A Review of Liver Patient Analysis Methods Using Machine Learning

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GOVERNMENT ARTS AND SCIENCE COLLEGE , KADAYANALLUR.

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1.INTRODUCTION

Liver disease prediction using machine learning is a growing area of research that involves the use of advanced algorithms and statistical models to identify individuals at high risk of liver disease. Machine learning techniques can be used to analyze large datasets of clinical and laboratory parameters to develop accurate and reliable models for predicting liver disease. Machine learning algorithms can be trained on data from patients with liver disease and healthy individuals to identify patterns and factors that are associated with the development of liver disease. These algorithms can then be used to predict the risk of liver disease in new patients based on their clinical and demographic characteristics. The use of machine learning algorithms in liver disease prediction has several advantages. It allows for the analysis of large and complex datasets, which can be difficult to analyze using traditional statistical methods. Additionally, machine learning algorithms can learn and adapt to new data, making them suitable for predicting the risk of liver disease in diverse populations. Liver disease prediction using machine learning has the potential to improve the early detection and management of liver disease, leading to better health outcomes for patients. However, the development of accurate and reliable machine learning models requires careful consideration of the data used for training and validation, as well as the selection of appropriate algorithms and techniques.

1.1 Overview

Liver disease prediction using machine learning involves developing models that use algorithms to analyze large and complex datasets of clinical and laboratory parameters to identify patterns and factors associated with the development of liver disease. These models can help healthcare providers identify individuals at high risk of liver disease, leading to better health outcomes for patients. However, the development of

accurate and reliable models requires careful consideration of the data used for training and validation, as well as the selection of appropriate algorithms and techniques. Overall, liver disease prediction in machine learning has significant implications for improving the prevention and management of liver disease.

1.2 Purpose

Early detection and intervention: Liver disease prediction in machine learning can help healthcare providers to detect liver disease at an early stage, before it progresses to advanced stages. This enables early intervention, which can prevent the development of complications and improve patient outcomes.

Improved patient outcomes: The accurate identification of individuals at high risk of liver disease can help healthcare providers to develop targeted interventions and treatment plans that are tailored to the specific needs of the patient. This can improve patient outcomes and reduce healthcare costs.

Personalized medicine: Machine learning models for liver disease prediction can be tailored to the specific needs of individual patients based on their unique risk factors and characteristics. This enables the development of personalized medicine approaches, where treatment plans are customized to the individual patient.

Population health management: The accurate identification of individuals at high risk of liver disease can help healthcare providers to develop population health management strategies that are tailored to the needs of specific populations. This can improve the health outcomes of populations that are at high risk of liver disease.

Overall, the purpose of liver disease prediction in machine learning is to improve the prevention, early detection, and management of liver disease by developing accurate and reliable models that can assist healthcare providers in identifying individuals at high risk of liver disease and providing appropriate interventions and treatment plans.

2. PROBLEM DEFINITION & DESIGN THINKING

Problem Definition:

Liver disease is a major public health problem that affects millions of people worldwide. The early detection and management of liver disease are crucial for improving patient outcomes and preventing the development of complications. However, identifying individuals at high risk of liver disease can be challenging, as it requires analyzing large and complex datasets of clinical and demographic characteristics. Machine learning offers a promising approach for identifying individuals at high risk of liver disease based on their clinical and demographic characteristics.

Design Thinking:

Design thinking can be used to develop a machine learning model for liver disease prediction. The following steps can be used:

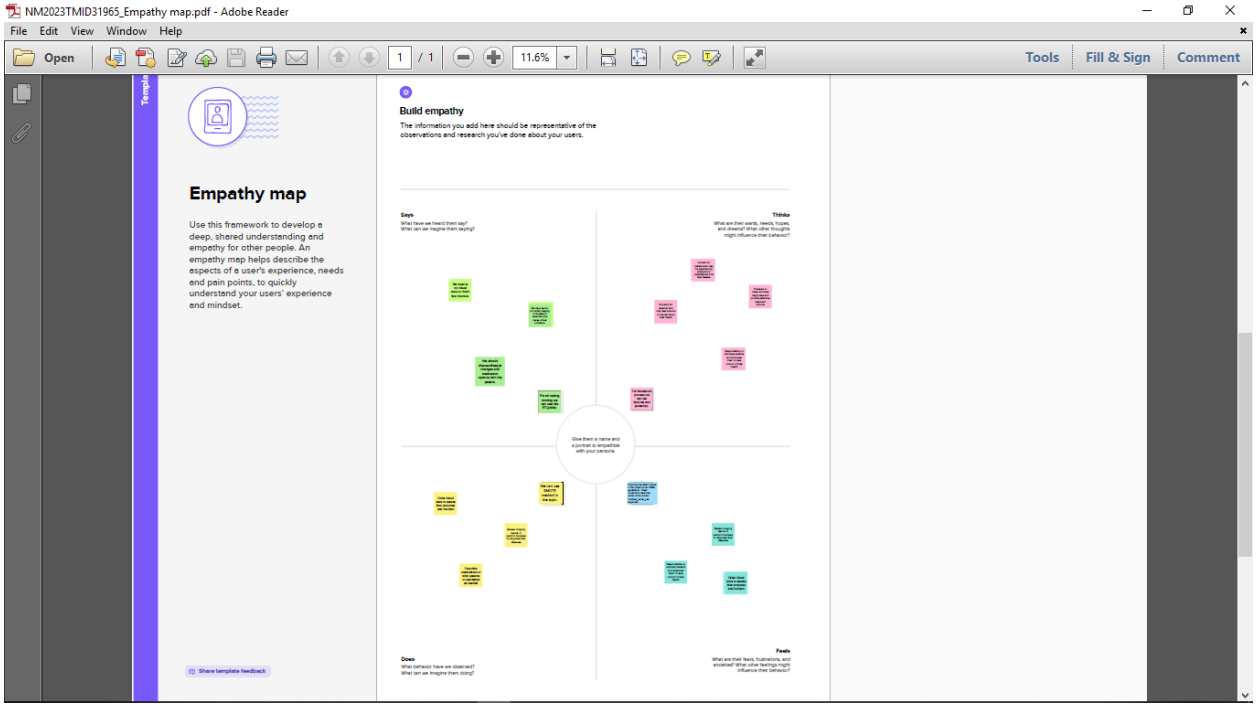
- Empathize: The first step is to empathize with patients and healthcare providers to understand their needs and challenges. This can be achieved by conducting interviews, surveys, and observations.
- Define: The next step is to define the problem and identify the specific needs and requirements of the stakeholders. This involves synthesizing the information gathered in the empathize stage to identify the key challenges and opportunities.
- Ideate: The ideation stage involves generating a range of ideas and potential solutions for liver disease prediction using machine learning. This can be achieved through brainstorming sessions and other ideation techniques.
- Prototype: The prototyping stage involves developing a preliminary machine learning model for liver disease prediction based on the ideas generated in the

ideation stage. This can involve selecting an appropriate algorithm and testing it on a small dataset.

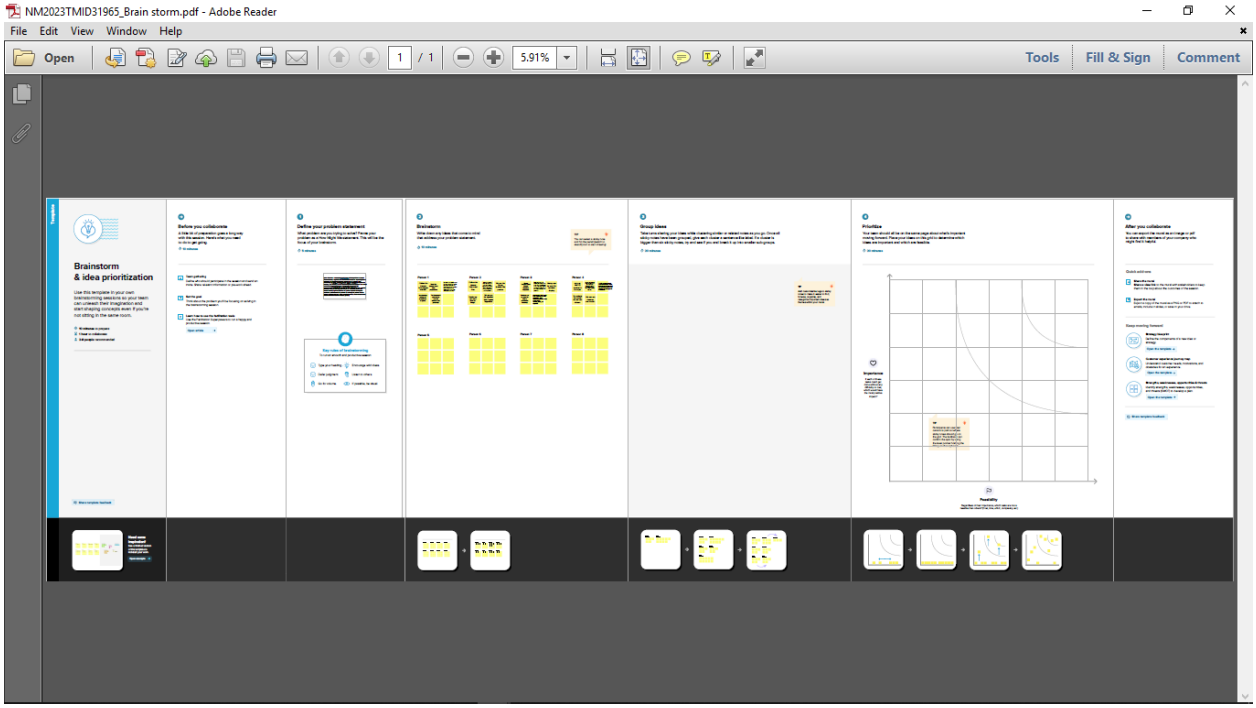
- Test: The final stage is to test and refine the machine learning model through iterative testing and evaluation. This involves gathering feedback from patients and healthcare providers and using this feedback to refine the model.

By using design thinking, a machine learning model for liver disease prediction can be developed that is based on the needs and requirements of the stakeholders. This can improve the accuracy and reliability of the model and increase its uptake in clinical practice.

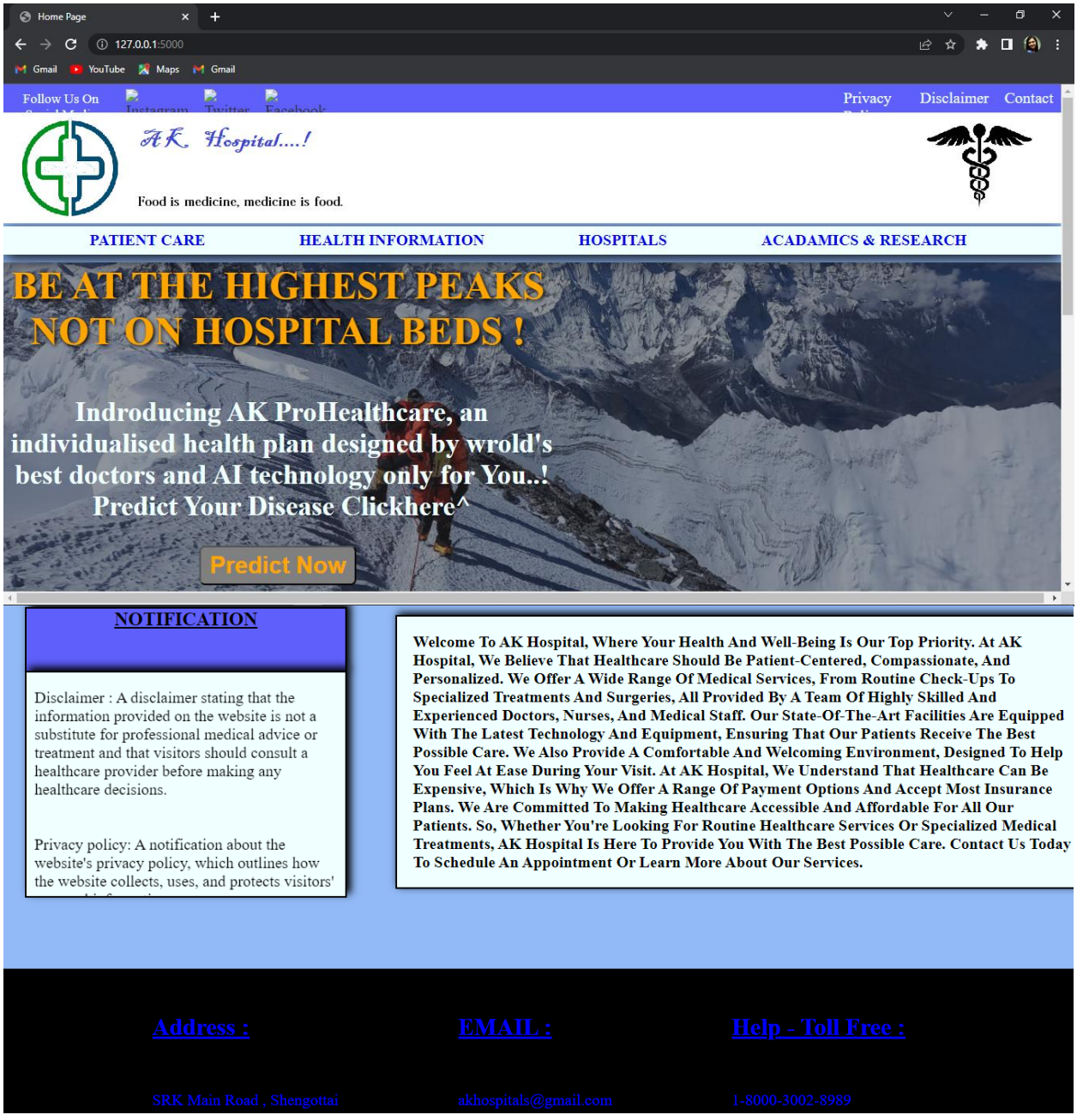
2.1 Empathy Map



2.2 Ideation & Brainstorming Map



3. RESULT


Home Page
127.0.0.1:5000
Gmail
YouTube
Maps
Gmail
Follow Us On
Privacy
Disclaimer
Contact
AK Hospital....!
Food is medicine, medicine is food.
PATIENT CARE
HEALTH INFORMATION
HOSPITALS
ACADAMICS & RESEARCH
BE AT THE HIGHEST PEAKS
NOT ON HOSPITAL BEDS !
Indroducing AK ProHealthcare, an individualised health plan designed by wrold's best doctors and AI technology only for You..!
Predict Your Disease Clickhere^
Predict Now
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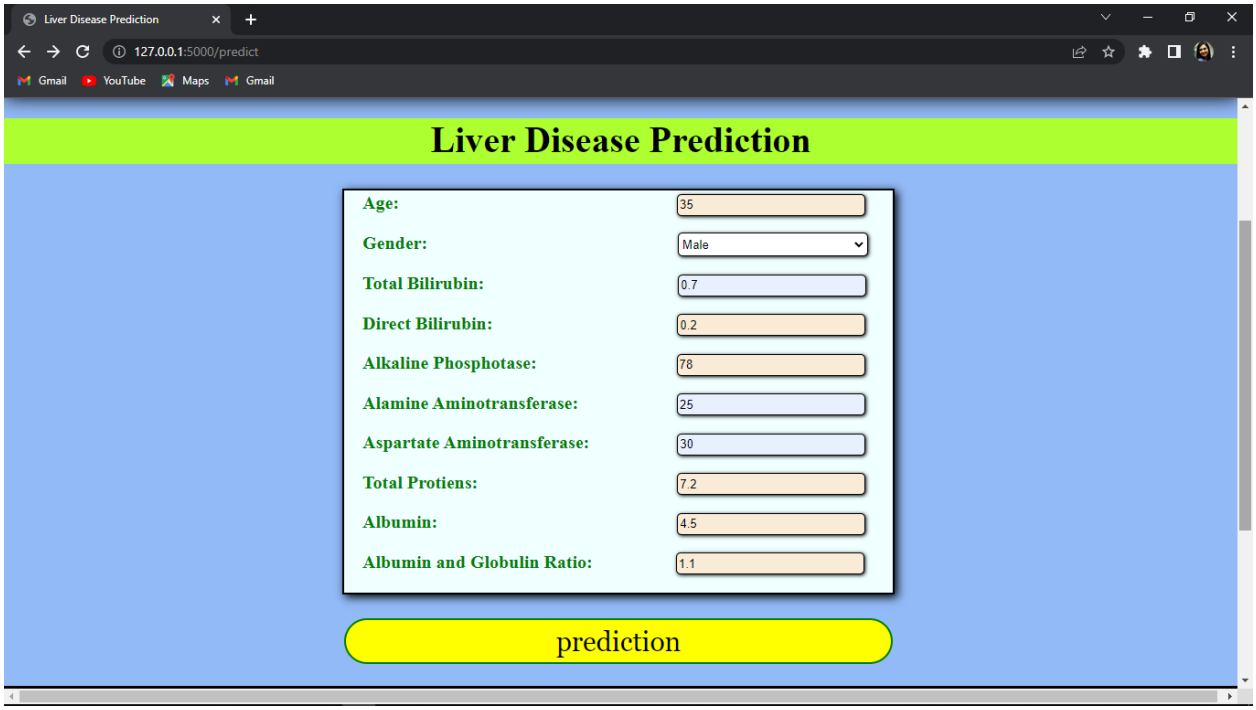
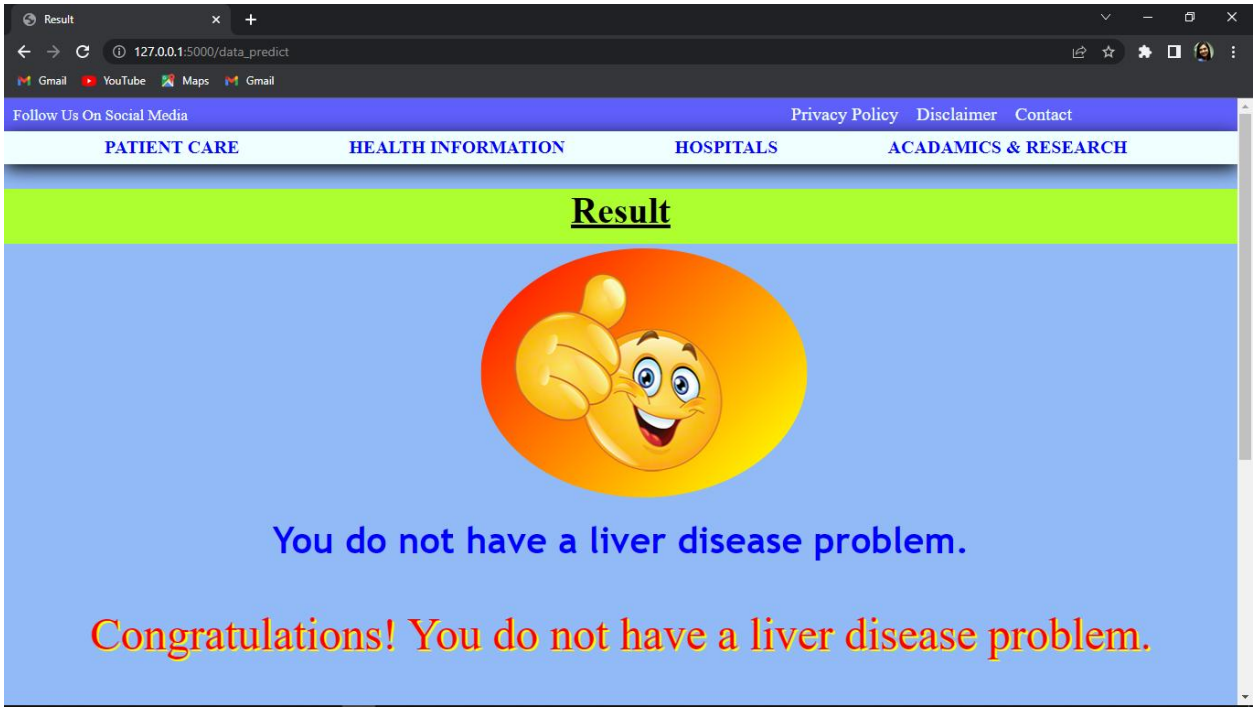
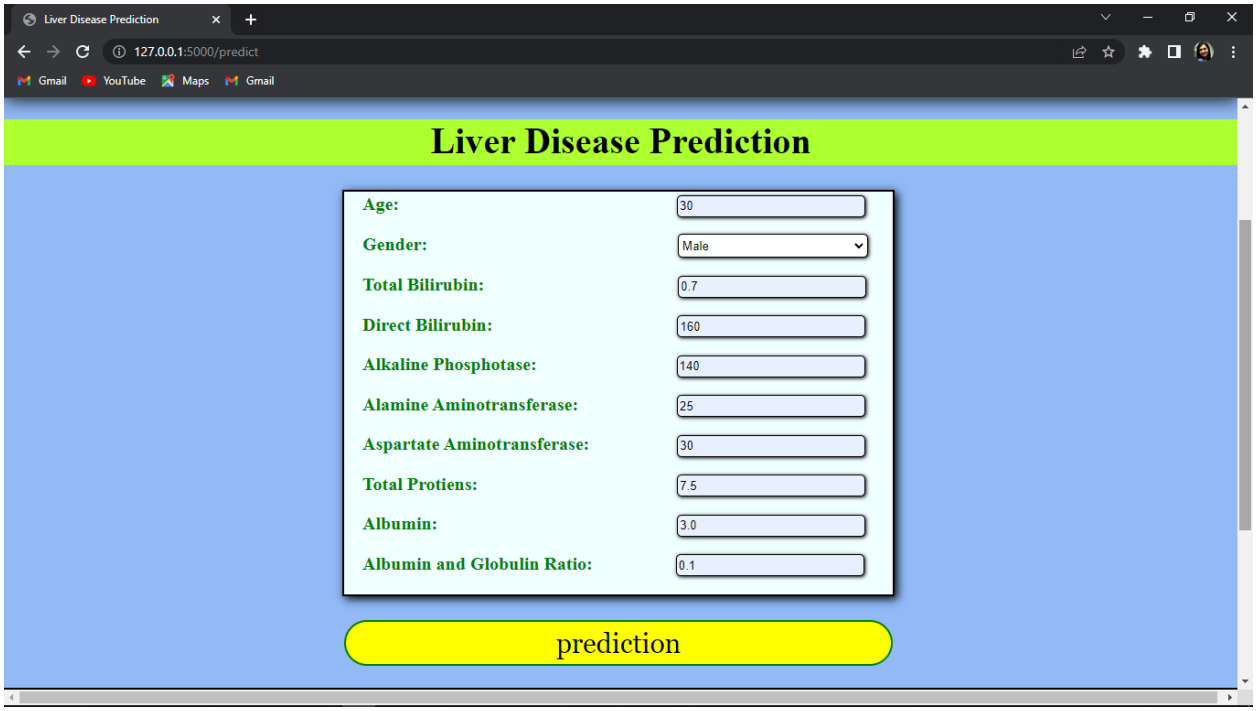

Liver Disease Prediction
127.0.0.1:5000/predict
Gmail
YouTube
Maps
Gmail
Liver Disease Prediction
Age:
35
Gender:
Male
Total Bilirubin:
0.7
Direct Bilirubin:
0.2
Alkaline Phosphotase:
78
Alamine Aminotransferase:
25
Aspartate Aminotransferase:
30
Total Protiens:
7.2
Albumin:
4.5
Albumin and Globulin Ratio:
1.1
prediction


Result
127.0.0.1:5000/data_predict
Gmail
YouTube
Maps
Gmail
Follow Us On Social Media
Privacy Policy
Disclaimer
Contact
PATIENT CARE
HEALTH INFORMATION
HOSPITALS
ACADAMICS & RESEARCH
Result
You do not have a liver disease problem.
Congratulations! You do not have a liver disease problem.


Liver Disease Prediction
127.0.0.1:5000/predict
Gmail
YouTube
Maps
Gmail
Liver Disease Prediction
Age:
30
Gender:
Male
Total Bilirubin:
0.7
Direct Bilirubin:
160
Alkaline Phosphotase:
140
Alamine Aminotransferase:
25
Aspartate Aminotransferase:
30
Total Protiens:
7.5
Albumin:
3.0
Albumin and Globulin Ratio:
0.1
prediction


No Chance
127.0.0.1:5000/data_predict
Gmail
YouTube
Maps
Gmail
Follow Us On
Instagram
Twitter
Facebook
Privacy
Disclaimer
Contact
PATIENT CARE
HEALTH INFORMATION
HOSPITALS
ACADAMICS & RESEARCH
Liver Disease Prediction
You have a liver disease problem. You must consult a doctor.
ALERT!!

4. ADVANTAGES & DISADVANTAGES

Advantages:

- Early detection of liver disease: Machine learning models can identify individuals at high risk of liver disease before symptoms appear, allowing for earlier detection and treatment.
- Personalized medicine: Machine learning models can be used to develop personalized treatment plans based on an individual's clinical and demographic characteristics.
- Improved patient outcomes: Early detection and personalized treatment can lead to improved patient outcomes and a reduced risk of complications.
- Efficient use of resources: Machine learning models can help healthcare providers prioritize resources by identifying individuals who are at the highest risk of developing liver disease.
- Population health management: Machine learning models can help public health officials identify at-risk populations and develop targeted prevention and intervention programs.

Disadvantages:

- Limited data availability: Machine learning models require large amounts of high-quality data to be trained effectively. However, data on liver disease may be limited or incomplete.
- Overfitting: Machine learning models can overfit the training data, resulting in poor performance on new data. Careful selection of features and regularization can help mitigate this risk.
- Lack of transparency: Machine learning models can be difficult to interpret, making it challenging to understand how they arrive at their predictions.
- Ethical concerns: The use of machine learning models for medical diagnosis raises ethical concerns around privacy, bias, and accountability.
- Need for expertise: Developing and deploying machine learning models requires expertise in data science and healthcare, which may be a barrier to implementation.

Overall, the advantages of using machine learning for liver disease prediction outweigh the potential disadvantages, but careful attention must be paid to data quality, model transparency, and ethical considerations.

5. APPLICATIONS

- Clinical practice: Machine learning models can be used in clinical practice to identify individuals at high risk of liver disease, personalize treatment plans, and improve patient outcomes.
- Public health: Machine learning models can be used to identify at-risk populations and develop targeted prevention and intervention programs for liver disease.
- Pharmaceutical research: Machine learning models can be used to identify potential drug targets and develop new treatments for liver disease.
- Medical education: Machine learning models can be used to teach medical students and healthcare providers about the diagnosis and management of liver disease.
- Health insurance: Machine learning models can be used by insurance companies to identify individuals at high risk of liver disease and develop appropriate coverage plans.

  Overall, the application of machine learning in liver disease prediction has broad implications for improving healthcare outcomes and reducing the burden of liver disease on individuals and society.

6. CONCLUSION

Information mining is the technique to recover an example from huge informational collection regarding AI, information base, and insights. An information mining strategy such as grouping, order and affiliation which is suitable for medicinal finding. Prominent order calculation, for example, SVM, NB and others considered for execution in assessment in liver issue infections forecast. In liver issue infections there are 500 informational indexes with 10 traits. The qualities are Total Bilirubin, Direct Bilirubin, Total Proteins, Albumin, A/G proportion, SGPT (Alanine Aminotransferase), SGOT (Aspartate Aminotransferase) and Alkaline Phosphatase. Future work we can utilize the blend and increasingly Hybrid way to deal with improve execution exactness for liver issue maladies forecast with their reasonable informational collections.

7. FUTURE SCOPE

- Integration with electronic health records (EHRs): Machine learning models can be integrated with EHRs to enable real-time risk prediction and personalized treatment plans for patients.
- Integration with wearable devices: Machine learning models can be integrated with wearable devices to monitor individuals' health status continuously and identify early signs of liver disease.
- Multi-modal data analysis: Machine learning models can incorporate various data types, including genetic, imaging, and clinical data, to improve prediction accuracy and identify new biomarkers for liver disease.
- Explainable AI: Efforts should be made to make machine learning models more transparent and interpretable to enable better understanding and decision-making in clinical practice.
- Incorporating patient preferences: Future models should incorporate patient preferences and values to enable truly personalized medicine.
- Validation and implementation: Future research should focus on validating and implementing machine learning models in clinical practice and evaluating their impact on patient outcomes and healthcare systems.

  Overall, future enhancements in liver disease prediction using machine learning have the potential to improve the accuracy and usability of models, leading to better patient outcomes and reduced healthcare costs.

8. APPENDIX

- Data Preprocessing:

1. Data Cleaning: Removing duplicates, handling missing data, and dealing with outliers.

2. Data Transformation: Scaling the features, converting categorical variables to numerical values, and creating new features.

3. Feature Selection: Selecting the most relevant features for the model.

- Model Selection:

1. Choosing the appropriate algorithm based on the type of problem, the size of the dataset, and the desired accuracy.

2. Splitting the dataset into training, validation, and testing sets.

3. Training the model on the training set and tuning hyperparameters using cross-validation.

4. Evaluating the model on the validation set and selecting the best model.

5. Testing the model on the testing set and reporting the performance metrics.

- Performance Metrics:

1. Confusion Matrix: A table that summarizes the performance of the model by comparing the predicted and actual values.

2. Accuracy: The percentage of correctly classified instances.

3. Precision: The percentage of true positive predictions among all positive predictions.

4. Recall: The percentage of true positive predictions among all actual positive instances.

5. F1 Score: A weighted average of precision and recall.

f. ROC Curve: A graph that shows the trade-off between true positive rate and false positive rate at different classification thresholds.

- Interpretation:

1. Feature Importance: Identifying the most important features for the model.

2. Decision Boundaries: Visualizing the decision boundaries of the model.

3. Error Analysis: Analyzing the types of errors made by the model and identifying patterns in the data.

- Deployment:

1. Saving the trained model.

2. Creating a user interface for inputting new data.

3. Integrating the model into a larger system or application.

4. Monitoring the model's performance and updating it as needed.

A.Source code

Liver disease prediction.py

```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
from matplotlib import rcParams
from scipy import stats
from sklearn.preprocessing import StandardScaler
from sklearn.model_selection import train_test_split



data = pd.read_csv('C:/Users/ELCOT/Desktop/ARun project/indian_liver_patient.csv')
print(data.head())
print(data.info())
print(data.isnull().any())
print(data.isnull().sum())
data.fillna(data.mode().iloc[0], inplace=True)
print(data.isnull().sum())
from sklearn.preprocessing import LabelEncoder
lc = LabelEncoder()
data['Gender']=lc.fit_transform(data['Gender'])
sns.histplot(data['Age'])
plt.title('Age Distribution Graph')
```

```
plt.show()
sns.heatmap(data.corr(), cmap='coolwarm', annot=True)
plt.title('Correlation Heatmap')
plt.show()
from sklearn.preprocessing import scale
x_scaled = pd.DataFrame(scale(data), columns=data.columns)
print(x_scaled.head())
# separate the features and target variable
x = data.iloc[:,:-1]
y = data.Dataset

# standardize the features using StandardScaler
scaler = StandardScaler()
x_scaled = scaler.fit_transform(x)

# split the data into training and testing sets
x_train, x_test, y_train, y_test = train_test_split(x_scaled, y, test_size=0.2,
random_state=42)

# Import required libraries
from imblearn.over_sampling import SMOTE

# Create a SMOTE object
smote = SMOTE()
```

```
# Check the class distribution in the training data
print("Before SMOTE:")
print(y_train.value_counts())

# Use SMOTE to oversample the minority class in the training data
x_train_smote, y_train_smote = smote.fit_resample(x_train, y_train)

# Check the class distribution after oversampling
print("After SMOTE:")
print(y_train_smote.value_counts())



from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import accuracy_score, classification_report
import pandas as pd

# Assuming you have already split your data into x_train_smote, y_train_smote, x_test,
and y_test

# Initialize the model
model1 = RandomForestClassifier()

# Fit the model on the training data
model1.fit(x_train_smote, y_train_smote)
```

```
# Use the model to predict on the test data
y_pred = model1.predict(x_test)

# Calculate the accuracy of the model
rfc1= accuracy_score(y_test, y_pred)
print("Accuracy:", rfc1)

# Print a confusion matrix
confusion_matrix = pd.crosstab(y_test, y_pred)
print("Confusion Matrix:")
print(confusion_matrix)

# Print a classification report
classification_report = classification_report(y_test, y_pred)
print("Classification Report:")
print(classification_report)


# Import required libraries
from sklearn.tree import DecisionTreeClassifier
from sklearn.metrics import accuracy_score, classification_report
import pandas as pd

# Create a decision tree classifier object
```

```
model4 = DecisionTreeClassifier()

# Train the model on the training data
model4.fit(x_train_smote, y_train_smote)

# Use the trained model to predict on the test data
y_predict = model4.predict(x_test)

# Evaluate the accuracy of the model
dtc1= accuracy_score(y_test, y_predict)
print("Decision Tree Model Accuracy: ", dtc1)

# Print the confusion matrix
print(pd.crosstab(y_test, y_predict))

# Print the classification report
print(classification_report(y_test, y_predict))



# Import required libraries
from sklearn.neighbors import KNeighborsClassifier
from sklearn.metrics import accuracy_score, classification_report
import pandas as pd

# Create a KNN classifier object
```

```
model2 = KNeighborsClassifier()

# Train the model on the training data
model2.fit(x_train_smote, y_train_smote)

# Use the trained model to predict on the test data
y_predict = model2.predict(x_test)

# Evaluate the accuracy of the model
knn1= accuracy_score(y_test, y_predict)
print("KNN Model Accuracy: ", knn1)

# Print the confusion matrix
print(pd.crosstab(y_test, y_predict))

# Print the classification report
print(classification_report(y_test, y_predict))



# Import required libraries
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import accuracy_score, classification_report
import pandas as pd

# Create a logistic regression classifier object
```

```
model5 = LogisticRegression()

# Train the model on the training data
model5.fit(x_train_smote, y_train_smote)

# Use the trained model to predict on the test data
y_predict = model5.predict(x_test)

# Evaluate the accuracy of the model
logi1= accuracy_score(y_test, y_predict)
print("Logistic Regression Model Accuracy: ", logi1)

# Print the confusion matrix
print(pd.crosstab(y_test, y_predict))

# Print the classification report
print(classification_report(y_test, y_predict))

# Import required libraries
import tensorflow.keras
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense

# Create a Sequential model
classifier = Sequential()
```

```
# Add layers to the model
classifier.add(Dense(units=100, activation='relu', input_dim=10))
classifier.add(Dense(units=50, activation='relu'))
classifier.add(Dense(units=1, activation='sigmoid'))

# Compile the model
classifier.compile(optimizer='adam', loss='binary_crossentropy', metrics=['accuracy'])

# Train the model on the training data
model_history = classifier.fit(x_train, y_train, batch_size=100, validation_split=0.2,
epochs=100)



def predict_exit(sample_value):
    sample_value = np.array(sample_value)
    sample_value = sample_value.reshape(1,-1)
    sample_value = scale(sample_value)
    return classifier.predict(sample_value)

sample_value = [[50,1,1.2,0.8,150,70,80,7.2,3.4,0.8]]

if predict_exit(sample_value) > 0.5:
    print('Prediction: Liver Patient')
else:
```

```
    print('Prediction: Healthy')



acc_smote = [['KNN Classifier', knn1], ['RandomForestClassifier', rfc1],
            ['DecisionTreeClassifier', dtc1], ['LogisticRegression', logi1]]

Liverpatient_pred = pd.DataFrame(acc_smote, columns=['Classification Models',
'Accuracy Score'])
print(Liverpatient_pred)

import matplotlib.pyplot as plt
import seaborn as sns

# set plot size
plt.figure(figsize=(7, 5))

# rotate x-axis labels by 90 degrees
plt.xticks(rotation=90)

# set plot title
plt.title('Classification Models & Accuracy Scores after SMOTE', fontsize=18)

# create bar plot
sns.barplot(x='Classification Models', y='Accuracy Score', data=Liverpatient_pred,
palette='Set2')
```

```
# show plot
plt.show()



from sklearn.ensemble import ExtraTreesClassifier
import matplotlib.pyplot as plt
import pandas as pd

model = ExtraTreesClassifier()
model.fit(x, y)

feature_importances = pd.DataFrame(model.feature_importances_, index=x.columns,
columns=['Importance']).sort_values('Importance', ascending=False)
print(feature_importances)

df = pd.DataFrame(model.feature_importances_, index=x.columns).sort_values(0,
ascending=False)

plt.figure(figsize=(7,6))
plt.barh(df.index, df[0], align='center')
plt.title("FEATURE IMPORTANCE", fontsize=14)
plt.show()
```

```
import joblib
joblib.dump(model1, 'ETC.pkl')
joblib.dump(model, 'ETC.joblib'
```

app.py

```
# Import necessary libraries
from flask import Flask, render_template, request
from joblib import load
import numpy as np

# Initialize the Flask application
app = Flask(__name__)

# Define the home page route
@app.route('/')
def home():
    return render_template("home.html")

# Define the route to show the input form
@app.route('/predict')
def index():
    return render_template("index.html")

# Define the route to handle the form submission
```

```
@app.route('/data_predict', methods=['POST'])
def predict():
    # Get the input values from the form
    age = request.form['age']
    gender = request.form['gender']
    tb = request.form['tb']
    db = request.form['db']
    ap = request.form['ap']
    aa1 = request.form['aa1']
    aa2 = request.form['aa2']
    tp = request.form['tp']
    a = request.form['a']
    agr = request.form['agr']

    # Create a list with the input values
    data = [[float(age), float(gender), float(tb), float(db), float(ap), float(aa1), float(aa2),
float(tp), float(a), float(agr)]]

    # Load the trained model
    model = load("C:/Users/ELCOT/Desktop/ARun project/ETC.joblib")

    # Make a prediction using the model
    prediction = model.predict(np.array(data))[0]

    # Show the appropriate message based on the prediction result
```

```
    if prediction == 1:
        return render_template('noChance.html', prediction='You have a liver disease problem. You must consult a doctor.')
    else:
        return render_template('chance.html', prediction='You do not have a liver disease problem.')

# Run the Flask application
if __name__ == '__main__':
    app.run()
```

home.html

```
<!DOCTYPE html>
<html>
  <head>
    <title>Home Page</title>
  </head>
  <style>
    body{
      background-color: rgb(146, 186, 247);
      margin: 0%;
    }
    header {

background-color: rgb(95, 95, 252);
  height: 30px;
  padding-top: 6px;
}

nav ul {
  list-style: none;
  margin: 0;
  padding: 0;
  display: flex;
}

nav li {
  margin: 0 10px;

}
.q{
  text-align: center;
  font-size: 17px;
  margin-top: 3px;
  color: azure;
}


nav li a {
  display: block;
  color: #333;
  text-decoration: none;
  font-size: 20px;
}

nav li a img {
  height: 24px;
}
.header-links{
  display: inline-flexbox;
```

```
  margin-left: 650px;
}
#w{
  color: azure;

}
#w:hover{
  color: black;
  transform: scale(1.2);
}
.search-box {
  display: flex;
  align-items: center;
  border: 1px solid #ccc;
  border-radius: 5px;
  padding: 5px;
}

input[type="text"] {
  border: none;
  outline: none;
  flex: 1;
}

button[type="submit"] {
  background: none;
  border: none;
  outline: none;
  cursor: pointer;
}

.fa {
  font-size: 18px;
}
.qwe{
  height: 30px;
  background-color: azure;
  box-shadow: 1px 5px 20px black;
}
#po{
  margin-left: 100px;
  color: blue;
  font-weight: bolder;
}
#po:hover{
  color: black;
  transform: scale(1.5);
}
.o{
  width: 100%;
```

```
  position: absolute;
  z-index: -1;
  background-color: rgba(8, 7, 7, 0.637);
}
.imt{
  text-align: center;
  margin-top: 10px;
  color: orange;
  font-size: 50px;
  font-weight: bolder;
  width: 700px;

  text-shadow: 2px 2px 5px black;
}
.simt{
  text-align: center;
  font-size: 35px;
  font-weight: 900;
  width: 700px;
  padding: 5px;
  color: azure;
}
.but{
  width: 200px;
  height: 50px;
  border-radius: 7px;
  background-color: gray;
  margin-left: 250px;
  margin-top: -10px;
  text-align: center;
  font-weight: bolder;
  color: orange;
  font-size: 30px;
  cursor: pointer;

}
.mnb{
  background-color: rgba(41, 40, 40, 0.459);
  padding-bottom: 15px;
}
.announcement-container {
  position: absolute;
  height: 280px;
  width: 400px;
  margin-top: 100px;
  background-color: azure;
  border: 2px solid black;
  overflow: hidden;
  margin-left: 30px;
  box-shadow: 5px -5px 10px black;
```

```
}
.announcement {

  height: 100%;
  padding: 10px;
  display: flex;
  flex-direction: column;
  justify-content: center;
  font-size: 20px;

}

.announcement span {
  white-space: nowrap;
  animation: marquee 1s linear infinite;
}

@keyframes marquee {
  0% { transform: translateY(100%); }
  100% { transform: translateY(-100%); }
}
h2{
  margin-left: 30px;
  float: left;
  color: black;
  background-color: rgb(95, 95, 252);
  border: 2px solid black;
  box-shadow: 5px -5px 10px black;
  text-align: center;
  text-decoration: underline;
  height: 80px;
  width: 400px;


}
.txt{
    width: 850px;
    margin-top: 30px;

    float: right;
    background-color: azure;
    box-shadow: 3px -3px 10px black;
    border: 2px solid black;
}
.gui{
  margin-left: 20px;
  font-size: 20px;
  font-weight: bold;
  text-transform: capitalize;
}
```

```
#foot{
  margin-top: 100px;
  float: left;
  height: 300px;
  background-color: black;
  width: 100%;
  color: blue;
}
li{
  float: left;
  margin-left: 150px;
  font-size: 20px;
  list-style: none;
  }
li:hover{
  transform: scale(1.5);
}
h4{
  font-size: 30px;
  text-decoration: underline;
  }
  </style>
  <body>
    <header>
      <nav>
        <ul>
          <li class="q">Follow Us On Social Media</li>
          <li class="social-links"><a href="#"><img
src="https://www.instagram.com/static/images/ico/favicon-192.png/68d99ba29cc8.png"
alt="Instagram"></a></li>
          <li class="social-links"><a href="#"><img
src="https://abs.twimg.com/favicons/twitter.ico" alt="Twitter"></a></li>
          <li class="social-links"><a href="#"><img
src="https://www.facebook.com/favicon.ico" alt="Facebook"></a></li>
          <li class="header-links"><a id="w" href="#">Privacy Policy</a></li>
          <li><a id="w" href="#">Disclaimer</a></li>
          <li ><a id="w" href="#">Contact</a></li>
        </ul>
      </nav>
    </header>
    <img class="p" src="{{url_for('static',filename='finhos.png')}}">
    <header class="qwe">
      <nav class="wer">
        <ul class="ert">
          <li><a id="po" href="">PATIENT CARE</a></li>
          <li><a id="po" href="">HEALTH INFORMATION</a></li>
          <li><a id="po" href="">HOSPITALS</a></li>
          <li><a id="po" href="">ACADAMICS & RESEARCH</a></li>
        </ul>
      </nav>
```

```
  </header>
  <div class="lkj">
    <img class="o" src="{{url_for('static',filename='mount2.png')}}">
    <div class="mnb"><p class="imt">BE AT THE HIGHEST PEAKS <br>
    NOT ON HOSPITAL BEDS !</p>
    <p class="simt">Indroducing AK ProHealthcare, an individualised health plan designed by wrold's best doctors and AI technology only for You..! Predict Your Disease Clickhere^</p>


  <a href="/predict"><button class="but" >Predict Now</button></a>
 </div>
 </div>
 <h2>NOTIFICATION</h2>
  <div class="announcement-container">
    <marquee behavior="scroll" direction="up">

      <span class="announcement">Disclaimer : A disclaimer stating that the information provided on the website is not a substitute for professional medical advice or treatment and that visitors should consult a healthcare provider before making any healthcare decisions.

      <br><br><br>Privacy policy: A notification about the website's privacy policy, which outlines how the website collects, uses, and protects visitors' personal information.

      <br><br><br>Terms of use: A notification about the website's terms of use, which outlines the rules and regulations for using the website and its content.

      <br><br><br>HIPAA compliance: A notification stating that the website complies with the Health Insurance Portability and Accountability Act (HIPAA), which sets standards for protecting the privacy and security of individuals' health information.

      <br><br><br>Medical emergency: A notification that the website is not intended for medical emergencies and that visitors should call 911 or their local emergency number for immediate assistance.

      <br><br><br>Accessibility: A notification that the website is designed to be accessible to individuals with disabilities and that accommodations can be made upon request.</marquee>
    </div>
    <div class="txt">
      <p class="gui">Welcome to AK Hospital, where your health and well-being is our top priority.

At AK Hospital, we believe that healthcare should be patient-centered, compassionate, and personalized. We offer a wide range of medical services, from routine check-ups to specialized treatments and surgeries, all provided by a team of highly skilled and experienced doctors, nurses, and medical staff.
```

```
Our state-of-the-art facilities are equipped with the latest technology and equipment, ensuring that our patients receive the best possible care. We also provide a comfortable and welcoming environment, designed to help you feel at ease during your visit.

At AK Hospital, we understand that healthcare can be expensive, which is why we offer a range of payment options and accept most insurance plans. We are committed to making healthcare accessible and affordable for all our patients.

So, whether you're looking for routine healthcare services or specialized medical treatments, AK Hospital is here to provide you with the best possible care. Contact us today to schedule an appointment or learn more about our services.</p>
    </div>

    <div id="foot">
      <ul class="foo">
        <li><h4>Address :</h4><br>SRK Main Road , Shengottai<br> 627809 ,
<br>Tamil Nadu , India .</li>
        <li><h4>EMAIL :</h4><br> akhospitals@gmail.com</li>
        <li><h4>Help - Toll Free :</h4><br> 1-8000-3002-8989 </li>
      </ul>
      </div>

  </body>
</html>
```

index.html

```
<!DOCTYPE html>
<html>
  <head>
    <title>Liver Disease Prediction</title>
  </head>
  <style>
     body{
      background-color: rgb(146, 186, 247);
      margin: 0%;
    }
    header {

background-color: rgb(95, 95, 252);
  height: 30px;
  padding-top: 6px;
}

nav ul {
  list-style: none;
  margin: 0;
  padding: 0;
  display: flex;
}

nav li {
  margin: 0 10px;

}
.q{
  text-align: center;
  font-size: 17px;
  margin-top: 3px;
  color: azure;
}


nav li a {
  display: block;
  color: #333;
  text-decoration: none;
  font-size: 20px;
}

nav li a img {
  height: 24px;
}
.header-links{
  display: inline-flexbox;
```

```
  margin-left: 650px;
}
#w{
  color: azure;

}
#w:hover{
  color: black;
  transform: scale(1.2);
}
.search-box {
  display: flex;
  align-items: center;
  border: 1px solid #ccc;
  border-radius: 5px;
  padding: 5px;
}

input[type="text"] {
  border: none;
  outline: none;
  flex: 1;
}

button[type="submit"] {
  background: none;
  border: none;
  outline: none;
  cursor: pointer;
}

.fa {
  font-size: 18px;
}
.qwe{
  height: 30px;
  background-color: azure;
  box-shadow: 1px 5px 20px black;
}
#po{
  margin-left: 100px;
  color: blue;
  font-weight: bolder;
}
#po:hover{
  color: black;
  transform: scale(1.5);
}
    h1{
      background-color: greenyellow;
```

```
  height: 50px;
  font-size: 40px;
  text-align: center;
 }
 form{
  width: 600px;
  height: 440px;
  margin-left: 370px;
  border: 2px solid black;
  box-shadow: 3px 3px 10px black;
  background-color: azure;
 }
 label{
  font-size: 20px;
  background-color: transparent;
  color: green;
  font-weight: bolder;
  margin-left: 20px;
 }
 input{
  width: 200px;
  height: 20px;
  border: 2px solid black;
  background-color: antiquewhite;
  margin-left: 70px;

 }
 #gender{
  border: 2px solid black;
  margin-left: 70px;
  width: 208px;
  box-shadow: 1px 1px 4px black;
  height: 26px;
 }
 tr{
  padding: 10px;
 }
 #poi{

  cursor: pointer;
  border: 2px solid black;
  border: 2px solid green;
  font-size: 30px;
  font-family: Georgia, 'Times New Roman', Times, serif;
  border-radius: 100px;
  margin-top: 30px;
  margin-left: 0px;
  width: 600px;
  height: 50px;
  background-color: yellow;
```

```
}
#age{
  margin-top: 4px;
  border: 1px solid black;
  margin-left: 300px;
  border-radius: 5px;
  box-shadow: 1px 1px 4px black;
}
#gender{
  margin-left: 270px;
  border-radius: 5px;
  border: 1px solid black;
  box-shadow: 1px 1px 4px black;
}
#tb{
  margin-left: 208px;
  border-radius: 5px;
  border: 1px solid black;
  box-shadow: 1px 1px 4px black;
}
#db{
  margin-left: 198px;
  border: 1px solid black;
  box-shadow: 1px 1px 4px black;
  border-radius: 5px;
}
#ap{
  margin-left: 149px;
  border: 1px solid black;
  box-shadow: 1px 1px 4px black;
  border-radius: 5px;
}
#aa1{
  margin-left: 104px;
  border: 1px solid black;
  box-shadow: 1px 1px 4px black;
  border-radius: 5px;
}
#aa2{
  margin-left: 92px;
  border: 1px solid black;
  box-shadow: 1px 1px 4px black;
  border-radius: 5px;
}
#tp{
  margin-left: 214px;
  border: 1px solid black;
  box-shadow: 1px 1px 4px black;
  border-radius: 5px;
}
```

```
   #a{
     margin-left: 258px;
     border: 1px solid black;
     box-shadow: 1px 1px 4px black;
     border-radius: 5px;
   }
   #agr{
     margin-left: 87px;
     box-shadow: 1px 1px 4px black;
     border: 1px solid black;
     border-radius: 5px;
   }
   #foot{
  margin-top: 100px;
  float: left;
  height: 300px;
  background-color: black;
  width: 100%;
  color: blue;
}
li{
  float: left;
  margin-left: 150px;
  font-size: 20px;
  list-style: none;

}
li:hover{
  transform: scale(1.5);
}
h4{
  font-size: 30px;
  text-decoration: underline;

}
  </style>
  <body>
    <header>
      <nav>
        <ul>
          <li class="q">Follow Us On Social Media</li>
          <li class="social-links"><a href="#"><img
src="https://www.instagram.com/static/images/ico/favicon-192.png/68d99ba29cc8.png"
alt="Instagram"></a></li>
          <li class="social-links"><a href="#"><img
src="https://abs.twimg.com/favicons/twitter.ico" alt="Twitter"></a></li>
          <li class="social-links"><a href="#"><img
src="https://www.facebook.com/favicon.ico" alt="Facebook"></a></li>
          <li class="header-links"><a id="w" href="#">Privacy Policy</a></li>
          <li><a id="w" href="#">Disclaimer</a></li>
```

```
      <li ><a id="w" href="#">Contact</a></li>
    </ul>
  </nav>
</header>
<img class="p" src="{{url_for('static',filename='finhos.png')}}">
<header class="qwe">
  <nav class="wer">
    <ul class="ert">
      <li><a id="po" href="">PATIENT CARE</a></li>
      <li><a id="po" href="">HEALTH INFORMATION</a></li>
      <li><a id="po" href="">HOSPITALS</a></li>
      <li><a id="po" href="">ACADAMICS & RESEARCH</a></li>
    </ul>
  </nav>
</header>
<h1>Liver Disease Prediction</h1>
<form action="/data_predict" method="POST">
  <label for="age">Age:</label>
  <input type="text" id="age" name="age"><br><br>

  <label for="gender">Gender:</label>
  <select id="gender" name="gender">
    <option value="1">Male</option>
    <option value="2">Female</option>
  </select><br><br>

  <label for="tb">Total Bilirubin:</label>
  <input type="text" id="tb" name="tb"><br><br>

  <label for="db">Direct Bilirubin:</label>
  <input type="text" id="db" name="db"><br><br>

  <label for="ap">Alkaline Phosphotase:</label>
  <input type="text" id="ap" name="ap"><br><br>

  <label for="aa1">Alamine Aminotransferase:</label>
  <input type="text" id="aa1" name="aa1"><br><br>

  <label for="aa2">Aspartate Aminotransferase:</label>
  <input type="text" id="aa2" name="aa2"><br><br>

  <label for="tp">Total Protiens:</label>
  <input type="text" id="tp" name="tp"><br><br>

  <label for="a">Albumin:</label>
  <input type="text" id="a" name="a"><br><br>

  <label for="agr">Albumin and Globulin Ratio:</label>
  <input type="text" id="agr" name="agr"><br><br>
```

```
    <input id="poi" type="submit" value="prediction">
  </form>
  <div id="foot">
    <ul class="foo">
      <li><h4>Address :</h4><br>SRK Main Road , Shengottai<br> 627809 , <br>Tamil
Nadu , India .</li>
      <li><h4>EMAIL :</h4><br> akhospitals@gmail.com</li>
      <li><h4>Help - Toll Free :</h4><br> 1-8000-3002-8989 </li>
    </ul>
    </div>

 </body>
</html>
```

noChance.html

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>No Chance</title>
    <img class="ty" src="{{url_for('static',filename='alert.jpg')}}">
    <style>
        body{
      background-color: rgb(146, 186, 247);
      margin: 0%;
    }
    header {

background-color: rgb(95, 95, 252);
  height: 30px;
  padding-top: 6px;
}

nav ul {
  list-style: none;
  margin: 0;
  padding: 0;
  display: flex;
}

nav li {
  margin: 0 10px;

}
.q{
  text-align: center;
  font-size: 17px;
  margin-top: 3px;
  color: azure;
}


nav li a {
  display: block;
  color: #333;
  text-decoration: none;
  font-size: 20px;
}

nav li a img {
  height: 24px;
```

```
}
.header-links{
  display: inline-flexbox;
  margin-left: 650px;
}
#w{
  color: azure;

}
#w:hover{
  color: black;
  transform: scale(1.2);
}
.search-box {
  display: flex;
  align-items: center;
  border: 1px solid #ccc;
  border-radius: 5px;
  padding: 5px;
}

input[type="text"] {
  border: none;
  outline: none;
  flex: 1;
}

button[type="submit"] {
  background: none;
  border: none;
  outline: none;
  cursor: pointer;
}

.fa {
  font-size: 18px;
}
.qwe{
  height: 30px;
  background-color: azure;
  box-shadow: 1px 5px 20px black;
}
#po{
  margin-left: 100px;
  color: blue;
  font-weight: bolder;
}
#po:hover{
  color: black;
  transform: scale(1.5);
```

```
}
      .ty{
         position: absolute;
         z-index: -1;
         width: 1200px;
         height: 500px;
         transform: translate(-50%,-50%);
         background: linear-gradient(135deg, red, blue 50%, white 50%);
         background-position: 100% 100%;
         padding: 8px;
         background-size: 250%;
         border-radius: 30%;
         top: 50%;
         left: 49.5%;
         transition: background 0.7s;

      }
      img:hover{
         background-position: 0% 0%;
      }
      body {
         background-color: #f5f5f5;
      }
      .container {
         margin-top: 100px;
         text-align: center;
      }
      h1 {
         font-size: 40px;
         font-weight: bold;
         margin-bottom: 30px;
         color: #f5f5f5;
      }
      p {
         font-size: 30px;
         color: blue;
         font-weight: bold;

      }
      #foot{
  margin-top: 300px;
  float: left;
  height: 300px;
  background-color: black;
  width: 100%;
  color: blue;
}
li{
  float: left;
  margin-left: 150px;
```

```
  font-size: 20px;
  list-style: none;

}
li:hover{
  transform: scale(1.5);
}
h4{
  font-size: 30px;
  text-decoration: underline;

}
    </style>
</head>
<body>
    <header>
    <nav>
      <ul>
        <li class="q">Follow Us On Social Media</li>
        <li class="social-links"><a href="#"><img
src="https://www.instagram.com/static/images/ico/favicon-192.png/68d99ba29cc8.png"
alt="Instagram"></a></li>
        <li class="social-links"><a href="#"><img
src="https://abs.twimg.com/favicons/twitter.ico" alt="Twitter"></a></li>
        <li class="social-links"><a href="#"><img
src="https://www.facebook.com/favicon.ico" alt="Facebook"></a></li>
        <li class="header-links"><a id="w" href="#">Privacy Policy</a></li>
        <li><a id="w" href="#">Disclaimer</a></li>
        <li ><a id="w" href="#">Contact</a></li>
      </ul>
    </nav>
  </header>

  <header class="qwe">
    <nav class="wer">
      <ul class="ert">
        <li><a id="po" href="">PATIENT CARE</a></li>
        <li><a id="po" href="">HEALTH INFORMATION</a></li>
        <li><a id="po" href="">HOSPITALS</a></li>
        <li><a id="po" href="">ACADAMICS & RESEARCH</a></li>
      </ul>
    </nav>
  </header>
    <div class="container">
        <h1>Liver Disease Prediction</h1>
        <p>{{ prediction }}</p>
    </div>
    <div id="foot">
        <ul class="foo">
```

```
        <li><h4>Address :</h4><br>SRK Main Road , Shengottai<br> 627809 ,
<br>Tamil Nadu , India .</li>
        <li><h4>EMAIL :</h4><br> akhospitals@gmail.com</li>
        <li><h4>Help - Toll Free :</h4><br> 1-8000-3002-8989 </li>
      </ul>
      </div>
</body>
</html>
```

Chance.html

```
<!DOCTYPE html>
<html>
<head>
    <title>Result</title>
    <img src="{{url_for('static',filename='healthy.png')}}">
    <style>
        body{
      background-color: rgb(146, 186, 247);
      margin: 0%;
    }
    header {

background-color: rgb(95, 95, 252);
  height: 30px;
  padding-top: 6px;
}

nav ul {
  list-style: none;
  margin: 0;
  padding: 0;
  display: flex;
}

nav li {
  margin: 0 10px;

}
.q{
  text-align: center;
  font-size: 17px;
  margin-top: 3px;
  color: azure;
}


nav li a {
  display: block;
  color: #333;
  text-decoration: none;
  font-size: 20px;
}

nav li a img {
  height: 24px;
}
.header-links{
  display: inline-flexbox;
```

```
  margin-left: 650px;
}
#w{
  color: azure;

}
#w:hover{
  color: black;
  transform: scale(1.2);
}
.search-box {
  display: flex;
  align-items: center;
  border: 1px solid #ccc;
  border-radius: 5px;
  padding: 5px;
}

input[type="text"] {
  border: none;
  outline: none;
  flex: 1;
}

button[type="submit"] {
  background: none;
  border: none;
  outline: none;
  cursor: pointer;
}

.fa {
  font-size: 18px;
}
.qwe{
  height: 30px;
  background-color: azure;
  box-shadow: 1px 5px 20px black;
}
#po{
  margin-left: 100px;
  color: blue;
  font-weight: bolder;
}
#po:hover{
  color: black;
  transform: scale(1.5);
}
        body{
            margin: 0%;
```

```
    }
    img{
        margin-top: 300px;
        margin-left: 700px;
        transform: translate(-50%,-50%);
        background: linear-gradient(135deg, red, yellow 50%, white 50%);
        background-position: 100% 100%;
        padding: 8px;
        background-size: 250%;
        border-radius: 100%;
        transition: background 0.5s;
        position: absolute;
    }
    img:hover{
        background-position: 0% 0%;
    }
    h1{
        background-color: greenyellow;
        font-size: 40px;
        font-weight: bolder;
        text-decoration: underline;
        text-align: center;
        height: 60px;
    }
    h2{
        margin-top: 300px;

        text-align: center;
        font-size: 40px;
        color: blue;
        font-family: 'Trebuchet MS', 'Lucida Sans Unicode', 'Lucida Grande', 'Lucida
Sans', Arial, sans-serif;
        font-weight: bolder;
    }
    p{
        text-align: center;
        font-size: 50px;
        color: red;
        text-shadow: 2px 2px yellow;
    }
    .button{
        margin-left: 630px;
        height: 30px;
        padding: 5px;
        border-radius: 10px;
        border: none;

        width: 100px;
        text-align: center;
    }
```

```
      #foot{
  margin-top: 100px;
  float: left;
  height: 300px;
  background-color: black;
  width: 100%;
  color: blue;
}
li{
  float: left;
  margin-left: 150px;
  font-size: 20px;
  list-style: none;

}
li:hover{
  transform: scale(1.5);
}
h4{
  font-size: 30px;
  text-decoration: underline;

}
      </style>
</head>
<body>
   <header>
      <nav>
        <ul>
          <li class="q">Follow Us On Social Media</li>
      <li class="header-links"><a id="w" href="#">Privacy Policy</a></li>
          <li><a id="w" href="#">Disclaimer</a></li>
          <li ><a id="w" href="#">Contact</a></li>
        </ul>
      </nav>
    </header>

    <header class="qwe">
      <nav class="wer">
        <ul class="ert">
          <li><a id="po" href="">PATIENT CARE</a></li>
          <li><a id="po" href="">HEALTH INFORMATION</a></li>
          <li><a id="po" href="">HOSPITALS</a></li>
          <li><a id="po" href="">ACADAMICS & RESEARCH</a></li>
        </ul>
      </nav>
    </header>
   <div class="container">
      <h1>Result</h1>
      <div class="result">
```

```
        <h2>{{ prediction }}</h2>
        <p>Congratulations! You do not have a liver disease problem.</p>
      </div>
      <div class="button">
        <a href="/" class="btn">Try Again</a>
      </div>
    </div>
    <div id="foot">
      <ul class="foo">
        <li><h4>Address :</h4><br>SRK Main Road , Shengottai<br> 627809 ,
<br>Tamil Nadu , India .</li>
        <li><h4>EMAIL :</h4><br> akhospitals@gmail.com</li>
        <li><h4>Help - Toll Free :</h4><br> 1-8000-3002-8989 </li>
      </ul>
      </div>
</body>
</html>
```