Imports

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

```
import plotly.express as px
```

```
data = pd.read_csv('/content/combine_rating_all_vehicle.csv')
data.head()
```

	Rating	Model Name	Type
0	1.0	TVS iQube	2-wheeler
1	1.0	TVS iQube	2-wheeler
2	3.0	TVS iQube	2-wheeler
3	1.0	TVS iQube	2-wheeler
4	1.0	TVS iQube	2-wheeler

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1113 entries, 0 to 1112
Data columns (total 3 columns):
 #   Column      Non-Null Count  Dtype  
---  ------      --------------  -----  
 0   Rating      1113 non-null   float64
 1   Model Name  1113 non-null   object 
 2   Type        1113 non-null   object 
dtypes: float64(1), object(2)
memory usage: 26.2+ KB
```

Pre Processing

```
col = 'Model Name'
modelCounts = pd.DataFrame(data[col].value_counts())
modelCounts.reset_index(inplace=True)
modelCounts.columns = ['Model Name', 'Count']
modelCounts.head()
```

	Model Name	Count
0	Hero Electric Flash	102
1	Okinawa Praise	95
2	Hero Electric Optima	82
3	tata nexon ev	75
4	Tata Nexon EV	74

```
temp = modelCounts.sort_values(by=['Model Name']).reset_index()
temp = temp[list(temp.columns[1:])]
temp.head()
```

	Model Name	Count
0	Ampere Magnus EX	28
1	Ampere Magnus Pro	22
2	Ampere REO	24
3	Ampere Zeal	13
4	Ather 450X	30

```
modelRating = pd.DataFrame(data.groupby(['Model Name', 'Type']).mean()).reset_index()
modelRating.head()
```

	Model Name	Type	Rating
0	Ampere Magnus EX	2-wheeler	3.964286
1	Ampere Magnus Pro	2-wheeler	3.090909
2	Ampere REO	2-wheeler	2.583333
3	Ampere Zeal	2-wheeler	2.846154
4	Ather 450X	2-wheeler	3.666667

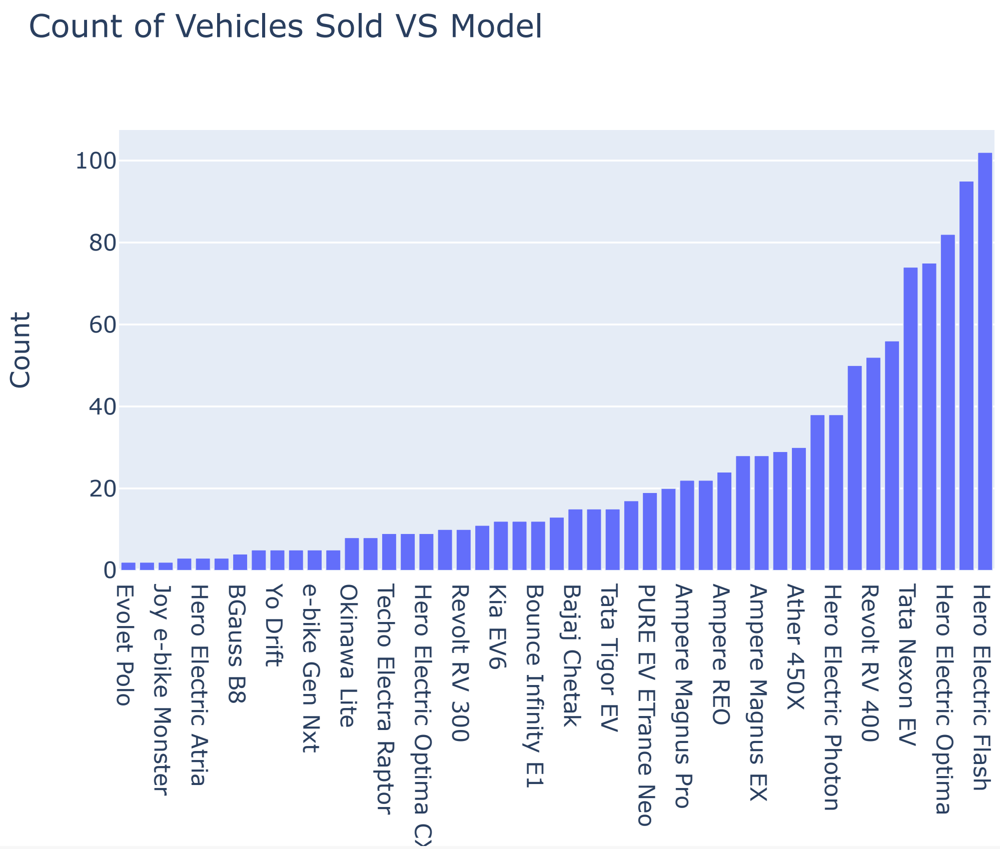
```
df = pd.concat([modelRating, temp], axis=1)
df = df.T.drop_duplicates().T

df['NewType'] = df['Type'].apply(lambda x: x.split('-')[0])
df.drop_duplicates(keep='first', inplace=True)
df.head()
```

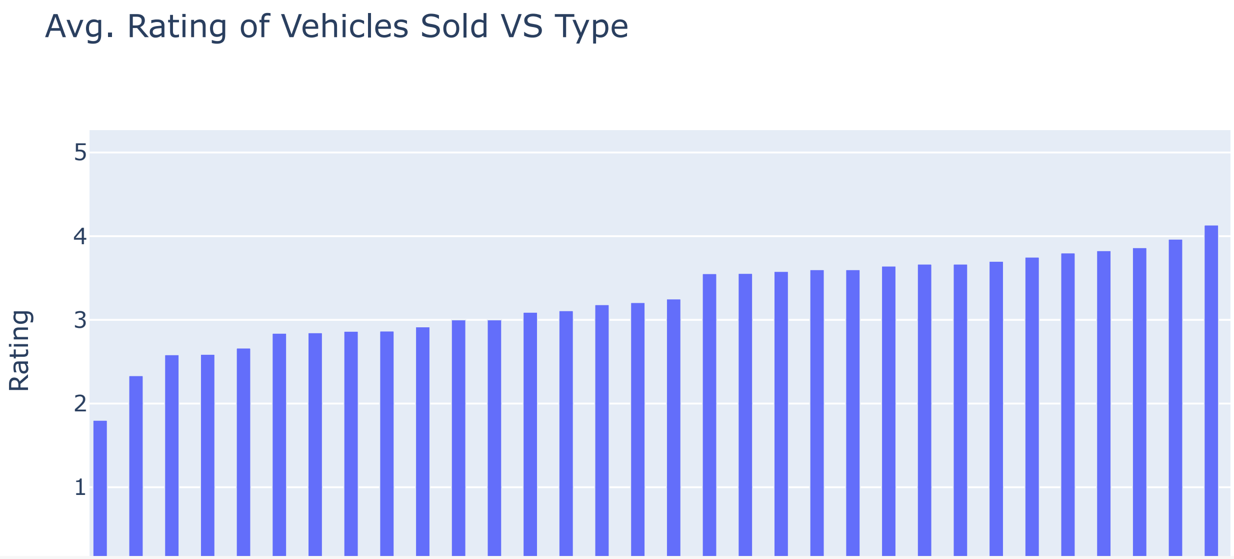
	Model Name	Type	Rating	Count	NewType
0	Ampere Magnus EX	2-wheeler	3.964286	28	2
1	Ampere Magnus Pro	2-wheeler	3.090909	22	2
2	Ampere REO	2-wheeler	2.583333	24	2
3	Ampere Zeal	2-wheeler	2.846154	13	2
4	Ather 450X	2-wheeler	3.666667	30	2

EDA

```
fig = px.bar(df.sort_values(by=['Count']), x = 'Model Name', y='Count', title='Count of Vehicles Sold VS Model')
fig.show()
```



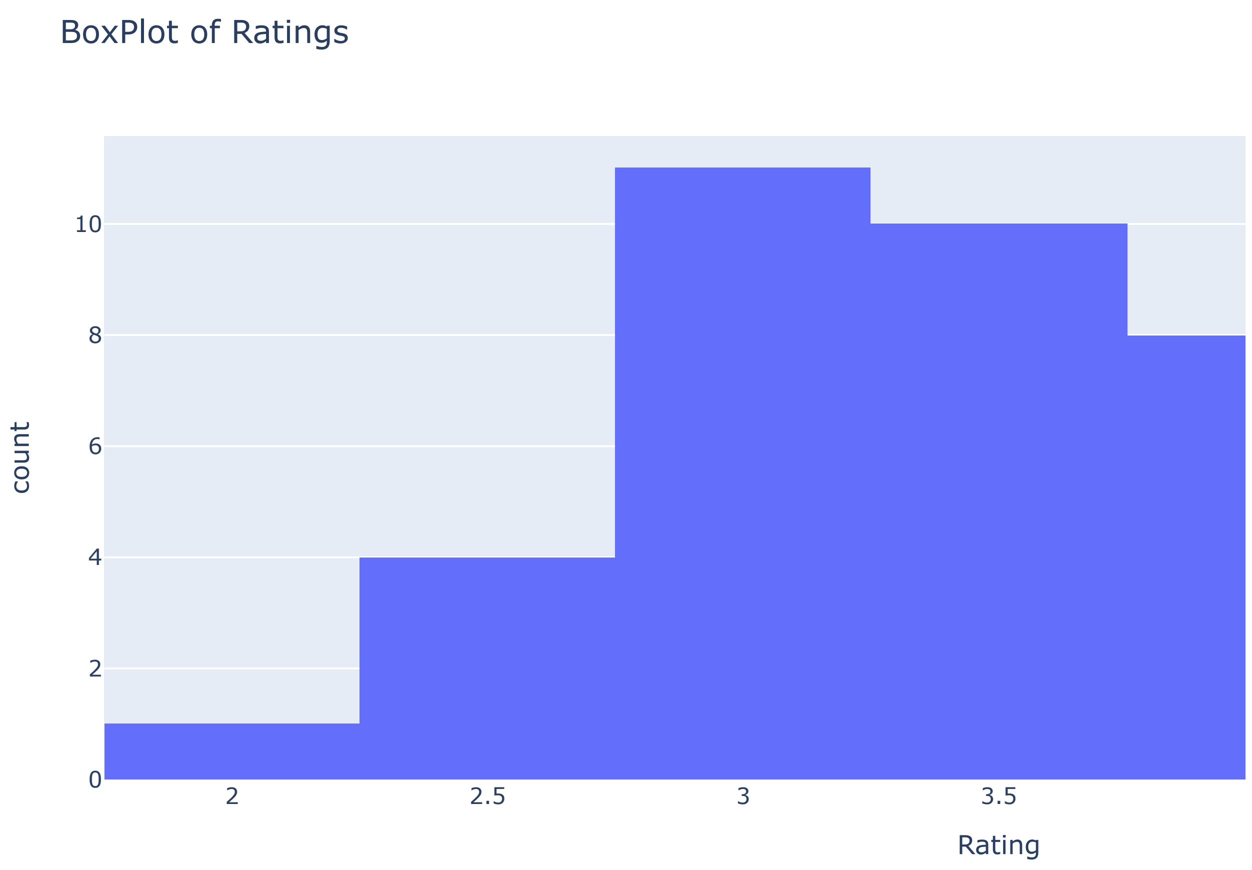
```
fig = px.bar(df.sort_values(by=['Rating']), x="Model Name", y="Rating", color='Type', barmode='group', title='Avg. Rating of Vehicles Sold VS T
fig.show()
```



```
fig = px.bar(pd.DataFrame(df['Type'].value_counts()), title='Count of Vehicles Sold VS Type')
fig.show()
```

```
fig = px.box(df, x='Type', y = 'Rating', title='BoxPlot of Ratings')
fig.show()
```

```
fig = px.histogram(df, x = 'Rating', title='BoxPlot of Ratings')
fig.show()
```



Resampling for Clustering

```
from sklearn.utils import resample
```

```
wheels_2 = df[df['NewType'] == '2']
wheels_4 = df[df['NewType'] == '4']

wheels_2_downsample = resample(wheels_2,
             replace=True,
             n_samples=len(wheels_4),
             random_state=np.random.randint(1, 101))

print(wheels_2_downsample.shape)
print(wheels_4.shape)
```

```
(8, 5)
(8, 5)
```

```
D = pd.concat([wheels_2_downsample, wheels_4], axis=0).reset_index()
D = D[list(D)[1:]]
# D.drop_duplicates(keep='first', inplace=True)
D
```

	Model Name	Type	Rating	Count	NewType
0	Hero Electric Flash	2-wheeler	3.862745	102	2
1	Odysse Evoqis	2-wheeler	5.0	3	2
2	Hero Electric NYX HX	2-wheeler	5.0	2	2
3	Ampere Magnus EX	2-wheeler	3.964286	28	2

Clustering

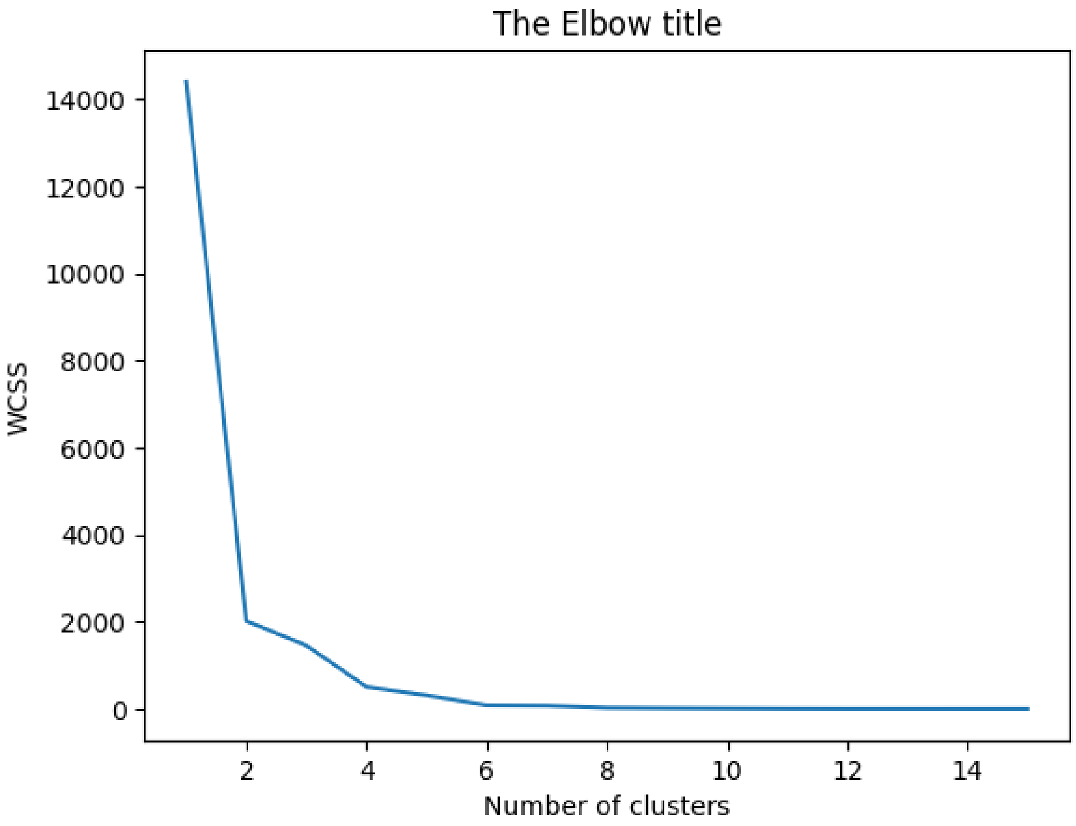
```
from sklearn.preprocessing import StandardScaler, OneHotEncoder
from sklearn.cluster import KMeans
from sklearn.metrics import silhouette_score
```

```
X = D[['NewType', 'Rating', 'Count']]
X.head()
```

	NewType	Rating	Count
0	2	3.862745	102
1	2	5.0	3
2	2	5.0	2
3	2	3.964286	28
4	2	4.2	10

```
wcss=[]
r = range(1, 16)
for i in r:
  kmeans = KMeans(i, n_init=1)
  kmeans.fit(X)
  wcss_iter = kmeans.inertia_
  wcss.append(wcss_iter)
```

```
number_clusters = r
plt.plot(number_clusters,wcss)
plt.title('The Elbow title')
plt.xlabel('Number of clusters')
plt.ylabel('WCSS')
plt.show()
```

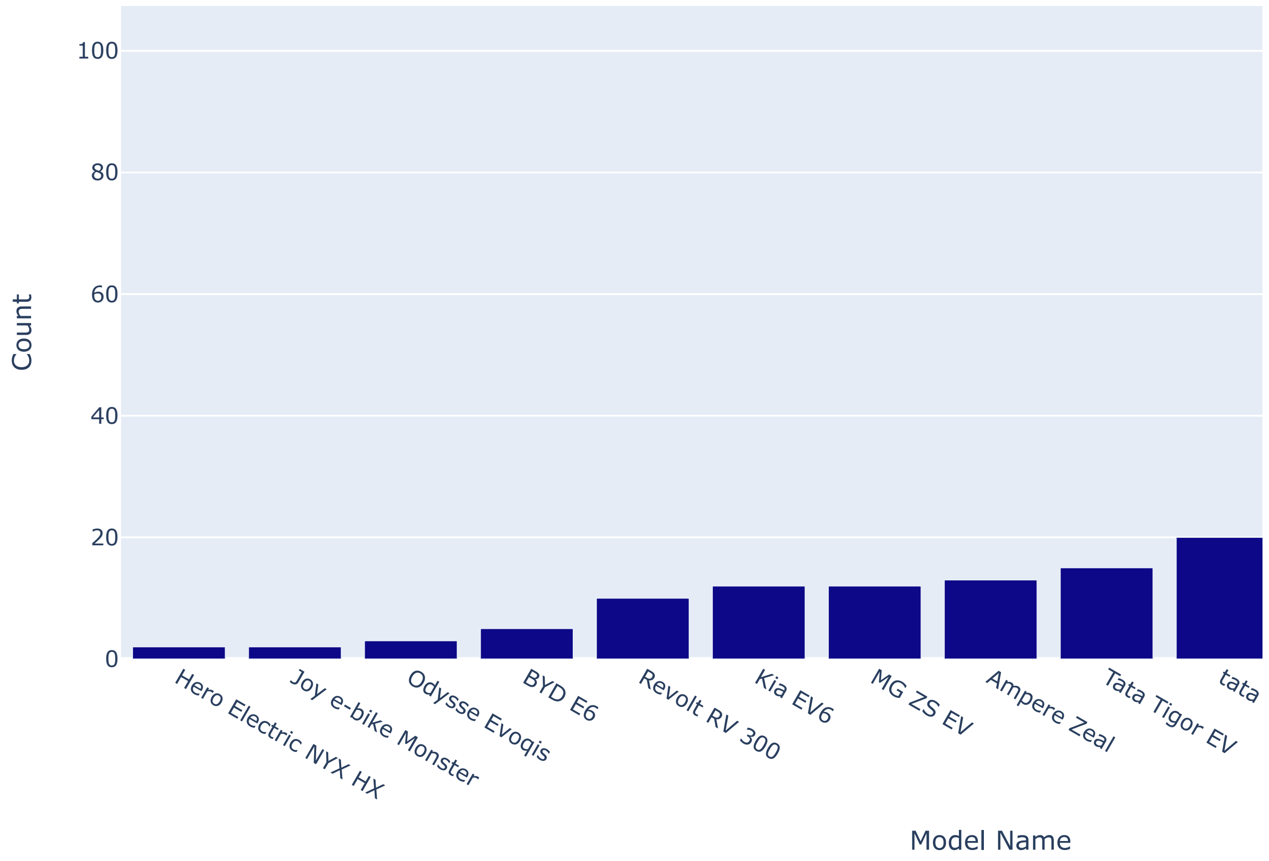


Made 2 Clusters

```
kmeans = KMeans(n_clusters=2, random_state=np.random.randint(1, 11), n_init="auto").fit(X)
```

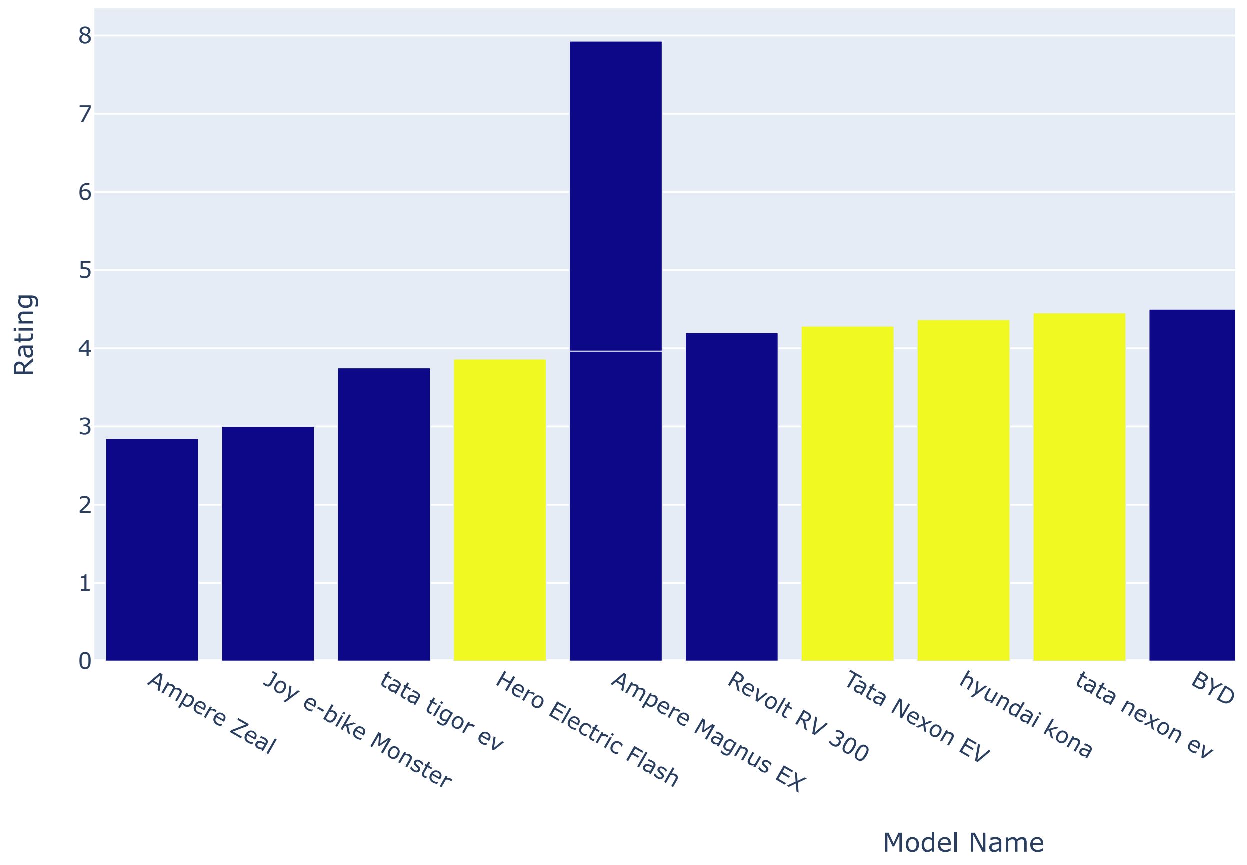
```
data_with_clusters = D.copy()
identified_clusters = kmeans.fit_predict(X)
data_with_clusters['Clusters'] = identified_clusters
```

```
y = 'Count'
fig = px.bar(data_with_clusters.sort_values(by = [y]), x = 'Model Name', y = y, color = 'Clusters', barmode = 'group')
fig.show()
```



```
y = 'Rating'
fig = px.bar(data_with_clusters.sort_values(by = [y]), x = 'Model Name', y = y, color = 'Clusters', barmode = 'group')
```

```
fig.show()
```



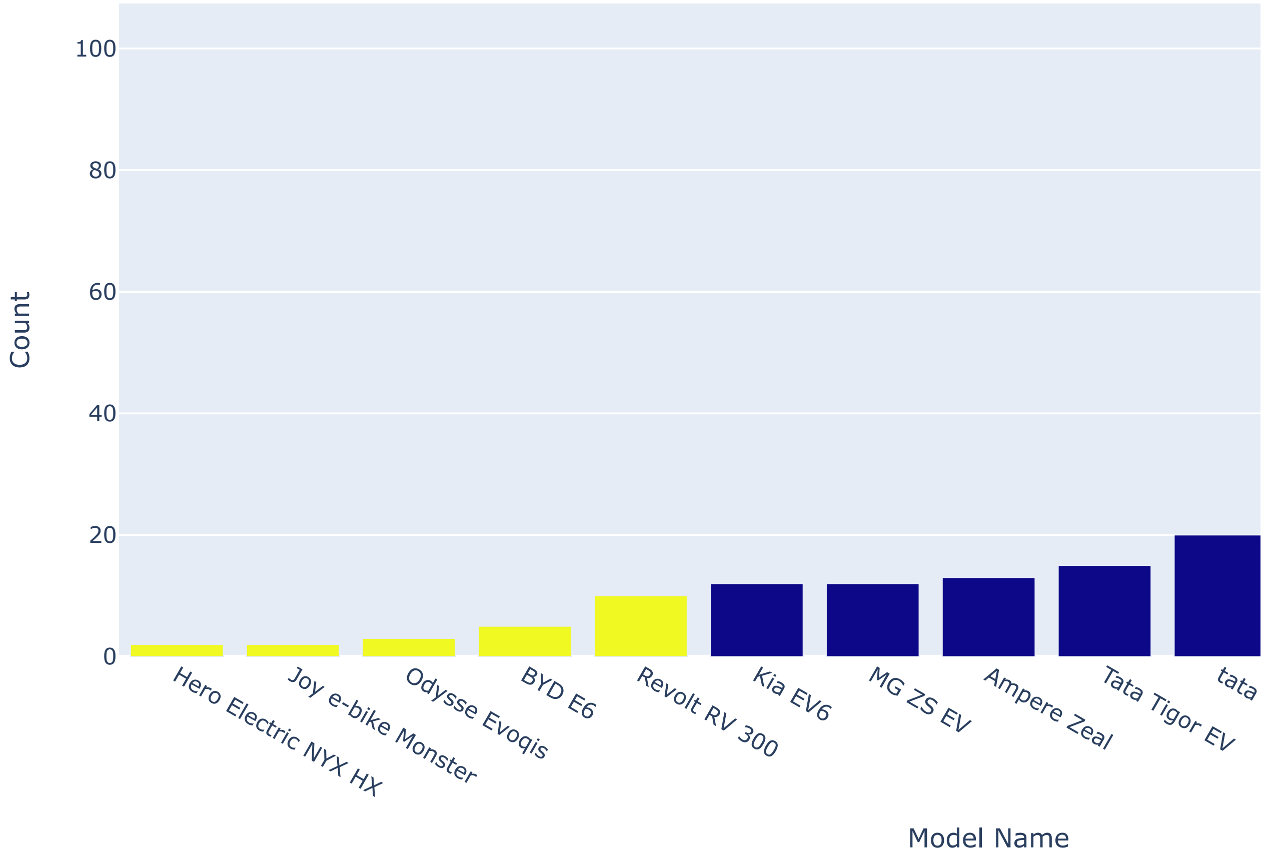
Made 3 Clusters

```
kmeans = KMeans(n_clusters=3, random_state=np.random.randint(1, 11), n_init="auto").fit(X)
```

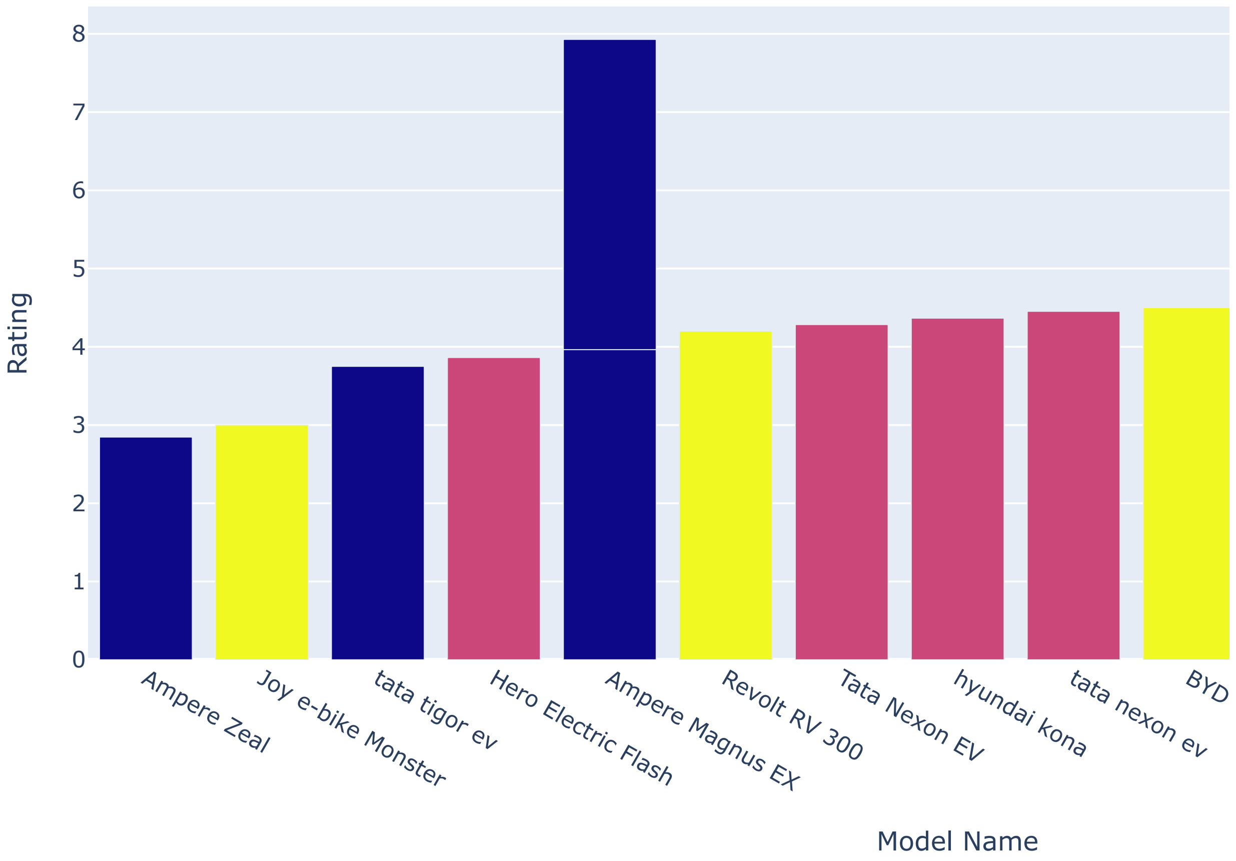
```
data_with_clusters = D.copy()
identified_clusters = kmeans.fit_predict(X)
```

```
data_with_clusters['Clusters'] = identified_clusters
```

```
y = 'Count'
fig = px.bar(data_with_clusters.sort_values(by = [y]), x = 'Model Name', y = y, color = 'Clusters', barmode = 'group')
fig.show()
```



```
y = 'Rating'
fig = px.bar(data_with_clusters.sort_values(by = [y]), x = 'Model Name', y = y, color = 'Clusters', barmode = 'group')
fig.show()
```



Conclusion: It works well with Count of Vehicle sold, not Rating