Rutvik Sakpal

- Data Science Intern at LetsGrowMore Virtual Internship Program (APRIL-2022)

  Beginner Level Task 3 - Music Recommendation

Import the required libraries

In [ ]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

In [ ]:
```
import warnings
warnings.filterwarnings('ignore')
```

Load the data

In [ ]:
```
song_data = pd.read_csv('songs.csv')
```

In [ ]:
```
song_data.head()
```

Out[ ]:

	song_id	title	release	artist_name	year
0	SOQMMHC12AB0180CB8	Silent Night	Monster Ballads X-Mas	Faster Pussy cat	2003
1	SOVFVAK12A8C1350D9	Tanssi vaan	Karkuteillä	Karkkiautomaatti	1995
2	SOGTUKN12AB017F4F1	No One Could Ever	Butter	Hudson Mohawke	2006
3	SOBNYVR12A8C13558C	Si Vos Querés	De Culo	Yerba Brava	2003
4	SOHSBXH12A8C13B0DF	Tangle Of Aspens	Rene Ablaze Presents Winter Sessions	Der Mystic	0

In [ ]:
```
user_data = pd.read_csv('users.csv')
```

In [ ]:
```
user_data.head()
```

Out[ ]:

	user_id	song_id	listen_count
0	b80344d063b5ccb3212f76538f3d9e43d87dca9e	SOAKIMP12A8C130995	1
1	b80344d063b5ccb3212f76538f3d9e43d87dca9e	SOBBMDR12A8C13253B	2
2	b80344d063b5ccb3212f76538f3d9e43d87dca9e	SOBXHDL12A81C204C0	1
3	b80344d063b5ccb3212f76538f3d9e43d87dca9e	SOBYHAJ12A6701BF1D	1
4	b80344d063b5ccb3212f76538f3d9e43d87dca9e	SODACBL12A8C13C273	1

Pre-process the data

In [ ]:
```
song_data["year"] = song_data["year"].astype('Int64')
```

In [ ]:
```
song_data.rename(columns={"song_id":"SongId","title":"Title","release":"Album","arti
```

In [ ]:
```
user_data["listen_count"] = user_data["listen_count"].astype('Int64')
```

In [ ]:
```
user_data.rename(columns={"user_id":"UserId","song_id":"SongId","listen_count":"List
```

Merge the datasets

In [ ]:
```
final_data = pd.merge(user_data, song_data.drop_duplicates(["SongId"]), on='SongId',
final_data['Song'] = final_data['Title'] + ' by ' + final_data['Artist']
final_data = final_data.drop(['Title'],axis=1)
final_data = final_data.head(50000)
final_data.head()
```

Out[ ]:

	UserId	SongId	ListenCount	Album	Ar
0	b80344d063b5ccb3212f76538f3d9e43d87dca9e	SOAKIMP12A8C130995	1	Thicker Than Water	J John
1	b80344d063b5ccb3212f76538f3d9e43d87dca9e	SOBBMDR12A8C13253B	2	Flamenco Para Niños	Paco Lu
2	b80344d063b5ccb3212f76538f3d9e43d87dca9e	SOBXHDL12A81C204C0	1	Graduation	Ka W
3	b80344d063b5ccb3212f76538f3d9e43d87dca9e	SOBYHAJ12A6701BF1D	1	In Between Dreams	J John
4	b80344d063b5ccb3212f76538f3d9e43d87dca9e	SODACBL12A8C13C273	1	There Is Nothing Left To Lose	I Fight

In [ ]:
```
print(len(song_data), len(user_data))
```

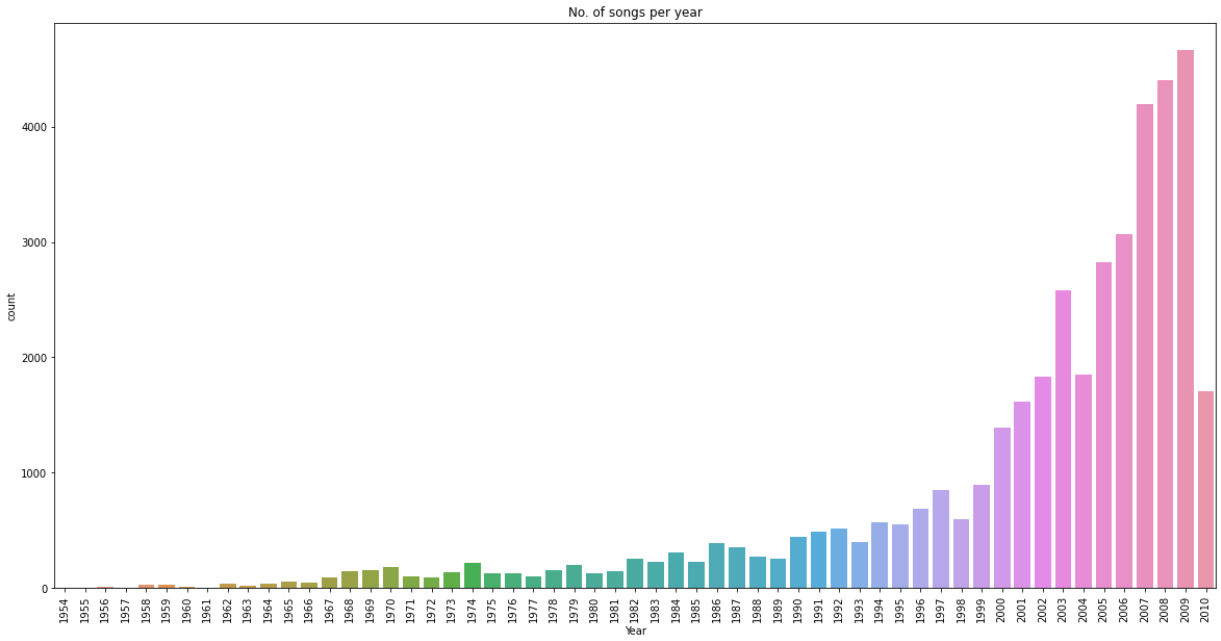
```
1000000 2000000
```

In [ ]:
```
len(final_data)
```

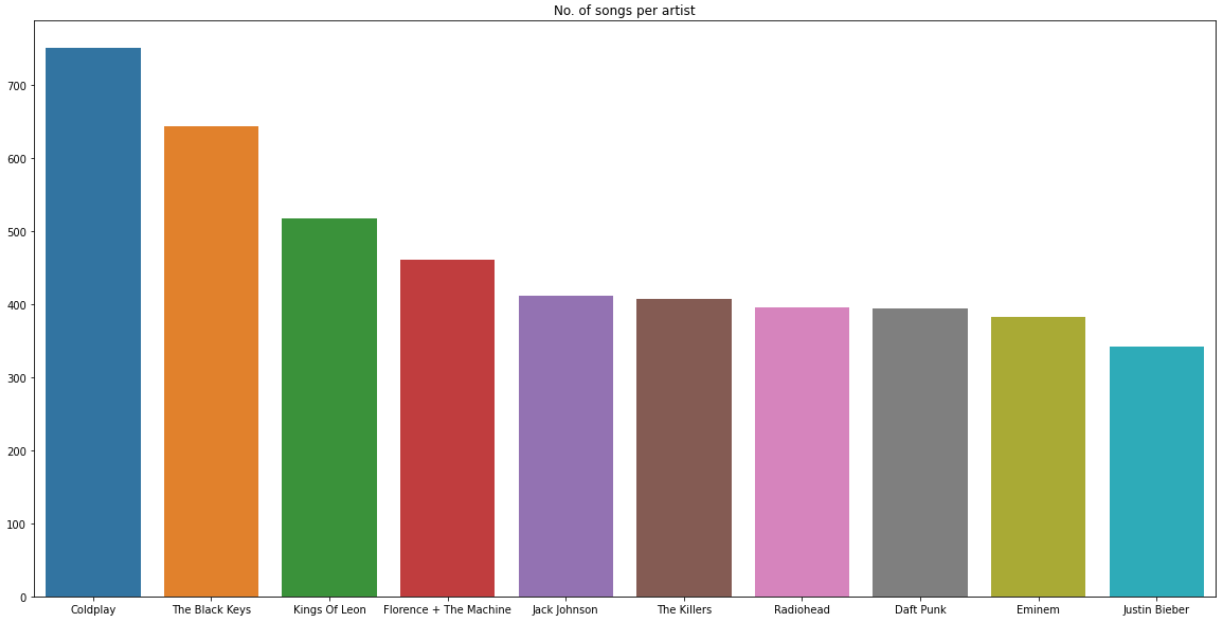
Out[ ]:
```
50000
```

Visualize the data

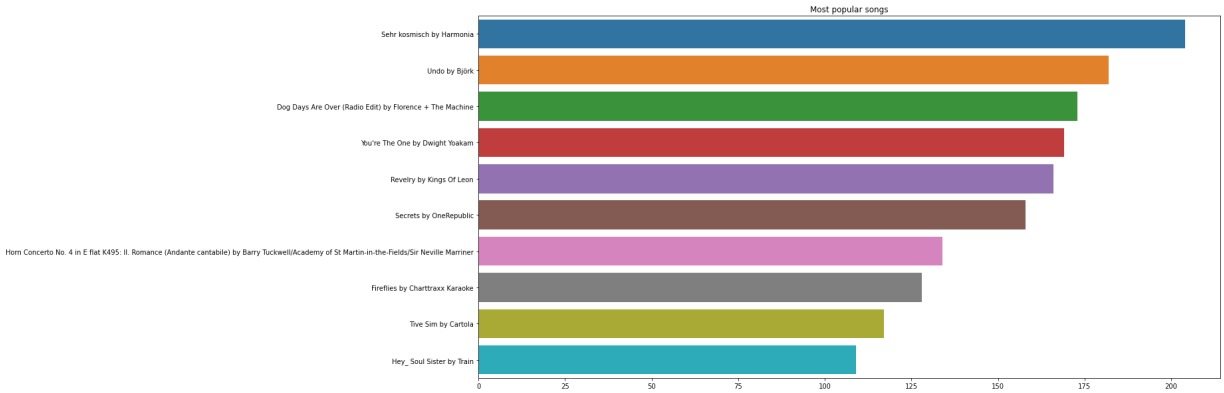
In [ ]:
```
#Using countplot to see the number of songs per year
plt.figure(figsize=(20,10))
sns.countplot(x='Year', data=final_data[-(final_data['Year']==0)])
plt.xticks(rotation=90)
plt.title("No. of songs per year")
plt.show()
```



In [ ]:
```
#Using barplot to see the number of songs per artist
plt.figure(figsize=(20,10))
sns.barplot(final_data['Artist'].value_counts()[:10].index,final_data['Artist'].valu
plt.title("No. of songs per artist")
plt.show()
```



In [ ]:
```
#Using barplot to see the most popular songs
plt.figure(figsize=(20,10))
sns.barplot(final_data['Song'].value_counts()[:10].values,final_data['Song'].value_c
plt.title("Most popular songs")
plt.show()
```



Build the recommendation system

In [ ]:

```
class Recommendation():
    def __init__(self, data, user_id, song):
        self.data = data
        self.user_id = user_id
        self.song = song
        self.glcm = None

    def song_history(self, user):
        user_data = self.data[self.data[self.user_id] == user]
        return list(user_data[self.song].unique())

    def users(self, item):
        item_data = self.data[self.data[self.song] == item]
        return set(item_data[self.user_id].unique())

    def all_songs(self):
        return list(self.data[self.song].unique())

    def get_glcm(self, user_songs, all_songs):
        users = []
        for p in range(0, len(user_songs)):
            users.append(self.users(user_songs[p]))
        glcm = np.matrix(np.zeros(shape=(len(user_songs), len(all_songs))), float)

        for p in range(0,len(all_songs)):
            songs_p_data = self.data[self.data[self.song] == all_songs[p]]
            users_p = set(songs_p_data[self.user_id].unique())

            for q in range(0,len(user_songs)):
                users_q = users[q]
                users_intersection = users_p.intersection(users_q)

                users_union = users_p.union(users_q)
                glcm[q,p] = float(len(users_intersection))/float(len(users_union))

        return glcm

    def generate(self, user, glcm, all_songs, user_songs):
        scores = glcm.sum(axis=0)/float(glcm.shape[0])
        scores = np.array(scores)[0].tolist()
        sort_index = sorted(((e,p) for p,e in enumerate(list(scores))), reverse=True
        columns = ['UserID', 'Song', 'Score', 'Rank']
        final_data = pd.DataFrame(columns=columns)

        rank = 1
        for i in range(0,len(sort_index)):
            if ~np.isnan(sort_index[i][0]) and all_songs[sort_index[i][1]] not in us
                final_data.loc[len(final_data)]=[user,all_songs[sort_index[i][1]],so
```

```
                rank = rank+1

        print("Music Recommendations: \n")
        return final_data.drop(['UserID'], axis=1)

    def get_recommendations(self, user):
        user_songs = self.song_history(user)
        all_songs = self.all_songs()
        glcm = self.get_glcm(user_songs, all_songs)
        return self.generate(user, glcm, all_songs, user_songs)

    def get_similar_songs(self, item_list):
        user_songs = item_list
        all_songs = self.all_songs()
        glcm = self.get_glcm(user_songs, all_songs)
        return self.generate("", glcm, all_songs, user_songs)
```

Get song history for a user

In [ ]:
```
r = Recommendation(final_data,'UserId','Song')
history=r.song_history(final_data['UserId'][5])
```

In [ ]:
```
print("Song history of the user:\n")
for song in history:
  print(song)
```

```
Song history of the user:

The Cove by Jack Johnson
Entre Dos Aguas by Paco De Lucia
Stronger by Kanye West
Constellations by Jack Johnson
Learn To Fly by Foo Fighters
Apuesta Por El Rock 'N' Roll by Héroes del Silencio
Paper Gangsta by Lady GaGa
Stacked Actors by Foo Fighters
Sehr kosmisch by Harmonia
Heaven's gonna burn your eyes by Thievery Corporation feat. Emiliana Torrini
Let It Be Sung by Jack Johnson / Matt Costa / Zach Gill / Dan Lebowitz / Steve Adams
I'll Be Missing You (Featuring Faith Evans & 112)(Album Version) by Puff Daddy
Love Shack by The B-52's
Clarity by John Mayer
I?'m A Steady Rollin? Man by Robert Johnson
The Old Saloon by The Lonely Island
Behind The Sea [Live In Chicago] by Panic At The Disco
Champion by Kanye West
Breakout by Foo Fighters
Ragged Wood by Fleet Foxes
Mykonos by Fleet Foxes
Country Road by Jack Johnson / Paula Fuga
Oh No by Andrew Bird
Love Song For No One by John Mayer
Jewels And Gold by Angus & Julia Stone
Warning by Incubus
83 by John Mayer
Neon by John Mayer
The Middle by Jimmy Eat World
High and dry by Jorge Drexler
All That We Perceive by Thievery Corporation
The Christmas Song  (LP Version) by King Curtis
Our Swords (Soundtrack Version) by Band Of Horses
```

```
Are You In? by Incubus
Drive by Incubus
Generator by Foo Fighters
Come Back To Bed by John Mayer
He Doesn't Know Why by Fleet Foxes
Trani by Kings Of Leon
Bigger Isn't Better by The String Cheese Incident
Sun Giant by Fleet Foxes
City Love by John Mayer
Right Back by Sublime
Moonshine by Jack Johnson
Holes To Heaven by Jack Johnson
```

Get recommendations

In [ ]:
```
r.get_recommendations(final_data['UserId'][5])
```

```
Music Recommendations:
```

Out[ ]:

	Song	Score	Rank
0	Questions by Jack Johnson	0.037157	1
1	Great Indoors by John Mayer	0.036953	2
2	Wrong Turn by Jack Johnson	0.036740	3
3	Ghost Dream by Hymie's Basement	0.036463	4
4	Baby I Want You by Amos Lee	0.036244	5
5	Better That We Break by Maroon 5	0.035016	6
6	The Sharing Song by Jack Johnson	0.034193	7
7	Better Days by Amos Lee	0.034193	8
8	Dreamin' by Amos Lee	0.034193	9
9	Mr.Curiosity (Album Version) by Jason Mraz	0.034193	10

In [ ]:
```
r.get_similar_songs(['The Cove by Jack Johnson'])
```

```
Music Recommendations:
```

Out[ ]:

	Song	Score	Rank
0	Moonshine by Jack Johnson	0.400000	1
1	Baby I Want You by Amos Lee	0.333333	2
2	Country Road by Jack Johnson / Paula Fuga	0.333333	3
3	Questions by Jack Johnson	0.285714	4
4	Wrong Turn by Jack Johnson	0.285714	5
5	Holes To Heaven by Jack Johnson	0.266667	6
6	What's Been Going On by Amos Lee	0.250000	7
7	Ghost Dream by Hymie's Basement	0.250000	8
8	Painting by Chagall by The Weepies	0.250000	9
9	Mrs Thompson by The Kooks	0.250000	10