In [1]:
```
import warnings
warnings.filterwarnings('ignore')
```

In [2]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

In [3]:
```
df = pd.read_csv('rolling_stones_spotify.csv')
df.head()
```

Out[3]:

	Unnamed: 0	name	album	release_date	track_number	id	
0	0	Concert Intro Music - Live	Licked Live In NYC	2022-06-10	1	2lEkywLJ4ykbhi1yRQvmsT	spc
1	1	Street Fighting Man - Live	Licked Live In NYC	2022-06-10	2	6GVgVJBKkGJoRfarYRvGTU	spotif
2	2	Start Me Up - Live	Licked Live In NYC	2022-06-10	3	1Lu761pZ0dBTGpzxaQoZNW	spotif
3	3	If You Can't Rock Me - Live	Licked Live In NYC	2022-06-10	4	1agTQzOTUnGNggyckEqiDH	spotif
4	4	Don't Stop - Live	Licked Live In NYC	2022-06-10	5	7piGJR8YndQBQWVXv6KtQw	spotify

EDA

In [4]:
```
df = df.drop(['Unnamed: 0'], axis=1)
df.shape
```

Out[4]: (1610, 17)

In [5]:
```
# create copy
dfc = df.copy()
dfc.shape
```

Out[5]: (1610, 17)

In [6]:
```
df.head()
```

Out[6]:

	name	album	release_date	track_number	id	
0	Concert Intro Music - Live	Licked Live In NYC	2022-06-10	1	2IEkywLJ4ykbhi1yRQvmsT	spotify:track:2IEl
1	Street Fighting Man - Live	Licked Live In NYC	2022-06-10	2	6GVgVJBKkGJoRfarYRvGTU	spotify:track:6GVg\
2	Start Me Up - Live	Licked Live In NYC	2022-06-10	3	1Lu761pZ0dBTGpzxaQoZNW	spotify:track:1Lu76
3	If You Can't Rock Me - Live	Licked Live In NYC	2022-06-10	4	1agTQzOTUnGNggyckEqiDH	spotify:track:1agTC
4	Don't Stop - Live	Licked Live In NYC	2022-06-10	5	7piGJR8YndQBQWVXv6KtQw	spotify:track:7piGJR

In [7]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1610 entries, 0 to 1609
Data columns (total 17 columns):
 #   Column            Non-Null Count  Dtype  
---  ------            --------------  -----  
 0   name              1610 non-null   object 
 1   album             1610 non-null   object 
 2   release_date      1610 non-null   object 
 3   track_number      1610 non-null   int64  
 4   id                1610 non-null   object 
 5   uri               1610 non-null   object 
 6   acousticness      1610 non-null   float64
 7   danceability      1610 non-null   float64
 8   energy            1610 non-null   float64
 9   instrumentalness  1610 non-null   float64
 10  liveness          1610 non-null   float64
 11  loudness          1610 non-null   float64
 12  speechiness       1610 non-null   float64
 13  tempo             1610 non-null   float64
 14  valence           1610 non-null   float64
 15  popularity        1610 non-null   int64  
 16  duration_ms       1610 non-null   int64  
dtypes: float64(9), int64(3), object(5)
memory usage: 214.0+ KB
```

In [8]:
```
df.describe()
```

Out[8]:

	track_number	acousticness	danceability	energy	instrumentalness	liveness	
count	1610.000000	1610.000000	1610.000000	1610.000000	1610.000000	1610.00000	1
mean	8.613665	0.250475	0.468860	0.792352	0.164170	0.49173	
std	6.560220	0.227397	0.141775	0.179886	0.276249	0.34910	
min	1.000000	0.000009	0.104000	0.141000	0.000000	0.02190	
25%	4.000000	0.058350	0.362250	0.674000	0.000219	0.15300	
50%	7.000000	0.183000	0.458000	0.848500	0.013750	0.37950	
75%	11.000000	0.403750	0.578000	0.945000	0.179000	0.89375	
max	47.000000	0.994000	0.887000	0.999000	0.996000	0.99800	

In [9]:
```
df.isnull().sum()
```

Out[9]:
```
name              0
album             0
release_date      0
track_number      0
id                0
uri               0
acousticness      0
danceability      0
energy            0
instrumentalness  0
liveness          0
loudness          0
speechiness       0
tempo             0
valence           0
popularity        0
duration_ms       0
dtype: int64
```

In [10]:
```
df.columns
```

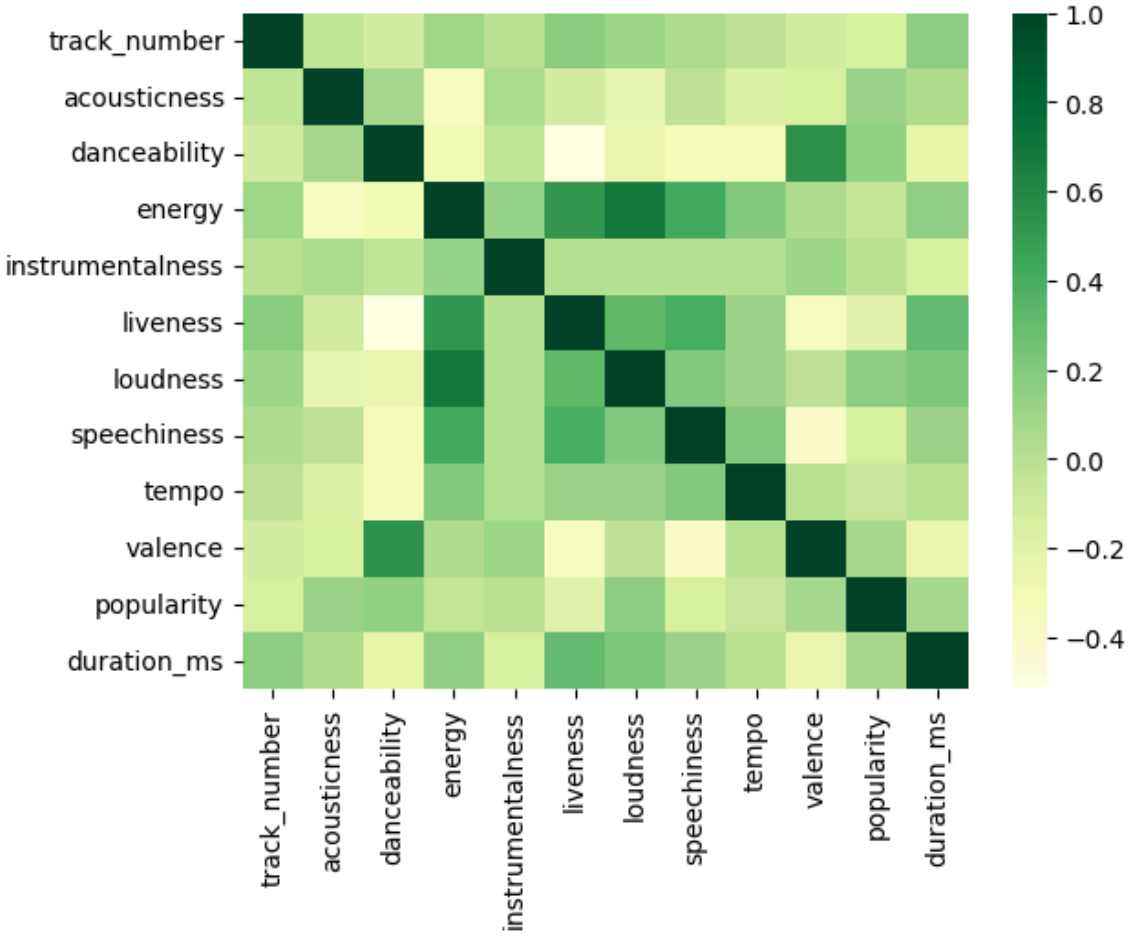
Out[10]:
```
Index(['name', 'album', 'release_date', 'track_number', 'id', 'uri',
       'acousticness', 'danceability', 'energy', 'instrumentalness',
       'liveness', 'loudness', 'speechiness', 'tempo', 'valence', 'popularity',
       'duration_ms'],
      dtype='object')
```

In [11]:
```
df.dtypes
```

Out[11]:
```
name                object
album               object
release_date        object
track_number         int64
id                  object
uri                 object
acousticness       float64
danceability       float64
energy             float64
instrumentalness   float64
liveness           float64
loudness           float64
speechiness        float64
tempo              float64
valence            float64
popularity           int64
duration_ms          int64
dtype: object
```

In [12]:
```
sns.heatmap(df.corr(numeric_only=True), annot=None, cmap='YlGn')
```

Out[12]: <Axes: >



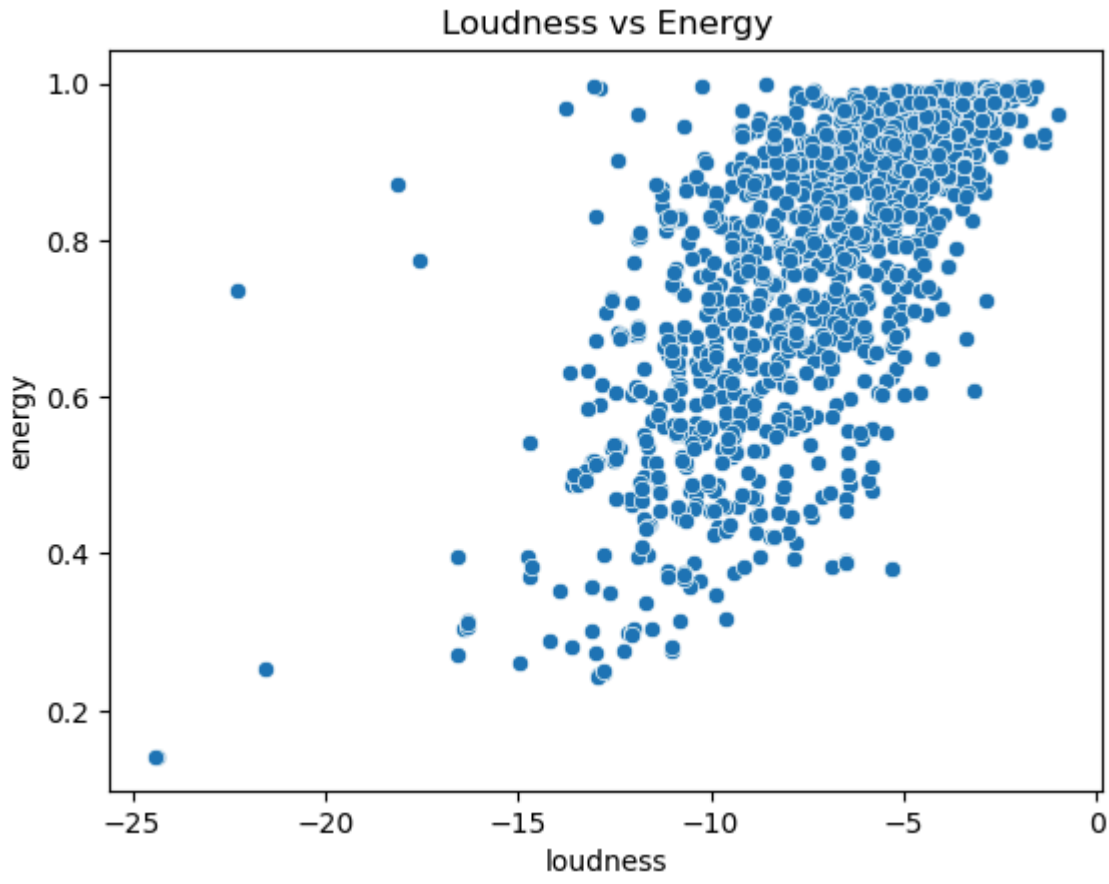
In [13]:
```
corr = df.corr(numeric_only=True)
corr.to_csv('spotify_corr.csv')
```

In [14]:
```
df.drop(['track_number'], axis=1, inplace=True)
df.drop(['acousticness'], axis=1, inplace=True)
df.drop(['instrumentalness'], axis=1, inplace=True)
df.drop(['tempo'], axis=1, inplace=True)
df.drop(['popularity'], axis=1, inplace=True)
df.drop(['duration_ms'], axis=1, inplace=True)
```

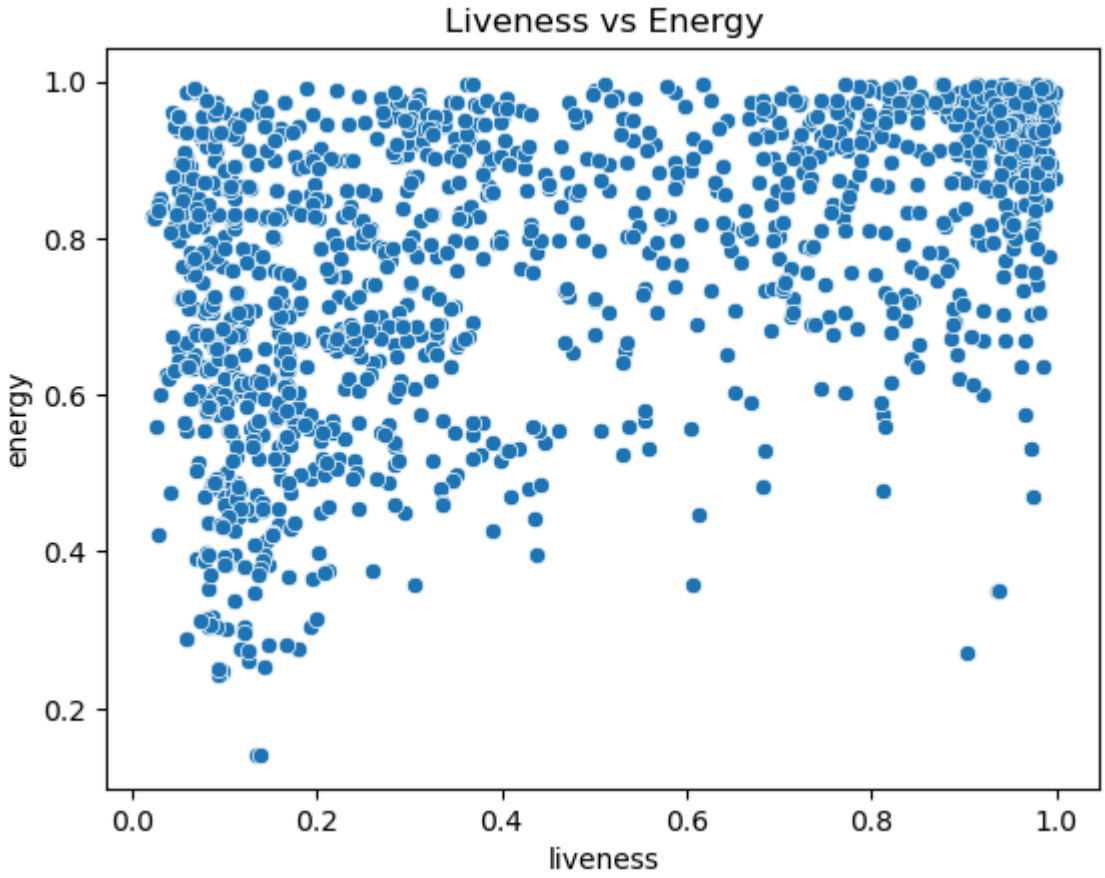
In [15]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1610 entries, 0 to 1609
Data columns (total 11 columns):
 #   Column        Non-Null Count  Dtype  
---  ------        --------------  -----  
 0   name          1610 non-null   object 
 1   album         1610 non-null   object 
 2   release_date  1610 non-null   object 
 3   id            1610 non-null   object 
 4   uri           1610 non-null   object 
 5   danceability  1610 non-null   float64
 6   energy        1610 non-null   float64
 7   liveness      1610 non-null   float64
 8   loudness      1610 non-null   float64
 9   speechiness   1610 non-null   float64
 10  valence       1610 non-null   float64
dtypes: float64(6), object(5)
memory usage: 138.5+ KB
```

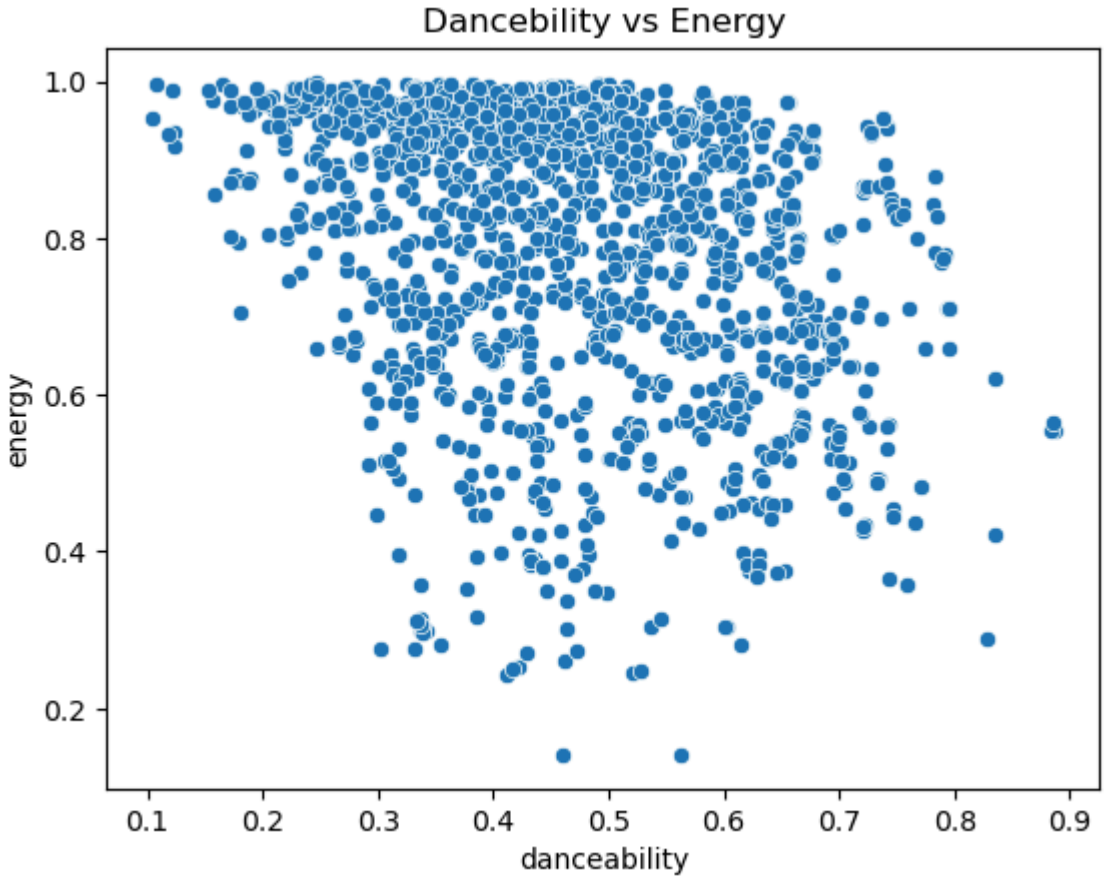
In [16]:
```
sns.scatterplot(x = df['loudness'], y = df['energy'])
plt.title('Loudness vs Energy')
plt.show()
```



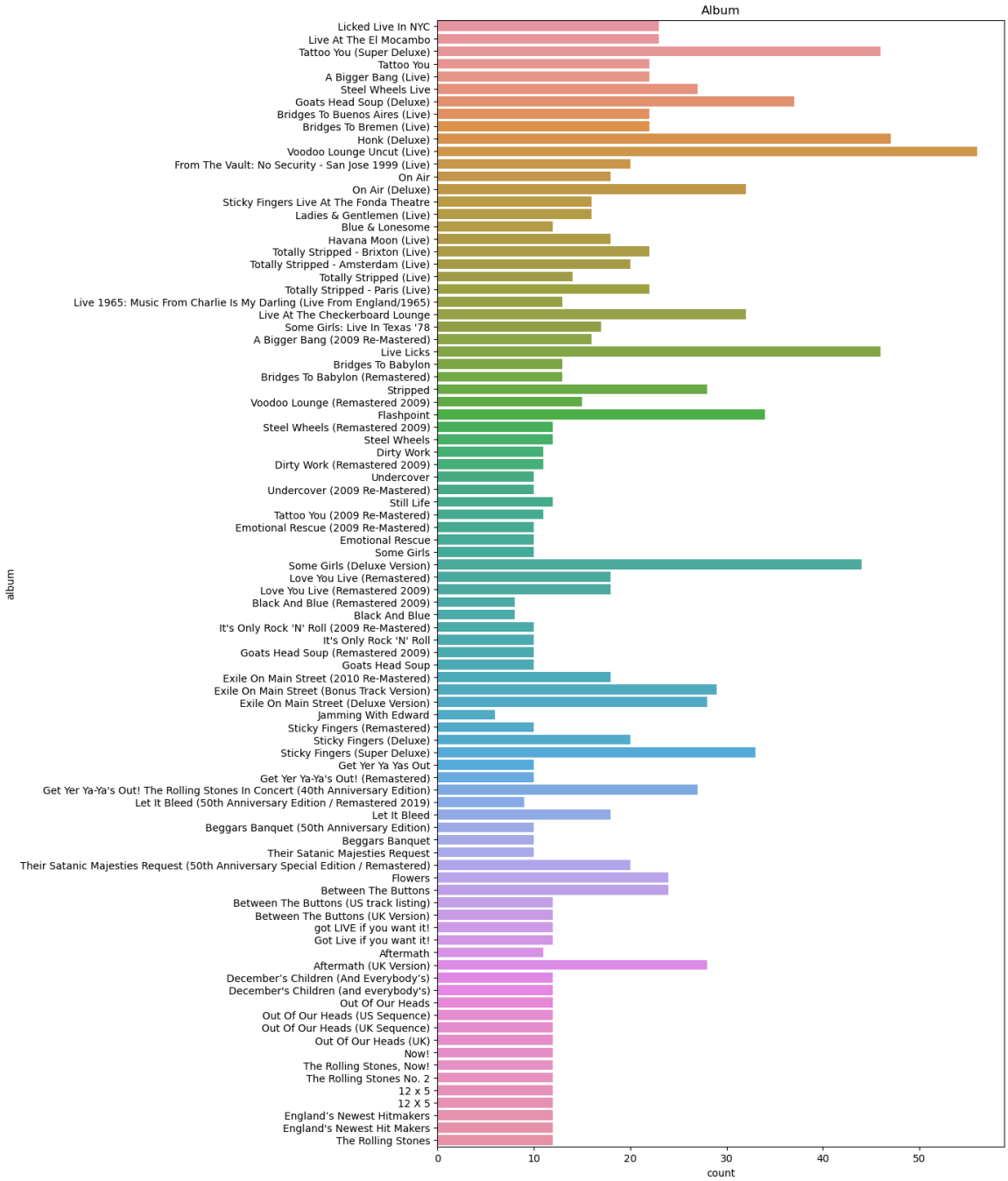
In [17]:
```
sns.scatterplot(x = df['liveness'], y = df['energy'])
plt.title('Liveness vs Energy')
plt.show()
```



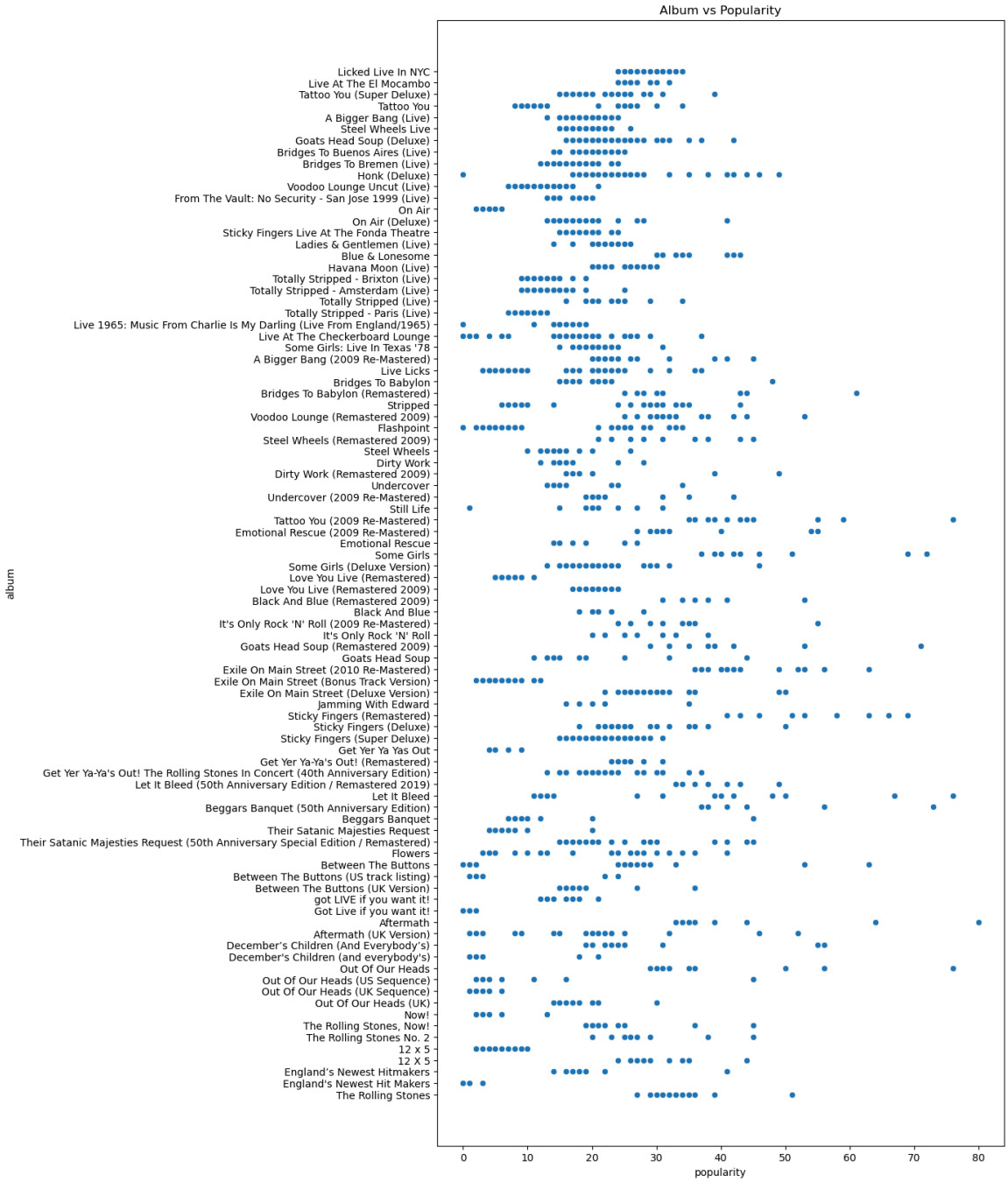
In [18]:
```
sns.scatterplot(x = df['danceability'], y = df['energy'])
plt.title('Dancebility vs Energy')
plt.show()
```



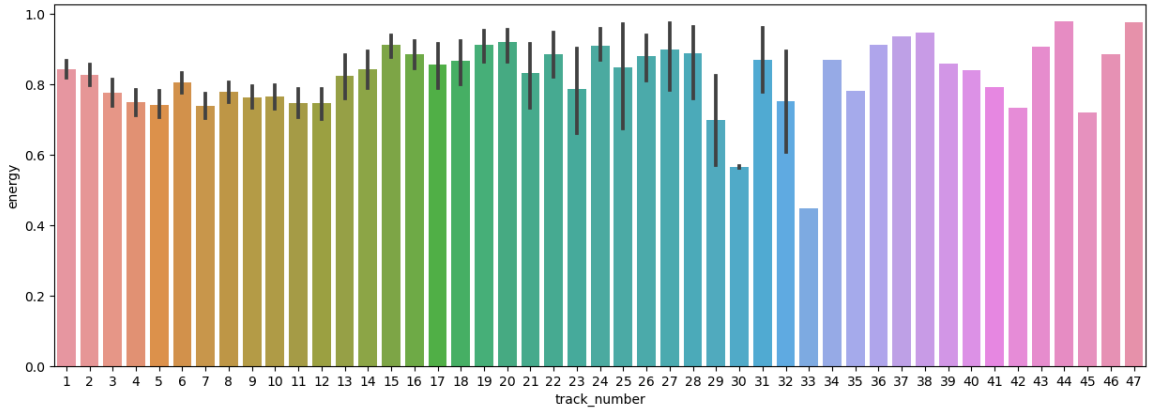
In [19]:
```
plt.figure(figsize=(10,20))
sns.countplot(y = df['album'])
plt.title('Album')
plt.show()
```



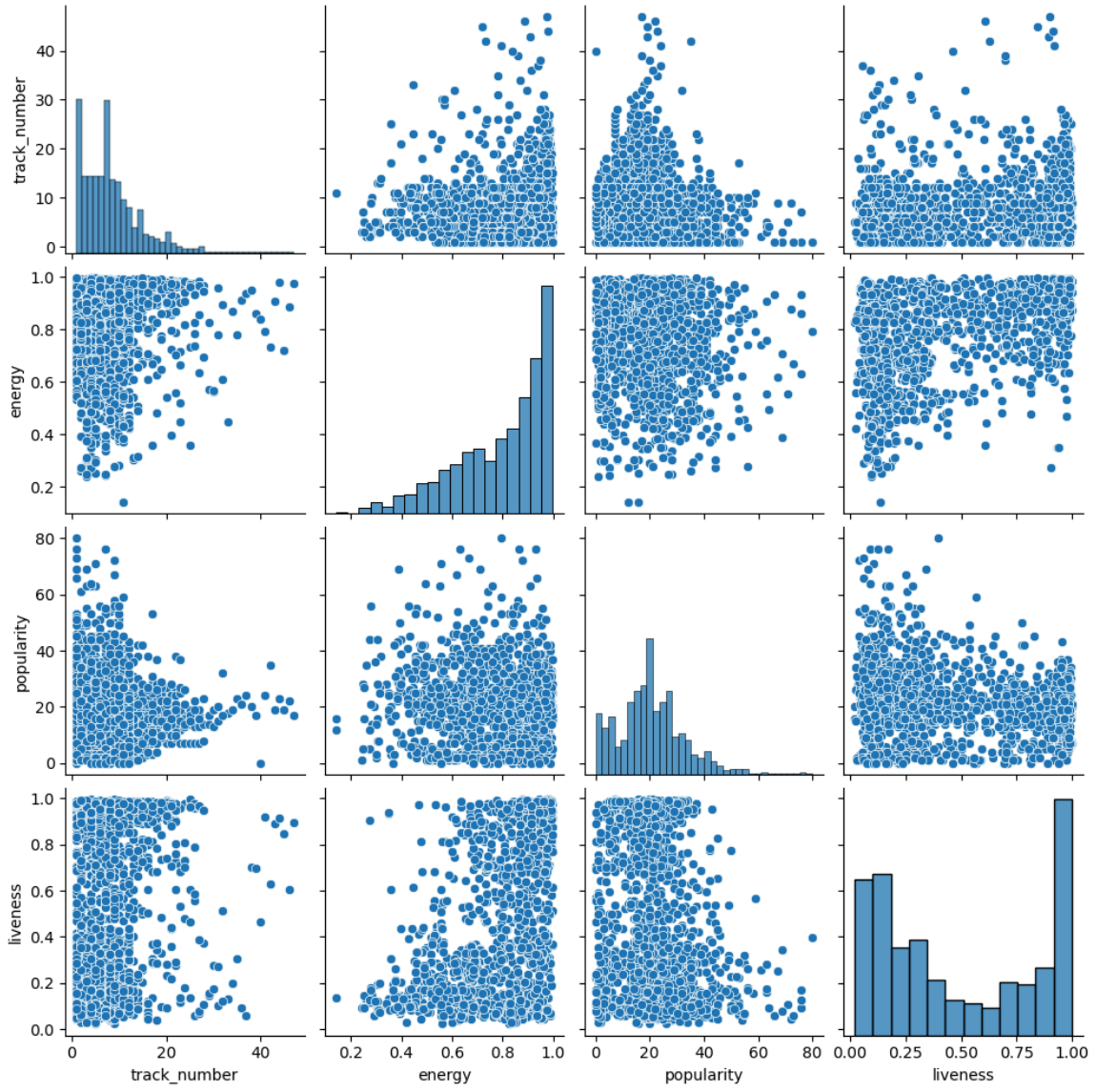
In [20]:
```
plt.figure(figsize=(10,20))
sns.scatterplot(x = dfc['popularity'], y = dfc['album'])
plt.title('Album vs Popularity')
plt.show()
```



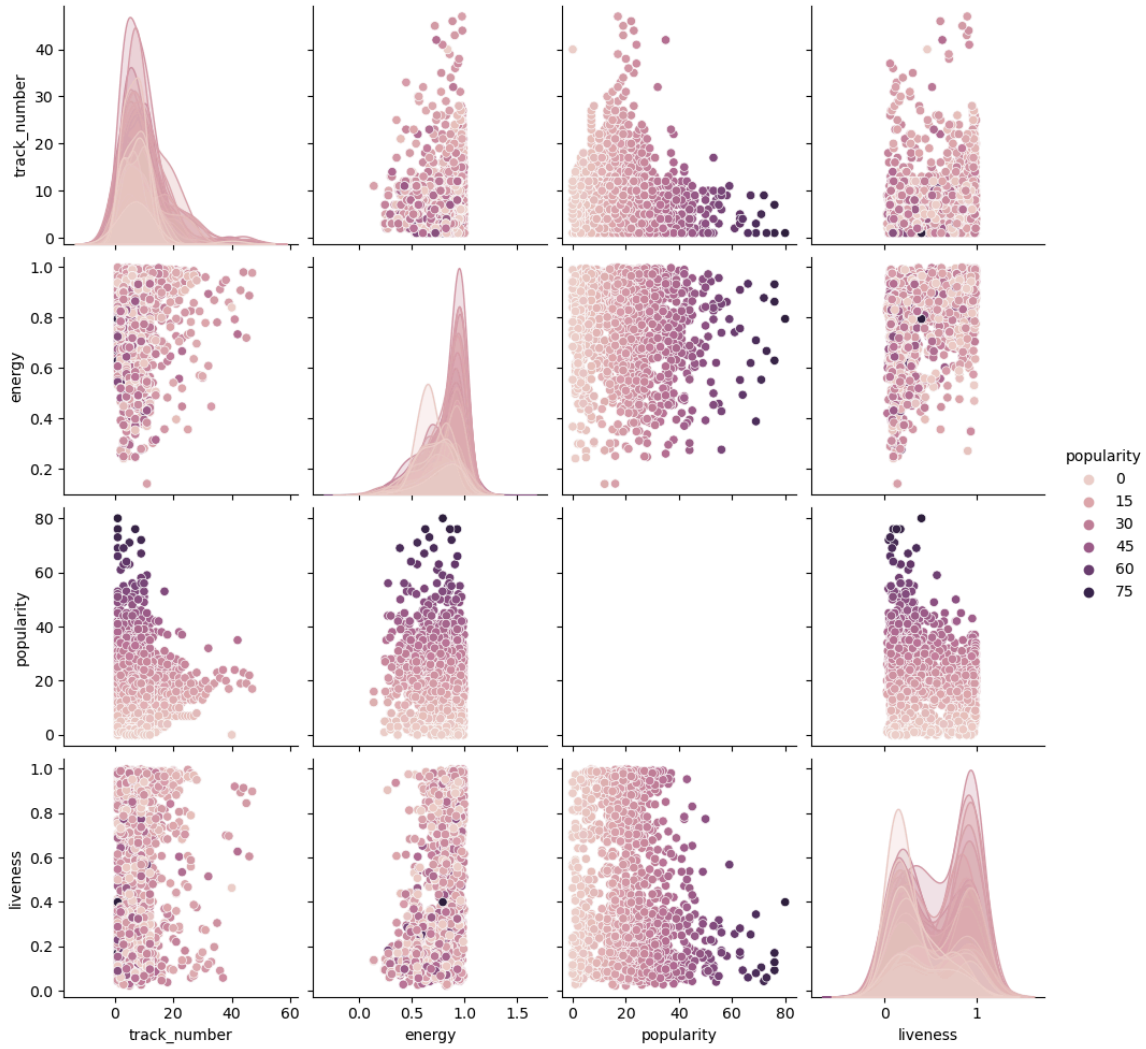
In [21]:
```
plt.figure(figsize=(15,5))
sns.barplot(x=dfc['track_number'], y = dfc['energy'])
plt.show()
```



In [22]:
```
cols = ['track_number', 'energy', 'popularity', 'liveness']
sns.pairplot(dfc, vars=cols)
plt.show()
```



In [23]:
```
cols = ['track_number', 'energy', 'popularity', 'liveness']
sns.pairplot(dfc, vars=cols, hue='popularity')
plt.show()
```



Cluster Analysis

In [24]:
```
df
```

Out[24]:

	name	album	release_date	id	
0	Concert Intro Music - Live	Licked Live In NYC	2022-06-10	2IEkywLJ4ykbhi1yRQvmsT	spotify:track:2IEkywLJ4ykbhi1
1	Street Fighting Man - Live	Licked Live In NYC	2022-06-10	6GVgVJBKkGJoRfarYRvGTU	spotify:track:6GVgVJBKkGJoRfa
2	Start Me Up - Live	Licked Live In NYC	2022-06-10	1Lu761pZ0dBTGpzxaQoZNW	spotify:track:1Lu761pZ0dBTGpz
3	If You Can't Rock Me - Live	Licked Live In NYC	2022-06-10	1agTQzOTUnGNggyckEqiDH	spotify:track:1agTQzOTUnGNgg
4	Don't Stop - Live	Licked Live In NYC	2022-06-10	7piGJR8YndQBQWVXv6KtQw	spotify:track:7piGJR8YndQBQW
...	...	...	...	...	
1605	Carol	The Rolling Stones	1964-04-16	08l7M5UpRnffGl0FyuRiQZ	spotify:track:08l7M5UpRnffG
1606	Tell Me	The Rolling Stones	1964-04-16	3JZllQBsTM6WwoJdzFDLhx	spotify:track:3JZllQBsTM6Wwc
1607	Can I Get A Witness	The Rolling Stones	1964-04-16	0t2qvfSBQ3Y08lzRRoVTdb	spotify:track:0t2qvfSBQ3Y08l
1608	You Can Make It If You Try	The Rolling Stones	1964-04-16	5ivIs5vwSj0RChOIvlY3On	spotify:track:5ivIs5vwSj0RCl
1609	Walking The Dog	The Rolling Stones	1964-04-16	43SkTJJ2xleDaeiE4TIM70	spotify:track:43SkTJJ2xleDa

1610 rows × 11 columns

In [25]:
```
df.drop(['name'], axis=1, inplace=True)
df.drop(['album'], axis=1, inplace=True)
df.drop(['release_date'], axis=1, inplace=True)
df.drop(['id'], axis=1, inplace=True)
df.drop(['uri'], axis=1, inplace=True)
```

In [26]:
```
df
```

Out[26]:

	danceability	energy	liveness	loudness	speechiness	valence
0	0.463	0.993	0.9320	-12.913	0.1100	0.0302
1	0.326	0.965	0.9610	-4.803	0.0759	0.3180
2	0.386	0.969	0.9560	-4.936	0.1150	0.3130
3	0.369	0.985	0.8950	-5.535	0.1930	0.1470
4	0.303	0.969	0.9660	-5.098	0.0930	0.2060
...	...	...	...	...	...	...
1605	0.466	0.932	0.3240	-9.214	0.0429	0.9670
1606	0.509	0.706	0.5160	-9.427	0.0843	0.4460
1607	0.790	0.774	0.0669	-7.961	0.0720	0.8350
1608	0.700	0.546	0.1660	-9.567	0.0622	0.5320
1609	0.727	0.934	0.0965	-8.373	0.0359	0.9690

1610 rows × 6 columns

In [27]:
```
from sklearn.preprocessing import MinMaxScaler
scaler = MinMaxScaler()
df_scaled = scaler.fit_transform(df[['loudness']])
```

In [28]:
```
df_scaled.shape
```

Out[28]: (1610, 1)

In [29]:
```
df['loud'] = df_scaled
df
```

Out[29]:

	danceability	energy	liveness	loudness	speechiness	valence	loud
0	0.463	0.993	0.9320	-12.913	0.1100	0.0302	0.491365
1	0.326	0.965	0.9610	-4.803	0.0759	0.3180	0.838035
2	0.386	0.969	0.9560	-4.936	0.1150	0.3130	0.832350
3	0.369	0.985	0.8950	-5.535	0.1930	0.1470	0.806745
4	0.303	0.969	0.9660	-5.098	0.0930	0.2060	0.825425
...	...	...	...	...	...	...	...
1605	0.466	0.932	0.3240	-9.214	0.0429	0.9670	0.649483
1606	0.509	0.706	0.5160	-9.427	0.0843	0.4460	0.640378
1607	0.790	0.774	0.0669	-7.961	0.0720	0.8350	0.703044
1608	0.700	0.546	0.1660	-9.567	0.0622	0.5320	0.634393
1609	0.727	0.934	0.0965	-8.373	0.0359	0.9690	0.685432

1610 rows × 7 columns

In [30]:
```
df.drop(['loudness'], axis=1, inplace=True)
df
```

Out[30]:

	danceability	energy	liveness	speechiness	valence	loud
0	0.463	0.993	0.9320	0.1100	0.0302	0.491365
1	0.326	0.965	0.9610	0.0759	0.3180	0.838035
2	0.386	0.969	0.9560	0.1150	0.3130	0.832350
3	0.369	0.985	0.8950	0.1930	0.1470	0.806745
4	0.303	0.969	0.9660	0.0930	0.2060	0.825425
...	...	...	...	...	...	...
1605	0.466	0.932	0.3240	0.0429	0.9670	0.649483
1606	0.509	0.706	0.5160	0.0843	0.4460	0.640378
1607	0.790	0.774	0.0669	0.0720	0.8350	0.703044
1608	0.700	0.546	0.1660	0.0622	0.5320	0.634393
1609	0.727	0.934	0.0965	0.0359	0.9690	0.685432

1610 rows × 6 columns

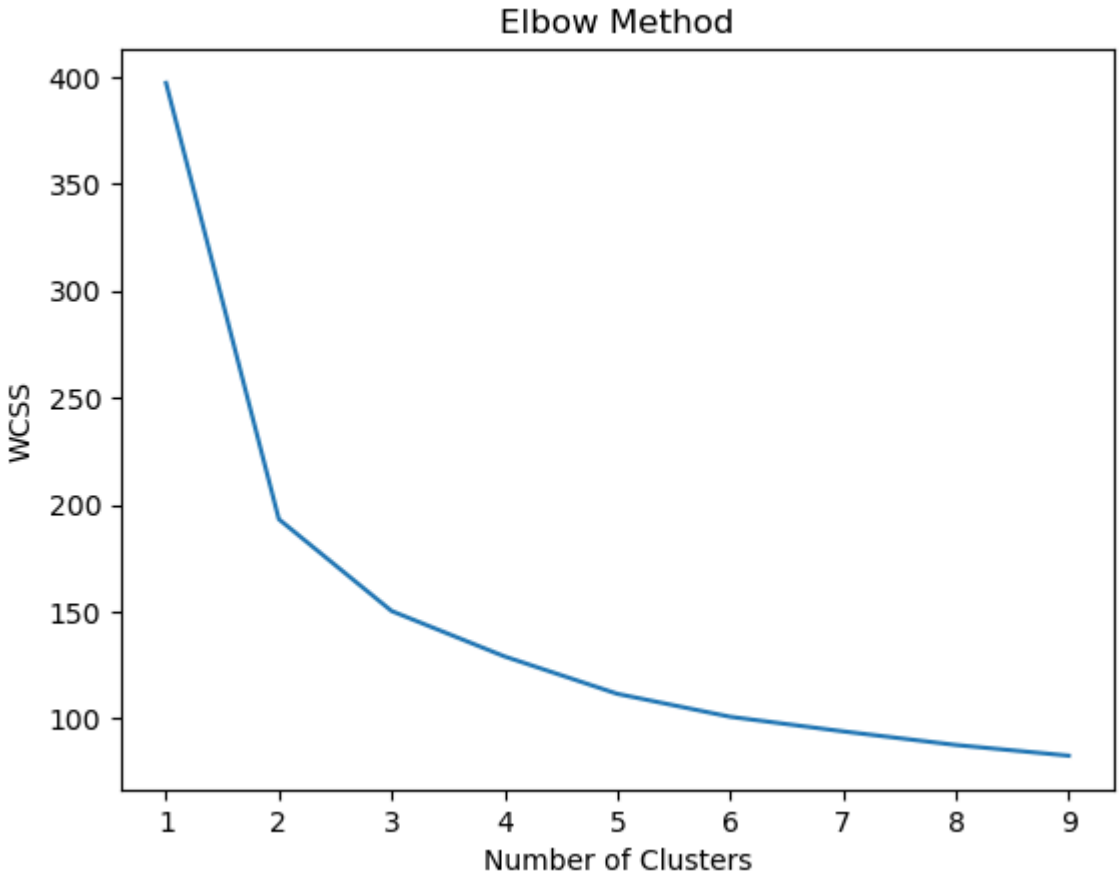
In [31]:
```
from sklearn.cluster import KMeans
```

In [32]:
```
wcss = []
for i in range(1, 10):
    kmeans = KMeans(n_clusters=i)
    kmeans.fit(df)
    wcss.append(kmeans.inertia_)
```

In [33]:
```
wcss
```

Out[33]:
```
[397.1857907317948,
 193.18064606930497,
 150.23820091118213,
 129.02953128023643,
 111.5379749265686,
 100.81336784670273,
 93.98696575596233,
 87.62817675845817,
 82.62079564478233]
```

In [34]:
```
plt.plot(range(1,10), wcss)
plt.title('Elbow Method')
plt.xlabel('Number of Clusters')
plt.ylabel('WCSS')
plt.show()
```



In [35]:
```
kmeans = KMeans(n_clusters=2)
kmeans.fit(df)
```

Out[35]:
```
KMeans
KMeans(n_clusters=2)
```

In [36]:
```
labels = kmeans.labels_
labels
```

Out[36]:
```
array([0, 0, 0, ..., 1, 1, 1], dtype=int32)
```

In [37]:
```
df['Clusters'] = labels
df
```

Out[37]:

	danceability	energy	liveness	speechiness	valence	loud	Clusters
0	0.463	0.993	0.9320	0.1100	0.0302	0.491365	0
1	0.326	0.965	0.9610	0.0759	0.3180	0.838035	0
2	0.386	0.969	0.9560	0.1150	0.3130	0.832350	0
3	0.369	0.985	0.8950	0.1930	0.1470	0.806745	0
4	0.303	0.969	0.9660	0.0930	0.2060	0.825425	0
...	...	...	...	...	...	...	...
1605	0.466	0.932	0.3240	0.0429	0.9670	0.649483	1
1606	0.509	0.706	0.5160	0.0843	0.4460	0.640378	1
1607	0.790	0.774	0.0669	0.0720	0.8350	0.703044	1
1608	0.700	0.546	0.1660	0.0622	0.5320	0.634393	1
1609	0.727	0.934	0.0965	0.0359	0.9690	0.685432	1

1610 rows × 7 columns

In [38]:
```
from sklearn.metrics import silhouette_score
silhouette_s = round(silhouette_score(df, labels),2)
silhouette_s
```

Out[38]: 0.66

In [ ]:
```

```