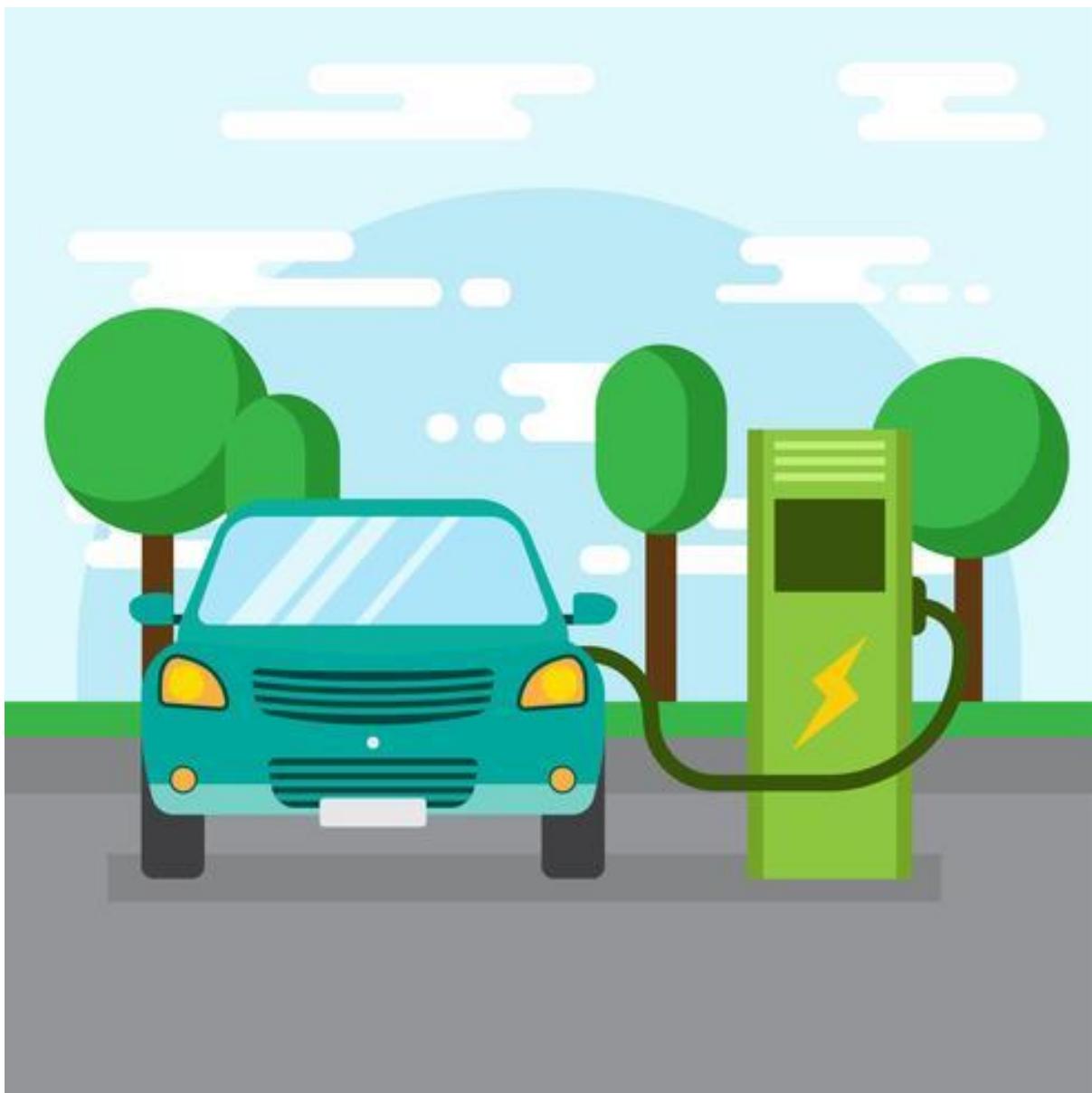


Visualization Tool for Electric Vehicle Charge and Range Analysis



Project Report Format

1. INTRODUCTION

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1.1 Project Overview

The rise of **Electric Vehicles (EVs)** has created a growing demand for data-driven tools to support consumers and policymakers in making informed decisions. This project aims to build an **interactive dashboard using Tableau** that visualizes data from various EV datasets including vehicle specifications, pricing, efficiency, and charging infrastructure in India and globally.

The dashboard is designed to be a **user-friendly, centralized platform** where users can explore and compare different electric vehicles based on key performance and usability factors. It integrates multiple publicly available datasets and uses **visual storytelling** to help users derive actionable insights.

With filters for **brand, powertrain, range, price, body style, and region**, and an interactive **charging station map**, this dashboard enables a comprehensive view of the EV landscape, providing value to both everyday users and strategic planners.

1.2 Purpose

The primary purpose of this project is to:

- Simplify complex EV-related data into intuitive, interactive visual dashboards.
- Empower users to make well-informed decisions about purchasing EVs.
- Provide policymakers with visual tools to assess and plan EV infrastructure development.
- Promote data-driven awareness around electric vehicle adoption in India and globally.
- Enhance the reach and accessibility of EV insights by publishing the dashboard on **Tableau Public**.

Ideation Phase

Define the Problem Statements

Date	27 June 2025
Team ID	LTVIP2025TMID48284
Project Name	Visualization Tool for Electric Vehicle Charge and Range Analysis
Maximum Marks	2 Marks

Customer Problem Statement Template:

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.

Problem Statement:

Analysing different data from multiple sources for Electric cars in India and Globally. We have 4 different datasets we need to analyse and create a dashboard and story that can represent the data and show meaningful visuals.

Example:

Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PS-1	a tech-savvy and environment ally conscious car buyer	understand and compare electric vehicles based on range, performance, and price	it's hard to interpret scattered and unorganized data	data is spread across multiple sources and lacks a unified visual format	overwhelmed and unsure about making an informed EV decision
PS-2	a policymaker or EV infrastructure planner	identify areas where EV charging stations are lacking	it's difficult to find integrated, comparative insights	public datasets are available but not easily visualized or Analyzed	unequipped to make strategic infrastructure decisions

Empathize & Discover

Date	27 June 2025
Team ID	LTVIP2025TMID48284
Project Name	Visualization Tool for Electric Vehicle Charge and Range Analysis
Maximum Marks	4 Marks

Empathy Map Canvas:

An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviours and attitudes.

It is a useful tool to help teams better understand their users.

Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.

Empathy for EV Car Buyers Says: "I want a sustainable vehicle, but it should also be affordable and practical."

Thinks: "Which EV gives the best mileage, performance, and support in my city?"

Does: Compares brands, browses car specs, reads reviews.

Feels: Excited about green technology, but confused due to information overload.

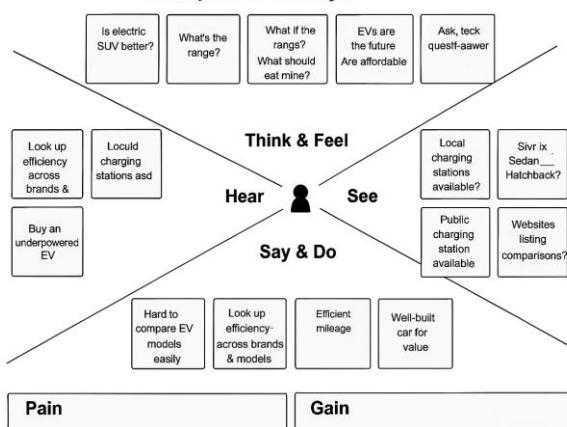
Goals:

- Own a reliable and efficient electric car.
- Get access to nearby charging stations.
- Contribute to a greener future.

Pains:

- Hard to compare EVs side by side.
- Lack of region-specific infrastructure data.
- Fear of buying an underperforming model.

Example: EV Car Buyer



Brainstorm & Idea Prioritization Template

Date	27 June 2025
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Maximum Marks	4 Marks

Brainstorm & Idea Prioritization Template:

Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem solving. Prioritizing volume over value, out-of-the-box ideas are welcome and built upon, and all participants are encouraged to collaborate, helping each other develop a rich amount of creative solutions.

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.

Step-1: Team Collaboration & Problem Identification

- EV buyers and planners struggle to make informed decisions due to scattered data.
- Need to consolidate and visualize EV-related data.

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

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

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](#)

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.

Step-2: Brainstorming Ideas

- Create Tableau dashboard for:
 - EV brands and models comparison
 - Powertrain and body style filters
 - Charging station maps
 - Efficiency vs Price analysis
 - Top efficient brands
 - Global vs India views

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!

Amar

Yuktesh

Person 3

Person 4

Person 5

Person 6

Person 7

Person 8

3

Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. In the last 10 minutes, 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 custom icons to sticky notes to make it easier to find, browse, organize, and categorize important ideas as themes within your mind.

Person 4

Step-3: Idea Prioritization

Idea	Impact	Feasibility	Priority
Map of EV charging stations	High	Medium	<input checked="" type="checkbox"/> High
Comparison of brands & prices	High	High	<input checked="" type="checkbox"/> High
Body style and drivetrain filters	Medium	High	Medium
Efficiency-based sorting	High	Medium	<input checked="" type="checkbox"/> High
Global vs India toggle	Medium	Medium	Medium



Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

⌚ 20 minutes



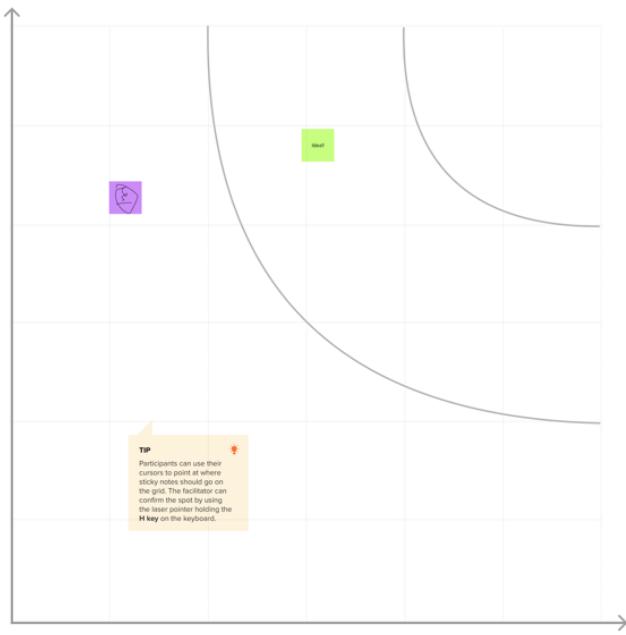
Importance

If each of these tasks could get done without any干扰 (distractions), which would have the most positive impact?



Feasibility

Regardless of their importance, which tasks are more feasible than others? (Cost, time, effort, complexity, etc.)



Project Design Phase-II

Solution Requirements (Functional & Non-functional)

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Project Name	Visualization Tool for Electric Vehicle Charge and Range Analysis
Maximum Marks	4 Marks

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	Data Preparation	Clean and merge multiple EV datasets Handle missing values and format dates
FR-2	Data Integration & Extract Creation	Convert datasets into Tableau Extracts (.hyper) Ensure compatibility with Tableau Public
FR-3	Dashboard Visualization	Create filter options (brand, powertrain, body style) Create summary cards and KPI tiles Add map to show EV charging stations
FR-4	User Interaction	Enable users to filter and explore visuals Enable dashboard storytelling features
FR-5	Deployment	Publish dashboard to Tableau Public Provide public access link

Non-functional Requirements:

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

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	Dashboard must be intuitive, with simple filters and clear visuals
NFR-2	Security	Ensure data is anonymized; only public datasets used, no PII exposed
NFR-3	Reliability	Data must load consistently without failure; Tableau Public must not break links
NFR-4	Performance	Dashboards must load within 3–5 seconds; visuals optimized for speed
NFR-5	Availability	Dashboard should be accessible 24/7 via Tableau Public
NFR-6	Scalability	Easy to add new datasets (e.g., global EVs or real-time charging stations) without redesigning the entire dashboard

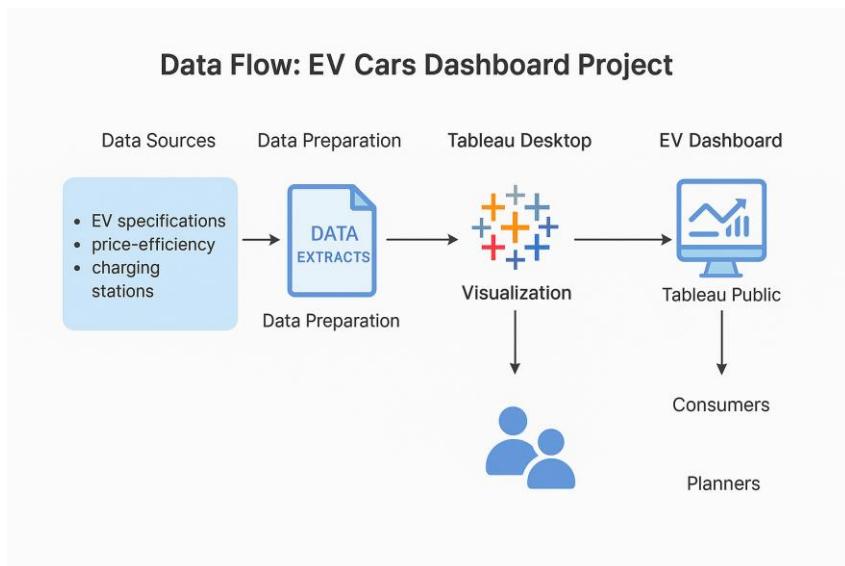
Data Flow Diagram & User Stories

Date	27 June 2025
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Project Name	Visualization Tool for Electric Vehicle Charge and Range Analysis
Maximum Marks	4 Marks

Data Flow Diagrams:

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.

Data Flow: EV Cars Dashboard Project



User Stories: Use the below template to list all the user stories for the product.

Problem – Solution Fit Template

Date	27 June 2025
Team ID	LTVIP2025TMID48284
Project Name	Visualization Tool for Electric Vehicle Charge and Range Analysis
Maximum Marks	2 Marks

Problem :

- EV consumers and planners face difficulty due to scattered and unstructured data across multiple sources.
- Lack of a unified platform for comparing electric vehicles by price, range, body type, efficiency, and charging infrastructure.
- Manual research is time-consuming, and static sources (PDFs, tables) are not interactive.
- Consumers are unable to confidently make informed decisions when purchasing an EV.
- Policymakers cannot easily visualize regional EV infrastructure gaps.

Solution -

- Develop a centralized interactive Tableau dashboard to visualize and analyze EV data.
- Integrate multiple datasets (EV specifications, prices, range, efficiency, charging stations).
- Enable filtering by brand, location, powertrain type, body style, and charging infrastructure.
- Use Tableau Public for accessible, no-login-required publishing.
- Help both buyers and planners with real-time, visually rich comparisons.

Purpose of Problem–Solution Fit

- Solve complex problems -
→ Transforms raw, disconnected EV data into a clear, unified, and insightful dashboard experience.
- Tap into existing user Behavior -
→ Leverages online EV research habits and adds value through dynamic filters and visuals.
- Sharpen communication & messaging -
→ Uses intuitive charts, filters, and tooltips to present data clearly and reduce user confusion.

- Build trust and increase adoption -
 - Helps users make confident EV decisions, and assists planners with credible infrastructure insights.
- Improve the current experience -
 - Replaces scattered static files and generic comparisons with an intelligent, interactive, and visual solution.

<p>1. CUSTOMER SEGMENT(S) Who is your customer? I.e. working parents of 0-5 y.o. kids</p>	<p>CS</p> <p>6. CUSTOMER CONSTRAINTS What constraints prevent your customers from taking action or limit their choices of solutions? I.e. spending power, budget, no cash, network connection, available devices.</p>	<p>CC</p> <p>5. AVAILABLE SOLUTIONS Which solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? I.e. pen and paper is an alternative to digital notetaking</p>
<p>2. JOBS-TO-BE-DONE / PROBLEMS Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one, explore different sides.</p>	<p>J&P</p> <p>9. PROBLEM ROOT CAUSE What is the real reason that this problem exists? What is the back story behind the need to do this job? I.e. customers have to do it because of the change in regulations.</p>	<p>RC</p> <p>7. BEHAVIOUR What does your customer do to address the problem and get the job done? I.e. directly related: find the right solar panel installer, calculate usage and benefits; Indirectly associated: customers spend free time on volunteering work (I.e. Greenpeace)</p>
<p>3. TRIGGERS What triggers customers to act? I.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news.</p>	<p>TR</p> <p>10. YOUR SOLUTION If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality. If you are working on a new business proposition, then keep it blank, until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour.</p>	<p>SL</p> <p>8. CHANNELS of BEHAVIOUR 8.1 ONLINE What kind of actions do customers take online? Extract online channels from #7</p> <p>CH</p> <p>8.2 OFFLINE What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development.</p>
<p>4. EMOTIONS: BEFORE / AFTER How do customers feel when they face a problem or a job and afterwards? I.e. lost, Insecure > confident, In control - use it in your communication strategy & design.</p>		

Define CS, fit into CC

Focus on J&P, tap into BE, understand RC

Identify strong TR & EM

Explore AS, differentiate

Focus on J&P, tap into BE, understand RC

Extract online & offline CH of BE

Proposed Solution Template

Date	27 June 2025
Team ID	LTVIP2025TMID48284
Project Name	Visualization Tool for Electric Vehicle Charge and Range Analysis
Maximum Marks	2 Marks

Proposed Solution Template:

Project team shall fill the following information in the proposed solution template.

S.N o.	Parameter	Description
1.	Problem Statement (Problem to be solved)	The rise in Electric Vehicles (EVs) demands accessible, insightful data to guide customer choices and infrastructure planning. Currently, EV-related data is scattered across multiple sources and lacks clear visual storytelling. This creates confusion for buyers and limitations for policymakers.
2.	Idea / Solution description	The project involves developing a Tableau Dashboard that integrates and visualizes key EV datasets — including vehicle specifications, prices, efficiency metrics, and charging station locations. It enables users to compare EVs, filter by technical attributes, and view geospatial data on infrastructure.
3.	Novelty / Uniqueness	The uniqueness lies in the integration of multiple open datasets into a single, interactive dashboard that caters to both EV consumers and infrastructure planners. It transforms raw data into actionable insights using powerful visual elements like maps, filters, KPIs, and stories in Tableau.
4.	Social Impact / Customer Satisfaction	This dashboard empowers sustainable decision-making , helping users choose efficient EVs and understand local charging

		access. It reduces confusion and increases trust in EV adoption, while also aiding government agencies and planners in identifying underserved regions.
5.	Business Model (Revenue Model)	The solution can be monetized by offering dashboard customization services to EV brands, dealerships, or government departments. Additionally, advertising EV-related products/services or offering subscription-based analytical insights to businesses can provide revenue streams.
6.	Scalability of the Solution	The dashboard can be scaled by adding real-time data integration, regional filters , or expanding into global datasets . It can evolve into a full-fledged analytics platform serving EV manufacturers, transport planners, and customers worldwide.

Project Design Phase

Solution Architecture

Date	27 June 2025
Team ID	LTVIP2025TMID48284
Project Name	Visualization Tool for Electric Vehicle Charge and Range Analysis
Maximum Marks	4 Marks

System Architecture – EV Cars Dashboard

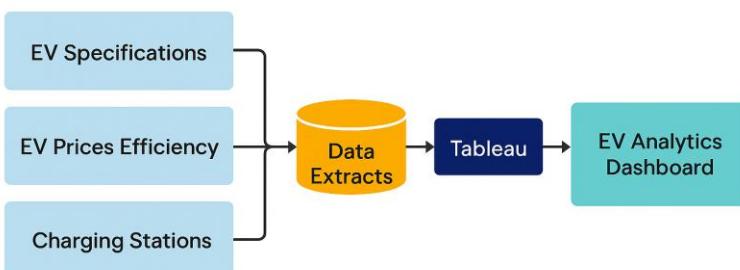
The system collects EV data from multiple sources such as EV specifications, price-efficiency datasets, and charging station lists. These datasets are cleaned and converted into Tableau Data Extracts. Using Tableau Desktop, the data is then visualized through an interactive dashboard that allows users to filter and explore insights. The final dashboard is published on Tableau Public, making it accessible to EV consumers and planners.

Flow Summary:

Data Sources (CSV/Excel) → Data Extracts → Tableau Desktop → EV Dashboard (Tableau Public)

Solution Architecture Diagram:

Solution Architecture



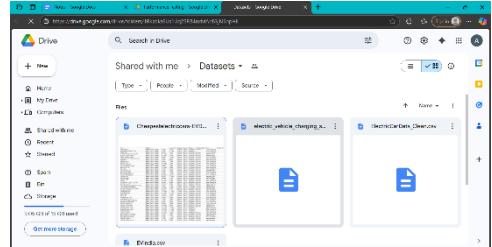
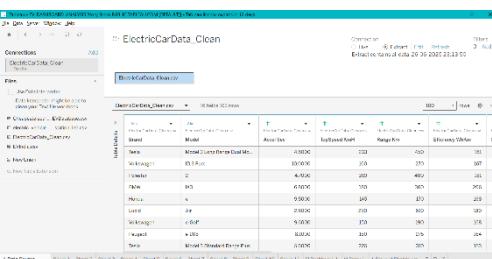
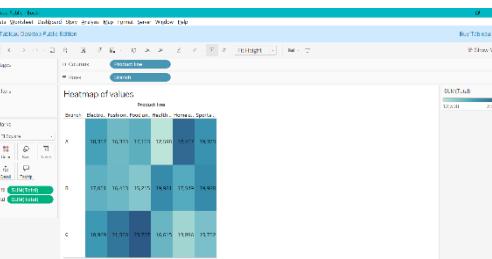
Solution Architecture

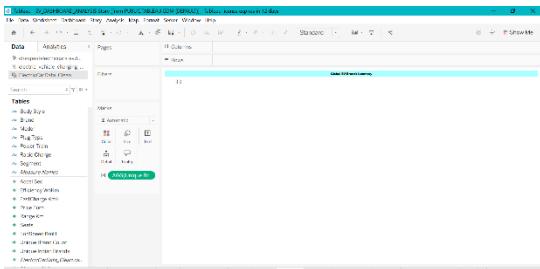
Model Performance Test

Date	10 February 2025
Team ID	LTVIP2025TMID48284
Project Name	Visualization Tool for Electric Vehicle Charge and Range Analysis
Maximum Marks	

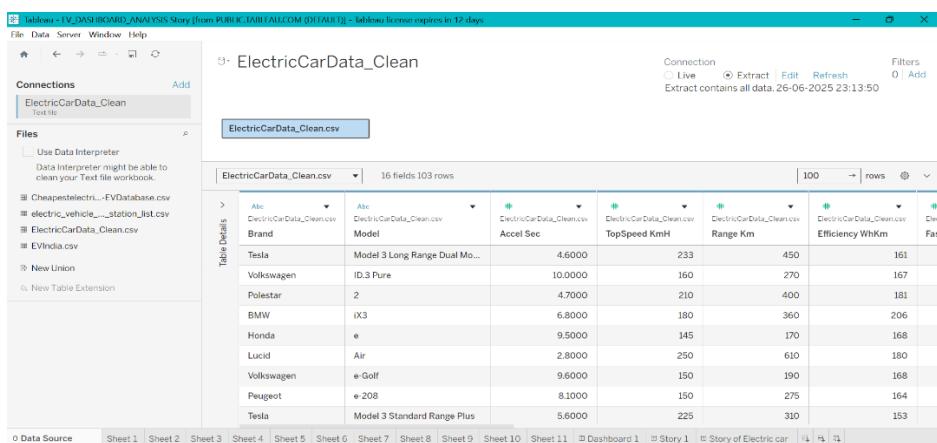
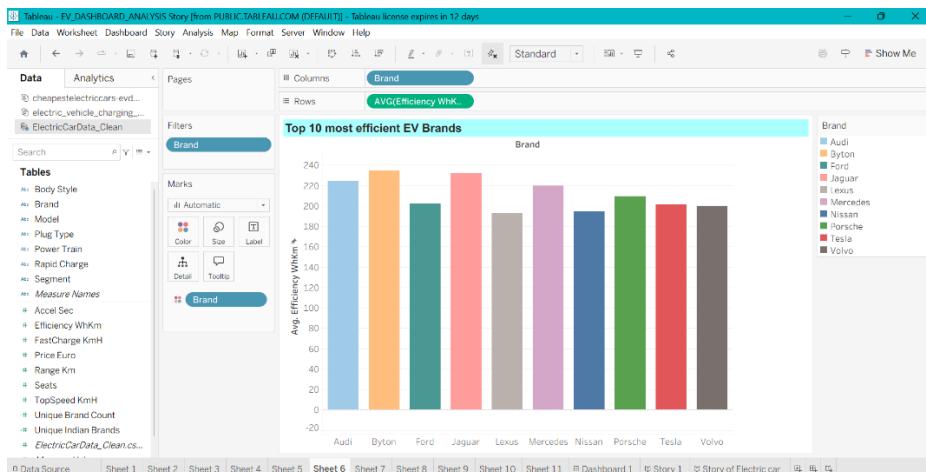
Model Performance Testing:

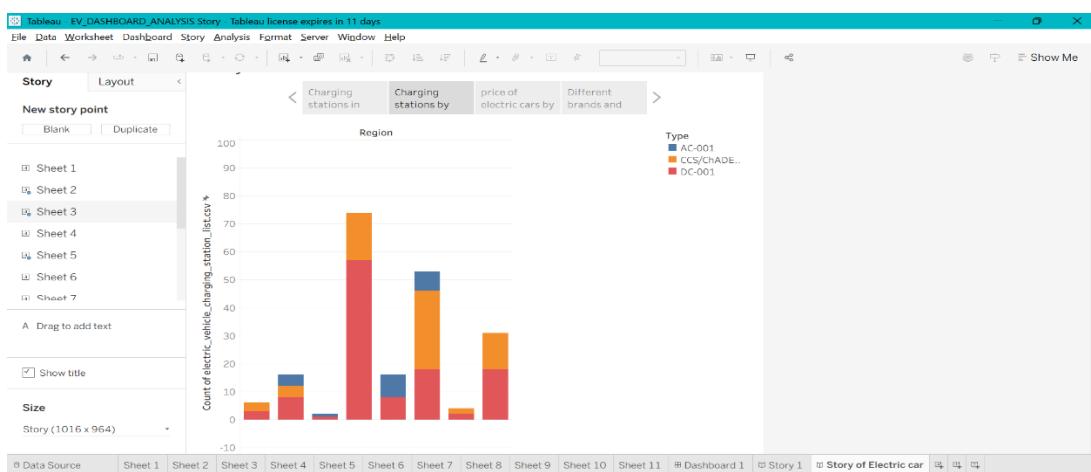
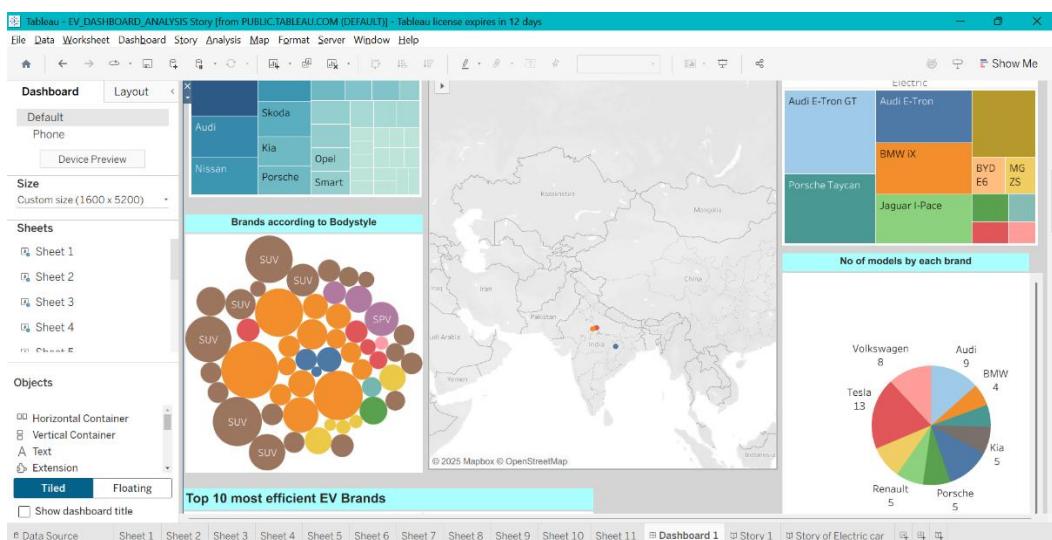
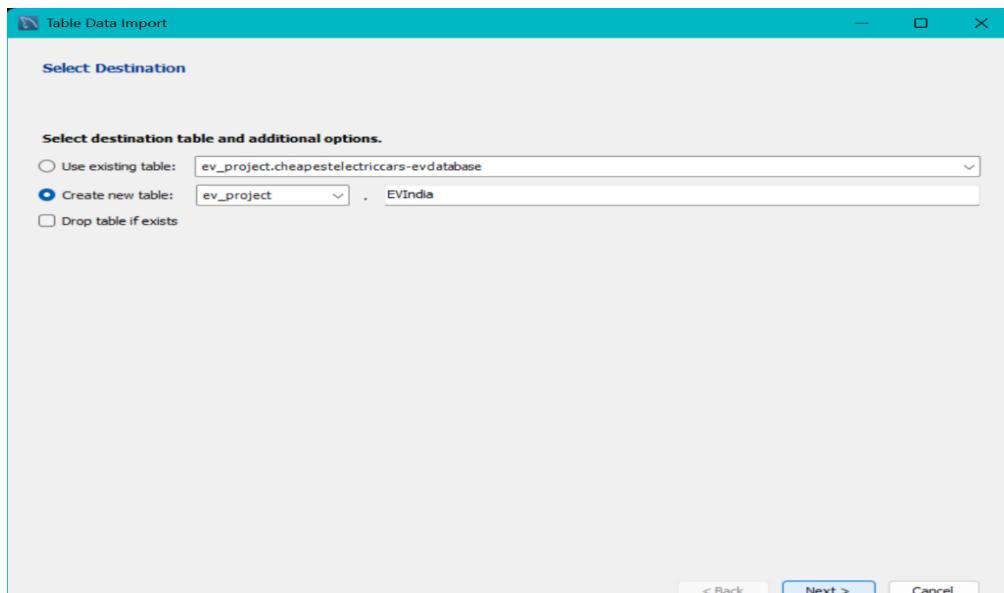
Project team shall fill the following information in model performance testing template.

S.No.	Parameter	Screenshot / Values
1.	Data Rendered	
2.	Data Preprocessing	
3.	Utilization of Filters	

4.	Calculation fields Used	
5.	Dashboard design	No of Visualizations / Graphs - 11
6	Story Design	No of Visualizations / Graphs - 4

RESULTS





8. Advantages & Disadvantages

Advantages

- **User-Friendly Interface:** Easy to interact with filters and visuals, even for non-technical users.
- **Integrated Insights:** Combines multiple datasets (EV specs, price, efficiency, infrastructure) into one platform.
- **Accessibility:** Published on Tableau Public, accessible anytime from any browser.
- **Time-Saving:** Reduces time spent manually comparing data across websites or PDFs.
- **Visual Appeal:** Attractive dashboards using charts, maps, and KPIs make data interpretation intuitive.
- **Support for Decision-Making:** Helps both EV buyers and policymakers make informed choices.

Disadvantages

- **Static Dataset:** Data is not updated in real-time unless manually refreshed and republished.
- **Limited Interactivity** (compared to full web apps): Though highly visual, the dashboard has limited logic compared to custom-built applications.
- **Dependent on Tableau Public:** Requires Tableau Public for hosting, which has limitations like no backend database.
- **Requires Internet Access:** Offline viewing is not possible unless the workbook is downloaded and opened in Tableau Desktop.

9. Conclusion

The **EV Cars Tableau Dashboard Project** successfully consolidates various electric vehicle-related datasets into a single, meaningful, and interactive dashboard. The project demonstrates the power of **data visualization** in simplifying complex information and aiding better decisions.

By offering key comparisons of EVs by brand, efficiency, and infrastructure availability, the solution supports both **consumer education** and **infrastructure planning**. The dashboard is designed with accessibility, usability, and clarity in mind, and full fills the project objective of making EV data understandable and useful for all stakeholders.

This project also showcases skills in **data cleaning**, **Tableau visualization**, **storytelling**, and **project planning**, creating a professional-level output from open datasets.

Future Scope-

- **Real-Time Data Integration:** Connect to live APIs or web data connectors to keep datasets automatically updated.
- **Global Expansion:** Include datasets from other countries to make it a global EV comparison platform.
- **Mobile Optimization:** Redesign dashboard layout for better mobile and tablet viewing.
- **Advanced Analytics:** Include predictive models like EV recommendation engines or infrastructure gap detection.
- **User Feedback Loop:** Integrate a form or feedback system to gather improvement suggestions from real users.
- **Stakeholder Customization:** Offer customizable dashboards for companies, government agencies, and manufacturers.

11. APPENDIX

GITHUB LINK –

<https://github.com/Akshaya-2004-Analytics/Electric-Vehicle-Charge-and-Range-Analysis.git>

DATASET LINK –

https://drive.google.com/drive/folders/1Ig0usXtZK5elaENw_PokQsKyepNLenS4?usp=sharing

VEDIO LINK –

<https://drive.google.com/file/d/16CRLurT1hfEEyf3iVWoKgsTJVqCmwF8g/view?usp=sharing>