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CHAPTER 2: BACKGROUND STUDY AND LITERATURE REVIEW

1.

1.1. Background Study

Electric Vehicle is not a new concept. It has been a topic of discussion and research as an alternative fuel vehicle since the beginning of 21st century. With the breakthrough in research in recent years, and a global awareness of the adverse climatic effects due to fossil fuels, electric vehicles has been a prominent and upcoming field of research.

The biggest problem of the EV is the travel distance as the per charge range is significantly lower than the per tank range of ICE based vehicles. The other fuel system is the use of Hydrogen fuel, but the problematic storage of Hydrogen and Oxygen required for the fuel cell makes the process of fuel cell-based vehicles a challenging concept. Solar power can be used, but solar power produces inconsistent power and may be subject to higher cost due to the innate costs of the panels, maintenance, and repair. So, with careful consideration to all the possibilities, EVs with L-ION batteries and accessible charging stations seems to be the most likely future for the next few decades. Research in EVs have been prominent and research into ways to increase the range of EVs have been a topic of heavy interest. But, for now, it seems though that the availability of suitable EVCS is the better approach towards EV charging.

Furthermore, most of the EVCS recommendation system is based on technicalities. EV charging is treated as ICE vehicle fuelling and recommendations are based on technical parameters only. While technical parameters are important and effective, EV charging is more than just the technicalities. EV charging is not as quick and robust as ICE fuelling and the human aspect is mostly neglected by most researches and systems. While recommendation systems like that of movies is based on human preferences, the recommendation system of EVCS mostly does not consider potential human factors like what will they do during the downtime when their vehicle is charging and how can recommendation be made more human-centric.

1.2. Literature Review

Many prominent researches have been done on the recommendation systems and few of them are based on the electric vehicle charging station.

In a study on Electric Vehicles in Hyderabad, the Urooj and Annamma research on the EV taxies in Hyderabad, and how can the EVCS recommendation be beneficial to the EV taxies. The EV taxies were compared based on real and simulated recommendations with an accuracy of 94.7%, among which the accuracy of to-station state prediction is 92.2%, 96.8% for recharging, and 95.3% for operating. The comparison of real selections with predicted selections was obtained as 84.7% on integral recharge intention identification,

including to-station state, and charging station selection [1].

Research in a similar system was conducted in 2021 by Zhang et al which discusses recommendation system of EVCS. The research focused on various parameters like charging request, charging wait time, charging price, and charging failure rate to recommend the most proper charging station with long term goals of minimising the charging wait time, charging price, and charging failure rate [2].

Aarthi and Prasath proposed an enhanced real-time charging station recommendation system for the EV charging station

recommendation system for load-based taxis. The study suggested that EV taxis' higher time-cost at the charging stations is due to the EV taxi drivers rushing to the same EV charging stations during the same time-frame. The system also suggested the use of real-time recommendation system so that the taxi drivers can get real time suggestions so that they do not rush only to the charging stations they frequently use [3].

The study by Wang et al in Beijing in 2021 also proposed a similar recommendation system, albeit using federated learning. The research compared the model based on real data and that based on their model and concluded that the model was accurate by a factor of 0.92, 92% [4].

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