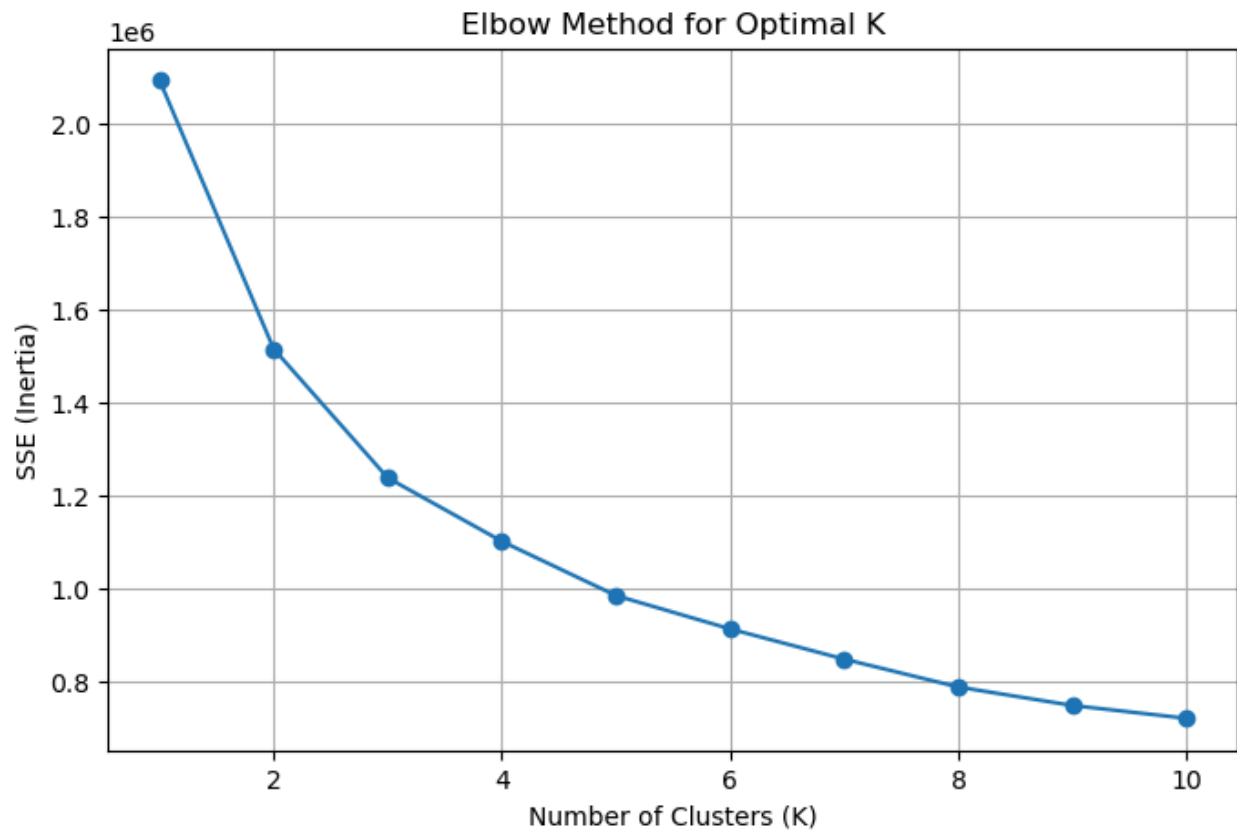


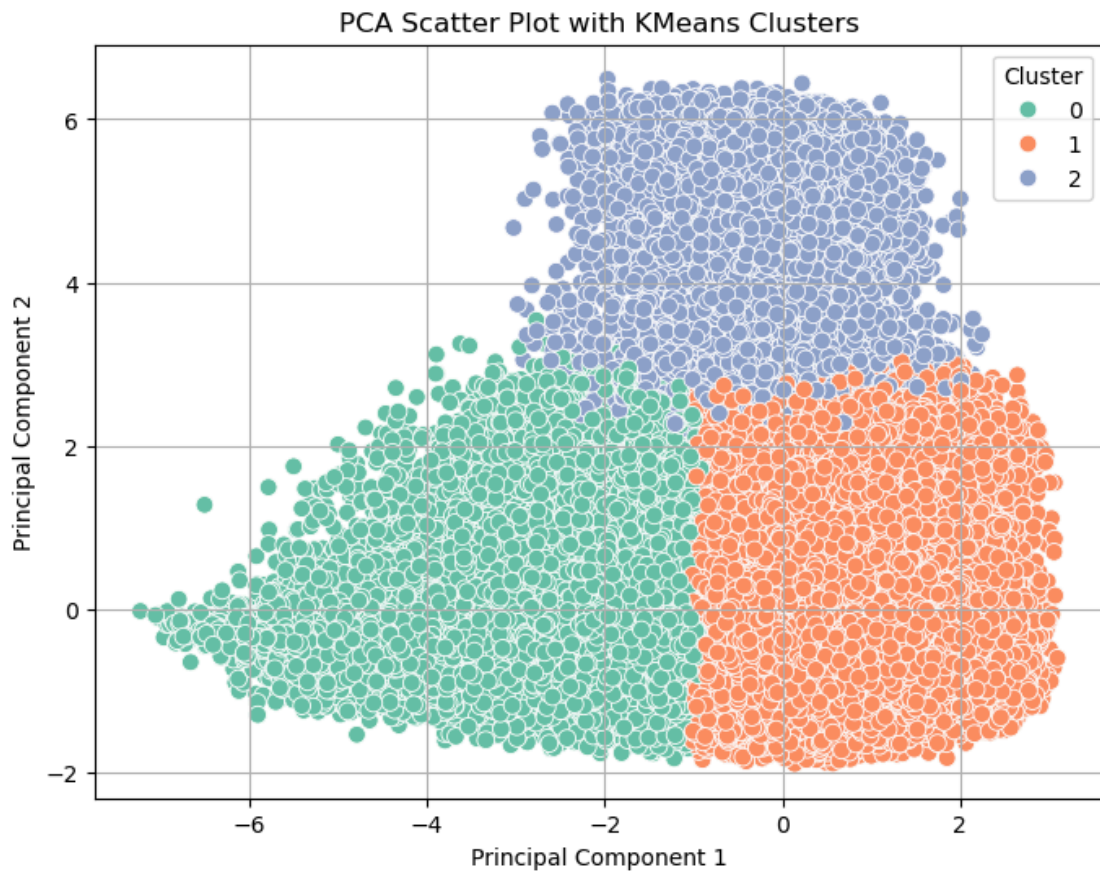
Appendix (Unsupervised learning)



1. Elbow Method to find optimal K

```
Silhouette Score for k=2: 0.3433  
Silhouette Score for k=3: 0.3729  
Silhouette Score for k=4: 0.2204  
Silhouette Score for k=5: 0.1851
```

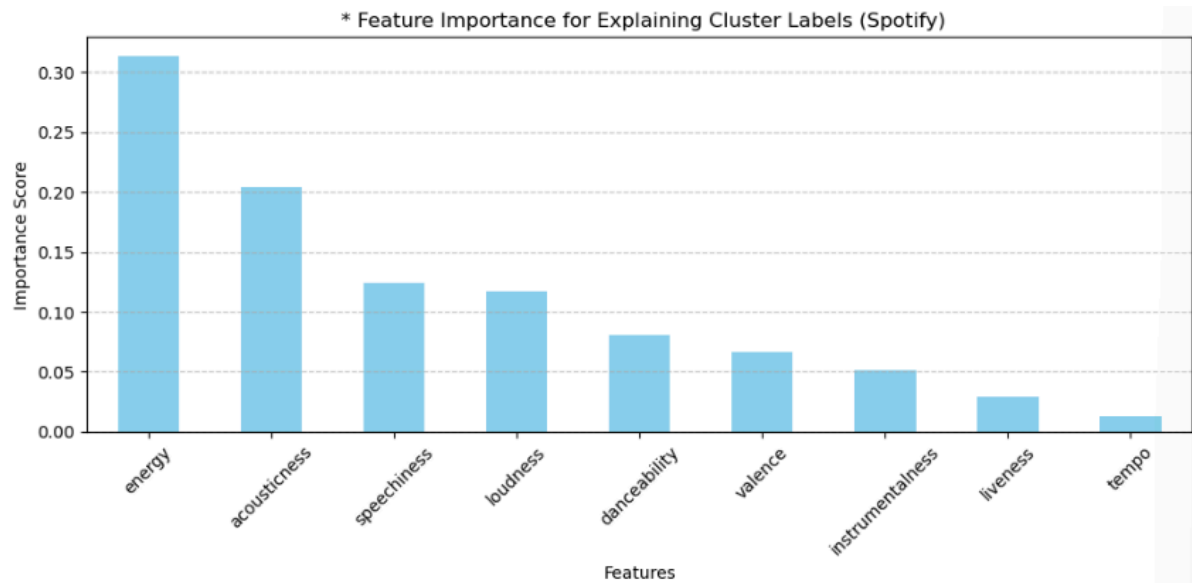
2. Silhouette Score Evaluation



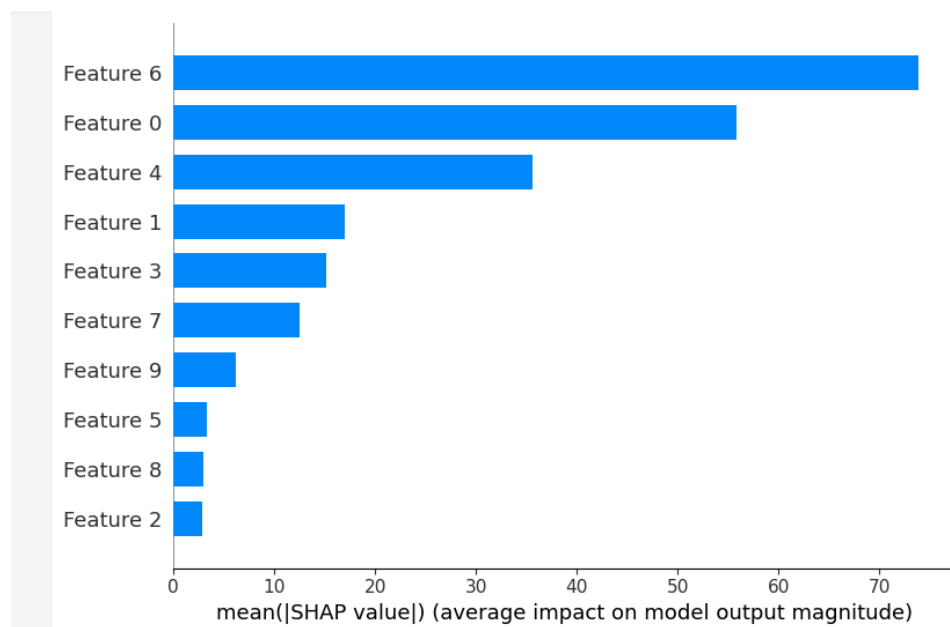
3. Apply PCA for 2D Visualization

	acousticness	danceability	energy	instrumentalness	liveness	loudness	speechiness	tempo	valence
Cluster									
0	0.822820	0.367039	0.212512	0.441002	0.164690	-17.485691	0.050743	106.264408	0.217745
1	0.200539	0.612675	0.677964	0.065420	0.199434	-6.938802	0.097028	122.425852	0.531746
2	0.783803	0.562365	0.660834	0.001492	0.727112	-11.960247	0.867065	98.397242	0.416038

4. Interpretation of Clusters



5. Random Forest Feature Importance from Cluster Labels



6. SHAP Analysis