Music, Mind and Technology - Assignment 2

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Short Answer Questions

1. Both the spotify metrics and the aggregated user ratings (mmt_measures) reflect the essence and genre of most of the songs pretty well. For a lot of the songs, they are also very close if not exactly the same values. However, I do think that 'mmt_measures' is better at capturing the emotional essence of a song.
    - For the song 'Tumhi Dekho Naa' by Shankar-Ehsaan-Loy - the aggregated user ratings and spotify features have been summarised below.

	Danceability	Energy	Valence
Spotify	0.0670731707317073	-0.104022411654957	-0.288
MMT	-0.0789473684210525	-0.287037037037037	0.226666666666667

As is evident from the above table, while the spotify features gets close to capturing the actual essence of the song, it is not entirely accurate. In my opinion, the mmt_measures better represent this song, especially when it comes to danceability and valence.
The song is more 'happy' in nature, talking about love and longing for another person, which means it should have a higher valence rating. Further, the song is not very danceable which is reflected in the mmt_measures.

Since the spotify algorithm depends on the acoustic characteristics of the song to categorise it, I think that it gave it a lower valence because

of the slow tempo of the song and a higher danceability score because of the tabla (drums) in the background.

- Thus, I think the user aggregated ratings are a better measure of a song's emotional features because people's ratings of a song take into account the lyrics, context and experiences. Even among people, there could be a difference in rating because people can experience a song differently depending on their culture, experience and mood. While Spotify might be better at capturing the generic mood of the song (because it relies on the acoustic features), the emotion in the song is better captured by people's ratings.

2. Yes, I do strongly believe that familiarity with a song will affect the ratings for that song. For example, one of my songs was Cherry by Lana Del Rey, which is a song that I am very familiar with and enjoy a lot. Hence, I already started out knowing that I would be giving the song a high rating. I think as we listen to a song more and become more familiar, we start liking it more too. If this was my first time listening to this song, I probably would not have rated it so high. Sometimes, we also strongly associate certain songs with certain moments in our lives (episodic memory), and thus we would rate familiar songs with some preconceived emotions. Another perspective is that we might be familiar with the artist and expect the song to be a certain way, based on their other music, which can also influence our rating of various aspects of the song.

Long Answer Questions

1. The valence, energy and danceability of a song play an important role in our perception of the music's emotional aspects.

Valence

- The valence of a song refers to how pleasurable/happy the song sounds. In other words, it is a measure of the musical positivity of the song.
- A song with higher pitch and tempo, would suggest a higher valence song compared to one that is slower and at a lower pitch.
- Thus, higher valence songs are often self-reported with emotions like happiness, euphoria and lower valence songs are associated with emotions like sadness, anger and fear.
- Using the example of two assigned songs,

	Valence (Spotify)	**Valence (mmt_meas)**
Take One Deep Breath (by Ron Adelaar)	-0.718	-0.36
Take My Breath (by The Weekend)	-0.292	0.6

We notice that the song 'Take My Breath' has a high valence which is valid because the song is very fast and rhythmic, instilling positive emotions. The lyrics are also very upbeat and fun. On the contrary, 'Take One Deep Breath' is much slower (classical song) with the piano adding to a calmer, sadder song. Thus, the valence is lower than the other song.

Energy

- Energy or arousal refers to how intense the song sounds. A loud, higher tempo song in the major key is usually associated with higher energy.
- I believe high energy would be correlated with high self-reported (subjective) emotions of aggression, excitement, thrill and lower energy would be related to emotions of relaxation, calm and sadness. There would also be a correlation between heart rate and energy - a faster heart rate for higher energy songs.
- The energy scores of the two songs are -

	Energy (Spotify)	**Energy (mmt_meas)**
Take One Deep Breath (by Ron Adelaar)	-0.742035363317875	-0.680555555555556
Take My Breath (by The Weekend)	0.537990621209611	0.611111111111111

The spotify feature and MMT scores both reflect the energy of these songs perfectly. 'Take One Deep Breath' is a very calm, relaxed song and thus has lower scores for energy, while the other song is very loud and high in energy, as reflected by its scores.

Danceability

- A song with a high danceability score means the song is easy to move to and encourages physical movement. These songs usually have high tempo, high BPM and a stable rhythm.
- A high danceability score would correlate with self-reported emotions of fun while also being described as groovy and catchy.

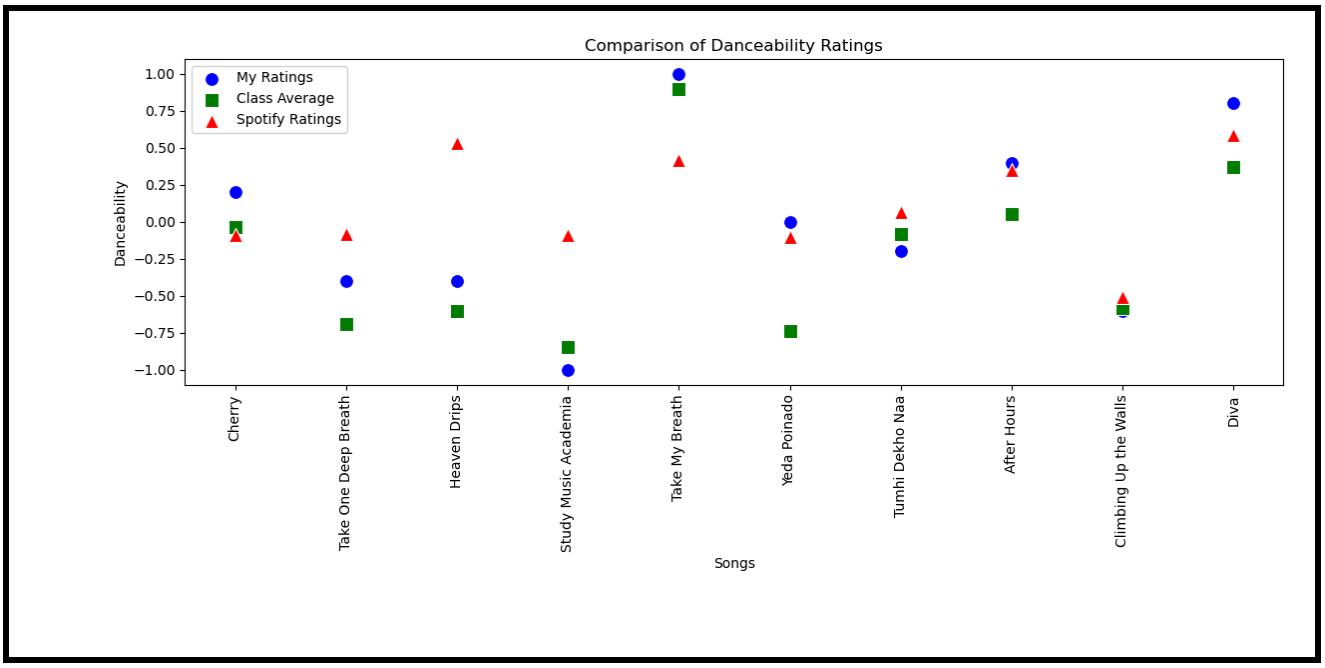
EGG (Electroencephalogram) signals would also show high motor cortex activation for these songs, possibly due to the high relation to physical activity.

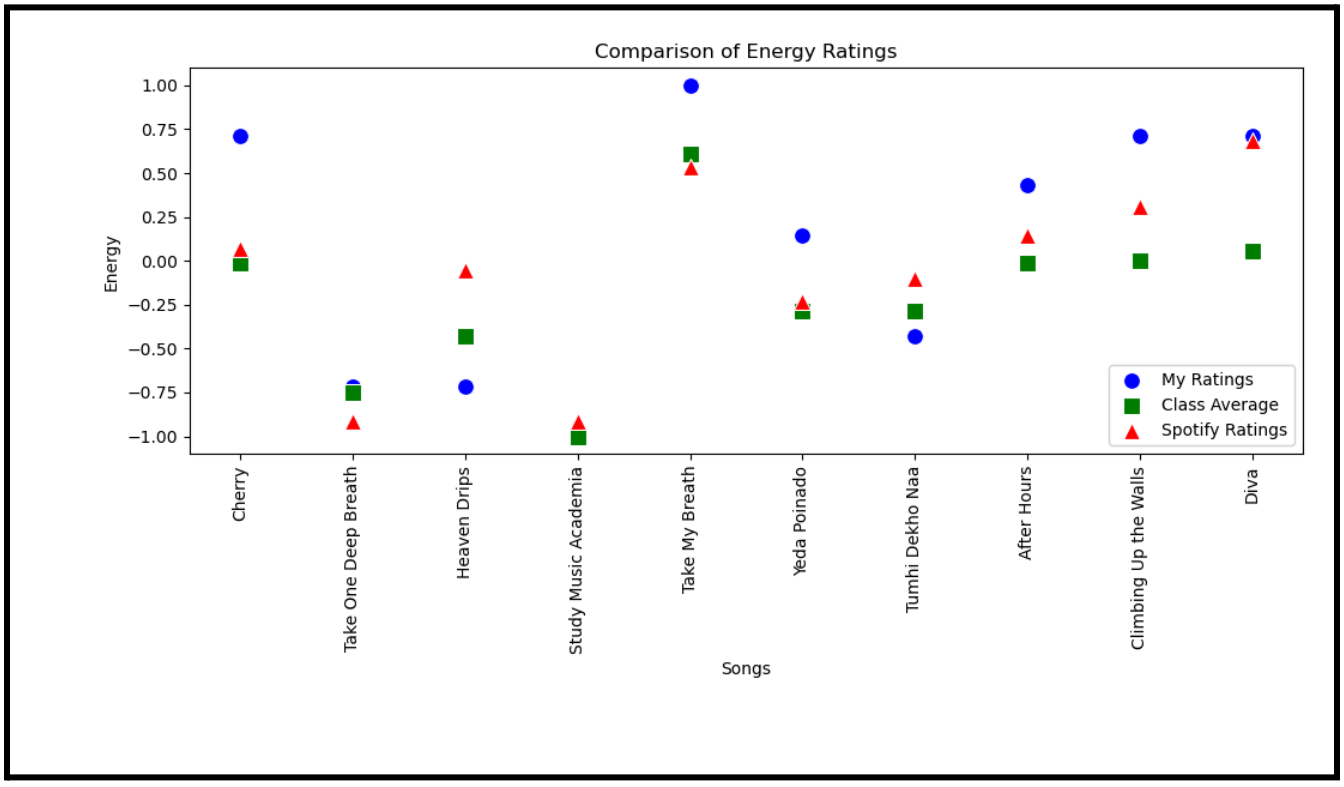
- The scores for the two songs are -

	Danceability (Spotify)	**Danceability (mmt_meas)**
Take One Deep Breath (by Ron Adelaar)	-0.34349593495935	-0.671052631578947
Take My Breath (by The Weekend)	0.41869918699187	0.894736842105263

These scores reflect the danceability of the songs perfectly. 'Take My Breath' , which is a very conventional pop song with a steady beat, has a high danceability score and the other classical piano song is rated low on danceability.

2. The scatterplots were generated using python code, and they are shown below:


Comparison of Danceability Ratings
My Ratings
Class Average
Spotify Ratings
Danceability
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
Cherry
Take One Deep Breath
Heaven Drips
Study Music Academia
Take My Breath
Yeda Poinado
Tumhi Dekho Naa
After Hours
Climbing Up the Walls
Diva
Songs


Comparison of Energy Ratings
Energy
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
My Ratings
Class Average
Spotify Ratings
Cherry
Take One Deep Breath
Heaven Drips
Study Music Academia
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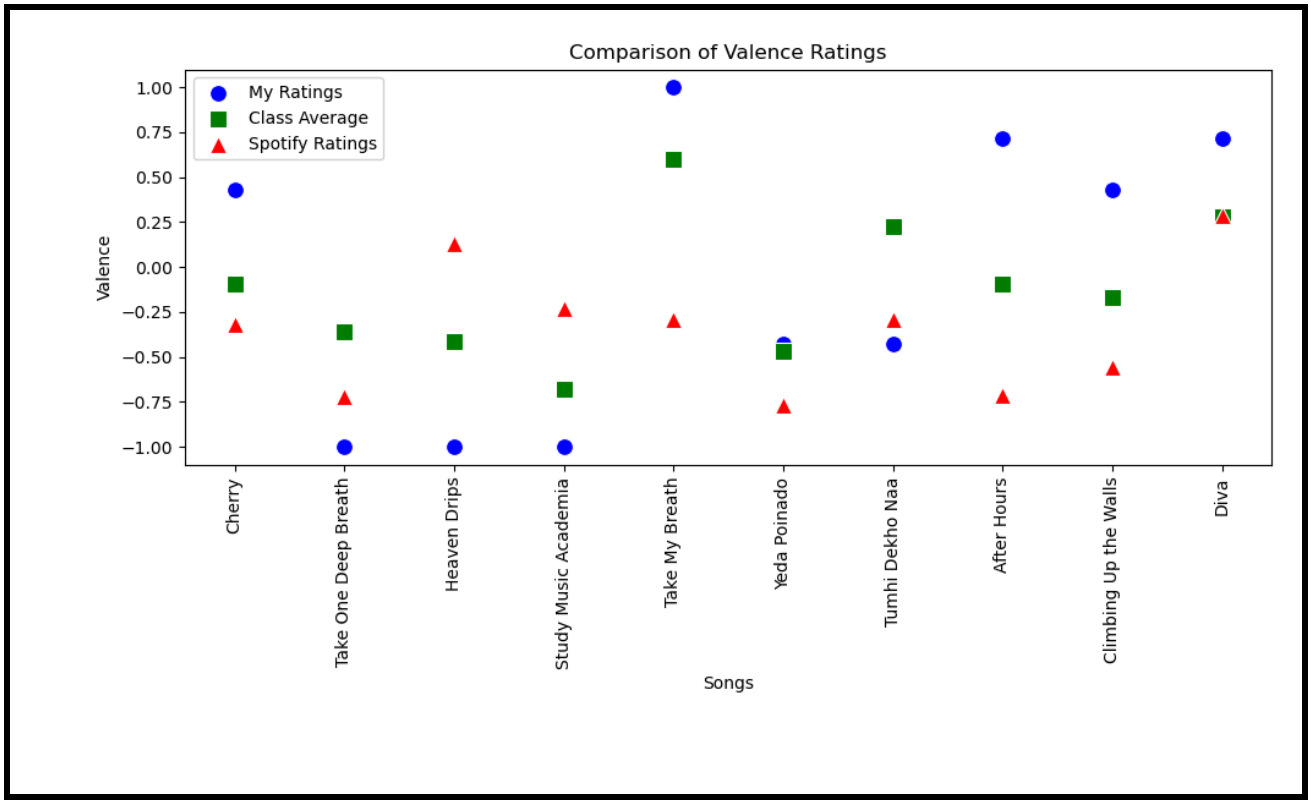


The plots help visualise the differences between my ratings, the class average and the Spotify feature ratings for valence, danceability and energy.

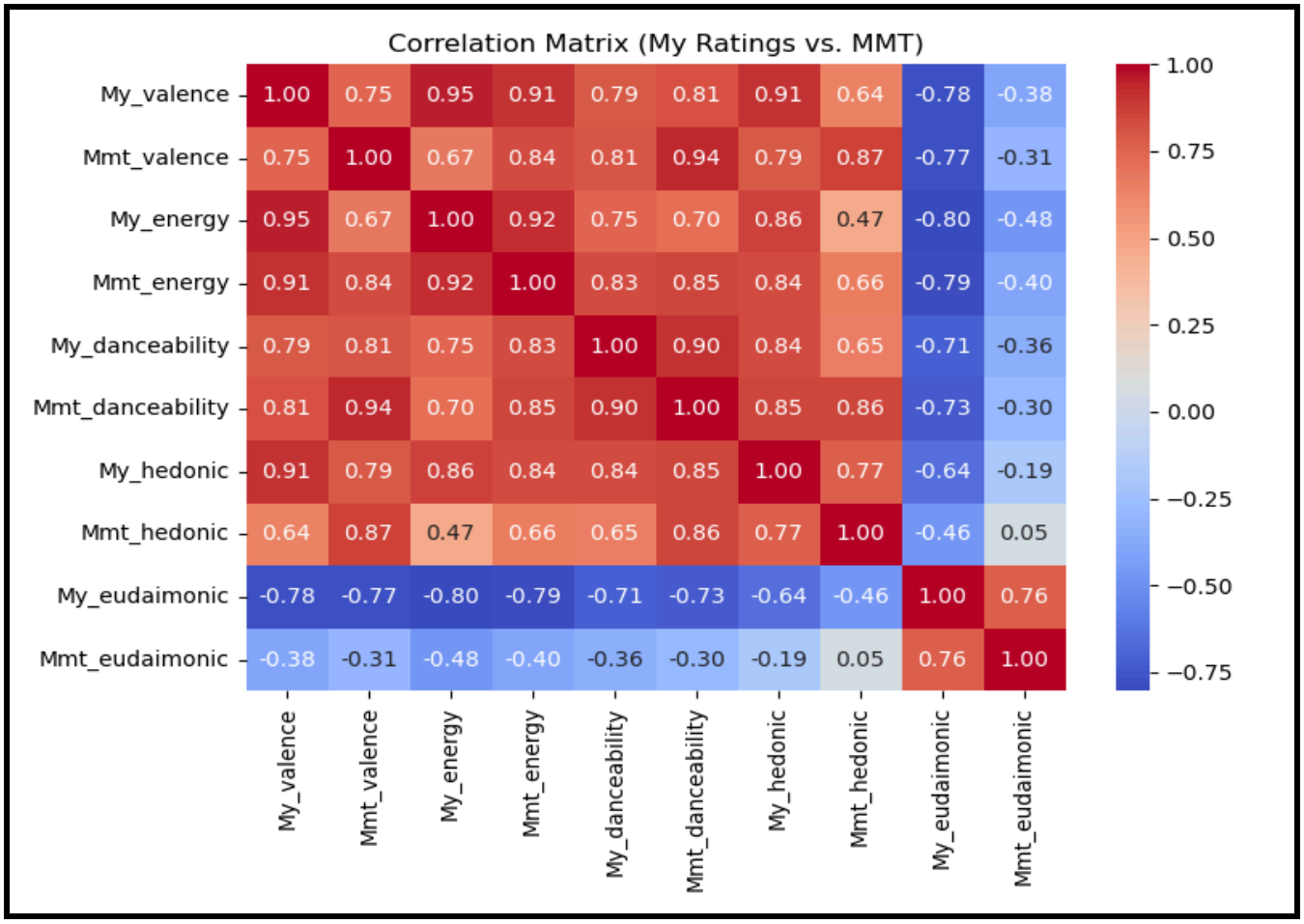
- Generally, my ratings are higher than the class average and Spotify ratings. This could be attributed to the fact that 4 out of the 10 songs were already slightly familiar to me and thus, could have led to me giving them a higher rating due to my personal biases.
- My ratings are also influenced by the type of music I like, cultural and social influences, personality traits etc., while the average class measures would also smooth out any individual variations, which could be the reason for the lower ratings as well. For example, my valence ratings for all the classical songs were the lowest because it is something I'm not familiar with.

- Further, there are a couple of songs where the class average is significantly different from the Spotify feature ratings as well, indicating that they do not accurately reflect self-reported measures. This could be due to the reasons discussed - where aggregated ratings would take into account the lyrics, context and experiences but the Spotify algorithm likely only depends on the acoustic features like beat, tempo and key.

3. Hedonic responses refer to how pleasurable or fun a song is thought to be while eudaimonic is used to refer to a song that evokes deep thought and is reflective.
- People could prefer either of these depending on their own personality traits and mood. People in a happier mood tend to seek out more pleasure (hedonic) while a person that is sad will stick to thought-provoking music.
- There could also be differences among people depending on the context of the situation - more hedonic music when listening in a big group versus listening alone.

From the correlation matrix given below, it is evident that there is quite a strong correlation between the class ratings and my personal ratings. The strongest correlation is between 'My_energy' and 'Mmt_energy' (0.92) and the weakest one is between 'My_valence' and 'Mmt_valence' (0.75), which is still pretty high.

By normalising all my ratings to be between -1 and 1, and then calculating the absolute difference between my ratings and the class averages for all the features and adding them up - 'Cherry' is the song that has the highest deviation.


Correlation Matrix (My Ratings vs. MMT)
My_valence 1.00 0.75 0.95 0.91 0.79 0.81 0.91 0.64 -0.78 -0.38
Mmt_valence 0.75 1.00 0.67 0.84 0.81 0.94 0.79 0.87 -0.77 -0.31
My_energy 0.95 0.67 1.00 0.92 0.75 0.70 0.86 0.47 -0.80 -0.48
Mmt_energy 0.91 0.84 0.92 1.00 0.83 0.85 0.84 0.66 -0.79 -0.40
My_danceability 0.79 0.81 0.75 0.83 1.00 0.90 0.84 0.65 -0.71 -0.36
Mmt_danceability 0.81 0.94 0.70 0.85 0.90 1.00 0.85 0.86 -0.73 -0.30
My_hedonic 0.91 0.79 0.86 0.84 0.84 0.85 1.00 0.77 -0.64 -0.19
Mmt_hedonic 0.64 0.87 0.47 0.66 0.65 0.86 0.77 1.00 -0.46 0.05
My_eudaimonic -0.78 -0.77 -0.80 -0.79 -0.71 -0.73 -0.64 -0.46 1.00 0.76
Mmt_eudaimonic -0.38 -0.31 -0.48 -0.40 -0.36 -0.30 -0.19 0.05 0.76 1.00
My_valence
Mmt_valence
My_energy
Mmt_energy
My_danceability
Mmt_danceability
My_hedonic
Mmt_hedonic
My_eudaimonic
Mmt_eudaimonic
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75