Data Exploration

This is my exploration through the dataframes seeing what I can do with the information and how I should clean and use the available information. For more information about the datasets and their contained contents or the logistic regression model, see the README on my github, github.com/devin-lepur, for more information.

In [ ]:

```
import pandas as pd
import numpy as np
from matplotlib import pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import mean_squared_error, mean_absolute_error
from sklearn import metrics
from sklearn.preprocessing import MinMaxScaler
from collections import defaultdict
```

In [ ]:

```
from google.colab import drive
drive.mount('/content/drive')
```

```
Drive already mounted at /content/drive; to attempt to forcibly remount, cal
l drive.mount("/content/drive", force_remount=True).
```

In [ ]:

```
#Read datasets and add 'isLiked' column with default values to both dataframes
liked = pd.read_csv("/content/drive/MyDrive/MusicMachineLearningProject/databa
disliked = pd.read_csv("/content/drive/MyDrive/MusicMachineLearningProject/dat
liked["isLiked"] = True
disliked["isLiked"] = False
```

In [ ]:

```
liked.info()
disliked.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 529 entries, 0 to 528
Data columns (total 24 columns):
 #   Column            Non-Null Count  Dtype  
---  ------            --------------  -----  
 0   Spotify ID        487 non-null    object 
 1   Artist IDs        487 non-null    object 
 2   Track Name        529 non-null    object 
 3   Album Name        518 non-null    object 
 4   Artist Name(s)    518 non-null    object 
 5   Release Date      487 non-null    object 
 6   Duration (ms)     529 non-null    int64  
 7   Popularity        529 non-null    int64  
 8   Added By          529 non-null    object 
 9   Added At          529 non-null    object 
 10  Genres            486 non-null    object 
 11  Danceability      487 non-null    float64
 12  Energy            487 non-null    float64
 13  Key               487 non-null    float64
 14  Loudness          487 non-null    float64
 15  Mode              487 non-null    float64
 16  Speechiness       487 non-null    float64
 17  Acousticness      487 non-null    float64
 18  Instrumentalness  487 non-null    float64
 19  Liveness          487 non-null    float64
 20  Valence           487 non-null    float64
 21  Tempo             487 non-null    float64
 22  Time Signature    487 non-null    float64
 23  isLiked           529 non-null    bool   
dtypes: bool(1), float64(12), int64(2), object(9)
memory usage: 95.7+ KB
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 374 entries, 0 to 373
Data columns (total 24 columns):
 #   Column            Non-Null Count  Dtype  
---  ------            --------------  -----  
 0   Spotify ID        374 non-null    object 
 1   Artist IDs        374 non-null    object 
 2   Track Name        374 non-null    object 
 3   Album Name        374 non-null    object 
 4   Artist Name(s)    374 non-null    object 
 5   Release Date      374 non-null    object 
 6   Duration (ms)     374 non-null    int64  
 7   Popularity        374 non-null    int64  
 8   Added By          374 non-null    object 
 9   Added At          374 non-null    object 
 10  Genres            372 non-null    object 
 11  Danceability      374 non-null    float64
 12  Energy            374 non-null    float64
 13  Key               374 non-null    int64  
 14  Loudness          374 non-null    float64
 15  Mode              374 non-null    int64  
 16  Speechiness       374 non-null    float64
 17  Acousticness      374 non-null    float64
 18  Instrumentalness  374 non-null    float64
 19  Liveness          374 non-null    float64
 20  Valence           374 non-null    float64
 21  Tempo             374 non-null    float64
 22  Time Signature    374 non-null    int64
 23  isLiked           374 non-null    bool
dtypes: bool(1), float64(9), int64(5), object(9)
memory usage: 67.7+ KB
```

Liked has a signinificant number of missing values which is expected due to the existance of local files.

Disliked surpringly has some although it only appears to be two.

In [ ]:
```
liked.columns
```

Out[111]:
```
Index(['Spotify ID', 'Artist IDs', 'Track Name', 'Album Name',
       'Artist Name(s)', 'Release Date', 'Duration (ms)', 'Popularity',
       'Added By', 'Added At', 'Genres', 'Danceability', 'Energy', 'Key',
       'Loudness', 'Mode', 'Speechiness', 'Acousticness', 'Instrumentalnes
s',
       'Liveness', 'Valence', 'Tempo', 'Time Signature', 'isLiked'],
      dtype='object')
```

In [ ]:
```
#Drop missing values
liked.dropna(inplace=True)
disliked.dropna(inplace=True)
```

In [ ]:

```
#Demonstration of how the DataFrames look
print(liked)
```

```
                 Spotify ID  \
0    3oHkMCVJyOcjg5FhfLc2Rq   
1    51EC3I1nQXpec4gDk0mQyP   
2    7AvprzMsRJpybaalckaT8c   
3    3L0IKstjUgDFVQAbQIRZRv   
4    7aAEJfIzJUUSRXQNz2JzfO   
..                      ...   
524  0FA4wrjDJvJTTU8AepZTup   
525  1Rq4GtIucW9CAcF8B6PAbW   
526  787rCZF9i4L1cXGMkdyIk4   
527  2gbMPBrBVj3CuNTLp2dHYs   
528  2ZUJsR8HEktit58X6FuPQM   

                                            Artist IDs  \
0    13ubrt8QOOCPljQ2FL1Kca,3OsRAKCvk37zwYcnzRf5XF,...   
1        0Y5tJX1MQlPlqiwlOH1tJY,4dYQmk5ma04mZ1KJ9KkAQK   
2                               4MCBfE4596Uoi2O4DtmEMz   
3                               699OTQXzgjhIYAHMy9RyPD   
4                               0fA0VVWsXO9YnASrzqfmYu   
..                                                 ...   
524  4O15NlyKLIASxsJ0PrXPfz,0M2CO5ijP35MDhNwvpgxTV,...   
525                             1RyvyyTE3xzB2ZywiAwp0i   
526                             13ubrt8QOOCPljQ2FL1Kca   
527                             5K4W6rqBFWDnAN6FQUkS6x   
528                             5K4W6rqBFWDnAN6FQUkS6x   

                                           Track Name  \
0    A$AP Forever REMIX (feat. Moby, T.I. & Kid Cudi)   
1                             90210 (feat. Kacy Hill)   
2                                     Man Of The Year   
3                                              R.I.P.   
4                                              GHOST!   
..                                                ...   
524           Watch This - ARIZONATEARS Pluggnb Remix   
525                                  I Serve the Base   
526                                               LVL   
527                                      Off The Grid   
528                                   Heaven and Hell   

                                      Album Name  \
0                                        TESTING   
1                                          Rodeo   
2                              Legends Never Die   
3                                        Die Lit   
4    Man On The Moon II: The Legend Of Mr. Rager   
..                                           ...   
524      Watch This (ARIZONATEARS Pluggnb Remix)   
525                                 DS2 (Deluxe)   
526              LONG.LIVE.A$AP (Deluxe Version)   
527                                        Donda   
528                                        Donda   

                                  Artist Name(s) Release Date  Duration (ms)  
\
0                  A$AP Rocky,Moby,T.I.,Kid Cudi   2018-05-25         315773   
1                         Travis Scott,Kacy Hill   2015-09-04         339066   
2                                     Juice WRLD   2020-07-10         136408   
```

```
3                                  Playboi Carti   2018-05-11         192026
4                                       Kid Cudi   2010-11-09         289066
..                                           ...          ...            ...
524  Lil Uzi Vert,sped up nightcore,ARIZONATEARS   2023-02-05         163139
525                                       Future   2015-07-17         190893
526                                   A$AP Rocky         2013         220133
527                                   Kanye West   2021-08-29         339249
528                                   Kanye West   2021-08-29         145301

     Popularity                                Added By              Added A
t  \
0            64  spotify:user:gpqs1jf3s9yaezduz9yxpq2cm  2024-02-10T03:25:38
Z
1            84  spotify:user:gpqs1jf3s9yaezduz9yxpq2cm  2024-02-10T03:25:38
Z
2            71  spotify:user:gpqs1jf3s9yaezduz9yxpq2cm  2024-02-10T03:25:38
Z
3            79  spotify:user:gpqs1jf3s9yaezduz9yxpq2cm  2024-02-10T03:25:38
Z
4            60  spotify:user:gpqs1jf3s9yaezduz9yxpq2cm  2024-02-10T03:25:38
Z
..          ...                                     ...
...
524          84  spotify:user:gpqs1jf3s9yaezduz9yxpq2cm  2024-02-16T22:42:02
Z
525          75  spotify:user:gpqs1jf3s9yaezduz9yxpq2cm  2024-02-16T22:42:59
Z
526          73  spotify:user:gpqs1jf3s9yaezduz9yxpq2cm  2024-02-16T22:43:09
Z
527           0  spotify:user:gpqs1jf3s9yaezduz9yxpq2cm  2024-02-16T22:43:24
Z
528           0  spotify:user:gpqs1jf3s9yaezduz9yxpq2cm  2024-02-16T22:43:40
Z

     ... Loudness  Mode  Speechiness  Acousticness  Instrumentalness  \
0    ...   -6.416   0.0       0.1790       0.30000          0.000000   
1    ...   -6.741   0.0       0.0904       0.11300          0.000008   
2    ...   -5.124   1.0       0.0911       0.00584          0.000000   
3    ...   -6.067   0.0       0.1590       0.01190          0.000000   
4    ...   -4.465   0.0       0.0253       0.04940          0.000005   
..   ...      ...   ...          ...           ...               ...   
524  ...   -7.180   0.0       0.0386       0.01030          0.103000   
525  ...   -5.973   1.0       0.0571       0.01100          0.002040   
526  ...   -6.764   0.0       0.0536       0.18000          0.000013   
527  ...   -5.582   1.0       0.3700       0.04380          0.000000   
528  ...   -7.265   0.0       0.1190       0.04090          0.000000   

     Liveness  Valence    Tempo  Time Signature  isLiked  
0      0.1360   0.3940  125.948             4.0     True  
1      0.1050   0.3120   81.404             4.0     True  
2      0.0860   0.2980  173.966             4.0     True  
3      0.0860   0.5150  140.003             4.0     True  
4      0.2430   0.3300   89.938             3.0     True  
..        ...      ...      ...             ...      ...  
524    0.1530   0.3550  129.975             4.0     True  
525    0.0677   0.0883  168.202             4.0     True  
526    0.1210   0.0997  120.085             4.0     True  
```

```
527    0.1370   0.6300  137.728             4.0     True
528    0.1520   0.2680   82.986             4.0     True

[486 rows x 24 columns]
```

In [ ]:

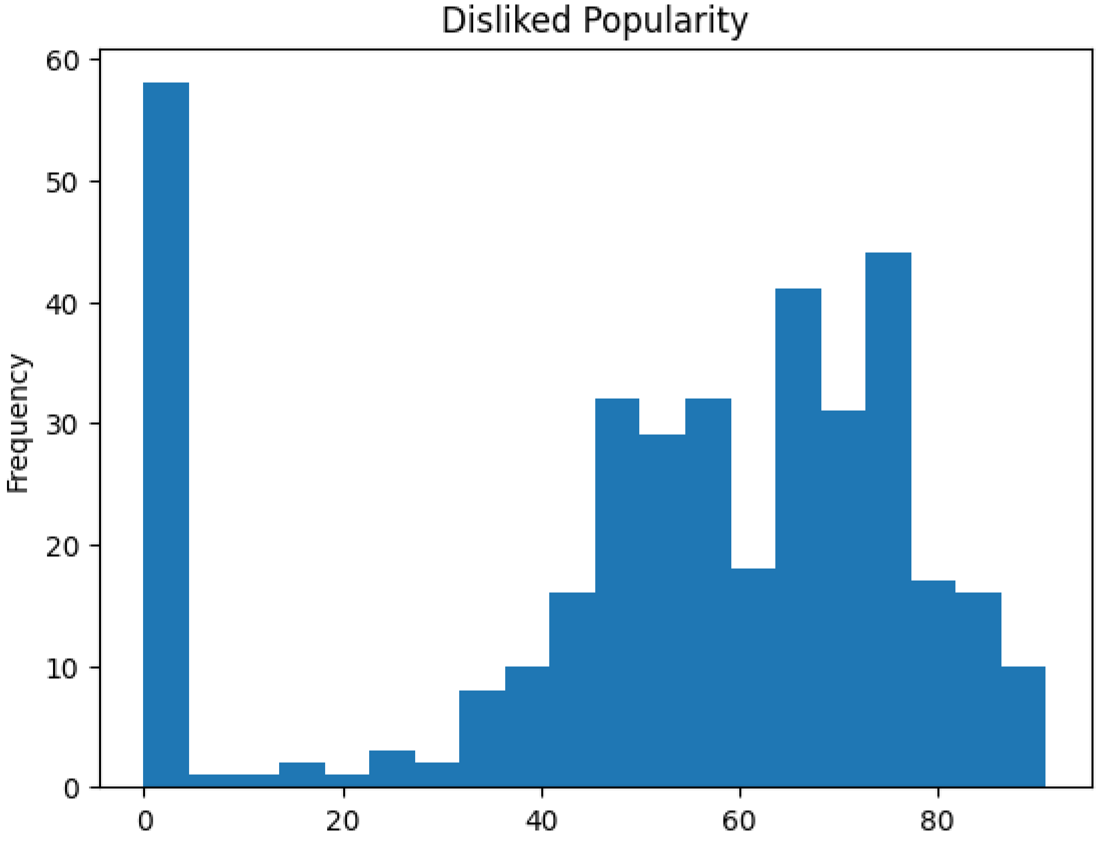
```
print(disliked)
```

```
                 Spotify ID  \
0    5kkxyqYSQrnHpfsmkjKi81   
1    2ooF4088y5L72c4YTEJQoB   
2    3e7Y6sfFlIdBMJhX7wpqVO   
3    67T0J1IDGgRwNMp3vWYaVb   
4    08zAFXhfyIxq9359NHksdP   
..                      ...   
369  2c7sRekhMGlj7u1WIIzoQu   
370  3ZaEs1O8BG581qYPHpQ8d6   
371  4FdlNCxdyXOXKIZNKcIqAs   
372  4m4CMXt4jTczOLC14kG8cx   
373  7sTyAjxDXq9afwfSQy6D0s   

                                            Artist IDs  \
0                               1Bl6wpkWCQ4KVgnASpvzzA   
1                               15UsOTVnJzReFVN1VCnxy4   
2                               4xRYI6VqpkE3UwrDrAZL8L   
3        6fxyWrfmjcbj5d12gXeiNV,2P5sC9cVZDToPxyomzF1UH   
4    21dooacK2WGBB5amYvKyfM,3CbYyyd8wH3RT6t0jwpdzC,...   
..                                                 ...   
369                             3gBZUcNeVumkeeJ19CY2sX   
370  13ubrt8QOOCPljQ2FL1Kca,6Xb4ezwoAQC4516kI89nWz,...   
371  3VrGfWE8YdYMK4ySpnE0ly,2RDOrhPqAM4jzTRCEb19qX,...   
372  3VrGfWE8YdYMK4ySpnE0ly,15iVAtD3s3FsQR4w1v6M0P,...   
373                             4Gso3d4CscCijv0lmajZWs   

                                            Track Name  \
0                                          NEW ORLEANS   
1                                           YuNg BrAtZ   
2                                              44 More   
3                                               Zenith   
4           Do Not Disturb (feat. Lil Yachty & Offset)   
..                                                 ...   
369                                 Fighting My Demons   
370  I Smoked Away My Brain (I'm God x Demons Mashu...   
371  Fly Away (with Sheck Wes, Ski Mask The Slump G...   
372        Say Ya Grace (with Chief Keef & Lil Yachty)   
373                                             Bandit   

                                            Album Name  \
0                                          iridescence   
1                                              Revenge   
2                                   Bobby Tarantino II   
3                                             Imperial   
4                                        Bless Yo Trap   
..                                                 ...   
369                                      A Great Chaos   
370  I Smoked Away My Brain (I'm God x Demons Mashu...   
371                                      All Is Yellow   
372                                      All Is Yellow   
373                                             Bandit   

                                        Artist Name(s) Release Date  \
0                                         BROCKHAMPTON   2018-09-21   
1                                         XXXTENTACION   2017-05-16   
2                                                Logic   2018-03-09   
3                             Denzel Curry,Joey Bada$$   2016-10-14   
```

```
4             Smokepurpp,Murda Beatz,Lil Yachty,Offset   2018-04-13
..                                                 ...          ...
369                                         Ken Carson   2023-10-13
370                A$AP Rocky,Imogen Heap,Clams Casino   2023-08-18
371  Lyrical Lemonade,Sheck Wes,Ski Mask The Slump ...   2024-01-26
372             Lyrical Lemonade,Chief Keef,Lil Yachty   2024-01-26
373                                        Don Toliver   2024-02-01

     Duration (ms)  Popularity                                Added By  \
0           243280          54  spotify:user:gpqs1jf3s9yaezduz9yxpq2cm   
1           101851          77  spotify:user:gpqs1jf3s9yaezduz9yxpq2cm   
2           188600          66  spotify:user:gpqs1jf3s9yaezduz9yxpq2cm   
3           242889          53  spotify:user:gpqs1jf3s9yaezduz9yxpq2cm   
4           157557           0  spotify:user:gpqs1jf3s9yaezduz9yxpq2cm   
..             ...         ...                                     ...   
369         150401          81  spotify:user:gpqs1jf3s9yaezduz9yxpq2cm   
370         190285          84  spotify:user:gpqs1jf3s9yaezduz9yxpq2cm   
371         185538          71  spotify:user:gpqs1jf3s9yaezduz9yxpq2cm   
372         156800          73  spotify:user:gpqs1jf3s9yaezduz9yxpq2cm   
373         147746          84  spotify:user:gpqs1jf3s9yaezduz9yxpq2cm   

                 Added At  ... Loudness  Mode  Speechiness  Acousticness  \
0    2024-02-10T03:25:57Z  ...   -4.962     0       0.2520       0.23200   
1    2024-02-10T03:25:57Z  ...   -5.963     1       0.2600       0.01790   
2    2024-02-10T03:25:57Z  ...   -7.098     0       0.2210       0.07180   
3    2024-02-10T03:25:57Z  ...   -5.276     0       0.0966       0.08710   
4    2024-02-10T03:25:57Z  ...   -4.566     0       0.0659       0.20300   
..                    ...  ...      ...   ...          ...           ...   
369  2024-02-10T03:25:57Z  ...   -4.970     1       0.0518       0.00437   
370  2024-02-10T03:25:57Z  ...   -9.629     1       0.0561       0.08310   
371  2024-02-10T03:25:57Z  ...   -9.384     0       0.0835       0.33800   
372  2024-02-10T03:25:57Z  ...   -8.807     0       0.1090       0.01370   
373  2024-02-10T03:25:57Z  ...   -9.593     1       0.0955       0.00113   

     Instrumentalness  Liveness  Valence    Tempo  Time Signature  isLiked  
0            0.000000     0.299   0.4000  159.903               4    False  
1            0.000000     0.107   0.4930  128.063               4    False  
2            0.000000     0.106   0.2190  139.965               4    False  
3            0.000000     0.154   0.2100   91.715               4    False  
4            0.001850     0.335   0.2120  131.026               4    False  
..                ...       ...      ...      ...             ...      ...  
369          0.000010     0.430   0.0389  141.659               4    False  
370          0.000041     0.175   0.1040  141.981               4    False  
371          0.000000     0.384   0.3090  129.908               4    False  
372          0.000000     0.120   0.4030  150.095               4    False  
373          0.000001     0.211   0.1090  130.031               4    False  

[372 rows x 24 columns]
```

```
In [ ]: popDf = pd.DataFrame(disliked["Popularity"])
        popDf['Popularity'].plot(kind='hist', bins=20, title='Disliked Popularity')
```

```
Out[115]: <Axes: title={'center': 'Disliked Popularity'}, ylabel='Frequency'>
```



In displaying the heads for disliked I noticed a song with a Popularity score of 0 which was alarming to me because almost all of the songs on this playlist should be somewhat popular given the nature of how they were taken from a public playlist. Also alarming were the two very popular artists on the one specific song. In looking further into it that song has 100 million streams on Spotify which surely would not correlate to a score of 0. In the representation above I also noticed the most common score in popularity for the dislikes is 0 so I will need to investigate.

In [ ]:

```
filtered_df = liked[liked["Popularity"] == 0]
print(filtered_df["Track Name"])
```

```
19                                       United In Grief
23                                          Count Me Out
24                                                Mirror
226                           On Time (with John Legend)
232    Feel The Fiyaaaah (with A$AP Rocky & feat. Tak...
237              Trance (with Travis Scott & Young Thug)
480                                       Just What I Am
489                                                 Walk
492                                       Never Catch Me
502    F**kin' Problems (feat. Drake, 2 Chainz & Kend...
511                   Party and Bullshit - 2008 Remaster
527                                         Off The Grid
528                                      Heaven and Hell
Name: Track Name, dtype: object
```

In just a quick manual search of these songs makes me believe this is an error. The popularity value defined by Spotify is, "based, in the most part, on the total number of plays the track has had and how recent those plays are." The oldest of these songs is two years so it seems difficult to say they have a popularity of 0.

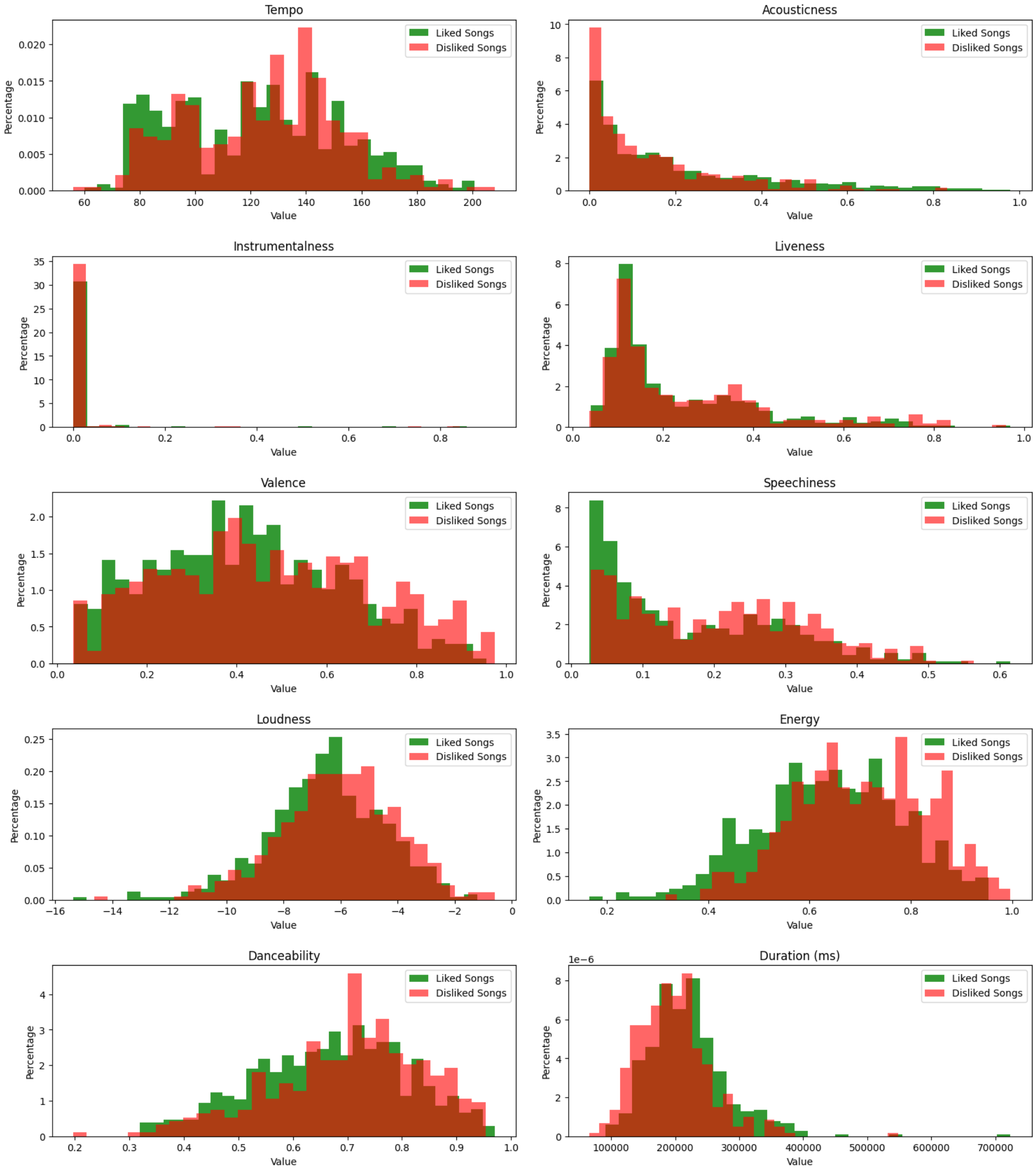
```
In [ ]: filtered_df = liked[liked["Album Name"].isin(["HEROES & VILLAINS", "Mr. Morale
        print(filtered_df["Track Name"])
```

```
19                                       United In Grief
20                                                   N95
21                                              Die Hard
22                                           Rich Spirit
23                                          Count Me Out
24                                                Mirror
95                                                Savior
166                                                Crown
226                           On Time (with John Legend)
227    Superhero (Heroes & Villains) [with Future & C...
228    Niagara Falls (Foot or 2) [with Travis Scott &...
230    Too Many Nights (feat. Don Toliver & with Future)
231                        Around Me (feat. Don Toliver)
232    Feel The Fiyaaaah (with A$AP Rocky & feat. Tak...
233               Raindrops (Insane) [with Travis Scott]
234               Umbrella (with 21 Savage & Young Nudy)
235                       Metro Spider (with Young Thug)
236    I Can't Save You (Interlude) [with Future & fe...
237              Trance (with Travis Scott & Young Thug)
239                                     The Heart Part 5
241    Walk Em Down (Don't Kill Civilians) [with 21 S...
243                           Father Time (feat. Sampha)
310                                           Mr. Morale
320               Creepin' (with The Weeknd & 21 Savage)
383                                          Silent Hill
388                                   Worldwide Steppers
389                                        Purple Hearts
390                                       Auntie Diaries
521    Feel The Fiyaaaah (with A$AP Rocky & feat. Tak...
522    Superhero (Heroes & Villains) [with Future & C...
Name: Track Name, dtype: object
```

Here are all the songs within the same albums as the songs with 0 for popularity in the liked dataframe. Not a single one of the songs on the 0 popularity list are the least listened to, and, by nature, are not older than any of the other songs. This indicates that there is, to some extent, an error. I am thinking this is likely to not be treated as I can't remove every song with a score of 0 in popularity because some of them could very well have a 0. I will likely experiment with the model to see if removing the column all together provides any increase and decrease in the accuracy of the model.

In [ ]:

```
#Generate Frequency graphs for all of the numeric features
plt.figure(figsize=(15,30))

for i,category in enumerate(['Tempo', 'Acousticness', 'Instrumentalness', 'Li
                            'Valence', 'Speechiness', 'Loudness', 'Energy', 'D
    plt.subplot(9, 2, i+1)

    #Graph and normalize the data to remove imbalance in the two sets
    plt.hist(liked[category], bins=30, color = "green", alpha = .8, label= "L
    plt.hist(disliked[category], bins =30, color = "red", alpha = .6, label= 
    plt.xlabel('Value')
    plt.ylabel('Percentage')
    plt.title(category)
    plt.legend()

plt.tight_layout(h_pad=2, w_pad=2)

plt.show()
```



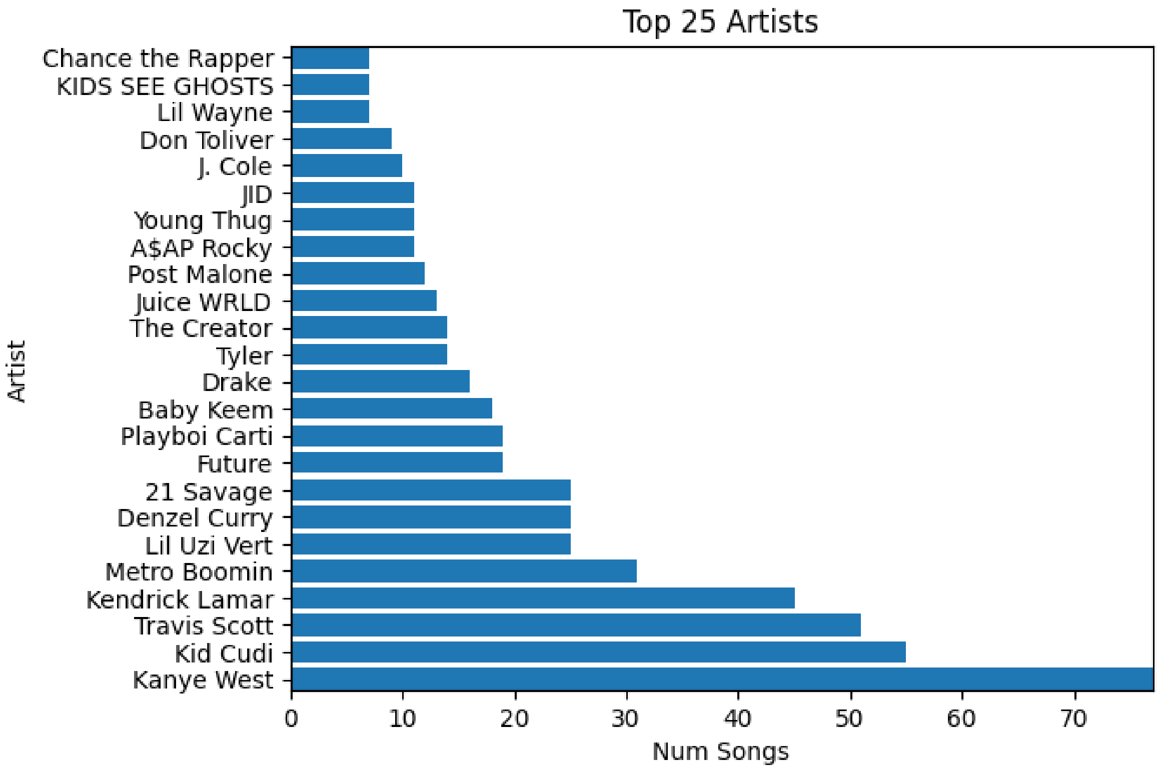
There's two major things I notice with these visualizations. Firstly Instrumentalness will likely have little to no impact on the accuracy of the model due to how very clearly skewed it is in both models. The second thing I noticed is the fact that there is a slight pattern between the duration of the song and the likability. This was the opposite of what I suspected. Despite this I will still likely not include duration in the final model because I don't really think of a song being ruined by its length (as shown by the twelve minute song) and as a result I don't want the model to suggest songs simply because they aare of a certain length.

In [ ]:
```
#Avoid issue with matplotlib and artists with a "$" in their name
data = liked
data["Artist Name(s)"] = data["Artist Name(s)"].str.replace("$", "\$")
```

```
<ipython-input-119-ab3191126861>:3: FutureWarning: The default value of rege
x will change from True to False in a future version. In addition, single ch
aracter regular expressions will *not* be treated as literal strings when re
gex=True.
  data["Artist Name(s)"] = data["Artist Name(s)"].str.replace("$", "\$")
```

In [ ]:
```
artists = defaultdict(int)
for i,song in data.iterrows():
    for musician in song['Artist Name(s)'].split(','):
        artists[musician] += 1

# sort for chart
artists = pd.DataFrame(artists.items(), columns=['Artist', 'Num Songs']
                          ).sort_values('Num Songs', ascending=False).reset_i
print("number of unique artists:", artists.shape[0])

#Create a horizontal bar graph for readability
plt.barh(artists['Artist'][:24], artists['Num Songs'][:24])
plt.xlabel(artists.columns[1])
plt.ylabel(artists.columns[0])
plt.title('Top 25 Artists')
plt.autoscale(tight=True)
plt.show()
```

```
number of unique artists: 203
```



I have yet to decide how to deal with the Artist category. The category containts helpful information however I suspect there are some flaws that need to be avoided. A normalized label encoding based of frequency seems nice but ignores two things. Firstly, how many songs the artist has. For example, Kanye West has about 75 appearances here, however this is closer to 10% of his songs whereas Baby Keem has about 17 but only 90 released songs coming out to 19% of his songs. Label encoding however would boost Kanye's weighting by factor of about 4 over Baby Keem. There seems to be a simple solution of turning this feature into a percent of all artist songs that are on the playlist but this has two issues again. The scale of finding out this percentage for every unique artist, and also the fact that it assumes the listener has heard every song from the included artists.

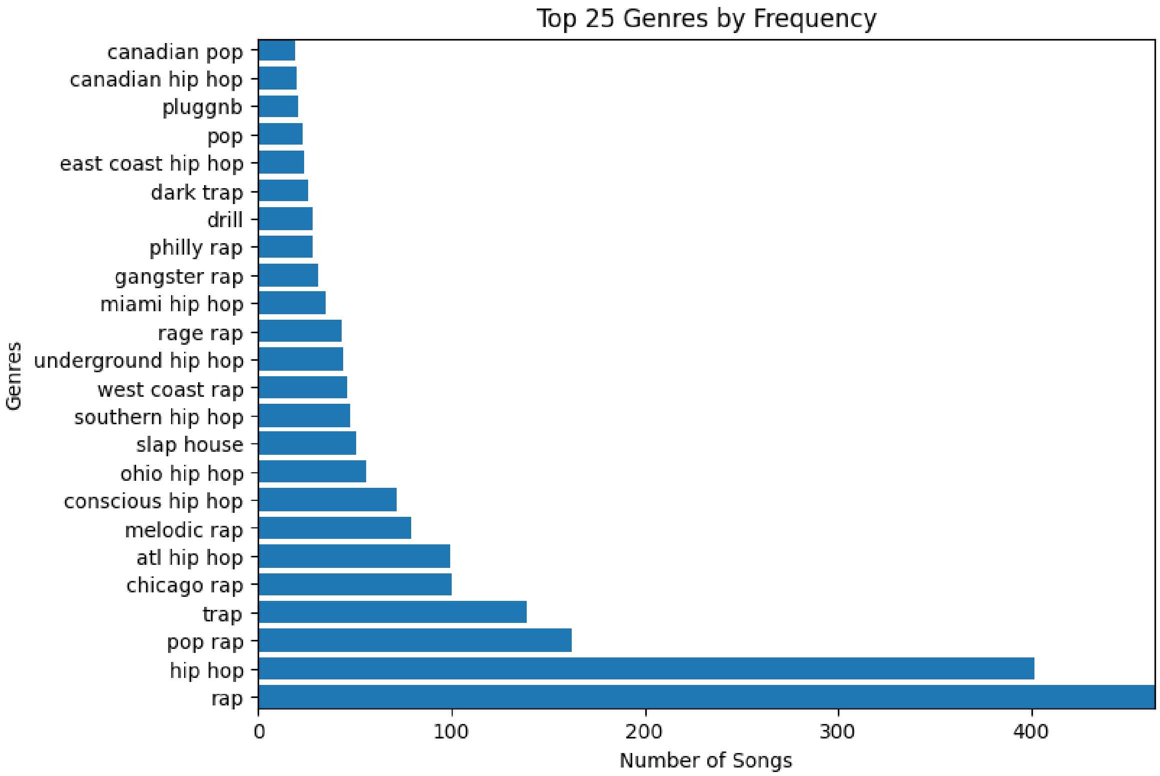
Im leaning toward a simple normalized label encoding based on frequency but mapping the lowest value to 0 so that the model doesn't assume a value of 0 here equated to dislike. I do need to decide if I don't care about feature artists or how to incorporate them into this value.

(Note for myself in the future, "Tyler, the Creator" is being split into "Tyler" and "the Creator")

In [ ]:

```
#Generate a frequency graph of split genres (top 25 for readability)
data = liked
genres = defaultdict(int)
for i,song in data.iterrows():
    for genre in song['Genres'].split(','):
        genres[genre] += 1

# sort for chart
genres = pd.DataFrame(genres.items(), columns=['Genres', 'Number of Songs']
                          ).sort_values('Number of Songs', ascending=False).re
print("number of unique genres:", genres.shape[0])

plt.figure(figsize=(8, 6))
#Create a horizontal bar graph for readability
plt.barh(genres['Genres'][:24], genres['Number of Songs'][:24])
plt.xlabel(genres.columns[1])
plt.ylabel(genres.columns[0])
plt.title('Top 25 Genres by Frequency')
plt.autoscale(tight=True)
plt.show()
```

```
number of unique genres: 192
```



Similar issues here to the artist feature. However, this time there is no chance of calculating the genre frequencies as a percent of a whole. Will need to label encode to include in the model and, again, determine how multiple listed genres willl be included

```
In [ ]: #Drop columns to not be used and display remaining contents
        newliked = liked.drop(columns=['Spotify ID', 'Artist IDs', 'Track Name', 'Albu
               'Artist Name(s)', 'Release Date', 'Duration (ms)', 'Added By', 'Added A
        newdisliked = disliked.drop(columns=['Spotify ID', 'Artist IDs', 'Track Name',
               'Artist Name(s)', 'Release Date', 'Duration (ms)', 'Added By', 'Added A
        print(newliked)
```

```
     Popularity  Danceability  Energy   Key  Loudness  Mode  Speechiness  \
0            64         0.428   0.754   5.0    -6.416   0.0       0.1790   
1            84         0.402   0.526   9.0    -6.741   0.0       0.0904   
2            71         0.621   0.695   4.0    -5.124   1.0       0.0911   
3            79         0.725   0.725   8.0    -6.067   0.0       0.1590   
4            60         0.516   0.708   9.0    -4.465   0.0       0.0253   
..          ...           ...     ...   ...       ...   ...          ...   
524          84         0.686   0.897  11.0    -7.180   0.0       0.0386   
525          75         0.636   0.570   1.0    -5.973   1.0       0.0571   
526          73         0.597   0.427   5.0    -6.764   0.0       0.0536   
527           0         0.546   0.640   8.0    -5.582   1.0       0.3700   
528           0         0.764   0.422   0.0    -7.265   0.0       0.1190   

     Acousticness  Instrumentalness  Liveness  Valence    Tempo  \
0         0.30000          0.000000    0.1360   0.3940  125.948   
1         0.11300          0.000008    0.1050   0.3120   81.404   
2         0.00584          0.000000    0.0860   0.2980  173.966   
3         0.01190          0.000000    0.0860   0.5150  140.003   
4         0.04940          0.000005    0.2430   0.3300   89.938   
..            ...               ...       ...      ...      ...   
524       0.01030          0.103000    0.1530   0.3550  129.975   
525       0.01100          0.002040    0.0677   0.0883  168.202   
526       0.18000          0.000013    0.1210   0.0997  120.085   
527       0.04380          0.000000    0.1370   0.6300  137.728   
528       0.04090          0.000000    0.1520   0.2680   82.986   

     Time Signature  isLiked  
0               4.0     True  
1               4.0     True  
2               4.0     True  
3               4.0     True  
4               3.0     True  
..              ...      ...  
524             4.0     True  
525             4.0     True  
526             4.0     True  
527             4.0     True  
528             4.0     True  

[486 rows x 14 columns]
```

Conclusion

Due to the distribution of the variables and the similarities of the music, I find it difficult to believe that the model will be very accurate without Artist and or Genre data. This is furthered by the fact that both the liked and disliked data sets are mostly rap/hip-hop and are, by definition, similar. I have decided that I will not be including artists or Genres because I think it would skew too heavily toward rap/hip-hop and artists I frequent and would prefer it to be