```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
Matplotlib is building the font cache; this may take a moment.
Sdf = pd.read csv(r"C:\New folder\spotify-2023.csv", encoding='ISO-
8859-1')
Sdf.head()
                            track name
                                         artist(s) name
                                                         artist count
O Seven (feat. Latto) (Explicit Ver.) Latto, Jung Kook
                                                                    2
                                  LALA
                                                                     1
1
                                            Myke Towers
2
                                          Olivia Rodrigo
                                                                     1
                               vampire
3
                          Cruel Summer
                                           Taylor Swift
                                                                     1
                        WHERE SHE GOES
                                               Bad Bunny
                                                                    1
   released_year released_month released day
in_spotify_playlists
            2023
                               7
                                            14
                                                                553
1
            2023
                               3
                                            23
                                                                1474
2
            2023
                               6
                                            30
                                                                1397
3
            2019
                                            23
                                                                7858
            2023
                               5
                                            18
                                                                3133
   in spotify charts
                        streams in apple playlists
                                                         bpm key
mode \
                 147
                      141381703
                                                          125
                                                 43 ...
Major
                  48
                      133716286
                                                 48 ...
                                                          92 C#
Major
                 113 140003974
                                                 94 ...
                                                          138 F
Major
                 100
                     800840817
                                                116 ...
                                                          170 A
Major
                  50 303236322
                                                 84 ...
                                                         144 A
Minor
```

```
danceability_% valence_% energy_% acousticness_% instrumentalness
%
0
               80
                          89
                                    83
                                                    31
0
1
               71
                          61
                                    74
                                                     7
0
2
               51
                                                    17
                          32
                                    53
0
3
               55
                          58
                                    72
                                                    11
0
4
               65
                          23
                                    80
                                                    14
63
   liveness %
                speechiness %
0
            8
1
           10
                             4
2
                             6
           31
3
           11
                            15
4
           11
                             6
[5 rows x 24 columns]
Sdf.info()
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 953 entries, 0 to 952
Data columns (total 24 columns):
#
     Column
                             Non-Null Count
                                              Dtype
 0
                             953 non-null
     track name
                                              object
 1
     artist(s) name
                             953 non-null
                                              object
 2
     artist_count
                             953 non-null
                                              int64
 3
     released_year
                             953 non-null
                                              int64
 4
     released month
                             953 non-null
                                              int64
 5
     released_day
                             953 non-null
                                              int64
     in_spotify_playlists
 6
                             953 non-null
                                              int64
 7
     in_spotify_charts
                             953 non-null
                                              int64
 8
                             953 non-null
     streams
                                              object
 9
     in_apple_playlists
                             953 non-null
                                              int64
     in_apple_charts
 10
                             953 non-null
                                              int64
 11
     in_deezer_playlists
                             953 non-null
                                              object
 12
     in deezer charts
                             953 non-null
                                              int64
 13
     in shazam charts
                             903 non-null
                                              object
 14
     bpm
                             953 non-null
                                              int64
 15
     key
                             858 non-null
                                              object
 16
     mode
                             953 non-null
                                              object
 17
     danceability %
                             953 non-null
                                              int64
 18
                             953 non-null
     valence %
                                              int64
 19
                             953 non-null
                                              int64
     energy_%
 20
     acousticness_%
                             953 non-null
                                              int64
```

track name artist(s)_name artist_count released_year released_month \ 0 False False False False False False False False	21 instrumentalness_% 953 non-null int64 22 liveness_% 953 non-null int64 23 speechiness_% 953 non-null int64 dtypes: int64(17), object(7) memory usage: 178.8+ KB								
released_month \ 0	Sdf.isnu	ull()							
False			t(s)_name art	ist_count i	released_year				
Talse False		_ False	False	False	False				
False	1	False	False	False	False				
False	2	False	False	False	False				
4 False False False False False False 948 False False False False False False 949 False False False False False 950 False False False False False 951 False False False False False 952 False False False False False False released_day in_spotify_playlists in_spotify_charts streams \ 0 False False False False False False 1 False False False False False False 2 False False False False False False 3 False False False False False False 4 False False False False False False 94 False False False False False 950 False False False False False False 951 False False False False False False 952 False False False False False False 9552 False False False False False False in_apple_playlists bpm key mode danceability_% valence_% \ 0 False False False False False	3	False	False	False	False				
	4	False	False	False	False				
948 False False False False False False 949 False False False False False 950 False False False False 951 False False False False 952 False False False False False released_day in_spotify_playlists in_spotify_charts streams \ 0 False False False False False False 1 False False False False False False 2 False False False False False 3 False False False False False False 4 False False False False False 949 False False False False False 950 False False False False False 951 False False False False False 952 False False False False False 953 False False False False False 954 False False False False False 955 False False False False False 956 False False False False False 957 False False False False False 958 False False False False False 959 False False False False False									
False 949 False False False False 950 False False False 951 False False False False 952 False 952 False False False False False released_day in_spotify_playlists in_spotify_charts streams \ 0 False False False False False False 1 False False False False False False 2 False False False False False False 3 False False False False False False 4 False False False False False 5 False False False False 6 False False False False 950 False False False False False 951 False False False False False 952 False False False False False 953 False False False False False 954 False False False False 955 False False False False False 956 False False False False False 957 False False False False False 958 False False False False 959 False False False False False 950 False False False False False		False	False	False	False				
False 950 False False False False False 951 False False False False False 952 False False False False False released_day in_spotify_playlists in_spotify_charts streams \ 0 False False False False False False 1 False False False False False False 2 False False False False False 3 False False False False False 4 False False False False False 5 False False False False 6 False False False False 7 False False False False 949 False False False False 950 False False False False False 951 False False False False False 952 False False False False False 953 False False False False 954 False False False False 955 False False False False False 956 False False False False False 957 False False False False False 958 False False False False False 959 False False False False	False								
False 951 False False False False 952 False False False False 952 False released_day in_spotify_playlists in_spotify_charts streams \ 0 False False False False False False 1 False False False False False False 2 False False False False False False 3 False False False False False False 4 False False False False False 5 False False False False 6 False False False False 949 False False False False False 950 False False False False False 951 False False False False False 952 False False False False False in_apple_playlists bpm key mode danceability_% valence_% \ 0 False False False False False	False								
False 952 False False False False False released_day in_spotify_playlists in_spotify_charts streams \ 0 False False False False False 1 False False False False False 2 False False False False False 3 False False False False False 4 False False False False False 5 False False False False False 6 False False False False 7 False False False False 8 False False False False 950 False False False False 951 False False False False 952 False False False False 953 False False False False 954 False False False False 955 False False False False 956 False False False False 957 False False False False 958 False False False False 959 False False False False		False	False	False	False				
False		False	False	False	False				
released_day in_spotify_playlists in_spotify_charts streams \ 0 False	952	False	False	False	False				
<pre>0 False</pre>		looged day in	anatify playli	ata in anot	tify charts o	+ manma \			
948 False False False False 949 False False False 950 False False False False 951 False False False False 952 False False False False in_apple_playlists bpm key mode danceability_% valence_% \ 0 False False False False False	0 1 2 3 4	False False False False False	Fa Fa Fa Fa	alse alse alse alse alse	False False False False False	False False False False False			
951 False False False False 952 False False False False in_apple_playlists bpm key mode danceability_% valence_% \ 0 False False False False False	948 949	False False	Fa	alse alse	False False	False False			
valence_% \ 0 False False False False	951	False	Fa	lse	False	False			
False False False False False									
	0		e False	False Fals	se F	alse			

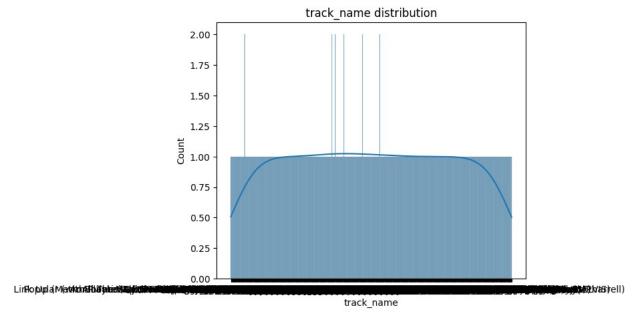
False	1		False		False	False	False	False
False 3 False False False False False False 4 False False False False False 4 False False False False False False 5			Falco		Eal co	Falso	Eal co	Falco
False			ratse		гасѕе	ratse	ratse	ratse
False	3		False		False	False	False	False
False			Falco		False	False	False	Falco
948 False False False False False False False False 949 False False False False False 950 False False False False False 950 False False False False False 951 False False False False False 952 False False False False False 952 False False False False False False 952 False 952 False 953 False Fals			Tatse		Tatse	10136	Tatse	Tacse
948 False False False False False False False 949 False False False False False False 950 False False False False False 951 False False False False False 952 False False False False False 952 False False False False False False 953 acousticness instrumentalness liveness False False 1 False False False False False False 1 False False False False False False 1 False False False False False False 2 False False False False False False 1 False False False False False False 93 False False False False False False 94 False False False False False False 95 False False False False False False 950 False False False False False False 951 False False False False False False 952 False False False False False False 953 False False False False False False 954 False False False False False False 955 False False False False False False 956 False False False False False False 957 False False False False False False 958 False False False False False False 959 False False False False False False								
False 949 False False False False False 950 False False False False False 951 False False False False False 951 False False False False False 952 False False False False False 952 False False False False False 953 False False False False False 954 False False False False False 955 False False False False False 956 False False False False False 957 False False False False False 958 False False False False False 959 False False False False False 950 False False False False False 951 False False False False False 952 False False False False False 953 False False False False False 954 False False False False False 955 False False False False False 956 False False False False False 957 False False False False False 958 False False False False False 959 False False False False False 950 False False False False False 951 False False False False False 952 False False False False False 953 rows x 24 columns			False		False	False	False	False
False 950 False False False False False 951 False False False False False 952 False 952 False False False False False 952 False 954 False 958 False 958 False 959 False 959 False 950 False 950 False False 951 False False 952 False 953 False 954 False False 955 False False 955 False			Tacse		1 4 1 3 6	14136	1 4 6 5 6	Tacse
950 False False False False False 951 False False False False False 952 False False False False False 952 False False False False False 953 acousticness_% instrumentalness_% liveness_% 954 False False False False False 955 False False False False False 956 False False False False False 957 False False False False False 958 False False False False False False 959 False False False False False 950 False False False False False 951 False False False False False 952 False False False False False 953 False False False False False 954 False False False False False 955 False False False False False 956 False False False False False 957 False False False False False 958 False False False False False 9595 False False False False False 9595 False False False False False 9595 False False False False False			False		False	False	False	False
False 951 False False False False False 952 False False False False False 952 False False False False False 952 False False False False False			False		False	False	False	False
False 952 False			Tacsc		Tacsc	14130	Tacsc	racsc
952 False False False False False False energy_% acousticness_% instrumentalness_% liveness_% speechiness_% 0 False False False False False False False 1 False False False False False False False 2 False False False False False False False False 3 False False False False False False False False 4 False False False False False False False False			False		False	False	False	False
energy_% acousticness_% instrumentalness_% liveness_% speechiness_% 0 False			Falco		False	Falco	Falco	False
speechiness_% 0 False False False False False 1 False False False False False 2 False False False False False 3 False False False False False 4 False False False False False False			Tacse		1 4 6 5 6	14136	1 4 6 5 6	Tacse
speechiness_% 0 False False False False False 1 False False False False False 2 False False False False False 3 False False False False False 4 False False False False False False	0.0	0.501 (0.	a couction	0.55 0.	inata	man+a1	noss 0.	liveness 0
False			acousticn	ess_%	instr	umentat	ness_%	tiveness_%
1False	0			False			False	False
False 2 False False False False 3 False False False False 4 False False False False False 948 False False False False False 949 False False False False False 950 False False False False False 951 False False False False False 952 False False False False False [953 rows x 24 columns]		Folso		Folso			F21.00	F2122
2 False		ratse		гасѕе			ratse	ratse
False	2	False		False			False	False
False 4 False False False False False 948 False False False False False 949 False False False False False 950 False False False False False 951 False False False False False 952 False False False False False [953 rows x 24 columns]		Falco		Ealco			Falso	Falso
4 False False False False False False False False		Tatse		iatse			Tatse	ratse
948 False		False		False			False	False
948 False False False False False 949 False False False 950 False False False 951 False False False False 952 False								
False 949 False False False False 950 False False False 951 False False False False 952 False False False False [953 rows x 24 columns]								
949 False False False False 950 False False False 951 False False False 952 False False False False [953 rows x 24 columns]		False		False			False	False
False 950 False False False False 951 False False False 952 False False False False False [953 rows x 24 columns]		False		False			False	False
False 951 False False False 952 False False False False [953 rows x 24 columns]		· acsc		. a csc				1 4 1 3 0
951 False False False False 952 False False False False [953 rows x 24 columns]		False		False			False	False
False 952 False False False False [953 rows x 24 columns]		False		False			False	False
[953 rows x 24 columns]								
[953 rows x 24 columns]		False		False			False	False
	ratse							
	[953 ro	ws x 24	columns]					
Sdf.isnull().sum()	_							

```
track name
                          0
                          0
artist(s) name
artist_count
                           0
                          0
released year
released_month
                          0
released_day
                          0
                           0
in spotify playlists
in_spotify_charts
                           0
                          0
streams
                          0
in apple playlists
                          0
in apple charts
                          0
in_deezer_playlists
in_deezer_charts
                          0
in shazam charts
                         50
bpm
                          0
                         95
key
mode
                          0
                          0
danceability_%
                          0
valence %
                          0
energy_%
acousticness %
                          0
                          0
instrumentalness %
liveness %
                          0
speechiness %
dtype: int64
Sdf.dropna(inplace = True)
Sdf.isnull().sum()
                         0
track_name
                         0
artist(s)_name
artist count
                         0
                         0
released_year
released month
                         0
released day
                         0
                         0
in_spotify_playlists
in_spotify_charts
                         0
                         0
streams
in apple playlists
                         0
in apple charts
                         0
in deezer playlists
                         0
in deezer charts
                         0
in_shazam_charts
                         0
                         0
bpm
                         0
key
mode
                         0
danceability %
                         0
                         0
valence %
                         0
energy_%
```

```
0
acousticness %
instrumentalness %
                         0
liveness %
                         0
speechiness %
                         0
dtype: int64
Sdf.info()
<class 'pandas.core.frame.DataFrame'>
Index: 817 entries, 0 to 952
Data columns (total 24 columns):
#
     Column
                            Non-Null Count
                                             Dtype
     _ _ _ _ _ _
 0
                            817 non-null
                                             object
     track name
 1
     artist(s) name
                            817 non-null
                                             object
 2
     artist count
                            817 non-null
                                             int64
 3
     released year
                            817 non-null
                                             int64
 4
     released month
                            817 non-null
                                             int64
 5
     released day
                            817 non-null
                                             int64
     in_spotify_playlists
                            817 non-null
 6
                                             int64
 7
     in_spotify_charts
                            817 non-null
                                             int64
 8
     streams
                            817 non-null
                                             object
 9
     in apple playlists
                            817 non-null
                                             int64
 10
                            817 non-null
     in apple charts
                                             int64
     in deezer playlists
                            817 non-null
 11
                                             object
 12
     in deezer charts
                            817 non-null
                                             int64
 13
     in shazam charts
                            817 non-null
                                             object
 14
     bpm
                            817 non-null
                                             int64
 15
                            817 non-null
     key
                                             object
 16
     mode
                            817 non-null
                                             object
 17
     danceability %
                            817 non-null
                                             int64
 18
                            817 non-null
    valence %
                                             int64
 19
                            817 non-null
     energy %
                                             int64
 20
     acousticness %
                            817 non-null
                                             int64
                                             int64
 21
     instrumentalness %
                            817 non-null
22
     liveness %
                            817 non-null
                                             int64
 23
     speechiness_%
                            817 non-null
                                             int64
dtypes: int64(17), object(7)
memory usage: 159.6+ KB
Sdf.describe(include = 'all')
         track_name artist(s)_name
                                      artist count
                                                     released_year \
                                        817.000000
                                                        817.000000
count
                817
                                 817
                811
                                 571
                                               NaN
                                                               NaN
unique
        Die For You
top
                       Taylor Swift
                                               NaN
                                                               NaN
                   2
                                  29
                                               NaN
freq
                                                               NaN
                                                       2018.457772
mean
                NaN
                                 NaN
                                          1.567931
                NaN
                                          0.876211
                                                         10.829267
std
                                NaN
min
                NaN
                                NaN
                                          1.000000
                                                       1930.000000
```

25% 50% 75% max	NaN NaN NaN NaN	NaN NaN NaN NaN	1.0000 1.0000 2.0000 8.0000	000 2022 000 2022	.000000 .000000 .000000	
re in_spotify count 817.000000	leased_month _charts \ 817.000000	released_day 817.000000		fy_playlis ⁻ 817.0000		
unique NaN	NaN	NaN		Na	aN	
top NaN	NaN	NaN		Na	aN	
freq NaN	NaN	NaN		Na	aN	
mean 11.722154	6.018360	13.696450		4849.89840	09	
std 18.617668	3.572554	9.299663		7741.1264	55	
min 0.000000	1.000000	1.000000		31.0000	00	
25% 0.000000	3.000000	5.000000		829.0000	00	
50% 3.000000	5.000000	13.000000		2040.0000	00	
75% 16.000000	9.000000	22.000000		4890.0000	00	
max 147.000000	12.000000	31.000000		52898.0000	00	
	817 814 23481149	N	00 8 laN laN	bpm 17.000000 NaN NaN	key mode 817 817 11 2 C# Major	
freq mean std min 25% 50% 75% max	2 NaN NaN NaN NaN NaN NaN	60.1615 74.9235 0.0000 12.0000 32.0000 78.0000 532.0000	94 000 000 000 1	NaN .22.565483 .28.174803 .65.000000 .99.000000 .20.000000 .41.000000 .06.000000	115 452 NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN	
dan count unique top freq mean std	ceability_% 817.000000 NaN NaN NaN 67.391677 14.688458	NaN NaN NaN	energy_% 17.000000 NaN NaN NaN 64.362301 16.107587	26.30 25.47	0000 NaN NaN NaN 9670	

```
min
            23.000000
                          4.000000
                                      14.000000
                                                       0.000000
25%
            57.000000
                         32.000000
                                      53.000000
                                                       5.000000
50%
            70.000000
                         51.000000
                                      66.000000
                                                      17.000000
75%
            79.000000
                         70.000000
                                      76,000000
                                                      41.000000
            96,000000
                         97.000000
                                      97,000000
                                                      97.000000
max
        instrumentalness %
                              liveness %
                                           speechiness %
                 817.000000
                              817.000000
                                              817.000000
count
unique
                        NaN
                                     NaN
                                                     NaN
                        NaN
                                     NaN
                                                     NaN
top
freq
                        NaN
                                     NaN
                                                     NaN
                   1.676867
                                               10.526316
mean
                               18.168911
                               13.541996
std
                   8.767328
                                               10.219987
                   0.000000
                                3,000000
                                                2.000000
min
                               10.000000
25%
                   0.000000
                                                4.000000
50%
                   0.000000
                               12.000000
                                                6.000000
75%
                   0.000000
                               24.000000
                                               12,000000
max
                  91.000000
                               97.000000
                                               64.000000
[11 rows x 24 columns]
plt.figure(figsize=(6,5))
sns.histplot(Sdf['track name'],kde=True,bins=10)
plt.title("track name distribution")
plt.show()
```



```
Sdf_num = Sdf.select_dtypes(include=['number'])
Sdf_num.head()
```

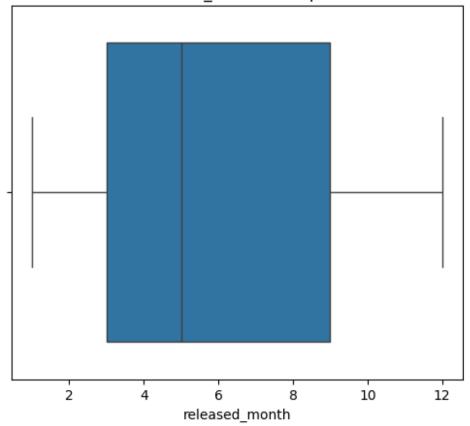
```
artist count
                  released year
                                  released month
                                                   released day \
0
                            2023
                                                              14
1
               1
                            2023
                                                3
                                                              23
2
               1
                                                6
                            2023
                                                              30
3
               1
                                                8
                                                              23
                            2019
4
               1
                                                5
                                                              18
                            2023
                                               in apple playlists \
   in spotify playlists
                           in spotify charts
0
                     553
                                          147
                                                                43
1
                    1474
                                           48
                                                                48
2
                    1397
                                          113
                                                                94
3
                    7858
                                                               116
                                          100
4
                    3133
                                           50
                                                                84
   in apple charts in deezer charts
                                        bpm
                                              danceability % valence
%
0
                263
                                    10
                                         125
                                                           80
                                                                       89
                126
                                    14
                                         92
                                                           71
                                                                       61
1
                207
                                                           51
                                                                       32
2
                                    14
                                         138
3
                207
                                    12
                                         170
                                                           55
                                                                       58
                133
                                    15
                                         144
                                                           65
                                                                       23
   energy % acousticness % instrumentalness % liveness %
speechiness_%
         83
                           31
                                                 0
                                                              8
0
4
1
         74
                            7
                                                 0
                                                             10
4
2
         53
                           17
                                                 0
                                                             31
6
3
         72
                           11
                                                 0
                                                             11
15
4
         80
                           14
                                                63
                                                             11
6
plt.figure(figsize=(9,5))
sns.heatmap(Sdf_num.corr(),annot=True,cmap='coolwarm',linewidth=0.5)
plt.title("correlation matrix")
plt.show()
```

correlation matrix

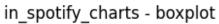
```
1.0
        artist_count - 1 0.0740.0340.01-50.0805.00805.01-70.0705.02-30.0590.21 0.12 0.140.09-50.0610.0340.13
      released_year -0.074 1 0.0760.17 0.350.069 0.20.0036.0960.0120.220.048.0790.130.02400850.13
                                                                                                             - 0.8
    released day -0.0150.170.058 1 -0.110.0160.01020070.0550.038.0840.0630.04070007090230.0140.015
 in_spotify_playlists -0.0850.39-0.12-0.11 1 0.14 0.69 0.22 0.1-0.0340.0970.030.0360.0650.0250.0520.078
                                                                                                             - 0.6
   in_spotify_charts-9.00860690.050.0160.14 1 0.21 0.56 0.570.0290.0510.05 0.1-0.070.00508.02-70.094
  in_apple_playlists -0.017-0.2-0.03-0.0120.69 0.21 1 0.36 0.330.005-0.018.0410.040.07-0.05-0.06-0.098
                                                                                                             - 0.4
    in_apple_charts -0.07050036.010800770.22 0.56 0.36 1 0.370.0270.026.0430.130.09070000.00770.15
   - 0.2
               bpm -0.05-90.01-20.04-90.03-30.03-40.02-90.005-66.02-70.022 1 -0.150.02-90.01-30.01-00.00-384005-08038
     danceability % -0.21 0.220.05 0.08 0.09 0.05 0.01 0.02 0.08 0.01 1 0.39 0.16 0.24 -0.1 -0.1 0.2
                                                                                                              - 0.0
         valence % -0.120.0480.110.0630.03 0.050.0410.0430.0730.0290.39 1 0.350.0640.105000104036
          energy_% -0.140.0790.0870.0470.036 0.1 0.04 0.13 0.1 0.0130.16 0.35 1 0.550.0520.110.027
                                                                                                               -0.2
    acousticness_% -0.0950.130.0550007090650.0750.0750.0970.0350.0110.240.0640.55 1 0.0470.0470.018
instrumentalness_% -0.06-0.0240.0350.0230.0250.0058.054000036003500340.1 -0.150.050.047 1 0.0450.091
         liveness_% 4.034.008500140.01-10.05-20.02-10.0605.0010200306005-80.10.000141.110.0440.045 1 0.023
     speechiness_% -0.13 0.130.0420.0150.0780.0940.0980.150.0820.038 0.2 0.0360.0270.0180.0940.023 1
                                                                     danceability_%
                                                                                                  speechiness %
                                                                          walence_%
                                                                                    acousticness_%
                                                                                        instrumentalness_%
                                                                                             liveness_%
                      artist_count
                                              in_spotify_charts
                                                   in_apple_playlists
                                                       in_apple_charts
                                                            n_deezer_charts
                                                                               energy_%
                                released_month
                                    released_day
                           released_year
                                         spotify_playlists
```

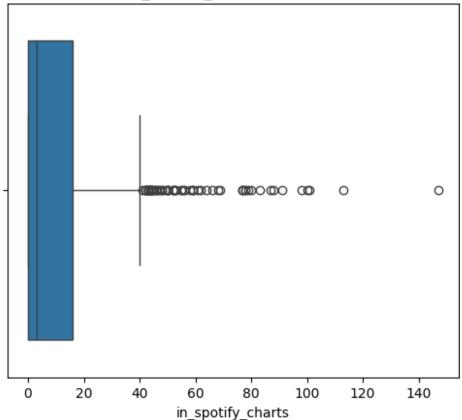
```
plt.figure(figsize=(6,5))
sns.boxplot(x=Sdf['released_month'])
plt.title("released_month - boxplot")
plt.show()
```

$released_month$ - boxplot

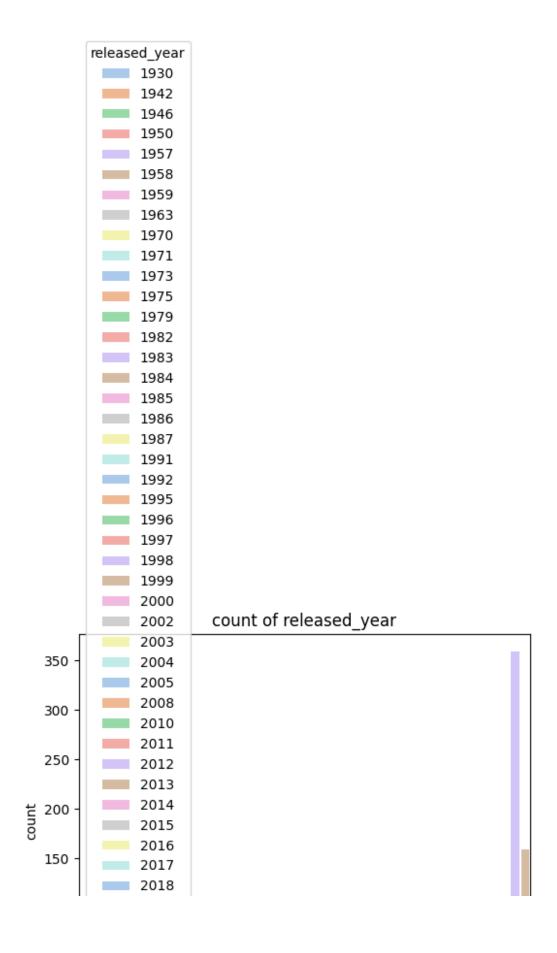


```
plt.figure(figsize=(6,5))
sns.boxplot(x=Sdf['in_spotify_charts'])
plt.title("in_spotify_charts - boxplot")
plt.show()
```

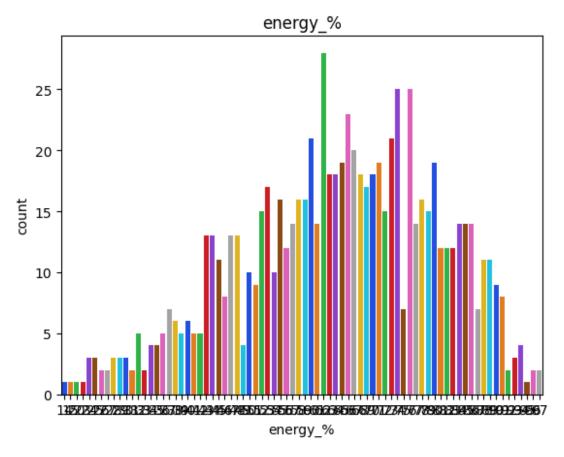




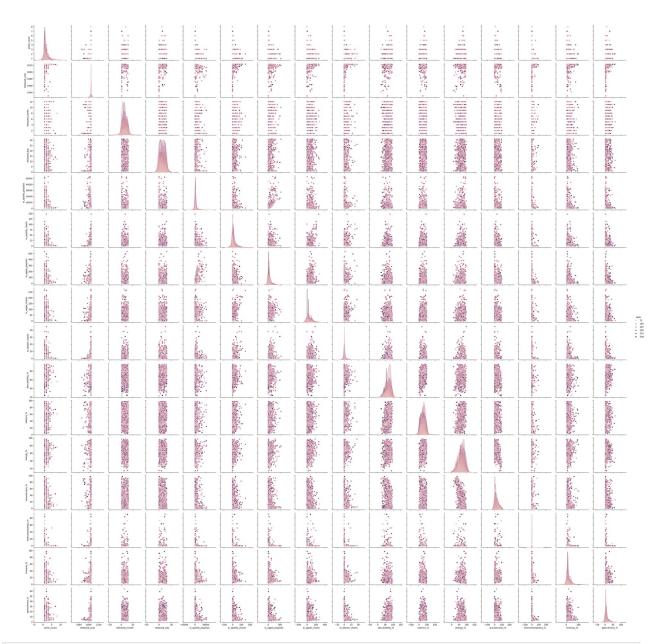
```
plt.figure(figsize=(6,5))
sns.countplot(x=Sdf['released_year'],hue =
Sdf['released_year'],palette='pastel')
plt.title('count of released_year')
plt.show()
```



```
sns.countplot(x=Sdf['energy_%'],hue=Sdf['energy_%'],palette =
'bright',legend = False)
plt.title("energy_%")
plt.show()
```



sns.pairplot(Sdf,hue='bpm')
<seaborn.axisgrid.PairGrid at 0x155ceda63f0>



```
plt.show()
Sdf.groupby('bpm')['danceability_%'].mean()
bpm
65
       71.0
       53.0
67
       59.0
71
72
       60.0
73
       83.0
198
       59.0
200
       39.0
       29.0
202
```

204 52.0 206 43.0 Name: danceability_%, Length: 122, dtype: float64