CHAPTER 1

INTRODUCTION

1.1 Overview

The electric vehicle market has grown quickly in recent years. The world's major automakers are investing in electric vehicles, introducing more high-performance, long-range electric models. For example, brands such as Tesla, BYD, and Nissan have launched a number of new models around the world, which are loved by consumers in the market.

Electric vehicles exert a profound influence on the environment, society and economy, promoting the development of new energy industries, reducing greenhouse gas emissions, promoting the development of new energy industries, and changing the way people travel. Therefore, many countries have introduced many policies to encourage the development of electric vehicles, such as grant, tax exemptions and charging infrastructure construction, etc., thus promoting the rapid development of electric vehicle technology, battery technology, motor and control system, automatic driving technology and other technologies, so that the battery performance, system safety, driving experience of electric vehicles have been significantly improved, and at the same time, a variety of different energy technologies have been born models, such as: Pure Electric Vehicles (BEV), Plug-in Hybrid Electric Vehicles (PHEV), Fuel Cell Vehicles (FCEVs) and Hybrid Electric Vehicles (HEVs). The emergence of these different forms of electric vehicles is often accompanied by the characteristics of more affordable prices, which makes consumers' acceptance of new energy electric vehicles greatly improved.

Looking ahead, the EV market is expected to continue growing steadily. With the development of technology and the continuous decrease of costs, the market share of electric vehicles will further expand. At the same time, the convergence of intelligent and autonomous driving technologies will enrich the functions and experiences of electric vehicles. In the future, the electric vehicle market will be more diversified to meet the needs of different consumers.

1.2 Problem Background

In recent years, the Electric Vehicle (EV) market has experienced significant and rapid expansion., with major global automakers investing in more high-performance, long-range electric models, such as new models from brands such as Tesla, BYD, and Nissan. Electric vehicles significantly contribute to lowering greenhouse gas emissions, fostering the growth of new energy industries, and revolutionizing travel methods.

The rapid growth of this market is mainly due to several factors: governments have introduced policies to encourage the development of electric vehicles, including subsidies for car purchases, tax breaks, and subsidies for charging infrastructure; Continuous innovation in battery technology, motor and control systems, and autonomous pilot technology has significantly improved the range and economy of electric vehicles. Increasing consumer concern for environmental protection and energy conservation is driving the demand for electric vehicles; The reduction in production and maintenance costs has made electric vehicles more affordable.

The diverse range of electric vehicles includes Pure Electric Vehicles (BEV), Plug-in Hybrid Electric Vehicles (PHEV), Fuel Cell Vehicles (FCEVs) and Hybrid Electric Vehicles (HEVs) , each with a unique history and characteristics. Pure electric vehicles rely on battery energy storage to achieve zero emissions; Plug-in Hybrid Electric Vehicles (PHEV) combine electric drive and internal combustion engines to offer long range and flexible fuel options; Fuel Cell Vehicles (FCEVs) generate electricity through hydrogen fuel cells, which are suitable for long-distance transportation, and the emissions are only water vapor; Hybrid Electric Vehicles (HEVs) combine an electric motor and an internal combustion engine to be charged through energy recovery and have high fuel economy. They play a crucial role in reducing pollution, enhancing energy efficiency, and driving the growth of the new energy industry.

In the future, the electric vehicle market will present a more diverse range of models to meet the needs of different consumers. These include battery electric vehicles, Plug-in Hybrid Electric Vehicles (PHEV), Fuel Cell Vehicles (FCEVs), and Hybrid Electric Vehicles (HEVs). Each model has significant characteristics in terms of range, flexibility, environmental performance and intelligence, and government policy support and technological progress will

further promote the development of these models, making the electric vehicle market more diversified and close to the people, and significantly improving consumer acceptance of new energy electric vehicles.

Despite the promisingness of the EV market, there are still some challenges, such as battery recycling, the deployment and adoption of charging infrastructure, and how to reduce production and operating costs. These issues require the joint efforts of the government, enterprises and scientific research institutions to continue to promote technological innovation and policy optimization. The electric vehicle market is expected to continue to grow rapidly. With the continuous advancement of technology and the further reduction of costs, the market share of electric vehicles will continue to rise. The rapid development of technology will continue to drive the rapid development of the electric vehicle industry. In the future, the electric vehicle market will be more diversified to meet the needs of different consumers. Based on past EV development trends, this research project will predict the future development trend of the dominant models in the EV market, provide reference for industry and policymakers, and contribute to the achievement of global sustainable development goals.

1.3 Problem Statement

By analyzing the relevant historical data of the electric vehicle market sales since 2010, it is possible to analyze the trends and characteristics of the electric vehicle market, so as to predict the future development trend of electric vehicles. Based on these trends and data, it can provide strategic references to stakeholders, such as automakers, policymakers, and investors, to support policy decisions and strategic planning.

1.4 Research Questions

The study focuses on the following research questions:

1. What has been the trend of the electric vehicle industry since 2010?

2. What are the trends and characteristics of the development of models in the historical development process?

3. What predictions can be made for the future based on these trends and characteristics?

1.5 Research Aim

The main objective of this project is to use data from Kaggle and IEA Global EV Data Explorer to gain a comprehensive understanding of the dynamics of the electric vehicle (EV) market, with a particular focus on major countries with high global EV penetration and market influence. By analyzing and predicting the future development of the electric vehicle industry, this study aims to provide valuable references and recommendations for stakeholders.

1.6 Research Objectives

The specific objectives of this study:

i. To Analyze historical trends: Study EV sales data from 2010 to 2023 to identify key trends and patterns. Understanding these trends will provide valuable insights into the global adoption rate of electric vehicles.

ii. To Predicting future sales: Leverage advanced data science techniques such as predictive modeling and machine learning to predict EV sales trends through 2030. This forecast will help automakers, policymakers, and investors make informed decisions.

iii. To Evaluate influencing factors: Evaluate how technological advancements, government policies, market dynamics, and consumer preferences affect the adoption of electric vehicles. Analyzing these factors will help understand the drivers and barriers to widespread adoption of electric vehicles.

iv. To Focus on key countries: Focus on key countries with high EV penetration and market influence, including but not limited to the United States, China, Germany, Norway, and Japan. This focus will allow us to understand the diverse market dynamics in detail.

1.7 Research Scope (Current Work)

As with all other studies, the production and evaluation of this study is subject to the following boundaries and limitations:

i. This study will analyze historical EV sales data from 2010 to 2023, identify key trends and patterns, and use predictive modeling and machine learning techniques to predict EV sales trends from the future to 2030.

ii. This study will evaluate the impact of factors such as technological advancements, government policies, market dynamics, and consumer preferences on EV adoption. Methods such as regression analysis and factor analysis are used to identify the key drivers and barriers that are driving or hindering the widespread adoption of electric vehicles.

iii. The focus of this study is to implement and improve predictive modeling methods to improve the accuracy of EV sales forecasts by adding multiple influencing factors, such as technological advancements, government policies, market dynamics, and consumer preferences.

iv. The dataset for this study will use data provided by Kaggle and IEA Global EV Data Explorer to ensure the reliability and comprehensiveness of the data.

1.8 Expected Research Contribution

i. Theoretical Contributions:

Provides an in-depth analytical understanding of the dynamics of the electric vehicle market, especially in key countries with high penetration and market influence. By analyzing historical sales data, evaluating influencing factors, and predicting future sales, this paper enriches the theoretical research of the electric vehicle market and fills the gaps in the current literature.

ii. Method Contributions:

Leverage advanced data science techniques, such as predictive modeling and machine learning, to improve the accuracy of EV sales forecasts. Develop and optimize analytical and forecasting models for the EV market, providing actionable methodologies that lay the foundation for future research.

iii. Practical Contributions:

To provide a scientific basis for governments and policymakers to help formulate policies and measures to support the development of the electric vehicle market. Provide market insights to automakers and investors to help them develop strategic plans and optimize resource allocation. By identifying and analyzing the key influencing factors, we propose strategies to promote the widespread adoption of electric vehicles and promote the sustainable development of the electric vehicle market.

1.9 Thesis Organization

The remaining sections of the thesis are structured as follows:

Chapter 2: Literature Review

An extensive review of the existing literature related to the electric vehicle market, technological advancements, government policies, and consumer behavior. Cover the research context, explore gaps in existing research, and delve into the current state of research.

Chapter 3: Research Methods

Describe the methodology used in this study, including data collection, trend analysis, predictive modeling, and influencing factor assessment. Detailed information on data sources, analysis tools, and technical methods.

Chapter 4: Data Analysis and Results

Present the results of an analysis of EV sales data to identify key trends and patterns. Presents forecasts of future sales trends through predictive modeling and machine learning.

Chapter 5: Discussion and Recommendations

Discuss the key drivers and obstacles of the electric vehicle market based on the data analysis results. Corresponding countermeasures and suggestions are put forward to promote the healthy development of the electric vehicle market.

Chapter 6: Conclusions and Prospects

Summarize the main findings and contributions of the study, discuss the limitations of the study, and propose future research directions. Looking ahead to the development trends and potential impact of the electric vehicle market.

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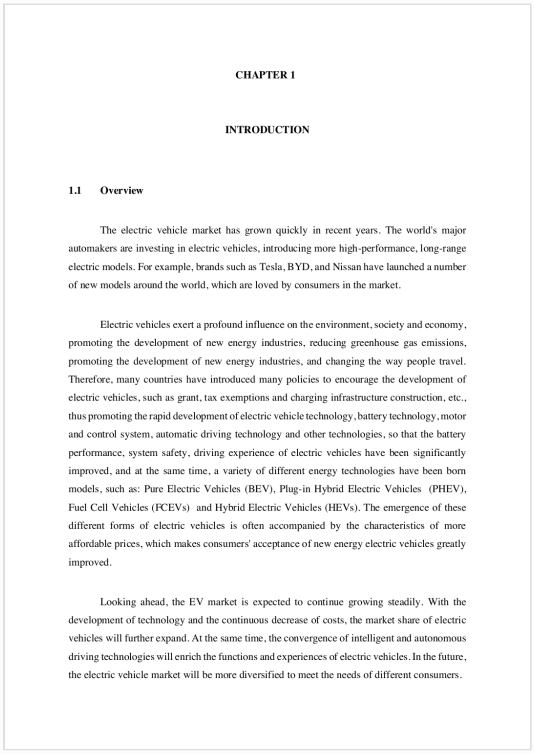

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