

Research Article

Fake News Detection using Machine Learning

Navhal Ritesh S. and Mrs. Bhagyashree Dhakulkar

Department of Computer Engineering Dr. D.Y. Patil School of Engineering and Technology ,Lohgaon ,Pune ,India

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Abstract

The proliferation of misleading information in everyday access media outlets such as social media feeds, news blogs, and online newspapers have made it challenging to identify trustworthy news sources. In this paper, we focus on the automatic identification of fake content in news. This aims at investigating the principles, methodologies and algorithms for detecting fake news articles, creators and subjects from online social networks and evaluating. It is observed that LSTM may be the best results. In this different set of embedding's for pre-processing the data was fed to our LSTM mode. Corresponding performance and multiple machine learning algorithms and detection process as studied in detail and present several exploratory analyses on the identification of linguistic differences in fake and legitimate news content are presented.

Keywords: Fake news detection using ML ,fake news detection, machine learning LSTM algorithms

Introduction

This paper aims at investigating the principles, methodologies and algorithms for detecting fake news articles, creators and subjects from online social networks and evaluating the corresponding performance. This report addresses the challenges introduced by the unknown characteristics of fake news and diverse connections among news articles, creators and subjects. In this report describe the multiple machine learning algorithms and detection process in detail and present several exploratory analyses on the identification of linguistic differences in fake and legitimate news content. It empowers the widespread of "fake news", i.e., low-quality news with deliberately bogus data. The fake news has the potential for very negative effects on people and society.

Literature Survey

Counterfeit news recognition has as of late pulled in a developing enthusiasm from the overall population and researchers as the course of misinformation online expands, especially in news sources, for example, web based life channels, news web journals, and online papers

A. Detecting Fake news

Fake news has been shown to be detectable in several ways. Obviously, fact checking is one way to identify and debunk fake news; however, this is slow and

difficult to automate. Batchelor has suggested tasking libraries to help with this task. Automated detection, however, can occur at or near the speed of transmission, limiting the level of human involvement in certain areas of operations. Fake news has also been shown to differ from legitimate journalism in structural and other ways. Horne and Adali note that fake and legitimate news differ in title length and the simplicity and repetitiveness of body text. Fake news has also been shown to differ from legitimate journalism in structural and other ways. Horne and Adali note that fake and legitimate news differ in title length and the simplicity and repetitiveness of body text [1]. They introduced the conceptual characterization of traditional fake news and fake news in social media. Based on this characterization, further explore the problem definition and proposed approaches for fake news detection. So one can see, that fake news articles and spam messages indeed share a lot of important properties. Therefore, it makes sense to use similar approaches for spam filtering and fake news detection [3]. Detection of fake news is a difficult task as it is intentionally written to falsify information. It propose Social Article Fusion (SAF) model that uses the linguistic features of news content and features of social context to classify fake news. Formulate the fake news detection as a binary classification problem [4]. Detecting fake news on social media presents unique challenges. First, fake news pieces are intentionally written to mislead consumers, which makes it not satisfactory to spot fake news from news content itself. Thus, we need to

explore information in addition to news content, such as user engagement and social behaviors of users on social media. [5]. A recent report by the Jumps hot Tech Blog showed that Facebook referrals accounted for 50% of the total traffic to fake news sites and 20% total traffic to reputable websites.¹ Since as many as 62% of U.S. adults consume news on social media (Jeffrey and Elisa, 2016), being able to identify fake content in online sources is a pressing need. Knowledge of the algorithms of machine Learning is required to compare and dataset and find the witch algorithm give best accuracy [6]. For example, a credible user's comment that "This is fake news" is a strong signal that the news may be fake. Second, the research community lacks datasets which contain spatiotemporal information to understand how fake news propagates over time in different regions, how users react to fake news, and how can extract useful temporal patterns for (early) fake news detection and intervention[7]. Fake news itself is not a new problem. The media ecology of fake news has been changing over time from newsprint to radio/television and, recently, online news and social media. Here denote "traditional fake news" as the fake news problem before social media had important effects on its production and dissemination. Next, it will describe several psychological and social science foundations that describe the impact of fake news at both the individual and social information ecosystem levels [8]. Knowledge of the algorithms of machine Learning is required to compare and dataset and find the witch algorithm give best accuracy[9] Preservation of word order information makes Doc2Vec useful for our application, as they are aiming to detect subtle differences between text documents[10] The detail theory of the LSTM is introduced in [11]

B. Survey on Machine Learning algorithm

The attribution classifier work and definitions originally put forth by multiple researchers were extended to build the attribution classifier and resultant one-feature fake news identification system. Source:- The span of text that includes who put forth the quote or who the content is attributed to.

Cue:- A verb or verb phrase that lexically links the source to the quote or content

The embedding's used for the majority of our modeling are create using the Doc2Vec mode The goal is to produce a vector representation of each article. Before applying Doc2Vec, It perform some basic pre-processing of the data. This includes removing stop words, deleting special character sand punctuation, and converting all text to lowercase[4]. This produces a comma-separated list of words, which can be input into the Doc2Vec algorithm to produce an 300-length embedding vector for each article. The datasets used for this project were drawn from Kaggle. The training dataset has about 16600 rows of data from various articles on the Internet. Quite a bit of pre-processing of the data, as is evident from our source code, in order to train our models[12].

Proposed Methodology

Fake news articles often use the same set of words, which may indicate that the specific article is indeed a fake news article. Of course, it is impossible to claim that the article is a fake news just because of the fact that some words appear in it, but these words affect the probability of this fact. There are numerous social science studies have been done on the impact of fake news and how humans react to them. Fake news can be any content that is not truthful and generated to convince its readers to believe in something that is not true

A. Architecture

Use multiple Machine Learning algorithm to find the which algorithm gives the best accuracy. Kaggle provide a problem statement of fake news so use that tanning dataset to apply all algorithms. Analyzing all algorithm we found that the best output reference are as follows

- Naive Bayes
- Support Vector Machine
- Long Short-Term Memory

B. DataSet

The dataset contains information about Facebook posts, each of which represent a news article. They were collected from three large Facebook pages each from the right and from the left, as well as three large mainstream political news pages (Politico, CNN, ABC News). All nine pages have earned the coveted verified blue checkmark from Facebook, which gives them an additional layer of credibility on the platform. The smallest of these public pages has over 450 thousand of followers, and the largest – over 4.1 million followers.

1. id: unique id for a news article
2. title: the title of a news article
3. author: author of the news article
4. text: the text of the article; incomplete in some cases
5. label: a label that marks the article as unreliable.

C. Algorithm Analysis

Pre-Processing

The embedding's used for the majority of our modeling are generated using the Doc2Vec model. The goal is to produce a vector representation of each article. Before applying Doc2Vec, It perform some basic pre-processing of the data. This includes removing stopwords, deleting special character sand punctuation, and converting all text to lowercase[4]. This produces a comma-separated list of words, which can be input into the Doc2Vec algorithm to produce an 300-length embedding vector for each article.

Doc2Vec is a model developed in 2014 based on the existing Word2Vec model, which generates vector representations for words. Word2Vec represents documents by combining the vectors of the individual words, but in doing so it loses all word order information. Doc2Vec expands on Word2Vec by adding a "document vector" to the output representation, which contains some information about the document as a whole, and allows the model to learn some information about word order. Preservation of word order information makes Doc2Vec useful for our application, as they are aiming to detect subtle differences between text documents[10] Use multiple Machine Learning algorithm to find the witch algorithm gives the best accuracy. Kaggle data set that show below[4], Kaggle provide a problem statement of fake news so use that tanning dataset to apply all algorithms. Analyzing all algorithm found that the LSTM give the best output reference of that given below. The attribution classifier work and definitions originally put forth by multiple researchers were extended to build the attribution classifier and resultant one-feature fake news identification system. Specifically, the definitions and constructs originally proffered by Pareti, and by O'Keefe, [1] were augmented. Both prior research teams defined attribution as a linguistic convention where a verb or attribution cue links a source to a quoted piece of text called content. Specifically An attribution to a quote is defined using the following definition, to build the custom feature extractor: Let be any content span of random span length for a quote that requires attribution. The attribution span is the absolute distance "d" in character spaces from the beginning or end of a content span marked by double quotes. So for any properly attributed quote [1]

$$(Source, Cue) \leq x^i + len(C) + 2d$$

$$\exists (Source, Cue) \text{ for } C \text{ s. t. } \left\{ \begin{array}{l} \text{or} \\ (Source, Cue) \geq x^i \end{array} \right. \quad (1)$$

• Naive Bayes

In order to get a baseline accuracy rate for kaggle data, implemented a Naive Bayes classifier. Specifically, in that used the scikit-learn implementation of Gaussian Naive Bayes. This is one of the simplest approaches to classification, in which a probabilistic approach is used, with the assumption that all features are conditionally independent given the class label. As with the other models, it used the Doc2Vec embedding's described above. The Naive Bayes Rule is based on the Bayes' theorem

$$P(c|x) = \frac{P(x|c)P(c)}{P(x)}$$

Parameter estimation for naive Bayes models uses the method of maximum likelihood. The advantage here is that it requires only a small amount of training data to estimate the parameters.

• Support Vector Machine

The original Support Vector Machine (SVM) was proposed by Vladimir N. Vapnik and Alexey Ya. Chernenko in 1963. But that model can only do linear classification so it doesn't suit for most of the practical problems. Later in 1992, Bernhard E. Boser, Isabelle M. Guyon and Vladimir N. Vapnik introduced the kernel trick which enables the SVM for non-linear classification

$$K(x, x') = \exp\left(-\frac{\|x - x'\|^2}{2\sigma^2}\right)$$

$$\arg \max_{w, b} \left\{ \frac{1}{\|w\|} \min_n [t_n(w^T \phi(x_n) + b)] \right\}$$

$$\text{s.t. } t_n(w^T \phi(x_n) + b) \geq 1, \quad n = 1, \dots, N$$

$$h_t = o_t \cdot \tanh(c_t)$$

$$c_t = f_t \cdot c_{t-1} + i_t \cdot \tilde{c}_t$$

$$\tilde{c}_t = \tanh(x_t W_c + h_{t-1} U_c + b_c)$$

$$o_t = \sigma(x_t W_o + h_{t-1} U_o + b_o)$$

$$i_t = \sigma(x_t W_i + h_{t-1} U_i + b_i)$$

$$f_t = \sigma(x_t W_f + h_{t-1} U_f + b_f)$$

The details of the theory of the LSTM is introduced in [11] Notice that the 5000 most common words cover the most of the text, so only lose little information but transfer the string to a list of integers. Since the LSTM unit requires a fixed input vector length, truncate the list longer than 500 numbers because more than half of the news is longer than 500 words Then for those lists shorter than 500 words, pad 0's at the beginning of the list. It also delete the data with only a few words since they don't carry enough information for training. By doing this, and transfer the original text string to a fixed length integer vector while preserving the words order information. Finally, use word embedding qto transfer each word ID to a 32-dimension vector. The word embedding will train each word vector based on word similarity. If two words frequently appear together in the text, they are thought to be more similar and the distance of their corresponding vectors is small. The pre-processing transfers each news in raw text into a fixed size matrix. Then feed the processed training data into the LSTM unit to train the model. The LSTM is still a neural network. But different from the fully connected neural network, it has a cycle in the neuron connections.

So, the previous state (or memory) of the LSTM unit will play a role in new prediction

• Training a Models

Shown in Fig apply the app Machine Learning algorithms to the training set get from Kaggle and predict the given news if fake or not. Fig 1 Methodology will show how a model will be ready in future only input as a string and return with the new

fake or not if the news was returned original news content.

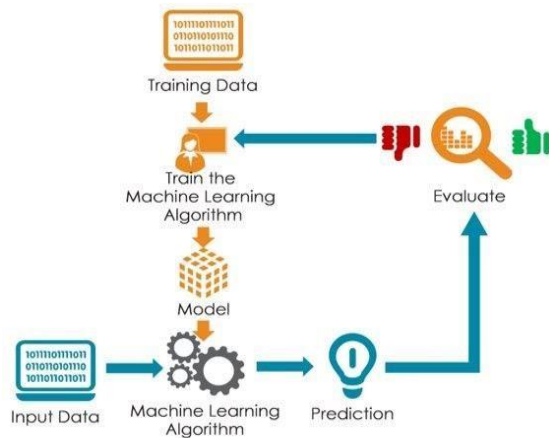


Fig 1. Training a model

In This model news articles in text format take as input and apply machine learning models on it to predict the news was fake or not. The model prediction compared with the training data set and find the accuracy of the model. In this process any point if prediction was wrong so try to analyze that point to increase the accuracy of model. Use the dataset with much greater length of the news articles. The news articles, that were presented in the current dataset, usually were not that long, because they often were just a preview to a longer news article, available on the website, different from Facebook. Training a classifier on a dataset with larger news articles should improve its performance significantly. This will show the future reference add news content to check the fake or not. Machine Learning Algorithms apply on the dataset, News Articles, and the Content which takes as an input, In the second step check and make decisions news fake or not id news fake so also return the true news

Result and discussions

The models were compared using their Confusion Matrices to calculate the Accuracy

Comparison of results

Table 1. Comparison of results

Name	Accuracy (%)
Naive Bayes	72.36
SVM	87.70
LSTM	93.62

It is observed that LSTM gave the best results. In this different set of embedding's for pre-processing the data was fed to our LSTM model. It uses ordered set of Word2Vec representations One of the reasons that LSTM performs so well is because the text

is inherently a serialized object. All the other models use the Doc2Vec to get their feature vectors and hence, they rely on the Doc2Vec to extract the order information and perform a classification on it. On the other hand, the LSTM model preserves the order using a different preprocessing method and makes prediction based on both the words and their order. This is how it outperforms others.

Conclusions

The conclusion that best accuracy is given by the LSTM that 93.62 that using of LSTM can detect the fake new but using that is required the proper dataset about that news or content. A large amount of dataset takes much time to analyze. Also try to solve the increase in accuracy of the LSTM using modifications We can also aggregate the well-performed classifiers to achieve better accuracy. For example, using bootstrap aggregating for the Neural Network, LSTM and SVM models to get better prediction result In the future, we will try to use less amount of time used by the algorithm to analyze data by using the DoctoVec better performance as compared with this. Also an app can be created which can help to detect fake news detection from social media

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