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## Analysis of Twitter Reactions to Government Policies

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### ABSTRACT

*With the increasing use of social media, especially Twitter, the way governments policies are perceived can be understood through the reactions they garner on twitter. In India, in recent times, there have been many significant policy changes like demonetization, Goods and Services Tax to name a few. Sentiment analysis of Twitter reaction to these policy changes across different regions can provide very useful insights. In this paper, we talk about sentiment analysis of twitter reactions, its use in the government policies context, the various methods which can be used for it and output visualization for better understanding.*

**Keywords:** Sentiment Analysis, Twitter Reactions, Government Policies, Social Media Analysis, RNN, LSTM, Neural Network, Opinion Mining.

### 1. INTRODUCTION

In recent times, Twitter has gained a lot of importance in shaping public opinion. Many politicians and other eminent public figures use the platform to connect with people and many governmental departments have their official Twitter handles too.

Currently, India is witnessing the introduction of new reforms like Goods and Services Tax, demonetization, Aadhar for delivering government aid and many others. The penetration of social media, especially Twitter, now offers a cheaper and extremely efficient approach to accumulating public opinions about such changes. Individuals spread across the map voice their opinions in the forms of tweets, which could give us an insight as to how the policy was received. This is largely helpful to government and private think tanks as well as news organizations.

Traditionally, the only way to tap public opinion was grass root level surveys. These were expensive, time-consuming and limited in terms of dataset size. Sentiment analysis of Twitter data offers a better way of analyzing public opinion. The tweets are classified as positive, negative or neutral. Many supervised machine learning algorithms can be used for this. However, the advent of deep learning techniques in recent years is providing a greater impetus to such kind of text analysis by way of more accurate predictions.

This paper is divided VII sections. In section II we have talked about the social media giant Twitter and data extraction from it. Section III and IV discuss the various algorithms which can be used for sentiment analysis and the related work done in this field. Section V describes our proposed system. Section VI specifies the result and conclusions of our work.

## 2. TWITTER DATA FOR ANALYSIS

Twitter, a popular microblogging site has a 140 character limit for tweets as of writing this paper. The historical tweet data can be extracted using the REST API provided by Twitter by using hash tags. For live tweet gathering, the Twitter streaming API can be used. Twitter also provides metadata along with the tweets like the geo-tagged location of the user.

The twitter URLs and emoticons are removed to clean the data. If using supervised learning other preprocessing steps like lemmatization which reduces a word to its root (lemma), stop words removal are also performed.

## 3. METHODS FOR SENTIMENT ANALYSIS

A dictionary based method is the simplest approach to this problem. A dictionary listing the positive and negative words is created and the individual tweets are separated into their lemmatized words and compared with the dictionary to give an overall sentiment score which helps in classifying the tweet as positive or negative.[3]

A supervised machine learning approach uses algorithms like Support Vector Machines, Logistic Regression, and Naïve Bayes to predict the sentiment score. Words in a tweet act as features to these classifiers. Naïve Bayes uses conditional probability to predict the probability of a tweet belonging to a particular class. Support Vector Machines map an input to high dimensional planes using various kernels. [1][4]

However, these supervised learning techniques operate on individual words. We may use bigrams, trigrams or n-grams to group two, three or n words together respectively. However, long sequences of words which affect the sentiment cannot be efficiently captured by the above-mentioned techniques.

In recent times, deep learning has been used to perform sentiment analysis. The emotion conveyed by a word is influenced by what words come before and after it. In recurrent neural networks, each word corresponds to a particular time step. It has hidden function which contains information about words seen previously. Thus, the value of hidden state for a current word input is determined by previously hidden state value and current word vector. This helps preserve relationships between different words separated by distance and often leads to more accurate results. [5][6]

## 4. RELATED WORK

In this paper, the author has carried out sentiment analysis on the government initiative “Digital India”. Various data preprocessing techniques were discussed and a dictionary-based approach was used.[3]

In this paper, the tweets during the FIFA 2014 world cup were analyzed. A Bayesian logistic regression classifier was used as a classifier, n-grams were used for feature extraction and the WEKA machine learning framework was employed. Correlation between events and sentiments were studied by studying how the sentiment fluctuated in the aftermath of the Suarez biting Italy’s defender and later apologizing and finalizing the contract with Barcelona.[4]

This paper discusses various deep learning methodologies like Convolutional Neural Network (CNN), Recurrent Neural Network (RNN), Long Short-Term Memory Cell (LSTM) for sentiment classification on IMDB movie review dataset and Stanford sentiment treebank(SST) dataset. It uses word2vec for obtaining word embedding’s. It combines historical, present and future context representations to obtain a comprehensive context representation [7].

This paper uses RNN and LSTM to perform sentiment analysis. This model results in the better analysis of long sentences used to convey emotions leading to better accuracy. Three separate LSTMs were trained on positive, negative and neutral tweets. [5]

## 5. PROPOSED SYSTEM

We propose a system which will analyze twitter reactions to government policies. To get twitter data regarding historical policies, we use the REST API provided by Twitter whereas the data for a recent policy we use the Twitter Streaming API to get tweets. Currently, our system focuses only on the Indian government policies implemented after 2014. For supervised learning, we create a manually labeled tweets dataset.

The Block Diagram of the system is specified below:

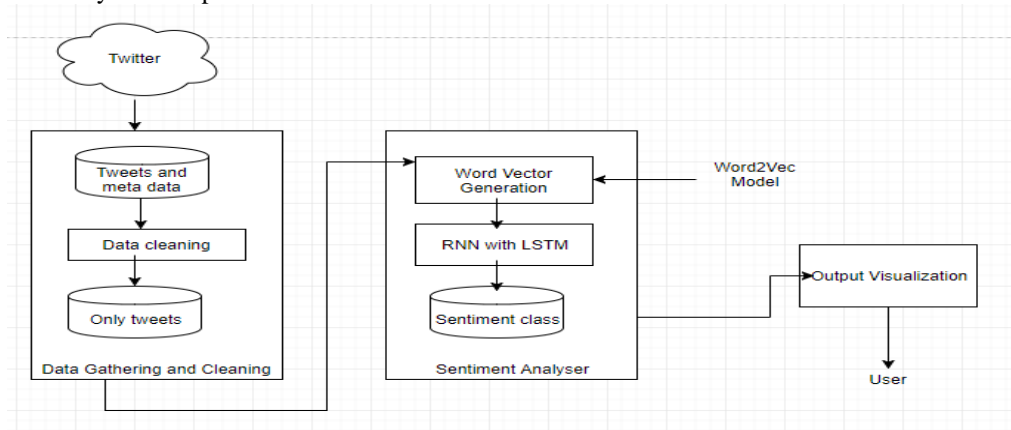


Fig1: Block Diagram

A user will be able to select a policy from the drop-down menu and also the period for the analysis if he/she wishes to. We store the tweets in CSV files. We use two different algorithms Support Vector Machines (SVM) and Recurrent Neural networks- Long Term Short Memory (RNN- LSTM) and also provide a comparison between these two methods for sentiment analysis in particular. For SVM, we perform various preprocessing steps like lemmatization and stopword removal and use the bigram technique for feature extraction. Then we train the SVM classifier on our manually labeled dataset and classify the tweets as positive, negative or neutral. We use word vectors as input to RNN-LSTM and Word2Vec is used to create the word embeddings. We use the Tensorflow environment to implement the neural network. The output of these two algorithms is compared.

We can also obtain the user location from the Twitter. This enables us to analyze how the policies fared across various states and in particular cities. Also, we show how the sentiment varied across time, this will enable us to ascertain if certain events like announcements or speeches by the authorities lead to a change in people's perception. We will be able to correlate sentiment changes, if any, with certain events.[4] We use the Tableau tool for all the output visualizations

## **6. RESULTS AND CONCLUSION**

This paper discusses the importance of sentiment analysis to help policy makers and private think tanks analyze how people perceive certain government policies. It further discusses the various dictionary based, supervised learning based and deep learning based approaches to sentiment analysis. Finally, a system is proposed for analyzing twitter reactions to Indian government policies.

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