



INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

USED CAR SALES PREDICTION USING DEEP LEARNING MODEL

Mr. Arockia Selvaraj A¹ Ms. Darshini J², Ms. MahaLakshmi V.S³, Mr.Santhosh kumar G⁴

A. Arockia Selvaraj, Assistant Professor / Information Technology, Info Institute of Engineering, India.
1

J. Darshini, B.Tech Information Technology, Info Institute of Engineering, India. 2

V.S MahaLakshmi, B.Tech Information Technology, Info Institute of Engineering, India. 3

G. Santhosh kumar, B.Tech Information Technology, Info Institute of Engineering, India. 4

Abstract: Because a variety of factors influence a used car's value, it can be difficult to predict its exact price. These elements include the vehicle's make, model, year of manufacture, mileage, fuel type, gearbox, and general state. Traditionally, straightforward techniques like linear regression are used to forecast prices. Although these techniques can yield approximations, they frequently fall short in comprehending the intricate connections among various automobile attributes. Because of this, the anticipated price might not always coincide with the actual market value. In this study, we apply a Deep Neural Network (DNN) technique to increase the accuracy of used automobile price forecast. One kind of artificial intelligence that functions similarly to a DNN is typically missed. Using a sizable dataset of used automobile information, we trained the DNN, and over time, the model discovered how various attributes affect the car's ultimate cost. We tested the model and discovered that it outperformed the conventional linear regression approach. It decreased the likelihood of overpricing or underpricing a car and provided more precise forecasts. This improvement in prediction accuracy is very helpful for people looking to buy or sell a car. Buyers can make sure they are not overpaying, and sellers can be confident they are asking for a fair price. This approach can also be used by platforms and car dealers to more precisely establish prices and draw in more clients. By including more real-world data and extra elements like location, insurance history, and service records, this model can be significantly enhanced in the future. Overall, this project shows that deep learning can make a big difference in how we predict prices and make better decisions in the used car market.

I.INTRODUCTION

The objective of this project, "used car sales prediction using deep learning model," is to develop an accurate model for predicting used car prices using deep neural networks (dnn). by leveraging features such as make, model, year, mileage, and other car attributes, the project aims to improve the accuracy of price predictions compared to traditional machine learning methods like linear regression. the model will be trained using deep learning frameworks such as tensorflow or pytorch, focusing on minimizing prediction errors using evaluation metrics like mean absolute error (mae) and mean squared error (mse). data preprocessing will be incorporated to clean and normalize the dataset. the project will also feature a user interface to allow users to input car details and receive realtime price predictions. this system will enhance decision-making for both buyers and sellers in the used car market. ultimately, the project aims to demonstrate the potential of deep learning in improving the pricing process for used cars.

1.1 SCOPE

The scope of the "Used Car Sales Prediction using Deep Learning Model" project involves developing an accurate system for predicting used car prices using Deep Neural Networks (DNN). The project will focus on collecting and preprocessing a dataset receive real-time predictions. The project will also explore the potential of deploying the model for real -world applications in the used car market. However, the scope will not include mobile app development or complex third-party integrations. The primary goal is to provide an efficient and accurate pricing tool for buyers and sellers.containing car attributes such as make, model, year, mileage, and engine type. The DNN model will be trained to improve accuracy over traditional machine learning approaches, with performance evaluated using metrics like Mean Absolute Error (MAE) and Mean Squared Error (MSE). A user-friendly interface

PROBLEM DEFINITION

The problem addressed in this project is the lack of accurate, data driven methods for determining the resale value of used cars in market. Traditional methods of pricing used cars often rely on subjective factors, individual dealer experience, or price comparisons, which can lead to inconsistent and inaccurate valuations. This inconsistency results in buyers overpaying or sellers underpricing their vehicles. Additionally, the growing volume of used car transactions demands a more systematic approach to price prediction that can handle large datasets and consider various influencing factors such as car make, model, year, mileage, and condition. The existing manual and basic algorithmic approaches often fail to capture the complex relationships between multiple variables that influence a car's price. As a result, there is a need for an automated, intelligent solution that can predict car prices more accurately by analyzing historical data and recognizing patterns in car features. This project aims to address this problem by using a Deep Neural Network (DNN), which will leverage machine learning techniques to make precise predictions based on a car's attributes. The goal is to create a reliable, real-time tool that helps buyers, sellers, and car dealerships determine fair prices for used cars.

1.2 PROJECT OVERVIEW

1. Dataset: The dataset includes features like car brand, model, year, mileage, fuel type, transmission, and selling price. It is the core resource that trains the model to understand the relationship between these features and the car's price. 2. Data Preprocessing: Libraries like Pandas and NumPy are used to clean the data, handle missing values, encode categorical variables, and normalize numerical values. This step ensures the data is clean, consistent, and ready for effective model training. 3. Deep Neural Network: The prediction model is built using a Deep Neural Network with frameworks like TensorFlow or PyTorch. These tools help create a model that can learn complex patterns in the data and deliver more accurate predictions than traditional models.

PROJECT IMPACT

The scope of the "used car sales prediction using deep learning model" project involves developing an accurate system for predicting used car prices using deep neural networks (dnn). the project will focus on collecting and preprocessing a dataset containing car attributes such as make, model, year, mileage, and engine type. the dnn model will be trained to improve accuracy over traditional machine learning approaches, with performance evaluated using metrics like mean absolute error (mae) and mean squared error (mse). a user-friendly interface will be created to allow users to input car details and receive real-time predictions. however, the scope will not include mobile app development or complex third-party integrations. the primary goal is to provide an efficient and accurate pricing tool for buyers and sellers.

.PROJECT OUTCOME

Implementing an AI-powered teaching platform significantly improved student learning outcomes. Students improved their attention, retention of concepts, and academic achievement across many subjects. Interactive mind maps improved students' understanding of complicated concepts, while the Virtual Professor provided targeted guidance to reduce cognitive overload and confusion. Flexible learning routes were employed to accommodate diverse learning styles and encourage self-directed learning. Teachers and students reported improved enthusiasm, comprehension, and a more engaging and supportive learning environment. The project developed a scalable, AI-driven approach to modern education, bridging the gap

between traditional teaching methods and student demands in modern times.

II. SYSTEM ANALYSIS

2.1 LITERATURE REVIEW

2.1.1 DEEP LEARNING-BASED USED CAR PRICE PREDICTION SYSTEM TO ENHANCE AUTOMOTIVE MARKET TRANSPARENCY

The study "An Analytical Study on Used Car Price Prediction Using Deep Learning Models" explores how deep learning can significantly improve used car price prediction accuracy. It demonstrates that Deep Neural Networks (DNNs) outperform traditional machine learning models like Linear Regression, particularly in identifying nonlinear patterns in automotive datasets. By leveraging features such as make, model, year, mileage, and fuel type, the DNN model reduces error rates and increases the R^2 score, enabling more reliable market estimates. This data-driven approach enhances pricing transparency and supports fair trade in the used car industry.

Keywords: Deep Neural Network (DNN), Used Car Pricing, Predictive Analytics, Nonlinear Patterns

2.1.2 MACHINE LEARNING STRATEGIES FOR SUSTAINABLE USED CAR MARKET VALUE PREDICTION

The reviewed paper highlights the role of machine learning in fostering sustainability in the automotive resale sector. Focusing on past studies like those by Areej Alhowaity et al., it shows how Linear Regression models have been applied to predict used car values to support greener and more informed consumer behavior. While these approaches offer basic forecasting capabilities, their inability to capture complex data limits their effectiveness. This calls for advanced models like DNNs, as proposed in the current study, to better serve a dynamic and sustainable car marketplace.

Keywords: Sustainability, Linear Regression, Used Car Resale, Machine Learning, Predictive Modeling

2.1.3 THEORETICAL AND PRACTICAL INSIGHTS INTO MACHINE LEARNING FOR AUTOMOTIVE SALES STRATEGIES

The paper also examines how machine learning enhances marketing strategies within the automotive industry. Referencing a review study by Dr. Indira Bhardwaj, it explains how ML can improve decision-making in sales promotion planning through data-driven insights. Although Bhardwaj's work is theoretical and lacks practical implementation, it provides context for the broader applicability of ML. The current research builds on this by implementing and evaluating a deep learning model, offering tangible results for predictive performance in real-world pricing scenarios.

Keywords: Automotive Marketing, Sales Promotion, Data-Driven Insights, Machine Learning, Business Intelligence

2.2 EXISTING SYSTEM

This study uses a **Linear Regression model** to predict used car prices based on historical data. The system considers car attributes like brand, model, year, and mileage to estimate a vehicle's market value. It establishes a straightforward statistical relationship between features and price using a regression line. The model is easy to understand and fast to train, making it suitable for simple, structured datasets. This work lays the groundwork for predictive systems in the automotive domain by offering a fundamental yet effective solution.

DISADVANTAGE

- **Basic Model:** Limited to linear relationships; cannot detect complex patterns.
- **Low Accuracy:** Higher error rate compared to advanced models.
- **Scalability:** Performance decreases with diverse or large datasets.
- **Static Predictions:** Does not adapt well to real-time data or changing market conditions.

2.3 PROPOSED SYSTEM

The suggested system is a cutting-edge AI-powered platform for predicting used car prices that makes use of Deep Neural Networks (DNNs) to provide precise and up-to-date market value estimates for used cars. This system is made to process and learn from nonlinear patterns across a variety of automotive datasets, in contrast to traditional linear regression models, which frequently fall short in capturing complex data relationships. To provide accurate price assessments, it incorporates a number of features, including vehicle make, model, year, mileage, fuel type, and condition. To guarantee resilience and flexibility, the system is

trained on extensive datasets and makes use of deep learning frameworks integrated into Python. Because of its real-time data ingestion capabilities, it can continuously update from sources such as market trends and online car listings. Furthermore, Explainable AI (XAI) capabilities could be added to the platform to improve transparency and trust by assisting users in understanding how predictions are made.

ADVANTAGE

- **Real-Time Market Adaptability:** The system remains up to date and dynamically adjusts to changes in vehicle values by incorporating real-time data streams from internet listings and market trends.
- **Comprehensive Feature Analysis:** For a thorough and comprehensive price estimate, the platform takes into account a variety of vehicle attributes, including make, model, mileage, year, fuel type, and more.
- **Explainable AI Integration:** By integrating Explainable AI (XAI) tools, users can gain insight into the prediction process, increasing system transparency and confidence.
- **Data-Driven Decision Support:** By lowering the possibility of under- or overpricing and boosting negotiation confidence, data-backed insights are advantageous to buyers, sellers, and dealers.
- **User-Friendly Interface:** Developed using contemporary web technologies, the platform provides a simple, easy-to-use user interface for smooth interaction on a range of devices.

III SYSTEM REQUIREMENTS

Hardware Requirements

- **Processor:** Intel Core i5 (9th Gen or above) / AMD Ryzen 5 or higher
- **RAM:** Minimum 8 GB (16 GB recommended for training large datasets)
- **Hard Disk:** At least 512 GB SSD for faster data processing and storage
- **GPU:** NVIDIA GeForce GTX 1050 Ti or higher (for deep learning model training)
- **Network:** Stable internet connection (for real-time data fetching and API integration)

Software Requirements

- **Operating System:** Windows 10/11, Ubuntu 20.04+, or macOS 11+
- **Programming Language:** Python 3.8 or later

IV. SYSTEM DESIGN

The suggested system is an artificial intelligence (AI) platform that uses Deep Neural Networks (DNN) to forecast used car prices with higher performance and accuracy. In contrast to conventional linear regression models, this system analyzes a variety of features, including make, model, year, mileage, and fuel type, to comprehend intricate patterns in data. It helps buyers and sellers make informed decisions by offering fair and data-driven price estimates. For efficiency and scalability, the model is constructed with Python, TensorFlow, and MongoDB and trained on sizable datasets.

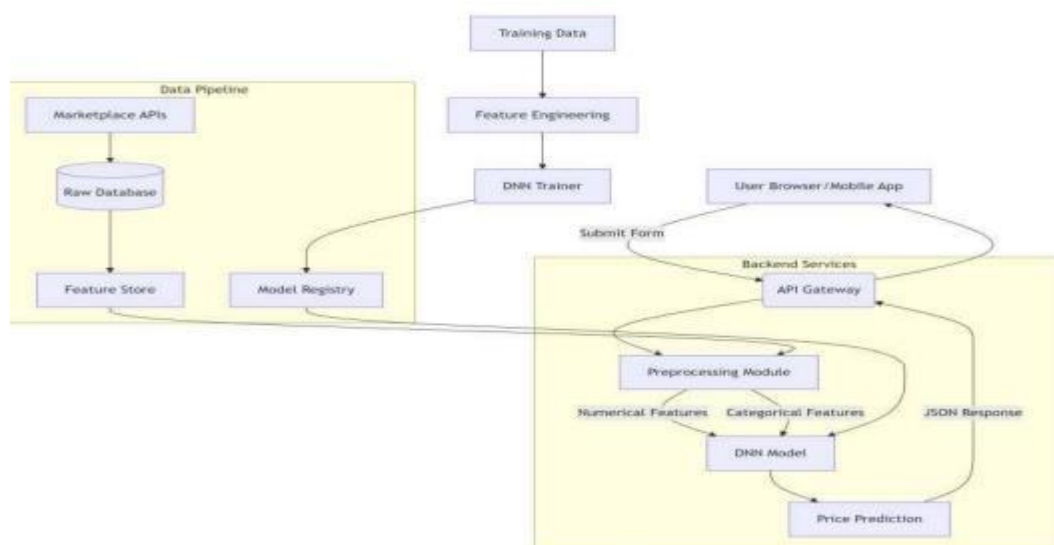
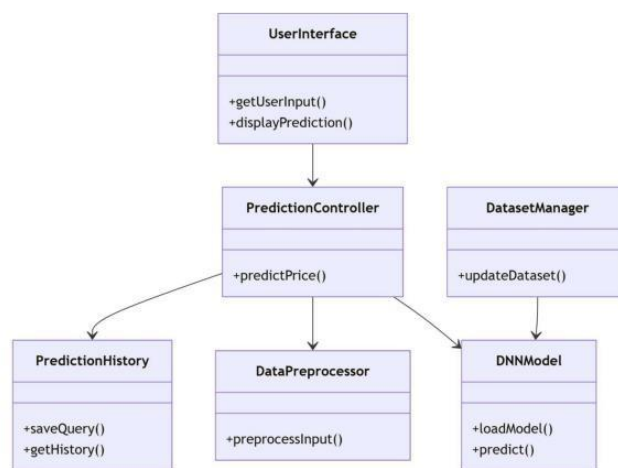


Figure IV – SYSTEM ARCHITECTURE

4.2.1 CLASS DIAGRAM

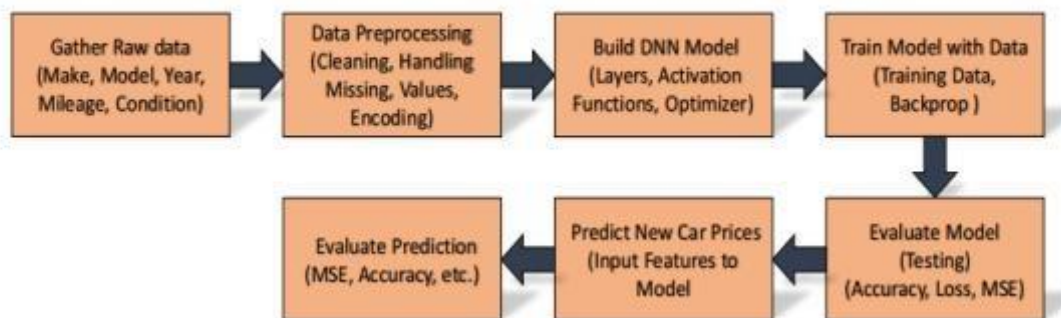
The architecture of the used car price prediction system is designed to handle data collection, preprocessing, model training, and real-time predictions in a streamlined, scalable manner. The process begins in the data pipeline, where car-related data is gathered through Marketplace APIs. These APIs pull listings and historical data related to car sales, which is then stored in a Raw Database. This raw data contains various attributes of used cars such as make, model, year, mileage, fuel type, and more. Once stored, the data is curated and processed into a Feature Store, a specialized storage for cleaned and structured data used for both training and inference. Simultaneously, a Model Registry is used to manage trained machine learning models, including their versions, performance metrics, and deployment status. In the next phase, Feature Engineering is applied to the Training Data. This step involves transforming raw data into machine-readable formats, selecting the most relevant features, and encoding categorical variables. The refined data is then used by the DNN Trainer, which trains a Deep Neural Network (DNN) model capable of capturing complex, non-linear relationships between features and car prices. After training, the resulting model is stored in the Model Registry for future deployment and reference. On the client side, users interact with the system through a User Browser or Mobile App, where they can submit car details via a form. This request is handled by Backend Services, which are accessed through an API Gateway.



4.2.1 CLASS DIAGRAM

4.2.2 DATA FLOW DIAGRAM

Our car price prediction system works like a smart assistant that estimates used car values in seconds. First, it collects basic details about the car - things like the make, model, year, mileage, and overall condition, just like you'd describe a car to a friend. Then it cleans up this information, filling in any missing details and converting everything into numbers the computer can understand. The heart of the system is its artificial intelligence "brain" that has studied thousands of past car sales to learn how different factors affect prices - like how high mileage reduces value or how certain brands hold their worth better.

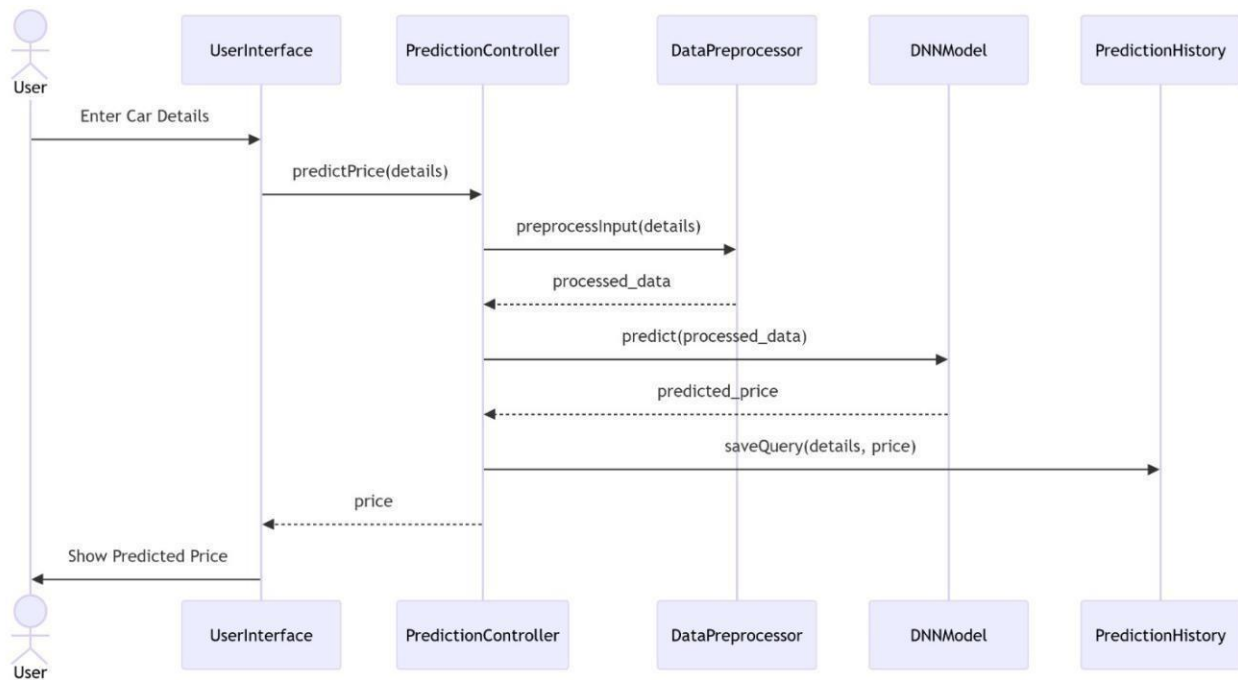


4.2.2 DATA FLOW DIAGRAM

4.2.3 USE CASE DIAGRAM

The use case diagram provides a high-level overview of how a user interacts with the used car price prediction system powered by a Deep Neural Network (DNN). The main actor in this system is the User, who initiates the interaction through the Interface. The interface serves as the central point that connects all functionalities of the system. The first use case is "Input Car Details", where the user enters essential vehicle information such as make, model, year, mileage, fuel type, transmission, and other relevant parameters. This step is critical, as accurate input directly impacts the reliability of the prediction. This use case is marked with an

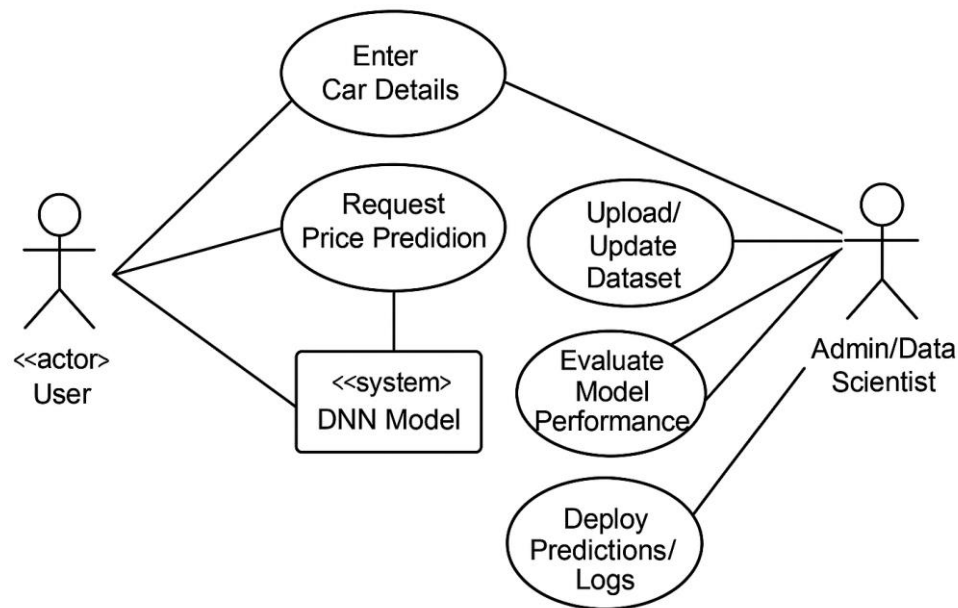
<> relationship to indicate that it is a mandatory step for the main process to continue.



4.2.3 USECASE DIAGRAM

4.2.5 SEQUENCE DIAGRAM

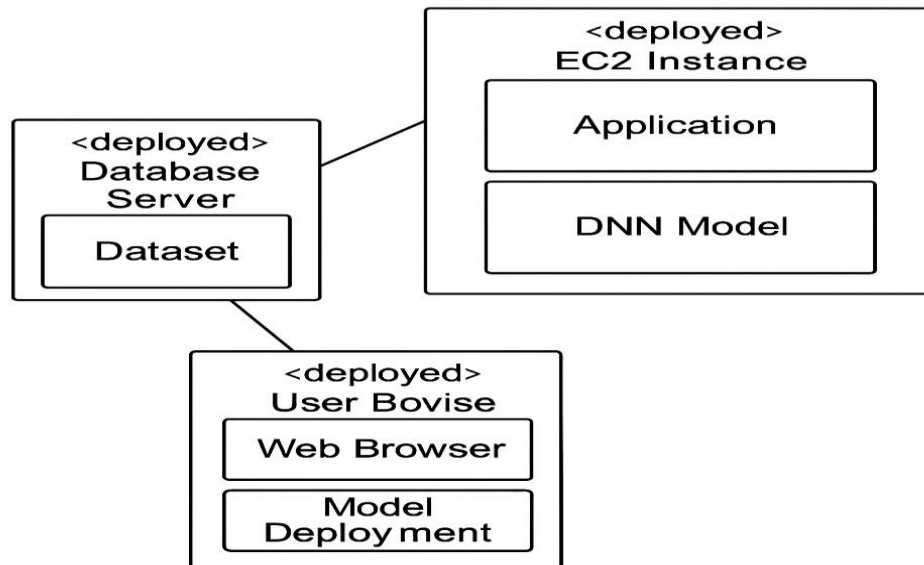
The sequence diagram illustrates the complete flow of how a used car price prediction is performed using a deep learning model in the system. The interaction begins with the User, who accesses the UserInterface and enters car-related details such as make, model, year, mileage, and other specifications. These details are sent to the PredictionController through the predictPrice(details) method. The controller acts as the central unit managing the flow and forwards the raw input data to the DataPreprocessor via the preprocessInput(details) method.



4.2.5 SEQUENCE DIAGRAM

4.2.6 DEPLOYMENT DIAGRAM

This system architecture diagram outlines the flow of data for the "Used Car Price Prediction Using Deep Learning" project. The process begins with the User Device (browser or mobile), where users input car details. These inputs are securely sent via HTTPS to the Web Server, which hosts the user interface. The web server forwards the data through REST APIs to the Application Server that runs the DNN model for price prediction.



4.2.6 DEPLOYMENT DIAGRAM

4.3 SOFTWARE DESIGN

The software design of the proposed system follows a modular, layered architecture that ensures maintainability, scalability, and efficient performance. At the core is the Model Layer, where a Deep Neural Network (DNN) is implemented using Python with TensorFlow or Keras. This model is responsible for learning patterns from historical car data and making accurate price predictions. The Data Layer manages the collection, preprocessing, and storage of car attributes—such as make, model, year, mileage, and fuel type—using libraries like Pandas and NumPy. This data is stored in a NoSQL database such as MongoDB for flexibility and fast retrieval. The Application Layer handles business logic, implemented using Flask or Node.js, and facilitates the interaction between the frontend and the backend services through RESTful APIs. The Presentation Layer consists of a responsive user interface developed using React.js, which allows users to input vehicle information and receive real-time predictions. The system also incorporates a module for Explainable AI (XAI), providing users with transparent insights into how the model arrives at its predictions. Security and data validation mechanisms are integrated at all levels to ensure the integrity and privacy of user data. Overall, the software design supports a clean separation of concerns, promoting efficient collaboration, future enhancements, and deployment in real-world environments.

VII. CONCLUSION

Based on the three papers reviewed, it is clear that predicting used car prices using machine learning can offer valuable insights for both buyers and sellers. The first study, using linear regression, demonstrates the importance of machine learning in analysing large datasets to provide accurate price predictions. The second paper highlights the role of machine learning in improving marketing strategies within the automotive industry, though it lacks practical implementation. The third paper focuses on sustainability and demonstrates that machine learning can be used to predict used car prices, but it only addresses the marketplace value without offering deeper analysis. While all three papers showcase the potential of machine learning in the automotive sector, they also highlight limitations such as narrow focus, lack of real-world testing, and reliance on simple algorithms like linear regression.

IX. FUTURE ENHANCEMENT

To improve the project in the future, we can use more advanced techniques like Deep Neural Networks (DNNs) or Random Forests, which can better understand complex patterns in the data compared to linear regression. Adding more details about the car, such as its condition, accident history, or previous owners, would help make the price predictions even more accurate. It would also be helpful to include real-time data from the market, like current car listings or recent sales, so the predictions stay up-to-date. Looking at different regions or markets could give more specific price estimates based on location and local demand. A user-friendly app or website would allow people to easily input car details and get instant price predictions. Making the model easier to understand with tools like Explainable AI (XAI) could help users know how the predictions are made. Additionally, predicting how much a car will lose value over time and adding data from related industries, like insurance or repair history, could make the model even more useful for both buyers and sellers.

REFERENCES

- [1] Prof. Dr. Indira Bhardwaj, Tapos Ranjan Biswas, Muhammad Waqas Arshad, Ajay Upadhyay, Dr. Amrita Baid More. "Examination of MIS-Function in the Automotive Industry's Sales Promotion Planning Using Machine Learning." Library Progress International 2024.
- [2] Alhowaity, Anwar Abdullah Alatawi, and Hadeel Alsaadi. "Used cars More Sustainable Price Prediction Based on Linear Regression." Sustainability 2023.
- [3] Williams, Ian D., and Michael Blyth. "Autogeddon or autoheaven: Environmental and social effects of the automotive industry from launch to present." Science of the Total Environment 2023.
- [4] Vengatasubbu.P, Ganesh. M, Used cars price prediction using supervised learning techniques 2019.
- [5] Puteri. C.K, Safitri L.N, Analysis of Linear regression on used car sales in Indonesia 2020.

- [6] Shalendar, Kumar, and Nripendra Singh. "Marketing flexibility: Significance and implications for automobile industry." Global journal of flexible systems management 2015.
- [7] Kiran, S. Prediction of resale value of the car using linear regression algorithm. Int. J. Innov. Sci. Res. Technol. 2020.
- [8] Reddy, A.; Kamalraj, R. Old/Used Cars Price Prediction using Machine Learning Algorithms. IITM J. Manag. IT 2021.
- [9] Gatón, B. There's no need to buy new: Buying a second-hand EV. Renew Technol. Sustain. Future 2022.
- [10] Glavič, P. Evolution and Current Challenges of Sustainable Consumption and Production. Sustainability 2021,

