

Fake News Detector

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Abstract—Abstract—Fake news and hoaxes 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 clickbaits. Clickbaits 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. The experimental results show a 99.57% accuracy using decision tree classifier.

Keywords—Fake news, classification, clickbait

I. INTRODUCTION

Fake news isn't a novel concept, let alone being an internet-based problem. Even before the emergence of the internet, the idea of fake news has been in existence as publishers used false titles and misleading information to further their interests. With the invention of web, more people began dismissing traditional media channels to use online platforms [1]. With online platforms allowing users to more alternativess and varieties of publications, and being more convenient and faster to use in one sitting, it has began replacing traditional ways completely. However, this development has caused us to redefine the concept of fake news, as more and more publishers began using what we refer to as clickbaiting. Clickbaits are phrases that are designed to attract the attention of a user, then direct them to a web page that is grossly below their expectations . Many users find clickbaits to be an annoyance, and in results said users spend less and less time in visiting such sites.

However, for content publishers more clicks translate into more income as the economy of using online advertisements is highly adaptive on web traffic [2]. As such, despite the concerns that have been raised by readers about the use of clickbaits and the whole idea of publishing misleading information, there has been little effort on the part of content publishers to refrain from doing so. At best, tech companies such as Google, Facebook, and Twitter have attempted to address this particular concern. However, these efforts have hardly contributed towards solving the problem as the organizations have resorted to denying the individuals associated with such sites the income that they would have gained from the increased traffic. Users on the other hand, continue to deal with sites containing false information and whose involvement tends to affect the reader's ability to engage with actual news. The reason behind the involvement of firms such as Facebook in the issue concerning fake news is because the emergence and

subsequent development of social media platforms have served to accelerate the problem [3]. In particular, most of the sites that contain such information also include a sharing option that implores users to spread the contents of the web page further. Social networking sites allow for efficient and fast sharing of material and; thus, users can share the misleading information within a short time. In the wake of the data breach of millions of accounts by Cambridge Analytica, Facebook and other giants vowed to do more to stop the spread of fake news [4].

A. Research Problem

The project is concerned with identifying a solution that could be used to detect and filter out articles and news containing fake news for purposes of helping users to avoid being lured by clickbaits. It's secondary concern is to repair the lost trust in online news platforms for the user.

B. Proposed Solution

The project comes up with a solution which uses Python's classification algorithms to detect whether the target is fake or fact, and filter out fake articles, news, websites and such from the ones that are reliable, then warn the user about it's findings.

II. PREPARATION

An application will be built using Machine Learning steps, able to correctly analyze information [5].

A. Finding and Importing Data

The project will use a trained model. Data that is necessary to train this model will be found and imported.

B. Cleaning and Preparing Data

To perform a better training on the model, duplicate and null values in the data will be cleansed. Then, usable data will be prepared to train and test the model.

C. Data Splitting

Data will be divided into two as input and output, with certain percentages selected as training and testing data. These data will be arranged and divided.

D. Creating Model

A model will be made with algorithm to use in the project.

E. Training Model

The model will be trained using the previously selected and arranged data.

F. Prediction

Model will perform prediction based on the training and testing it received.

III. SOLUTION

Before beginning the project, it was decided that the previous dataset was not reliable for this project and it was replaced with a better one [6]. Initially, datasets that have fake and true news were acquired to train and test the model. Afterwards, necessary libraries were imported into the project.

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.feature_extraction.text import CountVectorizer
from sklearn.feature_extraction.text import TfidfTransformer
from sklearn import feature_extraction, linear_model, model_selection, preprocessing
from sklearn.metrics import accuracy_score
from sklearn.model_selection import train_test_split
from sklearn.pipeline import Pipeline
```

Figure 1. Imported dictionaries

Reading datasets

Read datasets

```
fake = pd.read_csv("data/Fake.csv")
true = pd.read_csv("data/True.csv")
```

```
fake.shape
```

```
(23481, 4)
```

```
true.shape
```

```
(21417, 4)
```

Figure 2. Reading Datasets

Two different datasets which include fake and true news each, will be merged into one in the future. Datasets have columns title, text, subject and date. A new column named target will be introduced and elaborated as true and fake.

```
# Add flag to track fake and real
fake['target'] = 'fake'
true['target'] = 'true'
```

```
fake.head()
```

	title	text	subject	date	target
0	Donald Trump Sends Out Embarrassing New Year...	Donald Trump just couldn't wish all Americans ...	News	December 31, 2017	fake
1	Drunk Bragging Trump Staffer Started Russian ...	House Intelligence Committee Chairman Devin Nu...	News	December 31, 2017	fake
2	Sheriff David Clarke Becomes An Internet Joke...	On Friday, it was revealed that former Milwauk...	News	December 30, 2017	fake
3	Trump Is So Obsessed He Even Has Obama's Name...	On Christmas day, Donald Trump announced that ...	News	December 29, 2017	fake
4	Pope Francis Just Called Out Donald Trump Dur...	Pope Francis used his annual Christmas Day mes...	News	December 25, 2017	fake

```
true.head()
```

	title	text	subject	date	target
0	As U.S. budget fight looms, Republicans flip t...	WASHINGTON (Reuters) - The head of a conservat...	politicsNews	December 31, 2017	true
1	U.S. military to accept transgender recruits o...	WASHINGTON (Reuters) - Transgender people will...	politicsNews	December 29, 2017	true
2	Senior U.S. Republican senator: 'Let Mr. Muell...	WASHINGTON (Reuters) - The special counsel inv...	politicsNews	December 31, 2017	true
3	FBI Russia probe helped by Australian diplomat...	WASHINGTON (Reuters) - Trump campaign adviser ...	politicsNews	December 30, 2017	true
4	Trump wants Postal Service to charge 'much mor...	SEATTLE/WASHINGTON (Reuters) - President Donald...	politicsNews	December 29, 2017	true

Figure 3. Head of two datasets

Datasets are merged and shuffled after the addition of target column. Title and date columns are dropped as only text and subject will be used by the project. Such, a dataset including both fake and true news is created. To make it easier to work in this dataset, punctuation and stopwords are removed. With the new dataset, it's proceeded into examination stage.

Basic data exploration

```
In [51]: # How many articles per subject?
print(data.groupby(['subject'])['text'].count())
data.groupby(['subject'])['text'].count().plot(kind="bar")
plt.show()
```

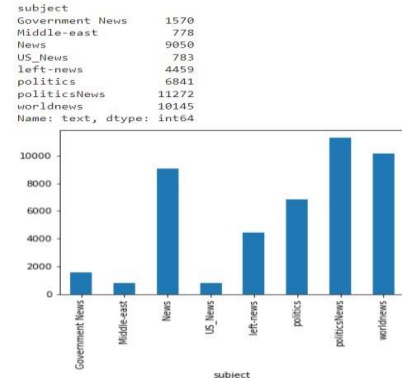


Figure 4. Articles per subject

```
In [52]: # How many fake and real articles?
print(data.groupby(['target'])['text'].count())
data.groupby(['target'])['text'].count().plot(kind="bar")
plt.show()
```

```
target
fake    23481
true    21417
Name: text, dtype: int64
```

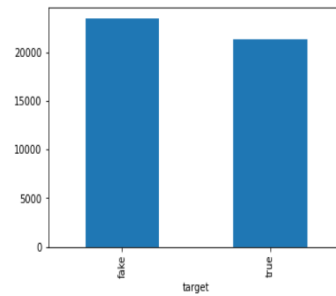


Figure 5. How many real and fake articles dataset have

```
[58]: # Most frequent words in fake news
counter(data[data['target'] == 'fake'], "text", 20)
```

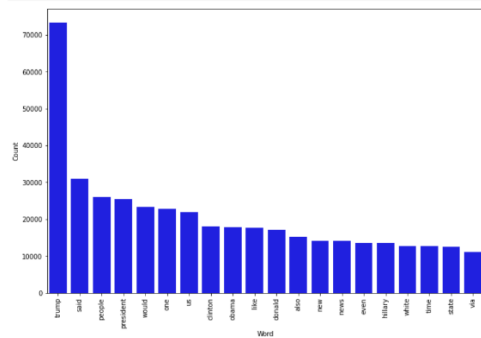


Figure 6. Most frequent words in fake news

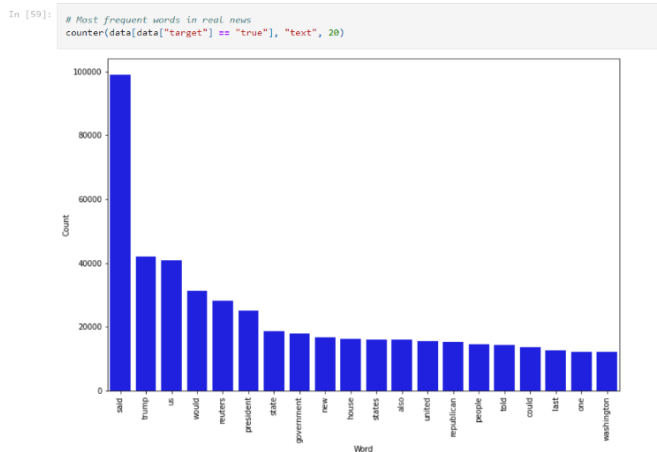


Figure 7. Most frequent words in real news

True news and fake news counts for each subject and words that's used most in the fake news and true news can be observed in the above graphs.

Splitting the data commences after the examination of the dataset. Then dataset is split into four as "x_train", "y_train", "x_test" and "y_test". X includes text and subject columns while y includes target column. Test_size is set as 0.2, which translates into 20% of data for the test stage.

Modelling begins after data splitting. DecisionTreeClassifier algorithm is used as it's given the most efficiency. Methods countVectorizer and TfidfTransformer is used in modelling to provide assistance.

Decision Tree is one of the most powerful and popular algorithm. Decision-tree algorithm falls under the category of supervised learning algorithms. It works for both continuous as well as categorical output variables [7].

What is a TfidfVectorizer?

Equivalent to countVectorizer followed by TfidfTransformer [8].

TF (Term Frequency): The number of times a word appears in a document is its Term Frequency. A higher value means a term appears more often than others, and so, the document is a good match when the term is part of the search terms.

IDF (Inverse Document Frequency): Words that occur many times a document, but also occur many times in many others, may be irrelevant. IDF is a measure of how significant a term is in the entire corpus.

The TfidfVectorizer converts a collection of raw documents into a matrix of TF-IDF features.

Accuracy is checked after the modelling is finished.

```
# Accuracy
prediction = model.predict(X_test)
print("accuracy: {}".format(round(accuracy_score(y_test, prediction)*100,2)))

accuracy: 99.57%
```

Figure 8. Accuracy of model

And lastly, confusion matrix is used on the model to see how many wrong outputs the model gives.

```
cm = metrics.confusion_matrix(y_test, prediction)
plot_confusion_matrix(cm, classes=['Fake', 'Real'])
```

Confusion matrix, without normalization

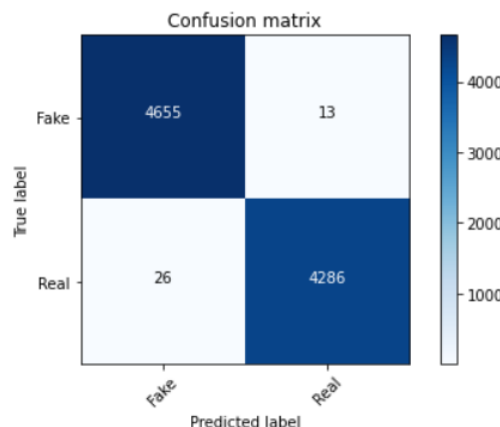


Figure 9. Confusion Matrix

CONTRIBUTION AND FINDINGS

Both members research "What is fake news?" and "How can we detect fake news?". After that; Burak Özcan performed 'search and find a dataset', 'cleansing and preparing data', 'splitting data' operations. He found the good datasets, prepared it for model and explored it with graphics. He performed displaying dataset's frequent words, subject for articles.

Muhammed Said Ögüt preformed 'creating model', 'training model' and 'predictions' operations. He searched for model algorithms and functions, tried algorithms on datasets and found best one (accuracy). He trained model and performed finding accuracy and displaying confusion matrix.

ETHICAL STATEMENT

While preparing the project, I did not take any action that could be considered as plagiarism.

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