

A Contemporary Analysis of Hate Speech in Political Context

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Abstract: Hate speech is becoming a very imperative problem in social as well political context in the present era. It ultimately reflects an intolerance to difference (on the basis of ethnicity, caste and creed, religious views, race, political views, etc.). As a matter of fact, a data generator (user), who uses hate speech wants to emphasize their viewpoints and identity among others and a consequence of such activities somehow leads to hate deeds and conduct. Social media platforms with their wide approach have now become very powerful and influential to affect the psychology of people. The Internet, especially social media, acts as a “turbo accelerator” of hate speech in any context. It is a communication channel that plays a significant role both in opposing hate speech and amplifying it at the same time as well. According to standards for the Facebook community, “Hate Speech” is classified as the text or speech that hurts emotions and attacks someone on the basis of their ethnicity, caste, nation of origin, religion, disability or some type of disease. Twitter, also provides a policy which applies to promoted tweets and prohibits the promotion of sensitive content. This work proposes the mining of web content for available political speeches and then classifying them as hate speech or benign speech. This paper also presents background on hate speech and its detection approaches.

Keywords: Hate speech, data processing, social media, web mining, data generator

Introduction

As per political perspective, hate speech is referred to as an agitation to hatred predominantly against a group of people. This agitation is expressed (Bijo, 2020) generally in terms of race, culture, traditions, way of life, gender and religious beliefs and the like.

It means that hate speech is essentially any word that could be written or spoken, any sign, or any form of evidence that is within the approach or sight of a person with the intention to create panic and apprehension to violence.

Human being is considered as an activist for doing rational things. But when it comes to the expression of views one should be controlled, regulated, and composed with the expressions, thoughts and views of another person (Francoise, 2013). So, this is considered as a general practice that a number of people with diversified caste, creed and religion are associated (Marley Morris, 2020; Antonio Guillen, 2017), hence it is important to express views for backing up the principles of liberty. This paper represents an exploration of political speeches and then analyzes that using suitable machine learning algorithms. Data would be collected from various sources through web via blogs, social media sites etc. and then creating a storage for such data to be stored that would further be used for analysis of hate speech in political context.

Enormous amount of data is being generated daily with the advent of web technology. Nature of data generated is considered as structured, semi structured and unstructured data. This data is preprocessed (Donghui, 2017) and for preprocessing of data; cleaning, transformation and loading processes are being carried out.

This paper also specifies the machine learning methodology; used to classify the data as hate speech or benign speech. Machine Learning is a subset of Artificial Intelligence that provides the machine an ability to work like human beings and to learn and improve functionality from past experience without being programmed explicitly. Artificial Intelligence is a branch of computer science and technology that supports the creation of computers and machines as intelligent as human beings. Artificial Intelligence is designing a computer, a software or some computer-controlled robot that could think intelligently as the human brain does. In the same way as, human beings can learn by training and by past experience, then decide and implement the task for problem solving. The outcome of this study acts as the basis for developing intelligent systems and software.

Afterwards how the data generated is being processed? It concerns the collaboration between humans and computers with natural language. Natural language is the language used by humans (TawehBaysolow, 2013) for communication with computers. Natural Language Processing is a branch of Artificial Intelligence (Antonio Guillen, 2017).

2. Literature Review

In today's era we are drowning in data and information but starving for knowledge. This has been made possible (i.e. availability of data and information) because of fast growing Internet and technology. One can share data over the web and among a number of users. Various kinds of data are being generated from the web primarily

via human to machine communication and machine to machine communication. The nature of data is heterogeneous (i.e. textual data, images, audio, videos etc.) thus this need to be converted to homogeneous data, so that data could be applied to obtain meaningful information. For this purpose, various techniques and methodologies are available. Data processing (Donghui, 2017) is actually the process of converting raw data into meaningful information or output.

This can simply be summarized as: with the advent of the web, the means of data and information sharing have evolved largely. Data could be shared easily among a number of users and also available on the web for everyone via various sources such as blogs, social media like: Twitter, Facebook etc. and so on. This paper represents data analysis techniques for classification of the text. Now as far as the hate speech is concerned, to deal with it is a multidimensional task. It should be understood that dealing with hate speech is a multidimensional task. Seeing as (from data through the web) there is a variation in hate speech, so there is a need for variation of responses. The criminalization of hate speech (Bijo, 2020) should be foreseen that this is direct provocation to violence.

However, the politicians and other political figures are pretty more responsible to speak out about hate speech and also to promote an environment where diversity is a value. Here, the media is also supposed to have a responsibility in fighting against hate speech. So various communities like the media should develop a system of self-regulation (Francoise, 2013). This should be based on some code of ethics and a mechanism to receive and respond to complaints.

Hate Speech related issues are much more prevalent on the Internet, as it is considered as an information superhighway. So, web blogs and other Online social media platforms such as Twitter (Amrita Shelar, 2018) and Facebook, have gigantic probability for distribution of hate speech.

Brief Survey of literature work: -

Table:1- Summary of literature survey

Year of Publication	Topic	Text Representation	Classifier used	Application Area
2017	A Lexicon Enhanced method for Sentiment Classification.	Parts of Speech	K-Medoids	Online Product Reviews
2017	Implementation of n-Gram methodology for rotten tomatoes review dataset sentiment analysis.	Unigram and bigram	Support Vector Machines and Naïve Bayes	Rotten Tomatoes and Movies.
April 2018	A survey on Sentiment Analysis (MoorthiMadhavan, 2018)	Prediction Algorithm	Support Vector Machines and Naïve Bayes	Social Media
August 2018	Conceptual Sentiment Analysis Model (Kranti, 2018)	Polarity Classification	Bag of Words	Movies.
2018	Sentiment Analysis on textual reviews (Mirsa Karim, 2018)	Rule based classifier	Mining algorithms	Movies reviews.
June 2019	Assessing and Probing Sentiment Classification (Jeremy Barnes, 2019)	Binary sentence classification	Bag of Words Classifier	Real time Online data
March 2019	Sentiment Analysis with word embedding (NLTK, 2020)	Word2vec	n-grams	Online Data
July 2019	Sentiment Analysis	Machine Learning	Bag of Words.	Persian Text Analysis

	Challenges in Persian Language (Mohammad, 2019).			
November 2019	Sentiment Analysis for Social Media (Carlos, 2019).	Natural Language Processing	Binary Classification Method	Social Media
December 2019	A Framework for Sentiment Analysis in Arabic text. (Alaa, 2019).	Machine Learning Algorithm.	Bag of Words	Arabic Text Analysis

3. Methodology

Data Analysis

Data Analysis is the process of collecting, transforming, cleaning and modelling data with the goal of discovering the required information. Main source for collection of data is through the web, and it is heterogeneous in nature.

Data is a collection of raw facts and figures, which after processing are used to draw conclusions and analysis. Data can exist in various forms that are defined below: -

1. Numerical Data:- It is the information that is measurable. Numerical data is always collected in number form. For example: The number of people who went to see a movie in a theatre, over the course of a month. Thus, it is quantitative in nature.
2. Categorical Data:- It is the type of data that can be divided into groups. Like the age groups are categorized as child, adult, young and old aged. This is qualitative in nature.
3. Ordinal Data:- It is considered as a type of categorical data in which some order or a scale is being provided. Example: - Likert's scale.

Phases of Data Analysis: -

Various phases of data analysis are defined as:-

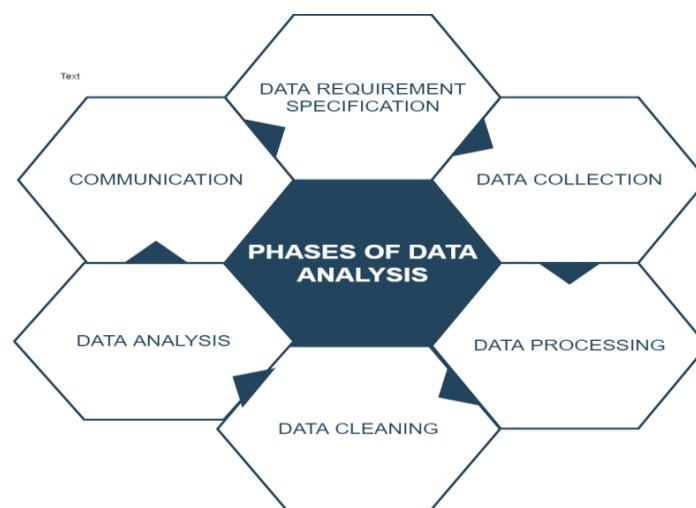


Figure: 1- Phases of Data Analytics

1. Data Requirement Specification: - Based on the problem statement, type of data required for analysis must be specified and identified.
2. Data Collection: - The process of gathering data and information on target variables that are identified during specification storage.
3. Data Processing: - Data collected in the previous stage from various heterogeneous sources may be accurate and inaccurate. Also, data collected might not be consistent, structured and may lack relevant information, so data processing and cleaning is probably needed.

Data Processing techniques can be specified as: -

- Handling Null Values
 - Standardization
 - Handling categorical Variables
 - Multicollinearity
4. Data Cleaning: - Data cleaning is the process of correcting and prevention of the errors that could be the result of processed and organized data. This processed data may tend to have duplicate, incomplete or erroneous data.
5. Data Analysis: - The processed and cleaned data is then ready for analysis. For analysis various tools and techniques are available to understand, interpret and derive the conclusions. However, data analysis is iterative in nature, so it may require additional data collection as well.

For example: Tools and techniques available in context of Artificial Intelligence and Machine Learning are:

Tools: -

- R programming
- Python
- Tableau
- Excel
- SAS

Techniques: -

- Decision Trees
 - Artificial Neural Networks
 - Fuzzy logic
 - Support Vector Machines
 - Regression
 - Clustering
6. Communication: - Communication is considered as visualization of data in any graphical format. For clear and efficient communication data analysts choose data visualization techniques such as tables and charts.

In visualization the results of analysis are represented or reported in user defined format and on the basis of this further analysis and Data Analysis is performed by Exploratory Data Analysis (EDA) and Data Modelling. EDA, is an approach used to analyse a dataset and summarize that on the basis of their characteristics. Data modelling means the application of mathematical formulas, models, algorithms applied or implemented on data to identify relationships among variables.

3.1.1 An explanation of study of various machine learning methodologies for data processing

a. Bag of Words Model

For the representation of textual data Bag of words model is used. This is a machine learning algorithm for data modelling. In this modelling approach, Bag-of-words model extracts the features from text for use in modelling; similarly, as the machine learning algorithms.

Bag of words model is used to pre-process the text by converting it to a bag of words that keeps the count of total occurrences of most frequently used words.

To create Bag-of-Words model, following steps are being followed: -

- a) Pre-process the data: - Pre-processing of data refers to the conversion of text into lower case letters and then elimination of stop words (non-word characters) and punctuations.
- b) Obtaining the most frequent words in the text: - Now finding out the frequent words here, the dictionary is declared to hold a bag of words. Then tokenize the sentences into words and hence for each word in sentence check for the existence of the word, in the dictionary. If it doesn't exist then increase the count by "1"; else add the new word to the dictionary and set its counter as 1.
- c) Build BoW Model: - Now construct a vector that tells whether a word in each sentence is a frequent word or not. If it is then set the value as "1" else set it as "0".

b. Support Vector Machines

Support Vector Machine or SVM is a Supervised Machine Learning Algorithm. Although SVM can be used for classification and regression techniques for text analytics, still primarily it is used in Classification problems. As far as the implementation of support vector machines is concerned, here we plot the data items as a point in multidimensional space with n number of features. The value of each feature is the value of a particular coordinate. Subsequently classification is performed by finding the hyperplane for differentiating the two classes in multidimensional space.

c. Naive Bayes Theorem

This is a supervised machine learning algorithm that is used for classification techniques. This method is grounded on Bayes' Theorem; that computes Posterior Probability; with an assumption of interdependence among predictors. Naïve Bayes classifier

Let's suppose an apple; a fruit, is considered to be an apple if it is red in colour, round shaped, and about 4 inches in diameter. These features depend on each other or on the existence of some other feature. Thus, all the mentioned properties subsidize the probability that the given fruit is an apple and hence it is known as "Naïve" Bayes.

Naïve Bayes is a highly advanced method of classification and is useful for very large dataset.

Bayes theorem provides a way of calculating posterior probability as: -

$$P(B) = \frac{P(A).P(A)}{P(B)}$$

Figure 2: - Equation for Posterior Probability

Where:

$P(A/B)$ = Posterior Probability; i. e. conditional probability of occurrence of event A, given when B is true.

$P(B/A)$ = Likelihood; Probability of B, when A is true.

$P(A)$ = Probability of an evidence.

$P(B)$ = Probability of Proposition.

Applications of Naïve Bayes Theorem

- ❖ Text Classification
- ❖ Prediction of multiclass
- ❖ Predictions in real time
- ❖ Recommendation System
- ❖ Sentiment Analysis

d. Binary Classification

Binary classification approach for text processing refers to the assignment of any one category to an individual out of two. However, the value is assigned on the basis of measurement / determination of a series of the attributes in a piece of text. An example for the same is reviews of a movie whether it is a great movie or boring, based on the data collected by some social media network; say twitter. Here the action space has two elements i: e. great movie or boring!

Either of these two categories; one is assigned to that specific data, by collecting data from online sources; creating a database for positive and negative words individually and thus computing the value to be positive or negative. Then, classifying the individual data into one category. This is Binary classification.

3.1.2 Comparison of the pre-processing methodologies: -

As for implementation of data, various research methodologies are tested for providing most accurate results; likewise, different pre-processing methods are studied and established which method is used in most situations, more effective and accurate. Though various researchers have implemented different pre-processing methodologies; so out of 112 different research papers a comparison is made for these methodologies, which is used most; and least.

Table:2- Various methodologies with number of research papers

S.No	METHODOLOGIES	No of Research Papers
1	K-Medoids	7
2	Support Vector Machines and Naïve Bayes	10
3	Bag of Words	28
4	Binary Classification Method	7
	logistic regression	10
6	Naïve Bayes	22
7	n-grams	9
8	Latent Dirichlet Allocation (LDA)	2
9	Lexical and Syntactic	5
10	Word Embedding and word2vec model	12

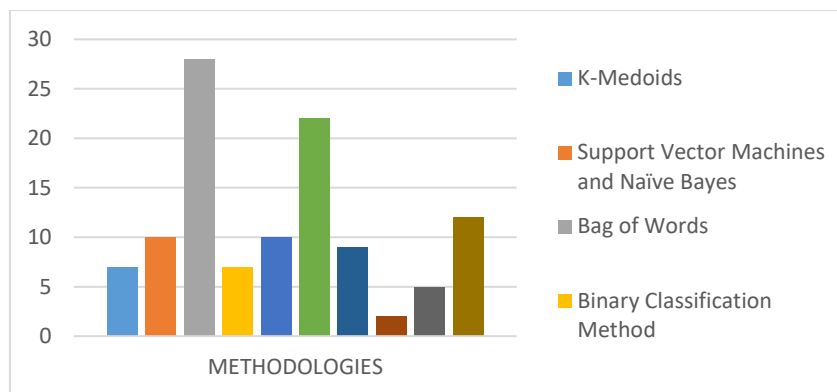


Figure 3: Comparison of usage of pre-processing methodologies

Explanation of variance of use of methodologies: -

From the above statistics of comparison of methodologies, it has been interpreted that Bag-of-Words model is highest used and LDA is used least.

- Bag of words model is used most because of its simplifying representation in information retrieval and natural language processing. In this model text is represented as bag of its words regardless of grammar and order of words; but considers the multiplicity of words. This model is used for document classification where occurrence of each word is used as feature for training classifier.

- Analyzing the results is very difficult in LDA. It is based on heuristics so one has to go through many trials and errors; hence it becomes difficult to conclude insights from outputs. Domain expertise is needed for feedback and to decide whether the results are best suited or not.
- In Support Vector Machine (SVM) and Naïve Bayes algorithms; when the dataset is large enough, it doesn't perform well. When number of features for each data point exceeds the number of training data samples; then the target classes starts overlapping.
- K-Medoid algorithm finds dissimilar results on the same dataset for different execution shots; as first K-medoids are chosen randomly. Also, this algorithm is not appropriate for clustering arbitrary shaped (especially non-spherical) group of objects.
- Logistic Regression predicts only categorical results. While implementing Logistic regression; all the independent variables need to be identified prior to implementation.
- n-Gram model does not guarantee to represent or understand all the unseen instances with respect to already learned training data. Major drawback of this model is intensive sparsity. Though it is compatible with extremely large dataset; but it is not possible for this model to classify new instances as the classifier cannot understand and represent.

4. Conclusion

While going through the literature survey it has been found that though various strategies and framework for analysis of data (from various sources) are proposed. Thus, consider the real time data obtained from web i: e. online sources such as some blogs, other Online social media platforms such as Twitter and Facebook etc. then that needs to be analyzed about the opinion of the text writers and region wise by creation of database for storing that data and then processing it using some appropriate research methodology to classify the text as per the user requirement

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