Electric Vehicle Range Prediction - Mini Project

Introduction:

Electric vehicles (EVs) have become increasingly popular due to their environmental benefits and cost efficiency. One key concern for users is estimating how far an EV can travel on a single charge, known as the electric range. This project aims to build a machine learning model to predict the range of electric vehicles using various vehicle features.

Dataset and Methodology:

The dataset includes attributes such as battery capacity, energy consumption, and other vehicle characteristics. The analysis was conducted using Python, leveraging libraries like pandas, scikit-learn, and SHAP for model explainability.

Two machine learning models were developed:
- Linear Regression: A simple baseline model to understand basic relationships.
- Random Forest Regressor: A more complex, ensemble-based model for better accuracy.

The dataset was split into training and testing sets, and standard performance metrics were used for evaluation, including Mean Absolute Error (MAE), Root Mean Squared Error (RMSE), and R^2 Score.

Results:

The Random Forest model outperformed Linear Regression, showing higher prediction accuracy and robustness. SHAP (SHapley Additive exPlanations) values were used to interpret the model, revealing that battery size and energy consumption were the most influential features affecting the predicted range.

Conclusion:

Machine learning models, particularly ensemble methods like Random Forest, can effectively predict the electric range of vehicles based on technical specifications. This has practical applications for both EV manufacturers and consumers. Future work could include real-time

sensor data and vehicle-specific driving patterns to improve prediction accuracy.

Technologies Used:

- Python
- pandas, numpy, matplotlib, seaborn
- scikit-learn
- SHAP
- Jupyter Notebook

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