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Machine Learning Based Vehicle Performance Analyzer

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ABSTRACT: Predicting the performance level of cars is an important and interesting problem. The main goal is to predict the performance of the car to improve the certain behavior of the vehicle. This can significantly help to improve the system's fuel consumption and increase efficiency. The performance analysis of the car is based on the engine type, no of engine cylinders, fuel type, and horsepower, etc. These are the factors on which the health of the car can be predicted. It is an on-going process of obtaining, researching, analyzing, and recording the health based on the above three factors. The performance objectives like mileage, dependability, flexibility, and cost can be grouped together to play a vital role in the prediction engine and engine management system. This approach is a very important step towards understanding the vehicle's performance. With the increasing population the dependency of man on vehicles are the primary source of transportation, the number of motor vehicles being registered for commercial as well as noncommercial activities. 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. Machine learning techniques to predict the fuel efficiency of car.

KEYWORDS: Machine Learning, Decision tree, Random forest, KNN, and xgboost.

I. INTRODUCTION

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 (Predi'c et al.(2016)). The result of using fossil fuels as the primary source for the operation of these motor vehicles is already well known to man and extensive efforts are being carried out to at least subside them. Global temperature rise increased anthropogenic CO₂ emissions, depletion of fossil fuels and hazardous health risks are most concerning. Several legislative principles and policies are being drafted proactively by the government to help mitigate the emission of CO₂ emissions. Here it becomes important to understand that the levels of CO₂ emission by a particular motor vehicle is parallel to the amount of fuel being consumed by the same motor vehicle during operation. This in turn corresponds to the performance characteristics and the efficiency of the vehicle. Periodic maintenance of these motor vehicles becomes very essential in maintaining its fuel efficiency. Yet, with the assistance of the new and updated developments in technology, monitoring of the fuel consumption of these motor vehicles can be achieved easily today.

This document is structured as follows: Section 2 Critique on the literature highlighting the purpose, method and the limitations, section 3 Methodology this research follows and the steps involved, section 4 Design Specification and the architecture of the techniques used in this research, section 5 Implementation details of the techniques used to develop models, section 6 Results/Evaluation of the models developed, section 7 conclusion and future scope, acknowledgement and References.

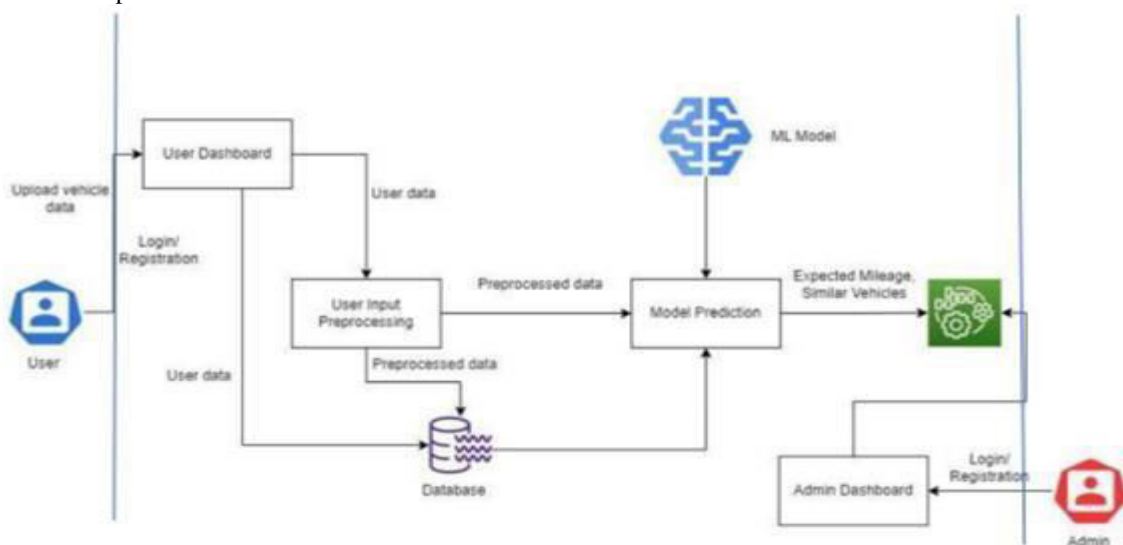
II. RELATED WORK

Vehicle's fuel consumption is influenced by external and internal factors.[1] Road conditions, weather and traffic are considered as the external factors and vehicle characteristics, driving behaviour and load are considered to be the internal factors.[2] Wickramanayake and Bandara (2016) in their work predicted the fuel consumption of fleet vehicles using Machine Learning techniques like Random Forest, Gradient Boosting and Artificial Neural Network. The dataset consisted of a number of parameters of which few are speed, fuel level, fuel consumption and acceleration, the data was collected from a public bus in Sri Lanka. [3] Random Forest outperformed the other two models built. Several factors which directly influences the fuel consumption was considered in the study but other main factors like the engine RPM, traffic conditions and load were not considered in the study. Although engine and drive technology, vehicle type and condition influences vehicle's fuel consumption, personal driving style is an eminent factor and change in the style can minimize the fuel consumption.[4] Thitipatanapong and Luangnarutai (2011) conducted a study in Thailand to analyse the relationship between driving behaviour and fuel economy of a car. Based on the acceleration, driving behaviour was classified as 'moderate', 'aggressive' and 'claim'. [5]The study concluded that fuel consumption rate and vehicle driver index (vdi), measure of driving behaviour, were deeply related and hence vdi can be used to estimate driving behaviour. Driver is said to be aggressive when there is a higher vdi resulting in lower fuel economy.

III. METHODOLOGY

The Knowledge Discovery in Databases (KDD) methodology is used for the research and analysis of huge data collected by instruments given by Fayyad et al. (1996) and points out that KDD applications in areas like business, finance are difficult than in the field of science in general because science end-users know their data in detail. It consists of the following steps:

- Data Selection
- Data Pre-processing
- Data Transformation
- Data Mining
- Evaluation/Interpretation





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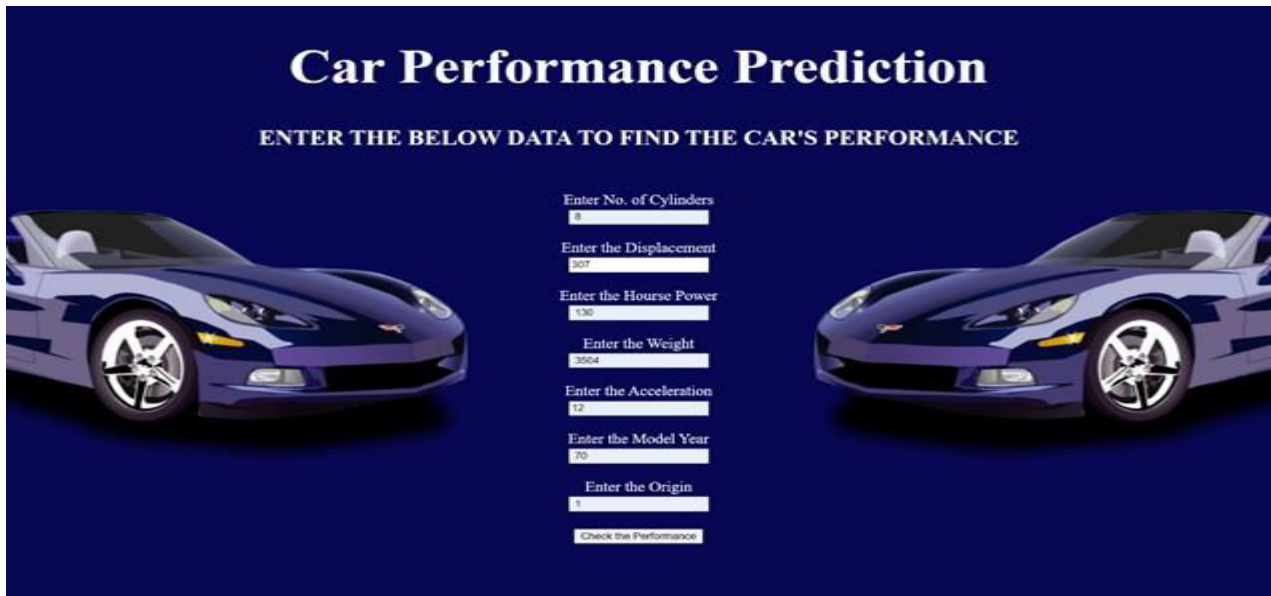
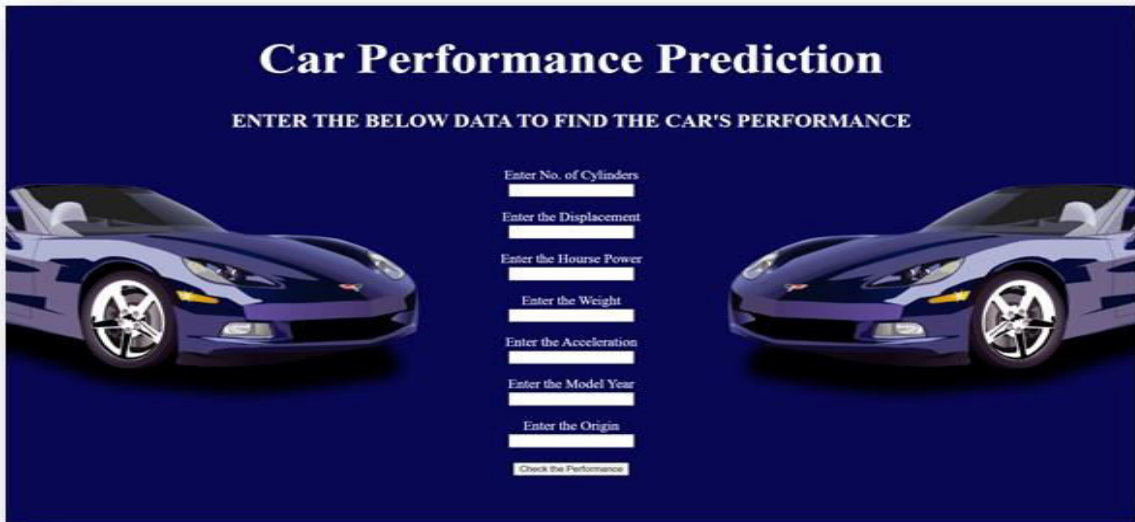
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IV. EXPERIMENTAL RESULTS

In our project, we predict the performance of the vehicle with the help of inputs given by the car user. The inputs are

- Number of cylinders
- Displacement
- Horse power
- Weight
- Acceleration
- Model Year
- Origin

This labels and the text box below the labels are used to get the inputs from the car users who want to analyze the performance of the vehicle.



V. CONCLUSION

From these results we can analyze the different types of automobile are includes displacement, cylinder, horse power, acceleration, weight, model year and origin. A successful machine learning model depends on both the data and the performance of the learning algorithms. The sophisticated learning algorithms then need to be trained through the collected real-world data and knowledge related to the target application before the system can assist with intelligent decision-making.

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