nlp-assignment

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[3]:

```
import pandas as pd
import numpy as np
import nltk
from nltk.corpus import stopwords
from nltk.tokenize import word_tokenize
from nltk.stem import WordNetLemmatizer
import re
from sklearn.model_selection import train_test_split
from sklearn.feature_extraction.text import CountVectorizer, TfidfVectorizer
from sklearn.linear_model import LogisticRegression
from sklearn.svm import SVC
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import classification_report, confusion_matrix
import seaborn as sns
import matplotlib.pyplot as plt
```

[4]:

```
df = pd.read_csv('IMDB Dataset.csv')
df.head()
```

[4]:

```
                                              review sentiment
0  One of the other reviewers has mentioned that …  positive
1  A wonderful little production. <br /><br />The…  positive
2  I thought this was a wonderful way to spend ti…  positive
3  Basically there's a family where a little boy …  negative
4  Petter Mattei's "Love in the Time of Money" is…  positive
```

[8]:

```
# Preprocessing
nltk.download('punkt')
nltk.download('wordnet')
nltk.download('stopwords')

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

def preprocess_text(text):
    # Remove URLs
    text = re.sub(r"http\S+|www\S+|https\S+", '', text, flags=re.MULTILINE)

    # Remove punctuation and numbers
    text = re.sub(r'\W', ' ', text)

    # Tokenization
    tokens = word_tokenize(text)

    # Remove stopwords and lemmatize
    tokens = [lemmatizer.lemmatize(word.lower()) for word in tokens if word.
 ↪lower() not in stop_words]

    return ' '.join(tokens)

# Apply preprocessing to the 'review' column
df['review'] = df['review'].apply(preprocess_text)
df.head()
```

```
[nltk_data] Downloading package punkt to
[nltk_data]     C:\Users\samee\AppData\Roaming\nltk_data…
[nltk_data]   Package punkt is already up-to-date!
[nltk_data] Downloading package wordnet to
[nltk_data]     C:\Users\samee\AppData\Roaming\nltk_data…
[nltk_data]   Package wordnet is already up-to-date!
[nltk_data] Downloading package stopwords to
[nltk_data]     C:\Users\samee\AppData\Roaming\nltk_data…
[nltk_data]   Package stopwords is already up-to-date!
```

[8]:

```
                                              review sentiment
0  one reviewer mentioned watching 1 oz episode h…  positive
1  wonderful little production br br filming tech…  positive
2  thought wonderful way spend time hot summer we…  positive
3  basically family little boy jake think zombie …  negative
4  petter mattei love time money visually stunnin…  positive
```

[9]:

```
# Vectorization
# Split the data into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(df['review'],␣
 ↪df['sentiment'], test_size=0.2, random_state=42)

# Vectorization
count_vect = CountVectorizer()
tfidf_vect = TfidfVectorizer()

X_train_count = count_vect.fit_transform(X_train)
X_test_count = count_vect.transform(X_test)
```

```
X_train_tfidf = tfidf_vect.fit_transform(X_train)
X_test_tfidf = tfidf_vect.transform(X_test)
```

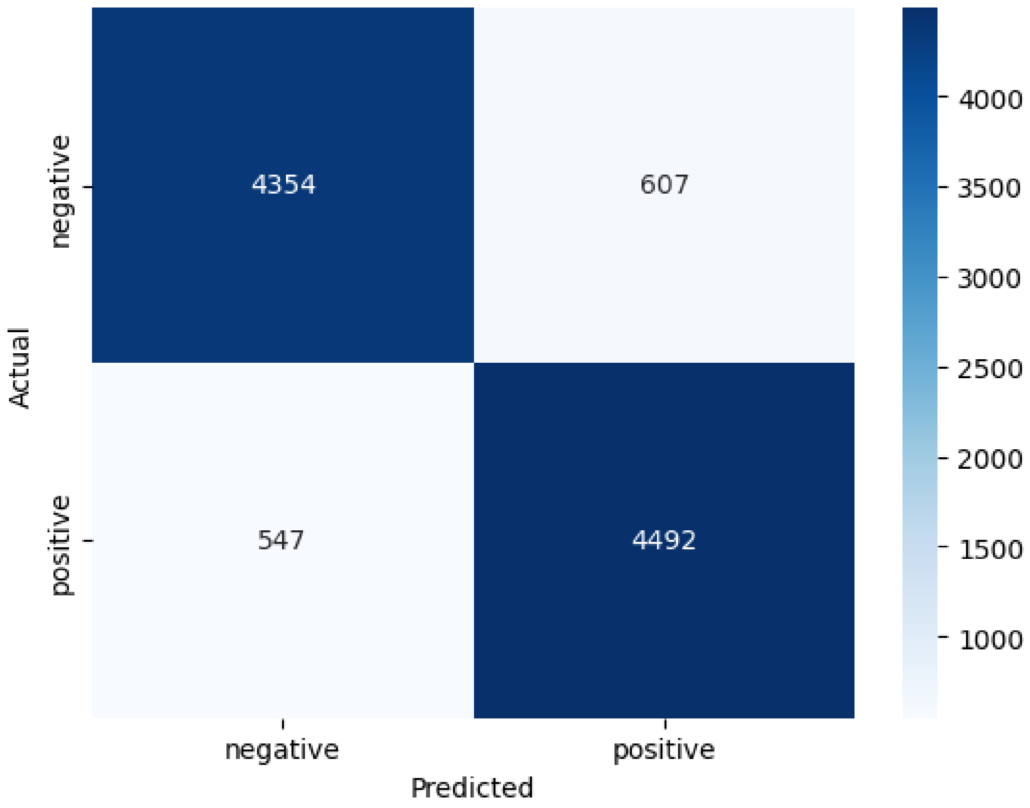
[10]:

```
# Step 6: Model Training and Evaluation
def evaluate_model(model, X_train, X_test, y_train, y_test):
    model.fit(X_train, y_train)
    y_pred = model.predict(X_test)

    # Print classification report
    print(classification_report(y_test, y_pred))

    # Plot confusion matrix
    cm = confusion_matrix(y_test, y_pred, labels=model.classes_)
    sns.heatmap(cm, annot=True, fmt='d', cmap='Blues', xticklabels=model.
 ↪classes_, yticklabels=model.classes_)
    plt.ylabel('Actual')
    plt.xlabel('Predicted')
    plt.show()

# Logistic Regression
print("Logistic Regression with CountVectorizer")
evaluate_model(LogisticRegression(), X_train_count, X_test_count, y_train,␣
 ↪y_test)

print("Logistic Regression with TfidfVectorizer")
evaluate_model(LogisticRegression(), X_train_tfidf, X_test_tfidf, y_train,␣
 ↪y_test)

# SVC
print("SVC with CountVectorizer")
evaluate_model(SVC(), X_train_count, X_test_count, y_train, y_test)

print("SVC with TfidfVectorizer")
evaluate_model(SVC(), X_train_tfidf, X_test_tfidf, y_train, y_test)

# Random Forest
print("Random Forest with CountVectorizer")
evaluate_model(RandomForestClassifier(), X_train_count, X_test_count, y_train,␣
 ↪y_test)

print("Random Forest with TfidfVectorizer")
evaluate_model(RandomForestClassifier(), X_train_tfidf, X_test_tfidf, y_train,␣
 ↪y_test)
```

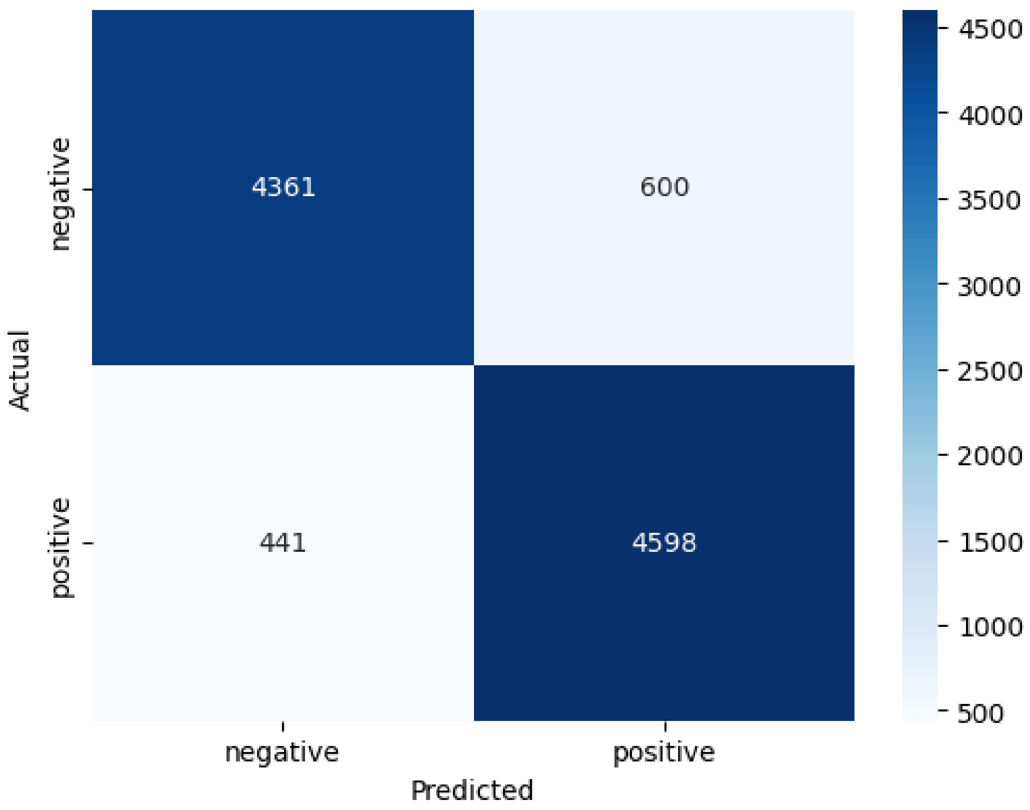
```
Logistic Regression with CountVectorizer
```

```
C:\Users\samee\AppData\Local\Packages\PythonSoftwareFoundation.Python.3.12_qbz5n
```

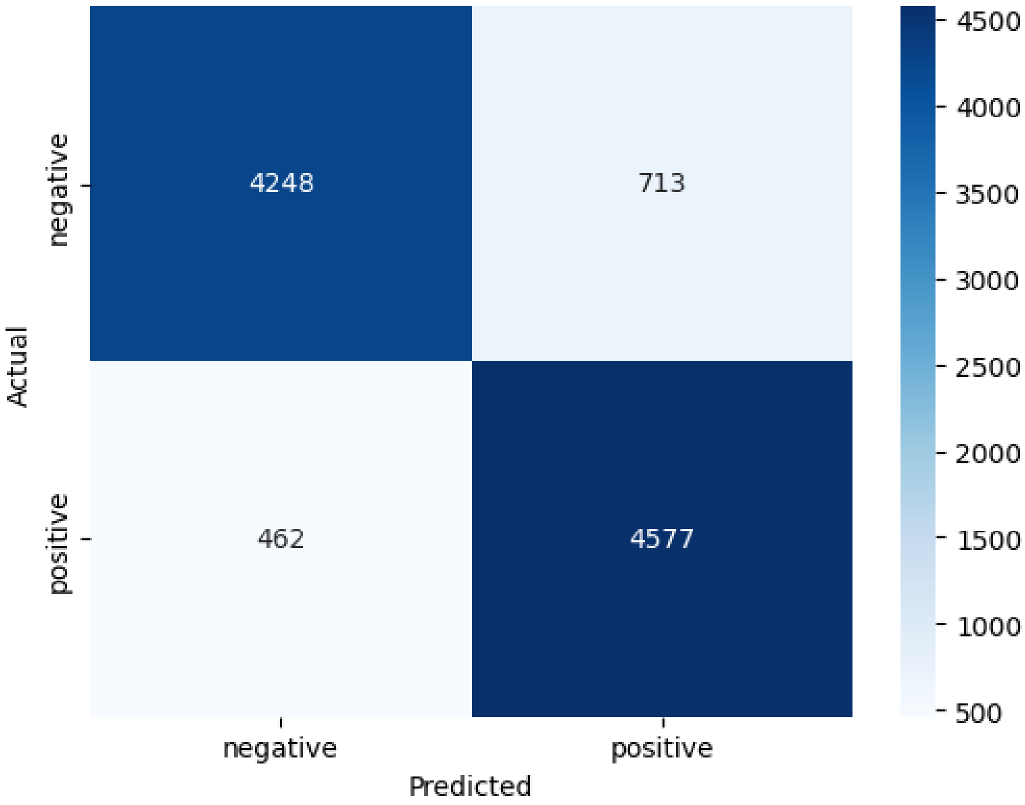
```
2kfra8p0\LocalCache\local-packages\Python312\site-
packages\sklearn\linear_model\_logistic.py:469: ConvergenceWarning: lbfgs failed
to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
Please also refer to the documentation for alternative solver options:
    https://scikit-learn.org/stable/modules/linear_model.html#logistic-
regression
  n_iter_i = _check_optimize_result(
              precision    recall  f1-score   support

    negative       0.89      0.88      0.88      4961
    positive       0.88      0.89      0.89      5039

    accuracy                           0.88     10000
   macro avg       0.88      0.88      0.88     10000
weighted avg       0.88      0.88      0.88     10000
```



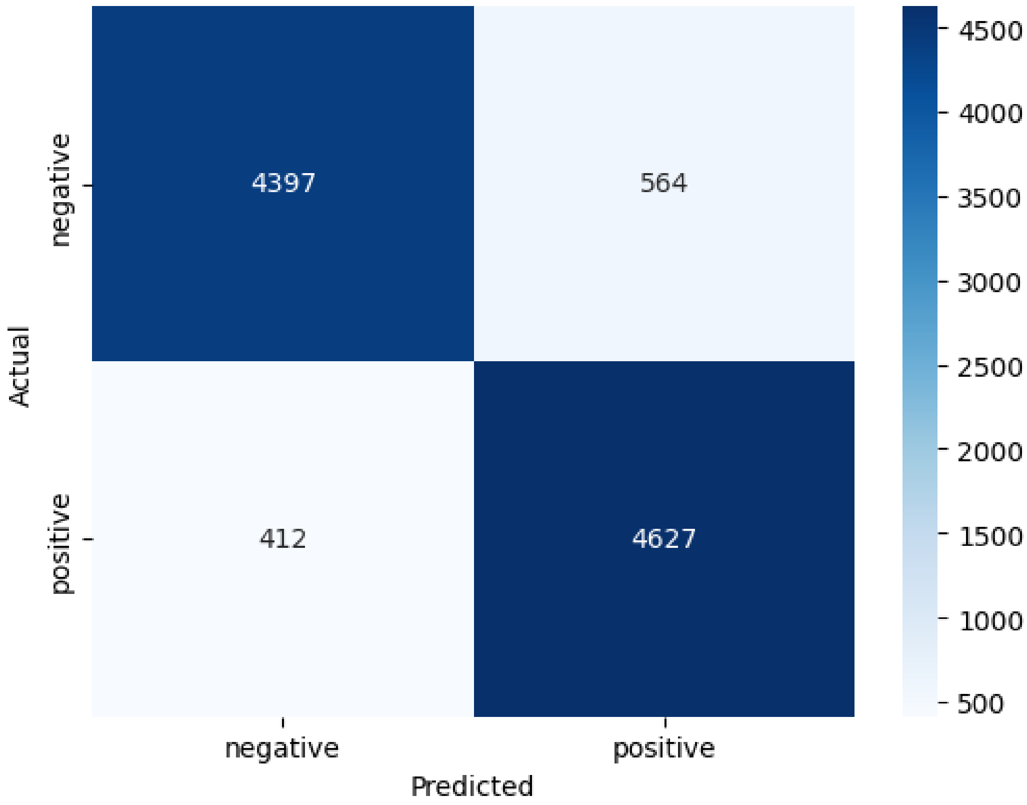
```
Logistic Regression with TfidfVectorizer
              precision    recall  f1-score   support

    negative       0.91      0.88      0.89      4961
    positive       0.88      0.91      0.90      5039

    accuracy                           0.90     10000
   macro avg       0.90      0.90      0.90     10000
weighted avg       0.90      0.90      0.90     10000
```



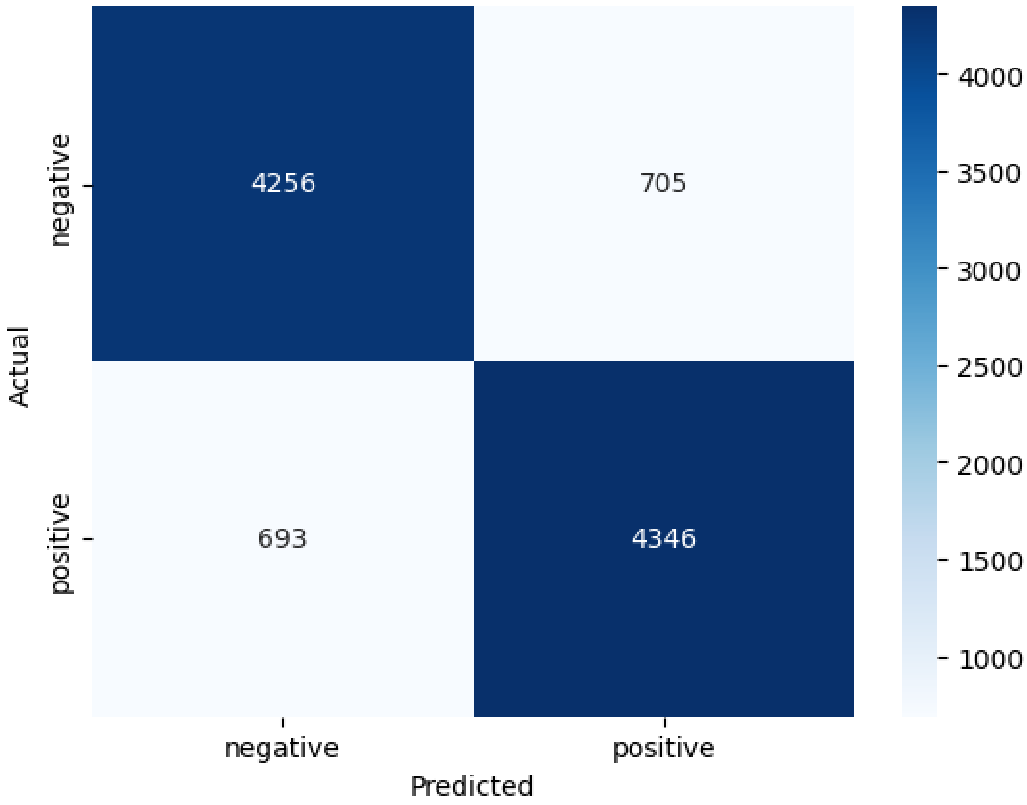
```
SVC with CountVectorizer
              precision    recall  f1-score   support

    negative       0.90      0.86      0.88      4961
    positive       0.87      0.91      0.89      5039

    accuracy                           0.88     10000
   macro avg       0.88      0.88      0.88     10000
weighted avg       0.88      0.88      0.88     10000
```



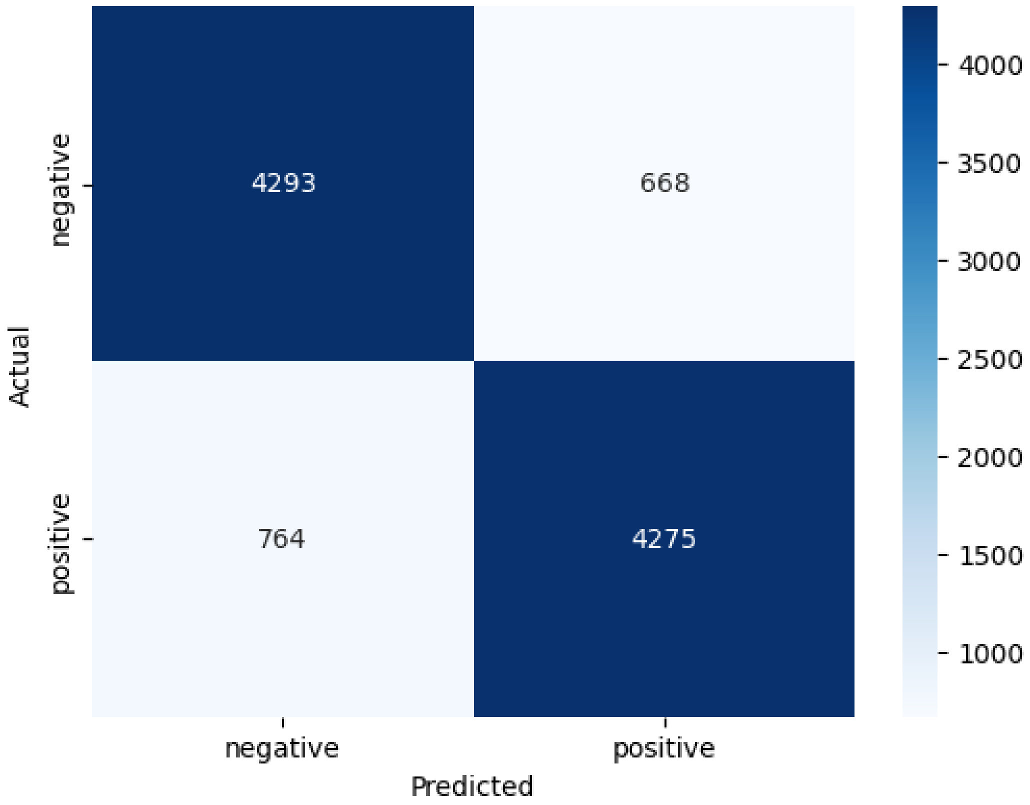
```
SVC with TfidfVectorizer
              precision    recall  f1-score   support

    negative       0.91      0.89      0.90      4961
    positive       0.89      0.92      0.90      5039

    accuracy                           0.90     10000
   macro avg       0.90      0.90      0.90     10000
weighted avg       0.90      0.90      0.90     10000
```



```
Random Forest with CountVectorizer
              precision    recall  f1-score   support

    negative       0.86      0.86      0.86      4961
    positive       0.86      0.86      0.86      5039

    accuracy                           0.86     10000
   macro avg       0.86      0.86      0.86     10000
weighted avg       0.86      0.86      0.86     10000
```



```
Random Forest with TfidfVectorizer
              precision    recall  f1-score   support

    negative       0.85      0.87      0.86      4961
    positive       0.86      0.85      0.86      5039

    accuracy                           0.86     10000
   macro avg       0.86      0.86      0.86     10000
weighted avg       0.86      0.86      0.86     10000
```


4293
668
764
4275
negative
positive
Actual
negative
positive
Predicted
4000
3500
3000
2500
2000
1500
1000