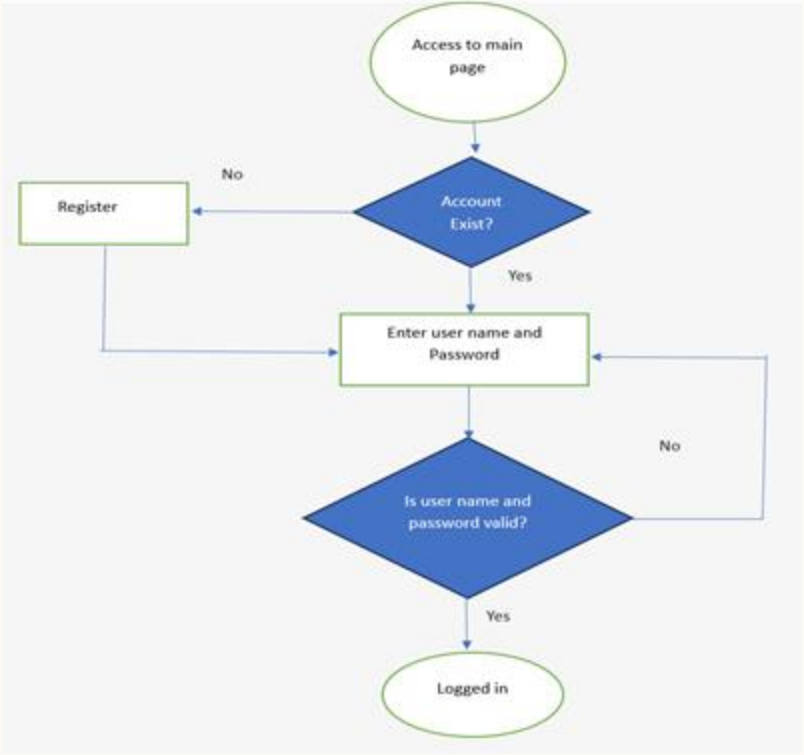
# EV FLEET MONITORING AND PREDICTION

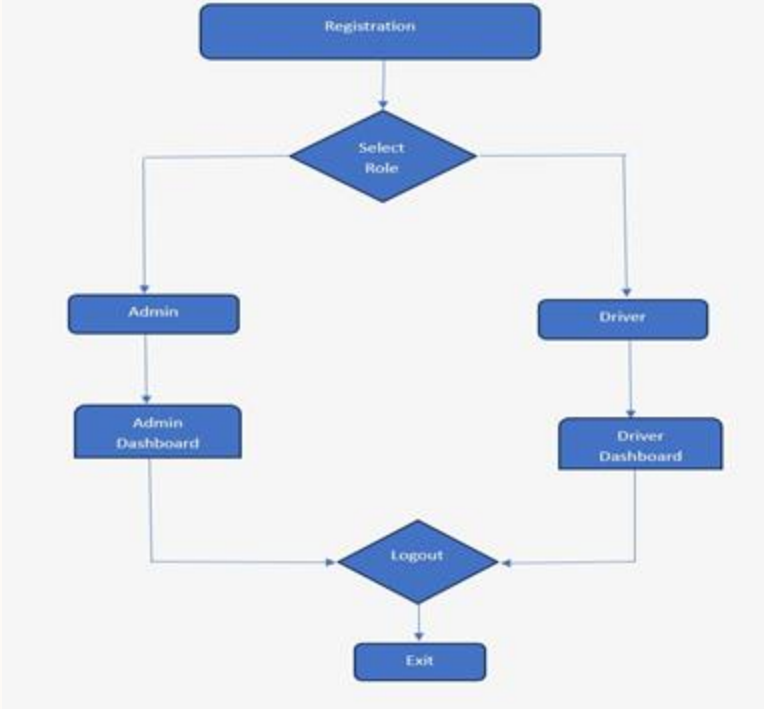
# INTRODUCTION

EV Fleet Monitoring and Predictive Analysis is a Python-based solution designed to enhance the management and operation of electric vehicle (EV) fleets. By predicting the range of EVs, the system provides fleet operators and data-driven recommendations.

- Predictive Analytics: Use historical data to forecast range and maintenance needs.
- User-Friendly Interface: Provides both fleet operators and administrators with easy-to-access insights, empowering them to make data-driven decisions.

# FLOW OF PROJECT



# PROJECT OVERVIEW

***DRIVER FEATURES***

- **User Account Creation**
  - Drivers can create a new user account to access the application.

- **Secure Login**
  - Log in with a email and password.
  - Forgot password? Easily reset via a link sent to the registered email.

- **Driver's Dashboard**
  - After login, access a dashboard.
  - Predict EV range by selecting the car name and entering battery percentage.

# PROJECT OVERVIEW



***ADMINISTRATOR FEATURES***

- **Admin Dashboard Access**
  - After login, access the admin dashboard with advanced tools.
- **Data Visualization**
  - Bar graphs for dynamic distribution analysis.
  - Pie charts for understanding distribution.
  - Relationship visualization for better insights.
  - Status Counts: View the count of vehicles in Working or Charging conditions.
  - Average maintenance costs by manufacturer.
- **Driver Behavior Analysis**
  - Identify overspeeding drivers.
  - Notify drivers via email regarding safety and behavior.
- **Range Prediction**
  - Select models and input battery percentages for EV range prediction.

# SOFTWARE SPECIFICATION

Operating System: Linux /Windows 10

Programming Language: Python 3.12.3

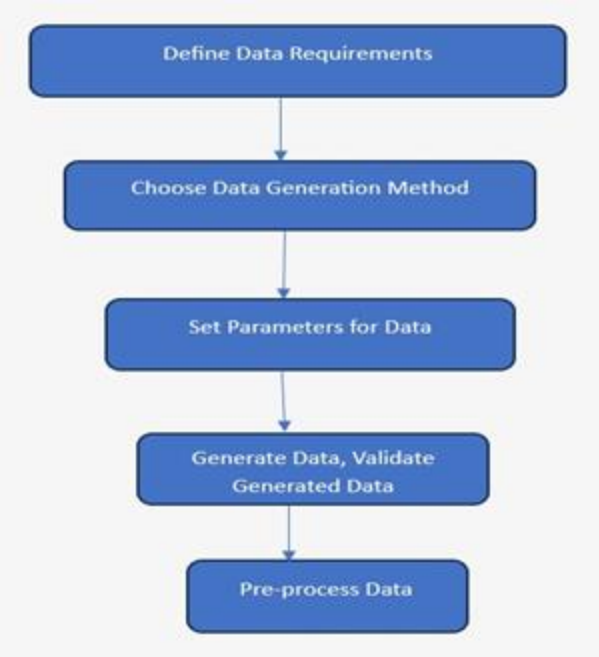
IDE : VS code , Jupyter notebook/google colab

DataBase: mysql Ver 8.0.39

Libraries Used : Flask(3.1.0), Numpy(2.1.3), Pandas(2.2.3), Flask-Mail(0.10.0), Faker(32.1.0)

# SYNTHETIC DATA STEPS





# SYNTHETIC DATA RULES

1. Install the Faker Library: First, install the faker library in your environment, either using Google Colab or Jupyter Notebook.

2. Import Required Libraries: Import all necessary libraries for creating the DataFrame. In this code, we will use pandas, random, faker, and datetime.

3. Create DataFrame : We will generate a DataFrame containing 10000 rows of data with the following columns:

   – Range: Generate a correlated range value.
   – Battery Level (%): Use random.randint to generate random battery levels within the range of (15, 100).
   – Latitude (N) and Longitude (E): Use random.uniform to generate latitude values in the range (10.00, 20.00) and longitude values in the range (76.00, 80.00).
   – Speed: Generate random speeds within the range (30, 200).
   – Length and Width: Generate random values within the range,Length Range(2500,5500) in mm,Width Range(1500,4500) in mm.
   – Height: Generate random values within the range (500, 2000) in mm.
   – Top Speed: Generate values within the range (70, 200).
   – Vehicle Status: Use random.choice to select randomly between 0 and 1, representing the vehicle's status.
   – Charge Time: Use fake.time() to generate fake times.
   – Maintenance Cost: Generate random values within the range (400, 2500).
   – Charge Cost: Generate values within the range (10, 100).
   – Dates: Use a custom function generate_random_dates to create dates formatted as %d for day, %m for month, and %y for year. Set the start date as January 1, 2024, and the end date as October 31, 2024.

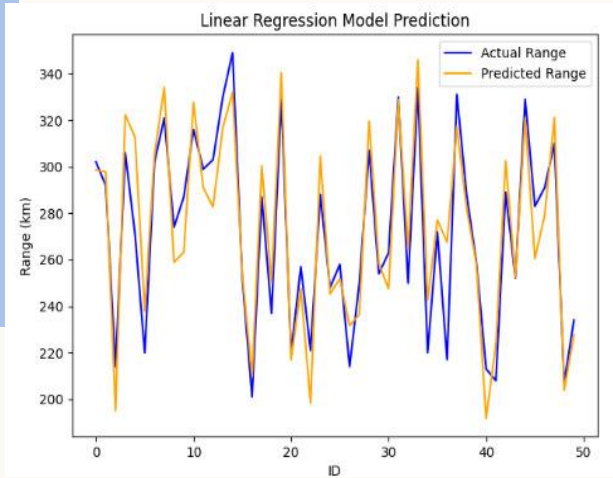
4. Extract Day, Month, and Year: Use Python's substring functions to extract the day, month, and year from the date column.

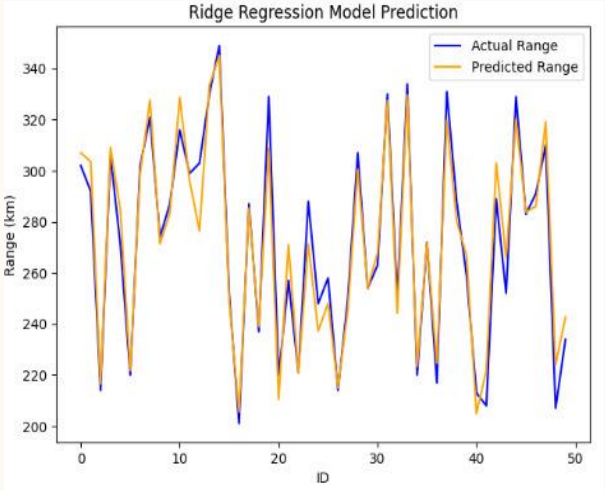
5. Create the DataFrame: Finally, create the DataFrame using the function pd.dataframe

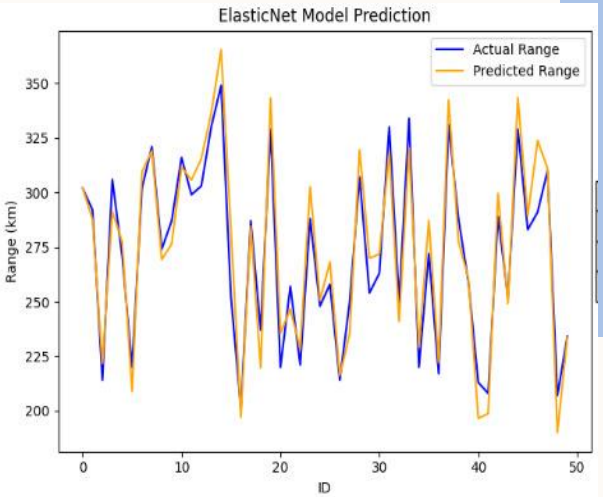
# MODEL PREDICTION STEPS

- **Prepare Your Dataset** : Ensure the dataset is in the correct directory and properly formatted.
- **Process the Data** : Select Features and Target
- **Split the Dataset** : Use train_test_split() to divide the data into training and testing subsets , ensuring that 80% is used for training and 20% for testing.
- **Scale the Data** : Standardize the feature set using StandardScaler(). Fit the scaler on the training data, and apply the same transformation to the testing data.
- **Train the Model** : Initialize and train the models on scaled training data.
- **Make Predictions** : Use the predict() method on the test set(X_test_scaled) to generate predictions for the 'Range'.
- **Evaluate the Model** : Calculate evaluation metrics using(MSE,RMSE,MAE,RSS)

# MODEL PREDICTION




Accuracy using

Linear Regression is 0.895080

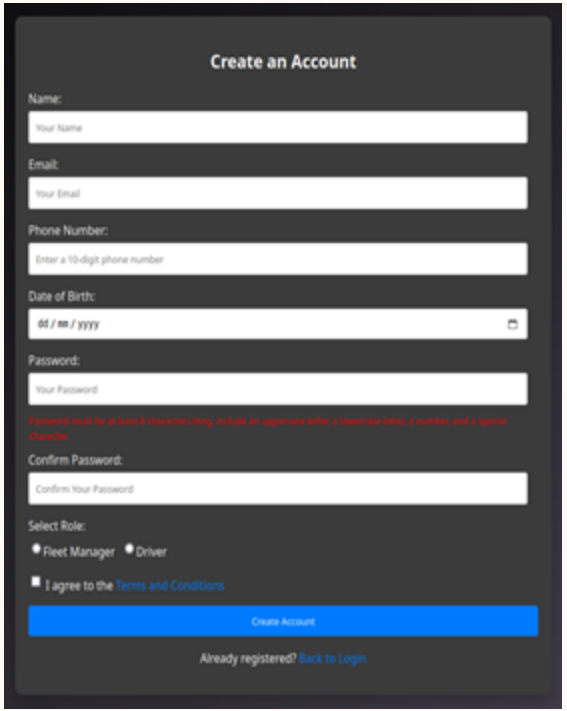
Accuracy using

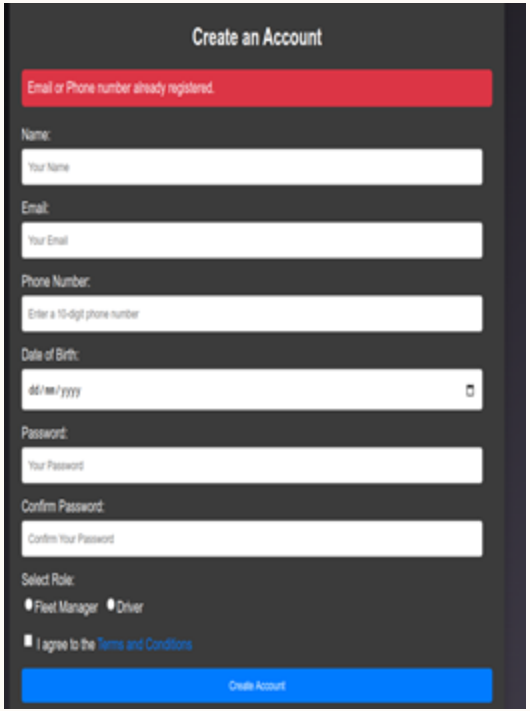
Ridge Regression is 0.895070

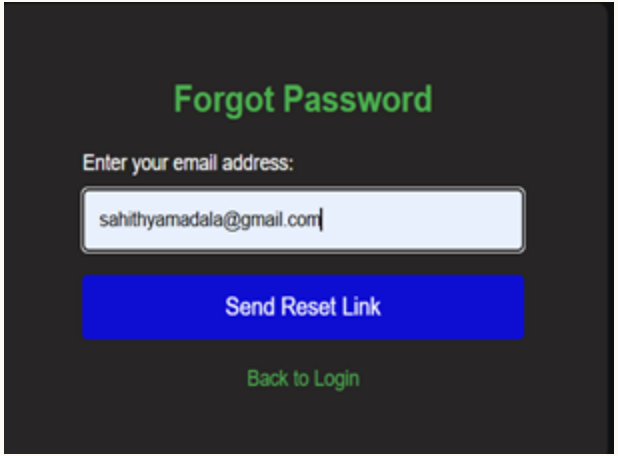
Accuracy using

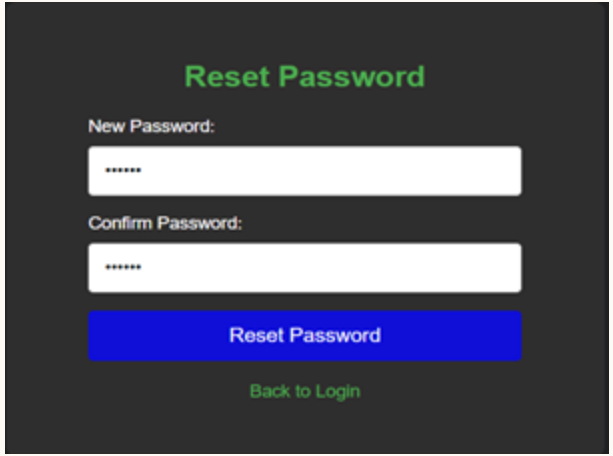
ElasticNet Regression is 0.895079

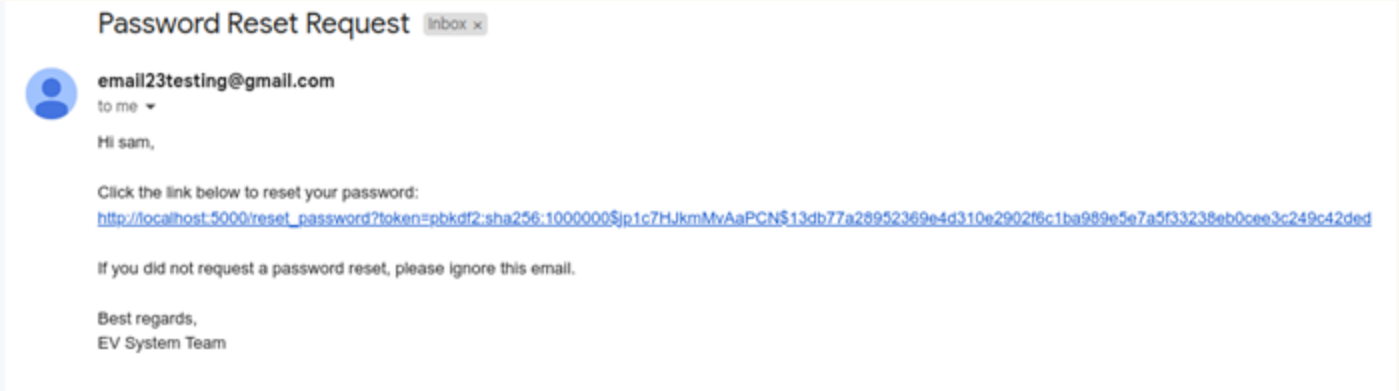
# LOGIN/REGISTER



Password Reset Request Inbox ×

**email23testing@gmail.com**
to me

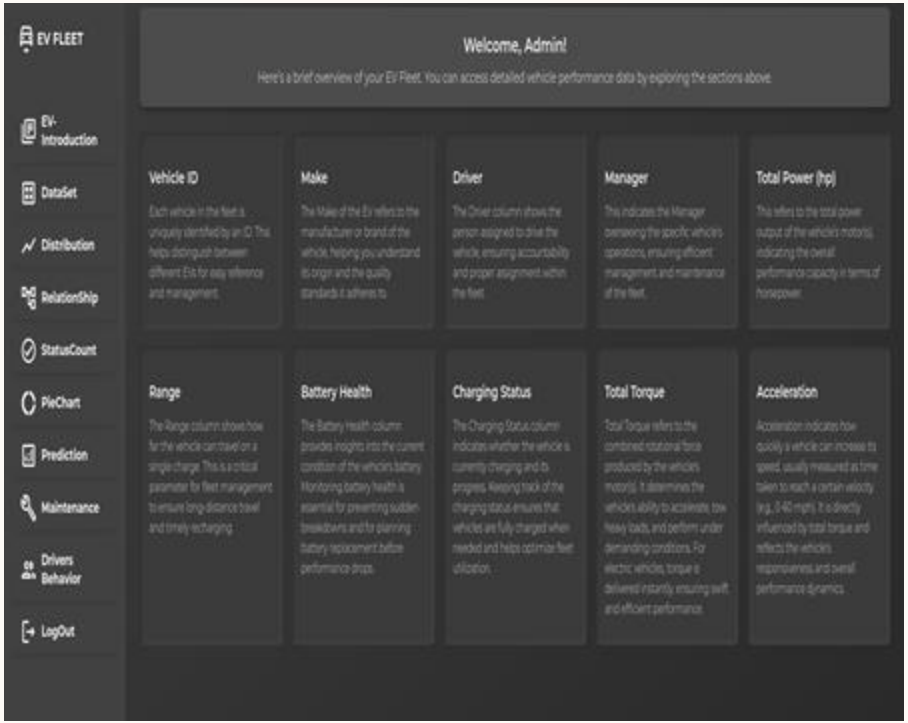
Hi sam,

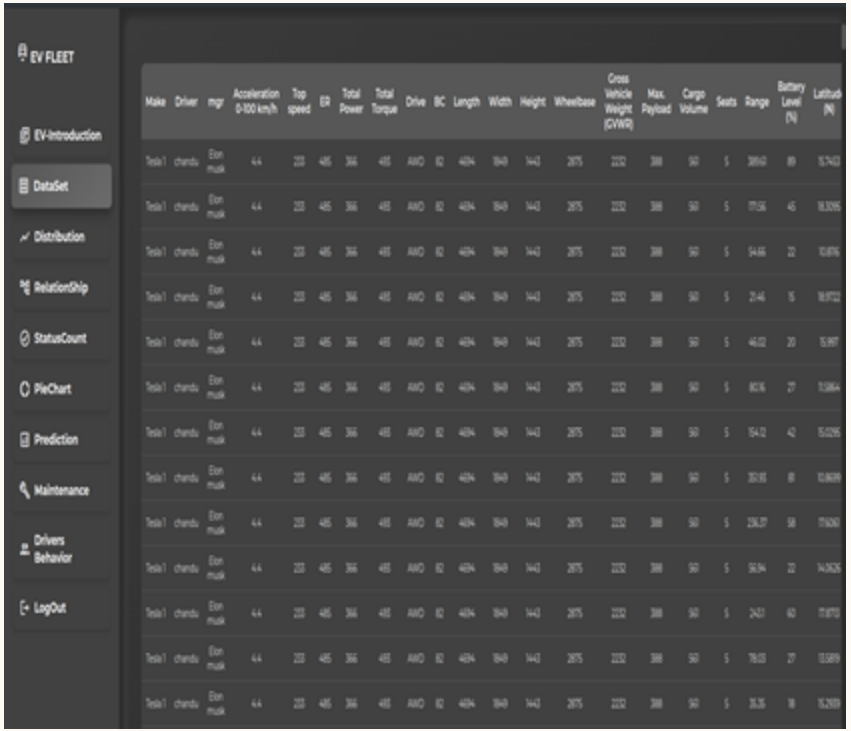
Click the link below to reset your password:
http://localhost:5000/reset_password?token=pbkdf2:sha256:1000000$jp1c7HJkmMvAaPCN$13db77a28952369e4d310e2902f6c1ba989e5e7a5f33238eb0cee3c249c42ded

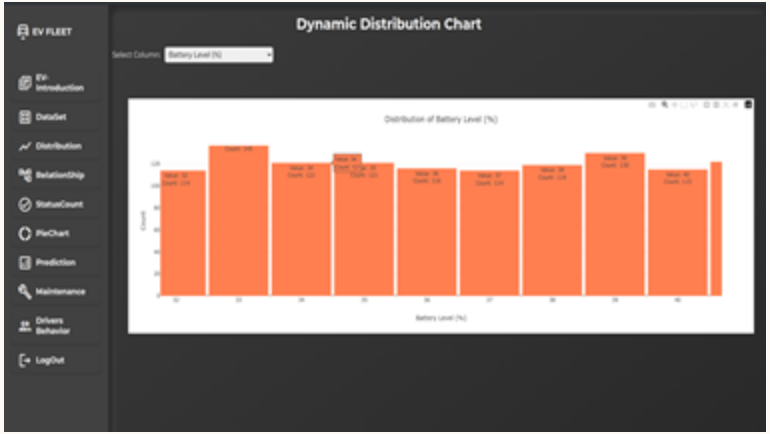
If you did not request a password reset, please ignore this email.

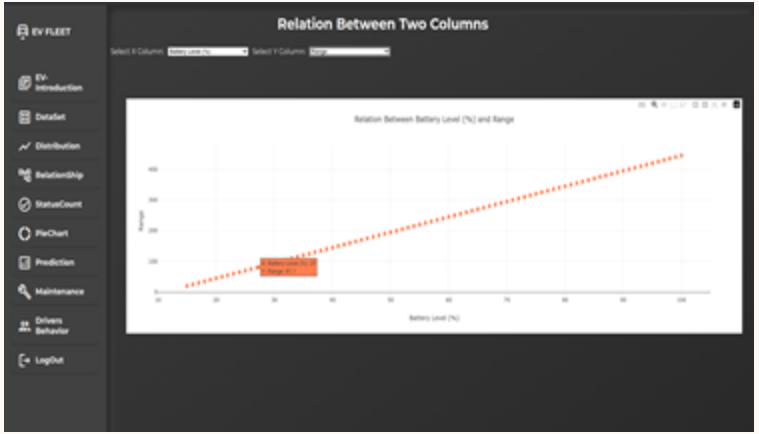
Best regards,
EV System Team

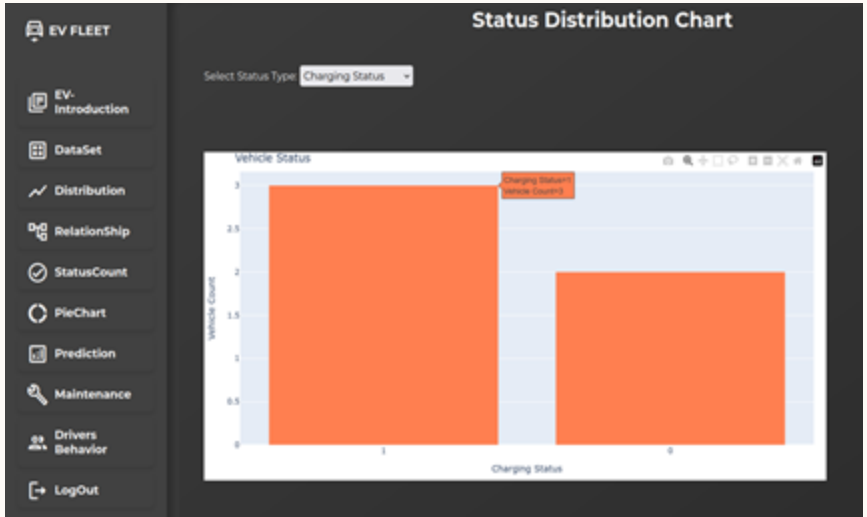
# DASHBOARD FOR FLEET MANAGER

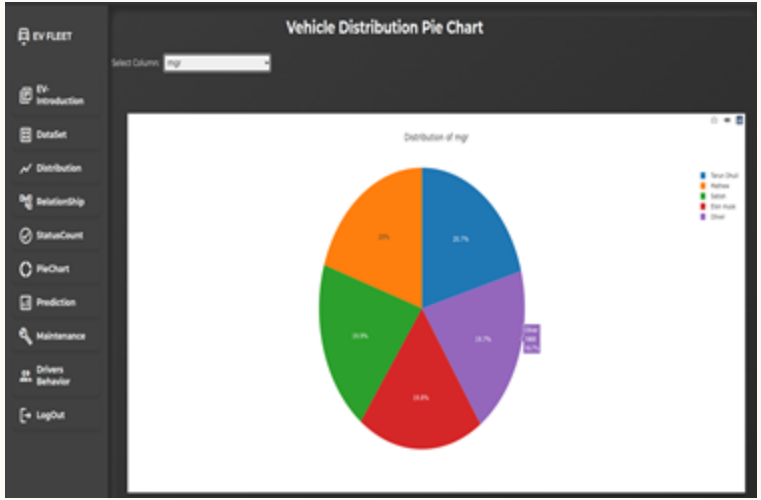


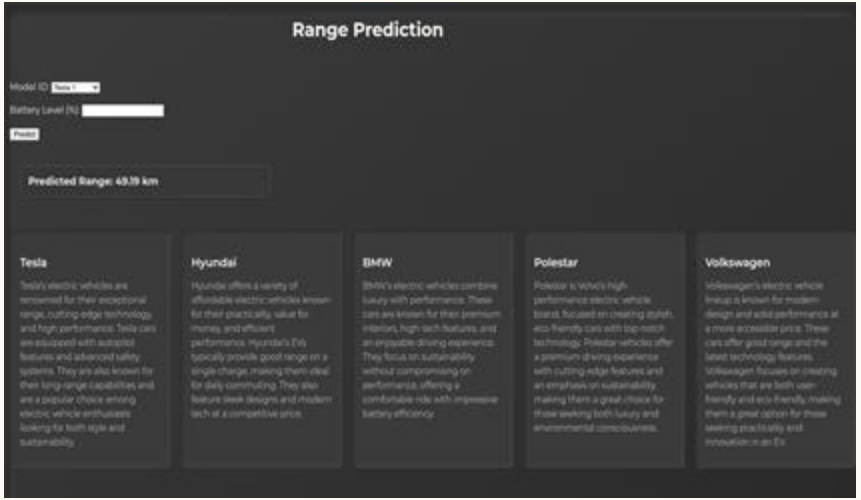



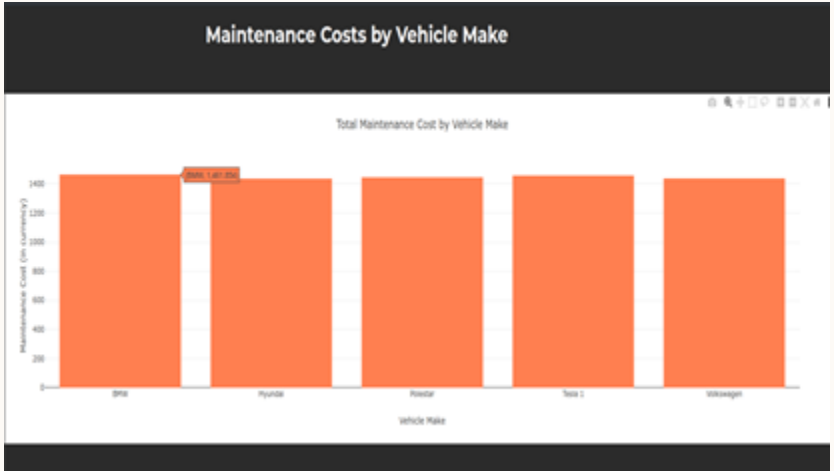

EV FLEET
Dynamic Distribution Chart
EV-Introduction
DataSet
Distribution
RelationShip
StatusCount
PieChart
Prediction
Maintenance
Drivers Behavior
LogOut

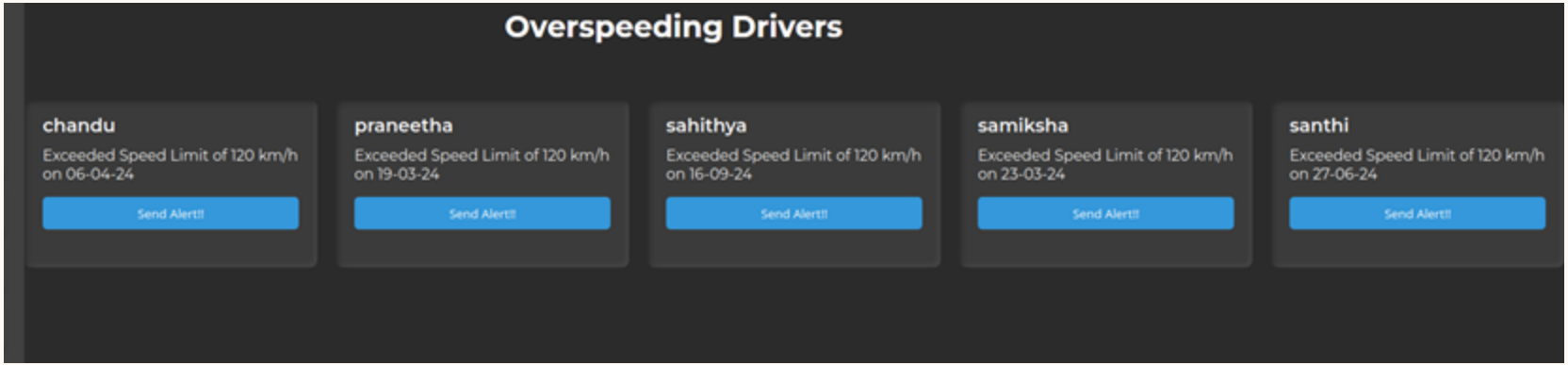

EV FLEET
Relation Between Two Columns
EV-Introduction
DataSet
Distribution
RelationShip
StatusCount
PieChart
Prediction
Maintenance
Drivers Behavior
LogOut

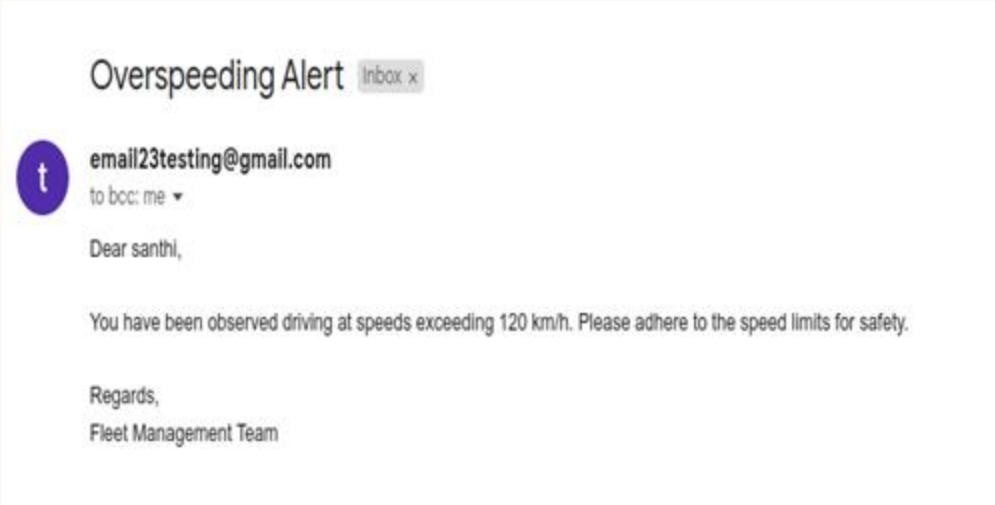

EV FLEET
Status Distribution Chart
Select Status Type: Charging Status
EV-Introduction
DataSet
Distribution
RelationShip
StatusCount
PieChart
Prediction
Maintenance
Drivers Behavior
LogOut
Vehicle Status
Vehicle Count
Charging Status


EV FLEET
EV-Introduction
DataSet
Distribution
Relationship
StatusCount
PieChart
Prediction
Maintenance
Drivers Behavior
LogOut
Vehicle Distribution Pie Chart
Select Column:
Distribution of mgr

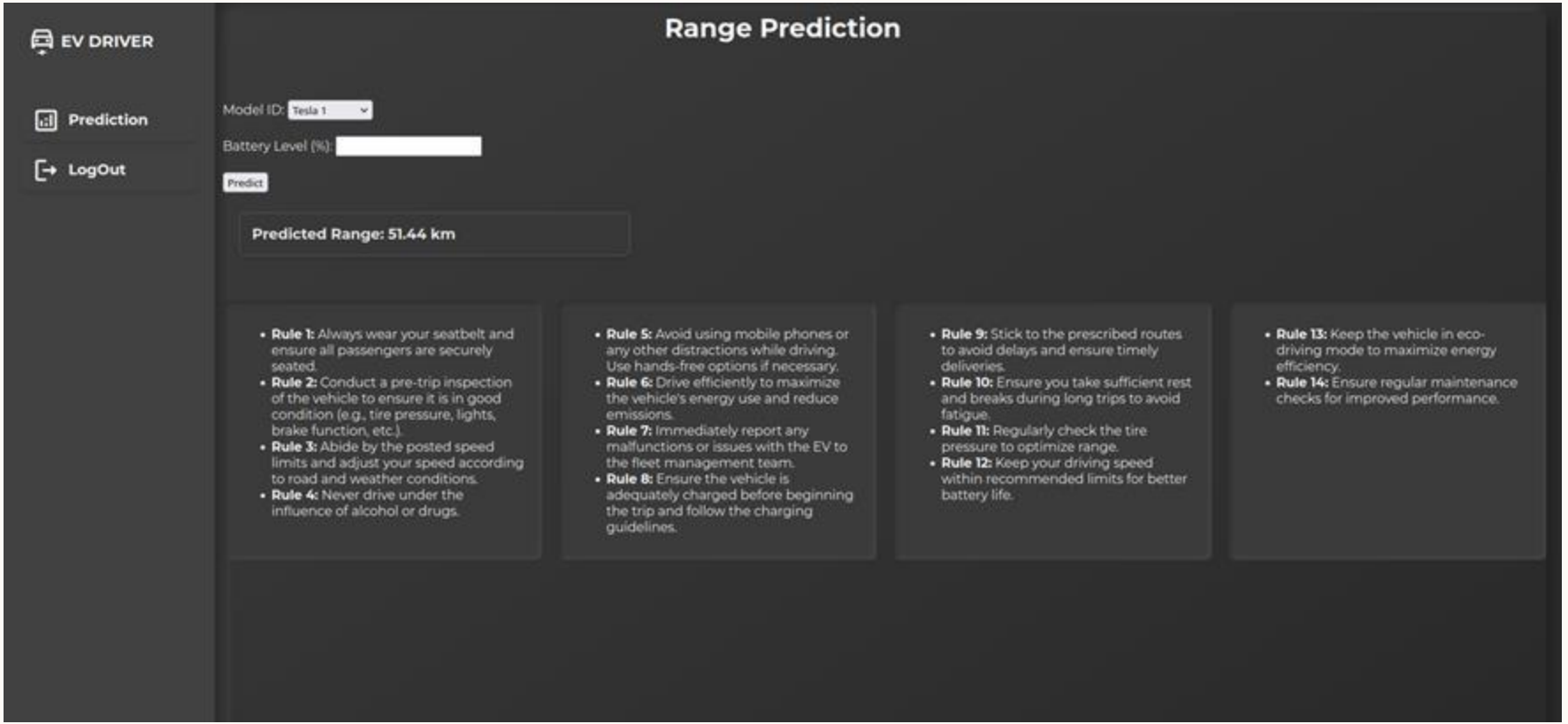

Range Prediction
Model ID:
Battery Level (%):
Predict
Predicted Range: 49.39 km
Tesla
Hyundai
BMW
Polestar
Volkswagen


Maintenance Costs by Vehicle Make
Total Maintenance Cost by Vehicle Make
Maintenance Cost (in currency)
Vehicle Make
BMW
Hyundai
Polestar
Tesla
Volkswagen


Overspeeding Drivers
chandu
Exceeded Speed Limit of 120 km/h on 06-04-24
Send Alert!!
praneetha
Exceeded Speed Limit of 120 km/h on 19-03-24
Send Alert!!
sahithya
Exceeded Speed Limit of 120 km/h on 16-09-24
Send Alert!!
samiksha
Exceeded Speed Limit of 120 km/h on 23-03-24
Send Alert!!
santhi
Exceeded Speed Limit of 120 km/h on 27-06-24
Send Alert!!


Overspeeding Alert
Inbox x
t
email23testing@gmail.com
to bcc: me
Dear santhi,
You have been observed driving at speeds exceeding 120 km/h. Please adhere to the speed limits for safety.
Regards,
Fleet Management Team

# DASHBOARD FOR DRIVER



# FUTURE SCOPE

- **Driver Behavior Monitoring and Feedback**
  - Tracks driving patterns and provides real-time feedback to encourage safe and efficient driving.
- **Mobile App Integration**
  - Offers a mobile platform for drivers and fleet managers to access real-time updates
- **Live Location Tracking**
  - Tracks the real-time location of vehicles using GPS.
- **Personalized Dashboards**
  - Customizes dashboard views based on user roles

# CONCLUSION

The EV Fleet Monitoring and Predictive Analysis System is a comprehensive solution designed to optimize fleet management. This project integrates various metrics including vehicle status, cost per meter, fuel and maintenance expenses, assignments, and open issues, offering a holistic view of fleet operations.

The system provides essential tools for tracking and analyzing fleet performance, enabling managers to make data-driven decisions, reduce operational costs, and improve overall efficiency. By predicting vehicle range and providing detailed dashboards, this solution enhances the ability to manage and monitor electric vehicles effectively, paving the way for a sustainable and efficient fleet management approach.

# TEAM MEMBERS

**Wagh Samiksha Satish**

**Masetty Lakshmi Chandana**

**Chutla Praneetha**

**Madala  Sahithya**

# THANK YOU