SENTIMENT ANALYSIS OF ONLINE PRODUCT REVIEWS USING BERT

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ABSTRACT

The use of the BERT model of neural networks to evaluate emotions from online consumer feedback has been effective in improving understanding of customer preferences for online products. This technique not only helps platforms better meet the needs of its customers, but it also helps customers find appropriate and affordable products. This development helps to improve the accuracy of product suggestions through intelligent processing. A number of sentiment analysis tests were carried out using the pre-trained BERT model. A highly accurate categorization model was created by making meticulous parameter tweaks throughout the experimentation phase. The BERT layer was used as the fundamental word vector layer. This layer received input text sequences and transformed them into vectors. After being processed by respective neural networks, the vectors were subjected to classification using the SoftMax activation function. Sentiment analysis entails evaluating customer attitudes using text data, notably product reviews in this instance. Our research led to the development of a solution proficient in discerning sentiments conveyed in online product reviews. To accomplish this, we utilized algorithms like Logistic Regression, Random Forest Classifier, and Sentiment Intensity Analyzer. The experimental results demonstrate the accuracy attained in conducting sentiment analysis.

Keyword - *BERT, Activation function, Neural Network, NLP, Product review*

1. INTRODUCTION

In the current business environment, the advancement of information technology and the continuous development of online registration and payment have made online document evaluation the importance of companies' competitive strategy. In the online shopping market, more and more customers prefer to shop from platforms like Amazon and Flipkart. At the same time, more and more customers seek recommendations from other members through online reviews. This change reflects the rapid expansion of online marketing through product marketing. Online reviews are more relevant to potential customers because they come from people who have prior experience with the product or service. The impact of these reviews influences customer needs and purchasing decisions, which in turn affects the overall performance of the company. The importance of online review business lies in its ability to improve product quality and increase customer engagement. It is important to improve accuracy and understanding of behavior in online messages. The benefits of examining the opinions expressed in online product reviews are twofold. First, it allows companies to conduct customer research and collect positive and negative comments for individual services

and products. Second, in-depth research on users' opinions can allow companies to understand users' opinions and real needs.

1.1 Benefits of sentiment analysis using BERT

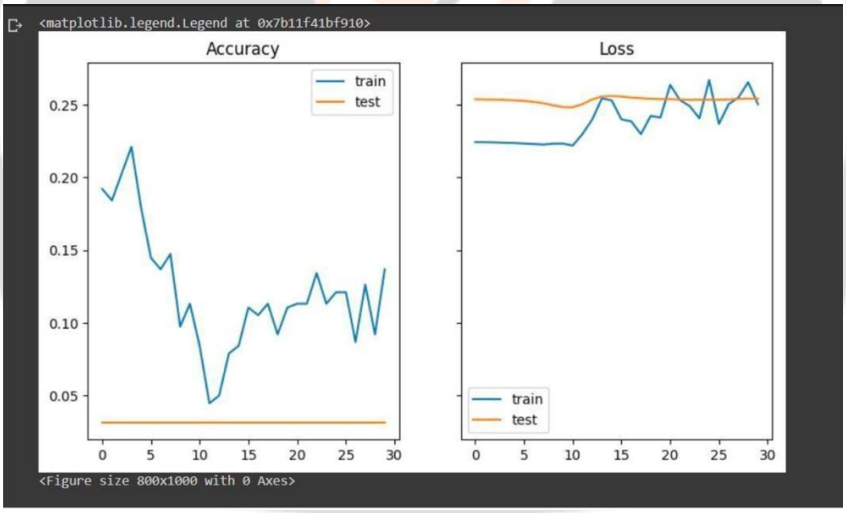
BERT (Bidirectional Encoder Represented by Transformers) is a neural network model pre-trained on a wide variety of text and programming codes. This pre-training enables BERT to understand the meaning of a word, enabling it to succeed in reasoning tasks. Overall, BERT is a powerful tool with extensive experience. Its accuracy, functionality, flexibility, performance, and disclosure make it a good choice for many applications, including social monitoring, analytics products, and clients.

1.2 Application theory for using BERT.

Companies can use BERT to monitor social media posts so they can remove reviews of their products or services. This process helps identify areas for improvement and introduce new products or services that are in high demand. E-commerce platforms can use BERT to classify product reviews into positive, negative, or neutral opinions. These features help consumers make informed purchasing decisions and businesses identify areas for improvement.

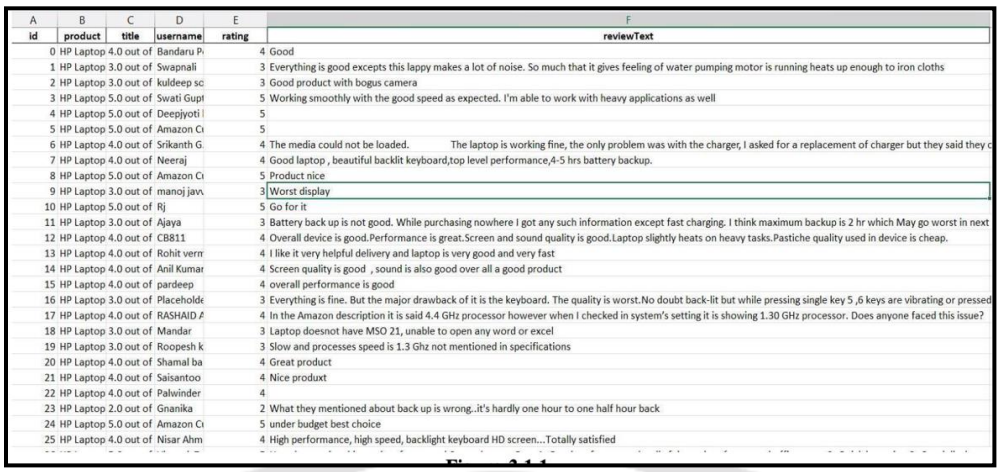
2. OBJECTIVES AND METHODOLOGY

Create a sentiment model that can analyze sentiment expressed in online product reviews. Using the BERT neural network model as the basis of the IQ theory model. Conduct various tests to evaluate the effectiveness of the model. Compare the performance of this model with other advanced models. Evaluate test results over time and draw conclusions about applicable models.



Accuracy of the BERT Model

Assisting consumers in making well-informed judgements about what to buy, Before making a purchase, consumers may use internet product reviews to learn about the benefits and drawbacks of a certain item. This reduces the possibility that they will waste money by enabling people to make well-informed selections and steer clear of purchasing subpar goods.



id	product	title	username	rating	reviewText
0	HP Laptop	4.0 out of	Bandaru P	4	Good
1	HP Laptop	3.0 out of	Swapnali	3	Everything is good excepts this lappy makes a lot of noise. So much that it gives feeling of water pumping motor is running heats up enough to iron cloths
2	HP Laptop	3.0 out of	kuldeep sc	3	Good product with bogus camera
3	HP Laptop	5.0 out of	Swati Gupt	5	Working smoothly with the good speed as expected. I'm able to work with heavy applications as well
4	HP Laptop	5.0 out of	Deepjyoti I	5	
5	HP Laptop	5.0 out of	Amazon Cı	5	
6	HP Laptop	4.0 out of	Srikanth G	4	The media could not be loaded. The laptop is working fine, the only problem was with the charger, I asked for a replacement of charger but they said they c
7	HP Laptop	4.0 out of	Neeraj	4	Good laptop , beautiful backlit keyboard,top level performance,4-5 hrs battery backup.
8	HP Laptop	5.0 out of	Amazon Cı	5	Product nice .
9	HP Laptop	3.0 out of	manoj jav	3	Worst display
10	HP Laptop	5.0 out of	Rj	5	Go for it
11	HP Laptop	3.0 out of	Ajaya	3	Battery back up is not good. While purchasing nowhere I got any such information except fast charging. I think maximum backup is 2 hr which May go worst in next
12	HP Laptop	4.0 out of	CB811	4	Overall device is good.Performance is great.Screen and sound quality is good.Laptop slightly heats on heavy tasks.Pastiche quality used in device is cheap.
13	HP Laptop	4.0 out of	Rohit verr	4	I like it very helpful delivery and laptop is very good and very fast
14	HP Laptop	4.0 out of	Anil Kumar	4	Screen quality is good , sound is also good over all a good product
15	HP Laptop	4.0 out of	pardeep	4	overall performance is good
16	HP Laptop	3.0 out of	Placeholde	3	Everything is fine. But the major drawback of it is the keyboard. The quality is worst.No doubt back-lit but while pressing single key 5 ,6 keys are vibrating or pressed
17	HP Laptop	4.0 out of	RASHAID A	4	In the Amazon description it is said 4.4 GHz processor however when I checked in system's setting it is showing 1.30 GHz processor. Does anyone faced this issue?
18	HP Laptop	3.0 out of	Mandar	3	Laptop doesnot have MSO 21, unable to open any word or excel
19	HP Laptop	3.0 out of	Roopesh k	3	Slow and processes speed is 1.3 Ghz not mentioned in specifications
20	HP Laptop	4.0 out of	Shamal ba	4	Great product
21	HP Laptop	4.0 out of	Saisantoo	4	Nice produxt
22	HP Laptop	4.0 out of	Palwinder	4	
23	HP Laptop	2.0 out of	Gnanika	2	What they mentioned about back up is wrong..it's hardly one hour to one half hour back
24	HP Laptop	5.0 out of	Amazon Cı	5	under budget best choice
25	HP Laptop	4.0 out of	Nisar Ahm	4	High performance, high speed, backlight keyboard HD screen...Totally satisfied

Sample Dataset from E-commerce

2.1 The use of BERT in sentiment analysis

Assisting consumers in making well-informed judgements about what to buy Before making a purchase, consumers may use internet product reviews to learn about the benefits and drawbacks of a certain item. This reduces the possibility that they will waste money by enabling people to make well-informed selections and steer clear of purchasing subpar goods. Assist companies in improving their goods and services, Companies can identify areas in which their goods and services need to be improved by using data gathered from online product reviews. This proactive strategy contributes to improving the calibre of the goods and services, which in turn raises consumer happiness.

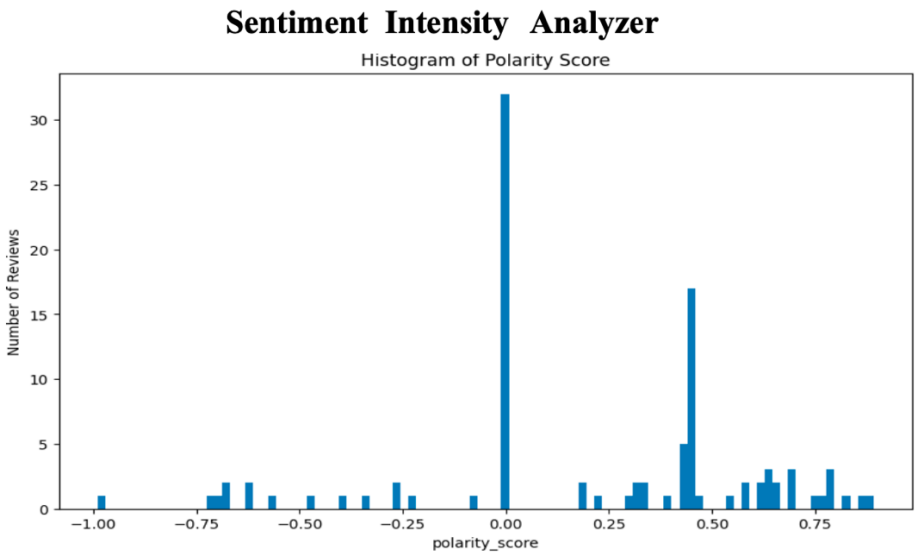
2.2 Theory of using BERT for online product analysis

A theoretical analysis of the use of BERT for online product review involves the use of the BERT neural network model to determine product review. BERT is a pre-trained model with a large amount of text and data. encoding. It is a model that can retain the content of a word and is particularly suitable for emotional analysis.

- Product inspection is the first step to eliminating pauses, interruptions, and other noise.
- Predicates are marked, that is, they are divided into words or sentences.
- The tokenized message is then passed to the BERT model.
- The BERT model then predicts the positive, negative, or neutral sentiment of each review.

3. PROPOSED WORK MODULES

Websites with product reviews that are easily available might be a good source of data. Users may write product reviews on a variety of sites, such as Google Shopping, Yelp, and Amazon. For this purpose, a variety of web scraping solutions are available, including Beautiful Soup and Scrapy. Preprocessing is necessary for data before it can be used to train the model developed by BERT. This entails getting rid of symbols, punctuation, and other noise. Furthermore, terms with little semantic significance, such as "the," "and" or "of," are also usually eliminated. Word reduction to their most basic form, or text stemming, can also be used. Tokenization is also carried out, which divides text into discrete words or phrases. Because BERT models can process a single symbol or sentence at a time, this step is essential. Historical data is used to train the BERT model. This entails feeding information to the model and adjusting its parameters so that it can forecast the expected results of the investigation. Depending on the volume of data and the complexity of the constituent parts, the training period may range from a few hours to a whole day. A dataset different from the training dataset is utilised to evaluate the model's efficacy. This assessment dataset includes real opinions or feelings for contrast. The ground truth, that reflects the actual perspectives of the analysis, is contrasted with the model projections based on this data collection. The percentage of accurate predictions the model makes is then used to calculate the model's accuracy.



Sentiment Intensity Analyzer

3.1 Methodology of Proposed Work

1. Compile online product reviews: Use web crawling methods to compile reviews on social media platforms or websites.
2. Prepare the data: Eliminate symbols, punctuation, and other extraneous information from the gathered data. encode the text by dividing it into discrete words or sentences.
3. Train your BERT model: To predict sentiment, feed the data that has been preprocessed via the BERT model and adjust its parameters. Analyze the model's effectiveness with a hold-out review dataset.
4. Implement the model: After the model has been trained and assessed, implement it to forecast the sentiment of fresh reviews, enabling real-time analysis.

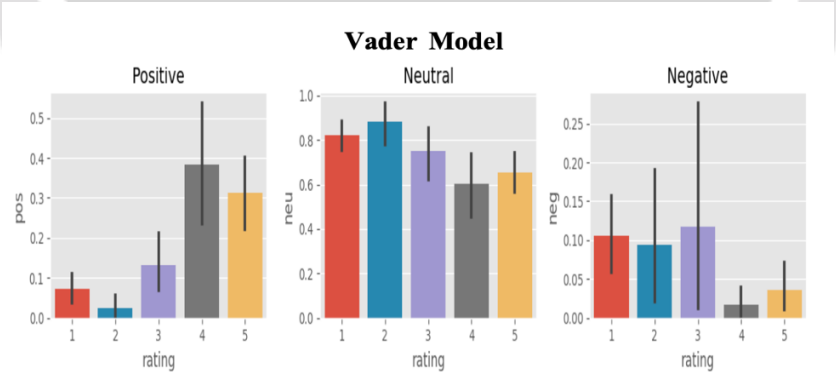


Figure 5.2 Vader model.

Vader Modal

Training a BERT model: Historical data is used to train the BERT model. This entails feeding information to the model and adjusting its parameters so that it can forecast the expected results of the investigation. Depending on the volume of data and the complexity of the constituent parts, the training period may range from a few hours to a whole

day. Model effectiveness evaluation: The model's efficiency is evaluated with specially analyzed data, which is different from the training data. This assessment dataset includes real opinions or feelings for contrast. The accuracy of the model is then determined by comparing its predictions with these actual attitudes; this is expressed as the proportion of accurately anticipated analyses that the model produced.

4. CONCLUSIONS

The research presented here represents a noteworthy development in the field of sentiment analysis. Comparing it to other approaches, it improves accuracy and dependability by using the most recent BERT model and a sizable dataset of internet product evaluations. There are several drawbacks to the suggested effort, such as its high expense and present incapacity to fully handle several difficulties. It's crucial to remember that these restrictions are manageable and that they should be addressed when the research continues. Among the many benefits of the planned study are the use of cutting- edge language models and an extensive database of internet product evaluations. These positive results highlight the approach's effectiveness in sentiment analysis and point to its potential to become a vital resource for companies and organizations.

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