Music Recommender System

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import math
import missingno as ms
import os
import random
```

```
#for accsess data
from google.colab import files
from google.colab import drive
drive.mount('/content/gdrive')
```

```
Mounted at /content/gdrive
```

```
import warnings
warnings.filterwarnings('ignore')
```

Working on dataset kaggle_visible_evaluation_triplets.txt

```
df=pd.read_csv('/content/gdrive/MyDrive/data/kaggle_visible_evaluation_triplets.txt',sep='\t'
```

```
df.head()
```

	user_id	song_id	freq
0	fd50c4007b68a3737fe052d5a4f78ce8aa117f3d	SOBONKR12A58A7A7E0	1
1	fd50c4007b68a3737fe052d5a4f78ce8aa117f3d	SOEGIYH12A6D4FC0E3	1
2	fd50c4007b68a3737fe052d5a4f78ce8aa117f3d	SOFLJQZ12A6D4FADA6	1
3	fd50c4007b68a3737fe052d5a4f78ce8aa117f3d	SOHTKMO12AB01843B0	1
4	fd50c4007b68a3737fe052d5a4f78ce8aa117f3d	SODQZCY12A6D4F9D11	1

```
df['song_id'].nunique()
```

```
163206
```

if we observed here there are 1,63,206 unique number of songs in triplets file

```
df['user_id'].nunique()
```

```
110000
```

there are 1,10,000 unique users are observed here in triplets file

```
df.shape
```

```
(1450933, 3)
```

```
dup=df.duplicated()
sum(dup)
# there are no duplictes in triplets file
```

```
0
```

```
print(sum(df.isnull().any())) # no null values are observed
```

```
0
```

working on 2 dataset unique.txt

```
df1=pd.read_csv("/content/gdrive/MyDrive/data/unique_tracks.txt",sep='<SEP>',names=['track_id
df1=df1.drop(['track_id'],axis=1)
df1.shape
```

```
(1000000, 3)
```

10L unique tracks are observed in uniquqe_tracks file and here we drop the column track_id

```
df1.head()
```

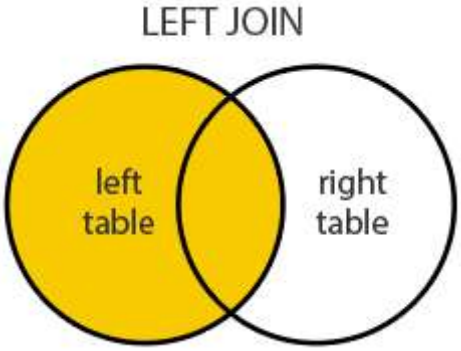
	song_id	artist_name	release
0	SOQMMHC12AB0180CB8	Faster Pussy cat	Silent Night
1	SOVFVAK12A8C1350D9	Karkkiautomaatti	Tanssi vaan
2	SOGTUKN12AB017F4F1	Hudson Mohawke	No One Could Ever
3	SOBNYVR12A8C13558C	Yerba Brava	Si Vos Querés
4	SOHSBXH12A8C13B0DF	Der Mystic	Tangle Of Aspens

```
df1['song_id'].nunique()
```

```
999056
```

9,99,056 number of unique songs are available in unique_tracks file

merging df and df1 on the bisis of "song_id". it means that if song_id of df is present in df1 then only there will be merege if not then next song_id will select and same condtion will on that also. for help see the image.




```
df_final = pd.merge(df, df1.drop_duplicates(['song_id']), on='song_id',how='left')
df_final.head(10)
```

	user_id	song_id	freq	artist_nam
0	fd50c4007b68a3737fe052d5a4f78ce8aa117f3d	SOBONKR12A58A7A7E0	1	Dwight Yoaka
1	fd50c4007b68a3737fe052d5a4f78ce8aa117f3d	SOEGIYH12A6D4FC0E3	1	Bar Tuckwell/Acaden of St Martin-in-th Fie
2	fd50c4007b68a3737fe052d5a4f78ce8aa117f3d	SOFLJQZ12A6D4FADA6	1	Carto
3	fd50c4007b68a3737fe052d5a4f78ce8aa117f3d	SOHTKMO12AB01843B0	1	Lonnie Gordo

here we merged the both the datasets according to the user_id matched song, it should merge only with respect to user listened songs in unique_tracks file, so here we dropped the duplicates, which removes similar identified rows

```
df_final.shape
```

```
(1450933, 5)
```

```
print(sum(df_final.isnull().any()))
```

```
1
```

there is one null value we will find it in which col there is null.

```
np.where(df_final['release'].isnull())[0]
```

```
array([192828])
```

**at row index 192828 there is null value now we will find col **

```
df_final.iloc[[192828]]
```

	user_id	song_id	freq	artist_nam
192828	7b3a62a418862aefc4b3d85feb191fa0fd752c69	SOZDBDL12AB018AFFF	1	Sébastie Roc

we have found out that in the release there is nan value.now we will find any artist named as 'Sébastien Roch' has any release or not. if not then we will drop it.

```
np.where(df_final['artist_name']=='Sébastien Roch')
```

```
(array([192828]),)
```

there is not any release for 'Sébastien Roch' so we will delete the row 192828.

```
df_final=df_final.drop(labels=192828, axis=0)
```

```
print(sum(df_final.isnull().any()))
```

```
0
```

```
df_final.shape
```

```
(1450932, 5)
```

```
dup3=df_final.duplicated()
sum(dup3)
```

```
0
```

```
print('total datapoints',df_final.shape[0])
print('total number of user',df_final['user_id'].unique().shape[0])
print('total number of songs',df_final['song_id'].unique().shape[0])
```

```
total datapoints 1450932
total number of user 110000
total number of songs 163205
```

```
print('total number of release',df_final['release'].unique().shape[0])
print('total number of artist',df_final['artist_name'].unique().shape[0])
```

```
total number of release 137622
total number of artist 28360
```

```
df_final.describe()
```

	freq
count	1.450932e+06
mean	3.187151e+00
std	7.051666e+00
min	1.000000e+00
25%	1.000000e+00
50%	1.000000e+00
75%	3.000000e+00
max	9.230000e+02

```
df_final.info()
```

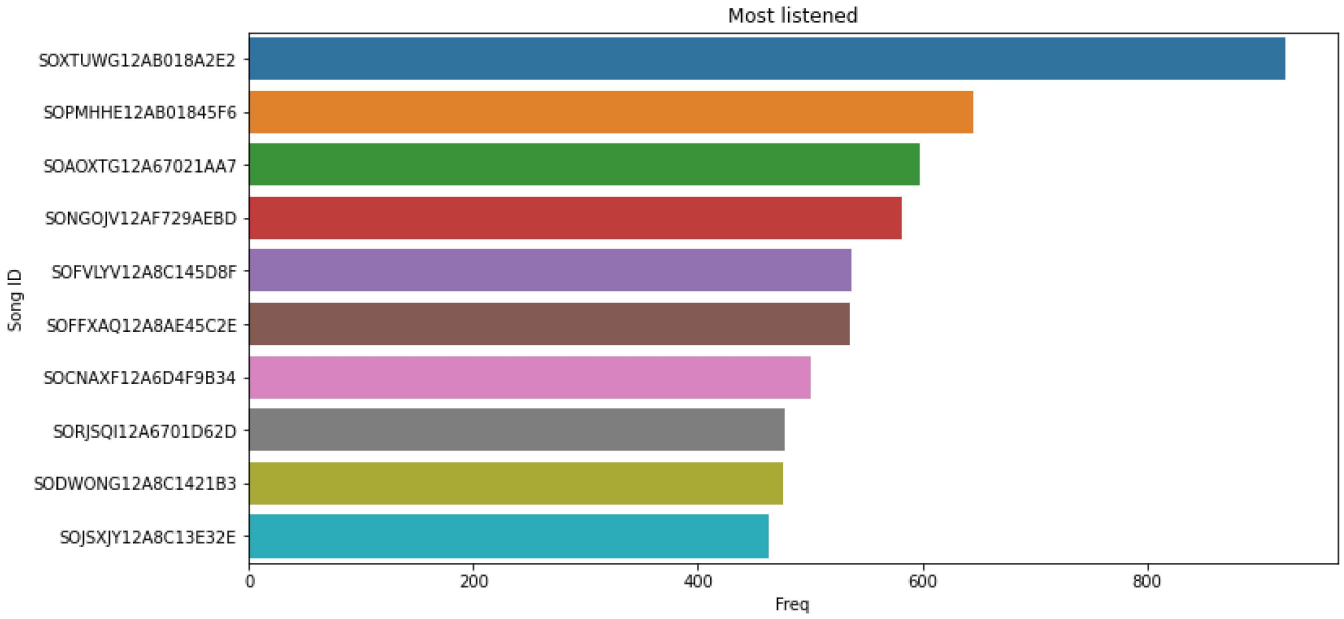
```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 1450932 entries, 0 to 1450932
Data columns (total 5 columns):
 #   Column       Non-Null Count    Dtype 
---  ------       --------------    ----- 
 0   user_id      1450932 non-null  object
 1   song_id      1450932 non-null  object
 2   freq         1450932 non-null  int64 
 3   artist_name  1450932 non-null  object
 4   release      1450932 non-null  object
dtypes: int64(1), object(4)
memory usage: 66.4+ MB
```

```
df_final.columns
```

```
Index(['user_id', 'song_id', 'freq', 'artist_name', 'release'], dtype='object')
```

```
freq=df_final.sort_values('freq',ascending=False)
plt.figure(figsize=(12,6))
ax=sns.barplot(x=freq['freq'].head(15), y=freq['song_id'].head(10), data=freq)
plt.title('Most listened')
plt.xlabel('Freq')
plt.ylabel('Song ID')
```

```
Text(0, 0.5, 'Song ID')
```



We have found that a song_id SOXTUWG12AB018A2E2 is most time played. Now, we will find song and artist.

```
np.where(df_final['song_id']=='SOXTUWG12AB018A2E2')
```

```
(array([1449166]),)
```

```
df_final.iloc[[1449166]]
```

	user_id	song_id	freq	artist_r

By this anlysis, we can find that artist name='Kilgore' and realase='Drop The Hammer (Album Version)' is most palyed by a crzay user whose user_id is='22bb29714137fa47083963c30e1a26f1bf517e7d' palyed this song 923 times

in the continuation of this analysis we are going to find 5 most crazy users and there crzay choice song.

```
most_played_song_by_one_user=df_final['freq'].value_counts().tail(5)
most_played_song_by_one_user
```

```
262    1
187    1
259    1
189    1
923    1
Name: freq, dtype: int64
```

```
#print(df_final[(df_final.freq==923)])
#print(df_final[(df_final.freq==262)])
#print(df_final[(df_final.freq==259)])
print(df_final[(df_final.freq==189)])
df_final[(df_final.freq==187)]
```

```
                                          user_id  ...                        release
311739  efd470cc7311509e0bd24c5510262d80bc95eb54  ...  Unite (2009 Digital Remaster)

[1 rows x 5 columns]
```

	user_id	song_id	freq	artist_name
927480	ccf9db671153c78301f2fc2fe7dd9df9aa7f8a30	SOTFIRT12A6701F2FA	187	Red Hot Chili

The top most 5 crazy users who have played their favt song in crazy way

1. 22bb29714137fa47083963c30e1a26f1bf517e7d
2. 70c9faa9bf2149c6ea98cf3a099077971fe6e9b9
3. d4da4dc045d2a9ad7e55f266e627e6096325a678
4. efd470cc7311509e0bd24c5510262d80bc95eb54
5. ccf9db671153c78301f2fc2fe7dd9df9aa7f8a30

```
df_final[df_final['freq']>=500] # this cell had the info about the songs with greater than 50
                                # there are only 7 users who had listened their favourite son
```

	user_id	song_id	freq	artist_
178584	fa82c0a1a93b7c52870d7b0a004b444bbdf19401	SOCNAXF12A6D4F9B34	500	Alli E

```
df_final[df_final['freq']>=100]
```

	user_id	song_id	freq	artist_
4043	ab8218336efff9f880d3a0e24b53a7aa7ebbf4b6	SOJSXJY12A8C13E32E	125	Clar
5056	96deca47a75bb70478c086f435426485d575746a	SOFTZUB12AB0188C67	150	Kru Dorfm
5064	96deca47a75bb70478c086f435426485d575746a	SOOFEHM12A8AE457B4	241	Min
5068	96deca47a75bb70478c086f435426485d575746a	SOPGFGG12A8C136E3A	214	
9376	8463ade505658a6f70e9cfaa948b3b8515e18072	SOFGTEF12AB0185FF9	126	Chris
...	...	...	...	
1447287	ab979b06c4f6230267e66c6cb64e5d0ea24fc1ea	SOVALCK12A8C13C1F7	139	

```
df_final[df_final['freq']>=100]['song_id'].nunique()
#there are 761 unique songs users listen each song more than or equal to 100 times
```

```
761
```

```
df_final[df_final['freq']>=100]['song_id'].unique()
#these are the 761 unique songs that users listen each song more than or equal to 100 times
```

```
array(['SOBXKXD12A8C13B126', 'SOUDKHW12A6310D8FF', 'SOLVKLL12A67020D7F',
       'SOFZLFC12AB01858EB', 'SOKWSJO12A58A79BC3', 'SOKBTLR12AAA8C6656',
       'SOEXUXT12A6701FFD9', 'SOPIJAI12AB01838F8', 'SOTGPCZ12A6D4FAEA5',
       'SORAGYH12AAA15FD76', 'SOQCEYC12AB017D92D', 'SOGZIOM12A8C14025D',
       'SOSQJWM12A6D4F79E0', 'SORHRZK12AB018187A', 'SOTWNDJ12A8C143984',
       'SOCHZVH12AB017C522', 'SOYRLND12AB018065C', 'SONYVJQ12A8C13DB65',
       'SOWNHVS12A8AE46D27', 'SOKXXTK12A8C1357CF', 'SOGFWUD12A6D4F6A71',
       'SOYRTVQ12AB018BD14', 'SOBDKVR12A8C13E705', 'SOJQTAY12A8C13AFDA',
       'SOYGQSW12AB0185688', 'SOKIYKQ12A8AE464FC', 'SOZRYCX12AC468A303',
       'SOHRQFL12A6D4F3C8A', 'SOUIBQV12AF729E50D', 'SOFGEDR12A8C13FBD3',
       'SODNOWW12A8C1450DD', 'SOXZFSB12AB017EC5B', 'SOFIPHI12AAF3B3DB2',
       'SOTHEUK12AC90971F3', 'SOCNIFM12A8C13D73B', 'SOHXHWB12A58A7ACD1',
       'SOXUQNR12AF72A69D6', 'SOOBYJS12A6D4FAB2E', 'SODPKNB12AF72ACEBA',
       'SOZUVYE12AB017CA2D', 'SOJXIDI12A6D4F4444', 'SOFKABN12A8AE476C6',
       'SOEHYJQ12A6D4F8058', 'SOTWCDE12AB018909C', 'SOFRQTD12A81C233C0',
       'SOWDLPO12A6D4F72BB', 'SOZAEQI12AF72A5116', 'SOFPHEZ12A8C134DFB',
```

```
       'SOFNMOU12A6D4F6892', 'SOTFIZA12A8C13D80F', 'SOUGCDK12AC95F075F',
       'SOAAEJQ12A8C1437EF', 'SOHIOMW12B0B808A9B', 'SODZVOZ12A6D4F7CFF',
       'SOGWZFC12A58A778BF', 'SODUWZY12AB0183594', 'SONWEHY12A58A796B5',
       'SOVZHYS12A8C14663F', 'SOJDWBY12A8C13F6B2', 'SOXYRHQ12A58A77779',
       'SOCZKYZ12A8C13C748', 'SOLLPYO12A8C13B38C', 'SOLFIMC12A8C136769',
       'SOLZTYD12A8C143215', 'SOCSCRC12AB017C60C', 'SOSSNAE12AB0186585',
       'SOQAJHW12AB0186004', 'SOIAVVU12A8C133CD8', 'SOIHRJH12A6D4F8ABF',
       'SOWGFPG12A6D4F83E4', 'SONENUZ12A8C14230C', 'SOSYOHI12A8C144584',
       'SOWOZZF12A8C133476', 'SOLWQQJ12A8C13A2BD', 'SOPFHKN12A8C141C9A',
       'SOALRXW12A6D4F787D', 'SOWQXHG12AB0189D1A', 'SOAZGWE12A8C140EDF',
       'SONYCOS12A5891F7E6', 'SOXDQPZ12A8C13F4FC', 'SOPHQGD12AB018561A',
       'SOGPBAW12A6D4F9F22', 'SODWFXL12A6D4FB509', 'SOZBGGA12A8C135D6A',
       'SONYEOJ12A8C142E86', 'SOVIZNF12AF72A710A', 'SOIFMIK12A58A791B5',
       'SOPEERJ12A6D4F4536', 'SOCJKED12A6D4FD24E', 'SOZOIUU12A67ADFA39',
       'SOGJYWQ12A6D4F7B2A', 'SOBRGZW12A8C13C541', 'SOCVNCZ12A58A77F01',
       'SOUNNWW12AB018795D', 'SOUVTSM12AC468F6A7', 'SOOWJZM12A6D4F7995',
       'SOVMADB12A8C137B96', 'SOWGPQK12A6701F299', 'SOSPAQW12A58A75619',
       'SOTDCXR12A8AE48F76', 'SOGYDEG12A6D4F93C5', 'SODKBJP12A6D4F753D',
       'SOPXMYF12A8C13FB16', 'SOYDHRV12AB0182B37', 'SOUMTMS12A6D4FDD9A',
       'SORHUJT12A8C13B85E', 'SOVRIPE12A6D4FEA19', 'SOIAVQP12A8C13A813',
       'SONGOJV12AF729AEBD', 'SOZQTAV12A58A80FF8', 'SOQANUA12AAF3B4628',
       'SOFUDED12A81C218BD', 'SOOAYRA12A8C13C8BE', 'SOFBQBK12AC3DF9F44',
       'SOYCNZF12A6D4F7F87', 'SORMLZF12A8C143FFA', 'SOWPTDD12A8C13247F',
       'SOBWPDC12A6D4FACBC', 'SONZZHO12AB01892E1', 'SOBXRNA12AB01892D6',
       'SOVKNEV12AB01892C5', 'SOVMCWX12A58A7D6E0', 'SOFEBZH12AB017FB35',
       'SODJJIH12A6D4F793E', 'SOGQANL12A6701E099', 'SOWTLYJ12A8C13BC7C',
       'SOWXUZK12AB018C0A8', 'SOEYKMZ12A58A813D5', 'SORFUWA12A58A80B26',
       'SOFZNFR12A8C1395E5', 'SOQQQMM12A6310DFCC', 'SOQUCNO12AB018752E',
       'SOLXQEG12A67AE2285', 'SOKBMTW12A8C13BC49', 'SOHUMQX12A8C140AE0',
       'SODJWHY12A8C142CCE', 'SOMITCV12A58A781E5', 'SOVZBSB12A6D4F7CDF',
       'SOSQIPK12A6D4F966A', 'SOUULHC12A6D4F9A4A', 'SOALFUO12AF72A4B98',
       'SOXQBCW12AB018704A', 'SOVUYQD12A6310DBC7', 'SOUCAJA12AB0187236',
       'SOBMVPB12A6D4FB90D', 'SOMNLUA12A8C143CF1', 'SOFCPOU12A8C13BF40',
       'SOQBYQC12A8C143F2A', 'SOWOQPD12A8C136EF6', 'SOWCUCK12AB0182AD1',
       'SOKKFDV12A6BD4DAA8', 'SOLFXKT12AB017E3E0', 'SOCPMIK12A6701E96D',
       'SOWSCMF12A8AE456BB', 'SOZJHMG12A8C13C49E', 'SOZCBWK12A58A7DFA5',
       'SONQEYS12AF72AABC9', 'SOMQHZK12A6D4F8074', 'SOBATYS12A58A76C6E',
       'SOTLASX12AB0183993', 'SOVTYYJ12A8C13EE56', 'SOXEZLY12A8C137AB0',
       'SOQPVXI12A6D4F7DC6', 'SOMWDXR12A8C13BBCA', 'SOLHFOM12AB017F654',
       'SOMGIYR12AB0187973', 'SOFQEIP12A58A7AA7F', 'SOILNZM12AF72A791A',
       'SOJJMWV12A67AE0ACB', 'SOYQKDL12AF729A9A6', 'SOYFRVX12AAF3B3F3E',
       'SOPJRXK12AB0180079', 'SOVALCK12A8C13C1F7', 'SOAWUML12A6D4F3FE1',
       'SOXTUWG12AB018A2E2', 'SOMEILB12AB01870CD'], dtype=object)
```

```
df_final[df_final['freq']>=100]['user_id'].nunique()
# there are 793 users who listens some songs more than or equal to 100 times
```

```
793
```

```
df_final[df_final['freq']<=1]
# this is the list of 1 time listened songs
```

	user_id	song_id	freq	art
0	fd50c4007b68a3737fe052d5a4f78ce8aa117f3d	SOBONKR12A58A7A7E0	1	Dwig
1	fd50c4007b68a3737fe052d5a4f78ce8aa117f3d	SOEGIYH12A6D4FC0E3	1	Tuckwel of St Ma
2	fd50c4007b68a3737fe052d5a4f78ce8aa117f3d	SOFLJQZ12A6D4FADA6	1	
3	fd50c4007b68a3737fe052d5a4f78ce8aa117f3d	SOHTKMO12AB01843B0	1	Lonr

```
(df_final.groupby(by=['artist_name']).count()>1000).value_counts()
# there are 213 artists whose songs had greater than 1000 users
```

```
user_id  song_id  freq   release
False    False    False  False      28147
True     True     True   True         213
dtype: int64
```

```
df_final.artist_name.nunique() # there are 28,361 unique artists are available
```

```
28360
```

```
df_final.groupby(by=['artist_name']).count()
```

artist_name	user_id	song_id	freq	release
!!!	109	109	109	109

```
df_final[df_final['artist_name']=='!!!'] # this is an abnormal activity which doesn't have an
```

	user_id	song_id	freq	artist_
23550	6de4f2710a3cf3138394d931215224efac265abf	SORLTDE12A6D4F5705	1	
82235	f6587207cba5d685999b650bb7b7701bacbb3c5d	SOKCVIN12A6D4F5709	2	
89231	3b0eb941d6d0f8b6236f23be34810de9e5de5e87	SOESDGT12A6D4F570A	4	
97981	0de845be9e6514cfe5212c4615cb35e2aa0839ce	SOYHNTG12A6D4F5703	1	
106522	3a280d1855a284a73aa4275699456a1f7aa1303b	SOGRWKZ12A6D4F5708	1	
...	...	...	...	
1408452	1b70a8a5ab97f9d92e183bd424ca87eaef6cb560	SOGRWKZ12A6D4F5708	6	
1410178	20f28480a33300f770a289f485f6f7e03a6a0277	SOGRWKZ12A6D4F5708	1	
1426426	0a5ce21d67387f5718334f75b60e2ce8b9169fee	SOYHNTG12A6D4F5703	1	

```
df_final.freq.mean(),df_final.freq.max(),df_final.freq.min(),df_final.freq.median(),df_final.
# this cell had info for freq with its mean, max, min, medin, standard deviation values
```

```
(3.187150741730143, 923, 1, 1.0, 7.0516658158527985)
```

in the continuation we will find most played song by all user.

```
df_final['release'].value_counts().head(5)
```

```
Sehr kosmisch                    5043
Undo                             4483
You're The One                   4270
Dog Days Are Over (Radio Edit)   3780
Revelry                          3672
Name: release, dtype: int64
```

now lets find most played song's artist.

```
df_final[(df_final.release == 'Sehr kosmisch')] # there are 5043 users for this artist and th
```

	user_id	song_id	freq	artist_r
22	d68dc6fc25248234590d7668a11e3335534ae4b4	SOFRQTD12A81C233C0	1	Harm
366	c732f882aa8d6db3bfaf8037d6418f27d3e07fc8	SOFRQTD12A81C233C0	2	Harm
455	bdbf8ddd82fa83ef4538a15298dfca19bfc4a3ca	SOFRQTD12A81C233C0	11	Harm
564	6493c305190b52657d4ea3f4adf367ffcf3427af	SOFRQTD12A81C233C0	3	Harm
693	a5d92e23cf3f711dfc473f1c3b296492ec02effd	SOFRQTD12A81C233C0	7	Harm
...	...	...	...	
1448701	f884ce6c56be78242d7d39b03856a6ec35ca0b7c	SOFRQTD12A81C233C0	6	Harm
1449061	cb7711f1f28de9a2873a026bab8f246198fed24f	SOFRQTD12A81C233C0	8	Harm

we can find "harmonia" is most played artist for a single song and listened by 5043 unique users

now in contious we will find which user have played this song most. "sehr kosmisch" by harmoia.

```
pop_song=df_final[df_final['song_id']=='SOFRQTD12A81C233C0']
pop_song
```

	user_id	song_id	freq	artist_r
22	d68dc6fc25248234590d7668a11e3335534ae4b4	SOFRQTD12A81C233C0	1	Harm
366	c732f882aa8d6db3bfaf8037d6418f27d3e07fc8	SOFRQTD12A81C233C0	2	Harm
455	bdbf8ddd82fa83ef4538a15298dfca19bfc4a3ca	SOFRQTD12A81C233C0	11	Harm
564	6493c305190b52657d4ea3f4adf367ffcf3427af	SOFRQTD12A81C233C0	3	Harm
693	a5d92e23cf3f711dfc473f1c3b296492ec02effd	SOFRQTD12A81C233C0	7	Harm
...	...	...	...	
1448701	f884ce6c56be78242d7d39b03856a6ec35ca0b7c	SOFRQTD12A81C233C0	6	Harm
1449061	cb7711f1f28de9a2873a026bab8f246198fed24f	SOFRQTD12A81C233C0	8	Harm

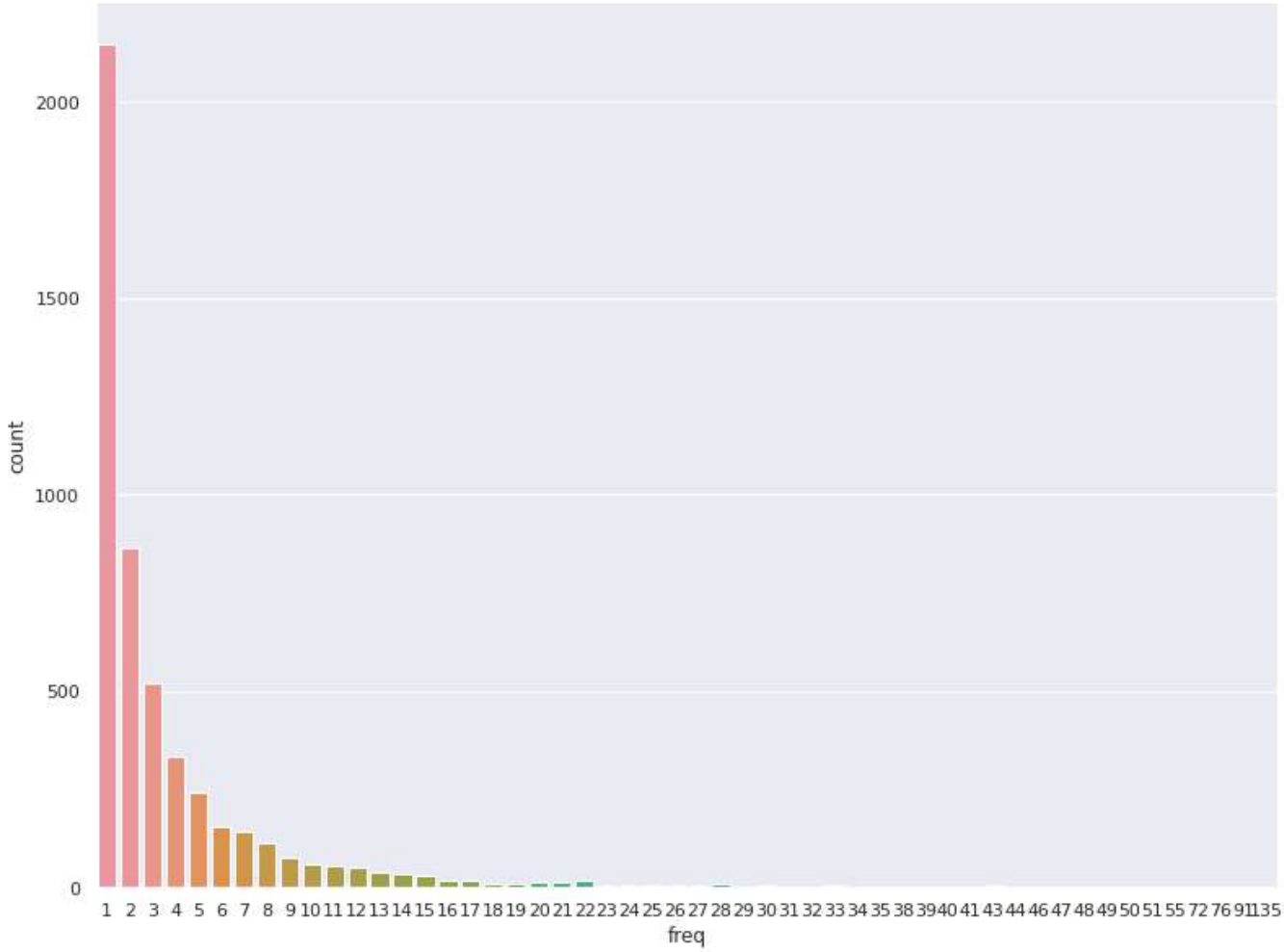
```
pop_song.max()
```

```
user_id        ffedd3bea08f4ef2c7e5df5821b5e79ef2ca6ae5
song_id                              SOFRQTD12A81C233C0
freq                                               135
artist_name                                   Harmonia
release                                 Sehr kosmisch
dtype: object
```

hence we have find the user "ffedd3bea08f4ef2c7e5df5821b5e79ef2ca6ae5" has plyed the song("sehr kosmisch" by harmoia.) most time(135). see also in graph

```
sns.set(rc={'figure.figsize':(13,10)})
sns.countplot(pop_song['freq'])
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f88dd02f810>
```



In the contious, we will find most active user.

```
most_user=df_final['user_id'].value_counts().head(5)
most_user
```

```
7d90be8dfdbde170f036ce8a4b915440137cb11c    53
d30e18323f15426c3cdc8585252ed34459916f51    52
016a24e91a72c159a5048ab1b9b2ba5ce761b526    52
2e424b28bff1f62a2dae22a918f09f9c30c06d1b    52
03ad93fdb01506ce205f4708decf8e4b1ae90fff    52
Name: user_id, dtype: int64
```

in the continuation we will find most palyed artist.

```
df_final['artist_name'].value_counts().head(5)
```

```
Coldplay                  12279
Kings Of Leon              8514
Florence + The Machine     8213
Justin Bieber              7669
Jack Johnson               6784
Name: artist_name, dtype: int64
```

In the continuation, we will find the coldplay artist's most played songs.

```
data_Coldplay = df_final[(df_final.artist_name == 'Coldplay')]
data_Coldplay
```

	user_id	song_id	freq	artist_
122	e9dc6b4c2b22aa6dc8260e1963021567728055b2	SOPXKYD12A6D4FA876	6	Col
336	248378ac27e1745d6a9d59392b7dc5b02a6186a6	SOKLRPJ12A8C13C3FE	1	Col
353	6530c4fc41b9110de5d39fe0355fa103c66385f0	SOWEJXA12A6701C574	5	Col
360	6530c4fc41b9110de5d39fe0355fa103c66385f0	SOKLRPJ12A8C13C3FE	2	Col
365	6530c4fc41b9110de5d39fe0355fa103c66385f0	SOPXKYD12A6D4FA876	3	Col
...	...	...	...	
1450525	b98e6137741a5ed1ffd03d81e0ade159ba4eeeeb	SOKLRPJ12A8C13C3FE	2	Col
1450545	b98e6137741a5ed1ffd03d81e0ade159ba4eeeeb	SOUKJBT12A6701C4D6	3	Col
1450651	32d65b81f82874077bd978fa129eff63a43e96f9	SOPXKYD12A6D4FA876	2	Col

```
data_Coldplay['release'].value_counts().head(5)
```

```
The Scientist    1675
Clocks           1500
Yellow           1299
Fix You          1033
In My Place       531
Name: release, dtype: int64
```

```
data_Coldplay.song_id.nunique() # 76 songs are sung by codplay
```

```
76
```

```
data_Coldplay.freq.max() # a song by coldplay had highest frequency of 261
```

```
261
```

```
data_Coldplay[data_Coldplay['freq']==261] # we can observe here info about highes listened so
```

	user_id	song_id	freq	artist_nam
558905	6a048c2e7fe977abb52aff4c43889f2819788c54	SOPXKYD12A6D4FA876	261	Coldpla

```
cold_freq=df_final[df_final['song_id']=='SOPXKYD12A6D4FA876'] # there are 1299 users listened
cold_freq
```

	user_id	song_id	freq	artist_
122	e9dc6b4c2b22aa6dc8260e19630215677280 55b2	SOPXKYD12A6D4FA876	6	Cold
365	6530c4fc41b9110de5d39fe0355fa103c66385f0	SOPXKYD12A6D4FA876	3	Cold
1642	36a35718d262b62cf00f038d76c4920912501b8a	SOPXKYD12A6D4FA876	5	Cold
1794	071fd3aabca95437e6c390938ec79ad9ca4f3ece	SOPXKYD12A6D4FA876	2	Cold
5053	6ad224a05378c6614ea08019a9494ee811d6c7e0	SOPXKYD12A6D4FA876	4	Cold
...	...	...	...	
1442468	60318fb458930606b80edbc190ea57609c818d44	SOPXKYD12A6D4FA876	1	Cold
1443009	2ee1adf0cdac5444af8c9186e5e3d432abcbea43	SOPXKYD12A6D4FA876	4	Cold
1445129	4b9cabf788964a5668be6b05986a7cd1056f28e8	SOPXKYD12A6D4FA876	1	Cold
1449505	32d1d1dc07de0f6e46495d98243ce412d705efda	SOPXKYD12A6D4FA876	4	Cold
1450651	32d65b81f82874077bd978fa129eff63a43e96f9	SOPXKYD12A6D4FA876	2	Cold

1299 rows × 5 columns

```
cold_freq.freq.sum() # total 3,879 times the popular song of coldplay is listened by 1299 use
```

```
3879
```

The above songs are most palyed song of our most played artist (coldplay)

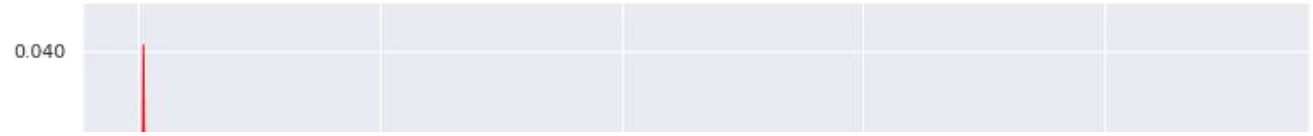
```
df_final['artist_name'].value_counts().tail(5)
```

```
Mark Mulcahy         1
Icewater             1
Rowland S Howard     1
Wally Badarou        1
Elegant Machinery    1
Name: artist_name, dtype: int64
```

By the above analysis, we can find that user that have only one release.

```
freq1=sns.distplot(df_final['freq'], hist=False, kde=True,
             bins=int(180/5), color = 'red',
             hist_kws={'edgecolor':'black'},
             kde_kws={'linewidth': 1})
freq1.set(xlabel="Freq", ylabel = "Density")
```

```
[Text(0, 0.5, 'Density'), Text(0.5, 0, 'Freq')]
```



by this graph we get to know about that there are very much less song which has more freq


```
print(df_final.groupby(['freq']).size())
```

```
freq
1      839135
2      213712
3       95726
4       55158
5       73542
        ...
537         1
582         1
597         1
646         1
923         1
Length: 299, dtype: int64
```


```
(df_final.freq.value_counts()/len(df_final)*100).round(2)
# here 1 time listened songs contribute 57.83% of data in the whole dataset and followed by 2
```

```
1      57.83
2      14.73
3       6.60
5       5.07
4       3.80
       ...
262     0.00
187     0.00
259     0.00
189     0.00
923     0.00
Name: freq, Length: 299, dtype: float64
```

```
(df_final.release.value_counts()/len(df_final)*100).round(2).head(10)
# percentage of top 10 releases and their contribution in the whole dataset
```

```
Sehr kosmisch                                                    0.35
Undo                                                             0.31
You're The One                                                   0.29
Dog Days Are Over (Radio Edit)                                   0.26
Revelry                                                          0.25
Secrets                                                          0.24
Horn Concerto No. 4 in E flat K495: II. Romance (Andante cantabile)  0.23
Hey_ Soul Sister                                                 0.19
Fireflies                                                        0.19
```

```
     Tive Sim                                                                0.18
     Name: release, dtype: float64
```

```
(df_final.freq.value_counts()/len(df_final)*100).round(2)
# here 1 time listened songs contribute 57.83% of data in the whole dataset and followed by 2
```

```
     1      57.83
     2      14.73
     3       6.60
     5       5.07
     4       3.80
            ...
     262     0.00
     187     0.00
     259     0.00
     189     0.00
     923     0.00
     Name: freq, Length: 299, dtype: float64
```

```
(df_final.song_id.value_counts()/len(df_final)*100).round(2).head(10)
# percentage of top 10 song id's and its contribution in the whole dataset
```

```
     SOFRQTD12A81C233C0    0.35
     SOAUWYT12A81C206F1    0.31
     SOBONKR12A58A7A7E0    0.29
     SOAXGDH12A8C13F8A1    0.26
     SOSXLTC12AF72A7F54    0.25
     SONYKOW12AB01849C9    0.24
     SOEGIYH12A6D4FC0E3    0.23
     SODJWHY12A8C142CCE    0.19
     SOLFXKT12AB017E3E0    0.19
     SOFLJQZ12A6D4FADA6    0.18
     Name: song_id, dtype: float64
```

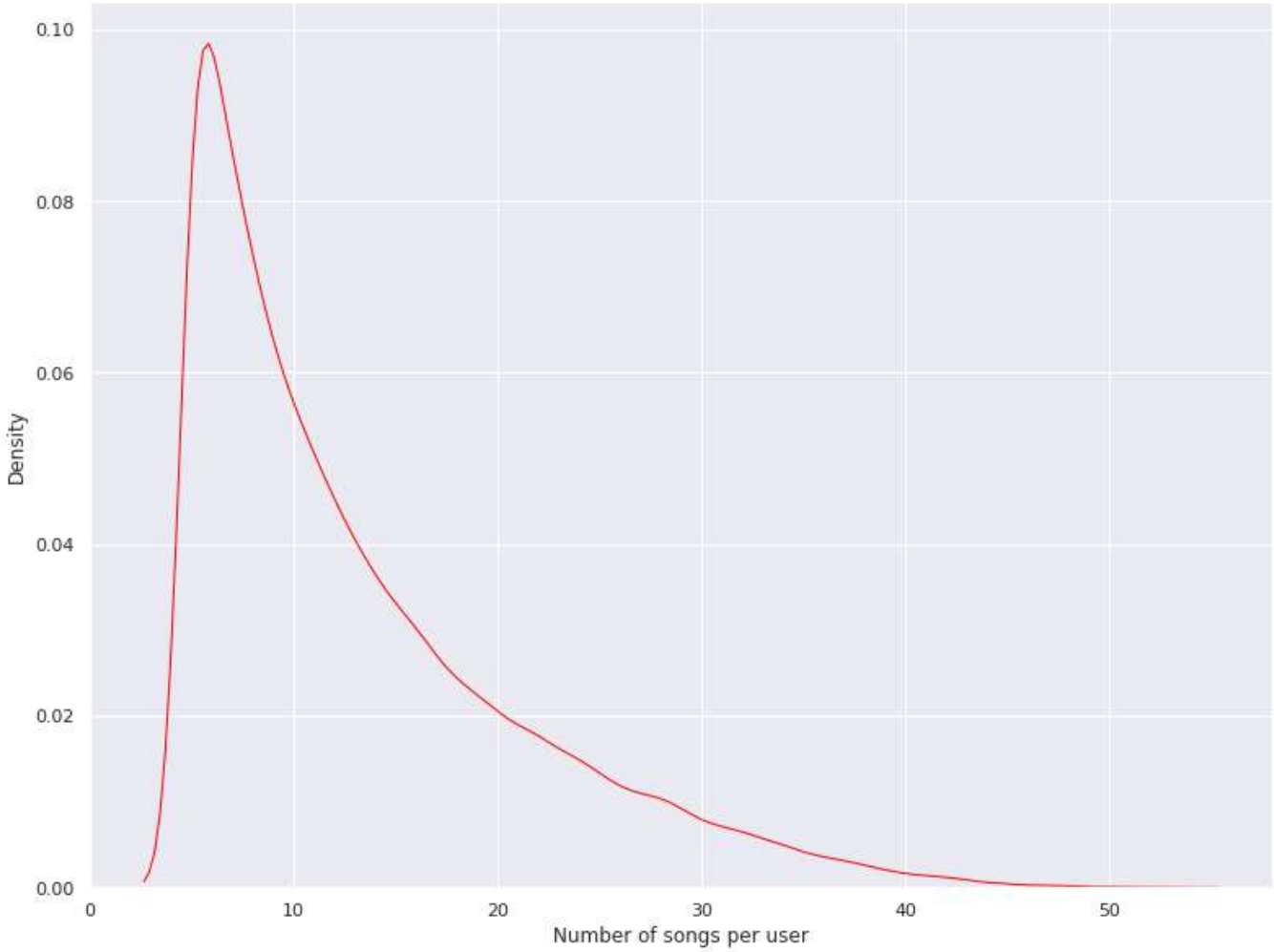
```
user=df_final.groupby(['user_id']).size()
user
```

```
     user_id
     00007a02388c208ea7176479f6ae06f8224355b3     9
     00014a76ed063e1a749171a253bca9d9a0ff1782    11
     00015189668691680bb1a2e58afde1541ec92ced    17
     0001ff7aa2667c8d8b945317b88adaed1c0b9dc2     9
     00020fcd8b01986a6a85b896ccde6c49f35142ad    32
                                                 ..
     fffdef71f13352e9cff769f1d96f5ccf90f8955e     7
     fffe29116f96c97b47a5dabdd406784ad0ba6f30     6
     fffe5b73c50c72ca9c54947efac1fcacf59c4a17    23
     fffed0bee753cd78494011b8b55dafd4f5c7e5ff    13
     ffff07d7d9bb187aa58c7b81b3d3f35e7cf7c0ee    13
     Length: 110000, dtype: int64
```

```
User1=sns.distplot(user, hist=False, kde=True,
             bins=int(180/5), color = 'red',
             hist_kws={'edgecolor':'black'},
             kde_kws={'linewidth': 1})
```

```
                kde_kws={'linewidth': 1})
User1.set(xlabel="Number of songs per user", ylabel = "Density")
```

```
[Text(0, 0.5, 'Density'), Text(0.5, 0, 'Number of songs per user')]
```




```
df_final.user_id.value_counts() #this cell gives user count that how many songs particular us
# there is user with highest user count of 53
```

```
7d90be8dfdbde170f036ce8a4b915440137cb11c    53
d30e18323f15426c3cdc8585252ed34459916f51    52
016a24e91a72c159a5048ab1b9b2ba5ce761b526    52
2e424b28bff1f62a2dae22a918f09f9c30c06d1b    52
03ad93fdb01506ce205f4708decf8e4b1ae90fff    52
                                            ..
2d294fc6f60caece142451e62349392e2ebad358     5
f56179701297e546dfdb88033459b376639b3fb5     5
23e63ff46119de222cd67e19b70745fe9087b9fc     5
c2d5fb2863176a72f618b3ae3a59a8534e993af4     5
ac14c0996baa800c779e11130c8e81d5503ace0f     5
Name: user_id, Length: 110000, dtype: int64
```

```
# lets check with the highest user count
user=df_final[df_final['user_id']=='7d90be8dfdbde170f036ce8a4b915440137cb11c']
user
```

	user_id	song_id	freq	artist_na
259575	7d90be8dfdbde170f036ce8a4b915440137cb11c	SOKNWRZ12A8C13BF62	1	Po Serv
259576	7d90be8dfdbde170f036ce8a4b915440137cb11c	SOMPGPP12A6BD55D5F	5	Nine I N
259577	7d90be8dfdbde170f036ce8a4b915440137cb11c	SOOVOSX12A81C22771	1	- Beginning The E
259578	7d90be8dfdbde170f036ce8a4b915440137cb11c	SOSLQGG12A6D4F5045	1	Neverm
259579	7d90be8dfdbde170f036ce8a4b915440137cb11c	SOTIFKV12A6D4FAD83	2	D-Fla Feat. Wa Mars
259580	7d90be8dfdbde170f036ce8a4b915440137cb11c	SOTFCUM12A6D4F7D0B	1	Re
259581	7d90be8dfdbde170f036ce8a4b915440137cb11c	SOECRTE12A8C14296D	1	Blue Octo
259582	7d90be8dfdbde170f036ce8a4b915440137cb11c	SOKXERP12A6D4F9895	1	Ana Car
259583	7d90be8dfdbde170f036ce8a4b915440137cb11c	SOJAMRN12AB018BA2B	5	Eartha
259584	7d90be8dfdbde170f036ce8a4b915440137cb11c	SOYSSSK12A8C13BC34	2	Yeasa
259585	7d90be8dfdbde170f036ce8a4b915440137cb11c	SOAXJHW12A81C21E1F	2	Param
259586	7d90be8dfdbde170f036ce8a4b915440137cb11c	SOOEEPE12A8AE459A4	2	Metal

```
user.song_id.value_counts() # highest user had listened 53 different songs
```

```
SOMDZLO12AF729A7C1    1
SOIIUPO12A6D4F7EA8    1
SOJSQYL12A81C23901    1
SOBABRB12A6701DF4B    1
SOOCQDM12A8C140869    1
SOTIFKV12A6D4FAD83    1
SOYSSSK12A8C13BC34    1
SOACEQF12A58A7B70E    1
SOBATYS12A58A76C6E    1
SOQXDUU12A6310E836    1
SOAXJHW12A81C21E1F    1
SOZJJCY12A8C13C917    1
SOVHIIY12A58A7A606    1
```

```
SONZTEN12A8C136B8C    1
SOMHUFR12A8C14179D    1
SOGGUCU12A6D4F76C2    1
SOBYWZZ12A58A7B90E    1
SODHITM12A58A79070    1
SOOVOSX12A81C22771    1
SOGYTIV12A6D4FBF10    1
SOWZREA12A6701D93D    1
SOEXMJG12A8C13EC18    1
SOLZTYD12A8C143215    1
SOATPFD12A8C136B88    1
SOWVLZC12AB017F4FB    1
SOQDYRL12A8C13211D    1
SOVOJVL12A6D4F93C1    1
SOKNWRZ12A8C13BF62    1
SOXHIDK12A58A7CFB3    1
SOTGHQR12A8C1406C5    1
SOZJFDM12AB01807DC    1
SOQBRAQ12A58A7D473    1
SOMPGPP12A6BD55D5F    1
SOKXERP12A6D4F9895    1
SOXGIHJ12A8C13B367    1
SOHTWGE12AB0188968    1
SOJAMRN12AB018BA2B    1
SOAVGMK12A8C144BDD    1
SOYYBHE12A6BD53865    1
SOOEEPE12A8AE459A4    1
SOCXEKQ12AAF3B5490    1
SODZVMN12AC3DF81C6    1
SOVFEGN12AF72A3369    1
SOECRTE12A8C14296D    1
SOSLQGG12A6D4F5045    1
SOHKZPT12AB0183E4B    1
SOZQOLR12A8C136B84    1
SOBHRTW12A8AE48014    1
SOQBYQC12A8C143F2A    1
SOPRYVX12AF72A5B7F    1
SOAPEQV12A8C13CD31    1
SOGMHOJ12A6D2282AA    1
SOTFCUM12A6D4F7D0B    1
Name: song_id, dtype: int64
```

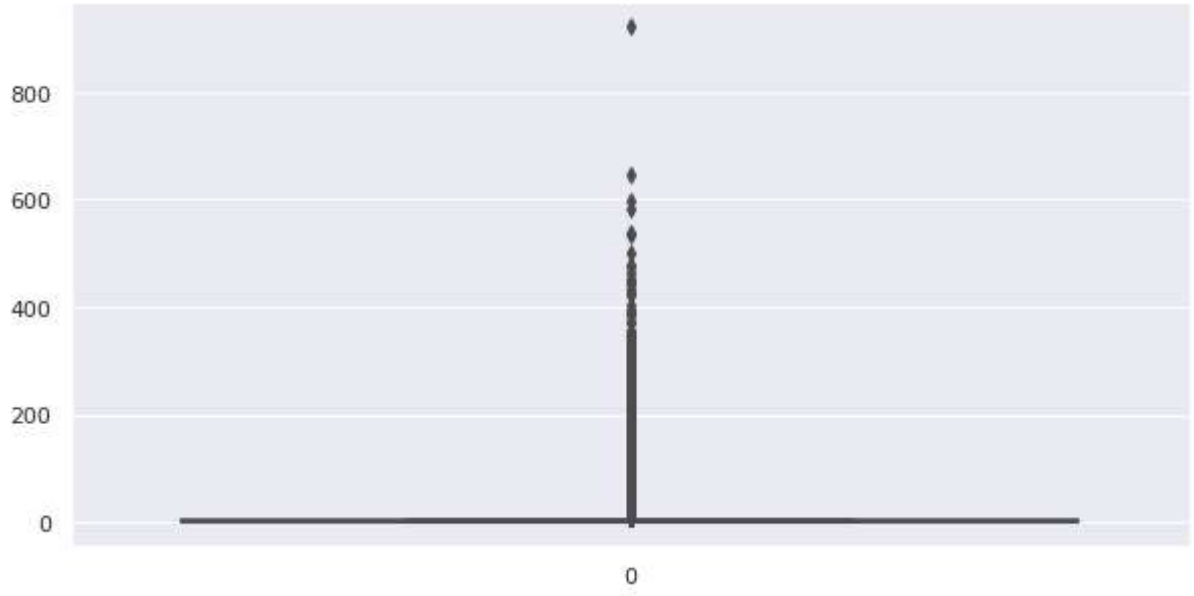
```
user[user['freq']>3] # this cell provides information about the song id's the highest user ha
```

	user_id	song_id	freq	artist_na
259576	7d90be8dfdbde170f036ce8a4b915440137cb11c	SOMPGPP12A6BD55D5F	5	Nine In N
259583	7d90be8dfdbde170f036ce8a4b915440137cb11c	SOJAMRN12AB018BA2B	5	Eartha
259590	7d90be8dfdbde170f036ce8a4b915440137cb11c	SOBHRTW12A8AE48014	5	Rolf Ha

by this graph we get to know that there are some user who listened to more than 3 songs.

```
plt.figure(figsize=[10,5])
sns.boxplot(data=df_final.freq)
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f88dccf72d0>
```




```
df_final.freq.skew()
```

```
17.24384045828895
```

By seeing skew value of Freq column the data is not normally distributed , it is highly positive skew which means when freq value is high then users are less ,when freq is low then user are more

1.Popularity Based Recommendation System Implementation

```
df_final.head()
```

	user_id	song_id	freq	artist_name
0	fd50c4007b68a3737fe052d5a4f78ce8aa117f3d	SOBONKR12A58A7A7E0	1	Dwight Yoakam
1	fd50c4007b68a3737fe052d5a4f78ce8aa117f3d	SOEGIYH12A6D4FC0E3	1	Barry Tuckwell/Academy of St Martin-in-the-Fie..

```
df_final.shape
```

```
(1450932, 5)
```

```
df_final['song'] = df_final["artist_name"] + ' - ' + df_final["release"]
song_grouped = df_final.groupby(['song']).agg({'freq': 'count'}).reset_index()
grouped_sum = song_grouped['freq'].sum()
song_grouped['percentage']  = song_grouped['freq'].div(grouped_sum)*100
song_grouped.sort_values(['freq', 'song'], ascending = [0,1])
```

	song	freq	percentage
59878	Harmonia - Sehr kosmisch	5043	0.347570
17175	Björk - Undo	4483	0.308974
42714	Dwight Yoakam - You're The One	4136	0.285058
51326	Florence + The Machine - Dog Days Are Over (Ra...	3780	0.260522
77664	Kings Of Leon - Revelry	3672	0.253079
...	...	...	...
162028	Ólafur Arnalds - Himininn er að hrynja_ en stj...	1	0.000069
162030	Ólafur Arnalds - Kjurrt	1	0.000069
162037	Ólafur Arnalds - Við vorum smá...	1	0.000069
162041	Órla Fallon - The Water Is Wide	1	0.000069
162042	Özlem Tekin - A)sik	1	0.000069

162043 rows × 3 columns

```
df_final.head()
```

	user_id	song_id	freq	artist_name

```
import sklearn
from sklearn.model_selection import train_test_split
# from Recommenders import Recommenders
train_data, test_data = train_test_split(df_final, test_size = 0.20, random_state=0)
```

```
import numpy as np

#Class for Popularity based Recommender System model
class popularity_recommender_py():
    def __init__(self):
        self.train_data = None
        self.user_id = None
        self.item_id = None
        self.popularity_recommendations = None

    #Create the popularity based recommender system model
    def create(self, train_data, user_id, item_id):
        self.train_data = train_data
        self.user_id = user_id
        self.item_id = item_id

        #Get a count of user_ids for each unique song as recommendation score
        train_data_grouped = train_data.groupby([self.item_id]).agg({self.user_id: 'count'}).
        train_data_grouped.rename(columns = {'user_id': 'score'},inplace=True)

        #Sort the songs based upon recommendation score
        train_data_sort = train_data_grouped.sort_values(['score', self.item_id], ascending =

        #Generate a recommendation rank based upon score
        train_data_sort['Rank'] = train_data_sort['score'].rank(ascending=0, method='first')

        #Get the top 10 recommendations
        self.popularity_recommendations = train_data_sort.head(10)

    #Use the popularity based recommender system model to make recommendations
    def recommend(self, user_id):
        user_recommendations = self.popularity_recommendations

        #Add user_id column for which the recommendations are being generated
        user_recommendations['user_id'] = user_id

        #Bring user_id column to the front
        cols = user_recommendations.columns.tolist()
        cols = cols[-1:] + cols[:-1]
        user_recommendations = user_recommendations[cols]

        return user_recommendations
```

```
users = df_final['user_id'].unique()
len(users)
```

```
110000
```

```
pm = popularity_recommender_py()
pm.create(train_data, 'user_id', 'song')

#user the popularity model to make some prediction
user_id = users[10]
pm.recommend(user_id)
```

	user_id	song	score	Rank
54711	fdf6afb5daefb42774617cf223475c6013969724	Harmonia - Sehr kosmisch	4014	1.0
15734	fdf6afb5daefb42774617cf223475c6013969724	Björk - Undo	3593	2.0
39035	fdf6afb5daefb42774617cf223475c6013969724	Dwight Yoakam - You're The One	3313	3.0
46956	fdf6afb5daefb42774617cf223475c6013969724	Florence + The Machine - Dog Days Are Over (Ra...	3012	4.0
71018	fdf6afb5daefb42774617cf223475c6013969724	Kings Of Leon - Revelry	2936	5.0
95274	fdf6afb5daefb42774617cf223475c6013969724	OneRepublic - Secrets	2727	6.0
12196	fdf6afb5daefb42774617cf223475c6013969724	Barry Tuckwell/Academy of St Martin-in-the-Fie...	2624	7.0
138665	fdf6afb5daefb42774617cf223475c6013969724	Train - Hey_ Soul Sister	2241	8.0

2.Collaborative Based Recommender System

User Based Colaborative Filtering

```
!pip install scikit-surprise
```

```
Collecting scikit-surprise
  Downloading https://files.pythonhosted.org/packages/97/37/5d334adaf5ddd65da99fc65f650
     |████████████████████████████████| 11.8MB 215kB/s
Requirement already satisfied: joblib>=0.11 in /usr/local/lib/python3.7/dist-packages (
Requirement already satisfied: numpy>=1.11.2 in /usr/local/lib/python3.7/dist-packages 
Requirement already satisfied: scipy>=1.0.0 in /usr/local/lib/python3.7/dist-packages (
Requirement already satisfied: six>=1.10.0 in /usr/local/lib/python3.7/dist-packages (fr
Building wheels for collected packages: scikit-surprise
  Building wheel for scikit-surprise (setup.py) ... done
  Created wheel for scikit-surprise: filename=scikit_surprise-1.1.1-cp37-cp37m-linux_x86
  Stored in directory: /root/.cache/pip/wheels/78/9c/3d/41b419c9d2aff5b6e2b4c0fc8d25c538
```

```
Successfully built scikit-surprise
Installing collected packages: scikit-surprise
Successfully installed scikit-surprise-1.1.1
```

```
import pandas as pd
from surprise import Reader
from surprise import Dataset
from surprise.model_selection import cross_validate
from surprise import NormalPredictor
from surprise import KNNBasic
from surprise import KNNWithMeans
from surprise import KNNWithZScore
from surprise import KNNBaseline
from surprise import SVD
from surprise import BaselineOnly
from surprise import SVDpp
from surprise import NMF
from surprise import SlopeOne
from surprise import CoClustering
from surprise.accuracy import rmse
from surprise import accuracy
from surprise.model_selection import train_test_split
```

```
df_final = df_final[:100000]
df_final.shape
```

```
(100000, 6)
```

```
from surprise import Dataset
reader =Reader()
data = Dataset.load_from_df(df_final[['user_id','song_id','freq']],reader)
```

```
trainset, testset = train_test_split(data, test_size=0.25)
```

```
algo = KNNWithMeans(k=50, sim_options={'name': 'cosine', 'user_based': True})
algo.fit(trainset)
predictions = algo.fit(trainset).test(testset)
```

```
Computing the cosine similarity matrix...
Done computing similarity matrix.
Computing the cosine similarity matrix...
Done computing similarity matrix.
```

```
df = pd.DataFrame(predictions, columns=['uid','iid','rui','est','details'])
df['err'] = abs(df.est - df.rui)
```

```
best_predictions = df.sort_values(by='err')[:10]
worst_predictions = df.sort_values(by='err')[-10:]
```

```
best_predictions
```

	uid	iid	rui	est	
15928	8001b820dbe3659bbf4068ff32987422ffdaec96	SORWEEW12A58A7A935	1.0	1.0	{'a 'was_
17311	10b7b7faa01faf9423067311bb050cee4528342a	SORVLRC12A8151E078	1.0	1.0	{'a 'was_
4683	a26a6f0348e0afd16e54ba25c9c2988c682fc17b	SOTVZIB12A6D4F694A	2.0	2.0	{'a 'was_
4687	88229ff8f023c55b78ebbc943dfa3b1811e6a59a	SOQLIZI12A8AE471C6	1.0	1.0	{'a 'was_
13497	ab35eaead21afe1f495add68a8b27dcb63573640	SOYJDRA12AB017F30D	1.0	1.0	{'a 'was_

```
worst_predictions
```

	uid	iid	rui	est
10796	95b77b9bccae40d78e81fb6781d34b990c2ce5bc	SODLLYS12A8C13A96B	155.0	1.000000
12771	ebea4e45634a73f02e3d462d2b0a0b807967a237	SOSYLXK12A8C13F738	163.0	5.000000
20760	85d5f406f90ce835cb8a3fb0086d06a7e2af291f	SOQZQTH12AB0189AB8	166.0	2.909091
2217	ae016a8529578fe7f69ab98b19838e94ded02f78	SOIKQFR12A6310F2A6	180.0	5.000000
9244	1b7aaf737834d88d807ac8e893ed7330645a59cf	SOTLHUV12A6D4FC541	226.0	4.261905

3.Content based recommender system

```
def combine_features(row):
    return row['user_id']+" "+row['song_id']+" "+row['artist_name']+" "+row['release']
```

```
df_final=df_final[:10000]
```

```
df_final['combine_features'] = df_final.apply(combine_features, axis=1)
df_final['combine_features'].head()
```

```
0    fd50c4007b68a3737fe052d5a4f78ce8aa117f3d SOBON...
1    fd50c4007b68a3737fe052d5a4f78ce8aa117f3d SOEGI...
2    fd50c4007b68a3737fe052d5a4f78ce8aa117f3d SOFLJ...
3    fd50c4007b68a3737fe052d5a4f78ce8aa117f3d SOHTK...
4    fd50c4007b68a3737fe052d5a4f78ce8aa117f3d SODQZ...
Name: combine_features, dtype: object
```

```
df_final=df_final.drop(['user_id','release','artist_name','freq'], axis=1)
df_final
```

	song_id	song	combine_features
0	SOBONKR12A58A7A7E0	Dwight Yoakam - You're The One	fd50c4007b68a3737fe052d5a4f78ce8aa117f3d SOBON...
1	SOEGIYH12A6D4FC0E3	Barry Tuckwell/Academy of St Martin-in-the-Fie...	fd50c4007b68a3737fe052d5a4f78ce8aa117f3d SOEGI...
2	SOFLJQZ12A6D4FADA6	Cartola - Tive Sim	fd50c4007b68a3737fe052d5a4f78ce8aa117f3d SOFLJ...
3	SOHTKMO12AB01843B0	Lonnie Gordon - Catch You Baby (Steve Pitron &...	fd50c4007b68a3737fe052d5a4f78ce8aa117f3d SOHTK...
4	SODQZCY12A6D4F9D11	Miguel Calo - El Cuatrero	fd50c4007b68a3737fe052d5a4f78ce8aa117f3d SODQZ...
...	...	...	...
9995	SOCKSGZ12A58A7CA4B	Linkin Park - Bleed It Out [Live	4e7abd655b2d28d772b20cbc912f3bdd542229d7 SOCKS...

```
df_final.set_index('song_id',inplace=True)
df_final.head()
```

```
                                                    song                                combine_features

                    song_id
```

```
from sklearn.feature_extraction.text import CountVectorizer
from sklearn.metrics.pairwise import cosine_similarity
```

```
                                Barry Tuckwell/Academy of  fd50c4007b68a3737fe052d5a4f78ce8aa117f3d
```

```
cv = CountVectorizer()

count_matrix= cv.fit_transform(df_final['combine_features'])
count_matrix
```

```
     <10000x18152 sparse matrix of type '<class 'numpy.int64'>'
             with 72037 stored elements in Compressed Sparse Row format>
```

```
indices = pd.Series(df_final.index)
indices[:20]
```

```
     0     SOBONKR12A58A7A7E0
     1     SOEGIYH12A6D4FC0E3
     2     SOFLJQZ12A6D4FADA6
     3     SOHTKMO12AB01843B0
     4     SODQZCY12A6D4F9D11
     5     SOXLOQG12AF72A2D55
     6     SOUVUHC12A67020E3B
     7     SOUQERE12A58A75633
     8     SOIPJAX12A8C141A2D
     9     SOEFCDJ12AB0185FA0
     10    SOATCSU12A8C13393A
     11    SOZPZGN12A8C135B45
     12    SOPFVWP12A6D4FC636
     13    SOHEKND12A8AE481D0
     14    SOPSVVG12A8C13B444
     15    SODSKZZ12AB0188524
     16    SONZTNP12A8C1321DF
     17    SOVVLKF12A8C1424F0
     18    SOMLKZO12AB017F4AE
     19    SOACRJG12A8C137A8D
     Name: song_id, dtype: object
```

```
cosine_sim = cosine_similarity(count_matrix)
```

```
df_sim = pd.DataFrame(cosine_sim)
df_sim.head()
```

	0	1	2	3	4	5	6	7	8	9	10	
0	1.000000	0.138675	0.158114	0.196116	0.144338	0.125000	0.0	0.00000	0.0	0.0	0.0	(
1	0.138675	1.000000	0.087706	0.054393	0.080064	0.069338	0.0	0.14825	0.0	0.0	0.0	(
2	0.158114	0.087706	1.000000	0.124035	0.182574	0.158114	0.0	0.00000	0.0	0.0	0.0	(

```
cosine_sim.shape
```

```
(10000, 10000)
```

5 rows × 10000 columns

```
def recommendations(song, cosine_sim=cosine_sim):
    recommended_song=[]
    idx= indices[indices == song ].index[0]
    score_series = pd.Series(cosine_sim[idx]).sort_values(ascending = False)
    top_10_indixes = list(score_series.iloc[1:11].index)

    for i in top_10_indixes:
        recommended_song.append(list(df_final.index)[i])

    return recommended_song
```

```
recommendations('SOVVLKF12A8C1424F0')
```

```
['SODSKZZ12AB0188524',
 'SOSOUKN12A8C13AB79',
 'SOACRJG12A8C137A8D',
 'SOUQERE12A58A75633',
 'SOIPJAX12A8C141A2D',
 'SOPSVVG12A8C13B444',
 'SOWTGDM12A8C1377D8',
 'SORALYQ12A8151BA99',
 'SORALYQ12A8151BA99',
 'SORALYQ12A8151BA99']
```

Here, we have implemented few kinds of Recommendation Systems for the Music Dataset

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