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A Survey on Sarcasm Detection in Social Media Audio and Text Conversation Using Support Vector Machine

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Abstract— **Emotion recognition plays a major role in making the human-machine interactions more natural. In spite of the different techniques to boost machine intelligence, machines are still not able to make out human emotions and expressions correctly. Emotion recognition automatically identifies the emotional state of the human from his or her speech. One of the greatest challenges in speech technology is evaluating the speaker's emotion. Usually emotion recognition tasks focus on extracting features from audio. Speaker's emotion can also be detected using text mining technique on audio material after translating it into text. One of the most important emotions is sarcasm[3]. Sarcasm is the use of language that normally signifies the opposite in order to mock or convey contempt. The goal of Sarcasm Detection is to determine whether a sentence is sarcastic or non-sarcastic. In this paper we are trying to detect sarcasm from the audio and text conversations present in social media. Here we will use SVM machine learning approach to classify sarcasm from the given data.This method aims to enhance the efficiency of sarcasm classification by consolidating the features of both audio and text into a single feature vector which is then given to the SVM classifier. Before applying the SVM approach, both text and audio are handled separately and classified .This allows the comparison of these methods with our proposed approach.**

***IndexTerms*—SVM, Bag of Words, Sarcasm**

I. INTRODUCTION

Recent world is online world and due to which there is humongous data available online which helps in many ways one of which is to understand and detect the customer feelings. Sentiment analysis is extremely useful in social media monitoring as it allows us to gain an overview of the wider public opinion.

Existing human-machine interaction systems can identify "what is said" and "who said it" using speaker identification and speech recognition techniques. These machines can evaluate "how it is said" to respond more correctly and make the interaction more natural, if provided with emotion recognition techniques. Emotion recognition is useful for applications such as Entertainment, e- Learning, and diagnostic tool for therapists, call centre applications etc.

In this work we are trying to detect sarcasm from the audio and text conversations present in social media. Here we will use SVM machine learning approach to classify sarcasm from the given data. This method aims to enhance the efficiency of sarcasm classification by consolidating the features of both audio and text into a single feature vector which is then given to the SVM classifier. Before applying the SVM approach, both text and audio are handled separately and classified .This allows the comparison of these methods with our proposed approach. Support Vector Machine or SVM is one of the most popular Supervised Learning algorithms, which is used for Classification as well as Regression problems. However, primarily, it is used for Classification problems in Machine Learning. The goal of the SVM algorithm is to create the best line or decision boundary that can segregate n-dimensional space into classes so that we can easily put the new data point in the correct category in the future. This best decision boundary is called a hyper plane. SVM(Support Vector Machine) chooses the extreme points/vectors that help in creating the hyper plane. These extreme cases are called as support vectors, and hence algorithm is termed as Support Vector Machine. [1]

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Our approach aims to analyze both audio and the corresponding text component, in order to recognize the sarcasms in certain data. The system automatically classifies sarcasm via Support Vector Machine.

First, we process textual data and then process it for various things like Noise Reduction, Tokenization and Normalization after that processed textual data is extracted for feature vector using Bag of Word Feature Extraction Technology and audio is converted textual data and whole process of Processing and Feature Extraction is repeated and another Feature Vector is generated. Now these two feature Vectors are concatenated and are then given to SVM Classifier for sarcasm Detection. Datasets which will be used for the proposed will be taken social media platform: Twitter and open source network Twine.com.

The proposed work consists of following modules:

• Preprocessing of textual data collected from the social Media.
• Feature Extraction of this data using Bag of Word Technology.
• Creating a Feature Vector

Converting Audio Data to Text Data
Preprocessing of textual data collected from the social Media.
Feature Extraction of this data using Bag of Word Technology.
Creating a Feature Vector
Concatenating Both the Feature Vector
And at last using SVM classifier on single vector to detect Sarcasm.

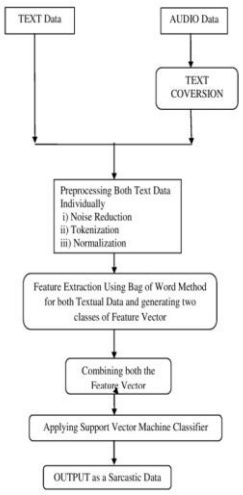

Figure 1: Methodology for Sarcasm Detection

II. LITERATURE REVIEW

Following papers discussed about the classification methods for sarcasm detection.

Shubham kumar Nigam et.al., 2022. Authors have built systems using stand-alone transformer based models and hierarchical ones by adding a BiLSTM layer with or without attention mechanism. In addition to this, they have created new datasets depending on the subtask using a combination of original and external datasets besides augmenting using word embedding or repetition. Their results shows that the augmented datasets enhanced the

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results for all subtasks and also they found that the fine-tuned stand-alone transformer based models in each subtask gave the best results especially with Type-II preprocessing.

Aditya shah et.al., 2022. Authors have presented a deep learning algorithm for detecting sarcasm in code-mixed data i.e. data in different languages. They have proposed the significance of incongruity in order to capture sarcasm in code-mix data. Their model effectively captures incongruity through Fast Text sub-word embeddings to detect sarcasm in the text. Empirical results on code mix sarcasm data show that their approach performs satisfactorily compared to the multilingual models while saving memory footprint and training time.

Yiyi Liu et.al., 2022. Authors have presented an approach for sarcasm recognition by Sentiment conflict. In this study; they argue that the essential characteristic of sarcastic text is the conflict between literal and implied sentiments in the same sentence. To this end, they have proposed a dual-channel framework to recognize sarcasm by decomposing the input text into the literal channel and the implied channel. Based on this framework, they developed DC-Net. DC Net is capable of exploiting the literal sentiment by encoding the sentiment words of input text, and exploiting the implied sentiment by encoding the remaining text. Experiments show that the proposed DC-Net achieves state-of-the-art performance.

Alif Tri Handoyo et.al., 2021. Authors have recognized sarcasm by augmenting data in already available twitter data. They have preprocessed the data using lexical normalization tool. They experiment using advanced state-of-the-art methodologies RoBERTa and using Glove word embeddings for data augmentation. In addition, in a small and unbalanced dataset like iSarcasm , by using the right amount of data augmentation and choosing the right word embedding model, it was found there will be a significant performance increase as high as 12.50% in true positive and 3.2% F-score result.

Sudesh Gupta et.al., 2021. This research paper work tackles the problem of sarcasm detection through capturing inter-modality incongruity. The proposed architecture handles the inter-modality incongruity in two ways: the first uses the co-attention, and the second is via FiLM network. Comparison with baselines on Twitter benchmark datasets reveals that the proposed architecture can better capture the contradiction present between the image and text modality. The ablation study highlights the importance of FiLM and co-attention layer between the image, image attribute embeddings and the text embeddings. Comparison with several baselines on benchmark dataset shows the effectiveness and superiority of our model.

Manjot Bedi et.al., 2021. Author paper presented research on the Hindi English code-mixed conversational dialog. We developed MaSaC, a qualitative multi-modal dataset for the sarcasm detection and humor classification in code-mixed conversations. The utterances in their dataset are adopted from a popular Indian television comedy show. They collected, cleaned, and annotated more than 15000 utterances across 1190 dialogs. To evaluate MaSaC, they have proposed MSH-COMICS, an attention based multi-modal classification model for the utterance classification. Evaluation results showed the incorporation of enriched textual representation has a positive impact on the performance. Further, benchmark has been set MaSaC dataset on MSH-COMICS by performing comparative analysis against exiting classification approaches.

Nastaran Babanejad et.al., 2020. Shows the affective and Contextual embedding for sarcasm detection. Two novel models (ACE1 and ACE 2) have been proposed that incorporate contextual and affective features in a deep neural network architecture for sarcasm detection. Each model extends BERT's architecture by incorporating into it affective features. ACE 1 uses them to adjust the contextual embeddings and also fine-tune the model, while ACE 2 uses them along with SBERT for performing the final classification. Their evaluation results showed that combining the two types of features greatly improves the sarcasm detection accuracy. In particular, deeply incorporating the affective features in the embedding training process (as in ACE 1) is more beneficial than simply concatenating the two types of features (as in ACE 2).It is also observed that training embeddings with corpora containing rich sarcastic or emotional utterances greatly benefits the sarcasm detection tasks. Findings suggest that transformer-based models like BERT can be trained to incorporate task-specific features to improve downstream task performance.

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Boaz Shmueli et.al., 2020. In this paper authors have presented a new method for collecting sarcasm .An innovative method for collecting sarcasm data that exploits the natural dynamics of online conversations. This approach has multiple advantages over all existing methods. Authors used it to create and release SPIRS, a large sarcasm dataset with multiple novel features. These new features, including labels for sarcasm perspective and unique context (e.g., oblivious texts), offer opportunities for advances in sarcasm detection. Reactive supervision is generalizable. By modifying the cue tweet selection criteria, This method can be adapted to related domains such as sentiment analysis and emotion detection, thereby advancing the quality and quantity of data collection and offering new research directions in affective computing.

Akshita Agrawal et.al., 2020. Authors have presented this paper to detect sarcasm in Hindi English code mixed data using word embedding. A class-balanced Hindi-English code mixed dataset for the problem of sarcasm detection is proposed, by scraping relevant tweets from twitter. Then compared two representations, FastText and Word2Vec, both based on different word representation learning mechanisms and trained on custom scraped data from scratch and created two versions of embeddings, one trained with purely Hinglish data, the other with a mixture of Hinglish and English data, and compared the performance in each case. They have analyzed the performance of different deep learning models, which take as input the generated word embeddings, to solve the problem of sarcasm detection.

Devin Pelser et.al., 2019. Paper presented here works on deep and dense sarcasm detection and they have introduced a deep and dense network for extracting additional intrinsic information from a standalone utterance. Low-level features are shown to be used during the formation of the final feature maps. These, in combination with abstracted hierarchical features, enabled our model to rival state-of-the-art approaches which incorporated considerably more information on the SARC 2.0 datasets - such as user profiling and topic trends within a specific sub forum. Their work demonstrate that whilst context is often needed to classify sarcasm.

Nielsen, et.al., 2018. In the paper title itself sarcastically said that “Detecting Sarcasm is extremely easy “where researchers analyzed the performance of system on datasets from Twitter comments and Amazon product reviews. For this Methodology Used is Classification Algorithm Multinomial Naïve Bayes (MNNB) researchers used multinomial naïve bayes (MNNB) and support vector machines approaches of machine learning to detect sarcasm. They used tweets to detect sarcasm.

Devamanyu Hazarika et.al., 2018. This paper shows Sarcasm detection can be made easy if context of statements will be analyzed to get correct discourse of the sentences. This will help in auto question answering systems, efficient chatbot and Human Machine Interaction. Papers speak about the context driven approach. In a Contextual Sarcasm Detector (CASCADE), which works on hybrid approach of both context- and content-driven modeling for sarcasm detection in online forums? Further it leads to discourse analysis of sentences. Methodology Used: CNN.

Y. Alex Kolchinski, et.al., 2018. Social media is continuously attracting researchers for sarcasm detection, authors explored two methods for representing the context of textual sarcasm detection, Bayesian approach that directly represents authors’ natural tendency to be sarcastic, and strong embedding approach that can learn relativity between the author and the text. Methodology Used: RNN with GRU cells.

III. Issues and needs

The human language is complex which means your social listening tool needs to be able to break it down to identify emotional terms. Thankfully our sentiment analysis uses Natural Language Processing (NLP), which can do precisely that, and isn’t limited to English versus French versus Cantonese, etc. NLP can identify slang and pop culture terms, as well as emojis, and even images.

And there are numerous ways to apply sentiment data once it’s in hand:

1. Find Your Audience

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Whatever we think we know about our audience, sentiment analysis can only improve it. Perhaps we are Amazon and want to nail down more specifics about our consumers to effectively campaign. Having a competitive intelligence tool such as Quid Social can draw out demographics such as gender and which aspects of our company they are more interested in.

2. To Identify Emerging Trends

Trends come and go, and just because there's a trend doesn't mean we should automatically seek to leverage it. Sentiment analysis with the aid of social media monitoring helps us to determine how invested our specific audience is in any trends that come along. And what, exactly, they feel about said trends too.

For example, there were lots of new trends in 2020. The year, as a whole, went a long way toward bringing back the basics i.e., baking, cooking from scratch, DIY projects, etc. Will these trends follow us throughout 2022? Will trends in our vertical shift? Only our social data will tell us. Our sentiment wheel around baking shows large amounts of positive sentiment, a good indicator that it's still a big hit.

However, it's not the complete picture and would need further social analysis around what kind of cooking is resonating – and with whom. Psychographic insight (capturing values, opinions, attitudes, interests, and lifestyles) complements demographic Intel here. And there could also be regional differences to be aware of (there usually are)! And all of this should be explored before planting our flag in a trend and calling it 'the next big thing.'

To Inspire and Get Feedback on New Products/Services

The ability to get honest feedback so quickly is something we take for granted with social media, and yet it's one of the biggest attributes of sentiment analysis. One of the best uses of this is prior to launching a new product or campaign – to be sure your audience even wants what you're offering. Even better? When brands capture intel from a post that sparks an idea for something consumers crave and can't find, so they're creating DIY options – such as vegan pretzel bites for game day.

3. Assess Competitors

We discussed the importance of how we are doing online, but that's only part of the equation. Social media is an open book (for the most part), so apply your sentiment analysis to competitors as well. After all, we share an audience, so it makes sense to know what consumers love and hate about other brands in your category.

We will save a ton of time and money by letting other brands do research for us.

4. To Identify and Resolve Problems

If there's one thing consumers do well, it's talk about the brands they love – and those they don't. Social media has become the sounding board for all disgruntled customers to vent.

Sentiment analysis helps us catch these negative sentiments and determine whether the intensity of emotion is headed into the danger zone. Savvy brands have learned to set alerts for damaging keywords, so they know immediately if something is about to spiral out of control.

But if we use social media analytics to keep an eye on sentiment and resolve negative issues before things get to that point, that's even better.

IV. CONCLUSION

In this work we have proposed a new classification method to detect the sarcasm in utterances of human audio and text. This method exploits both audio and textual features corresponding to it.

In our work SVM Classifier is used for sarcasm classification. Our work aims to show in future that the proposed approach entitles a better accuracy compared to other text mining or speech mining techniques. Our findings lead to more realistic human- machine interaction, as it helps to improve the efficiency of sarcasm classification of human conversations.

Furthermore, this work can be linked to many applications like call centers, music recommendation systems and e-learning where speech may replace traditional input devices, in order to make the human-machine interaction in these applications more natural and realistic.

This work can also help Psychologists to detect Neuron degenerative Disorder in patients as sarcastic tweets are very difficult to identify whether it is in positive Side or Negative side. So with the help of proposed application it will become very easy to detect sarcasm in one's tweet and what it is meant to be.

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