In [1]:
```
import pandas as pd
import numpy as np
```

In [2]:
```
df = pd.read_csv('task_4_dataset.csv')
```

In [3]:
```
df
```

Out[3]:

	ID	Topic	Sentiment	Tweet
0	2401	Borderlands	Positive	im getting on borderlands and i will murder yo...
1	2401	Borderlands	Positive	I am coming to the borders and I will kill you...
2	2401	Borderlands	Positive	im getting on borderlands and i will kill you ...
3	2401	Borderlands	Positive	im coming on borderlands and i will murder you...
4	2401	Borderlands	Positive	im getting on borderlands 2 and i will murder ...
...	...	...	...	...
74677	9200	Nvidia	Positive	Just realized that the Windows partition of my...
74678	9200	Nvidia	Positive	Just realized that my Mac window partition is ...
74679	9200	Nvidia	Positive	Just realized the windows partition of my Mac ...
74680	9200	Nvidia	Positive	Just realized between the windows partition of...
74681	9200	Nvidia	Positive	Just like the windows partition of my Mac is l...

74682 rows × 4 columns

In [5]:
```
df.dtypes
```

Out[5]:
```
ID            int64
Topic        object
Sentiment    object
Tweet        object
dtype: object
```

In [6]:
```
df.describe()
```

Out[6]:

	ID
count	74682.000000
mean	6432.586165
std	3740.427870
min	1.000000
25%	3195.000000
50%	6422.000000
75%	9601.000000
max	13200.000000

In [7]:
```
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   Topic      74682 non-null  object
 2   Sentiment  74682 non-null  object
 3   Tweet      73996 non-null  object
dtypes: int64(1), object(3)
memory usage: 2.3+ MB
```

Checking for duplicates and null values

In [8]:
```
df.duplicated().sum()
```

Out[8]:
```
2701
```

In [9]:
```
df.drop_duplicates(inplace = True)
df.duplicated().sum()
```

Out[9]:
```
0
```

In [10]:
```
df.isnull().sum()
```

Out[10]:
```
ID             0
Topic          0
Sentiment      0
Tweet        326
dtype: int64
```

In [11]:
```
df.dropna(inplace = True)
df.isnull().sum()
```

Out[11]:
```
ID           0
Topic        0
Sentiment    0
Tweet        0
dtype: int64
```

Analyze and visualize Sentiment patterns

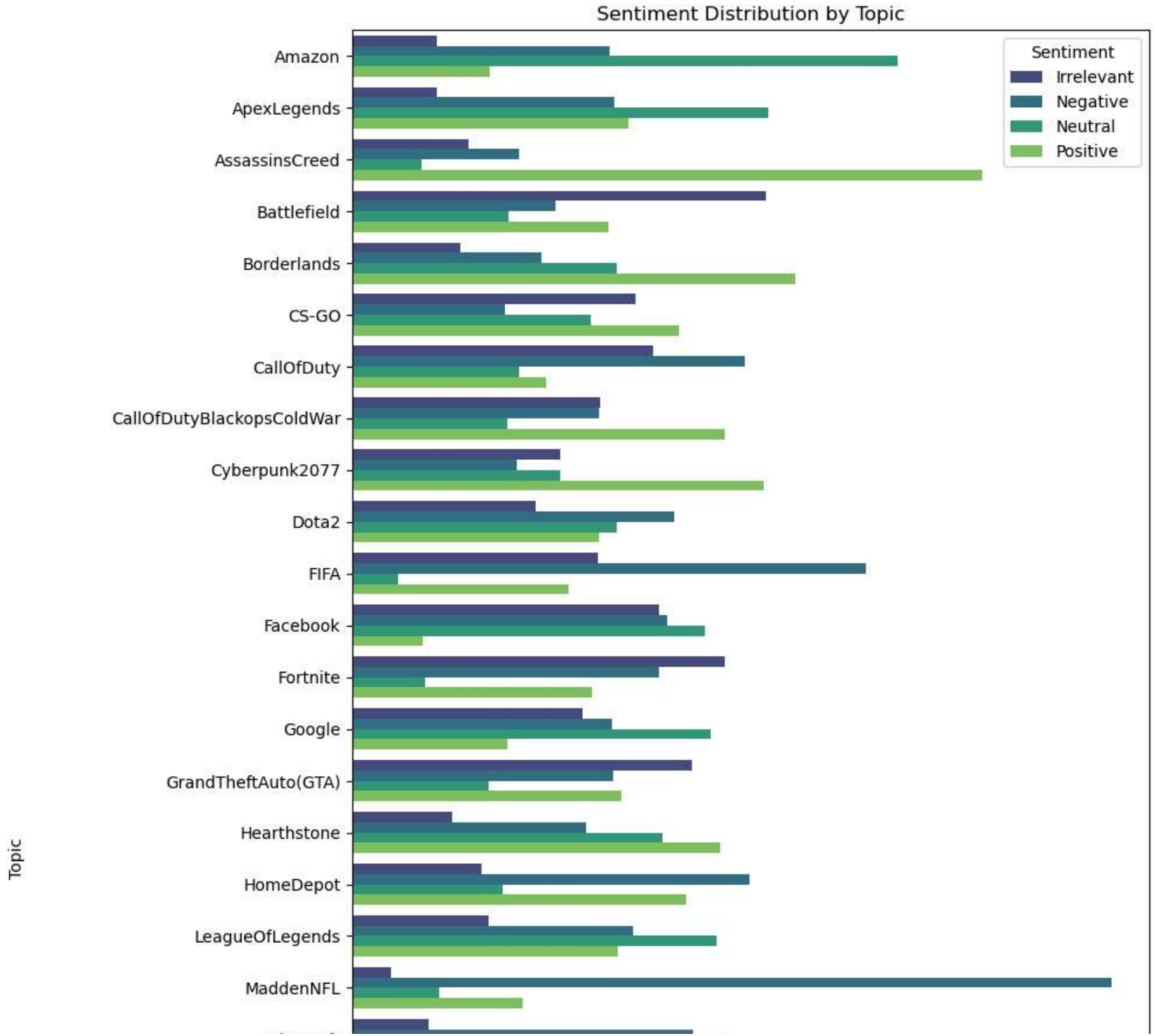
In [12]:
```
import matplotlib.pyplot as plt
import seaborn as sns
# Count the number of tweets per sentiment category per topic
sc = df.groupby(['Topic', 'Sentiment']).size().reset_index(name='counts')
sc
```

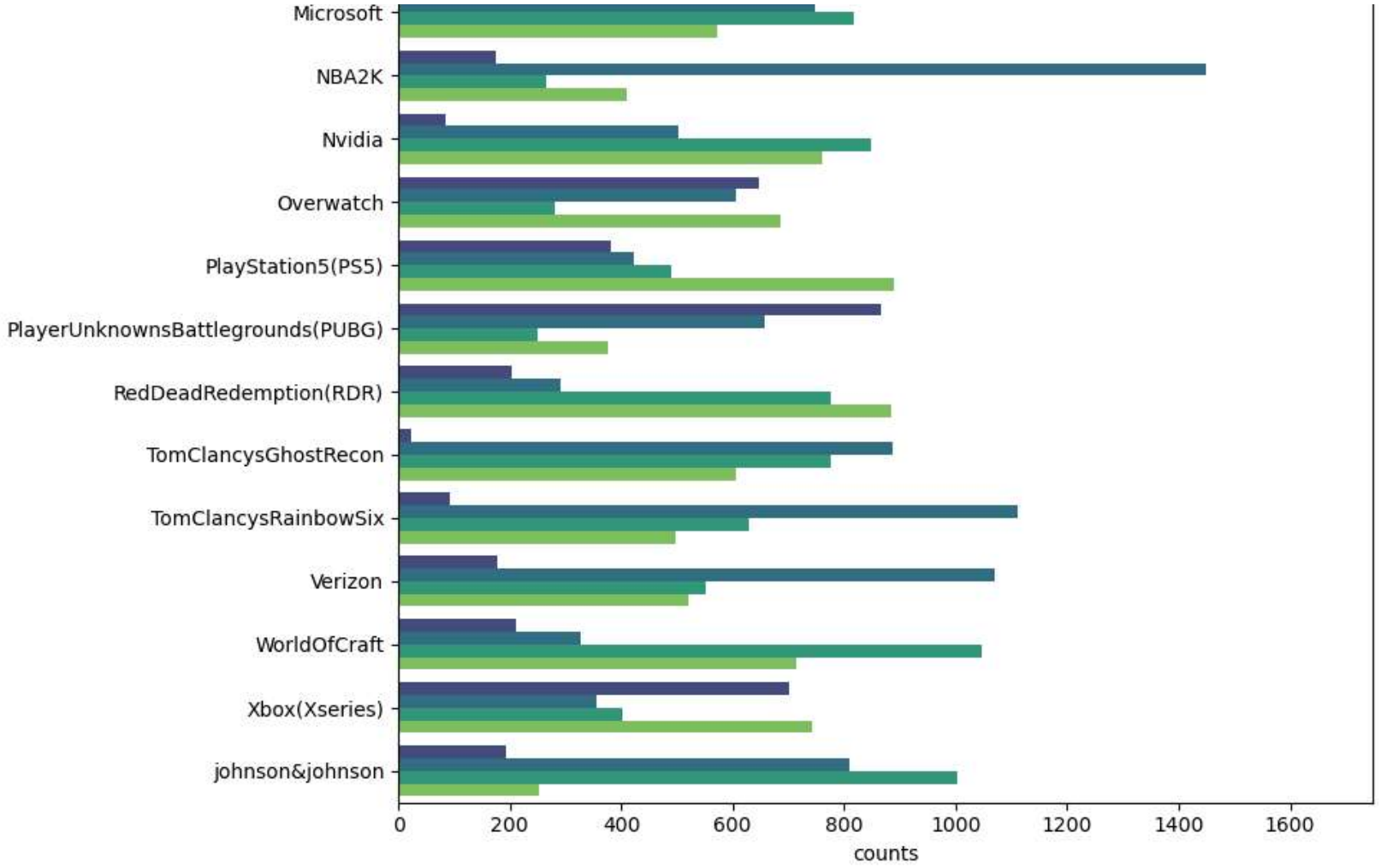
Out[12]:

	Topic	Sentiment	counts
0	Amazon	Irrelevant	185
1	Amazon	Negative	565
2	Amazon	Neutral	1197
3	Amazon	Positive	302
4	ApexLegends	Irrelevant	185
...	...	...	...
123	Xbox(Xseries)	Positive	743
124	johnson&johnson	Irrelevant	192
125	johnson&johnson	Negative	809
126	johnson&johnson	Neutral	1004
127	johnson&johnson	Positive	252

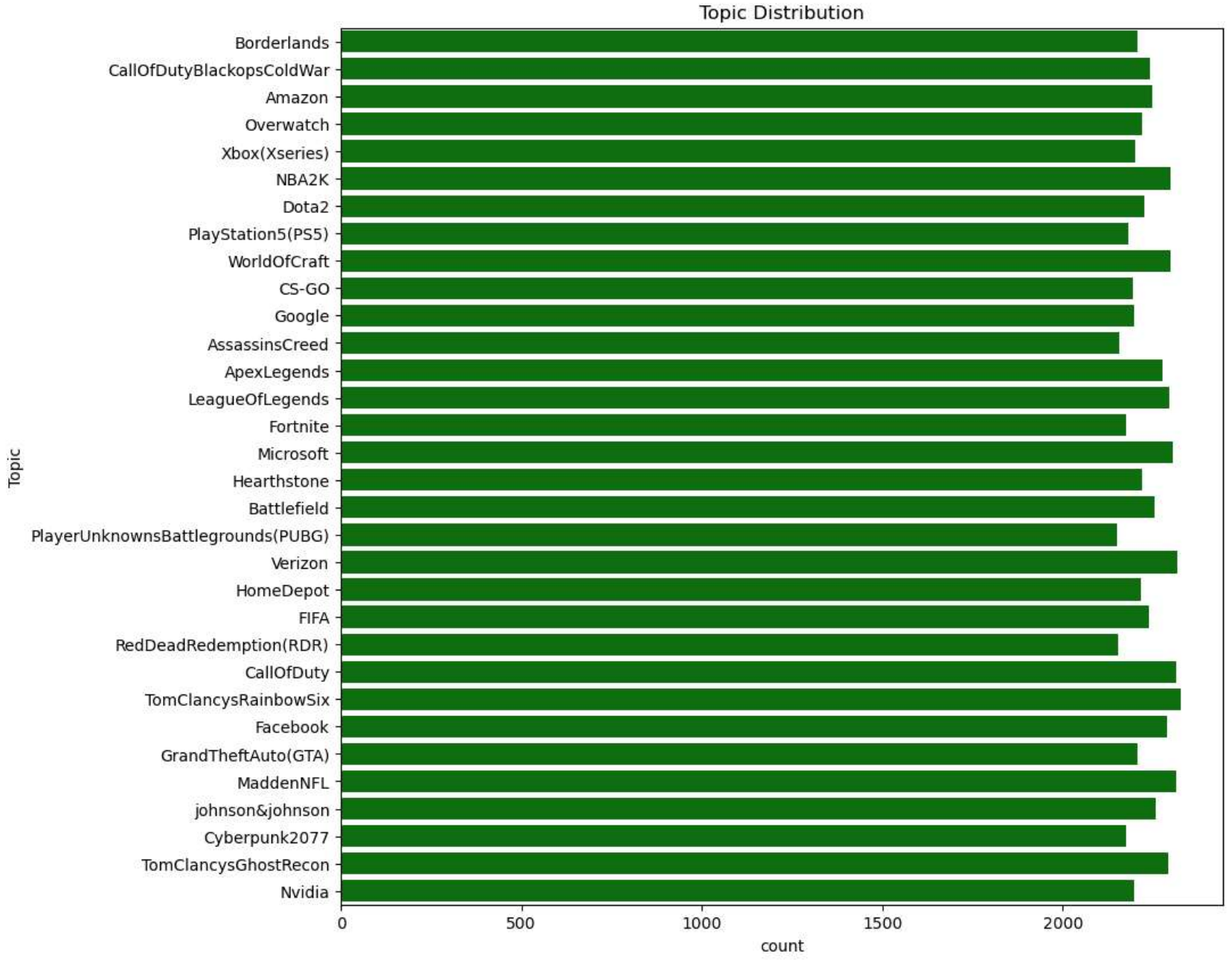
128 rows × 3 columns

In [13]:
```
# Plotting sentiment distribution for each topic
plt.figure(figsize=(10,15))
sns.barplot(y='Topic', x='counts', hue='Sentiment', data=sc,palette='viridis', orient='h')
plt.title('Sentiment Distribution by Topic')
plt.tight_layout()
plt.show()
```

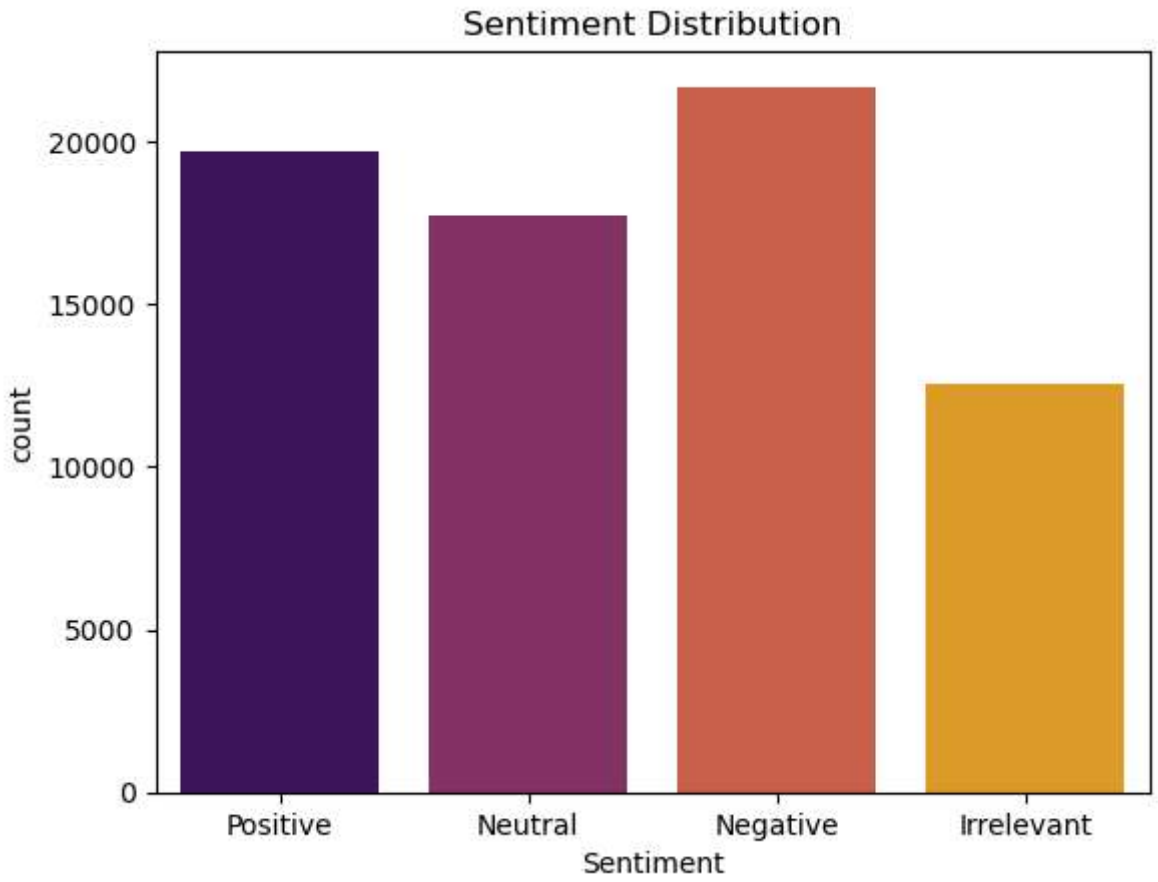

Sentiment Distribution by Topic
Sentiment
Irrelevant
Negative
Neutral
Positive
Topic
Amazon
ApexLegends
AssassinsCreed
Battlefield
Borderlands
CS-GO
CallOfDuty
CallOfDutyBlackopsColdWar
Cyberpunk2077
Dota2
FIFA
Facebook
Fortnite
Google
GrandTheftAuto(GTA)
Hearthstone
HomeDepot
LeagueOfLegends
MaddenNFL


Microsoft
NBA2K
Nvidia
Overwatch
PlayStation5(PS5)
PlayerUnknownsBattlegrounds(PUBG)
RedDeadRedemption(RDR)
TomClancysGhostRecon
TomClancysRainbowSix
Verizon
WorldOfCraft
Xbox(Xseries)
johnson&johnson
0
200
400
600
800
1000
1200
1400
1600
counts

In [14]:
```
# visualization for Topic distribution
plt.figure(figsize=(10,10))
sns.countplot(y='Topic',data=df,color='g')
plt.title("Topic Distribution")
plt.show()
```


Topic Distribution
Borderlands
CallOfDutyBlackopsColdWar
Amazon
Overwatch
Xbox(Xseries)
NBA2K
Dota2
PlayStation5(PS5)
WorldOfCraft
CS-GO
Google
AssassinsCreed
ApexLegends
LeagueOfLegends
Fortnite
Microsoft
Hearthstone
Battlefield
PlayerUnknownsBattlegrounds(PUBG)
Verizon
HomeDepot
FIFA
RedDeadRedemption(RDR)
CallOfDuty
TomClancysRainbowSix
Facebook
GrandTheftAuto(GTA)
MaddenNFL
johnson&johnson
Cyberpunk2077
TomClancysGhostRecon
Nvidia
Topic
0
500
1000
1500
2000
count

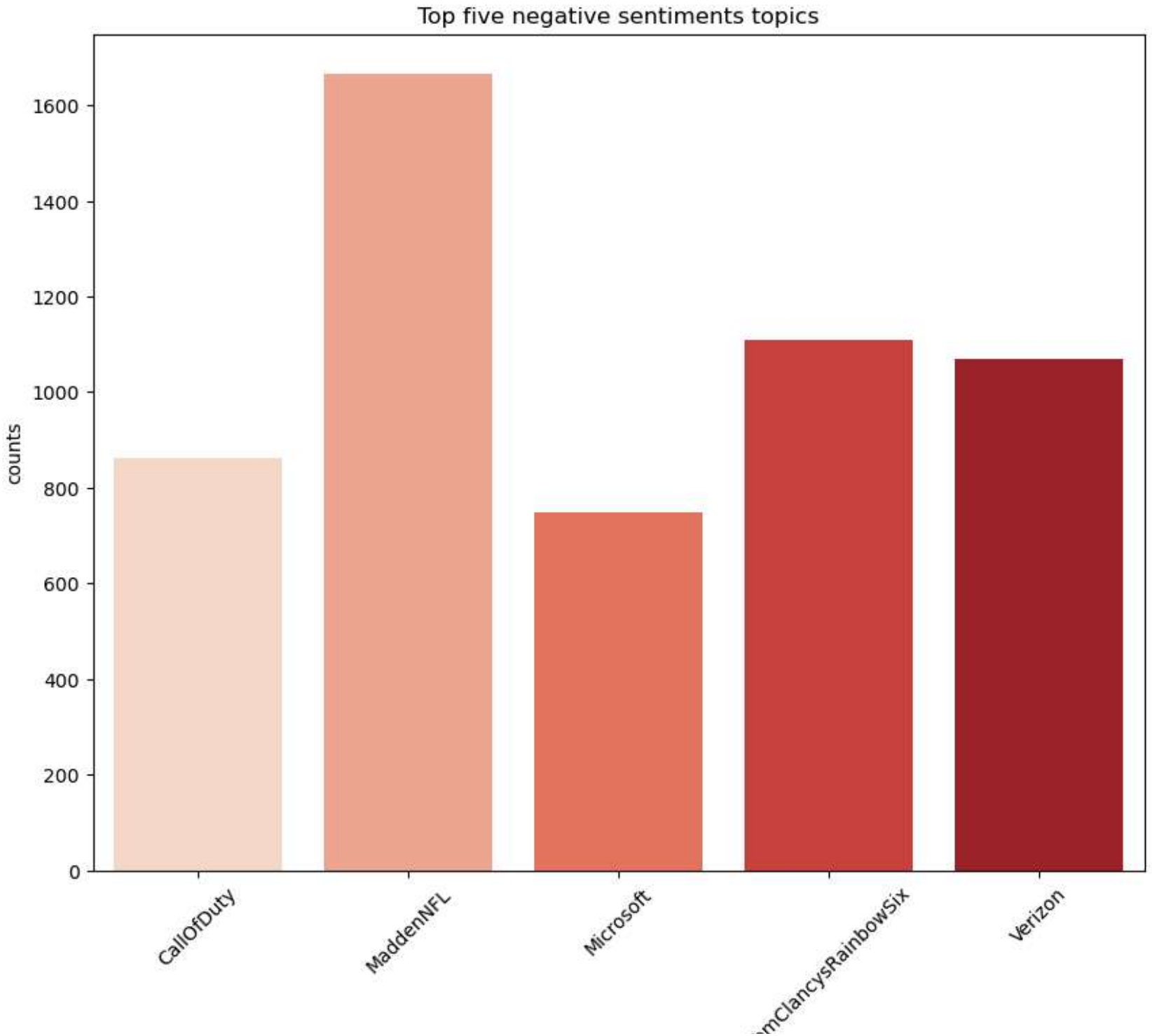
In [15]:
```
#Barplot for sentiment Distribution
sns.countplot(x='Sentiment',data=df,palette='inferno')
plt.title("Sentiment Distribution")
plt.show()
```



In [16]:
```
# Select top 5 topics
tc=df['Topic'].value_counts().nlargest(5).index
top= sc[sc['Topic'].isin(tc)]
```

Top Five Negative Sentiments Topics

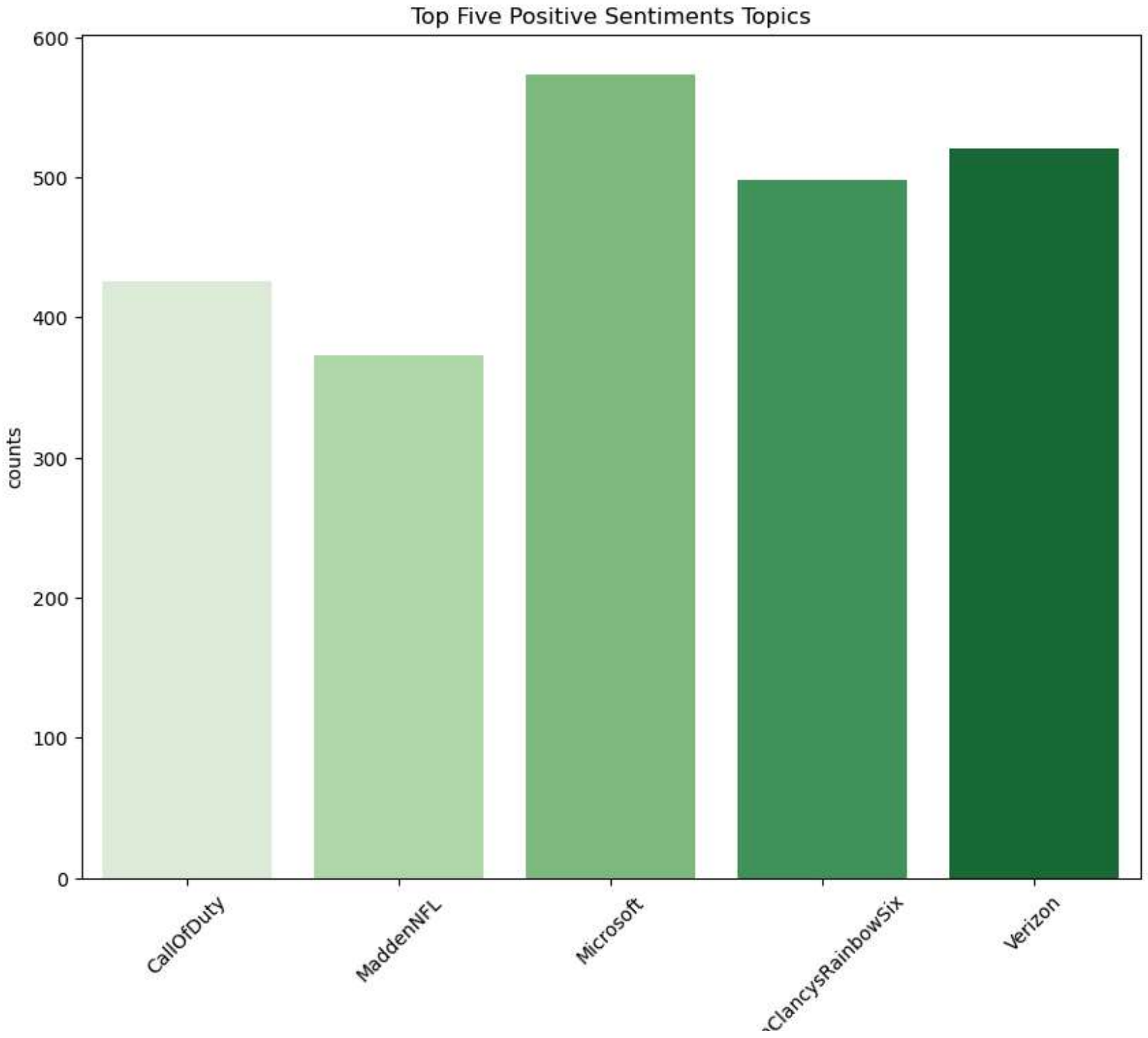
In [17]:
```
plt.figure(figsize=(10,8))
sns.barplot(x='Topic',y='counts',data=top[top["Sentiment"]=='Negative'],palette='Reds')
plt.xticks(rotation=45)
plt.title("Top five negative sentiments topics")
plt.show()
```


Top five negative sentiments topics
counts
0
200
400
600
800
1000
1200
1400
1600
CallOfDuty
MaddenNFL
Microsoft
mClancysRainbowSix
Verizon

Topic

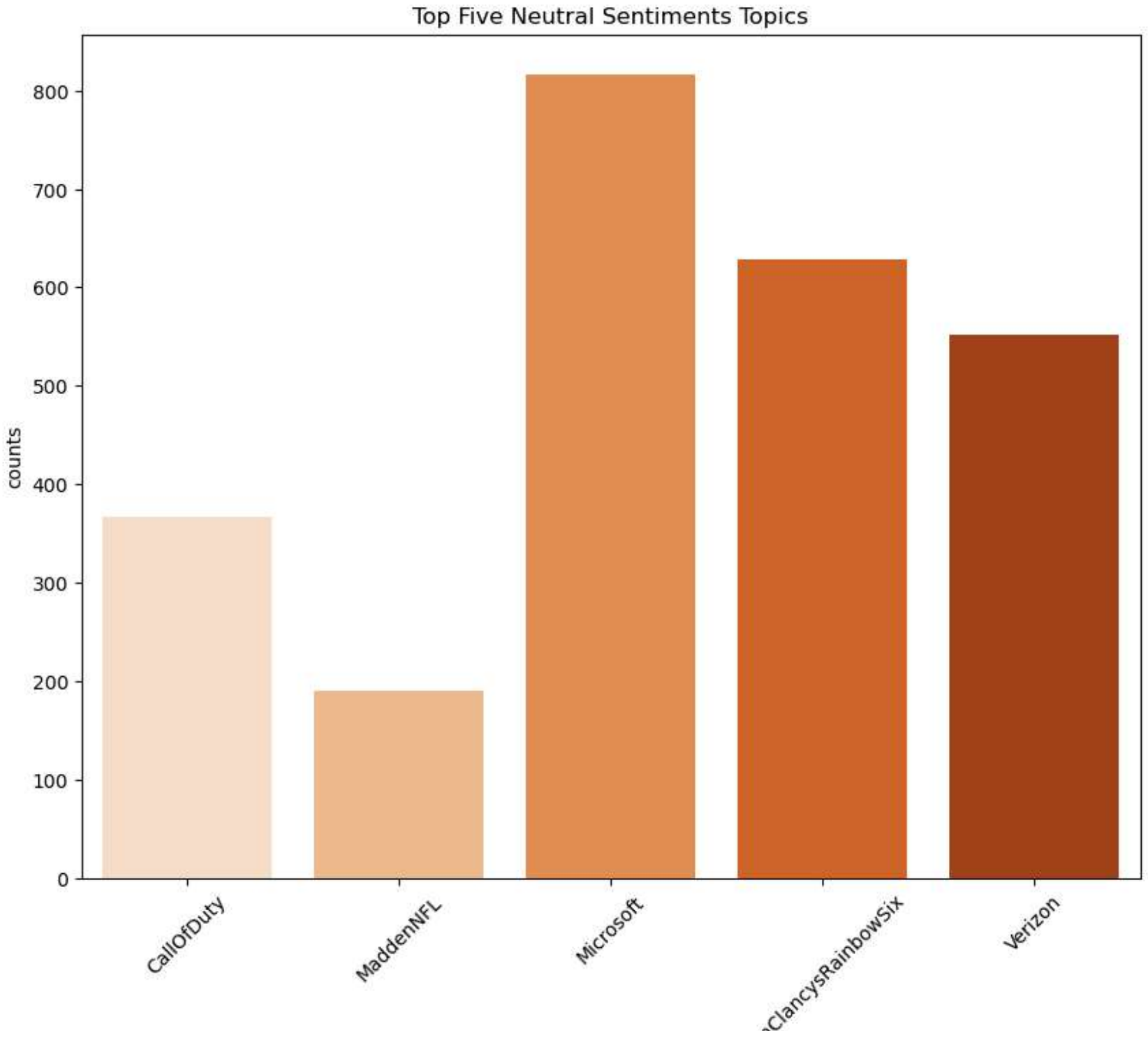
Top Five positive Sentiments Topics

In [33]:
```
plt.figure(figsize=(10,8))
sns.barplot(x="Topic",y='counts',data=top[top["Sentiment"]=='Positive'],palette="Greens")
plt.title("Top Five Positive Sentiments Topics")
plt.xticks(rotation=45)
plt.show()
```


Top Five Positive Sentiments Topics
counts
600
500
400
300
200
100
0
CallOfDuty
MaddenNFL
Microsoft
ClancysRainbowSix
Verizon

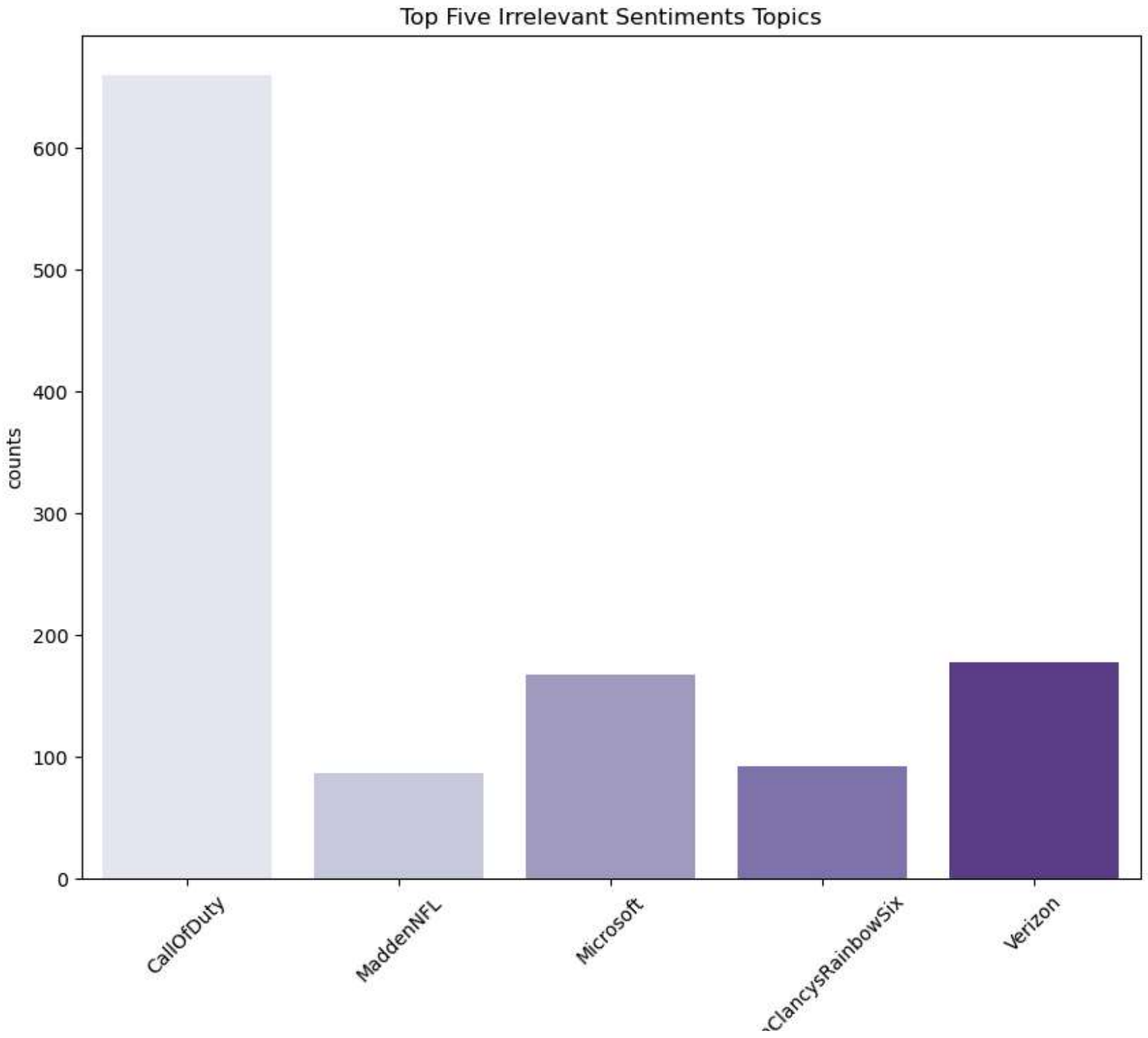
Top Five Neutral Sentiments Topics

In [35]:
```
plt.figure(figsize=(10,8))
sns.barplot(x="Topic",y="counts",data=top[top["Sentiment"]=="Neutral"],palette='Oranges')
plt.title("Top Five Neutral Sentiments Topics")
plt.xticks(rotation=45)
plt.show()
```


Top Five Neutral Sentiments Topics
counts
0
100
200
300
400
500
600
700
800
CallOfDuty
MaddenNFL
Microsoft
ClancysRainbowSix
Verizon

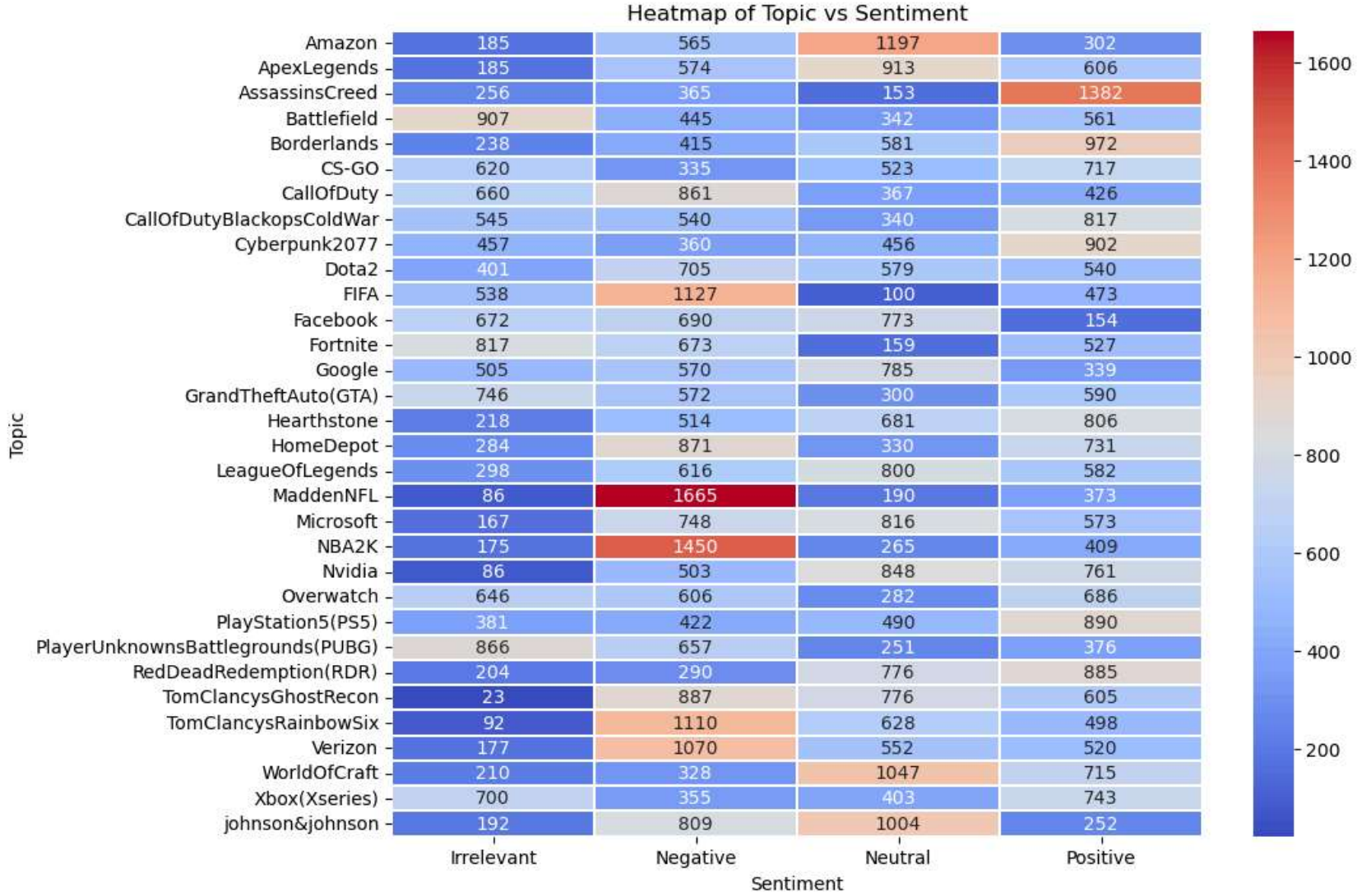
Top Five Irrelevant Sentiments Topics

In [20]:
```
plt.figure(figsize=(10,8))
sns.barplot(x="Topic",y="counts",data=top[top["Sentiment"]=="Irrelevant"],palette='Purples')
plt.title("Top Five Irrelevant Sentiments Topics")
plt.xticks(rotation=45)
plt.show()
```


Top Five Irrelevant Sentiments Topics
counts
0
100
200
300
400
500
600
CallOfDuty
MaddenNFL
Microsoft
ClancysRainbowSix
Verizon

Heatmap of Topic vs Sentiment

In [21]:
```
# Create the crosstab for categorical variables
crosstab = pd.crosstab(index=df['Topic'], columns=df['Sentiment'])

plt.figure(figsize=(10,8))
sns.heatmap(crosstab,cmap='coolwarm',annot=True, fmt='d', linewidths=.1)
plt.title('Heatmap of Topic vs Sentiment')
plt.show()
```

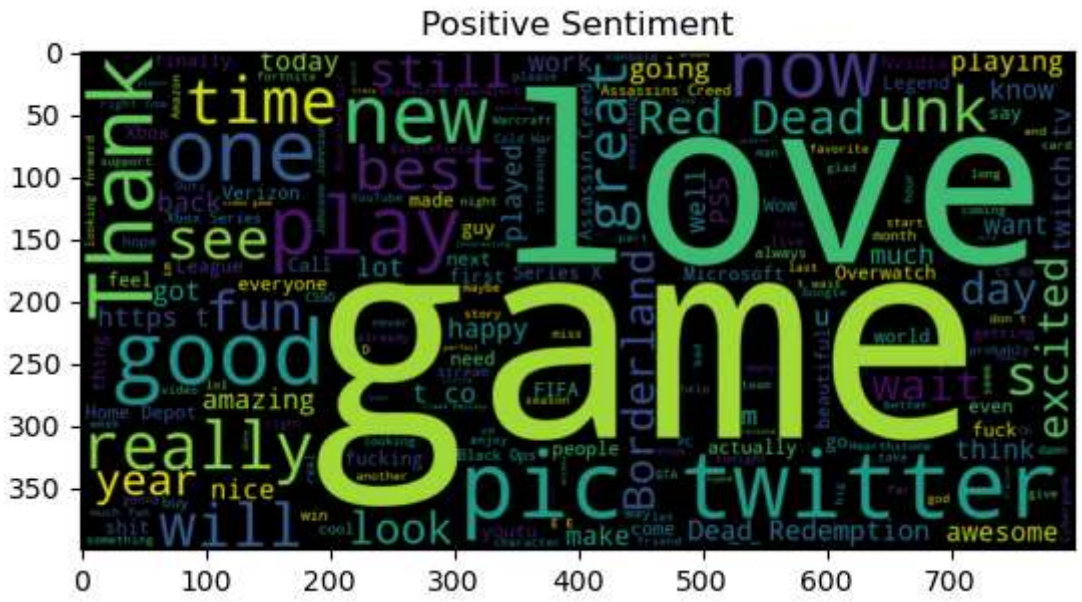


Word Clouds for Each Sentiment

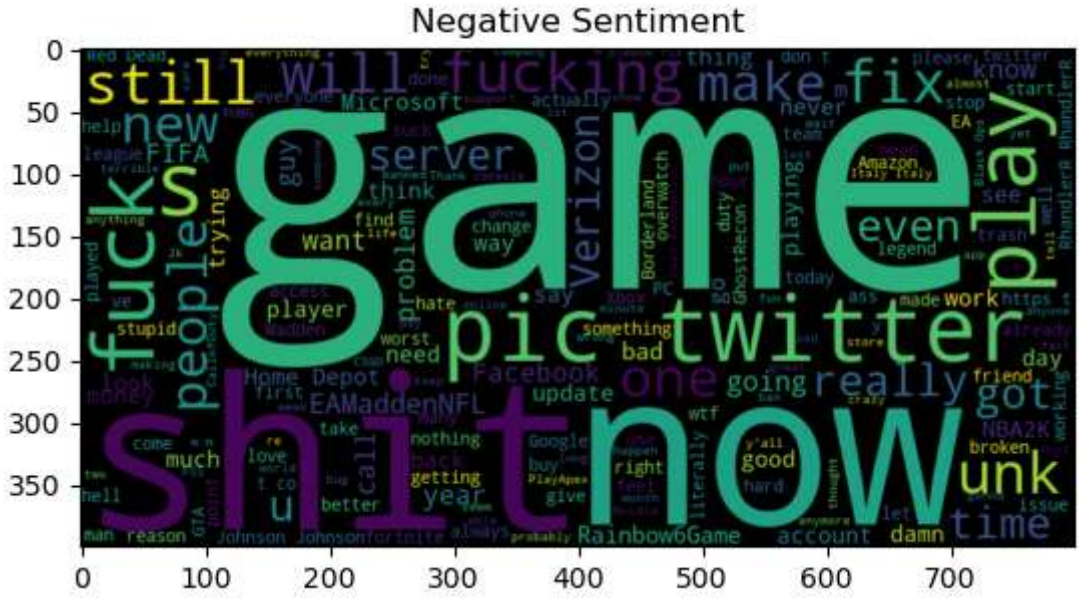
In [23]:
```
from wordcloud import WordCloud

# Generate word clouds
pst_text = ' '.join(df[df['Sentiment'] == 'Positive']['Tweet'])
neg_text = ' '.join(df[df['Sentiment'] == 'Negative']['Tweet'])
neu_text = ' '.join(df[df['Sentiment'] == 'Neutral']['Tweet'])
irr_text = ' '.join(df[df["Sentiment"]== 'Irrelevant']['Tweet'])
```

In [24]:
```
# Create word clouds
wc_pst = WordCloud(width=800, height=400).generate(pst_text)
wc_neg = WordCloud(width=800, height=400).generate(neg_text)
wc_neu = WordCloud(width=800, height=400).generate(neu_text)
wc_irr = WordCloud(width=800, height= 400).generate(irr_text)
```

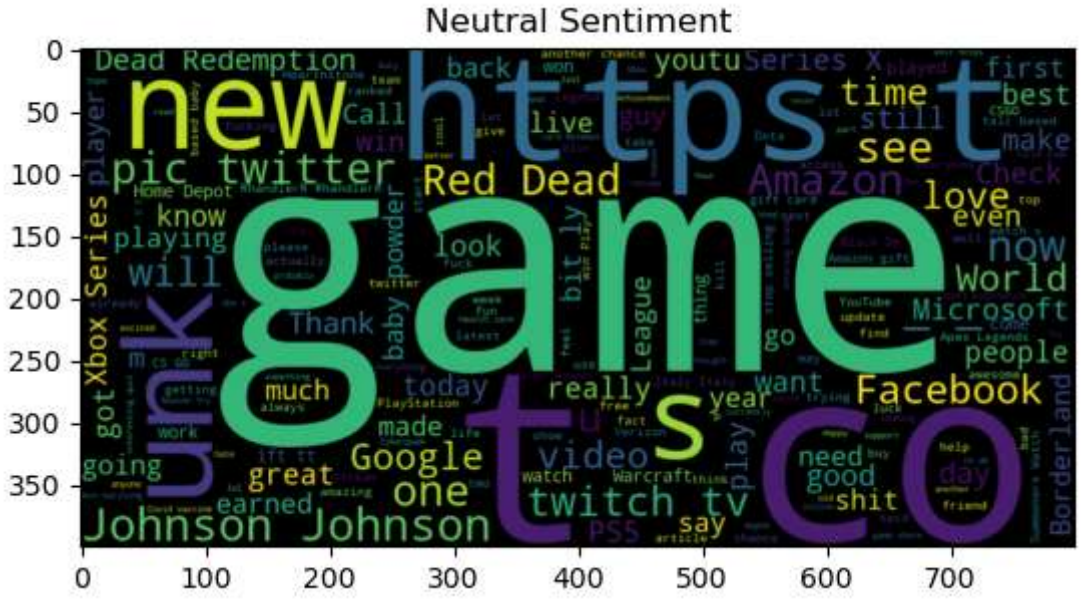
In [25]:
```
# For positive Sentiment
plt.imshow(wc_pst, interpolation='bilinear')
plt.title('Positive Sentiment')
plt.show()
```



In [26]:
```
# For negative sentiment
plt.imshow(wc_neg,interpolation='bilinear')
plt.title('Negative Sentiment')
plt.show()
```



In [27]:
```
# For neutral sentiment
plt.imshow(wc_neu,interpolation='bilinear')
plt.title('Neutral Sentiment')
plt.show()
```



In [28]:
```
# For Irrelevant Sentiment
plt.imshow(wc_irr,interpolation='bilinear')
plt.title('Irrelevant Sentiment')
plt.show()
```