FUEL CONSUMPTION ANALYSIS AND PREDICTION FOR HEAVY VEHICLES

AKSHAYAM PRASMITA1, BONTALA VENKATA AJITHA2

#1Assistant Professor, Department of CSE, PBR Visvodaya Institute of Technology and Science, Kavali

#2 Assistant Professor, Department of CSE-IoT, PBR Visvodaya Institute of Technology and Science, Kavali

Abstract_ Compared to the previous way of measuring fuel consumption based on the time period, machine learning models are useful for calculating fuel consumption depending on the distance travelled. This methodology is combined with seven predictors based on road grade and vehicle speed to create a highly predictive neural network model for heavy vehicle average fuel consumption. This tactic is used in conjunction with the following metrics: average moving speed, characteristic acceleration, aerodynamic speed squared, number of stops, stops time, change in kinetic energy, and change in potential energy. It produces a highly predictive neural network model for heavy vehicle fuel consumption on average. For each specific car, it is easy to create and implement in order to maximise fuel consumption.

1.INTRODUCTION

Producers, controllers, and clients are undeniably keen on vehicle fuel utilization models. They are expected during all phases of the vehicle's life cycle. We will demonstrate run of the mill fuel use for weighty vehicles during activity and upkeep in this task. Physical science based models, AI models, and factual models are the three essential classifications of approaches used to build fuel utilization models. There have been a few past models created for both prompt and normal fuel use. Since they can address the elements of the framework's action at different time steps, material science based models are the most ideal for assessing momentary fuel utilization. The proposed framework relies upon 7 elements to anticipate the typical fuel utilization. Seven factors, for example, num-stops, time-halted, normal moving-speed, trademark speed increase, streamlined speed-squared, change-in-motor energy, change-in-potential-energy are recorded from every vehicle head out as much as 100 kilo meters like number of times vehicles halted, complete halted time taken and so on. This multitude of values are gathered from weighty vehicle and use as dataset to prepare ANN model.

2.LITERAATURE SURVEY

2.1. NEURAL NETWORK-BASED PREDICTION OF VEHICLE FUEL CONSUMPTION BASED ON DRIVING CYCLE DATA:

URL:https://www.researchgate.net/publication/357744098_Neural_NetworkBased_Prediction_of_Vehicle_Fuel_Consumption_Based_on_Driving_Cycle_Data

This paper deals with fuel consumption prediction based on vehicle velocity, acceleration, and road slope time series inputs. Several data-driven models are considered for this purpose, including linear regression models and neural network-based ones. The emphasis is on accounting for the road slope impact when forming the model inputs, in order to improve the prediction accuracy. A particular focus is devoted to conversion of length-varying driving cycles into fixed dimension inputs suitable for neural networks. The proposed prediction algorithms are parameterized and tested based on GPS-and CAN based tracking data recorded on a number of city buses during the irregular operation. The test results demonstrate that a proposed neural network-based approach provides a favorable prediction accuracy and reasonable execution speed, thus making it suitable for various applications such as vehicle routing optimization, synthetic driving cycle validation, transport planning and similar.

2.2. AN ENHANCED FUEL CONSUMPTION MACHINE LEARNING MODEL IN VEHICLES:

URL:
https://ui.adsabs.harvard.edu/abs/2021JPhCS1979a2068D/abstract

In the present world, some of the people are not able to pay expenses for petrol/diesel. The model which we are generating will be useful for many people. The system which we are generating is a data summary approach will be based on distance rather than traditional conventional time period when developing personalized machine learning model for fuel consumption.

This system is utilized within conjunction with vehicle pace Also seven predictors inferred starting with way review to prepare a neural system model utilizing machine Taking in that predicts Normal fuel utilization done vehicles. Different window sizes are evaluated and the results mean that the 1km window can estimate the fuel consumption with a coefficient of 0.91 and it also means less than 4% peak to peak percentage error for routes that include both city and highway duty cycling sections.

2.3. FUEL CONSUMPTION PREDICTION MODEL USING MACHINELEARNING:

URL:https://www.researchgate.net/publication/356819804_Fuel_Consumption_Prediction_Model_using_ Machine Learning

In the paper, we are enhancing the accuracy of the fuel consumption prediction model with Machine Learning to minimize Fuel Consumption. This will lead to an economic improvement for thebusiness and satisfy the domain needs. We propose a machine learning model to predict vehicle fuel consumption. The proposed model is based on the Support Vector Machine algorithm. The Fuel Consumption estimation is given as a function of Mass Air Flow, Vehicle Speed, Revolutions per Minute, and Throttle Position Sensor features. Our model can compete with other Machine Learning algorithms for the same purpose which will help manufacturers find more choices for successful Fuel Consumption Prediction models.

3.PROPOSED SYSTEM

The average fuel usage is predicted by the proposed approach based on seven factors. Seven variables are recorded from each vehicle travel up to 100 kilometres, including the number of stops, total time spent stopped, characteristic acceleration, aerodynamic speed squared, number of stops, change in kinetic energy, and change in potential energy. These values are all gathered from heavy vehicles and used as training data for artificial neural networks.

In this study, fuel consumption throughout the distance traveled within the same time period is the output, while the input is aggregated in the time domain at 10-minute intervals. A transfer function F(p) = o, where F(·) denotes the system, p stands for the input predictors, and o denotes the system's response or output, is used to depict the complex system. Feed Forward Neural Networks (FNN) are the type of ANNs used in this paper. Training is an iterative process that can be carried out with a variety of methods, such as back propagation and particle swarm optimization. Future research will examine alternative strategies to see if they may raise the predicted accuracy of the model.

3.1 IMPLEMENTATION

- **Upload Heavy Vehicles Fuel Dataset:** Using this module we can upload train dataset to application. Dataset contains comma separated values.

- **Read Dataset & Generate Model:** We'll use this module to read a comma-separated dataset and then create a train and test model for an ANN using the values from that dataset. The dataset will be separated into two sections, with 80 percent being used to train the ANN model and 20 percent being used to test it. Run

- **ANN Algorithm:** Using this model, we can create ANN object and then feed train and test data to build ANN model.

- **Predict Average Fuel Consumption:** We will upload new test data to this module, and ANN will apply a train model to that data in order to predict average fuel usage for those test records.

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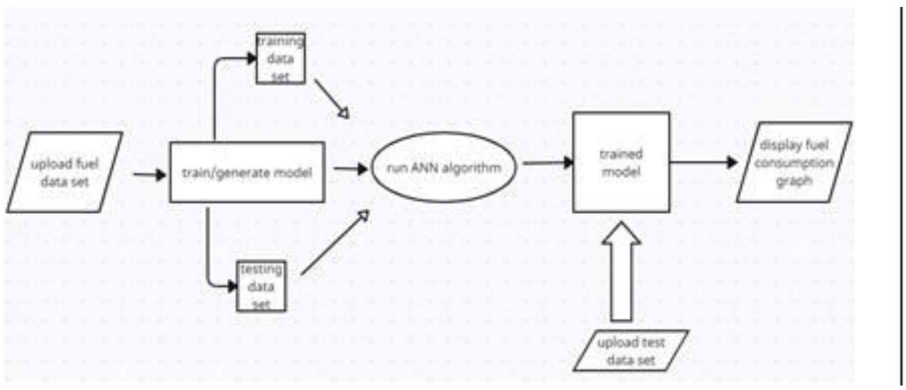

Fig 1:Architecture

4.RESULTS AND DISCUSSION

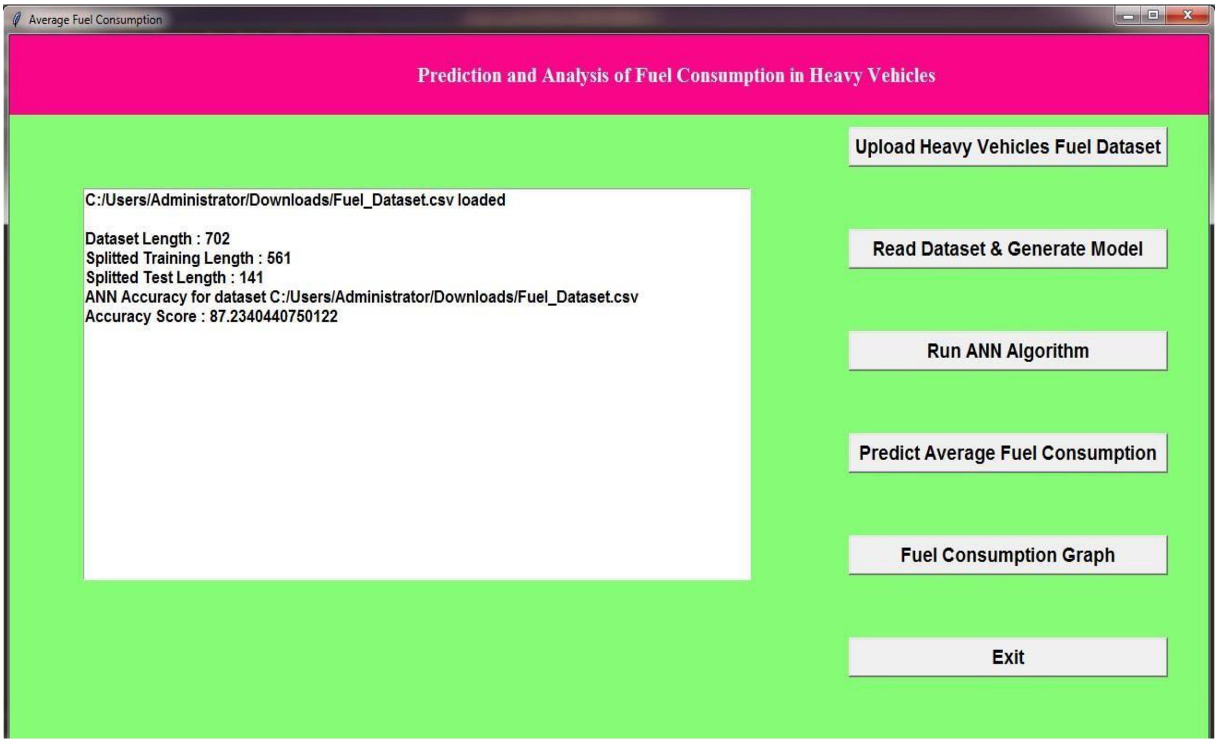

fig-2: Running the ANN algorithm and displaying the accuracy

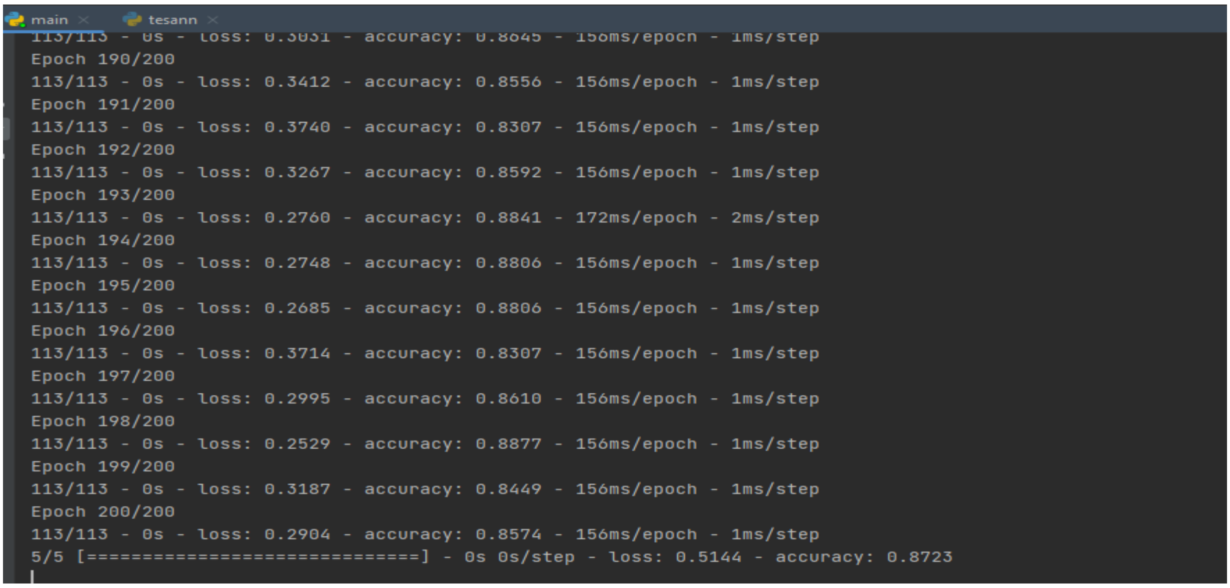

fig-3: Running ANN algorithm

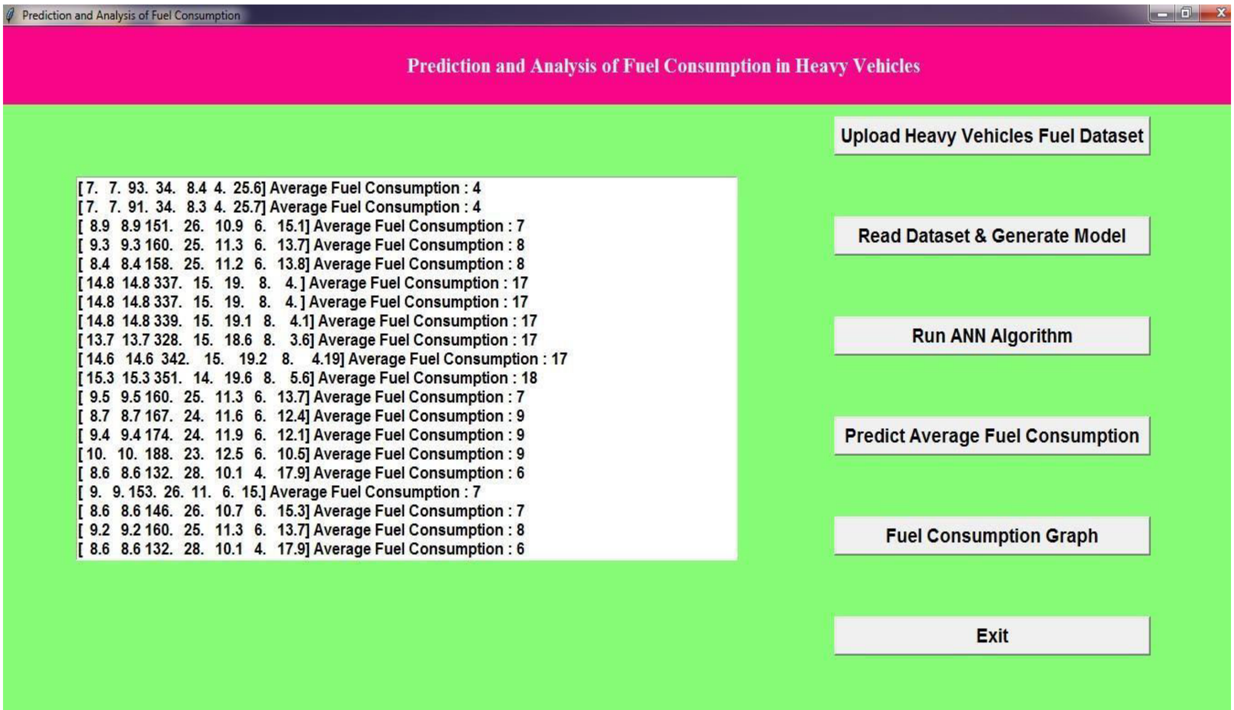

fig-4: To predict the data, on clicking predict average fuel consumption button it will prompt to upload the test data set. After that it displays the predicted data corresponding to test data set

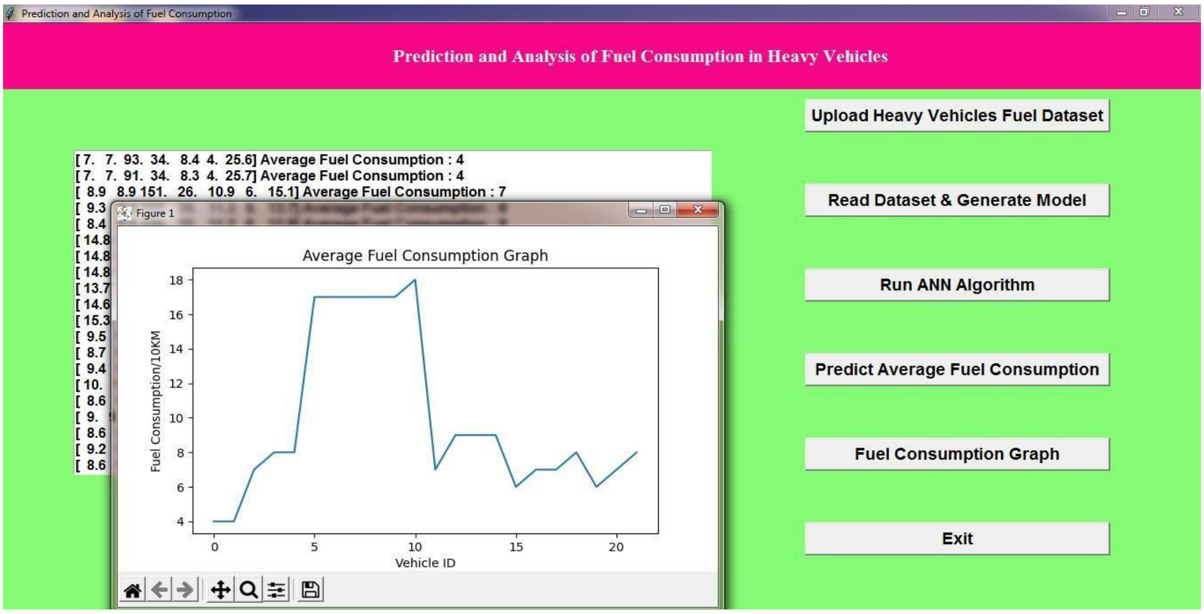

fig-5: displaying the fuel consumption graph

5.CONCLUSION

A convenient machine learning model that can be created for every heavy vehicle in a fleet. The number of stops, duration of stops, average speed, characteristic acceleration, squared aerodynamic speed, change in kinetic energy, and change in potential energy are the seven predictors that the model uses.In order to better capture the average dynamic behavior of the vehicle, the final two predictors are presented in this research. The road gradient and vehicle speed are the model's primary predictors.Telemetric devices, which are becoming a standard component of linked cars, easily provide these values. Furthermore, these two variables make it simple to compute the predictors on-board.

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