

Analysis of Efficiency in Electric Vehicles

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Abstract-

The article examines the efficiency of the electric vehicles. Most of the people in our country use the vehicles that run with fuel. The major drawback of using such vehicles is that they are not energy efficient. Using the vehicles that run with fuels causes air pollution which is not environmental friendly. By using electric vehicles we can overcome the drawback, that is electric vehicles are energy efficient and they do not pollute the atmosphere. The efficiency of electric vehicles such as car is calculated by considering the different attributes such as lifetime of the battery, number of seats, speed. These attributes are considered and different machine algorithms such as Logistic Regression, Decision Tree Regression, Random Forest Regression, Support Vector Machine, Linear Regression, Polynomial Regression and Artificial Neural Network (ANN) are applied and the results are compared.

KeyWords:

Electric vehicle, Efficiency, Machine Learning, Artificial Neural Network (ANN).

1. INTRODUCTION

Electric Vehicles are energy efficient and they are environmental friendly. They don't cause air pollution. They also reduce noise pollution. The maintenance of the electric vehicles is lower as they are energy efficient. Also the performance of electric vehicles is better when compared to the vehicles that run with fuel. Electric vehicles do not emit pollutants. One of the advantages of Electric vehicles is that it has increased stability and reliability. The vehicles that run with fuel are dangerous because they cause air pollution. As these vehicles emit pollutants that are part of greenhouse gases. This leads to global warming as these vehicles release dangerous gases into the atmosphere. Global warming leads to ozone layer depletion. In India most of the people are using vehicles that run with fuel. Fossil Fuels are non-renewable energy sources. It means that in future the fossil fuels will no longer be available. The maintenance cost of these vehicles is high when compared to fuelled vehicles. These fuelled vehicles also cause noise pollution. The first electric vehicle was developed by Robert Anderson during

1832-1839. But that electric car didn't gain much popularity. The electric cars such as Mercedes-Benz EQS, Tesla, Polestar 2, Audi Q4 e-tron, BMW i7, Tesla Roadster and many more electric cars have gained popularity these days. One of the famous electric cars is Tesla which is an American electric vehicle and the CEO is Elon Musk. Tesla gained much popularity and familiarity in United States and it is also one of the successful electric cars in the world. The functioning of automobiles mostly depend on the lifetime of the battery. To prevent pollution across the globe it's better to use electric vehicles so that we can save the atmosphere from the harmful pollutants that are released by the fuel vehicles. The working of electric vehicles involves majorly the motor which gets its energy from the controller depending on the driving of the user's accelerator pedal. Generally the electric cars use the energy that is stored in the rechargeable batteries. All the electric vehicles have three main components such as the : 1. Energy storage unit 2. Controller 3. Propulsion System. As the first important component is the energy storage unit which is useful for storing the power. The power is stored by a means of chemical battery. There are many chemical batteries that are existing these days. Some of the chemical batteries are as follows : Lithium , Lithium Ion , Nickel metal hydride , Lithium Sulfur batteries etc. These are some of the chemical batteries. Lithium Ion batteries are the most popular electric vehicle batteries that are available in the market. Nickel metal hydride batteries have better energy than that of the lead batteries. The Lithium Sulfur batteries power an electric car three times more than that of the Lithium Ion batteries. The next important component is the Controller which acts as the gateway to the electric motor. The main function of the Controller is that it moderates the power. The controller also acts as a converter. The Controller converts the power from DC to AC. The controller acts as the heart of the system since it is an important component. The next component is the Propulsion system which is responsible for converting the electric energy. It converts the electrical energy into the physical energy so that it results in the movement of the electric car. Hence each component in the electric vehicle has its own importance. So each and every component is required for the proper functioning of the

electric vehicles.

2. RELATEDWORK

The existing system worked on the knowledge of the electric vehicles which used the following algorithms like k-nearest neighbour and naïve bayes algorithm. The data was collected by conducting different surveys. The dataset consists of 250 peoples opinion which is the large dataset and the smallest dataset consisting of 90 different opinions. Different responses were captured from the people and they were analysed. It showed that many people are worried about the price of the electric vehicles. The accuracy given by these algorithms are 67 in k-nearest neighbours and 64 in naïve bayes for 250 and for that of 90 the accuracy was 77 in naïve bayes while k-nearest neighbours showed the accuracy of 63. These were analysed. The Dynamic charging of electric vehicles without using a cable move with the Mobile Energy Disseminators used the Intelligent decision making with IOT which describes about the Life time of the battery. The important factor for electric vehicles is the lifetime of the battery which shows a major impact on the electric vehicles. Electric vehicles need charging, which needs the supply of electricity. In electric vehicles electricity plays an important and vital role. These are the major aspects that are to be considered in the aspect of electric vehicles. Generally these vehicles are considered to be environmental friendly and thus these vehicles must be used in order to protect the atmosphere. Many industries have started the manufacturing and many of the electric vehicles are manufactured. Some of the countries already started using these electric vehicles. Still many countries didn't start using these electric vehicles. Expecting by 2030 these electric vehicles will have a lot of demand in the automobile industry. In the new era of the electric vehicles they will be huge demand for the electric vehicles as technology is improving rapidly in these days. The existing system says about the peoples opinion on electric vehicles. It says that many of the people are unaware of electric vehicles. So our proposed system is useful for these kind of customers.

3. PROPOSED SYSTEM

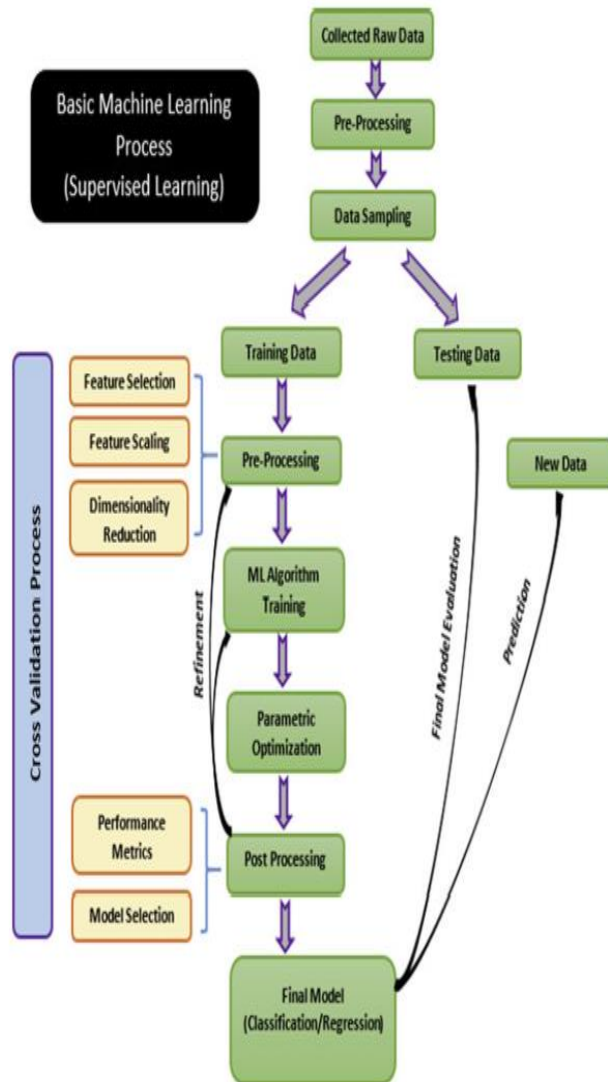
The proposed work is majorly helpful for those who are buying the electric vehicles. Many of the people don't have knowledge about electric vehicles. Our application is helpful for those people and the best vehicle is provided to the customers those who are going to purchase the electric vehicles. The efficiency of the electric vehicles is calculated by considering the parameters such as the speed, lifetime of the battery, acceleration, torque, number of seats etc. The dataset is collected and it has the following attributes such as the model of the electric car, acceleration, top speed, range

which is considered in kilometers, efficiency, fast charge, power train and number of seats. These all attributes are considered in the data set and the algorithms are applied on the dataset which is collected from kaggle. The algorithms such as logistic regression, linear regression, support vector machine(SVM), decision tree regression, , random forest and artificial neural networks(ANN) algorithms are used. These results are compared with each other and the algorithm which gives the best result is considered.

The architecture says that we have first collected the raw data by using the kaggle website. Then on that raw data we have done preprocessing, after that we have done data sampling. Then we have trained the data and preprocessed the data by using feature selection, feature scaling and dimensionality reduction. Then, for the trained data, we used machine learning(ML) methods. Then we have done parametric optimization. After that we have post processing by using the performance metrics and model selection. The final model is obtained that is the testing data and the results are obtained which is nothing but the new data.

The error rate measures are the Mean Squared Logarithmic error (MSLE) and R2 score. The MSLE is defined as the ratio of true to expected values. The R2 score is a critical performance statistic for evaluating the regression-based machine learning model's performance.

The following architecture gives the clear idea of the proposed work.



4. Experimental Results

Algorithms such as logistic regression, random forests, linear regression, decision trees, and support vector machine(SVM), and the artificial neural networks(ANN) uses sequential class. The results are compared with others. There are two types of data in the dataset: training data and testing data. Then it was scaled using z-score normalization. Logistic regression is one of the most familiar machine learning algorithm which comes under supervised learning. It predicts the output of the categorical variable and the output of this algorithm is the discrete value. Logistic regression and linear regression are much similar. The sole distinction is that logistic regression is used to solve classification difficulties whereas linear regression is used to solve regression problems. Linear regression is one of the most straightforward machine learning methods. This

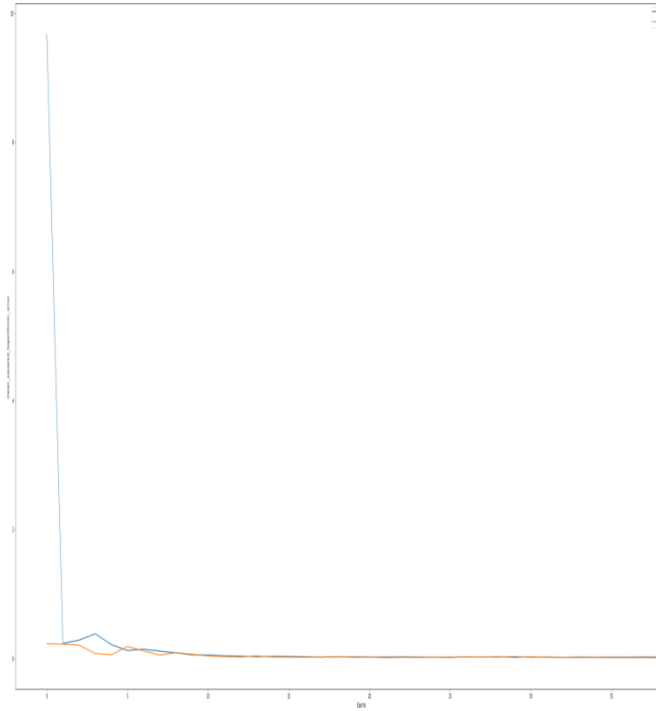
procedure is known as linear regression since it depicts the relationship between a dependent and one or more independent variables. One type of supervised learning is decision tree regression, which can be used for both regression and classification issues. There are two kinds of nodes in decision tree which are leaf nodes and the internal nodes. The properties are represented in the internal nodes, while the class labels are called leaf nodes. To build the decision tree, the input variables are repeatedly separated into subgroups. When creating a successful decision tree, the most significant variables are placed at the top of the tree hierarchy, while extraneous characteristics are removed. One of the regularisation techniques used in machine learning is lasso regression. It's a model that guards against overfitting. Overfitting is described as a process in which a machine learning model attempts to cover all or more than the needed number of data points in a given dataset. Random forest is the most widely used supervised learning machine learning method. It can be used to solve both classification and regression issues. Random Forest consists of a number of decision trees on diverse subsets of a particular dataset, with the average used to increase the dataset's predictive accuracy. When compared to other algorithms, Random Forest takes less time to train. One of the deep learning algorithms is Artificial Neural Networks. Vanilla, Recurrent, and Convolutional Neural Networks are examples of Artificial Neural Networks. The Vanilla neural networks can only handle structured data, however the Recurrent and Convolutional Neural Networks can handle both structured and unstructured data. In this article, we'll use Vanilla Neural Networks to do regression analysis. We'll use Tensor Flow's Sequential Class to create the neural network model. It is made up of four layers, the first of which has 250 concealed units. There are 200 hidden units in the second stratum. There are 150 secret units in the third layer. One unit with a linear activation function makes up the last layer. The following table shows the MSLE and R2 Score values for the following algorithms:

Algorithm	MSLE	R2 Score
Linear Regression	0.01661	0.373
DecisionTreeRegressor	0.00378	0.875
SupportVectorRegressor	0.2057	0.129
Logistic Regression	0.01662	0.373
Polynomial Regression	0.00870	0.712
Lasso Regression	0.01222	0.501
ANN	509.664	0.528
RandomForest regression	0.00378	0.875

From the above table we can see the MSLE and the R2 score values which are very less. When compared to all other algorithms Decision Tree regression and random forest regression has less MSLE and support vector regression has

least R2 score value.

The graphic above shows how the loss lowers as the epochs increase, which is a good sign of success.



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5. Conclusion

From the above we can draw the following conclusions that the values for MSLE and R2 score are least that means that error rate is too low which is a good sign of progress. The algorithms that has too least MSLE and R2 score values are decision tree regression, random forest regression and support vector regression. We can also use our application in online at the automobile industries. Hence we can say that we can easily predict the best car by using our application. So these algorithms are useful for predicting the results.

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Dynamic wireless charging of electric vehicles on the move with Mobile Energy Disseminators-2