A Novel Elephant Heard Random Forest Machine Learning Approach to Estimate the Sentiment Value of Online Customer Review

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Abstract: Nowadays, big data has attracted the attention of whole advanced world with its applications and features. Machine learning (ML) models are used to perform the online administrations in good manner .The ML approaches turned into a moving field in analyzing enormous data; consequently the accomplishment of online administrations or business depends on the client audits. Nearly the online customer review contains positive, negative and neutral sentiment value. In marketing system and product development fields the sentiment analysis value prediction has important role. In this paper, a novel Elephant Herd Random Forest Machine Learning (EHRFML) methodology is proposed to compute the sentiment value of online customer review. Moreover, customer review datasets are preprocessed and unwanted information is removed using machine learning approach. Sequentially, the outcomes of proposed system are compared with existing technique using parameters like accuracy, precision, recall, aspect term specification and opinion condition obtained good results by getting high accuracy based on opinion specification.

Keywords: machine learning, accuracy, precision, recall, sentiment analysis, aspect term specification, opinion condition, big data

1. INTRODUCTION

The development in innovation has attracted sentiment analysis (SA) as an inexorably famous area of study lately became the center of attention on the action of subjectivity in printed content [1]. The quick development of online media and improvements in ordinary language handling strategies made ready for SA procedures to extract client produced information in different fields, for example, the travel industry, showcasing, and legislative issues [2]. The clinical and medical services areas have been less explored by analysts in the field of sentiment analysis. The explosive growth of web data and quick development of online media, it is presently a typical exercise for patients to share their perspectives on cure and medications via web-based media stages [3]. Structure of sentiment analysis is shown in fig 1.

The large volume of unstructured printed information which might be used in significant applications including finding antagonistic medication responses aiding determination and treatment decisions, suggesting customized treatment choices, and finding fortunate medication utilization [4]. These applications customarily use organized informa-

tion which is hard to produce and restricted in amount [5]. Then the data produced by client audits dont have that much impediments in decision making for structured data [6].

Machine learning (ML) approaches provides the ability to the systems to learn from the past data with the assistance of AI and improve from the past examples without being modified expressly [7]. The perplexing conduct of social substance needs progressed common language and ML methods focus on analysis of concealed data [8]. Computational phonetics, factual strategies and ML algorithms are utilized in blend to shape an ideal arrangement of data [9]. To build a sentiment analyzer, the most important thing is to obtain the correct methodology. One such methodology is machine learning where one can build up a few procedures to arrange the assessments [10]. With the advancement in ML methods, scientists want to utilize them in content characterization [11]. There are two classes in ML methods to be specific directed ML and undirected ML [12]. In regulated ML information will be given by the engineer while in solo ML, a bunching method was found based on the separation among information [13]. Directed ML calculations have been utilized which permits computerized accumulated
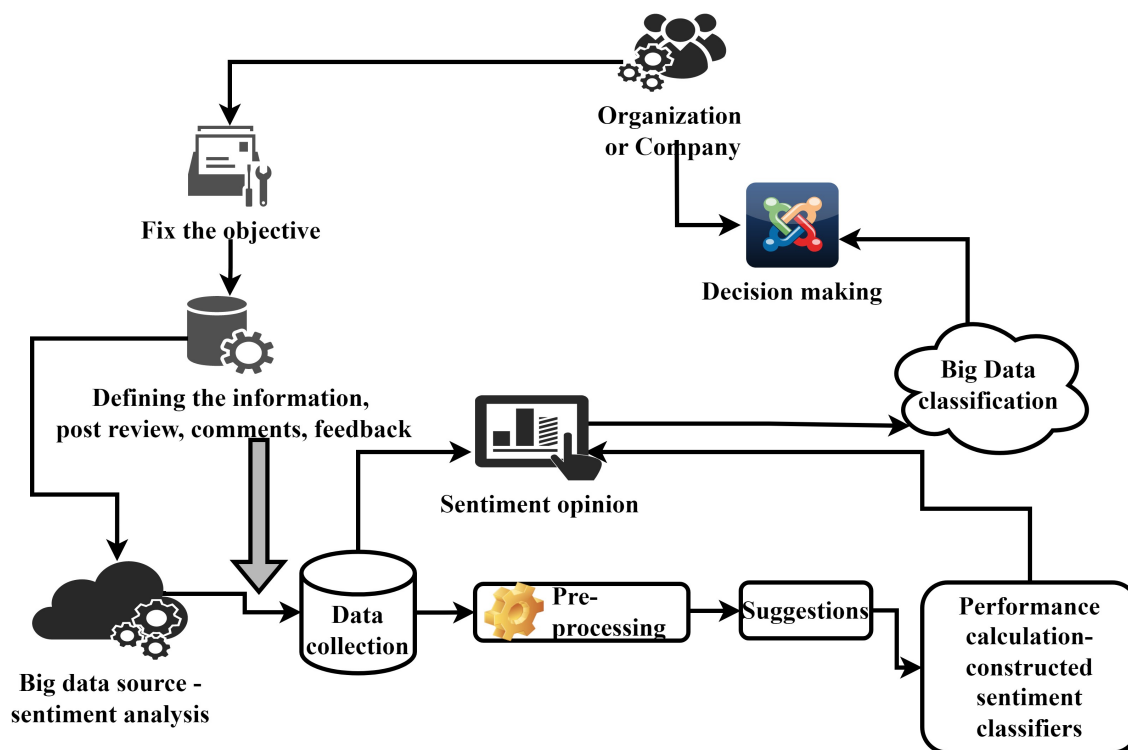
Figure 1. Sentiment Analysis

input without the need of human intercession [14]. Both of these methodologies need preprocessing of data [15]. Most of the works have been done in the area of opinion examination by using ML approaches [16]. The efficiency of proposed method is examined with existing approaches like ABCDM [17], NEA [18], and SLA [19].Recommendation systems were developed for tree structure data using tree similarity algorithms [20], [21].

The rest of this article is categorized as follows, section 2 demonstrated the related work, section 3 describes system design and Problem definition, section 4 describes the proposed technique, section 5 explains the outcome of the proposed method and section 6 presents conclusion.

2. RELATED WORKS

Sentiment analysis is the investigation theme in ordinary language processing and information retrieval field. To attain the capable results the deep neural system replica is concerned to the sentiment analysis. The variety of neural design concerned for the sentiment analysis such as gated repeated element (GRE), short and long term memory replica (SLTM) includes engrossed growing consideration. To overcome this issues Mohammad ehsan basiri et al [22] has developed. Attention based CNN-RNN profound replica (ABCPR), this approach extracts both future and past context of sequential statistics to run both the instructions and also the technique is concerned on the bidirectional outcomes of the ABCPR layers which includes less importance

on various terms. The outcomes of proposed approach are compared with the other techniques for sentiment analysis shows better performance. However, this approach is less applicable to all domains.

Akshi kumar et al [23] developed Contextual conv-net replica, this method has four units such as discretization, content methodical, picture methodical and finally assessment unit. The first module discretization is used to split the content from the image and also processed as the digital articles. Moreover, this information is transmitting into the content methodical well as picture methodical units. For this content methodical unit compute the hybrid difficulty neural system using sentiment analysis. In this approach the obtained accuracy is 91% that is enhancing the content and picture units individually.

Alorini et al [24] has investigated and calculated client's visions on perceptive and divisive titles such as bigotry and intolerance utilized twitter as a micro-blogging location. SA and ML procedures involves the named entity acknowledgment (NEA) and polarization technique. According to this shapeless character of observations as well as the accuracy of the SA enhanced proceeding to compute the sentiment.

Sentiment analysis is the fundamental in different schemes such as estimation removal with forecasting. Moreover, the several researches worked on sentiment analysis using different machine learning approaches. Alfarifi

et al [25] proposed new machine learning and big data approach for calculating the sentiment analysis procedures to overcome this issue. The information is extracted from an immense volume of datasets, supportive in the powerful assessment of frameworks. The commotion in the information is reduced using a preprocessing information mining approach. This approach improves framework effectiveness, dissected utilizing test aftereffects of mistake rate, exactness, review, and precision.

In present society fully based upon the new technologies such as personal computer, laptops, smart phones etc. Moreover, these new technologies are designed for a social communication with organizing all the expansion through the Internet. The bulk quantities of data and information are collected from the social media and also process the variety of activity application through the users. By investigating these statistics Alim et al [26] has proposed persons sentiments and their suggestions. This suggestion is used in industry side for example rating the product, marking of online classes, marking of online purchasing locations and finally, performance of peoples.

The importance of current method are explained as follows:

- Customer review datasets are collected from the big data

- Initially, the dataset of Customer review has to be trained

- Consequently, a novel EHTFML model is developed

- Update the fitness value based upon the proposed EHTFML model

- Sequentially, the unwanted data is removed from the customer review dataset

- The key performance measures are contrasted with the existing approaches and obtained best accuracy based on opinion specification

3. System Model

A basic way through which the important detail is mined from online is by sentiment analysis [27]. The human's suppositions, feelings, conclusions, and so on concerning the items are communicated as client audits just as star appraisals, which are being examined by a machine for example ML approach[28]. The examination of online items will enhance product quality based on impact of buyer habits. Hence, item audit investigation is a generally acknowledged, wherein the buyer could easily be aware of their necessities. System model For the SA of online items, however a few ML strategies were recommended previously, and those methods have just incorporated and restricted the highlights, the future expectation of online items will be considered by the client audit remarks[29]. 2
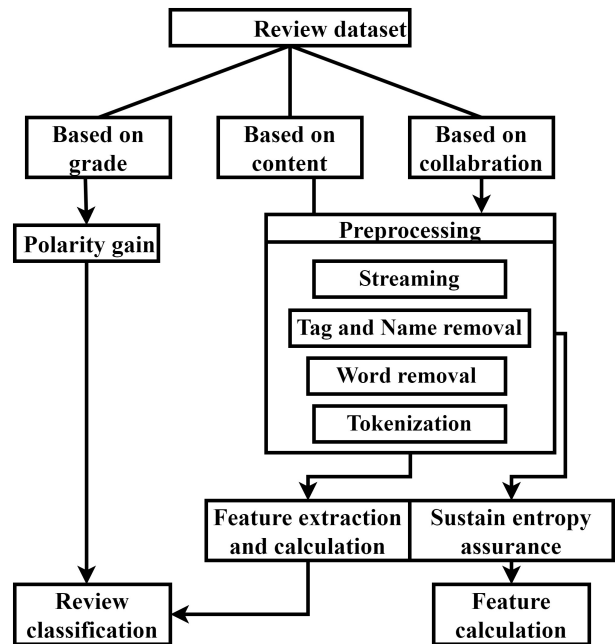

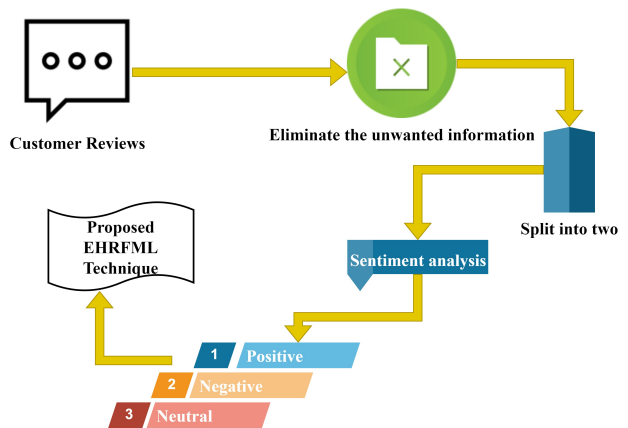
Figure 2. Sentiment analysis system

Figure 3. Proposed EHRFML approach

4. Proposed EHRFML for Sentiment Value Categorization

The proposed technique, EHRFML is used to compute the sentiment value of online customer review. Moreover, the proposed technique includes four stages according to the online customer review and also checks the accuracy, purity, recall of the each and every review. The projected replica is depicted in fig.3.

A. Dataset

We make use of customer review data. This dataset contains million customer appraises (inputs) and ratings (outputs) to learning and train for SA. This dataset has positive and negative ratings for items or products. Even though the appraisals are for older items, this data set is

best to exploit. The ratings will be in the range of 1 to 5. At first, the datasets are prepared to the system using of proposed EHRFML technique. Where, the datasets are taken from the sentiment analysis in customer reviews based on the positive, negative and finally neutral.

B. Preprocessing

This stage shortly named as the elimination stage and also called as cleaning process why because the customer reviews contain duplicate information. For this reasons the preprocessing stage is used to eliminate the each and every duplicate information appears in the online customer review.

Initial stage is removing the unwanted information are appears in the online customer review, Using the ML approach information removal is determined in eqn 1.

$$U = \sum_{i=1}^{k} \left[L_{i,n} = L_{i,n} \right] S / \sum_{i=1}^{k} \left[L_{i,n} = L_{i,n} \right] \quad (1)$$

Where, L is total content present in the customer review, S is the particular content and n is the each word present in the content.

C. Sentiment Analysis

After finishing the preprocessing, the SA step is applied on the customer review range (CRR) .The customer review is mainly depending on the three factors such as positive negative and neutral. Moreover, it updates the fitness value based on the proposed EHRFML technique. For this analysis replica is utilized by the CCR extensive techniques by means of fitness value. The proposed EHRFML technique is used to compute the customer review range of sentiment analysis is determined by the eqn 2

$$CRR = \left[L_{ij} + L_{ik} + L_{jk} \right] / S \quad (2)$$

Where, CRR is the customer review range based on the selection of three kinds of factor and S is the total and particular content present in the customer review i, j, k is the respectively.

D. Top word taking out

This step is used to examine and extract the online customer review based on the positive and negative sections. Moreover, the selected sentence will be partitioned into the two sections based on the fitness value. Positive clause is examined using good comments of the customer moreover; the negative clause is identified using complaints of the customer. Using the fitness value, the sentiment analysis value will be calculated by the eqn.3

$$D_n = \left\{ \beta \left(P_{i,j} + N_{i,j} + NL_{i,j} \right) + \alpha \left(P_{n(i,j)} + N_{n(i,j)} + NL_{n(i,j)} \right) \right\} S \quad (3)$$

Algorithm 1 shows the Proposed EHRFML technique, to estimate the sentiment value of online customer review. The algorithm of proposed approach flowchart is depicted in fig.4. At first, the online customer review the datasets are preprocessed. At first, unwanted information in the data set

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Algorithm 1 EHRFML Technique

1: **procedure** START
2:　　Update the customer review
3:　　Set the fitness value based upon the EHRFML approach
4:　　// Eliminate the unwanted data using ML approach
5:　　// Calculation
6:　　**if** U=1 **then**
7:　　　　Unwanted information is removed
8:　　**else**
9:　　　　Return to the calculation step
10:　　　Update the CRR
11:　　**end if**
12:　　// Calculate Customer review range based upon the EHRFML approach
13:　　// calculate the positive review
14:　　**if** CRR=1 **then**
15:　　　　Every sentence positive
16:　　**else**
17:　　　　Return to estimation
18:　　**end if**
19:　　// calculate the negative review
20:　　**if** CRR=-1 **then**
21:　　　　Every sentence negative
22:　　**else**
23:　　　　Return to estimation
24:　　**end if**
25:　　// calculate the neutral review
26:　　**if** CRR=0 **then**
27:　　　　Every sentence neutral
28:　　**else**
29:　　　　Return to estimation
30:　　**end if**
31:　　// Identify the positive, negative and neutral of the customer review
32:　　**if** D_n=1 **then**
33:　　　　Positive
34:　　**else if** D_n=-1 **then**
35:　　　　Negative
36:　　**else if** D_n=0 **then**
37:　　　　Neutral
38:　　**else**
39:　　　　Return the computation part
40:　　**end if**
41:　　// Separate the positive, negative and neutral of the customer review based on the EHRFML approach
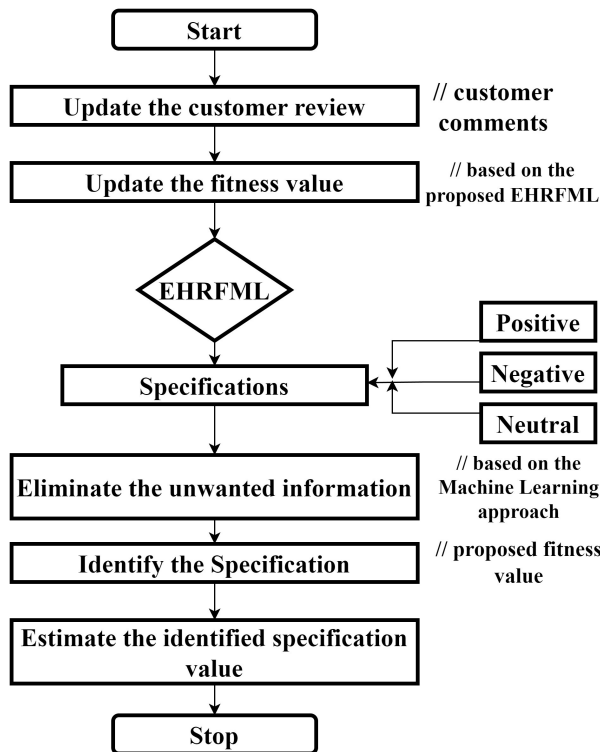42: **end procedure**

Figure 4. Proposed EHRFML approach

is eliminated by machine learning approach. Accordingly, the sentiment analysis value is calculated using proposed EHRML technique. The elimination of unwanted data is called as preprocessing technique. Preprocessing has been done in customer review data because some attributes are irrelevant and redundant. There are some methods to eliminate the unwanted or uninterested data. Based on the number of items involved in dataset, we can remove them using API such as SOAP. If the records are very less then we can eliminate manually otherwise we have to use tools to eliminate uninterested data or attributes.

5. RESULTS AND DISCUSSION

Machine learning approaches are the essential in big data analytics particularly in SA approach. In this paper the online customer review data are analyzed by the proposed replica approach and also that dataset are having three types of factors. Moreover, the proposed EHRFML technique is executed in MATLAB implementations. The proposed approach is used to improve the opinion pattern like as positive, negative and neutral.

A. Case Study

To compute the accuracy of the proposed approach, sentiment analysis is taken. Many of customer reviews are considered for an assessment process. At first, the unwanted information is removed by using machine learning approach. After that sentiment values are predicted

by this proposed approach. Some of the customer reviews are elaborated in table I. Let us consider the 10 customer reviews are taken from the big data system with its word condition is 200 and length of the word is 300 particular content is 100 i=10, n= 300 and k=1. Substitute this value in eqn 1 as shown in eqn 4

$$U = \sum_{i=1}^{1} [300_{10,200} = 300_{10,200}] \, 100 / \sum_{i=1}^{1} [300_{10,200} = 300_{10,200}]$$
(4)

The obtained value is 1.01 moreover the customer review range is calculated by the eqn 2 as shown in 5.

$$CRR = [300_{10,20} + 300_{10,30} + L_{20,30}]$$
(5)

Where CRR is the customer review range based on the selection of three kinds of factor, the value is identical to -1, it is called as negative and the value is identical to zero it is called as neutral and finally CRR is identical to 1, it is called as positive.

B. Performance Evaluation

The efficiency of proposed method is examined with existing techniques such as ABCDM, NEA, and SLA. Consequently, the efficiency of the wished-for model should be validated based on some of significant parameter metrics for instance precision, error rate, recall, F-measure, accuracy and opinion condition.

1) Accuracy Score

The accuracy of proposed EHRFML approach is determined by the eqn 6, here AP is accurate positive, AN is the accurate negative, WN is depicted as wrong positive and WP is defined as wrong negative.

$$Accuracy(A) = \frac{AP + AN}{AN + AP + WN + WP}$$
(6)

The performance of the SA value is compared with existing techniques as shown in fig 5, the ABCDM Approach obtained accuracy measure as 74%, NEA obtained 73% as the accuracy of classification, SLA accuracy rate is 79%. Consequently, the proposed technique produces accuracy as 97%.

2) Precision Score

The precision of the progressed information is estimated as the amount of exact true positive forecasts estranged by the total amount of particular estimation , which is evaluated by eqn. 7.

$$Precision(P) = \frac{AP}{AP + WP}$$
(7)

The comparison of performance metric parameters with existing approaches is depicted in fig.6.

3) Recall Score

Recall score is determined by the number of accurate sentiment conditions of the total quantity of content. The developed approach is compared with ABCDM, NEA, SLA

TABLE I. Customer Reviews

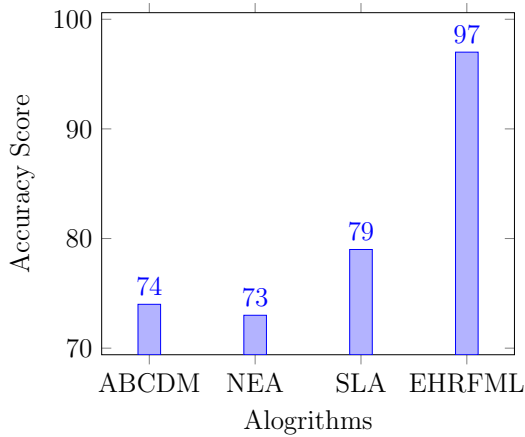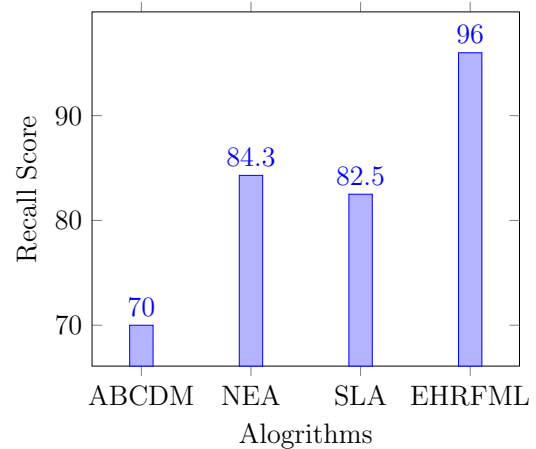| Sl no	Customer review	Positive	Negative	Neutral
1	This app is very useful	1	-	-
2	This is not good	-	-1	-
3	This product is very expensive	-	-1	-
4	Really expressed in this app	1	-	-
5	Product quality is poor	-	-1	-
6	Quality is to improve	-	-	0

Figure 5. Accuracy score
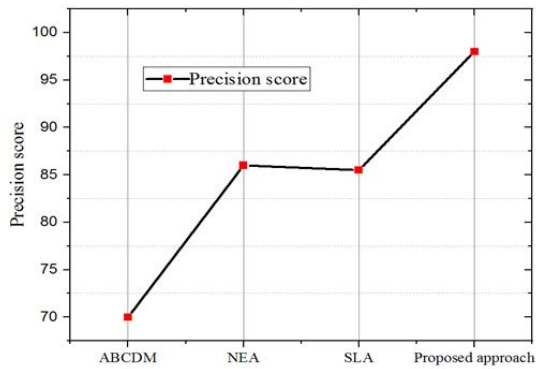

Figure 7. Recall score
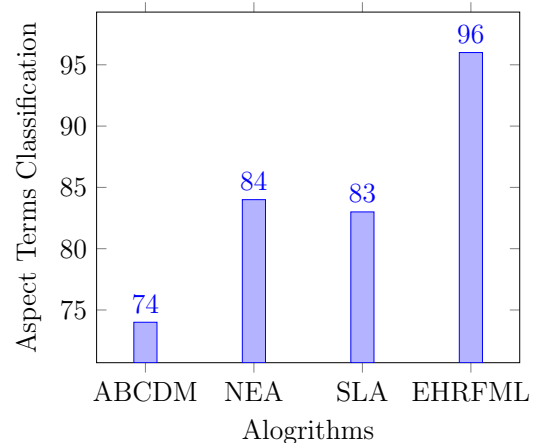

Figure 6. Proposed EHRFML approach

Figure 8. Aspect Terms Classification

techniques. The proposed approach is attained the recall rate 96% as shown in the fig 7.

4) Aspect Terms Classification (ATC)

Aspect terms measurement is the major performances metrics in sentiment analysis and also the splitting of sentiment content as Aspect terms measurement. Aspect terms specification is compared with the existing techniques and the values are enclosed in fig 8. Moreover, the proposed method achieves 96% aspect term.

5) Opinion Condition

Opinion condition is called as opinion specification moreover, the sentiment analysis are significantly classified into three types such as positive negative and neutral. The validation opinion condition is shown in fig.9. The calculation of ABCDM opinion condition range is 70%, NEA technique achieves 73% , SLA attained 82% .Furthermore, the proposed strategy achieved content opinion condition as 94%.

TABLE II. Comparisons with Existing Approaches

| Sr.No	Research work	Techniques Used	Dataset	Accuracy
1	A attribute Based Approach for Sentiment Analysis	SVM ,Deep Learning	Customer Review	72.6%
2	Document Level Sentiment Analysis	ML approaches	Twitter Dataset	56.7%
3	Sentiment Analysis on Twitter Data	SVM	Customer Review	73.09%
4	Sentiment Analysis and Opinion Mining	SRF	Twitter Dataset	58.4%
5	EHRFML	ABCDM	Customer Review	97%
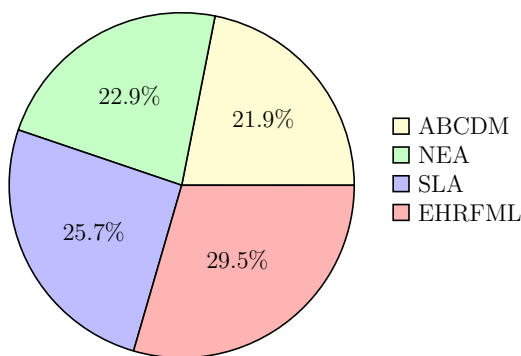
Figure 9. Opinion Condition

C. Comparisons with Existing Approaches

The experimental works are carried out and compared with various existing methods on various preprocessed datasets. Here the aim to judge against the efficiency of various methods and enhance the State-of-the-art of SA tasks. The table II shows the comparision results with the proposed approach

6. CONCLUSIONS

The main objective of this research is to estimate the sentiment value of customer review without any problems. Therefore, a novel EHRFML technique was developed. The online customer review comments have three factors such as positive, negative and neutral. The objective of this research is to compute the sentiment value of the customer review. The develpoed approach is useful to examine online customer opinions in a efficient manner and it assists to enhance the online services. The outcomes of proposed approach are judged against with existing techniques and it gives improved performance. Consequently, the comparison is demonstrated that the proposed approach improve the accuracy, precision, recall, etc.

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