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Electric Vehicles Market Segmentation Analysis

MARKET SEGMENTATION ANALYSIS OF ELECTRIC VEHICLES MARKET IN INDIA

Problem Statement

The task is to perform analyses on electric vehicles market in India using market segmentation to gain insights on the distinct customer segments based on various factors, allowing the startup to tailor its products and services to meet specific needs and preferences. The primary objective is to identify and target the most promising customer segments within the Indian Electric Vehicle market. This involves categorizing potential users into segments based on relevant attributes such as geographic and demographic. The segmentation will aid in developing a focused and effective market entry strategy.

GITHUB Link:- https://github.com/AmitAcharekar/Fyenn_Labs_Internship/tree/main/Market_Segmentation_on_EV

Data Collection

We are using 4 different datasets for analysis. In 1st dataset we have different attribute like Brand, Model, Top Speed, Plug Type, Seats etc. It has `103 rows and 14` columns.

	Brand	Model	AccelSec	TopSpeed_KmH	Range_Km	Efficiency_WhKm	FastCharge_KmH	RapidCharge	PowerTrain	PlugType	BodyStyle	Segment	Seats	PriceEuro
0	Tesla	Model 3 Long Range Dual Motor	4.6	233	450	161	940	Yes	AWD	Type 2 CCS	Sedan	D	5	55480
1	Volkswagen	ID.3 Pure	10.0	160	270	167	250	No	RWD	Type 2 CCS	Hatchback	C	5	30000
2	Polestar	2	4.7	210	400	181	620	Yes	AWD	Type 2 CCS	Liftback	D	5	56440
3	BMW	iX3	6.8	180	360	206	560	Yes	RWD	Type 2 CCS	SUV	D	5	68040
4	Honda	e	9.5	145	170	168	190	Yes	RWD	Type 2 CCS	Hatchback	B	4	32997

In 2nd dataset we have the list of total number of electric vehicles and non-electric vehicles in different states of India. It has `32 rows and 4 columns.`

	State Name	Total Electric Vehicle	Total Non-Electric Vehicle	Total
1	Andaman & Nicobar Island	162	146945	147107
2	Arunachal Pradesh	20	252965	252985
3	Assam	64766	4677053	4741819
4	Bihar	83335	10407078	10490413
5	Chandigarh	2812	746881	749693

In 3nd dataset we have the list number of electric vehicle charging station sanction in states of India.
It has 25 rows and 2 columns.

	State	No. of EV chargers sanctioned
1	Maharashtra	317
2	Andhra Pradesh	266
3	Tamil Nadu	281
4	Gujarat	278
5	Uttar Pradesh	207
6	Rajasthan	205
7	Karnataka	172
8	Madhya Pradesh	235
9	West Bengal	141
10	Telangana	138

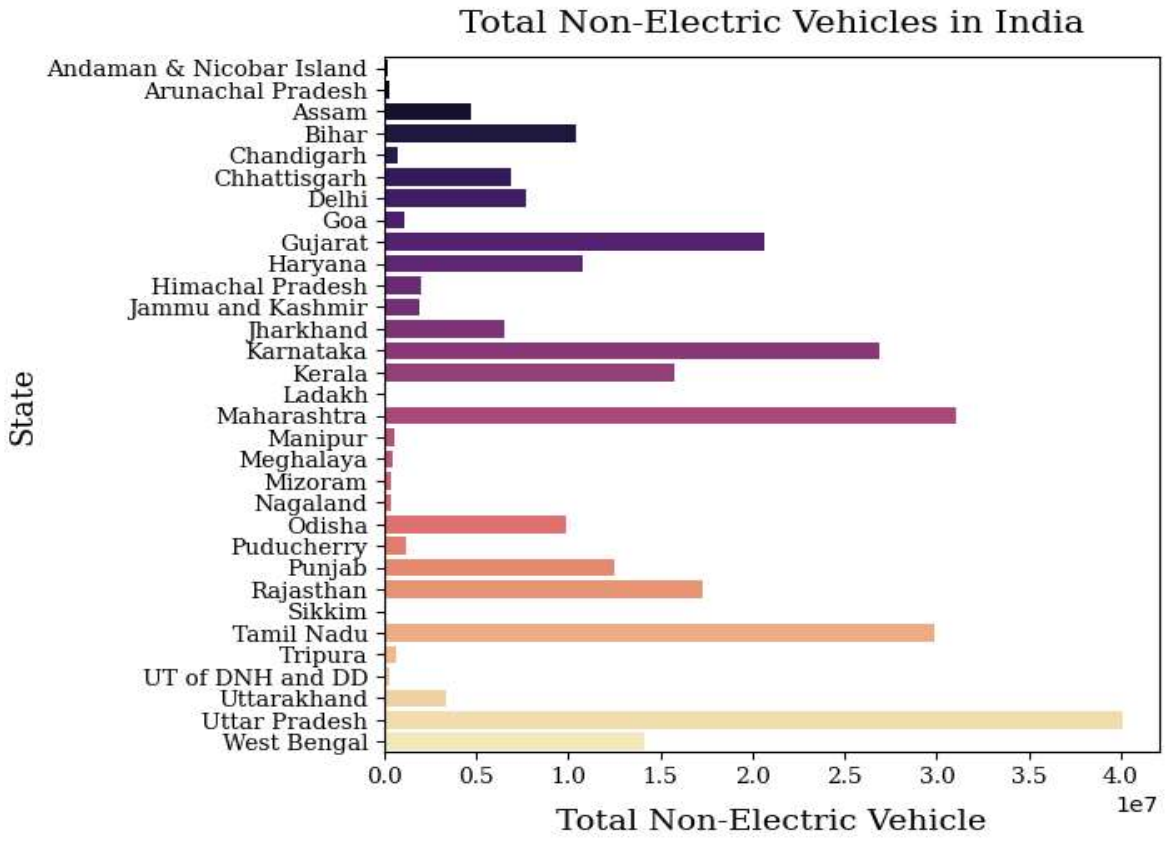
In 4th dataset we have different types of electric vehicles in states of India .2W (two wheeler electric vehicle), 3W(Three wheeler electric vehicle), 4W (Four wheeler electric vehicle)and electric Bus are the types of vehicles in this dataset. It has 25 rows and 2 columns.

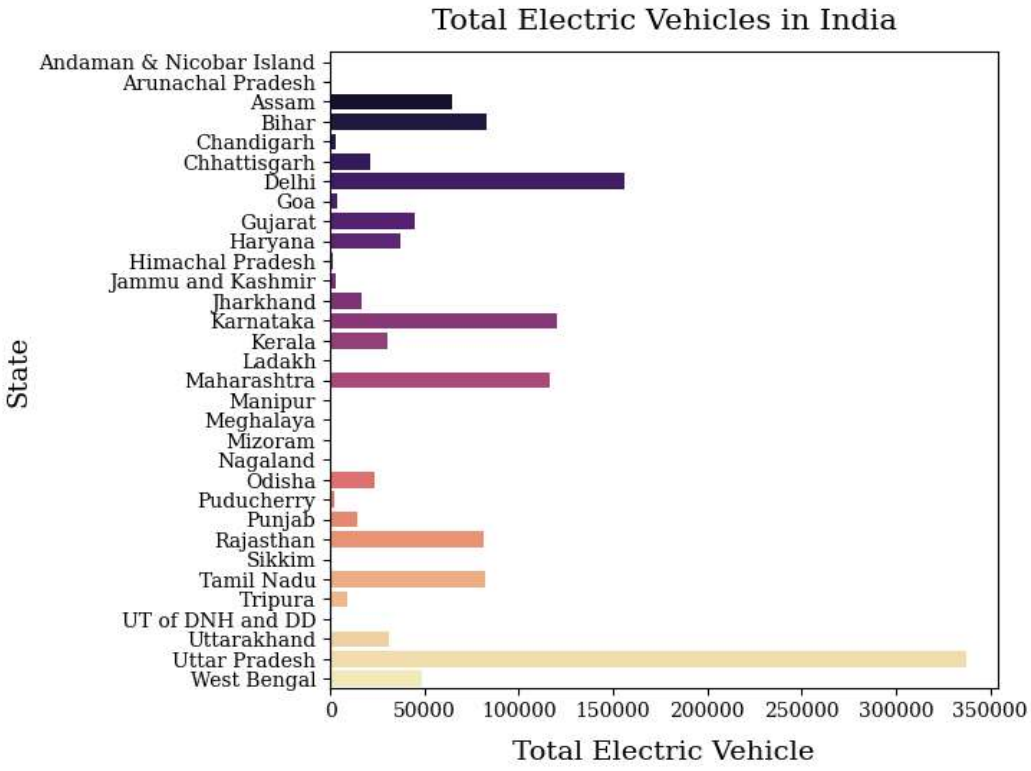
	Region	2W	3W	4W	Bus
0	Uttar Pradesh	9852	42881	458	197
1	Maharastra	38558	893	1895	186
2	Karnataka	32844	568	589	57
3	Tamil Nadu	25642	396	426	0
4	Gujarat	22359	254	423	22

Exploratory Data Analysis

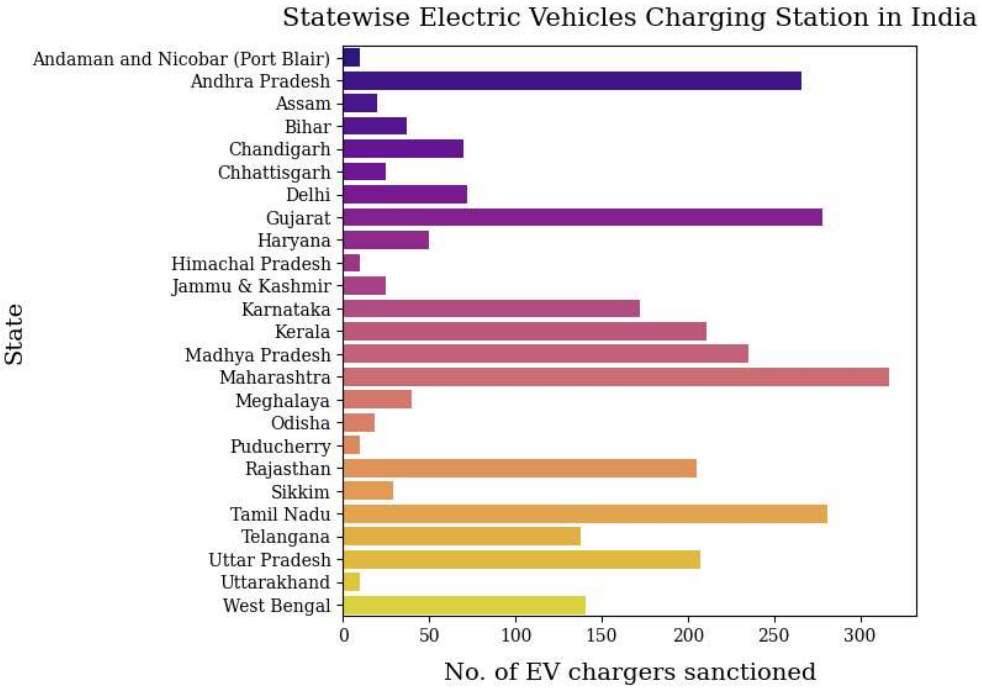
Exploratory Data Analysis, popularly abbreviated as EDA, is one of the most important steps in the data science pipeline. It is the process of gaining the information present inside the data with the help of summary statistics and visual representations. By using implementing EDA we will get detail insights on our dataset.

From our 2nd dataset we found out that the Total Non-Electric Vehicle in India is approximately **27,81,69,631** and Total Electric Vehicle is **13,34,385** . We also found the total electric and non-electric vehicle in states of India in which Uttar Pradesh is the leading one in both of the cases.

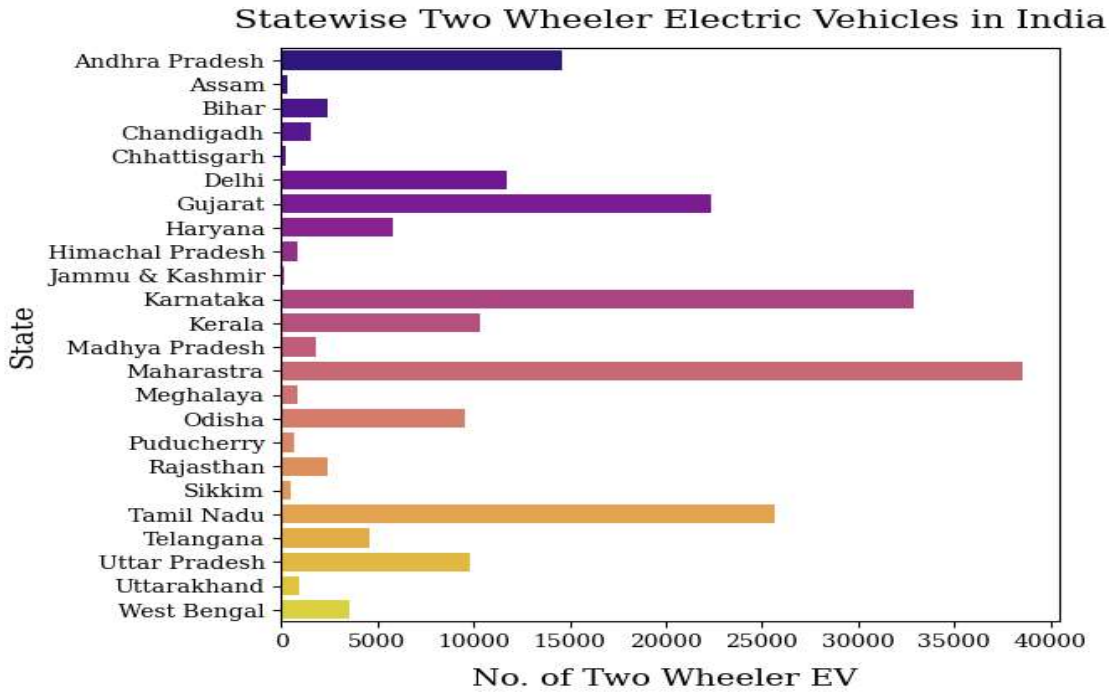


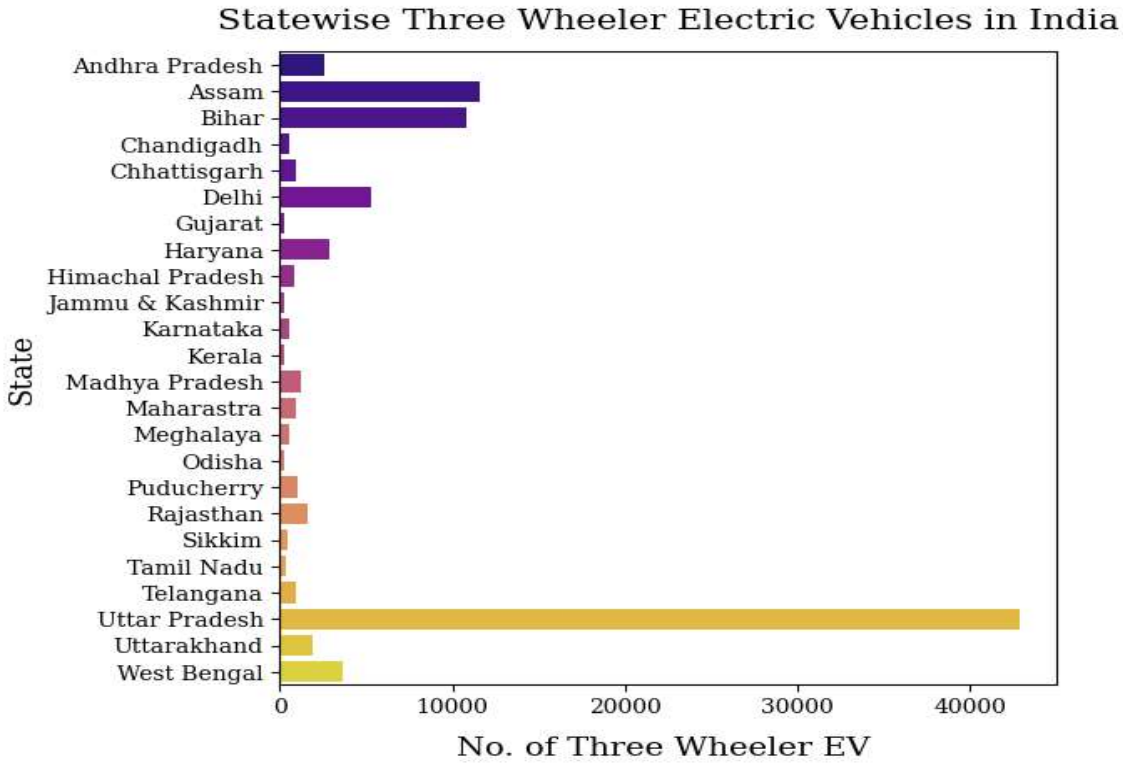


In further Analysis we found the total number of charging station sanction in each state of India. In which Maharashtra has the most amount of charging station in India.

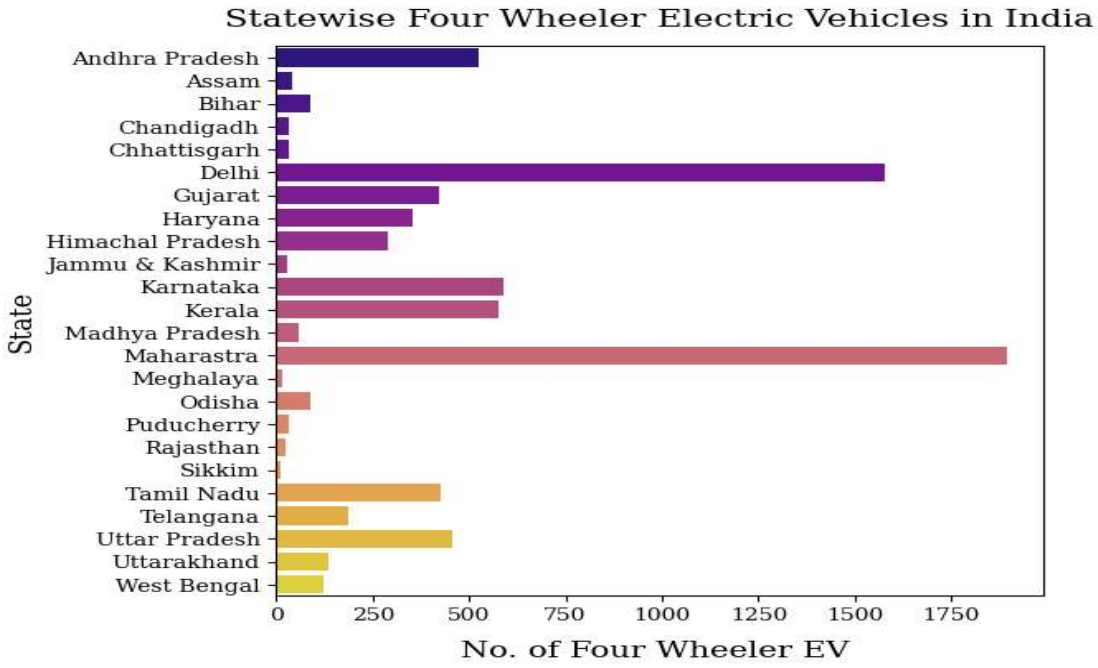


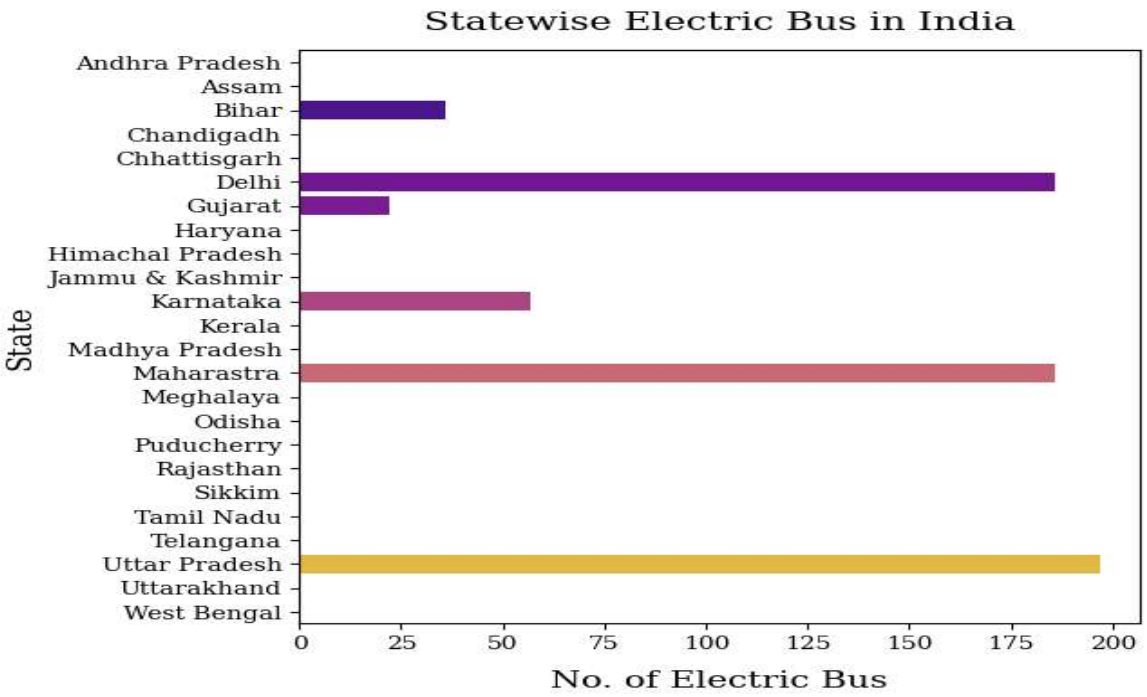
In India two wheeler vehicles are widely used by people for traveling and by delivery company .From this bar graph we can see that Maharashtra has the most amount of Electric 2 wheeler vehicles .As 3 wheeler vehicles are mostly used as public transport ,Uttar Pradesh has the most number of electric 3 wheeler vehicles.



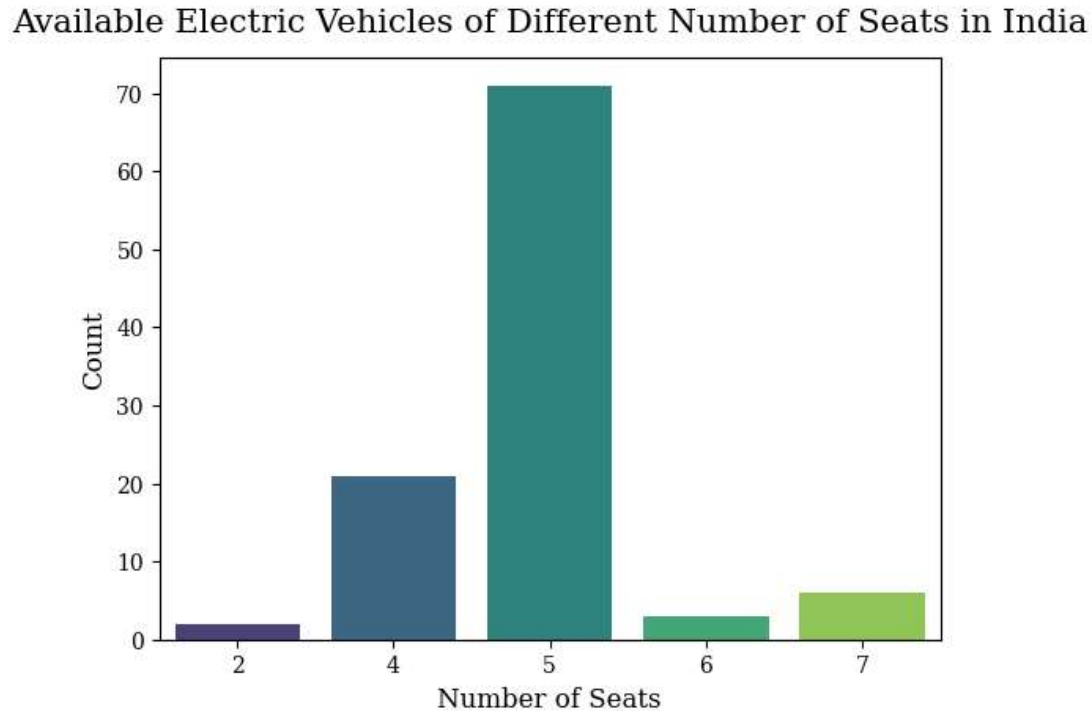


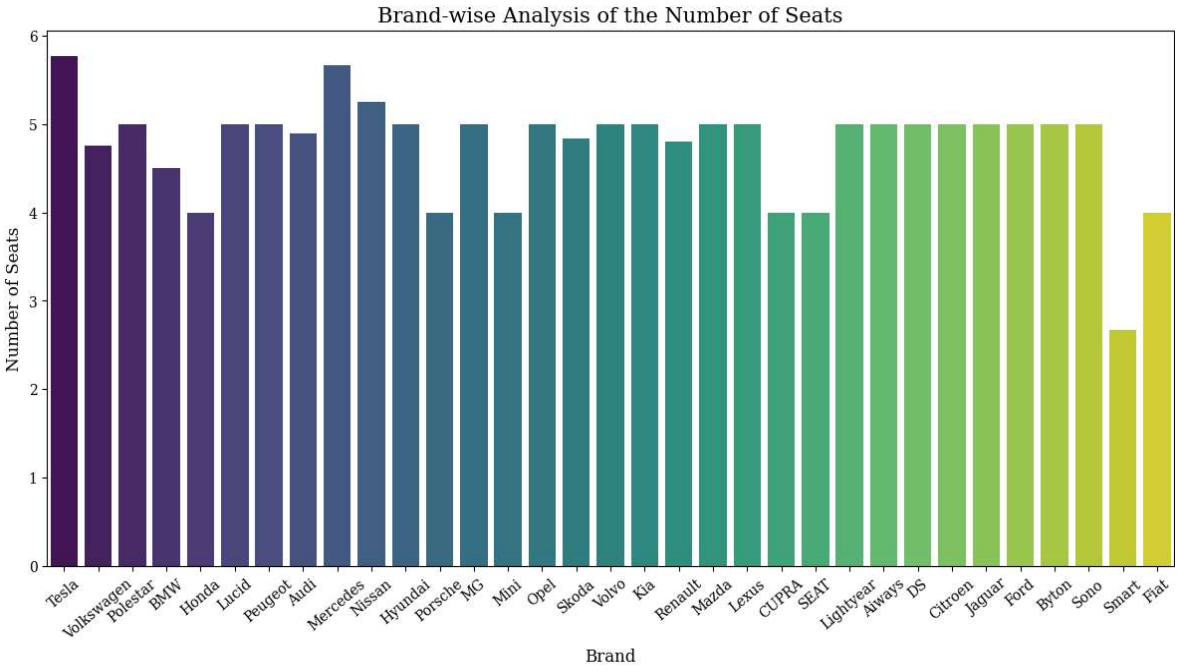
Four wheeler vehicles are the most preferred private and public transportation medium .Maharashtra has the most number of four wheeler electric vehicle in India .Electric Buses are new public transportation that has a huge growth. Uttar Pradesh is has the most number of Electric Buses while Mumbai and Delhi are at 2nd having almost same amount of electric buses.



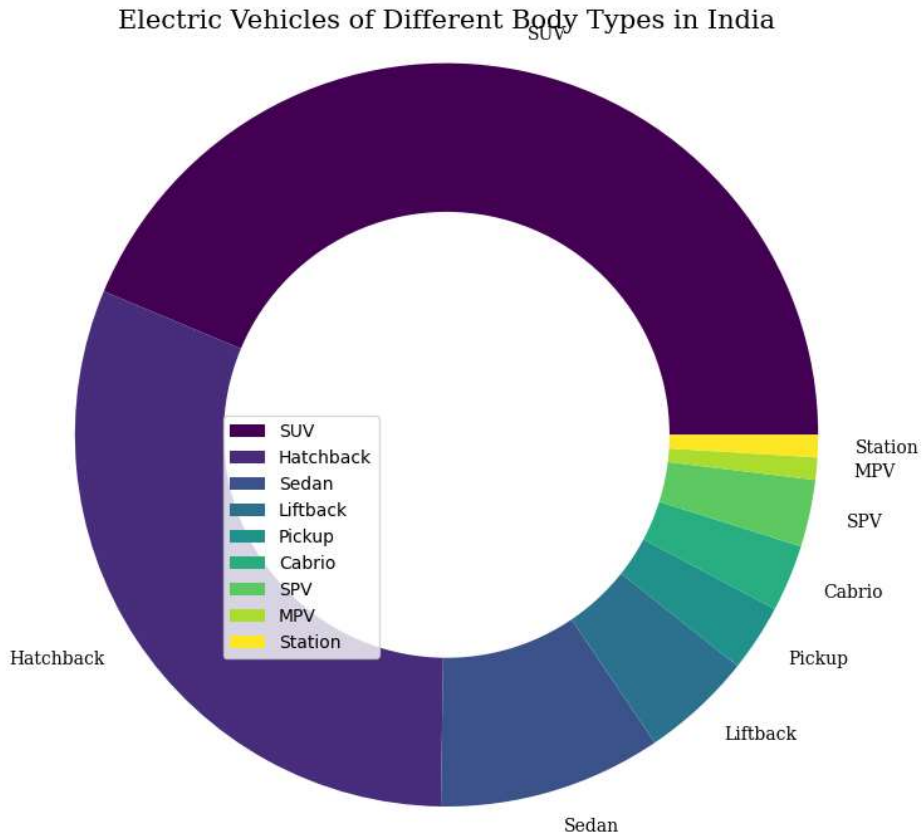


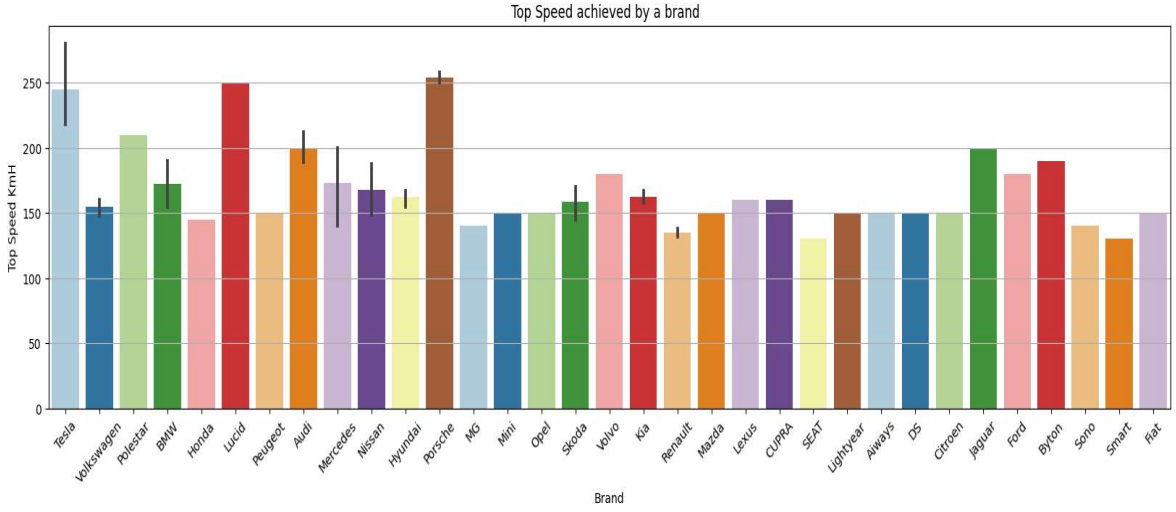
We have found different brands provide different number of seats in electric vehicles.



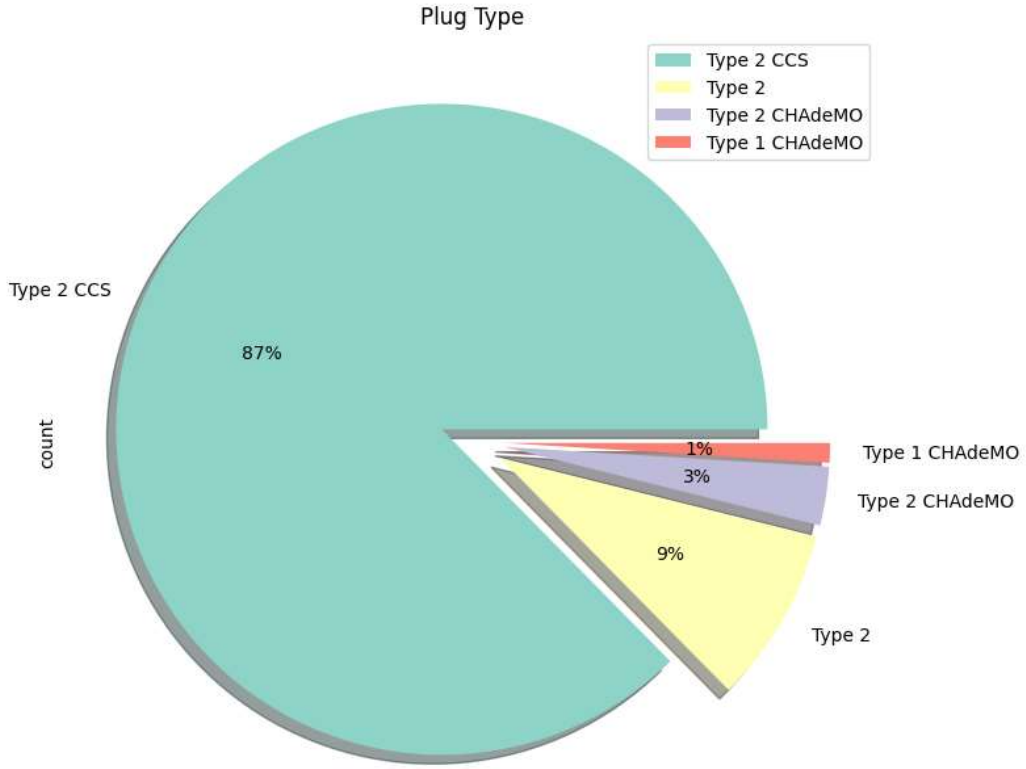


We have explore types for electric cars that are available in India along with the top speed are achieved by brands.

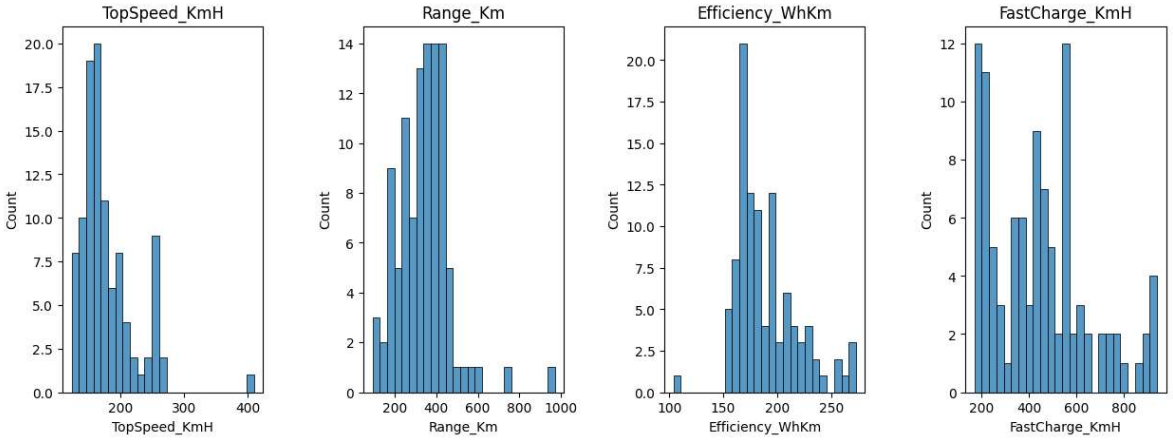




There are 4 types of electric charging plugs with Type 2 CCS having highest number of count in India.

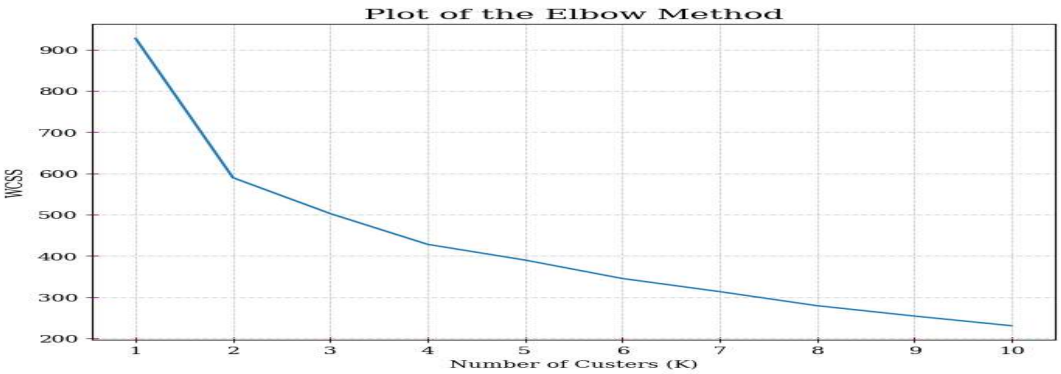


Here we have calculated the counts of brand providing there top speed, range, efficiency and fast charge.



Elbow Method

The Elbow method is a way of determining the optimal number of clusters (k) in K-Means Clustering. It is based on calculating the Within Cluster Sum of Squared Errors (WCSS) for a different number of clusters (k) and selecting the k for which change in WCSS first starts to diminish. When you plot its graph, at one point the line starts to run parallel to the X-axis and that point, known as the Elbow Point, is considered as the best value for the k (as 4 in the below figure).



K-Means Clustering

K-Means Clustering is an unsupervised learning algorithm whose job is to group the unlabelled dataset into different clusters where each datapoint belongs to only one cluster. Here, K is the number of clusters that need to be created in the process. The algorithm finds its applicability into a variety of use cases including market segmentation, image segmentation, image compression, document clustering etc. The below image is the results of clustering on one of our datasets. The clusters in bellow plot represents “0:Efficiency-Focused EVs","1:High-Performance EVs", "2:Long-Range Commuters", "3:Versatile Urban EVs.This show that these type of Electric vehicles are made in India.