Visualization Tool For Electric Vehicle Charge And Range Analysis

Important Links

Github
: https://github.com/KumarLakshmanan/naanmudhalvan

Live Demo
:https://kumarlakshmanan.github.io/naanmudhalvan

Demonstration Video
:https://github.com/KumarLakshmanan/naanmudhalvan/raw/main/Project%20Demonstration.mp4

Project Manual
:https://github.com/KumarLakshmanan/naanmudhalvan/blob/main/Project%20Manual.pdf

1. INTRODUCTION

1.1 OVERVIEW

Electric vehicles are becoming increasingly popular as people seek to reduce their carbon footprint and dependence on fossil fuels. However, one of the biggest concerns for electric vehicle owners is the range and charging capabilities of their vehicles. To address this concern, I have developed a visualization tool for electric vehicle charge and range analysis.

The visualization tool provides an easy-to-use interface for electric vehicle owners to explore and analyze the range and charging capabilities of their vehicles. The tool allows users to input various parameters such as battery capacity, charging rate, and driving conditions to simulate and visualize the range of their electric vehicles.

Furthermore, the tool also provides visualizations of the charging process, including the charging time required to fully charge the battery and the amount of charge that can be obtained at different charging stations. This information can be incredibly helpful for electric vehicle owners who are planning long trips and need to know where and when to charge their vehicles.

Overall, this visualization tool provides a comprehensive and intuitive way for electric vehicle owners to analyze the charge and range capabilities of their vehicles, ultimately helping them make more informed decisions and optimize their driving experience.

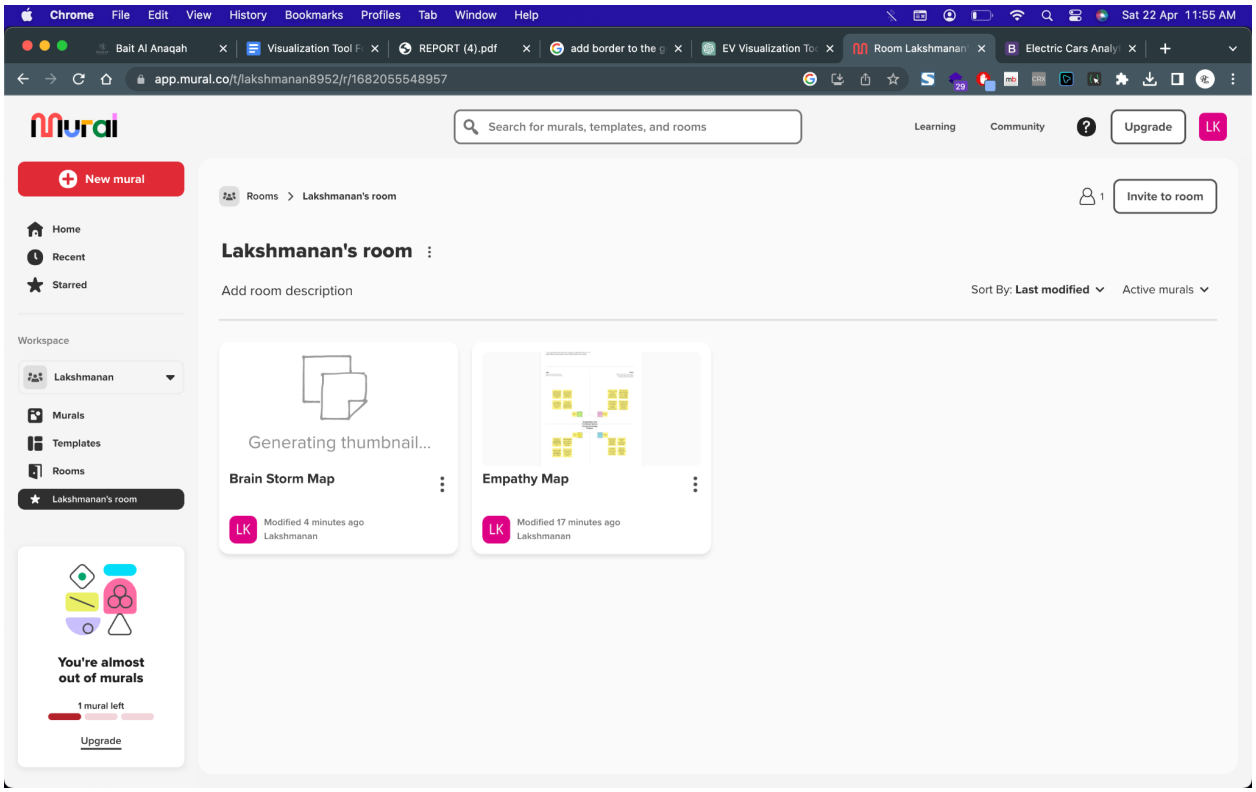
1.2 Purpose

The purpose of this project is to develop a visualization tool for electric vehicle charge and range analysis. The tool aims to provide an intuitive and comprehensive way for electric vehicle owners to explore and analyze the range and charging capabilities of their vehicles. By inputting various parameters such as battery capacity, charging rate, and driving conditions, users can simulate and visualize the range of their electric vehicles.

In addition to range analysis, the tool also provides visualizations of the charging process, including the charging time required to fully charge the battery and the amount of charge that can be obtained at different charging stations. This information can be incredibly helpful for electric vehicle owners who are planning long trips and need to know where and when to charge their vehicles.

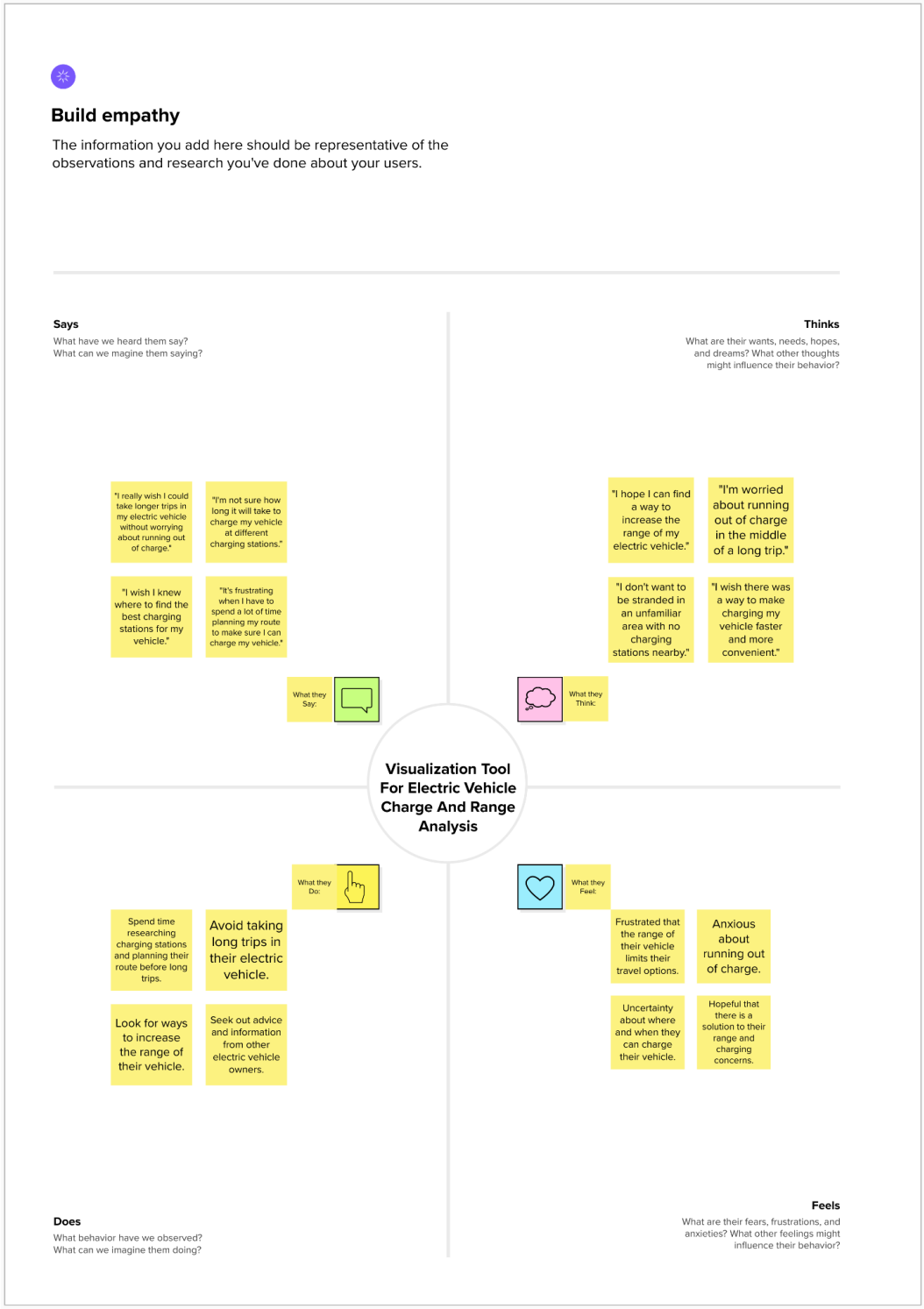
Overall, this project aims to provide electric vehicle owners with a tool that can help them make more informed decisions and optimize their driving experience. With the increasing popularity of electric vehicles, there is a growing need for tools that can help users better understand and manage their vehicles' range and charging capabilities. This project addresses this need by providing an easy-to-use and informative visualization tool for electric vehicle charge and range analysis.

2. PROBLEM DEFINING AND DESIGN THINKING



Mural Dashboard

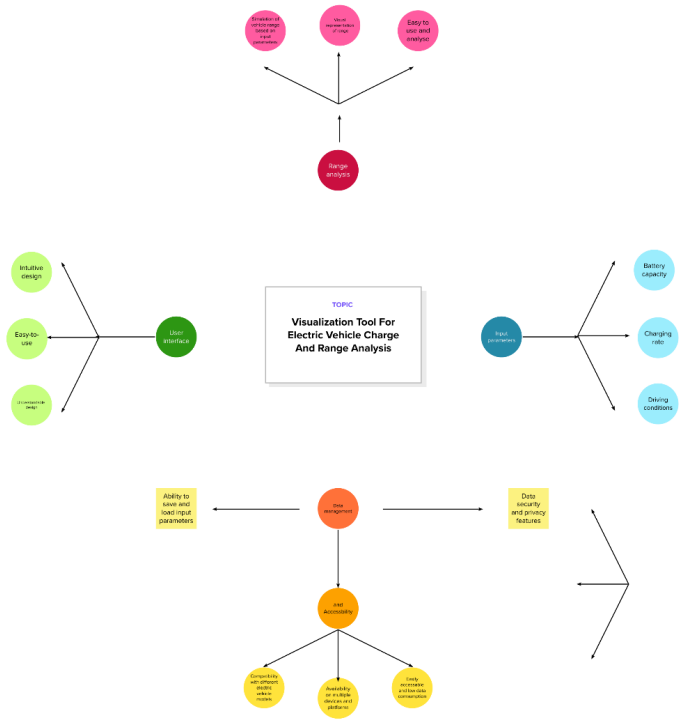
2.1 EMPATHY MAP



2.2 BRAINSTORM MAP

Brainstorm ideas

Add the challenge as a question to the center of your mind map, and work individually adding your ideas to the mind map.



3. Advantages

1. Provides Range Analysis: One of the biggest advantages of a visualization tool for electric vehicle charge and range analysis is that it allows users to simulate and visualize the range of their vehicles based on various input parameters such as battery capacity, charging rate, and driving conditions. This information can help electric vehicle owners plan their trips more effectively and reduce range anxiety.
2. Visualizations of Charging Process: Another advantage of this tool is that it provides visualizations of the charging process, including the charging time required to fully charge the battery and the amount of charge that can be obtained at different charging stations. This can help users plan their route and know where and when to charge their vehicle.
3. Optimization Features: A visualization tool for electric vehicle charge and range analysis can also provide optimization features, such as recommendations for optimal charging times and locations, and suggestions for improving range and battery efficiency. This can help users optimize their driving experience and reduce their carbon footprint.
4. Easy-to-Use Interface: An advantage of this tool is that it provides an easy-to-use interface that can be accessed on multiple devices and platforms. This makes it convenient for electric vehicle owners to access the tool and analyze the range and charging capabilities of their vehicle at any time.

5. Compatibility with Different Electric Vehicle Models: Another advantage of a visualization tool for electric vehicle charge and range analysis is that it can be designed to be compatible with different electric vehicle models. This means that a wider range of electric vehicle owners can use the tool to analyze the range and charging capabilities of their vehicle.

4. Disadvantages

1. Accuracy of Results: One of the main disadvantages of a visualization tool for electric vehicle charge and range analysis is that the accuracy of the results may vary depending on various factors such as weather conditions, driving habits, and battery degradation. Users may need to adjust the input parameters to get a more accurate range analysis.
2. Limited Availability of Charging Stations: Another disadvantage of this tool is that it may be limited by the availability of charging stations. If a user is planning a long trip and there are not enough charging stations along the way, they may not be able to complete their trip without running out of charge.
3. Cost: Another disadvantage of a visualization tool for electric vehicle charge and range analysis is that it may come at a cost. While some tools may be available for free, others may

require a subscription or purchase. This may be a barrier for some electric vehicle owners who are looking for a low-cost or free solution to analyze the range and charging capabilities of their vehicle.

4. Need for Regular Updates: Another disadvantage of this tool is that it may require regular updates to ensure compatibility with different electric vehicle models and charging stations. Failure to update the tool may result in inaccurate results or limited functionality.
5. Complexity: A visualization tool for electric vehicle charge and range analysis may be complex for some users to navigate and understand. This may be a barrier for some electric vehicle owners who are not as technologically savvy or who may not have the time to learn how to use the tool effectively.

5. Conclusion

In conclusion, a visualization tool for electric vehicle charge and range analysis has several advantages and disadvantages. The advantages include providing range analysis, visualizations of the charging process, optimization features, easy-to-use interface, and compatibility with different electric vehicle models. The disadvantages include accuracy of results, limited availability of charging stations, cost, need for regular updates, and complexity.

Despite the disadvantages, a visualization tool for electric vehicle charge and range analysis can be incredibly helpful for

electric vehicle owners who want to better understand and manage the range and charging capabilities of their vehicle. To mitigate some of the disadvantages,

2. Data Collection & Extraction From Database

First, we understand the problem and then we collect the data by using the given link and then we import the data set into the database. After that we connected there to our tableau

We have downloaded that data sets by using the given link in the PDF. After that, we install the Mysql PhpMyAdmin in our system And after that, we created a database named electric vehicles, and after that be imported, the collected CSV files into the database,

After that we connected the tableau software with phpmyadmin by the following credentials

Username : root
Password : empty
Server : localhost
Port : 3306
Database : electric

6. Prepare The Data For Visualization

The database electric has four tables and these are created by using the following CSV files provided in the datasets link

After that we make a relation between the four tables by using the tableau software

In the four tables EVIndia table has unique values and then we merge the four tables by using their EVIndia table

By this way, we created their data preparation for visualization

7. Data Visualization

1. No of Unique Visualizations
2. Charging Stations by region and type in India
3. EV Charging stations map of India
4. Different EV cars in India
5. Top speed for different Brands
6. Price for different cars in India
7. Top 10 most efficient EV Brands
8. Brands according to Bodystyle
9. Brand filtered by PowerTrain type
10. No of models by each brand
11. Summary card for Different brands of EV Cars globally
12. Summary card for Different brands of EV Cars in India

Data visualization is the practice of presenting data in a graphical or visual format, such as charts, graphs, and maps,

to help people better understand the information and insights contained within the data. By displaying data visually, it becomes easier to identify patterns, trends, and relationships that might be difficult to discern from raw data alone. Data visualization can be used in a wide variety of contexts, from scientific research and business analytics to journalism and education. Effective data visualization requires careful consideration of the data being presented, the audience for the visualization, and the goals of the communication.

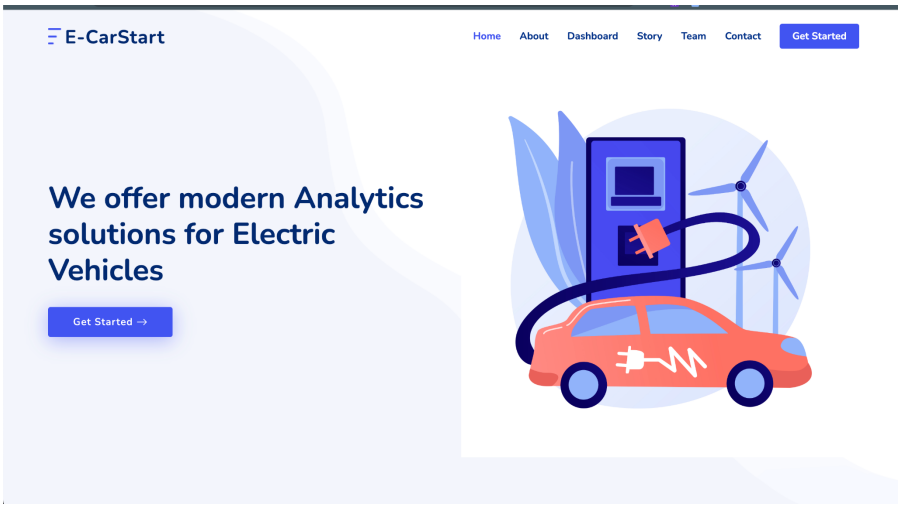
In the database the data is stored as rows and columns. The process of converting the data into the charts is called as data visualization

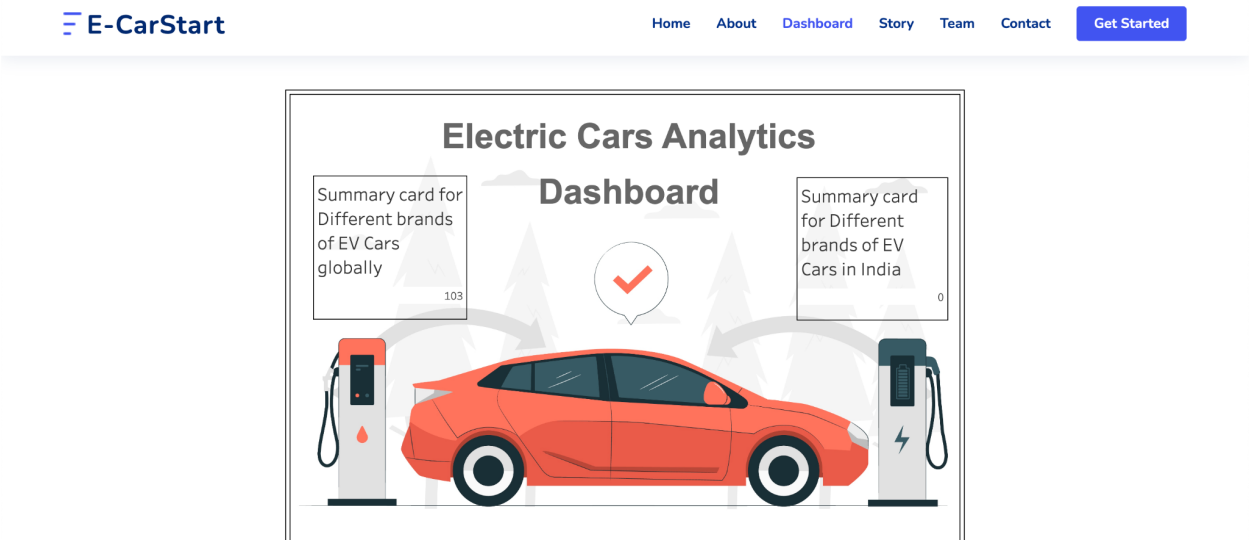
8. Dashboard

A dashboard is a graphical user interface (GUI) that displays information and data in an organized, easy-to-read format. Dashboards are often used to provide real-time monitoring and analysis of data, and are typically designed for a specific purpose or use case. Dashboards can be used in a variety of settings, such as business, finance, manufacturing, healthcare, and many other industries. They can be used to track key performance indicators (KPIs),

monitor performance metrics, and display data in the form of charts, graphs, and tables.

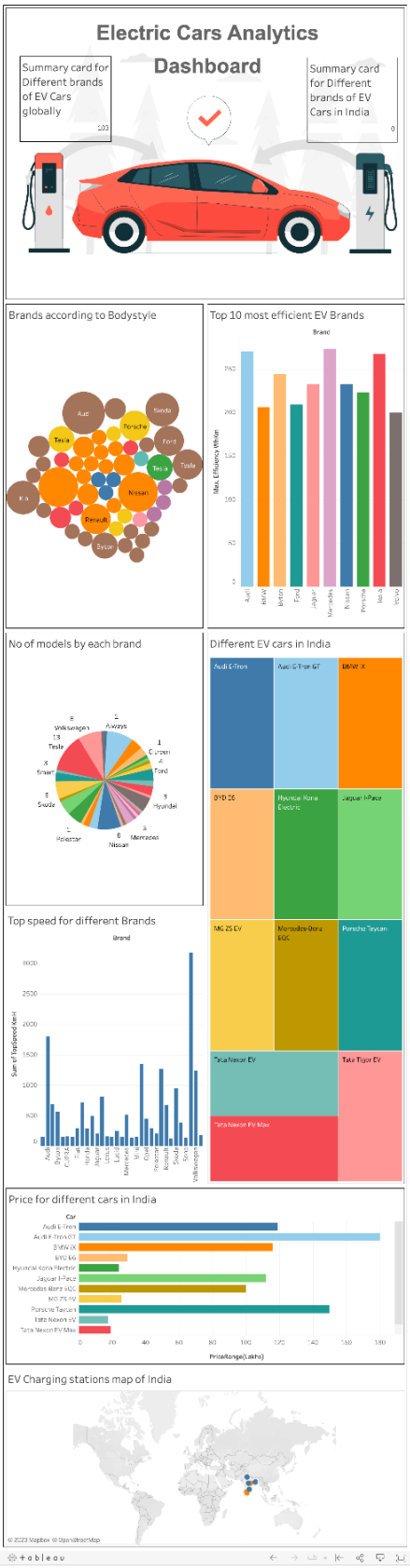
After creating the database connection start, we need to arrange the charts into the dashboard layout.
Arranging the charts into the dashboard layout is called as dashboard





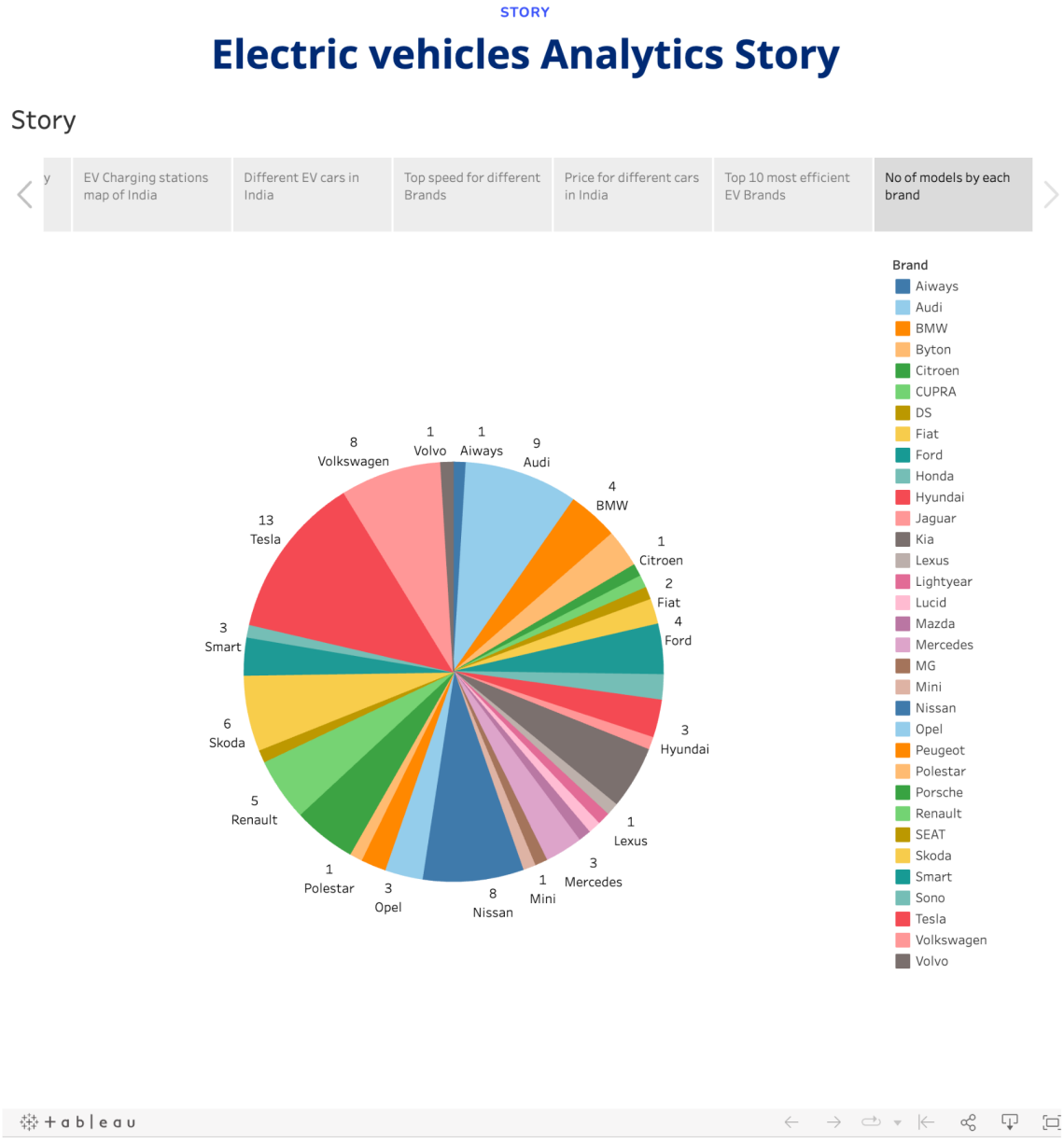
DASHBOARD

E-Car Start Analytics Dashboard



9. Story

A data story is a way of presenting data and analysis in a narrative format, with the goal of making the information more engaging and easier to understand. A data story typically includes a clear introduction that sets the stage and explains the context for the data, a body that presents the data and analysis in a logical and systematic way, and a conclusion that summarizes the key findings and highlights their implications. Data stories can be told using a variety of mediums, such as reports, presentations, interactive visualizations, and videos.



10. Performance Testing

Performance testing in SQL involves measuring and analyzing the performance of SQL queries and database operations

under different conditions to ensure that they meet the required performance standards.
There are several techniques for performance testing in SQL, including:

1. Benchmarking: This involves running SQL queries and database operations against a known set of data and comparing the results to established benchmarks to evaluate performance.
2. Load testing: This involves simulating heavy loads on the database, such as multiple users and concurrent transactions, to assess how the system performs under stress.
3. Stress testing: This involves pushing the system to its limits by increasing the workload beyond normal operating conditions to see how it handles extreme levels of traffic and usage.
4. Scalability testing: This involves evaluating the performance of the database as the size of the data and the number of users increase, to ensure that the system can handle future growth.

To perform effective performance testing in SQL, it is important to have a good understanding of the database schema, the queries being used, and the expected user workload. The results of performance testing can then be

used to identify and address any bottlenecks, optimize SQL queries and database operations, and improve overall system performance.

11. Web Integration

Integrating a project into a web application involves incorporating the project's functionality and data into a web-based user interface, so that users can access and interact with the project through a web browser.
To integrate a project into a web application, you may need to perform the following tasks:

1. Develop a web-based user interface: This involves designing and developing a user interface that allows users to interact with the project through a web browser. This may involve developing web pages using HTML, CSS, and JavaScript, as well as integrating server-side code to handle user requests and manage data.
2. Connect to the project's data sources: This involves establishing connections between the web application and the project's data sources, such as databases or

APIs, so that the data can be accessed and displayed in the web-based user interface.

3. Integrate project functionality: This involves integrating the project's functionality into the web application, so that users can access and use the project's features through the web-based user interface.
4. Test and debug: Once the project has been integrated into the web application, it is important to thoroughly test and debug the system to ensure that it is functioning correctly and providing a positive user experience.

12. APPENDIX

12.1. Dashboard Source Code

```
<div
 class="tableauPlaceholder"
 id="viz1681571526412"
 style="position: relative"
>
 <noscript
   ><a href="#"
     ><img
       alt="Analytics Dashboard "

src="https:&#47;&#47;public.tableau.com&#47;static&#47;images&#47;El&#47;ElectricVehic
les_16815710329410&#47;AnalyticsDashboard&#47;1_rss.png"
```

```
      style="border: none" /></a></noscript
 ><object class="tableauViz" style="display: none">
   <param name="host_url" value="https%3A%2F%2Fpublic.tableau.com%2F" />
   <param name="embed_code_version" value="3" />
   <param name="site_root" value="" />
   <param
     name="name"
     value="ElectricVehicles_16815710329410&#47;AnalyticsDashboard"
   />
   <param name="tabs" value="no" />
   <param name="toolbar" value="yes" />
   <param
     name="static_image"

value="https:&#47;&#47;public.tableau.com&#47;static&#47;images&#47;El&#47;ElectricVeh
icles_16815710329410&#47;AnalyticsDashboard&#47;1.png"
   />
   <param name="animate_transition" value="yes" />
   <param name="display_static_image" value="yes" />
   <param name="display_spinner" value="yes" />
   <param name="display_overlay" value="yes" />
   <param name="display_count" value="yes" />
   <param name="language" value="en-US" />
 </object>
</div>
<script type="text/javascript">
 var divElement = document.getElementById("viz1681571526412");
 var vizElement = divElement.getElementsByTagName("object")[0];
 if (divElement.offsetWidth > 800) {
   vizElement.style.width = "800px";
   vizElement.style.height = "3027px";
 } else if (divElement.offsetWidth > 500) {
   vizElement.style.width = "800px";
   vizElement.style.height = "3027px";
 } else {
   vizElement.style.width = "100%";
   vizElement.style.height = "2777px";
 }
 var scriptElement = document.createElement("script");
 scriptElement.src = "https://public.tableau.com/javascripts/api/viz_v1.js";
 vizElement.parentNode.insertBefore(scriptElement, vizElement);
</script>
```

12.2. Story Source Code

```
<div
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 id="viz1681571692624"
 style="position: relative"
>
 <noscript
   ><a href="#"
     ><img
       alt="Story "

src="https:&#47;&#47;public.tableau.com&#47;static&#47;images&#47;El&#47;ElectricVehic
lesStory&#47;Story&#47;1_rss.png"
       style="border: none" /></a></noscript
 ><object class="tableauViz" style="display: none">
   <param name="host_url" value="https%3A%2F%2Fpublic.tableau.com%2F" />
   <param name="embed_code_version" value="3" />
   <param name="site_root" value="" />
   <param name="name" value="ElectricVehiclesStory&#47;Story" />
   <param name="tabs" value="no" />
   <param name="toolbar" value="yes" />
   <param
     name="static_image"

value="https:&#47;&#47;public.tableau.com&#47;static&#47;images&#47;El&#47;ElectricVeh
iclesStory&#47;Story&#47;1.png"
   />
   <param name="animate_transition" value="yes" />
   <param name="display_static_image" value="yes" />
   <param name="display_spinner" value="yes" />
   <param name="display_overlay" value="yes" />
   <param name="display_count" value="yes" />
   <param name="language" value="en-US" />
   <param name="filter" value="publish=yes" />
 </object>
</div>
<script type="text/javascript">
 var divElement = document.getElementById("viz1681571692624");
 var vizElement = divElement.getElementsByTagName("object")[0];
```

```
 vizElement.style.width = "1016px";
 vizElement.style.height = "991px";
 var scriptElement = document.createElement("script");
 scriptElement.src = "https://public.tableau.com/javascripts/api/viz_v1.js";
 vizElement.parentNode.insertBefore(scriptElement, vizElement);
</script>
```