Naman Thaker

20BCE529

IRS PRACTICAL 3 vECTOR SPACE MODEL (COUNT VECTORIZER)

```
import pandas as pd
import  matplotlib.pyplot as plt
import numpy as np
import tensorflow as tf
import keras
import re
import string
import nltk
from nltk.corpus import stopwords
from nltk.stem.porter import PorterStemmer
from wordcloud import WordCloud
from nltk.stem.snowball import SnowballStemmer
from sklearn.model_selection import train_test_split
import pickle
import xgboost as xgb
from sklearn.linear_model import LogisticRegression
from sklearn.naive_bayes import MultinomialNB
from sklearn import metrics
from sklearn.metrics import roc_auc_score , accuracy_score , confusion_matrix , f1_score
from sklearn.multiclass import OneVsRestClassifier
from skmultilearn.problem_transform import BinaryRelevance
from sklearn.feature_extraction.text import TfidfVectorizer
```

```
train_data  =  pd.read_csv('../input/jigsaw-toxic-comment-classification-challenge/train.c
```

```
test_data  =  pd.read_csv('../input/jigsaw-toxic-comment-classification-challenge/test.csv
```

```
test_target =  pd.read_csv('../input/jigsaw-toxic-comment-classification-challenge/test_la
```

```
train_data.head()
```

	id	comment_text	toxic	severe_toxic	obscene	threat	insu
0	0000997932d777bf	Explanation\nWhy the edits made under my usern...	0	0	0	0	
1	000103f0d9cfb60f	D'aww! He matches this background colour I'm s...	0	0	0	0	
2	000113f07ec002fd	Hey man, I'm really not trying to edit war. It	0	0	0	0	

```
test_data.head()
```

	id	comment_text
0	00001cee341fdb12	Yo bitch Ja Rule is more succesful then you'll...
1	0000247867823ef7	== From RfC == \n\n The title is fine as it is...
2	00013b17ad220c46	" \n\n == Sources == \n\n * Zawe Ashton on Lap...
3	00017563c3f7919a	:If you have a look back at the source, the in...
4	00017695ad8997eb	I don't anonymously edit articles at all.

```
test_target.head()
test_target
```

	id	toxic	severe_toxic	obscene	threat	insult	identity_hat
0	00001cee341fdb12	-1	-1	-1	-1	-1	-
1	0000247867823ef7	-1	-1	-1	-1	-1	-
2	00013b17ad220c46	-1	-1	-1	-1	-1	-
3	00017563c3f7919a	-1	-1	-1	-1	-1	-
4	00017695ad8997eb	-1	-1	-1	-1	-1	-
...	...	...	...	...	...	...	.
153159	fffcd0960ee309b5	-1	-1	-1	-1	-1	-
153160	fffd7a9a6eb32c16	-1	-1	-1	-1	-1	-
153161	fffda9e8d6fafa9e	-1	-1	-1	-1	-1	-
153162	fffe8f1340a79fc2	-1	-1	-1	-1	-1	-
153163	ffffce3fb183ee80	-1	-1	-1	-1	-1	-

153164 rows × 7 columns

```
len(test_data)
```

```
153164
```

```
len(train_data)
```

```
159571
```

```
len(test_target)
```

```
153164
```

```
train_data.isnull().sum()
```

```
id               0
comment_text     0
toxic            0
severe_toxic     0
obscene          0
threat           0
insult           0
identity_hate    0
dtype: int64
```

```
train_data.describe()
```

	toxic	severe_toxic	obscene	threat	insult	ider
count	159571.000000	159571.000000	159571.000000	159571.000000	159571.000000	1595
mean	0.095844	0.009996	0.052948	0.002996	0.049364	
std	0.294379	0.099477	0.223931	0.054650	0.216627	
min	0.000000	0.000000	0.000000	0.000000	0.000000	
25%	0.000000	0.000000	0.000000	0.000000	0.000000	
50%	0.000000	0.000000	0.000000	0.000000	0.000000	
75%	0.000000	0.000000	0.000000	0.000000	0.000000	
max	1.000000	1.000000	1.000000	1.000000	1.000000	

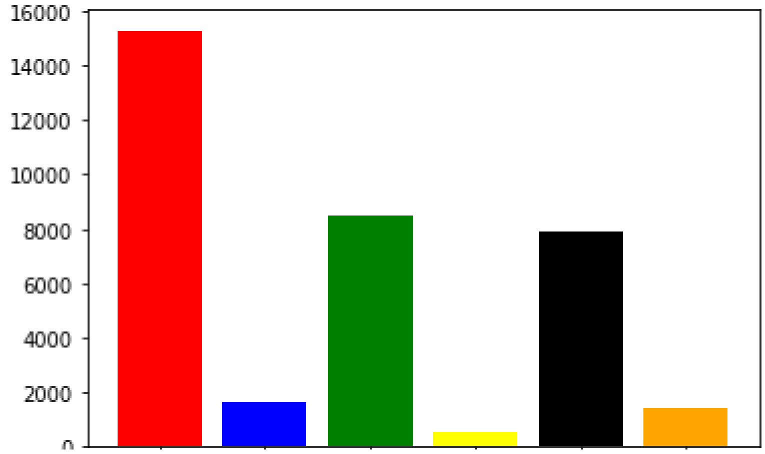
```
comments = train_data.drop(['id','comment_text'],axis = 1)
for i in comments.columns :
    print("Percent of {0}s: ".format(i), round(100*comments[i].mean(),2), "%")
```

```
Percent of toxics:  9.58 %
Percent of severe_toxics:  1.0 %
Percent of obscenes:  5.29 %
Percent of threats:  0.3 %
Percent of insults:  4.94 %
Percent of identity_hates:  0.88 %
```

```
classes = {}
for i in list(comments.columns):
    classes[i] =  comments[i].sum()
n_classes = [classes[i] for i in list(classes.keys())]
classes = list(classes.keys())
```

```
color = ['red','blue','green','yellow','black','orange']
plt.figure(figsize=(12,12))
fig, ax = plt.subplots()
ax.bar(classes,n_classes,color = color)
```

```
<BarContainer object of 6 artists>
<Figure size 864x864 with 0 Axes>
```



```
def  clean_text(text):
    text =  text.lower()
    text = re.sub(r"i'm", "i am", text)
    text = re.sub(r"\r", "", text)
    text = re.sub(r"he's", "he is", text)
    text = re.sub(r"she's", "she is", text)
    text = re.sub(r"it's", "it is", text)
    text = re.sub(r"that's", "that is", text)
    text = re.sub(r"what's", "that is", text)
    text = re.sub(r"where's", "where is", text)
    text = re.sub(r"how's", "how is", text)
    text = re.sub(r"\'ll", " will", text)
    text = re.sub(r"\'ve", " have", text)
    text = re.sub(r"\'re", " are", text)
    text = re.sub(r"\'d", " would", text)
    text = re.sub(r"\'re", " are", text)
    text = re.sub(r"won't", "will not", text)
    text = re.sub(r"can't", "cannot", text)
    text = re.sub(r"n't", " not", text)
    text = re.sub(r"n'", "ng", text)
    text = re.sub(r"'bout", "about", text)
    text = re.sub(r"'til", "until", text)
    text = re.sub(r"[-()\"#/@;:<>{}`+=~|.!?,]", "", text)
    text = text.translate(str.maketrans('', '', string.punctuation))
    text = re.sub("(\\W)"," ",text)
    text = re.sub('\S*\d\S*\s*','', text)

    return text



train_data.comment_text = train_data.comment_text.apply(clean_text)


train_data.head()
```

	id	comment_text	toxic	severe_toxic	obscene	threat	insult	ide
0	0000997932d777bf	explanation why the edits made under my userna...	0	0	0	0	0	

```
nltk.download('stopwords')
sn = SnowballStemmer(language='english')


def stemmer(text):
    words =  text.split()
    train = [sn.stem(word) for word in words if not word in set(stopwords.words('english')
    return ' '.join(train)
```

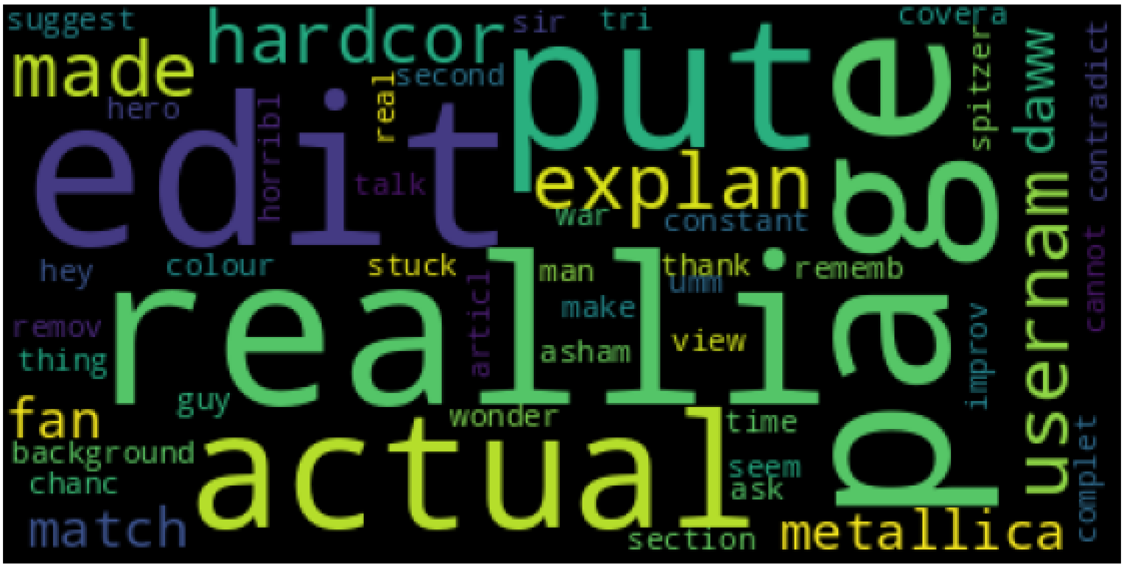
```
 [nltk_data] Downloading package stopwords to /usr/share/nltk_data...
 [nltk_data]   Package stopwords is already up-to-date!
```

```
train_data.comment_text = train_data.comment_text.apply(stemmer)
```

```
train_data.comment_text.head()
```

```
 0    explan edit made usernam hardcor metallica fan...
 1    daww match background colour seem stuck thank ...
 2    hey man realli tri edit war guy constant remov...
 3    cannot make real suggest improv wonder section...
 4                                 sir hero chanc rememb page
 Name: comment_text, dtype: object
```

```
wordcloud = WordCloud(stopwords=stopwords.words('english'),max_words=50).generate(str(trai
plt.figure(figsize=(10,6))
plt.imshow(wordcloud)
plt.axis('off')
plt.show()
```



```
x =  train_data.comment_text
```

```
y =  train_data.drop(['id','comment_text'],axis = 1)
```

```
x_train,x_test,y_train,y_test =  train_test_split(x,y,test_size = 0.2,random_state = 45)
```

```
x_train
```

```
9162      anteced etc technic manual page encyclopaedia ...
87716                             redirect talkrepubl survivor
63837     possibl imag hi patrick take look httpbroadsid...
148939    happi new year dheyward classplainlink dheywar...
30008          nobodi said coi remov content clear referenc
                                ...
81853                                                messag
143967    attack attack name synchrocat seem respons edi...
60960     ban spot even bother give warn never contribut...
137084    preced unsign comment ad talk contrib june utc...
137630    dear yamla sorri misunderstand dont know els c...
Name: comment_text, Length: 127656, dtype: object
```

```
y_train
```

	toxic	severe_toxic	obscene	threat	insult	identity_hate
9162	0	0	0	0	0	0
87716	0	0	0	0	0	0
63837	0	0	0	0	0	0
148939	0	0	0	0	0	0
30008	0	0	0	0	0	0
...	...	...	...	...	...	...
81853	0	0	0	0	0	0
143967	0	0	0	0	0	0
60960	0	0	0	0	0	0
137084	0	0	0	0	0	0
137630	0	0	0	0	0	0

127656 rows × 6 columns

```
word_vectorizer = TfidfVectorizer(
    strip_accents='unicode',
    analyzer='word',
    token_pattern=r'\w{1,}',
    ngram_range=(1, 3),
    stop_words='english',
    sublinear_tf=True)

word_vectorizer.fit(x_train)
train_word_features = word_vectorizer.transform(x_train)
```

```
X_train_transformed = word_vectorizer.transform(x_train)
X_test_transformed = word_vectorizer.transform(x_test)
```

```
print(X_train_transformed)
```

```
  (0, 4519984)	0.1625497902267149
  (0, 4519982)	0.12851811001523694
  (0, 4502375)	0.04091808252509933
  (0, 4315832)	0.04567361786893691
  (0, 4207682)	0.1625497902267149
  (0, 4207680)	0.15020368438587042
  (0, 4207157)	0.08495431931991007
  (0, 4135267)	0.1625497902267149
  (0, 4135266)	0.1625497902267149
  (0, 4134118)	0.07243925822538434
  (0, 3924582)	0.1625497902267149
  (0, 3924581)	0.1625497902267149
  (0, 3923546)	0.056561284231265205
  (0, 3632377)	0.1625497902267149
  (0, 3632376)	0.1625497902267149
  (0, 3632368)	0.13732911846254384
  (0, 3261139)	0.1625497902267149
  (0, 3261138)	0.1625497902267149
  (0, 3259781)	0.05804566020466676
  (0, 2965651)	0.1625497902267149
  (0, 2965650)	0.1625497902267149
  (0, 2956522)	0.03541498449032313
  (0, 2535228)	0.1625497902267149
  (0, 2535227)	0.15708655136012298
  (0, 2535021)	0.07759130531691434
  :	:
  (127655, 2326865)	0.10949707660587814
  (127655, 2325452)	0.08073683782023532
  (127655, 2245344)	0.1641448879172348
  (127655, 2245339)	0.12408218848844661
  (127655, 2240997)	0.04506174761915817
  (127655, 1872385)	0.1641448879172348
  (127655, 1872384)	0.1641448879172348
  (127655, 1339793)	0.1641448879172348
  (127655, 1339778)	0.13215154696550677
  (127655, 1339094)	0.06393258950811748
  (127655, 1313306)	0.1641448879172348
  (127655, 1313305)	0.1641448879172348
  (127655, 1309375)	0.05423076762201019
  (127655, 1237088)	0.15167762999808757
  (127655, 1237037)	0.09828746172274881
  (127655, 1236193)	0.07256114075271146
  (127655, 1073538)	0.1641448879172348
  (127655, 1073537)	0.1641448879172348
  (127655, 1072242)	0.08186298102177123
  (127655, 817702)	0.1641448879172348
  (127655, 817701)	0.1641448879172348
  (127655, 812619)	0.05771639670516405
  (127655, 363971)	0.1641448879172348
  (127655, 363968)	0.15471377137816955
  (127655, 359886)	0.06265144410292947
```

```
log_reg = LogisticRegression(C = 10, penalty='l2', solver = 'liblinear', random_state=45)

classifier = OneVsRestClassifier(log_reg)
classifier.fit(X_train_transformed, y_train)


y_train_pred_proba = classifier.predict_proba(X_train_transformed)
y_test_pred_proba = classifier.predict_proba(X_test_transformed)


roc_auc_score_train = roc_auc_score(y_train, y_train_pred_proba,average='weighted')
roc_auc_score_test = roc_auc_score(y_test, y_test_pred_proba,average='weighted')

print("ROC AUC Score Train:", roc_auc_score_train)
print("ROC AUC Score Test:", roc_auc_score_test)
```

```
ROC AUC Score Train: 0.9998057854773116
ROC AUC Score Test: 0.9776951604870202
```

```
def make_test_predictions(df,classifier):
    df.comment_text = df.comment_text.apply(clean_text)
    df.comment_text = df.comment_text.apply(stemmer)
    X_test = df.comment_text
    X_test_transformed = word_vectorizer.transform(X_test)
    y_test_pred = classifier.predict_proba(X_test_transformed)
    return y_test_pred
    #y_test_pred_df = pd.DataFrame(y_test_pred,columns=comments.columns)
    #submission_df = pd.concat([df.id, y_test_pred_df], axis=1)
    #submission_df.to_csv('submission.csv', index = False)
```

```
xx ={'id':[565],'comment_text':['Shut up your mouth bitch']}
xx = pd.DataFrame(xx)
```

```
#test 1
make_test_predictions(xx,classifier)
```

```
array([[0.99999983, 0.87949241, 0.99992886, 0.01799141, 0.9999273 ,
        0.06406467]])
```

```
xx ={'id':[565],'comment_text':['hi I am happy to be here']}
xx = pd.DataFrame(xx)
```

```
#test 2
make_test_predictions(xx,classifier)
```

```
array([[0.00573629, 0.00150594, 0.00329071, 0.00081877, 0.00235262,
        0.00235218]])
```

```
pickle.dump(classifier, open('classifier.sav', 'wb'))

loaded_model = pickle.load(open('classifier.sav', 'rb'))
```