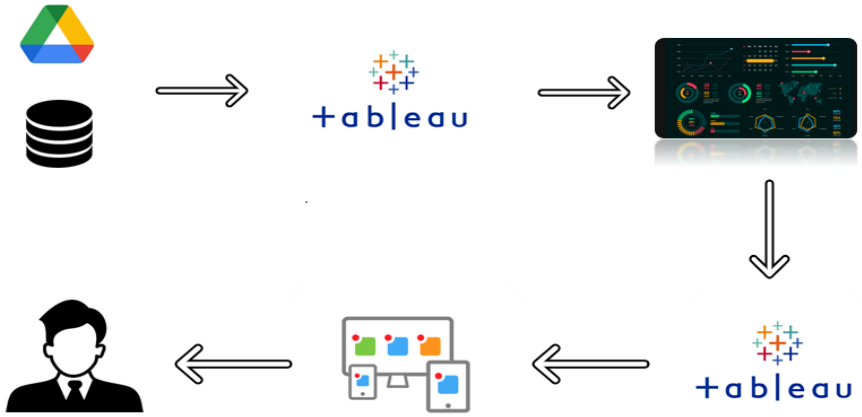
1. INTRODUCTION

1.1 Project Overview :

This project is a visualization tool that focuses on analyzing electric vehicle range and charging infrastructure. The EV Charge and Range Analysis project is a web-based platform that helps users understand important aspects of electric vehicles, such as driving range, charging options, price, and performance. It presents EV data through interactive dashboards and visual stories, making it easy to compare different brands, models, and charging stations across various regions

1.2 Purpose :

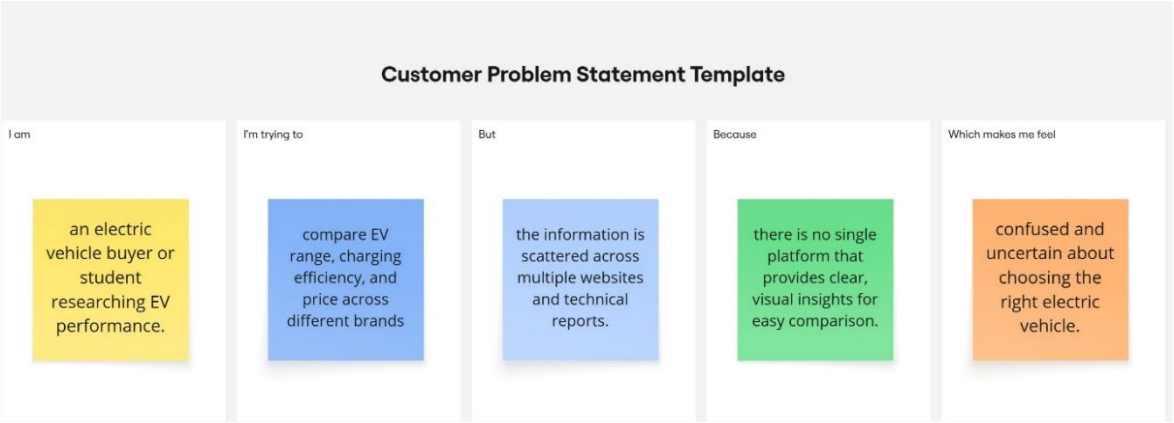
By turning raw EV data into simple and clear visual insights, the platform helps users make better and more informed decisions when choosing an electric vehicle. The web interface is designed to be clean, responsive, and easy to use, so both new and experienced users can navigate it without difficulty.



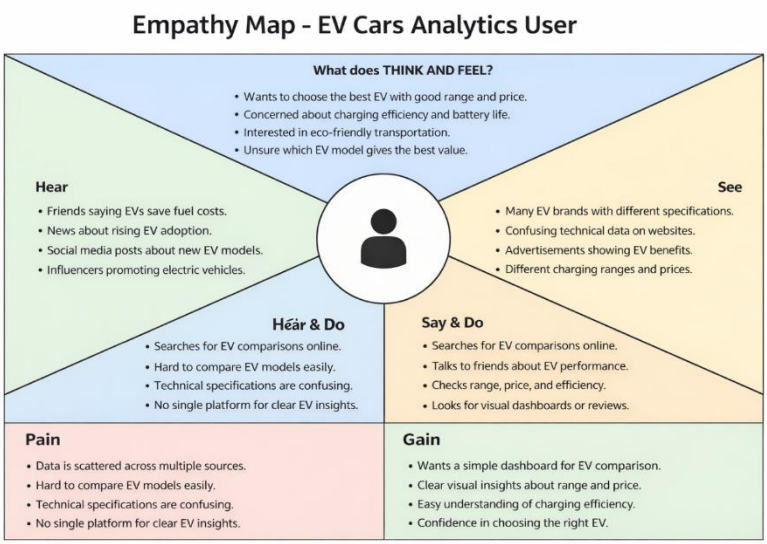
2. IDEATION PHASE

2.1 Problem Statement :

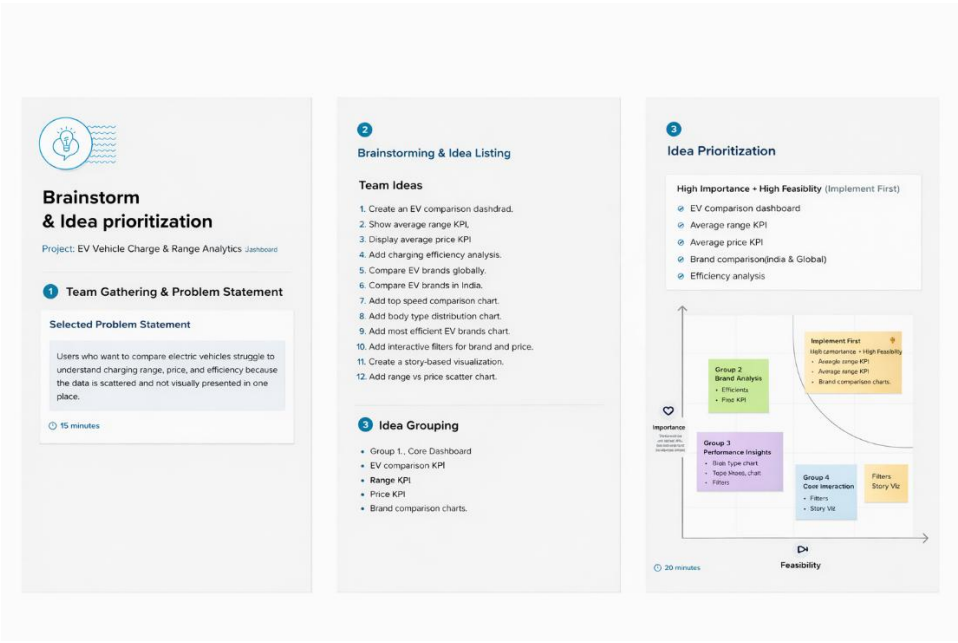
Analysing different data from Multiple sources for Electric cars in India and Globally. We have 4 Different datasets we need to analyse the data and create Dashboard and story that can represent the data and show the Visuals for the data.



2.2 Empathy Map Canvas :

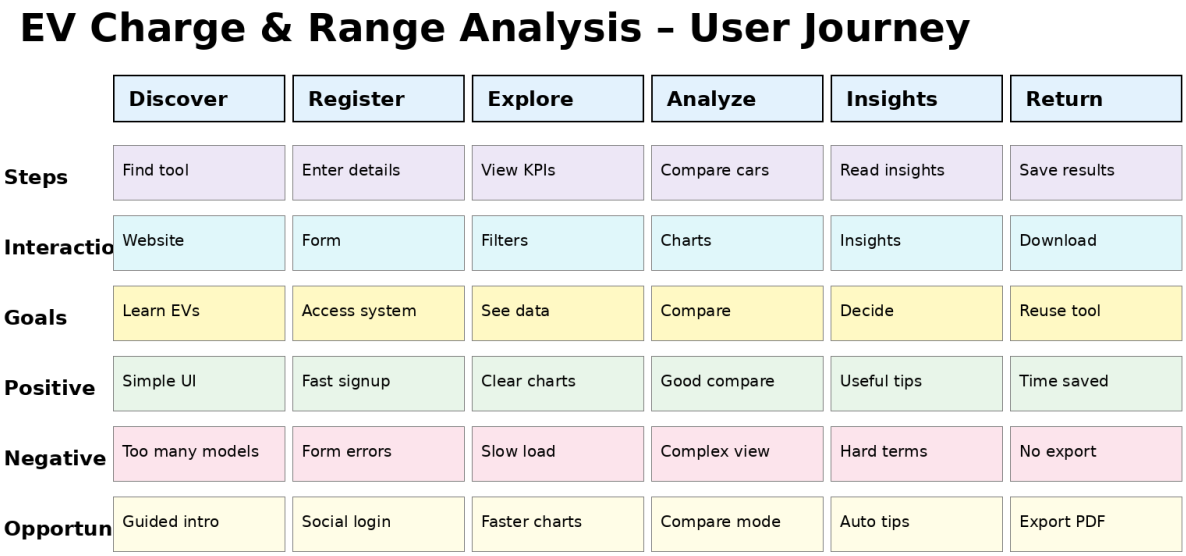


2.3 Brainstorming :



3. REQUIREMENT ANALYSIS

3.1 Customer Journey map :



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	User Registration	Registration through form (name, email, password) Basic email confirmation after registration
FR-2	User Confirmation	Login using email and password Redirect to dashboard after successful login
FR-3	EV Data Visualization	Display EV dashboards using Tableau Show charts for range, price, and brand comparison
FR-4	KPI Display	Show average range KPI Show average price KPI Show total EV models KPI
FR-5	Dashboard Navigation	"Get Started" button opens EV dashboard Navigation menu for Home, Features, Story, Register, Contact
FR-6	Contact Form	User can send a message through contact form

		Show success notification after submission

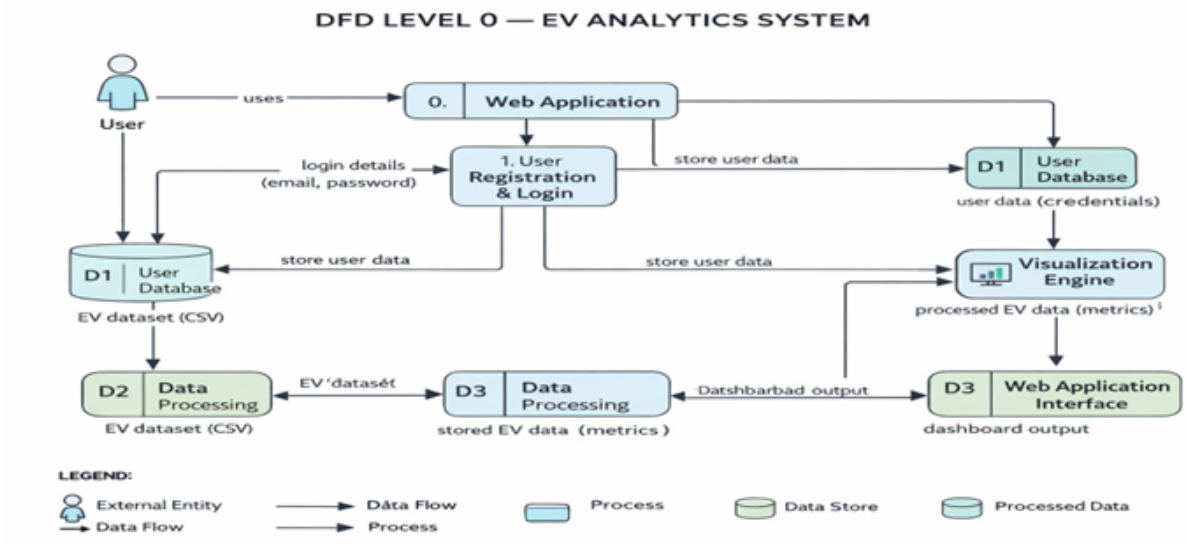
Non-functional Requirements:

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

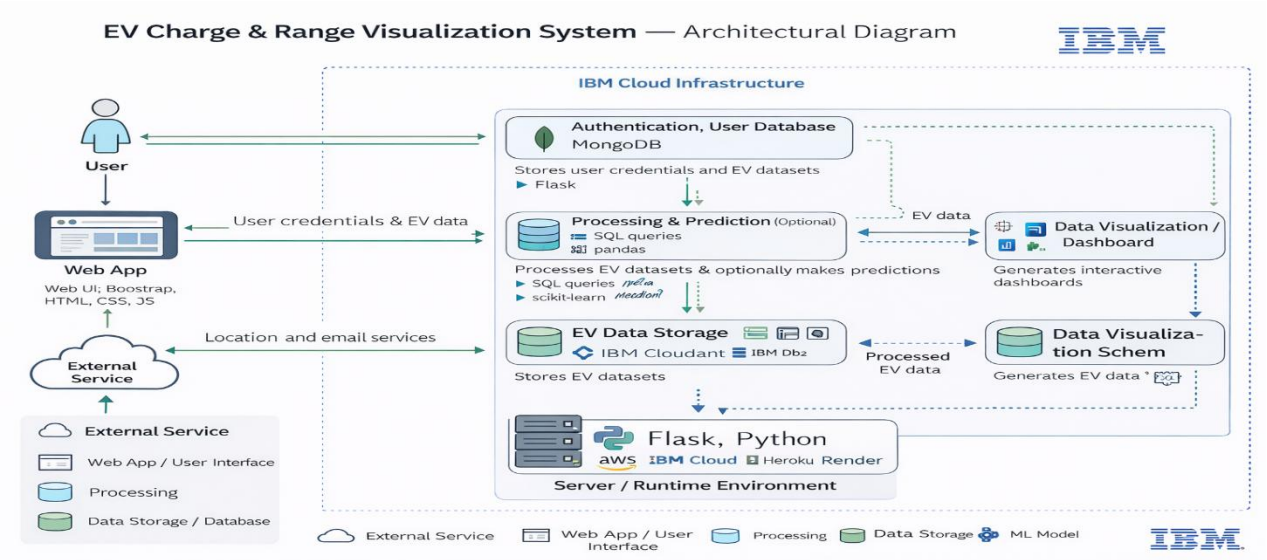
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	The system should have a simple, responsive, and user-friendly interface accessible on desktop and mobile devices
NFR-2	**Security**	User credentials should be stored securely and protected from unauthorized access
NFR-3	**Reliability**	The system should display dashboards and data without crashes or errors.
NFR-4	**Performance**	Web pages and dashboards should load within a few seconds under normal conditions.
NFR-5	**Availability**	The application should be accessible anytime through a web browser.

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.

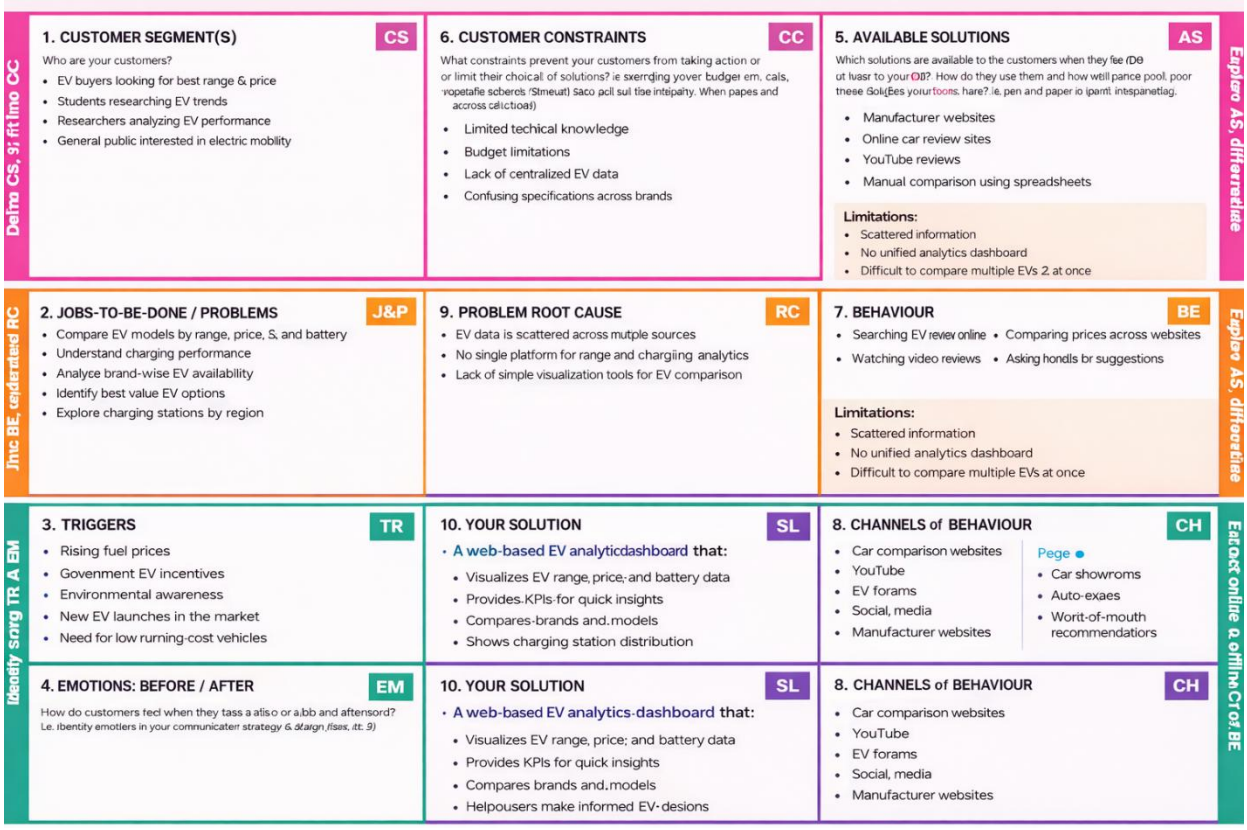


3.4 Technology Stack :



4. PROJECT DESIGN

4.1 Problem Solution Fit :



4.2 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	There is no centralized and easy-to-use platform for students and researchers to analyze electric vehicle performance, market trends, and environmental impact in a single system. Existing data is scattered across multiple sources, making analysis complex and time-consuming.
2.	Idea / Solution description	The proposed solution is a web-based EV Analytics Dashboard that provides interactive visualizations of electric vehicle data such as range, price, battery capacity, charging type, and CO_2 savings. The system uses Flask for backend routing and Tableau Public for advanced data visualization.
3.	Novelty / Uniqueness	The uniqueness of this solution lies in the integration of a lightweight Flask web interface with Tableau-powered interactive dashboards and OTP-based user registration. This combination provides both real-time analytics and user engagement in a single academic platform.
4.	Social Impact / Customer Satisfaction	This solution promotes awareness about sustainable transportation and helps users understand the benefits of electric vehicles. It enables informed decision-making for students, researchers, and EV enthusiasts, contributing to environmental consciousness.
5.	Business Model (Revenue Model)	The platform can be offered as a freemium model where basic analytics are free, while advanced features such as detailed reports, predictive analysis, and enterprise

		dashboards can be provided as paid services to organizations.

4.3 Solution Architecture :

5. PROJECT PLANNING & SCHEDULING

5.1 Project Planning :

Product Backlog, Sprint Schedule, and Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register using email and password.	2	High	Team
Sprint-1	Registration	USN-2	As a user, I receive confirmation after registration.	1	High	Team
Sprint-1	Login	USN-3	As a user, I can log in using email and password.	2	High	Team
Sprint-1	Web Setup	USN-4	Set up Flask project structure with templates and static folders.	3	High	Team
Sprint-2	Data Preparation	USN-5	Clean EV dataset and remove invalid values.	3	High	Team
Sprint-2	KPI Creation	USN-6	Create KPIs for average range and average price.	2	High	Team
Sprint-2	Visualization	USN-7	Create EV range comparison charts.	3	High	Team
Sprint-3	Dashboard	USN-8	Build Tableau dashboard with multiple sheets.	5	High	Team
Sprint-3	Dashboard	USN-9	Create EV story visualization.	3	Medium	Team
Sprint-3	Integration	USN-10	Embed Tableau dashboard into web page.	3	High	Team
Sprint-4	UI Features	USN-11	Add features, FAQ, and contact sections.	2	Medium	Team
Sprint-4	Contact	USN-12	Add contact form with success notification.	2	Medium	Team
Sprint-4	Finalization	USN-13	Test the system and fix UI or data issues.	3	High	Team
Sprint-4	Deployment	USN-14	Prepare final submission files and documentation.	2	High	Team

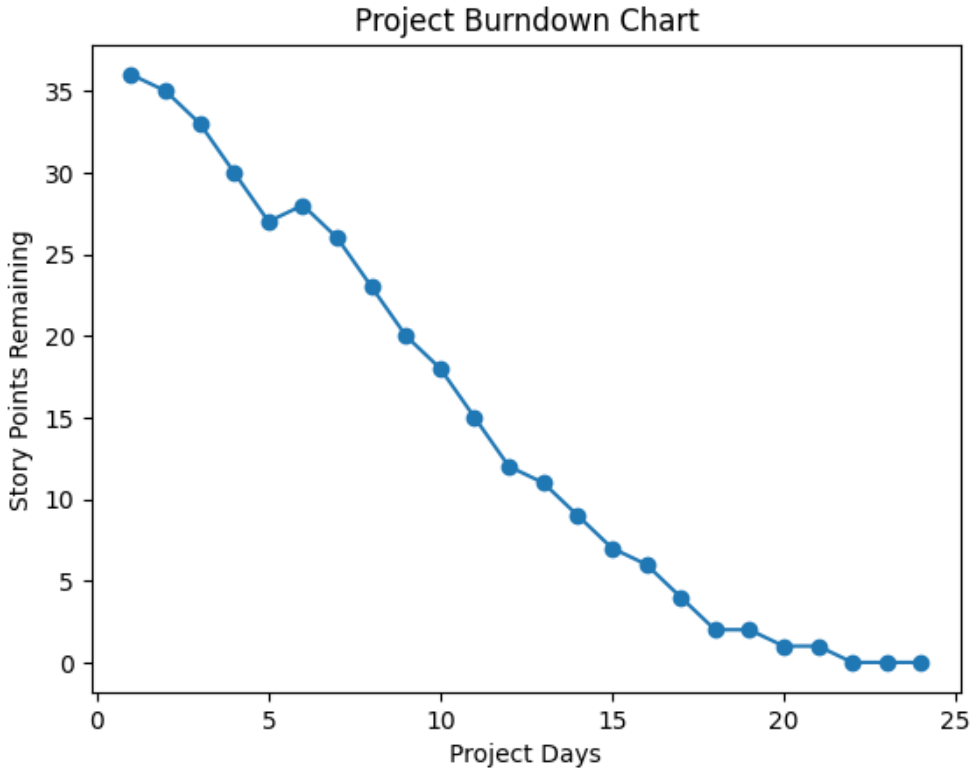
Project Tracker, Velocity & Burndown Chart:

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed	Sprint Release Date (Actual)
Sprint-1	8	6 Days	Day 1	Day 6	8	Day 6
Sprint-2	8	6 Days	Day 7	Day 12	8	Day 12
Sprint-3	11	6 Days	Day 13	Day 18	11	Day 18
Sprint-4	9	6 Days	Day 19	Day 24	9	Day 24

Velocity:

$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

Burndown Chart:



6. FUNCTIONAL AND PERFORMANCE TESTING

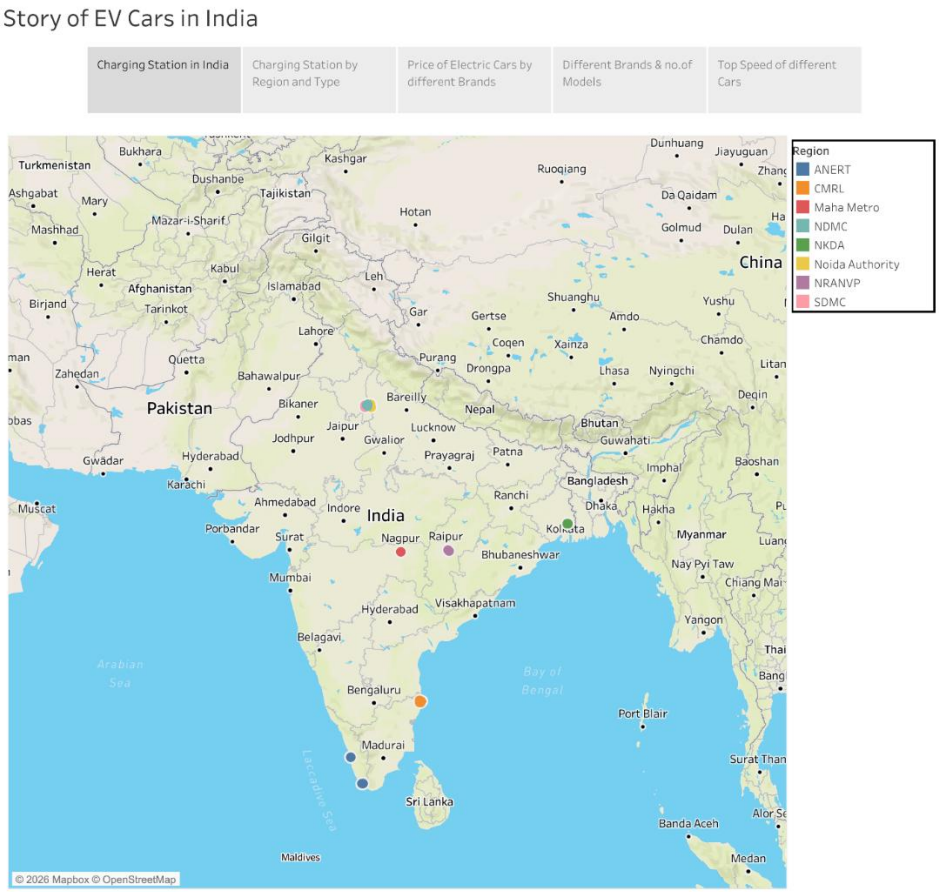
6.1 Performance Testing :

S.No.	Parameter	Screenshot / Values
1.	Data Rendered	EV car dataset containing: brand, model, price, range, charging type, region, and top speed. Total multiple EV brands and models displayed across dashboard visuals
2.	Data Preprocessing	1. Removed duplicate entries. 2. Handled missing values in price and range fields. 3. Standardized brand and model names. 4. Converted price units into Lakhs. 5. Categorized charging types (AC / DC).
3.	Utilization of Filters	1. Brand filter to view specific EV manufacturers. 2. Charging type filter (AC / DC). 3. Region filter in charging station map.

4.	Calculation fields Used	1. Average Range (km). 2. Average Price (₹). 3. Count of Cars per brand. 4. Max Efficiency (Wh/km). 5. Top Speed per brand.
5.	Dashboard design	**No. of Visualizations:** 7 1. Charging Stations Map 2. Count of Cars (Pie Chart) 3. Efficient Brands (Bar Chart) 4. Charging Stations by Region & Type (Stacked Bar) 5. Prices of Cars (Bar Chart) 6. Top Speed of Cars (Bar Chart) 7. Car Types (Treemap)
6	Story Design	**No. of Visualizations: 5** 1. Charging Stations in India 2. Charging Stations by Region & Type 3. Price of EV Cars by Brands 4. Different Brands & Number of Models 5. Top Speed of Different Cars

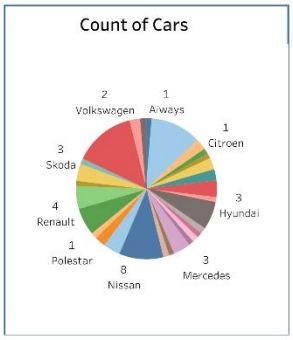
7. RESULTS

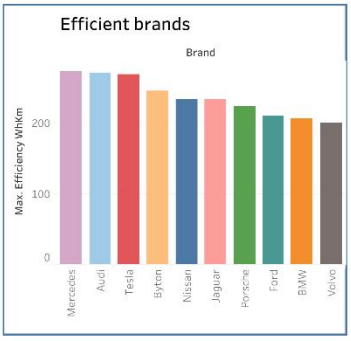
7.1 Output Screenshots :

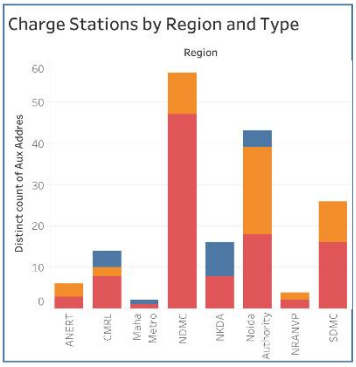


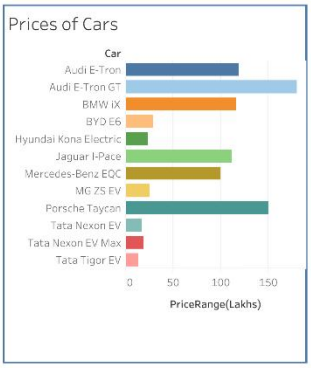
Brand
Aiways
Audi
Byton
Citroen
DS
Fiat
Ford
Hyundai
Jaguar
Kia
Lexus
Lightyear
Lucid
Mazda
Mercedes
MG
Mini
Nissan
Opel
Peugeot
Polestar
Porsche
Renault
SEAT
Skoda
Sono
Tesla
Volkswagen
Volvo

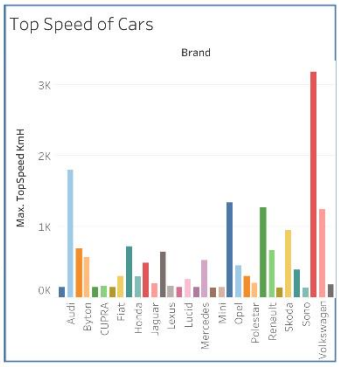
Type
AC-001
CCS/ChADEMO/ Ty..
DC-001

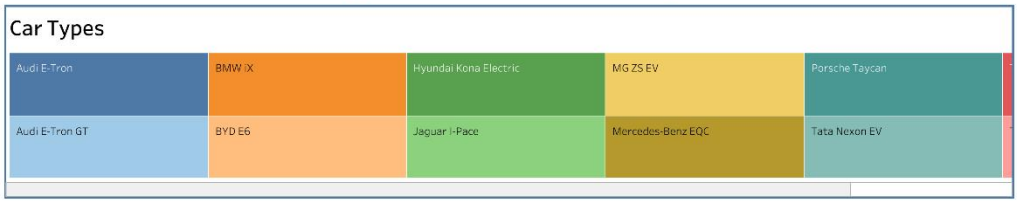


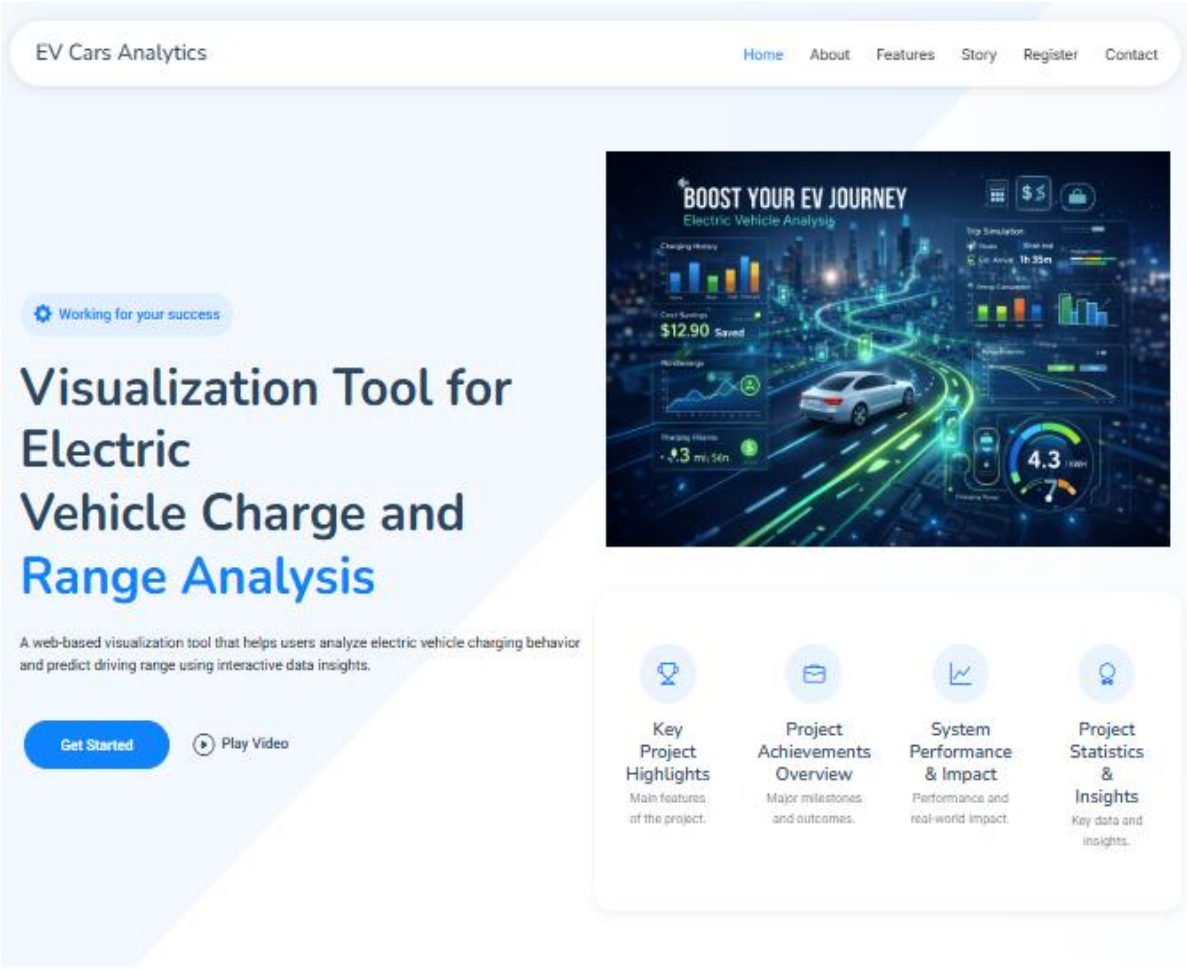












8. ADVANTAGES & DISADVANTAGES

Advantages

- Easy EV comparison
- Interactive visualizations

- Charging infrastructure insights
- User-friendly interface

Disadvantages

- Requires internet access
- No real-time charging data

9. CONCLUSION

The EV Charge & Range Analysis project successfully demonstrates how data visualization can simplify EV decision-making.The dashboard provides meaningful insights into range, pricing, and charging infrastructure, helping users choose the best electric vehicle.

10. FUTURE SCOPE

- **Real-time charging data:** Integrate live APIs to show real-time availability of charging stations.
- **Mobile application:** Develop an Android or iOS app for easier access on smartphones.
- **AI-based recommendations:** Suggest the best EV to users based on budget, range, and usage patterns.
- **User accounts and preferences:** Allow users to save favorite vehicles and personalized comparisons.
- **Expanded dataset:** Include more EV models, global charging stations, and updated specifications.
- **Route planning feature:** Add a tool to plan trips with charging stops based on vehicle range.

11. APPENDIX

11.1 Tableau Public Links:

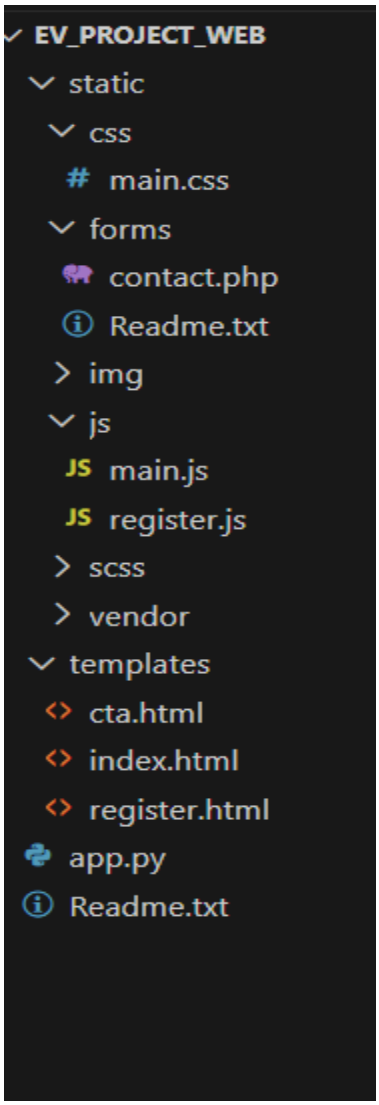
Dashboard Link :

https://public.tableau.com/shared/TXFB7S72Y?:display_count=n&:origin=viz_share_link

Story Link :

https://public.tableau.com/views/EVCarAnalyticsstory/StoryofEVCarsinIndia?:language=en-US&publish=yes&:sid=&:redirect=auth&:display_count=n&:origin=viz_share_link

Folder Structure:



11.2 Dataset Link:
https://drive.google.com/drive/folders/1Rkzdks6Us1Uq2SRB4nxMAb83jN5bpHll

11.3 GitHub Repository Link
https://github.com/z-irfan/visualization-tool-for-Electric-Vehicle.git

11.4 Project Demo Video Link
https://drive.google.com/file/d/1ZeJ_ipbsEzFyI1XHx58RK5mbQnC9togf/view?usp=drivesdk