Name of the Team leader:

JASPER ALWIN RAJ

Team ID: PNT2022TMID25152

Roll number: 19JITCS111

Registration Number: 210619104016

Mobile Number: 9994200812

Name of the Team Member 1:
JOHN SAMUEL LEWIS

Roll number: 19JITCS138

Registration Number: 210619104018

Mobile Number: 7358903097

Mail Id:

johnsamuellewis8228@gmail.com

Name of the Team Member 2:

ELTON RIO

Roll number: 19JITCS132

Registration Number: 210619104009

Mobile Number: 9566781346

Mail ID: eltonrio37@gmail.com

Name of the Team Member 3:
GOKUL NATH
Roll number: 19JITCS107

Registration Number: 210619104010

Mobile Number: 9791246864

Mail ID: gokulnath242001@gmail.com

ABSTRACT

Predicting the price of used cars is one of the significant and interesting areas of analysis. As an increased demand in the second-hand car market, the business for both buyers and sellers has increased. For reliable and accurate prediction it requires expert knowledge about the field because of the price of the cars dependent on many important factors. This paper proposed a supervised machine learning model using KNN (K Nearest Neighbor) regression algorithm to analyze the price of used cars . Through this experiment, the data was examined with different trained and test ratios. As a result, the accuracy of the proposed model is around 85% and is fitted as the optimized model. The predictions are then evaluated and compared in order to find those which provide the best performances. A seemingly easy problem turned out to be indeed very difficult to resolve with high accuracy. All the four methods provided comparable performance. In the future, we intend to use more sophisticated algorithms to make the predictions . Determining whether the listed price of a used car is a challenging task, due to the many factors that drive a used vehicle's price on the market. The focus of this project is developing machine learning models that can accurately predict the price of a used car based on its features, in order to make informed purchases. We implement and evaluate various learning methods on a dataset consisting of the sale prices of different makes and models across cities in the United States. Our results show that Random Forest model and K-Means clustering with linear regression yield the best results, but are compute heavy. Conventional linear regression also yielded satisfactory results, with the advantage of a significantly lower training time in comparison to the aforementioned methods.

LITERATURE SURVEY

Several studies and related works have been done previously to predict used car prices around the world using different methodologies and approaches, with varying results of accuracy from 50% to 90%. In (Pudaruth, 2014) the researcher proposed to predict used car prices in Mauritius, where he applied different machine learning techniques to achieve his results like decision tree, K-nearest neighbours, Multiple Regression and Naïve Bayes algorithms to predict the used cars prices, based on historical data gathered from the newspaper.

Achieved results ranged from accuracy of 60-70 percent, the author suggested using more sophisticated models and algorithms to make the evaluation, with the main weakness off the decision tree and naïve Bayes that it is required to discretize the price and classify it which accrue to more inaccuracies. Moreover, he suggested a larger set of data of data to train the models hence the data gathered was not sufficient.

(Monburinon, et al., 2018) Gathered data from a German e-commerce site that totalled to 304,133 rows and 11 attributes to predict the prices of used car using different techniques and measured their results using Mean Absolute Error (MEA) to compare their results. Same training dataset and testing dataset was given to each model. Highest results achieved was by using gradient boosted regression tree with a MAE of 0.28, and MEA of 0.35 and 0.55 for mean absolute error and multiple linear regression respectively. Authors suggested adjusting the parameters in future works to yield better results, as well as using one hot encoding instead of label encoding for more realistic data interpretations on categorical data.

(Gegic, Isakovic, Keco, Masetic, & Kevric, 2019) from the International Burch University in Sarajevo, used three different machine learning techniques to predict used car prices. Using data scrapped from a local Bosnian website for used cars totalled at 797 car samples after pre-processing, and proposed using these methods: Support Vector Machine, Random Forest and Artificial Neural network. Results have shown using only one machine learning algorithm achieved results less

than 50%, whereas after combing the algorithms with pre calcification of prices using Random Forest, results with accuracies up to 87.38% was recorded.

(Noor & Jan, 2017) were able to achieve high level of accuracy using Multiple linear regression models to predict the price of cars collected from used cars website in Pakistan called Pak Wheels that totalled to 1699 records after pre-processing, and where able to achieve accuracy of 98%, this was done after reducing the total amount of attributes using variable selection technique to include significant attributes only and to reduce the complexity of the model.

(K.Samruddhi & Kumar, 2020) Proposed using Supervised machine leaning model using K-Nearest Neighbour to predict used car prices from a data set obtained from Kaggle containing 14 different attributes, using this method accuracy reached up to 85% after different values of K as well as Changing the percent of training data to testing data, expectedly when increasing the percent of data that is tested better accuracy results are achieved. The model was also cross validated with 5 and 10 folds by using K fold method.

(Gongqi, Yansong, & Qiang, 2011) proposed using Artificial Neural Network (ANN) through a combined method of BP neural network and nonlinear curve fit and have achieved accurate value prediction with a feasible model.

(Listiani, 2009) used Support Vector Machines to evaluate leased cars prices, results have shown that SVM is far more accurate in large dataset with high dimensional data than Multiple linear regression. Whereas the computation Multiple linear regression can take several minutes and the SVM would take up to a day to compute the results. Multiple linear regression may be simple, but SVM is far more accurate. Moreover, the study includes Samples with up to 178 attributes which is far more than the proposed variable in our study, hence the use of multiple linear regression may be more suitable in our case.

(Kuiper, 2008) Collected data from General Motor of cars that are produced in 2005, where he as well used variable selection technique to include the most relevant attributes in his model to reduce the

complexity of the data. He proposed used Multivariate regression model that would be more suitable for values with numeric format.

In order to predict the price of used cars, researchers (Nabarun Pal, 2018) used a supervised learning method known as Random Forest. Kaggle's dataset was used as a basis for predicting used car prices. In order to determine the price impact of each feature, careful exploratory data analysis was performed. 500 Decision Trees were trained with Random Forests. It is most commonly used for classification, but they turned it into a regression model by transforming the problem into an equivalent regression problem. Using experimental results, it was found that training accuracy was 95.82%, and testing accuracy was 83.63%. By selecting the most correlated features, the model can accurately predict the car price.

In light of the number of works that have been done in this field, another group of researchers (Jian Da Wu, 2017) conducted research on this topic and tried to develop a system that consists of three components: a data acquisition system, a price forecasting algorithm, and a performance analysis. Due to its adaptive learning capability, a conventional artificial neural network (ANN) with a back-propagation network is compared to the proposed ANFIS. In the ANFIS, qualitative fuzzy logic approximation as well as adaptive neural network capabilities are included. Using ANFIS as an expert system in predicting used car prices showed better results in the experiment. Using GUI, the consumer can get accurate and convenient

information about used cars' purchasing prices, and experiments proved that the proposed system could provide accurate and convenient price forecasting.

Hence, from all literature review it is concluded that used cars price prediction is an important topic which is the area of many researchers nowadays. So far, the best achieved accuracy is 83.63% on kaggle’s dataset using random forest technique. The researchers have tested multiple regressors and final model is regression model using linear regression.

Method :

The topic such as this can be assessed with mathematical models derived from quantitative data. A multiple variable regression can analyze the data by assessing the role each independent variable plays in determining the dependent variable (in this case, resale value). Significance can also be assessed by observing the p-values for each variable. The use of a statistical model will aide in making a claim on this, and to identify some of the major contributors to resale value in automobiles.

Data Collection :

The data used for this regression will be quantitative in nature. The sources of data are what someone would expect for used car information. Four sources that are used include Kelly Blue Book, Edmunds, a government fuel economy resource, and Car and Driver. Kelly Blue Book and Edmunds will both serve as data sources, with each source providing different aspects of the independent variables used. With the cooperation of these sources, data regarding price of a car-including new and used-with the respective age, mileage, make, condition, miles per gallon, safety ratings, and hybrid technology information will be obtained. These variables will allow for a regression to be run and an equation to be estimated.

Expected Outcomes :

Before I can make predictions regarding the influence each variable will have on resale value, a review of prior research and literature is appropriate. This will allow me to make a more confident prediction as well as confirm which variables are needed to produce a strong equation that explains much of the variations in vehicle depreciation. An expected equation could look like this:

Resale Value (DV) = Intercept- B3(Age) - B4(Mileage) + Bl(Make) + B2(MPG) + B5(Hybrid Tech)

REFERENCES

[1] Pudaruth, Sameerchand. "Predicting the price of used cars using machine learning techniques." Int. J. Inf. Comput. Technol 4, no. 7 (2014): 753-764.

[2] Monburinon, Nitis, Prajak Chertchom, Thongchai Kaewkiriya, Suwat Rungpheung, Sabir Buya, and Pitchayakit Boonpou. "Prediction of prices for used car by using regression models." In 2018 5th International Conference on Business and Industrial Research (ICBIR), pp. 115-119. IEEE, 2018.

[3] Gegic, Enis, Becir Isakovic, Dino Keco, Zerina Masetic, and Jasmin Kevric. "Car price prediction using machine learning techniques." TEM Journal 8, no. 1 (2019): 113.

[4] Noor, Kanwal, and Sadaqat Jan. "Vehicle price prediction system using machine learning techniques." International Journal of Computer Applications 167, no. 9 (2017): 27-31.

[5] https://ieeexplore.ieee.org/Xplore/home.jsp

[6] https://www.analyticsvidhya.com/blog/2018/08/k-nearestneighbor-introduction-regression-python/

[7] https://machinelearningmastery.com/k-fold-cross-validation/