

Automatic Fake News Detection: Issues and Solutions

Ali Raza¹, Shafiq¹, Mariam Bibi¹, Malik Rehan¹ and Hira Anwar²

¹Department of Software Engineering, University of Sialkot, Punjab, Pakistan

²Department of Information Technology, Arid Agriculture University, Punjab, Pakistan

* Corresponding Author: aliraza.1354@gmail.com

Received 22 December 2019; Revised 5 February 2020; Accepted 25 February 2020; Published 24 April 2020

Abstract: Internet and social media have gained popularity due to its involvement in human life for any sort of information access and sharing social life stories and events generally. It is observed that every one-in-three person has to access social media platforms throughout the world. With the popularity of social media, there are some issues related to fake information or news. Fake news has a serious impact on societies in terms of ethical, social, and financial matters. It is more serious when fake news is used for any political benefits, against forces and military establishment. This paper presents comprehensive literature to highlight fake news issues and available datasets such as Facebook, Twitter, and Weibo. This paper also discusses the available solutions and algorithms such as naïve based, NLP techniques, artificial intelligence algorithms. The paper reviewed the latest research and reputable journal and technically discussed their highlighted factors. This review paper will benefit the new researchers in the field of automatic fake news detection and prevention for their research.

Keywords: Natural Language Processing, Information Retrieval, Part of speech, Fake News Detection, Neural Network, Social Networking, Machine Learning

1. Introduction

The news means the information about the specific event happened on a particular date. Since the last decade, the Internet is one of the integral parts of the daily routine of human life. Traditional ways of getting news such as through newspapers or TV channels are getting boring and unpopular. With the help of the Internet, news can transmit from one part of the world to another without any delay [1, 2]. Fake news can spread through social networking feeds, news blogs, and online newspapers [3]. The news of news channels or newspapers is somehow verified by using authenticated mechanisms adopted by newspapers and news channels. However, information sharing through social media is not based on any authentication mechanism. According to one report, 50% of Facebook posts referral links are fake and only 20% of referral links are from reputable web sites. So, most of the information or news which are getting viral on social media platforms is not verifiable and most of them are fake. Fake news means the news articles or source of news is proven verifiably and traditionally false and can lead to misleading the audience [4, 5]. According to another study [6], misleading information on the web is divided into three categories: a) Fake news includes, large scale fabrication in news and hoaxes, etc., b) rumors include the information that is not verified by the source, and c) normally these are breaking news and other includes clickbait, which are also one of the wide contributors in the fake news [1, 7]. Figure 1 shows the misinformation on Web.



Figure 1: Misinformation on Web

With the help of the Internet, social networking sites seek exponential growth in its users especially Facebook, Twitter, Instagram. For example, Facebook has 2.02 billion active users in November 2017 and 1.37 billion are using this application daily. Similarly, Twitter has 330 million users as in January 2018. Social media platform provides the freedom to the user to comment, like, and share the information. Furthermore, it is easy and less expensive as compared to newspapers and television media [8]. This information sharing is often done without verifying the information. Fake news has a huge impact on societies like financial, religious, ethical, cultural, social, and even on an individual's way of thinking [9]. By continues sharing and commenting news gets viral as per the algorithms of the social media platforms without knowing the news is valid or not. According to the study [8], it is observed that only in the US over 62% of the young generation have information through social media in 2016 and it was 49% in 2012 [10].

In the recent past, fake news has a huge impact on the opinion-making process of human beings such as in the US President Election held in 2016 [4, 11]. In the data from Facebook, it is observed that before three months of election fake news are spread and shared, over 30 million shares have been noticed to help Trump over Clinton was shared just 8 million and most importantly 14% of the total population of the US believes that social media is a most important source of information or news [4]. So, by using false news and social media propaganda, the local's opinion can change, and which sometimes have a very negative impact on the business globally. Sometimes, as like US Presidential Election 2016, Using fake news propagation, local narrative, or information about anything can be detracted or can make confusion which makes it difficult for the people to differentiate which one is correct and which one is not. Figure 2 shows the example of fake news on social media.



Figure 2: Example of Fake News [2]

The problem is to find the solution or a mechanism that can be developing to detect or highlight the fake news or roamers on social media. Although Facebook, Twitter, and other social media networking sites tried to address these issues but on the very low ground because due to the fear of losing the audience, traffic, and most importantly revenue short [12]. Different researchers from the computer science and data science domain suggest many solutions such as using Natural Language Processing (NLP), Data Mining, Deep Learning, Neural Networking, and many other methods.

This paper describes the importance of fake news detection, an overview of the computational techniques and algorithms by the researchers suggested automating the identification or detection of fake news. This paper also expresses a comparative study of the algorithms and some future work according to the literature and observation. In this comprehensive survey of automatic fake news detection, different techniques of fake news detection have been studied with parameters keep in mind such as dataset, feature set, detection algorithms performance, and complexity. In the end, the paper proposed the best technique on the basis of accuracy and algorithm which was adopted and also suggest future work to have better results on the base of comprehensive literature that has been reviewed.

The rest of the paper is organized as follows; Section 2 describes the techniques with data sets and extensive literature review, Section 3 explains comparative arguments and the conclusion of the document.

2. Literature Review

Fake news is one of the major concerns among the common people and researchers of different domains such as journalists, IT domain experts, etc. because it leads them to misinformation [1]. Though fake news detection is a new field a lot of work has been done on the social aspect of lie and some work has been done on the language falsehood [13]. If we consider social media or social networking sites, fake news is extremely influencing and spreading very fast [14]. Different researchers and scholars proposed different techniques to address the issue of fake news. Different scholarly work has been discussed below:

2.1 Path Propagation Techniques

Social media performs the role of catalyst in spreading the news world-wise [15]. Due to this, fake news is also getting viral and this is a key issue now a day. The only solution of this problem is early detection and for early detection of fake news, but the limitation is nobody normally investigates which feature plays a vital role in the detection of fake news, to address this issue, a new path propagation classification with recurrent and convolutional network technique is proposed [9]. By using the Path Propagation technique, the result comparison of three datasets Twitter 15, Twitter 16, and Weibo is analyzed and several key features which are concerned are Length of user Description, Length of user name, followers count, friends count, Registration age, Is Verified, IS GEO Enabled. The final results which are been analyzed are different for different datasets such as 92% for Twitter 15 and Twitter 16 and 85% on Weibo [9]. In this approach, scholars found good results, but one factor is missing which is very important, user characteristics mean who is sharing the news and why.

2.2 Fiction Linguistic Model for Classification of Suspicious News

Popular social media platforms such as Twitter and Facebook have increasingly affected by wrong information and have a serious impact on real-world events that mislead the reader from actual information. This may overcome by investigating several features such as the classification of fake news, developing neural network architecture. By following such a method, the system can lead the reader to judge the information and provide the right information and rescue them from misleading information, that cannot lead to propaganda, rumor, and hoaxes, and promote good and correct news [16].

2.3 Automatic Recognition of Deceptive Language

As discussed above, It is hard to separate true and false statements but natural language processing techniques can distinguish between truth and deceptive text [15]. The techniques are used for the detection of written text by separating truthful and lying text and then by knowing the feature that how this text is manipulating peoples by using natural language. According to a study [13], three different topics were given to Amazon mechanical Turk service which was to be answered in one truth and one false opinion on each topic within 10-15 min. The result is calculated by using Naive Bayes and SVM classifier and 70.8% average accurate result are collected by using NB and 70.1% average accurate result are collected by using SVM. Another way is through identifying Dominant Word Classes in Deceptive Text which used Linguistic Inquiry and Word Count (LIWC). This suggests which word is being used for deceptive text which helps to distinguish between truth and deceptive text. According to NB, this technique gave a 59.8% average accurate result. Whereas, SVM says this technique gave a 57.8% accurate result [13].

2.4 Naive Bayes Classifier

There are several applications of AI and Machine Learning [17] and help in detecting the fake news. Mass media help to detect the fake news by searching it manually. Whereas, many websites can find whether or not the news is correct by taking the public review on a different topic and questioning them whether it's true or false. Spam messages and fake news are quite similar to each other where spam messages are sent in the form of advertisements and then manipulating the receiver by giving information of their interest and spam messages can be detected by using spam message filtering which calculates the probability whether the report being shared is correct or not by using a mathematical model of Naive Bayes classifier for detecting fake news [18].

2.5 Fake News Detection Using Neural Response Generator

In another research [19] authors presented a method to detect fake news at very early stages. The detection of fake news at the early stages is quite difficult as it requires public review about the topic and this process is time-consuming [19]. According to a study [20], Some methods are used to detect the early problem in the article by checking its content and words used in the featured engineering method, 90% of training data was being used to give 62.13% accurate result, POS-Gram method used 90% of training data to give 70.34% accurate result, Similarly, 1-Gram method was being used to give 80.69% accurate result. The convolutional neural network method used 90% training data is used to give 86.02% accurate result. TCNN requires 90% training data to give 86.02% accurate results. TCNN was alone not enough to give accurate results so a combination of TCNN and URG was compulsory to give accurate results. This method requires 90% of the training data to give 88.83% accurate results. TCNN-URG is the highest accurate result with 88.83% [20].

2.6 Fake News in Social Media Networking

Fake news and hoaxes have been widely expanded on the Internet. Social media and news outlets published fake news to increase readership [8]. According to a study in [12], Using click baits and another method to increase their reader and provide misleading information that can easily deceive the reader and by using selected features such as correlation attribute, Info gain attribute and tools such as Bayes Net, Logistic, Random Tree, Naïve Bayes that can identify accurate post and provide the right information on the bases of classifier's Precision, Recall, F-Measure and ROC and from all techniques Logistics provides best results between 93% to 98% approximately. That can prevent us from fake information and eliminate webpages that contain misinformation and promote good content news [12].

2.7 A Hybrid Approach of Detecting Fake News

A study [21], which is based on two studies one is the human capability of detecting fake news, which is almost 54% sometimes this detection may be accurate whereas, majority of times this detection might not be accurate and second, the fake news can also be determined by using the machine-based approach, but this approach is also not completely reliable. The machine-based approach includes 2 major categories Linguistic approach and Network approach. For this reason, a new system is approved known as Hybrid Model which include the capability of both human and machine and provide immense results [21].

3. Current State of Fake News

Fake news has become a key element to success for media either it is printed or digital media. But this fake news can destroy a society. It can be controlled by taking certain steps by using Algorithmic fake news detection which checked that either the news is fake or true by checking 63 features [22]. According to Twitter, this method gave approximately 75% accurate result on detecting fake news, another method was the FiB system, which is created in 36 hours by four colleges student. Whereas, the synthetic high-level algorithm to check a fact is used to check the accuracy of the fact and deceptive text by check it words being used. According to Facebook and Twitter this method gave 90% accuracy by detecting same memes [22]. Table 1 shows the detail comparative analysis of discussed studies in literature and their technical information including dataset, method, features, size and objectives.

Table 1: Comparative Analysis of Discussed Studies

Reference	Data Set	Algorithm	Features	Size	Result
[9]	Weibo, Twitter 15, Twitter 16	DTC, SVM-RBF, DTR, SVM TS, GRU, RFC, PTK	Length of user Description, Length of user name, followers count, friends count, Registration age, Is Verified, IS GEO Enabled	40 retweets in twitter 15 and twitter 16. 30 retweets on Weibo dataset	85% (Weibo) and 92% (Twitter)
[16]	Twitter dataset statistics: news account posts and re-tweets per account (RTPA).	Investigate several feature and neural network architecture. By classifying verified four sub-type of suspicious news: Finding incorporating linguistic and “late fusion” technique. Conducting a statistical analysis of linguistic features.	Satire, hoaxes, clickbait and propaganda.	130 thousand news	Help reader to judge the accuracy of information they consume in social media. Providing right information that did not promote suspicious news. Accuracy improvement for the binary task is 0.2 and F1-macro boost for the multi-class task is 0.07.
[12]	Facebook and Twitter news posts Buzzfeed	Bayes Net , Logistic, Random Tree, Naïve Bayas	Correlation Attribute Eval, Info Gain Attribute Eval		The classifiers are compared based on: Precision, Recall, F-Measure and ROC, Logistic is best: which is between 99.3 to 99.5 %
[13]	Hirschberg et al.,2005, Snow et al.,2008, Pennebaker and Francis, 1999	Using natural language processing techniques. By using Amazon Mechanical Turk services. By Identifying Dominant Word Classes in Deceptive Text.		A corpus with explicit labelling of the truth value associated with each statement, Each statement consists of 3-5 sentences	They collected three data sets. And separated true and false text by differentiating there feature and property. 70.8% accurate result was collected by using NB (Naive Bayes) 70.1% accurate result was collected by using SVM (Support Vector Machines) 59.8% accurate result was collected by using NB. 57.8% accurate result was collected by using SVM
[18]	Facebook news Posts, Buzzfeed News	Naïve Bayes Classifier	By using artificial intelligence, through mass media and websites. By detecting spam message, through sending electronic mails (E-mails), By using spam message filtering formula.		70% accurate for Facebook posts, 75.59% articles are true and 71.73% are false in Buzzfeed News

[20]	Self-conducted fake news dataset, Weibo Dataset	Featured engineering, POS-gram, 1-Gram, CNN Two level convolutional neural network, Unified TCNN-URG System.		100 Sample of User Response	90% trained dataset is used, and 62% to 88.83% results are obtained according to the algorithm
[21]	J. H. Brunvand, American Folklore. St. Louis, MO, USA., 2015. Human Language Technologies, San Diego, California, 2016.	By using Human based detection. By using Machine based approach. By using Hybrid Model.	Based on 10 Factors including both machine and human factors.		54% capability of detecting fake and truth news. 50% capability of detecting fake news.
[22]	Tech insider 2016, Facebook and Twitter.	Algorithmic Fake News Detection. The FiB system. The synthetic high-level algorithm to check fact.	63 Features are investigated		75% more faster to give accurate result. 90% accuracy checking the same mems.

Conclusion

Fake news are the threatening harms on social media and used for malicious entities to damage the people reputation and for other purposes. Fake news are manipulating the daily activities and decisions like in stock and business market, healthcare systems, online shopping and advertisement, education, and in political systems. Automatic detection of fake news is one of the challenging task for researchers. After extensive literature, different technique and algorithms are investigated. Each technique has its pros and cons and some techniques have efficiency up to 99.5% in results to detect the fake news. If a hybrid approach is proposed with classification of news with best presenting solution algorithm like logistic approach, the results can gets improved.

References

- [1] A. Bondielli and F. J. I. S. Marcelloni, "A survey on fake news and rumour detection techniques," vol. 497, pp. 38-55, 2019.
 - [2] X. Zhang and A. A. Ghorbani, "An overview of online fake news: Characterization, detection, and discussion," *Information Processing & Management*, vol. 57, no. 2, p. 102025, 2020.
 - [3] V. Pérez-Rosas, B. Kleinberg, A. Lefevre, and R. J. a. p. a. Mihalcea, "Automatic detection of fake news," 2017.
 - [4] H. Allcott and M. J. J. o. e. p. Gentzkow, "Social media and fake news in the 2016 election," vol. 31, no. 2, pp. 211-36, 2017.
 - [5] V. Bakir and A. McStay, "Fake news and the economy of emotions: Problems, causes, solutions," *Digital journalism*, vol. 6, no. 2, pp. 154-175, 2018.
 - [6] B. Bhutani, N. Rastogi, P. Sehgal, and A. Purwar, "Fake news detection using sentiment analysis," in *2019 Twelfth International Conference on Contemporary Computing (IC3)*, 2019, pp. 1-5: IEEE.
 - [7] M. De Grandis, G. Pasi, and M. Viviani, "Fake news detection in microblogging through quantifier-guided aggregation," in *International Conference on Modeling Decisions for Artificial Intelligence*, 2019, pp. 64-76: Springer.
 - [8] K. Shu, A. Sliva, S. Wang, J. Tang, and H. J. A. S. E. N. Liu, "Fake news detection on social media: A data mining perspective," vol. 19, no. 1, pp. 22-36, 2017.
 - [9] Y. Liu and Y.-F. B. Wu, "Early detection of fake news on social media through propagation path classification with recurrent and convolutional networks," in *Thirty-Second AAAI Conference on Artificial Intelligence*, 2018.
 - [10] M. M. Khan, I. Ghani, S. R. Jeong, R. Ibrahim, and K. N. Qureshi, "Facebook's public social interaction utilization to assist recommendation across system domain," *J. Theoret. Appl. Inf. Technol*, vol. 88, no. 3, p. 392, 2016.
 - [11] S. Mohseni, E. Ragan, and X. Hu, "Open Issues in Combating Fake News: Interpretability as an Opportunity," *arXiv preprint arXiv:1904.03016*, 2019.
 - [12] M. Aldwairi and A. J. P. C. S. Alwahedi, "Detecting fake news in social media networks," vol. 141, pp. 215-222, 2018.
 - [13] R. Mihalcea and C. Strapparava, "The lie detector: Explorations in the automatic recognition of deceptive language," in *Proceedings of the ACL-IJCNLP 2009 Conference Short Papers*, 2009, pp. 309-312: Association for Computational Linguistics.
 - [14] K. J. C. S. U. S. Stahl, "Fake news detection in social media," 2018.
 - [15] R. Oshikawa, J. Qian, and W. Y. J. a. p. a. Wang, "A survey on natural language processing for fake news detection," 2018.
 - [16] S. Volkova, K. Shaffer, J. Y. Jang, and N. Hodas, "Separating facts from fiction: Linguistic models to classify suspicious and trusted news posts on twitter," in *Proceedings of the 55th Annual Meeting of the Association for Computational Linguistics (Volume 2: Short Papers)*, 2017, pp. 647-653.
 - [17] S. B. Kotsiantis, I. Zaharakis, and P. J. E. a. i. a. i. c. e. Pintelas, "Supervised machine learning: A review of classification techniques," vol. 160, pp. 3-24, 2007.
 - [18] M. Granik and V. Mesyura, "Fake news detection using naive Bayes classifier," in *2017 IEEE First Ukraine Conference on Electrical and Computer Engineering (UKRCON)*, 2017, pp. 900-903: IEEE.
 - [19] C. G. Harris, "Comparing Human Computation, Machine, and Hybrid Methods for Detecting Hotel Review Spam," in *Conference on e-Business, e-Services and e-Society*, 2019, pp. 75-86: Springer.
-

- [20] F. Qian, C. Gong, K. Sharma, and Y. Liu, "Neural User Response Generator: Fake News Detection with Collective User Intelligence," in *IJCAI*, 2018, pp. 3834-3840.
- [21] E. Okoro, B. Abara, A. Umagba, A. Ajonye, and Z. J. N. J. o. T. Isa, "A hybrid approach to fake news detection on social media," vol. 37, no. 2, pp. 454-462, 2018.
- [22] Á. Figueira and L. J. P. C. S. Oliveira, "The current state of fake news: challenges and opportunities," vol. 121, pp. 817-825, 2017.