# statment-analysis

June 23, 2025

[29]:
```
import pandas as pd
import nltk
from nltk.sentiment.vader import SentimentIntensityAnalyzer
from nltk.tokenize import word_tokenize
from nltk.corpus import stopwords
import re
import matplotlib.pyplot as plt
import seaborn as sns
from wordcloud import WordCloud
```

[22]:
```
# Download NLTK resources
nltk.download('vader_lexicon')
nltk.download('punkt')
nltk.download('stopwords')
```

```
[nltk_data] Downloading package vader_lexicon to /root/nltk_data…
[nltk_data]   Package vader_lexicon is already up-to-date!
[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.
```

[22]:
```
True
```

[45]:
```
# This cell is not needed as a sample dataframe is created in the next cell.

df = pd.read_csv("/twitter_training.csv" ,␣
 ↪names=["Id","Country","Label","Text"])
```

[46]:
```
df
```

[46]:

| | Id | Country | Label | \ |
|---|---|---|---|---|
| 0 | 2401 | Borderlands | Positive | |
| 1 | 2401 | Borderlands | Positive | |
| 2 | 2401 | Borderlands | Positive | |
| 3 | 2401 | Borderlands | Positive | |

```
4      2401  Borderlands  Positive
…       …           …         …
74677  9200       Nvidia  Positive
74678  9200       Nvidia  Positive
74679  9200       Nvidia  Positive
74680  9200       Nvidia  Positive
74681  9200       Nvidia  Positive

                                                    Text
0      im getting on borderlands and i will murder yo…
1      I am coming to the borders and I will kill you…
2      im getting on borderlands and i will kill you …
3      im coming on borderlands and i will murder you…
4      im getting on borderlands 2 and i will murder …
…                                                    …
74677  Just realized that the Windows partition of my…
74678  Just realized that my Mac window partition is …
74679  Just realized the windows partition of my Mac …
74680  Just realized between the windows partition of…
74681  Just like the windows partition of my Mac is l…

[74682 rows x 4 columns]
```

[39]:
```
print(df.shape)
```

```
(74682, 4)
```

[41]:
```
df.head(10)
```

[41]:
```
     id      country     label  \
0  2401  Borderlands  Positive
1  2401  Borderlands  Positive
2  2401  Borderlands  Positive
3  2401  Borderlands  Positive
4  2401  Borderlands  Positive
5  2401  Borderlands  Positive
6  2402  Borderlands  Positive
7  2402  Borderlands  Positive
8  2402  Borderlands  Positive
9  2402  Borderlands  Positive

                                                text
0  im getting on borderlands and i will murder yo…
1  I am coming to the borders and I will kill you…
2  im getting on borderlands and i will kill you …
3  im coming on borderlands and i will murder you…
4  im getting on borderlands 2 and i will murder …
```

```
5  im getting into borderlands and i can murder y…
6  So I spent a few hours making something for fu…
7  So I spent a couple of hours doing something f…
8  So I spent a few hours doing something for fun…
9  So I spent a few hours making something for fu…
```

[42]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 74682 entries, 0 to 74681
Data columns (total 4 columns):
 #   Column   Non-Null Count  Dtype
---  ------   --------------  -----
 0   id       74682 non-null  int64
 1   country  74682 non-null  object
 2   label    74682 non-null  object
 3   text     73996 non-null  object
dtypes: int64(1), object(3)
memory usage: 2.3+ MB
```

[47]:
```
df['Label'].value_counts()
```

[47]:
```
Label
Negative      22542
Positive      20832
Neutral       18318
Irrelevant    12990
Name: count, dtype: int64
```

[51]:
```
df[["Label","Text"]]
```

[51]:

| | Label | Text |
|---|---|---|
| 0 | Positive | im getting on borderlands and i will murder yo… |
| 1 | Positive | I am coming to the borders and I will kill you… |
| 2 | Positive | im getting on borderlands and i will kill you … |
| 3 | Positive | im coming on borderlands and i will murder you… |
| 4 | Positive | im getting on borderlands 2 and i will murder … |
| … | … | … |
| 74677 | Positive | Just realized that the Windows partition of my… |
| 74678 | Positive | Just realized that my Mac window partition is … |
| 74679 | Positive | Just realized the windows partition of my Mac … |
| 74680 | Positive | Just realized between the windows partition of… |
| 74681 | Positive | Just like the windows partition of my Mac is l… |

[74682 rows x 2 columns]

[53]:
```
df.isnull().sum()
```

[53]:
```
Id           0
Country      0
Label        0
Text       686
dtype: int64
```

[54]:
```
df.dropna(inplace=True)
```

[57]:
```
stop_words = set(stopwords.words('english'))
stop_words
```

[57]:
```
{'a',
 'about',
 'above',
 'after',
 'again',
 'against',
 'ain',
 'all',
 'am',
 'an',
 'and',
 'any',
 'are',
 'aren',
 "aren't",
 'as',
 'at',
 'be',
 'because',
 'been',
 'before',
 'being',
 'below',
 'between',
 'both',
 'but',
 'by',
 'can',
 'couldn',
 "couldn't",
 'd',
 'did',
 'didn',
 "didn't",
 'do',
 'does',
```

```
'doesn',
"doesn't",
'doing',
'don',
"don't",
'down',
'during',
'each',
'few',
'for',
'from',
'further',
'had',
'hadn',
"hadn't",
'has',
'hasn',
"hasn't",
'have',
'haven',
"haven't",
'having',
'he',
"he'd",
"he'll",
"he's",
'her',
'here',
'hers',
'herself',
'him',
'himself',
'his',
'how',
'i',
"i'd",
"i'll",
"i'm",
"i've",
'if',
'in',
'into',
'is',
'isn',
"isn't",
'it',
"it'd",
```

```
"it'll",
"it's",
'its',
'itself',
'just',
'll',
'm',
'ma',
'me',
'mightn',
"mightn't",
'more',
'most',
'mustn',
"mustn't",
'my',
'myself',
'needn',
"needn't",
'no',
'nor',
'not',
'now',
'o',
'of',
'off',
'on',
'once',
'only',
'or',
'other',
'our',
'ours',
'ourselves',
'out',
'over',
'own',
're',
's',
'same',
'shan',
"shan't",
'she',
"she'd",
"she'll",
"she's",
'should',
```

```
"should've",
'shouldn',
"shouldn't",
'so',
'some',
'such',
't',
'than',
'that',
"that'll",
'the',
'their',
'theirs',
'them',
'themselves',
'then',
'there',
'these',
'they',
"they'd",
"they'll",
"they're",
"they've",
'this',
'those',
'through',
'to',
'too',
'under',
'until',
'up',
've',
'very',
'was',
'wasn',
"wasn't",
'we',
"we'd",
"we'll",
"we're",
"we've",
'were',
'weren',
"weren't",
'what',
'when',
'where',
```

```
 'which',
 'while',
 'who',
 'whom',
 'why',
 'will',
 'with',
 'won',
 "won't",
 'wouldn',
 "wouldn't",
 'y',
 'you',
 "you'd",
 "you'll",
 "you're",
 "you've",
 'your',
 'yours',
 'yourself',
 'yourselves'}
```

[69]:
```
def preprocess_text(text):
    # Convert to lowercase
    text = text.lower()
```

[79]:
```
df.drop(columns=['Cleaned_Text'], inplace=True)
```

[81]:
```
sia = SentimentIntensityAnalyzer()
```

[83]:
```
df['Sentiment_Scores'] = df['Text'].apply(lambda x: sia.polarity_scores(x))
df['Compound_Score'] = df['Sentiment_Scores'].apply(lambda x: x['compound'])

# Classify sentiment based on compound score
def classify_sentiment(score):
    if score >= 0.05:
        return 'Positive'
    elif score <= -0.05:
        return 'Negative'
    else:
        return 'Neutral'
```

[84]:
```
df['Sentiment'] = df['Compound_Score'].apply(classify_sentiment)
```

[85]:
```
print(df['Sentiment'].value_counts())
```

```
Sentiment
```

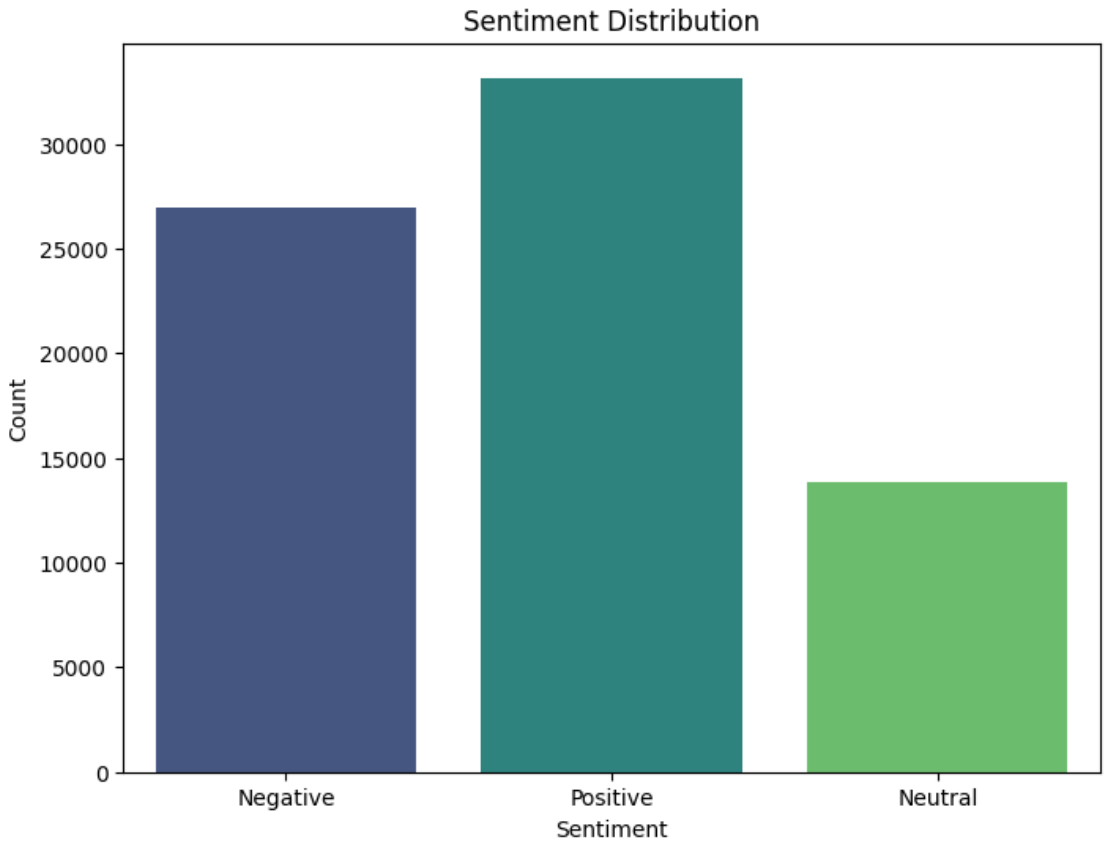
```
Positive    33161
Negative    26986
Neutral     13849
Name: count, dtype: int64
```

[86]:
```
# Plot sentiment distribution
plt.figure(figsize=(8, 6))
sns.countplot(x='Sentiment', data=df, palette='viridis')
plt.title('Sentiment Distribution')
plt.xlabel('Sentiment')
plt.ylabel('Count')
plt.show()
```

```
/tmp/ipython-input-86-1752459092.py:3: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in
v0.14.0. Assign the `x` variable to `hue` and set `legend=False` for the same
effect.

  sns.countplot(x='Sentiment', data=df, palette='viridis')
```



[92]:
```
from sklearn.preprocessing import LabelEncoder

le_model = LabelEncoder()
df['Label'] = le_model.fit_transform(df['Label'])
```

[95]:
```
df.head(5)
```

[95]:
```
     Id      Country  Label  \
0  2401  Borderlands      3
1  2401  Borderlands      3
2  2401  Borderlands      3
3  2401  Borderlands      3
4  2401  Borderlands      3

                                                Text  \
0  im getting on borderlands and i will murder yo…
1  I am coming to the borders and I will kill you…
2  im getting on borderlands and i will kill you …
3  im coming on borderlands and i will murder you…
4  im getting on borderlands 2 and i will murder …

                                   Sentiment_Scores  Compound_Score  \
0  {'neg': 0.37, 'neu': 0.63, 'pos': 0.0, 'compou…         -0.6908
1  {'neg': 0.343, 'neu': 0.657, 'pos': 0.0, 'comp…         -0.6908
2  {'neg': 0.37, 'neu': 0.63, 'pos': 0.0, 'compou…         -0.6908
3  {'neg': 0.37, 'neu': 0.63, 'pos': 0.0, 'compou…         -0.6908
4  {'neg': 0.343, 'neu': 0.657, 'pos': 0.0, 'comp…         -0.6908

  Sentiment Preprocessed Text
0  Negative              None
1  Negative              None
2  Negative              None
3  Negative              None
4  Negative              None
```

[106]:
```
from sklearn.model_selection import train_test_split

X_train, X_test, y_train, y_test = train_test_split(df['Text'], df['Label'],␣
 ↪test_size=0.2, random_state=42, stratify=df['Label'])
```

[107]:
```
print("Shape of X_train: ", X_train.shape)
print("Shape of X_test: ", X_test.shape)
```

```
Shape of X_train:  (59196,)
Shape of X_test:  (14800,)
```

[108]:
```
from sklearn.pipeline import Pipeline
from sklearn.ensemble import RandomForestClassifier
from sklearn.feature_extraction.text import TfidfVectorizer


classifier = Pipeline([
    ('vectorizer_tri_grams', TfidfVectorizer()),
    ('naive_bayes', (RandomForestClassifier()))
])
```

[109]:
```
classifier.fit(X_train, y_train)
```

[109]:
```
Pipeline(steps=[('vectorizer_tri_grams', TfidfVectorizer()),
                ('naive_bayes', RandomForestClassifier())])
```

[112]:
```
y_pred = classifier.predict(X_test)
```

[114]:
```
from sklearn.metrics import accuracy_score, classification_report

print(accuracy_score(y_test, y_pred))
```

```
0.9219594594594595
```

[115]:
```
print(classification_report(y_test, y_pred))
```

```
              precision    recall  f1-score   support

           0       0.98      0.86      0.92      2575
           1       0.91      0.95      0.93      4472
           2       0.92      0.92      0.92      3622
           3       0.90      0.93      0.92      4131

    accuracy                           0.92     14800
   macro avg       0.93      0.92      0.92     14800
weighted avg       0.92      0.92      0.92     14800
```

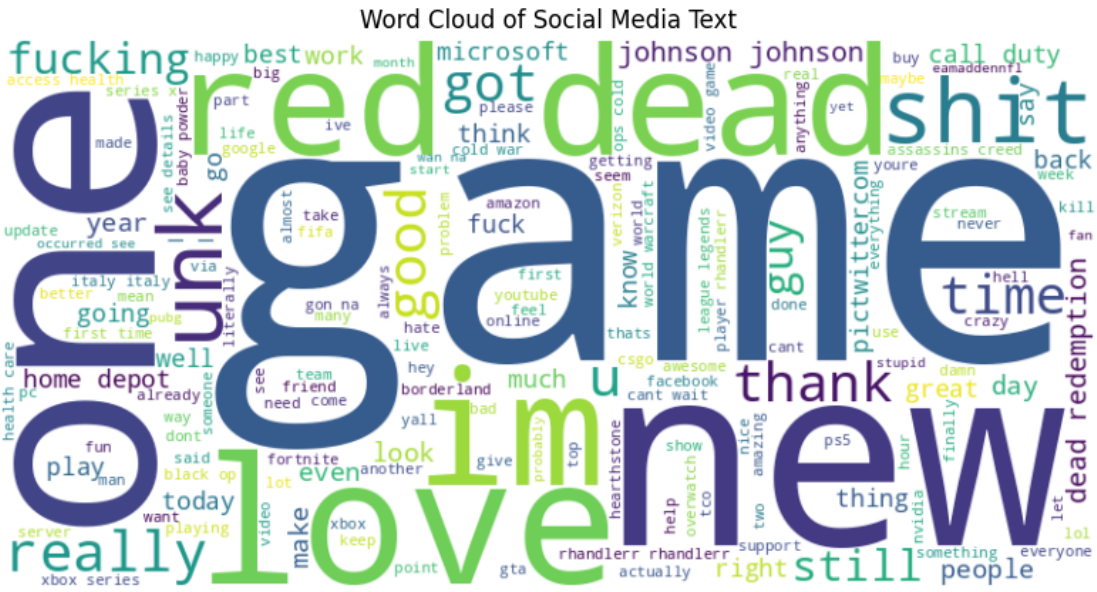
[116]:
```
from wordcloud import WordCloud
import matplotlib.pyplot as plt
```

[126]:
```
df['Cleaned_Text'] = df['Text'].apply(preprocess_text)

# Combine all cleaned text for the word cloud
all_text = ' '.join(df['Cleaned_Text'])
```

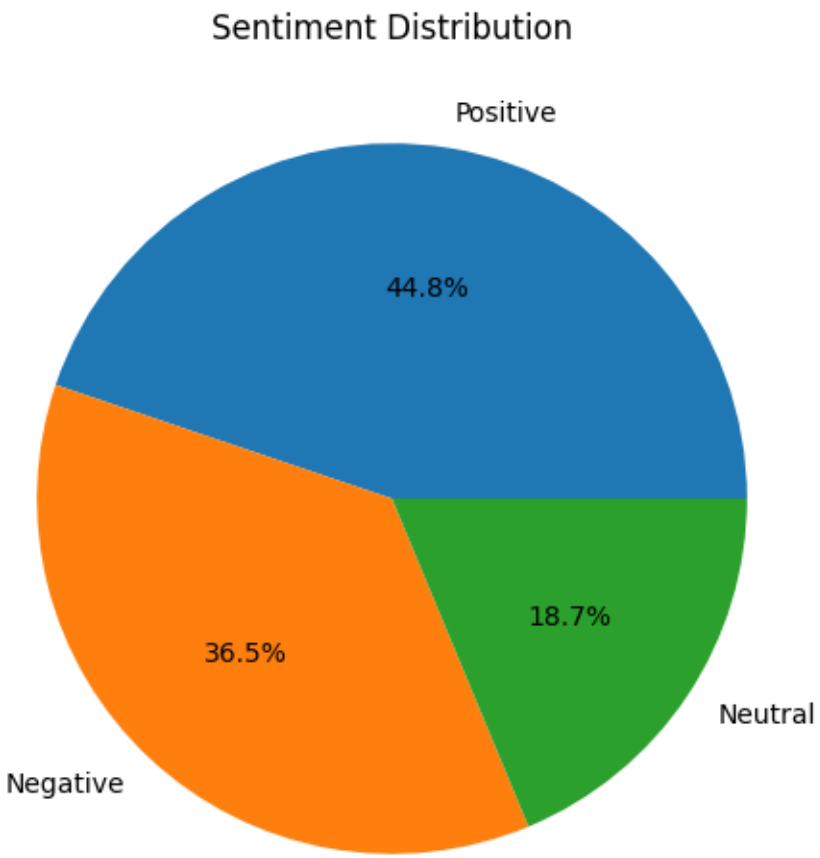
[122]:
```
wordcloud = WordCloud(width=800, height=400, background_color='white',␣
 ↪min_font_size=10).generate(all_text)
```

```
# Plot the word cloud
plt.figure(figsize=(10, 5))
plt.imshow(wordcloud, interpolation='bilinear')
plt.title('Word Cloud of Social Media Text')
plt.axis('off')
plt.show()
```




[133]:
```
sentiment_counts = df['Sentiment'].value_counts()

plt.figure(figsize=(8,6))
plt.pie(sentiment_counts, labels=sentiment_counts.index, autopct='%1.1f%%',)
plt.title('Sentiment Distribution')
plt.show()
```

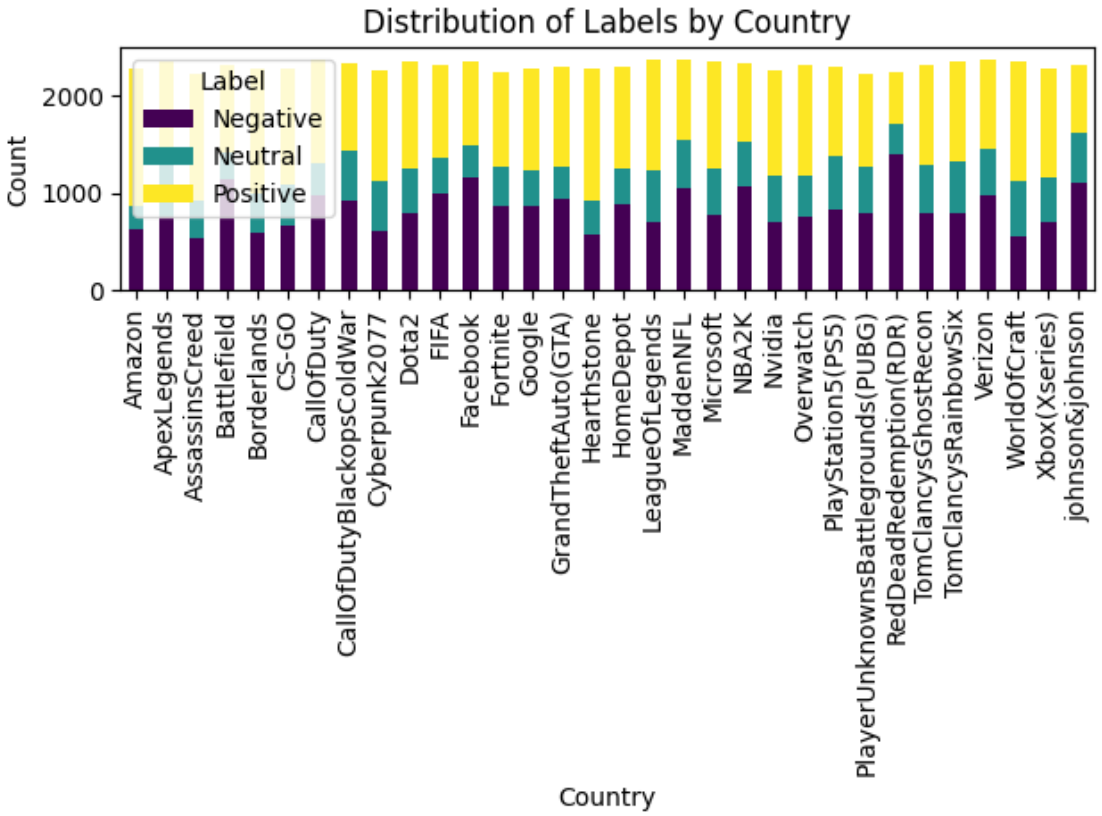



[162]:
```
# Step 5: Visualization 3 - Distribution of Labels by Country
if 'Country' in df.columns:
    # Assuming 'Sentiment' is the label column; adjust if named 'Label'
    label_by_country = df.groupby(['Country', 'Sentiment']).size().
 ↪unstack(fill_value=0)

    # Plot stacked bar plot
    plt.figure(figsize=(12, 8))
    label_by_country.plot(kind='bar', stacked=True, colormap='viridis')
    plt.title('Distribution of Labels by Country')
    plt.xlabel('Country')
    plt.ylabel('Count')
    plt.legend(title='Label')
    plt.xticks(rotation=90)
    plt.tight_layout()
    plt.show()
else:
```

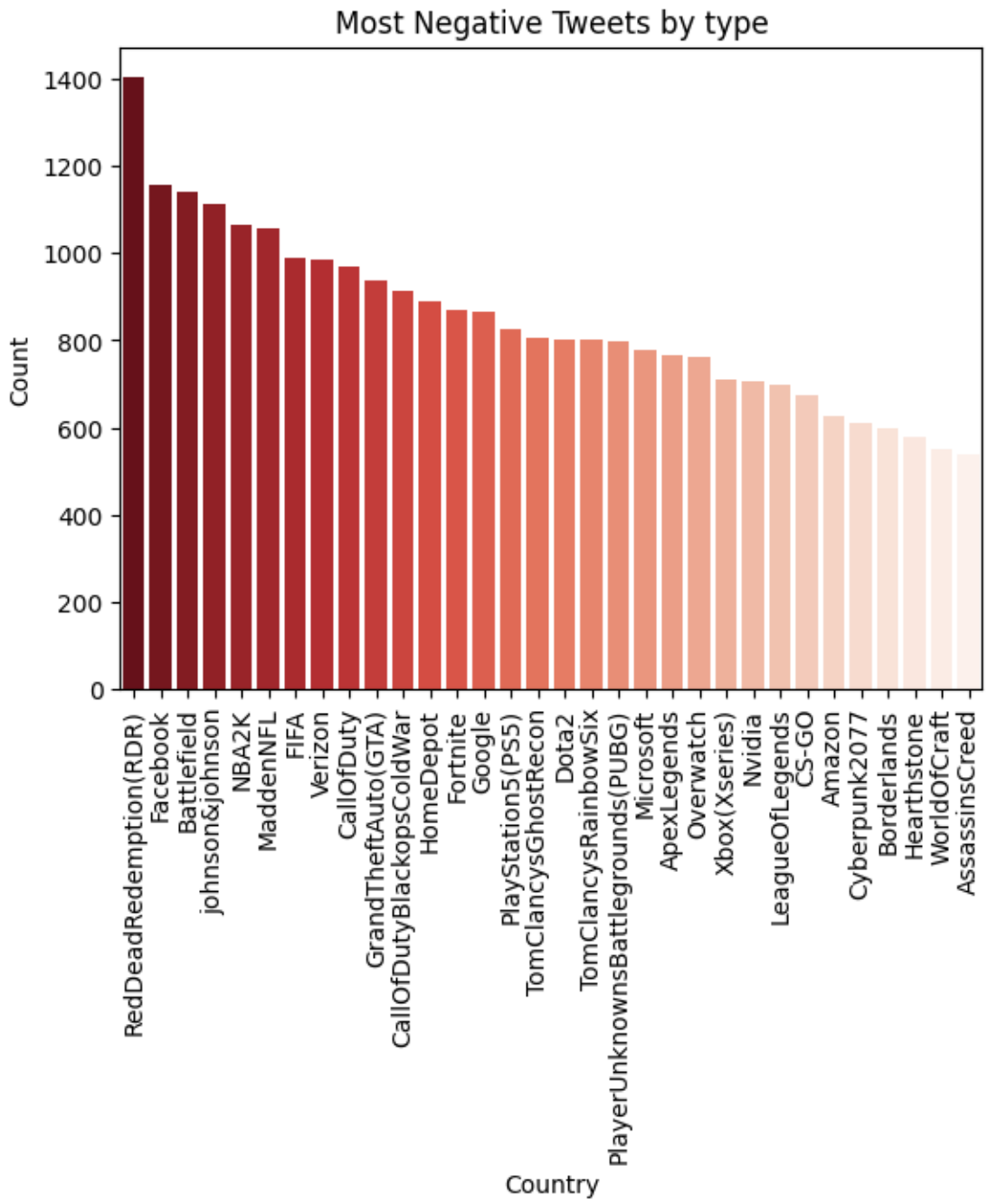
```
    print("No 'Country' column found. Skipping Distribution of Labels by␣
↪Country.")
```

```
<Figure size 1200x800 with 0 Axes>
```




[154]:
```
most_negative =label_by_country['Negative'].sort_values(ascending=False)
```

[159]:
```
sns.barplot(x=most_negative.index, y=most_negative.values, palette='Reds_r')
plt.title('Most Negative Tweets by type')
plt.xlabel('Country')
plt.ylabel('Count')
plt.xticks(rotation=90)
plt.show()
```




[166]:
```
df
```

[166]:

| | Id | Country | Label | \ |
|---|---|---|---|---|
| 0 | 2401 | Borderlands | 3 | |
| 1 | 2401 | Borderlands | 3 | |
| 2 | 2401 | Borderlands | 3 | |
| 3 | 2401 | Borderlands | 3 | |

```
4      2401  Borderlands      3
…       …           …     …
74677  9200       Nvidia      3
74678  9200       Nvidia      3
74679  9200       Nvidia      3
74680  9200       Nvidia      3
74681  9200       Nvidia      3

                                                    Text  \
0      im getting on borderlands and i will murder yo…
1      I am coming to the borders and I will kill you…
2      im getting on borderlands and i will kill you …
3      im coming on borderlands and i will murder you…
4      im getting on borderlands 2 and i will murder …
…                                                    …
74677  Just realized that the Windows partition of my…
74678  Just realized that my Mac window partition is …
74679  Just realized the windows partition of my Mac …
74680  Just realized between the windows partition of…
74681  Just like the windows partition of my Mac is l…

                                      Sentiment_Scores  Compound_Score  \
0      {'neg': 0.37, 'neu': 0.63, 'pos': 0.0, 'compou…         -0.6908
1      {'neg': 0.343, 'neu': 0.657, 'pos': 0.0, 'comp…         -0.6908
2      {'neg': 0.37, 'neu': 0.63, 'pos': 0.0, 'compou…         -0.6908
3      {'neg': 0.37, 'neu': 0.63, 'pos': 0.0, 'compou…         -0.6908
4      {'neg': 0.343, 'neu': 0.657, 'pos': 0.0, 'comp…         -0.6908
…                                                    …              …
74677  {'neg': 0.086, 'neu': 0.817, 'pos': 0.097, 'co…          0.0772
74678  {'neg': 0.104, 'neu': 0.896, 'pos': 0.0, 'comp…         -0.2960
74679  {'neg': 0.091, 'neu': 0.909, 'pos': 0.0, 'comp…         -0.2960
74680  {'neg': 0.074, 'neu': 0.842, 'pos': 0.084, 'co…          0.0772
74681  {'neg': 0.09, 'neu': 0.728, 'pos': 0.182, 'com…          0.3687

      Sentiment                                      Cleaned_Text
0      Negative                      im getting borderlands murder
1      Negative                                coming borders kill
2      Negative                        im getting borderlands kill
3      Negative                       im coming borderlands murder
4      Negative                     im getting borderlands 2 murder
…         …                                                    …
74677  Positive  realized windows partition mac like 6 years be…
74678  Negative  realized mac window partition 6 years behind n…
74679  Negative  realized windows partition mac 6 years behind …
74680  Positive  realized windows partition mac like 6 years be…
74681  Positive  like windows partition mac like 6 years behind…
```

```
[73996 rows x 8 columns]
```

[ ]: