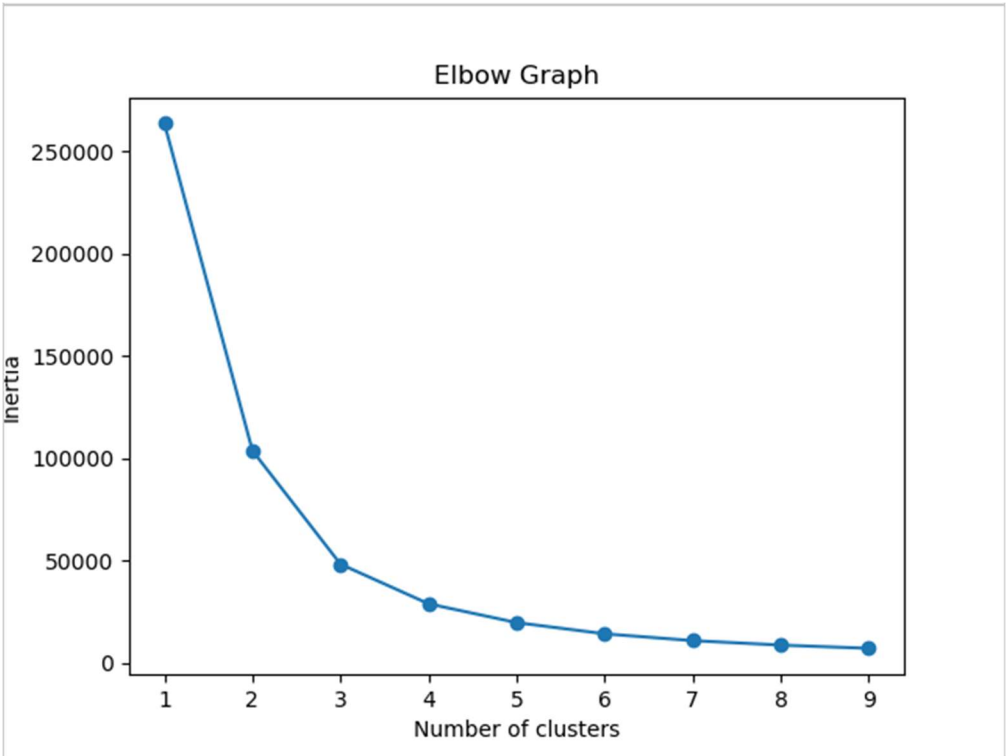
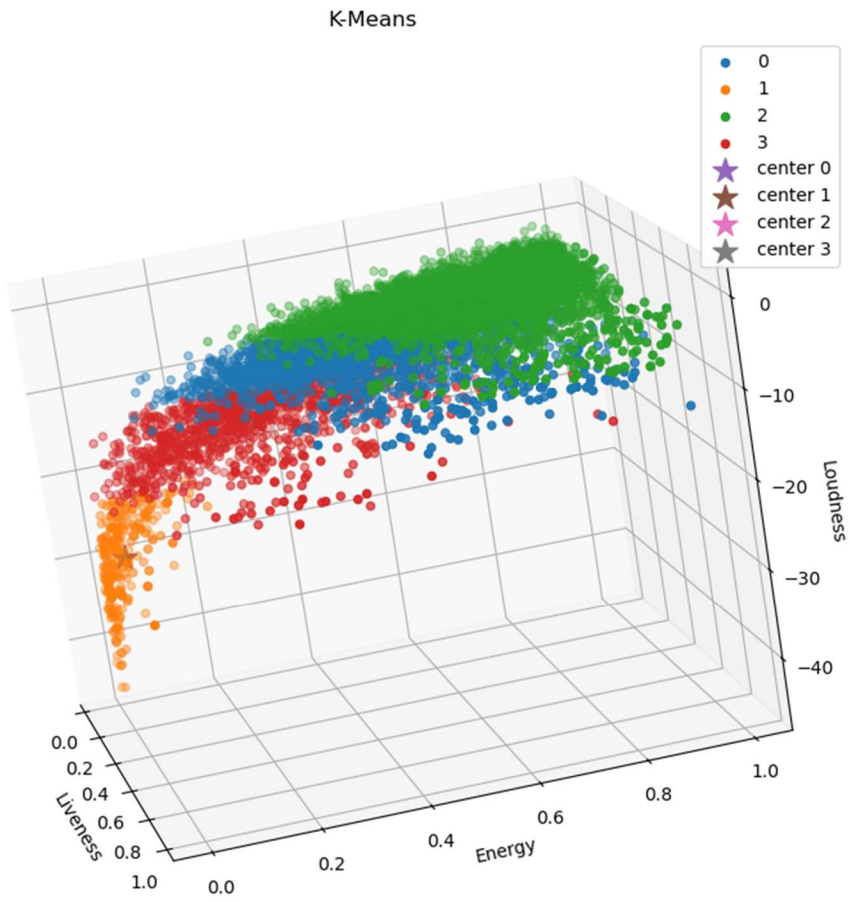
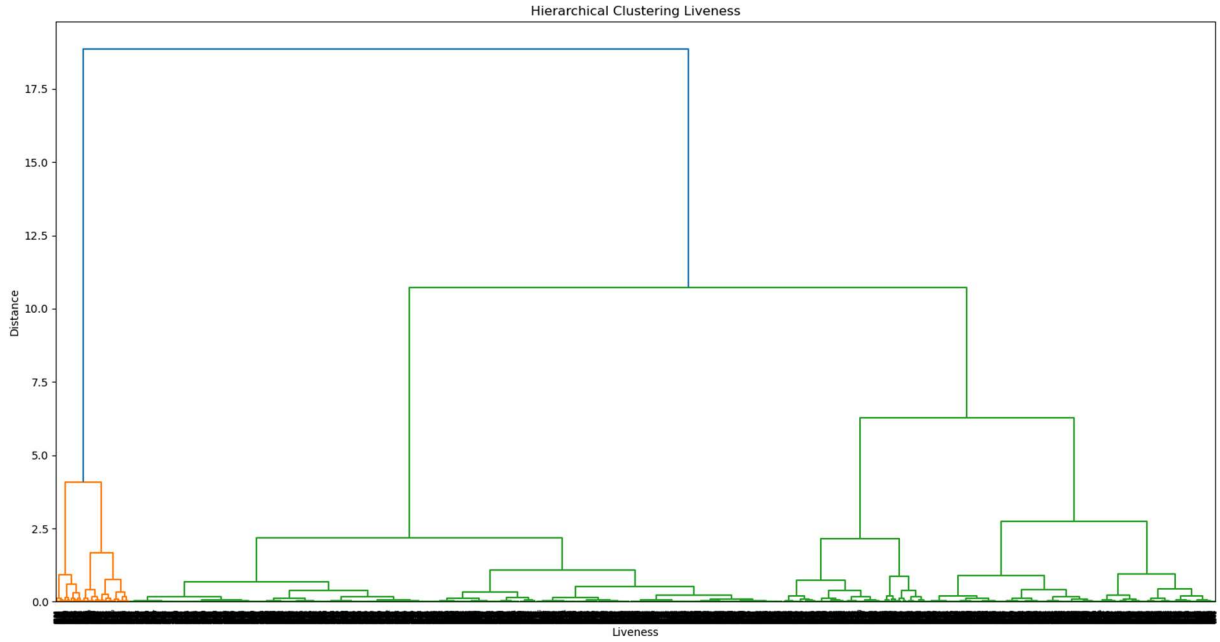
In order to make the provided code work for three dimensions, I added additional another dimension to variable x which is a list that holds the data point coordinates. I also added another dimension to k_clusters, a dictionary that organized lists of data points to the corresponding cluster. Finally, I changed the scatter plot to a 3D scatter plot by adding the projection to the axes of the graph and the third dimension to the scatter plot function calls.

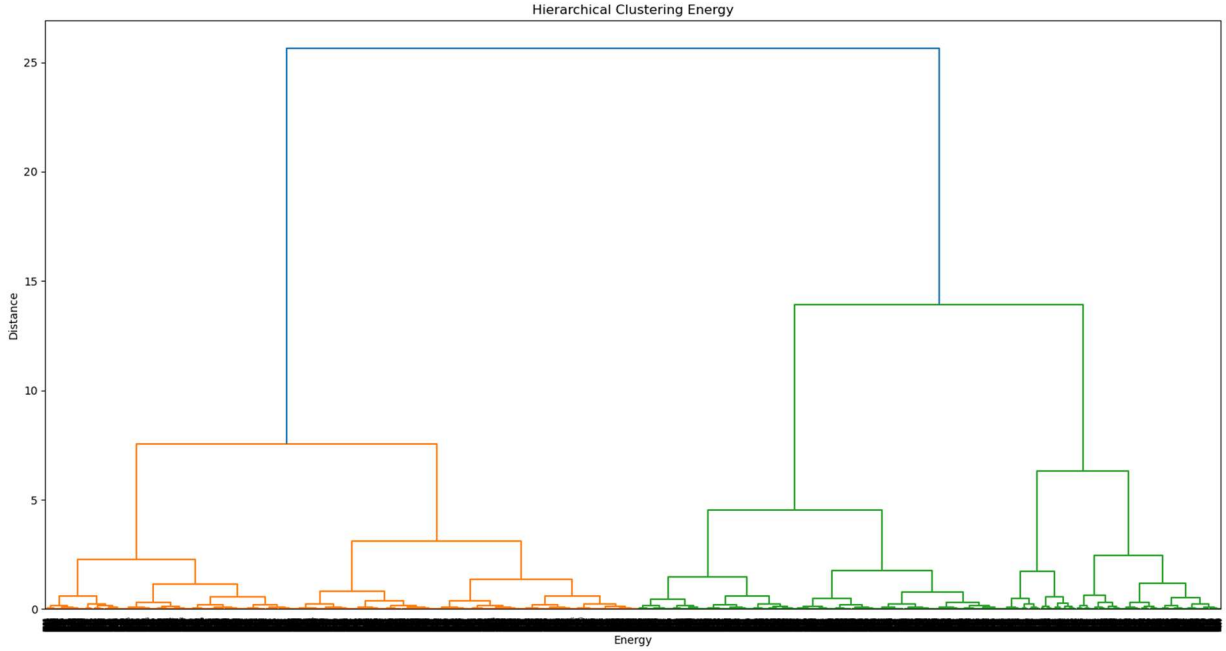


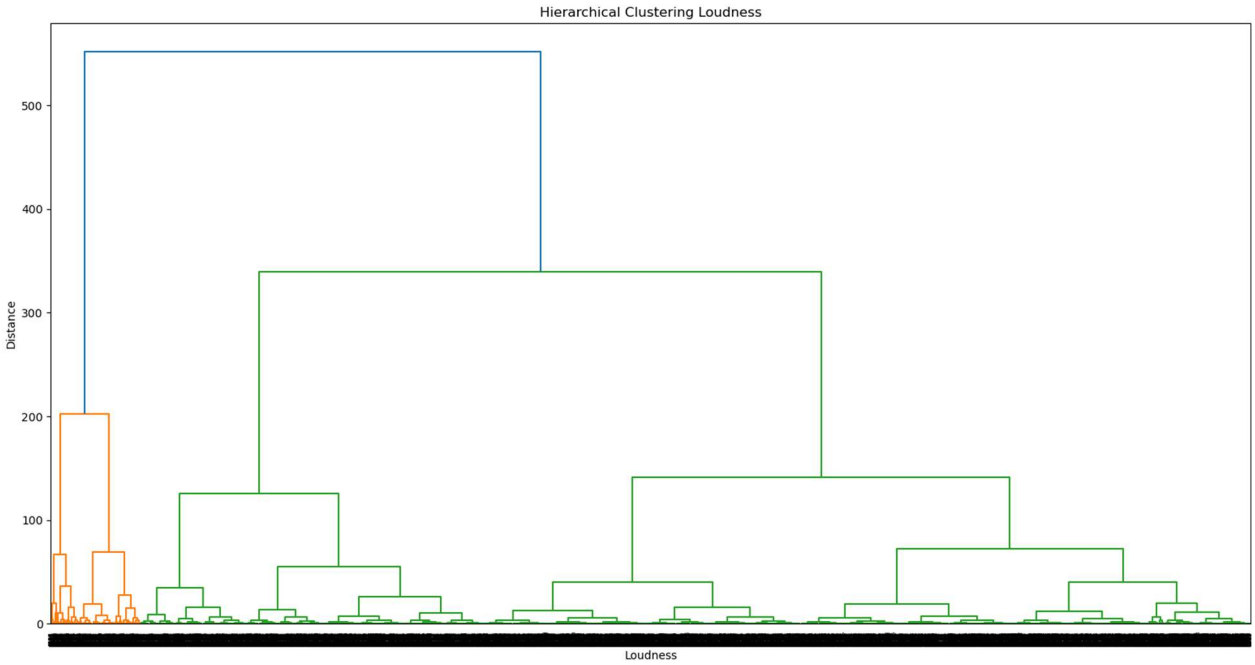
Looking at the elbow graph, it appears to me that the elbow is where k= 4. That is where the graph appears to transition to smaller deltas of inertia for the following points.



The clusters appear to have clear separation along loudness. The separation along the energy and liveness axes is not clearly defined. This scatter plot seems to show that loudness contributes more to the classification of a song more than liveness or energy.


Hierarchical Clustering Liveness
Distance
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
Liveness


Hierarchical Clustering Energy
Distance
25
20
15
10
5
0
Energy



All I can say from the dendrograms is the distance of each dimension at different values of k and how the data points get included in the clusters as k changes. Visually, k of 4 does seem like to have “space” around its threshold value on all of the graphs except energy.