Revolutionizing Liver Care : Predicting Liver Cirrhosis using Advanced Machine Learning Techniques

Introduction

Liver cirrhosis is a serious condition where healthy liver tissues get damaged and replaced by scar tissue, affecting liver function. Early detection is important to prevent complications. This project uses machine learning techniques to predict the risk of liver cirrhosis based on patient health data like alcohol consumption, blood tests, and other clinical details. The goal is to help doctors identify high-risk individuals early and take preventive steps.

Problem Statement

Liver cirrhosis is a slow-progressing disease that often remains undiagnosed until severe damage occurs. Early detection is difficult with traditional methods. This project focuses on building a machine learning model to predict liver cirrhosis risk based on medical data, helping with timely diagnosis and treatment.

Objectives of the problem

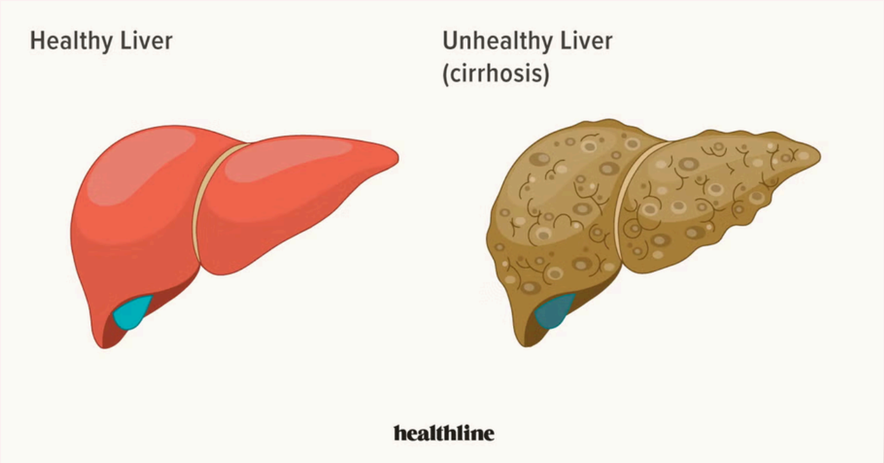
OBJECTIVES

At the end of the class the students are able to,

- define Cirrhosis of liver
- List out types of Cirrhosis of liver
- describe the risk factor, etiology of Cirrhosis of liver
- Explain the stages, Pathophysiology and clinical manifestation of Cirrhosis of liver
- Discuss the diagnostic evaluation and complication of Cirrhosis of liver
- enumerate medical, surgical and nursing management of patient with Cirrhosis of liver

What is Liver Cirrhosis

- Liver cirrhosis is a serious condition where healthy liver tissues are replaced by scar tissue, which blocks blood flow and affects the liver's ability to work properly. It is usually caused by long-term damage due to alcohol consumption, viral infections (Hepatitis B & C), or fatty liver disease.
- If not detected early, cirrhosis can lead to liver failure and other life-threatening complications.



Dataset Description and Preprocessing

✓ Medical data includes age, gender, alcohol use, blood tests, and liver health details.

✓ Handled missing values and converted categorical data.

✓ Managed outliers and scaled data.

✓ Split into training and testing sets.

- In this project we have used .csv data.

Link: https://www.kaggle.com/datasets/bhavanipriya222/liver-cirrhosis-prediction

Model Building (Machine Learning Algorithms Used)

✔ Applied multiple machine learning algorithms to predict liver cirrhosis:

- Logistic Regression
- Random Forest Classifier
- Support Vector Machine (SVM)

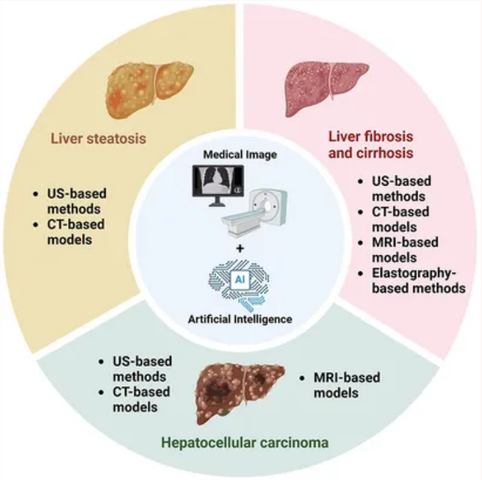
✔ Compared the performance of different models based on accuracy and other metrics.

✔ Selected the best-performing model for final prediction.

Work Flow

1. Data Collection

2.Data Preprocessing



6. Prediction Output

3. Model Building

5. Deployment

4. Model Evaluation

Technologies Used

- ✓ Python – For data analysis and machine learning
- ✓ Scikit-learn – ML algorithms and model building
- ✓ Flask – Backend deployment of prediction model
- ✓ HTML & CSS – Basic frontend for user interface
- ✓ Jupyter Notebook – Development and testing environment

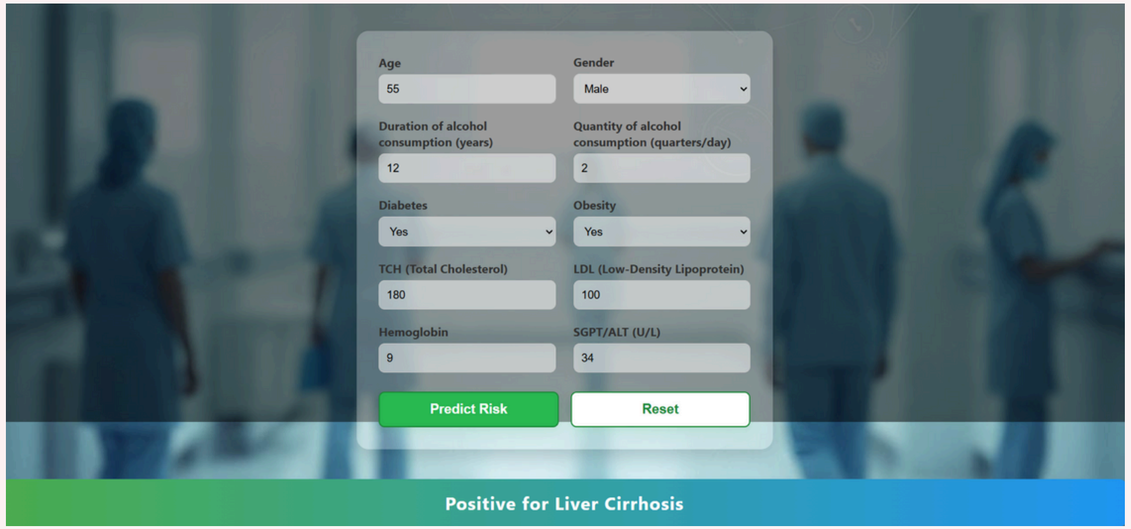
Results and Accuracy

```python
precision = precision_score(y_test, y_pred)
print("Precision:", precision)

recall = recall_score(y_test, y_pred)
print("Recall:", recall)

f1 = f1_score(y_test, y_pred)
print("F1 Score:", f1)
```

```
Precision: 1.0
Recall: 1.0
F1 Score: 1.0
```

- ✓ The machine learning models were evaluated using accuracy, precision, recall, and F1-score.
- ✓ Among all, Random Forest Classifier showed the best results.
- ✓ Achieved an accuracy of around 98%, indicating a good starting point for early prediction.
- ✓ The model helps in identifying high-risk individuals effectively.

Positive result



Negative result

Conclusion

The project successfully demonstrated the use of machine learning for predicting liver cirrhosis based on patient health data. Early prediction can assist healthcare providers in taking timely action, thus reducing the risk of severe complications. The results encourage the use of technology in medical diagnosis.

Thank You