The EV Adoption Playbook: Insights for a Sustainable Future

SI 699 Big Data Analytics

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Background & Problem Statement

EVs play a key role in sustainable transportation, but adoption varies across U.S. states. While national strategies focus on infrastructure, they often overlook state-specific factors like income, gas prices, and traffic safety. We address this gap by analyzing multi-year, state-level data to understand what drives EV adoption.

Data

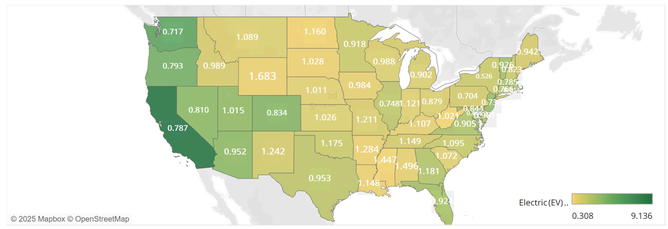
Multi-year, state-level data (2018–2023) from sources including the U.S. Census, the Federal Highway Administration (FHWA), the Energy Information Administration (EIA), and the American Farm Bureau Federation (AFBF). The dataset covers EV registrations, fuel usage, gas prices, traffic volume, income, and population.

Scan to enter the interactive webpage

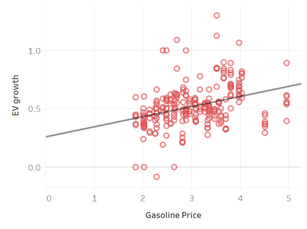
Methodology

- Data Collection & Preprocessing
- Exploratory Analysis & Visualization (Tableau & GeoPandas)
- Interactive Visualization & Webpage building (Streamlit)
- Machine Learning
- Policy Text Mining

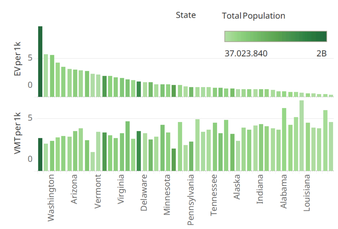
State Map of EV Sales and VMT per 1k Population



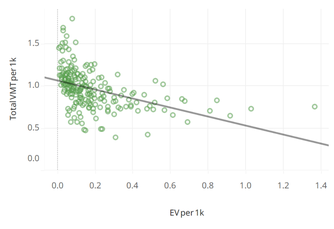
EV Sales Growth and Gas Price



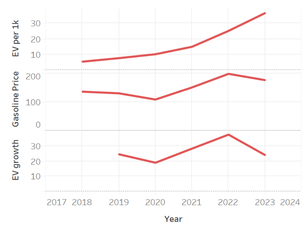
EV Sales and VMT by State



EV Sales and VMT

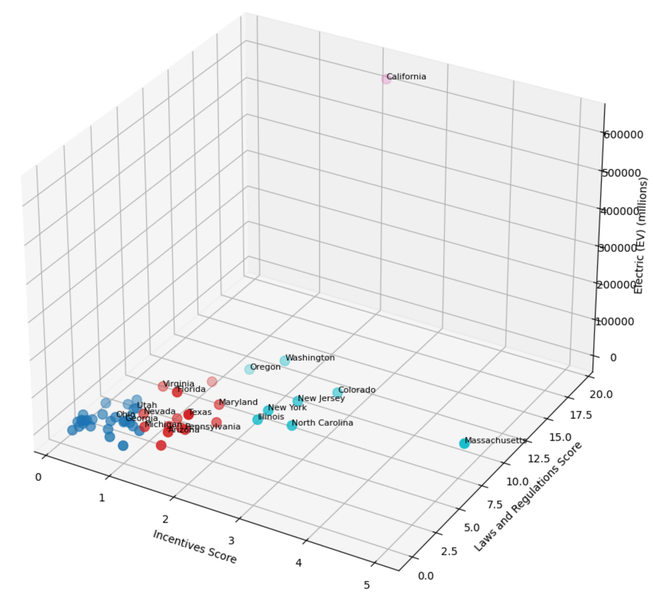


EV Sales and Gas Price by Year

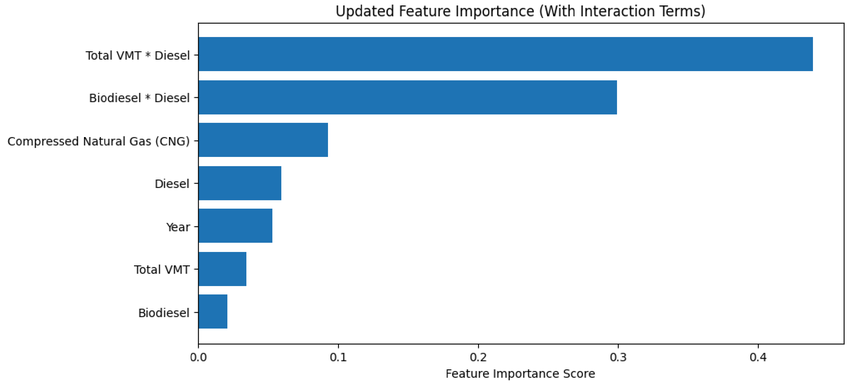


EV adoption is highest on the West Coast and parts of the Southeast, led by California and Colorado. It's moderately linked to higher gas prices and lower VMT, suggesting ties to urban density or EV limits for long-distance travel.

Top 20 EV States in 3D Clustering of Policy Impact

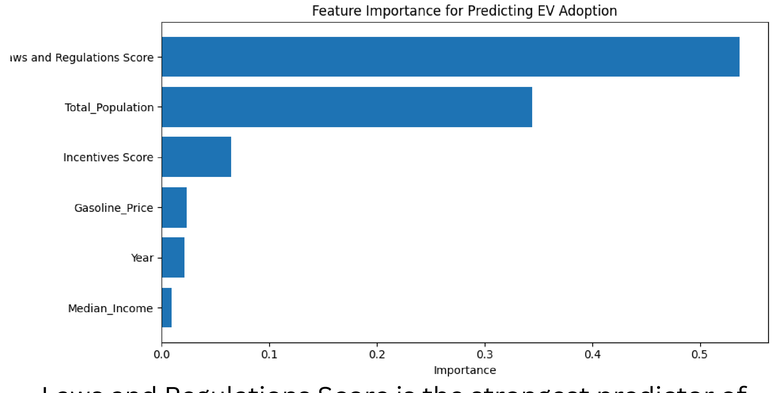


Updated Feature Importance (With Interaction Terms)



The plot highlights key predictors of EV adoption, with fuel-related interactions like VMT × Diesel and Biodiesel × Diesel showing strong influence. Other factors include natural gas use, diesel consumption, and yearly trends.

Feature Importance for Predicting EV Adoption



Laws and Regulations Score is the strongest predictor of EV adoption among policies. States like California with high policy scores show the highest EV numbers. The cluster summary confirms that stronger policies align with greater EV adoption.

Conclusion

The EV Adoption Playbook offers a concise summary for policymakers and EV-related companies to track adoption trends over time and identify key factors influencing EV sales. It also highlights state-level policies, with a focus on how incentives and laws & regulations impact EV adoption rates. For companies, these insights can inform market strategies, investment decisions, and product planning by revealing where EV demand is growing and what factors drive it. Drawing from diverse data sources, the playbook provides a well-rounded view to support informed decision-making across sectors.