American International University-Bangladesh

A Report on

A review on Sentiment analysis from Text using Deep Learning

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A SYSTEMATIC MAPPING STUDY of A REVIEW ON SENTIMENT ANALYSIS FROM TEXT USING DEEP LEARNING

Abstract:

The sentiment analysis seemed to be a crucial tool for automating the extraction of knowledge from user-generated data. Deep learning methods have recently been put out for a variety of sentiment analysis applications and have produced cutting-edge outcomes. Therefore, this review study, evaluate deep learning algorithms that have been used to various sentiment analysis tasks and their trends of growth in order to aid researchers in swiftly depicting the present progress as well as current concerns to be addressed. The performance analysis of various deep learning models on a specific dataset at the conclusion of each sentiment analysis task is also provided in this review paper.

Keywords: Sentiment Analysis, Deep Learning, Humor, Sarcasm Identification, Social Media, Textual Data, BERT.

1. Introduction:

Sentiment analysis (SA) is the process of determining the human emotion that is expressed in a way that makes it possible to forecast a person's emotion, attitude, or even personality as it shows itself in different ways. Computers can accurately identify human emotions thanks to sentiment analysis, which pinpoints the one that is highlighted in the context. This study set out to provide a wide range of assessments on several studies that used AI-driven SA and OM of emotion. A comparison table of SA based on past studies from online is also included in this publication, along with a full analysis of SA and OM using a range of techniques, including both implicit and explicit data extraction.

2. Background:

2.1. Sentiment Analysis Taxonomy:

Finding the emotion from the context in this review paper is the major goal of sentiment analysis (SA). The context might be information from a document or online review; it could be anything in huge quantities where humans could slow down the process while handling it. To determine the precise meaning and the sentiment directed to it, there are many stages that must be taken. As a result, this section describes the numerous Sentiment analysis (SA) techniques. Figure 1 shows the taxonomy of sentiment analysis.

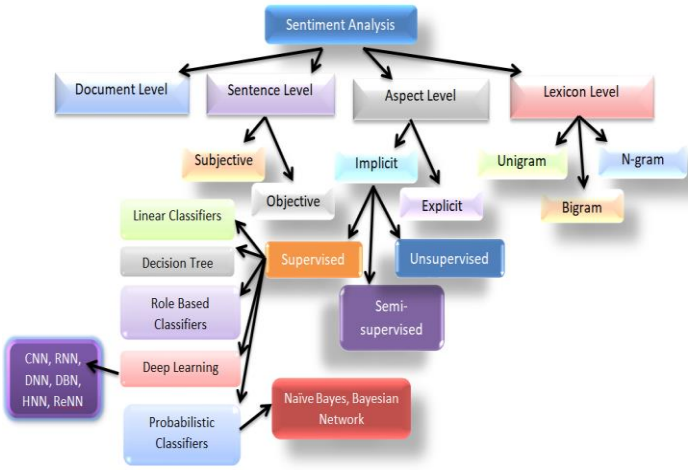

Fig 1: Sentiment Analysis Taxonomy

2.2. Systematic Mapping:

A systematic mapping is a sort of evidence-based engineering that tries to provide a broad perspective of a research topic by classifying and organizing the material about a study or

research field. According to this review report, there is a figure 2 to help with understanding.

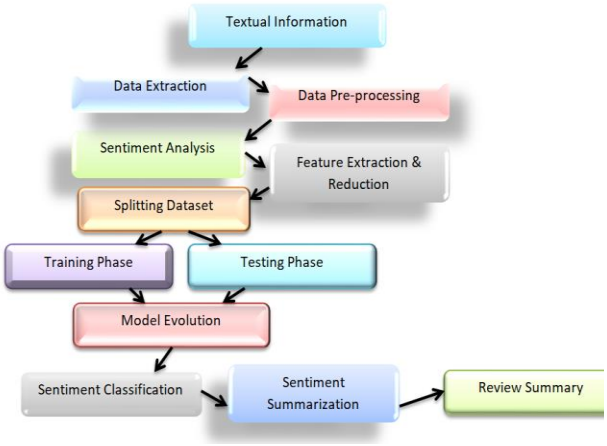

Fig 2: The whole process

3. Related Work:

Due to a growing tendency of individuals expressing their ideas on social media, review pages, feedback forms, and other online platforms, sentiment analysis has become a popular area of study. As a result, researchers are interested in this subject. Researchers who are interested in the use of machine learning in sentiment analysis concentrate on feature extraction techniques like building lexicons to understand sentiment polarity or mastering word embedding and using them in machine learning algorithms for sentiment classification. However, the majority of widely used machine learning techniques still struggle to capture complex emotions like sarcasm and irony.

In 2021, Verma [1] gives a paper where levels of sentiment analysis, different emotion models, and the method of sentiment analysis and emotion detection from text are all explained in this review study. The difficulties encountered during sentiment and emotion analysis are also covered in this work.

Most recent year Vincent [2] with his six partner give a comprehensive survey's where primary goals were to assess some of the most important studies completed to date and to give a general overview of Sentiment Analysis (SA) models in the field of emotion AI-driven SA. Additionally, this paper provides an overview of lexicon- and ontology-based SA in addition to machine learning models that are employed to assess the sentiment of the given context. This work also explores various neural network-based techniques for sentiment analysis. Finally, sample data gathered from Twitter was also used to analyze these various approaches.

Mary [3] and another researcher gives a study where examines how several artificial intelligence approaches were used to analyze social media data for sentiment in order to identify anxiety or despair. In the survey, it was clearly seen that social media data, including texts, emoticons, and emoji's, was used to identify sentiment using a variety of artificial intelligence techniques. When performing sentiment analysis, multi-class classification using a deep learning algorithm demonstrates higher precision values.

Afterward Grover [4] gives a paper where the main objective is to discuss how emoji's can be used in addition to words to convey various emotions. This study contrasts various classic lexicons and word embedding based on text. The evolution of emoji-based lexicons and emoji embedding's then covered in the study. Emoji-based deep learning techniques are also investigated in order to enhance current sentiment categorization jobs. This paper's main contribution is a survey of numerous methods for using emoji's in sentiment analysis, which hasn't been done to the best of our knowledge up until now.

Chen with two other participant [5] gives the review paper examines recent studies in which researchers presented alternative BERT-based models, taking into account BERT's strength and popularity in text-based emotion detection. The survey outlines its objectives, findings, constraints, and datasets used. In order to promote study in text-based emotion detection

utilizing these models, we have also offered future research directions.

In a review study published in 2019 by Yuhua [6], the performance of multiple deep learning models on a given dataset is examined after each sentiment analysis task. The assessment continues by outlining current issues and suggested solutions for future work to take into account. Additionally, the future work section offers concepts that, using the insights from earlier studies, can be incorporated into fresh deep learning models to produce better performance. A few ideas include common sense, reinforcement learning, sentiment-specific word embedding models, bidirectional encoder representations from transformers (BERT), cognition-based attention models, and generative adversarial networks.

Around 2019 year Suguna [7] this survey paper discusses various sarcasm detection methods and datasets. Various methods, including statistical methods, rule-based methods, classification methods, and deep learning methods, were surveyed. It also sheds light on the various sarcasm detection techniques employed in the past. After investigating, we discovered that deep learning produces better results than other methods.

Tarus [8] provides a survey paper of sentiment analysis in scientific citations. The process of scientific citation sentiment analysis is described in this review, along with recently developed approaches and their key drawbacks. They also discuss similar disciplines that have recently received a lot of interest, like citation function categorization and citation recommendation. Their contributions include highlighting the most pressing issues and classifying current techniques for sentiment analysis of scientific citations.

Recent century; Yue [9] focuses on presenting standard methods in the field of sentiment analysis from three different perspectives (task-oriented, granularity-oriented, and methodology-oriented). Particularly, many different techniques and methods are compared and categorized. On the other hand, several data formats and cutting-edge research methods are introduced, along with their limits. These resources serve as the foundation for identifying and discussing the key future prospects for sentiment analysis.

Observing 95 articles Houby [10] give review, which is based on works published in the Science Direct and Springer databases between 2016 and 2020, focuses on recent work in SA using Deep Learning (DL) approaches in the sentiment categorization process. It illuminates several DL algorithms in use and various SA system implementations. 58 publications were checked out on Science Direct. With a total of 84 papers evaluated and analyzed for this evaluation, 26 articles published by Springer met the same criteria. Review topics include DL methods, language, domain, and performance outcomes.

4. Research Methodology

The research approach used to perform the review study is briefly outlined in this section. It comprises the size of the literature review, the search strategy, the databases used, and the search phrases. In the search methodology, the authors conducted a systematic search for the terms in each research database listed below in order to compile all relevant material to date that fits the scope described above. The pertinent papers were gathered into tables, and a choice was taken in stages based on the inclusion criteria.

4.1 Research Questions

Writing research questions should take field relevance into consideration. In conclusion, the research should be focused on using qualitative questions that also take into account the unique aspects of the subject. They must also be brief and clear enough for the audience to understand them without further explanation.

- **RQ1.** Can the intensity or strength of Sarcasm sentiment expressed in text be accurately quantified using Deep Learning methods? **Ans:** Yes.
- **RQ2.** Does GPT best detector model to find actual humor**? Ans:** Yes.

4.2 Search Process

The reference document is derived from the following online academic libraries using the "Google Scholars" website for finding or adopting this concept:

- SpringerLink (https://link.springer.com)
- MDPI (https://www.mdpi.com)
- Elsevier (https://www.elsevier.com)
- IEEE Xplorer (https://ieeexplore.ieee.org)

4.3 Study Selection Process

Multiple studies that attempted to categorize various groupings, including sentiment and emotions, served as inspiration for this idea. It is also one of the important works that followed. Continue the selection process using the research question and keywords as a guide.

4.4 Inclusion and Exclusion Criteria

The criteria for inclusion must be met by all the information a study needs to include. The features that would prevent a study from being included are known as exclusion criteria.

SL	Ref. No	Criteria
01	[1]	The technique of sentiment analysis and emotion detection from text is provided, along with knowledge of the many levels of sentiment analysis and emotion models.
02	[5]	This paper reviews BERT-based approaches frequently.
03	[6]	It provides vary much valuable information about selected topic.
04	[7]	Gives valuable information about different way of Sarcasm detection.
05	[8]	Have proper information in survey according to the sentiment analysis.
06	[9]	Gives a whole review about the sentiment through survey on social media data.
07	[10]	This paper is subject to Deep Learning approaches with a review result.

Table 1: Inclusion Criteria

SL	Ref. No	Criteria
01	[2]	Only present AI related works.
02	[3]	Presents depression detection from social media.
03	[4]	Relevant to exploiting emoji most.

Table 2: Exclusion Criteria

4.5 Data Extraction Process

According to how each article is described in terms of its metadata, which includes the year of publication, the source, the kind, the solutions offered, the level of application for the solutions offered, the validation method, and the application platforms, a data extraction portion is created.

SL	Data item	Description	RQ
01	Name	Author name	
02	Year	Publication year	
03	Source	Publication source	
04	Type	Review or survey paper	
05	Category	Review, comparison, survey	RQ1, RQ2
06	Threats	Finding paper	
07	Source of Threats	Internal or external	
08	Solution type	N\A	
09	Mechanisms	Comparison	

Table 3: Data extraction portion

4.6 Data Synthesis

This data synthesis is constructed in accordance with the search and research questions and also provides guidance for the subsequent step.

5. Results of the Mapping

SL	Ref No	Year	Type	Publisher	Focus Area	Application Area/ Technique	Approach	Methods/ Models/ Algorithm	Language	Data Set	Percentage	RQ
1	[1]	2021	Review	Springer	SA ED	ML approach, DL approach	UnS, Sup	SVM, LDA SVC	English	News, blogs, fictions, letters, twitter	81%, 77.54% 96.75%	
2	[2]	2019	Survey	MDPI	Comparative review of SA	AI approach, DL approach, LB approach	UnS, Sup, S-Sup	Compared outcomes	English	Tweets, Microblogs	82% 84.3%	
3	[3]	2022	Review	Springer	SA, DD	AI approach ,ML approach, DL approach	UnS, Sup, S-Sup	SVM KNN, RNN, LSTM	English	Tweeter, Facebook, Reddit	74.18%, 73%, 80%, 75%,	
4	[4]	2022	Survey	Springer	SA, Emoji	ML approach, DL approach, AI approach	UnS, Sup	SVM Bi-LSTM, LSTM, CNN	English, Italian, French	5805 Feedbacks	55.92% 66.51% 71.19% 87.34%	
5	[5]	2022	Review	Springer	SA ED Transformer Model	DL approach, BERT approach	Uns, Sup	Tf*idf, SVM, LDA KNN	English	Twitter, Blogs, Movies	87%, 82%, 86.52% 86.56%	
6	[6]	2019	Review	Springer	SA, DL	ML approach, DL approach, LB approach	Sup, S-Sup, BERT	CNN, KNN, LSTM, RF	English	Unlabeled tweets (300M)	93% 89% 67.09% 82.14%	1
7	[7]	2019	Survey	Springer	SA, Sarcasm Detection	ML approach, LB approach, DL approach	Uns, S-Sup, Sup	RF, LR SVC, RF	English, Greek	Twitter, Reddit, Book	71.15% 62.35% 86.26% 87%	1
8	[8]	2019	Survey	Springer	SA, Scientific citation	NLP approach, DL approach	UnS, Sup	E-LDA, kMeans, tf*idf NB, RM, ME	English	Facebook, Twitter comment, News	F1 = 93.5%	2

9	[9]	2019	Survey	Springe	SA, Humor	DL approach, LB approach	Sup	CNN, LSTM, KNN, RNN, DT	English, Spanish, & French	2033 Survey response	F1 = 86%, P = 88%, R = 85%, Acc = 93% 66.44% 55.92%	2
10	[10]	2020	Review	IEEE	SA, DL	NLP approach, DL approach, ML approach, LB approach	UnS, Sup, Uns, S-Sup	LR, RF, GRU, Bi-LSTM	English, Arabic	Twitter, Microblogs	86.56% 88% F1 = 71% 92.5% 78.9%	

Table 4: Comparison of different paper

NB: SA = Sentiment Analysis, ED = Emotion Detection, DD = Depression Detection, ML = Machine Learning approach, LB = Lexicon Based approach, DL = Deep Learning approach, NLP = Natural Language Processing, Sup: Supervised, UnS: Unsupervised, S-Sup = Semi- Supervised, RF = Random Forest, AI = Artificial Intelligence.

6. Conclusion

The ten relevant papers that were selected for this mapping study were examined with regard to a number of different aspects, including the investigated entities/aspects in the fields of education and customer feedback, the most popular bibliographical sources, the research trends and patterns, the tools, and the most widely used data representation techniques for sentiment analysis. It showed a general upward trend in articles examining this topic across the examined years of 2019 to 2022, with DL techniques being the most common.

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