Project Report

Visualization tool for electric vehicle charge and range analysis.

Date	12 February 2026
Team ID	LTVIP2026TMIDS53912
Project Name	Visualization tool for electric vehicle charge and range analysis.
Maximum Marks	

1. INTRODUCTION

1.1 Project Overview

The Electric Car Analytics Dashboard project focuses on analysing global and Indian electric vehicle data to identify trends in brands, efficiency, pricing, body styles, and performance. The project uses data preprocessing techniques and Tableau visualizations to provide meaningful insights through interactive dashboards and stories.

1.2 Purpose

The purpose of this project is to analyse and visualize electric vehicle data to support better understanding of market trends, brand performance, and efficiency comparisons. It helps users make data-driven decisions through interactive filters, dashboards, and visual storytelling.

2. IDEATION PHASE

2.1 Problem Statement

The Electric Car Analytics project addresses challenges faced by first-time EV buyers and EV infrastructure investors in India. Buyers struggle with unclear real-world range data and scattered charging station information, leading to range anxiety and confusion. At the same time, investors lack integrated insights into EV sales trends and charging infrastructure gaps. This creates uncertainty in decision-making and highlights the need for a unified, data-driven analytical dashboard.

Customer Problem Statement Template:

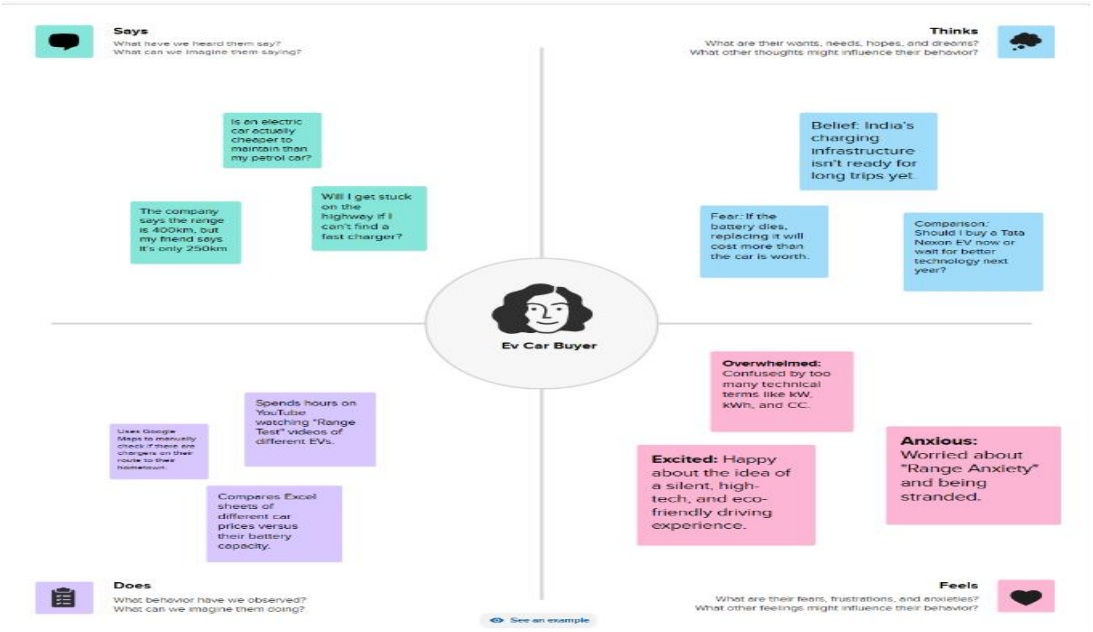
Problem Statement – 1: **THE CAR BUYER**

Problem Statement – 2: **THE BUSINESS PLANNER**

Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
The Car Buyer	A first-time EV buyer in India.	Buy an electric car that won't run out of charge on long trips.	I can't find clear data on real-world mileag and charging spots.	Information is scattered and technical specs are confusing.	Stressed about "Range Anxiety" and afraid of getting stranded.
The Business Planner	An EV charging station investor.	Find the best spots in India to build new fast-chargers.	I don't know where the "charging gaps" are compared to car sales.	Sales data and charger locations are in separate.	Worried about wasting money on the wrong locations.

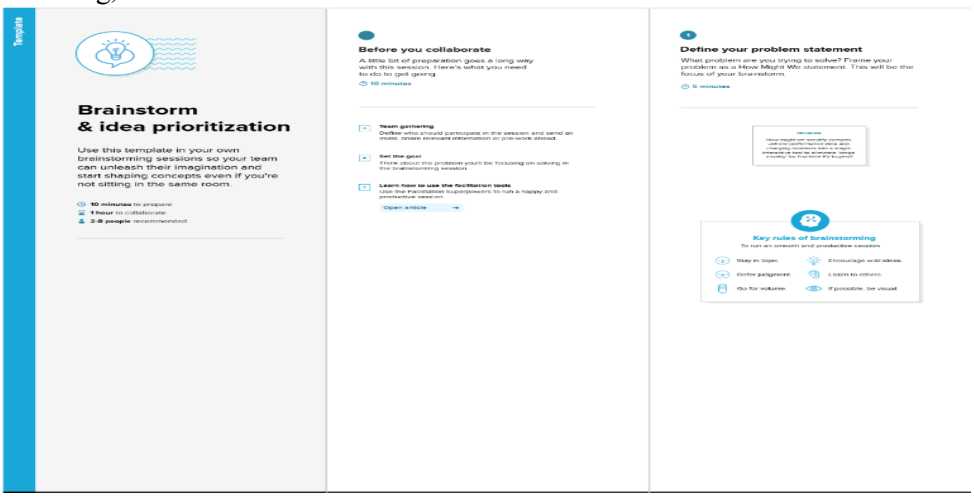
2.2 Empathy Map Canvas

The Mind of an EV Enthusiast

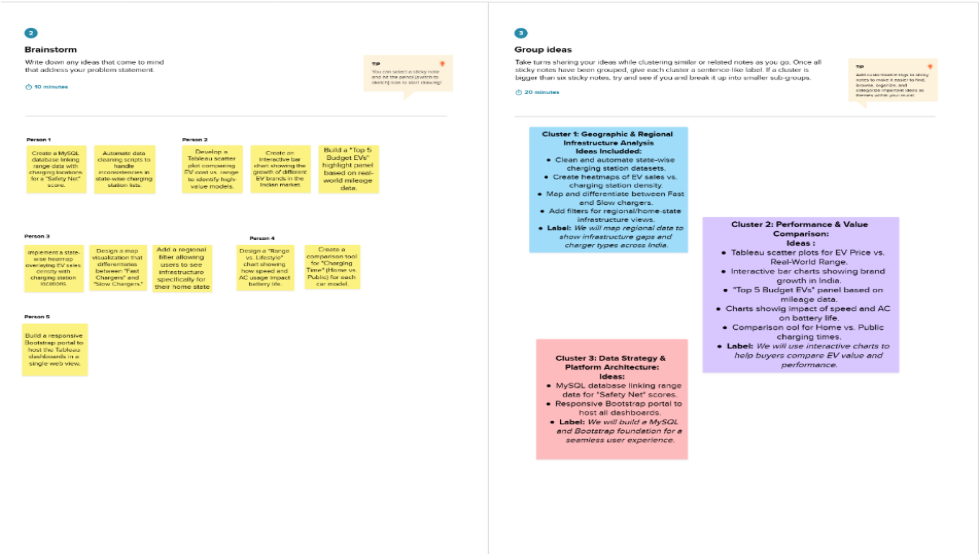


2.3 Brainstorming

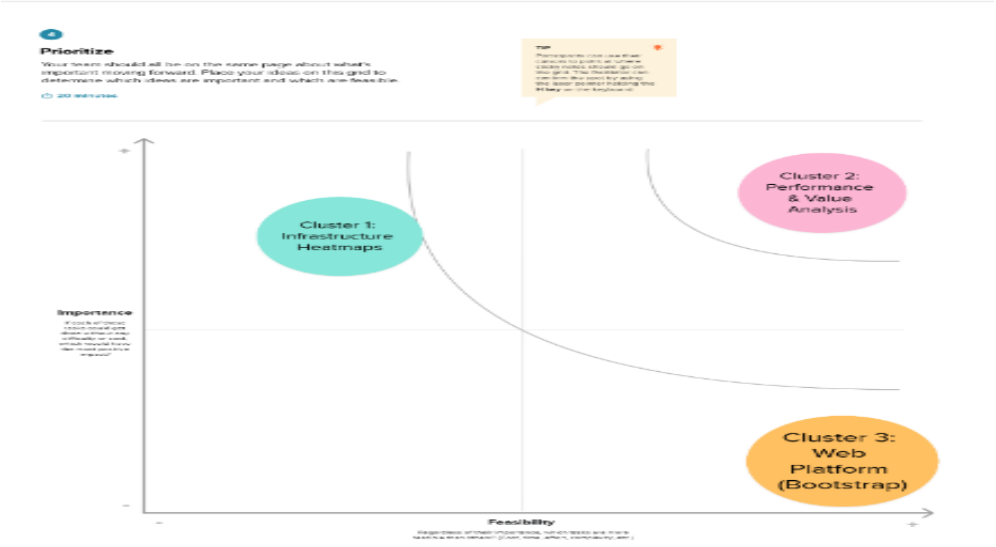
Step-1: Team Gathering, Collaboration and Select the Problem Statements



Step-2: Brainstorm, Idea Listing and Grouping



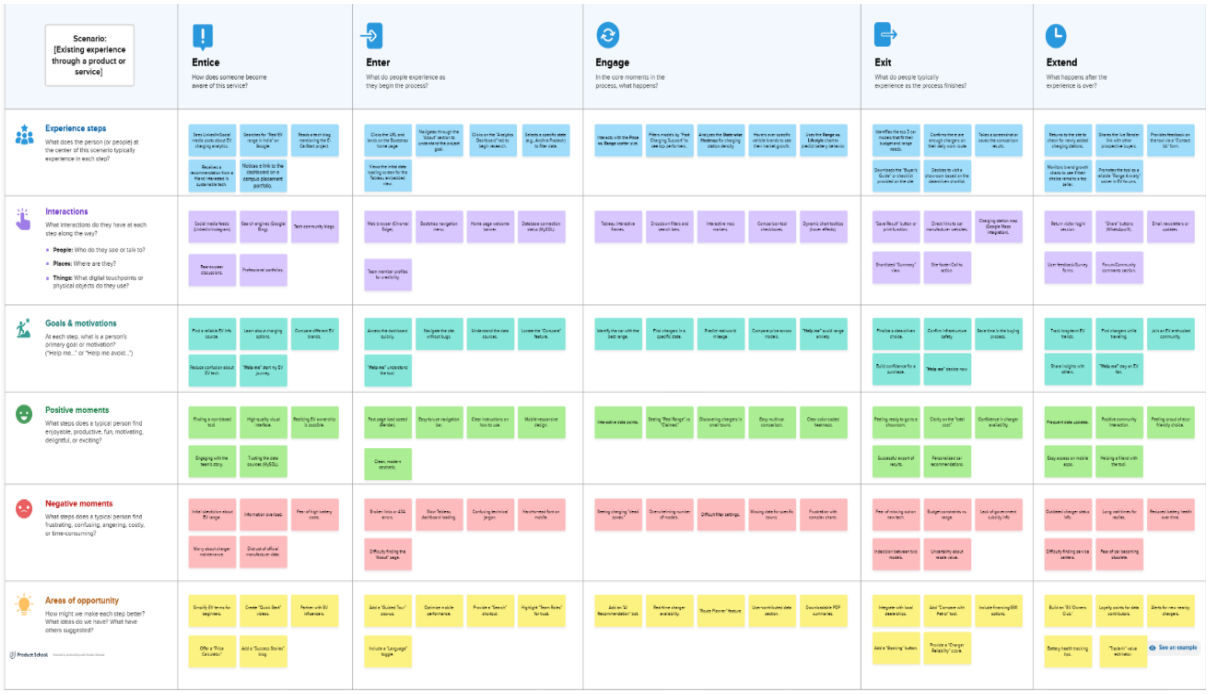
Step-3: Idea Prioritization



3. REQUIREMENT ANALYSIS

3.1 Customer Journey Map

The customer journey map outlines the experience of EV buyers and business planners while interacting with electric vehicle data. It identifies pain points such as range anxiety, scattered charging information, and lack of infrastructure insights. The journey highlights decision-making challenges and information gaps. This analysis helps define the exact needs of users. It ensures the dashboard is built to solve real-world problems effectively.



3.2 Solution Requirement

The solution requires an interactive dashboard that integrates EV sales, efficiency, pricing, and charging station data. It must provide clear visualizations and filtering options for easy analysis. The system should support comparative insights between brands and regions. Data accuracy and preprocessing are essential. The solution must be user-friendly and visually intuitive.

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	View Website	Access Home, About, Team & Contact sections
FR-2	View EV Dashboard	Load EV Charging & Range Tableau Dashboard Display interactive charts Responsive dashboard view
FR-3	View EV Story	Load Tableau Story Navigate between story tabs
FR-4	Contact Form	Submit user details Validate required fields Display submission confirmation
FR-5	Admin Data Management	Upload EV dataset to Tableau Update dashboard visuals Publish dashboard

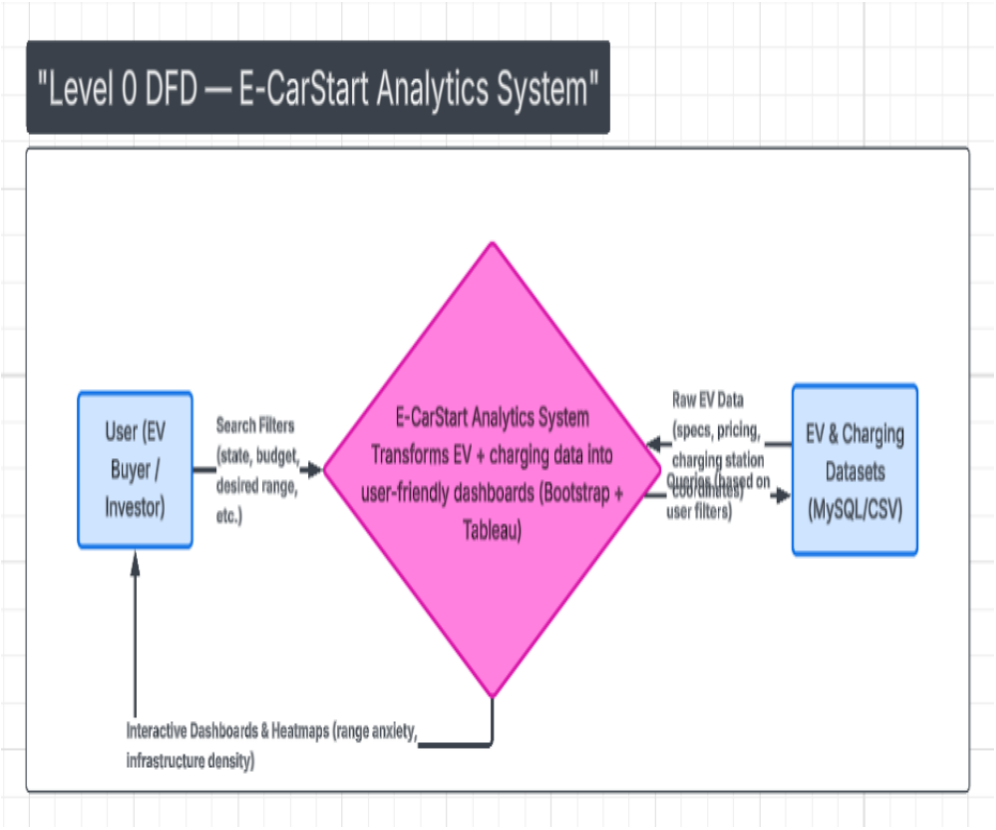
Non-functional Requirements:

Following are the non-functional requirements of the proposed solution.

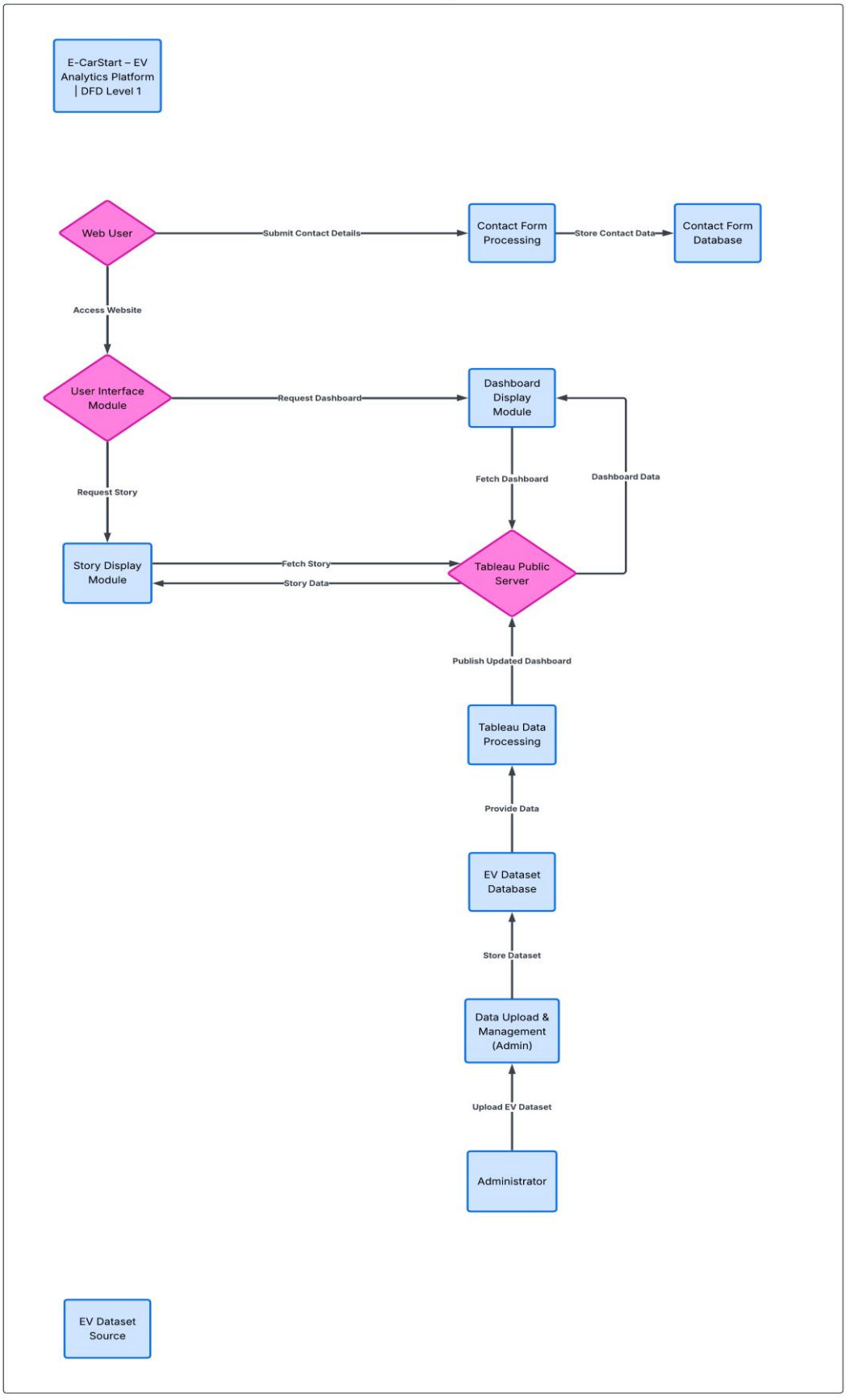
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	The website should be user-friendly, easy to navigate, and visually clear with proper section alignment.
NFR-2	**Security**	User contact data must be protected and not publicly exposed. Tableau dashboards should be securely embedded.
NFR-3	**Reliability**	The system should consistently load dashboards and story without failure.
NFR-4	**Performance**	The website should load within 3–5 seconds and dashboard rendering should be responsive.
NFR-5	**Availability**	The system should be available 24/7 through web browsers.
NFR-6	**Scalability**	The system should support addition of new datasets and future dashboard extensions.

3.3 Data Flow Diagram

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.



E-CarStart – EV Analytics Platform DFD Level 1



3.4 Technology Stack

The project uses Excel/CSV datasets for data storage. MySQL is used for database management and structured data storage. Tableau Desktop is used for data visualization and dashboard creation. Basic data preprocessing techniques are applied before visualization. These tools together ensure efficient data handling and presentation.

Table-1: Components & Technologies:

S. No	Component	Description	Technology
1.	User Interface	Web-based interface where users view EV dashboard, story and submit contact form	HTML, CSS, JavaScript, Bootstrap 5
2.	Application Logic – Dashboard Integration	Handles embedding and rendering of Tableau Dashboard inside the website.	JavaScript, Tableau Embed API
3.	Application Logic – Story Integration	Embeds Tableau Story and manages responsive display	JavaScript, Tableau Public
4.	Dataset Storage	EV dataset stored and processed within Tableau environment	Tableau Data Extract (TDE)
5.	File Storage	EV dataset files stored locally before upload to Tableau	Tableau Data Extract (TDE)
6.	Tableau Public API	Used to embed and display dashboard and story in website	Tableau Public Embed API
7.	Infrastructure (Web Hosting)	Website hosted on web server, dashboards hosted on Tableau Public Cloud:	Local Hosting / GitHub Pages / Render, Tableau Public Cloud

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	Website built using open-source front-end frameworks	Bootstrap 5, HTML5, CSS3
2.	Security Implementations	Secure embedding of Tableau dashboards and form validation	HTTPS Protocol, Input Validation
3.	Scalable Architecture	Web-based modular structure allows addition of new dashboards and datasets	Modular Web Architecture, Cloud Hosting
4.	Availability	Dashboard available 24/7 via Tableau Public cloud	Tableau Public Cloud
5.	Performance	Optimized responsive UI and embedded dashboard loading	Bootstrap Grid System, Optimized Tableau Embed

4. PROJECT DESIGN

4.1 Problem Solution Fit

The dashboard directly addresses range anxiety and infrastructure planning issues. It combines EV sales data with charging station insights. Buyers can compare efficiency and range, while investors can identify infrastructure gaps. The solution aligns with user pain points identified in requirement analysis. It ensures informed, data-driven decision-making.

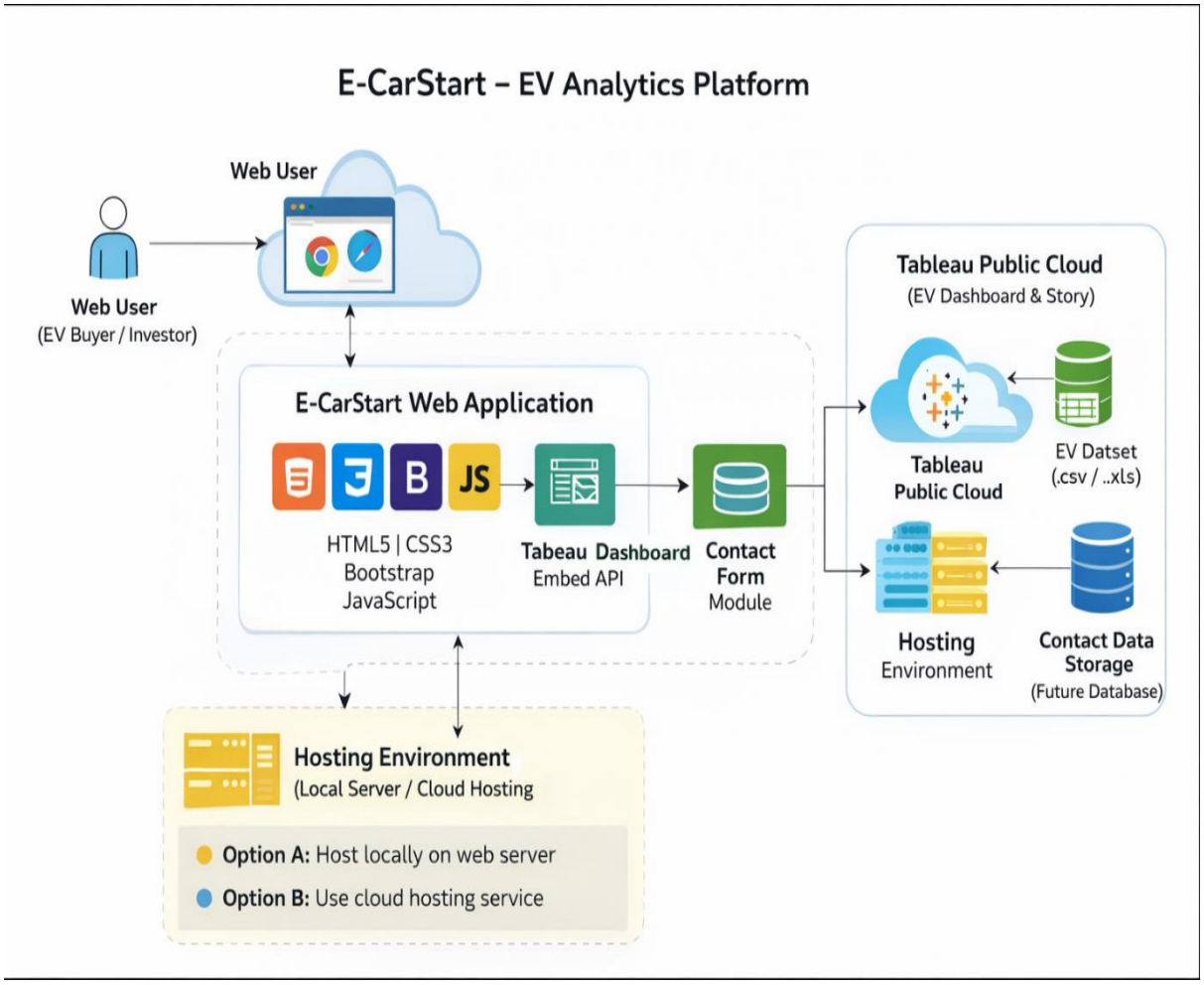
4.2 Proposed Solution

The proposed solution is an Electric Car Analytics Dashboard with multiple visualizations. It includes brand comparison charts, efficiency rankings, body style analysis, and summary cards. Interactive filters enhance user exploration. The dashboard is designed for clarity and simplicity. It transforms raw data into actionable insights.

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	First-time EV buyers in India lack centralized and reliable data about charging infrastructure and vehicle range, leading to confusion and range anxiety. Infrastructure investors also struggle to identify regional charging gaps due to fragmented information sources.
2.	Idea / Solution description	E-CarStart is a web-based EV analytics platform that provides interactive dashboards and visual stories about EV charging, range, and adoption trends. It centralizes data into an easy-to-understand format using Tableau and a responsive web interface.
3.	Novelty / Uniqueness	The platform combines EV charging, range, and market adoption insights into one interactive system focused on the Indian market. Unlike static reports or blogs, it offers real-time visual comparison and centralized analytics.
4.	Social Impact / Customer Satisfaction	E-CarStart promotes informed EV adoption, reducing range anxiety and increasing customer confidence. It also supports sustainable mobility by providing transparency in EV infrastructure growth.
5.	Business Model (Revenue Model)	The platform can adopt a freemium model with basic dashboards free and premium analytics for investors. Additional revenue can come from partnerships, advertisements, and data insight reports.
6.	Scalability of the Solution	The web-based modular architecture allows easy addition of new datasets and dashboards. It can scale to include real-time APIs, more regions, and advanced analytics features in the future.

4.3 Solution Architecture

The architecture follows a simple data pipeline structure. Raw EV datasets are collected and cleaned. Cleaned data is stored in a database. Tableau connects to the database to create visual dashboards. Users interact with the dashboard to generate insights.



5. PROJECT PLANNING & SCHEDULING

5.1 Project Planning

The project was planned in stages: data collection, preprocessing, database integration, visualization, and testing. Each phase was executed sequentially. Timelines were set to ensure proper completion of tasks. Dashboard design and refinement were done iteratively. Proper planning ensured smooth execution.

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Data Collection	USN-1	Download EV dataset from reliable source	3	High	P Jeevan
Sprint-1	Data Understanding	USN-2	Analyse and understand dataset attributes	3	High	K Dinesh
Sprint-1	Database Setup	USN-3	Import dataset into database	4	High	R Srikanth
Sprint-1	Tableau Connection	USN-4	Connect Tableau Desktop to database	4	High	N Akhila
Sprint-1	Data Preparation	USN-5	Clean and prepare dataset for visualization	6	High	M Manasa
Sprint-2	Data Visualization	USN-6	Create charts & EV analysis visuals	5	High	K Dinesh
Sprint-2	Dashboard Creation	USN-7	Design interactive dashboard	5	High	N Akhila
Sprint-2	Story Creation	USN-8	Create EV analytics story in Tableau	3	High	M Manasa
Sprint-2	Publishing	USN-9	Publish dashboard to Tableau Public	3	High	P Jeevan
Sprint-2	Website Integration	USN-10	Embed dashboard into website	4	High	R Srikanth
Sprint-3	Website Navigation	USN-11	Develop website sections	4	High	M Manasa
Sprint-3	Contact Form	USN-12	Implement form validation	4	High	R Srikanth
Sprint-3	Responsive Design	USN-13	Make website mobile responsive	5	Medium	K Dinesh
Sprint-3	Testing	USN-14	Cross-browser testing	3	Medium	P Jeevan
Sprint-3	Final Review	USN-15	Final deployment & bug fixing	4	High	All

Project Tracker, Velocity & Burndown Chart:

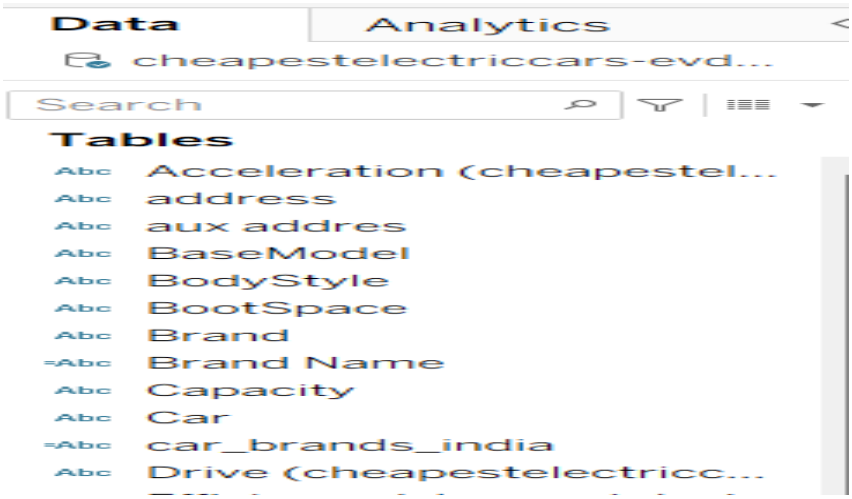
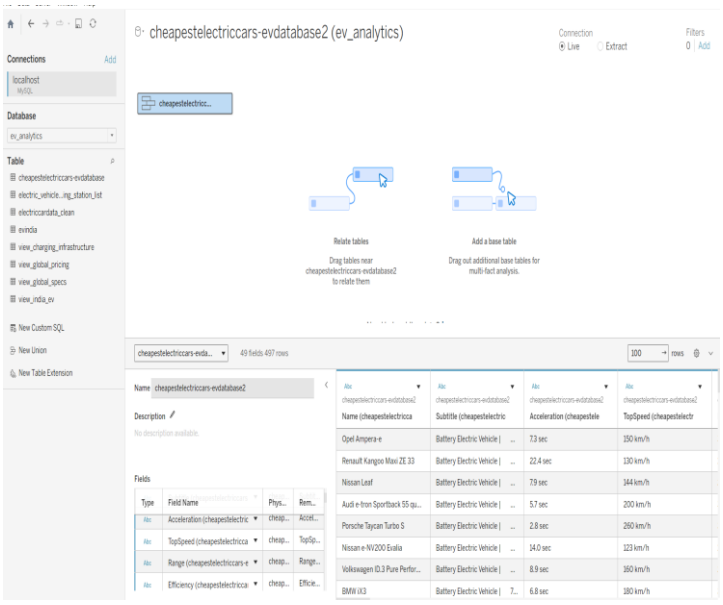
Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	7 Days	28 Jan 2026	03 Feb 2026	20	03 Feb 2026
Sprint-2	20	7 Days	04 Feb 2026	10 Feb 2026	20	10 Feb 2026
Sprint-3	20	7 Days	11 Feb 2026	14 Feb 2026	20	14 Feb 2026

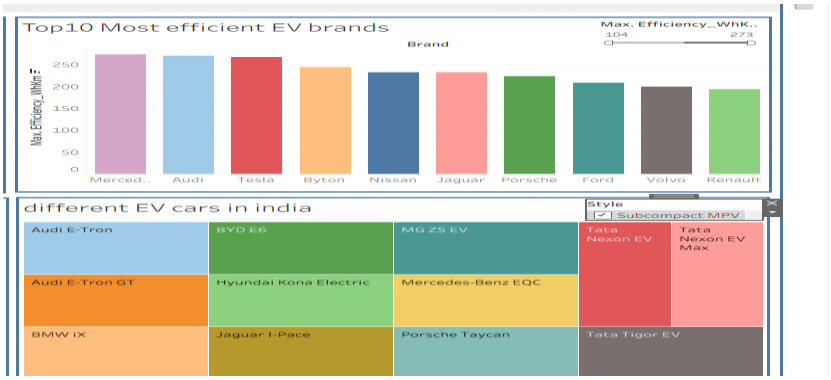
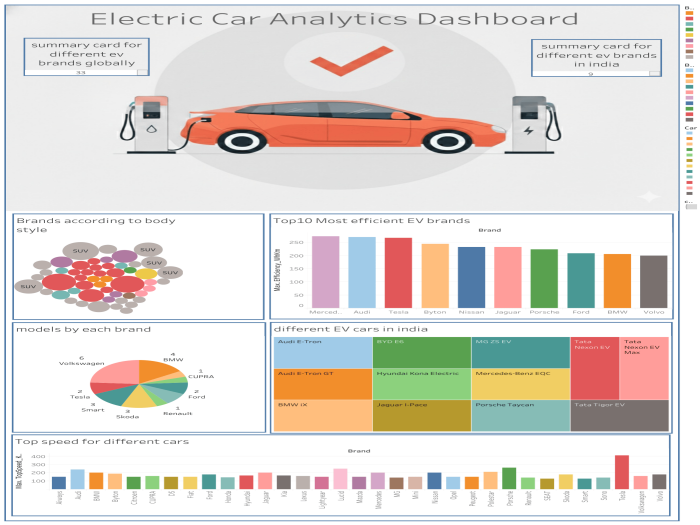
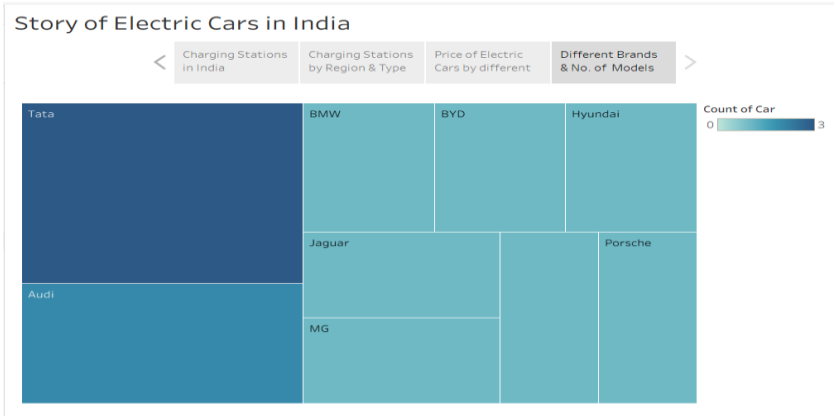
AV = Sprint duration/velocity =20/7= 2.85 ~ 3 story points per day

6. FUNCTIONAL AND PERFORMANCE TESTING

6.1 Performance Testing

The dashboard was tested for responsiveness and accuracy. Filters and interactive features were validated. Data consistency between database and visualizations was checked. Performance was monitored for loading time and smooth interaction. The system performs efficiently for the given dataset size.

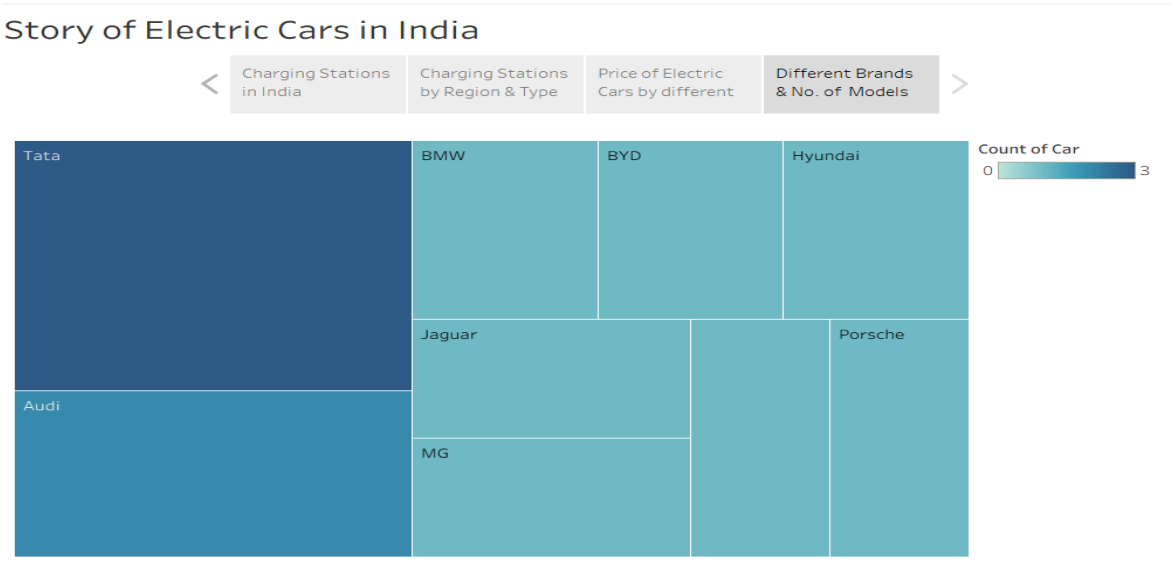
S.No.	Parameter	Screenshot / Values
1.	Data Rendered	The EV dataset was successfully rendered in Tableau Desktop. All fields including vehicle type, charging time, range, state, and price were loaded correctly without errors. 
2.	Data Preprocessing	Data preprocessing was performed by handling missing values, removing duplicate records, correcting data types, and creating calculated fields. Units were standardized and unnecessary columns were removed before visualization. 

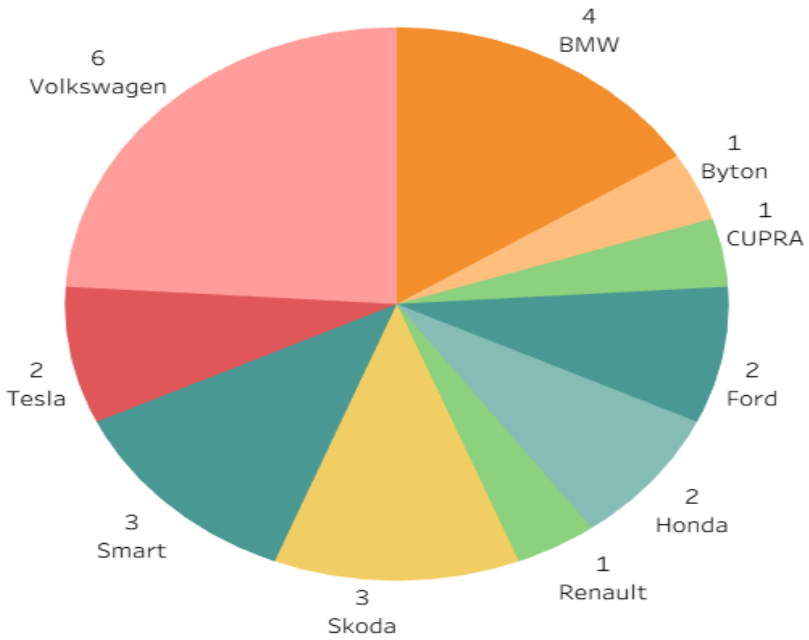
3.	Utilization of Filters	Filters such as Style, Vehicle Type, Charging Type, and Range were applied to enable dynamic interaction in the dashboard. 
4.	Calculation fields Used	AVG([Range]) COUNT([Vehicle Type])
5.	Dashboard design	No of Visualizations / Graphs – 5 
6	Story Design	No of Visualizations / Graphs – 4 

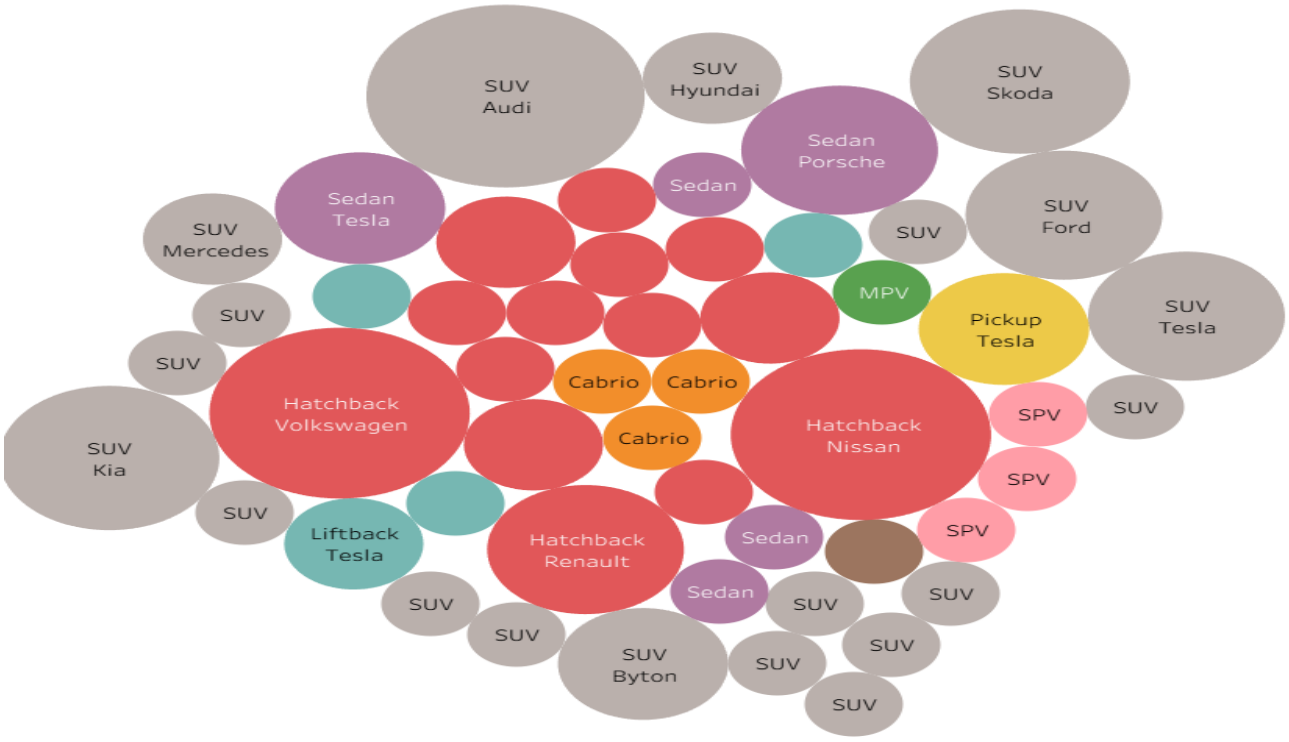
7. RESULTS

7.1 Output Screenshots

The final dashboard displays EV brand analysis, efficiency comparisons, and body style distribution. Summary cards highlight key metrics. Filters allow dynamic exploration of data. Visualizations provide clear and actionable insights. The results demonstrate successful implementation of the project objectives.






SUV Audi
SUV Hyundai
SUV Skoda
Sedan Porsche
Sedan Tesla
Sedan
SUV Mercedes
SUV
SUV Ford
MPV
Pickup Tesla
SUV Tesla
SUV
SUV
Hatchback Volkswagen
Cabrio
Cabrio
Cabrio
Hatchback Nissan
SPV
SUV
SUV Kia
SPV
SUV
Liftback Tesla
Hatchback Renault
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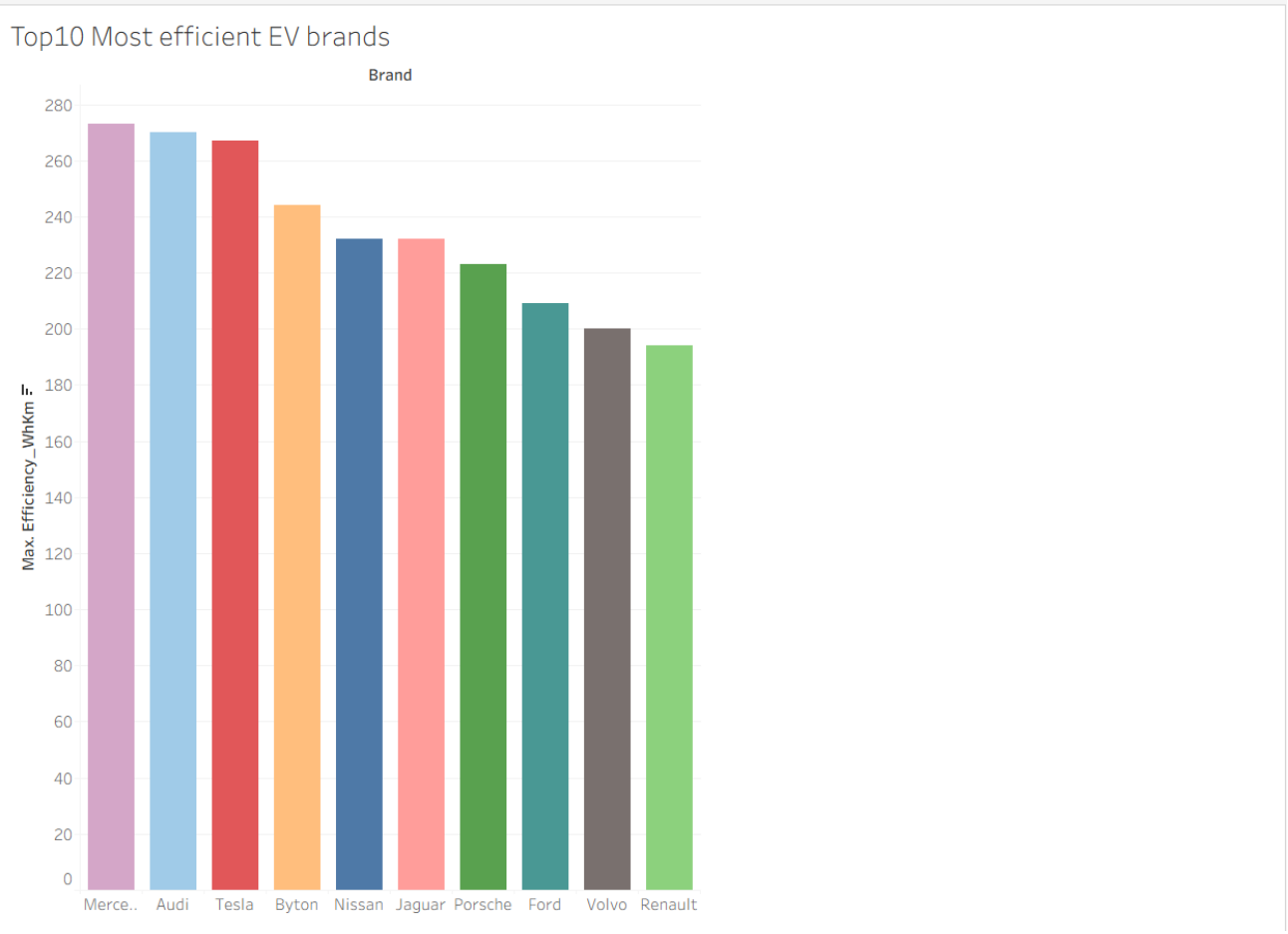
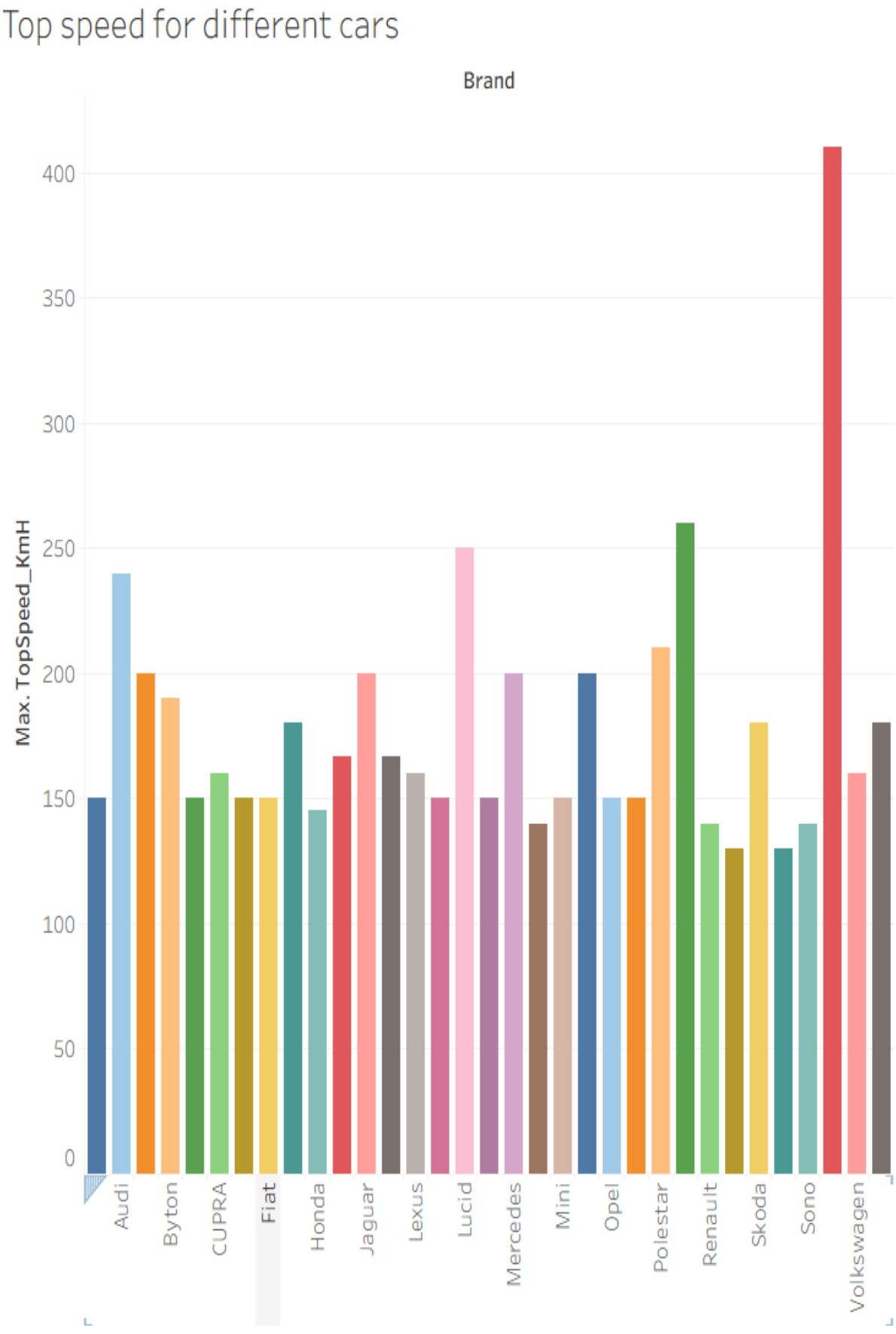
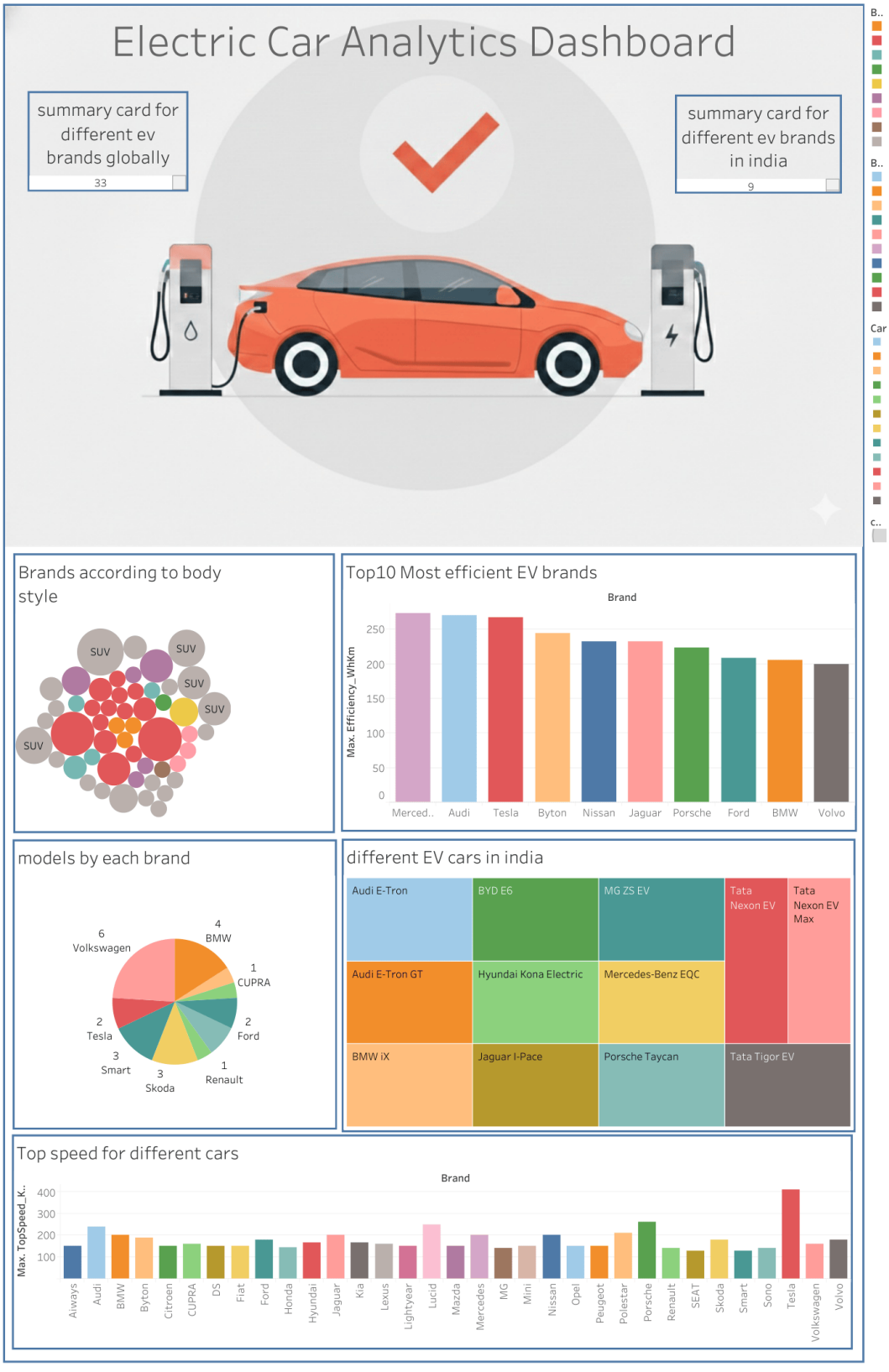

Top10 Most efficient EV brands
Brand
Max. Efficiency_WhKm
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
Merce..
Audi
Tesla
Byton
Nissan
Jaguar
Porsche
Ford
Volvo
Renault


Top speed for different cars
Brand
Max. TopSpeed_KmH
400
350
300
250
200
150
100
50
0
Audi
Byton
CUPRA
Fiat
Honda
Jaguar
Lexus
Lucid
Mercedes
Mini
Opel
Polestar
Renault
Skoda
Sono
Volkswagen


Electric Car Analytics Dashboard
summary card for different ev brands globally
33
summary card for different ev brands in india
9
Brands according to body style
SUV
SUV
SUV
SUV
SUV
Top10 Most efficient EV brands
Brand
Max. Efficiency_WhKm
250
200
150
100
50
0
Merced..
Audi
Tesla
Byton
Nissan
Jaguar
Porsche
Ford
BMW
Volvo
models by each brand
6
Volkswagen
4
BMW
1
CUPRA
2
Ford
1
Renault
3
Skoda
3
Smart
2
Tesla
different EV cars in india
Audi E-Tron
BYD E6
MG ZS EV
Tata Nexon EV
Tata Nexon EV Max
Audi E-Tron GT
Hyundai Kona Electric
Mercedes-Benz EQC
BMW iX
Jaguar I-Pace
Porsche Taycan
Tata Tigor EV
Top speed for different cars
Brand
Max. TopSpeed_K..
400
300
200
100
Aiways
Audi
BMW
Byton
Citroen
CUPRA
DS
Fiat
Ford
Honda
Hyundai
Jaguar
Kia
Lexus
Lightyear
Lucid
Mazda
Mercedes
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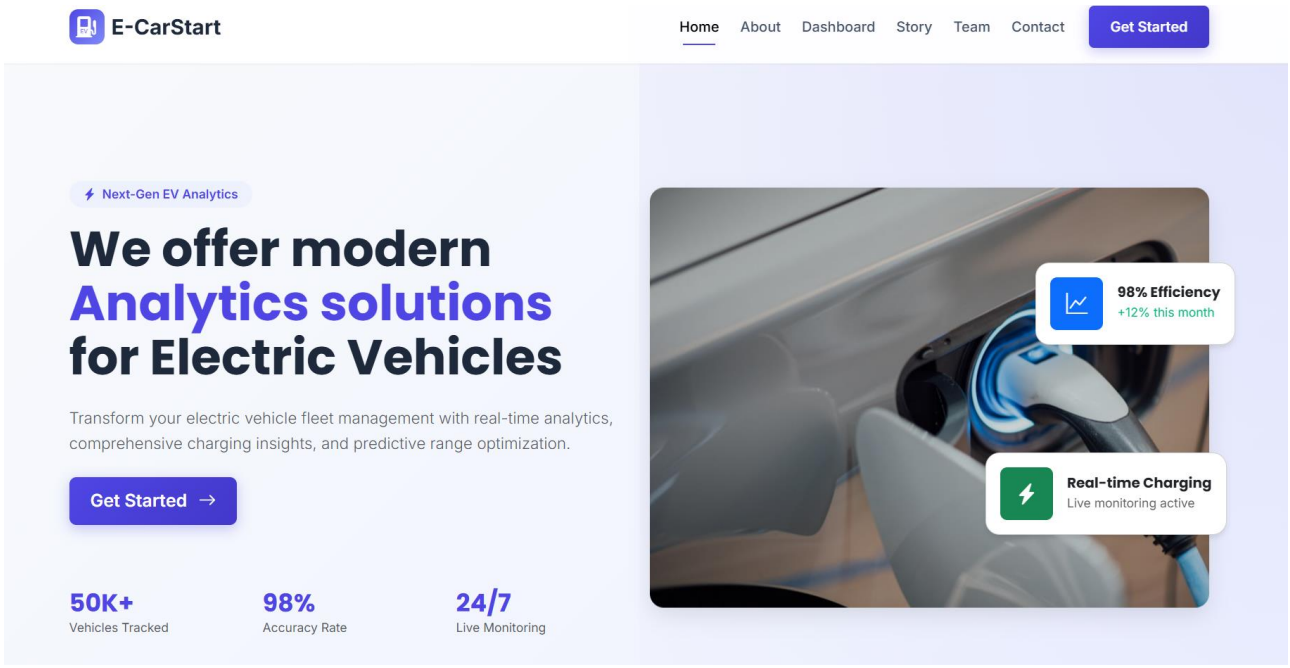
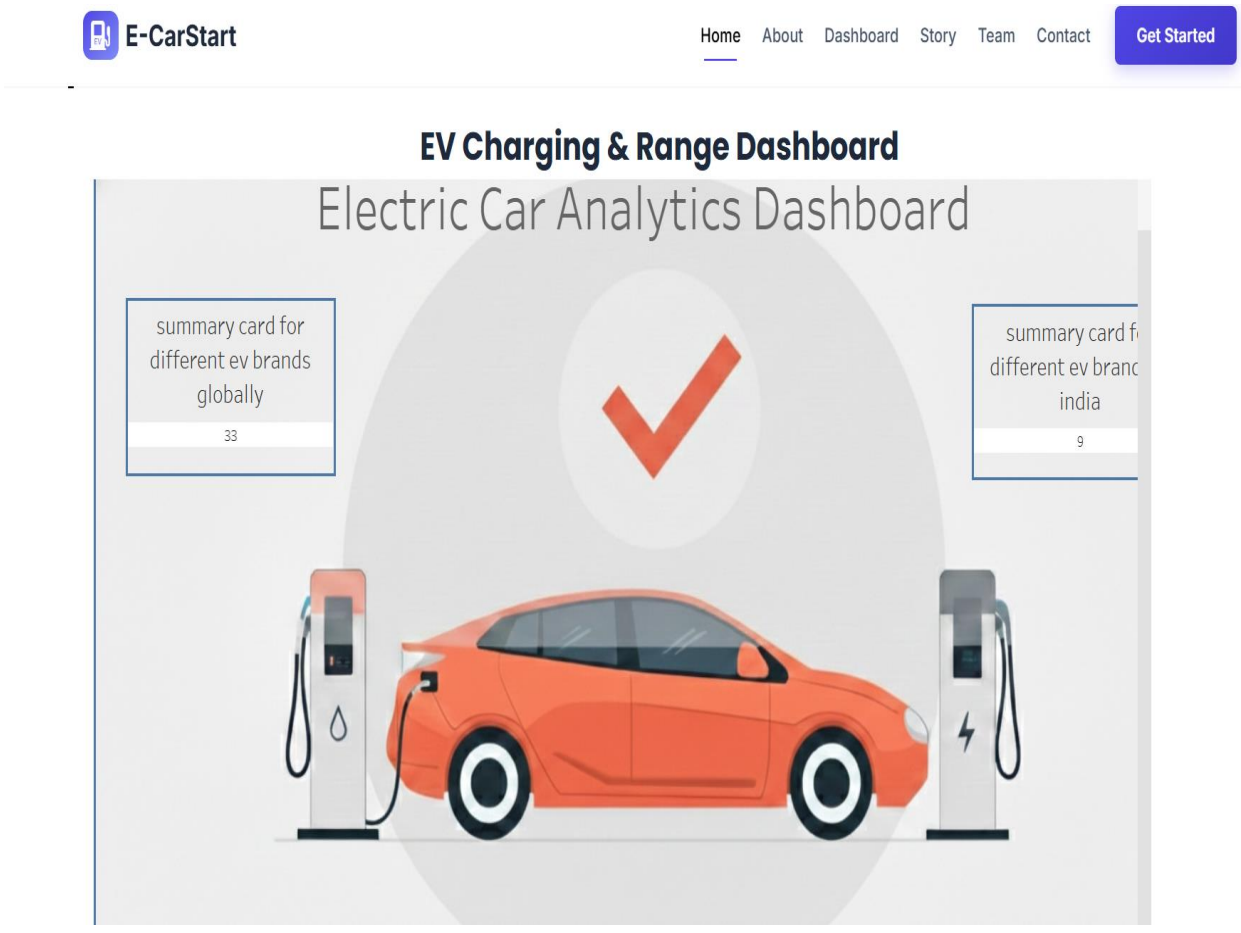
Polestar
Porsche
Renault
SEAT
Skoda
Smart
Sono
Tesla
Volkswagen
Volvo


E-CarStart
Home
About
Dashboard
Story
Team
Contact
Get Started
Next-Gen EV Analytics
We offer modern
Analytics solutions
for Electric Vehicles
Transform your electric vehicle fleet management with real-time analytics, comprehensive charging insights, and predictive range optimization.
Get Started →
50K+
Vehicles Tracked
98%
Accuracy Rate
24/7
Live Monitoring
98% Efficiency
+12% this month
Real-time Charging
Live monitoring active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Get Started
EV Charging & Range Dashboard
Electric Car Analytics Dashboard
summary card for different ev brands globally
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summary card f
different ev branc
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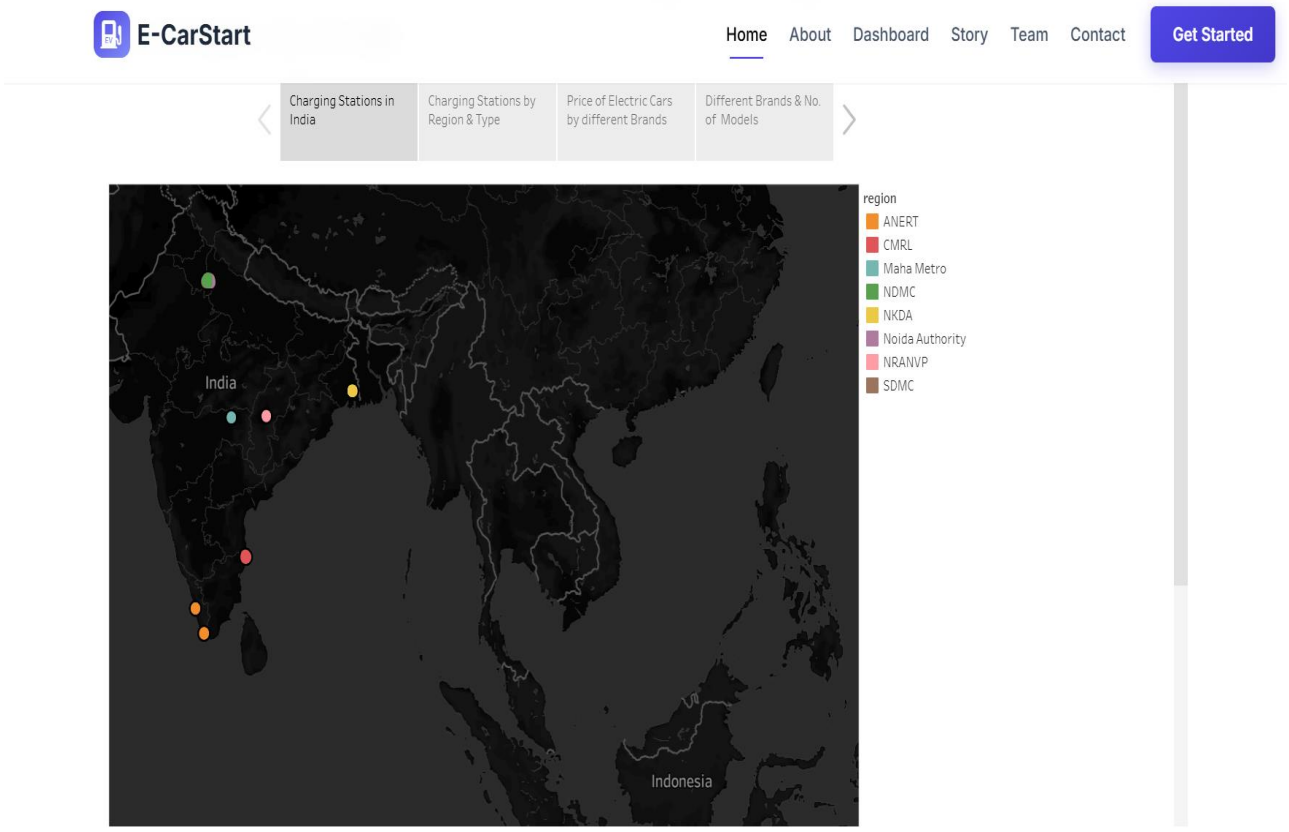
9


E-CarStart
Home
About
Dashboard
Story
Team
Contact
Get Started
Charging Stations in India
Charging Stations by Region & Type
Price of Electric Cars by different Brands
Different Brands & No. of Models
India
Indonesia
region
ANERT
CMRL
Maha Metro
NDMC
NKDA
Noida Authority
NRANVP
SDMC


E-CarStart
Home
About
Dashboard
Story
Team
Contact
Get Started
Brands according to body style
SUV
Audi
Sedan
Pickup
BodyStyle: SUV
Brand: Skoda
Bodystyle_count: 5
Top10 Most efficient EV brands
Brand
250
200
150
100
50
0
Mercedes
Audi
Tesla
Byton
Nissan
Jaguar
Porsche
Ford
BMW
models by each brand
6
Volkswagen
4
BMW
different EV cars in india
Audi E-Tron
BYD E6
MG ZS EV
Tata Nexon EV
Audi E-Tron GT
Hyundai Kona Electric
Mercedes-Benz EQC

8. ADVANTAGES & DISADVANTAGES

Advantages:

The dashboard provides centralized EV insights. It simplifies complex technical data. Interactive filters improve usability. It supports data-driven decisions for buyers and investors.

Disadvantages:

The project depends on dataset accuracy. Real-time data updates are not included. Limited to available dataset scope. Large datasets may affect performance.

9. CONCLUSION

The Electric Car Analytics Dashboard successfully integrates EV data into meaningful visual insights. It addresses both consumer and investor challenges. The project demonstrates effective data preprocessing, database integration, and visualization techniques. It enhances decision-making through interactive dashboards. Overall, it meets the intended objectives efficiently.

10. FUTURE SCOPE

The project can be extended with real-time EV and charging station data. Predictive analytics can be added for future sales forecasting. Integration with live APIs can improve accuracy. Geographic map visualizations can enhance infrastructure planning. The system can also be deployed as a web-based analytics platform

11. APPENDIX

Dataset Link:
https://drive.google.com/drive/folders/1SNwXwNYZChq9XMDXov6h27F7kahHqVb3?usp=sharing
Github Link:
https://github.com/manasa1311/E-Carstart-Analytics
Project Demo Link:
https://drive.google.com/file/d/1XRkd2hdjN9kOECps7lR4f6Pb8kqiESl-/view?usp=sharing