

IBM NALAIYA THIRAN 2022-23 PROJECT REPORT

VISUALIZING AND PREDICTING HEART DISEASE WITH AN INTERACTIVE DASHBOARD

TEAM ID - PNT2022TMID02476

1. INTRODUCTION

1.1 PROJECT OVERVIEW

Predicts the chances of Heart Disease and classifies patient's risk level. Find Number of people suffering from heart disease and classifying with genders,using data analytics to improve diagnosis.Chest pain is the key to recognize the heart disease. In this work, the heart diseases are predicted by considering major factors with four types of chest pain.The role of exploratory data using tableau provided a visual appealing and accurate clustering experience.

2. LITERATURE SURVEY

Bo Jin, Chao Che et al. (2018) proposed a “Predicting the Risk of Heart Failure With EHR Sequential Data Modeling” model designed by applying neural network. This paper used the electronic health record (EHR) data from real-world datasets related to congestive heart disease to perform the experiment and predict the heart disease before itself. We tend to used one-hot encryption and word vectors to model the diagnosing events and foretold coronary failure events victimization the essential principles of an extended memory network model. By analyzing the results, we tend to reveal the importance of respecting the sequential nature of clinical records

[1]

Aakash Chauhan et al. (2018) presented "Heart Disease Prediction using Evolutionary Rule Learning". This study eliminates the manual task that additionally helps in extracting the information (data) directly from the electronic records. To generate strong association rules, we have applied frequent pattern growth association mining on patient's dataset. This will facilitate (help) in decreasing the amount of services and shown that overwhelming majority of the rules helps within the best prediction of coronary sickness [2].

Ashir Javeed, Shijie Zhou et al. (2017) designed "An Intelligent Learning System based on Random Search Algorithm and Optimized Random Forest Model for Improved Heart Disease Detection". This paper uses random search algorithm (RSA) for factor selection and random forest model for diagnosing the cardiovascular disease. This model is principally optimized for using grid search algorithmic program. Two forms of experiments are used for cardiovascular proposed Random Search Algorithm based random forest model is developed. This methodology is efficient and less complex than conventional random forest model. Comparing to conventional random forest it produces 3.3% higher accuracy. The proposed learning system can help the physicians to improve the quality of heart failure detection.[3]

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Two forms of experiments are used for cardiovascular disease prediction. In the first form, only random forest model is developed and within the second experiment the proposed Random Search Algorithm based random forest model is developed. This methodology is efficient and less complex than conventional random forest model. Comparing to conventional random forest it produces 3.3% higher accuracy. The proposed learning system can help the physicians to improve the quality of heart failure detection.

K.Prasanna Lakshmi, Dr. C.R.K.Reddy (2015) designed “Fast Rule-Based Heart Disease Prediction using Associative Classification Mining”. In the proposed Stream Associative Classification Heart Disease Prediction (SACHDP), we used associative classification mining over landmark window of data streams. This paper contains two phases: one is generating rules from associative classification mining and next one is pruning the rules using chi-square testing and arranging the rules in an order to form a classifier. Using these phase to predict the heart disease easily [5].

“Prediction and Diagnosis of Heart Disease by Data Mining Techniques” designed by Boshra Bahrami, Mirsaeid Hosseini Shirvani. This paper uses various classification methodology for diagnosing cardiovascular disease. Classifiers like KNN, SVO classifier and Decision Tree are used to divide the datasets. Once the classification and performance evaluation the Decision tree is examined as the best one for cardiovascular disease prediction from the dataset[6].

2.1 PROBLEM STATEMENT DEFINITION

Using various statistical test for feature selection and to find out the most efficient classification algorithm that can help us to detect heart diseases at early stage. This algorithm can be used on heart records of the patient or by using it on classification reports.

3.IDEATION AND PROPOSED SOLUTION

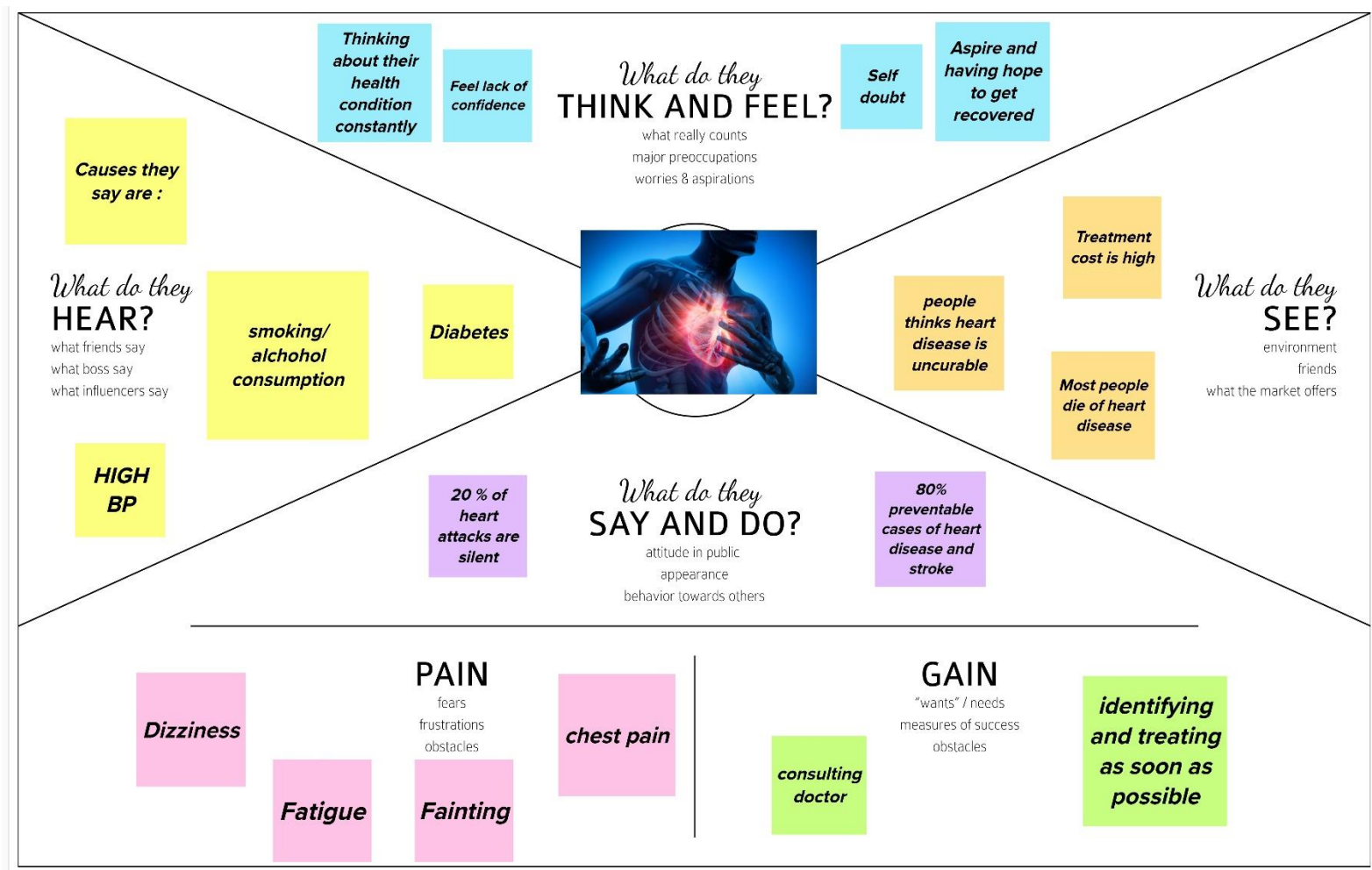
3.1 EMPATHY MAP CANVAS

<https://github.com/IBM-EPBL/IBM-Project-24635-1659946282/blob/main/project%20design%20and%20planning/ideation%20phase/heart%20disease%20empathy%20map.pdf>

3.2 Ideas and Techniques

<https://github.com/IBM-EPBL/IBM-Project-24635-1659946282/blob/main/project%20design%20and%20planning/ideation%20phase/ideas%20and%20techniques.pdf>

EMPATHY MAP :



3.3 Proposed solution Fit :

<https://github.com/IBM-EPBL/IBM-Project-24635-1659946282/blob/main/project%20design%20and%20planning/project%20design%20phase%201/proposed%20solution%20fit.pdf>

Problem-Solution Fit canvas Visualising and prediction of heart disease Version: _____

1. CUSTOMER SEGMENT(S) <small>CS</small> People with the age group of above 20>	6. CUSTOMER LIMITATIONS <small>CL</small> <small>EG. BUDGET, DEVICES</small> Health expenses especially people who are from low profile	5. AVAILABLE SOLUTIONS <small>AS</small> <small>PROS & CONS</small> Using various statistical test for feature selection Using various algorithm
2. PROBLEMS / PAINS <small>PR</small> <small>+ ITS FREQUENCY</small> Preprocessing of data sets, Calculating the scores	9. PROBLEM ROOT / CAUSE <small>RC</small> Smoking/alcohol High BP Stress	7. BEHAVIOR <small>BE</small> <small>+ ITS INTENSITY</small> Use interactive dashboard for visualising and predicting
3. TRIGGERS TO ACT <small>TR</small> People who believe these modern technology and data analytics	10. YOUR SOLUTION <small>SL</small> Find Number of people suffering from heart disease and classifying with genders ->using data analytics to improve diagnosis ->Visualize frequency distribution of lach variable and find what the heart rate and heart disease relation	8. CHANNELS of BEHAVIOR <small>CH</small> <small>ONLINE</small> Patient get a detail score and report of the disease <small>OFFLINE</small> Spreading awareness about this to others
4. EMOTIONS <small>EM</small> <small>BEFORE / AFTER</small> Lack of confidence or Fear about everything Especially about their health		

Problem-Solution fit canvas is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License. Designed by Daria Nepriukhina / ideaHackers.nl - we tailor ideas to customer behaviour and increase solution adoption probability.

IdeaHackers.nl

4.CUSTOMER JOURNEY

<https://github.com/IBM-EPBL/IBM-Project-24635-1659946282/blob/main/project%20design%20and%20planning/project%20design%20phase%20II/Custom%20Journey%20Map%20-%20Visualizing%20and%20Predicting%20Heart%20Diseases%20with%20an%20Interactive%20Dash%20Board.pdf>

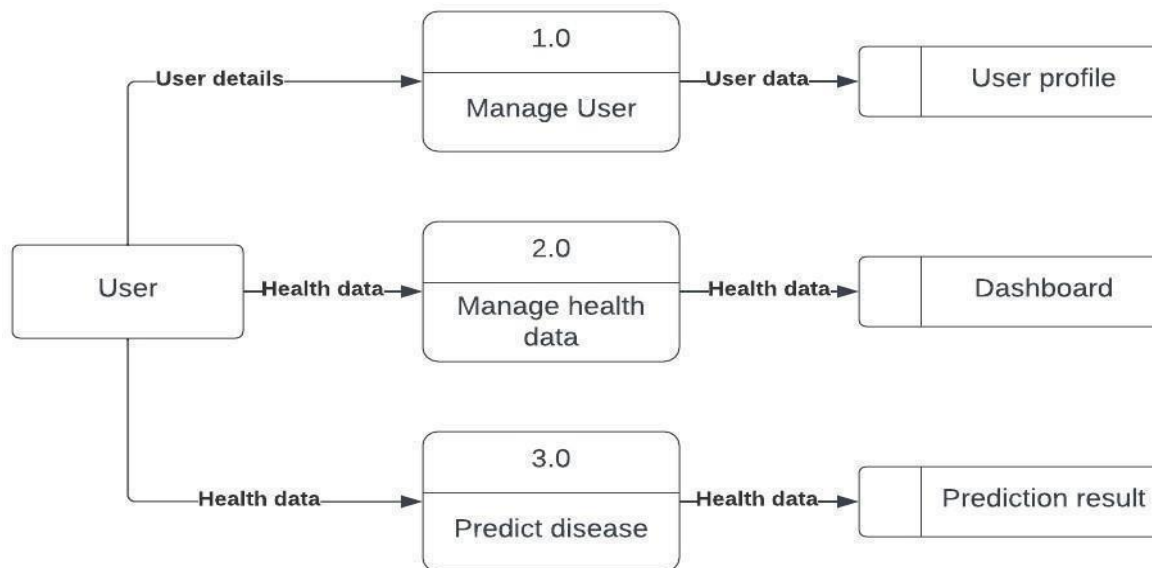


Document an existing experience

Narrow your focus to a specific scenario or process within an existing product or service. In the **Steps** row, document the step-by-step process someone typically experiences, then add detail to each of the other rows.

Scenario Browsing, looking, attending, and rating a local city tour	Enter What do people experience as they begin the process?	Engage In the core moments in the process, what happens?	Exit What do people typically experience as the process finishes?
Steps What does the person (or group) typically experience?	By searching through online Finding our prediction dashboard Create User Account	Visualize the information of prediction User gives their problems as their input to prediction system Reviews of the users about prediction system	Easy to access and visualize the prediction
Interactions What interactions do they have at each step along the way? ■ People: Who do they see or talk to? ■ Places: Where are they? ■ Things: What digital touchpoints or physical objects would they use?	Interactive Dashboard for Heart Disease prediction Disease Prediction at online	Interaction with Dashboard View the results from interactive dashboard	
Goals & motivations At each step, what is a person's primary goal or motivation? ("Help me..." or "Help me avoid...")	Help me to check whether I have heart disease or not Help me to get awareness about my health condition	Quick prediction for the given symptoms Emotional support, empathy and respect	Maintain Good health Awareness about heart diseases
Positive moments What steps does a typical person find enjoyable, productive, fun, motivating, delightful, or exciting?	Detailed information about diseases Easy to access and visualize the prediction	Positive results from the prediction Clear information communication	Detailed explanation about the diseases Improved Prediction system
Feelings and pains of Customers	Fear about their health condition Bewilderment	Trust User friendly environment	Knowing health condition from home Cost-effective method
Areas of opportunity How might we make each step better? What ideas do we have? What have others suggested?	Suggestion to avoid heart diseases Displaying Symptoms related to heart diseases	Healthy Lifestyle Recommendation Learn about treatment and self-care	Staying informed about the diseases Incorporate new desired activities

4.1 DATA FLOWS AND USER STORIES



4.2 Data Flow Diagrams:

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.

Flow:

- 1) User creates an account in the application.
- 2) User enters the medical records in the dashboard.
- 3) User can view the visualizations of trends in the form of graphs and charts for his/her medical records with the trained dataset.
- 4) User can view the accuracy of probability of occurrence of heart disease in the dashboard.

User Stories:

User Type	Functional Requirement(Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Web user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / Dashboard.	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the application.	I can receive confirmation email & click confirm.	High	Sprint-1
	Login	USN-3	As a user, I can log into the application by entering email & password.	I can access my account / Dashboard when logged in.	High	Sprint-1
Customer (Web user)	Dashboard	USN-4	User can view his/her complete medical analysis and accuracy of disease prediction.	I can view my medical analysis in the dashboard.	High	Sprint-2

		USN-5	User can view the accuracy of occurrence of heart disease.	I can view the accuracy of heart disease in the dashboard.	High	Sprint-2
Customer Care Executive	Helpdesk	USN-6	As a customer care executive, he/she can view the customer queries.	I can post my queries in the dashboard.	Medium	Sprint-3
		USN-7	As a customer care executive, he/she can answer the customer queries.	I can get support from helpdesk.	High	Sprint-3
Administrator	User Profile	USN-8	As an admin, he/she can update the health details of users.	I can view my updated health details.	High	Sprint-4

User Type	Functional Requirement(Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
		USN-9	As an admin, he/she can add or delete users.	I can access my account / Dashboard when logged in.	High	Sprint-4
		USN-10	As an admin, he/she can manage the user details.	I can view the organized data of myself.	High	Sprint-4

<https://github.com/IBM-EPBL/IBM-Project-24635-1659946282/blob/main/project%20design%20and%20planning/project%20design%20phase%20II/Data%20Flow%20Diagrams%20and%20User%20Stories%20-%20Visualizing%20and%20Predicting%20Heart%20Diseases%20with%20an%20Interactive%20Dash%20Board.pdf>

5. FUNCTIONAL REQUIREMENT

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement(Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Enables user to make registration for the application through Gmail.

FR-2	User Confirmation	Once after registration, the user will get confirmation via E-mail.
FR-3	Visualizing Data	User can visualize the trends on the heart disease through Dashboard created using IBM Cognos Analytics.
FR-4	Generating Report	User can view his/her health report and can make decisions accordingly.

Non-functional Requirements:

Following are the non-functional requirements of the proposed solution.

NFR No.	Non-Functional Requirement	Description
NFR-1	Usability	The application will have a simple and user-friendly graphical interface. Users will be able to understand and use all the features of the application easily. Any action has to be performed with just a few clicks.
NFR-2	Security	For security of the application the technique known as database replication should be used, so that all the important data should be kept safe. In case of crash, the system should be able to backup and recover the data.

NFR-3	Reliability	The application has to be consistent at every scenario and has to work without failure in any environment.
NFR-4	Performance	Performance of the application depends on the response time and the speed of the data submission. The response time of the application is direct and faster which depends on the efficiency of implemented algorithm.
NFR-5	Availability	The application has to be available 24 x 7 for users without any interruption.
NFR-6	Scalability	The application can withstand the increase in the Number of users and has to be able to develop higher versions.

6.PROJECT DEVELOPMENT PHASE

6.1 SPRINT 1

<https://github.com/IBM-EPBL/IBM-Project-24635-1659946282/tree/main/project%20development%20phase/sprint%201>

6.2 SPRINT 2

<https://github.com/IBM-EPBL/IBM-Project-24635-1659946282/tree/main/project%20development%20phase/sprint%202>

6.3 SPRINT 3

<https://github.com/IBM-EPBL/IBM-Project-24635-1659946282/tree/main/project%20development%20phase/sprint%203>

6.4 SPRINT 4

<https://github.com/IBM-EPBL/IBM-Project-24635-1659946282/tree/main/project%20development%20phase/sprint%204>

7.CODING AND SOLUTION

HOMEPAGE

16 lines (14 sloc) | 276 Bytes

Raw

Blame



```
1  import React from 'react';
2  import { Causes, Treatment, Prevention, FAQs, Header } from '../containers';
3
4  function HomePage() {
5    return (
6      <>
7        <Header />
8        <Causes />
9        <Treatment />
10       <Prevention />
11       <FAQS />
12     </>
13   );
14 }
15
16 export default HomePage;
```

LOGIN

```
1 import axios from 'axios';
2 import React, { useState } from 'react';
3 import './FormPageCommons.css';
4 import { useNavigate } from 'react-router-dom';
5
6 const Login = () => {
7   const [email, setEmail] = useState('');
8   const [password, setPassword] = useState('');
9   const navigate = useNavigate();
10
11   function loginUser(event) {
12     event.preventDefault();
13     const userDetails = {
14       email, password,
15     };
16     // console.log(userDetails); // eslint-disable-line no-console
17     if (userDetails && userDetails.email && userDetails.password) {
18       axios.post('http://127.0.0.1:8000/login', userDetails)
19         .then((response) => {
20           sessionStorage.setItem('token', response.data.token);
21           navigate('/predict');
22         })
23         .catch((ex) => {
24           // console.log(ex); // eslint-disable-line no-console
25           // const error = JSON.parse(ex);
26           if (ex.response && ex.response.status && ex.response.status === 404) {
27             alert('User not found'); // eslint-disable-line no-alert
28           } else {
29             console.log(ex); // eslint-disable-line no-console
30           }
31         });
32     } else {
33       alert('Please enter valid credentials'); // eslint-disable-line no-alert
34     }
35   }
36 }
```

```

23     .catch((ex) => {
24         // console.log(ex); // eslint-disable-line no-console
25         // const error = JSON.parse(ex);
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28         } else {
29             console.log(ex); // eslint-disable-line no-console
30         }
31     });
32 } else {
33     alert('Please enter valid credentials'); // eslint-disable-line no-alert
34 }
35 }
36 return (
37     <div className="main-container">
38         <form className="main-form" onSubmit={loginUser}>
39             <div className="form-input">
40                 <p>e-mail</p>
41                 <input type="email" name="email" id="email" value={email} onChange={(e) => setEmail(e.target.value)} />
42             </div>
43             <div className="form-input">
44                 <p>Password</p>
45                 <input type="password" name="password" id="password" value={password} onChange={(e) => setPassword(e.target.value)} />
46             </div>
47             <div className="button-container">
48                 <input type="submit" />
49             </div>
50         </form>
51     </div>
52 );
53 };
54
55 export default Login;

```

RESULT

38 lines (34 sloc) | 1.19 KB

Raw

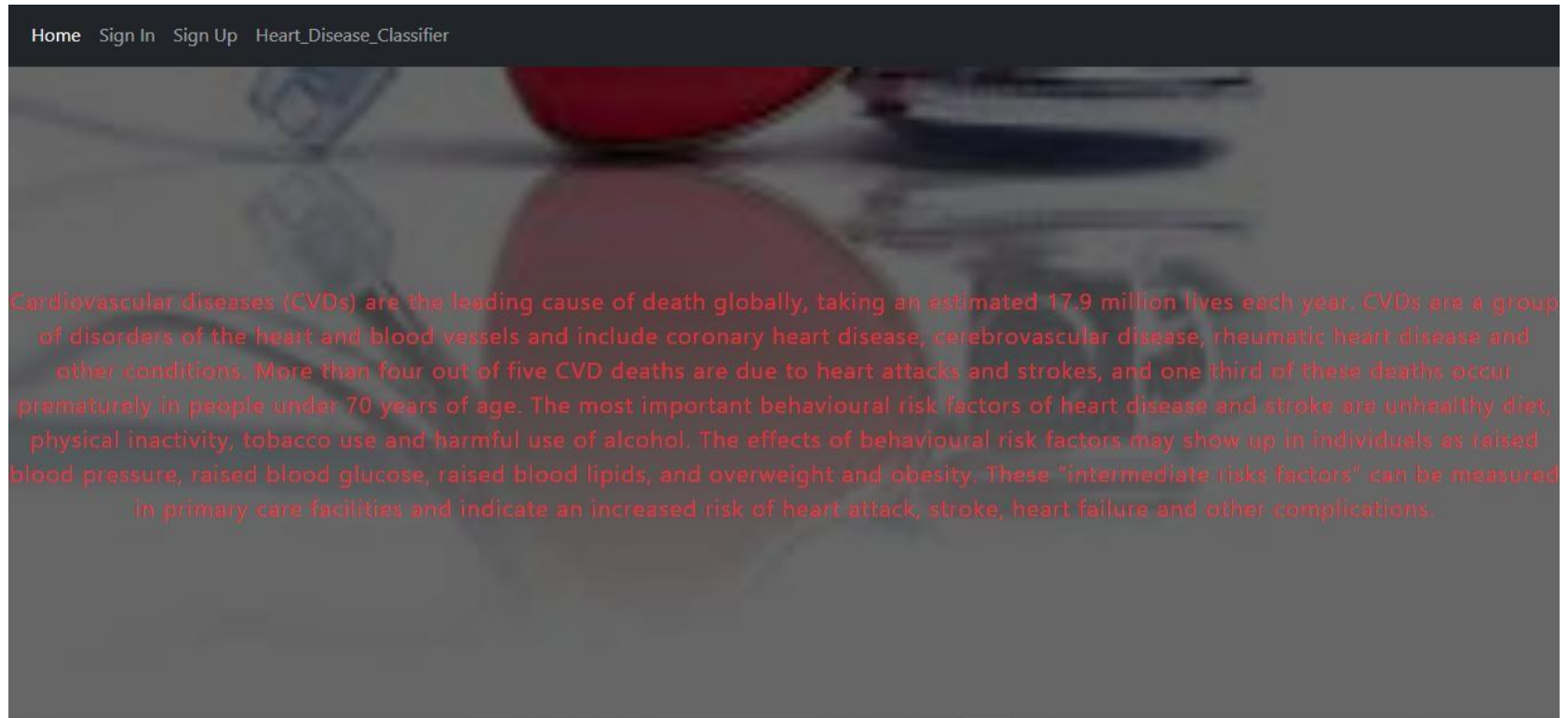
Blame



```
1 import axios from 'axios';
2 import React, { useState } from 'react';
3 import './Results.css';
4 import { Link } from 'react-router-dom';
5
6
7 function Results() {
8   const predictionObject = JSON.parse(sessionStorage.getItem('prediction'));
9   const [saveState, setSaveState] = useState(false);
10  const headers = {
11    Authorization: `Bearer ${sessionStorage.getItem('token')}`,
12  };
13  function saveResult() {
14    axios.put('http://127.0.0.1:8000/save_result', predictionObject, { headers })
15      .then(() => setSaveState(true))
16      .catch((ex) => console.log(ex)); // eslint-disable-line no-console
17  }
18
19  return (
20    <div className="main">
21      <h1>Based on the parameters provided, our ML model has predicted the {predictionObject.prediction} of heart disease</h1>
22      <div className="button-container">
23        {saveState ? (<h3>Your result has been successfully saved</h3>)
24          : (
25            <>
26              <h3>Do you want to save the results?</h3>
27              <button type="submit" onClick={saveResult}>Save</button>
28            </>
29          )}
30      <Link to="/dashboard">
31        <button type="submit">Dashboard</button>
32      </Link>
33    </div>
34  </div>
35  );
36 }
37
38 export default Results;
```

8.Output:

Home.html:



Sign in.html:



[Create an account](#)

login

Gopi

.....

☐ Remember me

Log in

Or login with



SignUp.html:

Sign up

Your Name

Your Email

Password

Repeat your password

☐ I agree all statements in [Terms of service](#)

Register



[I am already member](#)

Heart_Disease_Classifier.html

Heart Disease Test Form

Age	Sex		
<input type="text" value="35"/>	<input type="text" value="Male"/>		
Chest Pain Type	Resting Blood Pressure in mm Hg	Serum Cholestorl in mg/dl	Fasting Blood Sugar > 120 mg/dl
<input type="text" value="Atypical Angina"/>	<input type="text" value="23"/>	<input type="text" value="456"/>	<input type="text" value="False"/>
Resting ECG Results	Maximum Heart Rate	Exercise Induced Angina	ST Depression Induced
<input type="text" value="Having ST-T wave abnormal"/>	<input type="text" value="134"/>	<input type="text" value="Yes"/>	<input type="text" value="67"/>
Slope of the Peak Exercise ST Segment	Number of Vessels Colored by Flourosopy	Thalassemia	
<input type="text" value="Downsloping"/>	<input type="text" value="2"/>	<input type="text" value="Normal"/>	
<input type="button" value="Result"/>			

Age	Sex		
<input type="text"/>	<input type="text" value="-- Select an Option --"/>		
Chest Pain Type	Resting Blood Pressure in mm Hg	Serum Cholestorl in mg/dl	Fasting Blood Sugar > 120 mg/dl
<input type="text" value="-- Select an Option --"/>	<input type="text"/>	<input type="text"/>	<input type="text" value="-- Select an Option --"/>
Resting ECG Results	Maximum Heart Rate	Exercise Induced Angina	ST Depression Induced
<input type="text" value="-- Select an Option --"/>	<input type="text"/>	<input type="text" value="-- Select an Option --"/>	<input type="text"/>
Slope of the Peak Exercise ST Segment	Number of Vessels Colored by Flourosopy	Thalassemia	
<input type="text" value="-- Select an Option --"/>	<input type="text" value="-- Select an Option --"/>	<input type="text" value="-- Select an Option --"/>	
<input type="button" value="Result"/>			
The patient is likely to have heart disease!			