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Social Media Sentiment Analysis using Machine Learning Classifiers

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Abstract: *Comparison of different machine learning techniques applied to the case of sentiment analysis in social media. Several machine learning methods were used during experimentation session: Maximum Entropy, Naive Bayes and Support Vector Machines we tried to compare different techniques for preprocessing Social media data and find those ones which impact on the building accurate classifiers. We use Twitter, an online social networking and micro blogging tweets facility, which user can update related post in the form of content type is text, known as tweets, with 140-character limit. There are also many sources that express opinions of news entities (people, places, things) while publishing recent events. We develop an automated system which extracts the sentiments from the online posts from twitter. Our system shows sentiment identification, which expresses opinion associated with each entity. Also it consists of scoring phase, which assigns scores to each entity, on which the tweets are classified. Finally we have leveraged Naive Bayes, Support vector machine and Maximum Entropy classifiers Algorithms to do the sentiment analysis on this myriad of data.*

Keywords: *SVM, Naive Bayes, Maximum Entropy MAE, ME, Sentiment Analysis*

Introduction:

Social media is a growing source of data and information spread. However, the information is convoluted with varying interests, opinions and emotions. Growing use of social media websites and cloud computing technology advances have bumped up tremendous amount of on-line data

available. This data consisted primarily Textual and numerical forms that can be categorized as Structured, semi-structured or non-structured. The focus of most of the researchers revolves around the Approaches and Techniques to extract and apply useful information from this myriad of data.

The sudden spike in Computer technology advancements in area of Sentiment Analysis and Opinion mining which deals with the analysis of subjectivity and sentiment of the posted content using different retrieval techniques and tools. As a result of this advancement in data and text mining, researchers have shown considerable interest in Sentiment analysis of this relevant cloud data. Sentiment analysis, also known as opinion mining is basically done to computationally identify and extract subjective information from source materials and to categorize this information to know the user's attitude towards a particular agenda. This categorization is basically done broadly into Positive, Neutral, or Negative.

Using appropriate mechanisms and techniques, this vast amount of data can be processed into information to support operational, managerial, and strategic decision making [8]. Sentiment analysis aims to identify and extract opinions and attitudes from a given piece of text towards a specific subject [11]. This Sentiment Analysis process delivers a smarter and more of human-like artificial intelligence, which can analyze and respond in a unique way based on the emotions user show in a written chat/tweet/blog conversation. There has been much progress on sentiment analysis of conventional text which is usually found in open forums, blogs and the typical review channels. Through the platforms like Facebook, Yammer and Twitter, millions of status updates, posts and Tweet messages, which reflects people's present opinion and attitude towards particular agenda, are created and posted every day. However, Sentiment analysis of micro blogs like twitter is considered as a much harder problem due to the unique characteristics possessed by micro blogs (e.g. short length of status updates and language variations with regional language influence).

Related Work:

Varsha Jadhav et al [1] computing process of accuracy parameters in sentiment analysis Warih Maharani [2] highlighted difference between process mining and intention mining. In process mining some technique is used to process models by analyzing event logs where no apriori information is available and some α -algorithm may be used to model the behavior of the actor. In intention mining actor's intention is identified from event logs and produce intentional process models. Novel approaches on modeling and inferring users actions in a computer is proposed [3] using two linguistic features-keyword and concept features. Luiz F. S. et.al [4] considered the problem of classifying tweets documents not by topic, but by overall sentiment. They employed Naïve Bayes, maximum entropy classification, and support vector machines, which do not perform well on sentiment classification. Rohit Joshi et al [3] present Sentiment Analyzer (SA), which detects all references for the given subject, and determines sentiment in each of the references using natural language processing (NLP) techniques. R. Nivedha, N. Sairam [5] A Machine Learning based Classification for Social Media Messages. Lopamudra Dey [6] et al Sentiment Analysis of Review Datasets Using Naïve Bayes'and K-NN Classifier here Naïve Bayes machine learning techniques compare with K-nn, Bhumika M. Jadav [10] et al Sentiment Analysis using Support Vector Machine based on Feature Selection and Semantic Analysis here

authors aim of paper is to find best effective features which provide better result and also provide better feature selection method. They have also express that how unigram feature set can be reduced to get better result.

Experimental Setup:

Datasets Collection from Twitter:

We are collecting twitter datasets is used to collect a corpus of text posts and a dataset is formed of three classes: positive, negative and neutral sentiments. We are using Indian government announced schemes in 2017 like Budget2017, Demonetization, Digital India, GST Kashmir, Make in India, Swach Bharat, the data on twitter was all datasets collected in March 2017.

FEATURE EXTRACTION

The collected dataset is used to extract features that will be used to train the sentiment classifier. Experimentation is carried out using n-gram binary features. The process of obtaining n-grams from the Twitter post is as follows.

- i) **Filtering:** here we are Removing URL links that are in datasets files before preprocessing
- ii) **Tokenization:** Tokenization is the process of breaking a stream of text up into words, phrases, symbols, or other meaningful elements called tokens. The list of tokens becomes input for further processing such as parsing or text mining. Tokenization is useful both in linguistics we segment text by splitting it by spaces and punctuation marks. However, we make sure that short forms such as “din’t”, “w’ll”, remain as one word.
- iii) **Removing stop words:** we remove articles (“a”, “an”, “the”) from datasets.
- iv) **Removing numbers, punctuation, and unnecessary spaces:** e.g. Photoset [httpco46iM8j8pkt](http://t.co/46iM8j8pkt) after preprocessing is obtained as Photoset <https://t.co/f9zDs2Zr9v> Missing values: NA is assigned to the missing values.
- v) **Converting to lower case:** All the letters in the sentences are converted into lower case.
- vi) **Constructing n-grams:** we make a set of n-grams out of consecutive words. A negation (such as “no” and “not”) is attached to a word which precedes it or follows it. For example, a sentence “I do not like fish” will form two bigrams: “I do+not”, “do+not like”, “not+like fish”

Generate Score for sentiment Analysis:

The most important part of sentiment analysis to generate score each tweet, score. Sentiment () function is used to iterate through the input text. It strips punctuation and control characters from each line using in R Programming platform regular expression-powered substitution function, and matches against each word list to find matches. The score. Sentiment () function assigns score to the tweets using the formula as $\text{Score} = \text{sum}(\text{pos.matches}) - \text{sum}(\text{neg.matches})$ The score is maintained between -4 to 4. 4 and 3 represent very positive -4 and -3 represent very negative 2 and 1 represent positive -2 and -1 represent negative if the score turns out to be zero, it is classified as neutral.

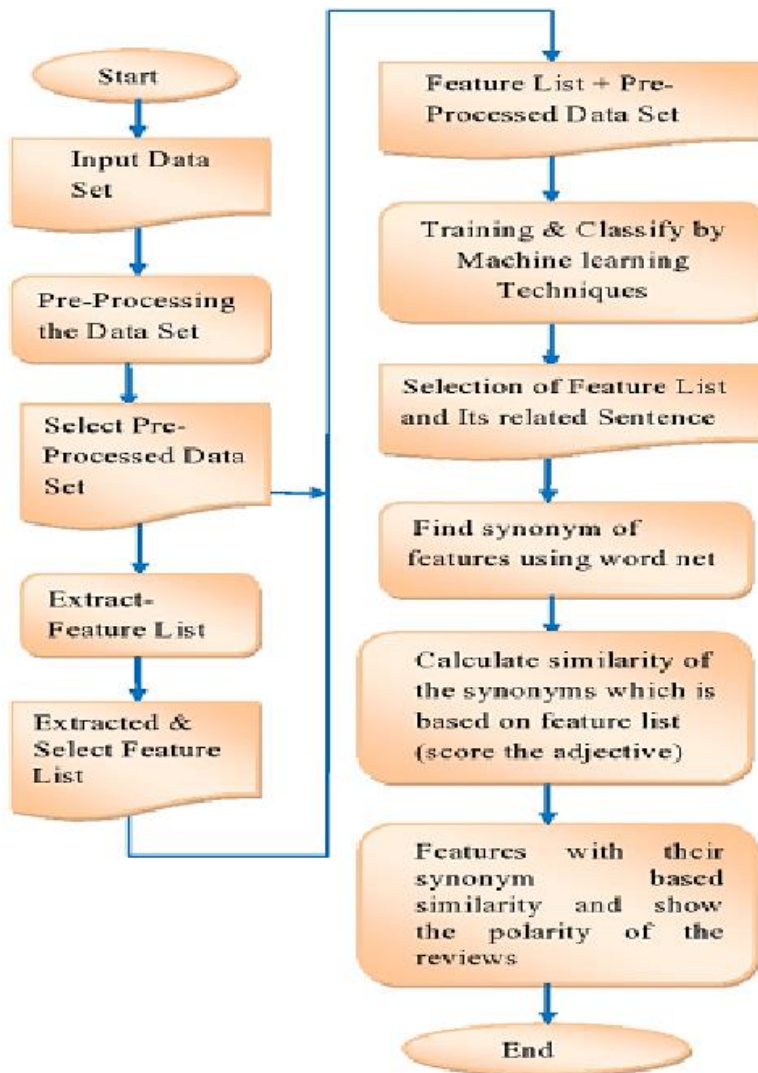


Fig 1. Proposed methodology

Machine Learning Methods:

We experimented the three standard Machine Learning algorithms: Naive Bayes, Support vector machine and Maximum Entropy. To implement these machine learning algorithms, there is need to have a mechanism which categorizes words (or combination of words) of the post by its sentiment. Hu and Liu’s “opinion lexicon” categorizes nearly 6,800 words as positive or negative and can be downloaded from Bing Liu’s web site:<http://www.cs.uic.edu/~liub/FBS/opinion-lexicon-English.rar>. The lexicon has been divided into two text files, one containing a list of positive words and the other containing negative words. Each file begins with some documentation, which we need to skip and is denoted by initial semi-colon (“;”) characters.

Result Analysis:

We are using the classifiers that are compared based on the accuracy measures such as Mean error (ME), Root mean square error (RMSE), Mean absolute error (MAE), Mean Percentage Error (MPE), Mean Absolute Percentage Error (MAPE). These are accuracy measurement parameters in sentiment analysis. Here we are comparing majorly two important parameters i.e. ME (Mean error) and (MAE) Mean absolute error. The simplest measure of forecast accuracy is called Mean Absolute Error (MAE). MAE is a quantity used to measure how close forecasts or predictions are to the eventual outcomes or in other words we can say it simply the mean of the absolute errors. The absolute error is the absolute value of the difference between the forecasted value and the actual value.

MAE tells us how big of an error we can expect from the forecast on average. Cort J. Willmott *et.al* [19] indicates that MAE is the most natural measure of average error magnitude also the Mean Error is important here we are finding the error value of particular datasets than RMSE. Evaluations and inter-comparisons of average model performance error should be based on ME and MAE. Table 1 shows the ME and table 2 shows MAE for the datasets Budget2017, Demonetization, GST2017, Digital India, Kashmir, Make in India, Startup India and Table 3 shows the intensity of Datasets.

Table 1 ME (Mean Error) of Datasets

Classifier	ME						
Datasets	Budget2017	Demonetization	GST2017	Digital India	Kashmir	Make in India	Startup India
Naïve Bayes	45	97	15	20	27	35	30
SVM	66	78	31	47	91	12	36
Maximum Entropy	60	35	39	39	12	10	28

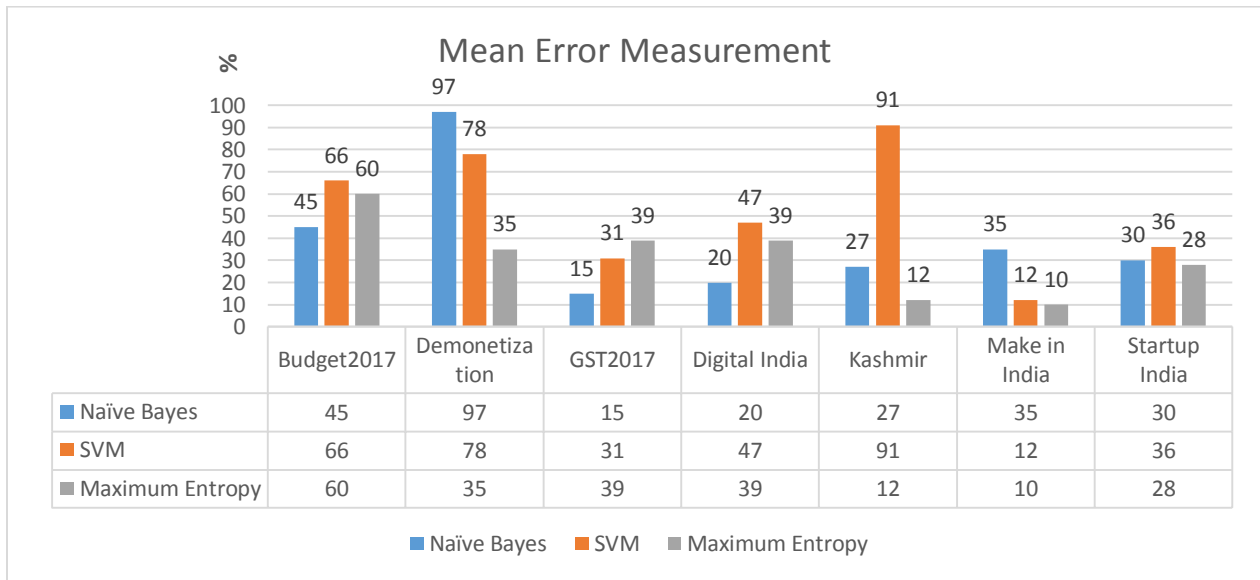


Table 2 MAE (Mean Absolute Error) of Datasets

Classifier	MAE						
Datasets	Budget2017	Demonetization	GST2017	Digital India	Kashmir	Make in India	Startup India
Naïve Bayes	33	15	59	38	27	68	49
SVM	66	78	31	47	91	12	69
Maximum Entropy	60	35	39	29	12	10	28

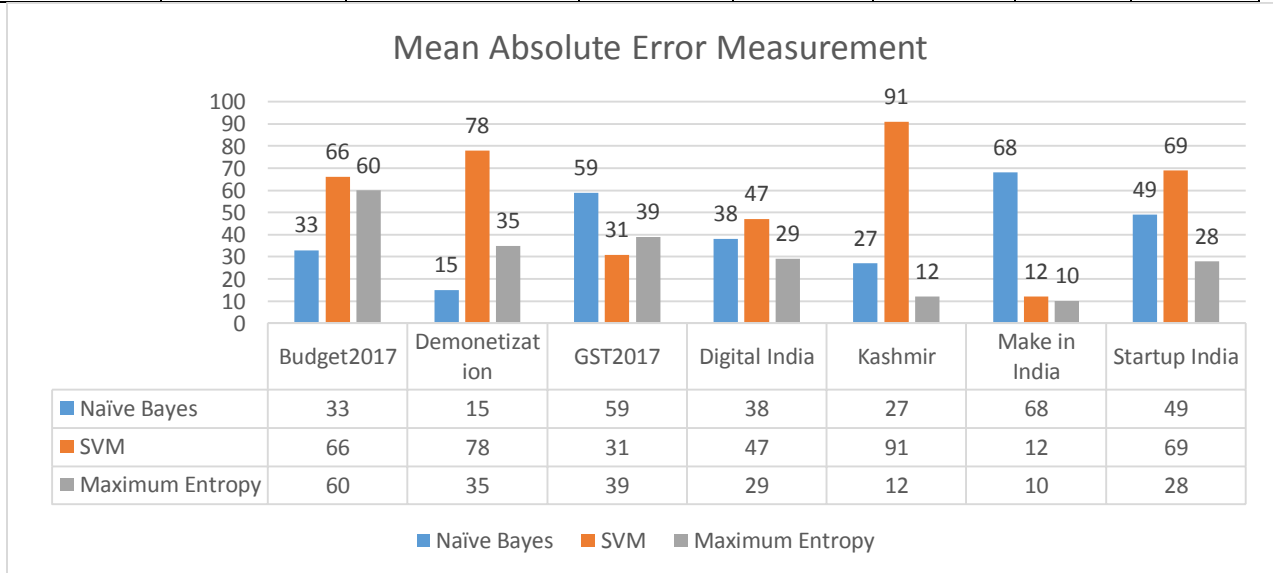


Table 3 Intensity of Tweets polarity in Datasets

Intensity of Tweets Polarity in Datasets

Trend Name	Positive Sentiments	Negative Sentiments	Neutral Sentiments	Tweets used
#GST4India	2040	416	2544	5000
#Startupindia	1831	305	2864	5000
#FinBudget	1830	304	2866	5000
#Digital India	2070	620	2310	5000
#Demonetization	1866	2769	4347	8980
#MakeInIndia	2638	482	1880	5000
#Kashmir	1034	1579	2387	5000

Conclusions and Future Scope

If the MAE is smaller than accuracy is more. The results show that the performance of the classifiers is same. There is marginal difference in the MAE. The performance of the classifiers was made for seven datasets (Budget2017, Demonetization, GST2017, Digital India, Kashmir, Make in India, Startup India). In the Budget2017 dataset Naïve Bayes performs best, In Demonetization dataset Naïve Bayes performs best. In the GST2017 SVM is showing best performance, whereas in the Digital India, Kashmir, Make in India and Startup shows Max Entropy performs best. Here we are also find the Mean Error for predicting the Mean Absolute Error easily. In future we plan find the other accuracy measurement parameters.

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