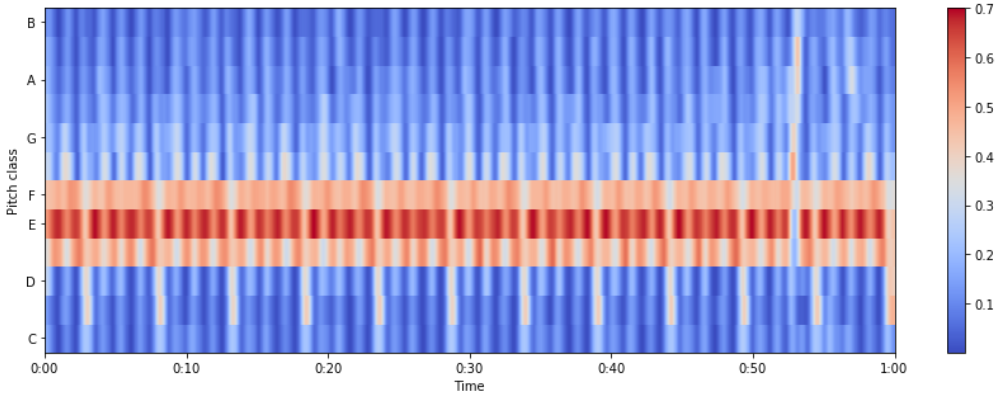
Our 4 notebooks in the code folder display all our output and results of different metrics on the 4 different categories. This is a summary of our findings and some key points.

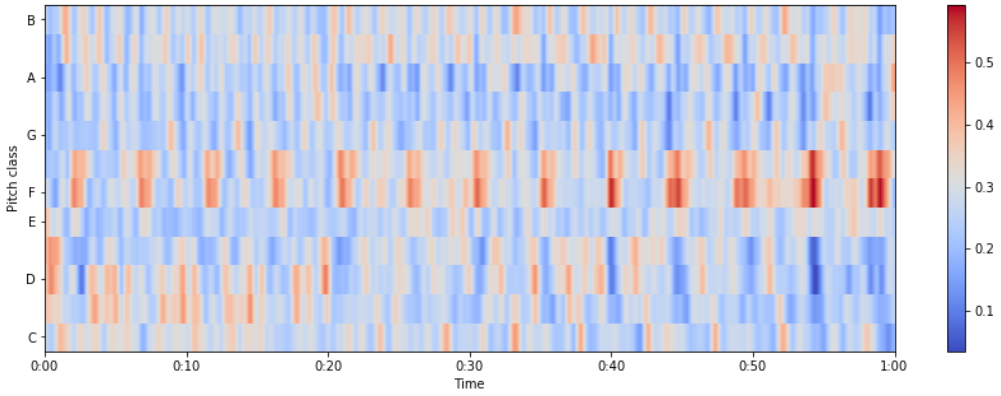
Results:

The documentation of the output of our results is included in the notebooks that contain our code. Using the results found in each of these notebooks, we compared the different measurements that we calculated across the different categories. Our results gave us a number of interesting insights into the relationship between East Coast and West Coast hip-hop, both during the 1990's and 2010's.

Based on what we found using the Fourier transform, 1990's East Coast hip-hop songs seem to feature a wide variety of notes, with the most common notes being G2 and F10. Looking at the chromagrams of all the samples, the loudest portions, in general, tend to stay within the D, F and G pitches. Zooming into these chromagrams, however, shows that many of the songs tend to follow similar pitch distributions, with five of the ten songs having dense, straight red "band" patterns spanning roughly 3 half pitches that persist throughout the entire song, and with four of the ten songs having a sinusoidal wave pattern spanning roughly 9 half pitches. The 90's hip-hop song, "The Choice is Yours," features the widest variation in pitch classes with the total intensity of the song being dispersed across all 12 half pitches. We also found that, on average, the samples have 124,713 zero crossings, with the range of zero crossings being 85,987 - 170,486.



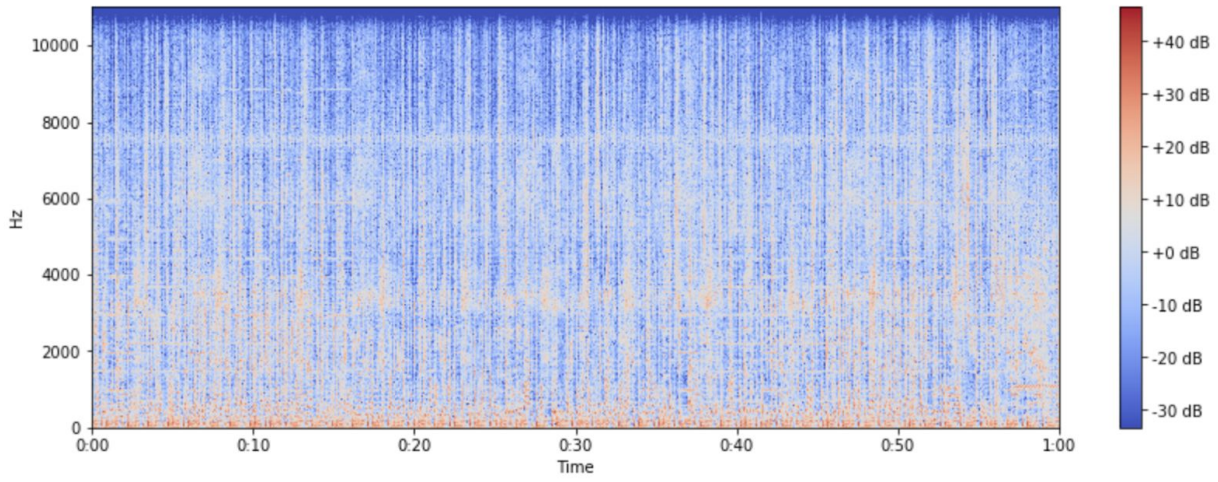
Chromagram of "Survival of the Fittest - Mobb Deep" showing what a "band" would look like



Chromagram of “The Choice is Yours - Black Sheep” showing a large dispersion of pitch presences

1990’s West Coast hip-hop featured a lot of G1 and F10 notes, demonstrated through the Fourier transform. The chromagram of each song illustrates a consistent use of the D and G pitch classes. The chromagrams also show a “band” pattern on many of the songs, generally near the G pitch class, which demonstrates the consistent use of the G pitch class throughout this era’s hip-hop music. One of the most prominent of these “bands" is shown in the Chroma for “Nuthin But a G Thang” where we can see a long red line throughout the entire clip spanning only the G pitch class. The number of zero crossings for this specific era and location was also very high; the average total number of zero crossings being 163,882. These zero crossing values help to identify beat detection and to give us a better understanding of different beats patterns in different songs. For instance, “Regulate” had a significantly lower number of zero crossings (68,977), which makes sense as the song is much more relaxed and slow than the others.

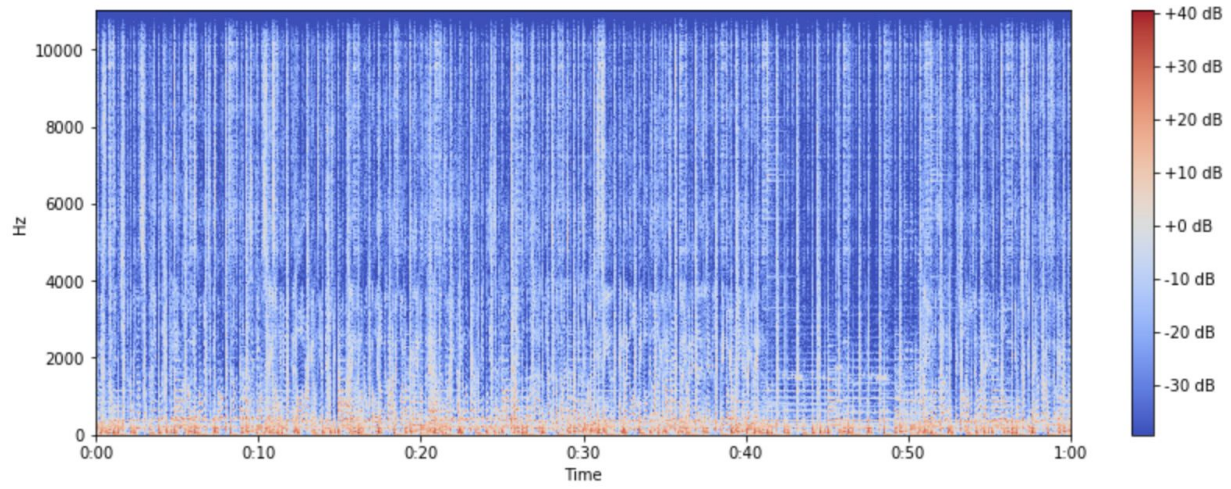
Nuthin But a G Thang:



Looking at the Spectrogram for “Nuthin But a G Thang,” we can see the consistent intensity

throughout the song, which is similar to the style of many of the other West coast hip-hop songs from the 90's.

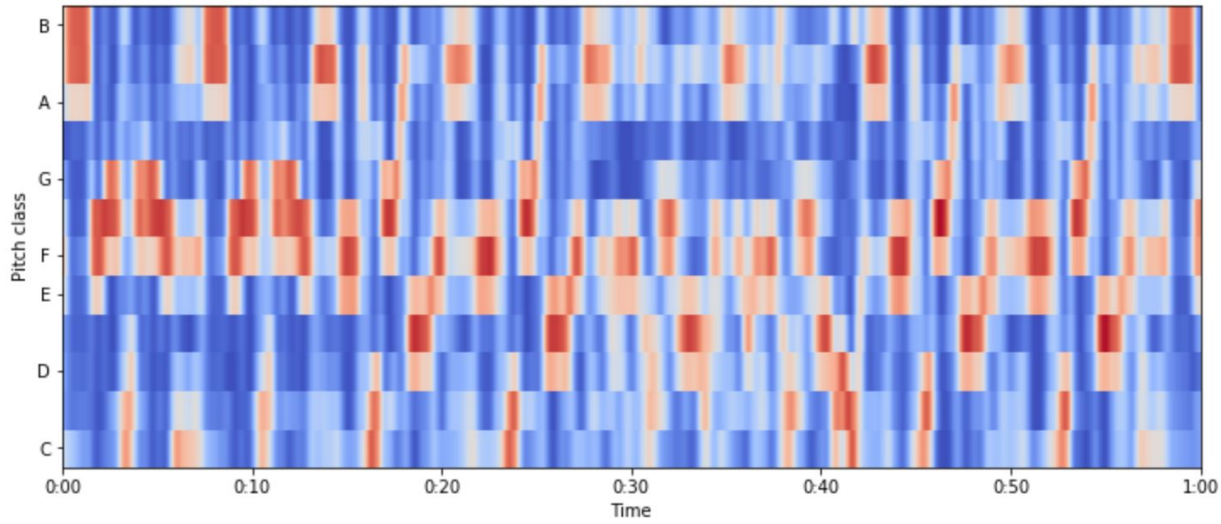
Regulate:



Looking at the Spectrogram for "Regulate" we can see that it is an outlier in this subset as it shows a much more calm style. This may explain why the zero crossing rate was so low compared to the other songs.

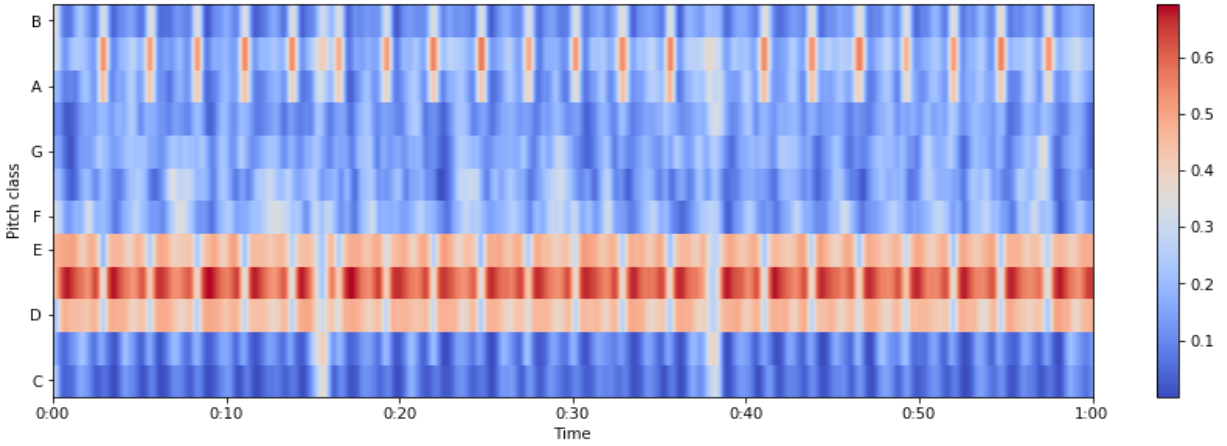
2010's East Coast hip-hop, according to our findings, heavily featured the use of the D#1 and F10 notes. Analyzing our chosen songs using the Fourier transform, we were able to identify these two notes as being especially prevalent in the music of this era and area. The results of our chromagrams indicated prominent usage of the E, F, and D pitch classes. We also found that for this subsection of our data, while most of the chroma charts were heavily banded and formed straight lines, 3 out of our 10 songs featured heavy variation among the pitch classes throughout the entirety of the song, an example of which can be seen below. We also found that the ten chosen songs had an average of 83,741 zero crossings.

Digits:

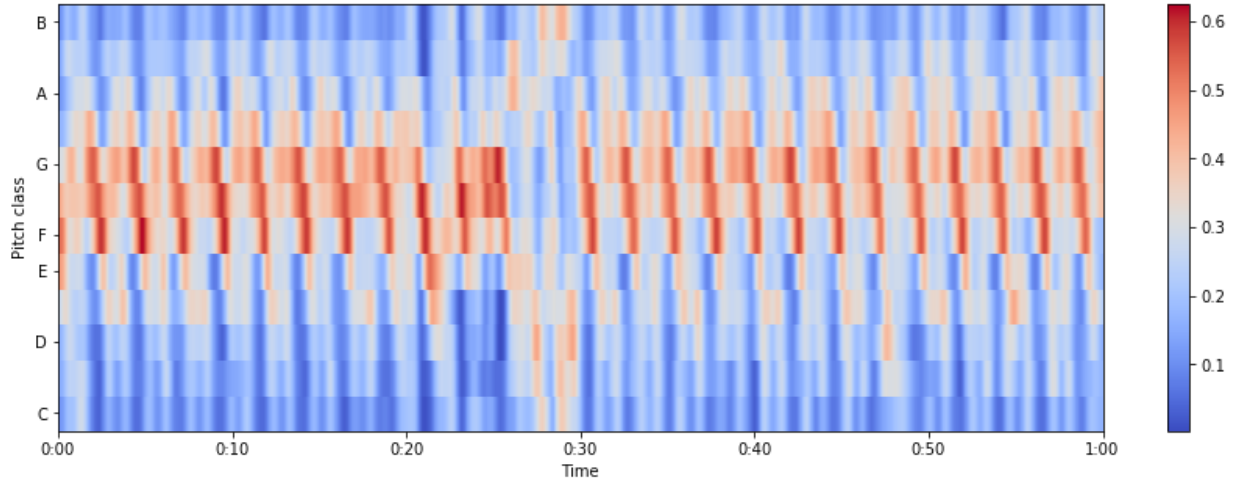


2010's West coast hip-hop, on the other hand, featured some use of the A#0 and G1 notes, though there was no clear pattern as to which notes were most prevalent. There was a similar issue in determining which pitch classes were most common using the chromagrams. This is because there was much more variance in the hip-hop music of this era and region than of the other eras and regions analyzed. Also, the number of zero crossings, on average, were higher than the 2010's East Coast rap, averaging at 122,558 zero crossings.

We found distinct differences between East Coast and West Coast hip-hop in the 1990's. Using the Fourier Transformation, we found that East Coast hip-hop has a much more dispersed usage of pitches across songs with the mode of the sample being G2 (2 occurrences), while the West Coast heavily features G1(4 occurrences) as the dominant note, with G#1 occurring twice. However, upon looking at the chromagrams, the intensity of pitches from East Coast hip-hop are much more defined around the center of the band, while the West Coast's hip-hop has a much more dispersed presence of pitches.



Chromagram of “Dangerous Mindz - Gravediggaz” **East Coast** band spanning 3 half pitches



Chromagram of “Straight Outta Compton - NWA” **West Coast** showing larger dispersion of pitches

We found some clear differences between the two regions we analyzed during the 2010s. From the chroma vectors of either region, East Coast hip-hop songs used the D#1 and F10 notes quite heavily, while the notes used in West Coast songs were more varied. West Coast songs also had less striation within their chroma vectors than East Coast songs.