

## Marketing Policy In Service Enterprises Using Deep Learning Model

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Submitted: 01/10/2023

Revised: 20/11/2023

Accepted: 02/12/2023

**Abstract:** Consumer awareness has risen to unprecedented heights as a result of scientific and technological progress, yet the economic model of established markets is crumbling quickly as a result of the same factors. Marketing strategies in the Internet age need constant updating and optimization to reflect the changing demographics of the customer base. This research provides a high-level summary of the relationship between sales strategy and psychology. Then, it employs the deep learning technique neural network architecture to build a fusion model for preference prediction. The proposed technique is then evaluated with the conventional metrics. Collaboration and outsourcing, job complexity and autonomy, and work organization and innovation were found to have the greatest positive effects on corporate success and well-being. Organization and creativity in the workplace are also essential. The prediction of sales is shown in the result, public opinion and the internet search index results in a 17.5% improvement in the accuracy of the model predictions. This allows the enterprises to improve both the accuracy of their sales forecasts as well as the reliability of the references they provide for future negotiations.

**Keywords:** Marketing Policy, Service Enterprises, Deep Learning Model

### 1. Introduction

One of the key areas of attention that this organization has always placed a strong emphasis on is their ability to provide accurate estimates regarding future sales. It is vital that all suppliers establish a method of forecasting that is both more accurate and takes less time if they are to continue to provide marketing organizations with the ability to maintain their level of productivity. It is not desirable in the fast-paced world that we live in today to carry out this process manually due to the fact that it presents significant risks to the management of the company and, more importantly, because it would take a significant amount of time to carry out [1]. In other words, it is undesirable. The world of business is critical to the health of the economy as a whole; as a consequence, it is under consistent pressure to keep up with rising consumer demand in order to ensure its own continued viability.

One of the key goals of businesses is normally to focus on a specific segment of the consumer population that makes up a given market. Because of this, it is of the utmost

importance that the business has, through the application of a system of forecasting, been successful in accomplishing the goal at hand [2]. In order for analysts to produce reliable projections, they must first examine a wide variety of data, which may include patterns in the applicable industry, the activities of clients, and a variety of other aspects.

It is possible that companies will improve their ability to manage their money with the assistance of this study [3]. The method of forecasting can be applied in a range of settings, such as the estimation of future sales volumes and the projection of product demand, to name just two examples of these applications [4].

Because of the existing circumstances, there is a fantastic opportunity to make use of machine learning. Machine learning is a subfield of computer science that focuses on teaching computers how to outperform people in a variety of different occupations. They are put to use so that a certain activity can be carried out in a methodical manner and so that the outputs can be enhanced for the benefit of modern society [5]. Specifically, the activity in question is: The mathematical arts are the foundation of machine learning, which enables the development of a broad variety of paradigms that may be utilized in an effort to get closer to the output that is ideal. This progress was made possible because the mathematical arts form the base of machine learning [6]. The same can be said for sales projections, which is another another field in which machine learning has been shown to be of considerable use. It helps to produce more accurate estimates of future sales, which is a contribution that it makes.

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It is vital to have an accurate sales estimate in order to assist in production planning, which will eventually help improve business. This is because precise planning will help improve business. This is due to the several elements. The information contained in these articles shines a bright light on the complexity of the act of forecasting and brings it into harsh relief. The following activities are intended to help achieve the purpose of this case study, which is to provide a constructive contribution to the solution of issues linked with sales forecasting:

- 1) Forecasting varied variety of factors that could potentially affect sales performance.
- 2) Assessing the accuracy with which deep neural networks (DNN) can estimate sales at retail apparel businesses. Existing models that were built to answer this problem usually focus their emphasis on a limited percentage of the variables that are known to have an effect on sales.
- 3) Because the application of deep learning in this setting is still in its formative stages, conducting research on this subject is something that should be prioritized. The following above three issues will be the primary focus of this conversation.

## 2. Sales Forecast

Even though it is indisputable that the application of data analytics techniques makes a contribution to the improvement of forecasts as a result of their increased objectivity and higher reasoning capacities, special consideration should be given to the inputs that come from the domain experts. This is because the application of data analytics techniques makes a contribution to the improvement of forecasts. Despite the fact that the implementation of data analytics techniques makes this contribution possible, this is still the case [7].

Numerous studies drawn from a diverse range of academic fields have been carried out in order to investigate the value that can be added to forecasting models by including expert opinion in the process of model construction. This aims to determine whether or not the incorporation of expert opinion can improve the accuracy of forecasts. This research has shed light on the critical significance of incorporating human insight into the forecasting process whenever it is necessary to make adjustments. It is possible that these modifications will need to be made because new information has come to light or because extraordinary events have taken place. They may also be required by other kinds of circumstances [8].

Numerous studies have shown that when forecasting models are developed combining expert knowledge and data analytics tools, the results are considerably better than when using either method separately. This has been shown to be the case when comparing the results of using either method individually. Despite this, no research has been found that

can accurately forecast sales in the retail fashion business by factoring in product characteristics and the opinions of subject matter experts [9].

The influence of incorporating human knowledge into seven different data mining categorization systems. Their research was conducted within the context of indirect bank lending. They came to the conclusion that incorporating domain expertise into the modeling process led to the production of superior results across the board. Due to the significance of the ramifications that this discovery brings, it is possible that it will have a big impact on the industry of data mining, which has traditionally relied more on automated procedures than the discretion of human analysts[10]. The majority of research focuses on predicting sales for entire product categories. They used a combination of clustering and neural networks to create a decision support system that predicts the popularity of new products based on their features and similarities to existing ones. This work is a standout example because it demonstrates how a combination of these two techniques can produce accurate results.

## 3. Proposed Method

Machine learning algorithms can't make use of data in its original, unprocessed form; rather, in order for it to be incorporated into models, it needs to be in a form that has been appropriately constructed. This stands in stark contrast to more conventional learning algorithms, which keep the data in its raw form. The process of identifying what sorts of information are required for the vehicle to make judgements about how it should be used is referred to as preprocessing[11]. The preparation of data consists of carrying out all of the following steps in sequence:

- 1) Importing the dataset: The first thing that has to be done in order to generate an accurate forecast of the future sales or demand of an item outlet is to import the dataset that we utilized in our research and that was collected from a grocery store. This is because the data was collected from the grocery store.
- 2) Data Cleaning, During the second stage of the process of cleaning the data, you will be tasked with removing from the data some columns that aren't necessary for the output of the algorithm.
- 3) Handling missing values: Third, in order to guarantee that the input to the model is consistent, it is essential to perform any necessary manipulations on any missing data.
- 4) Encoding categorical data: It is vital to have a significant amount of numerical data to back up our hypotheses if we want to get the most out of machine learning. If we want to get the most out of machine learning, we need to get the most out of it. This is due to the fact that the principles of machine learning rely on mathematical models in order to solve problems.

5) Feature scaling: In order to improve the accuracy of our calculations and cut down on the number of mistakes that are made, one strategy that we may use is referred to as feature scaling. This strategy entails resizing the data in a manner that is both exact and scalable. To begin, it inhibits the algorithm from making use of data that contains a wide range of variability, which finally leads to an improvement in the correctness of the outputs produced by the algorithm[12].

6) Extracting variables: The terms dependent variables and independent variables refer, respectively, to the variables that are finally compared to one another and evaluated. With knowledge of the independent variables alone, it is possible to make an accurate prediction of the results. The properties or input components of a model that cannot be altered are referred to as independent variables.

7) Splitting the dataset: Overfitting, importing two distinct datasets for the train and test stages is not done. The term training dataset refers to the collection of data that is used in the process of educating the model. This process may take several iterations. The term test dataset refers to any dataset that has the potential to be utilized in the production of an accurate prediction.

#### *Prediction*

We construct a baseline model by utilizing q-order autoregressive models to forecast sales. This model will be used to predict sales in the following months. The dependent variable in this model is the variable  $t$ , and it is used to make sales predictions. We include a time dummy variable ( $dt$ ) in the model that we developed for this study. To be more specific, we are interested in determining how to adjust for the impact of frequent releases of regulations.

The sentiments that consumers hold toward a certain brand or product can have a significant bearing on the amount of business transacted with that entity. The fact that intelligent cars have their roots in the Internet and are constructed in a manner that makes them susceptible to being influenced by their online environments gives them a genetic propensity to be such affected. In order to obtain an intelligent automobile sales forecast model that is more precise and accurate, this article makes use of the big data technology that is based on the sales prediction model that is based on prior sales data.

This model is based on the data that was collected from previous sales. A mathematical formula is defined by adding the influence of Weibo sentiment and Baidu index on sales volume in order to obtain a sales forecast model that takes into account both online public opinion and online search index. This is done in order to obtain a model that can accurately predict sales and takes into account both of these factors. This is done in order to acquire a model that has the ability to effectively predict future sales.

People who have a significant amount of influence have the potential to affect the sales of things. The term disruptive leader (DL) refers to individuals who are recognized as influential thinkers and frontrunners in their respective industries. Evidence gained from academic studies as well as the marketing efforts of particular companies indicates that DLs have been shown to have a major impact on the market share of smart automobiles. On the other hand, the comments made by DLs and those made by the general public were given the same amount of weight and were put together in the model that came before this one. The study was unable to provide an accurate reflection of either the influence of DLs or the subject of whether or not the comments made by DLs were more important for sales prediction.

This research is an improvement above previous efforts because it focuses entirely on DL sentiment on Weibo, where sentiment is defined as Weibo postings that have earned more than 50 likes or comments. The purpose of this investigation is to construct a model for estimating future sales that takes into account both DL online public opinion as well as its online search index.

Building on the base of the traditional sales prediction model and adding DL online public opinion and online search index, we will apply the LSTM deep learning algorithm to optimize the model at a deeper level than was previously achievable. This will make it possible for us to obtain an intelligent model for predicting vehicle sales that has a high level of accuracy in its predictions. The LSTM deep learning method will be utilized in order for us to accomplish this goal.

#### **4. Results and Discussion**

It can be fairly advantageous to develop sales estimates for autonomous car makes and models by taking into account online public opinion as well as the online search index. This can be the case if the projections are accurate. When compared to the accuracy of the prediction model before the modification was made, the accuracy of the prediction model after factoring in online  $p$  It can be fairly advantageous to develop sales estimates for autonomous car makes and models by taking into account online public opinion as well as the online search index. This can be the case if the projections are accurate. When compared to the accuracy of the prediction model before the modification was made, the accuracy of the prediction model after factoring in online public opinion and the internet search index results in a 17.5% improvement in the accuracy of the model predictions. This improvement can be seen when comparing the accuracy of the prediction model before the modification was made to the accuracy of the prediction model after the modification was made. The prediction of sales is shown in Table 1 to Table 4, public opinion and the internet search index results in a 17.5% improvement in the accuracy of the

model predictions. This improvement can be seen when comparing the accuracy of the prediction model before the modification was made to the accuracy of the prediction model after the modification was made. The prediction of sales is shown in Table 1, Table 2, Table 3 and Table 4.

**TABLE I** PREDICTION OF SALES FOR VARIOUS PRODUCTS

Products	Predicted Value
Personal products	0.8482
Car	0.9108
Clothing	0.9753
Food	0.9408
Baby Products	0.6306
Vehicle	0.6733
Grocery	0.8116

**TABLE II** PREDICTION FOR A DAY

Products	Prediction for a day
Personal products	0.8808
Car	0.9600
Clothing	0.9882
Food	0.9648
Baby Products	0.6971
Vehicle	0.7431
Grocery	0.8611

**TABLE III** PREDICTION OVER A MONTH

Products	Prediction over a month
Personal products	0.8825
Car	0.9600
Clothing	0.9893
Food	0.9588
Baby Products	0.6971
Vehicle	0.7424
Grocery	0.8442

**TABLE IV** TRAINING/TESTING RESULTS

Products	Training	Testing
Personal products	0.8981	0.9015
Car	0.9600	0.9600
Clothing	0.9898	0.9926

Food	0.9754	0.9795
Baby Products	0.6962	0.6999
Vehicle	0.7396	0.7403
Grocery	0.8539	0.8549

In terms of the public opinion that can be found online, the public opinion that can be found on DL has a much bigger impact on the accuracy of sales projections than the public opinion that can be found among the general population. When the accuracy of this model forecast is compared to the accuracy of a model constructed on historical sales data, taking into consideration DL online public opinion results in an improvement of 35% in the model accuracy. This is because taking into consideration DL online public opinion improves the likelihood that the forecast will be accurate. As a consequence of this, it is abundantly clear that DL has an impact on sales forecasting that is substantially more significant than the opinion of the general public on social media. This is the underlying reason why ordinary consumers get the impression that the businesses they patronize do not take seriously their ideas and feedback that they submit online. This perception is popular among regular consumers.

On the other hand, given that only long-term trends can be reliably predicted, the model is only capable of accurately predicting those trends. The addition of online public opinion as well as an online search index has the potential to increase the accuracy of sales projections by reflecting current events and news trends that are prevalent on the network. This has a positive influence on the ability to predict short-term variations in the latter time, as well.

It is feasible that differences in the short term during the early stage have a predictive influence; however, this is not yet completely clear. Nevertheless, it is possible.

## 5. Conclusion

This article provides a summary of a study that investigates the connection between sales techniques and behavioral science. The study was conducted by the authors of this article. After that, it constructs a fusion model for preference prediction by making use of the neural network architecture that is applied in deep learning. We strongly advocate giving careful consideration to a wide variety of deep learning strategies while conducting research and putting together a sales prediction. These strategies can be found in a wide variety of contexts. Enterprises are able to improve the accuracy of their sales forecasts as well as the reliability of the references they provide for future negotiations by selecting deep learning algorithms that are tailored to their specific needs and training their models on the enterprise own data.

This allows the enterprises to improve both the accuracy of their sales forecasts as well as the reliability of the references they provide for future negotiations. There will be a marked increase in both the accuracy and the dependability of the references that are offered for any future discussions that take place. We evaluated the approach based on our established standards, which we then applied to the method that was proposed. It was discovered that the factors that contributed the most to the success and enjoyment of a company were collaboration and outsourcing, job complexity and autonomy, as well as work organization and innovation. The ability to achieve success in one professional efforts requires both organization and inventiveness on the part of the individual.

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