Avinash Bunga

Information Systems and Business Analytics, Park University

CIS607HOF1P2024 Applied Business Forecasting

Professor: Dr. Abdelmonaem Jornaz

September 18, 2024

Unit 6: Discussion

Predicting Electric Vehicle Charging Patterns for Optimized Infrastructure Using Decision Trees

Introduction

When working with complex information, decision trees are an excellent categorization technique. Predicting electric vehicle (EV) charging trends is a practical business application. This can help optimize the placement of charging stations and improve energy distribution, ensuring that the infrastructure is prepared to accommodate the increasing demand for EVs.

Business Context: With the increasing use of electric vehicles, it is essential to efficiently plan and maintain the necessary infrastructure. Predicting where and when EVs will require charging helps governments and businesses optimize charging station locations, ensuring demand is met without overloading the energy grid (Fitzgerald, 2024).

Type of Data: To predict EV charging patterns, the following data can be used:

Column	Type	Description
Vehicle Type	Categorical	Type of EV (e.g., sedan, SUV, truck)
Charging Frequency	Numerical	Frequency of vehicle charging
Average Trip	Numerical	Average distance driven per trip

Distance		
Time of Day	Categorical	Typical time of day the vehicle is charged (morning, etc.)
Location	Categorical	Charging location (home, work, public)
Battery Capacity	Numerical	Vehicle's battery capacity in kWh
Charging Duration	Numerical	Average time spent charging
Charging Pattern	Binary	Charging demand (High/Low)

Type of Tree: A **classification tree** would be used for this example. The goal is to classify EV charging patterns (e.g., high demand vs. low demand) based on factors like vehicle type, location, and time of day (Genov et al., 2024; Hogarty, 2022).

Why Use a Decision Tree?

Decision trees are highly effective in this scenario because they help identify the key factors driving EV charging demand. They provide a clear, interpretable model that can show infrastructure planners which variables, such as time of day or battery capacity, are most important for predicting charging patterns. This makes it easier to allocate resources and develop a charging station network that meets user's needs efficiently (Genov et al., 2024).

Conclusion

Using decision trees to predict electric vehicle charging patterns can greatly benefit infrastructure planning by identifying the most important factors affecting charging demand. With insights gained from this model, businesses and governments can better allocate resources and optimize the placement of EV charging stations, ensuring that the growing demand for electric vehicles is met efficiently.

References

Fitzgerald, G. (2024, February 8). *EV Charging Infrastructure: Trends, Requirements & Costs*. Smart Electric Power Alliance. https://sepapower.org/knowledge/ev-charging-infrastructure/

Genov, E., Cauwer, C. D., Kriekinge, G. V., Coosemans, T., & Messagie, M. (2024, January 1). *Forecasting flexibility of charging of electric vehicles: Tree and cluster-based methods*. ScienceDirect. https://www.sciencedirect.com/science/article/pii/S0306261923013338

Hogarty, S. (2022, November 9). *Decision trees: Definition, analysis, and examples*. Wework. https://www.wework.com/ideas/professional-development/business-solutions/decision-trees-definition-analysis-and-examples