Team Details

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Team Size: 4

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Project Documentation

Title

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

Domain

Machine Learning | Healthcare

Objective

Liver cirrhosis is a chronic and progressive liver condition that, if undetected, can lead to liver failure and other life-threatening complications.

This project aims to develop a robust machine learning model to predict the risk of liver cirrhosis, enabling early diagnosis and timely medical intervention.

The model is integrated into a user-friendly web application that allows healthcare providers to input patient data and receive real-time predictions.

Project Flow

1. Users enter patient health information through a web-based form.

2. The backend sends this data to a trained machine learning model.

3. The model analyzes the data and predicts the risk of liver cirrhosis.

4. The result is instantly displayed on the interface with an advisory message.

How It Works

1. User Access: The user opens the Liver Cirrhosis Prediction web app.

2. Data Input: A form collects features such as age, alcohol consumption, medical history, etc.

3. Model Prediction: The input is passed to a Random Forest classifier via Flask.

4. Result Display: The model returns a prediction - "At Risk" or "Not at Risk".

5. Advisory Output: A recommendation is provided regarding medical consultation.

The process is real-time, ensuring minimal delay between input and prediction.

Technologies & Tools

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- Programming Languages: Python, JavaScript, HTML, CSS

- Frameworks & Libraries: Flask, Pandas, Scikit-Learn, Seaborn, Matplotlib

- Model: Random Forest Classifier

- Deployment: Web-based interface using Flask

Project Organization

app.py - Flask backend for model inference

liver_cirrhosis.ipynb - Jupyter Notebook for model training & EDA

cleaned_data.csv - Cleaned dataset used for training

liver_prediction.pkl - Trained ML model saved for deployment

templates/ - HTML files (form page, result page)

static/ - CSS, JS, and image assets

HealthCareData.xlsx - Original raw medical dataset

Development Lifecycle

Understanding the Problem:

- Early detection of liver cirrhosis can drastically improve patient outcomes.

- There is a need for an accessible, intelligent, and reliable diagnostic aid.

Data Preparation:

- Collected real-world healthcare data.

- Performed data cleaning, imputation, and EDA.

Model Development:

- Models tested: Logistic Regression, KNN, Random Forest, XGBoost

- Best accuracy achieved using Random Forest

- Applied hyperparameter tuning to improve model performance.

Deployment:

- Saved the trained model as .pkl

- Built a Flask-based web application

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- Linked the frontend with backend for real-time predictions

Key Takeaways

- Practical application of classification algorithms

- Experience in model evaluation using accuracy, precision, recall, etc.

- Integrated ML model deployment using Flask

- End-to-end understanding of ML lifecycle from data ingestion to deployment

Findings

- Achieved high prediction accuracy

- Provided a simple, intuitive interface for clinical decision support

- Demonstrated the feasibility of ML in assisting early detection

Summary

This project demonstrates the potential of machine learning to revolutionize liver disease diagnostics.

By combining intelligent prediction with an accessible web interface, it empowers healthcare providers to make faster, data-driven decisions.

Future Scope

- Extend to detect other liver conditions (e.g., hepatitis, fatty liver)

- Improve UI/UX for mobile and low-resource environments

- Integrate with EHR (Electronic Health Record) systems

- Collect more diverse data for model generalization and robustness