

Assignment 2

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Genre Classification

Subtask-1

Plotting scatter plots for the recommended genre pairs

Subtask-2

Using the features for genre classification

Importing the necessary libraries-

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import scipy
import librosa, librosa.display
import IPython.display as ipd
```

Displaying the dataset-

```
df = pd.read_csv('/kaggle/input/gtzan-dataset-music-genre-classification/Data/features_3_sec.csv')
df1 = df
df1
```

link - <https://www.kaggle.com/tiramisu315/gen-classification>

MIR Toolbox exercises

Rhythm and Meter

Part 1

Reading the demo sounds using the miraudio command-

```
ragtime = miraudio('ragtime.wav');
vivaldi = miraudio('vivaldi.wav');
valse_triste_happy = miraudio('valse_triste_happy.wav');
```

```
laksin = miraudio('laksin.wav');
czardas = miraudio('czardas.wav');
```

Using online metronome and playing the tracks using the command `mirplay`, we can observe that the tempi of the given files are-

Track	Tempo
ragtime.wav	127 bpm
vivaldi.wav	180 bpm
valse_trsite_happy.wav	120 bpm
laksin.wav	80-170 bpm
czardas.wav	140-170 bpm

Part 2

Using `mirtempo` to computationally estimate the tempi of the tracks -

Track	Tempo
ragtime.wav	129.4 bpm
vivaldi.wav	182.4 bpm
valse_trsite_happy.wav	121.5 bpm
laksin.wav	83.9-177.2 bpm
czardas.wav	138-173.7 bpm

We can see that the tempi observed by using the online metronome and the `mirtempo` command are similar with slight variations. These variations could be due to the difference between obtaining the tempo perceptually vs using an algorithm to estimate the tempo of the track.

Part 3

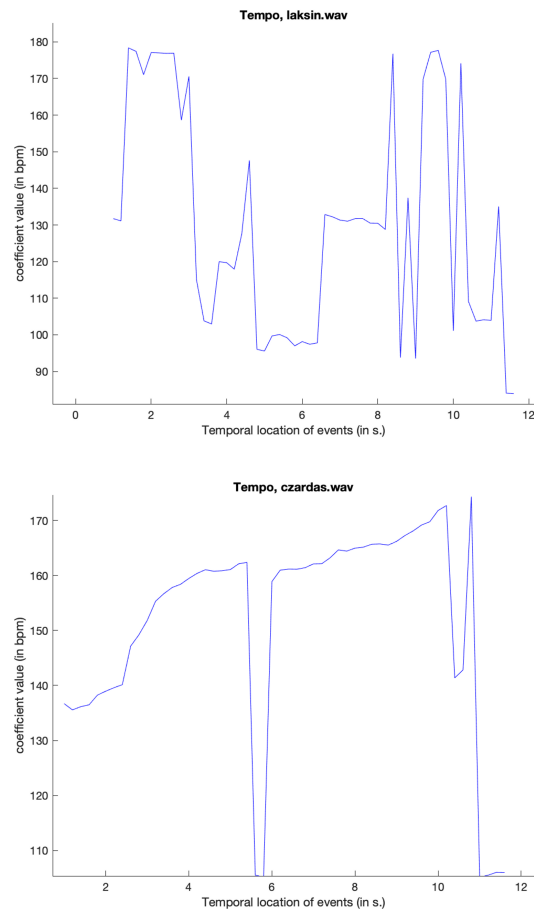
Loading the excerpts 'czardas.wav' and 'laksin.wav' -

```
laksin = miraudio('laksin.wav');
czardas = miraudio('czardas.wav');
```

Computing the tempo using the Frame option with frame length 2sec -

```
l = mirtempo(laskin, 'Frame', 2, 's');
c = mirtempo(czardas, 'Frame', 2, 's');
```

From the results obtained, it can be observed that the tempi of the given tracks are as follows-



laksin.wav - 83.9-174.1 bpm

czardas.wav - 138-173 bpm

These results are consistent with the tempo we have obtained in the previous parts.

Part 4

By analyzing the given tracks using mirtempo, we can observe that -

Track	Tempo
Derezzed.mp3	119.9 bpm
Despacito.mp3	88.9 bpm
Makeba.mp3	115.9 bpm
Rite_of_spring.mp3	112.04 bpm
Stream_of_Consciousness.mp3	127.09 bpm

The order - Despacito.mp3 < Rite_of_Spring.mp3 < Makeba.mp3 < Derezzed.mp3 < Stream_of_Consciouness.mp3

By perceptually analyzing using a metronome,

Track	Tempo
Derezzed.mp3	120 bpm
Despacito.mp3	90 bpm
Makeba.mp3	115 bpm
Rite_of_spring.mp3	112 bpm
Stream_of_Consciousness.mp3	126 bpm

The order - `Despacito.mp3 < Rite_of_Spring.mp3 < Makeba.mp3 < Derezzed.mp3 < Stream_of_Consciousness.mp3`

We can observe that estimated tempo and perceptual tempo are similar and follow the same order.

In terms of pulse clarity, the perceptual pulse clarity order from the lowest to highest is as given - `Rite_of_Spring.mp3 < Stream_of_Consciousness.mp3 < Despacito.mp3 < Makeba.mp3 < Derezzed.mp3`

Using mirpulseclarity, we get -

Track	Pulse Clarity
Derezzed.mp3	0.82521
Despacito.mp3	0.51556
Makeba.mp3	0.75563
Rite_of_spring.mp3	0.05276
Stream_of_Consciousness.mp3	0.10329

The order - `Rite_of_Spring.mp3 < Stream_of_Consciousness.mp3 < Despacito.mp3 < Makeba.mp3 < Derezzed.mp3`

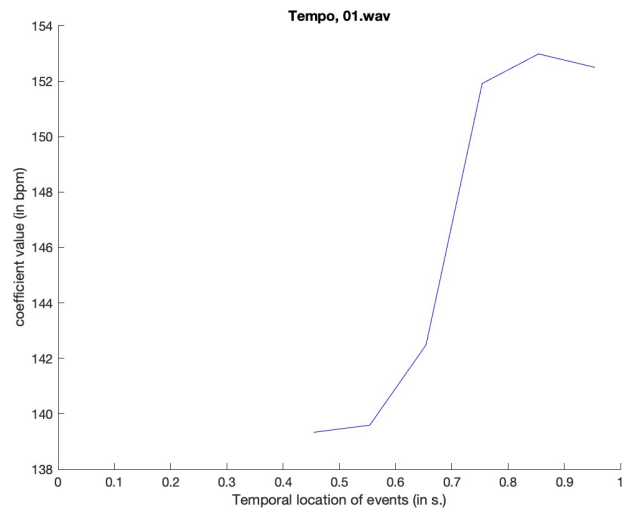
We can observe that the estimated pulse clarity and the perceptual pulse clarity of the tracks follow the same order.

Repetition in Music

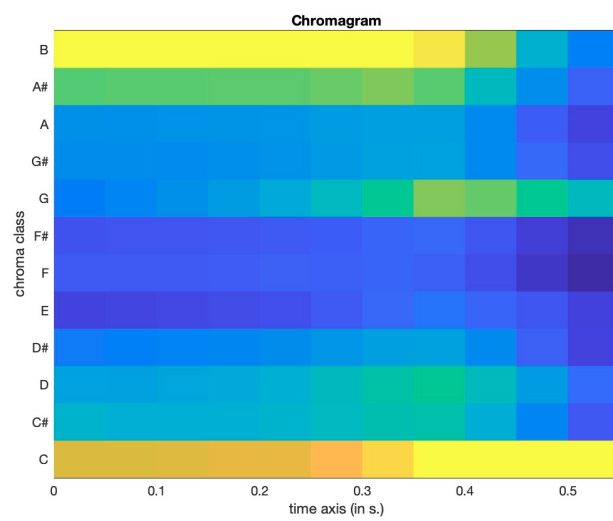
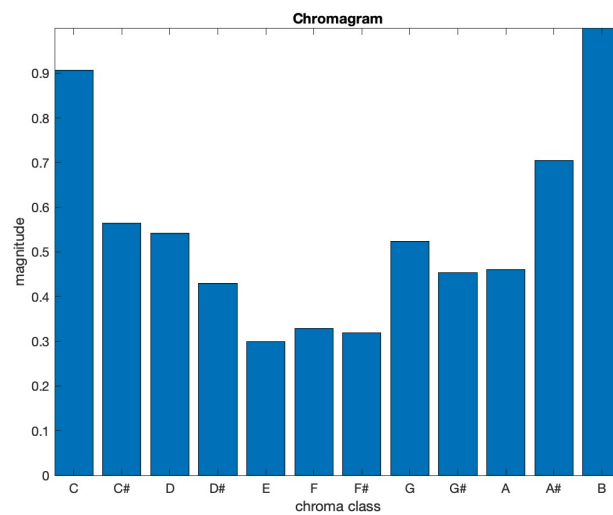
Here $x = 1$ as $x = 2019112005 \% 7$

Analysing the song 01.wav from the data (stimuli) folder.

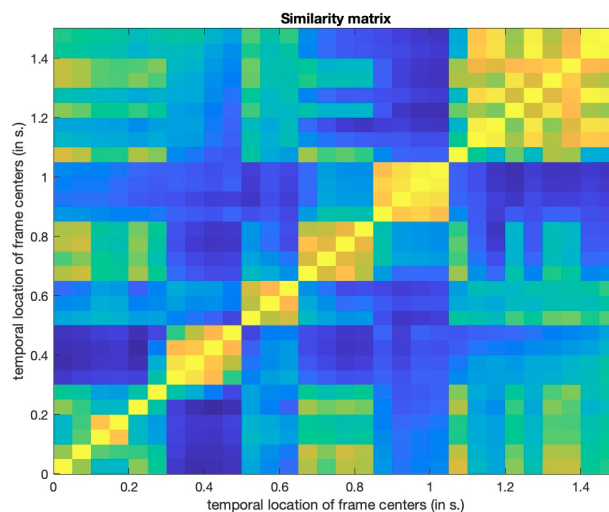
Tempo obtained -



Corresponding chromagram -



Similarity Matrix -



Timbre

Zero-crossing rate is one of the timbral descriptors of sounds. Spectral descriptors include low energy, spectral centroid, spectral rolloff, spectral irregularity, spectral entropy and MFCCs.

Zero Crossing Rate (batch processing of the stimuli folder)

```
The Zero-crossing rate related to file 01.wav is 4139.6667
The Zero-crossing rate related to file 02.wav is 873
The Zero-crossing rate related to file 03.wav is 1340.6667
The Zero-crossing rate related to file 04.wav is 1498
The Zero-crossing rate related to file 05.wav is 1463.3333
The Zero-crossing rate related to file 06.wav is 1059
The Zero-crossing rate related to file 07.wav is 566.3333
The Zero-crossing rate related to file 08.wav is 1828.3333
The Zero-crossing rate related to file 09.wav is 1524
The Zero-crossing rate related to file 10.wav is 1418.3333
The Zero-crossing rate related to file 11.wav is 1596.3333
The Zero-crossing rate related to file 12.wav is 544.6667
The Zero-crossing rate related to file 13.wav is 834.6667
The Zero-crossing rate related to file 14.wav is 2036
The Zero-crossing rate related to file 15.wav is 860.6667
The Zero-crossing rate related to file 16.wav is 2001.6667
The Zero-crossing rate related to file 17.wav is 357.6667
The Zero-crossing rate related to file 18.wav is 3268.3333
The Zero-crossing rate related to file 19.wav is 396.6667
The Zero-crossing rate related to file 20.wav is 2049.6667
The Zero-crossing rate related to file 21.wav is 1264.6667
The Zero-crossing rate related to file 22.wav is 1766
The Zero-crossing rate related to file 23.wav is 1353.6667
The Zero-crossing rate related to file 24.wav is 1206.6667
The Zero-crossing rate related to file 25.wav is 709.6667
The Zero-crossing rate related to file 26.wav is 78.3333
The Zero-crossing rate related to file 27.wav is 2057
The Zero-crossing rate related to file 28.wav is 1535.3333
The Zero-crossing rate related to file 29.wav is 1420.6667
The Zero-crossing rate related to file 30.wav is 930.3333
The Zero-crossing rate related to file 31.wav is 1142
```

The Zero-crossing rate related to file 32.wav is 737.6667
The Zero-crossing rate related to file 33.wav is 2096
The Zero-crossing rate related to file 34.wav is 322
The Zero-crossing rate related to file 35.wav is 1297.3333
The Zero-crossing rate related to file 36.wav is 255
The Zero-crossing rate related to file 37.wav is 3071.3333
The Zero-crossing rate related to file 38.wav is 1381.3333
The Zero-crossing rate related to file 39.wav is 1035.6667
The Zero-crossing rate related to file 40.wav is 1719
The Zero-crossing rate related to file 41.wav is 1343.3333
The Zero-crossing rate related to file 42.wav is 1182.3333
The Zero-crossing rate related to file 43.wav is 523.3333
The Zero-crossing rate related to file 44.wav is 419.6667
The Zero-crossing rate related to file 45.wav is 473.3333
The Zero-crossing rate related to file 46.wav is 817
The Zero-crossing rate related to file 47.wav is 358
The Zero-crossing rate related to file 48.wav is 1352.3333
The Zero-crossing rate related to file 49.wav is 1104.3333
The Zero-crossing rate related to file 50.wav is 2046.6667
The Zero-crossing rate related to file 51.wav is 274.6667
The Zero-crossing rate related to file 52.wav is 2050
The Zero-crossing rate related to file 53.wav is 1739.3333
The Zero-crossing rate related to file 54.wav is 936.3333
The Zero-crossing rate related to file 55.wav is 243.3333
The Zero-crossing rate related to file 56.wav is 1344.3333
The Zero-crossing rate related to file 57.wav is 2961.6667
The Zero-crossing rate related to file 58.wav is 2068.3333
The Zero-crossing rate related to file 59.wav is 3348
The Zero-crossing rate related to file 60.wav is 486.6667
The Zero-crossing rate related to file 61.wav is 2670
The Zero-crossing rate related to file 62.wav is 1156.3333
The Zero-crossing rate related to file 63.wav is 672.3333
The Zero-crossing rate related to file 64.wav is 1284
The Zero-crossing rate related to file 65.wav is 431.6667
The Zero-crossing rate related to file 66.wav is 1467
The Zero-crossing rate related to file 67.wav is 1201
The Zero-crossing rate related to file 68.wav is 2068.3333
The Zero-crossing rate related to file 69.wav is 244.3333
The Zero-crossing rate related to file 70.wav is 1733.6667
The Zero-crossing rate related to file 71.wav is 1111.3333
The Zero-crossing rate related to file 72.wav is 1500.6667
The Zero-crossing rate related to file 73.wav is 3672
The Zero-crossing rate related to file 74.wav is 425.3333
The Zero-crossing rate related to file 75.wav is 750.6667
The Zero-crossing rate related to file 76.wav is 1522
The Zero-crossing rate related to file 77.wav is 1266
The Zero-crossing rate related to file 78.wav is 1505.3333
The Zero-crossing rate related to file 79.wav is 864
The Zero-crossing rate related to file 80.wav is 2399.3333
The Zero-crossing rate related to file 81.wav is 1930.3333
The Zero-crossing rate related to file 82.wav is 859.3333
The Zero-crossing rate related to file 83.wav is 5030
The Zero-crossing rate related to file 84.wav is 867.3333
The Zero-crossing rate related to file 85.wav is 1719.3333
The Zero-crossing rate related to file 86.wav is 900
The Zero-crossing rate related to file 87.wav is 1060.6667
The Zero-crossing rate related to file 88.wav is 1149
The Zero-crossing rate related to file 89.wav is 1267.3333
The Zero-crossing rate related to file 90.wav is 1711.6667
The Zero-crossing rate related to file 91.wav is 1257
The Zero-crossing rate related to file 92.wav is 954.3333
The Zero-crossing rate related to file 93.wav is 1207
The Zero-crossing rate related to file 94.wav is 1285
The Zero-crossing rate related to file 95.wav is 1357.3333

```
The Zero-crossing rate related to file 96.wav is 2019
The Zero-crossing rate related to file 97.wav is 2306.3333
The Zero-crossing rate related to file 98.wav is 1405.3333
The Zero-crossing rate related to file 99.wav is 1214.3333
The Zero-crossing rate related to file 99100.wav is 1270.3333
```