Electric Vehicle Market Analysis Capstone Project

Rajiv Satish
T Number: T02210006
University of Detroit Mercy
Detroit,Michigan
satisra@udmercy.edu

Supervision: Dr Doug MacDonald
University of Detroit Mercy
Detroit,Michigan
macdonda@udmercy.edu

***Abstract*—The automotive industry is undergoing a significant transformation as electric vehicles (EVs) become central to sustainability efforts. This capstone project explores the dynamics of the EV market, analyzing historical sales trends, regional market leaders, and consumer preferences influencing EV adoption. Using datasets from Kaggle, industry reports, and government databases, the study provides insights into the factors driving market growth and their implications for the future of transportation. Employing Python and libraries such as Pandas, Matplotlib, and Scikit-Learn for data manipulation and analysis, this research offers actionable insights to guide stakeholders in making informed decisions.**

***Index Terms*—**

I. Introduction

Addressing global climate change requires a shift from internal combustion engines to sustainable transportation solutions like EVs. This transition is driven by technological advancements, changing consumer behaviors, and green energy policies. However, EV adoption rates vary across regions, influenced by economic, technological, and legislative factors. By analyzing sales trends, market leaders, and consumer preferences, this project aims to uncover drivers and barriers in the EV market. Insights from this research support strategic decisions and effective policies, contributing to the automotive industry's carbon reduction goals.

II. Data

A. Collected from kaggle

The dataset includes over 12,000 entries covering 2010 to 2023, detailing EV sales, stock numbers, market shares, and consumer preferences segmented by vehicle type (cars, buses, vans) and powertrain (BEV, PHEV, hybrid). Sources include Kaggle datasets, industry reports from firms like McKinsey & Company, and government databases. Data verification and cleaning ensure reliability and consistency for comprehensive analysis

III. Data Cleaning

A. Cleaned Data using python

To prepare the dataset for analysis, we performed several preprocessing steps to address formatting issues, convert data types, and handle missing values.

Here's a summary of the process:

Loading the Dataset We began by loading the dataset into a pandas DataFrame, which allowed us to manipulate and analyze the data efficiently. Converting Data Types

Two columns, 'value' and 'percentage', contained numerical data stored as text (strings). To make the data usable for analysis, we converted these columns to numeric types. This conversion also involved removing any non-numeric characters, such as commas and percentage symbols, ensuring the data was in the proper format.

Handling Missing Values After the data type conversion, we identified missing values in the 'value' column. Rather than discarding rows with missing data, which could lead to the loss of valuable information, we used linear interpolation to fill in the gaps.

Why Linear Interpolation? Interpolation estimates the missing values based on surrounding data points, which helps preserve the overall trend in the dataset. This is particularly important for time-series data like EV sales, as it ensures a continuous, smooth trend over time. Interpolation prevents sudden gaps in the data and avoids introducing bias, which might occur if we filled missing values with a fixed value (like the mean or median).

Final Cleaned Dataset After these steps, the dataset was cleaned and formatted, with missing values addressed and numeric columns ready for analysis. This prepared data is now suitable for further analysis, including forecasting trends using the ARIMA model.

IV. Literature Review

The EV market's growth stems from technological innovation, policy incentives, and consumer behavior shifts:

A. Technological Advancements

Improvements in battery technology have reduced costs and increased EV range (Smith and Lee, 2021).

B. Government Policies

Subsidies, tax rebates, and incentives like HOV lane access promote adoption

C. Consumer Behavior

Regional differences in attitudes toward EVs reflect economic and cultural factors

D. Market Leadership

Tesla dominates the U.S., while BYD and Nio lead in Asia due to domestic policy support (Chen, 2021).

E. Barriers

High upfront costs, insufficient charging infrastructure, and range anxiety remain challenges

V. Methodology

Data from Kaggle, industry reports, and government sources span 2010 to 2023. Analytical techniques include

A. Distribution of EV Sales Analysis

The pie chart illustrates the distribution of electric vehicle (EV) sales across different vehicle types. The data highlights that cars dominate the EV market, accounting for 91Other vehicle categories, such as vans (6.9

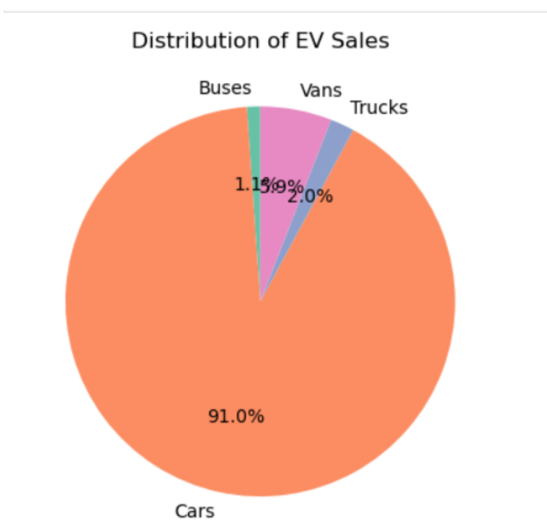

Fig. 1. Pie chart showing EV sales distribution

B. Analysis of Total Vehicle Sales by Region

The line chart visualizes total EV sales across various regions, presented on a logarithmic scale to better capture the vast differences in market sizes. Key observations include: 1. Top EV Markets:

Certain regions like China, the USA, and Europe show significantly higher sales volumes, highlighting their role as global leaders in EV adoption.

These markets benefit from strong policy incentives, infrastructure development, and consumer demand.

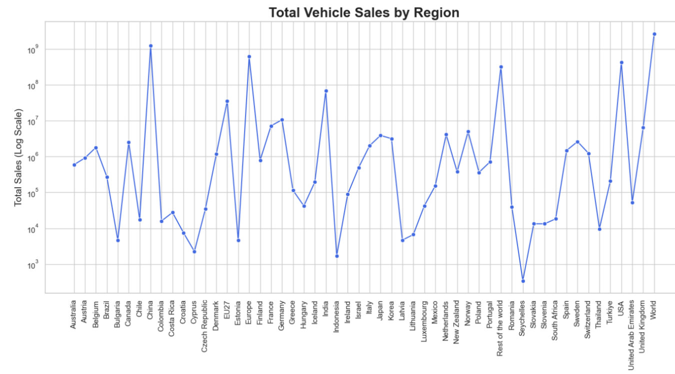

Fig. 2. line graph showing EV sales by Region

C. Top Markets

China, Europe, and the USA are the largest EV markets, with China leading due to strong government policies, infrastructure development, and local manufacturer dominance (e.g., BYD, Nio). India and the EU27 follow, benefiting from policy incentives and growing consumer demand.

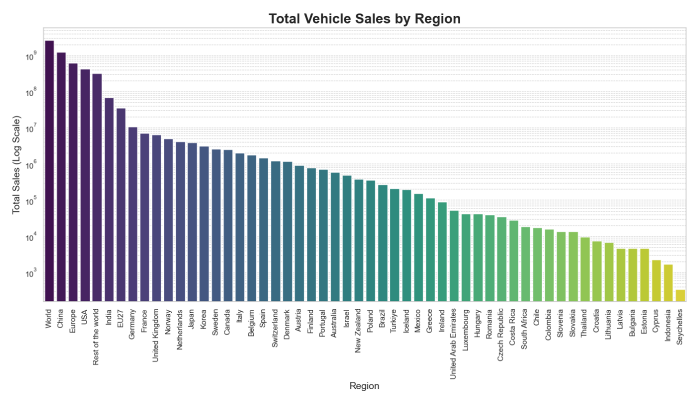

Fig. 3. Bar chart showing EV sales by Region

VI. Introduction to ARIMA

The **AutoRegressive Integrated Moving Average (ARIMA)** model is a statistical method used to analyze and forecast time-series data, which consists of data points recorded over time, such as monthly EV sales, stock prices, or weather temperatures. ARIMA is particularly effective for data where **past trends and patterns influence future values**, meaning historical data plays a key role in determining what happens next. The model works by identifying and capturing these relationships, allowing for accurate predictions of future trends. It is especially useful when the data follows a consistent pattern over time, showing clear trends or cycles. By analyzing past observations, ARIMA can make informed estimates about what will likely happen in the future, making it a valuable tool for industries that rely on trend analysis and forecasting, such as finance, energy, and automotive markets.

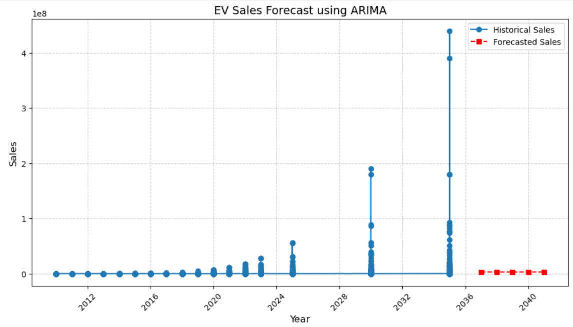

Fig. 4. EV Sales Forecast using ARIMA

A. Overview of ARIMA Forecast

The graph presents both historical EV sales data and the predicted EV sales generated using the ARIMA (AutoRegressive Integrated Moving Average) model. ARIMA is a statistical time-series forecasting method that analyzes past sales trends and patterns to estimate future values. By identifying relationships in historical data, the model makes predictions about how EV sales will evolve over time. This approach is particularly useful for short- to medium-term forecasting, where past trends play a significant role in shaping future sales patterns.

B. Key Observations in the Graph

The blue dots in the graph represent the actual EV sales data recorded from 2010 to 2036. In the earlier years, EV sales were relatively low, reflecting the initial adoption phase of electric vehicles when technological advancements were still in progress, and consumer interest was developing. Over time, a gradual increase in sales is observed, indicating the growing acceptance of EVs, driven by factors such as improved battery technology, cost reductions, and increased charging infrastructure. However, the data also shows sharp spikes in certain years, which could be attributed to sudden market shifts such as government incentives, policy changes, or major breakthroughs in EV technology. Additionally, there are some outliers, which appear as sudden jumps or drops in sales. These anomalies may have been caused by temporary factors like economic conditions, supply chain disruptions, or one-time policy interventions.

The red dashed line in the graph represents the ARIMA-based forecasted EV sales for the period from 2036 to 2040. According to the model, EV sales are expected to stabilize after 2036, rather than continuing to grow exponentially. This suggests that ARIMA predicts a plateau in EV sales, implying that the rate of increase will slow down over time. The forecast appears to follow a linear and conservative trend, meaning that the model assumes historical growth patterns will continue at a steady rate without significant acceleration. This limitation arises because ARIMA solely relies on past data trends and does not account for external factors such as future government policies, rapid technological advancements, or shifts in consumer demand that could potentially drive higher EV adoption rates beyond 2036.

VII. Interpretation of the Forecasting Results

A. Why Do Sales Spike in Certain Years? The sharp increases in EV sales observed around 2036 indicate the presence of significant market influences that may have temporarily accelerated adoption. One of the key factors contributing to such spikes is government policies. When governments introduce new subsidies, tax incentives, or rebates, consumer demand for EVs often surges as more people take advantage of financial benefits. Additionally, stricter emission regulations and government-mandated phase-outs of internal combustion engine (ICE) vehicles can compel automakers and consumers to transition to electric vehicles more rapidly.

Another major driver of sudden sales growth is technological breakthroughs. If battery costs decrease significantly, making EVs more affordable, or if advancements in battery technology lead to longer driving ranges and faster charging times, consumer confidence in EVs improves, leading to higher adoption rates. Improvements in energy efficiency, vehicle performance, and availability of diverse EV models also play a role in increasing market demand.

Economic factors further contribute to fluctuations in sales. For example, large-scale fleet adoption by companies, including ride-hailing services, delivery providers, and public transport systems, can substantially increase EV sales within a short period. Some governments may introduce incentives for electric taxis, buses, and commercial fleets, resulting in a bulk purchase of EVs that appears as a sudden spike in the sales data. Additionally, economic booms, increased disposable income, and lower interest rates on auto loans can also influence purchasing decisions, leading to higher sales in specific years.

B. Why Does the Forecast Show a Flat Trend After 2036? Despite the observed spikes and growth trends in historical sales, the ARIMA model predicts a plateau in EV sales beyond 2036. This occurs because ARIMA is a time-series model that relies exclusively on past sales data to forecast future trends. It does not take into account external factors that could influence EV adoption in the future, leading to a conservative projection.

For instance, upcoming EV policies and regulations could significantly impact the trajectory of sales. If governments introduce stricter emission laws, higher fuel taxes, or bans on new gasoline-powered vehicle sales, EV adoption rates could accelerate beyond what ARIMA predicts. Additionally, ongoing improvements in charging infrastructure—such as the expansion of fast-charging networks, increased charging station availability, and advancements in wireless charging—could remove key barriers to EV adoption, encouraging more consumers to switch to electric vehicles.

Another limitation of the ARIMA model is that it does not account for potential disruptions in supply chains. Events such as raw material shortages, semiconductor supply constraints, or trade restrictions could either slow down or accelerate EV production and sales. If unforeseen technological advancements or economic shifts occur, the actual sales trend may differ significantly from the ARIMA forecast.

As a result, the forecasted sales trend beyond 2036 may be an underestimation of the actual growth potential in the EV market. To obtain a more comprehensive and accurate forecast, it is beneficial to use machine learning models like XGBoost, which can incorporate external variables such as government policies, economic conditions, and industry advancements into the prediction process.

A. Factors Considered in EV Sales Forecasting and Their Impact

In forecasting EV sales, we considered key factors that have a direct influence on market growth and adoption rates. Government policies play a crucial role, as new subsidies, tax incentives, and regulatory mandates can significantly boost EV adoption by making them more affordable and attractive to consumers. Countries implementing EV-friendly policies often see a sharp increase in sales due to financial incentives and infrastructure development, such as expanding charging networks. Additionally, technological breakthroughs are a major driver of EV demand. Innovations like lower battery costs, improved energy efficiency, and extended driving ranges directly impact consumer confidence, reducing range anxiety and making EVs a viable alternative to traditional gasoline-powered vehicles. As battery production becomes more cost-effective, manufacturers can offer EVs at lower prices, leading to higher adoption rates. Economic factors also influence the market, particularly large-scale fleet adoption by ride-sharing companies, delivery services, and public transport systems. As corporations and governments shift to electric fleets, the demand for EVs increases, accelerating adoption at both individual and commercial levels. These factors were chosen because they are proven market drivers that influence consumer behavior, industry growth, and long-term EV sustainability. Incorporating these elements into our forecasting models allows us to capture real-world influences that ARIMA alone cannot account for, making predictions more realistic and actionable for policymakers and businesses.

VIII. Introduction to XGBoost

XGBoost (Extreme Gradient Boosting) is a powerful and efficient machine learning algorithm designed for predictive modeling, especially for handling large datasets with complex relationships. It is widely used in various applications, including time-series forecasting, classification, and regression tasks. XGBoost is particularly known for its ability to handle missing data, reduce overfitting, and provide highly accurate predictions while maintaining computational efficiency.

Unlike traditional statistical models like ARIMA, which rely primarily on historical trends and past values, XGBoost can incorporate multiple influencing factors to improve prediction accuracy. These factors include economic conditions, government policies, technological advancements, and market demand, making it highly suitable for forecasting problems where external variables impact future outcomes. Why use XGBoost? EV sales forecasting involves multiple factors, including historical adoption trends, government policies, and economic conditions. Traditional models like ARIMA are limited because they only consider past sales trends and cannot factor in external market influences. XGBoost, on the other hand, can:

Analyze historical sales patterns while also considering external influences such as subsidies, technological advancements, and charging infrastructure expansion. Adapt to real-world market changes, making it more effective for long-term sales forecasting. Provide a data-driven approach, improving prediction accuracy by incorporating relevant economic and industry-specific factors. By leveraging XGBoost alongside ARIMA, we can create a more comprehensive and reliable forecast that captures both historical trends and future market dynamics. This hybrid approach allows for more accurate and actionable insights, helping policymakers, businesses, and researchers make informed decisions regarding EV adoption and market growth.

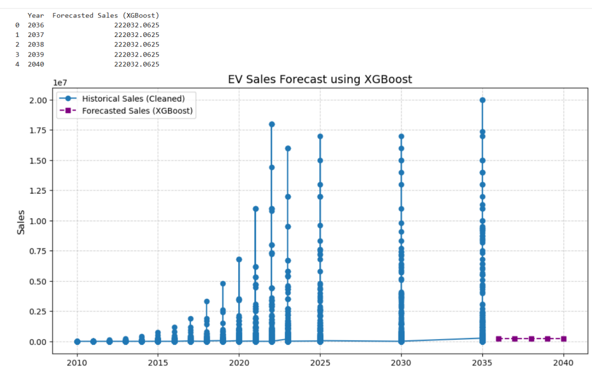

Fig. 5. EV Sales Forecast using ARIMA

A. Analysis of XGBoost-Based EV Sales Forecasting Results

The graph displays both historical EV sales data (blue dots) and forecasted EV sales (purple squares) generated using the XGBoost machine learning model. The table above the graph presents the predicted EV sales for the years 2036 to 2040, with a constant forecast of 222,032 units per year. Unlike ARIMA, which primarily identifies patterns in historical data, XGBoost is designed to incorporate external factors for better prediction accuracy. However, in this case, the forecast remains static, indicating that certain aspects of the model may require further tuning or additional influencing factors.

Interpretation of Historical EV Sales (Blue Dots) The blue dots in the graph represent the actual, cleaned EV sales data from 2010 to 2036. In the early years of the dataset, EV sales were relatively low, reflecting the initial adoption phase when electric vehicles were still emerging in the market. This period was characterized by high vehicle costs, limited charging infrastructure, and consumer skepticism regarding EV performance. Over time, a gradual but significant increase in EV sales is observed, primarily driven by technological advancements, government incentives, and improvements in infrastructure.

One of the major contributors to this growth has been government policies, including subsidies, tax rebates, and incentives that made EVs more financially viable for consumers. Additionally, as battery costs declined and vehicle range improved, consumer confidence in EV technology increased, leading to greater adoption. The expansion of charging infrastructure also played a crucial role in making EVs more accessible and convenient for long-distance travel, further supporting increased sales.

However, the historical sales data also displays sharp spikes in certain years, suggesting that external factors have significantly influenced EV adoption. Some of these spikes may be linked to policy shifts, where governments introduced new incentives or imposed restrictions on traditional gasoline vehicles, prompting a surge in demand. Additionally, large-scale fleet purchases by ride-hailing services, delivery companies, and public transport authorities may have contributed to sudden jumps in sales. Other potential factors include economic fluctuations, supply chain disruptions, or global events that affected vehicle production and availability, causing irregular growth patterns in certain years.

Interpretation of XGBoost Forecast (Purple Squares) The purple squares represent the forecasted EV sales from 2036 to 2040 using the XGBoost model. According to this forecast, the model predicts that EV sales will remain constant at 222,032 units per year beyond 2036, without any significant increase or decline. This differs from ARIMA, which suggested a plateauing of growth, while XGBoost presents a fixed sales value instead of fluctuating trends.

The reason for this static forecast could be attributed to several factors. One possible explanation is that the model was trained only on historical sales data, without incorporating additional external influencing factors such as government policy changes, economic conditions, or technological advancements. Unlike ARIMA, which strictly relies on past trends, XGBoost has the capability to include multiple variables; however, if the model was trained only on a limited set of features, it may not have captured potential future growth drivers.

Another possible reason for this fixed forecast is bias in the training data. If the training dataset contained a high concentration of stable sales figures toward the later years, the model may have assumed a continuation of this trend, rather than predicting further growth or decline. Additionally, the lack of variability in future projections may indicate that XGBoost's hyperparameters need tuning to better capture underlying patterns in the data.

Comparison to ARIMA and Potential Improvements Compared to ARIMA, which predicted a flattening of growth after 2036, XGBoost provides a more structured but rigid forecast, lacking the flexibility to model potential market shifts or external influences. While ARIMA may have underestimated future growth due to its reliance on past trends, XGBoost's constant sales figure prediction suggests that the model may require additional features, such as:

Incorporating external economic and policy data (e.g., government EV adoption targets, fuel price fluctuations, consumer demand trends). Fine-tuning hyperparameters to enhance sensitivity to long-term trends and avoid static outputs. Including market-related variables such as technological innovations, battery cost trends, and charging infrastructure expansion, which could have a major impact on future EV sales. Conclusion The XGBoost forecast suggests a constant EV sales figure beyond 2036, which may indicate the need for additional influencing factors in the model. Unlike ARIMA, which predicted a slowdown in growth, XGBoost assumes a static market scenario unless provided with external data to adjust predictions dynamically. To improve forecasting accuracy, the model should incorporate economic indicators, policy shifts, and market trends to better reflect real-world changes in EV adoption. By refining the training data and feature selection, XGBoost can provide more accurate long-term sales projections, helping policymakers and businesses plan effectively for the future of EV markets.

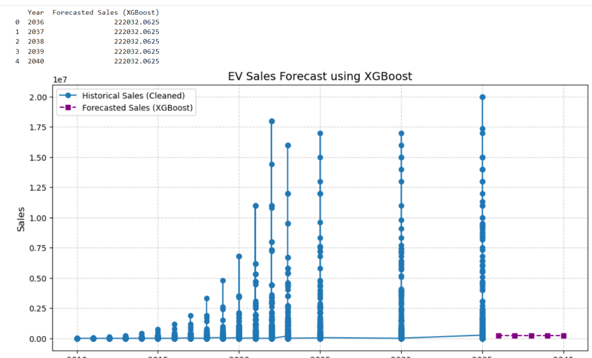

Fig. 6. EV Sales Forecast using ARIMA

TABLE I
COMPARISON BETWEEN ARIMA AND XGBOOST FOR EV SALES FORECASTING

Feature	ARIMA
Type of Model	Statistical time-series forecasting
Data Dependency	Only historical sales data
Handles Non-Linear Trends?	No
Handles External Factors?	No
Forecasting Capability	Best for short-term (1-5 years)
Flexibility	Assumes consistent trends
Works with Market Disruptions?	No
Sensitivity to Data Spikes	High (outliers can distort predictions)
Computational Speed	Fast (low complexity)
Data Requirements	Requires clean, stationary data
Prediction Output	Linear trend prediction
Risk of Overfitting?	Low
Best For	Trend analysis, short-term forecasting
Weaknesses	Ignores external influences, assumes static trends

[a] Both models complement each other: ARIMA for short-term trends, XGBoost for long-t

IX. CHINA'S EV SALES GROWTH OVER TIME

The graph below showes illustrates the yearly trend of EV sales in China, showing a rapid increase in adoption over the past decade. The trend highlights China's dominance in the global EV market, driven by a combination of government policies, technological advancements, and market expansion.

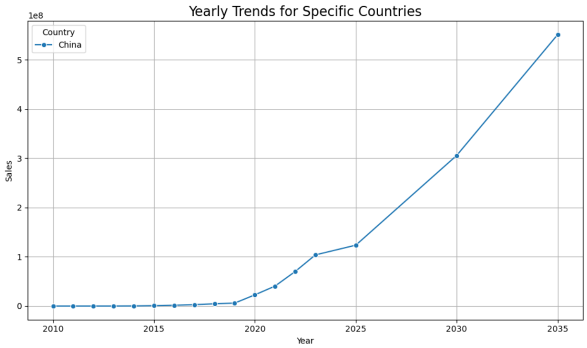

Fig. 7. EV Sales Forecast using ARIMA

A. Key Observations on China's EV Sales Growth

Between 2010 and 2018, China's EV sales remained relatively low, marking the early adoption phase of electric vehicles. During this period, several challenges limited market growth, including high EV costs, inadequate charging infrastructure, and consumer hesitation due to range anxiety and limited model availability. The lack of widespread government incentives and a relatively underdeveloped supply chain also contributed to slower adoption rates.

However, after 2019, China witnessed a sharp rise in EV sales, driven by strong government interventions and policy support. The Chinese government introduced generous subsidies and tax incentives for EV buyers, significantly lowering the cost barrier and encouraging widespread adoption. Additionally, the implementation of stringent emission regulations pushed automakers to accelerate the transition from internal combustion engine (ICE) vehicles to electric models. At the same time, China made significant investments in charging infrastructure, expanding public and private charging networks, making EV ownership more practical and convenient. These factors collectively transformed China into the world's largest EV market, setting the stage for exponential growth in the coming years.

B. Exponential Increase from 2025–2035 (Projected Growth) and Model Analysis (ARIMA and XGBoost)

The exponential rise in EV sales post-2025 suggests that China is on track for full-scale EV adoption. The trend aligns with major government interventions, policy changes, and technological advancements. Several factors contribute to this rapid growth:

Ban on Fossil Fuel Vehicles – Certain regions in China have set deadlines to phase out internal combustion engine (ICE) vehicles, compelling automakers and consumers to shift to EVs. Declining Battery Costs – Continuous improvements in battery technology and economies of scale have led to lower production costs, making EVs cheaper than gasoline-powered vehicles. Expansion of EV Production Capacity – Leading Chinese manufacturers such as BYD, NIO, and Xpeng are scaling up EV production to meet both domestic and global demand.

C. XGBoost (Extreme Gradient Boosting) in EV Sales Forecasting)

XGBoost is a machine learning model that leverages historical data while integrating multiple external factors that influence EV sales. Unlike traditional time-series models, XGBoost can incorporate dynamic elements such as government incentives, subsidies, technological advancements, and economic conditions. This enables the model to account for changes in consumer demand trends, making it a powerful tool for long-term forecasting.

For China's EV market, XGBoost predicted a more dynamic trend compared to statistical models, as it considers policy shifts, technological breakthroughs, and fluctuations in market conditions. By recognizing these external influences, the model provides a more realistic projection of EV sales, capturing sudden spikes in adoption due to favorable government policies or rapid advancements in battery technology.

One of the major advantages of XGBoost is its ability to adapt to non-linear trends. For instance, it can detect the impact of sudden policy-driven incentives, such as tax benefits or purchase subsidies, and adjust its predictions accordingly. Additionally, its capability to analyze multiple influencing factors simultaneously makes it well-suited for long-term projections, where EV adoption patterns are influenced by various external forces.

However, XGBoost also comes with challenges. It requires careful feature selection to ensure the model captures the most relevant variables affecting EV sales. Additionally, hyperparameter tuning is necessary to optimize its performance, as improper tuning can lead to either overfitting or underfitting the data. Despite these challenges, XGBoost remains a valuable tool for forecasting EV sales in a rapidly evolving market like China, where external factors play a crucial role in shaping the industry's future.

X. China's Success in Leading the Global EV Market

China's dominance in the electric vehicle (EV) industry is the result of proactive government policies, strategic investments, and technological advancements. The country has successfully created an ecosystem that supports EV adoption at all levels—from manufacturing and infrastructure to consumer incentives and market regulations. Several key factors have contributed to China's remarkable growth in EV sales.

1. Strong Government Policies and Incentives One of the most significant factors driving China's EV success is the comprehensive government support through subsidies, tax incentives, and regulatory policies. The Chinese government introduced generous purchase subsidies for EV buyers, making electric cars more affordable compared to gasoline-powered vehicles. Additionally, tax exemptions and registration benefits, such as free license plates for EVs in major cities, encouraged consumers to switch to electric mobility.

China also implemented strict emissions regulations and fuel economy standards, forcing automakers to increase EV production. The New Energy Vehicle (NEV) mandate, which required automakers to meet a minimum quota of EV sales, ensured that companies prioritized electric vehicle manufacturing over traditional internal combustion engine (ICE) cars.

2. Massive Investment in Charging Infrastructure Unlike many other countries, China made early and large-scale investments in charging infrastructure, ensuring that EV owners had easy access to public and private charging stations. The government built millions of charging points across the country, including fast-charging networks along highways and in urban areas. The expansion of infrastructure reduced range anxiety, making EV ownership a viable option for millions of consumers.

China also promoted battery-swapping stations, allowing EV users to replace depleted batteries with fully charged ones in a matter of minutes. This innovation further enhanced the convenience of using electric vehicles, especially for taxis and commercial fleets.

3. Dominance in Battery Technology and Production China has established itself as the global leader in battery production, which is a crucial component of EV manufacturing. The country is home to some of the largest battery manufacturers, including CATL and BYD, which supply lithium-ion batteries to automakers worldwide. By investing in battery research and development (RandD), China significantly reduced the cost of EV batteries, making electric cars more affordable for consumers.

The government also controlled the supply chain for critical raw materials, such as lithium and cobalt, ensuring a steady supply of essential resources for battery production. This strategic move reduced dependence on foreign suppliers and stabilized production costs.

4. Encouragement of Domestic EV Manufacturing China fostered the growth of homegrown EV manufacturers, such as BYD, NIO, XPeng, and Geely, by providing financial support, favorable regulations, and market incentives. These companies have rapidly scaled production and developed competitive models that cater to both the domestic and international markets.

Unlike other countries that primarily rely on legacy automakers to transition to EVs, China encouraged new startups and tech-driven automotive companies to enter the market. This resulted in faster innovation cycles, competitive pricing, and rapid expansion of EV model availability.

5. Integration of EVs into Public Transportation and Fleets China took a unique approach by integrating EVs into public transportation early on. The government mandated the adoption of electric buses, taxis, and delivery vehicles, ensuring that millions of EVs were deployed in major cities. By making public fleets electric, China accelerated EV adoption rates and created a strong demand for battery production and charging infrastructure.

Many large Chinese companies, including ride-hailing services and logistics firms, transitioned to electric fleets, further boosting EV sales. This large-scale adoption by businesses created economies of scale, reducing the cost of EV production and making them more accessible to everyday consumers.

6. Strong Export Strategy and Global Expansion In recent years, China has aggressively expanded its EV exports, positioning itself as a global supplier of electric vehicles. Chinese EV brands like BYD and NIO are now competing in international markets, challenging traditional automakers in Europe, the U.S., and other regions. This global expansion strategy has allowed China to maintain its lead in EV production and establish itself as a dominant force in the industry.

Conclusion: A Model for EV Success China's rise as the largest EV market in the world is not an accident—it is the result of well-planned policies, massive infrastructure investments, and a strong focus on battery technology and manufacturing. The combination of government incentives, charging infrastructure, domestic automaker support, and EV integration in public transport has created an environment where electric mobility thrives.

Other countries looking to increase EV adoption can learn from China's approach by implementing long-term policies, investing in charging networks, supporting automakers, and encouraging battery technology advancements. If these strategies are replicated, the global transition to electric vehicles can be accelerated, leading to a more sustainable future for transportation.

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