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PREDICTION OF CAR PERFORMANCE AND RESALE VALUE

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***Abstract*— Everybody owns a motorcar in the 21st century. As the number of motorcars on the road grows, so does the quantity of energy consumed and the cost of fuel. We should know how well it's suitable for travel before embarking on it. As a result, our technology forecasts the country miles per gallon (mpg), which indicates the motorcar's effectiveness. Higher the mpg, the more effective it is. Our system also predicts the motorcar's resale value. People currently aren't hesitant to buy a used motorcar. To avoid losses, both the dealer and the buyer must be apprehensive of the motorcar's resale value. The system takes colorful inputs grounded on which the model predicts an outgrowth. The performance analysis of the auto is grounded on the engine type, no of engine cylinders, fuel type, horsepower, etc. The resale value of the motorcar is predicated on power, kms traveled, model, enrollment time, etc.**

***Keywords*— Random Forest, Prediction, Regression, Machine Learning**

I. INTRODUCTION

Transportation is playing a seriously important role in one's day-to-day life. Cars being a part of this are drawing the people's attention. The sales of the car have grown to 21% in the year 2021. There were more than 30 lakh sales. One of the biggest industries in the world is car industry. It holds a great number of people, financial and time resources. This fact has helped the company owners to lead a progressive business. Usually when a car is bought, the users usually look into its performance. Although performance can be determined by many factors in our dataset, we predict it by the parameter mileage. We use a machine learning model with a befitting algorithm and integrating it with the flask app. The machine learning model takes number of cylinders, engine displacement, horsepower, weight, acceleration, model year and origin. The user has to give in all these inputs and the model will predict the car's mpg. It will tell us if the car has high performance or low performance. Higher the mpg, higher will be the performance and vice versa. The model will also tell us if we our car is suitable for a long journey, or a short journey. As the number of car buyers are increasing, so are the people who are selling their car after using it for a while. There are numerous websites where people may purchase and sell used cars, but they have no idea what the car's price should be. Buyers tend to pay a greater price for the car, whereas sellers tend to sell for a lesser price. To avoid this problem, our system will predict the resale value of the car based on registration year & month, power of car, total distance travelled by car, whether it is automatic or manual, if it damaged or repaired, model type, brand, fuel type of car, and vehicle type. This resale value will help people to predict the actual resale price. We use random forest regressor to predict both these values. Random forest is a machine learning algorithm used to create various decision trees which involves subset of data which is random. We have to train the model various times such that we get an accurate prediction value. We get the final prediction value by combining the result of all the decision trees. We get the final result either by choosing the most frequent value or by combing the outputs of all the decision trees.

II. RELATED WORK

External and internal factors influence a vehicle's fuel usage. Elements like weather and traffic are considered external, whereas Vehicle attributes, driving behavior, and load are considered internal. Wickramanayake and Bandara [1] (2016) used Machine Learning techniques such as Random Forest, Gradient Boosting, and Artificial Neural Network to forecast the fuel consumption of fleet vehicles. The data was obtained from a public bus in Sri Lanka and included a number of factors, including speed, fuel level, fuel usage, and acceleration. The Random Forest model outperformed the other two models. The study took into account a number of parameters that directly influence fuel usage, including engine RPM, traffic conditions, and load.

Various studies have looked into how to predict the price of a used car. Listian wrote about this in her Master's thesis work

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[2]. Support Vector Machine was used to create a regression model. Machines (SVM) can estimate the cost of an automobile. SVM has been rented with more accuracy than multivariate regression versus simple multiple regression. This is due to the fact that Support Vector SVM is superior at coping with large datasets. It has more dimensions and is less susceptible to overfitting and underfitting. According to studies, a change in simple regression with Advanced SVM regression was not demonstrated in basic indicators such as mean, variance, and standard deviation.

To forecast the residual value of private used cars, Gonggi [3] created a new methodology based on artificial neural networks. The study's major features were mileage, manufacturer, and estimated useful life. The model was tweaked to accommodate nonlinear relationships, which are difficult to analyse using traditional linear regression methods. This model was proven to be fairly reliable at predicting the residual value of old autos.

III. PROPOSED SYSTEM

The goal of the car performance and resale value prediction is to predict the performance and resale value. To save time and resources, the system only accepts a few inputs and predicts the results with near-perfect accuracy. A web application has been created which has three main components

- A home page: This is the first page that appears when you run the software. This is an introductory page that explains the purpose of the website and why it is necessary. On the top right corner, there are three buttons: home, performance, and resale. The user can navigate between those three pages according to their need.
- Performance prediction: If the user clicks on performance, they are taken to the performance prediction page. There are a set of inputs which have to be filled by the user. The user has to know the number of cylinders in their car, the engine displacement, horsepower, weight, acceleration, the model year, car name and the origin of the car. The origin is 1 if it is American, 2 if it is European and 3 if it is Asian. The output is in mileage per gallon. Depending on the mpg, the system will predict the performance from worst to best. It will also advise you on what type of journey it is best suited for.
- Resale value prediction: If the user clicks on the resale button, the resale value prediction page is shown. The buyer/seller can know the market value of the used car. Set of details like present price of the car, kilometers driven by the car, number of previous owners, how old the car is, the fuel type, dealer or individual, the transmission type have to be given by the user. The system will then predict the resale value.

IV.IMPLEMENTATION

A. Random Forest Algorithm

Random forest algorithm is being used to predict the performance and the resale value. Classification and regression can be done using this supervised learning algorithm. Classification problems are mainly used. In a single decision tree, the over-fitting is reduced because the result is averaged. Unlike single decision trees, the random forest algorithm creates various decision trees using the sample data and selects the result from each decision tree. Therefore, random forest algorithm is better than single decision trees.

Working of Random Forest Algorithm

Working of Random Forest Algorithm can be understood by following the below steps as shown:

- **Step 1** – In this first step, we have to choose or select the samples of random samples from the given dataset which helps us to predict the values.
- **Step 2** – In this next step, after selecting the random values we have to construct decision trees for every sample that has been selected from the given data. And also, we have to start predicting the output from the decision trees.
- **Step 3** −In this step, we have to observe the voting process which is performed for predicting the result to help us find the more accurate results based on the voting process
- **Step 4** – In this last step, we have the most important step to follow we have to select the most voted predicted result as the final prediction result so this will help to find the good result

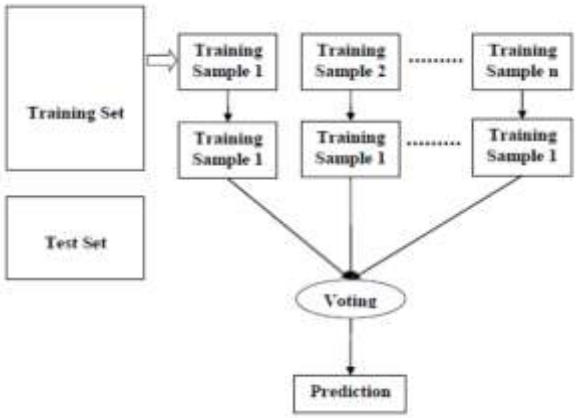

Figure 1 Workflow of Random Forest Algorithm

B. Workflow of the system

The workflow encompasses all of the steps that make up a model, from the beginning to end. Each step is equally important in the Prediction

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1. Data Collection
- The quantity and quality of the data determines the accuracy of the model has.
- The output of this step is usually a representation of the data that uses for the training (Gui simplifies the provision of tables)
- The use of data previously collected based on datasets from the UCI, Kaggle, etc. Continues to fit in this step.

2. Data Preparation
- Collect the data & prepare it for the training.
- Clean up what the data might require (duplicate removal, error correction, missing value handling, normalization and data type conversion, etc).
- Data Randomization. This eliminates the effects in a particular order. Where data was collected and /or processed
- Visualize data to identify relationships between variables and class imbalances (bias alert), or to perform the other exploratory analyzes.
- Dividing into the training & the evaluation of sets

3. Choose a Model
- Different algorithms are used for different types of tasks. Therefore, choose a correct algorithm to get the correct result.

4. Train the Model
- The goal of training the model is to answer questions or get as many predictions as possible.
- Linear regression example: The algorithm needs to learn the values of m (or W) and b (whereas X is the input, Y is output).
- The training steps are the iterations of each process

5. Evaluate the Model
- Measure the model's objective performance using some or a combination of metrics.
- Testing the model against the previously undisplayed data.
- This hidden data is intended to give some indications of this real-world performance, but also helps tune the model (whereas the test data does not)
- The training data can be split into 80/20 or 70/30, or similar for good evaluation, depending on domain or the data availability, or based on the record details.

6. Parameter Tuning
- This step involves adjusting hyperparameters, which is an "art form" as opposed to science.
- Adjusting of the model parameters to improve the performance.
- Hyperparameters of a simple model include the number of training steps, initialization values, training rate and distribution, and so on

7. Make Predictions
- The model is being tested with the additional (test set) data that has been withdrawn from the model (and the class labels are well known) by this point. A better approximation of model performance in this real-world will be known.

V. CONCLUSION

Buying a vehicle is a big decision and involves a lot of research and responsibility before you buy a vehicle. But if done correctly, it saves money and time, making it a great vehicle. It is very important to get all the information you need before you buy a vehicle. This study analyzed the current system of vehicle performance prediction using machine learning, the theoretical background, and previous work in similar scenarios using machine learning algorithms. This study also proposes solutions to overcome the irregularities of current systems. Based on the first results of the previous study, it can be seen that the proposed solution can determine the efficiency value of the vehicle with high accuracy and also it helps us to show the current market value of the vehicle.

VI. FUTURE WORK

The proposed solution, that wishes to be examined with one-of-a-kind algorithms/mixture of algorithms to gain the least error. As destiny upgrades to the machine, due to the fact that it's far advanced as an assisting device for car valuators, a cellular software may be advanced to be utilized by car valuators. This software is used for giving the capacity to connect with the OBDII tool this is plugged to the OBD (On Board Diagnosis) port of the motor car with a purpose to get those important statistics at the circumstance of the engine which can't be visible through outside inspections. This machine may be similarly stepped forward to facilitate the predictions of the car values. It can be achieved by training a neural network to learn from data of vehicles from different years of manufacture. Vehicle cost prediction is specially vital for car leasing organizations to decide what the cost of the car may be after some of years. This is likewise a vital thing even as creating a choice for car purchasing companies to decide what the cost of the car may be after some years. This is likewise a vital thing even as creating a choice for car purchasing

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