ELETRIC VEHICLE MARKET SEGMENTATION

--Team Himansu---

Name - Himansu Ranjan Mallick

Github link-https://github.com/himansuranjan1/Ev-market

Psychographic Segmentation (based on preferred Electric Vehicle Type):

Psychographic segmentation in the electric vehicle (EV) market based on preferred EV type reflects diverse consumer preferences and values:

Eco-Conscious Consumers: Prioritize environmental sustainability, seeking EVs for their low carbon footprint and commitment to green living.

Tech Enthusiasts: Embrace EVs as cutting-edge technology, valuing innovation, smart features, and connectivity in electric vehicles.

Practical Consumers: Focus on cost savings and efficiency, choosing EVs for long-term economic benefits and lower operating costs.

Performance Seekers: Value EVs for their high performance, acceleration, and driving experience, seeking an electrified alternative without compromising on speed or power.

Urban Commuters: Seek compact, city-friendly EVs for daily commuting, prioritizing convenience, ease of parking, and maneuverability.

Understanding these psychographic segments helps marketers tailor messaging, features, and incentives to resonate with diverse consumer values, thereby fostering broader adoption of electric vehicles.

Problem Statement:

Psychographic segmentation in the electric vehicle (EV) market reveals challenges in addressing consumer attitudes and values. Misconceptions about EVs, diverse consumer priorities, and concerns about charging convenience create barriers to adoption. Tailoring marketing strategies to dispel myths, align with varied values, and enhance perceptions of convenience is crucial for broadening the appeal of EVs across different psychographic segments

Data view:

```
df=pd.read_csv('/content/ev_data.csv')
```

```
df.sample(5)
```

	age	city	profession	marital_stat	education	family_count	annual_income	replace_with_ev	preferred_ev_type	think_ev_are_economica
550	27	Pune	None	Single	Graduate	4	2.083677e+06	No	SUV	Mayt
942	27	Pune	Working Professional	Married	Graduate	5	3.051231e+06	Yes	Sedan	N
357	29	Pune	None	Single	Graduate	4	1.064091e+06	Maybe	Liftback	Ye
674	25	Ahmedabad	None	Single	Post Graduate	4	6.662585e+05	Yes	SUV	Mayt
102	28	Pune	None	Single	Post Graduate	4	2.105553e+06	Yes	Liftback	Ye

```
df.describe()
```

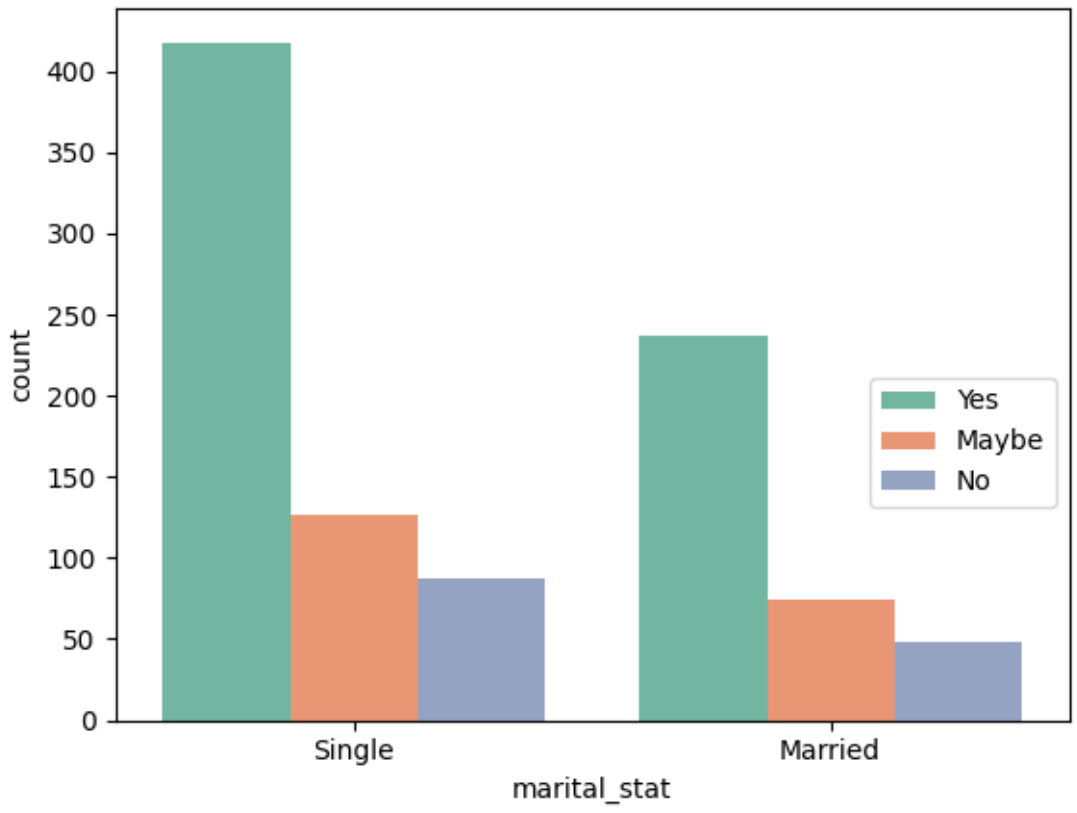
	age	family_count	annual_income	preferred_wheel_count
count	990.000000	990.000000	9.900000e+02	990.000000
mean	31.802020	4.116162	2.261180e+06	3.350505
std	11.279929	1.469488	1.001444e+06	0.886578
min	15.000000	0.000000	-3.761509e+05	2.000000
25%	26.000000	4.000000	1.794900e+06	2.000000
50%	29.000000	4.000000	2.329246e+06	4.000000
75%	31.000000	5.000000	2.758737e+06	4.000000
max	118.000000	8.000000	1.282128e+07	4.000000

Steps used—

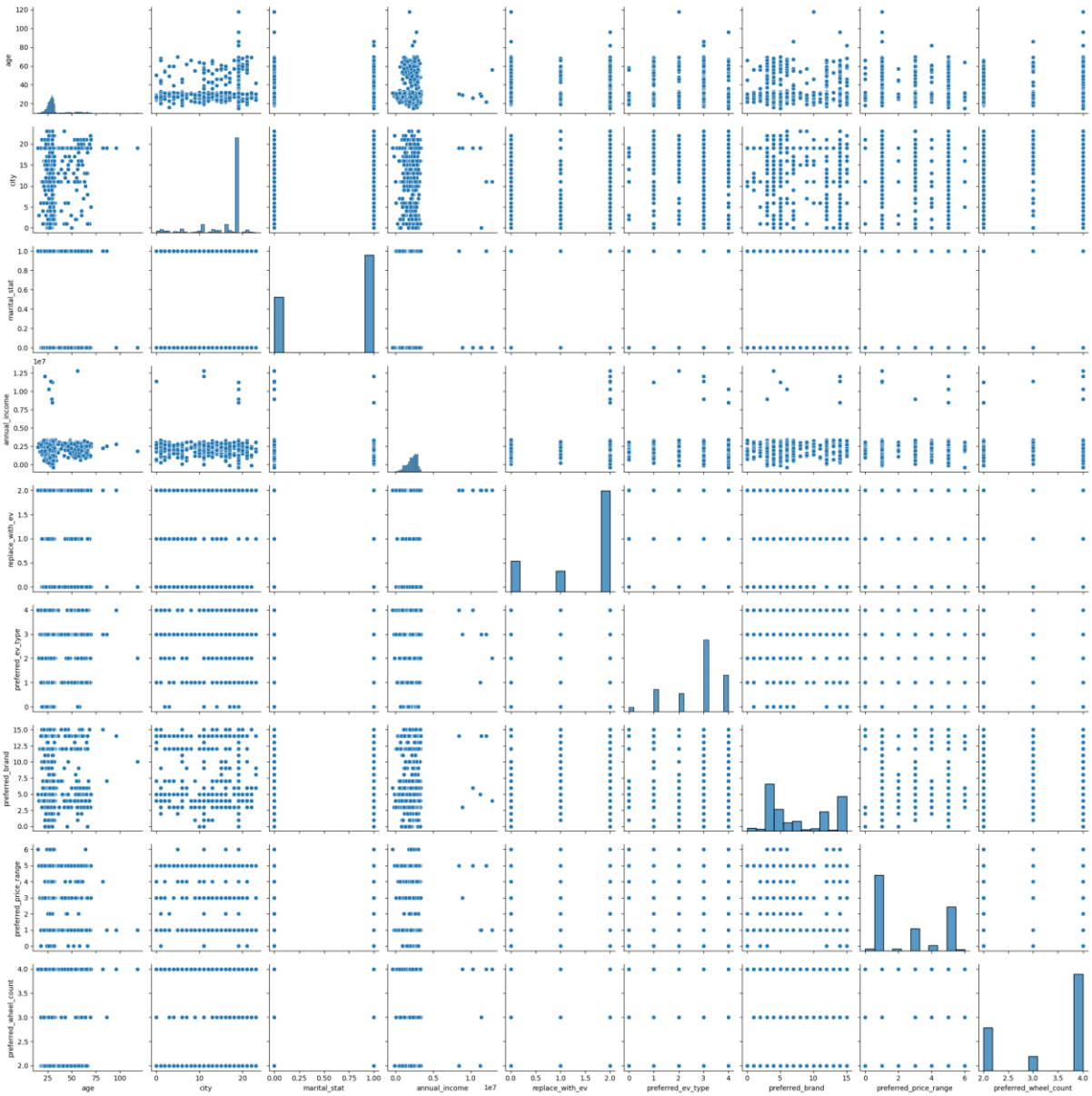
```
df.describe()
```

	age	family_count	annual_income	preferred_wheel_count
count	990.000000	990.000000	9.900000e+02	990.000000
mean	31.802020	4.116162	2.261180e+06	3.350505
std	11.279929	1.469488	1.001444e+06	0.886578
min	15.000000	0.000000	-3.761509e+05	2.000000
25%	26.000000	4.000000	1.794900e+06	2.000000
50%	29.000000	4.000000	2.329246e+06	4.000000
75%	31.000000	5.000000	2.758737e+06	4.000000
max	118.000000	8.000000	1.282128e+07	4.000000

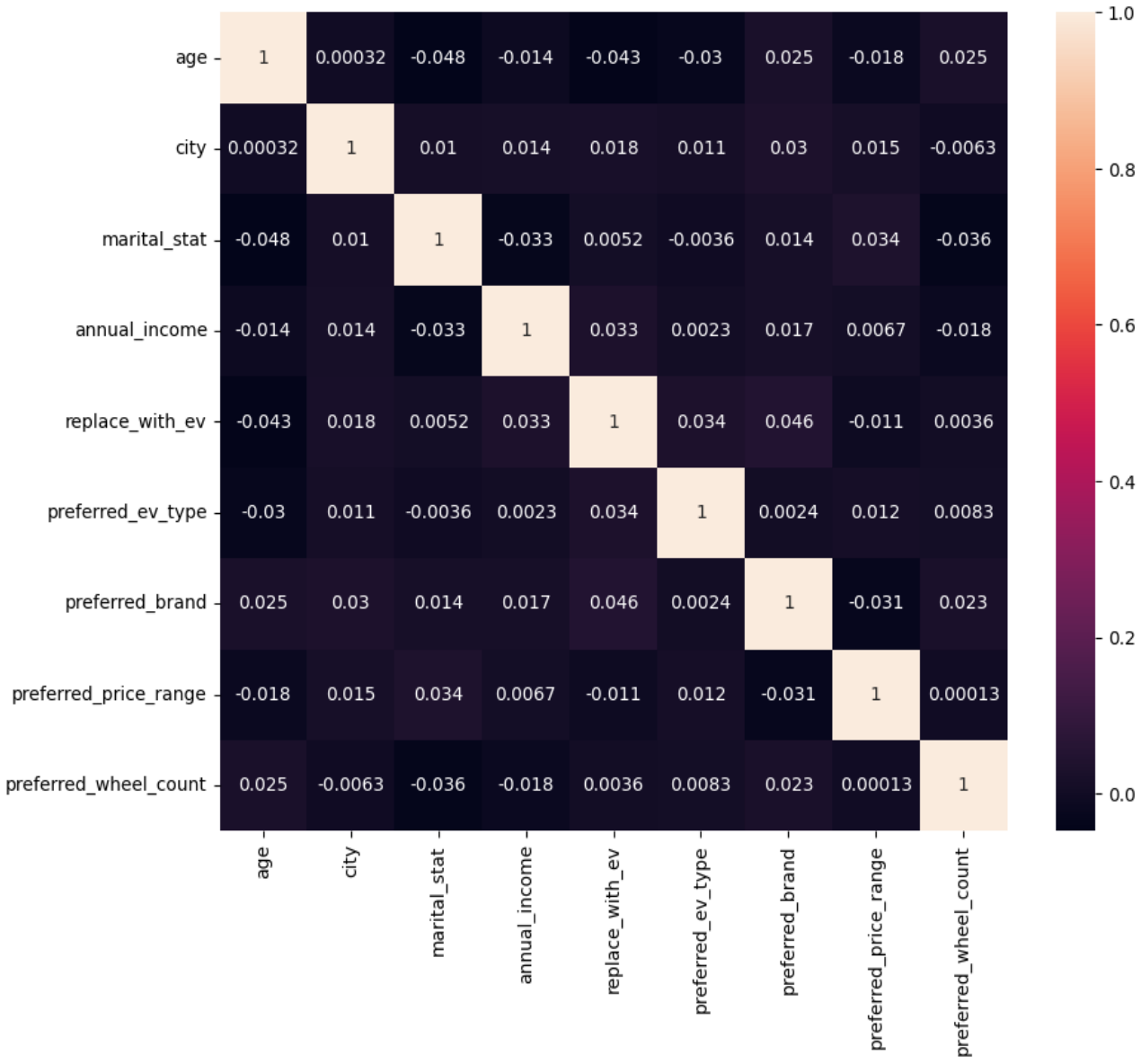
This is how ‘replace with ev ‘ depend on marital status----



pairplots for exploring data patterns, understanding feature relationships, and making informed decisions during the data preprocessing and feature engineering stages and it contribute to a better understanding of the dataset, which can lead to improved model performance and interpretability.



Used heatmaps to visually intuitive way to represent complex relationships within a dataset. They are particularly effective when dealing with large datasets or when exploring relationships between multiple variables simultaneously, making them a valuable tool in the early stages of data analysis and model development.



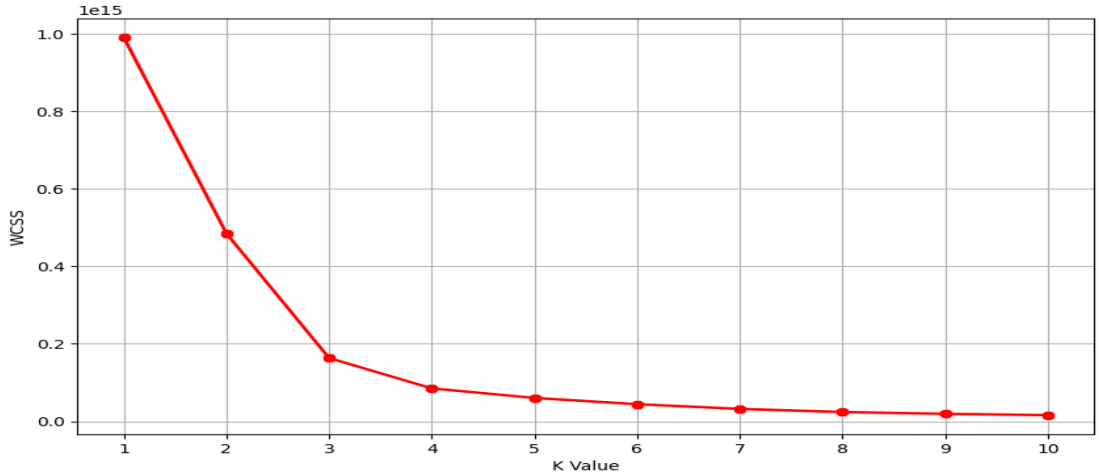
Segment Extraction

K-Means Clustering is one of the most popular Unsupervised Machine Learning Algorithms Used for Solving Classification Problems. K Means segregates the unlabeled data into various groups, called clusters, based on having similar features, common patterns.

Suppose we have N number of Unlabeled Multivariate Datasets of various features like water- availability, price, city etc. from our dataset. The technique to segregate Datasets into various groups, on the basis of having similar features and characteristics, is called Clustering. The groups being Formed are known as Clusters. Clustering is being used in Unsupervised Learning Algorithms in Machine Learning as it can segregate multivariate data into various groups, without any supervisor, on the basis of a common pattern hidden inside the datasets.

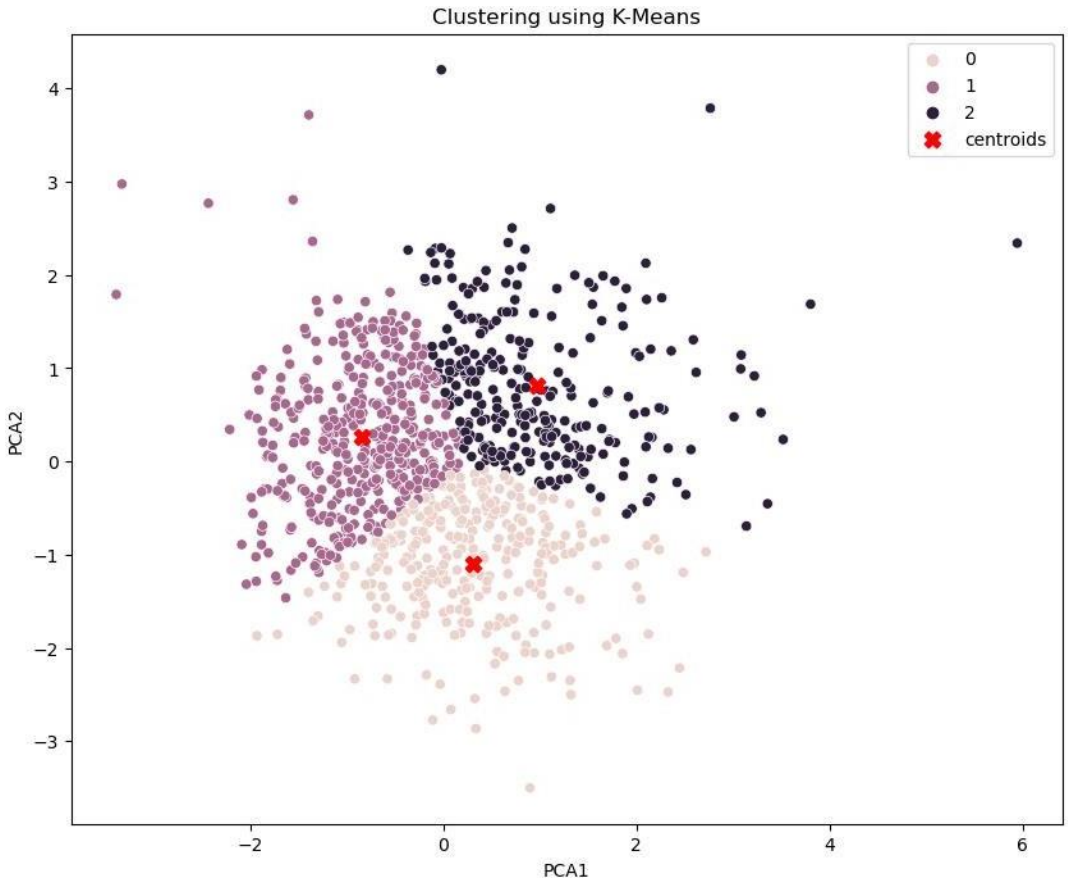
In the Elbow method, we are actually varying the number of clusters (K) from 1 – 10. For each value of K, we are calculating WCSS (Within-Cluster Sum of Square). WCSS is the sum of squared distance between each point and the centroid in a cluster. Whenwe plot the WCSS with the K value, the plot looks like an Elbow , As the number of clusters increases, the WCSS value will start to decrease. WCSS value is largest when K = 1. When we analyze the graph, we can see that the graph will rapidly change at a point and thus creating an elbow shape. From this point, the graph starts to move almost parallel to the X-axis. The K value corresponding to this point is the optimal K value or an optimal number ofclusters.

Finding optimum number of clusters:

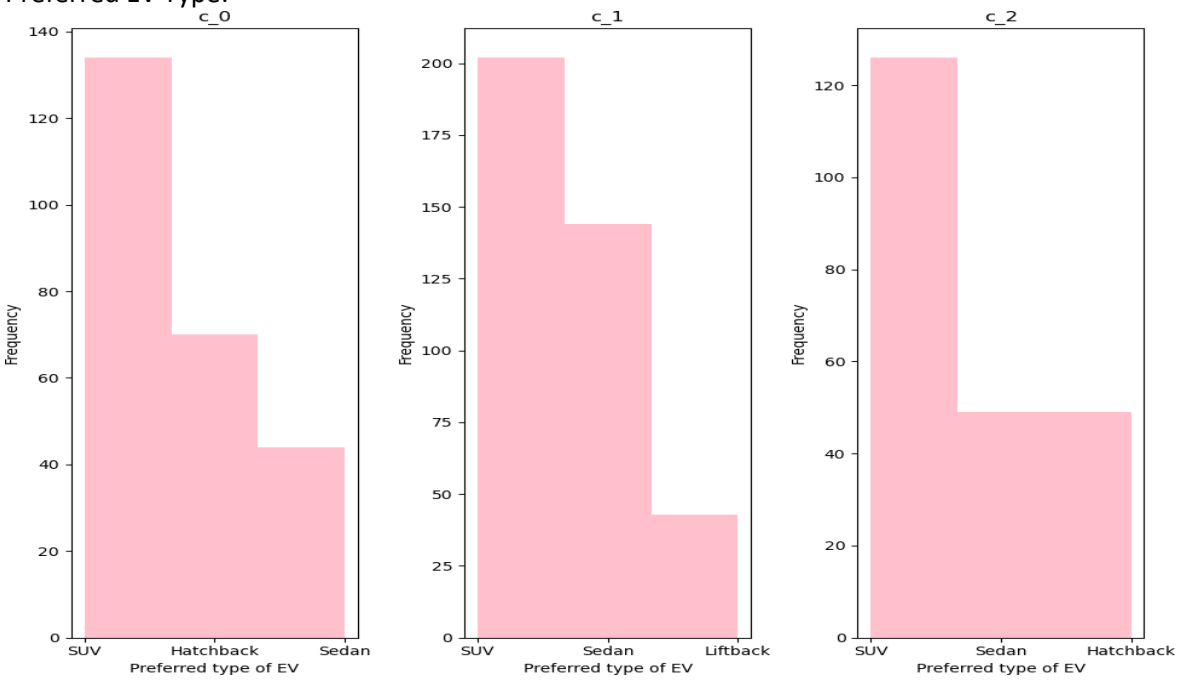


We get k value = 3

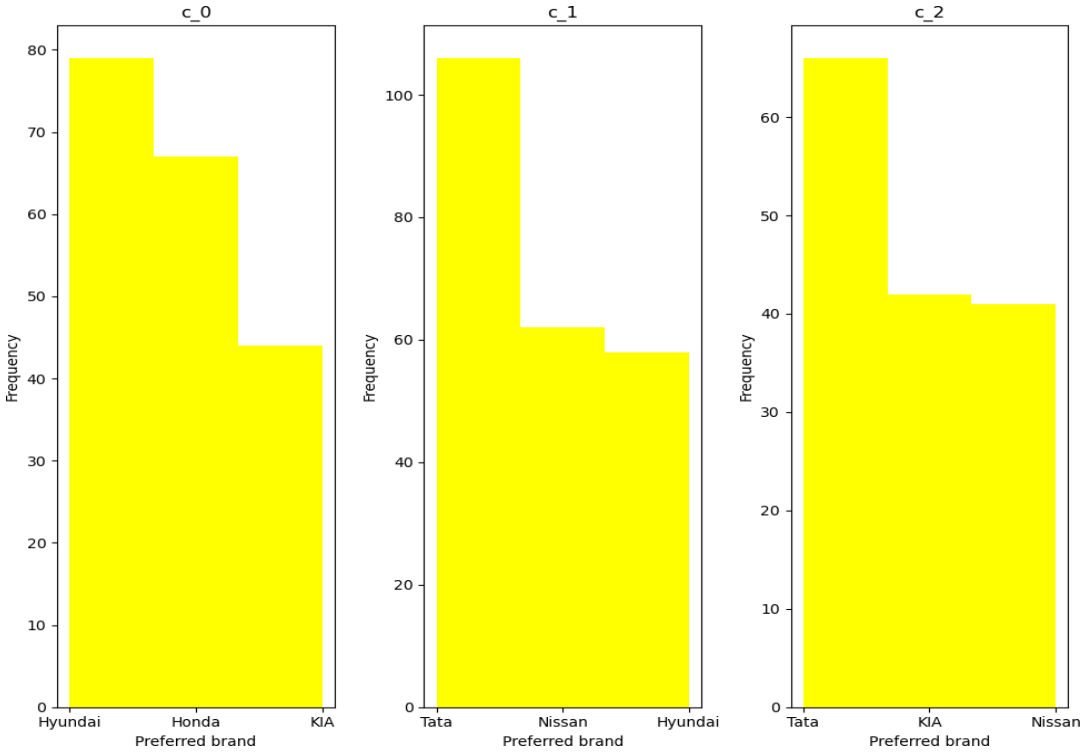
From the scree plot as well as dendogram, we get the optimum number of cluster size as 3. So, we fit and predict the model using n_clusters = 3, and obtain the following plot:



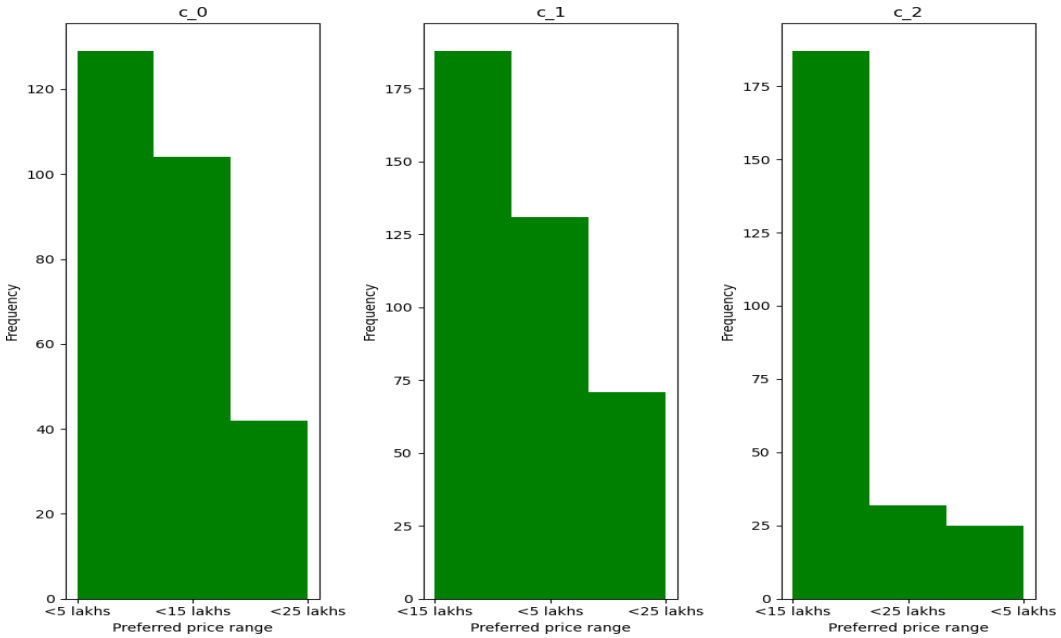
We find the below target segments by performing K-Means Clustering on the dataset: 1. By Preferred EV Type:



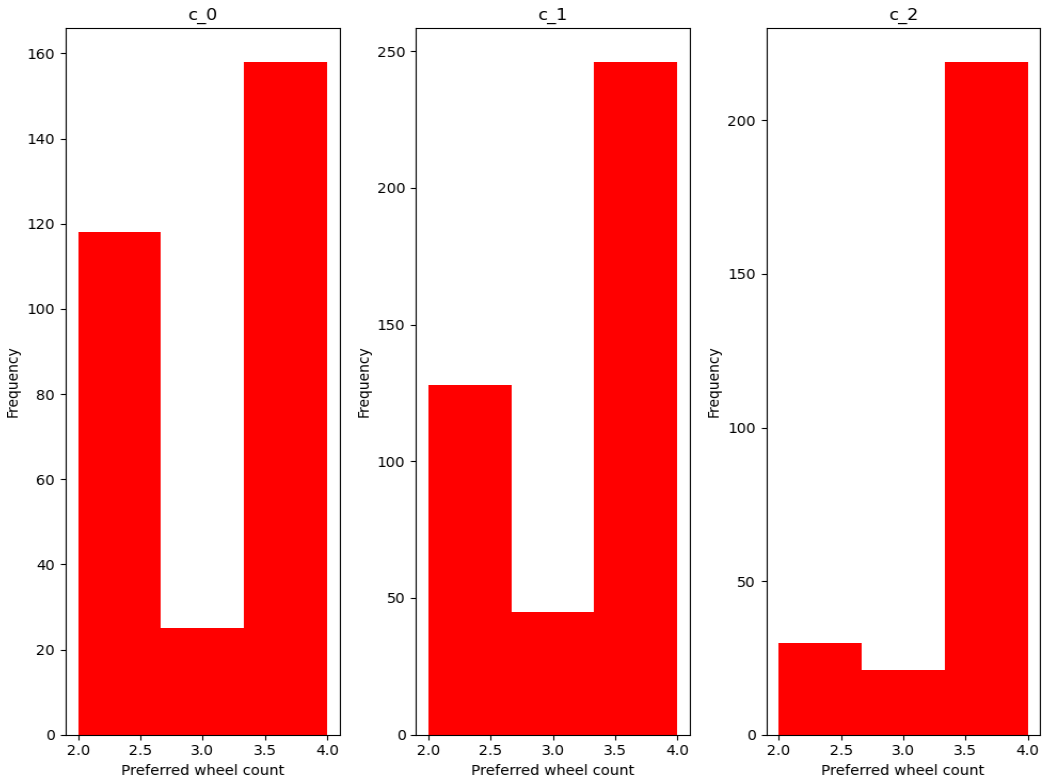
2.By Preferred Brand:



3.By Preferred Price Range:



4.by Preferred Wheel Count:



:

From the analysis-

- ➔ 4 wheeler EV are the most popular with 3 wheeler EV being the least popular in all the segments.
- ➔ By this,we can infer most customers want to invest less than 15 lakhs for their EV.
- ➔ Considering SUV, Sedan and Hatchback as most preferred vehicle type.
- ➔ Considering the money Customers can spend on EV and manufacturing cost for the company wrt. different EV .
- ➔ Company should focus on making 'Sedan' in price range less than 15 lakhs.

➔ If company wants to make SUV's, only 15.32% of customers are willing to pay more than 15 lakhs.

Demographic segments –

Age- Target Age group of 28-31

Income -*Target who earn Rs. 20,64,995 to Rs. 28,12,149 per year.*

Education- Target Graduates

Geographic segments –

Location-

Pune, Mumbai, New Delhi, Bengaluru Considering based on Segmentation analysis and the Infrastructres sanctioned by Govt.

Psychographic segments

Lifestyle -Target Single Marital Status, Family with 3-5 members

Customizing the market mix

The marketing mix helps enable the growth of the business in the automotive industry. A company'smarketing mix or 4Ps (Product, Place, Promotion, and Price) specify the approaches and strategies that address the target market, based on the details of the marketing plan. The company's aim is to maximize sales and improve market presence. With astrong position in the market, However, strategic decision-makers must allow for flexibility in relevant strategies.

The automotive market has various opportunities for the growth, such as opportunities for products that integrate advanced computing technologies. However, the company faces threatsin its businessenvironment. Managers can use the SWOT Analysis to determine appropriate adjustments in the marketing mix or 4Ps to deal with these threats and opportunities.

Prices and Pricing Strategies

The setting of price points and price ranges for the company's products is the main concern in this aspect of the marketing mix. Pricing affects the perceived value of brands and products, and influences sales in price-sensitive markets. the pricing strategies for its automotive products are as follows:

1. Market-oriented pricing strategy
2. Premium pricing strategy

Promotional Mix

Promotional activities are considered in this aspect of marketing mix of 4Ps. These activities are also known as marketing communications tactics. The combination of these tactics is called a promotional mix or marketing communications mix the following promotional activitiesare used,arranged according to significance in the automotive business:

1. Advertising (primary)
2. Direct marketing
3. Personal selling
4. Sales promotion
5. Public relations

Place/Distribution

In this aspect of marketing mix or 4Ps, the virtual or physical locations of transactions are considered. Such locations are significant because they enable the company to reach target customersJn specific markets, while also allowing customers to access information and products available from the automotive business. The following places are used in the distribution of products and services:

1. Official websites
2. Dealerships
3. Automotive shows and exhibits

Potential Sales in Early Market

The potential sales in the early market of the Electric Vehicle (EV) market depend on various factors, including consumer adoption, regulatory support, technological advancements, and infrastructure development. Here are some key considerations:

1. **Consumer Adoption:** Early market sales depend on the willingness of consumers to adopt electric vehicles. Factors influencing consumer decisions include the perceived benefits of EVs, such as reduced environmental impact, lower operating costs, and government incentives.

2. **Regulatory Support:** Government policies and incentives play a crucial role in shaping the early market for EVs. Subsidies, tax credits, and regulatory measures promoting EV adoption can significantly boost sales.

3. **Technological Advancements:** Advances in electric vehicle technology, especially improvements in battery performance, range, and charging infrastructure, can positively impact early market sales. Enhanced features and competitive pricing can attract early adopters.

4. **Infrastructure Development:** The availability of a robust charging infrastructure is essential for the growth of the EV market. Early market sales may be limited if consumers perceive a lack of convenient charging options.

5. **Market Competition:** The presence of a variety of EV models from different manufacturers can stimulate early market sales. A diverse range of options catering to various consumer preferences and needs contributes to market growth.

6. **Awareness and Education:** Successful marketing campaigns and educational initiatives can influence consumer perceptions and create awareness about the benefits of electric vehicles. Early market sales may be higher if consumers are well-informed about the advantages of EVs.

7. **Economic Factors:** Economic conditions, including fuel prices and overall economic stability, can impact the early market for electric vehicles. Consumers may be more inclined to switch to EVs during periods of high fuel prices.

8. **Fleet Adoption:** In addition to individual consumers, fleet adoption by businesses can contribute significantly to early market sales. Companies adopting electric vehicles for their fleets can drive demand and set an example for wider adoption.

The potential sales in the early market of the Electric Vehicle (EV) market depend on various factors, including consumer adoption, regulatory support, technological advancements, and infrastructure development. Here are some key considerations:

9. **Consumer Adoption:** Early market sales depend on the willingness of consumers to adopt electric vehicles. Factors influencing consumer decisions include the perceived benefits of EVs, such as reduced environmental impact, lower operating costs, and government incentives.

10. **Regulatory Support:** Government policies and incentives play a crucial role in shaping the early market for EVs. Subsidies, tax credits, and regulatory measures promoting EV adoption can significantly boost sales.

11. **Technological Advancements:** Advances in electric vehicle technology, especially improvements in battery performance, range, and charging infrastructure, can positively impact early market sales. Enhanced features and competitive pricing can attract early adopters.

12. **Infrastructure Development:** The availability of a robust charging infrastructure is essential for the growth of the EV market. Early market sales may be limited if consumers perceive a lack of convenient charging options.

13. **Market Competition:** The presence of a variety of EV models from different manufacturers can stimulate early market sales. A diverse range of options catering to various consumer preferences and needs contributes to market growth.

14. **Awareness and Education:** Successful marketing campaigns and educational initiatives can influence consumer perceptions and create awareness about the benefits of electric vehicles. Early market sales may be higher if consumers are well-informed about the advantages of EVs.

15. **Economic Factors:** Economic conditions, including fuel prices and overall economic stability, can impact the early market for electric vehicles. Consumers may be more inclined to switch to EVs during periods of high fuel prices.

16. **Fleet Adoption:** In addition to individual consumers, fleet adoption by businesses can contribute significantly to early market sales. Companies adopting electric vehicles for their fleets can drive demand and set an example for wider adoption.

Most Optimal Market Segment

There are many EV manufacturing companies in the country like Hero Electric, Tata Motors, Ather Energy, Ashok Leyland, Hyundai Kona Electric, etc. Tesla has also arrived; the demand will get higher & higher since it is automotive so the investments and policies and all that would be bigger but it will take some time to perfectly settle in India. The following are the key insights of the project:

- The electric vehicle industry has not done that much good due to the devastating hit of the Covid outbreak but it will take a huge jump in upcoming years.
- The use of EVs will be game-changing in terms of environment, air, noise pollution-free, post-electric, and much more.
- The company should plan to establish local operations in India either by partnering with a localcompany or by setting up its own manufacturing/ development unit, potentially combined with imports of specific components.
- The company would expect to further grow in India, underpinned by a growing commercial fleet market for two-wheelers and three-wheelers especially for last km delivery/urban freight services. The company must see opportunities across the supply chain in the battery, EV component and charging infrastructure segments including the machinery and equipment needed for establishing manufacturing plants, training and provision of skilled workforce etc.
- The company should start their business from Metro Cities in India and then after considerablebusiness expand to other cities of the same state of the Metro Cities. This will help the company to expand easily as they will be having a prior knowledge of business from Metro Cities and Network of Supply chain will be easy for the company as the time goes in business.

Conclusion:

In conclusion, effective segmentation is pivotal in navigating the Electric Vehicle (EV) market. By understanding diverse consumer segments—such as eco-conscious, tech enthusiasts, practical consumers, performance seekers, and urban commuters—stakeholders can tailor strategies to address specific needs. Psychographic segmentation, focusing on attitudes and values, is instrumental in dispelling misconceptions and enhancing EV appeal. As the market evolves with technological advancements and growing sustainability concerns, continued adaptation of segmentation strategies is essential for fostering broader acceptance and driving the widespread adoption of electric vehicles.