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

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Overview

Liver cirrhosis is a chronic and progressive disease characterized by irreversible scarring of liver tissue, leading to severe complications and potential liver failure. Early detection is crucial for timely intervention and improved patient outcomes. This project leverages advanced machine learning algorithms to predict the risk of liver cirrhosis based on clinical data, providing a user-friendly web interface for healthcare professionals.

Objectives

- Develop a predictive model for early detection of liver cirrhosis.
- Compare multiple machine learning algorithms and select the best performer.
- Provide an easy-to-use web interface for real-time predictions.
- Demonstrate the potential of machine learning in hepatology and clinical decision support.

Workflow

1. Data Acquisition: Automatically downloads the latest liver cirrhosis dataset from Kaggle using KaggleHub.
2. Data Preprocessing: Cleans the data by removing missing values and prepares features and labels.
3. Model Training & Optimization: Trains and tunes seven classification algorithms using GridSearchCV:
   - Logistic Regression
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   - XGBoost Classifier
   - Ridge Classifier
   - K-Nearest Neighbors Classifier
   - Random Forest Classifier
   - Decision Tree Classifier

4. Model Selection: Selects and saves the best-performing model based on test accuracy.

5. Web Application: Provides a Flask-based web interface for user input and displays predictions.

Technical Stack

- Python 3.x
- Libraries: pandas, scikit-learn, xgboost, flask, kagglehub, joblib
- Web Framework: Flask
- Machine Learning: Classification algorithms with hyperparameter optimization