Fake News Detection on Social Media using K-Nearest Neighbor Classifier

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Abstract— Consumption of news from social media is gradually increasing because of it's easy to access, cheap and more attractive and it's capable to spread the "fake news". The widespread of fake news has latent adverse impressions on people and culture. Some people spread wrong information on social media to get the attention or financial and political gain. We need to be smarter at the recognition of fake or real news. The unique feature of detecting fake news on social media that make current detection algorithms ine ective or not appropriate. Thereafter is essential to consider secondary information. Secondary information may include social activities of user on social media. So, in this research work we are presenting a simple approach for detecting fake news on social media with the help of K-Nearest Neighbor classifier. We achieved a classification accuracy of this model approximate 79% tested against Facebook news posts dataset.

Keywords— Fake news; K-Nearest Neighbor; Data Mining; Supervised.

I. INTRODUCTION

The propagation of ambiguous information available every day at different platforms such as news blogs, online newspapers and social media. Now a day's young generation is mostly spent his time on social media and internet thus it has become the main source of consuming news or information instead of acquiring from traditional sources. News on social media is more appealing and less expensive compared to other traditional news organization and it is easy to share, like and comment but despite providing the benefit, this class of news from social media is inferior than other traditional news sources. As per survey conducting in 2016, the percentage of consuming news on social media was 62% whereas in 2012 it was 49%. It shows that we are bombarded with information day-by-day and do not have the related resources, knowledge or expertise to verify the information. Fake news intentionally spread for a variety of purpose such as, it can impact their ability to distinguish what is legitimate or what is not legitimate. Detection of news on social media is an interesting problem. Fake news spread in different format like click baits, news blogs and online newspaper. In the recent survey, Facebook referrals account consists 50% fake news sites and 20% genuine websites. Here are some strategies to shield yourself from fake news. First one, Are you familiar with the source? Does it be legitimated? Has it been reliable in the past, if not you may not want to trust it? The second one, if inflammatory headline drew your attention then read one times more before you decide. Many scholars consider that with help of artificial intelligence and machine learning technique we can easily handle fake news detection problem because of recently artificial intelligence algorithms are used in classification problems (voice detection, image recognition) and they work much better [1]. We collect the data of Users' social engagements from different websites but that data is huge, incomplete, unstructured and noisy. Then our main focus on finding the way to extract useful feature, a credible user. Data mining is the way toward taking care of data from a dataset which is undetectable straightforwardly.

Detection of fake news on social media is the latest evolving research area, which can be solved by different data mining perspective. This research issues divided into four categories.

- Application Oriented
- Data Oriented
- Model Oriented
- Features Oriented

In previous research work, the author used different approaches to find out a difference between legitimate and fake news content. Some author solves this issue with help of N-gram, NMF (Non-Negative factorization), RST-SVM (Rhetorical Structure Theory and Vector Space Model), LIWC and SVM classifier [13] and some author used CL Score, RIX and LIX indices to find a clickbait and not-clickbait [10].

Data Mining is the way of extracting information from the large scale of data to identify the hidden and crucial information from it. In other words, we can say that it is the tool for finding information which cannot be identified directly from the data. Classification is one of the techniques in Data mining to classify the data. Classification is the method to forecast the label which is unidentified before to distinguish between one object to another on the basis of selected feature or attributes [2]. In this method, data will be divided into two part first one is training data i.e. information to be related to find out the category label, second one testing data where we perform the test to know the category label of the new object.

In this article, we use the K-Nearest Neighbor classification algorithm. We collect and analyse the particular features of users in various aspect like implicit and explicit. Those features, which are obtained directly from metadata return by Querying social media site API, is known as Explicit features. We can not access implicit features directly It contains only basic information like gender, age and personality while explicit features contain information about whether it verified user or not, favour count (no. of people like that post), follower count, share count and comment count (no. of people comment on a post).

This research describes a simple approach for fake news detection with the help of K- Nearest Neighbor (Artificial intelligence algorithms). The aim of this research is to develop a model which can efficiently predict fake news or real news on basis of learning behaviour.

II. K-Nearest Neighbor Classifier

In machine learning, K-Nearest Neighbor is one of the popular Supervised technique used for different regression and classification problems [4]. Supervised Learning is a learning that is executed using label data points. KNN classification can be effectively used as an anomaly detection technique (i.e. fraud); KNN regression can be applied in many types of regression problem effectively, including actuarial models, environmental model and real estate model. Now we can also use this algorithm for Fake News Detection on Social media K-Nearest Neighbor is a simple technique for building a classification model which assign the class label to problem instances. This is not only one algorithm for training such classifier but a family of algorithm exist. KNN is used in recommendation systems, semantic searching and detection and anomaly detection. It's mostly used for classification problem in the industry as it's easy to interpret, consume less time and can easily handle the noise.

In machine learning problems, the first thing is finding a way to represent data points feature vector. A feature vector is a mathematical representation of data. If a given data is having N unique feature than the length of the feature vector is N. The aim of this algorithm is to classify a new object based on their training data and attributes. To classify new object KNN performs some steps.

- Evaluate the distance among the item to be classified and each point in the training dataset.
- Pick the closest data points with the K lowest distance.
- Conducting a "majority vote" among those data points.

III. Mathematical Model of K-Nearest Neighbor Classifier for Fake News Detection

K-Nearest Neighbor mathematical model is entire training dataset. Prediction is done on the basis K most similar instances by searching the entire training dataset. To find out, which of K instances in the training dataset are more similar to the new object, Euclidean Distance formula is used. In simple word, we can say that in K-Nearest Neighbor we use Euclidean Distance formula to find out K most similar instances. Euclidean Distance define as a "the square root of the sum of the square difference b/w a training object and testing point across all the input".

$$d(q, p) = \sqrt{\sum_{i=1}^{n} (q_i - p_i)^2}$$

Where d (q, p) is the distance between training object and testing. We take different value ok K (Nearest Neighbor)

and seed at which value of K our model gets maximum accuracy [5]. Figure 1 shows the K-Nearest Neighbor decision rule for K=1 and K=4. In Fig 1(a) unknown object classified only one of the most similar instances and in Fig 1(b) unknown object classified based on 4 most similar instances.
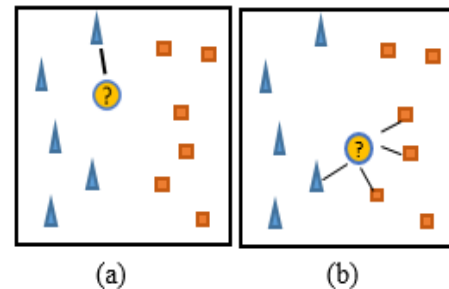

Figure.1: (a) The 1-NN decision rule: (b) The 4-NN decision rule

IV. Overview of the Training Datasheet

The dataset has been collected from Buzz Feed News organization that was used in training and testing of the model. Buzz Feed News used social analytic services BuzzSumo to identify the top performing Facebook content from 167 websites that consistently publish articles. This dataset gathered information about the Facebook post and each of which represents a news article. These News articles collect from the three main political news pages Politico, ABC News and CNN.

Employees of the Buzz Feed regularly access and examine the reality of each post that is published during seven weekdays. They split each post into 4 labels "mostly true", "mostly false", "mixture of true and false" and "no factual content". Apart from this they also collect information about user social activities (Share count, Comment count and Reaction count) for each post that was collected from the Facebook API.
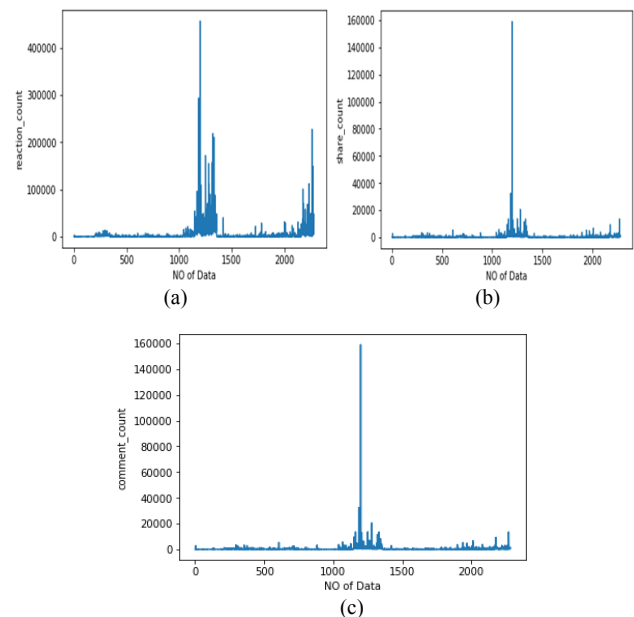

Figure.2: social engagements

Share count explains the number of times the news article has been shared so that number of the user is aware

of the news article and Comment count explain the number of people who review or share their opinion about these articles. Figure 2 shows how many Reaction counts, Share count and Comment count to a particular news article. They also tell about the weather the post was video, image, link and text. Buzz Feed dataset gather 2282 post.

V. IMPLEMENTATION DETAILS

We have followed these steps to implement this model as shown in Figure 3.

- Among the features of Buzz feed datasets, only a few of them are used. They are linked to the Facebook post. We selected only five features (account_id, post_id, share_count, comment_count, Rating) to train our model. A couple of articles do not contain any information (contain "null" as text) so we are ignoring such type of thing.
- Our proposed datasets contain total 2282 post where 1669 posts are "Mostly True", 264 posts are "No Factual" Contents, 245 posts are "Mixture of True and False" and 104 posts are "Mostly False". Than Our proposed datasets are divided into two-part Training and testing. Training datasets were used for training K-Nearest Neighbor classifier and Testing datasets were used for test the performance of this model (How well the classifier perform on the new object).
- The dataset contains around 2000 articles; this number is really small. If we have trained model with the greater number of data that significantly it will improve the performance of the model. We trained our model with 80% of the Datasets.
- After the training of model, the next thing we have to focus on at which value of K model will give the maximum accuracy. The performance of K-Nearest Neighbor depends on the value of K. If the value of K is small than we are limiting the region of a given prediction and force the classifier to be 'more bind' to overall distribution. A small value of K provides the most flexible fit. If we increase the value of K than it will cover large region around the quarry. Whereas higher value of K value, more votes in each prediction.
- Performance Evolution of this model has been done by the use of various evaluation Metrix.
- Various evaluation metrics have been used to evaluate the performance of this model. We have assumed that result is positive when classifying the news article is fake.
  Classification outcomes:
  - True Positive (TP): When fake news predicted as fake news.
  - True Negative (TN): When true news predicted as true news.
  - False Negative (FN): When fake news predicted as true news.
  - False Positive (FP): When true news predicted as fake news.

These are following evaluation metrics:

$$Precision = \frac{|TP|}{|TP| + |FP|}$$

$$Recall = \frac{|TP|}{|TP|+|FN|}$$

$$F1 = 2.\frac{Precision * Recall}{Precision + Recall}$$

$$Accuracy = \frac{|TP| + |TN|}{|TP| + |TN| + |FP| + |FN|}$$

Accuracy is the total no of correct classification divided by total no of possible cases. A recall is the total no of true positive divided by total no of actual positive. A recall is used to measure the sensitivity. Precision defines as a total no of true positive divided by total no of predictive positive. These metrics are used in evaluating the performance of classifier from different perspectives.
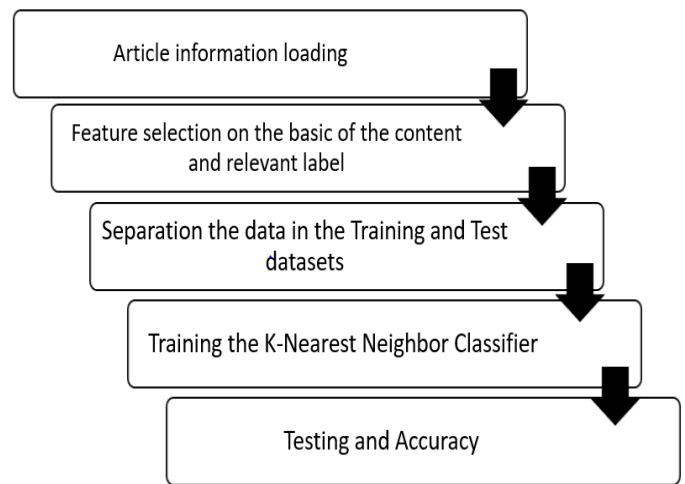

Figure.3: Generalized scheme of this algorithm

VI. RESULT

The results are shown in figure 4. After testing our model by different values of K, we found that at which value of K system gives maximum accuracy. We achieved an approximate 79% classification accuracy of this model on the test set. The weight average precision of this model is .75 and recall is .79. In this, the row of the confusion matrix represents the actual class (labels) of the test data and the column represent what the classified predicts.

The Fourth row of Confusion Matrix shows that out of 402 "Mostly True" news article, 331 news articles are classified as "mostly true", 32 news articles are misclassified as "mixture of true and false", 30 news articles are misclassified as "no factual content" and 9 news articles are misclassified as "mostly false". We can observe that in figure 5 that model has achieved maximum accuracy when the value ok K taken between 15 to 20.
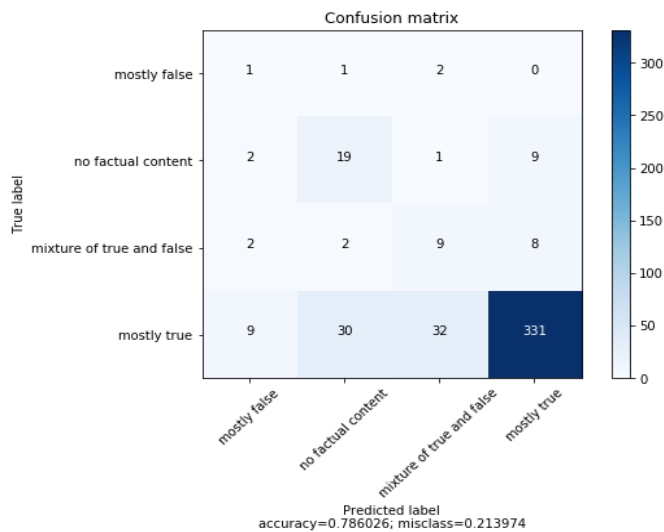
Figure 4 Confusion matrix of the KNN classification algorithm with 15 Nearest Neighbor.
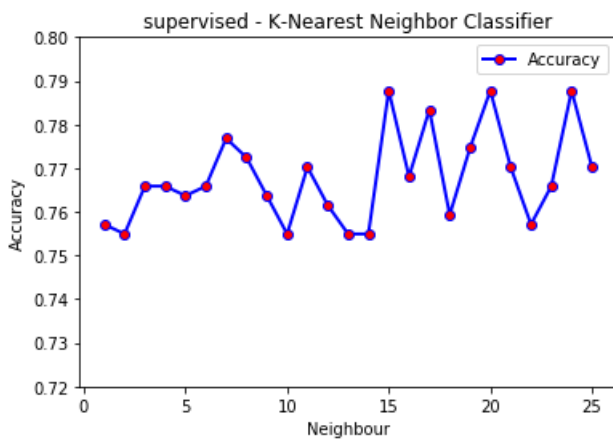

Figure.5: Accuracy at different value of Nearest Neighbor

VII. CONCLUSION AND FUTURE WORK

In recent years, misleading content is gradually increasing and their impact on the online user is getting worse. In this paper, we presented a specific frame to predict fake news on social media. Features selection from the datasets is the essential part of this process as this is used by data mining algorithm (K-Nearest Neighbor) to classify the news article on social media. In previous work, author used different data set[1] and when we compare our model to that our model accuracy much better. This approach achieved a maximum classification accuracy of 79%. In future, we will try to solve the fake news detection problem with the help of different classification algorithm and compare them to show the best classification technique.

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