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Project Title: Exploring Electric Vehicle Adoption Trends in Washington State

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Abstract

Background:

Electric vehicles (EVs) are becoming popular due to concerns about the environment and sustainable transportation. In Washington State, it's important to understand why people are choosing EVs and what factors are driving this choice. This project aims to look at data about EV ownership to figure out why people in Washington are choosing electric cars and what might happen in the future.

Problem Statement/ Research Question:

We're trying to answer three main questions:

1. What makes people in Washington State decide to buy electric cars like Battery Electric Vehicles (BEVs) and Plug-in Hybrid Electric Vehicles (PHEVs)?
2. Can we use machine learning to predict how many more people will start using electric cars in the future, based on things like where they live and how much money they make?
3. How do geographic location and local infrastructure (electric utilities) impact EV adoption in Washington??

Data:

Dataset Link: https://catalog.data.gov/dataset/electric-vehicle-population-data

License Information: https://opendatacommons.org/licenses/odbl/1-0/

The dataset utilized in this study comprises registered Battery Electric Vehicles (BEVs) and Plug-in Hybrid Electric Vehicles (PHEVs) through the Washington State Department of Licensing (DOL). It includes detailed information on vehicle types, ownership demographics, geographic distribution and additional attributes such as vehicle make, model, year, and electric range.

Column Breakdown:

- **VIN (1-10):** The first ten characters of the Vehicle Identification Number, which uniquely identifies each vehicle.
- **County:** This is the geographic region of a state that a vehicle's owner is listed to reside within. Vehicles registered in Washington state may be located in other states.
- **City:** The city in which the registered owner resides.
- **State:** This is the geographic region of the country associated with the record. These addresses may be located in other states.
- **Postal Code:** The 5-digit zip code in which the registered owner resides.
- **Model Year:** The model year of the vehicle, determined by decoding the Vehicle Identification Number (VIN).
- **Make:** The manufacturer of the vehicle, determined by decoding the Vehicle Identification Number (VIN).
- **Model:** The model of the vehicle, determined by decoding the Vehicle Identification Number (VIN).

- **Electric Vehicle Type:** Indicates whether the vehicle is a Battery Electric Vehicle (BEV) or a Plug-in Hybrid Electric Vehicle (PHEV), distinguishing between different types of electric vehicles.
- **Clean Alternative Fuel Vehicle (CAFV) Eligibility:** This categorizes vehicle as Clean Alternative Fuel Vehicles (CAFVs) based on the fuel requirement and electric-only range requirement in House Bill 2042 as passed in the 2019 legislative session.
- **Electric Range:** Describes how far a vehicle can travel purely on its electric charge.
- **Base MSRP:** This is the lowest Manufacturer's Suggested Retail Price (MSRP) for any trim level of the model in question.
- **Legislative District:** The specific section of Washington State that the vehicle's owner resides in, as represented in the state legislature.
- **DOL Vehicle ID:** An identification number assigned by the Washington State Department of Licensing, serving as a unique identifier within the licensing system.
- **Vehicle Location:** The center of the ZIP Code for the registered vehicle.
- **Electric Utility:** This is the electric power retail service territories serving the address of the registered vehicle. All ownership types for areas in Washington are included: federal, investor owned, municipal, political subdivision, and cooperative. If the address for the registered vehicle falls into an area with overlapping electric power retail service territories, then a single pipe | delimits utilities of same TYPE and a double pipe || delimits utilities of different types.

- **2020 Census Tract:** The census tract identifier is a combination of the state, county, and census tract codes as assigned by the United States Census Bureau in the 2020 census, also known as Geographic Identifier (GEOID).

Techniques and Tools:

To address our research questions, we will employ Python programming language. Classification and regression algorithms will be utilized to analyze the data and identify patterns in EV adoption. Additionally, predictive analytics techniques, including time-series analysis and pattern mining, will be applied to forecast future trends in EV adoption rates. Python's versatility and robust ecosystem of data analysis tools will facilitate data preprocessing, model development, and visualization of results.

Conclusion:

By using machine learning algorithms and predictive analytics on EV population data from Washington State, this project aims to provide valuable insights into the factors driving the adoption of Battery Electric Vehicles (BEVs) and Plug-in Hybrid Electric Vehicles (PHEVs). The findings from this research could help policymakers and businesses in developing strategies to promote sustainable transportation solutions and accelerate the transition to electric mobility.