SPOTIFY DATA ANALYSIS(2021)

Spotify

CHART TYPE

Select all | top200 | viral50

NUMBER OF SONGS

40.51K

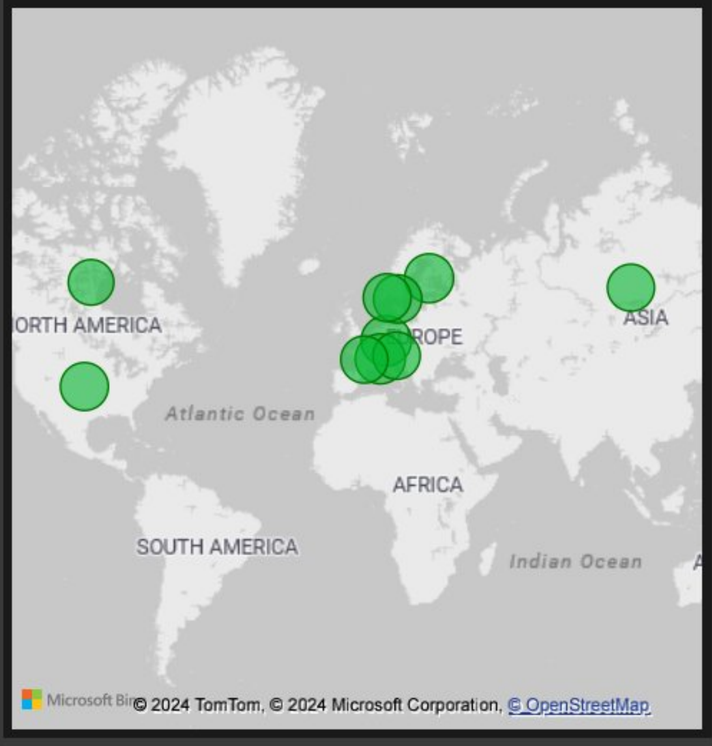
NUMBER OF COUNTRIES

70

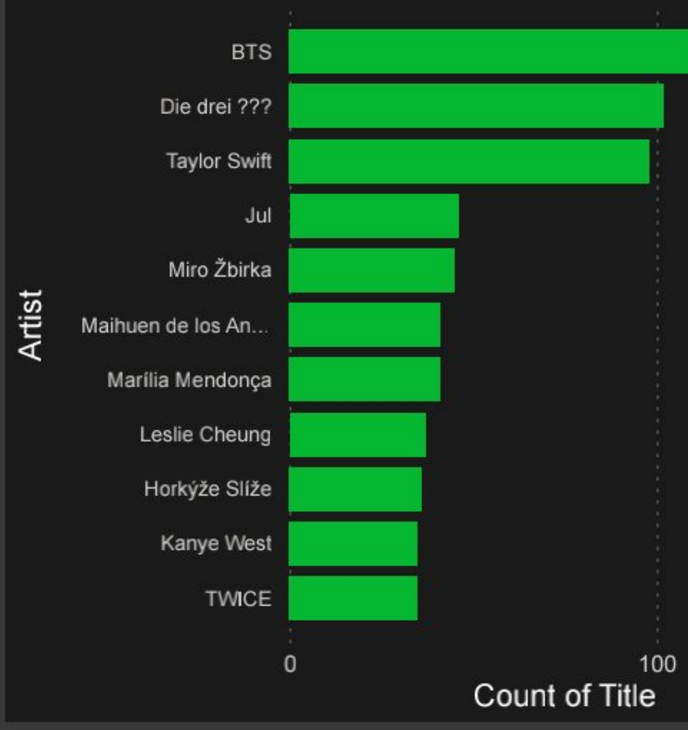
NUMBER OF ARTISTS

25.38K

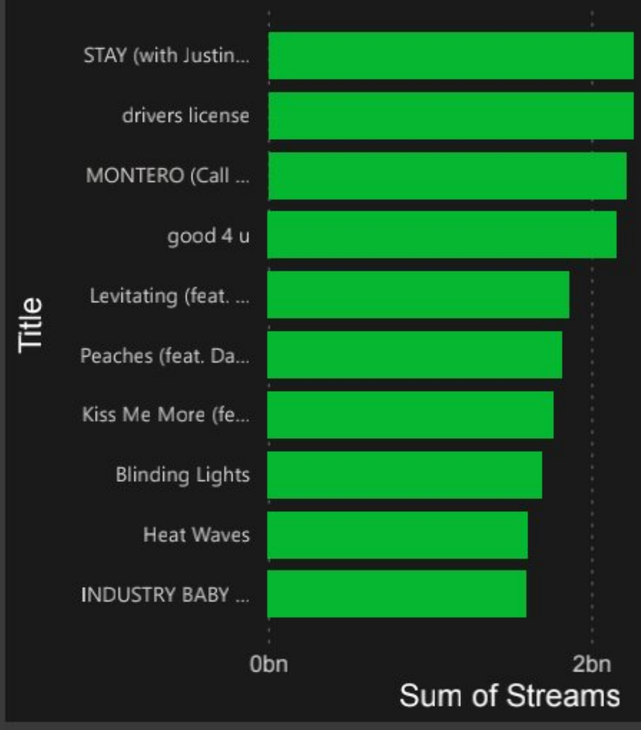
TOP 10 REGIONS BASED ON TITLES



TOP 10 POPULAR ARTISTS



TOP 10 TITLES BASED ON NO. OF STREAMS



exploratory-data-analysis

April 22, 2024

[1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

[2]:
```
df=pd.read_csv("tracks.csv")
```

[3]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 586672 entries, 0 to 586671
Data columns (total 20 columns):
 #   Column            Non-Null Count   Dtype  
---  ------            --------------   -----  
 0   id                586672 non-null  object 
 1   name              586601 non-null  object 
 2   popularity        586672 non-null  int64  
 3   duration_ms       586672 non-null  int64  
 4   explicit          586672 non-null  int64  
 5   artists           586672 non-null  object 
 6   id_artists        586672 non-null  object 
 7   release_date      586672 non-null  object 
 8   danceability      586672 non-null  float64
 9   energy            586672 non-null  float64
 10  key               586672 non-null  int64  
 11  loudness          586672 non-null  float64
 12  mode              586672 non-null  int64  
 13  speechiness       586672 non-null  float64
 14  acousticness      586672 non-null  float64
 15  instrumentalness  586672 non-null  float64
 16  liveness          586672 non-null  float64
 17  valence           586672 non-null  float64
 18  tempo             586672 non-null  float64
 19  time_signature    586672 non-null  int64  
dtypes: float64(9), int64(6), object(5)
memory usage: 89.5+ MB
```

[4]:
```
df.describe().transpose()
```

[4]:

	count	mean	std	min	25%	50%	75%	max
popularity	586672.0	27.570053	18.370642	0.0	13.0000	27.000000	41.00000	100.000
duration_ms	586672.0	230051.167286	126526.087418	3344.0	175093.0000	214893.000000	263867.00000	5621218.000
explicit	586672.0	0.044086	0.205286	0.0	0.0000	0.000000	0.00000	1.000
danceability	586672.0	0.563594	0.166103	0.0	0.4530	0.577000	0.68600	0.991
energy	586672.0	0.542036	0.251923	0.0	0.3430	0.549000	0.74800	1.000
key	586672.0	5.221603	3.519423	0.0	2.0000	5.000000	8.00000	11.000
loudness	586672.0	-10.206067	5.089328	-60.0	-12.8910	-9.243000	-6.48200	5.376
mode	586672.0	0.658797	0.474114	0.0	0.0000	1.000000	1.00000	1.000
speechiness	586672.0	0.104864	0.179893	0.0	0.0340	0.044300	0.07630	0.971
acousticness	586672.0	0.449863	0.348837	0.0	0.0969	0.422000	0.78500	0.996
instrumentalness	586672.0	0.113451	0.266868	0.0	0.0000	0.000024	0.00955	1.000
liveness	586672.0	0.213935	0.184326	0.0	0.0983	0.139000	0.27800	1.000
valence	586672.0	0.552292	0.257671	0.0	0.3460	0.564000	0.76900	1.000
tempo	586672.0	118.464857	29.764108	0.0	95.6000	117.384000	136.32100	246.381
time_signature	586672.0	3.873382	0.473162	0.0	4.0000	4.000000	4.00000	5.000

[5]:
```
df.set_index("release_date", inplace=True)
```

[6]:
```
df.index=pd.to_datetime(df.index, format='mixed')
```

[7]:
```
df.head()
```

[7]:

release_date	id	name
1922-02-22	35iwgR4jXetI318WEWsa1Q	Carve
1922-06-01	021ht4sdgPcrDgSk7JTbKY	Capítulo 2.16 - Banquero Anarquista
1922-03-21	07A5yehtSnoedViJAZkNnc	Vivo para Quererte - Remasterizado
1922-03-21	08FmqUhxtyLTn6pAh6bk45	El Prisionero - Remasterizado
1922-01-01	08y9GfoqCWfOGsKdwojr5e	Lady of the Evening

```
              popularity  duration_ms  explicit              artists  \
release_date
1922-02-22             6       126903         0             ['Uli']
1922-06-01             0        98200         0  ['Fernando Pessoa']
1922-03-21             0       181640         0  ['Ignacio Corsini']
1922-03-21             0       176907         0  ['Ignacio Corsini']
1922-01-01             0       163080         0     ['Dick Haymes']

                          id_artists  danceability  energy  key  loudness  \
release_date
1922-02-22    ['45tIt06XoI0Iio4LBEVpls']         0.645  0.4450    0   -13.338
1922-06-01    ['14jtPCOoNZwquk5wd9DxrY']         0.695  0.2630    0   -22.136
1922-03-21    ['5LiOoJbxVSAMkBS2fUm3X2']         0.434  0.1770    1   -21.180
1922-03-21    ['5LiOoJbxVSAMkBS2fUm3X2']         0.321  0.0946    7   -27.961
1922-01-01    ['3BiJGZsyX9sJchTqcSA7Su']         0.402  0.1580    3   -16.900

              mode  speechiness  acousticness  instrumentalness  liveness  \
release_date
1922-02-22       1       0.4510         0.674            0.7440     0.151
1922-06-01       1       0.9570         0.797            0.0000     0.148
1922-03-21       1       0.0512         0.994            0.0218     0.212
1922-03-21       1       0.0504         0.995            0.9180     0.104
1922-01-01       0       0.0390         0.989            0.1300     0.311

              valence    tempo  time_signature
release_date
1922-02-22      0.127  104.851               3
1922-06-01      0.655  102.009               1
1922-03-21      0.457  130.418               5
1922-03-21      0.397  169.980               3
1922-01-01      0.196  103.220               4
```

[8]:
```
df[["artists"]].iloc[-1]
```

[8]:
```
artists    ['Afrosound']
Name: 2015-07-01 00:00:00, dtype: object
```

[9]:
```
df[["artists"]].iloc[0]
```

[9]:
```
artists    ['Uli']
Name: 1922-02-22 00:00:00, dtype: object
```

[10]:
```
df["duration"]= df["duration_ms"].apply(lambda x: round(x/1000))
df.drop("duration_ms", inplace=True, axis=1)
```

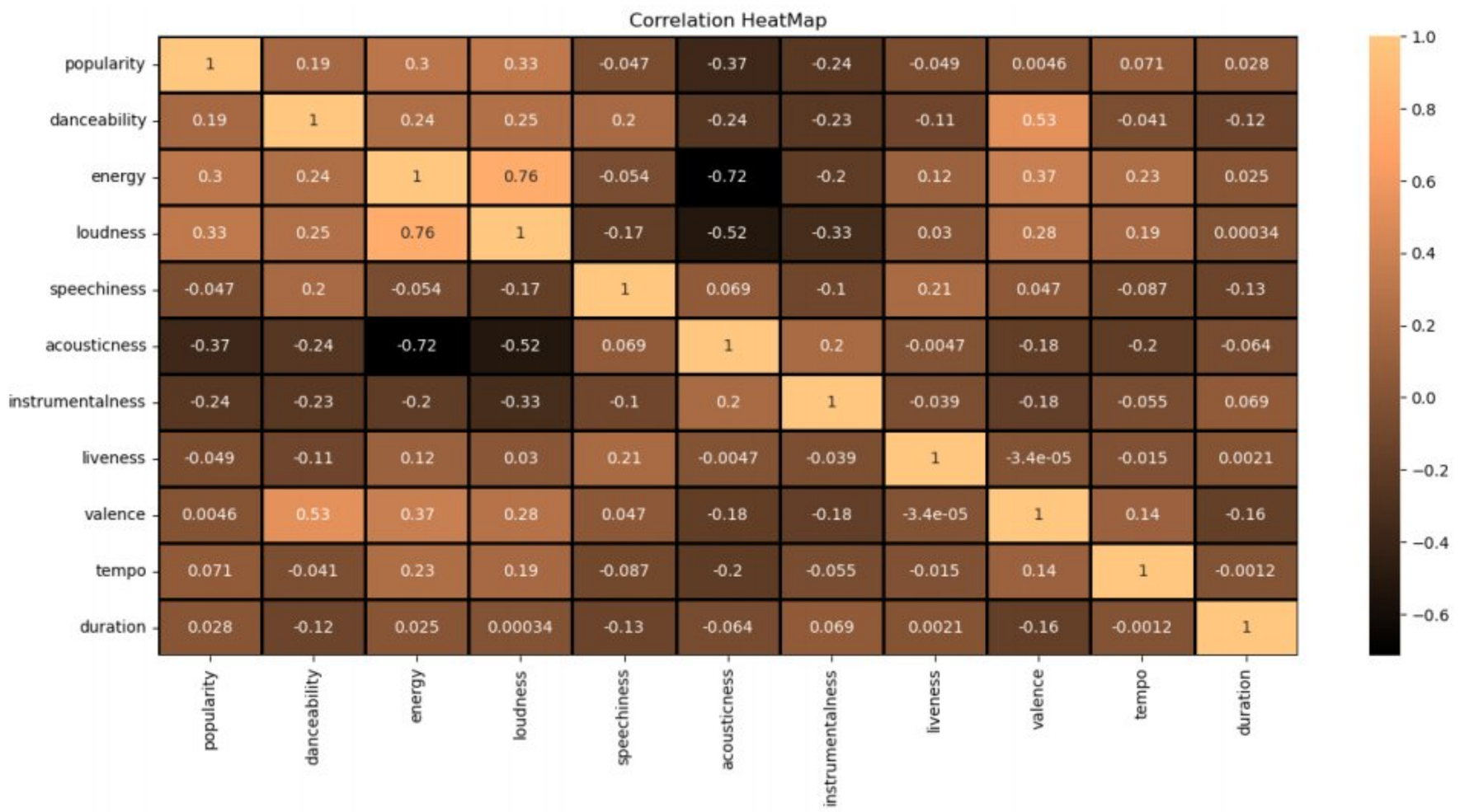
[11]:
```
df.duration.head()
```

[11]:
```
release_date
1922-02-22    127
1922-06-01     98
1922-03-21    182
1922-03-21    177
1922-01-01    163
Name: duration, dtype: int64
```

1 Feature Analysis

[12]:
```
corr_df=df.
 ↪drop(["key","mode","id","name","artists","time_signature","id_artists","explicit"],axis=1).
 ↪corr(method="pearson")
plt.figure(figsize=(16,7))
heatmap=sns.heatmap(corr_df,annot=True,cmap="copper", linewidths=1,␣
 ↪linecolor="Black")
heatmap.set_title("Correlation HeatMap")
```

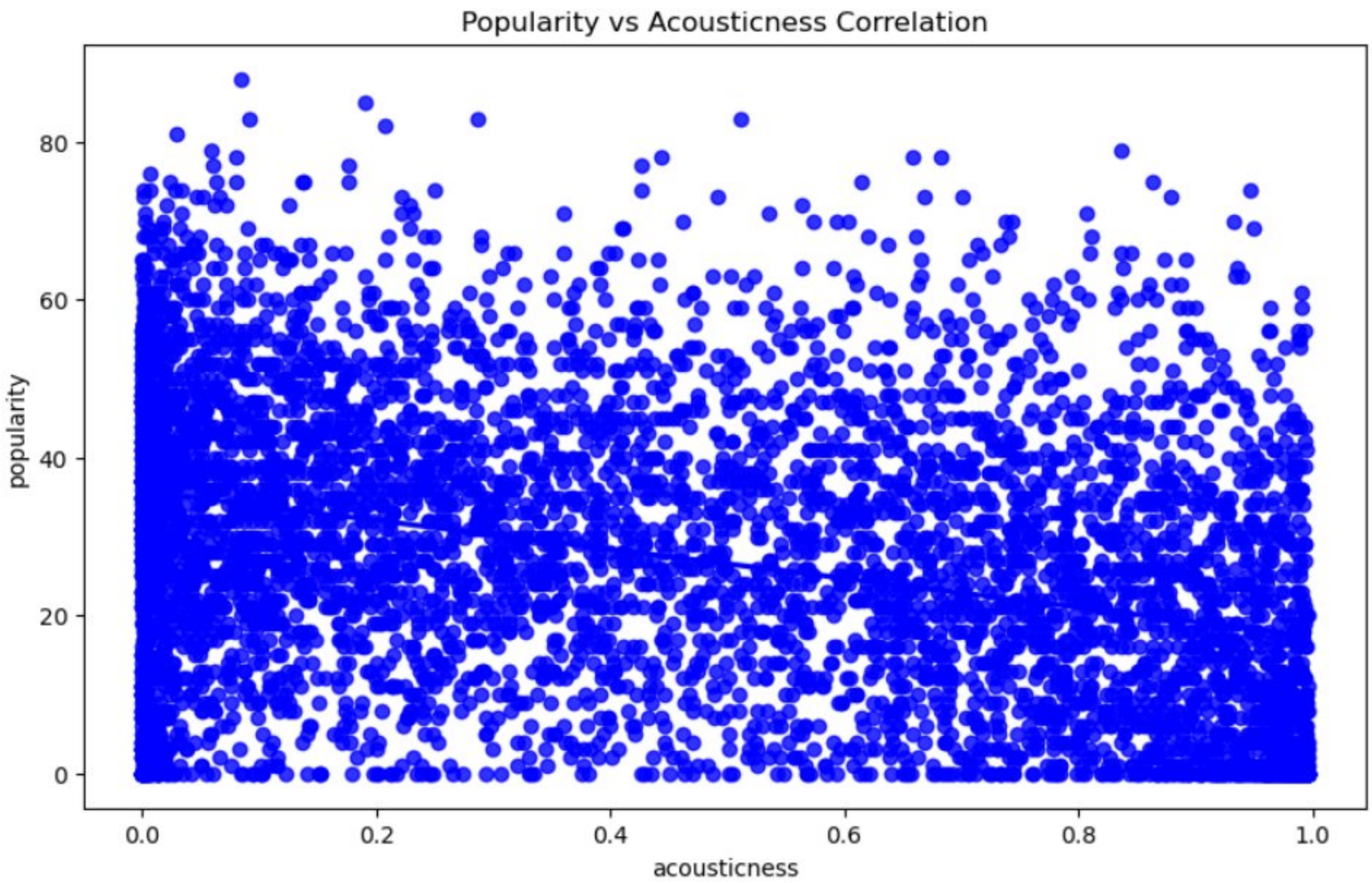
[12]:
```
Text(0.5, 1.0, 'Correlation HeatMap')
```



[13]:
```
sample_df=df.sample(int(0.01*len(df)))
```

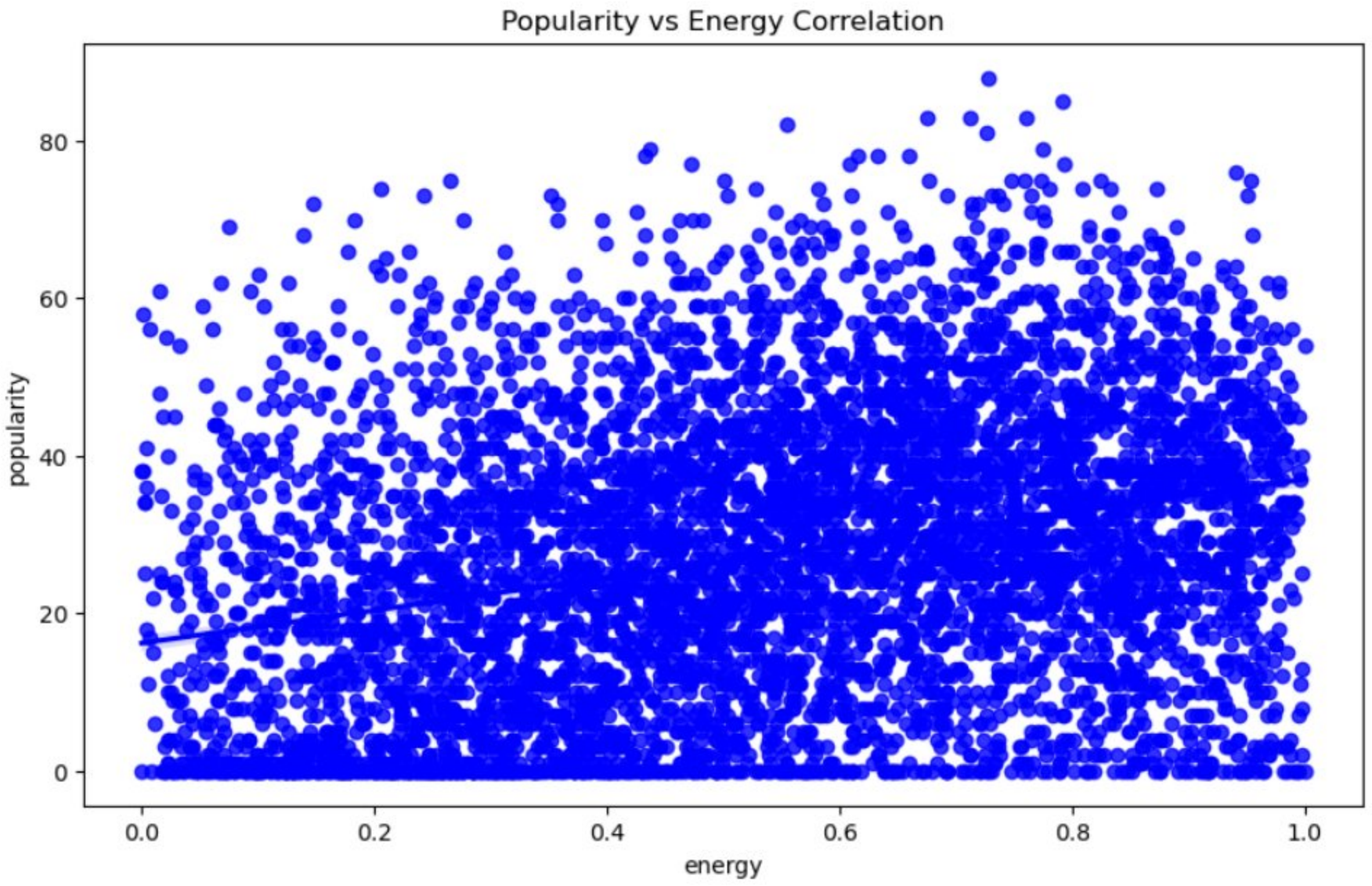
[14]:
```
plt.figure(figsize=(10,6))
sns.regplot(data=sample_df, y="popularity", x="acousticness",color="b").
 ↪set(title="Popularity vs Acousticness Correlation")
```

[14]: [Text(0.5, 1.0, 'Popularity vs Acousticness Correlation')]



[15]:
```
plt.figure(figsize=(10,6))
sns.regplot(data=sample_df, y="popularity", x="energy", color="b").
 ↪set(title="Popularity vs Energy Correlation")
```

[15]: [Text(0.5, 1.0, 'Popularity vs Energy Correlation')]

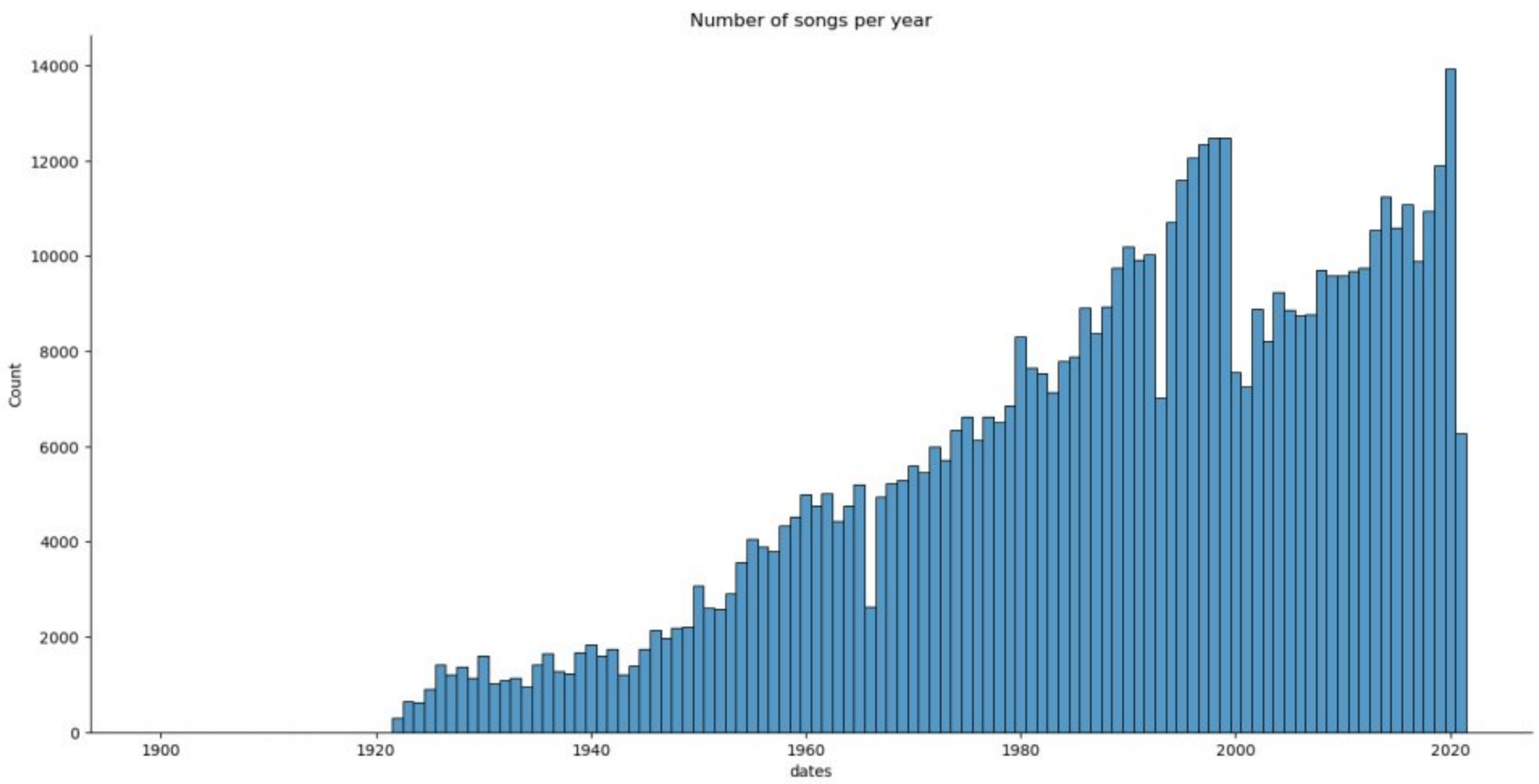


[16]:
```
df['dates']=df.index.get_level_values('release_date')
df.dates=pd.to_datetime(df.dates)
years=df.dates.dt.year
```

[17]:
```
sns.displot(years,discrete=True,aspect=2,height=7 ,kind="hist").
  ↪set(title="Number of songs per year")
```

```
C:\ProgramData\anaconda3\Lib\site-packages\seaborn\axisgrid.py:118: UserWarning:
The figure layout has changed to tight
  self._figure.tight_layout(*args, **kwargs)
```

[17]:
```
<seaborn.axisgrid.FacetGrid at 0x22882f1c390>
```



[18]:
```
dr=df.duration
fig_dims = (20, 9)
fig, ax = plt.subplots(figsize=fig_dims)
fig=sns.barplot(x=years, y=dr,ax=ax,errwidth=False).set(title="Year vs␣
 ↪Duration")
plt.xticks(rotation=90)
```

[18]:
```
(array([  0,   1,   2,   3,   4,   5,   6,   7,   8,   9,  10,  11,  12,
         13,  14,  15,  16,  17,  18,  19,  20,  21,  22,  23,  24,  25,
         26,  27,  28,  29,  30,  31,  32,  33,  34,  35,  36,  37,  38,
         39,  40,  41,  42,  43,  44,  45,  46,  47,  48,  49,  50,  51,
         52,  53,  54,  55,  56,  57,  58,  59,  60,  61,  62,  63,  64,
         65,  66,  67,  68,  69,  70,  71,  72,  73,  74,  75,  76,  77,
         78,  79,  80,  81,  82,  83,  84,  85,  86,  87,  88,  89,  90,
         91,  92,  93,  94,  95,  96,  97,  98,  99, 100]),
[Text(0, 0, '1900'),
 Text(1, 0, '1922'),
 Text(2, 0, '1923'),
 Text(3, 0, '1924'),
 Text(4, 0, '1925'),
 Text(5, 0, '1926'),
 Text(6, 0, '1927'),
 Text(7, 0, '1928'),
 Text(8, 0, '1929'),
 Text(9, 0, '1930'),
 Text(10, 0, '1931'),
 Text(11, 0, '1932'),
 Text(12, 0, '1933'),
```

```
Text(13, 0, '1934'),
Text(14, 0, '1935'),
Text(15, 0, '1936'),
Text(16, 0, '1937'),
Text(17, 0, '1938'),
Text(18, 0, '1939'),
Text(19, 0, '1940'),
Text(20, 0, '1941'),
Text(21, 0, '1942'),
Text(22, 0, '1943'),
Text(23, 0, '1944'),
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Text(25, 0, '1946'),
Text(26, 0, '1947'),
Text(27, 0, '1948'),
Text(28, 0, '1949'),
Text(29, 0, '1950'),
Text(30, 0, '1951'),
Text(31, 0, '1952'),
Text(32, 0, '1953'),
Text(33, 0, '1954'),
Text(34, 0, '1955'),
Text(35, 0, '1956'),
Text(36, 0, '1957'),
Text(37, 0, '1958'),
Text(38, 0, '1959'),
Text(39, 0, '1960'),
Text(40, 0, '1961'),
Text(41, 0, '1962'),
Text(42, 0, '1963'),
Text(43, 0, '1964'),
Text(44, 0, '1965'),
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Text(46, 0, '1967'),
Text(47, 0, '1968'),
Text(48, 0, '1969'),
Text(49, 0, '1970'),
Text(50, 0, '1971'),
Text(51, 0, '1972'),
Text(52, 0, '1973'),
Text(53, 0, '1974'),
Text(54, 0, '1975'),
Text(55, 0, '1976'),
Text(56, 0, '1977'),
Text(57, 0, '1978'),
Text(58, 0, '1979'),
Text(59, 0, '1980'),
```
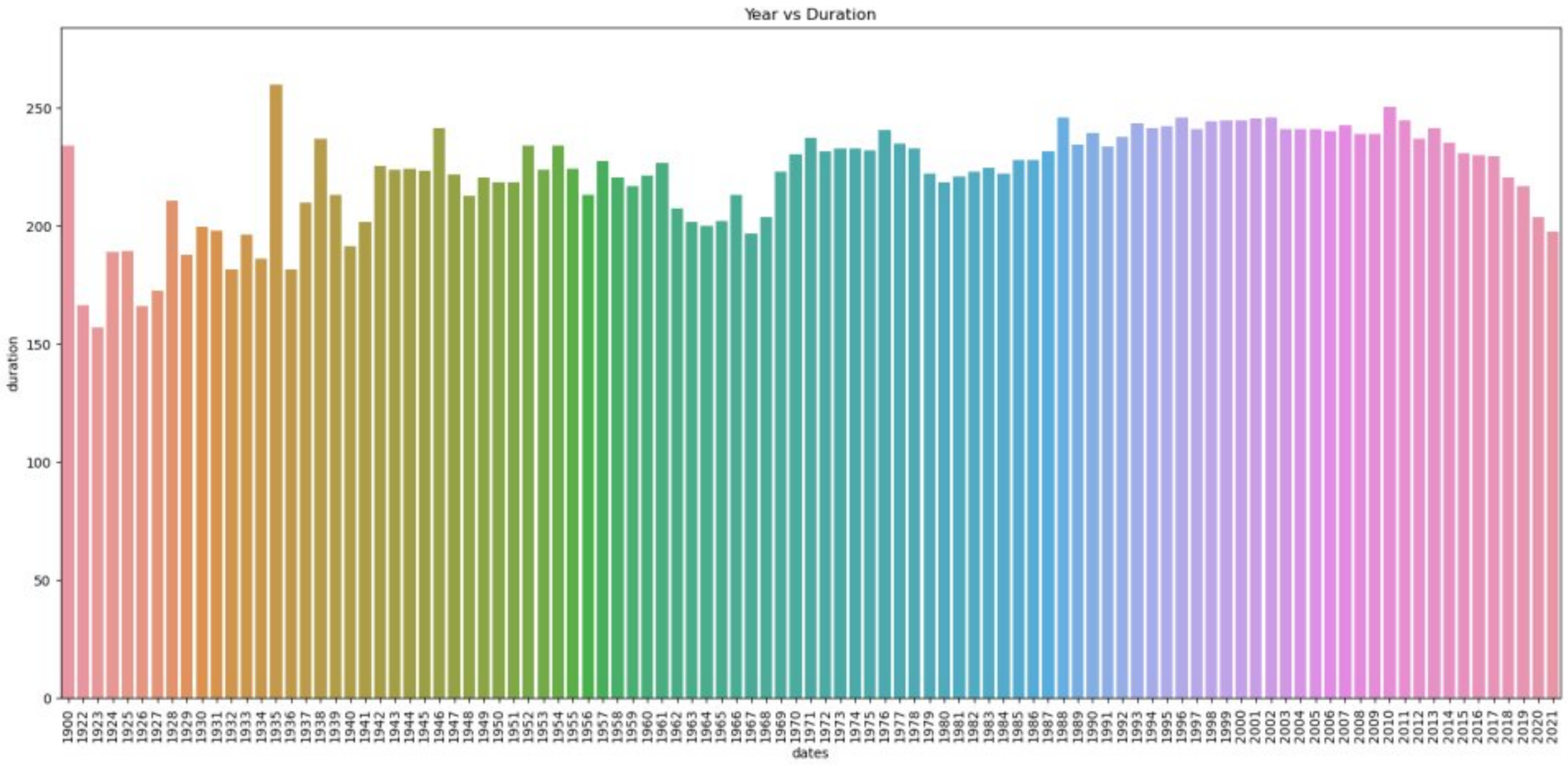
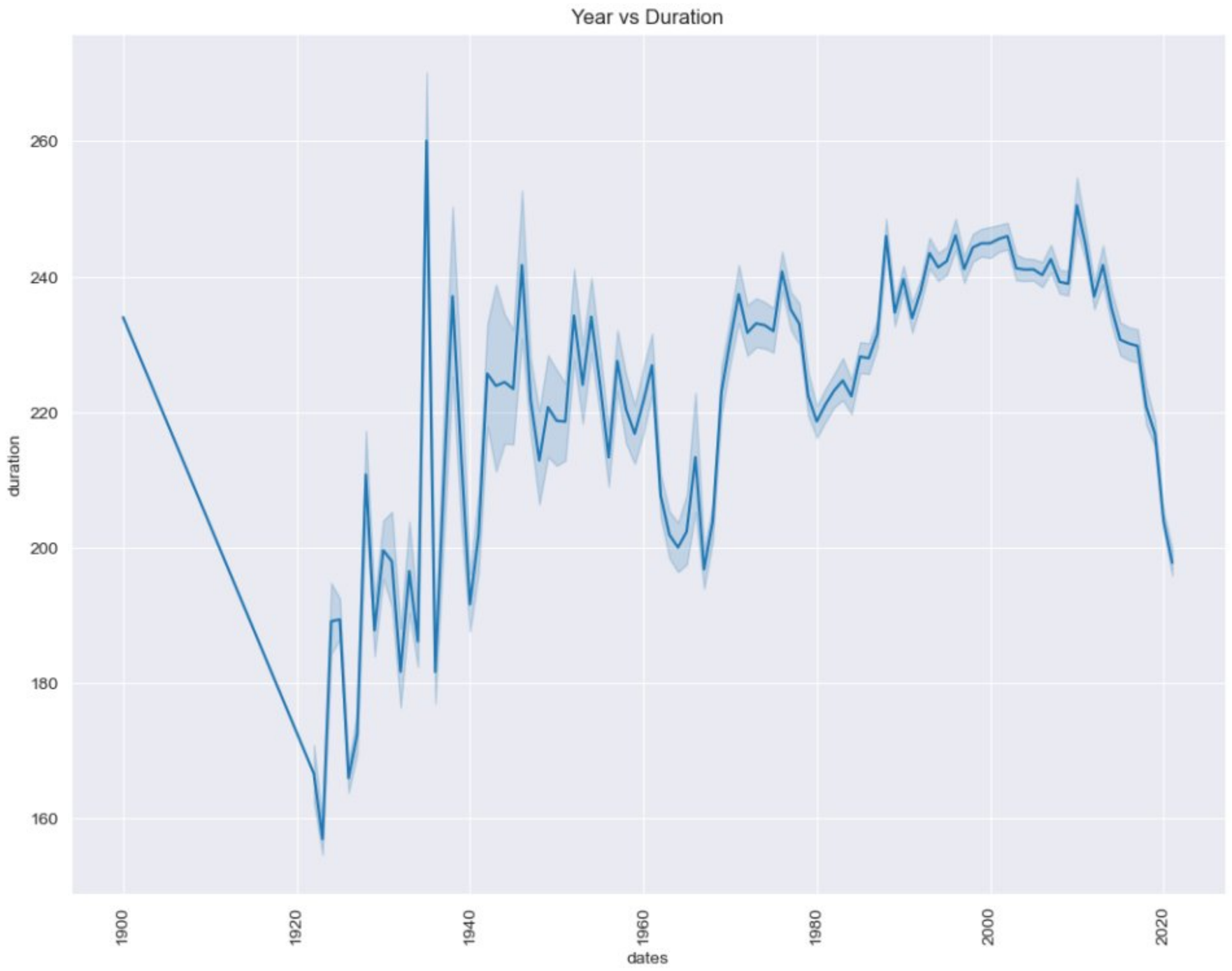

```
Text(60, 0, '1981'),
Text(61, 0, '1982'),
Text(62, 0, '1983'),
Text(63, 0, '1984'),
Text(64, 0, '1985'),
Text(65, 0, '1986'),
Text(66, 0, '1987'),
Text(67, 0, '1988'),
Text(68, 0, '1989'),
Text(69, 0, '1990'),
Text(70, 0, '1991'),
Text(71, 0, '1992'),
Text(72, 0, '1993'),
Text(73, 0, '1994'),
Text(74, 0, '1995'),
Text(75, 0, '1996'),
Text(76, 0, '1997'),
Text(77, 0, '1998'),
Text(78, 0, '1999'),
Text(79, 0, '2000'),
Text(80, 0, '2001'),
Text(81, 0, '2002'),
Text(82, 0, '2003'),
Text(83, 0, '2004'),
Text(84, 0, '2005'),
Text(85, 0, '2006'),
Text(86, 0, '2007'),
Text(87, 0, '2008'),
Text(88, 0, '2009'),
Text(89, 0, '2010'),
Text(90, 0, '2011'),
Text(91, 0, '2012'),
Text(92, 0, '2013'),
Text(93, 0, '2014'),
Text(94, 0, '2015'),
Text(95, 0, '2016'),
Text(96, 0, '2017'),
Text(97, 0, '2018'),
Text(98, 0, '2019'),
Text(99, 0, '2020'),
Text(100, 0, '2021')])
```



[19]:
```
dr=df.duration
sns.set_style(style="darkgrid")
fig_dims = (12, 9)
fig, ax = plt.subplots(figsize=fig_dims)
fig=sns.lineplot(x=years, y=dr,ax=ax).set(title="Year vs Duration")
plt.xticks(rotation=90)
```

[19]:
```
(array([1880., 1900., 1920., 1940., 1960., 1980., 2000., 2020., 2040.]),
 [Text(1880.0, 0, '1880'),
  Text(1900.0, 0, '1900'),
  Text(1920.0, 0, '1920'),
  Text(1940.0, 0, '1940'),
  Text(1960.0, 0, '1960'),
  Text(1980.0, 0, '1980'),
  Text(2000.0, 0, '2000'),
  Text(2020.0, 0, '2020'),
  Text(2040.0, 0, '2040')])
```



[20]:
```
df[df["duration"]==df["duration"].min()].iloc[0]
```

[20]:
```
id                      2s6e7KLoQ5hie3Cnh73v2v
name                                Pause Track
popularity                                    0
explicit                                      0
artists                       ['Louis Armstrong']
id_artists          ['19eLuQmk9aCobbVDHc6eek']
danceability                                0.0
energy                                      0.0
key                                           0
loudness                                  -60.0
mode                                          0
speechiness                                 0.0
acousticness                                0.0
instrumentalness                            0.0
liveness                                    0.0
valence                                     0.0
tempo                                       0.0
```

```
time_signature                                0
duration                                      3
dates                          1925-01-01 00:00:00
Name: 1925-01-01 00:00:00, dtype: object
```

[21]:
```
df[df["duration"]==df["duration"].max()].iloc[0]
```

[21]:
```
id                                3EEv9UCeZdn4MVFv8tsO1E
name
popularity                                             3
explicit                                               0
artists                                          ['     ']
id_artists                       ['2ySk9zib3PuomvMGmCqdTA']
danceability                                       0.638
energy                                             0.537
key                                                    8
loudness                                         -13.365
mode                                                   1
speechiness                                        0.775
acousticness                                       0.825
instrumentalness                                     0.0
liveness                                           0.345
valence                                            0.401
tempo                                            131.446
time_signature                                         3
duration                                            5621
dates                                1979-07-28 00:00:00
Name: 1979-07-28 00:00:00, dtype: object
```

[22]:
```
decades_df=df.drop(["id","name","id_artists","artists"],axis=1).resample("10A").
  ↪mean()
decades_df.index=[f"{date_index-1}'s " for date_index in decades_df.index.year]
decades_df
```

[22]:

	popularity	explicit	danceability	energy	key	loudness	\
1899's	19.000000	0.000000	0.659000	0.791000	2.000000	-4.895000	
1909's	NaN	NaN	NaN	NaN	NaN	NaN	
1919's	NaN	NaN	NaN	NaN	NaN	NaN	
1929's	1.154622	0.003038	0.591392	0.290079	5.061849	-14.467812	
1939's	2.101966	0.001054	0.546994	0.307452	5.129904	-13.437494	
1949's	2.076927	0.001298	0.478537	0.266274	5.266078	-14.400397	
1959's	9.366773	0.000429	0.482315	0.305697	5.045977	-14.267081	
1969's	19.129777	0.000752	0.497264	0.417778	5.077728	-12.330709	
1979's	24.321556	0.002076	0.530289	0.509039	5.129180	-11.389069	
1989's	25.706795	0.012112	0.563001	0.552254	5.184684	-11.325755	
1999's	30.286927	0.033560	0.574754	0.580257	5.251843	-10.089910	
2009's	36.797246	0.050843	0.591064	0.651000	5.315793	-7.465232	

2019's	40.032942	0.135694	0.615645	0.656647	5.335338	-7.319048
2029's	35.191848	0.260627	0.671531	0.617998	5.269543	-7.898172

	mode	speechiness	acousticness	instrumentalness	liveness	\
1899's	1.000000	0.029500	0.139000	0.000002	0.161000	
1909's	NaN	NaN	NaN	NaN	NaN	
1919's	NaN	NaN	NaN	NaN	NaN	
1929's	0.731011	0.262685	0.896172	0.326337	0.207478	
1939's	0.713457	0.187095	0.870396	0.280580	0.216754	
1949's	0.705580	0.114451	0.901684	0.357791	0.214518	
1959's	0.704834	0.099794	0.829466	0.236285	0.211956	
1969's	0.710525	0.074259	0.657810	0.151731	0.214114	
1979's	0.690587	0.112379	0.487428	0.098135	0.223204	
1989's	0.666956	0.130598	0.402808	0.080092	0.224767	
1999's	0.662785	0.099696	0.360872	0.072077	0.216725	
2009's	0.637965	0.079916	0.311532	0.055901	0.210008	
2019's	0.595547	0.094608	0.284220	0.094913	0.203696	
2029's	0.520936	0.130416	0.278645	0.119411	0.172572	

	valence	tempo	time_signature	duration	\
1899's	0.956000	141.999000	4.000000	234.000000	
1909's	NaN	NaN	NaN	NaN	
1919's	NaN	NaN	NaN	NaN	
1929's	0.598686	112.810796	3.782227	185.289280	
1939's	0.570885	112.393005	3.782438	206.058513	
1949's	0.498483	107.313873	3.743213	221.555982	
1959's	0.496949	111.064630	3.778960	222.952709	
1969's	0.565004	114.394391	3.801876	210.820786	
1979's	0.582910	117.787538	3.848624	231.113428	
1989's	0.577633	118.906802	3.868787	230.590793	
1999's	0.569688	119.713682	3.889851	242.100170	
2009's	0.562085	121.572760	3.924630	242.592185	
2019's	0.509203	122.129494	3.934927	227.986914	
2029's	0.506228	120.758488	3.942843	197.759911	

	dates
1899's	1900-01-01 00:00:00.000000000
1909's	NaT
1919's	NaT
1929's	1927-02-10 20:41:05.624999936
1939's	1936-03-17 06:59:01.170268800
1949's	1946-05-11 10:31:41.188684160
1959's	1956-03-28 06:42:41.239645056
1969's	1965-11-14 14:30:05.754403568
1979's	1976-01-06 02:55:57.605985024
1989's	1986-01-15 23:27:33.758282432
1999's	1995-11-30 22:58:45.342420736

```
2009's  2006-01-06 10:45:07.503291008
2019's  2016-04-02 22:44:44.666697216
2029's  2021-03-06 22:53:44.582073088
```

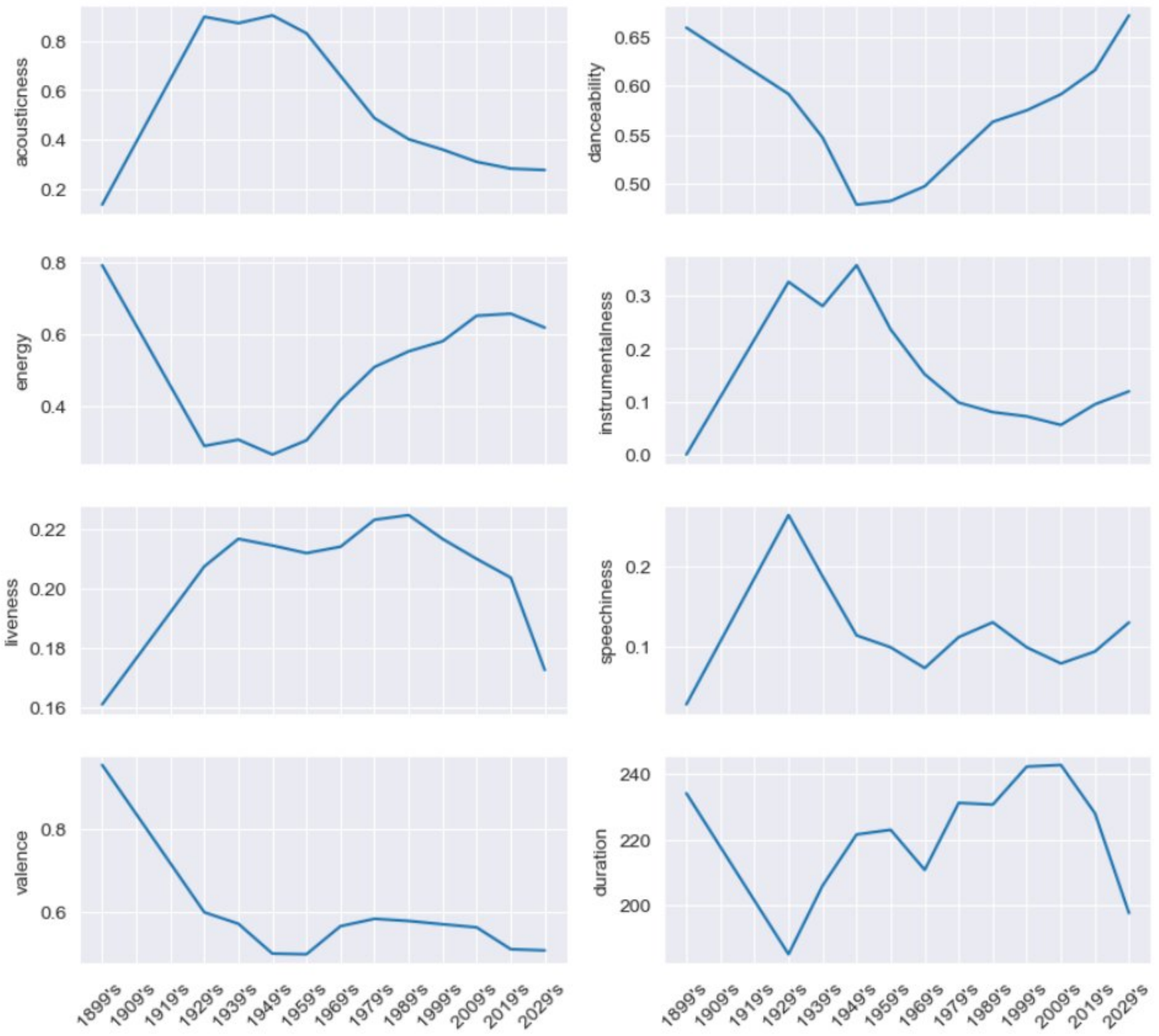
[23]:
```
trend_df=decades_df[["acousticness", "danceability", "energy",␣
 ↪"instrumentalness", "liveness", "speechiness", "valence","duration"]]
trend_df
```

[23]:

	acousticness	danceability	energy	instrumentalness	liveness	\
1899's	0.139000	0.659000	0.791000	0.000002	0.161000	
1909's	NaN	NaN	NaN	NaN	NaN	
1919's	NaN	NaN	NaN	NaN	NaN	
1929's	0.896172	0.591392	0.290079	0.326337	0.207478	
1939's	0.870396	0.546994	0.307452	0.280580	0.216754	
1949's	0.901684	0.478537	0.266274	0.357791	0.214518	
1959's	0.829466	0.482315	0.305697	0.236285	0.211956	
1969's	0.657810	0.497264	0.417778	0.151731	0.214114	
1979's	0.487428	0.530289	0.509039	0.098135	0.223204	
1989's	0.402808	0.563001	0.552254	0.080092	0.224767	
1999's	0.360872	0.574754	0.580257	0.072077	0.216725	
2009's	0.311532	0.591064	0.651000	0.055901	0.210008	
2019's	0.284220	0.615645	0.656647	0.094913	0.203696	
2029's	0.278645	0.671531	0.617998	0.119411	0.172572	

	speechiness	valence	duration
1899's	0.029500	0.956000	234.000000
1909's	NaN	NaN	NaN
1919's	NaN	NaN	NaN
1929's	0.262685	0.598686	185.289280
1939's	0.187095	0.570885	206.058513
1949's	0.114451	0.498483	221.555982
1959's	0.099794	0.496949	222.952709
1969's	0.074259	0.565004	210.820786
1979's	0.112379	0.582910	231.113428
1989's	0.130598	0.577633	230.590793
1999's	0.099696	0.569688	242.100170
2009's	0.079916	0.562085	242.592185
2019's	0.094608	0.509203	227.986914
2029's	0.130416	0.506228	197.759911

[24]:
```
i=0
f, axes = plt.subplots(4, 2, figsize=(10, 9), sharex=True)
for ax in f.axes:
    sns.lineplot(x=trend_df.index, y=trend_df.iloc[:,i], data=trend_df, ax=ax)
    plt.sca(ax)
    plt.xticks(rotation=45)
    i=i+1
```



[25]:
```
key={0:"C",1:"C ",2:"D",3:"D ",4:"E",5:"F",6:"F ",7:"G",8:"G ",9:"A",10:"A ",11:
  ↪"B"}
key_df=pd.DataFrame(df["key"].value_counts())
```

[26]:
```
key_df.head()
```

[26]:

key	count
0	74950
7	73779
2	66552
9	65128
5	53614

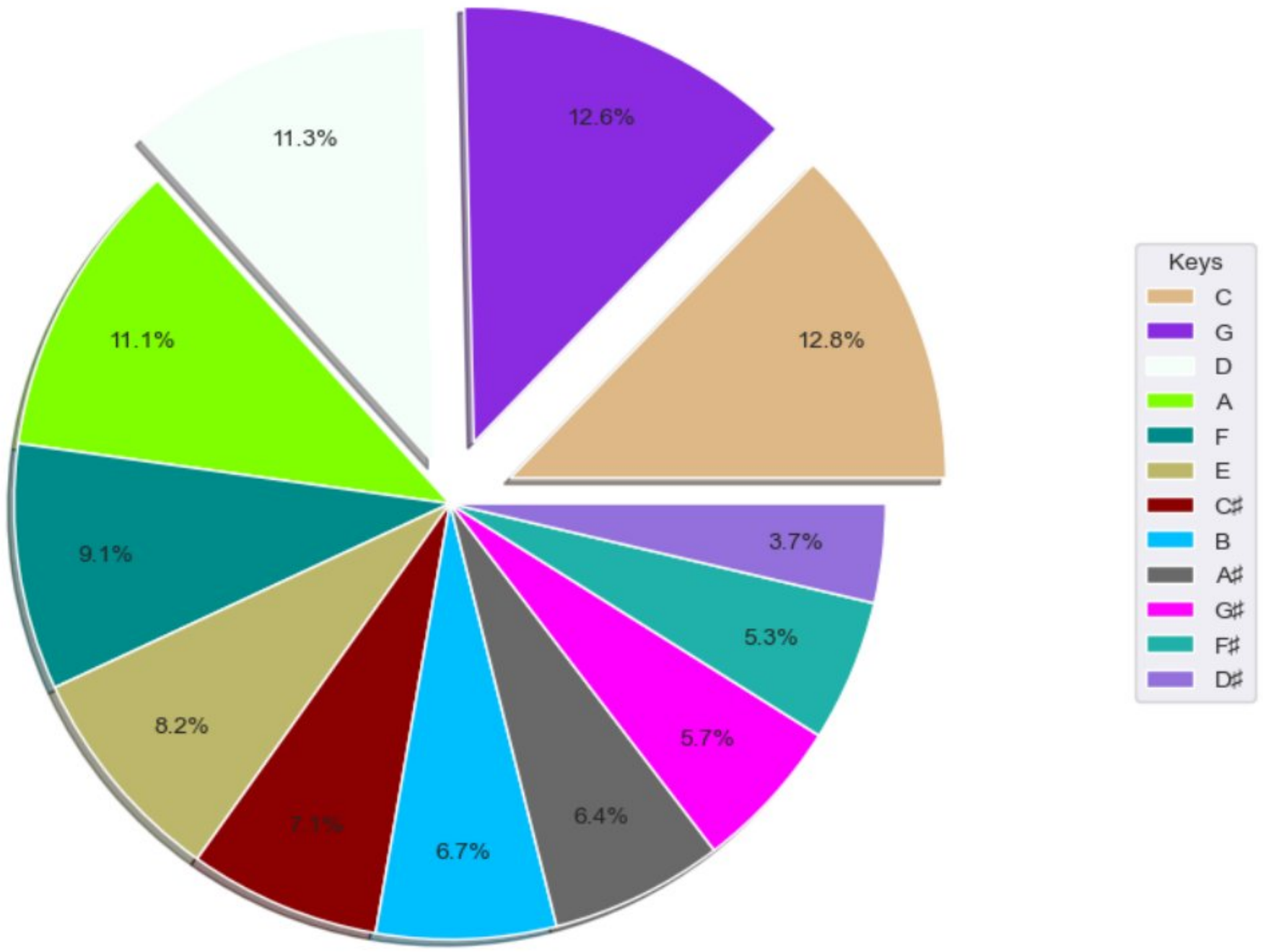
[27]:
```
key_df["key names"]= key_df.index.to_series().map(key)
key_df
```

[27]:

key	count	key names
0	74950	C
7	73779	G
2	66552	D
9	65128	A
5	53614	F
4	48220	E
1	41736	C
11	39132	B
10	37710	A
8	33460	G
6	30856	F
3	21535	D

[28]:
```
colors=["#DEB887","#8A2BE2", "#F5FFFA", "#7FFF00", "#008B8B", "#BDB76B",␣
↪"#8B0000", "#00BFFF","#696969","#FF00FF","#20B2AA","#9370DB"]
plt.figure(figsize=(12,4))
key_labels=key_df["key names"].values
key_values=key_df["count"].values
plt.pie(key_values,shadow=True,pctdistance=0.8, autopct="%.
↪1f%%",radius=2,explode=(0.3,0.3,0.
↪2,0,0,0,0,0,0,0,0,0),center=(2,3),colors=colors)
plt.legend(labels=key_labels, bbox_to_anchor=(2,1),title="Keys")
```

[28]:
```
<matplotlib.legend.Legend at 0x2289897e250>
```



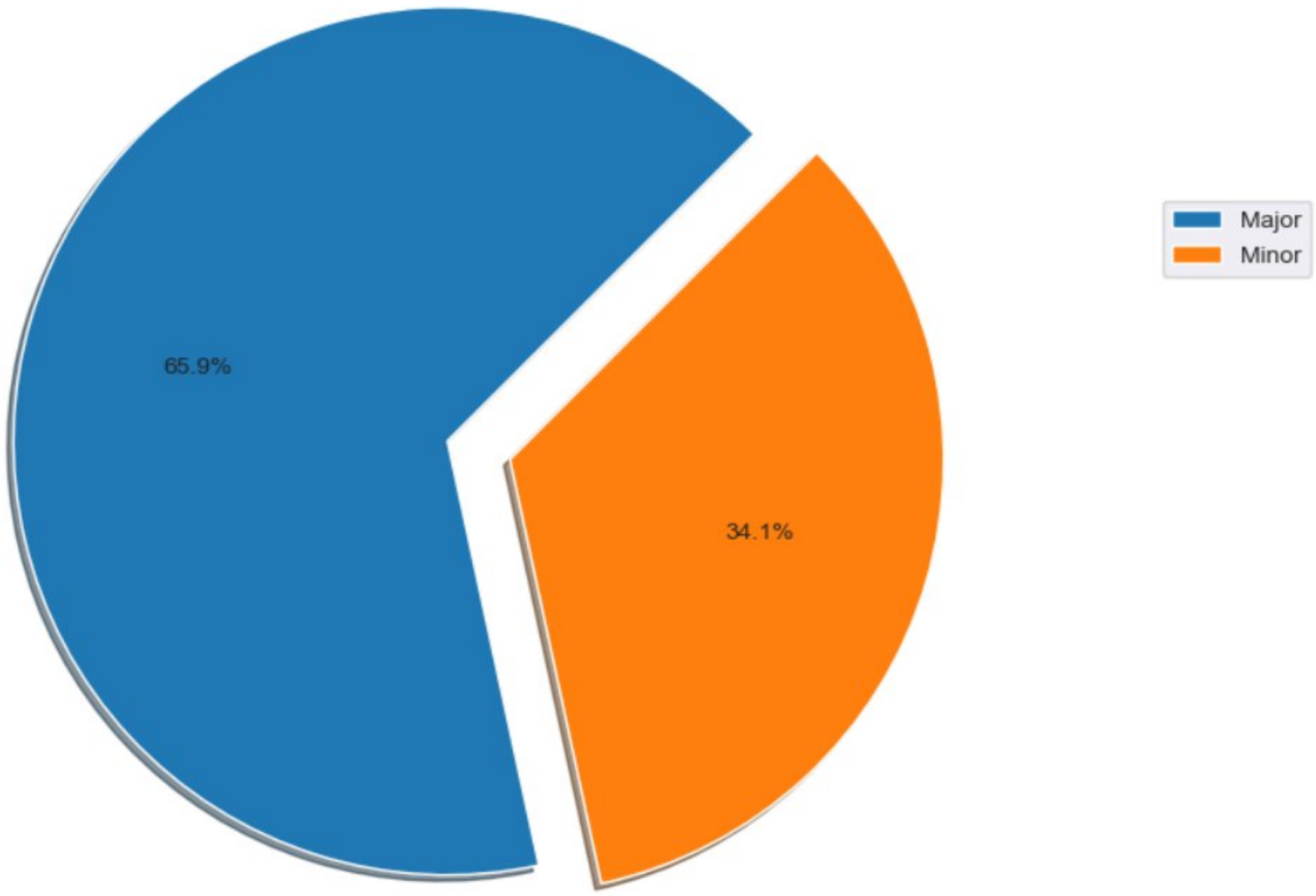
[29]:
```
mode={0:"Minor", 1:"Major"}
mode_df=pd.DataFrame(df["mode"].value_counts())
mode_df["Mode names"]=mode_df.index.to_series().map(mode)
mode_df
```

[29]:

mode	count	Mode names
1	386498	Major
0	200174	Minor

[30]:
```
plt.figure(figsize=(10,4))
mode_labels=mode_df["Mode names"].values
mode_values=mode_df["count"].values
plt.pie(mode_values,shadow=True,autopct="%.1f%%",radius=2,explode=(0.
↪3,0),center=(2,1), startangle=45)
plt.legend(labels=mode_labels, bbox_to_anchor=(2,1))
```

[30]:
```
<matplotlib.legend.Legend at 0x22898a9b490>
```



2 Genre Based Analysis

[31]:
```
artists_df = pd.read_csv("artists.csv")
tracks_df = pd.read_csv("tracks.csv")
df = pd.concat([tracks_df, artists_df["genres"]], axis=1)
```

[32]:
```
df.
↪drop(["id","name","explicit","artists","id_artists","release_date","time_signature"],axis=1
```

[32]:

	popularity	duration_ms	danceability	energy	key	loudness	mode	\
0	6.0	126903.0	0.645	0.4450	0.0	-13.338	1.0	
1	0.0	98200.0	0.695	0.2630	0.0	-22.136	1.0	
2	0.0	181640.0	0.434	0.1770	1.0	-21.180	1.0	
3	0.0	176907.0	0.321	0.0946	7.0	-27.961	1.0	
4	0.0	163080.0	0.402	0.1580	3.0	-16.900	0.0	
…	…	…	…	… …	…	…		
1162090	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
1162091	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
1162092	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
1162093	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
1162094	NaN	NaN	NaN	NaN	NaN	NaN	NaN	

```
         speechiness  acousticness  instrumentalness  liveness  valence  \
0             0.4510         0.674            0.7440     0.151    0.127
1             0.9570         0.797            0.0000     0.148    0.655
2             0.0512         0.994            0.0218     0.212    0.457
3             0.0504         0.995            0.9180     0.104    0.397
4             0.0390         0.989            0.1300     0.311    0.196
…                …             …                 …         …        …
1162090          NaN           NaN               NaN       NaN      NaN
1162091          NaN           NaN               NaN       NaN      NaN
1162092          NaN           NaN               NaN       NaN      NaN
1162093          NaN           NaN               NaN       NaN      NaN
1162094          NaN           NaN               NaN       NaN      NaN

             tempo            genres
0          104.851                []
1          102.009                []
2          130.418                []
3          169.980                []
4          103.220                []
…              …                 …
1162090        NaN  ['black comedy']
1162091        NaN                []
1162092        NaN                []
1162093        NaN  ['black comedy']
1162094        NaN    ['new comedy']

[1162095 rows x 14 columns]
```

[33]:
```
df.isna().any()
```

[33]:
```
id                 True
name               True
popularity         True
duration_ms        True
explicit           True
artists            True
id_artists         True
release_date       True
danceability       True
energy             True
key                True
loudness           True
mode               True
speechiness        True
acousticness       True
instrumentalness   True
liveness           True
```

```
valence              True
tempo                True
time_signature       True
genres              False
dtype: bool
```

[34]:
```
genre_df=df.dropna()
```

[37]:
```
genre_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 586601 entries, 0 to 586671
Data columns (total 21 columns):
 #   Column            Non-Null Count   Dtype
---  ------            --------------   -----
 0   id                586601 non-null  object
 1   name              586601 non-null  object
 2   popularity        586601 non-null  float64
 3   duration_ms       586601 non-null  float64
 4   explicit          586601 non-null  float64
 5   artists           586601 non-null  object
 6   id_artists        586601 non-null  object
 7   release_date      586601 non-null  object
 8   danceability      586601 non-null  float64
 9   energy            586601 non-null  float64
 10  key               586601 non-null  float64
 11  loudness          586601 non-null  float64
 12  mode              586601 non-null  float64
 13  speechiness       586601 non-null  float64
 14  acousticness      586601 non-null  float64
 15  instrumentalness  586601 non-null  float64
 16  liveness          586601 non-null  float64
 17  valence           586601 non-null  float64
 18  tempo             586601 non-null  float64
 19  time_signature    586601 non-null  float64
 20  genres            586601 non-null  object
dtypes: float64(15), object(6)
memory usage: 98.5+ MB
```

[38]:
```
genre_df['duration'] = genre_df['duration_ms'].apply(lambda x:round(x/1000))
genre_df.drop(['genres','key','mode'],axis=1).describe().transpose().
 ↪sort_index()
```

```
C:\Users\Admin\AppData\Local\Temp\ipykernel_10560\2083305419.py:1:
SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead
```

```
See the caveats in the documentation: https://pandas.pydata.org/pandas-
docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  genre_df['duration'] = genre_df['duration_ms'].apply(lambda x:round(x/1000))
```

[38]:

	count	mean	std	min	25%	\
acousticness	586601.0	0.449803	0.348812	0.0	0.0969	
danceability	586601.0	0.563612	0.166101	0.0	0.4530	
duration	586601.0	230.054333	126.532822	3.0	175.0000	
duration_ms	586601.0	230054.852626	126532.824981	3344.0	175083.0000	
energy	586601.0	0.542071	0.251910	0.0	0.3430	
explicit	586601.0	0.044091	0.205298	0.0	0.0000	
instrumentalness	586601.0	0.113425	0.266843	0.0	0.0000	
liveness	586601.0	0.213933	0.184328	0.0	0.0983	
loudness	586601.0	-10.205789	5.089422	-60.0	-12.8910	
popularity	586601.0	27.573212	18.369417	0.0	13.0000	
speechiness	586601.0	0.104870	0.179902	0.0	0.0340	
tempo	586601.0	118.467930	29.762942	0.0	95.6060	
time_signature	586601.0	3.873410	0.473112	0.0	4.0000	
valence	586601.0	0.552306	0.257673	0.0	0.3460	

	50%	75%	max
acousticness	0.422000	0.78400	0.996
danceability	0.577000	0.68600	0.991
duration	215.000000	264.00000	5621.000
duration_ms	214907.000000	263867.00000	5621218.000
energy	0.549000	0.74800	1.000
explicit	0.000000	0.00000	1.000
instrumentalness	0.000024	0.00955	1.000
liveness	0.139000	0.27800	1.000
loudness	-9.242000	-6.48100	5.376
popularity	27.000000	41.00000	100.000
speechiness	0.044300	0.07630	0.971
tempo	117.387000	136.32400	246.381
time_signature	4.000000	4.00000	5.000
valence	0.564000	0.76900	1.000

[39]:
```
genre_df.head()
```

[39]:

	id	name	popularity	\
0	35iwgR4jXetI318WEWsa1Q	Carve	6.0	
1	021ht4sdgPcrDgSk7JTbKY	Capítulo 2.16 - Banquero Anarquista	0.0	
2	07A5yehtSnoedViJAZkNnc	Vivo para Quererte - Remasterizado	0.0	
3	08FmqUhxtyLTn6pAh6bk45	El Prisionero - Remasterizado	0.0	
4	08y9GfoqCWfOGsKdwojr5e	Lady of the Evening	0.0	

	duration_ms	explicit	artists	id_artists	\

```
0     126903.0       0.0              ['Uli']  ['45tIt06XoI0Iio4LBEVpls']
1      98200.0       0.0  ['Fernando Pessoa']  ['14jtPCOoNZwquk5wd9DxrY']
2     181640.0       0.0  ['Ignacio Corsini']  ['5LiOoJbxVSAMkBS2fUm3X2']
3     176907.0       0.0  ['Ignacio Corsini']  ['5LiOoJbxVSAMkBS2fUm3X2']
4     163080.0       0.0     ['Dick Haymes']  ['3BiJGZsyX9sJchTqcSA7Su']

  release_date  danceability  energy  …  mode  speechiness  acousticness  \
0   1922-02-22         0.645  0.4450  …   1.0       0.4510         0.674
1   1922-06-01         0.695  0.2630  …   1.0       0.9570         0.797
2   1922-03-21         0.434  0.1770  …   1.0       0.0512         0.994
3   1922-03-21         0.321  0.0946  …   1.0       0.0504         0.995
4         1922         0.402  0.1580  …   0.0       0.0390         0.989

   instrumentalness  liveness  valence    tempo  time_signature  genres  \
0            0.7440     0.151    0.127  104.851             3.0      []
1            0.0000     0.148    0.655  102.009             1.0      []
2            0.0218     0.212    0.457  130.418             5.0      []
3            0.9180     0.104    0.397  169.980             3.0      []
4            0.1300     0.311    0.196  103.220             4.0      []

   duration
0       127
1        98
2       182
3       177
4       163

[5 rows x 22 columns]
```

[40]:
```
genre_df[genre_df['genres']=="[]"]
```

[40]:
```
                        id                                      name  \
0       35iwgR4jXetI318WEWsa1Q                                     Carve
1       021ht4sdgPcrDgSk7JTbKY  Capítulo 2.16 - Banquero Anarquista
2       07A5yehtSnoedViJAZkNnc   Vivo para Quererte - Remasterizado
3       08FmqUhxtyLTn6pAh6bk45        El Prisionero - Remasterizado
4       08y9GfoqCWfOGsKdwojr5e                 Lady of the Evening
…                          …                                     …
586667  5rgu12WBIHQtvej2MdHSH0
586668  0NuWgxEp51CutD2pJoF4OM                                 blind
586669  27Y1N4Q4U3EfDU5Ubw8ws2          What They'll Say About Us
586670  45XJsGpFTyzbzeWK8VzR8S                  A Day At A Time
586671  5Ocn6dZ3BJFPWh4ylwFXtn                  Mar de Emociones

        popularity  duration_ms  explicit                      artists  \
0              6.0     126903.0       0.0                     ['Uli']
1              0.0      98200.0       0.0       ['Fernando Pessoa']
```

```
2              0.0     181640.0       0.0                ['Ignacio Corsini']
3              0.0     176907.0       0.0                ['Ignacio Corsini']
4              0.0     163080.0       0.0                   ['Dick Haymes']
…              …         …            …                            …
586667        50.0     258267.0       0.0                     [' YueYue']
586668        72.0     153293.0       0.0                   ['ROLE MODEL']
586669        70.0     187601.0       0.0                      ['FINNEAS']
586670        58.0     142003.0       0.0  ['Gentle Bones', 'Clara Benin']
586671        38.0     214360.0       0.0                    ['Afrosound']

                                                id_artists release_date  \
0                                ['45tIt06XoI0Iio4LBEVpls']   1922-02-22
1                                ['14jtPCOoNZwquk5wd9DxrY']   1922-06-01
2                                ['5LiOoJbxVSAMkBS2fUm3X2']   1922-03-21
3                                ['5LiOoJbxVSAMkBS2fUm3X2']   1922-03-21
4                                ['3BiJGZsyX9sJchTqcSA7Su']         1922
…                                                       …            …
586667                           ['1QLBXKM5GCpyQQSVMNZqrZ']   2020-09-26
586668                           ['1dy5WNgIKQU6ezkpZs4y8z']   2020-10-21
586669                           ['37M5pPGs6V1fchFJSgCguX']   2020-09-02
586670  ['4jGPdu95icCKVF31CcFKbS', '5ebPSE9YI5aLeZ1Z2g…   2021-03-05
586671                           ['0i4Qda0k4nf7jnNHmSNpYv']   2015-07-01

        danceability  energy  …  mode  speechiness  acousticness  \
0              0.645  0.4450  …   1.0       0.4510         0.674
1              0.695  0.2630  …   1.0       0.9570         0.797
2              0.434  0.1770  …   1.0       0.0512         0.994
3              0.321  0.0946  …   1.0       0.0504         0.995
4              0.402  0.1580  …   0.0       0.0390         0.989
…                …       …  …   …    …          …             …
586667         0.560  0.5180  …   0.0       0.0292         0.785
586668         0.765  0.6630  …   1.0       0.0652         0.141
586669         0.535  0.3140  …   0.0       0.0408         0.895
586670         0.696  0.6150  …   1.0       0.0345         0.206
586671         0.686  0.7230  …   1.0       0.0363         0.105

        instrumentalness  liveness  valence    tempo  time_signature  genres  \
0               0.744000    0.1510   0.1270  104.851             3.0      []
1               0.000000    0.1480   0.6550  102.009             1.0      []
2               0.021800    0.2120   0.4570  130.418             5.0      []
3               0.918000    0.1040   0.3970  169.980             3.0      []
4               0.130000    0.3110   0.1960  103.220             4.0      []
…                    …         …       …        …                …       …
586667          0.000000    0.0648   0.2110  131.896             4.0      []
586668          0.000297    0.0924   0.6860  150.091             4.0      []
586669          0.000150    0.0874   0.0663  145.095             4.0      []
586670          0.000003    0.3050   0.4380   90.029             4.0      []
```

```
586671          0.000000    0.2640   0.9750  112.204              4.0       []

        duration
0            127
1             98
2            182
3            177
4            163
…            …
586667       258
586668       153
586669       188
586670       142
586671       214

[399952 rows x 22 columns]
```

[41]:
```
genre_df=genre_df[genre_df['genres']!="[]"]
```

[42]:
```
genre_df.head()
```

[42]:

```
                        id                                    name  popularity  \
45   1kXWSsJkBVZ1jSoI8NnEDm                                   Marta         0.0
46   1l1WkOnOkuMCzioN6l2yfJ                  Carol of the Bells             0.0
47   1lia44teZBfbv0PnPkc5dK                       Machinalement             0.0
48   1pGBOfY0PvpArBZT7GaUVK   Capítulo 2.19 - Banquero Anarquista             0.0
136  6tl1bsB5SXbsLjOndGiM7Q  El Poder de Tus Ojos - Remasterizado             0.0

     duration_ms  explicit             artists                id_artists  \
45       177693.0       0.0     ['Dick Haymes']  ['3BiJGZsyX9sJchTqcSA7Su']
46       286370.0       0.0  ['Grandcubby Trio']  ['4XVZpokXbUzg6QeomBANY9']
47       145400.0       0.0   ['Victor Boucher']  ['7vVRO2JJYvsEAEPNHQMxOQ']
48       106000.0       0.0  ['Fernando Pessoa']  ['14jtPCOoNZwquk5wd9DxrY']
136      172800.0       0.0  ['Ignacio Corsini']  ['5LiOoJbxVSAMkBS2fUm3X2']

    release_date  danceability  energy  …  mode  speechiness  acousticness  \
45          1922         0.255   0.343  …   1.0       0.0305         0.987
46          1922         0.382   0.750  …   1.0       0.0742         0.123
47          1922         0.457   0.193  …   1.0       0.0655         0.996
48    1922-06-01         0.729   0.211  …   1.0       0.9570         0.769
136   1922-03-21         0.357   0.244  …   1.0       0.0478         0.993

     instrumentalness  liveness  valence    tempo  time_signature  \
45             0.0153    0.3260    0.313  101.096             4.0
46             0.7510    0.7250    0.346  149.787             3.0
47             0.3480    0.0809    0.671  177.097             4.0
48             0.0000    0.5560    0.728  110.862             5.0
```

```
136            0.0455    0.2740    0.559   72.510             5.0
```

```
                        genres  duration
45           ['carnaval cadiz']       178
46           ['carnaval cadiz']       286
47           ['carnaval cadiz']       145
48           ['carnaval cadiz']       106
136  ['classical harp', 'harp']       173

[5 rows x 22 columns]
```

[43]:
```
genre_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 186649 entries, 45 to 586664
Data columns (total 22 columns):
 #   Column            Non-Null Count   Dtype
---  ------            --------------   -----
 0   id                186649 non-null  object
 1   name              186649 non-null  object
 2   popularity        186649 non-null  float64
 3   duration_ms       186649 non-null  float64
 4   explicit          186649 non-null  float64
 5   artists           186649 non-null  object
 6   id_artists        186649 non-null  object
 7   release_date      186649 non-null  object
 8   danceability      186649 non-null  float64
 9   energy            186649 non-null  float64
 10  key               186649 non-null  float64
 11  loudness          186649 non-null  float64
 12  mode              186649 non-null  float64
 13  speechiness       186649 non-null  float64
 14  acousticness      186649 non-null  float64
 15  instrumentalness  186649 non-null  float64
 16  liveness          186649 non-null  float64
 17  valence           186649 non-null  float64
 18  tempo             186649 non-null  float64
 19  time_signature    186649 non-null  float64
 20  genres            186649 non-null  object
 21  duration          186649 non-null  int64
dtypes: float64(15), int64(1), object(6)
memory usage: 32.8+ MB
```

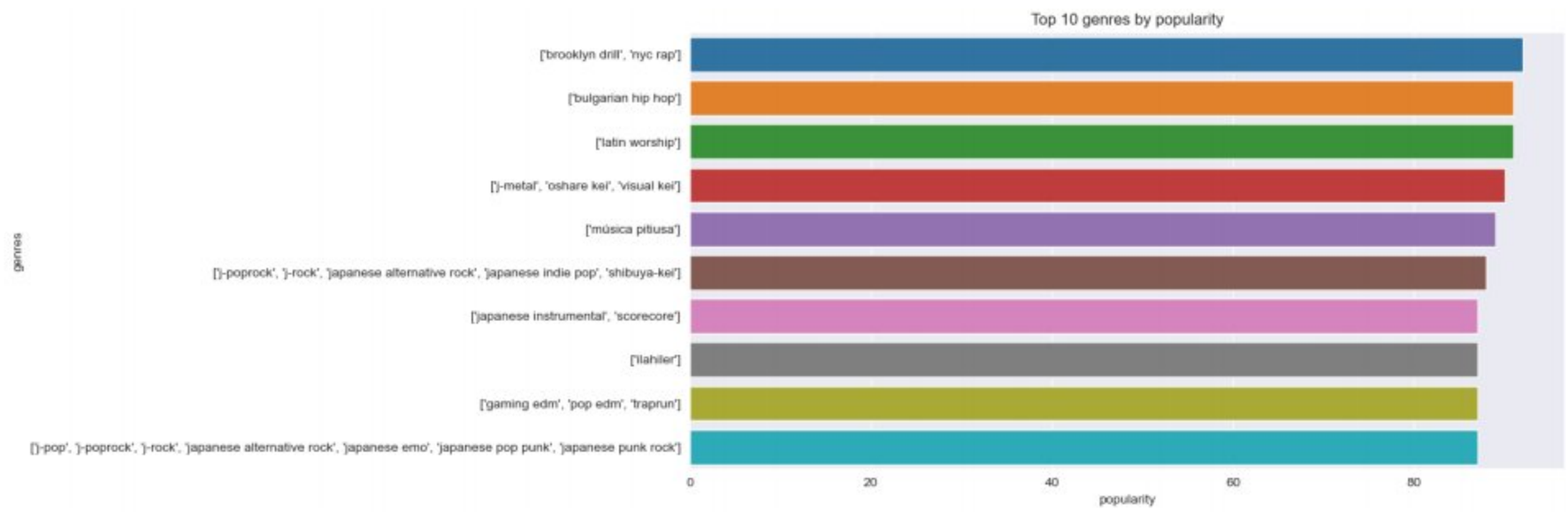
[44]:
```
genre_df.nunique()
```

[44]:
```
id                186649
name              160670
```

```
popularity            93
duration_ms        62556
explicit               2
artists            53602
id_artists         53918
release_date       16249
danceability        1161
energy              2176
key                   12
loudness           24148
mode                   2
speechiness         1645
acousticness        4779
instrumentalness    5401
liveness            1750
valence             1709
tempo              85136
time_signature         5
genres             39688
duration            1356
dtype: int64
```

[45]:
```
sns.set_style(style="darkgrid")
plt.figure(figsize=(12,6))
popu=genre_df.sort_values("popularity", ascending=False).head(10)
sns.barplot(y="genres", x="popularity", data=popu, ).set(title="Top 10 genres␣
 ↪by popularity")
```

[45]:
```
[Text(0.5, 1.0, 'Top 10 genres by popularity')]
```



[46]:
```
genre_df.sort_values("popularity", ascending=True).head(10)[["popularity",␣
 ↪"genres"]]
```

[46]:

	popularity	genres
45	0.0	['carnaval cadiz']
85715	0.0	['arabesk']
85717	0.0	['turkish classical', 'turkish instrumental']
512205	0.0	['dark clubbing']
85719	0.0	['karadeniz pop']
512203	0.0	['canadian electronic']
512195	0.0	['deep darkpsy']
512193	0.0	['goa psytrance']
85725	0.0	['ilahiler', 'turkish classical']
512188	0.0	['dark psytrance']

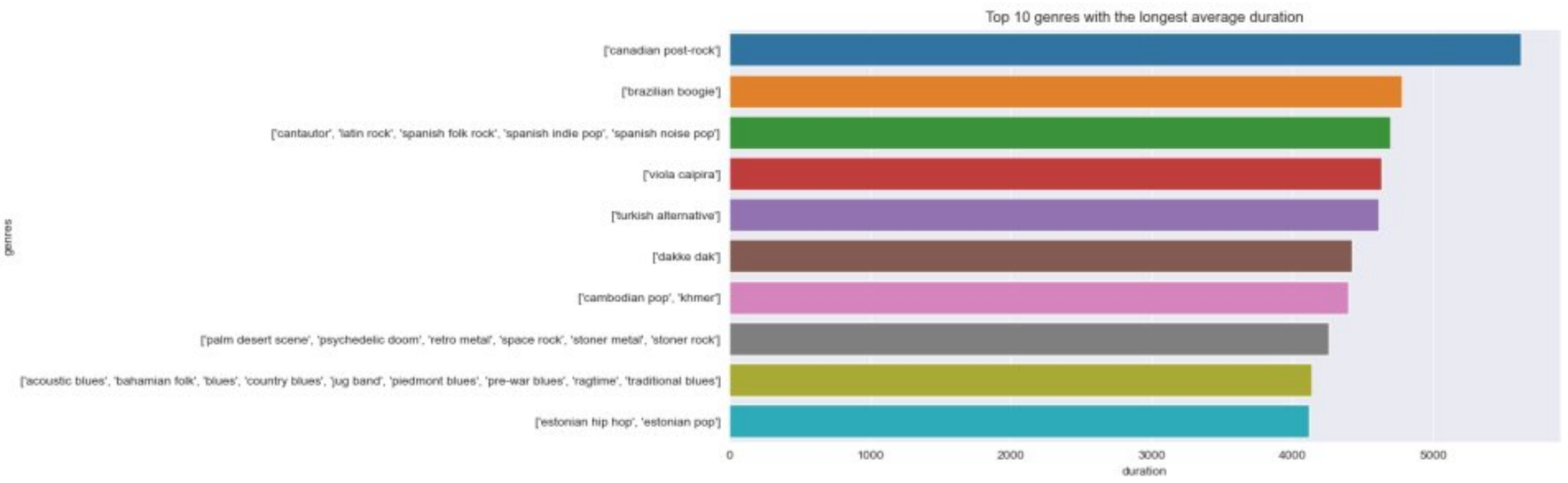
3 Duration of Genres

[47]:
```
genre_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 186649 entries, 45 to 586664
Data columns (total 22 columns):
 #   Column            Non-Null Count   Dtype
---  ------            --------------   -----
 0   id                186649 non-null  object
 1   name              186649 non-null  object
 2   popularity        186649 non-null  float64
 3   duration_ms       186649 non-null  float64
 4   explicit          186649 non-null  float64
 5   artists           186649 non-null  object
 6   id_artists        186649 non-null  object
 7   release_date      186649 non-null  object
 8   danceability      186649 non-null  float64
 9   energy            186649 non-null  float64
 10  key               186649 non-null  float64
 11  loudness          186649 non-null  float64
 12  mode              186649 non-null  float64
 13  speechiness       186649 non-null  float64
 14  acousticness      186649 non-null  float64
 15  instrumentalness  186649 non-null  float64
 16  liveness          186649 non-null  float64
 17  valence           186649 non-null  float64
 18  tempo             186649 non-null  float64
 19  time_signature    186649 non-null  float64
 20  genres            186649 non-null  object
 21  duration          186649 non-null  int64
dtypes: float64(15), int64(1), object(6)
memory usage: 32.8+ MB
```

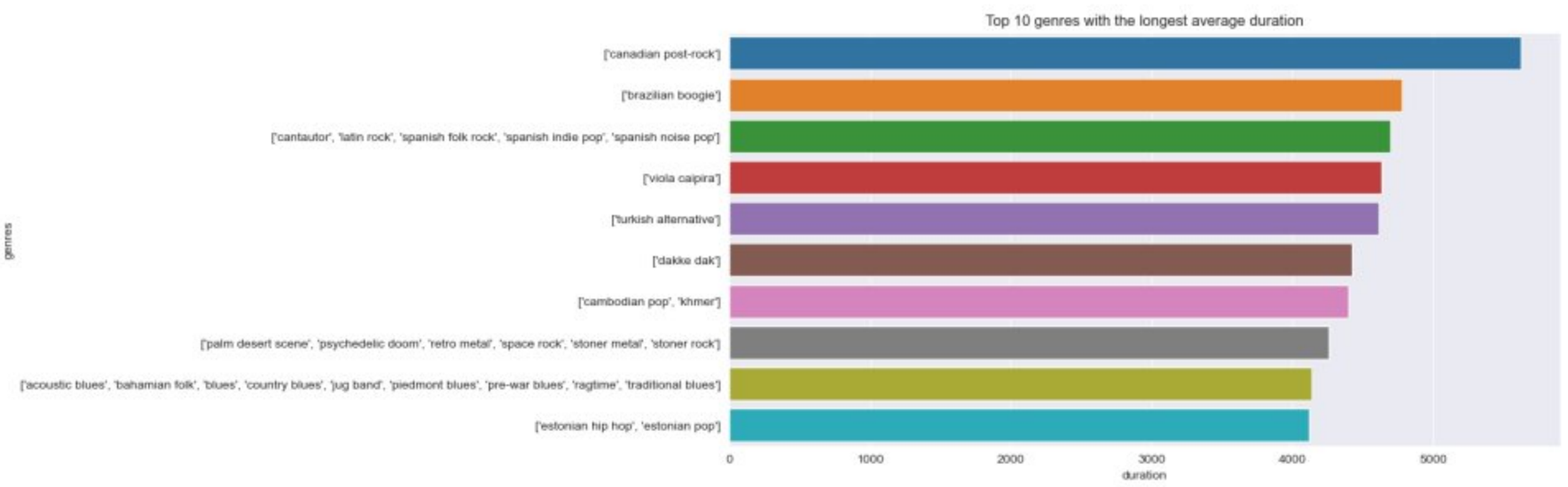
[48]:
```
sns.set_style(style="darkgrid")
plt.figure(figsize=(12,6))
dur=genre_df.sort_values("duration", ascending=False).head(10)
sns.barplot(y="genres", x="duration", data=dur ).set(title="Top 10 genres with␣
 ↪the longest average duration")
```

[48]:
```
[Text(0.5, 1.0, 'Top 10 genres with the longest average duration')]
```



[49]:
```
sns.set_style(style="darkgrid")
plt.figure(figsize=(12,6))
dur=genre_df.sort_values("duration", ascending=False).head(10)
sns.barplot(y="genres", x="duration", data=dur ).set(title="Top 10 genres with␣
 ↪the longest average duration")
```

[49]:
```
[Text(0.5, 1.0, 'Top 10 genres with the longest average duration')]
```



[50]:
```
genre_df.sort_values("duration").head(10)
```

[50]:

	id
1620	52qf3kN9pExTlHdSlh3ZeR
1575	4WeyR22Ax2fF9dY0NxgjFV
1570	4SjlyAejCNUB4MrGM1KuVp

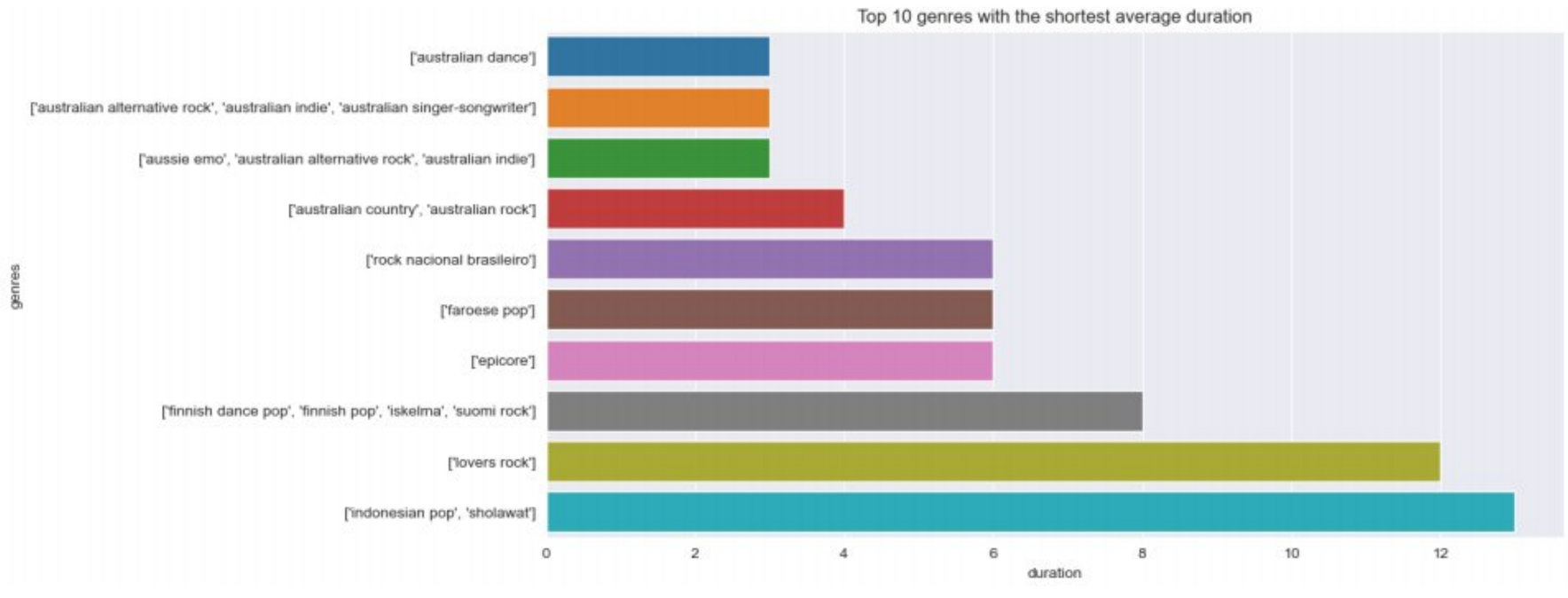
```
1580     4ZyFcBGN2aU9vgX1nD9d38
12550    3IcXTeq9O2dpsSXsDj9naH
352701   4A2ljLdaDYg6N4HXzxJhbn
12627    523qs4UcGlQ6ycdha1VGqs
15601    4LBPCzMSewb6UalrMJaTBb
158610   1N4jTBZnj2M3SOTLB8FXPs
210767   4HlJR8xpuwQH5EMEOQoyL4
```

```
                                                  name  popularity  \
1620                                        Pause Track         0.0
1575                                        Pause Track         0.0
1570                                        Pause Track         0.0
1580                                        Pause Track         0.0
12550                                 Pause Track - Live         0.0
352701                             Spectacle - Live 2019         0.0
12627                                Pause Track - Live          0.0
15601   Rhapsody on a Theme of Paganini, Op. 43: Intro…          0.0
158610                            Happy New Year 2019          0.0
210767                 Skit - Happy New Year MAPARA!!!         0.0

        duration_ms  explicit                                    artists  \
1620         3344.0       0.0                       ['Louis Armstrong']
1575         3344.0       0.0                       ['Louis Armstrong']
1570         3344.0       0.0                       ['Louis Armstrong']
1580         4000.0       0.0                       ['Louis Armstrong']
12550        5991.0       0.0                         ['Benny Goodman']
352701       6373.0       0.0                        ['The Dark Tenor']
12627        6362.0       0.0                         ['Benny Goodman']
15601        7523.0       0.0  ['Sergei Rachmaninoff', 'Leopold Stokowski']
158610      12000.0       1.0                                ['Corey-G']
210767      13284.0       0.0                         ['Skeem Sa 2015']

                                    id_artists release_date  \
1620                ['19eLuQmk9aCobbVDHc6eek']         1925
1575                ['19eLuQmk9aCobbVDHc6eek']         1925
1570                ['19eLuQmk9aCobbVDHc6eek']         1925
1580                ['19eLuQmk9aCobbVDHc6eek']         1925
12550               ['1pBuKaLHJlIlqYxQQaflve']         1938
352701              ['2GIKcsT0xfsxpYUZ5yX2tL']   2019-10-11
12627               ['1pBuKaLHJlIlqYxQQaflve']         1938
15601   ['0Kekt6CKSo0m5mivKcoH51', '52sDxFX9DvIxUupTy8…         1941
158610              ['3VSvWHcT0eMCQ4pT1mxF9b']   2019-01-01
210767              ['5WJS8w04yAX3kC75bkwB9Z']   2018-03-30

        danceability  energy  …  mode  speechiness  acousticness  \
1620             0.0   0.000  …   0.0          0.0      0.000000
1575             0.0   0.000  …   0.0          0.0      0.000000
```

```
1570              0.0   0.000  …   0.0          0.0      0.000000
1580              0.0   0.000  …   0.0          0.0      0.000000
12550             0.0   0.000  …   0.0          0.0      0.000000
352701            0.0   0.951  …   1.0          0.0      0.000003
12627             0.0   0.000  …   0.0          0.0      0.000000
15601             0.0   0.177  …   0.0          0.0      0.992000
158610            0.0   0.101  …   0.0          0.0      0.227000
210767            0.0   0.553  …   0.0          0.0      0.827000

        instrumentalness  liveness  valence  tempo  time_signature  \
1620               0.000     0.000      0.0    0.0             0.0
1575               0.000     0.000      0.0    0.0             0.0
1570               0.000     0.000      0.0    0.0             0.0
1580               0.000     0.000      0.0    0.0             0.0
12550              0.000     0.000      0.0    0.0             0.0
352701             0.990     0.000      0.0    0.0             0.0
12627              0.000     0.000      0.0    0.0             0.0
15601              0.412     0.000      0.0    0.0             0.0
158610             0.000     0.264      0.0    0.0             0.0
210767             0.000     0.278      0.0    0.0             0.0

                                                   genres  duration
1620                                  ['australian dance']         3
1575    ['australian alternative rock', 'australian in…         3
1570    ['aussie emo', 'australian alternative rock', …         3
1580           ['australian country', 'australian rock']         4
12550                    ['rock nacional brasileiro']            6
352701                                ['faroese pop']            6
12627                                     ['epicore']            6
15601   ['finnish dance pop', 'finnish pop', 'iskelma'…         8
158610                                ['lovers rock']           12
210767                  ['indonesian pop', 'sholawat']          13

[10 rows x 22 columns]
```

[51]:
```
sns.set_style(style="darkgrid")
plt.figure(figsize=(12,6))
dur_min=genre_df.sort_values("duration", ascending=True).head(10)
sns.barplot(y="genres", x="duration", data=dur_min ).set(title="Top 10 genres␣
 ↪with the shortest average duration")
```

[51]:
```
[Text(0.5, 1.0, 'Top 10 genres with the shortest average duration')]
```



[52]:
```
from collections import Counter
genre_names = " ".join(genre_df['genres'].tolist()).split(" ")
column_names = ["word","count"]
most_common_words_in_genres_df = pd.
 ↪DataFrame([dict(zip(column_names,word_count)) for word_count in␣
 ↪Counter(genre_names).most_common(30)])
```

[53]:
```
most_common_words_in_genres_df
```

[53]:

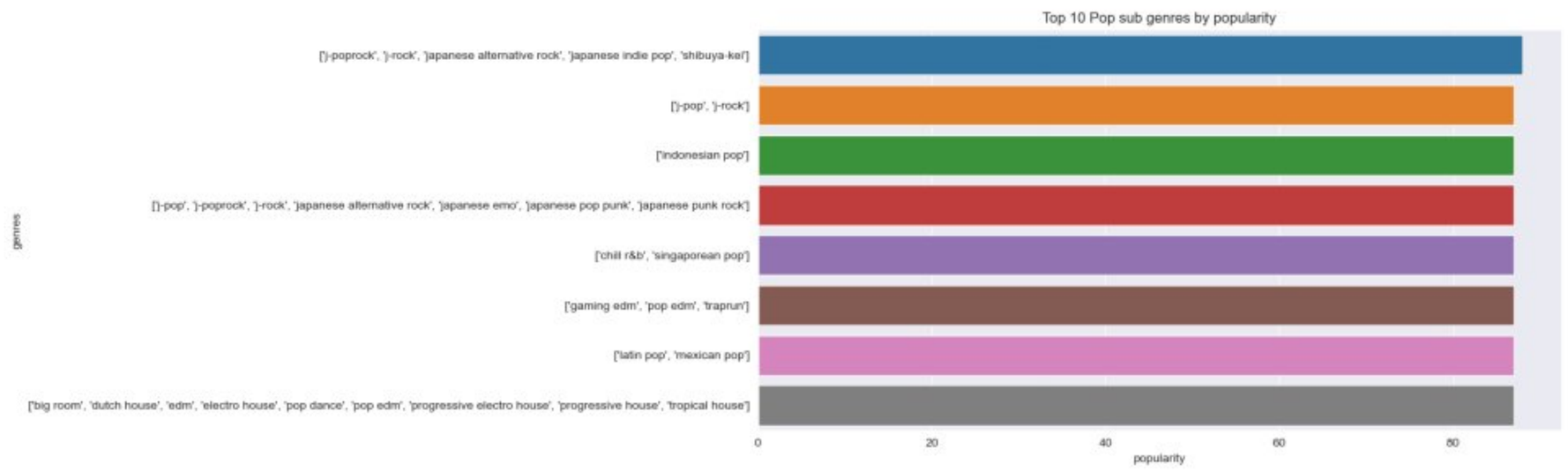
	word	count
0	pop']	18642
1	pop',	12664
2	hip	12569
3	rock',	11098
4	rock']	10485
5	['classic	7232
6	indie']	6818
7	hop']	6703
8	hop',	6596
9	metal',	6557
10	['deep	5384
11	metal']	4531
12	indie',	3846
13	folk']	3738
14	house']	3713
15	rap']	3362
16	house',	3358
17	jazz']	3337
18	'pop	2848
19	'indie	2765
20	['german	2759
21	punk']	2713

```
22       folk',   2512
23     ['musica   2465
24        rap',   2388
25  alternative   2241
26      ['indie   2219
27         'new   2190
28        jazz',   2185
29   ['japanese   2167
```

[54]:
```
pop_df=genre_df[genre_df["genres"].str.contains("pop")].
 ↪sort_values("popularity", ascending=False).head(10)
metal_df=genre_df[genre_df["genres"].str.contains("metal")].
 ↪sort_values("popularity", ascending=False).head(10)
indie_df=genre_df[genre_df["genres"].str.contains("indie")].
 ↪sort_values("popularity", ascending=False).head(10)
rock_df=genre_df[genre_df["genres"].str.contains("rock")].
 ↪sort_values("popularity", ascending=False).head(10)
```

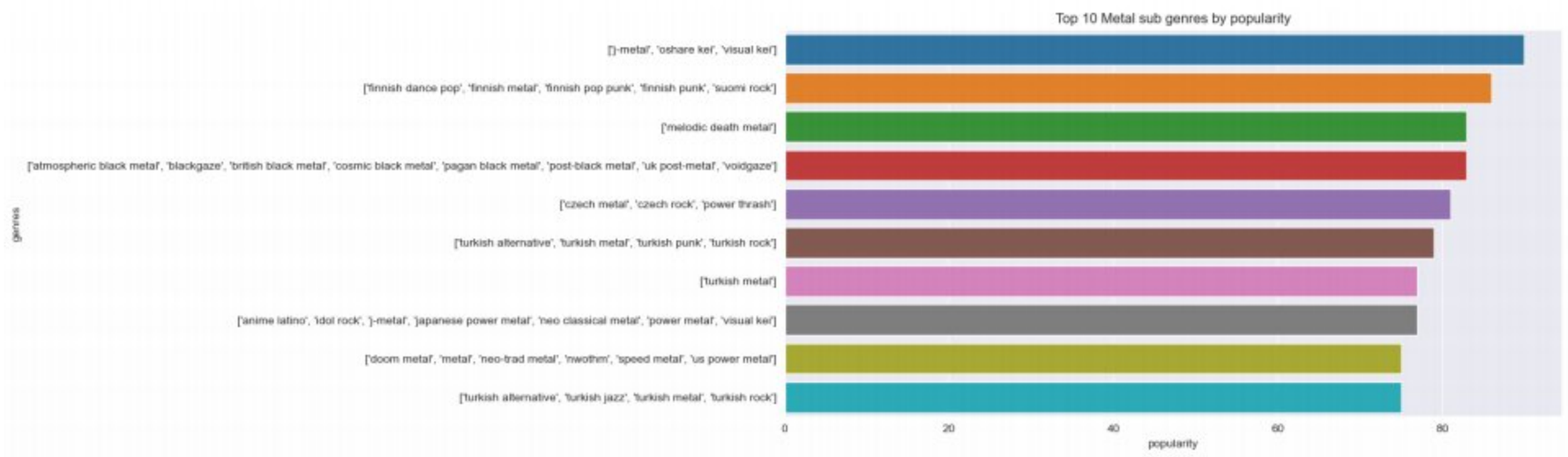
[55]:
```
plt.figure(figsize=(12,6))
sns.barplot(y="genres", x="popularity", data=pop_df).set(title="Top 10 Pop sub␣
 ↪genres by popularity")
```

[55]: [Text(0.5, 1.0, 'Top 10 Pop sub genres by popularity')]



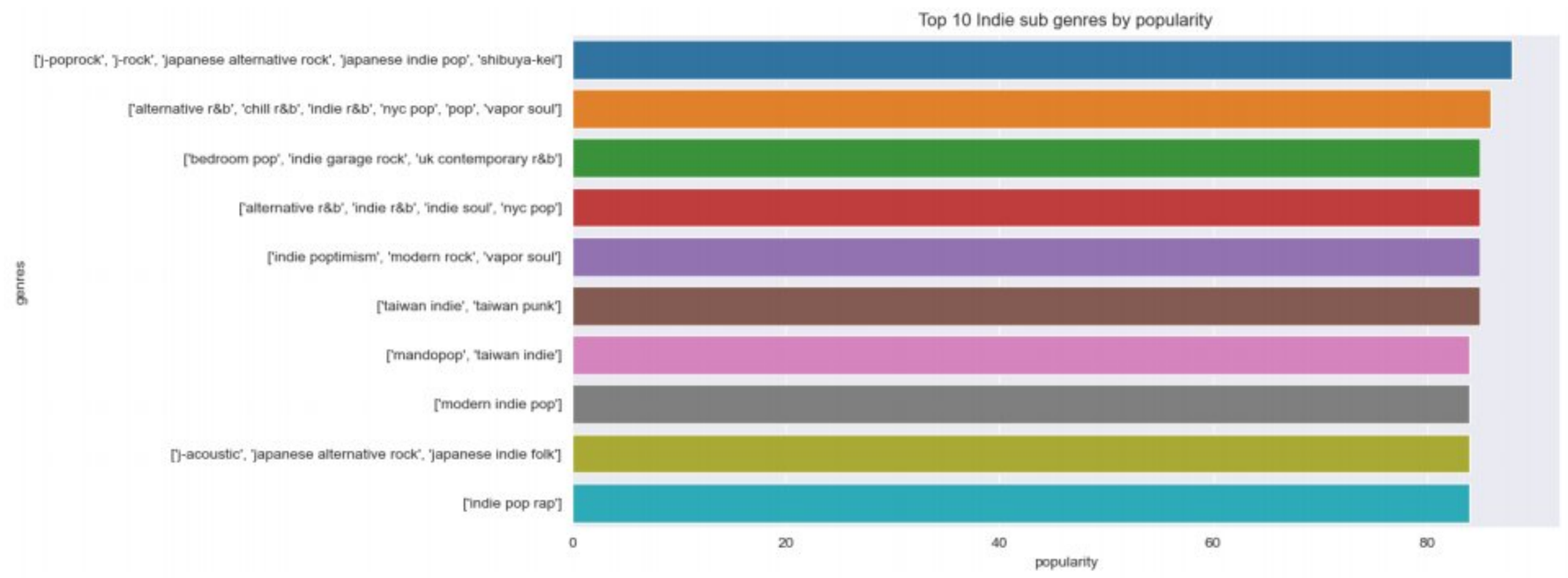
[56]:
```
plt.figure(figsize=(12,6))
sns.barplot(y="genres", x="popularity", data=metal_df).set(title="Top 10 Metal␣
 ↪sub genres by popularity")
```

[56]: [Text(0.5, 1.0, 'Top 10 Metal sub genres by popularity')]



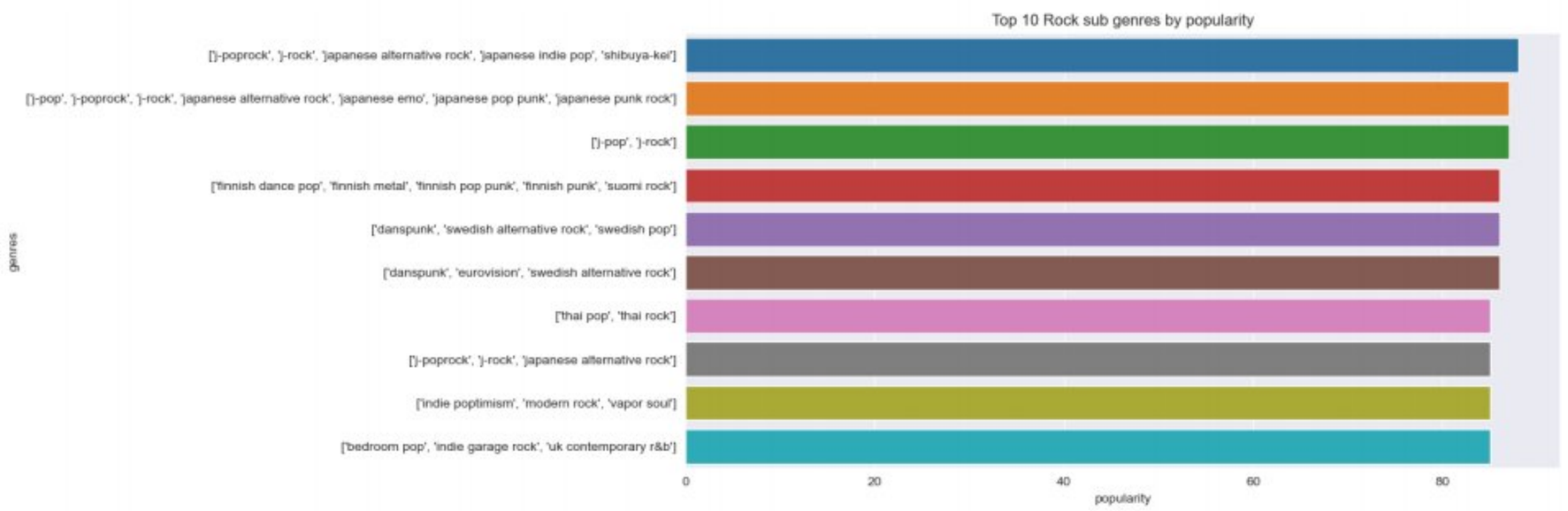
[57]:
```
plt.figure(figsize=(12,6))
sns.barplot(y="genres", x="popularity", data=indie_df).set(title="Top 10 Indie␣
↪sub genres by popularity")
```

[57]: [Text(0.5, 1.0, 'Top 10 Indie sub genres by popularity')]



[58]:
```
plt.figure(figsize=(12,6))
sns.barplot(y="genres", x="popularity", data=rock_df).set(title="Top 10 Rock␣
↪sub genres by popularity")
```

[58]: [Text(0.5, 1.0, 'Top 10 Rock sub genres by popularity')]



4 Artist based Analysis

[84]:
```
artists= pd.read_csv("artists.csv")
```

[85]:
```
artists.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1162095 entries, 0 to 1162094
Data columns (total 5 columns):
 #   Column      Non-Null Count    Dtype
---  ------      --------------    -----
 0   id          1162095 non-null  object
 1   followers   1162084 non-null  float64
 2   genres      1162095 non-null  object
 3   name        1162092 non-null  object
 4   popularity  1162095 non-null  int64
dtypes: float64(1), int64(1), object(3)
memory usage: 44.3+ MB
```

[94]:
```
art=artists.drop(["id","name","popularity"],axis=1)
```

[95]:
```
tracks = pd.read_csv("tracks.csv")
artists_df = pd.concat([tracks_df, art], axis=1)
```

[96]:
```
artists_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1162095 entries, 0 to 1162094
Data columns (total 22 columns):
 #   Column            Non-Null Count    Dtype
---  ------            --------------    -----
 0   id                586672 non-null   object
 1   name              586601 non-null   object
```

```
2   popularity        586672 non-null   float64
3   duration_ms       586672 non-null   float64
4   explicit          586672 non-null   float64
5   artists           586672 non-null   object
6   id_artists        586672 non-null   object
7   release_date      586672 non-null   object
8   danceability      586672 non-null   float64
9   energy            586672 non-null   float64
10  key               586672 non-null   float64
11  loudness          586672 non-null   float64
12  mode              586672 non-null   float64
13  speechiness       586672 non-null   float64
14  acousticness      586672 non-null   float64
15  instrumentalness  586672 non-null   float64
16  liveness          586672 non-null   float64
17  valence           586672 non-null   float64
18  tempo             586672 non-null   float64
19  time_signature    586672 non-null   float64
20  followers         1162084 non-null  float64
21  genres            1162095 non-null  object
dtypes: float64(16), object(6)
memory usage: 195.1+ MB
```

[97]:
```
artists_df["artists"].value_counts()
```

[97]:
```
artists
['Die drei ???']                    3856
['TKKG Retro-Archiv']               2006
['Benjamin Blümchen']               1503
['Bibi Blocksberg']                 1472
['Lata Mangeshkar']                 1373
                                    …
['IU', 'Jang Yi-jeong']                1
[' ']                                  1
['Vincy Chan', ' ']                    1
['Dough-Boy']                          1
['Gentle Bones', 'Clara Benin']        1
Name: count, Length: 114030, dtype: int64
```

[113]:
```
artists_df['release_date'] = pd.
 ↪to_datetime(artists_df['release_date'],format='mixed')
artists_df['year'] = artists_df['release_date'].dt.year
artists_df.dropna
```

[113]:
```
<bound method DataFrame.dropna of                                      id
name  \
0         35iwgR4jXetI318WEWsa1Q                                 Carve
```

```
1         021ht4sdgPcrDgSk7JTbKY  Capítulo 2.16 - Banquero Anarquista
2         07A5yehtSnoedViJAZkNnc   Vivo para Quererte - Remasterizado
3         08FmqUhxtyLTn6pAh6bk45        El Prisionero - Remasterizado
4         08y9GfoqCWfOGsKdwojr5e                    Lady of the Evening
…                            …                                    …
1162090                    NaN                                  NaN
1162091                    NaN                                  NaN
1162092                    NaN                                  NaN
1162093                    NaN                                  NaN
1162094                    NaN                                  NaN

          popularity  duration_ms  explicit                artists  \
0                6.0     126903.0       0.0                ['Uli']
1                0.0      98200.0       0.0  ['Fernando Pessoa']
2                0.0     181640.0       0.0  ['Ignacio Corsini']
3                0.0     176907.0       0.0  ['Ignacio Corsini']
4                0.0     163080.0       0.0      ['Dick Haymes']
…                …            …         …                    …
1162090          NaN          NaN       NaN                  NaN
1162091          NaN          NaN       NaN                  NaN
1162092          NaN          NaN       NaN                  NaN
1162093          NaN          NaN       NaN                  NaN
1162094          NaN          NaN       NaN                  NaN

                        id_artists release_date  danceability  energy  …  \
0        ['45tIt06XoI0Iio4LBEVpls']   1922-02-22         0.645  0.4450  …
1        ['14jtPCOoNZwquk5wd9DxrY']   1922-06-01         0.695  0.2630  …
2        ['5LiOoJbxVSAMkBS2fUm3X2']   1922-03-21         0.434  0.1770  …
3        ['5LiOoJbxVSAMkBS2fUm3X2']   1922-03-21         0.321  0.0946  …
4        ['3BiJGZsyX9sJchTqcSA7Su']   1922-01-01         0.402  0.1580  …
…                               …            …             …       …  …
1162090                        NaN          NaT           NaN     NaN  …
1162091                        NaN          NaT           NaN     NaN  …
1162092                        NaN          NaT           NaN     NaN  …
1162093                        NaN          NaT           NaN     NaN  …
1162094                        NaN          NaT           NaN     NaN  …

          acousticness  instrumentalness  liveness  valence    tempo  \
0                0.674            0.7440     0.151    0.127  104.851
1                0.797            0.0000     0.148    0.655  102.009
2                0.994            0.0218     0.212    0.457  130.418
3                0.995            0.9180     0.104    0.397  169.980
4                0.989            0.1300     0.311    0.196  103.220
…                …                …          …        …        …
1162090            NaN               NaN       NaN      NaN      NaN
1162091            NaN               NaN       NaN      NaN      NaN
1162092            NaN               NaN       NaN      NaN      NaN
```

```
1162093           NaN                NaN        NaN      NaN      NaN
1162094           NaN                NaN        NaN      NaN      NaN

         time_signature  followers               genres    year   years
0                   3.0        0.0                   []  1922.0  1922.0
1                   1.0        5.0                   []  1922.0  1922.0
2                   5.0        0.0                   []  1922.0  1922.0
3                   3.0        0.0                   []  1922.0  1922.0
4                   4.0        2.0                   []  1922.0  1922.0
…                   …          …                     …       …       …
1162090             NaN     4831.0  ['black comedy']      NaN     NaN
1162091             NaN       46.0                   []      NaN     NaN
1162092             NaN      257.0                   []      NaN     NaN
1162093             NaN     2357.0  ['black comedy']      NaN     NaN
1162094             NaN       40.0    ['new comedy']      NaN     NaN

[1162095 rows x 24 columns]>
```

[114]:
```
years=artists_df.year.unique()
years
```

[114]:
```
array([1922., 1923., 1924., 1925., 1926., 1927., 1928., 1929., 1930.,
       1931., 1932., 1933., 1934., 1935., 1936., 1937., 1938., 1939.,
       1940., 1941., 1942., 1943., 1944., 1945., 1946., 1947., 1948.,
       1949., 1950., 1951., 1952., 1953., 1954., 1955., 1956., 1957.,
       1958., 1959., 1960., 1961., 1962., 1963., 1964., 1965., 1966.,
       1968., 2008., 2020., 2018., 1997., 2006., 1991., 2012., 2015.,
       2011., 1992., 2007., 1996., 2021., 2013., 2014., 2017., 1967.,
       1969., 1970., 1971., 1972., 1973., 1974., 1975., 1976., 1977.,
       1978., 1979., 1980., 1981., 1982., 1983., 1984., 1985., 1986.,
       1987., 1988., 1989., 1990., 1993., 1994., 1995., 1998., 1999.,
       2000., 2019., 2016., 2010., 2009., 2004., 2003., 2005., 2001.,
       2002., 1900.,   nan])
```

[125]:
```
artists_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1162095 entries, 0 to 1162094
Data columns (total 25 columns):
 #   Column            Non-Null Count    Dtype
---  ------            --------------    -----
 0   id                586672 non-null   object
 1   name              586601 non-null   object
 2   popularity        586672 non-null   float64
 3   duration_ms       586672 non-null   float64
 4   explicit          586672 non-null   float64
 5   artists           586672 non-null   object
```

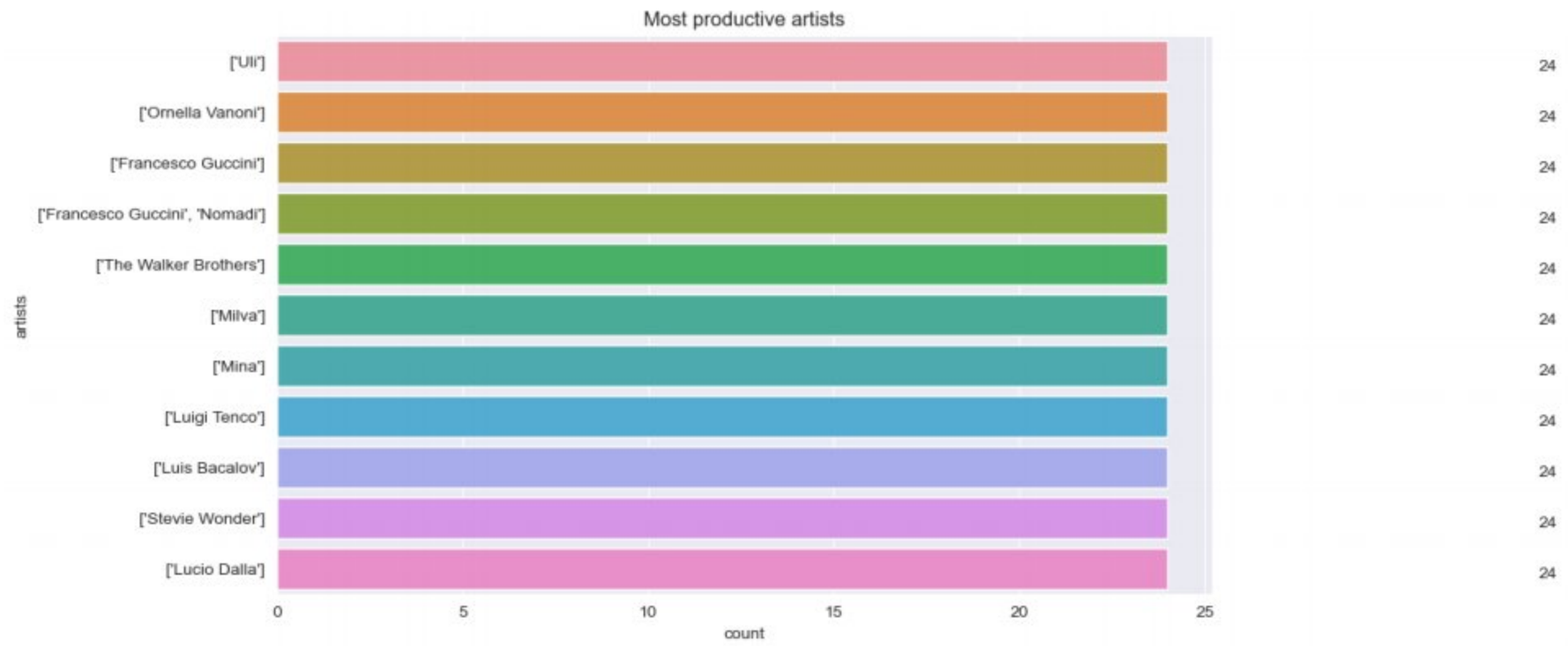
```
6   id_artists         586672 non-null   object
7   release_date       586672 non-null   datetime64[ns]
8   danceability       586672 non-null   float64
9   energy             586672 non-null   float64
10  key                586672 non-null   float64
11  loudness           586672 non-null   float64
12  mode               586672 non-null   float64
13  speechiness        586672 non-null   float64
14  acousticness       586672 non-null   float64
15  instrumentalness   586672 non-null   float64
16  liveness           586672 non-null   float64
17  valence            586672 non-null   float64
18  tempo              586672 non-null   float64
19  time_signature     586672 non-null   float64
 20  followers          1162084 non-null  float64
 21  genres             1162095 non-null  object
 22  year               586672 non-null   float64
 23  years              586672 non-null   float64
 24  count              0 non-null        float64
dtypes: datetime64[ns](1), float64(19), object(5)
memory usage: 221.7+ MB
```

[137]:
```
artists_df["count"] = artists_df.count(axis=1)
artists_df.drop(["followers","genres"],axis=1)
artists_df.dropna
```

[137]:
```
<bound method DataFrame.dropna of                                      id
name  \
0          35iwgR4jXetI318WEWsa1Q                                 Carve
1          021ht4sdgPcrDgSk7JTbKY  Capítulo 2.16 - Banquero Anarquista
2          07A5yehtSnoedViJAZkNnc   Vivo para Quererte - Remasterizado
3          08FmqUhxtyLTn6pAh6bk45        El Prisionero - Remasterizado
4          08y9GfoqCWfOGsKdwojr5e                 Lady of the Evening
…                             …                                    …
1162090                      NaN                                  NaN
1162091                      NaN                                  NaN
1162092                      NaN                                  NaN
1162093                      NaN                                  NaN
1162094                      NaN                                  NaN

           popularity  duration_ms  explicit             artists  \
0                 6.0     126903.0       0.0             ['Uli']
1                 0.0      98200.0       0.0  ['Fernando Pessoa']
2                 0.0     181640.0       0.0  ['Ignacio Corsini']
3                 0.0     176907.0       0.0  ['Ignacio Corsini']
4                 0.0     163080.0       0.0     ['Dick Haymes']
…                   …          …         …                   …
```

```
1162090         NaN           NaN       NaN                   NaN
1162091         NaN           NaN       NaN                   NaN
1162092         NaN           NaN       NaN                   NaN
1162093         NaN           NaN       NaN                   NaN
1162094         NaN           NaN       NaN                   NaN

                          id_artists release_date  danceability  energy  …  \
0         ['45tIt06XoI0Iio4LBEVpls']   1922-02-22         0.645  0.4450  …
1         ['14jtPCOoNZwquk5wd9DxrY']   1922-06-01         0.695  0.2630  …
2         ['5LiOoJbxVSAMkBS2fUm3X2']   1922-03-21         0.434  0.1770  …
3         ['5LiOoJbxVSAMkBS2fUm3X2']   1922-03-21         0.321  0.0946  …
4         ['3BiJGZsyX9sJchTqcSA7Su']   1922-01-01         0.402  0.1580  …
…                                …          …             …      …  …
1162090                          NaN         NaT           NaN     NaN  …
1162091                          NaN         NaT           NaN     NaN  …
1162092                          NaN         NaT           NaN     NaN  …
1162093                          NaN         NaT           NaN     NaN  …
1162094                          NaN         NaT           NaN     NaN  …

         instrumentalness  liveness  valence    tempo  time_signature  \
0                  0.7440     0.151    0.127  104.851             3.0
1                  0.0000     0.148    0.655  102.009             1.0
2                  0.0218     0.212    0.457  130.418             5.0
3                  0.9180     0.104    0.397  169.980             3.0
4                  0.1300     0.311    0.196  103.220             4.0
…                     …         …        …        …                …
1162090               NaN       NaN      NaN      NaN             NaN
1162091               NaN       NaN      NaN      NaN             NaN
1162092               NaN       NaN      NaN      NaN             NaN
1162093               NaN       NaN      NaN      NaN             NaN
1162094               NaN       NaN      NaN      NaN             NaN

         followers            genres    year   years  count
0              0.0                []  1922.0  1922.0     24
1              5.0                []  1922.0  1922.0     24
2              0.0                []  1922.0  1922.0     24
3              0.0                []  1922.0  1922.0     24
4              2.0                []  1922.0  1922.0     24
…              …                  …       …       …       …
1162090     4831.0  ['black comedy']     NaN     NaN       2
1162091       46.0                []     NaN     NaN       2
1162092      257.0                []     NaN     NaN       2
1162093     2357.0  ['black comedy']     NaN     NaN       2
1162094       40.0    ['new comedy']     NaN     NaN       2

[1162095 rows x 25 columns]>
```

[138]:
```
plt.figure(figsize=(10,6))
plot1=sns.barplot(data=artists_df.sort_values("count", ascending=False).
 ↪head(20),x="count" ,y="artists")
plt.title("Most productive artists")
for p in plot1.patches:
    width = p.get_width()
    plt.text(10+p.get_width(), p.get_y()+0.65*p.get_height(),
             '{:1.0f}'.format(width),
             ha='left', va='center')
```



[150]:
```
tracks = pd.read_csv("tracks.csv")
genre_w_df = pd.concat([tracks_df, art], axis=1)
genre_w_df.dropna(axis=1)
```

[150]:

	genres
0	[]
1	[]
2	[]
3	[]
4	[]
…	…
1162090	['black comedy']
1162091	[]
1162092	[]
1162093	['black comedy']
1162094	['new comedy']

[1162095 rows x 1 columns]

[ ]: