CAR PERFORMANCE ANALYSIS

Submitted by,

FARHANA SHIRIN M R

S DEVIKA DAS

1.INTRODUCTION

Car makers are continually streamlining their cycles to increment eco-friendliness, in light of the fact that the vehicle business has been developing for more than two centuries, and fuel costs are persistently expanding. Clients are turning out to be more specific about highlights, so car creators are continually changing their cycles to increment eco-friendliness. In any case, imagine a scenario where there was a precise assessorfor a vehicle's MPG (Miles per Gallon) or the fuel utilization indicator in light of a few known details. By having a more positive vehicle that is likewise more proficient, you could beat rivals on the lookout, increment interest for the item and put more creation into the market. Utilizing Machine Learning, we are currently planning the expectation models and lessening the Error valuesfor carsthat have been made in the beyond couple of year. Here we will use the datasets available to machine learning practitioners to create a model to predict fuel efficiency of various kinds of vehicles across various periods. As part of the model, we will include descriptions of many different cars from different periods. These descriptions will include things such as cylinders, displacement, horsepower, and weight. The ML method is appropriate for this type of analysis since it can be applied to learn patterns in data and construct models from them. Besides that, deep learning concepts will be implemented to create othermodels. Based on the analysis, itwill be seenwhetherwhichmodel will produce less errorwith better efficiency.

a. OVERVIEW

Having a decent comprehension of what influences fuel utilization, and afterward having the option to foresee it, is vital to upgrading eco-friendliness. In the transportation business, the Miles per Gallon, or MPG, is utilized to work out a vehicle's proficiency as a component of the energy it consumes. MPG fluctuates by beginning. To check the MPG content in vehicles, we have made chart models. The diagram models relate with this MPG in the vehicles in view of chambers, removal, drive, and weight. Motors are estimated by relocation, or their volume,

which is normally communicated in liters or cubic centimeters. The beginning is a discrete number going from 1 to 3. In light of this dataset, we accepted that 1 addresses a vehicle from America, 2 addresses a vehicle from Europe, and 3 addresses a vehicle from Asia or different spots. A few of the qualities in this dataset may be erroneous, so we will address those qualities during the pre-handling of the information. Demonstrating fuel utilization in expressways is more straightforward, since outer factors, for example, traffic and street conditions don't fundamentally impact fuel utilization. Besides, by having the option to anticipate the fuel utilization the proprietors may likewise distinguish potential fuel extortion if any.

1.2 PURPOSE

The main objective of the project is- Car makers are continually streamlining their cycles to increment eco-friendliness, in light of the fact that the vehicle business has been developing for more than two centuries, and fuel costs are persistently expanding. Clients are turning out to be more specific about highlights, so car creators are continually changing their cycles to increment eco-friendliness

2.LITERATURE SURVEY

Makers, controllers, and clients are totally intrigued by vehicle fuel utilization models. They are expected during all phases of the vehicle's life cycle. The objective of this work is to display average fuel utilization for weighty vehicles all through activity and upkeep. As a general rule, there are three sorts of techniques for creating fuel utilization models:

• Material science-based models, these are the models that are framed from an exhaustive handle of the actual framework. These models utilize exhaustive numerical conditions to depict the elements of the vehicle's parts at each time step.

• Factual models, which are additionally information driven and lay out a planning between the likelihood circulation of a chose set of indicators and the objective result.

• AI models, which are information driven and address a theoretical planning from an info space

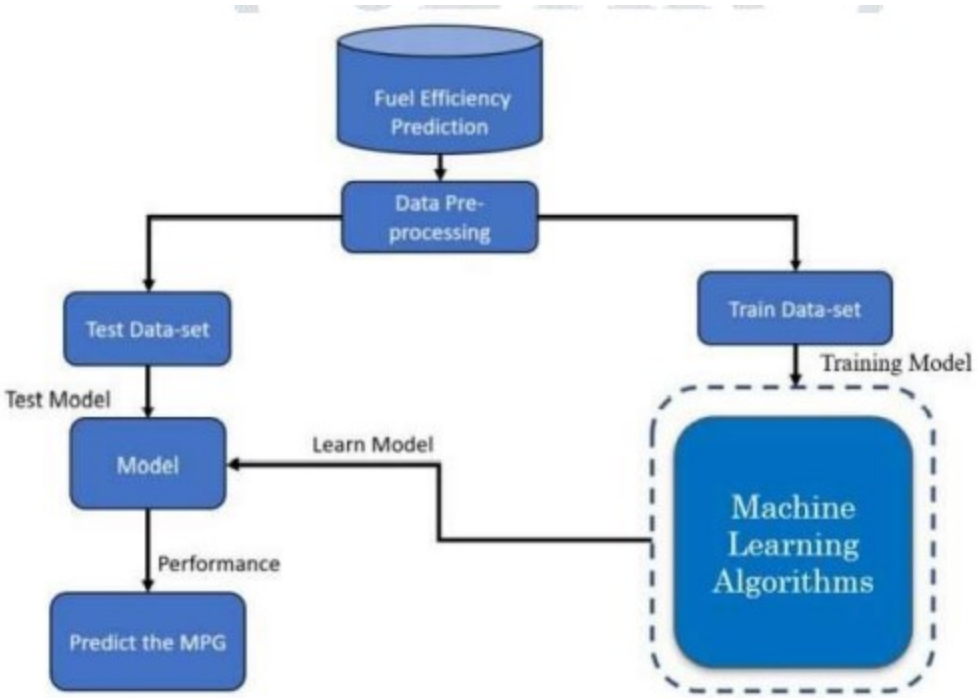
comprising of a chose set of indicators to a result space that addresses the objective result, for this situation normal fuel utilization.

Compromises between the above techniques not entirely settled by cost and precision, contingent upon the necessities of the planned application. Without exact information on the vehicle's actual properties and estimations, the technique should apply and adjust to a wide scope of vehicle advancements (counting future ones) and arrangements for every vehicle. While gauging the required exactness versus the expense of creating and adjusting an individualized model for every vehicle, AI arises as the strategy for decision. There have been a few past models created for both immediate and normal fuel use. Since they can address the elements of the framework's movement at different time steps, physical science-based models are the most appropriate for assessing momentary fuel use. Since figuring out designs in genuine opportunity information i**s** troublesome, AI models can't foresee prompt fuel utilization with an elevated degree of exactness. These calculations, then again, are prepared to do precisely recognizing and learning patterns in normal fuel use. Recently proposed AI strategies for normal fuel utilization utilize a bunch of indicators accumulated after some time to gauge fuel utilization in gallons per mile or liters per kilometer. While our recommended method is as yet centered around normal fuel utilization, it changes from prior models in that the indicators' feedback space is quantized with respect to a proper distance instead of a decent time span. All indicators in the proposed models are collected regarding a proper window that addresses the vehicle's distance voyaged, bringing about a superior planning from the information space to the model's result space. Past AI models, then again, needed to not just gain proficiency with the examples in the info information, yet additionally convert from the info area's time sensitive scale to the result space's distance-based scale (i.e., normal fuel utilization). Involving similar scale for the model's feedback and result regions enjoys different benefits.

3.THEORITICAL ANALYSIS

3.1 METHODOLOGIES

In this project, we will be implementing Linear regression, Random Forest, Decision tree, Neural Network etc. algorithms. At first, we will perform the data preprocessing on our data along with its data cleaning. All the visualizations related to the data can be seen here, various graphs and plots will be used. Cleaning of the data will include filling the null units in the dataset if any or rectifying any other defects. Then, we will be constructing different models with the various algorithms and start performing the training process on the data. Each different model will be constructed using the different algorithms. The predictions values will be dependent on the proper training of data with the ones from the dataset. After all this, testing will be done on the datasets with the datasets for MPG or the fuel efficiency predicted value. The RMSE values of all the models will be compared in order to find the better suited and efficient model. Once the models are finalized, the deployment of it can be done. Deployment process includes the creation of a web page with the suitable models and deploys them in that web page. The user either from the automobile industry side or the customer will visit the page or give the new inputs as per their models to be checked. The given input will be fed to the model and predictions of the fuel efficiency will be calculated accordingly. Finally, the predicted output which will be the MPG or fuel efficiency will be displayed on to the screen.



3.2 HARDWARE / SOFTWARE DESIGNING

The hardware required for the development of this project is:

Processor : Intel CoreTM i5-9300H

Processor speed : 2.4GHz

RAM Size : 8 GB DDR

System Type : X64-based processor

SOFTWARE DESIGNING:

The software required for the development of this project is:

Desktop GUI : Anaconda Navigator
Operating system : Windows 10
Front end : HTML, CSS,JAVASCRIPT
Programming : PYTHON
Cloud Computing Service : IBM Cloud Services

4.EXPERIMENTAL INVESTIGATION

IMPORTING AND READING THE DATASET

Importing the Libraries

First step is usually importing the libraries that will be needed in the program.

Pandas: It is a python library mainly used for data manipulation.

NumPy: This python library is used for numerical analysis.

Matplotlib and Seaborn: Both are the data visualization library used for plotting graph which will help us for understanding the data.

csr_matrix() :A dense matrix stored in a NumPy array can be converted into a sparse matrix using the CSR representation by calling the csr_matrix() function.

Train_test_split: used for splitting data arrays into training data and for testing data.

Pickle: to serialize your machine learning algorithms and save the serialized format to a file.

Reading the Dataset

For this project, we make use of three different datasets (Books_Ratings, Books, Users). We will be selecting the important features from these datasets that will help us in recommending the best results.

The next step is to read the dataset into a data structure that's compatible with pandas. Let's load a .csv data file into pandas. There is a function for it, called **read_csv().**We will need to locate the directory of the CSV file at first (it's more efficient to keep the dataset in the same directory as your program).If the dataset in same directory of your program, you can directly read it, without any path. After the next Steps we made following bellow:

1.Data visualization

2.Collabrative and filtering

3.Creating the Model

4.Test and save the model

5.Buil Python Code

6.Build HTML Code

7.Run the Application

We are the following above sections we did and investigate it.

5.FLOWCHART

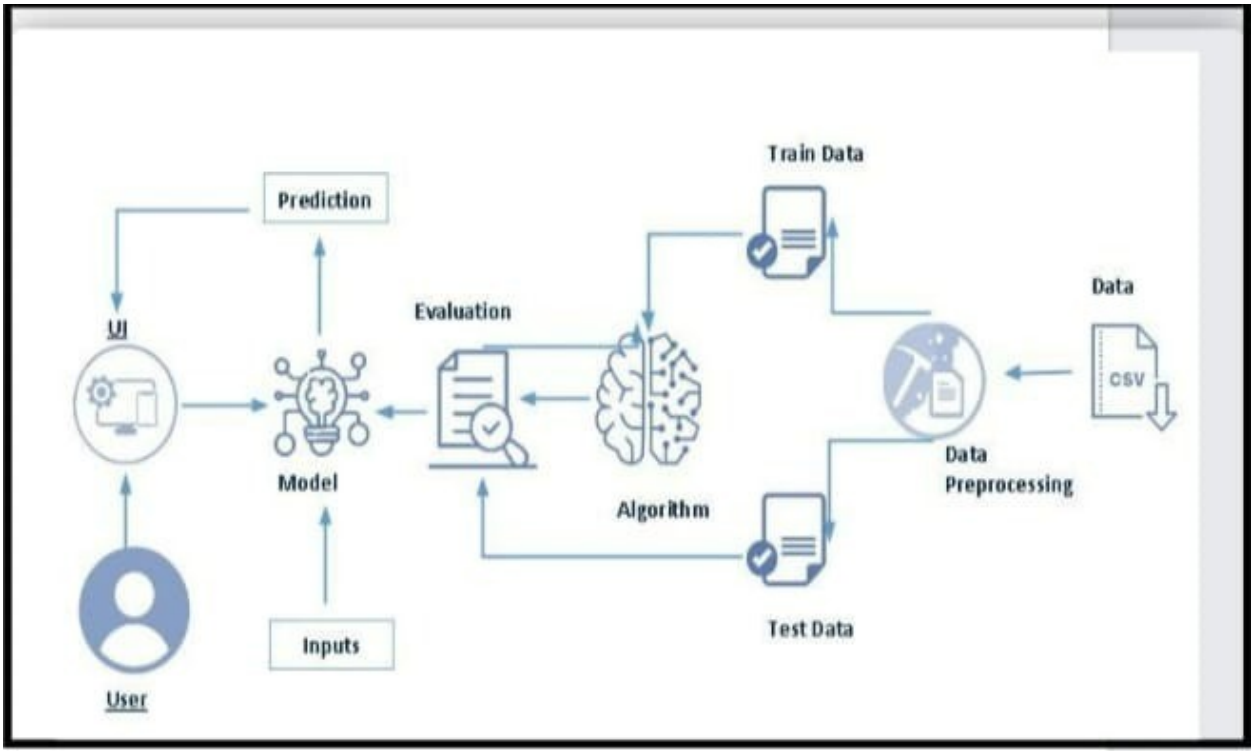


Fig 5.1 Flowchart of the project

Project Flow:

1. User interacts with the UI (User Interface) to upload the input features.
2. Uploaded features/input is analysed by the model which is integrated.

   Once a model analyses the uploaded inputs, the prediction is showcased on the UI.

1. Data Collection.

- Collect the dataset or Create the dataset

2. Data Pre- processing.

- Import the Libraries.
- Importing the dataset.
- Exploratory Data Analysis
- Data Visualization

3. Collaborating Filtering

- Merging datasets
- Creating the Model
- Predicting the results
- Saving our model and dataset

4. Application Building

- Create an HTML file
- Build a Python Code

6.RESULT

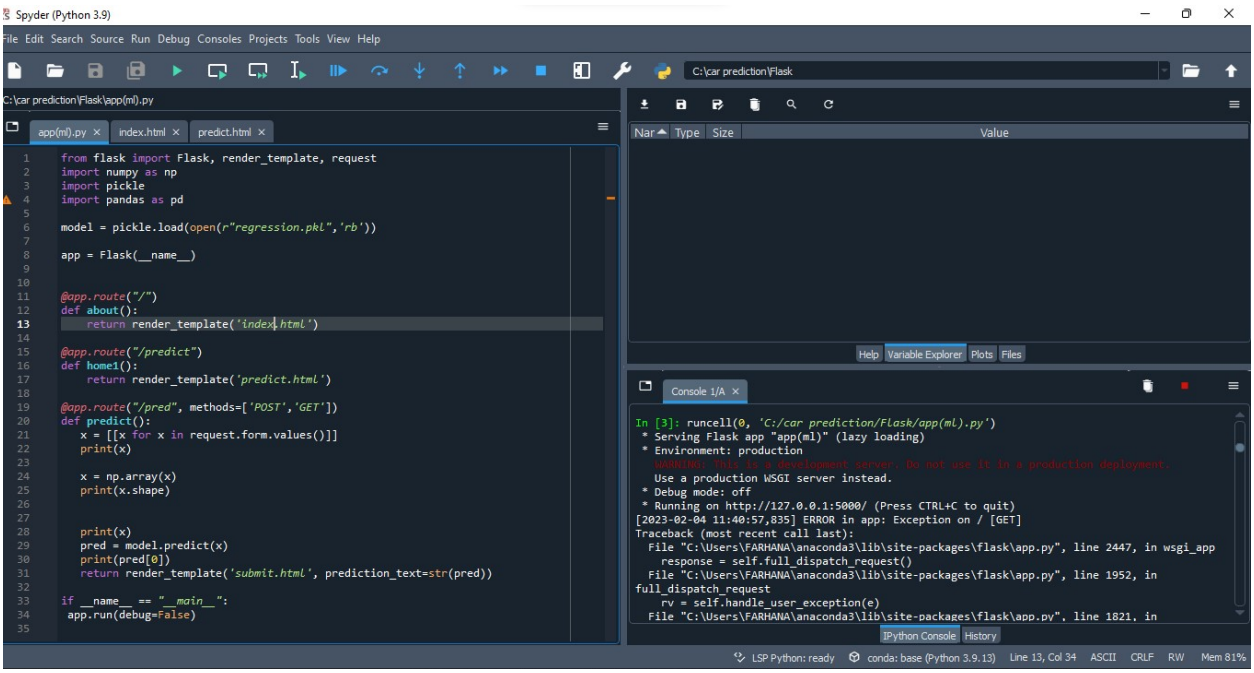


Fig 6.1 Flask code on Spyder

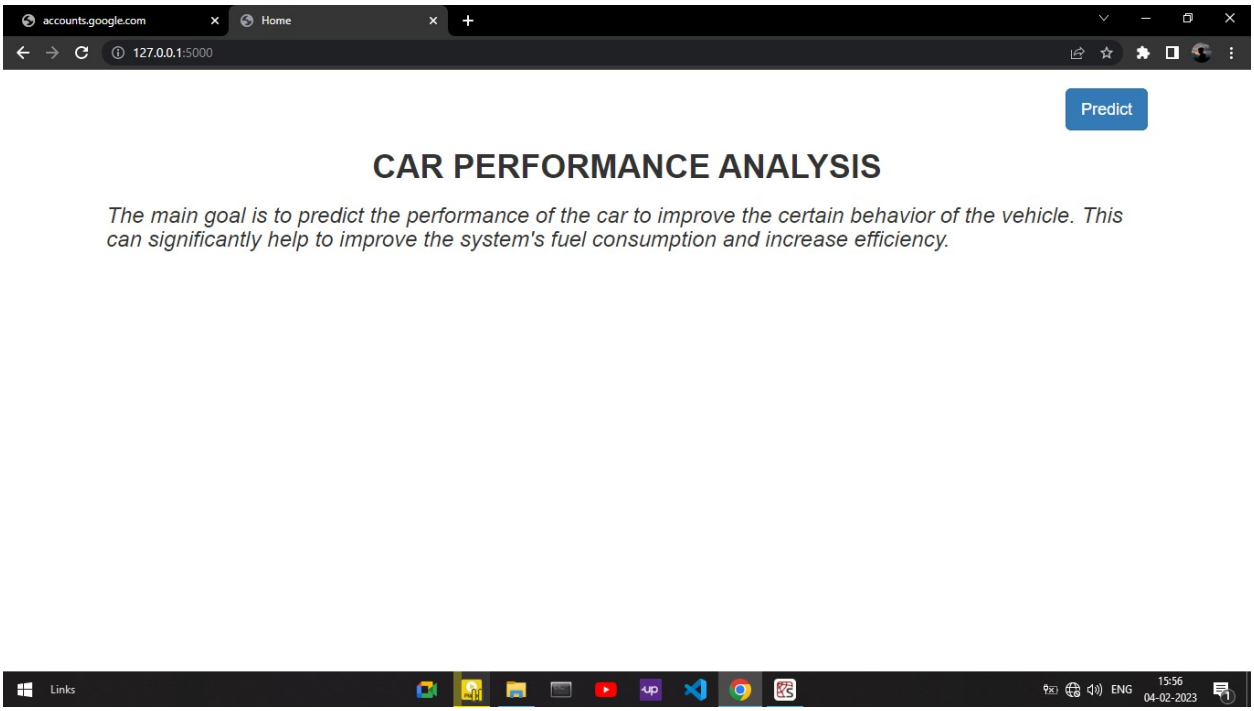


Fig 6.2 Home page

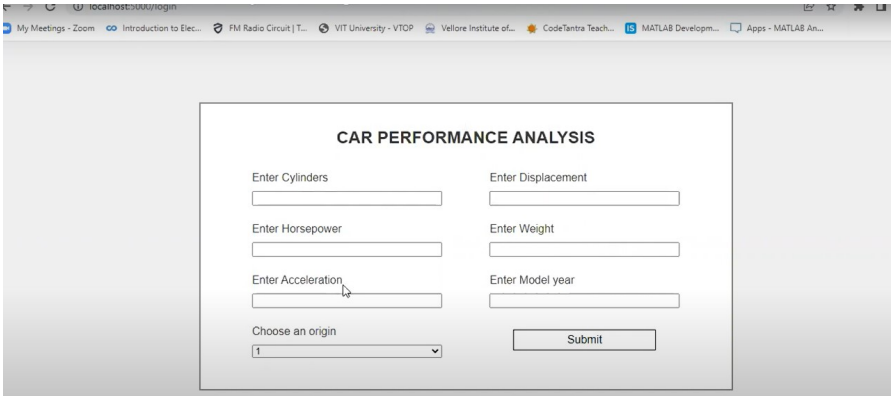


Fig 6.3 Predicting page

7.ADVANTAGES AND DISADVANTAGES

ADVANTAGES

- Upon comparing and testing all the models, we found that Decision tree is the most efficient one among all the models with an accuracy of 99.9%
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DISADVANTAGES

- It predict the performance very slowly.
- Out of datas cannot be analysis.

8.APPLICATIONS

- Upon comparing and testing all the models, we found that Decision tree is the most efficient one among all the models with an accuracy of 99.9%

9.CONCLUSION

Fuel prices are increasing rapidly each day, and the demand of vehicles with better fuel efficiency or Miles per gallon is growing tremendously. This situation leads consumers to choose vehicles wisely, on the other hand the vehicle manufacturers also have a tight competition and close margins to deal with to have a better vehicle in the market. In this kind of situations our model to predict the fuel efficiency of vehicles will come into action for making effective vehicles by knowing its specifications beforehand and make more popular vehicles that outshine competitors. During this project, our main objective was to predict the vehicle's fuel efficiency or the MPG (Miles per gallon). We have done the data preprocessing to make the dataset free from null values and other disturbances, then we performed data visualization of the data represent and know well about the attributes in the dataset. We have implemented various machine learning models and checked for their errors and accuracies until we get the best effective model for the data taken. Upon attaining the best fit model, we have deployed it. In the deployment page, it calculates the result value and gives that answer based on the probability and calculations been made by that model. Here the user can give the dataset taken or their own values as an input to the model and it gives the output based on the comparison of the probability of that MPG.

10.FUTURESCOPE

Fuel prices are increasing rapidly each day, and the demand of vehicles with better fuel efficiency or Miles per gallon is growing tremendously. This situation leads consumers to choose vehicles wisely, on the other hand the vehicle manufacturers also have a tight competition and close margins to deal with to have a better vehicle in the market. In this kind of situations our model to predict the fuel efficiency of vehicles will come into action for making effective vehicles by knowing its specifications beforehand and make more popular vehicles that outshine competitors. During this project, our main objective was to predict the vehicle's fuel efficiency

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11.BIBILOGRAPHY

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[2] Varun Shirbhayye, Deepesh Kurmi, Siddharth Dyavanapalli, Agraharam Sai Hari Prasad, Nidhi Lal, “An Accurate Prediction of MPG (Miles Per Gallon) using Linear Regression Model of Machine Learning”.

[3] J. Lindberg, “Fuel consumption prediction for he’avy vehicles using machine learning on log data,” Master’s thesis, KTH, School of Computer Science and Communications (CSC), 2014.

APPENDIX

A Source Code of Flask:

```
from flask import Flask, render_template, request
import numpy as np
import pickle
import pandas as pd

model = pickle.load(open(r"regression.pkl",'rb'))

app = Flask(__name__)



@app.route("/")
def about():
    return render_template('index.html')

@app.route("/predict")
def home1():
    return render_template('predict.html')

@app.route("/pred", methods=['POST','GET'])
def predict():
```

```
    x = [[x for x in request.form.values()]]

    print(x)



    x = np.array(x)

    print(x.shape)




    print(x)

    pred = model.predict(x)

    print(pred[0])

    return render_template('submit.html', prediction_text=str(pred))


if __name__ == "__main__":

 app.run(debug=False)
```