NALAIYA THIRAN - IBM PROJECT REPORT

(19IT410T Professional Readiness for Innovation, Employability and Entrepreneurship)

ON

VISUALIZING AND PREDICTING HEART DISEASES WITH AN INTERACTIVE DASH BOARD

Submitted by

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in partial fulfillment for the award of the degree of

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1IN

COMPUTER SCIENCE AND ENGINEERING

VELAMMAL ENGINEERING COLLEGE, CHENNAI-66.

(An Autonomous Institution, Affiliated to Anna University, Chennai)

2022-2023

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BONAFIDE CERTIFICATE

Certified that this NALAIYA THIRAN – IBM PROJECT REPORT **“VISUALIZING AND PREDICTING HEART DISEASES WITH AN INTERACTIVE DASHBOARD”** is the Bonafide work of “YUVANKUMAR S (113219031167), VINOTHKUMAR M (113219031164), RATISH G (113219031122), VIJAY NARAYEN (113219031162)” carried out in “PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY AND ENTREPRENEURSHIP (NALAIYA THIRAN-IBM PROJECT)**”** during the Academic Year 2022-2023.

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1.INTRODUCTION

1.1Project Overview

Today, heart failure diseases affect more people worldwide than other autoimmune conditions. Cardiovascular Diseases (CVDs) affect the heart and obstruct blood flow through the blood vessels. Better technologies like MCGs help in detecting these diseases when they are in an early stage. This project of ours aims to create an interactive Dashboard and dataset to predict which patients are most likely to suffer from a heart disease in the near future using the variables given.

1.2 Purpose

Several risk factors for manual heart disease prediction may include inactivity in a physical form, unhealthy eating habits, or even the consumption of alcohol. With such well-defined parameters and the rise of data science, a data-driven approach can surely help in heart disease prediction using machine learning technologies. Early identification of heart disease of improved diagnosis and high-risk individuals using a prediction model can be recommended for a fatality rate reduction, and decision-making is improved for further treatment and prevention. It can identify anyone who no expiring any heart diseases symptoms, such as chest pain or high blood pressure. Around the world machine learning is applied in many different fields. There is no exception in the healthcare sector. Machine learning may be crucial in determining whether locomotor disorders, health illness, and other conditions are present or absent. If foreseen well in advance, such information can offer valuable insights to doctors, who can then customize their diagnosis and course of care for each patient.

2. Literature Survey

2.1 Existing Problem

Healthcare industries generate enormous amount of data, so called big data that accommodates hidden knowledge or pattern for decision making. The huge volume of data is used to make decision which is more accurate than intuition. Exploratory Data Analysis (EDA) detects mistakes, finds appropriate data, checks assumptions and determines the correlation among the explanatory variables. In the context, EDA is considered as analysing data that excludes inferences and statistical modelling. Analytics is an essential technique for any profession as it forecast the future and hidden pattern. Data analytics is considered as a cost effective technology in the recent past and it plays an essential role in healthcare which includes new research findings, emergency situations and outbreaks of disease. The use of analytics in healthcare improves care by facilitating preventive care and EDA is a vital step while analysing data.

2.2 References

“Heart Disease Prediction Using Supervised Machine Learning Algorithms” Narendra Mohan, Vinod Jain, Gauranshi Agrawal

Predicting and detecting cardiac disease has always been a difficult and time-consuming undertaking for doctors. To treat cardiac disorders, hospitals and other clinics are giving costly therapies and operations. As a result, anticipating cardiac disease in its early stages will be beneficial to people all around the world, allowing them to take required treatment before it becomes serious. Heart disease has been a major issue in recent years, with the primary causes being excessive alcohol use, tobacco use, and a lack of physical activity. Machine learning methods are utilized to forecast cardiac illnesses in this article. For training and testing, a data collection containing diverse human health parameters is used. Many AI&ML algorithms are used to predict cardiac disorders. The performance of the machine learning algorithm is compared after it has been implemented.

Prediction of heart disease at early stage using data mining and big data analytics: A survey N. K. Salma Banu, Suma Swamy

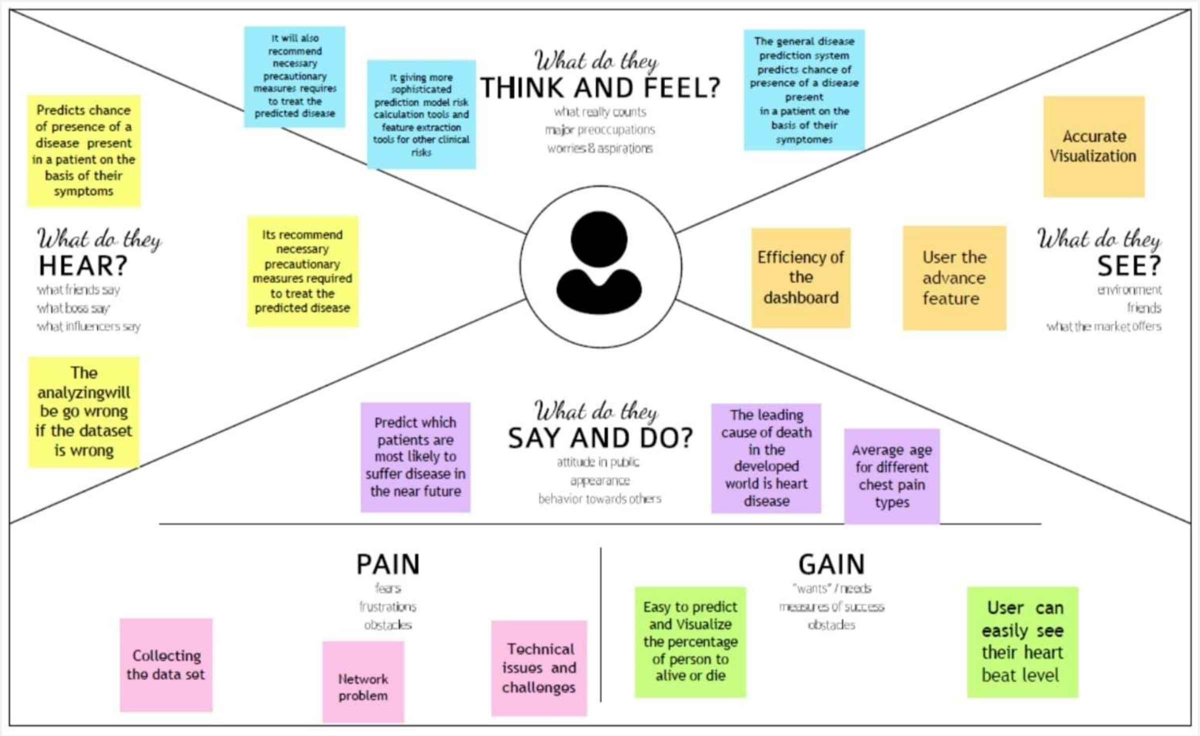
Predicting and detection of heart disease has always been a critical and challenging task for healthcare practitioners. Hospitals and other clinics are offering expensive therapies and operations to treat heart diseases. So, predicting heart disease at the early stages will be useful to the people around the world so that they will take necessary actions before getting severe. Heart disease is a significant problem in recent times; the main reason for this disease is the intake of alcohol, tobacco, and lack of physical exercise. Over the years, machine learning shows effective results in making decisions and predictions from the broad set of data produced by the health care industry.

2.3 Problem Statement Definition

The issue occurs for people with unhealthy lifestyles and age above 40. Where is the issue occuring. The issue is originating from an unhealthy lifestyle. It mostly occurs in the blood valves of the heart. If we don’t solve the problem, many people will die at a young age. The death rate due to heart disease will increase rapidly. We should predict the problem before giving treatment to the patients. As the problem is predicted early, we can solve it easily and early.

3. Ideation and Proposed Solution

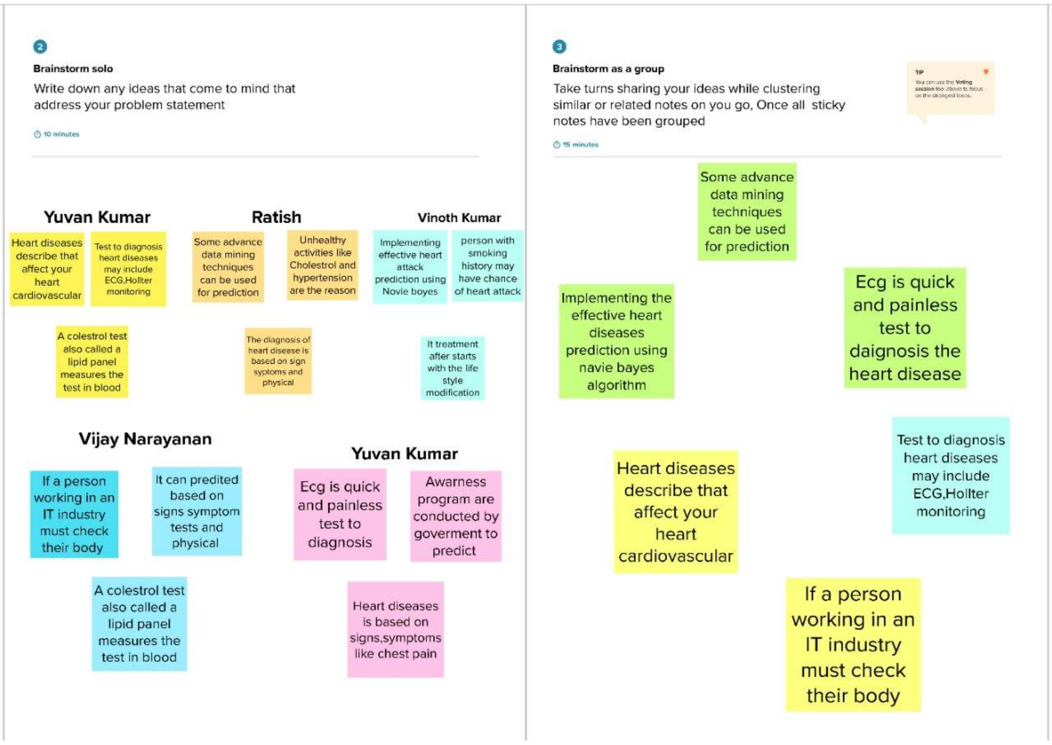
3.1 Empathy map


What do they
THINK AND FEEL?
what really counts
major preoccupations
worries & aspirations
It will also recommend necessary precautionary measures requires to treat the predicted disease
It giving more sophisticated prediction model risk calculation tools and feature extraction tools for other clinical risks
The general disease prediction system predicts chance of presence of a disease present in a patient on the basis of their symptomes
What do they
HEAR?
what friends say
what boss say
what influencers say
Predicts chance of presence of a disease present in a patient on the basis of their symptoms
Its recommend necessary precautionary measures required to treat the predicted disease
The analyzingwill be go wrong if the dataset is wrong
What do they
SEE?
environment
friends
what the market offers
Accurate Visualization
Efficiency of the dashboard
User the advance feature
What do they
SAY AND DO?
attitude in public
appearance
behavior towards others
Predict which patients are most likely to suffer disease in the near future
The leading cause of death in the developed world is heart disease
Average age for different chest pain types
PAIN
fears
frustrations
obstacles
Collecting the data set
Network problem
Technical issues and challenges
GAIN
"wants" / needs
measures of success
obstacles
Easy to predict and Visualize the percentage of person to alive or die
User can easily see their heart beat level

3.2 Ideation and Brainstorming

Step-1: Team gathering, Collaboration and Select the Problem statement

Step-2: Brainstorm, Idea Listing and Grouping



2

Brainstorm solo

Write down any ideas that come to mind that address your problem statement

10 minutes

Yuvan Kumar

Heart diseases describe that affect your heart cardiovascular

Test to diagnosis heart diseases may include ECG,Hollter monitoring

A colestrol test also called a lipid panel measures the test in blood

Ratish

Some advance data mining techniques can be used for prediction

Unhealthy activities like Cholestrol and hypertension are the reason

The diagnosis of heart disease is based on sign syptoms and physical

Vinoth Kumar

Implementing effective heart attack prediction using Novie boyes

person with smoking history may have chance of heart attack

It treatment after starts with the life style modification

Vijay Narayanan

If a person working in an IT industry must check their body

It can predited based on signs symptom tests and physical

A colestrol test also called a lipid panel measures the test in blood

Yuvan Kumar

Ecg is quick and painless test to diagnosis

Awarness program are conducted by goverment to predict

Heart diseases is based on signs,symptoms like chest pain

3

Brainstorm as a group

Take turns sharing your ideas while clustering similar or related notes on you go, Once all sticky notes have been grouped

15 minutes

TIP

You can use the **Voting session** tool above to focus on the strongest ideas.

Some advance data mining techniques can be used for prediction

Implementing the effective heart diseases prediction using navie bayes algorithm

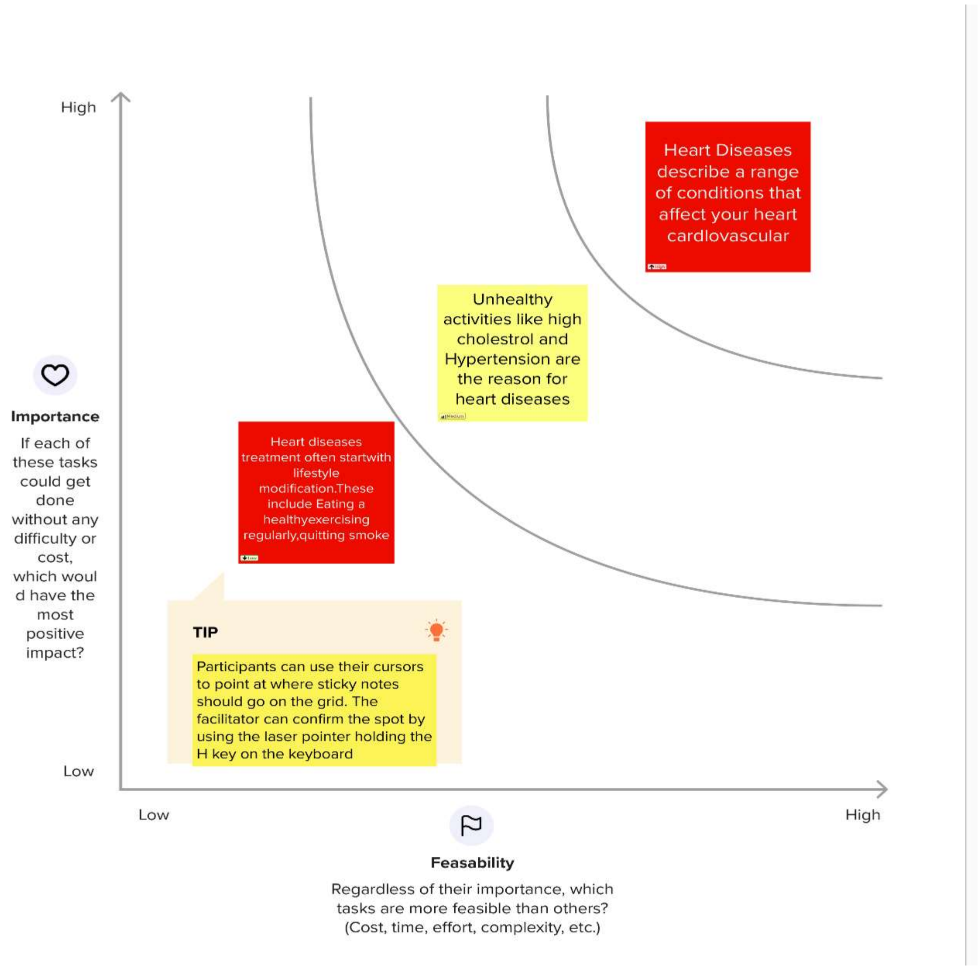
Ecg is quick and painless test to daignosis the heart disease

Heart diseases describe that affect your heart cardiovascular

Test to diagnosis heart diseases may include ECG,Hollter monitoring

If a person working in an IT industry must check their body

Step-3: Idea Prioritization



If each of these tasks could get done without any difficulty or cost, which woul d have the most positive impact?

Regardless of their importance, which tasks are more feasible than others? (Cost, time, effort, complexity, etc.)

Heart Diseases describe a range of conditions that affect your heart cardlovascular

Unhealthy activities like high cholestrol and Hypertension are the reason for heart diseases

Heart diseases treatment often startwith lifestyle modification.These include Eating a healthyexercising regularly,quitting smoke

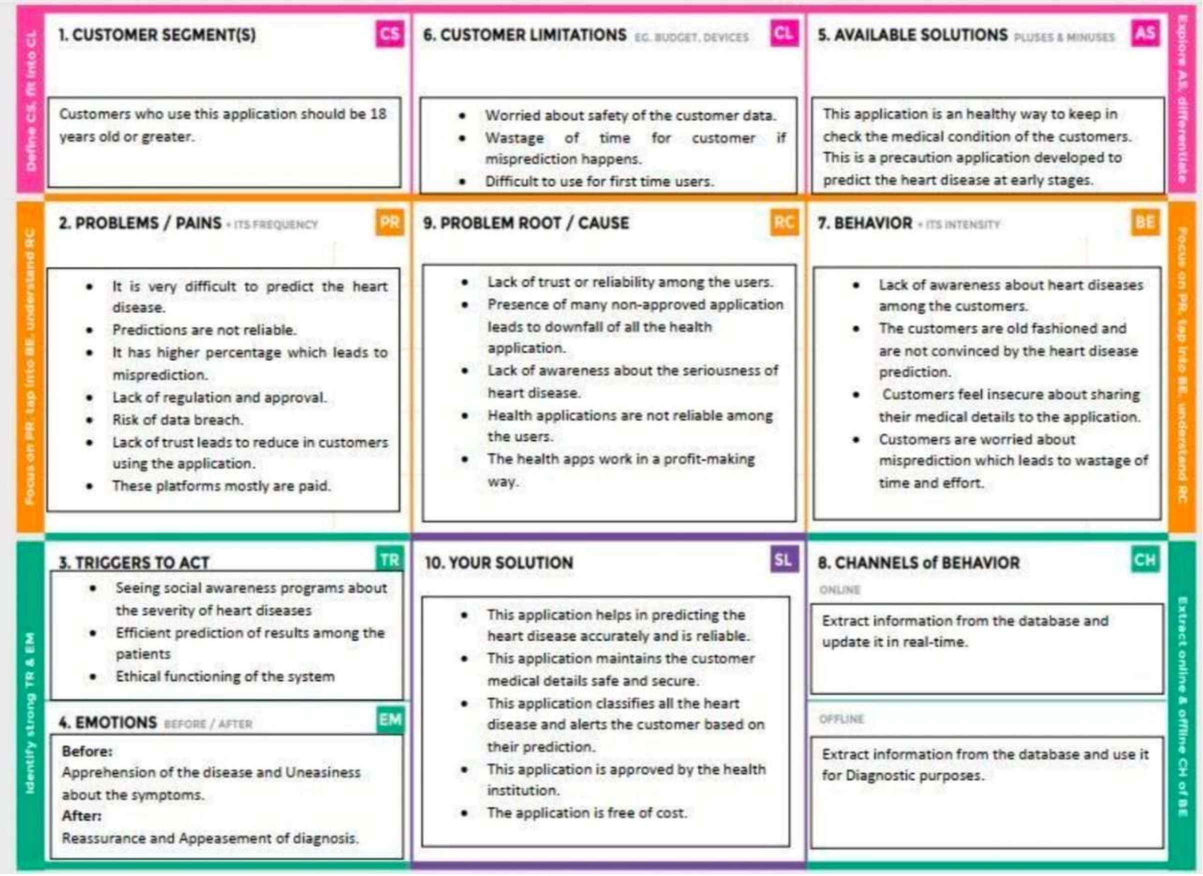
TIP

Participants can use their cursors to point at where sticky notes should go on the grid. The facilitator can confirm the spot by using the laser pointer holding the H key on the keyboard

3.3 Proposed Solution

S. No.	Parameter	Description
1.	Problem Statement	Heart diseases is even being highlighted as a silent killer which leads to the death of a person without obvious symptoms. The nature of the diseases the cause of growing anxiety about the diseases and its consequence. Hence continued efforts are being done to predict the possibility of this deadly diseases in prior. So that various tool and techinques are regularly being experimented with to suit the present day health needs.
2.	Idea/Solution description	The working of the system starts with the collection of data and selecting the important attributes. Then the required data is pre-processed into the required format. The data is then divided into two parts training and tested data. The algorithms are applied and the model is trained using the training data. The accuracy of the system is obtained by testing the system
3.	Novelty/Uniqueness	The primary purpose of this study is to give clinicians a tool to detect cardiac problems at an early stage.
4.	Social Impact/customer satisfaction	The heart diseases detection system assists a patient based on his/her clinical information of them beer diagnosed with a previous heart diseases by using these computer aided techniques we can predict the patient fast and better and the cost can be reduced very much.
5.	Business Model(Revenue Model)	Can be deployed by Hospital or other Health organizations, so that the success rate of prediction is higher .
6.	Scalability of the solution	It is the property of a system to handle a growing amount of work by adding resources to the system. In order to stay at top position in market the scalability and adaptability towards changing needs must be met

3.4 Problem Solution fit



Define CS, fit into CL

1. CUSTOMER SEGMENT(S) CS

Customers who use this application should be 18 years old or greater.

6. CUSTOMER LIMITATIONS EG. BUDGET, DEVICES CL

- Worried about safety of the customer data.
- Wastage of time for customer if misprediction happens.
- Difficult to use for first time users.

5. AVAILABLE SOLUTIONS PLUSES & MINUSES AS

This application is an healthy way to keep in check the medical condition of the customers. This is a precaution application developed to predict the heart disease at early stages.

Explore AS, differentiate

Focus on PR, tap into BE, understand RC

2. PROBLEMS / PAINS + ITS FREQUENCY PR

- It is very difficult to predict the heart disease.
- Predictions are not reliable.
- It has higher percentage which leads to misprediction.
- Lack of regulation and approval.
- Risk of data breach.
- Lack of trust leads to reduce in customers using the application.
- These platforms mostly are paid.

9. PROBLEM ROOT / CAUSE RC

- Lack of trust or reliability among the users.
- Presence of many non-approved application leads to downfall of all the health application.
- Lack of awareness about the seriousness of heart disease.
- Health applications are not reliable among the users.
- The health apps work in a profit-making way.

7. BEHAVIOR + ITS INTENSITY BE

- Lack of awareness about heart diseases among the customers.
- The customers are old fashioned and are not convinced by the heart disease prediction.
- Customers feel insecure about sharing their medical details to the application.
- Customers are worried about misprediction which leads to wastage of time and effort.

Focus on PR, tap into BE, understand RC

Identify strong TR & EM

3. TRIGGERS TO ACT TR

- Seeing social awareness programs about the severity of heart diseases
- Efficient prediction of results among the patients
- Ethical functioning of the system

4. EMOTIONS BEFORE / AFTER EM

Before:
Apprehension of the disease and Uneasiness about the symptoms.
After:
Reassurance and Appeasement of diagnosis.

10. YOUR SOLUTION SL

- This application helps in predicting the heart disease accurately and is reliable.
- This application maintains the customer medical details safe and secure.
- This application classifies all the heart disease and alerts the customer based on their prediction.
- This application is approved by the health institution.
- The application is free of cost.

8. CHANNELS of BEHAVIOR CH

ONLINE

Extract information from the database and update it in real-time.

OFFLINE

Extract information from the database and use it for Diagnostic purposes.

Extract online & offline CH of BE

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	User Registration	Enables user to make registration used for the application through Google account
FR-2	User Confirmation	Once after registration, the user will get confirmation via email.
FR-3	Visualizing Data	User can visualize the trends on the heart disease through Dashboard and see their deliverables.
FR-4	Generation Report	User can view his/her health report and can get treated accordingly

4.2 Non-Functional Requirement

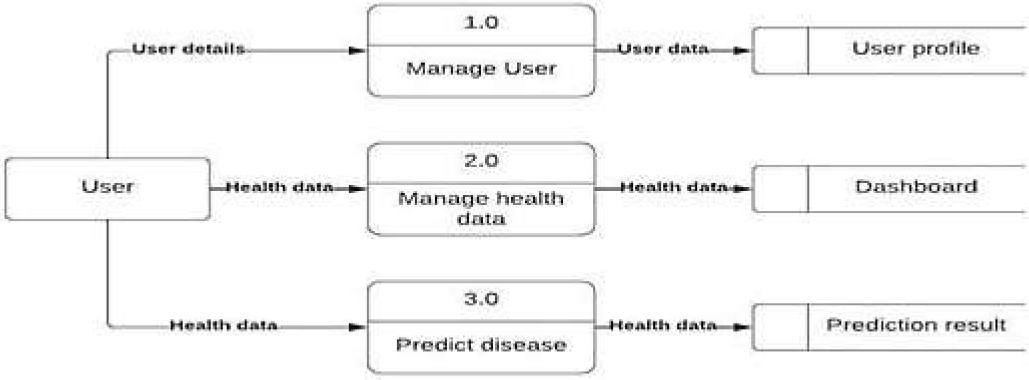
Following are the non-functional requirements of the proposed solution

FR No.	**Non-Functional Requirement**	**Description**
NFR-1	Usability	The application will have a simple and user-friendly graphical interface. Using will be able to understand and use all the features of the application. Any action has to be performed with just a few clicks
NFR-2	Security	To overcome that the data was collected and processed are encrypted with standards that cannot be broken. So, this makes our system to ensure privacy rights to the users.
NFR-3	Reliability	The applications has to be consistent at every scenario and has to work without failure in any Environment
NFR-4	Performance	Making the data available in times need is important. We have enclosed a feature of sharing the patients record to authorized facilities in case of emergencies so that right medications can be given on time
NFR-5	Availability	The application has to be available 24 x 7 for users without any interruption
NFR-6	Scalability	The application can withstand the increase in the no. of users and has to be able to develop Higher versions

5.Project Design

5.1 Data Flow Diagram

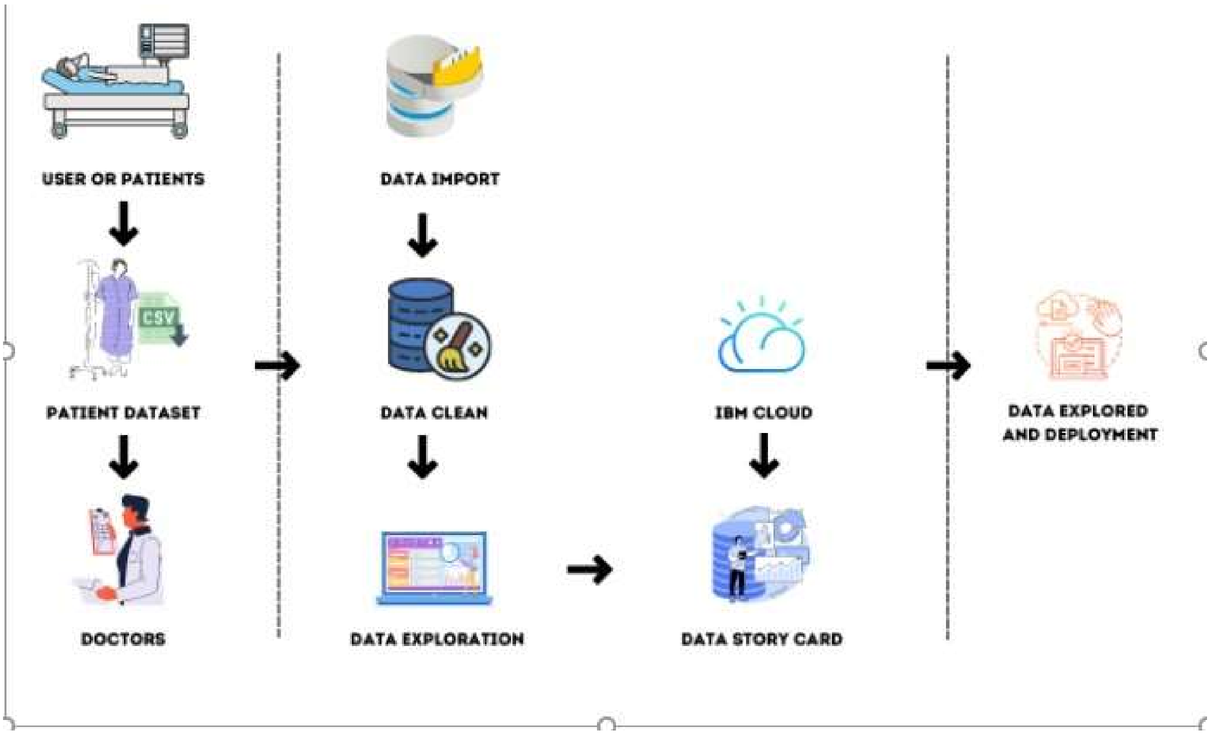
A Data Flow Diagram (DFD) is a graphical representation of the flow of data in a business information system. It describes the processes that are involved in a system to transfer data from the input to the file storage and reports generation. It shows how data enters and leaves the system, what changes the information, and where data is stored.



5.2 Solution and Technical Architecture

Solution architecture is a complex process with many sub-processes that bridges the gap between business problems and technology solutions. Its goals are to:

- **a.** Find the best tech solution to solve existing business problems.
- **b.** Describe the structure, characteristics, behavior, and other aspects of the software to project stakeholders.
- **c.** Define features, development phases, and solution requirements.
- **d.** Provide specifications according to which the solution is defined, managed, and delivered.



5.3 User Stories

Use the below template to list all the user stories of the product

User Type	Functional requirement	User story Number	User story/Task	Acceptance criteria	Priority	Release
Customer(mobile user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirm my password	I can access my account / dashboard	High	Sprint-1
		USN-2	I will receive confirmation email once I have registered for the application	I can receive confirmation email click confirm	High	Sprint-1
		USN-3	I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-2
		USN-4	I can register for the application through Gmail		Medium	Sprint-1
Customer(web user)	Login	USN-5	I can log into the application by entering email & password		High	Sprint-1
	Dashboard	USN-6	User can able to view only his medical record	I can view it in Dashboard	High	Sprint-2
		USN-7	User can able to view the possibilities of occurrence of heart disease	I can view it in the analysis report	High	Sprint-2
Customer Care Executive	Helpdesk	USN-8	Able to view the queries	I can able to post queries on dashboard	Medium	Sprint-3
		USN-9	Able to answer queries	I can able to view the answer for those queries	High	Sprint-3
Administrator	User profile	USN-10	Able to update the users medical records	I can view my updated health details	High	Sprint-4
		USN-11	Able to add or delete users	I can access my account when logged in	High	Sprint-4

			Able to manage the user details	I can view the organized data of yourself	High	Sprint-4

6.Project Planning and Scheduling

6.1 Sprint Planning & Estimation

Use the below template to create product backlog and sprint schedule

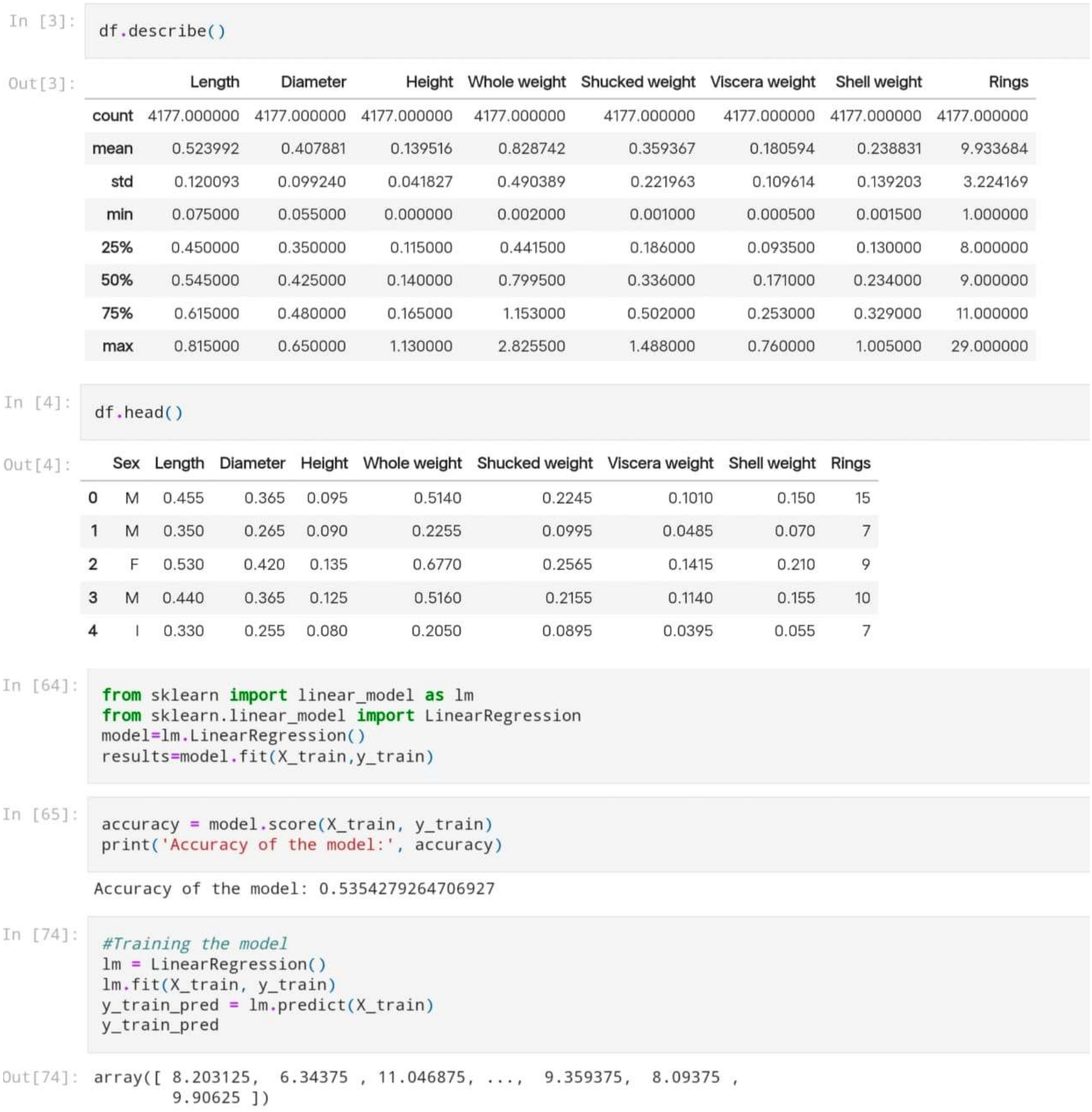
Sprint	Functional Requirement	User Story Number	User Story/Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirm my password	2	High	1
Sprint-1		USN-2	I will receive confirmation email once I have registered for the application	1	High	2
Sprint-2		USN-3	I can register for the application through Facebook	2	Low	3
Sprint-1		USN-4	I can register for the application through Gmail	2	Medium	4
Sprint-1	Login	USN-5	I can log into the application by entering email & password	1	High	1
Sprint-2	Dashboard	USN-6	User can able to view only his medical record	2	High	3
Sprint-2		USN-7	User can able to view the possibilities of occurrence of heart disease	1	High	4
Sprint-3	Helpdesk	USN-8	Able to view the queries	2	Medium	1
Sprint-3	Registration	USN-9	Able to answer queries	2	High	2
Sprint-4	User profile	USN-10	Able to update the users medical records	1	High	3
Sprint-4		USN-11	Able to add or delete users	2	High	4
Sprint-4		USN-12	Able to manage the user details	1	High	2

6.2 Sprint Delivery Schedule

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date	Story Points Completed	Sprint Release Date
Sprint-1	20					
Sprint-2	20					
Sprint-3	20					
Sprint-4	20					

7. Coding & Solution

Feature 1



In [3]:
```
df.describe()
```

Out[3]:

	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
count	4177.000000	4177.000000	4177.000000	4177.000000	4177.000000	4177.000000	4177.000000	4177.000000
mean	0.523992	0.407881	0.139516	0.828742	0.359367	0.180594	0.238831	9.933684
std	0.120093	0.099240	0.041827	0.490389	0.221963	0.109614	0.139203	3.224169
min	0.075000	0.055000	0.000000	0.002000	0.001000	0.000500	0.001500	1.000000
25%	0.450000	0.350000	0.115000	0.441500	0.186000	0.093500	0.130000	8.000000
50%	0.545000	0.425000	0.140000	0.799500	0.336000	0.171000	0.234000	9.000000
75%	0.615000	0.480000	0.165000	1.153000	0.502000	0.253000	0.329000	11.000000
max	0.815000	0.650000	1.130000	2.825500	1.488000	0.760000	1.005000	29.000000

In [4]:
```
df.head()
```

Out[4]:

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
0	M	0.455	0.365	0.095	0.5140	0.2245	0.1010	0.150	15
1	M	0.350	0.265	0.090	0.2255	0.0995	0.0485	0.070	7
2	F	0.530	0.420	0.135	0.6770	0.2565	0.1415	0.210	9
3	M	0.440	0.365	0.125	0.5160	0.2155	0.1140	0.155	10
4	I	0.330	0.255	0.080	0.2050	0.0895	0.0395	0.055	7

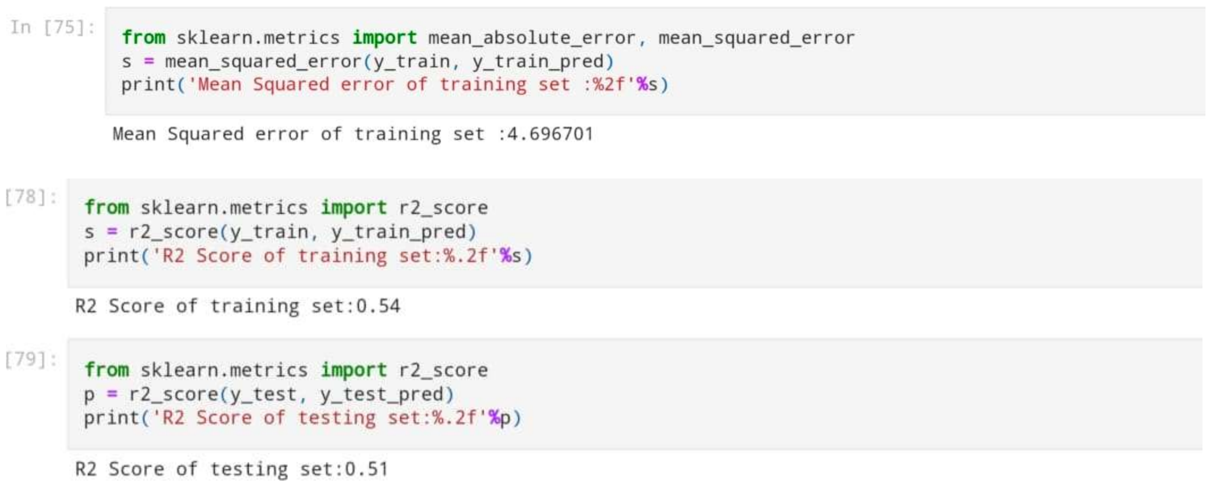
In [64]:
```
from sklearn import linear_model as lm
from sklearn.linear_model import LinearRegression
model=lm.LinearRegression()
results=model.fit(X_train,y_train)
```

In [65]:
```
accuracy = model.score(X_train, y_train)
print('Accuracy of the model:', accuracy)
```

```
Accuracy of the model: 0.5354279264706927
```

In [74]:
```
#Training the model
lm = LinearRegression()
lm.fit(X_train, y_train)
y_train_pred = lm.predict(X_train)
y_train_pred
```

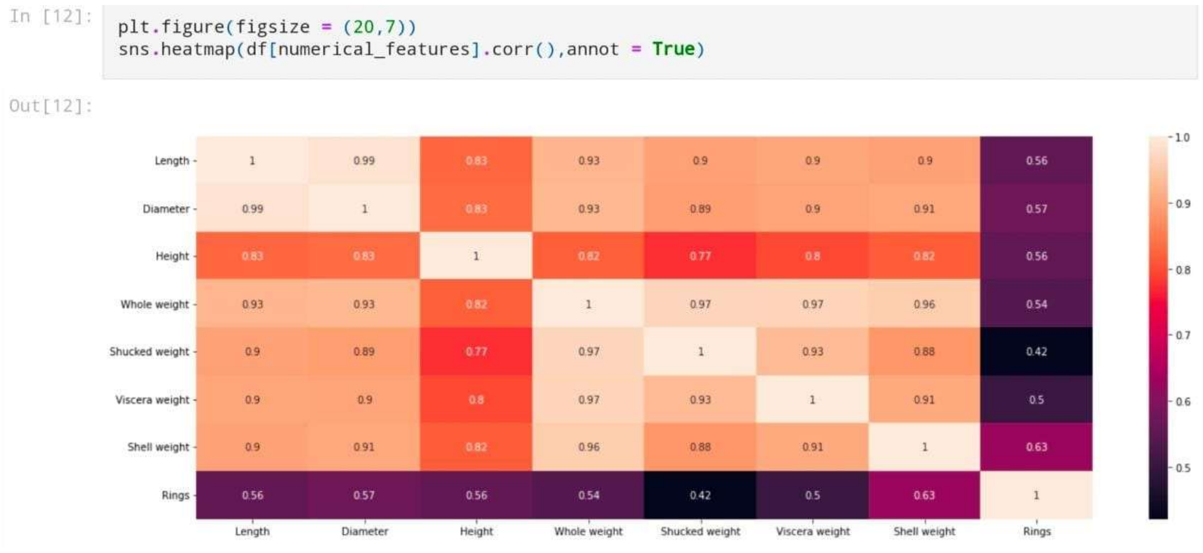
Out[74]:
```
array([ 8.203125,  6.34375 , 11.046875, ...,  9.359375,  8.09375 ,
        9.90625 ])
```



```
In [75]:  from sklearn.metrics import mean_absolute_error, mean_squared_error
           s = mean_squared_error(y_train, y_train_pred)
           print('Mean Squared error of training set :%2f'%s)

           Mean Squared error of training set :4.696701
```

```
[78]:  from sklearn.metrics import r2_score
       s = r2_score(y_train, y_train_pred)
       print('R2 Score of training set:%.2f'%s)

       R2 Score of training set:0.54
```

```
[79]:  from sklearn.metrics import r2_score
       p = r2_score(y_test, y_test_pred)
       print('R2 Score of testing set:%.2f'%p)

       R2 Score of testing set:0.51
```

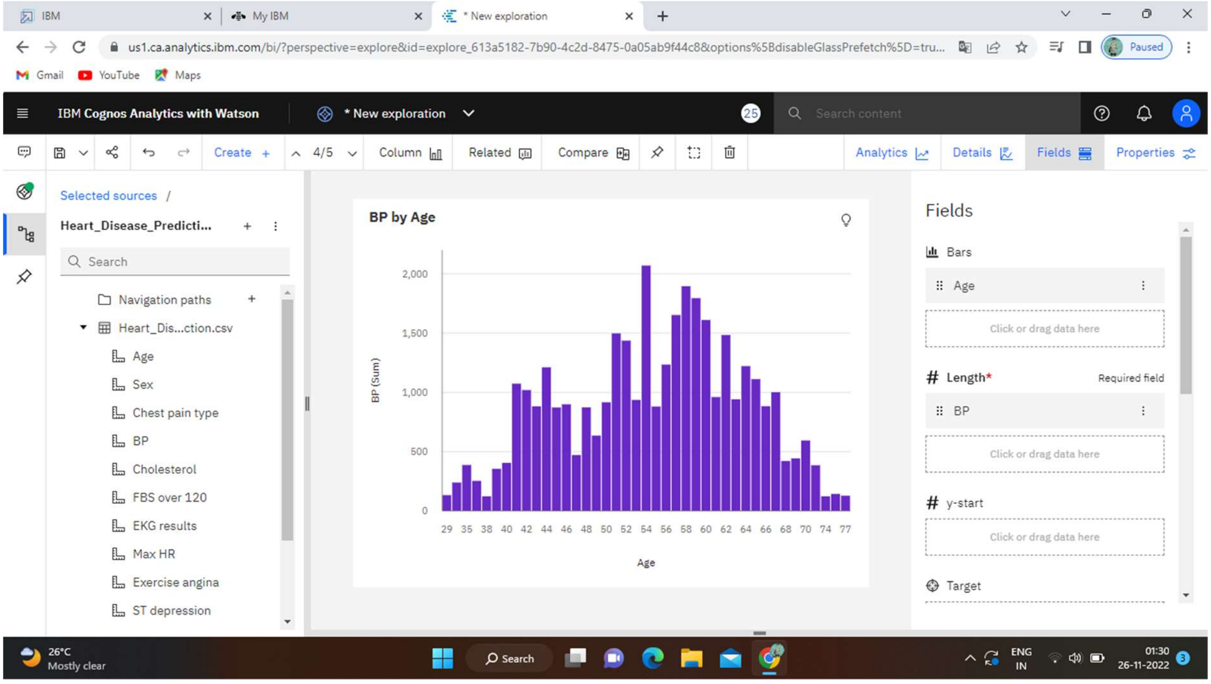


```
In [12]:  plt.figure(figsize = (20,7))
           sns.heatmap(df[numerical_features].corr(),annot = True)

Out[12]:
```

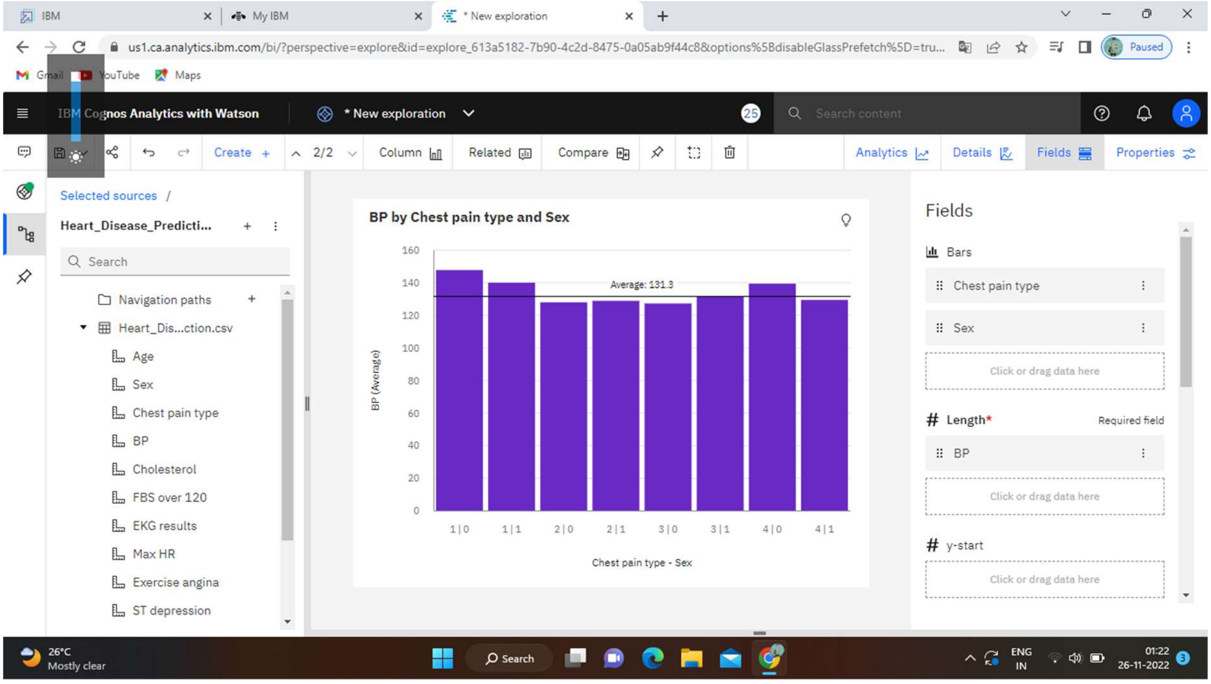
	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
Length	1	0.99	0.83	0.93	0.9	0.9	0.9	0.56
Diameter	0.99	1	0.83	0.93	0.89	0.9	0.91	0.57
Height	0.83	0.83	1	0.82	0.77	0.8	0.82	0.56
Whole weight	0.93	0.93	0.82	1	0.97	0.97	0.96	0.54
Shucked weight	0.9	0.89	0.77	0.97	1	0.93	0.88	0.42
Viscera weight	0.9	0.9	0.8	0.97	0.93	1	0.91	0.5
Shell weight	0.9	0.91	0.82	0.96	0.88	0.91	1	0.63
Rings	0.56	0.57	0.56	0.54	0.42	0.5	0.63	1

Feature 2 Dashboard

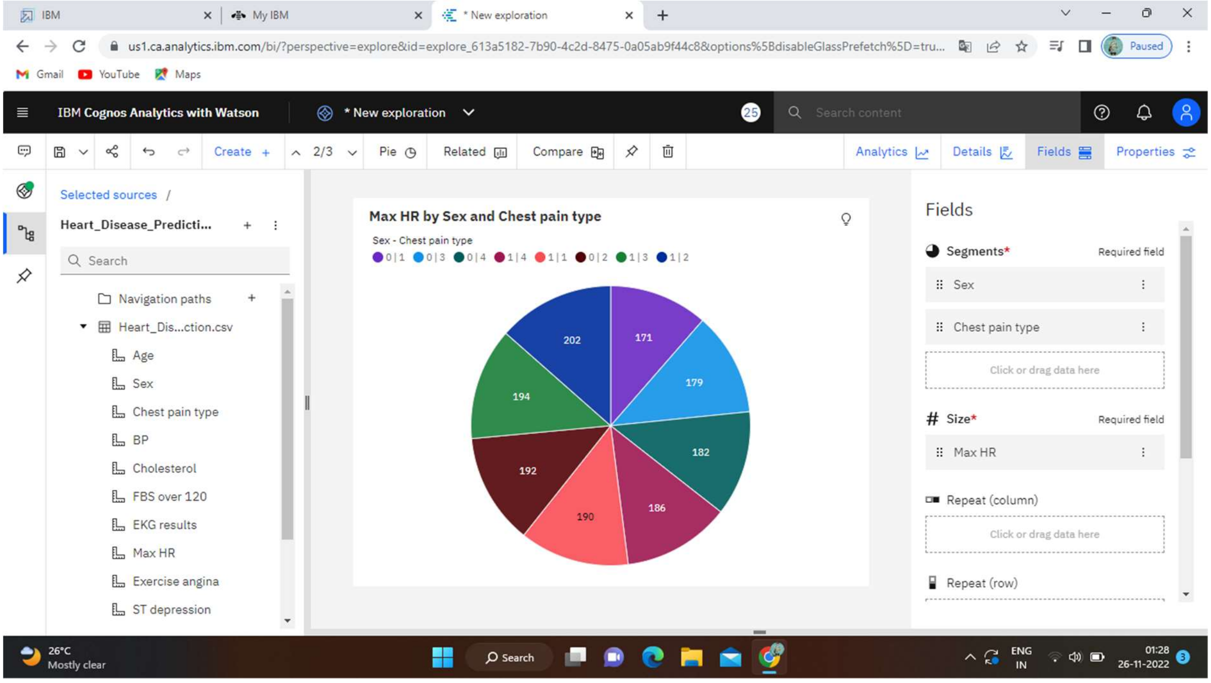
Exploration of BP by AGE



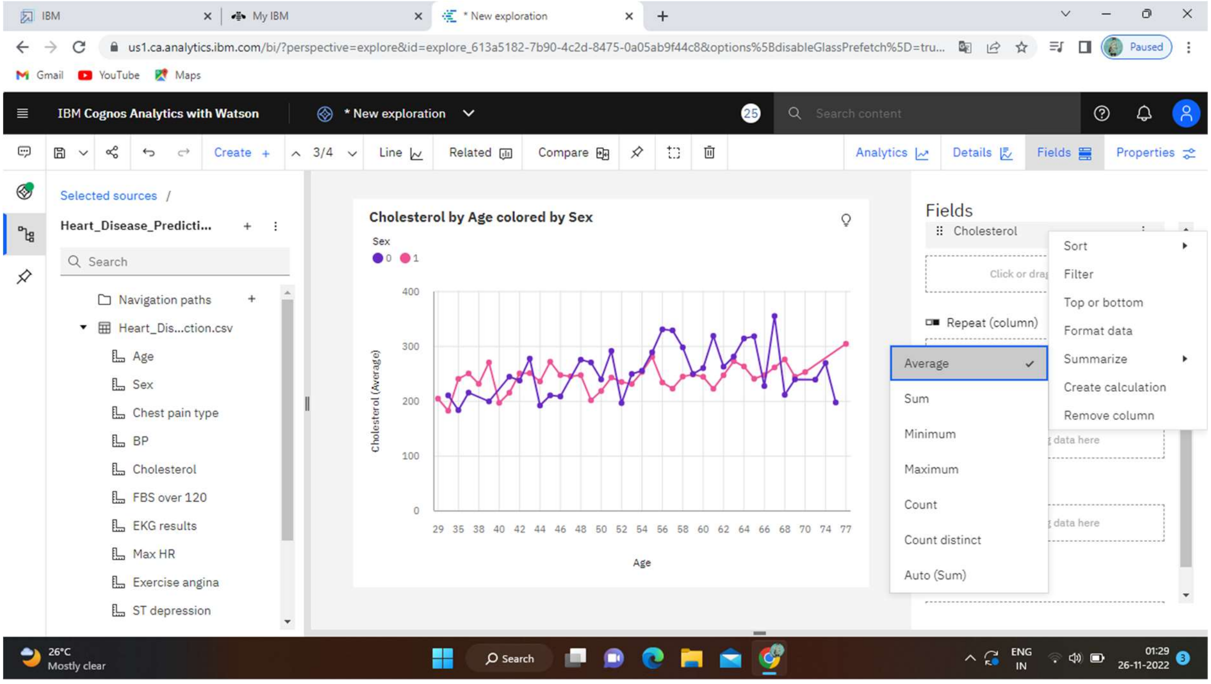
Exploration of BP vs Chest pain Type and Gender



Exploration of Max HR during the Chest Pain



Exploration of Cholesterol by Age and Gender



8.Testing

8.1 Perform Testing

S. No.	Parameter	Screenshot/Values
1.	Dashboard design	No of Visualizations/Graphs-10
2.	Data Responsiveness	Good
3.	Amount data to Rendered	No
4.	Utilization of Data Filters	Yes for filtering out visualizations concerning people with existing heart disease
5.	Effective User story	No of Scene added-8
6.	Descriptive Reports	No of Visualization/Graphs-7

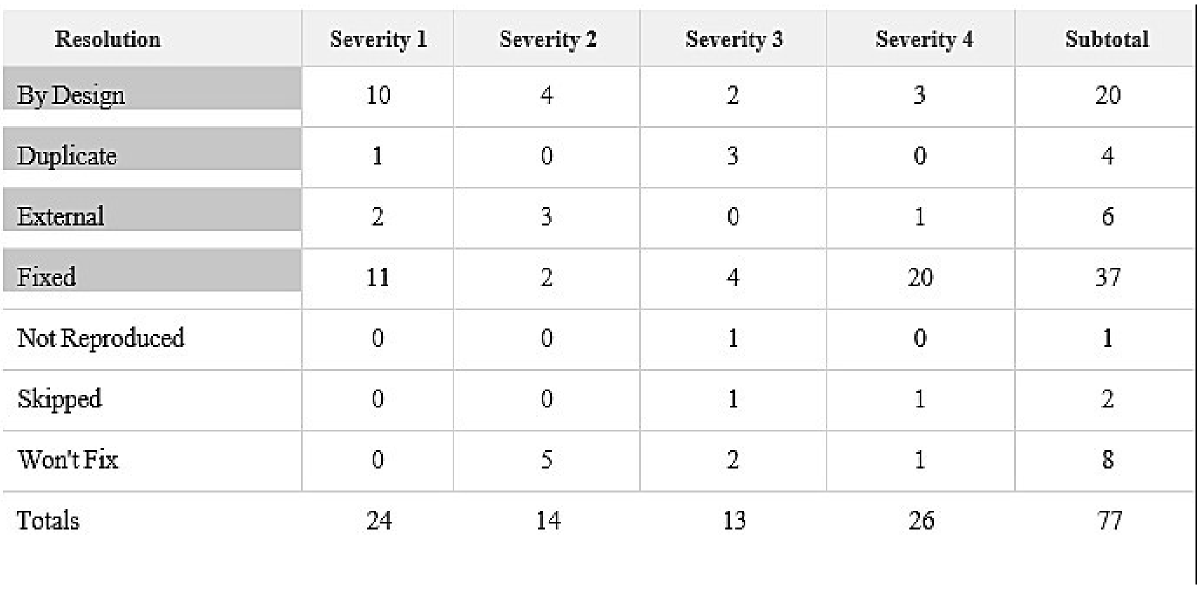
8.2 User Acceptance Testing

1. Purpose of Document

The purpose of the document is to briefly explain the test coverage and op issues of the project at the time of the releaseto Us Acceptance Testing(UAT)

2.Defect Analysis

This report shows the number of resolved or closed bugs at each severity level, and how they were solved



Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	10	4	2	3	20
Duplicate	1	0	3	0	4
External	2	3	0	1	6
Fixed	11	2	4	20	37
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won't Fix	0	5	2	1	8
Totals	24	14	13	26	77

3.Test Case Analysis

This report shows the number of test cases that have passed, failed, and untested

Section	Total Cases	Not tested	Fail	Pass
Print Engine	7	0	0	7
Client Application	51	0	0	51
Security	2	0	0	2
Outsource Shipping	3	0	0	3
Exception Shipping	9	0	0	9
Final Report Output	4	0	0	4
Version Control	2	0	0	2

9.Result

Performance Metrics

i. Stick to timelines: 95%

ii. Worked Hours:30 hours

iii. Stay with Budget:100%

iv. Consistency of product:80%

v. Efficiency of product:90%

vi. Quality of product:90%

10.Advantages & Disadvantage

Advantages

- One of the fastest and easiest way to determine if a person is likely to suffer from a heart disease or not
- Useful for all the medical officers to know about the patient's history
- User Friendly
- Easy to understand

Disadvantages

- Need a more dynamic User interface
- Users need to know all the fields
- Does Not take null value as input
- Does not provide suggestions to the user

11.Coclusion

There are several complications when it comes to heart diseases. We can reduce the risk of complications with early diagnosis and treatment. The solution that we provide from the website will help the patients. It is always to get treated in the early stages when it comes to heart diseases. The work can be improved in the future by creating a web application based on machine learning algorithm.

12.Future Scope

In this study, we are using data analysis to estimate the risk of developing heart diseases based only on the history or data set we have acquired from the subject. However, there may be dangers of developing one prior to the prediction if we wish to use this to anticipate heart diseases. In order to show the person cardiac state, we would like to design or find some algorithm to analyse data that has been streaming collected from wearable devices such smart watch fitness bands, and healthcare meters

13.APPENDIX

Source code

Sig in index.html:

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <meta http-equiv="X-UA-Compatible" content="ie=edge">
    <link rel="stylesheet" href="fonts/material-icon/css/material-design-iconic-font.min.css">
    <link rel="stylesheet" href="css/style.css">
</head>
<body>
     <section class="sign-in">
        <div class="container">
            <div class="signin-content">
                <div class="signin-image">
                    <figure><img src="../static/heart.jpg" alt="sing up image"></figure>
                    <a href="/signup" class="signup-image-link">Create an account</a>
                </div>
                <div class="signin-form">
                    <h2 class="form-title">login</h2>
```

```
<form method="POST" class="register-form" id="login-form">
  <div class="form-group">
    <label for="your_name"><i class="zmdi zmdi-account material-icons-name"></i></label>
    <input type="text" name="name" id="your_name" placeholder="Your Name"/>
  </div>
  <div class="form-group">
    <label for="your_pass"><i class="zmdi zmdi-lock"></i></label>
    <input type="password" name="password" id="your_pass" placeholder="Password"/>
  </div>
  <div class="form-group">
    <input type="checkbox" name="remember-me" id="remember-me" class="agree-term" />
    <label for =”remember-me class=”label-agree-term”><sapn><span></span>
    </span>Remember me</label>
  </div>
  <div class="form-group form-button">
    <input type="submit" name="signin" id="signin" class="form-submit" value="Log in"/>
  </div>
</form>
<div class="social-login">
  <span class="social-label">Or login with</span>
  <ul class="socials">
    <li><a href="#"><i class="display-flex-center zmdi zmdi-facebook"></i></a></li>
    <li><a href="#"><i class="display-flex-center zmdi zmdi-twitter"></i></a></li>
    <li><a href="#"><i class="display-flex-center zmdi zmdi-google"></i></a></li>
  </ul>
```

```
                    </div>
                 </div>
              </div>
           </div>
        </section>
</body>
</html>
```

Sign up:

```
{% extends 'home.html'%}


{% endblock title %}
{% block content %}
<body>
    <div class="main">
        <section class="signup">
            <div class="container">
                <div class="signup-content">
                    <div class="signup-form">
                        <h2 class="form-">sign up</h2>
                         <from method="POST"class="register-form"id="register-form>
                            <div class="form-group">
                                <label for="name"><I class="zmdi zmdi-account material-icons-name"></i><label>
                                 <input type="text" name"="name" id="name" plaeholderc ="your name"></i></label
                                 </div>
                                 <div class="form-group">
                                     <label for="email"><I class="zmdi zmdi-email"></i></lable>
```

```
                          <inut tyoe=”email” name=”email” id=”email”
placeholder=”your Email”/>
                       </div>
                       <div class=”form-group”>
                          <label for=”pass”><I class=”zmdi zmdi-
lock”></i></label>
                          <input type=”password” name=”password” id=”pass”
placeholder=”password”/>
                       </div>
                       <div class=”form-group”>
                          <label for=”re-pass”><i class=”zmdi zmdi-lock-
pitline”></i></label>
                          <input type=”password” name=”re_pass”
id=”re_pass” placeholder=”repeat your password”/>
                          </div>
                          <div class=”form-group”>
                             <input type=”checkbox” name=”agree-term”
id=”agree-term” class=”agree-term”/>
                             <Label for=”agree-term” class=”label-agree-
term”><span><span></span></span>I agree all
Statements in <a href=”#” class=”term-service”>term of service</a></label>
                   </div>
                   <div class=”from-group from-bottum”>
                      <input type=”submit” name=”signup” id=”signup”
class=”from-Submit” value=”Register”/>
                  </div>
                </form>
              </div>
              <div class=”signup-image”>
                <figure><img src=”../static/heart1,jpg” alt=”sing up
image”></figure>
                <a href=”/signin” class=”signup-image-link”>I am already
member</a>
```

```
                    </div>
                  </div>
                </div>
              </section>
            </div>
          </body>
{% endlock content %}
```

Home page.Html:

```
<!DOCTYPE html>
<htnl 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=”/static/style.css”>
    <link href=https://cdn.jsdelivr.net/npm/bootstrap@5.2.1/dist/css/bootstrap.min.css
rel=”stylesheet” integrity =”sha384-
iYQezEYFbKjA/T2uDLTpkwGzCiq6soy8tYaI1GyVh/UjpbCx/TYkiZh1ZB6+fzT”
crossorigin=”anonymous”>
</head>
<body>
    <div id=”content”>
        <nav class=”navbar navbar-dark navbar-expand-lg bg-dark”>
            <div class=”container-fluid”>
                <button class=”navbar-toggler” type=”button” data-bs-toggle=”collapse”
data-ds-target=”#navbarNavAltMarkup” aria-contols=”navbarNavAltMarkup” aria-
expanded=”false” aria label=”Toggle navigation”>
                <span class =”navbar-toggler-icon”></span>
                </button>
                <div class=”collapse navbar-collapse” id=”navbarNavAltMarkup”>
```

```
                    <div class=”navbar-nav”>
                        <a class=”nav-link active” aria-current=”page” href=”/”>Home</a>
                        <a class=”nav-link” href=”signin”>Sign In</a>
                        <a class=”nav-link” href=”signup”>Sign Up</a>
                        <a class=”nav-link” href=”Heart_Disease_Classifier”>Heart_Disease_
Classifier</a>
                    </div>
                </div>
            </div>
        </nav>
        {% block content%}
        {% endblock content%}
    </div>
    <script     src=https://cdn.jsdelivr.net/npm/bootstrap@5.2.1/dist/js/bootstrap.bundle.min.js
integrity=”sha384-u1OknCvxWvY5ffmNBILK2hRnQC3pr17a+RTT6rIHI7NnikvbZIhgTpO
OmMi466C8” crossorigin=”anonymous”></script>
</body>
</html>
```

Visualization.html:

```
<html>
<head>
      <!—Boostrap CSS-->
           <link rel=”stylesheet” href=”https://stackpath.bootstrapcdn.com/bootstrap.min.css”
Integrity=”sha384-JcKb8q3iqJ61gNV9KGb8thSsNjpSL0n8PARn9HuZOnIxN0hoP+VmmD
GMN5t9UJ0Z” crossorigin=”anonymous”>
           <script src=”https://code.jquery.com/jquery-3.5.1.slim.min.js” integrity=”sha384-
DfXdz2htPH0lsSSs5nCTpuj/zy4C+OGpamoFVy38MVBnE+IbbVYUew+OrCXaRkfj"
Crossorigin=”anonymous”>
           <script src=https://cdn.jsdelivr.net/npm/popper.js@1.16.1/dist/umd/popper.min.js
Integrity=”sha384-9/reFTGAW83EW2RDu2S0VKaIzap3H66lZH81PoYlFhbGU+6BZpG7
```

```
Niu&35Sk7lN” crossorigin=”anonymous”></script>
          <script src=https://stackpath.bootstrapcdn.com/bootstrap/4.5.2/js/bootstrap.min.js
Integrity=”sha384-B4gt1jrGC7Jh4AgTPSdUtOBvfO8shuf57BaghqFfPlYxofvL8/KUEfYiJO
MMV+rV” crossorigin=”anonymous”></script>
          <title> Heart Disease Test</title>
</head>
<body>
<!--Java Script -->
          <script  src=”https://code.jquery.com/jquery-3.5.1.slim.min.js”  integrity=”sha384-
DfXdz2htPH0lsSSs5nCTpuj/zy4C+OGpamoFVy38MVBnE+IbbVYUew+OrCXaRkfj” cross
Origin=”anonymous”></script>
         <script src=https://cdn.jsdelivr.net/npm/popper.js@1.16.1/dist/umd/popper.min.js
Integrity=”sha384-9/reFTGAW83EW2RDu2S0VKaIzap3H66lZH81PoYlFhbGU+6BZp6G7
Niu735Sk7lN” crossorigin=”anonymous”></script>
         <script src=https://stackpath.bootstrapcdn.com/bootstrap/4.5.2/js/bootstrap.min.js
integrity="sha384-B4gt1jrGC7Jh4AgTPSdUtOBvfO8shuf57BaghqFfPlYxofvL8/KUEfYiJO
MMV+rV” crossorigin=”anonymous”></script>
         <!-- Navbar-->
                   <nav class="navbar navbar-dark" style="background-color: rgb(13, 102,
87);">
                        <span class="navbar-brand mb-0 h1">Heart Disease Test</span>
                    </nav>
                   <div class="container">
                        <br>
                        <!--Form-->
                          <form action = "{{url_for('predict')}}" method ="POST" >
                             <fieldset>
                             <legend style="color: rgb(41, 15, 134);"><b>Heart Disease Test
Form</b></legend><br>

                                        <div class="card card-body" style=
“background-color: rgb(194245 236/56%);”>
```

```
                                        <div class="form-group  row">
                                            <div class="col-sm-3">
                                                 <label for="age">Age</label>
                                                       <input type="number" class="form-control
Id=”age” name=”age” required></div>
                                            <div class="col-sm-3">
                                                 <label for="sex">Sex</label>
                                                  <select class="form-control" id="sex"  name="sex"
required>
                                                   <option disabled selected value> -- Select an Option
-- </option>
                                                   <option value = "0">Female</option>
                                                   <option value = "1">Male</option>
                                                 </select>
                                             </div>
                                           </div>
                                           <br>
                                           <div class="form-group  row">
                                                <div class="col-sm">
                                  <label for="cp">Chest PainType</label>
                                       <select class="form-control" id="cp"
name = "cp" required>
                                                   <option disabled selected value> -- Select an Option
-- </option>
                                                   <option value = "1">Typical Angina</option>
                                                   <option value = "2">Atypical Angina</option>
                                                   <option value = "3">Non-anginal Pain</option>
                                                   <option value = "4">Asymptomatic</option>
                                                 </select>
                                             </div>
                                             <div class="col-sm">
```

```
                                                    <label for="trestbps">Resting Blood Pressure in mm
Hg</label>
                                                    <input type="number" class="form-control” id=
“trestbps” name=”trestbps” required>
                                                </div>
                                                <div class="col-sm">
                                                        <label for="chol">Serum Cholestoral in
mg/dl</label>
                                                       <input type="number" class="form-control"
id="chol" name="chol" required>
                                                </div>
                                                <div class="col-sm">
                                                      <label for="fbs">Fasting Blood
Sugar > 120 mg/dl</label>
                                                      <select class="form-control" id="fbs"
name="fbs" required>
                                                      <option disabled selected value> -- Select an Option
-- </option>
                                                      <option value = "0">False</option>
                                                      <option value = "1">True</option>
                                                    </select>
                                               </div>
                                           </div>

                                           <br>
                                           <div class="form-group row">
                                                    <div class="col-sm">
                                                         <labelfor="restecg">Resting
ECG Results </label>
                                                              <select class="form-control" id="restecg"
name="restecg" required>
                                                              <option disabled selected value> -- Select an
Option -- </option>
```

```
                                                    <option value = "0">Normal  </option>
                                                     <option value = "1"> Having ST-T
waveabnormality </option>
                                                     <option value = "2">Probable or definite
left ventricular hypertrophy</option>
                                                  </select>
                                             </div>
                                             <div class="col-sm">
                                                   <label for="thalach">Maximum Heart
Rate</label>
                                                    <input type="number" class="form
control" id="thalach" name="thalach" required>
                                             </div>
                                             <div class="col-sm">
                                             <label for="exang"> Exercise InducedAgnia
</label>

                                                  <select class="form-control" id="exang"
name="exang" required>
                                                  <option disabled selected value> -- Select an
Option -- </option>
                                                  <option value = "0">No</option>
                                                  <option value = "1">Yes</option>
                                                  </select>
                                             </div>
                                             <div class="col-sm">
                                                   <label for="oldpeak">ST
Depression Induced</label>
                                                   <input type="number" step="any" class=
“form-control” id=”oldpeak” name=”oldpeak” required>
                                             </div>
                                        </div>
                                        <br>
                                        <div class="form-group  row">
                                        <div class="col-sm">
                                              <label for="slope">Slope
Of the peak Exercise St Segment </label>
                                               <select class="form-control" id="slope"
name="slope" required>
                                             <option disabled selected value> -- Select an Option
-- </option>
                                             <option value = "1">Upsloping</option>
                                             <option value = "2">Flat</option>
                                             <option value = "3">Downsloping</option>
                                           </select>
                                        </div>
                                         <div class="col-sm">
                                           <label for="ca">Number of Vessels Colored by
Flourosopy</label>
                                              <select class="form-control” id=

“ca” name=”ca” required>

                                                <option disabled selected value> -- Select
an option--</option>
                                                <option value = "0">0</option>
                                                <option value = "1">1</option>
                                                <option value = "2">2</option>
                                                <option value = "3">3</option>
                                           </select>
                                        </div>
                                        <div class="col-sm">
                                           <label for="thal">Thalassemia</label>
                                           <select class="form-control" id="thal" name = "thal"
required>
```

```
                                                        <option disabled selected value> -- Select an Option
-- </option>
                                                        <option value = "3">Normal</option>
                                                        <option value = "6">Fixed defect</option>
                                                        <option value = "7">Reversable defect</option>
                                                      </select>
                                                 </div>
                                           </div>
                                           <br>
                                           <div class="form-group">
                                                <input class="btn btn-primary" type="submit"
value="Result">
                                           </div>
                                           <!--Prediction Result-->
                                           <div id ="result">
                                                      <strong style="color:red">{{result}}</strong>
                                           </div>
                                       </div>
                              </form>
                        </div>
             </body>
</html>
```

App.py:

```
#import numpy as np
#import pickle
#import sklearn
#from flask import Flask, request, render_template
#model = pickle.load(open('models.pkl', 'rb'))
#app = Flask(__name__)
#@app.route('/')
#def home():
 #return render_template('home.html')
#@app.route('/signin')
```

```
#def signin():
   #return render_template('signin.html')
#@app.route('/signup')
#def signup():
   #return render_template('signup.html')
#@app.route('/predict', methods =['POST'])
#def predict():
  #features = [float(i) for i in request.form.values()]
  #Convert features to array
  #array_features = [np.array(features)]
  #Predict features
  #prediction = model.predict(array_features)
  #output = prediction
  #if output == 1:
    #return render_template('Heart_Disease_Classifier.html', result = 'The patient is not likely to have heart disease!')
  #else:
    #return render_template('Heart_Disease_Classifier.html', result = 'The patient is likely to have heart disease!')

#if __name__ == '__main__':
   #debug(True)
import numpy as np
import pickle
import sklearn
from flask import Flask, render_template, request, redirect, url_for, flash
import sqlite3
model = pickle.load(open('models.pkl', 'rb'))
app = Flask(__name__)
app.secret_key = "7847541"
def get_db():
    conn = sqlite3.connect('user_details.db')
    conn.row_factory = sqlite3.Row
    return conn
@app.route('/')
```

```
def index():
    return render_template('index.html', title='Home')
@app.route('/about')
def about():
    return render_template('about.html', title='About')
@app.route('/signin', methods=('GET', 'POST'))
def signin():
    error = None
    if request.method == 'POST':
        name = request.form['name']
        password = request.form['password']
        db = get_db()
        user = db.execute(
            'SELECT name FROM user_details WHERE password = ?', (password, )
        ).fetchone()

        if user is None:
            error = 'Incorrect Username/Password.'
        if error is None:
            return render_template('index.html', title="Home", succ="login successfull!")
        flash(error)
        db.close()
    return render_template('signin.html', title='Sign In', error=error)
@app.route('/signup', methods=('POST', 'GET'))
def signup():
    if request.method == 'POST':
        name = request.form['name']
        email = request.form['email']
        password = request.form['password']
        db = get_db()
        curr = db.cursor()
        curr.execute(
            'INSERT INTO user_details (name, email, password) VALUES (?, ?, ? );', (name,
email, password )
        )
        db.commit()
        curr.close()
        db.close()
        return render_template('index.html', title="Home", succ="Registration Successfull!")
    return render_template('signup.html', title='Sign Up')
@app.route('/Heart_Disease_Classifier')
def Heart_Disease_Classifier():
      return render_template('Heart_Disease_Classifier.html')
@app.route('/predict', methods =['POST'])
def predict():
   features = [float(i) for i in request.form.values()]
  #Convert features to array
  array_features = [np.array(features)]
  #Predict features
  prediction = model.predict(array_features)
  output = prediction
  if output == 1:
    return render_template('Heart_Disease_Classifier.html', result = 'The patient is not likely to have heart disease!')
  else:
    return render_template('Heart_Disease_Classifier.html', result = 'The patient is likely to have heart disease!')
if __name__ == '__main__':
   debug(True)
```

Github link :

https://github.com/IBM-EPBL/IBM-Project-25532-1659966904

Demo link:

https://youtu.be/_dlPGsyvr7s