



Visualization Tool for Electric Vehicle Charge and Range Analysis

Project Based Experiential Learning Program

TEAM MEMBERS

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Visualization Tool for Electric Vehicle Charge and Range Analysis

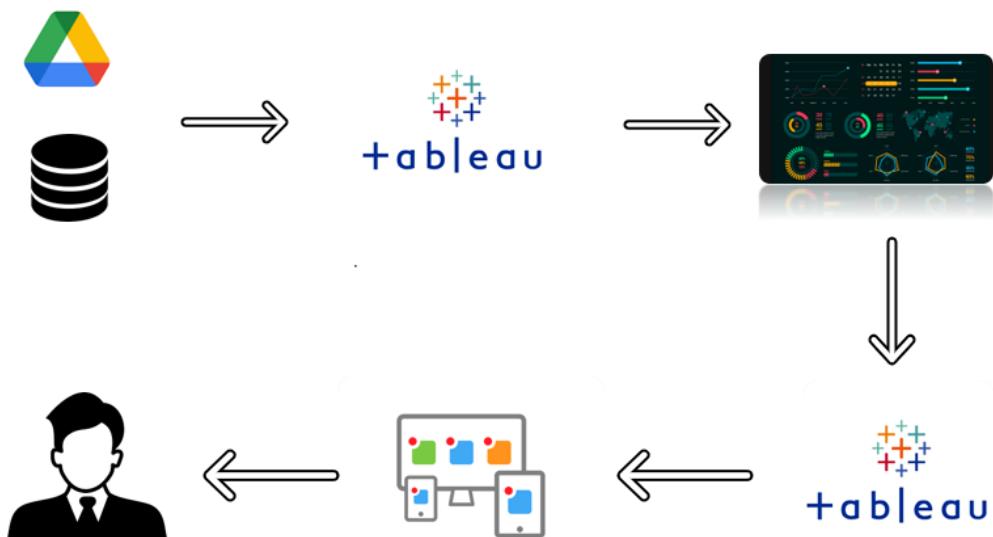
Project Description

A vehicle that can be powered by an electric motor that draws electricity from a battery and is capable of being charged from an external source and have an electric motor instead of an internal combustion engine.

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.

The new EV's are combined Electrical storage and propulsion systems with electronic sensors, controls, and actuators, integrated closely with software, secure data transfer to form a comprehensive transportation solution.

Technical Architecture



Project Flow

To accomplish this, we have to complete all the activities listed below,

- Define Problem / Problem Understanding
 - Specify the business problem
 - Business requirements
 - Literature Survey
 - Social or Business Impact.
- Data Collection & Extraction from Database
 - Collect the dataset,
 - Storing Data in DB
 - Perform SQL Operations
 - Connect DB with Tableau
- Data Preparation
 - Prepare the Data for Visualization
- Data Visualizations
 - No of Unique Visualizations
- Dashboard
 - Responsive and Design of Dashboard
- Story
 - No of Scenes of Story
- Performance Testing
 - Amount of Data Rendered to DB '
 - Utilization of Data Filters
 - No of Calculation Fields
 - No of Visualizations/ Graphs
- Web Integration
 - Dashboard and Story embed with UI With Flask
- Project Demonstration & Documentation
 - Record explanation Video for project end to end solution
 - Project Documentation-Step by step project development procedure

Milestone 1: Define Problem / Problem Understanding

Activity 1: Specify the business problem

Refer Project Description

Activity 2: Business requirements

The business requirements for analyzing the performance and efficiency of Electric cars include identifying KPIs, comparing performance across different parameters and brands also, identifying patterns and trends over time, identifying affecting factors, creating interactive dashboards and reports, identifying areas for improvement, making data-driven decisions, comparing to industry average and creating forecasting models for future performance. The ultimate goal is to gain insights and improve performance through data visualization techniques.

Activity 3: Literature Survey (Student Will Write)

A literature survey is a method of researching existing literature and studies related to a specific topic. In the context of analyzing the performance and efficiency of electric vehicles, a literature survey would involve reviewing studies and articles that have been published on the topic of hotel performance and efficiency, as well as studies specific to electric vehicles. The literature survey would include sources such as academic journals, industry reports, and online articles. It would aim to identify key performance indicators (KPIs) and metrics that are commonly used to measure hotel performance and efficiency, as well as any best practices or strategies that have been identified for improving performance. The literature survey would also explore any existing research on electric vehicles specifically, and would aim to identify any unique challenges or opportunities that the electric vehicles faces in terms of performance and efficiency

Activity 4: Social or Business Impact.

Social Impact: By solving or helping to solve the biggest issue in EV market. More people will understand and buy the EV instead of ICE's.

Business Model/Impact: This project can provide the insights for the Car/Battery Manufacturers and it can also provide the insights for the people who are using the EV or Thinking to enter in EV Market.

Milestone 2: Data Collection & Extraction from Database

Data collection is the process of gathering and measuring information on variables of interest, in an established systematic fashion that enables one to answer stated research questions, test hypotheses, and evaluate outcomes and generate insights from the data.

Activity 1: Collect the dataset

Please use the link to download the dataset: [Link](#)

Activity 1.1: Understand the data

Data contains all the meta information regarding the columns described in the CSV files. we have provided 4 CSV files:

1. EVIndia
2. Electric_vehicle_charging_station_list
3. ElectricCarData_Clean
4. Cheapestelectriccars-EVDatabase

Column Description for EVIndia:

1. Car - Car Brand name and model
2. Style Range - Style range of car
3. Transmission- Transmission type
4. VehicleType – Type of vehicle
5. PriceRange(Lakhs) - Price Range in Lakhs
6. Capacity - Capacity of car
7. BootSpace – Bootspace of the car
8. BaseModel – Base model name
9. TopModel – Top model name

Column Description for Electric_vehicle_charging_station_list:

1. region: This column represents the region of the charging station.
2. address: This column represents the address of the charging station.
3. aux address: This column represents the auxiliary address of the charging station.
4. latitude: This column represents the latitude of the charging station.
5. longitude: This column represents the longitude of the charging station
6. type: This column represents the type of the charging station.
7. power: This column represents the power of the charging station.
8. service: This column represents the type of service at the charging station.

Column Description for ElectricCarData_Clean:

1. Brand
2. Model
3. AccelSec
4. TopSpeed_KmH
5. Range_Km
6. Efficiency_WhKm
7. FastCharge_KmH
8. RapidCharge
9. PowerTrain
10. PlugType
11. BodyStyle
12. Segment

13. Seats
14. PriceEuro

Column Description for Cheapestelectriccars-EVDatabase:

1. Name
2. Subtitle
3. Acceleration
4. TopSpeed
5. Range
6. Efficiency
7. FastChargeSpeed
8. Drive
9. NumberofSeats
10. PriceinGermany
11. PriceinUK

Activity 2: Storing Data in DB & Perform SQL Operations

Explanation video link: [Database creation](#)

Explanation video link: [Basic SQL Operations](#)

Activity 3: Connect DB with Tableau

Explanation video link: [Database connection](#)

Milestone 3: Data Preparation

Activity 1: Prepare the Data for Visualization

Preparing the data for visualization involves cleaning the data to remove irrelevant or missing data, transforming the data into a format that can be easily visualized, exploring the data to identify patterns and trends, filtering the data to focus on specific subsets of data, preparing the data for visualization software, and ensuring the data is accurate and complete. This process helps to make the data easily understandable and ready for creating visualizations to gain insights into the performance and efficiency.

Explanation video link:

https://drive.google.com/file/d/1IAMzG-Cut2uKqrYv7Z1gHtBJZ7XtM1YT/view?usp=share_link

Milestone 4: Data Visualization

Data visualization is the process of creating graphical representations of data in order to help people understand and explore the information. The goal of data visualization is to make complex data sets more accessible, intuitive, and easier to interpret. By using visual elements such as charts, graphs, and maps, data visualizations can help people quickly identify patterns, trends, and outliers in the data.

Activity 1: No of Unique Visualizations

Activity 1.1: Charging Stations by region and type in India

Explanation video link:

https://drive.google.com/file/d/1QuWuNC6S0wd04n8kCH_Z7Bo9PnZZvaEK/view?usp=share_link

Activity 1.2: EV Charging stations map of India

Explanation video link:

https://drive.google.com/file/d/1JgMIZ7pKEIoYvOe5X0v59kmVTFZ-nSQV/view?usp=share_link

Activity 1.3: Different EV cars in India

Explanation video link:

https://drive.google.com/file/d/1PvVm2oqr8j1ERO2luaNUcsROI3QY2ffC/view?usp=share_link

Activity 1.4: Top speed for different Brands

Explanation video link:

https://drive.google.com/file/d/1VXW8C9b4ycVHaEXnAJoBgB_N_miSII9V/view?usp=share_link

Activity 1.5: Price for different cars in India

Explanation video link:

https://drive.google.com/file/d/115HwkYlphwVgQGu8LHxBmuJKH9dyfhp/view?usp=share_link

Activity 1.6: Top 10 most efficient EV Brands

Explanation video link:

https://drive.google.com/file/d/1EhhapHIPsEqEE21e_2sLHQtR0VDXt8d/view?usp=share_link

Activity 1.7: Brands according to Bodystyle

Explanation video link:

https://drive.google.com/file/d/16KiZpHu-mIdDb88ggZ8ZzvrOqpAJw8gg/view?usp=share_link

Activity 1.8: Brand filtered by PowerTrain type

Explanation video link:

https://drive.google.com/file/d/1Gnrj7h6A7il6p26TLTNfRVQTYnREoQwn/view?usp=share_link

Activity 1.9: No of models by each brand

Explanation video link:

https://drive.google.com/file/d/1-FZplgBanEa6HHql9M-lu6YchyQszskC/view?usp=share_link

Activity 1.10: Summary card for Different brands of EV Cars globally

Explanation video link:

https://drive.google.com/file/d/1CaL3ZLOypWIH77xmbJg4K8fKNlxavtH/view?usp=share_link

Activity 1.11: Summary card for Different brands of EV Cars in India

Explanation video link:

https://drive.google.com/file/d/1C61Jxi4jOCdoVbrRNWluDSJse6dguMPS/view?usp=share_link

Milestone 5: Dashboard

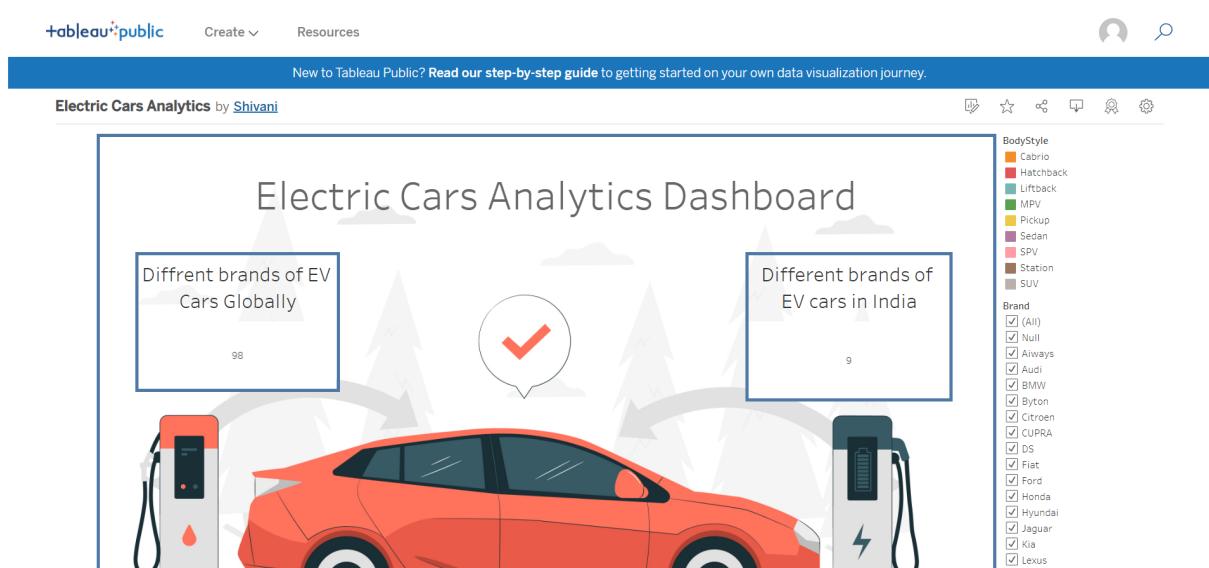
A dashboard is a graphical user interface (GUI) that displays information and data in an organized, easy-to-read format. Dashboards are often used to provide real-time monitoring and analysis of data, and are typically designed for a specific purpose or use case. Dashboards can be used in a variety of settings, such as business, finance, manufacturing, healthcare, and many other industries. They can be used to track key performance indicators (KPIs), monitor performance metrics, and display data in the form of charts, graphs, and tables.

Activity :1- Responsive and Design of Dashboard

Once you have created views on different sheets in Tableau, you can pull them into a dashboard.

Explanation video link:

https://drive.google.com/file/d/1R-WWO932vyqfBuGuhQsFLyfAlbbf6p_8/view?usp=share_link



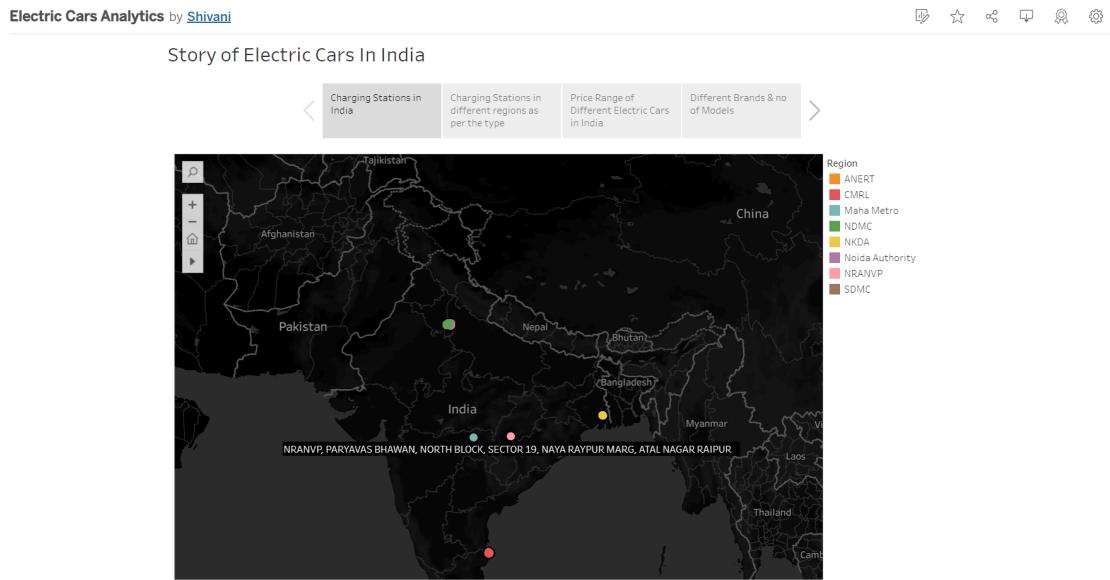
Milestone 6: Story

A data story is a way of presenting data and analysis in a narrative format, with the goal of making the information more engaging and easier to understand. A data story typically includes a clear introduction that sets the stage and explains the context for the data, a body that presents the data and analysis in a logical and systematic way, and a conclusion that summarizes the key findings and highlights their implications. Data stories can be told using a variety of mediums, such as reports, presentations, interactive visualizations, and videos.

Activity:1- No of Scenes of Story

Explanation video link:

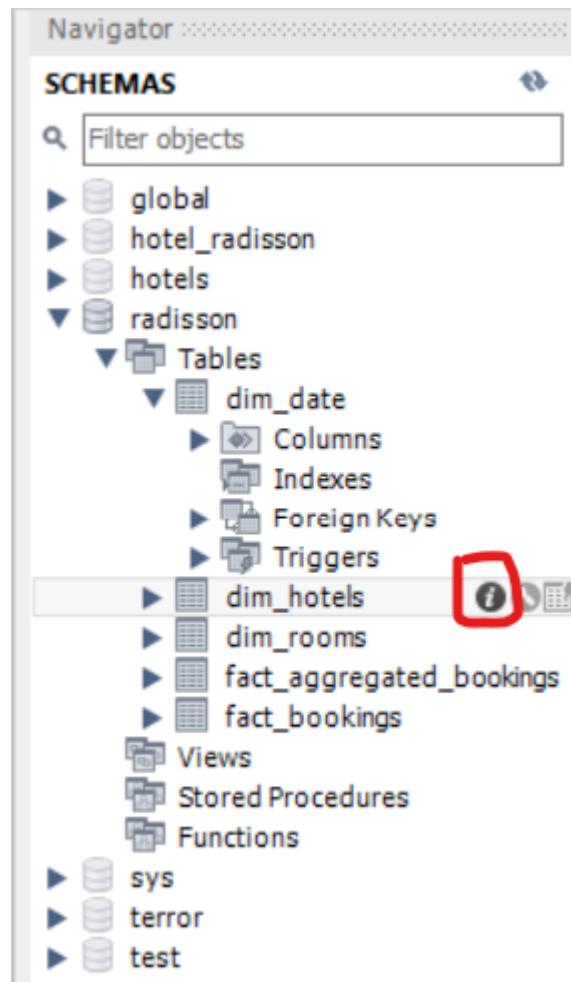
https://drive.google.com/file/d/1BIm4nlyGNqrclvIN-PZ27-g0VUIVptCN/view?usp=share_link



Milestone 7: Performance Testing

Activity 1: Amount of Data Rendered to DB

- The amount of data that is rendered to a database depends on the size of the dataset and the capacity of the database to store and retrieve data.
- Open the MySQL Workbench, go to the database then click to expand the tables, select the table and click on (i) button to get the information related to table such as column count, table rows etc.



This screenshot shows the MySQL Workbench main window with the 'dim_date' table selected in the central table list. The 'Table Details' pane on the right provides specific information about the table:

Engine	InnoDB
Row format	Dynamic
Column count	4
Table rows	92
AVG row length	178
Data length	16.0 kB
Index length	0.0 bytes
Max data length	0.0 bytes
Data free	0.0 bytes
Table size (estimate)	16.0 kB
File format	
Data path	C:\ProgramData\MySQL\MySQL Server 8.0\Data\radisson\dim_date.ibd
Update time	
Create time	2022-12-03 13:23:13

The bottom left pane shows the table's columns: 'property_id', 'property_name', 'category', and 'city'. The bottom right pane contains tabs for 'Object Info' and 'Session'.

MySQL Workbench

mysql

File Edit View Query Database Server Tools Scripting Help

Navigator Schemas

SQL File 3* radisson.dim_date radisson.dim_hotels radisson.dim_rooms radisson.fact_aggregated_bookings radisson.fact_bookings

Info Columns Indexes Triggers Foreign keys Partitions Grants DDL

mysql radisson.dim_hotels

Table Details

Engine: InnoDB
Row format: Dynamic
Column count: 4
Table rows: 25
AVG row length: 655
Data length: 16.0 KiB
Index length: 0.0 bytes
Max data length: 0.0 bytes
Data free: 0.0 bytes
Table size (estimate): 16.0 KiB
File format:
Data path: C:\ProgramData\MySQL\MySQL Server 8.0\Data\radisson\dim_hotels.ibd
Update time:
Create time: 2022-12-03 10:49:55

Information on this page may be outdated. Click Analyze Table to update it.

Context Help Snippets

Object Info Session

MySQL Workbench

mysql

File Edit View Query Database Server Tools Scripting Help

Navigator Schemas

SQL File 3* radisson.dim_date radisson.dim_hotels radisson.dim_rooms radisson.fact_aggregated_bookings radisson.fact_bookings

Info Columns Indexes Triggers Foreign keys Partitions Grants DDL

mysql radisson.dim_rooms

Table Details

Engine: InnoDB
Row format: Dynamic
Column count: 2
Table rows: 4
AVG row length: 4096
Data length: 16.0 KiB
Index length: 0.0 bytes
Max data length: 0.0 bytes
Data free: 0.0 bytes
Table size (estimate): 16.0 KiB
File format:
Data path: C:\ProgramData\MySQL\MySQL Server 8.0\Data\radisson\dim_rooms.ibd
Update time:
Create time: 2022-12-03 10:50:30

Information on this page may be outdated. Click Analyze Table to update it.

Context Help Snippets

Object Info Session

This screenshot shows the MySQL Workbench interface. The main window displays the 'radisson.fact_aggregated_bookings' table details. The table has an InnoDB engine, 5 columns, and 8167 rows. The columns are fact_aggregated_bookings, fact_bookings, dim_date, dim_rooms, and property_id. The table was created on 2022-12-03 14:41:24. The 'Table Details' pane provides a summary of the table's structure and performance metrics. The 'Columns' pane shows the schema definition:

Column	Type	Properties
property_id	int	
property_name	text	
category	text	
City	text	

The 'Output' pane at the bottom shows the results of an 'Analyze Table' operation.

This screenshot shows the MySQL Workbench interface. The main window displays the 'radisson.fact_bookings' table details. The table has an InnoDB engine, 12 columns, and 51957 rows. The columns are fact_aggregated_bookings, fact_bookings, dim_date, dim_hotels, dim_rooms, fact_bookings, property_id, property_name, category, City, and check_in. The table was created on 2022-12-03 10:51:45. The 'Table Details' pane provides a summary of the table's structure and performance metrics. The 'Columns' pane shows the schema definition:

Column	Type	Properties
property_id	int	
property_name	text	
category	text	
City	text	

The 'Output' pane at the bottom shows the results of an 'Analyze Table' operation.

Activity 2: Utilization of Data Filters

Electric Cars Analytics Dashboard

Different brands
of EV Cars
Globally

98



Different brands
of EV cars in
India

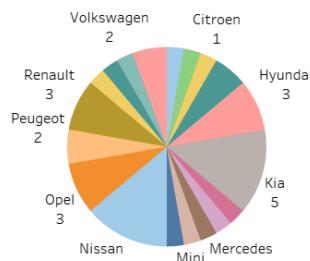
9

Brands according to bodystyle

Top 10 most efficient brands

Brand

Brand filtered by PowerTrain type



Different EV Cars in India



Top speed for different brands

Activity 3: No of Calculation Fields

```

Abc power
Abc PowerTrain
=Abc Price Range - Split 3   !
=## Price Range - Split 3 ... !
Abc PriceinGermany
Abc PriceinUK
Abc Range1
Abc RapidCharge
Abc Region
Abc Segment
Abc service
Abc Style1
Abc Subtitle
Abc Table Name
=Abc Top_speed
Abc TopModel
Abc TopSpeed
Abc Transmission
Abc Type
Abc VehicleType
Abc Measure Names
  # AccelSec
  =## count
  =## Count_powertrain
  # Efficiency_WhKm
  # FastCharge_KmH
  @ Latitude

```

Activity 4: No of Visualizations/ Graphs

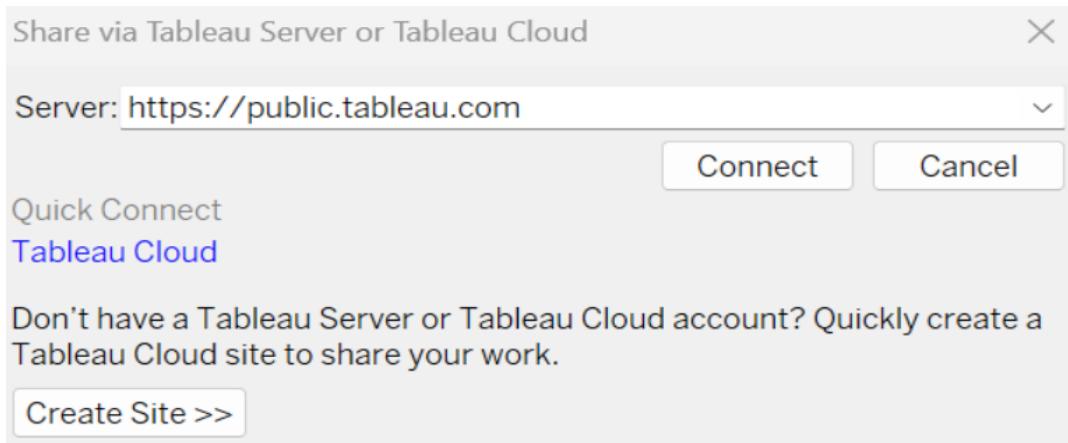
1. Charging Stations by region and type in India
2. EV Charging stations map of India
3. Different EV cars in India
4. Top speed for different Brands
5. Price for different cars in India
6. Top 10 most efficient EV Brands
7. Brands according to Bodystyle
8. Brand filtered by PowerTrain type
9. No of models by each brand
10. Summary card for Different brands of EV Cars globally
11. Summary card for Different brands of EV Cars in India

Milestone 8: Web integration

Publishing helps us to track and monitor key performance metrics, to communicate results and progress. help a publisher stay informed, make better decisions, and communicate their performance to others.

Publishing dashboard and reports to tableau public

Step 1: Go to Dashboard/story, click on share button on the top ribbon



Give the server address of your tableau public account and click on connect.

Explanation Video:-

https://drive.google.com/file/d/1HU4uV8P8Hc53eu0XxYHPRIu51YFK-8NA/view?usp=share_link

Step 2: Once you click on connect it will ask you for tableau public user name and password



Once you login into your tableau public using the credentials, the particular visualization will be published into tableau public

Note: While publishing the visualization to the public, the respective sheet will get published when you click on share option.

Activity 1: Dashboard and Story embed with UI With Flask

Explanation video link:

https://drive.google.com/file/d/1gp1P4Z0kIYReDsWbGK-HGOd3uRS5QjR1/view?usp=share_link

E-CarStart

Home About Dashboard Story Team Contact Get Started

We offer modern Analytics solutions for Electric Vehicles

Get Started →



E-CarStart

Home About Dashboard Story Team Contact Get Started

E-CAR START

E-Cart Start is a complete analytics tool for electric vehicles all over the world.

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. 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 EVs, but the common thread that runs through all these elements is data analytics.

Read More →



DASHBOARD



DASHBOARD

E-Car Start Analytics Dashboard

Electric Cars Analytics Dashboard

Diffrent brands of EV Cars Globally

98

Different brands of EV cars in India

9

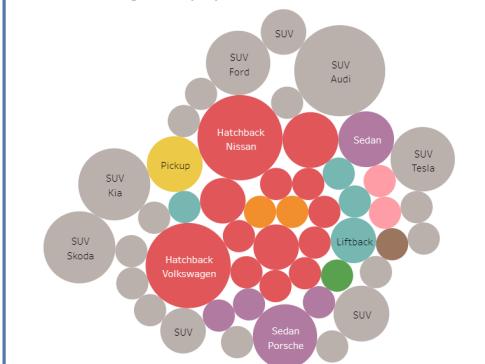


BodyStyle
 Cabrio
 Hatchback
 Liftback
 MPV
 Pickup
 Sedan
 SPV
 Station
 SUV

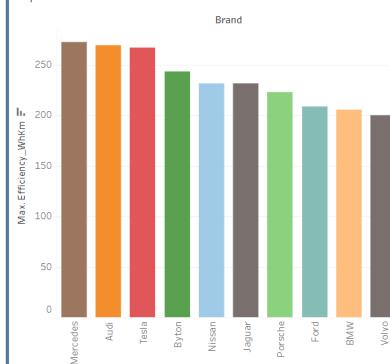
Brand
 (All)
 Null
 Aiways
 Audi
 BMW
 Byton
 Citroen
 CUPRA
 DS
 Fiat
 Ford
 Honda
 Hyundai
 Jaguar
 Kia
 Lexus



Brands according to bodystyle



Top 10 most efficient brands



Brand
 Mazda
 Mercedes
 MG
 Mini
 Nissan
 Opel
 Peugeot
 Polestar
 Porsche
 Renault
 SEAT
 Skoda
 Sono
 Tesla
 Volkswagen
 Volvo

Brand
 Audi
 BMW
 Byton
 Ford
 Jaguar
 Mercedes
 Nissan
 Porsche
 Tesla
 Volvo

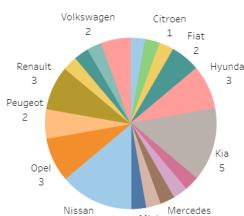
PowerTrain
 (All)
 AWD
 AWB
 FWD
 RWD



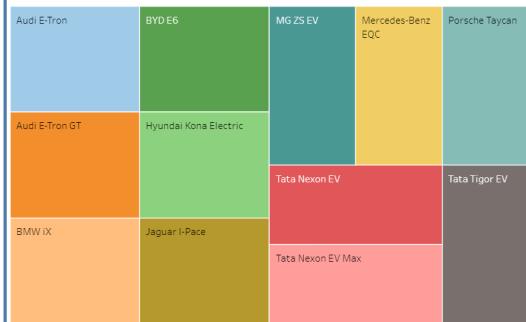
RWB

- Car1
- Audi E-Tron
 - Audi E-Tron GT
 - BMW iX
 - BYD E6
 - Hyundai Kona Electric
 - Jaguar I-Pace
 - Mercedes-Benz EQC
 - MG ZS EV
 - Porsche Taycan
 - Tata Nexon EV
 - Tata Nexon EV Max
 - Tata Tigor EV

Brand filtered by PowerTrain type



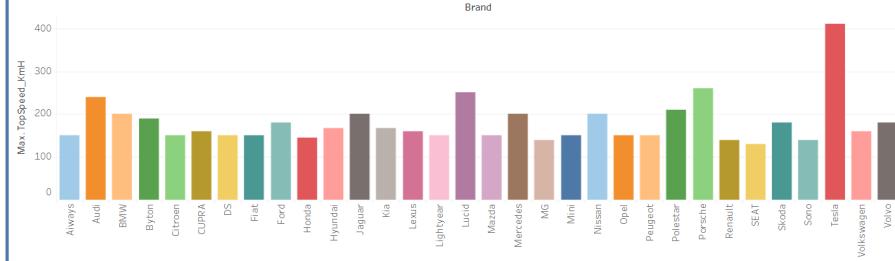
Different EV Cars in India



top speed for different brands



top speed for different brands


Tableau
Navigation icons

FEATURES

There are many different features of our project



There are many different features of our project



- Analyse the current stats
- Get to know EV more
- Know about Charging Stations
- Top performing Brands
- different brands in India
- different brands Globally

Overview of Electric Vehicle Sector

OVERVIEW PRICING

ELECTRIC



Overview of Electric Vehicle Sector

OVERVIEW PRICING

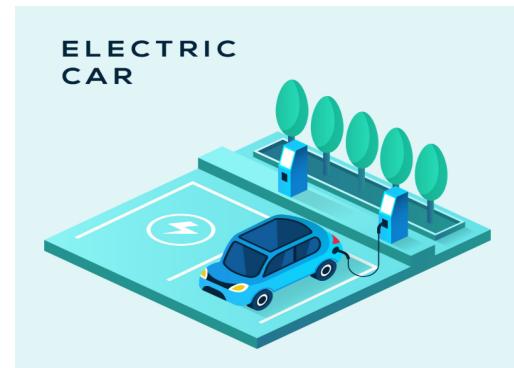
The supply of fossil fuels is constantly decreasing. The situation is very alarming. It is time for the world to slowly adapt to electric vehicles.

A lot of change needs to happen

Major carmakers like Tesla and Porsche manufacture many electric vehicles.

The improvement of battery technology in recent years has led to the higher popularity of electric vehicles.

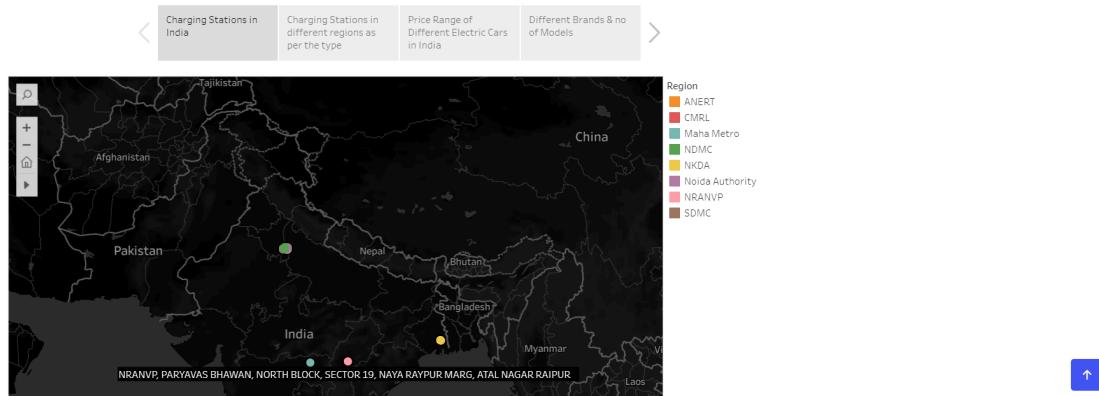
Buying an electric vehicle can be a great choice for consumers. The drive quality, low noise levels, and convenience are really great.



STORY

Electric vehicles Analytics Story

Story of Electric Cars In India



TESTIMONIALS

What they are saying about us



Fugiat enim eram quae cillum dolore dolor amet nulla culpa multos export minim fugiat minim velit minim dolor enim quis veniam ipsum anim magna sunt elit fore quem dolore labore illum veniam.



Matt Brandon
Freelancer



Quis quorum aliqua sint quem legam fore sunt eram irure aliqua veniam tempor noster veniam enim culpa labore quis sunt culpa nulla illum cillum fugiat legam esse veniam culpa fore nisi cillum quid.



John Larson
Entrepreneur



Proin iaculis purus consequat sem cure dignissim donec portitora entum suscipit rhoncus. Accusantium quam, ultricies eget id, aliquam eget nibh et. Maecen aliquam, risus at semper.



Saul Goodman
Ceo & Founder



TEAM

Our hard working team

**Walter White**
Chief Executive Officer

Velit aut quia fugit et et. Dolorum ea voluptate vel tempore tenetur ipsa quae aut. Ipsum exercitationem iure minima enim corporis et voluptate.

**Sarah Jhonson**
Product Manager

Quo esse repellendus quia id. Est eum et accusantium paratur fugit nihil minima suscipit corporis. Voluptate sed quas reiciendi animi neque sapiente.

**William Anderson**
CTO

Vero omnis enim consequatur. Voluptas consecetur unde qui molestiae deserunt. Voluptates enim aut architecto porro aspernatur molestiae modi.

**Amanda Jepson**
Accountant

Rerum volutate non adipisci animi distinctio et deserunt omet voluptas. Quia aut aliquid doloremque ut possimus ipsum officia.



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Open Hours

Monday - Friday
9:00AM - 07:00PM



Milestone 9: Project Demonstration & Documentation

Below mentioned deliverables to be submitted along with other deliverables

Activity 1:- Record explanation Video for project end to end solution

Activity 2:- Project Documentation-Step by step project development procedure

Create document as per the template provided