



Spotify Music Analysis

Required Library

```
In [1]: import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import warnings
warnings.filterwarnings("ignore")
```

Load Data

```
In [2]: Spotify = pd.read_csv(r"C:\Users\dell\Downloads\track_data_final.csv")
```

```
In [3]: # Read first 5 rows
Spotify.head()
```

```
Out[3]:
```

	track_id	track_name	track_number	track_popularity	track
0	6pymOcrCnMuCWdgGVTvUgP		3	57	61
1	2lWc1ijlz2NVcStV5fbtPG	Clouds	1	67	
2	1msEuwSBneBKpVCZQcFTsU	Forever & Always (Taylor's Version)	11	63	
3	7bcy34fBT2ap1L4bfPsl9q	I Didn't Change My Number	2	72	
4	0GLfodYacy3BJE7Al3A8en	Man Down	7	57	

Data Cleaning & Preparation

```
In [4]: Spotify.info()
```

```

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 8778 entries, 0 to 8777
Data columns (total 15 columns):
#   Column                Non-Null Count  Dtype
---  -
0   track_id              8778 non-null   object
1   track_name            8776 non-null   object
2   track_number          8778 non-null   int64
3   track_popularity      8778 non-null   int64
4   track_duration_ms     8778 non-null   int64
5   explicit              8778 non-null   bool
6   artist_name           8774 non-null   object
7   artist_popularity     8774 non-null   float64
8   artist_followers      8774 non-null   float64
9   artist_genres         8774 non-null   object
10  album_id              8778 non-null   object
11  album_name            8776 non-null   object
12  album_release_date    8778 non-null   object
13  album_total_tracks    8778 non-null   int64
14  album_type            8778 non-null   object
dtypes: bool(1), float64(2), int64(4), object(8)
memory usage: 968.8+ KB

```

```

In [5]: for col in Spotify.columns:
        print(Spotify[col].unique())
        print("-"*50)

```

```

['6pym0crCnMuCWdgGVTvUgP' '2lwcl1Jl2NVcStV5fbtPG'
 '1msEuwsBneBKpVCZQcFTsU' ... '37F0uwRSrdzkBiuJ0D5UHI'
 '42qNwdLKCI41S4uzfamhFM' '7KZJnMtwu2s80j05Frthap']
-----
['3' 'Clouds' 'Forever & Always (Taylor's Version)' ... 'Reminder' 'Duvet'
 'So Much Better']
-----
[ 57   1  11   2   7   3  15   5   8   9  13  12   4  16   6  10  25  47
 29  17  34  14  18  23  38  20  22  24  19  30  21  28  26  32  27  49
 44  35  40  36  31  66 102  37  46  43  33  41  45  54  39  42  52  70]
-----
[ 61  67  63  72  57  77  78  52  50  75  40  45  74  54  60  83   1  71
  0   9  62  56  34  43  64  55  46  36  48  49   8  80  84  15  69  66
 32  38  79  81   3  76   2  59  68  42  58  65  85  25  39  73  51  41
 88  33  37  28  20  21  70   5  44  29  31  24  82  23  26  47  12  27
 35  14  53  10  19  86   4  87  92  13  30  91  18   6  17  22  90  16
 89  94  11  93   7  95  99  97 100]
-----
[213173 158760 225328 ... 218880 203600 261385]
-----
[False True]
-----
['Britney Spears' 'BUNT.' 'Taylor Swift' ... 'Troy' 'Zelda' 'bôa']
-----
[ 80.  69. 100.  90.  72.  76.  88.  48.  83.  79.  59.  68.  89.  32.
 82.  71.  67.  84.   0.  85.  77.  49.  73.  62.  64.  24.  95.  61.
 70.  29.  86.   5.  38.  39.  35.  53.  81.  91.  25.  18.  50.  45.
 66.  75.  41.  65.  78.  63.  55.  30.  33.  58.  47.  60.   6.  17.
 74.  56.  52.  14.  87.  28.  93.  57.  16.  43.  42.  34.  12.   2.
 54.  46.  40.   3.  51.  23. nan   8.  31.  20.   4.  44.  37.  13.
 26.  36.  27.   9.  21.  19.  10.  22.   7.  15.   1.  11.  94.]
-----
[1.77554510e+07 2.93734000e+05 1.45396321e+08 ... 7.86890000e+05
 3.26300000e+03 1.18850800e+06]
-----
['[pop]' '[stutter house]' '[]' '[dream pop]'
 '[brazilian bass', 'electronic', 'slap house', 'electro house']'
 '[soft pop]' '[uk drill', 'drill', 'uk grime', 'grime']'
 '[edm', 'electronic]' '[hip hop', 'west coast hip hop]'
 '[emo rap', 'cloud rap]'
 '[nu metal', 'rap metal', 'rock', 'alternative metal]'
 '[bedroom pop]' '[folk pop]' '[latin pop]' '[soundtrack]'
 '[ambient folk]'
 '[blues rock', 'garage rock', 'modern blues', 'rock]'
 '[metal', 'hard rock]' '[country', 'acoustic country]'
 '[reggaeton', 'trap latino', 'urbano latino', 'latin]'
 '[egyptian hip hop', 'arabic hip hop', 'egyptian pop', 'mahraganat]'
 '[country', 'classic country]'
 '[honky tonk', 'classic country', 'traditional country]'
 '[reggaeton', 'urbano latino]' '[k-pop]' '[country]'
 '[country', 'pop country', 'acoustic country]'
 '[dark r&b', 'trap soul]' '[german hip hop]'
 '[soundtrack', 'medieval]' '[proto-punk', 'baroque pop]'
 '[soft pop', 'acoustic pop]' '[rap', 'hip hop]' '[r&b]'

```

"['dark r&b']" "['indie folk']" "['post-rock']"
"['egyptian pop', 'khaleeji', 'sholawat']" "['christmas']"
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"['nu metal', 'metal', 'alternative metal', 'rap metal', 'rock']"
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"['east coast hip hop', 'hardcore hip hop', 'old school hip hop', 'hip hop']"
"['east coast hip hop', 'old school hip hop', 'hip hop']"
"['bluegrass', 'newgrass', 'traditional folk', 'country blues', 'folk', 'americana']"
"['emo rap', 'trap metal', 'cloud rap', 'horrorcore']"
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"['classic country', 'country', 'honky tonk', 'outlaw country']"
"['future house', 'edm']"
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"['folk', 'americana', 'southern gothic', 'bluegrass']" "['sexy drill']"
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bow belico', 'sad sierrreño', 'sierrreño']"
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core hip hop']"
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"['grime', 'uk grime', 'uk drill', 'drill']"
"['celtic', 'medieval', 'ambient folk']" "['future house']"
"['outlaw country', 'country']"
"['darkwave', 'lo-fi indie', 'post-punk', 'cold wave']"

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"['sea shanties', 'medieval', 'celtic']" "['slap house', 'italo dance']"
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"['downtempo', 'ambient', 'psytrance']"
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"['christian', 'christian pop', 'christian hip hop', 'worship', 'gospel r&b']"
"['trip hop']" "['edm', 'progressive house', 'electronica']"
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"['dancehall', 'riddim', 'ragga', 'reggae']"

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"['brooklyn drill', 'melodic rap']"
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"['ambient', 'krautrock', 'art rock', 'minimalism', 'drone', 'glam rock', 'spa
ce music']"
"['sholawat', 'khaleeji']" "['uk garage']"
"['metal', 'glam metal', 'heavy metal', 'hard rock']"
"['electro swing', 'swing music', 'nu jazz']" "['idm', 'electronica']"
"['folk rock', 'folk', 'singer-songwriter', 'roots rock', 'country rock']"
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"['funk de bh', 'funk carioca']" "['melbourne bounce']"
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"['old school hip hop', 'east coast hip hop', 'hip hop']"
"['alté', 'afrobeats', 'afro r&b']" "['progressive metal', 'metalcore']"
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u metal']"
"['new age', 'celtic']" "['bluegrass', 'christian country', 'americana']"
"['j-pop']" "['new jack swing']" "['funkot', 'lagu jawa']"
"['riot grrrl']" "['blues rock']" "['drum and bass', 'liquid funk']"
"['stoner rock']" "['trip hop', 'nu jazz', 'downtempo']"

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 ['afrobeat']" ["afrobeats', 'afrobeat', 'afro r&b', 'afropop']"
 ['orchestral']" ["breakcore']" ["blues rock', 'modern blues']"
 ['riot grrrl', 'queercore']" ["edm', 'melodic bass']"
 ['country', 'country rock']"
 ['red dirt', 'texas country', 'southern rock', 'outlaw country', 'country', 'country rock']"
 ['hypertechno', 'hard techno']" ["afrobeats']"
 ['german hip hop', 'german indie', 'german pop', 'german indie pop']"
 ['uk drill', 'drill', 'grime', 'uk grime', 'afroswing']"
 ['post-punk', 'noise rock']"
 ['progressive rock', 'art rock', 'psychedelic rock']"
 ['arabic hip hop', 'egyptian hip hop', 'egyptian pop']"
 ['country', 'red dirt']" ["gangster rap']" ["spoken word']"
 ['worship', 'christian', 'ccm']"
 ['celtic', 'sea shanties', 'celtic rock', 'celtic punk']"
 ['post-grunge', 'nu metal', 'alternative metal']"
 ['classic country', 'country', 'outlaw country', 'traditional country']"
 ['bolero', 'chicha']"
 ['industrial metal', 'metal', 'industrial rock', 'industrial']"
 ['gangster rap', 'old school hip hop', 'g-funk']"
 ['japanese classical']" ["country hip hop', 'southern hip hop']"
 ['downtempo', 'trip hop']" ["progressive rock', 'art rock']"
 ['classical', 'chamber music']" ["melodic bass']"
 ['classic country', 'country', 'traditional country', 'outlaw country', 'honky tonk']"
 ['arrocha']" ["texas country', 'red dirt', 'country']"
 ['country', 'country rock', 'country hip hop', 'acoustic country']"
 ['avant-garde']" ["rap', 'melodic rap', 'trap']"
 ['east coast hip hop', 'old school hip hop', 'hardcore hip hop']"
 ['dancehall', 'soca', 'shatta', 'ragga']"
 ['reggaeton', 'urbano latino', 'trap latino', 'latin']"
 ['blues rock', 'psychedelic rock']" ["trip hop', 'downtempo']"
 ['alternative metal', 'post-grunge', 'rock', 'hard rock']"
 ['garage rock']" ["slap house', 'melbourne bounce']"
 ['motown', 'disco']" ["art pop', 'baroque pop']"
 ['grime', 'uk drill']" ["trap latino']"
 ['cumbia norteña', 'banda', 'norteño', 'música mexicana', 'corrido', 'corridos tumbados', 'grupera', 'tejano', 'ranchera', 'corridos bélicos']"
 ['new wave', 'synthpop', 'darkwave']"
 ['jam band', 'psychedelic rock', 'acid rock']"
 ['azonto', 'afrobeats', 'hiplife']" ["classical']"
 ['japanese vgm', 'soundtrack']" ["slap house', 'nightcore']"
 ['classic country', 'outlaw country', 'country']"
 ['latin house', 'hypertechno']" ["jazz rap']"
 ['classic rock', 'rock', 'hard rock', 'rock and roll']"
 ['blues rock', 'modern blues', 'garage rock']"
 ['jazz rap', 'old school hip hop']" ["slowcore', 'singer-songwriter']"
 ['soul jazz', 'big band', 'quiet storm']"
 ['shoegaze', 'dream pop', 'slowcore', 'noise rock']"
 ['synthpop', 'hi-nrg']"

["shoegaze', 'post-punk', 'dream pop', 'noise rock', 'new wave']"
 ["french pop', 'chanson', 'pop urbaine']"
 ["classic rock', 'hard rock']" ["shoegaze', 'post-grunge']"
 ["melbourne bounce', 'electro house']" ["swedish pop"]
 ["melodic bass', 'nightcore', 'bass music']"
 ["cloud rap', 'emo rap', 'horrorcore', 'trap metal', 'underground hip hop']"
 ["math rock', 'djent', 'progressive metal', 'progressive rock']"
 ["outlaw country', 'classic country', 'country', 'honky tonk', 'traditional c
 ountry']"
 ["post-grunge', 'alternative metal', 'rock']" ["uk grime"]
 ["quiet storm', 'new jack swing', 'r&b']" ["christmas', 'villancicos"]
 ["slap house', 'g-house']"
 ["art pop', 'singer-songwriter', 'alternative rock']"
 ["happy hardcore', 'hardstyle']" ["rally house"]
 ["reggae', 'roots reggae', 'reggae rock']"
 ["acid techno', 'techno', 'hard techno', 'tekno']"
 ["children's music"] ["pop punk', 'emo', 'queercore']"
 ["texas country', 'country', 'red dirt']" ["reggae"] ["nederpop"]
 ["glam rock', 'glam metal', 'hard rock', 'rock', 'classic rock']"
 ["soundtrack', 'japanese vgm', 'japanese classical']" ["glam rock"]
 ["power pop', 'jangle pop']"
 ["classic soul', 'motown', 'philly soul', 'soul']"
 ["nu metal', 'alternative metal']" ["old school hip hop"]
 ["alté', 'nigerian drill', 'afrobeats', 'afrobeat']"
 ["surf rock', 'exotica']" ["cloud rap"]
 ["afro house', 'house', 'afro tech']"
 ["motown', 'soul', 'classic soul']" ["bollywood', 'desi', 'hindi pop']
 ["punk', 'proto-punk']" ["future bass', 'pinoy hip hop"]
 ["outlaw country', 'classic country', 'country', 'traditional country', 'honk
 y tonk']"
 ["nu disco', 'alternative dance']"
 ["psychedelic rock', 'baroque pop', 'acid rock', 'proto-punk']"
 ["dance pop"] ["witch house', 'chillstep"]
 ["christian rock', 'christian alternative rock', 'christian']"
 ["psychedelic rock', 'acid rock']" ["witch house', 'drift phonk"]
 ["quiet storm"] ["indie rock', 'indie', 'alternative rock']
 ["house', 'tech house']" ["nu metal"] ["reggaeton chileno"]
 ["art pop', 'baroque pop', 'art rock']" ["reggaeton mexa"]
 ["afrobeats', 'afrobeat']" ["rockabilly', 'rock and roll']
 ["uk drill', 'drill', 'uk grime']" ["lo-fi"]
 ["hyperpop', 'nightcore']" ["folk pop', 'indie folk']
 ["3 step', 'gqom"] ["funk rock"] ["alternative r&b', 'indie soul"]
 ["classic rock', 'southern rock', 'country rock']
 ["darkwave', 'post-punk', 'cold wave', 'synthwave', 'witch house']
 ["hypertechno', 'melbourne bounce']" ["arabic hip hop"]
 ["east coast hip hop', 'old school hip hop', 'hip hop', 'boom bap']
 ["classical', 'classical piano', 'chamber music']
 ["corridos tumbados', 'sad sierrreño', 'corrido', 'sierrreño', 'música mexican
 a', 'corridos bélicos']
 ["eurodance"] ["latin alternative"] ["pop punk"]
 ["nu jazz', 'downtempo"] ["yacht rock', 'soft rock', 'folk rock']
 ["classic country', 'honky tonk', 'traditional country', 'outlaw country', 'c
 ountry', 'christian country']
 ["corrido', 'corridos tumbados', 'corridos bélicos', 'música mexicana', 'sad

sierreño', 'banda', 'electro corridos']"
 "['exotica']"
 "['celtic', 'celtic rock', 'sea shanties', 'celtic punk', 'folk']"
 "['hipdut']" "['disco']" "['folk', 'indie folk', 'folk rock']"
 "['classical', 'orchestral']"
 "['afrobeats', 'afrobeat', 'afropop', 'afropiano']"
 "['hard rock', 'glam metal', 'rock']"
 "['french pop', 'chanson québécoise', 'variété française', 'chanson']"
 "['reggaeton', 'urbano latino', 'latin']" "['anime rap', 'anime']"
 "['brazilian pop', 'funk pop', 'brazilian funk', 'funk carioca']"
 "['indonesian r&b']" "['jangle pop', 'alternative rock', 'rock']"
 "['alt country']"
 "['garage rock', 'surf rock', 'skate punk', 'indie punk']"
 "['east coast hip hop', 'jazz rap', 'hip hop']"
 "['gangster rap', 'old school hip hop', 'west coast hip hop', 'g-funk']"
 "['chicago drill']" "['jam band']"
 "['southern rock', 'classic rock', 'rock']" "['folk metal']"
 "['britpop', 'madchester', 'alternative rock']" "['indie r&b']"
 "['amapiano', 'afropiano']" "['yacht rock', 'soft rock']"
 "['brazilian funk', 'trap funk', 'funk consciente']"
 "['afrobeats', 'afrobeat', 'afropop', 'azonto', 'afroswing', 'afro r&b', 'afro
 piano']"
 "['surf rock', 'rockabilly', 'psychobilly']"
 "['deep house', 'slap house']" "['organic house']"
 "['classical', 'orchestral', 'opera']" "['trap soul']"
 "['big room', 'edm']" "['organic house', 'downtempo']"
 "['country', 'texas country', 'red dirt', 'acoustic country']"
 "['classical', 'requiem', 'opera', 'classical piano', 'chamber music']"
 "['stoner rock', 'alternative rock']"
 "['sea shanties', 'celtic', 'celtic rock', 'celtic punk']"
 "['alt country', 'outlaw country', 'americana', 'country rock']"
 "['proto-punk', 'art rock']"
 "['happy hardcore', 'hardstyle', 'hardcore techno']" "['agronejo']"
 "['bachata', 'latin']" "['latin house', 'afro house', 'techengue']"
 "['afro house', 'hypertechno']" "['neoclassical', 'minimalism']"
 "['electroclash', 'riot grrrl', 'queercore']" "['darkwave', 'cold wave']"
 "['glam metal', 'aor', 'classic rock']"
 "['minimalism', 'classical', 'neoclassical']"
 "['indie rock', 'baroque pop']" "['gospel', 'gospel r&b']"
 "['classic rock', 'aor', 'rock']" "['country hip hop', 'country']"
 "['heavy metal', 'metal', 'speed metal', 'hard rock', 'rock']"
 "['southern gothic', 'americana']" "['drift phonk']"
 "['trance', 'progressive trance', 'progressive house', 'electronica']"
 "['emo', 'screamo', 'post-hardcore']"
 "['witch house', 'darkwave', 'cold wave']" "['reggaeton']"
 "['post-punk', 'riot grrrl']"
 "['blues', 'classic blues', 'rock and roll', 'rockabilly']"]

 ['325wcm5wMnlfjmKZ8PXIIIn' '2ArQNLxf9t000gvmG5Vsjs'
 '4hDok00AJd57SGIT8xuWJH' ... '48ssTnnFOCIP17sRaFNqu1'
 '0JJAFVZtn3EvZnXSQrpLSh' '7sGYAV0xv7ZfAMzIpMl8m1']

 ['The Singles Collection' 'Clouds' "Fearless (Taylor's Version)" ...
 'the fruits' 'The Legend of Zelda' 'Twilight']

```
-----
['2009-11-09' '2023-01-13' '2021-04-09' ... '2018-11-08' '2023-08-19'
 '2001-03-21']
-----
[ 58   1  26  16  13   9   2  19  17  15  14  10  20  21  29  12   5  11
 22   8  28  55  56  49  46  18   3   7  47  25  24  34  70  23  38  79
 36  27  40   6  53  37  30  44   4  62 181  45  31  50  75  42  43  57
 35  41  32  59  39  71  33  65  66 100  60 131  63  76  52  67  77 136
 48 144  51 137  92  85  80  84  99  72]
-----
['compilation' 'single' 'album']
-----
```

```
In [6]: # Replace Blank List from Artist gen
        Spotify["artist_genres"]=Spotify["artist_genres"].replace("[]",np.nan)

In [7]: Spotify["artist_genres"] = Spotify["artist_genres"].str.strip("[]").str.replace(

In [8]: # Change data type for
        Spotify["album_release_date"]=pd.to_datetime(Spotify["album_release_date"], er

In [9]: # Null Summary
        Null_Summary = pd.DataFrame({"Num of NULL":Spotify.isnull().sum(),"Perctenage"
        Spotify.isnull().sum()/len(Spotify)*100})
        Null_Summary
```

```
Out[9]:
```

	Num of NULL	Perctenage
track_id	0	0.000000
track_name	2	0.022784
track_number	0	0.000000
track_popularity	0	0.000000
track_duration_ms	0	0.000000
explicit	0	0.000000
artist_name	4	0.045568
artist_popularity	4	0.045568
artist_followers	4	0.045568
artist_genres	4496	51.218956
album_id	0	0.000000
album_name	2	0.022784
album_release_date	2	0.022784
album_total_tracks	0	0.000000
album_type	0	0.000000

```
In [10]: # Remove null values
columns = ["track_name", "artist_name", "artist_popularity", "artist_followers", "
Spotify.dropna(subset=columns, inplace=True, axis=0)

# Handling Missing
Spotify.fillna(Spotify["artist_genres"].mode()[0], inplace=True)
```

```
In [11]: # Convert Trac duration ms to min
# We know that 1 min = 1000*60
Spotify["track_duration_min"] = (Spotify["track_duration_ms"]/60000).round(2)
```

```
In [12]: # Drop Track duration ms
Spotify.drop(columns="track_duration_ms", axis=1, inplace=True)
```

```
In [13]: Spotify.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 8772 entries, 0 to 8777
Data columns (total 15 columns):
#   Column                Non-Null Count  Dtype
---  -
0   track_id              8772 non-null   object
1   track_name            8772 non-null   object
2   track_number          8772 non-null   int64
3   track_popularity      8772 non-null   int64
4   explicit              8772 non-null   bool
5   artist_name           8772 non-null   object
6   artist_popularity     8772 non-null   float64
7   artist_followers      8772 non-null   float64
8   artist_genres         8772 non-null   object
9   album_id              8772 non-null   object
10  album_name            8772 non-null   object
11  album_release_date    8772 non-null   datetime64[ns]
12  album_total_tracks    8772 non-null   int64
13  album_type            8772 non-null   object
14  track_duration_min    8772 non-null   float64
dtypes: bool(1), datetime64[ns](1), float64(3), int64(3), object(7)
memory usage: 1.0+ MB
```

Export Data in MYSQL Database

```
In [14]: import urllib.parse
from sqlalchemy import create_engine

username = "root"
raw_password = "ANku7970@!#"
password = urllib.parse.quote_plus(raw_password)

host = "localhost"
port = "3306"
database = "my_Database"
```

```
engine = create_engine(f"mysql+pymysql://{username}:{password}@{host}:{port}/{  
Spotify.to_sql("Spotify", engine, if_exists="replace", index=False)  
pd.read_sql("SELECT * FROM Spotify LIMIT 5;", engine)
```

Out[14]:

	track_id	track_name	track_number	track_popularity	expli
--	----------	------------	--------------	------------------	-------

0	6pymOcrCnMuCWdgGVTvUgP		3	57	61
1	2lWc1ijlz2NVcStV5fbtPG	Clouds	1	67	
2	1msEuwSBneBKpVCZQcFTsU	Forever & Always (Taylor's Version)	11	63	
3	7bcy34fBT2ap1L4bfPsl9q	I Didn't Change My Number	2	72	
4	0GLfodYacy3BJE7Al3A8en	Man Down	7	57	

Exploratory Data Analysis and Visualization

In [15]:

```
# Set theme  
sns.set_theme(style="dark")
```

In [16]:

```
Spotify.describe()
```

Out[16]:

	track_number	track_popularity	artist_popularity	artist_followers	album
--	--------------	------------------	-------------------	------------------	-------

count	8772.000000	8772.000000	8772.000000	8.772000e+03	
mean	5.750456	52.243274	69.970930	2.435979e+07	04:57
min	1.000000	0.000000	0.000000	0.000000e+00	1952-
25%	1.000000	39.000000	60.000000	5.145230e+05	2012-
50%	4.000000	58.000000	74.000000	6.284112e+06	2018-
75%	9.000000	71.000000	84.000000	3.055055e+07	2022-
max	102.000000	100.000000	100.000000	1.455421e+08	2025-
std	6.019187	24.068279	19.506421	3.814064e+07	

In [17]:

```
Spotify.describe(include="object")
```

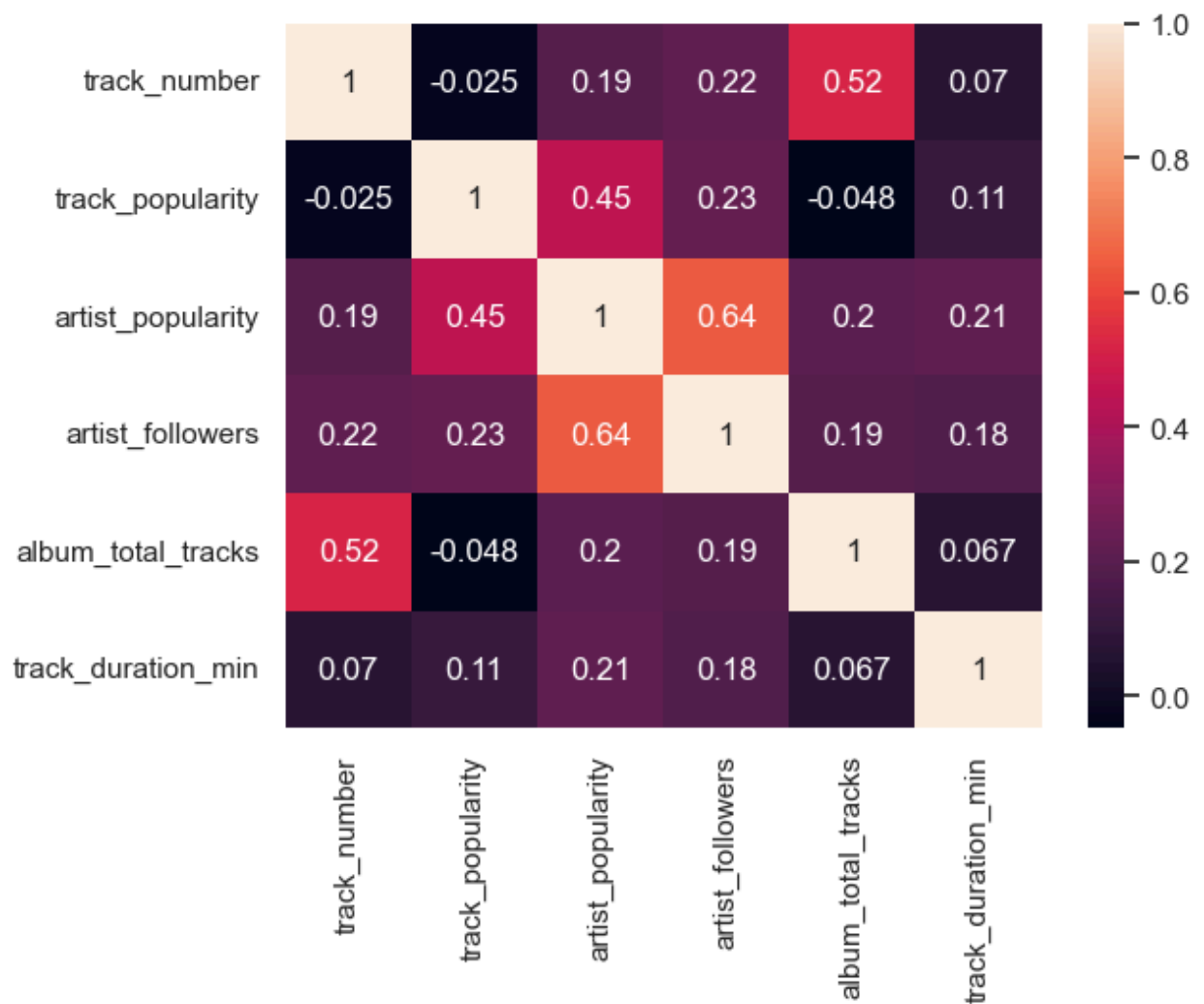
Out[17]:

	track_id	track_name	artist_name	artist_genres
count	8772	8772	8772	8772
unique	8772	7463	2547	651
top	6pymOcrCnMuCWdgGVTvUgP	Home	Taylor Swift	soundtrack 3FFC
freq	1	8	330	4836

Correlation

```
In [18]: num = Spotify.select_dtypes(include=["float64","int64"])
sns.heatmap(num.corr(),annot=True)
```

Out[18]: <Axes: >



1 Artist Popularity ↔ Artist Followers (0.64)

- This is the strongest positive correlation in the dataset.
- **Insight:** Artists with more followers tend to have higher popularity.

2 Track Popularity ↔ Artist Popularity (0.45)

-Tracks by popular artists tend to be more popular. -**Insight:** Artist fame influences the success of individual tracks.

3 Track Number ↔ Album Total Tracks (0.52)

- High correlation because track numbers naturally increase with more tracks in an album.
- **Insight:** Longer albums naturally produce higher track numbering. (Structural relationship, not business meaning.)

4 Artist Followers ↔ Track Popularity (0.23)

- Weak but positive correlation.
- **Insight:** Artists with more followers slightly help their track popularity, but track success also depends on other factors like genre, marketing, playlist placement, etc.

5 Artist Popularity ↔ Album Total Tracks (0.20)

- Weak correlation.
- **Insight:** Popular artists tend to release albums with slightly more tracks, but it's not a very strong pattern

6 Track Duration ↔ Popularity (0.11)

- Almost no correlation.
- **Insight:** Track length does NOT influence popularity.

7 Track Number ↔ Track Popularity (-0.025)

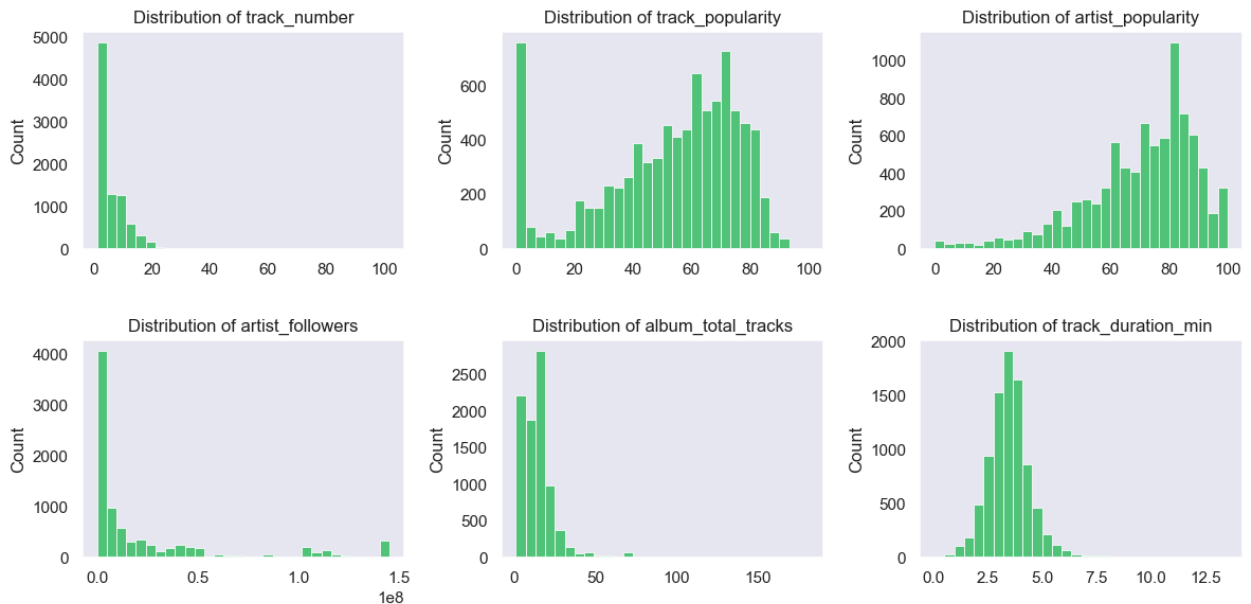
- Essentially zero.
- **Insight:** A song's position in an album has no impact on how popular it becomes.

Distribution

```
In [19]: plt.figure(figsize=(12,6))
for x, col in enumerate(num):
    plt.subplot(2,3,x+1)
```



```
sns.histplot(x = col,data=Spotify,bins=30,color = '#1db954' )
plt.title(f"Distribution of {col}",color = "#212121")
plt.xlabel(" ")
plt.tight_layout()
plt.show()
```

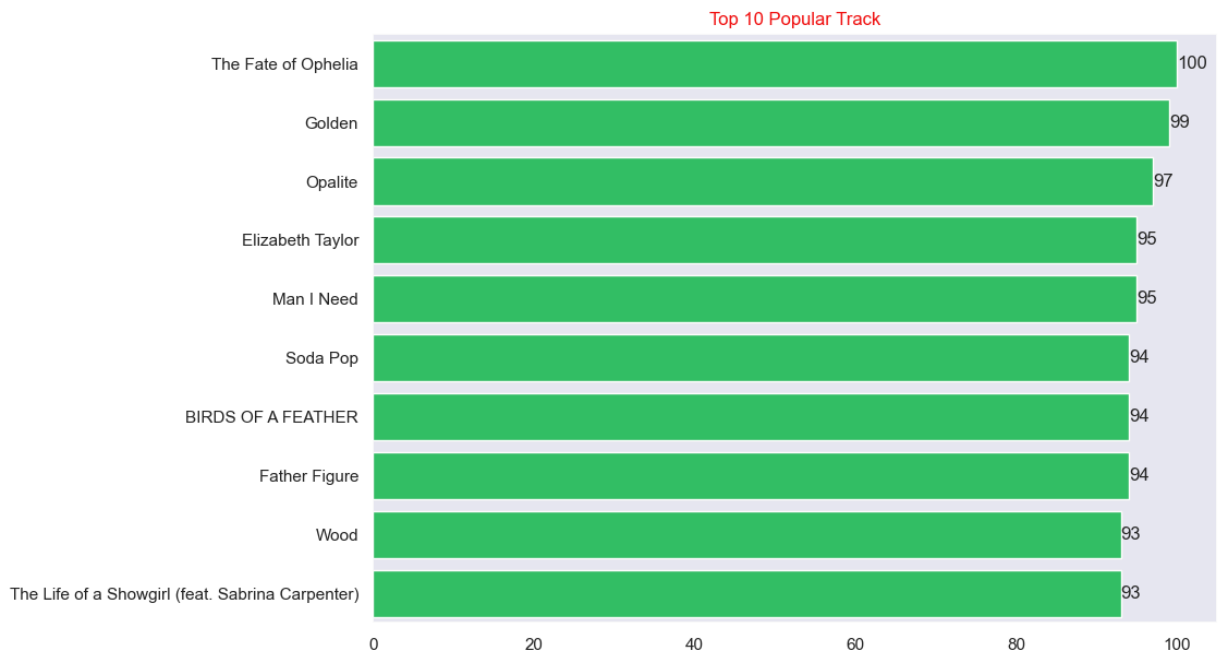


Insights:

The Dataset shows clear skewness across several key features. **Artist followers** and **track numbers** exhibit heavy right skew, suggesting that only a small group of artists dominate the follower counts and that long albums are relatively uncommon. In contrast, **track popularity** and **artist popularity** display more balanced distributions, indicating stable and consistent listener engagement across Spotify. **Track duration** follows a near-normal distribution centered around **3-5** minutes, which aligns with standard patterns observed in the global music industry.

Top Track

```
In [64]: Top_Track = pd.read_sql_query("select Track_Name, Track_Popularity from Spotify")
plt.figure(figsize=(10,7))
ax=sns.barplot(x="Track_Popularity",y = "Track_Name",data=Top_Track, color="#1db954")
for bar in ax.containers:
    ax.bar_label(bar)
plt.title("Top 10 Popular Track",color = "#F41010")
plt.xlabel(" ")
plt.ylabel(" ")
plt.show()
```



Insights:

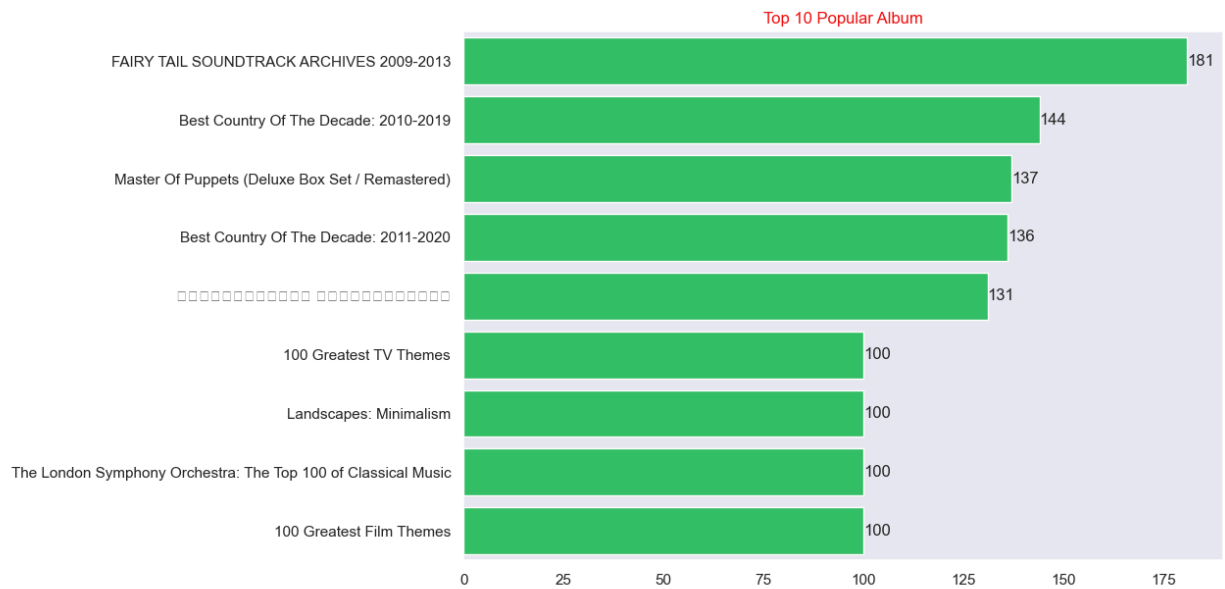
The top 10 tracks on Spotify show exceptionally high popularity, with scores ranging from 93 to 100. “The Fate of Ophelia” stands out as the most popular track, achieving a perfect 100 score. Other songs like “Golden” (99) and “Opalite” (97) also perform extremely well, indicating widespread listener engagement.

All tracks in the top list are clustered in the 90+ popularity range, which reflects:

- Strong streaming performance
- High playlist reach
- Strong fan engagement
- Consistent listener preference

Top Album

```
In [63]: Album = pd.read_sql_query("Select Album_Name, Album_Total_Tracks from Spotify
" order by Album_Total_Tracks desc limit 10", engine)
plt.figure(figsize=(10,7))
ax = sns.barplot(x="Album_Total_Tracks",y = "Album_Name",data=Album, color="#1
for bar in ax.containers:
    ax.bar_label(bar)
plt.title("Top 10 Popular Album",color = "#F41010")
plt.xlabel(" ")
plt.ylabel(" ")
plt.show()
```



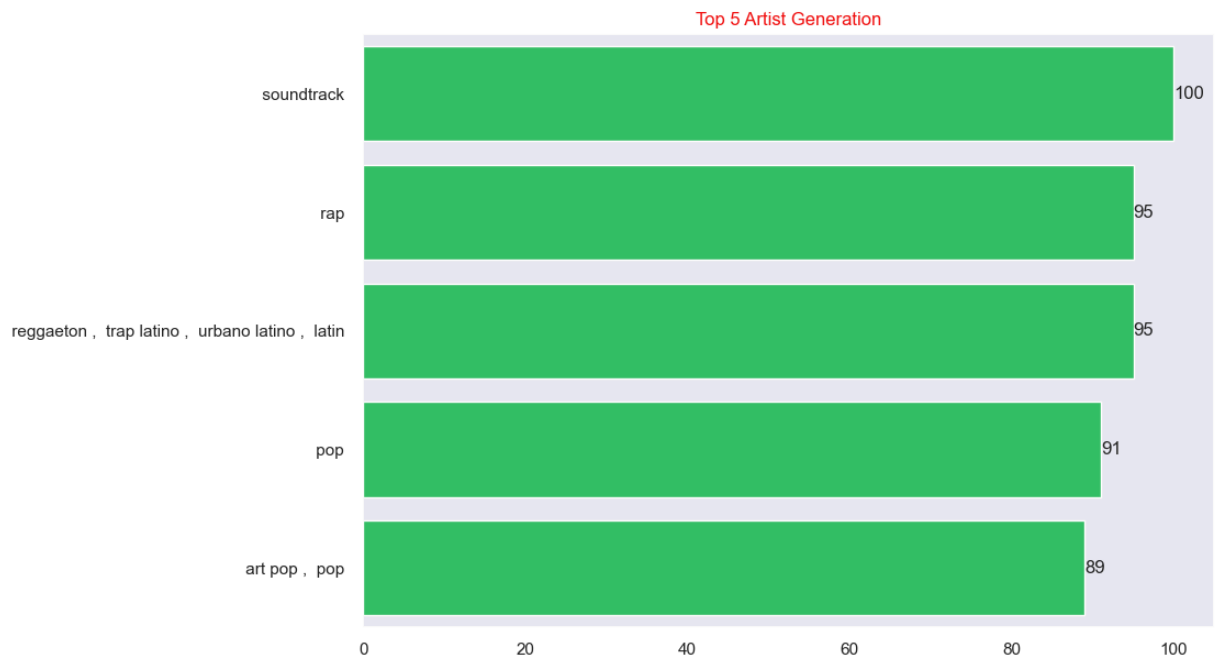
Insights:

The album “FAIRY TAIL SOUNDTRACK ARCHIVES 2009–2013” dominates the list with 181 tracks, far exceeding all other albums. Collections like “Best Country Of The Decade” (2010–2019 and 2011–2020 editions) and “Master of Puppets (Deluxe Box Set)” also appear prominently, each containing over 130 tracks, indicating extensive compilation or special edition releases.

Most of the remaining albums—including “100 Greatest TV Themes”, “Landscapes: Minimalism”, and “100 Greatest Film Themes”—contain exactly 100 tracks, reflecting curated collections or thematic anthologies rather than standard studio albums.

Popular Artist_Generation

```
In [62]: Top_Artist_Gen = pd.read_sql_query("select Artist_Genres,max(Artist_Popularity
'Spotify group by Artist_genres order by Artist_popularity desc limit 5;",eng
plt.figure(figsize=(10,7))
ax = sns.barplot(y="Artist_Genres",x = "Artist_Popularity",data=Top_Artist_Gen
for bar in ax.containers:
    ax.bar_label(bar)
plt.title("Top 5 Artist Generation",color = "#F41010")
plt.xlabel(" ")
plt.ylabel(" ")
plt.show()
```

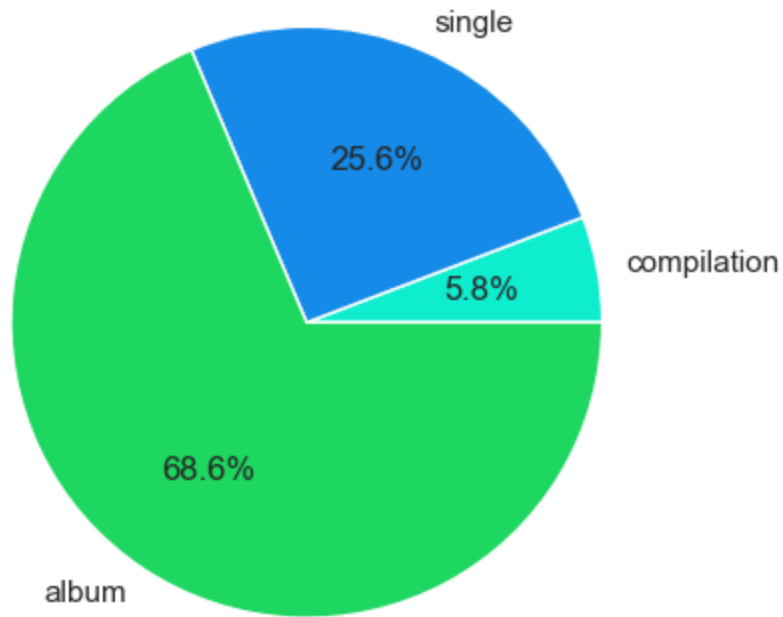


Insights:

The most popular genre group is soundtrack, with a perfect popularity score of 100, indicating extremely strong global listener interest. Genres like rap and combined Latin styles (reggaeton, trap latino, urbano latino, latin) also achieve high popularity scores (95), showing broad engagement across diverse audiences. Pop-based genres remain consistently popular, appearing twice in the top 5 with popularity scores above 89. Overall, the chart highlights a mix of mainstream and culturally rich genres that attract widespread listeners.

Album Type

```
In [59]: Album_Type = pd.read_sql_query("Select Album_Type, count(*) as Count from Spot")
plt.pie(Album_Type["Count"], labels=Album_Type["Album_Type"], autopct="%1.1F%%",
        colors=["#0FEDCF", "#168AE8", "#1ED760"] )
plt.show()
```

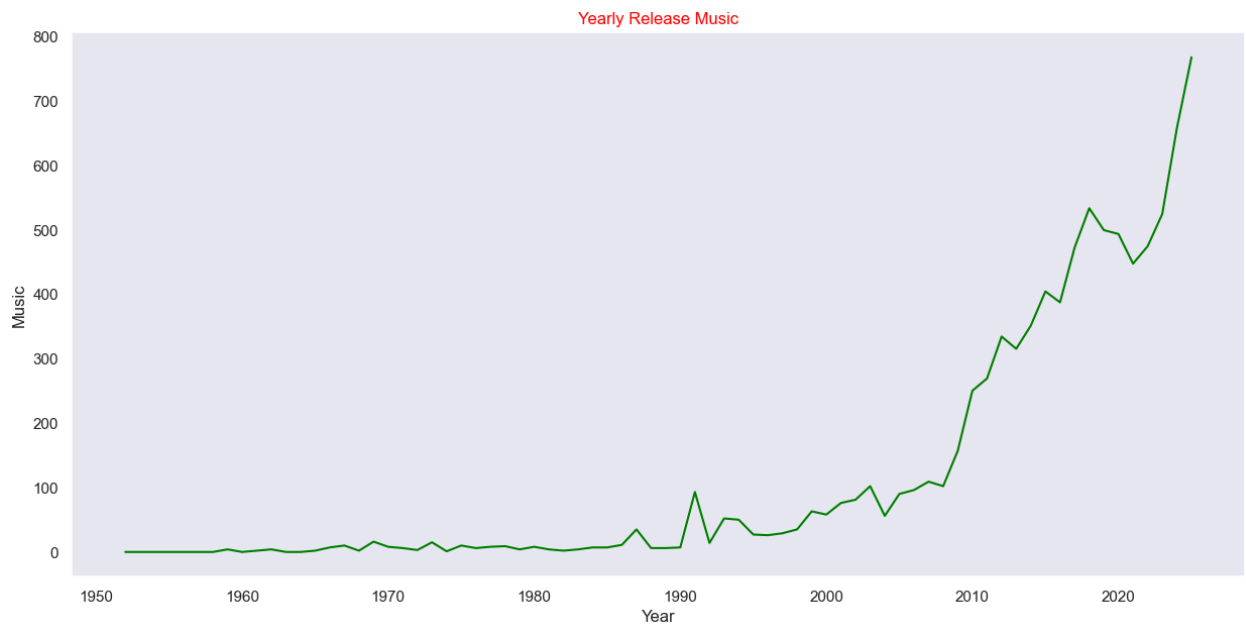


Insights:

The dataset is dominated by albums, which make up 68.6% of all releases. This indicates that most content on Spotify comes in the form of full-length albums rather than shorter formats. Singles account for 25.6%, reflecting the modern trend where artists frequently release individual tracks to maintain audience engagement. Compilation albums form only 5.8%, showing that curated or multi-artist collections are far less common.

Yearly Release Music

```
In [75]: Yearly = pd.read_sql_query("select year(Album_release_Date) as Year, count(*)  
    Spotify group by Year ;",engine)  
plt.figure(figsize=(15,7))  
sns.lineplot(x = "Year", y = "Music", data= Yearly, color = "Green")  
plt.title("Yearly Release Music", color = "Red")  
plt.show()
```



Insights:

Music releases remained very low and stable from the 1950s to the late 1980s, showing minimal growth during the early decades. A noticeable increase begins around the 1990s, followed by steady expansion through the 2000s. A major surge appears after 2010, with releases rising sharply — reflecting the impact of digital platforms, home studios, and global streaming adoption. The highest spike occurs in the 2020s, where yearly releases peak at nearly 800, indicating explosive growth in music production and distribution in the streaming era.

Artist Ranking

```
In [77]: pd.read_sql_query("SELECT Artist_Name, MAX(Artist_Followers) AS " \
"Artist_Followers,RANK() OVER (ORDER BY MAX(Artist_Followers) DESC) " \
"AS Ranks FROM Spotify GROUP BY Artist_Name limit 10",engine)
```

Out[77]:

	Artist_Name	Artist_Followers	Ranks
0	Taylor Swift	145542136.0	1
1	Ed Sheeran	122802777.0	2
2	Billie Eilish	118797451.0	3
3	The Weeknd	113039308.0	4
4	Ariana Grande	107418606.0	5
5	Eminem	104584370.0	6
6	Drake	103126025.0	7
7	Bad Bunny	102610644.0	8
8	Justin Bieber	85050158.0	9
9	BTS	81197976.0	10

	Artist_Name	Artist_Followers	Ranks
0	Taylor Swift	145542136.0	1
1	Ed Sheeran	122802777.0	2
2	Billie Eilish	118797451.0	3
3	The Weeknd	113039308.0	4
4	Ariana Grande	107418606.0	5
5	Eminem	104584370.0	6
6	Drake	103126025.0	7
7	Bad Bunny	102610644.0	8
8	Justin Bieber	85050158.0	9
9	BTS	81197976.0	10

Insights:

✓ Taylor Swift holds the No. 1 position with an extraordinary 145M+ followers, making her the most-followed and globally dominant artist on Spotify. ✓ Ed Sheeran (122M+) and Billie Eilish (118M+) secure 2nd and 3rd spots, showing extremely strong fanbases and international presence. ✓ Artists like The Weeknd, Ariana Grande, Eminem, Drake, and Bad Bunny form the mid-top tier, each exceeding 100M followers, indicating strong global influence and streaming popularity. ✓ Justin Bieber and BTS complete the top 10 with massive follower counts, reflecting their sustained popularity across diverse audiences.