P1. Topic and Objectives

The GitHub link is below:
https://github.com/starsbro/DAMG6210_Group02

Topic

Electric Vehicle (EV) Charging Station Management

Mission Statement

To enable reliable, accessible, and efficient **EV charging services** by managing stations, reservations, users, and payments in a centralized database that supports both operational efficiency and customer satisfaction.

For example:

1) A driver with a Tesla Model 3 can quickly find the nearest fast charger that matches their vehicle's connector type and reserve a time slot in advance.
2) A family with multiple EVs can manage all their vehicles under one account, ensuring compatibility with different charger types.
3) Station operators can monitor which chargers are occupied, which ones need maintenance, and when peak demand occurs.
4) The system can generate accurate billing records — whether a user pays per kWh, per minute, or via a subscription plan.

By supporting these functions, the database ensures that:

1) **Drivers** experience convenience and trust in the availability of charging services.
2) **Operators** gain insights into usage trends, revenue, and maintenance needs.
3) **Communities** benefit from smoother EV adoption, reduced range anxiety, and more sustainable transportation infrastructure.

Mission Objectives

Our database will accomplish the following objectives:

1. Station Management

1) Maintain comprehensive records for each charging station, including:
    a) Station ID, name, address, and GPS coordinates.
    b) Number of charging points available.
    c) Charger type (fast charger, slow charger, connector type such as CCS/CHAdeMO).
    d) Operating hours and service availability.
2) Continuously update the **status of each charging point** (Available, Occupied, Out of Service).
3) Provide a lookup function that allows users to search for stations by **location, charger type, or availability**.

2. User & Vehicle Management

1) Store EV owner details: user ID, name, email, phone number, account type (regular, premium).
2) Maintain vehicle records linked to each user:
    a) Vehicle make, model, battery capacity, and charging compatibility.
3) Support **multiple vehicles per user** (e.g., a family with two EVs).
4) Allow the system to suggest suitable charging points based on the vehicle's **connector type**.

3. Reservation & Scheduling

1) Enable users to:
    a) Reserve charging slots in advance for a specific station and time.
    b) Cancel or modify reservations within defined rules (e.g., at least 1 hour before).
2) Automatically **prevent double-booking** of the same charger.
3) Support **walk-in users** (without reservations) by updating system slot occupancy in real-time.
4) Provide alerts/reminders (e.g., reservation confirmation, approaching time slot).

4. Billing & Payments

1) Log details of every charging session:
    a) Start/end time, energy consumed (kWh), total cost.
    b) Payment method (credit card, digital wallet, membership plan).
2) Support flexible billing models:
    a) **Pay-as-you-go** (per kWh).
    b) **Time-based fees** (per minute/hour).
    c) **Subscription plans** (flat fee per month with discounts).
3) Track payment history for each user (invoices, receipts, outstanding balances).

4) Generate financial summaries for station operators.

5. Analytics & Reporting

1) Provide operators with performance insights:
    a) Utilization rates of each charging station and charging point.
    b) Peak usage times (daily, weekly, seasonal patterns).
    c) Most common user profiles (e.g., regular vs. premium users).
2) Track **faults and maintenance history** for chargers, enabling predictive maintenance.
3) Generate **revenue reports**: total earnings per station, per location, and per charging type.
4) Support **sustainability tracking**, e.g., an estimate of CO_2 emissions saved by EV usage compared to gasoline.

This Mission Statement and Mission Objectives make the project **clear, achievable, and reasonable**.