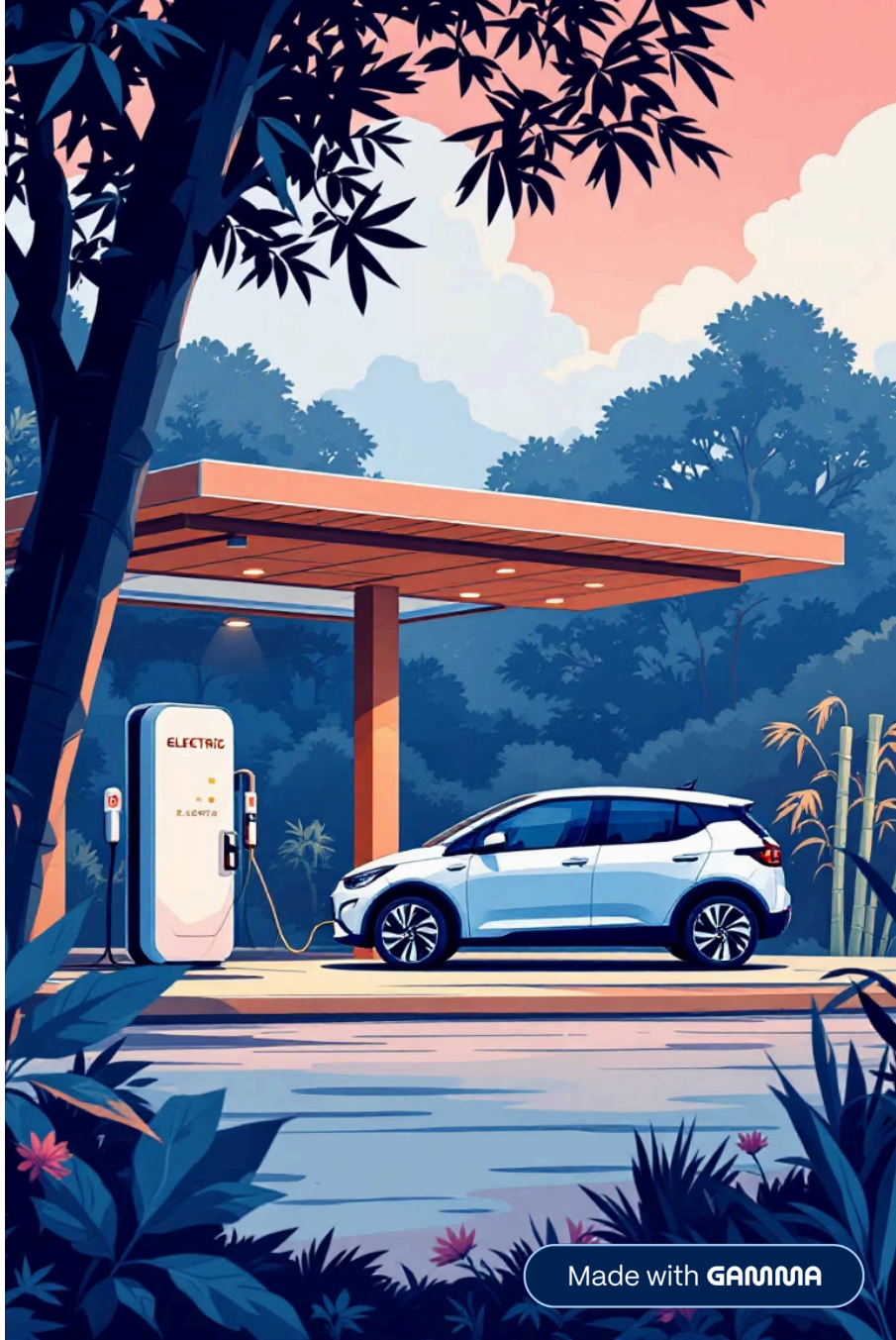
Electric Vehicle (EV) Sales Analysis & Prediction in India

Data-driven insights & predictive modelling for India's EV revolution (2014–2024)



Project Overview

Objective

Analyse EV sales trends across India and develop machine learning models to predict future sales patterns for strategic planning.

Dataset

Comprehensive analysis of ~96K rows covering 11 key variables including temporal, geographical, and vehicle classification data.

Methodology

Advanced data preprocessing, feature engineering, and Random Forest Regression for accurate sales forecasting and trend analysis.

Data Engineering & Model Preparation

01

Data Cleaning

Systematically handled missing values and outliers to ensure data quality and model reliability across all 96K records.

02

Feature Engineering

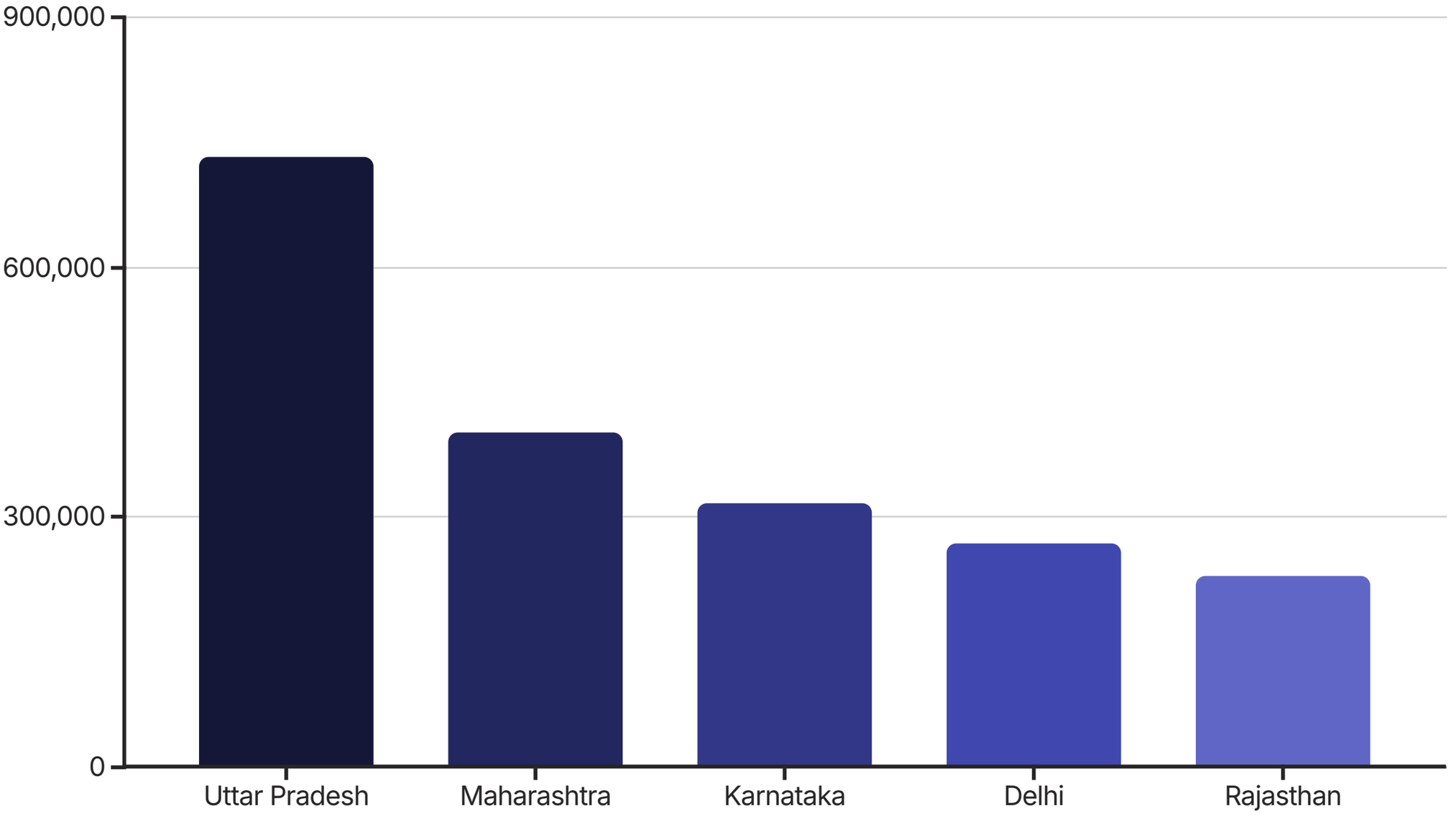
Extracted temporal features (year, month, seasonality) and created categorical encodings for geographic and vehicle classifications.

03

Model Training

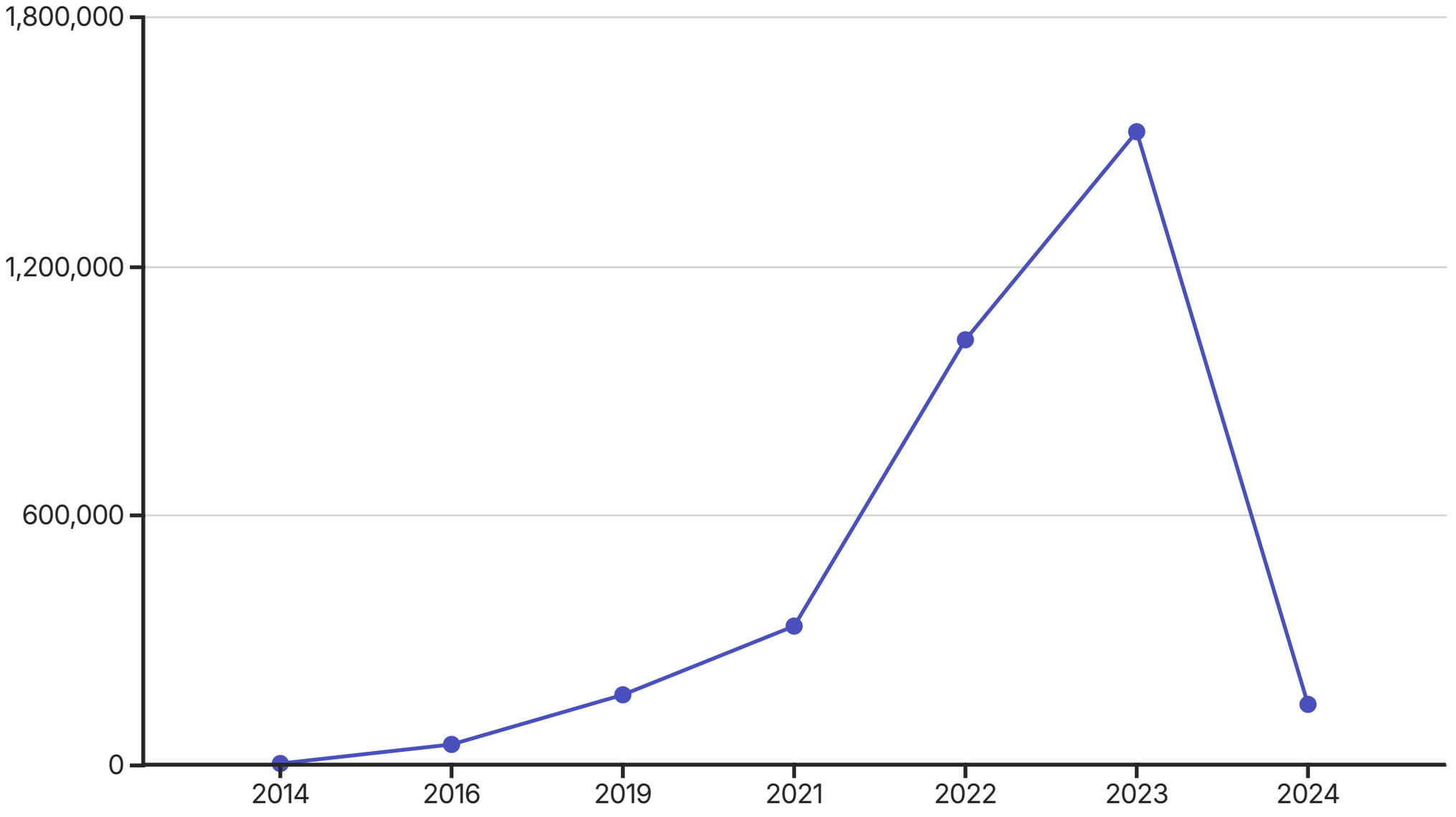
Implemented train-test split methodology with Random Forest Regression for robust predictive modelling and validation.

Leading States Driving EV Adoption



Uttar Pradesh leads with over 730K EV sales, followed by Maharashtra and Karnataka. These five states represent the primary growth engines for India's electric mobility transformation.

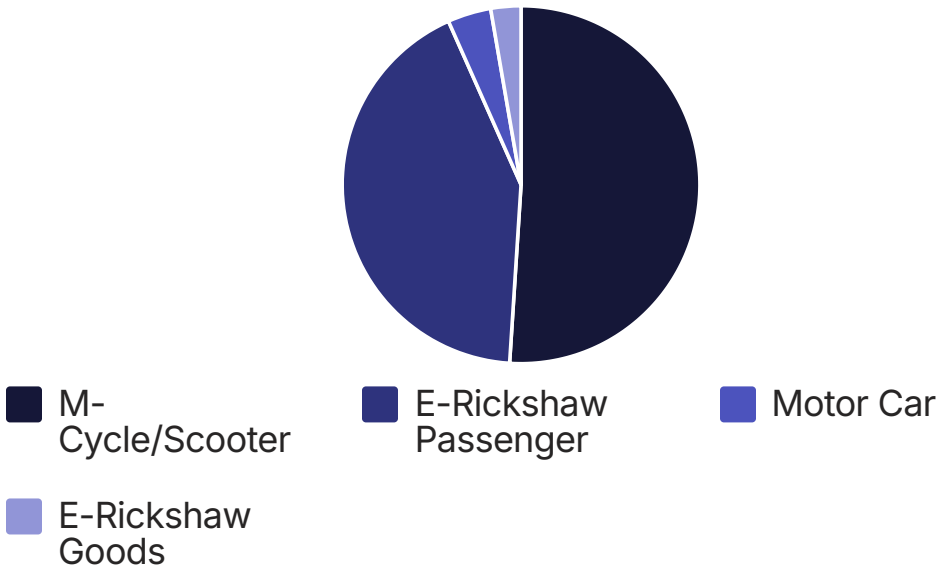
Explosive Growth Trajectory



Peak year 2023 witnessed unprecedented growth with 1.5M+ sales. The exponential rise post-2020 reflects successful policy interventions and increased environmental awareness.

Vehicle Segment Distribution

By Vehicle Class



By Category

1.8M

2-Wheelers

Dominant segment driving mass adoption

1.6M

3-Wheelers

Commercial applications leading growth

150K

4-Wheelers

Emerging premium segment

Machine Learning Model Performance

Model Architecture

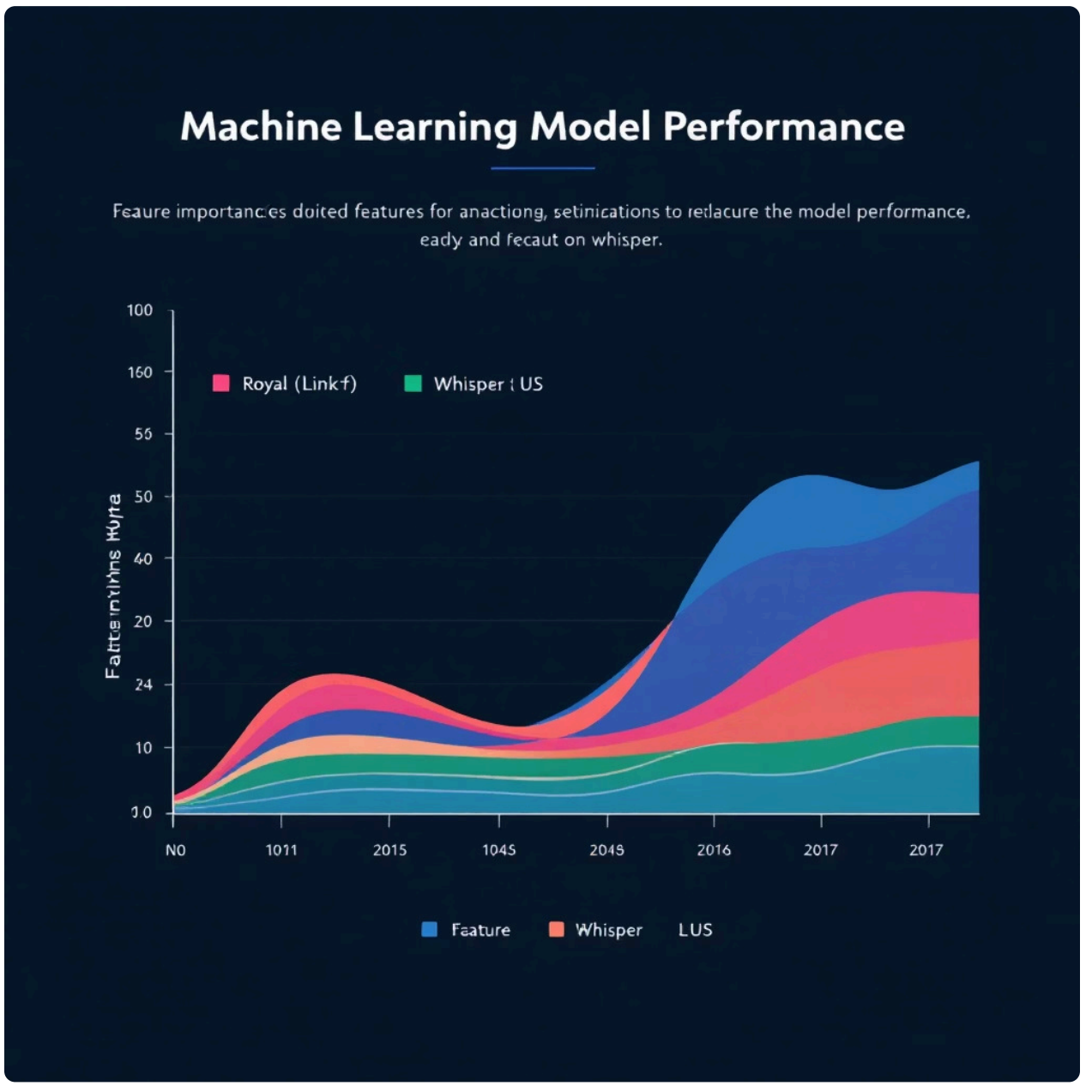
Random Forest Regressor with optimised hyperparameters for robust sales prediction and trend forecasting.

Performance Metrics

Achieved strong predictive accuracy with low RMSE, demonstrating reliable forecasting capabilities for strategic planning.

Feature Importance Rankings

- **Year:** Primary driver of sales trends
- **State:** Geographic market influence
- **Vehicle Class:** Category-specific demand patterns
- **Month:** Seasonal purchasing behaviour
- **Vehicle Type:** Consumer preference indicators



Strategic Insights & Recommendations

Market Focus

Prioritise infrastructure development and marketing initiatives in Uttar Pradesh, Maharashtra, and Karnataka for maximum impact.

Segment Strategy

Continue supporting 2-wheeler and 3-wheeler adoption whilst developing targeted policies to accelerate 4-wheeler penetration.

Predictive Planning

Leverage machine learning models for demand forecasting, supply chain optimisation, and strategic resource allocation.

Future of Electric Mobility in India

> India's EV sector is experiencing **exponential growth** with tremendous potential for continued expansion through data-driven decision making.

Market Transformation

From 2.4K sales in 2014 to 1.5M+ in 2023, demonstrating unprecedented market evolution and consumer acceptance.

Strategic Applications

Predictive analytics enables policymakers and manufacturers to optimise strategies, infrastructure deployment, and market positioning.

Future Enhancement

Integration of charging infrastructure data, fuel price dynamics, and subsidy impact analysis will further improve model accuracy.