In [3]:

```
import pandas as pd
import numpy as np
from nltk.tokenize import sent_tokenize, word_tokenize
from sklearn.feature_extraction.text import CountVectorizer
from sklearn.model_selection import train_test_split
from sklearn.svm import SVC
from sklearn.datasets import fetch_20newsgroups
from nltk.corpus import stopwords
import string
from nltk import pos_tag
from nltk.stem import WordNetLemmatizer
from sklearn.feature_extraction.text import TfidfVectorizer
from sklearn.naive_bayes import MultinomialNB
from sklearn.ensemble import RandomForestClassifier
from sklearn.svm import SVC
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn import preprocessing
import seaborn as sns
import matplotlib.pyplot as plt
%matplotlib inline
```

In [4]:

```
import nltk
nltk.download('stopwords')
```

```
[nltk_data] Downloading package stopwords to
[nltk_data]     C:\Users\Lenovo\AppData\Roaming\nltk_data...
[nltk_data]   Unzipping corpora\stopwords.zip.
```

Out[4]:

```
True
```

In [6]:

```
data = pd.read_csv(r'C:\Users\Lenovo\Desktop\data-task4\twitter_training.csv')
v_data = pd.read_csv(r'C:\Users\Lenovo\Desktop\data-task4\twitter_validation.csv
```

In [7]:

```
data
```

Out[7]:

	2401	Borderlands	Positive	im getting on borderlands and i will murder you all ,
0	2401	Borderlands	Positive	I am coming to the borders and I will kill you...
1	2401	Borderlands	Positive	im getting on borderlands and i will kill you ...
2	2401	Borderlands	Positive	im coming on borderlands and i will murder you...
3	2401	Borderlands	Positive	im getting on borderlands 2 and i will murder ...
4	2401	Borderlands	Positive	im getting into borderlands and i can murder y...
...	...	...	...	...
74676	9200	Nvidia	Positive	Just realized that the Windows partition of my...
74677	9200	Nvidia	Positive	Just realized that my Mac window partition is ...
74678	9200	Nvidia	Positive	Just realized the windows partition of my Mac ...
74679	9200	Nvidia	Positive	Just realized between the windows partition of...
74680	9200	Nvidia	Positive	Just like the windows partition of my Mac is l...

74681 rows × 4 columns

In [8]:

```
v_data
```

Out[8]:

	3364	Facebook	Irrelevant	I mentioned on Facebook that I was struggling for motivation to go for a run the other day, which has been translated by Tom’s great auntie as ‘Hayley can’t get out of bed’ and told to his grandma, who now thinks I’m a lazy, terrible person 🤣
0	352	Amazon	Neutral	BBC News - Amazon boss Jeff Bezos rejects clai...
1	8312	Microsoft	Negative	@Microsoft Why do I pay for WORD when it funct...
2	4371	CS-GO	Negative	CSGO matchmaking is so full of closet hacking,...
3	4433	Google	Neutral	Now the President is slapping Americans in the...
4	6273	FIFA	Negative	Hi @EAHelp I’ve had Madeleine McCann in my cel...
...	...	...	...	...
994	4891	GrandTheftAuto(GTA)	Irrelevant	⭐️ Toronto is the arts and culture capital of ...
995	4359	CS-GO	Irrelevant	tHIS IS ACTUALLY A GOOD MOVE TOT BRING MORE VI...
996	2652	Borderlands	Positive	Today sucked so it’s time to drink wine n play...
997	8069	Microsoft	Positive	Bought a fraction of Microsoft today. Small wins.
998	6960	johnson&johnson	Neutral	Johnson & Johnson to stop selling talc baby po...

999 rows × 4 columns

In [9]:

```
data.columns = ['id', 'game', 'sentiment', 'text']
v_data.columns = ['id', 'game', 'sentiment', 'text']
```

In [10]:

```
data
```

Out[10]:

```
          id         game  sentiment                                                text
0       2401  Borderlands   Positive       I am coming to the borders and I will kill you...
1       2401  Borderlands   Positive        im getting on borderlands and i will kill you ...
2       2401  Borderlands   Positive  im coming on borderlands and i will murder you...
3       2401  Borderlands   Positive     im getting on borderlands 2 and i will murder ...
4       2401  Borderlands   Positive    im getting into borderlands and i can murder y...
...      ...          ...        ...                                                 ...
74676   9200       Nvidia   Positive    Just realized that the Windows partition of my...
74677   9200       Nvidia   Positive     Just realized that my Mac window partition is ...
74678   9200       Nvidia   Positive    Just realized the windows partition of my Mac ...
74679   9200       Nvidia   Positive    Just realized between the windows partition of...
74680   9200       Nvidia   Positive       Just like the windows partition of my Mac is l...
```

74681 rows × 4 columns

In [11]:

```
v_data
```

Out[11]:

	id	game	sentiment	text
0	352	Amazon	Neutral	BBC News - Amazon boss Jeff Bezos rejects clai...
1	8312	Microsoft	Negative	@Microsoft Why do I pay for WORD when it funct...
2	4371	CS-GO	Negative	CSGO matchmaking is so full of closet hacking,...
3	4433	Google	Neutral	Now the President is slapping Americans in the...
4	6273	FIFA	Negative	Hi @EAHelp I’ve had Madeleine McCann in my cel...
...	...	...	...	...
994	4891	GrandTheftAuto(GTA)	Irrelevant	⭐️ Toronto is the arts and culture capital of ...
995	4359	CS-GO	Irrelevant	tHIS IS ACTUALLY A GOOD MOVE TOT BRING MORE VI...
996	2652	Borderlands	Positive	Today sucked so it’s time to drink wine n play...
997	8069	Microsoft	Positive	Bought a fraction of Microsoft today. Small wins.
998	6960	johnson&johnson	Neutral	Johnson & Johnson to stop selling talc baby po...

999 rows × 4 columns

In [12]:
```
data.shape
```

Out[12]:
```
(74681, 4)
```

In [13]:
```
data.columns
```

Out[13]:
```
Index(['id', 'game', 'sentiment', 'text'], dtype='object')
```

In [14]:
```
data.describe(include='all')
```

Out[14]:

	id	game	sentiment	text
count	74681.000000	74681	74681	73995
unique	NaN	32	4	69490
top	NaN	TomClancysRainbowSix	Negative	
freq	NaN	2400	22542	172
mean	6432.640149	NaN	NaN	NaN
std	3740.423819	NaN	NaN	NaN
min	1.000000	NaN	NaN	NaN
25%	3195.000000	NaN	NaN	NaN
50%	6422.000000	NaN	NaN	NaN
75%	9601.000000	NaN	NaN	NaN
max	13200.000000	NaN	NaN	NaN

In [15]:

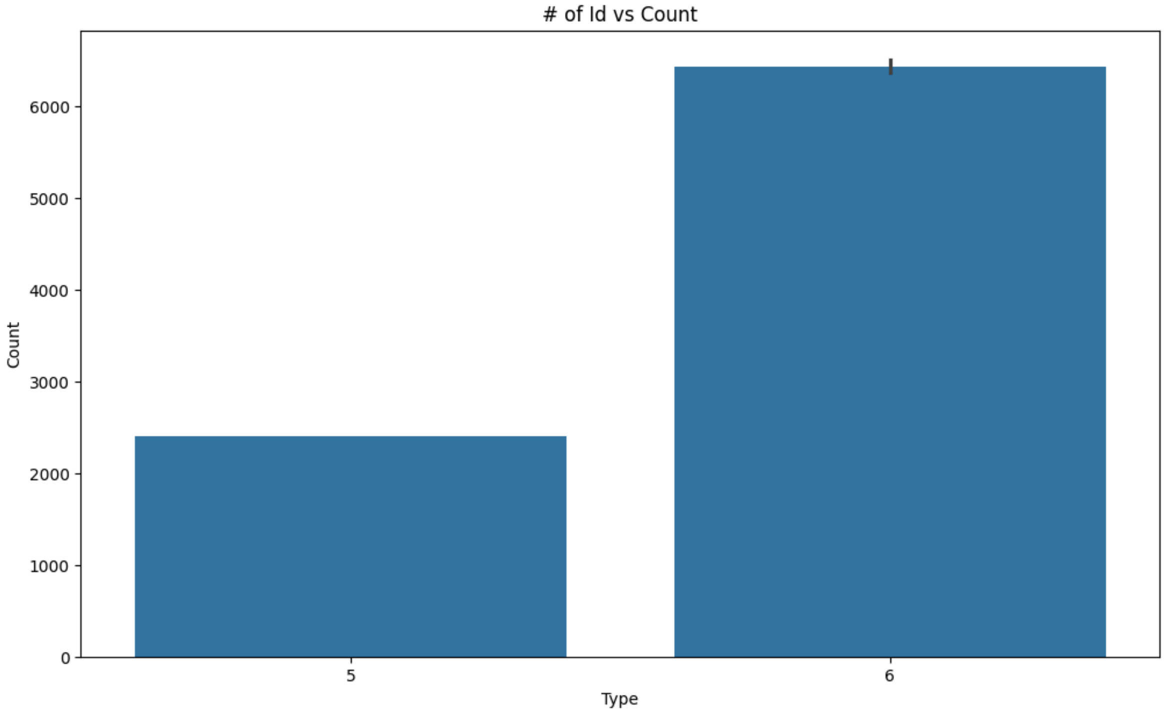
```
id_types = data['id'].value_counts()
id_types
```

Out[15]:

```
id
5203    6
6164    6
6141    6
6142    6
6143    6
       ..
4678    6
4679    6
4680    6
4681    6
2401    5
Name: count, Length: 12447, dtype: int64
```

In [16]:

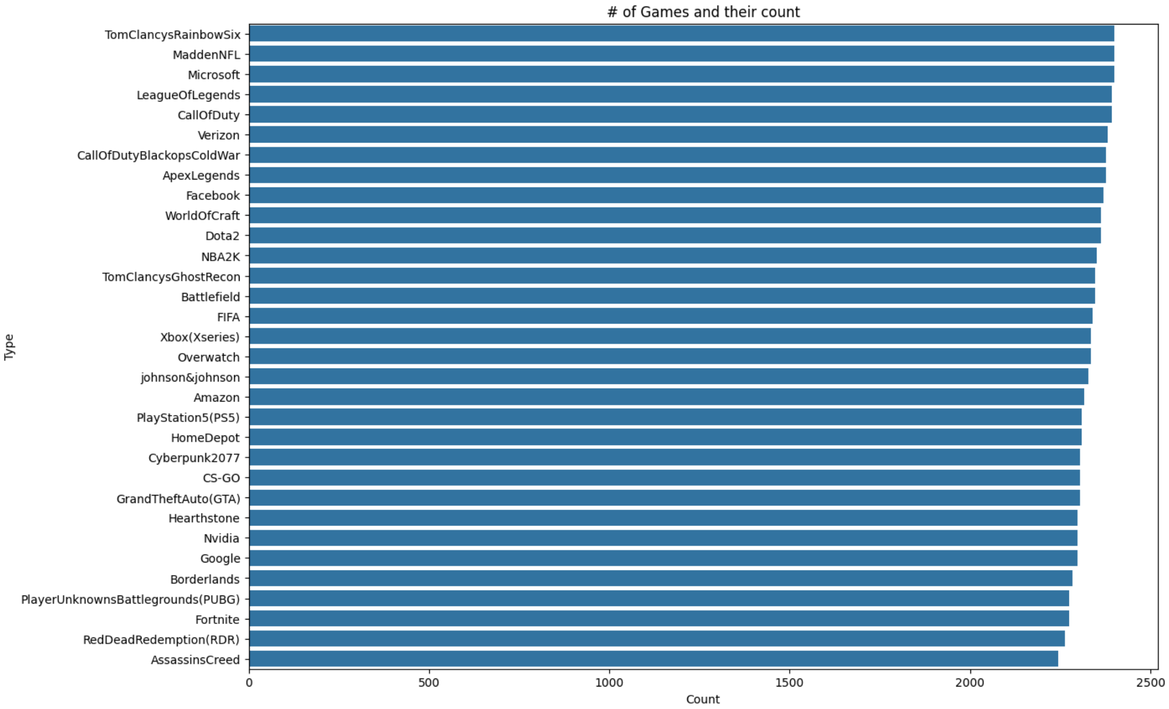
```
plt.figure(figsize=(12,7))
sns.barplot(y=id_types.index, x=id_types.values)
plt.xlabel('Type')
plt.ylabel('Count')
plt.title('# of Id vs Count')
plt.show()
```



```
In [17]: game_types = data['game'].value_counts()
         game_types
```

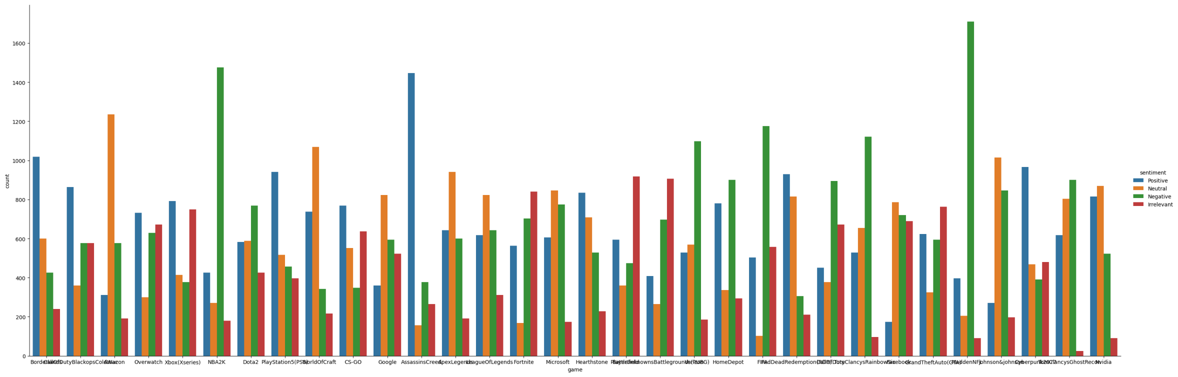
```
Out[17]: game
         TomClancysRainbowSix                 2400
         MaddenNFL                            2400
         Microsoft                            2400
         LeagueOfLegends                      2394
         CallOfDuty                           2394
         Verizon                              2382
         CallOfDutyBlackopsColdWar            2376
         ApexLegends                          2376
         Facebook                             2370
         WorldOfCraft                         2364
         Dota2                                2364
         NBA2K                                2352
         TomClancysGhostRecon                 2346
         Battlefield                          2346
         FIFA                                 2340
         Xbox(Xseries)                        2334
         Overwatch                            2334
         johnson&johnson                      2328
         Amazon                               2316
         PlayStation5(PS5)                    2310
         HomeDepot                            2310
         Cyberpunk2077                        2304
         CS-GO                                2304
         GrandTheftAuto(GTA)                  2304
         Hearthstone                          2298
         Nvidia                               2298
         Google                               2298
         Borderlands                          2285
         PlayerUnknownsBattlegrounds(PUBG)    2274
         Fortnite                             2274
         RedDeadRedemption(RDR)               2262
         AssassinsCreed                       2244
         Name: count, dtype: int64
```

In [19]:
```
plt.figure(figsize=(14,10))
sns.barplot(x=game_types.values,y=game_types.index)
plt.title('# of Games and their count')
plt.ylabel('Type')
plt.xlabel('Count')
plt.show()
```



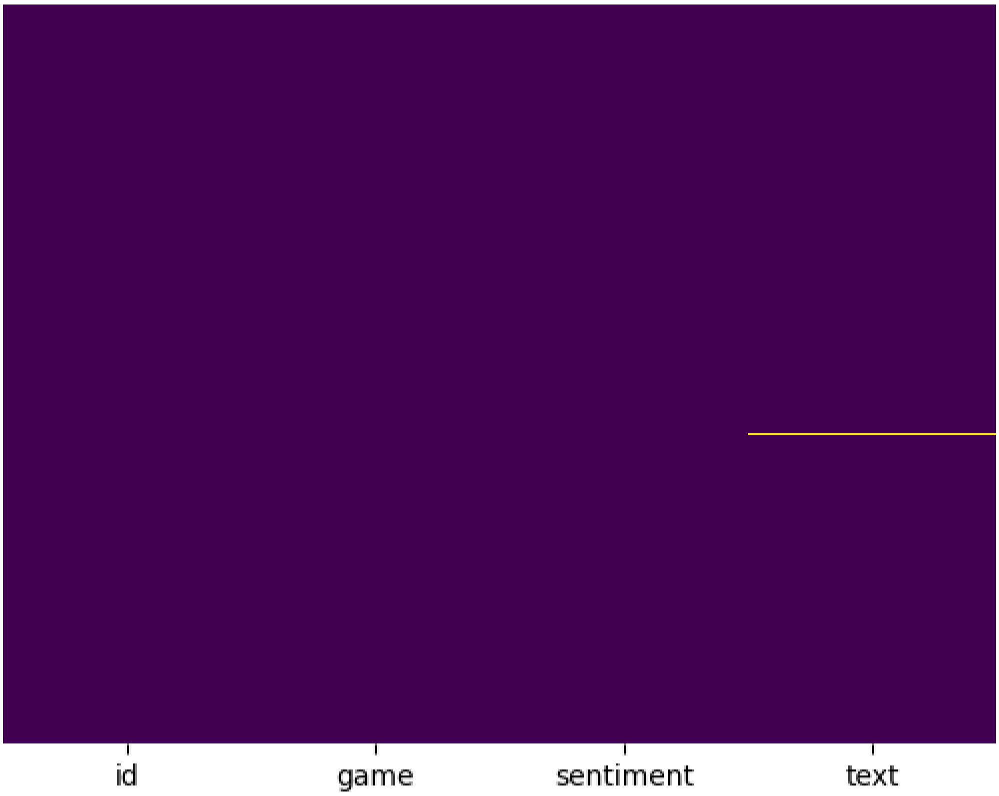
In [20]:
```
sns.catplot(x="game",hue="sentiment", kind="count",height=10,aspect=3, data=data
```

Out[20]:
```
<seaborn.axisgrid.FacetGrid at 0x25680cdede0>
```



In [21]:
```
sns.heatmap(data.isnull(),yticklabels=False,cbar=False,cmap='viridis')
```

Out[21]:
```
<Axes: >
```



In [22]:

```
total_null=data.isnull().sum().sort_values(ascending=False)
percent = ((data.isnull().sum()/data.isnull().count())*100).sort_values(ascendi
print("Total records = ", data.shape[0])
missing_data = pd.concat([total_null,percent.round(2)],axis=1,keys=['Total Miss
missing_data.head(10)
```

```
Total records =  74681
```

Out[22]:

	Total Missing	In Percent
text	686	0.92
id	0	0.00
game	0	0.00
sentiment	0	0.00

In [25]:

```
data.dropna(subset=['text'],inplace=True)
total_null=data.isnull().sum().sort_values(ascending=False)
percent = ((data.isnull().sum()/data.isnull().count())*100).sort_values(ascendin
print("Total records = ", data.shape[0])
missing_data = pd.concat([total_null,percent.round(2)],axis=1,keys=['Total Missi
missing_data.head(10)
```

```
Total records =  73995
```

Out[25]:

	Total Missing	In Percent
id	0	0.0
game	0	0.0
sentiment	0	0.0
text	0	0.0

In [26]:
```
train0=data[data['sentiment']=="Negative"]
train1=data[data['sentiment']=="Positive"]
train2=data[data['sentiment']=="Irrelevant"]
train3=data[data['sentiment']=="Neutral"]
```

In [27]:
```
train0.shape, train1.shape, train2.shape, train3.shape
```

Out[27]:
```
((22358, 4), (20654, 4), (12875, 4), (18108, 4))
```

In [29]:
```
train0=train0[:int(train0.shape[0]/12)]
train1=train1[:int(train1.shape[0]/12)]
train2=train2[:int(train2.shape[0]/12)]
train3=train3[:int(train3.shape[0]/12)]
```

In [30]:
```
train0.shape, train1.shape, train2.shape, train3.shape
```

Out[30]:
```
((1863, 4), (1721, 4), (1072, 4), (1509, 4))
```

In [31]:
```
 data=pd.concat([train0,train1,train2,train3],axis=0)
 data
```

Out[31]:

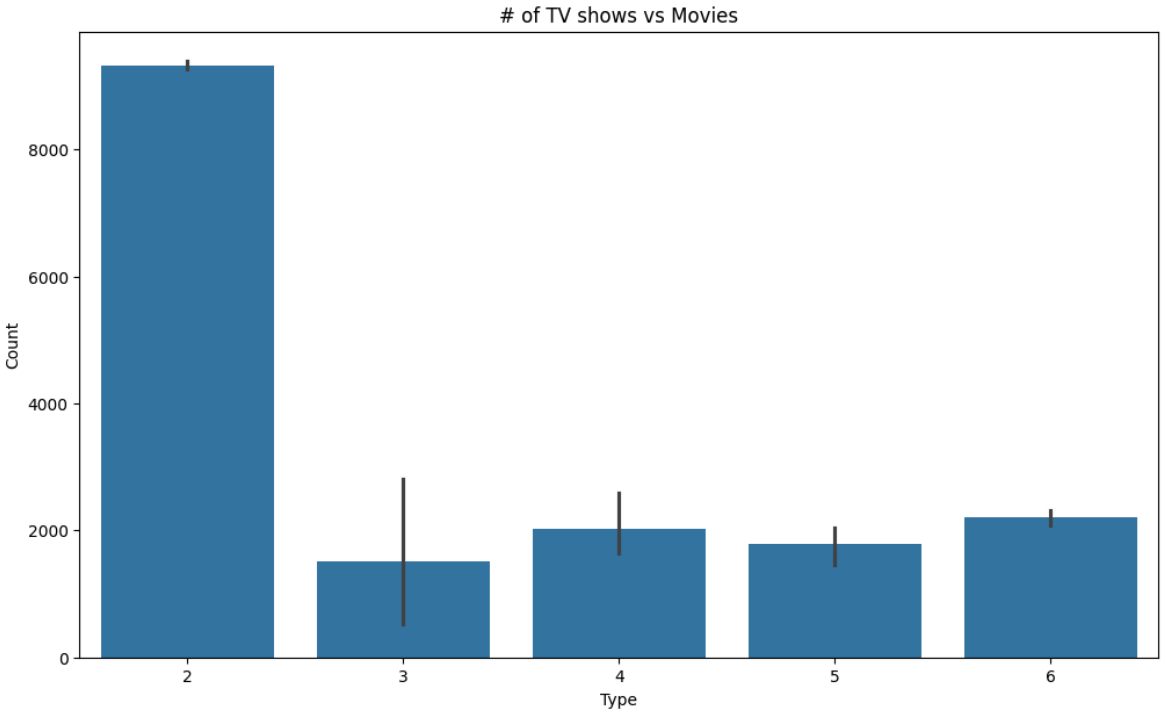
	id	game	sentiment	text
23	2405	Borderlands	Negative	the biggest dissappointment in my life came out...
24	2405	Borderlands	Negative	The biggest disappointment of my life came a y...
25	2405	Borderlands	Negative	The biggest disappointment of my life came a y...
26	2405	Borderlands	Negative	the biggest dissappointment in my life coming o...
27	2405	Borderlands	Negative	For the biggest male dissappointment in my life...
...	...	...	...	...
5603	165	Amazon	Neutral	An amazing read aloud book for you and your ch...
5604	165	Amazon	Neutral	An amazing reading book for you and your child...
5605	165	Amazon	Neutral	An amazing book to read aloud for you and your...
5606	165	Amazon	Neutral	An amazing read aloud book for you and your ch...
5607	165	Amazon	Neutral	and An amazing read aloud book for you and you...

6165 rows × 4 columns

In [32]:
```
 id_types = data['id'].value_counts()
 id_types
```

Out[32]:
```
id
2405    6
1810    6
1748    6
1754    6
1760    6
       ..
1602    3
1880    3
333     3
9388    2
9267    2
Name: count, Length: 1040, dtype: int64
```

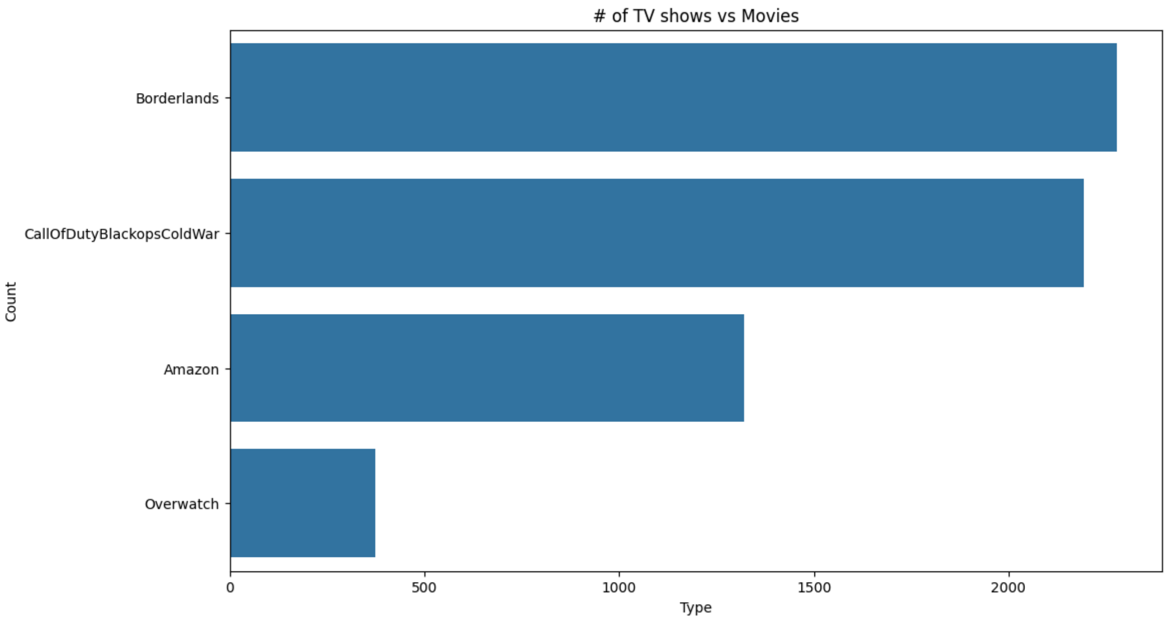
In [34]:
```
plt.figure(figsize=(12,7))
sns.barplot(x=id_types.values,y=id_types.index)
plt.xlabel('Type')
plt.ylabel('Count')
plt.title('# of TV shows vs Movies')
plt.show()
```



In [35]:
```
game_types = data['game'].value_counts()
game_types
```

Out[35]:
```
game
Borderlands                 2279
CallOfDutyBlackopsColdWar   2192
Amazon                      1321
Overwatch                    373
Name: count, dtype: int64
```

In [36]:
```
plt.figure(figsize=(12,7))
sns.barplot(x=game_types.values,y=game_types.index)
plt.xlabel('Type')
plt.ylabel('Count')
plt.title('# of TV shows vs Movies')
plt.show()
```



In [38]:

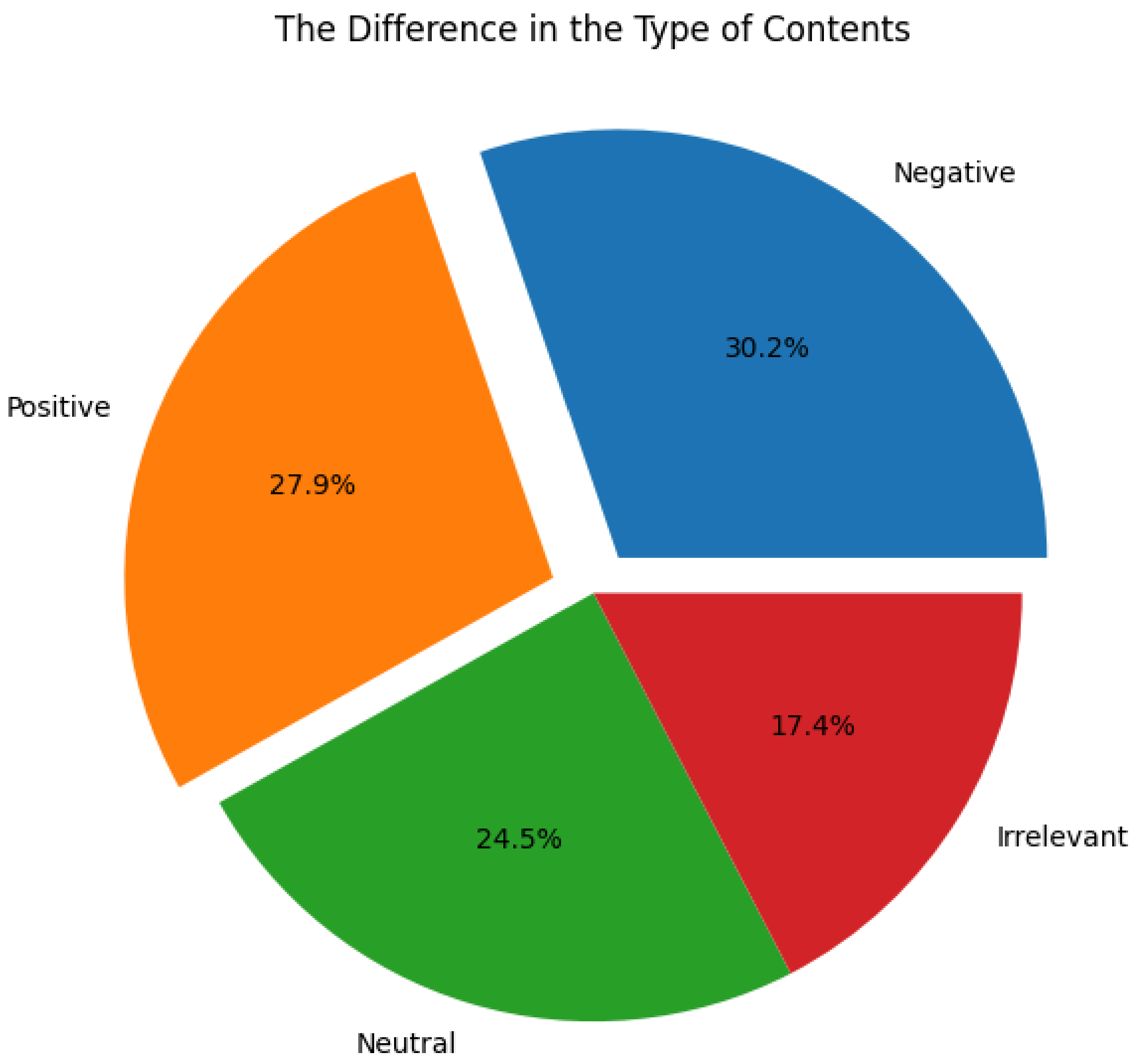
```
sentiment_types = data['sentiment'].value_counts()
sentiment_types
```

Out[38]:

```
sentiment
Negative      1863
Positive      1721
Neutral       1509
Irrelevant    1072
Name: count, dtype: int64
```

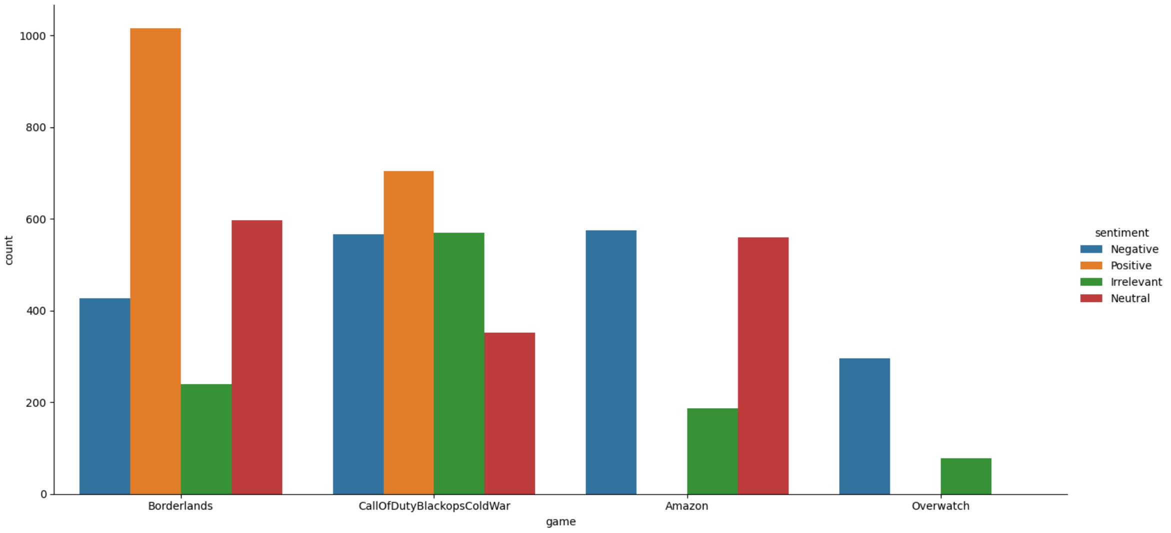
In [39]:

```
plt.figure(figsize=(12,7))
plt.pie(x=sentiment_types.values, labels=sentiment_types.index, autopct='%.1f%%'
plt.title('The Difference in the Type of Contents')
plt.show()
```



In [40]:
```
sns.catplot(x='game',hue='sentiment',kind='count',height=7,aspect=2,data=data)
```

Out[40]:
```
<seaborn.axisgrid.FacetGrid at 0x25680f7a4e0>
```



In [41]:
```
from sklearn import preprocessing
label_encoder = preprocessing.LabelEncoder()
```

```
In [43]: data['sentiment']=label_encoder.fit_transform(data['sentiment'])
         data['game']=label_encoder.fit_transform(data['game'])
         v_data['sentiment']=label_encoder.fit_transform(v_data['sentiment'])
         v_data['game']=label_encoder.fit_transform(v_data['game'])
```

```
In [45]: data = data.drop(['id'],axis=1)
         data
```

Out[45]:

	game	sentiment	text
23	1	1	the biggest dissappoinment in my life came out...
24	1	1	The biggest disappointment of my life came a y...
25	1	1	The biggest disappointment of my life came a y...
26	1	1	the biggest dissappoinment in my life coming o...
27	1	1	For the biggest male dissappoinment in my life...
...	...	...	...
5603	0	2	An amazing read aloud book for you and your ch...
5604	0	2	An amazing reading book for you and your child...
5605	0	2	An amazing book to read aloud for you and your...
5606	0	2	An amazing read aloud book for you and your ch...
5607	0	2	and An amazing read aloud book for you and you...

6165 rows × 3 columns

```
In [46]: data.nunique()
```

```
Out[46]: game            4
         sentiment       4
         text         5854
         dtype: int64
```

```
In [47]: v_data.nunique()
```

```
Out[47]: id           999
         game          32
         sentiment      4
         text         998
         dtype: int64
```

```
In [ ]:
```