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SENTIMENT ANALYSIS OF SURVEY DATA

Dr.D.Bhuvaneswari
Assistant Professor
Department of Computer Science
SRM Arts and Science College, Kattankulathur-603203

Dr.V.Shoba
Assistant Professor
Department of Computer Applications and Technology
SRM Arts and Science College, Kattankulathur-603203

Abstract: **The process of figuring out if a piece of writing is positive, negative, or neutral is called sentiment analysis (SA). Opinion mining is an alternative term for sentiment analysis. Sentiment analysis is a branch of Natural Language Processing (NLP) that collects subjective opinions and feelings from diverse sources regarding a given topic. A collection of tools called sentiment analysis is used in business to detect, extract, and utilize sentiment. It is a ranking algorithm designed to identify a viewpoint based on opinion. There are various approaches to sentiment analysis. Supervised machine learning algorithms like Naive Bayes (NB), Support Vector Machine (SVM), and Linear Regression (LR) are part of the automatic classification technique. Recurrent neural networks (RNN) are another technique used in classification. The rule-based classification strategy employs a variety of NLP processes. Sentiment analysis uses machine learning to create accurate knowledge of people without the need for human interaction. Sentiment analysis can transform text into something favorable, negative, or neutral. As a result, any institution, foundation, or film critic can take public opinion into account and act accordingly.**

Keywords: **NB, SVM, LR, RNN and TNR**

I. INTRODUCTION

Sentiment analysis or opinion mining is nothing but analyzing opinions or sentiments based on textual data. Sentiment analysis identifies each person's opinion or feeling about a particular event. For sentiment analysis, we need to pass the document or text to be analyzed and create a system or model that represents the aggregated opinion about the given document. Twitter sentiment analysis is one of the recent and challenging research fields. Since social media such as twitter contains a huge amount of textual sentiments in the form of tweets, it is useful to identify people's sentiments or opinions about a certain event.

The study of sentiment, often known as opinion polling, is beneficial for examining movies, products, customer service, and opinions on any topic. This allows us to assess whether a product or service is good, bad, or preferable. It is also useful to determine people's opinions towards any event or person, as well as the text's polarity, which might be positive, negative, or neutral. Sentiment analysis is a method of categorizing text into different emotions.

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Fig 1: Evaluation of Emotions

II. WORKING OF SENTIMENTAL ANALYSIS

Evaluation of sentiment categorizes opinions and highlights relevant information. The study of sentiment defines "opinion" as "a view or judgment formed about something, not necessarily based on fact or knowledge." In data science, opinions are more than just that. The main function of empathy examination is to identify an opinion-expressing point of view and where it is expressed, and in the process, extract particularly interesting information. Sentiment analysis is basically a classification algorithm. Opinion polling defines "opinion" as "a view or judgment formed about something that may not be based on any facts or information." From a data science standpoint, opinion is far more than that.

Symbol assesses sentiment using a transformer-based deep learning architecture. Our analytics infrastructure is designed to handle conversational data first. Topics are used in multimodal analysis to assess the level of discussion on a topic. We consider the emotional impact of music when determining the overall tone of a discourse.

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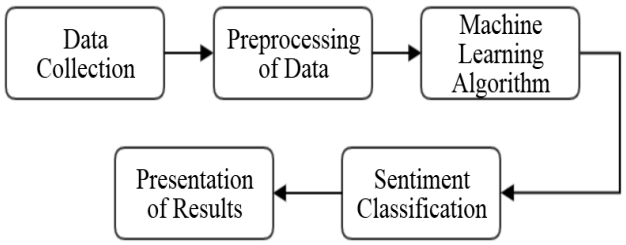

Fig 2: Workings of Emotional Evaluation

2.1 PRE-PROCESSING: Begin by acquiring text data that will be examined for opinions (such as customer evaluations, social media posts, news, or other text content). Collected text is pre-processed to clean and standardize data utilizing a range of tasks, including the elimination of unnecessary data (e.g., HTML elements, special characters). Tokenization is the process of splitting a text into discrete words or characters. Remove unnecessary ending words (such as "and," "the," and so on). Lemmatizing or pinching: reducing words to their roots.

2.2 EXAMINE: Text is transformed into analysis using approaches such as a bag of words or word input. The models are then trained on known datasets that link text to emotions (positive, negative, or neutral). Following training and validation, the model predicts the mood of new data and assigns labels based on previously learned patterns. Listen to social audio material on a regular basis or at a certain time, such as a product launch. Analysing video survey results for a large-scale research project. Meetings in large organizations are used to process employee input. Identify disgruntled customers so you can conduct closed-loop follow-up. Determine where sentiment trends are strongest in specific groups or locations. Competitor analysis is the process of comparing your approval ratings with those of similar businesses.

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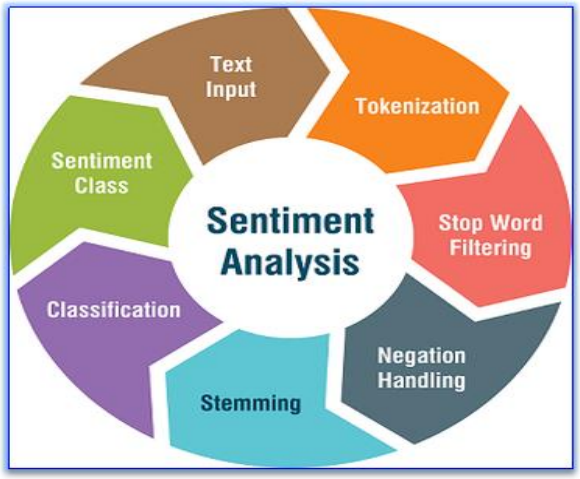

Fig 3: Steps for Affective Diagnosis

- Document-level – for the entire text.
- Sentence-level – obtains the sentiment of a single sentence.
- Sub-sentence level – obtains the sentiment of sub-expressions within a sentence.

2.3VARIOUS TYPES OF SENTIMENT ANALYSIS

Type 1 opinion analysis is concerned with determining the polarity of opinion. It could be as basic as distinguishing between positive and negative feelings. Depending on the use case, this type can also progress to higher specifications (such as very positive, positive, neutral, negative, and very negative).

Type 2 emotion recognition is used to identify evidence of specific emotional states in written material. It is usually a blend of vocabulary and machine learning algorithms that determines what is and why.

Type 3: Aspect-based opinion analysis delves deeper. Its objective is to determine an opinion about a certain aspect of the product. For example, consider the lighting from a smartphone flashlight. Aspect-based analysis is commonly used in product analytics to determine how a product is perceived and what its strengths and flaws are from the customer's perspective.

Type 4 target analysis relates to action. Its objective is to determine what intent is conveyed in the message. It is frequently used in customer support systems to improve workflow.

2.4 SENTIMENT EXTRACTION

Identification of the text's emotional tonality is the main goal of sentiment analysis. Identifying the sentiment as good, negative, or neutral is its main objective; this is useful for comprehending consumer opinions, reviews, and social media comments. In order to determine the dominant sentiment and determine how the general public or specific individuals are responding to certain goods, services, or occasions, sentiment analysis algorithms examine the language used.

2.5 SEMANTIC ANALYSIS

However, sentiment analysis stops there. Semantic analysis seeks to understand the text's meaning and context. It looks for connections between terms, sentences, and ideas within a certain body of work. The underlying meaning, intent, and relationships between the many components of a sentence are all taken into account by semantic analysis. For jobs requiring a deeper comprehension of context and semantics, such as question answering, language translation, and content summaries, this is essential. Fig 4 define the general text classification task's problem in formal terms.

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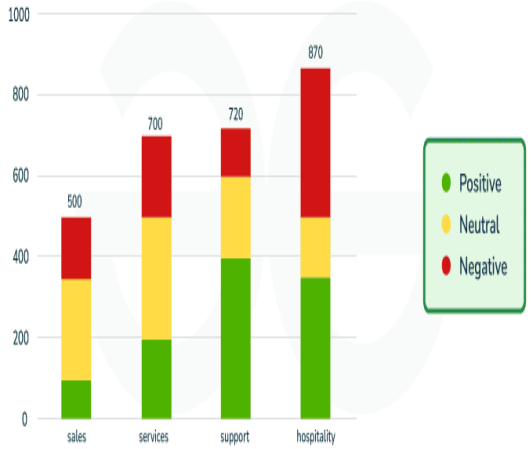

Fig 4: Some instances of Social Assessment.

A document (d) and a fixed set of classes (C = {c1,c2,..,cn}) are the inputs. A predicted class c $\in$ C is the output. because it pertains to the field of text classification, the term "document" is deemed subjective in this context. A document can be a tweet, a statement, an article, a product guide, a story, or portions of an article. The word, which is a little entity in this context, is the basis for this terminology. The term "document" is frequently described using extensive word lists. An article denotes a longer document, whereas tweets indicate a shorter one. A learned classifier is the end product, and the training set with documents labeled n looks like this: (d1, c1), (d2, c2),... (dn, cn).
Construct a Naive Bayes classifier using the following code: naïve Bayes (as.matrix (train_dtm), data $sentiments [split])# Predict the sentiment based on predictions made using test data \- predict(classifier, newdata = as.matrix (test_dtm))# Determine accuracy: accuracy \- mean(predictions == data $sentiments[-split]).

2.6 GENERATE A SMALL DATASET FIT FOR EMOTIONAL ANALYZATION

2.6.1 Produce textual data: Gather text from a range of sources, including news stories, product reviews, and social media. Make sure the messages address a range of emotions, including neutral, negative, and positive ones.

2.6.2 Data annotation: either manually annotate some text or annotate it with an appropriate emotion. Put "positive" for "positive," "negative" for "negative," and "neutral" for "neutral" in sentences that convey any feelings at all.

2.6.3 Arrange the data: Put the data in a format that is appropriate for analysis. This may be a CSV file with two columns—one for the text and another for the opinion tag—where each line represents a sample of text.

2.7 RATES OF PERFORMANCE

- **Accuracy:** It is determined by dividing the total number of occurrences by the sum of the examples that exactly match.
- **Precision:** A method's effectiveness is gauged by its precision, which represents the sentiment classification accuracy.
- **Sensitivity or recall:** Sensitivity, often known as recall, is a defined term that expresses the percentage of the assessed favorable sentiment.
- **Specificallyity:** Specificity (SP) is derived by dividing the total number of correct negative predictions by the recall, which reflects the proportion of the assessed positive emotion. Another name for it is a True Negative Rate (TNR).
- **F-value**: It also known as the F1 score, F score, or F measure, represents the precision and recall weighted mean. The accuracy improves with a greater F value. In actuality, the F1 score is computed to achieve a compromise between recall and precision.
- **Loss function:** The unpredictability is calculated via the loss function. The cross-entropy loss function computation

III. CONCLUSION

Recognizing emotions has become an emergent process with several difficulties. Studying techniques and strategies that guarantee the automatic categorization of emotions into positive or negative polarity is the aim of this endeavor. This article employs a variety of strategies. In order to improve our model's ability to anticipate sarcasm in future work, we must supply sufficient training data. Also, when tagging tweets, we only took into account positive, negative, and neutral polarity; however, other tags that distinctly convey other moods can be added. Future plans are to apply the hybrid classification technique to examine the efficacy of the method using Arabic tweets, as a significant number of tweets are generated every minute, many of which are in Arabic.

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