

# Survey on EV Charging Locator

Pankaj Maudekar<sup>1</sup>, Dhanshri Patle<sup>2</sup>, Ritika Sakharwade<sup>3</sup>, Danish Sheikh<sup>4</sup>, Vicky Patle<sup>5</sup>, Rakesh Jambhulkar<sup>6</sup>

<sup>1,2,3,4,5</sup>Student, Manoharbai Patel institute of Engineering and Technology Shahapur, Bhandara

<sup>6</sup>Assistant Professor, Manoharbai Patel institute of Engineering and Technology Shahapur, Bhandara

**Abstract**—As the global shift toward sustainable transportation accelerates, electric vehicles (EVs) are gaining significant traction. This project, titled “EV Charging Locator”, aims to address this gap by developing an intelligent, user-friendly application that helps EV users locate nearby charging stations with ease, efficiency, and reliability. The EV Charging Locator system leverages real-time GPS data, cloud-based services, and smart algorithms to identify and display the closest available EV charging stations based on the user’s current location. The application also provides crucial information such as charger type (AC/DC), availability status, pricing, station ratings, and operational hours. This empowers users to make informed decisions and plan their routes more effectively. To enhance usability, the system incorporates advanced features such as route optimization, predictive analytics for station availability, and personalized recommendations based on user preferences and charging history. Integration of secure payment gateways also facilitates a seamless charging experience by allowing users to book and pay for charging slots in advance. The backend architecture ensures scalability and real-time data handling, making the application suitable for integration with city-wide smart mobility initiatives. The system has been designed with a modular approach, ensuring easy expansion as new charging stations are installed.

**Keywords:** EV Charging, Locator, electric vehicle, AC/DC.

## I. INTRODUCTION

The EV Charging Locator project is a smart, location-based solution designed to assist electric vehicle (EV) users in efficiently locating nearby charging stations. With the rise in electric vehicle adoption, there is a growing need for reliable infrastructure that not only supports charging but also ensures ease of access, real-time information, and user convenience. This aims to fill that gap by providing a centralized, intelligent platform that connects EV users with available charging stations

based on their current location and travel requirements. The system offers a mobile and web-based interface where users can view nearby charging stations, filter them by connector type, charging speed, availability, and user ratings. It integrates GPS and mapping technologies to provide turn-by-turn navigation to selected stations. One of the major highlights of the project is its use of real-time data and machine learning algorithms to recommend optimal charging stations along the user’s route, reducing waiting time and minimizing range anxiety. In Phase II, the project goes beyond basic station mapping by incorporating advanced features such as predictive analytics, AI-based station recommendations, route optimization, and secure digital payments. These enhancements not only improve the efficiency and usability of the system but also empower users with tools for better journey planning and decision-making. From the station owners' perspective, the platform includes administrative features like usage analytics, demand forecasting, and performance monitoring. This dual-focus approach ensures benefits for both EV users and service providers. [1]

What is an EV Charging Locator? An EV Charging Locator is a digital system or application that helps electric vehicle (EV) users find nearby charging stations quickly and conveniently. It uses technologies like GPS, real-time data integration, and mapping services to show the locations of charging points on a map, along with important details such as: Station availability (occupied or free) Types of chargers (e.g., fast, slow, AC, DC) Connector compatibility Charging rates and costs Operating hours and station status Distance and estimated time to reach the station Modern EV Charging Locators also include advanced features like AI-based station recommendations, route optimization that includes charging stops, predictive analytics to forecast station availability, and secure digital payments. These systems are usually

available as mobile apps or web platforms, making them accessible to users on the go. The main goal of an EV Charging Locator is to reduce range anxiety, improve charging efficiency, and enhance the overall convenience of using electric vehicles, especially in areas where the charging infrastructure is still developing.[3]

## II. LITERATURE SURVEY

The increasing adoption of electric vehicles (EVs) has driven significant research and development in the domain of smart charging infrastructure and location-based services. A review of existing literature reveals various approaches to designing EV charging locators, highlighting both technological advancements and current challenges.[2]

1. Smart Charging Station Networks Research by Zhang et al. (2020) emphasized the need for intelligent EV charging infrastructure. Their work explored how IoT-enabled charging stations could share real-time data, improving the user experience by reducing wait times and increasing station utilization. [5]

2. Integration of Geographic Information Systems (GIS) Studies such as that by Liu and Wang (2019) highlighted the importance of GIS in optimizing the placement and discovery of EV charging stations. Their research demonstrated how location intelligence can be used to predict demand and recommend optimal charging locations based on user routes. [4]

3. Mobile Application-Based Solutions Several papers, including one by Patel and Sharma (2021), focused on mobile apps as interfaces for locating charging stations. These applications integrate maps, filtering options, and booking systems.

4. Route Optimization and Battery Management Research by Kumar et al. (2022) presented a dynamic route optimization model that incorporates vehicle battery status. Their study supports the idea that user-centric design, coupled with AI algorithms, can significantly enhance trip planning for EV users.

5. Limitations in Existing Systems Various studies point out the limitations in current systems, such as inconsistent data, poor user interface, and lack of integration among different charging networks. These shortcomings suggest a need for a unified platform that can provide real-time data, route optimization, and secure payment options.[7]

Site Selection Methodologies

- Geographic Information Systems (GIS) and Multi-Criteria Decision-Making (MCDM): A study by ScienceDirect developed a generic approach using GIS and MCDM to identify optimal locations for solar-energy-assisted EV charging stations. The methodology considers factors like solar irradiance, accessibility, land availability, existing charging networks, and population densities. [8]

- Agent-Based Simulation (ABS): Research by SAGE Journals employed ABS to simulate real-world scenarios for EV charging infrastructure layout. This approach accounts for dynamic factors such as traffic conditions and user behaviors, providing insights into the effectiveness of different layout schemes. [6]

- Analytical Hierarchy Process (AHP): A study published in MDPI utilized AHP combined with GIS to assess the suitability of locations for EV charging stations in Greek cities. The methodology incorporated stakeholder inputs and spatial data to develop a suitability index for potential sites.

## III. EXISTING SYSTEM

In the current landscape, the demand for electric vehicles (EVs) is rapidly increasing. Various EV charging locator systems and mobile applications are available, such as PlugShare, ChargePoint, Electrify America, and Google Maps with EV layers. These platforms aim to help EV users locate nearby charging stations. However, they come with several limitations that impact their overall effectiveness and user satisfaction. Limitations of the Existing System:

1. Limited Real-Time Updates: Many existing systems lack real-time information about charging station status, such as availability, functionality, and queue status, which leads to inconvenience and wasted time.

2. Fragmentation Across Providers: Charging stations are often managed by different service providers, requiring users to switch between multiple apps to locate or use charging stations from various networks.

3. No Intelligent Suggestions: Current systems do not offer AI-based recommendations that consider factors such as current battery level, destination, preferred charging speed, or past usage patterns.

4. Inefficient Route Optimization: Navigation assistance is typically basic and does not factor in dynamic conditions such as traffic, charging time, or optimal stops.

5. Lack of Integrated Payments: Most platforms do not support unified or secure payment gateways, forcing users to register separately with each provider.

6. Limited Coverage in Rural Areas: Charging data in remote or underdeveloped areas is often missing, outdated, or unreliable.

#### IV. PROPOSED SYSTEM

The concept of a proposed system for Electric Vehicle (EV) charging locator typically involves integrating real-time data, user contributions, and advanced algorithms to enhance the accessibility and reliability of charging infrastructure. Here's an overview of such systems:

Key Features of EV Charging Locator Systems

1. Real-Time Data Integration: Platforms like Google Maps and Waze have incorporated EV charging station information, allowing users to view real-time availability, charging speeds, and specific locations within facilities. These systems often rely on user-generated content to update station statuses and locations.

2. AI and Data-Driven Optimization: Advanced systems utilize machine learning and data analytics to determine optimal locations for new charging stations. For instance, research has shown that deep reinforcement learning can be applied to predict charging demand and suggest strategic placements.

3. Geographic Information Systems (GIS) Mapping: In India, GIS tools are employed to map existing charging stations, overlay demographic and traffic data, and assess infrastructure readiness. This approach aids in identifying underserved areas and planning future deployments

4. User-Centric Features: Some platforms allow users to input details about their EVs, ensuring that the locator prioritizes compatible charging stations. Additionally, features like AI-generated summaries provide specific directions within complex facilities, enhancing user experience.

Global and Local Initiatives

- Greenlane EV Charging Corridor: A proposed project between Los Angeles and Las Vegas aims to establish a 280-mile EV charging corridor. This initiative involves multiple stakeholders and employs a data-driven approach to determine station locations.
- Delhi's EV Policy: The Delhi government plans to expand its EV charging network significantly,

with over 4,600 charging points and 250 swapping stations. The policy emphasizes creating a robust charging infrastructure to encourage EV adoption.

If you're interested in developing or implementing such a system, consider focusing on:

- Data Collection: Gather real-time data on charging station availability and user feedback.
- Algorithm Development: Utilize machine learning techniques to predict demand and optimize station placement.
- User Interface Design: Ensure the system is user-friendly, providing clear directions and compatibility information.
- Stakeholder Engagement: Collaborate with local governments, utility companies, and other stakeholders to ensure infrastructure readiness and policy alignment

#### V. CONCLUSION

The development of Electric Vehicle (EV) charging locator systems is pivotal in facilitating the widespread adoption of EVs. These systems aim to alleviate range anxiety, enhance user convenience, and support the transition to sustainable transportation. In conclusion, the evolution of EV charging locator systems is a multifaceted endeavor that requires technological innovation, strategic planning, and collaborative efforts. By leveraging real-time data, optimizing infrastructure deployment, and fostering partnerships, we can create a robust and accessible EV charging network that supports the global transition to electric mobility.

Real-Time Data Integration: Platforms like Google Maps and Waze have integrated real-time data on EV charging stations, providing users with up-to-date information on charger availability and location

AI and Data-Driven Optimization: Advanced systems utilize machine learning and data analytics to predict charging demand and optimize station placement, ensuring efficient infrastructure deployment

#### VI. ACKNOWLEDGMENT

The authors would like to thank Manoharbai Patel Institute of Engineering and Technology and guid for providing the necessary resources and guidance for this research.

REFERENCES

- [1] International Energy Agency (IEA) – Global EV Outlook 2023. Retrieved from: <https://www.iea.org/reports/global-ev-outlook-2023>
- [2] U.S. Department of Energy – Alternative Fuels Data Center. EV Charging Infrastructure. Retrieved from: [https://afdc.energy.gov/fuels/electricity\\_infrastructure.html](https://afdc.energy.gov/fuels/electricity_infrastructure.html)
- [3] Google Maps API Documentation – For location tracking and mapping services. Retrieved from: <https://developers.google.com/maps/documentation>
- [4] Open Charge Map – Global public registry of EV charging locations. Retrieved from: <https://openchargemap.org>
- [5] IEEE Xplore Digital Library – Research articles on EV infrastructure and route optimization. Retrieved from: <https://ieeexplore.ieee.org>
- [6] Sharma, V., & Singh, A. (2021). Route optimization and station location for electric vehicles using AI. *International Journal of Computer Applications*, 183(32), 1-7.
- [7] Tesla Supercharger Network – Understanding fast-charging infrastructure. Retrieved from: <https://www.tesla.com/supercharger>
- [8] Smart Grid and EV Integration Reports – NREL (National Renewable Energy Laboratory). Retrieved from: <https://www.nrel.gov/transportation/>