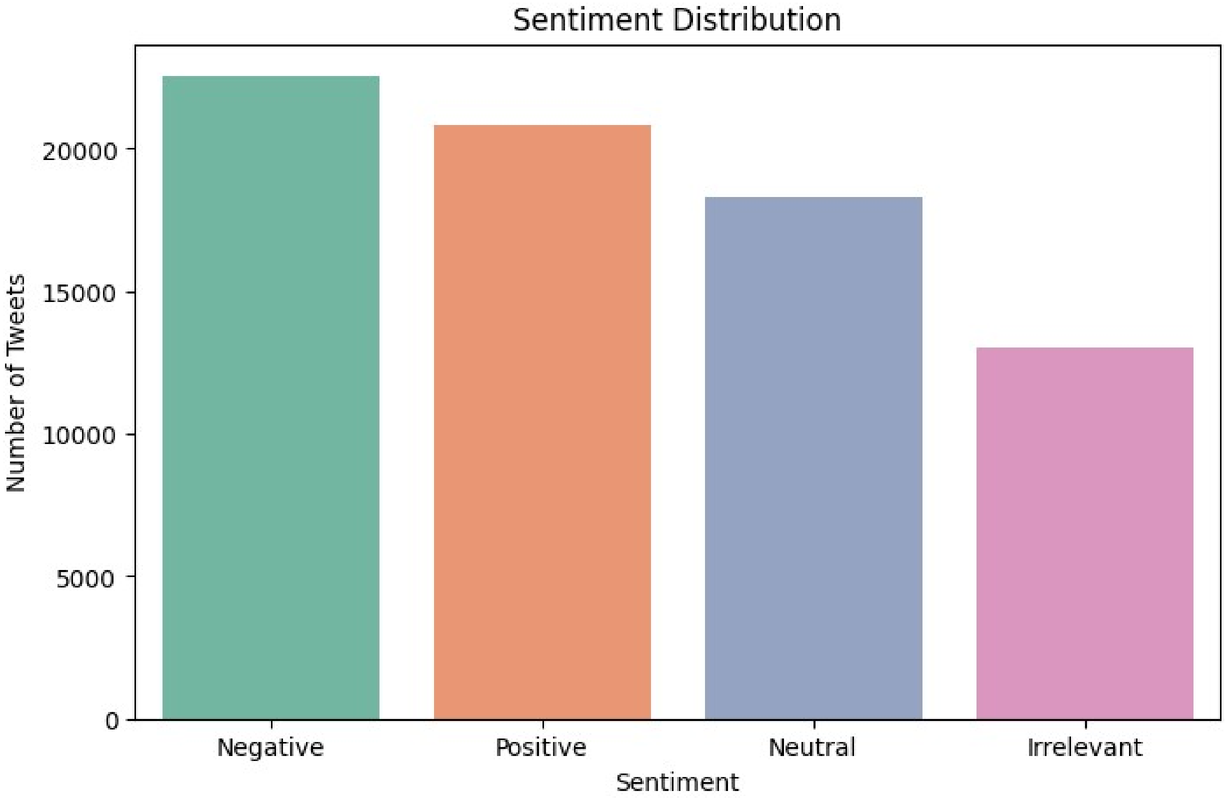
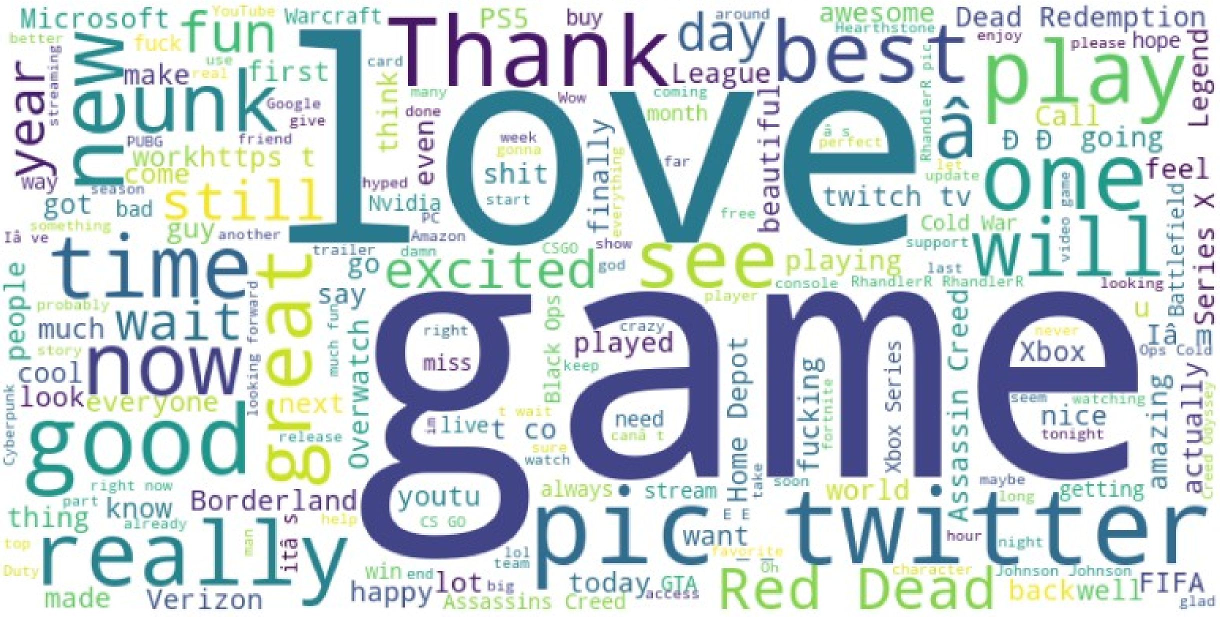
```python
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from wordcloud import WordCloud
# Load the CSV file
df = pd.read_csv('twitter_training.csv', encoding='latin1',
header=None)

# Add column names
# Add correct column names for all 4 columns
df.columns = ['id', 'entity', 'sentiment', 'content']

# Preview the first few rows
df.head()
```

```
     id       entity sentiment  \
0  2401  Borderlands  Positive
1  2401  Borderlands  Positive
2  2401  Borderlands  Positive
3  2401  Borderlands  Positive
4  2401  Borderlands  Positive

                                             content
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 ...
```

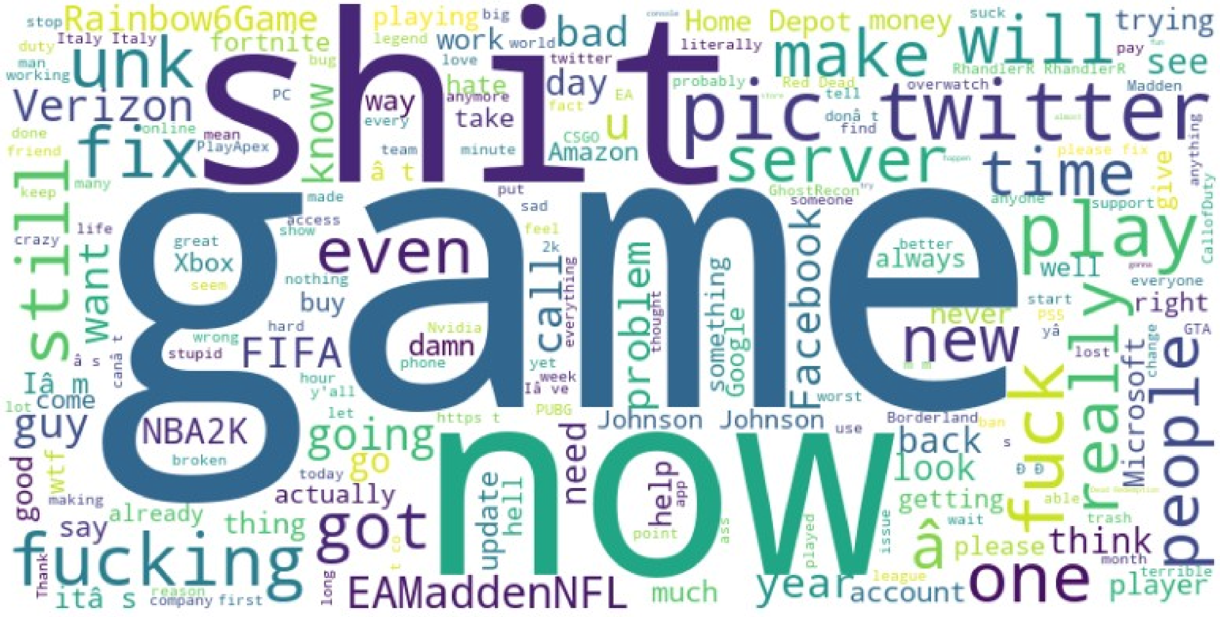
```python
# Create a DataFrame for plotting
sentiment_df = sentiment_counts.reset_index()
sentiment_df.columns = ['sentiment', 'count']

# Plot using hue to avoid warning
plt.figure(figsize=(8, 5))
sns.barplot(data=sentiment_df, x='sentiment', y='count',
hue='sentiment', palette='Set2', legend=False)
plt.title("Sentiment Distribution")
plt.xlabel("Sentiment")
plt.ylabel("Number of Tweets")
plt.show()
```



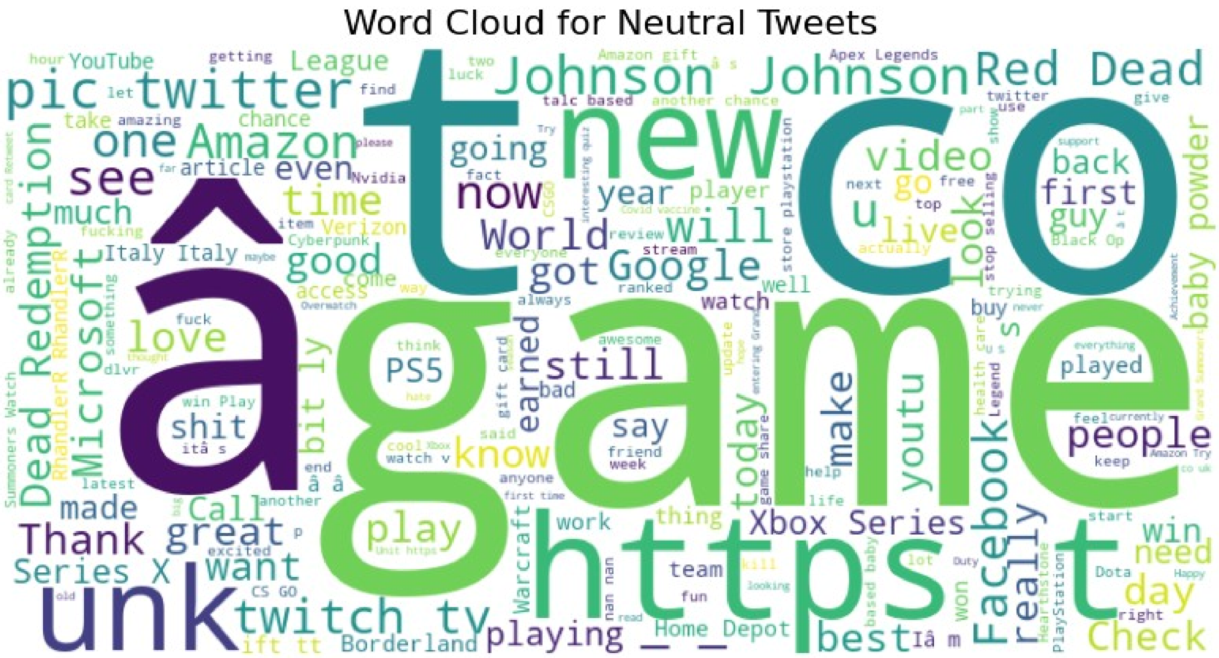
```python
from wordcloud import WordCloud

# Set figure size
plt.figure(figsize=(10, 6))

# Loop through each sentiment
for sentiment in ['Positive', 'Negative', 'Neutral']:
    # Join all tweet texts of the current sentiment
    text = " ".join(df[df['sentiment'] == sentiment]
['content'].astype(str))

    # Generate the word cloud
    wc = WordCloud(
        width=800, height=400,
        background_color='white',
        max_words=200,
        contour_width=3,
        contour_color='steelblue'
    )

    # Display the word cloud
    plt.figure(figsize=(10, 5))
    plt.imshow(wc.generate(text), interpolation='bilinear')
    plt.axis('off')
    plt.title(f"Word Cloud for {sentiment} Tweets", fontsize=16)
    plt.show()

<Figure size 1000x600 with 0 Axes>
```



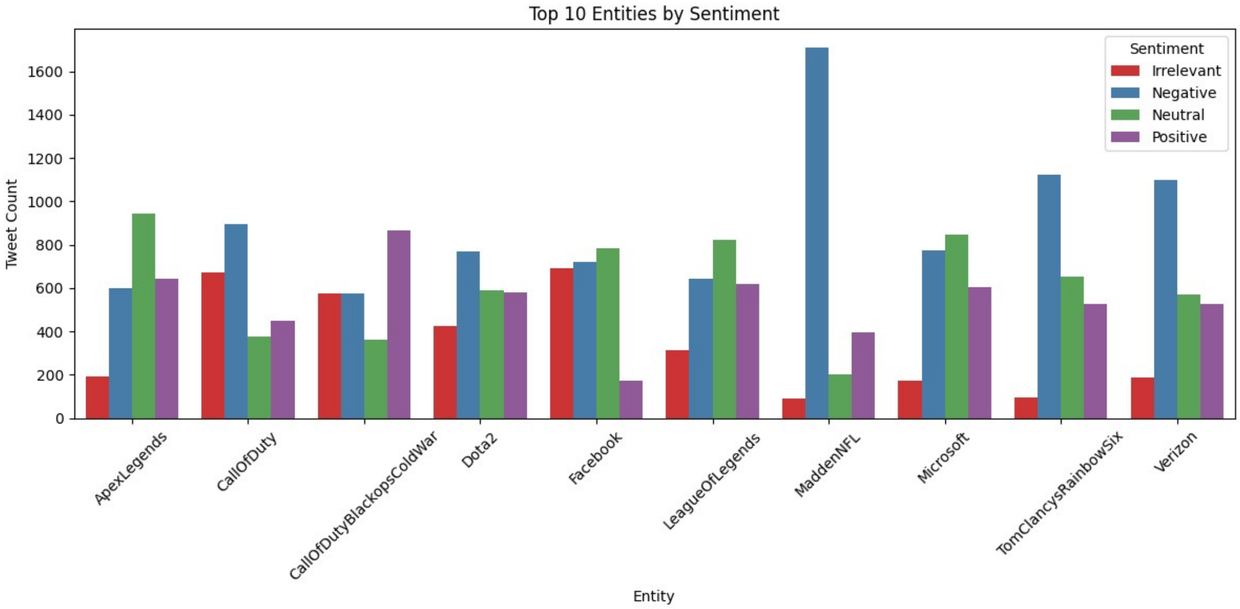
Word Cloud for Positive Tweets



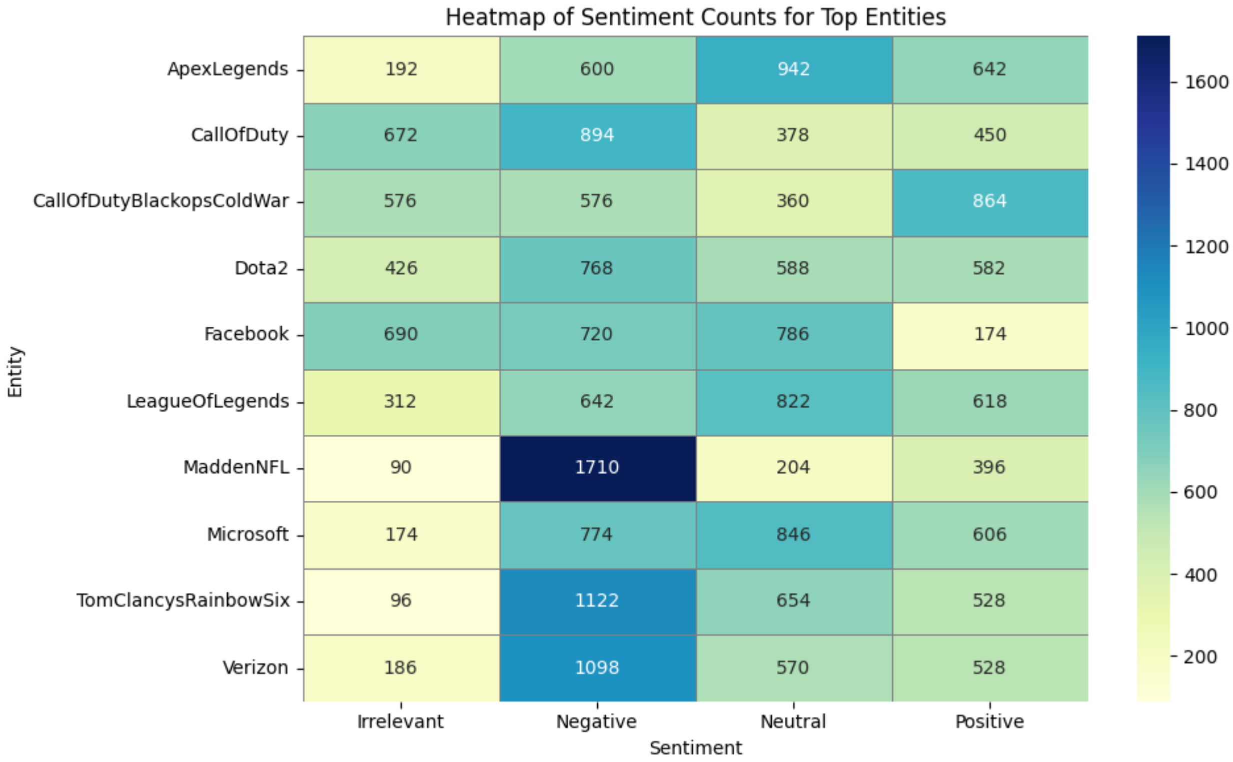
Word Cloud for Negative Tweets


Word Cloud for Neutral Tweets

```python
# Group by entity and sentiment, and count occurrences
entity_sentiment_counts = df.groupby(['entity', 'sentiment']).size().reset_index(name='count')

# Get top 10 most mentioned entities (across all sentiments)
top_entities = entity_sentiment_counts.groupby('entity')['count'].sum().nlargest(10).index

# Filter only top entities
filtered_data = entity_sentiment_counts[entity_sentiment_counts['entity'].isin(top_entities)]

# Plot
plt.figure(figsize=(12, 6))
sns.barplot(data=filtered_data, x='entity', y='count', hue='sentiment', palette='Set1')
plt.title("Top 10 Entities by Sentiment")
plt.xlabel("Entity")
plt.ylabel("Tweet Count")
plt.xticks(rotation=45)
plt.legend(title="Sentiment")
plt.tight_layout()
plt.show()
```



```python
# Pivot table for heatmap
heatmap_data = filtered_data.pivot(index='entity',
columns='sentiment', values='count').fillna(0)

# Plot the heatmap
plt.figure(figsize=(10, 6))
sns.heatmap(heatmap_data, annot=True, fmt='.0f', cmap='YlGnBu',
linewidths=.5, linecolor='gray')
plt.title('Heatmap of Sentiment Counts for Top Entities')
plt.xlabel('Sentiment')
plt.ylabel('Entity')
plt.tight_layout()
plt.show()
```


Heatmap of Sentiment Counts for Top Entities
Entity
Sentiment
Irrelevant
Negative
Neutral
Positive
ApexLegends 192 600 942 642
CallOfDuty 672 894 378 450
CallOfDutyBlackopsColdWar 576 576 360 864
Dota2 426 768 588 582
Facebook 690 720 786 174
LeagueOfLegends 312 642 822 618
MaddenNFL 90 1710 204 396
Microsoft 174 774 846 606
TomClancysRainbowSix 96 1122 654 528
Verizon 186 1098 570 528
1600
1400
1200
1000
800
600
400
200