



A Study on fake news prediction using machine learning approach

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Abstract

Fake news have been there since before the advent of the Internet. The widely accepted definition of Internet fake news is: "fictitious articles deliberately fabricated to deceive readers". Social media and news outlets publish fake news to increase readership or as part of psychological warfare. In general, the goal is profiting through click baits. Click baits lure users and entice curiosity with flashy headlines or designs to click links to increase advertisements revenues. This exposition analyzes the prevalence of fake news in light of the advances in communication made possible by the emergence of social networking sites. The purpose of the work is to come up with a solution that can be utilized by users to detect and filter out sites containing false and misleading information. We use simple and carefully selected features of the title and post to accurately identify fake posts. Therefore, building an algorithm with the best possible accuracy will be a revelation and it will have a massive impact on the social issues which are prevalent as well as on the current political scenario.

Keywords: fake news detection, text mining, machine learning

1. Introduction

As an increasing amount of our lives is spent interacting online through social media platforms, more and more people tend to seek out and consume news from social media rather than traditional news organizations.

The reasons for this change in consumption behaviors are inherent in the nature of these social media platforms:

1. It is often more timely and less expensive to consume news on social media compared with traditional news media, such as newspapers or television.
2. It is easier to further share, comment on, and discuss the news with friends or other readers on social media. For example, 62 percent of U.S. adults get news on social media in 2016, while in 2012, only 49 percent reported seeing news on social media. It was also found that social media now outperforms television as the major news source.

Despite the advantages provided by social media, the quality of news on social media is lower than traditional news organizations. However, because it is cheap to provide news online and much faster and easier to disseminate through social media, large volumes of fake news, i.e., those news articles with intentionally false information, are produced online for a variety of purposes, such as financial and political gain. It was estimated that over 1 million tweets are related to fake news "Pizzagate" by the end of the presidential election. Given the prevalence of this new phenomenon, "Fake news" was even named the word of the year by the Macquarie dictionary in 2016.

The extensive spread of fake news can have a serious negative impact on individuals and society. First, fake news can break the authenticity balance of the news ecosystem. For example, it is evident that the most popular fake news was even more widely spread on Facebook than the most popular authentic mainstream news during the U.S. 2016 president election ^[1].

Second, fake news intentionally persuades consumers to

accept biased or false beliefs. Fake news is usually manipulated by propagandists to convey political messages or influence. For example, some report shows that Russia has created fake accounts and social bots to spread false stories. Third, fake news changes the way people interpret and respond to real news. For example, some fake news was just created to trigger people's distrust and make them confused, impeding their abilities to differentiate what is true from what is not. To help mitigate the negative effects caused by fake news—both to benefit the public and the news ecosystem—it's critical that we develop methods to automatically detect fake news on social media.

Detecting fake news on social media poses several new and challenging research problems. Though fake news itself is not a new problem—nations or groups have been using the news media to execute propaganda or influence operations for centuries—the rise of web-generated news on social media makes fake news a more powerful force that challenges traditional journalistic norms.

There are several characteristics of this problem that make it uniquely challenging for automated detection. First, fake news is intentionally written to mislead readers, which makes it nontrivial to detect simply based on news content. The content of fake news is rather diverse in terms of topics, styles and media platforms, and fake news attempts to distort truth with diverse linguistic styles while simultaneously mocking true news. For example, fake news may cite true evidence within the incorrect context to support a non-factual claim ^[2].

Thus, existing hand-crafted and data-specific textual features are generally not sufficient for fake news detection. Other auxiliary information must also be applied to improve detection, such as knowledge base and user social engagements. Second, exploiting this auxiliary information actually leads to another critical challenge: the quality of the data itself. Fake news is usually related to newly emerging, time-critical events, which may not have been properly verified by existing knowledge bases due to the lack of

corroborating evidence or claims. In addition, users' social engagements with fake news produce data that is big, incomplete, unstructured, and noisy [3]. Effective methods to differentiate credible users, extract useful post features and exploit network interactions are an open area of research and need further investigations.

The key motivations of this paper are summarized as follows:

- Fake news on social media has been occurring for several years; however, there is no agreed upon definition of the term "fake news". To better guide the future directions of fake news detection research, appropriate clarifications are necessary.
- Social media has proved to be a powerful source for fake news dissemination. There are some emerging patterns that can be utilized for fake news detection in social media. A review on existing fake news detection methods under various social media scenarios can provide a basic understanding on the state-of-the-art fake news detection methods.
- Fake news detection on social media is still in the early age of development, and there are still many challenging issues that need further investigations. It is necessary to discuss potential research directions that can improve fake news detection and mitigation capabilities.

Fake News on Social Media

In this subsection, we will discuss some unique characteristics of fake news on social media. Specifically, we will highlight the key features of fake news that are enabled by social media. Note that the aforementioned characteristics of traditional fake news are also applicable to social media. Malicious Accounts on Social Media for Propaganda. While many users on social media are legitimate, social media users may also be malicious, and in some cases are not even real humans. The low cost of creating social media accounts also encourages malicious user accounts, such as social bots, cyborg users, and trolls. A social bot refers to a social media account that is controlled by a computer algorithm to automatically produce content and interact with humans (or other bot users) on social media [3]. Social bots can become malicious entities designed specifically with the purpose to do harm, such as manipulating and spreading fake news on social media. Studies shows that social bots distorted the 2016 U.S. presidential election online discussions on a large scale [4], and that around 19 million bot accounts tweeted in support of either Trump or Clinton in the week leading up to election day.

Trolls, real human users who aim to disrupt online communities and provoke consumers into an emotional response, are also playing an important role in spreading fake news on social media. For example, evidence suggests that there were 1,000 paid Russian trolls spreading fake news on Hillary Clinton. Trolling behaviors are highly affected by people's mood and the context of online discussions, which enables the easy dissemination of fake news among otherwise "normal" online communities [5]. The effect of trolling is to trigger people's inner negative emotions, such as anger and fear, resulting in doubt, distrust, and irrational behavior. Finally, cyborg users can spread fake news in a way that blends automated activities with human input. Usually cyborg accounts are registered by

human as a camouflage and set automated programs to perform activities in social media. The easy switch of functionalities between human and bot offers cyborg users unique opportunities to spread fake news [6].

Related Work

Detecting fake news on social media poses several new and challenging research problems. Though fake news itself is not a new problem—nations or groups have been using the news media to execute propaganda or influence operations for centuries—the rise of web-generated news on social media makes fake news a more powerful force that challenges traditional journalistic norms. There are several characteristics of this problem that make it uniquely challenging for automated detection.

First, fake news is intentionally written to mislead readers, which makes it nontrivial to detect simply based on news content. The content of fake news is rather diverse in terms of topics, styles and media platforms, and fake news attempts to distort truth with diverse linguistic styles while simultaneously mocking true news. For example, fake news may cite true evidence within the in-correct context to support a non-factual claim.

Thus, existing hand-crafted and data-specific textual features are generally not sufficient for fake news detection. Other auxiliary information must also be applied to improve detection, such as knowledge base and user social engagements. Second, exploiting this auxiliary information actually leads to another critical challenge: the quality of the data itself. Fake news is usually related to newly emerging, time-critical events, which may not have been properly verified by existing knowledge bases due to the lack of corroborating evidence or claims.

In addition, users' social engagements with fake news produce data that is big, incomplete, unstructured, and noisy. Effective methods to differentiate credible users, extract useful post features and exploit network interactions are an open area of research and need further investigations. Most challenging problem of deceptive language detection is addressed by using automatic classification techniques.

Reis et al. [1] presented a new set of features and measure the prediction performance of current approaches and features for automatic detection of fake news. Our results reveal interesting findings on the usefulness and importance of features for detecting false news. Finally, we discuss how fake news detection approaches can be used in the practice, highlighting challenges and opportunities.

Sadiq et al. [2] proposed a novel method that builds a latent representation of natural language to capture its underlying hidden meanings accurately and classify fake news. Our approach connects the high-level semantic concepts in the news content with their low-level deep representations so that the complex news text consisting of satire, sarcasm, and purposeful misleading content can be translated into quantifiable latent spaces. This allows us to achieve very high accuracy, surpassing the scores of all winners of the fake news challenge.

Telang et al. [3] approached the issue from a data-oriented perspective by investigating whether automatic computational approaches in NLP and Machine Learning can be used to detect falsehoods in written text. Performance of features like n-grams and word vectors used with five supervised learning techniques in detecting Fake News articles are compared. The impact of certain changes

in the parameters of feature extraction on classifier performance are also analysed in this paper.

Jeong et al. [4] tried to solve the problem of judging whether the sentence to be verified is correct after collecting the facts. This paper defines the problem of extracting the related sentences from the input sentence in Fact Data Corpus which is assumed to be fact and judging whether the extracted sentence and the input sentence are true or false. In the various NLP tasks, we create a Korean-specific pre-training model using state-of-the-art BERT. Using this model, fine-tuning is performed to match the data set detected by Korean fake news. The AUROC score of 83.8% is derived from the test set generated using the fine-tuned model.

Li et al [5] proposed a pipeline that combines preprocessing, feature extraction and model fusion for a more accurate and automated prediction. Specially we fusion of latent semantic analysis (LSA) and ensemble learning model results using stacking. Experimental analysis of real-world data demonstrates that our pipeline achieves higher accuracy than existing approaches.

Paul et al. [6] discussed about blockchain technology and its applications, where security is a big concern. Here, any transaction ever held is recorded permanently. Over the years, some non-reputable sources have been publishing fake and attractive news stories. Due to the lack of any regulatory systems, this news cannot be verified. Hence, these unreliable sources can publish whatever they want, and even in some cases, it makes chaos in society. In recent times due to the ease in internet availability and social media, inappropriate news can spread more quickly than ever before. In some cases, fake news is more attractive than the real one. Thus, people become misguided. Using the advantages of Blockchain's peer-to-peer network concepts, we will discuss a way to detect fake news in social media.

Recent study by Shu et al .[7] developed a false news collection methodology along with a deep learning solution in order to utilize metadata such as language based and replies, retweets etc. to further improve detection of fake news. Social article fusion model was adopted to classify fake news by them.

Shu et al. [8] constructed real-world datasets measuring users trust level on fake news and select representative groups of both "experienced" users who are able to recognize fake news items as false and "naïve" users who are more likely to believe fake news. We perform a comparative analysis over explicit and implicit profile features between these user groups, which reveals their potential to differentiate fake news. The findings of this paper lay the foundation for future automatic fake news detection research.

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Bhargava et al. [10] presented the model to predict the popularity of online news using machine learning methods. In this work, the result analysis is performed by applying Co-relation algorithm, particle swarm optimization and principal component analysis. For performance evaluation support vector machine, naïve bayes, k-nearest neighbor and

neural network classifiers are used to classify the popular and unpopular data.

Ajao et al. [11] aimed to understand and analyse the characteristics of fake news especially in relation to sentiments, for the automatic detection of fake news and rumors. Based on empirical observations, we propose a hypothesis that there exists a relation between fake messages or rumors and sentiments of the texts posted online. We verify our hypothesis by comparing with the state-of-the-art baseline text-only fake news detection methods that do not consider sentiments. We performed experiments on standard Twitter fake news dataset and show good improvements in detecting fake news or rumor posts.

However, fake news categorization may depend on whether the writer's attitude towards a particular topic like product, book, leader etc. is positive, negative, or neutral. For e.g., some opposition party made a statement on a political party, the sentiment of the statement is negative. It is an indication that the news is most probably fake. But it is not 100 percent sure that a fake news is always negative but surely it plays an important part in determining whether the news is fake or not.

Social media for news consumption is a double-edged sword. On the 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.

The paper is concerned with identifying a solution that could be used to detect and filter out sites containing fake news for purposes of helping users to avoid being lured by click baits. It is imperative that such solutions are identified as they will prove to be useful to both readers and tech companies involved in the issue.

Conclusion

Fake news detection on social media requires a method that is able to find and capture distinctive characteristics, patterns and regularities of the news consumption on the online ecosystem. Existing works on fake news detection mechanism demonstrate the utilization of methods that mostly highlight on specific content-based or social context-based approaches for the classification and verification tasks. Evidently, these detection mechanisms which are implemented in restricted domains reveal high accuracy result in predicting deception of the news content. However, there is a desperate demand for a more accurate, up-to-date fact-checking and fully automated detection mechanism as fake news has now become more challenging to handle in terms of interpretation, extraction and analysis.

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