Visualizing and Predicting Heart Diseases with an Interactive Dash Board

PROFESSIONAL READINESS PROJECT REPORT
Submitted By

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CHAPTER 1
INTRODUCTION

PROJECT OVERVIEW:

According to the World Health Organization, every year 12 million deaths occur worldwide due to Heart Disease. The load of cardiovascular disease is rapidly increasing all over the world from the past few years. Many researches have been conducted in attempt to pinpoint the most influential factors of heart disease as well as accurately predict the overall risk. Heart Disease is even highlighted as a silent killer which leads to the death of the person without obvious symptoms.The early diagnosis of heart disease plays a vital role in making decisions on lifestyle changes in high-risk patients and in turn reduce the complications. This project aims to predict future HeartDisease by analyzing data of patients which classifies whether they have heart disease or not using machine-learning algorithms.

PURPOSE:

Heart is the next major organ comparing to brain which has more priority in Human body. It pumps the blood and supplies to all organs of the whole body. Prediction of occurrences of heart diseases in medical field is significant work. Data analytics is useful for prediction from more information and it helps medical center to predict of various disease. Huge amount of patient related data is maintained on monthly basis. The stored data can be useful for source of predicting the occurrence of future disease. Some of the data mining and machine learning techniques are used to predict the heart disease, such as Artificial Neural Network (ANN), Decision tree, Fuzzy Logic, K-Nearest Neighbour(KNN), Naïve Bayes and Support Vector Machine (SVM). This paper provides an insight of the existing algorithm and it gives an overall summary of the existing work.

TYPES OF HEART DESEASE

Arrhythmia	The heart beat is improper whether it may irregular, too slow or too fast.
Cardiac arrest	An unexpected loss of heart function, consciousness and breathing occur suddenly.
Congestive heart failure	The heart does not pump blood as well as it should, it is the condition of chronic.
Congenital heart disease	The heart’s abnormality which develops before birth.
Coronary artery disease	The heart’s major blood vessels can damage or any disease occurs in the blood vessels.

High Blood Pressure	It has a condition that the force of the blood against the artery walls is too high.
Peripheral artery disease	The narrowed blood vessels which reduce flow of blood in the limbs, is the circulatory condition.
Stroke	Interruption of blood supply occur damage to the brain.

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Stroke	Interruption of blood supply occur damage to the brain.

LITERATURE SURVEY :

There are numerous works has been done related to disease prediction systems using different data mining techniques and machine learning algorithms in medical centers.

Table 2 A comparative study of various algorithms in literature review.

YEAR	AUTHOR	PURPOSE	TECHNIQUES USED	ACCURACY
2015	Sharma Purushottam et al,[15]	Efficient Heart Disease Prediction System using Decision Tree.	Decision tree classifier	86.3% for testing phase. 87.3% for training phase.
2015	Boshra Brahmi et al, [20]	Prediction and Diagnosis of Heart Disease by Data Mining Techniques.	J48, Naïve Bayes, KNN, SMO	J48 gives better accuracy than other three techniques.
2015	Sairabi H. Mujawar et al, [24]	Prediction of Heart Disease using Modified K-means and by using	Modified k-means algorithm, naive bayes algorithm.	Heart Disease detection=93%. Heart Disease
		Naïve Bayes.		undetection=89%.
2015	Noura Ajam et al, [21]	Heart Disease Diagnoses using Artificial Neural Network.	ANN	88%

2015	Sharma Purushottam et al, [26]	Heart Disease Prediction System Evaluation using C4.5 Rules and Partial Tree.	C4.5 rules and Naive Bayes algorithm	C4.5 gives better accuracy than Naive Bayes.
2016	Marjia et al, [8]	Prediction of Heart Disease using WEKA tool.	K Star	75%
			J48	86%
			SMO	89%
			Bayes Net	87%
			Multi layer Perception	86%
2016	S. Seema et al, [9]	Chronic Disease Prediction by mining the data.	Naïve Bayes	Highest accuracy achieved by SVM, in case of heart disease 95.56%
			Decision Tree	Highest accuracy of 73.588% achieved by Naïve Bayes in case of diabetes.
			Support Vector Machine	
2016	Ashok Kumar et Dwivedi al[10]	Evaluate the performance of different machine learning techniques for heart disease prediction.	Naïve Bayes	83%
			KNN	80%
			Logistic Regression	85%

			Classification Tree	77%
2016	K. Gomathi et al,[16]	Multi Disease Prediction using Data Mining Techniques.	Naïve Bayes	Heart Disease: 79% Diabetes: 77.6% Breast Cancer: 82.5%
			J48	Heart Disease: 77% Diabetes: 100% Breast Cancer: 75.5%

2016	S. Prabhavathi et al, [23]	Analysis and Prediction of Various Heart Diseases using DNFS Techniques.	Decision tree, c4.5, SVM, naïve bayes.	Accuracy according to the types of heart disease. CVD Diagnosis= between 85% and 99%. CHD Diagnosis= between 82% and 92%.
2016	Sharan Monica. L et al,[25]	Analysis of CardioVasular Disease Prediction using Data Mining Techniques.	J48	91.4%
			Naïve Bayes	88.5%
			Simple CART	92.2%
2017	Jayami Patel et al,[14]	Heart disease Prediction using Machine Learning and Data mining Technique.	LMT, UCI	UCI gives better accuracy, compared to LMT.
2017	P. Sai Chandrasekhar Reddy et al, [17]	Heart disease prediction using ANN algorithm in data mining.	ANN	Accuracy proved in JAVA.
2018	Chala Bayen et al,[12]	Prediction and Analysis the occurrence of Heart Disease using data mining techniques.	J48, Naïve Bayes, Support Vector Machine.	It gives short time result which helps to give quality of services and reduce cost to individuals.

2018	R. Sharmila et al, [13]	A conceptual method to enhance the prediction of heart diseases using the data techniques.	SVM in parallel fashion	SVM provides better and efficient accuracy of 85% and 82.35%. SVM in parallel fashion gives better accuracy than sequential SVM.

REFERENCES

[1] Animesh Hazra, Arkomita Mukherjee, Amit Gupta, Asmita Mukherjee, "Heart Disease Diagnosis and Prediction Using Machine Learning and Data Mining Techniques: A Review", Research Gate Publications, July 2017, pp.2137-2159.

1. Computer Science Technology, vol.6 2017, pp.457-466. [12]Mr. Chala Beyene, Prof. Pooja Kamat, "Survey on

Prediction and Analysis the Occurrence of Heart Disease
Using Data Mining Techniques", International Journal of Pure and Applied Mathematics, 2018.

1. R. Sharmila, S. Chellammal, "A conceptual method to enhance the prediction of heart diseases using the data techniques", International Journal of Computer Science and Engineering, May 2018.

2. Jayami Patel, Prof. Tejal Upadhay, Dr. Samir Patel,

"Heart disease Prediction using Machine Learning and Data mining Technique", March 2017.

3. Purushottam, Prof. (Dr.) Kanak Saxena, Richa Sharma, "Efficient Heart Disease Prediction System", 2016, pp.962-969.

4. K.Gomathi, Dr.D.Shanmuga Priyaa, "Multi Disease

Prediction using Data Mining Techniques", International Journal of System and Software Engineering, December 2016, pp.12-14.

5. Mr.P.Sai Chandrasekhar Reddy, Mr.Puneet Palagi,

S.Jaya, "Heart Disease Prediction using ANN Algorithm in Data Mining", International Journal of Computer

PROBLEM STATEMENT:

Who does the Problem Affect?	This problem can involve major structural issues, such as the absence of a ventricle or problems with unusual connections between the main arteries that leave the heart. It is caused by the people having age of more than 46 years. This is also a disease passed down byhereditary.
Some issues of heart diseases	• Heart attacks • Heart failure • Arrhythmia • Valve disease. ... • High blood pressure. ... • Congenital heart conditions. ... • Inherited heart conditions. • Unstable angina.
When does the heart related issues occur	This issue occurs in men/people with unstable lifestyle and in people above the age of 45 or above.
Where is the issue coming	This issue is coming originates from people who have an unstable health conditions. A heart attack occurs when an artery that sends blood and oxygen to the heart is blocked. Fatty, cholesterol-containing deposits build up over time, forming plaques in the heart's arteries.
Why is it important so we fix the problem	There are 2,380 deaths from CVD each day, based on 2018 data. On average, someone in the US has a stroke every 40 seconds. There are about 795,000 new or recurrent strokes each year, based on 1999 data. On average, someone dies of a stoke every 3 minutes and 33 seconds in the US. About 697,000 people died from heart disease in 2020—that's 1 in every 5 deaths. So it is important to create a

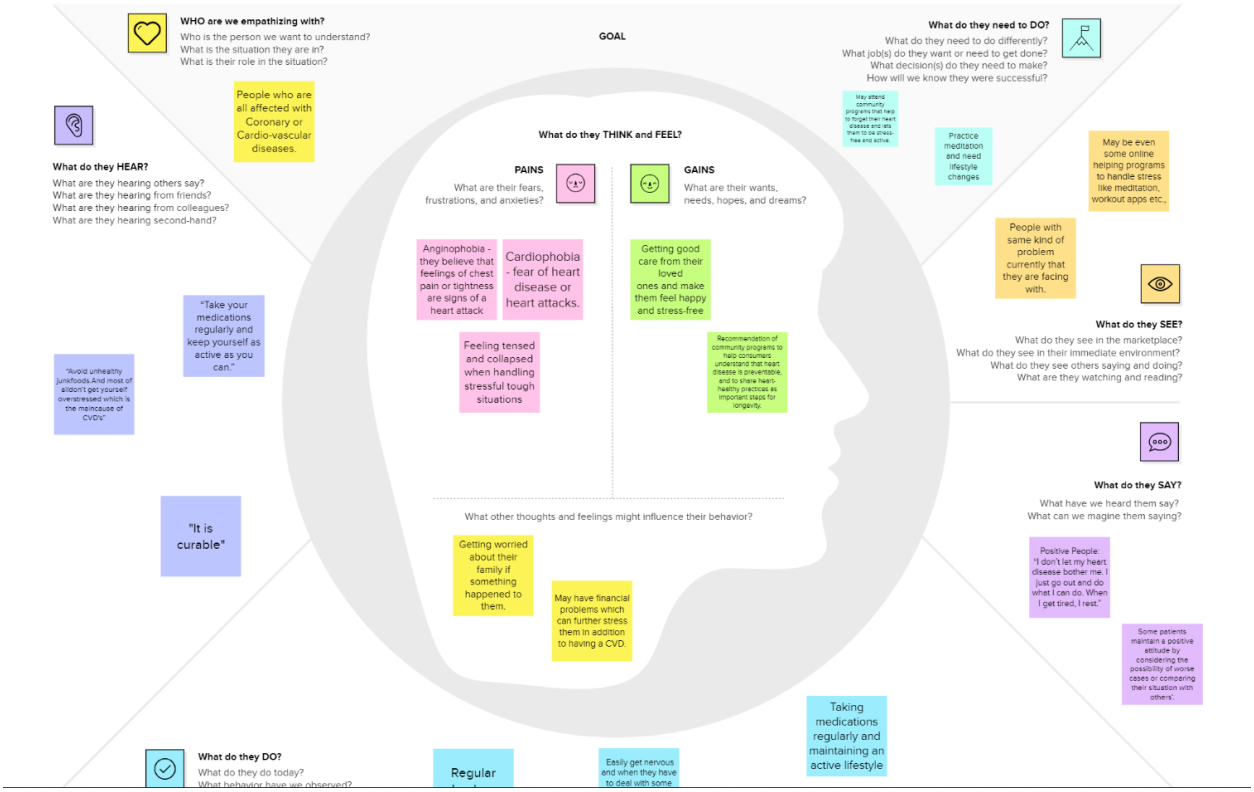
PROBLEM DEFINITION :

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

IDEATION AND BRAINSTORMING:

Brainstorming is a method of generating ideas and sharing knowledge to solve a particular commercial or technical problem, in which participants are encouraged to think without interruption. Brainstorming is a group activity where each participant shares their ideas as soon as they come to mind.

EMPATHY MAP:



PROPOSED SOLUTION:

To over come this we are implementing random forests in order to achieve accurate results in less time . Machine learning is given a major priority in modern life in many application and in healthcare sector . Prediction is one of areas where machine learning plays a vital role , Our topic is to predict heart diseases by processing patient's dataset and a data of patients i.e., user of whom we need to predict the chances of occurrence of the heart diseases. Our aim is to build an application of heart diseases prediction system using Flask and deployed on Heroku. A csv file is given as input . After the successful completion of operation the result is predicted and displayed

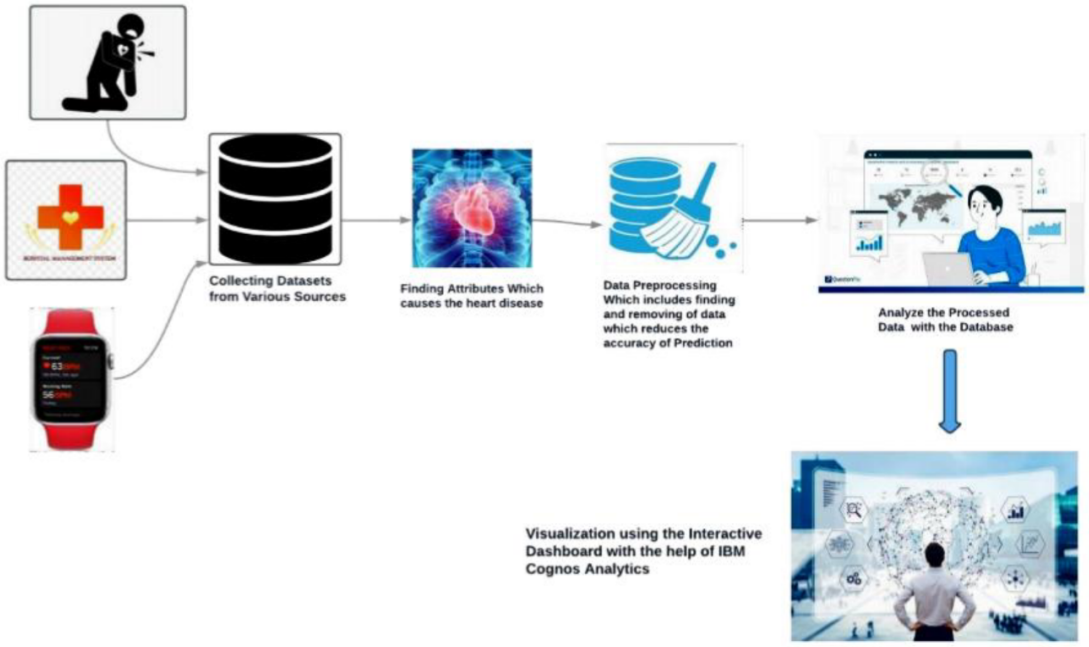
PROBLEM SOLUTION FIT:

The Problem-Solution Fit simply means that you have found a problem with your customer and that the solution you have realized for it actually solves the customer's problem.

After having identified the target customer segment, it's time to investigate their needs. One of the cheapest, fastest and most informative things to do at this stage is to meet with customers through customer discovery interviews (more about customer discovery interviews here and here) until we keep hearing the same things from customers. Meeting with a customer is an invaluable source of insights, much more valuable than a survey.Besides, as entrepreneurs, our job is to meet and pitch to customers all the time, we'd be better off to start earlier rather than later.

PROPOSED ARCHITECTURE:

In this system we are implementing effective heart attack prediction system using Naïve Bayes algorithm. We can give the input as in CSV file or manual entry to the system. After taking input the algorithms apply on that input that is Naïve Bayes. After accessing data set the operation is performed and effective heart attack level is produced. The proposed system will add some more parameters significant to heart attack with their weight, age and the priority levels are by consulting expertise doctors and the medical experts. The heart attack prediction system designed to help the identify different risk levels of heart attack like normal, low or high and also giving the prescription details with related to the predicted result.



REQUIREMENT ANALYSIS:

A functional requirement defines a system or its component. A non-functional requirement defines the quality attribute of a software system. It specifies “What should the software system do?” It places constraints on “How should the software system fulfill the functional requirements?”

4.1 FUNCTIONAL REQUIREMENT

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Dashboard Registration through APP Registration through LINK
FR-2	User Fill The Particular	User Fill Through the Online User Fill Through The Application
FR-3	User Confirmation	User Confirmation Through Gmail User Confirmation Through Notification

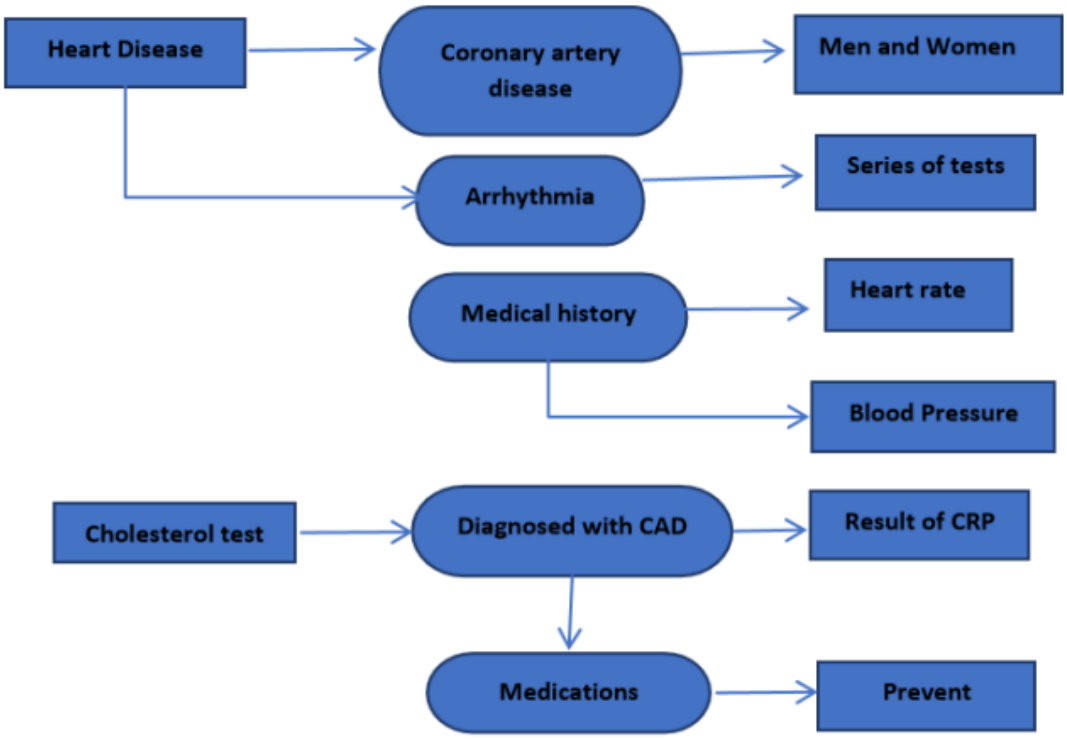
4.2 NON-FUNCTIONAL REQUIREMENT

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Used to Improve The Accuracy Of The Heart Diseases Prediction
NFR-2	**Security**	In This Project We Secure More Lives Early
NFR-3	**Reliability**	Reliability For Accessing The Attributes Of Cardiovascular Patients About The Illness
NFR-4	**Performance**	The Performance Of This Project Is To Improve The Accuracy Of The Diseases Prediction
NFR-5	**Availability**	The Availability Solution Is More Benefit For All Type Persons To Predict The Heart Diseases
NFR-6	**Scalability**	The Scalability Is 90%-95%

PROJECT DESIGN

DATA FLOW DIAGRAM

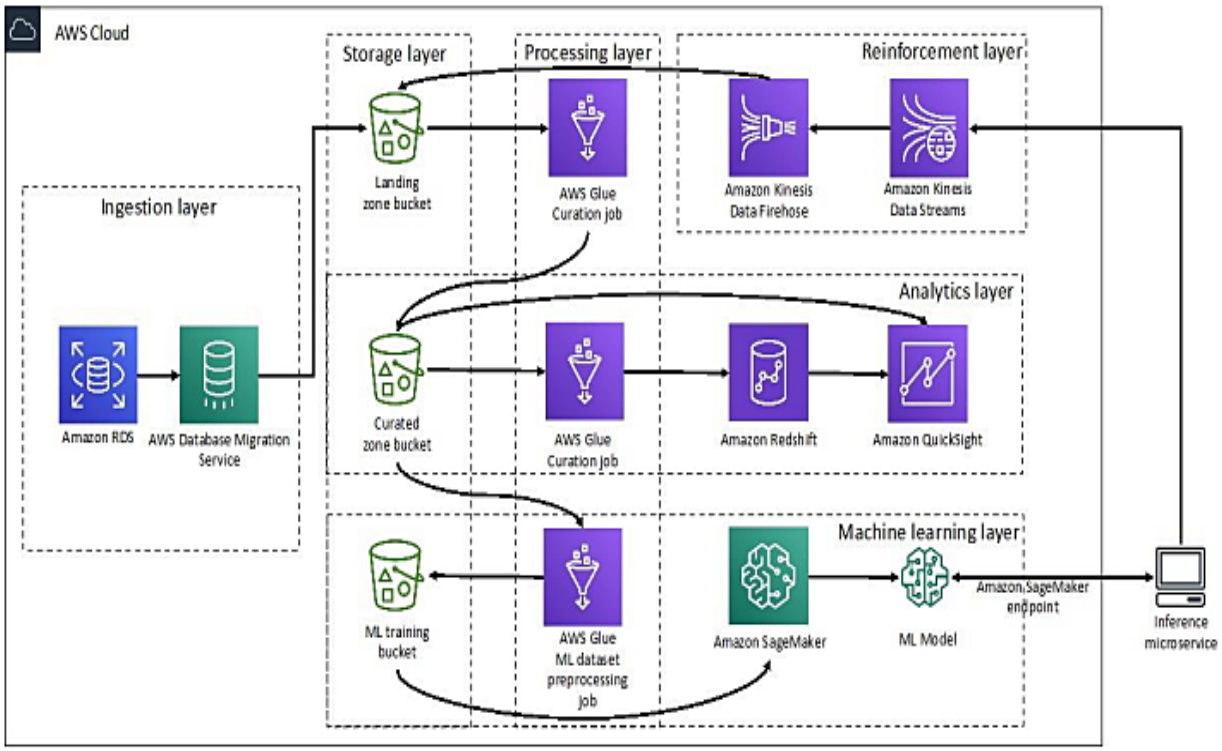
A data flow diagram (DFD) is a graphical or visual representation using a standardized set of symbols and notations to describe a business's operations through data movement.



In this flow diagram we are showing that the heart diseases prediction.

SOLUTION AND TECHNICAL ARCHITECTURE:

A solution architecture (SA) is an architectural description of a specific solution. SAs combine guidance from different enterprise architecture viewpoints (business, information and technical), as well as from the enterprise solution architecture (ESA).



USER STORIES:

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 through facebook	Low	Sprint-2
		USN-4	As a user, I can register for the application through Gmail	I can register through gmail	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password		High	Sprint-1
	Dashboard					
Customer (Web user)		USN-6	As a user I can fill the detail asked here	I can register the asked detail	high	Sprint 1
Customer Care Executive		USN-6	As a user I executive the given detail	I can accept the terms	medium	Sprint-1
Administrator		USN-7	As a administer it predict the output	Show the result	High	Sprint-1

PROJECT PLANNING & SCHEDULING:

SPRINT PLANNING & ESTIMATION:

Product Backlog, Sprint Schedule, and Estimation (4 Marks)

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	E.ABINAYA,K.ARULSAKTHI
Sprint-1		USN-2	As a user, I will receive confirmation email once I have registered for the application	1	High	S.DHANALAKSHMI,S.GAYATHRI
Sprint-2		USN-3	As a user, I can register for the application through Facebook	2	Low	E.ABINAYA,K.NIVETHA
Sprint-1		USN-4	As a user, I can register for the application through Gmail	2	Medium	E.ABINAYA
Sprint-1	Login	USN-5	As a user, I can log into the application by entering email & password	1	High	K.ARULSAKTHI
	Dashboard	USN-6	Creating a Dashboard to predict the heart diseases	3	high	S.GAYATHRI

SPRINT DELIVERY SCHEDULE:

TITLE	DESCRIPTION	DATE
Literature Survey & Information Gathering	Literature survey on the selected project & gathering information by referring technical papers,research publications etc.	26 September 2022
Prepare Empathy Map	Prepare Empathy Map Canvas to capture the user Pains & Gains, Prepare list of problem statements	19 September 2022
Ideation	List the ideas by organizing the brainstorming session and prioritize the top 3 ideas based on the feasibility & importance.	19 September 2022
Proposed Solution	Prepare the proposed solution document, which includes the novelty, feasibility of idea, business model, social impact, scalability of solution, etc.	1 October 2022
Problem Solution Fit	Prepare problem - solution fit document.	1 October 2022
Solution Architecture	Prepare a solution architecture document.	22 October 2022

Customer Journey	Prepare the customer journey maps to understand the user interactions & experiences with the application (entry to exit).	15 October 2022
Functional Requirement	Prepare the functional requirement document.	05 October 2022
Data Flow Diagrams	Draw the data flow diagrams and submit for review.	7 October 2022
Technology Architecture	Prepare the technology architecture diagram.	16 October 2022
Prepare Milestone & Activity List	Prepare the milestones & activity list of the project.	15 November 2022
Project Development - Delivery of Sprint-1, 2, 3 & 4	Develop & submit the developed code by testing it.	15 November

REPORT FROM JIRA:

A burndown chart shows the amount of work that has been completed in an epic or sprint, and the total work remaining. Burndown charts are used to predict your team's likelihood of completing their work in the time available.

Burndown Chart:

CODING AND SOLUTION

PHASE 1:

```
<!DOCTYPE html>
<html lang="en">

<head>
  <meta charset="utf-8" />
  <meta name="viewport" content="width=device-width, initial-scale=1, shrink-to-fit=no">
  <link rel="apple-touch-icon" sizes="76x76" href="../assets/img/apple-icon.png">
  <link rel="icon" type="image/png" href="../assets/img/favicon.png">
  <title>
   LOGIN PAGE
  </title>
  <!--     Fonts and icons     -->
  <link rel="stylesheet" type="text/css"
href="https://fonts.googleapis.com/css?family=Roboto:300,400,500,700,900|Roboto+Slab:400,700" />
  <!-- Nucleo Icons -->
  <link href="../assets/css/nucleo-icons.css" rel="stylesheet" />
  <link href="../assets/css/nucleo-svg.css" rel="stylesheet" />
  <!-- Font Awesome Icons -->
  <script src="https://kit.fontawesome.com/42d5adcbca.js" crossorigin="anonymous"></script>
  <!-- Material Icons -->
  <link href="https://fonts.googleapis.com/icon?family=Material+Icons+Round" rel="stylesheet">
  <!-- CSS Files -->
  <link id="pagestyle" href="../assets/css/material-dashboard.css?v=3.0.4" rel="stylesheet" />
</head>

<body class="bg-gray-200">
  <div class="container position-sticky z-index-sticky top-0">
    <div class="row">
      <div class="col-12">
        <!-- Navbar -->
        <nav class="navbar navbar-expand-lg blur border-radius-xl top-0 z-index-3 shadow position-absolute my-3 py-2 start-0 end-0 mx-
4">
          <div class="container-fluid ps-2 pe-0">
            <a class="navbar-brand font-weight-bolder ms-lg-0 ms-3 " href="../pages/dashboard.html">
              Welcome to Our Project for Heart analysis Dashboard
            </a>
            <button class="navbar-toggler shadow-none ms-2" type="button" data-bs-toggle="collapse" data-bs-target="#navigation" aria-
controls="navigation" aria-expanded="false" aria-label="Toggle navigation">
              <span class="navbar-toggler-icon mt-2">
                <span class="navbar-toggler-bar bar1"></span>
                <span class="navbar-toggler-bar bar2"></span>
                <span class="navbar-toggler-bar bar3"></span>
              </span>
            </button>
            <div class="collapse navbar-collapse" id="navigation">
              <ul class="navbar-nav mx-auto">
                <li class="nav-item">
                  <a class="nav-link d-flex align-items-center me-2 active" aria-current="page" href="../pages/dashboard.html">
                    <i class="fa fa-chart-pie opacity-6 text-dark me-1"></i>
```

```
                Dashboard
              </a>
            </li>
            <li class="nav-item">
              <a class="nav-link me-2" href="../pages/profile.html">
                <i class="fa fa-user opacity-6 text-dark me-1"></i>
                Profile
              </a>
            </li>
            <li class="nav-item">
              <a class="nav-link me-2" href="../pages/sign-up.html">
                <i class="fas fa-user-circle opacity-6 text-dark me-1"></i>
                Sign Up
              </a>
            </li>
            <li class="nav-item">
              <a class="nav-link me-2" href="../pages/sign-in.html">
                <i class="fas fa-key opacity-6 text-dark me-1"></i>
                Sign In
              </a>
            </li>
          </ul>
          </ul>
        </div>
      </div>
    </nav>
    <!-- End Navbar -->
  </div>
 </div>
</div>
<main class="main-content  mt-0">
  <div class="page-header align-items-start min-vh-100" style="background-image: url('https://media.istockphoto.com/photos/the-adult-and-the-child-holding-red-heart-picture-id1224521725?b=1&k=20&m=1224521725&s=612x612&w=0&h=URlSMm61G-Ef3rges2RZer4-Qt7A72EtXi4N0_ZHe3Y=');">
    <span class="bg-gradient-dark opacity-6"></span>
    <div class="container my-auto">
      <div class="row">
        <div class="col-lg-4 col-md-8 col-12 mx-auto">
          <div class="card z-index-0 fadeIn3 fadeInBottom">
            <div class="card-header p-0 position-relative mt-n4 mx-3 z-index-2">
              <div class=" bg-gradient-danger shadow-primary border-radius-lg py-3 pe-1">
                <h4 class="text-white font-weight-bolder text-center mt-2 mb-0">Sign in</h4>
                <div class="row mt-3">
                  <div class="col-2 text-center ms-auto">
                    <a class="btn btn-link px-3" href="javascript:;">
                      <i class="fa fa-facebook text-white text-lg"></i>
                    </a>
                  </div>

                  <div class="col-2 text-center me-auto">
                    <a class="btn btn-link px-3" href="javascript:;">
                      <i class="fa fa-google text-white text-lg"></i>
                    </a>
                  </div>
                </div>
              </div>
```

```
          </div>
          <div class="card-body">
            <form role="form" class="text-start">
              <div class="input-group input-group-outline my-3">
                <label class="form-label"></label>
                <input type="text" class="form-control" placeholder="Email/PhoneNumber">
              </div>
              <div class="input-group input-group-outline mb-3">
                <label class="form-label"></label>
                <input type="password" class="form-control" placeholder="Password">
              </div>
              <div class="form-check form-switch d-flex align-items-center mb-3">
                <input class="form-check-input" type="checkbox" id="rememberMe" checked>
                <label class="form-check-label mb-0 ms-3" for="rememberMe">Remember me</label>
              </div>
              <div class="text-center">
                <button type="button" class="btn bg-gradient-danger w-100 my-4 mb-2">Sign in</button>
              </div>
              <p class="mt-4 text-sm text-center">
                Don't have an account?
                <a href="../pages/sign-up.html" class="text-danger text-gradient font-weight-bold">Sign up</a>
              </p>
            </form>
          </div>
        </div>
      </div>
    </div>
  </div>
 </main>
 <!--   Core JS Files   -->
 <script src="../assets/js/core/popper.min.js"></script>
 <script src="../assets/js/core/bootstrap.min.js"></script>
 <script src="../assets/js/plugins/perfect-scrollbar.min.js"></script>
 <script src="../assets/js/plugins/smooth-scrollbar.min.js"></script>
 <script>
  var win = navigator.platform.indexOf('Win') > -1;
  if (win && document.querySelector('#sidenav-scrollbar')) {
    var options = {
      damping: '0.5'
    }
    Scrollbar.init(document.querySelector('#sidenav-scrollbar'), options);
  }
 </script>
 <!-- Github buttons -->
 <script async defer src="https://buttons.github.io/buttons.js"></script>
 <!-- Control Center for Material Dashboard: parallax effects, scripts for the example pages etc -->
 <script src="../assets/js/material-dashboard.min.js?v=3.0.4"></script>
</body>

</html>
```

PHASE 2:

```
<!DOCTYPE
<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>
                                 <link href="https://fonts.googleapis.com/css2?family=Pacifico&display=swap" rel="stylesheet">
                      </head>
                  <body>
                      <!-- Website Title -->
                                <div class="container">
                                 <h2 class='container-heading'><span class="heading_font">Heart Disease Predictor</span></h2>
                                 <div class='description'>
                                           <p>A Machine Learning Web App, Built with Flask, Deployed using Heroku.</p>
                                </div>
                      </div>
                                <!-- Result -->
                                <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>
                      </body>
</html>
```

TESTING

TEST CASES

A test case is nothing but a series of step executed on a product, using a predefined set of input data, expected to produce a pre-defined set of outputs, in a given environment. It describes “how” to implement those test cases. Test case specifications are useful as it enlists the specification details of the items. The purpose of testing is to discover errors . Testing is the process of trying to discover every conceivable fault or weakness in a work product . It provide a way to check the functionality of component , sub assemblies , assemblies and/or a finished product. It is the process of exercising software with the intent of ensuring that the software system meets its requirement and user expectation and does not fail in an unacceptable manner. There are various types of testing. Each test type addressing a specific testing requirement. The testing report are submitted in github account.

USER ACCEPTANCE TESTING

User acceptance testing is a critical phase of any project and requires significant participant by the end user. It also ensure that the system meets the functional requirement.

RESULTS

PERFOMANCE METRICES

Classification Report

	precision	recall	f1-score	support
0	0.98	1.00	0.99	132
1	1.00	0.98	0.99	125
accuracy			0.99	257
macro avg	0.99	0.99	0.99	257
weighted avg	0.99	0.99	0.99	257

Accuracy: 98.83%

ADVANTAGE & DISADVANTAGE ADVANTAGE:

• The advantage of this model are high performance and accuracy rate.
• It is very flexible and high rates of success are achieved
• The application when implemented using random forests has more accuracy rate when compare to other algorithm. In this system, we achieve around 98%.

CONCLUTION

The primary objective of the proposed algorithm is to minimize Makespan and improve fitness function. Improving the load balance process through task Scheduling can result in efficient utilization of cloud resources. The objective of this proposed work was to provide an enhanced load balancing algorithm. Result proved that our algorithm reduce makespan and provide efficient resources utilization of compared to existing dynamic LBA (load balancing algorithm). It also shows that the proposed algorithm can function in a dynamic cloud environment where user requests arrive in random order and where there are many changes in the length of the user requests. The algorithm is also to handle large size requests compared to the existing approach.

FUTURE SCOPE

In the future, various other metrics like throughput, average time, resources utilizing, waiting time, etc. can be considered. In the future, author will work to optimize the cloud resources further and enhance cloud-based application performance, such as considering more SLA (service level agreement) parameters. For example, the algorithm will be tested based on the number of violation and the migration count for better performance. Also, the algorithm will be comprehensively compared to other existing algorithm in the literature.

APPENDIX

PYTHON

Python is a computer programming language often used to build websites and software, automate tasks, and conduct data analysis. Python is a general purpose language, meaning it can be used to create a variety of different programs and isn't specialized for any specific problems.

SOURCE CODE

```
# Importing essential libraries
from flask import Flask, render_template, request
import pickle
import numpy as np

# Load the Random Forest CLassifier model
filename = 'heart-disease-prediction-knn-model.pkl'
model = pickle.load(open(filename, 'rb'))

app = Flask(__name__)

@app.route('/')
def home():
                                return render_template('main.html')


@app.route('/predict', methods=['GET','POST'])
def predict():
    if request.method == 'POST':
```

```
    age = int(request.form['age'])
    sex = request.form.get('sex')
    cp = request.form.get('cp')
    trestbps = int(request.form['trestbps'])
    chol = int(request.form['chol'])
    fbs = request.form.get('fbs')
    restecg = int(request.form['restecg'])
    thalach = int(request.form['thalach'])
    exang = request.form.get('exang')
    oldpeak = float(request.form['oldpeak'])
    slope = request.form.get('slope')
    ca = int(request.form['ca'])
    thal = request.form.get('thal')

    data = np.array([[age,sex,cp,trestbps,chol,fbs,restecg,thalach,exang,oldpeak,slope,ca,thal]])
    my_prediction = model.predict(data)

    return render_template('result.html', prediction=my_prediction)



if __name__ == '__main__':
                                app.run(debug=True)
```

PROJECT LINK
https://heart-disease-predictor-flask.herokuapp.com/

DEMO LINK
https://www.kapwing.com/videos/63789559e00b290263490459

GIT RIPO
IBM-Project-20262-1668781674