## A special thanks to all my mentors for helping me constantly to progress technically

## Jupyter notebook prepared, arranged and executed by Karthi Balasundaram , sentimentally analysing Russian Ukraine War using real tweet data from twitter.

In [3]:

```
# installing natural language toolkit(nltk)
!pip install nltk
```

```
Defaulting to user installation because normal site-packages is not writeable
Collecting nltk
  Downloading nltk-3.7-py3-none-any.whl (1.5 MB)
     |████████████████████████████████| 1.5 MB 2.4 MB/s
Requirement already satisfied: click in ./Library/Python/3.9/lib/python/site-p
ackages (from nltk) (8.0.3)
Collecting regex>=2021.8.3
  Downloading regex-2022.3.15-cp39-cp39-macosx_10_9_x86_64.whl (288 kB)
     |████████████████████████████████| 288 kB 2.6 MB/s
Requirement already satisfied: tqdm in /Library/Frameworks/Python.framework/Ve
rsions/3.9/lib/python3.9/site-packages (from nltk) (4.62.3)
Requirement already satisfied: joblib in /Library/Frameworks/Python.framework/
Versions/3.9/lib/python3.9/site-packages (from nltk) (1.0.1)
Installing collected packages: regex, nltk
  WARNING: The script nltk is installed in '/Users/karthibalasundaram/Library/
Python/3.9/bin' which is not on PATH.
  Consider adding this directory to PATH or, if you prefer to suppress this wa
rning, use --no-warn-script-location.
Successfully installed nltk-3.7 regex-2022.3.15
WARNING: You are using pip version 21.3.1; however, version 22.0.4 is availabl
e.
You should consider upgrading via the '/Library/Frameworks/Python.framework/Ve
rsions/3.9/bin/python3.9 -m pip install --upgrade pip' command.
```

In [9]:

```
# installing openpyxl (a python library to read/write excel files)
!pip install openpyxl
```

```
Defaulting to user installation because normal site-packages is not writeable
Collecting openpyxl
  Downloading openpyxl-3.0.9-py2.py3-none-any.whl (242 kB)
     |████████████████████████████████| 242 kB 1.7 MB/s
Collecting et-xmlfile
  Downloading et_xmlfile-1.1.0-py3-none-any.whl (4.7 kB)
Installing collected packages: et-xmlfile, openpyxl
Successfully installed et-xmlfile-1.1.0 openpyxl-3.0.9
WARNING: You are using pip version 21.3.1; however, version 22.0.4 is availabl
e.
You should consider upgrading via the '/Library/Frameworks/Python.framework/Ve
rsions/3.9/bin/python3.9 -m pip install --upgrade pip' command.
```

In [4]:

```
#importing other default and necessary libraries
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import string
import re
import nltk
from nltk.util import pr
from nltk.corpus import stopwords
import warnings
warnings.filterwarnings('ignore')
stemmer = nltk.SnowballStemmer("english")
nltk.download('stopwords')
stopword=set(stopwords.words('english'))
```

```
[nltk_data] Downloading package stopwords to
[nltk_data]     /Users/karthibalasundaram/nltk_data...
[nltk_data]   Unzipping corpora/stopwords.zip.
```

In [111…

```
#reading the excel file using pandas library
data = pd.read_excel("/Users/karthibalasundaram/Downloads/Russia_Ukraine_war/
```

In [112…

```
#the below line calls last 5 rows from the excel
data.tail()
```

Out[112…

| | id | conversation_id | created_at | date | time | timezone | user_id |
|---|---|---|---|---|---|---|---|
| **10009** | 1.504308e+18 | 1.503516e+18 | 2022-03-17 04:06:25 UTC | 2022-03-17 | 04:06:25 | 0.0 | 1.486028e+18 |
| **10010** | 1.504308e+18 | 1.504308e+18 | 2022-03-17 04:06:24 UTC | 2022-03-17 | 04:06:24 | 0.0 | 1.504306e+18 |
| **10011** | 1.504308e+18 | 1.486862e+18 | 2022-03-17 04:06:24 UTC | 2022-03-17 | 04:06:24 | 0.0 | 1.470945e+18 |
| **10012** | 1.504308e+18 | 1.504289e+18 | 2022-03-17 04:06:24 UTC | 2022-03-17 | 04:06:24 | 0.0 | 1.239372e+18 |
| **10013** | 1.504308e+18 | 1.504111e+18 | 2022-03-17 04:06:23 UTC | 2022-03-17 | 04:06:23 | 0.0 | 1.464508e+18 |

5 rows × 36 columns

In [113…

```
#the below line calls first 5 rows from the excel
data.head()
```

Out[113...

| | id | conversation_id | created_at | date | time | timezone | user_id | |
|---|---|---|---|---|---|---|---|---|
| **0** | 1.504326e+18 | 1.504083e+18 | 2022-03-17 05:15:51 UTC | 2022-03-17 | 05:15:51 | 0.0 | 1.016938e+09 | bowti |
| **1** | 1.504326e+18 | 1.504323e+18 | 2022-03-17 05:15:51 UTC | 2022-03-17 | 05:15:51 | 0.0 | 1.420232e+18 | the |
| **2** | 1.504326e+18 | 1.504326e+18 | 2022-03-17 05:15:51 UTC | 2022-03-17 | 05:15:51 | 0.0 | 1.387731e+18 | rosaor |
| **3** | 1.504326e+18 | 1.504326e+18 | 2022-03-17 05:15:50 UTC | 2022-03-17 | 05:15:50 | 0.0 | 5.421008e+07 | |
| **4** | 1.504326e+18 | 1.504325e+18 | 2022-03-17 05:15:50 UTC | 2022-03-17 | 05:15:50 | 0.0 | 6.432839e+07 | ar |

5 rows × 36 columns

In [114...

```
#understanding rows and columns present in the excel
data.shape
```

Out[114...

```
(10014, 36)
```

In [115...

```
#retreives basic info about the excel data
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10014 entries, 0 to 10013
Data columns (total 36 columns):
 #   Column           Non-Null Count  Dtype         
---  ------           --------------  -----         
 0   id               10014 non-null  float64       
 1   conversation_id  10014 non-null  float64       
 2   created_at       10014 non-null  object        
 3   date             10014 non-null  datetime64[ns]
 4   time             10014 non-null  object        
 5   timezone         10014 non-null  float64       
 6   user_id          10014 non-null  float64       
 7   username         10014 non-null  object        
 8   name             10014 non-null  object        
 9   place            1 non-null      object        
 10  tweet            10014 non-null  object        
 11  language         10014 non-null  object        
 12  mentions         10014 non-null  object        
 13  urls             10014 non-null  object        
 14  photos           10014 non-null  object        
 15  replies_count    10014 non-null  float64       
 16  retweets_count   10014 non-null  float64       
 17  likes_count      10014 non-null  float64       
 18  hashtags         10014 non-null  object        
 19  cashtags         10014 non-null  object        
 20  link             10014 non-null  object        
 21  retweet          10014 non-null  bool          
 22  quote_url        876 non-null    object        
 23  video            10014 non-null  float64       
 24  thumbnail        936 non-null    object        
 25  near             0 non-null      float64       
 26  geo              0 non-null      float64       
 27  source           0 non-null      float64       
 28  user_rt_id       0 non-null      float64       
 29  user_rt          0 non-null      float64       
 30  retweet_id       0 non-null      float64       
 31  reply_to         10014 non-null  object        
 32  retweet_date     0 non-null      float64       
 33  translate        0 non-null      float64       
 34  trans_src        0 non-null      float64       
 35  trans_dest       0 non-null      float64       
dtypes: bool(1), datetime64[ns](1), float64(18), object(16)
memory usage: 2.7+ MB
```

In [116…

```
#a brief description about the data
data.describe()
```

Out[116…

| | id | conversation_id | timezone | user_id | replies_count | retweets_count |
|---|---|---|---|---|---|---|
| **count** | 1.001400e+04 | 1.001400e+04 | 10014.0 | 1.001400e+04 | 10014.000000 | 10014.000000 |
| **mean** | 1.504317e+18 | 1.502877e+18 | 0.0 | 6.984499e+17 | 0.313661 | 0.552227 |
| **std** | 5.075717e+12 | 2.728863e+16 | 0.0 | 6.443610e+17 | 2.549457 | 10.848945 |
| **min** | 1.504308e+18 | 4.371802e+17 | 0.0 | 7.421430e+05 | 0.000000 | 0.000000 |
| **25%** | 1.504312e+18 | 1.504181e+18 | 0.0 | 4.921743e+08 | 0.000000 | 0.000000 |
| **50%** | 1.504317e+18 | 1.504309e+18 | 0.0 | 8.388104e+17 | 0.000000 | 0.000000 |
| **75%** | 1.504321e+18 | 1.504316e+18 | 0.0 | 1.354872e+18 | 0.000000 | 0.000000 |
| **max** | 1.504326e+18 | 1.504326e+18 | 0.0 | 1.504322e+18 | 142.000000 | 666.000000 |

In [117…

```
data.isnull().sum()
```

Out[117…

```
id                      0
conversation_id         0
created_at              0
date                    0
time                    0
timezone                0
user_id                 0
username                0
name                    0
place               10013
tweet                   0
language                0
mentions                0
urls                    0
photos                  0
replies_count           0
retweets_count          0
likes_count             0
hashtags                0
cashtags                0
link                    0
retweet                 0
quote_url            9138
video                   0
thumbnail            9078
near                10014
geo                 10014
source              10014
user_rt_id          10014
user_rt             10014
retweet_id          10014
reply_to                0
retweet_date        10014
translate           10014
trans_src           10014
trans_dest          10014
dtype: int64
```

In [118…

```
#retreives all the columns
data.columns
```

Out[118…

```
Index(['id', 'conversation_id', 'created_at', 'date', 'time', 'timezone',
       'user_id', 'username', 'name', 'place', 'tweet', 'language', 'mentions'
,
       'urls', 'photos', 'replies_count', 'retweets_count', 'likes_count',
       'hashtags', 'cashtags', 'link', 'retweet', 'quote_url', 'video',
       'thumbnail', 'near', 'geo', 'source', 'user_rt_id', 'user_rt',
       'retweet_id', 'reply_to', 'retweet_date', 'translate', 'trans_src',
       'trans_dest'],
      dtype='object')
```

In [119…

```
#lists first 5 data(tweets) listed under the column "tweet"
data[["tweet"]].head()
```

Out[119…

|   | tweet |
|---|---|
| **0** | @PeterSchiff @PadaPrabu @SteveKrohn1 If it wer... |
| **1** | @meatballsubzero Are you pro russia or pro Ukr... |
| **2** | @SUBWAY Please stop doing business in Russia.... |
| **3** | Is Russia prepared for an economic crisis? Dev... |
| **4** | @BW Putin is Fake News ðŸ“° The Ruble is trash... |

In [120…

```
#lists first 5 data(username) listed under the column "username"
data[["username"]].head()
```

Out[120…

|   | username |
|---|---|
| **0** | bowtiedbeyonce |
| **1** | theshydoomer |
| **2** | rosaort91373426 |
| **3** | woodsallan |
| **4** | artemistweet |

In [121…

```
#lists first 5 data(langauge) listed under the column "language"
data[["language"]].head()
```

Out[121…

|   | language |
|---|---|
| **0** | en |
| **1** | en |
| **2** | en |
| **3** | en |
| **4** | en |

In [122…

```
#displays the tweets posted in corresponding languages
data["language"].value_counts()
```

Out[122…

```
en     9018
pt      211
und     158
it      118
hi       80
in       79
ru       69
ja       54
es       22
pl       19
tl       18
nl       15
de       14
ar       13
fr       13
zh       11
th       10
ca        9
ta        8
ro        6
et        6
bn        5
fi        5
mr        5
ne        5
or        5
uk        4
kn        4
cs        4
ml        4
te        3
el        3
ur        3
no        3
gu        3
tr        2
iw        2
sl        1
am        1
fa        1
Name: language, dtype: int64
```

In [123…

```
#lists first 5 data(URL's) listed under the column "link"
data[["link"]].head()
```

Out [123...

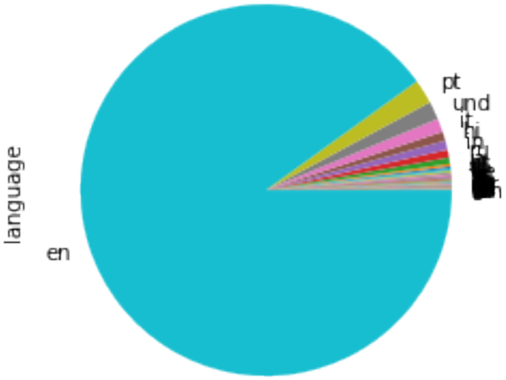
|   | link |
|---|---|
| 0 | https://twitter.com/bowtiedbeyonce/status/1504... |
| 1 | https://twitter.com/TheShyDoomer/status/150432... |
| 2 | https://twitter.com/RosaOrt91373426/status/150... |
| 3 | https://twitter.com/WoodsAllan/status/15043256... |
| 4 | https://twitter.com/ArtemisTweet/status/150432... |

In [124...

```
#sorting the languages
pi = data.language.value_counts().sort_values()
```

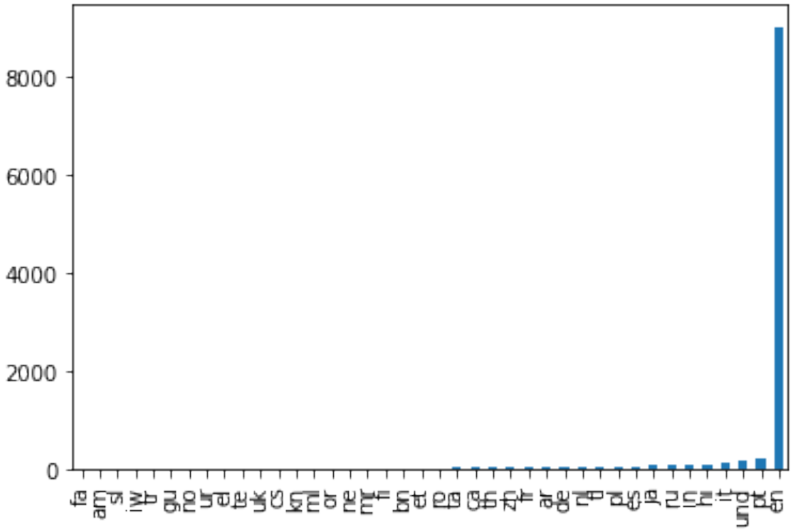
In [125...

```
#displaying the sorted lanuages in a pie chart
displ = pi.plot(kind = 'pie')
```



In [126...

```
#displaying the sorted lanuages in a bar chart
displ1 = pi.plot(kind = 'bar')
```



In [127…

```
#displays the 369th tweet
data["tweet"][369]
```

Out[127…

```
'@MarshaHairbrush @RusEmbJakarta @mfa_russia @natomission_ru @NATO @Kemlu_RI @
RusEmbUSA @RusEmbIndia @EmbassyofRussia  https://t.co/dSosWvqgMo'
```

In [128…

```
# defining function for twitter hashtag extraction to classify sentiment anal
def hashtag_extract(text_list):
    hashtags = []
    for text in text_list:
        ht = re.findall(r"#(\w+)", text)
        hashtags.append(ht)
    return hashtags
```

In [133…

```
#importing seaborn library
import seaborn as sns
```

In [134…

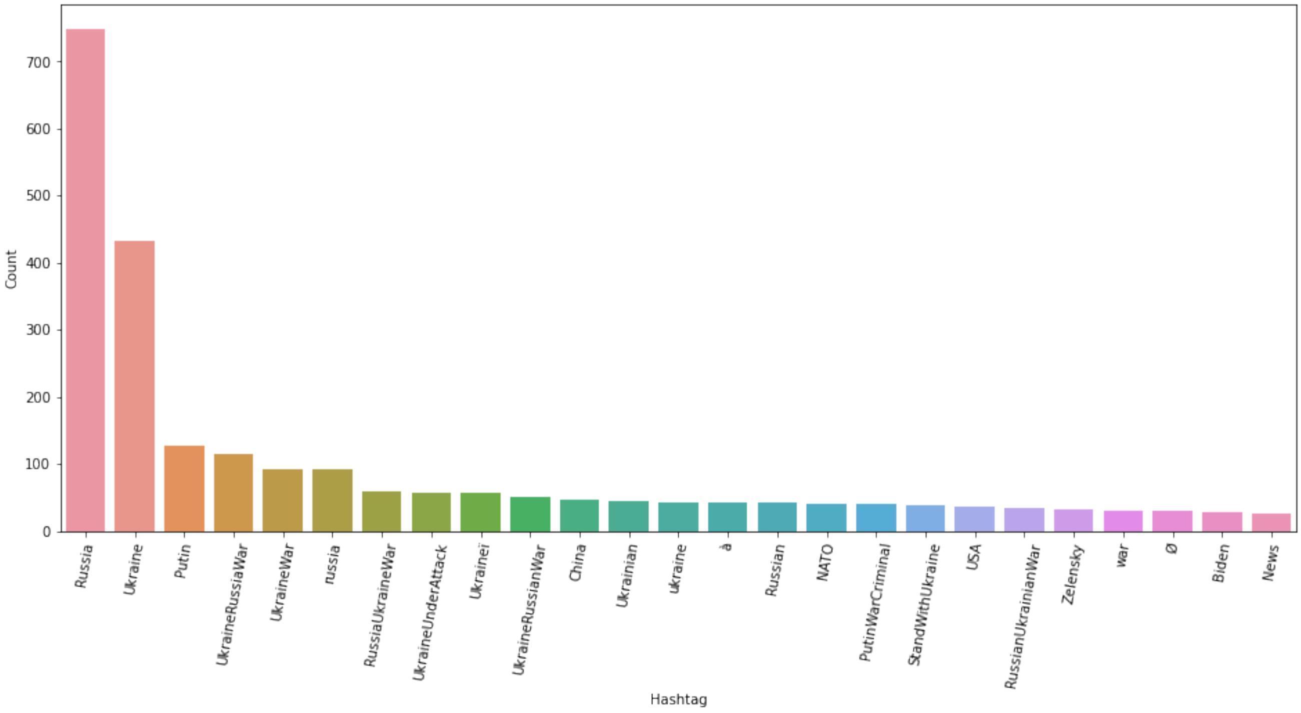
```
# defining function for generating frequent hashtag used
def generate_hashtag_freqdist(hashtags):
    a = nltk.FreqDist(hashtags)
    b = pd.DataFrame({'Hashtag': list(a.keys()),'Count': list(a.values())})
    # selecting top 15 most frequent hashtags
    b = b.nlargest(columns="Count", n = 25)
    plt.figure(figsize=(16,7))
    ax = sns.barplot(data=b, x= "Hashtag", y = "Count")
    plt.xticks(rotation=80)
    ax.set(ylabel = 'Count')
    plt.show()
```

In [135…

```
hashtags = hashtag_extract(data["tweet"])
hashtags = sum(hashtags, [])
```

In [136…

```
#frequently used hastags are displayed using seaborn library
generate_hashtag_freqdist(hashtags)
```



In [188…

```
data['total_length_characters'] = data['tweet'].str.len()
print(data['total_length_characters'])
total_length_characters = data['total_length_characters'].sum()
print(total_length_characters)
count = 0
for y in data["tweet"]:
    count = count + 1
print(count)
average_length = total_length_characters / count
print (average_length)
```

```
0        130
1        162
2        167
3        220
4         87
        ... 
10009    255
10010     84
10011    176
10012    249
10013    216
Name: total_length_characters, Length: 10014, dtype: int64
1831052
10014
182.84921110445376
```

In [189…

```
data['total_count_words'] = data['tweet'].str.split().str.len()
print(data['total_count_words'])
total_words = data['total_count_words'].sum()
print(total_words)
count = 0
for y in data["tweet"]:
    count = count + 1
print(count)
average_words = total_words / count
print (average_words)
```

```
0        22
1        28
2        26
3        32
4        15
         ..
10009    44
10010    11
10011    32
10012    39
10013    32
Name: total_count_words, Length: 10014, dtype: int64
271703
10014
27.13231475933693
```

In [190…

```
def clean(text):
    text = str(text).lower()
    text = re.sub('\[.*?\]', '', text)
    text = re.sub('https?://\S+|www\.\S+', '', text)
    text = re.sub('<.*?>+', '', text)
    text = re.sub('[%s]' % re.escape(string.punctuation), '', text)
    text = re.sub('\n', '', text)
    text = re.sub('\w*\d\w*', '', text)
    text = [word for word in text.split(' ') if word not in stopword]
    text=" ".join(text)
    text = [stemmer.stem(word) for word in text.split(' ')]
    text=" ".join(text)
    return text
data["tweet"] = data["tweet"].apply(clean)
```

In [191…

```
data['total_length_characters'] = data['tweet'].str.len()
print(data['total_length_characters'])
total_length_characters = data['total_length_characters'].sum()
print("Total_length :",total_length_characters)
count = 0
for y in data["tweet"]:
    count = count + 1
print("Total_rows :",count)
average_length = total_length_characters / count
print ("Averge length :",average_length)
```

```
0          64
1          98
2         121
3         134
4          59
        ... 
10009     126
10010      74
10011     115
10012     130
10013     137
Name: total_length_characters, Length: 10014, dtype: int64
Total_length : 1142035
Total_rows : 10014
Averge length : 114.04383862592371
```

In [192…

```
data['total_count_words'] = data['tweet'].str.split().str.len()
print(data['total_count_words'])
total_words = data['total_count_words'].sum()
print(total_words)
count = 0
for y in data["tweet"]:
    count = count + 1
print(count)
average_words = total_words / count
print (average_words)
```

```
0         9
1        16
2        19
3        19
4        11
         ..
10009    20
10010    10
10011    19
10012    20
10013    18
Name: total_count_words, Length: 10014, dtype: int64
163674
10014
16.344517675254643
```

In [68]:

```
!pip3 install textblob
```

```
Defaulting to user installation because normal site-packages is not writeable
Collecting textblob
  Downloading textblob-0.17.1-py2.py3-none-any.whl (636 kB)
     |████████████████████████████████| 636 kB 1.7 MB/s
Requirement already satisfied: nltk>=3.1 in ./Library/Python/3.9/lib/python/si
te-packages (from textblob) (3.7)
Requirement already satisfied: joblib in /Library/Frameworks/Python.framework/
Versions/3.9/lib/python3.9/site-packages (from nltk>=3.1->textblob) (1.0.1)
Requirement already satisfied: click in ./Library/Python/3.9/lib/python/site-p
ackages (from nltk>=3.1->textblob) (8.0.3)
Requirement already satisfied: tqdm in /Library/Frameworks/Python.framework/Ve
rsions/3.9/lib/python3.9/site-packages (from nltk>=3.1->textblob) (4.62.3)
Requirement already satisfied: regex>=2021.8.3 in ./Library/Python/3.9/lib/pyt
hon/site-packages (from nltk>=3.1->textblob) (2022.3.15)
Installing collected packages: textblob
Successfully installed textblob-0.17.1
WARNING: You are using pip version 21.3.1; however, version 22.0.4 is availabl
e.
You should consider upgrading via the '/Library/Frameworks/Python.framework/Ve
rsions/3.9/bin/python3.9 -m pip install --upgrade pip' command.
```

In [193...

```
from textblob import TextBlob
```

In [194...

```
def analyze_sentiment(tweet):
    analysis = TextBlob(clean(tweet))
    if analysis.sentiment.polarity > 0:
        return 1
    elif analysis.sentiment.polarity == 0:
        return 0
    else:
        return -1
```

In [195...

```
data['Sentiment'] = data['tweet'].apply(lambda x:analyze_sentiment(x))
data['Source'] = 'random_user'
data['Length'] = data['tweet'].apply(len)
data['Word_counts'] = data['tweet'].apply(lambda x:len(str(x).split()))
```

In [196...

```
data1=data[['tweet','retweets_count', 'Sentiment', 'Source',
'Length','Word_counts']]
data1.head()
```

Out[196...

| | tweet | retweets_count | Sentiment | Source | Length | Word_counts |
|---|---|---|---|---|---|---|
| **0** | peterschiff padaprabu would shit pant chang n... | 0.0 | -1 | random_user | 64 | 9 |
| **1** | meatballsubzero pro russia pro ukrain cannot ... | 0.0 | 0 | random_user | 98 | 16 |
| **2** | subway pleas stop busi russia everi dollar sp... | 0.0 | 1 | random_user | 121 | 19 |
| **3** | russia prepar econom crisi develop expert nata... | 0.0 | 0 | random_user | 134 | 19 |
| **4** | bw putin fake news ðÿ"° rubl trash ðÿ— russia... | 0.0 | -1 | random_user | 59 | 11 |

In [197...

```
data1['Clean tweet'] = data1['tweet'].apply(lambda x:clean(x))
```

In [198...

```
data1[["Clean tweet","Sentiment"]].iloc[369]
```

Out[198...

```
Clean tweet    marshahairbrush rusembjakarta mfarussia natomi...
Sentiment                                                      0
Name: 369, dtype: object
```

In [200…

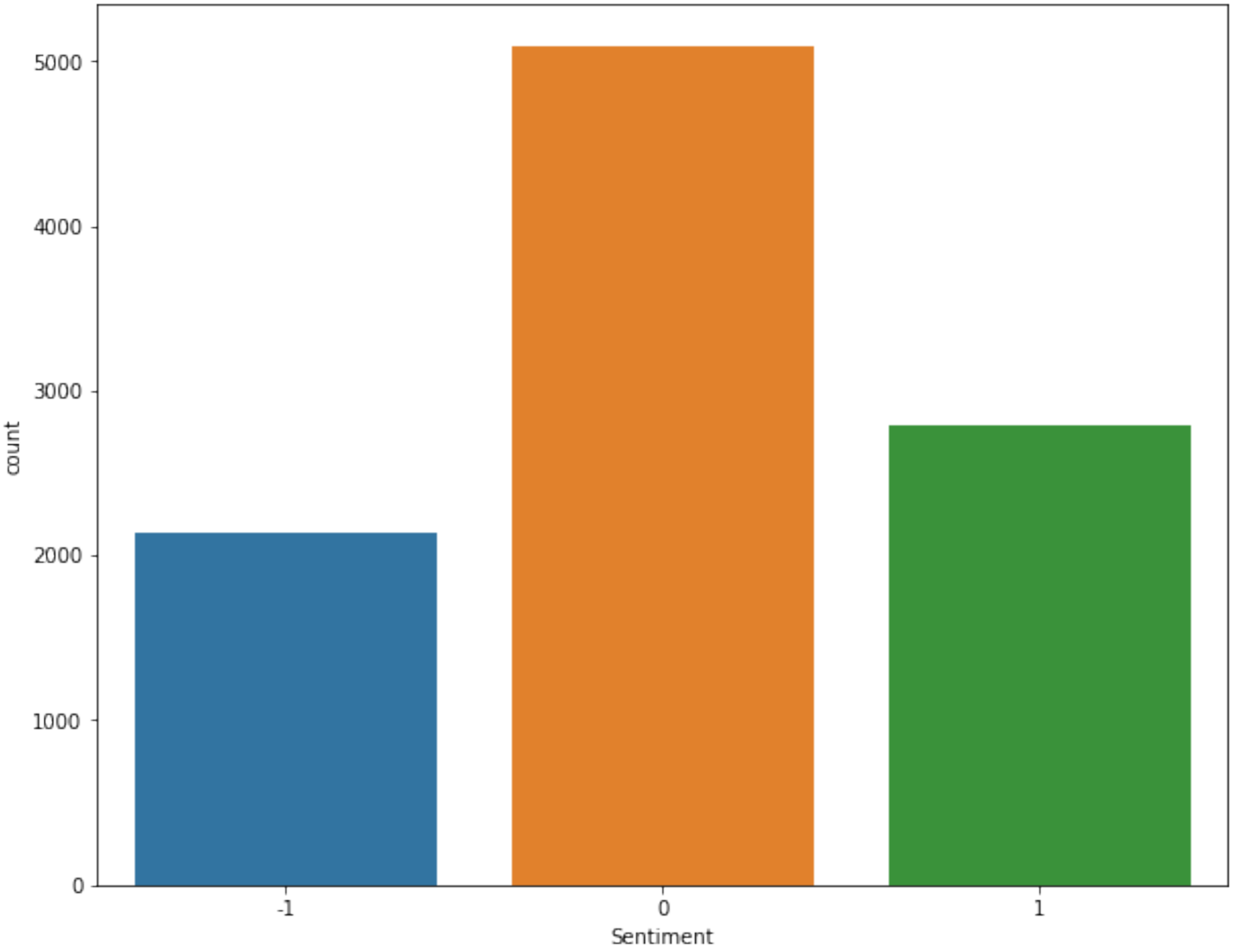
```
#displaying total number of neutral, positive and negative sentiments
sentiment = data1['Sentiment'].value_counts()
sentiment
```

Out[200…

```
 0    5094
 1    2788
-1    2132
Name: Sentiment, dtype: int64
```

In [201…

```
#plotting the sentiments using seaborn library
plt.figure(figsize = (10,8))
sns.countplot(data = data1, x = 'Sentiment')
plt.show()
```



In [202…

```
#defining values for neutral, positive and negative sentiments as 0, 1 and -1
neutral = data1[data1['Sentiment'] == 0]
positive = data1[data1['Sentiment'] == 1]
negative = data1[data1['Sentiment'] == -1]
```

In [203…

```
#retrieving details about 2001th negative tweet
negative.iloc[2001]
```

Out[203…

```
tweet             russia would like get game
retweets_count                           0.0
Sentiment                                 -1
Source                           random_user
Length                                    26
Word_counts                                5
Clean tweet       russia would like get game
Name: 9385, dtype: object
```

In [204…

```
#retrieving details about 400th postive tweet
positive.iloc[400]
```

Out[204…

```
tweet             one thing love russia there much steak japan
retweets_count                                             0.0
Sentiment                                                    1
Source                                             random_user
Length                                                      44
Word_counts                                                  8
Clean tweet             one thing love russia much steak japan
Name: 1428, dtype: object
```

In [205…

```
#retrieving details about 4300th neutral tweet
neutral.iloc[4300]
```

Out[205…

```
tweet             kyivindepend russia lost  lost 
retweets_count                                0.0
Sentiment                                       0
Source                                random_user
Length                                         31
Word_counts                                     4
Clean tweet       kyivindepend russia lost  lost 
Name: 8454, dtype: object
```

In [206…

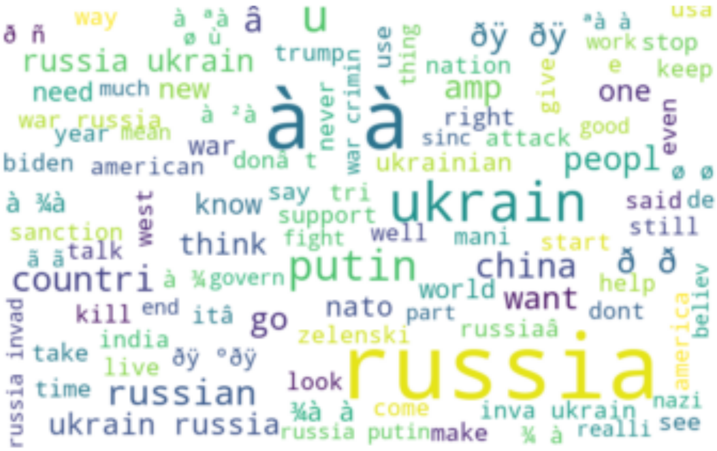
```
print ("*********************************************************************
#neutral_tweet
print("Example of a neutral tweet :",neutral['tweet'].values[3])
print ("*********************************************************************
#positive tweet
print("Example of a positive tweet :",positive['tweet'].values[6])
print ("*********************************************************************
#negative_text
print("Example of a negative tweet :",negative['tweet'].values[9])
print ("*********************************************************************
********************************************************************************
********************
Example of a neutral tweet : prayerfeath russia putin war crimin putin held ac
count russia choke sanctionsaggress invas  total unaccept russia etern dame
********************************************************************************
********************
Example of a positive tweet : itâ€™ show  america amp nato arenâ€™t tri win gr
ound war russia give scrap ukrain compar could give  zelenski isnâ€™t tri stri
ke deal  long go drag
********************************************************************************
********************
Example of a negative tweet : mani compani step help put pressur russia list h
avent long includ reebok eddiebau ninewest subway halliburton dunkindonut gene
ralmil hiltonhotel marriott hyatt mani
********************************************************************************
********************
```

In [207…

```python
from wordcloud import WordCloud
```

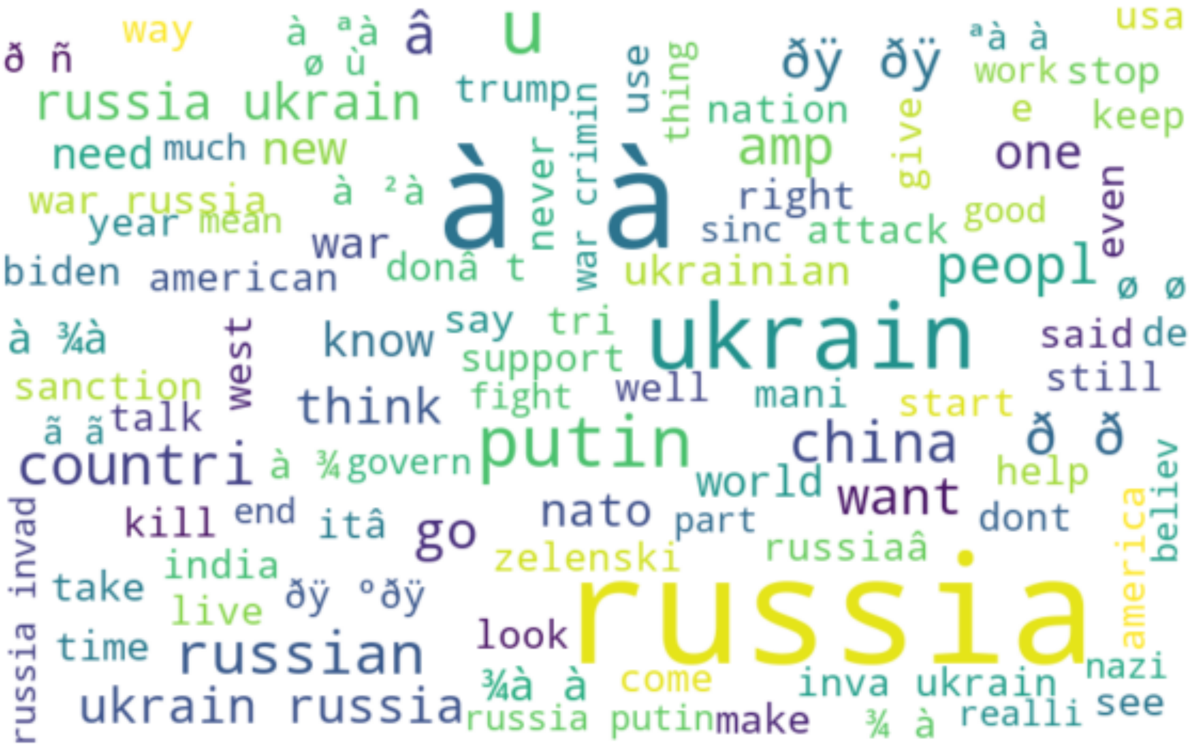
In [208…

```python
txt = ' '.join(text for text in data1['Clean tweet'])
wordcloud = WordCloud(
            background_color = 'white',
            max_font_size = 100,
            max_words = 100,
            width = 800,
            height = 500
            ).generate(txt)
plt.imshow(wordcloud,interpolation = 'bilinear')
plt.axis('off')
plt.show()
```



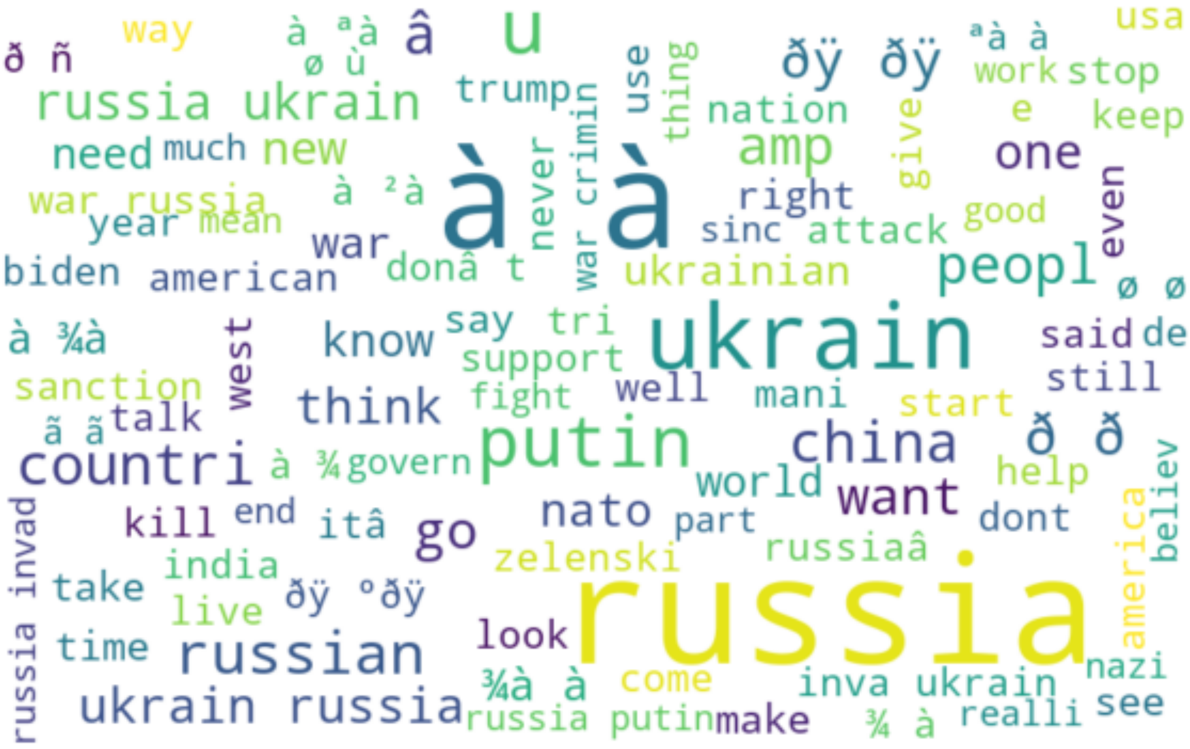
In [209…

```
#displaying the positive words using wordcloud
positive_words =' '.join([text for text in data1['Clean tweet'][data1['Sentim
#wordcloud = WordCloud(width=800, height=500, random_state=21, max_font_size=
wordcloud1 = WordCloud(
            random_state=21,
            max_font_size = 110,
            max_words = 100,
            width = 800,
            height = 500
            ).generate(positive_words)
plt.figure(figsize=(10, 7))
plt.imshow(wordcloud, interpolation="bilinear")
plt.axis('off')
plt.show()
```



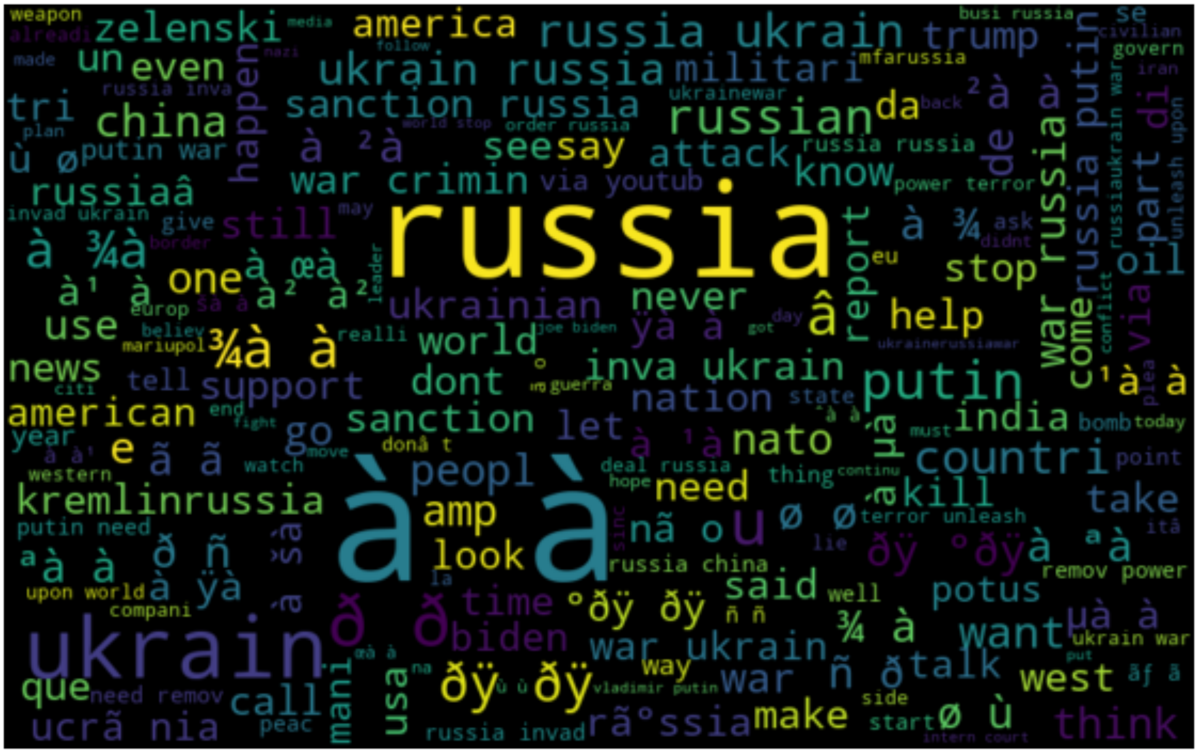
In [210…

```
#displaying the negative words using wordcloud
negative_words =' '.join([text for text in data1['Clean tweet'][data1['Sentim
#wordcloud = WordCloud(width=800, height=500, random_state=21, max_font_size=
wordcloud1 = WordCloud(
            random_state=21,
            max_font_size = 110,
            max_words = 100,
            width = 800,
            height = 500
            ).generate(negative_words)
plt.figure(figsize=(10, 7))
plt.imshow(wordcloud, interpolation="bilinear")
plt.axis('off')
plt.show()
```



In [102…

```
#displaying the neutral words using wordcloud
neutral_words =' '.join([text for text in data1['Clean tweet'][data1['Sentime
wordcloud = WordCloud(width=800, height=500, random_state=21, max_font_size=1
plt.figure(figsize=(10, 7))
plt.imshow(wordcloud, interpolation="bilinear")
plt.axis('off')
plt.show()
```



Thank you for time.

Dataset may be shared upon request.

In [ ]: