

Visualization Tool for Electric Vehicle Charge and Range Analysis

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PROJECT REPORT

INTRODUCTION:

A vehicle that can be powered by an electric motor that draws electricity from a battery and is capable of being charged from an external source and have an electric motor instead of an internal combustion engine. The Electric Vehicle (EV) is not new, but it has been receiving significantly more attention in recent years. Advances in both EV analytics and battery technologies have led to increased automotive market share. However, this growth is not attributed to hardware alone. The modern mechatronic vehicle marries electrical storage and propulsion systems with electronic sensors, controls, and actuators, integrated closely with software, secure data transfer, and data analysis, to form a comprehensive transportation solution. Advances in all these areas have contributed to the overall rise of EV's, but the common thread that runs through all these elements is data analytics. The new EV's are combined Electrical storage and propulsion systems with electronic sensors, controls, and actuators, integrated closely with software, secure data transfer to form a comprehensive transportation solution.

PURPOSE:

The purpose of a visualization tool for electric vehicle (EV) charge and range analysis is to help EV drivers and fleet managers better understand their EV charging and driving patterns. This tool can provide insights into how much energy is being used, how far the vehicle can go on a single charge, and how long it takes to charge the battery.

Some of the specific benefits of a visualization tool for EV charge and range analysis include:

1. Improved Range Anxiety: One of the biggest concerns for EV drivers is range anxiety, or the fear of running out of battery power before reaching their destination. A visualization tool can help drivers understand how far they can go on a single charge and how long it will take to recharge the battery, reducing their anxiety and increasing their confidence in their EV.

2. **Optimized Charging Strategy:** A visualization tool can help drivers and fleet managers optimize their charging strategy by identifying the most efficient times and locations to charge the vehicle. This can help reduce charging costs and minimize downtime.

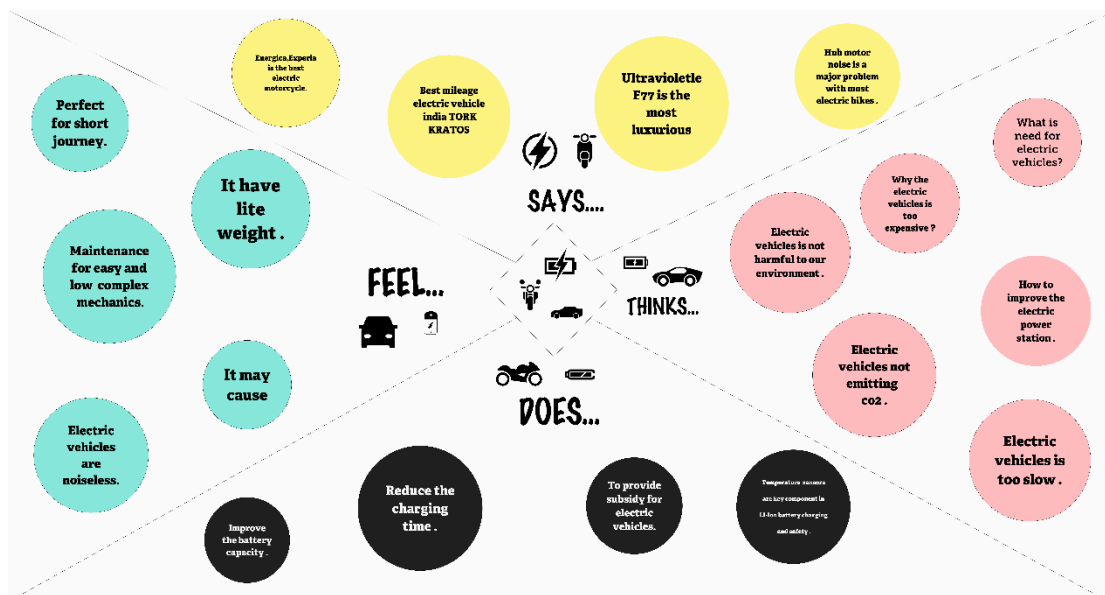
3. **Increased Awareness of Energy Use:** A visualization tool can help drivers and fleet managers become more aware of their energy use patterns, including how much energy is being used for different driving conditions and how much energy is being used for different components of the vehicle. This can help identify areas where energy use can be reduced to improve efficiency and reduce costs.

4. **Better Vehicle Maintenance:** A visualization tool can also help identify potential issues with the vehicle's battery or charging system, allowing for proactive maintenance and reducing the risk of unexpected downtime.

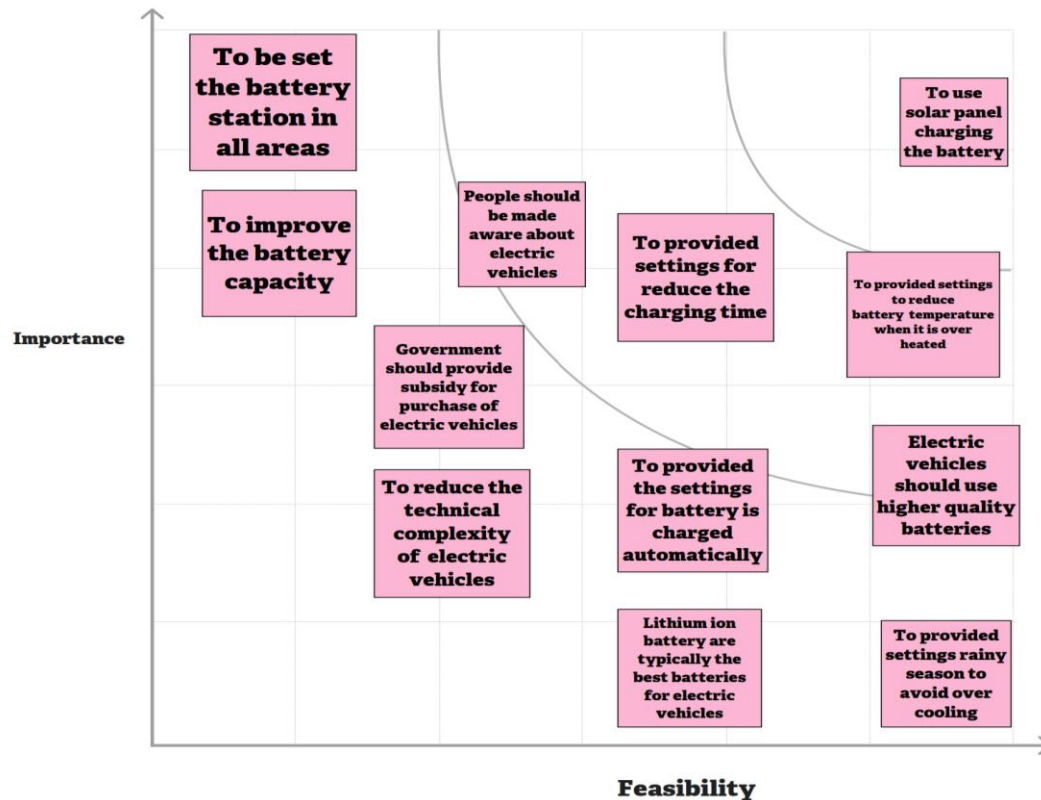
Overall, a visualization tool for EV charge and range analysis can provide valuable insights that can help EV drivers and fleet managers make more informed decisions about their vehicle usage and charging strategies, leading to increased efficiency, reduced costs, and improved overall performance.

PROBLEM DEFINITION & DESIGN THINKING

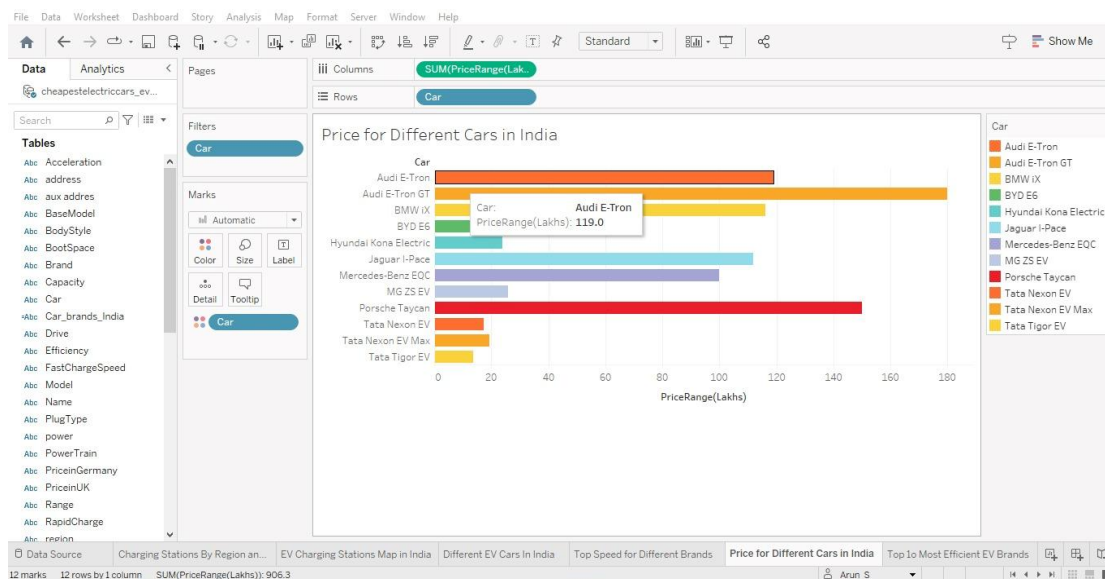
Empathy Map:

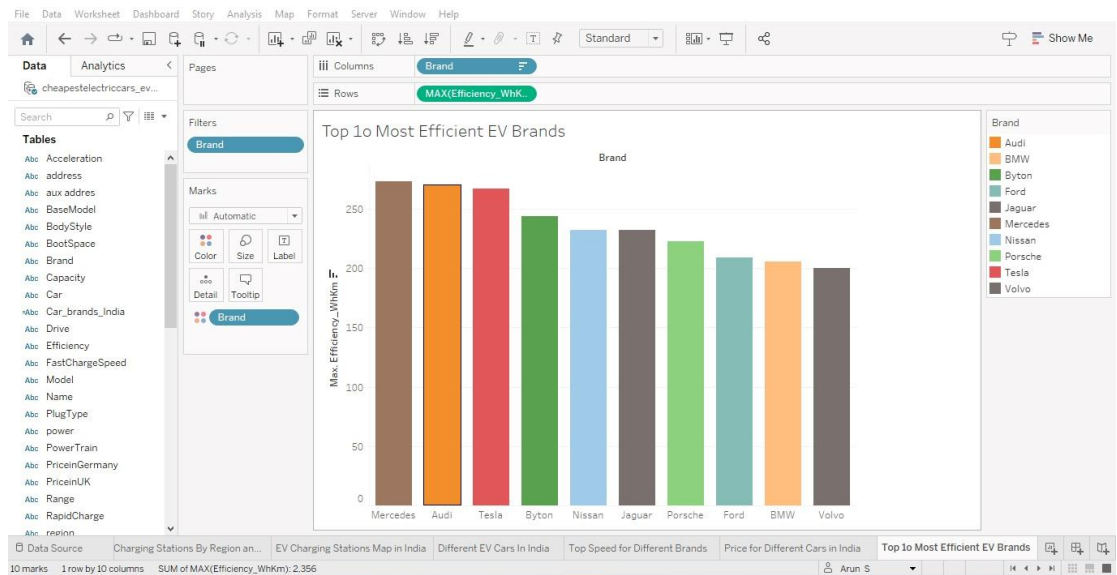
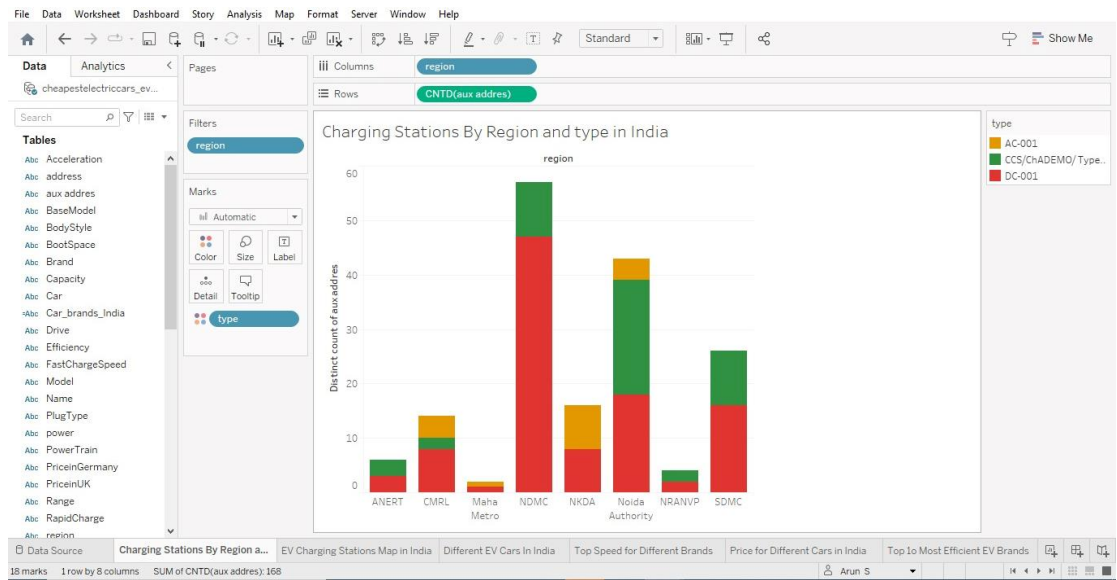


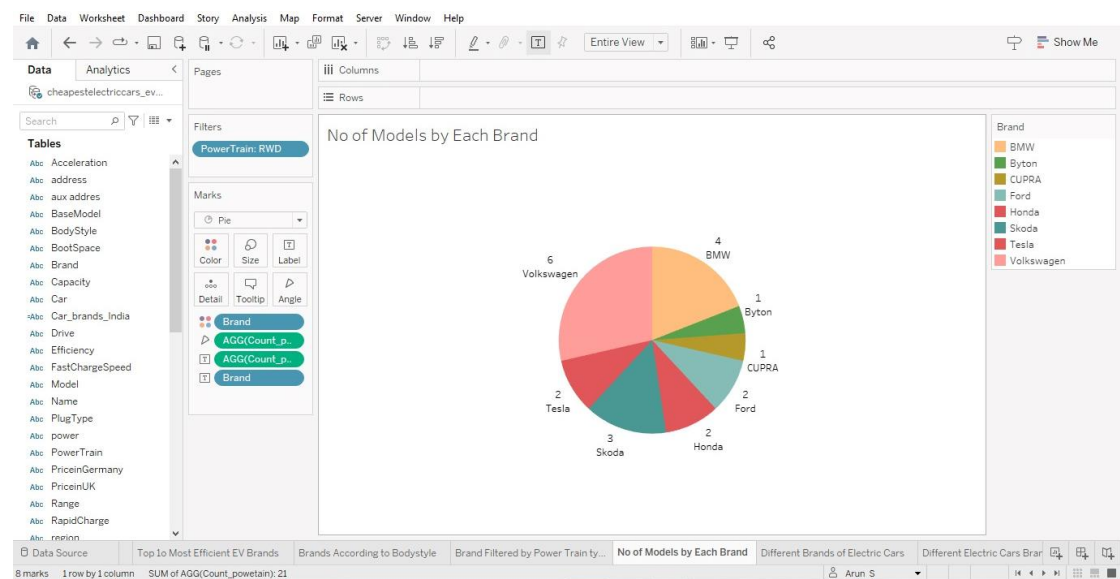
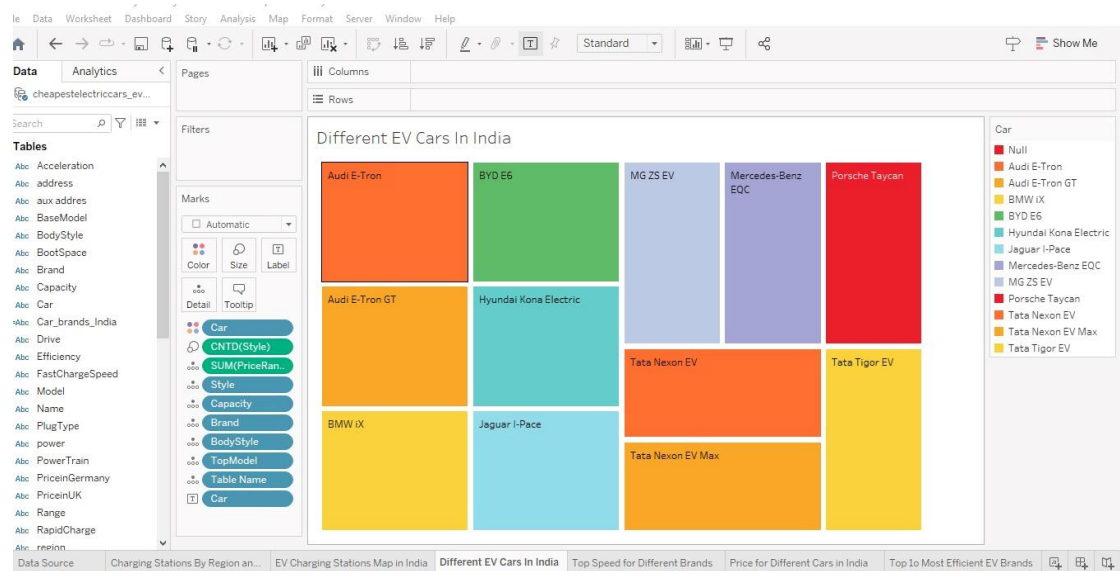
IDEATION & BRAINSTORMING MAP:

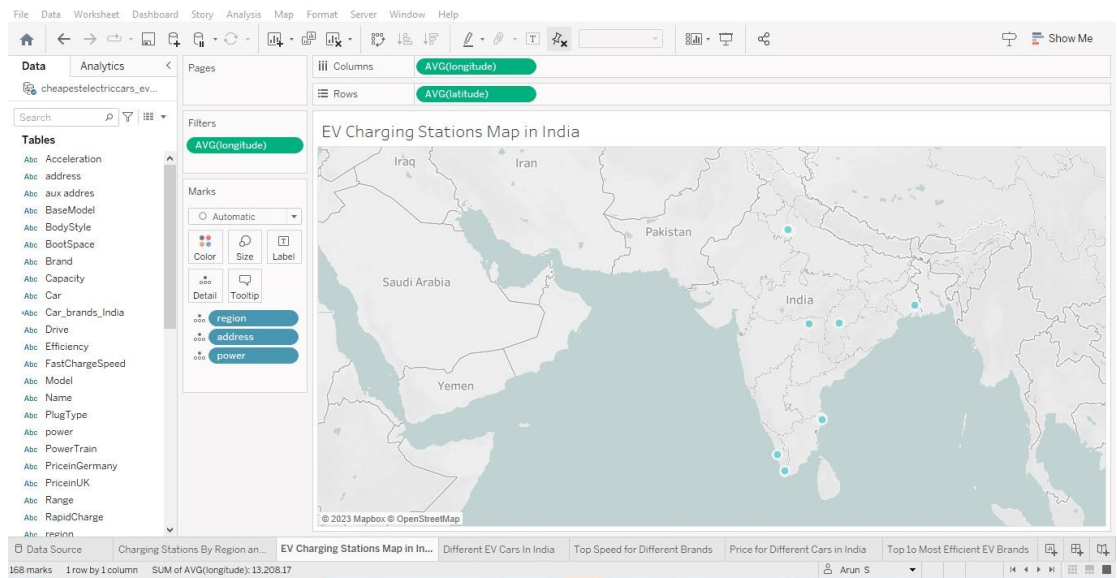
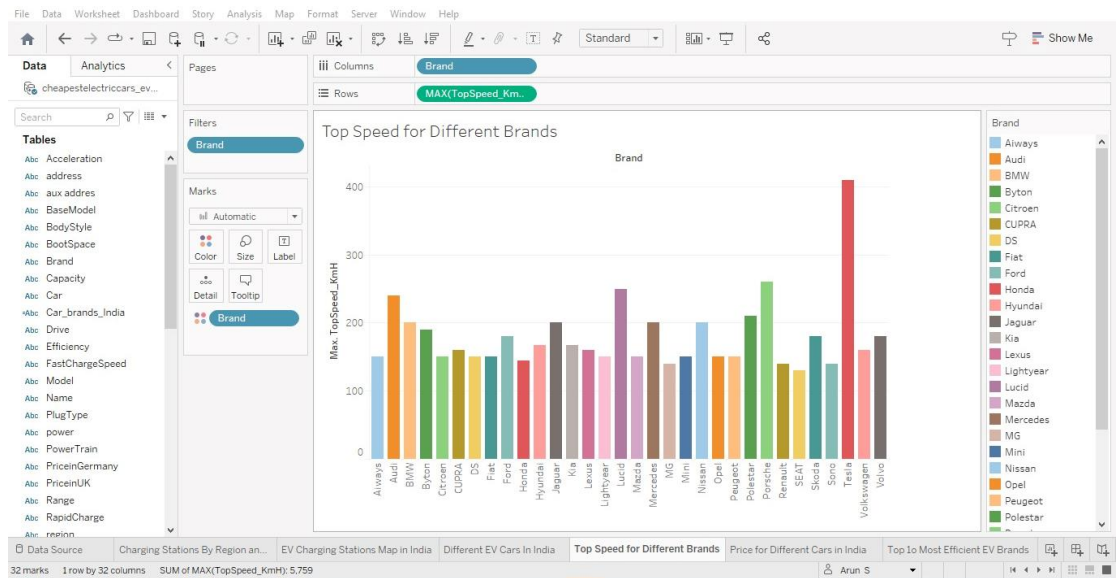


RESULT:









ADVANTAGES & DISADVANTAGES:

Advantages of electric vehicles:

1. Environmentally friendly: Electric vehicles emit no harmful pollutants, unlike gasoline and diesel vehicles, which emit carbon dioxide, nitrogen oxides, and other pollutants.
2. Lower operating costs: Electric vehicles are much cheaper to operate than gasoline or diesel vehicles. The cost of electricity is lower than the cost of gasoline or diesel, and electric vehicles require less maintenance because they have fewer moving parts.
3. Quieter: Electric vehicles are much quieter than gasoline or diesel vehicles, which is good for reducing noise pollution in urban areas.
4. Energy efficient: Electric vehicles are more energy efficient than gasoline or diesel vehicles, meaning they require less energy to travel the same distance.

Disadvantages of electric vehicles:

1. Limited driving range: Electric vehicles can only travel a limited distance on a single charge, which can be a problem for long-distance travel.
2. Long charging time: Charging an electric vehicle can take several hours, which is much longer than the time it takes to fill up a gasoline or diesel vehicle.
3. Limited charging infrastructure: There are still relatively few charging stations available for electric vehicles, which can be a problem for those who need to travel long distances.
4. Higher upfront cost: Electric vehicles are generally more expensive than gasoline or diesel vehicles, although the cost is coming down as technology improves and economies of scale are achieved.

APPLICATIONS:

Electric vehicles have a wide range of applications in various sectors, including:

1. **Personal Transportation:** Electric vehicles are increasingly being used for personal transportation. They are particularly popular in urban areas where short commutes are common. Electric cars, scooters, and bicycles are being used as efficient and eco-friendly alternatives to gasoline-powered vehicles.
2. **Public Transportation:** Electric buses and trains are being used in many cities to provide sustainable and efficient public transportation. Electric buses and trains are particularly useful in areas where air quality is poor, such as in cities with high levels of smog.
3. **Commercial Transportation:** Electric vehicles are being used in the commercial sector for transportation and delivery. Electric trucks and vans are being used for last-mile deliveries, reducing emissions and improving air quality in urban areas.
4. **Military and Defense:** Electric vehicles are being used by the military for various applications, including transportation, reconnaissance, and logistics. Electric vehicles are particularly useful in remote areas where it is difficult to transport fuel and where emissions can have a significant impact on the environment.
5. **Agriculture:** Electric vehicles are being used in the agricultural sector for various applications, including transporting crops and livestock. Electric tractors are particularly useful for small farms and urban agriculture.
6. **Mining and Construction:** Electric vehicles are being used in the mining and construction industry for various applications, including hauling and excavation. Electric vehicles are particularly useful in underground mines, where emissions can be dangerous to workers.

Overall, electric vehicles have a wide range of applications in various sectors and are becoming increasingly popular as a sustainable and eco-friendly alternative to gasoline-powered vehicles.

CONCLUSION:

- A visualization tool for electric vehicle charge and range analysis can be extremely beneficial for both EV owners and fleet managers.
- By providing real-time data on the current state of charge, range, and predicted range based on driving behaviour, this tool can help users make informed decisions about their charging and driving habits.
- Additionally, the visualization tool can help identify patterns in charging behaviour and usage, allowing fleet managers to optimize their charging infrastructure and improve overall efficiency.
- Overall, a well-designed visualization tool can help promote the adoption of electric vehicles by alleviating concerns about range anxiety and providing users with the information they need to maximize the benefits of their EV.

FUTURE SCOPE:

The future scope of electric vehicles (EVs) is very promising, and there are many reasons to believe that they will become more widespread in the coming years. Here are some reasons why:

1. Environmental Concerns: There is a growing concern about the impact of traditional internal combustion engine (ICE) vehicles on the environment. EVs have zero tailpipe emissions and are therefore seen as a cleaner alternative to ICE vehicles. Governments around the world are also promoting the adoption of EVs to reduce air pollution and greenhouse gas emissions.
2. Improvements in Battery Technology: One of the biggest challenges facing the widespread adoption of EVs has been their limited range and long charging times. However, battery technology is rapidly improving, and we are seeing new breakthroughs in energy density, charge times, and cost. As battery technology continues to improve, EVs will become more practical and convenient for everyday use.
3. Cost Reduction: As production volumes increase, the cost of EVs is expected to decrease. The cost of batteries, which is currently one of the most significant factors contributing to the high cost of EVs, is expected to decrease by up to 50% in the next decade.
4. Government Incentives: Governments around the world are offering incentives to encourage the adoption of EVs. These incentives include tax credits, rebates, and subsidies, which can make EVs more affordable and attractive to buyers.
5. Industry Growth: The EV industry is growing rapidly, and many new players are entering the market. This growth is driving innovation and competition, which is leading to more affordable and accessible EVs for consumers.

Overall, the future scope of electric vehicles is very promising, and we can expect to see continued growth and development in this sector. As the technology continues to improve and become more affordable, EVs will become a more practical and accessible alternative to traditional ICE vehicles.

APPENDIX:

Source Code:

https://drive.google.com/file/d/1--5g0HU7iDrtr_M8u0e0TlMFHcUultQm/view?usp=drivesdk