

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

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## 1. Introduction

Liver cirrhosis is a serious health condition that affects liver function over time. Early detection is critical for treatment and management. This project uses machine learning to build a predictive model that helps identify liver cirrhosis using patient data.

## 2. Objective

To design and implement a machine learning model that can:

- Predict liver cirrhosis based on medical data.
- Assist healthcare professionals in early diagnosis.
- Provide a simple user interface for predictions.

## 3. Dataset Details

The dataset includes features such as age, bilirubin levels, albumin levels, etc. Data preprocessing involved handling missing values, label encoding, and splitting the data into training and testing sets.

## 4. Exploratory Data Analysis (EDA)

EDA was performed to understand value distributions, check for outliers, and visualize feature correlations using heatmaps and pair plots. Key features like bilirubin were found to be highly correlated with cirrhosis.

## 5. Machine Learning Models Used

The following models were implemented and evaluated:

- Random Forest
- Support Vector Machine (SVM)
- K-Nearest Neighbors (KNN)

- Gradient Boosting
- XGBoost
- Logistic Regression

✅ Best Model: Logistic Regression, which achieved the highest accuracy of 75%.

## 6. Model Evaluation Metrics

Logistic Regression performed best overall with:

- Accuracy: 0.75
- Balanced precision and recall

Other models like SVM and XGBoost also performed well but were slightly less accurate.

## 7. Web App Deployment

A Flask-based web application was created to deploy the model. Users can input patient details via a web form and receive a prediction result. The app also provides performance metrics and visual outputs.

## 8. Technologies Used

1. Programming: Python
2. ML Libraries: Scikit-learn, XGBoost
3. Web Framework: Flask
4. Visualization: Matplotlib, Seaborn
5. Deployment: Flask local server

## 9. How to Run the Project

1. Clone the repository:

“ git clone <https://github.com/Mayuri-kub-26/Revolutionizing-Liver-Care-Predicting-Liver-Cirrhosis-using-Advanced-Machine-Learning-Techniques> “

2. Install requirements: pip install -r requirements.txt
3. Run the app: python app.py
4. Access via: http://127.0.0.1:5000

## 10. Results and Observations

The Logistic Regression model achieved 75% accuracy and provided reliable predictions. The web app was functional and easy to use, making it a useful tool for liver disease screening.

## 11. Future Work

- Expand dataset and features
- Tune hyperparameters for better performance
- Deploy on cloud platforms
- Add history logging and PDF export of results

## 12. Conclusion

This project demonstrates the potential of machine learning in healthcare. By predicting liver cirrhosis at an early stage, it supports doctors in making informed, data-driven decisions.

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