AAI Mandatory Assignment 1

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Abstract

This paper investigates predictive modeling of car fuel consumption using the "cars.csv" dataset. Through regression and logistic regression analyses, we address three key research questions aimed at understanding the influence of various automotive attributes on Kilometers Per Liter (KPL). Leveraging neural network models, we assess the impact of cylinders, displacement, horsepower, weight, acceleration, model year, and origin on fuel efficiency. Our findings reveal that adjusting acceleration has the most significant effect on KPL, followed by horsepower, displacement, weight, and cylinders, respectively. These insights provide valuable guidance for optimizing automotive performance and market strategies.

1 Introduction

This paper explores predictive modeling of cars using the "cars.csv" dataset. Mandatory Assignment 1 tasks us with formulating regression and logistic regression problems, designing and fine-tuning models, and constructing a compact research article. From the dataset's attributes, we aim to gain insights in automotive performance and market trends.

1.1 Research Question

Q.1 To what degree does cylinders, displacement, horsepowers, weight, acceleration, model year and origin respectively affect the KPL?

Q.2 Can a model predict an imaginary cars fuel consumption and categorize it into high or low compared to the fuel KPL mean?

Q.3 By tuning the different values, which one has the biggest impact on the KPL value?

2 Methods

By using a neural network, we will construct a model that with a certain accuracy can predict how much fuel a car uses based on its performance characteristics. Based on this model we plan on finding out what characteristics has the biggest impact on the fuel consumption by tuning each individual value by the same percentage. [1]

3 Analysis

In the pursuit of finding the characteristic that has the biggest impact on KPL(Kilometer per liter). We found the mean of the individual characteristics and found the nearest amount that could be divided into an 7/8 of the original amount to see what a 1/8's reduction in the value would result in. We then did 5 rounds of 100 epochs on the model with an average of 90% accuracy with each iteration. With each round of 5 iterations, we tuned each characteristic and removed 12,5% of the original amount and observed the expected kpl that the model would produce. [2]

4 Findings

In table 1 we have listed an initial car and five fine tuned cars with their respectable KPL and MPG values.

Characteristic	Value
Initial imaginary car	
Cylinders	8
Displacement	320
Horsepower	144
Weight	3360
Acceleration	16
KPL: 5,76 / MPG: 13,71	
fine tuned cylinders	
Cylinders	7
Displacement	320
Horsepower	144
Weight	3360
Acceleration	16
KPL: 5,97 / MPG: 14,06	
fine tuned displacement	
Cylinders	8
Displacement	280
Horsepower	144
Weight	3360
Acceleration	16
KPL: 6,18 / MPG: 14,54	
fine tuned horsepower	
Cylinders	8
Displacement	320
Horsepower	126
Weight	3360
Acceleration	16
KPL: 6,38 / MPG: 15,01	
fine tuned weight	
Cylinders	8
Displacement	320
Horsepower	144
Weight	2940
Acceleration	16
KPL: 6,00 / MPG: 14,13	
fine tuned acceleration	
Cylinders	8
Displacement	320
Horsepower	144
Weight	3360
Acceleration	14
KPL: 6,55 / MPG: 15,42	

Table 1: Likert scale and scoring

5 Conclusion

From the tuning of the values on the imaginary car by 12,5% evidently proved that changing the acceleration on a car, is going to impact a cars KPL the most. Thereafter it follows the order: horsepower -¿ displacement -¿ weight -¿ cylinders.

References

[1] Niklas Faurholt. *Google Colab Notebook.* May 2023. URL: `https://colab.research.google.com/drive/1_WVvy5Kgu7IRvWoNpavYNbFKxB3FKmZx?usp=sharing`.

[2] Group Neon. *github model 1.* Apr. 2024. URL: `https://github.com/Breelef/AImandatoryEksempel/blob/master/model1.py`.