Experiment 10: Sentiment Analysis on Twitter Data using NLP and Machine Learning

COM-611: AI with Computer Vision Lab

In [7]:

```
# Step 1: Import Libraries
import pandas as pd
import numpy as np
import re
import nltk
from nltk.corpus import stopwords
from textblob import TextBlob
from sklearn.model_selection import train_test_split
from sklearn.feature_extraction.text import TfidfVectorizer
from sklearn.naive_bayes import MultinomialNB
from sklearn.metrics import accuracy_score, classification_report, confusion_mat
import seaborn as sns
import matplotlib.pyplot as plt

nltk.download('stopwords')
```

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

Out[7]:

```
True
```

In [8]:

```
# Step 2: Load Dataset
df = pd.read_csv("tweets.csv")  # Replace with your path
print("Original Columns:", df.columns)

# Preview the dataset
print(df[['text', 'location']].head())
```

```
Original Columns: Index(['id', 'created_at', 'text', 'location'], dtype='object')
                                                text            location
0  @CIBC please explain to me why I want to remai...              Canada
1  RT @CIBCLiveLabs: We are pleased to announce, ...     Oshawa, Ontario
2  CIBC World Markets Inc. Decreases Holdings in ...     The Netherlands
3  Le patron de la Banque @cibc s’attend à un ral...            Montréal
4  Your home is a valuable asset. Use your equity...  Lower Mainland, BC
```

In [9]:

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# Step 3: Clean the Tweet Text
def clean_text(text):
    text = re.sub(r"http\S+", "", str(text))           # Remove URLs
    text = re.sub(r"@\S+|#\S+", "", text)              # Remove mentions/hashtag
    text = re.sub(r"[^A-Za-z\s]", "", text)            # Remove special characte
    text = text.lower()
    return text

stop_words = set(stopwords.words('english'))

def remove_stopwords(text):
    return ' '.join([word for word in text.split() if word not in stop_words])
```

```
df['clean_text'] = df['text'].apply(clean_text).apply(remove_stopwords)

print("Sample cleaned tweet:")
print(df['clean_text'].head(1).values[0])
```

```
Sample cleaned tweet:
please explain want remain card holder called travel concierge number b
```

In [10]:

```
# Step 4: Auto-label Tweets Using TextBlob
def get_sentiment(text):
    polarity = TextBlob(text).sentiment.polarity
    return 1 if polarity > 0 else 0

df['label'] = df['clean_text'].apply(get_sentiment)

# Optional: Check sentiment distribution
print("Sentiment counts:")
print(df['label'].value_counts())
```

```
Sentiment counts:
0    1159
1     792
Name: label, dtype: int64
```

In [11]:

```
# Step 5: Text Vectorization using TF-IDF
vectorizer = TfidfVectorizer(max_features=3000)
X = vectorizer.fit_transform(df['clean_text']).toarray()
y = df['label']
```

In [12]:

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# Step 6: Train-Test Split
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_
```

In [13]:

```
# Step 7: Train a Naive Bayes Classifier
model = MultinomialNB()
model.fit(X_train, y_train)
y_pred = model.predict(X_test)
```

In [14]:

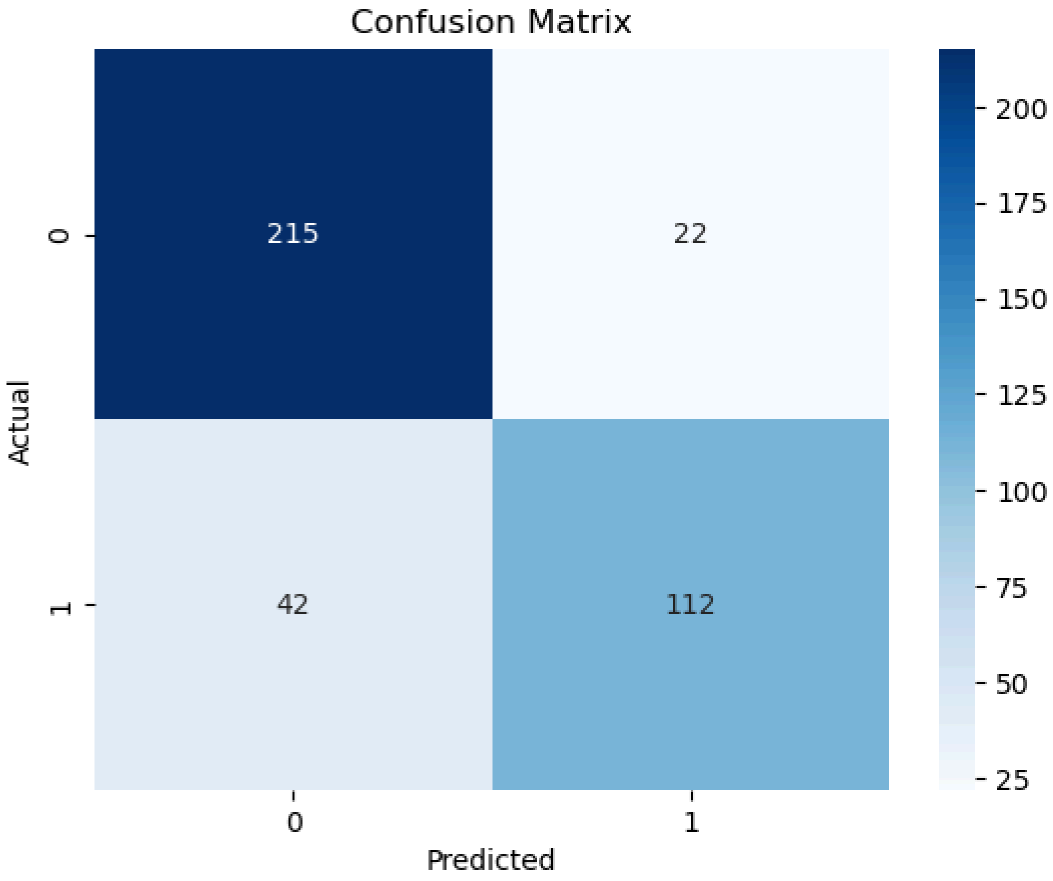
```
# Step 8: Evaluate the Model
print("Accuracy:", accuracy_score(y_test, y_pred))
print("Classification Report:\n", classification_report(y_test, y_pred))

# Confusion Matrix
cm = confusion_matrix(y_test, y_pred)
sns.heatmap(cm, annot=True, fmt='d', cmap='Blues')
plt.title("Confusion Matrix")
plt.xlabel("Predicted")
plt.ylabel("Actual")
plt.show()
```

```
Accuracy: 0.8363171355498721
Classification Report:
               precision    recall  f1-score   support

           0       0.84      0.91      0.87       237
           1       0.84      0.73      0.78       154

    accuracy                           0.84       391
   macro avg       0.84      0.82      0.82       391
weighted avg       0.84      0.84      0.83       391
```



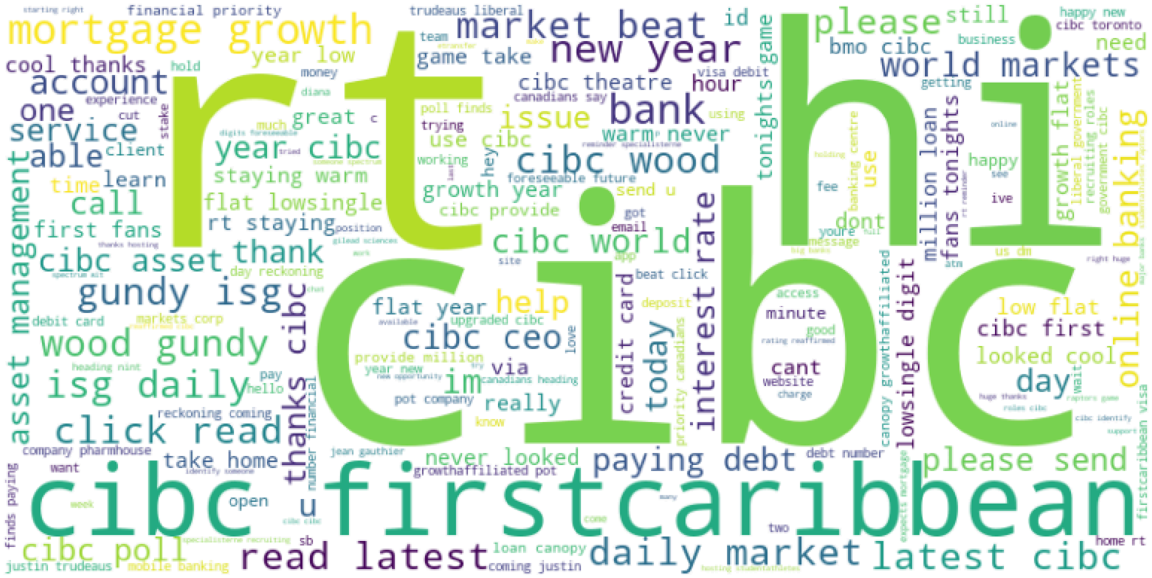
In [15]:

```
from wordcloud import WordCloud

all_words = ' '.join(df['clean_text'])
wordcloud = WordCloud(width=800, height=400, background_color='white').generate(

plt.figure(figsize=(10, 5))
plt.imshow(wordcloud, interpolation='bilinear')
plt.axis('off')
plt.title("Word Cloud of All Tweets")
plt.show()
```

Word Cloud of All Tweets



In [ ]: