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Artificial Intelligent Based Electric Vehicle Monitoring System Using IOT

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ABSTRACT: *As air pollution levels rise and environmental degradation increases, urban spaces are looking for ways to tackle this problem. One of the key ways to control air pollution in cities is to reduce vehicular pollution. Electric vehicles (EVs) are an innovative step in this direction. Electric vehicles are hi-tech machines that bank on a lot of data to deliver optimum performance. The performance parameters include monitoring speed, acceleration, mileage, battery management, charging, fault alert, and predictive maintenance systems. IoT plays a large role in the monitoring of these electric vehicles. EVs are like machines that run on a charging battery. An EV's condition is depending on the battery's performance. The parameters for the battery's condition the voltage, current, and temperature. By using these parameters State of Charge (SOC) is determined. These performances are monitored as Battery Management System (BMS). In this project, the EV monitoring system is proposed using the combination of Artificial Intelligence (AI) and Internet of Things (IoT) interfacing by the sensors in the vehicle's battery, and to the cloud. The performance of the battery is monitored using the mobile application.*

Keywords: *AI,SOC,EVS,IoT.*

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I. INTRODUCTION:

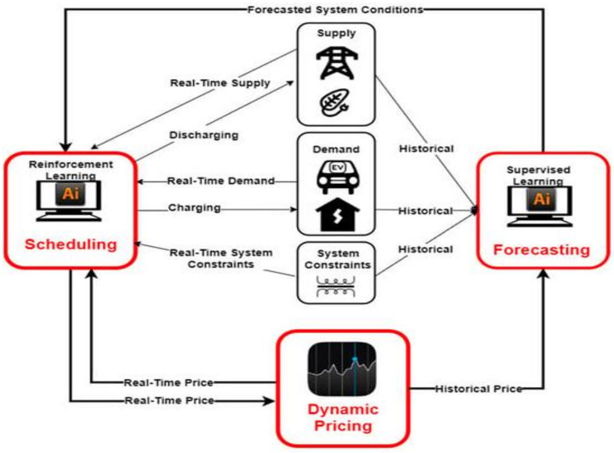
The most effective methods for charging and discharging a vehicle can be determined by AI algorithms by analyzing data from the grid, the vehicle, and other external elements. As a result, energy waste is minimized, EVs use electricity from renewable sources, and the planet's carbon footprint is diminished overall. Autonomous vehicles have neural networks and specific algorithms. These are Artificial Intelligence (AI) and Machine Language (ML) based object detection algorithms. These serve to collect data, analyze objects, and make accurate decisions while on the road. The Wi-Fi adaptor will serve as a beacon or extender for this project to increase the connectivity and range of distant vehicles. With this connection, the bot may easily transfer data for face recognition on the receiving side and capture live feeds. This project makes use of cutting-edge research on IoT device intercommunication and network setups [1] . In this paper, the EV monitoring system is implemented using the combination of Artificial Intelligence (AI) and Internet of Things (IoT) interfacing by the sensors in the vehicle's battery, and to the cloud. The performance of the battery is monitored using the mobile application of the cloud [2]. This paper studies an embedded edge computing technology in the power Internet of things system, proposes an implementation scheme of edge computing based on vehicle terminal, and designs a vehicle terminal hardware platform with ArmCortex-A7 and EMMC as the computing core, which is based on Embedded Linux system and socket virtual machine[3]. Based on the battery levels, IoT and MQTT protocol are used in this article to create battery monitoring. Navigation to the closest charging station is also shown [4]. In this work, battery monitoring based on charge levels is implemented utilizing IoT and MQTT protocol, and navigation to the nearest accessible charging station is also provided[5]. The shared secret between the IoT server and the IoT device in our technique is referred to as a secure vault, which is a collection of equal sized keys. The server and the IoT device share the initial contents of the secure vault, and the contents of the secure vault update after each successful communication session [6]. We analyze the impact of different serverside stream processing architectures for ingesting and interpreting IoT sensor data in real-time in this research. Namatad, our real-time IoT platform, makes use of real-world building sensor data[7]. This research provides an animal behavior monitoring platform based on IoT technology. It incorporates an IoT local network to collect data from animals and a cloud platform with processing and storage capabilities to autonomously shepherd ovine within vineyard areas [8]. We merged an existing energy meter with IoT technologies in this article. Implementing IoT in the case of electricity meter reading can provide customers with relief when utilizing electrical energy [9].

II. ARTIFICIAL INTELLIGENCE IN EV CHARGING SYSTEM

The widespread use of electric vehicles (EVs) may strain the existing power distribution infrastructure if charging and discharging are not properly coordinated. Dynamic pricing is a type of demand response that can incentivize EV owners to engage in scheduling initiatives. As a result, EV charging and discharging schedules, as well as its dynamic pricing mechanism, are critical areas of research.

- **Battery Degradation:**

Battery degradation refers to the gradual decline in the ability of a battery to store and deliver energy. This inevitable process can result in reduced energy capacity, range, power, and overall efficiency of your device or vehicle.



- **Charging Efficiency:**

Charging efficiency is calculated by dividing the energy added to the battery by the energy used by the charger. Many factors influence efficiency, including power source, battery temperature, and ambient temperature.

- **Artificial Intelligence-Based Forecasting Model:**

An AI forecasting process can take the heavy lifting involved in forecast analysis and delivering forecast accuracy off of a planner's shoulders by automating analysis and suggesting courses of action. These actions can also be automated or authorized by planners triggering workflows or widgets.

- **Supervised Learning Methods:**

Machine learning algorithms are mathematical model mapping methods used to learn or uncover underlying patterns embedded in the data. Machine learning comprises a group of computational algorithms that can perform pattern recognition, classification, and prediction on data by learning from existing data.

- **Gated Recurrent Units:**

Gated recurrent units (GRUs) are a gating method in recurrent neural networks first proposed by Kyunghyun Cho et al. in 2014. The GRU functions similarly to a long short-term memory (LSTM) with a forget gate, but with fewer parameters because it lacks an output gate

- **Long Short-Term Memory:**

Long Short-Term Memory (LSTM) is a form of Recurrent Neural Network (RNN) designed to handle sequential data such as time series, audio, and text.

- **Hybrid and Ensemble:**

Combining two separate ensemble models to improve the ensemble model's prediction/generalization capability.

- **Heuristic Algorithms:**

A heuristic algorithm is a method for finding near-optimal solutions to optimization problems. However, this is accomplished by sacrificing optimality, completeness, accuracy, or precision in exchange for speed.

- **Fuzzy logic:**

Fuzzy logic is a computing approach based on "degrees of truth" rather than the traditional "true or false" (1 or 0) Boolean logic on which modern computers are based.

- **Q-learning algorithm:**

The Q-learning algorithm process is an interactive method in which the agent learns by exploring its surroundings and updating the Q-table based on the rewards it receives.

- **Deep Reinforcement Learning:**

The challenge of a computer agent learning to make judgments through trial and error is addressed by RL. Deep RL adds deep learning into the system, allowing agents to make decisions based on unstructured input data without the need for manual state space engineering.

- **DHT11 Sensor Interface:**

The DHT11 is a low-cost humidity and temperature sensor that has a good level of dependability and long-term stability.

III. CONCLUSION

EV is still a massive market today. Companies are turning to autonomous solutions for commercial and strategic imperatives as old hurdles to adoption and new challenges for EVs emerge. Autonomous fleets have the potential to cut total cost of ownership by 53%. As autonomy improves, cars will be able to not only drive themselves better, but also predict the likelihood of problems occurring in the future, allowing fleet operators to examine cars proactively before they go out on their next shift. To summarize, businesses and sectors all across the world are already working on methods to enable EV technology reach its full potential.Overall, the combination of IoT and AI technology holds considerable promise for the adoption of electric vehicles. It has the potential to hasten EV deployments while also improving the customer experience.

Forecasting, timing, and dynamic pricing are three critical components of EV charging and discharging covered in this study. The interdependence of forecasting, scheduling, and dynamic pricing is identified. The performance of scheduling models is mostly determined by the accuracy of forecasting results and pricing techniques. Forecasting accuracy and scheduling performance, on the other hand, have a significant impact on the effectiveness of dynamic pricing schemes in reflecting real-time power system conditions. The majority of the forecasting models discussed in this work are supervised, learning-based models. Because of their capacity to manage nonlinear and long-term dependency, LSTM and GRU are the most preferred approaches. Uncertainty, on the other hand, is one of the intrinsic features of predicting models. As a result, forecasting model performance must continue to improve. Other strategies for assisting decision-making include using the most recent available data to update forecasting models and adding uncertainty ranges. numerous researchers have used reinforcement learning-based optimization models that can accept numerous variables as state spaces to make optimal EV charging and discharging decisions based on projected results, including charging and discharging charges. Some of the most common reinforcement learning models are DQN, DDPG, and SAC. They all have pros and disadvantages. DQN can overcome the dimensionality curse that plagues traditional Q-learning. However, these systems frequently encounter overestimation of action values and lengthy training time requirements. Double-DQN and A3C, respectively, can solve action value overestimation and shorten training time. Improving reinforcement learning performance is another important area of study. Scheduling models cannot make efficient charging/discharging decisions to optimize power grids if the information they utilize to make decisions does not precisely reflect the real-time state of the power grid. As a result, both forecasting results and dynamic price signals that can reflect real-time power system conditions are critical.

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