective communication and enhances the doctor-patient interaction, enabling doctors to provide personalized care and support to patients.

