Prediction of Resale Value of the Car Using Linear Regression Algorithm

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Abstract: The expected estimate for resale value of a car is most significant in the field of present research and technology. Most significant attributes are considered for predicting the resale value of the car. The significant relationships among various attributes are found by establishing the correlations. In this research the price of the car is considered as dependent variable for target prediction. The data used for prediction was taken from web. The suitability of linear regression algorithm is identified and implemented in this research work for accurately predicting the resale value of the vehicle based on most significant attributes that are been selected on the basis of highest correlation. The outcome of the research shows that the accuracy of the model built is upto 90 percent and error obtained is 10 percent.

Keywords: Machine Learning, Prediction, Linear regression, Target, Correlation

I. INTRODUCTION

Predicting the resale value of a car is not an easy job to be performed. It requires adequate knowledge because the value of used cars depends on a number of factors. The most significant ones are usually the age of the car, its make and model, the origin of the car (the original country of the manufacturer), its mileage (the number of kilometres it has run) and its horsepower. Due to increase in fuel prices, fuel economy is also of greater importance. Practically speaking, many people do not know exactly how many kilometres their cars can be driven for each litre of either petrol or diesel. Different factors for example the type of fuel it uses, the interior and exterior style, the kind of breaking system, acceleration, the volume of its cylinders (measured in cc), safety features, its size, number of seating capacity, total number of doors, body colour of car, weight of the car, consumer reviews, prestigious awards won by the car manufacturer, its physical built quality, is it a sports car, if it has cruise control, is it automatic or manual transmission, is it owned by an individual or a company and other options such as air conditioner and purifiers, sound system with audio and video controls, power steering, alloy wheels, GPS navigator all may change the price of car. Some special things which buyers attach for importance in Mauritius is the car local or previous owners, if the car had been involved in serious accidents and if it is a lady-driven car. The look and feel of the car is most important factors for the price of the car. It is noticed that price probably depends on a huge number of factors. In reality, the information about all these factors is not always available and the buyers are forced to make the decision to purchase without clear information provided. In the present times it is observed that the prediction of used car for second hand cars are done manually and it is based on some basic parameters. Cars 24 is best example wherein there is a manual testing done for car in order to know the resale value of the car. So it takes huge amount of time and space to manually predict the price of the car. Taking into consideration of all the factors mentioned above, this paper is built where the prediction of resale value of the car is done automatically by the model built and it is totally computerized. This research makes use of Linear Regression Algorithm from Machine Learning for prediction of car price.

II. LITERATURE SURVEY

Doan Van Thai ; Luong Ngoc Son ; Pham Vu Tien ; Nguyen Nhat Anh ; Nguyen Thi Ngoc Anh[1] This paper will include the procedures for extraction of importance, information derivation, and rules for subjective information. The fundamental reason for the flow research is to investigate various information kinds of vehicle information and the goal is to make a mechanized procedure to foresee vehicle costs.

Nitis Monburinon ; Prajak Chertchom ; Thongchai Kaewkiriya ; Suwat Rungpheeung ; Sabir Buya ; Pitchayakit Boonpou[2] report on execution of relapse dependent on directed ML models. Each model is prepared utilizing information of trade-in vehicle showcase gathered from German web based business site. Thus, inclination helped relapse trees gives the best execution with mean total mistake (MSE) =3D 0.28. Followed by arbitrary woodland relapse with MSE =3D 0.35 and various direct relapse with MSE =3D 0.55 separately.

Ning Sun ; Hongxi Bai ; Yuxia Geng ; Huizhu Shi[3] In this paper, the value assessment model dependent on enormous information investigation is proposed, which exploits generally circled vehicle information and countless vehicle exchange information to dissect the value information for each sort of vehicles by utilizing the improved BP neural system calculation. It intends to set up a recycled vehicle value assessment model to get the value that best matches the vehicle.
III. OBJECTIVES

- To find the correlation with each attribute to that of target attribute
- To draw a linear regression curve with the target attribute
- Finding out the total error and accuracy

IV. METHODOLOGY

Linear Regression is a machine learning algorithm based on supervised learning. It performs a regression task. Regression models a target prediction value based on independent variables. It is mostly used for finding out the relationship between variables and forecasting. Different regression models differ based on – the kind of relationship between dependent and independent variables, they are considering and the number of independent variables being used.

Software Specifications: Anaconda Navigator, Jupiter notebook, Machine learning packages: Sklearn, Matplotlib, Python ADE, Microsoft window 2010.

V. IMPLEMENTATION AND ANALYSIS

Machine Learning algorithms can be implemented on some standard data having no redundancy. We mainly require the raw data from some standard sources that are available in the web. Initially data can be in either of two forms i.e. structured data or unstructured data. Structured data is normally in the form of rows and columns, it can be a database or a dataset. whereas unstructured data is in the form of images, videos, audio tapes etc. The flow of execution of the work done is shown in Figure 1.

VI. RESULTS AND DISCUSSIONS

Initially the dataset is used from an standard source from web. This dataset which is in the form of rows and columns is initially loaded into the Jupiter notebook. This dataset is mainly required to predict the target attribute. The dataset is imported into the code by the command car price=pd.read_csv("data.csv") where in the dataset is in the format of csv file and the dataset is given with a variable called car price.

![Dataset Used](image1)

The Fig 2 shows the dataset used which contains 16 attributes and 14 thousand instances. All 16 attributes are Make, Model, Year, Engine fuel type, engine hp, engine cylinders, transmission type, driven wheels, number of doors, market category, vehicle size, vehicle style, highway mpg, city mpg, popularity, msrp. In this dataset msrp is the target attribute that is predicted by using all other 15 attributes.

![Finding Out Null Values](image2)

In [97]: df.isnull().sum()

Out[97]:
Make    0
Model    0
Year    0
Engine Fuel Type    0
Engine HP    0
Engine Cylinders    0
Transmission Type    0
Driven_Wheels    0
Number of Doors    0
Market Category    0
Vehicle Size    0
Vehicle Style    0
highway MPG    0
city mpg    0
Popularity    0
msrp    0

dtype: int64

Fig 3:- Finding Out Null Values
Fig 3 shows that there are no null values present in each of the attributes in the dataset. So there is no necessity so removing and cleaning any null values for this dataset.

The Fig 4 shows the conversion of strings to integers. Dataset contains values for attributes in strings as well as in integers. But strings cannot be compared to integers in Machine Learning models. So strings to be converted to integers or integers to be converted into strings. Here Strings are converted into integers by a function called fit_transform() which converts strings to integers. All the attribute names should be passed into this function separately so as to convert all the values in the particular attribute.

The Fig 5 shows the results of string to integer conversion as mentioned in Fig 4. So in the fig 5 the total dataset has been converted into integers. Now it turns out to be easy to compare the attributes.

The Fig 6 shows the sorted correlation values of all the attributes to that of target attribute msrp. The highest correlated attributes to that of target attribute msrp are Engine hp and Engine cylinders having 0.65 and 0.58 correlation values. Therefore Engine HP and Engine cylinders are taken for consideration to predict the target attribute msrp.

The Fig 7 shows the correlation values between all the attributes that correlation between each and every attribute is found out by the function corr(). The max value of correlation is 1 and minimum value is 0. The command abs(df.corr()) defines that absolute of correlation is found out so that if there are any negative correlations, then it can be converted into positive. This Absolute of correlation is done so as to keep all the correlation values between 0 to 1.
The Fig 8 shows the plotting of a graph between engine hp and the target msp. Engine hp is in x axis and target msp is in y axis. Any attribute that is predicted should always be in y axis according to linear regression model. The values plotted are in red color.

The Fig 9 shows the plotting of the graph between number of cylinders and msp. Number of cylinders are in x axis and the target msp is in y axis. The values plotted are in blue color.

The Fig 10 shows plotting of both combinations. The Fig 11 shows the best fit linear curve between engine hp and msp. This is the best fit linear curve that is obtained for the values of engine hp and msp. The investigation shows that blue color curve shows good result than the green curve.
The Fig 12 shows the best fit linear curve between number of cylinders and msrp. This is the best fit linear curve that is obtained for the values of number of cylinders and msrp. The investigation shows that green color curve shows good result than the blue curve.

Fig 13: Total Error Percentage

The Fig 13 shows the total error that is obtained by this model. It shows an error of 10.7% with accuracy rate of around 90%. From this investigation we can note that linear regression model in machine learning is providing good efficiency and it performing well with the dataset that is used.

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