

Project Design Phase

Problems and Solutions

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| Date | 27 June 2025 |
| Team ID | LTVIP2025TMID38326 |
| 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 |
| | Focus on PR, tap into BE, understand RC | 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 |
| Identify strong TR & EM | | 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 |
| | 4. EMOTIONS <small>BEFORE / AFTER</small> EM Before: Uncertain, anxious, reactive After: Confident, proactive, data-supported decision making | OFFLINE Patient check-ups and medical history intake | |

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 Designed by Daria Nepriakhina / ideahackers.nl - we tailor ideas to customer behaviour and increase solution adoption probability.

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