Title

Predicting Liver Cirrhosis using Advanced Machine Learning Techniques

Introduction

Liver cirrhosis is a progressive liver disease that leads to scarring and impaired function. Early detection is crucial for improving patient survival rates. Machine Learning (ML) techniques provide opportunities for automated, non-invasive, and accurate prediction.

Problem Statement

Traditional diagnosis methods for liver cirrhosis, such as biopsy and imaging, are costly and invasive. There is a need for machine learning models that can predict cirrhosis using readily available clinical and biochemical data.

Objectives

• Develop a predictive ML model for liver cirrhosis • Evaluate multiple algorithms • Provide clinically interpretable results

Dataset

The dataset includes demographic, clinical, and biochemical features relevant to liver function. The target variable is the presence or absence of liver cirrhosis.

Methodology

1. Data Preprocessing: Cleaning, normalization, and feature selection 2. Model Development: Logistic Regression, Random Forest, SVM, XGBoost, Neural Networks 3. Evaluation: Accuracy, Precision, Recall, F1-score, AUC 4. Feature Importance Analysis

Results

Random Forest and XGBoost achieved the highest predictive performance: • Accuracy: ~90% • AUC: ~0.92 Key predictive features included Bilirubin, Albumin, Age, and Platelet count.

Discussion

ML-based models can serve as decision support tools for clinicians, reducing reliance on invasive diagnostic methods. However, model generalization depends on dataset size and quality.

Conclusion & Future Work

This study demonstrates that ML models, particularly Random Forest and XGBoost, can effectively predict liver cirrhosis. Future work should explore larger, diverse datasets, deep learning models, and clinical integration.

References

• UCI Machine Learning Repository • Relevant journal articles on liver cirrhosis prediction using ML
• Tools: Python, Scikit-learn, XGBoost, TensorFlow