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Machine Learning Algorithms based car Purchase Predicting on Customers' Demands

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ABSTRACT

One major perk of shopping online is how easy it is to see exactly what things cost. Online retailers greatly benefit from dynamic pricing, even though it is not novel and many utilise it to boost profits. In order to develop the e-commerce platform with the aid of consumers, the suggested research is the outcome of an ongoing project that aims to expand a standard framework and relevant technologies utilising sound system learning algorithms to identify purchases at the optimal price (no longer the lowest price). One of the most visible sectors of the country's economy is the automotive industry. A growing number of people are opting to use this specific vehicle charging station. Prior to making a purchase, the buyer must determine whether the vehicle is suitable for his requirements. Parts, cylinder diameter, headlights, and, most significantly, pricing are just a few of the many criteria and considerations to think about when purchasing a new vehicle. In light of this, it is incumbent upon the buyer to choose an item that adequately satisfies all requirements. Ultimately, we want the consumer to make an informed choice about whether or not to purchase a vehicle. We set out to create a decision-making tool specifically for the car-buying process for that reason. For this reason, we suggest a few popular algorithms in our post to help make automobile buying more precise. Our dataset, which comprises fifty datasets, was processed using these techniques. The Support Vector Machine (SVM) stands out among these models for its impressive 86.7% prediction accuracy.

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INTRODUCTION

Offering products at various prices that change in response to client demand is the idea behind dynamic pricing, also known as price optimisation. Considerations such as supply and demand, conversion rates, and sales targets may influence the commodity's price [1]. A few other names for dynamic pricing are yield management, revenue management, and individual level price discrimination [2–3]. Another method to define dynamic pricing is as follows: adjusting the rates according on consumer will [4]. In addition, dynamic pricing refers to the process of tailoring inventory items to individual clients by dividing them into segments based on product choice and then providing them customised prices [5]. Also known as "real time pricing," this method uses the present state of the market to establish a product's worth in the context of a business transaction. Pricing is defined by the competitive environment among providers, the time of day, and the weather conditions [6]. It is a general word for the shopping experience. Retail, transportation, mobile communication, power, airline tickets, and countless more sectors are all affected by dynamic pricing. Retail has been booming recently [7] because to a number of factors, including better access to consumer demand data, decision-support tools made possible by new technologies, and more efficient pricing determination based on analysis of consumer patterns. Lower call prices, more competition, and better network infrastructure are the causes of the impact seen in the mobile communication industry [8]. The development of a direct-to-consumer business concept, which has an effect on the automobile sector, is a byproduct of better coordination between manufacturing processes and inventory choices [9]. In addition,

Due to the increased connectivity of networks, the fantastic idea of dynamic pricing has been at the forefront for some time now [10]. Reduced menu costs and the integration of client information into a comprehensive database are two ways in which this has benefited both buyers and sellers. Customers have benefited from the availability of the internet as a self-service resource, which has allowed them to save time. By combining online connectivity and automation with the idea of dynamic pricing, suppliers also gain in many ways. By doing away with the need for vendors to physically be present, it cuts down on input costs, consolidates consumer data into a single database, and lessens the financial burden of producing fresh catalogues. Furthermore, it is not a one-way highway between buyers and sellers, but rather an open forum for constructive criticism and discussion on service quality. Customers' willingness to pay varied prices, market segmentation, reduced arbitrage possibility, fair play regulations, and a revenue cost greater than segmenting and policing capital are all necessary for dynamic pricing to be a useful application [4]. Additionally, it may be used to sectors that have high fixed costs and low variable costs.

LITERATURE SURVEY

Depending on your budget, you may get high-quality components that are perfect for certain cars, while others cater only to well-known brands. Finding the ideal vehicle remains a challenge, despite the availability of information on factors like as colour, comfort, seating capacity, etc. [2]. That is why we set out to determine which algorithm provides the most accurate predictions for the purpose of purchasing an automobile. In their proposal, Fitrina et al. [3] provide an implementation of the Naive Bayes Classification algorithm. There is a basic probabilistic classifier called Naive Bayes. They used this strategy to forecast sales. A dataset consisting of 20 vehicles' purchase histories yielded a 75% accuracy rate. Data from several sources, including satellites, hearts, diabetes, and shuttles, were subjected to the powerful learning approach Support Vector Machinen (SVM) by Srivasta et al. [4]. Multiple classes are present in those databases. Their report also includes evidence from their research of the comparative impacts of using different kernel functions. According to Ragupathy et al. [5], it might be beneficial to compare different machine learning algorithms. They

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made an effort to categorise and determine the major text's communicated emotion in their work. Twitter, blog comments, news articles, status updates, and other social media have all contributed to their data collection. Additionally, for the sake of comparison, they used Naive Bayes, Decision Tree, K-Nearest Neighbour, and Support Vector Machine classifiers. They set out to determine the most effective categorization method, and support vector machines (SVMs) had the highest accuracy, at 72.7%. Using supervised machine learning, yet another prediction method

Noor et al. [6] put forth the idea. To make their price prediction, they used multiple linear regression. Their approach had a 98% success rate. To forecast the prices of pre-owned vehicles, Pal et al. [7] put forth a technique. In order to forecast how much secondhand automobiles will cost, the authors of the study used a Random Forest classifier. They built a Random Forest using 500 Decision trees to train the data. The final results showed a training accuracy of 95.62% and a testing accuracy of 83.63%. To further forecast the value of pre-owned vehicles, Pudaruth et al. [8] put forth an alternative technique. The author of the study employed a variety of methods for making predictions, including multiple linear regression analysis, k-nearest neighbours, Naive Bayes, and Decision Tree. The supervised machine learning method was suggested by Osisanwo F.Y. et al. [9]. They detailed and contrasted seven distinct supervised learning techniques. On top of that, they discovered the dataset's optimal categorization method. Alternatively, R. Busse et al. [10] suggested a method for purchasing automobiles. The psychological impact of weather was given precedence in their article. They used two important psychological mechanisms, projection bias and salience. Veneget al. [11] presented a novel method for defect classification that uses class label prediction for the "severity" tuple. The data tuples were characterised by a number of attributes, including Phase, Defect, Impact, and Weight. Their prediction was aided by the Naive Bayes classifier.

purpose. In order to study automobiles, Jayakameswaraiah et al. [2] created a data mining system. In order to forecast the correct vehicle, they suggested the TkNN clustering technique. They also demonstrated how their new TkNN clustering method compares to KNN. Gegic et al. [2] presented an additional method for predicting vehicle prices using three machine learning algorithms. When all ML approaches were combined, they achieved an accuracy of 92.38 percent. Jabbar et al. [3] suggested an additional piece of medical work for the purpose of diagnosing cardiac illness. Predictions were made using the K-nearest-neighbor (KNN) method. The algorithm is quite accurate and performs brilliantly. In order to forecast the value of used vehicles, Peerun et al. [4] laid forth a method. Artificial Neural Networks were used in their article. They tested it using a variety of machine learning algorithms on a dataset consisting of 200 vehicle records. A research on prediction was provided by Yuan et. al. [5]. He looked at search data from the internet in an effort to forecast the sales of automobiles. There are, of course, more difficult works among these famous ones. Consequently, we want to determine which of four popular machine learning algorithms provides the highest level of accuracy for our dataset by comparing their performance.

1. AN OVERVIEW OF PROPOSED SYSTEM

The proposed model considers the amalgamation of three different techniques to identify the customer segments, appropriate pricing for them, and the prediction for their likely purchase within that price range. The is the first and foremost step in the process of the framework. It involves the collection of data from various data points under an integrated database. For the research purpose, we used a subset of an online marketplace data the schema of the two data sets.

Algorithm:

We need to train our computer to learn before we can make any predictions. With the right algorithm, such machines can learn. Machine learning algorithms may be broadly categorised into three groups.

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Three of these methods are known as supervised, unsupervised, and semi-supervised learning. Among them, supervised learning algorithms were selected. These include the Random Forest tree, K-nearest neighbour algorithm (KNN), Naive Bayes, and Support Vector Machine (SVM). 1) Baisic Naive: One mathematical approach to classification issues is Naive Bayes, which is based on the Bayes Theorem. It is a well-known, easy-to-understand learning algorithm that gets the job done. The belief that it shortens computations is what gives it its naive reputation. Things that are close together or comparable are what the KNN algorithm focuses on. That's right; it presupposes to calculate all those comparable things that happen in the immediate vicinity.K-NN are recognised by another name:

neglectful student. The reason being that it has no interest in learning a discriminative function system from the training data and can simply memorise the training dataset.

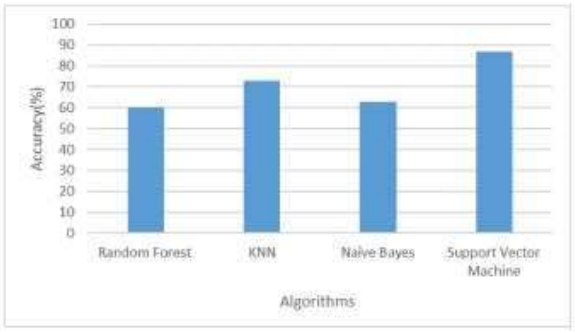

Fig. Accuracy of Several algorithms.

Support Vector Machine outperforms Random Forest, K-nearest Neighbour (KNN), and Naive Bayes in terms of accuracy, coming in at 87.6%. This indicates that out of 50 datasets, Support Vec tor Machine is able to categorise 44 instances of vehicle purchase data. Predicting the price of an automobile has been the subject of several studies throughout the years. A number of machine learning approaches are used in various studies. Using the Naive Bayes algorithm, a technique was able to achieve a 75% success rate in forecasting purchases [3]. Another study that employed Random Forest to forecast the pricing of secondhand automobiles had an accuracy rate of 83.63% in the test [7]. A review study employing Cosine Distance yielded an accuracy of 86.7% when combined with Support Vector Machine, according to our suggested strategy. When faced with increasingly large data sets, some classifiers, such as the Naive Bayes classifier, struggle.

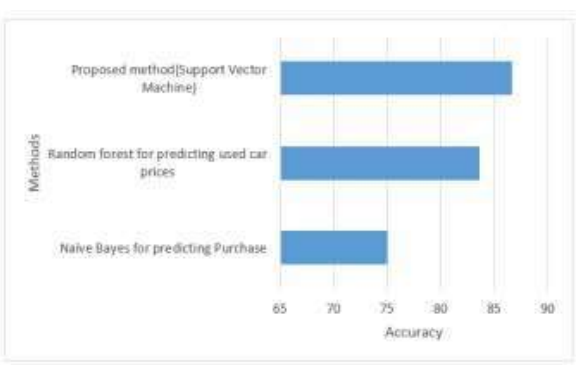

Fig. Comparison with Other Methods

CONCLUSION

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In order to anticipate an online shopper's actions and allocate a suitable price range according to Dynamic Pricing, the suggested framework was developed using the potent tools of Machine Learning, Data Mining, and Statistical Methods. The results of this framework's testing on a big dataset for an e-commerce corporation are promising enough to fully deploy it. A more accurate pricing range that benefits the client and the business is established with a much lower mistake rate. It is possible to tailor the overarching framework to meet the needs of certain online sectors. It is probable that the findings will be presented in the subsequent section of this investigation.

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