Statistical Machine Learning Approaches to Liver Disease Prediction

TEAM ID: PNT2022TMID14539

PROJECT REPORT

1. INTRODUCTION

1.1 Project Overview

It is essential to diagnose liver disease early in order to save lives and take the necessary steps to control the condition. The ensemble approach has been successfully used in a number of sectors, particularly in the field of medical science. This study examines the early diagnosis of liver illness using a variety of ensemble methodologies.

1.2 Purpose

Our project's objective is to analyze data from liver patients with a focus on the correlations between a vital list of liver enzymes, proteins, age and gender using them to try and predict the likeliness of liver disease. We are creating a model in this instance by utilizing different machine learning algorithms to identify the most accurate model. and incorporate into web applications built with flask. By entering certain parameters into the web application, users can predict the disease.

2. LITERATURE SURVEY

2.1 Existing problem

The liver related diseases are identified by analyzing liver function blood test reports and scan reports. This paper while employing different data mining algorithms to ease this process, it is possible to reduce the time for diagnosing the liver disease. But it doesn't assist in making effective decisions and some accuracy Issues.

2.2 References

1. **TITLE:** "A Comparative Analysis of Unsupervised Machine Techniques for Liver Disease Prediction"
   AUTHOR: Varun Vats
   YEAR: 2018
   He considered three different ML (Machine Learning) algorithms. A comparison of these algorithms had been carried out for evaluating their forecasting accuracy and computing intricacy . These algorithms included AP (Affinity Propagation), K means and DBSCAN. This work was dedicated to the

medical dataset based on lever disorders. This work made use of the Silhouette coefficient to measure the comparative efficiency of the considered algorithmic approaches.

2. **TITLE :** "Prognosis of Liver Disease using Machine Learning Algorithms"
AUTHOR: Vyshali J Gogi
YEAR : 2018
He stated that the healthcare sector had a lot of data but this data was of no use [17]. This ample data required a leading analytic tool so that the hidden relationship and the valuable knowledge could be determined. The liver disease referred to the medical condition of the human liver-related to the human liver. The liver diseases led to sudden changes in health conditions that governed the functioning of the liver affecting other internal body organs. This work made use of several classification algorithms based on data mining. These algorithms included DT (Decision Tree), LD (Linear Discriminant), SVM Fine Gaussian, and LR (Logistic Regression). This work made use of Lab-based metrics of patients in the form of a liver dataset.

3. **TITLE:** "Accuracy Prediction Using Machine Learning Techniques for Indian Patient Liver Disease"
AUTHOR: Auxilia
YEAR: 2018
She stated that the use of medical datasets had attracted the medical experts globally [18]. The use of ML (Machine Learning) algorithms was quite common as a branch of making selection expressively helpful networks for the prediction of diseases by arranging therapy-based datasets. Grouping schemes had been generally employed as a segment of the curative domain for extracting order more efficiently as compared to a signal classification model. The disorders of the Liver malady could be described as liver damage or sickness. Liver disorder can be categorized into several categories. This work made use of standard Indian liver illness patient records as a database for providing support to the researcher

4. **TITLE:** "New Fuzzy-ANWKNN algorithm for the successful prediction of liver disorder"
AUTHOR: Pushpendra Kumar
YEAR: 2019
He stated that it was a very difficult task for the doctors to detect the consequences of liver disorders on a person . In general, researchers used datasets based on LFT (Liver Function Test) for implementing classification algorithms so that the predictions about liver disorders could be generated. The dataset based on ground truth had several problems such as a class imbalance in the liver disorder data. With regard to the majority classes, the classic algorithms of classification generated influenced outcomes. This work presented a new Fuzzy-ANWKNN algorithm for the successful prediction of liver disorder.

5. **TITLE**: “To accurately predict liver disorder by means of several data mining algorithms”
   AUTHOR: Sanjay Kumar
   YEAR: 2018
   He described different classification approaches by implementing them on the dataset of patients suffering from liver diseases . The main objective here was to accurately predict liver disorder by means of several data mining algorithms. This work performed the analysis using the dataset of real-time patients to build classification paradigms for the prediction of liver diseases. This work implemented five classification algorithms on the used dataset. This work analyzed different metrics such as precision, recall, and accuracy for determining the efficiency of the implemented classification models.

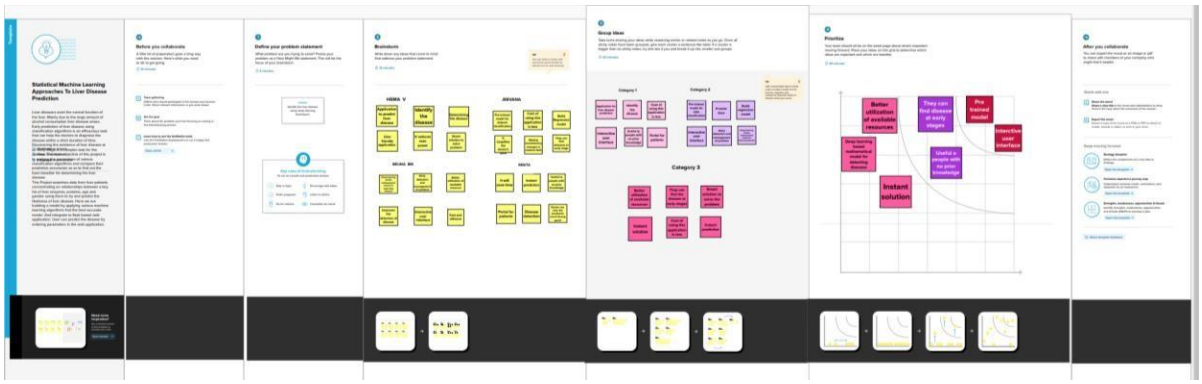
2.3:Problem Statement Definition

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. Here we are building a model by applying various machine learning algorithms to find the best accurate model and integrate it to a flask-based web application. User can predict the disease by entering parameters in the web application. ML algorithms are new techniques to handle many hidden problems in medical data sets. This approach can help healthcare management and professionals to explore better results in numerous clinical applications, such as medical image processing, language processing, and tumor or cancer cell detection, by finding appropriate features.

3. IDEATION & PROPOSED SOLUTION

3.1 :Empathy Map Canvas

3.1: Ideation & Brainstorming



3.3 Proposed Solution

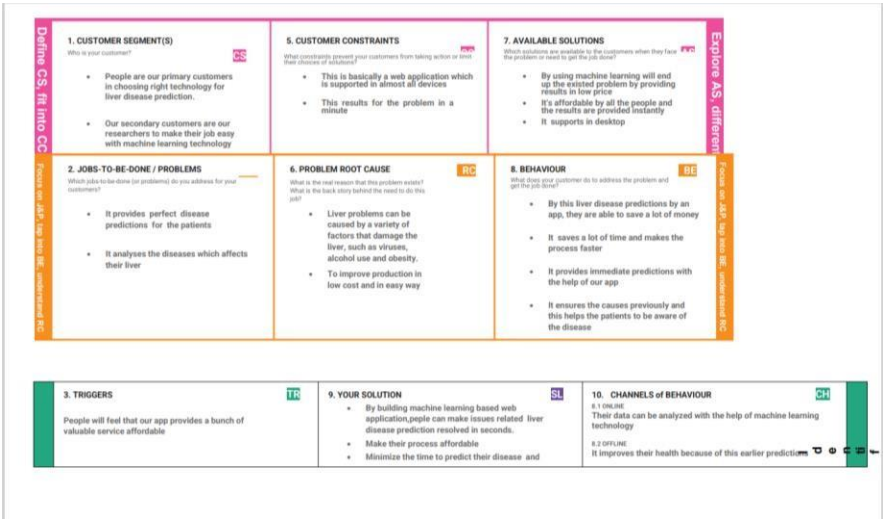
S.No.	Parameter	Description
1.	Problem Statement	Statistical Machine Learning Approaches to Liver Disease Prediction
2.	Solution description	Analyze the parameters of various classification algorithms and compare their predictive accuracies so as to find out the best classifier for determining the liver disease.
3.	Performance	Effective development of application
4.	Social Impact / Customer Satisfaction	With the help of this analysis patients can detect liver disease an early stage and evaluate the condition of the disease
5.	Availability	24/7 service
6.	Precision of Disease	Based on accuracy and better performance of implemented classifiers, the development of application to predict liver disease of the patient.

3.4 Problem Solution fit

The Problem-Solution Fit simply means that you have found a problem with your customer and that the solution you have realized for it actually solves the customer's problem. It helps entrepreneurs, marketers and corporate innovators identify behavioral patterns

Purpose:

Solve complex problems in a way that fits the state of your customers. Succeed faster and increase your solution adoption by tapping into existing mediums and channels of behavior. Sharpen your communication and marketing strategy with the right triggers and messaging. Increase touch-points with your company by finding the right problem-behavior fit and building trust by solving frequent annoyances, or urgent or costly problems.



4. REQUIREMENT ANALYSIS

4.1 Functional requirement

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement	Sub Requirement
FR-1	User Registration	Registration through Form
FR-2	User Confirmation	Confirmation via Email
FR-3	User Profile	Filling the profile page after logging in
FR-4	Uploading dataset	Patient data needed to upload
FR-5	Requesting solution	Patient data is compared with pre-defined data and solution is generated
FR-6	Solution display	The predicted solution is displayed on the screen

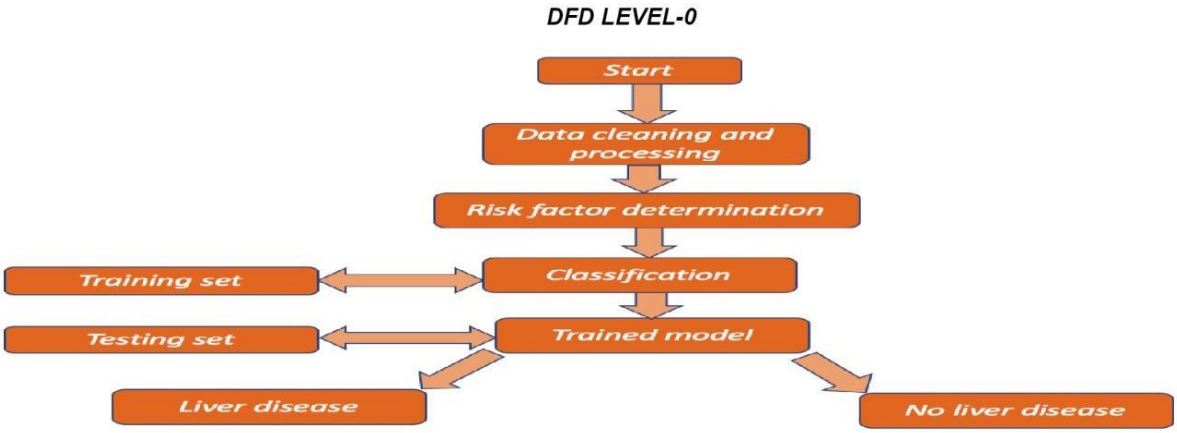
4.1 Non-Functional requirement

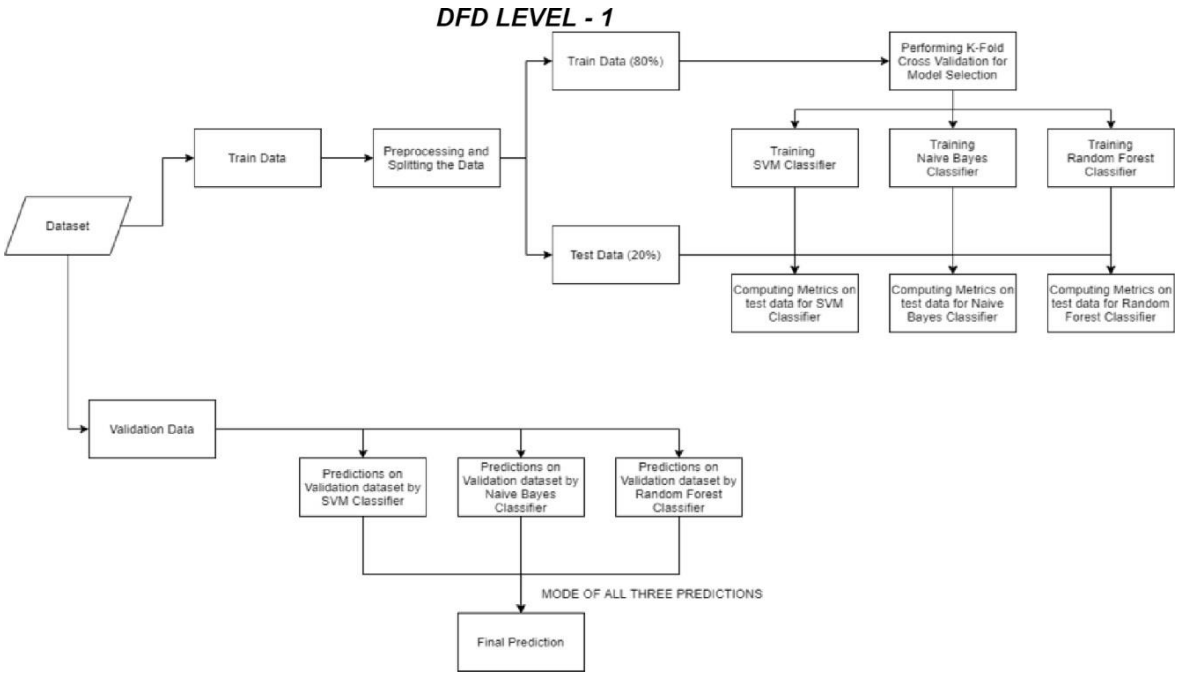
Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	The system allows the user to perform the tasks easily, effectively and efficiently.
NFR-2	Security	Assuring all data inside the system or its parts to be protected against malware attacks or unauthorized access.
NFR-3	Reliability	The website does not recover from failure quickly as it is running on a single server.
NFR-4	Performance	Response time and net processing time is fast.
NFR-5	Availability	The system will be available upto 95% of time
NFR-6	Scalability	The website is scalable

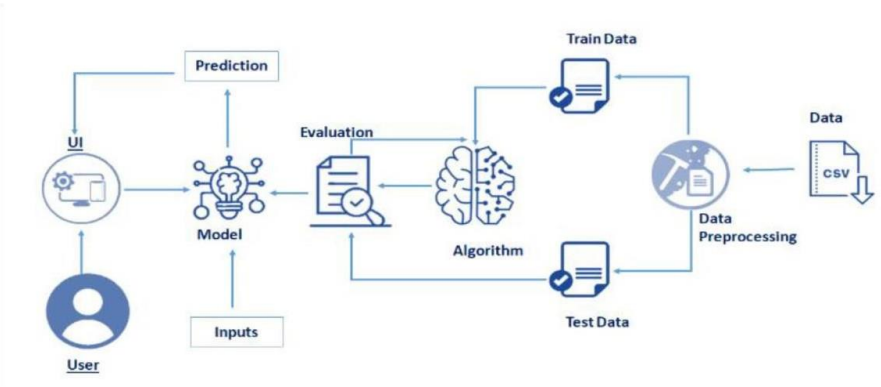
5. PROJECT DESIGN

5.1: Data Flow Diagrams





5.2 Solution & Technical Architecture



5.3 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
	Login	USN-2	As a user, I can log into the application by entering email & password	I can login using my Email ID accounts or user credentials	High	Sprint-1
	Dashboard	USN-3	As a user, I can view the page of the application where I can upload my data and the result is predicted	I can access my account/ dashboard	High	Sprint-2
Customer (Web user)	Registration	USN-4	As a user, I can login to web dashboard just Like website dashboard	I can register using my username and password	Medium	Sprint-3
	Login	USN-5	As a user, I can login to my web dashboard with the login credentials	I can login using my User credentials	High	Sprint-3
	Dashboard	USN-6	As a user, I can view the web application where i can upload my data and the result is predicted	I can access my account/ dashboard	High	Sprint-4
		USN-7	As a user, the result predicted to me should be of higher accuracy	I can access my account/ dashboard	High	Sprint-4
Care Executive	Login	USN-8	As a care executive, I can login to the website using my login credentials	I can login to the website using my login credentials	High	Sprint-5
	Dashboard	USN-9	As a care executive, I can view the dashboard of application	I can access my dashboard	High	Sprint-5

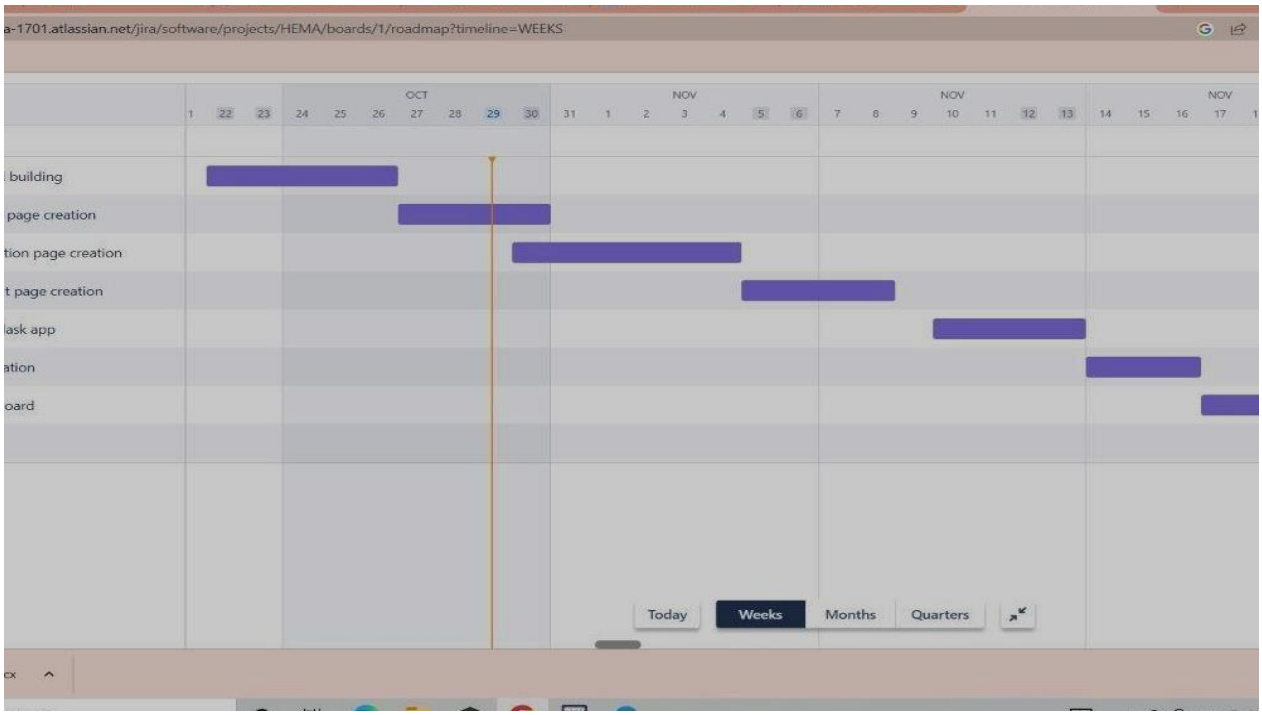
6. PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Model Creation		Aa a user,I built a model to predict the liver disease of the patients	10	High	Hema,Beuna,Jeevana,Antony Renita.
Sprint-2	Home Page Creation	USN-1	Creation of home page is done for initiation	8	High	Hema,Beuna,Jeevana,Antony Renita.
	Prediction Page Creation	USN-2	The information of patients necessary for liver disease predictions are given	7	High	Hema,Beuna,Jeevana,Antony Renita.
Sprint-3	Output Page Creation	USN-3	The results are predicted according to the information given	7	Medium	Hema,Beuna,Jeevana,Antony Renita.
	Base Flask App	USN-4	A base flask web app must be created as an interface for the ML model	8	High	Hema,Beuna,Jeevana,Antony Renita.
Sprint-4	Integration	USN-5	Integrate Flask,CNN model with cloudant DB	5	Low	Hema,Beuna,Jeevana,Antony Renita.
	Dashboard	USN-6	As a user,I can view the previous results and history	5	Low	Hema,Beuna,Jeevana,Antony Renita.

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	10	5 Days	22 Oct 2022	26 Oct 2022	10	30 Oct 2022
Sprint-2	15	10 Days	26 Oct 2022	04 Nov 2022	15	06 Nov 2022
Sprint-3	15	10 Days	04 Nov 2022	13 Nov 2022	15	13 Nov 2022
Sprint-4	10	7 Days	13 Nov 2022	19 Nov 2022	10	20 Nov 2022

6.2 Reports from JIRA



7. CODING & SOLUTIONING

7.1 Feature 1

```
#!/usr/bin/env python
# coding: utf-8

Run Cell | Run Below | Debug Cell
# In[1]:


import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import pickle


Run Cell | Run Above | Debug Cell
# In[2]:


data = pd.read_csv(r'C:\Users\Hema\Desktop\IBMProject\indian_liver_patient (1).csv')


Run Cell | Run Above | Debug Cell
# In[3]:


data.info()


Run Cell | Run Above | Debug Cell
# In[4]:


data.head(10)


Run Cell | Run Above | Debug Cell
# In[5]:


data.tail(10)


Run Cell | Run Above | Debug Cell
# In[6]:


data.describe()


Run Cell | Run Above | Debug Cell
# In[7]:


data.isnull().any()


Run Cell | Run Above | Debug Cell
# In[8]:


data.isnull().sum()


Run Cell | Run Above | Debug Cell
# In[9]:


data['Albumin_and_Globulin_Ratio']=data['Albumin_and_Globulin_Ratio'].fillna(data['Albumin_and_Globulin_Ratio'].mode()[0])


Run Cell | Run Above | Debug Cell
# In[10]:


data.isnull().sum()

sns.countplot(data=data,x='Gender',label='Count')
m,f=data['Gender'].value_counts()
print("No of Males:",m)
print("no of Females:",f)


Run Cell | Run Above | Debug Cell
# In[12]:


sns.countplot(data=data,x='Dataset')
LD,NLD=data['Dataset'].value_counts()
print("liver disease patients:",LD)
print("non-liver disease patients:",NLD)


Run Cell | Run Above | Debug Cell
# In[13]:


def partition(x):
    if x=='Male':
        return 1
    return 0
data['Gender']=data['Gender'].map(partition)


Run Cell | Run Above | Debug Cell
# In[14]:


#data

```

```
Run Cell | Run Above | Debug Cell
# In[15]:


def partition(x):
    if x==2:
        return 0
    return 1

data['Dataset']=data['Dataset'].map(partition)

Run Cell | Run Above | Debug Cell
# In[16]:


data['Dataset']


Run Cell | Run Above | Debug Cell
# In[17]:


x=data.iloc[:,0:-1].values
y=data.iloc[:,-1].values


Run Cell | Run Above | Debug Cell
# In[18]:


from sklearn.model_selection import train_test_split
xtrain,xtest,ytrain,ytest=train_test_split(x,y,test_size=0.25,random_state=42)


Run Cell | Run Above | Debug Cell
# In[19]:


    from sklearn.preprocessing import StandardScaler
    sc=StandardScaler()
    xtrain=sc.fit_transform(xtrain)
    xtest=sc.transform(xtest)


    Run Cell | Run Above | Debug Cell
    # In[20]:


    from sklearn.neighbors import KNeighborsClassifier
    knn_classifier=KNeighborsClassifier(n_neighbors=21,metric='minkowski')
    knn_classifier.fit(xtrain,ytrain)


    Run Cell | Run Above | Debug Cell
    # In[21]:


    knn_y_pred=knn_classifier.predict(xtest)


    Run Cell | Run Above | Debug Cell
    # In[22]:


    from sklearn.svm import SVC
    svm_classifier=SVC(kernel='rbf',random_state=0)
    svm_classifier.fit(xtrain,ytrain)


    Run Cell | Run Above | Debug Cell
    # In[23]:


    svm_y_pred=svm_classifier.predict(xtest)


    from sklearn.ensemble import RandomForestClassifier
    RFModel=RandomForestClassifier()
    RFModel.fit(xtrain,ytrain)


    Run Cell | Run Above | Debug Cell
    # In[28]:


    from sklearn.metrics import accuracy_score


    Run Cell | Run Above | Debug Cell
    # In[29]:


    SVMaccuracy=accuracy_score(svm_y_pred,ytest)
    SVMaccuracy


    Run Cell | Run Above | Debug Cell
    # In[31]:


    RFpred=RFModel.predict(xtest)


    Run Cell | Run Above | Debug Cell
    # In[32]:


    RFaccuracy=accuracy_score(RFpred,ytest)
    RFaccuracy
```

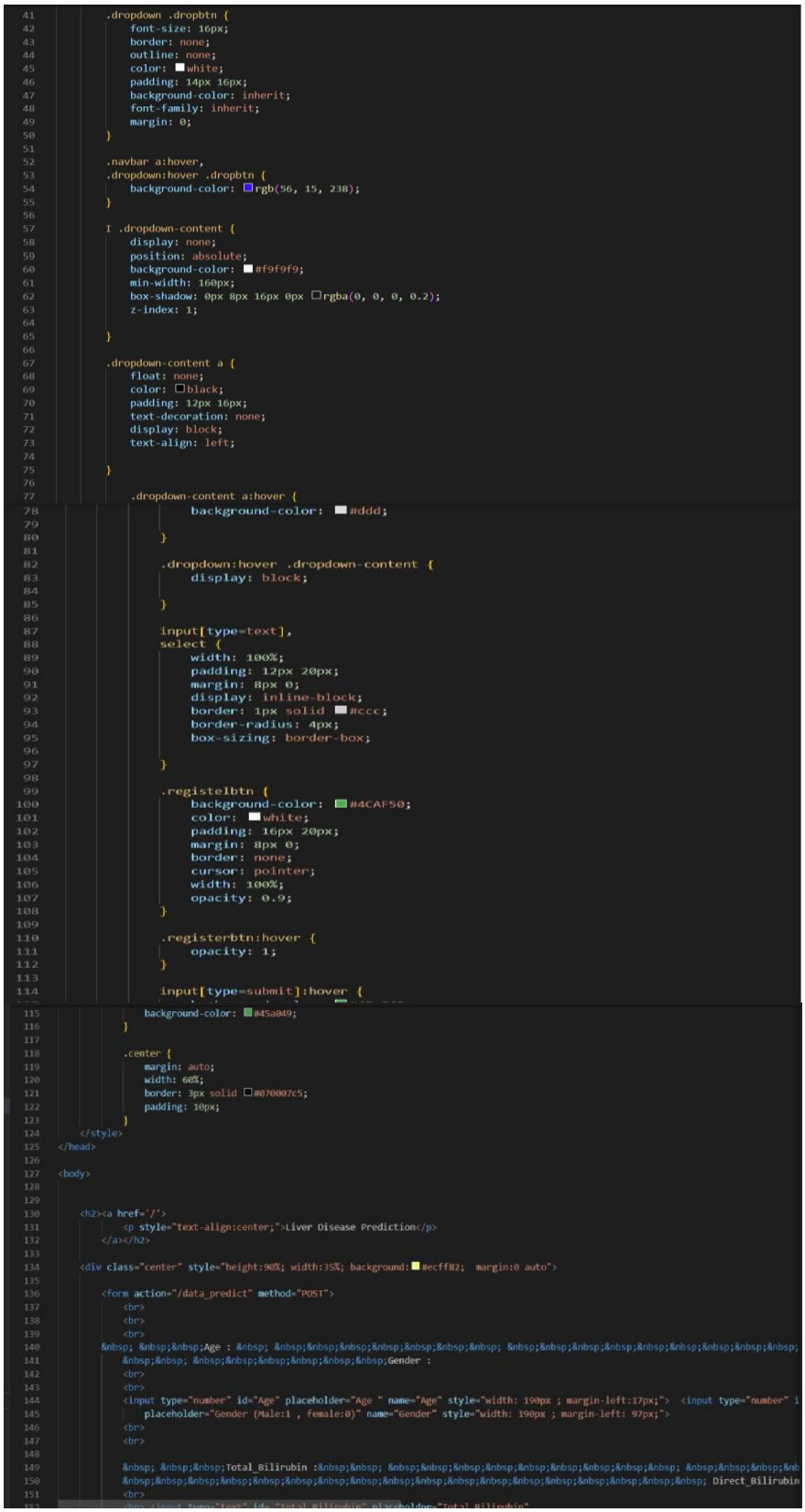
```
from sklearn.metrics import confusion_matrix


Run Cell | Run Above | Debug Cell
# In[37]:


RFcm=confusion_matrix(RFpred,ytest)
RFcm


Run Cell | Run Above | Debug Cell
# In[38]:


KNNaccuracy=accuracy_score(knn_y_pred,ytest)
KNNaccuracy


Run Cell | Run Above | Debug Cell
# In[39]:


KNNcm=confusion_matrix(knn_y_pred,ytest)
KNNcm


Run Cell | Run Above | Debug Cell
# In[40]:


import pickle
pickle.dump(knn_classifier,open('liver_analysis.pkl','wb'))

```

7.2 Feature 2

```
<!DOCTYPE html>
<html>

<head>
    <meta charset="utf-8">
    <title>HOME PAGE</title>
<style>
    * {
    box-sizing: border-box;
}

body {
    margin: 0px;
    padding: 0px;
    font: poppins;
}

#main {
    background-color: beige;
    width: 100%;
    height: 50vh;
    position: relative;
}

nav {
    display: flex;
    justify-content: space-around;
    align-items: center;
    top: 0;
    bottom: 0;
    width: 100%;
    background-color: rgb(255, 255, 255);
    z-index: 1;
}

.menu {
    list-style: none;
    display: flex;
}

a {
    text-decoration: none;

}

.menu li a {
    height: 40px;
    line-height: 43px;
    margin: 3px;
    padding: 0px 22px;
    display: flex;
    text-transform: uppercase;
    font-size: 0.8em;
    font-weight: 500;
    letter-spacing: 1px;
    color: gray;
}

.content {
    background-color: #eaf275;
    display: flex;
    width: 90%;
    justify-content: space-around;
    align-items: center;
    position: absolute;
    left: 50%;
    right: 50%;
    transform: translate(-50%, -50%);
}
.content-new{
    background-color: #eaf275;
    display: flex;
    width: 90%;
    height:45%;
    justify-content: space-around;
```

```
        align-items: center;
        position: absolute;
        left: 50%;
        right: 50%;
        transform: translate(-50%, -50%);

    }

    .main-text {
        width: 500px;
    }

    .main-text h1 {
        font-size: 3.5em;
        color: #1c3548;
        block-size: 0ex;
        margin: 0px 0px 10px 0px;
        line-height: 60px;
    }

    .main-text p {
        color: rgb(0, 0, 0);
    }

    .menu li a:hover {
        background-color: #23cdaf;
        color: white;
        box-shadow: 5px 10px 30px rgba(24, 139, 119, 0.2);
        transition: all ease 0.2s;
    }
    </style>
    <body>
        <section id="main">

            <nav>
                <span class="menu-space"></span>
                <h2>Liver Patient Analysis</h2>
                <ul class="menu">
                <li><a href="#">home</a></li>
                <li><a href="{{ url_for('index') }}">Goto Predict</a></li>
                </ul>
            </nav>
        </section>
        <div class="content">

            <div class="main-text">

                <h3>Introduction</h3>
                <p>Liver diseases averts the normal function of the Liver. Mainly due to the large amount of alcohol consumption liver disease
                arises. Early prediction of Liver disease using classifcation  is an efficacious task that can help the doctors to diagnoise the disease
                with in  a short period of time. Discovering the existence of Liver Disease at an early stage is a complex for the doctors. The main objective
                of this paper is to analyse the parameters of various classification algorithms and compare with predictive accuracies so as to find out the best classifer
                for determining the liver disease. This paper focuses on related works of various authours on liver disease such that algorithms were implemented
                using weka tool that is a machine learning software written in Java. Various attributes that are essential in the prediction of liver disease
                where examined and the data set of liver patients also evaluated. This paper compares various classification algorithms such as random forest,
                KNN,logistic regression and seperation algorithm with the aim to identify the best technique. Based on this study,KNN with the highest accuracy
                outperformed the other algorithms and can be further utilised in the prediction of liver disease recommended.
                |</p>
            </div>
        </div>
    </body>

    </html>
```

```
<html>

<head>

    <title>Liver Patient Analysis</title>
    <meta name="viewport" content="width=device-width, initial-scale=1">
    <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-awesome/4.7.0/css/font-awesome.min.css">
    <style>
        body {

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

        .navbar {

            overflow: hidden;

            background-color: rgba(252, 17, 107, 0.74);
        }

        .navbar a {

            float: left;

            font-size: 16px;

            color: white;

            text-align: center;

            padding: 14px 16px;

            text-decoration: none;
        }

        .dropdown {
            float: left;
            overflow: hidden;
```



```
        .dropdown .dropbtn {
            font-size: 16px;
            border: none;
            outline: none;
            color: white;
            padding: 14px 16px;
            background-color: inherit;
            font-family: inherit;
            margin: 0;
        }

        .navbar a:hover,
        .dropdown:hover .dropbtn {
            background-color: rgb(56, 15, 238);
        }

        I .dropdown-content {
            display: none;
            position: absolute;
            background-color: #f9f9f9;
            min-width: 160px;
            box-shadow: 0px 8px 16px 0px rgba(0, 0, 0, 0.2);
            z-index: 1;

        }

        .dropdown-content a {
            float: none;
            color: black;
            padding: 12px 16px;
            text-decoration: none;
            display: block;
            text-align: left;

        }

            .dropdown-content a:hover {
                    background-color: #ddd;

                }

                .dropdown:hover .dropdown-content {
                    display: block;

                }

                input[type=text],
                select {
                    width: 100%;
                    padding: 12px 20px;
                    margin: 8px 0;
                    display: inline-block;
                    border: 1px solid #ccc;
                    border-radius: 4px;
                    box-sizing: border-box;

                }

                .registelbtn {
                    background-color: #4CAF50;
                    color: white;
                    padding: 16px 20px;
                    margin: 8px 0;
                    border: none;
                    cursor: pointer;
                    width: 100%;
                    opacity: 0.9;
                }

                .registerbtn:hover {
                    opacity: 1;
                }

                input[type=submit]:hover {
                    background-color: #45a049;
                }

                .center {
                    margin: auto;
                    width: 60%;
                    border: 3px solid #070007c5;
                    padding: 10px;
                }
    </style>
</head>

<body>


    <h2><a href='/'>
            <p style="text-align:center;">Liver Disease Prediction</p>
        </a></h2>

    <div class="center" style="height:90%; width:35%; background:#ecff82;  margin:0 auto">

        <form action="/data_predict" method="POST">
            <br>
            <br>
            <br>
            Age :                    
                     Gender :
            <br>
            <br>
            <input type="number" id="Age" placeholder="Age " name="Age" style="width: 190px ; margin-left:17px;">  <input type="number" i
                placeholder="Gender (Male:1 , female:0)" name="Gender" style="width: 190px ; margin-left: 97px;">
            <br>
            <br>

                Total_Bilirubin :               &nb
                                Direct_Bilirubin
            <br>
            <br> <input type="text" id="Total_Bilirubin" placeholder="Total_Bilirubin"
```

```
                name="Total_Bilirubin" style="width: 190px ; margin-left:17px;">
            <input type="text" id="Direct_Bilirubin" placeholder="Direct_Bilirubin"
                name="Direct_Bilirubin" style="width: 190px ; margin-left: 97px;">

            <br>
            <br>
                Alkaline Phosphotase:                
            <br>
            <br>
            <input type="text" id="Alkaline_Phosphotase" placeholder="Alkaline_Phosphotase"
                name="Alkaline_Phosphotase" style="width: 190px ; margin-left: 17px;">
            <input type="text" id="Alamine_Aminotransferase"
                placeholder="Alamine_Aminotransferase" name="Alamine_Aminotransferase" style="width: 190px ; margin-left: 95px;">
            <br>
            <br>

                Aspartate_Aminotransferase:               
            <br>
            <br>
            <input type=" text" id="Aspartate_Aminotransferase"
                placeholder="Aspartate_Aminotransferase" name="Aspartate_Aminotransferase" style="width: 190px ; margin-left: 17px;">
            <input type=" text" id="Total_Protiens" placeholder="Total_Protiens" name="Total_Protiens" style="width: 190px ; margin-left:

            <br>
            <br>

                Albumin:          
                                  
                               Albumin and Glob
            <br>
            <br>
            <input type="text" id="Albumin" placeholder="Albumin" name="Albumin" style="width: 190px ; margin-left:17px;">
            <input type="text" id="Albumin_and_Globulin_Ratio"
                placeholder="Albumin_and_Globulin_Ratio" name="Albumin_and_Globulin_Ratio" style="width: 190px ; margin-left: 100px;">
            <br>
            <br>
            <br>
            <button type="submit" style="width: 100px ; margin-left: 200px;">Predict</button>
            <a href="{{ url_for('data_predict') }}"></a>



        </form>

    </div>
</body>

</html>
```

```
<!DOCTYPE html>
<html>

<head>
    <meta charset="utf-8">
    <title>OUTPUT</title>

</head>

<body>
    <style>
        * {
        box-sizing: border-box;
    }

    body {
        margin: 0px;
        padding: 0px;
        font: poppins;
    }

    #main {
        background-color: beige;
        width: 100%;
        height: 50vh;
        position: relative;
    }

    nav {
        display: flex;
        justify-content: space-around;
        align-items: center;
        top: 0;
        bottom: 0;
        width: 100%;
        background-color: rgb(255, 255, 255);
        z-index: 1;
```

```
    .menu {
        list-style: none;
        display: flex;
    }

    a {
        text-decoration: none;

    }

    .menu li a {
        height: 40px;
        line-height: 43px;
        margin: 3px;
        padding: 0px 22px;
        display: flex;
        text-transform: uppercase;
        font-size: 0.8em;
        font-weight: 500;
        letter-spacing: 1px;
        color: gray;
    }

    .content {
        background-color: #eaf275;
        display: flex;
        width: 90%;
        justify-content: space-around;
        align-items: center;
        position: absolute;
        left: 50%;
        right: 50%;
        transform: translate(-50%, -50%);
    }
    .content-new{
        background-color: #eaf275;
        display: flex;
        width: 90%;
        height:45%;
        justify-content: space-around;
        align-items: center;
        position: absolute;
        left: 50%;
        right: 50%;
        transform: translate(-50%, -50%);

    }

    .main-text {
        width: 500px;
    }

    .main-text h1 {
        font-size: 3.5em;
        color: #1c3548;
        block-size: 0ex;
        margin: 0px 0px 10px 0px;
        line-height: 60px;
    }

    .main-text p {
        color: rgb(0, 0, 0);
    }

    .menu li a:hover {
        background-color: #23cdaf;
        color: white;
        box-shadow: 5px 10px 30px rgba(24, 139, 119, 0.2);
        transition: all ease 0.2s;
    }
    </style>
    <section id ="main">

        <nav>
            <span class="menu-space"></span>
            <h2>Liver Patient Predction</h2>
            <ul class="menu">

                <li><a href="{{ url_for('home') }}">home</a></li>

            </ul>
        </nav>
    </section>
    <div class="content-new">

            <h3>You have Liver disease problem, you must and should consult a doctor. Take care
            </h3>

    </div>
</body>

</html>
```

```
        <nav>
            <span class="menu-space"></span>
            <h2>Liver Patient Predction</h2>
            <ul class="menu">

                <li><a href="{{ url_for('home') }}">home</a></li>

            </ul>
        </nav>
    </section>
    <div class="content-new">

            <h3>You dont have a Liver Disease
            </h3>

    </div>
</body>

</html>
```

8. TESTING

8.1 TestCases

• The home page and the result page is tested .It is working well without issues.

• The app was tested for functionality.

• The scoring end point application is slower than the normal flask app.

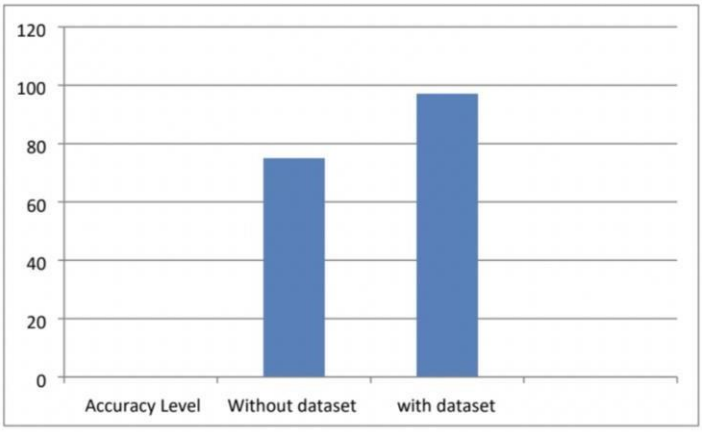
8.2 User AcceptanceTesting

This report shows the number of test cases that have passed, failed, and untested

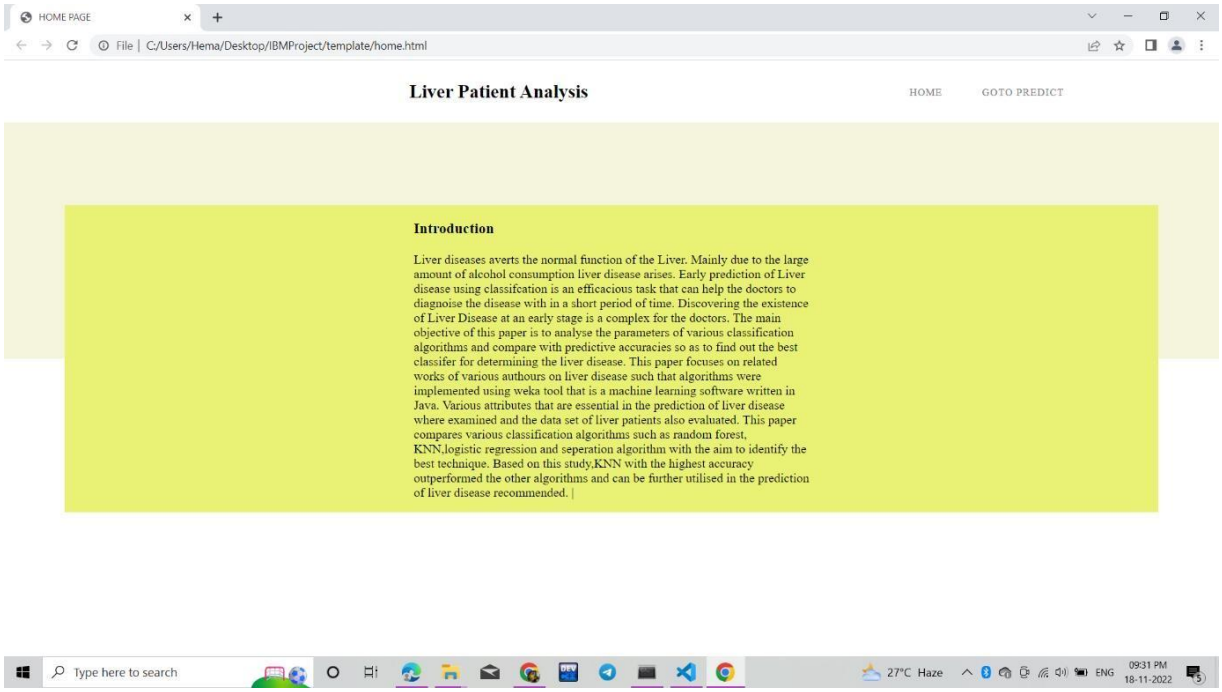
Section	Total Cases	Not Tested	Fail	Pass
Print Engine	8	0	0	8
Client Application	48	0	0	48
Security	2	0	0	2
Outsource Shipping	3	0	0	3
Exception Reporting	7	0	0	7
Final Report Output	4	0	0	4
Version Control	3	0	0	3

9. RESULTS

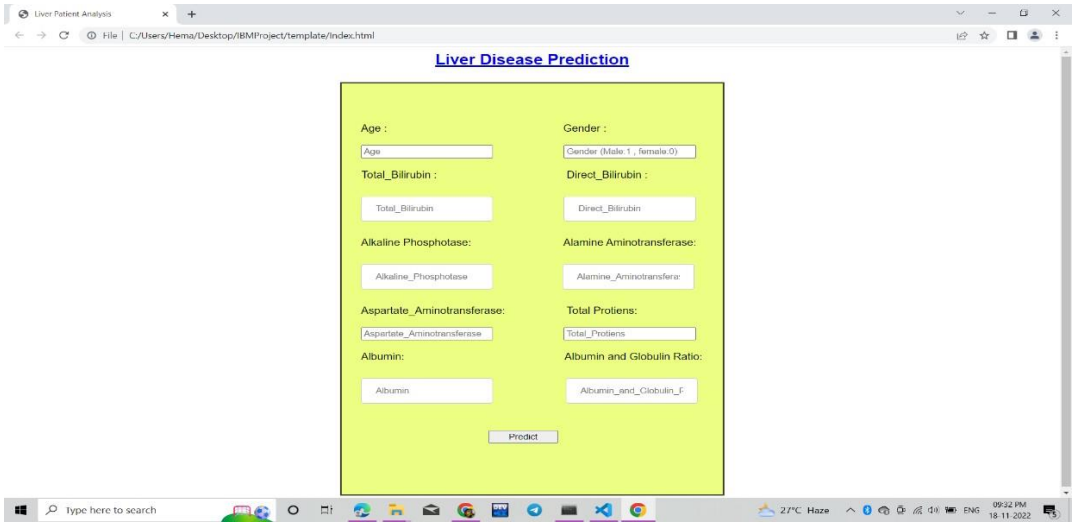
9.1 Performance Metrics

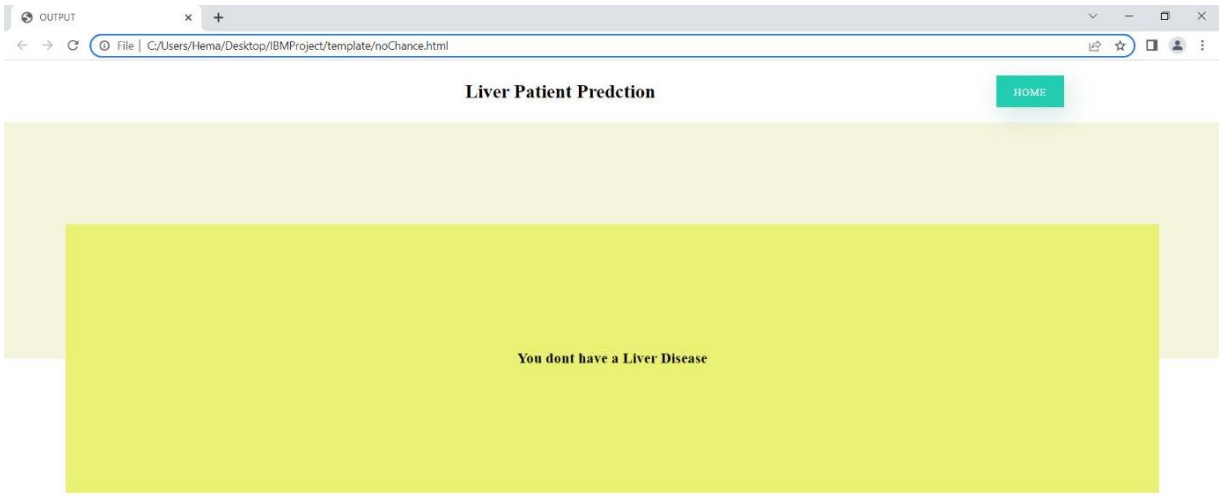


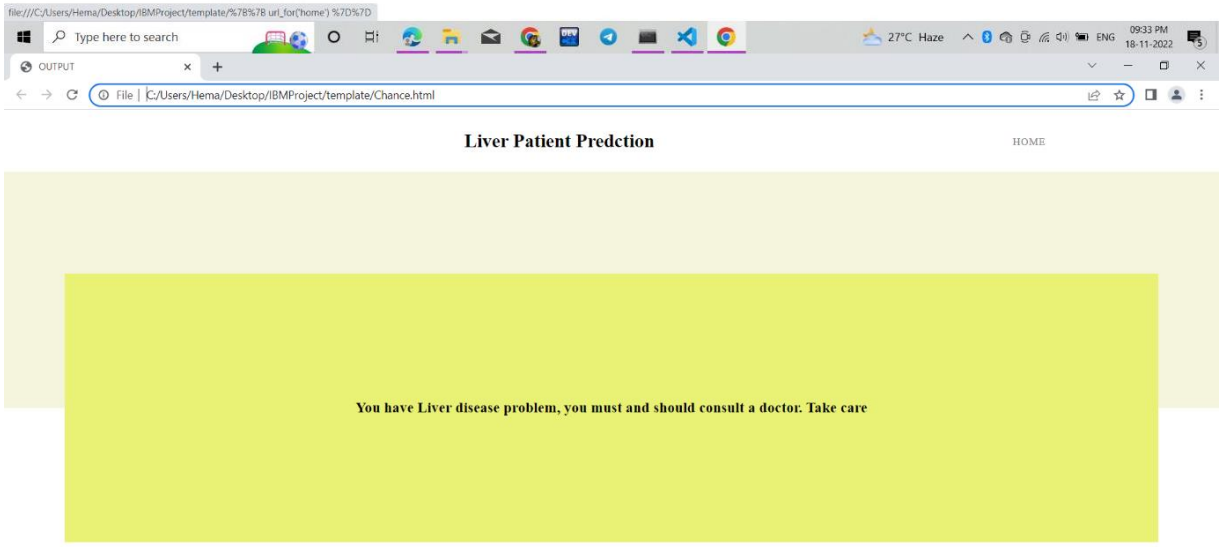
9.2 Output

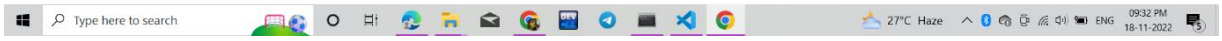

HOME PAGE
File | C:/Users/Hema/Desktop/IBMProject/template/home.html
Liver Patient Analysis
HOME
GOTO PREDICT
Introduction
Liver diseases averts the normal function of the Liver. Mainly due to the large amount of alcohol consumption liver disease arises. Early prediction of Liver disease using classifcation is an efficacious task that can help the doctors to diagnoise the disease with in a short period of time. Discovering the existence of Liver Disease at an early stage is a complex for the doctors. The main objective of this paper is to analyse the parameters of various classification algorithms and compare with predictive accuracies so as to find out the best classifer for determining the liver disease. This paper focuses on related works of various authours on liver disease such that algorithms were implemented using weka tool that is a machine learning software written in Java. Various attributes that are essential in the prediction of liver disease where examined and the data set of liver patients also evaluated. This paper compares various classification algorithms such as random forest, KNN,logistic regression and seperation algorithm with the aim to identify the best technique. Based on this study,KNN with the highest accuracy outperformed the other algorithms and can be further utilised in the prediction of liver disease recommended.

Type here to search
27°C Haze
ENG
09:31 PM
18-11-2022


Liver Patient Analysis
File | C:/Users/Hema/Desktop/IBMProject/template/index.html
Liver Disease Prediction
Age :
Age
Gender :
Gender (Male:1 , female:0)
Total_Bilirubin :
Total_Bilirubin
Direct_Bilirubin :
Direct_Bilirubin
Alkaline Phosphotase:
Alkaline_Phosphotase
Alamine Aminotransferase:
Alamine_Aminotransfera
Aspartate_Aminotransferase:
Aspartate_Aminotransferase
Total Protiens:
Total_Protiens
Albumin:
Albumin
Albumin and Globulin Ratio:
Albumin_and_Globulin_R
Predict
Type here to search
27°C Haze
ENG
09:32 PM
18-11-2022







10. CONCLUSION

This project this will,

● Help healthcare management and professionals to explore better results in numerous clinical applications, such as medical image processing, language processing, and tumor or cancer cell detection, by finding appropriate features.
● Several statistical and machine learning approaches (e.g., simulation modeling, classification, and inference) have been used by researchers and lab technicians for better prediction. The clinical results are more data-driven than model-dependent

11.ADVANTAGES AND DISADVANTAGES

Advantages :

- This helps in early diagnosis of liver disease .
- It makes the process simple and easier.
- We are able to monitor the patient in an effective manner.
- We can also help patients who are not in a condition to directly consult a doctor.

Disadvantages:

- There are inaccuracies which cannot be avoided.
- For people who have difficulty in accessing internet or those who do not have electronic gadgets , this is not a feasible solution.

12. FUTURE SCOPE

- In biomedical science, accuracy and speed are two important factors that should be considered chiefly in dealing with any disease.
- In this regard, Machine Learning techniques can be of great help to physicians. With advances, several machines have entered in our lives.
- One of the most famous areas where computers as the mostly used machines can be helpful is knowledge extraction with the help of a machine (machine learning).

13. APPENDIX

13.1 Source Code:

```python
from flask import Flask, render_template, request
import pickle
app=Flask(__name__ ,template_folder='template')

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

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

@app.route('/data_predict',methods=['POST'])
def data_predict():
    age=request.form['Age']
    gender=request.form['Gender']
    tb=request.form['Total_Bilirubin']
    db=request.form['Direct_Bilirubin']
    ap=request.form['Alkaline_Phosphotase']
    aa1=request.form['Alamine_Aminotransferase']
    aa2=request.form['Aspartate_Aminotransferase']
    tp=request.form['Total_Protiens']
    a=request.form['Albumin']
    agr=request.form['Albumin_and_Globulin_Ratio']

    data=[[float(age),float(gender),float(tb),float(db),float(ap),float(aa1),float(aa2),float(tp),float(a),float(agr)]]

    model=pickle.load(open('liver_analysis.pkl','rb'))
    prediction=model.predict(data)[0]

    if prediction==1:
        return render_template("Chance.html")
    else:
        return render_template("noChance.html")
if __name__=='__main__':
    app.debug=True
    app.run(host='0.0.0.0',port=5000)
```

13.2 GitHub & Project Demo Link

https://github.com/IBM-EPBL/IBM-Project-37647-1660315483

Project Demo Link

https://drive.google.com/drive/folders/1IbkxlO3mHwh6sXk4z0ocUAWMaiBj8GQm