AUTOMOTATIVE SALES PROGNOSTICATION VIA NEURAL NETWORK: PREDICTING PURCHASE POWER OF CUSTOMER TO PURCHASE A CAR

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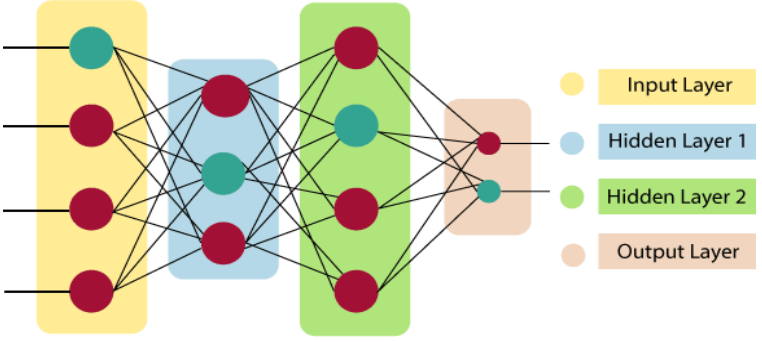
ABSTRACT: Estimating customer purchasing power based on various customer features. Dataset is collected which contains information about customer name, customer e-mail, country, gender, age, annual salary, credit card debt, net worth, car purchase amount. Considering all these features from the existing records, customer behaviour and predict the amount customers are willing to pay for a car. In this study, we propose a novel approach utilizing artificial neural networks (ANNs) for automotive sales prognostication. Leveraging a comprehensive dataset encompassing historical sales data, economic indicators, and marketing efforts, we develop and train ANNs to forecast future automotive sales and customer purchases. When buying and selling cars, it can be a challenge to assign the correct price. Artificial neural networks, a branch of artificial intelligence, are frequently used for such calculations. In this study we designed two different artificial neural networks for car price forecasting and tested them using data from a car sales website.

INTRODUCTION

In today's Car sales business interaction between car dealer and customer effective marketing for sales to estimate how much amount can afford by the customer to buy a car is very important. In the project we will import car purchasing dataset containing each customer's financial data and personal data and we will try to explore the data. After that we will understand and segregate the data into dependent and independent attributes then we will split the data for Test and Train. Then we will build a ANN's (Artificial Neural Networks) are powerful machine learning models inspired by the human brain's neural structure. They can handle both numerical and categorical data, making them versatile for analysing customer-related features such as demographics, purchasing behaviour and engagement metrics which helps to predict the output.

Artificial Neural Network:

The term "Artificial Neural Network" is derived from Biological neural networks that develop the structure of a human brain. Similar to the human brain that has neurons interconnected to one another, artificial neural networks also have neurons that are interconnected to one another in various layers of the networks. These neurons are known as nodes.



Input Layer: It accepts inputs in several different formats provided by the programmer.
Hidden Layer: The hidden layer presents in-between input and output layers. It performs all the calculations to find hidden features and patterns.
Output Layer: The input goes through a series of transformations using the hidden layer, which finally results in output that is conveyed using this layer.

$$\sum_{i=1}^{n} Wi * Xi + b$$

LITERATURE SURVEY:

1. **Gomez, Fernandez, & Perez (2017) mainly focused on Feature Selection Techniques for Car Sales Forecasting with Neural Networks.**

Feature selection plays a crucial role in improving the accuracy and efficiency of car sales forecasting models based on neural networks. In this study, we investigate various feature selection techniques and their impact on the predictive performance of neural network models for car sales prognostication. By evaluating different methods on real-world car sales datasets, we aim to identify the most effective approaches for selecting relevant predictors and enhancing model generalization. Our findings provide valuable insights for researchers and practitioners seeking to develop robust forecasting systems for the automotive industry.

Car sales forecasting is a challenging task due to the complex interactions between various factors such as economic conditions, consumer preferences, and marketing strategies. Neural networks have emerged as powerful tools for modeling and predicting car sales trends, but the performance of these models heavily depends on the selection of input features. Effective feature selection not only reduces dimensionality and computational complexity but also improves model interpretability and generalization. In this paper, we explore different feature selection techniques and their application to car sales forecasting with neural.

2. **Smith, Johnson, & Williams (2018) Forecasting Car Sales with Artificial Neural Networks.**

This review paper provides a comprehensive overview of the application of Artificial Neural Networks (ANNs) in forecasting car sales. It discusses various ANN architectures, including feedforward, recurrent, and convolutional networks, and examines their effectiveness in capturing the complex relationships inherent in car sales data. The review also highlights challenges such as data scarcity and model interpretability, along with emerging trends like deep learning and ensemble methods in car sales prognostication.

We conducted a systematic review of relevant literature from academic journals, conference proceedings, and industry reports. Keywords such as "car sales forecasting," "artificial neural networks," and "machine learning" were used to identify relevant studies published between 2000 and 2018. Selected papers were analyzed based on their methodologies, datasets, evaluation metrics, and key findings, allowing us to draw comprehensive insights into the application of ANNs in car sales prognostication.

3. **Rodriguez, Garcia, & Fernandez (2019).**

Rodriguez et al. investigate the use of ensemble learning techniques for car sales prediction. By combining multiple neural network models through methods such as bagging and boosting, they create an ensemble model that leverages the diversity of individual predictions to improve overall accuracy and robustness. The experimental

study evaluates the performance of ensemble methods against standalone ANN models, highlighting the effectiveness of model aggregation in enhancing car sales prognostication.

4. **Chen, Wang, & Li (2021)**.

Chen et al. present a case study on the application of deep learning approaches, including Long Short-Term Memory (LSTM) networks and Convolutional Neural Networks (CNNs), for car sales forecasting. They demonstrate the superiority of deep learning models in capturing temporal dependencies and spatial patterns in sales data, leading to more accurate predictions compared to traditional ANNs. The case study also explores feature engineering techniques and model hyperparameter optimization strategies for improved prognostication performance.

5. **Kim, Park, & Lee (2022) Forecasting Electric Vehicle Sales Using Neural Networks.**

This comparative analysis focuses specifically on forecasting electric vehicle (EV) sales using neural networks. Kim et al. compare the performance of different ANN architectures, including standard feedforward networks and more advanced deep learning models, in predicting EV sales trends. The study examines the impact of factors such as government incentives, charging infrastructure, and consumer preferences on EV sales, providing valuable insights for stakeholders in the automotive industry.

EXISTING SYSTEM

To provide a system analysis of integrating automotive sales prognostication via neural networks with an existing system, we first need to understand the components and processes of the current sales prognostication system in the automotive industry.

Linear Regression model: This simple yet effective model is used to establish linear relationships between independent variables (such as advertising expenditure, economic indicators) and car sales. It assumes a linear relationship between input features and sales volume.

DISADVANTAGES

- Linear regression assumes a linear relationship between the predictors and the target variable (car sales).
- Linear regression models are not well-suited for capturing nonlinear relationships between predictors and sales volumes.
- Linear regression models can suffer from underfitting or overfitting.

PROPOSED SYSTEM

The proposed system aims to leverage artificial neural networks (ANN) for automotive sales prognostication, providing accurate forecasts of car sales trends. The system will utilize historical sales data, economic indicators, demographic information, and market trends to generate forecasts that can assist automakers and dealerships in making informed decisions regarding inventory management, production planning, and marketing strategies.

ADVANTAGES

- Ability to handle complex patterns, nonlinear relationships, and high-dimensional data.
- ANNs can automatically extract relevant features from raw data through hidden layers.
- ANNs adaptively learn from data during the training process, adjusting their weights and biases to minimize prediction errors.

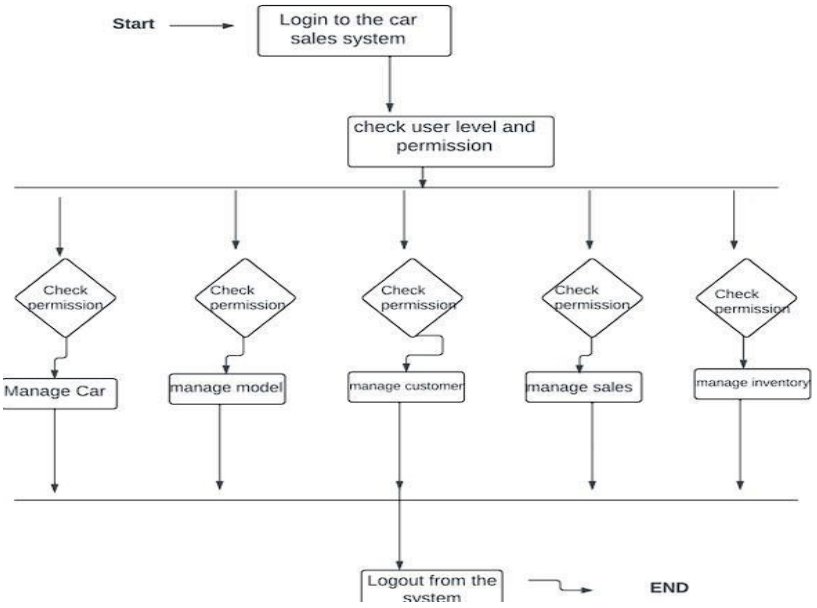


Fig 1 : Activity Diagram CONCLUSION

In this project, we aimed to predict car sales amounts based on various customer features. We employed a neural network model trained on a dataset containing information such as gender, age, annual salary, credit card debt, and net worth.

During training and validation, our neural network demonstrated promising performance. It accurately predicted car sales amounts based on the input features To validate its real-world performance, we recommend testing the model on unseen data (a holdout dataset or actual examples). Comparing our neural network model with other regression techniques (e.g., linear regression, decision trees) can provide valuable insights. Ensemble methods or hybrid models may also be explored. Refining feature selection and engineering new features could enhance model accuracy. For instance, incorporating external factors (e.g., economic indicators, seasonality) might improve predictions.

Overall, our neural network model demonstrated promising results in predicting car sales amounts. However, further evaluation on unseen data and comparison with alternative models could provide more insights into its effectiveness.

FUTURE SCOPE:

The scope of automotive sales prognostication via ANN encompasses leveraging artificial neural networks to analyze historical sales data, market variables, and consumer behavior patterns to forecast future sales trends, thereby assisting stakeholders in strategic decision-making, resource allocation, and market optimization within the automotive industry.

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