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A STUDY OF WEB-BASED BANGLA MUSIC GENRE CLASSIFICATION USING MACHINE LEARNING APPROACH

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Abstract - It's crucial to categorize music by genre if you want to propose music and understand its specifics. English music classification requires a lot of work. Use several machine learning techniques, such as K-NN, NN, and SVM, to categorize music. Bangladesh has a thriving music scene. It also features the clothes unique to that culture. There hasn't been any significant attempt to categorize Bangla music using machine learning, though. It is crucial to estimate the amount of Bengali songs. There are several songs that are well-liked by native speakers, numbering in the millions. There are a number of articles on Bengali music categorization that focus on the melody of the song rather than text-based lyrics. Bengali music may be categorized into a wide range of genres since it has so many different sorts and styles. Consider "Bangla Adhunik," "Bangla Baul," "Bangla Band," and "Nazrul Geety" for beginners. For each genre, we utilize 50 audio songs (.wav files). extracted various items properties of audio signals in the time and frequency domains from digital audio files (such as MP3 files).

Keywords - KNN, MFCC, Machine Learning, Bangla Music, Adhunik, Baul, Band Music, and Nazrulgeeti

I. INTRODUCTION

Bangladesh is the name of the heart of every Bengalis. Bangladesh is a developing country and its culture is quite rich. The culture was established 1400 years ago. Before the 18th century, Bengali literature was in a Music form. So the songs sat at the root of the culture since the charyapada was found. Every Bengali loves and celebrates its songs and culture. Bengali music has many genres like Baul, Band, Folks, Nazrul, Rabindra, Adhunik, etc. Nowadays Bengali music is getting more famous on music platforms like Spotify, SoundCloud, YouTube, etc. A music genre is the best way to classify music. Most of the classification is done by labeling music manually.

To recommend music classification is very necessary.Music can be classified in different ways based on Script, Lyrics, Areas, Time, Religion, etc. Classifying music is a very difficult task in itself. We did a survey on this topic as a result there is a lot of work in English music genre classification but on the other hand, Bengali has not any noticeable work.

In this paper, we are approaching a Machine Learning model KNN to classify Music. Here we Classify 4 Genres of Bengali music Band, Adhunik, Baul, and Nazrul. We create our own dataset. We collect 50 songs for each genre and then we cut them into major 30s. We also set the Frequency as 11000Hz.The Machine can predict the song by checking the Instrument and sound System.

II. RELATED WORK

In [1], the authors defined Bengal's music genres as being divided into many sections due to the vastly different music categories. Genres can be divided into three parts. This work proposes a style dataset of Bangla song lyrics to analyze the characteristics of the style. This paper examines the potential for future research in Bangla Stylometry. In [2], the authors presented an approach to categorize different genres of Bengal music in a simple yet very efficient way. They proposed a neural network model that predicts the genre of Bengali songs, surpassing traditional machine learning techniques for datasets. They found that creating datasets with larger offsets in MP3 files tends to make the trained model more accurate and give better predictions.The authors of [3] presented The accuracy of classification by different genres and different machine learning algorithms varies. The success rate of SVM was 83%, but the blues genre was misunderstood as the rock or metal genre. k-NN showed inadequate performance to detect blue with a detection rate of 49%. SVM also misidentified the classic genre as jazz or hip-hop, but accurately identified the rock genre with a 94% success rate. K-NN also worked well in identifying Classic with a 90% success rate.The authors of [4] defined songs are categorized into emotions based on the weighted combination of extracted text and voice features. This combination is achieved using a number of statistical experiments and eventually converges towards the weights required for each function. In the experiment, a striking balance between accuracy and ambiguity was achieved by adjusting the threshold and the

number of neighbors considered by the kNN algorithm. In [5] This article describes the role of lyrics in the MER process. We proposed a new style, structure, and semantic features and a new ground truth dataset, including 180 songs manually annotated according to the Russell emotion model. We used three classification strategies: quadrant (4 categories), awakening hemisphere (2 categories), and valence meridian (2 categories). With the addition of other features, including new features, compared to prior art features (CBF-baseline), results increased from 69.9% to 80.1% in the quadrant category, from 82.7% to 88% in the awake hemisphere, and 3%. It has been improved. 85.6% to 90% for the valence meridian.. In [6] this article, we looked at the accuracy rates of several techniques for classifying music genres in public datasets. They compared the results using raw audio data and a power spectrogram of the input signal using a two-layer neural network. We have been studying various learning methods such as PCA, SLPP, and SR as dimension reduction methods.

III. METHODOLOGY

As we have chosen to develop two simple models, the baseline system performance will come first. After that, we will go on to more sophisticated models in order to acquire significant accuracy. Here, the k-nearest neighbors technique is implemented using mel-frequency cepstral coefficients (MFCC). This paper is Assembled as follows: Initially, We demonstrate a Workflow of methodology. Then we displayed an overview of our dataset and data preparation process. Next, we discuss the features extraction and data processing procedure. Then we show the result of the prediction and make a comparison. Next, we show our web Application which generates the predicted result. Finally, the classification report is done through the website and we reach our conclusion.

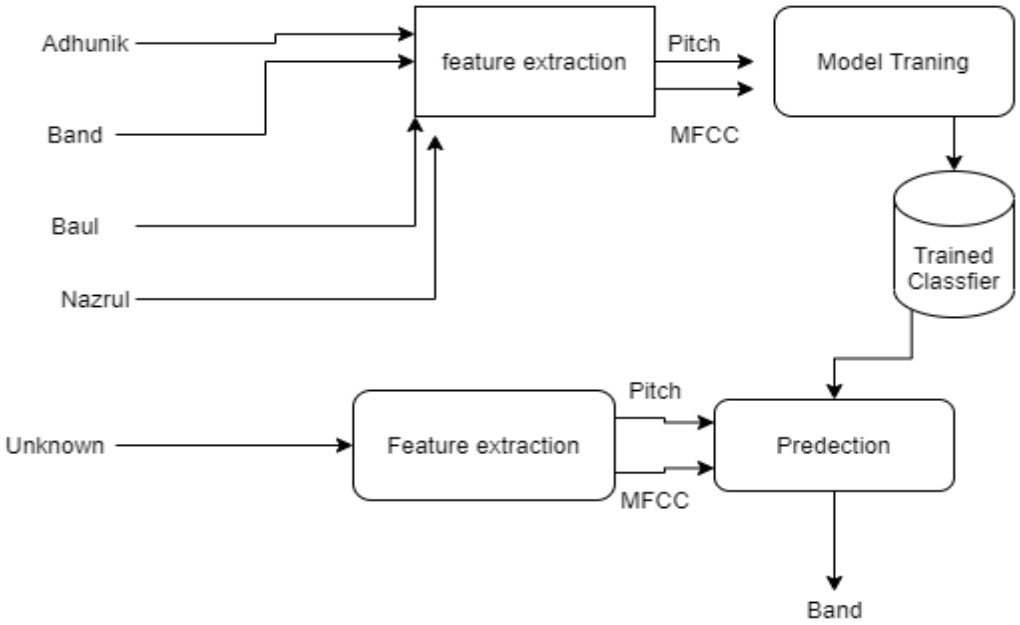

Fig 1. Workflow of methodology

We are using a python library named python_ speech_ features. It's used to convert the audio file. Any integer PCM depth between 1 and 64 bits is supported by this method when reading WAV files, which can specify any bit depth. The smallest suitable numpy int type, in left-justified format, contains the returned data. Unsigned bits are 8 bits and under, whereas signed bits are 9 bits and more. Sensitive data can also be safely stored in a temporary file. There are several functions in this module that allow you to simply create temporary files and directories. We will compile all the features retrieved using mfcc into a binary file (Mel Frequency Cepstral Coefficients).[9] A representation of a sound's short-term power spectrum used in sound processing is called a mel-frequency cepstrum (MFC), which is based on a linear cosine transform of a log power spectrum on a nonlinear mel scale of frequency binary file where we will collect all the features extracted using mfcc (Mel Frequency Cepstral Coefficients).An MFC is made up of a number of coefficients known as mel-frequency cepstral coefficients (MFCCs).They are formed from an audio clip's cepstral representation (a nonlinear "spectrum-of-a-spectrum").

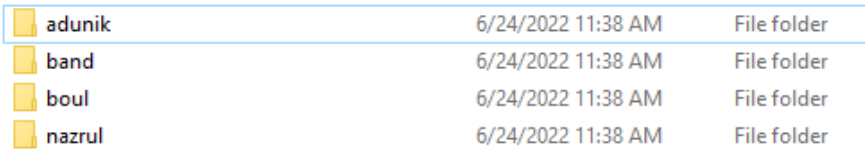

Fig. 2 . Folder name

The data collection for this article was carefully gathered. Given that the subject of our study is Bangla Tune, it has been decided to make the data, which consists of 200 brief Bangla audio clips from various websites, as short as possible. Bangla songs are used as a source of information, although mixed music melodies are often ignored. 50 Nazrulgeeti, 50 Baul, 50 Adhunik, and 50 Band songs are included in our dataset. Approximately 529 Megabytes (MB) of raw.wav format have been utilized. Each of the 200 recordings in our dataset is 30 seconds long, and there are 50 tracks for each of the 4 genres.

The tracks all feature mono 16 bit 11000 Hz.wav audio files.split up the data into train and test. The algorithm and KNN machine learning provide us with the predicted prediction outcomes.160 training sets and 40 audio test sets are created from the dataset. We take four folders of music and use feature extraction, model training, model classifier, and prediction to determine whether the uploaded song will produce the desired results. We can confidently state that our machine learning algorithm's prediction would be accurate, and it correctly identified the music.

Fig. 3. List of songs of Boul

BANGLADESHI MUSIC GENRES

Adhunik: Adhunik Bangla Sangeet, or current music, is the most recent addition to the long history of Bengali music. The existing genres of Nazrul Geeti, Rabindra Sangeet, Baul, Bhatiyali, and traditional Bengali classical music are fundamentally distinct from this one. The popular cinema music and many western music genres have a big impact on it.

Baul: The Bangladeshi folk music genre known as "baul" is the most well-known. In Bangladesh, hermits who practice Sufism predominately perform it. Sufis in modern times mostly make money through singing their music. Simple words are used in Baul songs to reveal profound meanings about society, creation, lifestyle, and human emotions. Very little musical accompaniment is provided for the songs' primary carrier, the voice. The Ektara ("one-string"), Dotara ("two-strings"), ba(n)shi (country flute made of bamboo), and cymbals are among the instruments utilized. Due to urbanization and westernization, the popularity of Baul geeti has declined recently.

Band Music: A folk-rock group from Bangladesh is called Bangla. Bangla is a form of music that was created by well-known independent musician Shayan Chowdhury Arnob and mostly combines western influences with traditional folk music from Bangladesh, such as jazz, blues, and rock. [1] In 2002, the group issued Kingkortobbobimurho, its debut album. The band has gained popularity throughout the years and is now one of the most sought-after bands, especially among urban young listeners.

Nazrulgeeti: Songs written and recorded by Kazi Nazrul Islam, a Bengali poet, Bangladesh's national poet, and an active revolutionary during the Indian Independence Movement, are known as Nazrul Geeti or Nazrul Sangeet, meaning "music of Nazrul." Revolutionary ideas are combined with more spiritual, intellectual, and romantic themes in Nazrul Sangeet.

IV. RESULT AND DISCUSSION

We classified 4 genres (Adhunik, Baul, Band Music, and Nazrulgeeti) in this project using k-NN with MFCC, and the accuracy is 74.19 percent. We also use data from four other genres, and it can accurately determine which songs belong to which genre.

Content	English			
	Blue	Jazz	Rock	Classic
	68%	65%	75%	70%
Total Accuracy	69%			

Table 1: English Accuracy Comparison

Content	Bangla			
	Adhunik	Band	Baul	Nazrul
	74%	76%	71%	69%
Total Accuracy	74%			

Table 2: Bangla Accuracy Comparison

Here is a comparison between our project and the reference model. Using the K-NN model, they achieve a 69 percent accuracy in the English paper. We had to describe this paper in the feature extraction section. On average, though, we get 74% accuracy for our Bengali song. Our highest accuracy rate was 76%. Thus, it is far superior to an English song. We are making a website also, this website integrates to the coding part. The website has a chosen option, we upload a song and the code detects which song it is, and it shows our expected output. The website has a registration part, a user can register his/her identification. When a user completes his/her registration, the user can sign up and take advantage of good features. A registered user signs it by using username and password which they use for registration time. Then a new window opens, this window shows an upload audio file option. Users can upload an unknown music audio, then submit it to the website backend file, detect the audio and give the output finally shown which category song it is. It is very helpful to find unknown songs.

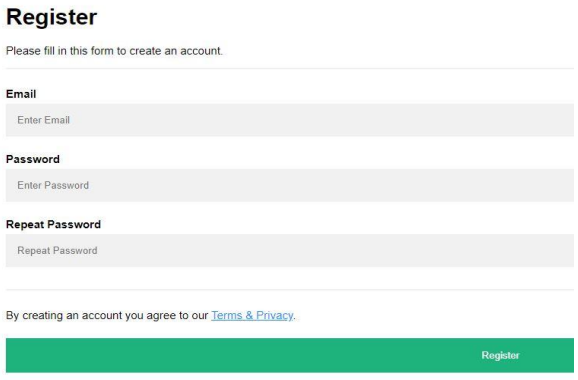

Fig.4. User Register in page

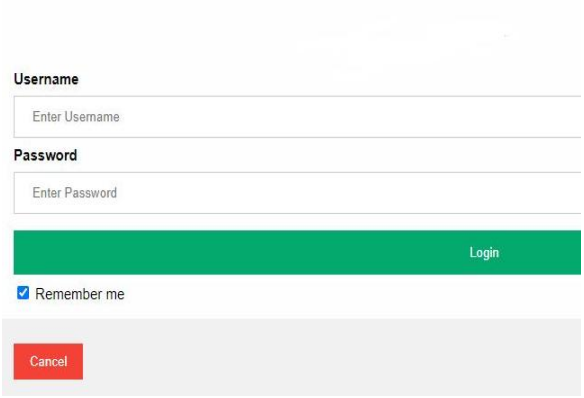

Fig 5. User Login Page

Fig.6. User-end Uploaded song

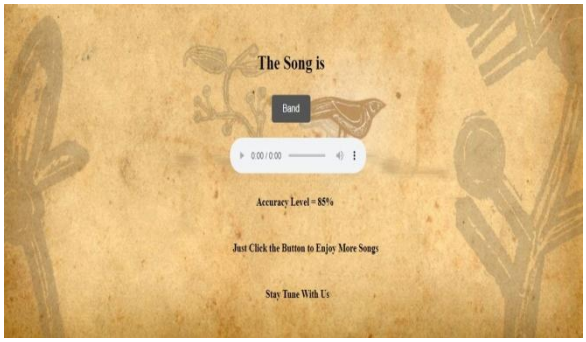

Fig.7. Output results

V. CONCLUSION

We have developed a straightforward yet highly effective system for classifying the many Bengali music subgenres. We investigated a KNN model that goes beyond traditional machine learning techniques for identifying Bengali music genres. This report's summary of the genre and features uses genre categorization. The breadth of our investigation is emphasized in the part on the literature review. Along with feature extraction and feature vector composition, KNN classifiers are also explained. The outcomes of a few different KNN implementations are shown. To improve the accuracy and precision of the genre classifier, more aspects of the reduction methods are put into practice. It is clear that some of the suggested elements are ineffective compared to other factors and lower the overall quality of the

genre categorization. We assess the outcomes and compile a list. This essay demonstrates that, when compared to the literature review classifier, the precision and accuracy of the suggested genre are observable.

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