LITRATURE SURVEY

TECHNOLOGY : APLLIED DATA SCIENCE

PROJECT TITLE : VEHICLE PERFORMANCE ANALYZER

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ABSTRACT:

With the increasing population demographics and the dependency of man on motor vehicles as the primary source of transportation, the number of motor vehicles being registered for commercial as well as non-commercial activities on a daily basis is massive and yet continues to increase at an alarming rate. This has a direct and an unambiguous effect on the amount of fossil fuels being utilized globally and its subsequent environmental effects, which is of great concern in the present situation. Several attempts from various research sectors are ongoing in order to overcome this global issue and promising results are expected. This project is one such attempt at identifying the performance of small passenger cars in terms of fuel efficiency and map them with factors affecting it using machine learning techniques. The commencing activity while carrying out any such research activity will be the identification of the problem and all its possible sources. In this case, two potential sources can be identified and they are; the vehicle characteristics and the driver/driving behaviour. The relevant data for this analysis was taken from

the public source, Kaggle which is the data collected from the OBD of the car and models are built using techniques like Multiple Linear Regression, XGBoost, Support Vector Machine and Artificial Neural Network and their performance is compared to discover the first rate technique in predicting the fuel efficiency and to propose the optimum driving behaviour in terms of throttle position to achieve better fuel efficiency. The results reveal that XGBoost model outperforms all other models developed in predicting the fuel efficiency for the different split ratios evaluated and comparing the throttle position with the predicted fuel efficiency explains that to achieve better fuel efficiency the throttle position must be around 70 to 80 on a scale of 100, referred to as full throttle position. The knowledge discovered from the research could be used by car manufacturers to design cars in future to mitigate the fuel consumption.

INTRODUCTION:

This project completely depends upon Since the advent of the industrial revolution, transportation facilities has played a vital role in all areas of livelihood such as travel, trade and exchange. Despite the invention of multiple transportation modes, roadways transportation is the most commonly preferred course by people to carry out day to day activities. Irrespective of the type of activity being carried out i.e., commercial or non-commercial purpose, roadways take up a major share in the global transportation statistics. Although the growth of the automobile industry has contributed to the luxury of commuting to the communities and boosted economic growth, it certainly has had unfavourable effect on environment.

ARTICLE SAYS:

The primary objective of the research was to develop a model using machine learning techniques which precisely predicts the fuel efficiency and to propose the optimum driving style and vehicle characteristics to achieve better fuel efficiency. A review on the literature related to the research exposed the techniques that could be used to build the model and the analysis to be carried out to meet the objectives. Machine learning techniques like Multiple Linear Regression, Support Vector Machine, Artificial Neural Network and XGBoost was chosen to develop the model. Data pre-processing and data transformation like normalisation was carried out before building the model.

Five models were built using the machine learning techniques Multiple Linear Regression, Support Vector Machine, Artificial Neural Network and XGBoost. The parameter was selected by running Grid Search for few algorithms like Support Vector Machine and XGBoost and for the other algorithms through parametric analysis. The developed models were evaluated with the help of standard evaluation metrics like RMSE, MAE and R2. Throttle position and speed are examined with the predicted fuel efficiency to evaluate their relationship with the fuel consumption. Analysis on mass air flow rate, intake air temperature and other vehicle characteristics with the predicted fuel efficiency is also carried out which gives deeper insight and better recommendations to mitigate fuel consumption. One limitation was the hardware resource available because of which the Grid Search was unable to run on all algorithms for all parameters. Another limitation was the availability of the data required, although the car manufacturing companies collect all the data related to the car, it is limited.

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INNOVATION WE MAKE:

There is more scope in future for research and analysis of fuel efficiency by including other factors like the road condition and real-time traffic with the help of google maps, this would help in analysing much deeper. The knowledge discovered from the research and future work can be used by the car manufacturing companies to improve the fuel economy by considering the characteristics that substantially influence the fuel efficiency.

CONCLUTION:

As discussed in section 6 the models developed have promising results in predicting the fuel efficiency with the XGBoost model outperforming all other models by constantly predicting better for all the experiments conducted with different train and test split ratio. The XGBoost model's performance is low only when there is low fuel efficiency repeatedly but in comparison with other models developed XGBoost model's perform ance is exceptional and the values obtained for RMSE, MAE and R2 is also acceptable. Although this model was run on the data collected from small passenger car, the model is not limited only to that class and can be generalised for any vehicle with the driving data and vehicle characteristics available.