Project Topic:

Electric Vehicle Market Dynamics in Washington State: A Comparative Study of Battery Electric Vehicles (BEV) and Plug-in Hybrid Electric Vehicles (PHEV) by Range, Price, and Region.

Data Cleaning & Preprocessing

- Filled missing categorical values using mode, and numerical values using median.
- Dropped rows with missing critical data (e.g., `Legislative District`, vehicle location).
- Converted data types to improve consistency and memory usage.
- Added derived features:

  - `Vehicle_Age` = 2025 − Model Year

  - `Price_per_Mile` = Base MSRP ÷ Electric Range

  - `Region` based on U.S. Census categories

  - `Is_Electric`, `High_Range_EVs` (Range > 200 miles)

Univariate Analysis

- Electric Range: Right-skewed distribution; BEVs dominate in higher range (>200 miles).
- Base MSRP: Wide spread; BEVs generally priced higher.
- Price_per_Mile: BEVs offer better value per mile.
- Vehicle Age: Most vehicles are recent (post-2018).

Bivariate & Multivariate Analysis

- Key Correlations

Metric	Correlated With	Insight
Base MSRP	Electric Range	Moderately positive correlation (~0.42)
Vehicle Age	Price per Mile	Older vehicles tend to have lower price/mile

- BEV vs. PHEV Comparison
  - Range: BEVs significantly outperform PHEVs in electric range.
  - Price: BEVs cost more upfront but provide better price efficiency per mile.

- Adoption: BEVs are more prevalent in urban counties and newer model years

Regional Analysis

- Western region (primarily Washington) leads in EV adoption.
- Regional variation in CAFV eligibility and price trends.
- Urban counties show higher BEV penetration—likely due to better charging infrastructure and policy support.