Electric Vehicle Start-Up Analysis Report

Analysis of Indian Electric Vehicle Market to begin an Electric Vehicle Startup Business

By

Sindhiyadevi. T

Overview:

Electric vehicles, as the name suggests, run at least partially on electricity. Instead of fossil fuel-driven internal combustion engines, these vehicles are powered by electric motors for propulsion. The electric motor, in turn, derives energy from rechargeable batteries, solar panels or fuel cells.

Electric vehicles (EVs) are a promising technology for achieving a sustainable transport sector in the future, due to their exceptionally low to zero carbon emissions, low noise, high efficiency, and flexibility in grid operation and integration. In India, the automobile industry is one of the key sectors driving economic growth. More than 25 Mn vehicles including passenger vehicles, commercial vehicles, three wheelers and two-wheelers were produced in FY17, reporting a jump of 5.41% from the previous fiscal. However, it is also one of the biggest contributors of pollution, which incidentally keeps the country's capital shrouded in smog for several months every winter.

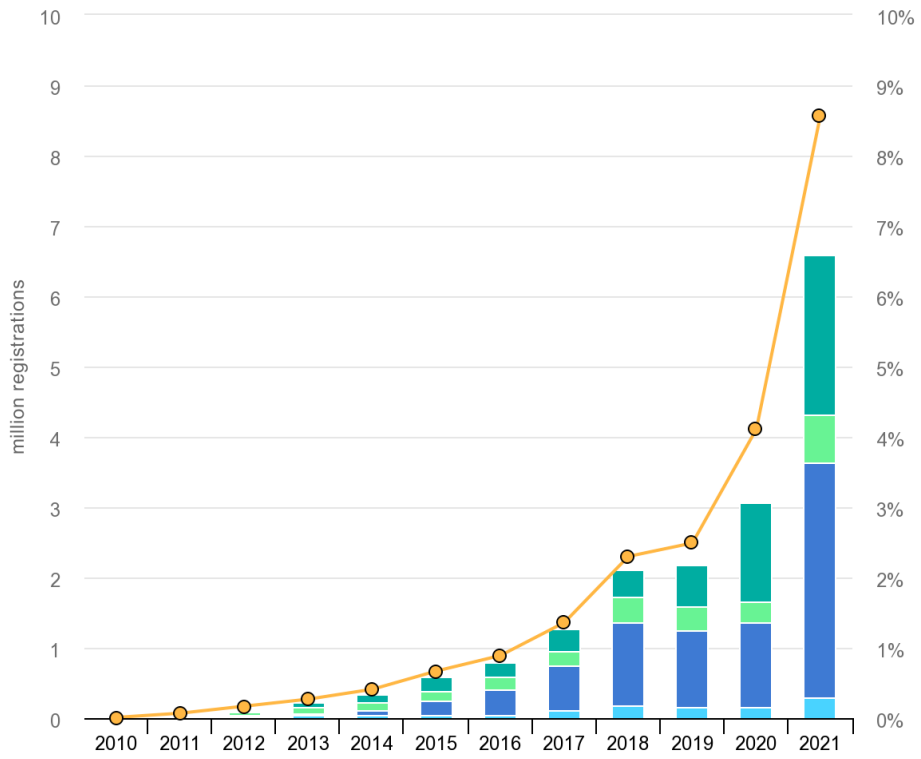
As India hurtles towards an apocalyptic future, the Indian government is now racing to switch to all-electric cars by 2030. While the report by UBS might be an overly optimistic take on what the future of electric vehicles will look like, one cannot overlook the massive strides the industry has made in the last decade or so.

Market overview:

As more and more governments across the world are aggressively looking for ways to benefit from the ongoing EV revolution, the market opportunity in the space has grown dramatically over the years. Thanks to the push from local governments and corporates, the sector is expected to grow at a CAGR of 28.3% between 2017 and 2026, as per BIS Research.

For the first time in 2015, the global electric vehicle fleet surpassed 1 Mn, which was later doubled in 2016.

New registrations of electric cars hit an all-time high in 2016, with over 750K sales worldwide, according to the International Energy Agency (IEA). With a 29% market share, Norway currently boasts the most successful deployment of electric vehicles globally, followed by the Netherlands at 6.4% and Sweden with 3.4% market share. Recently, the Scandinavian nation of Norway set a new world record, with electric and hybrid vehicles accounting for nearly 52% of its total car sales in 2017 against 40% in 2016. Coming closely behind are China, France and the United Kingdom, all of whom have electric car market shares close to 1.5% respectively.



Considering the growing pollution problem, the Government of India, over the last few years, has been increasingly promoting alternative mobility solutions, chief among which are electric vehicles. Because they are powered by electricity and not fossil fuels, EVs are relatively emission-free and therefore, hold the key to India's burgeoning air pollution issue.

Along those lines, the government unveiled the "National Electric Mobility Mission Plan (NEMMP) 2020" in 2013, under which it has rolled out a slew of initiatives and programmed geared towards accelerating the adoption of electric vehicles in India. The plan, essentially, aims to deploy around 7 Mn hybrid and all-electric vehicles in the country by 2020.

Realizing the potential of EVs, the Indian government has also announced plans to make the country a 100% electric vehicle nation by 2030. To that end, in January 2017, the central government said that it would bear up to 60% of the research and development (R&D) cost for developing the indigenous low-cost electric technology.

- Kerala aimed to put one million EV units on the road by 2022 and 6,000 e-buses in public transport by 2025.
- Telangana aims to have EV sales targets for 2025 to achieve 80% 2- and 3- wheelers (motorcycles, scooters, auto-rickshaws), 70% commercial cars (ride-hailing companies, such as Ola and Uber), 40% buses, 30% private cars, and 15% electrification of all vehicles.
- Bengaluru has recently bought 90 electric buses for in city transportation for BMTC and is looking to go all electric by 2023.

Factors influencing the Global Electric Vehicles Market Growth:

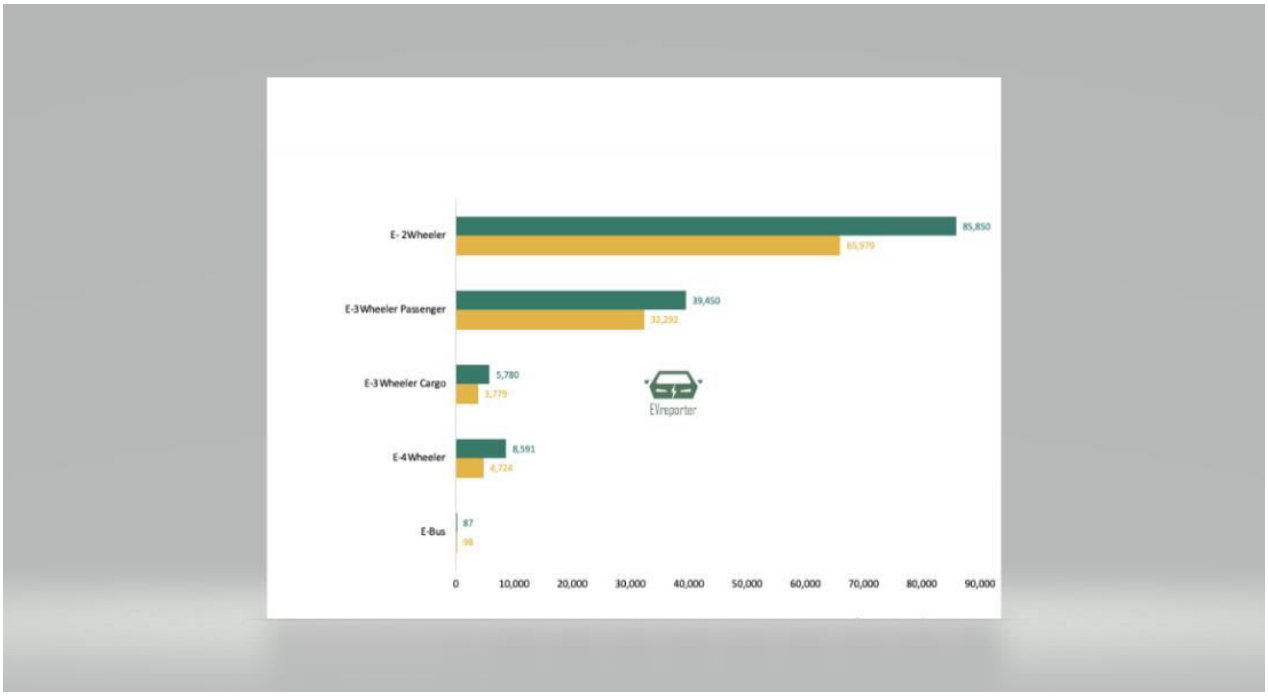
The growth of electric vehicles market is attributed to the ever-increasing production and sales of automobiles. Vehicles are becoming an increasingly affordable commodity owing to the growing disposable incomes across the world.

Another important factor which is pushing the surge of electric vehicle market is the attractive incentives provided by the governments of various countries with a motive. Customers are offered benefits such as tax exemption, reduced selling prices, and free charging of electric vehicles at various charging points.

Segmentation:

Electric vehicle market can be segmented by hybrid electric vehicles, plug-in hybrid electric vehicles, battery electric vehicles, type of product (two-wheeler, four-wheeler) and finally by region.

India is the second most populated country in the world after China, and just like China, which has the largest electric bus fleet in the world. India is also pushing hard for the electrification of buses. Many state governments have already started procuring electric buses from Chinese and local electric bus manufacturers.



Electric Two-Wheeler market in India:

From 2017 to 2021, electric two-wheeler sales increased at 9.9% CAGR, which was slower than expected because of massive production shutdowns in 2020 due to COVID-19. China, the United States, Germany, Spain, Australia & New Zealand, and Japan accounted for large share in the global demand for electric two wheelers.

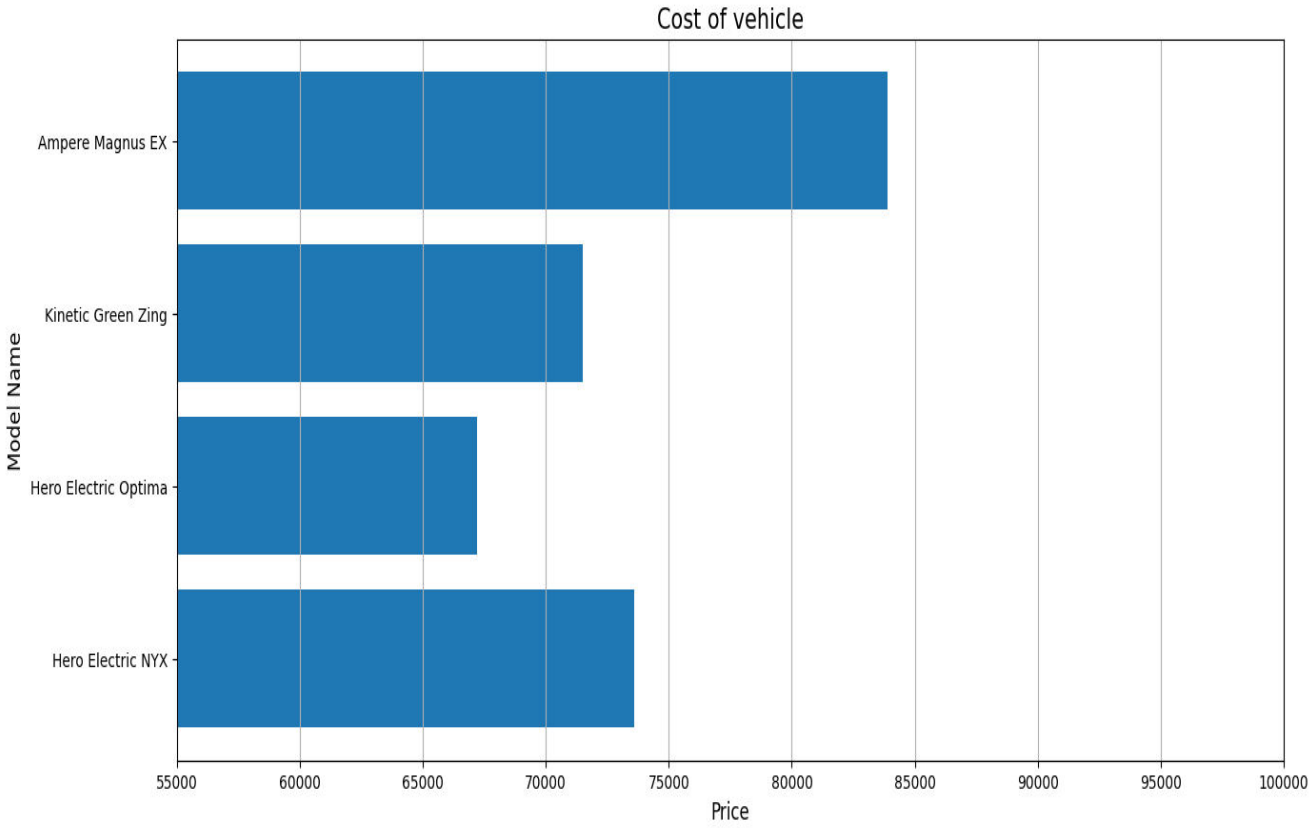
Electric vehicles can contribute to the reduction in air pollution, carbon emission and oil dependency in India. Due to fewer moving parts compared to ICE vehicles, electric two-wheeler requires less maintenance service cost and overall, less running cost. Also, electric two-wheelers provide a better performance range per charge compared to the same amount of fuel in ICE vehicles. Electric two-wheeler manufacturers, along with emerging players, are increasing the competition while reducing the cost of ownership in the market with their technologically advanced products, which is expected to aid the growth even further in upcoming years. In India, around 50% of the middle-class population considers intra-city travel for their daily need while keeping minimal cost.

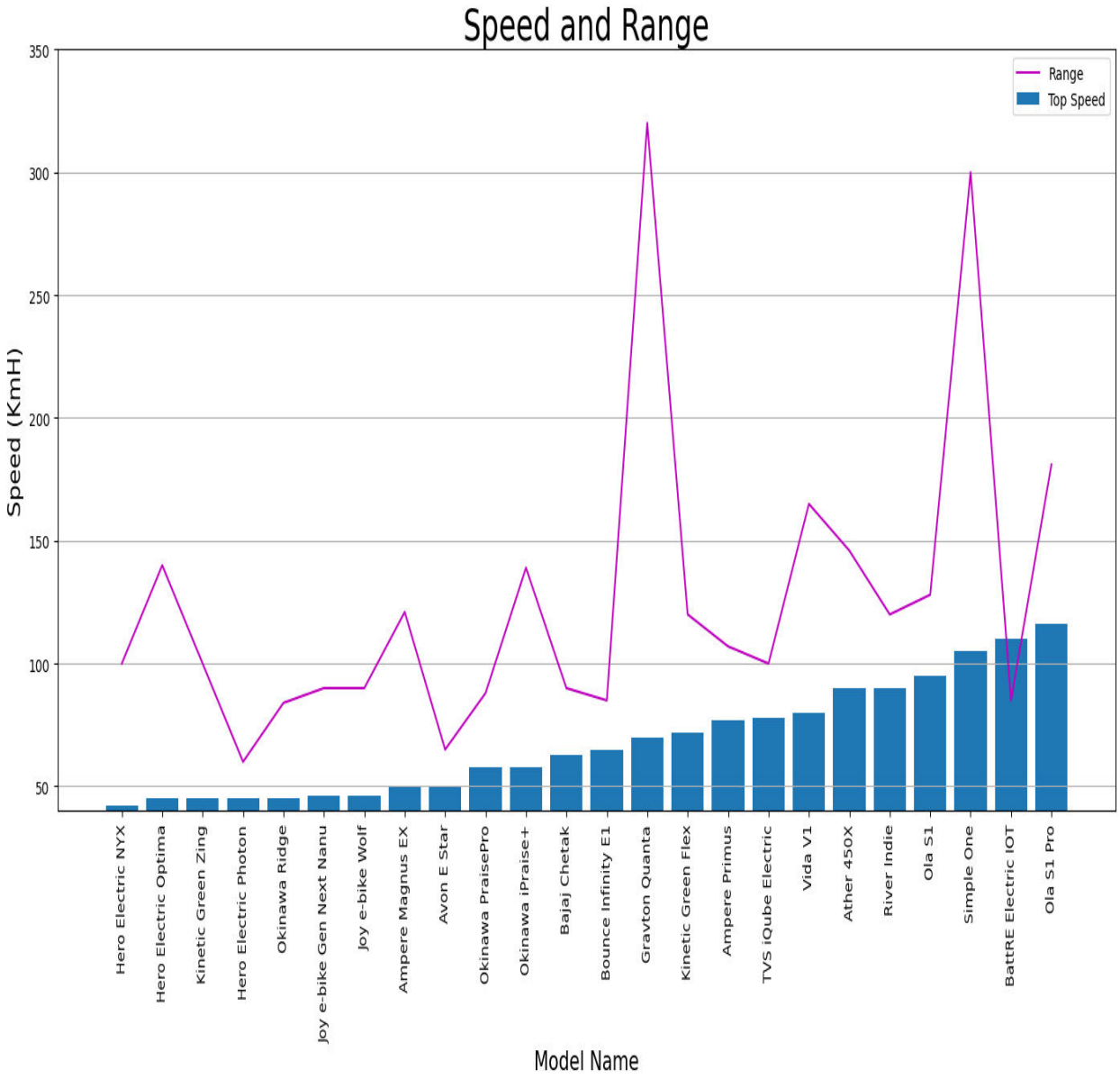
Important developments in the electric two wheelers business will be related to battery technology. Improvements in Li-ion batteries, for example, have resulted in lighter and longer-lasting electric two-wheel vehicles than NiMH and lead-based batteries.

The Indian electric scooter and motorcycle market size stood at USD 893 million in 2022, and it is expected to advance at a compound annual growth rate of 27.30% during 2022-2030, to reach USD 6,161 million by 2030.

Furthermore, the availability of a considerable number of electric two-wheeler models, their low cost, as well as their availability as a substitute for conventional fuel-base vehicles. These aforementioned factors are fueling the demand in the Indian electric vehicle market.

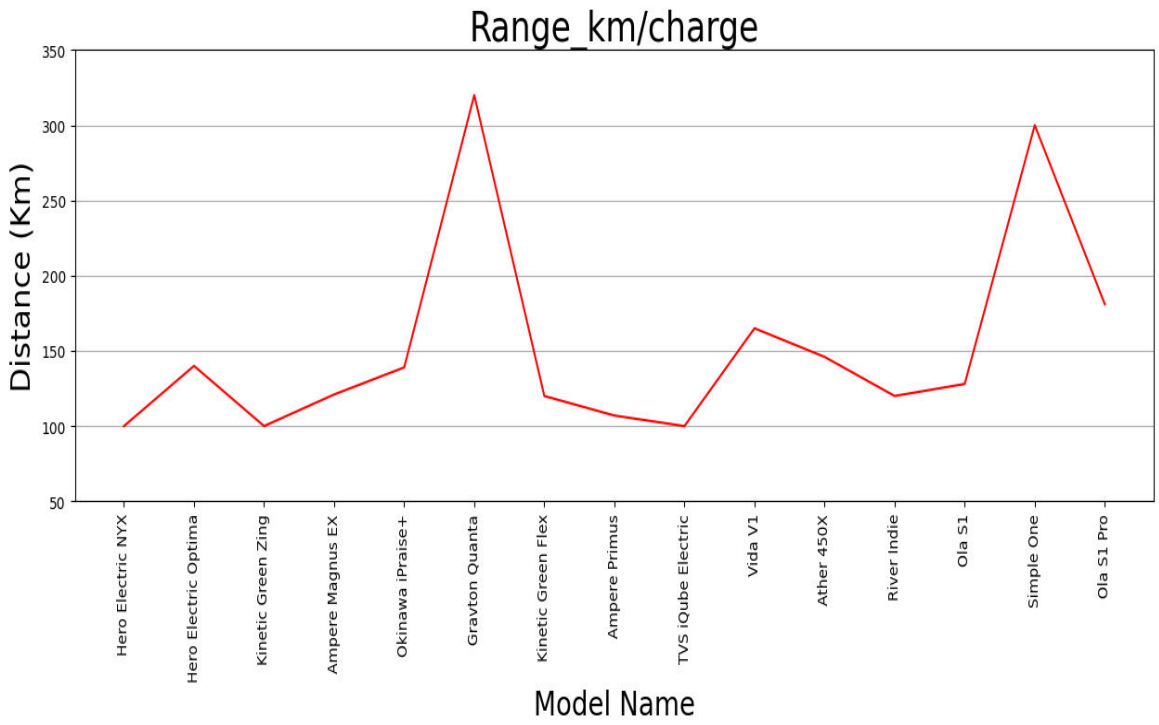
Below are the top electric vehicles model in India with affordable cost.


Cost of vehicle
Ampere Magnus EX
Kinetic Green Zing
Hero Electric Optima
Hero Electric NYX
Model Name
55000
60000
65000
70000
75000
80000
85000
90000
95000
100000
Price



- The above chart describes the available model of Two-wheeler with their respective speed and range.

- According to the above chart Ampere magnus, Kinetic Green and Hero electric Optima are having good speed and range with affordable price.



- The above chart describes the models with high range.

Dependent variables to find the best models with range/speed/price/

- Price
- Range_km/charge
- Top_speed_kmph

Price:

Price plays an important role in electric vehicle, its very important to produce vehicle based on economic level of the people.

Range_km/charge:

Mid-level people always expect medium price with good range scooter, so it's a very critical variable people consider while buying a vehicle.

Top_speed_kmph:

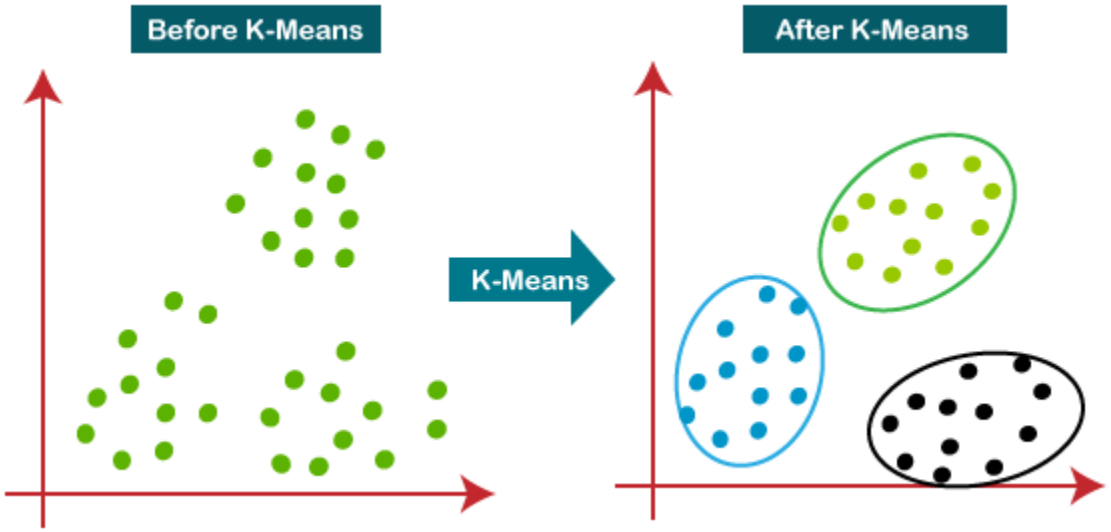
Mid-level people always expect medium price with good range scooter, so it's a very critical variable people consider while buying a vehicle.

K-Means Clustering:

Clustering:

Clustering is one of the most common exploratory data analysis techniques used to get an intuition about the structure of the data. It can be defined as the task of identifying subgroups in the data such that data points in the same subgroup (cluster) are very similar while data points in different clusters are very different.

we have N number of unlabeled multivariate datasets of various animals like dogs, cats, birds, etc. The technique of segregating these datasets into various groups based on having similar features and characteristics is called clustering.



K Means Algorithm:

K means is one of the most popular Unsupervised Machine Learning Algorithms Used for Solving Classification Problems in data science and is very important if you are aiming for a data scientist role. K Means segregates the unlabeled data into various groups, called clusters, based on having similar features and common patterns. This tutorial will teach you the definition and applications of clustering, focusing on the K means clustering algorithm and its implementation in Python. It will also tell you how to choose the optimum number of clusters for a dataset.

Implementation of the K-Means Algorithm:

The implementation and working of the K-Means algorithm are explained in the steps below:

Step 1: Select the value of K to decide the number of clusters (n_clusters) to be formed.

Step 2: Select random K points that will act as cluster centroids (cluster_centers).

Step 3: Assign each data point, based on their distance from the randomly selected points (Centroid) to the nearest/closest centroid, which will form the predefined clusters.

Step 4: Place a new centroid of each cluster.

Step 5: Repeat step no.3, which reassigns each datapoint to the new closest centroid of each cluster.

Step 6: If any reassignment occurs, then go to step 4; else, go to step 7.

Step 7: Finish

In this analysis K-means algorithm have been used to find the best region to start the Electric vehicle business.

Data set have been collected based on Geographic, Demographic, Psychographic and Behavioral data.

Reference Link for Data collection:

- https://pib.gov.in/PressReleasePage.aspx?PRID=1842704
- https://censusindia.gov.in/census.website/
- https://jmkresearch.com/wp-content/uploads/2022/11/Electric-Two-Wheeler-Market-in-India_Nov-2022-1.pdf
- https://jmkresearch.com/electric-vehicles-published-reports/annual-india-ev-report-card-fy2022/

Dependant variable:

Based on the below variable the most suitable state has been found.

- Total Electric Vehicle
- Charging Stations
- Total Population
- Total Working People
- EV Annual Sales Percentage in 2022

Total Electric Vehicle:

This data will be collected based on the survey and direct interview. Finding total number of electric vehicles on the region helps to take the decision whether the people are adopted to the new technology or not.

Charging Stations:

It is important to find the available charging stations on the region. Because charging source should be available in order the people to buy the vehicle. So, this variable plays an important role to find the best region.

Total Population:

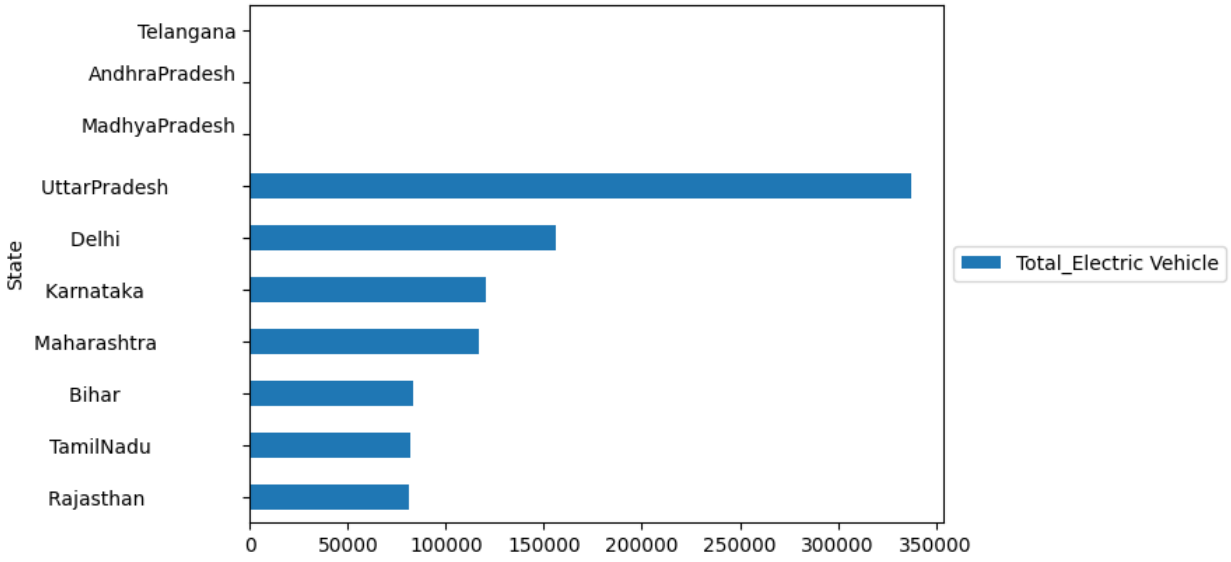
Total population is a geographic data, the difference percentage of total population and people who bought electric vehicle is plays major role.

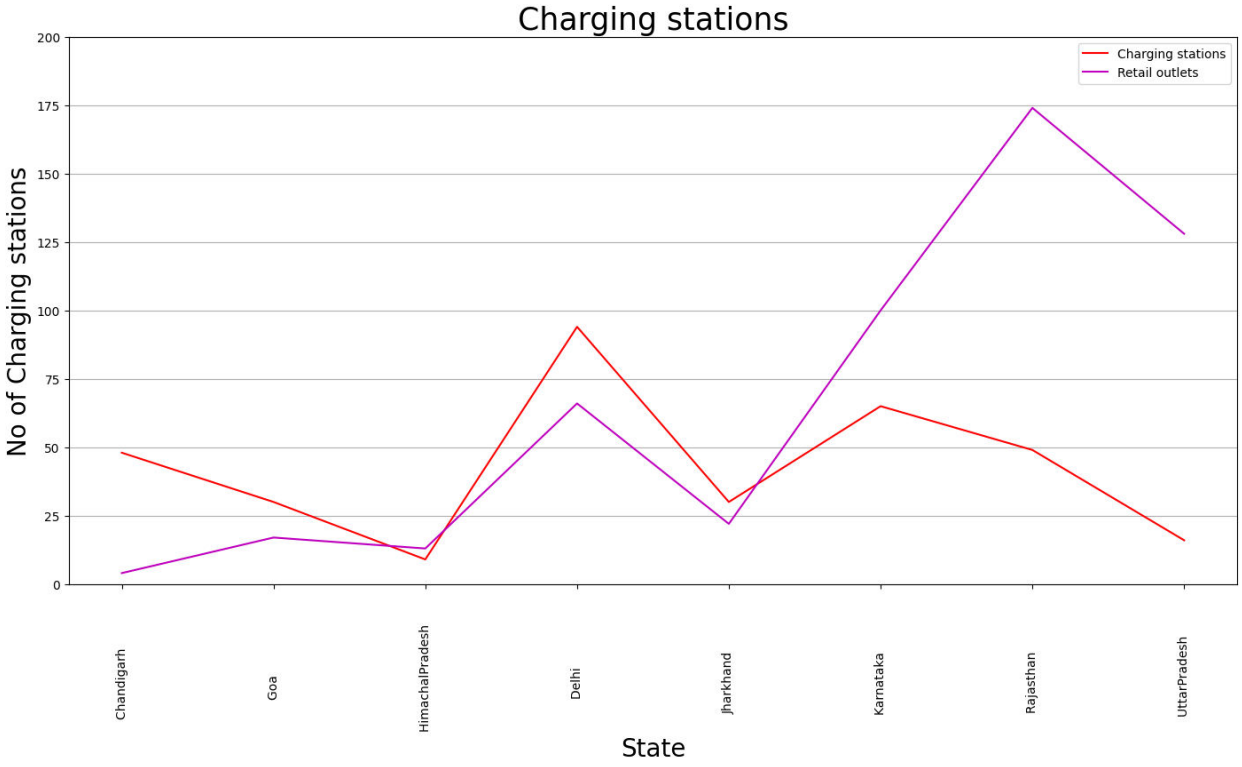
Total Working People:

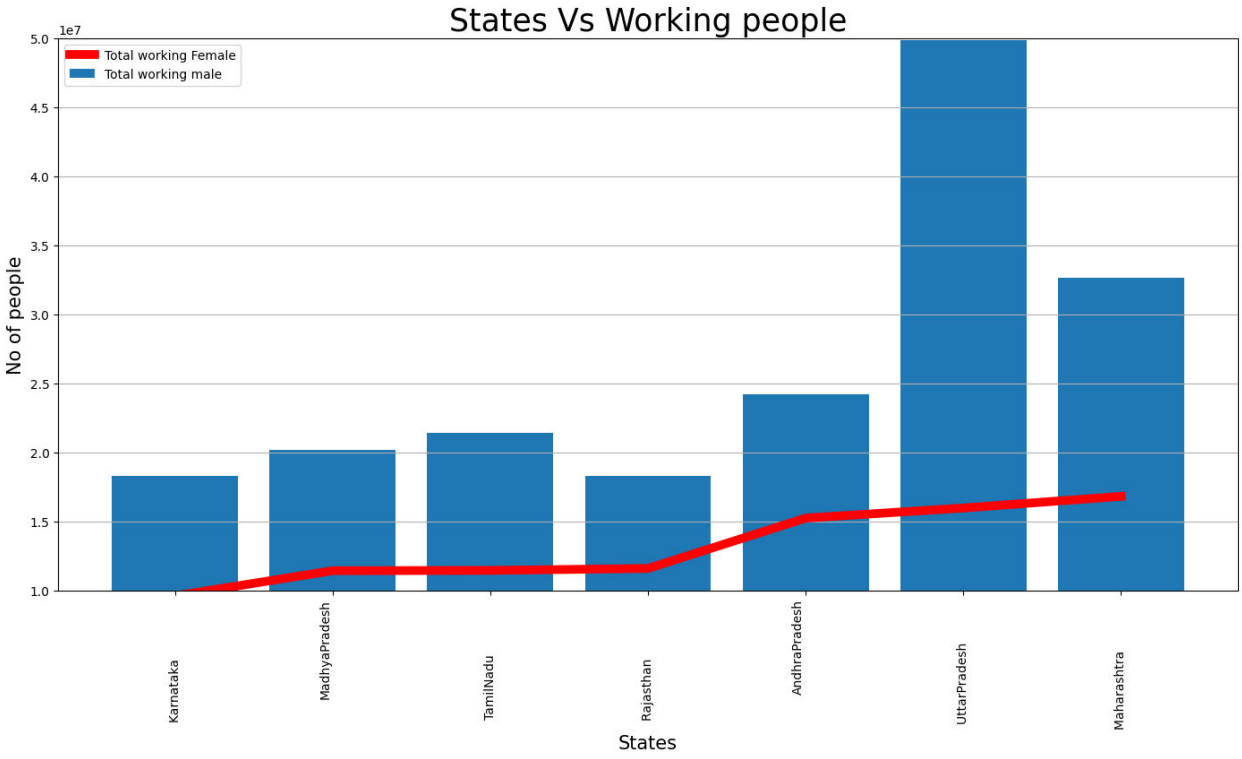
Number of increases in working people more chances to buy the electric vehicle.

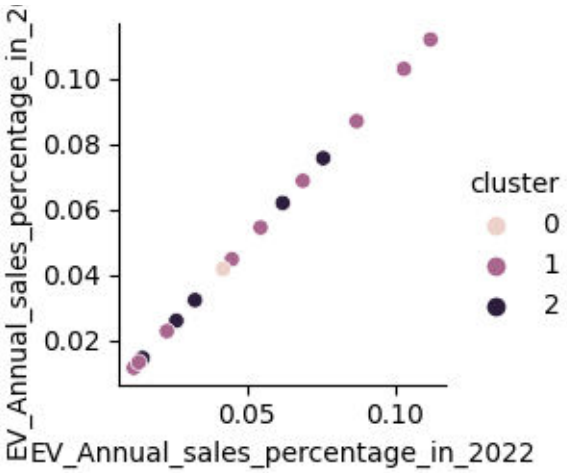
EV Annual Sales Percentage in 2022:

It plays very big role to find the region.




Charging stations
Charging stations
Retail outlets
No of Charging stations
200
175
150
125
100
75
50
25
0
Chandigarh
Goa
HimachalPradesh
Delhi
Jharkhand
Karnataka
Rajasthan
UttarPradesh
State


States Vs Working people
1e7
Total working Female
Total working male
No of people
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
Karnataka
MadhyaPradesh
TamilNadu
Rajasthan
AndhraPradesh
UttarPradesh
Maharashtra
States



Improvements on Segmentation:

The following things will improve the results of the segmentation.

1. We can apply multiple segmentation algorithm on the dataset to find the best result, its time-consuming process.
2. Data collection plays main role to find the best result, to get the accurate data we can visit every region to collect the quality and accurate data. Paid data set will be having many efforts.

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https://www.persistencemarketresearch.com/market-research/electric-two-wheelers-market.asp

https://viva.pressbooks.pub/humangeog/chapter/geographic-skills/#:~:text=In%20terms%20of%20geography%2C%20data,tend%20to%20be%20more%20quantitative.

Github:

https://github.com/SindhiyaDevi/Electric-Vehicle-Analysis