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Indonesian's Dangdut Music Classification Based on Audio Features

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Abstract—The uniqueness of modern dangdut music today is in the beat and melody of music that is relatively faster like techno dance music, and the progressive melody arrangement from synthesizer keyboard. In this paper, we will extract audio features from music, and then used that features for classification based on machine learning methods. Support Vector Machine (SVM) was used in this study. In this paper's experiment we use 32 audio music files, consisting of 16 for dangdut music and 16 for techno dance music. The results of this testing get varying accuracy levels, between 80% to 90% for each music audio file that has been successfully classified.

Keywords—dangdut music classification, machine learning, Support Vector Machine

I. INTRODUCTION

Very extraordinary music in Indonesia today, where music listeners in Indonesia vary widely, from a young age to old age. Various types of music exist in this country, from Rock, Pop, HipHop, RnB, Rap, Traditional, etc., are growing rapidly in Indonesia. Lately there is an extraordinary phenomenon, where the type of music "Dangdut" starts to get a very extraordinary response[1]. In the era of the 80s, this music was typical of "old style" music that was not so popular, and its listeners were dominated by the lower classes and more often heard in the villages. Dangdut music is basically wilderness music from the Arab region with a combination of "tabla" musical instruments from India, which then enter the country of Indonesia and experience alkulturation with local culture.

Time has changed, nowadays dangdut music is music that is quite popular [2] because it has a more modern "look", especially with the influence of western music. "Dangdut Koplo Remix" is so popular today, a modern form of dangdut music where a blend of dangdut music with "techno dance music" that originating from European countries. The uniqueness of modern dangdut music today is in the beat and melody of music that is relatively faster like techno dance music[3], and the progressive melody arrangement from synthesizer keyboard. Between dangdut music and techno dance music, sometimes there are similarities that are at first glance difficult to distinguish.

In this paper, we will extract audio features from music, and then used that features for classification based on machine learning methods. The goal in this study is to do music clustering between two class of genre music, which is dangdut music and techno dance music.

II. RELATED WORK

There have been several studies conducted to classify music using audio features. Basically this is part of music information retrieval (MIR). In 2014, Konstantin Markov [4] uses several features to classify music, one of these features is: MFCC (Mel Frequency Cepstral Coefficients) features and TMBR (timbre features). Classification of 8 musical genres, including: Blues, Electronic, Rock, Classical, Folk, Jazz, Country and Pop. The algorithm used as a classifier is Support Vector Machine (SVM).

In 2016, Prafulla et al [5] used 5 features of audio that are used as a basis for classification. The features that they extract are: rhythm, timbre, pitch, tonality and dynamic features. This research was conducted on Indian music genre. The feature is extracted using MIR Toolbox in MATLAB. The algorithm that they used as a classifier is the Neural Network and SVM.

In 2016, Khonglah et al [6] they use audio features, such as zero crossing rate, spectral roll-off, spectral flux, spectral centroid and energy in their study. In 2017, Aisha et al [7] they clustered traditional Indonesian music using 11 features on the time domain and frequency domain. These features include energy, entropy energy, zero-crossing rate, spectral centroid, spectral entropy, spectral flux, spectral rolloff, melfrequency cepstral coefficient, harmonic, chroma vector, and spectral zone. Meanwhile in the terms of success for doing the classification, there is few example show us that they success in their study using SVM [4],[5],[8],[9],[10] as classifier in audio classification.

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III. METHODOLOGY

In this study we used nine features from audio [7] to do music classification. The features include time-domain audio features, which consist of energy, entropy energy and zero crossing rate. And also frequency-domain audio features, which consist of spectral centroid, spectral entropy, spectral flux, spectral roll-off, harmonic, mel-frequency cepstral coefficient, and chroma vector.

Following is the equation of audio features:

1. Energy:

$$E(i) = \sum_{n=1}^{W_{\rm L}} |\mathbf{x}_{\rm i}(n)|^2 \tag{1}$$

2. Entropy Energy:

$$H(i) = -\sum_{j=1}^{K} e_j \log_2(e_j)$$
(2)

3. Zero Crossing Rate:

$$Z(i) = \frac{1}{2W_L} \sum_{n=1}^{W_L} |\operatorname{sgn}[x_i(n)] - \operatorname{sgn}[x_i(n-1)]|$$
(3)

4. Spectral Centroid:

$$C_{i} = \frac{\sum_{k=1}^{Wf_{L}} kX_{i}(k)}{\sum_{k=1}^{Wf_{L}} X_{i}(k)}$$
(4)

5. Spectral Entropy:

$$H = -\sum_{f=0}^{L-1} nf \cdot \log_2(nf)$$
(5)

6. Spectral Flux:

$$Fl_{(i,i-1)} = \sum_{k=1}^{Wf_L} (EN_i(k) - EN_{i-1}(k))^2$$
(6)

7. SpectralRoll-Off:

$$\sum_{k=1}^{m} X_{i}(k) = C \sum_{k=1}^{Wf_{L}} X_{i}(k)$$
(7)

8. Harmonic:

$$r(i,k) = \frac{\sum_{j=m}^{m+n-1} s(j) s(j-k)}{(\sum_{j=m}^{m+n-1} s(j)^2 \ge \sum_{j=m}^{m+n-1} s(j-k)^2)^{0.5}}$$

where $H(i) = \max_{k=Q} r(i,k)$ (8)

9. Chroma Vector:

$$v_k = \sum_{n \in S_k} \frac{Xi(n)}{N_k}, k \in 0$$
⁽⁹⁾

IV. EXPERIMENT

This experiment is generally divided into four major steps, starting from data collection, pre processing data, testing data and experimental results. Each section we will explain one by one. The whole process flow in this experiment is illustrated in the Fig. 1.



Fig. 1. Process flow in experiment

A. Data Collection



Fig. 2. Stereo audio waveform





We collect audio files for dangdut music and techno dance music using Internet search engine and Youtube[11]. From the results of this collection, 80 audio files for dangdut music and 80 audio files for techno dance music were obtained, so that the total audio files collected were 160 audio files. All audio files collected are in MP3 format with a frequency sampling of 44.1 kHz, stereo with the duration of each song about four minutes. Fig. 2 show stereo audio waveform. In table I, is a list of dangdut song title used in this study:

No	Song Title (Artist)	No	Song Title (Artist)			
01	5 Centi (Via Vallen)	30	Aku Mah Apa Tuh (Cita Citata)			
02	Abang Ghoib (Barbie Felia)	31	Aku Tak Biasa (Ria Amelia)			
03	Abang Goda (Duo Serigala)	32	Alamat Palsu (Ayu Ting Ting)			
04	Aisah Jamilah (Sandrina)	33	Baru 6 Bulan (Connie Nurlita)			
05	Aku Jijik (Sandrina)	34	Berdiri Bulu Romaku (Bebizy)			
06	Cie Cie (Nella Kharisma)	35	Kau Tercipta Bukan Untukku (Nella Kharisma)			
07	Cikini Gondangdia (Duo Anggrek)	36	Keong Racun (Lissa)			
08	Cinta Basi (Regina)	37	Konco Mesra (Meggy Diaz)			
09	Cinta Ganjil Genap (Susie Legit)	38	Kost Kostan (Duo Serigala)			
10	Cinta Kurang Gizi (Via Vallen)	39	Kuper (Susi Ngapak)			
11	Cinta Pertama (Hesty Klepek Klepek)	40	Lagi Syantik (Siti Badriah)			
12	Cinta Putih (Duo Biduan)	41	Makan Hati (2Racun Youbi sister)			
13	Cinta Satu Malam (Melinda)	42	Makan Hati ver 2 (Baby Shima)			
14	Cinta Tak Terbatas Waktu (Ucie Sucita)	43	Mama Minta Pulsa (Siti Badriah)			
15	Cinta Tulalit (Bebizy)	44	Melanggar Hukum (Siti Badriah)			
16	CKC Cuma Kamu Cin (Camel Petir)	45	Pacar Baru (Yuni R)			
17	Coba Coba (iMeyMey)	46	Pacar Satu Satunya (Ratu Idola)			
18	Cowok Ayam Kampung (Ayu Maharany)	47	Perawan Atau Janda (Cita Citata)			
19	Cuit Cuit Witwiw (Neng Oshin)	48	Pernikahan Dini (Cita Citata)			
20	Depan Belakang (Salsiah)	49	Pura Pura Bahagia (Cita Citata)			
21	Di Tikung Teman (Sandrina)	50	Pusing Pala Barbie (Lula Lula)			
22	Dibalas Dusta (Ratu Idola)	51	Sakit Sakit Hatiku (Via Vallen)			
23	Digenjot Cinta (Ucie Sucita)	52	Sakitnya Luar Dalam (Ratu Meta)			
24	Duda Anak 2 (Nyimas Idola)	53	Sambalado (Ayu Ting Ting)			
25	Duyeh (Neng Oshin)	54	Sebelas Duabelas (Nella Kharisma)			
26	Enaknya Dikamu (Salsiah)	55	Selfie (Viola Arsa)			
27	Gak Ada Waktu Beib (Ghea Youbi)	56	Sianida (Duo Serigala)			
28	Galau Ting Ting (Ratu Idola)	57	Suamiku Kawin Lagi (Siti Badriah)			
29	Gantung Aku Di Monas (Meggy Diaz)	58	Sudah Cukup Sudah (Zakia Gotik)			

a Section No Song Title (Artist) No Song Title (Artist) Sumpah Aku Nggak Sakit 59 Goyang 2 Jari (Sandrina) 70 (Ratu Idola) Susah Move ON (Duo Govang Dumang (Cita 60 71 Citata) Anggrek) Goyang Nasi padang (Duo Tak Sanggup Lagi (Dinda 72 61 Anggrek) Permata) Goyang Pantura (Velline 62 73 Teganya (Susi Legit) Ratu Begal) Goyang Pokemon (Varra 74 63 Tercyduk (Desy Ning Nong) Selvarra) Hello Sayang (Baby Terong Dicabein (Siti 75 64 Sexyola) Badriah) Hey Siapa Kamu (2Racun Tua Tua Keladi (Hesty 76 65 Youbi Sister) Klepek Klepek) 66 Jagung Bakar (Lynda Moy) 77 Tuh Kan (Ayurasi) Jagung Rebus (Maya Undangan Mantan (Siti 67 78 Jasika) Badriah) Jaran goyang (Nella 79 Ya Nasib (Susi Legit) 68 Kharisma)

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B. Data Pre Processing

Kamu Pelakor (Ratu Idola)

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Before the data is used, initial preparations are made for existing data. Audio music data that has been collected, is converted to mono and with a sampling rate of 44.1 kHz then changed the format to WAV. The song duration is taken only 20 seconds from the beginning, and then audio normalization process is carried out to get the same sound hardness level to -16 dB. All this process is done using Praat software[12]. Fig. 3 show the wave form after alteration to 20s and from stereo to mono with format convertion to WAV.

80

Yank Haus (2TikTok)



Fig. 3. Wave form after alteration

C. Training

For training and testing purposes, we use Python[13] based programming languages and specific python open library for audio extraction features. In this experiment pyAudioAnalysis [14] was used. The advantage of this open library is its ability to extract audio features and also as a classifier. All can be done automatically, using only changes



to few parameters. The classifier in this experiment uses SVM[15]. For each type of music, 80% is taken for training and 20% for testing. A total of 64 audio dangdut music files are placed into a file folder named "DGD", and 64 techno dance music files are placed into a file folder called "TCH". See Fig. 4 dan Fig. 5 for more details.

Racun Youbi sister - Makan Hati mono part part.wav	A Meogy Diaz - Konco Mesra mono part part.wav	Via Vallen - 5 Centi mono part part.wav				
2TikTokYank_Haus_mono_part_part.wav	MeindaOnta_Satu_Malam_mono_part_part.wav	Via_ValenSakit_Sakit_Hatiku_mono_part_part.wav				
Ayu_Maharany Cowok_Ayam_Kampung_mono_part_part.wav	Nela Kharisma - Ge_Ge_mono_part_part.wav	Yuni R - Pacar Baru mono part part.wav				
Ayu_Ting_TingAlamat_Palsu_mono_part_part.wav	Nela Kharisma_Jaran_goyang_mono_part_part.wav AZakia_GotkSudah_Cukup_Sudah_mono_part_part.wav					
Baby_SexyolaHello_Sayang_mono_part_part.wav	ANela Kharisma - Kau Tercipta Bukan Untukku mono part part wav					
Baby_ShimaMakan_Hati_mono_part_part.wav	Neng_OshinOuit_Ouit_Witwiw_mono_part_part.wav					
Barbie_FelaAbang_Ghob_mono_part_part.wav	Neng_OshinDuyeh_mono_part_part.wav					
BebizyCinta_Tulalit_mono_part_part.wav	Nyimas_IdolaDuda_Anak_2_mono_part_part.wav					
Cita_CitataAku_Mah_Apa_Atuh_mono_part_part.wav	Ratu Idola - Kamu Pelakor mono part part wav					
Ota_Ota_OtataGoyang_Dumang_mono_part_part.wav	Ratu_idolaPacar_Satu_Satunya_mono_part_part.wav					
Cita_CitataPerawan_Atau_Janda_mono_part_part.wav	Ratu_IdolaSumpah_Aku_Nggak_Sakit_mono_part_part.wav					
Ota_CitataPura_Pura_Bahagia_mono_part_part.wav	Ratu_MetaSakitnya_Luar_Dalam_mono_part_part.wav					
Connie_NurlitaBaru_6_Bulan_mono_part_part.wav	ReginaCinta_Basi_mono_part_part.wav					
Desy_Ning_NongTercyduk_mono_part_part.wav	SalsiahDepan_Belakang_mono_part_part.wav					
Dinda_PermataTak_Sanggup_Lagi_mono_part_part.wav	SalsiahEnaknya_Dikamu_mono_part_part.wav					
Duo_AnggrekCkini_Gondangdia_mono_part_part.wav	SandrinaAku_Xijk_mono_part_part.wav					
Duo_AnggrekGoyang_Nasi_Padang_mono_part_part.wav	SandrinaGoyang_2_Jari_mono_part_part.wav					
Duo_AnggrekSusah_Move_ON_mono_part_part.wav	Sandrina_feativa_LolaAisah_Jamilah_mono_part_part.wav					
Duo_SerigalaAbang_Goda_mono_part_part.wav	Sti_BadriahLagi_Syantik_mono_part_part.wav					
Duo_SerigalaKost_Kostan_mono_part_part.wav	Slö_BadriahMama_Minta_Pulsa_mono_part_part.wav					
Duo_SerigalaSianida_mono_part_part.wav	Stö_BadriahSuamiku_Kawin_Lagi_mono_part_part.wav					
Ghea_YoubiGak_Ada_Waktu_Beb_mono_part_part.wav	Stil_BadriahTerong_Dicabein_mono_part_part.wav					
Hesty_Kepek_KepekCinta_Pertama_mono_part_part.wav	Susi_LegitTeganya_mono_part_part.wav					
Hesty_Kepek_KepekTua_Tua_Kelad_mono_part_part.wav	Susi_LegitYa_Nasb_mono_part_part.wav					
MeyMeyCoba_Coba_mono_part_part.wav	Susi_NgapakKuper_mono_part_part.wav					
LissaKeong_Racun_mono_part_part.wav	Susie_LegitCinta_Ganjil_Genap_mono_part_part.wav					
Lula_LulaPusing_Pala_Berbie_mono_part_part.wav	Ucie_SucitaCinta_Tak_Terbatas_Waktu_mono_part_part.wav					
Maya_JaskaJagung_Rebus_mono_part_part.wav	Varra_SelvarraGoyang_Pokemon_mono_part_part.wav					
Meggy_DiazGantung_Aku_Di_Monas_mono_part_part.wav	Veline_Ratu_BegalGoyang_Pantura_mono_part_part.wav					

Fig. 4. List in file folder DGD

Training is done by setting the parameter "isSignificant = 0.8" in pyAudioAnalysis, this means that the threshold level for accuracy in this experiment is set on 80%. The training process runs 600 times iteration. Training result are shown in Fig. 6.

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Dance-02_mono_part_part.wav	Dance-43_mono_part_part.wav	Dance-77_mono_part_part.wav
Dance-03_mono_part_part.wav	Dance-45_mono_part_part.wav	Dance-78_mono_part_part.wav
Dance-05_mono_part_part.wav	Dance-46_mono_part_part.wav	Dance-79_mono_part_part.wav
Dance-06_mono_part_part.wav	Dance-47_mono_part_part.wav	Dance-80_mono_part_part.wav
Dance-08_mono_part_part.wav	Dance-48_mono_part_part.wav	
Dance-09_mono_part_part.wav	Dance-50_mono_part_part.wav	
Dance-10_mono_part_part.wav	Dance-51_mono_part_part.wav	
Dance-12_mono_part_part.wav	Dance-52_mono_part_part.wav	
Dance-13_mono_part_part.wav	Dance-54_mono_part_part.wav	
Dance-14_mono_part_part.wav	Dance-55_mono_part_part.wav	
Dance-16_mono_part_part.wav	Dance-56_mono_part_part.wav	
Dance-17_mono_part_part.wav	Dance-57_mono_part_part.wav	
Dance-19_mono_part_part.wav	Dance-58_mono_part_part.wav	
Dance-20_mono_part_part.wav	Dance-59_mono_part_part.wav	
Dance-22_mono_part_part.wav	Dance-60_mono_part_part.wav	
Dance-23_mono_part_part.wav	Dance-61_mono_part_part.wav	
Dance-25_mono_part_part.wav	Dance-62_mono_part_part.wav	
Dance-26_mono_part_part.wav	Dance-63_mono_part_part.wav	
Dance-27_mono_part_part.wav	Dance-64_mono_part_part.wav	
Dance-29_mono_part_part.wav	Dance-66_mono_part_part.wav	
Dance-30_mono_part_part.wav	Dance-67_mono_part_part.wav	
Dance-32_mono_part_part.wav	Dance-68_mono_part_part.wav	
Dance-33_mono_part_part.wav	Dance-69_mono_part_part.wav	
Dance-35_mono_part_part.wav	Dance-70_mono_part_part.wav	
Dance-36_mono_part_part.wav	Dance-71_mono_part_part.wav	
Dance-37_mono_part_part.wav	Dance-72_mono_part_part.wav	
Dance-38_mono_part_part.wav	Dance-73_mono_part_part.wav	
Dance-40_mono_part_part.wav	Dance-74_mono_part_part.wav	
Dance-41_mono_part_part.wav	Dance-75_mono_part_part.wav	
Dance-42 mono part part.way	Dance-76 mono part part.way	

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Fig. 5. List in file folder TCH

D. Testing and Result

At this stage an experiment will be conducted to find out whether training results can recognize a music file correctly or not. There are 32 audio music files, consisting of 16 for dangdut music and 16 for techno dance music. The results of this testing get varying accuracy levels, between 80% to 90% for each music audio file that has been successfully classified. Fig. 7, show example of testing result.

Table II shows the overall results in the classification between dangdut music and techno dance music.

	Fig.6. Training Result													
serect	eo	i params:	. U.	- OT GOO										
Select		nanamo'	- 6											
TCH		7 8	42	` 2										
ngn —		41 1	80											
oomas	-	DGD	TCI	1										
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		10 000	54	5 83 3	78 7	81 1	21 5		รัด	77 4	77 3			
		5 000	52	0 79.2	73.7	77.3 77.4	50.5		2 0	75.4	75.4			
		1 000	53	6 75 9	52.0	70.7	54.3		2 9	72 4	72 4			
с нес		0 500	76	7 90 9	99 0	70 0	94.2		c c	99.9	99 9			
+ 0.00		0.010	84	.1 82.2	83.1	02.0	84.5	8	3.5	83.3	83.3	nest	FI	лes
		0.001	21	.7 71.8	80.7	88.7	64.2	- 2	1.5	78.0	77.6	1	D4	1
		C and	L KI	E REC	F1	PRE	REC	- F		HCC	F1			
		~	DCI		114	ICH	DEO	<u> </u>	PERALL	A 0.0	114			
Param	=	10.00000	<u> </u>	Classifier	Evaluation	Experi	ment 10	N O	100					
Param		10.00000	- 1	Glassifier	Evaluation	Experi	ment 99	Of	100					
Param		10.00000	- 1	Glassifier	Evaluation	Experi	ment 98	01	100					
Param	-	10.00000	- e	Glassifier	Evaluation	Experi	ment 97	ot	100					
Param		10.00000	<u> </u>	Classifier	Evaluation	Experi	ment ye	of	100					
Param	=	10.00000	<u> </u>	Classifier	Evaluation	Experi	ment 95	of	100					
Param		10.00000	- L	Classifier	Evaluation	Experi	ment 94	of	100					
Param	=	10.00000	<u> </u>	Classifier	Evaluation	Experi	ment 93	of	100					
Param		10.00000	- 1	Classifier	Evaluation	Experi	ment 92	of	100					
Param		10.00000	- 1	Classifier	Evaluation	Experi	ment 91	of	100					
Param		10.00000	- 1	Glassifier	Evaluation	Experi	ment 90	of	100					
raram		10.00000	. –	Classifier	Evaluation	Experi	ment 89	ot	100					
Param		10.00000	- c	Classifier	Evaluation	Experi	ment 88	01	100					
Param		10.00000	- c	Classifier	Evaluation	Experi	ment 87	of	100					
Param		10.00000	g —	Classifier	Evaluation	Experi	ment 86	of	100					
Param		10.00000	- n	Classifier	Evaluation	Experi	ment 85	of	100					
Param		10.00000	g —	Classifier	Evaluation	Experi	ment 84	of	100					
Param		10.00000	g —	Classifier	Evaluation	Experi	ment 83	of	100					
Param	=	10.00000	g —	Classifier	Evaluation	Experi	ment 82	of	INN					
Param		10.00000	<u>1</u> –	Classifier	Evaluation	Experi	ment 81	of	100					
Param		10.00000	a —	Classifier	Evaluation	Experi	ment 80	of	100					
Param		10.00000	<u>d</u> –	Classifier	Evaluation	Experi	ment 79	of	100					
Param		10.0000	d —	Classifier	Evaluation	Experi	ment 78	of	100					
Param		10.0000] —	Class if ier	Evaluation	Experi	ment 77	of	100					
Param		10.0000] —	Class if ier	Evaluation	Experi	ment 76	of	100					
Param		10.00000] —	Classifier	Evaluation	Experi	ment 75	of	100					
Param		10.0000] —	Classifier	Evaluation	Experi	ment 74	of	100					
Param		10.00000	a —	Classifier	Evaluation	Experi	ment 73	of	100					
Param		10.0000	<u>a</u> –	Classifier	Evaluation	Experi	ment 72	of	100					
Param		10.0000	<u> </u>	Classifier	Evaluation	Experi	ment 71	of	100					
Param		10.00000	a —	Classifier	Evaluation	Experi	ment 70	of	100					
Param		10.0000	<u> </u>	Classifier	Evaluation	Experi	ment 69	of	100					
Param		10.00000	ā —	Classifier	Evaluation	Experi	ment 68	of	100					
Param		10.0000	á —	Classifier	Evaluation	Experi	ment 67	of	100					
Param	_	10 00000	ă —	Classifier	Fualuation	Experi	ment 66	of	100					
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Param	_	10.00000		Classifier	Evaluation	Experi	ment 63	- 6	100					
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D		40 0000		01	T	T		- 6	4 00					



Fig.7. Testing Result

TABLE II. CLASSIFICATION RESULT

	DGD	ТСН
Classification success	8	7
Unsuccessful	8	9
	16	16

Explanation for table II, from 16 audio dangdut music files, 8 audio music files were successfully classified and 8 audio music files were not successfully classified. Meanwhile, from 16 audio techno dance music files, 7 audio music files were successfully classified and 9 audio music files were not successfully classified.

V. CONCLUSION AND FUTURE RESEARCH

The results from table II are not very satisfying. This is understandable, given the relatively small amount of data for training, and then in the pre processing stage, the music duration is limited to 20 seconds at the beginning.

There are still wide open opportunities for research in this area. For example, with the use of more and varied data, and also not limited to two types of music. Also can be considered to examine similarities in different types of music by using the feature extraction that from audio music.

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