Disaster_tweets

February 18, 2024

1 Natural Language Processing with Disaster Tweets

Jupyter notebook

https://github.com/alex80ds/Boulder-CU/blob/main/Disaster_tweets.ipynb

PDF file

https://github.com/alex80ds/Boulder-CU/blob/main/Disaster_tweets.pdf

[1]:
```
import numpy as np
import pandas as pd
```

[2]:
```
train = pd.read_csv('train.csv')
test = pd.read_csv('test.csv')
```

2 EDA

[3]:
```
train.head()
```

[3]:
```
   id keyword location                                              text  \
0   1     NaN      NaN  Our Deeds are the Reason of this #earthquake M…
1   4     NaN      NaN             Forest fire near La Ronge Sask. Canada
2   5     NaN      NaN  All residents asked to 'shelter in place' are …
3   6     NaN      NaN  13,000 people receive #wildfires evacuation or…
4   7     NaN      NaN  Just got sent this photo from Ruby #Alaska as …

   target
0       1
1       1
2       1
3       1
4       1
```

[4]:
```
train.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 7613 entries, 0 to 7612
Data columns (total 5 columns):
```

```
 #   Column    Non-Null Count  Dtype
---  ------    --------------  -----
 0   id        7613 non-null   int64
 1   keyword   7552 non-null   object
 2   location  5080 non-null   object
 3   text      7613 non-null   object
 4   target    7613 non-null   int64
dtypes: int64(2), object(3)
memory usage: 297.5+ KB
```

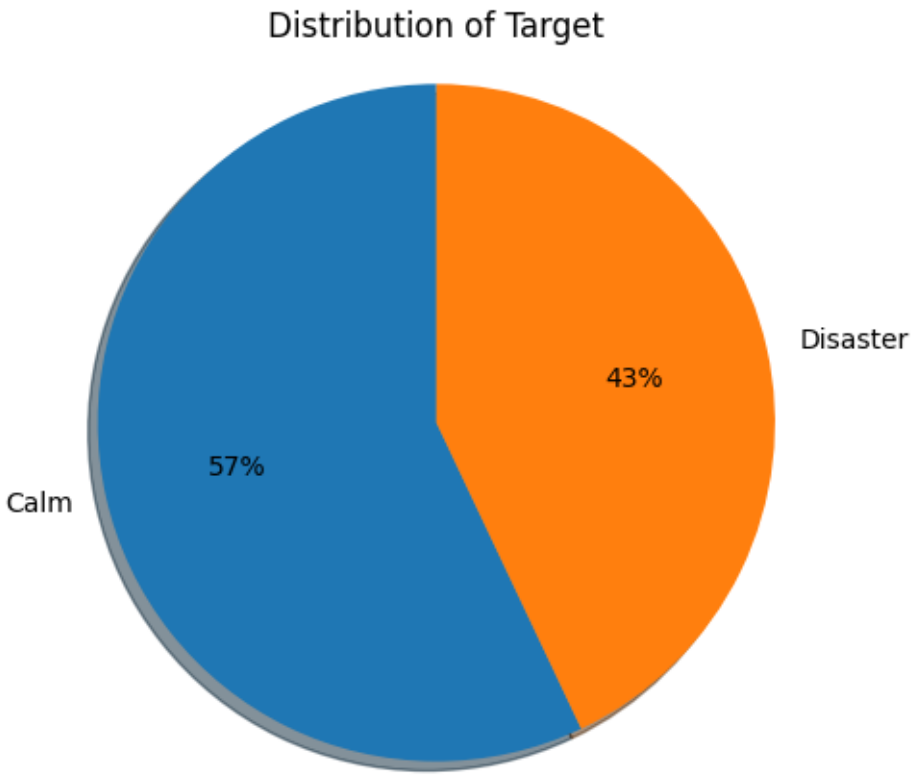
[5]:
```
train.describe()
```

[5]:
```
                id      target
count   7613.000000  7613.00000
mean    5441.934848     0.42966
std     3137.116090     0.49506
min        1.000000     0.00000
25%     2734.000000     0.00000
50%     5408.000000     0.00000
75%     8146.000000     1.00000
max    10873.000000     1.00000
```

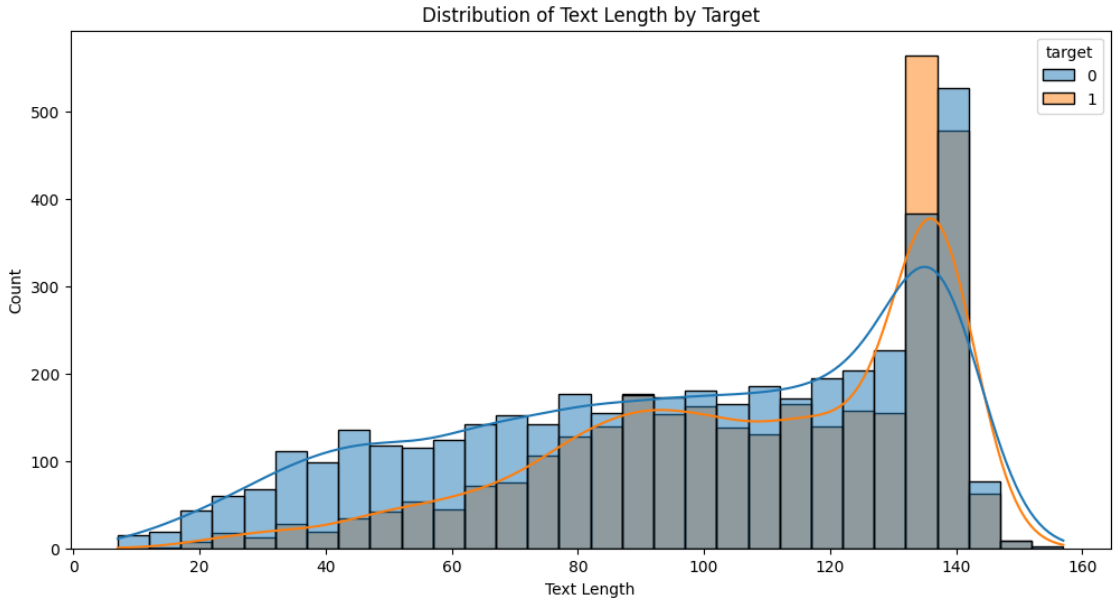
[6]:
```
train.isnull().sum()
```

[6]:
```
id             0
keyword       61
location    2533
text           0
target         0
dtype: int64
```

[7]:
```
import matplotlib.pyplot as plt

calm, disaster = train['target'].value_counts()
calm, disaster

fig = plt.figure(figsize=(5,5))
labels = 'Calm', 'Disaster'
sizes = [calm, disaster]
plt.pie(sizes, labels=labels, autopct='%0.0f%%',
        shadow=True, startangle=90)
plt.title('Distribution of Target')
plt.axis('equal')
plt.show()
```



[8]:
```
import seaborn as sns

train['text_length'] = train['text'].apply(len)

plt.figure(figsize=(12, 6))
sns.histplot(data=train, x='text_length', hue='target', bins=30, kde=True)
plt.title('Distribution of Text Length by Target')
plt.xlabel('Text Length')
plt.ylabel('Count')
plt.show()
```



3 DATA PREPROCESSING

[9]:
```
train.drop(['id','keyword', 'location'], axis = 1, inplace=True)
train.head()
```

[9]:

	text	target	text_length
0	Our Deeds are the Reason of this #earthquake M…	1	69
1	Forest fire near La Ronge Sask. Canada	1	38
2	All residents asked to 'shelter in place' are …	1	133
3	13,000 people receive #wildfires evacuation or…	1	65
4	Just got sent this photo from Ruby #Alaska as …	1	88

[10]:
```
import re
import nltk
import pandas as pd
from nltk.tokenize import word_tokenize
from nltk.corpus import stopwords
from nltk.stem import PorterStemmer

# Download necessary resources for NLTK
nltk.download('punkt')
nltk.download('stopwords')


def preprocess_text(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('\n', '', text)
    text = re.sub('\w*\d\w*', '', text)
    text = re.sub(r'[^\w\s\d]', '', text)

    tokens = word_tokenize(text)

    clean_tokens = [re.sub(r'[^a-zA-Z0-9]', '', token) for token in tokens if␣
 ↪re.sub(r'[^a-zA-Z0-9]', '', token)]

    stop_words = set(stopwords.words('english'))
    filtered_tokens = [token for token in clean_tokens if token not in␣
 ↪stop_words]

    stemmer = PorterStemmer()
    stemmed_tokens = [stemmer.stem(token) for token in filtered_tokens]

    preprocessed_text = ' '.join(stemmed_tokens)

    return preprocessed_text

train['text'] = train['text'].apply(preprocess_text)
test['text'] = test['text'].apply(preprocess_text)
test.drop(['keyword', 'location'], axis = 1, inplace=True)
train
```

```
[nltk_data] Downloading package punkt to /home/alex/nltk_data…
[nltk_data]   Package punkt is already up-to-date!
[nltk_data] Downloading package stopwords to /home/alex/nltk_data…
[nltk_data]   Package stopwords is already up-to-date!
```

[10]:

	text	target	text_length
0	deed reason earthquak may allah forgiv us	1	69
1	forest fire near la rong sask canada	1	38
2	resid ask shelter place notifi offic evacu she…	1	133
3	peopl receiv wildfir evacu order california	1	65
4	got sent photo rubi alaska smoke wildfir pour …	1	88
…	…	…	…
7608	two giant crane hold bridg collaps nearbi home…	1	83
7609	ariaahrari thetawniest control wild fire calif…	1	125
7610	volcano hawaii http co	1	65
7611	polic investig e bike collid car littl portug …	1	137
7612	latest home raze northern california wildfir a…	1	94

```
[7613 rows x 3 columns]
```

[11]:
```
test
```

[11]:
```
          id                                                text
0          0                             happen terribl car crash
1          2     heard earthquak differ citi stay safe everyon
2          3  forest fire spot pond gees flee across street …
3          9                       apocalyps light spokan wildfir
4         11                  typhoon soudelor kill china taiwan
…        …                                                   …
3258   10861       earthquak safeti lo angel safeti fasten xrwn
3259   10865  storm ri wors last hurrican citi amp hardest h…
3260   10868       green line derail chicago http co utbxlcbiuy
3261   10874        meg issu hazard weather outlook hwo http co
3262   10875    cityofcalgari activ municip emerg plan yycstorm

[3263 rows x 2 columns]
```

4 MODELS

[38]:
```
from sklearn.feature_extraction.text import TfidfVectorizer
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.svm import SVC
from sklearn.ensemble import RandomForestClassifier
from sklearn.naive_bayes import MultinomialNB
from xgboost import XGBClassifier
from sklearn.model_selection import GridSearchCV
from sklearn.metrics import classification_report, accuracy_score
import warnings
warnings.filterwarnings('ignore')


tfidf = TfidfVectorizer()
X = tfidf.fit_transform(train['text'])
```

[22]:
```
X_train, X_valid, y_train, y_valid = train_test_split(X, train['target'],␣
 ↪test_size=0.2, random_state=42)
```

4.0.1 Random Forest

[25]:
```
param_grid = {'n_estimators': [100, 200, 300], 'max_depth': [10, 20, 30, None]}
random_forest = RandomForestClassifier()
grid_search_rf = GridSearchCV(random_forest, param_grid, cv=5)
grid_search_rf.fit(X_train, y_train)
best_params_rf = grid_search_rf.best_params_
best_score_rf = grid_search_rf.best_score_
```

[25]:
```
0.7816091954022987
```

[30]:
```
pred_rf_val = grid_search_rf.predict(X_valid)
print("Random Forest Accuracy:", accuracy_score(y_valid, pred_rf_val))
```

```
Random Forest Accuracy: 0.7905449770190414
```

4.0.2 Logistic Regression

[40]:
```
param_grid = {'C': [0.001, 0.01, 0.1, 1, 10, 100]}
logistic_regression = LogisticRegression()
grid_search_lr = GridSearchCV(logistic_regression, param_grid, cv=5)
grid_search_lr.fit(X_train, y_train)
best_params_lr = grid_search_lr.best_params_
best_score_lr = grid_search_lr.best_score_
```

[32]:
```
pred_lr_val = grid_search_lr.predict(X_valid)
print("Logistic Regression Accuracy:", accuracy_score(y_valid, pred_lr_val))
```

```
Logistic Regression Accuracy: 0.7957977675640184
```

4.0.3 Support Vector Machine

[33]:
```
param_grid = {'C': [0.1, 1, 10, 100], 'gamma': [1, 0.1, 0.01, 0.001], 'kernel':␣
↪['linear', 'rbf']}
svm = SVC()
grid_search_svm = GridSearchCV(svm, param_grid, cv=5)
grid_search_svm.fit(X_train, y_train)
best_params_svm = grid_search_svm.best_params_
best_score_svm = grid_search_svm.best_score_
```

[34]:
```
pred_svm_val = grid_search_svm.predict(X_valid)
print("Support Vector Machine Accuracy:", accuracy_score(y_valid, pred_svm_val))
```

```
Support Vector Machine Accuracy: 0.7951411687458962
```

4.0.4 Naive Bayes

[35]:
```
naive_bayes = MultinomialNB()
naive_bayes.fit(X_train, y_train)
```

[35]:
```
MultinomialNB()
```

[36]:
```
pred_nb_val = naive_bayes.predict(X_valid)
print("Naive Bayes Accuracy:", accuracy_score(y_valid, pred_nb_val))
```

```
Naive Bayes Accuracy: 0.8069599474720945
```

4.0.5 XGBoost

[37]:
```
param_grid = {'learning_rate': [0.1, 0.01, 0.001], 'max_depth': [3, 5, 7],␣
 ↪'n_estimators': [100, 200, 300]}
xgb = XGBClassifier()
grid_search_xgb = GridSearchCV(xgb, param_grid, cv=5)
grid_search_xgb.fit(X_train, y_train)
best_params_xgb = grid_search_xgb.best_params_
best_score_xgb = grid_search_xgb.best_score_
```

[39]:
```
pred_xgb_val = grid_search_xgb.predict(X_valid)
print("XGBoost Accuracy:", accuracy_score(y_valid, pred_xgb_val))
```

```
XGBoost Accuracy: 0.7846355876559422
```

All values are very close, but it showed better NAIVE BAYES = 0.807

5 Predict on test set

[41]:
```
X_test = tfidf.transform(test['text'])
test['target'] = grid_search_xgb.predict(X_test)
```

[42]:
```
test[['id', 'target']].to_csv('submission_AL.csv', index=False)
```

5.0.1 Result and conclusion

The study on disaster tweets utilized various machine learning models to classify tweets into disaster and non-disaster categories. The models tested include Random Forest, Logistic Regression, Support Vector Machine, Naive Bayes, and XGBoost. Naive Bayes demonstrated the highest accuracy at approximately 80.7%. The document concludes by applying the chosen model to predict disaster relevance on a test dataset, producing a submission file for evaluation. This study illustrates the effectiveness of Naive Bayes for text classification tasks in the context of natural disaster tweet analysis.

[ ]:
```

```