

# Electric Vehicle Analysis: Mean Range vs Total Cars by Make

By Luis Mireles

In this analysis, we explore the relationship between the mean range of electric vehicles and the total number of cars by make in Washington State. We use data from the Electric Vehicle Population Data and create a scatter plot to visualize the relationship.

source data: <https://catalog.data.gov/dataset/electric-vehicle-population-data>

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In [4]: import pandas as pd
import matplotlib.pyplot as plt
import matplotlib.cm as cm
import numpy as np

file_path = '/Users/fernando/Desktop/Code/Sources/Electric_Vehicle_Population_Data.csv'
data = pd.read_csv(file_path)

data_filtered = data[data['Electric Range'] != 0]

counted_data = (
    data_filtered
    .groupby(['Model Year', 'Make', 'Model'])
    .size()
    .reset_index(name='TotalCars')
    .sort_values('TotalCars', ascending=False)
    .reset_index(drop=True)
)

# I assign the rank column and start it from 1 up to length of data set
counted_data['Rank'] = range(1, len(counted_data) + 1)
rank_col = counted_data.pop('Rank')
counted_data.insert(0, 'Rank', rank_col)
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# Creating the range with stats view
range_stats = (
    data_filtered.groupby(['Make', 'Model'])
    ['Electric Range']
    .describe()
    .loc[:, ['mean', 'max', 'min', 'std']]
    .sort_values('mean', ascending=False)
)

formatted_range_stats = range_stats.head(10).reset_index()

# Formatting the 'mean', 'max', 'min', and 'std' columns as strings with 2 decimal places
formatted_range_stats['mean'] = formatted_range_stats['mean'].apply(lambda x: f"{x:.2f}")
formatted_range_stats['max'] = formatted_range_stats['max'].apply(lambda x: f"{x:.2f}")
formatted_range_stats['min'] = formatted_range_stats['min'].apply(lambda x: f"{x:.2f}")
formatted_range_stats['std'] = formatted_range_stats['std'].apply(lambda x: f"{x:.2f}")

formatted_range_stats = formatted_range_stats.rename(columns={'mean': 'MeanRange',
                                                             'max': 'MaxRange',
                                                             'min': 'MinRange',
                                                             'std': 'StandardDeviation'})

formatted_range_stats['Rank'] = range(1, len(formatted_range_stats) + 1)
rank_col = formatted_range_stats.pop('Rank')
formatted_range_stats.insert(0, 'Rank', rank_col)

print("Top 10 Total Cars Data:")
print(counted_data.head(10))
print("Range Stats by mean range rank:\n", formatted_range_stats)

# Box Plot
make_counts = data_filtered['Make'].value_counts().sort_values(ascending=False)
top_10_makes = make_counts.head(10).index
data_filtered_top_10_makes = data_filtered[data_filtered['Make'].isin(top_10_makes)]

data_filtered_top_10_makes.boxplot(column='Electric Range', by='Make', figsize=(12,8))
plt.title('Boxplot of Mean Electric Range by Make (Top 10)')

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plt.suptitle('')
plt.ylabel('Mean Electric Range (Miles)')
plt.xlabel('Make')
plt.xticks(rotation=45)
plt.show()

merged_data = pd.merge(range_stats, counted_data, on=['Make', 'Model'])

merged_data = merged_data.sort_values('TotalCars', ascending=False).head(20)

fig, ax = plt.subplots(figsize=(10, 6))

colors = cm.rainbow(np.linspace(0, 1, len(merged_data['Make'].unique()))))

for i, (make, group) in enumerate(merged_data.groupby('Make')):
    ax.scatter(group['mean'], group['TotalCars'], color=colors[i], alpha=0.6, label=make)

ax.set_title('Mean Range vs Total Cars')
ax.set_xlabel('Mean Range')
ax.set_ylabel('Total Cars')

# move the legend to the right outside the plot area
ax.legend(loc='center left', bbox_to_anchor=(1.05, 0.5))

plt.show()
```

## Top 10 Total Cars Data:

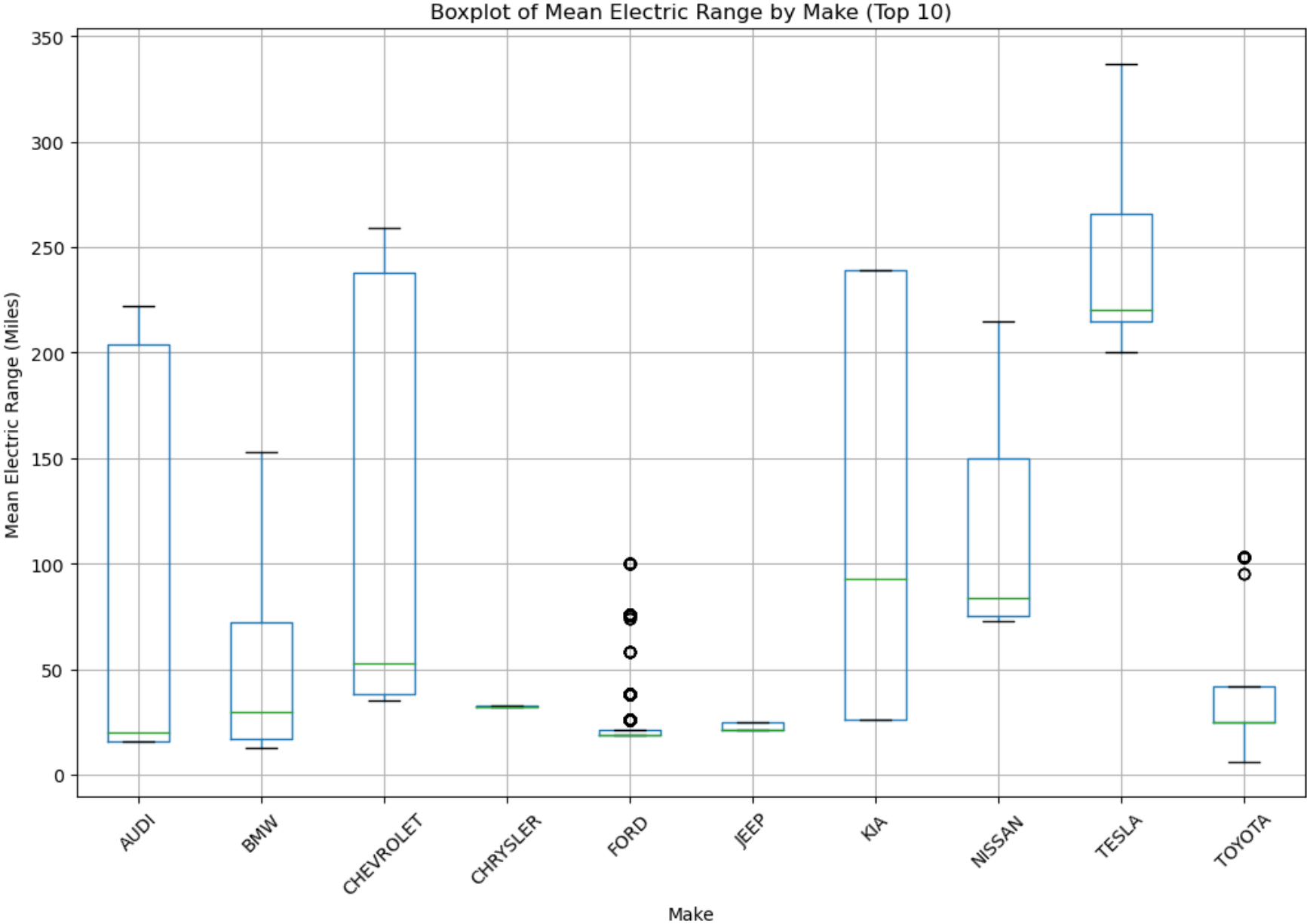
	Rank	Model	Year	Make	Model	TotalCars
0	1		2018	TESLA	MODEL 3	6179
1	2		2019	TESLA	MODEL 3	4052
2	3		2020	TESLA	MODEL 3	3583
3	4		2020	TESLA	MODEL Y	2369
4	5		2013	NISSAN	LEAF	1925
5	6		2015	NISSAN	LEAF	1831
6	7		2017	CHEVROLET	VOLT	1433
7	8		2019	NISSAN	LEAF	1384
8	9		2017	CHEVROLET	BOLT EV	1296
9	10		2018	NISSAN	LEAF	1233

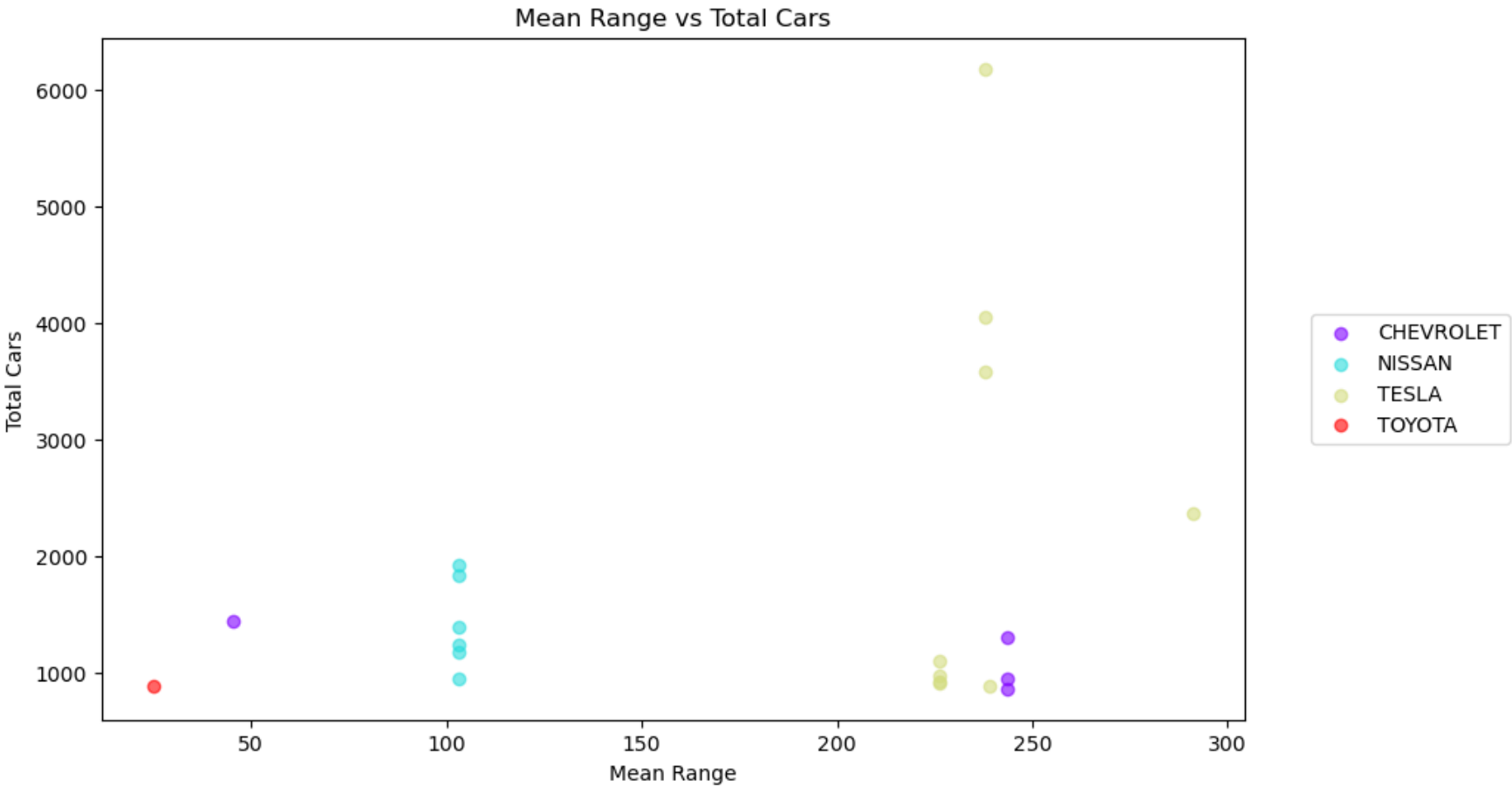
## Range Stats by mean range rank:

	Rank	Make	Model	MeanRange	MaxRange	MinRange	\
0	1	TESLA	MODEL Y	291.00	291.00	291.00	
1	2	HYUNDAI	KONA	258.00	258.00	258.00	
2	3	CHEVROLET	BOLT EV	243.61	259.00	238.00	
3	4	TESLA	MODEL X	239.25	293.00	200.00	
4	5	TESLA	MODEL 3	237.86	322.00	215.00	
5	6	JAGUAR	I-PACE	234.00	234.00	234.00	
6	7	TESLA	ROADSTER	234.00	245.00	220.00	
7	8	POLESTAR	PS2	233.00	233.00	233.00	
8	9	TESLA	MODEL S	226.33	337.00	208.00	
9	10	AUDI	E-TRON SPORTBACK	218.00	218.00	218.00	

## StandardDeviation

0	0.00
1	0.00
2	9.30
3	38.33
4	37.85
5	0.00
6	12.54
7	0.00
8	33.24
9	0.00





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