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Music Genre Classification Using Machine Learning

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ABSTRACT: Music genre is a traditional way to describe the type of music that fits into a tradition or set of rules. A music platform with \$26 billion in assets is in charge of streaming music right now. At the moment, it has a huge number of songs, is a database of information, and says it has the right music score for everyone. Such as Spotify and Amazon Music, Wynk has done a lot of research to improve how people find and listen to music. AI is at the centre of what they are looking at. All music platforms use all of them, from NLP to collaborative sifting to deep learning. Songs are judged on how well they do in certain areas, such as rhythm, acoustics, energy, danceability, etc., in order to answer that old, confusing first-date question. Companies use music arrangement these days, either to offer suggestions to their customers (like Spotify and Soundcloud) or as a product (for instance, Shazam). Choosing what kind of music to listen to is the first step on that path. AI methods have turned out to be very good at finding patterns and examples in a large pool of data. Also, the same standards are used in Music Analysis. Deep learning techniques have only been done a few times in the past few years. Machine learning techniques are used to classify most types of music today. In this, we show a music dataset that includes Rock, Pop, Folk, Classical, and many other types of music. KNN is used to train and classify the system, and a Deep Learning method is used to do this.

KEYWORDS: Genre classification, Audio signals, Deep Learning, K-Nearest Neighbour.

I. INTRODUCTION

Because of insight and separation, music is a normal place to learn. Through the web and the melodic app, it will become easier and easier to get to music. Every day, more and more of these web-based features are being made to find new popular music in a music library. Libraso is the library used here to classify music by genre and analyse music and audio in order to make a system for retrieving music information. Now, it's hard to find a certain kind of music because there is so much of it. In the field of Music Data Recovery, putting music in order has been a hard task (MDR). Sorting had been done physically by connecting it to a sound document metadata store. Sorting makes sure that the knowledge is useful for this task. Music classification lets music be put into general groups based on tunes so that it can be used in applications. A music classification classifier is a programme that can tell from the way a piece of music sounds what type of music it is. Also, many existing songs don't have labels, and new songs are always being added to the music genre classification. With apps like Drinkify and Pandora coming and going, it's interesting to think about how to group music. This is an area of research because it can be hard to choose the best sound features. Physically, type grouping is done by people using their own understanding of music. Due to how hard it is to choose and extract music files, this review paper still focuses on the traditional Artificial Intelligence approach of adding deep learning for grouping by finding the right highlights of sound signs, preparing the classifier based on the highlights, and making predictions. The goal of this project is to come up with an idea for classifying music by genre using deep learning and the KNN algorithm. This idea should be able to accurately predict the genre and confidence level of Western music from different types like traditional, rock, jazz, rap, and so on. In doing this, we hoped to create a deep learning model that could be used to describe 10 different kinds of music. We trained this model with most of the music data from the past and just a few files from the present. This means that the music grouping interactions should be able to be done in less time and with a higher success rate for predicting new music files than with the previous model, which was done by people.

II. LITERATURE REVIEW

In the field of MIR, it has been hard to put music into different genres. ML techniques were used to help Tzanetakis and Cook classify different kinds of music. They used the GTZAN dataset as a standard for dividing music into genres.

[1] Digital music has become a big part of people's lives. Services like recommendation systems and similarity tests, which are made possible by digital music, then become essential for online services and marketing. Genre classification is an important part of these services because it is a building block for these systems. Before, most research was done on low-level features, and few people looked at this problem from a more interpretable angle, such as a musicological one. Because of this, it's hard to figure out what's going on in the middle stages of the classification process, so the knowledge of music professionals wasn't very useful in the process. This paper looks at how to classify genres from a very musical point of view. The proposed method takes into account high-level features that have clear musical meanings. This means that music experts would be able to understand the results of the classification. We use a data set of only symbolic piano works, which has over 200 records of classical, jazz, and ragtime music, to look at more musicological aspects and get more statistical data.

Nilesh M. Patil.[2] have shown a model for automatically classifying music genres. First, it found good parts of each type of music. From the dataset, features like MFCC, chroma frequencies, spectral centroid, and zero-crossing rate were used to get features for the classifiers. Both K-NN classifiers and SVM classifiers were set up and used to characterise, but they did so in different ways.

Sergio Oramas.[3] have shown that there is a way to deal with, think about, and combine different ways of representing data in order to classify genres. We have finished analysing both single-label and multi-label classifications of genres, evaluating the effects of the different learned representations and how they work together. Results from the two trials show that the classification is more accurate when learned representations from different modalities are added together.

Muhammad Asim Ali [4] had written about an ML algorithm that uses k-NN and SVM to predict what kind of music a song is. This paper also does a similar comparison between k-NN and SVM with dimensionality return and then without dimensionality reduction using principal component analysis (PCA). Based on the results, they saw that both k-NN and SVM gave more accurate results than dimensionality reduction.

III. SYSTEM DESIGN

Flowchart

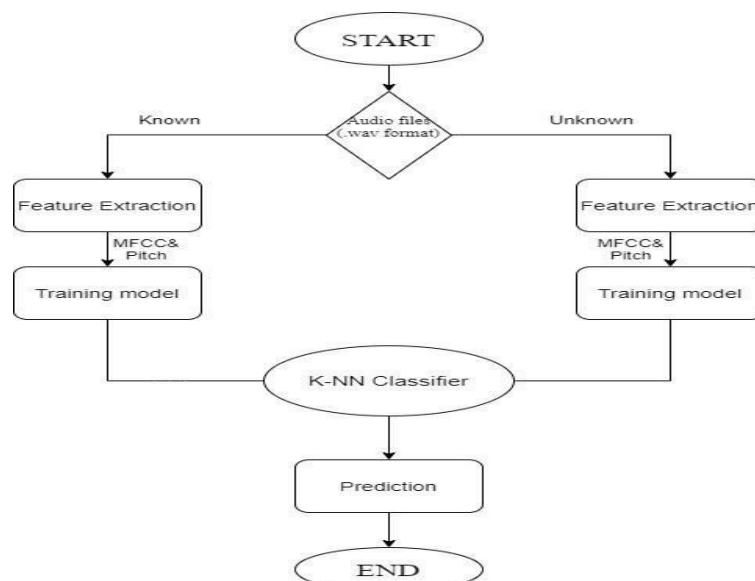


Fig: Flow Chart

Data Collection

The data for the GTZAN genre collection was gathered in 2000 and 2001. It has 1,000 audio files, each of which is 30 seconds long. There are 10 types of music, or classes, and each class has 100 audio tracks. Each track is saved as a .wav file. It has songs from the following 10 categories:

- Blues
- Classical
- Country
- Disco
- Hip-hop
- Jazz
- Metal
- Pop
- Reggae
- Rock

Since there are ten different types of music in the GTZAN data set, accuracy was used as the main measure of performance. Even though a listener might think of it as a subjective measure, the average percentage of music similarity is also used as a measure of how good a music recommendation is..

Feature Extraction using MFCC

At first, the speech signal can be broken down into acoustic features that represent the sound information. As other papers have shown, the mel-frequency cepstral coefficients are best for figuring out the structure of music signals and changing the subjective pitch and frequency content of sound signals. Psychological studies have found the mel pitch scale and the critical band, and the frequency scale-warping to the mel scale has led to the cepstrum domain.

Classification Using SVM and BPNN

The SVM (Vapnik, 1998) is a useful statistical machine learning technique that has been used successfully in the pattern recognition area. The Structural Risk Minimization theory from the Computational Knowledge Hypothesis is what Support Vector Machines are based on. SVMs do not depend on how many dimensions the feature space has.

What SVM is and what it does:

- High dimensional input space
- Document vectors are sparse
- Few irrelevant features
- Mainly text classification problems are linear

IV. METHODOLOGY

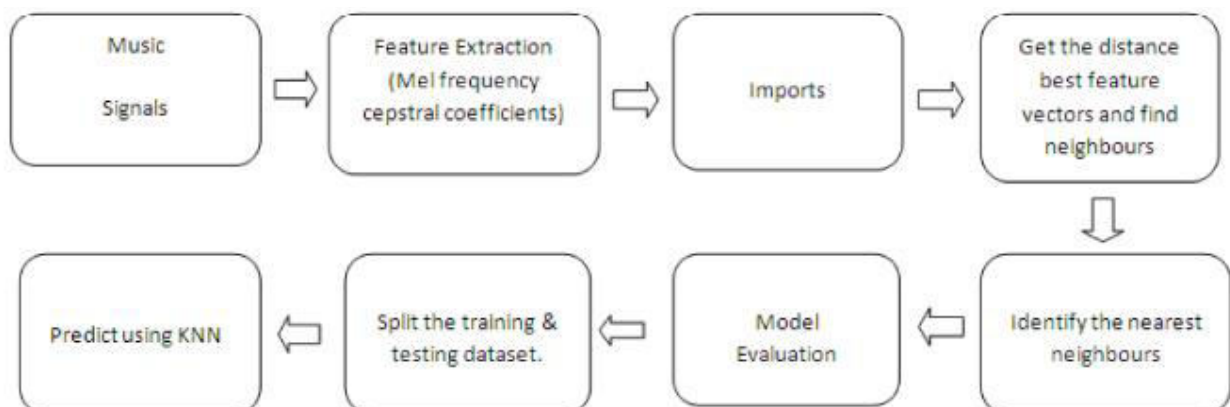
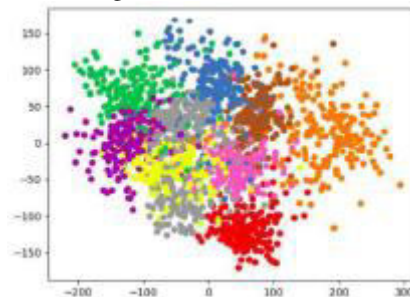
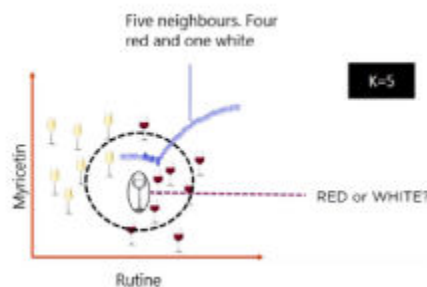


Fig: Brief Understanding the working process of our model.

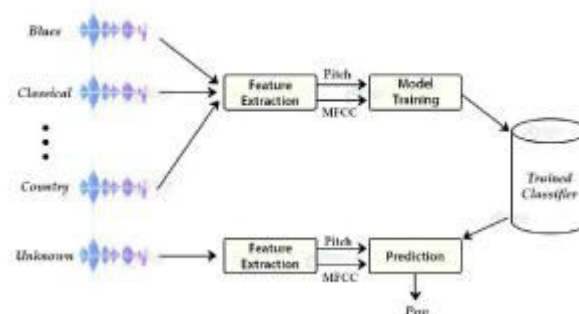
K-Nearest Neighbor Algorithm K-Nearest Neighbor, or "KNN" for short. It is a machine learning algorithm that is taught by humans. Both classification and regression problems can be solved by using the calculation. The letter "K" stands for the number of variables that are close to another unknown variable that must be predicted or categorised. Its goal is to find all of a new unknown data point's closest neighbours to figure out what class it belongs to. It's a method based on distance. KNN figures out how far away each focus is from the unknown data and gets rid of the ones that are closest to it. Because of this, it is often called a distance-based calculation. To correctly order the results, we should first figure out what K is (Number of Nearest Neighbours).



When the issue announcement is of the "classification" type, KNN will usually use the "Majority Voting" idea. Within the range of K values that are given, the class with the most votes is chosen. In the next picture, a circle is drawn inside the space between the five closest points. Four of the five people who live in this area chose "RED," while the fifth person chose "WHITE." Based on the most votes, it will be called a "RED" wine.



Since K-nearest neighbours is a supervised AI technique that takes a main element and calculates the distance between k labelled data focuses, the point is classified by the number of votes it gets from the k-nearest elements. The word "supervised" means that we know for sure what kind of music the song is before we test it and give it a grade. For example, if $k = 5$ and the five closest information points are labelled as 1.Classical, 2.Classical, 3.Disco, 4.Classical, and 5.Disco, the new information point would also be labelled as Classical because 3 out of the 5 closest information points are Classical and 2 are Disco. The Euclidean distance is used to figure out how far something is. Choosing the value of k can be a complicated cycle. There are at least one or two ways to find the best value. But for this set of data, I have estimated k to be the square root of n.



One thing we need to do to set up our data is to combine the two data edges of each genre, mix up the lines, and label the class (genre) of each song. Classical is worth 0 and Disco is worth 1 for this project. Then, we need to separate the data into training data and testing data. Even though KNN models don't need to be trained (because the calculation contains all the information), it's a good idea to look at how close the training and testing samples are to the real world.

V. RESULTS & DISCUSSION

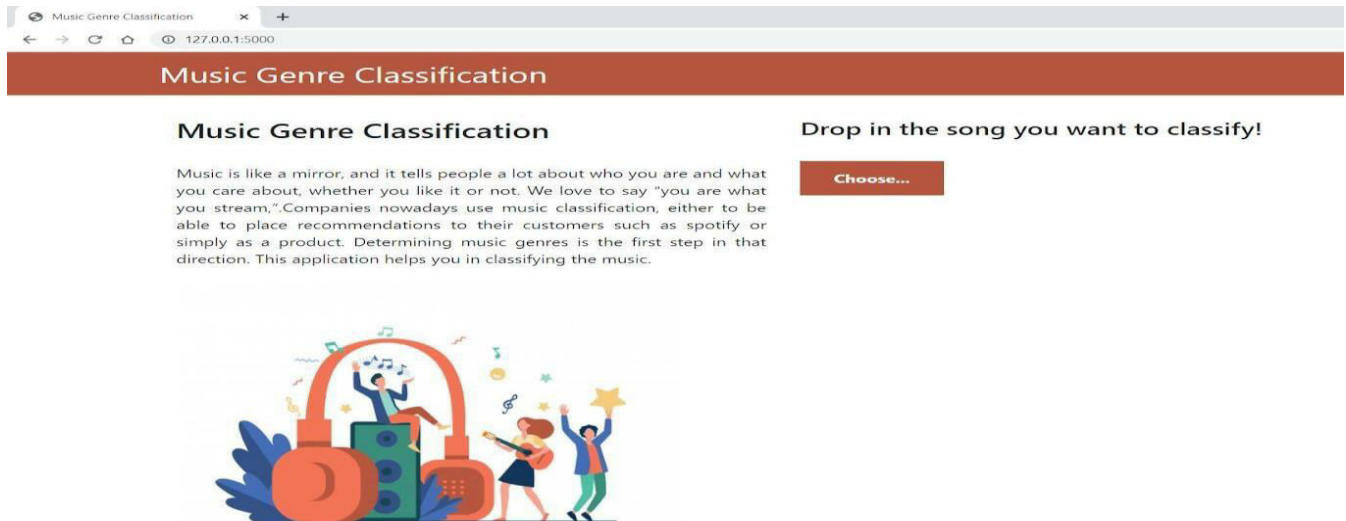


Fig: Choosing the song

Description: The above fig describes to choose a song that we want to predict.

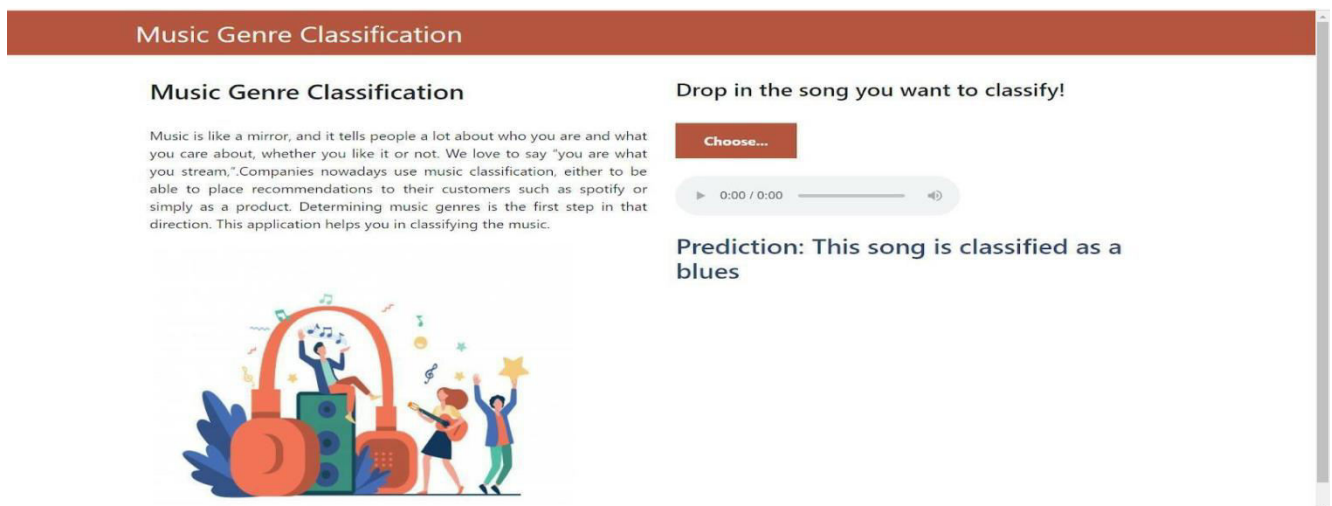


Fig: Predicting the song

Description: The above fig predicts the classification of the song that we have given as a input.

VI. CONCLUSION

Using machine learning, we were able to build an automatic music genre classification system using the k-nearest neighbours algorithm. This system will replace humans' efforts to classify music genres by understanding each tone of music. It can be used in music applications because it is accurate and takes less time to figure out the genre. Which helps developers work together to classify music automatically by genre in music apps. Offers different types of genres, such as rock, hip-hop, classical, and so on, which make it easy for the user to find the genre and play songs from that



genre. The K-nearest neighbours algorithm is more accurate than any other algorithm. It gives the best results by correctly classifying the genre.

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