

Project Design Phase Problems and Solutions

Date	19 July 2025
Team ID	LTVIP2025TMID41526
Project Name	Revolutionizing Liver Care: Predicting Liver Cirrhosis Using Advanced Machine Learning Techniques.
Maximum Marks	2 Marks

Problem:

Liver cirrhosis is a chronic disease that often goes undiagnosed until its late stages. Due to a lack of early detection tools and awareness, many patients suffer severe health consequences, leading to increased mortality rates.

2. Target Group / Customers:

Patients at risk of liver disease, hospitals, healthcare institutions, and diagnostic labs that require efficient and early screening tools.

3. Existing Alternatives:

Traditional liver function tests and biopsies are invasive, time-consuming, and costly. Manual interpretation can be inconsistent and prone to human error.

4. Problems With Existing Alternatives:

- Lack of early-stage prediction capability.
- High cost and invasiveness.
- Delay in diagnosis and treatment decisions.
- Requires clinical expertise for interpretation.

5. Solution:

A machine learning-based predictive model that uses patient health data to accurately classify the presence of liver cirrhosis. It enables early detection, allowing for timely medical intervention and better prognosis.


Purpose:


1. Early Detection of Liver Cirrhosis: The main goal is to identify liver cirrhosis at an early stage using machine learning or data analysis techniques to prevent further complications.
2. Support Clinical Decision-Making: Help doctors and healthcare professionals make more accurate and timely diagnoses using automated prediction systems based on patient data.
3. Reduce Diagnosis Time: Speed up the diagnostic process compared to traditional methods, ensuring patients receive quicker treatment and medical advice.

4. **Improve Patient Outcomes:** By detecting cirrhosis early, the project aims to increase patient survival rates and improve overall health outcomes through timely interventions.
5. **Enhance Medical Data Utilization:** Utilize available clinical data efficiently to train models that can predict liver conditions accurately, leading to better insights and research.
6. **Cost-Effective Screening Tool:** Provide a low-cost, scalable, and non-invasive tool for screening liver cirrhosis, especially in remote or under-resourced areas.

Problem and Solutions:

Problem-Solution Fit canvas		Purpose / Vision	Version:
Define CS, fit into CL	1. CUSTOMER SEGMENT(S) CS Medical researchers Doctors in rural hospitals Public health analysts Patients seeking early detection	6. CUSTOMER LIMITATIONS CL <small>EG. BUDGET, DEVICES</small> Limited budget in rural/low-income hospitals Lack of technical expertise to run complex ML systems Limited access to internet or advanced diagnostic labs	5. AVAILABLE SOLUTIONS AS <small>PROS & CONS</small> Manual analysis of lab reports Offline prediction based on experience Government awareness programs
	2. PROBLEMS / PAINS + ITS FREQUENCY PR Predict liver cirrhosis early based on health parameters Reduce time and effort in manually identifying risky patients Help medical professionals take preventive action earlier	9. PROBLEM ROOT / CAUSE RC Lack of early diagnostic tools Growing alcoholic and non-alcoholic liver disease burden Overload of patients vs fewer doctors in rural clinics	7. BEHAVIOR + ITS INTENSITY BE Doctors review liver function tests manually Patients often ignore symptoms until serious Health workers use basic thresholds
Focus on PR, tap into BE, understand RC	3. TRIGGERS TO ACT TR Increasing liver disease cases Late-stage detection leading to fatalities	10. YOUR SOLUTION SL A machine learning-based model (built using Python, scikit-learn, XGBoost) that: Accepts patient data (from Excel/CSV) Trains and evaluates ML models (KNN, Logistic SVC, XGBoost) Outputs prediction (Yes/No) for liver cirrhosis	8. CHANNELS of BEHAVIOR CH ONLINE Use of Google Colab OFFLINE Patient check-ups and medical history intake
	4. EMOTIONS EM <small>BEFORE / AFTER</small> Before: Uncertain, anxious, reactive After: Confident, proactive, data-supported decision making		
Identify strong TR & EM			Extract online & offline CH of BE


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