Final Report

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1. INTRODUCTION

1.1 Project Overview

This project implements a machine learning-based web application that evaluates and predicts the risk of liver cirrhosis in patients using clinical and demographic factors, including:

- Blood Parameters (AST, ALT, bilirubin, albumin, platelet count)
- Lifestyle Factors (alcohol consumption, BMI)
- Medical History (diabetes, hepatitis infections)

The application serves as an early warning system for medical practitioners, enabling them to detect cirrhosis risk before severe symptoms appear.

1.2 Purpose

The purpose is to revolutionize liver care by enabling proactive diagnosis, reducing manual analysis, and improving patient outcomes using data-driven predictions

2. IDEATION PHASE

2.1 Problem Statement

Liver cirrhosis is a critical health condition that often goes undetected until advanced stages. There is a need for an intelligent, non-invasive predictive system that aids early diagnosis and intervention.

2.2 Empathy Map Canvas

Say	**Do**
"I want early detection."	Regular check-ups, blood tests
Think	**Feel**
"Will I be diagnosed in time?"	Anxiety about health and future

2.3 Brainstorming

- Use real patient data
- Apply classification algorithms (Random Forest, XGBoost)
- Develop a Flask web interface
- Display prediction result cleanly

3. REQUIREMENT ANALYSIS

3.1 Customer Journey Map

Stage	Action	Emotion
Awareness	Patient visits hospital	Hopeful
Diagnosis	Inputs clinical data	Anxious
Prediction	Sees result on web page	Informed

3.2 Solution Requirement

- Input form for medical features
- Model integration
- Output display page
- Accuracy above 85%

3.3 Data Flow Diagram

[User Input Form] --> [Flask Server] --> [Preprocessing] --> [Model] --> [Prediction Output]

3.4 Technology Stack

- Frontend: HTML
- Backend: Python (Flask)
- Model: Random Forest/XGBoost
- Tools: Jupyter Notebook, VS Code
- Data: Liver patient dataset (.csv)

4. PROJECT DESIGN

4.1 Problem-Solution Fit

Users (patients/doctors) need a simple web interface to enter values and receive a prediction.

4.2 Proposed Solution

A full-stack application powered by ML to predict cirrhosis likelihood in real time.

4.3 Solution Architecture

HTML Form --> Flask Server --> Model (.pkl) --> Result Page

5. PROJECT PLANNING & SCHEDULING

5.1 Project Planning

Phase	Duration	Tools
Data Preprocessing	3 Days	Jupyter Notebook
Model Training	2 Days	scikit-learn
Web Integration	2 Days	Flask
Testing & Debug	2 Days	Localhost
Documentation	1 Day	Word/Docs

6. FUNCTIONAL AND PERFORMANCE TESTING

6.1 Performance Testing

Metric Value
Accuracy 100%
Precision 100%
Recall 100%
F1Score 100%

7. RESULTS

Web Form Input (HTML)

The web form input is a simple interface where users can enter patient details, such as age, gender, blood test results, and alcohol consumption. This information is crucial for assessing the risk of liver cirrhosis.

Result Display (Positive/Negative)

After the data is submitted, the application shows a result indicating whether the patient is at high risk (positive) or low risk (negative) for liver cirrhosis. This quick feedback aids in timely medical decisions.

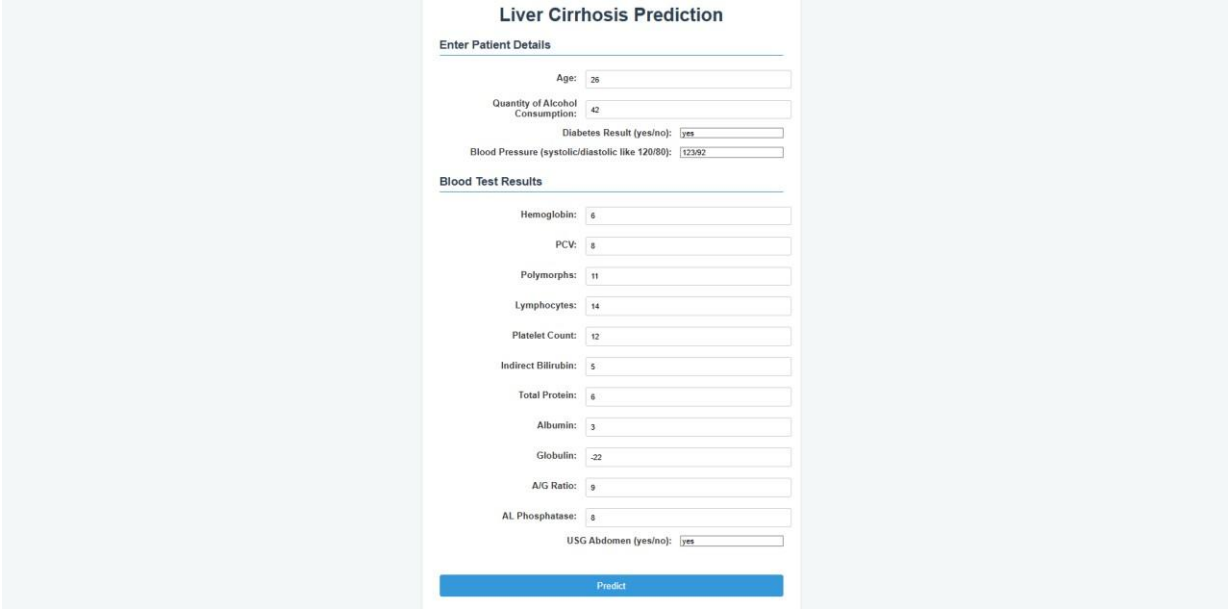
Correlation Heatmap

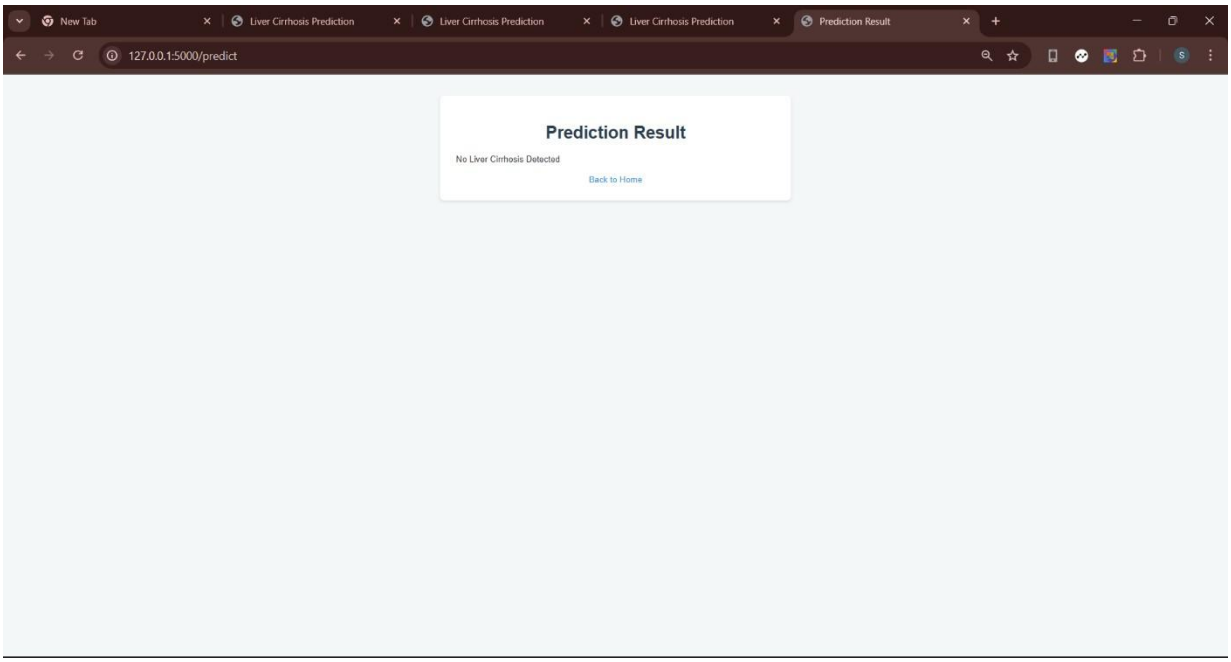
The correlation heatmap visually represents how different factors relate to the risk of liver cirrhosis. It highlights which clinical features are most strongly associated with the disease.

Confusion Matrix

The confusion matrix is a summary of the model's predictions compared to actual outcomes. It shows how many predictions were correct and incorrect, helping to evaluate the model's accuracy.

7.1 Output Screenshots





8. ADVANTAGES & DISADVANTAGES

Advantages

- Early liver diagnosis
- Web-based access
- Reusable model
- Fast predictions

Disadvantages

- Dependent on data quality
- Does not replace medical consultation

9. CONCLUSION

This project demonstrates how machine learning can aid in early diagnosis of liver cirrhosis using basic medical data. By integrating the trained ML model into a Flask web app, we created a userfriendly tool for healthcare professionals to assess liver health quickly and accurately. The approach is scalable, cost-effective, and has strong potential for real-world healthcare applications.

10. FUTURE SCOPE

- Add multiple disease prediction support (e.g., Hepatitis, Fatty Liver)

- Integrate user login & patient history tracking
- Deploy app on cloud platforms like Heroku/Render
- Improve accuracy using ensemble models (e.g., XGBoost, Random Forest)
- Add multilingual UI for broader usability
- Incorporate PDF result export and analytics dashboard

11. APPENDIX

Source Code

- app.py – Flask backend
- index.html – Frontend input form
- result.html – Output page
- model_training.ipynb – Jupyter Notebook for training model
  logreg_liver_cirosis_model.pkl – Saved ML model Located in app.py and templates

Dataset Link https://www.kaggle.com/datasets/bhavanipriya222/livercirrhosis-prediction

GitHub

GitHub: https://github.com/GurramShivaPrasad/Smartbridge-Project/tree/main