Music Recommendation System

Import Libraries

In [1]:
```
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 [2]:
```
members = pd.read_csv("members.csv")
members
```

Out[2]:

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

34403 rows × 7 columns

In [3]:
```
songs=pd.read_csv("songs.csv", nrows=20000)
songs
```

Out[3]:

	song_id	song_length	genre_ids	artist_name	composer	lyricis
0	CXoTN1eb7AI+DntdU1vbcwGRV4SCIDxZu+YD8JP8r4E=	247640	465	張信哲 (Jeff Chang)	董貞	何啟
1	o0kFgae9QtnYgRkVPqLJwa05zIhRIUjfF7O1tDw0ZDU=	197328	444	BLACKPINK	TEDDY| FUTURE BOUNCE| Bekuh BOOM	TEDD
2	DwVvVurfpuz+XPuFvucclVQEyPqcpUkHR0ne1RQzPs0=	231781	465	SUPER JUNIOR	NaN	Na
3	dKMBWoZyScdxSkihKG+Vf47nc18N9q4m58+b4e7dSSE=	273554	465	S.H.E	湯小康	徐世
4	W3bqWd3T+VeHFzHAUfARgW9AvVRaF4N5Yzm4Mr6Eo/o=	140329	726	貴族精選	Traditional	Traditiona
...	...	...	...	...	...	.
19995	XTDNdQR/VbqECrUmXlmyeOnhD4dFglDefCw/auQ/mrU=	363946	958	Rachel Podger	Heinrich Ignaz Franz von Biber	Na
19996	iUWEK/CODxzJtYSPUIp/0SM5yUd8RBrAZeCPwJFu/+c=	319712	958	Various Artists	Johann Sebastian Bach	Na
19997	ljBHnpgdxRnzxO0lJoiwVZdjlDZEUgjOvvVhLKCxwNY=	214274	958	Mozart	NaN	Na
19998	OOowMAm1BHvDzH0xt33+heZkV2lnWK2sffo9kugb9zU=	223425	465	Jorge Ben Jor	Jorge Ben Jor	Na
19999	J4QBnnRehlmXlQn3wBXPOe91rw5ykabW9Ex0lzB8EL4=	197369	451	Various Artists	Michael Lai	Na

20000 rows × 7 columns

In [4]:
```
songs_info=pd.read_csv("song_extra_info.csv")
songs_info
```

Out[4]:

	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/+rJy1Q56C1DuYqT9hKKqi5TUqx0sN0lwvoHrw=	愛投羅網	TWA471306001
...	...	...	...
2295966	hLnetpF6UbPg28sSfXnPE2vsdaGsLvddlXEdJR4VTIA=	Deep Breathing	PLL431720793
2295967	N+6vJ8actKQm0S3Fpf4elipTjoAo9ev28aA5FJN5e40=	In Hiding	US5UL1519827
2295968	pv35uG0ts05mWtirM/AMOWEzbHxlVart5ZzRXqKUY1c=	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 [5]:
```
submission=pd.read_csv("sample_submission.csv", nrows=20000)
submission
```

Out[5]:

	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 [6]:
```
train_data=pd.read_csv("train.csv", nrows=20000)
train_data
```

Out[6]:

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

20000 rows × 6 columns

In [7]:
```
test_data=pd.read_csv("test.csv", nrows=20000)
test_data
```

Out[7]:

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

20000 rows × 6 columns

In [8]:
```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 [9]:
```python
songs.describe()
```

Out[9]:

	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 [10]:
```python
print("Columns present in the songs data are:")
for columns in songs.columns:
    print(columns)
```

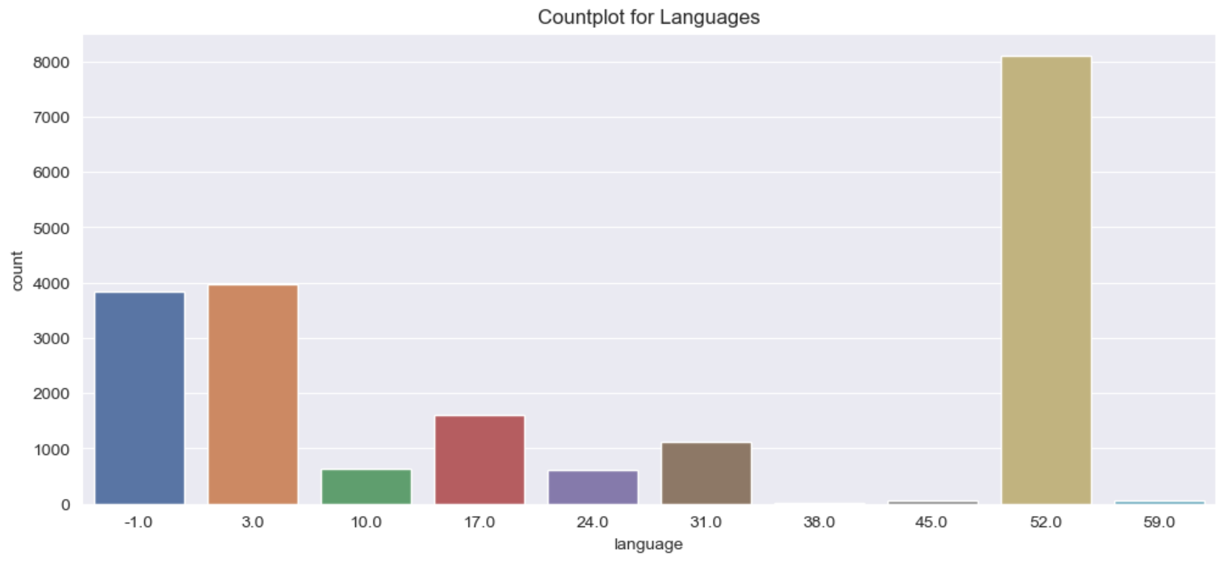
```
Columns present in the songs data are:
song_id
song_length
genre_ids
artist_name
composer
lyricist
language
```

In [11]:
```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 [12]:
```
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()
```

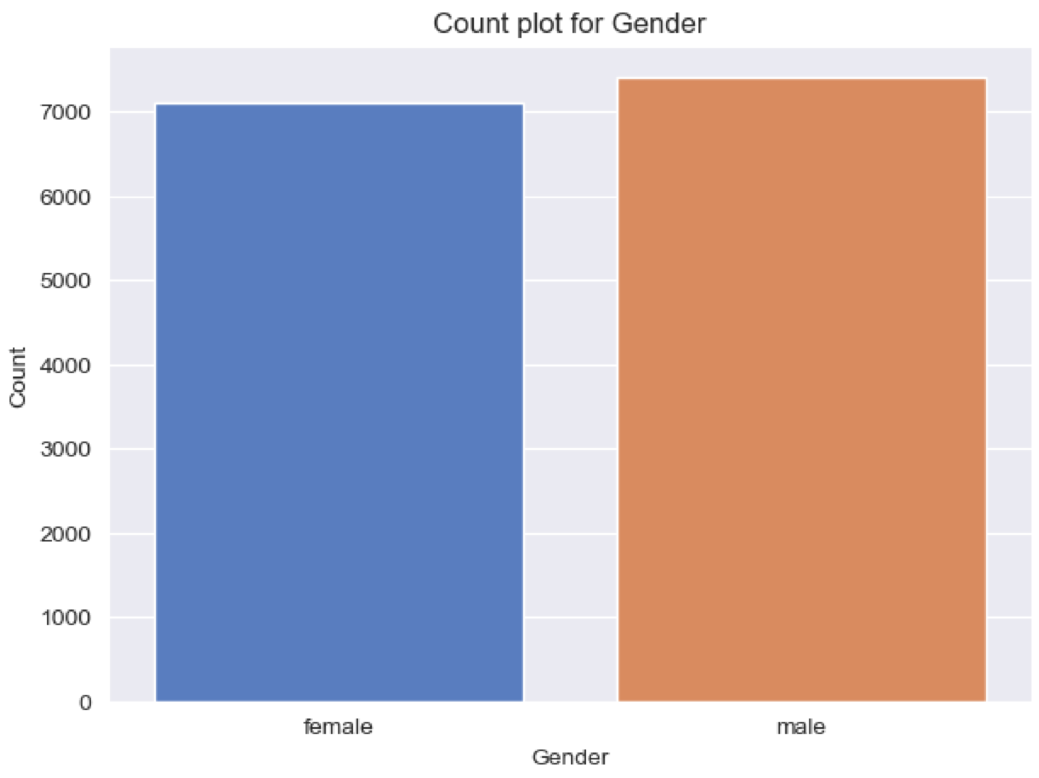


In [13]:
```
print("Columns present in the Members Data are:")
for columns in members.columns:
    print(columns)
```

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

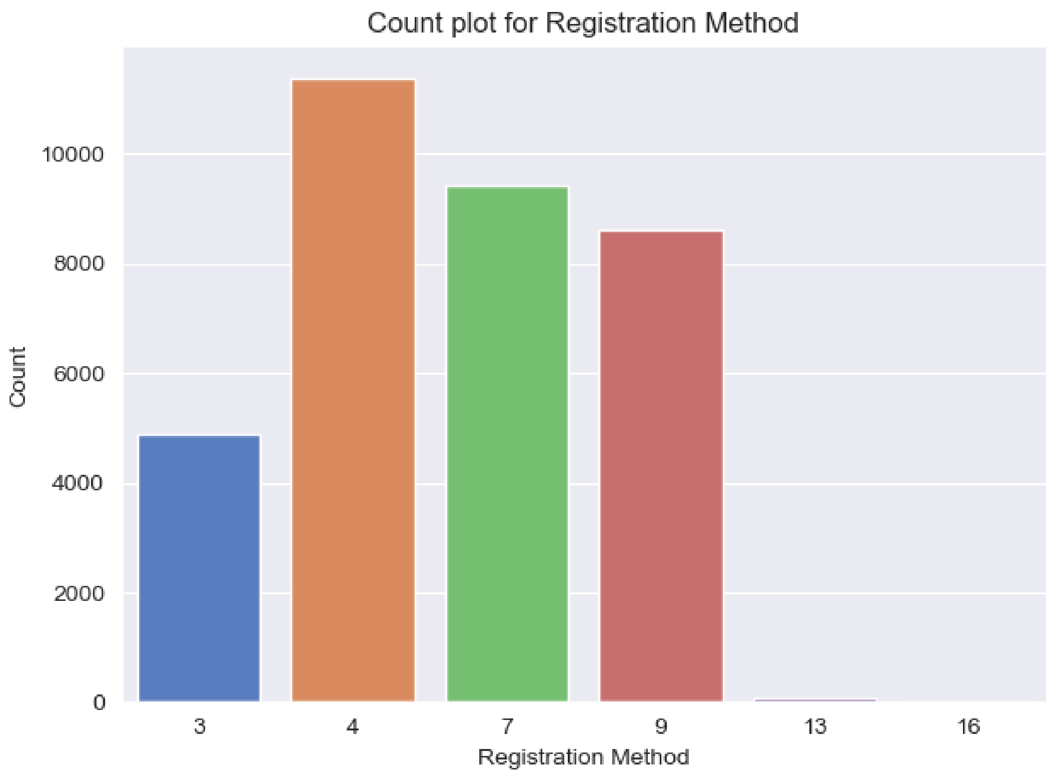
In [14]:
```
plt.figure(figsize= (7, 5))
sns.set_style("darkgrid")
sns.countplot(x='gender', data=members, palette="muted")
plt.xlabel("Gender")
plt.ylabel("Count")
plt.title("Count plot for Gender")
```

Out[14]:
```
Text(0.5, 1.0, 'Count plot for Gender')
```



```
In [15]: 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")
```

```
Out[15]: Text(0.5, 1.0, 'Count plot for Registration Method')
```

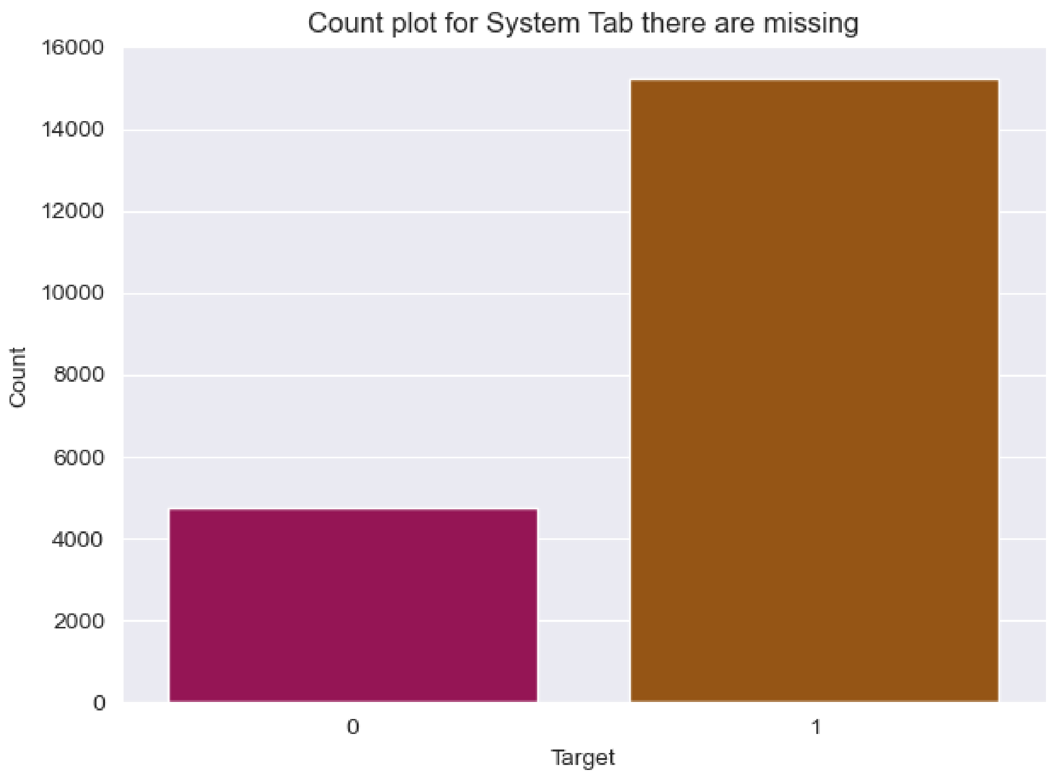


```
In [16]: print(f"Total number of records : {train_data.shape[0]}")
```

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

```
In [17]: 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")
```

Out[17]:
```
Text(0.5, 1.0, 'Count plot for System Tab there are missing')
```



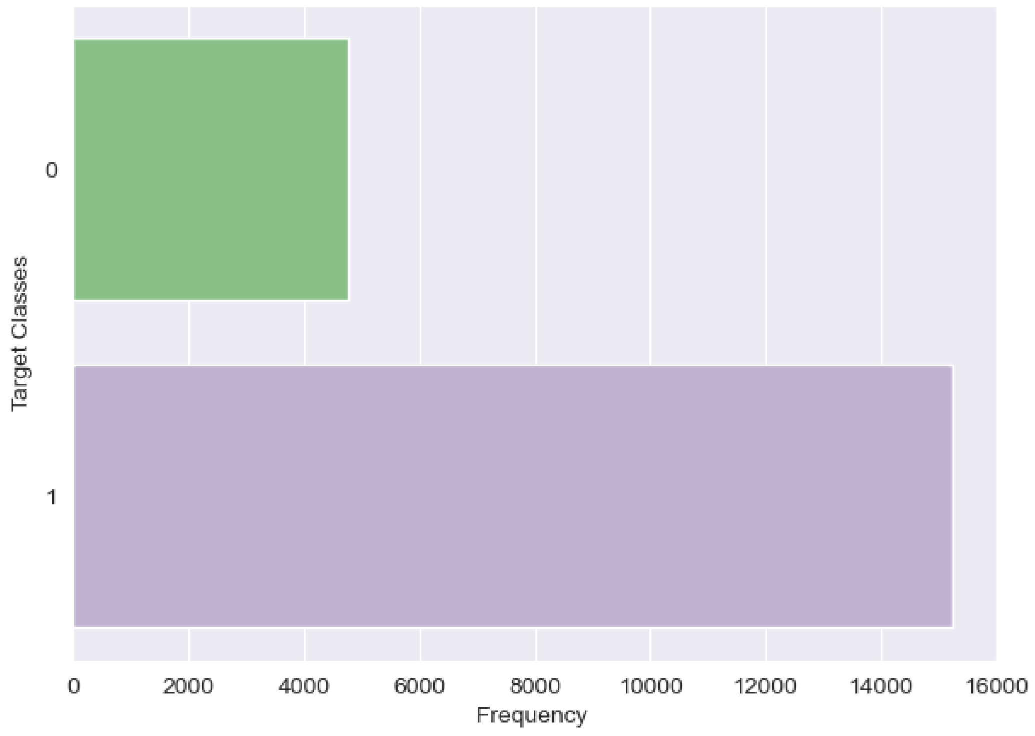
In [18]:
```
print("Total percentage for NaN value in target column : ", (train_data["target"].isna().sum()/len(t
```

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

In [19]:
```
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 [20]:
```
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 [21]: songs_info.head()
```

Out[21]:

	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/+rJy1Q56C1DuYqT9hKKqi5TUqx0sN0lwvoHrw=	愛投羅網	TWA471306001

```
In [22]: songs_info.isnull().sum()
```

```
Out[22]: song_id         0
         name            2
         isrc       136548
         dtype: int64
```

```
In [23]: songs.isnull().sum()
```

```
Out[23]: song_id            0
         song_length        0
         genre_ids        346
         artist_name        0
         composer        8382
         lyricist       14332
         language           0
         dtype: int64
```

```
In [24]: songs['genre_ids'].fillna(' ', inplace=True)
```

```
In [25]: songs['composer'].fillna(' ', inplace=True)
         songs['lyricist'].fillna(' ', inplace=True)
         songs['language'].fillna((52.0), inplace=True)
```

```
In [26]: songs.isnull().sum()
```

Out[26]:
```
song_id        0
song_length    0
genre_ids      0
artist_name    0
composer       0
lyricist       0
language       0
dtype: int64
```

In [27]:
```python
train_data.isnull().sum()
```

Out[27]:
```
msno                    0
song_id                 0
source_system_tab      67
source_screen_name    576
source_type            50
target                  0
dtype: int64
```

In [28]:
```python
train_data = train_data.drop(['source_system_tab', 'source_screen_name', 'source_type'], axis=1)
train_data.head()
```

Out[28]:

	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=	3qm6XTZ6MOCU11x8FIVbAGH5l5uMkT3/ZalWG1oo2Gc=	1

In [29]:
```python
train_data.shape
```

Out[29]:
```
(20000, 3)
```

In [30]:
```python
train_data.rename(columns={'msno':"user_id"}, inplace=True)
train_data.head()
```

Out[30]:

	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=	3qm6XTZ6MOCU11x8FIVbAGH5l5uMkT3/ZalWG1oo2Gc=	1

In [31]:
```python
songs.head()
```

Out[31]:

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

In [32]:
```python
df = train_data.merge(songs, on="song_id")
df.head()
```

Out[32]:

	user_id	song_id	target	song_le
0	FGtllVqz18RPiwJj/edr2gV78zirAiY/9SmYvia+kCg=	3Hg5kugV1S0wzEVLAEfqjIV5UHzb7bCrdBRQlGygLvU=	1	24
1	hZyOA+0yqClPLt6uIEndf8fG8szH/95eKMbaxLE5z30=	3Hg5kugV1S0wzEVLAEfqjIV5UHzb7bCrdBRQlGygLvU=	1	24
2	0LhkakIQDn36HZXI6ClQSO7W7jkpZAy+9MvYgPOZGrA=	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	1	24
3	MofmAMt7P8LIcF4+LLlcjyIhYUzmv13L/LRwYFxiGYE=	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	1	24
4	U9Z+N+szYGJHTPMn/C0V7yIyIC24fDI0RDRWChXATkg=	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	0	24

In [33]:
```python
df = df.drop(['song_length', 'language'], axis=1)
df.head()
```

Out[33]:

	user_id	song_id	target	genre_i
0	FGtllVqz18RPiwJj/edr2gV78zirAiY/9SmYvia+kCg=	3Hg5kugV1S0wzEVLAEfqjIV5UHzb7bCrdBRQlGygLvU=	1	12
1	hZyOA+0yqClPLt6uIEndf8fG8szH/95eKMbaxLE5z30=	3Hg5kugV1S0wzEVLAEfqjIV5UHzb7bCrdBRQlGygLvU=	1	12
2	0LhkakIQDn36HZXI6ClQSO7W7jkpZAy+9MvYgPOZGrA=	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	1	4
3	MofmAMt7P8LIcF4+LLlcjyIhYUzmv13L/LRwYFxiGYE=	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	1	4
4	U9Z+N+szYGJHTPMn/C0V7yIyIC24fDI0RDRWChXATkg=	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	0	4

In [34]:
```python
songs_info.head()
```

Out[34]:

	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 [35]:
```python
df = df.merge(songs_info,on="song_id").drop('isrc',axis=1)
df.head()
```

Out[35]:

	user_id	song_id	target	genre_i
0	FGtllVqz18RPiwJj/edr2gV78zirAiY/9SmYvia+kCg=	3Hg5kugV1S0wzEVLAEfqjIV5UHzb7bCrdBRQlGygLvU=	1	12
1	hZyOA+0yqClPLt6uIEndf8fG8szH/95eKMbaxLE5z30=	3Hg5kugV1S0wzEVLAEfqjIV5UHzb7bCrdBRQlGygLvU=	1	12
2	0LhkakIQDn36HZXI6ClQSO7W7jkpZAy+9MvYgPOZGrA=	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	1	4
3	MofmAMt7P8LIcF4+LLlcjyIhYUzmv13L/LRwYFxiGYE=	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	1	4
4	U9Z+N+szYGJHTPMn/C0V7yIyIC24fDI0RDRWChXATkg=	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	0	4

In [36]:

```python
df.rename(columns={'name':'song_name'}, inplace=True)
df.head()
```

Out[36]:

	user_id	song_id	target	genre_i
0	FGtllVqz18RPiwJj/edr2gV78zirAiY/9SmYvia+kCg=	3Hg5kugV1S0wzEVLAEfqjIV5UHzb7bCrdBRQlGygLvU=	1	12
1	hZyOA+0yqClPLt6uIEndf8fG8szH/95eKMbaxLE5z30=	3Hg5kugV1S0wzEVLAEfqjIV5UHzb7bCrdBRQlGygLvU=	1	12
2	0LhkakIQDn36HZXI6ClQSO7W7jkpZAy+9MvYgPOZGrA=	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	1	4
3	MofmAMt7P8LIcF4+LLlcjyIhYUzmv13L/LRwYFxiGYE=	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	1	4
4	U9Z+N+szYGJHTPMn/C0V7yIyIC24fDI0RDRWChXATkg=	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	0	4

Data cleaning

In [37]:

```python
df['genre_ids'].value_counts()
```

```
Out[37]: 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 [38]: df['genre_ids']=df['genre_ids'].str.replace('|', ' ', regex=True)
         df['genre_ids'].value_counts()
```

Out[38]:
```
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 [39]:
```python
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 [42]:
```python
df['songs_details']=df['artist_name']+' '+df['composer']+df['lyricist']
df.head()
```

Out[42]:

	user_id	song_id	target	genre_i
0	FGtllVqz18RPiwJj/edr2gV78zirAiY/9SmYvia+kCg=	3Hg5kugV1S0wzEVLAEfqjIV5UHzb7bCrdBRQlGygLvU=	1	12
1	hZyOA+0yqClPLt6uIEndf8fG8szH/95eKMbaxLE5z30=	3Hg5kugV1S0wzEVLAEfqjIV5UHzb7bCrdBRQlGygLvU=	1	12
2	0LhkakIQDn36HZXI6ClQSO7W7jkpZAy+9MvYgPOZGrA=	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	1	4
3	MofmAMt7P8LIcF4+LLlcjylhYUzmv13L/LRwYFxiGYE=	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	1	4
4	U9Z+N+szYGJHTPMn/C0V7ylylC24fDI0RDRWChXATkg=	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	0	4

In [43]:
```python
df.user_id.value_counts()
```

Out[43]:
```
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 [45]:
```python
df.duplicated().sum()
```

Out[45]:
```
0
```

In [46]:
```python
#Creating a copy file before performing a similarity
main_df=df.copy()
main_df.head()
```

Out[46]:

	user_id	song_id	target	genre_i
0	FGtllVqz18RPiwJj/edr2gV78zirAiY/9SmYvia+kCg=	3Hg5kugV1S0wzEVLAEfqjIV5UHzb7bCrdBRQlGygLvU=	1	12
1	hZyOA+0yqClPLt6uIEndf8fG8szH/95eKMbaxLE5z30=	3Hg5kugV1S0wzEVLAEfqjIV5UHzb7bCrdBRQlGygLvU=	1	12
2	0LhkakIQDn36HZXI6ClQSO7W7jkpZAy+9MvYgPOZGrA=	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	1	4
3	MofmAMt7P8LIcF4+LLlcjylhYUzmv13L/LRwYFxiGYE=	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	1	4
4	U9Z+N+szYGJHTPMn/C0V7ylylC24fDI0RDRWChXATkg=	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	0	4

In [47]:
```python
main_df.songs_details.duplicated().sum()
```

Out[47]:
```
889
```

In [49]:
```python
main_df.shape
```

Out[49]:
```
(1509, 9)
```

In [50]:
```
main_df.duplicated().sum()
```

Out[50]:
```
0
```

In [51]:
```
main_df=main_df.drop(['user_id'], axis=1)
```

In [52]:
```
main_df
```

Out[52]:

	song_id	target	genre_ids	artist_name	composer	lyricist	song_nar
0	3Hg5kugV1S0wzEVLAEfqjIV5UHzb7bCrdBRQlGygLvU=	1	1259	desiigner	sidney selby| adnan khan		Pan
1	3Hg5kugV1S0wzEVLAEfqjIV5UHzb7bCrdBRQlGygLvU=	1	1259	desiigner	sidney selby| adnan khan		Pan
2	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	1	458	莊心妍	鄭建浩	鄭建浩	我過的很
3	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	1	458	莊心妍	鄭建浩	鄭建浩	我過的很
4	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	0	458	莊心妍	鄭建浩	鄭建浩	我過的很
...	...	...	...	...	...	...	
1504	gtenKB6Uz9z5MnC8GIvaDSyW+6m6JhmgRBoFc/Jin2U=	1	465	various artists	jung joonil	jung joonil	Fine D
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 那首情
1506	ceQpMUI3zi3wbvUuwa2gcOzzvCv6QoagUpKHU9dwJQU=	1	465	曾沛慈 (pets tseng)	梁正	葛大為 +梁正	這裡還有
1507	Ny0HzjYum9lyotgPXzdRrcXhx20sFbpdSW68VRvtGfQ=	1	465	郭靜 (claire kuo)	陳小霞	姚若龍	在樹上唱
1508	NGGXOVTfxaeWP5FCG4FqEXThMN5oArLN3V6gG/XFBnY=	0	465	小樂 (吳思賢) (ben wu)	秦洋	姚若龍	最大的缺

1509 rows × 8 columns

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

Out[53]:
```
715
```

In [54]:
```
main_df=main_df.drop_duplicates()
main_df
```

```
Out[54]:
```

	song_id	target	genre_ids	artist_name	composer	lyricist	song_nar
0	3Hg5kugV1S0wzEVLAEfqjIV5UHzb7bCrdBRQlGygLvU=	1	1259	desiigner	sidney selby| adnan khan		Pan
2	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	1	458	莊心妍	鄭建浩	鄭建浩	我過的很
4	skehue/d/R59G71dXYpntDwdjRRPlweN3JE8g40TgZU=	0	458	莊心妍	鄭建浩	鄭建浩	我過的很
21	reXuGcEWDDCnL0K3Th//3DFG4S1ACSpJMzA+CFipo1g=	1	458	周湯豪 (nickthereal)	周湯豪	周湯豪\崔惟楷	帥到分
73	reXuGcEWDDCnL0K3Th//3DFG4S1ACSpJMzA+CFipo1g=	0	458	周湯豪 (nickthereal)	周湯豪	周湯豪\崔惟楷	帥到分
...	...	...	...	...	...	...	
1504	gtenKB6Uz9z5MnC8GIvaDSyW+6m6JhmgRBoFc/Jin2U=	1	465	various artists	jung joonil	jung joonil	Fine D
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 那首情
1506	ceQpMUI3zi3wbvUuwa2gcOzzvCv6QoagUpKHU9dwJQU=	1	465	曾沛慈 (pets tseng)	梁正	葛大為+梁正	這裡還有
1507	Ny0HzjYum9lyotgPXzdRrcXhx20sFbpdSW68VRvtGfQ=	1	465	郭靜 (claire kuo)	陳小霞	姚若龍	在樹上
1508	NGGXOVTfxaeWP5FCG4FqEXThMN5oArLN3V6gG/XFBnY=	0	465	小樂 (吳思賢) (ben wu)	秦洋	姚若龍	最大的

794 rows × 8 columns

```
In [55]: main_df.reset_index(inplace=True)
```

```
In [57]: main_df.shape
```

```
Out[57]: (794, 9)
```

Mapping frequent words

```
In [59]: from sklearn.feature_extraction.text import TfidfVectorizer
         tfidf=TfidfVectorizer(analyzer='word', stop_words='english')
         tfidf_matrix=tfidf.fit_transform(main_df['songs_details'])
```

```
In [60]: tfidf_matrix
```

```
Out[60]: <794x1932 sparse matrix of type '<class 'numpy.float64'>'
                 with 3696 stored elements in Compressed Sparse Row format>
```

Building Similarity

```
In [61]: from sklearn.metrics.pairwise import cosine_similarity
In [62]: cosine_similarity = cosine_similarity(tfidf_matrix)
```

```
In [63]: cosine_similarity
```

```
Out[63]: 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 [64]: sorted(list(enumerate(cosine_similarity[0])), reverse=True, key=lambda x:x[1])[1:6]
```

```
Out[64]: [(658, 0.6015656934945277),
          (78, 0.0911295308657028),
          (1, 0.0),
          (2, 0.0),
          (3, 0.0)]
```

```
In [65]: #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]: 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]: 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.

You can find this project on **GitHub.**