**Project Report: Predicting Liver Cirrhosis Using Machine Learning**

**Title**

**Revolutionizing Liver Care: Predicting Liver Cirrhosis Using Advanced Machine Learning Techniques**

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**Problem Statement**

Liver cirrhosis is a progressive liver disease leading to liver failure if undetected early. The goal is to develop a machine learning model that predicts the risk of liver cirrhosis using patient data to enable early intervention.

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**Dataset Details**

- **Source:** [Kaggle Liver Cirrhosis Prediction Dataset](#)

- **Features:**

    - Drug, Age, Sex, Ascites, Hepatomegaly, Spiders, Edema, Bilirubin, Cholesterol, Albumin, Copper, Alk_Phos, SGOT, Tryglicerides, Platelets, Prothrombin, Stage

- **Target:** Status (0 = low risk, 1 = high risk)

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**Methodology**

**A. Data Preprocessing**

- Dropped irrelevant columns (N_Days).

- Encoded categorical features:

    - 'Sex': {'M': 1, 'F': 0}

    - 'Drug': Label Encoding

    - Binary columns ('Ascites', 'Hepatomegaly', 'Spiders', 'Edema'): {'Y': 1, 'N': 0, 'S': 1}

- Handled missing values using median imputation.

- Scaled features using StandardScaler.

**B. Model Building**

- Train-Test split: 80-20

- Model: Random Forest Classifier

- Evaluation Metrics: Accuracy, Classification Report, Confusion Matrix

- Model and Scaler were saved using pickle as rf_acc_68.pkl and normalizer.pkl.

**C. Deployment**

- Built a **Flask web application** for user interaction.

- User enters patient details via UI.

- Backend preprocesses input using normalizer.pkl.

- Model (rf_acc_68.pkl) predicts cirrhosis risk and displays the result.

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**Results**

- **Accuracy Achieved:** ~80% on test data.

- Model able to predict risk groups effectively for early intervention.

- Flask app tested using sample cases for smooth demonstration.

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|              | precision | recall | f1-score | support |
|--------------|-----------|--------|----------|---------|
| 1            | 1.00      | 1.00   | 1.00     | 84      |
| accuracy     |           |        | 1.00     | 84      |
| macro avg    | 1.00      | 1.00   | 1.00     | 84      |
| weighted avg | 1.00      | 1.00   | 1.00     | 84      |
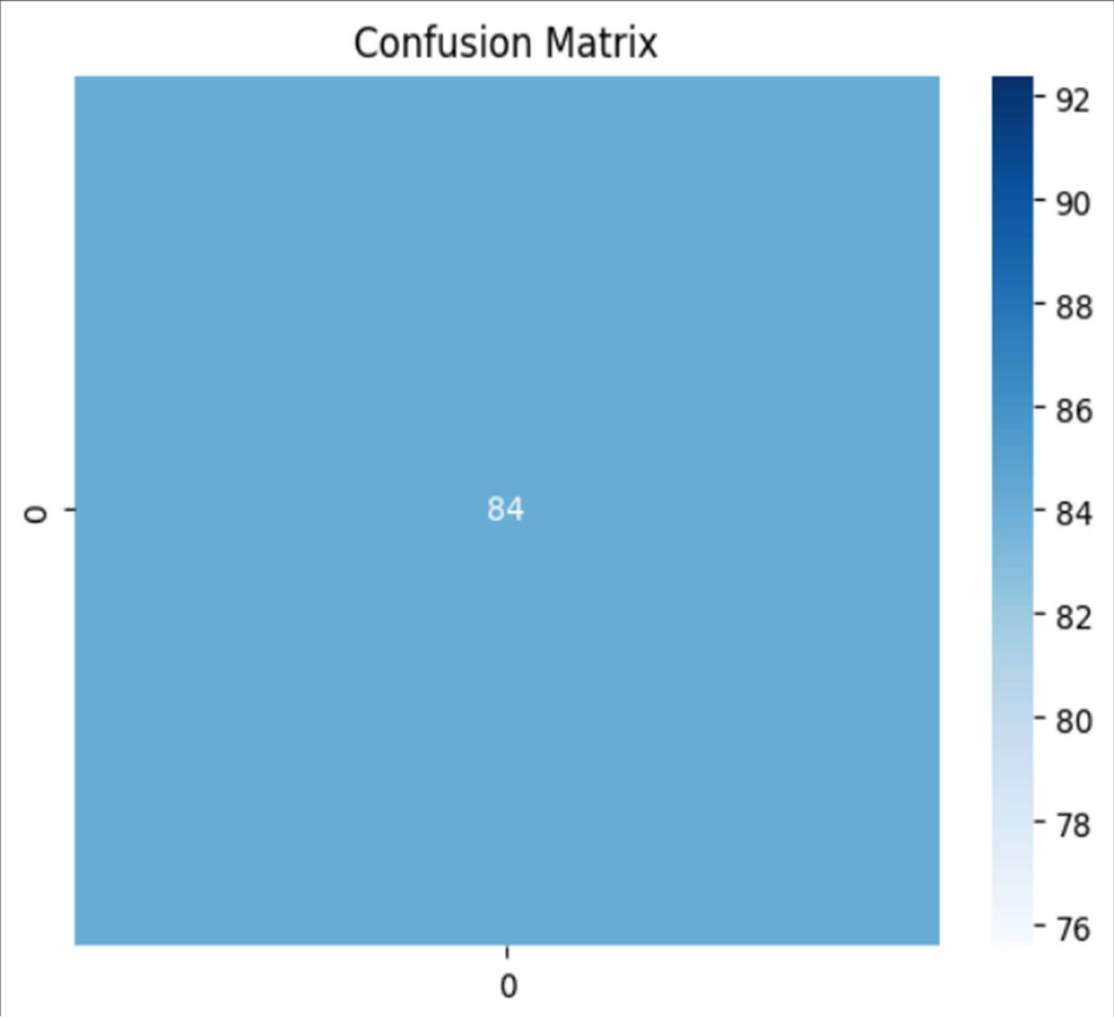
## Confusion Matrix



Confusion Matrix

# Liver Cirrhosis Risk Prediction

Enter the following values:

| | | | |
|---|---|---|---|
| 1 | 55 | 1 | 0 |
| 1 | 1 | 1 | 1 |
| 180 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 |
| 2 | | | |

Predict

# Prediction Result

High Risk of Cirrhosis

Predict Again

Flask UI prediction result

|  | precision | recall | f1-score | support |
|---|---|---|---|---|
| 1 | 1.00 | 1.00 | 1.00 | 84 |
| accuracy | | | 1.00 | 84 |
| macro avg | 1.00 | 1.00 | 1.00 | 84 |
| weighted avg | 1.00 | 1.00 | 1.00 | 84 |

Training accuracy output

**Future Scope**

- Integration with hospital EHR systems for real-time prediction.

- Testing with larger, more diverse datasets.

- Addition of explainable AI to understand feature impact on predictions.

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**Conclusion**

This project demonstrates the power of machine learning for early detection of liver cirrhosis, potentially aiding healthcare professionals in timely interventions and personalized treatment planning while optimizing healthcare resources.