Visualizing Spotify Song Data

Introduction

This data visualization project aims to explore and analyze a Spotify song dataset using various univariate and multivariate graphs. The project utilizes the seaborn and matplotlib libraries in Python for data visualization.

Project overview

Univariate Graphs:

Definition: Univariate graphs represent data involving a single variable. They help us understand the distribution, central tendency, and spread of values within that variable.

Graphs Used in my Project:

1. **Histogram of Danceability Percentages:**
    - **Purpose:** Shows how danceability percentages are spread across songs.
    - **Insight:** Reveals the variety in danceability within the dataset.
2. **Line plot of Energy Percentages in Spotify Charts:**
    - **Purpose:** Illustrates the distribution of energy percentages for songs in Spotify Charts.
    - **Insight:** Highlights the range of energy levels among popular songs.

Bivariate Graphs:

Definition: Bivariate graphs involve the relationship between two variables. They help us understand how one variable changes with respect to another.

Graphs Used in my Project:

1. **Joint Plot with Regression Line (Energy vs Valence):**

- **Purpose:** Shows the relationship between energy and valence percentages.
- **Insight:** Indicates if there's a trend or correlation between energy and valence.

2. **Hexbin Plot of Danceability vs Energy:**
    - **Purpose:** Demonstrates how danceability and energy percentages are correlated.
    - **Insight:** Reveals patterns in the joint distribution of danceability and energy.

Multivariate Graphs:

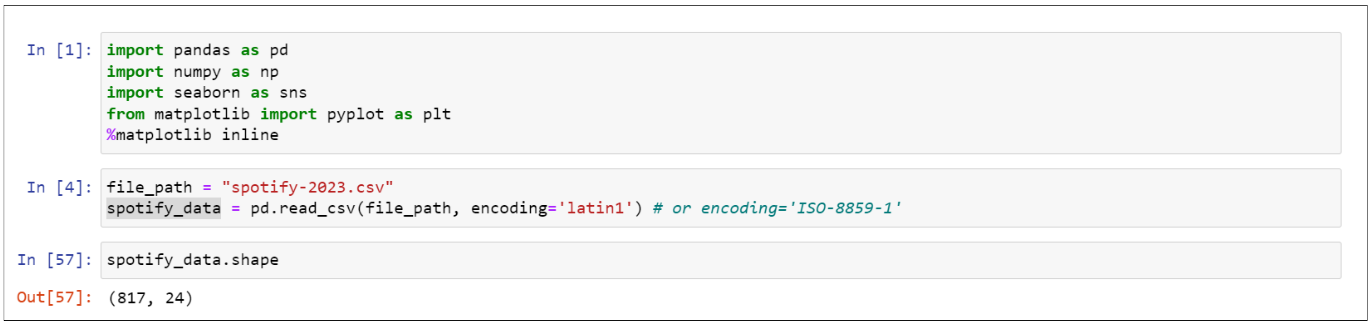
Definition: Multivariate graphs involve more than two variables. They help us understand relationships and patterns among multiple variables simultaneously.

Graphs Used in my Project:

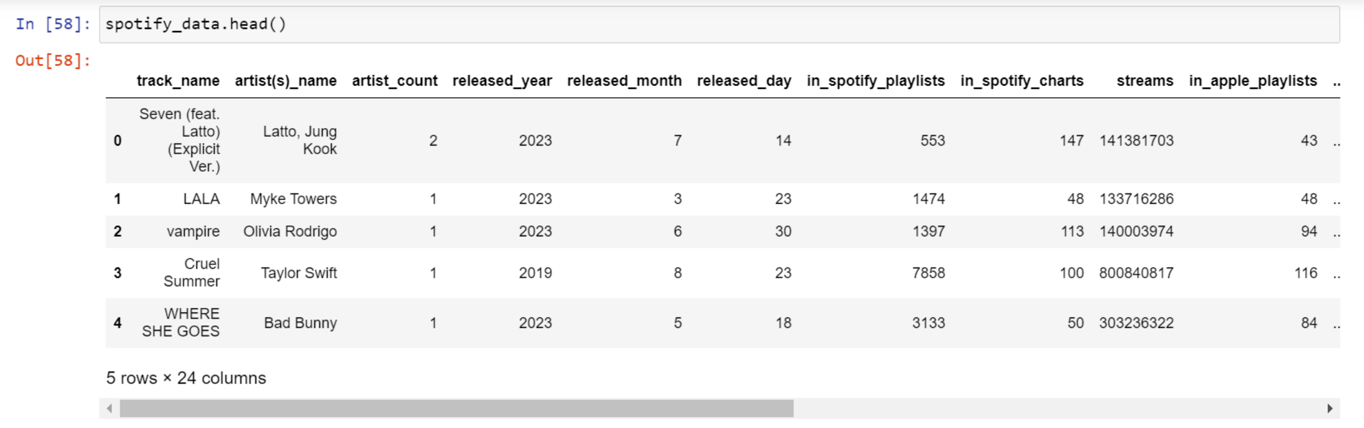
1. **Correlation Heatmap of BPM, Acousticness, and Speechiness Across Modes:**
    - **Purpose:** Illustrates correlations among BPM, Acousticness, Speechiness, and the musical mode.
    - **Insight:** Shows how these features relate to each other across different musical modes.
2. **Bubble Plot of BPM, Acousticness, and Speechiness with Energy as the Bubble Size:**
    - **Purpose:** Visualizes the relationship between BPM, Acousticness, Speechiness, and Energy.
    - **Insight:** Highlights the interplay of musical features, with bubble size indicating energy levels.

These graphs collectively help us to explore and communicate insights about the Spotify song dataset from different perspectives, making this analysis comprehensive and engaging.

Codes and Outputs: -



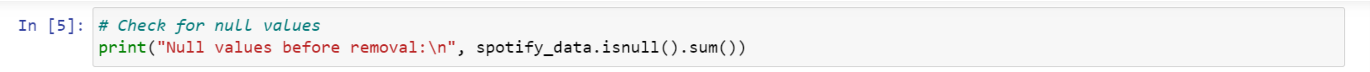
```
In [1]: import pandas as pd
        import numpy as np
        import seaborn as sns
        from matplotlib import pyplot as plt
        %matplotlib inline

In [4]: file_path = "spotify-2023.csv"
        spotify_data = pd.read_csv(file_path, encoding='latin1') # or encoding='ISO-8859-1'

In [57]: spotify_data.shape

Out[57]: (817, 24)
```



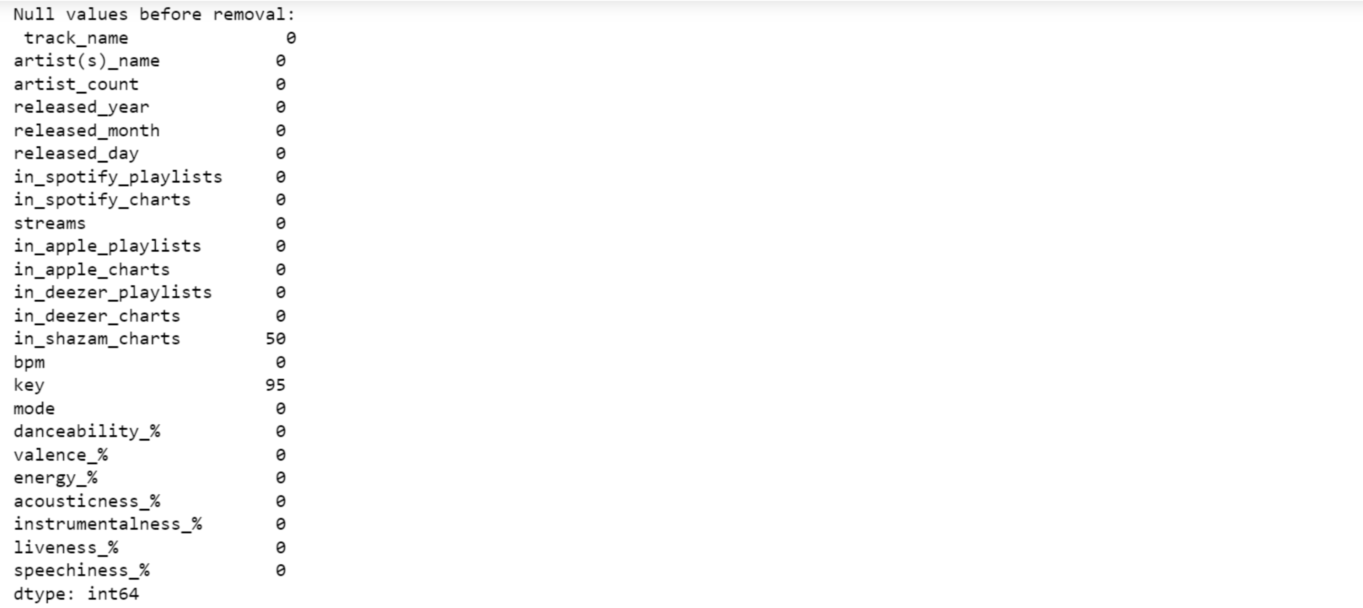
```
In [58]: spotify_data.head()

Out[58]:
```

	track_name	artist(s)_name	artist_count	released_year	released_month	released_day	in_spotify_playlists	in_spotify_charts	streams	in_apple_playlists	..
0	Seven (feat. Latto) (Explicit Ver.)	Latto, Jung Kook	2	2023	7	14	553	147	141381703	43	..
1	LALA	Myke Towers	1	2023	3	23	1474	48	133716286	48	..
2	vampire	Olivia Rodrigo	1	2023	6	30	1397	113	140003974	94	..
3	Cruel Summer	Taylor Swift	1	2019	8	23	7858	100	800840817	116	..
4	WHERE SHE GOES	Bad Bunny	1	2023	5	18	3133	50	303236322	84	..

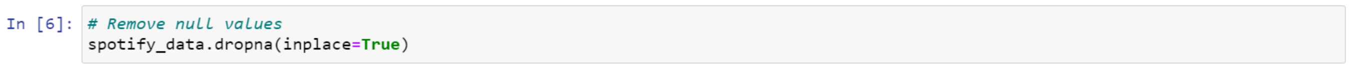
5 rows × 24 columns



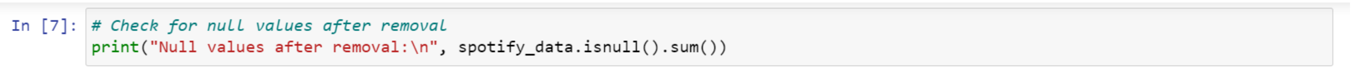
```
In [5]: # Check for null values
        print("Null values before removal:\n", spotify_data.isnull().sum())
```



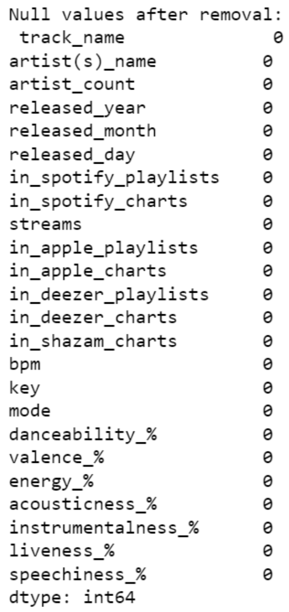
```
Null values before removal:
 track_name              0
artist(s)_name          0
artist_count            0
released_year           0
released_month          0
released_day            0
in_spotify_playlists    0
in_spotify_charts       0
streams                 0
in_apple_playlists      0
in_apple_charts         0
in_deezer_playlists     0
in_deezer_charts        0
in_shazam_charts       50
bpm                     0
key                    95
mode                    0
danceability_%          0
valence_%               0
energy_%                0
acousticness_%          0
instrumentalness_%      0
liveness_%              0
speechiness_%           0
dtype: int64
```



```
In [6]: # Remove null values
        spotify_data.dropna(inplace=True)
```



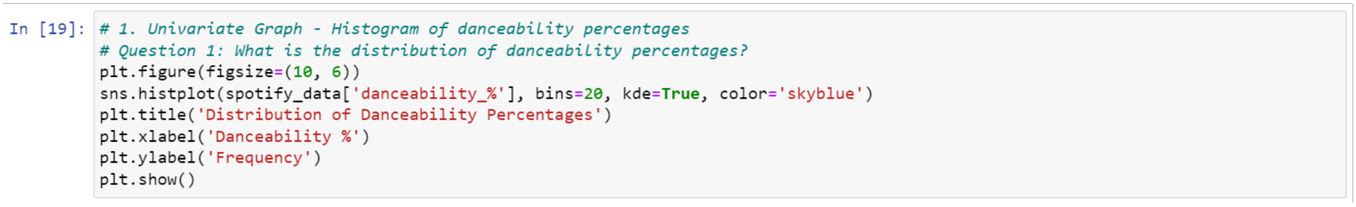
```
In [7]: # Check for null values after removal
        print("Null values after removal:\n", spotify_data.isnull().sum())
```



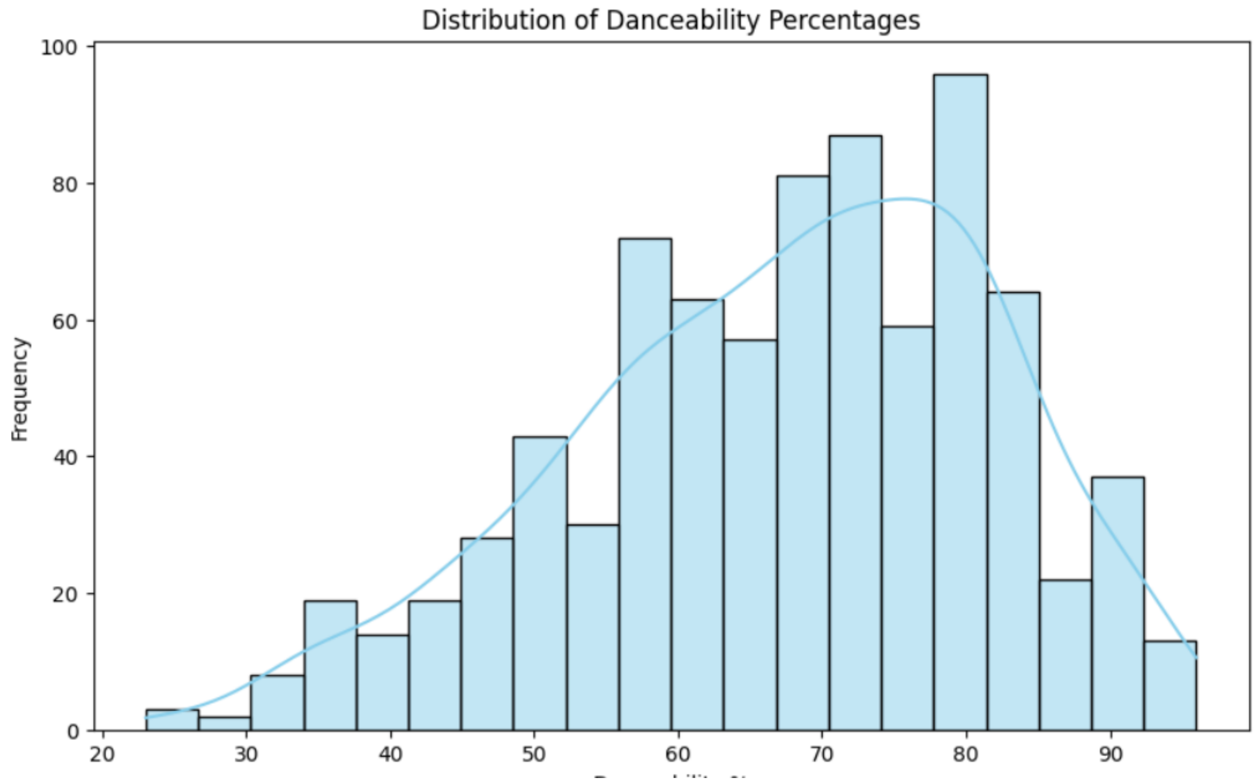
```
Null values after removal:
 track_name              0
artist(s)_name          0
artist_count            0
released_year           0
released_month          0
released_day            0
in_spotify_playlists    0
in_spotify_charts       0
streams                 0
in_apple_playlists      0
in_apple_charts         0
in_deezer_playlists     0
in_deezer_charts        0
in_shazam_charts        0
bpm                     0
key                     0
mode                    0
danceability_%          0
valence_%               0
energy_%                0
acousticness_%          0
instrumentalness_%      0
liveness_%              0
speechiness_%           0
dtype: int64
```

Univariate graphs: -

Q1) What is the distribution of danceability percentages? (Histogram).



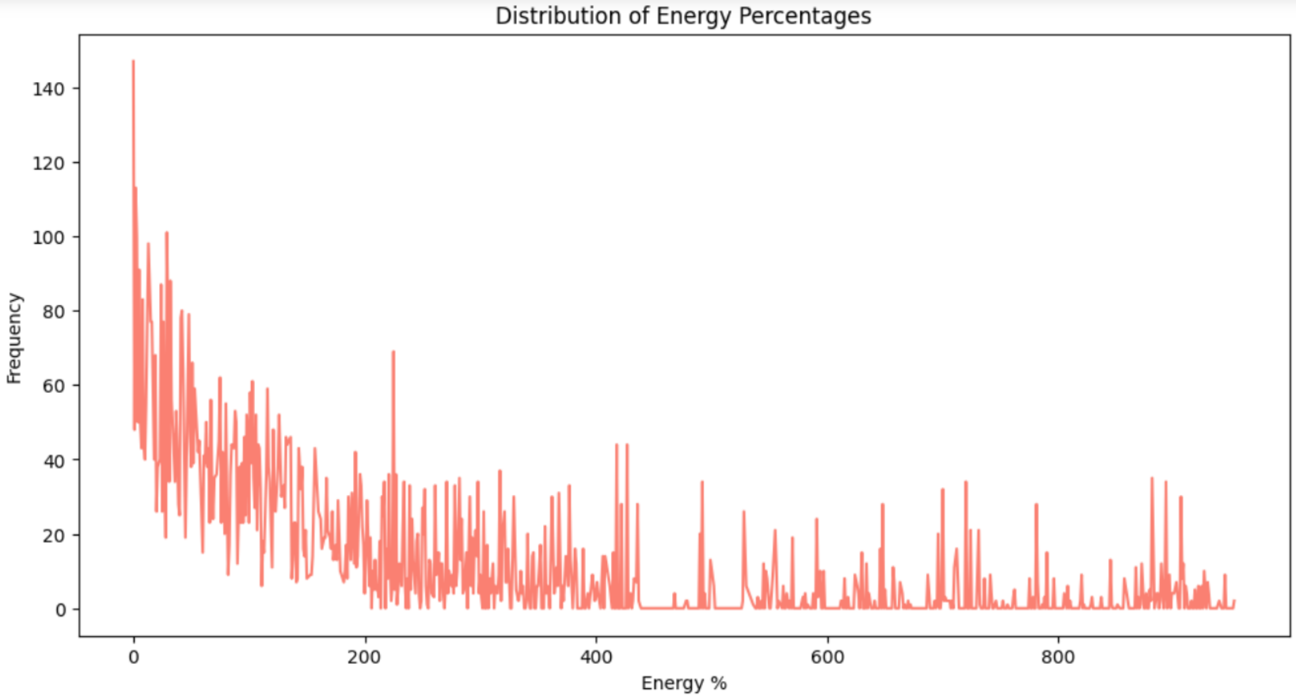
```
In [19]: # 1. Univariate Graph - Histogram of danceability percentages
         # Question 1: What is the distribution of danceability percentages?
         plt.figure(figsize=(10, 6))
         sns.histplot(spotify_data['danceability_%'], bins=20, kde=True, color='skyblue')
         plt.title('Distribution of Danceability Percentages')
         plt.xlabel('Danceability %')
         plt.ylabel('Frequency')
         plt.show()
```



Q2) How are energy percentages distributed? (Line Plot)

In [55]:

```
# Question 2: How are energy percentages distributed? spotify charts
plt.figure(figsize=(12, 6))
sns.lineplot(spotify_data['in_spotify_charts'],color='salmon')
plt.title('Distribution of Energy Percentages')
plt.xlabel('Energy %')
plt.ylabel('Frequency')
plt.show()
```

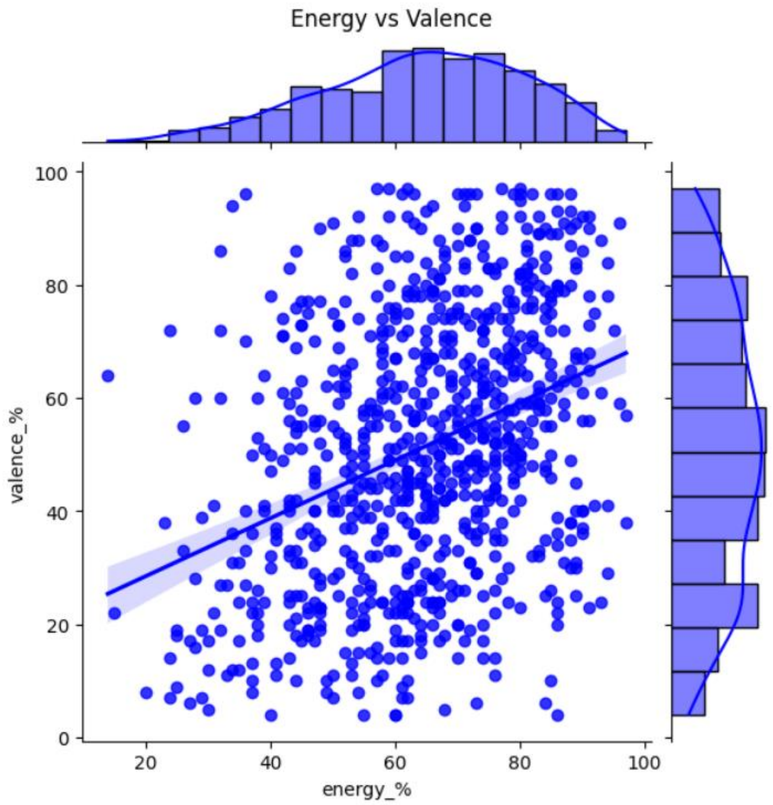


Q3) Energy vs Valence in Spotify songs (Joint Plot)

In [24]:

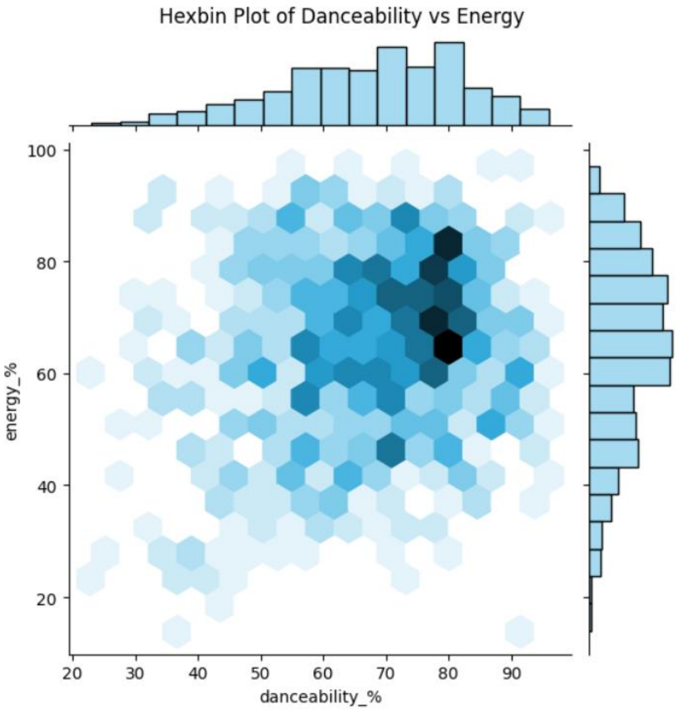
```
import seaborn as sns
import matplotlib.pyplot as plt

# Joint plot with regression line
plt.figure(figsize=(10, 6))
sns.jointplot(x='energy_%', y='valence_%', data=spotify_data, kind='reg', color='blue')
plt.suptitle('Energy vs Valence', y=1.02)
plt.show()
```

```
<Figure size 1000x600 with 0 Axes>
```



Q4) How does danceability correlate with energy? (Hexbin Plot)

```
In [23]: # Question 4: How does danceability correlate with energy?
         plt.figure(figsize=(10, 8))
         sns.jointplot(x='danceability_%', y='energy_%', data=spotify_data, kind='hex', color='skyblue')
         plt.suptitle('Hexbin Plot of Danceability vs Energy', y=1.02)
         plt.show()
```



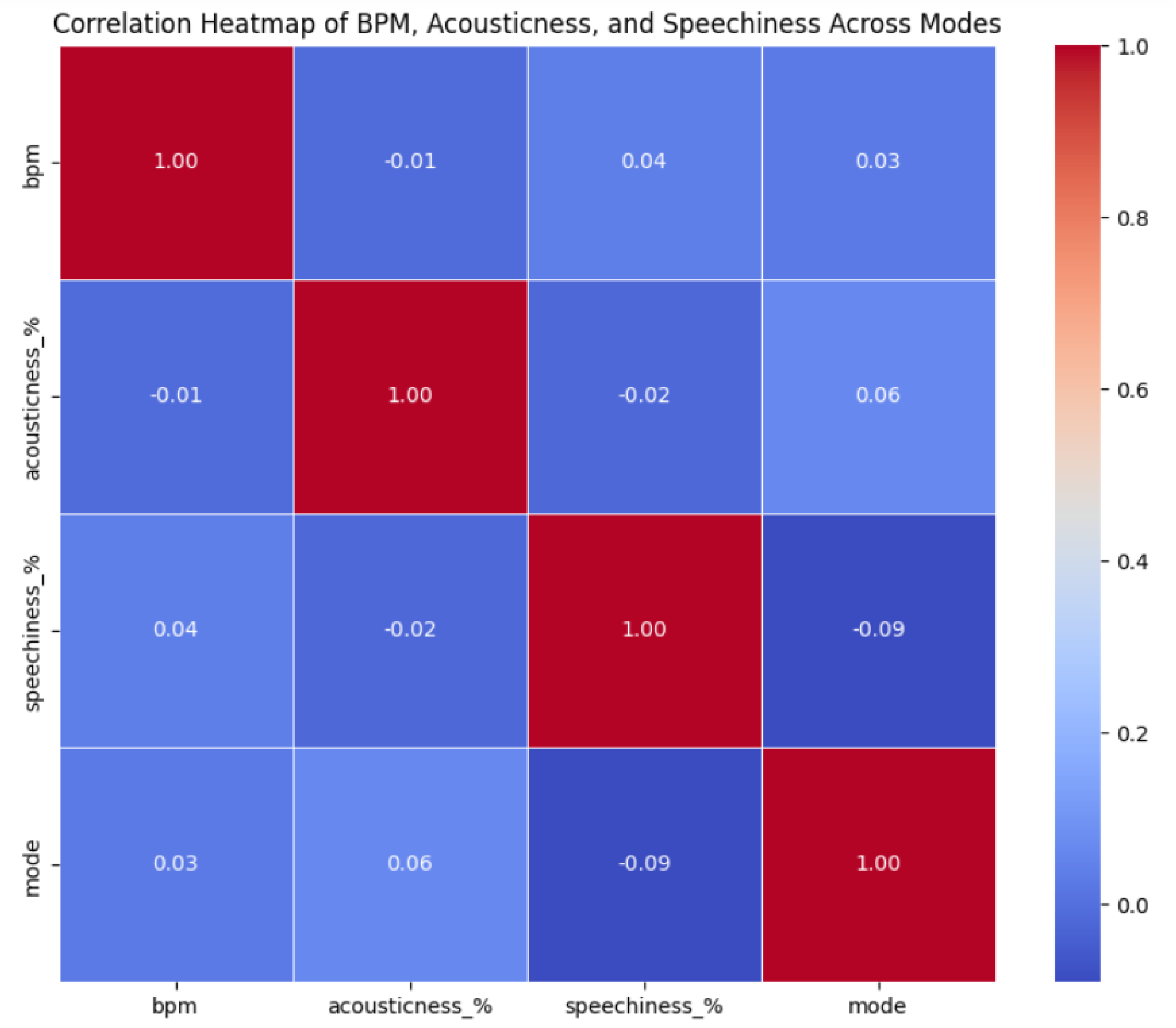
Q5) How do BPM, Acousticness, and Speechiness relate across different modes? (Heatmap)

In [36]:
```
# Check unique values in 'mode' column
print("Unique values in 'mode' column:", spotify_data['mode'].unique())
```

```
Unique values in 'mode' column: ['Major' 'Minor']
```

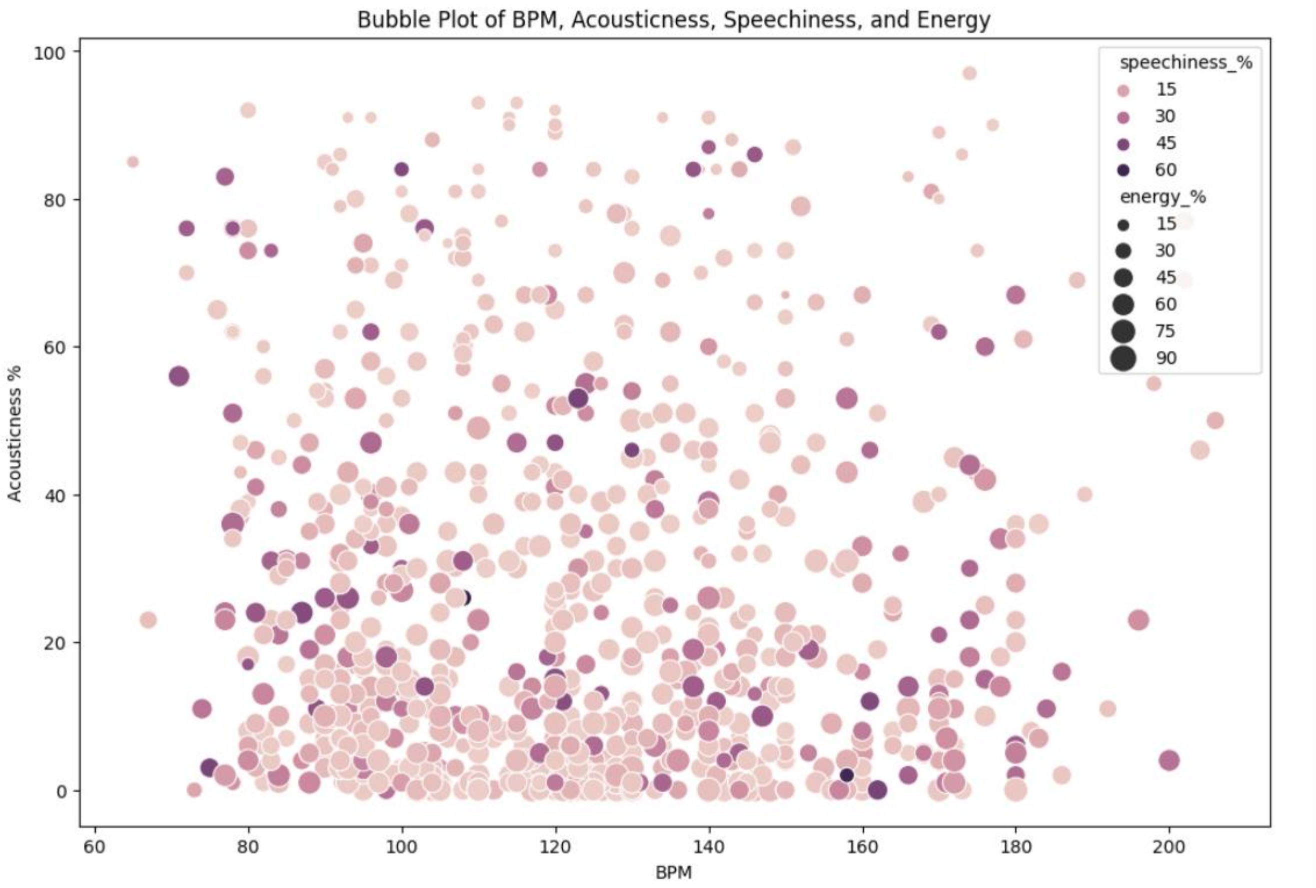
In [37]:
```
# Convert 'mode' to numerical values
spotify_data['mode'] = spotify_data['mode'].map({'Minor': 0, 'Major': 1})
```

In [40]:
```
# Question 7: How do BPM, Acousticness, and Speechiness relate across different modes?
multivariate_columns = ['bpm', 'acousticness_%', 'speechiness_%']

# Calculate the correlation matrix
correlation_matrix = spotify_data[multivariate_columns + ['mode']].corr()

# Plot a heatmap
plt.figure(figsize=(10, 8))
sns.heatmap(correlation_matrix, annot=True, cmap='coolwarm', fmt=".2f", linewidths=.5, square=True)
plt.title('Correlation Heatmap of BPM, Acousticness, and Speechiness Across Modes')
plt.show()
```



Q6) Bubble plot of BPM, Acousticness, and Speechiness with Energy as the bubble size (Bubble Plot)

```
In [41]: # 3. Multivariate Graphs
         # Question 8: Bubble plot of BPM, Acousticness, and Speechiness with Energy as the bubble size
         plt.figure(figsize=(12, 8))
         sns.scatterplot(x='bpm', y='acousticness_%', hue='speechiness_%', size='energy_%', sizes=(30, 200), data=spotify_data)
         plt.title('Bubble Plot of BPM, Acousticness, Speechiness, and Energy')
         plt.xlabel('BPM')
         plt.ylabel('Acousticness %')
         plt.show()
```



Conclusion

In a nutshell, this project journeyed through Spotify's musical world, using cool charts to understand what makes songs tick. We learned about danceability vibes, energy levels, and how musical elements groove together. Each graph painted a story, turning numbers into a song of insights. Behind every data point is a unique melody waiting to be heard. 🎵🚀