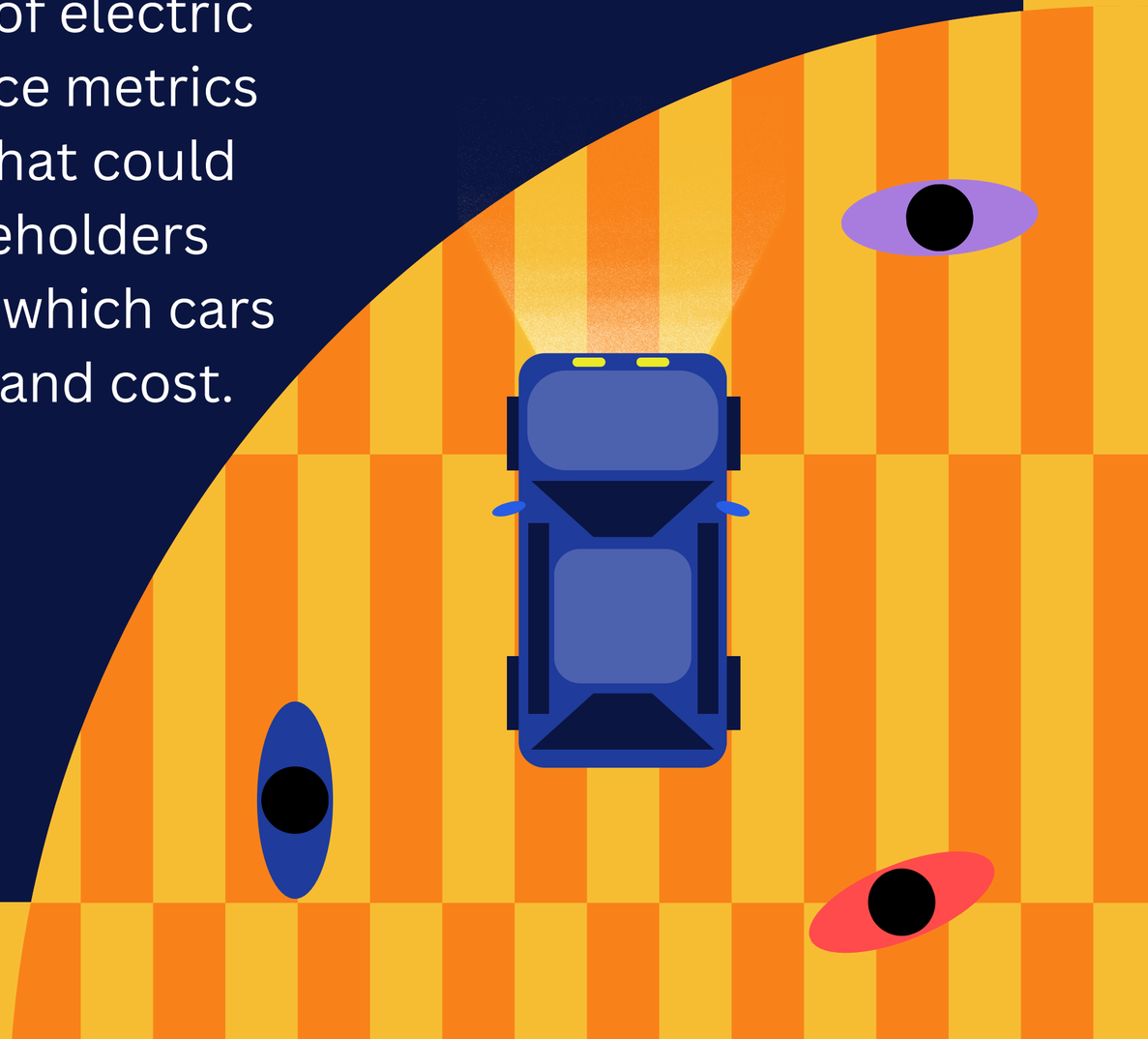
EV CARS ANALYSIS

Think Green, Drive Clean.

Introduction

This project focuses on analyzing a dataset of electric vehicles (EVs) to explore various performance metrics and features. The aim is to derive insights that could help consumers, manufacturers, and stakeholders understand trends in the EV market, such as which cars offer the best balance of efficiency, range, and cost.



Dataset Description

The dataset includes information on various electric vehicle models, with columns representing different attributes:

Battery : Size of the car's battery (in kWh).

Car_name : Name of the EV model.

Car_name_link : URL to the detailed page for the car model.

Efficiency : Efficiency of the car (miles per kWh).

Fast_charge: Fast charging capabilities (time to charge 0-80%).

Price.DE: Price of the car in Germany (in Euros).

Range: Driving range on a full charge (in miles).

Top_speed : Maximum speed of the car (in mph).

Acceleration (0-100) : Time taken to accelerate from 0 to 100 km/h (in seconds).

Analysis Steps:

Data Loading and Initial Exploration:

Loaded the dataset into a Pandas DataFrame. Conducted an initial exploration to understand the structure and contents of the data, including checking for missing values and basic statistics.

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

Load Data

```
df = pd.read_csv(r"C:\Users\ANIKET LIGAM\Downloads\EV_cars.csv")
df.head()
```

	Battery	Car_name	Car_name_link	Efficiency	Fast_charge	Price.DE.	Range	Top_speed	acceleration..0.100.
0	75.0	Tesla Model Y Long Range Dual Motor	https://ev-database.org/car/1619/Tesla-Model-Y...	172	670.0	59017.0	435	217	5.0
1	57.5	Tesla Model 3	https://ev-database.org/car/1991/Tesla-Model-3	137	700.0	46220.0	420	201	6.1
2	60.5	BYD ATTO 3	https://ev-database.org/car/1782/BYD-ATTO-3	183	370.0	44625.0	330	160	7.3
3	61.7	MG MG4 Electric 64 kWh	https://ev-database.org/car/1708/MG-MG4-Electr...	171	630.0	39990.0	360	160	7.9
4	75.0	Tesla Model 3 Long Range Dual Motor	https://ev-database.org/car/1992/Tesla-Model-3...	149	780.0	55220.0	505	201	4.4

Exploratory Data Analysis (EDA):

Descriptive Statistics: Generated summary statistics to understand the distribution of key variables.

```
df.describe()
```

	Battery	Efficiency	Fast_charge	Price.DE.	Range	Top_speed	acceleration..0.100.
count	360.000000	360.000000	358.000000	309.000000	360.000000	360.000000	360.000000
mean	71.187500	195.175000	552.960894	67264.284790	369.694444	180.919444	7.288889
std	20.389849	31.909429	236.864801	34508.249544	107.315514	36.232023	3.005897
min	21.300000	137.000000	170.000000	22550.000000	135.000000	125.000000	2.100000
25%	57.500000	171.000000	360.000000	45690.000000	295.000000	155.750000	4.900000
50%	71.000000	188.000000	520.000000	56942.000000	380.000000	180.000000	6.750000
75%	85.000000	208.250000	680.000000	73100.000000	446.250000	200.000000	9.000000
max	123.000000	295.000000	1290.000000	218000.000000	685.000000	320.000000	19.100000

Analysis Steps:

Data Loading and Initial Exploration:

Loaded the dataset into a Pandas DataFrame.
Conducted an initial exploration to understand the structure and contents of the data, including checking for missing values and basic statistics.

Data Cleaning and Preprocessing:

Addressed missing values by either imputing with mean/median or dropping them if necessary.
Performed basic data transformation such as converting units where needed and formatting column names for consistency.

Check Missing Data

```
df.isnull().sum()
```

```
Battery                  0
Car_name                 0
Car_name_link            0
Efficiency               0
Fast_charge              2
Price.DE.               51
Range                    0
Top_speed                0
acceleration..0.100.     0
dtype: int64
```

Drop Null Value

```
df.dropna()
```

Pyt

	Battery	Car_name	Car_name_link	Efficiency	Fast_charge	Price.DE.	Range	Top_speed	acceleration..0.100.
0	75.0	Tesla Model Y Long Range Dual Motor	https://ev-database.org/car/1619/Tesla-Model-Y...	172	670.0	59017.0	435	217	5.0
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Key Insights and Findings:

Efficiency vs. Battery Size:

The analysis revealed that efficiency does not always correlate directly with battery size. Some models achieve higher efficiency with smaller batteries, likely due to optimized design and technology.

Price vs. Range:

There is a general trend where higher-priced EV models offer a longer range. However, some mid-priced models offer competitive ranges, making them attractive options for budget-conscious consumers.

Top Performing Models:

Identified the top 10 EV models in terms of efficiency. These models provide a high number of miles per kWh, indicating better energy utilization.

Some models were found to offer an excellent balance of efficiency, range, and price, making them standout choices for potential buyers.

Market Trends:

The analysis highlighted that newer models tend to offer better efficiency and faster charging capabilities, reflecting technological advancements in the EV industry.

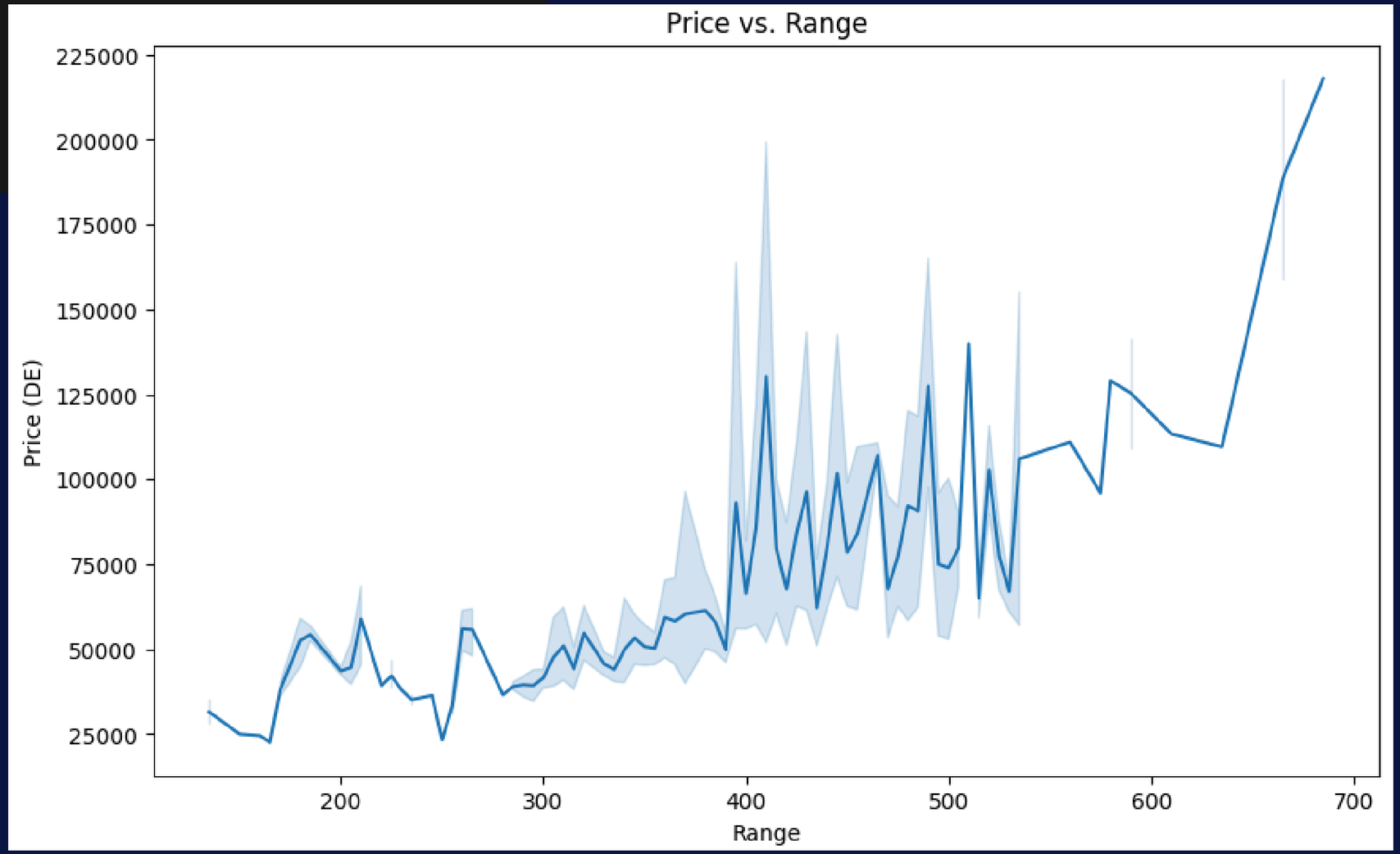
Correlation Insights:

A strong correlation was found between price and range, suggesting that consumers are paying a premium for extended driving range.

Fast charging times also tend to correlate with higher prices, indicating that advanced charging technology is a key selling point for premium models.

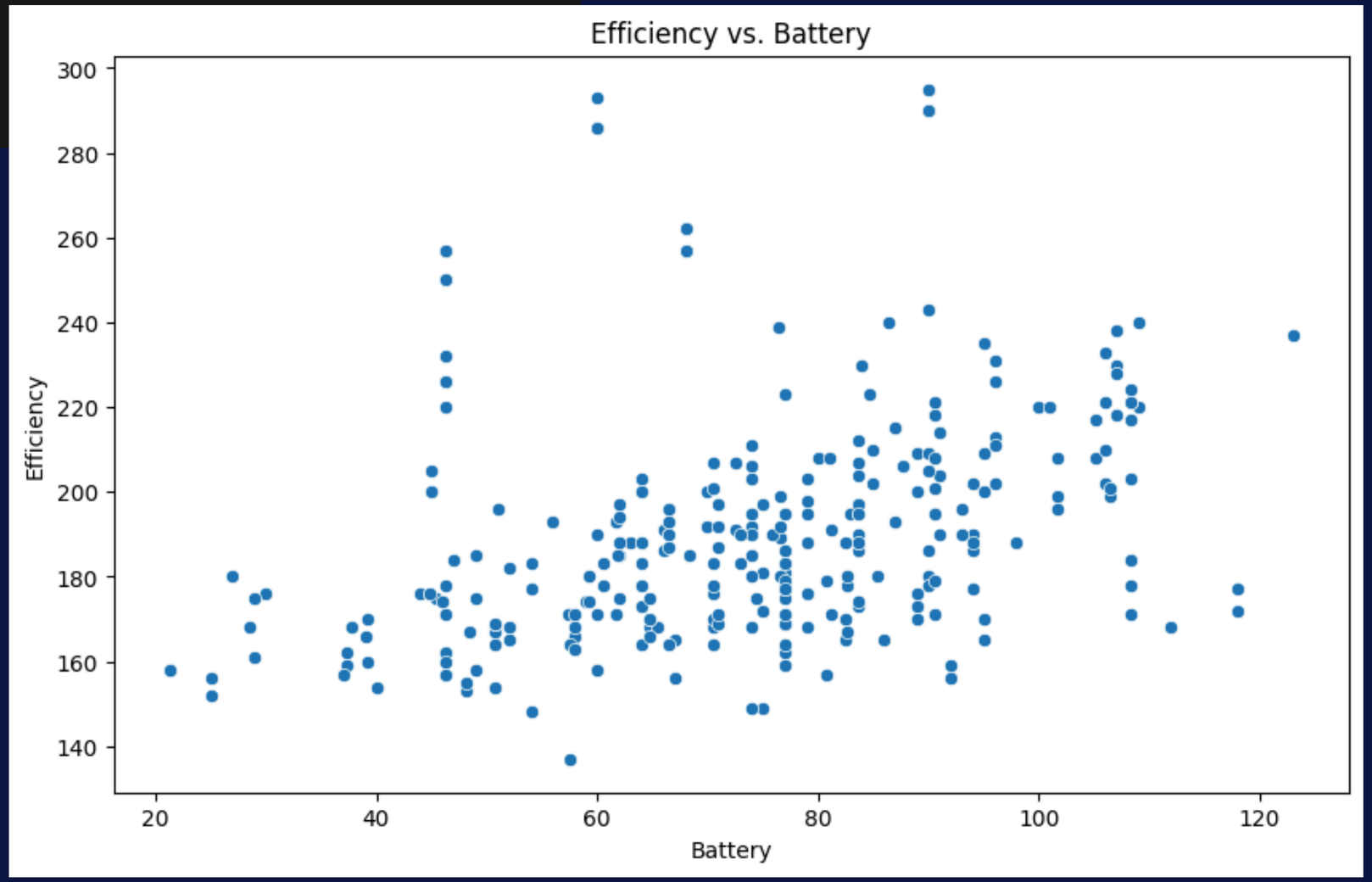
Price vs. Range Analysis

```
plt.figure(figsize=(10, 6))
sns.lineplot(data=df, x='Range', y='Price.DE.')
plt.title('Price vs. Range')
plt.xlabel('Range')
plt.ylabel('Price (DE)')
plt.show()
```



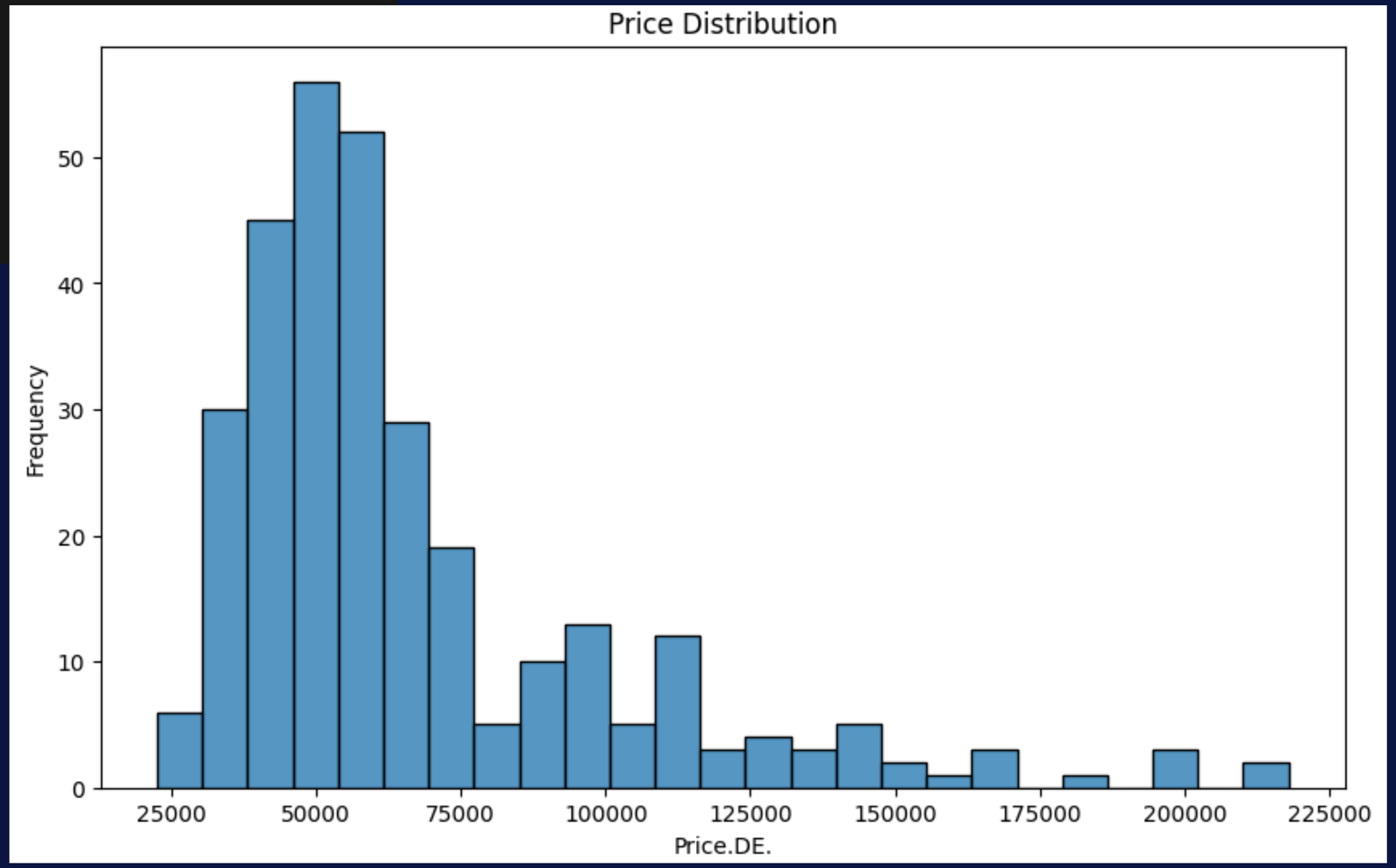
Efficiency Analysis

```
plt.figure(figsize=(10, 6))
sns.scatterplot(data=df, x='Battery', y='Efficiency')
plt.title('Efficiency vs. Battery')
plt.xlabel('Battery')
plt.ylabel('Efficiency')
plt.show()
```



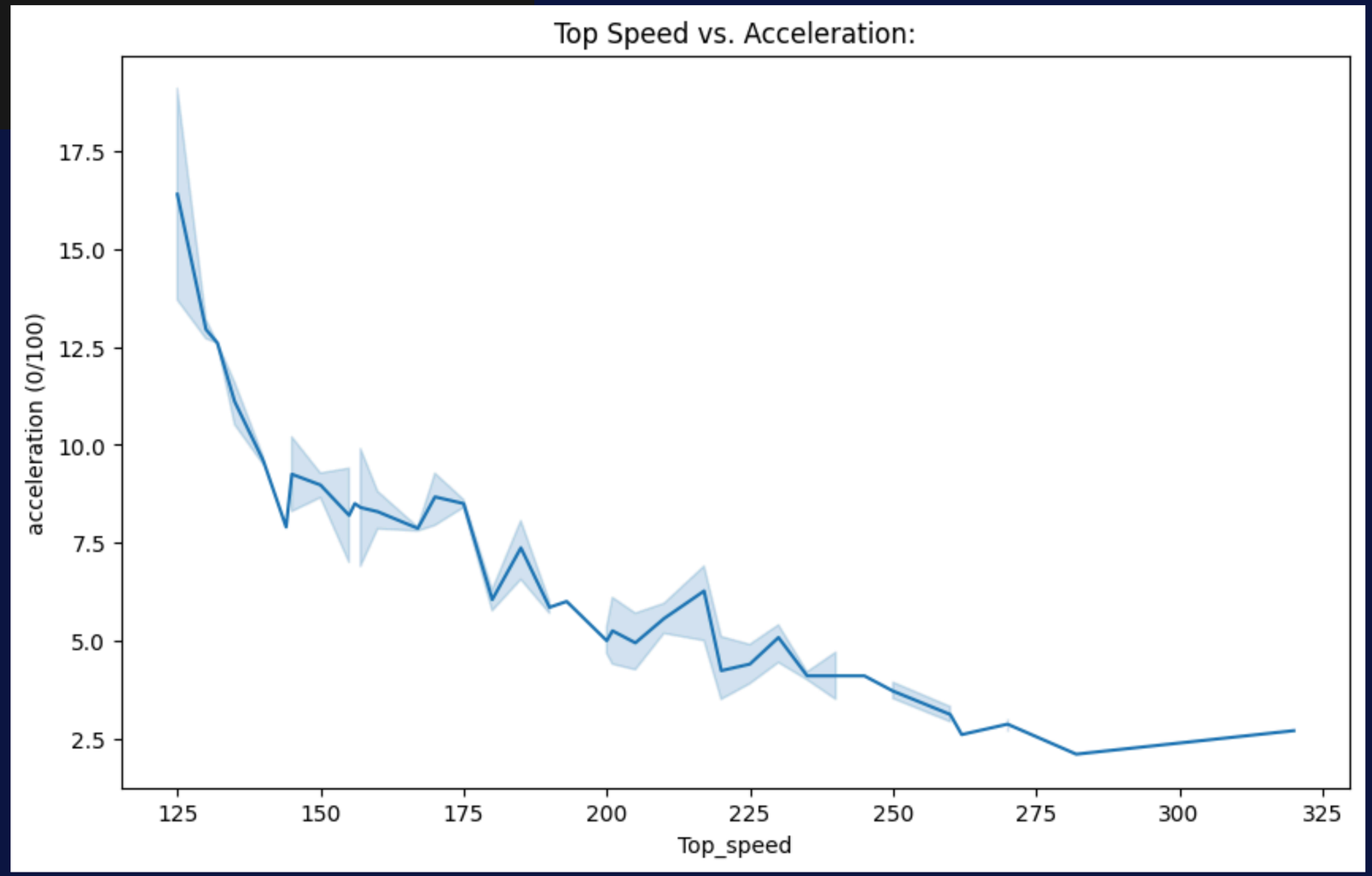
Price Distribution

```
plt.figure(figsize=(10,6))
sns.histplot(data=df,x="Price.DE.")
plt.title("Price Distribution")
plt.xlabel("Price.DE.")
plt.ylabel("Frequency")
plt.show()
```



Top Speed vs. Acceleration:

```
plt.figure(figsize=(10,6))
sns.lineplot(data=df,x="Top_speed",y="acceleration..0.100.")
plt.title("Top Speed vs. Acceleration:")
plt.xlabel("Top_speed")
plt.ylabel("acceleration (0/100)")
plt.show()
```



Value for Money: Identify cars with the lowest Price per Range

```
from tabulate import tabulate

df['Price_per_Range'] = df['Price.DE.'] / df['Range']

value_for_money_cars = df[['Car_name', 'Price_per_Range']].sort_values(by='Price_per_Range')
print("Cars offering the best value for money (Lowest Price per Range):")
rounded_table = value_for_money_cars.head().round(2)
display(rounded_table)
```

```
Cars offering the best value for money (Lowest Price per Range):
```

	Car_name	Price_per_Range
8	Citroen e-C3	93.20
41	BYD SEAL 82.5 kWh RWD Design	95.16
29	MG ZS EV Long Range	102.68
50	CUPRA Born 170 kW - 77 kWh	103.22
124	Volkswagen ID.3 Pro S - 4 Seats	104.60

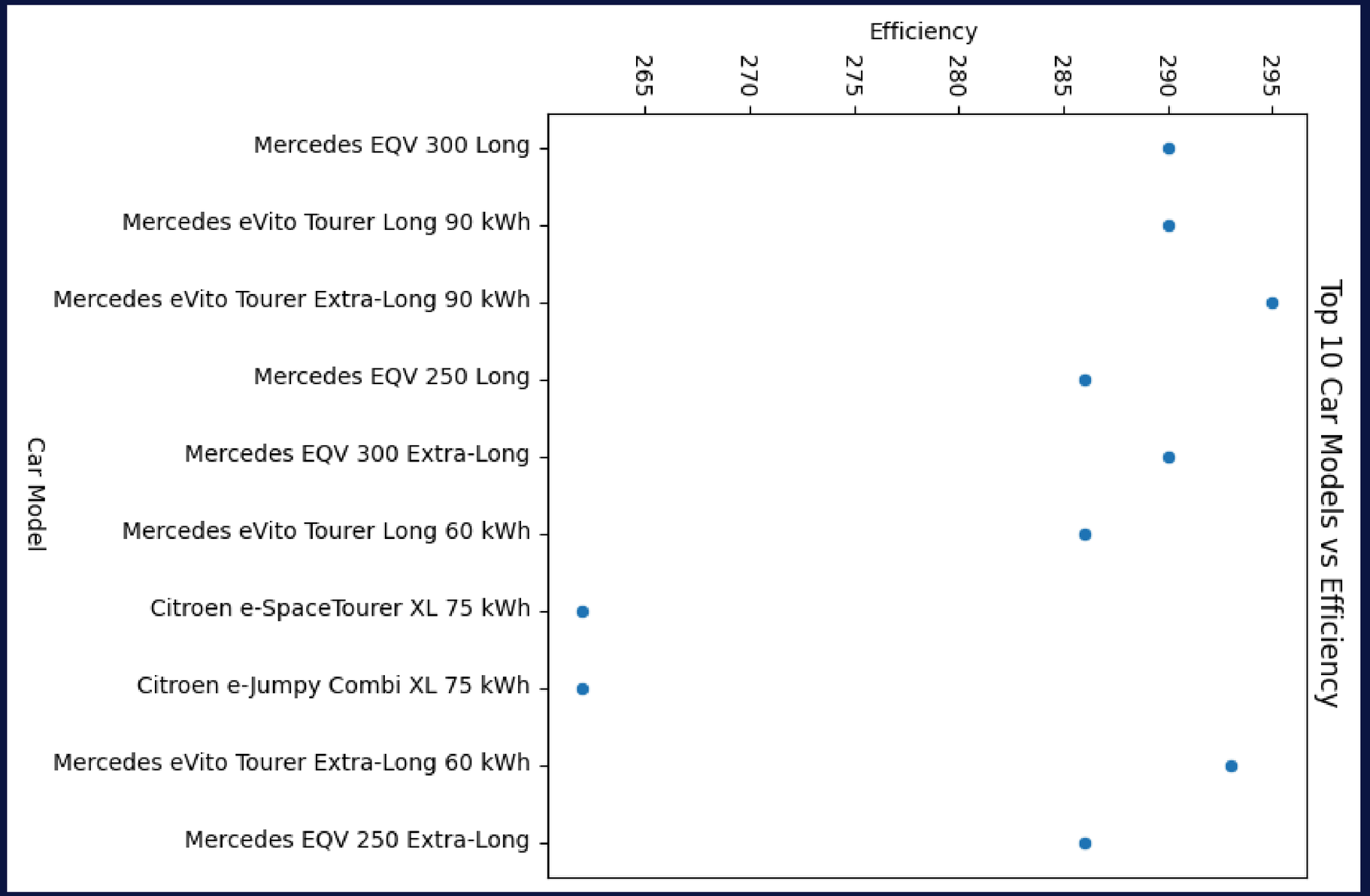
Top 10 Car Models vs Efficiency

```
mean_efficiency = df.groupby('Car_name')['Efficiency'].mean().reset_index()

# Get the top 10 car models by average efficiency
top_10_models = mean_efficiency.sort_values(by='Efficiency', ascending=False).head(10)['Car_name']

# Filter the original DataFrame to include only these top 10 models
filtered_df = df[df['Car_name'].isin(top_10_models)]

# Create the boxplot
plt.figure(figsize=(6, 6))
sns.scatterplot(x='Car_name', y='Efficiency', data=filtered_df)
plt.xticks(rotation=90)
plt.title('Top 10 Car Models vs Efficiency')
plt.xlabel('Car Model')
plt.ylabel('Efficiency')
plt.show()
```


Efficiency
265
270
275
280
285
290
295
Mercedes EQV 300 Long
Mercedes eVito Tourer Long 90 kWh
Mercedes eVito Tourer Extra-Long 90 kWh
Mercedes EQV 250 Long
Mercedes EQV 300 Extra-Long
Mercedes eVito Tourer Long 60 kWh
Citroen e-SpaceTourer XL 75 kWh
Citroen e-Jumpy Combi XL 75 kWh
Mercedes eVito Tourer Extra-Long 60 kWh
Mercedes EQV 250 Extra-Long
Car Model
Top 10 Car Models vs Efficiency

Conclusion:

The EV market is rapidly evolving, with significant improvements in efficiency, range, and technology. This analysis provides a snapshot of current market offerings, helping consumers make informed decisions. For manufacturers and industry stakeholders, the findings underscore the importance of balancing efficiency with cost and providing competitive features in mid-range models.