vips-project

November 9, 2024

[ ]:
```
import pandas as pd
import numpy as np
import re
import nltk
import seaborn as sns
import matplotlib.pyplot as plt
from matplotlib import style
style.use('ggplot')
from textblob import TextBlob
from nltk.tokenize import word_tokenize
from nltk.stem import PorterStemmer
from nltk.corpus import stopwords
nltk.download('stopwords')
stop_words = set(stopwords.words('english'))
from wordcloud import WordCloud
from sklearn.feature_extraction.text import CountVectorizer
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import accuracy_score, classification_report,␣
↪confusion_matrix, ConfusionMatrixDisplay
```

```
[nltk_data] Downloading package stopwords to /root/nltk_data…
[nltk_data]   Unzipping corpora/stopwords.zip.
```

[ ]:
```
df = pd.read_csv('/content/vaccination_tweets.csv')
```

[ ]:
```
df.head()
```

[ ]:
```
                   id            user_name             user_location  \
0  1340539111971516416           Rachel Roh  La Crescenta-Montrose, CA
1  1338158543359250433         Albert Fong          San Francisco, CA
2  1337858199140118533               eli                   Your Bed
3  1337855739918835717       Charles Adler     Vancouver, BC - Canada
4  1337854064604966912  Citizen News Channel                        NaN

                                    user_description        user_created  \
0  Aggregator of Asian American news; scanning di…  2009-04-08 17:52:46
1  Marketing dude, tech geek, heavy metal & '80s …  2009-09-21 15:27:30
```

```
2                                  heil, hydra    2020-06-25 23:30:28
3  Hosting "CharlesAdlerTonight" Global News Radi…  2008-09-10 11:28:53
4  Citizen News Channel bringing you an alternati…  2020-04-23 17:58:42

   user_followers  user_friends  user_favourites  user_verified  \
0             405          1692             3247          False
1             834           666              178          False
2              10            88              155          False
3           49165          3933            21853           True
4             152           580             1473          False

                 date                                                text  \
0  2020-12-20 06:06:44  Same folks said daikon paste could treat a cyt…
1  2020-12-13 16:27:13  While the world has been on the wrong side of …
2  2020-12-12 20:33:45  #coronavirus #SputnikV #AstraZeneca #PfizerBio…
3  2020-12-12 20:23:59  Facts are immutable, Senator, even when you're…
4  2020-12-12 20:17:19  Explain to me again why we need a vaccine @Bor…

                                        hashtags               source  \
0                              ['PfizerBioNTech']  Twitter for Android
1                                             NaN      Twitter Web App
2  ['coronavirus', 'SputnikV', 'AstraZeneca', 'Pf…  Twitter for Android
3                                             NaN      Twitter Web App
4    ['whereareallthesickpeople', 'PfizerBioNTech']   Twitter for iPhone

   retweets  favorites  is_retweet
0         0          0       False
1         1          1       False
2         0          0       False
3       446       2129       False
4         0          0       False
```

[ ]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 11020 entries, 0 to 11019
Data columns (total 16 columns):
 #   Column            Non-Null Count  Dtype
---  ------            --------------  -----
 0   id                11020 non-null  int64
 1   user_name         11020 non-null  object
 2   user_location     8750 non-null   object
 3   user_description  10340 non-null  object
 4   user_created      11020 non-null  object
 5   user_followers    11020 non-null  int64
 6   user_friends      11020 non-null  int64
 7   user_favourites   11020 non-null  int64
```

```
 8   user_verified     11020 non-null  bool
 9   date              11020 non-null  object
 10  text              11020 non-null  object
 11  hashtags          8438 non-null   object
 12  source            11019 non-null  object
 13  retweets          11020 non-null  int64
 14  favorites         11020 non-null  int64
 15  is_retweet        11020 non-null  bool
dtypes: bool(2), int64(6), object(8)
memory usage: 1.2+ MB
```

[ ]:
```
df.isnull().sum()
```

[ ]:
```
id                    0
user_name             0
user_location      2270
user_description    680
user_created          0
user_followers        0
user_friends          0
user_favourites       0
user_verified         0
date                  0
text                  0
hashtags           2582
source                1
retweets              0
favorites             0
is_retweet            0
dtype: int64
```

[ ]:
```
df.columns
```

[ ]:
```
Index(['id', 'user_name', 'user_location', 'user_description', 'user_created',
       'user_followers', 'user_friends', 'user_favourites', 'user_verified',
       'date', 'text', 'hashtags', 'source', 'retweets', 'favorites',
       'is_retweet'],
      dtype='object')
```

[ ]:
```
text_df = df.drop(['id', 'user_name', 'user_location', 'user_description',␣
 ↪'user_created',
       'user_followers', 'user_friends', 'user_favourites', 'user_verified',
       'date', 'hashtags', 'source', 'retweets', 'favorites',
       'is_retweet'], axis=1)
text_df.head()
```

[ ]:
```
                                                text
0  Same folks said daikon paste could treat a cyt…
1  While the world has been on the wrong side of …
2  #coronavirus #SputnikV #AstraZeneca #PfizerBio…
3  Facts are immutable, Senator, even when you're…
4  Explain to me again why we need a vaccine @Bor…
```

[ ]:
```
print(text_df['text'].iloc[0],"\n")
print(text_df['text'].iloc[1],"\n")
print(text_df['text'].iloc[2],"\n")
print(text_df['text'].iloc[3],"\n")
print(text_df['text'].iloc[4],"\n")
```

```
Same folks said daikon paste could treat a cytokine storm #PfizerBioNTech
https://t.co/xeHhIMg1kF

While the world has been on the wrong side of history this year, hopefully, the
biggest vaccination effort we've ev… https://t.co/dlCHrZjkhm

#coronavirus #SputnikV #AstraZeneca #PfizerBioNTech #Moderna #Covid_19 Russian
vaccine is created to last 2-4 years… https://t.co/ieYlCKBr8P

Facts are immutable, Senator, even when you're not ethically sturdy enough to
acknowledge them. (1) You were born i… https://t.co/jqgV18kch4

Explain to me again why we need a vaccine @BorisJohnson @MattHancock
#whereareallthesickpeople #PfizerBioNTech… https://t.co/KxbSRoBEHq
```

[ ]:
```
def data_processing(text):
    text = text.lower()
    text = re.sub(r"https\S+|www\S+https\S+", '',text, flags=re.MULTILINE)
    text = re.sub(r'\@w+|\#','',text)
    text = re.sub(r'[^\w\s]','',text)
    text_tokens = word_tokenize(text)
    filtered_text = [w for w in text_tokens if not w in stop_words]
    return " ".join(filtered_text)
```

[ ]:
```
!pip install nltk
import nltk
import re
from nltk.corpus import stopwords
from nltk.tokenize import word_tokenize

nltk.download('punkt') # download punkt resource

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

```
text_df.text = text_df['text'].apply(data_processing)
```

```
Requirement already satisfied: nltk in /usr/local/lib/python3.10/dist-packages
(3.8.1)
Requirement already satisfied: click in /usr/local/lib/python3.10/dist-packages
(from nltk) (8.1.7)
Requirement already satisfied: joblib in /usr/local/lib/python3.10/dist-packages
(from nltk) (1.4.2)
Requirement already satisfied: regex>=2021.8.3 in
/usr/local/lib/python3.10/dist-packages (from nltk) (2024.9.11)
Requirement already satisfied: tqdm in /usr/local/lib/python3.10/dist-packages
(from nltk) (4.66.6)

[nltk_data] Downloading package punkt to /root/nltk_data…
[nltk_data]   Unzipping tokenizers/punkt.zip.
```

[ ]:
```
text_df = text_df.drop_duplicates('text')
```

[ ]:
```
stemmer = PorterStemmer()
def stemming(data):
    text = [stemmer.stem(word) for word in data]
    return data
```

[ ]:
```
text_df['text'].apply(lambda x: stemming(x))
```

[ ]:
```
0        folks said daikon paste could treat cytokine s…
1        world wrong side history year hopefully bigges…
2        coronavirus sputnikv astrazeneca pfizerbiontec…
3        facts immutable senator even youre ethically s…
4        explain need vaccine borisjohnson matthancock …
                              …
11014    ruvanw gmalavige chandi2012 already 3rd pfizer…
11015    number covid19 cases today 17 november 2021 re…
11017    number covid19 cases today 16 november 2021 re…
11018    pfizerbiontech developed new pill paxlovid inc…
11019    number covid19 cases today 15 november 2021 re…
Name: text, Length: 10543, dtype: object
```

[ ]:
```
text_df.head()
```

[ ]:

	text
0	folks said daikon paste could treat cytokine s…
1	world wrong side history year hopefully bigges…
2	coronavirus sputnikv astrazeneca pfizerbiontec…
3	facts immutable senator even youre ethically s…
4	explain need vaccine borisjohnson matthancock …

[ ]:
```
print(text_df['text'].iloc[0],"\n")
print(text_df['text'].iloc[1],"\n")
print(text_df['text'].iloc[2],"\n")
print(text_df['text'].iloc[3],"\n")
print(text_df['text'].iloc[4],"\n")
```

```
folks said daikon paste could treat cytokine storm pfizerbiontech

world wrong side history year hopefully biggest vaccination effort weve ev

coronavirus sputnikv astrazeneca pfizerbiontech moderna covid_19 russian vaccine
created last 24 years

facts immutable senator even youre ethically sturdy enough acknowledge 1 born

explain need vaccine borisjohnson matthancock whereareallthesickpeople
pfizerbiontech
```

[ ]:
```
text_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 10543 entries, 0 to 11019
Data columns (total 1 columns):
 #   Column  Non-Null Count  Dtype
---  ------  --------------  -----
 0   text    10543 non-null  object
dtypes: object(1)
memory usage: 164.7+ KB
```

[ ]:
```
def polarity(text):
    return TextBlob(text).sentiment.polarity
text_df['polarity'] = text_df['text'].apply(polarity)
```

[ ]:
```
text_df.head(10)
```

[ ]:

	text	polarity
0	folks said daikon paste could treat cytokine s…	0.000
1	world wrong side history year hopefully bigges…	-0.500
2	coronavirus sputnikv astrazeneca pfizerbiontec…	0.000
3	facts immutable senator even youre ethically s…	0.100
4	explain need vaccine borisjohnson matthancock …	0.000
5	anyone useful adviceguidance whether covid vac…	0.400
6	bit sad claim fame success vaccination patriot…	-0.100
7	many bright days 2020 best 1 bidenharris winni…	0.675
8	covid vaccine getting covidvaccine covid19 pfi…	0.000
9	covidvaccine states start getting covid19vacci…	0.000

[ ]:
```
def sentiment(label):
    if label < 0:
        return "Negative"
    elif label == 0:
        return "Neutral" # This line was missing, causing the IndentationError
    elif label > 0:
        return "Positive"
```

[ ]:
```
text_df['sentiment'] = text_df['polarity'].apply(sentiment)
```

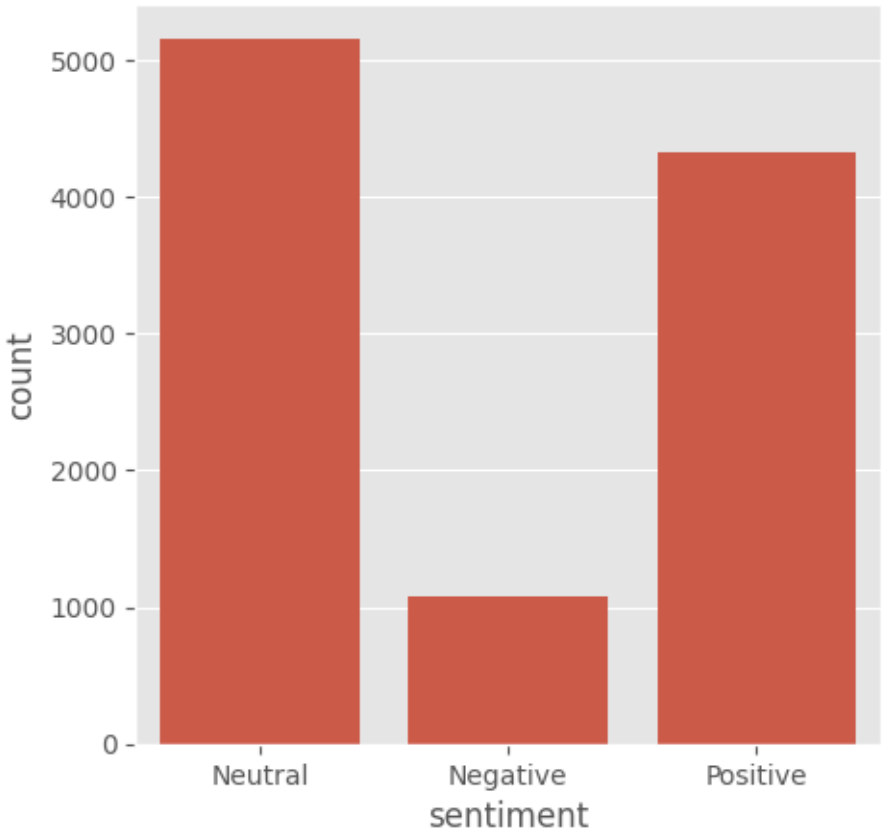
[ ]:
```
text_df.head()
```

[ ]:

	text	polarity	sentiment
0	folks said daikon paste could treat cytokine s…	0.0	Neutral
1	world wrong side history year hopefully bigges…	-0.5	Negative
2	coronavirus sputnikv astrazeneca pfizerbiontec…	0.0	Neutral
3	facts immutable senator even youre ethically s…	0.1	Positive
4	explain need vaccine borisjohnson matthancock …	0.0	Neutral

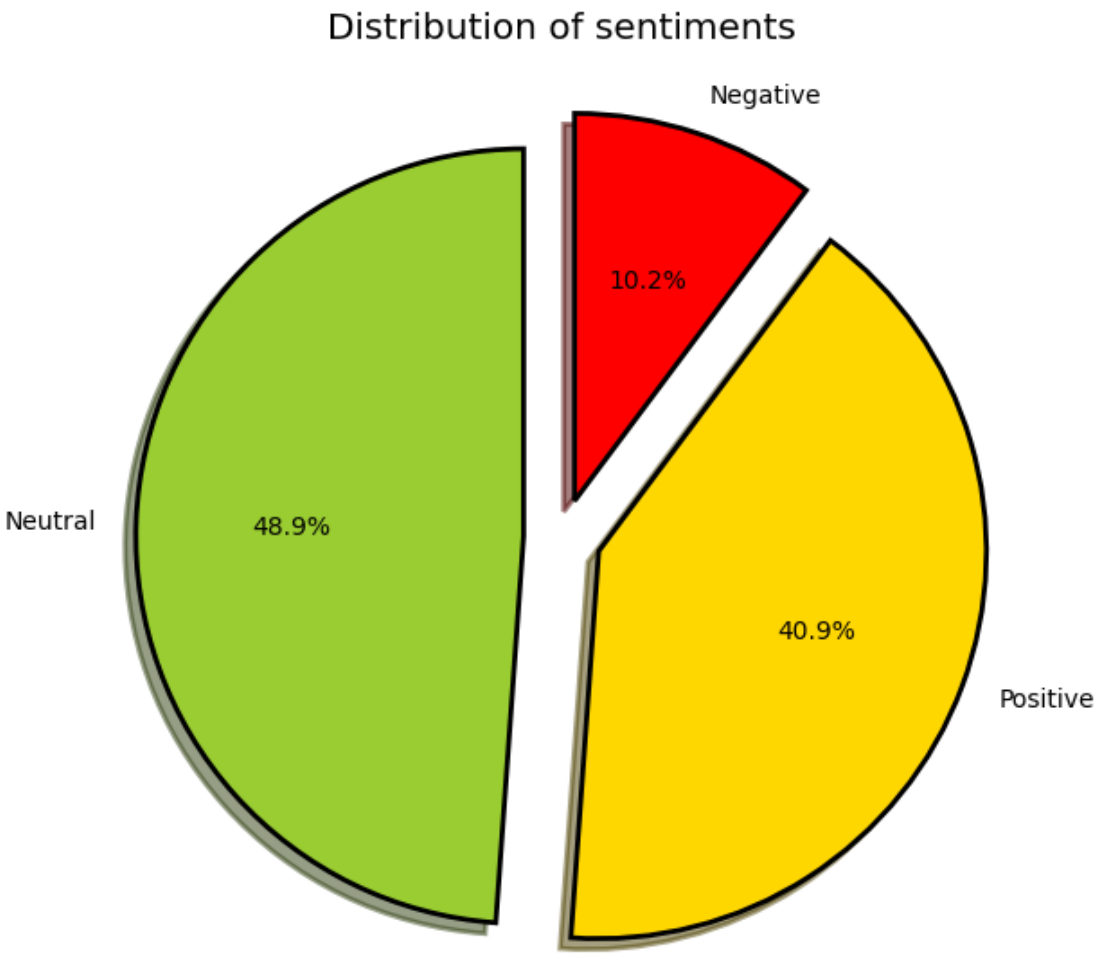
[ ]:
```
fig = plt.figure(figsize=(5,5))
sns.countplot(x='sentiment', data=text_df)
```

[ ]:
```
<Axes: xlabel='sentiment', ylabel='count'>
```



[ ]:
```
fig = plt.figure(figsize=(7,7))
colors = ("yellowgreen", "gold", "red")
wp = {'linewidth':2, 'edgecolor':"black"}
tags = text_df['sentiment'].value_counts()
explode = (0.1,0.1,0.1)
tags.plot(kind='pie', autopct='%1.1f%%', shadow=True, colors = colors,
          startangle=90, wedgeprops = wp, explode = explode, label='')
plt.title('Distribution of sentiments')
```

[ ]:
```
Text(0.5, 1.0, 'Distribution\xa0of\xa0sentiments')
```



[ ]:
```
pos_tweets = text_df[text_df.sentiment == 'Positive']
pos_tweets = pos_tweets.sort_values(['polarity'], ascending= False)
pos_tweets.head()
```

[ ]:

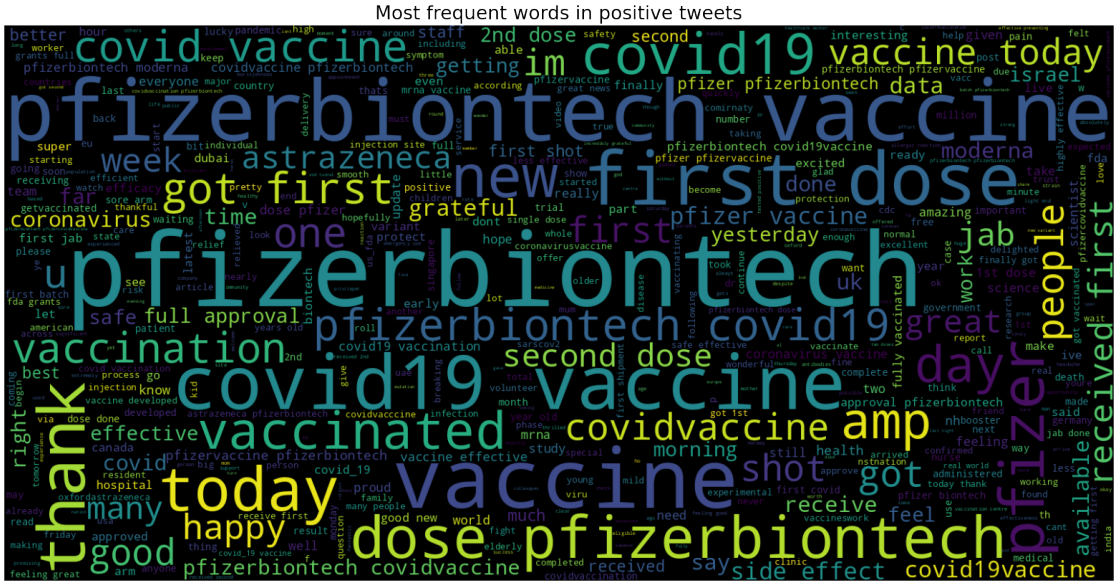
	text	polarity	sentiment
9317	best way get merrygoround pfizer pfizerbiontec…	1.0	Positive
2340	applying emotion pfizerbiontech based best evi…	1.0	Positive
6295	pfizer jab morning efficient wellorganised tha…	1.0	Positive
5041	get art printed awesome products support redbu…	1.0	Positive
1055	already vaccinated getting vaccine soon plan t…	1.0	Positive

[ ]:
```
pos_tweets = text_df[text_df.sentiment == 'Positive']
pos_tweets = pos_tweets.sort_values(['polarity'], ascending= False)
pos_tweets.head()
```

[ ]:

	text	polarity	sentiment
9317	best way get merrygoround pfizer pfizerbiontec…	1.0	Positive
2340	applying emotion pfizerbiontech based best evi…	1.0	Positive
6295	pfizer jab morning efficient wellorganised tha…	1.0	Positive
5041	get art printed awesome products support redbu…	1.0	Positive
1055	already vaccinated getting vaccine soon plan t…	1.0	Positive

[ ]:
```
text = ' '.join([word for word in pos_tweets['text']])
plt.figure(figsize=(20,15), facecolor='None')
wordcloud = WordCloud(max_words=500, width=1600, height=800).generate(text)
plt.imshow(wordcloud, interpolation='bilinear')
plt.axis("off")
plt.title('Most frequent words in positive tweets', fontsize=19)
plt.show()
```

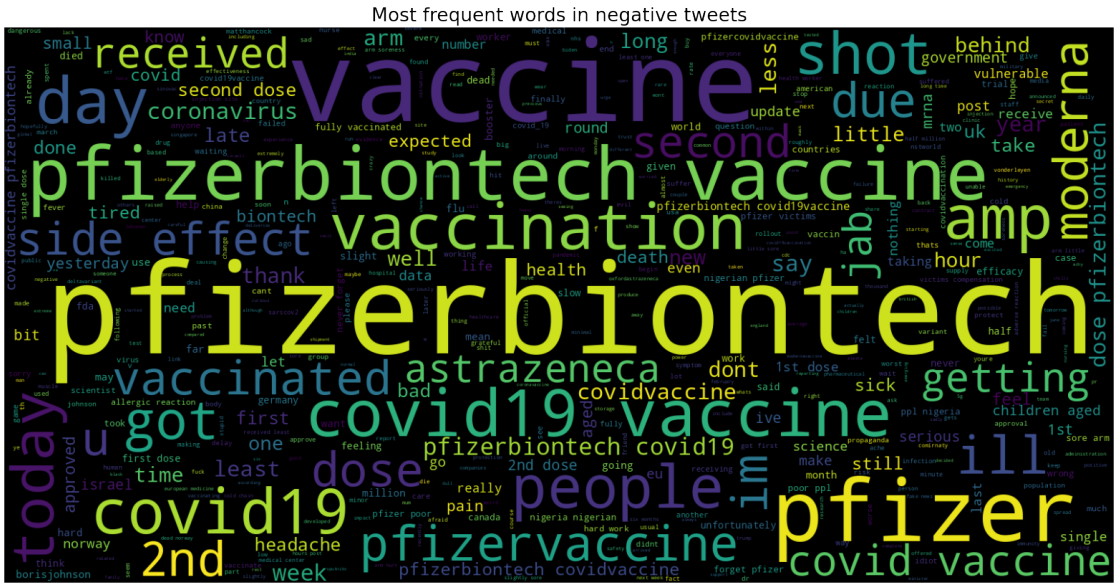


[ ]:
```
neg_tweets = text_df[text_df.sentiment == 'Negative']
neg_tweets = neg_tweets.sort_values(['polarity'], ascending= False)
neg_tweets.head()
```

[ ]:

	text	polarity	sentiment
2912	work skilled nursing facility got first vaccin…	-0.003333	Negative
7256	200321 752308 vaccinations new daily record da…	-0.003409	Negative
2073	ukgovernment cant even vaccinate properly ethi…	-0.004762	Negative
7715	got first dose less waiting time airport vacci…	-0.005556	Negative
7157	nas_k27 second dose due end next month well fa…	-0.006250	Negative

[ ]:
```
text = ' '.join([word for word in neg_tweets['text']])
plt.figure(figsize=(20,15), facecolor='None')
wordcloud = WordCloud(max_words=500, width=1600, height=800).generate(text)
plt.imshow(wordcloud, interpolation='bilinear')
plt.axis("off")
plt.title('Most frequent words in negative tweets', fontsize=19)
plt.show()
```



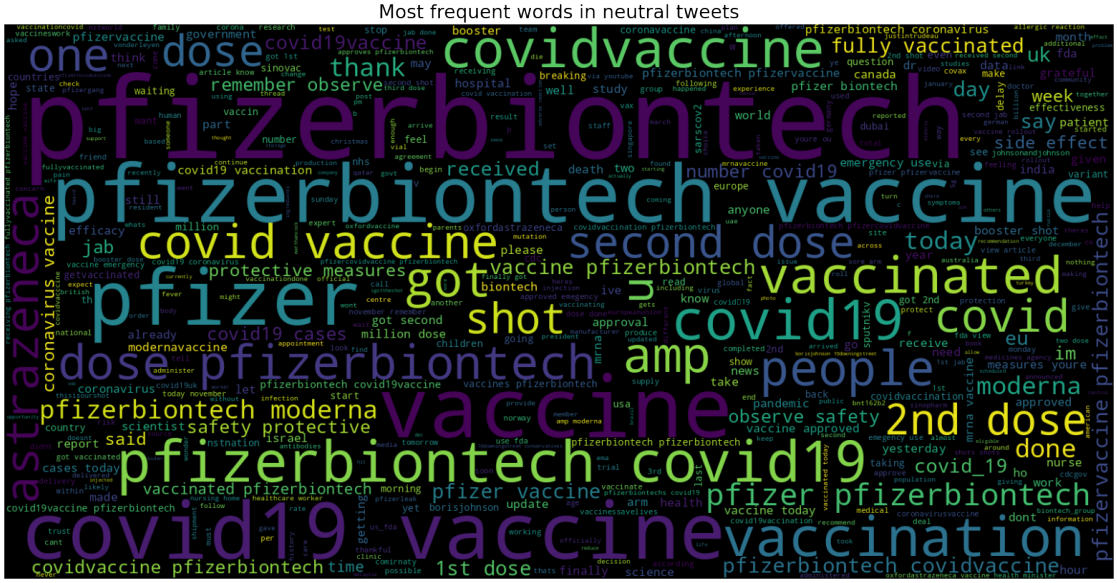
[ ]:
```
neutral_tweets = text_df[text_df.sentiment == 'Neutral']
neutral_tweets = neutral_tweets.sort_values(['polarity'], ascending= False)
neutral_tweets.head()
```

[ ]:

	text	polarity	sentiment
0	folks said daikon paste could treat cytokine s…	0.0	Neutral
7347	anyone else feel like framing vaccine card pfi…	0.0	Neutral
7458	looking forward getting second pfizer shot any…	0.0	Neutral
7454	never thought id running diff vaccine modernav…	0.0	Neutral
7453	john___m dont get choose one person know asked…	0.0	Neutral

[ ]:
```
text = ' '.join([word for word in neutral_tweets['text']])
plt.figure(figsize=(20,15), facecolor='None')
wordcloud = WordCloud(max_words=500, width=1600, height=800).generate(text)
plt.imshow(wordcloud, interpolation='bilinear')
plt.axis("off")
plt.title('Most frequent words in neutral tweets', fontsize=19)
plt.show()
```

Most frequent words in neutral tweets



[ ]:
```
vect = CountVectorizer(ngram_range=(1,2)).fit(text_df['text'])
```

[ ]:
```
from sklearn.feature_extraction.text import CountVectorizer

vect = CountVectorizer(ngram_range=(1,2)).fit(text_df['text'])

# Replace get_feature_names with get_feature_names_out
feature_names = vect.get_feature_names_out()
print("Number of features: {}\n".format(len(feature_names)))
print("First 20 features:\n {}".format(feature_names[:20]))
```

```
Number of features: 78583

First 20 features:
 ['000' '000 doses' '000 initial' '000 people' '000 vaccines' '0000001'
 '0000001 covid19' '0011' '0011 abt' '004' '004 covid' '004 israelis' '01'
 '01 getting' '01 june' '01 november' '01aug2021' '01aug2021 doublevaxxed'
 '02' '02 175']
```

[ ]:
```
X = text_df['text']
Y = text_df['sentiment']
X = vect.transform(X)
```

[ ]:
```
from sklearn.model_selection import train_test_split

# Assuming X and Y are your features and target variable respectively
# Split the data into training and testing sets
```

```
x_train, x_test, y_train, y_test = train_test_split(X, Y, test_size=0.2,␣
 ↪random_state=42) # Adjust test_size and random_state as needed

print("Size of x_train:", (x_train.shape))
print("Size of x_train:", (x_train.shape))
print("Size of y_train:", (y_train.shape))
print("Size of x_test:", (x_test.shape))
print("Size of y_test:", (y_test.shape))
```

```
Size of x_train: (8434, 78583)
Size of x_train: (8434, 78583)
Size of y_train: (8434,)
Size of x_test: (2109, 78583)
Size of y_test: (2109,)
```

[ ]:
```
import warnings
warnings.filterwarnings('ignore')
```

[ ]:
```
logreg = LogisticRegression()
logreg.fit(x_train, y_train)
logreg_pred = logreg.predict(x_test)
logreg_acc = accuracy_score(logreg_pred, y_test)
print("Test accuracy: {:.2f}%".format(logreg_acc*100))
```

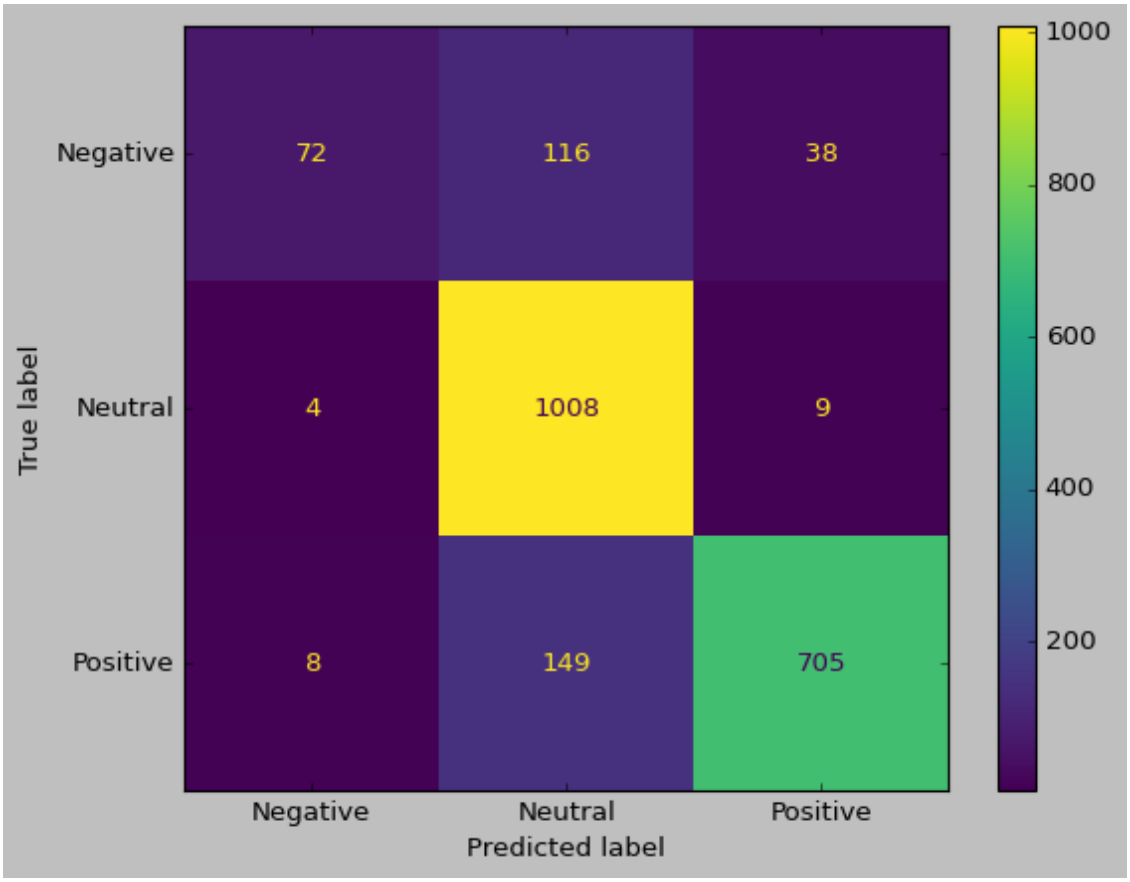
```
Test accuracy: 84.64%
```

[ ]:
```
print(confusion_matrix(y_test, logreg_pred))
print("\n")
print(classification_report(y_test, logreg_pred))
```

```
[[  72  116   38]
 [   4 1008    9]
 [   8  149  705]]


              precision    recall  f1-score   support

    Negative       0.86      0.32      0.46       226
     Neutral       0.79      0.99      0.88      1021
    Positive       0.94      0.82      0.87       862

    accuracy                           0.85      2109
   macro avg       0.86      0.71      0.74      2109
weighted avg       0.86      0.85      0.83      2109
```

[ ]:
```
style.use('classic')
cm = confusion_matrix(y_test, logreg_pred, labels=logreg.classes_)
disp = ConfusionMatrixDisplay(confusion_matrix = cm, display_labels=logreg.
 ↪classes_)
disp.plot()
```

[ ]:
```
<sklearn.metrics._plot.confusion_matrix.ConfusionMatrixDisplay at
0x7a23bc41aaa0>
```



[ ]:
```
from sklearn.model_selection import GridSearchCV
```

[ ]:
```
param_grid={'C':[0.001, 0.01, 0.1, 1, 10]}
grid = GridSearchCV(LogisticRegression(), param_grid)
grid.fit(x_train, y_train)
```

[ ]:
```
GridSearchCV(estimator=LogisticRegression(),
             param_grid={'C': [0.001, 0.01, 0.1, 1, 10]})
```

[ ]:
```
print("Best parameters:", grid.best_params_)
```

```
Best parameters: {'C': 10}
```

[ ]:
```
y_pred = grid.predict(x_test)
```

[ ]:
```
logreg_acc = accuracy_score(y_pred, y_test)
print("Test accuracy: {:.2f}%".format(logreg_acc*100))
```

```
Test accuracy: 86.30%
```

[ ]:
```
print(confusion_matrix(y_test, y_pred))
print("\n")
print(classification_report(y_test, y_pred))
```

```
[[  90  101   35]
 [   5 1006   10]
 [   9  129  724]]


              precision    recall  f1-score   support

    Negative       0.87      0.40      0.55       226
     Neutral       0.81      0.99      0.89      1021
    Positive       0.94      0.84      0.89       862

    accuracy                           0.86      2109
   macro avg       0.87      0.74      0.77      2109
weighted avg       0.87      0.86      0.85      2109
```

[ ]:
```
from sklearn.svm import LinearSVC
```

[ ]:
```
SVCmodel = LinearSVC()
SVCmodel.fit(x_train, y_train)
```

[ ]:
```
LinearSVC()
```

[ ]:
```
svc_pred = SVCmodel.predict(x_test)
svc_acc = accuracy_score(svc_pred, y_test)
print("test accuracy: {:.2f}%".format(svc_acc*100))
```

```
test accuracy: 87.34%
```

[ ]:
```
print(confusion_matrix(y_test, svc_pred))
print("\n")
print(classification_report(y_test, svc_pred))
```

```
[[ 101   91   34]
 [   6 1007    8]
```

```
 [  14  114  734]]
```

	precision	recall	f1-score	support
Negative	0.83	0.45	0.58	226
Neutral	0.83	0.99	0.90	1021
Positive	0.95	0.85	0.90	862
accuracy			0.87	2109
macro avg	0.87	0.76	0.79	2109
weighted avg	0.88	0.87	0.87	2109

[ ]:
```
from sklearn.model_selection import GridSearchCV
from sklearn.svm import LinearSVC

SVCmodel = LinearSVC()
SVCmodel.fit(x_train, y_train)

# Remove 'kernel', 'degree', and 'gamma' from the grid
grid = {
    'C': [0.01, 0.1, 1, 10],
    # 'kernel': ["linear", "poly", "rbf", "sigmoid"],  # Remove this line
    # 'degree': [1, 3, 5, 7],  # Remove this line
    # 'gamma': [0.01, 1]  # Remove this line
}

grid = GridSearchCV(SVCmodel, param_grid=grid)
grid.fit(x_train, y_train)
```

[ ]:
```
GridSearchCV(estimator=LinearSVC(), param_grid={'C': [0.01, 0.1, 1, 10]})
```

[ ]:
```
print("Best parameter:", grid.best_params_)
```

```
Best parameter: {'C': 10}
```

[ ]:
```
y_pred = grid.predict(x_test)
```

[ ]:
```
logreg_acc = accuracy_score(y_pred, y_test)
print("Test accuracy: {:.2f}%".format(logreg_acc*100))
```

```
Test accuracy: 87.58%
```

[ ]:
```
print(confusion_matrix(y_test, y_pred))
print("\n")
print(classification_report(y_test, y_pred))
```

```
[[ 105   87   34]
 [   7 1005    9]
 [  14  111  737]]
```

	precision	recall	f1-score	support
Negative	0.83	0.46	0.60	226
Neutral	0.84	0.98	0.90	1021
Positive	0.94	0.85	0.90	862
accuracy			0.88	2109
macro avg	0.87	0.77	0.80	2109
weighted avg	0.88	0.88	0.87	2109

[1]:
```
import tweepy #to access the twitter api
import pandas as pd #for basic data operations
```

[7]:
```
# Importing the keys from twitter api
consumerKey = "xxxxxxxxxxxxxxxxxxx"
consumerSecret = "xxxxxxxxxxxxxxxxxxx"
accessToken = "xxxxxxxxxxxxxxxxxxx"
accessTokenSecret = "xxxxxxxxxxxxxxxxxxx"
# Establish the connection with twitter API
auth = tweepy.OAuthHandler(consumerKey, consumerSecret)
auth.set_access_token(accessToken, accessTokenSecret)
api = tweepy.API(auth)
# Search for the Term and define number of tweets
searchTerm = input("Enter Keyword/Tag to search about: ")
NoOfTerms = int(input("Enter how many tweets to search: "))
# Get no of tweets and searched term together
```

```
Enter Keyword/Tag to search about: covidvaccine
Enter how many tweets to search: 9
```

[ ]: