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Car Recommendation and Car Price Prediction System using Machine Learning

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ABSTRACT - The automotive industry has witnessed a significant surge in the availability of car options, making it increasingly challenging for buyers and sellers to navigate the market. To address this issue, we present the implementation of a Car Recommendation and Price Prediction System. This paper showcases the development of two intelligent applications: a Car Recommendation System and a Car Price Prediction System.

The Car Recommendation System is an intelligent application designed to assist users in finding their ideal cars based on their preferences. The system utilizes a dataset of car details and employs content-based filtering techniques to generate personalized recommendations. Users can specify their desired choices to filter the available car options. The system then analyzes the features of the cars and recommends the most similar and suitable options based on the selected choices. The recommendations are ranked according to various factors such as price and can help users make informed decisions when searching for their desired cars. The Car Price Prediction System is a predictive tool designed to estimate the selling price of used cars. The system leverages a trained regression model to predict the price based on various features. The system employs a random forest regression algorithm that has been trained on a dataset of historical car prices. Users can input the relevant details of the car they intend to sell, and the system generates an estimated selling price. The predicted price provides users with valuable insights into the market value of their cars, enabling them to make informed decisions about pricing and selling their vehicles.

KEYWORDS: Car Recommendation System, Price Prediction System, Content Based Filtering, Random Forest Algorithm, Choices, Machine learning

1. INTRODUCTION

The rapid growth of the automotive market, coupled with the abundance of car choices, has made the process of buying and selling cars a complex endeavor. Buyers are often overwhelmed by the numerous options available, while sellers struggle to determine the appropriate selling price for their vehicles. To alleviate these challenges and provide valuable insights to users, we have implemented two interconnected systems: the Car Recommendation System and the Car Price Prediction System.

Due to the complicated way of life of the population, owning a car has become a necessity. There are many different domestic car kinds on the market.Some of them have multiple uses, while others have particular uses. To meet the needs of its clients from various social and economic backgrounds, the auto industry makes significant investments in the development of numerous car types.

The Car Recommendation System utilizes advanced content-based filtering techniques to generate personalized car recommendations based on user preferences. Complementing the Car Recommendation System, the Car Price Prediction System leverages machine learning algorithms, specifically random forest regression, to estimate the selling price of used cars.

To some extent, it involves technical know-how and direction to make the best decision by analysing the needs of the consumer. Thus, before purchasing a car, the majority of customers speak with specialists or advisors. Most of the currently available consulting services lack technical expertise, customerrequirement analysis expertise, or both. Therefore, utilising cutting-edge machine learning techniques, we looked into a potential fix for this problem. As a result, there is a large variety in the pricing of automobiles with the same specifications. Therefore, it can be difficult for consumers who are planning topurchase a car to select the most suitable car. In this paper, we present the technical details and implementation process of these systems, including the choice of algorithms, data preprocessing, system architecture, and user interface design. Furthermore, we evaluate the performance of the systems and discuss potential future enhancements to further improve their accuracy and effectiveness.

2. LITERATURE REVIEW

Sr. No.	Title of the paper	Year	Findings
1	Recommender Systems Challenges and Solutions Survey(IEEE)	2019	In this paper, different techniquesin recommender systems and their advantages and disadvantages werediscussed.
2	Prediction car prices using quantify qualitative data and knowledge-based system	2020	In this paper techniques for extraction of meaning, data interference, rules for qualitative data.
3	Content-Based RecommendationUsing Machine Learning (IEEE)	2021	Here, they have studied about Content Based Recommendation with three-step profiling method.
4	A ComprehensiveStudy of Regression Analysis and the Existing Techniques (IEEE)	2022	This paper examinesand compares various regression models and machine learning algorithms.
5	The Design of Web Based Car RecommendationSystem using Hybrid Recommender Algorithm	2018	Web based recommendations for any item is mandatory in E-commerce based web sites. This paper ıs about the designof web based car recommendation system using the hybrid recommender algorithm.

3. SYSTEM ARCHITECTURE

Car Recommendation System:

The Car Recommendation System follows a client-server architecture, with the server-side implementation handling the data processing and recommendation generation, and the client-side serving as the user interface. The architecture can be divided into the following components:

1. Client Interface: The user interacts with the system through a web-based interface. The client interface allows users to input their preferences, such as brand, fuel type, seller type, transmission, owner, maximum budget, maximum kilometers driven, and minimum manufacturing year. These inputs are sent to the server for further processing.

2. Server-Side Processing: The server-side of the Car Recommendation System is responsible for data processing and recommendation generation. It consists of the following components:

- Input Processing: The server receives the user preferences from the client interface and performs necessary data validation and preprocessing. It ensures that the inputs are in the correct format and within valid ranges.
- Data Filtering: The system retrieves car details from a dataset containing information about various cars. The dataset is preprocessed to remove irrelevant data and filter cars based on the user's preferences. Filtering is performed based on attributes such as brand, fuel type, seller type, transmission, owner, maximum budget, maximum kilometers driven, and minimum manufacturing year.
- Feature Extraction: The relevant features from the filtered cars are extracted and processed to create a representation of each car. This representation can include attributes like the name, brand, year, selling price, kilometers driven, fuel, seller type, transmission, and owner.
- Recommendation Generation: Using the extracted features, a similarity matrix is constructed to calculate the similarity between cars. Cosine similarity or other suitable similarity metrics are applied to measure the resemblance between car features. Based on the similarity scores, the system generates a list of recommended cars that closely match the user's preferences.
- Result Formatting: The recommended cars are formatted into a suitable output format and sent back to the client interface for display.

3. Client-Side Presentation: The recommended cars are presented to the user through the client interface. The client-side processes the recommendations received from the server and displays them in a user-friendly manner. The user can view details of the recommended cars, such as name, brand, year, selling price, kilometers driven, fuel, seller type, transmission, and owner.

Overall, the system architecture of the Car Recommendation System enables efficient processing of user preferences, filtering of car data, similarity calculation, and generation of personalized recommendations. It provides a seamless user experience by integrating the client and server components.

Car Price Prediction System:

The Car Price Prediction System also follows a client-server architecture, with the server-side responsible for training the prediction model and handling prediction requests, and the client-side serving as the user interface. The architecture can be divided into the following components:

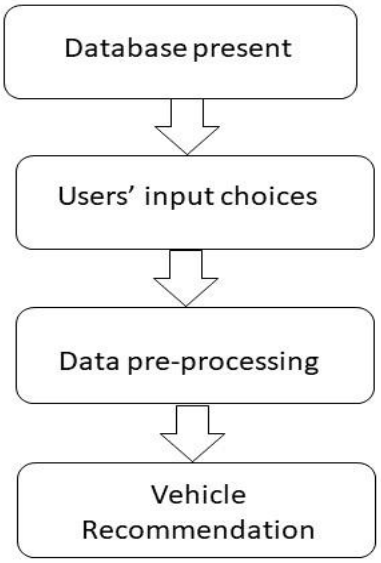


Figure 1 System Architecture of Car Recommendation System

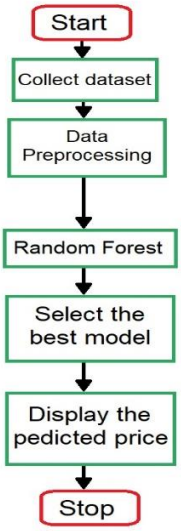


Figure 2 System Architecture of Car's Price Prediction System

1. Client Interface: The user interacts with the system through a web-based interface. The client interface allows users to input relevant details of a car, including the present price, manufacturing year, kilometers driven, fuel type, owner type, and seller type. These inputs are sent to the server for price prediction.

2. Server-Side Processing: The server-side of the Car Price Prediction System performs the data preprocessing, model training, and price prediction. It consists of the following components:

- Input Processing: The server receives the car details from the client interface and performs data validation and preprocessing. It ensures that the inputs are in the correct format and within valid ranges.
- Feature Scaling: The car details are standardized using techniques like standard scaling to ensure that all features are on a similar scale. This step is essential for training the prediction model.
- Model Training: The system utilizes a machine learning algorithm, such as random forest regression, to train a predictive model.

4. IMPLEMENTATION

The Car Recommendation System utilizes advanced content-based filtering techniques to generate personalized car recommendations based on user preferences. By considering factors such as brand, fuel type, seller type, transmission, owner, maximum budget, maximum kilometers driven, and minimum manufacturing year, the system sifts through a comprehensive dataset of car details. It then employs algorithms to analyze the features of available cars and recommends the most suitable options based on the user's selected car. The recommendations assist buyers in finding their ideal cars and facilitate informed decision-making.

Complementing the Car Recommendation System, the Car Price Prediction System leverages machine learning algorithms, specifically random forest regression, to estimate the selling price of used cars. By incorporating features like present price, manufacturing year, kilometers driven, fuel type, owner type, and seller type, the system predicts the market value of a car. Sellers can input their car details, and the system generates an estimated selling price, empowering them to make informed pricing decisions and optimize their selling strategies.

The implementation of these two systems not only provides users with personalized car recommendations but also offers valuable insights into the market value of cars. By leveraging cutting-edge technologies and utilizing extensive datasets, the Car Recommendation and Price Prediction System aim to enhance the car buying and selling experience for both buyers and sellers.

Overall, the implementation of both systems involves data collection, preprocessing, model training (in the case of the car price prediction system), user input handling, recommendation/prediction generation, and presentation through a user interface. The systems are designed to provide personalized recommendations and predicted car prices based on user preferences and input data.

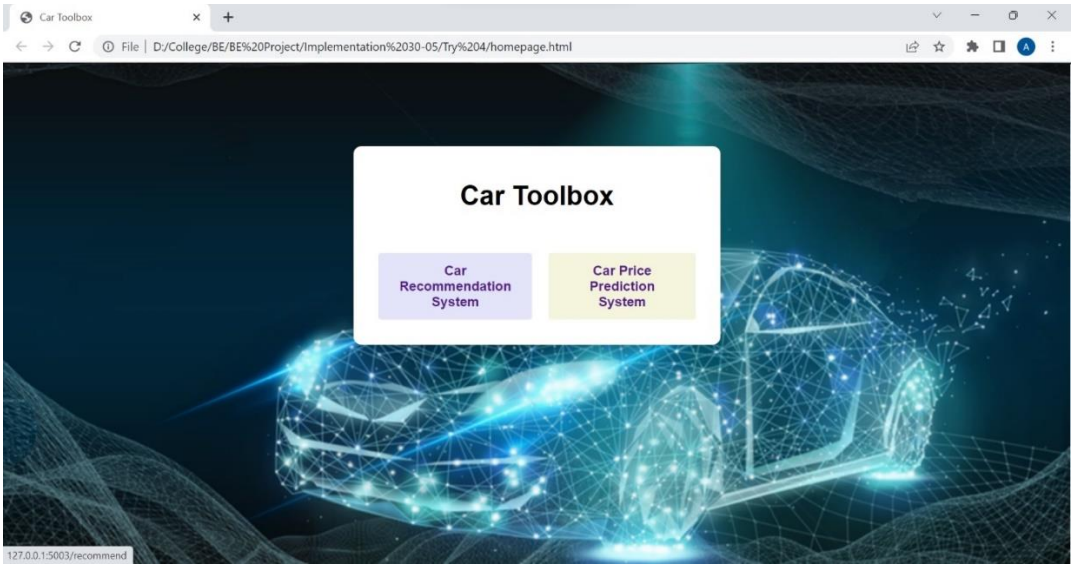


Figure 3 Car Toolbox

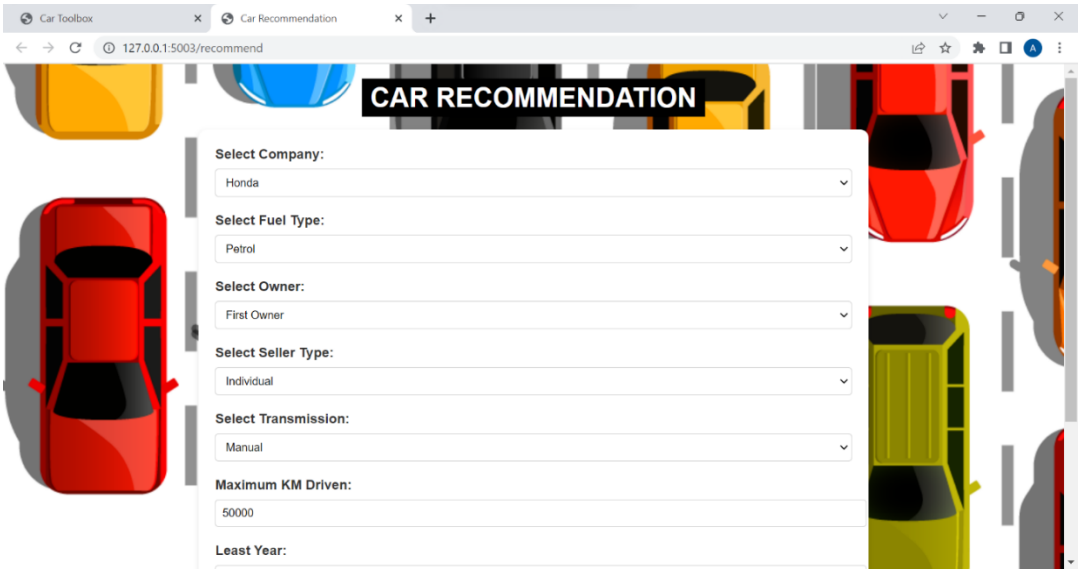


Figure 4 Car Recommendation UI

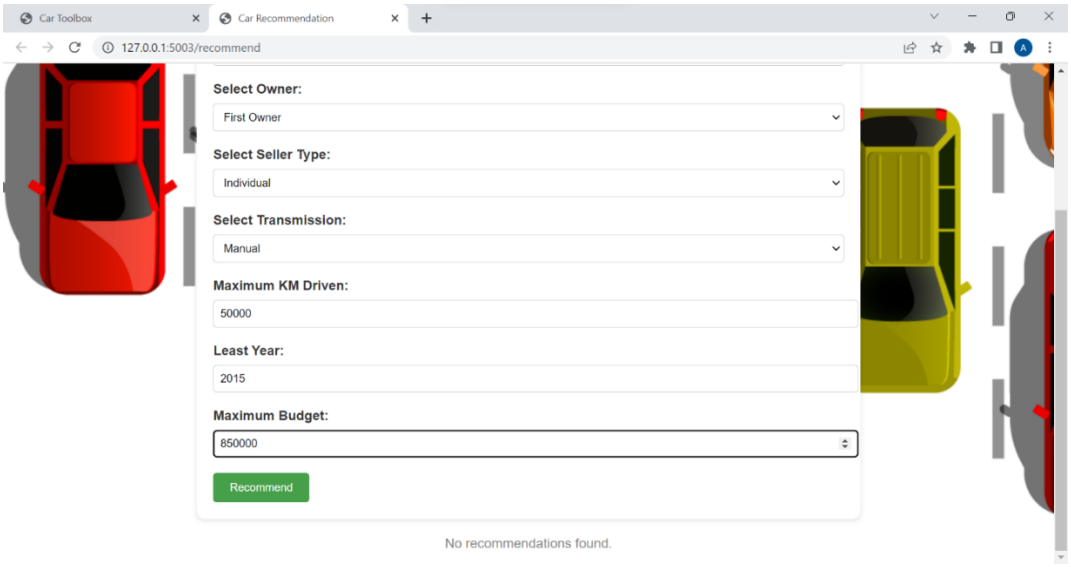
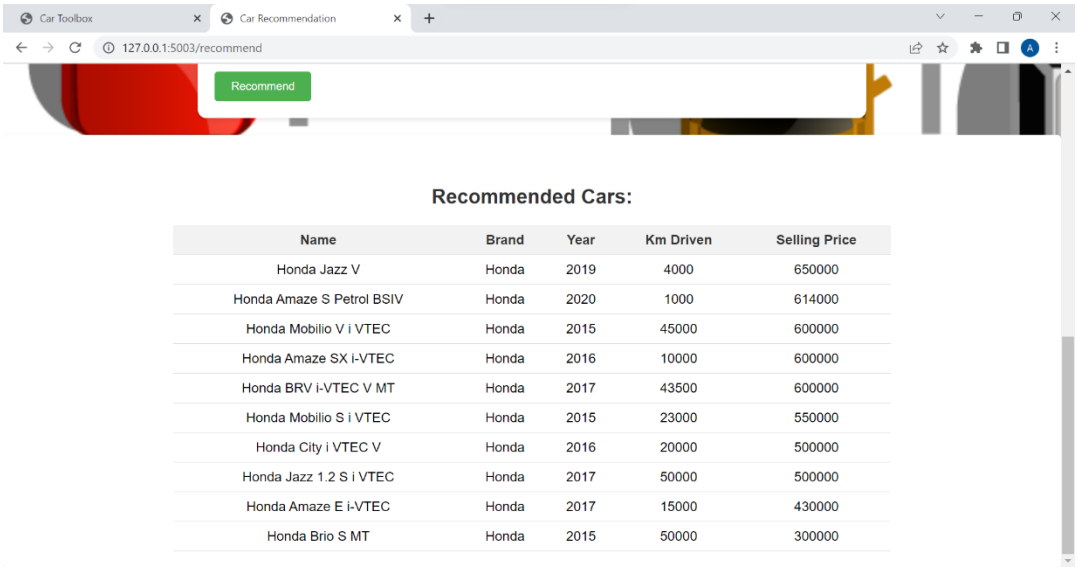


Figure 5 Car Recommendation - Input Values Entered



Name	Brand	Year	Km Driven	Selling Price
Honda Jazz V	Honda	2019	4000	650000
Honda Amaze S Petrol BSIV	Honda	2020	1000	614000
Honda Mobilio V i VTEC	Honda	2015	45000	600000
Honda Amaze SX i-VTEC	Honda	2016	10000	600000
Honda BRV i-VTEC V MT	Honda	2017	43500	600000
Honda Mobilio S i VTEC	Honda	2015	23000	550000
Honda City i VTEC V	Honda	2016	20000	500000
Honda Jazz 1.2 S i VTEC	Honda	2017	50000	500000
Honda Amaze E i-VTEC	Honda	2017	15000	430000
Honda Brio S MT	Honda	2015	50000	300000

Figure 6 Car Recommendation System - Output

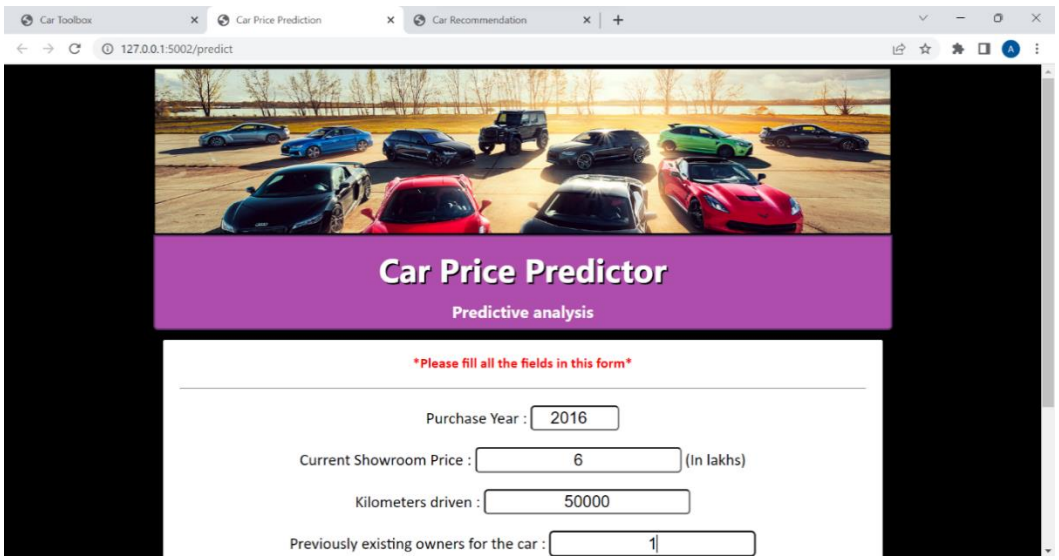


Figure 7 Car Price Prediction UI

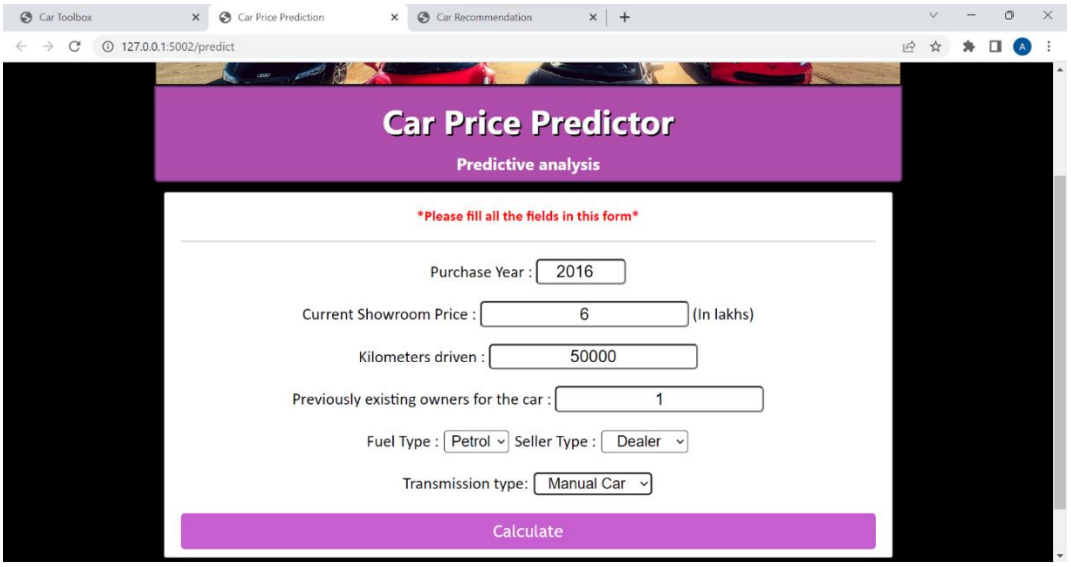


Figure 8 Car Price Prediction - Input Values Entered

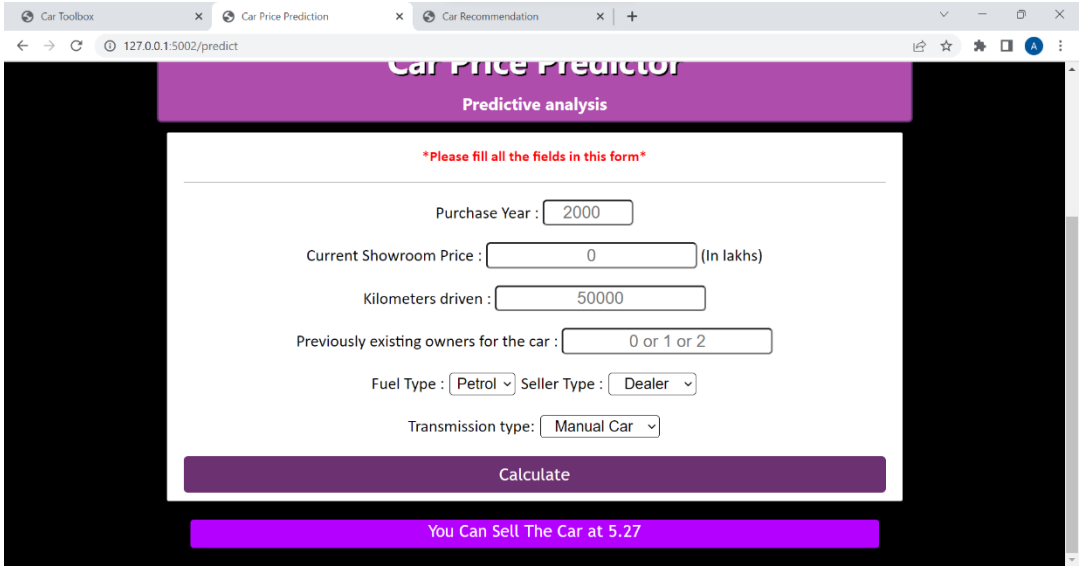


Figure 9 Car Price Prediction - Output

The car recommendation system utilizes a content-based filtering approach, considering various car features such as brand, fuel type, seller type, transmission, owner, and price. By employing cosine similarity and filtering techniques, the system effectively matches user preferences with similar cars in the dataset. This empowers users to make informed decisions and discover potential car options that align with their requirements.

On the other hand, the car price prediction system employs machine learning techniques, specifically random forest regression, to predict the price of a car based on relevant factors like the present price, manufacturing year, kilometers driven, fuel type, owner type, and seller type. This system assists sellers in estimating a reasonable price for their cars and enables buyers to gauge the fairness of a listed price.

5. CONCLUSION

The Car Recommendation and Price Prediction System offer innovative solutions to address the challenges faced by users in the automotive market. By harnessing the power of data analysis, machine learning, and intelligent algorithms, this implementation aims to empower users with personalized recommendations and reliable price

predictions, ultimately streamlining the car purchasing and selling processes.

The car recommendation and price prediction system presented in this implementation paper demonstrate the potential to enhance the car shopping experience. These systems provide valuable insights, personalized recommendations, and predicted prices, empowering users to make informed decisions and navigate the car market more effectively. With further improvements and refinements, these systems have the potential to revolutionize the way individuals buy and sell cars, improving efficiency and facilitating better outcomes for both buyers and sellers.

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