Visualizing and Predicting Heart Diseases with an Interactive Dashboard

PROJECT DETAILS

TEAM ID	**PNT2022TMID21090**
DOMAIN	**DATA ANALYTICS AND MACHINE LEARNING**
PROJECT NAME	**VISUALIZING AND PREDICTING HEART DISEASES WITH AN INTERACTIVE DASHBOARD**

TEAM MEMBORS

TEAM MEMBER	NAME	REGISTER NUMBER
TEAM LEADER	NITHIN K	714019104069
TEAM MEMBER - 1	NIKIL V	714019104068
TEAM MEMBER - 2	RAHUL S	714019104078
TEAM MEMBER - 3	TALASANI JAGADEESWARA REDDY	714019104106

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1.INTRODUCTION

1.1 Project Overview

The major challenge in heart disease is its detection. There are instruments available which can predict heart disease but either they are expensive or are not efficient to calculate chance of heartdisease in human. Early detection of cardiac diseases can decrease the mortality rate and overallcomplications. However, it is not possible to monitor patients every day in all cases accurately andconsultation of a patient for 24 hours by a doctor is not available since it requires more sapience,time and expe
rtise. Since we have a good amount of data in today's world, we can use various
machine learning algorithms to analyze the data for hidden patterns. The hidden patterns can beused for health diagnosis in medicinal data

1.2 Purpose

The goal is to accurately predict the chances of heart attack or heart failure of the person using their health

datas.Using datas like age , Sex , blood pressure , cholestrol etc is used to train the model and predict the chances.

2.LITERATURE SURVEY

2.1 Existing problem

Heart disease is even being highlighted as a silent killer which leads to the death of a person without obvious symptoms. The nature of the disease is the cause of growing anxiety about the disease & its consequences. Hence continued efforts are being done to predict the possibility of this deadly disease in prior. So that various tools & techniques are regularly being experimented with to suit the present-day health needs. Machine Learning techniques can be a boon in this regard. Even though heart disease can occur in different forms, there is a common set of core risk factors that influence whether someone will ultimately be at risk for heart disease or not. By collecting the data from various sources, classifying them under suitable headings & finally analysing to extract the

desired data we can conclude. This technique can be very well adapted to the do the prediction of heart disease. As the well-known quote says “Prevention is better than cure”, early prediction & its control can be helpful to prevent & decrease the death rates due to heart disease.

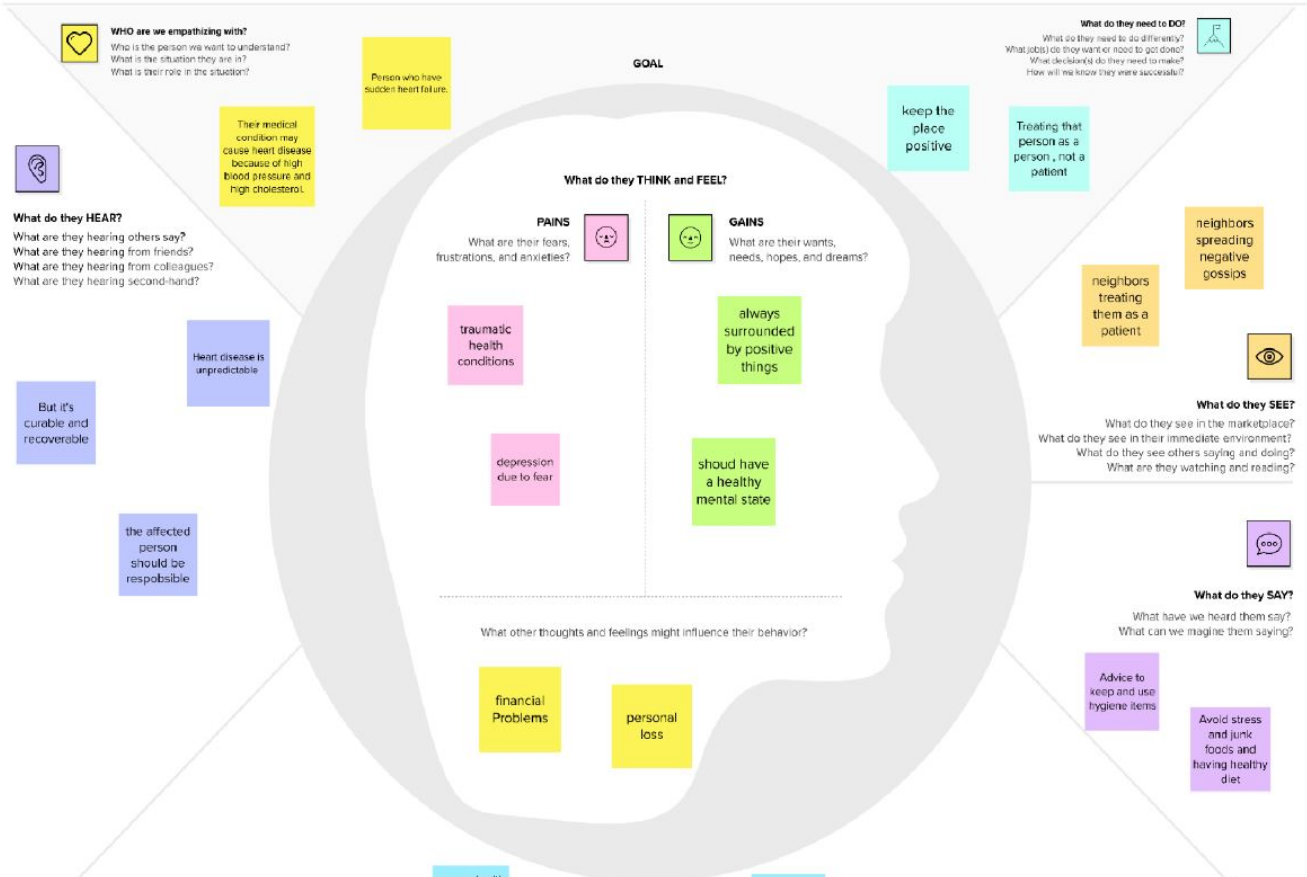
2.2 Problem Statement Definition

The major challenge in heart disease is its detection. There are instruments available which can predict heart disease but either it are expensive or are not efficient to calculate chance of heart disease in human. Early detection of cardiac diseases can decrease the mortality rate and overall complications. However, it is not possible to monitor patients everyday 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. Since we have a good amount of data in today’s world, we can use various machine learning algorithms to analyze the data for hidden patterns. The hidden patterns can be used for health diagnosis in medicinal data

3.IDEATION AND PROPOSED SOLUTION

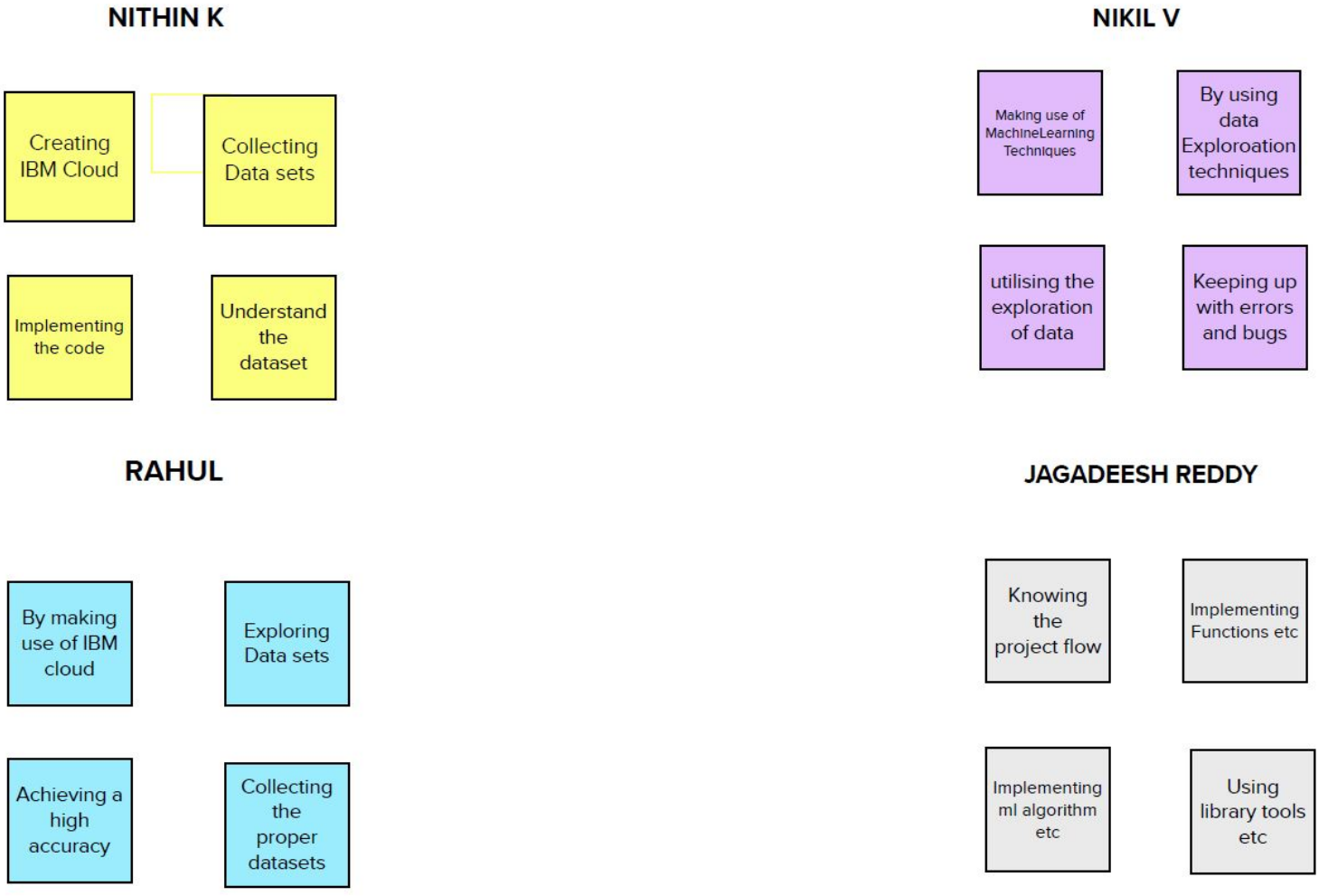
3.1 Empathy Map Canvas

An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviours and attitudes.It is a useful tool and helps teams better understand their users. Creating and effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.



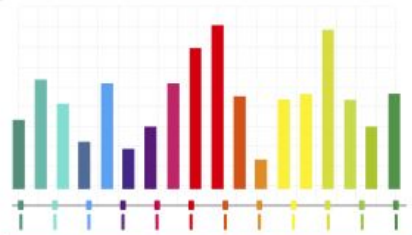
3.2 Ideation and Brainstorming

Brainstorming provides a free and open environment that encourges everyone within a team to participate in the creative thinking process that leads to problem solving. Priotizing volume over value, out-of-the-box ideas are welcome and built upon, and all participants are encouraged to collaborate, helping each other develop a rich amount of creative solution.



3 Group Ideas

20 minutes



Data Visualization

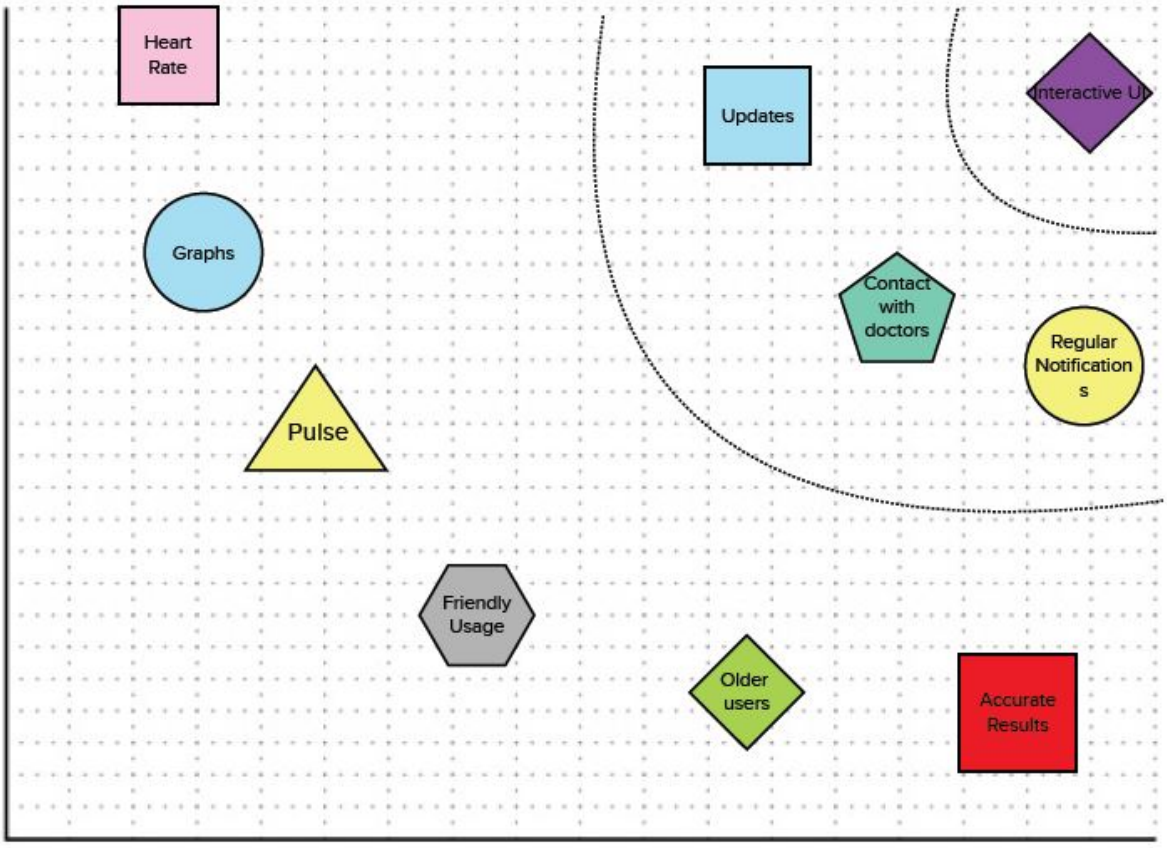
IBM COGNOS & IBM CLOUD

Data Engineering

Final Dashboard

Data Mining

Prioritize


Heart Rate
Updates
Interactive UI
Graphs
Contact with doctors
Regular Notifications
Pulse
Friendly Usage
Older users
Accurate Results

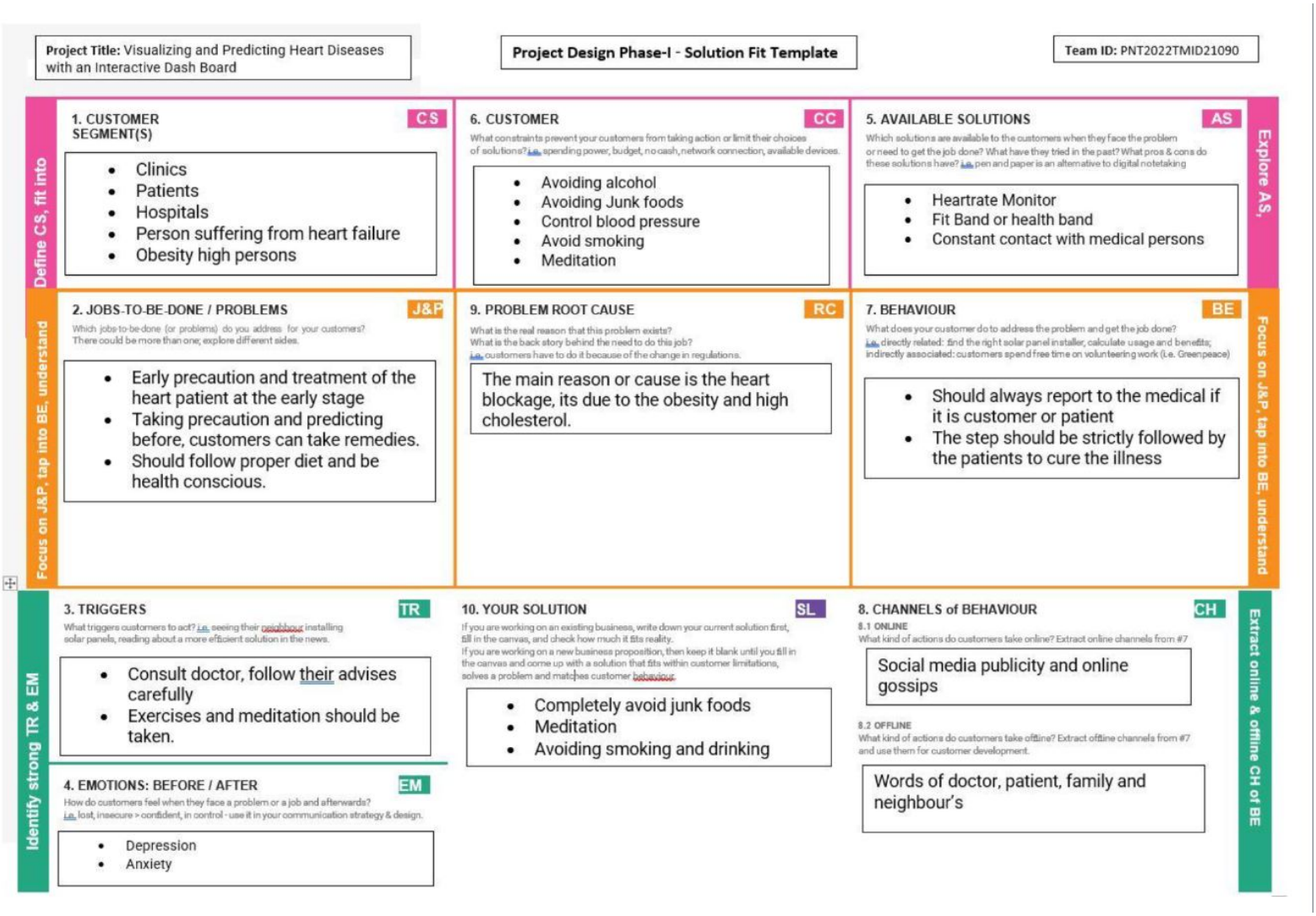
3.3 Proposed Solution

Proposed Solution:

S.No	Parameter	Description
1.	Problem Statement (Problem to be solved)	To develop an interactive dashboard to predict the heart disease accurately and to predict the possibility of heart disease
2.	Idea / Solution description	In our project, Data are collected and using Cognos Analytics, collected data are visualized in a graph dashboard and by using ML model the result is predicted the chances of Heart attack
3.	Novelty / Uniqueness	IBM Cognos Analytics is the platform that we are going to build the dashboard. Following data are used to visualize Sex Age Chest Pain
4.	Social Impact / Customer Satisfaction	User-friendly Website User can check by themselves More usage, more data, more accuracy
5.	Business Model (Revenue Model)	Easy to Use Constant Updates Data Security User-friendly

6.	Scalability of the Solution	□ Used in any Platform □ Data Visualization □ Accurate output graph displayed

3.4 Problem Solution Fit



4.REQUIREMENT ANALYSIS

4.1 Functional requirement

Following are the functional requirements of the proposed solution

FR No.	Functional Requirement(Epic)	Sub Requirement(Story/Sub-Task)
FR-1	Dataset	proper Dataset of patient's details,Hospital's Details,Bed Count,Infection severity, etc..are reuqired.
FR-2	Data Cleaning and Wrangling	The Data need to be cleaned because they are possibilities for the data to be duplicated or mislabeled

FR - 3	Creating the data model	Data Analysis and the defining the relationship between those bits of data is necessary for creating the model
FR4	Predictive Analysis	The Underlying information are analysed and predicted with the help of predictive Analysis to make a report
FR-5	Visualization	Visualization of the prediction is provides clear report to the user.
FR-6	Accuracy	The prediction of Lenth of Stay(LOS) of the patients should be accurate

4.2 Non-Funcational requirements

Following are the non-functional requirements of the proposed solution

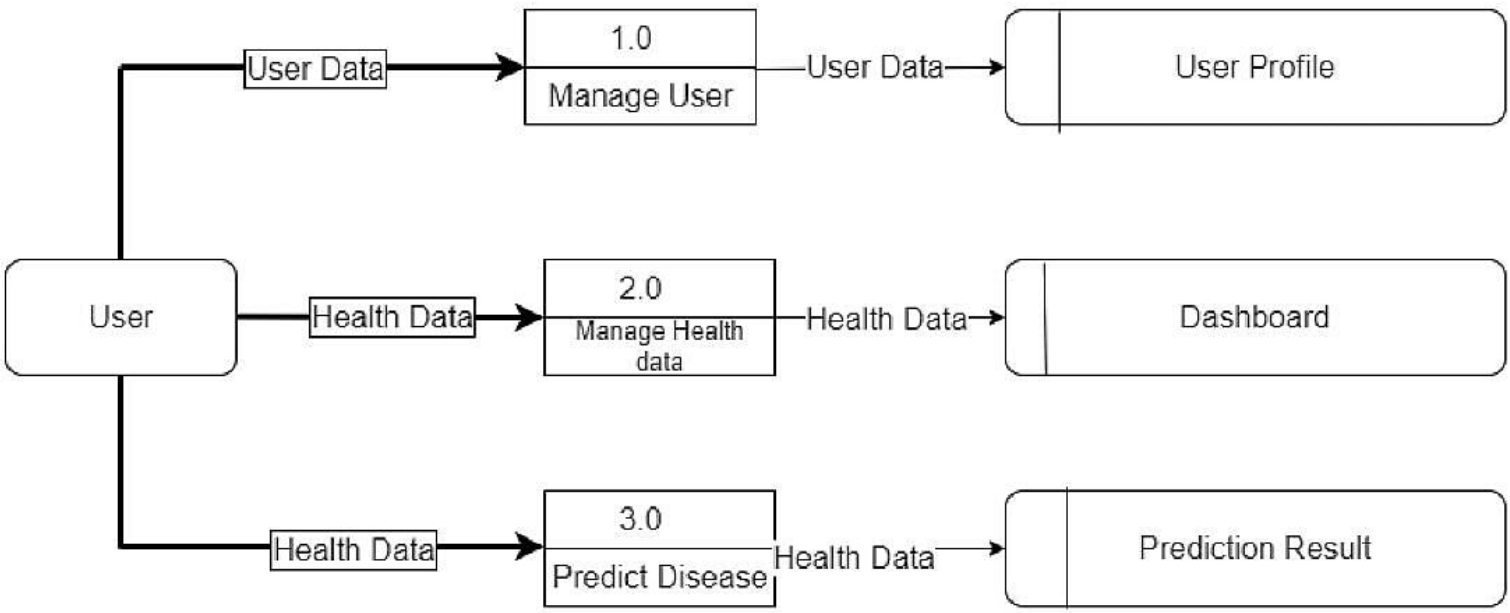
NFR No.	Non-Funcational Requirement	Description
NFR - 1	Usability	The Project must be easy to use.The user needs to have a good experince while working with the interface.
NFR - 2	Security	Every user can acess the website only if they posses the password
NFR - 3	Reliability	The project must have minimal degree of failure under normal usage and how often does the user get access to this work
NFR - 4	Performance	The project must respond quickly to the user's actions or even if the user has to wait the

		waiting period must be short.
NFR - 5	Availability	A project is platform independent.It runs perfectly on almost every platform

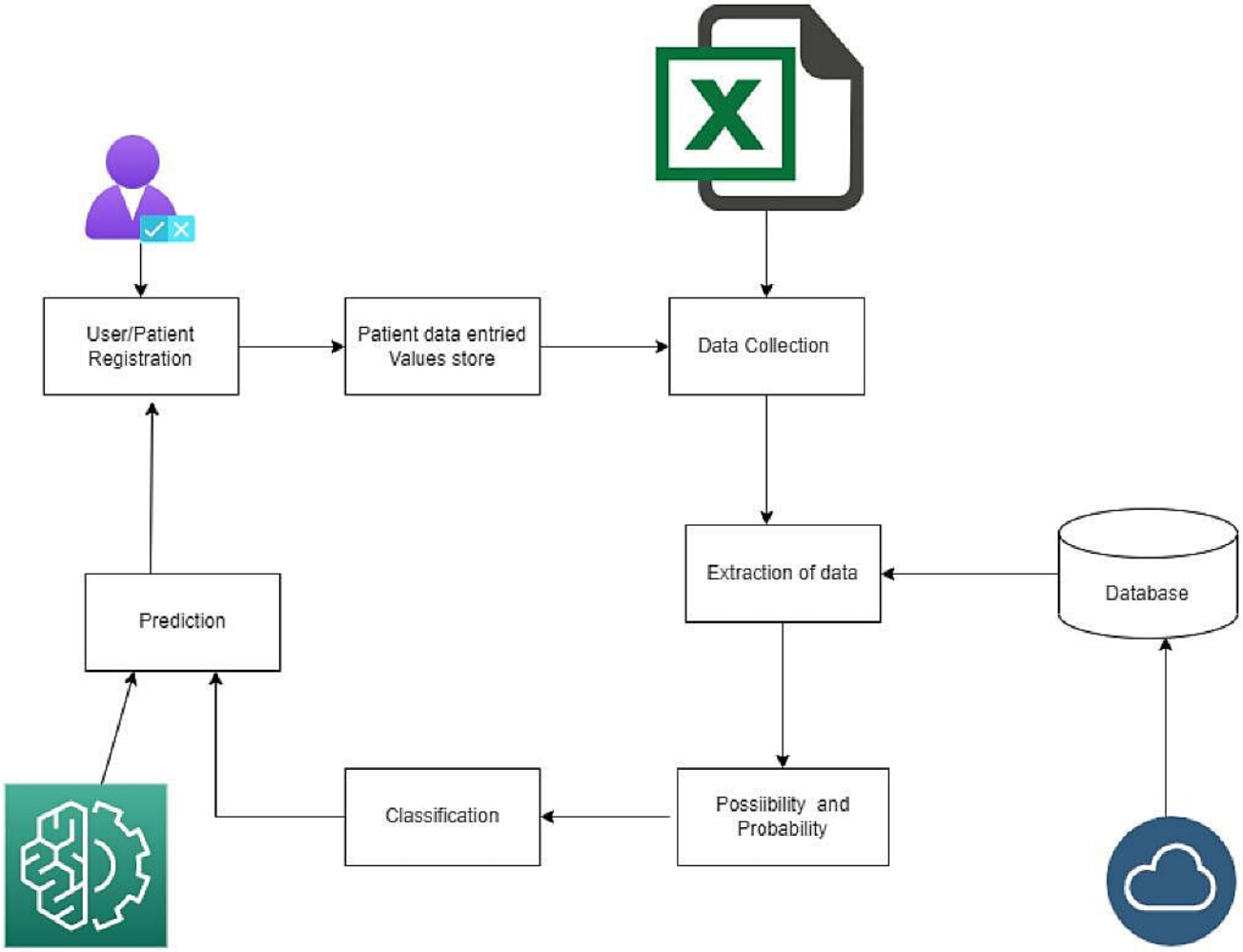
5.PROJECT DESIGN

5.1 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



5.2 Solution and Technical Architecture



5.3 User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
User	**Login**	**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
	Dashboard	**USN-2**	As a user, I can Access Dashboard through website	I can view the Dashboard	High	Sprint-2
	View	**USN-3**	As a user , I can view	I can view the	High	Sprint-3

			Patient Details	details of the patient		
Admin	**Analyse**	**USN-4**	As a user, I can view the analysed report of the dataset	can view of the Analysed Report	High	Sprint - 3
	Predict	**USN-5**	As a user, I can predict the Length Of Stay (LOS) of a patient	I can view the Prediction Report	High	Sprint -4

6.PROJECT PLANNING AND SCHEDULING

6.1 Sprint Planning and Estimation

Sprint	Funcational Requirement(Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Membors
Sprint - 1	Dataset	USN-1	Setup Kaggle API and IBM DB2 and Load Data from IBM DB2 storage to IBM Cognos	2	Medium	Nithin K
Sprint-1	Data Preparation	USN-2	The dataset should be cleaned from irregularities inorder to be	1	High	Nikil V Rahul

			explored			
Sprint-2	Data Exploration	USN-3	Data needs to be explored inorder to uncover insights from the data	2	High	Nithin K Rahul
Sprint-3	Visualization	USN-4	The insights form the data exploration is visualized graphically.	3	High	Nikil V Jagadeesh Reddy
Sprint-4	Predictive Model	USN-5	The Predictive analysis on the data is performed	4	High	Jagadeesh Reddy Rahul Nikil V

			by modelling the predictive model.			
Sprint-4	Dashboard	USN-6	The dashboard is created to display the visualization and prediction	2	Medium	Nithin K Rahul Nikil v

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 Release Date (Actual)
Sprint	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022 Sprint-2
Sprint	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022 Sprint-3
Sprint	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

7.CODING AND SOLUTIONING

Predictive Analysis Algorithms Used:

Logistic Regression:

Logistic regression is a statistical analysis method to predict a binary outcome, such as yes or no, based on prior observations of a data set. A logistic regression model predicts a dependent data variable by analyzing the relationship between one or more existing independent variables.

For example, a logistic regression could be used to predict whether a political candidate will win or lose an election or whether a high school student will be admitted or not to a particular college. These binary outcomes allow straightforward decisions between two alternatives. A logistic regression model can take into consideration multiple input criteria. In the case of college acceptance, the logistic function could consider factors such as the student's grade point average, SAT score and number of extracurricular activities. Based on historical data about earlier outcomes involving the same input criteria, it then scores new cases on their probability of falling into one of two outcome categories.Logistic regression has become an important tool in the discipline of machine learning. It allows algorithms used in machine learning applications to classify incoming data based on historicaldata.

As additional relevant data comes in, the algorithms get better at predicting classifications within data sets. Logistic regression can also play a role in data preparation activities by allowing data sets to be put into specifically predefined buckets during the extract, transform, load ETL process in order to stage the information for analysis.

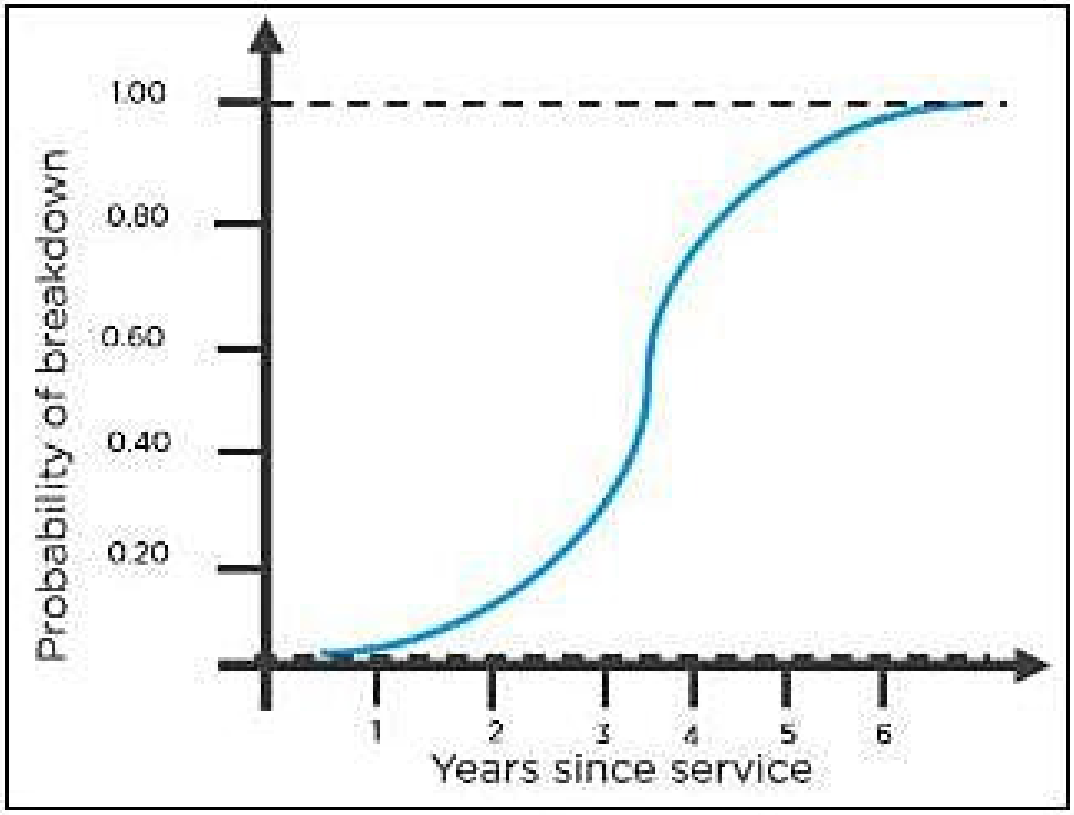
LOGISTIC REGRESSION

Logistic regression is an example of supervised learning. It is used to calculate or predict the probability of a binary (yes/no) event occurring. An example of logistic regression could be applying machine learning to determine if a person is likely to be infected with COVID-19 or not. Since we have two possible outcomes to this question - yes they are infected, or no they are not infected - this is called Binary Classification

Logistic regression is a statistical method that is used for building machine learning models where the dependent variable is dichotomous: i.e. binary. Logistic regression is used to describe data and the relationship between one dependent variable and one or more independent variables. The independent variables can be nominal, ordinal, or of interval type.

The name “logistic regression” is derived from the concept of the logistic function that it uses. The logistic function is also known as the sigmoid

function. The value of this logistic function lies between zero and one.



In [68]:
```
from sklearn.linear_model import LogisticRegression
lr=LogisticRegression(C=1.0, class_weight='balanced', dual=False,
                  fit_intercept=True, intercept_scaling=1, l1_ratio=None,
                  max_iter=100, multi_class='auto', n_jobs=None, penalty='l2',
                  random_state=1234, solver='lbfgs', tol=0.0001, verbose=0,
                  warm_start=False)
model1=lr.fit(X_train,y_train)
```

```
/usr/local/lib/python3.7/dist-packages/sklearn/linear_model/_logistic.py:818: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
Please also refer to the documentation for alternative solver options:
    https://scikit-learn.org/stable/modules/linear_model.html#logistic-regression
  extra_warning_msg=_LOGISTIC_SOLVER_CONVERGENCE_MSG,
```

In [69]:
```
log_re=LogisticRegression()
```

In [70]:
```
log_re.fit(X_train,y_train)
log_re_pred=log_re.predict(X_test)
```

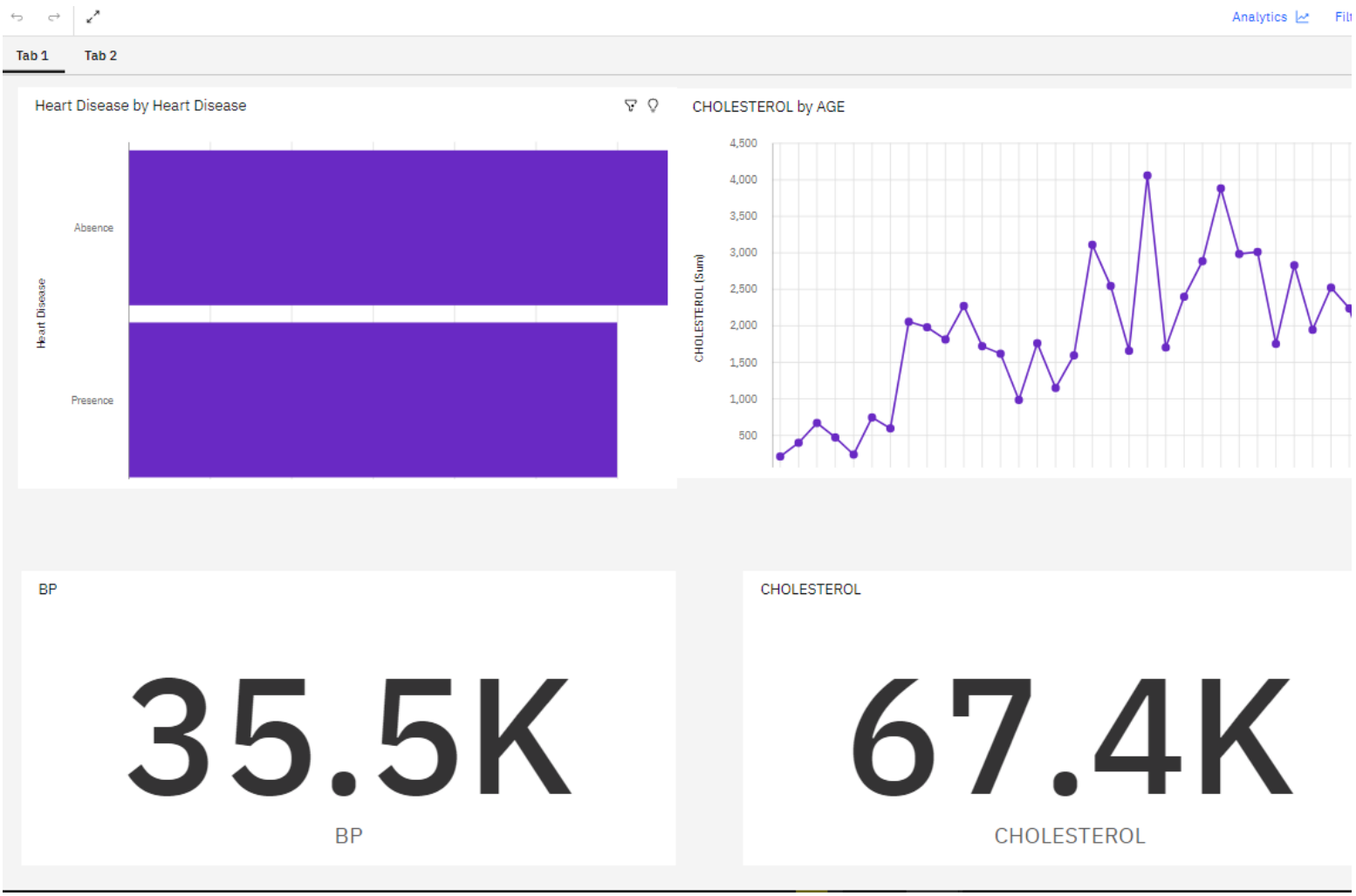
```
/usr/local/lib/python3.7/dist-packages/sklearn/linear_model/_logistic.py:818: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
Please also refer to the documentation for alternative solver options:
    https://scikit-learn.org/stable/modules/linear_model.html#logistic-regression
  extra_warning_msg=_LOGISTIC_SOLVER_CONVERGENCE_MSG,
```

In [71]:
```
log_acc=accuracy_score(y_test,log_re_pred)
print("Logistic Accuracy Score: ","{:.2f}%".format(100*log_acc))
```

```
Logistic Accuracy Score:  79.41%
```

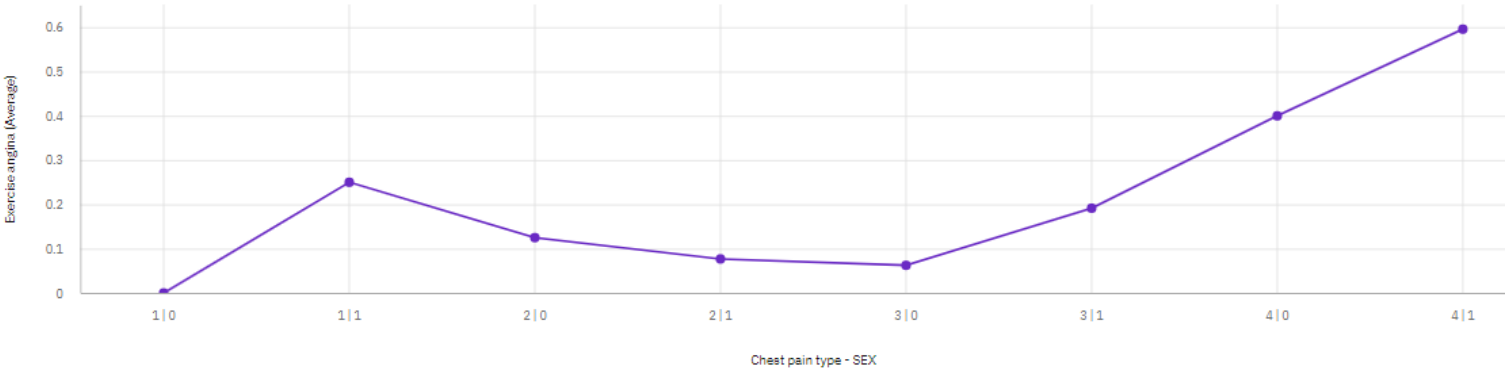
Project Dashboard with Data Analytics



Analytics

Tab 1 | Tab 2

Exercise angina by Chest pain type and SEX

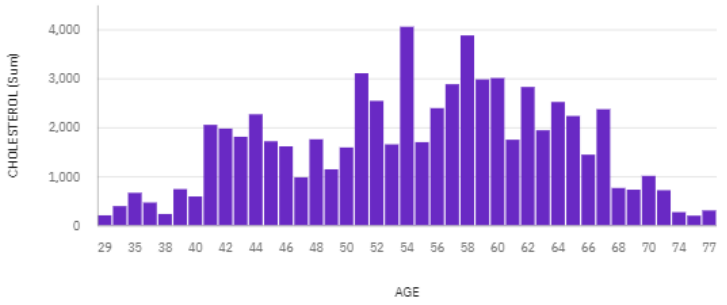


EKG results

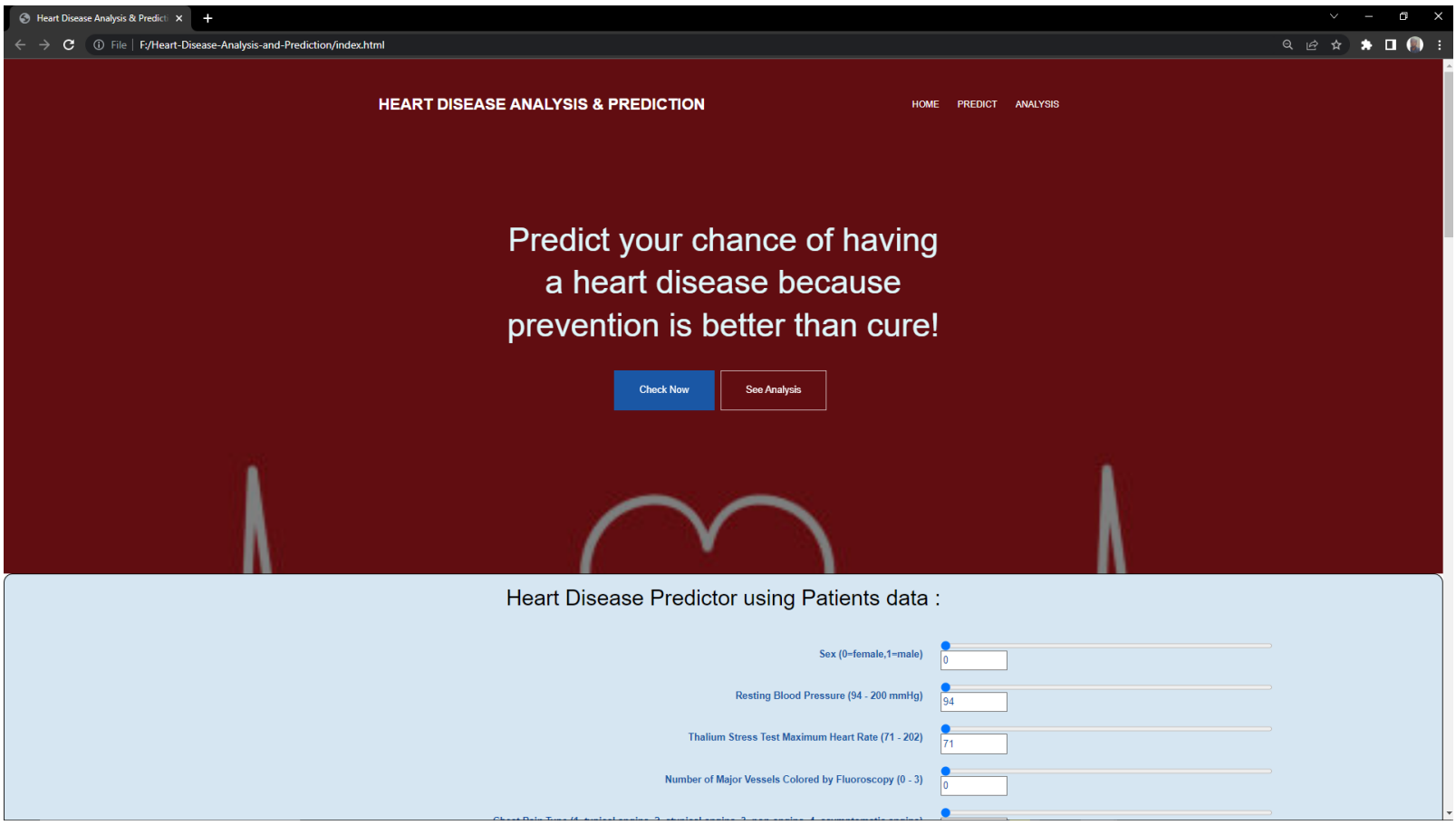
276

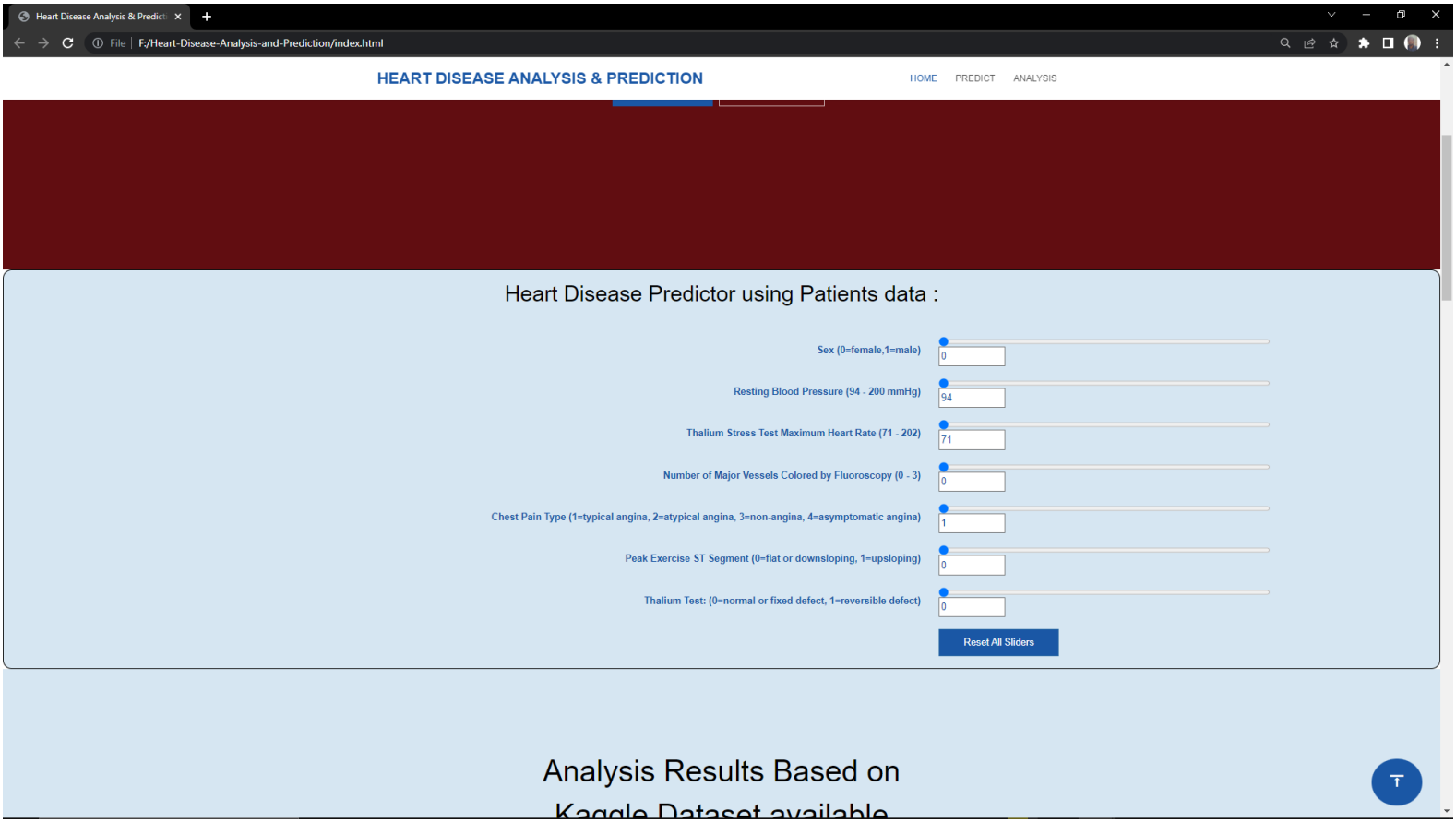
EKG results

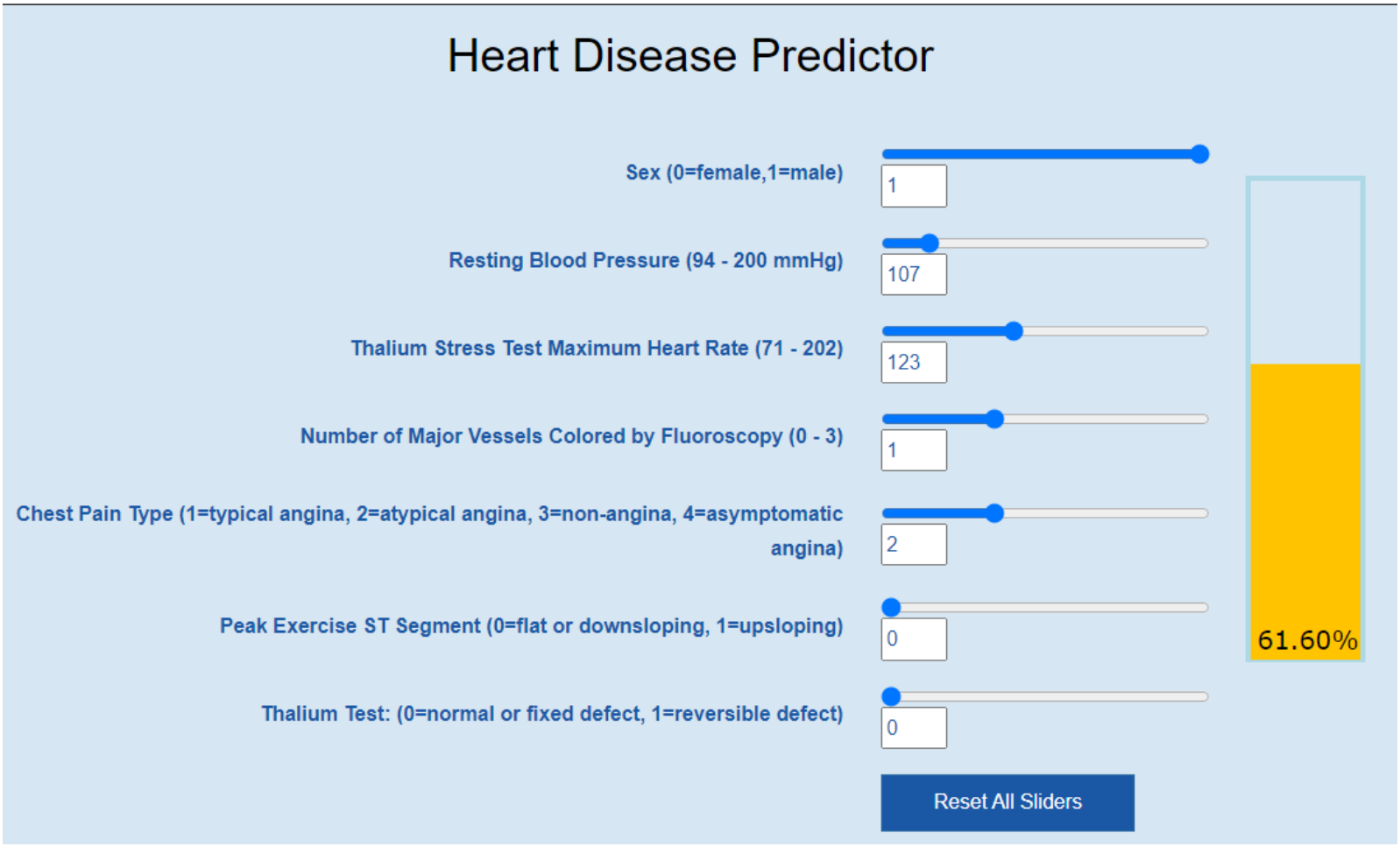
CHOLESTEROL by AGE



Website Screenshots




Heart Disease Analysis & Predict
File | F:/Heart-Disease-Analysis-and-Prediction/index.html
HEART DISEASE ANALYSIS & PREDICTION
HOME
PREDICT
ANALYSIS
Heart Disease Predictor using Patients data :
Sex (0=female,1=male)
0
Resting Blood Pressure (94 - 200 mmHg)
94
Thalium Stress Test Maximum Heart Rate (71 - 202)
71
Number of Major Vessels Colored by Fluoroscopy (0 - 3)
0
Chest Pain Type (1=typical angina, 2=atypical angina, 3=non-angina, 4=asymptomatic angina)
1
Peak Exercise ST Segment (0=flat or downsloping, 1=upsloping)
0
Thalium Test: (0=normal or fixed defect, 1=reversible defect)
0
Reset All Sliders
Analysis Results Based on
Kaggle Dataset available
T



8.ADVANTAGES

- Early detection of Heart Attacks
- Prevention of Unnecessary loss
- Discovery of new medicines
- More data so more accuracy

DISADVANTAGES

- Data Security
- Lack of Privacy

9.CONCLUSION

Heart diseases are a major killer in India and throughout the world, application of promising technology like machine learning to the initial prediction of heart diseases will have a profound impact on society. The early prognosis of heart disease can aid in making decisions on lifestyle changes in high-risk patients and in turn reduce the complications, which can be a great milestone in the field of medicine. The number of people facing heart diseases is on a raise each year. This prompts for its early diagnosis and treatment. The utilization of suitable technology support in this regard can prove to be highly beneficial to the medical fraternity and patients. In this paper, the seven different machine learning algorithms used to measure the performance are SVM, Decision Tree, Random Forest, Naïve Bayes, Logistic Regression, Adaptive Boosting, and Extreme Gradient Boosting applied on the dataset. The expected attributes leading to heart disease in patients are available in the dataset which contains 76 features and 14 important features that are useful to evaluate the system are selected among them. If all the features taken into the consideration then the efficiency of the system the author gets is less. To increase efficiency, attribute selection is done. In this n features have to be selected for evaluating the model which gives more accuracy. The correlation of some features in the dataset is almost equal and so they are removed. If all the attributes present in the dataset are taken into account then the efficiency decreases considerably. All the seven machine learning methods accuracies are compared based on which one prediction model is

generated. Hence, the aim is to use various evaluation metrics like confusion matrix, accuracy, precision, recall, and f1-score which predicts the disease efficiently. Comparing all seven the extreme gradient boosting classifier gives the highest accuracy of 81%.

10.FUTURE SCOPE

- In future an intelligent system may be developed that can lead to selection of proper treatment methods for a patient diagnosed with heart disease. A lot of work has been done already in making models that can predict whether a patient is likely to develop heart disease or not.

- There are several treatment methods for a patient once diagnosed with a particular form of heart disease. Data mining can be of very good help in deciding the line of treatment to be followed by extracting knowledge from such suitable databases.

11.APPENDIX

Index.html

```
<!DOCTYPE html>
<html lang="en">
<head>
   <meta charset="utf-8">
   <meta content="width=device-width, initial-scale=1"
name="viewport">
   <title>Heart Disease Analysis &amp;amp; Prediction</title>

   <link href="css/styles-merged.css" rel="stylesheet">
   <link href="css/style.min.css" rel="stylesheet">
   <link href="fonts/icomoon/style.css" rel="stylesheet">
   <link href="css/predictor.css" rel="stylesheet">
   <link href="css/back-to-top.css" rel="stylesheet">

   <!--[if lt IE 9]>
   <script src="js/vendor/html5shiv.min.js"></script>
   <script src="js/vendor/respond.min.js"></script>
   <![endif]-->
</head>
<body>
<script src="//d3js.org/d3.v3.min.js"></script>
<script src="js/back-to-top.js"></script>
```

```
<!-- Fixed navbar -->
<nav class="navbar navbar-default probootstrap-navbar">
   <div class="container">
      <div class="navbar-header">
         <button aria-controls="navbar" aria-expanded="false"
class="navbar-toggle collapsed"
               data-target="#navbar-collapse"
               data-toggle="collapse" type="button">
            <span class="sr-only">Toggle navigation</span>
            <span class="icon-bar"></span>
            <span class="icon-bar"></span>
            <span class="icon-bar"></span>
         </button>
         <a class="navbar-brand" href="index.html">Heart Disease
Analysis &amp;amp; Prediction</a>
      </div>

      <div class="navbar-collapse collapse" id="navbar-collapse">
         <ul class="nav navbar-nav navbar-right">
            <li class="active"><a data-nav-section="home"
href="#">Home</a></li>
            <li><a data-nav-section="predict"
href="#">Predict</a></li>
            <li><a data-nav-section="analysis"
href="#">Analysis</a></li>
         </ul>
      </div>
```

```
    </div>
</nav>

<section class="probootstrap-hero
prohttp://localhost/probootstrap/frame/#featuresbootstrap-slant"
        data-section="home" data-stellar-background-ratio="0.5"
id="home"
        style="background-image: url(img/istockphoto-1249722446-
612x612.jpg);">
    <div class="container">
        <div class="row intro-text">
            <div class="col-md-8 col-md-offset-2 text-center">
                <h1 class="probootstrap-heading probootstrap-animate"
style="color:#E0F7FA">Predict your chance of
                    having a heart disease because prevention is better
than cure!</h1>
                <div class="probootstrap-subheading center">
                    <p class="probootstrap-animate"><a class="btn btn-
primary" href="#predict" role="button">Check
                        Now</a><a class="btn btn-default smoothscroll"
href="#analysis" role="button">See Analysis</a>
                    </p>
                </div>
            </div>
        </div>
    </div>
</section>
```

```
<button class="btn btn-primary" id="backToTopBtn"
onclick="topFunction()" title="Go to top">
   <span class="icon icon-align-top"></span>
</button>

      <div id="parent">
         <div id="wrapper">
            <div style="text-align: center;">
               <h1 class="text-black probootstrap-heading">Heart
Disease Predictor using Patients data : </h1>
            </div>
            <div class="child1">
               <table class="naked_table">
                  <tr>
                     <td>
                        <label class="before_slider" for="nSex1">
                           Sex (0=female,1=male)</label></td>
                     <td class="input_slider">
                        <form class="slider_input">
                           <input class="hd-slider-width" id="nSex1"
max="1" min="0" name="amountRange"

oninput="this.form.amountInput.value=this.value"
                                 step="1" type="range" value="0"/>
                           <input class="hd-number-width" id="nSex2"
max="1" min="0" name="amountInput"
```

```
oninput="this.form.amountRange.value=this.value"
                        step="1" type="number" value="0"/>
                    </form>
                  </td>
                </tr>
                <tr>
                  <td><label class="before_slider" for="nRestbp1">
                    Resting Blood Pressure (94 - 200
mmHg)</label></td>
                  <td class="input_slider">
                    <form class="slider_input">
                      <input class="hd-slider-width" id="nRestbp1"
max="200" min="94" name="amountRange"

oninput="this.form.amountInput.value=this.value"
                        step="all" type="range" value="94"/>
                      <input class="hd-number-width"
id="nRestbp2" max="200" min="94" name="amountInput"

oninput="this.form.amountRange.value=this.value"
                        step="all" type="number" value="94"/>
                    </form>
                  </td>
                </tr>
                <tr>
                  <td><label class="before_slider" for="nThalach1">
```

```
                    Thalium Stress Test Maximum Heart Rate (71 -
202)</label></td>
                <td class="input_slider">
                  <form class="slider_input">
                    <input class="hd-slider-width" id="nThalach1"
max="202" min="71" name="amountRange"

oninput="this.form.amountInput.value=this.value"
                           step="all" type="range" value="71"/>
                    <input class="hd-number-width"
id="nThalach2" max="202" min="71" name="amountInput"

oninput="this.form.amountRange.value=this.value"
                           step="all" type="number" value="71"/>
                  </form>
                </td>
              </tr>
              <tr>
                <td><label class="before_slider" for="nCa1">
                  Number of Major Vessels Colored by
Fluoroscopy (0 - 3)</label></td>
                <td class="input_slider">
                  <form class="slider_input">
                    <input class="hd-slider-width" id="nCa1"
max="3" min="0" name="amountRange"

oninput="this.form.amountInput.value=this.value"
```

```
                        step="all" type="range" value="0"/>
                    <input class="hd-number-width" id="nCa2"
max="3" min="0" name="amountInput"

oninput="this.form.amountRange.value=this.value"
                        step="all" type="number" value="0"/>
                </form>
              </td>
            </tr>
            <tr>
              <td><label class="before_slider" for="nCp1">
                Chest Pain Type (1=typical angina, 2=atypical
angina, 3=non-angina, 4=asymptomatic
                angina)</label></td>
              <td class="input_slider">
                <form class="slider_input">
                  <input class="hd-slider-width" id="nCp1"
max="4" min="1" name="amountRange"

oninput="this.form.amountInput.value=this.value"
                        step="1" type="range" value="1"/>
                    <input class="hd-number-width" id="nCp2"
max="4" min="1" name="amountInput"

oninput="this.form.amountRange.value=this.value"
                        step="1" type="number" value="1"/>
                </form>
```

```
                    </td>
                </tr>
                <tr>
                    <td><label class="before_slider" for="nSlope1">
                        Peak Exercise ST Segment (0=flat or
downsloping, 1=upsloping)</label></td>
                    <td class="input_slider">
                        <form class="slider_input">
                            <input class="hd-slider-width" id="nSlope1"
max="1" min="0" name="amountRange"

oninput="this.form.amountInput.value=this.value"
                                step="1" type="range" value="0"/>
                            <input class="hd-number-width" id="nSlope2"
max="1" min="0" name="amountInput"

oninput="this.form.amountRange.value=this.value"
                                step="1" type="number" value="0"/>
                        </form>
                    </td>
                </tr>
                <tr>
                    <td><label class="before_slider" for="nThal1">
                        Thalium Test: (0=normal or fixed defect,
1=reversible defect)</label></td>
                    <td class="input_slider">
                        <form class="slider_input">
```

```
                        <input class="hd-slider-width" id="nThal1"
max="1" min="0" name="amountRange"

oninput="this.form.amountInput.value=this.value"
                                step="1" type="range" value="0"/>
                        <input class="hd-number-width" id="nThal2"
max="1" min="0" name="amountInput"

oninput="this.form.amountRange.value=this.value"
                                step="1" type="number" value="0"/>
                    </form>
                </td>
            </tr>
            <tr>
                <td></td>
                <td class="input_slider">
                    <input class="btn btn-primary"
onclick="updateOne(val01,-1)" type="button"
                           value="Reset All Sliders"/>
                </td>
            </tr>
        </table>
    </div>
    <div class="child2">
        <script>
            const width = 100;
            const height = 400;
```

```
const holder = d3.select(".child2")
    .append("svg")
    .attr("width", width)
    .attr("height", height);

// draw a rectangle
const y0 = 20;
const height0 = 380;
holder.append("rect")
    .attr("x", 5)
    .attr("y", y0 + height0)
    .style("fill", "rgb(0,255,0)")
    .attr("height", 0)
    .attr("width", 90);

// draw a container rectangle
holder.append("rect")
    .attr("x", 5)
    .attr("y", y0)
    .style("fill", "none")
    .style("stroke", "lightblue")
    .style("stroke-width", 4)
    .attr("height", height0)
    .attr("width", 90);

// add text inside rectangle
```

```
                holder.append("text")
                    .text("0.00%")
                    .attr("x", 12)
                    .attr("y", y0 + height0 - 10)
                    .attr("fill", "black")
                    .attr("font-family", "Verdana")
                    .attr("font-size", "20");

                // initialize
                let val01 =
document.getElementById("nSex1").value;
                let val02 =
document.getElementById("nRestbp1").value;
                let val03 =
document.getElementById("nThalach1").value;
                let val04 = document.getElementById("nCa1").value;
                let val05 = document.getElementById("nCp1").value;
                let val06 =
document.getElementById("nSlope1").value;
                let val07 =
document.getElementById("nThal1").value;
                updateOne(val01, 0);

                // Check for changes in the inputs and update output
bar
                d3.select("#nSex1").on("input", function () {
                    updateOne(+this.value, 1);
```

```
});
d3.select("#nSex2").on("input", function () {
   updateOne(+this.value, 1);
});
d3.select("#nRestbp1").on("input", function () {
   updateOne(+this.value, 2);
});
d3.select("#nRestbp2").on("input", function () {
   updateOne(+this.value, 2);
});
d3.select("#nThalach1").on("input", function () {
   updateOne(+this.value, 3);
});
d3.select("#nThalach2").on("input", function () {
   updateOne(+this.value, 3);
});
d3.select("#nCa1").on("input", function () {
   updateOne(+this.value, 4);
});
d3.select("#nCa2").on("input", function () {
   updateOne(+this.value, 4);
});
d3.select("#nCp1").on("input", function () {
   updateOne(+this.value, 5);
});
d3.select("#nCp2").on("input", function () {
   updateOne(+this.value, 5);
```

```
});
d3.select("#nSlope1").on("input", function () {
    updateOne(+this.value, 6);
});
d3.select("#nSlope2").on("input", function () {
    updateOne(+this.value, 6);
});
d3.select("#nThal1").on("input", function () {
    updateOne(+this.value, 7);
});
d3.select("#nThal2").on("input", function () {
    updateOne(+this.value, 7);
});

// Update the heart disease probability
function updateOne(value, index) {

    if (index === 1) {
        val01 = value;
    } else if (index === 2) {
        val02 = value;
    } else if (index === 3) {
        val03 = value;
    } else if (index === 4) {
        val04 = value;
    } else if (index === 5) {
        val05 = value;
```

```
                } else if (index === 6) {
                    val06 = value;
                } else if (index === 7) {
                    val07 = value;
                } else if (index === -1) {
                    // Set everything back to default state:
                    val01 =
document.getElementById("nSex1").defaultValue;
                    document.getElementById("nSex1").value =
val01;
                    document.getElementById("nSex2").value =
val01;
                    val02 =
document.getElementById("nRestbp1").defaultValue;
                    document.getElementById("nRestbp1").value =
val02;
                    document.getElementById("nRestbp2").value =
val02;
                    val03 =
document.getElementById("nThalach1").defaultValue;
                    document.getElementById("nThalach1").value =
val03;
                    document.getElementById("nThalach2").value =
val03;
                    val04 =
document.getElementById("nCa1").defaultValue;
                    document.getElementById("nCa1").value =
```

```
val04;
                    document.getElementById("nCa2").value =
val04;
                    val05 =
document.getElementById("nCp1").defaultValue;
                    document.getElementById("nCp1").value =
val05;
                    document.getElementById("nCp2").value =
val05;
                    val06 =
document.getElementById("nSlope1").defaultValue;
                    document.getElementById("nSlope1").value =
val06;
                    document.getElementById("nSlope2").value =
val06;
                    val07 =
document.getElementById("nThal1").defaultValue;
                    document.getElementById("nThal1").value =
val07;
                    document.getElementById("nThal2").value =
val07;
                }

                // Standardize the continuous features:
                let srbp_val = (val02 - 131.7157) / 17.7478;
                let sthalach_val = (val03 - 149.3278) / 23.1211;
                let sca_val = (val04 - 0.6722) / 3.0;
```

```
                    // Disentangle the categorical features:
                    let cp_contr = 0.0;
                    if (val05 === 1) {
                        cp_contr = -2.2318;
                    } else if (val05 === 2) {
                        cp_contr = -1.2681;
                    } else if (val05 === 3) {
                        cp_contr = -2.1124;
                    }
                    let slope_contr = 0.0;
                    if (val06 === 1) {
                        slope_contr = -1.4726;
                    }
                    let thal_contr = 0.0;
                    if (val07 === 1) {
                        thal_contr = 1.5009;
                    }

                    // Compute log-odds, then probability:
                    let scprod = 1.4361 * val01 + 0.4415 * srbp_val -
0.4431 * sthalach_val + 3.7984 * sca_val + cp_contr + slope_contr
+ thal_contr;
                    let drec = 1.0 / (1.0 + Math.exp(-scprod));
                    let drecs = height0 * drec;
                    drec *= 100;
```

```
                    // Update plot:
                    let rcolor = percentToRGB(drec);
                    holder.select("rect")
                        .attr("y", y0 + height0 - drecs)
                        .attr("height", drecs)
                        .style("fill", rcolor);

                    holder.select("text")
                        .text(function () {
                            return parseFloat(Math.round(drec * 100) /
100).toFixed(2) + "%";
                        });

                }

                function percentToRGB(percent) {
                    if (percent === 100) {
                        percent = 99
                    }
                    let r, g, b;

                    if (percent < 50) {
                        // green to yellow
                        r = Math.floor(255 * (percent / 50));
                        g = 255;

                    } else {
```

```
                    // yellow to red
                    r = 255;
                    g = Math.floor(255 * ((50 - percent % 50) / 50));
                }
                b = 0;

                return "rgb(" + r + "," + g + "," + b + ")";
            }
        </script>
    </div>
    </div>
    <div class="clear"></div>
  </div>
</div>
</section>
<!-- END section -->

<section class="probootstrap-section probootstrap-bg-light" data-
section="analysis" id="analysis">
  <div class="container">
    <div class="row text-center mb100">
      <div class="col-md-8 col-md-offset-2 probootstrap-section-
heading">
        <style>
          h2{text-align: center;}
          iframe {text-align: center;}
        </style>
```

<h2 class="mb30 text-black probootstrap-heading">Analysis Results Based on Kaggle Dataset available</h2>
<iframe src="https://us1.ca.analytics.ibm.com/bi/?perspective=dashboard&pathRef=.my_folders%2FHeart%2BDashboard1&closeWindowOnLastView=true&ui_appbar=false&ui_navbar=false&shareMode=embedded&action=view&mode=dashboard&subView=model000001848b324e22_00000002" width="1500" height="1200" frameborder="0" gesture="media" allow="encrypted-media" allowfullscreen=""></iframe>
<h2 class="mb30 text-black probootstrap-heading">Story</h2>
<iframe src="https://us1.ca.analytics.ibm.com/bi/?perspective=story&pathRef=.my_folders%2FData%2BModules%2FNew%2Bstory&closeWindowOnLastView=true&ui_appbar=false&ui_navbar=false&shareMode=embedded&action=view&sceneId=model000001848ba6e4c9_00000002&sceneTime=0" width="1500" height="1000" frameborder="0" gesture="media" allow="encrypted-media" allowfullscreen=""></iframe>
<h2 class="mb30 text-black probootstrap-heading">Report</h2>
<iframe src="https://us1.ca.analytics.ibm.com/bi/?pathRef=.my_folders%2FData%2BModules%2FNew%2Breport%2B8&closeWindowOnLastView=true&ui_appbar=false&ui_navbar=false&a

```
mp;shareMode=embedded&amp;action=run&amp;format=HTML&
amp;prompt=false" width="1500" height="1000" frameborder="0"
gesture="media" allow="encrypted-media"
allowfullscreen=""></iframe>
        </div>
    <!-- END row -->


<script src="js/scripts.min.js"></script>
<script src="js/custom.js"></script>

</body>
</html>
```