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

1. INTRODUCTION

1.1 Project Overview

The Liver Disease Prediction project uses machine learning to detect the possibility of liver disease from user input. The aim is to assist healthcare professionals and individuals by providing early predictions based on accessible health metrics.

1.2 Purpose

This project aims to reduce diagnostic time and cost by offering an easy-to-use tool that can predict liver disease using clinical parameters, aiding in early detection and improved healthcare outcomes.

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2. IDEATION PHASE

2.1 Problem Statement

Liver diseases are often diagnosed late due to expensive and delayed testing. There is a need for a simple, fast, and cost-effective prediction tool to identify potential cases using available health data.

2.2 Empathy Map Canvas

- **Think & Feel:** Worry about health reports, uncertainty of diagnosis.
- **Hear:** Suggestions from friends, doctors, family members.
- **See:** Reports, symptoms, awareness posters.
- **Say & Do:** Seek alternative diagnosis options.
- **Pain:** Costly tests, time-consuming process.
- **Gain:** Quick preliminary results, early detection.

2.3 Brainstorming

- Use publicly available dataset.
- Train multiple ML models to find the best fit.

- Create a simple web interface for predictions.
- Include real-time model integration using Flask.

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3. REQUIREMENT ANALYSIS

3.1 Customer Journey Map

Discover tool → Input parameters → View prediction → Take action (consult doctor or retest).

3.2 Solution Requirement

- Input: Age, Gender, Total Bilirubin, Alkaline Phosphatase, Albumin, etc.
- ML model: Pre-trained `.pkl` model.
- User interface: HTML/CSS with Flask backend.

3.3 Data Flow Diagram

```
css
CopyEdit
[User Input] → [Frontend Form] → [Flask Backend] → [ML Model] → [Prediction
Output]
```

3.4 Technology Stack

- **Frontend:** HTML, CSS, JavaScript
- **Backend:** Python, Flask
- **Model:** Scikit-learn (e.g., RandomForest, Logistic Regression)
- **Deployment:** Localhost / Cloud (optional)
- **Dataset:** UCI ILPD Dataset

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4. PROJECT DESIGN

4.1 Problem-Solution Fit

Helps address late diagnosis by offering a simple tool that users can access anytime for risk assessment.

4.2 Proposed Solution

Develop a lightweight web application that predicts liver disease using clinical data, trained ML model, and Flask backend.

4.3 Solution Architecture

```
css
CopyEdit
[User Interface] → [Flask Backend] → [ML Model] → [Return Prediction]
```

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5. PROJECT PLANNING & SCHEDULING

5.1 Project Planning

Week	Task
1	Data collection & preprocessing
2	Exploratory Data Analysis (EDA)
3	Model training & evaluation
4	Frontend development
5	Backend integration
6	Testing & documentation

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6. FUNCTIONAL AND PERFORMANCE TESTING

6.1 Performance Testing

- Accuracy: ~75%
- Evaluated using train-test split and confusion matrix
- Tools: Scikit-learn metrics (`accuracy_score`, `confusion_matrix`)

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7. RESULTS

7.1 Output Screenshots

- Input form page
- Prediction output
- Terminal log (Flask server)
  💼 Screenshots included in the project folder.

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8. ADVANTAGES & DISADVANTAGES

Advantages

- Cost-effective and fast
- Easily accessible
- Easy integration with real-world platforms

Disadvantages

- Not a substitute for medical diagnosis
- Relies on data quality and limited features

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9. CONCLUSION

The project demonstrates how machine learning can be applied to healthcare problems, offering a valuable tool for liver disease screening and supporting the goal of early detection.

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10. FUTURE SCOPE

- Use of deep learning for better accuracy
- Add patient record management system
- Mobile app integration
- Deploy to cloud (Heroku, AWS)

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11. APPENDIX

Source Code

📁 Included in `source_code/` directory.

Dataset Link

Indian Liver Patient Dataset (UCI)

GitHub Link

https://github.com/anusha506777/liver-disease-prediction

Project link

https://drive.google.com/file/d/1I7wwaERNKlznZ3rHIOnCggZ6zuRykPgP/view?usp=drive_link

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Project Demonstration

Demo video link

:https://drive.google.com/file/d/1I7wwaERNKlznZ3rHIOnCggZ6zuRykPgP/view?usp=drive_link