Recognizing Emotion in Text using Neural Network and Fuzzy Logic

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Abstract

Objectives: To find out sentiment of people about a particular thing or objects and to classify these sentiments. **Methods:** The common dialect handling techniques like fuzzy logic and neural system to be used extract emotions from text present in various blogs using MATLAB. **Findings:** The results show that with Neural Network and Fuzzy Logic performs very well in recognizing the emotional polarity of the sentences. From result simulations it has been concluded that the proposed method worked well having accuracy of 90% and able to classify the text according to their class (Happy, Sad and Anger). **Improvements:** The proposed method achieves better results in terms of Accuracy, Precision, Sensitivity and Specificity.

Keywords: Classification, Emotion Recognition, Fuzzy Logic, Neural Network, Sentiment Analysis

1. Introduction

Nowadays social media are being used in daily life. Social media development leads to the usage of internet as the participation of persons is increasing simultaneously[1,2]. Emotion plays very important role in human expressions. Emotions may be recognized from persons face, speech as well as written text. Large amount of work has been done in regards to detection of emotions from speech and face[3]. In "Emotions In Social Psychology", in which he clarified the feeling framework and formally arranged the human feelings through a feeling chain of command in six classes at essential level which are Love, Joy, Anger, Sadness, Fear and Surprise. Certain different words additionally fall in optional and tertiary levels. As of late, numerous scientists have concentrated on this region[4]. They are attempting to get sentiment data to examine and abridge the operation inions communicated naturally with PCs. This new research area is generally called Opinion mining of enormous information and Sentiment Analysis[5,6]. Classification problem is one of the problems in which data has to be classified into different classes present inside the db[7]. This extricated data can be then further

arranged by extremity as positive, negative or impartial[8,9]. It can be characterized as a computational errand of separating notions from the supposition. A few suppositions speak to conclusions and a few assessments don't speak to any opinion.

The proposed methodology in this work will utilize the common dialect handling techniques like fuzzy logic and neural system to extract emotions from text present in various blogs. Fuzzy logic is easy to apply and understand. Mathematically, concepts of fuzzy logic are also very simple. It is based on the natural language. Also neural network is used on the basis of connections of various neurons. It adjusts it output according to the input and weight assigned.

1.1 Sentiment Analysis

Sentiment analysis is the process of extracting the useful information from large pool of the information. Sentiment analysis has worked up the interest to several researchers in recent years[10]. The important concern is that to collect information activities has to discover what person assumes towards a particular thing such as individual, services, any topics, organizations, Products, issues, events, and

their attributes[11]. The field has becomes very interesting research area in recent years. Sentiment Analysis suggests many chances to develop new applications, because of the enormous available information in WWW such as blogs and social networks. It takes input from the text that is written in the digital form. In it, information is mined through the text. Sometimes it's done from the signs or symbols also which are called Emoticons. These are usually used in social media for conveys one's thought about a particular thing[12,13]. This thing can be anything likes it can be a person, place, movie, product or any real world object. Sentiment can be given at any intensity, either it can be of human being sentiment or can be the sentiment of an organization or a group. In the process of analyzing the sentiments, we examine from the written review to make sure that review is positive, negative or neutral.

This thing can be a person, place, movie, product or any real world object. Sentiment can be given at any intensity, either it can be of human being sentiment or can be the sentiment of an organization or a group. In the process of analyzing the sentiments, we examine from the written review to make sure that review is positive, negative or neutral .for e.g. If we take an example of any online movie review, it express their opinion about films then it can affect the interest of customer for the particular movie. Any types of movies Hindi, Punjabi or English. If reviews will be good, then the number of customers interacts towards the movie. If reviews will be bad, then interacts towards the movies will be decreased automatically as it will give a wrong message about the movie. If reviews are neutral, then any of the above conditions will be achieved or there are chances that it does not show any effect on the movie[13-16].

Figure 1 shows flowchart of sentiment analysis obtains dataset from any social sites and then segment that data. After that we will check the sentiments and assign tags to the extracted tokens. In the last overall polarity of the text is calculated. If the polarity of data is positive, it is positive sentence and if polarity is negative it is negative sentence.

2. Problem Formulation

Main challenges in this research is that we use ensemble schema in combination of three classifiers naive bayes, maximum entropy classifier and a knowledge-based tool that perform cryptic analysis in the text. Max Entropy Learner can accomplish very complex classification job and takes more compared to Naïve Bayes for training the dataset.
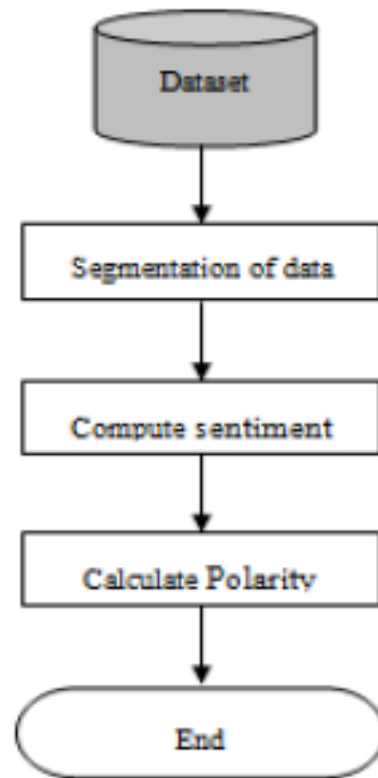

Figure 1. Flowchart of sentiment analysis process.

3. Proposed Methodology

The methodology of proposed work is given below:

Step 1: Start.

Step 2: Upload textual data from database which is collected from online websites.

Step 3: Then apply pre-processing on uploaded data in which feature extraction is done to get features of words.

Step 4: Then in next phase, creation of fuzzy rules will be done to get rule set.

Step 5: After this uploaded data will be tested on the basis of extracted features. In the dictionary there are some words that have meaning given to them in natural language. Hence matching can be done easily using neural network.

Step 6: In the end the consequences of the proposed method will be done and various parameter evaluations will be done to check the accuracy of the proposed work model.

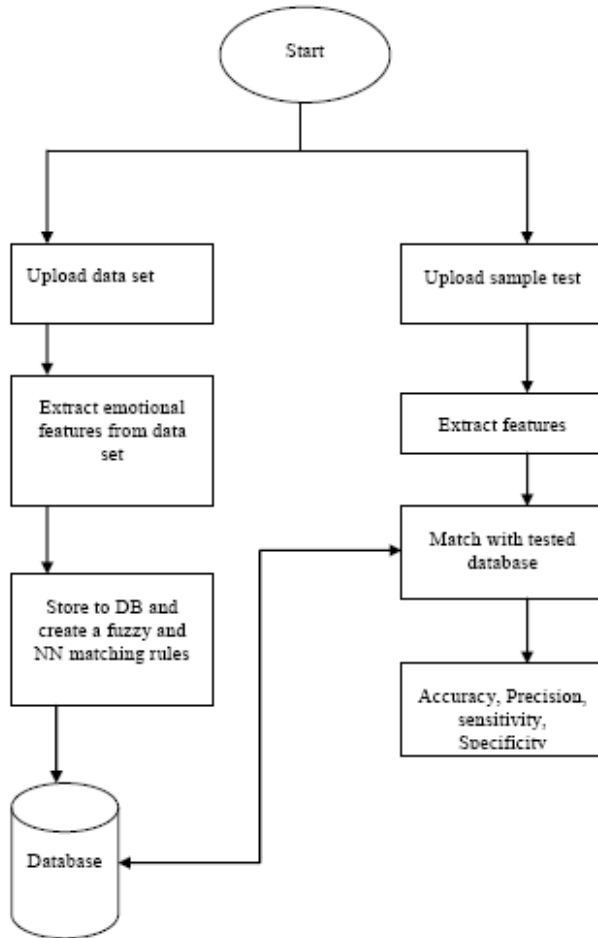Figure 2 represents the block diagram of proposed Methodology.

Figure 2. Methodology of proposed work.

4. Simulation Model

The proposed model utilizes the fuzzy logic as well as neural network for extraction of emotions from text. Feature extraction of emotions will be done using fuzzy logic based on membership functions and set of rules build in MATLAB. Then after that classification of emotions will be done using neural network. So by using both approaches we think to get the good accuracy results by extracting the emotions from big data.

The proposed work gives the graphical representation of the proposed work in which fuzzy logic and neural network has been utilized. Initially upload textual data from database which is collected from online websites. Then apply pre-processing on uploaded data in which feature extraction is done to get features of words. Then in next phase, creation of fuzzy rules will be done to get rule set[17-18]. After this, uploaded data will be tested on the basis of extracted features. In the dictionary there are some words

that have meaning given to them in natural language. Hence matching can be done easily using neural network. In the end the consequences of the proposed method will be done and various parameter evaluations will be done to check the accuracy of the proposed work (Figure 3).

5. Results and Discussion

This is a First phase to initialize the process to detect emotions from text. Here two different button that shows two different operation or parts of application. First button that shows training phase of the implementation that train the system for next phase. And classify the text according to their class Happy, Sad and Anger. Another phase that shows the testing phase which classifies the emotions to corresponding text that user uploads to test the dataset (Figure 4).

It's a phase where we train the system with various categories that will use to classify the user's queries. There are three type of emotion SAD, HAPPY and ANGRY.
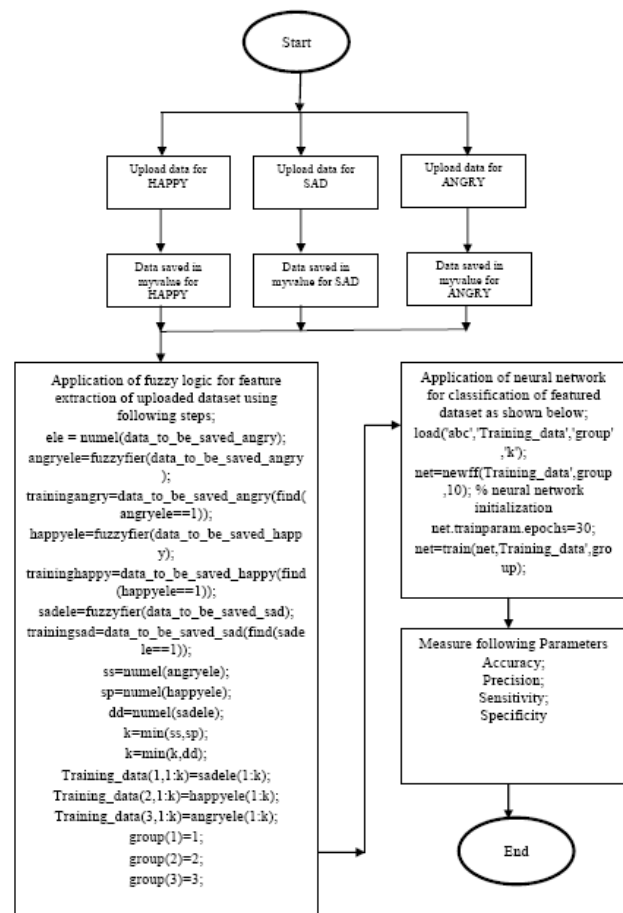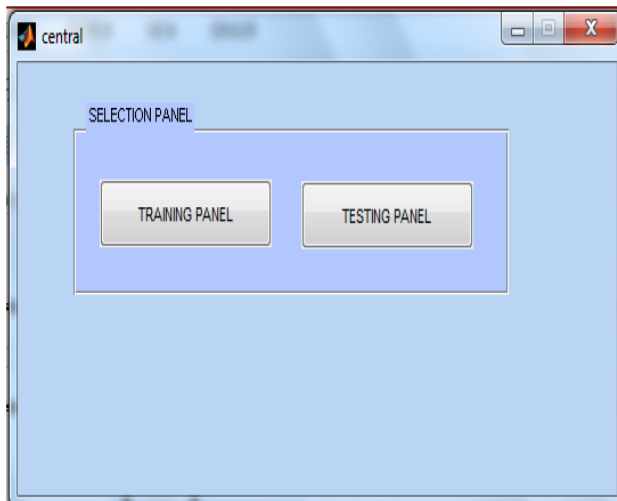

Figure 3. Simulation model.

Figure 4. Training and testing panel.

Figure 5. Text upload and feature extraction window.

Different panel that shows the training of their corresponding textual set and knowledge base of system are shown. Then text feature extraction and classification will be done using fuzzy logic and neural network (Figure 5).

In proposed work various functions has been used by neural network with different values i.e. epochs = 20, 6 validation checks, 1.00 gradient values and 2 hidden layers. Figure 6 shows the training done using neural network.

After the training and Classification using Neural Network, there are various texts that have been used for testing purpose like happy, joy, wonderful, good, best, better, awesome, great and fine. Testing panel shows the original category of dataset and classifies the text according to their class Happy, Sad and Anger (Figure 7).

The accuracy percentage is better than the previous work by using Neural Network for classification (Figure 8). Different values of accuracies are 88.79 for test 1, 87.14 for test 2, 91.23 for test 3, 89.20 for test 4 and 90.13 for test 5.

Figure 8 shows the accuracy when it is tested with different categories. The Accuracy is better using neural Network for classification.

Figure 9 shows Sensitivity, Specificity and Precision when it is tested with different categories. The Sensitivity, Specificity and Precision are better than the previous work by using Neural Network for classification. There values must be low in order to have good efficiency and it has been seen that sensitivity lies between .22 to .18, specificity lies between .87 to.53 and precision rate lies between .0057 to .0079.
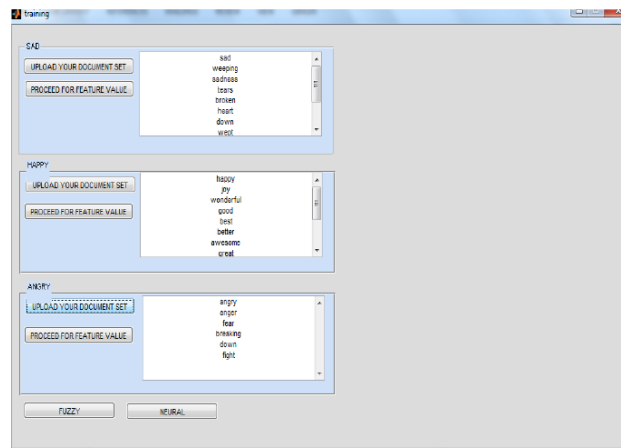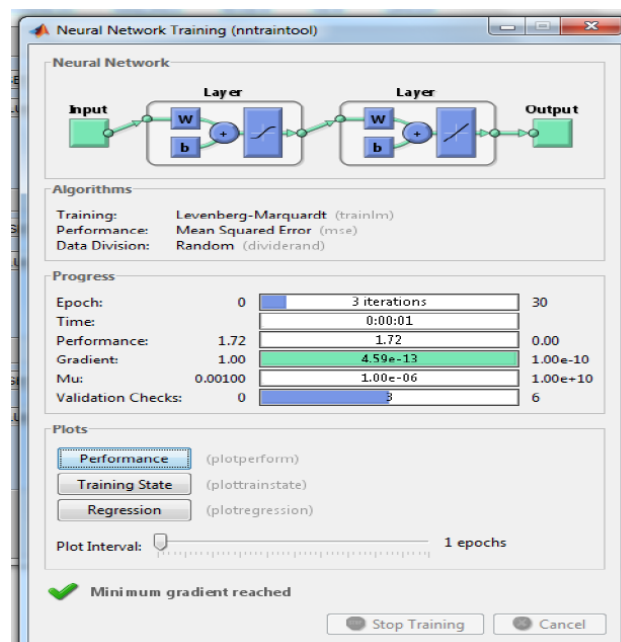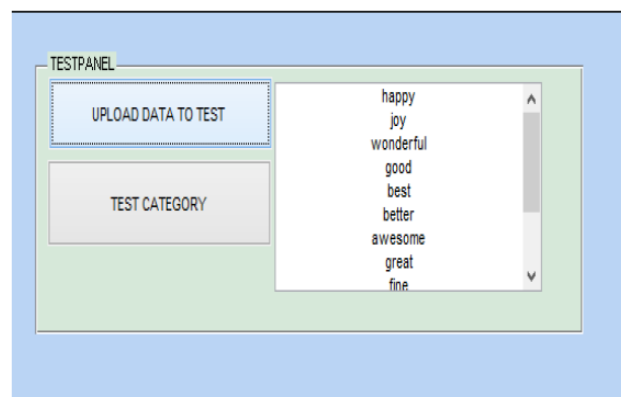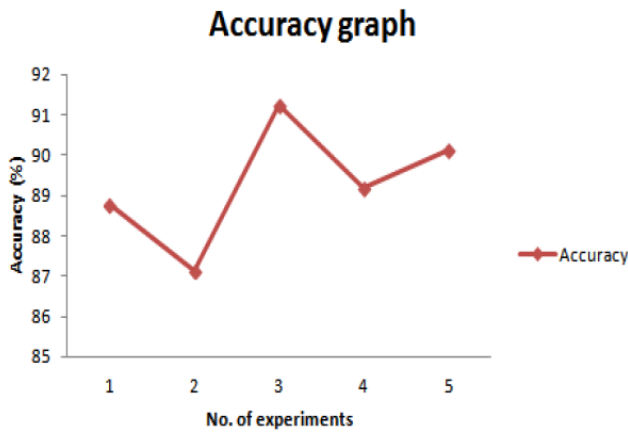

Figure 6. Neural network training.

Figure 7. Testing panel.
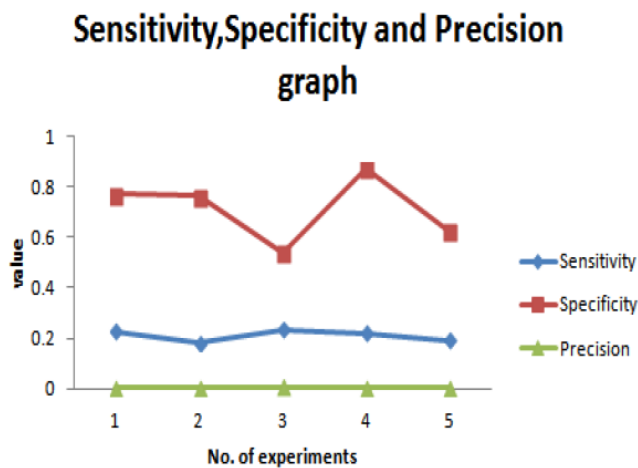
Table 1. Accuracy table.

Accuracy	88.79	87.14	91.23	89.20	90.13

Figure 8. Accuracy graph.

Table 2. Sensititvity, specificity and precision table.

Sensitivity	Specificity	Precision
0.229	0.771	0.00582
0.184	0.763	0.00635
0.234	0.539	0.00792
0.221	0.871	0.00438
0.193	0.623	0.00576

Figure 9. Sensitivity, specificity and precision graph.

6. Conclusion

Large amount of work has been done in emotion extraction from text. But good accuracy has not been reached by using various techniques of data mining, AI and classification algorithms. So, in the proposed work hybridization of both AI and classification algorithm has been done in which fuzzy logic and neural network has been utilized. From simulations result it has been concluded that proposed method worked well having accuracy of 90%.

7. References

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