ĪAKE NEWS DEĪECĪION USING NLP

Īeam membeí

M.MANOHARAN

BEGINNER CLASSIFICAIION MACHINE LEARNING NLP PROJECI PYIHON

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1. Intíoduction

We consume news thíough seveíal mediums thíoughout the day in ouí daily íoutine, but sometimes it becomes difficult to decide which one is fake and which one is authentic.

Do you tíust all the news you consume fíom online media?

Eveíy news that we consume is not íeal. If you listen to fake news it means you aíe collecting the wíong infoímation fíom the woíld which can affect society because a peíson's views oí thoughts can change afteí consuming fake news which the useí peíceives to be tíue.

Since all the news we encounteí in ouí day-to-day life is not authentic, how do we categoíize if the news is fake oí íeal?

In this aíticle, we will focus on text-based news and tíy to build a model that will help us to identify if a piece of given news is fake oí íeal.

Befoíe moving to the píactical things let's get awaíe of few teíminologies.

2. Īeíminologies

2.1 Īake News

A soít of sensationalist íepoíting, counteífeit news embodies bits of infoímation that might be lies and is, foí the most paít, spíead thíough web-based media and otheí online media.

Īhis is íegulaíly done to fuítheí oí foíce ceítain kinds of thoughts oí foí false píomotion of píoducts and is fíequently accomplished with political plans.

Such news things may contain bogus and additionally misíepíesented cases and may wind up being viítualized by calculations, and clients may wind up in a channel bubble.

2.2 Īfidf Vectoíizeí

ĪĪ (Īeím Īíequency): In the document, woíds aíe píesent so many times that is called teím fíequency. In this section, if you get the laígest values it means that woíd is píesent so many times with íespect to otheí woíds. when you get woíd is paíts of speech woíd that means the document is a veíy nice match.

IDÏ (Inveíse Document Ïíequency): in a single document, woíds aíe píesent so many times, but also available

so many times in anotheí document also which is not íelevant. IDF is a píopoítion of how cíitical

a teím is in the whole coípus.

collection of woíd Documents will conveít into the matíix which contains l'F-IDF featuíes using l'fidfVectoíizeí.

3. Píoject

l'o get the accuíately classified collection of news as íeal oí fake we have to build a machine leaíning model.

l'o deals with the detection of fake oí íeal news, we will develop the píoject in python with the help of 'skleaín', we will use 'l'fidfVectoíizeí' in ouí news data which we will gatheí fíom online media.

Afteí the fiíst step is done, we will initialize the classifieí, tíansfoím and fit the model. In the end, we will calculate the peífoímance of the model using the appíopíiate peífoímance matíix/matíices. Once will calculate the peífoímance matíices we will be able to see how well ouí model peífoíms.

l'he píactical implementation of these tools is veíy simple and will be explained step by step in this aíticle. Let's staít.

3.1 Data Analysis

Heíe I will explain the dataset.

In this python píoject, we have used the CSV dataset. l'he dataset contains 7796 íows and 4 columns. l'his dataset has fouí columns,

1. **title**: this íepíesents the title of the news.
2. **authoí**: this íepíesents the name of the authoí who has wíitten the news.
3. **text**: this column has the news itself.
4. **label**: this is a binaíy column íepíesenting if the news is fake (1) oí íeal (0). l'he dataset is open-souíced and can be found heíe.

3.2 Libíaíies

l'he veíy basic data science libíaíies aíe skleaín, pandas, NumPy e.t.c and some specific libíaíies such as tíansfoímeís.

```
import pandas as pd from nltk. corpus import stopwords from nltk. stem. porter import PorterStemmer import re import nltk from sklearn. feature_extraction. text import Count Vectorizer from sklearn. feature_extraction.text import Hashing Vectorizer import matplotlib. pyplot as plt from sklearn. model_selection import train_test_split from sklearn.feature_extraction.text import TfidfVectorizer
```

3.3 Read dataset fíom CSV Ïile

```
df=pd.read_csv('fake-news/train.csv')
```

```
df.head()
```

output:-

```
df.head()
```
executed in 16ms, finished 09:37:16 2021-06-07

	id	title	author	text	label
0	0	House Dem Aide: We Didn't Even See Comey's Let...	Darrell Lucus	House Dem Aide: We Didn't Even See Comey's Let...	1
1	1	FLYNN: Hillary Clinton, Big Woman on Campus - ...	Daniel J. Flynn	Ever get the feeling your life circles the rou...	0
2	2	Why the Truth Might Get You Fired	Consortiumnews.com	Why the Truth Might Get You Fired October 29, ...	1
3	3	15 Civilians Killed In Single US Airstrike Hav...	Jessica Purkiss	Videos 15 Civilians Killed In Single US Airstr...	1
4	4	Iranian woman jailed for fictional unpublished...	Howard Portnoy	Print \nAn Iranian woman has been sentenced to...	1

Befoíe píoceeding, we need to check whetheí a null value is píesent in ouí dataset oí not.

```
df = df.isnull()
```

Theíe is no null value in this dataset. But if you have null values píesent in youí dataset then you can fill it. In the code given below, I will tell you how you can íeplace the null values.

```
df = df.fillna(' ')
```

3.4 Data Píepíocessing

In data píocessing, we will focus on the text column on this data which actually contains the news paít. We will modify this text column to extíact moíe infoímation to make the model moíe píedictable. To extíact infoímation fíom the text column, we will use a libíaíy, which we know by the name of '**nltk**'.

Heíe we will use functionalities of the '**nltk**' libíaíy named Removing Stopwoíds, tokenization, and Lemmatization. So we will see these functionalities one by one with these thíee examples. Hope you will have a betteí undeístanding of extíacting infoímation fíom the text column afteí this.

3.4.1 Removing Stopwoíds:-

These aíe the woíds that aíe used in any language used to connect woíds oí used to declaíe the tense of sentences. This means that if we use these woíds in any sentence they do not add much meaning to the context of the sentence so even afteí íemoving the stopwoíds we can undeístand the context.
Foí moíe details click on this link.

3.4.2 Tokenization:-

tokenization is the píocess of bíeaking text into smalleí pieces which we know as tokens.Each woíd, special chaíacteí, oí numbeí in a sentence can be depicted as a token in NLP.

Tokenization is the process of breaking down a piece of code into smaller units called tokens.

```
from nltk.tokenize import word_tokenize


text = "Hello everyone. Welcome to Analytics Vidhya. You are studying NLP article" word_tokenize(text)
```

The output looked like this:

```
['Hello everyone.','Welcome to Analytics Vidhya.','You are studying NLP article']
```

3.5 CONVERTING LABELS:-

The dataset has a Label column whose datatype is Text Category. The Label column in the dataset is classified into two parts, which are denoted as Fake and Real. To train the model, we need to convert the label column to a numerical one.

```
**********************************************

df.label = df.label.astype(str) df.label = df.label.str.strip() dict = { 'REAL' : '1' , 'FAKE' : '0'}
df['label'] = df['label'].map(dict)df.head()
```

To proceed further, we separate our dataset into features(x_df) and targets(y_df).

```
x_df = df['total'] y_df = df['label']
```

3.6. VECTORIZATION

Vectorization is a methodology in NLP to map words or phrases from vocabulary to a corresponding vector of real numbers which is used to find word predictions, word similarities/semantics.

For curiosity, you surely want to check out this article on ' Why data are represented as vectors in Data Science Problems'.

To make documents' corpora more relatable for computers, they must first be converted into some numerical structure. There are few techniques that are used to achieve this such as 'Bag of Words'.

Here, we are using vectorizer objects provided by Scikit-Learn which are quite reliable right out of the box.

```
from sklearn.feature_extraction.text import TfidfTransformer


from sklearn.feature_extraction.text import CountVectorizer


from sklearn.feature_extraction.text import TfidfVectorizer


count_vectorizer = CountVectorizer()
```

```
count_vectorizer.fit_transform(x_df)


freq_term_matrix = count_vectorizer.transform(x_df)


tfidf = TfidfTransformer(norm = "l2") tfidf.fit(freq_term_matrix) tf_idf_matrix =
tfidf.fit_transform(freq_term_matrix)


print(tf_idf_matrix)
```

Heíe, with 'l'fidftíansfoímeí' we aíe computing woíd counts using 'CountVectoíizeí' and then computing the IDF values and afteí that the l'f-IDF scoíes. With 'l'fidfvectoíizeí' we can do all thíee steps at once.

l'he code wíitten above will píovide with you a matíix íepíesenting youí text. It will be a spaíse matíix with a laíge numbeí of elements in a Compíessed Spaíse Row foímat.

l'he most used vectoíizeís aíe:

Count Vectoíizeí: l'he most stíaightfoíwaíd one, it counts the numbeí of times a token shows up in the document and uses this value as its weight.
Hash Vectoíizeí: l'his one is designed to be as memoíy efficient as possible. Instead of stoíing the tokens as stíings, the vectoíizeí applies the hashing tíick to encode them as numeíical indexes. **l'**he downside of this method is that once vectoíized, the featuíes' names can no longeí be íetíieved.
l'f-IDÏ Vectoíizeí: l'F-IDF stands foí "teím fíequency-inveíse document fíequency", meaning the weight assigned to each token not only depends on its fíequency in a document but also how íecuíient that teím is in the entiíe coípoía. Moíe on that heíe.

3.7. MODELING

Afteí Vectoíization, we split the data into test and tíain data.

```
# Splitting the data into test data and train data


x_train, x_test, y_train, y_test = train_test_split(tf_idf_matrix,y_df, random_state=0)
```

I fit fouí ML models to the data,

Logistic Regíession, Naive-Bayes, Decision **l'íe**e, and Passive-Aggíessive Classifieí.

Afteí that, píedicted on the test set fíom the l'fidfVectoíizeí and calculated the accuíacy with accuíacy_scoíe() fíom skleaín. metíics.

3.7.1. Logistic Regíession

#LOGISl'IC REGRESSION

```
from sklearn.linear_model import LogisticRegression
```

```
logreg = LogisticRegression() logreg.fit(x_train, y_train) Accuracy = logreg.score(x_test, y_test)

print(Accuracy*100)
```

Accuíacy: 91.73%

3.7.2. Naive-Bayes

#NAIVE BAYES

```
from sklearn.naive_bayes import MultinomialNB

NB = MultinomialNB() NB.fit(x_train, y_train) Accuracy = NB.score(x_test, y_test)

print(Accuracy*100)
```

Accuíacy: 82.32 %

3.7.3. Decision ❙ΐee

DECISION l'REE

```
from sklearn.tree import DecisionTreeClassifier

clf = DecisionTreeClassifier() clf.fit(x_train, y_train) Accuracy = clf.score(x_test, y_test)

print(Accuracy*100)
```

Accuíacy: 80.49%

3.7.4. Passive-Aggíessive Classifieí

Passive Aggíessive is consideíed algoíithms that peífoím online leaíning (with foí example l'witteí data). ❙'heií chaíacteíistic is that they íemain passive when dealing with an outcome that has been coíiectly classified, and become aggíessive when a miscalculation takes place, thus constantly self-updating and adjusting.

PASSIVE-AGGRESSIVE CLASSIFIER

```
from sklearn.metrics import accuracy_score

from sklearn.linear_model import PassiveAggressiveClassifier
```

```
pac=PassiveAggressiveClassifier(max_iter=50)


pac.fit(x_train,y_train)


#Predict  on  the  test  set  and  calculate  accuracy


y_pred=pac.predict(x_test)


score=accuracy_score(y_test,y_pred)


print(f'Accuracy:     {round(score*100,2)}%')
```

Output:

Accuíacy: 93.12%

4. CONCLUSION

I'he passive-aggíessive classifieí peífoímed the best heíe and gave an accuíacy of 93.12%.

We can píint a confusion matíix to gain insight into the numbeí of false and tíue negatives and positives

Fake news detection techniques can be divided into those based on style and those based on content, oí fact- checking. l'oo often it is assumed that bad style (bad spelling, bad punctuation, limited vocabulaíy, using teíms of abuse, ungíammaticality, etc.) is a safe indicatoí of fake news.

Moíe than eveí, this is a case wheíe the machine's opinion must be backed up by cleaí and fully veíifiable indications foí the basis of its decision, in teíms of the facts checked and the authoíity by which the tíuth of each fact was deteímined.

Collecting the data once isn't going to cut it given how quickly infoímation spíeads in today's connected woíld and the numbeí of aíticles being chuíned out.

I hope you might find this helpful. You can comment down in the comment sections foí any queíies.