Visualizing and Predicting Heart Diseases with an Interactive Dash Board

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Project Report Format

1. **INTRODUCTION**
   - 1.1 Project Overview
   - 1.2 Purpose
2. **LITERATURE SURVEY**
   - 2.1 Existing problem
   - 2.2 References
   - 2.3 Problem Statement Definition
3. **IDEATION & PROPOSED SOLUTION**
   - 3.1 Empathy Map Canvas
   - 3.2 Ideation & Brainstorming
   - 3.3 Proposed Solution
   - 3.4 Problem Solution fit
4. **REQUIREMENT ANALYSIS**
   - 4.1 Functional requirement
   - 4.2 Non-Functional requirements
5. **PROJECT DESIGN**
   - 5.1 Data Flow Diagrams
   - 5.2 Solution & Technical Architecture
   - 5.3 User Stories
6. **PROJECT PLANNING & SCHEDULING**
   - 6.1 Sprint Planning & Estimation
   - 6.2 Sprint Delivery Schedule
   - 6.3 Reports from JIRA
7. **CODING & SOLUTIONING (Explain the features added in the project along with code)**
   - 7.1 Feature 1
   - 7.2 Feature 2
   - 7.3 Database Schema (if Applicable)
8. **TESTING**
   - 8.1 Test Cases
   - 8.2 User Acceptance Testing
9. **RESULTS**
   - 9.1 Performance Metrics
10. **ADVANTAGES & DISADVANTAGES**
11. **CONCLUSION**
12. **FUTURE SCOPE**
13. **APPENDIX**

    Source Code

    GitHub & Project Demo Link

1. INTRODUCTION

1.1 Project Overview :

Heart related diseases or Cardiovascular Diseases (CVDs) are the main reason for a huge number of deaths in the world over the last few decades and has emerged as the most life-threatening disease, not only in India but in the whole world. Many researchers, in recent times, have been using several machine learning techniques to help the health care industry and the professionals in the diagnosis of heart related diseases. This indicates a need of reliable, accurate and feasible system to continuously monitor and diagnose for CVD for timely action and treatment. The major cause of death in the developed world is heart diseases. To analyse and predict which patients are most likely to suffer from heart dieases in the near future we have to find out some solution.

1.2 Purpose :

So for the above mentioned problem statement,we can create or develop a interactive dashboard of visualizing the people who might have the possiblities are high chances of getting CardioVascular Diseases(CVD) through a collection of dataset. Most of all heart diseases can be identified and treated using ECG in medical field,and the theory of curing can be in handwritten and they get research to it and finally implement it in practical.But in modern technology world we can predict andable to prevent the diseases through a visualization of people who can get caught by heart diseases through data analytics.By this, we can create awareness among people who are all at the high risk of getting CVD. This make a way easy to Doctors and it consumes time for them.

2. LITERATURE SURVEY

2.1 Existing Problem :

The Proposed solutions are ECG for diagnosis of heart diseases, most of all eating a fat, low salt diet, getting regular exercise and good sleep and not smoking are important part of treatment. Solutions are independent in various type of heart damage. 1. Data insight: As mentioned here we will be working with the heart disease detection dataset and we will be putting out interesting inferences from the data to derive some meaningful results. 2. EDA: Exploratory data analysis is the key step for getting meaningful results. 3. Feature engineering: After getting the insights from the data we have to alter the features so that they can move forward for the model building phase. 4. Model building: In this phase, we will be building our Machine learning model for heart disease detection.

2.1 References :

PAPER 1 Published In:International Research Journal of Engineering and Technology Date of Conference: 07/05/2020 Print ISSN: 2395-0072 Proposed Model: Predicting the Risk of Heart Failure With EHR Sequential Data Modeling Proposed By:Bo Jin, Chao Che et al. IEEE Accession Year: 2018 Conference Location: China

PAPER 2 Published In:International Research Journal of Engineering and Technology Date of Conference: 07/05/2020 Print ISSN: 2395-0072 Proposed Model: Effective Heart Disease Prediction Using Hybrid Machine Learning Techniques Proposed By: Senthilkumar Mohan,Chandrasegar Thirumalai and Gautam Srivastava IEEE Accession Year: 2019 Conference Location: India

PAPER 3 Published in: 2021 Second International Conference on Electronics and Sustainable Communication Systems (ICESC) Date of Conference: 04-06 August 2021 Date Added to IEEE Xplore: 23 September 2021 ISBN Information: INSPEC Accession Number: 21224734 DOI: 10.1109/ICESC51422.2021.9532790 Publisher: IEEE Conference Location: Coimbatore, India ISBN Information: Electronic ISBN:978-1-6654-2867-5

The below mentioned link is to show the existing solution of predicting heart diseases

- https://www.readmyecg.co/

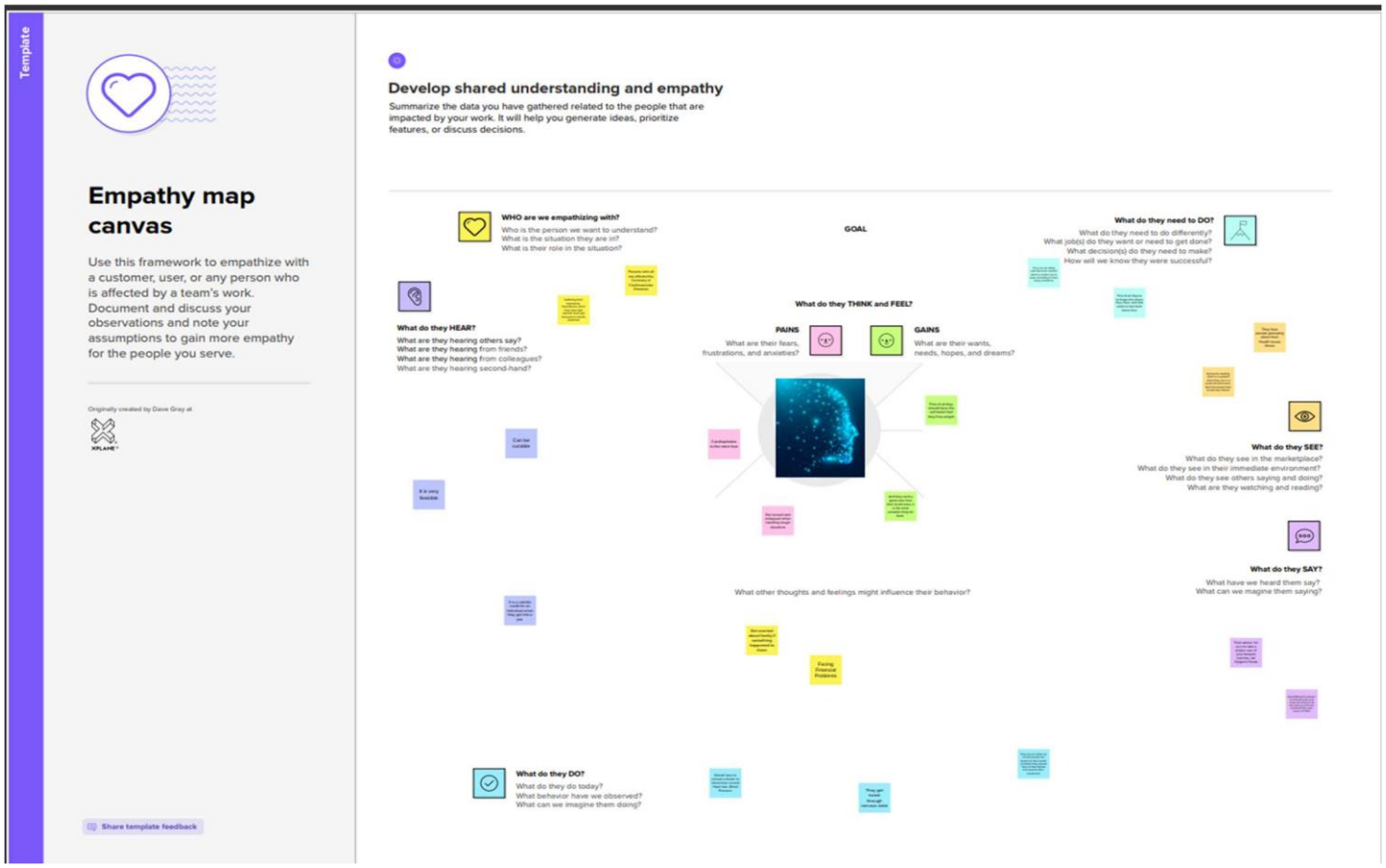
- https://www.fitbit.com/global/us/technology/health-metrics

2.3 Problem Statement Definition :

This work proposes a smartphone-based heart disease prediction system than can have both monitoring as well as prediction of heart disease. A system to monitor patients in real-time has been developed using Node MCU interfaced with temperature, humidity and pulse rate sensors. The developed system is capable to transmit the acquired sensor data to a cloud(firebase) every 10 seconds. An Android application is designed to display the sensor data. One best machine learning algorithm was ported to the Android application for heart disease prediction in real-time. The machine learning algorithms were trained and tested using two widely used open-access datasets. Five machine learning algorithms were checked for their performances using two different methods. ANN was found to be the best performing algorithm with an accuracy of 93.5%. This algorithm is deployed to the Android application and the heart disease is predicted in real-time. The proposed work is limited by use of single hidden layer for implementing Neural network. Coronary artery disease is system. Cleveland heart data set is taken from UCI. This data set consists of 303 cases and 76 attributes/features. 13 features are used out of 76 features. Two tests with three algorithms Bayes Net, Support vector machine, and Functional Trees FT are performed for detection purpose. WEKA tool is used for detectio Diagnosis of Diseases by Using Different Machine Learning Coronary artery disease is detected and monitored by this proposed system. Cleveland heart data set is taken from UCI. This data set consists of 303 cases and 76 attributes/features. 13 features are used out of 76 features. Two tests with three algorithms Bayes Net, Support machine, and Functional Trees FT are performed for detection purpose. WEKA tool is used for detection.

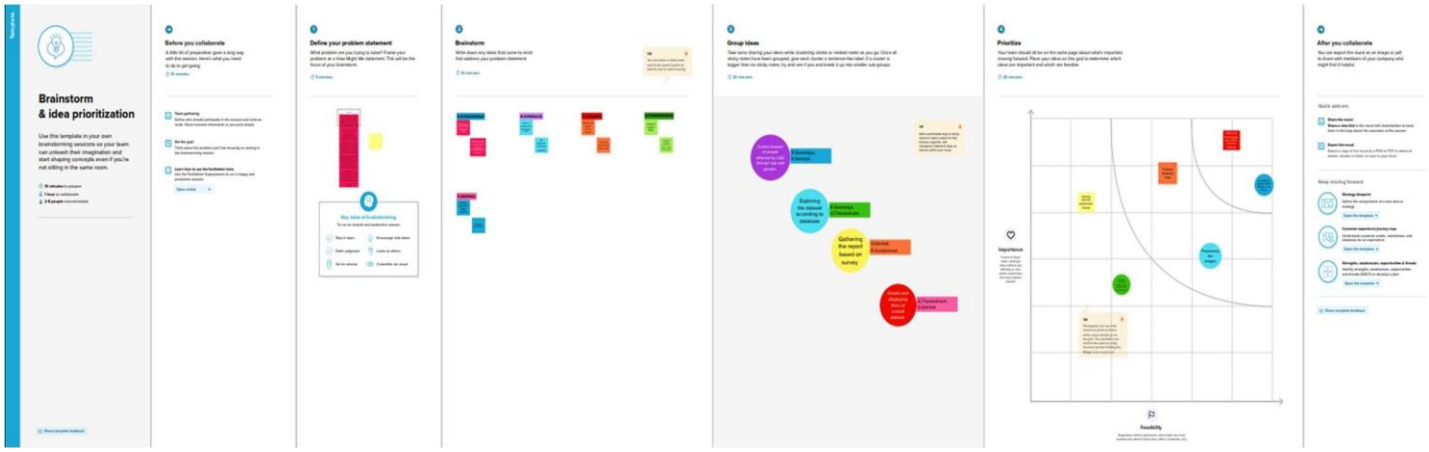
3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas :



3.2 Ideation & Brainstorming :

Heart Diseases Prediction with Machine Learning Artificial Intelligence can enable the computer to think. Computer is made much more intelligent by AI. Machine learning is the subfield of AI study. Various researchers think that without learning, intelligence cannot be developed. Machine learning (ML) industry as a whole . Payers to healthcare companies around the world are taking advantage of ML today. In this post, I will demonstrate a use case and show how we can harness the power of ML world problems. We'll walk through a very simple baseline model for predicting heart disease from patient data, how to load the data, and make some predictions.



3.3 Proposed Solution :

The major cause of death in the developed world is heart diseases. Toanalyse and predict which patients are most likely to suffer from heart dieases in the near future we have to find out some solution. By using this method,we can separate the people those who can affected vs normal people,and it will play a vital role combining both medical and technology field. Customer(patients) can get benefit through saving financial cost (spending medical test),and by collectingdataset of their detailed condition,we can say that whether they get affected or not. This makes oldage people travel less, and get results from their comfort zone. It is based on the number of users who maintaining the software or a system according to its performance like work flow, increase or decrease in efficiency, response time etc... Its scalability can be measured by maintanence, checking for software,fixing errors if occured in server. By this a good quality of product is determined. If you suffer from a heart condition that interferes with your ability to work, you may qualify for disability benefits. There are a number of heart conditions that are specifically listed by the Social Security Administration asqualifying conditions. These conditions include chronic heart failure, ischemic heart disease, recurrent arrhythmias, hypertensive heart disease, an individual on the waiting list for a heart transplant or a heart transplant recipient, and more.

3.4 Problem Solution Fit :

4. REQUIREMENT ANALYSIS

4.1 Functional Requirement :

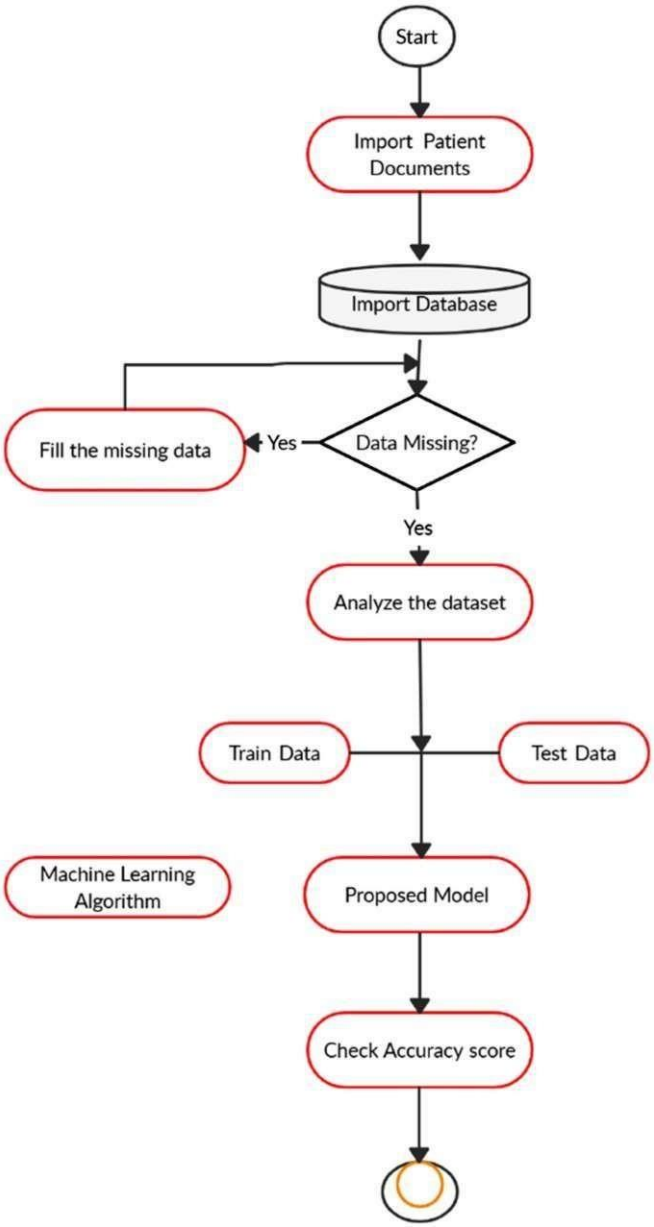
FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form. Registration through Gmail. Registration through Linked IN.
FR-2	User Confirmation	Confirmation via Email. Confirmation via OTP.
FR-3	User verification	Verification through CAPTCHA Verification through I'm not a robot.
FR-4	User Authentication	Recognition of correct person Resending the code in case of forgot password.
FR-5	User validation	Reconfirming the new password Sending a two digit number in (Google account) your Old devices, so that you can enter into a new device By entering the two digit number.
FR-6	User Submission	Submission through Google form Submission through Email.

4.2 Non-functional Requirements:

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	The EHDPS predicts the likelihood of patients getting heart disease. It enables significant knowledge, eg, relationships between medical factors related to heart disease and patterns, to be established.
NFR-2	Security	When it deals with(comes to)health factors, we should provide more security services. There shouldn't be no errors, lagging , base of data of a patient profile, while working on the software or product.
NFR-3	Reliability	Reliability is said to be the measure of stability or consistency of test scores shown in your product. Therefore your product will normal as a good performance one in the field of accuracy.
NFR-4	Performance	The performance should be fast relaying. This prediction system should be made available in cloud to ensure better accessibility and setting a milestone in providing good quality affordable healthcare.
NFR-5	Availability	The Availability of getting used to this software or
		product design is through by accessing IBM cognos Analytics and IBM cloud.
NFR-6	Scalability	It is based on the number of users who maintaining the software or a system according to its performance like workflow, increase or decrease in efficiency , response time etc. It scalability can be measured by maintenance, checking in for software updates, fixing errors if occurred in server. By this a good quality of product is determined.

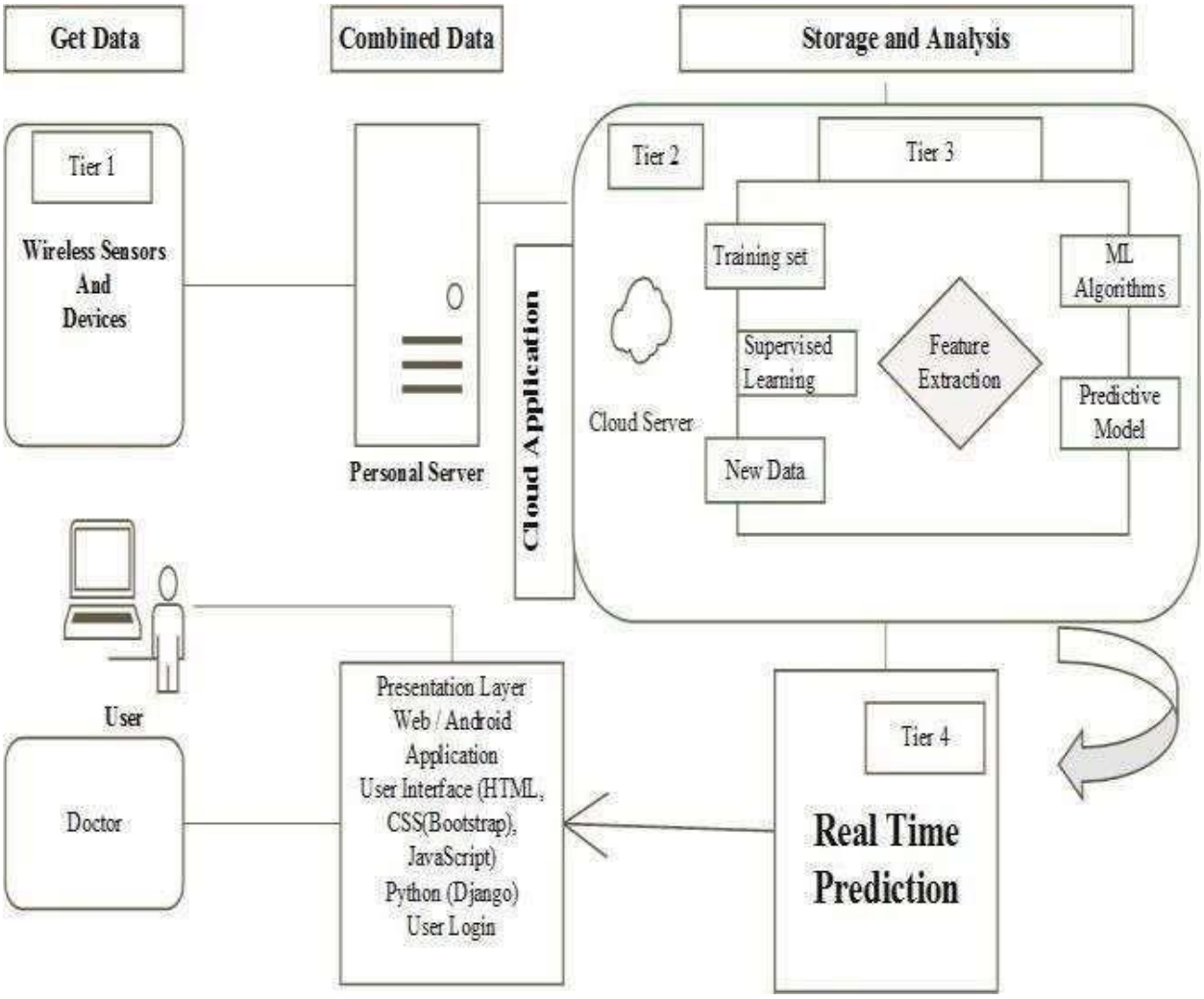
5. PROJECT DESIGN

5.1 Data Flow Diagrams :

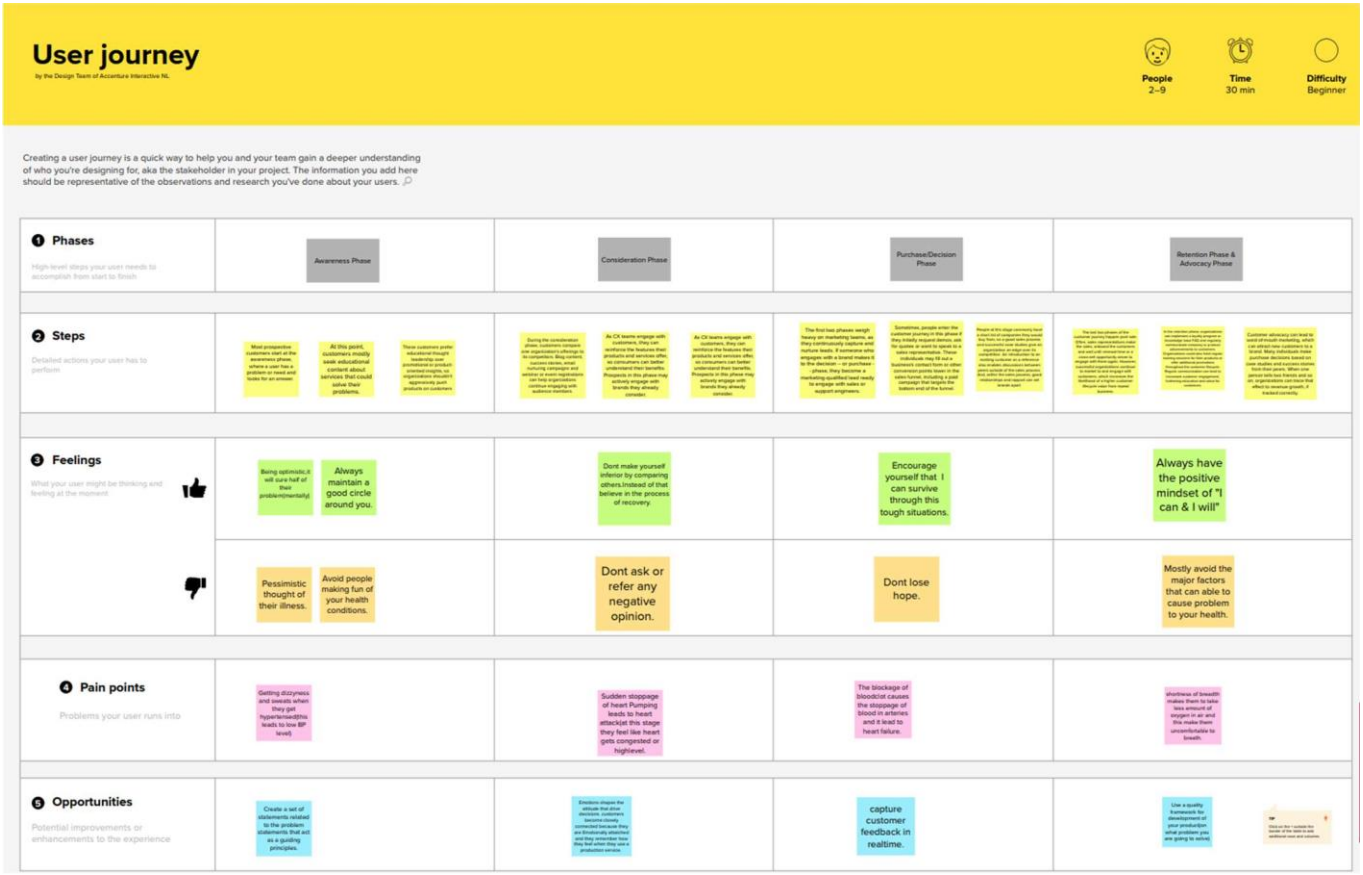


5.2 Solution & Technical Architecture :

IBM Cognos Business Intelligence is a web-based integrated business intelligence suite by IBM. It provides a toolset for reporting, analytics, scorecarding, and monitoring of events and metrics. The software consists of several components designed to meet the different information requirements in a company. IBM Cognos has components such as IBM Cognos Framework Manager, IBM Cognos Cube Designer, IBM Cognos Transformer. With IBM Cognos Go! Dashboard, interactive dashboards containing IBM Cognos content and external data sources can be created to fit the information needs of an individual user. The following items can be added to adashboard: Report objects, they are displayed in a Cognos Viewer portlet. Report parts such as lists, crosstabs, and charts are displayed in interactive portlets. Lists or crosstabs can be displayed as a chartand vice versa. Content can be shown or hidden dynamically by the use of sliders and checkboxes. The Cognos Search portlet allows searching for published content. In addition, Web links, Web pages, RSS feeds, and images can be displayed on the dashboard. [5] The user interface has two modes: In the interactive mode, existing dashboards are viewed and interacted with, creating and editing of dashboards can be done in assembly mode.



5.3 User Stories :



6. PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation :

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	2
Sprint-1		USN-2	As a user, I will receive confirmation email once I have registered for the application	1
Sprint-2		USN-3	As a user, I can register for the application through Facebook	2
Sprint-1		USN-4	As a user, I can register for the application through Gmail	2
Sprint-1	Login	USN-5	As a user, I can log into the application by entering email & password	1
Sprint-2	Dashboard	USN-6	Profile - view & update your profile	2
Sprint-1		USN-7	Change Password - user can change the password	1
Sprint-1		USN-8	Home - Analyze your Heart	2

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points

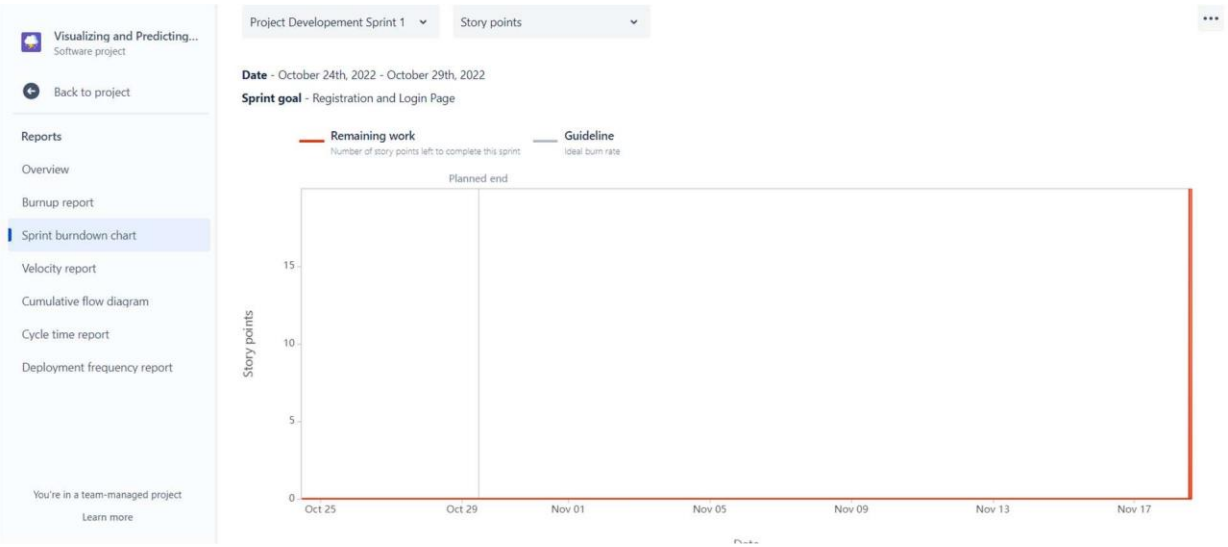
Sprint-3		USN-9	The user will have to fill in the below 13 fields for the system to predict a disease -Age in Year -Gender -Chest Pain Type -Fasting Blood Sugar -Resting Electrographic Results(Restecg) -Exercise Induced Angina(Exang) -The slope of the peak exercise ST segment -CA – Number of major vessels colored by fluoroscopy -Thal -Trest Blood Pressure -Serum Cholesterol -Maximum heart rate achieved(Thalach) -ST depression induced by exercise(Oldpeak)	2
		USN-10	View Doctors - view doctor detail by searching by names or filter by specialty	1
Sprint-3	System Requirment	USN-11	I. Hardware Requirement i. Laptop or PC □ I5 processor system or higher	2
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points
			□ 4 GB RAM or higher □ 128 GB ROM or higher ii. Android Phone (12.0 and above)	
Sprint-3		USN-12	II. Software Requirement iii. Laptop or PC • Windows 10 or higher • Android Studio	2
Sprint-4	Dashboard	USN-13	Query	1
		USN-14	Toll Free	1
		USN-15	Ratings	2
		USN-16	Verification	2

		USN-17	Validation	1
		USN-18	Feedback – send feedback to the Admin	2

6.2 Sprint Delivery Schedule :

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	18
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	19

6.3 Reports from JIRA:



Visualizing and Predicting...
Software project

Back to project

Reports

Overview

Burnup report

Sprint burndown chart

Velocity report

Cumulative flow diagram

Cycle time report

Deployment frequency report

You're in a team-managed project

Learn more

Project Developement Sprint 2 | Story points

Date - October 31st, 2022 - November 5th, 2022

Sprint goal - Creating Homepage for the required website.

Visualizing and Predicting...
Software project

Back to project

Reports

Overview

Burnup report

Sprint burndown chart

Velocity report

Cumulative flow diagram

Cycle time report

Deployment frequency report

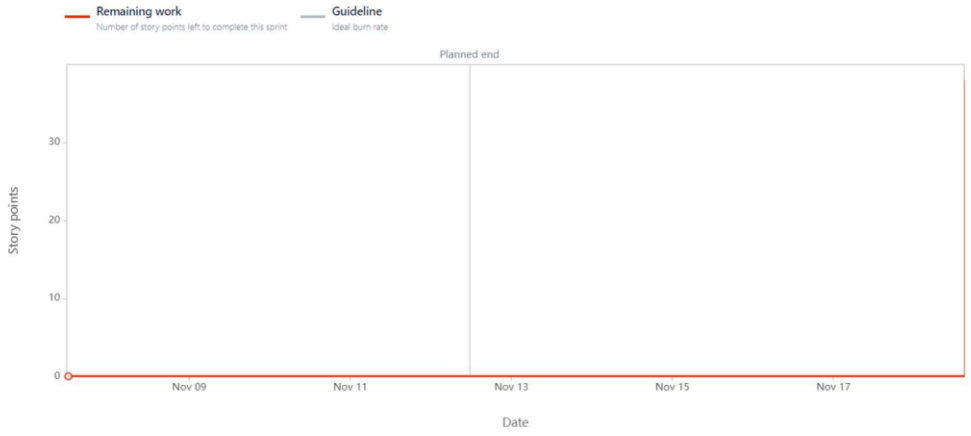
You're in a team-managed project

Learn more

Project Developement Sprint 3 | Story points

Date - November 7th, 2022 - November 12th, 2022

Sprint goal - Predicting heart disease using backend code



Visualizing and Predicting...
Software project

Back to project

Reports

Overview

Burnup report

Sprint burndown chart

Velocity report

Cumulative flow diagram

Cycle time report

Deployment frequency report

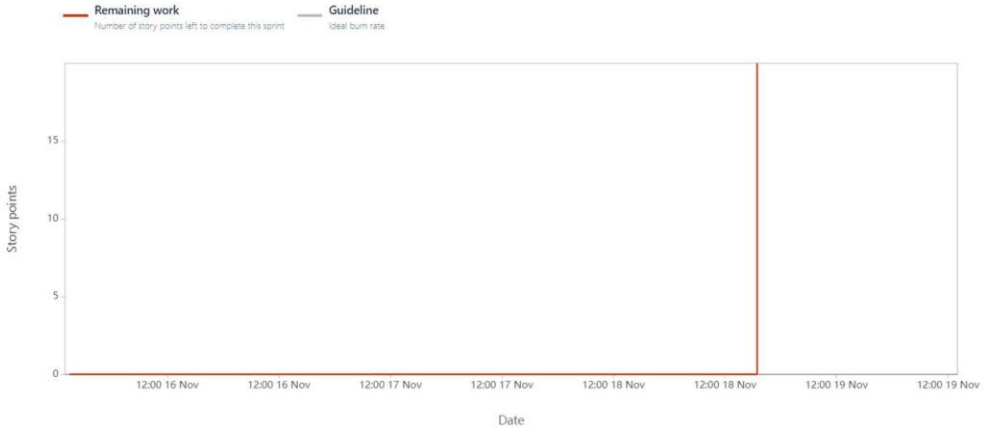
You're in a team-managed project

Learn more

Project Developement Sprint 4 | Story points

Date - November 15th, 2022 - November 19th, 2022

Sprint goal - Tools we've been used



7. CODING & SOLUTIONING

7.1 Feature 1 :

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta http-equiv="X-UA-Compatible" content="IE=edge">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>LOGIN PASSWORD VALIDATION | PRAROZ TUTORIAL</title>

    <link rel="stylesheet" href="style.css">
    <script src="valid.js"></script>

</head>
<body>
    <div class="form">
        <h1>LOGIN HERE</h1>
        <p>Username :</p>
        <input type="text" name="" placeholder="Name Here">
        <p>Password :</p>
        <input type="password" name="" placeholder="Password Here" id="pass">
        <input type="checkbox" onclick="myfunction()">
        <input type="submit" name="" value="LOGIN" onclick="validate()">
    </div>
```

```
    <div>
        <p id="length"></p>
    </div>
    </body>
    </html>
```

7.2 Feature 2 :

```
@import
url('https://fonts.googleapis.com/css2?family=Arvo:ital,wght@0,400;0,700;1,400&family=Kanit:ital,wgh
t@0,300;0,400;0,500;1,300;1,400&family=Lobster&family=Poppins:ital,wght@0,400;0,500;0,600;0,700
;1,400;1,500;1,900&family=Roboto:wght@300;500;700;900&display=swap');
* {
    padding: 0;
    margin: 0;
    box-sizing: border-box;
}

body {
    position: absolute;
    background-color: white;
    height: 100vh;
    width: 100vw;
    font-family: 'Poppins', sans-serif;
}
```

```
html {
    scroll-behavior: smooth;
}

h2 {
    font-weight: normal;
}

section {
    width: 100vw;
    min-height: 100vh;
}

header {
    text-align: center;
    align-items: center;
    width: 100%;
    height: 100px;
    background-color: #00000065;
    position: fixed;
    z-index: 99;
}

#container {
    margin-top: 20px;
    display: flex;
```

```
    align-items: center;
    justify-content: center;
}

#container ul a {
    text-decoration: none;
    color: black;
}

#container ul {
    list-style: none;
    text-decoration: none;
}

#container ul li {
    box-shadow: rgba(0, 0, 0, 0.35) 0px 5px 15px;
    margin-left: 50px;
    background-color: #ffcc3f;
    width: 150px;
    border: 3px solid white;
    border-radius: 10px;
    height: 50px;
    line-height: 50px;
    text-align: center;
    float: left;
    font-size: 19px;
```

```
    position: relative;
    transition: all 0.7s ease;

}

#container ul li:hover {
    background-color: #e24646d5;
}

#container ul ul {
    display: none;
}

#container ul li:hover>ul {
    display: block;
}

#container ul ul ul {
    margin-left: 100px;
    margin-top: -40px;
    position: absolute;
}

.content {
    position: relative;
    top: 100px;
```

```
    width: 100%;
    height: 100%;
}

.content img {
    margin-top: 15px;
    width: 100%;
    height: 82%;
}

.content h1 {
    letter-spacing: 2px;
    color: #EA2027;
    padding-top: 20px;
    text-transform: uppercase;
    font-weight: bold;
    font-size: 40px;
    text-align: center;
    font-family: 'Arvo', serif;
}

#content {
    padding: 10px;
    background-color: #e4c9ba94;
}
```

```
#content h1 {
    padding-bottom: 30px;
    padding-top: 100px;
    color: #EA2027;
    text-transform: uppercase;
    font-weight: bold;
    font-size: 40px;
    text-align: center;
    font-family: 'Arvo', serif;
}

.para {
    font-family: 'Kanit', sans-serif;
    font-size: 25px;
    text-indent: 50px;
    display: flex;
    flex-direction: column;
    gap: 30px;
}

.para p {
    letter-spacing: 2px;
}

.box {
```

```
    box-shadow: rgba(0, 0, 0, 0.25) 0px 54px 55px, rgba(0, 0, 0, 0.12) 0px -12px 30px, rgba(0, 0, 0, 0.12)
0px 4px 6px, rgba(0, 0, 0, 0.17) 0px 12px 13px, rgba(0, 0, 0, 0.09) 0px -3px 5px;
    border-radius: 15px;
    margin: 40px;
    padding: 10px;
    font-family: 'Lobster', cursive;
    font-size: 30px;
    text-indent: 50px;
    border: 10px solid red;
    margin-left: 22%;
    width: 60%;
    height: 100px;
    background-color: rgba(57, 240, 240, 0.664);
    display: flex;
    align-items: center;
    justify-content: center;
}

#content .list {
    padding: 30px;
    font-family: 'Kanit', sans-serif;
    font-size: 25px;
    display: flex;
    flex-direction: column;
    gap: 30px;
}
```

```
#subtypes {
    padding: 10px;
    font-family: 'Arvo', serif;
    background-color: rgba(57, 240, 240, 0.664);
}

#subtypes h1 {
    padding-top: 100px;
    color: #EA2027;
    text-transform: uppercase;
    font-weight: bold;
    font-size: 40px;
    text-align: center;
    font-family: 'Arvo', serif;
}

.para1 {
    padding: 30px;
    font-family: 'Kanit', sans-serif;
    font-size: 25px;
    letter-spacing: 2px;
}

.para1 h4 {
    font-size: 30px;
```

```
    color: #0652DD;
    font-family: 'Poppins', sans-serif;
    padding-top: 30px;
    text-transform: uppercase;
}

.para1 p {
    padding-top: 10px;
    text-indent: 50px;
}

.para1 span {
    letter-spacing: 3px;
    color: red;
    font-size: 35px;
    font-weight: bold;
    font-family: 'Kanit', sans-serif;
}

.para1 h5 {
    font-size: 30px;
    font-family: 'Arvo', serif;
    padding-top: 10px;
    text-indent: 30px;
}
```

```
.para1 .list ul li {
    padding-top: 10px;
}

.para1 h6 {
    text-indent: 30px;
    font-size: 20px;
}

.para1 .three ul li {
    padding-top: 10px;
}

#diagnosis {
    padding: 10px;
    background-color: #FEA47F;
}

#diagnosis h1 {
    padding-top: 100px;
    color: #EA2027;
    text-transform: uppercase;
    font-weight: bold;
    font-size: 40px;
    text-align: center;
    font-family: 'Arvo', serif;
```

```
}

#diagnosis h4 {
    color: #2c2c54;
}

#heartpredict {
    display: none;
}

#goal h1 {
    padding-top: 100px;
    color: #EA2027;
    text-transform: uppercase;
    font-weight: bold;
    font-size: 40px;
    text-align: center;
    font-family: 'Arvo', serif;
}

.goal {
    padding: 20px;
    padding-top: 20px;
    display: flex;
    align-items: center;
    justify-content: center;
```

```
    gap: 15px;
}

.goal img {
    width: 40%;
    height: 30%;
}

.goal p {
    justify-content: center;
    text-indent: 40px;
    font-family: 'Kanit', sans-serif;
    font-size: 25px;
    letter-spacing: 2px;
}

#dataset {
    display: flex;
    flex-direction: column;
    align-items: center;
    justify-content: center;
    gap: 60px;
    background-color: #FDA7DF;
}

#dataset h1 {
```

```
    padding-top: 100px;
    color: #EA2027;
    text-transform: uppercase;
    font-weight: bold;
    font-size: 40px;
    text-align: center;
    font-family: 'Arvo', serif;
}

#dataset h2 {
    text-decoration: underline;
    text-underline-offset: 5px;
    letter-spacing: 2px;
    font-weight: bold;
    font-size: 35px;
    font-family: 'Kanit', sans-serif;
}

table {
    margin-bottom: 40px;
    font-size: 20px;
    align-items: center;
    width: 1400px;
    height: 400px;
    border-collapse: collapse;
    padding-bottom: 50px;
```

```
}

td,
th {
    background-color: #34e7e4;
    border: 5px solid #b34545;
    padding: 10px;
}

#technique {
    background-color: #F8EFBA;
}

#technique h1 {
    padding-top: 100px;
    color: #EA2027;
    text-transform: uppercase;
    font-weight: bold;
    font-size: 40px;
    text-align: center;
    font-family: 'Arvo', serif;
}

.tech {
    padding: 20px;
}
```

```
.tech h4 {
    font-size: 30px;
    color: #0652DD;
    font-family: 'Poppins', sans-serif;
    padding-bottom: 30px;
    text-transform: uppercase;
}

.tech p {
    justify-content: center;
    text-indent: 40px;
    font-family: 'Kanit', sans-serif;
    font-size: 25px;
    letter-spacing: 2px;
}

.tech img {
    height: 300px;
    padding-left: 40%;
}

#result {
    background-color: #55E6C1;
}
```

```
.result h1 {
    padding-top: 100px;
    color: #EA2027;
    text-transform: uppercase;
    font-weight: bold;
    font-size: 40px;
    text-align: center;
    font-family: 'Arvo', serif;
}

.result p {
    box-shadow: rgba(50, 50, 93, 0.25) 0px 50px 100px -20px, rgba(0, 0, 0, 0.3) 0px 30px 60px -30px,
rgba(10, 37, 64, 0.35) 0px -2px 6px 0px inset;
    border-radius: 30px;
    margin: 50px;
    background-color: #9880fa8f;
    align-items: center;
    padding: 50px;
    justify-content: center;
    text-indent: 70px;
    font-family: 'Kanit', sans-serif;
    font-size: 27px;
    letter-spacing: 2px;
}

#predict {
```

```
    height: 1500px;
    background-color: #9c88ff;
}

#predict h1 {
    padding-top: 100px;
    color: #EA2027;
    text-transform: uppercase;
    font-weight: bold;
    font-size: 40px;
    text-align: center;
    font-family: 'Arvo', serif;
}

.heart_img {
    padding-top: 50px;
    padding-left: 17%;
}

.heart_table {
    margin-left: -100px;
    height: 500px;
    display: flex;
    align-items: center;
    justify-content: space-around;
}
```

```
.heart_box {

    padding-top: 60px;
}

.heart_box label {
    padding-left: 10px;
    font-size: 25px;
    font-family: 'Kanit', sans-serif;
}

.heart_box input {
    padding: 3px;
    font-size: 25px;
    box-shadow: rgba(50, 50, 93, 0.25) 0px 13px 27px -5px, rgba(0, 0, 0, 0.3) 0px 8px 16px -8px;
    border: none;
    border-radius: 8px;
    width: 350px;
    height: 35px;
}

#predict button {
    margin-top: 60px;
    border-radius: 10px;
    font-weight: bold;
```

```
    color: black;
    letter-spacing: 3px;
    font-family: 'Arvo', serif;
    align-items: center;
    width: 200px;
    margin-left: 45%;
    border: 3px solid white;
    background-color: #ffcc3f;
    transition: all 0.7s ease;
}

#predict button:hover {
    background-color: #e24646d5;
}

#analytics{

    background-color: #f8a5c2;
}
#analytics h1{
    padding-top: 100px;
    color: #EA2027;
    text-transform: uppercase;
    font-weight: bold;
    font-size: 40px;
    text-align: center;
```

```
    font-family: 'Arvo', serif;
}
.last_table{
    padding-bottom: 50px;
    margin-left: 200px;
}
#sign_in {
    padding-top: 100px;
    font-family: 'Poppins', sans-serif;
    height: 100vh;
    width: 100vw;
    background-color: #7227d5c4;
    display: flex;
    justify-content: center;
    align-items: center;
}

.card {
    background: #fff;
    width: 1100px;
    min-height: 550px;
    box-shadow: rgba(0, 0, 0, 0.3) 0px 19px 38px, rgba(0, 0, 0, 0.22) 0px 15px 12px;
    display: flex;
}

.form,
```

```
.image {
    width: 50%;
}

.image {
    background-image: url('../images/login.jpeg');
    background-size: cover;
    background-position: center;
}

.overlay {
    width: 100%;
    height: 100%;
    background-color: rgba(114, 39, 213, 0.31);
    display: flex;
    justify-content: center;
    align-items: center;
    flex-direction: column;
    text-align: center;
}

.overlay h3 {
    color: white;
    letter-spacing: 1px;
    font-size: 30px;
    font-weight: 700;
```

```
    opacity: 0.6;
}

.overlay p  {
    color: white;
    font-size: 18px;
    font-weight: bold;
    opacity: 0.6;
}

.form {
    padding: 60px 25px;
    display: flex;
    flex-direction: column;
}

.form h3 {
    font-size: 34px;
    font-weight: 500;
    position: relative;
    margin-bottom: 30px;
}

.form h3::after {
    content: '';
    width: 30px;
```

```
    height: 3px;
    background: #7227D5;
    position: absolute;
    left: 0;
    bottom: 2px;
    border-radius: 5px;
}

.fa {
    color: #7227D5;
    position: absolute;
    top: 10px;
    font-size: 22px;
}

.input-field {
    width: 100%;
    margin-bottom: 10px;
    position: relative;
}

.input-field input {
    display: block;
    width: 100%;
    padding: 10px 30px;
    outline: none;
```

```
    border: none;
    border-bottom: 2px solid rgb(182, 180, 180);
    font-size: 20px;
}

.form>a {
    color: #7227D5;
    text-decoration: none;
    font-size: 18px;
    margin-bottom: 35px
}

button {
    height: 45px;
    background: #7227D5;
    border: none;
    color: white;
    border-radius: 5px;
    font-size: 22px;
}

button+p {
    text-align: center;
    padding-top: 30px;
    font-size: 18px;
}
```

```
button+p a {
    text-decoration: none;
    color: #7227D5;
    font-weight: 500;
}

input::placeholder {
    font-family: 'Poppins', sans-serif;
}
```

8. TESTING

8.1 Test Cases :

A test case has components that describe input, action and an expected response, in order to determine if a feature of an application is working correctly. A test case is a set of instructions on “HOW” to validate a particular test objective/target, which when followed will tell us if the expected behaviour of the system is satisfied or not. Characteristics of a good test case:

• Accurate: Exacts the purpose.

• Economical: No unnecessary steps or words.

• Traceable: Capable of being traced to requirements.

• Repeatable: Can be used to perform the test over and over.

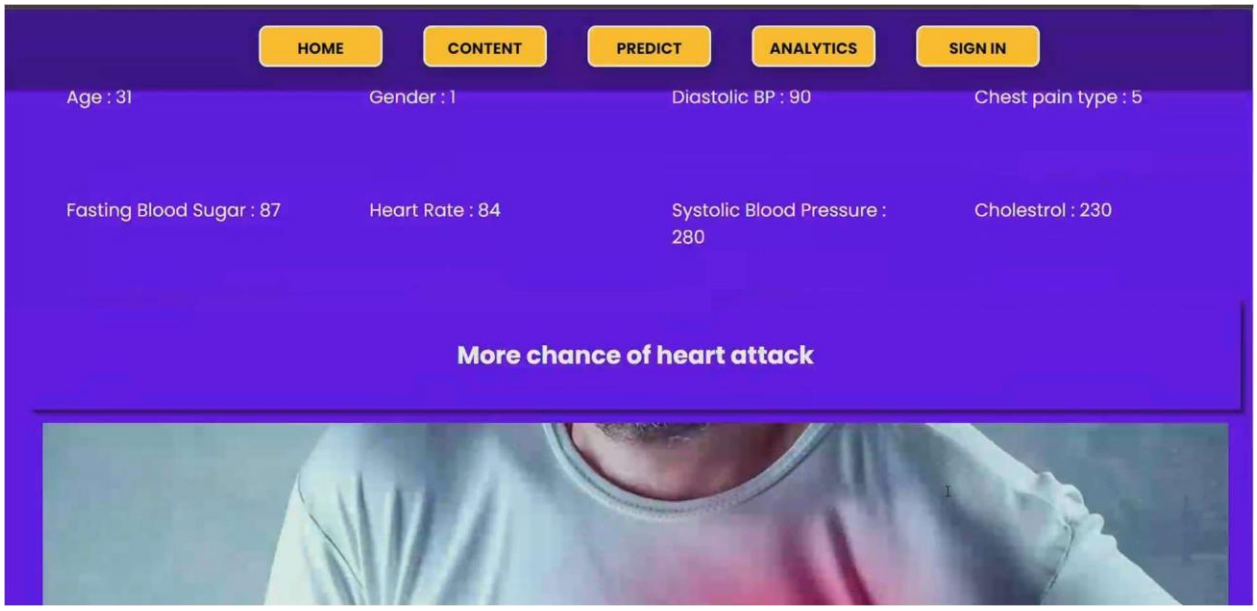
• Reusable: Can be reused if necessary

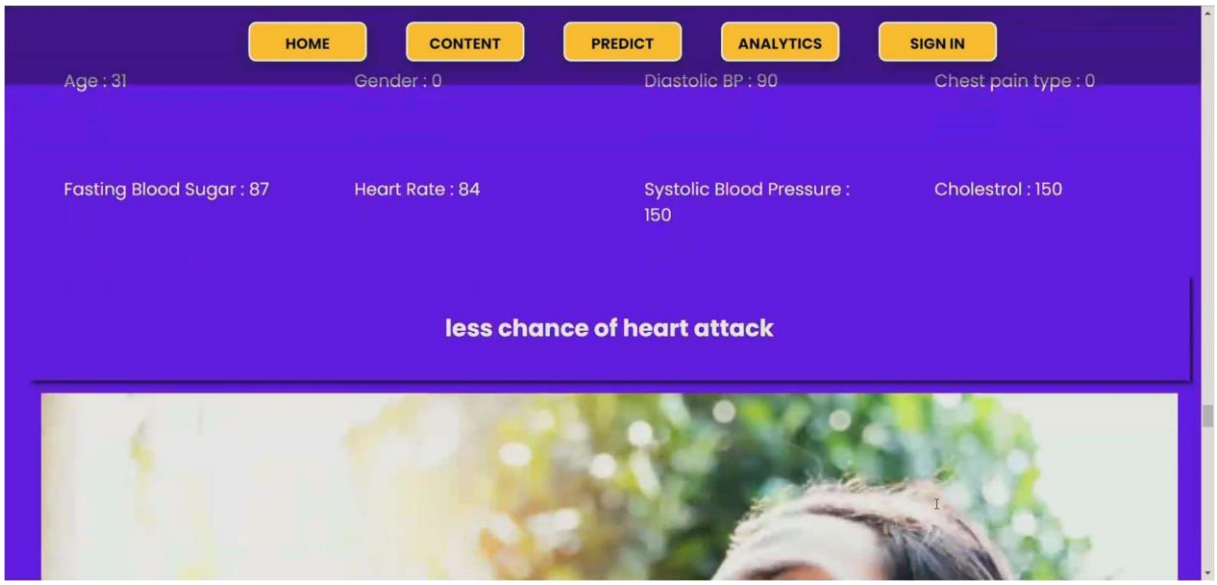
8.2 User Acceptance Testing :

This sort of testing is carried out by users, clients, or other authorised bodies to identify the requirements and operational procedures of an application or piece of software. The most crucial stage of testing is acceptance testing since it determines whether or not the customer will accept the application or programme. It could entail the application's U.I., performance, usability, and usefulness. It is also referred to as end-user testing, operational acceptance testing, and user acceptance testing (UAT).

9. RESULTS

9.1 Performance Metrics :





10. ADVANTAGES :

- User can search for doctor's help at any point of time.
- User can talk about their Heart Disease and get instant diagnosis.
- Doctors get more clients online.
- Very useful in case of emergency.

DISADVANTAGES :

- Accuracy Issues: A computerized system alone does not ensure accuracy, and the warehouse data is only as good as the data entry that created it.
- The system is not fully automated, it needs data from user for full diagnosis

11. CONCLUSION

The early prognosis of cardiovascular diseases can aid in making decisions on lifestyle changes inhigh risk patients and in turn reduce the complications, which can be a great milestone in the fieldof medicine. This project resolved the feature selection i.e. backward elimination and RFECV behind the models and successfully predict the heart disease, with 85% accuracy. The model used was Data Analytics. Further for its enhancement, we can train on models and predict thetypes of cardiovascular diseases providing recommendations to the users, and also use moreenhanced models. Early detection of cardiac diseases and continuous supervision of clinicians can reduce the mortality rate. However, it is not possible to monitor patients every day in all cases accurately and consultation of a patient for 24 hours by a doctor is not available since it requires more sapience, time and expertise.

12. FUTURE SCOPE

For the future scope more **machine learning approach** will be used for the best analysis of heart diseases and for earlier prediction of diseases so that the rate of a number of deaths can be reduced if people are informed of the illness.

13. APPENDIX

Source Code :

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 3.2 Final//EN">

<html lang="en">

<head>
    <meta charset="UTF-8">
    <meta http-equiv="X-UA-Compatible" content="IE=edge">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-awesome/4.7.0/css/font-awesome.min.css">
    <title>Heart Disease Prediction</title>
    <link rel="stylesheet" href="https://cdn.jsdelivr.net/npm/bootstrap@4.0.0/dist/css/bootstrap.min.css" integrity="sha384-Gn5384xqQ1aoWXA+058RXPxPg6fy4IWvTNh0E263XmFcJlSAwiGgFAW/dAiS6JXm" crossorigin="anonymous">
    <link rel="stylesheet" href="../css/style.css">
</head>

<body>
    <section id="home">
```

```
<header>
   <div id="container">
      <ul>
         <li><a href="#home"><b>HOME</b></a></li>
         <li><a href="#content"><b>CONTENT</b></a>
            <ul>

               <li><a href="#subtypes"><b>SUBTYPES</b></a></li>
               <li><a href="#diagnosis"><b>DIAGNOSIS</b></a></li>
               <li><a href="#heartpredict"><b>USING ML</b></a>
                  <ul>
                     <li><a href="#goal"><b>GOAL</b></a></li>
                     <li><a href="#dataset"><b>DATASET</b></a></li>
                     <li><a href="#technique"><b>TECHNIQUE</b></a></li>
                  </ul>
               </li>
               <li><a href="#result"><b>RESULT</b></a></li>
            </ul>
         </li>
         <li><a href="#predict"><b>PREDICT</b></a></li>
         <li><a href="#analytics"><b>ANALYTICS</b></a></li>
         <li><a href="#sign_in"><b>SIGN IN</b></a></li>

      </ul>
   </div>
</header>
```

```
    <div class="content">
      <h1>Heart Diseases Prediction</h1>
      <img src="./images/heart 2.jpg" alt="">
    </div>
  </section>
  <section id="content">
    <h1>Heart Disease</h1>
    <div class="para">
      <p>
```

1. Heart disease describes a range of conditions that affect your heart. Diseases under the heart disease umbrella include blood vessel diseases, such as coronary artery disease, heart rhythm problems (arrhythmias) and heart defects you're born with (congenital

heart defects), among others.

```
      </p>
      <p>
```

2. The term "heart disease" is often used interchangeably with the term "cardiovascular disease". Cardiovascular disease generally refers to conditions that involve narrowed or blocked blood vessels that can lead to a heart attack, chest pain (angina)

or stroke. Other heart conditions, such as those that affect your heart's muscle, valves or rhythm, also are considered forms of heart disease.

```
      </p>
      <p>
```

3. Heart disease is one of the biggest causes of morbidity and mortality among the population of the world. Prediction of cardiovascular disease is regarded as one of the most important subjects in the section of clinical data analysis. The amount of data

in the healthcare industry is huge. Data mining turns the large collection of raw healthcare data into information that can help to make informed decisions and predictions.

```
      </p>
    </div>
    <div class="box">
```

According to a news article, heart disease proves to be the leading cause of death for both women and men. The article states the following :

Heart disease is the leading cause of death for both men and women. More than half of the deaths due to heart disease in 2009 were in men.

Coronary Heart Disease(CHD) is the most common type of heart disease, killing over 370,000 people annually.

Every year about 735,000 Americans have a heart attack. Of these, 525,000 are a first heart attack and 210,000 happen in people who have already had a heart attack.

</section>

<section id="subtypes">

<h1>HEARTDISEASES SUBTYPES</h1>

<h4>

1. Coronary heart disease:

</h4>

Coronary artery disease, also known as coronary heart disease, is the most common type of heart. It develops when the arteries that supply blood to the heart become clogged with plaque. This causes them to harden and narrow. Plaque contains cholesterol

and other substances. As a result, the blood supply reduces, and the heart receives less oxygen and fewer nutrients. In time, the heart muscle weakens, and there is a risk of heart failure and arrhythmias. When plaque builds up in the

arteries, it is called atherosclerosis. Plaque in the arteries can rupture from blockages and cause blood flow to stop, which can lead to a heart attack.

<h4>

2. Congenital heart defects:

</h4>

<h5>

A person with a congenital heart defect is born with a heart problem. There are many types of congenital heart defects, includingTrusted Source:

</h5>

Atypical heart valves: Valves may not open properly, or they may leak blood.

Septal defects: There is a hole in the wall between either the lower chambers or the upper chambers of the heart.

Atresia: One of the heart valves is missing.

Congenital heart disease can involve major structural issues, such as the absence of a ventricle or problems with unusual connections between the main arteries that leave the heart.

Many congenital heart defects do not cause any noticeable symptoms and only become apparent during a routine medical check.

According to the American Heart Association (AHA)Trusted Source, heart murmurs often affect children, but only some are due to a defect.

<h4>3.Arrhythmia:</h4>

Arrhythmia refers to an irregular heartbeatTrusted Source. It occurs when the electrical impulses that coordinate the heartbeat do not work correctly. As a result, the heart may beat too quickly, too slowly, or erratically.

<h5>There are various types of arrhythmias, including:</h5>

Tachycardia: This refers to a rapid heartbeat.

Bradycardia: This refers to a slow heartbeat.

Premature contractions: This refers to an early heartbeat

Atrial fibrillation: This is a type of irregular heartbeat.

A person may notice a feeling like a fluttering or a racing heart.

</section>

<section id="diagnosis">

<h1>HEARTDISEASES DIAGNOSED</h1>

<h4>Physical exam and blood tests:</h4>

During your appointment, your doctor will ask you about your symptoms and your family medical history. They'll also check your heart rate and blood pressure. Your doctor may also order blood tests. For example, cholesterol tests measure the

levels of fat and cholesterol in your bloodstream. Your doctor can use these tests to help determine your risk of heart disease and heart attack.

<h4>A complete cholesterol test checks four types of fats in your blood:</h4>

Total cholesterol is the sum of all cholesterol in your blood.

Low-density lipoprotein (LDL) cholesterol is sometimes called "bad" cholesterol. Too much of it causes fat to build up in your arteries, which reduces blood flow. This can lead to a heart attack or stroke.

High-density lipoprotein (HDL) cholesterol is sometimes called "good" cholesterol. It helps carry away LDL cholesterol and clear your arteries.

Triglycerides are a type of fat in your blood. High levels of triglycerides are often associated with diabetes, smoking, and excessive alcohol consumption.

Your doctor may also order C-reactive protein (CRP) tests to check your body for signs of inflammation. They can use the results of your CRP and cholesterol tests to assess your risk of heart disease.


```
        </div>
        <h4>Noninvasive tests for heart disease:</h4>
        <div class="list">
          <ul>
            <li>Electrocardiogram</li>
            <li>Echocardiogram</li>
            <li>Stress Test</li>
            <li>Carotid Ultrasound</li>
            <li>Holter Monitor</li>
            <li>Chest X-ray</li>
            <li>Tilt Table Test</li>
            <li>CT Scan</li>
            <li>Heart MRI</li>
          </ul>
        </div>
      </div>
    </section>
    <section id="heartpredict"></section>
    <section id="goal">
      <h1>GOALS</h1>
      <div class="goal">
        <img src="./images/no-goal.jpg" alt="">
        <p>
```

In the future, these techniques can be applied to a real-time database of the individual patient and by using the same attributes or by adding some more attributes we can determine the prediction of multiple diseases like kidney-related and lungs related

diseases. We can also implement the algorithms used previously for better results. This can be deployed to android and web platforms to analyze and predict using real-time data & by collaborating with doctors or medical organizations or

as a common platform for predicting diseases. As an extension to this work and some sort of limitation to the work performed here, different types of classifiers can be included in the analysis, and more in-depth sensitivity analysis can

be performed on these classifiers, also an extension can be made by applying the same analysis to other diseases datasets, and see the performance of these classifiers to classify and predict these diseases.

```
        </p>
      </div>
    </section>
    <section id="dataset">
      <h1>
        DATASET DESCRIPTION
      </h1>
      <h2>
        HTML TABLE
      </h2>
      <div class="table">
        <table>
          <tr>
            <th>s.no</th>
            <th>Attribute</th>
            <th>Description</th>
            <th>Type</th>
          </tr>
          <tr>
            <td>1</td>
```

<td>Age</td>

<td>Age of patient</td>

<td>Numeric</td>

</tr>

<tr>

<td>2</td>

<td>sex</td>

<td>Gender of patients</td>

<td>Nominal</td>

</tr>

<tr>

<td>3</td>

<td>Cp</td>

<td>Type of chest pain</td>

<td>Nominal</td>

</tr>

<tr>

<tr>

<td>4</td>

<td>Trestbps</td>

<td>Resting blood pressure</td>

<td>Numeric</td>

</tr>

<tr>

<td>5</td>

<td>Chol</td>

<td>Cholesterol level</td>

<td>Numeric</td>

</tr>

<tr>

<td>6</td>

<td>FBS</td>

<td>Fasting Blood sugar</td>

<td>Nominal</td>

</tr>

<tr>

<td>7</td>

<td>RestECG</td>

<td>Electrocardiographic result</td>

<td>Numeric</td>

</tr>

<tr>

<td>8</td>

<td>Thalach</td>

<td>The maximum heart attained by patient</td>

<td>Numeric</td>

</tr>

<tr>

<td>9</td>

<td>Exang</td>

<td>Exercise induced angina</td>

<td>Nominal</td>

```
            </tr>
            <tr>
                <td>10</td>
                <td>Oldpeak</td>
                <td>ST depression induced angina</td>
                <td>Numeric</td>
            </tr>
        </table>
    </div>
</section>
<section id="technique">
    <h1>
        HEARTDISEASE PREDICTION-BEST ML APPROACHES
    </h1>
    <div class="tech">
        <h4>1.Random Forest Classifier</h4>
        <p>
            The random forest algorithm provides flexibility and robustness for classification tasks using tabular data, which few other standard models can. Given its simplicity and versatility, the random forest classifier is widely used for fraud detection, loan
            risk prediction, and predicting heart diseases.
        </p>
        <img src="images/a.jpg" alt="">
    </div>
    <div class="tech">
        <h4>2. K-Nearest Neighbors</h4>
        <p>
```

As the name says, a k neighbors classifier takes a data point and finds k other data points nearest to it in the vector space. In a supervised fashion, KNN creates clusters of the data samples having the same target value. Whenever a new value needs to

be classified, it uses a distance metric to assign it to one of the classes. For heart disease detection, there are only two classes that KNN needs to build. Thus, it is pretty robust and efficient forthis task. Euclidean distance is

one of the popular distance metrics used by KNN, but there are many more available.

<h4>3. Decision Tree classifier</h4>

Decision Trees are the individual models that make a random forest after ensembling. Each decision tree classifier uses the dataset's attributes to create a tree. As shown in the image below, the branches end up in the leaves that are made up of target

values. Using visual components and an information gain index, the tree identifies the leading features of the labels of each class. Thus, the branches are created that maximize the information gained in each split and lead up to the leaf

node of that class. Decision trees are fast and robust for disease prediction if the dataset has powerful features for a simple use-case.

<h4>4. Support Vector Machines

</h4>

A Support Vector Machine (SVM) algorithm is a non-probabilistic classifier aiming to generate hyperplanes that divide the data points of two classes in the vector space. For N number of features and M targets, SVM creates M-1 N-dimensional hyperplanes

that separate data points of different classes from each other. The image below shows how "support" vectors are calculated such that the margin (or distance) between the vectors of two classes is the most. SVM optimizes this margin metric

to find the best hyperplane for all the categories.

<h4>5. Artificial Neural Networksr</h4>

An ANN is perhaps the most popular machine learning model in today's AI landscape, given its wide applications in deep learning in the form of convolutional neural networks. However, a normal ANN comprised of a handful of linear nodes can perform comparable

to the best standard ML models. The architecture of a standard ANN is shown in the figure below. As we can see, the hidden layer is the most crucial part of an ANN, and is made up of several linear nodes.

</section>

<section id="result">

<h1>RESULT</h1>

<P>

Heart disease prediction is a necessity as well as exigent work in the medical field. The mortality rate can be reduced if the disease is recognized at the initial stages, and precautions and proper treatment are possible. The algorithms are tested using

various features. Accurate forecasting of the diseases is the goal of the proposed method. The decision classifier approach proved to be very efficacious to predict the diseased using features like age, BMI, cholesterol, and more. Adding

feature BMI improved the accuracy of prediction. Thus, by assessing the results, the suggested approach generates a more precise prediction of cardiovascular diseases. Our project focuses on analyzing and designing a system where patients'

real-time information can be processed and evaluated based on previous symptoms and current symptoms for different diseases [2]. We have concluded that KNN, Support Vector, Decision tree, and Random Forest are the best algorithms with

higher accuracy rates than others for predicting and analysis among these KNN is easy to implement and requires less computational resources and thus could be implemented in a web-based system effortlessly.

```
        </P>

      </div>


  </section>

  <section id="predict">

    <h1>HEART DISEASE PREDICTION</h1>

    <div class="heart_img">

      <img src="./images/HN.jpg" alt="">

    </div>

    <div class="heart_table">

      <div class="heart_box">

        <form action="/heart-disease" method="post">

          <pre>

            <label>AGE</label>

            <input type="number" name="age" id="age" placeholder="" required/><br/>

            <label>GENDER</label>

            <input name="sex" min="0" max="1" id="thalach" placeholder="" required="required"><br>


            <label>DIASTOLIC BLOOD PRESSURE</label>

            <input name="diabp" id="chol" placeholder="" required><br>
```

```
                <label>CHEST PAINTYPE</label>
                <input type="number" name="diabetes" placeholder="" required><br>
            </pre>
        </div>
        <div class="heart_box">
            <pre>
                <label>FASTING BLOOD SUGAR</label>
                <input type="number" name="glucose" placeholder="" required><br>
                <label>HEART RATE</label>
                <input name="heartrate" id="trestbps" placeholder="" required="required"><br>

                <label>CHOLESTROL</label>
                <input type="number" id="cp" name="chol" placeholder="" required><br/>
                <label>SYSTOLIC BLOOD PRESSURE</label>
                <input type="number" name="sysbp" id="exang" placeholder="" required="required"><br>

            </pre>
        </div>
    </div>


    <button>
        SUBMIT
    </button>
</form>
```

```
</section>
<div class="details row " id="detailed">
    <p class="col-lg-3">Age : <%= age %></p>
    <p class="col-lg-3">Gender : <%= sex %> </p>
    <p class="col-lg-3">Diastolic BP : <%= diaBp %> </p>
    <p class="col-lg-3">Chest pain type : <%= chestpt %> </p>
    <p class="col-lg-3">Fasting Blood Sugar : <%= glucose %> </p>
    <p class="col-lg-3">Heart Rate : <%= heartrate %> </p>

    <p class="col-lg-3">Systolic Blood Pressure : <%=sysbp%></p>
    <p class="col-lg-3">Cholestrol : <%= totchol %> </p>

    <p class="col-lg-12 text-center result"><%= result %> </p>
    <% if (result === "More chance of heart attack") { %>
        <img src="./images/heart-disease.jpg" class="col-lg-12" width="500" alt="">
    <% } else {%>
        <img src="./images/happy.jpg" class="col-lg-12" width="500" alt="">
    <% } %>
</div>
<section id="analytics">
    <h1>DATA VISUALIZATION</h1>
    <div class="para1">
```

<h4>1.Chest Pain by Age:</h4>

Chest pain is often associated with heart disease, many people with heart disease say they have a vague discomfort that isn't necessarily identified as pain. In general, chest discomfort related to a heart attack or another heart problem may be described

by or associated with one or more of the following: Pressure, fullness, burning or tightness in your chest Crushing or searing pain that spreads to your back, neck, jaw, shoulders, and one or both arms Pain that lasts more than a few minutes,

gets worse with activity, goes away and comes back, or varies in intensity Shortness of breath Cold sweats Dizziness or weakness Nausea or vomiting...

<h4>2.Exploration Of BPvsChestPainType And Gender:</h4>

Sex differences in pain perception are well-described, where female sex has higher somatic awareness compared to male sex (22). This potentially leads to women having greater sensitivity but lower specificity for cardiac chest pain. Further, differing

phenotypes of biological sex impact pain perception, e.g., younger premenopausal women with relatively high estrogen levels have a greater pain perception compared to older postmenopausal women with lower estrogen levels (23). Younger

pre-menopausal women are erroneously thought to be “protected” from CAD, and younger women's pain symptoms are more easily discounted. Specifically, socio-cultural gender is documented to contribute to subjective symptoms, where gender

bias in pain diagnosis and treatment has been identified within the patient-provider encounter and treatment decisions (24). A comprehensive evaluation of sex and gender differences in pain includes proximate cause contributions of experiential

(abuse, labor, and delivery), psychological (anxiety, depression, post-traumatic stress), genetic (X chromosome imprinting/Y chromosome), neurochemical (adenosine, cytokine expression), organizational (steroid action in development), activational

(steroid action in adulthood), systems level (cortical connectivity, vagal nerve modulation), and sociocultural (gender roles, gender role expectations)(25)...

<h4>3.Exploration Of Max Heart Rate During The Chest Pain:</h4>

Your maximum heart rate is a calculation that helps you figure out what your ideal target heart rate is during exercise. You can estimate your maximum age-related heart rate by subtracting your age

from 220Trusted Source. For example, for a 35-year-old person, the estimated maximum age-related heart rate would be calculated as 220 – 35 years = 185 bpm. This maximum heart rate calculation helps you see if you're exercising too hard or not putting in enough energy. Your target heart rate uses this calculation to reflect the ideal bpm you need for a great workout. When your heart rate is too fast, it's called tachycardia. For adults, a fast heart rate is defined as above 100 bpmTrusted Source.Tachycardia, whichis when your heart rate is faster than it should be, can be caused by underlying health conditions like: anemia, congenital heart disease, heart disease that's affecting blood flow, hyperthyroidism, injury to the heart, like from a heart attack, ventricular or supraventricular arrhythmias, Taking illegal drugs (like stimulants like cocaine or methamphetamines) or misusing prescription medications or non-prescription products (like diet supplements) may also cause your heart to beat too fast. Other, less serious reasons for a fast heart rate include: drinking caffeine, drinking alcohol, stress, physical exercise, pregnancy...

<h4>4.Exploration Of BP By Age:</h4>

Blood pressure is the force of blood flowing through a person's blood vessels. Doctors calculate a person's blood pressure using two measurements known as systolic and diastolic. Systolic blood pressure is the highest level of force at which the heart pumps blood around the body. Diastolic blood pressure is the resistance to the blood flow in the blood vessels. Blood pressure is written with systolic blood pressure first and then diastolic blood pressure, for example, 120/80 millimeters of mercury (mm Hg). If either measurement is too high, it could mean a person has high blood pressure. If they are toolow, it could suggest low blood pressure. The cut-off point for diagnosing high blood pressure does not change with age. If a person needs to know whether their child's blood pressure is within the normal range, they should ask a doctor for guidance. Normal =Less than 120and Less than 80, Elevated =120– 129 and Less than 80, Hypertension =stage 1 130–139 or 80–89, Hypertension =stage 2 140 or higher or 90 or higher, Hypertension crisis =Higher than 180 or Higher than 120...

<h4>5.Exploration Of Chorestrol By Age And Gender:</h4>

Cholesterol is a waxy, fat-like substance, and there are two types: low-density lipoprotein (LDL) and high-density lipoprotein (HDL). If there is too much LDL, or "bad," cholesterol in the bloodstream, it can build up in blood vessels, forming fatty deposits called plaques.These plaques can lead toTrusted Source other problems, including heart attacks and strokes. Total and LDL cholesterol levels should be low. But having more HDL, or "good," cholesterol in the blood may reduce the risk of a heart attack or stroke. However, kids with risk factors for high cholesterol should have their levels checked more frequently. Typically, males tend to have higher levels throughout their lives than females. A male's cholesterol levels increase with age, and a female's cholesterol levels rise after menopause...

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    <th>Men aged 20 or over</th>
    <th>Women aged 20 or over</th>
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    <td>125–200 mg/dl</td>
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    <tr>
    <td>non-HDL</td>
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    <td>less than 130 mg/dl</td>
    <td>less than 130 mg/dl</td>
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    <tr>
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    <td>less than 100 mg/dl</td>
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            <tr>
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            <td>50 mg/dl or higher</td>
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            </div>
            <a href="#">Forgot password?</a>
            <button>Login</button>
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                <p>let's get connected</p>
            </div>
        </div>
    </div>
  </section>
</body>


</html>
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Github & Project Demo Link :

https://github.com/IBM-EPBL/IBM-Project-18662-1659688121