```
import pandas as pd
df = pd.read_csv('/Tweets.csv')
display(df.head())
```

	tweet_id	airline_sentiment	airline_sentiment_confidence	negativ
0	570306133677760513	neutral	1.0000	
1	570301130888122368	positive	0.3486	
2	570301083672813571	neutral	0.6837	
3	570301031407624196	negative	1.0000	B
4	570300817074462722	negative	1.0000	

```
display(df[['text', 'airline_sentiment']].head())
```

	text	airline_sentiment
0	@VirginAmerica What @dhepburn said.	neutral
1	@VirginAmerica plus you've added commercials t...	positive
2	@VirginAmerica I didn't today... Must mean I n...	neutral
3	@VirginAmerica it's really aggressive to blast...	negative
4	@VirginAmerica and it's a really big bad thing...	negative

```
import nltk

# Download necessary NLTK data directly
nltk.download('punkt')
nltk.download('stopwords')
nltk.download('punkt_tab') # Added to resolve the new LookupError
```

```
from nltk.corpus import stopwords
from nltk.tokenize import word_tokenize

# Get English stopwords
stop_words = set(stopwords.words('english'))

# Function to tokenize and remove stopwords
def preprocess_text(text):
    # Convert to lowercase
    text = text.lower()
    # Tokenize the text
    tokens = word_tokenize(text)
    # Remove stopwords and non-alphabetic tokens
    filtered_tokens = [word for word in tokens if word.isalpha() and word not i
    return " ".join(filtered_tokens)

# Apply the preprocessing to the 'text' column
df['processed_text'] = df['text'].apply(preprocess_text)

# Display the original and processed text for comparison
display(df[['text', 'processed_text']].head())
```

```
[nltk_data] Downloading package punkt to /root/nltk_data...
[nltk_data]   Package punkt is already up-to-date!
[nltk_data] Downloading package stopwords to /root/nltk_data...
[nltk_data]   Package stopwords is already up-to-date!
[nltk_data] Downloading package punkt_tab to /root/nltk_data...
[nltk_data]   Unzipping tokenizers/punkt_tab.zip.
```

	text	processed_text
0	@VirginAmerica What @dhepburn said.	virginamerica dhepburn said
1	@VirginAmerica plus you've added commercials t...	virginamerica plus added commercials experienc...
2	@VirginAmerica I didn't today... Must mean I n...	virginamerica today must mean need take anothe...
3	@VirginAmerica it's really aggressive to blast...	virginamerica really aggressive blast obnoxiou...
4	@VirginAmerica and it's a really big bad thing...	virginamerica really big bad thing

```
from sklearn.feature_extraction.text import TfidfVectorizer

# Initialize TF-IDF Vectorizer
tfidf_vectorizer = TfidfVectorizer(max_features=5000) # Limiting to top 5000 fe

# Fit and transform the processed text
tfidf_matrix = tfidf_vectorizer.fit_transform(df['processed_text'])
```

```
# Display the shape of the TF-IDF matrix and some feature names
print(f"Shape of TF-IDF matrix: {tfidf_matrix.shape}")
print(f"Top 10 feature names: {tfidf_vectorizer.get_feature_names_out()[:10]}")
```

```
Shape of TF-IDF matrix: (14640, 5000)
Top 10 feature names: ['aa' 'aadvantage' 'aafail' 'aarp' 'abc' 'abcnetwork' 'abi
 'ability' 'able' 'aboard']
```

```
# Filter for negative sentiment tweets
negative_tweets_df = df[df['airline_sentiment'] == 'negative']

# Transform the processed text of negative tweets using the *already fitted* TF
tfidf_matrix_negative = tfidf_vectorizer.transform(negative_tweets_df['processe

# Get feature names (terms)
feature_names = tfidf_vectorizer.get_feature_names_out()

# Sum TF-IDF scores for each term across all negative tweets
# The .A converts the sparse matrix to a dense NumPy array for summation
sum_tfidf_scores_negative = tfidf_matrix_negative.sum(axis=0).A1

# Create a Series of terms and their summed TF-IDF scores
tfidf_scores_series_negative = pd.Series(sum_tfidf_scores_negative, index=featu

# Sort the terms by their TF-IDF scores in descending order and get the top N
top_n_negative_terms = tfidf_scores_series_negative.nlargest(20) # Display top

print("Top 20 TF-IDF terms for Negative Sentiment:")
display(top_n_negative_terms)
```

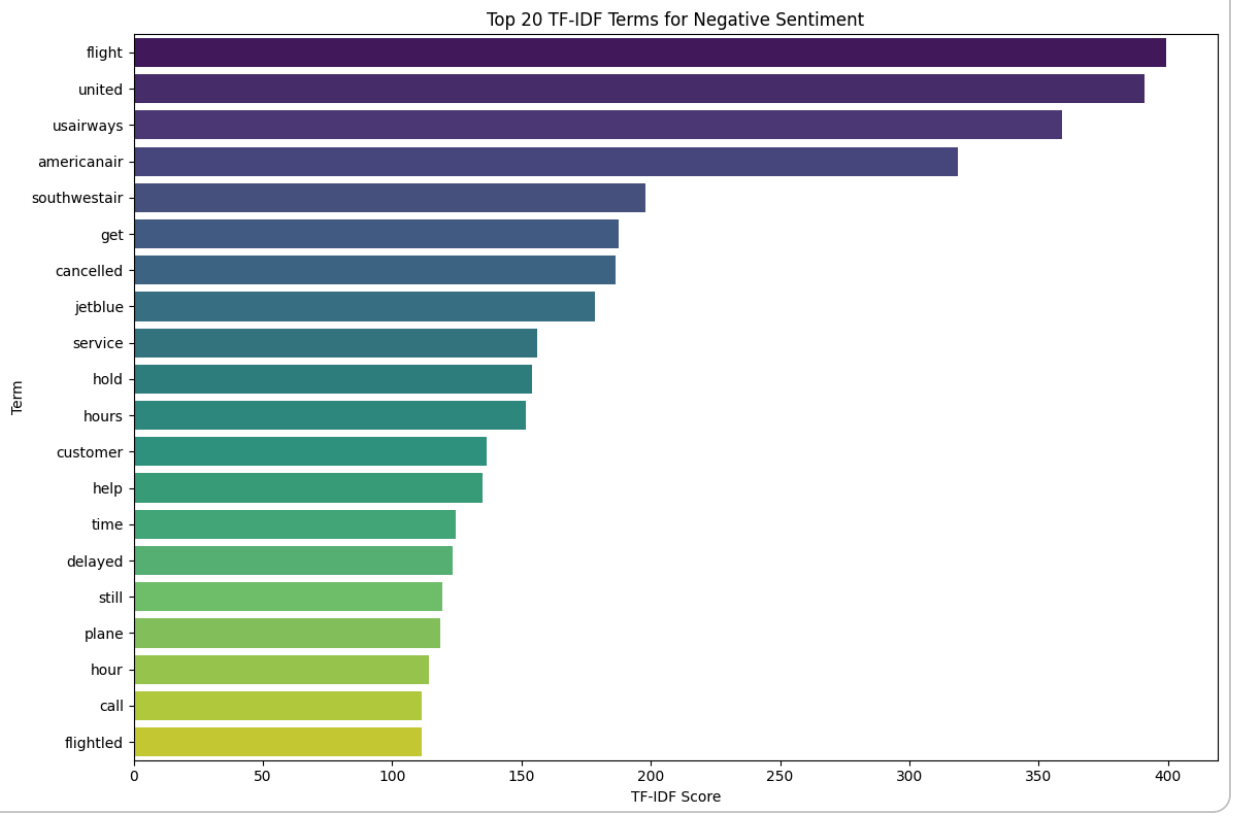
```
Top 20 TF-IDF terms for Negative Sentiment:
```

	0
flight	399.280532
united	390.873367
usairways	358.955895
americanair	318.814738
southwestair	197.952409
get	187.455508
cancelled	186.415954
jetblue	178.373214
service	156.102443
hold	154.205142
hours	151.847064
customer	136.386221
help	134.771582
time	124.744890
delayed	123.243031
still	119.499013
plane	118.396010
hour	114.349198
call	111.339799
flightled	111.233616

dtype: float64

```
import matplotlib.pyplot as plt
import seaborn as sns

# Create a bar chart for the top 20 negative TF-IDF terms
plt.figure(figsize=(12, 8))
sns.barplot(x=top_n_negative_terms.values, y=top_n_negative_terms.index, palett
plt.title('Top 20 TF-IDF Terms for Negative Sentiment')
plt.xlabel('TF-IDF Score')
plt.ylabel('Term')
plt.tight_layout()
plt.show()
```




```
# Install the wordcloud library if not already installed
!pip install wordcloud
```

```
Requirement already satisfied: wordcloud in /usr/local/lib/python3.12/dist-packa
Requirement already satisfied: numpy>=1.19 in /usr/local/lib/python3.12/dist-pac
Requirement already satisfied: pillow in /usr/local/lib/python3.12/dist-packages
Requirement already satisfied: matplotlib in /usr/local/lib/python3.12/dist-pack
Requirement already satisfied: contourpy>=1.0.1 in /usr/local/lib/python3.12/dis
Requirement already satisfied: cycler>=0.10 in /usr/local/lib/python3.12/dist-pa
Requirement already satisfied: fonttools>=4.22.0 in /usr/local/lib/python3.12/di
Requirement already satisfied: kiwisolver>=1.3.1 in /usr/local/lib/python3.12/di
Requirement already satisfied: packaging>=20.0 in /usr/local/lib/python3.12/dist
Requirement already satisfied: pyparsing>=2.3.1 in /usr/local/lib/python3.12/dis
Requirement already satisfied: python-dateutil>=2.7 in /usr/local/lib/python3.12
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.12/dist-packag
```

```
from wordcloud import WordCloud

# Generate a word cloud for negative sentiment terms
# We'll use the tfidf_scores_series_negative for weights
wordcloud = WordCloud(width=800, height=400, background_color='white').gene

plt.figure(figsize=(15, 7))
plt.imshow(wordcloud, interpolation='bilinear')
plt.axis('off')
plt.title('Word Cloud for Negative Sentiment Terms')
plt.show()
```

Word Cloud for Negative Sentiment Terms