PROJECT REPORT

Team ID: LTVIP2025TMID51738

1. INTRODUCTION

1.1 Project Overview

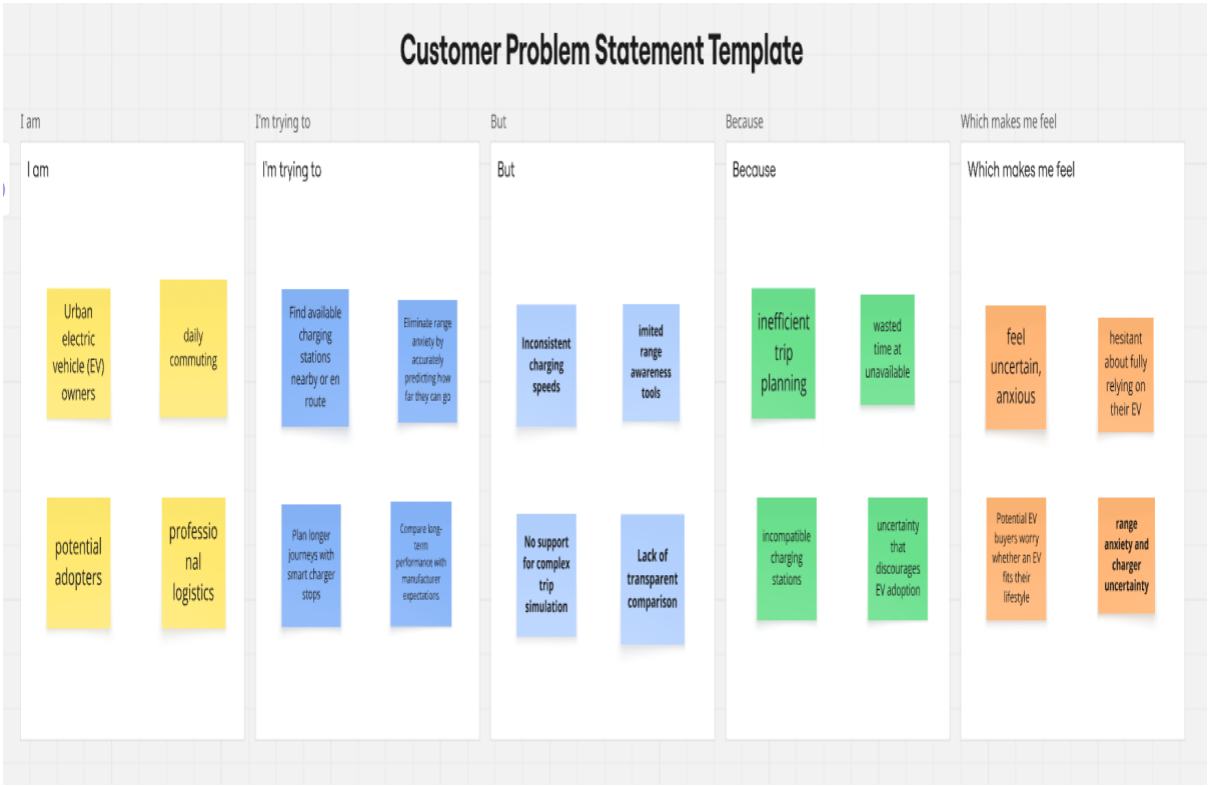
The Electric Vehicle Charge and Range project aims to explore and analyze the impact of EV Cars in the Indian market using powerful visual analytics. By leveraging Tableau, this project brings together multiple dimensions of EV Cars data such as Charging stations, Region, Range, address, Speed, Powertrain , to deliver clear, interactive dashboards. It transforms complex datasets into intuitive visual stories, helping Potential Buyer insights faster and more effectively.

1.2 Purpose

The main purpose of this project is to assist product analysts, marketing teams, and decision-makers in understanding how various EV Cars models perform across different Indian regions and quarters. By using a data-driven approach, the project provides a platform to explore trends, thus encouraging smarter decision-making in charging , Range, and feature planning.

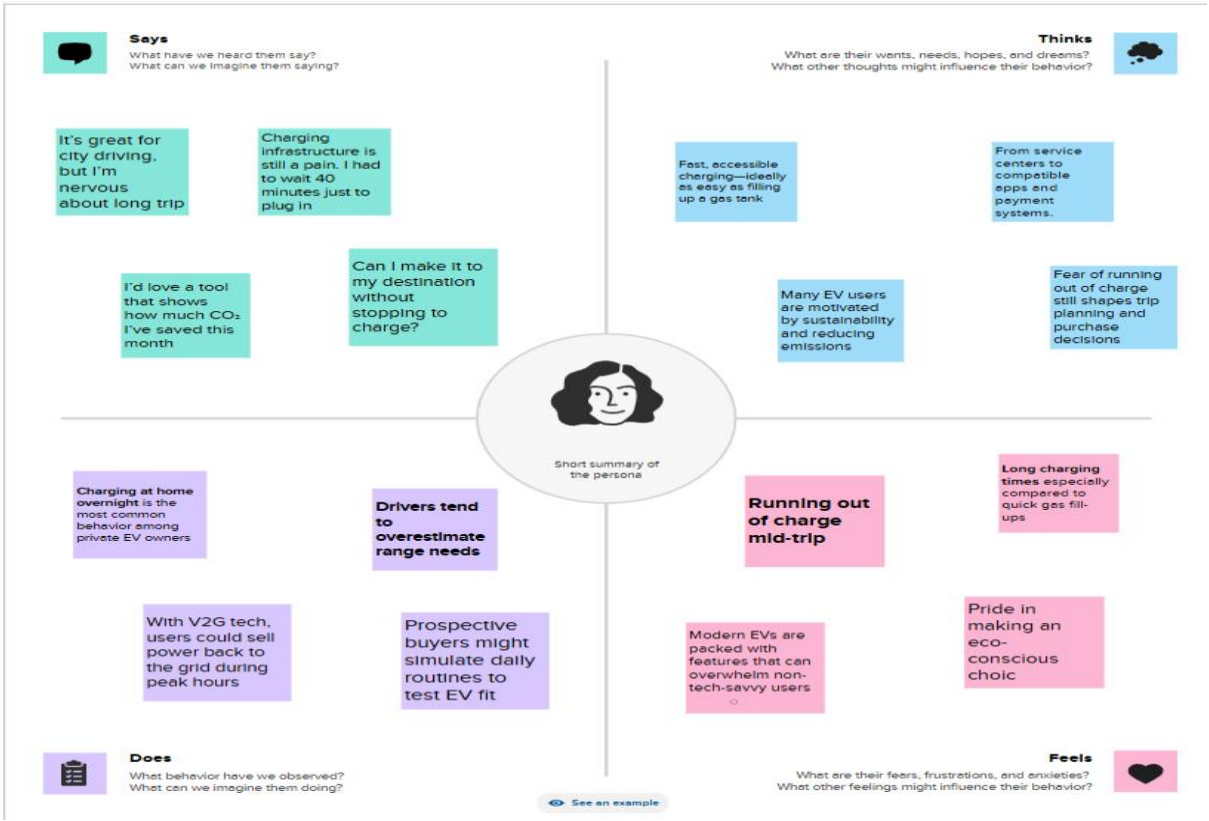
2. IDEATION PHASE

2.1 Problem Statement



Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PS-1	Urban EV Owner	Finding Charging stations nearby	Imited rage awareness tools	Cost of repair that caused by the battery's	Hesitant about fully relying on EV
PS-2	Dailt communting usres	Predicting how far they can go with one charge	Lack if transparent comparaison	Wasted time at unavailable charging stations	Range anxiety
PS-3	Professional logistics	Comparing long term performance	Inconsistent charging speeds	Inconsistent Charging stations	Charger uncertainly
PS-4	Potential Adopters	Longer journeys with smart charger stops	No support for complex trip simulation	Inefficient trip pllanning	Feel uncertain

2.2 Empathy Map Canvas



2.3 Brainstorming

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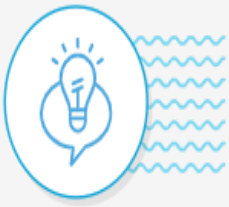


Brainstorm & idea prioritization

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

10 minutes to prepare
1 hour to collaborate
2-8 people recommended

Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.

10 minutes

A **Team gathering**
Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.

B **Set the goal**
Think about the problem you'll be focusing on solving in the brainstorming session.

C **Learn how to use the facilitation tools**
Use the Facilitation Superpowers to run a happy and productive session.

Open article →

1

Define your problem statement

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

5 minutes

PROBLEM

How might we [your problem statement]?

Key rules of brainstorming

To run an smooth and productive session

- Stay in topic.
- Encourage wild ideas.
- Defer judgment.
- Listen to others.
- Go for volume.
- If possible, be visual.

2

Brainstorm

Write down any ideas that come to mind that address your problem statement.

10 minutes

TIP

You can select a sticky note and hit the pencil [switch to sketch] icon to start drawing!

Instead of waiting to charge, drivers can swap depleted batteries for fully charged ones in minutes. Companies in China and India are already piloting this for taxis and delivery fleets

Identify top factors affecting long-term battery health (fast charging frequency, high-speed driving, heat)

Score drivers based on regenerative braking, acceleration smoothness, and cruise control usage

Include real-time electricity prices and fuel prices

Charging stations per 100 km

Predict range with inputs like driving style, load, terrain, and temperature

3

Group Ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you and break it up into smaller sub-groups.

20 minutes

TIP

Add customizable tags to sticky notes to make it easier to find, browse, organize, and categorize important ideas as themes within your mural.

Ultra-fast chargers (80% in <10 minutes)

Battery capacity vs. charging frequency

Charge time comparisons across charger types

Integration of solar panels in vehicles

Smart Route Optimizer: Plan around charging and terrain

Driving style vs. energy consumption correlation

EV vs. ICE adoption trends

Smart roads and wireless charging potential

Monthly energy spend forecaster

3.1 Customer Journey Map

This map represents how a product strategist or analyst interacts with Electric Vehicle Charge and Range dashboard from need to insight

Stage	Need	Action	Touchpoint	Pin point	Opportunity
Discover	Wants EV car with good Range and charging stations	Search Excel/market Data	Emails, Files	Data is scattered	Single dashboard entry point
Explore	Needs Region &Range	Browses charts manually	Spreadsheets, BI tools	Time-consuming	Filter-enabled Tableau dashboard
Engage	Wants to compare EV vs ICE cars	Tries Custom Visualizations	Excel Formulas	Lacks interactivity	Pre-built Brands/style/Range
Decide	Prepares pitch for leadership	Screenshots, graphs	Presentations	Dry data story telling	Use Tableau story points with captions

3.2 Solution Requirement

Functional Requirements

Following are the functional requirements of the proposed solution.

FR No.	**Functional Requirement (Epic)**	**Sub Requirement (Story / Sub-Task)**
FR-1	Trip & Range Simulation	Accept user input for origin, destination, vehicle model, and driving style Calculate real-time range based on terrain, weather, and battery status Suggest optimal charging stops with ETA, cost, and charger type
FR-2	Battery Health Monitoring	Display current battery state of health (SoH) and charge cycles Alert users to degradation trends and suggest best charging practices

FR-3	Charging Station Discovery	Show nearby chargers with filters for speed, connector type, availability, and pricing Integrate real-time data from multiple charging networks Allow users to rate, or report charger issues
FR-4	Cost & Savings Tracker	Track electricity usage and charging costs (home and public). Compare total cost of ownership vs. ICE vehicles
FR-5	Offline Mode Support	Cache recent routes, charger data, and user preferences Allow trip planning and charging even without internet

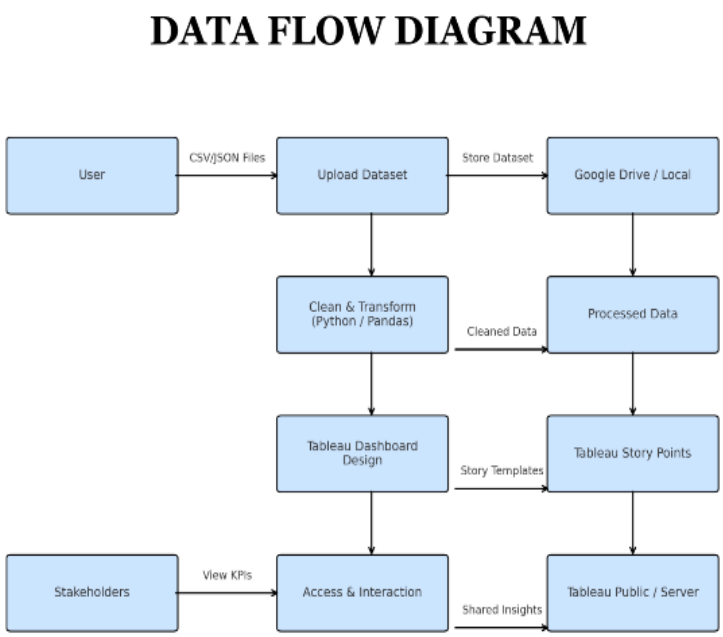
Non-functional Requirements:

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

FR No.	Non-Functional Requirement	Description
NFR-1	**Performance**	The dashboard should load within **2 seconds** under normal network conditions. It must support **real-time updates** for charger availability and battery data with minimal lag.
NFR-2	**Scalability**	The system should handle **up to 100,000 concurrent users** without degradation.

NFR-3	**Reliability**	• The system should maintain **99.9% uptime** annually. • It must gracefully handle API failures (e.g., fallback to cached charger data).
NFR-4	**Security**	All user data must be encrypted in transit and at rest (e.g., AES-256). Role-based access control should be implemented for fleet or multi-user accounts.
NFR-5	**Portability**	The dashboard must be responsive across **mobile, tablet, and desktop**. It should support **offline mode** with cached data and sync when reconnected
NFR-6	**Testability**	All modules should be covered by **unit and integration tests**. Performance and usability tests must be conducted before major releases

3.3 Data Flow Diagram

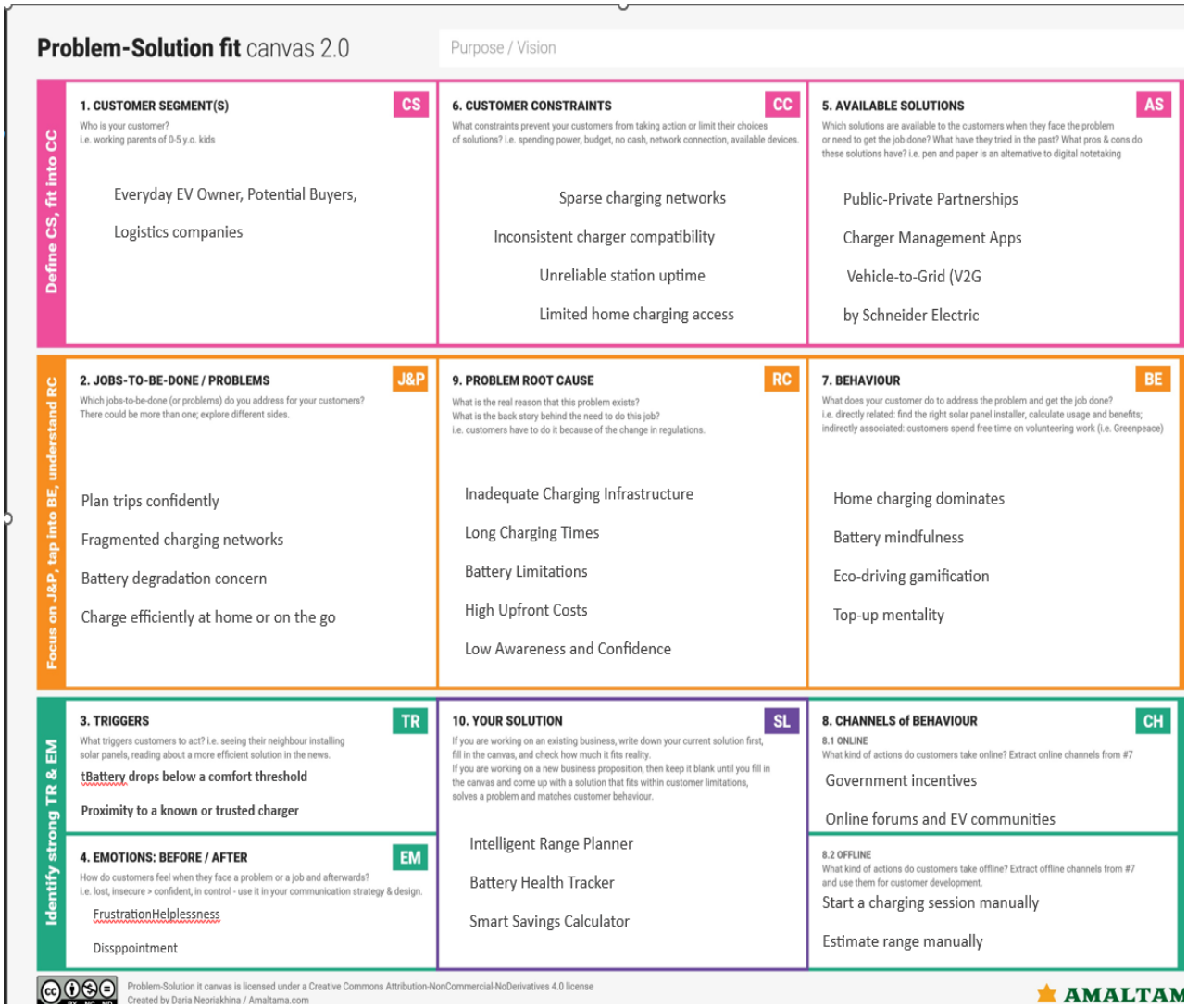


3.4 Technology Stack

Component	Tool/Technology	Purpose
Data source	CSV, JSON files	Raw EV cars brands, charging station, Range, Price, Style, Bodystyle
Visualization	Tableau Desktop	Creating Interactive dashboards and stories
Storage	Google Drive/local	Storing raw and processed datasets
Collaboration	Google Doc,Slack	Team Communication and report writing
Deployment	Tableau Public/server	Dashboard sharing and stakeholder acess

4 PROJECT DESIGN

4.1 Problem Solution Fit

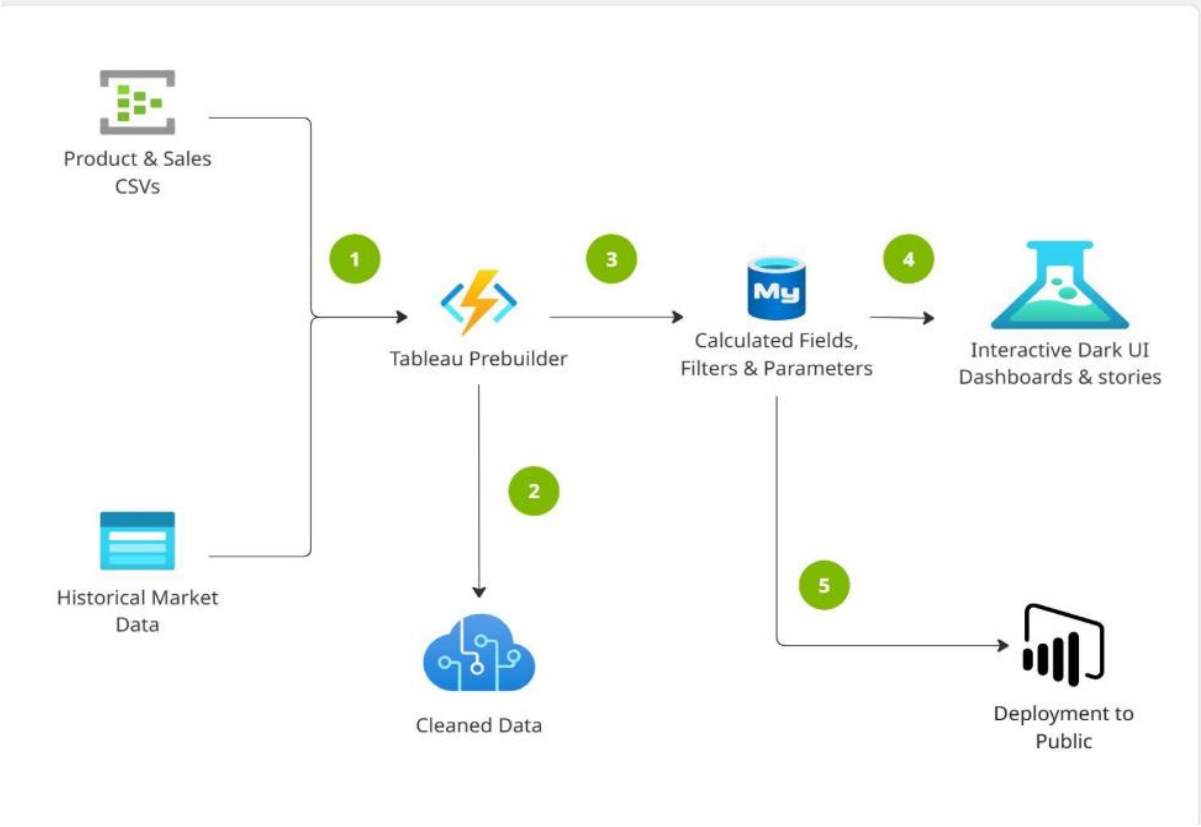


4.2 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Electric vehicle (EV) users struggle with range anxiety, inconsistent charging infrastructure, and limited visibility into battery health and energy costs. These challenges create uncertainty, reduce confidence in long-distance travel, and hinder broader EV adoption—especially among new or hesitant users.
2.	Idea / Solution description	A smart, interactive dashboard that helps EV users visualize, optimize, and confidently manage their vehicle usage across trips, charging, battery health, and savings
3.	Novelty / Uniqueness	Skateboard-style chassis enable flexible designs across sedans, SUVs, and even delivery vans. EVs evolve post-purchase—adding features, improving range, or tweaking performance remotely
4.	Social Impact / Customer Satisfaction	Cleaner Cities, Healthier Lives Energy Independence & Decentralization Urban Transformation 78% of EV buyers report high satisfaction Lower running and maintenance cost
5.	Business Model (Revenue Model)	Tiered access (Basic, Pro, Fleet) with features like advanced route planning, battery analytics, and offline mode. Micro-payments for premium simulations, trip exports, or charger reservations.

		Partner with EV manufacturers, charger networks, or insurance providers. Earn commissions for test drives, charger installations, or policy sign-ups. Offer anonymized usage analytics to city planners, OEMs, or energy companies. License the dashboard to dealerships, EV startups, or fleet operators under their brand.
6.	Scalability of the Solution	start with solo EV owners, then expand to fleet managers, rideshare drivers, and logistics operators.Plug into APIs from local networks (e.g., Tata Power, Ather Grid) and global ones (like ChargePoint or Ionity).Add new features (like V2G tracking or solar integration) without overhauling the core

4.3 Solution Architecture



5. PROJECT PLANNING & SCEDULING

5.1 Project Planning

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Data Collection	USN-2	As a user, I can load data into the processing environment	1	High	All
Sprint-2	Data Preprocessing	USN-3	As a user, I can handle missing values in the dataset	3	Medium	All
Sprint-2	Data preprocessing	USN-4	As a user, I can encode or map categorical variables appropriately	2	Medium	All
Sprint-3	Marking Graphs/Visualizations	USN-5	As a user, I can build the initial model based on processed data	5	High	All
Sprint-4	DashBoard& Story	USN-6	As a user, I can create the dashboard with user friendly and easy to understand	6	High	All
Sprint-5	Report&Doccumentation	USN-7	The step by step guide doccumentation	7	Medium	All

6.FUNCTIONAL AND PERFORMANCE TESTING

6.1 Performance Testing

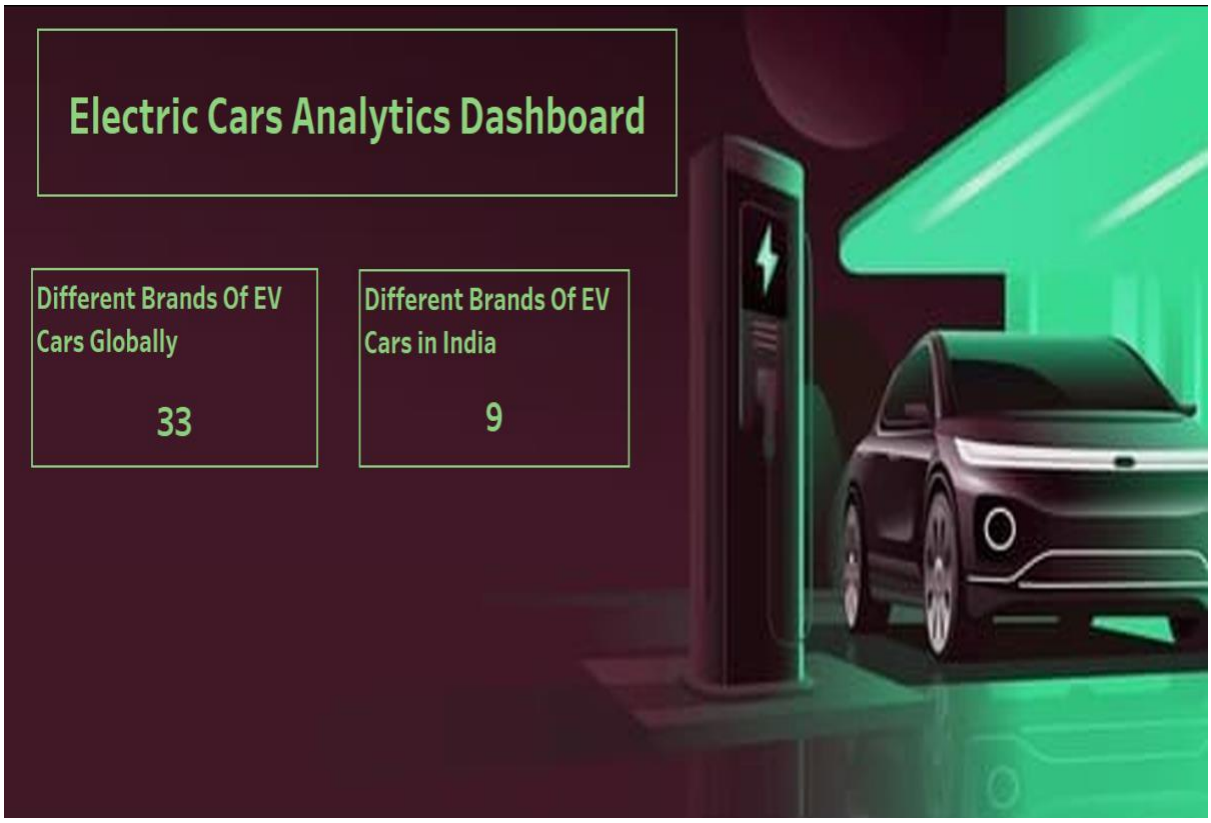
S.No.	Parameter	Screenshot / Values
1.	Data Rendered	Rendered from cleaned CSV files with EV Cars prices, Range, charging stations in India, Charging stations by Region, Powertrain, Style, Bands, BodyStyle, etc.

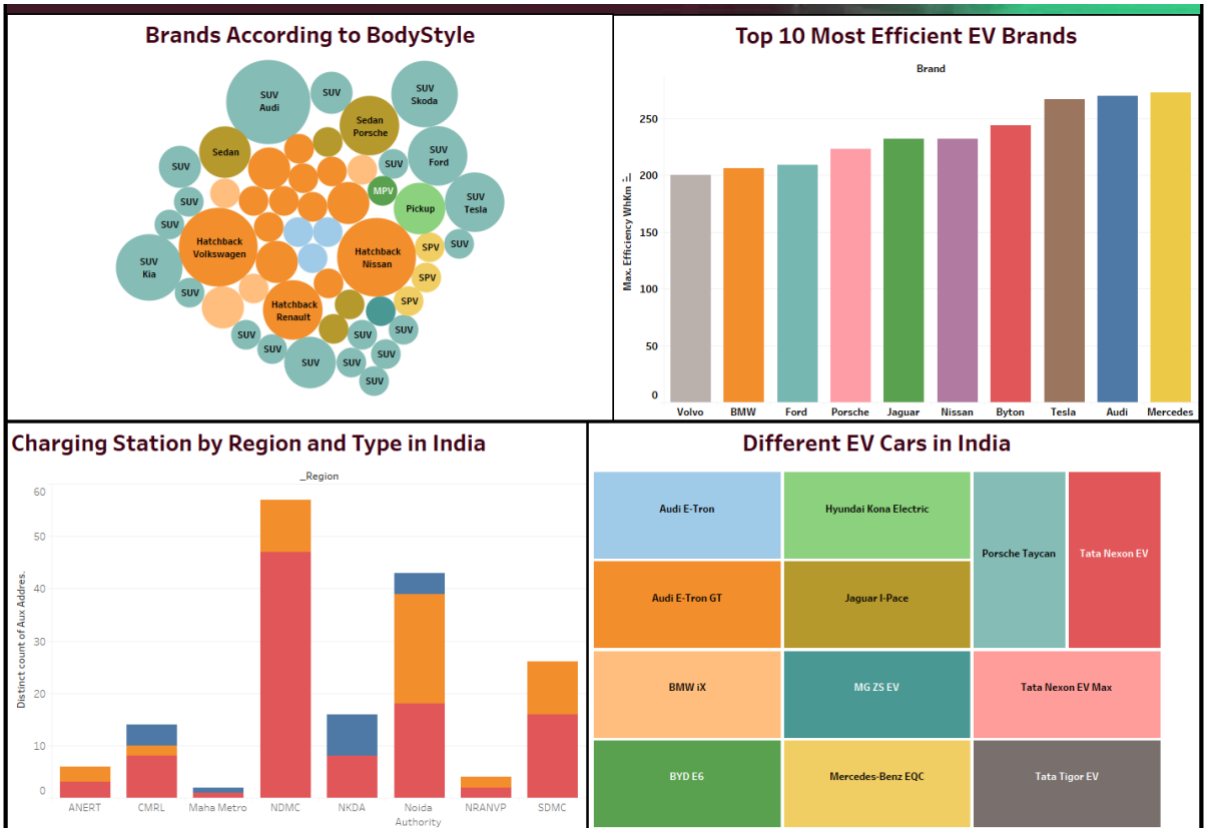
2.	Data Preprocessing	Null values handled; feature mapping applied for Brands, Regions, Cars, Powertrain, Price's
3.	Utilization of Filters	Applied Tableau filters for Brands, Region, Powertrain, Price, Style, BodyStyle
4.	Calculation fields Used	Sum of Price Range Maximum EV Brands Average count of Bodystyle Sum of different EV brands Globally & in India
5.	Dashboard design	No of Visualizations / Graphs – 1 Daashboards
6	Story Design	No of Visualizations / Graphs -11 Visualizations with 4 story

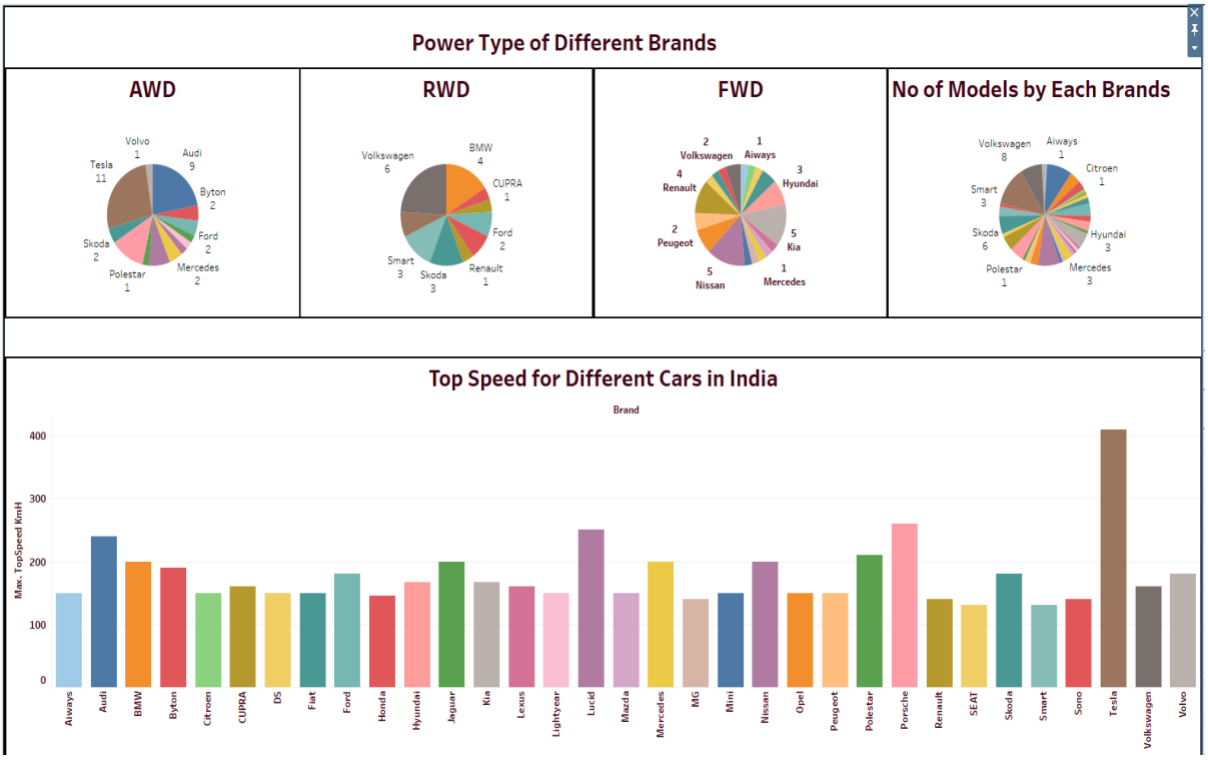
7.RESUILTS

7.1 Outputs Screenshots

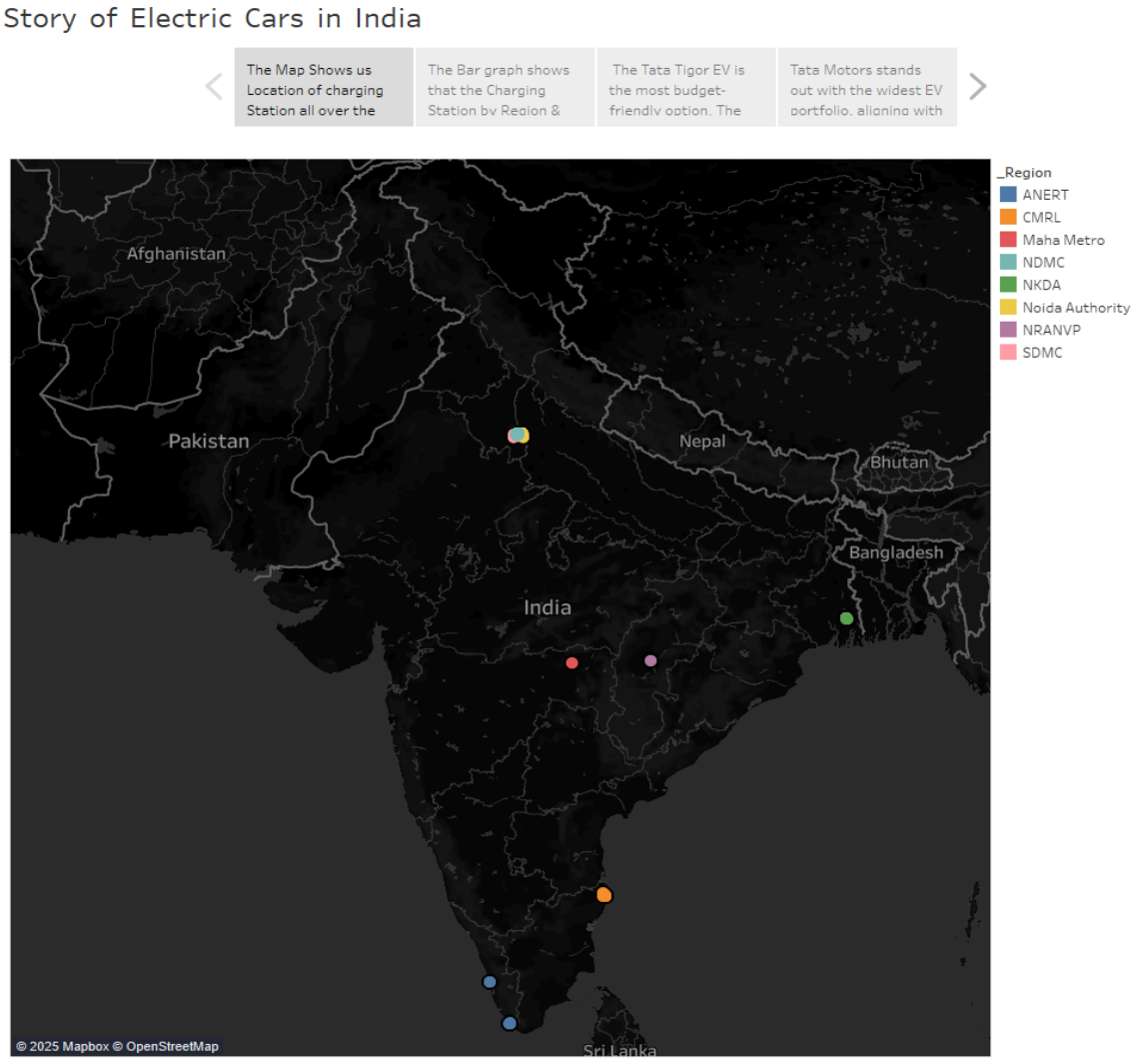
DASHBOARD

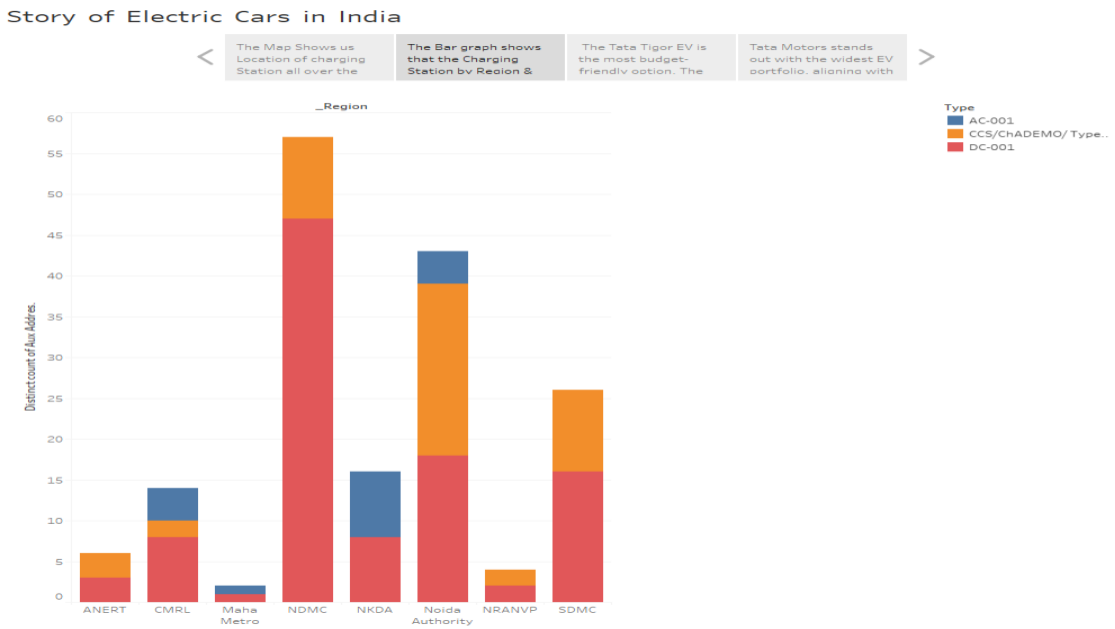



Brands According to BodyStyle
SUV Audi
SUV
SUV Skoda
Sedan Porsche
Sedan
SUV
SUV Ford
MPV
Pickup
SUV Tesla
SUV Kia
Hatchback Volkswagen
Hatchback Nissan
SPV
Hatchback Renault
Top 10 Most Efficient EV Brands
Brand
Max. Efficiency Whkm
250
200
150
100
50
0
Volvo
BMW
Ford
Porsche
Jaguar
Nissan
Byton
Tesla
Audi
Mercedes
Charging Station by Region and Type in India
_Region
Distinct count of Aux Addres..
60
50
40
30
20
10
0
ANERT
CMRL
Maha Metro
NDMC
NKDA
Noida Authority
NRANVP
SDMC
Different EV Cars in India
Audi E-Tron
Hyundai Kona Electric
Porsche Taycan
Tata Nexon EV
Audi E-Tron GT
Jaguar I-Pace
BMW iX
MG ZS EV
Tata Nexon EV Max
BYD E6
Mercedes-Benz EQC
Tata Tigor EV


Power Type of Different Brands
AWD
Volvo 1
Audi 9
Tesla 11
Byton 2
Ford 2
Skoda 2
Polestar 1
Mercedes 2
RWD
Volkswagen 6
BMW 4
CUPRA 1
Ford 2
Smart 3
Skoda 3
Renault 1
FWD
2 Volkswagen
1 Aiways
3 Hyundai
4 Renault
5 Kia
2 Peugeot
1 Mercedes
5 Nissan
No of Models by Each Brands
Volkswagen 8
Aiways 1
Citroen 1
Smart 3
Hyundai 3
Skoda 6
Mercedes 3
Polestar 1
Top Speed for Different Cars in India
Brand
Max. TopSpeed Kmh
400
300
200
100
0
Aiways
Audi
BMW
Byton
Citroen
CUPRA
DS
Fiat
Ford
Honda
Hyundai
Jaguar
Kia
Lexus
Lightyear
Lucid
Mazda
Mercedes
MG
Mini
Nissan
Opel
Peugeot
Polestar
Porsche
Renault
SEAT
Skoda
Smart
Sono
Tesla
Volkswagen
Volvo

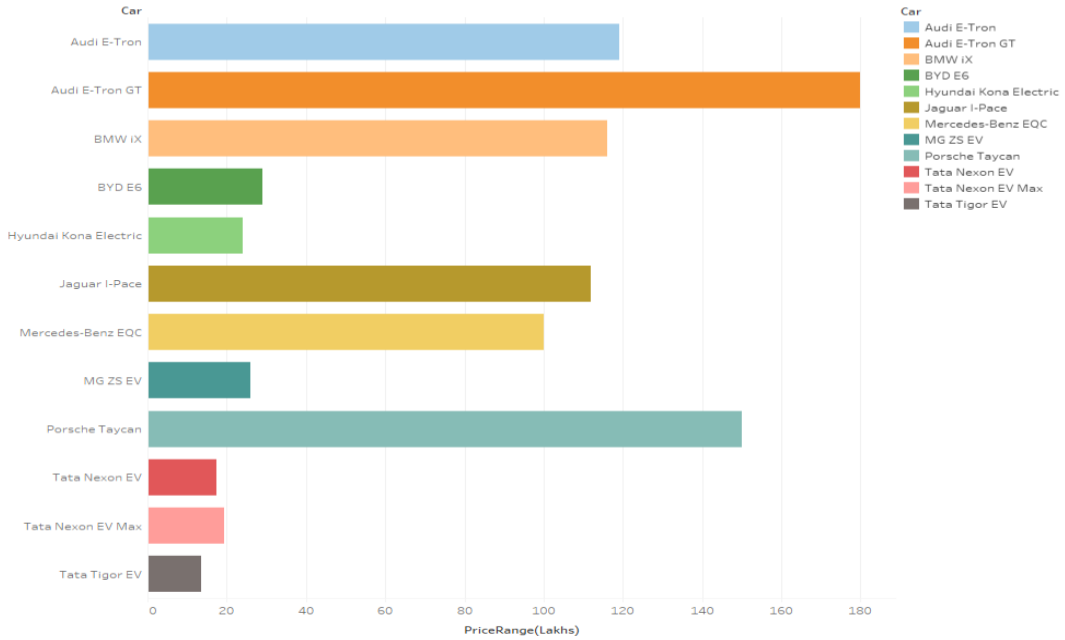
STORY OUTPUT:





Story of Electric Cars in India

The Map Shows us Location of charging Station all over the | The Bar graph shows that the Charging Station by Region & | **The Tata Tigor EV is the most budget-friendly option. The** | Tata Motors stands out with the widest EV portfolio, aligning with



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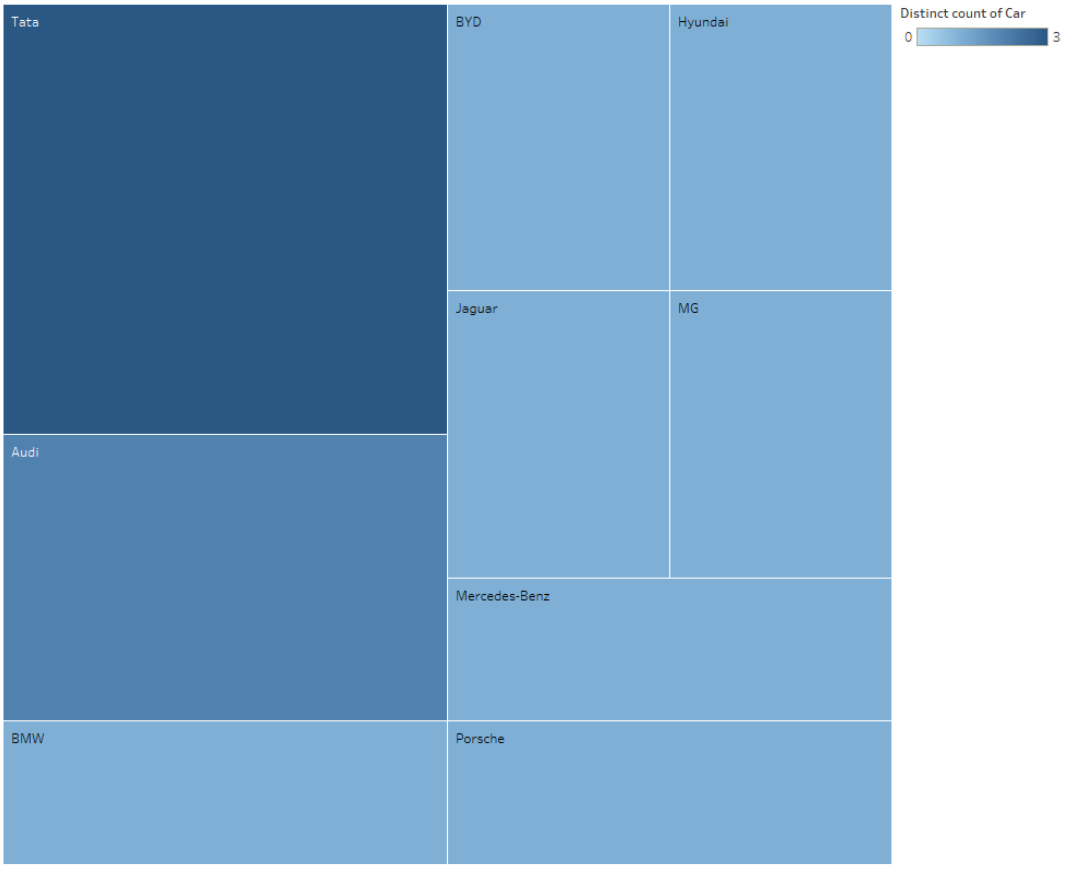

8. ADVANTAGES & DISADVANTAGES

● ADVANTAGES:

- **User-Friendly Dashboards**: Intuitive interface with dark-themed visuals that reduce eye strain and enhance readability.
- **Interactive Insights**: Real-time filtering and data slicing allow users to extract exactly what they need without manual intervention.
- **Data-Driven Decision** Making: Helps strategists, marketers, and executives make smarter, evidence-based decisions.
- **Time-Saving**: Reduces the manual workload for analysts by providing ready-to-explore visualizations.

● DISADVANTAGES:

- **Platform Limitation**: Tableau Public may limit some functionality such as real-time backend connection and publishing privacy.
- **Dependence on Data Accuracy**: Insights are only as good as the quality of input data; inaccurate or outdated datasets could mislead.
- **Static Structure in Story**: While dashboards are interactive, Tableau stories have limited flexibility in dynamic narration

9. CONCLUSION

The EV Cars Charging and Range project successfully demonstrates how data visualization, combined with user-centered design, can drive meaningful insights into charging station, Range in India. By integrating Brands, pricing, Bodystyle, and market data into interactive Tableau dashboards, the project not only simplifies complex analytics but also empowers decision-makers to act with confidence. This end-to-end effort—from ideation to deployment—shows the real-world value of design thinking and data storytelling in business intelligence.

10. FUTURE SCOPE

- Multi-brand Integration: Extend the current dashboard to include competitor analysis
- Real-Time Data Connection: Integrate live data sources (APIs or Google Sheets) to keep the dashboards updated automatically.
- Mobile Optimization: Redesign dashboards for optimal viewing on tablets and mobile devices.
- AI-Powered Forecasting: Use predictive analytics to project future sales, pricing trends, or charging Stations in india.

11. APPENDIX

Dataset Link

https://drive.google.com/drive/folders/1TU7KlMJoikHOwJr63MpfGxXi0DMGuUXq?usp=sharing

GitHub & Project Demo Link

https://github.com/dharahaas23/Electric-Car-Charging-and-Range

Team Members: Simhadri Dharahaas, Rekapalli Bhindu Sri, Ratakonda Saisri, pushadapu Ramyatha