ESSENTIALS OF DATA SCIENCE

EXPLORING THE CAR DATASET

Mini Project

MIT | Academy of Engineering

(An Autonomous Institute Affiliated to Savitribai Phule Pune University)

Guided by -

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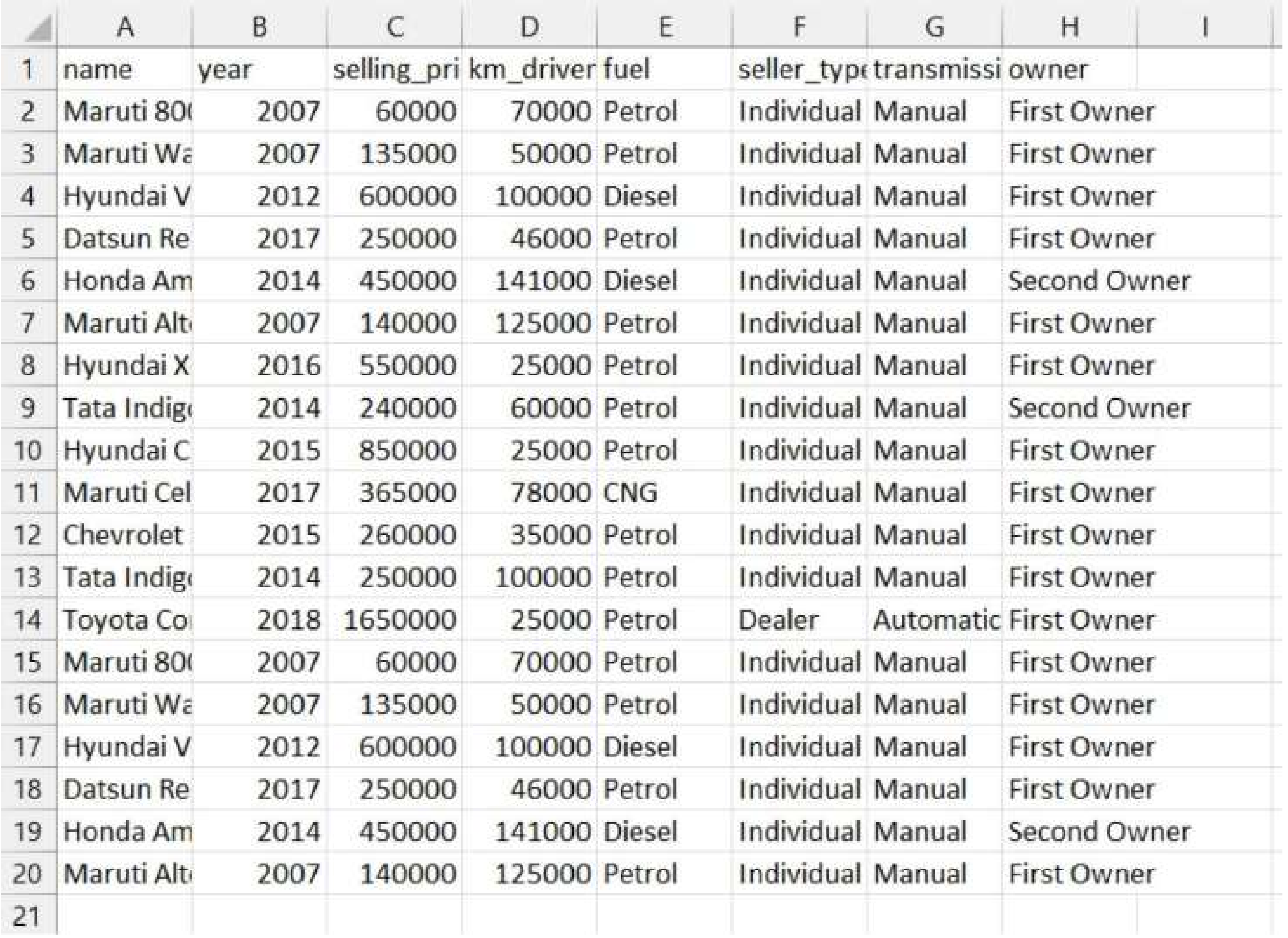
INTRODUCTION

- Data analytics involves examining and interpreting large datasets to uncover patterns and insights.
- It helps businesses make data-driven decisions and improve their operations.
- Techniques such as statistical analysis, data mining, machine learning, and visualization are used in data analytics.
- It can be applied to various fields like finance, marketing, healthcare, and manufacturing.
- Ethical considerations and data privacy are crucial in data analytics due to the hand sensitive information.

MOTIVATION



	A	B	C	D	E	F	G	H	I
1	name	year	selling_pri	km_driver	fuel	seller_typ	transmissi	owner	
2	Maruti 80	2007	60000	70000	Petrol	Individual	Manual	First Owner	
3	Maruti Wa	2007	135000	50000	Petrol	Individual	Manual	First Owner	
4	Hyundai V	2012	600000	100000	Diesel	Individual	Manual	First Owner	
5	Datsun Re	2017	250000	46000	Petrol	Individual	Manual	First Owner	
6	Honda Am	2014	450000	141000	Diesel	Individual	Manual	Second Owner	
7	Maruti Alt	2007	140000	125000	Petrol	Individual	Manual	First Owner	
8	Hyundai X	2016	550000	25000	Petrol	Individual	Manual	First Owner	
9	Tata Indig	2014	240000	60000	Petrol	Individual	Manual	Second Owner	
10	Hyundai C	2015	850000	25000	Petrol	Individual	Manual	First Owner	
11	Maruti Cel	2017	365000	78000	CNG	Individual	Manual	First Owner	
12	Chevrolet	2015	260000	35000	Petrol	Individual	Manual	First Owner	
13	Tata Indig	2014	250000	100000	Petrol	Individual	Manual	First Owner	
14	Toyota Co	2018	1650000	25000	Petrol	Dealer	Automatic	First Owner	
15	Maruti 80	2007	60000	70000	Petrol	Individual	Manual	First Owner	
16	Maruti Wa	2007	135000	50000	Petrol	Individual	Manual	First Owner	
17	Hyundai V	2012	600000	100000	Diesel	Individual	Manual	First Owner	
18	Datsun Re	2017	250000	46000	Petrol	Individual	Manual	First Owner	
19	Honda Am	2014	450000	141000	Diesel	Individual	Manual	Second Owner	
20	Maruti Alt	2007	140000	125000	Petrol	Individual	Manual	First Owner	
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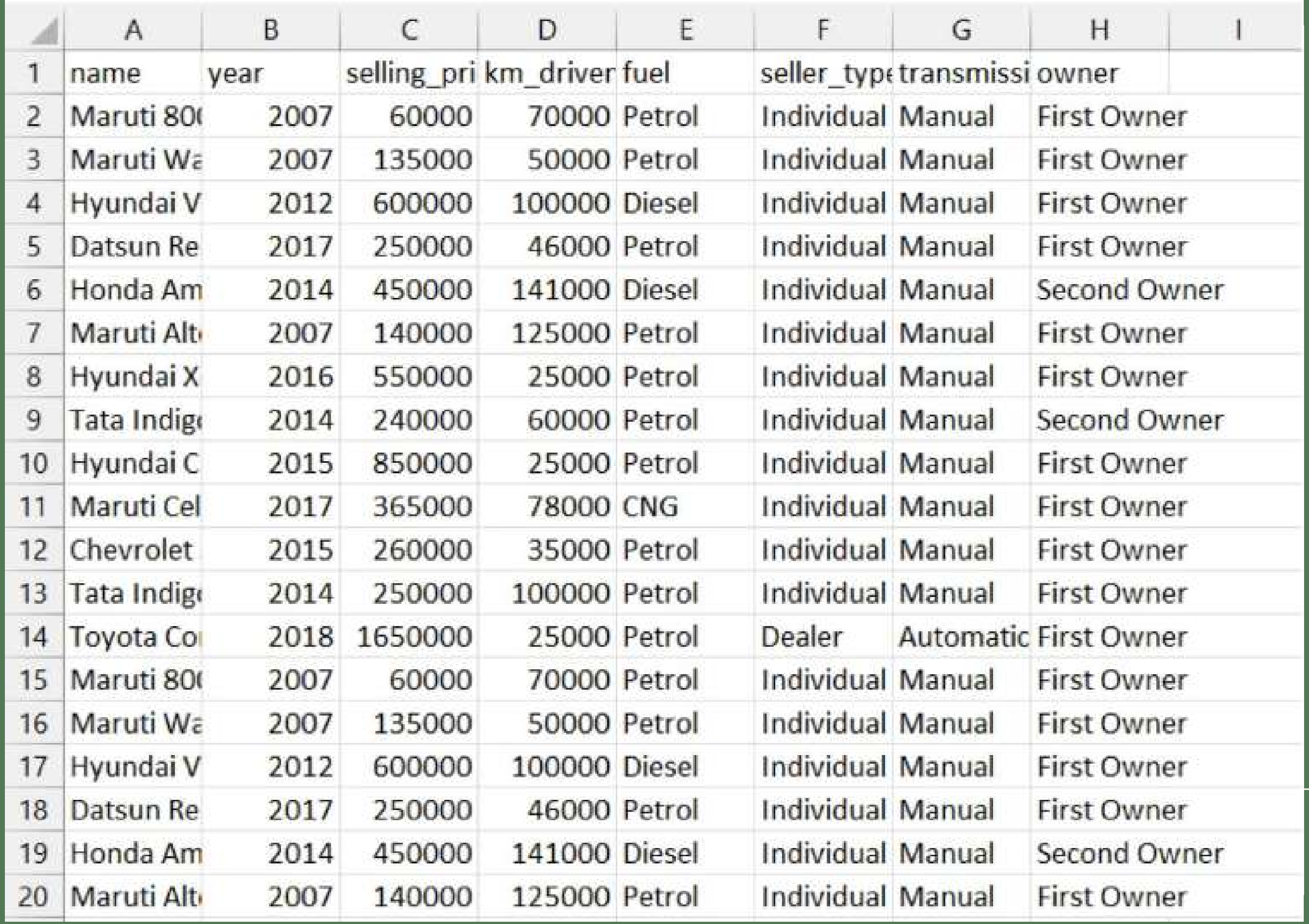
- **Analyzing the dataset can provide valuable insights into the depreciation rate of different car models over time.**
- **Understanding the relationship between the selling price and the number of kilometers driven can help buyers and sellers determine fair pricing.**
- **Identifying the most popular fuel type among car owners can highlight trends and potential market opportunities.**
- **Exploring the impact of car ownership (e.g., single owner vs. multiple owners) on the selling price can guide buyers and sellers in making informed decisions.**
- **By analyzing the data, one can uncover patterns or correlations between the year of the car and its selling price, helping buyers assess the value retention of different car models.**

DETAILS OF DATASET



	A	B	C	D	E	F	G	H	I
1	name	year	selling_pri	km_driver	fuel	seller_type	transmissi	owner	
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3	Maruti Wa	2007	135000	50000	Petrol	Individual	Manual	First Owner	
4	Hyundai V	2012	600000	100000	Diesel	Individual	Manual	First Owner	
5	Datsun Re	2017	250000	46000	Petrol	Individual	Manual	First Owner	
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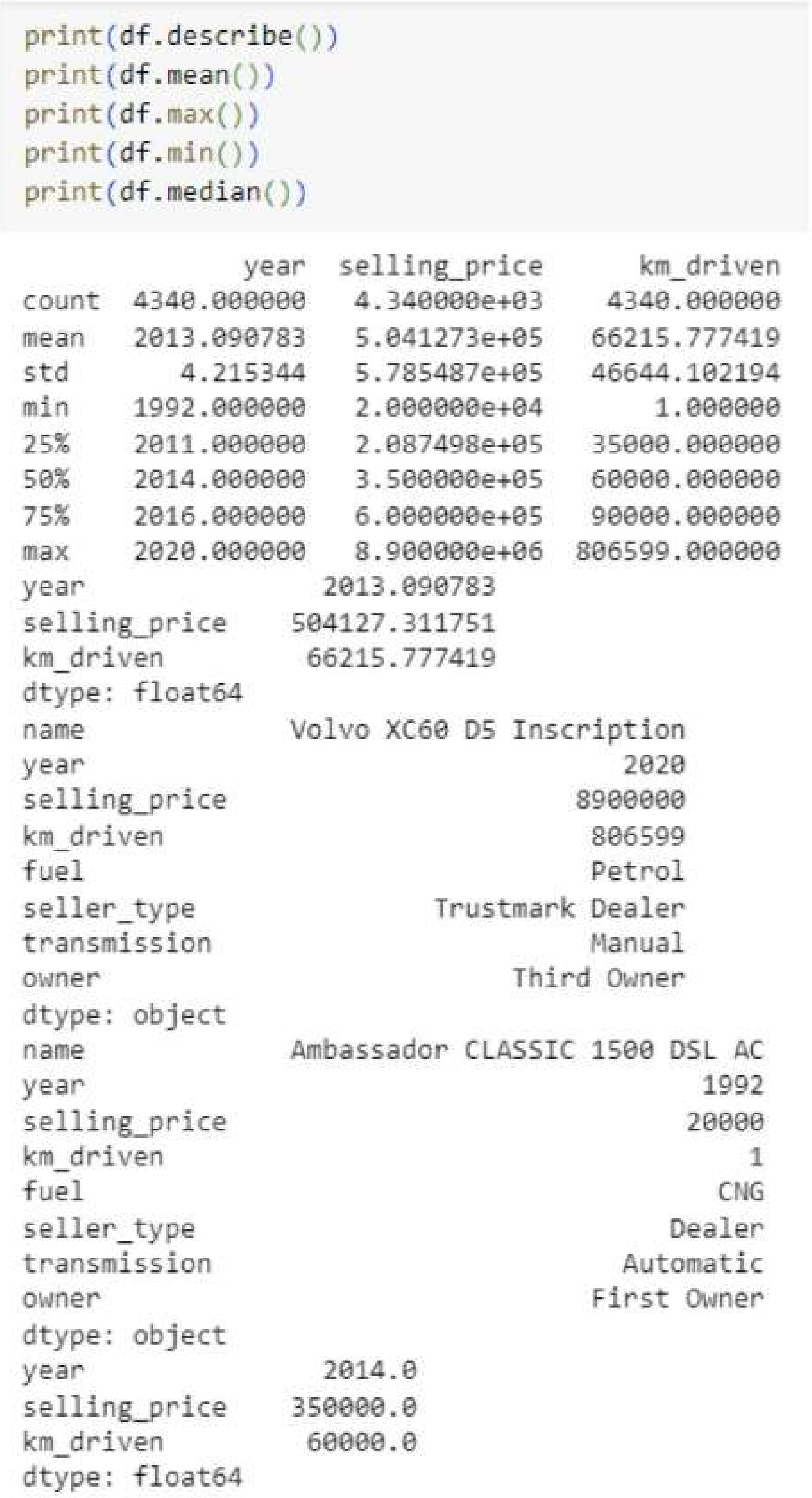
Dataset name: Car Sales Dataset

- Number of features: 8 (Car name, Year, Selling price of car, Km driven, Fuel type, seller type,transmission, Owner)

- Number of records:5000

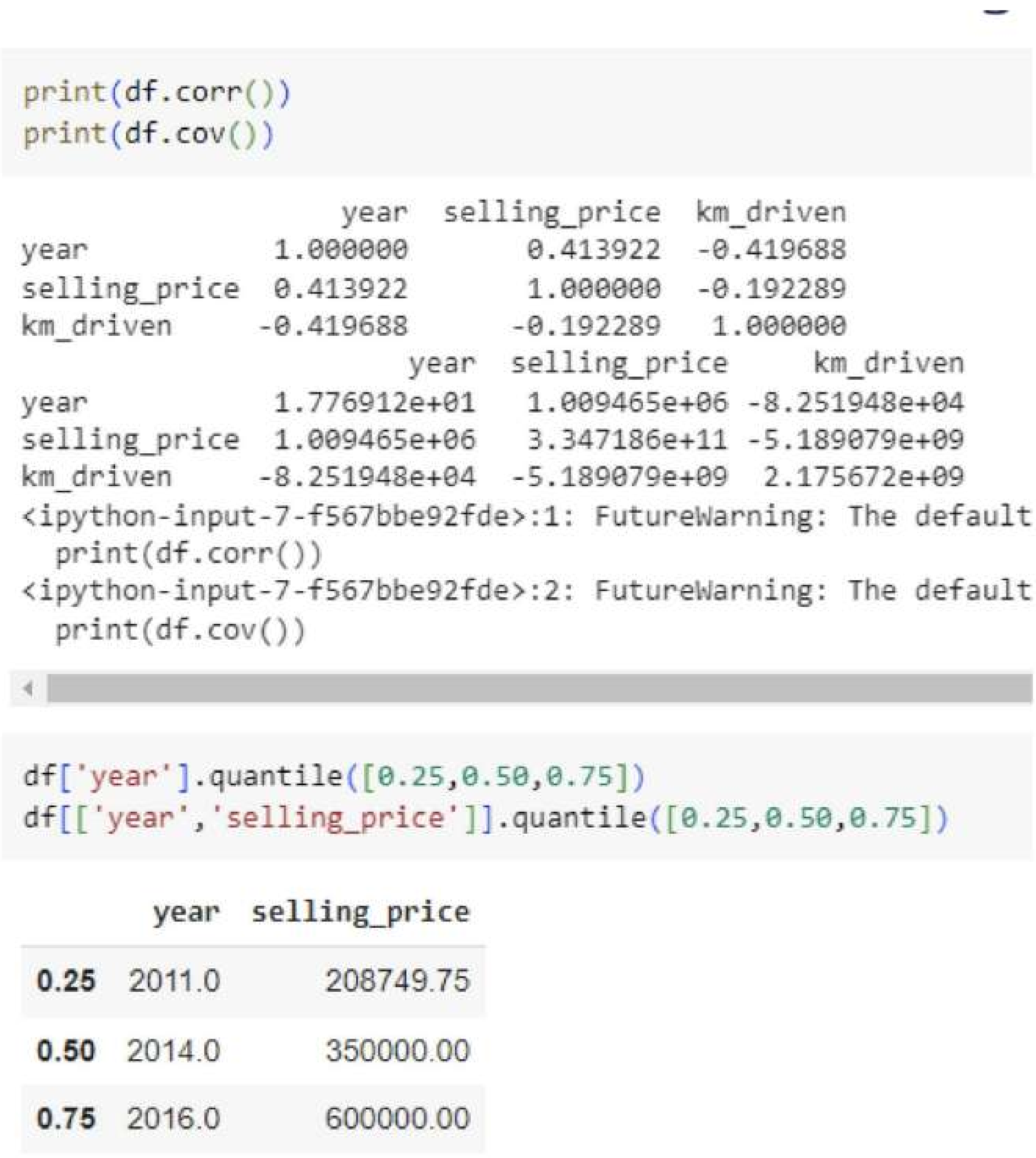
DATA MANIPULATION

- Data manipulation modifies, transforms, or restructures data for meaningful insights or specific requirements.
- It involves operations like filtering, sorting, merging, aggregating, and transforming data.
- Programming languages (e.g., Python, SQL) and specialized tools are used for data manipulatior
- Tasks include cleaning, preprocessing, handlin missing values, outliers, and creating new variables.
- Data manipulation is vital for data analysis, preparing data, creating derived variables, and ensuring data quality.



```python
print(df.describe())
print(df.mean())
print(df.max())
print(df.min())
print(df.median())
```

```
              year  selling_price      km_driven
count  4340.000000   4.340000e+03    4340.000000
mean   2013.090783   5.041273e+05   66215.777419
std       4.215344   5.785487e+05   46644.102194
min    1992.000000   2.000000e+04       1.000000
25%    2011.000000   2.087498e+05   35000.000000
50%    2014.000000   3.500000e+05   60000.000000
75%    2016.000000   6.000000e+05   90000.000000
max    2020.000000   8.900000e+06  806599.000000
year               2013.090783
selling_price    504127.311751
km_driven         66215.777419
dtype: float64
name             Volvo XC60 D5 Inscription
year                                  2020
selling_price                      8900000
km_driven                           806599
fuel                                Petrol
seller_type                Trustmark Dealer
transmission                        Manual
owner                          Third Owner
dtype: object
name             Ambassador CLASSIC 1500 DSL AC
year                                       1992
selling_price                             20000
km_driven                                     1
fuel                                        CNG
seller_type                              Dealer
transmission                          Automatic
owner                               First Owner
dtype: object
year               2014.0
selling_price    350000.0
km_driven         60000.0
dtype: float64
```

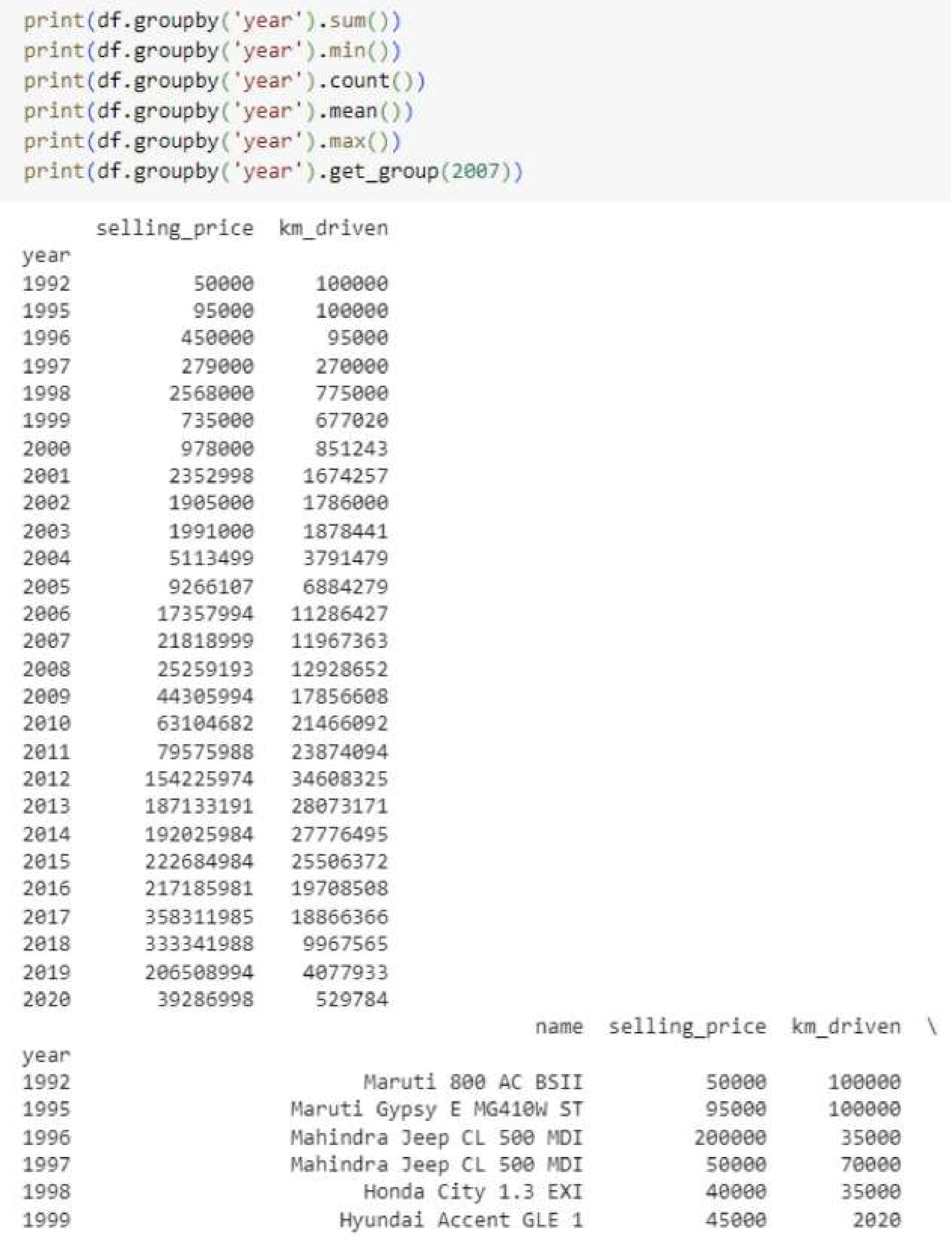


```python
print(df.corr())
print(df.cov())
```

```
                   year  selling_price  km_driven
year           1.000000       0.413922  -0.419688
selling_price  0.413922       1.000000  -0.192289
km_driven     -0.419688      -0.192289   1.000000
                       year  selling_price     km_driven
year           1.776912e+01   1.009465e+06 -8.251948e+04
selling_price  1.009465e+06   3.347186e+11 -5.189079e+09
km_driven     -8.251948e+04  -5.189079e+09  2.175672e+09
<ipython-input-7-f567bbe92fde>:1: FutureWarning: The default
  print(df.corr())
<ipython-input-7-f567bbe92fde>:2: FutureWarning: The default
  print(df.cov())
```

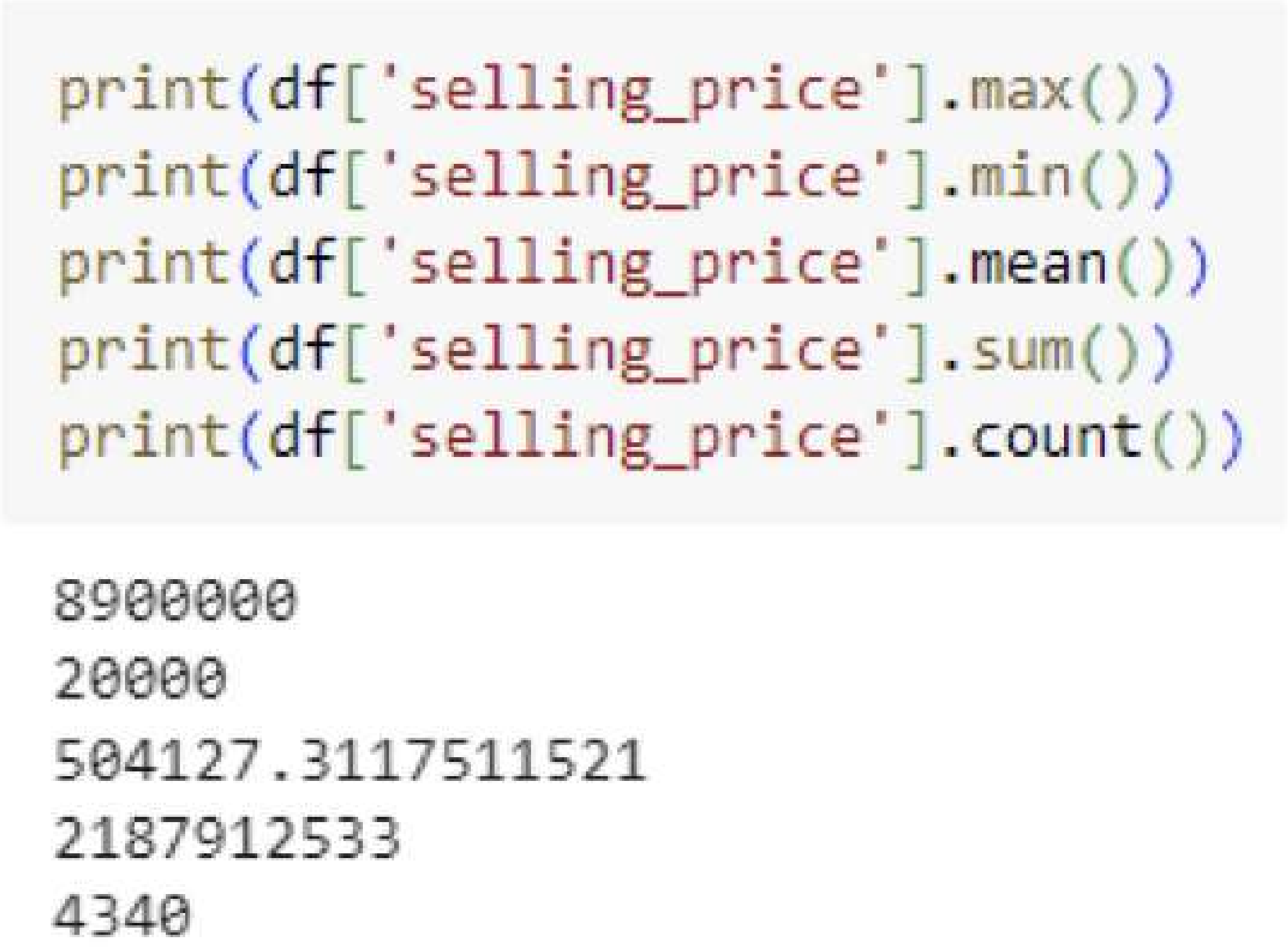
```python
df['year'].quantile([0.25,0.50,0.75])
df[['year','selling_price']].quantile([0.25,0.50,0.75])
```

	year	selling_price
0.25	2011.0	208749.75
0.50	2014.0	350000.00
0.75	2016.0	600000.00



```
print(df.groupby('year').sum())
print(df.groupby('year').min())
print(df.groupby('year').count())
print(df.groupby('year').mean())
print(df.groupby('year').max())
print(df.groupby('year').get_group(2007))
```

```
      selling_price  km_driven
year
1992          50000     100000
1995          95000     100000
1996         450000      95000
1997         279000     270000
1998        2568000     775000
1999         735000     677020
2000         978000     851243
2001        2352998    1674257
2002        1905000    1786000
2003        1991000    1878441
2004        5113499    3791479
2005        9266107    6884279
2006       17357994   11286427
2007       21818999   11967363
2008       25259193   12928652
2009       44305994   17856608
2010       63104682   21466092
2011       79575988   23874094
2012      154225974   34608325
2013      187133191   28073171
2014      192025984   27776495
2015      222684984   25506372
2016      217185981   19708508
2017      358311985   18866366
2018      333341988    9967565
2019      206508994    4077933
2020       39286998     529784
                                  name  selling_price  km_driven  \
year
1992                  Maruti 800 AC BSII          50000     100000
1995              Maruti Gypsy E MG410W ST          95000     100000
1996              Mahindra Jeep CL 500 MDI         200000      35000
1997              Mahindra Jeep CL 500 MDI          50000      70000
1998                  Honda City 1.3 EXI          40000      35000
1999                 Hyundai Accent GLE 1          45000       2020
```

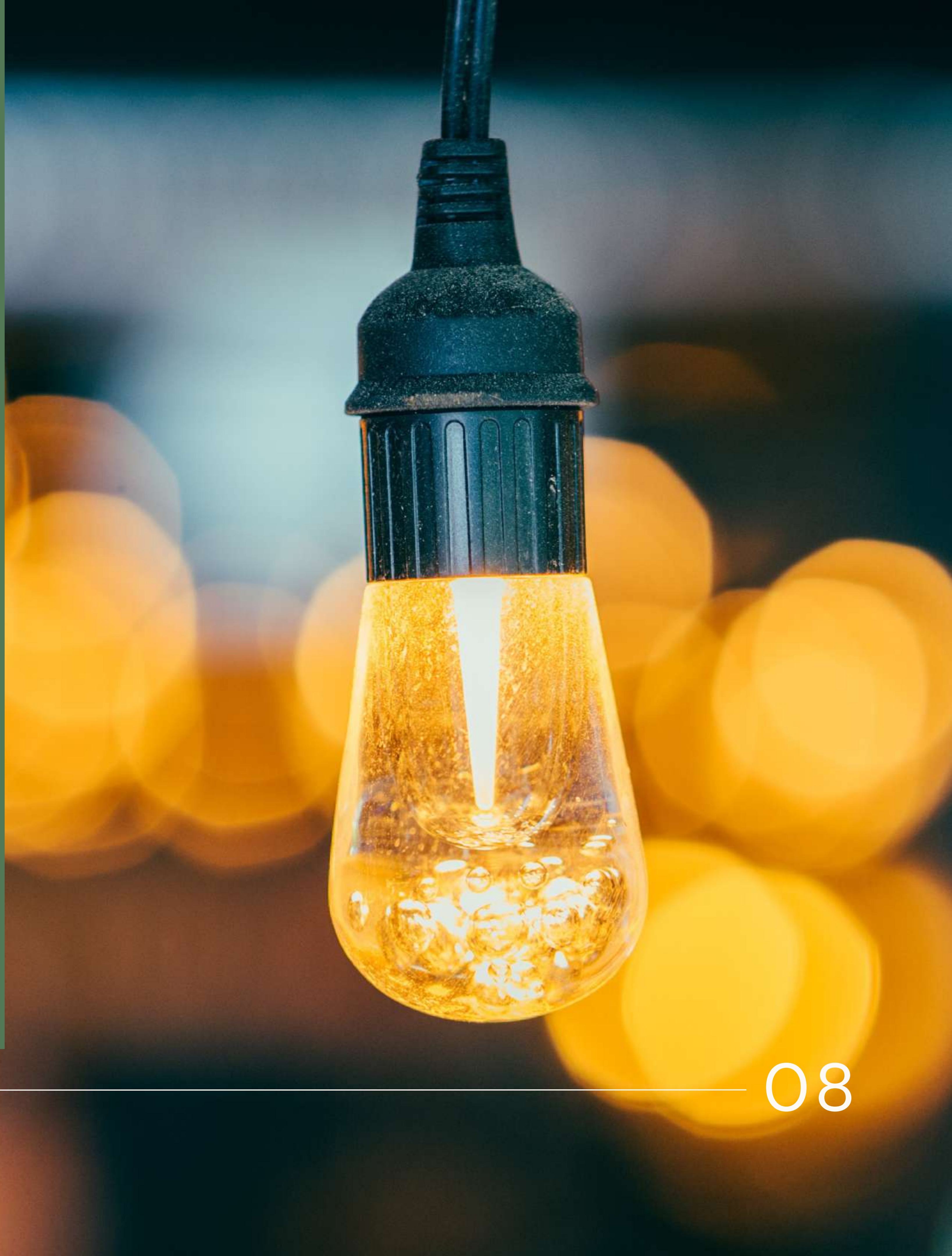


```
print(df['selling_price'].max())
print(df['selling_price'].min())
print(df['selling_price'].mean())
print(df['selling_price'].sum())
print(df['selling_price'].count())
```

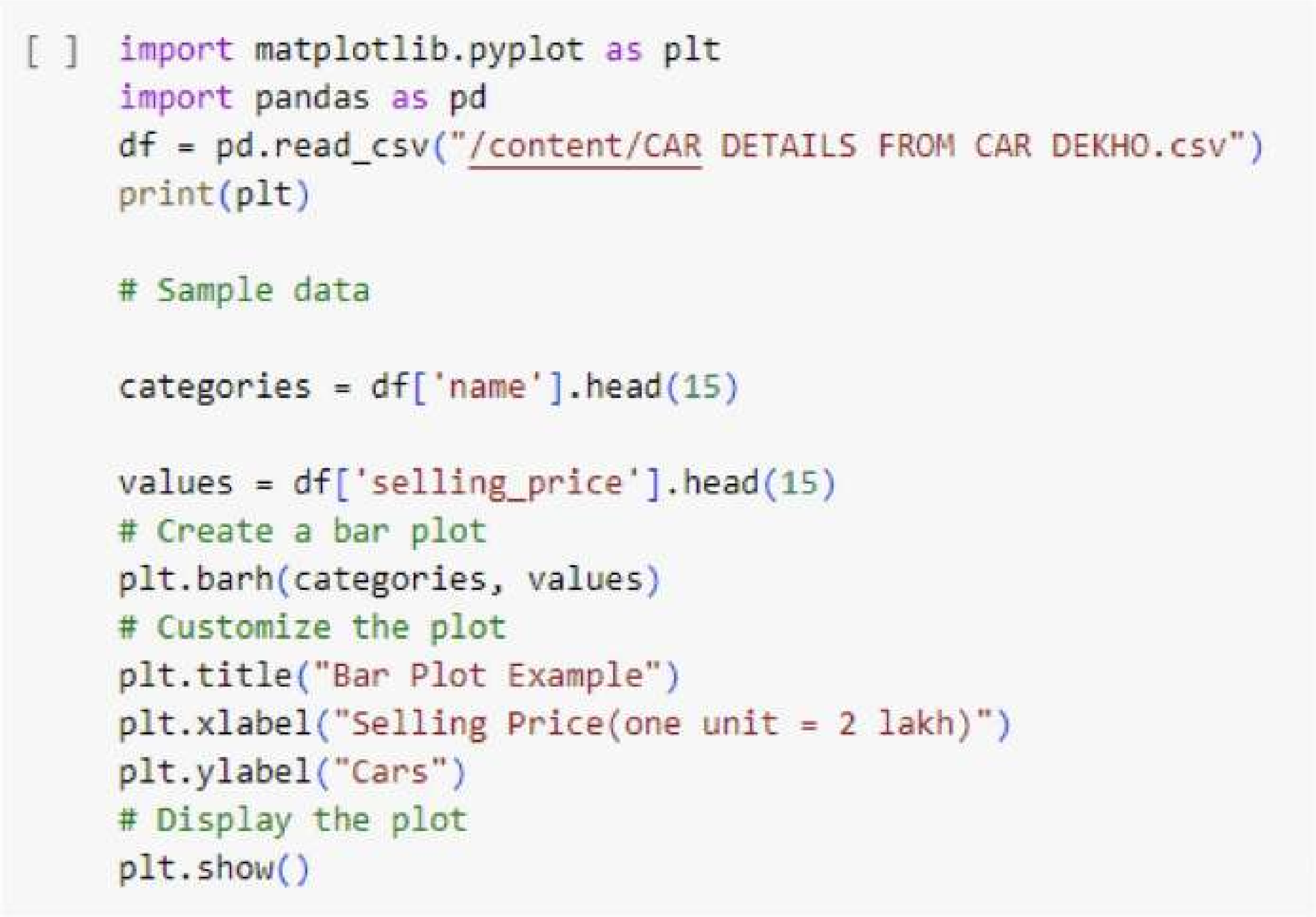
```
8900000
20000
504127.3117511521
2187912533
4340
```

DATA VISUALIZATION

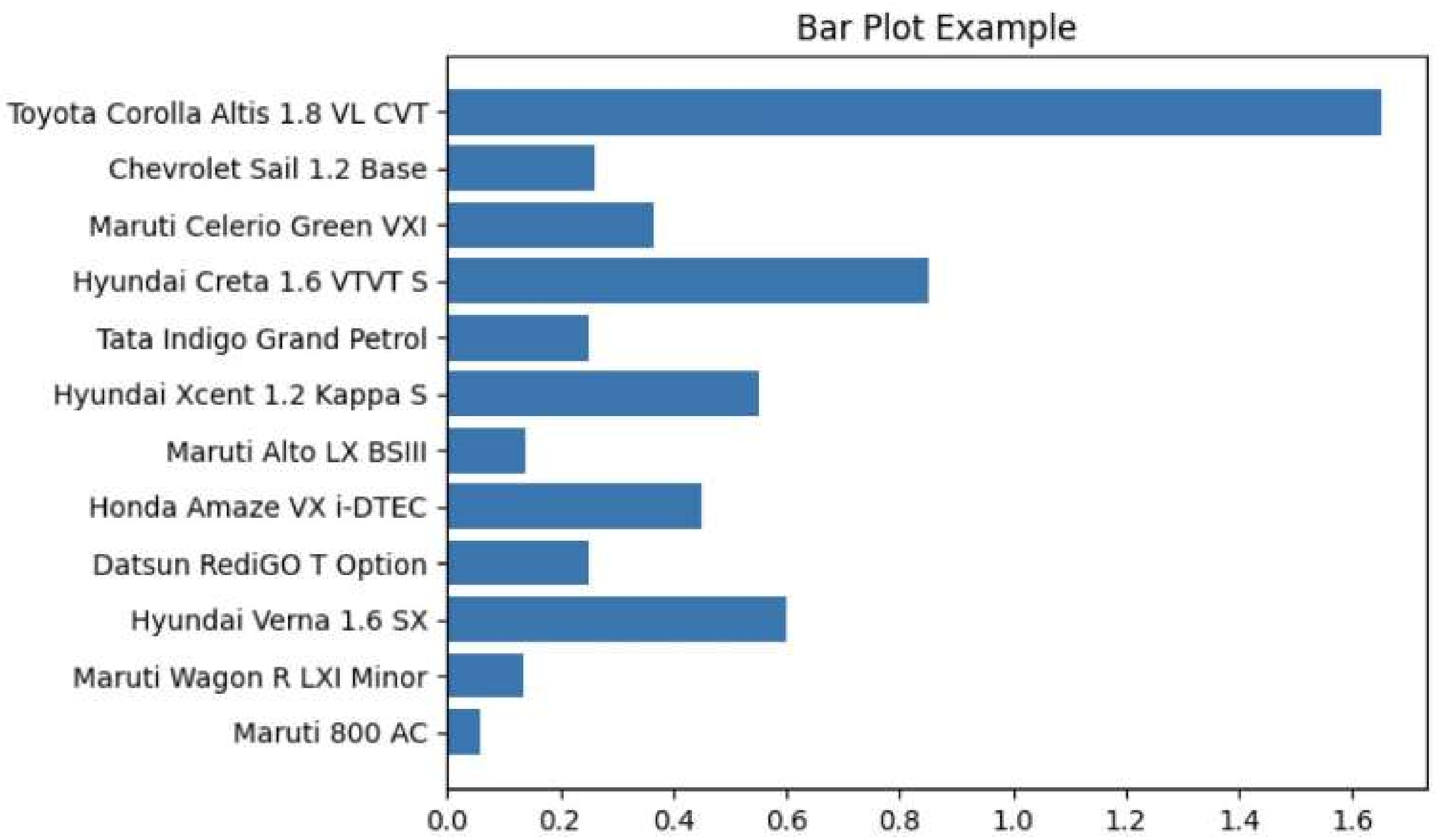
- Data visualization represents data in graphical or visual format for better understanding.
- It simplifies complex information and patterns for easier comprehension.
- It utilizes charts, graphs, maps, and visual elements to present data visually.
- Data visualization helps identify trends, outliers, and relationships in the data.
- It supports data exploration, analysis, and decision-making through intuitive visuals.
- Effective data visualization communicates insights to diverse audiences and is visually appealing.

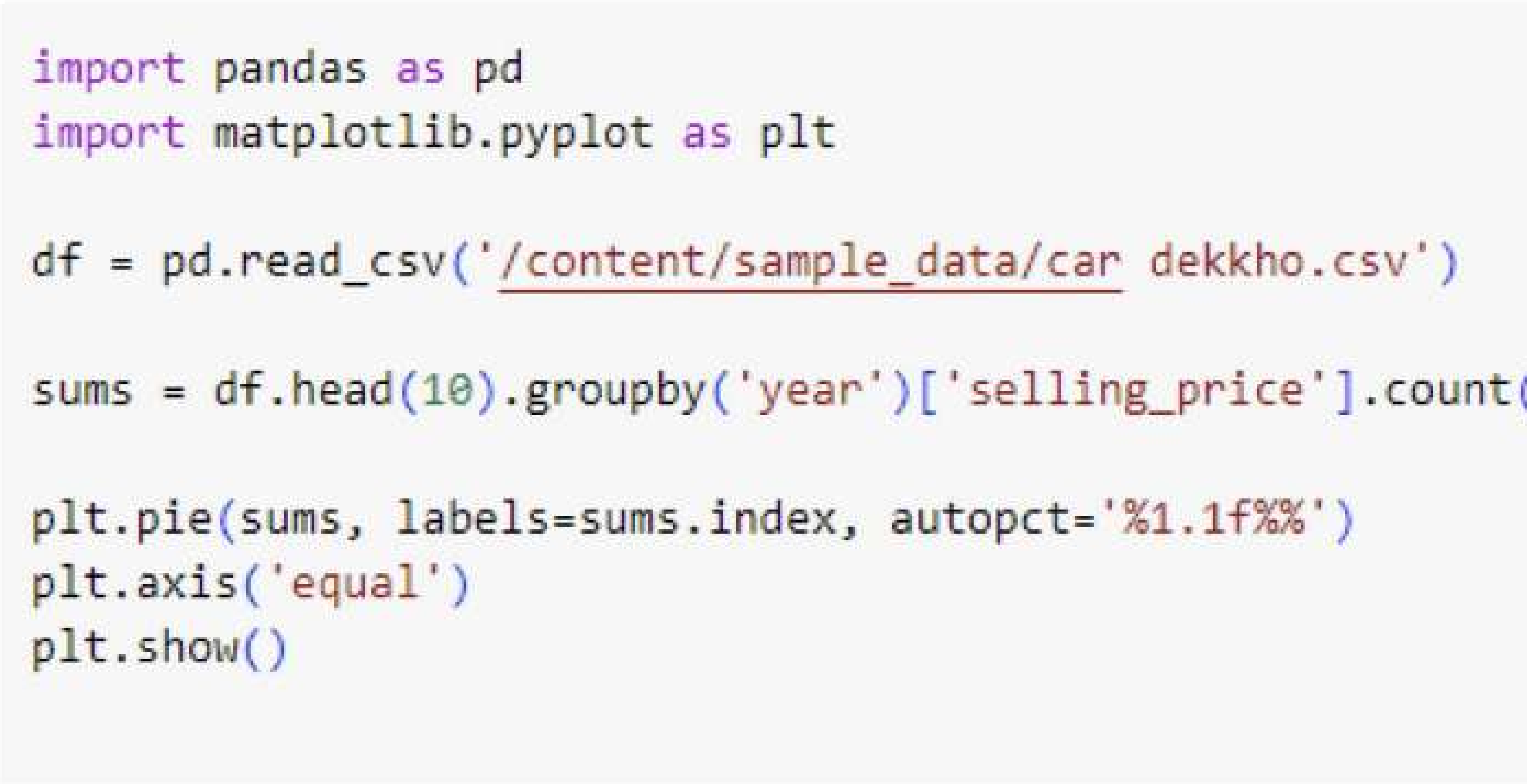


DATASET EXAMPLE

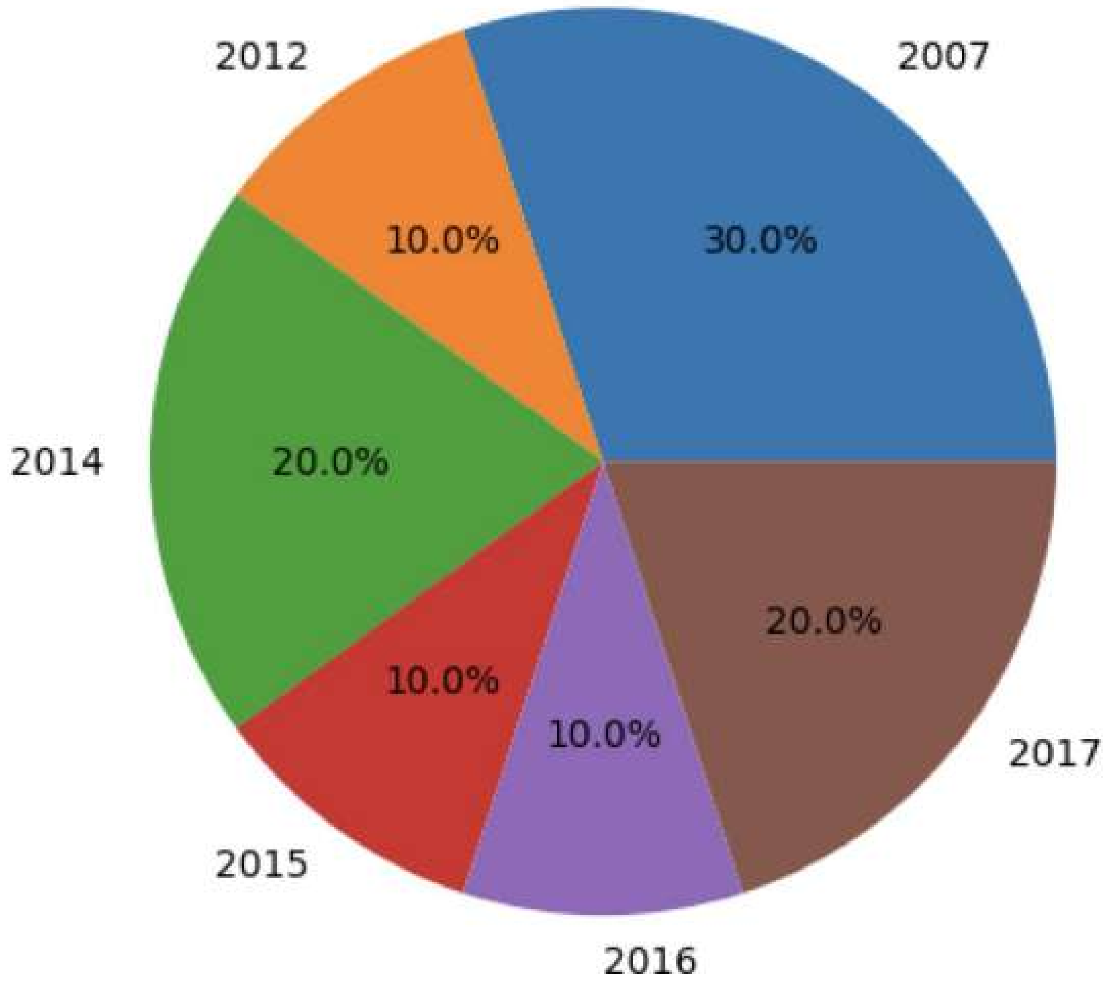


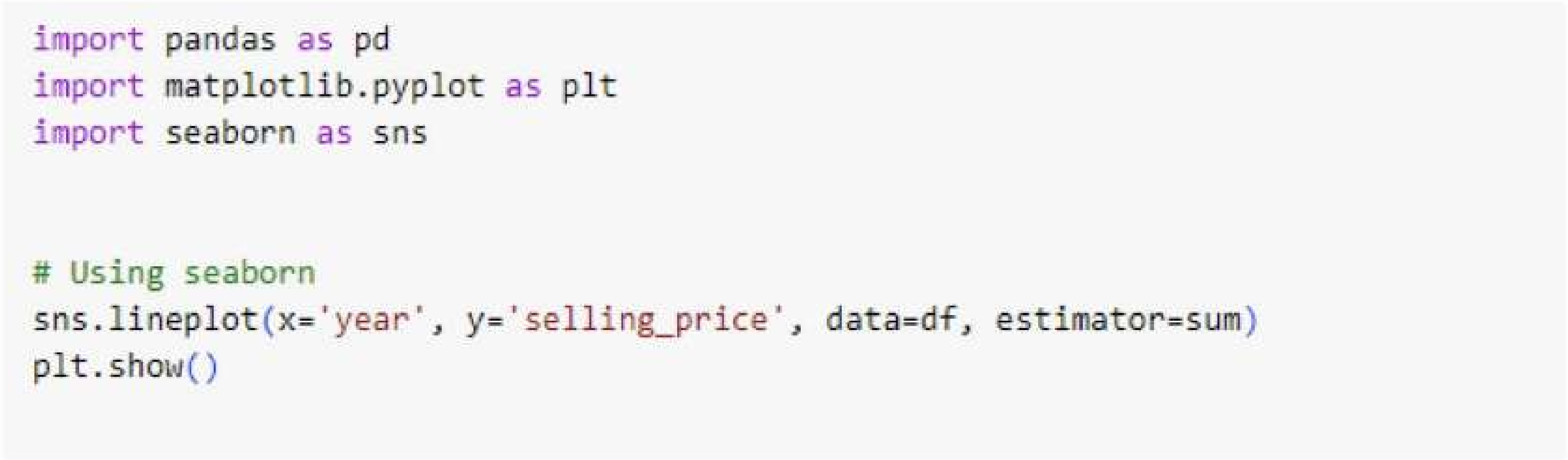
```python
import matplotlib.pyplot as plt
import pandas as pd
df = pd.read_csv("/content/CAR DETAILS FROM CAR DEKHO.csv")
print(plt)

# Sample data

categories = df['name'].head(15)

values = df['selling_price'].head(15)
# Create a bar plot
plt.barh(categories, values)
# Customize the plot
plt.title("Bar Plot Example")
plt.xlabel("Selling Price(one unit = 2 lakh)")
plt.ylabel("Cars")
# Display the plot
plt.show()
```



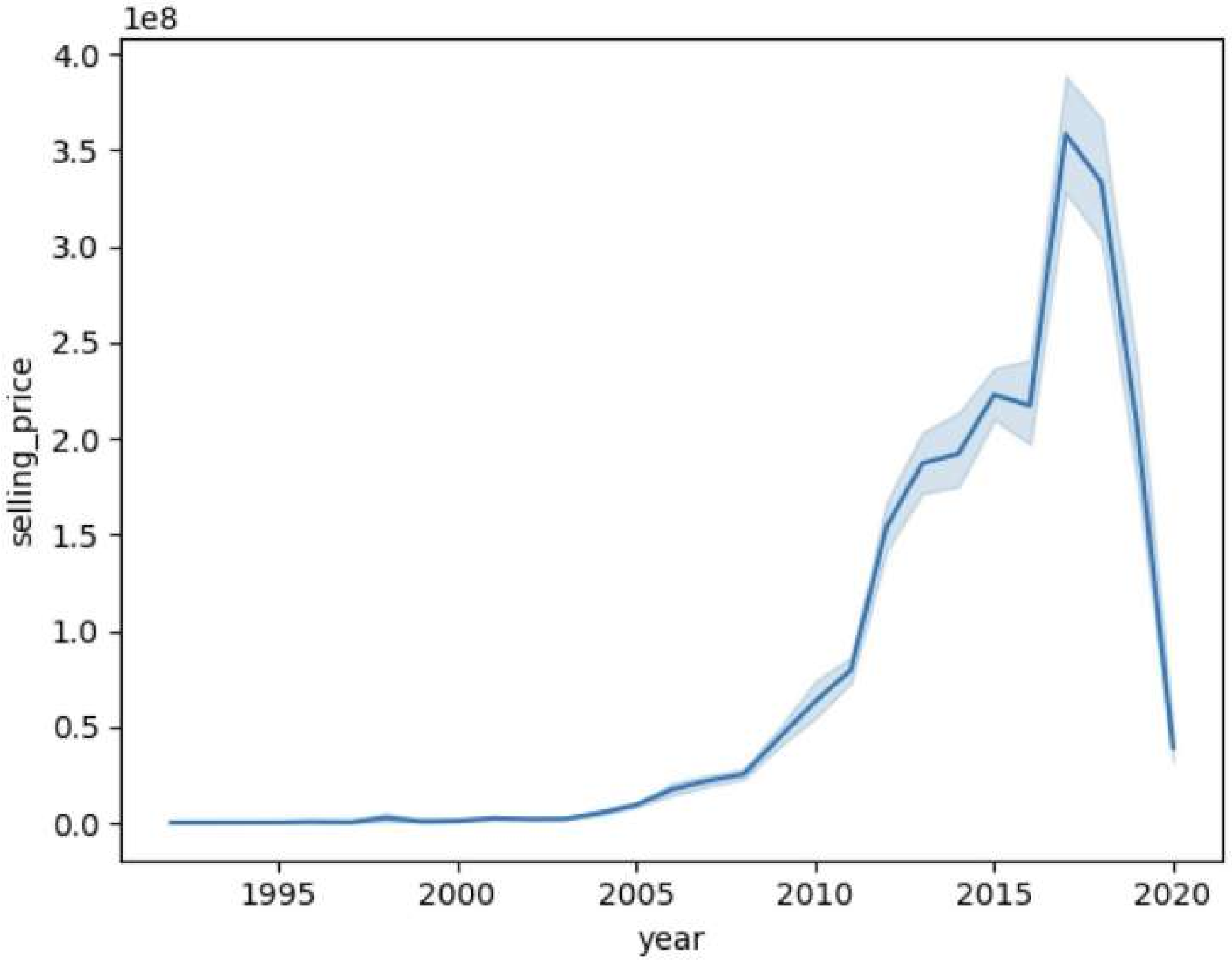


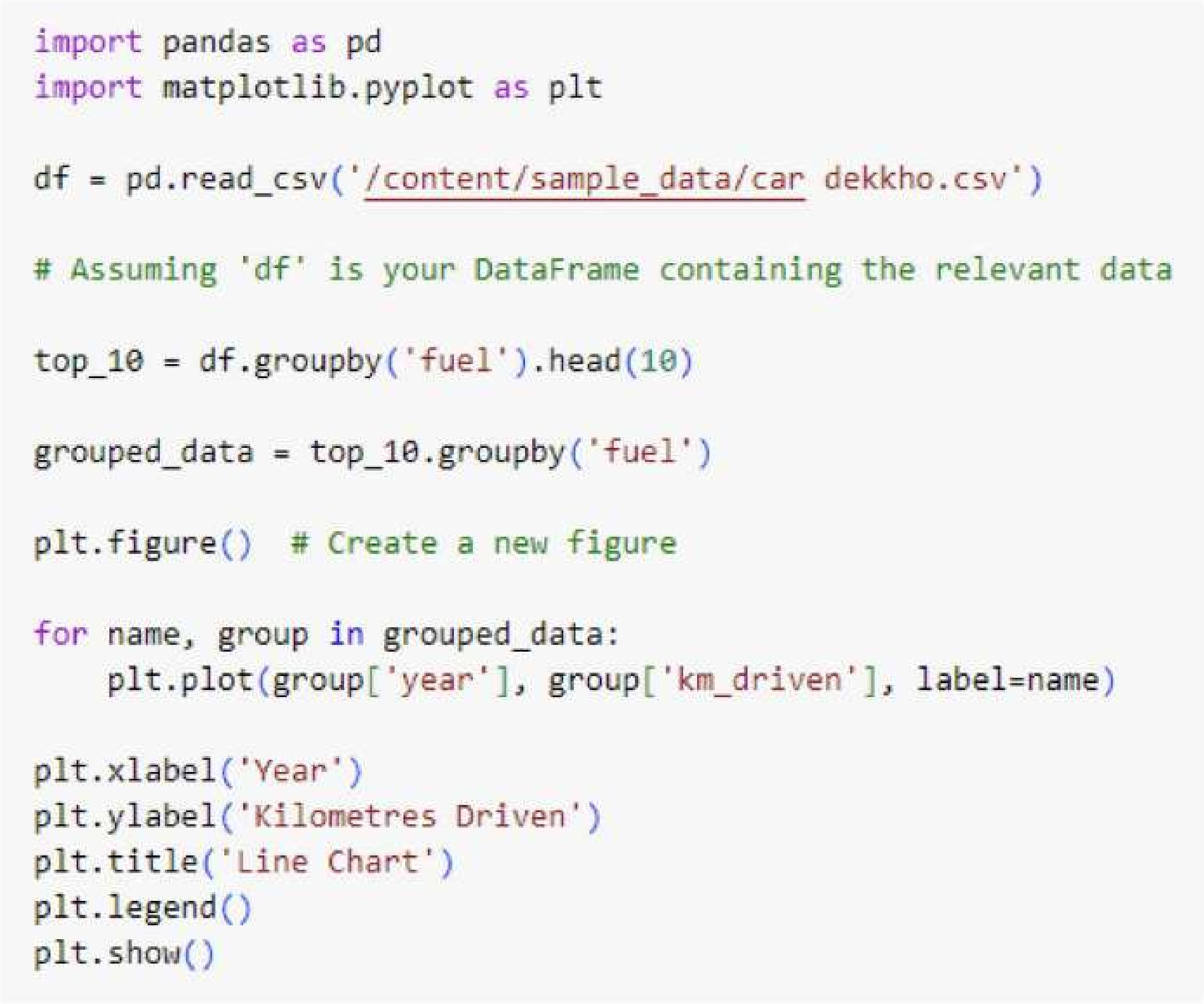
```
import pandas as pd
import matplotlib.pyplot as plt

df = pd.read_csv('/content/sample_data/car dekkho.csv')

sums = df.head(10).groupby('year')['selling_price'].count(

plt.pie(sums, labels=sums.index, autopct='%1.1f%%')
plt.axis('equal')
plt.show()
```



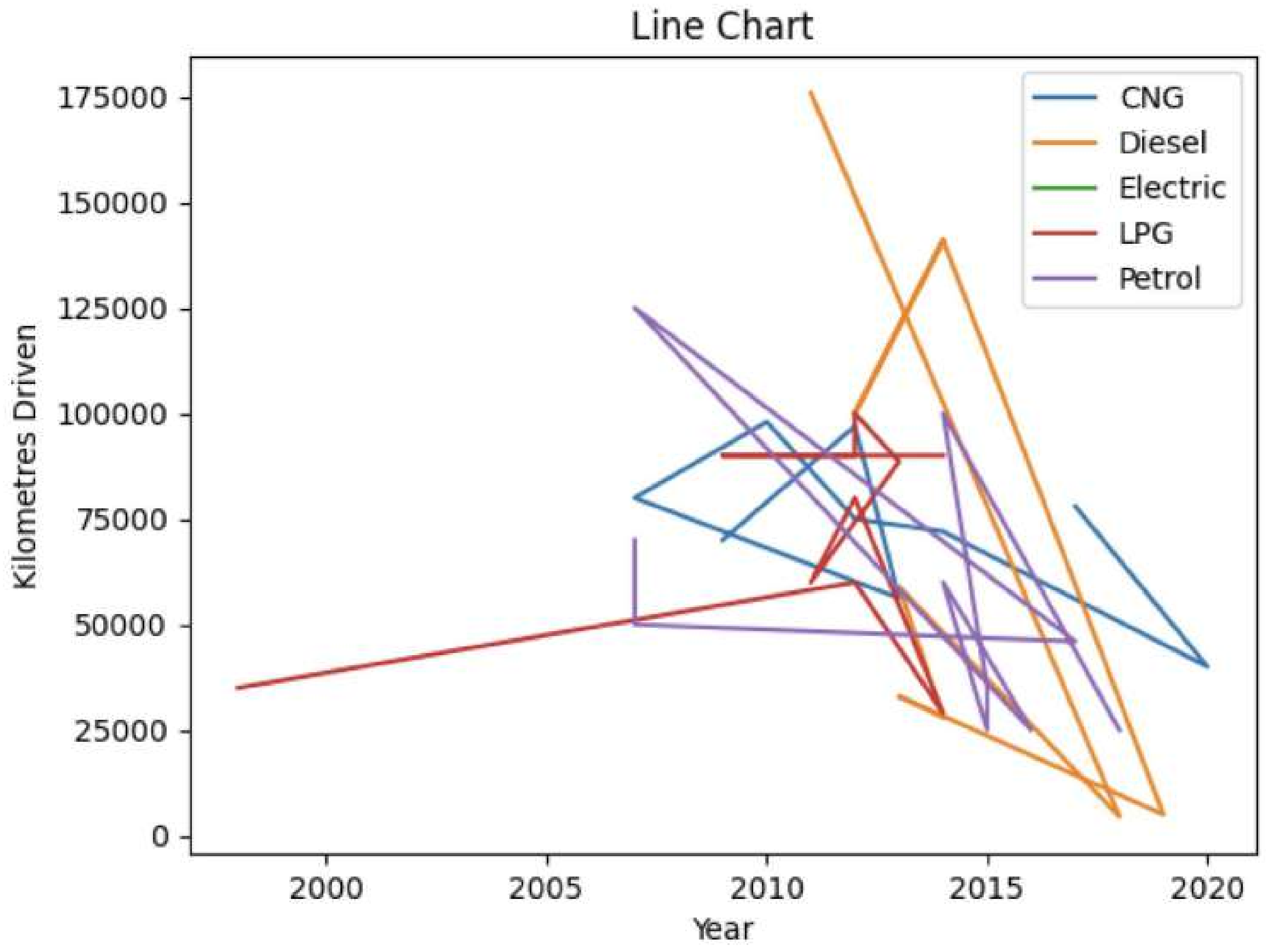


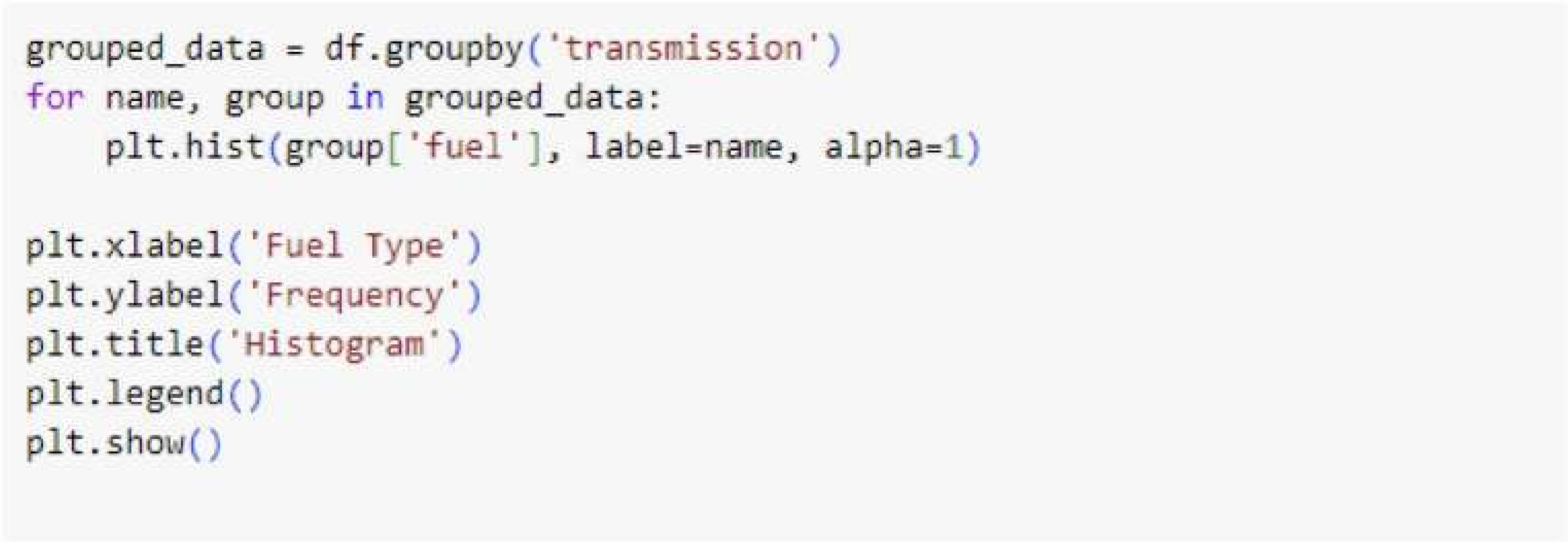
```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns


# Using seaborn
sns.lineplot(x='year', y='selling_price', data=df, estimator=sum)
plt.show()
```



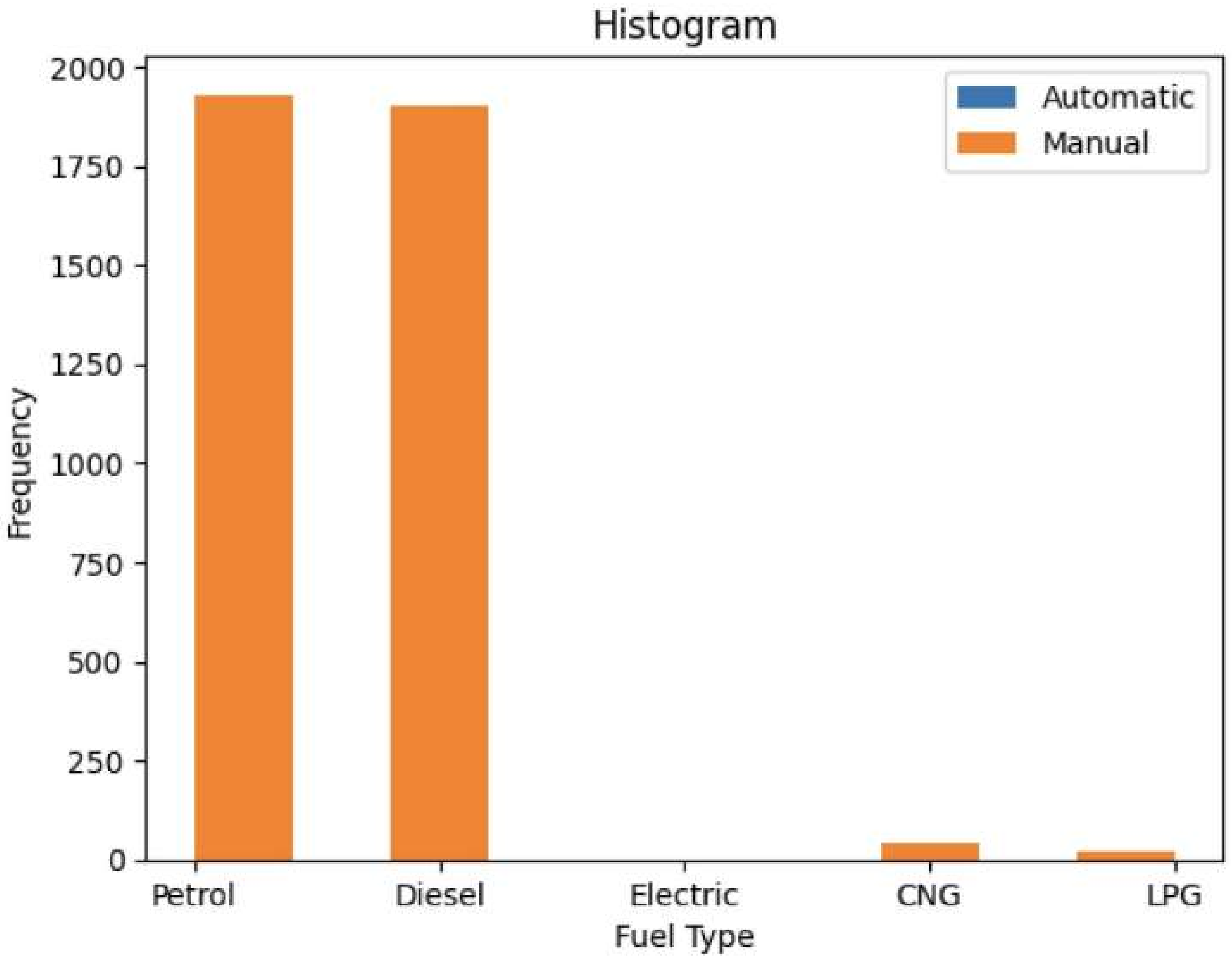


```python
import pandas as pd
import matplotlib.pyplot as plt

df = pd.read_csv('/content/sample_data/car dekkho.csv')

# Assuming 'df' is your DataFrame containing the relevant data

top_10 = df.groupby('fuel').head(10)

grouped_data = top_10.groupby('fuel')

plt.figure()  # Create a new figure

for name, group in grouped_data:
    plt.plot(group['year'], group['km_driven'], label=name)

plt.xlabel('Year')
plt.ylabel('Kilometres Driven')
plt.title('Line Chart')
plt.legend()
plt.show()
```

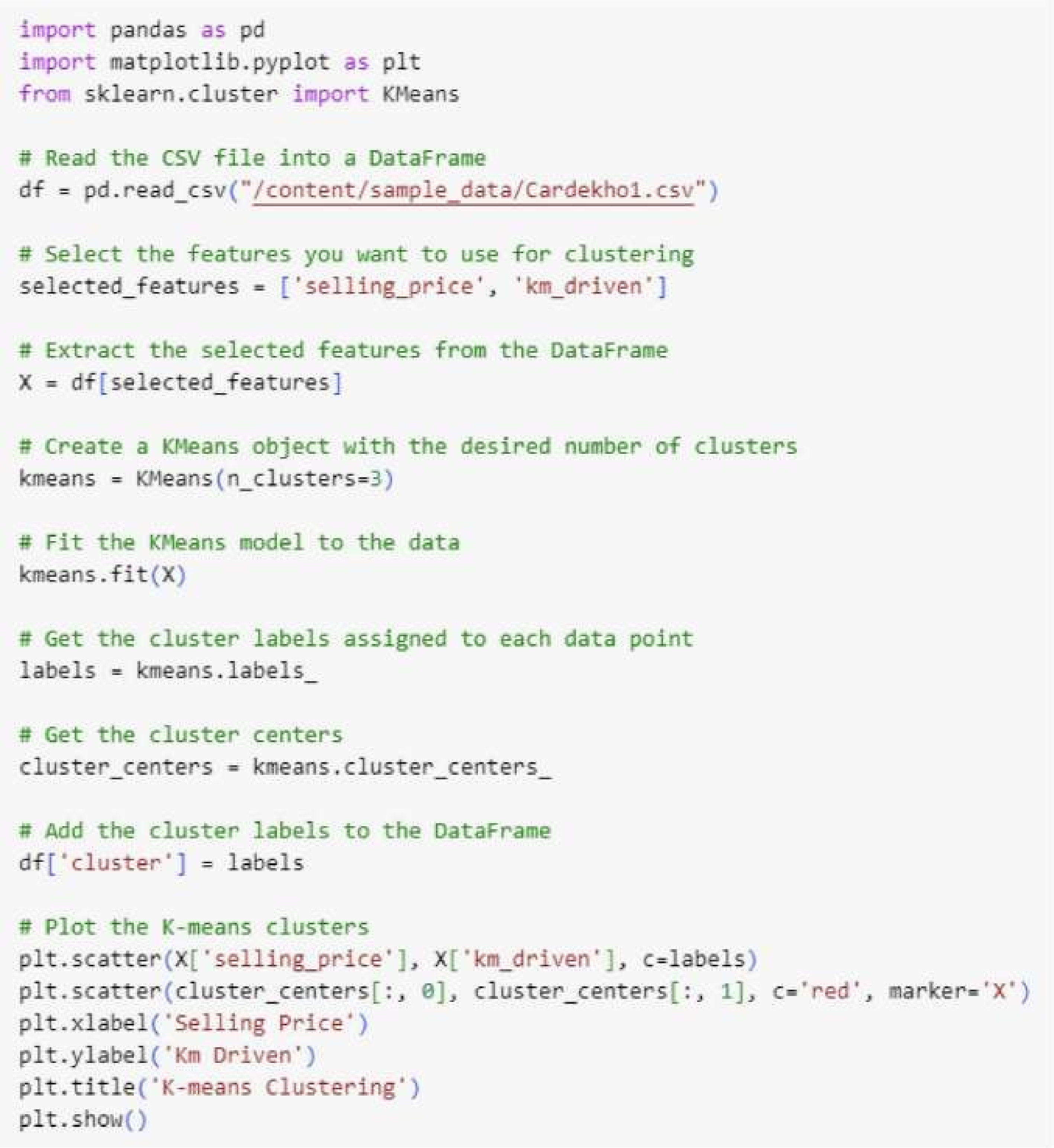




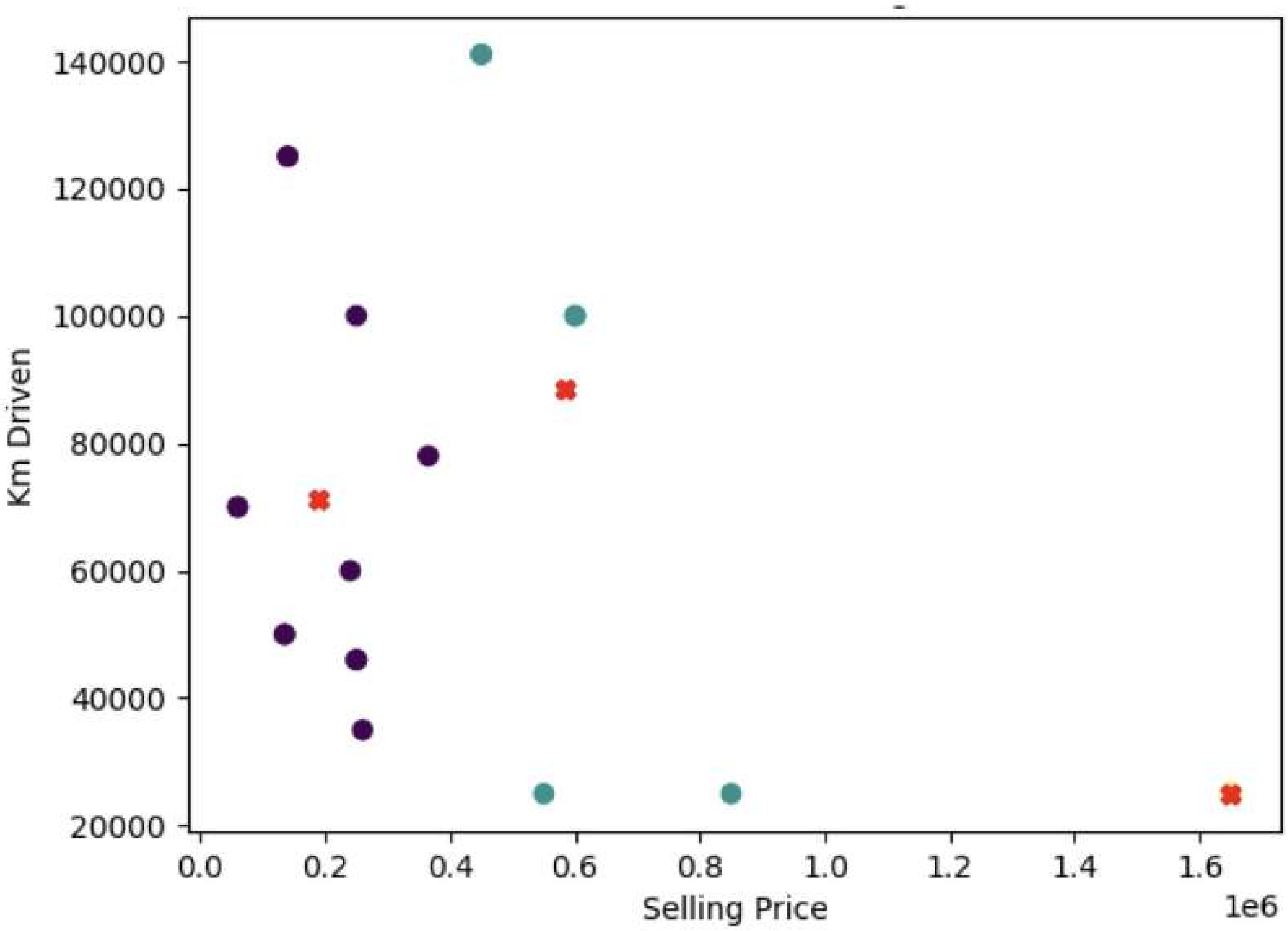
```
grouped_data = df.groupby('transmission')
for name, group in grouped_data:
    plt.hist(group['fuel'], label=name, alpha=1)

plt.xlabel('Fuel Type')
plt.ylabel('Frequency')
plt.title('Histogram')
plt.legend()
plt.show()
```

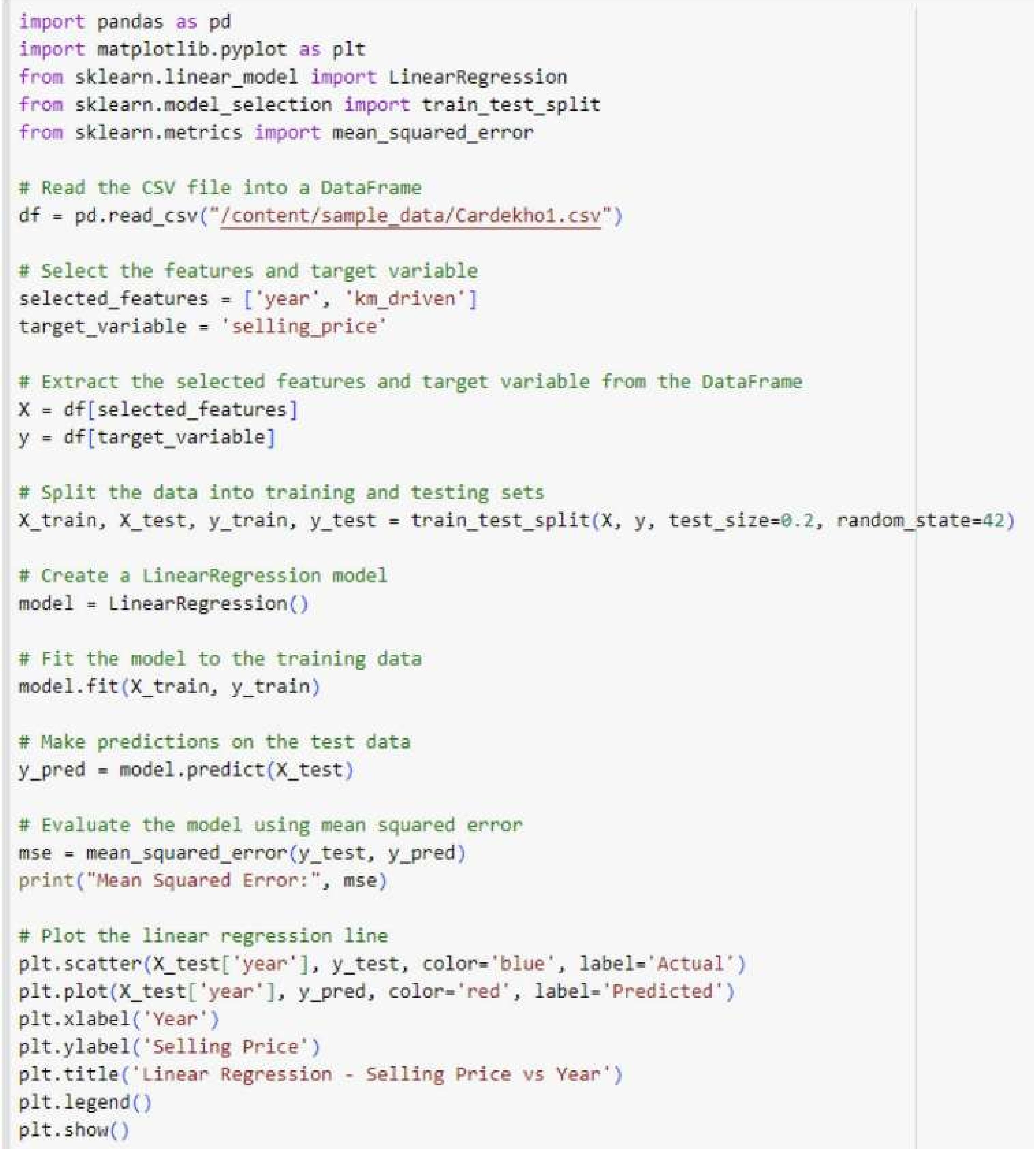


PREDICTIVE TECHNIQUE

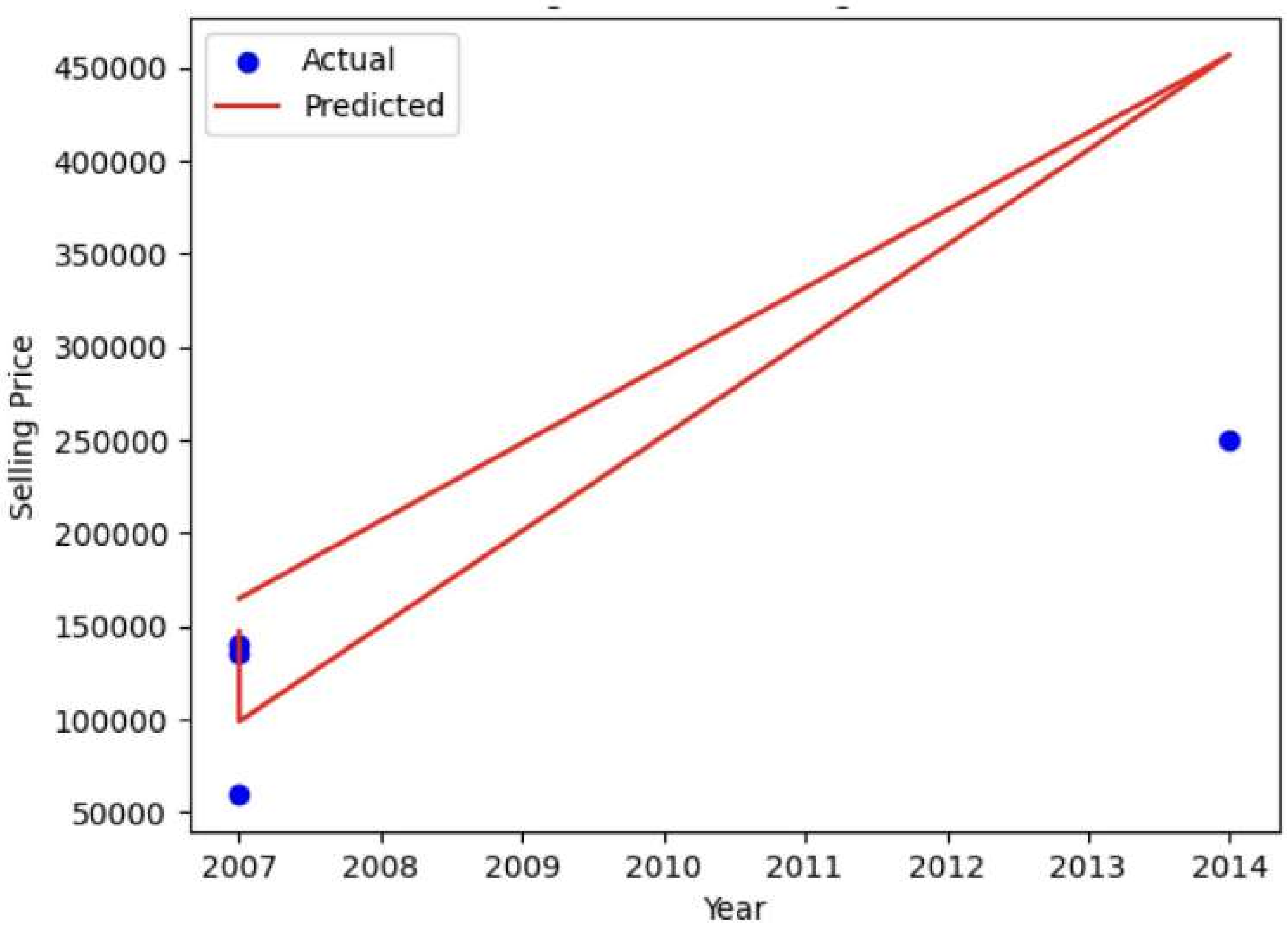


```
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.cluster import KMeans

# Read the CSV file into a DataFrame
df = pd.read_csv("/content/sample_data/Cardekho1.csv")

# Select the features you want to use for clustering
selected_features = ['selling_price', 'km_driven']

# Extract the selected features from the DataFrame
X = df[selected_features]

# Create a KMeans object with the desired number of clusters
kmeans = KMeans(n_clusters=3)

# Fit the KMeans model to the data
kmeans.fit(X)

# Get the cluster labels assigned to each data point
labels = kmeans.labels_

# Get the cluster centers
cluster_centers = kmeans.cluster_centers_

# Add the cluster labels to the DataFrame
df['cluster'] = labels

# Plot the K-means clusters
plt.scatter(X['selling_price'], X['km_driven'], c=labels)
plt.scatter(cluster_centers[:, 0], cluster_centers[:, 1], c='red', marker='X')
plt.xlabel('Selling Price')
plt.ylabel('Km Driven')
plt.title('K-means Clustering')
plt.show()
```





```
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.linear_model import LinearRegression
from sklearn.model_selection import train_test_split
from sklearn.metrics import mean_squared_error

# Read the CSV file into a DataFrame
df = pd.read_csv("/content/sample_data/Cardekho1.csv")

# Select the features and target variable
selected_features = ['year', 'km_driven']
target_variable = 'selling_price'

# Extract the selected features and target variable from the DataFrame
X = df[selected_features]
y = df[target_variable]

# Split the data into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)

# Create a LinearRegression model
model = LinearRegression()

# Fit the model to the training data
model.fit(X_train, y_train)

# Make predictions on the test data
y_pred = model.predict(X_test)

# Evaluate the model using mean squared error
mse = mean_squared_error(y_test, y_pred)
print("Mean Squared Error:", mse)

# Plot the linear regression line
plt.scatter(X_test['year'], y_test, color='blue', label='Actual')
plt.plot(X_test['year'], y_pred, color='red', label='Predicted')
plt.xlabel('Year')
plt.ylabel('Selling Price')
plt.title('Linear Regression - Selling Price vs Year')
plt.legend()
plt.show()
```



APPLICATION

- Data manipulation techniques ensure data quality and enhance usability for analysis by handling missing values, removing duplicates, and standardizing formats. Reorganizing and structuring data improves compatibility with analysis techniques, while filtering and selecting specific criteria enable focused analysis. Aggregating and summarizing data yield valuable insights like average selling prices and fuel type distribution. Applying these techniques refines the car dataset for exploration and analysis.
- Data visualization in the car dataset helps in analyzing and presenting information effectively. It includes creating charts to compare fuel type distribution, line graphs to uncover selling price trends over years, interactive dashboards for comprehensive exploration, box plots to understand transmission's impact on prices, and mapping to identify regional preferences or market penetration,
- Predictive techniques in the car dataset include regression analysis for selling price prediction, classification algorithms for fuel type prediction, clustering algorithms like K-means for identifying car segments, estimation of car ownership change likelihood, and forecasting future car demand and market trends. These techniques enhance decision- making and provide valuable insights from the dataset.

CONCLUSION

- The car dataset provides valuable information on car attributes, including car name, year, selling price, km driven, fuel type, transmission, and owner.
- Analysis of the dataset reveals insights into car pricing trends, fuel type preferences, transmission preferences, and ownership patterns.
- Data manipulation techniques ensure the dataset is clean, transformed, and organized for effective analysis.
- Data visualization aids in visually understanding the dataset's distribution, trends, and relationships, enabling better insights and decision making.

THANK YOU