PROJECT REPORT FORMAT

INTRODUCTION

OVERVIEW

- I am creating a Data Analysis Project on Heart Disease Prediction.
- The project uses raw data in form of a .csv file and transforms into Data Analysis.
- This project is an attempt of data analyzing Heart Disease Prediction with the help of data science and data analytics in python code.
- Heart disease is one of the biggest causes of morbidity and mortality among the population of the world.
- Prediction of cardiovascular disease is regarded as one of the most important subjects in the section of clinical data analysis. The amount of data in the healthcare industry is huge.
- Data mining turns the large collection of raw healthcare data into information that can help to make informed decisions and predictions.
- Coronary Heart Disease (CHD) is the most common type of heart disease, killing over 370,000 people annually.
- Every year about 735,000 Americans has a heart attack. Of these, 525,000 are a first heart attack and 210,000 happen in people who have already had a heart attack.
- This makes heart disease a major concern to be dealt with. But it is difficult to identify heart disease because of several risk factors such as diabetes, high blood pressure, high cholesterol, abnormal pulse rate, and many other factors.
- Because of these factors, scientists have turned towards modern approaches like Data Mining and Machine Learning for predicting the disease.

Visualizing and Predicting Heart Diseases with an Interactive Dash Board

1. **DOMAIN NAME** : DATA ANALYTICS
2. **TEAM ID :** PNT2022TMID29533
3. **BATCH :** B7-1A3E
4. **TEAM LEADER :** MOHAMMED YASEER H
5. **TEAM MEMBER 1** : KURAL ARASAN S
6. **TEAM MEMBER 2 :** SUDHARSHAN R
7. **TEAM MEMBER 3 :** SYED SALEEM N
8. **TEAM MEMBER 4 :** YUJINE K

PAPER-1: Research on Two Dimensional Visualization of Heart Sound Signal Based on Variant Model Theory

Author: xiang liu

Abstract:

Cardiac auscultation plays an important role in the diagnosis of heart disease. Domestic and foreign researchers have done a lot of research on the analysis of heart sound signals from the point of view of signals, hoping to find an effective signal analysis method to assist doctors in the diagnosis of congenital heart disease. This paper introduces a new method to perform a series of logical transformations on the envelope of the heart sound signal, making it a two-dimensional scatter plot, and reflecting its characteristics in the case that the characteristics of the original signal are not substantially lost. In the dispersal point distribution map, different features of different pathological heart sound signals can be directly observed in the corresponding two-dimensional scatter plot.

PAPER-2: Evaluation of Artery Visualizations for Heart Disease Diagnosis

Authors:Michelle Borkin

publised year : 2011

Abstract:

Heart disease is the number one killer in the United States, and finding indicators of the disease at an early stage is critical for treatment and prevention. In this paper we evaluate visualization techniques that enable the diagnosis of coronary artery disease. A key physical quantity of medical interest is endothelial shear stress (ESS). Low ESS has been associated with sites of lesion formation and rapid progression of disease in the coronary arteries. Having effective visualizations of a patient's ESS data is vital for the quick and thorough non-invasive evaluation by a cardiologist. We present a task taxonomy for hemodynamics based on a formative user study with domain experts. Based on the results of this study we developed HemoVis, an interactive visualization application for heart disease diagnosis that uses a novel 2D tree diagram representation of coronary artery trees.

PAPER-3: Visualization and Prediction of Heart Diseases Using Data Science Framework

Authors:Vaibhav Gupta

published year : 2021

Abstract:

Heart is one the most vital organ in the human body. When we talk about heart diseases, we can have multiple conditions where heart is not working the way it should be like blockage in blood vessels. According to many researches that have been conducted through a period of time have found out that heart failure and heart disease has been the cruel cause of death in human beings. What aggravates this situation is that most of these diseases are being diagnosed at later stages at which it is very difficult to control. But if somehow, we can diagnose these diseases at its early stage, then we can surely cure the disease.

PAPER-4: Visual Analysis of Cardiac 4D MRI Blood Flow Using Line Predicates

Authors:Silvia Born

published year : 2012

Abstract:

Four-dimensional MRI is an in vivo flow imaging modality that is expected to significantly enhance the understanding of cardiovascular diseases. Among other fields, 4D MRI provides valuable data for the research of cardiac blood flow and with that the development, diagnosis, and treatment of various cardiac pathologies. However, to gain insights from larger research studies or to apply 4D MRI in the clinical routine later on, analysis techniques become necessary that allow to robustly identify important flow characteristics without demanding too much time and expert knowledge.

PAPER-5: Real-time machine learning for early detection of heart disease using big data approach

Authors:Abderrahmane Ed-Daoudy

published year:2019

Abstract:

Over the last few decades, heart disease is the most common cause of global death. So early detection of heart disease and continuous monitoring can reduce the mortality rate. The exponential growth of data from different sources such as wearable sensor devices used in Internet of Things health monitoring, streaming system and others have been generating an enormous amount of data on a continuous basis.

PAPER-6: Glyph-Based SPECT Visualization for the Diagnosis of Coronary Artery Disease.

Authors : Jennis Meyer-Spradow

published year : 2008

Abstract:

Myocardial perfusion imaging with single photon emission computed tomography (SPECT) is an established method for the detection and evaluation of coronary artery disease (CAD). State-of-the-art SPECT scanners yield a large number of regional parameters of the left-ventricular myocardium (e.g., blood supply at rest and during stress, wall thickness, and wall thickening during heart contraction) that all need to be assessed by the physician.

PAPER-7: Component-composition based heart isolation for 3D volume visualization of coronary arteries

Authors : Mingqing Chen

published year : 2015

Abstract:

Heart isolation (separating the heart from the neighboring tissues, e.g, lung, liver, and rib cage) is a prerequisite to generate a 3D volume visualization as an intuitive view for coronary disease diagnosis and treatment planning. Previously, we proposed a component-carving based heart isolation approach by removing unwanted background tissues (e.g, non-cardiac structures, left atrial appendage, and pulmonary veins/arteries) sequentially

PAPER-8: Visualization of a Digital Twin of the Heart

Authors : Oleg N. Bodinpublished

published year : 2021

This paper considers methods applying of computer graphics for visualization of electrical activity of the heart based on algorithms for topological transformation and a voxel representation of a 3-D heart model. A distinctive feature of a proposed approach is use of a spring voxel as a unit volume, which

mathematical model is a rough approximation of the heart muscle cell - a cardiomyocyte. The article describes criteria for choosing a technological platform for visualization 3D objects.

PAPER-9: 3D Visualization of Echocardiogram and Blood Flow

Authors : Jun Wangpublished

published year : 2006

Abstract:

Congenital heart defect is a leading cause of children mortality. Two-dimensional echocardiography is a safe and noninvasive diagnostic tool and two-dimensional images can be reconstructed to a three-dimensional model. However, for some complex congenital heart diseases, the visualization of three-dimensional cardiac tissue structure alone is not enough. Visualization of blood flow patterns in a human heart is important to evaluate cardiac disease of patients.

PAPER-10:Machine Learning-Based Heart Patient Scanning, Visualization, and Monitoring

Authors : Ahmed Al Ahdal

published year : 2021

Abstract:

Heart diseases leading most causes of death globally according to World Health Organization cardiovascular or all heart related disease are responsible for 17.9 million death every year. An early detection and diagnosis of the disease is very important and maybe it's the key of cure. The major challenge is to predict the disease in early stages therefor most of scientists and researches focus on Machine learning techniques which have the capability of detection with accurate result for large and complex data and apply those techniques to help in health care.

Visualizing and Predicting Heart Diseases with an Interactive DashBoard

Team ID: PNT2022TMID29533

Faculty Mentor:

A.Elangovan

Team Leader : H.Mohammed Yaseer

Team Member : R.Sudharshan

Team Member : S.Kural Arasan

Team Member : N.Syed Saleem

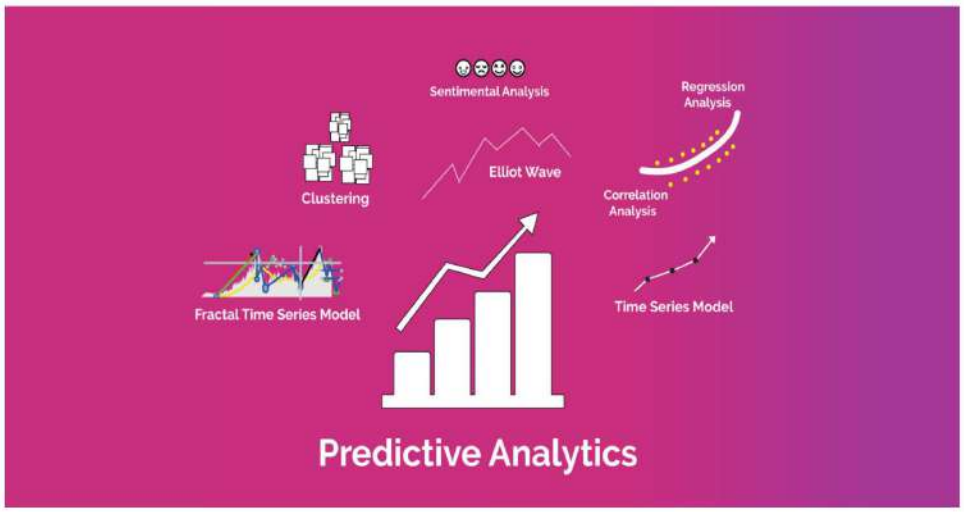
Team Member : K.Yujine

PROBLEM STATEMENT:

The major cause of death in the developed world is heart diseases. To analyse and predict which patients are most likely to suffer from heart dieases in the near future we have to find out some solution.

IDEA /SOLUTION DESCRIPTION:

So for the above mentioned problem statement,we can create or develop a interactive dashboard of visualizing the people who might have the possiblities are high chances of getting CardioVascular Diseases(CVD) through a collection of dataset.



NOVELTY /UNIQUENESS:

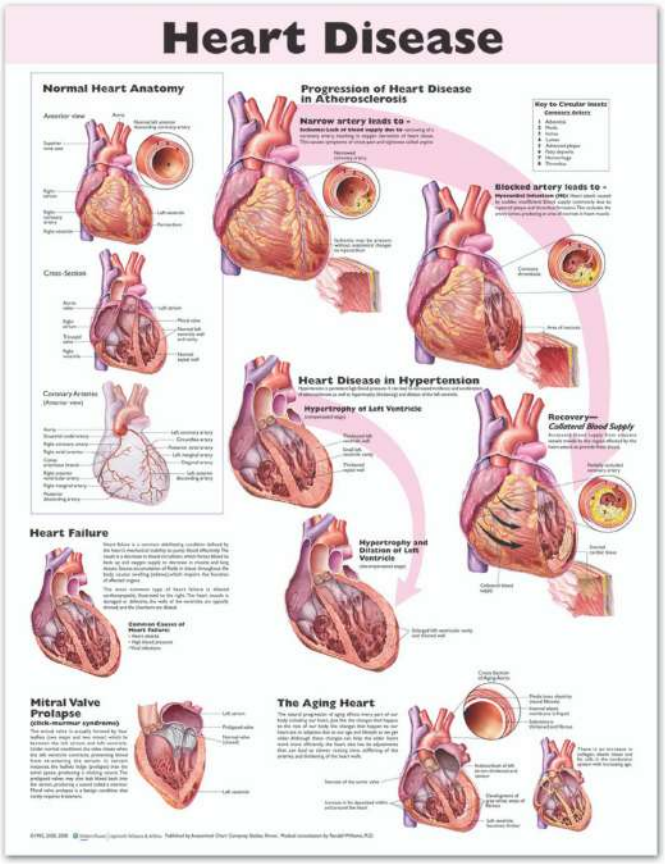
Most of all heart diseases can be identified and treated using ECG in medical field,and the theory of curing can be in handwritten and they get research to it and finally implement it in practical.But in modern technology world we can predict and able to prevent the diseases through a visualization of people who can get caught by heart diseases through data analytics.By this, we can create awareness among people who are all at the high risk of getting CVD. This make a way easy to Doctors and it consumes time for them.

Predictive Analytics Steps

SOCIAL IMPACT/CUSTOMER SATISFACTION:

By using this method,we can separate the people those who can affected vs normal people,and it will play a vital role combining both medical and technology field.

Customer(patients) can get benefit through saving financial cost (spending medical test),and by collecting dataset of their detailed condition,we can say that whether they get affected or not. This makes oldage people travel less, and get results from their comfort zone.

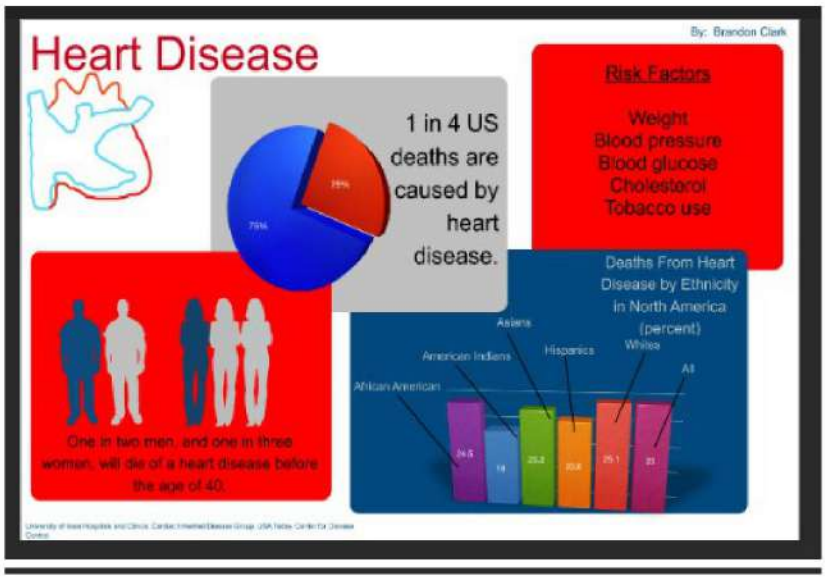


BUSINESS MODEL(REVENUE MODEL):

We can make revenue from this by making our developed model or a product form which can be modified into software kit, application or a webpage where they can interact easily. This all comes and developed under data analytics. We can get profited by selling or giving access with permission to our clients(Doctors).

SCALABILITY OF THE SOLUTION:

It is based on the number of users who maintaining the software or a system according to its performance like work flow, increase or decrease in efficiency, response time etc... Its scalability can be measured by maintanence, checking for software,fixing errors if occured in server. By this a good quality of product is determined. If you suffer from a heart condition that interferes with your ability to work, you may qualify for **disability benefits**. There are a number of heart conditions that are specifically listed by the Social Security Administration as qualifying conditions. These conditions include chronic heart failure, ischemic heart disease, recurrent arrhythmias, hypertensive heart disease, an individual on the waiting list for a heart transplant or a heart transplant recipient, and more.



IDEATION AND PROPOSED SOLUTION

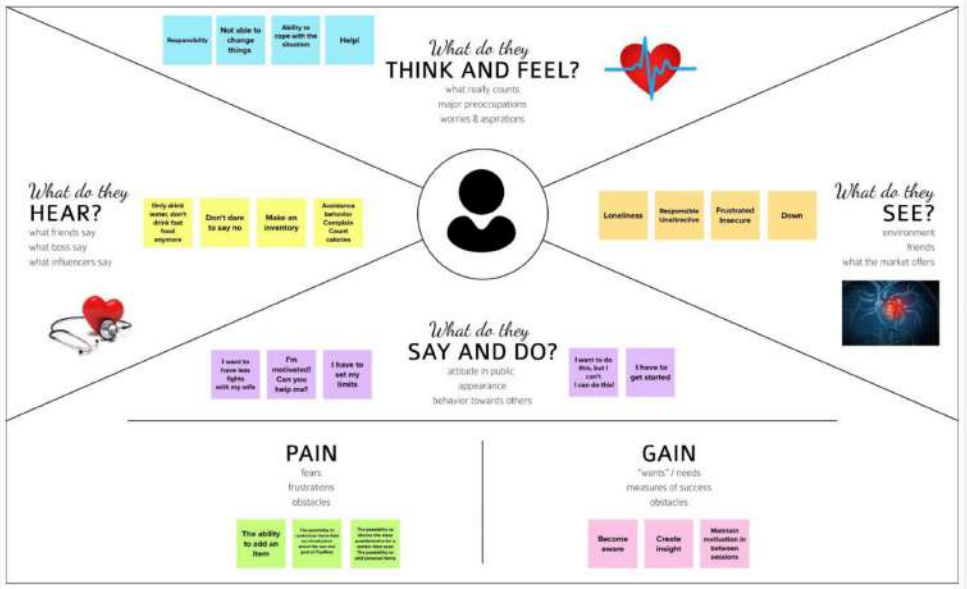
Ideation Phase
Empathize & Discover

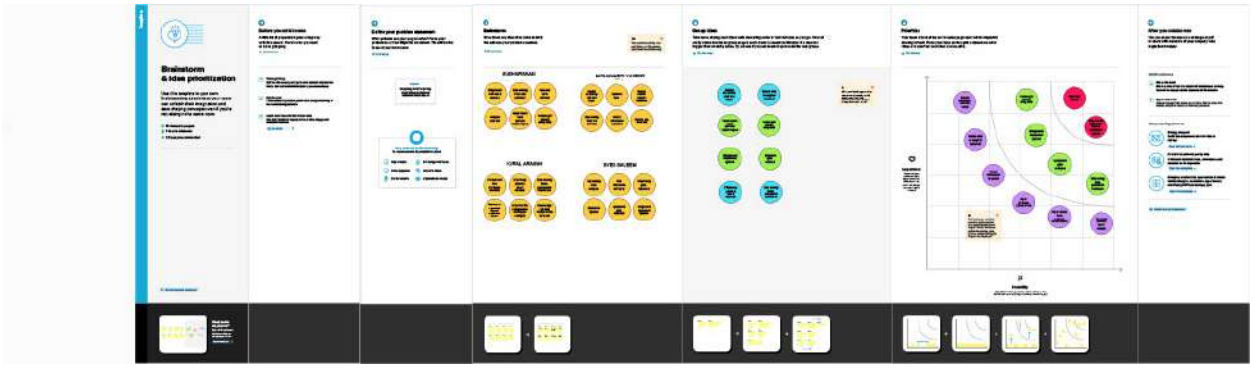
Date	19 September 2022
Team ID	PNT2022TMID29533
Project Name	Project - Visualizing and Predicting Heart Diseases with an Interactive Dash Board
Maximum Marks	4 Marks

Empathy Map Canvas:

An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviours and attitudes.

It is a useful tool to helps teams better understand their users.
Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.



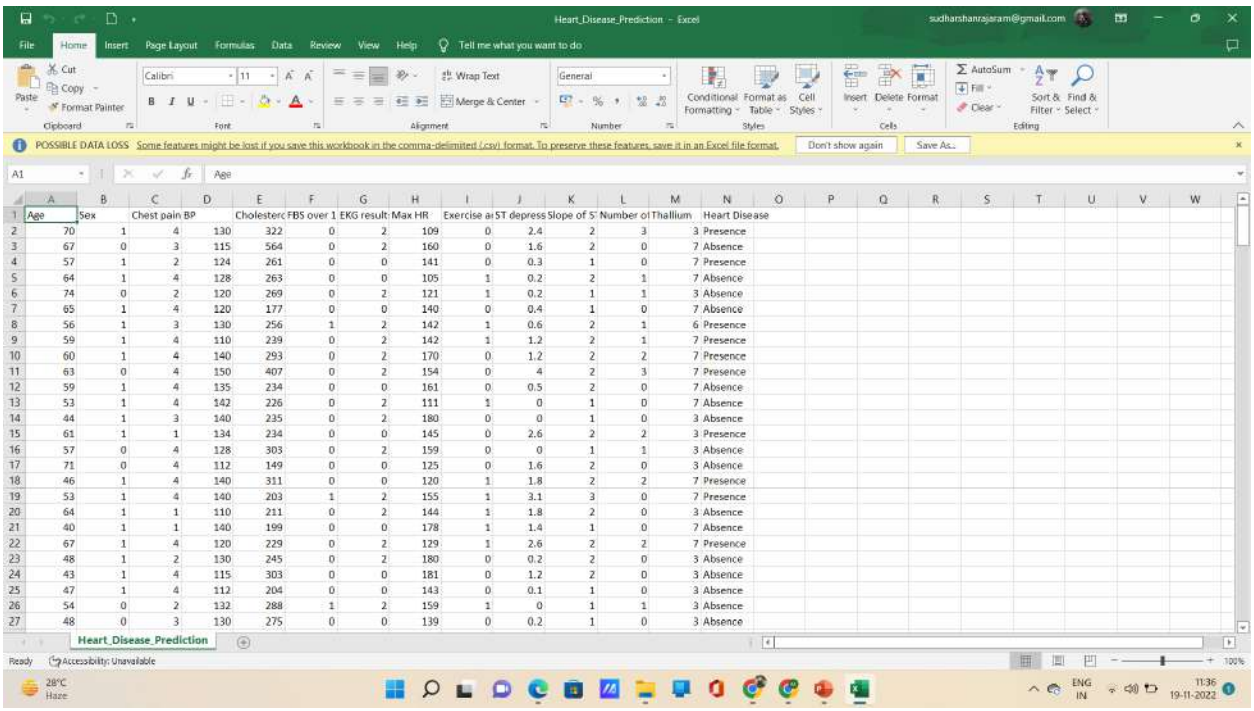

Brainstorm
& Idea prioritization


Problem-Solution fit canvas 2.0
Purpose / Vision
1. CUSTOMER SEGMENT(S)
CS
people affected with heart diseases are said to be our customers and the doctors also considered as our customers because they are the ones who wants a technology based services for treating people.
6. CUSTOMER CONSTRAINTS
CC
Focus on consumer decision making process, highlighting the key moments from identifying a need to buying and consuming a product, and adopt a true "consumer focus" in your managerial decisions by analysing how consumers make decisions, what happens in their hearts and minds.
5. AVAILABLE SOLUTIONS
AS
The proposed solutions are ECG for diagnosis of heart diseases, most of all eating a fat ,low salt diet,getting regular exercise and good sleep and not smoking are important part of treatment.Solutions are independent in various type of heart damage.
Define CS, fit into CC
Explore AS, differentiate
2. JOBS-TO-BE-DONE / PROBLEMS
J&P
It describe the mechanisms that cause a customer to adopt an innovation The theory states that markets grow evolve,and renew whatever customers have a job to be done,then buy a product to complete it.In our project, a person needs to recover from heart disease , no matter what were going to use,they need a end solution which can change their health condition when compare to before
9. PROBLEM ROOT CAUSE
RC
The main reason of getting CHD are diabetes, high chloesterol and blood pressure, smoking, mental depression, eating an unhealthy diet, and any family history of heart disease.
7. BEHAVIOUR
BE
First of all they (customer or patients) should report what problem they are undergoing according to their health condition. After that they are instructed to follow the steps that the solution provider given (that is jobs to be done for curing their illness).
Focus on J&P, tap into BE, understand RC
Focus on J&P, tap into BE, understand RC
3. TRIGGERS
TR
4. EMOTIONS: BEFORE / AFTER
EM
10. YOUR SOLUTION
SL
Our solution is about to find out the persons where at on the edge to get caught by heart disease. For this we taking a survey on peoples health conditions by age,gender , and what type of foods they are intaking . So that we predict our solution the people those who are at normal as affected through , Data Analytics.
8. CHANNELS of BEHAVIOUR
CH
They can check the symptoms of heart diseases or any other health illness by referring in online websites, etc.....
They can consult a Doctor in practical of what problem they have in their body.
Identify strong TR & EM
Extract online & offline CH of BE
AMALTAMA

REQUIREMENT ANALYSIS

FUNCTIONAL REQUIREMENTS

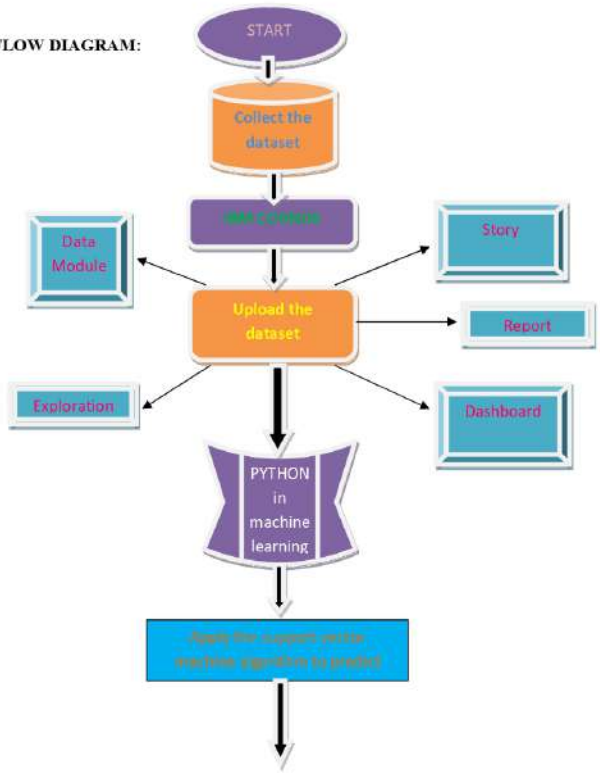
DATA SETS

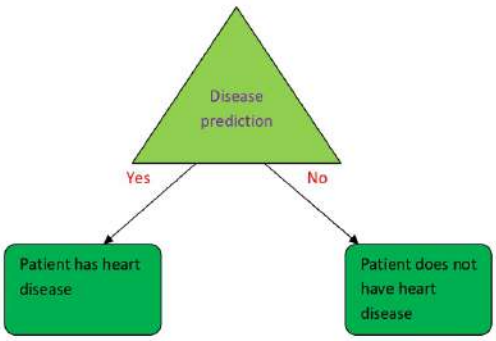


Age	Sex	Chest pain	BP	Cholesterol	FBS over 120	EKG results	Max HR	Exercise angina	ST depression	Slope of ST	Number of vessels	Thallium	Heart Disease
70	1	4	130	322	0	2	109	0	2.4	2	3	3	Presence
67	0	3	115	564	0	2	160	0	1.6	2	0	7	Absence
57	1	2	124	261	0	0	141	0	0.3	1	0	7	Presence
64	1	4	128	263	0	0	105	1	0.2	2	1	7	Absence
74	0	2	120	269	0	2	121	1	0.2	1	1	3	Absence
65	1	4	120	177	0	0	140	0	0.4	1	0	7	Absence
56	1	3	130	256	1	2	142	1	0.6	2	1	6	Presence
59	1	4	110	239	0	2	142	1	1.2	2	1	7	Presence
60	1	4	140	293	0	2	170	0	1.2	2	2	7	Presence
63	0	4	150	407	0	2	154	0	4	2	3	7	Presence
59	1	4	135	234	0	0	161	0	0.5	2	0	7	Absence
53	1	4	142	226	0	2	111	1	0	1	0	7	Absence
44	1	3	140	235	0	2	180	0	0	1	0	3	Absence
61	1	1	134	234	0	0	145	0	2.6	2	2	3	Presence
57	0	4	128	303	0	2	159	0	0	1	1	3	Absence
71	0	4	112	149	0	0	125	0	1.6	2	0	3	Absence
46	1	4	140	311	0	0	120	1	1.8	2	2	7	Presence
53	1	4	140	203	1	2	155	1	3.1	3	0	7	Presence
64	1	1	110	211	0	2	144	1	1.8	2	0	3	Absence
40	1	1	140	199	0	0	178	1	1.4	1	0	7	Absence
67	1	4	120	229	0	2	129	1	2.6	2	2	7	Presence
48	1	2	130	245	0	2	180	0	0.2	2	0	3	Absence
43	1	4	115	303	0	0	181	0	1.2	2	0	3	Absence
47	1	4	112	204	0	0	143	0	0.1	1	0	3	Absence
54	0	2	132	288	1	2	159	1	0	1	1	3	Absence
48	0	3	130	275	0	0	139	0	0.2	1	0	3	Absence

PROJECT DESIGN

DATA FLOW DIAGRAM:





Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	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 confirming my password.	I can access my account / dashboard.	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm.	High	Sprint-1
		USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login.	Low	Sprint-2
		USN-4	As a user, I can register for the application through Gmail	I can register & access the dashboard with Gmail Login	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password	I can register & access the dashboard	High	Sprint-1

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
				with Gmail Login		
	Dashboard	USN-6	Profile - view & update your profile	I can see the profile.	Medium	Sprint-2
		USN-7	Change Password - user can change the password	I can able to change the password.	High	Sprint-1
		USN-8	Home - Analyze your Heart	I can detect the health condition from where ever I want.	High	Sprint-1
		USN-9	The user will have to fill in the below 13 fields for the system to predict a disease -Age in Year -Gender -Chest Pain Type -Fasting Blood Sugar -Resting Electrographic Results(Restecg) -Exercise Induced Angina(Exang) -The slope of the peak exercise ST segment -CA – Number of major vessels colored by fluoroscopy -Thal -Trest Blood Pressure -Serum Cholesterol -Maximum heart rate achieved(Thalach) -ST depression induced by exercise(Oldpeak)	These are the categories available in that application.	High	Sprint-2
		USN-10	View Doctors - view doctor detail by searching by names or filter by specialty	Using this application, people can known that the speciality doctors.	Medium	Sprint-1
Customer (Web user)	System Requirement	USN-11	I. Hardware Requirement i. Laptop or PC • I5 processor system or higher • 4 GB RAM or higher	These are all the specification available in your PC.	High	Sprint-2

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
			• 128 GB ROM or higher ii. Android Phone (12.0 and above)			
		USN-12	II. Software Requirement iii. Laptop or PC • Windows 10 or higher • Android Studio	Install your application. This system can be used to predict the presence of heart disease.	Medium	Sprint-2
		USN-13	***Reference- https://ieeexplore.ieee.org/document/9619208/***	Go and Check our Reference link.	Medium	Sprint-1
Customer Care Executive	Dashboard	USN-14	Query	You can post your queries in the text box available in that application.	High	Sprint-1
		USN-15	Toll Free	Ask your doubts in given number(8365492107).	High	Sprint-1
		USN-16	Ratings	Give your ratings as your wish.	Medium	Sprint-1
Administrator	Dashboard	USN-17	Verification	Verification through CAPTCHA Verification through I'm not a robot	High	Sprint-1
		USN-18	validation	Reconfirming the new password Sending a two digit number in (Google account) your Old devices, so that you can enter into	High	Sprint-2

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
				a new device By entering the two digit number.		
		USN-19	Feedback - send feedback to the Admin.	Please send your feedback to host.	Medium	Sprint-2

Technical Architecture

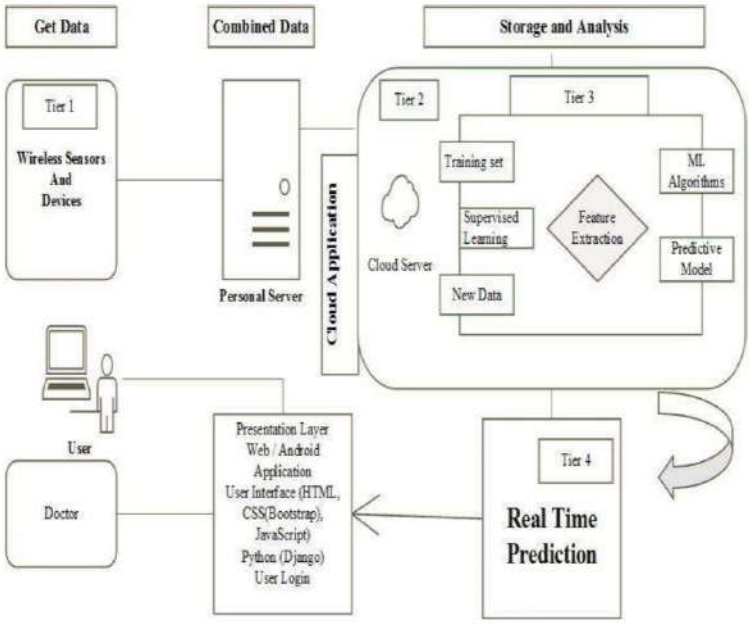


Table-1 : Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	How user interacts with application e.g. Web UI, Mobile App, etc.	HTML, CSS, Python etc.
2.	Application Logic-1	Logic for a process in the application	Python
3.	Application Logic-2	Logic for a process in the application	IBM Cognos Analytics
4.	Application Logic-3	Logic for a process in the application	IBM Watson Assistant
5.	Database	Data Type, Configurations etc.	MySQL, etc.
6.	Cloud Database	Database Service on Cloud	IBM DB2, IBM Pak etc.
7.	File Storage	File storage requirements	Use Professional Records Storage, IBM Block Storage or Other Storage Services.
8.	External API	Purpose of External API used in the application	IBM SPSS, etc.
9.	Infrastructure (Server / Cloud)	Application Deployment on Local System / Cloud Local Server Configuration: Cloud Server Configuration :	Personal Server, IBM Cloud Server etc.

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	Open-source frameworks used	Technology of Opensource framework – Django or Flask in Python.
2.	Security Implementations	Security / access controls implemented, use of firewalls etc.	e.g. Privacy - Encryptions, IBM Security Manager etc.
3.	Scalable Architecture	Scalability of architecture (3 – tier, Micro-services)	Technology used - IaaS, PaaS, SaaS (IBM Cloud).
4.	Availability	Availability of application	Technology used - The Availability of getting used to this software or product design is through by accessing IBM cognos Analytics and IBM cloud.
5.	Performance	Performance of the application	Technology used - The performance should be fast relaying. This prediction system should be made available in cloud to ensure better accessibility and setting a milestone in providing good quality affordable healthcare.

References :

https://www.ibm.com/products/cognos-analytics

https://cloud.ibm.com/catalog/services/watson-assistant

https://www.ibm.com/in-en/cloud-paks

https://www.ibm.com/cloud

PROJECT PLANNING SCHEDULING

Project Planning Phase

Project Planning Template (Product Backlog, Sprint Planning, Stories, Story points)

Product Backlog, Sprint Schedule, and Estimation

Use the below template to create product backlog and sprint schedule

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

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-3		USN-9	The user will have to fill in the below 13 fields for the system to predict a disease -Age in Year -Gender -Chest Pain Type -Fasting Blood Sugar -Resting Electrographic Results(Restecg) -Exercise Induced Angina(Exang) -The slope of the peak exercise ST segment -CA – Number of major vessels colored by fluoroscopy -Thal -Trest Blood Pressure -Serum Cholesterol -Maximum heart rate achieved(Thalach) -ST depression induced by exercise(Oldpeak)	2	High	5
		USN-10	View Doctors - view doctor detail by searching by names or filter by specialty	1	Medium	4
Sprint-3	System Requirment	USN-11	I. Hardware Requirement i. Laptop or PC • I5 processor system or higher	2	High	2

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
			• 4 GB RAM or higher • 128 GB ROM or higher ii. Android Phone (12.0 and above)			
Sprint-3		USN-12	II. Software Requirement iii. Laptop or PC • Windows 10 or higher • Android Studio	2	Medium	2
Sprint-4	Dashboard	USN-13	Query	1	High	1
		USN-14	Toll Free	1	High	1
		USN-15	Ratings	2	Medium	2
		USN-16	Verification	2	High	2
		USN-17	Validation	1	High	2
		USN-18	Feedback – send feedback to the Admin	2	Medium	3

Project Tracker, Velocity

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	18	06 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	11 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	19	19 Nov 2022

Velocity:

Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

Reference:

https://ieeexplore.ieee.org/document/9619208/

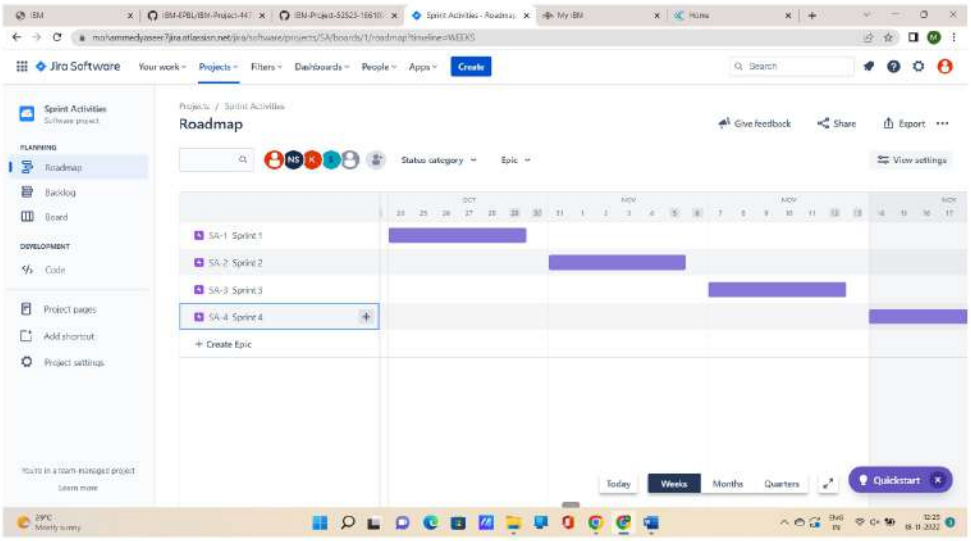
JIRA
SOFTWARE SETUP

Date :	29 OCT 2022
Team ID :	PNT2022TMID29533
Project Name :	Visualizing and Predicting Heart Diseases with an Interactive Dash Board

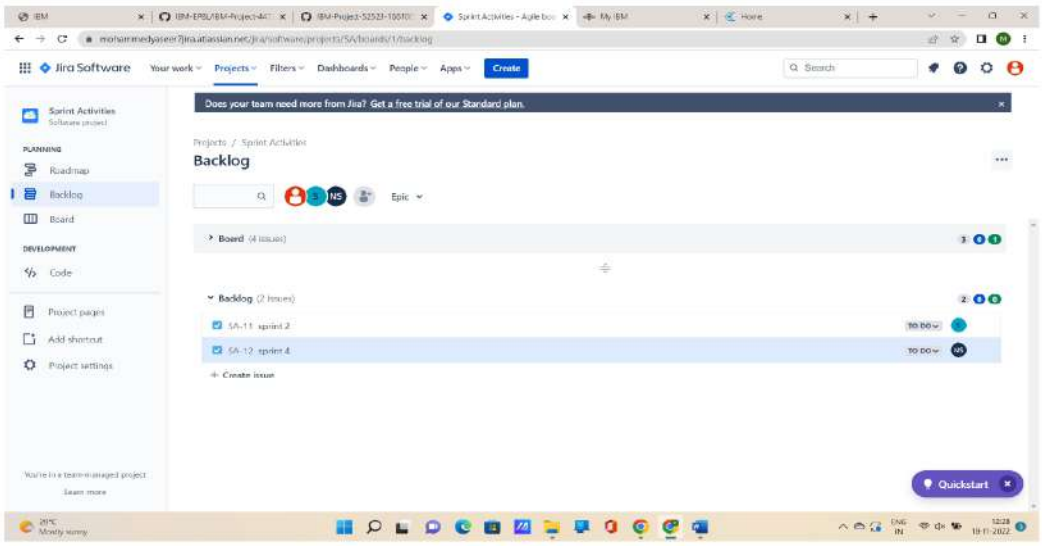
TEAM MEMBERS

- Mohammed Yaseer H(TL)
- Sudharshan R
- Kural Arasan S
- Syed Saleem N
- Yujin K

ROADMAP


Jira Software
Your work
Projects
Filters
Dashboards
People
Apps
Create
Search
Sprint Activities
Software project
PLANNING
Roadmap
Backlog
Board
DEVELOPMENT
Code
Project pages
Add shortcut
Project settings
You're in a team-managed project
Learn more
Projects / Sprint Activities
Roadmap
Give feedback
Share
Export
View settings
Status category
Epic
OCT
NOV
NOV
NOV
SA-1 Sprint 1
SA-2 Sprint 2
SA-3 Sprint 3
SA-4 Sprint 4
+ Create Epic
Today
Weeks
Months
Quarters
Quickstart

BACKLOGS


Jira Software
Your work
Projects
Filters
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Search
Sprint Activities
Software project
PLANNING
Roadmap
Backlog
Board
DEVELOPMENT
Code
Project pages
Add shortcut
Project settings
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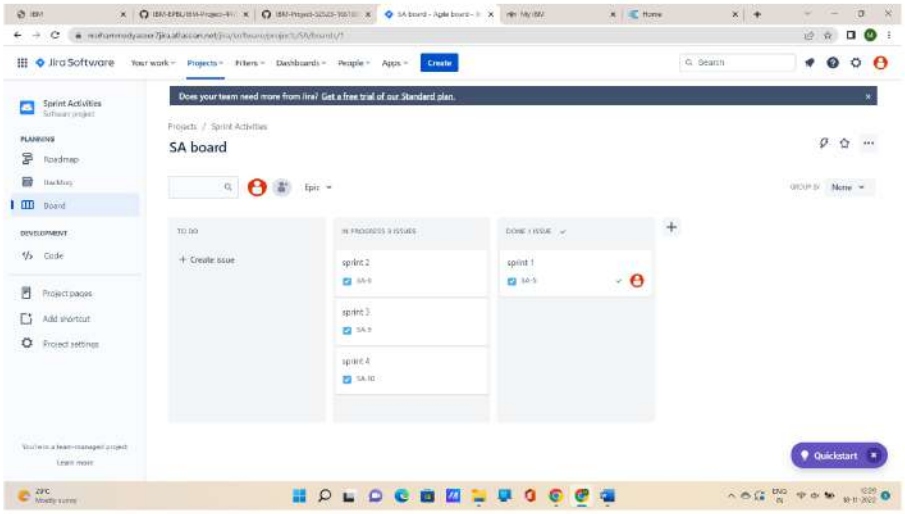
Projects / Sprint Activities
Backlog
Epic
Board (4 issues)
Backlog (2 issues)
SA-11 sprint 2
SA-12 sprint 4
Create issue
Quickstart

JIRA-BOARD


Jira Software
Your work
Projects
Filters
Dashboards
People
Apps
Create
Search
Sprint Activities
Software project
PLANNING
Roadmap
Backlog
Board
DEVELOPMENT
Code
Project pages
Add shortcut
Project settings
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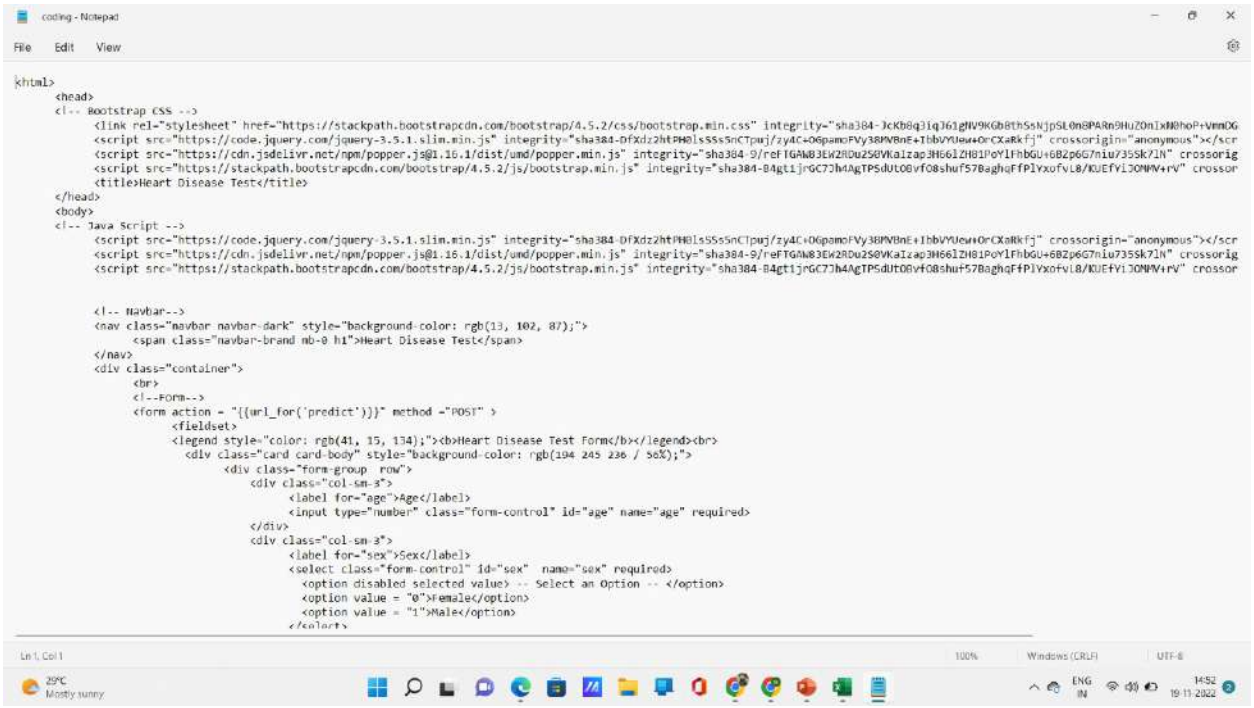
Projects / Sprint Activities
SA board
Epic
GROUP BY None
TO DO
+ Create issue
IN PROGRESS 3 ISSUES
sprint 2
SA-8
sprint 3
SA-9
sprint 4
SA-10
DONE 1 ISSUE
sprint 1
SA-5
Quickstart

JIRA SOFTWARE LINK

https://mohammedyaseer7jira.atlassian.net/jira/software/projects/SA/boards/1/roadmap

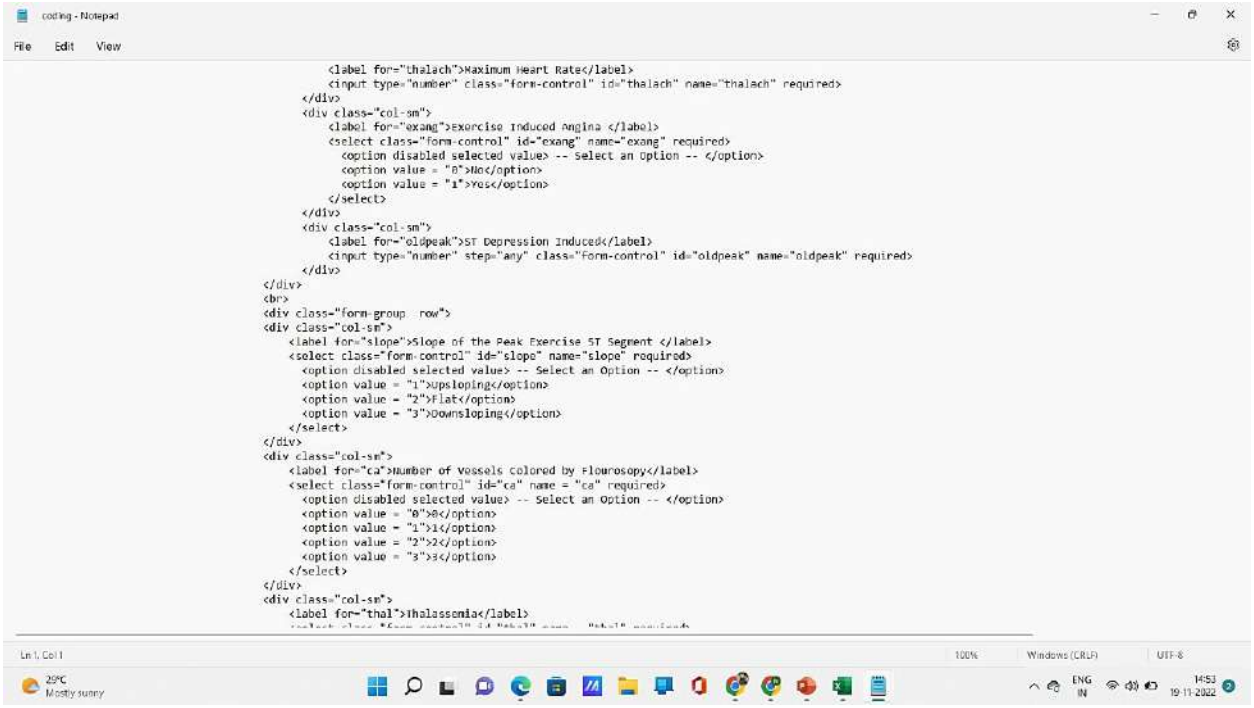
CODING AND SOLUTIONING


coding - Notepad
File Edit View
<!doctype html>
<head>
<!-- Bootstrap CSS -->
<link rel="stylesheet" href="https://stackpath.bootstrapcdn.com/bootstrap/4.5.2/css/bootstrap.min.css" integrity="sha384-JcKb8q3iqJ61gNV9KGb8thSsNjpSL0n8PARn9HuZOnIxN0hoP+VmmDG
<script src="https://code.jquery.com/jquery-3.5.1.slim.min.js" integrity="sha384-DfXdz2htPH0lsSSs5nCTpuj/zy4C+OGpamoFVy38MVBnE+IbbVYUew+OrCXaRkfj" crossorigin="anonymous"></scr
<script src="https://cdn.jsdelivr.net/npm/popper.js@1.16.1/dist/umd/popper.min.js" integrity="sha384-9/reFTGAW83EW2RDu2S0VKaIzap3H66lZH81PoYlFhbGU+6BZp6G7niu735Sk7lN" crossorig
<script src="https://stackpath.bootstrapcdn.com/bootstrap/4.5.2/js/bootstrap.min.js" integrity="sha384-B4gt1jrGC7Jh4AgTPSdUtOBvF0Bshuf57BaghqFfPlYxofvL8/KUEfYiJOMMV+rV" crossor
<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" crossorigin="anonymous"></scr
<script src="https://cdn.jsdelivr.net/npm/popper.js@1.16.1/dist/umd/popper.min.js" integrity="sha384-9/reFTGAW83EW2RDu2S0VKaIzap3H66lZH81PoYlFhbGU+6BZp6G7niu735Sk7lN" crossorig
<script src="https://stackpath.bootstrapcdn.com/bootstrap/4.5.2/js/bootstrap.min.js" integrity="sha384-B4gt1jrGC7Jh4AgTPSdUtOBvF0Bshuf57BaghqFfPlYxofvL8/KUEfYiJOMMV+rV" crossor
<!-- navbar-->
<nav class="navbar navbar-dark" style="background-color: rgb(13, 102, 87);">
Heart Disease Test
</nav>

<!--Form-->
<form action = "{{url_for('predict')}}" method ="POST" >
<fieldset>
<legend style="color: rgb(41, 15, 134);">Heart Disease Test Form</legend>

<label for="age">Age</label>
<input type="number" class="form-control" id="age" name="age" required>

<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>
Ln 1, Col 1
100%
Windows (CRLF)
UTF-8
29°C
Mostly sunny
ENG
IN
14:52
19-11-2022


coding - Notepad
File Edit View
<label for="thalach">Maximum Heart Rate</label>
<input type="number" class="form-control" id="thalach" name="thalach" required>

<label for="exang">Exercise Induced Angina </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>

<label for="oldpeak">ST Depression Induced</label>
<input type="number" step="any" class="form-control" id="oldpeak" name="oldpeak" required>

<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>

<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>

<label for="thal">Thalassemia</label>
Ln 1, Col 1
100%
Windows (CRLF)
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29°C
Mostly sunny
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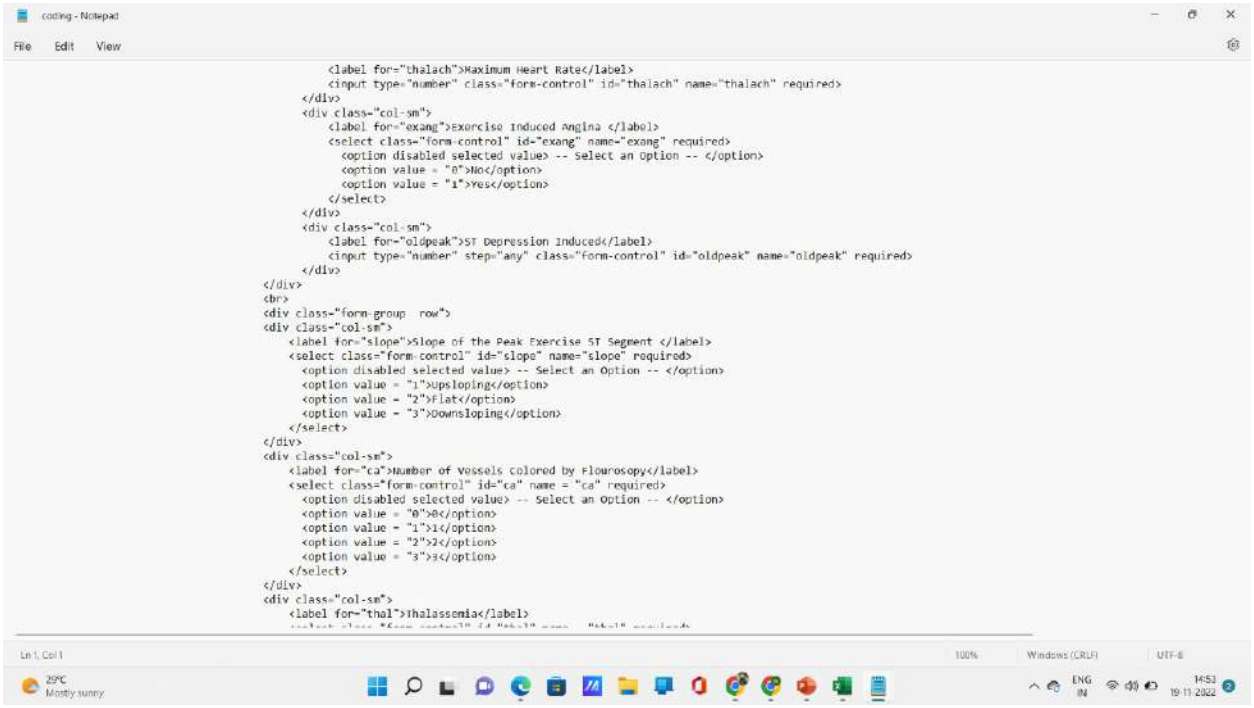
19-11-2022


coding - Notepad
File Edit View
<label for="thalach">Maximum Heart Rate</label>
<input type="number" class="form-control" id="thalach" name="thalach" required>

<label for="exang">Exercise Induced Angina </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>

<label for="oldpeak">ST Depression Induced</label>
<input type="number" step="any" class="form-control" id="oldpeak" name="oldpeak" required>

<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>

<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>

<label for="thal">Thalassemia</label>
Ln 1, Col 1
100%
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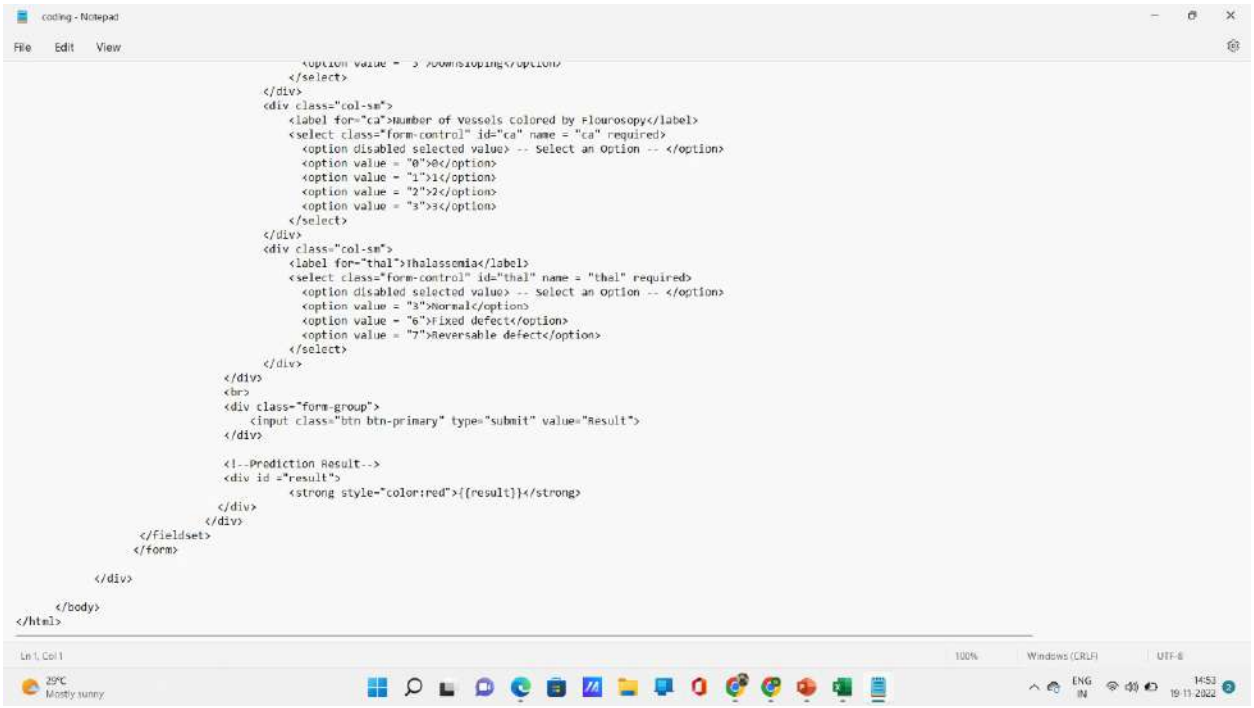
UTF-8
29°C
Mostly sunny
ENG
IN
14:53
19-11-2022


coding - Notepad
File Edit View
<option value = "3">Downsloping</option>
</select>

<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>

<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>

<input class="btn btn-primary" type="submit" value="Result">

<!--Prediction Result-->

{{result}}

</Fieldset>
</form>

</body>
</html>
Ln 1, Col 1
100%
Windows (CRLF)
UTF-8
29°C
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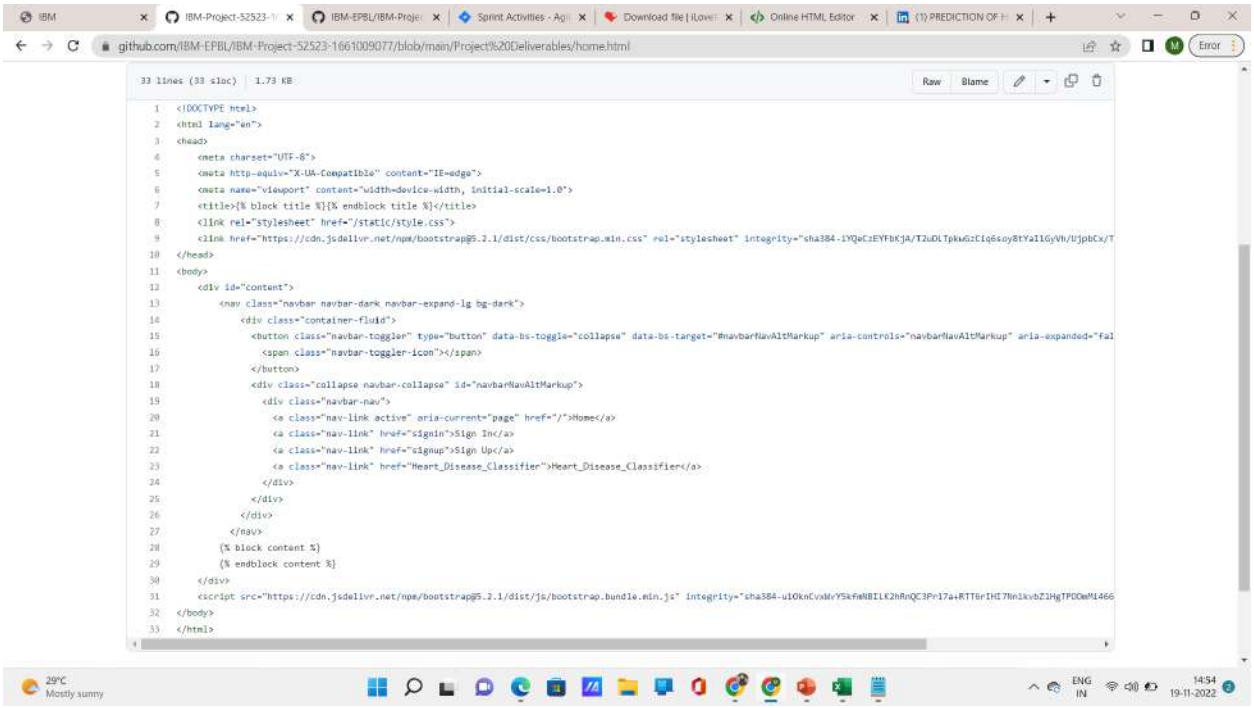
19-11-2022


github.com/IBM-EPBL/IBM-Project-52523-1661009077/blob/main/Project%20Deliverables/home.html
33 lines (33 sloc) | 1.73 KB
Raw
Blame
<!DOCTYPE html>
<html lang="en">
<head>
<meta charset="UTF-8">
<meta http-equiv="X-UA-Compatible" content="IE=edge">
<meta name="viewport" content="width=device-width, initial-scale=1.0">
<title>{% block title %}{% endblock title %}</title>
<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-iYQeCzEYFbKjA/T2uDLTpkwGzCiq6soy8tYaI1GyVh/UjpbCx/T
</head>
<body>

<nav class="navbar navbar-dark navbar-expand-lg bg-dark">

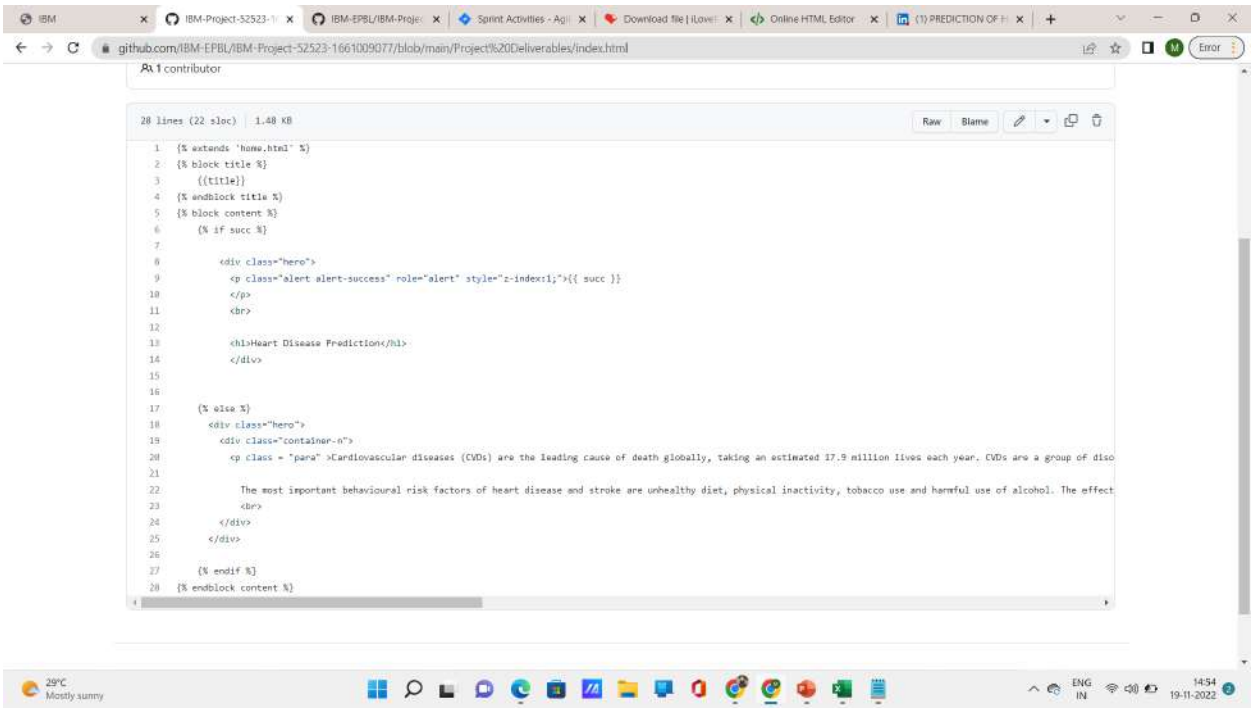
<button class="navbar-toggler" type="button" data-bs-toggle="collapse" data-bs-target="#navbarNavAltMarkup" aria-controls="navbarNavAltMarkup" aria-expanded="fal

</button>

Home
Sign In
Sign Up
Heart_Disease_Classifier

</nav>
{% block content %}
{% endblock content %}

<script src="https://cdn.jsdelivr.net/npm/bootstrap@5.2.1/dist/js/bootstrap.bundle.min.js" integrity="sha384-u1OknCvxWvY5kfmNBILK2hRnQC3Pr17a+RTT6rIHI7NnikvbZlHgTPOOmMi466
</body>
</html>
29°C
Mostly sunny
ENG
IN
14:54
19-11-2022


IBM
IBM-Project-52523-1
IBM-EPBL/IBM-Projec
Sprint Activities - Agil
Download file | iLovel
Online HTML Editor
(1) PREDICTION OF H
github.com/IBM-EPBL/IBM-Project-52523-1661009077/blob/main/Project%20Deliverables/index.html
Error
1 contributor
28 lines (22 sloc) | 1.48 KB
Raw
Blame
{% extends 'home.html' %}
{% block title %}
{{title}}
{% endblock title %}
{% block content %}
{% if succ %}

{{ succ }}

<h1>Heart Disease Prediction</h1>

{% else %}

Cardiovascular diseases (CVDs) are the leading cause of death globally, taking an estimated 17.9 million lives each year. CVDs are a group of diso
The most important behavioural risk factors of heart disease and stroke are unhealthy diet, physical inactivity, tobacco use and harmful use of alcohol. The effect

{% endif %}
{% endblock content %}
29°C
Mostly sunny
ENG
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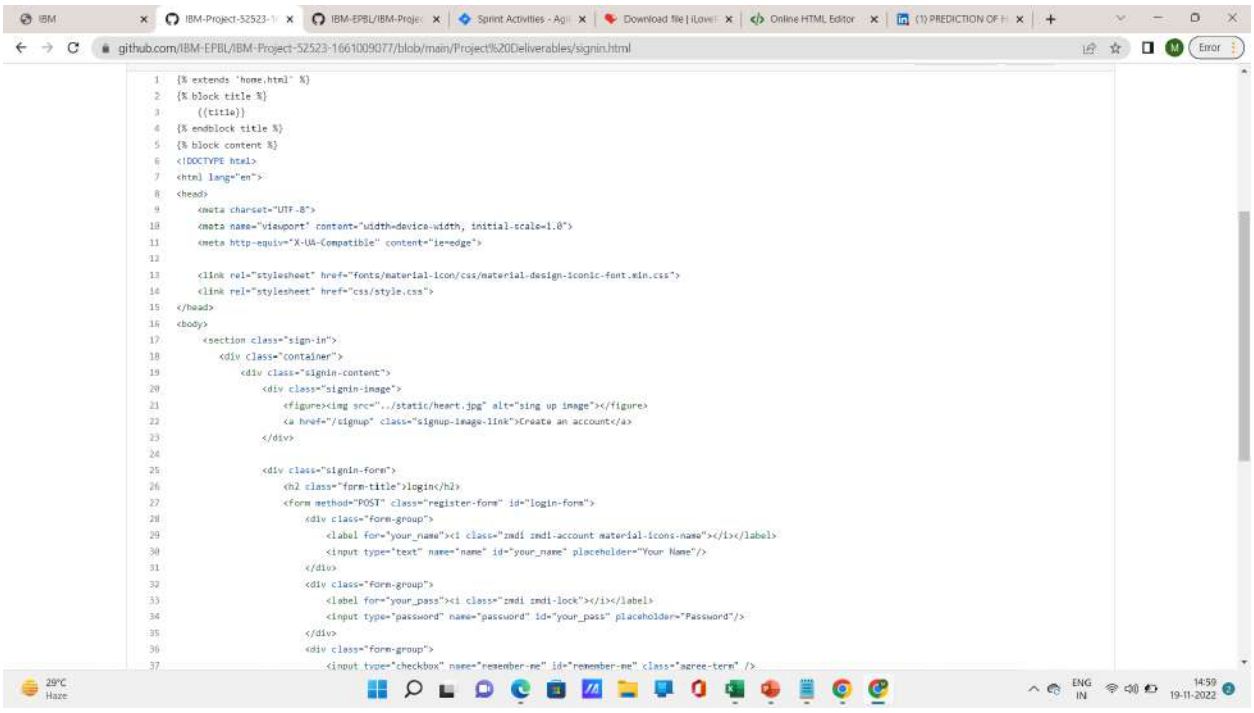
19-11-2022


IBM
IBM-Project-52523-1
IBM-EPBL/IBM-Projec
Sprint Activities - Agil
Download file | iLovel
Online HTML Editor
(1) PREDICTION OF H
github.com/IBM-EPBL/IBM-Project-52523-1661009077/blob/main/Project%20Deliverables/signin.html
Error
{% extends 'home.html' %}
{% block title %}
((title))
{% endblock title %}
{% block content %}
<!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">

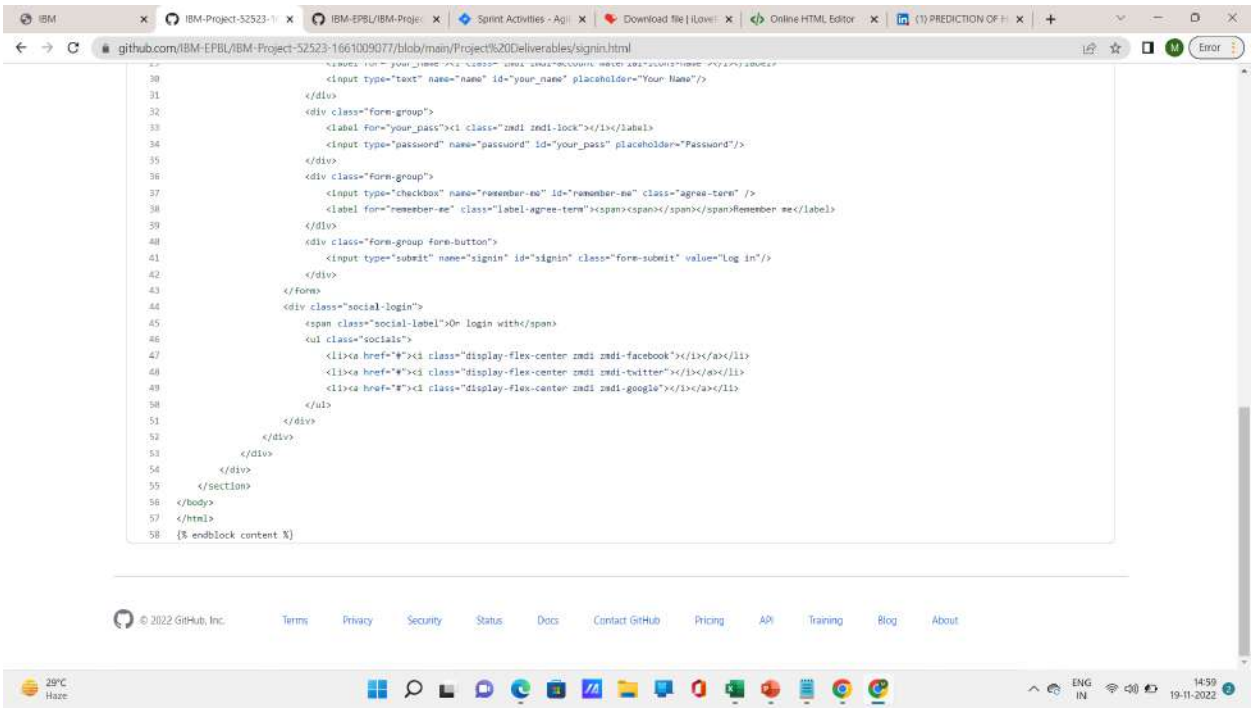
<figure><img src="../static/heart.jpg" alt="sing up image"></figure>
Create an account

<h2 class="form-title">login</h2>
<form method="POST" class="register-form" id="login-form">

<label for="your_name"></label>
<input type="text" name="name" id="your_name" placeholder="Your Name"/>

<label for="your_pass"></label>
<input type="password" name="password" id="your_pass" placeholder="Password"/>

<input type="checkbox" name="remember-me" id="remember-me" class="agree-term" />
29°C
Haze
ENG
IN
14:59
19-11-2022


IBM
IBM-Project-52523-1
IBM-EPBL/IBM-Projec
Sprint Activities - Agil
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Online HTML Editor
(1) PREDICTION OF H
github.com/IBM-EPBL/IBM-Project-52523-1661009077/blob/main/Project%20Deliverables/signin.html
Error
<input type="text" name="name" id="your_name" placeholder="Your Name"/>

<label for="your_pass"></label>
<input type="password" name="password" id="your_pass" placeholder="Password"/>

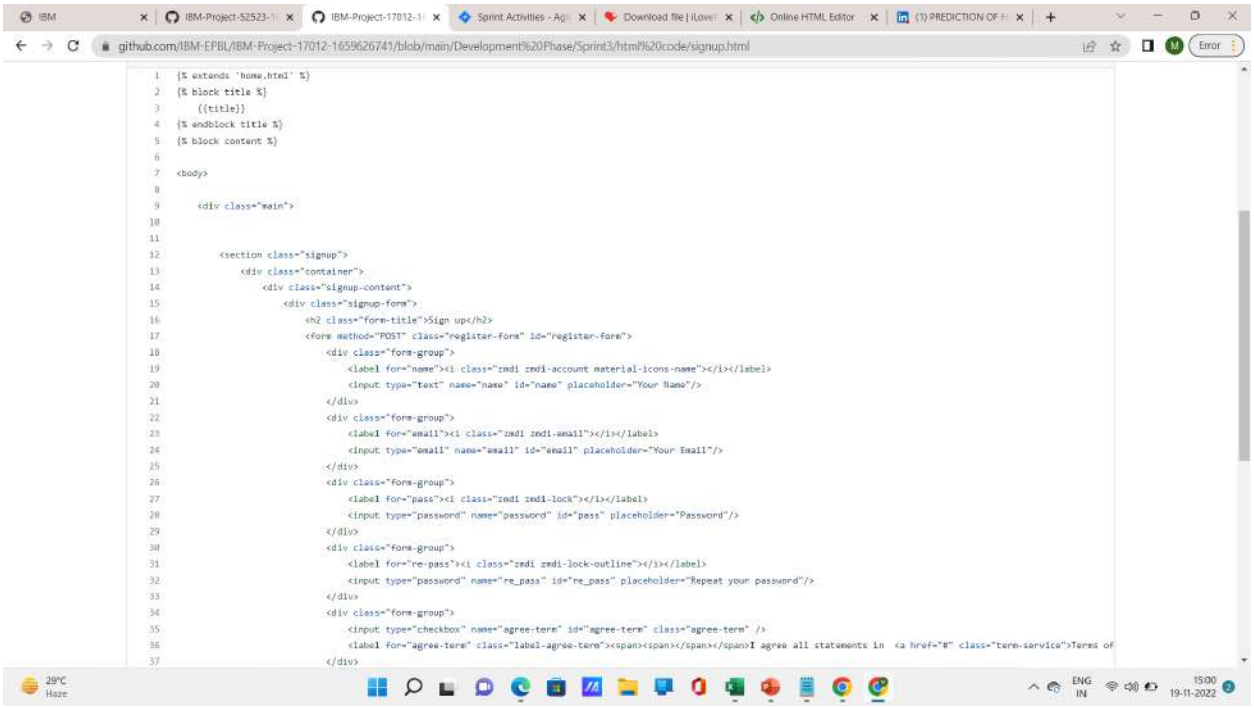
<input type="checkbox" name="remember-me" id="remember-me" class="agree-term" />
<label for="remember-me" class="label-agree-term">Remember me</label>

<input type="submit" name="signin" id="signin" class="form-submit" value="Log in"/>

</form>

Or login with
<ul class="socials">

</section>
</body>
</html>
{% endblock content %}
© 2022 GitHub, Inc.
Terms
Privacy
Security
Status
Docs
Contact GitHub
Pricing
API
Training
Blog
About
29°C
Haze
ENG
IN
14:59
19-11-2022


IBM
IBM-Project-17012-1
Sprint Activities - Agile
Download file | iLovel
Online HTML Editor
(1) PREDICTION OF H
github.com/IBM-EPBL/IBM-Project-17012-1659626741/blob/main/Development%20Phase/Sprint3/html%20code/signup.html
Error
{% extends 'home.html' %}
{% block title %}
{{title}}
{% endblock title %}
{% block content %}
<body>

<section class="signup">

<h2 class="form-title">Sign up</h2>
<form method="POST" class="register-form" id="register-form">

<label for="name"></label>
<input type="text" name="name" id="name" placeholder="Your Name"/>

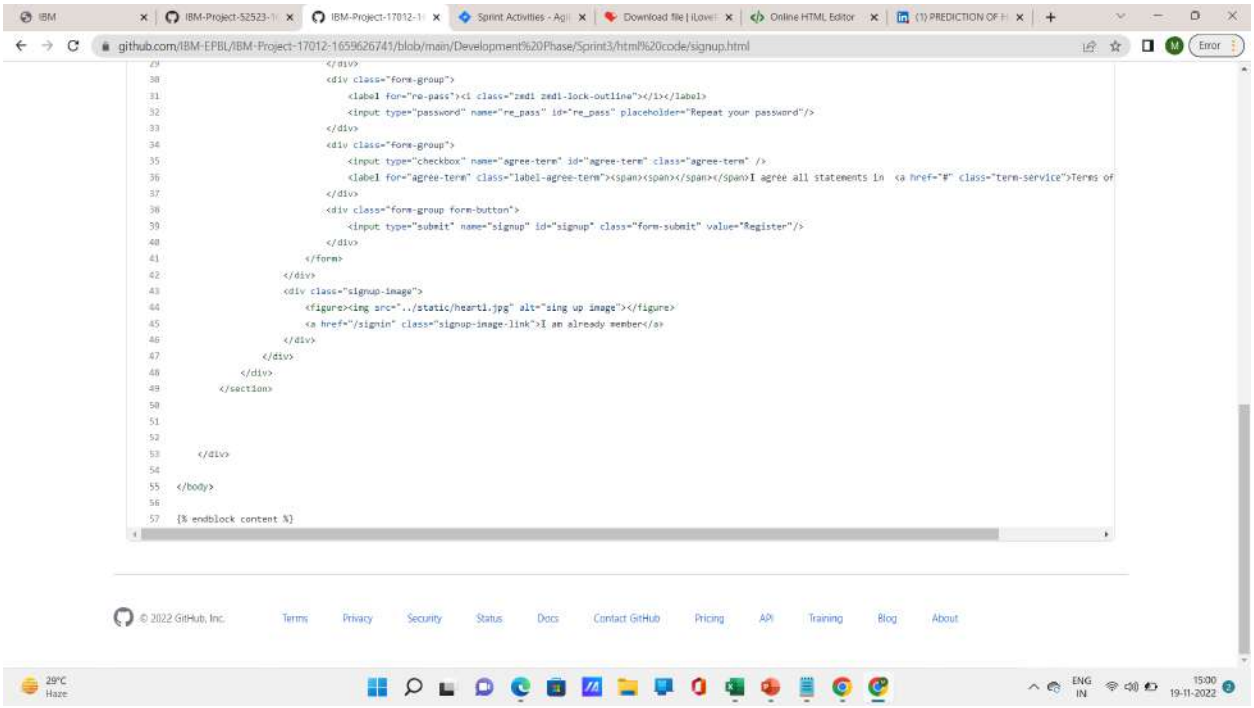
<label for="email"></label>
<input type="email" name="email" id="email" placeholder="Your Email"/>

<label for="pass"></label>
<input type="password" name="password" id="pass" placeholder="Password"/>

<label for="re-pass"></label>
<input type="password" name="re_pass" id="re_pass" placeholder="Repeat your password"/>

<input type="checkbox" name="agree-term" id="agree-term" class="agree-term" />
<label for="agree-term" class="label-agree-term">I agree all statements in <a href="#" class="term-service">Terms of

29°C
Haze
ENG
IN
15:00
19-11-2022


IBM
IBM-Project-52523-1
IBM-Project-17012-1
Sprint Activities - Agile
Download file | iLovel
Online HTML Editor
(1) PREDICTION OF H
github.com/IBM-EPBL/IBM-Project-17012-1659626741/blob/main/Development%20Phase/Sprint3/html%20code/signup.html
Error

<label for="re-pass"></label>
<input type="password" name="re_pass" id="re_pass" placeholder="Repeat your password"/>

<input type="checkbox" name="agree-term" id="agree-term" class="agree-term" />
<label for="agree-term" class="label-agree-term">I agree all statements in <a href="#" class="term-service">Terms of

<input type="submit" name="signup" id="signup" class="form-submit" value="Register"/>

</form>

<figure><img src="../static/heart1.jpg" alt="sing up image"></figure>
I an already member

</section>

</body>
{% endblock content %}
© 2022 GitHub, Inc.
Terms
Privacy
Security
Status
Docs
Contact GitHub
Pricing
API
Training
Blog
About
29°C
Haze
ENG
IN
15:00
19-11-2022

TESTING

				Date	05-Nov-22					
				Team ID	PNT2022TMID29533					
				Project Name	Visualization and prediction of heart					
				Maximum Marks	4 marks					
Test case ID	**Feature Type**	**Component**	**Test Scenario**	**Pre-Requisite**	**Steps To Execute**	**Test Data**	**Expected Result**	**Actual Result**	**Status**	**Comments**
LoginPage_TC_001	Functional	Home Page	Verify user is able to see the Login/Signup popup when user clicked on My account button		1.Enter URL and click go 2.Click on My Account dropdown button 3.Verify login/Singup popup displayed or not	https://tyqz.io/_7990b13	Login/Signup popup should display	Working as expected	Pass	sign on next process
LoginPage_TC_002	UI	Home Page	Verify the UI elements in Login/Signup popup		1.Enter URL and click go 2.Click on My Account dropdown button 3.Verify login/Singup popup with below UI elements: a.email text box b.password text box c.Login button d.New customer? Create account link e.Lost password? Recovery password link	https://tyqz.io/_7990b13	Application should show below UI elements: a.email text box b.password text box c.Login button with orange colour d.New customer? Create account link e.Lost password? Recovery password link	Working as expected	Fail	Steps are not clear to follow
LoginPage_TC_003	Functional	Home page	Verify user is able to log into application with Valid credentials		1.Enter URL(https://shopenzer.com/) and click go 2.Click on My Account dropdown button 3.Enter Valid username/email in Email text box 4.Enter valid password in password text box 5.Click on login button	Username: syedhaleem@gmail.com password: Testing123	User should navigate to user account homepage		fail	not expected result
LoginPage_TC_004	Functional	Login page	Verify user is able to log into application with InValid credentials		1.Enter URL(https://shopenzer.com/) and click go 2.Click on My Account dropdown button 3.Enter inValid username/email in Email text box 4.Enter valid password in password text box 5.Click on login button	Username: ckalam@gmail password: Testing123	Application should show 'Incorrect email or password ' validation message.		Pass	
LoginPage_TC_004	Functional	Login page	Verify user is able to log into application with InValid credentials		1.Enter URL(https://shopenzer.com/) and click go 2.Click on My Account dropdown button 3.Enter Valid username/email in Email text box 4.Enter invalid password in password text box 5.Click on login button	Username: kural password: Testing123678867867876	Application should show 'Incorrect email or password ' validation message.		Pass	
LoginPage_TC_005	Functional	Login page	Verify user is able to log into application with InValid credentials		1.Enter URL(https://shopenzer.com/) and click go 2.Click on My Account dropdown button 3.Enter inValid username/email in Email text box 4.Enter invalid password in password text box 5.Click on login button	Username: yaseer password: Testing123678867867876	Application should show 'Incorrect email or password ' validation message.		Pass	

USER ACCEPTANCE TESTING

Acceptance Testing
UAT Execution & Report Submission

Date	03 November 2022
Team ID	PNT2022TMID29533
Project Name	Visualization and prediction of heart diseases with an interactive dashboard
Maximum Marks	4 Marks

1. Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the [ProductName] project at the time of the release to User Acceptance Testing (UAT).

2. Defect Analysis

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

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	18	7	6	4	35
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 Reporting	9	0	0	9
Final Report Output	4	0	0	4
Version Control	2	0	0	2

RESULTS

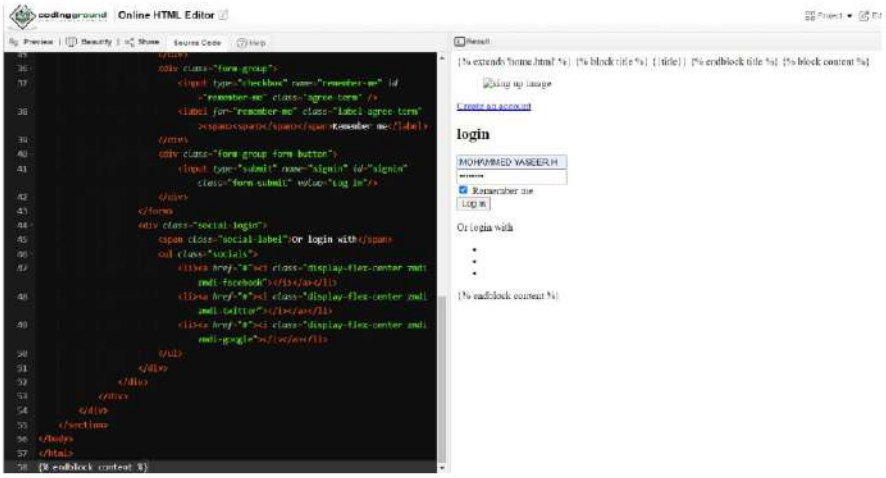
Team ID: PNT2022TMID29533

Project Name: Visualizing and Predicting Heart Diseases with an Interactive Dash Board.

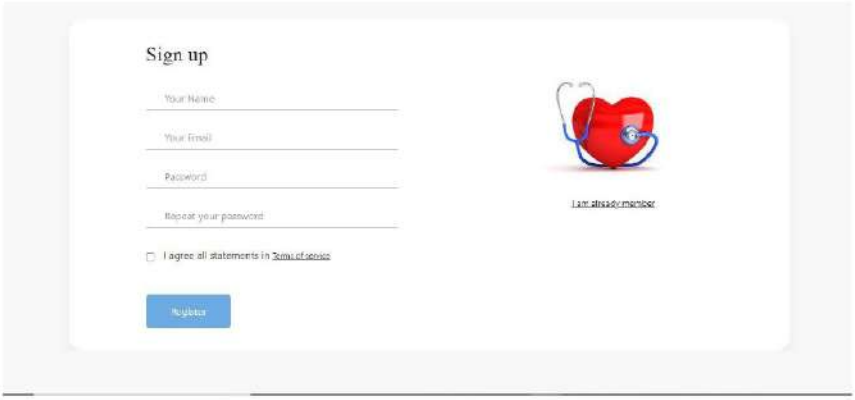
Output:

Home.html:

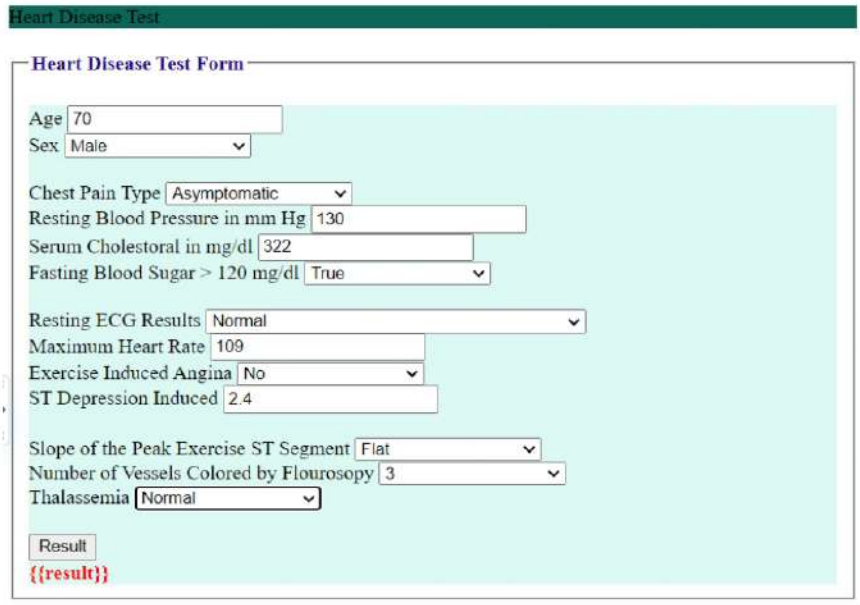
Sign in.html:



SignUp.html:


Sign up
Your Name
Your Email
Password
Repeat your password
I agree all statements in Terms of service
I am already member

Heart_Disease_Classifier.html:



ADVANTAGES

1. Increased accuracy for effective heart disease diagnosis.
2. Handles roughest(enormous) amount of data using random forest algorithm and feature selection.
3. Reduce the time complexity of doctors.
4. Cost effective for patients

DISADVANTAGES

1. Prediction of cardiovascular disease results is not accurate.

2. Data mining techniques does not help to provide effective decision making.

3. Cannot handle enormous datasets for patient records

CONCULSION

- Heart stroke and vascular disease are the major cause of disability and premature death.
- Chest pain is the key to recognize the heart disease.
- In this work, the heart diseases are predicted by considering major factors with four types of chest pain.
- K-means clustering is one of the simplest and popular unsupervised machine learning algorithms.
- Here the datasets are clustered and based upon the clusters the happening of chest pain is predicted.
- The early prognosis of cardiovascular diseases can aid in making decisions on lifestyle changes inhigh risk patients and in turn reduce the complications, which can be a great milestone in the fieldof medicine.
- This project resolved the feature selection i.e. backward elimination and RFECV behind the models and successfully predict the heart disease, with 85% accuracy.
- The model usedwas Logistic Regression.
- Further for its enhancement, we can train on models and predict thetypes of cardiovascular diseases providing recommendations to the users, and also use moreenhanced models.

In [27]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from scipy import stats
```

In [5]:
```
import os
os.chdir("C:/Users/admin/Desktop/DATASET")
```

In [6]:
```
df=pd.read_csv('Heart_Disease_Prediction.csv')
```

In [7]:
```
df
```

Out[7]:

	Age	Sex	Chest pain type	BP	Cholesterol	FBS over 120	EKG results	Max HR	Exercise angina	ST depression	Slope of ST	Number of vessels flurc
0	70	1	4	130	322	0	2	109	0	2.4	2	3
1	67	0	3	115	564	0	2	160	0	1.6	2	0
2	57	1	2	124	261	0	0	141	0	0.3	1	0
3	64	1	4	128	263	0	0	105	1	0.2	2	1
4	74	0	2	120	269	0	2	121	1	0.2	1	1
...	...	...	...	...	...	...	...	...	...	...	...	...
265	52	1	3	172	199	1	0	162	0	0.5	1	0
266	44	1	2	120	263	0	0	173	0	0.0	1	0
267	56	0	2	140	294	0	2	153	0	1.3	2	0
268	57	1	4	140	192	0	0	148	0	0.4	2	0
269	67	1	4	160	286	0	2	108	1	1.5	2	3

270 rows × 14 columns

In [8]:
```
df.describe()
```

Out[8]:

	Age	Sex	Chest pain type	BP	Cholesterol	FBS over 120	EKG results	Ma
count	270.000000	270.000000	270.000000	270.000000	270.000000	270.000000	270.000000	270.0(
mean	54.433333	0.677778	3.174074	131.344444	249.659259	0.148148	1.022222	149.67
std	9.109067	0.468195	0.950090	17.861608	51.686237	0.355906	0.997891	23.1(
min	29.000000	0.000000	1.000000	94.000000	126.000000	0.000000	0.000000	71.0(
25%	48.000000	0.000000	3.000000	120.000000	213.000000	0.000000	0.000000	133.0(
50%	55.000000	1.000000	3.000000	130.000000	245.000000	0.000000	2.000000	153.5(
75%	61.000000	1.000000	4.000000	140.000000	280.000000	0.000000	2.000000	166.0(
max	77.000000	1.000000	4.000000	200.000000	564.000000	1.000000	2.000000	202.0(

In [9]:
```
df.columns
```

Out[9]:
```
Index(['Age', 'Sex', 'Chest pain type', 'BP', 'Cholesterol', 'FBS over 120',
       'EKG results', 'Max HR', 'Exercise angina', 'ST depression',
       'Slope of ST', 'Number of vessels fluro', 'Thallium', 'Heart Disease'],
      dtype='object')
```

In [11]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 270 entries, 0 to 269
Data columns (total 14 columns):
 #   Column                  Non-Null Count  Dtype  
---  ------                  --------------  -----  
 0   Age                     270 non-null    int64  
 1   Sex                     270 non-null    int64  
 2   Chest pain type         270 non-null    int64  
 3   BP                      270 non-null    int64  
 4   Cholesterol             270 non-null    int64  
 5   FBS over 120            270 non-null    int64  
 6   EKG results             270 non-null    int64  
 7   Max HR                  270 non-null    int64  
 8   Exercise angina         270 non-null    int64  
 9   ST depression           270 non-null    float64
 10  Slope of ST             270 non-null    int64  
 11  Number of vessels fluro  270 non-null    int64  
 12  Thallium                270 non-null    int64  
 13  Heart Disease           270 non-null    object 
dtypes: float64(1), int64(12), object(1)
memory usage: 29.7+ KB
```

In [12]:
```
df.head()
```

Out[12]:

	Age	Sex	Chest pain type	BP	Cholesterol	FBS over 120	EKG results	Max HR	Exercise angina	ST depression	Slope of ST	Number of vessels fluro
0	70	1	4	130	322	0	2	109	0	2.4	2	3
1	67	0	3	115	564	0	2	160	0	1.6	2	0
2	57	1	2	124	261	0	0	141	0	0.3	1	0
3	64	1	4	128	263	0	0	105	1	0.2	2	1
4	74	0	2	120	269	0	2	121	1	0.2	1	1

In [13]:
```
df.tail()
```

Out[13]:

	Age	Sex	Chest pain type	BP	Cholesterol	FBS over 120	EKG results	Max HR	Exercise angina	ST depression	Slope of ST	Numbe o vessels fluro
265	52	1	3	172	199	1	0	162	0	0.5	1	0
266	44	1	2	120	263	0	0	173	0	0.0	1	0
267	56	0	2	140	294	0	2	153	0	1.3	2	0
268	57	1	4	140	192	0	0	148	0	0.4	2	0
269	67	1	4	160	286	0	2	108	1	1.5	2	3

In [14]:
```
df.isnull().sum()
```

Out[14]:
```
Age                       0
Sex                       0
Chest pain type           0
BP                        0
Cholesterol               0
FBS over 120              0
EKG results               0
Max HR                    0
Exercise angina           0
ST depression             0
Slope of ST               0
Number of vessels fluro   0
Thallium                  0
Heart Disease             0
dtype: int64
```

In [15]:
```
df.corr()
```

Out[15]:

	Age	Sex	Chest pain type	BP	Cholesterol	FBS over 120	EKG results	Max HR
Age	1.000000	-0.094401	0.096920	0.273053	0.220056	0.123458	0.128171	-0.402215
Sex	-0.094401	1.000000	0.034636	-0.062693	-0.201647	0.042140	0.039253	-0.076101
Chest pain type	0.096920	0.034636	1.000000	-0.043196	0.090465	-0.098537	0.074325	-0.317682
BP	0.273053	-0.062693	-0.043196	1.000000	0.173019	0.155681	0.116157	-0.039136
Cholesterol	0.220056	-0.201647	0.090465	0.173019	1.000000	0.025186	0.167652	-0.018739
FBS over 120	0.123458	0.042140	-0.098537	0.155681	0.025186	1.000000	0.053499	0.022494
EKG results	0.128171	0.039253	0.074325	0.116157	0.167652	0.053499	1.000000	-0.074628
Max HR	-0.402215	-0.076101	-0.317682	-0.039136	-0.018739	0.022494	-0.074628	1.000000
Exercise angina	0.098297	0.180022	0.353160	0.082793	0.078243	-0.004107	0.095098	-0.380719
ST depression	0.194234	0.097412	0.167244	0.222800	0.027709	-0.025538	0.120034	-0.349045
Slope of ST	0.159774	0.050545	0.136900	0.142472	-0.005755	0.044076	0.160614	-0.386847
Number of vessels fluro	0.356081	0.086830	0.225890	0.085697	0.126541	0.123774	0.114368	-0.265333
Thallium	0.106100	0.391046	0.262659	0.132045	0.028836	0.049237	0.007337	-0.253397

In [16]:
```
df.cov()
```

Out[16]:

	Age	Sex	Chest pain type	BP	Cholesterol	FBS over 120	EKG results	M
Age	82.975093	-0.402602	0.838786	44.426394	103.605452	0.400248	1.165056	-84.8
Sex	-0.402602	0.219207	0.015407	-0.524287	-4.879719	0.007022	0.018340	-0.8
Chest pain type	0.838786	0.015407	0.902671	-0.733044	4.442434	-0.033320	0.070467	-6.9
BP	44.426394	-0.524287	-0.733044	319.037051	159.731185	0.989674	2.070384	-16.1
Cholesterol	103.605452	-4.879719	4.442434	159.731185	2671.467107	0.463307	8.647005	-22.4
FBS over 120	0.400248	0.007022	-0.033320	0.989674	0.463307	0.126669	0.019000	0.1
EKG results	1.165056	0.018340	0.070467	2.070384	8.647005	0.019000	0.995787	-1.7
Max HR	-84.874721	-0.825403	-6.992028	-16.193432	-22.437340	0.185461	-1.725155	536.6
Exercise angina	0.421685	0.039694	0.158020	0.696448	1.904557	-0.000688	0.044692	-4.1
ST depression	2.026208	0.052230	0.181970	4.557435	1.640149	-0.010409	0.137175	-9.2
Slope of ST	0.894176	0.014539	0.079912	1.563486	-0.182762	0.009638	0.098472	-5.5
Number of vessels fluro	3.061586	0.038373	0.202575	1.444816	6.173510	0.041581	0.107724	-5.8
Thallium	1.875589	0.355308	0.484290	4.577117	2.892414	0.034008	0.014209	-11.3

In [17]:
```
df.dtypes
```

Out[17]:
```
Age                        int64
Sex                        int64
Chest pain type            int64
BP                         int64
Cholesterol                int64
FBS over 120               int64
EKG results                int64
Max HR                     int64
Exercise angina            int64
ST depression            float64
Slope of ST                int64
Number of vessels fluro    int64
Thallium                   int64
Heart Disease             object
dtype: object
```

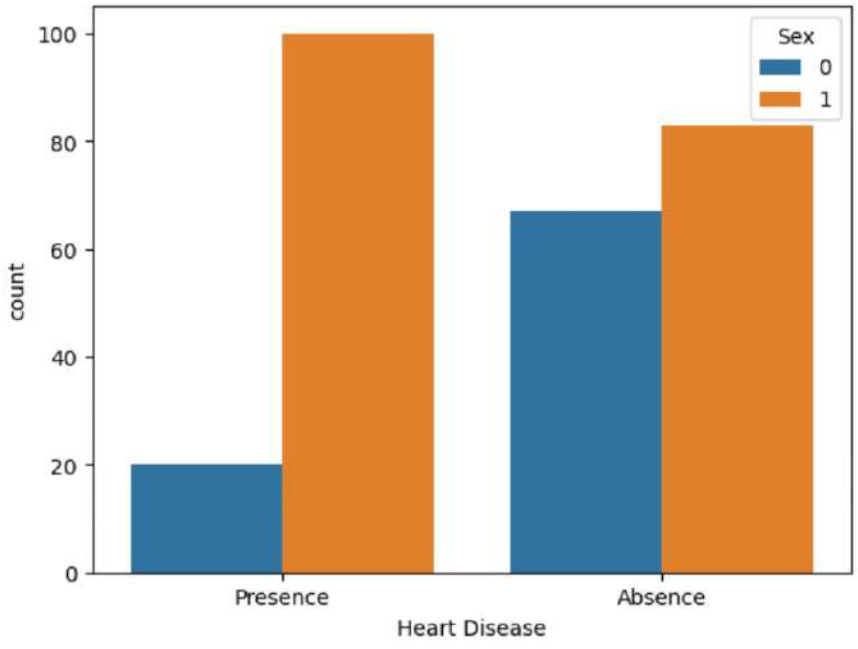
In [18]:
```
df.shape
```

Out[18]:
```
(270, 14)
```

In [19]:
```
import seaborn as sns
import matplotlib.pyplot as plt
```

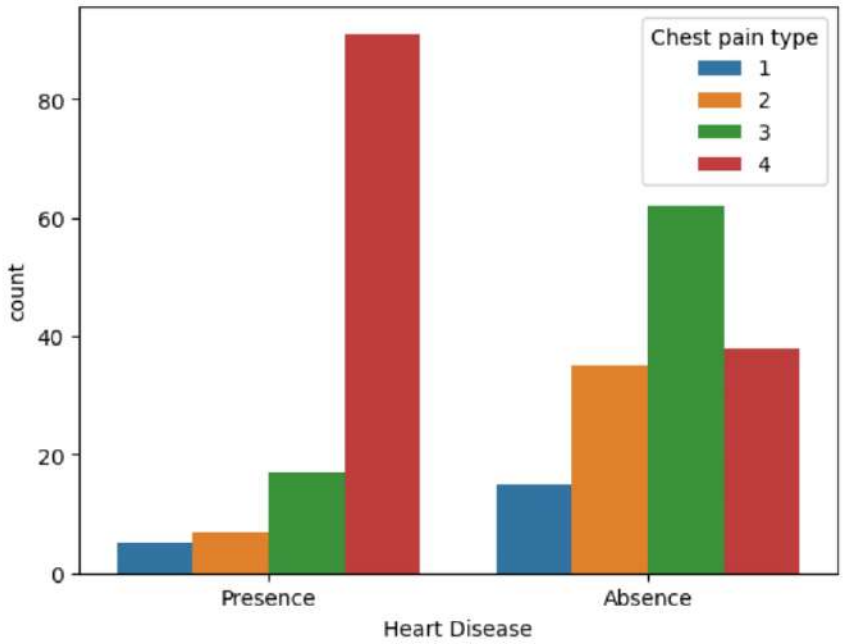
In [35]:
```
sns.countplot(x=df['Heart Disease'],hue='Sex',data=df)
```

Out[35]:
```
<AxesSubplot:xlabel='Heart Disease', ylabel='count'>
```



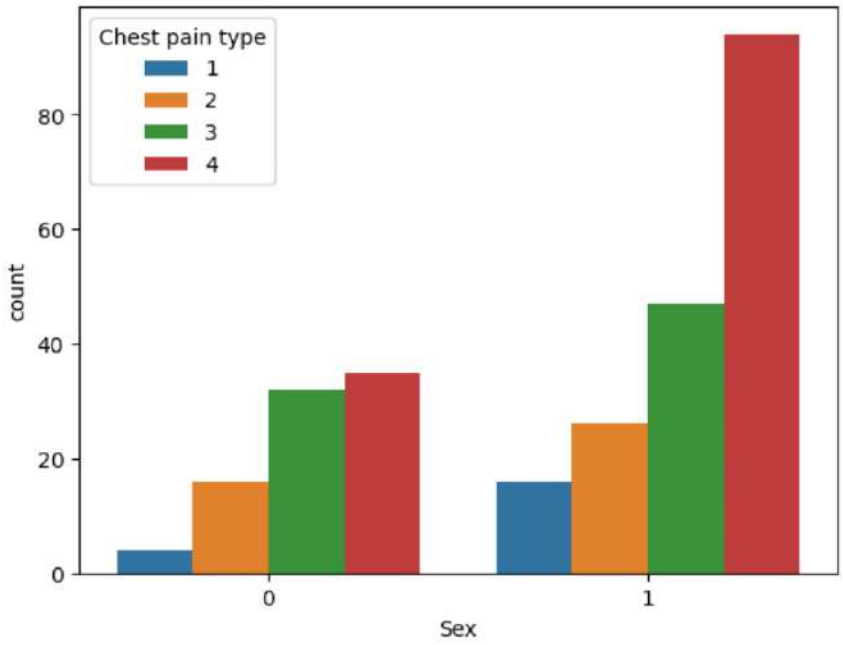
In [36]:
```
sns.countplot(x=df['Heart Disease'],hue='Chest pain type',data=df)
```

Out[36]:
```
<AxesSubplot:xlabel='Heart Disease', ylabel='count'>
```



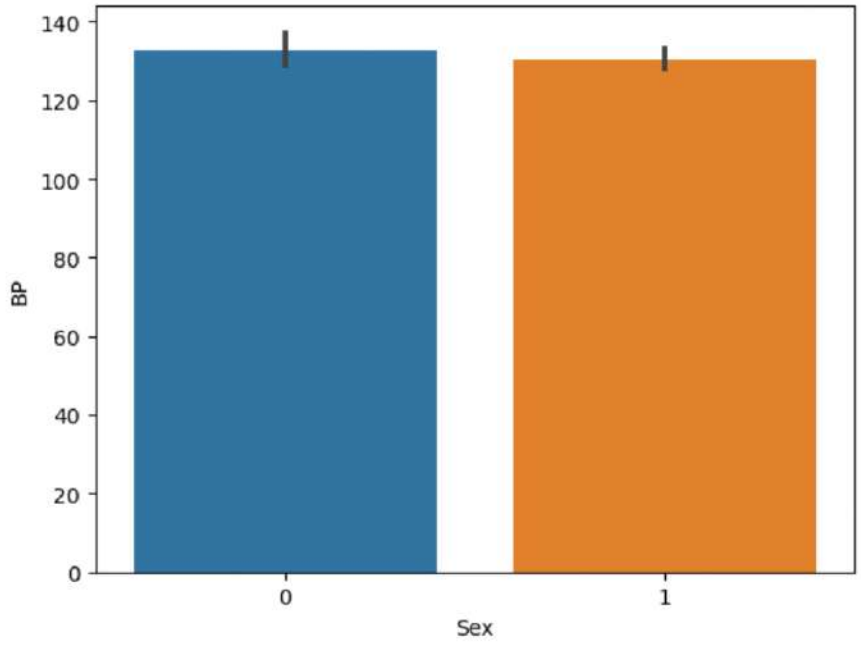
In [37]:
```
sns.countplot(x=df['Sex'],hue='Chest pain type',data=df)
```

Out[37]:
```
<AxesSubplot:xlabel='Sex', ylabel='count'>
```



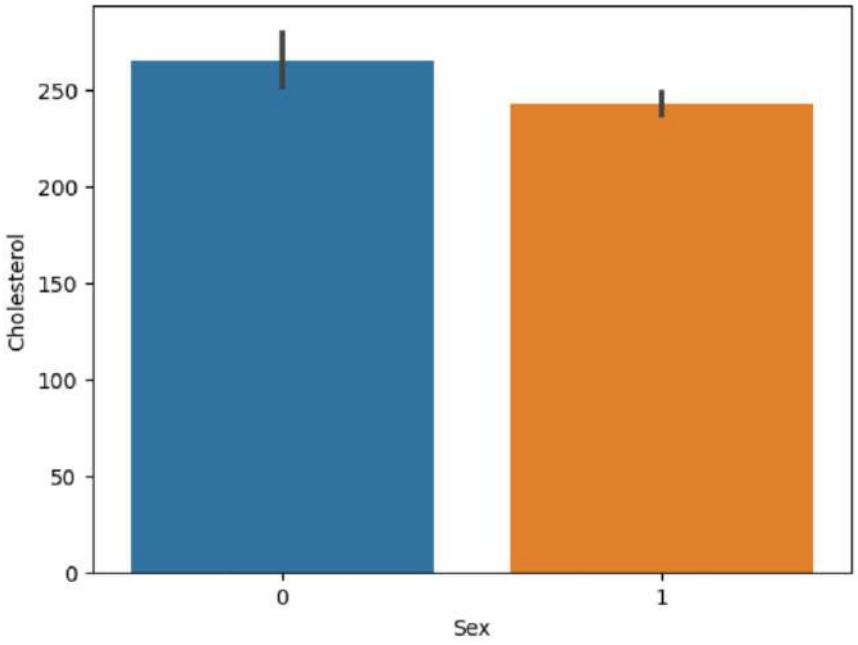
In [38]:
```
sns.barplot(x=df['Sex'],y=df['BP'],data=df)
```

Out[38]:
```
<AxesSubplot:xlabel='Sex', ylabel='BP'>
```



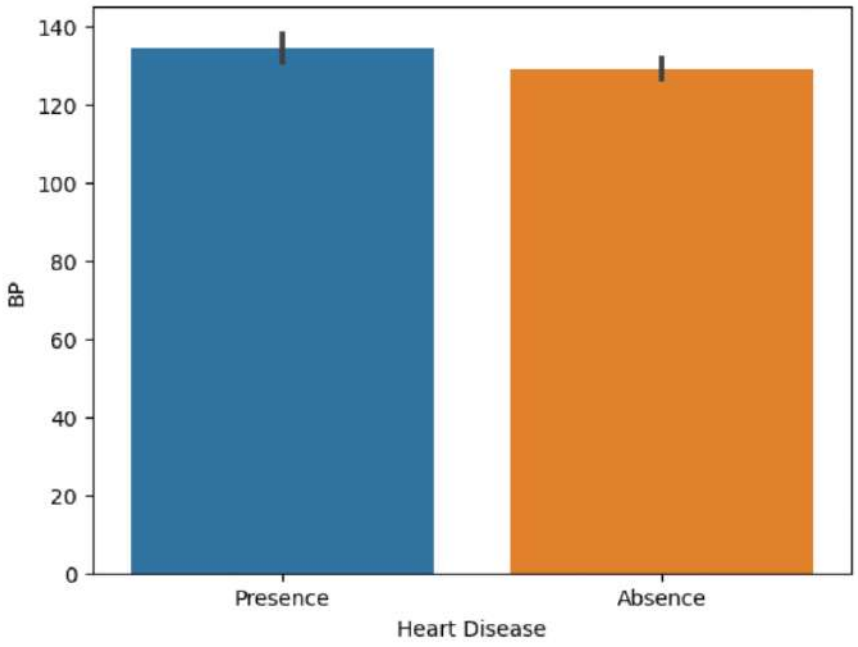
In [39]:
```
sns.barplot(x=df['Sex'],y=df['Cholesterol'],data=df)
```

Out[39]:
```
<AxesSubplot:xlabel='Sex', ylabel='Cholesterol'>
```



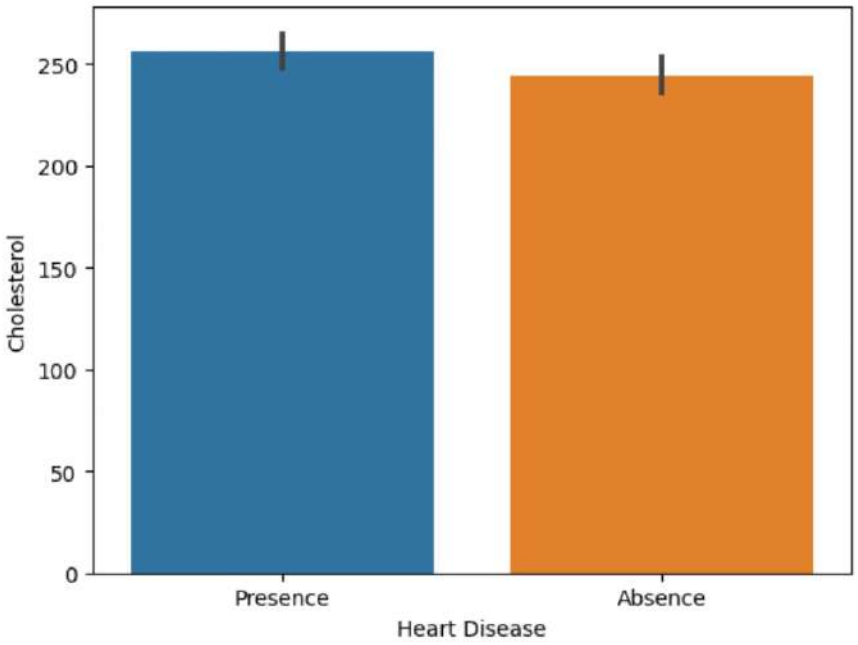
In [42]:
```
sns.barplot(x=df['Heart Disease'],y=df['BP'],data=df)
```

Out[42]:
```
<AxesSubplot:xlabel='Heart Disease', ylabel='BP'>
```



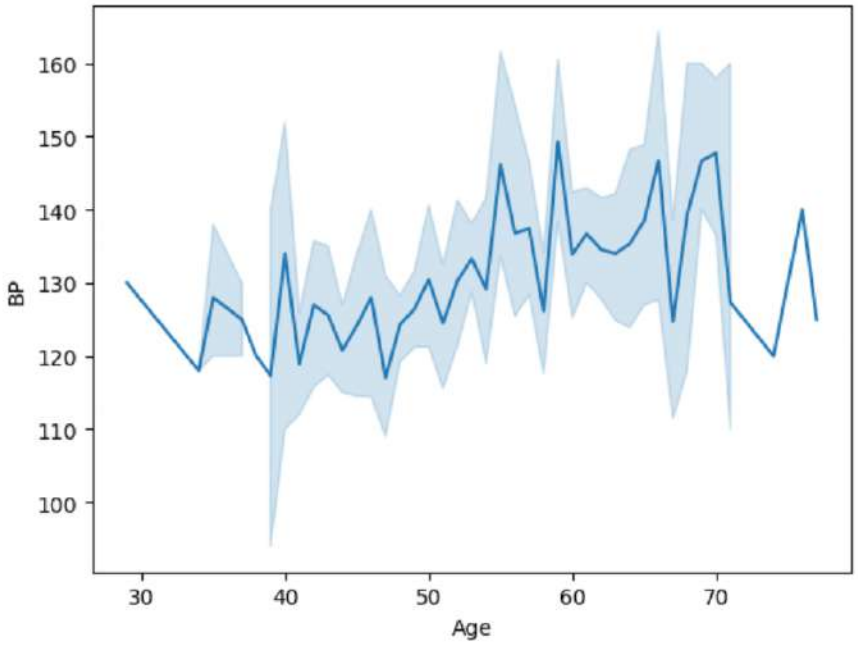
In [43]:
```
sns.barplot(x=df['Heart Disease'],y=df['Cholesterol'],data=df)
```

Out[43]:
```
<AxesSubplot:xlabel='Heart Disease', ylabel='Cholesterol'>
```



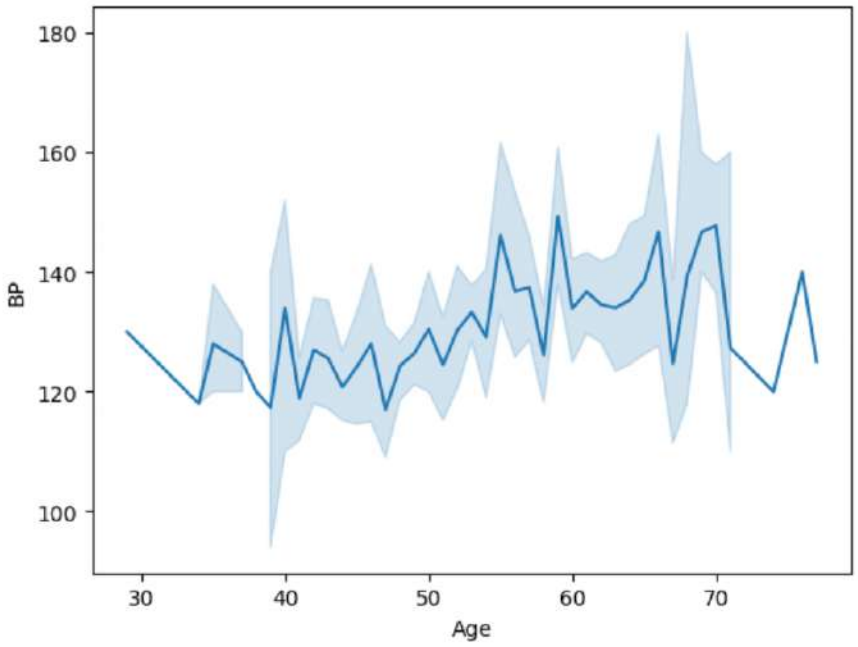
In [44]:
```
sns.lineplot(x=df['Age'],y=df['BP'],data=df)
```

Out[44]:
```
<AxesSubplot:xlabel='Age', ylabel='BP'>
```



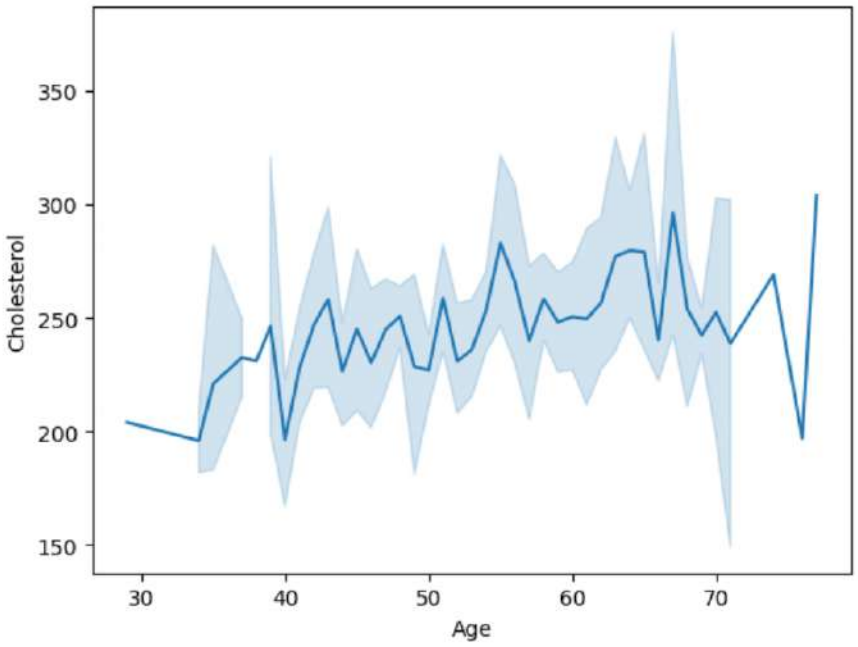
In [45]:
```
sns.lineplot(x=df['Age'],y=df['BP'],data=df)
```

Out[45]:
```
<AxesSubplot:xlabel='Age', ylabel='BP'>
```



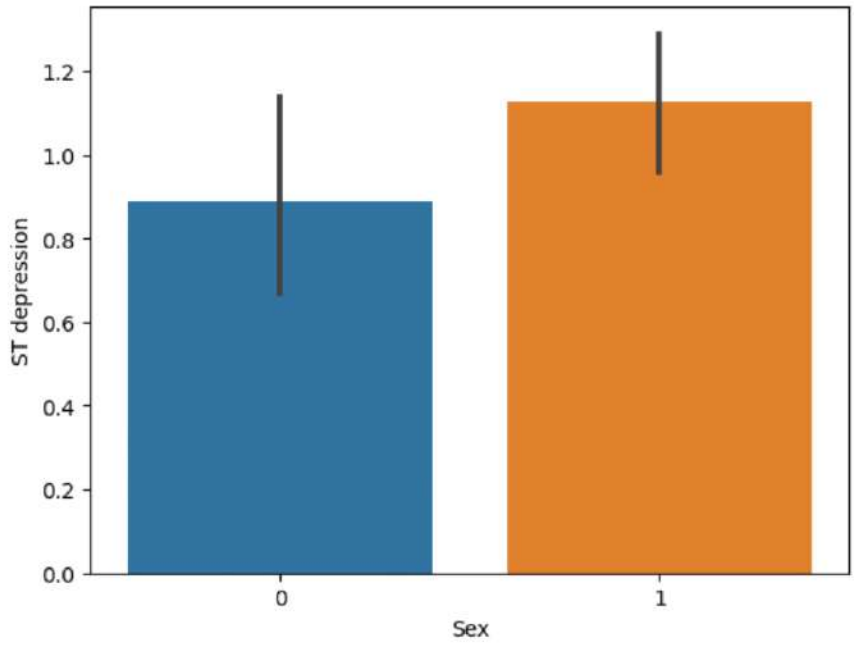
In [46]:
```
sns.lineplot(x=df['Age'],y=df['Cholesterol'],data=df)
```

Out[46]:
```
<AxesSubplot:xlabel='Age', ylabel='Cholesterol'>
```



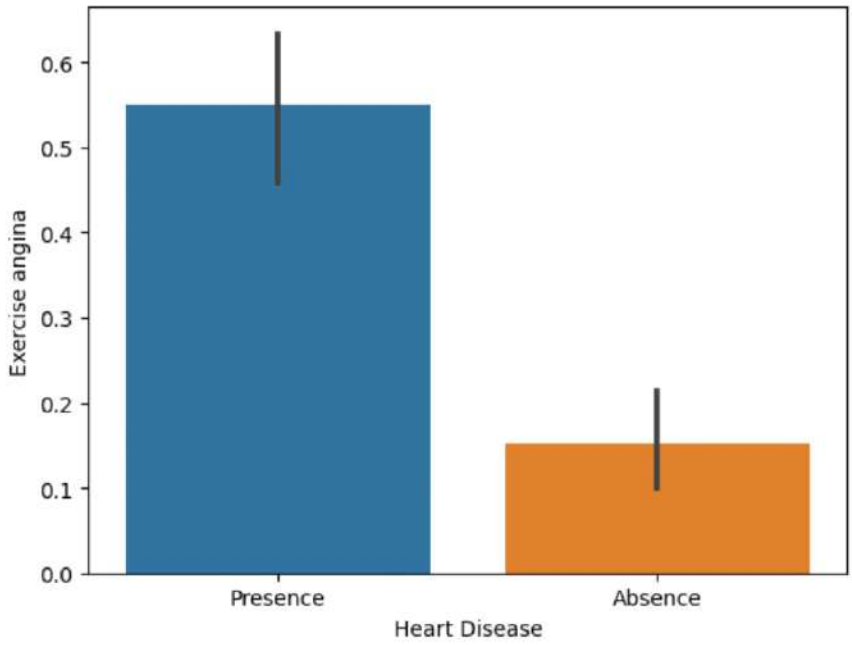
In [47]:
```
sns.barplot(x=df['Sex'],y=df['ST depression'],data=df)
```

Out[47]:
```
<AxesSubplot:xlabel='Sex', ylabel='ST depression'>
```



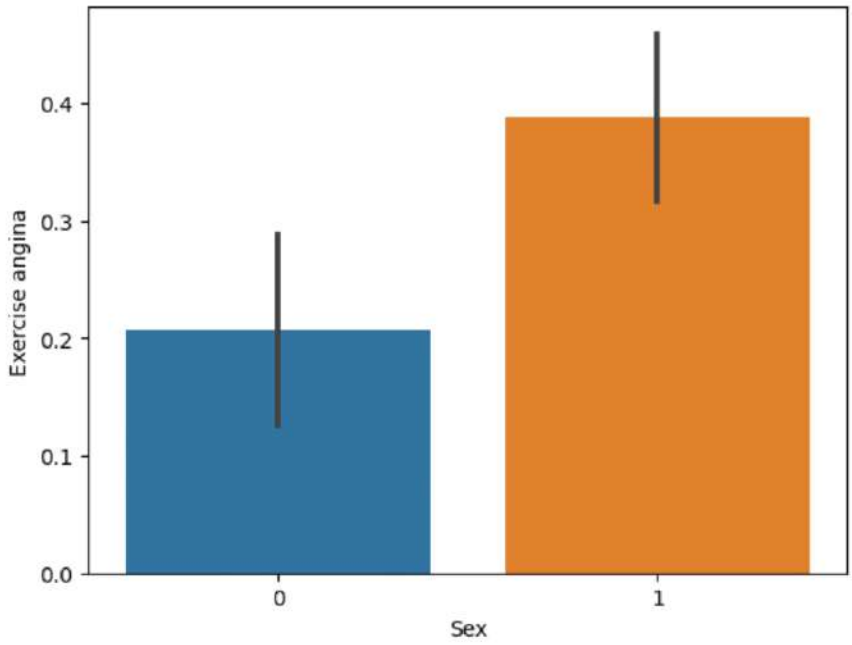
In [48]:
```
sns.barplot(x=df['Heart Disease'],y=df['Exercise angina'],data=df)
```

Out[48]:
```
<AxesSubplot:xlabel='Heart Disease', ylabel='Exercise angina'>
```



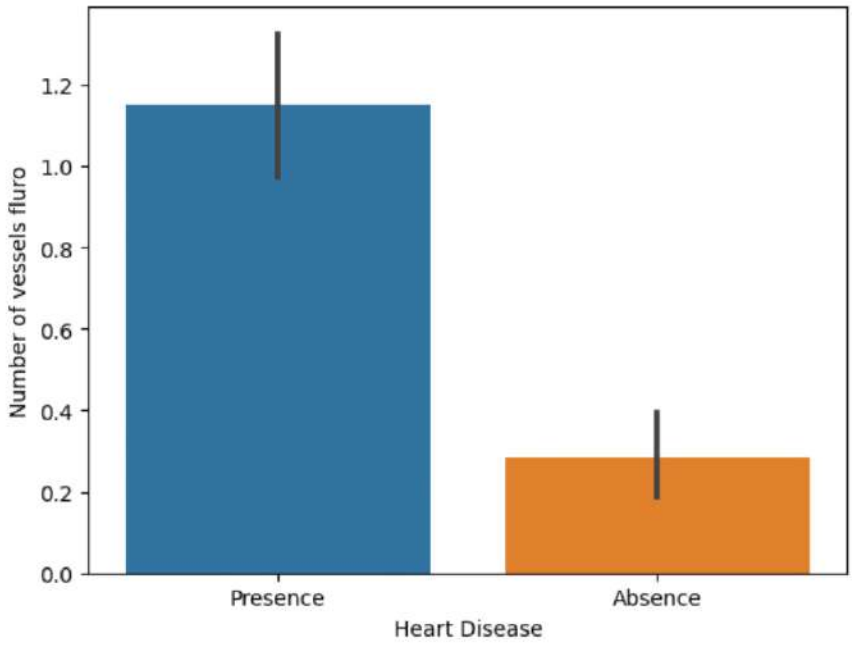
In [49]:
```
sns.barplot(x=df['Sex'],y=df['Exercise angina'],data=df)
```

Out[49]:
```
<AxesSubplot:xlabel='Sex', ylabel='Exercise angina'>
```



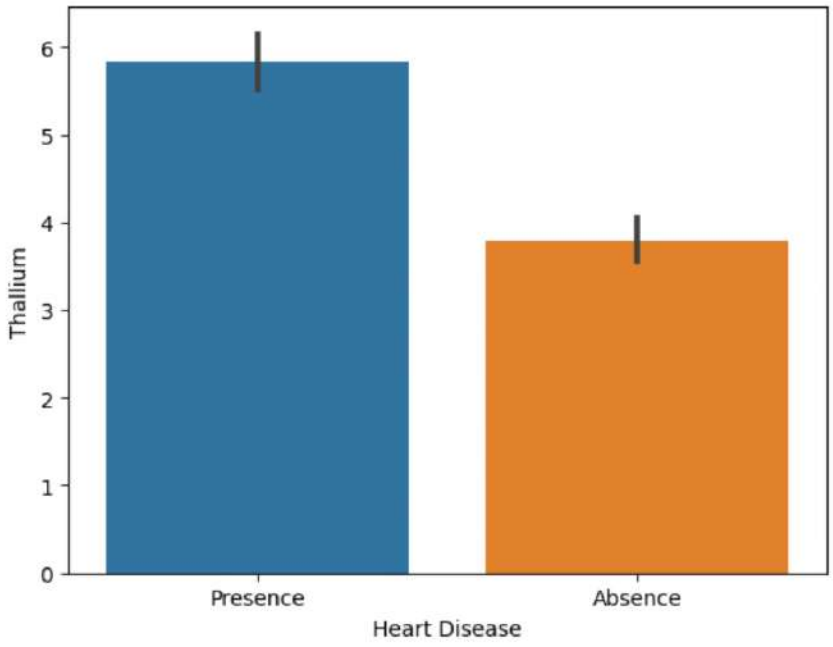
In [50]:
```
sns.barplot(x=df['Heart Disease'],y=df['Number of vessels fluro'],data=df)
```

Out[50]:
```
<AxesSubplot:xlabel='Heart Disease', ylabel='Number of vessels fluro'>
```



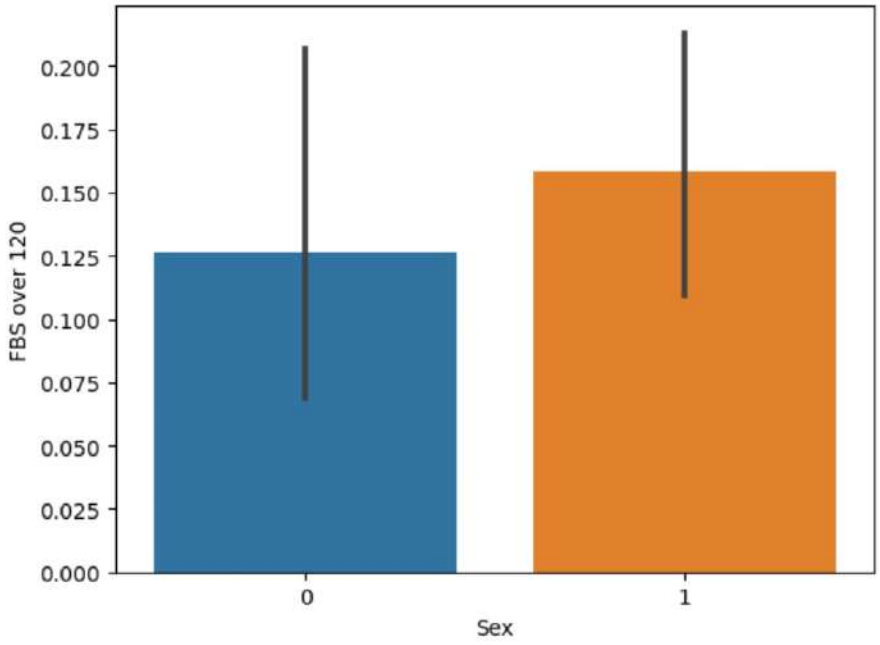
In [51]:
```
sns.barplot(x=df['Heart Disease'],y=df['Thallium'],data=df)
```

Out[51]:
```
<AxesSubplot:xlabel='Heart Disease', ylabel='Thallium'>
```



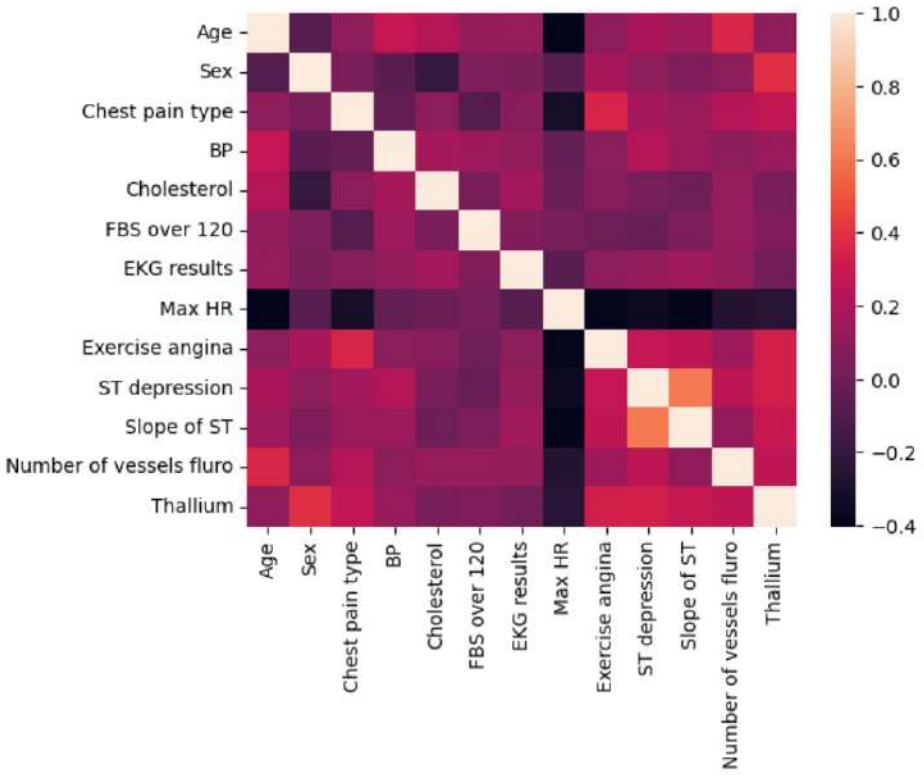
In [52]:
```
sns.barplot(x=df['Sex'],y=df['FBS over 120'],data=df)
```

Out[52]:
```
<AxesSubplot:xlabel='Sex', ylabel='FBS over 120'>
```



In [53]:
```
sns.heatmap(df.corr())
```

Out[53]: <AxesSubplot:>



In [54]:
```
from sklearn.preprocessing import LabelEncoder,StandardScaler
le=LabelEncoder()
df['Heart Disease']=le.fit_transform(df['Heart Disease'])
```

In [55]:
```
y=df['Heart Disease']
x=df.drop(['Heart Disease'],axis=1)
```

In [56]:
```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(x,y,random_state=0,test_size=0.2)
```

In [57]:
```
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import accuracy_score
lr=LogisticRegression(max_iter=10000)
lr.fit(x_train,y_train)
pred_1=lr.predict(x_test)
score_1=accuracy_score(y_test,pred_1)
```

In [58]:
```
score_1
```

Out[58]:
```
0.7777777777777778
```

In [59]:
```
from sklearn.ensemble import RandomForestClassifier
rfc=RandomForestClassifier()
rfc.fit(x_train,y_train)
pred_2=rfc.predict(x_test)
score_2=accuracy_score(y_test,pred_2)
```

In [60]:
```
score_2
```

Out[60]:
```
0.7592592592592593
```

In [64]:
```
max(list_1)
```

Out[64]:
```
0.7037037037037037
```

In [ ]:

GITHUB

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