NLP Disaster Tweets Kaggle Mini-Project

December 10, 2024

[29]:
```
# Display basic description of the data
print("Data Description:")
print("This Kaggle competition involves classifying tweets into two categories: disaster-related or non-disaster-related.")
print("The training data contains the following columns:")
print("1. 'id': Unique identifier for each tweet")
print("2. 'keyword': Contains a relevant keyword, or NaN")
print("3. 'location': The location from which the tweet was posted, or NaN")
print("4. 'text': The actual tweet content")
print("5. 'target': The label for the tweet (1 for disaster-related, 0 for non-disaster-related)")
```

```
Data Description:
This Kaggle competition involves classifying tweets into two categories:
disaster-related or non-disaster-related.
The training data contains the following columns:
1. 'id': Unique identifier for each tweet
2. 'keyword': Contains a relevant keyword, or NaN
3. 'location': The location from which the tweet was posted, or NaN
4. 'text': The actual tweet content
5. 'target': The label for the tweet (1 for disaster-related, 0 for non-
disaster-related)
```

[28]:
```
import pandas as pd

# Load the datasets
train_df = pd.read_csv('train.csv')
test_df = pd.read_csv('test.csv')
sample_submission_df = pd.read_csv('sample_submission.csv')

# Display the first few rows of the datasets
print("Training Data:")
print(train_df.head())
print("\nTest Data:")
print(test_df.head())
print("\nSample Submission Data:")
print(sample_submission_df.head())
```

```
Training Data:
   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

Test Data:
   id keyword location                                                text
0   0     NaN      NaN                 Just happened a terrible car crash
1   2     NaN      NaN  Heard about #earthquake is different cities, s…
2   3     NaN      NaN  there is a forest fire at spot pond, geese are…
3   9     NaN      NaN           Apocalypse lighting. #Spokane #wildfires
4  11     NaN      NaN      Typhoon Soudelor kills 28 in China and Taiwan

Sample Submission Data:
   id  target
0   0       0
1   2       0
2   3       0
3   9       0
4  11       0
```

[10]:
```
# Display the first few rows of the dataframe to inspect the data
print(train_df.head())
```

```
   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
```

[11]:
```
# Check column types
print(train_df.dtypes)
```

```
id           int64
keyword     object
location    object
text        object
target       int64
dtype: object
```

[12]:
```
# Check for object type columns that might be causing issues
for col in train_df.columns:
    print(f"Column: {col}, Type: {type(train_df[col].iloc[0])}")
```

```
Column: id, Type: <class 'numpy.int64'>
Column: keyword, Type: <class 'float'>
Column: location, Type: <class 'float'>
Column: text, Type: <class 'str'>
Column: target, Type: <class 'numpy.int64'>
```

[13]:
```
# Check for any completely empty rows
print(train_df.isnull().sum())
```

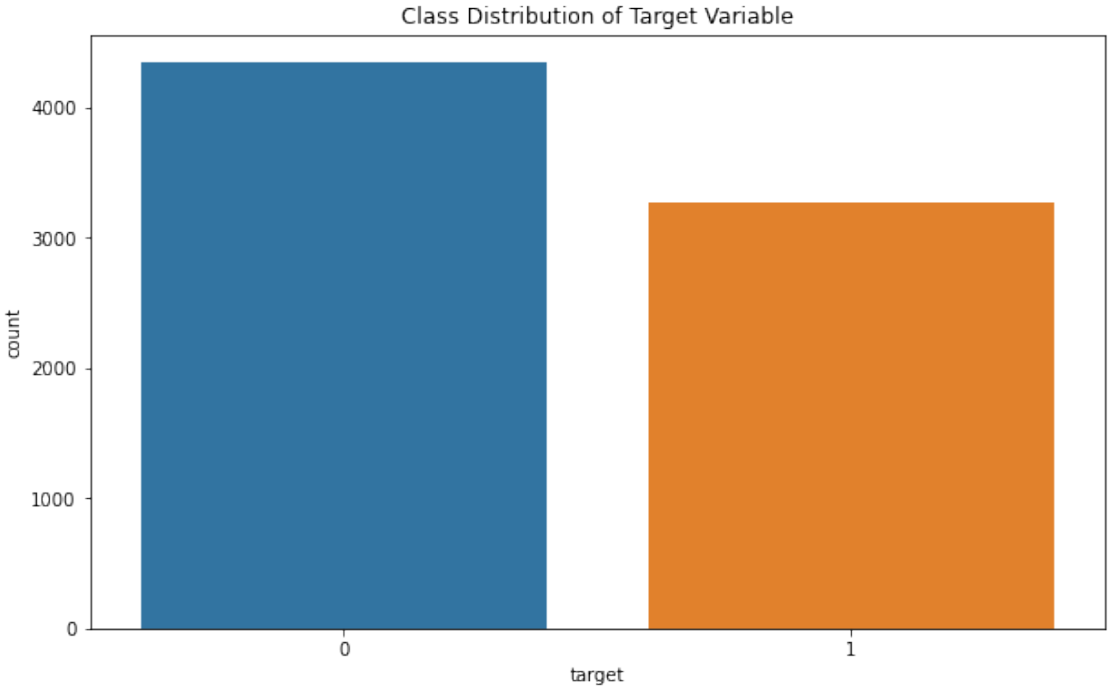
```
id             0
keyword       61
location    2533
text           0
target         0
dtype: int64
```

[14]:
```
# Fill missing 'keyword' with a placeholder (e.g., 'unknown')
train_df['keyword'] = train_df['keyword'].fillna('unknown')

# Fill missing 'location' with a placeholder (e.g., 'unknown')
train_df['location'] = train_df['location'].fillna('unknown')

# Convert 'keyword' and 'location' columns to object type (categorical data)
train_df['keyword'] = train_df['keyword'].astype('object')
train_df['location'] = train_df['location'].astype('object')

# Check if missing values are handled
print(train_df.isnull().sum())
```

```
id          0
keyword     0
location    0
text        0
target      0
```

```
dtype: int64
```

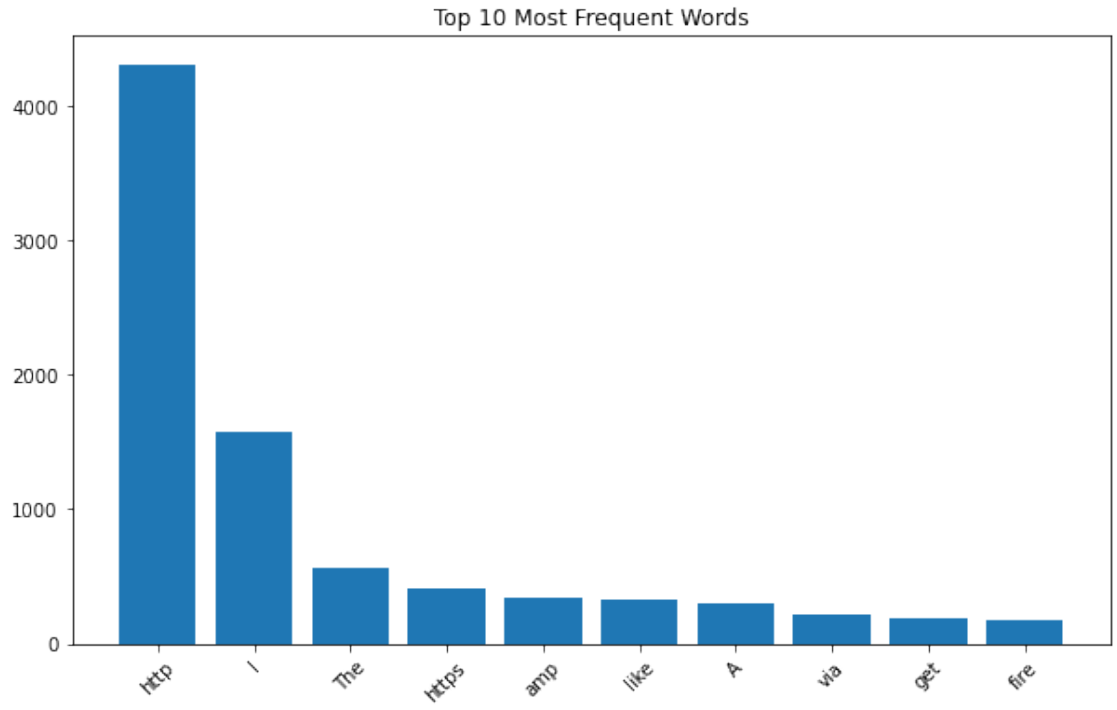
[16]:
```
import matplotlib.pyplot as plt
import seaborn as sns

# Visualize the distribution of the target variable
plt.figure(figsize=(10, 6))
sns.countplot(x='target', data=train_df)
plt.title('Class Distribution of Target Variable')
plt.show()
```



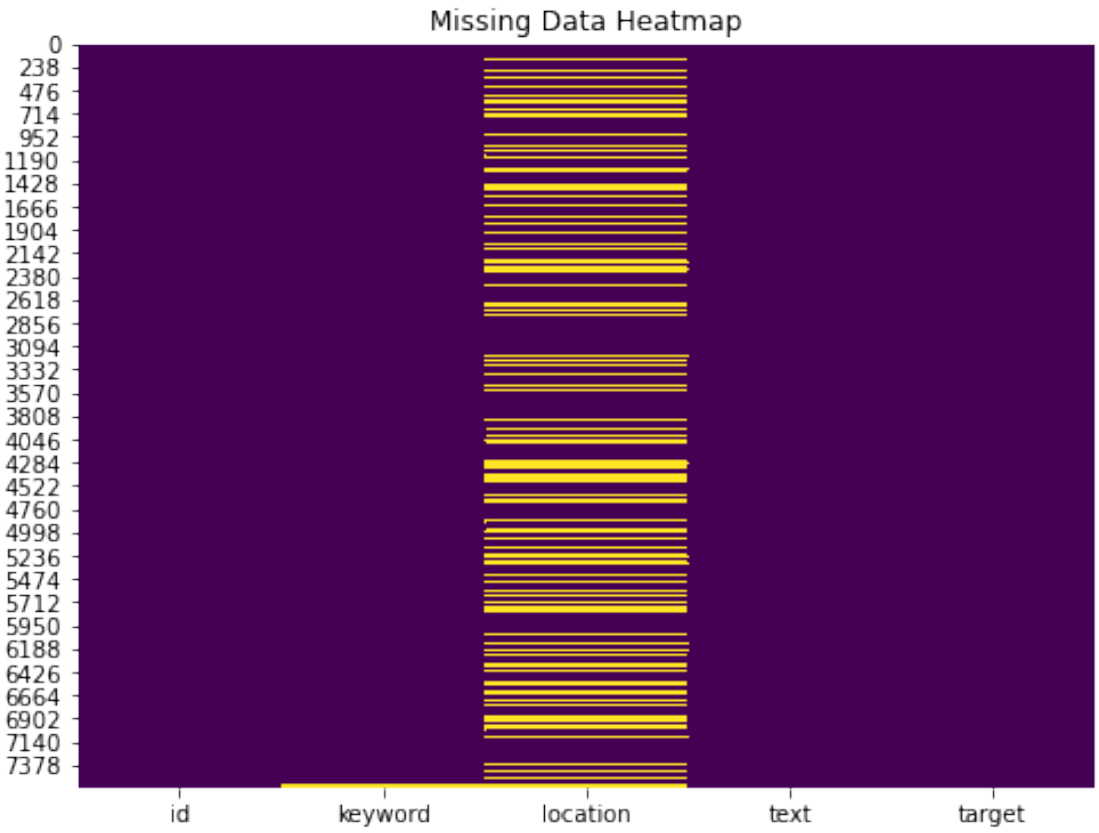
[25]:
```
from collections import Counter
import nltk
import matplotlib.pyplot as plt

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

# Tokenize the text data and get word frequencies
all_words = ' '.join(train_df['text'].dropna())
tokens = nltk.word_tokenize(all_words)
tokens = [word for word in tokens if word.isalpha()]  # Remove non-alphabetic␣
↪characters
```

```
# Remove stopwords
stop_words = set(nltk.corpus.stopwords.words('english'))
tokens = [word for word in tokens if word not in stop_words]

# Get the frequency of each word
word_freq = Counter(tokens)

# Get the 10 most common words
common_words = word_freq.most_common(10)

# Plot the most common words
words, counts = zip(*common_words)
plt.figure(figsize=(10, 6))
plt.bar(words, counts)
plt.title('Top 10 Most Frequent Words')
plt.xticks(rotation=45)
plt.show()
```

```
[nltk_data] Downloading package punkt to /home/jovyan/nltk_data…
[nltk_data]   Package punkt is already up-to-date!
[nltk_data] Downloading package stopwords to /home/jovyan/nltk_data…
[nltk_data]   Unzipping corpora/stopwords.zip.
```



[30]:
```
# Visualizing the missing data
import seaborn as sns

# Visualize the missing data in a heatmap
plt.figure(figsize=(8, 6))
sns.heatmap(train_df.isnull(), cbar=False, cmap='viridis')
plt.title("Missing Data Heatmap")
plt.show()
```



[32]:
```
# Model Explanation
print("""
The model used is a simple neural network architecture with the following␣
 ↪components:
1. **Embedding Layer**: Converts the sparse input (text represented by TF-IDF)␣
 ↪into dense word representations.
2. **Dense Layer**: Fully connected layer with ReLU activation function to␣
 ↪capture non-linear relationships.
3. **Output Layer**: Sigmoid function to perform binary classification␣
 ↪(disaster-related or non-disaster-related).
""")
```

The model used is a simple neural network architecture with the following components:
1. **Embedding Layer**: Converts the sparse input (text represented by TF-IDF) into dense word representations.
2. **Dense Layer**: Fully connected layer with ReLU activation function to capture non-linear relationships.
3. **Output Layer**: Sigmoid function to perform binary classification (disaster-related or non-disaster-related).

[ ]:
```
# Example of summary of the results
print("""
The model performed reasonably well, but there are potential improvements:
- Exploring more advanced architectures like LSTM could help in understanding␣
 ↪sequential dependencies in the text.
- Hyperparameter tuning (e.g., number of layers, dropout rates) could further␣
 ↪improve the performance.
- We could try using different vectorization methods like GloVe embeddings to␣
 ↪see if they perform better than TF-IDF.
""")
```