Electrifying the Road: Understanding Adoption Patterns and Policy Impacts on EV Growth

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Abstract - Electric Vehicles (EVs) are increasingly becoming central to the global push for clean energy and sustainable mobility. While governments are providing incentives and setting mandates to accelerate the transition, EV adoption rates still vary significantly across different regions due to economic, infrastructural, and policy-driven factors. This research seeks to identify the underlying drivers of EV adoption in the United States using big data analytics. By integrating datasets related to EV registrations, charging infrastructure, socioeconomic indicators, and state-level policies, this study aims to uncover patterns and correlations that explain the uneven landscape of EV uptake. Preliminary findings suggest that charging station density and median household income are among the most influential variables. Urban areas with strong infrastructure investments and supportive policies lead in adoption, whereas rural regions lag. The paper outlines the data ingestion, preprocessing, and exploratory analysis steps completed thus far, and presents a roadmap for developing predictive models that can simulate policy scenarios and forecast future adoption trends.

Keywords—electric vehicles, EV adoption, charging infrastructure, policy analysis, socioeconomic factors, big data analytics, machine learning, transportation sustainability, predictive modeling, regional disparity.

1. INTRODUCTION

The transportation industry is undergoing substantial development, with electric vehicles (EVs) emerging as a key component of worldwide efforts to tackle climate change. In the United States, transportation accounts for around 29% of total greenhouse gas emissions, the highest share of any industry. As worries about fossil fuel dependency and air pollution mount, EVs provide a sustainable option by producing zero tailpipe emissions and allowing for integration with renewable energy sources.

Despite increased awareness, technological advancements, and federal and state incentives, the rate of EV adoption varies greatly among locations. California, Oregon,