VISUALIZING AND PREDICTING HEART DISEASE USING INTERACTIVE DASH BOARD

NALAIYATHIRAN PROJECT BASED LEARNING

on

PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY AND ENTERPRENUERSHIP

A PROJECT REPORT

Submitted by

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BACHELOR OF ENGINEERING

in

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Velammal Engineering College

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ABSTRACT

Cardiovascular disease refers to any critical condition that impacts the heart. Because heart diseases can be life-threatening, researchers are focusing on designing smart systems to accurately diagnose them based on electronic health data, with the aid of machine learning algorithms. This work presents several machine learning approaches for predicting heart diseases, using data of major health factors from patients. This project demonstrated two classification methods: K Nearest Neighbour (KNN), Random Forest Classifier, to build the prediction models. Data Visualizations are done using IBM Cognos Analytics Data preprocessing and feature selection steps were done before building the models. The models were evaluated based on the accuracy.

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INTRODUCTION

1.1 Project Overview

Heart disease is the main cause of death in the developed world. Therefore, efforts must be made to reduce the chance of suffering a heart attack or stroke. The goal of this project is to develop an interactive dashboard that uses the IBM Cognos Tools and dataset to identify patients who are most likely to have a heart disease in the near future.

1.2 Purpose

The purpose of this study is to evaluate the likelihood that a patient will be diagnosed with a cardiovascular heart disease based on their medical parameters, such as gender, age, chest pain, fasting blood sugar level, etc. Heart disease is the main cause of death in the developed world. Since there are more and more occurrences of heart disease every day, it is important and concerning to anticipate any prospective problems. This diagnosis is a difficult task that demands precision and effectiveness. Therefore, efforts must be made to reduce the likelihood of suffering a heart attack or stroke. It is the primary cause of adult fatalities. Our project can determine who is most likely to be diagnosed with a heart issue by looking at a person's medical history. In order to properly treat patients, it can help in detecting disease with fewer medical tests and effective remedies. Anyone exhibiting any heart disease symptoms, such as chest pain or excessive blood pressure, can be identified by it. Machine learning is used in a wide range of industries worldwide. The healthcare industry is not an exception. The presence or absence of locomotor problems, cardiac diseases, and other pathologies may depend heavily on machine learning. Such information, if anticipated well in advance, can provide vital insights to medical professionals, who can then tailor their diagnosis and course of treatment for each patient.

LITERATURE SURVEY

2.1 Existing problem

There have been quite a few studies done on applying machine learning algorithms to diagnose heart disease. A reliable prediction of heart disease has been produced utilizing a variety of algorithms, including Logistic Regression, KNN, Random Forest Classifier, and others. Results show that each algorithm is capable of registering the specified objectives to varying degrees. The decision boundary might be calculated by the model incorporating IHDPS utilizing both the old and new deep learning and machine learning models. It made the most fundamental and significant factors/knowledge—like family history related to any cardiac disease—more accessible. However, the accuracy of the IHDPS model was much lower than that of new, upcoming models for detecting coronary heart disease using artificial neural networks and other machine and deep learning algorithms.

REFERENCES:

TITLE	AUTHOR	ALGORITHM	ADVANTAGES	DISADVANTAGES
Heart Disease Prediction using Exploratory Data Analysis	Indrakumari, T. Poongodi, Soumya Rajan Jena	K - means Clustering	The approach made here using K – means clustering is highly stable and used widely for analysing a set of Data.	Only based on type of chest pain the classification has been made.
Heart Disease Prediction using Data Mining Techniques	Dr. S. Anitha, Dr. N. Sridevi	KNN Algorithm, Naïve Bayes Algorithm, SVM Classification	The approach used here involves mathematical values which are very accurate in prediction	The approach yields an average accuracy of 70% which is very low using this algorithm
Effective heart disease prediction system using data mining techniques	Poornima Singh, Sanjay Singh, and Gayatri S Pandi-Jain	Multilayer perceptron neural network, Back propagation Algorithm	Different layers of data were involved which gives us more accuracy in the output	This technique does not involve any visualization of data (only pre-processing is done with the dataset) so the user does not able to understand the flow of the technique used

2.2 Problem Statement Definition

- Healthcare needs technology to predict the reason of heart disease to reduce them in near future and be prepared to tackle the medical whereabouts.

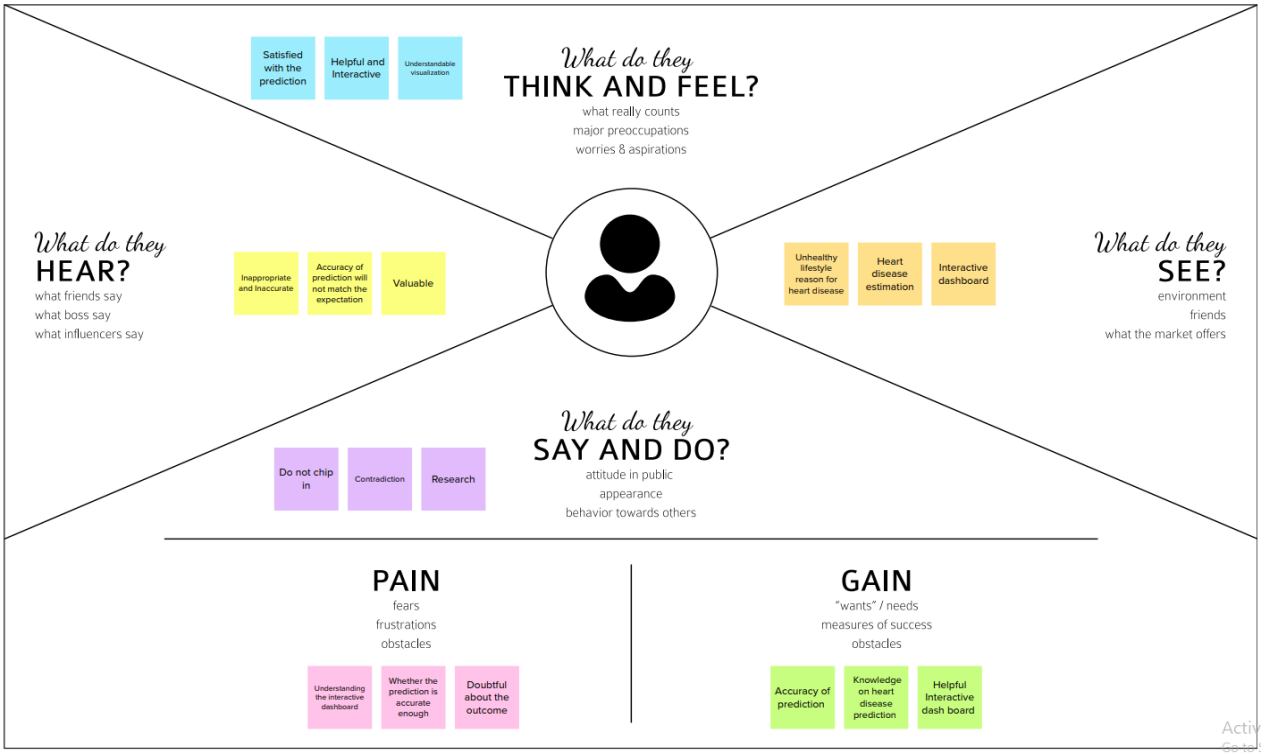
- To prevent heart disease in the near future by prediction and be ready to handle medical whereabouts, healthcare needs technology that is easy to grasp.

- Healthcare need technology that is simple to use in order to avoid heart disease in the near future and be prepared to address medical whereabouts.

- Doctors requires user-friendly technology to mitigate heart disease in the coming years and to address medical identity in society

IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas



3.2 Ideation & Brainstorming

Ideas laid out by each Team Member

1. GOKUL D

• Idea 1: Creating complete Dashboard to find out the heart disease cause
• Idea 2: Various Graphical Representations to view the heart disease rate
• Idea 3: Exploring the data in such a way that everyone can understand.
• Idea 4: Redundancy of data to be eliminated to provide better results.

2. CHRIS HARRY P

• Idea 1: Examine trends & correlations within our data
• Idea 2: Determine which features are most important to Positive/Negative Heart Disease diagnosis
• Idea 3: What first aid can be given if the person is found to have heart disease?
•Idea 4: The result shown should be clear and simple so that it is easily understandable

3. RUTHRESH KUMAR R

• Idea 1: Getting the required dataset for predicting heart disease
• Idea 2: With dataset doing repeated training and testing for better result
• Idea 3: Designing a interactive dashboard to find out the result for heart disease
• Idea 4: The result is shown in a graphical representation for better understanding

4. VIGNESH RAJ V

• Idea 1: Creating an easy to understand interactive dashboard

• Idea 2: The accuracy of the prediction should be maximum
• Idea 3: The data sets gathered should be from a trusted sources
• Idea 4: The end user should be able to understand the reasons of heart diseases

5. HARIHARAN V

• Idea 1: Heart disease rate
• Idea 2: Future prediction of heart diseases
• Idea 3: Easily understandable dashboard

Shortlisted Ideas

• Idea 1: Various Graphical Representations of our prediction
• Idea 2: Cleaning the Dataset and Removal of Redundant data
• Idea 3: Prediction of heart disease with maximum accuracy
• Idea 4: Interactive Dashboard is implemented

3.3 Proposed Solution

1.	Problem Statement (Problem to be solved)	Healthcare needs technology to predict the reason of heart disease to reduce them in near future and be prepared to tackle the medical whereabouts.
2.	Idea / Solution description	The concept behind the encountered solution is to suggest an interactive dashboard for visualising and forecasting cardiac problems, where the user may observe the analysis of people medical report and the anticipated outcome. IBM Cognos will be used to visualize thereby showcasing in a dashboard. The data set will first be examined and prepped. Several machine learning techniques, including the Support Vector Machine, Decision tree, Naive Bayes, Random forest, K-Nearest Neighbour, and Neural networks, can be used to predict cardiac disease. We discovered that these algorithms were each applied separately based on our study. To achieve greater accuracy than is feasible, our system combines all of these algorithms with the ideas of neural networks. The average forecast from the aforementioned algorithms will be our final outcome. We anticipate achieving an accuracy of >90% as we mix multiple algorithms.
3.	Novelty / Uniqueness	The suggested system is innovative in that it educates people about their bodies on a non-medical level and offers advice. This will enable them to take the necessary safeguards and pay attention to their body's needs. Based on gender ,age , chest pain ,blood pressure, cholesterol level etc a suggested study relating to cardiac arrest
		prediction utilising the real-time dataset is categorised. We intend to employ techniques to determine the probabilities of risk classification based on age , gender, chest pain ,blood pressure ,cholesterol level etc
4.	Social Impact / Customer Satisfaction	It helps with disease prediction at an early stage and frequently alerts the user to his current health status. Earn money by selling dashboards to medical, diagnostic, and clinical facilities. Effective management of heart disease can be achieved through a mix of medication, lifestyle modifications, and, occasionally, surgery.
5.	Business Model (Revenue Model)	This interactive dashboard for heart disease prediction can be

		installed in hospitals and healthcare facilities, allowing for quick analysis. Predicted outcomes can be utilised to avoid, and hence lower, the need for expensive surgical procedures. Companies who make smartwatches may use this dashboard as a tool.
6.	Scalability of the Solution	We show that this method can produce predictions with the maximum degree of accuracy, allowing it to be successfully applied in the healthcare industry.

3.4 Problem Solution fit

Project Title: Visualizing and Predicting Heart Diseases with an Interactive Dashboard

Project Design Phase-I - Solution Fit

Team ID: PNT2022TMID23310

Define CS, fit into CC

1. CUSTOMER SEGMENT(S) CS

Individual users include doctors, medical experts, patients, and those who wish to know if they are at risk for heart disease.

6. CUSTOMER CONSTRAINTS CC

Internet issues, Database errors, Understanding the interactive dashboard

5. AVAILABLE SOLUTIONS AS

Heart disease prediction using exploratory data analysis,data mining techniques etc.

Explore AS, differentiate

Focus on J&P, tap into BE, understand RC

2. JOBS-TO-BE-DONE / PROBLEMS J&P

Data quality should be precise and trustworthy. Naturally, the result will purely depend on the information we use to make the prediction. The prediction that is based on the data will also be biassed if the data is skewed.

9. PROBLEM ROOT CAUSE RC

High blood pressure, high LDL cholesterol, diabetes, smoking, secondhand smoke exposure, obesity, a poor diet, and inactivity are the main causes of heart diseases

7. BEHAVIOUR BE

To give a complete and organised data collection, including age, gender, chest discomfort, blood pressure, cholesterol level, and other factors, in order to make an accurate predictions

Focus on J&P, tap into BE, understand RC

Identify strong TR & EM

3. TRIGGERS TR

As a preventative strategy, dread of heart illnesses, abrupt chest pain, and easily understood prediction with an interactive dashboard

4. EMOTIONS: EM

BEFORE

There is no reliable technique to detect cardiovascular disease in its early stages.

AFTER

An interactive dashboard that displays the severity and stages of heart disease along with appropriate advice and suggestions

10. YOUR SOLUTION SL

The concept behind the encountered solution is to suggest an interactive dashboard for visualizing and forecasting cardiac problems, where the user may observe the analysis of people's medical reports and the anticipated outcome. IBM Cognos will be used to visualize thereby showcasing in a dashboard. The dataset will first be examined and prepped. Several machine learning techniques can be used to predict cardiac disease. To achieve greater accuracy than is feasible, our system combines all of these algorithms with the ideas of neural networks. The average forecast from the aforementioned algorithms will be our final outcome. We anticipate achieving an accuracy of >90% as we mix multiple algorithms.

8. CHANNELS of BEHAVIOUR CH

8.1 ONLINE

The user will provide their data using an interactive dashboard to get precise predictions.

8.2 OFFLINE

The user can decide whether or not to consult a doctor based on the prediction they receive.

Identify strong TR & EM

REQUIREMENT ANALYSIS

4.1 Functional requirement

FR No.	Functional Requirement (EPIC)	Subject Requirement (Story/ Sub-Task)
FR – 1	Dataset Collection	To acquire the best results, data is gathered from a variety of sources, especially those that specifically cater to real-world data. In this instance, we make use of a data set of individuals who have had examinations and testing to identify heart disease. The data set is a matrix where the rows represent the patients and the columns represent the factors or traits (features) that will be put to the test.
FR – 2	Manual Exploration	This process is crucial for the development of machine learning algorithms. Since we study the data set, we should rank or categorize each individual as either sick or not. We create the data set, which serves as the training dataset for the algorithms.
FR – 3	Data Pre-processing	Data pre-processing is a crucial phase in the machine learning process since the calibre of the data and the information that can be extracted from it directly affects how well our model can learn. For this reason, it is crucial that we pre-process the data before introducing it to our model.
FR – 4	Data Modelling	This stage involves applying and evaluating the chosen algorithms in order to determine which is the most effective.
FR – 5	Data Analysis and Prediction	The insights obtained from the model construction predicts the necessary output in accordance with user needs.
FR – 6	Visualization	We apply different techniques to achieve the final results, which are visualized using various representations

4.2 Non-Functional requirements

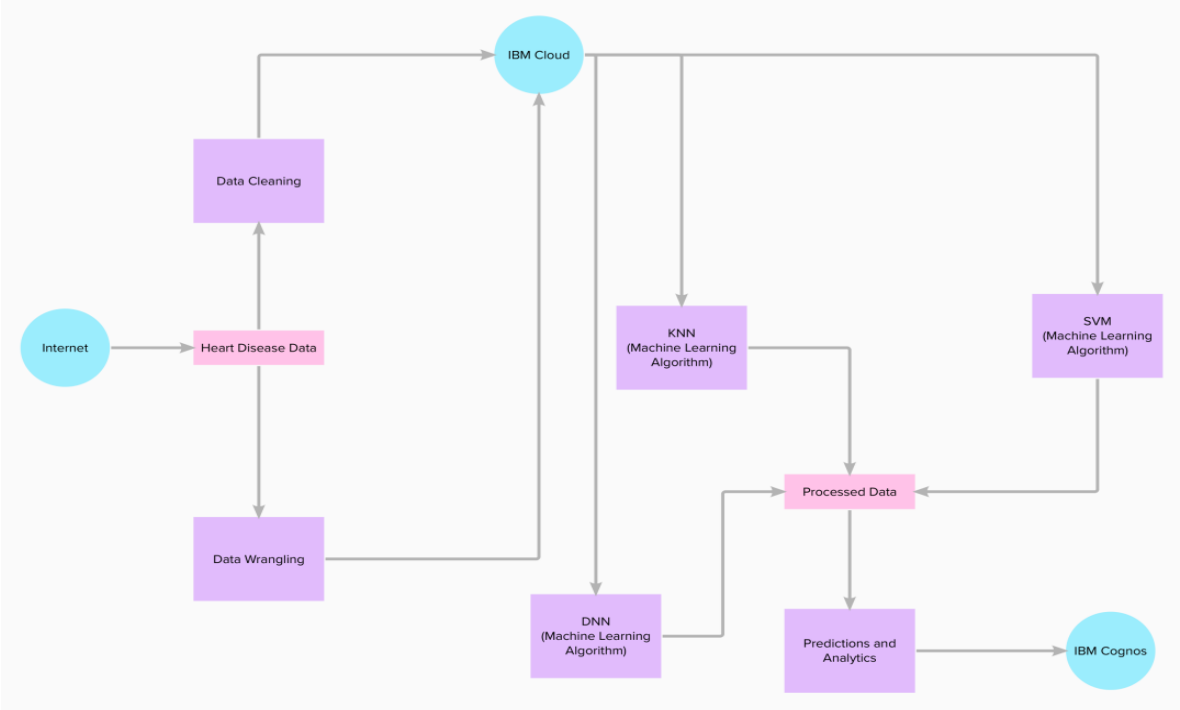
NFR No.	Non – Functional Requirement	Description
NFR 1	Quality of Dataset	Dataset should be gathered in such a way it is well suited to serve its specific purpose without any anomalies as the final result is dependent on the dataset selected.
NFR 2	Runtime, Adaptation, Evolution	To take into account a needs-based approach to runtime system operation, where functional and quality requirements might be tracked in real- time using information from the system that is actually running. Work in this field proceeded further to take requirements-based runtime adaptation into account. For instance, if a particular quality need is not properly met at runtime, the system will evolve and alter to try to improve performance or quality while taking quality trade-offs into account.
NFR 3	Accuracy & Performance	The majority of machine learning (ML) work discusses algorithm accuracy (typically precision and recall), or how "accurate" the output is in relation to reality. More research on algorithm performance is being done, including comparisons of performance in various circumstances.
NFR 4	Fairness	Concentrate on technological ways to improve the fairness of ML algorithms, concluding that removing sensitive features is insufficient to guarantee fair results, and taking into account the trade-off between fairness and other NFRs. The accurate implementation of fairness depends more on how it is defined and measured than how it is implemented, according to research in this area that has sought to find mathematical or

		formal definitions of fairness, such as statistical parity or individual fairness. Engineers seek to take into account fairness' negative impacts and view it in the context of a larger system.
NFR 5	Transparency	Although the outcomes of ML can have a substantial impact on the actual world, it is frequently unclear how these outcomes are obtained, which undermines confidence and openness. To address this problem, it is important to better the ML results explanations.
NFR 6	Security and Privacy	Introduce a technique to protect privacy in ML with an emphasis on minimising runtime and communication overhead. A threat model for ML that takes into account the rise in ML- related security and privacy issues to be recognized.
NFR 7	Testability	Testing the outcome of ML systems to improve software testing strategies.
NFR 8	Reliability	Looking at the reliability of individual ML predictions, focusing on reliability estimation

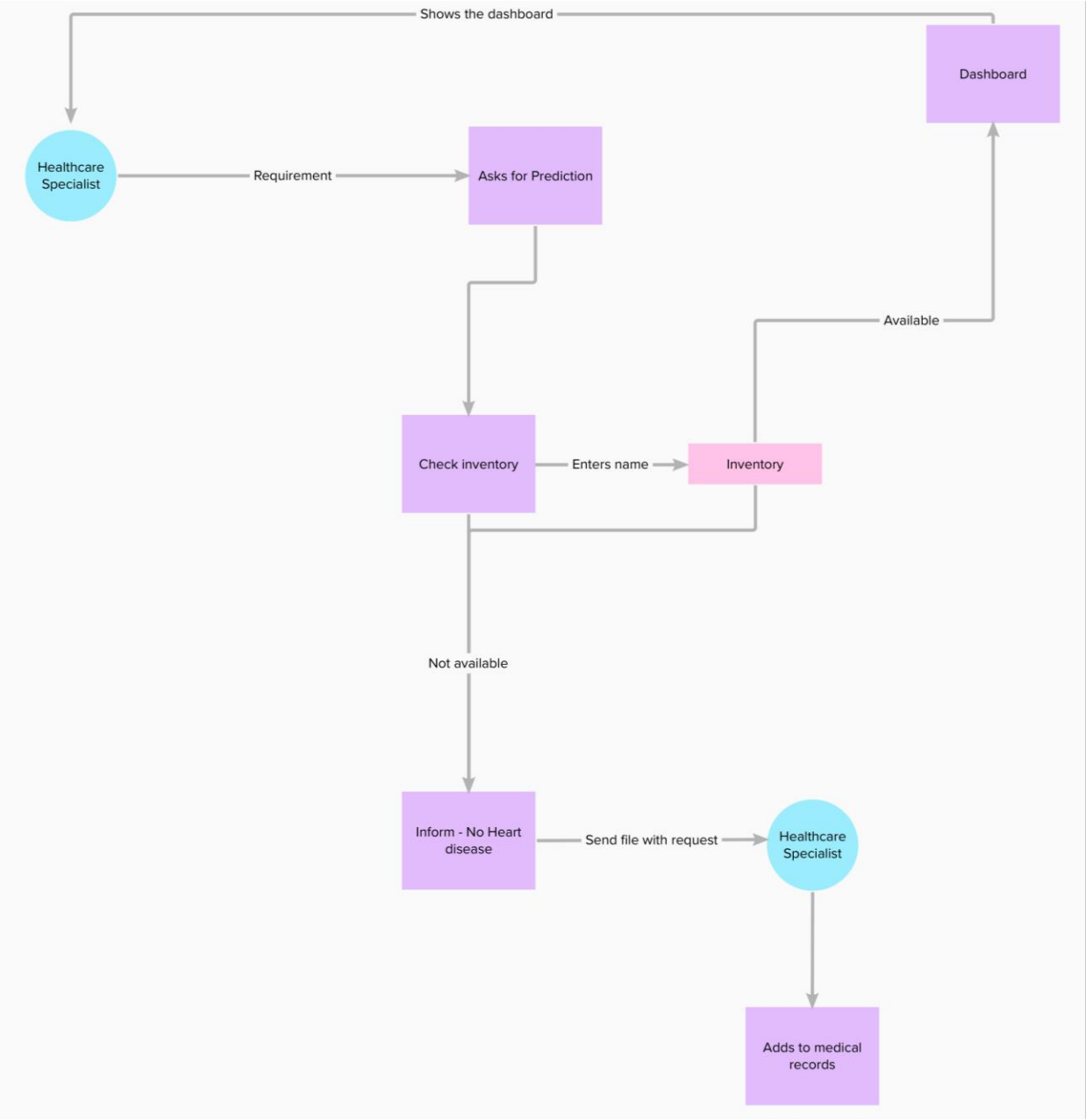
PROJECT DESIGN

5.1 Data Flow Diagrams

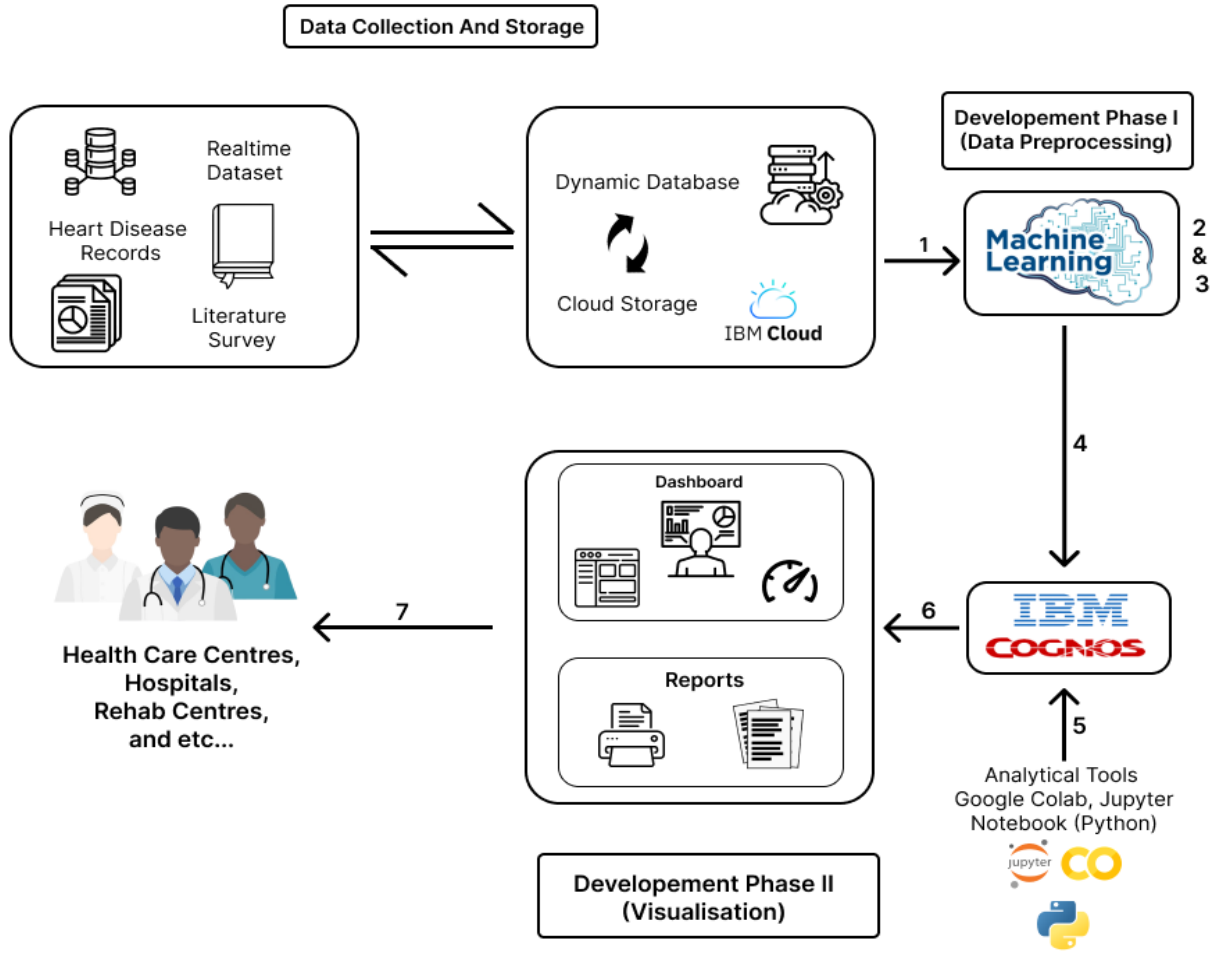
Level – 0 DFD:



Level – I DFD:


Shows the dashboard
Dashboard
Healthcare Specialist
Requirement
Asks for Prediction
Available
Check inventory
Enters name
Inventory
Not available
Inform - No Heart disease
Send file with request
Healthcare Specialist
Adds to medical records

5.2 Solution & Technical Architecture



1 - Loading the dataset
2 - Data cleaning & exploration
3 - Applying algorithms to the dataset to gather insights
5 - Using python tools for processing the dataset

4 - Loading the insight input from step 2 and 3 to explore the dataset
6 - Creating an interactive dashboard
7 - Providing the results to the users

5.3 User Stories

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance Criteria	Priority	Team Members
Sprint 1	Pre-processing the dataset	USN-1	Data Loading	Loading the dataset	High	Gokul D Chris Harry P Vigneshraj V Hari Haran V Ruthresh Kumar R
		USN-2	Data Cleaning	Deleting redundant values, missing values and wrong data	High	
Sprint 2	Training the dataset	USN-3	Training the given dataset with suitable algorithm	The given dataset trained without any errors.	High	Gokul D Chris Harry P Vigneshraj V Hari Haran V Ruthresh Kumar R
	Testing the Dataset	USN-4	Testing the trained data with some input	The testing goes well with correct prediction		
Sprint 3	Results and Metrics	USN-5	Computing the results based on prediction and enhancing the results.	Results should match the expected accuracy rate	High	Gokul D Chris Harry P Vigneshraj V Hari Haran Ruthresh Kumar R
Sprint 4	Classified result	USN-4	Creating a UI to get the input from user to predict according to user needs	Fills the categories to visualize	High	Gokul D Chris Harry P Vigneshraj V Hari Haran V Ruthresh Kumar R
		USN-7	Displaying the result	After prediction the results are shown on the same web page	High	

PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance Criteria	Priority	Team Members
Sprint 1	Pre-processing the dataset	USN-1	Data Loading	Loading the dataset	High	Gokul D Chris Harry P Vigneshraj V Hari Haran V Ruthresh Kumar R
		USN-2	Data Cleaning	Deleting redundant values, missing values and wrong data	High	
Sprint 2	Training the dataset	USN-3	Training the given dataset with suitable algorithm	The given dataset trained without any errors.	High	Gokul D Chris Harry P Vigneshraj V Hari Haran V Ruthresh Kumar R
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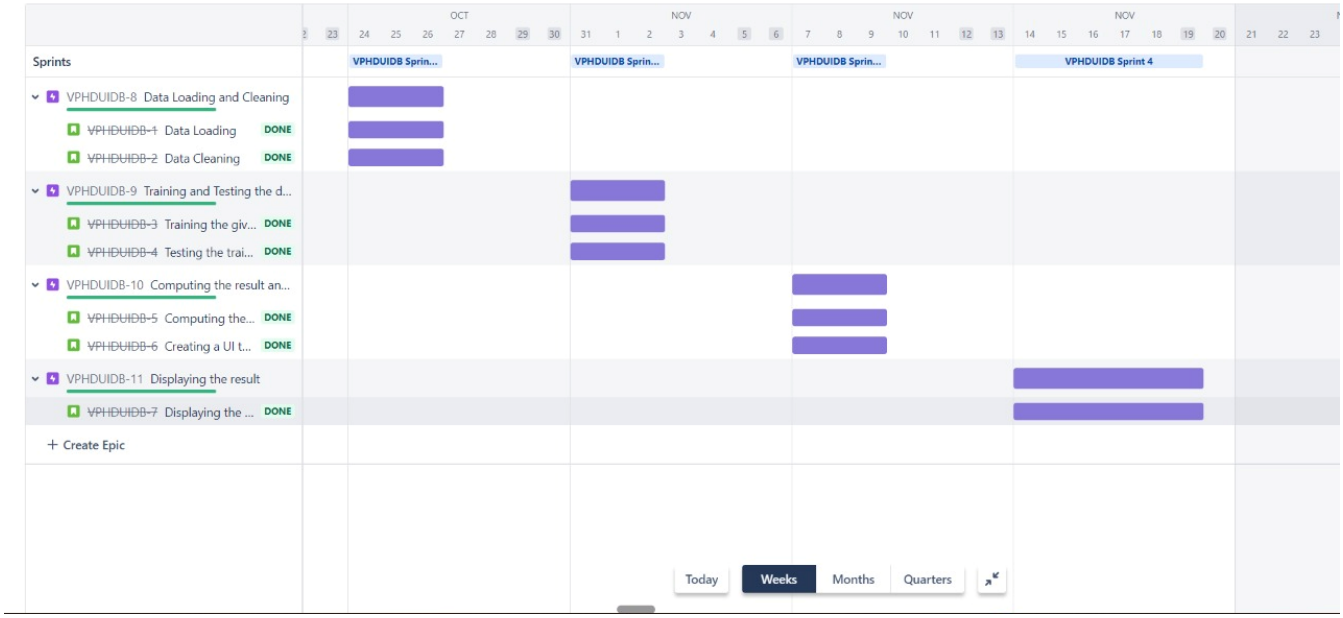
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance Criteria	Priority	Team Members
		USN-7	Displaying the result	After prediction the results are shown on the same web page	High	

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 (Expected)
Sprint-1	1	3 Days	24 Oct 2022	26 Oct 2022	1	26 Oct 2022
Sprint-2	1	3 Days	31 Oct 2022	02 Nov 2022	1	02 Nov 2022
Sprint-3	1	3 Days	07 Nov 2022	09 Nov 2022	1	09 Nov 2022
Sprint-4	1	6 Days	14 Nov 2022	19 Nov 2022	1	19 Nov 2022

6.3 Reports From JIRA



7 CODING AND SOLUTIONING

7.1 FEATURE 1: PREDICTION MODEL

Prediction Model: When applied to a nonlinear data set, the random forest technique performs better than the decision tree. The collection of decision trees known as a KNN was produced by several root nodes. The random forest algorithm can achieve more accuracy quickly and produce expected results.
Algorithm:
Step 1: Input the required details
Step 2: The model processes the input with the help of KNN algorithm
Step 3: The results are displayed

CODE:

```
# importing required libraries
import numpy as np
import pandas as pd
import pickle
from sklearn.preprocessing import StandardScaler
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import accuracy_score, classification_report, confusion_matrix
from sklearn.ensemble import RandomForestClassifier
from sklearn.svm import SVC
from sklearn.linear_model import LogisticRegression
from sklearn.neighbors import KNeighborsClassifier
from sklearn.tree import DecisionTreeClassifier


# loading and reading the dataset

heart = pd.read_csv("heart_cleveland_upload.csv")

# creating a copy of dataset so that will not affect our original dataset.
heart_df = heart.copy()

# Renaming some of the columns
heart_df = heart_df.rename(columns={'condition':'target'})
print(heart_df.head())

# model building
```

```
#fixing our data in x and y. Here y contains target data and X contains rest all the features.
x= heart_df.drop(columns= 'target')
y= heart_df.target

# splitting our dataset into training and testing for this we will use train_test_split library.
x_train, x_test, y_train, y_test= train_test_split(x, y, test_size= 0.25, random_state=42)

#feature scaling
scaler= StandardScaler()
x_train_scaler= scaler.fit_transform(x_train)
x_test_scaler= scaler.fit_transform(x_test)

# creating K-Nearest-Neighbor classifier
model=RandomForestClassifier(n_estimators=20)
model.fit(x_train_scaler, y_train)
y_pred= model.predict(x_test_scaler)
p = model.score(x_test_scaler,y_test)
print(p)

print('Classification Report\n', classification_report(y_test, y_pred))
print('Accuracy: {}%\n'.format(round((accuracy_score(y_test, y_pred)*100),2)))

cm = confusion_matrix(y_test, y_pred)
print(cm)

# Creating a pickle file for the classifier
filename = 'heart-disease-prediction-knn-model.pkl'
pickle.dump(model, open(filename, 'wb'))
```

Form.html

```
<!DOCTYPE html>

<html lang="en" dir="ltr">

  <head>
    <meta charset="utf-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Heart Disease Predictor</title>
    <!--<link rel="stylesheet" type="text/css" href="{{ url_for('static', filename='style.scss') }}"> -->
    <script src="https://kit.fontawesome.com/5f3f547070.js"
      crossorigin="anonymous"></script>
    <link href="https://fonts.googleapis.com/css2?family=Pacifico&display=swap"
      rel="stylesheet">
    <style>
    @import url(https://fonts.googleapis.com/css?family=Raleway:400,500);

html,
body {
  background-color: #00bfff;
  text-align: center;
  font-family: 'Raleway', Helvetica, sans-serif;
```

```
  min-width: 320px;
}

header {
  font-size: 2em;
  font-weight: bold;
  margin: 20px;
}

#form-outer {
  background-color: rgb(250, 250, 250);
  margin: 0 auto;
  border-radius: 4px;
  width: 75%;
  max-width: 900px;
  padding: 10px;
  padding-top: 20px;
}

.labels {
  display: inline-block;
  text-align: right;
  width: 40%;
  padding: 5px;
  vertical-align: top;
  margin-top: 10px;
}

.rightTab {
  display: inline-block;
  text-align: left;
  width: 48%;
  vertical-align: middle;
}

.input-field {
  height: 20px;
  width: 280px;
  padding: 5px;
  margin: 10px;
  border: 1px solid #c0c0c0;
  border-radius: 2px;
}

#userAge {
  width: 40px;
}


#submit {
  background-color: #1a8cff;
  border-radius: 4px;
```

```
  color: white;
  font-size: 1em;
  height: 40px;
  width: 96px;
  margin: 10px;
  border: 0px solid;
}

#reset {
  background-color: #1a8cff;
  border-radius: 4px;
  color: white;
  font-size: 1em;
  height: 40px;
  width: 96px;
  margin: 10px;
  border: 0px solid;
}
.dropdown {
  height: 35px;
  width: 140px;
  padding: 5px;
  margin: 10px;
  margin-top: 15px;
  border: 1px solid #c0c0c0;
  border-radius: 2px;
}


@media screen and (max-width: 833px) {
  .input-field {
    width: 80%;
  }
  select {
    width: 90%;
  }
}

@media screen and (max-width: 520px) {
  .labels {
    width: 100%;
    text-align: left;
  }
  .rightTab {
    width: 80%;
    float: left;
  }
  .input-field {
    width: 100%;
  }
  select {
    width: 100%;
```

```
  }
}
  </style>
  </head>

  <body>
    <h1 id="title">Heart Disease Prediction</h1>
    <div id="form-outer">
      <p id="description">
        Enter the below details to predict your health
      </p>
      <form id="survey-form" action="{{ url_for('predict')}}" method="POST">
        <div class="rowTab">
          <div class="labels">
            <label id="name-label" for="name">Age: </label>
          </div>
          <div class="rightTab">
            <input autofocus type="number" name="age" id="age"
              class="input-field" placeholder="Enter your age" required>
          </div>
        </div>

        <div class="rowTab">
          <div class="labels">
            <label for="department">Sex: </label>
          </div>
          <div class="rightTab">
            <select id="sex" name="sex" class="dropdown">
              <option disabled value>Select an option</option>
              <option value="1">Male</option>
              <option value="0">Female</option>
            </select>
          </div>
        </div>

        <div class="rowTab">
          <div class="labels">
            <label for="cp">Chest Pain Type: </label>
          </div>
          <div class="rightTab">
            <select id="cp" name="cp" class="dropdown">
              <option disabled value>Select an option</option>
              <option value="0">Typical Anigma</option>
              <option value="1">Atypical Anigma</option>
              <option value="2">Non-anginal Pain</option>
              <option value="3">Asymtomatic</option>
            </select>
          </div>
        </div>

        <div class="rowTab">
          <div class="labels">
```

```
    <label id="fname-label" for="trestbps">Resting Blood Pressure:
    </label>
  </div>
  <div class="rightTab">
    <input autofocus type="text" name="trestbps" id="trestbps"
      class="input-field" placeholder="Enter Resting BP (94-200) mm/Hg"
      required>
  </div>
</div>

<div class="rowTab">
  <div class="labels">
    <label id="mname-label" for="chol">Serum Cholesterol: </label>
  </div>
  <div class="rightTab">
    <input autofocus type="text" name="chol" id="chol"
      class="input-field" placeholder="Enter Cholesterol Level (126-564)
      mg/dl" required>
  </div>
</div>

<div class="rowTab">
  <div class="labels">
    <label for="fbs">Fasting Blood Sugar: </label>
  </div>
  <div class="rightTab">
    <select id="fbs" name="fbs" class="dropdown">
      <option disabled value>Select an option</option>
      <option value="1">Greater than 120 mg/dl</option>
      <option value="0">Less than 120 mg/dl</option>
    </select>
  </div>
</div>


<div class="rowTab">
  <div class="labels">
    <label for="restecg">Resting ECG Results: </label>
  </div>
  <div class="rightTab">
    <select id="restecg" name="restecg" class="dropdown">
      <option disabled value>Select an option</option>
      <option value="0">Normal</option>
      <option value="1">Having ST-T wave abnormality</option>
      <option value="2">Probable or definite left ventricular
        hypertrophy</option>
    </select>
  </div>


  <div class="rowTab">
    <div class="labels">
```

```
    <label id="mname-label" for="mname">Maximum Heart Rate: </label>
  </div>
  <div class="rightTab">
    <input autofocus type="text" name="thalach" id="thalach"
      class="input-field" placeholder="Enter Cholesterol Level
      (126-564) mg/dl" required>
  </div>
</div>

<div class="rowTab">
  <div class="labels">
    <label for="exang">Exercise Induced Angina </label>
  </div>
  <div class="rightTab">
    <select id="exang" name="exang" class="dropdown">
      <option disabled value>Select an option</option>
      <option value="1">Yes</option>
      <option value="0">No</option>

    </select>
  </div>
</div>

<div class="rowTab">
  <div class="labels">
    <label id="mname-label" for="oldpeak">ST depression: </label>
  </div>
  <div class="rightTab">
    <input autofocus type="text" name="oldpeak" id="oldpeak"
      class="input-field" placeholder="Enter ST depression (0-6.2)"
      required>
  </div>
</div>

<div class="rowTab">
  <div class="labels">
    <label for="slope">Slope of the peak exercise ST segment </label>
  </div>
  <div class="rightTab">
    <select id="slope" name="slope" class="dropdown">
      <option disabled value>Select an option</option>
      <option value="0">Upsloping</option>
      <option value="1">Flat</option>
      <option value="2">Downsloping</option>
    </select>
  </div>
</div>

<div class="rowTab">
  <div class="labels">
    <label id="mname-label" for="ca">Number of Major Vessels </label>
  </div>
```

```
        <div class="rightTab">
          <input autofocus type="text" name="ca" id="ca" class="input-field"
            placeholder="Typically between (0-4)" required>
        </div>
      </div>

      <div class="rowTab">
        <div class="labels">
          <label for="thal">Thalassemia </label>
        </div>
        <div class="rightTab">
          <select id="thal" name="thal" class="dropdown">
            <option disabled value>Select an option</option>
            <option value="0">Normal</option>
            <option value="1">Fixed Defect</option>
            <option value="2">Reversible Defect</option>
          </select>
        </div>
      </div>

      <button id="submit" type="submit" value="predict">Predict</button>
      <button id="reset" type="reset">Reset</button>
    </form>

  </div>


</body>
```

7.2 FEATURE 2: DASHBOARD

Dashboard: Our application helps the user in finding out if they have heart disease or not. They can find out by entering details such as their heart rate, cholesterol, blood pressure etc. A dashboard is also attached along with the results for better understanding where they can compare their blood pressure and similar metrics with other users.

CODE:

```
<!DOCTYPE html>

<html lang="en" dir="ltr">
    <head>
            <meta charset="utf-8">
            <meta name="viewport" content="width=device-width, initial-scale=1.0">
            <title>Heart Disease Predictor</title>
            <link rel="shortcut icon" href="{{ url_for('static',
                    filename='diabetes-favicon.ico') }}">
            <link rel="stylesheet" type="text/css" href="{{ url_for('static',
                    filename='style.css') }}">
            <script src="https://kit.fontawesome.com/5f3f547070.js"
```

```
        crossorigin="anonymous"></script>
<script
        src="https://cdnjs.cloudflare.com/ajax/libs/Chart.js/2.5.0/Chart.min.js"></script>
<link href="https://fonts.googleapis.com/css2?family=Pacifico&display=swap"
        rel="stylesheet">

<style>
        @import url(https://fonts.googleapis.com/css?family=Raleway:400,500);

html,
body {
  background-color: #00bfff;
  text-align: center;
  font-family: 'Raleway', Helvetica, sans-serif;
  min-width: 320px;
}

header {
  font-size: 2em;
  font-weight: bold;
  margin: 20px;
}

#form-outer {
  background-color: rgb(250, 250, 250);
  margin: 0 auto;
  border-radius: 4px;
  width: 75%;
  max-width: 900px;
  padding: 10px;
  padding-top: 20px;
}

.labels {
  display: inline-block;
  text-align: right;
  width: 40%;
  padding: 5px;
  vertical-align: top;
  /* margin-bottom: 10px; */
   margin-top: -6px;
}

.rightTab {
  display: inline-block;
  text-align: left;
  width: 48%;
   vertical-align: middle;
   margin-bottom: 8px;
}

.input-field {
```

```
  height: 20px;
  width: 280px;
  padding: 5px;
  margin: 10px;
  border: 1px solid #c0c0c0;
  border-radius: 2px;
}

#userAge {
  width: 40px;
}


#submit {
  background-color: #1a8cff;
  border-radius: 4px;
  color: white;
  font-size: 1em;
  height: 40px;
  width: 96px;
  margin: 10px;
  border: 0px solid;
}

#reset {
  background-color: #1a8cff;
  border-radius: 4px;
  color: white;
  font-size: 1em;
  height: 40px;
  width: 96px;
  margin: 10px;
  border: 0px solid;
}
.dropdown {
  height: 35px;
  width: 140px;
  padding: 5px;
  margin: 10px;
  margin-top: 15px;
  border: 1px solid #c0c0c0;
  border-radius: 2px;
}
.container{
        margin-bottom: 10px;
}


@media screen and (max-width: 833px) {
  .input-field {
        width: 80%;
  }
```

```
        select {
            width: 90%;
        }
    }

    @media screen and (max-width: 520px) {
        .labels {
            width: 100%;
            text-align: left;
        }
        .rightTab {
            width: 80%;
            float: left;
        }
        .input-field {
            width: 100%;
        }
        select {
            width: 100%;
        }
    }
    </style>
</head>

<body>

    <div id="form-outer">
        <!-- Website Title -->
        <div class="container">
            <h2 class='container-heading' style="text-align: center;"><span
                    class="heading_font">Heart Disease Predictor</span></h2>
        </div>

        <!-- Result -->

        <div class="info">
            {%for val1,val2 in input.items()%}
            <form id="survey-form">
                <div class="rowTab">
                    <div class="labels">
                        <label id="name-label" for="name">{{val1}}: </label>
                    </div>
                    <div class="rightTab">
                        <!-- <p style="margin-top:5px ;">{{val2}}</p> -->
                        <label id="name-label" for="name">{{val2}} </label>
                    </div>
                </div>
                <pre>  </pre>
            </form>
            {% endfor %}
        </div>
```

```
                <div class="results">
                        {% if prediction==1 %}
                        <h1>Prediction: <span class='danger'>Oops! You have Chances of Heart
                                        Disease.</span></h1>

                        {% elif prediction==0 %}
                        <h1>Prediction: <span class='safe'>Great! You DON'T chances have Heart
                                        Disease.</span></h1>

                        {% endif %}
                </div>




                <!--    <div class="graph">
                <img src="/static/1.jpeg" alt="" width="600" height="400"/>
                <img src="/static/2.jpeg" alt="" width="600" height="400"/>
                <img src="/static/3.jpeg" alt="" width="600" height="400"/>
                <img src="/static/4.jpeg" alt="" width="600" height="400"/>
                <img src="/static/5.jpeg" alt="" width="600" height="400"/>
                <img src="/static/6.jpeg" alt="" width="600" height="400"/>
                <img src="/static/7.jpeg" alt="" width="600" height="400"/>
                <img src="/static/8.jpeg" alt="" width="600" height="400"/>
        </div> -->
                <a

    href="https://us1.ca.analytics.ibm.com/bi/?perspective=dashboard&pathRef=.my_folders%2FAss_
2&action=view&mode=dashboard">hello</a><iframe
    src="https://us1.ca.analytics.ibm.com/bi/?perspective=dashboard&amp;pathRef=.my_folders%2
FAss_2&amp;closeWindowOnLastView=true&amp;ui_appbar=false&amp;ui_navbar=false&amp;
shareMode=embedded&amp;action=view&amp;mode=dashboard"
                        width="320" height="200" frameborder="0" gesture="media"
                        allow="encrypted-media" allowfullscreen=""></iframe>
                <!-- Footer -->
                <div class='footer'>
                </div>
        </div>
    </body>
</html>
```

8 TESTING

8.1 Test Cases

Testcase 1: Verify user is able to see the landing page and check the UI is rendered without no erros

Testcase 2: Visualization page shows all visualizations created for the project

Testcase 3: Web page page showing the dash board created for the project

Testcase 4: Report page showing the report created for the project

Testcase 5: Story page showing user story created for the project

Testcase 6: A input valued form appears to get the heart related input values form to process the prediction

Testcase 7: To check each form elements gets the input

Testcase 8: To check the prediction is happening when submit button is clicked and the results are displayed in a new page

8.2 User acceptance testing

Date	03-Nov-22
Team ID	PNT2022TMID23310
Project Name	Project - Visualizing and Predict
Maximum Marks	4 marks

Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Commnets	TC for Automation(Y/N)	BUG ID	Executed By
Landing	Functional	UI	Verify user is able to see the	Knowledge on HTML, CSS,	1.Enter URL and click go	https://github.com/IBM-	All the menu options should getv	Working as	Pass	Steps were clear and	No	NA	Vigneshraj V
Visualization_TC_	Funtional	Visualizati	Visualization page shows all	IBM Cognos Analytics	1.Enter URL and click go	https://github.com/IBM-	Visualization page should contain	Working as	Pass	Steps were clear and	No	NA	Chris Harry P
Dashboard_TC_O	Funtional	Dashboard	Web page page showing the	IBM Cognos Analytics	1.Enter URL and click go	https://github.com/IBM-	Dash Board page created for the	Working as	Pass	Steps were clear and	No	NA	Ruthresh Kumar R
Report_TC_OO4	Funtional	Report	Report page showing the report	IBM Cognos Analytics	1.Enter URL and click go	https://github.com/IBM-	Report page containing the report	Working as	Pass	Steps were clear and	No	NA	Hari Haran V
Story_TC_OO5	Funtional	Story page	Story page showing user story	IBM Cognos Analytics	1.Enter URL and click go	https://github.com/IBM-	Story page should containing user	Working as	Pass	Steps were clear and	No	NA	Gokul D
Predictor_TC_OO6	Funtional	Prediction	A input valued form appears to	Python Flask, HTML, CSS, JS	1.Enter URL and click go	https://github.com/IBM-	Prediction page should showing a	Working as	Pass	Steps were clear and	No	NA	Gokul D
Predictor_TC_OO7	Funtional	Prediction	To check each form elements	UI	1.Enter URL and click go	NIL	The form takes input for all fields	Working as	Pass	Steps were clear and	No	NA	Vigneshraj V, Chris
Predictor_TC_OO8	Funtional	Prediction	To check the prediction is	UI	1.Enter URL and click go	NIL	The prediction is happening after	Working as	Pass	Steps were clear and	No	NA	Gokul D

9 RESULTS

9.1 PERFORMANCE MATRICS

1. Hours worked: 50 hours
2. Stick to Timelines: 90%
3. Stay within budget: 100%
4. Consistency of the product: 85%
5. Efficiency of the product: 85%
6. Quality of the product: 85%

10 ADVANTAGES & DISADVANTAGES

Advantages:

- This is one of the quickest ways to ascertain if a person is at risk for developing a cardiac condition or not.
- Helpful for doctors to quickly categorise their patients.
- User-friendly and simple to comprehend
- Dashboard offers valuable information and is secure.

Disadvantages:

- Needs improvement
- Users must be aware of all fields,
- Null values are not accepted as input
- The user is not given any ideas.

11 CONCLUSION

Heart attack and stroke are two heart disease side effects. With early identification and treatment, the risk of problems might be decreased. So, the advice we receive from the website could potentially save lives. Heart disease should always be treated when it is young.

12 FUTURE SCOPE

"Prevention is better than cure," the proverb goes. Instead of only anticipating heart disease in its early stages, we need to look into ways to avoid it completely.
We must pass a tonne of checks before using this website. Therefore, it would be preferable if we could get the same results with less requirements.

13 APPENDIX

GitHub Link:
https://github.com/IBM-EPBL/IBM-Project-25353-1659960290

Demo Link:
https://drive.google.com/file/d/1_lnvqj0iVEF7QESuJnmVOVB0oJDXuSvS/view?usp=sharing