

MMT Assignment - 2 & 3

Report

Question A:

1c:

- Original melody: Provides a full, rich sound that highlights the harmonic complexity and completeness of the melody.
- Odd harmonics: Contributes to a unique character but has a "hollow" quality when compared to the full harmonic version.
- Even harmonics: Less warm and more focused than odd harmonics, but with a clearer tone nonetheless.

2d:

- Enhances the auditory experience by producing a full, rich sound when the melody contains all of the harmonics.
- Absence of the Fundamental Frequency: With the harmonic series, the intended pitch can still be identified, but the sound may become a little thinner or less grounded.
- The sound becomes even less full without the fundamental and second harmonics, giving it a more ethereal touch. It could be a little harder to perceive pitch when these lower harmonics are absent.

Question B:

1.2:

The following are the typical discrepancies:

- Perception and Analysis: Individuals often base their tempo estimates on the main rhythm they perceive, which could be the vocals, bassline, or another prominent element. In contrast, algorithms analyze the audio signal's overall energy or specific

features, which may not always align perfectly with human perception, leading to differences in tempo estimation.

- **Tempo Variability:** Algorithms for tempo estimation can vary in their approach, adjusting tempo estimates based on the most memorable sections of the piece. Depending on their design, these algorithms may average the tempo over the entire piece, identify the most dominant tempo, or offer a range of tempos, resulting in differing estimates.
- **Subdivisions of the Beat:** Discrepancies may arise between human perception and algorithmic analysis regarding the level of the beat being tracked. While people might tap along with the quarter notes in a piece, algorithms could identify the eighth note as the primary tempo, potentially doubling the perceived beats per minute (BPM).

1.3:

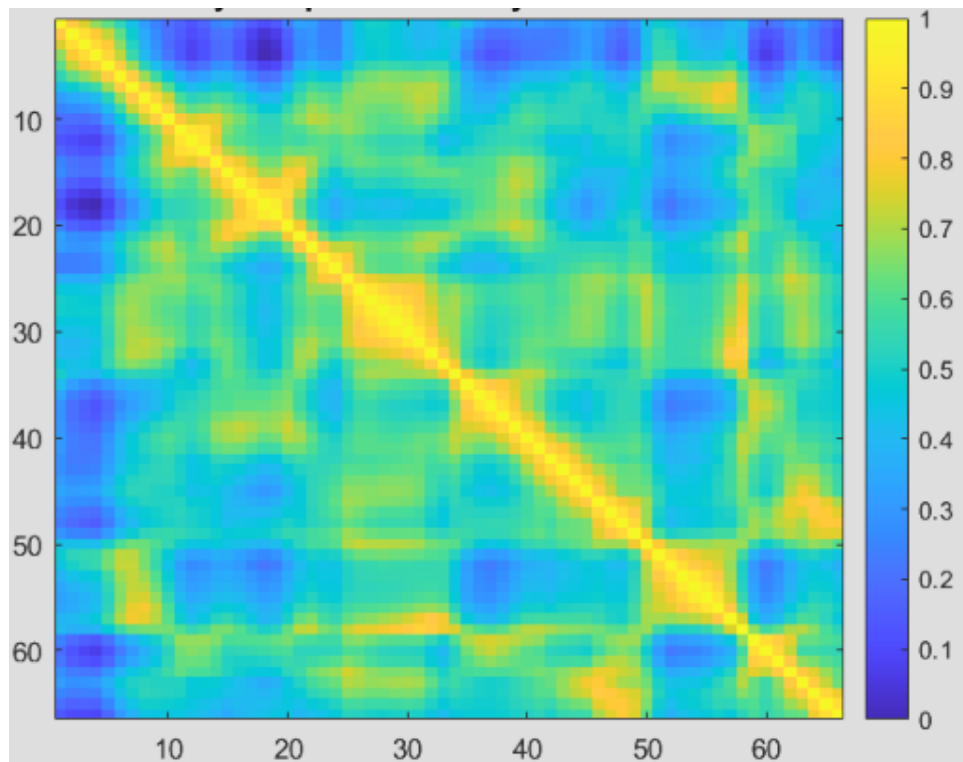
- **Frame-based analysis** provides a detailed view of the temporal evolution of each piece, highlighting both expected and unexpected variations, within the ranges of variation of tempi of about 90 to 200. These ranges differ from our initial estimates, highlighting the importance of thorough tempo analysis in comprehending musical rhythm dynamics.

2:

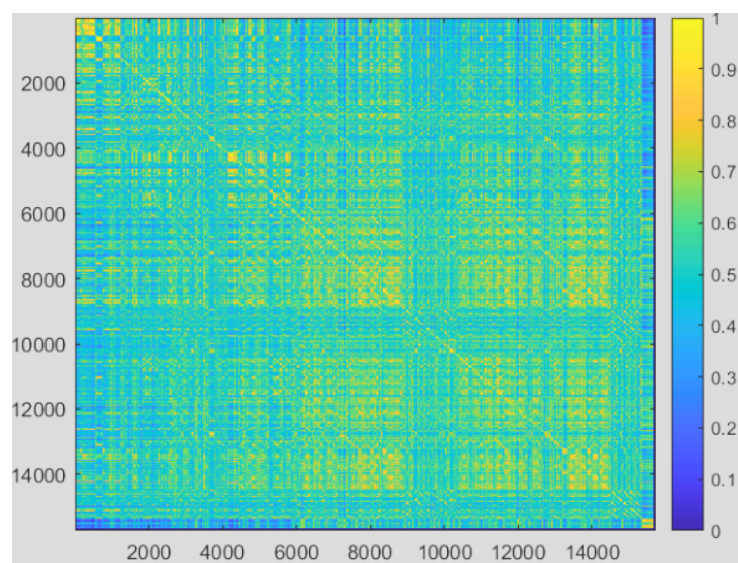
- **Perceptual Segmentation:** Effective in perceptually segmenting different timbral sections within a piece of music, MFCCs are valuable for compositions featuring diverse sound textures. They aid in distinguishing between various timbral qualities, enhancing the analysis and understanding of the music's structure.
- **MFCCs:** MFCCs (Mel-Frequency Cepstral Coefficients) capture the timbral characteristics of sound by deriving them from the short-term power spectrum of the audio signal. They represent the spectral envelope and provide insight into the sound's timbre.

- Repetition: MFCCs are particularly adept at identifying timbral repetitions and variations. They excel at detecting instances where similar sounds are used repeatedly, even amidst changes in melody or other musical elements.

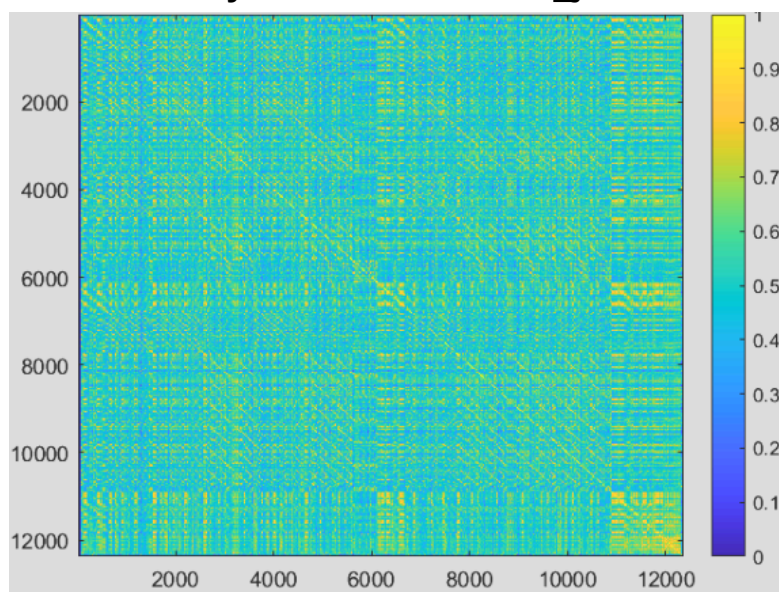
Similarity matrix for 0.wav



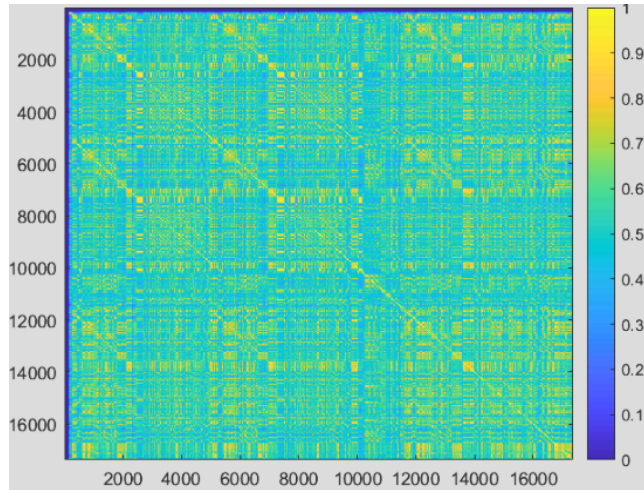
Similarity matrix for dream_theater



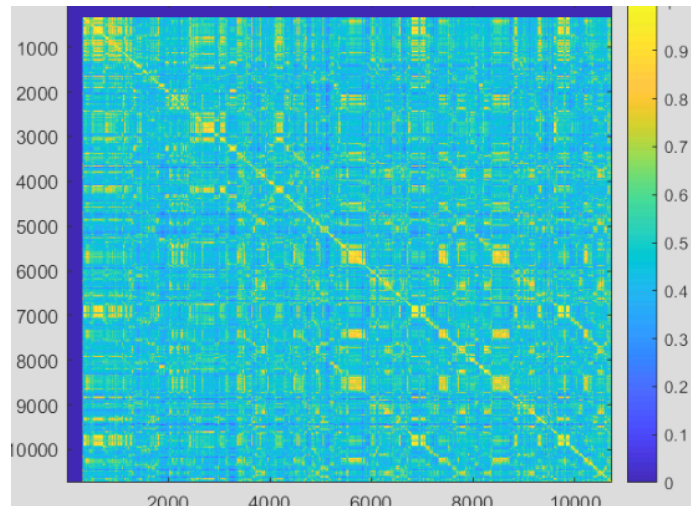
Similarity matrix for michael_jackson



Similarity matrix for mozart



Similarity matrix for queen



Similarity matrix for taylor_swft

