**Project Report: Vehicle Parking Management System**

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**1. Problem Statement**

Urban areas frequently experience issues with vehicle parking, leading to time wastage, frustration, and congestion. Most manual parking systems are inefficient and prone to errors. This project aims to automate the process of booking and managing parking slots via a web-based dashboard. Users can view, reserve, and manage parking slots through a streamlined interface.

**2. Proposed Solution**

The Vehicle Parking App is a web application that allows registered users to book available parking slots in real time. It consists of separate dashboards for users and administrators.

* **Users** can log in, view available slots, and make bookings.
* **Admins** can manage the slots, view all bookings, and monitor slot availability.

The project is built using Flask (Python) for backend logic and HTML/CSS/JavaScript for the frontend interface. SQLite is used for the database, ensuring a lightweight and fast data management experience.

**3. System Architecture**

* **Frontend:** HTML5, Bootstrap, and JavaScript
* **Backend:** Python Flask
* **Database:** SQLite
* **Hosting Environment:** Localhost

**Key Components:**

* login.html, register.html – Authentication pages
* user\_dashboard.html – User interface for slot booking
* admin\_dashboard.html – Admin slot management panel
* app.py – Main Flask app handling routes and logic
* parking.db – Stores user info, booking records, and slot availability

**4. Key Features**

* **User Authentication:** Secure login and registration for users and admins
* **Slot Booking System:** Displays real-time parking slot availability
* **Admin Control Panel:** Add, delete, or edit slot status
* **Booking Validation:** Prevents double-booking and provides confirmation
* **User-Friendly UI:** Clear layout for ease of access on all devices

**5. Challenges Faced**

* **Concurrency Handling:** Preventing slot clashes when multiple users book simultaneously
* **UI Responsiveness:** Ensuring consistent performance across browsers and devices
* **Glitch in Pop-up Booking Modal:** Solved using appropriate form reset and modal triggers in the JavaScript

**6. Future Scope**

* Online Payment Integration
* SMS/Email Confirmation on Booking
* Real-time Maps Integration with GPS Tracking
* Admin Analytics Dashboard for Usage Patterns

**7. AI/LLM Usage**

Frontend + Backend = 63%