HX8001 - PROFESSIONAL READINESS FOR INNOVATION EMPLOYABILITY AND ENTREPRENEURSHIP

PROJECT REPORT

Team ID : PNT2022TMID40372

Project Tittle : Statistical Machine Learning Approaches To Liver Disease Prediction

Team Size :4

Team Leader : VENGADESH R

Team Member : GOPINATH S

Team Member : SANTHOSH S

Team Member : SANJAY R

1. INTRODUCTION

1.1 Project Overview

With a growing trend of sedentary and lack of physical activities, diseases related to liver have become a common encounter nowadays. In rural areas the intensity is still manageable, but in urban areas, and especially metropolitan areas the liver disease is a very common sighting nowadays. Liver diseases cause millions of deaths every year. Viral hepatitis alone causes 1.34 million deaths every year. Problems with liver patients are not easily discovered in an early stage as it will be functioning normally even when it is partially damaged. An early diagnosis of liver problems will increase patients survival rate. Liver failures are at high rate of risk among Indians. It is expected that by 2025 India may become the World Capital for Liver

Diseases. The widespread occurrence of liver infection in India is contributed due to deskbound lifestyle, increased alcohol consumption and smoking. There are about 100 types of liver infections.

With such alarming figures, it is necessary to have a concern towards tackling these diseases. Afterall, we cannot expect a developed and prosperous nation, with unhealthy youths.

In this project we have taken Indian Liver patient Records, from North East of Andhra Pradesh, India. This data set contains 416 liver patient records and 167 non liver patient. The "Dataset" column is a class label used to divide groups into liver patient (liver disease) or not (no disease). This data set contains 441 male patient records and 142 female patient records.

Any patient whose age exceeded 89 is listed as being of age "90".

Columns:

- Age of the patient
- Gender of the patient
- Total Bilirubin
- Direct Bilirubin
- Alkaline Phosphotase
- Alamine Aminotransferase
- Aspartate Aminotransferase
- Total Protiens
- Albumin
- Albumin and Globulin Ratio

1.2 Purpose

This Project we are building a model by applying various machine learning algorithms find the best accurate model. And integrate to flask based web application. User can predict the disease by entering parameters in the web application.

The major outcomes that can be expected through this project are:

- Increased convenience for predicting a liver disease

2. LITERATURE SURVEY

2.1 Existing problem

2.2 References

2.3 problem Statement Definition

1	Paper Title	Liver Disease Prediction System using Machine Learning Techniques. Author- Rakshith D B, Mrigank Srivastava, Ashwani Kumar, Gururaj S P. Year-2021
	Problem Definition	In this paper we are going discuss how to predict risk of liver disease for a person, based on the blood test report results of the user. In this paper, the risk of liver disease was predicted using various machine learning algorithms.
	Methodology/Algorithm	"Predictive Model for Liver disease through SVM, KNN, ANN and Naive Bayes classification Algorithm"
	Advantages	The system predicts the results with 100 % accuracy for the dataset that we have used while creating this application.
	Disadvantages	The Naive bayes algorithm is only 55.56% accuracy. For more accuracy need to be used more Best algorithm

	Paper Title	Evaluation based Approaches for Liver Disease Prediction using Machine Learning Algorithms. Author – C Geetha and AR Arunachalam.
2	Problem Definition	In this paper, using machine learning techniques, the methods for diagnosing liver disease in patients has been proposed and evaluated
	Methodology/Algorithm	SVM, Logistic Regression, comprises two main machine learning techniques used.

	Advantages	The probability of liver disease prediction attained with an accuracy of 96%.
	Disadvantages	For better accuracy, can be compared with other techniques such as naïve bayes classification, Random forest etc.

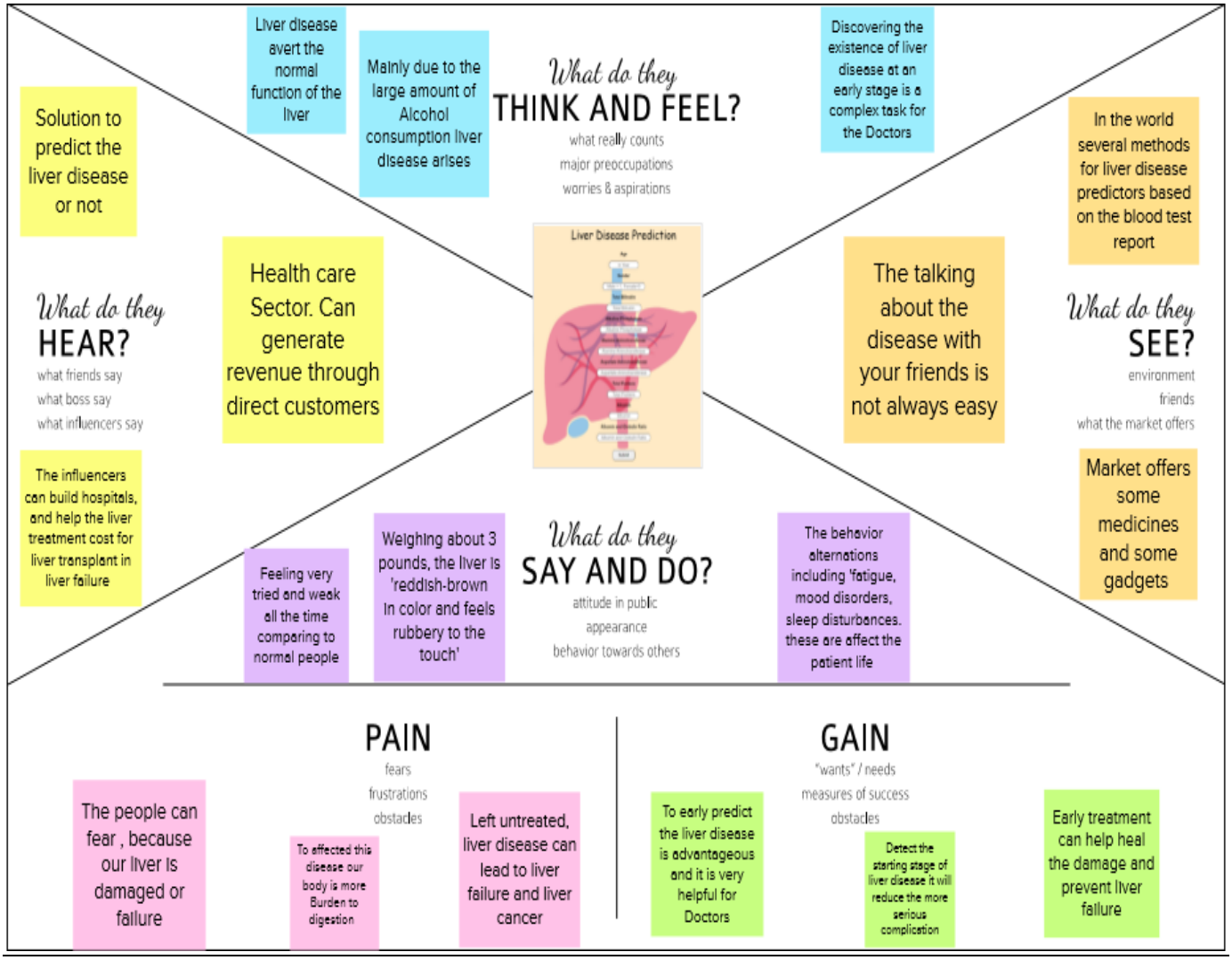
3	Paper Title	Comparison of machine learning approaches for prediction of advanced liver fibrosis in chronic hepatitis C patients. Author – Somaya Hashem, Gamal Esmat.
	Problem Definition	In this study, we made a comparison between different machine learning approaches on prediction of advanced liver fibrosis in Chronic Hepatitis C patients.
	Methodology/Algorithm	Decision tree, genetic algorithm, particle swarm optimization, and multi linear regression models for advanced fibrosis risk prediction were developed
	Advantages	The machine learning algorithms under study were able to predict advanced fibrosis in patients with HCC with AUROC ranging between 0.73 and 0.76 and accuracy between 66.3% and 84.4%.
	Disadvantages	Machine-learning approaches could be used as alternative methods in prediction of therisk of advanced liver fibrosis due to chronic hepatitis C.

4	Paper Title	A Probabilistic peptide machine for predicting hepatitis C virus protease cleavage sites. Author – Zheng Rong Yang.
	Problem Definition	This paper proposes a novel algorithm termed as a probabilistic peptide machine where estimating probability density functions and constructing a classifier for predicting protease cleavage sites are combined into one process.
	Methodology/Algorithm	Probabilistic Peptide Machine and Support vector Machines Algorithm were used
	Advantages	For instance, the cleaved peptide “DEMEELSQHL” is classified by PPM with a posterior probability of cleavage 46.9%

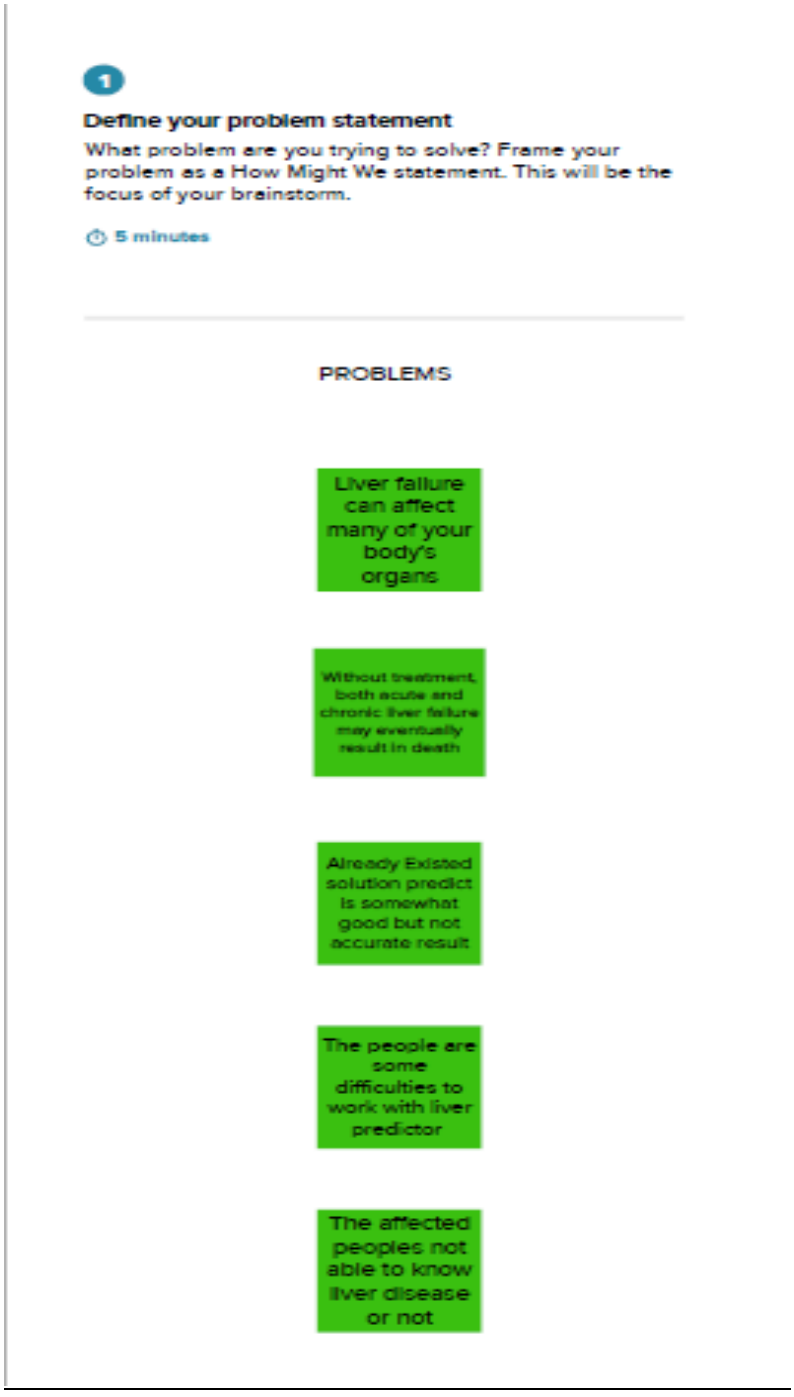
		which is very close to the decision boundary and is classified by SVM with a Z-score of 0.42
	Disadvantages	The accuracy is not necessary to predict the Liver Disease more properly

3. IDEATION AND PROPOSED SOLUTION

3.1 Empathy Map Canvas



3.2 Ideation and Brain Storming



Brainstorm

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

10 minutes

TIP

You can select a sticky note and hit the pencil [switch to sketch] icon to start drawing!

Person 1

- Due to acute liver failure, cerebral edema, severe mental confusion and seizures, bleeding
- Our goal is the collected dataset then train the dataset to Machine, them classify the accurate result
- For perfect estimation, we collect some data from the user and analyse by using Machine learning to give more accurate result
- In this project, we are using, the web application of Liver Disease Predition to pedict automatically liver disease in LFT report

Person 2

- Common symptoms: Jaundice, Nausea, vomiting, Dark-colored urine and Abdominal pain, etc.
- There are many test (LFT) available for diagnosing Liver Disease
- The liver disease is not curable. But early treatment may give the liver time to heal
- So we use these kind of application to identify the disease

Person 3

- Liver disease is mostly occur while more consumption of alchohal
- Early prediction can possible to minimize the serious effect
- our web application will more accurately predict the disease
- The prediction works based on the Machine learning by using collected datasets

Person 4

- Liver disease is a severe. If it is affect the all the people
- The proposed web application is very helpful for doctors in Early prediction
- The collected dataset and LFT blood test results help us to make prediction
- In our project more accuracy of prediction we are use proper algorithm for accurate Result

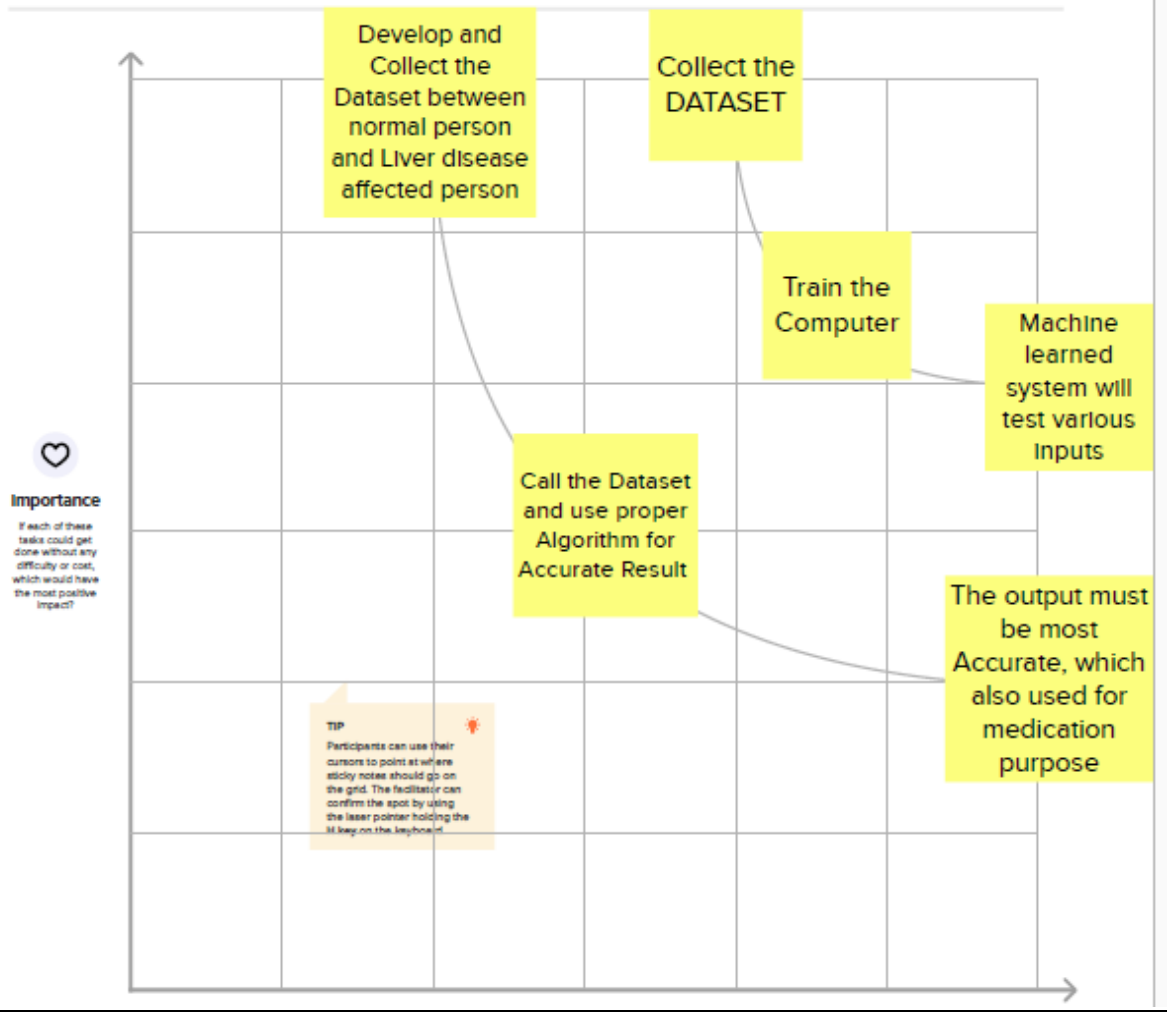

Group ideas
Take turns sharing your ideas while clustering similar or related notes as you go.
In the last 10 minutes, give each cluster a sentence-like label. If a cluster is bigger
than six sticky notes, try and see if you and break it up into smaller sub-groups.
20 minutes
Liver disease avert the normal function of the liver. Mainly due to large amount alcohol consumption is arives
Clinical symptoms: Jaundice, fatigue, weakness, abdominal pain, nausea vomiting, dark-colored urine and etc.
Discovering the existence of liver diseaseat an early stage is a complex task for Doctors
To accurate early predict of liver disease is very helpful for Doctors. Early treatment can help the damagr and prevent liver failure
Our goal is the collected dataset then train the dataset to Machine, them classify the accurate result
In this project, we are using, the web application of Liver Disease Predition to pedict automatically liver disease in LFT report

4

Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

20 minutes



3.3 Proposed Solution

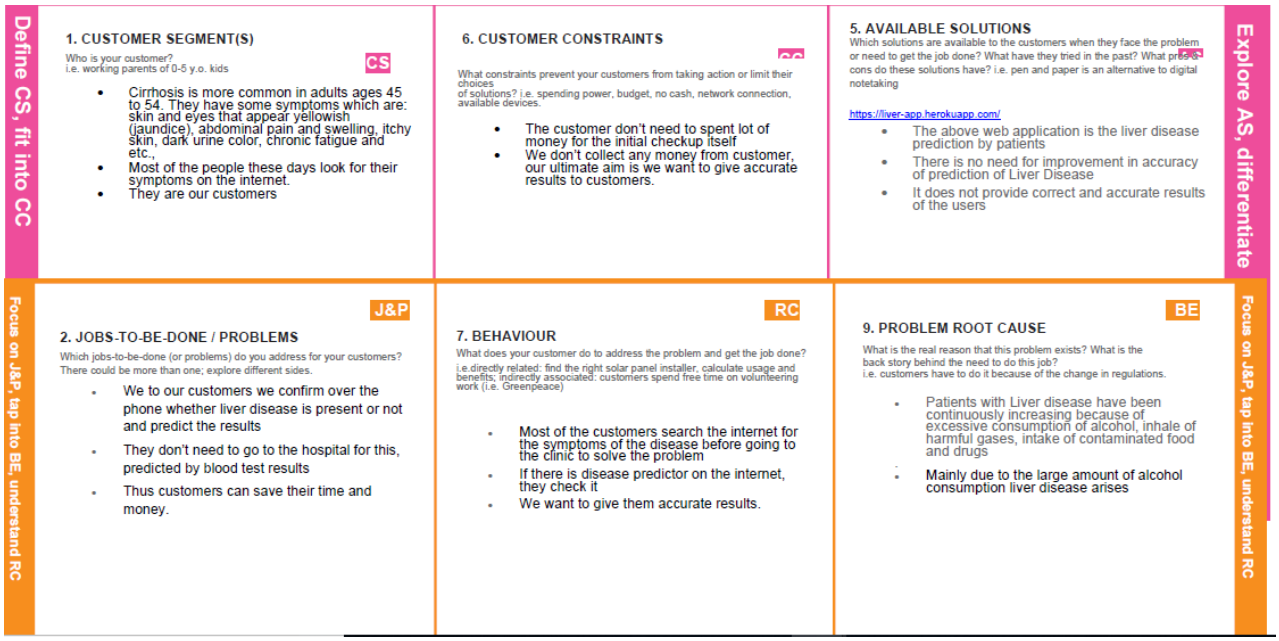
Date	24 September 2022
Team ID	PNT2022TMID40372
Project Name	Statistical Machine Learning Approaches to Liver Disease Prediction
Maximum Marks	2 Marks

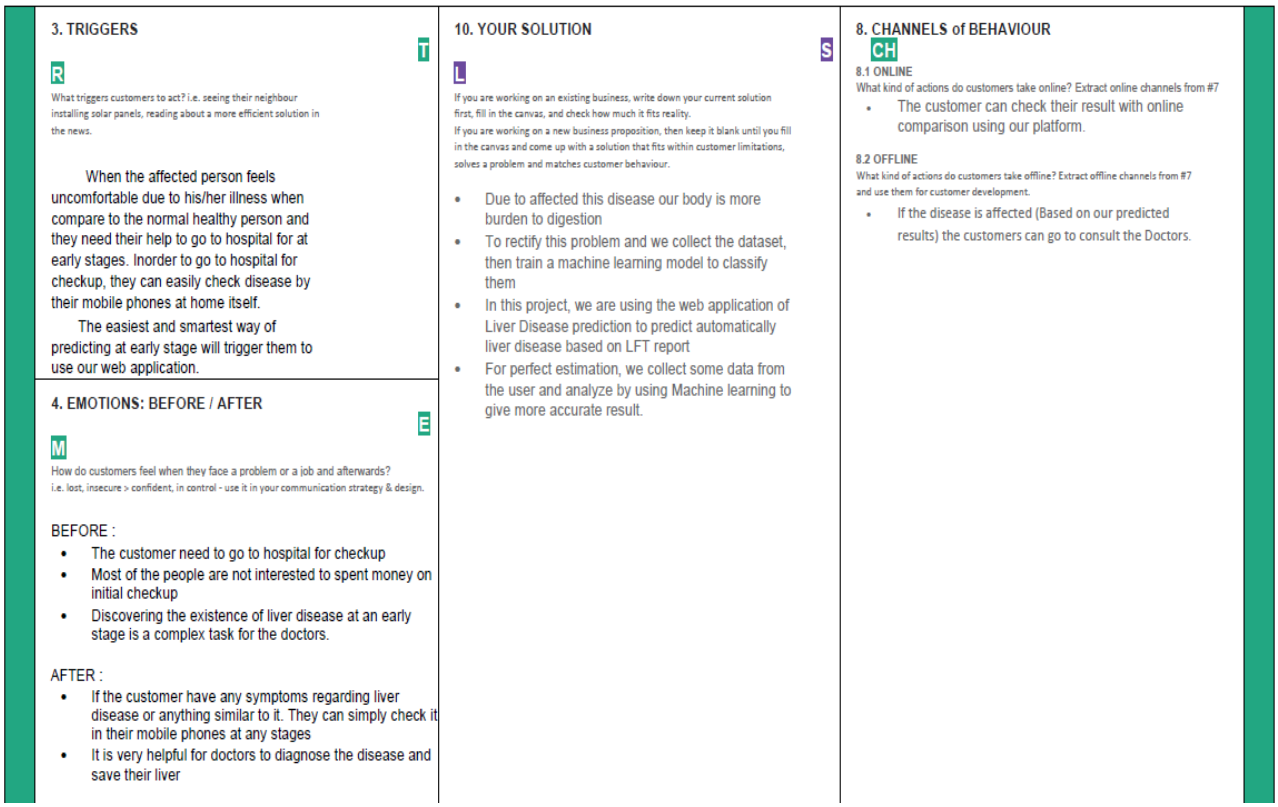
Proposed Solution Template:

S. No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	•Patients with liver disease have been continuously increasing because of excessive consumption of alcohol, inhale of harmful gases, intake of contaminated food and drugs. • To detect disease, Health care professionals need to collect samples from patients which can cost both time and money. • The main problem is Doctors cannot diagnose on the basis of variations in test results.
2.	Idea / Solution description	• For perfect estimation, we collect some data from the user and analyze by using Machine learning to give more accurate result. • Using better Machine Learning Algorithm will result in perfect estimation. • Our goal is the collected dataset the train the dataset in Machine Learning, them classify the accurate result.
3.	Novelty / Uniqueness	• Due to affected this disease our body is more burden to digestion.

		• Our goal is Collect the dataset then train a machine learning model to classify them. Most accurate result will be estimate. • In this project, we are using the web application of Liver disease Prediction to predict automatically liver disease based on LFT report. • For perfect estimation, we collect some data from the user and analyze by using Machine learning to give more accurate result.
4.	Social Impact / Customer Satisfaction	• Early disease prediction will help in diagnosis and related treatment of the patients. • Hence Customer will not suffer from serious effects of Liver disease.
5.	Business Model (Revenue Model)	• Health Care Sector (Hospitals). • Can generate revenue through direct customers. • Can collaborate with health care sector and generate revenue from their customers. • Can make an advertisement of hospitals that have special treatment of Liver Disease, and if patients allow, we share the details of the patients to that hospital for medication.

3.4 Problem Solution Fit





4. REQUIREMENT ANALYSIS

Date	12 October 2022
Team ID	PNT2022TMID40372
Project Name	Statistical Machine Learning Approaches to Liver Disease Prediction
Maximum Marks	4 Marks

4.1 Functional Requirements

FR No	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through Phone Number
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	User Details	Get user Name Get user Age Get user Gender Get user Address Get user Location Get user Mobile Number Get user Gmail id
FR-4	User(patient)Blood Test Report Details	Get user Name Get user Age Get user Gender Get user Total Bilirubin Get user Direct Bilirubin Get user Alkaline Phosphotase Get user Alamine Aminotransferase Get user Aspartate Aminotransferase Get user Albumin Get user Total Proteins Get user Albumin & Globulin Ratio
FR-5	User Known Value (Accurate/approximate)	Get user BP level Get user sugar level Get user Physical Health Condition Get user Disorder / Disabilities detail
FR-6	User demand	After Getting the Result, the Affected person need to consult an Doctor. The Non-Affected person need some medication which will show in same web application itself

4.2 Non-functional Requirements

FR No.	Non-Functional requirement	Description
NFR-1	Usability	Our Web application is User Friendly which show them demonstration skippable video
NFR-2	Security	We don't share user details
NFR-3	Reliability	Our web application have high accuracy which can be utilized multiple times
NFR-4	Performance	By using better Machine Algorithm and collecting lot of details, our web application provide more accuracy than all
NFR-5	Availability	Our web application can be used by using Both Mobile phones and Computers itself. Only need users Blood Test Report
NRF-6	scalability	Our web application can be used by worldwide with easy to access it. Most accurate will predicted

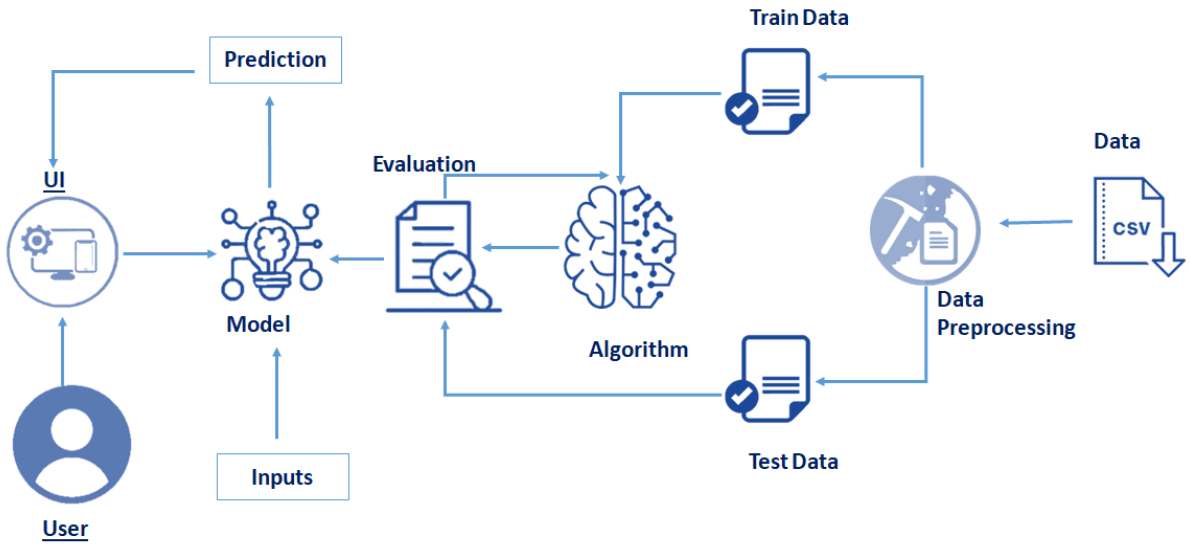
5. PROJECT DESIGN

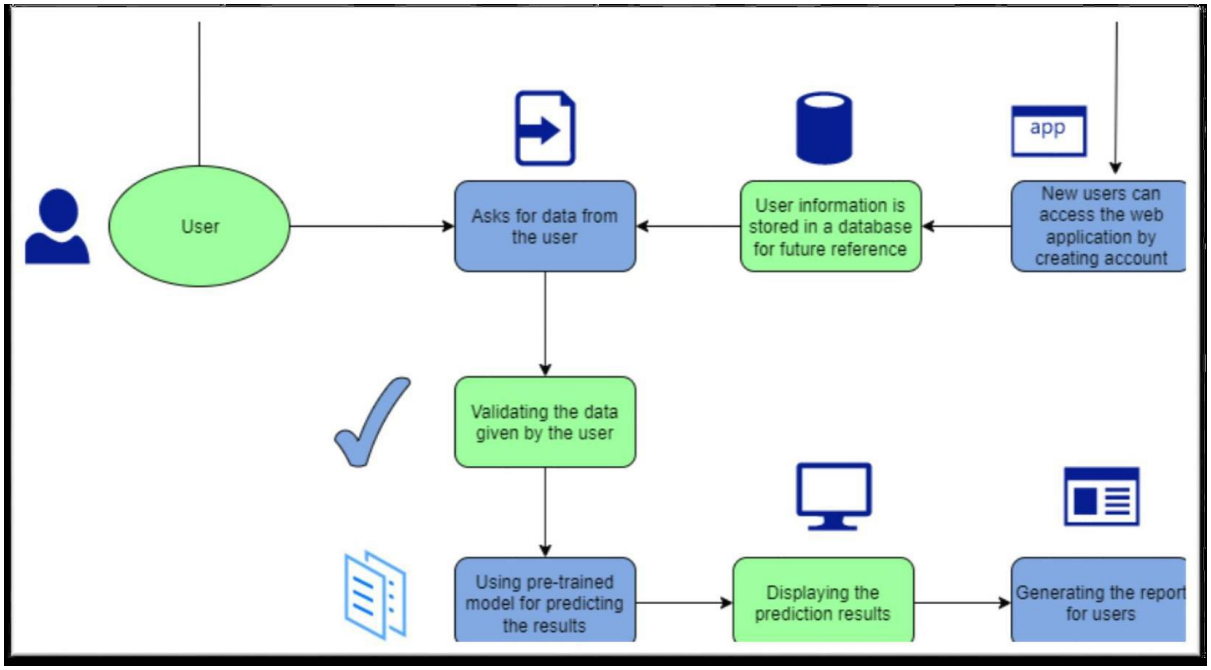
Date	14 October 2022
Team ID	PNT2022TMID40372
Project Name	Statistical Machine Learning Approaches to Liver Disease prediction
Maximum Marks	4 Marks

5.1 Data Flow Diagrams:

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.

Simplified





5.2 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
	Registration	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
	Registration	USN-3	As a user, I can register through web application	I can register & access the account with web application	High	Sprint-1

	Login	USN-4	As a user, I can log into the application by entering email & password	I can successfully login into application	High	Sprint-2
	Dashboard	USN-5	As a user, I can access the dashboard	I can referred dashboard for certainty	Midium	Sprint-2
Customer (Web user)	Analysis of prediction results	USN-6	As a user, I can predict the presence of liver disease using web application	I can predict the presence of liver disease using web application earlier	High	Sprint-1
Customer Care Executive	Customer queries	USN-7	As a user, I can be able to get the recommendations to cure the liver disease	I can get immediate recommendations to cure the liver disease	High	Sprint-3
Administrator	Getting value	USN-8	When there is a issues in getting analyzed value	Through administrator getting predicted value	Low	Sprint-2

5.3 Solution Architecture

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

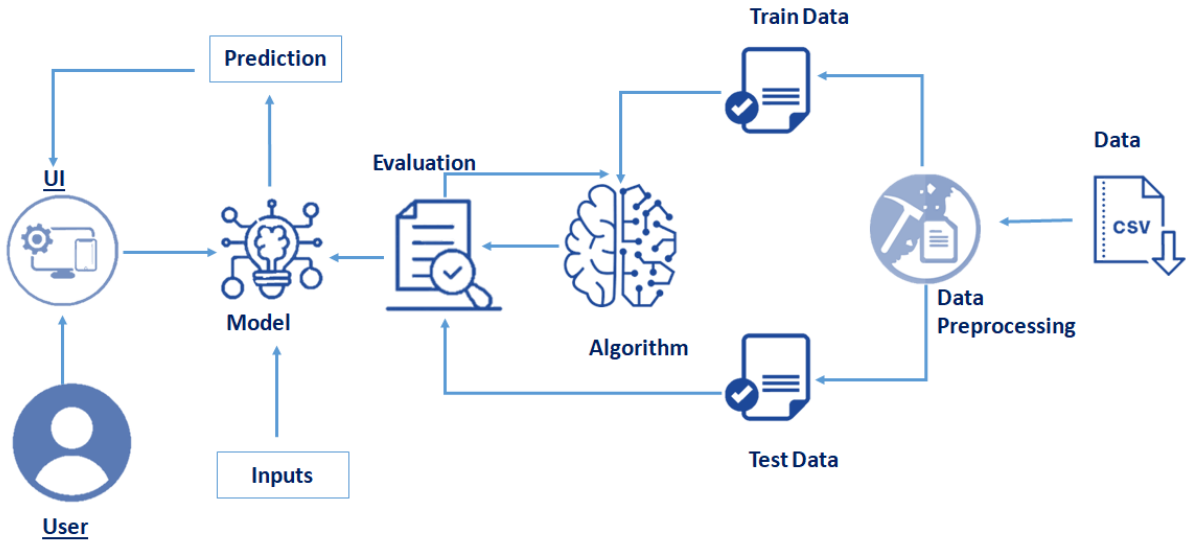
• Find the best tech solution to solve existing business problems

• Describe the structure, characteristics, behaviour, and other aspects of the software to project stakeholders.

• Define features, development phases, and solution requirements.

• Provide specifications according to which the solution is defined, managed, and delivered.

Solution Architecture Diagram



Technical Architecture

The Deliverable shall include the architectural diagram as below and the information as per the table1 & table 2
Example: Order processing during pandemics for offline mode
Reference**: https://www.ijert.org/research/liver-disease-prediction-system-using-machine-learning-techniques-IJERTV10IS060460.pdf**

Table 1 : Components & Technologies

S. No	Components	Description	Technology
1.	User Interface	How user interacts with application e.g. Web UI, Mobile App, Chatbot etc.	HTML, CSS, JavaScript / Angular Js / React Js etc.
2.	Application Logic-1	Logic for a process in the application	Java / Python
3.	Application Logic-2	Logic for a process in the application	IBM Watson STT service
4.	Application Logic-3	Logic for a process in the application	IBM Watson Assistant
5.	Database	Data Type, Configurations etc.	MySQL, NoSQL, etc.
6.	Cloud Database	Database Service on Cloud	IBM DB2, IBM Cloudt etc.
7.	File Storage	File storage requirements	IBM Block Storage or Other Storage Service or Local Filesystem

8.	External API-1	Purpose of External API used in the application	IBM Weather API, etc.
9.	External API-2	Purpose of External API used in the application	Aadhar API, etc.
10.	Machine Learning Model	Purpose of Machine Learning Model	Object Recognition Model, etc.
11.	Infrastructure (Server / Cloud)	Application Deployment on Local System / Cloud Local Server Configuration: Cloud Server Configuration :	Local, Cloud Foundry, Kubernetes, etc,.

Table-2: Application Characteristics:

S.no	**Characteristics**	**Description**	**Technology**
1.	Open-Source Frameworks	List the open-source frameworks used	Technology of Opensource framework
2.	Security Implementations	List all the security / access controls implemented, use of firewalls etc.	e.g.SHA-256, Encryptions, IAM Controls, OWASP etc.
3.	Scalable Architecture	Justify the scalability of architecture (3 – tier, Micro-services)	Technology used
4.	Availability	Justify the availability of application (e.g.Use of load balancers, distributed servers etc.)	Technology used
5.	Performance	Design consideration for the performance of the application (number of requests per sec, use of Cache, use of CDN's) etc	Technology used

References:

[1] Biomarkers for prediction of liver fibrosis in patients with chronic alcoholic liver disease written by Sylvie and Bruno Runyard.
[2] Strategic analysis in prediction of liver disease using classification algorithms written by Piyush Kr Shukla and Binish Khan.
[3] Software based prediction of liver disease with feature selection and classification techniques witten Jagdeep Singh, Sandeep Bagga and Ranjodh Kaur.
[4] Liver disease prediction using SVM and Naïve Bayes algorithm written by S Dhayanan
[5] Prediction and analysis of liver diseases using data mining written Shambel Kefelgen Pooja Kamat

6. PROJECT PLANNING & SCHEDULING

Date	21October 2022
Team ID	PNT2022TMID40372
Project Name	Statistical Machine Learning Approaches to Liver Disease Prediction
Maximum Marks	8 Marks

6.1 Sprint Planning and Estimation

SPRINT	FUNCTIONAL REQUIREMENT (EPIC)	USER STORY NUMBER	USER STORY/TASK	STORY POINT	PRIORITY	TEAM MEMBERS
Sprint-1	Registration	USN-1	As a user, I can register for the web application by entering my email, password, and confirming my password.	**2**	High	Sanjay R Vengadesh R
Sprint-1	Registration	USN-2	As a user, I will receive confirmation email once I have registered for the application	**1**	High	Gopinath S Santhosh S
Sprint-2	Registration	USN-3	As a user, I can register for the application through Facebook	**2**	Low	Gopinath S
Sprint-1	Registration	USN-4	As a user, I can register for the application through Gmail	**2**	Medium	Santhosh S
Sprint-2	Login	USN-5	As a user, I can log into the application by entering email & password	**1**	High	Vengadesh R

Sprint-1	Dashboard	USN-6	As a user, I can access the services and information provided in the dashboard	**2**	High	Sanjay R
Sprint-2	Login	USN-7	As a user, I can login to the web application and access the dashboard	**2**	High	Vengadesh R
Sprint-2	Description	USN-8	As a user, I can provide the description option to the web application	**1**	Low	Sanjay R Gopinath S
Sprint-3	Analysis of prediction results	USN-9	As a user, I can predict the presence of liver disease using web application	**2**	High	Vengadesh R Santhosh S
Sprint-3	Customer queries	USN-10	As a user, I can be able to get the recommendations to cure the liver disease	**2**	Low	Sanjay R Gopinath S
Sprint-3	Management	USN-11	As an administrator, I can collect the new datasets from user	**2**	High	Santhosh S Gopinath S
Sprint-4	Management	USN-12	As an administrator, I can update other features of the application	**1**	High	Vengadesh R Gopinath S
Sprint-4	Management	USN-13	As an administrator, I can maintain the information about the user	**2**	High	Santhosh S Sanjay R

6.2 Sprint Delivery Schedule

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date(Planned)	Story Points Completed (as on planned End Date)	Sprint Release Date (Actual)
Sprint-1	7	6 Days	24 Oct 2022	29 Oct 2022	7	29 Oct 2022
Sprint-2	6	6 Days	31 Oct 2022	05 Nov2022	7	05 Nov 2022
Sprint-3	6	6 Days	07 Nov 2022	12 Nov2022	5	12 Nov 2022
Sprint-4	3	6 Days	14 Nov 2022	19 Nov 2022	3	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)

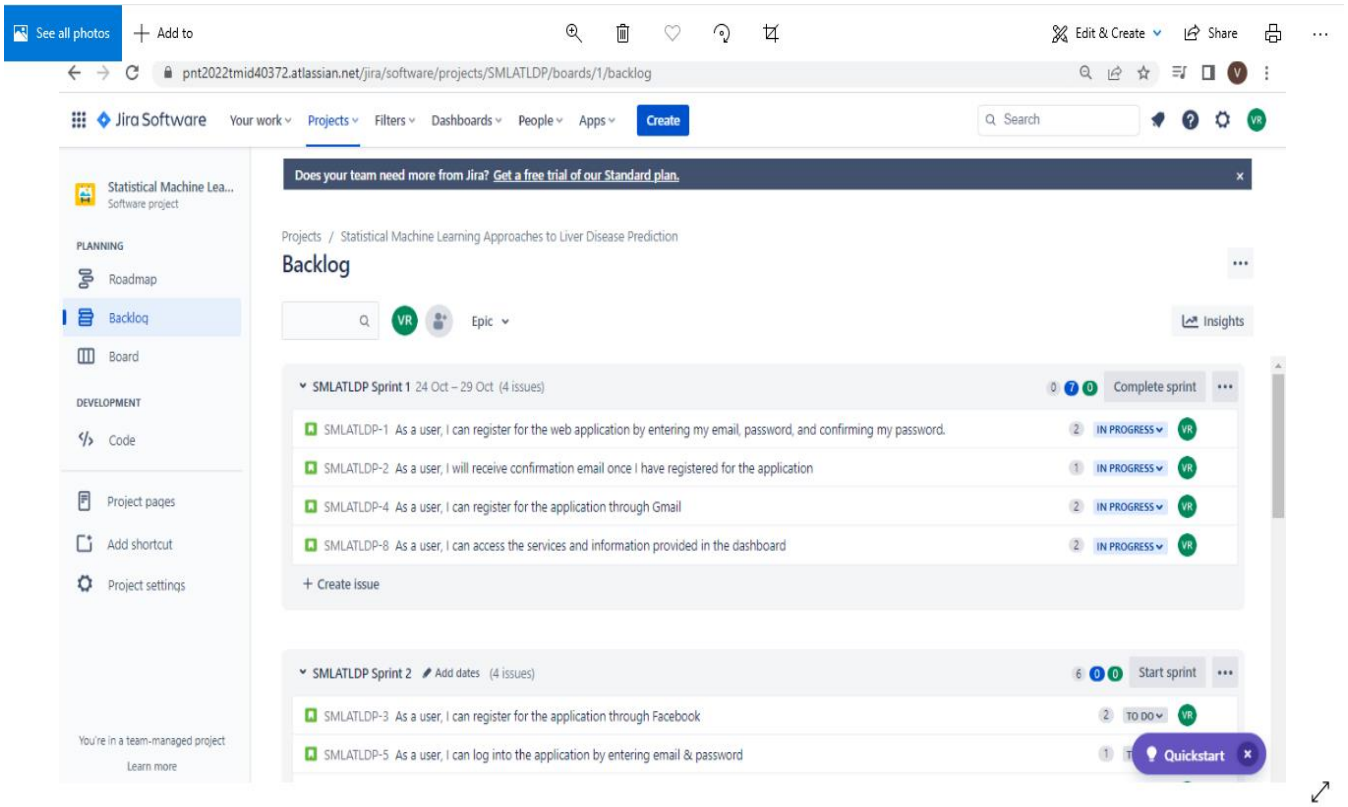
$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

AV (Sprint 1) = 7/6 = 1
AV (Sprint 2) = 6/6 = 1
AV (Sprint 3) = 6/6 = 1
AV (Sprint 4) = 3/6 = 1

Burndown Chart:

A burn down chart is a graphical representation of work left to do versus time. It is often used in agile software development methodologies such as Scrum. However, burn down charts can be applied to any project containing measurable progress over time.

6.3 Reports from JIRA



https://www.visual-paradigm.com/scrum/scrum-burndown-chart/

https://www.atlassian.com/agile/tutorials/burndown-charts

7. CODING & SOLUTIONING

7.1 Feature 1

- One of the main segments in chronic liver disease prediction is the selection of important features of liver disorder.

- In this step, several features such as age, gender hat represent the personal information of each patient is v One of the main segments in chronic liver disease prediction is the selection of important features of liver disorder.

- The purpose of this research was to provide medical diagnosis information

7.2 Database Schema

Flask provides utilities for testing an application. This documentation goes over techniques for working with different parts of the application in tests.

We will use the pytest framework to set up and run our tests.

```
$ pip install pytest
```

Most web applications have a database. When running tests, you want to be certain that the tests don't hit the production database. At the same time, you want something like a database to be there.

8. TESTING

8.1 Test Cases

We perform a testing analysis to validate its prediction capacity. we use subset of data that has not been used before, the testing instances.

The next table shows the confusion matrix for our problem. the confusion matrixs represents the real classes and the predicted classes 'columns for the testing data

8.2 User Acceptance Testing

1. Purpose of Document

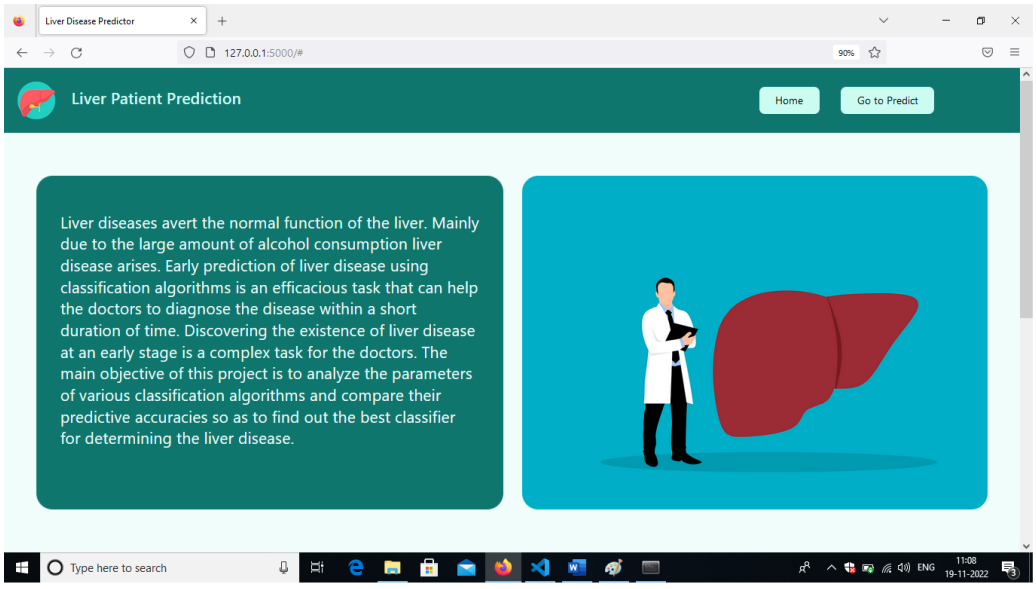
The purpose of this document is to briefly explain the test coverage and open issues of the [ProductName] project at the time of the release to User Acceptance Testing (UAT).

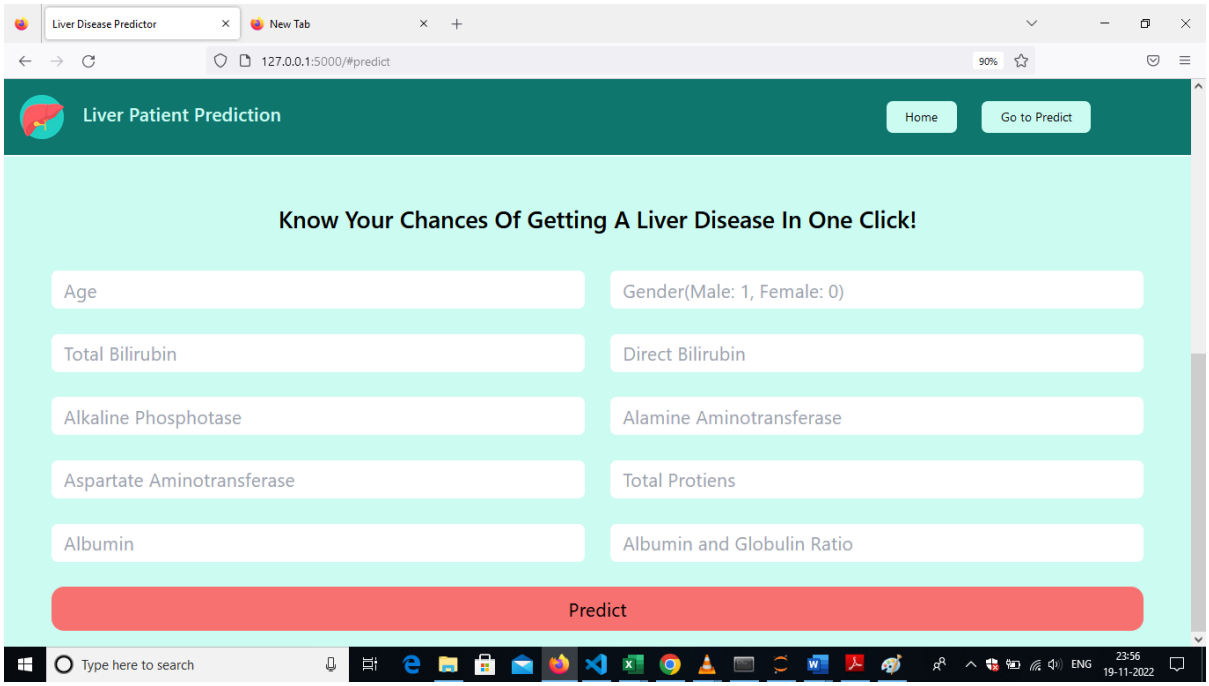
2. Defect Analysis

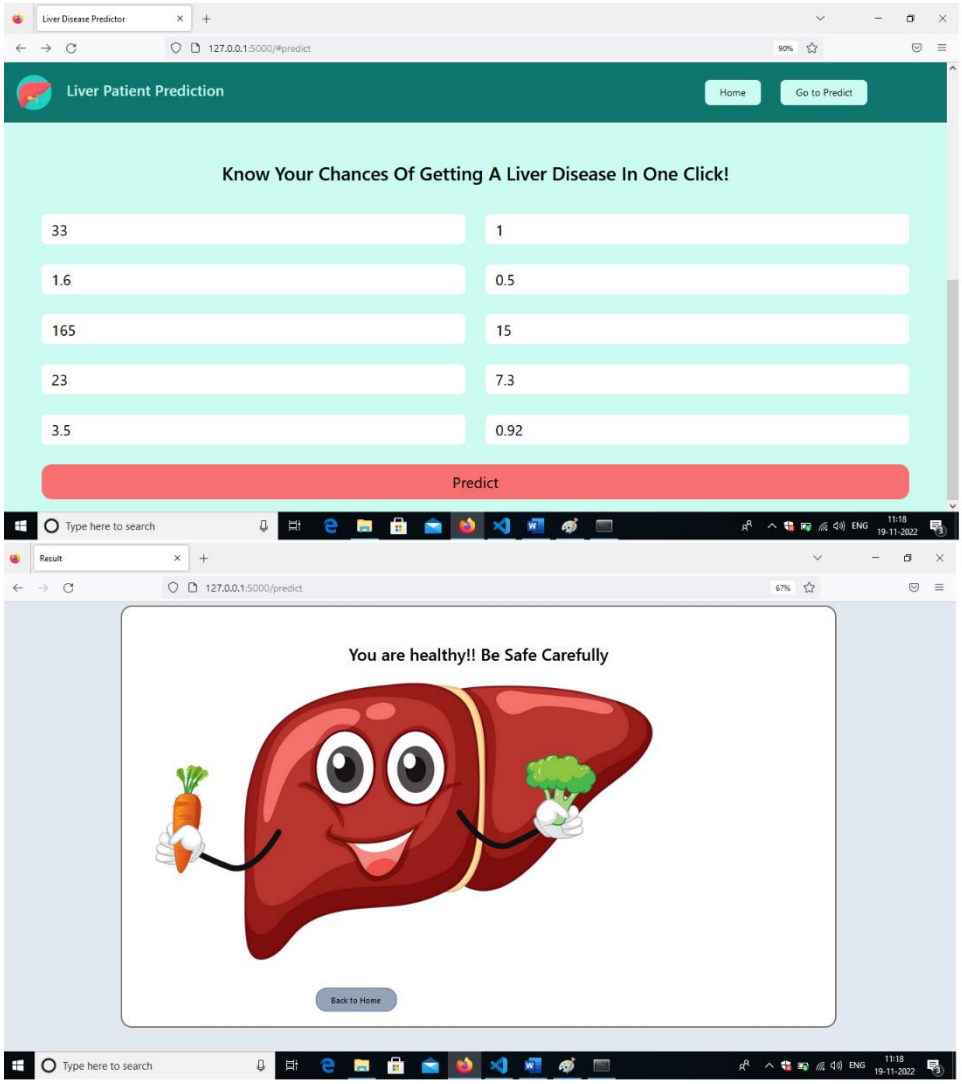
This report shows the number of resolved or closed bugs at each severity level, and how they were resolved

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

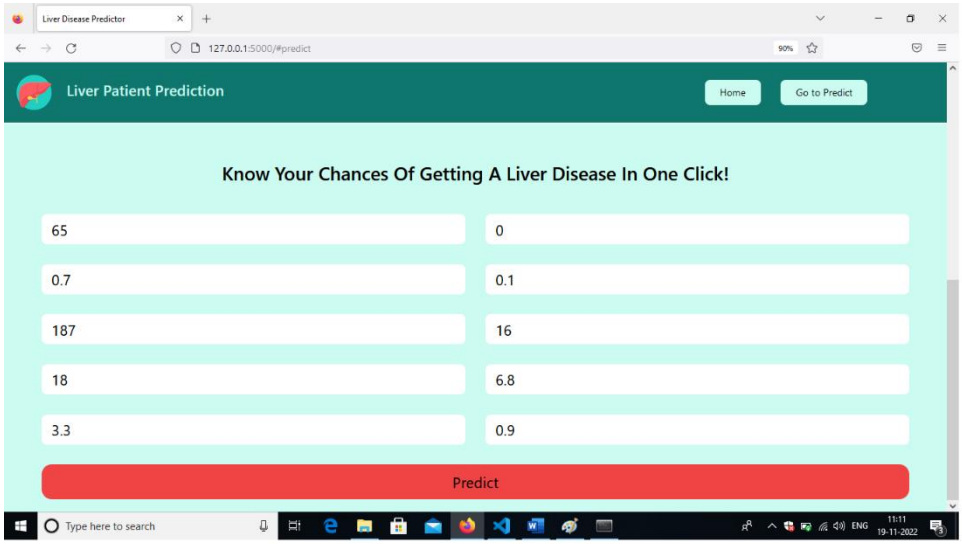
9. RESULTS

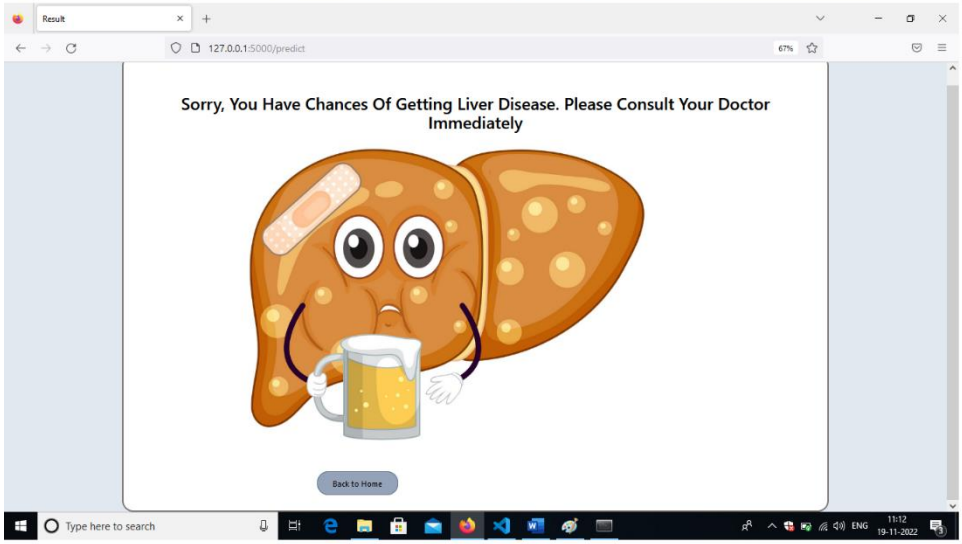



Liver Disease Predictor
New Tab
127.0.0.1:5000/#predict
90%
Liver Patient Prediction
Home
Go to Predict
Know Your Chances Of Getting A Liver Disease In One Click!
Age
Gender(Male: 1, Female: 0)
Total Bilirubin
Direct Bilirubin
Alkaline Phosphotase
Alamine Aminotransferase
Aspartate Aminotransferase
Total Protiens
Albumin
Albumin and Globulin Ratio
Predict
Type here to search
ENG
23:56
19-11-2022


Liver Disease Predictor
127.0.0.1:5000/#predict
Liver Patient Prediction
Home
Go to Predict
Know Your Chances Of Getting A Liver Disease In One Click!
33
1
1.6
0.5
165
15
23
7.3
3.5
0.92
Predict
Type here to search
ENG
11:18
19-11-2022

Result
127.0.0.1:5000/predict
You are healthy!! Be Safe Carefully
Back to Home
Type here to search
ENG
11:18
19-11-2022





9.1. Performance Metrics

True positives imply the positive liver tuples that were precisely named by the classifier,

True negatives are the negative liver tuples that were precisely set apart by the classifier.

False positives are the negative liver tuples that were erroneously set apart as positive tuples

False negatives are the positive liver tuples that were incorrectly stamped negative tuples

10. ADVANTAGES & DISADVANTAGES

ADVANTAGES

1.No medical expertise required: You don’t need to have any knowledge of medical science and liver diseases to predict the liver disease using this application. All you need to do is enter the details being asked, which are already present in the blood test report(some like age, gender are already known) and then you will get the results of prediction.

2. High accuracy: The system predicts the results with100 % accuracy for the dataset that we have used while creating this application. While the accuracy might be different in some cases, it will still be high enough to be trustworthy at a large scale.

DISADVANTAGES

There is no real time identity verification.

Not using data mining technique to detect chances of getting liver disease.

Time instense.

Some approaches are not adoptable for real time collection of database implementation.

Certain approaches being applicable only for the small data

11. CONCLUSION

Diseases related to liver and heart are becoming more and more common with time. With continuous technological advancements, these are only going to increase in the future. Although people are becoming more conscious of health nowadays and are joining yoga classes, dance classes; still these dentary lifestyle and luxuries that are continuously being introduced and enhanced; the problem is going to last long. So, in such a scenario, our project will be extremely helpful to the society. With the dataset that we used for this project, we got 100 % accuracy for Random Forest model, and though it might be difficult to get such accuracies with very large datasets, from this project's results, one can clearly conclude that we can predict the risk of liver diseases with accuracy of 90 % or more.

Today almost everybody above the age of 12 years has smart phones with them, and so we can incorporate these solutions into an android app or ios app. Also it can be incorporated into a website and these app and website will be highly beneficial for a large section of society.

12.FUTURE SCOPE

Database should be expanded on which the system will be tested much better.

Also, the model requires further improvement mostly regarding feature selection of the liver into multiple components.

The application must provide user interface for doctors input object of the prescription.

The application should have the capability for preprocessing of the given input.

The system should be capable to detect the chances of liver diease using past patient data.

Thus, combining the blood test features along with the features already used in the study can provide new directions.

Feature selection is the process of finding input features for a predictive model which removing irrelevant features that don’t contribute towards the model.

13.APPENDIX

SOURCE CODE

(Index.html)

```
<!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">

    <script src="https://cdn.tailwindcss.com"></script>
```

```
    <title>Liver Disease Predictor</title>
</head>
<body class="h-full w-full">
    <div class="p-5 bg-teal-700 sticky top-0">
        <nav class="flex content-center">
            <ul class="basis-3/4 content-center flex gap-6">
                <img class="w-14" src="{{url_for('static',filename='images/liver-logo-1.png')}}" alt="Logo" />
                <h1 class="text-2xl mt-2 font-semibold text-teal-100">Liver Patient Prediction</h1>
            </ul>
            <ul class="basis-1/4 flex gap-8 mt-2">
                <li><button class="bg-teal-100 px-6 py-2 rounded-lg"><a href="#">Home</a></button></li>
                <li><button class="bg-teal-100 px-6 py-2 rounded-lg"><a href="#predict">Go to Predict</a></button></li>
            </ul>
        </nav>
    </div>

    <div class="bg-teal-50 flex gap-7 px-12 py-16">
```

<section class="basis-1/2 px-8 py-12 text-slate-800 text-2xl font-sans border-4 border-teal-700 rounded-3xl hover:bg-teal-700 hover:text-teal-50">

Liver diseases avert the normal function of the liver. Mainly due to the large amount of alcohol consumption liver disease arises. Early prediction of liver disease using classification algorithms is an efficacious task that can help the doctors to diagnose the disease within a short duration of time. Discovering the existence of liver disease at an early stage is a complex task for the doctors. The main objective of this project is to analyze the parameters of various classification algorithms and compare their predictive accuracies so as to find out the best classifier for determining the liver disease.

</section>

<img class="w-3/4 basis-1/2 rounded-3xl" src="{{url_for('static',filename='images/liver-banner.png')}}" alt="doctor">

<!-- <button id="#predict" class="absolute bottom-4 left-1/2 bg-red-300 p-3 rounded-lg text-2xl ">Check Your Liver Health</button> -->

<h3 class="text-center px-12 mb-12 mt-10 font-semibold text-3xl">Know Your Chances Of Getting A Liver Disease In One Click!</h3>

<form class="grid grid-cols-2 gap-8 px-10" action="/predict" method="POST">

```
<input class="text-2xl px-4 py-2 rounded-lg focus:border-2
focus:border-teal-700 outline-none" type="text" name="age" placeholder="Age">

<input class="text-2xl px-4 py-2 rounded-lg focus:border-2
focus:border-teal-700 outline-none" type="text" name="gender"
placeholder="Gender(Male: 1, Female: 0)">

<input class="text-2xl px-4 py-2 rounded-lg focus:border-2
focus:border-teal-700 outline-none" type="text" name="tb" placeholder="Total Bilirubin">

<input class="text-2xl px-4 py-2 rounded-lg focus:border-2
focus:border-teal-700 outline-none" type="text" name="db" placeholder="Direct
Bilirubin">

<input class="text-2xl px-4 py-2 rounded-lg focus:border-2
focus:border-teal-700 outline-none" type="text" name="ap" placeholder="Alkaline
Phosphotase">

<input class="text-2xl px-4 py-2 rounded-lg focus:border-2
focus:border-teal-700 outline-none" type="text" name="aa1" placeholder="Alamine
Aminotransferase">

<input class="text-2xl px-4 py-2 rounded-lg focus:border-2
focus:border-teal-700 outline-none" type="text" name="aa2" placeholder="Aspartate
Aminotransferase">

<input class="text-2xl px-4 py-2 rounded-lg focus:border-2
focus:border-teal-700 outline-none" type="text" name="tp" placeholder="Total Protiens">

<input class="text-2xl px-4 py-2 rounded-lg focus:border-2
focus:border-teal-700 outline-none" type="text" name="al" placeholder="Albumin">

<input class="text-2xl px-4 py-2 rounded-lg focus:border-2
focus:border-teal-700 outline-none" type="text" name="agr" placeholder="Albumin and
Globulin Ratio">
```

```
                    <input class="bg-red-400 px-6 py-3 col-span-2 rounded-2xl text-2xl
hover:cursor-pointer hover:bg-red-500" type="submit" value="Predict">
                </form>
            </div>
</body>
</html>
```

(Result.html)

```
<!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">
    <script src="https://cdn.tailwindcss.com"></script>
    <title>Result</title>
</head>
<body class="bg-slate-200 flex justify-center items-center">
    <div class="bg-white border-4 border-stone-500 rounded-3xl flex-row p-8 mt-2 w-3/4 justify-center items-center">

        <br><br>
        {% if result == 0 %}
            <h1 class="text-4xl text-center font-semibold mb-6">Sorry, You Have Chances Of Getting Liver Disease. Please Consult Your Doctor Immediately</h1>
            <img class="w-3/4 ml-6" src="{{url_for('static',filename='images/damage.jpg')}}" alt="damage">
        {% else %}
            <h1 class="text-4xl text-center font-semibold mb-6">You are healthy!! Be Safe Carefully</h1>
            <img class="w-3/4 ml-6" src="{{url_for('static',filename='images/healthy.jpg')}}" alt="healthy">
        {% endif %}
        <br><br>
```

```
            <button class="bg-slate-400 px-8 py-3 rounded-3xl border-2 border-slate-500 ml-96"><a href="/">Back to Home</a></button>
        </div>



</body>
</html>
```

(tailwind.config.js)

```
/** @type {import('tailwindcss').Config} */
module.exports = {
    content: ["./src/**/*.{html,js}"],
    theme: {
        extend: {},
    },
    plugins: [],
  }
```

Python code – (app.py)

```
from flask import Flask, render_template, request
import pickle
```

```
app = Flask(__name__)


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


@app.route('/predict', methods=['POST'])
def predict():
    age = request.form['age']
    gender = request.form['gender']
    tb = request.form['tb']
    db = request.form['db']
    ap = request.form['ap']
    aa1 = request.form['aa1']
    aa2 = request.form['aa2']
    tp = request.form['tp']
    al = request.form['al']
    agr = request.form['agr']

    # converting data into float
```

```
        data =
[[float(age),float(tb),float(db),float(ap),float(aa1),float(aa2),float(tp),float(al),float(agr),float(gend
er)]]


        # Loading the model
        # using pickle
        model = pickle.load(open('liver.pkl','rb'))


        prediction = model.predict(data)[0]


        # if prediction == 1:
        #         return f"You have liver disease Result : {prediction}"
        # else:
        #         return f"You are healthy Result : {prediction}"
        return render_template('result.html',result = prediction)


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



# SVC from version 1.0.2 when using version 1.1.3.
```

2 - have disease - 1

1 - Not have disease - 0

Github Link :

https://github.com/IBM-EPBL/IBM-Project-48352-1660806979

Project Demo Link : https://youtu.be/py49eDrCCoU