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Application of Deep Learning For Sentiment Analysis

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***Abstract*- Deep learning is a type of artificial intelligence that employs neural networks, a multi-layered structure of algorithms. Deep learning is an accumulation of artificial intelligence statistics based on artificial neural networks for the teaching of functional hierarchies. In sentiment analysis, deep learning is also applied. This paper begins with an overview of deep learning before moving on to a detailed examination of its present uses in sentiment analysis.**

Keywords—AI, Neural Network, Sentiment Analysis, Deep Learning.

I. INTRODUCTION

The process of detecting positive or negative sentiment in text is known as sentiment analysis. Clients are expressing their ideas and sentiments more freely than ever before, and emotion recognition is quickly to become an indispensable tool for tracking and understanding that opinion. Brands can learn what makes customers happy or unhappy by automatically analyzing customer feedback, such as opinions in survey responses and social media conversations. This enables them to tailor goods and services to satisfy their users' requirements.

II. TYPES OF SENTIMENT ANALYSIS

Models of sentiment analysis concentrate on polarity (neutral, positive, and negative), as well as emotions and feelings (sad, angry, glad, etc.), urgency (not urgent, urgent), and even intents (not interested, interested).

1. Precision in polarity is critical in business. The following are the polarity categories: Sentiment analysis, which is very pleasant, helps to determine feelings such as joy, annoyance, rage, and melancholy.
2. "The battery life of this camera is very short," for example, an aspect-based classifier would be possible to ascertain that the statement communicates a negative judgment regarding the attribute standby time.
3. Preprocessing and resources are required for multilingual sentiment analysis. The majority of such tools are available on the internet; others must be generated, and you must be able to compute in order to use it.

III. BENEFITS OF SENTIMENT ANALYSIS INCLUDE

1. Sorting data from tens of thousands of tweets, customer support conversations, or surveys? There is simply too much corporate data to manually process. Sentiment analysis aids firms in efficiently and cost-effectively processing large amounts of data.
2. Authentic Method can identify key concerns in real-time, such as whether a media platforms PR disaster is developing. Is a disgruntled consumer about to leave? Sentiment analysis methods can assist you in quickly identifying these types of circumstances so that you can take appropriate action.

IV. DEEP LEARNING

Deep learning is a type of artificial intelligence that is intentionally programmed. In order to execute feature extraction and transformation, it employs a number of nonlinear processing units. Each of the subsequent layers uses the output from the previous layer as input.

Limitations

1. It only learns through the observations.
2. It comprises of biases issues.

Advantages

1. It lessens the need for feature engineering.
2. It eradicates all those costs that are needless.
3. It easily identifies difficult defects.
4. It results in the best-in-class performance on problems.

Disadvantages

1. It requires an ample amount of data.
2. It is quite expensive to train.
3. It does not have strong theoretical groundwork.

V. DEEP LEARNING APPLICATION IN SENTIMENT ANALYSIS

A. Sentiment Analysis Based of Customer Reviews

Deep Learning based Sentiment Analysis (DL-SA) is implemented to achieve framework for sentiment analysis.

Sentiment analysis results in identifying reviews as positive or negative. the solution is based on supervised learning method which needs training data [1].

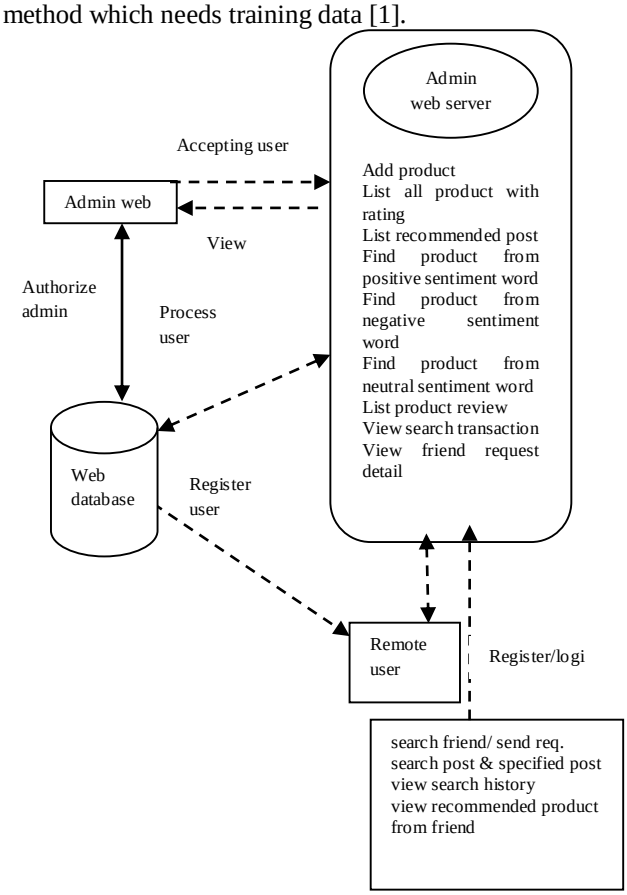

Fig.1. Framework for Customer Review Analysis

1. In the admin module, the Admin has to login by using valid user name and password.
2. After login successful he can do some operations such as add categories, add posts, list of all posts, list of all recommended posts, view good reviews, view bad reviews, list of all reviewed posts, list of users, list of all search history, update posts, by date wise, list of good reviews by date wise.
3. The admin can add the post by including product name, price, description and corresponding product image.
4. In the view all posts module, the admin can view the post by searching keyword and can get all the information about the product like product name, price, description and corresponding product image.
5. In the sentiment analytics module, the admin can analyze the sentiment based on products from positive sentiment words, products from negative sentiment words, products from neutral sentiment words and View Products Rating based on sentiment words.

B. A Deep Learning Classification Approach for Short Messages Sentiment Analysis

Peoples can communicate with each other through social media applications like whatsapp, facebook, twitter etc. social media apps get social media data from the applications and check what sentences are positive and negative sentiment using sentiment analysis. Deep learning methods like deep neural networks for using the Hindi tweets dataset and classifying them positive or negative sentiment polarity from twitter accounts.

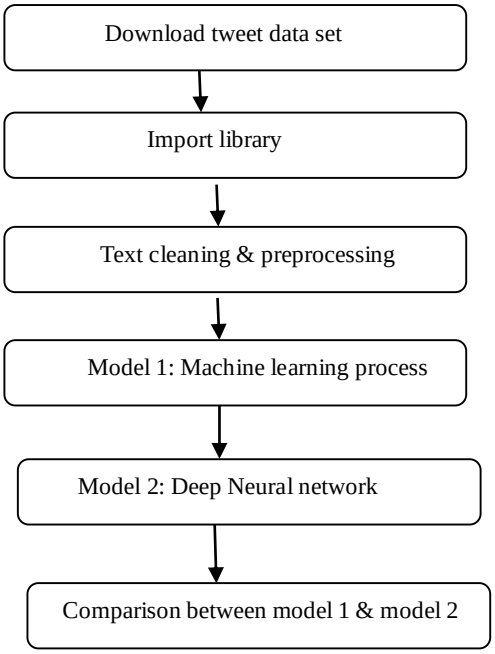

Fig.2. Social Media Sentiment Analysis Models

1. The Hindi dataset contains various posts in twitter.
2. The dataset is being used for text cleaning to get rid of the following things as follow[2][10]s:
   - Those words which have same linguistic are combined together. This is stemming or lemmatization.
   - All the text has been converted into lower case so that “the” and “The” will be consider as same word.
   - Check all digits, stop word like etc, special symbol like & has been removing it.
   - In preprocessing of text cleaning: non characters from each sentence has been Cleaned,
   - After this the sentences has been tokenized.
3. Using Machine Learning Algorithms: After cleaning the data, the following algorithm has been used.
   - Algorithm for Logistic Regression
   - Algorithm relates to Support Vector Machine (SVM).
   - Random Forest
   - XG Boost
4. After pre-modeling Neural Network recurrent technique which is also known as LSTM (Long Short Term Memory)[8][9] is used. This is help to remember the sequence of past data. Decision can be taken on the sentiment of the word. Keras is used for create a network. It has been built on tensor flow and it is helpful in most types of deep learning models. For estimating parameters such as dropout, no of cells have performed grid search with various parameter values.

5. We found that deep neural network model[8] stood out with a greater accuracy and the machine learning model scans the negative sentences and gives a score of 0.34 while the machine learning algorithms give a score of 0.54[2].

C. Sentiment Analysis and Contrastive Experiments of Long News Texts

There are three methods are tested separately and the experimental results will be compared [3].

1. Dictionary-based Method: It is based on grammatical rules. Dictionary-based approaches are as follows:
2. Read the text data and segment the text.
3. Find the emotional words in the sentences and record the emotional values and positions.
4. Find the degree words before the emotional words. Set weights for degree words and multiply them by emotional values.
5. Look up the negative words before the emotional words and find out all the negative words. If then number is odd, the emotional value is multiplied by - 1, and if it is even, the emotional value is multiplied by 1.
6. Compute the emotional values of all clauses and record them in an array.
7. Calculate the positive emotional mean, negative emotional mean, positive emotional variance and negative emotional variance of each text.
8. Determine whether the comment is positive or negative by calculating the emotional score.
9. Based on Machine Learning: The machine learning method uses logistic regression, support vector machine (SVM) and other methods to classify the text. The final classification effect depends on the choice of training text and the correct emotional label. The main steps of the machine learning method are as follows:

   Minimizing semantic granularity and using the two segment text.

   Feature extraction, including feature selection and feature extraction. The steps of feature selection are as follows:

   Calculate the information quantity of each word in the whole corpus by adding positive chi-square statistics to negative chi-square statistics of a word.

   According to the amount of information, author rank the words in reverse order and select them with the highest information quantity as the characteristics.

10. Based on Deep Learning: Deep learning is suitable for word processing and semantic understanding because of the flexibility of deep learning structure. The underlying word embedding technology can avoid the processing difficulties caused by uneven text length. Using deep learning abstract features, you can avoid the work of a lot of manual extraction of features. Deep learning has local feature abstraction and memory functions that can simulate the connection between words and words [3].

D. Sentiment Analysis Using SVM and Deep Neural Network

The use of Support vector machines, embedding deep neural networks which are suitable for the high dimensional data analysis. This will act as the generalized automated review system for various industries Such as E- Commerce platform, YouTube comments, movie review rating etc. with more high precision and has potential to replace orthodox star-based rating System.
Support Vector Machine: Support vector machines (SVMs) are more of the rugged method for both classification and regression work, and have very good generalization performance. In DNN SVM
joined model for the estimation analysis. The CBOW show is utilized here to take in word installing from a huge gathering from the crude content. After that DNN demonstrate is acquainted with build disseminated sentence portrayals for the more extensive info information. At last, the appropriated sentence include portrayals are being utilized as the highlights for SVM[9] classifier preparing them by learning the likelihood circulation over marks [4].

E. Sentiment Analysis of Movie Reviews Using Heterogeneous Features

System identified sentiment orientation from review text documents using a hybrid approach. The hybrid approach means a combination of Machine learning and Lexicon-based (knowledge-based) approach [5].
Table I Gives the Comparative Study of deep learning for sementic analysis

TABLE I: COMPARATIVE STUDY OF DEEP LEARNING FOR SEMENTIC ANALYSIS

Author	Description	Results
B.Seetharamulu et al. (2020)	Deep Learning for Sentiment Analysis Based of Customer Reviews	Better performance over existing system.
Amit Kumar Goel et al (2020)	A Deep Learning Classification Approach for Short Messages Sentiment Analysis	The LSTM model scans the negative sentences gives a score of 0.34 and the machine learning algorithms give a score of 0.54

Weinong Niu et al. (2019)	Sentiment Analysis and Contrastive Experiments of Long News Texts	Average of the positive and negative sample evaluations after ten-fold cross-validation.
Punit Dubey et al (2019)	Sentiment Analysis Using SVM and Deep Neural Network	Sparse vector is for solving movie reviews analysis obtained by Processing the review dataset of the movies.
Namita Mittal et al (2018)	Image Sentiment Analysis using Deep Learning	DNN, CNN, R-CNN, and Fast R-CNN get optimum result
Kruttika Jain et al(2018)	A Comparative Study of Machine Learning and Deep Learning Techniques for Sentiment Analysis	Reduce complexity
Rachana, Bandana et al. (2018)	Sentiment Analysis of Movie Reviews Using Heterogeneous Feature	Heterogeneous features can get better results rather than using only machine learning or lexicon based features

VI. CONCLUSION

In this paper, the study is presented on application of deep learning or machine learning for sentiment analysis. These techniques are applied in different application like twitter, Facebook, short message, images and movies data.

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