



PREDICTION ON ONLINE TOXIC COMMENTS USING RANDOM FOREST REGRESSOR

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Abstract

Currently, social places have become areas for great expression and opinion, and among them lies social media. However, it is important to note that not all people use these platforms in a decent manner. There are those that use them to vent their anger, insecurities or their prejudices thus inviting trouble with a lot of cases of online harassment. Social media abusive comments can have effects on the well-being of these individuals. This paper proposes a new way to solve this problem of online abuse by measuring the level of abusive comments, which has not had much coverage in previous studies. The study investigates how well various machine learning models determine abusive content including Naive Bayes, Random Forest, Logistic Regression and Support Vector Machine. Similarly, the paper explores the relationship between text preprocessing and model results. The Random Forest Regressor was found to be the most accurate predictive model with 92% accuracy out of the other models. This paper also puts forth all efforts to enhance the severity of abusive language on social networking sites detection models.

1.INTRODUCTION

Social networks have turned out to be one of the major discussion platforms, the very nature of which allows individuals to voice out opinions without fear of being reprimanded. At the same time, however, this liberty sometimes gets out of hand, when extreme disagreements with a particular position become too emotional and lead to personal attacks[1-3]. This insidious backdrop of negativity contributes to the choking of unhindered exchanges of process, itself in several ways discourages constructive integration of views within the virtual space, at least in this case[4-6] .Although social media companies are trying to deal with cases of aggressions consistently, the problem continues to be quite serious. It goes without saying that social media has changed people's lives including allowing

In the past few years, the growth of the use of social networking sites and other electronic mediums has been significant which has also led to the rapid increase in the number of people talking through such mediums[25-27]. Although most people would argue that this increase in the volume of information would assist in improving how human beings relate, there is a problem in that such differences in opinion may cause tempers to flare and lead to conflicts that contain very toxic comments[28-31]. This research aims at creating a multi-headed model to address inward addressing hate speech in the form of threats, obscenities, insults and hate on the basis rendered here after based on identity. The problem of recognition and suppression of obscene utterances finds its practical application in such areas as natural language processing (NLP).

2.LITERATURE SURVEY

Online toxic comments, which encompass hostile remarks, threats and other types of abusive language, are one of the major, if not the most major, obstacles to the creation of healthy cyberspaces[32-36]. Predicting and capturing such comments within a context is purposely done to discourage aggressiveness and encourage constructive social interactions[37-41]. The recent decades have seen considerable advances in the detection of these comments through various machine learning models in general, one of which is the Random Forest Regressor for its proven strength in great complexities.

Online Toxic Comments Detection

Web based sites like social network forums have over the years been dominated by user active content; the case has not been different with user content from toxic comments[42-46]. The standard approach in addressing this problem is employing the help of humans to moderate the content, an approach which is impractical considering the amount of content present[47]. The development of automatic information processing, in particular, the application of information technologies that include machine learning is necessary to solve this problem quickly and efficiently[48].

Random Forest Regressor in Toxic Comment Prediction

The Random Forest Regressor which is a model developed by combining several decision trees has gained wide acceptance in predicting outcomes in classification and regression studies including predicting toxic online comments[49]. Use of Random forest models with feature extraction in form of word embedding produced better out comes than the commonly used bag of words even without curtailing whichever engineering process in further improving the model[50]. Based on these situations, Waseem and Hovy (2016) used multiple supervised learning algorithms to detect abuse language on micro blogging site Twitte[51]. Random Forest classifiers in these studies were found o produce good recall and F1 Score measures suggesting that the models did well performing in classifying an imbalanced dataset which is often the case in Toxic comment detection studies.

3. PROPOSED SYSTEM

Data Collection

The researchers recruited data from Kaggle specifically on the discussions regarding the celebrities from the platform. This section was chosen on the basis that this section would have higher number of toxic comments than the others. The mau was started with retrieving comments from 40 topics of this section as at 8th November 2020. A web crawling framework Scrapy was used to scrape out all the corresponding comments on each of the concerned topics. This technique was effective as no personally identifiable information of the users was gathered while compiling the entire dataset. A flow diagram formulating the steps taken to gather the data is provided in Fig. 1.

Data Preparation

Upon completion of the data extraction and collection, each comment collected was then categorised into flattering and derogatory comments. The assigned scope of the comment was ‘tough’ if the language used in the comment was abrasive, rude and insulting so as to make the users not want to join the talk. Such a wide definition left little space for punishment for ignoring toxic content such as hate speech.



Fig 4 Gathering Data

At first, we thought of using sentiment analysis tools that would help in labeling based on available lexicon. But this document was inadequate as it did not convey the meaning as to why the help was being offered as it just assesses the whole text positivity or negativity rather than specific pieces of toxicity. For this reason, we reassigned and retouched each comment's labels according to their unique content. We also executed some steps for data transformation after the labeling. and the Island School and the College of the Holy Cross papers and any comments which were non Russian parts were deleted. So, after these steps Basha dataset with containing 12,000 records including 4,631 toxic comments and 5,369 non toxic were balanced. Here are some samples of toxic and non-toxic comments and their translation to English:

1. Toxic: "Haha, you dumb shit"
2. Non-Toxic: "Failure is a part of growth"

We prepared the data to be suitable for two different analysis. In both methods, numbers and punctuation marks were removed. In the first approach, we employed neural networks for maschin.

Support Vector Machine (SVM)

Support Vector Machine (SVM) has been extensively studied for its effectiveness in detecting abusive content online. However, the results of its performance have been mixed across different studies. For instance, research focused on detecting cyber bullying—a specific type of online abuse—found that SVM was less effective on larger datasets, such as those from Twitter, compared to other machine learning methods. In these cases, SVM achieved the lowest accuracy and precision but exhibited the highest recall among the classifiers. This indicates that while SVM was more likely to identify all potential abusive content, it also had a higher rate of false positives.

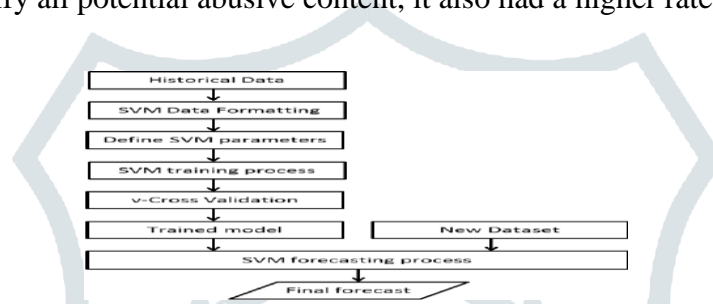


Fig 5 Flow chart

Naive Bayes

Although their effectiveness in fighting the abusive content online deserves much attention to attention Economic light has been shed on service machine learning SVM. But the findings on its performance are however conflicting across studies. For example, researches aimed at identifying cyber bullying, which is considered to be one type of online abuse, received results that showed that SVM was not as effective when larger datasets, such as Twitter were used compared to other machine algorithms. In these cases, Out of all the classifiers, SVM managed the lowest accuracy and precision but the highest recall. This means that while SVM was the only one to recover every potential abusive content identified SVM, this came with a curse as it also had the highest rate of false positives. Similarly, the effectiveness of SVM has also been shown to be influenced by the distribution of the dataset. In this study, where the classes abusive and non-abusive were equally distributed, the performance of SVM decreased.

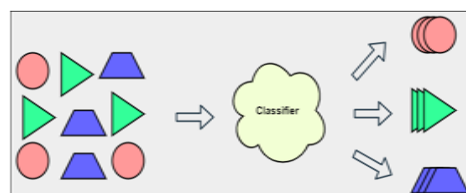


Fig : Naïve Bayes Classification

Fig 6 Naïve bayes

Random Forest Regression

The Random Forest Regression technique has also been reported in the previous research works in the identification of abusive content of the online platform by benchmarking the technique against other techniques such as SVM and Naïve Bayes. The Random Forest strategy is one of supervised learning which employs trained patterns for making predictions and falls under the group of regression techniques known as ensemble learning. It operates like a bagging technique where multiple decision trees are built and work fully in parallel without interaction amongst the exercised trees while the training takes place. Competitive Bias Restriction: In the trees' every node, like in control based point prospecting, only a certain agreed percent of predictors concerning that node are available to perform splitting.

Random Forest Classifier In addition, the Random Forest Classifier has also been documented as a mechanism employed in the evaluation of Online detection of toxic comment. In this context, several classifiers were compared including SVM, Naive Bayes, and Random Forest.

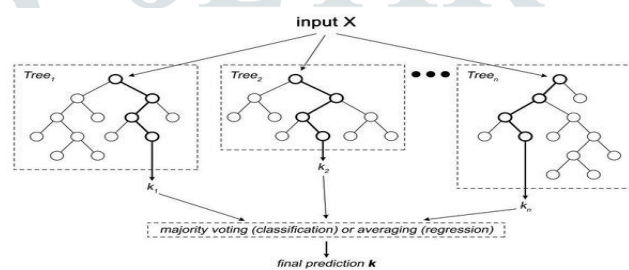


Fig 7 Input format

For the comprehensive evaluation of the classifiers for toxic comment detection, a number of metrics such as Hamming Loss, Log Loss among other effects measures were evaluated. Hamming Loss: This measures the fraction of incorrect labels for any instance with respect to the total number of instance's labels.

Log Loss: This finds the degree to which predicted probabilities correspond to the actual values.

Examination of results showed that Logistic Regression was the classifier who had least Hamming Loss best accuracy for the undertaken tests, implying that it was possible to capture averagely most toxic comments through its use. In another branch the authors used in previous studies text classification techniques Naïve Bayes SVMs etc. Taking this into consideration, it was viewed that the classifying of the level of severity of cyberbullying tweets worked most effectively with the Random Forest Classifier. Classifier Random forest has also been found effective in the tackling of class imbalance issues during cyberbullying detection on the internet hence better and desirable performance and accuracy levels that are required under complex viewpoints.

Logistic Regression

Among numerous techniques available for binary classification, Logistic Regression is one of the most used and easiest techniques. spam filtering, diabetes prognosis, and forecasting customers' purchasing behavior, and advertisement clicks are just a few of the areas where professionals use it. Baseline statistics have the added benefit of being used to build complexity so metric does not fall in uselessness in binary classification cases. This method is utilized by describing a quantitative relationship between a binary dependent variable and an independent variable or independent variables. It predicts whether an event will lead to one of two possible outcomes, hence, its applicability in modeling binary outcomes with an emphasis on probabilities. This particular feature not only facilitates the ease of its use but also helps in the use of more sophisticated forms of machine learning and deep learning.

	precision	recall	f1-score	support
toxic	0.846553	0.685932	0.757825	6177
severe_toxic	0.435764	0.394035	0.413850	637
obscene	0.849900	0.746557	0.794884	3413
threat	0.459184	0.228426	0.305085	197
insult	0.739411	0.645363	0.689194	3192
identity_hate	0.564470	0.358182	0.438265	550
micro avg	0.790552	0.659184	0.718916	14166
macro avg	0.649214	0.509749	0.566517	14166
weighted avg	0.788407	0.659184	0.717118	14166
samples avg	0.059556	0.059366	0.057028	14166

Fig 8 Data table

Besides other methods such as SVM, Naïve Bayes, and Random Forest, the application of Logistic Regression has also been documented for its use in detecting online abusive speech. It is simplistic as indicated earlier, yet dependable making it an essential tool for preliminary reviews and analyses in binary classification.

4.Result

The model which has been developed has also been evaluated in training and testing subsets of the data and optimized. However an evaluated subset that was not used in training and testing will be used mainly as a tool to qualify the model's validity. The holdout set performance of the model is quite similar to the earlier results, showing that it is indeed likely to work on new data. Typing of comments in the dataset ranges from simple informative posts to quite a number of confrontational threads and thus this presents a great opportunity for the model training. The textual data features were adequately transformed using Scikit-Learn's TfidfVectorizer() class to ensure that the model held its ground against new features. Features that have not been seen are safely disregarded providing the model with a broad scope of text input.

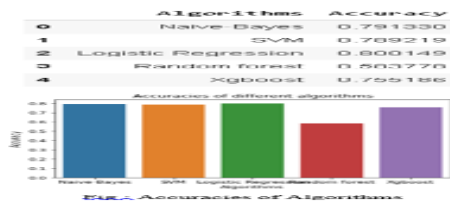


Fig 9 Algorithm Accuracy

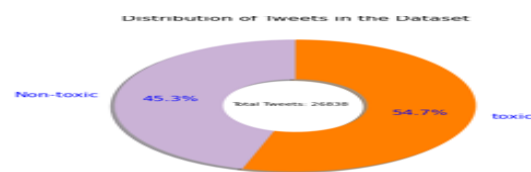


Fig : Distribution of Tweets in Dataset

5.CONCLUSION

In this research work, the effectiveness of different models for toxic comments classification is examined and a fusion technique called ML Algorithms is developed in the end. Different levels of model performance with two different classes using random under-sampling and over-sampling methods in an experiment are also considered. Two feature extraction methods a tf-idf and b are employed to create the feature vector for 'training of the models. Imbalance datasets yield low accuracy but generally, classification accuracy increases with the effort to create a balanced dataset. Other classifiers already discussed performing well on the balanced dataset include SVM, Random Forest, LogisticRegressionl etc. Under a condition where a greater number under sample and over sample were applied the results were better because of the increased data feature set hence the model yield a better accuracy. It is evident from the above that providing a balanced partition improves the chances of avoiding certain overfitting of the models from training on the imbalanced data.

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