Comparison of Music type classification by ML and NN Method
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Motivation:

As there are many music styles, in order to facilitate the management of the database, we hope to develop a system that can identify the style of music. As for the method we use, nowadays most technologies adopt neural network to train models for speech recognition. However, the input used in neural network is the entire audio file, which is multi-dimensional data, rather than the input we use in traditional machine learning method, which would be processed before being placed in the model for training. Therefore, we try to use the traditional machine learning method not only to achieve the accuracy of neural network, but also to speed up the model training, and use these two methods for comparison and analysis.

Approach:

(1) ML method (Machine Learning)

The flow below aims to analysis the audios in the frequency domain to extract low dimensional features. The frequency components are separated into several ranges in which spectral peak, spectral valley and their difference are computed as features. Next Karhunen-Loeve transform is performed on the features to remove the relativity, which leads to better classification performance. With the pre-processed features, we can train on difference models to obtain the optimal performance.
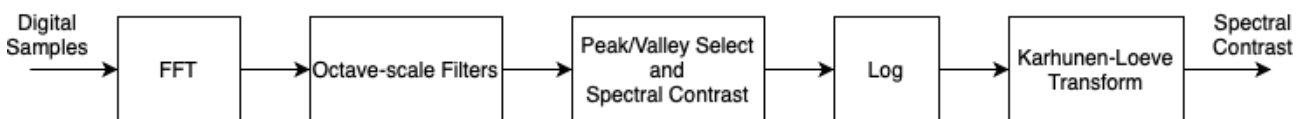
(2) NN method (Neural Network)

In the beginning, we also transform audios samples to frequency domain as input features. In this project, we adopt CNN architecture as our model because it is widely used in classification, and it's easy to compare with ML method.
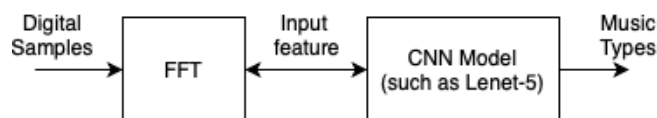
Dataset

GTZAN Dataset - Music Genre Classification

A collection of 10 type of music with 100 audios each, all having a length of 30 seconds

Website: https://www.kaggle.com/andradaolteanu/gtzan-dataset-music-genre-classification

Preliminary Result:

Based on the mathematical models of neural network and traditional machine learning, we predict that the model trained by neural network is more accurate than the model trained by traditional machine learning, but with longer training time.

Software:

MATLAB and related toolboxes. (or python to run neural networks)

Reference:

[1] Dan-Ning, Jiang *et al.*, "Music Type Classification By Spectral Contrast Feature", 2002

[2] https://towardsdatascience.com/classifying-music-genres-with-cnns-800f6bf2ab21