Music_Recommendation_System

Import Libraries

In [2]:
```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
%matplotlib inline
from sklearn.preprocessing import StandardScaler
from sklearn.ensemble import RandomForestClassifier
from sklearn.model_selection import train_test_split
from sklearn.metrics import accuracy_score, confusion_matrix
import warnings
warnings.filterwarnings('ignore')
```

Reading the dataset

In [3]:
```
members = pd.read_csv("members.csv")
members
```

Out[3]:

	msno	city	bd	gender	registered_via	registration_init_time	expiration_date
0	XQxgAYj3klVKjR3oxPPXYYFp4soD4TuBghkhMTD4oTw=	1	0	NaN	7	20110820	20170920
1	UizsfmJb9mV54qE9hCYyU07Va97c0lCRLEQX3ae+ztM=	1	0	NaN	7	20150628	20170622
2	D8nEhsIOBSoE6VthTaqDX8U6lqjJ7dLdr72mOyLya2A=	1	0	NaN	4	20160411	20170712
3	mCuD+tZ1hERA/o5GPqk38e041J8ZsBaLcu7nGoIlvhI=	1	0	NaN	9	20150906	20150907
4	q4HRBfVSssAFS9iRfxWrohxuk9kCYMKjHOEagUMV6rQ=	1	0	NaN	4	20170126	20170613
...	...	...	...	...	...	...	...
34398	Wwd/cudKVuLJ3txRVxlg2Zaeliu+LRUfiBmfrnxhRCY=	1	0	NaN	7	20131111	20170910
34399	g3JGnJX6Hg50lFbrNWfsHwCUmApIkiv2M8sXOaeXoIQ=	4	18	male	3	20141024	20170518
34400	IMaPMJuyN+ip9Vqi+z2XuXbFAP2kbHr+EvvCNkFfj+o=	1	0	NaN	7	20130802	20170908
34401	WAnCAJjUty9Stv8yKtV7ZC7PN+ilOy5FX3alJgGPANM=	1	0	NaN	7	20151020	20170920
34402	xH8KpzKGeNNq6dOvy51c/8VzqOiGG+m6vabhsPSDHX4=	1	0	NaN	4	20160815	20160818

34403 rows × 7 columns

In [5]:
```
songs = pd.read_csv("songs.csv", nrows=20000)
songs
```

Out[5]:

	song_id	song_length	genre_ids	artist_name	composer	lyricist	language
0	CXoTN1eb7AI+DntdU1vbcwGRV4SCIDxZu+YD8JP8r4E=	247640	465	張信哲 (Jeff Chang)	董貞	何啟弘	3.0
1	o0kFgae9QtnYgRkVPqLJwa05zIhRlUjfF7O1tDw0ZDU=	197328	444	BLACKPINK	TEDDY| FUTURE BOUNCE| Bekuh BOOM	TEDDY	31.0
2	DwVvVurfpuz+XPuFvucclVQEyPqcpUkHR0ne1RQzPs0=	231781	465	SUPER JUNIOR	NaN	NaN	31.0
3	dKMBWoZyScdxSkihKG+Vf47nc18N9q4m58+b4e7dSSE=	273554	465	S.H.E	湯小康	徐世珍	3.0
4	W3bqWd3T+VeHFzHAUfARgW9AvVRaF4N5Yzm4Mr6Eo/o=	140329	726	貴族精選	Traditional	Traditional	52.0
...	...	...	...	...	...	...	...
19995	XTDNdQR/VbqECrUmXlmyeOnhD4dFglDefCw/auQ/mrU=	363946	958	Rachel Podger	Heinrich Ignaz Franz von Biber	NaN	-1.0
19996	iUWEK/CODxzJtYSPUIp/0SM5yUd8RBrAZeCPwJFu/+c=	319712	958	Various Artists	Johann Sebastian Bach	NaN	-1.0
19997	ljBHnpgdxRnzxO0IJoiwVZdjlDZEUgjOvvVhLKCxwNY=	214274	958	Mozart	NaN	NaN	-1.0
19998	OOowMAm1BHvDzH0xt33+heZkV2lnWK2sffo9kugb9zU=	223425	465	Jorge Ben Jor	Jorge Ben Jor	NaN	52.0
19999	J4QBnnRehImXlQn3wBXPOe91rw5ykabW9Ex0lzB8EL4=	197369	451	Various Artists	Michael Lai	NaN	24.0

20000 rows × 7 columns

In [6]:
```python
songs_info = pd.read_csv("song_extra_info.csv")
songs_info
```

Out[6]:

	song_id	name	isrc
0	LP7pLJoJFBvyuUwvu+oLzjT+bI+UeBPURCecJsX1jjs=	我們	TWUM71200043
1	ClazTFnk6r0Bnuie44bocdNMM3rdlrq0bCGAsGUWcHE=	Let Me Love You	QMZSY1600015
2	u2ja/bZE3zhCGxvbbOB3zOoUjx27u40cf5g09UXMoKQ=	原諒我	TWA530887303
3	92Fqsy0+p6+RHe2EoLKjHahORHR1Kq1TBJoClW9v+Ts=	Classic	USSM11301446
4	0QFmz/+rJy1Q56C1DuYqT9hKKqi5TUqx0sN0IwvoHrw=	愛投羅網	TWA471306001
...	...	...	...
2295966	hLnetpF6UbPg28sSfXnPE2vsdaGsLvddlXEdJR4VTIA=	Deep Breathing	PLL431720793
2295967	N+6vJ8actKQm0S3Fpf4elipTjoAo9ev28aA5FJN5e40=	In Hiding	US5UL1519827
2295968	pv35uG0ts05mWtirM/AMOWEzbHxIVart5ZzRXqKUY1c=	Il Est Ne Le Divin Enfant	PLL431502294
2295969	QSySnm8jt2Go7byY34/PxsZP6dPCins2j2cyYquNhBo=	The Exodus Song	DEPZ69316095
2295970	DYKJKSgDOKxb19XzOVO81176qTH0OIHCsfzFRm/BG+g=	Like This	US5UL1512426

2295971 rows × 3 columns

In [7]:
```python
submission = pd.read_csv("sample_submission.csv", nrows=20000)
submission
```

Out[7]:

	id	target
0	0	0.5
1	1	0.5
2	2	0.5
3	3	0.5
4	4	0.5
...	...	...
19995	19995	0.5
19996	19996	0.5
19997	19997	0.5
19998	19998	0.5
19999	19999	0.5

20000 rows × 2 columns

In [8]:
```python
train_data = pd.read_csv("train.csv", nrows=20000)
train_data
```

Out[8]:

	msno	song_id	source_system_tab	source_screen_name
0	FGtllVqz18RPiwJj/edr2gV78zirAiY/9SmYvia+kCg=	BBzumQNXUHKdEBOB7mAJuzok+IJA1c2Ryg/yzTF6tik=	explore	Explore
1	Xumu+NIjS6QYVxDS4/t3SawvJ7viT9hPKXmf0RtLNx8=	bhp/MpSNoqoxOIB+/l8WPqu6jldth4DIpCm3ayXnJqM=	my library	Local playlist more
2	Xumu+NIjS6QYVxDS4/t3SawvJ7viT9hPKXmf0RtLNx8=	JNWfrrC7zNN7BdMpsISKa4Mw+xVJYNnxXh3/Epw7QgY=	my library	Local playlist more
3	Xumu+NIjS6QYVxDS4/t3SawvJ7viT9hPKXmf0RtLNx8=	2A87tzfnJTSWqD7gIZHisolhe4DMdzkbd6LzO1KHjNs=	my library	Local playlist more
4	FGtllVqz18RPiwJj/edr2gV78zirAiY/9SmYvia+kCg=	3qm6XTZ6MOCU11x8FIVbAGH5l5uMkT3/ZalWG1oo2Gc=	explore	Explore
...	...	...	...	...
19995	N9u0iiKsqZYNdmI12834pcyIc7xkifUUHyrb69T0jaU=	NGGXOVTfxaeWP5FCG4FqEXThMN5oArLN3V6gG/XFBnY=	my library	Local playlist more
19996	N9u0iiKsqZYNdmI12834pcyIc7xkifUUHyrb69T0jaU=	KVcvULyaMxyWdn3ywjZifiGJqkaT6uUKMBLZ+BTsB7Q=	my library	Local playlist more
19997	N9u0iiKsqZYNdmI12834pcyIc7xkifUUHyrb69T0jaU=	+ns7TUfsDgumML8q2hVjpi+B3dDLB/YlrEDoLuSmlKI=	my library	Local playlist more
19998	N9u0iiKsqZYNdmI12834pcyIc7xkifUUHyrb69T0jaU=	xf3Py8deCPXun3qc83fyceiXCJ/qZw7pfHxD1x3SvgY=	my library	Local playlist more
19999	N9u0iiKsqZYNdmI12834pcyIc7xkifUUHyrb69T0jaU=	Ixqk50t+WoPjlXelxSVEsKaMJpShQqEq8Sq0cVzVk2A=	my library	Local playlist more

20000 rows × 6 columns

In [9]:
```python
test_data = pd.read_csv("test.csv", nrows=20000)
test_data
```

Out[9]:

	id	msno	song_id	source_system_tab	source_screen_
0	0	V8ruy7SGk7tDm3zA51DPpn6qutt+vmKMBKa21dp54uM=	WmHKgKMlp1lQMecNdNvDMkvIycZYHnFwDT72I5sIssc=	my library	Local playlis
1	1	V8ruy7SGk7tDm3zA51DPpn6qutt+vmKMBKa21dp54uM=	y/rsZ9DC7FwK5F2PK2D5mj+aOBUJAjuu3dZ14NgE0vM=	my library	Local playlis
2	2	/uQAlrAkaczV+nWCd2sPF2ekvXPRipV7q0l+gbLuxjw=	8eZLFOdGVdXBSqoAv5nsLigeH2BvKXzTQYtUM53I0k4=	discover	
3	3	1a6oo/iXKatxQx4eS9zTVD+KlSVaAFbTIqVvwLC1Y0k=	ztCf8thYsS4YN3GcIL/bvoxLm/T5mYBVKOO4C9NiVfQ=	radio	
4	4	1a6oo/iXKatxQx4eS9zTVD+KlSVaAFbTIqVvwLC1Y0k=	MKVMpslKcQhMaFEgcEQhEfi5+RZhMYlU3eRDpySrH8Y=	radio	
...	...	...	...	...	
19995	19995	g2ZIsHl2Mheh31zqY9cbgx9MKizUzskgEcYUBhuExys=	F/zl2VkHgQs+Lx+XjS74XN1m59vNAVir/Sl11wc8Fr4=	my library	Local playlis
19996	19996	g2ZIsHl2Mheh31zqY9cbgx9MKizUzskgEcYUBhuExys=	vM08WBQRO9eZo1K+qTJmjuw2IqbuA3L65ojbGwB4GI0=	my library	Local playlis
19997	19997	g2ZIsHl2Mheh31zqY9cbgx9MKizUzskgEcYUBhuExys=	61cwHmq3kaaSf/yMvcEXUeGmPyG1g8gY7am/0fuECBw=	my library	Local playlis
19998	19998	g2ZIsHl2Mheh31zqY9cbgx9MKizUzskgEcYUBhuExys=	icCxTviW2hBsVijNHZnddwcjvVi+PE7ywBQEPidLt/4=	my library	Local playlis
19999	19999	g2ZIsHl2Mheh31zqY9cbgx9MKizUzskgEcYUBhuExys=	UHbrHH97KESebIQOL3/2fLOLCX558fZ4BlqmTNYUuqg=	my library	Local playlis

20000 rows × 6 columns

In [10]:
```python
print(f"The songs_data has {songs.shape[0]} rows and {songs.shape[1]} columns")
print(f"The songs_extra_info_data has {songs_info.shape[0]} rows and {songs_info.shape[1]} columns")
print(f"The members_data has {members.shape[0]} rows and {members.shape[1]} columns")
print(f"The sample_submission_data has {submission.shape[0]} rows and {submission.shape[1]} columns")
print(f"The train_data has {train_data.shape[0]} rows and {train_data.shape[1]} columns")
print(f"The test_data has {test_data.shape[0]} rows and {test_data.shape[1]} columns")
```

```
The songs_data has 20000 rows and 7 columns
The songs_extra_info_data has 2295971 rows and 3 columns
The members_data has 34403 rows and 7 columns
The sample_submission_data has 20000 rows and 2 columns
The train_data has 20000 rows and 6 columns
The test_data has 20000 rows and 6 columns
```

In [11]:
```python
songs.describe()
```

Out[11]:

	song_length	language
count	2.000000e+04	20000.000000
mean	2.456958e+05	25.946550
std	1.201716e+05	23.223231
min	4.922000e+03	-1.000000
25%	1.997060e+05	3.000000
50%	2.336850e+05	17.000000
75%	2.731360e+05	52.000000
max	4.025318e+06	59.000000

In [12]:
```python
print("Columns present in the songs data are:")
for columns in songs.columns:
    print(columns)
```

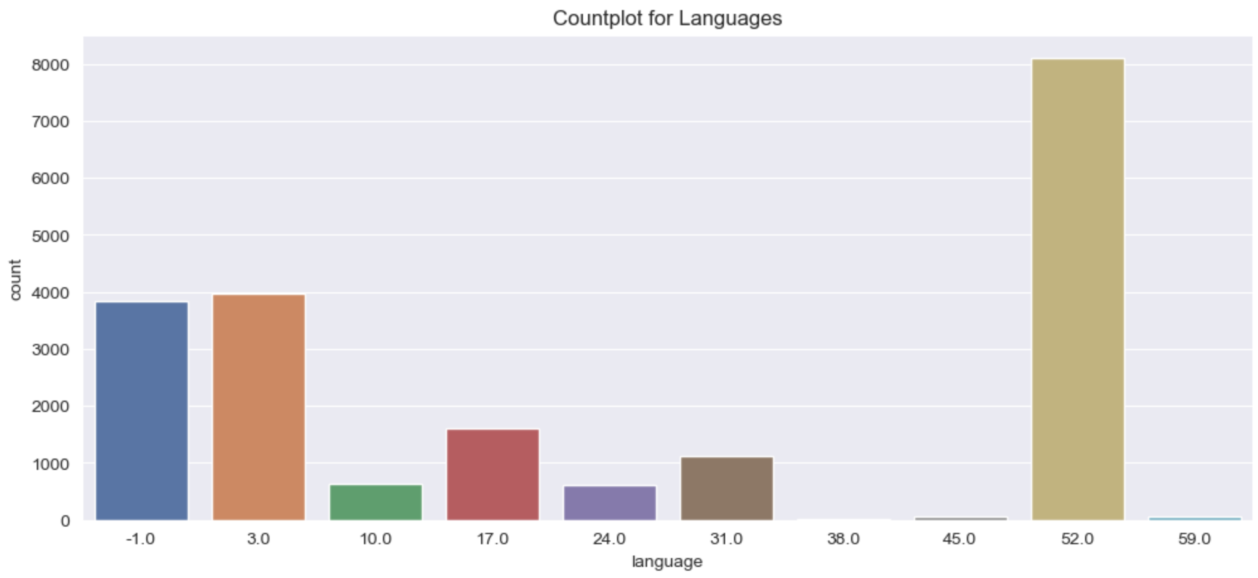
```
Columns present in the songs data are:
song_id
song_length
genre_ids
artist_name
composer
lyricist
language
```

In [13]:
```python
print(f"Number of records : {songs.shape[0]}")
print(f"Count of distinct song lengths : {len(songs.song_length.unique())}")
print(f"Count of distinct genre ids : {len(songs.genre_ids.unique())}")
print(f"Count of distinct artist name : {len(songs.artist_name.unique())}")
print(f"Count of distinct composer : {len(songs.composer.unique())}")
print(f"Count of distinct lyricist : {len(songs.lyricist.unique())}")
print(f"Count of distinct language : {len(songs.language.unique())}")
```

```
Number of records : 20000
Count of distinct song lengths : 10734
Count of distinct genre ids : 275
Count of distinct artist name : 8378
Count of distinct composer : 8332
Count of distinct lyricist : 3977
Count of distinct language : 10
```

Data preprocessing

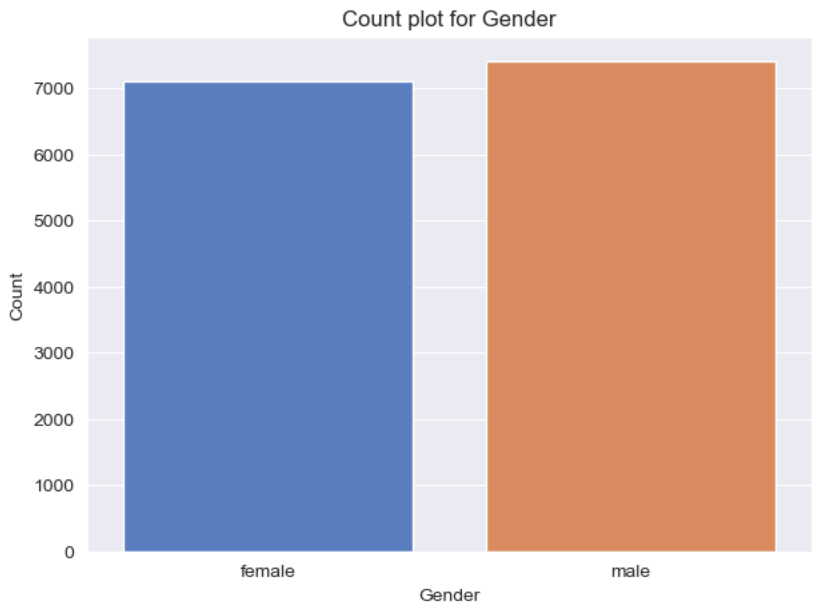
In [14]:
```
plt.figure(figsize= (12, 5))
sns.set_style("darkgrid")
ax = sns.countplot(x = songs.language, data = songs.language, palette="deep")
ax.set_title("Countplot for Languages")
plt.show()
```



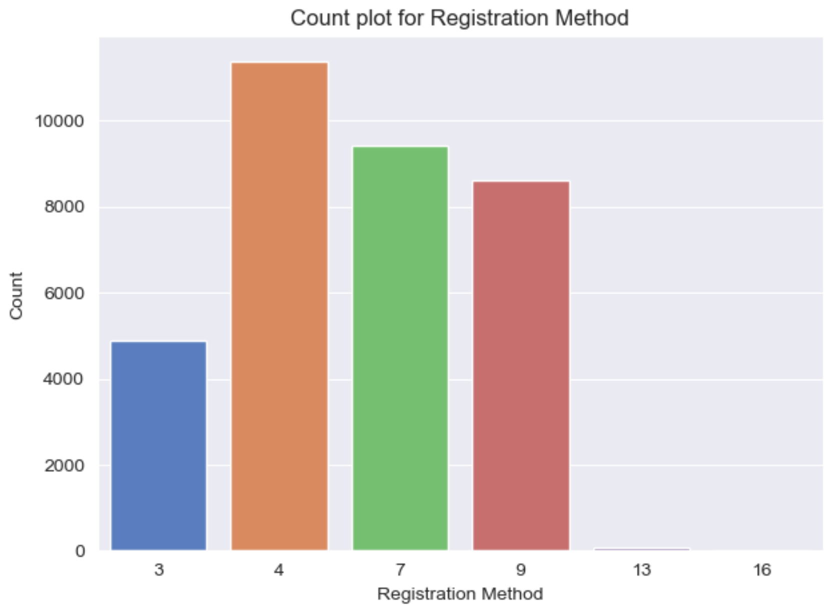
In [15]:
```
print("Columns present in the Members Data are:")
for columns in members.columns:
    print(columns)
```

```
Columns present in the Members Data are:
msno
city
bd
gender
registered_via
registration_init_time
expiration_date
```

In [19]:
```
plt.figure(figsize= (7, 5))
sns.set_style("darkgrid")
sns.countplot(x='gender', data=members, palette="muted")
plt.xlabel("Gender")
plt.ylabel("Count")
plt.title("Count plot for Gender")
plt.show()
```



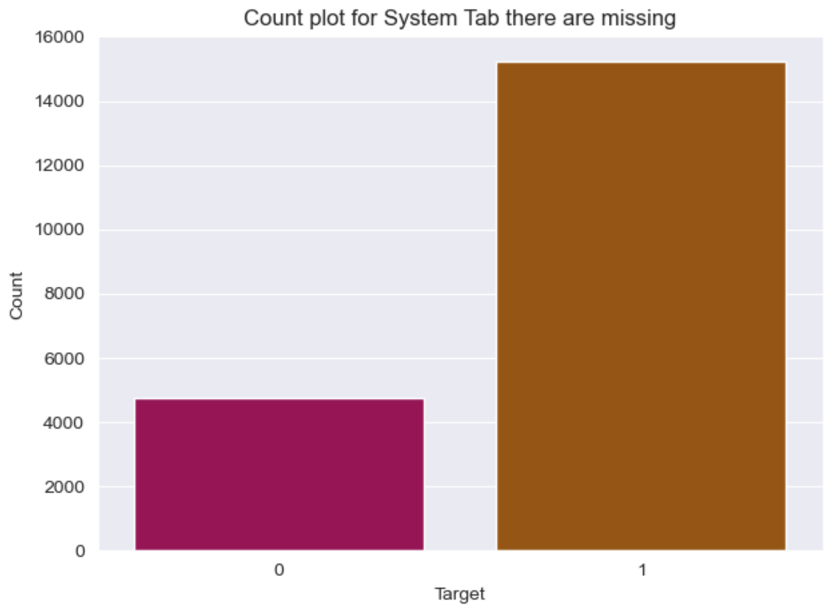
In [21]:
```
plt.figure(figsize= (7 ,5))
sns.countplot(x="registered_via", data=members, palette="muted")
plt.xlabel("Registration Method")
plt.ylabel("Count")
plt.title("Count plot for Registration Method")
plt.show()
```



In [22]:
```
print(f"Total number of records : {train_data.shape[0]}")
```

```
Total number of records : 20000
```

In [24]:
```
plt.figure(figsize= (7, 5))
sns.countplot(x='target', data=train_data, palette='brg')
plt.xlabel("Target")
plt.ylabel("Count")
plt.title("Count plot for System Tab there are missing")
plt.show()
```



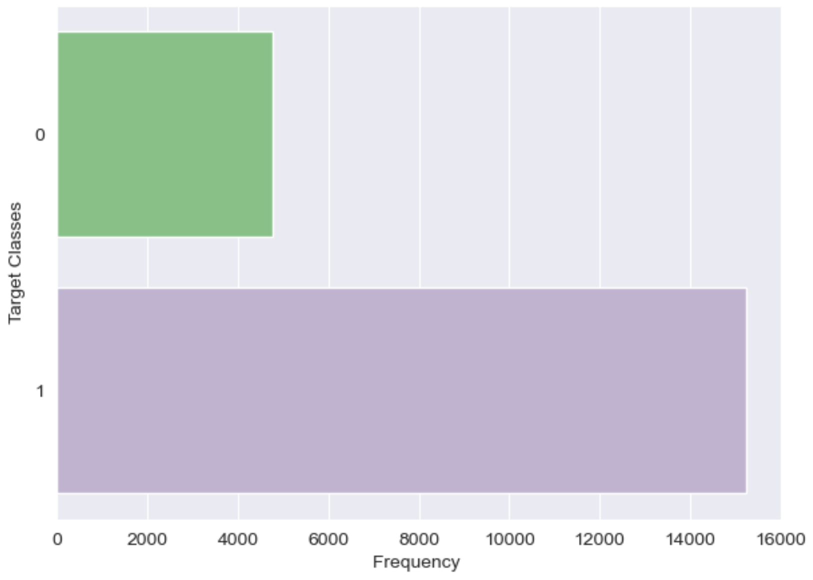
In [25]:
```
int("Total percentage for NaN value in target column : ", (train_data["target"].isna().sum()/len(train_data["target"]))*100,'
```

```
Total percentage for NaN value in target column :  0.0 %
```

In [26]:
```
duplicate_value1 = len(train_data["song_id"])-train_data["song_id"].nunique()
print("Total number of duplicate song id : ", duplicate_value1)
print("Total percentage of duplicate song id : ", (duplicate_value1/len(train_data["song_id"]))*100,"%")
```

```
Total number of duplicate song id :  10187
Total percentage of duplicate song id :  50.934999999999995 %
```

In [27]:
```
plt.figure(figsize=(7, 5))
sns.countplot(y=train_data["target"], data=train_data, palette="Accent")
plt.ylabel("Target Classes")
plt.xlabel("Frequency ")
plt.show()
```



In [28]:
```
songs_info.head()
```

Out[28]:

	song_id	name	isrc
0	LP7pLJoJFBvyuUwvu+oLzjT+bI+UeBPURCecJsX1jjs=	我們	TWUM71200043
1	ClazTFnk6r0Bnuie44bocdNMM3rdlrq0bCGAsGUWcHE=	Let Me Love You	QMZSY1600015
2	u2ja/bZE3zhCGxvbbOB3zOoUjx27u40cf5g09UXMoKQ=	原諒我	TWA530887303
3	92Fqsy0+p6+RHe2EoLKjHahORHR1Kq1TBJoClW9v+Ts=	Classic	USSM11301446
4	0QFmz/+rJy1Q56C1DuYqT9hKKqi5TUqx0sN0IwvoHrw=	愛投羅網	TWA471306001

In [29]:
```
songs_info.isnull().sum()
```

Out[29]:
```
song_id         0
name            2
isrc       136548
dtype: int64
```

In [30]:
```
songs.isnull().sum()
```

Out[30]:
```
song_id            0
song_length        0
genre_ids        346
artist_name        0
composer        8382
lyricist       14332
language           0
dtype: int64
```

In [31]:
```
songs['genre_ids'].fillna(' ', inplace=True)
```

In [32]:
```
songs['composer'].fillna(' ', inplace=True)
songs['lyricist'].fillna(' ', inplace=True)
songs['language'].fillna((52.0), inplace=True)
```

In [33]:
```
songs.isnull().sum()
```

Out[33]:
```
song_id        0
song_length    0
genre_ids      0
artist_name    0
composer       0
lyricist       0
language       0
dtype: int64
```

In [34]:
```
train_data.isnull().sum()
```
Out[34]:
```
msno                    0
song_id                 0
source_system_tab      67
source_screen_name    576
source_type            50
target                  0
dtype: int64
```

In [35]:
```
train_data = train_data.drop(['source_system_tab', 'source_screen_name', 'source_type'], axis=1)
train_data.head()
```
Out[35]:

	msno	song_id	target
0	FGtllVqz18RPiwJj/edr2gV78zirAiY/9SmYvia+kCg=	BBzumQNXUHKdEBOB7mAJuzok+IJA1c2Ryg/yzTF6tik=	1
1	Xumu+NIjS6QYVxDS4/t3SawvJ7viT9hPKXmf0RtLNx8=	bhp/MpSNoqoxOIB+/l8WPqu6jldth4DIpCm3ayXnJqM=	1
2	Xumu+NIjS6QYVxDS4/t3SawvJ7viT9hPKXmf0RtLNx8=	JNWfrrC7zNN7BdMpsISKa4Mw+xVJYNnxXh3/Epw7QgY=	1
3	Xumu+NIjS6QYVxDS4/t3SawvJ7viT9hPKXmf0RtLNx8=	2A87tzfnJTSWqD7gIZHisolhe4DMdzkbd6LzO1KHjNs=	1
4	FGtllVqz18RPiwJj/edr2gV78zirAiY/9SmYvia+kCg=	3qm6XTZ6MOCU11x8FIVbAGH5I5uMkT3/ZaIWG1oo2Gc=	1

In [36]:
```
train_data.shape
```
Out[36]:
```
(20000, 3)
```

In [37]:
```
train_data.rename(columns={'msno':"user_id"}, inplace=True)
train_data.head()
```
Out[37]:

	user_id	song_id	target
0	FGtllVqz18RPiwJj/edr2gV78zirAiY/9SmYvia+kCg=	BBzumQNXUHKdEBOB7mAJuzok+IJA1c2Ryg/yzTF6tik=	1
1	Xumu+NIjS6QYVxDS4/t3SawvJ7viT9hPKXmf0RtLNx8=	bhp/MpSNoqoxOIB+/l8WPqu6jldth4DIpCm3ayXnJqM=	1
2	Xumu+NIjS6QYVxDS4/t3SawvJ7viT9hPKXmf0RtLNx8=	JNWfrrC7zNN7BdMpsISKa4Mw+xVJYNnxXh3/Epw7QgY=	1
3	Xumu+NIjS6QYVxDS4/t3SawvJ7viT9hPKXmf0RtLNx8=	2A87tzfnJTSWqD7gIZHisolhe4DMdzkbd6LzO1KHjNs=	1
4	FGtllVqz18RPiwJj/edr2gV78zirAiY/9SmYvia+kCg=	3qm6XTZ6MOCU11x8FIVbAGH5I5uMkT3/ZaIWG1oo2Gc=	1

In [38]:
```
songs.head()
```
Out[38]:

	song_id	song_length	genre_ids	artist_name	composer	lyricist	language
0	CXoTN1eb7AI+DntdU1vbcwGRV4SCIDxZu+YD8JP8r4E=	247640	465	張信哲 (Jeff Chang)	董貞	何啟弘	3.0
1	o0kFgae9QtnYgRkVPqLJwa05zIhRlUjfF7O1tDw0ZDU=	197328	444	BLACKPINK	TEDDY| FUTURE BOUNCE| Bekuh BOOM	TEDDY	31.0
2	DwVvVurfpuz+XPuFvucclVQEyPqcpUkHR0ne1RQzPs0=	231781	465	SUPER JUNIOR			31.0
3	dKMBWoZyScdxSkihKG+Vf47nc18N9q4m58+b4e7dSSE=	273554	465	S.H.E	湯小康	徐世珍	3.0
4	W3bqWd3T+VeHFzHAUfARgW9AvVRaF4N5Yzm4Mr6Eo/o=	140329	726	貴族精選	Traditional	Traditional	52.0

In [39]:
```
df = train_data.merge(songs, on="song_id")
df.head()
```
Out[39]:

	user_id	song_id	target	song_length	genre_ids	artist_name	co
0	FGtllVqz18RPiwJj/edr2gV78zirAiY/9SmYvia+kCg=	3Hg5kugV1S0wzEVLAEfqjIV5UHzb7bCrdBRQlGygLvU=	1	247803	1259	Desiigner	
1	hZyOA+0yqClPLt6uIEndf8fG8szH/95eKMbaxLE5z30=	3Hg5kugV1S0wzEVLAEfqjIV5UHzb7bCrdBRQlGygLvU=	1	247803	1259	Desiigner	
2	0LhkakIQDn36HZXI6ClQSO7W7jkpZAy+9MvYgPOZGrA=	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	1	249443	458	莊心妍	
3	MofmAMt7P8LIcF4+LLlcjyIhYUzmv13L/LRwYFxiGYE=	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	1	249443	458	莊心妍	
4	U9Z+N+szYGJHTPMn/C0V7yIyIC24fDI0RDRWChXATkg=	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	0	249443	458	莊心妍	

In [40]:
```
df = df.drop(['song_length', 'language'], axis=1)
df.head()
```

Out[40]:

	user_id	song_id	target	genre_ids	artist_name	composer	lyricis
0	FGtllVqz18RPiwJj/edr2gV78zirAiY/9SmYvia+kCg=	3Hg5kugV1S0wzEVLAEfqjIV5UHzb7bCrdBRQlGygLvU=	1	1259	Desiigner	Sidney Selby| Adnan Khan	
1	hZyOA+0yqClPLt6uIEndf8fG8szH/95eKMbaxLE5z30=	3Hg5kugV1S0wzEVLAEfqjIV5UHzb7bCrdBRQlGygLvU=	1	1259	Desiigner	Sidney Selby| Adnan Khan	
2	0LhkakIQDn36HZXI6ClQSO7W7jkpZAy+9MvYgPOZGrA=	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	1	458	莊心妍	鄭建浩	鄭建
3	MofmAMt7P8LIcF4+LLlcjyIhYUzmv13L/LRwYFxiGYE=	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	1	458	莊心妍	鄭建浩	鄭建
4	U9Z+N+szYGJHTPMn/C0V7ylyIC24fDI0RDRWChXATkg=	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	0	458	莊心妍	鄭建浩	鄭建

In [41]:
```
songs_info.head()
```

Out[41]:

	song_id	name	isrc
0	LP7pLJoJFBvyuUwvu+oLzjT+bI+UeBPURCecJsX1jjs=	我們	TWUM71200043
1	ClazTFnk6r0Bnuie44bocdNMM3rdlrq0bCGAsGUWcHE=	Let Me Love You	QMZSY1600015
2	u2ja/bZE3zhCGxvbbOB3zOoUjx27u40cf5g09UXMoKQ=	原諒我	TWA530887303
3	92Fqsy0+p6+RHe2EoLKjHahORHR1Kq1TBJoClW9v+Ts=	Classic	USSM11301446
4	0QFmz/+rJy1Q56C1DuYqT9hKKqi5TUqx0sN0IwvoHrw=	愛投羅網	TWA471306001

In [42]:
```
df = df.merge(songs_info,on="song_id").drop('isrc',axis=1)
df.head()
```

Out[42]:

	user_id	song_id	target	genre_ids	artist_name	composer	lyricis
0	FGtllVqz18RPiwJj/edr2gV78zirAiY/9SmYvia+kCg=	3Hg5kugV1S0wzEVLAEfqjIV5UHzb7bCrdBRQlGygLvU=	1	1259	Desiigner	Sidney Selby| Adnan Khan	
1	hZyOA+0yqClPLt6uIEndf8fG8szH/95eKMbaxLE5z30=	3Hg5kugV1S0wzEVLAEfqjIV5UHzb7bCrdBRQlGygLvU=	1	1259	Desiigner	Sidney Selby| Adnan Khan	
2	0LhkakIQDn36HZXI6ClQSO7W7jkpZAy+9MvYgPOZGrA=	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	1	458	莊心妍	鄭建浩	鄭建
3	MofmAMt7P8LIcF4+LLlcjyIhYUzmv13L/LRwYFxiGYE=	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	1	458	莊心妍	鄭建浩	鄭建
4	U9Z+N+szYGJHTPMn/C0V7ylyIC24fDI0RDRWChXATkg=	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	0	458	莊心妍	鄭建浩	鄭建

In [43]:
```
df.rename(columns={'name':'song_name'}, inplace=True)
df.head()
```

Out[43]:

	user_id	song_id	target	genre_ids	artist_name	composer	lyricis
0	FGtllVqz18RPiwJj/edr2gV78zirAiY/9SmYvia+kCg=	3Hg5kugV1S0wzEVLAEfqjIV5UHzb7bCrdBRQlGygLvU=	1	1259	Desiigner	Sidney Selby| Adnan Khan	
1	hZyOA+0yqClPLt6uIEndf8fG8szH/95eKMbaxLE5z30=	3Hg5kugV1S0wzEVLAEfqjIV5UHzb7bCrdBRQlGygLvU=	1	1259	Desiigner	Sidney Selby| Adnan Khan	
2	0LhkakIQDn36HZXI6ClQSO7W7jkpZAy+9MvYgPOZGrA=	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	1	458	莊心妍	鄭建浩	鄭建
3	MofmAMt7P8LIcF4+LLlcjyIhYUzmv13L/LRwYFxiGYE=	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	1	458	莊心妍	鄭建浩	鄭建
4	U9Z+N+szYGJHTPMn/C0V7ylyIC24fDI0RDRWChXATkg=	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	0	458	莊心妍	鄭建浩	鄭建

Data cleaning

```
In [44]: df['genre_ids'].value_counts()
```

```
Out[44]: 465                     710
         458                     400
         444                      65
         1609                     57
         921                      49
         359                      32
                                  26
         139                      24
         2022                     21
         1259                     20
         2122                     13
         139|125|109               7
         726                       7
         451                       7
         437                       7
         958                       6
         786|947                   6
         465|1259                  4
         1011                      4
         786                       4
         947                       4
         691                       3
         921|465                   3
         430                       3
         921|458                   2
         458|1287                  2
         698                       2
         444|1259                  2
         829                       2
         850                       2
         1152                      1
         880|458                   1
         465|829                   1
         864|857|850|843           1
         465|798                   1
         474                       1
         864|850|726|857|843       1
         388                       1
         864|786|850|857|843       1
         940                       1
         1609|465                  1
         465|2122                  1
         423                       1
         726|242                   1
         437|850                   1
         Name: genre_ids, dtype: int64
```

In [45]:
```
df['genre_ids']=df['genre_ids'].str.replace('|', ' ', regex=True)
df['genre_ids'].value_counts()
```

Out[45]:
```
465                    710
458                    400
444                     65
1609                    57
921                     49
359                     32
                        26
139                     24
2022                    21
1259                    20
2122                    13
139 125 109              7
726                      7
451                      7
437                      7
958                      6
786 947                  6
465 1259                 4
1011                     4
786                      4
947                      4
691                      3
921 465                  3
430                      3
921 458                  2
458 1287                 2
698                      2
444 1259                 2
829                      2
850                      2
1152                     1
880 458                  1
465 829                  1
864 857 850 843          1
465 798                  1
474                      1
864 850 726 857 843      1
388                      1
864 786 850 857 843      1
940                      1
1609 465                 1
465 2122                 1
423                      1
726 242                  1
437 850                  1
Name: genre_ids, dtype: int64
```

In [46]:
```
df['artist_name']=df['artist_name'].str.replace('|', ' ', regex=True)
df['composer']=df['composer'].str.replace('/', ' ', regex=True)
df['lyricist']=df['lyricist'].str.replace('/', ' ', regex=True)
df['artist_name']=df['artist_name'].str.lower()
df['composer']=df['composer'].str.lower()
df['lyricist']=df['lyricist'].str.lower()
```

In [47]:
```
df['songs_details']=df['artist_name']+' '+df['composer']+df['lyricist']
df.head()
```

Out[47]:

	user_id	song_id	target	genre_ids	artist_name	composer	lyricis
0	FGtllVqz18RPiwJj/edr2gV78zirAiY/9SmYvia+kCg=	3Hg5kugV1S0wzEVLAEfqjIV5UHzb7bCrdBRQlGygLvU=	1	1259	desiigner	sidney selby| adnan khan	
1	hZyOA+0yqClPLt6uIEndf8fG8szH/95eKMbaxLE5z30=	3Hg5kugV1S0wzEVLAEfqjIV5UHzb7bCrdBRQlGygLvU=	1	1259	desiigner	sidney selby| adnan khan	
2	0LhkakIQDn36HZXI6ClQSO7W7jkpZAy+9MvYgPOZGrA=	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	1	458	莊心妍	鄭建浩	鄭建
3	MofmAMt7P8LIcF4+LLlcjylhYUzmv13L/LRwYFxiGYE=	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	1	458	莊心妍	鄭建浩	鄭建
4	U9Z+N+szYGJHTPMn/C0V7ylyIC24fDI0RDRWChXATkg=	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	0	458	莊心妍	鄭建浩	鄭建

In [48]:
```
df.user_id.value_counts()
```
Out[48]:
```
EozJegFxTFIWDb9aJ7O8kSUHAgx4ZIvqf7IuN5Zck50=    19
V5U4EGk2kaSKaUGSwhU6g3HBefxflEvAy1vWPu6UBQs=    18
Bwg9yS76qujJJeKsYSzfJrMlkjK5Ui7KFkgUcjuXRCg=    12
W9NYSCff57nmfyYCiX6IbW0/G3YuwC18h/rld+BGxMY=    11
UzlQoa9tdrcpYdh4wksoh+SpWCFcKvRGPA+xLNqghmo=    11
                                                ..
rb7TT328utsdnd8COyhstig0zciXIURo7M464E60EHg=     1
hSn7jMfIURFu+1W3PDIDTxbhM5SxRg9VFRoH23Rm2Ic=     1
yrMfQXudhDaA/bOePZtkKErbjZc5pALG79FHPayEy5U=     1
iP3eF1In0rH61CfgVmWVYj4CgFcQQ0iVZG7MBA+Plgo=     1
j2Sx5B7BrjqCiT3ZwWK4AvepwM14QEalhTPi2/sgdG4=     1
Name: user_id, Length: 975, dtype: int64
```

In [49]:
```
df.duplicated().sum()
```
Out[49]:
```
0
```

In [50]:
```
#Creating a copy file before performing a similarity
main_df=df.copy()
main_df.head()
```
Out[50]:

	user_id	song_id	target	genre_ids	artist_name	composer	lyricis
0	FGtllVqz18RPiwJj/edr2gV78zirAiY/9SmYvia+kCg=	3Hg5kugV1S0wzEVLAEfqjIV5UHzb7bCrdBRQlGygLvU=	1	1259	desiigner	sidney selby| adnan khan	
1	hZyOA+0yqClPLt6uIEndf8fG8szH/95eKMbaxLE5z30=	3Hg5kugV1S0wzEVLAEfqjIV5UHzb7bCrdBRQlGygLvU=	1	1259	desiigner	sidney selby| adnan khan	
2	0LhkakIQDn36HZXI6ClQSO7W7jkpZAy+9MvYgPOZGrA=	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	1	458	莊心妍	鄭建浩	鄭建
3	MofmAMt7P8LIcF4+LLlcjyIhYUzmv13L/LRwYFxiGYE=	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	1	458	莊心妍	鄭建浩	鄭建
4	U9Z+N+szYGJHTPMn/C0V7ylyIC24fDI0RDRWChXATkg=	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	0	458	莊心妍	鄭建浩	鄭建

In [51]:
```
main_df.songs_details.duplicated().sum()
```
Out[51]:
```
889
```

In [52]:
```
main_df.shape
```
Out[52]:
```
(1509, 9)
```

In [53]:
```
main_df.duplicated().sum()
```
Out[53]:
```
0
```

In [54]:
```
main_df=main_df.drop(['user_id'], axis=1)
```

In [55]:
```
main_df
```
Out[55]:

	song_id	target	genre_ids	artist_name	composer	lyricist	song_name	songs_details
0	3Hg5kugV1S0wzEVLAEfqjIV5UHzb7bCrdBRQlGygLvU=	1	1259	desiigner	sidney selby| adnan khan		Panda	desiigner sidney selby| adnan khan
1	3Hg5kugV1S0wzEVLAEfqjIV5UHzb7bCrdBRQlGygLvU=	1	1259	desiigner	sidney selby| adnan khan		Panda	desiigner sidney selby| adnan khan
2	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	1	458	莊心妍	鄭建浩	鄭建浩	我過的很好	莊心妍 鄭建浩鄭建浩
3	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	1	458	莊心妍	鄭建浩	鄭建浩	我過的很好	莊心妍 鄭建浩鄭建浩
4	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	0	458	莊心妍	鄭建浩	鄭建浩	我過的很好	莊心妍 鄭建浩鄭建浩
...	...	...	...	...	...	...	...	...
1504	gtenKB6Uz9z5MnC8GIvaDSyW+6m6JhmgRBoFc/Jin2U=	1	465	various artists	jung joonil	jung joonil	Fine Day	various artists jung jooniljung joonil
1505	7kGd6s2v5YwI4fsESa10llGKkGE+V0QtWGhwiwNTPao=	1	465	郭靜 (claire kuo)	木蘭號aka陳韋伶	木蘭號aka陳韋伶	我不是你的那首情歌	郭靜 (claire kuo) 木蘭號aka陳韋伶木蘭號aka陳韋伶
1506	ceQpMUI3zi3wbvUuwa2gcOzzvCv6QoagUpKHU9dwJQU=	1	465	曾沛慈 (pets tseng)	梁正	葛大為+梁正	這裡還有我	曾沛慈 (pets tseng) 梁正葛大為+梁正
1507	Ny0HzjYum9lyotgPXzdRrcXhx20sFbpdSW68VRvtGfQ=	1	465	郭靜 (claire kuo)	陳小霞	姚若龍	在樹上唱歌	郭靜 (claire kuo) 陳小霞姚若龍
1508	NGGXOVTfxaeWP5FCG4FqEXThMN5oArLN3V6gG/XFBnY=	0	465	小樂 (吳思賢) (ben wu)	秦洋	姚若龍	最大的缺點	小樂 (吳思賢) (ben wu) 秦洋姚若龍

1509 rows × 8 columns

In [56]:
```python
main_df.duplicated().sum()
```
Out[56]:
```
715
```

In [57]:
```python
main_df=main_df.drop_duplicates()
main_df
```
Out[57]:

	song_id	target	genre_ids	artist_name	composer	lyricist	song_name	songs_details
0	3Hg5kugV1S0wzEVLAEfqjIV5UHzb7bCrdBRQlGygLvU=	1	1259	desiigner	sidney selby| adnan khan		Panda	desiigner sidney selby| adnan khan
2	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	1	458	莊心妍	鄭建浩	鄭建浩	我過的很好	莊心妍 鄭建浩鄭建浩
4	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	0	458	莊心妍	鄭建浩	鄭建浩	我過的很好	莊心妍 鄭建浩鄭建浩
21	reXuGcEWDDCnL0K3Th//3DFG4S1ACSpJMzA+CFipo1g=	1	458	周湯豪 (nickthereal)	周湯豪	周湯豪\崔惟楷	帥到分手	周湯豪 (nickthereal) 周湯豪周湯豪\崔惟楷
73	reXuGcEWDDCnL0K3Th//3DFG4S1ACSpJMzA+CFipo1g=	0	458	周湯豪 (nickthereal)	周湯豪	周湯豪\崔惟楷	帥到分手	周湯豪 (nickthereal) 周湯豪周湯豪\崔惟楷
...	...	...	...	...	...	...	...	...
1504	gtenKB6Uz9z5MnC8GIvaDSyW+6m6JhmgRBoFc/Jin2U=	1	465	various artists	jung joonil	jung joonil	Fine Day	various artists jung jooniljung joonil
1505	7kGd6s2v5YwI4fsESa10lIGKkGE+V0QtWGhwiwNTPao=	1	465	郭靜 (claire kuo)	木蘭號aka陳韋伶	木蘭號aka陳韋伶	我不是你的那首情歌	郭靜 (claire kuo) 木蘭號aka陳韋伶木蘭號aka陳韋伶
1506	ceQpMUI3zi3wbvUuwa2gcOzzvCv6QoagUpKHU9dwJQU=	1	465	曾沛慈 (pets tseng)	梁正	葛大為+梁正	這裡還有我	曾沛慈 (pets tseng) 梁正葛大為+梁正
1507	Ny0HzjYum9lyotgPXzdRrcXhx20sFbpdSW68VRvtGfQ=	1	465	郭靜 (claire kuo)	陳小霞	姚若龍	在樹上唱歌	郭靜 (claire kuo) 陳小霞姚若龍
1508	NGGXOVTfxaeWP5FCG4FqEXThMN5oArLN3V6gG/XFBnY=	0	465	小樂 (吳思賢) (ben wu)	秦洋	姚若龍	最大的缺點	小樂 (吳思賢) (ben wu) 秦洋姚若龍

794 rows × 8 columns

In [58]:
```python
main_df.reset_index(inplace=True)
```

In [59]:
```python
main_df.shape
```
Out[59]:
```
(794, 9)
```

Mapping frequent words

In [60]:
```python
from sklearn.feature_extraction.text import TfidfVectorizer
tfidf=TfidfVectorizer(analyzer='word', stop_words='english')
tfidf_matrix=tfidf.fit_transform(main_df['songs_details'])
```

In [61]:
```python
tfidf_matrix
```
Out[61]:
```
<794x1932 sparse matrix of type '<class 'numpy.float64'>'
	with 3696 stored elements in Compressed Sparse Row format>
```

Building Similarity

In [62]:
```python
from sklearn.metrics.pairwise import cosine_similarity
```

In [63]:
```python
cosine_similarity = cosine_similarity(tfidf_matrix)
```

In [64]:
```python
cosine_similarity
```
Out[64]:
```
array([[1., 0., 0., ..., 0., 0., 0.],
       [0., 1., 1., ..., 0., 0., 0.],
       [0., 1., 1., ..., 0., 0., 0.],
       ...,
       [0., 0., 0., ..., 1., 0., 0.],
       [0., 0., 0., ..., 0., 1., 0.],
       [0., 0., 0., ..., 0., 0., 1.]])
```

In [65]:
```python
sorted(list(enumerate(cosine_similarity[0])), reverse=True, key=lambda x:x[1])[1:6]
```
Out[65]:
```
[(658, 0.6015656934945277),
 (78, 0.0911295308657028),
 (1, 0.0),
 (2, 0.0),
 (3, 0.0)]
```

In [66]:
```python
#In which you can recommend only index
def recommend(song):
    song_index=main_df[main_df['song_name']==song].index[0]
    distances=cosine_similarity[song_index]
    song_list=sorted(list(enumerate(cosine_similarity[0])), reverse=True, key=lambda x:x[1])[1:6]
    for i in song_list:
        print(i[0])
```

User based Recommender - Content ¶

In [67]:
```python
def recommend(song):
    song_index=main_df[main_df['song_name']==song].index[0]
    distances=cosine_similarity[song_index]
    song_list=sorted(list(enumerate(distances)), reverse=True, key=lambda x:x[1])[1:10]
    for i in song_list:
        print(main_df.iloc[i[0]].song_name)
```

In [68]:
```python
recommend('Panda')
```

```
Tiimmy Turner
La La La
我過的很好
我過的很好
帥到分手
帥到分手
迷些路 (Lost On The Way)
迷些路 (Lost On The Way)
Bokurano Yume
```

Results:

The results of the Music Recommendation System project are highly dependent on the specific implementation, data preprocessing techniques, and model selection. By employing collaborative filtering or content-based filtering approaches, the recommendation system was able to provide personalized music recommendations to users. The system's recommendations aimed to enhance user engagement, satisfaction, and enjoyment of the music streaming platform.

Thank You!!!

GitHub Link: https://github.com/anujtiwari21?tab=repositories (https://github.com/anujtiwari21?tab=repositories)