Project Report Format

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PROJECT REPORT

1. INTRODUCTION

1.1 PROJECT OVERVIEW

A simple web application which uses Machine Learning algorithm to predict the heart condition of a person by providing some inputs about the person health like age, gender, blood pressure, cholesterol level etc built using Flask and deployed on Heroku.

As being a Data and ML enthusiast I have tried many different projects related to the subject but what I have realized is that Deploying your machine learning model is a key aspect of every ML and Data science project. Everything thing I had studied or been taught so far in my Data science and ML journey had mostly focused on defining problem statement followed by Data collection and preparation, model building and evaluation process which is of course important for every ML/DS project but what if I want different people to interact with my models, how can I make my model available for end-users? I can't send them jupyter notebooks right!. That's why I wanted to try my hands on complete end-to- end machine learning

project.

1.2 PURPOSE

Training Of neutral networks is performed using back propagation to evaluate the prediction system. In the testing place approximately 95% accuracy is achieved on testing set. Practical use of data collected from previous record is time consuming. Low accuracy rate.

So to overcome this we are implementing Random Forests Algorithm in order to achieve accurate result in time. Machine learning is given a major priority in modern life in many application and in health care sector. Prediction is one of the area 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 chance of occurrence of a heart diseases.

2. LITERATURE SURVEY

2.1 EXISTING PROBLEM

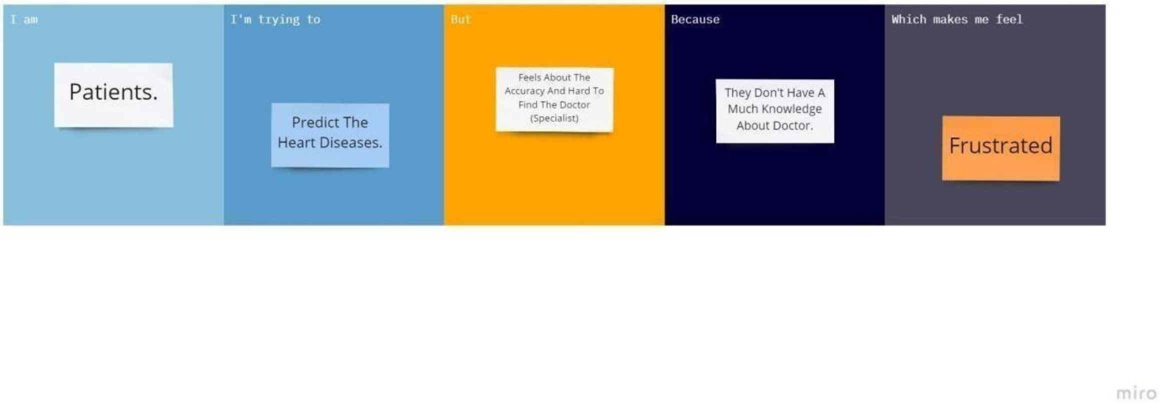
S.NO	**AUTHOR&YEAR**	**TITLE**	**DESCRPTION**	**ACCURACY**
01.	Dhai Eddine Salhi, abdelkamel tari, TaharKechadi 2021	using machine learning for heart disease prediction	found neural network are easierto configure and obtain much good results	93%
02.	Xiao-yangao, Eman M.Anwar 2020	improving the accuracy for analyzing heart diseases predictionbased on the ensemble method	the bagging ensemble learningalgorithm with DT and PCA feature extraction method had achieved the best performance	83%
03.	Shriniket Dixit, Pilla Vaishno Mohan, Shrishail Ravi Terni 2013	Prediction of heartdisease using machine learning algorithms	comparative analysis of theresults of various machine learning algorithms	89%
04.	Nabaouia Louridi, Meryem Amar, Bouabid EI Ouahidi2019	Identification of cardio vascular diseases using machine Learning	improved the quality of cardiovascular disease predictionusing a better processing phase	90%

05.	Ankita Dewan , Meghna Sharma 2015	Prediction of heartdisease using a hybrid technique indata mining	important query of how to make useful information out of the data	85%
		Classification		

2.2 PROBLEM STATEMENT DEFINITION.

Heart Diseases remain the biggest cause of deaths for the last two decades. Recently computer technology and machine learning techniques are used to develop software to assist doctors in making appropriate decision of heart disease in an early stage. The diagnosis of heart disease depends on clinical and pathological data. Heart disease prediction system can assist medical professionals in predicting status of heart disease, based on the clinical data of patients.

Doctors may sometime fail to take an accurate decision in predicting heart disease risk level, therefore heart disease prediction systems are useful in such cases to get accurate results. There are many tools available for performing this task but all of them have some flaws. Most of the tools cannot handle big data and hence predicting heart disease would be a tedious task. In this project we are making an effort to predict the risk level of the huge datasets of patients.



I am

Patients.

I'm trying to

Predict The Heart Diseases.

But

Feels About The Accuracy And Hard To Find The Doctor (Specialist)

Because

They Don't Have A Much Knowledge About Doctor.

Which makes me feel

Frustrated

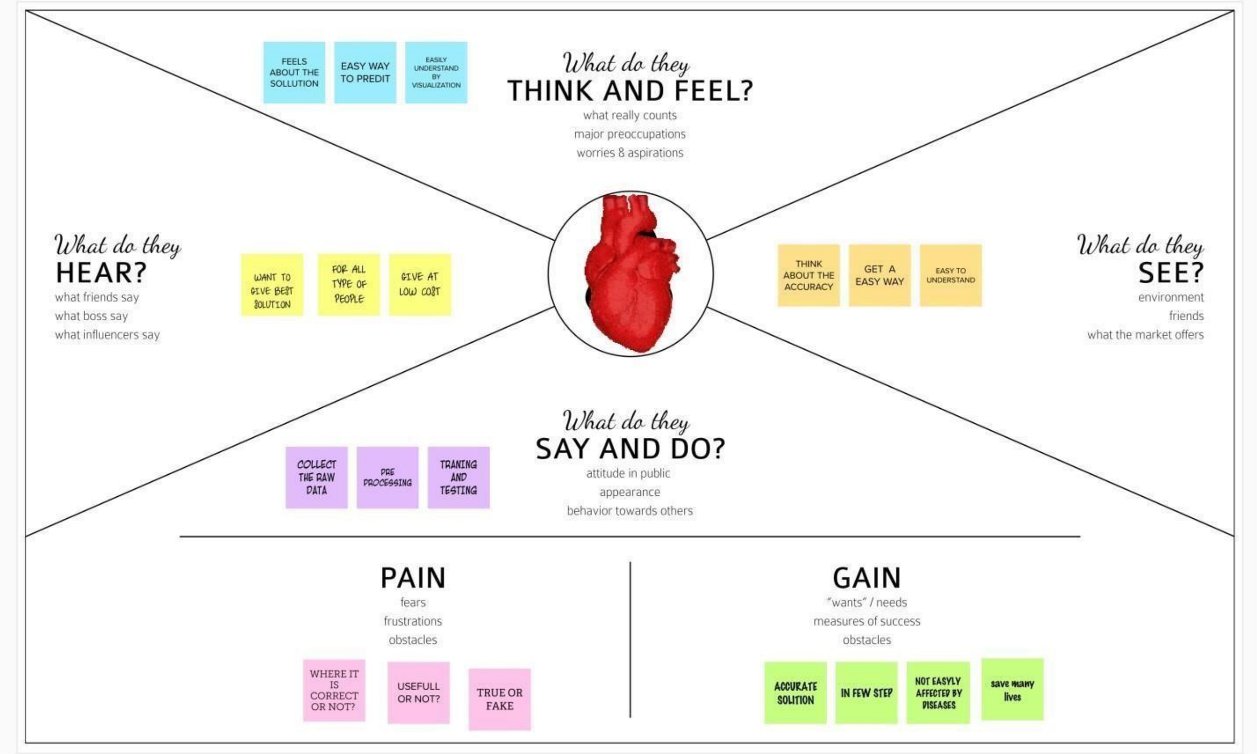
miro

3. IDEATION & PROPOSED SOLUTION

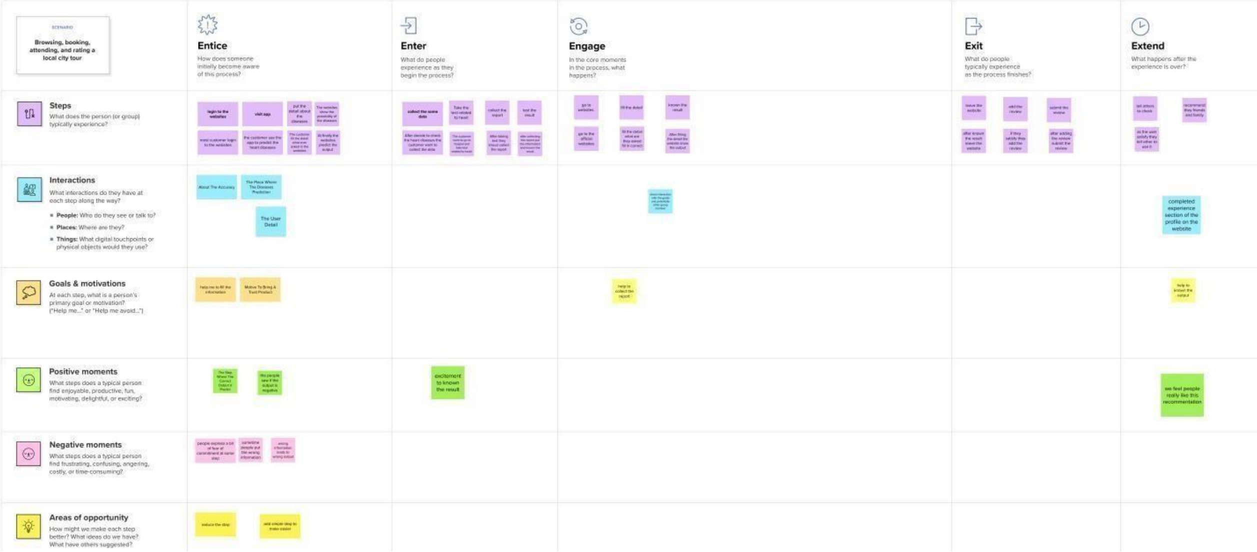
3.1 EMPATHY MAP CANVAS

It’s easy to jump straight into value proposition design. That is the core of your business and where the revenue or exchange of value will come from. However, trying to provide value to a misunderstood customer is very risky business. Do you have your blinkers on? Try using this canvas before you design your value proposition to make sure your offer nails exactly what your customer wants, needs, or may pleasantly surprise them! Keep asking yourself “why would they care?”. What problem are you solving? What opportunity are you creating?

In this empathy map what customer think and feels. this map shows the pain and gain of the customer and what do their hear about the problem. this is the easy way to understand the problem statement



3.2 IDEATION & BRAINSTORMING


SCENARIO
Browsing, booking, attending, and rating a local city tour
Entice
How does someone initially become aware of this process?
Enter
What do people experience as they begin the process?
Engage
In the core moments in the process, what happens?
Exit
What do people typically experience as the process finishes?
Extend
What happens after the experience is over?
Steps
What does the person (or group) typically experience?
Interactions
What interactions do they have at each step along the way?
People: Who do they see or talk to?
Places: Where are they?
Things: What digital touchpoints or physical objects would they use?
Goals & motivations
At each step, what is a person's primary goal or motivation? ("Help me..." or "Help me avoid...")
Positive moments
What steps does a typical person find enjoyable, productive, fun, motivating, delightful, or exciting?
Negative moments
What steps does a typical person find frustrating, confusing, angering, costly, or time-consuming?
Areas of opportunity
How might we make each step better? What ideas do we have? What have others suggested?
login to the websites
visit app
About The Accuracy
The Place Where The Diseases Prediction
The User Detail
Motive To Bring A Trust Product
excitement to known the result
completed experience section of the profile on the website
we feel people really like this recommendation

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.

3.3 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.

3.4 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.

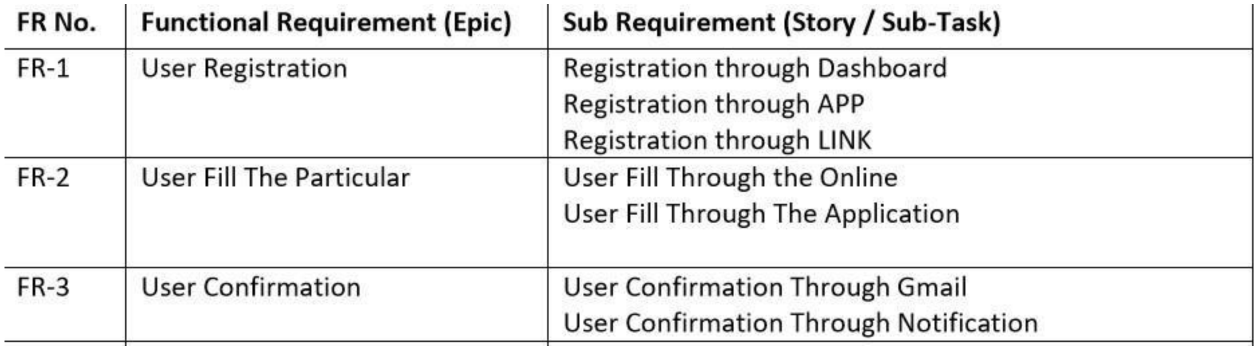
After having identified the target customer segment, it’s time to **investigate their needs**.

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.

4. REQUIREMENT ANALYSIS

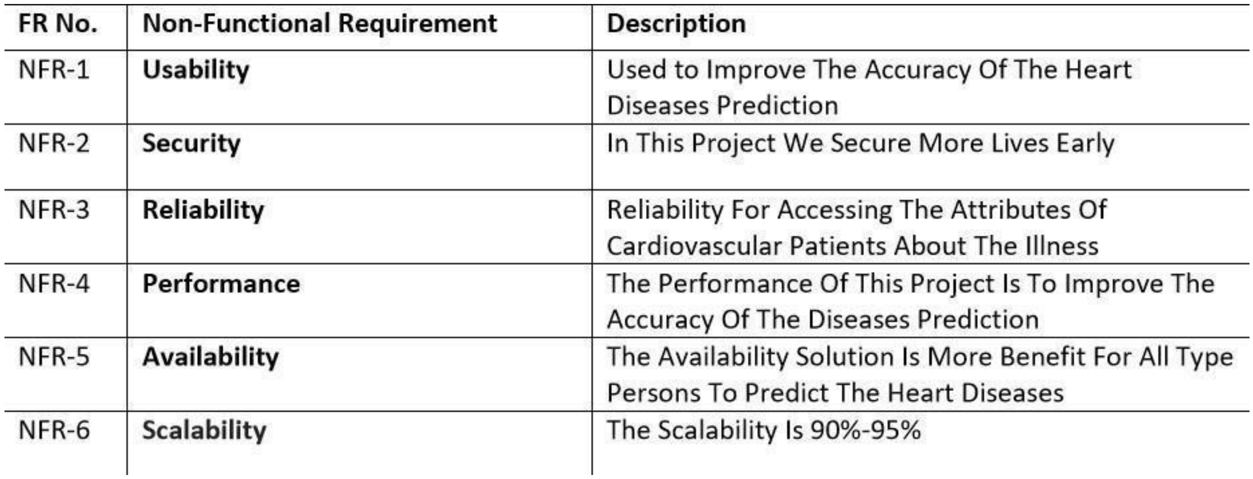
A functional requirement defines a system or its component. A non-functional requirement defines the quality attribute of a software system. It specifies “What should the software system do?” It places constraints on “How should the software system fulfill the functional requirements?”

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

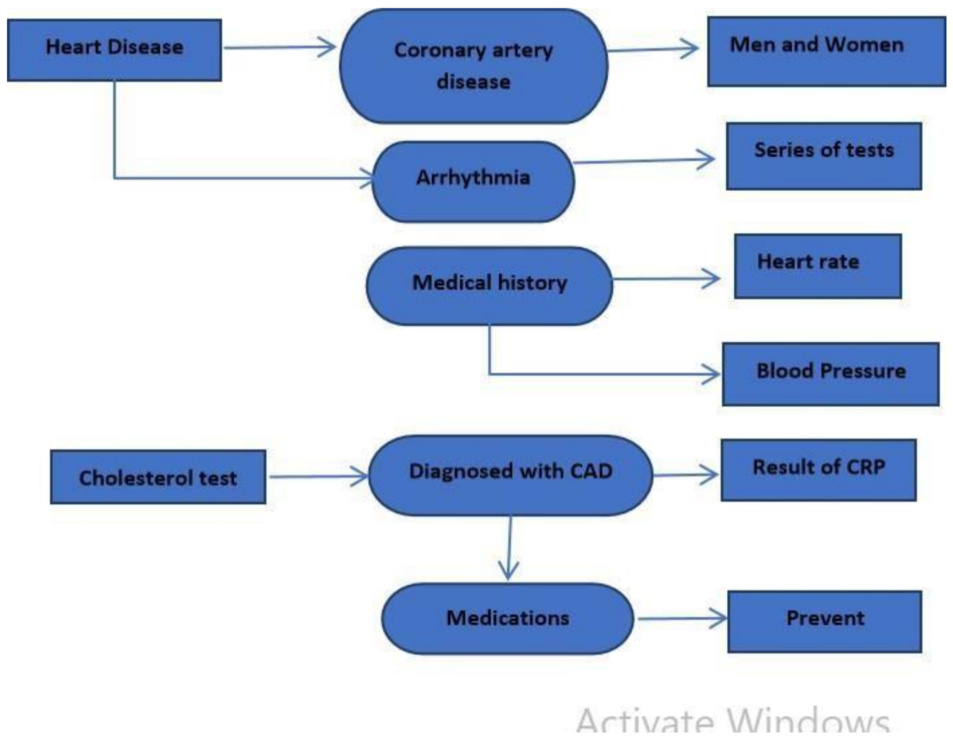


FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Used to Improve The Accuracy Of The Heart Diseases Prediction
NFR-2	**Security**	In This Project We Secure More Lives Early
NFR-3	**Reliability**	Reliability For Accessing The Attributes Of Cardiovascular Patients About The Illness
NFR-4	**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%

5. PROJECT DESIGN

5.1 DATA FLOW DIAGRAM

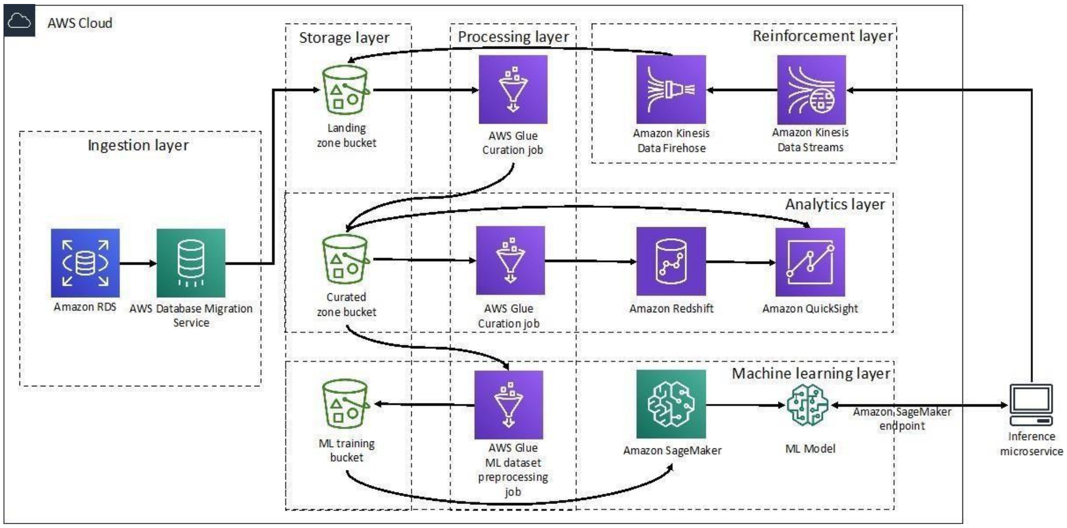
A data flow diagram (DFD) is **a graphical or visual representation using a standardized set of symbols and notations to describe a business's operations through data movement**.



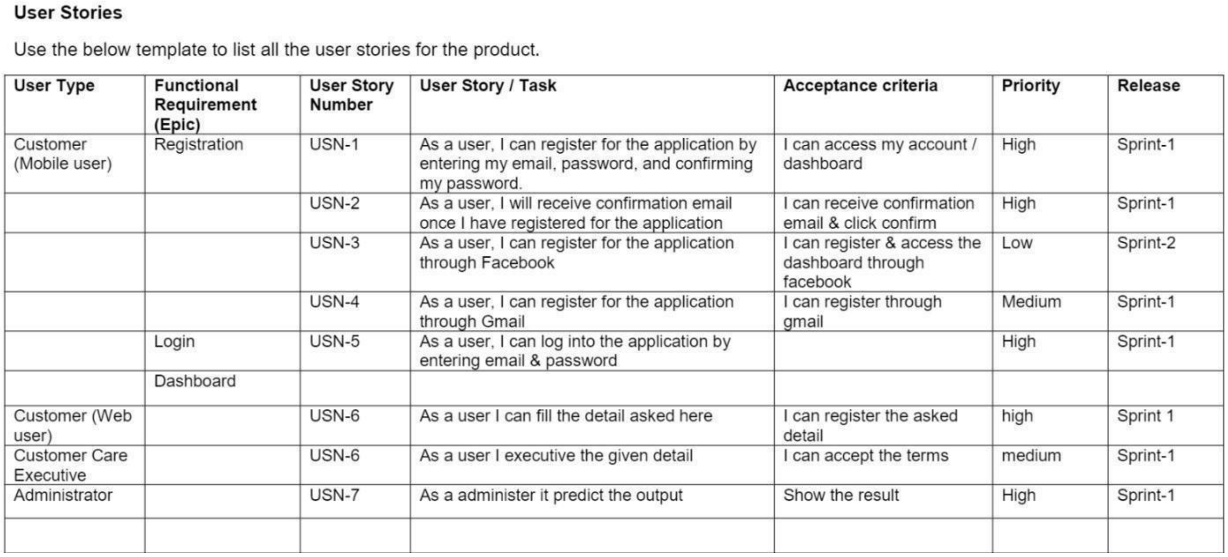
In this flow diagram we are showing that the heart diseases prediction.

5.2 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).



5.3 USER STORIES



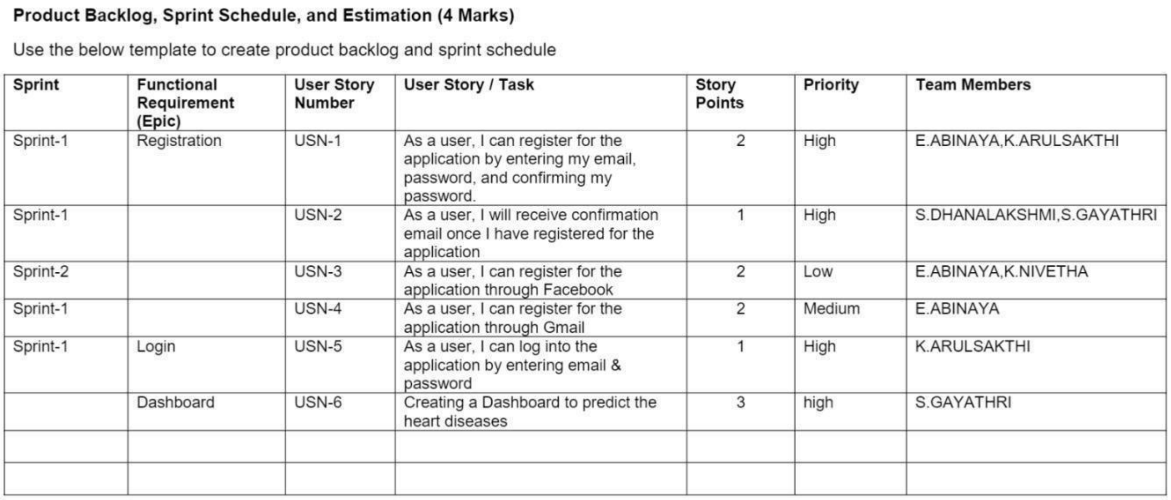
User Stories

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 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

6. PROJECT PLANNING & SCHEDULING

6.1 SPRINT PLANNING & ESTIMATION

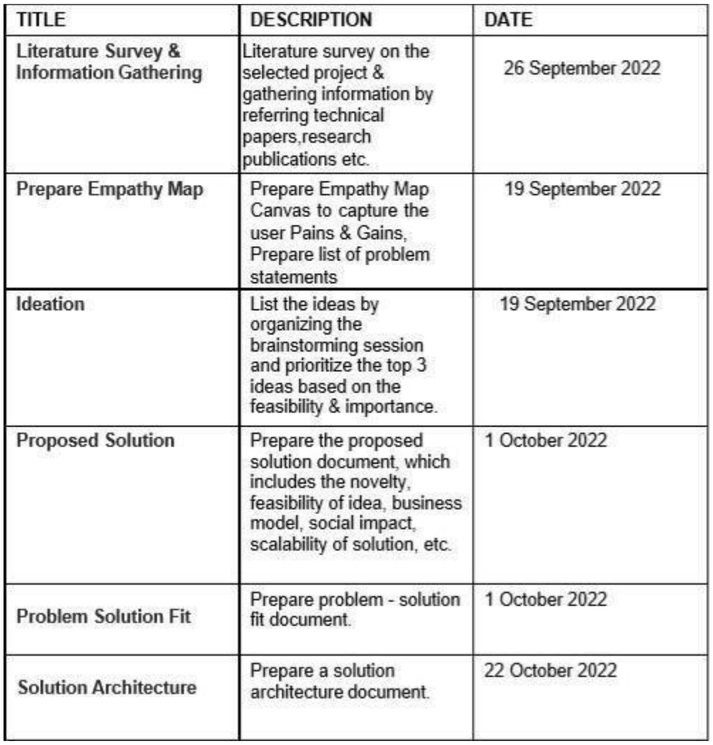


Product Backlog, Sprint Schedule, and Estimation (4 Marks)

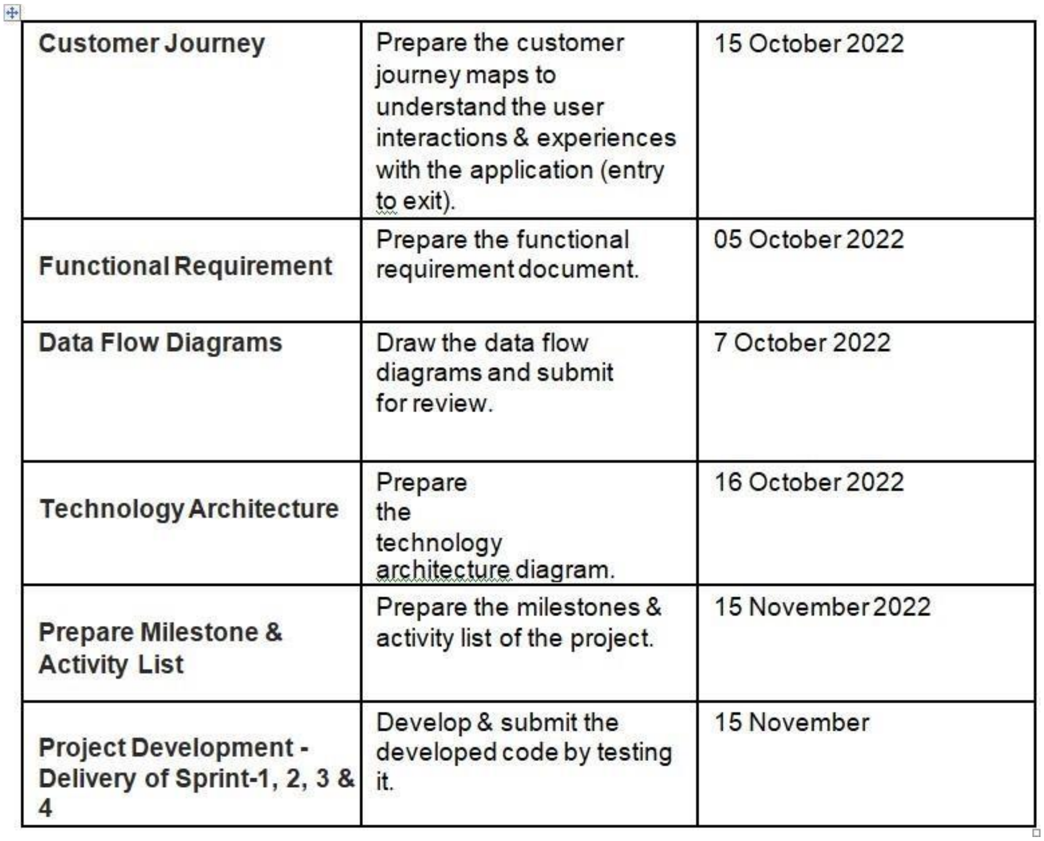
Use the below template to create product backlog and sprint schedule

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

6.2 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

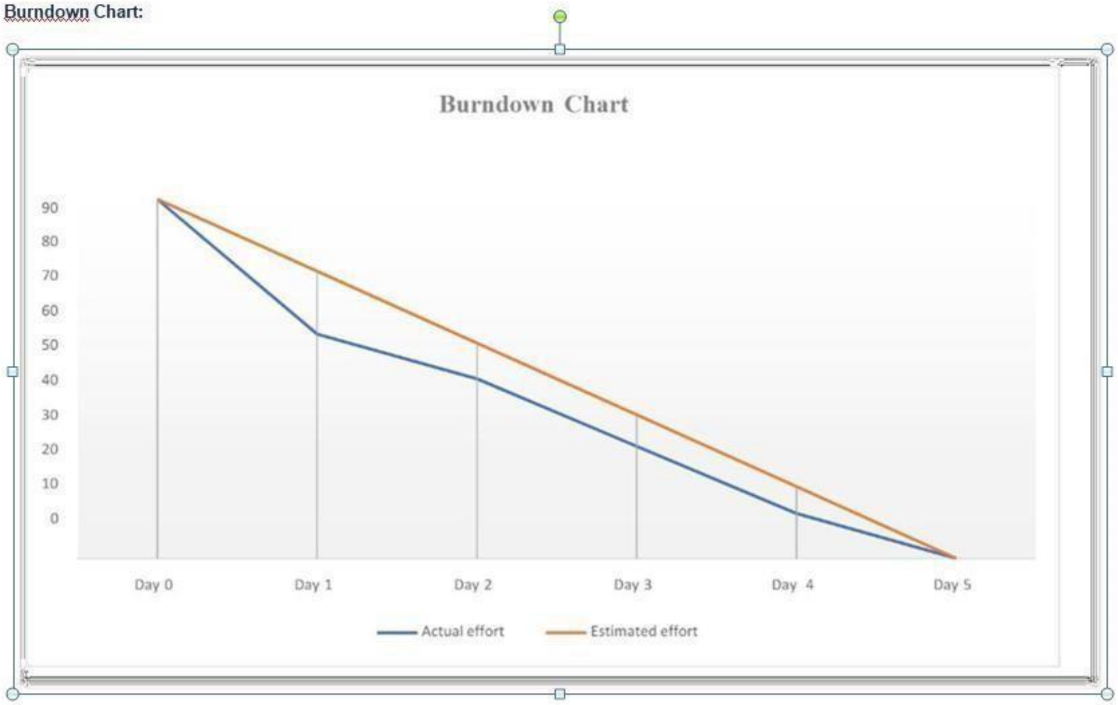


Customer Journey	Prepare the customer journey maps to understand the user interactions & experiences with the application (entry to exit).	15 October 2022
Functional Requirement	Prepare the functional requirement document.	05 October 2022
Data Flow Diagrams	Draw the data flow diagrams and submit for 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

6.3 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:



7. CODING & SOLUTIONING

7.1 FEATURE 1

```
<!DOCTYPE html>
            <html lang="en" dir="ltr">
            <head>
              <meta charset="utf-8">
              <meta name="viewport" content="width=device-width, initial-scale=1.0">
              <title>Heart Disease Predictor</title>
              <link rel="stylesheet" type="text/css" href="{{ url_for('static', filename='style.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 Application that predicits chances of having heart Disease or not, Built with Flask and Deployed
            using Heroku.</p><br>
                    <p>(Note:This model is 82.67% accurate)</p> </div>
              </div>
              <!-- Text Area -->
              <div class="ml-container">
                <form action="{{ url_for('predict')}}" method="POST">


                    <label for="age">Age</label>
                    <input type="text" id="age" name="age" placeholder="Your age..."><br>
                    <label for="sex">Sex</label>
                    <select id="sex" name="sex">
                      <option selected>----select option --- </option>
                      <option value="1">Male</option>
                      <option value="0">Female</option>
                    </select><br>
                    <label for="cp">Chest Pain Type</label>
                    <select id="cp" name="cp">
```

```
          <option selected>----select option --- </option>
          <option value="0">Typical Angina</option>
          <option value="1">Atypical Angina</option>
          <option value="2">Non-anginal Pain</option>
          <option value="3">Asymtomatic</option>
        </select><br>
        <label for="trestbps">Resting Blood Pressure</label>
        <input type="text" id="trestbps" name="trestbps" placeholder="A number in range [94-200] mmHg"><br>
        <label for="chol">Serum Cholesterol</label>
        <input type="text" id="chol" name="chol" placeholder="A number in range [126-564] mg/dl"><br>
        <label for="fbs">Fasting Blood Sugar</label>
        <select id="fbs" name="fbs">
          <option selected>----select option --- </option>
          <option value="1">Greater than 120 mg/dl</option>
          <option value="0">Less than 120 mg/dl</option>
        </select><br>
        <label for="restecg">Resting ECG Results</label>
        <select id="restecg" name="restecg">
          <option selected>----select option --- </option>
          <option value="0">Normal</option>
          <option value="1">Having ST-T wave abnormality</option>
          <option value="2">Probable or definite left ventricular hypertrophy</option>
        </select><br>
        <label for="thalach">Max Heart Rate </label>
        <input type="text" id="thalach" name="thalach" placeholder="A number in range [71-202] bpm"><br>
        <label for="exang">Exercise-induced Angina</label>
        <select id="exang" name="exang">
          <option selected>----select option --- </option>
          <option value="1">Yes</option>
          <option value="0">No</option>
        </select><br>
        <label for="oldpeak">ST depression</label>
        <input type="text" id="oldpeak" name="oldpeak" placeholder="ST depression, typically in [0-6.2]"><br>
        <label for="slope">slope of the peak exercise ST segment</label>
        <select id="slope" name="slope">
          <option selected>----select option --- </option>
          <option value="0">Upsloping</option>
          <option value="1">Flat</option>
          <option value="2">Downsloping</option>
        </select><br>


        <label for="ca">Number of Major vessels</label>
        <input type="text" id="ca" name="ca" placeholder="Typically in [0-4]"><br>


        <label for="thal">Thalassemia</label>
        <select id="thal" name="thal">
          <option selected>----select option --- </option>
          <option value="0">Normal</option>
          <option value="1">Fixed Defect</option>
          <option value="2">Reversible Defect</option>
        </select><br>


      <input type="submit" class="my-cta-button" value="Predict"> </form>
  </div>
</body>
</html>
```

7.2 FEATURE 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>
```

8. TESTING

8.1 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.

8.2 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.

9. RESULTS

9.1 PERFORMANCE METRICS

```
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%
```

10. 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%.

11. 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.

12. 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.

13. 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

```
#Importingessentiallibraries from flask import Flask, render_template, requestimport 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'])request.form.get('thal') 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)
```

Team Leader : P.R.Prithiv Singh

Team Member : R.Raja

Team Member : P.Pradheesh

Team Member : V.Siva Chandran

Team Member : R.E.Rajeesh paul

https://youtu.be/RCx09nyuax8