

Artificial Intelligence Based Approach to Validate the Authenticity of News

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Abstract: — Misinformation isn't definitely new thing; it is way before the inception of social media. It is evolving since 14th century but the term like "fake news", "post truth" are used commonly during movement of 2016 US presidential election. People use social media to read news as it is lost cost and user friendly platform; also it is possible to share news on social media with one click. With this merit, it is also having major disadvantage. If the news is false or misleading news then spread of such news will have adverse consequence on civilization. Therefore, battling fake news is important and has now become developing area of research. Researchers are using Artificial Intelligence based approach such as machine learning and natural language processing to battle with the fake news. This paper presents a comprehensive overview of the earlier detection techniques as well as proposes mathematical model and methodology to improve the result.

Keywords—artificial intelligence; fake news; social media; natural language processing; machine learning

I. INTRODUCTION

Social media [1, 2] has now become the essential part of daily routine due to the enormous development in field of science & telecommunication. It emerged as a popular way among the people for getting information. In addition to it, people post their thoughts, views and feelings on social media. Looking at the merits of using social media, people use it for consuming news rather than traditional news sources such as newspaper, television. The source point of false news is user and then it is shared on social media platform from one user and then shared by many users without verifying authenticity of news or information they are sharing.

Many researchers defined "Fake News" but still there is no standard or universal definition which is agreed by all; but all definitions directed Fake News as "the news which is intentionally and verifiably false" [3]. One user creates news with intention and others share the news without verification that creates the real chaos. With widespread of this type of news, it produces adverse effects on individual as well as society. Currently, every country is going through a serious pandemic issue and is in race to find a vaccine and a treatment for Covid-19. Fabricated content related to anti-mask myths, vaccines etc. are constantly spreading on media. World Health Organization (WHO) and applications developed by the various countries are also clarifying about the fake

message related to Covid-19 that is being circulated on social media and advising general public to check the dashboard/website of Ministry of respective country and WHO for genuine data on COVID-19 before believing [4].

As news is being circulated through social media [40] which impacts the society, fake news detection [5, 6] has become the challenge among the researchers. Humans are not proficient on recognizing the deception on own. Various research works have been published concerning detection of fake news [7, 8, 9]. On the basis on underlying techniques, algorithms for detection of fake news are categorized into groups: Data (Text) Mining, Machine Learning and Deep Learning. Feature extraction [3] is very important step in Artificial Intelligence. In machine learning, features are extracted manually whereas in deep learning it extracted automatically. Feature extraction technique in view of recognizing fake news can be classified into two: content and context. Content features is mainly concerned with linguistic approach, and intend to examine the fake news patterns by examining underlying lexical, syntactic and semantics. On the other hand, context is related to user profile, author and network techniques influence the existing knowledge networks to validate the news fact. Unfortunately, these techniques are inadequate for precisely and automatically validating the news as huge quantity of data is continuously generating on web and social media.

Validating authenticity of news on social media is still in the early stage of its development as there are still various artificial intelligence (AI) challenges that need further investigation. Some challenges are machine learning alone cannot work with plain text; it needs to convert into vector numbers which can be done using natural language processing which will again help model to understand the characteristics of news. Also, only understanding the content of news will not help to detect, understanding context is also important. The existing work and its challenges give new zeal to find out the emerging patterns by applying AI based techniques to detect fake news. Therefore, discussion on direction for research to validate the authenticity of news is necessary. The paper of Artificial Intelligence Based Approach to Validate Authenticity of News is organized as follows: Section 2 gives the detailed overview of earlier work to validate the

news authenticity. Section 3 outlines the methodology which gives the probable work plan. Section 4 gives the model based on methodology and finally Section 5 concludes the paper and throws light on to the future directions.

II. LITERATURE REVIEW

In this section, various research work conducted by different researchers related to fake news detection is addressed. In 1950, Turing [10, 11] wrote paper on “Computing Machinery and Intelligence”. He thought “Can Machines Think”, and proposed Imitation game which is now called as Turing test. Can evaluator (conductor) find out which the Human is and which is the machine? This was the beginning of Artificial Intelligence – Natural Language Processing. To convert tokenized texts obtained through tokenization into features, pre-processing techniques are used [12]. Processing related work done with respect to task of detecting fake news is as follows:

In 2009, Mihalcea and Strapparava [13] presented approach for automatic recognition of deceptive language and used Linguistic Inquiry and Word Count (LIWC). In 2013, Mikolov et al. [14] presented approaches that can be considered from big data sets for learning high quality word vectors. In 2014, Pennington et al. [15] used novel word representation technique GloVe: Global Vector for word representation which combines advantages of techniques like Latent Semantic Analysis and Skip Gram method. It is word embedding vector which are pre learned. To fact check (gather and utilize) the evidence, Recognizing Textual Entailment (RTE) method is most commonly used. Through this, RTE method can predict authenticity of news but to do this, textual evidence is needed by models that use RTE to checking facts. Thus, this method can only be used by dataset that includes evidence such as FEVER [16]. When dataset does not possess enough evidence, RTE models cannot predict correctly [22]. To provide solution for this limited evidence issue, this research work developed a novel technique to articulate instances in training set and labeled as “Not Enough Info” by sampling evident sentences. Thus, with this new approach RTE method can use data to perform the task without evidence. Analyzing the properties of input is important factor of fake news detection. This can be achieved systematically by finding coherence which includes Circumstance, Evidence and Purpose of story. This analytic framework termed as Rhetorical Structure Theory (RST) [12]. This can be further merged with Vector Space Model to detect fake news. In 2015, Rubin et al. presented this approach [18]. Machine learning is the basic means to make the computer intelligent [19]. Several machine learning techniques have been proposed to detect false news.

In 2018, Oshikawa et al. [17] presented the survey based on techniques to validate the authenticity of news and generalized the task as a classification or regression problem. To get the correct precise answer, approach is to set parameters such as more than two degrees of truthfulness which is reflected in dataset LIAR [20] and CREDDBANK [21] instead of only using two classes real or fake. With this datasets, multi-class labels are expected output [17, 22]. This task of detecting fake news can be solving using regression. In regression, output is not binary or multi class label but numeric value which denotes score of truthfulness. In 2014, Nakashole et al. [23] introduced the factchecker which considered the linguistic features and used regression approach in detecting fake news. In regression, assessment is complete by difference among score which is predicted by system and the base truth scores, or it can be done by using correlations method such as Pearson/Spearman. In 2012, Rubin et al. [24] presented statistical study in context of fact checking in politics domain and used clustering approach for this purpose as the data is not completely labeled. Deep learning (neural networks) algorithms also used by different researchers to detect fake news. It can be used as single or as many combinations of algorithms. In 2017, Rashkin et al. [22] and Ruchansky et al. [25] proposed LSTM algorithm to detect fake news where as Wang et al. [20] presented framework which based on model proposed by Kim’s CNN (Kim, 2014) [26]. Metadata representation is obtained from bidirectional LSTM and concatenates it with the max - pooled text representations. CNN is also used for the purpose of analyzing data with the help of obtained metadata.

In 2018, Karimi et al. [27] presented Multi-source Multi-class Fake news Detection framework MMFD to combine information from Multi source and Multi class means to distinguish between various classes (degrees) of fakeness instead of only two classes i.e. real and fake. Simulation of work on the real-world data result into the improved efficiency. In 2017, Long et al. [28] presented attention model with deep learning algorithm LSTM, that incorporates the features such as speakers (who said the statement) name and speaker other data such as affiliation of speaker, his location etc. Due to adding profile’s data, efficiency is improved. In 2018, Pham [29] in his thesis work first studied deep learning algorithms and presented neural network based single attention approach. All types of side information are summed simply and this vector acts as an attention factor over the main text. The simulation demonstrated that this approach of single attention improves than complicated hybrid CNN. In other approach, system is modeled the bidirectional interaction between text’s connected information and text itself. Recent improvements made in task of detecting fake news are as follows:

In 2019, Zhang et al. [30] has presented fake news detection model using text analytics-driven technique to minimize the effect triggered by the consumption of such news. The proposed model framework was formulated initially and described the analytical technique that comprises the validation and implementation details on the basis of news data corpus. A two-layered technique was used for detecting the fake news, which included the detection of fake events and fake topics both. The efficiency of the implemented approach was estimated dependent on evaluation as well as verification of narrative system.

In 2019, Qayyum et al. [31] has proposed approach based on blockchain for combating the fake news issues. A comprehensive overview has been carried out of approach based on blockchain concerning fake news and thereby described its challenges and occurrence it posed. For addressing these fake news problems, a smart contract-based blockchain framework has been proposed and elucidated its overarching structure. The simulation on this work has evaluated the better performance with improved fake news detection.

In 2019, Asghar et al. [32] has focused on the rumour detection issue in a microblog. Past work was not merely focused on context information. Proposed approach considered a contextual information in both directions like forward and backward, by formulating diverse Neural Network methods. The effective classification of tweet into rumours and non-rumours was exploited using the implemented system that depends on the concept of Bidirectional Long Short-Term Memory with Convolutional Neural Network. The analytical result on executed approach thus results in improved efficiency compared to other methods in view of statistical analysis.

In 2019, Ozbay and Alatas [33] have proposed approach to battle with false news on social media which possess two stages. In first step, different pre-processing technique is applied on dataset to convert unstructured data into structured data as structured data gives important feature to predict. This structured text in a corpus of news is then represented in vectors. This is done with the gained Document-Term Matrix and Term Frequency weighting model. In second step, twentythree types of supervised (annotated) artificial intelligence methods applied on obtained structured text dataset. The simulation of implemented works resulted in an improved efficiency than the previous work.

In 2019, Wang et al. [34] has presented algorithm for fine grained levels of untruth instead of only fact – fake and proposed a principled automated method for identifying these miscellaneous levels of untruth when classifying and assessing news. This method was on the basis of hierarchy of five distinguish fake types instead of only two- fact – fake and analytically formulated various

features from social media, extracting both the content and context features. This research work has compared different classifiers and provided experimental analysis regarding the performance of finegrained classifier. The paper also provided a review on the underlying obtained features.

In 2019, Li et al. [35] has presented the approach based on multi-level convolutional neural network (MCNN) that considered two types of feature, one feature is to obtain semantics and other is local convolutional features to efficiently differentiate the news claim or article as fake or not. Afterwards TFW model is applied to estimate the importance of words. This approach is resulted in good accuracy than previous model.

In 2019, Shu et al. [36] focused work on the novel feature than the traditional one that is news content. News content is mere one important factor but not wholesome feature for the prediction. With content, context is also necessary. This research work explored the role of user profile while detecting fake news. At first, the research focused on the user sharing behaviour on social platform and group representatives. Subsequently, they performed a relative investigation of implicit and explicit profile based features between these user groups to reveals their latent to help discriminate fake news from real one. Features extracted from user profile were robust to different learning techniques.

In 2020, Lu et al. [37] has worked on the twitter dataset and presented new techniques for fake news detection on social media based on the neural network, Graph aware Co- Attention mechanism (GCAN). As research work mainly worked on twitter data, work results into prediction whether the input tweet is fake or not. After prediction, it generated the explanation by looking at the evidences on mistrustful retweeters and the words retweeters use. Simulation of dual co attention work produced reasonable justifications.

In 2020, Ibrishimova et al. [38] defined fake news in view of factual accuracy and relative bias, and presented framework for detecting fake news using AI based techniques. Proposed algorithm utilized both manual and automated knowledge verification with style-based features too. They found that for detection source and verification of fact both should be analyzed using NLP techniques.

In 2020, Kaur et al. [39] has mainly focused on the classification method that determined the accurate phony features based on three feature extraction approaches like Count-Vectorizer (CV), Hashing-Vectorizer (HV) and Term Frequency-Inverse Document Frequency (TF-IDF). Further, this paper intended to introduce a new multi-level voting ensemble approach and was thus tested using twelve classifiers on three datasets. The combining

of these ML classifiers was on the basis of their false prediction ratio. The overall performance has revealed the better discriminating facilities among news on social media.

III. METHODOLOGY

The main aim of the research is to combat the issue occurred due to spread of fake news. In order to detect the fake news, combination of Machine Learning algorithms at various layers with Natural Language Processing is to be used.

This work intends to propose fake news detection approach as following.

- The different news sources (article or sentence) are given as input to the system
- Each of these sources are treated using different processing systems like,
 - Content based Scoring, semantic and other natural language processing techniques
 - Context based news quality detection models
- Each of these models are combined using a machine learning layer for better accuracy. In last, analysis of news and optimization is performed for better detection.

Basically, the task of detection is classified in following stages:

Stage 1: Pre-processing is initial step in detection of fake news. It converts unstructured input/text in corpus to structured input/text which gives meaning to text; it generally includes techniques such as removal of stop words, generalization or weighting tokenization, stemming, lemmatization and words. Pre-processing is necessary for improving efficiency and accuracy of fake news detection as it literally gives meaning to input and make easy to detect.

Stage 2: For prediction of fake news, researchers used supervised, unsupervised and hybrid machine learning methods. Supervised learning algorithms comprise classification and regression. Classification algorithms such as Naïve Bayes, Support Vector Machine, and Decision tree are commonly used to detect fake news. Regression methods such as linear regression and logistic regression also used which give numeric score of truthfulness. Comparison among the algorithm is necessary as all differs with respect to morphology. Unsupervised method needs unlabelled dataset which included approach such as clustering, hybrid requires both annotated and unlabelled dataset. Out of these, supervised method is most commonly used for research. Reinforcement learning is less explored area.

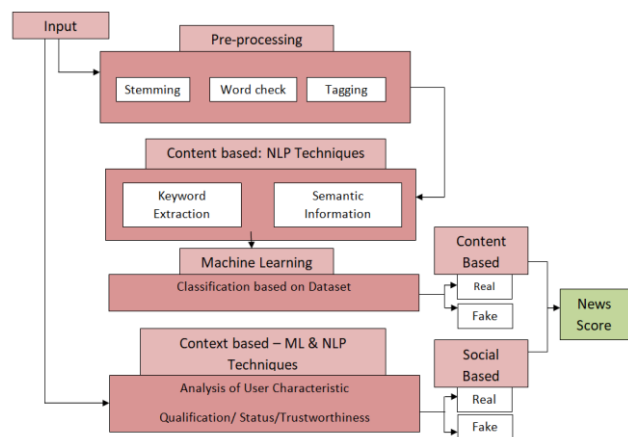


Fig. 1. Block Diagram of Methodology

IV. MATHEMATICAL MODEL

Based on the methodology, model of validating authenticity of news is derived. Assume “C” to be vector of content based features consisting characteristic of news.

$$C = \sum (C1, C2, \dots, Cn) \quad (1)$$

and “S” to be vector of social based features consisting the characteristics of user shared the news.

$$S = \sum (S1, S2, \dots, Sn) \quad (2)$$

News Score (NS) is 1 when news is real and 0 when news is fake based on the techniques applied to content and social based vectors.

$$NS = \epsilon(0, 1) \quad (3)$$

The score of news will be depending on the features extracted from news content and context used by the user. News score is function of C (content vector) and S (social vector).

$$NS = F(C, S) \quad (4)$$

V. CONCLUSION

Fake news means misinformation is not recent thing; it is occurring since ages, only this phrase “Fake news” is coined while US Presidential election, however, there is no agreed upon definitions of the Fake news. Appropriate and generalize definition is necessary to better guide future directions. In task of detecting fake news, input to system is news article or sentence, output is either the classified news (Fake or Real) or trust score (for say, range between 0-1). It has been found that unstructured text can never give good result so to convert it into structured, natural language processing techniques are used. After processing, neural or non-neural learning algorithms can be used to predict the news. This review can be concluded as detecting fake news is still not achieved its goal, it still has many challenges such as annotated datasets, need of labor to do extensive research

for labeling, how user propagate or share the news without verification.

In future, fake news detection system will be modelled to discriminate news as real or fake. Essential parameter in news datasets will be identified and model will be investigated using Natural Language Processing integrated with machine learning algorithm that can improve the accuracy of fake news detection.

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