

A Case Study On

Prices of Electric Vehicles

By

Shoaib Shaikh

HSNC University, Mumbai



School of Applied Sciences
Department of Data Science and Business Analytics

March 2024

Abstract:

This case study aims to analyze the factors influencing the prices of electric vehicles (EVs) using regression analysis. The dataset includes various attributes such as brand, model, acceleration time, top speed, range, efficiency, charging capabilities, powertrain, plug type, body style, segment, seats, and price in euros. By examining these factors, we seek to understand the relationship between EV features and their prices, providing insights for manufacturers, policymakers, and consumers in the electric vehicle market.

Keywords:

Electric vehicles, regression analysis, pricing factors, EV features, market analysis, consumer behavior.

Introduction:

The automotive industry is undergoing a significant transformation with the rise of electric vehicles (EVs) due to environmental concerns and advancements in battery technology. As the market for EVs grows, understanding the factors influencing their prices becomes crucial for manufacturers, policymakers, and consumers. This case study aims to explore these factors using regression analysis.

Objective:

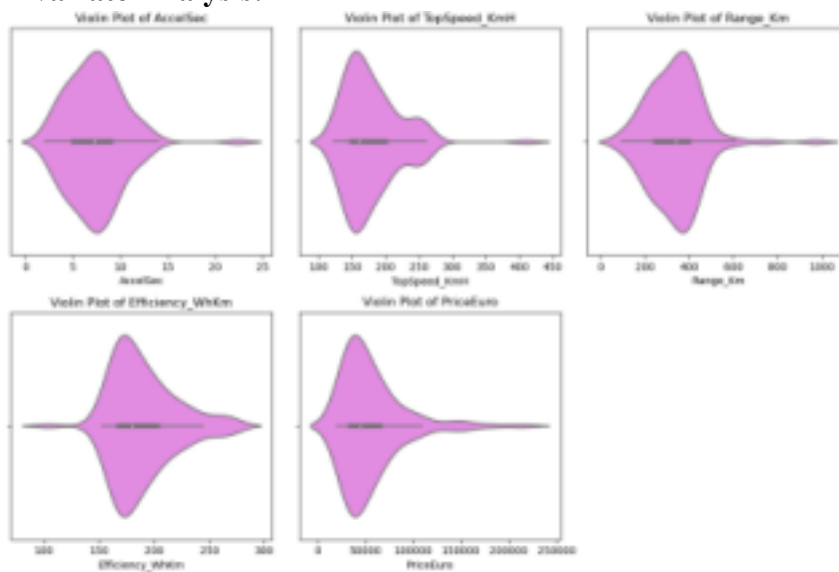
The primary objective of this study is to identify the key factors that impact the prices of electric vehicles. By analyzing a comprehensive dataset including attributes such as brand, model, acceleration time, top speed, range, efficiency, charging capabilities, powertrain, plug type, body style, segment, seats, and price in euros, we aim to build a regression model that can predict the price of an EV based on its features. This analysis will provide valuable insights into the pricing dynamics of EVs and help stakeholders make informed decisions in the rapidly evolving electric vehicle market.

Research Methodology:

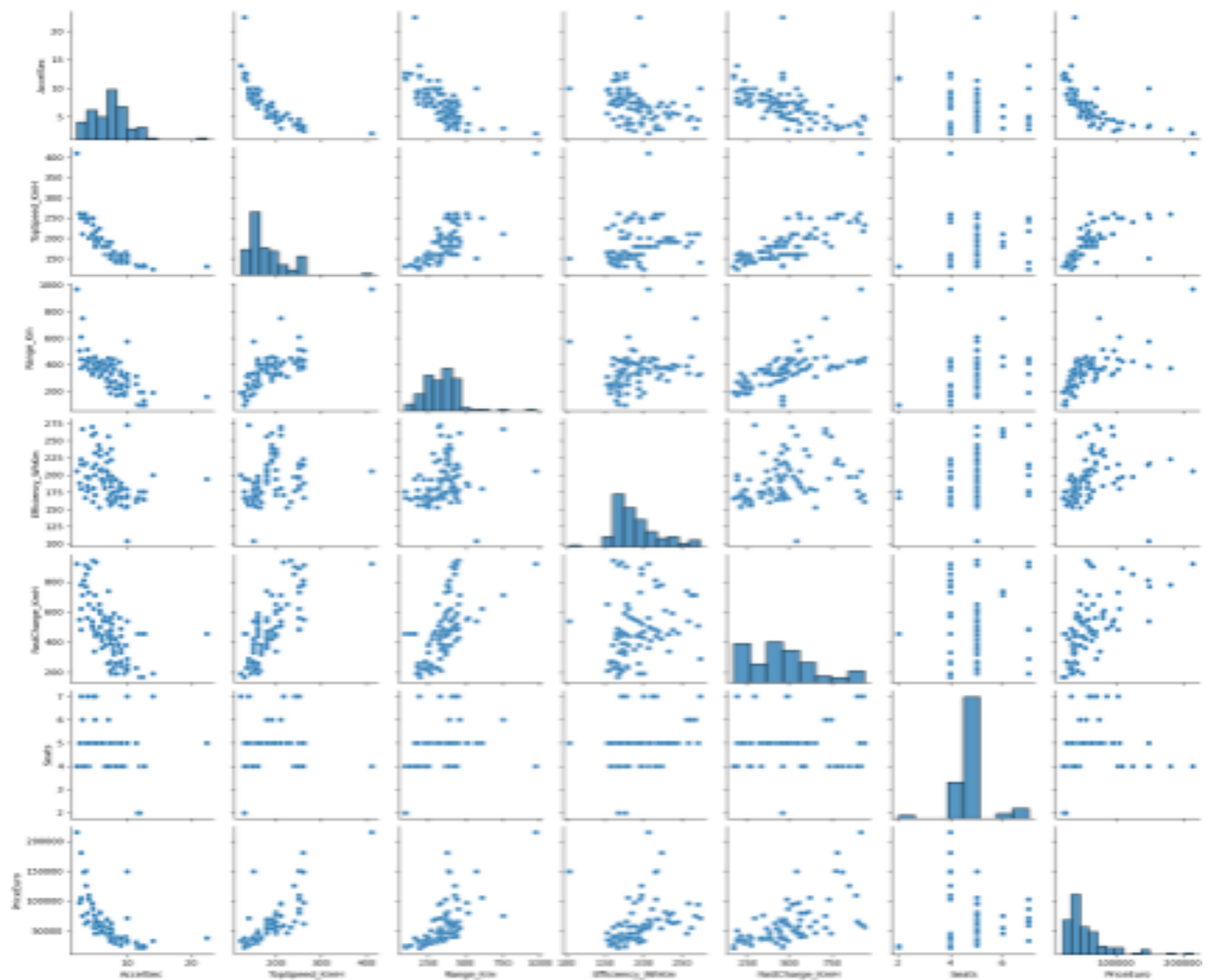
1. *Data Collection:* The dataset for this study was sourced from Google, containing information on various electric vehicles and their attributes.
2. *Data Preprocessing:* The dataset underwent preprocessing steps such as handling missing values, encoding categorical variables, and scaling numerical features.
3. *Regression Analysis:* Several regression models, such as Multiple Linear Regression, Ridge Regression, Random Forest Regression, Support Vector Regression were applied to the dataset to predict the prices of electric vehicles based on their features.
4. *Model Evaluation:* The performance of each regression model was evaluated using metrics such as mean squared error (MSE), R-squared, mean absolute error (MAE), root mean squared error (RMSE).

Results:

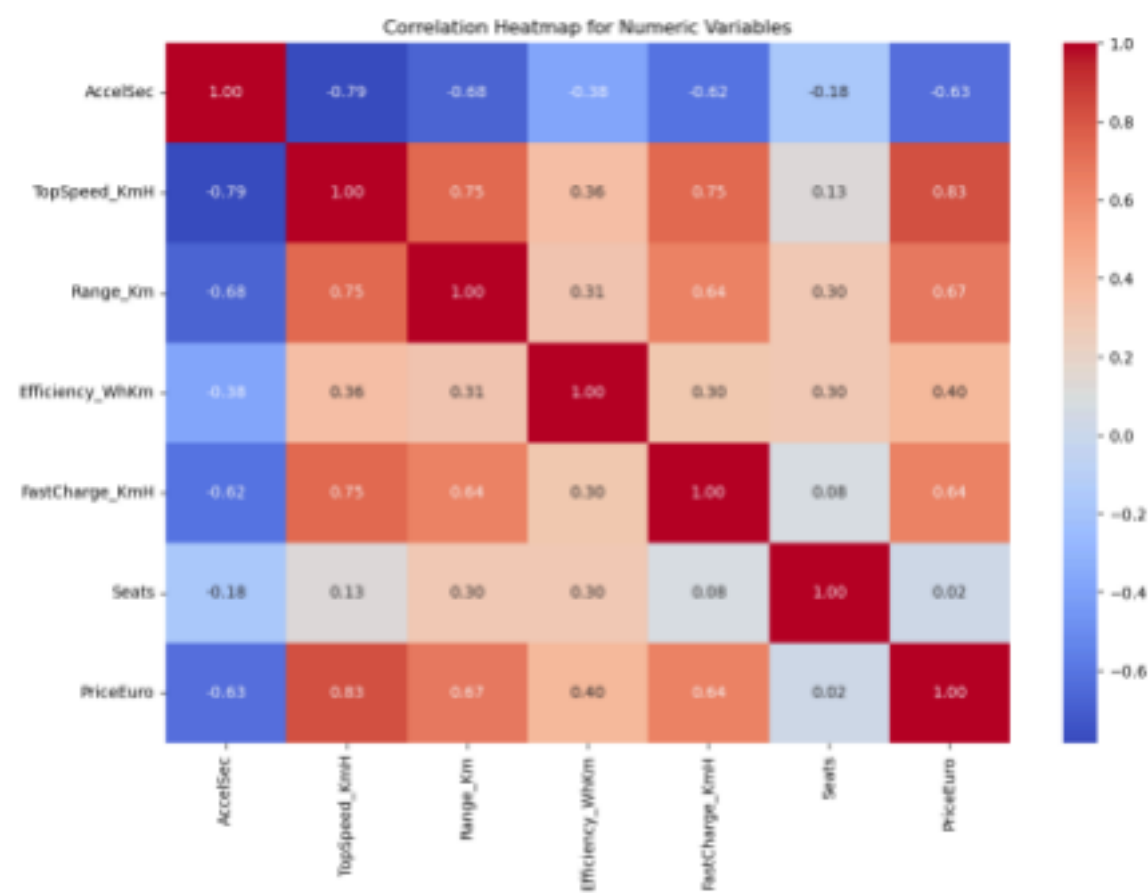
Univariate Analysis:



Bivariate Analysis:



Multivariate Analysis:



Multiple Linear Regression:

R-squared (R2) score: 0.6274534597924859

Mean Squared Error (MSE): 295443431.5655936

Mean Absolute Error (MAE): 13607.824120869782

Root Mean Squared Error (RMSE): 17188.467981923044



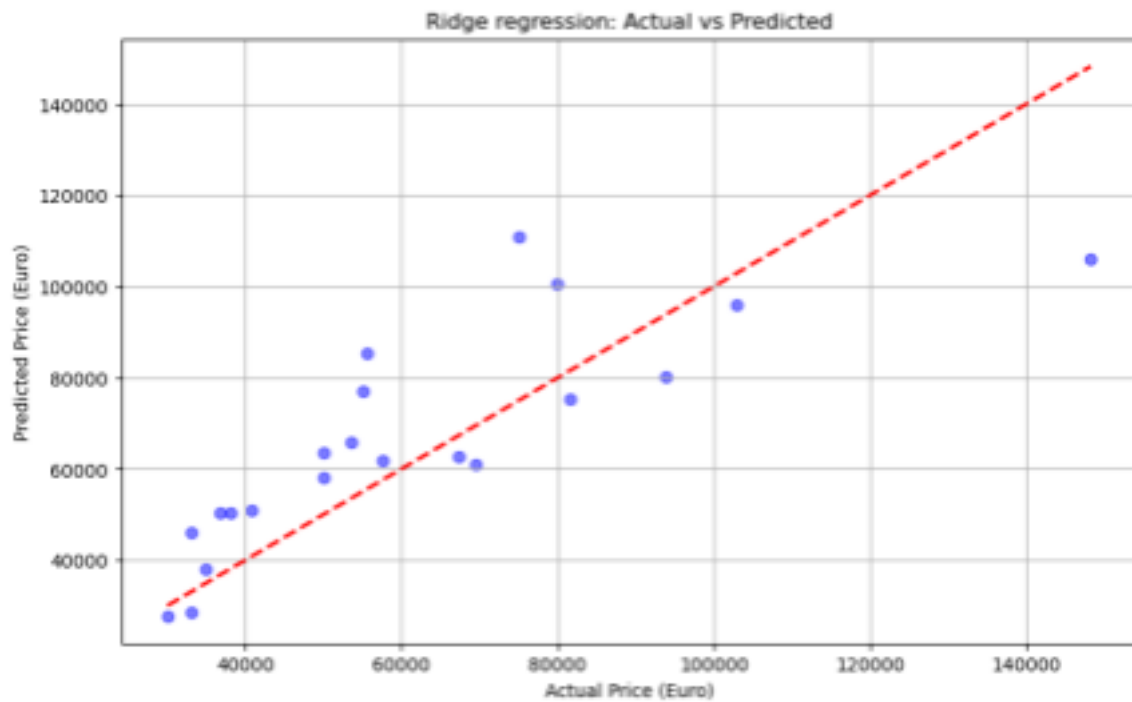
Ridge Regression

Mean Absolute Error (MAE): 13720.462086148598

Mean Squared Error (MSE): 301007241.7875823

Root Mean Squared Error (RMSE): 17349.560276490647

R-squared (R2) score: 0.620437638734664



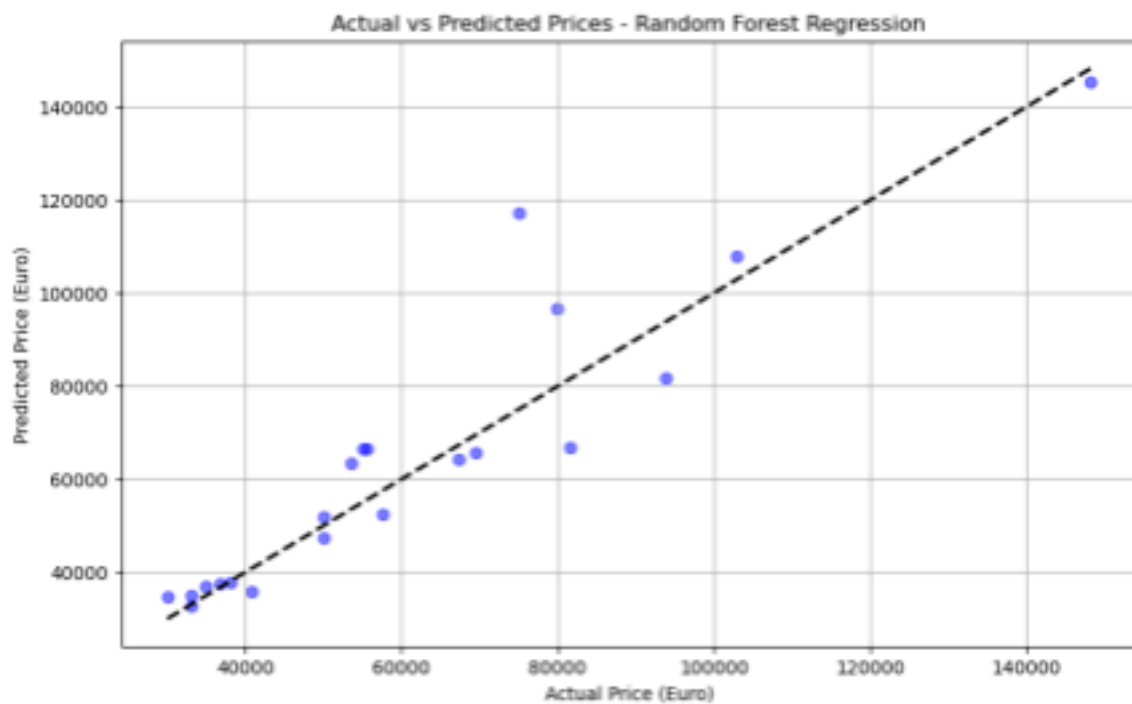
Random Forest Regression

Mean Squared Error (MSE) - Random Forest: 139941645.8167635 Mean

Absolute Error (MAE) - Random Forest: 7502.923015873016 Root Mean

Squared Error (RMSE) - Random Forest: 11829.693394875603 R-squared

(R2) score - Random Forest: 0.823537197277626



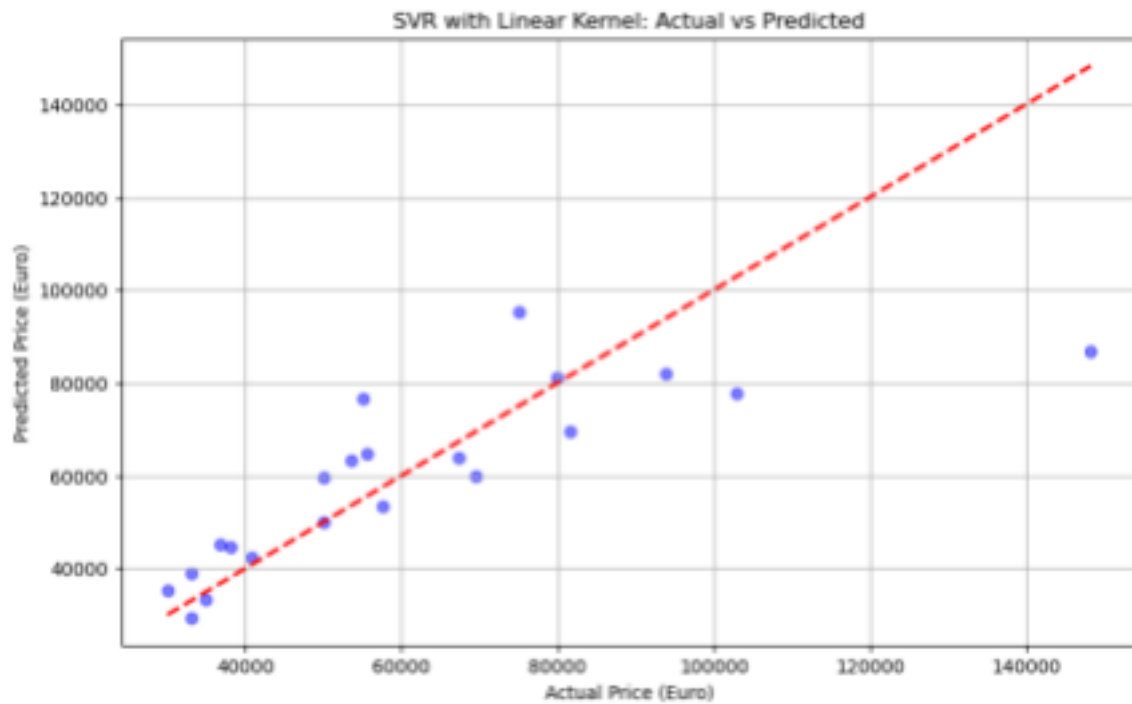
Support Vector Regression

Mean Squared Error (MSE) : 294466906.0823231

Mean Absolute Error (MAE) : 11082.809669320894

Root Mean Squared Error (RMSE) : 17160.038055969548

R-squared (R2) score : 0.6286848332174733



Analysis:

Model Performance Rankings

Random Forest Regression - 0.823537197277626

Support Vector Regression - 0.6286848332174733

Multiple Linear Regression - 0.6274534597924859

Ridge Regression - 0.620437638734664

Conclusion:

From observing the scatter plots and the R squared values, **Random Forest Regression** is the best fit for the data.