Market Segment Analysis of Electric Vehicle in India

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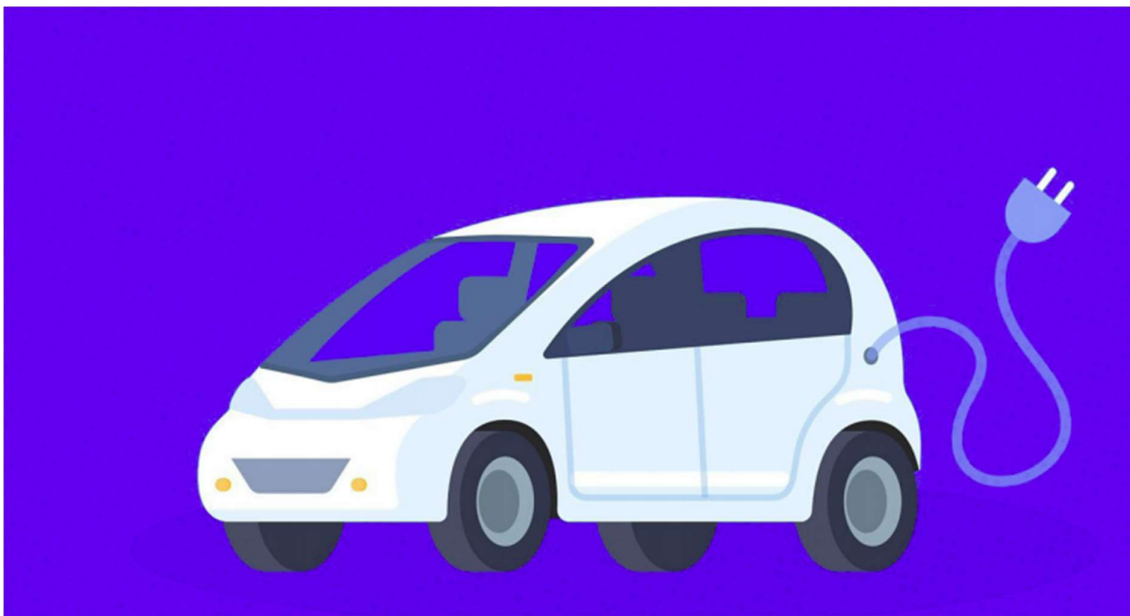
Team Pratyoosh

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2. Meet Bedmutha
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   Google Colab Link :-
   https://colab.research.google.com/drive/1BUxCOIwkyLDQ_W-Mi7iPJ-
   KCz2xOhvrw?authuser=1

Problem Statement:

Using market segmentation, analyse the electric vehicles in India and come up with a feasible strategy to enter the market and targeting the segments that are most likely to buy the Electric Vehicles.

Overview

Electric Vehicle:-

An electric motor runs an electric vehicle (EV) as opposed to an internal combustion engine, which produces power by burning a mixture of fuel and gases. Therefore, in order to solve issues such as increased pollution, global warming, the depletion of natural resources, etc., such a vehicle is considered as a potential substitute for current-generation automobiles. Even though the idea of electric cars has been around for a while, it has attracted a lot of attention in the last ten years due to the growing carbon footprint and other environmental effects of fuel-powered cars.

Benefits of Electric Vehicle:-
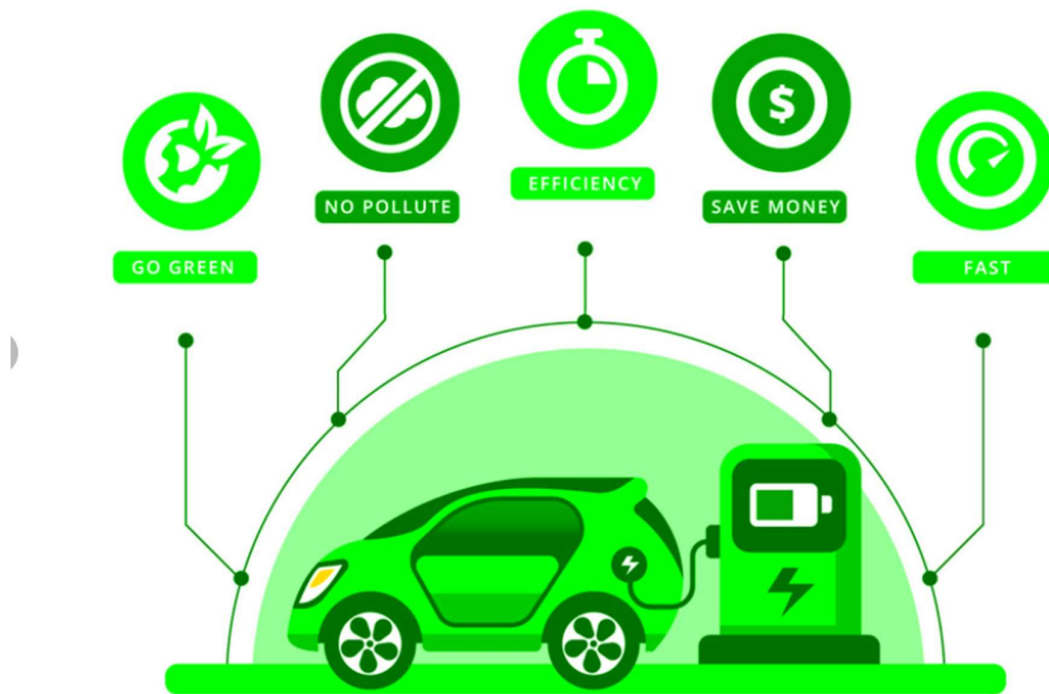
1) **Lower running costs:-**
   a. The running cost of an electric vehicle is much lower than an equivalent petrol or diesel vehicle. Instead of using fossil fuels like gasoline or diesel to charge their batteries, electric vehicles use electricity. Due to their greater efficiency and the lower cost of power, charging an electric car is more affordable than purchasing gasoline or diesel for your travel needs.

2) **Low maintenance cost:-**
   a. Because they have fewer moving parts than internal combustion engines, electric cars require very less maintenance. Compared to typical petrol or diesel automobiles, electric cars require less maintenance. As a result, operating an electric vehicle has a very low annual cost.

3) **Tax and Financial benefits:-**
   a. Registration fees and road tax on purchasing electric vehicles are lesser than petrol or diesel vehicles.

4) **Easy to drive and quiet:-**
   a. Electric cars are very convenient to drive and don't have gears. Only the accelerator, brake, and steering are controlled. Simply put your car into a home or public charger to start charging it. Due to their reduced noise emissions compared to conventional vehicles, electric vehicles are also silent.

5) **Convenience of charging at home:-**
   a. Imagine you are running late to work and you are at a busy gas station during peak hours. The use of an electric car can readily solve these issues. Just leave your car plugged into the charger at home for four to five hours before you go. It is incredibly simple to schedule your trips in advance if you can find a charger near where you park at home.

6) **No Noise Pollution:-**
   a. As there is no engine beneath the hood, electric vehicles can operate in silence. A silent vehicle has no engine. You have to look into your instrument panel to see if the electric motor is on because it runs so quietly. Manufacturers must create fake sounds to electric vehicles because they are so silent to keep pedestrians safe.

Market Overview:-

On the basis of type, vehicle type, vehicle class, top speed, vehicle drive type, and region, the global market for electric vehicles is divided into segments. Battery electric vehicles (BEV), plug-in hybrid electric vehicles (PHEV), and fuel cell electric vehicles are the three categories by kind (FCEV). Two-wheelers, passenger cars, and commercial vehicles are divided based on the kind of vehicle. Mid-priced and luxury class vehicles are divided according to vehicle class. It is divided into three categories based on max speed: less than 100 mph, 100 to 125 mph, and more than 125 mph. Front wheel drive, rear wheel drive, and all-wheel drive are the different categories of vehicle drive. The market is broken down regionally into North, Europe, Asia-Pacific, and LAMEA.

Who are making EVs in India today?
While established companies are slow to warm up to the transition to electric vehicles, lesser known entities and start-ups are stoking the change

Two wheelers
ACE, Ajanta Manufacturing, Ampere, AVON Cycles, BPG, BSA, Chris Motors, Eko, Electrotherm (India), Hero Moto Corp, Honda India, Lohia Auto, Mahindra & Mahindra, Okinawa Autotech, Peugeot, Tunwal Electronics, TVS Motors, Ultra Motors, YO Bykes
Source: CSE's market analysis

Three wheelers
Bajaj Auto, Electrotherm (India), Mahindra & Mahindra
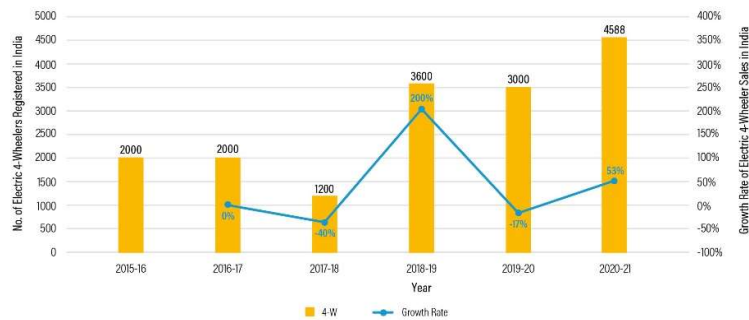
Four wheelers
Mahindra & Mahindra

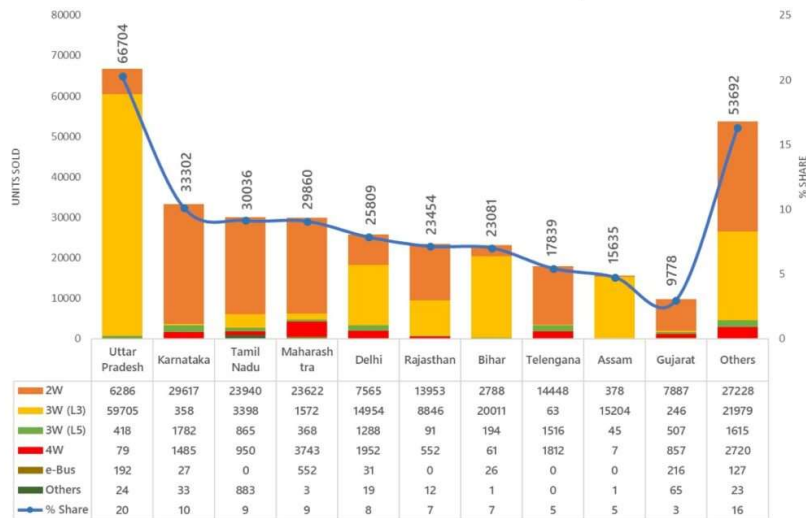**Bus**
Volmac Engg, Volvo, Goldstone-BYD

HDVs
Volmac Engg, Volvo

Trend of Electric Car Sales in India

State Wise Electric vehicle sales trend, 2021

	Uttar Pradesh	Karnataka	Tamil Nadu	Maharashtra	Delhi	Rajasthan	Bihar	Telangana	Assam	Gujarat	Others
■ 2W	6286	29617	23940	23622	7565	13953	2788	14448	378	7887	27228
■ 3W (L3)	59705	358	3398	1572	14954	8846	20011	63	15204	246	21979
■ 3W (L5)	418	1782	865	368	1288	91	194	1516	45	507	1615
■ 4W	79	1485	950	3743	1952	552	61	1812	7	857	2720
■ e-Bus	192	27	0	552	31	0	26	0	0	216	127
■ Others	24	33	883	3	19	12	1	0	1	65	23
◆ % Share	20	10	9	9	8	7	7	5	5	3	16

Business Opportunities in Electric Vehicles Sector India:-

Following is the list of business opportunities in the Indian EV Sector

- **Public EV charging Stations:**
  There is a need for conveniently accessible charging points for the charging infrastructure to support the Indian electric vehicle market. Recently, A technical committee met in Hyderabad Post-electric to discuss existing building codes and government regulations to set up charging infrastructure in Telangana.Because of reliability on such high factors maintenance and repair become priority issues. As per reports, there are one million public charging points in the world and only 0.1% are in India. and this could be a great Business Opportunity to work in EVs Sector.

- **Battery recycling Business:**
  Well, batteries are engines in EVs. They emit less carbon dioxide but batteries are harder to recycle. Which is composed of cobalt, lithium, and nickel, and mining these raw materials raises ethical and environmental concerns. Lithium-ion batteries are difficult to

recycle. The "Global Battery Alliance" estimates that the battery could cut the carbon industry required by 30% and several aspects have been created by this.

- **Battery swapping Technology:**
  It will eliminate wait time for charging, make better use of land, and will give increased available run time in India, the population increases the travel needs both within between two cities so, this could be a better option. Battery Swapping technologies have good future scope over EV charging stations, are less time consuming, and for this, it could be a great business opportunity.

- **solar electric vehicle charging:**
  Solar-based electric vehicles are just around the corner. Solar charging stations for EVS. The combination of charging stations and electric vehicle charging is the key to drastically reducing our dependence on fossil fuels.

- **Home charging stations:**
  As per the survey, 60% of Indians do not have the vehicle to keep vehicles at home. Electric car drivers choose home charging points to benefit from the faster-charging speed and some safety features as well. So home charging stations are quite useful.

- **EV Equipment Manufacturing:**
  Nowadays, after the U.S. and China conflict and this pandemic, many giant companies have started moving to India to manufacture their respective products. Union Minister Nitin Gadkari said that in the next six months, lithium-ion batteries will be manufactured in India and it will become the world's largest EV manufacturer.

By Technology	• Hybrid Electric Vehicle • Plug-In Hybrid Electric Vehicle • Battery Electric Vehicle
By Power Source	• Stored Electricity • On-Board Electric • Generator
By Vehicle Type	• Two Wheelers • Passenger Cars • Commercial Vehicles • Others (Golf Carts, etc.)
By Powertrain	• Series Hybrid • Parallel Hybrid • Combined Hybrid

Market Segmentation:-

- Electric Vehicle Types:
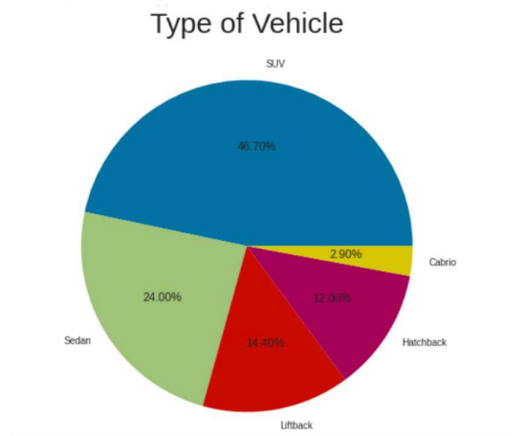
- **Geographic Segmentation:-**
  The EV market is mostly present in regions with highly established and expanded infrastructure as well as locations with considerable spending on charging networks.
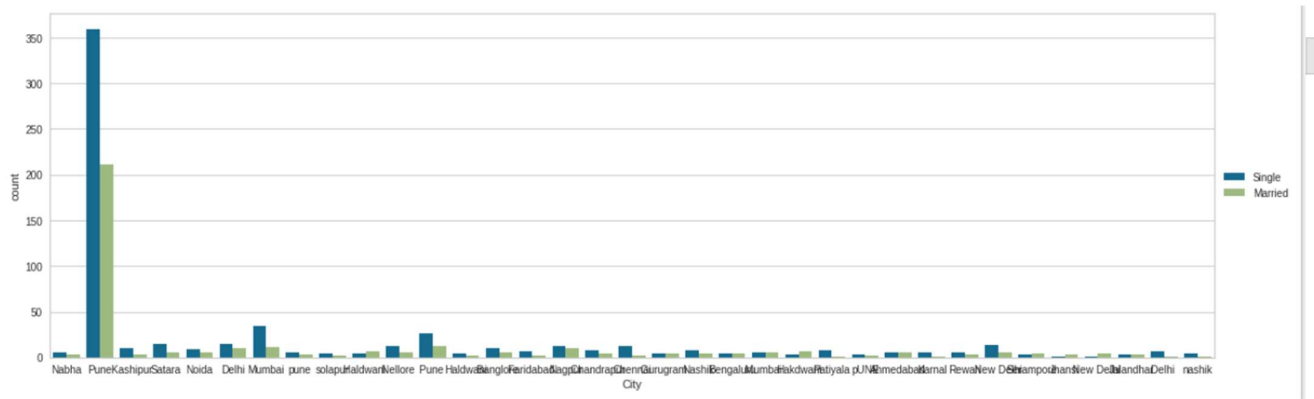

Table: City-wise marital status of EV in India

- **Demographic Segmentation:-**

Demographic segmentation is a market segmentation technique where an organization's target market is segmented based on demographic variables such as age, gender, education, income, etc. It helps organizations understand who their customers are so that their needs can be addressed more effectively. When an organization looks at the demographic segmentation, it focuses on the people who are most likely to buy a product. This helps in identifying the target market.The size of the family affects both the manufacturing and development of EVs as well as the kind of target markets in this sector.
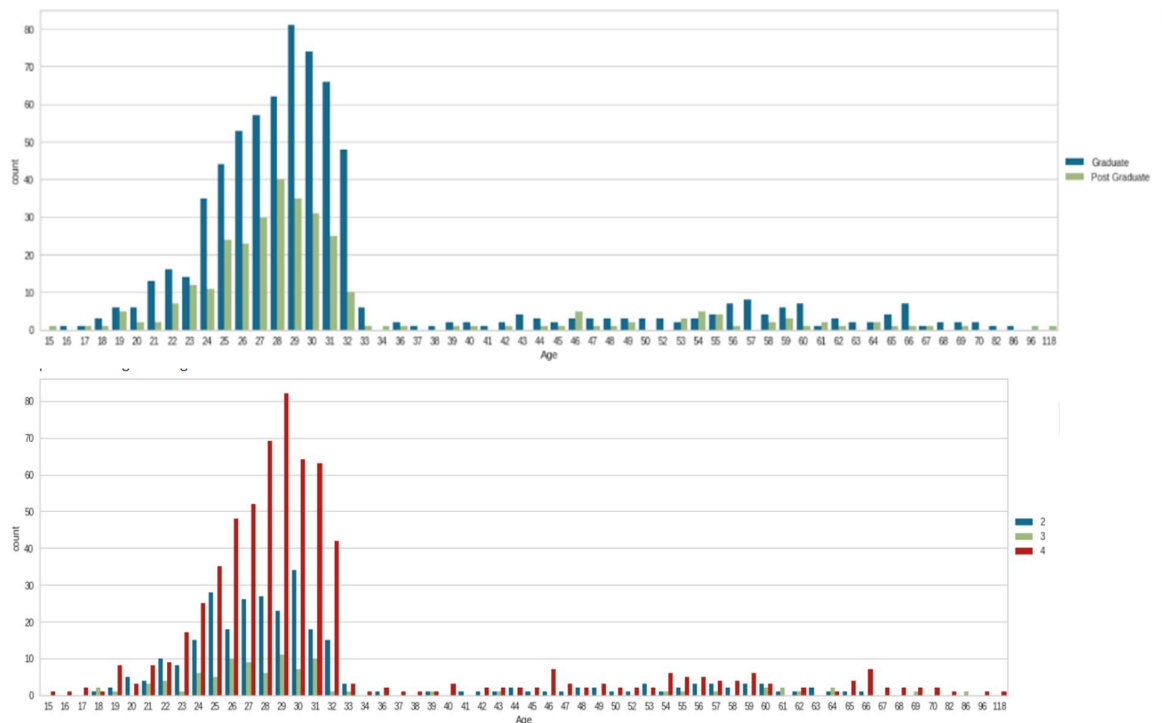
- **Psychological Segmentation:-**
  A significant factor is interest in environmentally friendly and sustainable transportation. Customers desire to lessen pollution and are willing to pay more for environmentally friendly vehicles.

- **Socio-economic Segmentation:-**
  The majority of consumers are highly knowledgeable about the effects of pollution and climate change and have high levels of income.

- **Behavioral Segmentation:-**
  Consumers' price sensitivity, as well as their perceptions of the benefits of quality, safety, and performance, are quite common in this industry and influence how EV manufacturers do their R&D and provide customer support.

The steps in the marketing segmentation process involve understanding the different client wants and figuring out how to meet them. Customers can vary greatly depending on their preferences, purchasing power, geography, attitudes, personalities, expertise, desired benefits, and/or habits. Therefore, a marketing campaign for a good or service can be more precisely tailored to match particular segments by identifying specific groups within a market. To pinpoint specific market categories, psychographic and behavioural characteristics were added to the standard socio-demographic variables.

CODE: -

Model Used:-

K-Means Clustering Algorithm

K-Means Clustering is an unsupervised learning algorithm that is used to solve the clustering problems in machine learning or data science. In this topic, we will learn what is K-means clustering algorithm, how the algorithm works, along with the Python implementation of k-means clustering.

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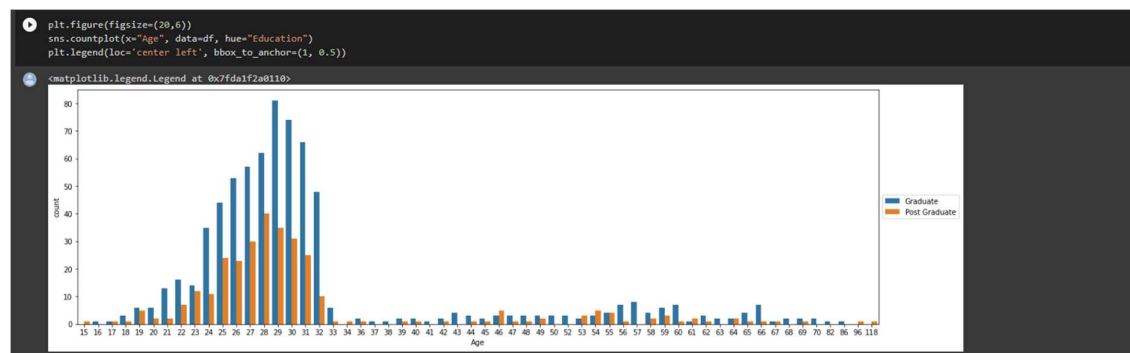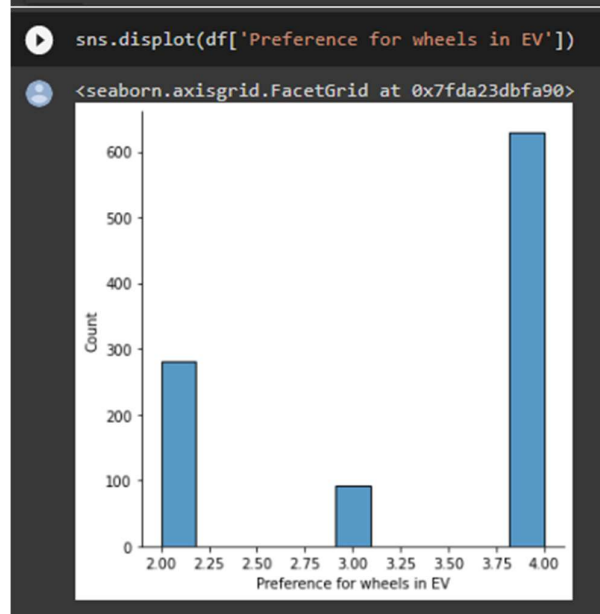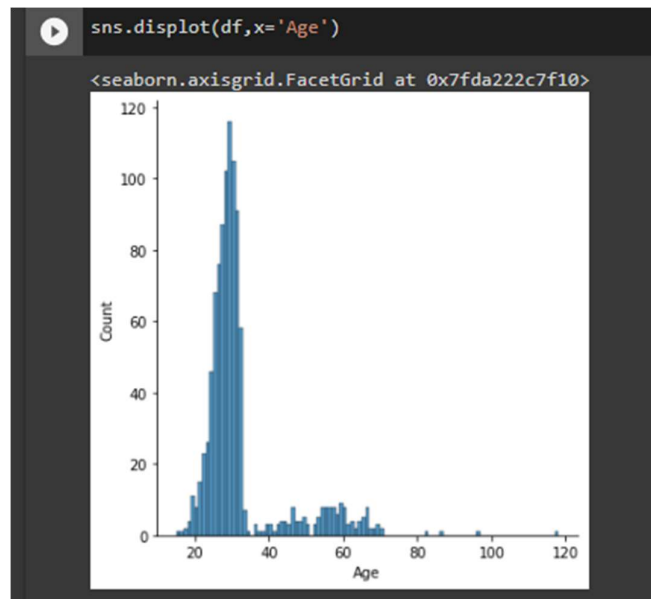
Data Pre-processing

Libraries Used :-

```python
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import sklearn
import plotly.graph_objects as go
import plotly.io as pio
import plotly.express as px
```

+ Code   +

With help of this database we can perform behavioural, pshycographic and demographic segmentation of Indian Automobile Market.

```python
df=pd.read_csv("EV_Data.csv")
df.head()
```

	Unnamed: 0	Age	City	Profession	Marital Status	Education	No. of Family members	Annual Income	Would you prefer replacing all your vehicles to Electronic vehicles?	If Yes/Maybe what type of EV would you prefer?	Do you think Electronic Vehicles are economical?	Which brand of vehicle do you currently own?	How much money could you spend on an Electronic vehicle?	Preference for wheels in EV	Do you think Electronic vehicles will replace fuel cars in India?
0	0	30	Nabha	None	Single	Graduate	5	1.193876e+06	Maybe	SUV	Yes	Hyundai	<5 lakhs	2	I don't think so
1	1	27	Pune	None	Single	Graduate	4	1.844540e+06	Yes	SUV	Yes	Honda	<15 lakhs	4	Yes, in <20years
2	2	32	Kashipur	None	Single	Graduate	4	2.948150e+06	Yes	Hatchback	Yes	KIA	<15 lakhs	4	Yes, in <20years
3	3	55	Pune	Business	Single	Graduate	3	2.832380e+06	Maybe	Hatchback	No	Hyundai	<5 lakhs	4	Yes, in <10 years
4	4	26	Satara	None	Single	Graduate	4	2.638751e+06	Yes	Sedan	Yes	McLaren	<15 lakhs	4	Yes, in <20years

Data Visualization


```
sns.displot(df,x='Age')
```

<seaborn.axisgrid.FacetGrid at 0x7fda222c7f10>


```
sns.displot(df['Preference for wheels in EV'])
```

<seaborn.axisgrid.FacetGrid at 0x7fda23dbfa90>


```
plt.figure(figsize=(20,6))
sns.countplot(x="Age", data=df, hue="Education")
plt.legend(loc='center left', bbox_to_anchor=(1, 0.5))
```

<matplotlib.legend.Legend at 0x7fda1f2a0110>
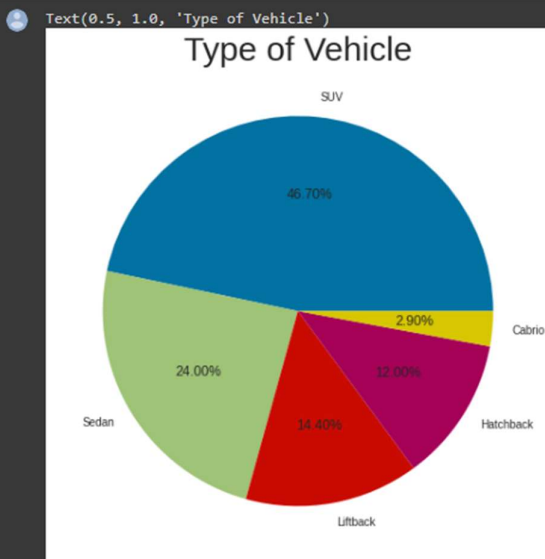
```
[ ] plt.xlabel('Age')
    plt.ylabel('Annual Income')
    plt.scatter(df['Age'],df['Annual Income'])
```

<matplotlib.collections.PathCollection at 0x7f16a6661a90>
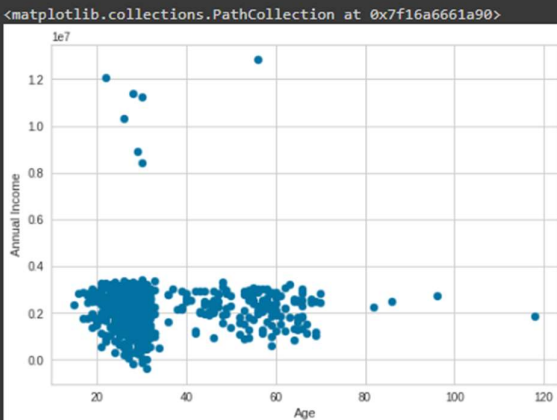
```
#EXPLORING DATA
plt.figure(figsize=(25,8))
labels=['SUV','Sedan','Liftback','Hatchback','Cabrio']
plt.pie(df['If Yes/Maybe what type of  EV would you prefer?'].value_counts(),
        labels=labels,autopct = '%.2f%%')
plt.title('Type of Vehicle', fontsize = 30)
```

Text(0.5, 1.0, 'Type of Vehicle')

K-Means Clustering

K-Means Clustering is an unsupervised learning algorithm that groups the unlabelled dataset into distinct groups. Here K defines the number of predefined groups to be created in the process, e.g., if K = 2, there are two groups, and for K = 3, there are three groups, and etc. It is an iterative algorithm that partitions the unlabelled dataset into k distinct groups such that each dataset belongs to a single group with similar properties.

How the K-Means algorithm works is explained in the following steps:

Step 1: Select the number K to set the number of groups.

Step 2: Pick K random points or centroids. (It may be another one from the input data set.)

Step 3: Associate each data point with its nearest centroid, which forms the standard K-clusters.

Step 4: Calculate the variance and place a new centroid for each cluster.

Step 5: Repeat the third steps, which means you reassign each data point to the new nearest centroid of each cluster.

Step 6: If reassignment occurs, proceed to

 Step 7: otherwise go to EXIT

Market segments to enter at the right time

According to the aforementioned report, we have come to the conclusion that if we were to launch an electric vehicle startup in India, the best market segment for us would be based on the geographic and demographic segments, which would represent the type of electric vehicle and the number of EVS sold in various states, respectively. The feasible strategy we have developed is that we will concentrate on the states that have higher EV demand, such as Maharashtra and Gujarat, following an analysis of the EV market using market segmentation analysis.

Marketing mix with regard to EV:

PRICE:-

For any car, affordability is the biggest problem; this is especially true for EVs. A product will sell more of it if it is more cost-effective. According to the analysis above, the ideal price range for the product is between Rs. 10 and 20 lakh, as this is the range in which the majority of consumers would be willing to spend.

Prototype:-

Product's design and mechanics are entirely dependent on the startup. Having said that, generally speaking, a 2-wheeler EV business would be the key for an EV start-up to succeed in India.

Public transportation vehicles are another product category that EV Start-ups should consider, as current government policies support the conversion of public transportation to electric-powered engines.

Target Cities

Targeting the nation's major cities—especially its metropolises—would be wise because these are the locations where infrastructure is most likely to exist. Targeting urban areas is also justified by the higher likelihood of encountering informed people who are prepared to purchase electric vehicles there. Our geographic analysis has provided a list of the top states for various vehicle types that will guarantee a healthy market.