Requirement Analysis Document

Project: Visualization Tool for Electric Vehicle Charge and Range Analysis

1. Introduction

This document defines the functional and non-functional requirements for the Electric Vehicle (EV) Charge and Range Analysis Visualization Tool. The system is designed to help EV users, fleet managers, and researchers analyze battery performance, charging behavior, and driving range predictions.

2. Scope

- Provide real-time visualization of battery State of Charge (SOC).
- Predict driving range based on current battery level and efficiency.
- Analyze historical charging sessions and trip data.
- Generate reports for performance and efficiency analysis.

3. Functional Requirements

- User Authentication: Secure login and registration system.
- Data Upload: Import vehicle telematics and trip datasets (CSV/JSON).
- Dashboard View: Display SOC trends, energy consumption graphs, and charging history.
- Range Prediction Module: Calculate estimated driving range using battery and consumption data.
- Charging Station Visualization: Map-based display of nearby charging stations.
- Report Generation: Export analysis reports in PDF/CSV format.

4. Non-Functional Requirements

- Performance: Dashboard should load within 2 seconds.
- Scalability: Support large datasets (10,000+ records).
- Security: Encrypt user data and ensure secure API communication.

- Usability: Responsive UI compatible with desktop and mobile devices.
- Reliability: System uptime of at least 99%.

5. System Requirements

- Frontend: React.js / Angular / Vue.js
- Backend: Python (Flask/Django) or Node.js
- Database: PostgreSQL / MongoDB
- Visualization Libraries: Chart.js, D3.js, or Plotly
- Deployment: Cloud platform (AWS / Azure / GCP)

6. Constraints

- Accuracy of predictions depends on quality of input data.
- API access limitations for charging station data.
- Hardware limitations for large-scale data processing.