Detecting and Analyzing the Fake News Information Using Diffusive Neural Network Model

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Abstract: *Now-a-days, the trend of social media is increasing with the time. Social media became a part of everyone's daily routine. In social media we meddle through a variety of contexts in a wide range of text, image, video and audio etc. So, the content which is being circulated will be assumed to be true. But various news articles circulating are false along with true news over the internet. The circulating false might mislead and even negatively impact the social and personal life of the society. In this scenario, fake detection comes into action to detect the fake news circulating by people over the internet. The information which is being circulated over the internet will be analyzed by usage of different fake detection techniques, algorithms, principles, methodology to check the fake news, and then we can conclude whether it is true or false news. Spams are usually easier to distinguish from the real ones, while identifying fake news with erroneous information is incredibly challenging, since it requires both tedious evidence collecting and careful fact checking due to lack of other comparative news articles available. Based on a set of specific and latent features derived from the textual data, a fake detector builds a deep diffusive network design to learn the descriptions of news articles, creators, and subjects concurrently. After doing several experiments, the results are provided in the full version of this paper.*

Keywords: *Fake News, Social Media, Machine Learning, Neural Network.*

I. Introduction

What is fake news?

Fake news is a term which is termed as different things (meanings) to different people. We are defining "fake news" as those news stories that are false: the story itself is fabricated, with no verifiable facts, sources or quotes. For example, recently a video was circulated in twitter regarding some religious issues among some groups of people. But after proper research and investigation, it is revealed as a fake video.

This video showed a huge impact on social media, people and on twitter functioning to stop the fake. Another example to say, a person posted a video which contains a snake making horrible sounds. It was circulated over the internet, newspapers and news channels. After the person was investigated by police, the person revealed the truth i.e., he mixed the two videos and edited them as new videos.

False Information vs Fake News:

Experts currently recommend circumventing the term 'fake news', or at least confine its usage, as the term 'fake news' is closely related to politics, and this will narrow the focus of the issue. The term 'false information' is the most preferred word, as it will refer to a diverse range of falsification of topics such as health, environmental and economics across all

platforms and genres, while 'fake news' is commonly viewed as political news stories.

Deep Learning:

Deep learning is a configuration of machine learning that utilizes a model that is persuaded by the structure of the brain. Deep learning permits computational models that are composed of multiple processing layers to grasp the representations of data with multiple levels of abstraction. These methods used have improved the state-of-the-art in speech recognition, visual object recognition, objects detection and numerous other domains such as drug discovery and genomics.

Deep learning discovers complex structure in large data sets with usage of the back propagation algorithm to specify a manner that change its internal parameters that have been used to determine the representation in each layer by the representation in the previous layer. Deep convolution nets have breakthroughs in processing images, video, speech and audio, whereas recurrent nets have displayed light on sequential data such as text and speech. Deep-learning methods are representation of learning methods with multiple levels of presentation, acquired by composing simple but non-linear modules that transform the representation at one level into a representation at a higher, but slightly more abstract level.

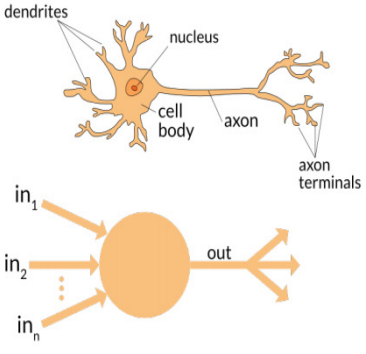

Fig 1. Neural Network

With the composition of these types of transformations, complex functions can be comprehended.

Supervised learning:

Supervised learning is defined as training the data that is well labeled. This means already some data is tagged with the correct answer. When we provide a machine with new data sets, it uses supervised learning algorithm to analyses the training data and it produces a specific outcome from labeled data.

It is divided into two types of problems when data mining:
1. Classification
2. Regression

Convolutional neural networks:

Convolutional Neural Networks are developed to process data that arrive in the form of arrays, for instance a colour image composed of three 2D arrays that is composed of pixel intensities in three colour channels. Data modalities appear in multiple arrays: 1D for signals and sequences that includes language; 2D for images or audio spectrograms; and 3D for video or volumetric images.

There are four key ideas behind Convolutional Neural Networks that gain benefit of the properties of natural signals: local connections, shared weights, pooling and the use of many layers. The architecture is structured as a succession of stages which are composed of two layers: convolutional layer and pooling layer. Convolutional layer units are arranged in feature maps, which are internally connected to local patches in the feature maps through a set of weights called a filter bank, which is later passed through non-linearity.

Recurrent neural networks:

When backpropagation was first introduced, it's most exciting to use for training recurrent neural networks (RNNs).

For the tasks that include sequential inputs, it is frequently sufficient to use RNNs. RNNs process an information sequence one part at a time, maintaining in their hidden units a state vector that essentially contains data about the records of all the past details of the sequence. When we consider the outputs are hidden parts at various discrete time steps as if they were the outputs of several neurons in a deep multilayer network, it becomes clear how we can apply backpropagation to train RNNs.

RNN is a very strong dynamic system, but training them has proved to be uncertain because the back propagated grades either grow or shrink at each certain event level, so many time levels they typically explode or disappear. RNNs are very good at prognosticating the next character in the next word in a sequence and also used for the difficult task.

II. Literature Survey

Title: Opinion fraud detection in online reviews by network effects

Author: L. Akoglu, R. Chandy, and C. Faloutsos

Year: 2013

Description:

User-generated online reviews will be playing a crucial role in the success of products, hotels, restaurants, etc. User review systems are often targeted by spammers who seek to disfigure the perceived quality of a product by generating duplicitous reviews. We propose a quick and efficacious framework, FRAUDEAGLE, for detecting imposters and fake reviews in online review datasets. Our method has several advantages

- It uses the network impact among analysts and products, rather than concentrating on the methods that are based on review text or behavioral study.
- It includes two interdependent levels; counting users and reviews for cheating detection, and grouping for visualization and sense-making.
- It operates in an unsupervised fashion.
- It is scalable to huge datasets as its run time increases linearly with network size.
- The framework effectiveness is essentially based on synthetic and authentic datasets; where FRAUDEAGLE successfully reveals fraud-bots in a review database.

Title: Social media and fake news in the 2016 election.

Author: H. Allcott and M. Gentzkow

Year: 2017

Description:

After the 2016 U.S president election, millions of people have expressed their concern regarding the consequences of false stories and news circulated largely through social media. In this, we scrutinize the economics of fake news and present new data on its utilization prior to the election. Based on web browsing data, archives of fact-checking websites, and results from a new online survey, we discover:

- Social media was a crucial but not a proponent source of election news.
- Acknowledged false news stories that appeared in the span of three months earlier to the election, the fake news favoring Trump was shared a total of 30 million times on social media, while those favoring Clinton were shared 8 million times.
- The average American adult has seen fake news stories in the months around the election, where

half of them deemed the fake news to be accurate.

- People tend to believe the news and stories that favor their preferred candidate, especially if they have ideologically segregated social media networks.

III. Existing System

In the year 2016 December, a group from academia and industry conducted a contest called Fake News Challenge. The main goal of the contest is the development of tools that help the human fact-checkers and identify the misinformation in news through the use of machine learning (ML), Natural Language Processing (NLP) and Artificial Intelligence (AI). The group's first overachieving goal is to understand what other news organizations are saying about the topic. The group decided to stage one of their contests, which would be a stance detection competition.

The group built a dataset of headlines and bodies of text and challenged others to build a classifier that could label the stance of the body text into one of four categories: agree, disagree, discuss and, unrelated. By the end of the contest over 75% accuracy on the task. The top model was based on Decision trees and a deep convolutional neural network.

Problem Statement:

The major drawback of this current system can be expressed that spam is generally found in personal emails and review websites which may have very minute or no impact on people, whereas the influence of fake news in social networks can be enormous based on the fact that social networks have a large number of users. And also the fact that the availability of numerous news and information on the social network might bemuse the users and they might not be able to distinguish between real and fake news.

IV. Proposed Approach

In this paper, we will study the fake news detection problem in online social networks. Based on the various data sources, including both textual contents/stories and the creation and article-subject relationships. We aim to detect fake news from online social networks concurrently. We show the fake news detection problem as a credibility inference problem, where the real ones will have higher credibility while unauthentic ones will have a lower one.

To solve the problem, in this model, we will introduce a Fake detector. in the Fake detector, the fake news detection problem is formulated as a probability label inference problem, and the Fake detector aims at learning a prediction model to understand the reliability labels of news articles, creators, and subjects. a fake detector deploys a new hybrid feature learning unit to prevent further fake news.

The main goal is to support Machine Learning (ML), which could be useful in classifying fake news. The models are relatively unphased by the execution of certain giveaway topic words in the training data set. It seems to be a fresh start in the tool that is used to increase human’s ability to detect fake news.

Fake Detection:

Fake news detection is the task of detecting forms of news consisting of deliberate disinformation or hoaxes spread via traditional news media or online social media.

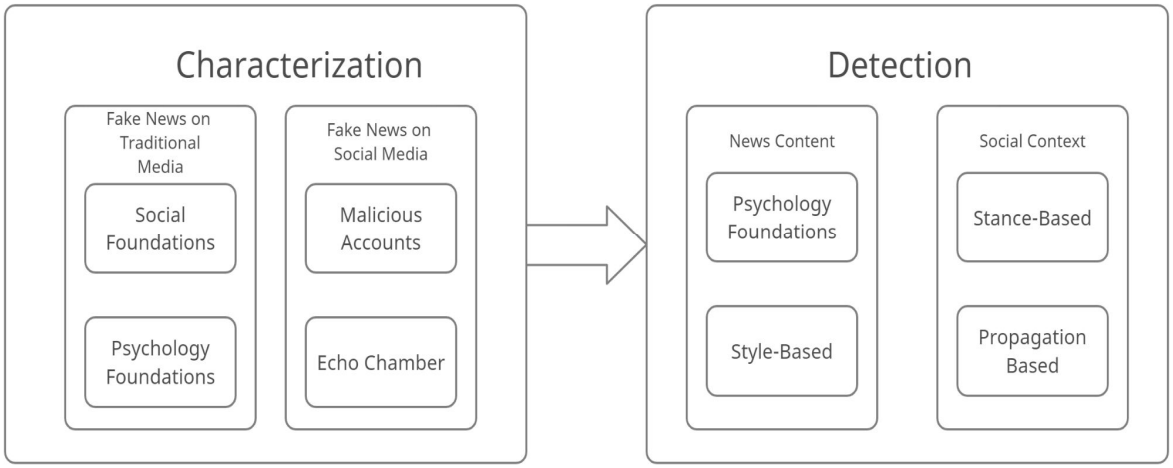

Fig 2. Fake Detection Model

Fake detection System Architecture:

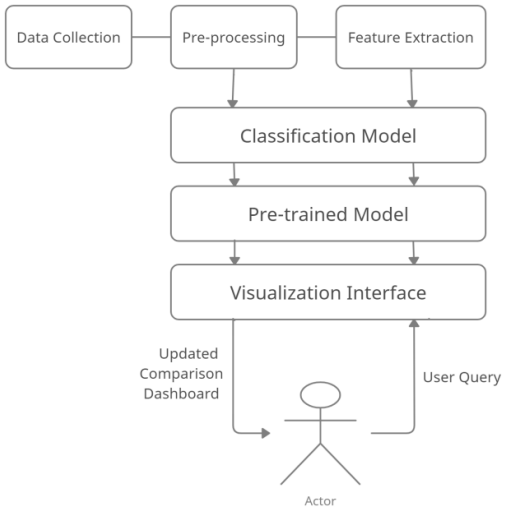

Fig 3. System Architecture

Data Collection:

Collection of data from various websites.

Preprocessing:

In this processing, we created a data set table utilizing the data collected from various sources.

Arrange it in the format of ID (Unique Identification Number), Title, Author, Text and, Label (Which might be reliable or not reliable).

Feature Extraction:

In this, we remove noisy data from the dataset and unnecessary symbols. Then we collect key attributes unique to its dataset and this attribute is used in the further processing.

Classification Model:

After completion of feature extraction and preprocessing, then the data is categorized into groups based on the theme of the data.

Pre-trained Model:

After the completion of classifying the dataset, in this process, we will be training the dataset using a fake detector algorithm with a deep diffusive neural network and save the trained data in the system.

Visualization Interface:

It is a graphical user interface where the system takes the user's query and gives the results.

MODULES:

Data Collection:

This is the first real move towards the real growth of a machine learning model, gathering data. This is a crucial step that will cascade in how great the model will be, the more and more reliable data that we get, the greater our model will perform.

There are various techniques to get the data, like network scraping, manual invasions, etc. The dataset used in this Fake news Detection taken from Kaggle.

Dataset:

The dataset is appraised of 20800 individual data. It consists of 5 columns in the dataset, which are described below:

1. Id: Unique identification number for a news article.
2. Title: The title of the news article.
3. Author: The author of the news article.
4. Text: The text of the article; could be incomplete.
5. Label: A label that marks the article as potentially unreliable or reliable by using either '1' or '0'.

   1: unreliable
   0: reliable

Data Preparation:

The data transformation can be completed by getting rid of missing data and removing columns. First, the transformation process creates a list of column names that will be kept or retained. Next, it drops or removes all columns except for the columns that willingly retain. Finally, it drops or removes the rows that have missing values from the data set.

Steps to follow:

1. Removing extra symbols
2. Removing punctuations
3. Removing the stop words
4. Stemming
5. Tokenization
6. Feature extractions
7. TF-IDF vectorizer
8. Counter vectorizer with TF-IDF transformer

Model Selection:

Passive-Aggressive algorithm is also used but in base paper a neural network algorithm is given. The Passive-Aggressive algorithm is a subclass of Machine learning algorithms that is not very well versed by beginners and intermediate Machine Learning enthusiasts. The algorithm is used as it is efficient for particularly specific applications.

Analyze and Prediction:

In the actual dataset, we chose only 2 features:

1. Text: the text of the article; could be incomplete
2. Label: a label that marks the article as potentially unreliable.
   1: FAKE
   0: REAL

Accuracy on test set:

We got an accuracy of 61% on the test set.

Saving the Trained Model:

When the tested and trained model is sent into the production-ready environment, the first step is to save it into a.h5 or. pkl file using a library like pickle. Make sure that

the pickles are installed in your environment .Now, import the model and dump the model into pkl file.

V. Conclusion

The major contribution of this project is to assist in the design that machine learning could be useful in a novel way for the task of classifying fake news. After properly processing the dataset, the Convolutional Neural Network (CNN) can take up a unique set of possibly complex language patterns that humans are also able to detect. We use inference, and overstatement to detect fake news using automatic patterns.

Likewise, our model looks for indefinite or inconclusive words, referential words, and evidence words as patterns that characterize real news. Even if a human could detect these patterns, they are not able to store as much information as a CNN model, and therefore, may not understand the complex relationships between the detection of these patterns and the decision for classification.

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