

STATISTICAL MACHINE LEARNING

APPROACH TO LIVER DISEASE

PREDICTION

Date	18 November 2022
Team ID	PNT2022TMID01272
Project Name	Project - Statistical Machine Learning Approaches to Liver Disease Prediction
Team Members	Team Lead – Deepthi Shree S Member 1 – Keerthika.L Member 2 – Harita.K.S Member 3 – Deepthi Shree S Member 4 – Deepa.S

PROJECT REPORT

INTRODUCTION

OVERVIEW OF THE PROJECT:

To detect disease, healthcare professionals need to collect samples from patients which can cost both time and money. Often, more than one kind of test or many samples are needed from the patient to accumulate all the necessary information for a better diagnosis. The most routine tests are urinalysis, complete blood count (CBC), and comprehensive metabolic panel (CMP). These tests are generally less expensive and can still be very informative.

The liver has many functions such as glucose synthesis and storage, detoxification, production of digestive enzymes, erythrocyte regulation, protein synthesis, and various other features of metabolism. Chronic liver diseases include chronic hepatitis, fibrosis, and cirrhosis. Hepatitis

can occur from viral infection (e.g., hepatitis c virus) or auto-immune origin. Inflammation from hepatitis infection can cause tissue damage and scarring to occur in the liver. Moderate scarring is classified as fibrosis, while severe liver damage/scarring is classified as cirrhosis. Fibrosis and cirrhosis can also occur from alcoholism and non-alcoholic fatty liver disease.

Common Liver Disorder :

- Fatty liver is a reversible condition where large vacuoles of triglyceride fat acquire in liver cells via the process of lipid. It can occur in people with a high level of alcohol consumption as well as in people who never had alcohol.

- Hepatitis (usually caused by a virus spread by excess contamination or direct contact with infected body fluids).

- Cirrhosis of the liver is one of the most serious liver diseases. It is an action used to indicate all forms of diseases of the liver characterized by the significant loss of cells. The liver gradually contracts in size and becomes leathery and hard. The regenerative action continues under liver cirrhosis but the progressive loss of liver cells exceeds cell replacement.

- Liver cancer. The risk of liver cancer is higher in those who have cirrhosis or who had viral types of viral hepatitis; but more often, the liver is the site of secondary (metastatic) cancers spread from other organs.

PURPOSE:

The main purpose of our project is that to predict the liver disease before it gets to serious state of health problem and gets very hard to cure. Knowledge of the level of liver damage in a patient with liver disease (particularly Hepatitis B and Hepatitis C) is a critical factor in determining the optimal course of treatment and to measure the effectiveness of alternative treatments in patients. The effort here expands on earlier work [4] by adding three additional artificial intelligence techniques to predict the degree of liver damage from blood serum results rather than determination from an invasive biopsy. Clinical Decision Support System (CDSS) provide

cost/effective solutions by correlating historical data to assist clinicians in treatment of disease. In this case we are developing a CDSS focused on predicting Fibrosis Stage from blood serum information. It is an information system which uses expert systems and artificial intelligence (AI) technology to support clinical decision. It makes integrated diagnostic and medical advice bases on the collected patients' information, providing reference for the clinical medical physician [6]. Clinical Decision Support Systems are "active knowledge systems which use two or more items of patient data to generate case%specific advice".

LITERATURE SURVEY

1) Prognosis of Liver Disease: Using Machine Learning Algorithms

Author:C.Priya (Assistant Professor) Department of CSE, PERI Engineering College

Data mining classification techniques like Decision Tree, Linear Discriminant, SVM Fine Gaussian and Logistic Regression algorithms are applied. Laboratory parameters of the patients are used as the dataset. Data contains features that can establish a rigorous model using Classification technique. MATLAB2016 is used in this paper for implementing classification algorithm on the dataset. Linear Discriminant algorithm showed the highest prediction accuracy 95.8% and ROC is 0.93. This paper helps in foresee the presence of liver disease using different classification algorithms. The dataset considered consists of lab reports of 574 patients who are advised with LFT. The initial phase includes assorting the information from the available source. This information is of the patients who are predicted of having liver disorder. The dataset is analyzed in the next phase to check which algorithm can be applied to obtain optimal results. The last phase includes classification of data by application of proper algorithm on the dataset and formatting a training model. In the last phase data is tested against the trained model to get proper predictive values. The proposed paper makes use of laboratory parameters of individuals after taking LFT. The model that yields the maximum efficiency is considered. Once the patient is predicted with the liver

disease, he is further advised for imaging tests to determine the existence of tumor lesions and their stage. This paper makes use of the lab test reports of the patients who has undergone Liver Function Test. MATLAB2016 is used but Logistic Regression gave high accuracy of 95.8%. Various predictors are tested by plotting graph that determined the existence of disorder in liver. Further research is proposed for considering the tumor characteristics of the patient once he is diagnosed with liver disorder. Also large dataset can be considered for training the model and algorithms can be determined.

2.Evaluation based Approaches for Liver Disease Prediction using Machine Learning Algorithms

Author: 1.C.Geetha (Assistant Professor) Department of CSE, Bharath Institute of Higher Education and Research Chennai, 2. India Geetha, Department of CSE Dr. MGR University.

This research also aims to compare the classification algorithms and to provide prediction accuracy results. In order to store large-scale information on patient outcomes, procedures, etc. Electronic health records (EHR) are used. The data on the EHR can be organized or unstructured. Electronic health records are stored in a standardised data format using managed language to log patient knowledge as a written text that is hyperlinked in existence. The EHR aims to streamline knowledge about the clinical workflow. Ensemble learning is a well-known method used for prediction by integrating multiple ensemble models of machine learning. Aggregations of various classifiers are J48, C4.5 and Naive Bayes. Ensembles search for better outcomes than all of the simple classifiers. The proposed work aims to enhance the predictive and classification quality of healthcare data by developing a hybrid predictive classifier model using the classifier ensemble. The SVM, Logistic Regression, comprises two main machine learning techniques. Using all the models, the prediction analysis has been implemented and their performance has been assessed. The probability of liver disease prediction attained with an accuracy of 96%. In future, the present scenario can be compared with other techniques such as naive baye's classification, Random forest etc. Also this work can be further focused on implementation of parametric classifications by bio-inspired optimization algorithms.

3.Liver Disease Prediction System using Machine Learning Techniques

AUTHOR: 1.Rakshith.D B, 2.Mrigank Srivastava 3.Ashwani Kumar 4.Gururaj.S P, From the Department of Computer Science and Engineering, Siddaganga Institute of Technology, Tumkur, India.

In this paper we are going to 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. The final output was predicted based on the most accurate machine learning algorithm. Based on the accurate model we designed a system which asks a person to enter the details of his/her blood test report. Then the system uses the most accurate model which is trained to predict, whether a person has risk of liver disease or not. In this project we have taken UCI ILPD Dataset which contains 10 variables that are age, gender, total Bilirubin, direct Bilirubin, total proteins, albumin, A/G ratio, SGPT, SGOT and Alkphos and contains 415 as liver disease patients and 167 as non-liver disease patients. As we go through the next parts of this paper we will explain what process has taken place for the selection of best model and building necessary system for the prediction of liver disease. The major outcomes that can be expected through this project is that it increased convenience for predicting a liver disease. 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 SVM 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.

4.LIVER DISEASE DIAGNOSIS USING MACHINE LEARNING

AUTHOR: 1.Prof. Sayalee Deshmukh , 2.Anushka Sawant, 3.Manasi Khopade, 4.Pratiksha Kawale, 5.Yashika Palan, Department of Computer Engineering, Bharati Vidyapeeth's College of Engineering for Women, Pune-411043.

The major goal of this study is to employ classification algorithms to distinguish between liver patients and healthy people. Chemical components (bilirubin, albumin, proteins, alkaline phosphatase) present in the human body, as well as tests such as SGOT and SGPT, determine whether a person is a patient, or whether they need to be diagnosed. Excessive alcohol consumption, inhalation of toxic gases, eating of contaminated food, pickles, and medicines have all contributed to an increase in patients with liver disease. The goal of this research is to analyse prediction algorithms in order to relieve doctors of their workload. Keywords— liver disease, SVM, Random Forest, KNN, ML, python, etc. The major goal of this study is to employ classification algorithms to distinguish between liver patients and healthy people. In this study, the performance of FIVE classification techniques was compared using data from liver patients: Logistic Regression, Support Vector Machines (SVM), K Nearest Neighbour (KNN), Decision Tree and Random Forest (RF). Furthermore, the most accurate model is implemented as a user-friendly Graphical User Interface (GUI) in Python using tkinter package. Doctors and medical practitioners can easily use the GUI as a screening tool for liver disease. The dataset used in this work is The Indian Liver Patient Dataset (ILPD), which was chosen from the UCI Machine Learning repository. It is a representative sampling of the entire Indian population.

5) A Survey on machine learning techniques for the diagnosis of liver disease

AUTHOR:1.Golmei Shaheamlung , 2.Harshpreet , 3.Mandeep.

The motive of this paper is to give a survey and comparative analysis of the entire machine learning techniques for diagnosis and prediction of liver disease in the medical area, which has already been used for the prediction of liver disease by various authors and the analysis are based on Accuracy, Sensitivity, Precision, and Specificity. With the help of this survey and study, it has clearly found and observed that some machine learning algorithm such as Decision tree, J48 and ANN provide better accuracy on detection and prediction of liver diseases. With this in mind and performance we know that different algorithm has different performance based on different scenario but most importantly, the dataset and feature selection is also very important to

get better prediction results. With this survey we found out that the accuracy and performance can be improved by using different combination or hybrid machine learning algorithm and in future we can also work on more parameter's which help to get better performance than the existing technique.

6) Prediction of Liver Disease using Classification Algorithms

AUTHOR:1.Thirunavukkarasu.K, 2.Ajay S. Singh, 3.Md Irfan, 4.Abhishek Chowdhury.

The main aim is to predict liver disease using different classification algorithms. The algorithms used for this purpose of work is Logistic Regression, K-Nearest Neighbour and Support Vector Machines. Accuracy score and confusion matrix is used to compare this classification algorithm. In this paper, Logistic Regression, K-Nearest neighbour and Support Vector Machines are been used for prediction of liver disease. The proposed methods are used to compare classification accuracy of Logistic Regression, K-nearest neighbour and Support Vector Machine. The comparison of all these algorithms been done are based on classification accuracy which is found through confusion matrix. From the experiment, Logistic Regression and K-Nearest Neighbour have the highest accuracy but logistic regression have the highest sensitivity. Therefore, it can be concluded that Logistic Regression is appropriate for predicting liver disease.

7) Optimizing Liver disease prediction with Random Forest by various Data balancing Techniques

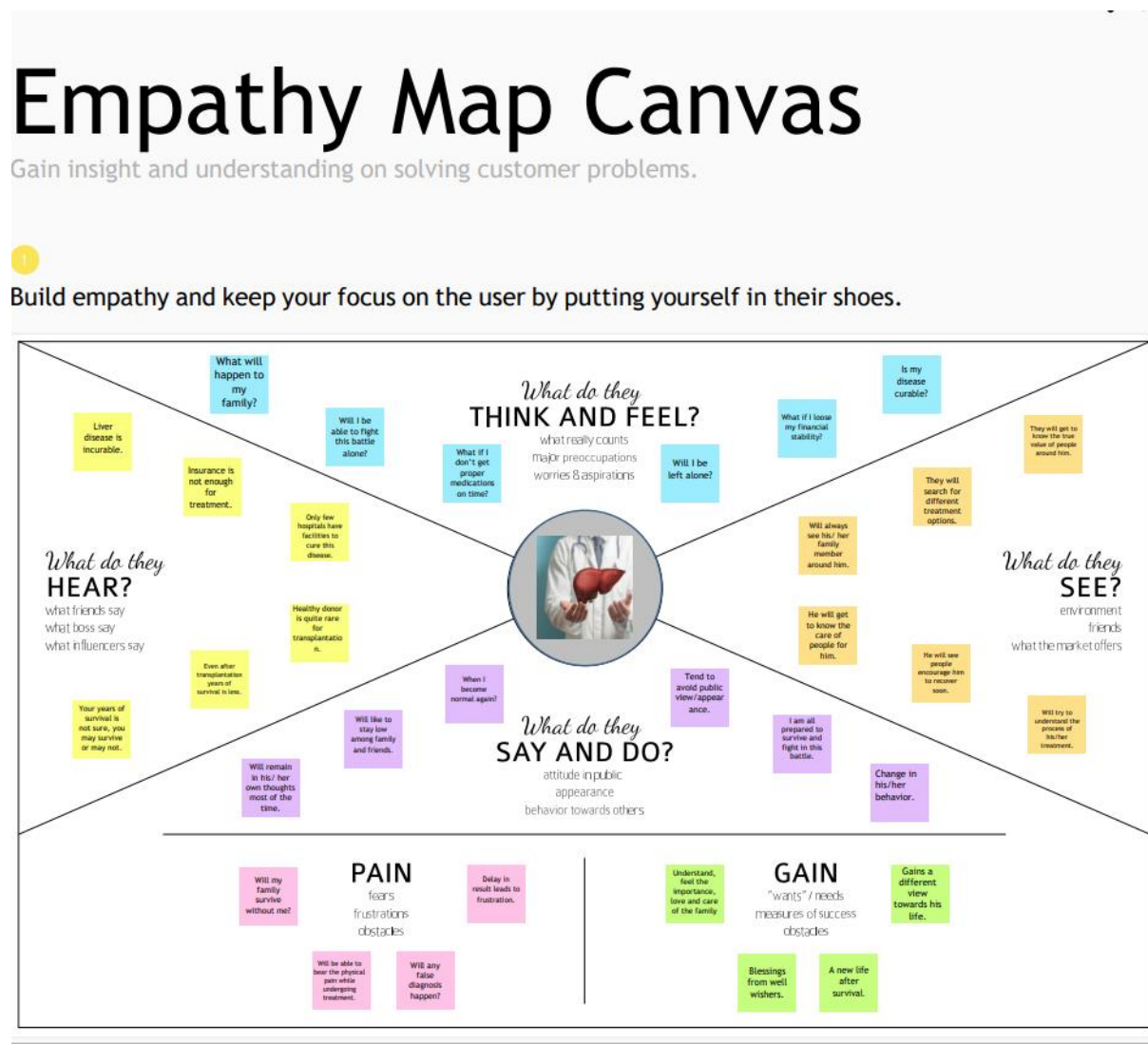
AUTHOR:1.Sateesh Ambesange, 2. Vijayalaxmi A, 3.Rashmi Uppin, 4. Shruthi Patil, 5. Vilaskumar PatiL.

Random Forest (RF) algorithm is used to predict the disease with different preprocessing techniques. Data set is checked for skewness, outliers and imbalance using univariate and bivariate analysis and then suitable algorithms used to remove outliers and various oversampling and under sampling techniques are used to balance such data's. In this work, Indian Liver Patient Dataset hosted at "ics.uci.edu" is used. Instead of selecting the algorithm, which gives better performance, the paper approaches how to tune the ML module for Random Forest

algorithm in step-by-step ways. The main focus of the paper is to deeply analyze how models can be further tuned beyond one point of saturation due to an imbalanced data set. In this work, ML models are built using various preprocessing techniques to balance the unbalanced data and predicted using RF algorithm.

IDEATION PHASE:


EMPATHY MAP CANVAS:



IDEATION & BRAINSTORMING:

Date	19 September 2022
Team ID	PNT2022TMID01272
Project Name	Statistical Machine Learning Approach to Liver Disease Prediction
Maximum Marks	4 Marks

Step-1: Team Gathering, Collaboration and Select the Problem State



Brainstorm & idea prioritization

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

⌚ 10 minutes to prepare
🕒 1 hour to collaborate
👥 3-8 people recommended

Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.

⌚ 10 minutes

- A Team gathering**
Define who should participate in the session and send an invite. Share relevant information or prework ahead.
- B Set the goal**
Think about the problem you'll be focusing on solving in the brainstorming session.
- C Learn how to use the facilitation tools**
Use the Facilitation Guide (page 5) to run a happy and productive session.

📄 Open article →

1 Define your problem statement

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

⌚ 5 minutes

PROBLEM

We propose a solution to predict liver disease using statistical machine learning and derive the useful insights to patient and doctor to help them to know about their disease. In hospitals, it is very necessary to treat patients in beforehand rather than letting it grow to worst stage.

Key rules of brainstorming
To run an smooth and a productive session

🗣️ Stay on topic

💡 Encourage wild ideas

⏸️ Defer judgment

👂 Listen to others

🗳️ Go for volume

🎨 If possible, be visual

Step-2: Brainstorm, Idea Listing and Grouping

2

Brainstorm

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

⌚ 10 minutes

TIP
You can add a sticky note and hit the pencil button to add or edit the sticky note.

DEEPTHI SHREE

To Find the variation of different types of Hepatitis

Suggest the consultation fees

Updating the back history of the patient to verify whether it is genetic or non genetic.

Obesity can also cause liver disease which can be predicted.

DEEPA

It concludes and displays the main cause or result in the website which has been created.

Notification will be send if the patient needs monitoring

It reduces the anxiety of the patient.

Exposure to certain chemicals can cause liver disease that can be predicted.

HARITA

It can also display the result in the app which has been created.

Suggest the best doctors in the field through website/app

Diabetes raises your risk of nonalcoholic fatty liver disease so checking that will be easier to predict.

Suggest whether liver transplant is required or not.

KEERTHIKA

Blood test is the best way to predict liver diseases.

With the help of ALT Test we can predict acute liver diseases such as hepatitis.

Blood pressure is strongly linked to the development of fatty liver (hepatic steatosis).

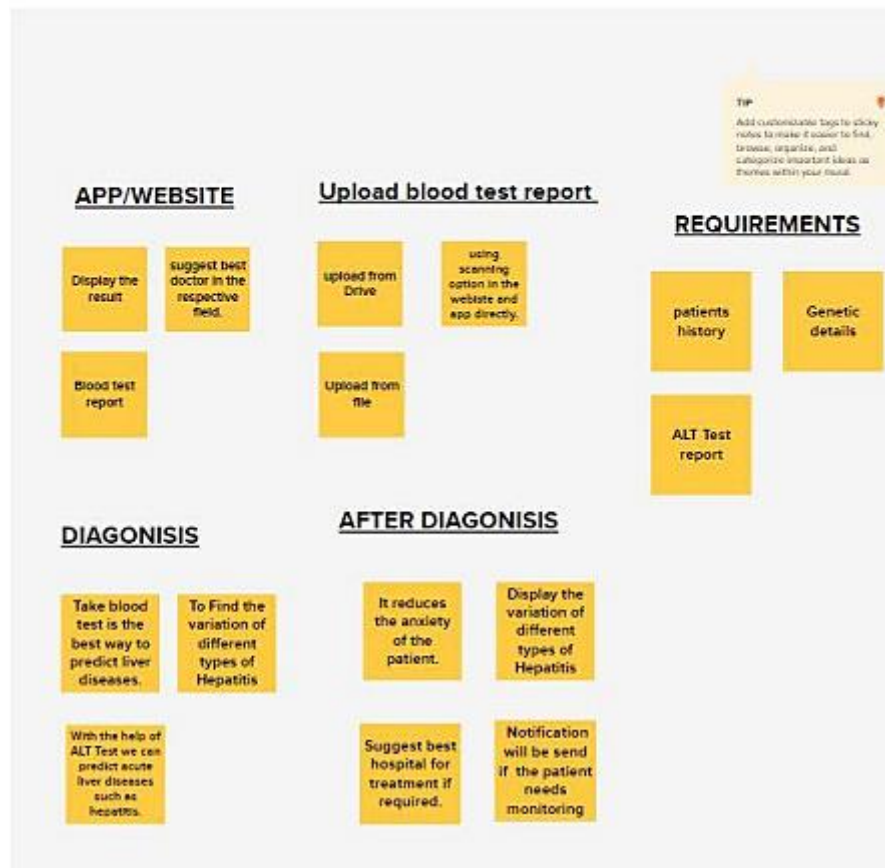
Determines the level of fat accumulation in the liver.

3

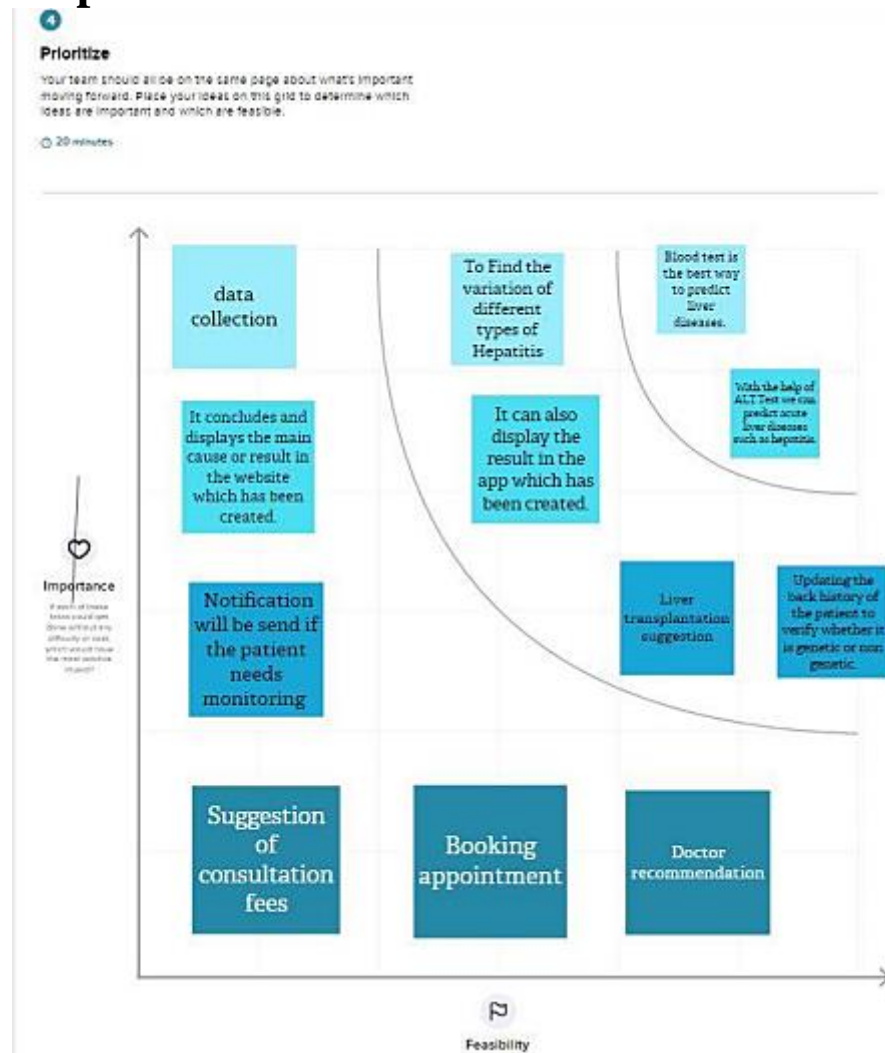
Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you can break it up into smaller sub-groups.

⌚ 20 minutes



Step-3: Idea Prioritization



PROPOSED SOLUTION:

Date	13 October 2022
TeamID	PNT2022TMID01272
Project Name	Statistical Machine Learning Approaches to Liver Disease Prediction
MaximumMarks	2Marks

ProposedSolution:

S.No	Parameter	Description
.		

1.	ProblemStatement(Problem tob be solved)	We propose a solution to predict liver disease using statistical machine learning and derive the useful insights to patient and doctor to help them in a know about their disease. In hospitals, it is very necessary to treat patients in before hand rather than letting it grow to worse stage.
2.	Idea/Solution description	We propose a solution to build a simple web application which takes input as patient data and returns us output with the prediction of liver disease affected by the patient. The results will be displayed to the end user in a web page.
3.	Novelty/Uniqueness	The innovative and additional perk to make this solution stronger and the results more reliable, we use machine learning algorithms to develop a predictive analysis model which will be used to make predictions either on the patient's liver disease. Prediction for these results will be shown in the user friendly-manner.
4.	Social Impact/Customer Satisfaction	The solution can never go unnoticed, though it is new to the society, because it is in a proactive way of prediction. It will address the concern of the key stakeholders, so it will create the impact in the patient as well as the social side.
5.	Business Model (Revenue Model)	The take-away of this project in a business scope of manner is mean to be plenty, it can be beneficial for the users (Patients and Doctors) more intriguing way. It is in need for the community of people, where it comes to handy in day-to-day life. It is a part of the life saving analysis and insights.

6.	Scalability of the Solution	Scalability is the measure of the system performance against the increase or decrease in user demand. The system can handle the user request and return the results on time. It does not require much of the Graphical processor unit; it can be even run on the system of both doctor and patient.
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PROBLEM SOLUTION FIT:

Project Title: Machine Learning Approach on Liver Disease Prediction		Project Design Phase-I - Solution Fit Template		Team ID: PNT2022TMID01272	
Define CS, fit into CC	1. CUSTOMER SEGMENT(S) <small>Who is your customer? i.e. working parents of 0-5 y.o. kids</small> Both Patients and the stakeholder is involved in the healthcare and hospitals to diagnose and predict the liver disease	6. CUSTOMER CONSTRAINTS <small>What constraints prevent your customers from taking action or limit their choices of solutions? i.e. spending power, budget, no cash, network connection, available devices</small> The constraints is mainly in the hospital side to manage and fetch the report without any delay	5. AVAILABLE SOLUTIONS <small>Which solutions are available to the customers when they face the problem? or need to get the job done? What have they tried in the past? What pros & cons do they see?</small> Predicting the stage of the liver disease which class it belongs to Pios: Reducing the man-woik behind the process Cons: Mis-training the system may lead to faulty predictions	Explore AS, differentiate	
	2. JOBS-TO-BE-DONE / PROBLEMS <small>Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides.</small> Predicting the stage of the liver disease where the patient falls under into the category.	9. PROBLEM ROOT CAUSE <small>What is the real reason that this problem exists? What is the back story behind the need to do this job? i.e. customers have to do it because of the change in regulations</small> The major setback to search for this solution is to get more accurate predictions in the healthcare domain and the human error should be minimized and eliminated.	7. BEHAVIOUR <small>What does your customer do to address the problem and get the job done? [X] Directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace)</small> Patients can verify their results with the doctors in case if they don't trust the results from the system.		
Focus on J&P, map into BE, understand RC	3. TRIGGERS <small>What triggers customers to act? i.e. seeing their neighbors installing solar panels, reading about a more efficient solution in the news.</small> Patients can get the more optimized results.	10. YOUR SOLUTION <small>If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits today. If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour.</small> Health-care industry has been booming with current technology day-by-day, so predicting the type of the liver disease based on the Scan report may be more useful in the future occurrences, it may lead to reduce the human error and lead to more optimized results.	8. CHANNELS of BEHAVIOUR <small>ONLINE: What kind of actions do customers take online? Extract online channels from 7 and map them for customer development. OFFLINE: What kind of actions do customers take offline? Extract offline channels from 7 and map them for customer development.</small> Online: check whether other sites could provide more optimized results than the current one. Offline: Can check the quality and performance of other hospitals in the surroundings.	Identify strong TR & EM	
	4. EMOTIONS: BEFORE / AFTER <small>How do customers feel when they face a problem at a job and afterwards? i.e. lost, insecure > confident, in control - use it in your communication strategy & design.</small> Before: Time delay, lack of clarity After: No time delay, More relieved, Automated results		EM & TR: Focus on fit		

REQUIREMENT ANALYSIS:

FUNCTIONAL REQUIREMENT:

Project Design Phase-II Solution Requirements (Functional & Non-functional)

Date	20 October 2022
Team ID	PNT2022TMID01272
Project Name	Project - Statistical Machine Learning Approaches to Liver Disease Prediction
Maximum Marks	4 Marks

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Website Registration through Application

FR-2	User Input	The dataset should be uploaded(blood test report).
FR-3	Building the system	Dataset will be splitted into training and test dataset and then the model will be trained using training dataset.
FR-4	Prediction model	After getting the dataset from the user the pattern of the blood content will be learned using all the algorithms and then it will predict whether the person is affected by liver disease or not.
FR-5	Algorithm of prediction of disease	Machine learning
FR-6	Output	Result will be shown at the last whether the person is affected or not.

NON-FUNCTIONAL REQUIREMENT:

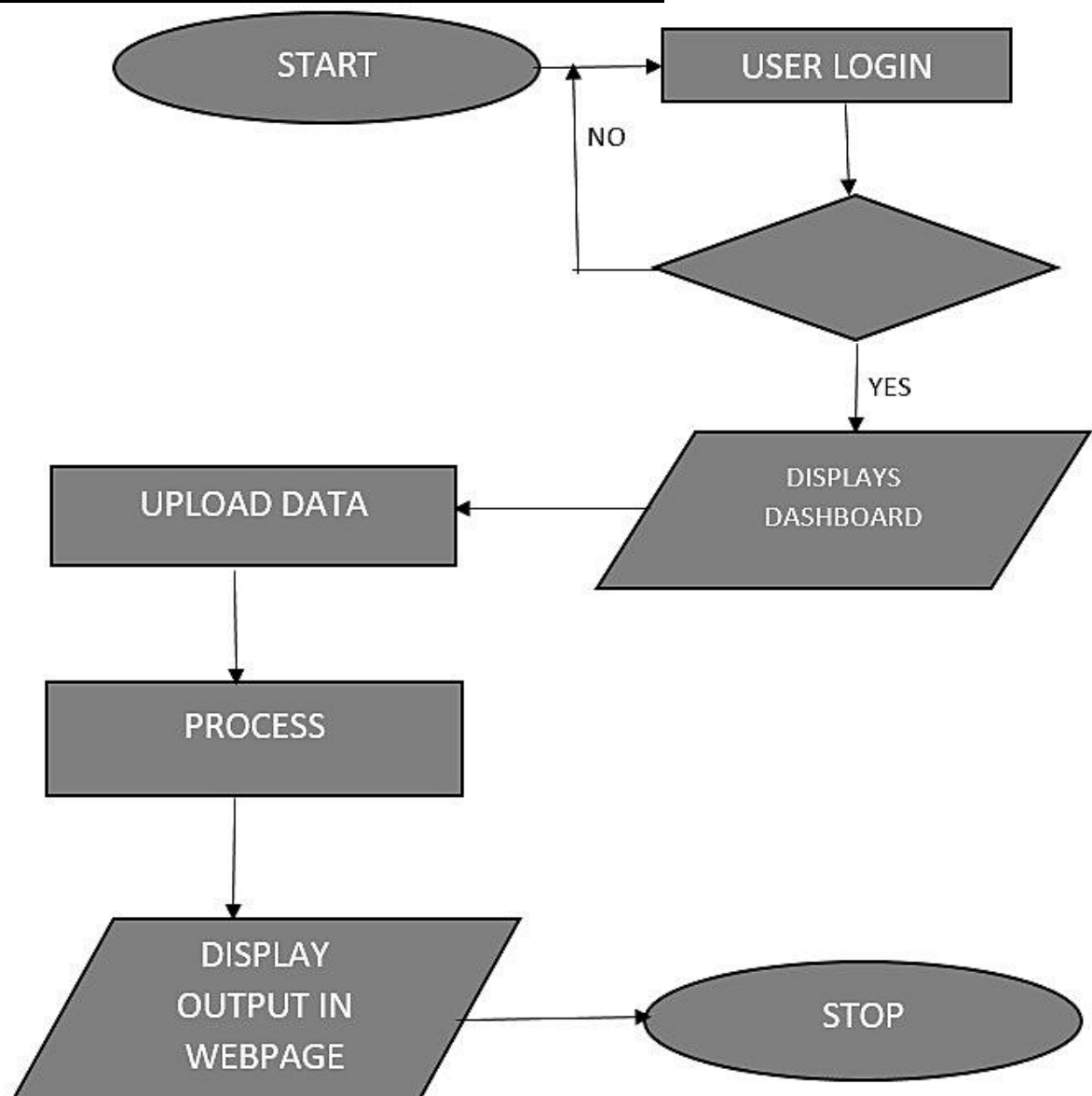
Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	It is very simple and easy way of predicting liver disease in an early stage.
NFR-2	Security	Early prediction of disease allows patients to take treatment in early stage and it will save many lives.
NFR-3	Reliability	This method will offer better performance and make it more dependable.
NFR-4	Performance	This provides more than 90% accuracy. Thus, it has high performance rate.
NFR-5	Availability	By having the dataset of the patient such as blood reports disease can be predicted.
NFR-6	Scalability	It has more efficiency in detecting liver disease.

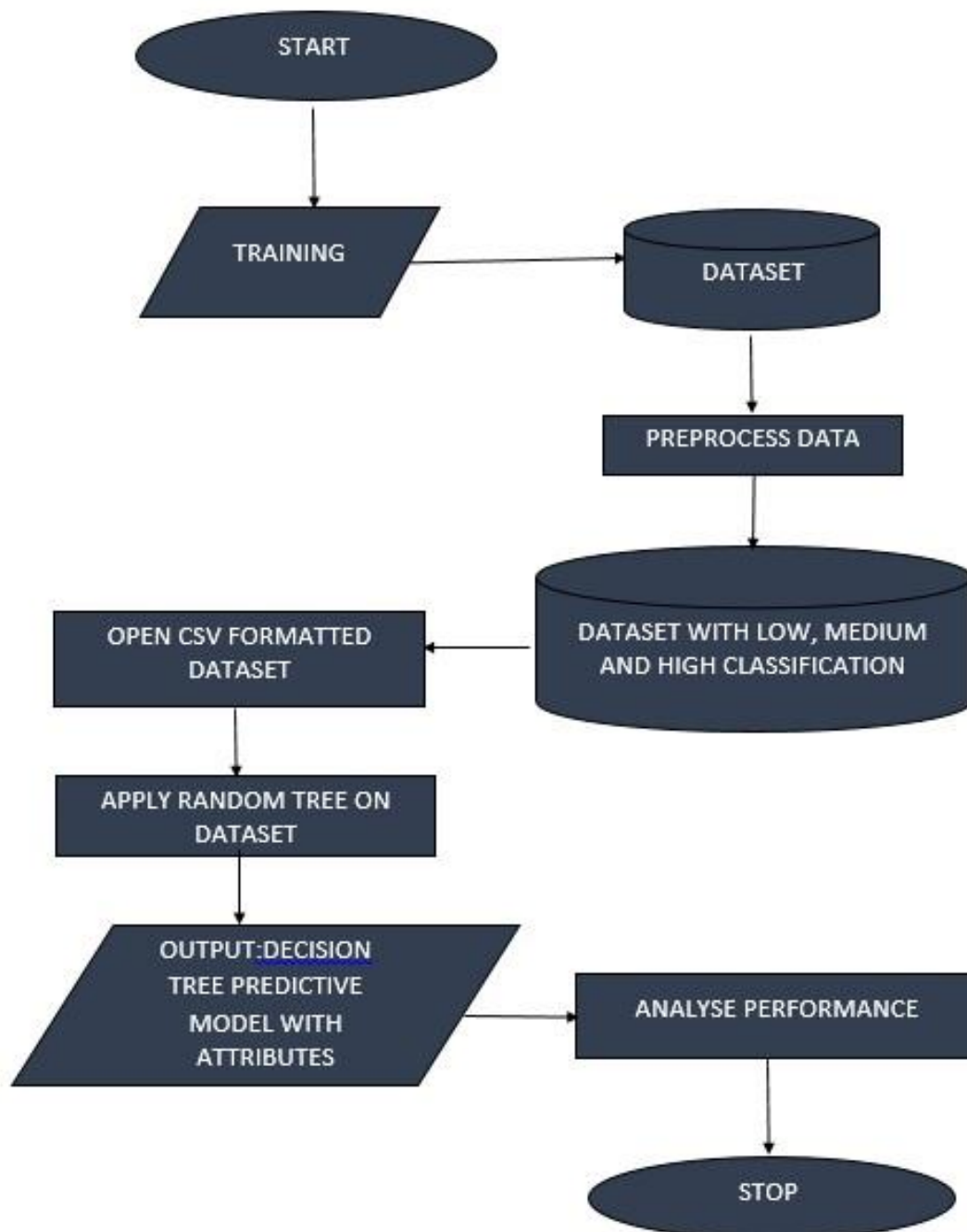
PROJECT DESIGN: **DATA FLOW DIAGRAM:**

Date	19 October 2022
Team ID	PNT2022TMID01272
Project Name	Project – Statistical Machine Learning Approaches to Liver Disease Prediction.
Maximum Marks	4 Marks

DATA FLOW DIAGRAMS: DFD 0



PROCESS: DFD1



USER STORIES:

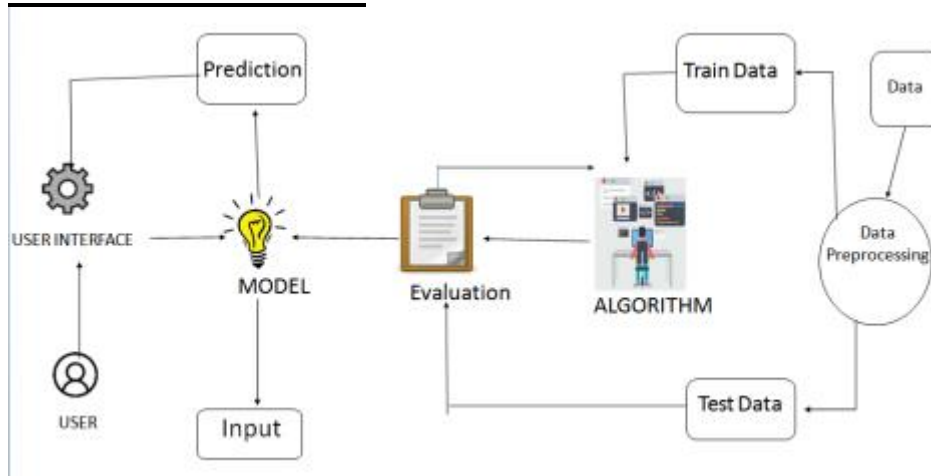
User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN -1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	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 with Facebook Login	Low	Sprint -2
		USN -4	As a user, I can register for the application through Gmail		Medium	Sprint -1
	Login	USN -5	As a user, I can log into the application by entering email & password	Can access the dashboard.	High	Sprint -1
	Dashboard	USN -6	As a user, I Can navigate through different pages using the dashboard	I can various pages	High	Sprint -2

Customer (Web user)	Upload data	USN -6	As a user, I can upload the data that required for finding whether liver disease is there are not.	Can get result based on the information provided.	High	Sprint -3
	Search	USN -7	As a user, I can search for the specialist and best hospital in that respective field.	I can receive information on various doctors and hospitals.	Low	Sprint -4
Administrator	Analyse	USN -8	As an admin, I will analyse the given data.	I can analyse the given data.	High	Sprint -2

SOLUTION & TECHNICAL ARCHITECTURE:

Date	13 October 2022
TeamID	PNT2022TMID01272
Project Name	Statistical Machine Learning Approaches to Liver Disease Prediction
MaximumMarks	2Marks

Solution Architecture:



PROJECT PLANNING & SCHEDULE:

SPRINT PLANNING & ESTIMATION:

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

Date	22 October 2022
Team ID	PNT2022TMID01272
Project Name	STATISTICAL MACHINE LEARNING APPROACH TO LIVER DISEASE PREDICTION
Maximum Marks	8 Marks

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

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint -1	Data Collection and Data Preprocessing	USN-1	As a user, I will get the data and take it as a input	10	Medium	KEERTHIK A L
Sprint -2	Visualize the data	USN-2	AS a user, I will get the visualization of the data for further understanding.	20	High	DEEPTHI SHREE S

Sprint -3	Training and Testing the model	USN-3	I will train and test the ML Model with higher accuracy and model performance.	10	Medium	HARITA K S
Sprint -4	Deploying the model into IBM Cloud	USN-4	I will deploy the model into IBM cloud as a web app for making predictions.	20	Medium	DEEPA S

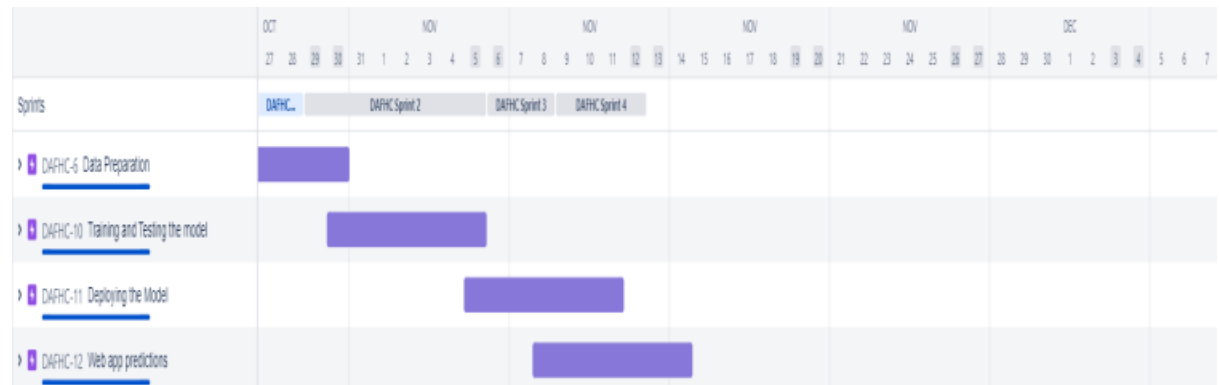
Project Tracker, Velocity & Burndown Chart:

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	(Actual) Sprint
Sprint -1	8	7 Days	22 Oct 2022	28 Oct 2022	20	
Sprint -2	8	8 Days	29 Oct 2022	05 Nov 2022	20	
Sprint -3	5	3 Days	06 Nov 2022	08 Nov 2022	20	
Sprint -4	5	4 Days	09 Nov 2022	12 Nov 2022	20	

Velocity:

Imagine we have a 6-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)

Burndown Chart:



SPRINT DELIVERY SCHEDULE:

SPRINT-1: PROJECT DELIVERABLES

Data Preparation and Preprocess Reading the dataset:

```
In [1]: import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns

In [3]: df = pd.read_csv('C:\Users\welcome\Desktop\Deepthi\Data science\Indian_Liver_patient.csv')

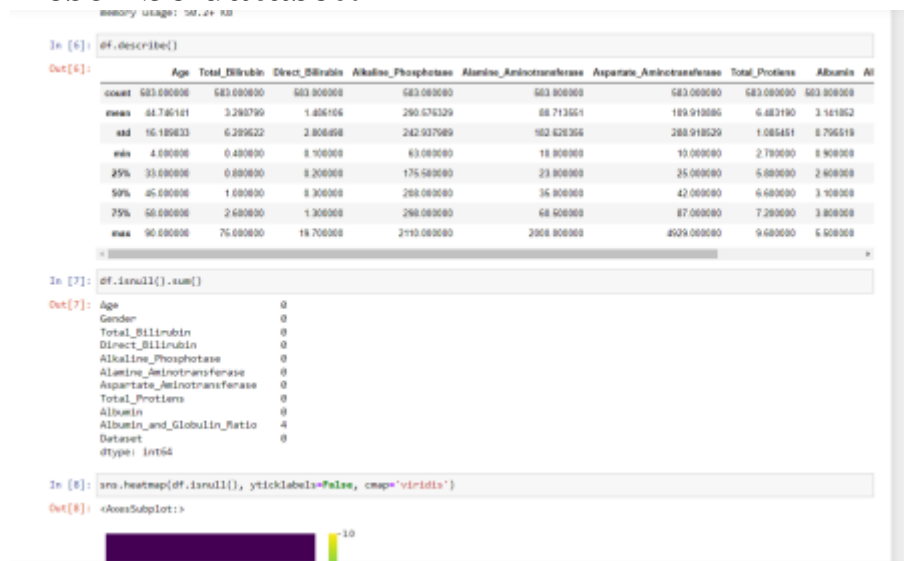
In [4]: df.head()
Out[4]:
```

	Age	Gender	Total_Bilirubin	Direct_Bilirubin	Alkaline_Phosphotase	Alanine_Aminotransferase	Aspartate_Aminotransferase	Total_Protiens	Albumin	Albumi
0	65	Female	9.7	3.1	167	16	19	6.8	3.3	
1	62	Male	19.9	5.5	999	64	180	7.5	3.2	
2	62	Male	7.3	4.1	498	68	88	7.8	3.3	
3	58	Male	1.9	0.4	152	14	20	6.8	3.4	
4	72	Male	3.9	2.0	196	27	99	7.3	2.4	

```
In [5]: df.info()

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 583 entries, 0 to 582
Data columns (total 11 columns):
#   Column                Non-Null Count  Dtype
---  ---
0   Age                   583 non-null    int64
1   Gender                583 non-null    object
2   Total_Bilirubin       583 non-null    float64
3   Direct_Bilirubin      583 non-null    float64
4   Alkaline_Phosphotase  583 non-null    int64
5   Alanine_Aminotransferase  583 non-null    int64
6   Aspartate_Aminotransferase  583 non-null    int64
7   Total_Protiens        583 non-null    float64
8   Albumin               583 non-null    float64
9   Albumin_and_Globulin_Ratio  579 non-null    float64
10  Dataset               583 non-null    int64
```

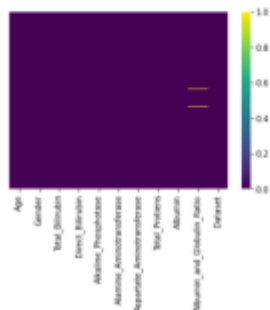
Describe dataset:



Heatmap for Visualizing Null Values:

```
In [8]: sns.heatmap(df.isnull(), yticklabels=False, cmap='viridis')
```

Out[8]: <AxesSubplot>



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

Out[9]: (583, 11)

```
In [10]: df['Gender'].unique()
```

Out[10]: array(['Female', 'Male'], dtype=object)

```
In [11]: df['Gender'].nunique()
```

Out[11]: 2

```
In [12]: df['Gender'] = df['Gender'].map({'Male': 1, 'Female': 0})
```

Dropping Null Values from Dataset:

```

In [ ]: df['Gender'] = df['Gender'].map({'Male': 1, 'Female': 0})

In [ ]: df.head()

In [ ]:
   Age  Gender  Total_Bilirubin  Direct_Bilirubin  Alkaline_Phosphotase  Alanine_Aminotransferase  Aspartate_Aminotransferase  Total_Proteins  Albumin  Albumi
0    65      0         0.7          0.1          187              16              18              6.8        3.3
1    62      1        10.9          5.5          889              84             100              7.5        3.2
2    62      1         7.3          4.1          498              60              60              7.0        3.3
3    58      1         1.8          0.4          182              14              20              6.8        3.4
4    72      1         3.9          2.8          155              27              59              7.3        2.4

In [ ]: df.dropna(inplace=True)

In [ ]: df.shape

In [ ]: (579, 11)

In [ ]: df.head()

In [ ]:
   Age  Gender  Total_Bilirubin  Direct_Bilirubin  Alkaline_Phosphotase  Alanine_Aminotransferase  Aspartate_Aminotransferase  Total_Proteins  Albumin  Albumi
0    65      0         0.7          0.1          187              16              18              6.8        3.3
1    62      1        10.9          5.5          889              84             100              7.5        3.2
2    62      1         7.3          4.1          498              60              60              7.0        3.3
3    58      1         1.8          0.4          182              14              20              6.8        3.4
4    72      1         3.9          2.8          155              27              59              7.3        2.4

In [ ]: df['Dataset'].unique()

In [ ]: array([1, 2], dtype=int64)

```

Heatmap to check if there is any Null Value:

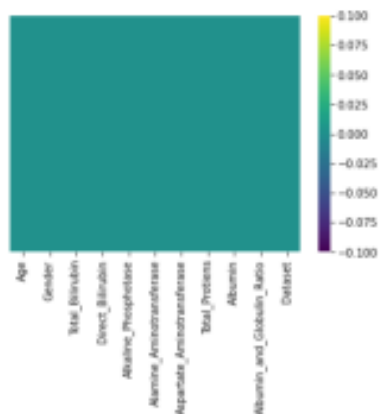
```

In [17]: df['Dataset'].unique()
In [17]: array([1, 2], dtype=int64)

In [18]: df['Dataset'].value_counts()
In [18]:
1    414
2    165
Name: Dataset, dtype: int64

In [19]: sns.heatmap(df.isnull(),yticklabels=False,cmap='viridis')
In [19]: <AxesSubplot:~>

```



```

In [18]: df.corr()['Dataset']

```


EDA : Exploratory Data Analysis

Uni – variate Analysis:

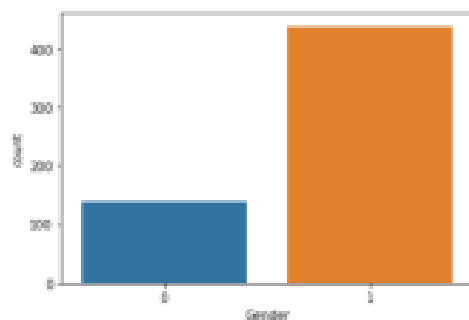
```
1) df.head()
```

```
2) 
```

	Age	Gender	Total_Bilirubin	Direct_Bilirubin	Alkaline_Phosphotase	Alanine_Aminotransferase	Aspartate_Aminotransferase	Total_Protiens	Albumin	Albumi
0	65	0	0.7	0.1	187	16	16	6.8	3.3	
1	62	1	10.9	5.5	699	64	100	7.5	3.2	
2	62	1	7.3	4.1	490	60	68	7.9	3.3	
3	59	1	1.0	0.4	182	14	20	6.8	3.4	
4	72	1	3.9	2.0	195	27	59	7.3	2.4	

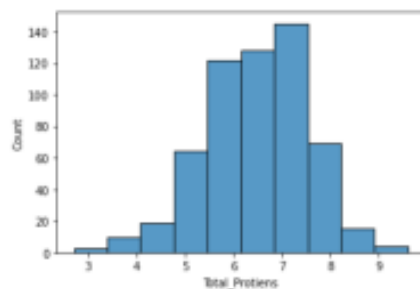
```
3) sns.countplot(x='Gender',data=df, dodge=True)
```

```
4) <AxesSubplot:xlabel='Gender', ylabel='count'>
```



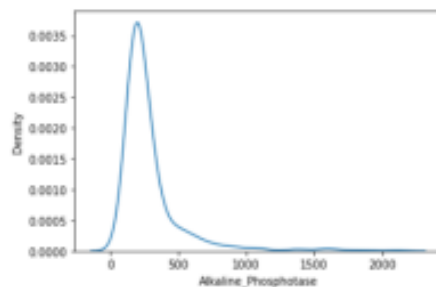
```
5) sns.histplot(x='Total_Protiens',data=df,bins=10)
```

```
6) <AxesSubplot:xlabel='Total_Protiens', ylabel='Count'>
```



```
7) sns.kdeplot(x='Alkaline_Phosphotase', data=df)
```

```
8) <AxesSubplot:xlabel='Alkaline_Phosphotase', ylabel='Density'>
```



```
9) sns.boxplot(x='Albumin and Globulin Ratio',data=df)
```

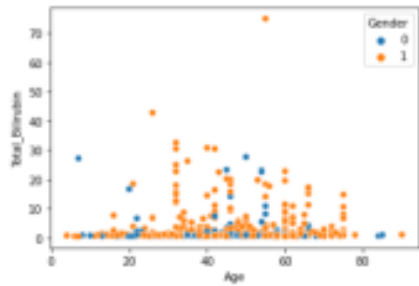
Bi – variate Analysis:

```
1 df.head()
```

	Age	Gender	Total_Bilirubin	Direct_Bilirubin	Alkaline_Phosphotase	Alanine_Aminotransferase	Aspartate_Aminotransferase	Total_Proteins	Albumin	Albumi
0	65	0	0.7	0.1	187	16	18	6.8	3.3	
1	62	1	10.9	5.5	656	64	190	7.5	3.2	
2	62	1	7.3	4.1	490	60	68	7.8	3.3	
3	58	1	1.0	0.4	182	14	20	6.8	3.4	
4	72	1	3.9	2.0	155	27	59	7.3	2.4	

```
1 sns.scatterplot(x='Age',y='Total_Bilirubin',data=df,hue='Gender')
```

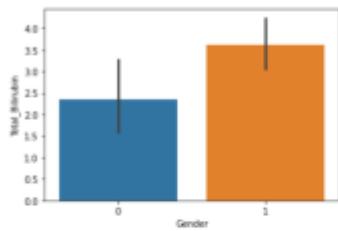
<AxesSubplot:xlabel='Age', ylabel='Total_Bilirubin'>



```
1 sns.barplot(x='Gender',y='Total_Bilirubin',data=df)
```

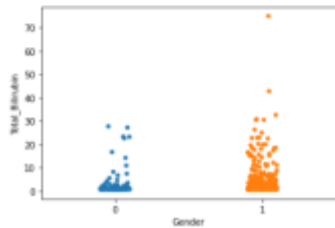
```
1 sns.barplot(x='Gender',y='Total_Bilirubin',data=df)
```

<AxesSubplot:xlabel='Gender', ylabel='Total_Bilirubin'>



```
1 sns.stripplot(x='Gender',y='Total_Bilirubin',data=df)
```

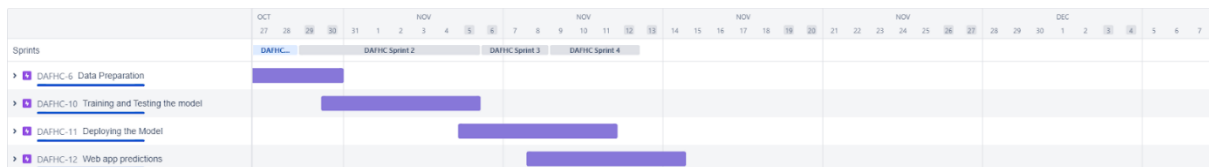
<AxesSubplot:xlabel='Gender', ylabel='Total_Bilirubin'>



Multi – variate Analysis:



REPORTS FROM JIRA



CODING & SOLUTIONS

FEATURE 1: Jupyter Notebook

In Jupyter Notebook, dataset is uploaded and read. After importing the dataset into notebook to extract the useful information and crop the unwanted information we do data preprocessing. After this, Heatmap is use to check the null values in the dataset. If any null values present, dropna command is used to rectify the null values. Next step is to detect the outliers. To detect the outliers we use flooring and capping technique. Here values above upper limit is considered as outliers and values below the lower limits is considered as outliers. We replace

those outliers with upper limit and lower limit values. Next we perform Data Visualization. In data visualization we do EDA - Exploratory Data Analysis, where we do three types of analysis. They are: 1. Uni-Variate Analysis, 2. Bi-Variate Analysis, 3. Multi-Variate Analysis. Next the dataset is split into train and test. Later, dataset is trained in three algorithms to check which algorithm gives best accuracy. Then, the algorithm which gives best accuracy is converted in pickle format to be deployed.

FEATURE 2: Visual Studio Code

After getting the pickle format, inorder to deploy it as a web application run using local host site we use a python library called Flask. It is the main application file used to route the HTML files and get into form and process it after it unpickles our model. It is used to classify the target with input data by getting data from the prediction form. We have four HTML forms. They are: 1. Index Page, 2. Home Page, 3. Prediction Page, 4. Result Page(No Chance, Chance). In prediction.html, it contains the form which is used to get the input data used.

TESTING:

TEST CASES:

HTML CODING:

1.INDEX PAGE:

```
<!DOCTYPEhtml>
<html>

<head>
  <metacharset="utf-8">
<style>
  body {
    background-image:
url('https://png.pngtree.com/thumb_back/fh260/background/20220217/pngtree-
fresh-wind-hand-painted-illustration-background-for-preventing-liver-disease-
image_946993.jpg');
    background-repeat: no-repeat;
    background-attachment: fixed;
    background-size: cover;
  }
</style>
  <title>HOME PAGE</title>

  <link rel="stylesheet"href="/css/style.css"type="text/css"/>
</head>
```

```

<body>

    <sectionid="main">
        <centre>
            <nav>

                <spanclass="menu-space"></span>
                <h2>Liver Patient Analysis</h2>
                <ul class="menu">

                    <li><a href="C:\Users\welcome\Documents\Liver_disease\templates\Homepage2.html">Home</a></li>
                    <li><a href="C:\Users\welcome\Documents\Liver_disease\templates\prediction.html">Prediction</a></li>
                </ul>
            </nav>
        </centre>
    </section>

    <divclass="content">

        <divclass="main-text">

            <h3>Introduction</h3>
            <p style="font-size: large;">
                <pstyle="color:rgb(1, 1, 1)">
                    <strong>
                        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.
                        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.
                </strong>
                </p>
            |</p>
        </div>
    </div>
</body>
</html>

```

2.HOME PAGE:

```

<Html>
<head>
<style>

body {
background-image: url('https://media.istockphoto.com/id/1414176792/photo/top-
view-photo-of-pink-silk-ribbon-symbol-of-breast-cancer-awareness-and-
stethoscope-on.jpg?s=612x612&w=0&k=20&c=7sjsU3Xu_kmxV349N-
_LxWEAjYC8cBWkAFvW51F3WfA=');
background-repeat: no-repeat;
background-attachment: fixed;
background-size: cover;
}

</style>
</head>
<body>

<title>home </title>
<h1><b>LIVER DISEASE </b></h1></head>
<body>
<h3><b>SYMPTOMS:</b></h3>
<p> 1.Skin and eyes that appear yellowish (jaundice)<br>
    2.Abdominal pain and swelling<br>
    3.Swelling in the legs and ankles<br>
    4.Itchy skin<br>
    5.Dark urine color<br>
    6.Pale stool color<br>
    7.Chronic fatigue<br>
    8.Nausea or vomiting<br>
    9.Loss of appetite<br>
    10.Tendency to bruise easily<br>
</p><br>

<h3><b>TOTAL BILIRUBIN: </b></h3>
<p> This is a blood test that measures the amount of a substance called
bilirubin.
    This test is used to find out how well your liver is working.

```

```

    It is often part of a panel of tests that measure liver function.
    A small amount of bilirubin in your blood is normal, but a high level may
    be a sign of liver disease.
</p>

<h3><b>DIRECT_BILIRUBIN:</b></h3>
<p> In the liver, bilirubin is changed into a form that your body can get rid
of.
    This is called conjugated bilirubin or direct bilirubin.
    This bilirubin travels from the liver into the small intestine.
    A very small amount passes into your kidneys and is excreted in your
urine.
    This bilirubin also gives urine its distinctive yellow color.
</p><br>

<h3><b>ALKALINE_PHOSPHATASE:</b></h3>
<p>An alkaline phosphatase level test (ALP test) measures the amount of
alkaline phosphatase enzyme in your bloodstream.
</p><br>

<h3><b>ALBUMIN:</b></h3>
<p> An albumin blood test is used to check your general health and to see how
well your liver and kidneys are working.
    If your liver is damaged or you're not well nourished, your liver may not
make enough albumin.
</p><br>
</body>
</html>

```

3.PREDICTION PAGE:

```

<html>
<head>
<title>  LIVER PATIENT PREDICTION </title>

<h1> Prediction page: </h1>

</head>

<style>
.one{
    text-align: center;
}
body{
    background-color: gold;
}
</style>

<body>
    <divclass="container">
        <h2class='container-heading'><spanclass="heading_font">Liver Disease
Prediction</span></h2>
    </div>
<centre>
<imgsrc="C:\Users\wecome\Documents\Liver_disease\static\images\liver.jpg" wid
th="200"height="100"/>

```

```

<br>
<divclass = "ml-container">
<form action="{{url_for('prediction')}}" method="POST">
<br>
<br>
<label> Age: </label>
<inputid="first"name="age"required="require"size="20"/><br>
<br>
<labelfor="Gender"required="require">Choose Gender:</label>
<selectid="Gender"name="Gender">
    <optionvalue="0">Female</option>
    <optionvalue="1">Male</option>
</select><br>
<br>
<label> Total_Bilirubin: </label>
<inputid="second"name="totalbilirubin"required="require"size="20"/><br><br>

<label> Direct_Bilirubin: </label>
<inputid="third"name="directbilirubin"required="require"size="20"/><br><br>

<label> Alkaline_Phosphotase: </label>
<inputid="fourth"name="alkalinephosphotase"required="require"size="20"/><br><br>

<label> Alamine_Aminotransferase: </label>
<inputid="fifth"name="alamine"required="require"size="20"/><br><br>

<label> Aspartate_Aminotransferase: </label>
<inputid="sixth"name="aspartate"required="require"size="20"/><br><br>

<label> Total_Proteins: </label>
<inputid="seventh"name="totalproteins"required="require"size="20"/><br><br>

<label> Albumin: </label>
<inputid="eighth"name="albumin"required="require"size="20"/><br><br>

<label> Albumin_and_Globulin_Ratio: </label>
<inputid="ninth"name="albuminandglobulin"required="require"size="20"/><br><br>

<buttonid="sub"type="submit">Predict</button>

</form>
</div>
</centre>
<style>
body{
    font-family: Arial, Helvetica,sans-serif;
    text-align: center;
    margin: 0;
    padding: 0;
    width: 100%;
    height: 100%;
    display: flex;

```



```
    flex-direction: column;
}
.container-heading{
    margin:0;
}
.heading_font{
    color: black;
    font-family: 'Pacifico', cursive;
    font-size: 50px;
    font-weight: normal;
}
#first{
    border-radius: 14px;
    height: 25px;
    width: 150px;
    font-size: 20px;
    text-align: center;
}
#second{
    border-radius: 14px;
    height: 25px;
    width: 150px;
    font-size: 20px;
    text-align: center;
}
#third{
    border-radius: 14px;
    height: 25px;
    width: 150px;
    font-size: 20px;
    text-align: center;
}
#fourth{
    border-radius: 14px;
    height: 25px;
    width: 150px;
    font-size: 20px;
    text-align: center;
}
#fifth{
    border-radius: 14px;
    height: 25px;
    width: 150px;
    font-size: 20px;
    text-align: center;
}
#sixth{
    border-radius: 14px;
    height: 25px;
    width: 150px;
    font-size: 20px;
    text-align: center;
}
#seventh{
    border-radius: 14px;
    height: 25px;
```

```

width: 150px;
font-size: 20px;
text-align: center;
}
#eighth{
border-radius: 14px;
height: 25px;
width: 150px;
font-size: 20px;
text-align: center;
}
#ninth{
border-radius: 14px;
height: 25px;
width: 150px;
font-size: 20px;
text-align: center;
}

#sub{
width: 120px;
height: 43px;
text-align: center;
border-radius: 14px;
font-size: 18px;
}
</style>
</body>
</html>

```

4.NO CHANCE PAGE:

```

<!DOCTYPEhtml>
<html>
  <html>
    <head>
      <meta charset="UTF-8">
      <meta name="viewport" content="width=device-width, initial-scale=1.0">
      <title>Liver Disease Result</title>
    </head>
    <body>
      <div class="container">
        <form action="{url_for('prediction')}" method="post">
          <h2 class="container-heading"><span class="heading_font">Liver
Disease Prediction</span></h2>

          <br><br><br><br><br><br><br>

          <!-- Result -->
          <div class="results">
            <h1><span class="safe">🎉 Congratulation! 🎉<br><br>You DON'T
have LIVER DISEASE.</span></h1>
          </div>
        </form>
      </div>
    </body>
  </html>

```

```
</div>

<style>

/* Color */
body{
    font-family: Arial, Helvetica,sans-serif;
    text-align: center;
    margin: 0;
    padding: 0;
    width: 100%;
    height: 100%;
    display: flex;
    flex-direction: column;
}

/* Heading Font */
.container-heading{
    margin: 0;
}

.heading_font{
    color: black;
    font-family: 'Pacifico', cursive;
    font-size: 50px;
    font-weight: normal;
}

</style>
</body>
</html>
```

5.CHANCE PAGE:

```
<!DOCTYPEhtml>
<htmllang="en">

<head>
  <metacharset="UTF-8">
  <metaname="viewport"content="width=device-width, initial-scale=1.0">
  <title>Liver Disease Result</title>
</head>

<body>

  <divclass="container">
    <formaction="{{ url_for('prediction')}}" method="post">
      <h2 class='container-heading'><spanclass="heading_font">Liver
Disease Prediction</span></h2>

      <br><br><br><br><br><br><br>

      <!-- Result -->
      <divclass="results">
```

```

                <h1><spanclass='danger'>Oops! 😞<br><br>You have LIVER DISEASE
<br><br>Please Consult a Doctor.</span></h1>

            </div>
        </form>

    </div>
    <div>
        <br><br><br><br><br><br><br><br><br>

    </div>

<style>
/* Color */
body{
    font-family: Arial, Helvetica,sans-serif;
    text-align: center;
    margin: 0;
    padding: 0;
    width: 100%;
    height: 100%;
    display: flex;
    flex-direction: column;
}

/* Heading Font */
.container-heading{
    margin: 0;
}

.heading_font{
    color: black;
    font-family: 'Pacifico', cursive;
    font-size: 50px;
    font-weight: normal;
}
</style>
</body>
</html>

```

USER ACCEPTANCE TESTING:

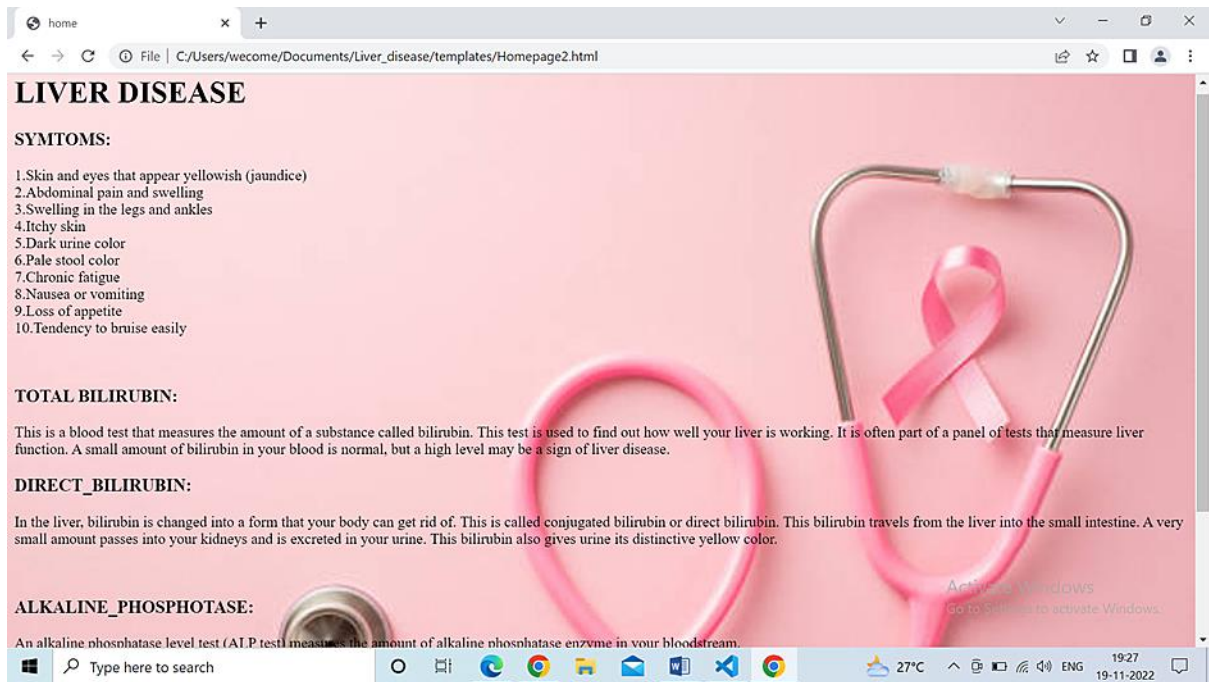
RESULTS:

Local Host Site:

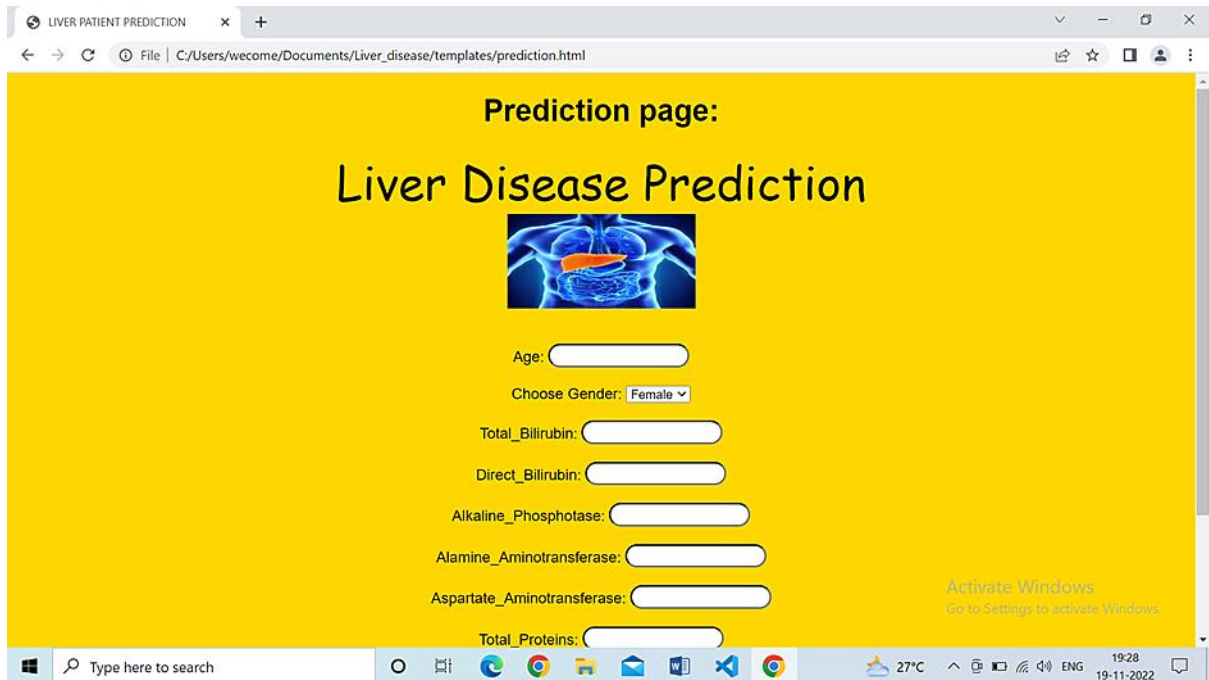
```
File Edit Selection View Go Run Terminal Help
app.py - Liver_disease - Visual Studio Code

EXPLORER
LIVER_DISEASE
  > __pycache__
  > css
  > static\images
    Homepage.png
    liver.jpg
  > templates
    Chances.html
    homepage.html
    Homepage2.html
    NoChance.html
    prediction.html
  app.py
  Best_Model.pkl

app.py
1 import flask
2 from flask import Flask
3 from flask import render_template
4 from flask import request
5 from flask import redirect
6 from flask import url_for
7 import pickle
8 import numpy as np
9
10
11 app=Flask(__name__, static_url_path='/static/images/', static_folder='/static/images/')
12
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```




Prediction Page:



LIVER PATIENT PREDICTION

File | C:/Users/wecome/Documents/Liver_disease/templates/prediction.html



Age:

Choose Gender: Female ▼

Total_Bilirubin:

Direct_Bilirubin:

Alkaline_Phosphatase:

Alamine_Aminotransferase:

Aspartate_Aminotransferase:

Total_Proteins:

Albumin:

Albumin_and_Globulin_Ratio:

Activate Windows
Go to Settings to activate Windows.

Type here to search

27°C 19:28 19-11-2022

PERFORMANCE METRICS:

Prediction Result:

HOME PAGE | LIVER PATIENT PREDICTION

127.0.0.1:8080/prediction

Not syncing

Age:

Choose Gender: Female ▼

Total_Bilirubin:

Direct_Bilirubin:

Alkaline_Phosphatase:

Alamine_Aminotransferase:

Aspartate_Aminotransferase:

Total_Proteins:

Albumin:

Albumin_and_Globulin_Ratio:

Activate Windows
Go to Settings to activate Windows.

Type here to search

27°C 19:30 19-11-2022

No Chance:

The screenshot shows a web browser window with the address bar displaying '127.0.0.1:8080/prediction'. The page title is 'Liver Disease Prediction'. The main content area displays a large 'Congratulation!' message with a party emoji on either side, followed by the text 'You DON'T have LIVER DISEASE.' in bold. The Windows taskbar at the bottom shows the search bar, task view button, and several application icons. The system tray on the right indicates a temperature of 27°C and the date 19-11-2022.

Liver Disease Prediction

🎉 Congratulation! 🎉

You DON'T have LIVER DISEASE.

Activate Windows
Go to Settings to activate Windows.

Prediction Result:

The screenshot shows a web browser window with the address bar displaying '127.0.0.1:8080/prediction'. The page title is 'LIVER PATIENT PREDICTION'. The main content area is a yellow background with a form for inputting patient data. The form includes fields for Age (65), Gender (Female), Total_Bilirubin (0.7), Direct_Bilirubin (0.1), Alkaline_Phosphatase (187), Alamine_Aminotransferase (16), Aspartate_Aminotransferase (18), Total_Proteins (6.8), Albumin (3.3), and Albumin_and_Globulin_Ratio (0.9). A 'Predict' button is located at the bottom of the form. The Windows taskbar at the bottom shows the search bar, task view button, and several application icons. The system tray on the right indicates a temperature of 27°C and the date 19-11-2022.

LIVER PATIENT PREDICTION

Age: 65

Choose Gender: Female

Total_Bilirubin: 0.7

Direct_Bilirubin: 0.1

Alkaline_Phosphatase: 187

Alamine_Aminotransferase: 16

Aspartate_Aminotransferase: 18

Total_Proteins: 6.8

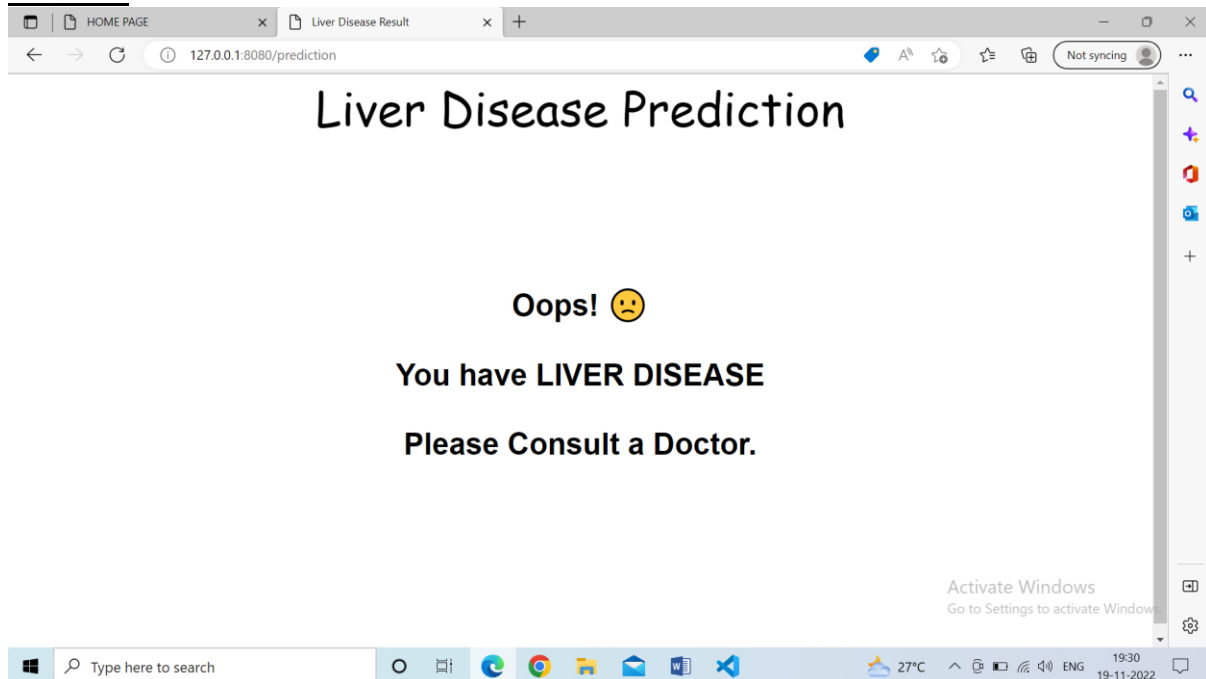
Albumin: 3.3

Albumin_and_Globulin_Ratio: 0.9

Predict

Activate Windows
Go to Settings to activate Windows.

Chance:



Conclusion:

In this paper, we proposed and built a machine learning based on a hybrid classifier to be used as a classification model for liver diseases diagnosis to improve performance and experts to identify the chances of disease and conscious prescription of further treatment healthcare and examinations. In future work, the use of fast datasets technique like Apache Hadoop or Spark can be incorporated with this technique. In addition to this, we can use distributed refined algorithms like Forest Tree implemented in Apache Hadoop to increase scalability and efficiency.

FUTURE SCOPE:

In future, along with this analysis of the input data, using Machine Learning algorithms for predictive analysis may be more effective. The predictions and classification of user data can be done by using the ML algorithms easily and a full fledged application can be created for analysis and predictions of the Patient

data can be done near future. And the results can be directly send to the patient email address without delay.

SOURCE CODE:

App.py:(Main)

```
import flask
from flask import Flask
from flask import render_template
from flask import request
from flask import redirect
from flask import url_for
import pickle
import numpy as np

app = Flask(__name__, static_url_path='/static/images/',
            static_folder='/static/images/')

model = pickle.load(open('Best_Model.pkl', 'rb'))

@app.route('/', methods=['GET'])
def home():
    return render_template('homepage.html')

@app.route('/nochance')
def result():
    return render_template("NoChance.html")

@app.route('/chance')
def result1():
    return render_template("Chances.html")

@app.route('/prediction', methods=['POST', 'GET'])
def prediction():
    if request.method == "GET":
        return render_template("prediction.html")
    age = request.form["age"]
    gender = request.form["Gender"]
    totalbilirubin = request.form['totalbilirubin']
    directbilirubin = request.form['directbilirubin']
    alkalinephosphotase = request.form['alkalinephosphotase']
    alamine = request.form['alamine']
    aspartate = request.form['aspartate']
    totalproteins = request.form['totalproteins']
    albumin = request.form['albumin']
    albuminandglobulin = request.form['albuminandglobulin']

    data = [(float(age), float(gender), float(totalbilirubin),
float(directbilirubin), float(alkalinephosphotase),
float(alamine), float(aspartate), float(totalproteins), float(albumin),
float(albuminandglobulin))]
```

```

model = pickle.load(open('Best_Model.pkl', 'rb'))

prediction = model.predict(data)[0]
print(prediction)
if (prediction == 1):
    return render_template('Chances.html')
else:
    return render_template('NoChance.html')

if __name__ == '__main__':
    app.run(debug=True, port=8080, use_reloader=False)

```

Index Page:

```
<!DOCTYPE html>
```

```
<html>
```

```
<head>
```

```
  <meta charset="utf-8">
```

```
<style>
```

```
  body {
```

```
    background-image: url('https://png.pngtree.com/thumb_back/fh260/background/20220217/pngtree-
    fresh-wind-hand-painted-illustration-background-for-preventing-liver-disease-image_946993.jpg');
```

```
    background-repeat: no-repeat;
```

```
    background-attachment: fixed;
```

```
    background-size: cover;
```

```
  }
```

```
</style>
```

```
  <title>HOME PAGE</title>
```

```
  <link rel="stylesheet" href="/css/style.css" type="text/css" />
```

```
</head>
```

```
<body>
```

```
  <section id="main">
```

```
    <centre>
```

```
      <nav>
```

```
        <span class="menu-space"></span>
```

```
        <h2>Liver Patient Analysis</h2>
```

```
        <ul class="menu">
```

```
          <li><a
```

```
href="C:\Users\wecome\Documents\Liver_disease\templates\Homepage2.html">Home</a></li>
```

```
          <li><a
```

```
href="C:\Users\wecome\Documents\Liver_disease\templates\prediction.html">Prediction</a></li>
```

```
        </ul>
```

```
      </nav>
```

```
    </centre>
```

```
  </section>
```

<div class="content">

<div class="main-text">

<h3>Introduction</h3>

<p style="font-size: large";>

<p style="color:rgb(1, 1, 1)">

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.

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.

</p>

|</p>

</div>

</div>

</body>

</html>

Home Page:

<Html>

<head>

<style>

body {

background-image: url('https://media.istockphoto.com/id/1414176792/photo/top-view-photo-of-pink-silk-ribbon-symbol-of-breast-cancer-awareness-and-stethoscope-on.jpg?s=612x612&w=0&k=20&c=7sjsU3Xu_kmxV349N-_LxWEAjYC8cBWkAFvW5lF3WfA=');

```
background-repeat: no-repeat;
background-attachment: fixed;
background-size: cover;
}
```

```
</style>
```

```
</head>
```

```
<body>
```

```
<title>home </title>
```

```
<h1><b>LIVER DISEASE </b></h1></head>
```

```
<body>
```

```
<h3><b>SYMPTOMS:</b></h3>
```

```
<p> 1.Skin and eyes that appear yellowish (jaundice)<br>
```

```
    2.Abdominal pain and swelling<br>
```

```
    3.Swelling in the legs and ankles<br>
```

```
    4.Itchy skin<br>
```

```
    5.Dark urine color<br>
```

```
    6.Pale stool color<br>
```

```
    7.Chronic fatigue<br>
```

```
    8.Nausea or vomiting<br>
```

```
    9.Loss of appetite<br>
```

```
    10.Tendency to bruise easily<br>
```

```
</p><br>
```

```
<h3><b>TOTAL BILIRUBIN: </b></h3>
```

```
<p> This is a blood test that measures the amount of a substance called bilirubin.
```

```
    This test is used to find out how well your liver is working.
```

```
    It is often part of a panel of tests that measure liver function.
```

```
    A small amount of bilirubin in your blood is normal, but a high level may be a sign of liver disease.
```

```
</p>
```

```
<h3><b>DIRECT_BILIRUBIN:</b></h3>
```

```
<p> In the liver, bilirubin is changed into a form that your body can get rid of.
```

```
    This is called conjugated bilirubin or direct bilirubin.
```

```
    This bilirubin travels from the liver into the small intestine.
```

```
    A very small amount passes into your kidneys and is excreted in your urine.
```

```
    This bilirubin also gives urine its distinctive yellow color.
```

```
</p><br>
```

```
<h3><b>ALKALINE_PHOSPHOTASE:</b></h3>
```

```
<p>An alkaline phosphatase level test (ALP test) measures the amount of alkaline phosphatase enzyme in your bloodstream.
```

```
</p><br>
```

```
<h3><b>ALBUMIN:</b></h3>
```

```
<p> An albumin blood test is used to check your general health and to see how well your liver and kidneys are working.
```

If your liver is damaged or you're not well nourished, your liver may not make enough albumin.

</p>

</body></html>

Prediction Page:

<html>
<head>
<title> LIVER PATIENT PREDICTION </title>

<h1> Prediction page: </h1>

</head>

<style>
.one{
text-align: center;
}
body{
background-color: gold;
}
</style>

<body>
<div class="container">
<h2 class='container-heading'>Liver Disease
Prediction</h2>
</div>
<centre>

<div class = "ml-container">
<form action="{{url_for('prediction')}}" method="POST" >

<label> Age: </label>
<input id="first" name="age" required="require" size="20"/>

<label for="Gender" required="require">Choose Gender:</label>
<select id="Gender" name="Gender">
<option value="0">Female</option>

```
<option value="1">Male</option>
</select><br>
<br>
<label> Total_Bilirubin: </label>
<input id="second" name="totalbilirubin" required="require" size="20"/> <br>
<br>

<label> Direct_Bilirubin: </label>
<input id="third" name="directbilirubin" required="require" size="20"/> <br>
<br>

<label> Alkaline_Phosphotase: </label>
<input id="fourth" name="alkalinephosphotase" required="require" size="20"/>
<br> <br>

<label> Alamine_Aminotransferase: </label>
<input id="fifth" name="alamine" required="require" size="20"/> <br> <br>

<label> Aspartate_Aminotransferase: </label>
<input id="sixth" name="aspartate" required="require" size="20"/> <br> <br>

<label> Total_Proteins: </label>
<input id="seventh" name="totalproteins" required="require" size="20"/> <br>
<br>

<label> Albumin: </label>
<input id="eigth" name="albumin" required="require" size="20"/> <br> <br>

<label> Albumin_and_Globulin_Ratio: </label>
<input id="ninth" name="albuminandglobulin" required="require" size="20"/>
<br> <br>

<button id="sub" type="submit">Predict</button>
```

```
</form>
```

```
</div>
```

```
</centre>
```

```
<style>
```

```
body{
```

```
    font-family: Arial, Helvetica,sans-serif;
```

```
    text-align: center;
```

```
    margin: 0;
```

```
    padding: 0;
```

```
    width: 100%;
    height: 100%;
    display: flex;
    flex-direction: column;
}
.container-heading{
    margin:0;
}
.heading_font{
    color: black;
    font-family: 'Pacifico', cursive;
    font-size: 50px;
    font-weight: normal;
}
#first{
    border-radius: 14px;
    height: 25px;
    width: 150px;
    font-size: 20px;
    text-align: center;
}
#second{
    border-radius: 14px;
    height: 25px;
    width: 150px;
    font-size: 20px;
    text-align: center;
}
#third{
    border-radius: 14px;
    height: 25px;
    width: 150px;
    font-size: 20px;
    text-align: center;
}
#fourth{
    border-radius: 14px;
    height: 25px;
    width: 150px;
    font-size: 20px;
    text-align: center;
}
#fifth{
```



```
border-radius: 14px;
height: 25px;
width: 150px;
font-size: 20px;
text-align: center;
}
#sixth{
border-radius: 14px;
height: 25px;
width: 150px;
font-size: 20px;
text-align: center;
}
#seventh{
border-radius: 14px;
height: 25px;
width: 150px;
font-size: 20px;
text-align: center;
}
#eighth{
border-radius: 14px;
height: 25px;
width: 150px;
font-size: 20px;
text-align: center;
}
#ninth{
border-radius: 14px;
height: 25px;
width: 150px;
font-size: 20px;
text-align: center;
}

#sub{
width: 120px;
height: 43px;
text-align: center;
border-radius: 14px;
font-size: 18px;
}
</style>
```

</body>
</html>

GITHUB & PROJECT DEMO LINK:

GITHUB LINK:

<https://github.com/IBM-EPBL/IBM-Project-4364-1658729878>

DEMO LINK:

https://drive.google.com/drive/folders/1mTfBtW9atpdqcuwTFDafiNzuE2i4vgGl?usp=share_link