Electric Vehicle Data Analysis

Data

Market Size Analysis in the context of electric vehicles (EVs), it involves assessing the total volume of EV registrations to understand the growth of the market, forecast future trends, and help stakeholders make informed decisions regarding production, infrastructure development, and policy-making.

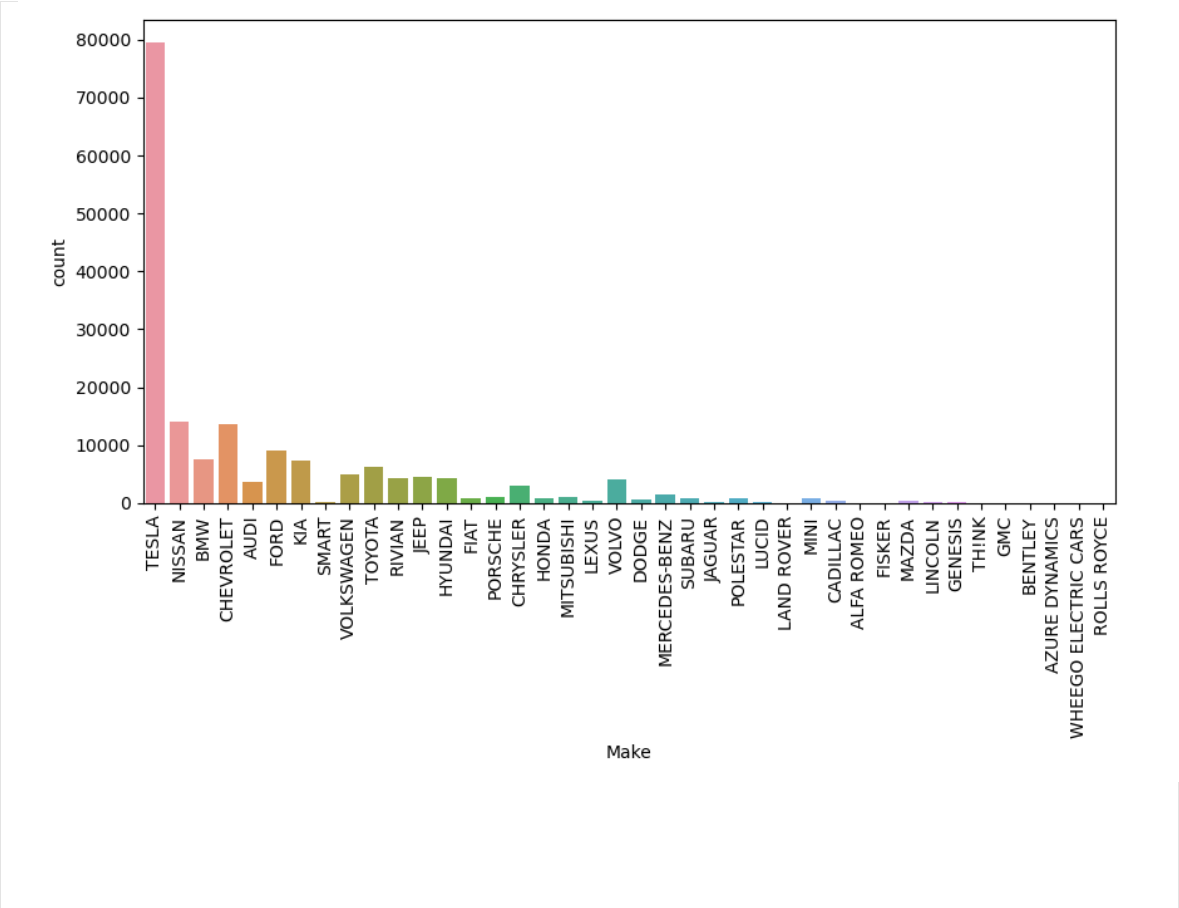
- **Descriptive Statistics:**

  - the mean, median, and standard deviation of the base MSRP for the vehicles in the dataset

    - The Base MSRP mean of this dataset is 1070.7425711886663
    - The median of the Base MSRP is 0.0
    - The standard deviation in it will be 8347.429563129466

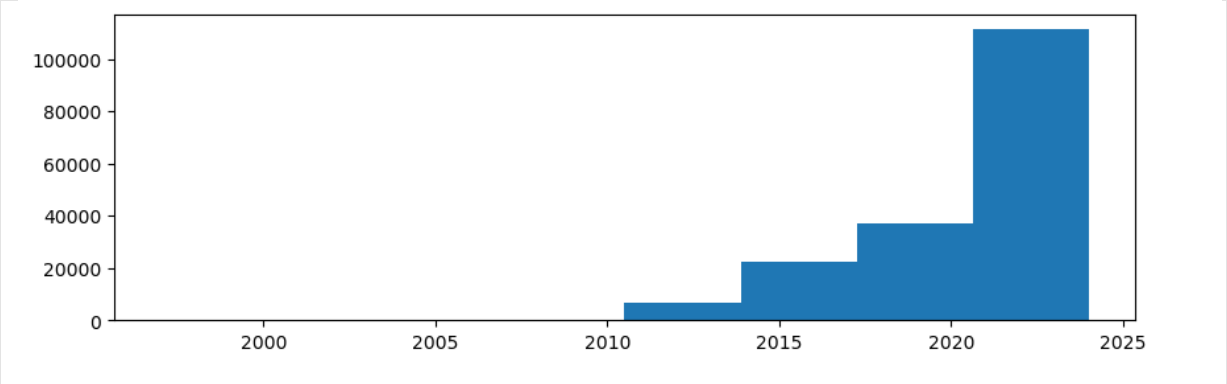
- **Data Distribution:**

  - the distribution of vehicle makes in the dataset and representing it using a bar chart.



❖ Model Year Analysis:

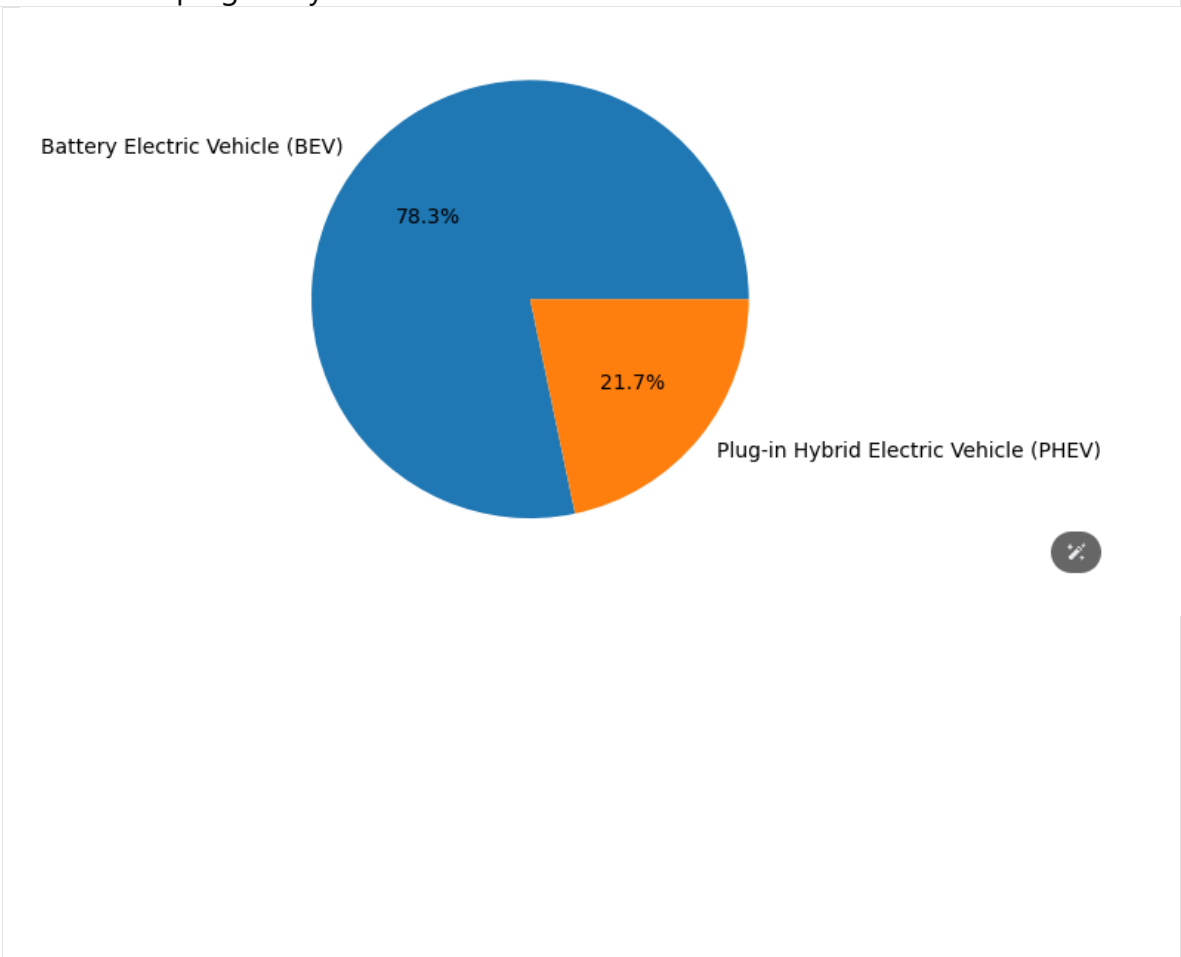
- The most common model year in the dataset according to our analysis is 2023 with 57517 ev cars in it



❖ Electric Vehicle Type:

- the proportion of Battery Electric Vehicles (BEV) versus other types of electric vehicles

❖ As we can observe in the chart the battery electric vehicle has a proportion of 78.3% and plug-in-hybrid electric has 21.7%



❖ **Electric Range Analysis:**

- the average electric range for vehicles of different makes and provided with a summary table.

❖ The average electric range for a vehicle in different makes are as follow in the chart-

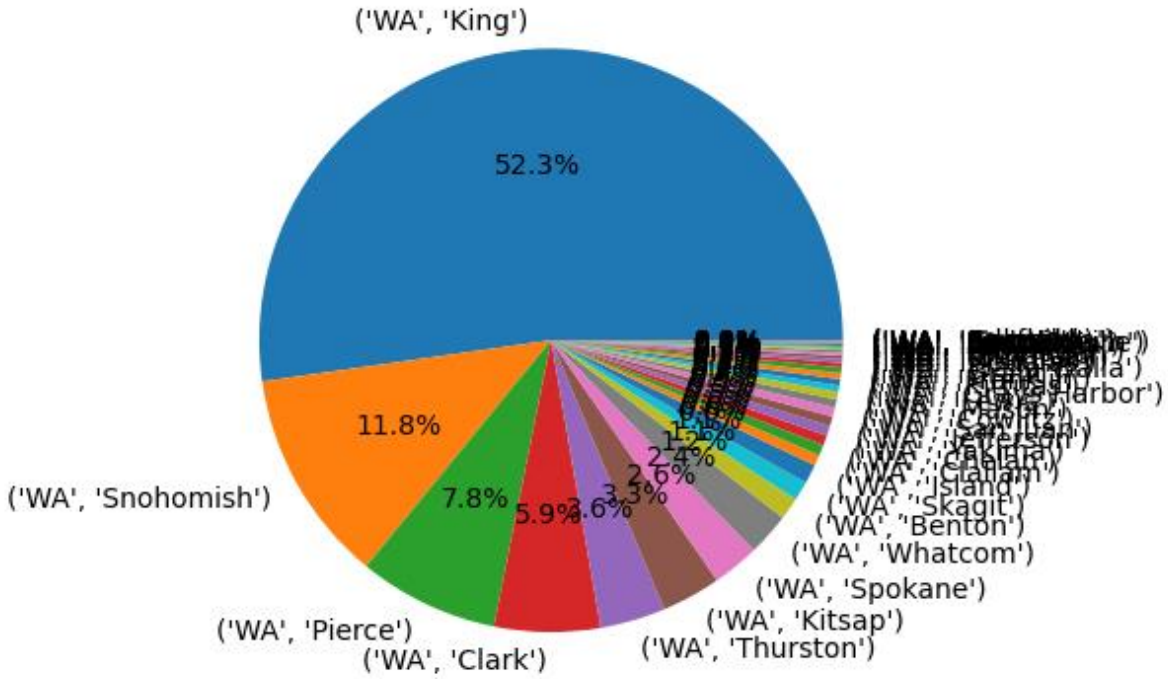
```
Make
ALFA ROMEO               33.000000
AUDI                     46.511823
AZURE DYNAMICS           56.000000
BENTLEY                  19.666667
BMW                      34.734547
CADILLAC                  8.665789
CHEVROLET                76.603729
CHRYSLER                 32.211022
DODGE                    32.000000
FIAT                     85.645408
FISKER                    8.250000
FORD                     10.796099
GENESIS                   0.000000
GMC                       0.000000
HONDA                    46.599278
HYUNDAI                  15.861414
JAGUAR                  163.254310
JEEP                     22.363250
KIA                      38.876381
LAND ROVER               25.109091
LEXUS                    18.800000
LINCOLN                  23.552632
LUCID                     0.000000
MAZDA                    25.781513
MERCEDES-BENZ             9.346348
MINI                     18.036789
MITSUBISHI               30.655172
NISSAN                   79.845711
POLESTAR                 30.221339
PORSCHE                  42.743624
RIVIAN                    0.000000
ROLLS ROYCE               0.000000
SMART                    62.325926
SUBARU                    1.331325
TESLA                    60.162346
TH!NK                   100.000000
TOYOTA                   28.090182
VOLKSWAGEN               22.935910
VOLVO                    16.129971
WHEEGO ELECTRIC CARS    100.000000
Name: Electric Range, dtype: float64
```

❖ **County Distribution:**

- vehicles distributed across different counties in Washington state and their represent the distribution using a pie chart.

❖ Vehicles distributed across different counties in Washington-

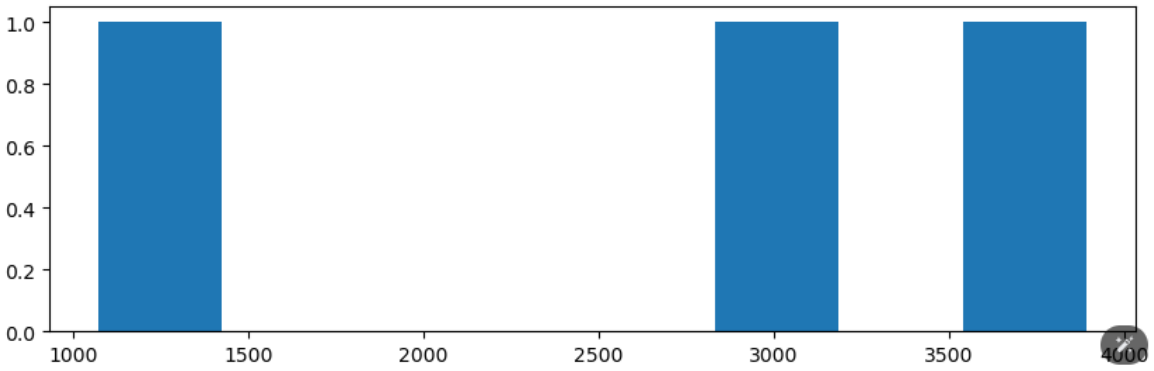
State	County	
WA	King	92729
	Snohomish	20996
	Pierce	13782
	Clark	10409
	Thurston	6427
	Kitsap	5837
	Spokane	4586
	Whatcom	4253
	Benton	2147
	Skagit	1910
	Island	1882
	Clallam	1058
	Chelan	1047
	Yakima	993
	Jefferson	974
	San Juan	942
	Cowlitz	897
	Mason	823
	Lewis	739
	Grays Harbor	625
	Kittitas	623
	Franklin	585
	Grant	561
	Walla Walla	437
	Douglas	364
	Whitman	334
	Klickitat	284
	Okanogan	263
	Stevens	219
	Pacific	198
	Skamania	192
	Asotin	73
	Wahkiakum	60
	Pend Oreille	55
	Lincoln	49
	Adams	48
	Ferry	31
	Columbia	16
	Garfield	3



❖ **Price Analysis:**

➢ The average base MSRP of vehicles eligible for the Clean Alternative Fuel Vehicle (CAFV) program versus those that are not.

```
Clean Alternative Fuel Vehicle (CAFV) Eligibility
Clean Alternative Fuel Vehicle Eligible                              3057.030549
Eligibility unknown as battery range has not been researched         1070.742571
Not eligible due to low battery range                                3891.219556
Name: Base MSRP, dtype: float64
```



❖ Geographical Analysis:

- The base MSRP vary across different cities in Washington state

❖ Base MSRP in each city –

```
City
Aberdeen          3774.807055
Acme              1070.742571
Addy              1070.742571
Adna              1070.742571
Airway Heights    2145.889379
                        ...
Yacolt            3343.122476
Yakima            1595.545231
Yarrow Point      2638.791052
Yelm              2571.139548
Zillah            3037.292783
Name: Base MSRP, Length: 468, dtype: float64
```

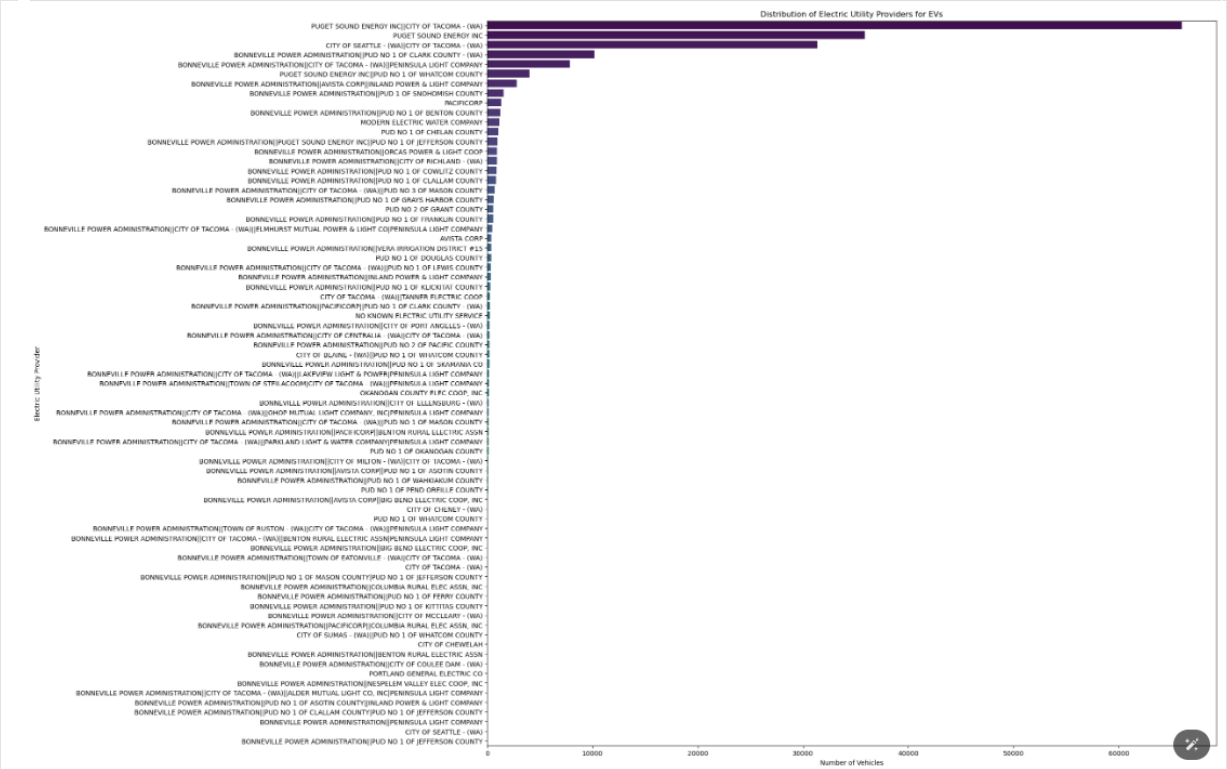
❖ Legislative Districts:

- legislative districts have the highest number of registered electric vehicles and Provided with a ranked list.

```
Legislative District
41.0    8441
45.0    7425
5.0     6810
48.0    6631
1.0     6265
36.0    5922
43.0    5049
46.0    5033
11.0    4871
34.0    4449
```

❖ Electric Utility Providers:

- The distribution of electric utility service providers for the vehicles in the dataset




```
Electric Utility
PUGET SOUND ENERGY INC||CITY OF TACOMA - (WA)                                  65985
PUGET SOUND ENERGY INC                                                         35873
CITY OF SEATTLE - (WA)||CITY OF TACOMA - (WA)                                  31375
BONNEVILLE POWER ADMINISTRATION||PUD NO 1 OF CLARK COUNTY - (WA)               10173
BONNEVILLE POWER ADMINISTRATION||CITY OF TACOMA - (WA)||PENINSULA LIGHT COMPANY  7828
                                                                                 ...
BONNEVILLE POWER ADMINISTRATION||PUD NO 1 OF ASOTIN COUNTY||INLAND POWER & LIGHT COMPANY      2
BONNEVILLE POWER ADMINISTRATION||PUD NO 1 OF CLALLAM COUNTY|PUD NO 1 OF JEFFERSON COUNTY      1
BONNEVILLE POWER ADMINISTRATION||PENINSULA LIGHT COMPANY                       1
CITY OF SEATTLE - (WA)                                                         1
BONNEVILLE POWER ADMINISTRATION||PUD NO 1 OF JEFFERSON COUNTY                  1
```

❖ **Census Tract Analysis:**

- vehicles distributed across different 2020 Census Tracts and provided with insights based on vehicle counts per tract.

```
2020 Census Tract
5.303303e+10    2479
5.303303e+10     983
5.303303e+10     820
5.303303e+10     801
5.306701e+10     672
                 ...
5.306300e+10       2
5.300396e+10       2
5.300396e+10       2
5.307700e+10       1
5.307700e+10       1
Name: count, Length: 1767, dtype: int64
```

❖ **Electric Range Correlation:**

- The correlation between the electric range of the base MSRP is 0.12976224160506392

❖ **VIN Analysis:**

- Identified patterns or commonalities in the VIN (1-10) for the vehicles.

❖ The most common correlations in the VIN column of this dataset

```
VIN (1-10)
5YJ    50232
7SA    29228
1G1    13363
```

❖ **Eligibility Status:**

- Percentage of vehicles are eligible for the Clean Alternative Fuel Vehicle (CAFV) program

```
Clean Alternative Fuel Vehicle (CAFV) Eligibility
Eligibility unknown as battery range has not been researched    51.723574
Clean Alternative Fuel Vehicle Eligible                         37.279587
Not eligible due to low battery range                           10.996839
Name: proportion, dtype: float64
```

❖ Model Popularity:

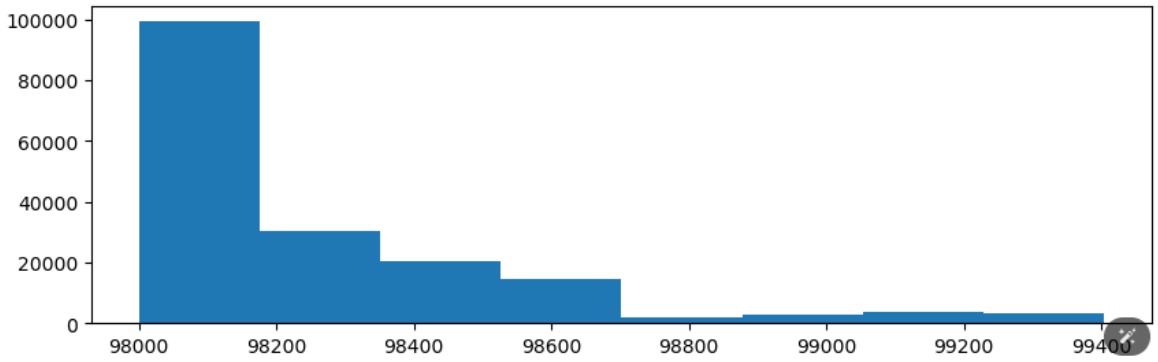
- vehicle models which are the most popular in the dataset.

❖ Popular model in the dataset are-

Model	
MODEL Y	35918
MODEL 3	30005
LEAF	13345
MODEL S	7708
BOLT EV	6811
MODEL X	5783
VOLT	4782
ID.4	3928
WRANGLER	3382
MUSTANG MACH-E	3316

❖ Postal Code Distribution:

- vehicles distributed across different postal codes.

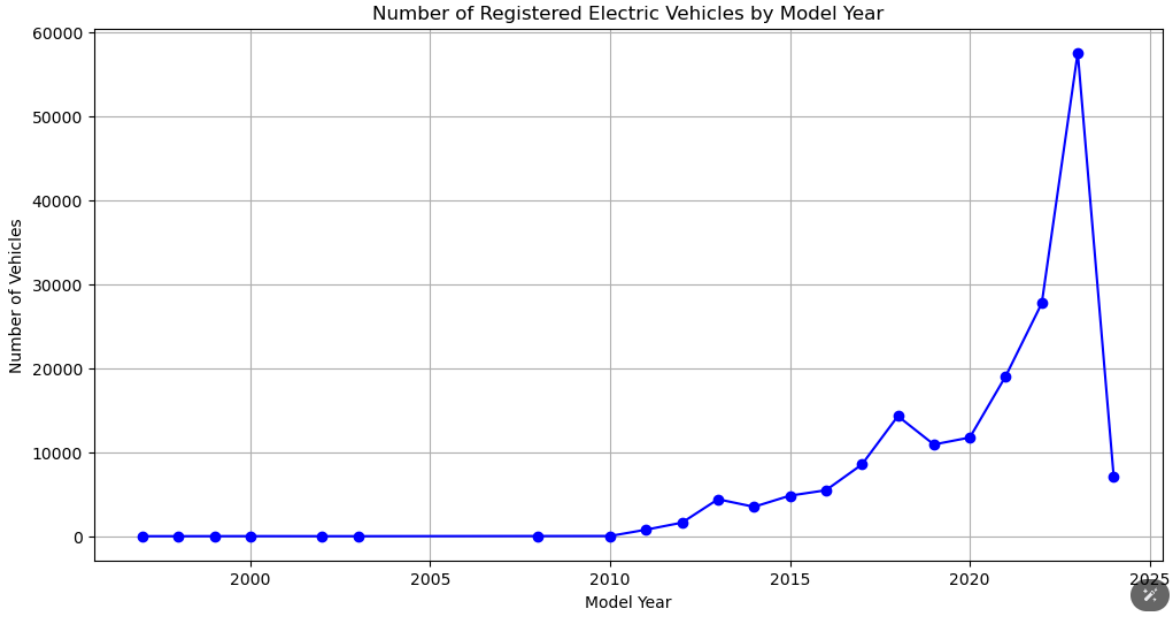


❖ It shows the postal code between 98000 and 98200 have really high density in the dataset.

❖ Model Year Trend:

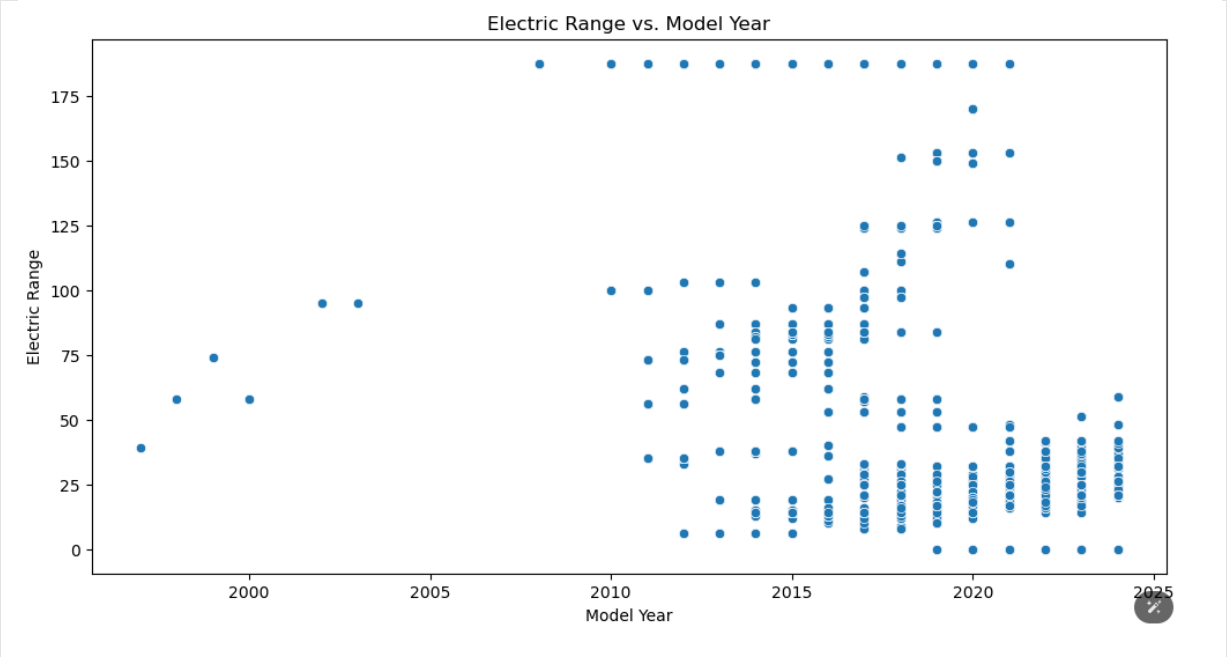
- Analysing the trend in the number of registered electric vehicles by model year. Provided with a line chart to show any increase or decrease over the years.

Model Year	
1997	1
1998	1
1999	5
2000	7
2002	2
2003	1
2008	19
2010	23
2011	775
2012	1614
2013	4397
2014	3496
2015	4824
2016	5467
2017	8530
2018	14284
2019	10910
2020	11739
2021	19061
2022	27707
2023	57517
2024	7071



❖ Range vs. Year:

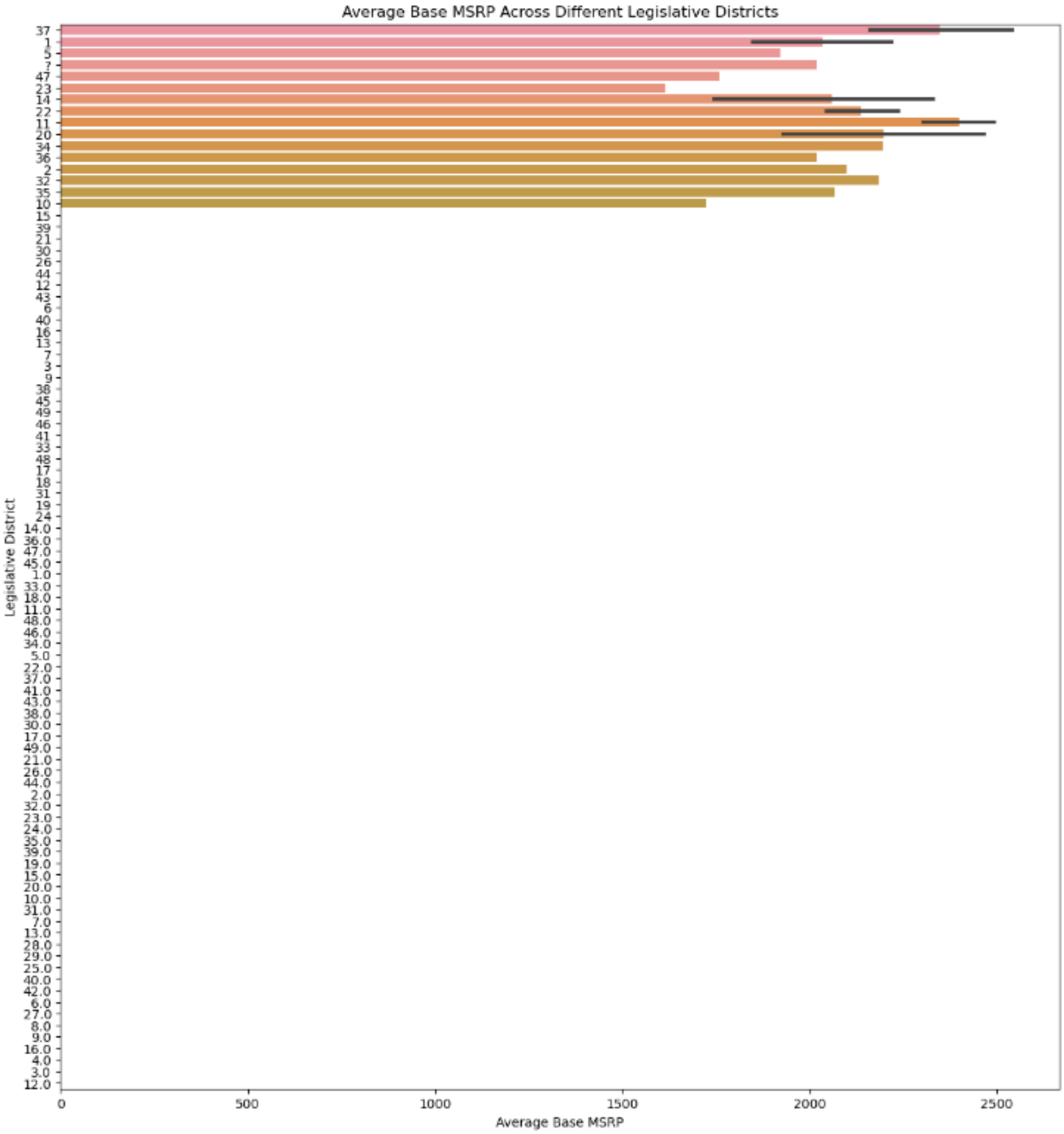
- A trend between the model year and the electric range of the vehicles.



❖ Legislative District and MSRP:

- the average base MSRP vary across different legislative districts

```
Legislative District
1.0    1826.326477
2.0    2140.423291
3.0    1922.921752
4.0    2306.659895
5.0    2143.689701
          ...
5      1739.104906
6      1070.742571
7      2857.958345
9      1070.742571
?      1070.742571
```


Average Base MSRP Across Different Legislative Districts
Legislative District
Average Base MSRP
0
500
1000
1500
2000
2500