INFO 5810 Data Analysis and Knowledge Discovery

Topic : Disaster data mining based on social media texts

Group Team 7

Project Final Submission

Dataset: https://www.kaggle.com/datasets/vstepanenko/disaster-tweets?resource=download (https://www.kaggle.com/datasets/vstepanenko/disaster-tweets?resource=download)

we have choosen above disaster dataset from the twitter social media platform as it has most of all disasters happen in various locations around the united states it have fields like id,keyword,location,text,target where target is 1 will defines the disater incident as real.

Github url: https://github.com/Haryanth/Project-group-7 (https://github.com/Haryanth/Project-group-7)

In [57]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import matplotlib as plt2

# Importing and reading csv file
df = pd.read_csv('tweet.csv')


# First 5 records
print("The first five records are ")
df.head(5)
print("The number of rows and columns are ",len(df.axes[0]),'and',len(df.axes[1]))
```

```
The first five records are 
The number of rows and columns are  11370 and 5
```

Data Cleaning:

1. Analysis on empty cells
   A. Finding number of empty cells present in the data set.
   B. Deciding whether to replace the data with mean, mode, median etc or to remove the empty cells.
2. Removing Duplicates if present in the data set.

In [58]:

```
# Analysis by removing empty cells

new_df = df.dropna()
print("The number of rows and columns are ",len(new_df.axes[0]),'and',len(new_df.axes[1]))
```

```
The number of rows and columns are  7952 and 5
```

In [59]:

```
# As there are nearly 4k records were removed, it is good to replace those empty values
# Finding number of missing values present in each column

print(' The number of missing values in each column are ')
print(df.isnull().sum())
```

```
 The number of missing values in each column are 
id             0
keyword        0
location    3418
text           0
target         0
dtype: int64
```

In [69]:

```
# From above analysis it is evident that the location column only has missing values
# Finding different values in location column and their counts

print(df.location.value_counts())
```

```
United States              96
Australia                  83
London, England            81
UK                         77
India                      74
                           ..
Great State of Texas        1
Karatina, Kenya             1
The internet or the gym     1
Reston, VA                  1
auroraborealis              1
Name: location, Length: 4504, dtype: int64
```

In [70]:

```
# Number of Unique values in location column

n = len(pd.unique(df['location']))
print("No.of.unique values :", n)
```

```
No.of.unique values : 4504
```

In [71]:

```
# From the above trend, as location are nominal type of values and there are 4505 unique values in it.
# The count of mode is 96 which is way small when compared to 8k records.
# It is best to remove those records

# Removing missing records
df.dropna(inplace = True)
print("The number of rows and columns are ",len(df.axes[0]),'and',len(df.axes[1]))
print("Missing values in each column are ")
print(df.isnull().sum())
```

```
The number of rows and columns are  7952 and 5
Missing values in each column are
id          0
keyword     0
location    0
text        0
target      0
dtype: int64
```

In [72]:

```
# Different columns and their data types

print('Columns and their data types are ')
print(df.info())
```

```
Columns and their data types are
<class 'pandas.core.frame.DataFrame'>
Int64Index: 7952 entries, 2 to 11368
Data columns (total 5 columns):
 #   Column    Non-Null Count  Dtype 
---  ------    --------------  ----- 
 0   id        7952 non-null   int64 
 1   keyword   7952 non-null   object
 2   location  7952 non-null   object
 3   text      7952 non-null   object
 4   target    7952 non-null   int64 
dtypes: int64(2), object(3)
memory usage: 372.8+ KB
None
```

In [73]:

```
# Removing duplicates

df.drop_duplicates(inplace = True)
```

In [74]:

```
print("The number of rows and columns are ",len(df.axes[0]),'and',len(df.axes[1]))
```

```
The number of rows and columns are  7952 and 5
```

In [75]:

```
# From above it is evident that there are no duplicates in the data.
```

In [76]:

```
df.to_csv('./disasters_cleaned.csv', index=False)
```

In [77]:

```
df
```

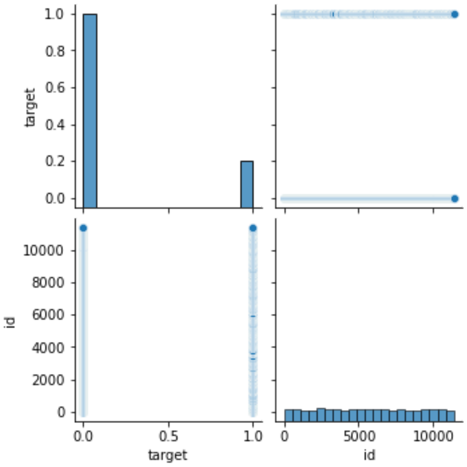
Out[77]:

	id	keyword	location	text	target
2	2	ablaze	New York City	Arsonist sets cars ablaze at dealership https:...	1
3	3	ablaze	Morgantown, WV	Arsonist sets cars ablaze at dealership https:...	1
5	5	ablaze	OC	If this child was Chinese, this tweet would ha...	0
6	6	ablaze	London, England	Several houses have been set ablaze in Ngemsib...	1
7	7	ablaze	Bharat	Asansol: A BJP office in Salanpur village was ...	1
...	...	...	...	...	...
11362	11362	wrecked	feuille d'érable	Stell wrecked ako palagi sayo. Haha. #ALABTopS...	0
11365	11365	wrecked	Blue State in a red sea	Media should have warned us well in advance. T...	0
11366	11366	wrecked	arohaonces	i feel directly attacked 💀 i consider moonbin ...	0
11367	11367	wrecked	PH	i feel directly attacked 💀 i consider moonbin ...	0
11368	11368	wrecked	auroraborealis	ok who remember "outcast" nd the "dora" au?? T...	0

7952 rows × 5 columns

In [78]:

```
sns.pairplot(df[['target','location','keyword','id']]);
```



In [79]:

```
disaster_types = df['keyword'].unique()
print("Types of Disasters reported:\n\n", 'location')
print("Occurrences:\n\n",df['keyword'].value_counts())
```

```
Types of Disasters reported:

 location
Occurrences:

 flattened      71
thunderstorm    70
collision       66
engulfed        66
stretcher       64
                ..
exploded        11
siren            7
deluged          6
rainstorm        6
tsunami          5
Name: keyword, Length: 219, dtype: int64
```

In [80]:

```
df
```

Out[80]:

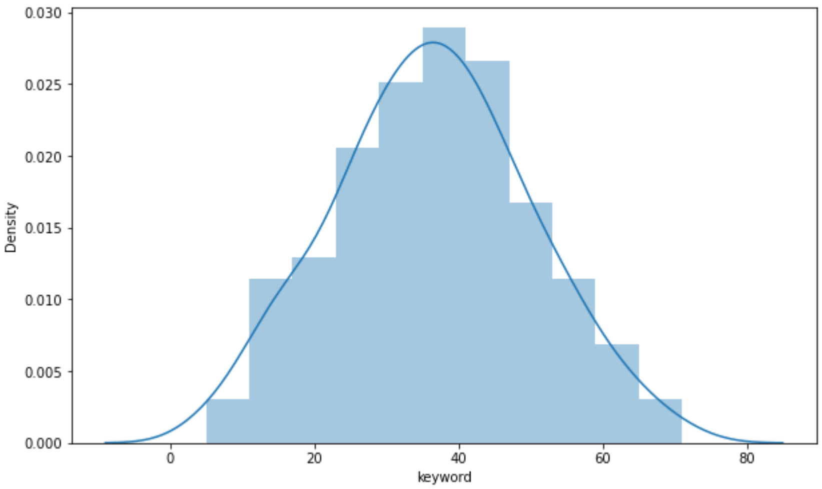
	id	keyword	location	text	target
2	2	ablaze	New York City	Arsonist sets cars ablaze at dealership https:...	1
3	3	ablaze	Morgantown, WV	Arsonist sets cars ablaze at dealership https:...	1
5	5	ablaze	OC	If this child was Chinese, this tweet would ha...	0
6	6	ablaze	London, England	Several houses have been set ablaze in Ngemsib...	1
7	7	ablaze	Bharat	Asansol: A BJP office in Salanpur village was ...	1
...	...	...	...	...	...
11362	11362	wrecked	feuille d'érable	Stell wrecked ako palagi sayo. Haha. #ALABTopS...	0
11365	11365	wrecked	Blue State in a red sea	Media should have warned us well in advance. T...	0
11366	11366	wrecked	arohaonces	i feel directly attacked 💀 i consider moonbin ...	0
11367	11367	wrecked	ᴘʜ	i feel directly attacked 💀 i consider moonbin ...	0
11368	11368	wrecked	auroraborealis	ok who remember "outcast" nd the "dora" au?? T...	0

7952 rows × 5 columns

In [81]:

```
plt2.pyplot.figure(figsize=(10,6))
sns.distplot(df['keyword'].value_counts());
```

```
C:\Users\akula\anaconda3\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a deprecated function
and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level function with simila
r flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
```



In [82]:

```
p = df[['keyword', 'location']]
p.groupby(['location'])
# p.reset_index(inplace=False)
# p=p.sort_values(by='keyword',ascending=False).head(10)
p_count = (p.groupby(['keyword']).count())
p_count
```

Out[82]:

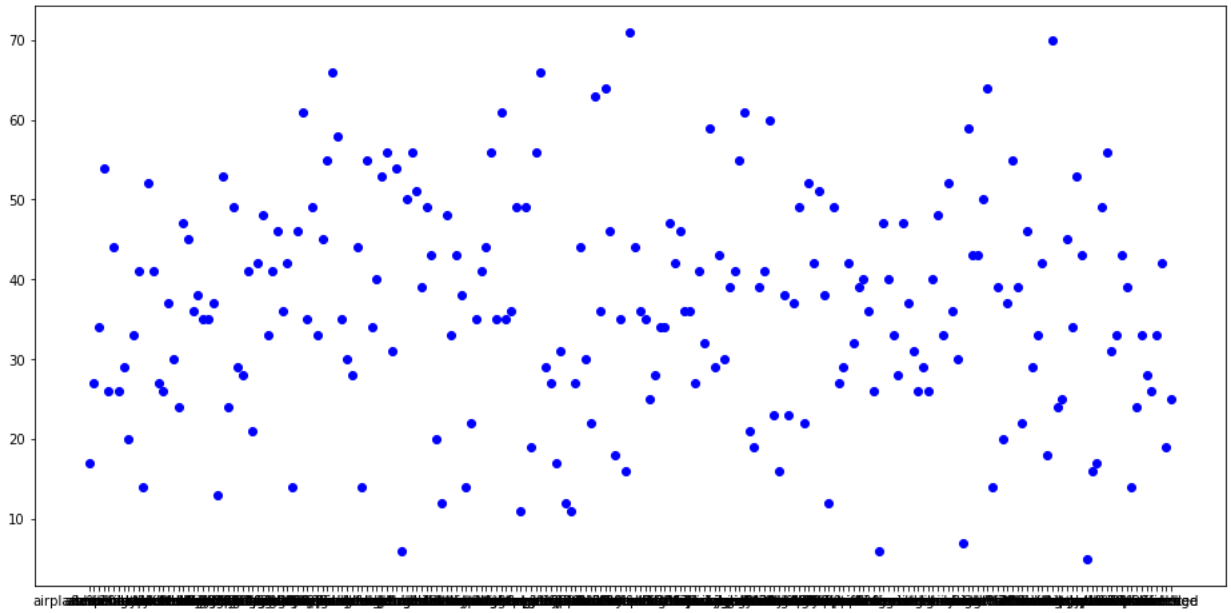
	location
keyword	
ablaze	17
accident	27
aftershock	34
airplane%20accident	54
ambulance	26
...	...
wounded	26
wounds	33
wreck	42
wreckage	19
wrecked	25

219 rows × 1 columns

lets have a look at the frequency of locations a disaster occurred in the country.

In [83]:

```
plt2.pyplot.figure(figsize=(16,8))
plt.scatter(p_count.index, p_count['location'], c='blue')
plt.show()
```



In [84]:

```
print("Texas mostly faces:\n")
df[['location','keyword']].groupby('location').max().loc['TX']
```

```
Texas mostly faces:
```

Out[84]:

```
keyword    electrocute
Name: TX, dtype: object
```

In [85]:

```python
# Description of Data

df.describe()
```

Out[85]:

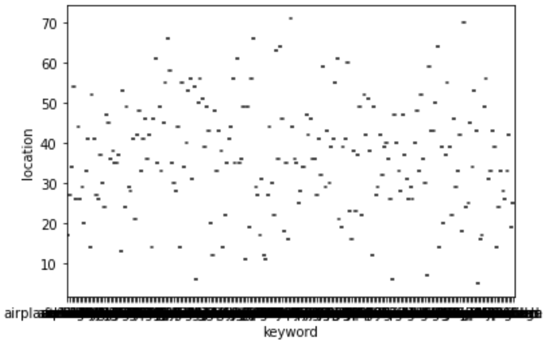
	id	target
count	7952.000000	7952.000000
mean	5679.721705	0.192530
std	3260.075795	0.394312
min	2.000000	0.000000
25%	2854.750000	0.000000
50%	5674.500000	0.000000
75%	8507.500000	0.000000
max	11368.000000	1.000000

In [86]:

```python
# Detecting outliners
sns.boxplot(x=p_count.index, y=p_count['location'])
```

Out[86]:

```
<AxesSubplot:xlabel='keyword', ylabel='location'>
```

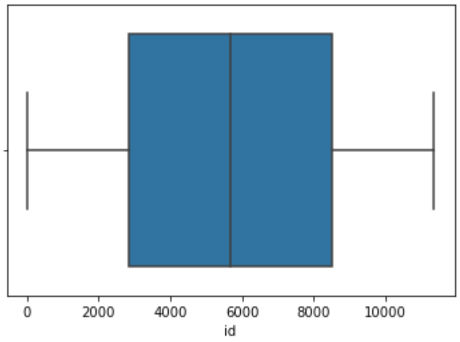


In [87]:

```python
sns.boxplot(x=df['id'])
```

Out[87]:

```
<AxesSubplot:xlabel='id'>
```



In [89]:

```python
#Logistic Regression Model Buiding

from sklearn import datasets, linear_model, metrics
from sklearn.model_selection import train_test_split

#X = df.drop('target',axis=1)
X = df['text']
y = df['target']

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.33,random_state=42)
print(X.shape)
```

```
(7952,)
```

In [90]:

```python
print(X_train.shape,X_test.shape,y_train.shape,y_test.shape)
```

```
(5327,) (2625,) (5327,) (2625,)
```

In [91]:

```
import nltk
nltk.download('stopwords')
from nltk.corpus import stopwords
stop = stopwords.words('english')
# Porter stemmer
from nltk.stem.porter import PorterStemmer
porter = PorterStemmer()
# Snowball stemmer
from nltk.stem import SnowballStemmer
snowball = SnowballStemmer('english')
# Wordnet lemmatizer
from nltk.stem import WordNetLemmatizer
lemmatizer = WordNetLemmatizer()
from sklearn.feature_extraction.text import CountVectorizer, TfidfVectorizer
from sklearn.pipeline import Pipeline
from sklearn.linear_model import LogisticRegression
from sklearn.model_selection import GridSearchCV


#Using count vectors
vectorizer = CountVectorizer(min_df=5)
vectors = vectorizer.fit_transform(df['text'])
```

```
[nltk_data] Downloading package stopwords to
[nltk_data]     C:\Users\akula\AppData\Roaming\nltk_data...
[nltk_data]   Package stopwords is already up-to-date!
```

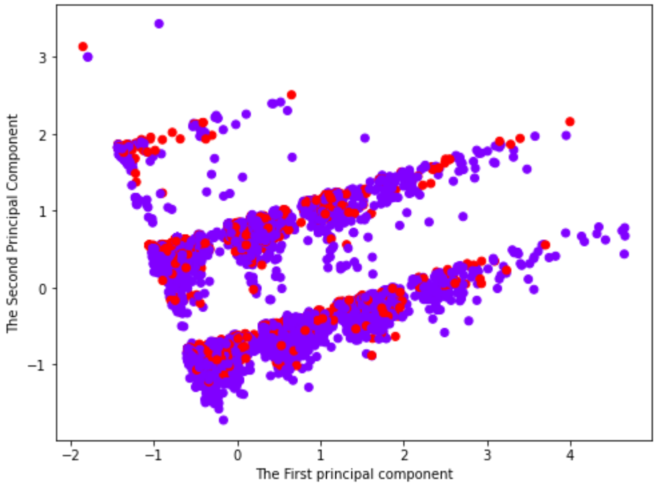
In [92]:

```
from sklearn.decomposition import PCA

#Reducing dimensionality of large dataset

pcanalysis = PCA(n_components=2)
x_pcanalysis = pcanalysis.fit_transform(vectors.todense())
plt.figure(figsize=(8,6))
plt.scatter(x_pcanalysis[:,0],x_pcanalysis[:,1],c=df['target'],cmap='rainbow')
plt.xlabel('The First principal component')
plt.ylabel('The Second Principal Component')
```

```
C:\Users\akula\anaconda3\lib\site-packages\sklearn\utils\validation.py:593: FutureWarning: np.matrix usage is deprecated in
1.0 and will raise a TypeError in 1.2. Please convert to a numpy array with np.asarray. For more information see: https://nu
mpy.org/doc/stable/reference/generated/numpy.matrix.html (https://numpy.org/doc/stable/reference/generated/numpy.matrix.htm
l)
  warnings.warn(
```

Out[92]:

```
Text(0, 0.5, 'The Second Principal Component')
```



In [93]:

```
#Using TF IDF
#Normalizing the Data

TFIDF = TfidfVectorizer(min_df=5)
tfidf_vectors = TFIDF.fit_transform(df['text'])
```

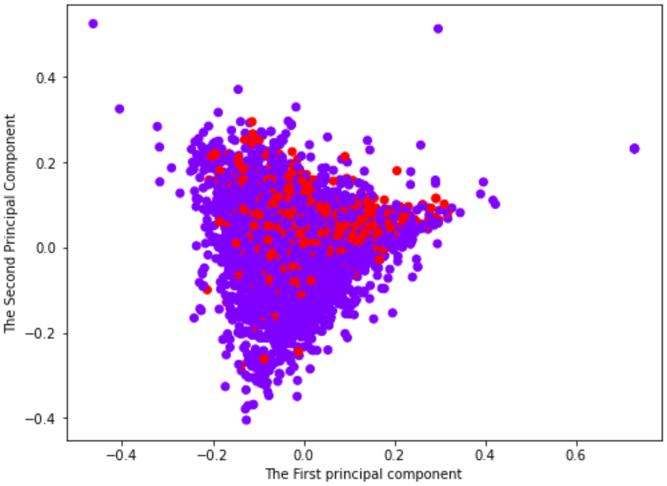
In [94]:

```
# Applying PCA technique to TF IDF vectors

tfidf_pca = PCA(n_components=2)
x_pca = tfidf_pca.fit_transform(tfidf_vectors.todense())
plt.figure(figsize=(8,6))
plt.scatter(x_pca[:,0],x_pca[:,1],c=df['target'],cmap='rainbow')
plt.xlabel('The First principal component')
plt.ylabel('The Second Principal Component')
```

```
C:\Users\akula\anaconda3\lib\site-packages\sklearn\utils\validation.py:593: FutureWarning: np.matrix usage is deprecated in
1.0 and will raise a TypeError in 1.2. Please convert to a numpy array with np.asarray. For more information see: https://nu
mpy.org/doc/stable/reference/generated/numpy.matrix.html (https://numpy.org/doc/stable/reference/generated/numpy.matrix.htm
l)
  warnings.warn(
```

Out[94]:

```
Text(0, 0.5, 'The Second Principal Component')
```



In [95]:

```
def split(text):
    return text.split()

def porter(text):
    return [porter.stem(word) for word in text.split()]

def snowball(text):
    return [snowball.stem(word) for word in text.split()]

def wordnet_lemmatizer(text):
    return [lemmatizer.lemmatize(word) for word in text.split()]

TFIDF = TfidfVectorizer(strip_accents=None, lowercase=False, preprocessor=None)
```

In [96]:

```
param_grid = [
    {
        'vect__ngram_range': [(1, 2)],
        'vect__stop_words': [stop, None],
        'vect__tokenizer': [split, porter, snowball, wordnet_lemmatizer],
        'clf__penalty': ['l1', 'l2'],
        'clf__C': [1.0, 10.0, 100.0]
    },
    {
        'vect__ngram_range': [(1, 2)],
        'vect__stop_words': [stop, None],
        'vect__tokenizer': [split, porter, snowball, wordnet_lemmatizer],
        'vect__use_idf': [False],
        'vect__norm': [None],
        'clf__penalty': ['l1', 'l2'],
        'clf__C': [1.0, 10.0, 100.0]
    }
]

pipeline_tfidf = Pipeline([('vect', TFIDF),
                     ('clf', LogisticRegression(C=0.1, penalty='l1', solver='liblinear'))])

#Using the grid search
grid_tfidf = GridSearchCV(pipeline_tfidf, param_grid, scoring='accuracy',
                          cv=5, verbose=1, n_jobs=-1)
```

In [97]:

```
nltk.download('wordnet')
X_train.shape
y_train.shape
grid_tfidf.fit(X_train, y_train)
```

```
             estimator=Pipeline(steps=[('vect',
                                        TfidfVectorizer(lowercase=False)),
                                       ('clf',
                                        LogisticRegression(C=0.1, penalty='l1',
                                                           solver='liblinear'))]),
             n_jobs=-1,
             param_grid=[{'clf__C': [1.0, 10.0, 100.0],
                          'clf__penalty': ['l1', 'l2'],
                          'vect__ngram_range': [(1, 2)],
                          'vect__stop_words': [['i', 'me', 'my', 'myself', 'we',
                                                'our', 'ours', 'ourselves',
                                                'you', "you're", "yo...
                                                'yourselves', 'he', 'him',
                                                'his', 'himself', 'she',
                                                "she's", 'her', 'hers',
                                                'herself', 'it', "it's", 'its',
                                                'itself', ...],
                                               None],
                          'vect__tokenizer': [<function split at 0x000002B9CDBA09D0>,
                                              <function porter at 0x000002B9CCA53310>,
```

In [98]:

```
grid_tfidf.best_params_
```

Out[98]:

```
{'clf__C': 100.0,
 'clf__penalty': 'l2',
 'vect__ngram_range': (1, 2),
 'vect__stop_words': None,
 'vect__tokenizer': <function __main__.split(text)>}
```

In [99]:

```
grid_tfidf.best_score_
```

Out[99]:

```
0.8837992054893464
```

In [100]:

```
# Accuracy of Model
estimator = grid_tfidf.best_estimator_
estimator.score(X_test, y_test)
```

Out[100]:

```
0.8853333333333333
```

In [102]:

```
#Prediction from the built model

print(df['text'].iloc[0])
print('The predicted value is ',estimator.predict([df['text'].iloc[0]]))
print('True target: ', df['target'].iloc[0])
```

```
Arsonist sets cars ablaze at dealership https://t.co/gOQvyJbpVI (https://t.co/gOQvyJbpVI)
The predicted value is  [1]
True target:  1
```