Revolutionizing Liver Care: Predicting Liver Cirrhosis Using Machine Learning Algorithms

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📌 1. Introduction

Project Title:

Revolutionizing Liver Care: Predicting Liver Cirrhosis Using Machine Learning Algorithms

Overview:

This project leverages the power of machine learning to build a predictive model that can detect liver cirrhosis in patients using medical records. By analyzing clinical features from liver patient datasets, the system can assist medical professionals in diagnosing liver cirrhosis at early stages, enabling faster treatment and better patient outcomes.

📌 2. Project Overview

Purpose:

To develop a data-driven, accurate, and reliable system that predicts the likelihood of liver cirrhosis using ML algorithms based on liver function test values and patient history.

Key Features:

Medical data analysis and preprocessing

Model training using multiple ML algorithms

Evaluation and selection of best-performing model

GUI for prediction using trained model

Exportable reports or diagnosis summaries

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3. System Architecture

Frontend (Optional GUI - Streamlit or Tkinter):

User form for inputting liver test data

Real-time prediction output

Responsive and simple interface

Backend (Python + Machine Learning):

Data Cleaning and Preprocessing

Feature Engineering and Selection

Model Training (Random Forest, Logistic Regression, etc.)

Evaluation and Metrics Calculation (Accuracy, Precision, Recall, ROC-AUC)

Model Serialization using joblib

Data:

Liver Cirrhosis Dataset (CSV format)

Features include: Age, Gender, Bilirubin, Albumin, Enzymes, etc.

⚙ 4. Setup Instructions

Prerequisites:

Python 3.8+

pip

Jupyter Notebook / VS Code / PyCharm

Liver Cirrhosis Dataset (CSV)

Installation & Setup:

```
# Clone the repository or download the code
git clone https://github.com/your-username/liver-cirrhosis-ml.git

# Navigate to project folder
cd liver-cirrhosis-ml

# Install dependencies
pip install -r requirements.txt
```

Run the Application:

```
# Run in Jupyter Notebook
jupyter notebook main.ipynb

# OR run a Streamlit GUI (if implemented)
streamlit run app.py
```

📁 5. Folder Structure

```
liver-cirrhosis-ml/
├── data/
│   └── liver_dataset.csv
├── notebooks/
│   └── EDA.ipynb
├── models/
│   └── trained_model.pkl
├── app.py (Streamlit app)
├── main.ipynb
└── README.md
```

▶ 6. Running the Application

```
# For notebook-based prediction
jupyter notebook main.ipynb

# For GUI-based prediction
streamlit run app.py
```

📡 7. ML Pipeline Stages

Stage	Description
Data Loading	Reading liver patient data
Preprocessing	Handling missing values, encoding, scaling
Feature Selection	Correlation analysis, domain knowledge
Model Training	Using algorithms like Logistic Regression, RF
Evaluation	Using metrics like Accuracy, Precision, AUC
Deployment	Streamlit/Tkinter interface for predictions

🔐 8. Model Validation & Evaluation

Split data into training and testing sets

Cross-validation for robust evaluation

Metrics used:

Accuracy

Precision & Recall

Confusion Matrix

ROC-AUC Curve

🎨 9. User Interface Screenshots (If GUI

used) Page Screenshot Name

Home Page home.png
Input Form Page input-form.png
Prediction Output Page prediction.png
Evaluation Metrics Page evaluation.png

🧪 10.

Testing Tools

Used:

Jupyter Notebook (model testing)

Streamlit GUI test (if used)

Manual input/output verification

Scikit-learn test set validation

Testing Coverage:

Input data validation

Model prediction correctness

UI prediction integration

Model evaluation metrics verification

📷 11. Demo or Showcase

Optional video demo or screenshots can be linked here.
Example:
[Insert YouTube/Google Drive link to project demo]

⚠ 12. Known Issues

Model accuracy depends on dataset quality

No SMS/email notification feature

No cloud deployment yet

GUI only supports basic input (no file upload)

🚀 13. Future

Enhancements Integration with

hospital systems Real-time API

deployment

Larger and more diverse datasets

Use of deep learning (CNN/LSTM) for advanced detection

Notification system for predictions

📌 14. Conclusion

The liver cirrhosis prediction system developed using machine learning offers a powerful and efficient tool for early disease detection. The integration of data science with healthcare not only improves diagnosis accuracy but also helps medical professionals make faster and more informed decisions.