

Comparative study of Sentiment Analysis on trending issues on Social Media

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Abstract

The territory of Iraq and Syria has been controlled by a group known as Islamic State of Iraq and Syria which has made many countries and organizations such as United State, Canada, and United Nation to intervene so as to restore peace to Iraq and Syria. The attacks by ISIS has filled the airwaves as many reports and updates on the ISIS attack has been broadcasted and published on different media including micro blogs such as the twitter, the Facebook and the Instagram in various languages and forms. These media has given people an opportunity to express and share their feelings and thoughts concerning the ISIS fight in Iraq and ISIS. These feelings include sadness, happiness, fear, doubt, joy, anger and neutral^[6]. The use of the social media to initiate discussions on the ISIS fight has tend to create an interesting and wide network in the social media which is an interesting area of study in social network analysis. The collection of the people's feelings and thoughts can help determine the depth of harm or benefit of the fight to the people, decision making towards providing a solution and the risk involved as well as knowing the opinions of the people.

This paper deals with overall sentiments of the people on activities of ISIS. For this we have gathered twitter data in form of tweets and analyzed those using different approaches. The initial approach is Jeffery Breen Approach, followed by use of different APIs namely Semantaria and Repustate. The positive side of these three approaches is that they have different parameters to analyze the tweet and the result so generated also provides variety of results

Keywords: ISIS, sentiment analysis, Repustate, FScore, Twitter, Semantaria, positive, negative, neutral, dataset.

1. Introduction

Micro blogging sites have millions of people sharing their thoughts daily because of its characteristics short and simple manner of expression. Social media became popular than ever as people are willing to share their emotions and opinions or to participate in social networking. Accordingly the understanding of social media usage is also very important. The sentiment analysis has emerged as one of the important source to analyze the emotional stats expressed in textual data including social media data. Micro blogging website like Twitter is one of the platform uses by people to share their opinion on any burning issue. Analysis of tweets or posts would help in designing smart recommendation systems^[2]. In such a system the gathered tweets or posts are categorized into different categories. Based on different categories formed the tweets or posts are then classified based on the type of words they use to express their feelings which further helps in polarizing the tweets or posts into mainly three categories namely: Positive Negative and

neutral tweets or posts. Different tools are used to calculate polarity. After processing the tweets or posts each tool gives its own FScore and every tool has its scale to analyze that F score. The overall analysis of score of all tweets or posts given by different tools gives the overall sentiment of people. One of the limitations of these analyzing tools is their accuracy. Many tools provide results which do not have much accuracy as the takes into account different neutral or slang words These slang words increases the count of words but do not take active part in determining the actual sentiment of the tweets.

Scalability is one of the key issues which we have to deal with huge amount of tweets or posts. As the bulk of tweets or posts increase the bulk of neutral words or the slang words increase and it affect accuracy. So the data with less number of tweets or posts is considered to be more accurate whereas the data with more number of tweets or posts tend to reduce the accuracy and thus, the F Score will be affected ^[6]. In this project we have tried to analyze the general opinion of people around the world about the rising activities of ISIS in the regions of Syria and Iraq. For doing so we tried to analyze the same issue using different sentiment analyzing techniques so as to generate more accurate results and thereby creating a better picture of overall sentiments of people on ISIS globally. The techniques which are under consideration includes use of different Streaming APIs available from developers site of different social media networks may it be Twitter, Facebook, Instagram. Fig. 1 shows the detailed taxonomy for sentiment analysis of the twitter data and different manner

Another technique involves the use of online dictionary and the data is being tested on with the online dictionary to generate a score about the tweet or post. Fig.1 below depicts the overall taxonomical distribution of sentiment analysis approaches.

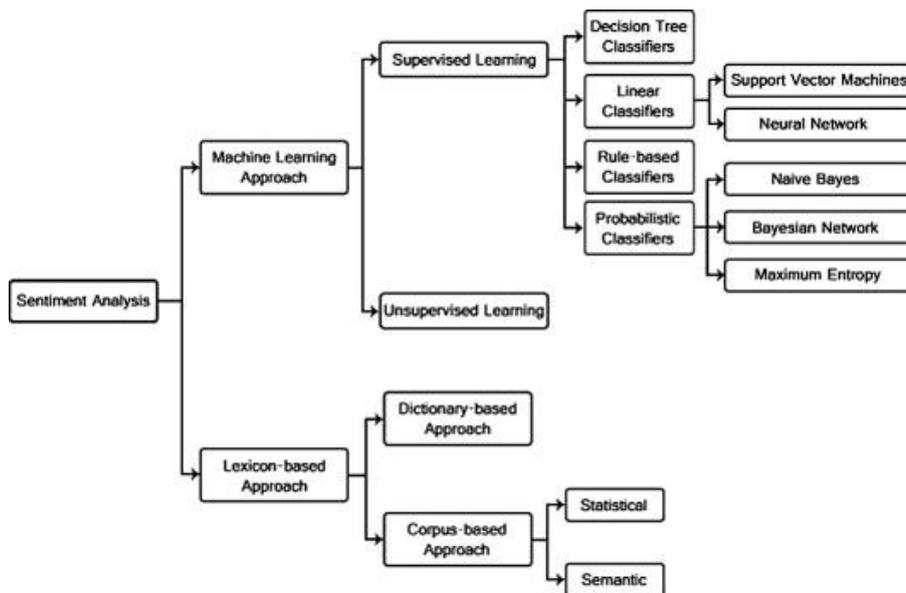


Fig.1 Taxonomy of Sentiment Analysis ^[19]

Sentiment analysis is a combination of two words, sentiment and analysis. Sentiment is defined as feelings, attitudes, emotions and opinions toward a discussion or object. Usually sentiment is subjective impressions and not facts. Analysis is the process of separating something into its appropriate structure or elements as a basis for discussion or interpretation. Therefore, sentiment analysis, sometimes referred to as opinion mining is a field that uses natural language processing (NLP), statistics, or machine learning methods to extract, identify and characterize the sentiment content of a text unit.

The ISIS group has been known for causing several killings, beheadings and unbearable environment for the Iraqis and Syrians which has attracted many actions from different countries and organizations as well as opinion and sentiment discussions on Twitter by internet users. This project collected streaming tweets and retweets on the current attacks by the ISIS group in Iraq and Syria to perform a discussion analysis using Opinion Mining techniques. This project focuses on

classifying the messages from the tweets and the retweets (don't mention retweets here) into positive, negative or neutral opinions about the ISIS group attacks.

2. Literature Survey

The literature survey involves study of different papers. In order to study the sentiment analysis and different papers need to be referred to have knowledge of different advancements which are being done in this topic. Also we have to look for the latest advancements which are being done in field of sentiment analysis and social network modeling.

To move ahead following papers are being referred and different approaches are being utilized for this comparative study.

1. "Sentiment Analysis on Twitter" by Akashi Kumar and Teeja Mary Sebastian

In this paper, the authors sited a basic technique for performing Sentiment Analysis. The algorithm discussed in this paper is Naive Bayes algorithm. The two unigram models use Naive Bayes bigram model and Maximum Entropy model to classify tweets. The conclusion drawn was that Naive Bayes perform better than the Maximum Entropy Model. The basic terminologies related to twitter are

Emoticons: These are pictorial representations of facial expressions using punctuation marks and letters.

Target: Twitter makes use of (@ symbol to refer to other users and twitter. . Hash Tags: Users use # to mark topics. It is used by Twitter users to make tweets visible to greater audience.

2. "Analysis of Users' Interest Based on Tweets" by Nimita Mangal, Rajdeep Niyogi and Alfredo Milani

In this paper, the authors are interested in classifying the interests of users based on their tweets. The topic to which a particular tweet belongs is done by categorization and through this we get to know the topic in which user is interested. In this paper the tweets are collected using the Twitter4j API in Java. Sentiment analysis has been done using Stanford core NLP integrated framework. This tool pipeline code is run on tweets. Sentiment score is computed based on the words composes and longer phrase. Classifications of tweets are done using the matching of words with a topic. This paper studies the combination of sentiment analysis and classification of tweets.

3. "Sentiment Analysis on Social Media Using Morphological Sentence Pattern Model" by Youngsub Han and Kwangmi KO Kim

This paper briefly describes the limitations of earlier techniques that are being used to need to be cleaned up and the techniques applied so far can remove the unnecessary tags but not the noise which is there in data reduces its quality which cannot be improved further.

The limitation is that the probabilistic model for sentiment analysis required human coded train set to maintain higher level of accuracy. This means the train set need to be built continuously as it cannot handle the new untrained data.

4. "Twitter Sentiment Analysis for Large-Scale Data: An Unsupervised Approach" by Rafeeqe Pandarachalil and Selvaraju Sendhikumar

This paper presents an unsupervised method for analyzing tweets sentiments. Polarity of tweets is evaluated by using three sentiment lexicons-SenticNet, SentiWordNet and Sentislang NetSentislangNet is a sentiment lexicon built from SenticNet and SentiWordNet for slangs and acronyms.

The authors propose an unsupervised and domain independent approach by using the polarity scores from three lexical resources -SentiWord 3.0,SentiNet 2.0 and SentislangNet. SentiWordNet contains polarity scores of unigrams. SenticNet 2.0 is a publicly available semantic resource which contains commonly used polarity concepts.

5. "Aspect Based Sentiment Analysis in Social Media with Classifier Ensembles" by Isidoros Perikos and Ioannis Hatzilygeroudis

This paper deals with presenting an aspect based sentiment analysis approach. The approach is generic and utilizes latent details to model a topic and to specify main aspects that user address then each comment is further analyzed and word dependencies that indicate the interaction between words and aspects are extracted. An ensemble classifier formulated by Naive Bayes, maximum entropy and support vector machines is designed to recognize the polarity of user's comment towards each aspect.

As a scope of future improvement paper also discusses the possibilities of use of weights on the votes of a base classifier and also examination of bagging and boosting ensemble methods. Further, lexicons that could be exploited to specify words that convey positive or negative content and enhance the textual representation of sentences with additional lexicon based features.

6. Survey Report on Sentiment Analysis on ISIS" by Imabong Erwine, Shubhra Singhal and Vibhore Jain

This report tells us the condition of different people after the havoc caused by terrorist group popularly known as Islamic State of Iraq and Syria (ISIS) which has made many countries and organizations of United States, Canada intervene so as to restore peace in Iraq and Syria. The Islamic State of Iraq and Syria is formed out of the Al-Qaeda splinter group on 8th April 2013 which aims in creating an Islamic state across Sunni areas of Iraq and in Syria. Initially the headquarters were situated in Iraq. This group has taken over large swaths of northern and western Iraq. It is known for killing dozens of people at a time and engaging in public executions. ISIS finances are traced to large -scale attacks with the aim of capturing and holding territory as opposed to the initial resource generation which was through extortion and robbery.

Later, different activities involving ISIS and different terrorist activities become very frequent. Besides this the mass genocide in USA was one of such dreadful event for which ISIS has taken responsibility for. One of their sleeper cell named Stevens was found guilty in attack a mass of people attending the concert at Las Vegas in 2017. This person was found dead at his place. Thus a lot of sleeper cells of ISIS became active during this period and their network was expanding all over the world. Many of sleeper cells were found active in parts of India chiefly in Kerala causing a new technique of crime called "Love Jihad" which is becoming popular very rapidly in many parts of the country. .

3. Methodology

Methodology comprise of different stages namely Data Collection followed by Sentiment Analysis and finally interpreting the result and drawing conclusion ^[3]. This section is divided into different sub sections of:

- Data Collection
- Sentiment Analysis
- Result Formulation.

Data Collection:

Micro blogging website has become a widely used communication tool among internet users for expressing their opinions about different aspects of life, therefore making such micro blogs a rich source of people's opinions for opinion mining and sentiment analysis. One of the most popular micro blogging platforms for sentiment analysis is the Twitter ^[3]. We use a dataset formed by collected messages on open discussions regarding ISIS attack from the twitter for the sentiment analysis. Twitter contains very large number of very short messages created by the micro blog platform users.

The contents of the messages may be individual thoughts or public statements. The short messages shared on twitter are referred to as tweets and has a length limit of 140 characters. People tend to use acronyms, emoticons and other characters with special meanings for composing their tweets due to the length restriction. Twitter platform users can follow others to receive their tweets. By using the Twitter developer API and R programming language, we collected 75,000 text posts on ISIS from 3rd November 2016 to 10th November 2016 which was within the period that the United State launched an airstrike in Iraq which of course attracted many tweet posts on twitter. The large

set of data collected from the twitter was used to carry out sentiment analysis in order to classify dataset of three classes:

- a) **Positive sentiments:** These sentiments express happiness, amusement or joy
- b) **Negative sentiments:** These sentiments express sadness, anger, disgust or disappointment
- c) **Neutral sentiments:** These sentiments state facts or do not express any emotions.

Sentiment Analysis:

To collect the three classes of sentiment (positive, negative and neutral), we used three different sentiment analysis approaches on the set of data collected on twitter. The sentiment analysis approaches used in this project is described in the following section.

Sentiment Analysis Approaches

I. Jeffrey Breen's Approach:

The Jeffrey Breen's ^[3] approach is named after Jeffrey Breen's unravel example of slides presentation on sentiment analysis of tweets using R. Breen's approach uses sentiment score to categorize tweets into positive, negative or neutral sentiments.

To calculate the sentiment score, Breen's approach uses a dictionary of positive and negative words on the set of tweets collected to classify which tweet is positive, negative or neutral. The formula used in calculating the Breen's sentiment score is as below:

Score = number of positive words – number of negative words

If score > 0 then overall sentiment of the tweet is classified as "Positive opinion"

If score < 0 then overall sentiment of the tweet is classified as "Negative opinion"

Else the overall sentiment of the tweet is classified as "Neutral opinion"

Flow Process for the Sentiment Analysis on ISIS using Breen's Approach

The step-by-step process followed in carrying out the sentiment analysis on ISIS is explained in Breen's approach flowchart as below:

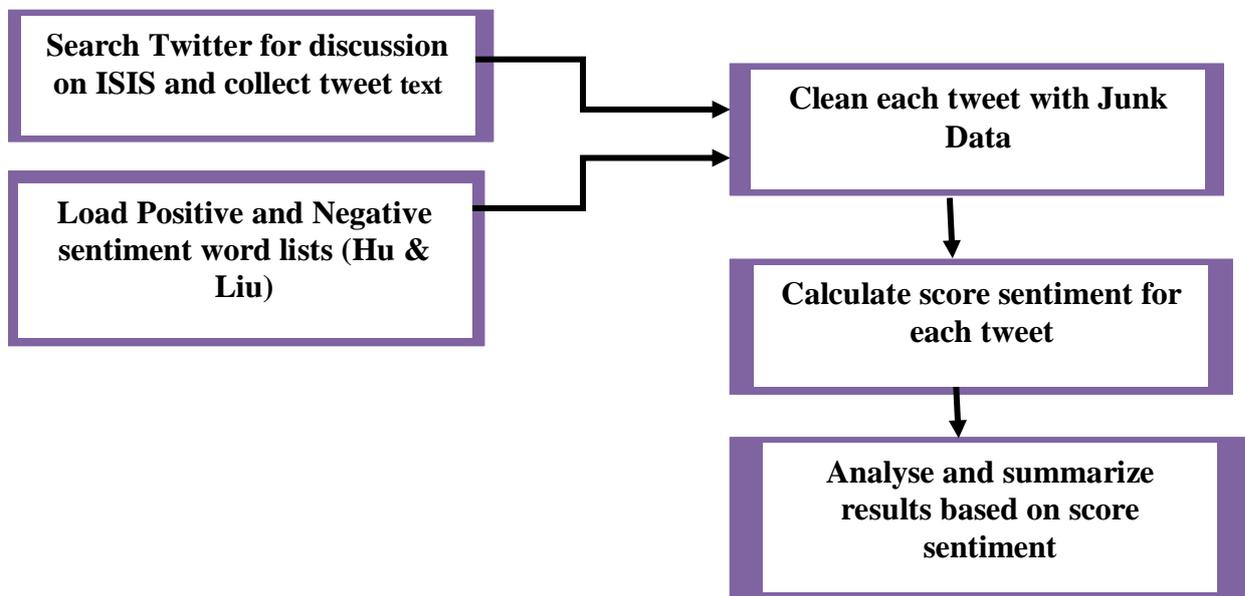


Fig 2: Flowchart of ISIS tweets Sentiment analysis using Breen's Approach ^[6]

Step 1:

We used the Twitter streaming developer API to collect tweets about ISIS on the Twitter starting from 3rd November 2016 to 10th November 2016. The tweets collection were done on a daily basis through the R programming language platform and stored in a file. The CSV file containing the collected tweets is imported into R using read.csv.

Step 2:

The positive words and negative words were loaded into the R by importing these words from the local storage location using Scan function. The positive and negative words are opinion lexicon provided by Breen which is primarily based on Hu and Liu papers. In Hu and Liu papers, he categorized 6,800 words as positive and negative with 2006 positive words and 4783 negative words. He categorized the positive and negative words based on the emotional or sentimental expressions defined by those words. Some examples of positive words include: happy, love, charming, courageous and fascinate.

Step 3:

After loading the stored tweet file and the positive and negative words on R, the next task was to clean the tweets by stripping of retweet entities (RT), names of people mentioned in tweets (that is, @Robin), punctuations (such as !, ., :), digits included in tweets (0-9), hyperlinks (such as http or https) and unnecessary spaces from the tweets using the gsub function.

Step 4:

The cleaned tweets are now ready for sentiment evaluation. We created a sentiment score function which was used to calculate scores of the cleaned tweets. The sentiment score function of the Breen approach accepts four parameters for the calculation of score; the cleaned tweets, the positive words, the negative words and the progress of the tweets. Once the function performed the sentiment score calculation, we get the result score against each sentence and stored this output in a CSV file for further study and analysis. The output file contains the tweet count, the score of the processed tweet and then analyzed tweet.

Fig. 3 Depicts of tweets along with their scores which are useful for analyzing overall sentiment

412	0	people watch newsx on isisindiablueprint right now india has issued advisory against isis threat
413	-1	louiscks twitter shut down over antiisis rantnot for rant on spalin amp son trig
414	2	mitch mcconnell will win this election a vote for lundergan is a vote to support isis gop will end isis
415	-1	i like how u guys r criticizing chris rock here but just about a month ago u were defending ur own lame jokes about isis beheading
416	0	viareports that large number of isis members cornered by ypg east of kobani twitterkurds kobane
417	-2	isis amp the westboro baptist church members should form a christianmuslim terror group equal hate for everyone
418	0	there are people in nz actively raising money for isispm
419	-4	nobody believes the isis propaganda they know theyre losing and think those vids will demoralize the kurds wrong
420	-1	video of killed isis members in kobani twitterkurds"
421	0	today ypg exchangeisis fighter wkurdishamp christiancivilian who captured m ago on the roads twitterkurds syria
422	-1	i am noting that the new muslim talking point is that all radical muslims are not muslim roflbama sez isis not islamic...
423	-1	turkey poll is isis a terror organisation junsepoct results latestsay yessay noht
424	0	iranians a great nation has been taken hostage by the godfather of isis and isil
425	2	isis media outlet instructs wives on how to better support jihadi husbands a new islamic state isis media o
426	0	afteriranian ppl r the real hostages iran gov is the teacher and father of isis norouhani
427	-1	warning against this man isis supporter extremist support isis there is no extremism in islam

Fig 3: Screen Shot of Scored Tweets ^[6]

II. SEMANTARIA API

Semantaria tool is powerful and easy-to-use tool for monitoring and visualizing Twitter, Facebook, surveys and other unstructured data for analytics community. It performs the sentiment analysis on large set of documents and therefore outputs data in multiple forms. These forms can be categories, entities, phrases and sentiment score. In addition, the beautiful feature of this tool is that it provides the charts for all different forms. The different forms in which represented are:

- **Entities:** These are the pronouns from the sentiments.
- **Themes:** Themes are the noun phrases that give meaning to a sentence. Without this sentence is doing not possess any meaning.
- **Categories:** Defines the type of the word user want.

Semantaria possess diverse features in analyzing sentiments. It allows analyzing sentiments in two different modes:

- **Detailed mode:** In detailed mode the sentiment score of each and every sentiment is calculated based on the words contained in the sentiments. These words are matched with the words contained in the default dictionary. In addition, in detailed mode scores and polarity of phrases and themes are also estimated.
- **Discover mode:** This mode allows discovering the data from sentiments in terms of entities, categories and themes. The sentiment scores and polarity of all the different forms are estimated and the chart is plot on the basis of the scores and polarity.
- The scores estimated by Semantaria is a number between 2 and -2 with sign +, - or no sign in front. Moreover this tool calculates the polarity of the data; the polarity can be categorized as positive negative and neutral. This can be seen In the diagram shown below:

Document Sentiment	Document Polarity	Data Column A
0.52499976	positive	will air strikes in iraq be enough to stop isis security expert alan bell weighs in
-0.60000024	negative	yazidi families still under siege by isis on mount sinjar
-0.432142794	negative	i have to check her teeth chilling footage shows isis fighters at slave girl market
-0.602763712	negative	last moderate mercenary group in syria surrenders to alnusra http://corimgghgfpplease share and support the removal of
-0.560750008	negative	isis kills innocents on friday college students in mexico missing and believed to be in mass grave
0.208333328	neutral	the nicest people are usually the worst inside you can trust noone anymore not even yourself j
-0.464285612	negative	watch isis video shows women being sold as slaves
-0.663333356	negative	pictures and video shocking look at how isis is funding their brutal killings via
0.086960405	neutral	isis threat can only be met with greater cooperation from technology companies new head of gchq in ft oped
-0.464285612	negative	footage of isis auctioning captured yazidi females as sex slaves
0.207662493	neutral	first air strikes today by the royal canadian air force against targets in canada is an essential coalition
0.264690012	positive	nato supreme commander comments discusses recent developments in the anti-isis bombing campaign via
-0.05262664	negative	western isis supporter americans need to be very wary seems hard to justify calling islam a religion of peace
0.476249993	positive	singapore to provide anti coalition with military support via
-0.439999998	negative	hot sex rough rear action for isis
0.033333331	neutral	uk to rehabilitate ex-isis fighters with good intentions
-0.444999993	negative	impossible for air strikes to stop isis they will adapt behind civilians and be even harder to fight
-0.953999937	negative	isl isis jsl are part of them like united in terrorism
-0.430750012	negative	shaheen missing key isis warning thank god veterans support for
-0.663333356	negative	democrats white house new where the hostages were and did nothing they were killed by isis how can people vote for this party traitors
-0.490000001	negative	isis mass executions of sunni muslim men women and children in continues read this
0.035324998	neutral	eduaubdedubuaaeduabdedubu canada launched its first air strikes against isis in iraq

Fig 4: Score and polarity estimation by Semantaria^[6]

III. REPUSTATE API

Another approach which is being covered in this comparative study is using an API called Repustate. The chief functioning of this API involves cleaning of tweets storing of tweets and calculating the FScore.

The main working of this API ^[6] is dependent on categorizing the words into three lexicon set positive, negative or neutral. The basis on which words are being categorized make use of online dictionary of words and then compare those words in the positive, negative and neutral words dictionary and then categorizing. The overall sentiment of tweets depends on ranking of each word in their respective category and also, the total words in the tweets which determine the overall score of the tweets.

So, these are the three approaches that are being covered and the outcome of these approaches can be seen below which are further use for result formulation and output analysis. After the sentiment analysis we now proceed to end result formulation which will form the base for further study

Result Formulation:

We used the output from the sentiment score obtained to analyze the tweets by plotting the scores on the bar chart and histogram. The scores obtained from the score sentiment calculation ranged from -7 to 5. Figure 5 below depicts the output of Jeffery Breen Approach which is represented in form of a bar graph.

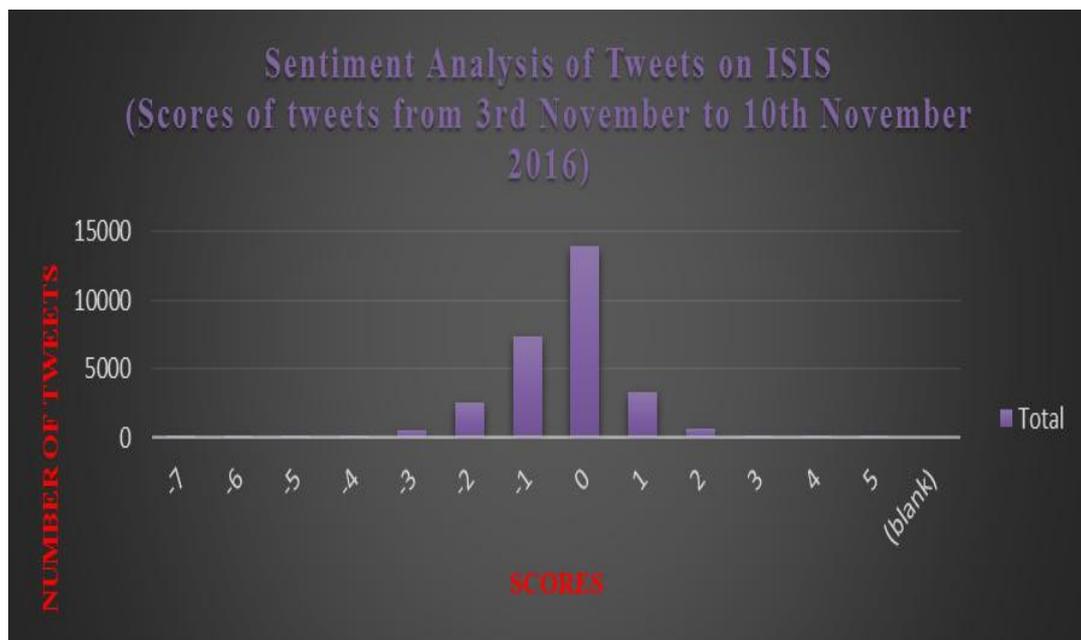


Fig 5: Bar Chart of Sentiment Analysis of Tweets on ISIS Using Breen's Approach ^[6]

The bar chart shows frequency of sentiments obtained from the analyzed tweets. The zero (0) value on the bar chart indicates tweets with neutral sentiments, the negative values (values to the left hand side of zero) indicates tweets with negative sentiments while the positive values (values to the right hand side of zero) indicates tweets with positive sentiments.

Subsequently we further categorized the sentiments in sub-categories for effective analysis. Any tweet that had a score of less than or equal to -2 was classified as an extreme negative sentiment, a score of -1 was classified as negative sentiment, score with 0 for neutral sentiments, a score of 1 was classified as positive sentiment and scores greater than or equal to 2 were classified as extreme positive sentiments.

Following the data on the bar chart above, for the overall tweets collected, the highest number of tweets was of neutral opinion (about 14,000), the second highest number of tweets was negative opinions (about 7,400) and the third highest tweets was positive opinions (3,200).

We also analyzed the overall scores of the tweet using a pie chart with a result interpretation as follows: The neutral sentiment tweets had the highest value with a percentage of 49%, the second highest score tweets were negative (26%) and the third highest score tweets were positive (12%). The next highest score tweet was the extreme negative with a value of 9%. Fig. 6 shows the graph plot between the scores of the tweets and count of scores

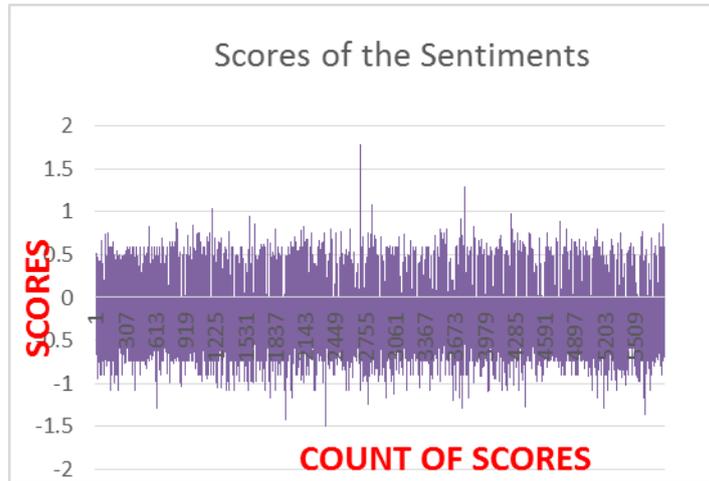


Fig.6: Sentiment Scores analysis using Semantaria tool [6]

From the above graph it can be observed that on average the count of the negative scores (value with negative sign) is high as compare to the count of positive score, hence we can conclude that the overall sentiment results are positive.

Similarly by plotting the polarity on the graph we can say that negative polarity is high therefore the ISIS sentiments are negative all over. Fig. 7 shows the distribution of tweets based on polarity which helps us in concluding that the overall sentiment of people globally is negative regarding the ISIS activities around the world.

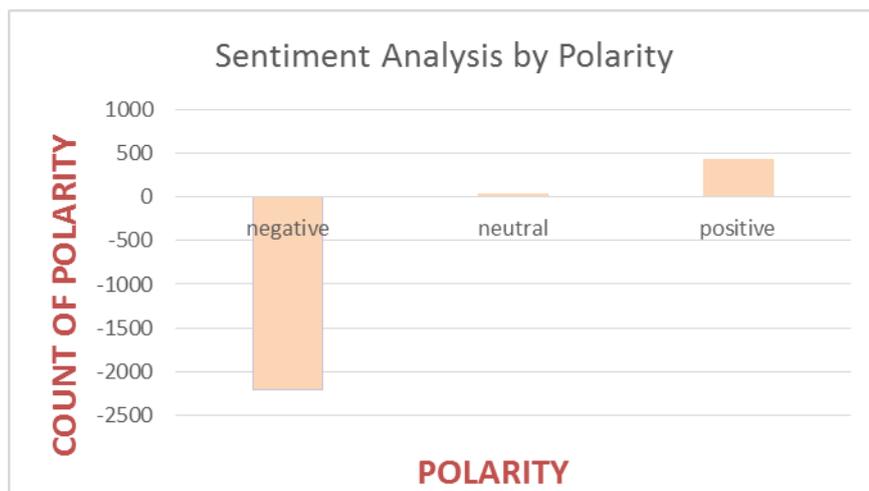


Fig.7: Depicting the polarity of tweets [19]

Analyzing the tweets and the score so given to each tweet may help us classify the tweets into positive, negative or neutral tweets. There by we can create graph based on the polarity and conclude that overall sentiment of people globally to be negative on ISIS.

4. Results and Discussions

We used the output from the sentiment score obtained to analyze the tweets by plotting the scores on the bar chart and histogram. The scores obtained from the score sentiment calculation ranged from -7 to 5.

The zero (0) value on the bar chart indicates tweets with neutral sentiments, the negative values (values to the left-hand side of zero) indicates tweets with negative sentiments while the positive values (values to the right-hand side of zero) indicates tweets with positive sentiments.

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Following the data on the bar chart above, for the overall tweets collected, the highest number of tweets was of neutral opinion (about 14,000), the second highest number of tweets was negative opinions (about 7,400) and the third highest tweets was positive opinions (3,200). We also analyzed the overall scores of the tweet using a pie chart with a result interpretation as follows: The neutral sentiment tweets had the highest value with a percentage of 49%, the second highest score tweets were negative (26%) and the third highest score tweets was positive (12%). The next highest score tweet was the extreme negative with a value of 9%.

There are different other approaches which are not included in this report. In this comparative study we covered different techniques like Jeffery Breen Approach, Repustste API, Semantaria API and other different tools which are included. As there is progress in technology there will be real time analysis of tweets which will give us instant results and it will be topic of further discussion that how the data can be interpreted. The figure given below shows the sentiment analysis of tweets based on the score and the score value of the tweets.

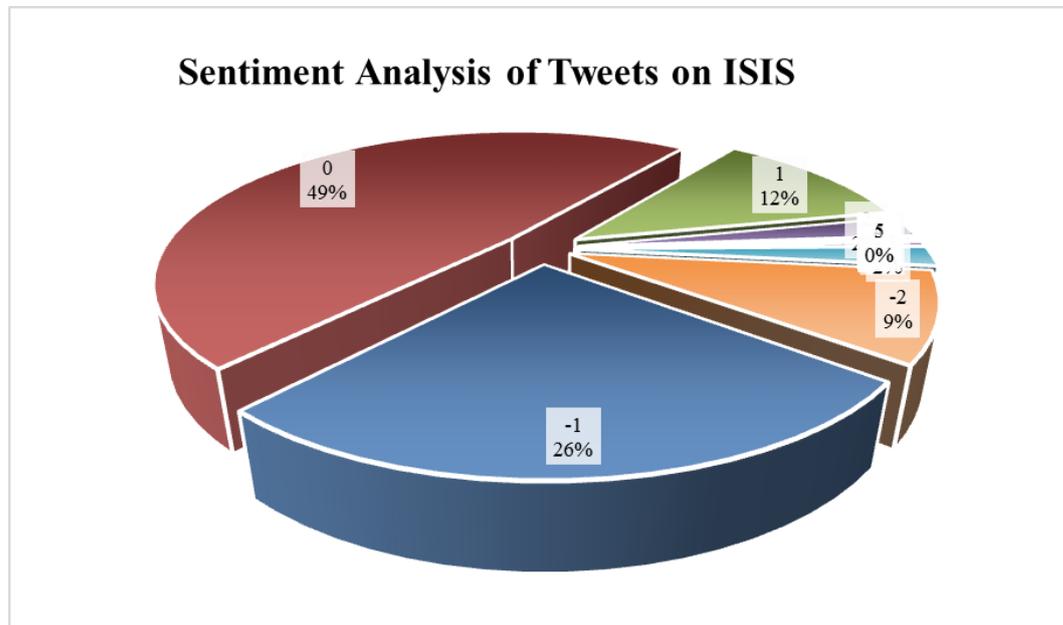


Fig .8: Sentiment Analysis of Tweets on ISIS Using Breen's Approach^[6]

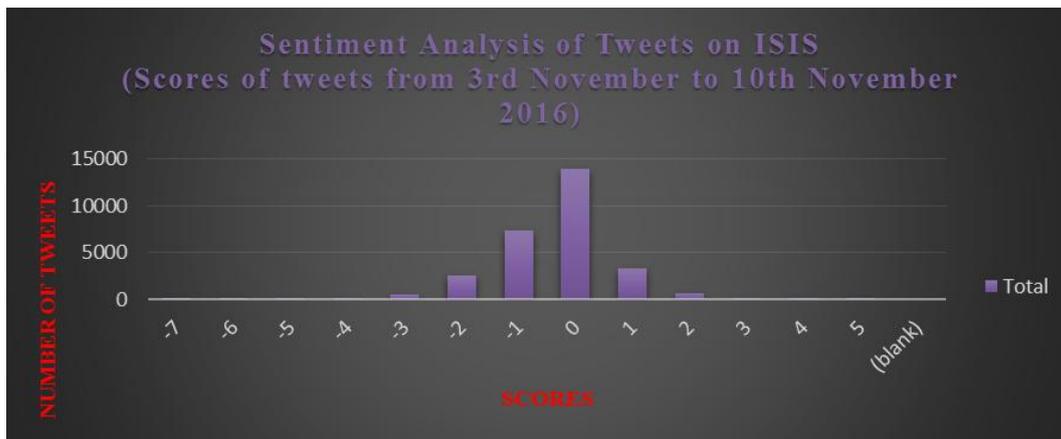


Fig.9: Bar Chart of Sentiment Analysis of Tweets on ISIS Using Breen's Approach ^[6]

Based on two figures, Fig.8 and Fig. 9 we can compare two results. These two pictorial diagrams of the sentiment score of tweets on ISIS, we observed that the highest number of tweets were both neutral followed by negative and positive types. If we ignore the neutral tweets, we observed that in overall, the negative tweets were of higher values than the positive tweets which indicate the fears, sadness, doubt, and tension experienced by the people as a result of the ISIS fight.

6. Future Scope:

As there are lot of attacks which are being done by ISIS the global media has lots of news to cover. For recent times, the news include a firing event at a music concert in Las Vegas by an ISIS sleeper cell Steven has caused a lot of humar loss in USA. Also there are different terrorist attacks in London, Paris and different parts of world which have drawn the attention of global media . In the recent times, the murder because of " Love Jihad" in Kerala was also a news of deep concern as it has put lot many peoples life at stake. The war with Kashmir and Alqaida's chief Hafeez Saeed is also one of trending topics in social media.As a future scope of this project we can analyze the overall sentiments of other terrorist activites in the world and can formulate them. As of now we have restricted our survey to only the destruction caused by ISIS in North part of Iraq and Syria.

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