Classifying Metal, Pop and Classical –

K-Means Clustering was run on the data set obtained from the 3 genres. The following confusion matrix was obtained –
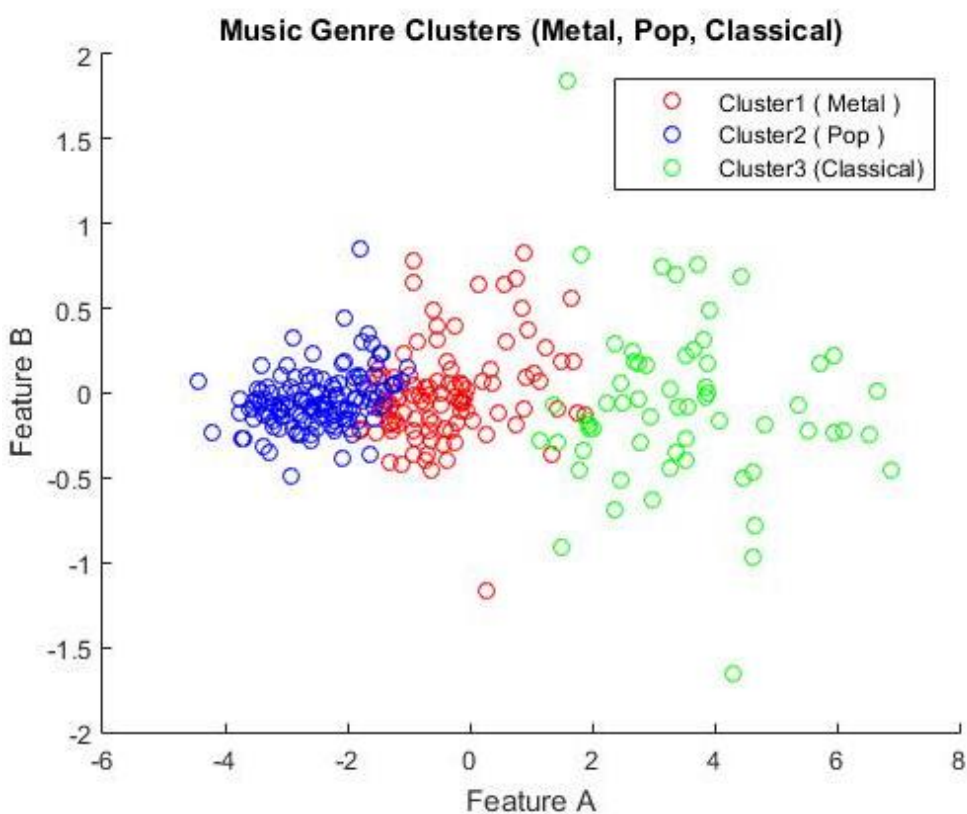
		Predicted		
	n=300	**Cluster1**	**Cluster2**	**Cluster3**
Actual	**Metal**	83	16	1
	Pop	42	51	7
	Classical	6	41	53
		131	108	61

Accuracy:	
Metal	0.83
Pop	0.51
Classical	0.53

Precision:	
Cluster1	0.633588
Cluster2	0.472222
Cluster3	0.868852

Observations:

1) The accuracies obtained are acceptable, although we can do bett er than this by using better supervised classifiers such as SVM's or Neural Networks

2) There is a large false positives for both Cluster 1 and Cluster 2, which implies the inherent similarity between the genres.

Music Genre Clusters (Metal, Pop, Classical)

PCA was used to reduce the dimensions of the features from 30 to 2, so as to visualize it in 2-D

What is a confusion matrix?

Usually in classification, we use a confusion matrix which describes the performance of a classification model.

Terminology –

True Positive: The correct predictions of genres for the songs

False Positives: Prediction that it belongs to a genre, whereas it doesn't

False Negatives: Prediction that it doesn't belong to a genre, whereas it does

Accuracy:

$$\frac{True\ Positives}{Total\ Songs\ in\ the\ Genre}$$

Precision:

$$\frac{True\ Positives}{True\ Positives + False\ Positives}$$

Recall:

$$\frac{True\ Positives}{True\ Positives + False\ Negatives}$$

F-Score: $2\dfrac{PR}{P+R}$,

where P – Precision, R – Recall

As we can see, our clusters formed are pretty fair, although there is significant overlap between Cluster 1 and Cluster 2, and Cluster 2 and Cluster 3 respectively, which explains a lot of false positives

Alternate Implementations –

While Euclidean distance is the standard notion of distance in the vector space, another notion is the Kullback Lieber Divergence. While this is not used as a metric for music, some groups have reported success with it.

While we have used the centroids as a point distribution, one group reports success using centroids as a multivariate Gaussian distribution and using the KL distance measure

Industry Applications –

Genre Classification plays a big role in the music industry, where many streaming apps need to automatically classify songs according to genre in order to recommend songs to its customers. Although state of the art supervised classifiers (CNN's, SVM's) achieve accuracies upto 95%, our aim was to implement a naive unsupervised learning method to get the gist of feature extraction and its application.