

UNIVERSITY OF LONDON

INTERNATIONAL PROGRAMMES

BSc Computer Science and Related Subjects



CM3070 PROJECT

PRELIMINARY PROJECT REPORT

Project Idea: Fake News Detection

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Date of Submission: 28 November 2023

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CHAPTER 1: INTRODUCTION

Project Background: What is Fake News?

With the constant advancement of technology, informative data has become more accessible, impacting daily lives in both a positive and negative manner. In the aspects of negative, increased accessibility has led to an increased spread of fake news. Fake news is generally fabricated to mislead its readers into believing misinformation of various forms such as propaganda, scandals, rumors. For example, BuzzFeed (<https://www.buzzfeed.com/>) compared and analyzed participation in 20 real news and 20 fake news articles (e.g., likes, comments, share activities) that spread the most on Facebook during the last three months of the 2016 US Presidential Election. According to the results, the participation rate of fake news (8.7 million) was higher than that of mainstream news (7.3 million), and 17 of the 20 fake news played an advantageous role in winning the election (Bogoan Kim, 2021). Another example, “There is much concern during this pandemic about the spread of misleading or inaccurate information. This article reports on a small study which attempted to identify the types and sources of COVID-19 misinformation. The authors identified and analyzed 1225 pieces of COVID-19 fake news stories taken from fact-checkers, myth-busters, and COVID-19 dashboards. The study is significant given the concern raised by the WHO Director-General that 'we are not just fighting the pandemic; we are also fighting infodemic'. The study concludes that the COVID-19 infodemic is full of false claims, half backed conspiracy theories and pseudoscientific therapies, regarding the diagnosis, treatment, prevention, origin and spread of the virus” (Salman Bin Naeem, 2021).

Hence, using Natural Language Processing (NLP) to tackle the spread of fake news is an excellent solution.

Aims and Objectives: Develop a Fake News Detection Model

To tackle the spread of fake news, the aim for this project is to develop a software module that can differentiate between real and fake news, in the form of a website or extension that utilizes past news data to predict the chances of whether the current news in question is spreading truth or lies.

By using multiple machine learning classifiers in question, in-depth analysis and vital insights will be done on the data with evaluation via high accuracy scores.

CHAPTER 2: LITERATURE REVIEW

In this section, literature review of past projects has been researched to aid in the development of this project for Fake News Detection.

Classifications of Fake News Detection

Fake news detection comes in multiple forms. Each style comes with unique ways to seek out and verify the credibility of the information found, especially on the net. The net is a breeding ground for both truth and lies. Hence, these are some of the methods for detecting fake news.

Content-based method

This method analyzes the semantic and way-of-speech of the news and how it is conveyed. For example, true news tends to be more subjective and more focused towards the main points of the news itself, whereas fake news, tends to exaggerate and contains more words to convince the reader of its credibility (Eric Lazarski, 2021).

Social network-based method

This method utilizes hidden auxiliary data such as background information and propagation paths of the news to identify whether the news is fake or not. One example is that fake news from social media will attempt to mimic the input style of the victim they are pretending to be. A solution is understanding the victim's algorithm patterns on the network and thus using that information to tell the fake from the truth (Eric Lazarski, 2021).

Knowledge-based method

The method works in ways of comparison. It compares the news with currently existing facts to fact check the credibility of the news itself. It comes into two categories, namely, Automatic Fact Checking and Manual Fact Checking. Automatic Fact Checking collects

data and stores it in its knowledge bank so that the stored information can be used to fact check the claims of other news by comparison of data. However, this also limits its capability to handle large sets of data due to its inability to scale well with data that is constantly growing. Manual Fact Checking on the other hand, can handle the workload because one part of manual fact checking is where becoming a platform for experts to share, and fact check among each other to enhance the credibility of the data, which in turn, makes this a scalable approach (Eric Lazarski, 2021).

Types of Classification Models

Logistic Regression/Harmonic Label Crowdsourcing

Some Like it Hoax: Automated Fake News Detection in Social Networks (Eugenio Tacchini, 2017)

For this research, a dataset consisting of 15,500 Facebook Posts has been chosen and the aim is to classify these posts between hoax and non-hoax. The two types of models created were the Logistic Regression Model and the Harmonic Label-Crowdsourcing Model. The evaluation metric was conducted with average accuracy and standard deviation in mind and the sample data used was set between having 'One-page out' and 'Half-page out'. After 50 runs, the Logistic Regression Model had an average of 71% (Half Page) – 79% (Full Page) whereas the Harmonic Label-Crowdsourcing Model had an overall average of 99% for both. In my opinion, even though a comparison was made, and the aim of the project has been met, this research is not very well done. The reason being that the dataset seems to be a little small and the number of runs conducted is less than 1% of the overall dataset, which impacts the overall accuracy of the research results. Hence, the takeaway from this research is that an appropriate dataset with a larger count in data is better to be used and that more runs must be conducted to ensure a fair data result for comparison.

Naïve-Beyes Classifier Model

Fake News Detection Using Naive Bayes Classifier (Mykhailo Granik, 2017)

For this research, a dataset consisting of 2282 Facebook Posts has been selected and the aim is to classify it been true and false. One thing of note is that only the Naïve Bayes Classifier Model has been developed for the classification. The research conducted has yielded results for the model accuracy having an overall score of 75%. Despite its decent accuracy level, this can be considered bad research. The dataset used was small, and some of the data were just previews of whole articles. Moreover, the author admitted that proper text-preprocessing steps had not been done stating that ways to improve accuracy included stopwords and stemming. Therefore, the takeaway for this research was that proper text-preprocessing steps must be done and a larger dataset must be used to avoid a skewed result for accuracy.

Convolutud Neural Network Hybrid Model

TI-CNN: Convolutional Neural Networks for Fake News Detection (Yang Yang, 2018)

For this research, a combination of two types of datasets were used, one being text while the other being images, the domain being news of the American Presidential Election. Different methods were used to conduct the experiment and their precision, recall and f-1 scores were used for evaluation. The methods were Convolutud Neural Network for images, Logistic Regression, Convolutud Neural Network, Long Short-Term Memory, Gated Recurrent Units were used for text data and finally a hybrid between Text and Image Convolutud Neural Network. Viewing the comparison between the results between all the models, the hybrid model ended up having the highest scores by a large margin between almost all the other models. In conclusion, the research conducted was very well done and some methods to adopt is to involve the development of a hybrid model to ensure that the final product created will be highly accurate.

In conclusion, if time permits it, a hybrid approach to developing a software module for fake news detection will be the best as fake news not only comes in the form of text, but images as well.

CHAPTER 3:PROJECT DESIGN

Design Concept

The concept of the project itself is to have a software module or extension that allows its user to input the news they are currently reading and notify them whether the information the said news is a fact or falsified rumors in real time.

Design Justification

With the web readily available to everyone these days, the project being developed into software is the most efficient way to allow users to gain access to this design. Moreover, since the validation of the news is in real time, users will be able to read and share knowledge with others without worries.

Design Planning

The methodology selected for the development of the prototype is the waterfall methodology.

A Gantt Chart will created to plan and monitor the work progress so far.

CHAPTER 4:FEATURE PROTOTYPE

The prototype developed is done using the Python Language in Jupyter Notebook.

Feature Objectives

The main goal of this section is to create multiple text classification models such as Passive-Aggressive Classifier, Logistic Regression, Random Forest Classifier to determine the level of accuracy of each model and thereafter compare the results with various evaluation techniques and choose the most appropriate model.

Selected Dataset: Fake News Detection

The dataset selected for this project, titled “Fake News Detection” is a dataset comprising of the csv files, namely, fake.csv and true.csv.

The csv file with fake news contains 4 columns with 17903 unique values, where the columns are title, text, subject, and date. The columns are the same for the csv file containing real news but with 20826 unique values instead. Fake.csv is 61mb and True.csv is 52mb. The datatype of this dataset is boolean, integer and string. The data is sourced from social media, news sites dating back from 31/03/2015 to 19/02/2018.

The dataset is suitable for this project as there are no missing values, saving some time and effort to clean it, and with enough data to work with.

Evaluation Methodology

For evaluation metrics regarding this project the four methodologies selected are Accuracy, Precision, Recall and F-1 Score.

Accuracy, in this project, is the measurement of the rate at which the specific data has been labelled correctly.

Precision is the measurement of the rate at which the predictions have been labelled correctly.

Recall, which measures the rate in which actual positives were identified correctly.

F-1 Score is the combined average of Precision and Recall, which is used to measure the performance of the model in general.

Prototype: Passive Aggressive Classifier Baseline Model

The baseline model for this project will be the Passive Aggressive Classifier Model. This classification was selected to be the baseline model because in its passive operation, it determines whether the prediction is correct and if it is, it maintains at the same status however, when it deems that the prediction is incorrect, it actively attempts to make changes to the model itself and correct it. Overall, this kind of approach to handling its tasks makes it an excellent choice for tackling big datasets that are too large for models in terms of training all the data.

Prototype Demo:

```
In [5]: #Import basic operations
import pandas as pd
import numpy as np
import nltk
import string
import matplotlib.pyplot as plt
import re

In [6]: #Import machine Learning Libraries and others
from sklearn.model_selection import train_test_split
from sklearn.metrics import accuracy_score
from sklearn.metrics import classification_report
from nltk.corpus import stopwords
from gensim.parsing.preprocessing import STOPWORDS
```

Importing Dataset

```
In [7]: try:
df_fake = pd.read_csv('fake.csv')
df_real = pd.read_csv('real.csv')
except:
    print("error reading csv files")
```

```
In [8]: #show dataset for fake news
df_fake.head(10)
```

```
Out[8]:
```

	title	text	subject	date
0	Donald Trump Sends Out Embarrassing New Year'...	Donald Trump just couldn't wish all Americans ...	News	December 31, 2017
1	Drunk Bragging Trump Staffer Started Russian ...	House Intelligence Committee Chairman Devin Nu...	News	December 31, 2017
2	Sheriff David Clarke Becomes An Internet Joke...	On Friday, it was revealed that former Milwauk...	News	December 30, 2017
3	Trump Is So Obsessed He Even Has Obama's Name...	On Christmas day, Donald Trump announced that ...	News	December 29, 2017
4	Pope Francis Just Called Out Donald Trump Dur...	Pope Francis used his annual Christmas Day mes...	News	December 25, 2017
5	Racist Alabama Cops Brutalize Black Boy While...	The number of cases of cops brutalizing and ki...	News	December 25, 2017
6	Fresh Off The Golf Course, Trump Lashes Out A...	Donald Trump spent a good portion of his day a...	News	December 23, 2017
7	Trump Said Some INSANELY Racist Stuff Inside...	In the wake of yet another court decision that ...	News	December 23, 2017

This is the initial importing of the libraries required for the task at hand.

Some data preprocessing for done as well to clean the data.

Dropping unnecessary columns

```
In [17]: df = df_merge.drop(["title", "subject", "date"], axis = 1)
```

```
In [18]: # Check for null values in dataset
df_merge.isnull().sum()
```

```
Out[18]: title      0
text          0
subject       0
date          0
class        0
dtype: int64
```

```
In [19]: df.head()
```

```
Out[19]:
```

	text	class
0	Donald Trump just couldn't wish all Americans ...	0
1	House Intelligence Committee Chairman Devin Nu...	0
2	On Friday, it was revealed that former Milwauk...	0
3	On Christmas day, Donald Trump announced that ...	0
4	Pope Francis used his annual Christmas Day mes...	0

```
In [20]: df.shape
```

```
Out[20]: (44898, 2)
```

One is dropping rows with null values.

```

In [16]: #Stopwords
stop_words = stopwords.words('english')

In [17]: def textProcess(text):
text = text.lower()
text = re.sub('[\.\*\?]', '', text)
text = re.sub("[\W]", "", text)
text = re.sub('https?://\S+|www\.\S+', '', text)
text = re.sub('<.*?>+', '', text)
text = re.sub('[%s]' % re.escape(string.punctuation), '', text)
text = re.sub('\n', '', text)
text = re.sub('\w*\d\w*', '', text)
return text

In [18]: df["text"] = df["text"].apply(textProcess)

In [19]: x = df["text"]
y = df["class"]

```

Natural Language Processing (NLP) wise, stopwords was used to clean the data further.

Testing with different classification models

```

In [*]: LogisticRegression.score(DataTest, y_test)

In [46]: print(classification_report(y_test, PredictionLR))

```

	precision	recall	f1-score	support
0	0.99	0.98	0.99	4397
1	0.98	0.99	0.99	5265
accuracy			0.99	9662
macro avg	0.99	0.99	0.99	9662
weighted avg	0.99	0.99	0.99	9662

This is one of the attempts for a logistic regression model.

CHAPTER 5: REFERENCES

- Bogoan Kim, A. X. (2021, December 9). A systematic review on fake news research through the lens of news creation and consumption: Research efforts, challenges, and future directions. *PloS one*, 16. doi:10.1371/journal.pone.0260080
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