

Analysing the Emotions of Food Products Reviews using NLP and Adaboost Algorithm

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Abstract- In the modern world, communication takes place over a large geographic region, and the Internet is expanding. Social media platforms enable text-based communication and human contact using either Emojis or text. The ability to express one's emotions through emotion is crucial to human existence. Speaking, making gestures, showing facial expression, and writing in comments are all ways to express emotions. A fascinating field of study has just arisen, and researchers are delving deeper into a variety of sorts of analysis, with emotional analysis being the most popular. Emotional analysis comes in three flavours: positive, negative, and neutral. Giving computers the ability to perceive, comprehend, and elicit certain emotional traits in a manner similar to those of humans is the aim of emotional computing so that they can communicate naturally, amicably, vividly, and with the same emotional intelligence as people. The development goal of the next-generation computer is to figure out how to humanise it and adaptively create the cosiest discussion atmosphere for the dialogue objects. In today's fiercely competitive business environment, gaining knowledge about consumer habits, wants, preferences, purchasing trends, and decision-making processes is crucial for brands and businesses. When determining the breadth and type of emotional analysis based on food reviews and feedback in e-commerce, our research will take a close look at the most often held points of view. A study on emotional analysis is required for social platforms because the information may become popular and have a big impact on social life. Emoji-based text-based emotion recognition is related to the NLP area (natural language processing). Additionally, we suggested the Adaboost algorithm as an approach to identifying emotion using only emojis. These techniques address the issue of identifying emotions both within and outside of sentences.

Keywords—Emotional Analysis, Data visualization, User Experience, Food products, Adaboost Algorithm, Natural Language Processing.

I.INTRODUCTION

People are increasingly vocal about their product-buying experiences via reviews now that almost everything is posted online. Reviews may be very useful for both consumers and producers to learn about consumer preferences and make decisions regarding products. Our feelings are frequently used to describe an emotion, which is a purely subjective state of being. Emotions result from the interaction of individual experience, language, overall findings, and physiological reactions. Systems that analyze emotions or recognize emotions examine people's faces, voices, or other physical characteristics in an effort to forecast emotions or infer mental states. While online, a social platform can be utilized to interact or communicate digitally. Amazon, Flipkart, and a long list of other social platforms and e-commerce sites are just a few examples.

The growth of mobile Internet has increased consumer demand for online purchasing, which presents fantastic growth potential for e-commerce platforms. In a human-computer interface, recognizing emotions from an e-commerce platform for food products is essential. Emotions can aid in decision-making and the processing of cognitive relationships. Positive and negative emotions make up the two main categories of emotions. Interest, laughter, and other positive feelings include happiness. Fear, rage, despair, and other adverse emotions are examples. Emotion can be detected in a variety of ways, including through speech, facial expressions, text, emoticons, and images. For many scholars, emoji analysis is the most difficult of all types of techniques. Here, the focus is primarily on emoji-based emotion analysis. This methodology ought to produce a more accurate result for identifying emotion.

The electronic business platform simultaneously lowers commodity prices while raising product quality. Otherwise, it is imperative that businesses understand their customers' emotional tendencies in order to evaluate data, mine internal data, and assist companies in improving service quality and luring in more customers. Therefore, these publications choose the online commentary data of food products on Amazon, eBay, etc. Online reviews of customers are a requirement for many online business that takes control over its reputation. Customers have profited from customer evaluations, which have also enabled businesses to market to them in novel ways.

In order to build lasting relationships with customers and recruit more trustworthy ones, reviews help firms position themselves for future business chances. The article's main focus is on customer feedback analysis, which provides a more thorough study of the goods and services on offer. Customer review analysis is one of the most well-known techniques for getting consumer opinion through their feedbacks. Consumer reviews can be difficult to read and understand since there may be several conflicting viewpoints and each review may contain a lengthy and in-depth amount of material. The manual analysis of these reviews takes a lot of time and effort.

A solution is therefore put forth for the practical examination of customer feedback. Natural language processing will be used to condense each customer review. Sentiment analysis will assign tags like "good" and "negative" to the summarized texts (reviews) using the translated content of the customers' reviews. Users can learn a lot about a certain product by looking at the overall positive, negative, and neutral reviews of that product.

There is different work consulted, Emotional analysis on food products reviews was presented in [1]. The goal of the research team's work is to propose an automated method that focuses on employing sentiment assessment based on aspects to gauge the degree of disagreement among internet users regarding various features of food goods. To use a component of the field of NLP called emotional analysis, the unstructured data from these evaluations may be transformed into structured data demonstrating popular opinion. Sentiment analysis is the process of identifying individual viewpoints on a subject from a text [2]. The experimental findings presented in this study indicate that the Text

CNN system outperforms the Bi-LSTM and Made with different fine-tuning models by 3 to eight basis points in regards to reliability, accuracy, recall, and F1 valuation. The results shown that Text-CNN handles short text discussion data with high text analysis accuracy and good sentiment classification impact as a farm products e-commerce platform. By using the emotional version of marketing review data as a key reference, manufacturers may more readily differentiate between customer comments [3]. In this study, sentiment analysis of the support for KFC Salted Egg was conducted using Twitter and YouTube. For this investigation, the Naive Bayes approach was selected since it is reliable at classifying feelings. The Naive Bayes method has an accuracy range of 82%-85.95%, per a study on sentiment analysis [4]. In this study, a structured overview of products that includes product flaws and user testimonials regarding these flaws is produced using the DBSCAN clustering method. The Amazon ReviewDataset1 was used to gather the reviews. In this work, part-of-speech (POS) tagging was employed to preprocess the text reviews[5]. In this study, the researchers develop a technique that uses the NRC emotion Lexicon to extrapolate new discrete positive and negative emotion components from product review text. For comparison and helpfulness prediction, additional variables are used, including product kind, reviewer, visibility, readability, linguistics, and sentiment[6]. In this paper, the classifiers Support Vector Machine (SVM), Multinomial Naive Bayes (MNB), and Random Forest are investigated. Research trials are done on an internal dataset of emotional Arabic tweets (RF). We think about utilizing an ensemble of classifiers in addition to testing out single classifiers. The findings demonstrate that, in virtually all conditions taken into account, using training data that has been automatically annotated (and is just one order of magnitude bigger than training data that has been manually annotated) leads to better results [7]. The major objective of this project is to examine the dietary habits of the current generation. It was able to use R-programming to analyse all of our data, which greatly simplified the procedure. We want to research opinions on leading a healthy lifestyle according to the customs of today's youth. We'd like to examine both their everyday eating patterns and their opinions of their lifestyle [8]. This paper construct a theoretical framework and offer some existing theories regarding customers' propensity for repeat purchases. Moreover, the model includes two intervening different factors:

client satisfaction and customer trust. Following online practice, data are gathered using self-report questionnaires, and the model and hypotheses are then tested using LISREL, a programme for structured equation modelling [9]. The aspect terms from the E-business reviews are extracted using the ensemble learning method in this paper. And the relevance of this technique is enormous. Due to the uniqueness of E-business evaluations, we decided to extract the emotional analysis of E-business reviews using a traditional method integrated with machine learning. The experiment was successful. Additionally, it annotate the comment data using aspect keywords and train an effective CRF model. Last but not least, the outcome depends on the primary two techniques are improved [10]. The objective of this essay is to determine which of the emotional, pragmatic, and sensible reasons is more important when customers purchase organic food items, particularly fruits and vegetables. To gain a better understanding of why consumers choose to purchase organic fruits and vegetables, a self-administered survey technique called questionnaire survey was used (OF&V). 79% of the 632 valid surveys that were collected had responses [11]. In order to assess emotion, both directly and indirectly, in connection with food in the perspective of eating patterns, this review set out to identify these techniques, measurements, and tools and to provide an upgraded and thorough overview of them [12]. The purpose of this study was to ascertain whether snack products made with Bambara groundnut flour, a sustainable and efficient ingredient, would be accepted by UK clients and how they would react emotionally to them. Realizing the impact that monitoring emotional reaction would disclose was one of the main goals [13]. In order to create a conceptual framework to clarify the factors affecting consumers' persistent intention to buy on fresh produce e-commerce platforms, this research used natural produce as the research object and took gender disparities into consideration. We conducted a survey of online purchasers of organic produce and obtained 454 reliable samples. Lastly, the findings imply that enterprises should concentrate on platform and product attributes to improve consumers' perceptions of value and raise their likelihood of making repeat purchases [14]. On e-commerce websites, the product review is crucial in helping customers decide what to buy. The method that reviews are evaluated can be strongly impacted by emotions. Past research did not thoroughly examine the significance of specific emotions that

are encoded in online evaluations and how they affect review usefulness. This study uses deep neural networks to develop a helpfulness predicting model and explores the effects of emotions on review helpfulness. Using the NRC emotion Lexicon, we offer a method for extracting additional categorical both favorable and adverse emotion aspects from written data of product reviews [15]. This research paper describes on emotion recognition based on client reviews is becoming more and more well-known on a global scale and BERT algorithm was used. Transform classifier on cars dataset 98.5% accuracy were founded, by applying same algorithm on hotels database 98.3% efficiency were founded, and for Mobility database 98.7% accurateness were yielded.

The remaining research paper is defined as. The proposed methodology for emotional analysis is described in Part II. Results and discussions are presented in part III. Part IV outlines the model's future course. Lastly, Section V provides the concluding observations.

II.PROPOSED METHODOLOGY

This method's main goal is to examine the emotional content of consumer reviews of food products. Since food items can be divided into several categories, the research concentrated specifically on dairy, grain, beverage, frozen food, and meat-related items. There are other factors to take into account as well, given that these food products are created using various techniques and purposes. After reading a variety of reviews on these food goods, four fundamental criteria effectiveness, pricing, and formula were manually selected. To accomplish the goal, the system adopts a sequential strategy. The collection of data, data preprocessing, aspect extraction, and eventually the analysis of users'/consumers' emotions through their reviews make up the system's overall flow, which can be divided into four main categories. Fig.1. illustrates a detailed process of the Flow diagram.

A. Collection of Data

The first phase was to collect data or customer reviews, which serve as the system's initial inputs. The system enables users to enter a URL for a product page from a website like Amazon, eBay, etc. in order to gather reviews. The technology is able to search through several review pages and pull up

every review of the product. After that, a CSV file containing the review data is created. The system merely records the author's identity, the review's subject, and the review body itself, which is used for aspect-based emotional analysis.

B. Data Pre-processing

Data preprocessing is a term used to describe any type of processing done to raw data in order to get it ready for usage with some other data processing method. It is recognized for a while as the data mining process's most important initial step. In order to prepare data for analysis, it is necessary to clean, transform, and integrate the data. Enhancing the quality and suitability of the data for the particular purpose is the aim of data preparation.

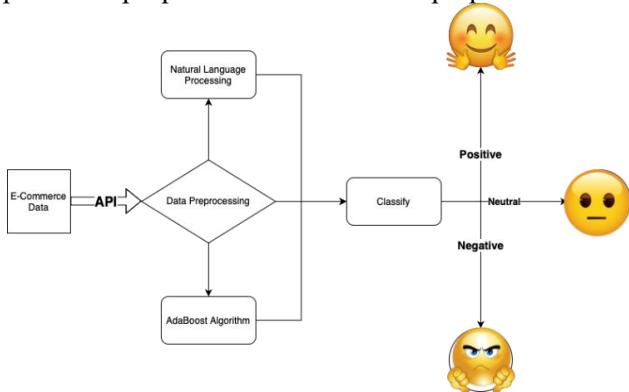


Fig.1. Flowchart of System Analysis

C. Aspect Extraction

In the extensively studied area of natural language processing known as aspect extraction, information is obtained from the text by identifying specific aspects. For instance, in aspect-based emotional analysis (ABEA), aspects must first be identified.

D. Natural Language Processing

NLP algorithms often start with machine learning algorithms. Instead of manually coding enormous amounts of rules, NLP may employ AI systems to automatically identify particular concepts by scanning a sample set and making a statistical conclusion. Often, it is not at all obvious in which the priority should be when designing rules manually. On the reverse side, algorithms for machine learning by default concentrate on the most common occurrences. Predictive modeling techniques can be used by automated learning systems to solve problems that appear to be resistant to innovative input. It is typically very challenging, failure, and time-consuming to create manual rule systems that provide sensitive decisions. However, it

is possible to accept such suggestions with kindness. Organizations use it because it provides data on the success of their brands and customer satisfaction. Companies can utilize NLP software to weed out irrelevant data and uncover crucial information that will help them enhance the customer experience with their brands.

E. AdaBoost Algorithm

Adaptive boosting, or the AdaBoost algorithm, is a boosting approach applied as an optimization learning in machine learning. Because each instance is given a fresh set of weights and examples that were misclassified are given larger weights, the technique is known as adaptive boosting. The AdaBoost system can automatically identify seven expressions in real time, including anger, disgust, fear, joyful, neutral, sadness, and surprise. With this method, each input is given the same weight when creating a model. Then, it gives the incorrectly categorized points more weight. In the model that follows, all points with proper weight have become assigned greater weight. The classifiers will continue until, perhaps, a lesser defect is determined. The algorithm which helps in detecting the emoji is followed by this equation:-

1. Initialize the observation $/N, i = 1, 2, \dots, N$. weights $\omega_i = 1$
2. Fit a classifier $G_m(x)$ to the training data using weights ω_i
3. Compute $\text{err}_m = \frac{\sum_{i=1}^N \omega_i I(y_i \neq G_m(x_i))}{\sum_{i=1}^N \omega_i}$
4. Compute $\alpha_m = \log((1 - \text{err}_m)/\text{err}_m)$
5. Set $\omega_i \leftarrow \omega_i \cdot \exp[\alpha_m \cdot I(y_i \neq G_m(x_i))], i = 1, 2, \dots, N$.
6. Output $G(x) = \text{sign} \left[\sum_{m=1}^M \alpha_m G_m(x) \right]$.

F. System Architecture



Fig.3. Detailed architecture diagram of system analysis

III.RESULTS & DISCUSSIONS

The goal of the study was to analyse the diverse public viewpoints on numerous food products-related topics that were expressed in online reviews. Displaying the feature was intended since it helps producers and consumers, respectively, obtain insight into consumer opinions and make purchasing decisions. The system's outcomes therefore show that it is able to dynamically display the aspect of reviews that have been posted on a certain product page. The test run results show that the system can generate outputs that are reasonably accurate for the specified attributes. However, the procedures of web scraping, writing to and reading from files, and the number of API calls required make it take a significant amount of time to produce the output. Additionally, because it is a general emotional analysis library, the NLP library returns "NEUTRAL" for some opinion units, such as "It tastes good and is a good value for the money, but use it within 2 months as it starts to secrete oil," even though the actual content of the opinion unit is positive. The issue has been resolved as a result. Following integration, it is demonstrated that the system can correctly anticipate sentences and emojis/icons used in reviews that are "POSITIVE," "NEUTRAL," and "NEGATIVE." as illustrated by Table. 1

TABLE 1 : CUSTOMER REVIEW DATASET

SNo	Customer Reviews	
	Review	Output
1.	Normal Yogurt is better than this 😊😊	Negative
2.	Better 🙌	Neutral
3.	Tastes good but flavor is strong 🤢	Neutral
4.	Tastes good 😊	Positive
5.	It has low price than local retailers' product is good 🙌🙌	Positive
6.	Have a normal taste recommend to buy	Neutral
7.	The price is too much high 😞😞😞	Negative
8.	Not as described 😞😞	Negative

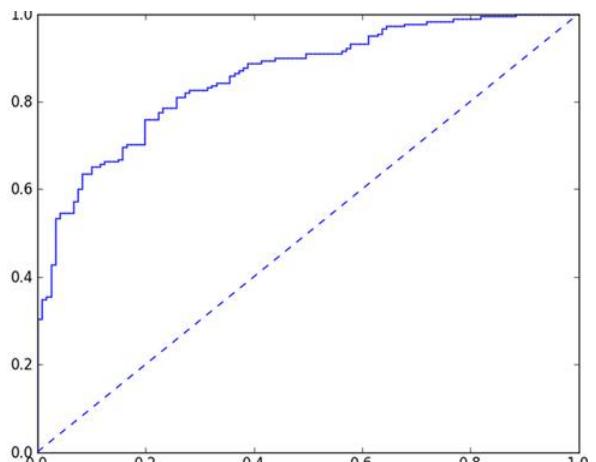


Fig.3. The level of Adaboost performance in graph

TABLE II. ACCURACY MEASUREMENT

Category	Before Endorsement		After Endorsement		Average Accuracy
	Training Data	Testing Data	Training Data	Testing Data	
True Positive	80	67	167	154	
True Negative	82	50	85	79	
True Neutral	100	89	106	101	
Amount of Data	262	206	358	334	
Accuracy	78.62%	78.62%	93.29%	93.29%	86.5%

IV.CONCLUSION

Deciphering the reviews of food products aspect by-aspect in order to make them valuable to both consumers and food product makers was the major goal of the study. In order to make future judgements and modify products to meet the needs of the majority of consumers, manufacturers can identify their strong and weak points. The public's perception of a certain objective that consumers

hope to accomplish by acquiring the goods can be quickly and easily determined by consumers. The primary step in achieving the aforementioned goal was to research and evaluate relevant literature as well as various emotional analysis techniques. Aspect extraction, pre-processing, and datacollection methods were developed using the knowledge gathered from the literature review. The reviews were gathered by using the URL of the product page on sites like Amazon, eBay, etc. as the input.

Review sentences were broken down into opinion units, which were then used using the Adaboost algorithm and NLP to categorize the aspect. The aspect-wise of the food product reviews was chosen as the final output after the models had been trained. The study is based on manually chosen factors for goods falling into the food product category. Therefore, a technique for detecting the aspects would be the best addition to the system in the future. Moreover, by using more training data, the system's accuracy in terms can be improved.

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