An Improved Model for Detection of Fake News On Social Media Using Deep Learning Algorithms (A Case Study of Twitter Networking Site)

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Social media for news consumption is a double-edged sword. On one hand, its low cost, easy access, and rapid dissemination of information lead people to seek out and consume news from social media. On the other hand, it enables the wide spread of fake news", i.e., low quality news with intentionally false information. The extensive spread of fake news has the potential for extremely negative impacts on individuals and society. Therefore, fake news detection on social media has recently become an emerging research that is attracting tremendous attention. Fake news detection on social media presents unique characteristics and challenges that make existing detection algorithms from traditional news media ineffective or not applicable. First, fake news is intentionally written to mislead readers to believe false information, which makes it difficult and nontrivial to detect based on news content; therefore, we need to include auxiliary information, such as user social engagements on social media, to help make a determination. Second, exploiting this auxiliary information is challenging in and of itself as users' social engagements with fake news produce data that is big, incomplete, unstructured, and noisy. Traditional machine learning algorithms such as SVM and Decision Tree were used to automatically classify fake news from genuine news. The challenging part of these algorithms is their inability to extract features automatically and also they handle small datasets. In this research, we intend to use a Deep Learning method to improve the detection fake news. FactChecking tool would be used to detect the source of news on social media while CNN algorithms would be applied to detect bot accounts and fake contents.

Keywords: *fake news, FactChecking, Social Media Sites; Naïve Bayes, Deep learning, Classifiers;*

INTRODUCTION

Fake news, rumours, lies are some of the major problems associated with information dissemination worldwide. Clear example is the origin of HIV, which the fake news stated that HIV was originally developed intentionally in the United States (Moscadelli et al., 2020). However, rumours and fake news were not spread faster in the 80s because there were no social media sites like Facebook and Twitter existing.

With the advancement of information technology and the emergence of Social media sites such as Facebook and Twitter, the spread of fake news become faster like fire on the mountain with little or no cost. The first globally recognized fake news on social media was that of U.S. 2016 election.

According to the English service of the BBC World News, there are many fake news regarding the ongoing Russia-Ukraine war .

In Nigeria, recall the death rumour of the Nigeria's president Muhammadu Buhari (Okoro et al., 2018), the news has been among the trending news of twitter site. Until the president's first appearance in public, most people have the believe that, the president was truly dead.

The spread of fake news if not stopped, can lead to negative reactions especially from the party whom the fake news targeted. In this regard, stopping the spread of fake news is as good as avoiding the post and spread of hate speech in our society.

The spread of fake news during the #ENDSARS saga is a clear indication of how fake news are rapidly spread in a short amount of time. During the #ENDSARS saga, there existed a fake news about killing protesters by

government security operatives . Such news has rose tension in Nigeria, until about eight (8) months later, the news was discovered as baseless.

In Nigeria, fake news is being spread on daily basis. The most affected areas where fake news emerge include politics and defence. For example, there were many fake news about Shekau's death, however, on May 19, 2021, Abubakar Shekau the long-time leader of Boko Haram (also known as Jama'atu Ahlissunah Lidda'awati Wal Jihad) was killed during a clash with Islamic State of West Africa ISWAP . Even with that news, other sources said that Shekau killed himself and not killed by ISWAP. All these are proofs that fake news do spread beyond imagination.

With more than 42 million users of Facebook[1] and over 7 million active twitter users in Nigeria[2], moreover, with the fact that 80% of this figure consume their news from social media sites (or social networking sites) mostly from Facebook and twitter, fake news can easily be spread instantly.

At best, tech companies such as Google, Facebook, and Twitter have attempted to address this particular concern (Domenico et al., 2021). However, these efforts have hardly contributed towards solving the problem as the organizations have resorted to denying the individuals associated with such sites the revenue that they would have realized from the increased traffic.

REVIEW OF RELATED LITERATURE

Several existing literatures and academic studies capture the term "fake news" with different definitions but arriving at similar meaning. The definition of the term is usually presented according to how it is operated in the research articles and guided from which

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[1]
https://www.statista.com/statistics/1028428/facebook-user-share-in-nigeria-by-age/#:~:text=As%20of%20March%202022%2C%20

there,16.5%20percent%20of%20the%20population.
[2]
https://www.statista.com/statistics/1176096/number-of-social-media-users-nigeria/

perspective or research discipline the studies stand on. The definition of fake news evolves from the article and period it is been used, thus, there is no definite definition of fake news, in fact as more knowledge about it is acquired, the definition evolves. For the purpose of this research, we refer to a narrow definition of fake news that has been used in recent works: *Fake news is a news articles that is intentionally and verifiably false*. This definition is able to provide theoretical and practical value for deeper comprehension and analysis of fake news matter; and techniques that apply the narrow conception of fake news can also be applied to under the broader definition (Mahid et al., 2018).

Fake News Detection Mechanisms

A fake news detection is a mechanism or system that assists users with the tools and functions in predicting deceptive news. The techniques classification ranging from those that are strictly content-based to approaches that are social context-based and hybrid-based as shown in Figure 1.

A. Content-based Approaches

Fake news detection mechanisms that are strictly content-based predict the deception cues based on the features or elements extracted from the news content. The content-based detection mechanism centered on the linguistic cue approaches and visual-based approaches. The following further discuss the different types of content-based approaches in fake news detection mechanisms.

1) *Linguistic Cue*: Linguistic cue approaches in fake news detection utilize the linguistic-based features to look for deceptive cues in the text content. The linguistic-based features basically are extracted from the text content from characters, words, sentences and documents level. The linguistic-based deception detection approaches using cues ranges from lexical level to discourse level as described below.

a) *Text Representation:* A simple yet flexible approach for text representation is by using the bag-of-words (BoW). In this approach, the text is represented as an orderless multiset of individual words (bag-of-words) where occurrence of the single words are utilized as feature for training classifier to characterize the text.

b) *Style-Based Deception Detection:* Style-based deception detection is a method that can be utilized to detect deception cue in text by considering the writing style of the news content. Undeutsch's hypothesis originated the idea of deception detection.

c) *Knowledge-Based*: The utilization of knowledge-based approach is used to check for truthfulness of claims in a news article, and is seen as better choice for scalable factchecking method. A deception of a particular data that is represented in the form of false "factual statements" can be extracted and examined to determine its truthfulness by querying external resources such as existing knowledge networks, or publicly available structured data, such as DBpedia ontology, Wikipedia, Wikidata or the Google Relation Extraction Corpus (GREC).

B. *Social Context-based*

The social context-based detection techniques highlight on users' social engagement analysis, involving the utilization of relevant social context features representing users, posts and networks aspects of the news consumption on social media. Based on the users's social engagement, the social context-based approaches can be categorized to stance-based and propagation-based.

C. *Hybrid-Based*

Hybrid-based detection method is a combination of techniques from the content-based method and social context-based method, utilizing auxiliary information from different perspectives. The hybrid-based detection mechanism emerged as an alternative to the existing works that are mostly tailored solutions of specific characteristic which has restricted the performance of the techniques (Okoro et al., 2018).

Related Works on Fake News Detection on Social Media

In this section, we discussed on recent works related to the detection of fake news on social media. The aim is to find the limitation(s) of those works and devise a means of filling the limitation(s) (gap).

It is worth noting that, fake news detection on social media is in its early stage, thus there are fewer literature on this research area.

Fake news remain a major concern in the IT sector. It is mostly spread via social media because of the less expensive access and sharing of news on it. There are many scholarly works on the detection of fake news on social media, however, these scholarly works are faced with numerous challenges which make makes it a high research area interest(Mahid et al., 2018). Scholars such as (Allcott & Gentzkow, 2017) used user opinion to rate the spread of fake news on social media. The research discovered that, about 60% of facebook users do not verify news they consume on social media. However, (Allcott & Gentzkow, 2017) was manually implemented, this method is time consuming and prone to manual errors. A logistic classifier was used by (Aldwairi & Alwahedi, 2018) to detect clickbaits. The research recorded 94.9% accuracy. However, the method is application to small dataset while the social media datasets keep on increasing geometrically. Support Vector Machines (SVM) was applied to derive empirical cues indicative to deception. The result recorded was relatively high with accuracy rates of 90% precision, 84% recall and 87% F-score. Even though the result is significantly good, SVM is known for manual feature selection process, this can limit the performance of SVM when dealing with larger datasets.
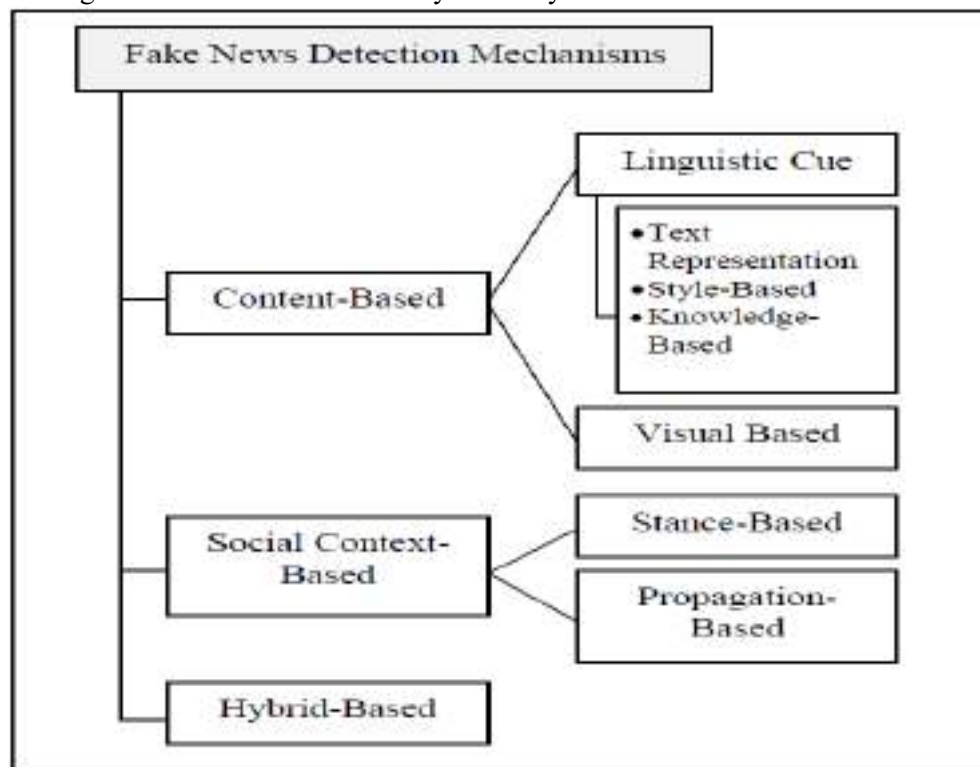

Figure 1: Classification of Fake News Detection Mechanisms

METHODOLOGY

In this section, we described the step-by-step procedure on how our research objectives can be achieved. We also describe the dataset source and the method for data collection.

Datasets

Social media news can be collected from social media websites such as Facebook and Twitter. However, manually determining the veracity of news is a challenging task, usually requiring annotators with domain expertise who performs careful analysis of claims and additional evidence, context, and reports from authoritative sources. Generally, news data with annotations can be gathered in the following ways: Expert journalists, Fact-checking websites, Industry detectors, and Crowdsourced workers. However, there are no agreed upon benchmark datasets for the fake news detection problem. Some publicly available datasets are listed below (Guimarães et al., 2021):

1. **BuzzFeedNews**: This dataset comprises a complete sample of news published in Facebook from 9 news agencies over a week close to the 2016 U.S. election from September 19 to 23 and September 26 and 27. Every post and the linked article were fact-checked claim-by-claim by 5 BuzzFeed journalists. This dataset is further enriched in [62] by adding the linked articles, attached media, and relevant metadata. It contains 1,627 articles{826 mainstream, 356 left-wing, and 545 right-wing articles.

2. **LIAR** (Guimarães et al., 2021): This dataset is collected from fact-checking website PolitiFact through its API [90]. It includes 12,836 human-labeled short statements, which are sampled from various contexts, such as news releases, TV or radio interviews, campaign speeches, etc. The labels for news truthfulness are ne-grained multiple classes: pants-re, false, barely-true, half-true, mostly true, and true.

1. **FacebookHoax** This data set comprises information related to posts from the Facebook pages related to scientific news (nonhoax) and conspiracy pages (hoax) collected using Facebook Graph API.x The data set contains 15,500 posts from 32 pages (14 conspiracy and 18 scientific) with >2,300,000 likes.

Model Construction

In the previous section, we introduced features extracted from different sources, i.e., news content and social context, for fake news detection. In this section, we discuss the details of the model construction process for several existing approaches. Specifically we categorize existing methods based on their main input sources as: News Content Models and Social Context Models.

Method

The first step was to locate a credible fake news database, then compute the attributes and produce the data files for MATLAB. That was not easy, therefore, we crawled the web to collect URLs for the fake news. We focused on social media websites that are likely to have more fake news articles, in this case: Twitter.

Algorithm 1 Compute fake news websites attributes

1: *Open URL file*
2: *for each title*
3:    *title starts with number?* $1 \rightarrow$ *output file*
4:    *title contains ? and/or ! marks?* $1 \rightarrow$ *output file*
5:    *all words are capital in title?* $1 \rightarrow$ *output file*
6:    *users left the website after visiting?* $1 \rightarrow$ *output file*
7:    *contents have no words from title?* $1 \rightarrow$ *output file*
8:    *title contains keywords? NoKeywords* $\rightarrow$ *output file*
9: *end for*
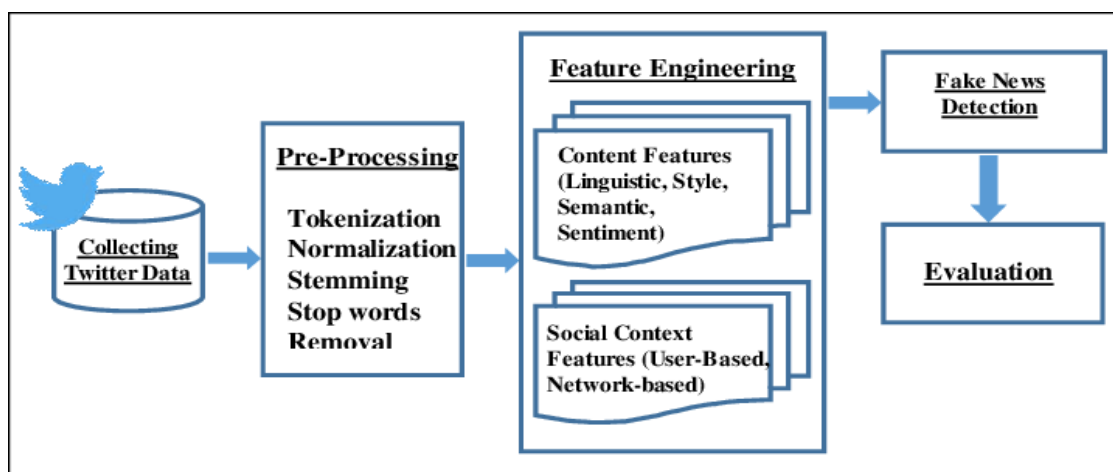
Figure 2: Algorithm for Fake News Classification

Figure 3: Fake News Detection Process on Twitter

RESULTS AND DISCUSSION

After reading the websites attributes, file was uploaded into MATLAB, we rank the attributes based on several algorithms, to choose the most relevant to increase the accuracy and decrease the training time.

The Convolutional Neural Network showed a promising result with high accuracy and precision. The result was compared with the traditional machine learning algorithms and discovered that CNN the traditional algorithms as shown in Fig.3.

CONCLUSION

Fake news detection and classification is a highly relevant challenge because of human limitations and knowledge authentication and the inadequacy of machine learning algorithms to automatically extract the dataset feature, there is a need for improving the limitation by employing a deep learning algorithms which are known for automating feature extraction.

It is important that we can adequately distinguish fake from real news because of the immense impacts it has shown in the past.

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