Hyperiondev

TASK

Exploratory Data Analysis on the Automobile Data Set

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Introduction

Automobile data set consists of three types of entities:

1. The specification of a vehicle based on a number of various characteristics (make, fuel-type, aspiration, number-of-doors, body-style etc.).

2. Its insurance risk rating.

3. Its normalized losses in use as compared to other vehicle.

A risk factor is assigned on the vehicles linked to its price. +3 depicts that the vehicle is risky while 3 the auto is less risky. Lastly the average loss payment per insured vehicle year. This value is normalized for all vehicles within a particular size classification.

In addition, this is a Python based Exploratory Data Analysis (EDA) project done out of an Automobile Dataset, where we have explored and analysed three major factors of a car which are as below:

1. **Price**
2. **Mileage**
3. **Performance**

We have also identified the 'Best Car' under the 'Low Budget Car-Category'.

Dataset Description

The Automobile Dataset consists of various information relating to the built, engine power, make, mileage and body attributes of a car. The data types include integers, floating points and strings.

The variables have been segregated as below.

General Attributes	Physical Attributes	Technical Attributes	Safety Related
Make	No. of Doors	Fuel Type	Symbolling
Price	Body Style	Aspiration	Normalized losses
City MPG	Wheel Drive	Engine Type	
Highway MPG	Engine location	Fuel System	
Horsepower	Wheel Base	Bore	
	Length	Stroke	
	Width	Compression Ratio	

	Height Curb Weight	Peak RPM	

DATA CLEANING

The Dataset was loaded in a data frame for manipulation. Upon displaying the data, it was clearly visible that the dataset contained special character in more than one of the columns in the data set; this would create problems for the pandas library as it does not know how to handle this type of character within its fields. The following methods and visualizations were used during data cleaning: (please refer to the jupyter notebook called automobile.ipynb

1. Automobile = pd.read_csv('automobile.txt').

2. automobile.info ().

3. automobile. head(5).

4. automobile.describe().

5. automobile.isnull().sum()

6. Replace inappropriate values.

The first Step was to read the data set and load it to a data frame, secondly get all the data set info (records, column names, number of entries , data types etc.) to better understand the data set and what values it contains.

Thirdly display the first five records contained in the dataset to see if there any missing or inconsistent values found and in which fields. Fourthly describe the data set to get the statistics of the data.

Last two steps I check the number of missing values per column, in the case of this particular dataset there was no null values only a special character was found in a few columns. I replaced the special character with appropriate values for each field in the dataset to ensure consistency of data within my dataset to ensure that I perform a realistic EDA.

MISSING DATA

Missing data was found is the following columns:

- **normalized_losses**
- **num-of-doors**
- **bore**
- **stroke**
- **horsepower**
- **peak-rpm**
- **price**

All fields that contained no number of doors on the vehicle were dropped, because it does not make sense for a vehicle not to have any number of doors and an average cannot be used.

All other fields an average of the column was computed and used to replace the missing values. This was easy to compute and will not affect the dataset greatly as opposed to dropping the fields all together.

DATA STORIES AND VISUALISATIONS

Let us take a look at our dataset in-depth and try and visualize the meaning of our data through visualization. (Refer to jupyter notebook automobile.ipynb)

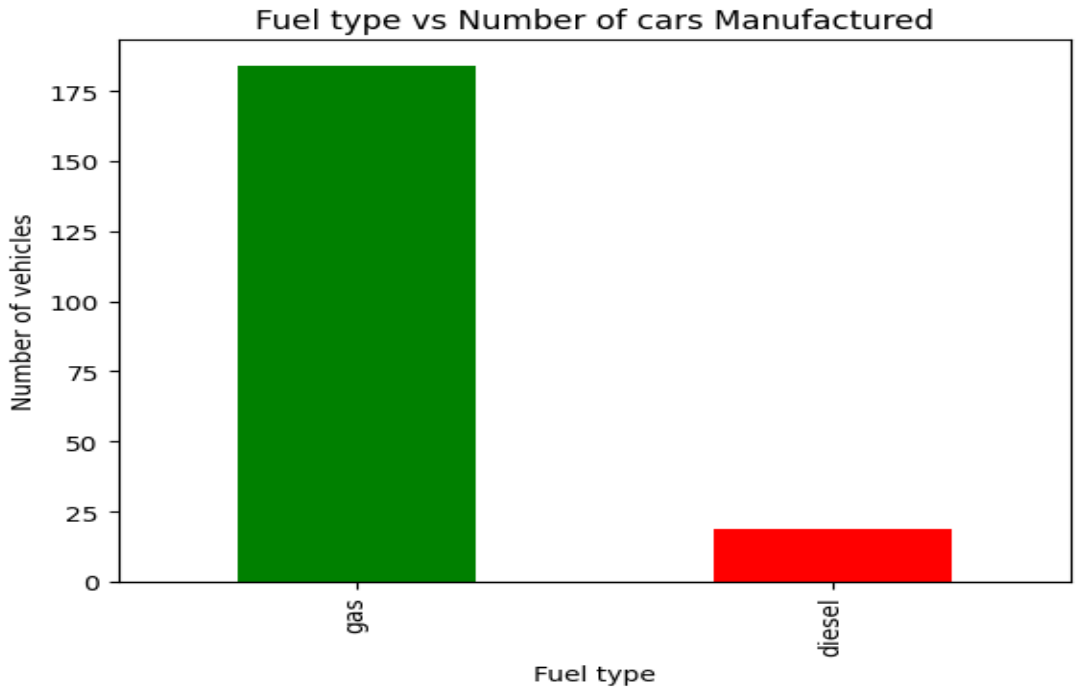


Figure 1. Fuel type versus Number of vehicles manufactured.

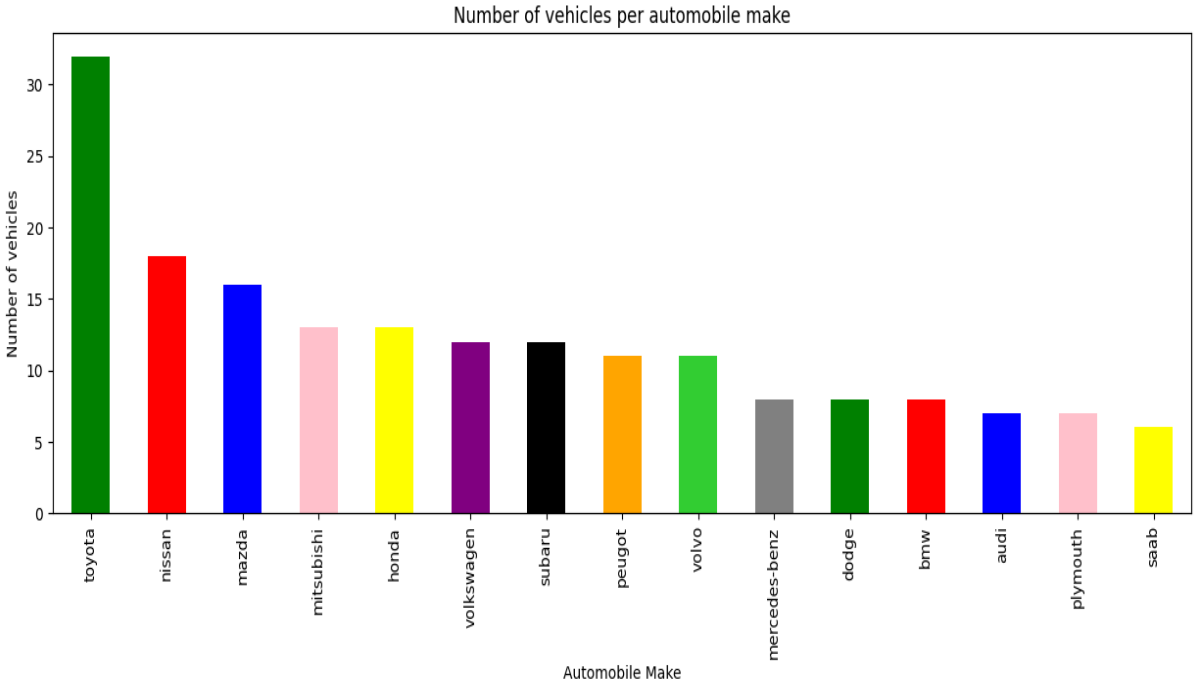


Figure 2. Vehicle make versus number of vehicles manufactured.

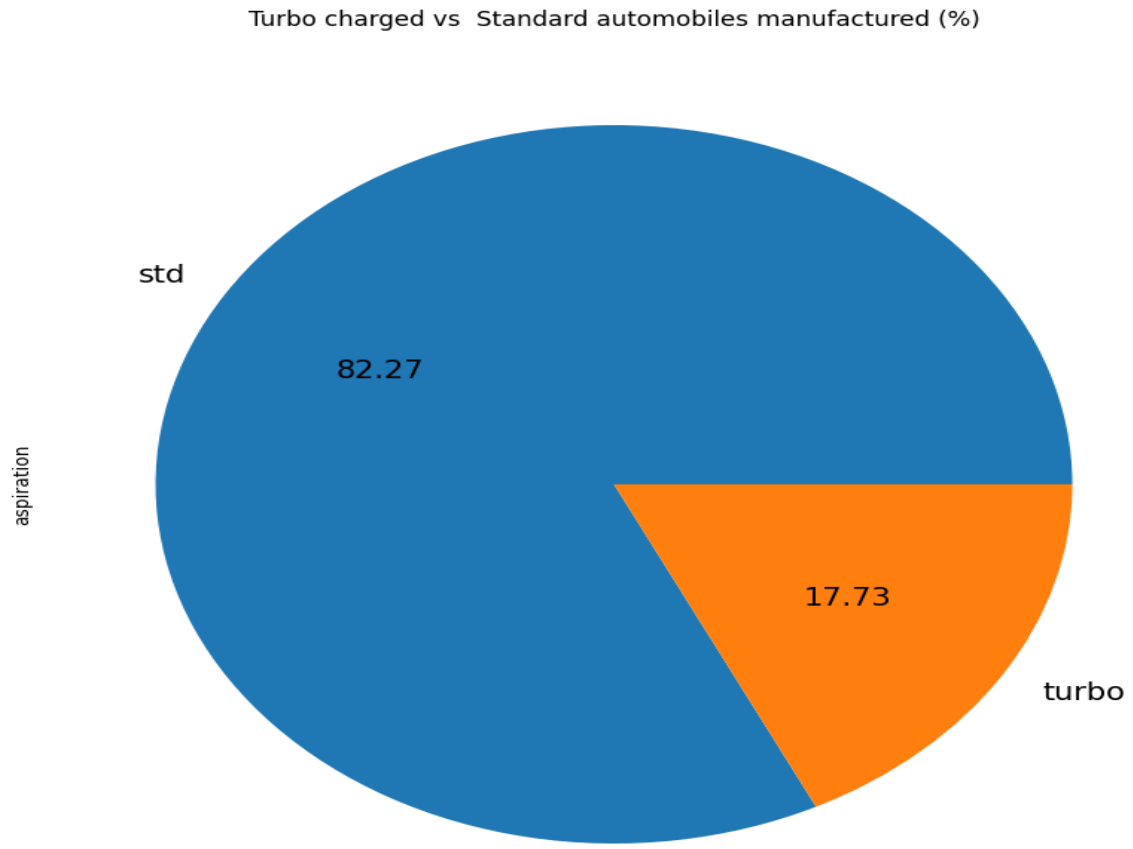


Figure 3: Turbo charged versus Naturally Aspirated engine vehicles produced.

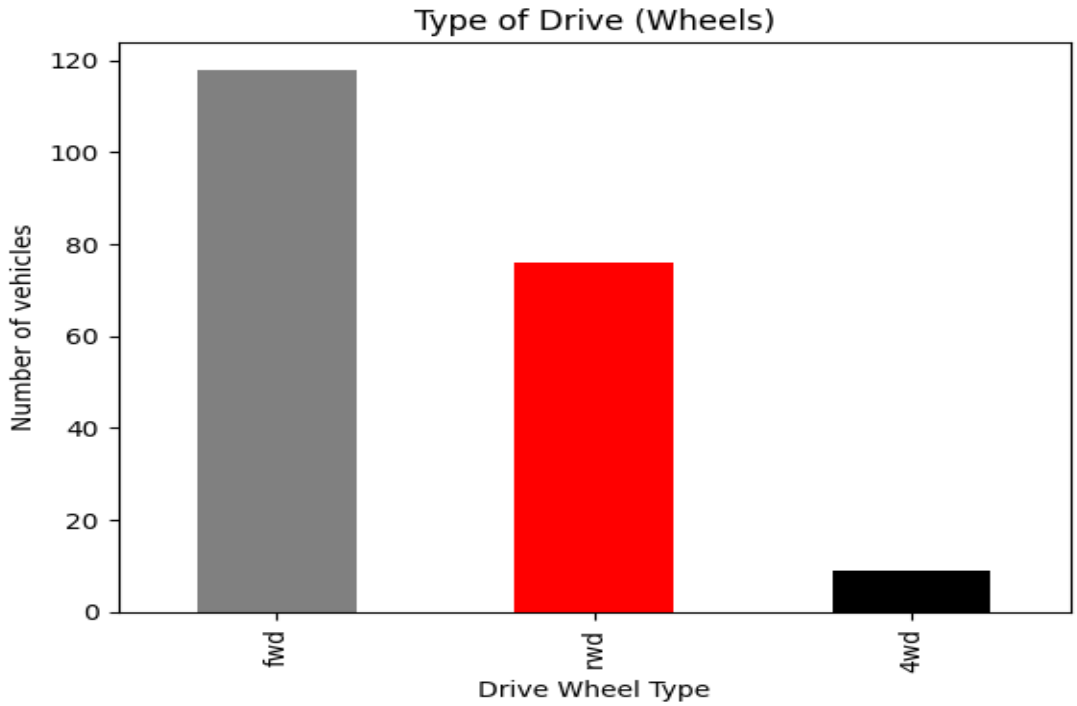


Figure 4: Type of Wheel drive versus number of vehicles produced.

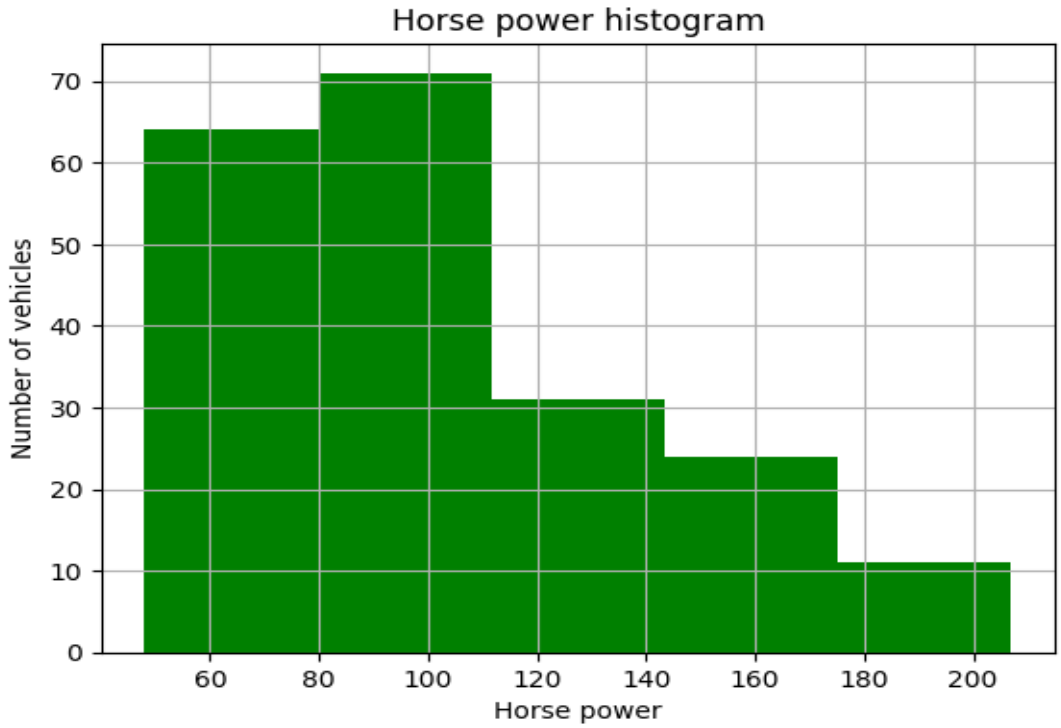


Figure 5: Histogram showing number of automobiles produced according to horsepower.

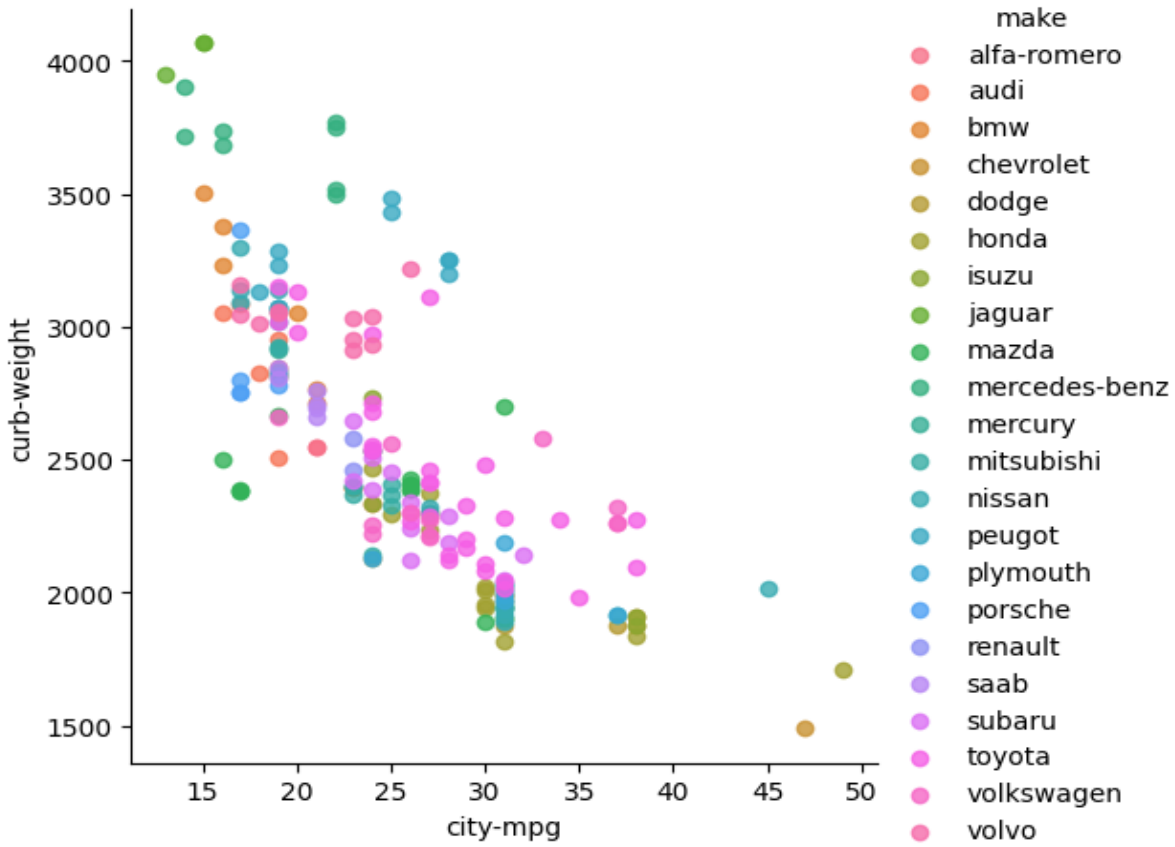


Figure 6. Weight of vehicle versus mileage in the city

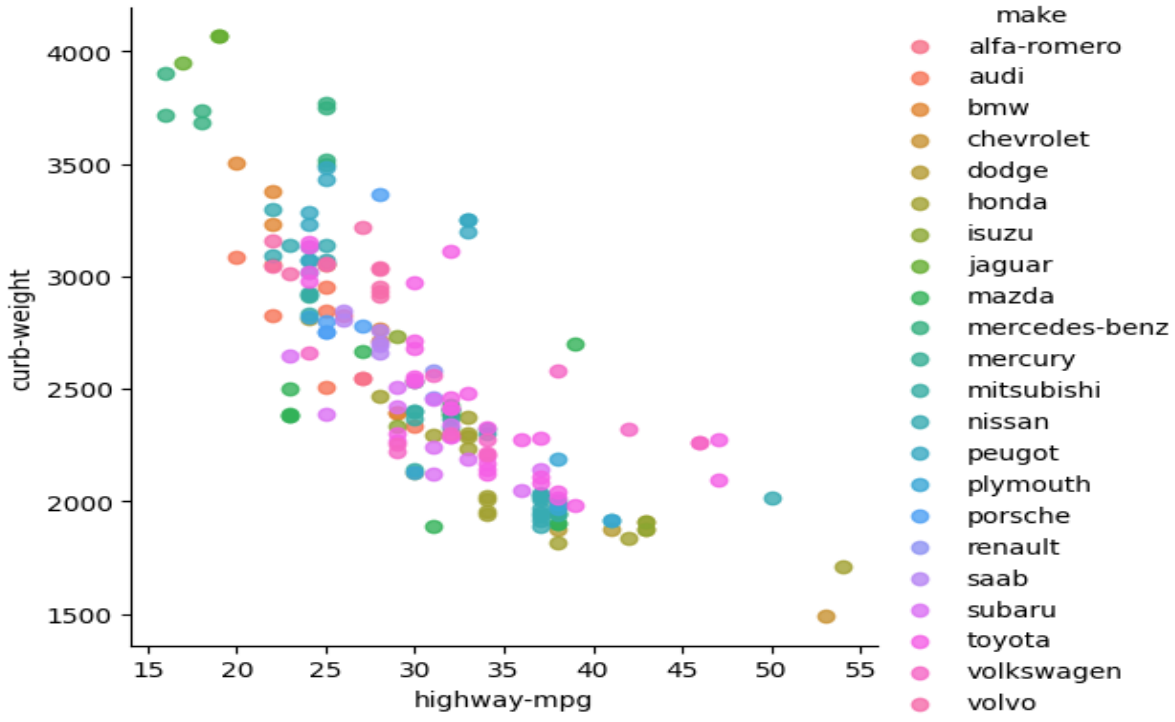


Figure 7. Weight of vehicle versus mileage on the highway

Price Analysis

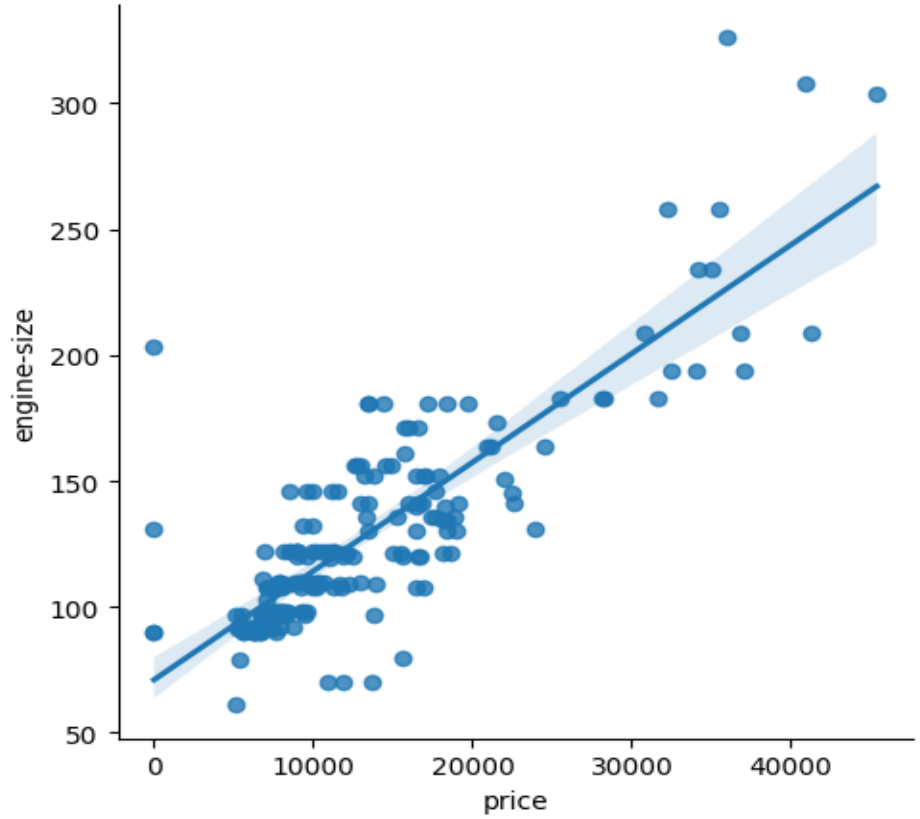


Figure 8. Price versus Engine Capacity/size

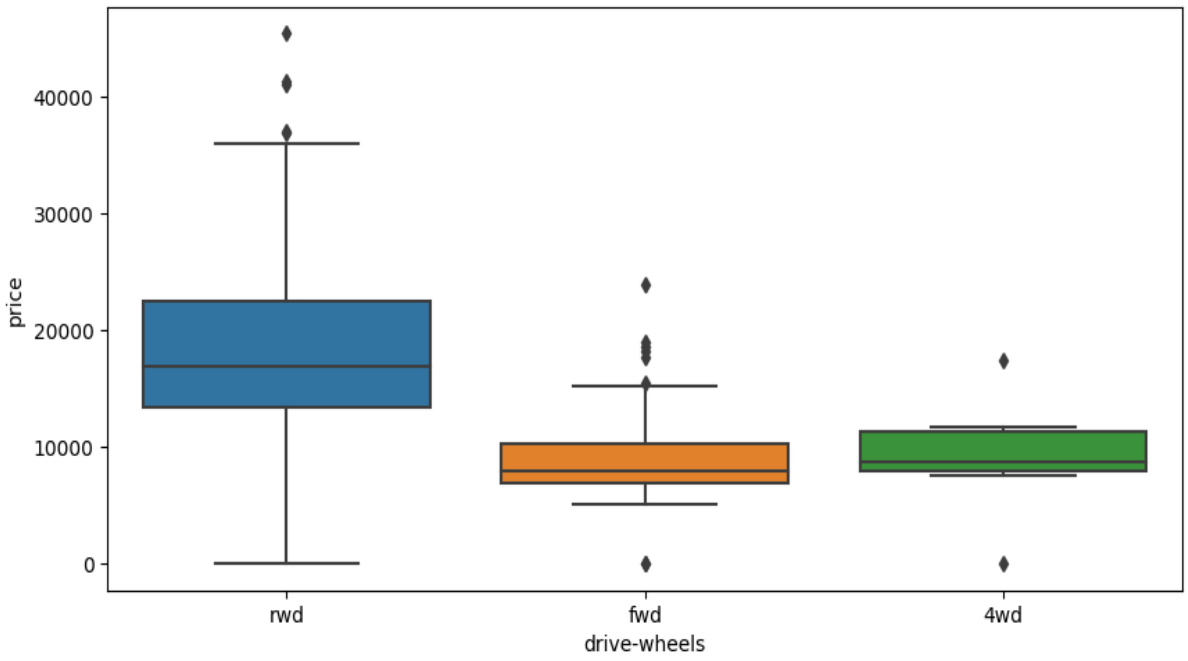


Figure 9. Drive wheel type versus Price of vehicles

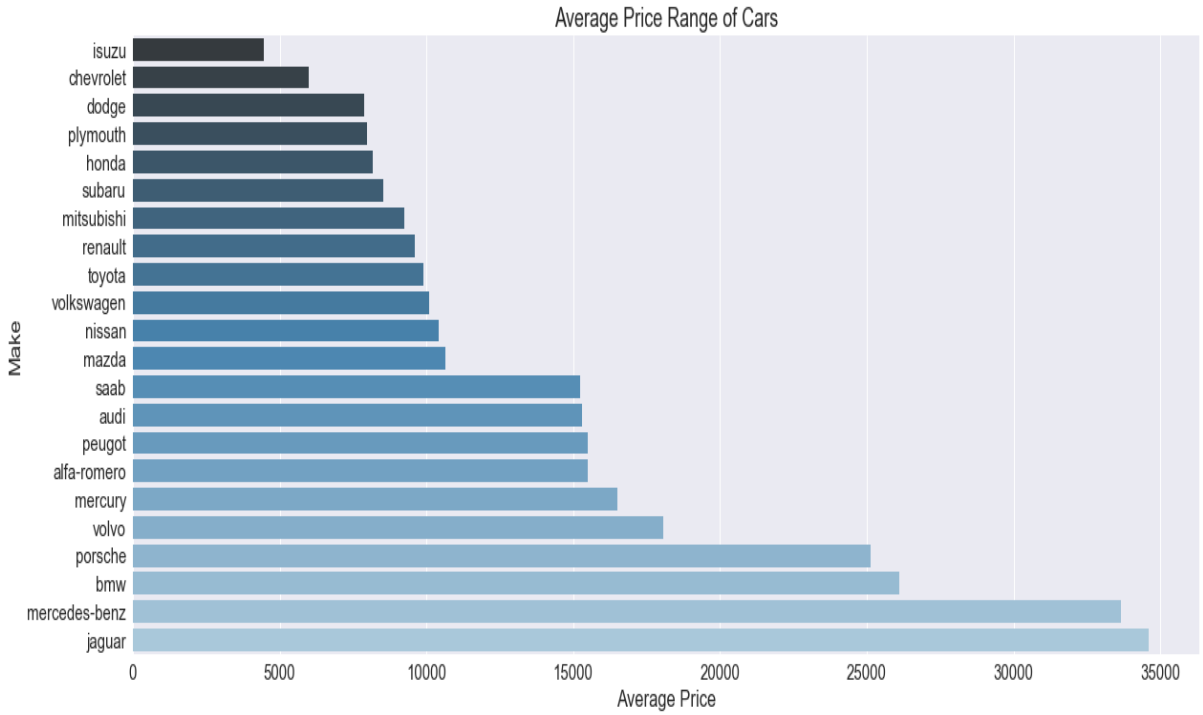


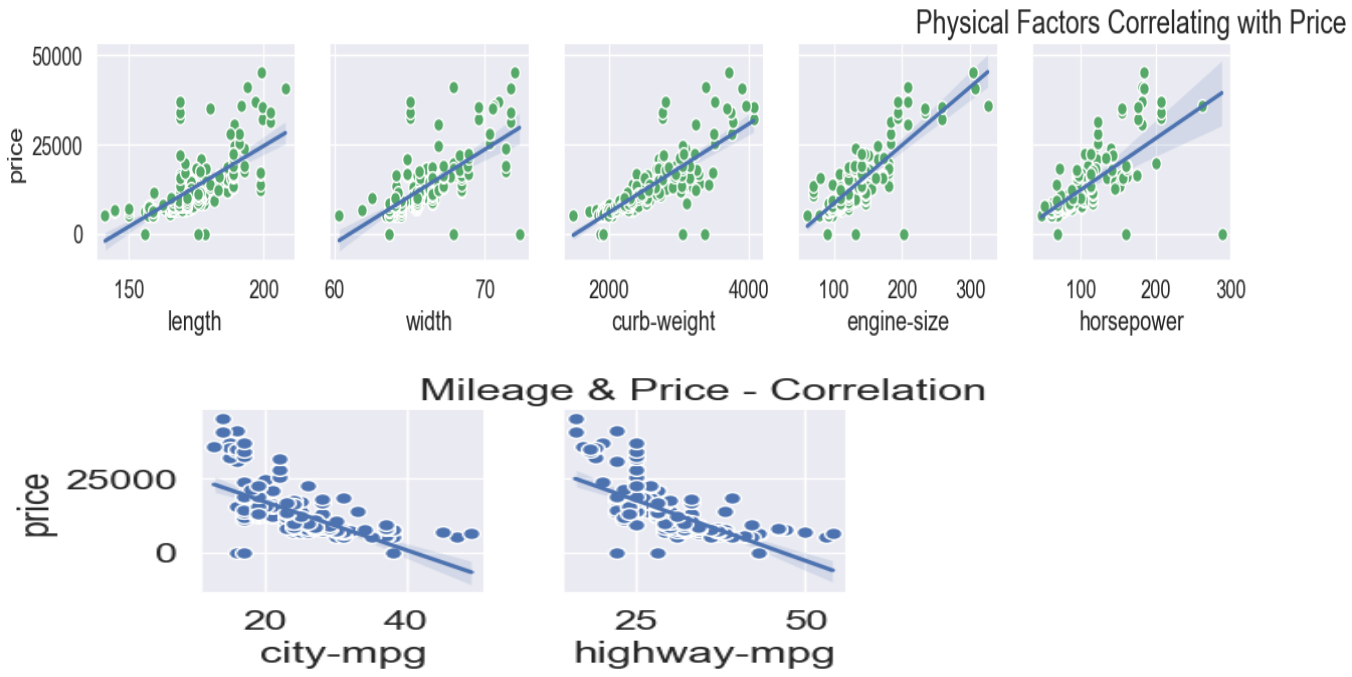
Figure 10: Classification based on Price

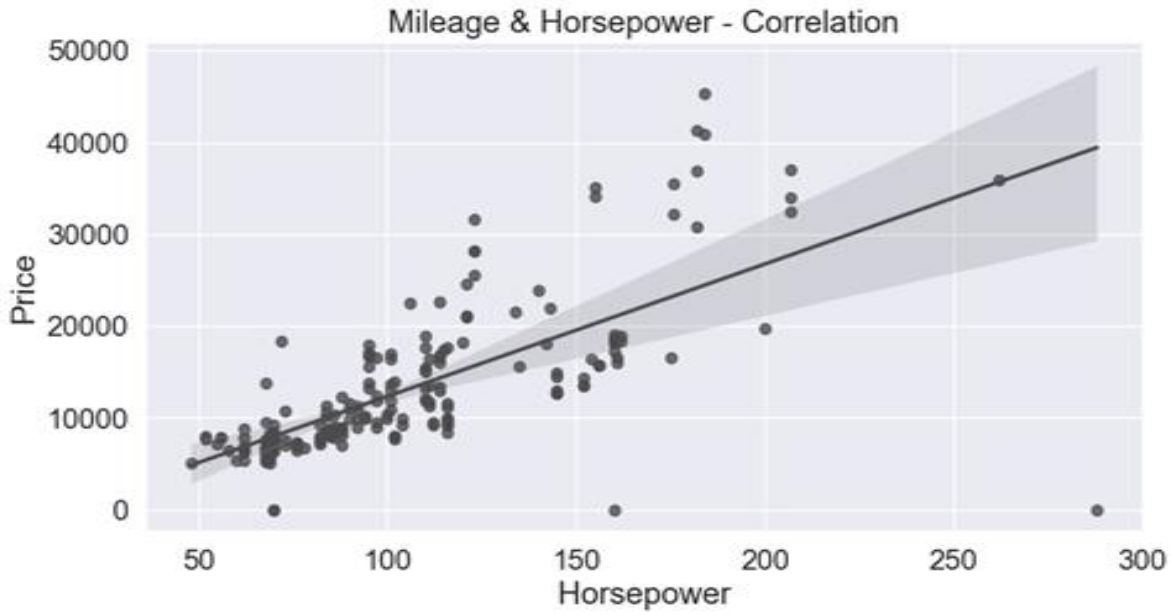
Low Price Segment: isuzu – mazda

Medium Price segment: saab – Volvo

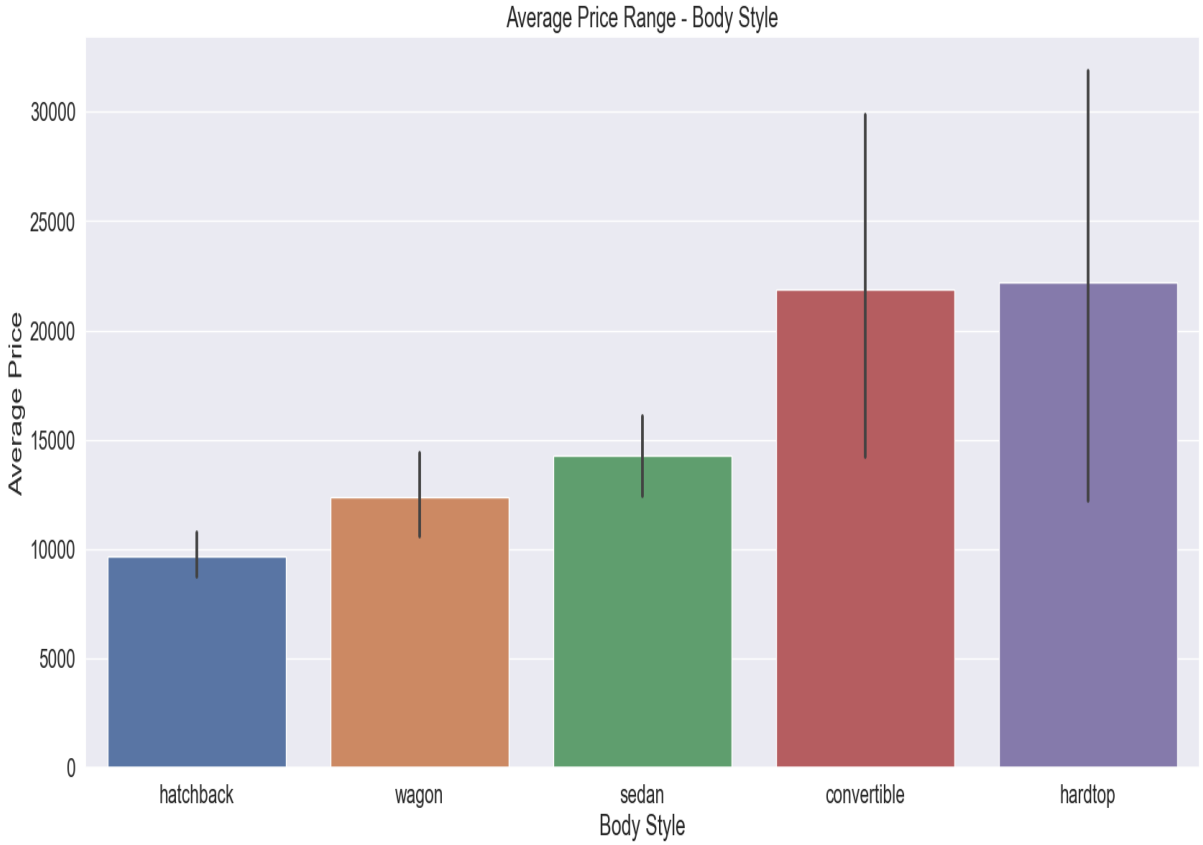
Premium Cars: porsche – jaguar

Attributes Correlating with Price



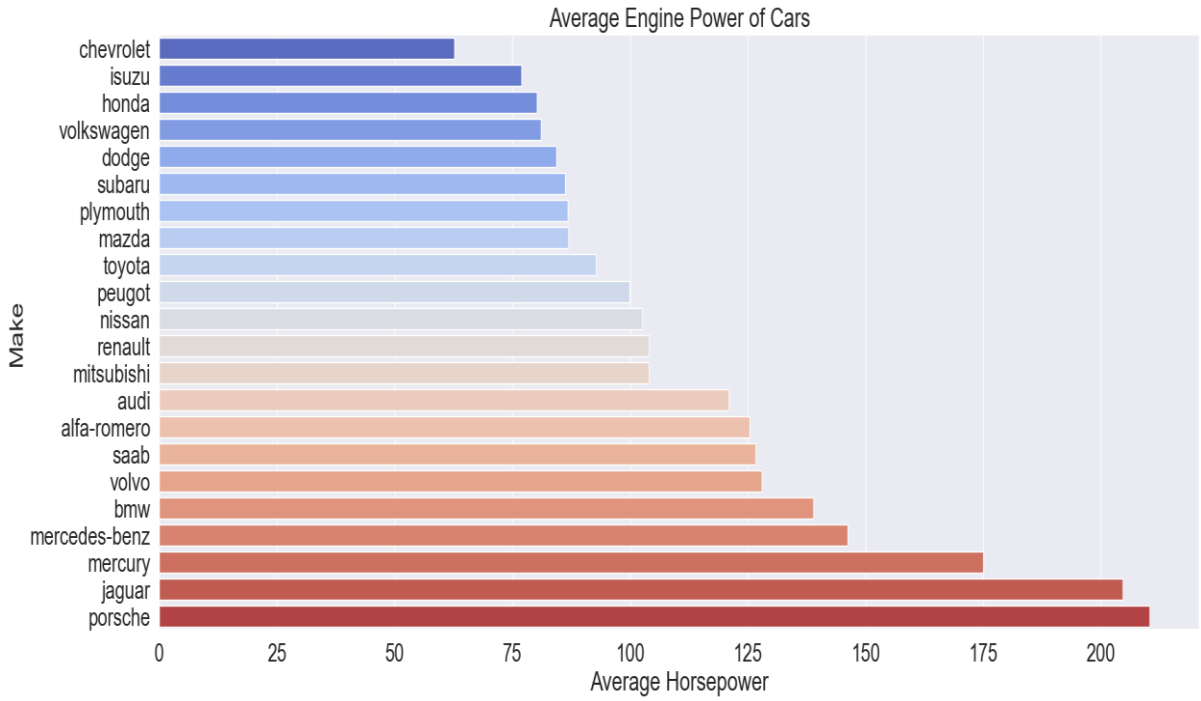


Average Price of Body Styles



Performance Analysis

Classification of Cars Based on Engine Power

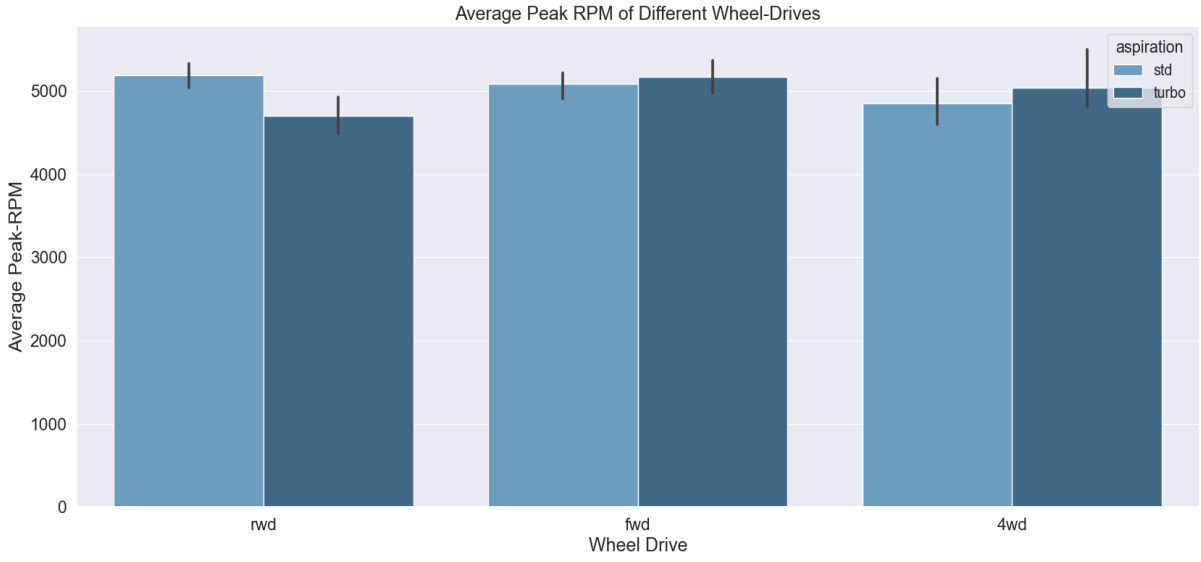


Average Performance Cars: Chevrolet - mitsubishi

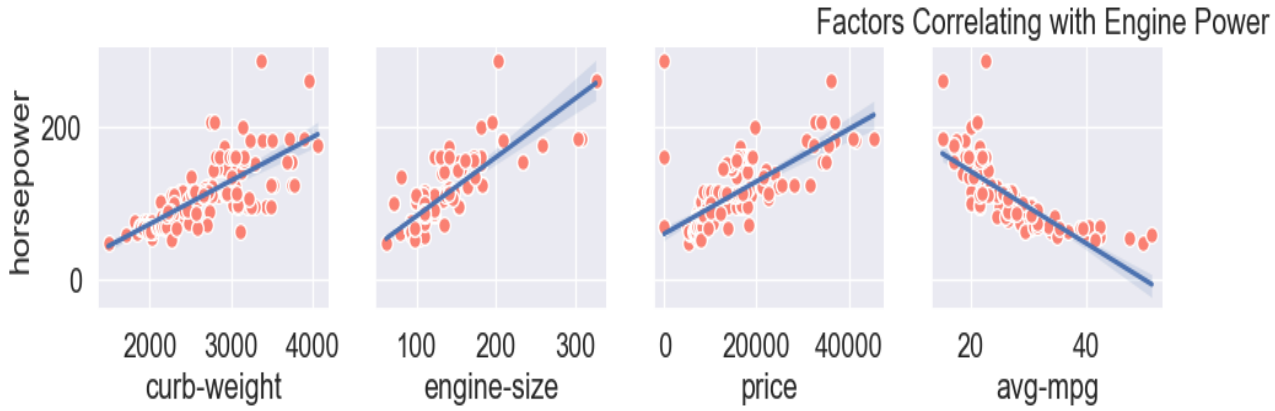
Medium Performance Cars: audi –mercedes-benz

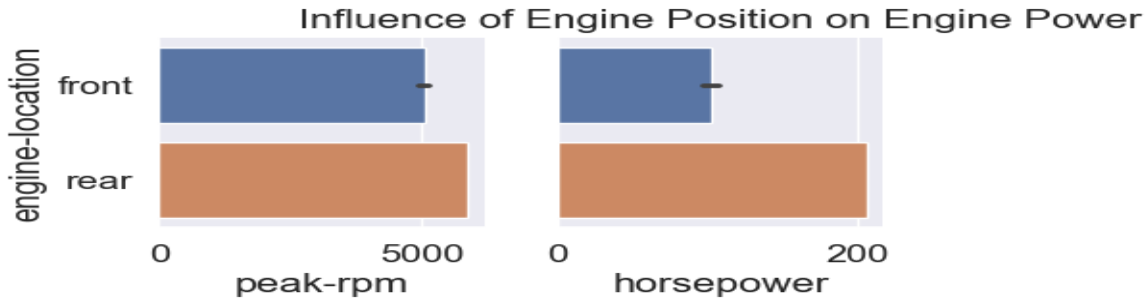
High Performance Cars: mercury – porsche

Average Peak RPM Comparison on Wheel Drive



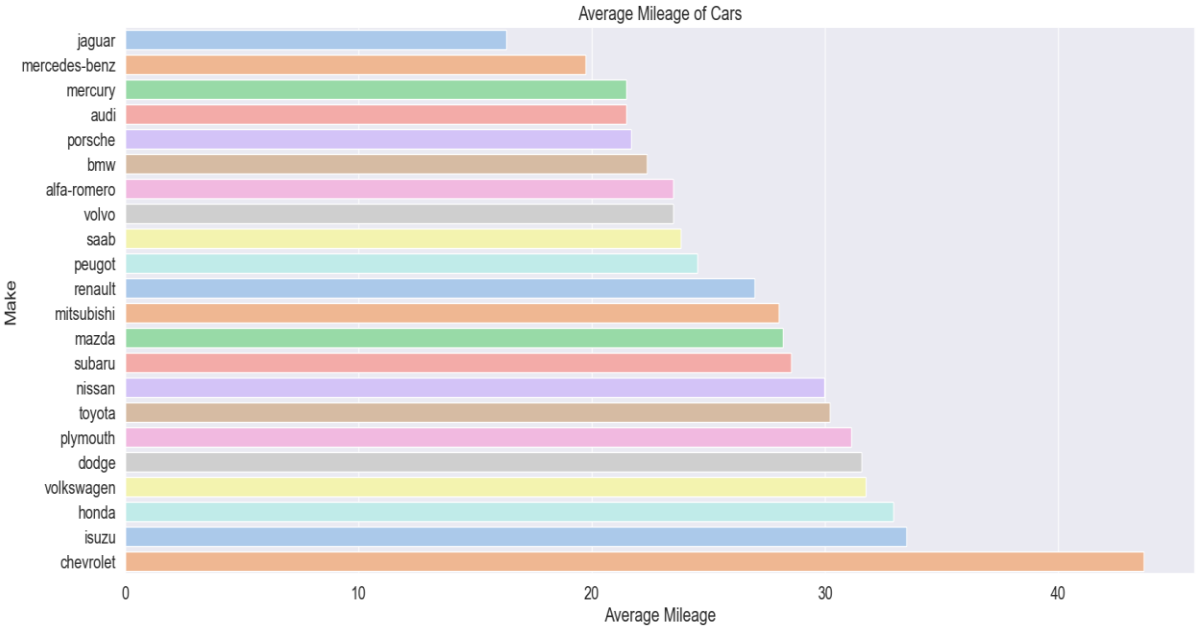
Factors Influencing & Influenced by the Engine Power



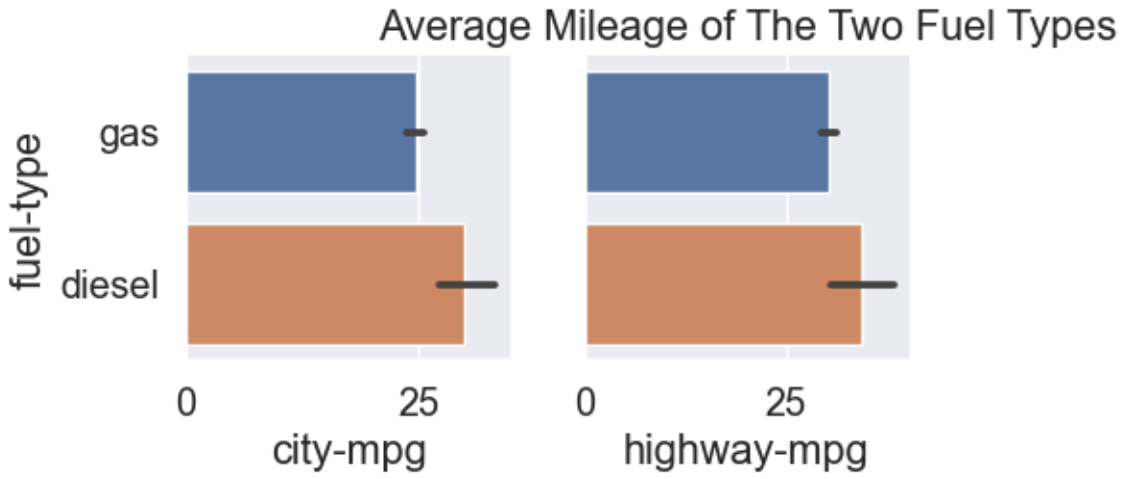


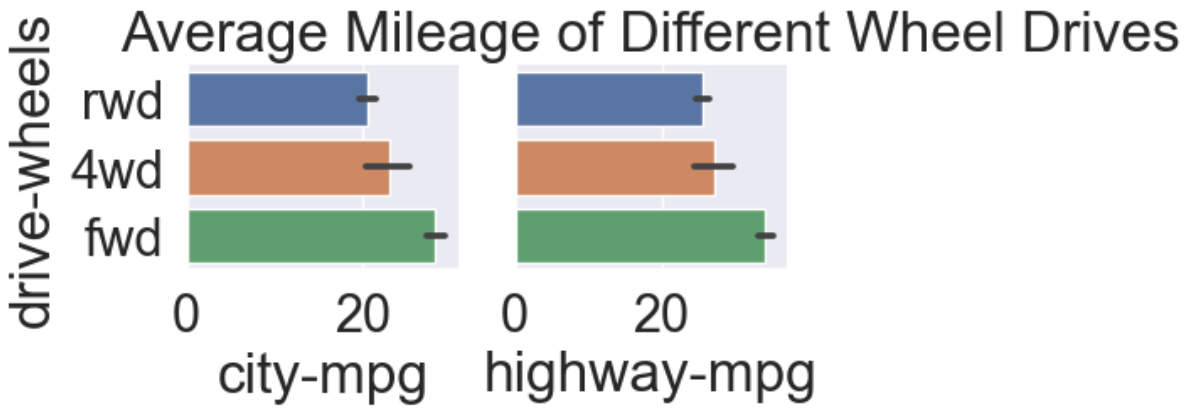
Mileage Analysis

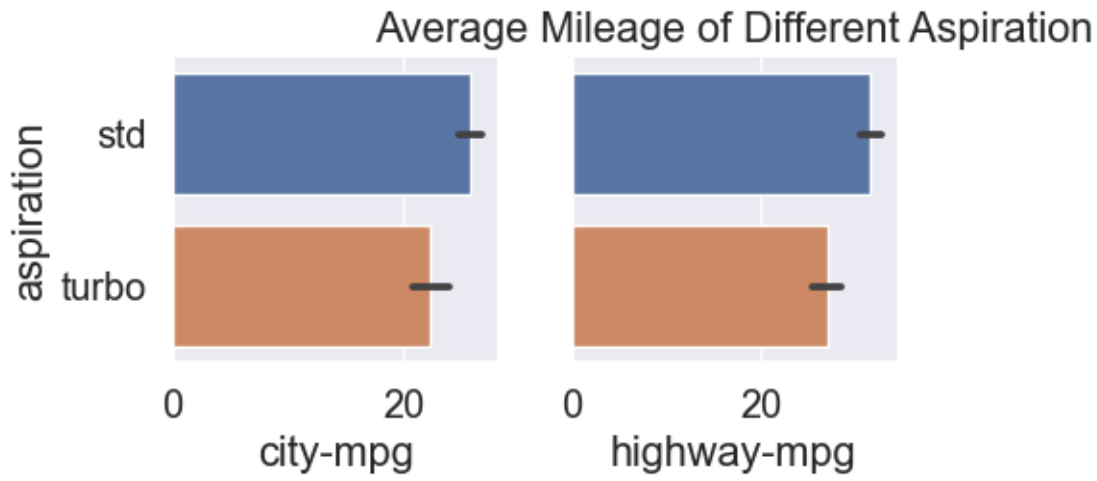
Mileage Comparison of Cars



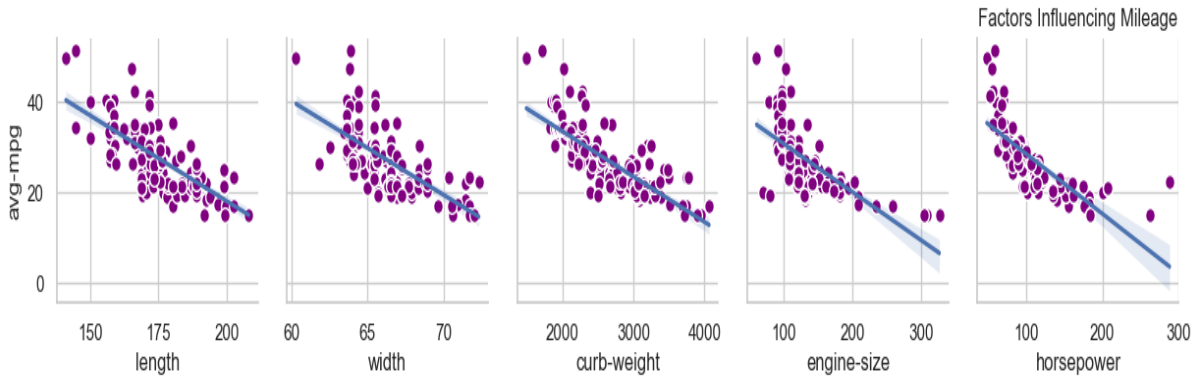
Mileage Comparison with Other Attributes





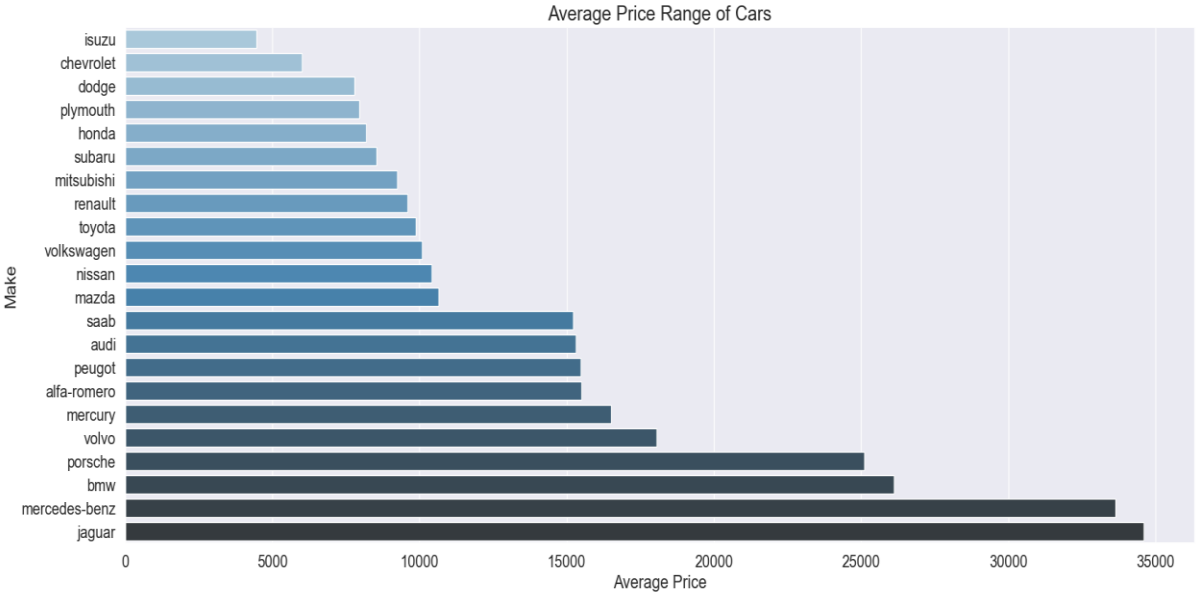


Factors Influencing Mileage



Best Budget Car Analysis

Cars Qualifying for the 'Budget Car' Category



make	Price
isuzu	4458.25
chevrolet	6007.00
dodge	7790.12
plymouth	7963.43
honda	8184.69
subaru	8541.25
mitsubishi	9239.77
renault	9595.00

toyota 9885.81

volkswagen 10077.50

nissan 10415.67

mazda 10644.00

saab 15223.33

audi 15307.86

peugot 15489.09

alfa-romero 15498.33

mercury 16503.00

volvo 18063.18

porsche 25120.40

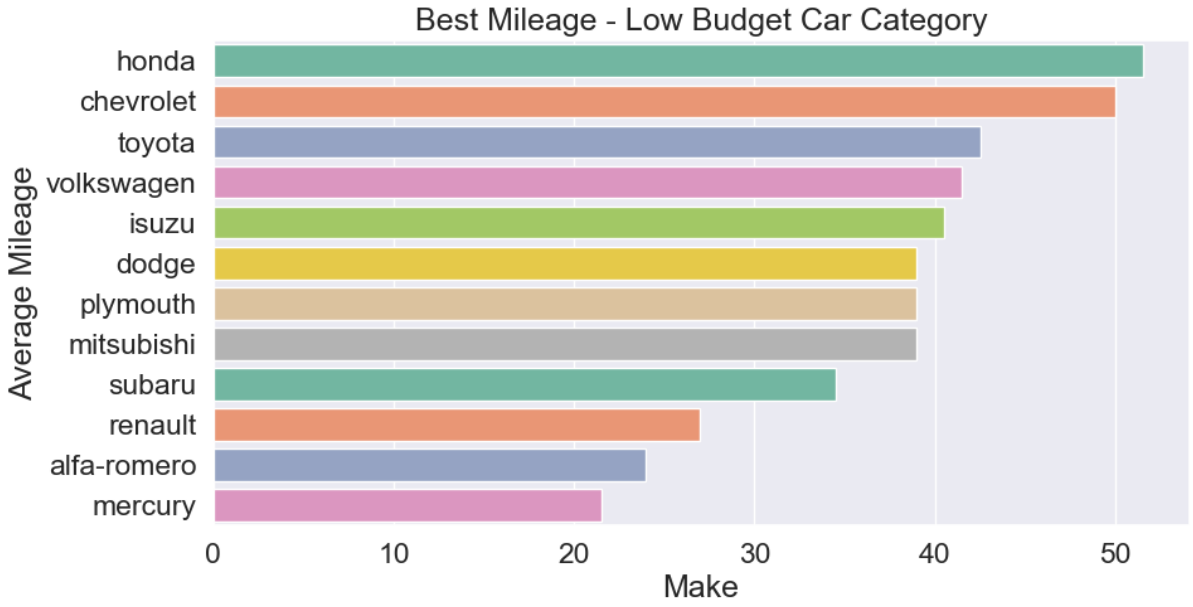
bmw 26118.75

mercedes-benz 33647.00

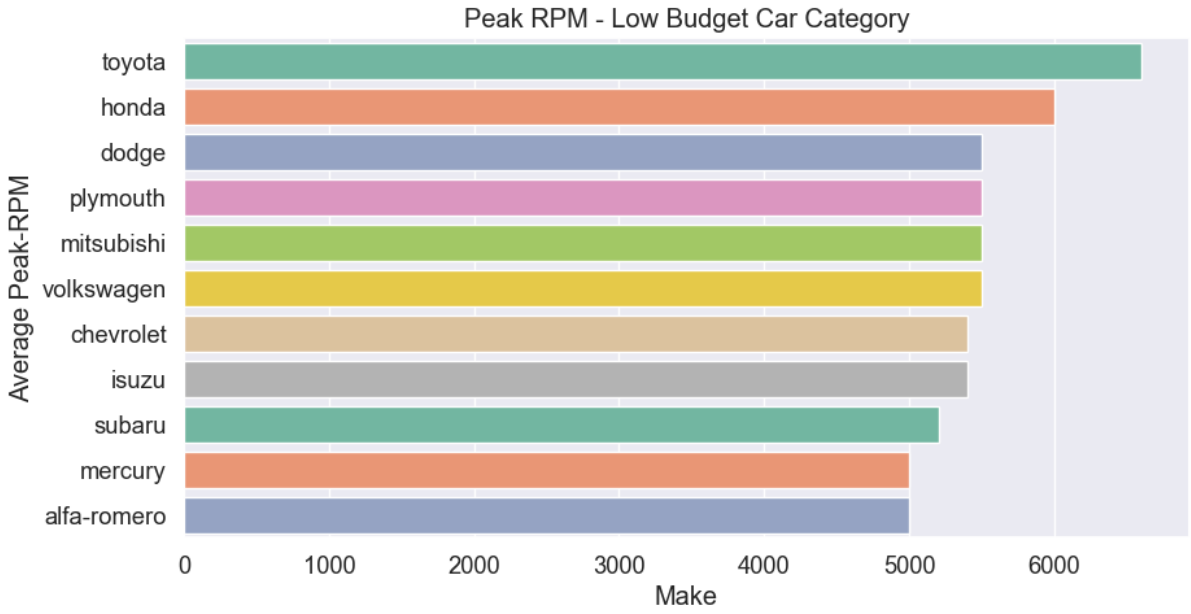
jaguar 34600.00

Low Segment Price Range = 6000 to 17000

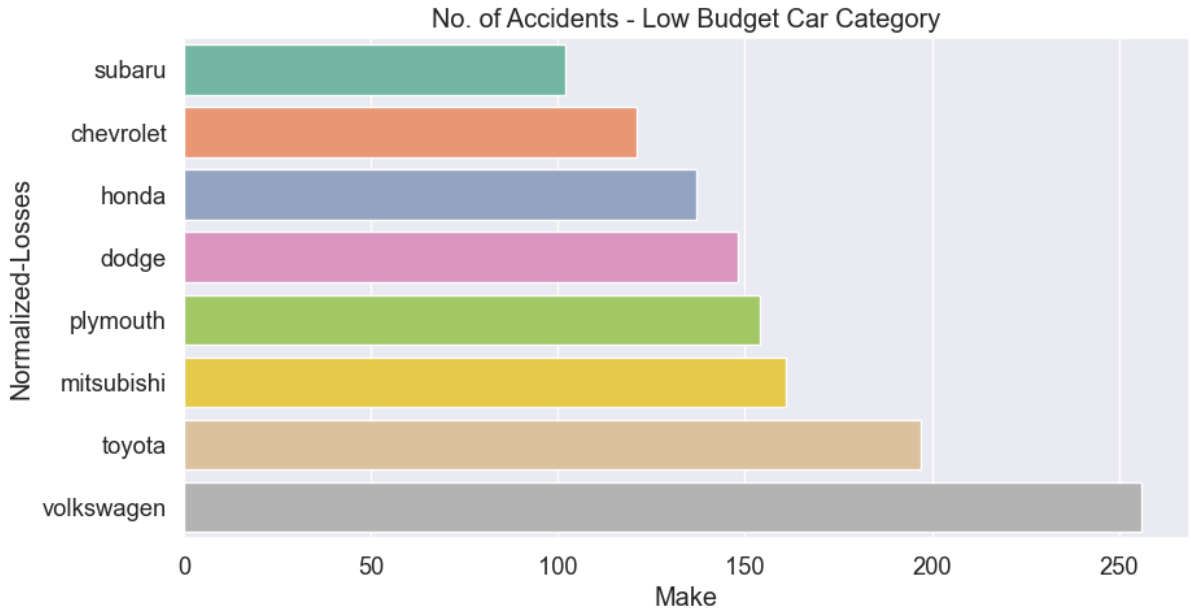
Feature Analysis of the Qualified Cars



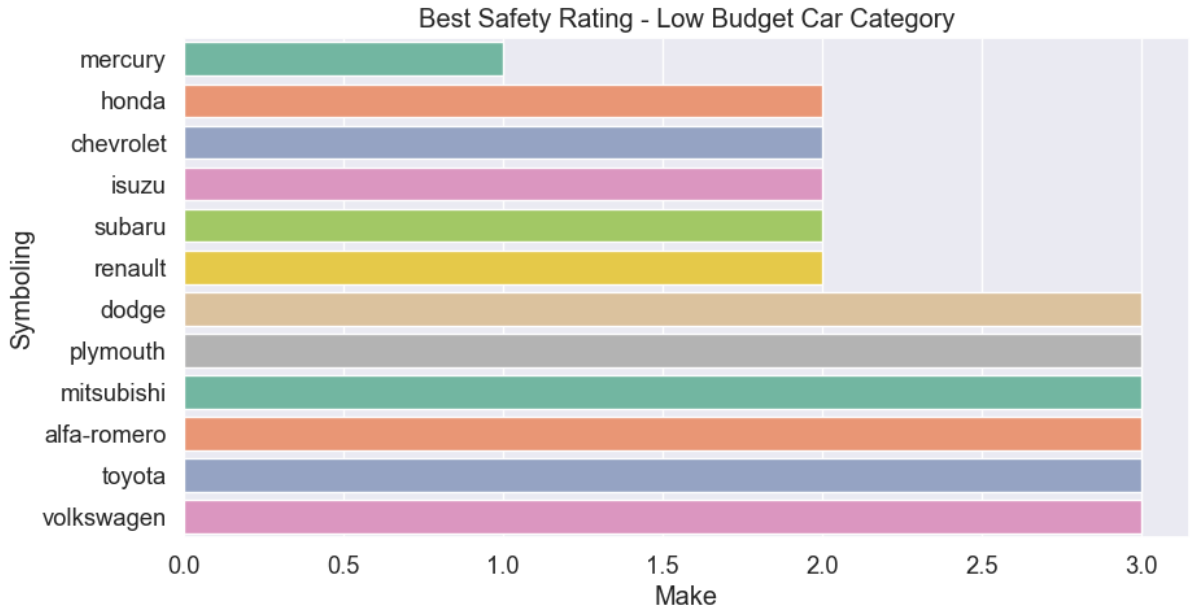
Top 3 Qualifiers are Honda, Chevrolet and Toyota



Top 3 Qualifiers are Toyota, Honda and Dodge



Top 3 Qualifiers are Subaru, Chevrolet and Honda



Top 3 Qualifiers are Mercury, Honda and Chevrolet.

Final Qualifiers

Vehicle line	Avg Price
Honda	**4**
Chevrolet	**3**
Toyota	2
Subaru	2
Dodge	1
Mercury	1
Isuzu	1
Renault	1

The best 2 qualifiers are Honda and Chevrolet

From the above different types of visualization and analysis using key features of the automobile dataset it is found that:

1. Most of the vehicles use gas rather than diesel.
2. Front wheel drive has most number of vehicles followed by rear wheel drive and four wheel drive.
3. Most cars have naturally aspirated engines versus Turbo Engine.
4. Toyota is the make of the car which has most number of vehicles with more than 40% than the 2nd highest Nissan.
5. The bigger the engine size the more expensive the vehicle.
6. Vehicles with less weight travel more in the city and highway this tells us that more and more people prefer to drive smaller cars.
7. Honda and Chevrolet are the best-qualified cars if we look at all features analysis factors.

Conclusion

Analysis of the dataset can be concluded to show the following:

- Importance of drive wheels and curb weight.
- How the data set are distributed.
- Correlation between different fields and how they are related.
- Factors affecting Price of the Automobile.
- Mileage based on City and Highway driving for various make and attributes.
- Performance Analysis.
- Mileage analysis based on different attributes.

THIS REPORT WAS WRITTEN BY: Vincent Gerald Mukomba