

Product Suggestion for Customers using Analytics

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Abstract - With the rapid growth of the internet and the advent of emerging technologies, more businesses today are moving their customer-facing operations online. This causes increased competition in the industry, which requires businesses to determine other ways of attaining a competitive advantage within these increasingly competitive markets. Due to the rapid increases in e-commerce websites and stores, it is harder for any business to stand out. A key element in enabling this is by improving customer experience, retention, and conversion rates. One of the ways this can be done is by improving product recommendations. This is important as it prevents information overload as only the products the user is interested in will be presented to them and prevents many from seeking out alternatives since what they want is immediately displayed. While there are different ways of implementing this functionality in a site, one of the most promising is Natural Language Processing (NLP). This is used to determine consumer sentiment and can prove useful when trying to improve the efficiency, effectiveness, and accuracy of product recommendation algorithms.

Key Words: Machine Learning, Natural Language Processing, Product Suggestion, Data Analytics, Sentiment Analysis

1. INTRODUCTION

With the rapid growth of the internet and the advent of emerging technologies, more businesses today are moving their customer-facing operations online. [1] In particular, e-commerce has emerged as one of the most profitable industries as more things become digitized and available at the click of a button. As more people shop online and the demand for online

products increases, businesses are beginning to recognize the importance of consumer satisfaction [1]. Consumer satisfaction gives rise to consumer loyalty and other benefits such as word-of-mouth advertising, all of which contribute to a prime advantage; increased profitability. Understanding what might satisfy a consumer is vital as it helps avoid problems such as consumer churn, reduction in customer conversion rates, and reduction in revenue. [2]. Consumer churn occurs when a given customer is dissatisfied with a product or the services they received and turns down any future services related to the seller. In this regard, businesses in the online world must develop methods of not only reading customer sentiment, bearing in mind the lack of face-to-face communication but also accurately determine the products that consumers might be interested in and, in turn, make sure that this gets seen by the customer.

In a world where more e-commerce is fast becoming saturated with different sellers offering rival products and services, a business should understand its consumers [2]. This will allow them to know which products they may want, when they want them and how to present these products to them. One-way businesses have tried to enable this is by better understanding the purchase decision. Numerous factors may influence an individual's purchase decision. However, apart from the rational ones such as price, there are others such as cognitive, social, and emotional factors. Together, these factors are often considered under the umbrella term, consumer sentiment. This paper argues that by taking these factors into account when modeling the purchase decision process, businesses can better

models that would paint a better picture of users' shopping patterns on the site. In essence, by understanding their behavior on the site, businesses can better predict what they might be interested in [6]. Following the success of these methods, more businesses are expanding their use and considering data analytics, especially within the realm of predictive analytics and big data, to understand clients better.

Predictive analysis uses statistical calculations and historical data to determine what is likely to happen in the future. The methods within the predictive analysis were previously used in business analytics to predict the future market of a given product or service [4]. In most cases, descriptive modeling is used. In this regard, the relationship between different elements, such as consumers and products, might prove useful. However, according to Khade (2017), this is not enough. For businesses to succeed, they need to not only know and anticipate what consumers might want but also when they may want [6]. This is the essence of prescriptive analytics.

Prescriptive analytics is very similar to predictive analytics, with the main difference being prescriptive analytics anticipates what, when, why particular events may happen, and even influences what happens [6]. As such, it can be used by businesses to take advantage of these situations. The method uses machine learning algorithms, heuristics, and other methods to predict future behavior. Various scholars have thus far showcased how recent improvements in technology have not only significantly improved computer processing speeds and efficiency, but also how this has improved machine learning. In this regard, methods within the realm of machine learning can be used to improve product suggestion algorithms and with the improvements in technology, do so in a far more efficient and effective manner.

One crucial factor that has to be kept into consideration is the fact that most predictive systems operate on current observed data. However, since behavioral outcomes are caused by factors in each consumer that are in constant flux, there is a need for new methods or ways of recognizing these changes beforehand [7]. It is important that the right tool that would allow for data to be analyzed both in real-time and previous data to help create a better

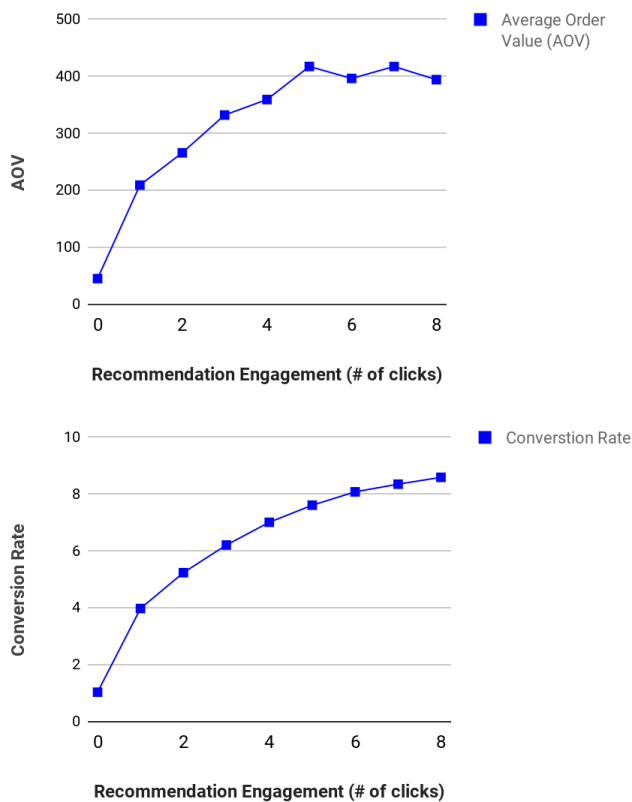
understanding of each consumer. According to Khade (2017), the changes that offer other people a window into another's emotions are their words, or at the very least, how they are communicating [6]. However, computers currently do not have a way of understanding certain aspects of language such as sarcasm, happiness, etc., and can therefore not connect. This is where NLP comes in.

3. PROPOSED SYSTEM

Based on the review above, it is evident that in most cases, the algorithms used in recommendation systems try to guess the interests of a particular user based on past behavior or other users' behavior [5]. This introduces a large margin of error and the business may recommend the wrong products to some users. The proposed system that would meet the requirements outlined without the disadvantages of the other methods will entail sentiment analysis using NLP and other additional machine learning algorithms. These would be used in a predictive analysis to determine the best products to suggest to a given customer that would interest them [4]. In simple terms, NLP is an artificial intelligence-based solution that helps computers understand, interpret, and manipulate human languages. It refers to computer systems that can process human language and derive meaning. It is often used when trying to determine sentiment, or the tone of a written or spoken message and tag the message as positive, neutral, or negative [8]. Combined with sentiment analysis, otherwise referred to as opinion mining or emotional intelligence, a business can better analyze communication with its consumers and better judge their preferences in real-time. Using the information from such analyses, companies can determine a consumer's perception and sentiment regarding a particular product and whether or not they should recommend it to the user.

Based on the outline above, sentiment analysis and NLP can prove useful when matching consumers' intent with the content or product on one's site. Since the algorithms process the most recent change in consumer sentiment, they can predict what might happen next and essentially introduce the prescriptive element of the whole model [8]. This would allow the business to determine when the consumer might be interested in a product and, in so doing, recommend it to them. As shown in the graph

below, such a system has been proven successful in the past, where businesses reported increases in average order value (AOV) by ensuring personalized product recommendations [7]. These recommendations were also associated with higher conversion rates. As such, while other methods have proven efficient, methods that ensure personalized recommendations yield far better results with regard to profitability.



Since these are learning algorithms, the base algorithm will have to be trained on the type of language the business is interested in. This can be done using previous data from collaborative and clustering filtering methods. A user's comments and their resulting decision can be taken into consideration. Types of products can also be considered in the process to ensure that the algorithm can make sense of how different products and other factors such as time play into the ultimate purchase decision. These factors can then be compiled into a single model that is run against every user action or communication-based activity. This would provide the real-time element of the approach.

4. USER SEARCH IMPROVEMENT

One key aspect that many businesses overlook is their search algorithms [3]. While slightly different in how recommendation algorithms work, search still acts as an important element in any given site as it allows users to not only define what they want but also allows the business to show the user the items that match their interests per the search term [9]. In essence, it is an opportunity for the business to showcase what it has that the user might be interested in, based on the search terms. According to a poll by Barilliance, cited by Serrano, ineffective search functionality is one of the major reasons consumers may leave a site for another [9]. The first ten seconds of a page visit are critical towards determining whether the user will stay or leave. As such, it is vital that the business not only place the right products in front of the user immediately but also place relevant products when the user defines what they want using the search functionality.

To this end, NLP can also prove useful in understanding search and determining what exactly a consumer might have meant or wished to see based on the query. One of the ways businesses can implement NLP is by using semantic search [3]. Semantic search allows users to obtain relevant search results even when using their unique queries. NLP is used to determine intent, which can then be passed to the search functions that bring out products deep in the merchant's catalog in the least amount of time [9]. Providing fruitful search results is a key element in improving user experience on one's site and has been proven to be far more efficient at keeping user engagement and conversions higher than normal text-based search.

5. CONCLUSION

As more products are being sold online and more businesses transition to e-commerce, information overload is fast becoming an issue that is preventing most businesses from attaining success in the industry. Fortunately, using sound recommendation techniques, these businesses can change this. Based on this paper's findings, while other product recommendation techniques have been effective, they are associated with limitations and demerits that, with time, become costly for any business. Fortunately, due to improvements in technology,

other methods such as NLP are becoming more popular. Businesses can now use this and other machine learning techniques to not only improve product recommendations and search functionality but also overall business operations as these methods can help the business better relate with other entities.

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