EvPowerStop - Electric Vehicle Station Finder and Slot Scheduler

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Abstract: *With the increasing adoption of electric vehicles (EVs) worldwide, a significant challenge has emerged for EV drivers: locating compatible charging stations in real-time and securing slots for efficient use. The transition to electric mobility has created a demand for seamless infrastructure that supports the dynamic needs of EV drivers. Currently, the lack of centralized information on charging station availability and compatibility with specific vehicles leads to inconveniences and delays, reducing the overall efficiency of electric vehicle usage. This project addresses this gap by developing an EV station finder and slot scheduling application—EV Power Stop—designed to simplify the charging process and ensure that EV drivers can plan their trips with confidence.*

The broader context of this work lies in the realm of smart cities and sustainable transportation. As nations push toward carbon-neutral goals, the role of electric vehicles becomes crucial in reducing emissions and lowering dependency on fossil fuels. For this shift to be effective, smart solutions that integrate transportation with infrastructure are vital. This project aligns with the goals of smart urban mobility by offering a system that leverages real-time data to provide EV drivers with the most up-to-date information on charging station availability.

The proposed system uses Flutter as a cross-platform framework for the frontend and Firebase as the backend for managing user data, station information, and slot booking in real-time. APIs like Google Maps are integrated to offer navigational support, ensuring users can easily find and access nearby stations. Key features include user authentication, slot booking, real-time updates on availability, and route guidance. The system is designed with scalability, performance, and security in mind, ensuring that it can handle a growing user base while maintaining quick response times.

Initial testing shows that the app responds within 2 seconds for most user interactions, meets usability standards, and securely manages personal data. Future developments will focus on integrating additional functionalities like iOS support, predictive scheduling, and automated slot management to improve efficiency further. This project demonstrates the potential for integrating real-time systems with urban mobility to enhance the electric vehicle user experience and support broader sustainability goals..

Keywords: Electric vehicles, charging stations, slot scheduling, real-time data, smart cities, sustainable transportation, Flutter, Firebase, Google Maps API