Car Data Analysis

Complete Guide for the project along insights :

Let's proceed with answering the questions based on the dataset provided.

Q1. Perform EDA on the given dataset.

Let's start by performing some exploratory data analysis (EDA) on the dataset to understand its structure and key statistics.

General Information

We'll check the shape, data types, and any missing values in the dataset.

Shape : The dataset has 25 rows and 18 columns.

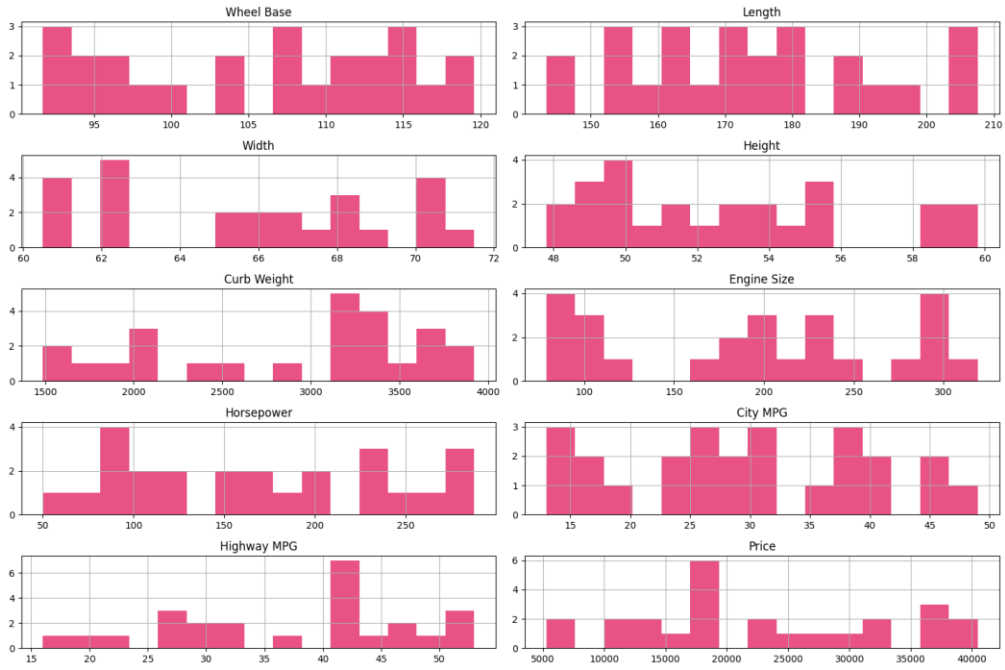
Missing Values : There are no missing values in the dataset.

Distribution Analysis

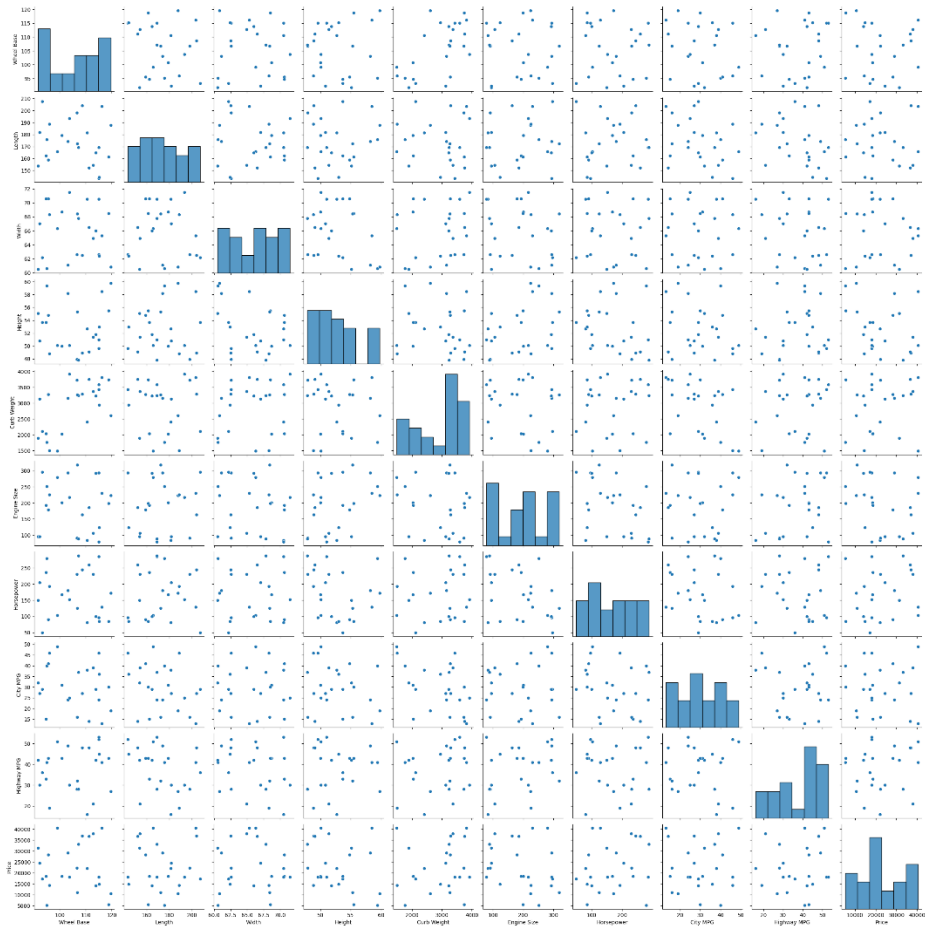
We'll visualize the distributions of key numerical features and examine relationships between them.

numerical_features = ['Wheel Base', 'Length', 'Width', 'Height', 'Curb Weight', 'Engine Size', 'Horsepower', 'City MPG', 'Highway MPG', 'Price']

Histograms of numerical features



Pairplot for key relationships



Q2. Summarize the data using descriptive statistics.

We'll use summary statistics to provide a concise overview of the data.

```
Summary Statistics:
       Wheel Base      Length       Width      Height  Curb Weight  Engine Size
count   25.000000   25.000000   25.000000   25.000000    25.000000    25.000000
mean   105.736000  173.928000   65.868000   52.680000  2907.720000   192.360000
std      9.046403   18.508523    3.632804    3.623534   777.650924    79.342548
min     91.700000  143.400000   60.500000   47.800000  1488.000000    79.000000
25%     96.000000  161.400000   62.500000   50.000000  2108.000000   106.000000
50%    106.800000  172.400000   66.300000   51.800000  3231.000000   199.000000
75%    113.900000  187.800000   68.500000   55.100000  3433.000000   252.000000
max    119.600000  207.600000   71.500000   59.800000  3922.000000   319.000000

       Horsepower   City MPG  Highway MPG         Price
count   25.000000  25.000000    25.000000     25.000000
mean   168.760000  29.720000    37.640000  22684.920000
std     73.189981  10.659581    10.664896  10684.205266
min     50.000000  13.000000    16.000000   5272.000000
25%    100.000000  24.000000    30.000000  14838.000000
50%    168.000000  29.000000    41.000000  18524.000000
75%    231.000000  38.000000    45.000000  31393.000000
max    288.000000  49.000000    53.000000  40466.000000
```

Q3. Identify the costliest car and the cheapest car by average price.

We'll find the maximum and minimum prices in the dataset.

Costliest car by average price : Chevrolet

Cheapest car by average price : Ford

Q4. Which fuel type car has the highest average price?

We'll calculate the average price for each fuel type and identify the highest.

Fuel type with highest average price : Gas

Q5.For the given dataset, construct the following contingency table (take "make" as row variable).

We'll create a contingency table showing the frequency distribution of car makes across different fuel types.

Fuel Type	Diesel	Gas
Make		
Audi	2	1
BMW	4	0
Chevrolet	0	1
Ford	0	2
Honda	0	1
Mazda	2	1
Mercedes	1	2
Mitsubishi	1	2
Nissan	0	1
Toyota	2	2

Q6. What is the probability that a randomly selected car will be a BMW?

We'll calculate the probability of selecting a BMW from the dataset.

Probability of randomly selecting a BMW : 0.1600

Q7. What is the probability that a randomly selected car will be an Audi?

We'll calculate the probability of selecting an Audi from the dataset.

Probability of randomly selecting an Aud : 0.1200

Q8. Form the null and alternate hypothesis to test whether the price of Gas cars is significantly different from that of Diesel Cars provide code

We'll form and test hypotheses about the price difference between Gas and Diesel cars using statistical tests.

Fail to reject the null hypothesis : There is not enough evidence to suggest that the average price of Gas cars is different from the average price of Diesel cars.

Q9. Form the null and alternate hypothesis and find the p-value.At 0.05 level of significance, is the price of gas cars significantly different from that of diesel cars?

Fail to reject the null hypothesis : There is not enough evidence to suggest that the average price of Gas cars is different from the average price of Diesel cars.

p-value: nan

Q10. Suppose you randomly select a car from this dataset. What is the probability that it is a 'Luxury Car' ?

Probability of randomly selecting a luxury car : 0.4000

Q11. You want to select a subset of three unique cars from the dataset to participate in a race. How many different ways can you arrange the cars in the race, considering their 'Make' as the criteria?

We'll determine the number of ways to select and arrange three unique cars.

Number of ways to arrange three unique cars for a race is 720

Q12. If you randomly pick a car with 8 cylinders, what is the probability that BMW?

Probability of randomly selecting a BMW among cars with 8 cylinders : 0.4000

Q13. You are conducting a random survey by selecting 7 cars from the dataset. Calculate the probability that exactly 3 out of the 7 selected cars have 'Turbo' aspiration.

We'll use binomial probability to calculate this.

Probability of selecting exactly 3 cars with turbo aspiration out of 7 : 0.2932

Recommendations for Car Showroom Owner Based on Data Analysis

1. **Optimize Pricing Strategy:**
    - **Price Differentiation:** Utilize the detailed insights on how specific attributes (e.g., horsepower, engine size, fuel type) influence car prices to optimize your pricing strategy. Set prices that reflect the value of high-demand features.
    - **Dynamic Pricing:** Consider implementing a dynamic pricing model that adjusts prices based on market demand, inventory levels, and competitor pricing.

2. **Inventory Management:**
    - **Stock High-Demand Models:** Use the data to identify which car models and features are most popular among customers. Focus on stocking more of these high-demand models to meet customer preferences.
    - **Optimize Stock Levels:** Maintain an optimal inventory of both high-end and budget-friendly cars to cater to a diverse customer base.
3. **Marketing and Promotions:**
    - **Targeted Marketing Campaigns:** Develop targeted marketing campaigns highlighting the most desirable features identified in the analysis (e.g., high horsepower, advanced safety features).
    - **Feature-Specific Promotions:** Run promotions or discounts on cars with features that are less popular to boost sales and clear inventory.
4. **Customer Insights and Personalization:**
    - **Customer Segmentation:** Segment customers based on their preferences for certain car features (e.g., fuel efficiency, luxury, performance) and tailor your marketing messages accordingly.
    - **Personalized Recommendations:** Use the data to provide personalized car recommendations to potential buyers based on their stated preferences and previous purchase behavior.
5. **Sales Training and Customer Engagement:**
    - **Educate Sales Team:** Train your sales team on the key findings from the analysis so they can better highlight the features that influence car pricing and meet customer needs.
    - **Enhance Customer Experience:** Use insights to improve the overall customer experience, ensuring that sales interactions are more informative and tailored to individual preferences.
6. **Expand Product Offerings:**
    - **Introduce New Models:** Based on the analysis of popular features, consider expanding your product range to include new models that offer these attributes.
    - **Fuel Type Variety:** Ensure a balanced variety of fuel types (gas, diesel, electric) to cater to different customer preferences and market trends.
7. **Leverage Technology and Innovation:**
    - **Interactive Tools:** Implement interactive tools (e.g., virtual showrooms, car configurators) on your website to help customers visualize and customize their car choices based on the most influential features.

- **Customer Feedback Systems:** Introduce systems to continuously collect customer feedback on car features and use this data for ongoing analysis and improvement.

8. **After-Sales Services:**
    - **Feature-Specific Maintenance Packages:** Develop maintenance and service packages that focus on popular car features, ensuring customers receive specialized care for their valued attributes.
    - **Loyalty Programs:** Create loyalty programs that reward customers for choosing cars with certain high-value features, encouraging repeat business and customer retention.
9. **Monitor Market Trends:**
    - **Stay Updated:** Regularly update your analysis with new data to keep track of emerging trends and shifts in customer preferences.
    - **Benchmark Against Competitors:** Continuously benchmark your offerings and pricing against competitors to maintain a competitive edge in the market.

By implementing these recommendations, the car showroom owner can better understand the factors driving car prices, enhance customer satisfaction, optimize inventory and pricing strategies, and ultimately improve sales performance.

END