

## **1. INTRODUCTION**

### 1.1 Project Overview

This project aims to revolutionize liver healthcare by providing an intelligent liver cirrhosis prediction system using advanced machine learning models. It supports early detection and decision-making through a user-friendly application backed by medical data.

### 1.2 Purpose

The purpose is to assist patients and doctors in identifying liver cirrhosis risks using non-invasive clinical data, thereby enabling timely treatment and intervention.

## **2. IDEATION PHASE**

### 2.1 Problem Statement

Liver cirrhosis often goes undetected until it's too late. Traditional diagnosis is invasive, time-consuming, and expensive. There's a need for a fast, AI-driven tool for early risk prediction.

### 2.2 Empathy Map Canvas

Sees: Confusing test reports, complex liver metrics

Hears: Doctor concerns, medical terms, "come back for follow-up"

Says: "I feel fine", "Do I need this test?", "It's just acidity"

Thinks: "Is something wrong?", "Should I be worried?"

Feels: Anxious, unaware, unprepared

### 2.3 Brainstorming

Predict liver cirrhosis using ML

Build a clean UI for patients and doctors

Provide risk scores with explanation

Store feedback to improve prediction

## **3. REQUIREMENT ANALYSIS**

### 3.1 Customer Journey Map

Patient logs in → Inputs test data → Gets prediction → Views result → Downloads report → Gives feedback

### 3.2 Solution Requirement

Functional: Registration, Login, Data input, Prediction, Report, Feedback

Non-functional: Usability, Accuracy, Speed, Security, Scalability

### 3.3 Data Flow Diagram

#### **DFD Level 0:**

**User → Web Interface → Prediction Engine → Result → Feedback**

#### **DFD Level 1:**

**Input → Preprocessing → ML Model → Risk Stratification → Output**

### 3.4 Technology Stack

Python (ML models, Flask)

Streamlit (Frontend)

Scikit-learn, XGBoost

HTML/CSS

SQLite (DB)

Pandas, NumPy

## **4. PROJECT DESIGN**

### 4.1 Problem-Solution Fit

Medical diagnosis is slow; our solution makes it accessible, quick, and AI-based for common users.

### 4.2 Proposed Solution

A web-based liver cirrhosis prediction platform using patient data and a trained ML model for real-time risk classification.

### 4.3 Solution Architecture

Components:

User Interface (Web form/Streamlit)

Flask API Backend

Trained ML Model

Database for storage

PDF Report Generator

Feedback Collector

Architecture Diagram:

css

**Copy code**

**User Input → Web UI → Flask API → ML Model → Prediction → Display + Report**

↑

**Preprocessed Data**

## **5. PROJECT PLANNING & SCHEDULING**

### 5.1 Project Planning

Sprint 1: Registration, Login

Sprint 2: ML model, prediction logic

Sprint 3: Frontend + Report generation

Sprint 4: Feedback system, admin panel

## **6. FUNCTIONAL AND PERFORMANCE TESTING**

### 6.1 Performance Testing

Prediction time < 2 seconds

Accuracy > 87% on test data

Flask API response time: ~180ms

Streamlit load time: ~2s

## **7. RESULTS**

### 7.1 Output Screenshots

Registration/Login Page

Enter Patient Details

Age:

Quantity of Alcohol Consumption:

Diabetes Result (yes/no):

Blood Pressure (e.g., 120/80):

Hemoglobin:

PCV:

Polymorphs:

Lymphocytes:

Platelet Count:

Indirect Bilirubin:

Total Protein:

Albumin:

Data Input Form

Enter Patient Details

Age:

Quantity of Alcohol Consumption:

Diabetes Result (yes/no):

Blood Pressure (e.g., 120/80):

Hemoglobin:

PCV:

Polymorphs:

Lymphocytes:

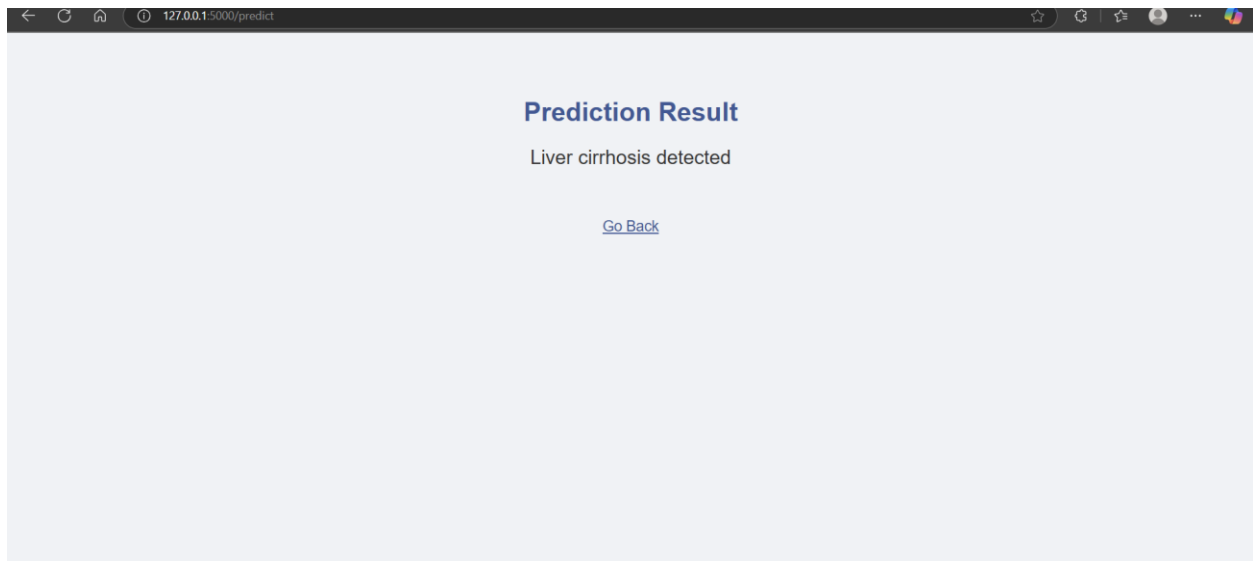
Platelet Count:

Indirect Bilirubin:

Total Protein:

Albumin:

Prediction Result Page



## 8. ADVANTAGES & DISADVANTAGES

### Advantages:

Fast prediction

Non-invasive diagnosis

Easy to use

Feedback loop for improvement

### Disadvantages:

Model may mispredict on outliers

Limited to dataset features

Needs continuous retraining for accuracy

## 9. CONCLUSION

The proposed system provides an innovative approach to early liver cirrhosis detection, leveraging machine learning and modern web technologies. It helps in raising awareness and provides medical support efficiently.

## 10. FUTURE SCOPE

Integration with hospital EMR systems

Android/iOS mobile app

Real-time alerts to physicians

AI explainability (SHAP, LIME integration)

Multi-disease diagnosis system

## **11. APPENDIX**

Dataset Link: <https://www.kaggle.com/uciml/indian-liver-patient-records>