Final Report

# 1. INTRODUCTION

# 1.1 Project Overview

Liver cirrhosis is a severe chronic disease involving the irreversible scarring of liver tissues. This project presents a machine learning-driven predictive model aimed at the early diagnosis of liver cirrhosis using clinical data, allowing healthcare providers to deliver timely and targeted interventions.

# 1.2 Purpose

The purpose of the project is to build an early prediction model using machine learning, deploy it via a web interface using Flask, and help medical professionals improve prognosis and care strategies.

# 2. IDEATION PHASE

# 2.1 Problem Statement

Early-stage liver cirrhosis often goes undiagnosed due to non-specific symptoms. A predictive tool can assist in identifying at-risk individuals through clinical parameters.

# 2.2 Empathy Map Canvas

- Who?: Healthcare professionals and patients  
- What they see?: Complicated diagnostic procedures  
- What they hear?: Risk of late-stage detection  
- What they feel?: Anxiety, uncertainty  
- What they say/do?: Seek quicker, reliable results  
- Pain?: Late diagnosis, irreversible damage  
- Gain?: Early treatment, better outcomes

# 2.3 Brainstorming

Ideas: Use of ML models like Gaussian Naive Bayes, Random Forest, XGBoost, deployment via Flask, clinical interpretability.

# 3. REQUIREMENT ANALYSIS

# 3.1 Customer Journey Map

User inputs clinical values → Backend model analyzes → UI displays prediction → Doctor uses result

# 3.2 Solution Requirement

Clean and normalized dataset, trained ML model, HTML interface, Flask integration for predictions.

# 3.3 Data Flow Diagram

1. UI Form Input → 2. Flask Backend → 3. ML Model → 4. Prediction → 5. Output on UI

# 3.4 Technology Stack

Python, Flask, HTML/CSS, scikit-learn, pandas, numpy, deployment on localhost/cloud

# 4. PROJECT DESIGN

# 4.1 Problem-Solution Fit

A tool for early-stage liver cirrhosis prediction is feasible and impactful in reducing fatality rates.

# 4.2 Proposed Solution

Train a Gaussian Naive Bayes model and deploy using Flask with an HTML-based interface.

# 4.3 Solution Architecture

User → Web Interface (HTML) → Flask App → Trained Model → Prediction Result

# 5. PROJECT PLANNING & SCHEDULING

# 5.1 Project Planning

Week 1–2: Problem research, dataset collection  
Week 3: Preprocessing and EDA  
Week 4: Model building  
Week 5: Evaluation and tuning  
Week 6: Flask integration  
Week 7: Documentation & demo recording

# 6. FUNCTIONAL AND PERFORMANCE TESTING

# 6.1 Performance Testing

Model: Gaussian Naive Bayes  
Accuracy: 68%  
Evaluation Metrics: Accuracy, Precision, Recall, F1-score  
Hyperparameter tuning applied

# 7. RESULTS

# 7.1 Output Screenshots

• UI Input Form  
• Prediction Output  
• Flask Logs

# 8. ADVANTAGES & DISADVANTAGES

## Advantages

- Early diagnosis  
- Fast predictions  
- Can be improved further

## Disadvantages

- Dataset limitations  
- Not a clinical substitute

# 9. CONCLUSION

This prediction tool demonstrates how machine learning and web technology can support liver health diagnostics. Gaussian Naive Bayes was chosen for its simplicity and performance balance.

# 10. FUTURE SCOPE

- Link with hospital databases  
- Deep learning enhancements  
- Mobile app version  
- Real-time API deployment

# 11. APPENDIX

## Source Code

Provided in the project folder

## Dataset Link

https://archive.ics.uci.edu/ml/datasets/liver+disorders

## GitHub & Project Demo Link

To be added by user after upload