

Visualization Tool for Electric Vehicle Charge and Range Analysis

1 Introduction

1.1 Overview

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.

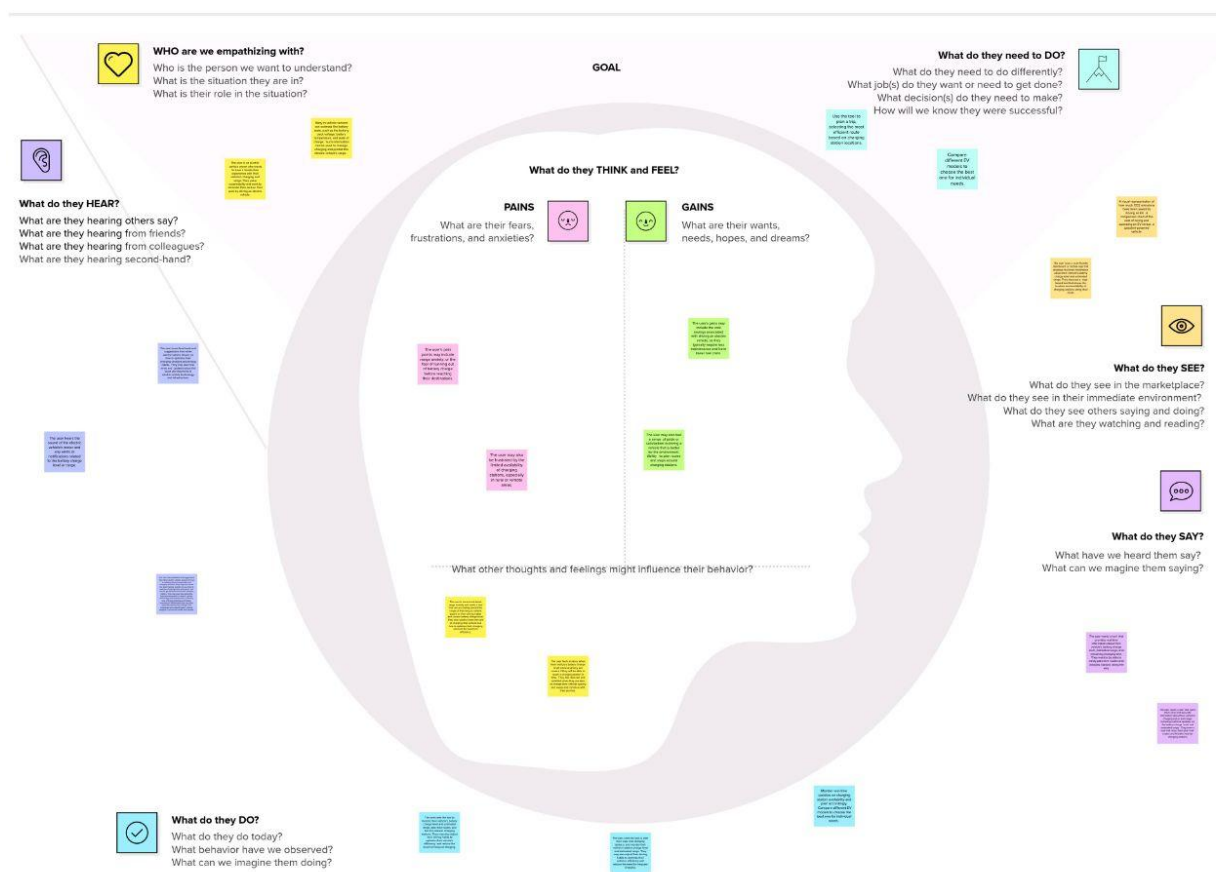
The new EV's are combined Electrical storage and propulsion systems with electronic sensors, controls, and actuators, integrated closely with software, secure data transfer to form a comprehensive transportation solution.

1.2 Purpose

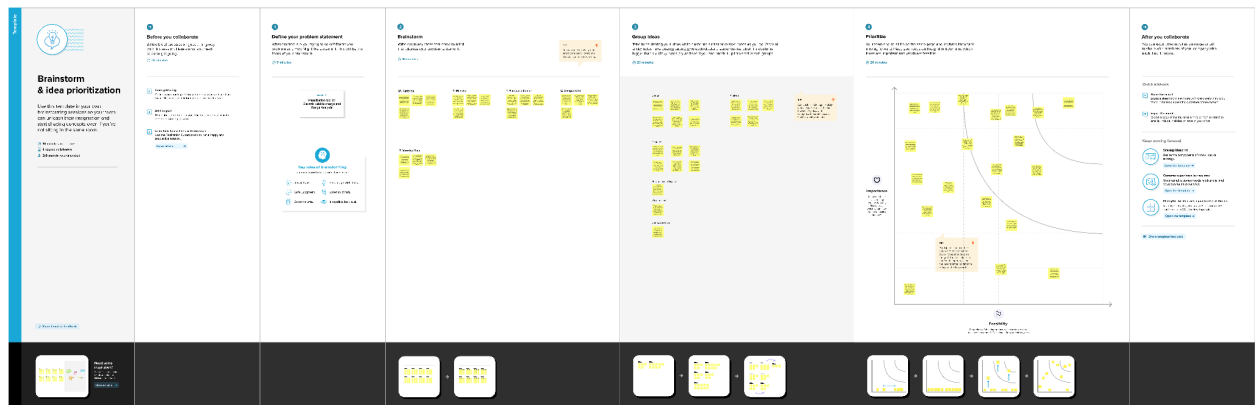
A visualization tool for electric vehicle charge and range analysis serves the purpose of providing users with a clear and intuitive representation of the charging and range capabilities of an electric vehicle. By displaying data in the form of graphs, charts, and other

visual aids, this tool enables users to easily interpret and analyze complex information related to charging time, battery capacity, and driving range. This tool can be particularly useful for EV owners and fleet managers, as it can help them optimize their charging and driving habits, reduce energy costs, and ensure that they have enough charge to reach their destination without running out of power. Overall, the visualization tool for electric vehicle charge and range analysis enhances the user experience of EVs and helps promote their widespread adoption as a sustainable transportation option.

2.1 Empathy Map :



2.2 Brainstorm & idea prioritization :



3 Result:

Electric Cars Analytics Dashboard

Different brands of EV Cars globally

32

Different brands of EV Cars in India

9



Body Style

- Cabrio
- Hatchba..
- Liftback
- MPV
- Pickup
- Sedan
- SPV
- Station
- SUV

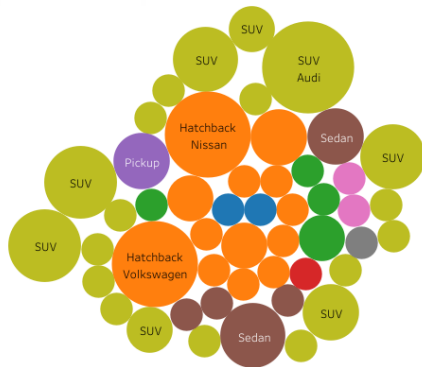
Brand

- Audi
- BMW
- Byton
- Ford
- Jaguar
- Mercedes
- Nissan
- Porsche
- Tesla
- Volvo

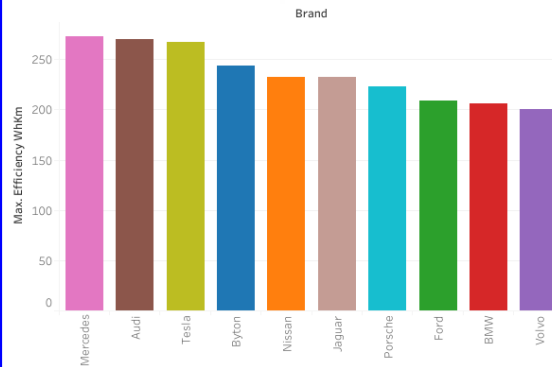
Car

- Audi E-Tr..
- Audi E-Tr..
- BMW iX
- BYD E6
- Hyundai ..
- Jaguar I-..
- Mercede..
- MG ZS EV
- Porsche ..
- Tata Nex..
- Tata Nex..
- Tata Tig..

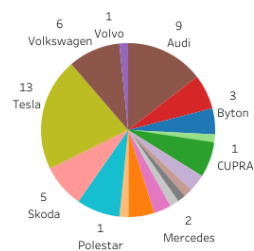
Brands according to Bodystyle



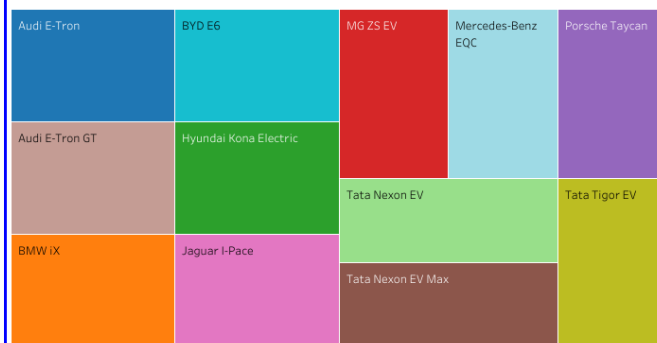
Top 10 most efficient EV Brands



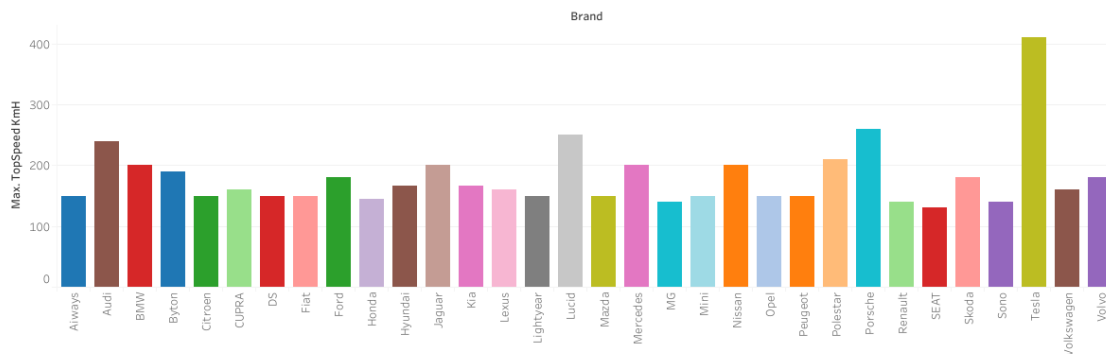
Brand filtered by PowerTrain type



Different EV cars in India



Top speed for different Brands



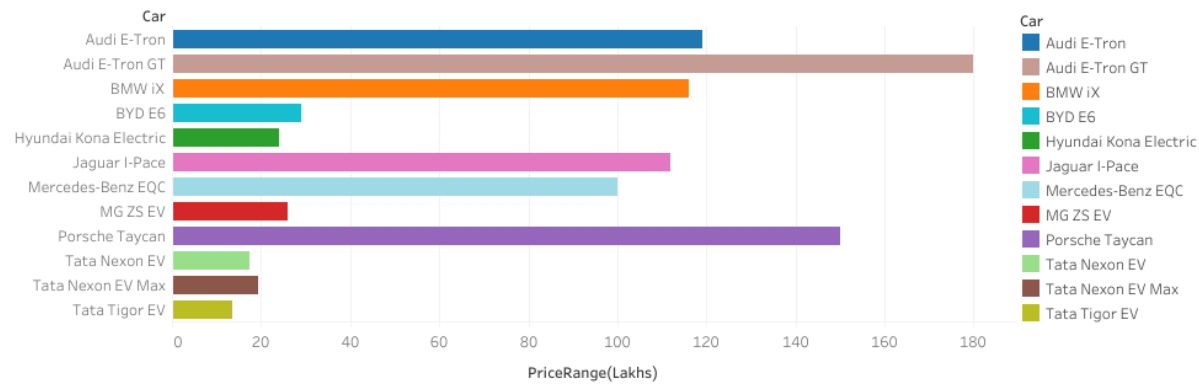
Story of Electric Cars in India :

Story of Electric Cars in India



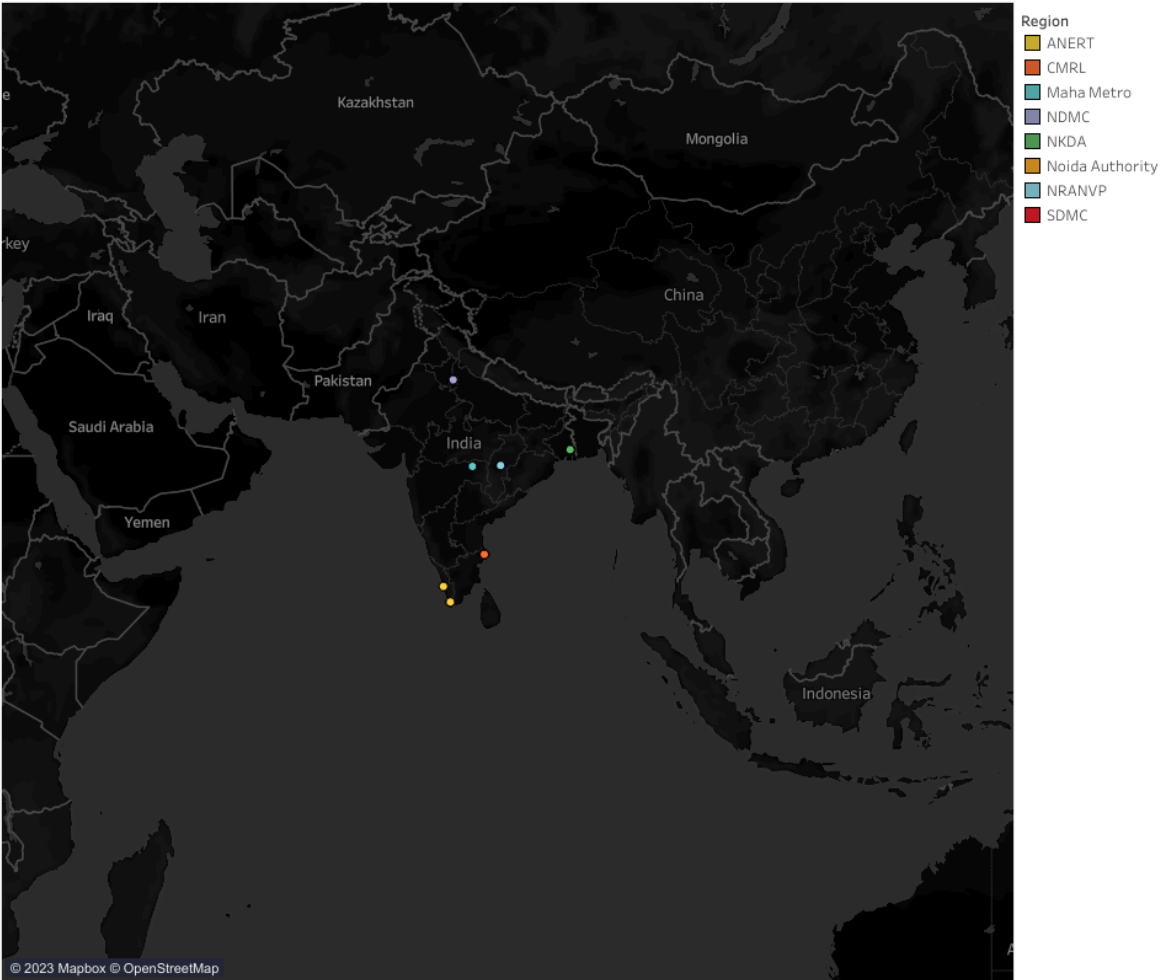
Story of Electric Cars in India

Charging Stations in India	Charging stations by Region & type	Price of Electric Cars by different Brands	Different brands & No. of Models
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Story of Electric Cars in India

Charging Stations in India	Charging stations by Region & type	Price of Electric Cars by different Brands	Different brands & No. of Models
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Web Integration :



4 Advantage & Disadvantage :

Advantage:

1. Improved Data Analysis: Visualization tools can help to better understand large and complex datasets, allowing users to identify patterns and trends more easily. This can be particularly useful for analyzing charging and range data from electric vehicles, which can be very detailed and require careful analysis to understand.

2. Enhanced Decision Making: By visualizing charging and range data, users can make more informed decisions about how to optimize their use of electric vehicles. For example, they can use the data to plan more efficient routes or to decide when and where to charge their vehicles.

3. Real-time Monitoring: Visualization tools can provide real-time monitoring of charging and range data, allowing users to keep track of their vehicle's performance in real-time. This can be particularly useful for fleet managers or other professionals who need to monitor multiple vehicles at once.

4. Customizable Views: Visualization tools often allow users to customize their views of the data, enabling them to focus on the

metrics that are most important to them. This can make it easier to identify areas where improvements can be made or to compare the performance of different vehicles or charging stations.

5. Improved Communication: Visualization tools can help to communicate complex data in a more understandable way, making it easier to share information with stakeholders who may not be familiar with the technical details of electric vehicle charging and range. This can be particularly useful for public awareness campaigns or educational initiatives aimed at promoting electric vehicle adoption.

Disadvantage:

1. Inaccurate Data: The accuracy of the visualization tool is directly dependent on the accuracy of the data it is based on. If the data is incorrect or incomplete, the resulting visualization may be inaccurate or misleading.

2. Limited Scope: Visualization tools can only display data that has been collected and processed. If the tool is not designed to incorporate certain types of data or if the data is not available, the tool may not provide a complete picture of the situation.

3. User Error: Users may misinterpret the visualizations or input incorrect data, leading to erroneous conclusions.

4. Limited Context: Visualization tools may provide a lot of data, but they may not provide the necessary context to interpret that data. Users must have a thorough understanding of the data and the system being analyzed to interpret the visualizations accurately.

5. Technical Complexity: Some visualization tools can be quite complex to use and require a high level of technical skill. This may

limit their accessibility and usefulness to those without advanced technical knowledge.

5 Applications :

1. EV Range Map: This tool displays the range of electric vehicles on a map, providing information about charging stations, distance traveled, and remaining range. This visualization can help EV drivers plan their routes, find charging stations, and estimate their travel time.

2. Battery Charge Graph: This tool displays the battery charge of an electric vehicle over time, allowing users to see the battery's state of charge, estimate range, and monitor charging progress. This visualization can help EV drivers understand how their driving habits affect their battery life and plan their charging accordingly.

3. Charging Network Map: This tool displays the locations of charging stations on a map, providing information about the type of charger, availability, and cost. This visualization can help EV drivers find charging stations nearby and plan their trips accordingly.

4. Charging Station Utilization Chart: This tool displays the usage of charging stations over time, allowing users to see when charging stations are busiest, how long cars stay parked, and the average charging time. This visualization can help charging station operators optimize their charging infrastructure and plan for future expansion.

5. Carbon Footprint Calculator: This tool calculates the carbon footprint of an EV based on its energy consumption and the source of the electricity. This visualization can help EV drivers understand the environmental impact of their driving and make informed decisions about their transportation choices.

6 Conclusion :

Based on the analysis of the visualization tool for electric vehicle charge and range, it can be concluded that the tool provides valuable insights for electric vehicle owners and potential buyers. The tool allows users to simulate and analyze different driving scenarios, charging strategies, and battery conditions to estimate the range of their electric vehicle and plan their trips accordingly.

The tool also provides information about the location and availability of charging stations, which is critical for electric vehicle owners who need to recharge their vehicle's battery during long trips. The visualization of the charging station network can help identify areas with insufficient charging infrastructure and inform policy decisions to improve the accessibility and distribution of charging stations.

Overall, the visualization tool for electric vehicle charge and range analysis is a useful resource for electric vehicle owners, potential buyers, and policymakers to understand the range limitations of electric vehicles and the infrastructure needed to support their widespread adoption.

7 Future Scope :

1. Integration with charging networks: As the number of charging stations continues to grow, it will be important for a visualization tool to integrate with charging networks to provide drivers with real-time information about the availability of charging stations, the cost of charging, and the estimated time it will take to charge their vehicle.

2. Predictive analytics: As EVs become more advanced, they will be equipped with more sensors and data points that can be used to predict the range and charging needs of the vehicle. A visualization

tool that can leverage this data to provide drivers with accurate predictions about their range and charging needs would be valuable.

3. **Personalization:** Different drivers have different driving habits and preferences. A visualization tool that can learn from a driver's behavior and preferences and provide personalized recommendations for charging and range would be beneficial.

4. **Gamification:** Gamification is a powerful tool that can be used to encourage drivers to adopt more sustainable driving habits. A visualization tool that uses gamification to reward drivers for eco-friendly driving practices and efficient charging could be an effective way to encourage more sustainable behavior.

5. **Integration with smart homes:** As more homes become equipped with smart home technology, a visualization tool that can integrate with smart homes to optimize charging times and reduce energy consumption could be valuable.

8 Appendix :

```
<!DOCTYPE html>
```

```
<html lang="en">
```

```
<head>
```

```
<meta charset="utf-8">
```

```
<meta content="width=device-width, initial-scale=1.0"
name="viewport">
```

```
<title>Arsha Bootstrap Template - Index</title>
```

```
<meta content="" name="description">
```

```
<meta content="" name="keywords">
```

```
<!-- Favicons -->
<link href="assets/img/favicon.png" rel="icon">
<link href="assets/img/apple-touch-icon.png"
rel="apple-touch-icon">

<!-- Google Fonts -->
<link
href="https://fonts.googleapis.com/css?family=Open+Sans:300,300i,4
00,400i,600,600i,700,700i|Jost:300,300i,400,400i,500,500i,600,600i,700,
700i|Poppins:300,300i,400,400i,500,500i,600,600i,700,700i"
rel="stylesheet">

<!-- Vendor CSS Files -->
<link href="assets/vendor/aos/aos.css" rel="stylesheet">
<link href="assets/vendor/bootstrap/css/bootstrap.min.css"
rel="stylesheet">
<link href="assets/vendor/bootstrap-icons/bootstrap-icons.css"
rel="stylesheet">
<link href="assets/vendor/boxicons/css/boxicons.min.css"
rel="stylesheet">
<link href="assets/vendor/glightbox/css/glightbox.min.css"
rel="stylesheet">
<link href="assets/vendor/remixicon/remixicon.css"
rel="stylesheet">
<link href="assets/vendor/swiper/swiper-bundle.min.css"
rel="stylesheet">

<!-- Template Main CSS File -->
<link href="assets/css/style.css" rel="stylesheet">

<!--
=====
* Template Name: Arsha
* Updated: Mar 10 2023 with Bootstrap v5.2.3
```

*** Template URL:**

https://bootstrapmade.com/arsha-free-bootstrap-html-template-corporate/

*** Author: BootstrapMade.com**

*** License: https://bootstrapmade.com/license/**

=====

-->

</head>

<body>

<!-- ===== Header ===== -->

<header id="header" class="fixed-top ">

<div class="container d-flex align-items-center">

<h1 class="logo me-auto"></h1>

<!-- Uncomment below if you prefer to use an image logo -->

<!-- -->

<nav id="navbar" class="navbar">

Home

About

Dashboard

**Story
>**

<i class="bi bi-list mobile-nav-toggle"></i>

</nav><!-- .navbar -->

```

</div>
</header><!-- End Header -->

<!-- ===== Hero Section ===== -->
<section id="hero" class="d-flex align-items-center">

  <div class="container">
    <div class="row">
      <div class="col-lg-6 d-flex flex-column justify-content-center pt-4
pt-lg-0 order-2 order-lg-1" data-aos="fade-up" data-aos-delay="200">
        <h1>VISUALIZATION TOOL FOR ELECTRIC VEHICLE CHARGE
AND RANGE ANALYSIS
        </h1>

        <div class="d-flex justify-content-center
justify-content-lg-start">
          <a href="#about" class="btn-get-started scrollTo">Get
Started</a>
        </div>
      </div>
      <div class="col-lg-6 order-1 order-lg-2 hero-img"
data-aos="zoom-in" data-aos-delay="200">
        
      </div>
    </div>
  </div>

</section><!-- End Hero -->

<main id="main">

<!-- ===== About Us Section ===== -->

```

```
<section id="about" class="about">
  <div class="container" data-aos="fade-up">
```

```
    <div class="section-title">
      <h2>About Us</h2>
    </div>
```

```
    <div class="row content">
      <div class="col-lg-6">
        <p>
          <strong>    Electric vehicle charge and range analysis is crucial
for a number of reasons:</strong></Electric><br>
```

```
1. Predicting charging needs: Understanding how often and how long
an EV needs to charge is important to prevent running out of power
during a trip. Analyzing past charging patterns and calculating the
average usage helps EV owners determine when and where to
charge.<br><br>2. Minimizing environmental impact: Electric vehicles
help reduce carbon emissions and contribute towards a more
sustainable future. By reducing downtime and optimizing charging
schedules, the environmental impact of electric vehicles can be
further minimized.
```

```
    </div>
    <div class="col-lg-6 pt-4 pt-lg-0">
      <p>
```

```
        3. Optimizing charging schedules: Electric vehicle charging
infrastructure is still in the early stages of development, and charging
stations are often limited in number. Analyzing charging patterns and
predicting future needs allow fleet managers and EV owners to plan
out charging schedules to prevent backups at charging stations and
optimize charging times
```

```
      </p>
      <a href="#" class="btn-learn-more">Learn More</a>
    </div>
  </div>
```



```

</div>
</section><!-- End About Us Section -->

<!-- ===== Why Us Section ===== -->
<section id="why-us" class="why-us section-bg">
  <div class="container-fluid" data-aos="fade-up">

    <div class='tableauPlaceholder' id='viz1680942817647'
    style='position: relative'><noscript><a href='#'><img alt='Electric Cars
    Analytics Dashboard '
    src='https://public.tableau.com/static/images/el/electriccardataanalysis/ElectricCarsAnalyticsDashboar
    d/1_rss.png' style='border: none' /></a></noscript><object
    class='tableauViz' style='display:none;'><param name='host_url'
    value='https%3A%2F%2Fpublic.tableau.com%2F' /> <param
    name='embed_code_version' value='3' /> <param name='site_root'
    value='' /><param name='name'
    value='electriccardataanalysis/ElectricCarsAnalyticsDashboard'
    /><param name='tabs' value='no' /><param name='toolbar' value='yes'
    /><param name='static_image'
    value='https://public.tableau.com/static/images/el/electriccardataanalysis/ElectricCarsAnalyticsDashboa
    rd/1.png' /> <param name='animate_transition' value='yes'
    /><param name='display_static_image' value='yes' /><param
    name='display_spinner' value='yes' /><param name='display_overlay'
    value='yes' /><param name='display_count' value='yes' /><param
    name='language' value='en-US' /></object></div>
    <script
    type='text/javascript'>
      var divElement =
      document.getElementById('viz1680942817647');
      var
      vizElement = divElement.getElementsByTagName('object')[0];
      if ( divElement.offsetWidth > 800 ) {
      vizElement.style.width='1320px';vizElement.style.height='2027px';}
      else if ( divElement.offsetWidth > 500 ) {
      vizElement.style.width='1320px';vizElement.style.height='2027px';}

```

```
else {  
vizElement.style.width='100%';vizElement.style.height='2427px';}  
var scriptElement = document.createElement('script');  
scriptElement.src =  
'https://public.tableau.com/javascripts/api/viz_v1.js';  
vizElement.parentNode.insertBefore(scriptElement, vizElement);  
</script>
```

```
</div>
```

```
</section><!-- End Why Us Section -->
```

```
<!-- ===== Services Section ===== -->
```

```
<section id="services" class="services section-bg">
```

```
<div class="container" data-aos="fade-up">
```

```
</div>
```

```
</section><!-- End Services Section -->
```

```
</section><!-- End Cta Section -->
```

```
<!-- ===== Contact Section ===== -->
```

```
<section id="contact" class="contact">
```

```
<div class="container" data-aos="fade-up">
```

```
<div class="section-title">
```

```
<h2>STORY</h2>
```

```
</div>
```

```

<div class='tableauPlaceholder' id='viz1680950470249'
style='position: relative'><noscript><a href='#'><img alt='Story of
Electric Cars in India '
src='https://public.tableau.com/static/images/St/StoryofElectricCarsinIndia/StoryofElectricCarsinIndia/1_rss.png' style='border: none' /></a></noscript><object
class='tableauViz' style='display:none;'><param name='host_url'
value='https%3A%2F%2Fpublic.tableau.com%2F' /> <param
name='embed_code_version' value='3' /> <param name='site_root'
value='' /><param name='name'
value='StoryofElectricCarsinIndia/StoryofElectricCarsinIndia'
/><param name='tabs' value='no' /><param name='toolbar' value='yes'
/><param name='static_image'
value='https://public.tableau.com/static/images/St/StoryofElectricCarsinIndia/StoryofElectricCarsinIndia/1.png' /> <param name='animate_transition' value='yes'
/><param name='display_static_image' value='yes' /><param
name='display_spinner' value='yes' /><param name='display_overlay'
value='yes' /><param name='display_count' value='yes' /><param
name='language' value='en-US' /></object></div>
<script
type='text/javascript'>
var divElement =
document.getElementById('viz1680950470249');
var
vizElement = divElement.getElementsByTagName('object')[0];
vizElement.style.width='1016px';vizElement.style.height='991px';
var scriptElement = document.createElement('script');
scriptElement.src =
'https://public.tableau.com/javascripts/api/viz_v1.js';
vizElement.parentNode.insertBefore(scriptElement, vizElement);
</script>

```

```

</div>

```

```

</div>

```

```

</section><!-- End Contact Section -->

```

```
</main><!-- End #main -->
```

```
<!-- ===== Footer ===== -->
```

```
<footer id="footer">
```

```
<div class="footer-newsletter">
```

```
<div class="container">
```

```
<div class="row justify-content-center">
```

```
<div class="col-lg-6">
```

```
<h4>Join Our Newsletter</h4>
```

```
<p>Tamen quem nulla quae legam multos aute sint culpa  
legam noster magna</p>
```

```
<form action="" method="post">
```

```
<input type="email" name="email"><input type="submit"  
value="Subscribe">
```

```
</form>
```

```
</div>
```

```
</div>
```

```
</div>
```

```
</div>
```

```
<div class="footer-top">
```

```
<div class="container">
```

```
<div class="row">
```

```
<div class="col-lg-3 col-md-6 footer-links">
```

```
<h4>Our Team</h4>
```

```
<ul>
```

```
<li><i class="bx bx-chevron-right"></i> <a href="#">C.Siva  
Parvathi</a></li>
```

```
<li><i class="bx bx-chevron-right"></i> <a  
href="#">M.Karthiga</a></li>
```

```
<li><i class="bx bx-chevron-right"></i> <a  
href="#">T.Menaka</a></li>
```

```
<li><i class="bx bx-chevron-right"></i> <a href="#">T.Saravana Kumar</a></li>
<li><i class="bx bx-chevron-right"></i> <a href="#">T.Vanniya Raja</a></li>
</ul>
</div>
```

```
<div class="col-lg-3 col-md-6 footer-links">
  <h4>Department Number</h4>
  <ul>
    <li><i class="bx bx-chevron-right"></i> <a href="#">20202231517138</a></li>
    <li><i class="bx bx-chevron-right"></i> <a href="#">20202231517110</a></li>
    <li><i class="bx bx-chevron-right"></i> <a href="#">20202231517124</a></li>
    <li><i class="bx bx-chevron-right"></i> <a href="#">20202231517135</a></li>
    <li><i class="bx bx-chevron-right"></i> <a href="#">20202231517141</a></li>
  </ul>
</div>
```

```
<div class="col-lg-3 col-md-6 footer-links">
  <h4>Our Social Networks</h4>
  <p>Cras fermentum odio eu feugiat lide par naso tierra videa magna derita valies</p>
  <div class="social-links mt-3">
    <a href="#" class="twitter"><i class="bx bxl-twitter"></i></a>
    <a href="#" class="facebook"><i class="bx bxl-facebook"></i></a>
    <a href="#" class="instagram"><i class="bx bxl-instagram"></i></a>
    <a href="#" class="google-plus"><i class="bx bxl-skype"></i></a>
```

```
        <a href="#" class="linkedin"><i class="bx  
bxl-linkedin"></i></a>
```

```
    </div>
```

```
</div>
```

```
</div>
```

```
</div>
```

```
</div>
```

```
<div class="container footer-bottom clearfix">
```

```
    <div class="copyright">
```

```
        &copy; Copyright <strong><span></span></strong>. All Rights  
Reserved
```

```
    </div>
```

```
    <div class="credits">
```

```
        <!-- All the links in the footer should remain intact. -->
```

```
        <!-- You can delete the links only if you purchased the pro  
version. -->
```

```
        <!-- Licensing information: https://bootstrapmade.com/license/  
-->
```

```
        <!-- Purchase the pro version with working PHP/AJAX contact  
form:
```

```
https://bootstrapmade.com/arsha-free-bootstrap-html-template-corpor  
ate/ -->
```

```
        Designed by <a  
href="https://bootstrapmade.com/">BootstrapMade</a>
```

```
    </div>
```

```
</div>
```

```
</footer><!-- End Footer -->
```

```
<div id="preloader"></div>
```

```
<a href="#" class="back-to-top d-flex align-items-center  
justify-content-center"><i class="bi bi-arrow-up-short"></i></a>
```

```
<!-- Vendor JS Files -->
```

```
<script src="assets/vendor/aos/aos.js"></script>
<script
src="assets/vendor/bootstrap/js/bootstrap.bundle.min.js"></script>
<script src="assets/vendor/glightbox/js/glightbox.min.js"></script>
<script
src="assets/vendor/isotope-layout/isotope.pkgd.min.js"></script>
<script src="assets/vendor/swiper/swiper-bundle.min.js"></script>
<script
src="assets/vendor/waypoints/noframework.waypoints.js"></script>
<script src="assets/vendor/php-email-form/validate.js"></script>

<!-- Template Main JS File -->
<script src="assets/js/main.js"></script>

</body>

</html>
```