Requirement Analysis

The Requirement Analysis Phase focuses on identifying, organizing, and validating the core needs that the liver care prediction system must address. It ensures that the solution is not only medically accurate but also aligned with real-world clinical workflows and stakeholder expectations—such as doctors, lab technicians, and health administrators.

In our project, "Revolutionizing Liver Care: Predicting Liver Cirrhosis," this phase bridged the gap between recognizing medical challenges and designing a technical solution using patient journeys, data flows, and system requirements. Where user-centered planning meets clinical clarity to transform a healthcare need into a buildable, intelligent solution..
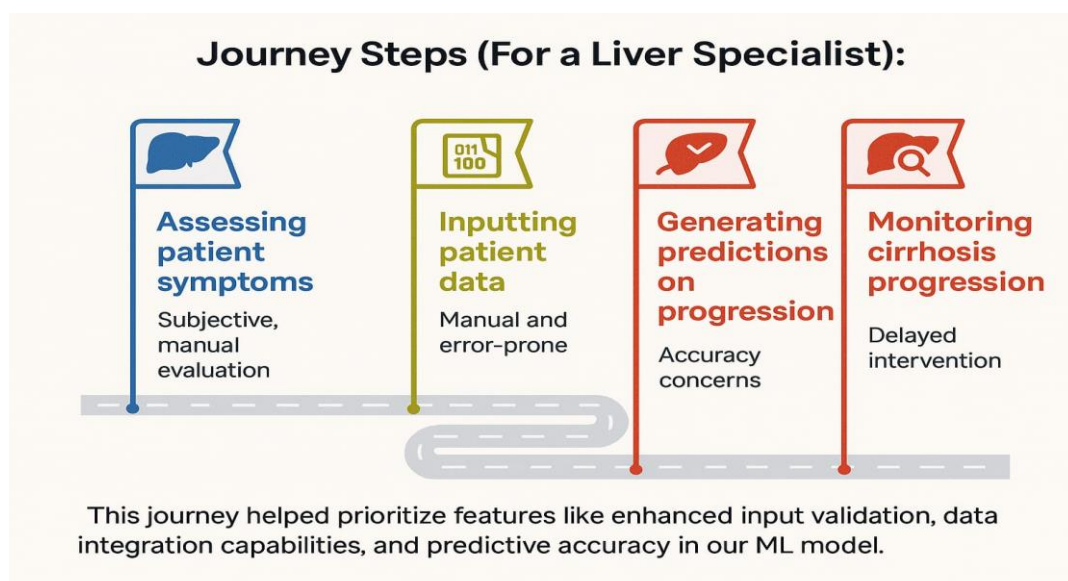
◆ Customer Journey Map-Understanding User Experience Flow

Purpose: The Patient Journey Map illustrates how liver care stakeholders (e.g., hepatologists, lab technicians, administrators) interact with the system throughout the diagnosis and treatment process. It highlights key actions, pain points, and improvement areas, guiding system design from a real-world medical perspective.

Journey Steps (For a Hepatology Clinician):

Journey Steps (For a Liver Specialist):

Assessing patient symptoms
Subjective, manual evaluation

Inputting patient data
Manual and error-prone

Generating predictions on progression
Accuracy concerns

Monitoring cirrhosis progression
Delayed intervention

This journey helped prioritize features like enhanced input validation, data integration capabilities, and predictive accuracy in our ML model.

◆ Data Flow Diagram

Purpose: Mapping Information Flow in Liver Cirrhosis Prediction System
The Data Flow Diagram (DFD) models how patient data and clinical information move through the liver cirrhosis prediction system. It structures the relationship between key components:
● Patient Records, Clinical Tests, Risk Factors, Prediction Engine, and Medical

Level 1 DFD Overview:

1. **Healthcare Provide Inputs**:

   ○ Adds patient demographics, medical history, lifestyle factors.

   ○ Inputs clinical test results (e.g., liver enzymes, bilirubin levels, imaging results).
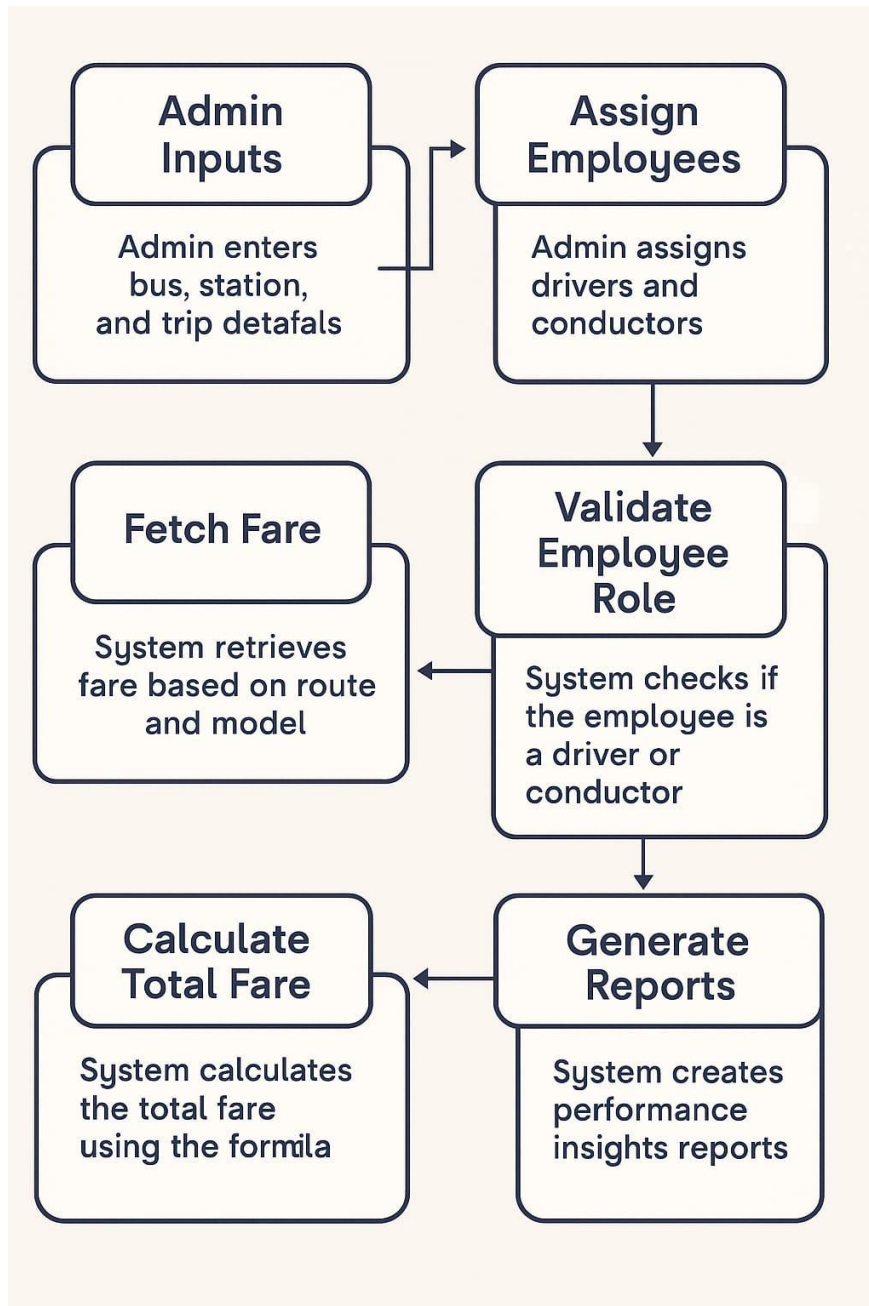2. **System Logic**:

   ○ Validates data completeness and test ranges.

   ○ Analyzes risk factors using a trained machine learning model.

   ○ Predicts liver cirrhosis risk based on patient profile and clinical indicators.

3. **Outputs**:

   ○ Generates risk source and predictive reports

   ○ Displays error messages for missing or invalid input data.

Revolutionizing Liver Care
Predicting Liver Cirrhosis

Doctor → Visit → Employee→Test→Tes
Resul

```
┌─────────────────┐        ┌─────────────────┐
│     Admin       │──────→ │     Assign      │
│     Inputs      │        │    Employees    │
│                 │        │                 │
│  Admin enters   │        │  Admin assigns  │
│  bus, station,  │        │  drivers and    │
│  and trip       │        │  conductors     │
│  detafals       │        │                 │
└─────────────────┘        └─────────────────┘
                                    │
                                    ↓
┌─────────────────┐        ┌─────────────────┐
│   Fetch Fare    │        │    Validate     │
│                 │        │    Employee     │
│                 │← ───── │      Role       │
│ System retrieves│        │                 │
│ fare based on   │        │ System checks if│
│ route and model │        │ the employee is │
│                 │        │ a driver or     │
│                 │        │ conductor       │
└─────────────────┘        └─────────────────┘
                                    │
                                    ↓
┌─────────────────┐        ┌─────────────────┐
│   Calculate     │        │    Generate     │
│   Total Fare    │        │    Reports      │
│                 │← ───── │                 │
│ System calculates│       │ System creates  │
│ the total fare  │        │ performance     │
│ using the formila│       │ insights reports│
└─────────────────┘        └─────────────────┘
```

◆ Solution Requirements

What the Liver Cirrhosis Prediction System System Must Do

Functional Requirements:

- Create custom data entities for:

  - Patient Profile, Clinical Test Results, Risk Factors, Prediction Scores

- Establish data relationships using lookup fields and clinical formula calculations.
- Validate clinical data entries and test ranges using automated logic.
- Automate risk prediction using machine learning workflows.
- Support real-time dashboards and detailed risk assessment reports for clinicians.

Non-Functional Requirements:

- Provide a **user-friendly healthcare interface** for easy data entry and monitoring.

- Enable **real-time clinical data validation** to ensure accuracy and completeness.

- Maintain a **centralized, secure patient database** with well-structured relationships.

◆ **Technology Stack**

Tools & Platforms Used for Liver Cirrhosis Prediction System

Category	Technology Used	Description
Platform	Python	Used to build advanced machine learning models for prediction
Automation	Data Pipelines & Real-time Validation	Automate data preprocessing, feature extraction, and ensure accurate clinical inputs
Custom Logic	Machine Learning Algorithms	Applied classification and regression models to predict liver cirrhosis risk levels
Reports & Dashboards	Interactive Dashboards	Analyze patient data, prediction outcomes, and risk trends
UI/UX	Web Interface	Create an intuitive clinical interface for data entry, model results, and patient tracking

Summary

This Requirement Analysis Phase ensured that all components of the liver cirrhosis prediction system were:

- **Clinically focused** to address real healthcare challenges.
- **Data-driven** with structured medical records and patient histories.
- **Powered by advanced machine learning** to enable early and accurate disease prediction.
- **User-friendly** through intuitive UI design and insightful performance dashboards.

It directly influenced our approach to data modeling, automation, interface design, and clinical reporting—making the system both reliable and actionable in real-world medical environments.