ROLE OF AI IN SENTIMENT ANALYSIS: A REVIEW

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Abstract: In sentiment analysis (also known as opinion mining or emotion AI), natural language processing, text analysis, computational linguistics, and biometrics are used to identify, extract, quantify, and study affective states and subjective information. While monitoring online conversations, sentiment analysis identifies and extracts subjective information from textual sources in order to help companies understand the social sentiment of their brand, product or service. Artificial Intelligence has a great role in Sentiment Analysis. Several good models to consider include logistic regression, SVMs, Random Forests, and Naive Bayes.

Keywords: Sentiment Analysis, Artificial Intelligence, SVM, Consumer Reviews

I. Introduction

Through the use of computational methods, sentiment analysis is the study of how people's feelings, sentiments, and emotions are revealed behind a text or interaction. To mine, extract, and categorize users' opinions regarding a company, product, person, service, event, or idea, it uses machine learning (ML), natural language processing (NLP), data mining, and artificial intelligence (AI) techniques.[1]

In order to gain insight into vast amounts of unstructured data from various online sources, including social media, emails, chats, blogs, and forums, organizations use sentiment analysis. Around 80-90% of all digital content is unstructured, according to a 2019 study by CIO. [1]

In general, sentiment analysis algorithms process data in three ways: rule-based, automatic, or hybrid. A rule-based approach identifies sentiments by using predefined and lexicon-based rules manually crafted. To perform sentiment analysis automatically, machine learning methods are used, while in a hybrid approach, a combination of the above is used. [2]

Several companies use sentiment analysis tools to streamline and optimize their businesses based on the volatile and constantly changing market, customer opinion, and feedback. Among the companies that offer sentiment analysis tools or SaaS products are Zoho, Lexalytics, and Brandwatch.[2]

1.1 Sentiment analysis types

It primarily consists of four types of sentiment analysis: happiness, sadness, surprise, interest, joy, and anger. The sentiment analysis has the following types,

Fine-Grained: You can define the polarity of the text or interaction precisely with fine-grained type. In this category, customer reviews and ratings are analyzed, with sentiments ranging from positive to negative, very positive to very negative. Based on the rating 1-10, the rating 1-4 may indicate a negative sentiment, while a rating 5-10 indicates a positive sentiment. [3]

The aspect-based approach: As a step further, aspect-based sentiment analysis analyses specific aspects of a product, service, or idea that users discuss. Let's say a customer reviews a laptop and says, "The webcam seems to turn on and off randomly." With aspect-based analysis, the laptop manufacturer will be able to determine that the customer has made a negative comment about the laptop's 'webcam'. [3]

Emotion detection: It utilizes lexicons (sets of words and expressions) that identify specific emotions, as well as machine learning-based classifiers to determine emotions such as joy, sadness, fear, worry, etc. Humans express feelings in a variety of ways, which is why machine learning-based emotion detection is preferred over lexicons. As an example: "This phone is insane". These sorts of reviews may confuse sentiment analysis models as they might evoke two different feelings. Using only lexicons may result in inaccurate results, since one may be entirely positive, while the lexicon 'insane' may classify it as one that implies fear or panic. However, by using machine learning-based detection, such a possibility is avoided. [4]

Intent analysis: To save time and money, businesses should leverage consumer intent when channeling their efforts. By identifying the user's intent–whether the user is interested in purchasing a product or is just browsing the website without any intention of purchasing one–intent analysis assists in achieving this goal. Those consumers who intend to purchase the product can be targeted with targeted advertisements, whereas those who will not buy can be left alone, saving money, effort, and resources. [4]

II. Artificial Intelligence and Sentiment Analysis

Among the characteristics of artificial intelligence are its ability to perform tasks that normally require human intelligence, such as visual perception, voice recognition, decision making, and language translation. A variety of business sectors can benefit from the AI strategies, including decision support, new service and product development, capacity building, etc. Deep learning and machine learning are used in the AI strategies. [5]

A wide variety of practical applications can be analyzed with deep learning. In order to detect data patterns, classification tasks require labeling datasets. Users should apply their prior knowledge to labeled sets when using labeling datasets. As a result, the neural network and system are able to relate the data to their labels. This is supervised learning [5]. Combining data-driven mathematics, statistics and AI, the development of machine learning [31] has opened up exciting new possibilities in technology. Rather than relying on engineers to write programs, these advancements make it feasible to create computers that are capable of training themselves for such tasks [5]. This is made possible by making the software "intelligent", meaning it can draw from past events and interactions to inform its decisions. This in turn enables the computer to autonomously develop programs and suggest proactive solutions based on what its learnt. Companies have been using this knowledge to their advantage; tapping into the sheer volume of data they possess, they leverage machine learning to provide actionable forecasts for executives.

The foundation of sentiment analysis is laid by developers who design a machine learning algorithm capable of detecting content with varied sentiments. In the first step, input data or text is processed with the help of ML classifiers, which train large volumes of datasets containing positive, negative, and neutral sentiments. During this phase, words, phrases, and sentences are separated from the data. [6]

In the training phase, input text is passed through the feature extractor, which extracts features to generate feature vectors, labels, and tags (positive, negative, or neutral). Word embeddings and word vectors are methods for extracting features that allow words with similar meanings to be represented in a similar way. The vectors are then input into a machine learning algorithm that produces a classifier. When the new data is entered into the feature extractor, it generates feature vectors, which the classifier model then processes to predict the sentiments hidden in the new data. The output is generated by neural networks,

linear regression, support vector machines, and deep learning algorithms. [6] As the new data passes through the ML classifier, the AI model provides a sentiment score. For instance, 1 indicates a negative sentiment, 0 indicates neutral sentiment, and +4 indicates a positive sentiment. [6]

III.   AI Sentiment Analysis Tools

- **Brand24 :** In essence, Brand24 is a media monitoring tool, and sentiment analysis is just one feature you can use. Web and social media monitoring are also available through Brand24. Social media networks, blogs, forums, the internet, news sites, podcasts, and newsletters are all covered by the tool. This makes Brand24 one of the best sentiment analysis tools available because it collects mentions in real-time and offers robust media monitoring analytics. With sentiment analysis, you can not only track your brand online, but also determine how people feel about it. Using machine learning algorithms and natural language processing, Brand24 analyzes text data in real-time inside different tabs of its dashboard. [7]

- **Clarabridge:** A sentiment analysis tool is part of Clarabridge's Customer Experience Management solution, which includes CX Analytics and CX Social.Grammar, context, industry, and source are all considered when scoring a piece of content using an 11-point scale. [7]

- **Repustate :** Repustate provides text analytics for businesses in 17 different languages through its sentiment analysis tool. A mechanism known as part-of-speech tagging is used by the tool to decompose text blocks into grammatical parts before the analysis is carried out. From a sentiment analysis perspective, it's much easier to determine which phrases are most interesting once this step is complete. The tool emphasizes other factors, like lemmatization, prior polarity, etc., as well. It is possible to try Repustate for free before you decide whether to sign up for one of the paid plans ranging from $99 to $1699. [8]

- **OpenText:** The OpenText Sentiment Analysis Tool is part of the OpenText Content Analytics platform. It identifies and evaluates subjective patterns and expressions of sentiment within textual content. The analysis takes place on three different levels: topic, sentence, and document. It's programmed to recognize whether portions of text are factual or subjective. As for the latter, it's also meant to determine whether content conveys a positive, a negative, a mixed, or a neutral opinion. [8]

- **ParallelDots:** A sentiment analysis tool is just one of ParallelDots' tools in their offering of products, APIs, and plugins, which includes their sentiment analysis tool. A text blob's sentiment can be classified into positive or negative using Long Short Term Memory (LSTM) algorithms. LSTMs are trained on social media and news data differently for dealing with casual and formal language. LSTMs model sentences as a chain of forget-remember decisions based on context. [9]

- **Lexalytics:** Lexalytics offers the ability to process high volumes of text data, run the system behind your firewall, or tune and configure your text analytics.Using text deconstruction and natural language processing, they break phrases and sentences apart to evaluate semantics, syntax, etc. The second step involves sentiment analysis, categorization, name entity recognition, intention detection, and more.Last but not least, structured data and conclusions are transferred to their data visualization suite or business intelligence platform so that historical and predictive analysis can be performed. Many tools can tell you who's talking and what they're talking about,

some of those tools can tell you how those people feel, but only Lexalytics can tell you why. Audience sentiment analysis can have a big impact on your bottom line. [9]

IV. Conclusion

Strategic competitive research requires an understanding of consumers' perceptions of the competitors and the reasons behind their perceptions. In order to determine the actual strengths and weaknesses of various firm components, market research is conducted to obtain data for business purposes. One of the most effective ways to achieve this goal is to utilize text analytics for sentiment analysis. This process can be used by brands to identify how their offerings measure up against those of their competitors. By analyzing this data, an organization can differentiate itself from the rest. AI-powered sentiment analysis is gradually becoming an indispensable tool for enterprise strategy. It helps businesses comprehend customer experiences and appreciate employee opinions. The most common applications include examining customer reviews, gauging the severity of service issues, and tracking mentions on social media platforms. Going forward, using sentiment analysis might prove beneficial in gaining more insight into people's emotions. Computers will be able to interpret messages, comments and feedback more accurately which should help further refine the process.

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