# Project Documentation format

## Visualization Tool for Electric Vehicle Charge and Range Analysis-Technical Documentation

### 1. Introduction

• **Project Title:**
Visualization Tool for Electric Vehicle Charge and Range Analysis

• **Team Members:**
T. Navya Gopika – Data Analysis & Dashboard Development
Sd. Asha Sulthana – Data Preparation & Documentation
V. Uday Sai – Visualization & Testing
Sk. Nagulmeera – SQL Processing & Integration

### 2. Project Overview

**Purpose:**

The objective of this project is to design and implement an interactive visualization platform for analyzing Electric Vehicle (EV) charging infrastructure, performance metrics, brand distribution, powertrain segmentation, and pricing trends.
The system integrates SQL-based data preprocessing, Tableau dashboard development, and Flask-based web integration to provide a unified and accessible analytics solution.

**Features:**

• Interactive EV analytics dashboard
• Charging station distribution analysis
• Brand and model comparison
• Performance and efficiency analysis
• Powertrain segmentation
• Price trend visualization
• Web integration using Flask
• Public dashboard hosting via Tableau Public

### 3. Architecture

**Frontend:**

The frontend is developed using HTML and Bootstrap for responsive design. The Tableau dashboards are embedded using Tableau JavaScript API within the Flask web application.

**Backend:**

The backend uses Python Flask framework to serve web pages and integrate Tableau dashboards. SQL queries were used during preprocessing stage in MySQL.

**Database:**

The project uses MySQL database for:

- Data cleaning
- Null value removal
- Data aggregation
- Standardization
- Preprocessing before visualization

The processed data is then imported into Tableau for visualization.

**Architecture Flow:**

- Raw EV datasets (CSV files) are collected.
- Data preprocessing and cleaning performed using MySQL.
- Cleaned data imported into Tableau Desktop.
- Interactive dashboards and stories created.
- Dashboards published to Tableau Public.
- Tableau dashboards embedded into Flask web application using JavaScript API.
- Users access dashboards via web browser.

## 4. Setup Instructions

**Prerequisites:**

- Python 3.x
- Flask
- MySQL
- Tableau Desktop
- Internet connection (for Tableau Public publishing)

**Installation:**

- Ensure templates folder exists inside Web Integration directory
- index.html must be placed inside templates folder

1. Clone the repository
2. Install Flask:

```
pip install flask
```

3. Navigate to project folder
4. Run:

```
python app.py
```

5. Open browser at:

http://127.0.0.1:5000/

## 5. Project Structure:

- **Dashboard and Story pdf/**

Contains exported PDF versions of the Tableau Dashboard and Story for submission and offline reference.

- **Datasets/**

Contains all CSV datasets used for data cleaning, preprocessing, and visualization development.

• **Documentation/**
Contains complete project documentation including Ideation Phase, Requirement Analysis, Design, Planning, Development, Testing, and Final Documentation.

• **Screenshots/**
Contains dashboard screenshots, analysis visuals, and web interface images used for reporting and demonstration.

• **Web Integration/**
Contains the Flask-based web application files including:
– app.py (backend server file)
– templates/index.html (frontend webpage)

## 6. Running the Application

To run the web application locally:

Step 1: Open terminal in project folder
Step 2: Run:

python app.py

Step 3: Open browser at:

http://127.0.0.1:5000/

The dashboard and story will be displayed through embedded Tableau integration.

## 7. API Documentation

This project does not expose REST APIs.
Data processing was performed using SQL queries during preprocessing phase.
Visualization is handled via Tableau dashboards.

## 8. Authentication

Authentication is managed through Tableau Public hosting.
The dashboard is publicly accessible via link.

No custom authentication system is implemented in the Flask web application.

## 9. User Interface

The UI is developed using Bootstrap framework.
It includes:

• Navigation bar
• Home section
• About section
• Interactive Dashboard
• Story Presentation

• Contact section

Screenshots are included in the documentation.

## 10. Testing

Testing was performed through:

• Validation of SQL preprocessing queries
• Verification of data accuracy in Tableau dashboards
• Functional testing of filters and interactions
• Cross-browser compatibility testing (Chrome, Edge)
• Responsive testing for different screen sizes
• Verification of Tableau dashboard embedding in Flask

## 11. Screenshots or Demo

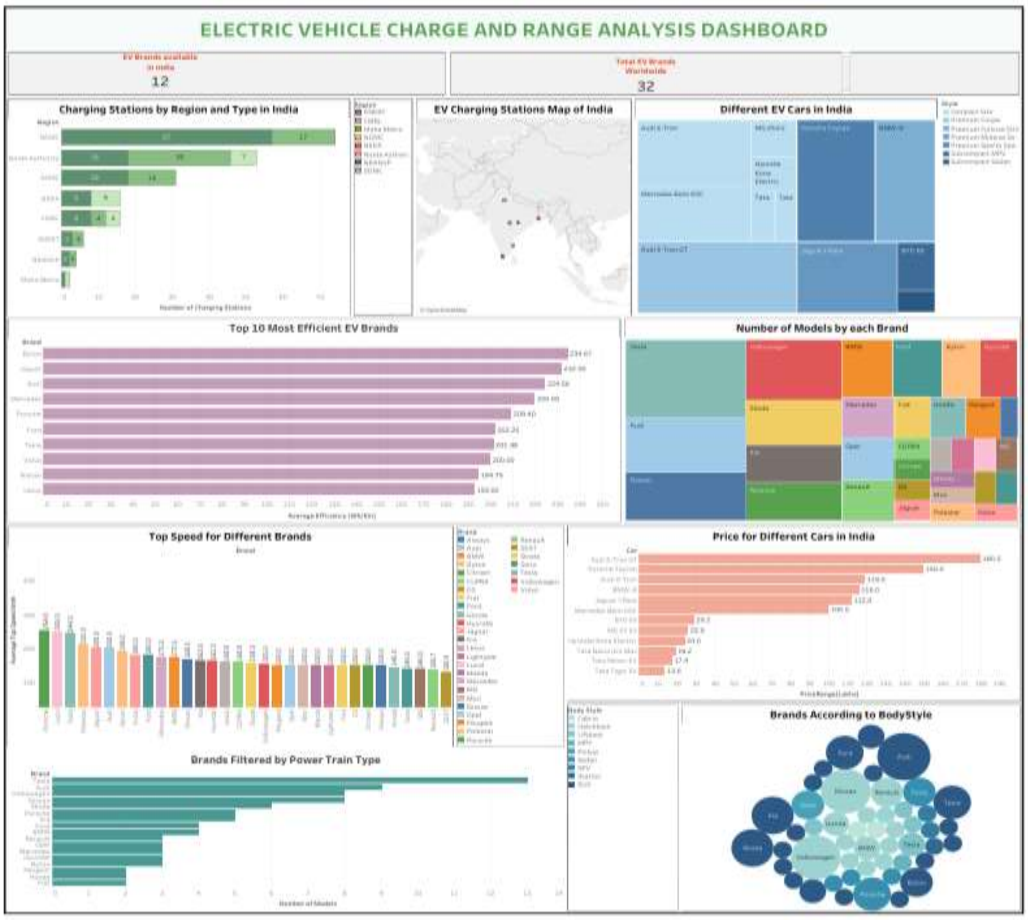
### Live Dashboard Link:

https://public.tableau.com/views/ELECTRICVEHICLECHARGEANDRANGEALAYSIS/Dashboard?:language=en-US&:sid=&:redirect=auth&:display_count=n&:origin=viz_share_link

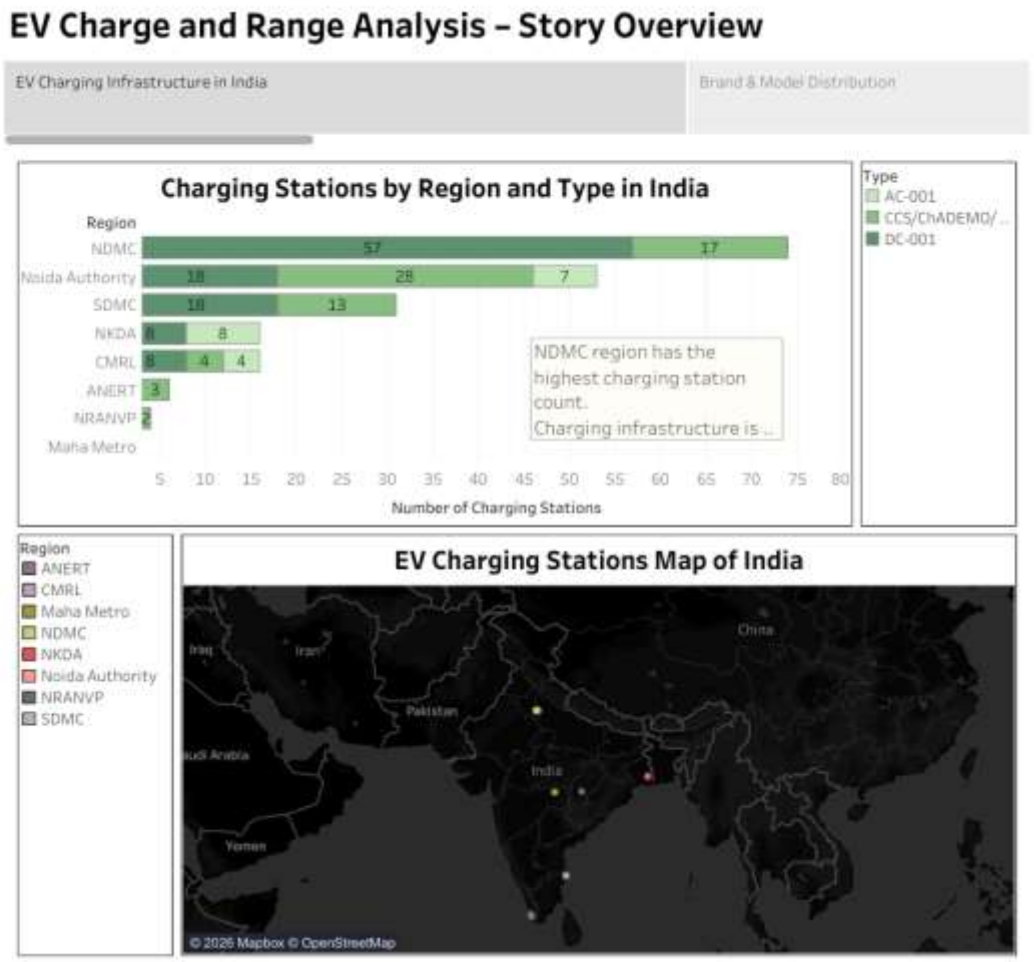
### Live Story Link:

https://public.tableau.com/views/ELECTRICVEHICLECHARGEANDRANGEALAYSIS-STORY/Story1?:language=en-US&:sid=&:redirect=auth&:display_count=n&:origin=viz_share_link

### • Dashboard


ELECTRIC VEHICLE CHARGE AND RANGE ANALYSIS DASHBOARD
EV Brands available in India
12
Total EV Brands Worldwide
32
Charging Stations by Region and Type in India
EV Charging Stations Map of India
Different EV Cars in India
Top 10 Most Efficient EV Brands
Number of Models by each Brand
Top Speed for Different Brands
Price for Different Cars in India
Brands According to BodyStyle
Brands Filtered by Power Train Type

• **Story**



EV Charge and Range Analysis – Story Overview

EV Charging Infrastructure in India

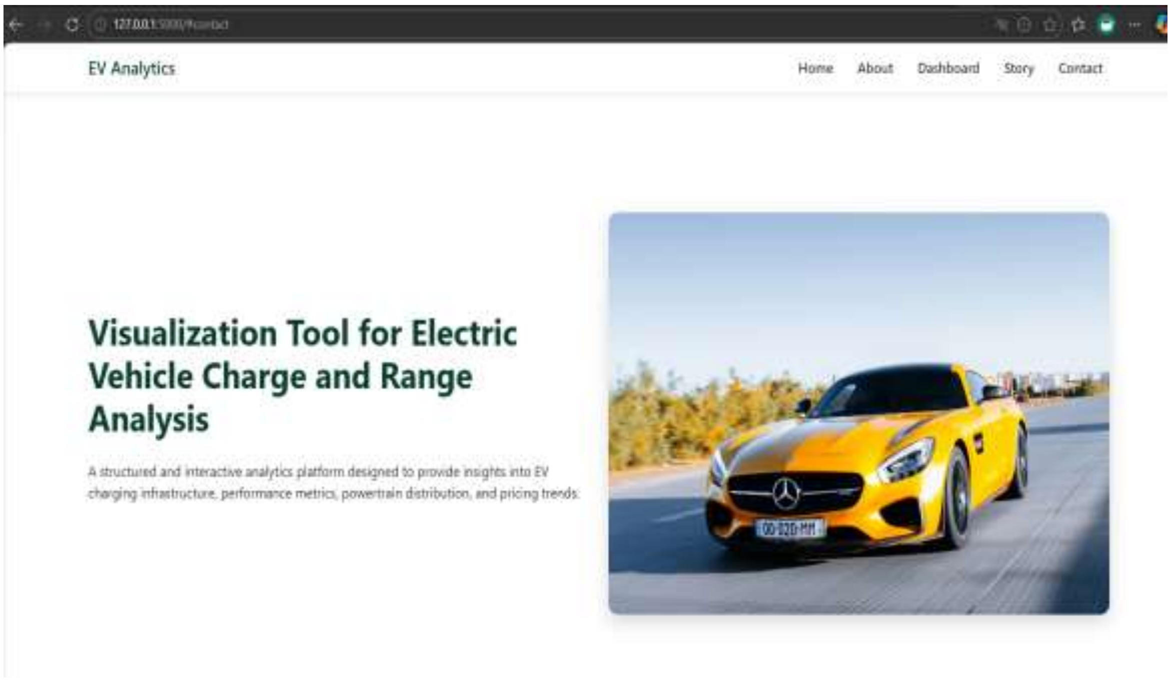
Brand & Model Distribution

Charging Stations by Region and Type in India

NDMC region has the highest charging station count.
Charging infrastructure is ...

EV Charging Stations Map of India

• **Flask web interface**



127.0.0.1:5000/#contact

EV Analytics

Home About Dashboard Story Contact

Visualization Tool for Electric Vehicle Charge and Range Analysis

A structured and interactive analytics platform designed to provide insights into EV charging infrastructure, performance metrics, powertrain distribution, and pricing trends.

## 12. Known Issues

- Dashboard requires internet connection for Tableau Public access
- Flask application runs locally unless deployed
- Large dashboards may take time to load

## 13. Future Enhancements

- Real-time EV data integration
- Deployment on cloud hosting platform (Render / PythonAnywhere / AWS)
- User authentication system
- Deployment on cloud platform
- Dynamic filtering using backend APIs
- Mobile-optimized layout improvements