Classical Music Classification

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By

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Chapter 1
Introduction

1.1 Introduction:

Music is an integral part of the society. Music lowers a person's stress level and improves health. It also reduces depression level in a person and also strengthens learning and memory. Thus, it can be said that music makes a person happy. There are multiple genres of music like Rock, Metal, Hip-Hop, Jazz, Classical, Pop, Folk, Country, R and B, etc. Though there are numerous genres of music, it is seen that a person usually likes listening to a particular genre only. There are multiple apps like Shazam and Spotify that recommends songs according to music similarity or artist similarity but not according to genre. Humans are good at classifying music into various genres, especially if the genres are distinct. But it is difficult to classify songs if they lie between the cusp of two genres or even more difficult to classify songs into various sub-genres. Hence, there is a need for a sub-genre classifier.

1.2 Problem Formulation:

The objective of our project is to develop a classifier that can classify classical music into its sub-genres with minimum 70 percent accuracy; the drawback in some of the existing classifiers is that they show unsuccessful results with certain algorithms.

1.3 Description:

We will be classifying music according to various sub-genres of classical music like Baroque, Avant-Garde, Opera, Orchestral, Renaissance, etc. A System will be developed that would classify music using classifiers. The GTZAN or the million song dataset will be used. These datasets contain thousand songs, each of around 30 seconds in length. The dataset is divided into 10 genres each containing 100 songs. The data from these datasets will be used to extract the dynamic, rhythm, tonal, and spectral features. These features will be used to develop trained models using classifiers like- Multilayer Perceptron, Random Forest, Support Vector Machine, K-Nearest Neighbors, Recurrent Neural Networks. The dataset should be into training and testing sets in the ratio of 60:40 for an optimum result. Using the classifiers and trained models, testing will be done on the testing set. A confusion matrix will be developed to check the accuracy of the classifier.

1.4 Motivation:

Though there are numerous genres of music, it is seen that a person usually likes listening to a particular genre only i.e. it is difficult to classify songs if they lie between the cusp of two genres or even more difficult to classify songs into various sub-genres such as Rock, Metal, Hip-Hop, Jazz, Classical, Pop, Folk, Country, R and B, etc.

1.5 Proposed Solution:

To classify music according to the sub-genres of classical music like Baroque, Avant-Garde, Opera, Orchestral, Renaissance, etc. a system is to be developed that would classify music using classifiers. To get the Songs data, the GTZAN or the million song dataset would be used. These GTZAN dataset contains thousand songs, each of around 30 seconds in length. The dataset is divided into 10 genres each containing 100 songs. Use the data from these datasets to extract the dynamic, rhythm, tonal, and spectral features. Use these features to develop trained models using classifiers like- Multilayer Perceptron, Random Forest, Support Vector Machine, K-Nearest Neighbors, Recurrent Neural Networks The dataset should be into training and testing sets in the ratio of 60:40 for an optimum result. Using the classifiers and trained models, test it on the testing set. Develop a confusion matrix to check the accuracy of the classifier.

1.6 Scope of the project

The classification would only be for sub-genres of classical music. Adding other genres would result in a reduced accuracy of the classifiers. The classifiers may produce a wrong output for songs having an unorthodox time composition or for songs that come under two or more genres

Chapter 2

Literature Review

Exploring different approaches for music genre classification by Antonio Jose Hmsi Goulart, Rodrigo Capobianco Guido, Carlos Dias Maciel. This paper was received on 31st December 2011. It was revised on 6th March 2012 and accepted on 12th March 2012. This paper was available online on 18 April 2012 The algorithm used in this paper is SVMs (Support System Vector). The issues faced are ambiguity and subjectivity in the classification and the dynamism of music styles. It achieved accuracy up to 65.06 percent. Features used are use of entropies and fractal dimensions. The music sample used is Digital Music files.

Jazz Music Sub-Genre Classification Using Deep Learning, by Rene Josiah M. Quinto, Rowel O. Atienza, and Nestor Michael C. Tiglao from Electrical and Electronics Engineering Institute, University of the Philippines – Diliman Quezon City, Philippines. The algorithm used are LSTM (Long Short Term Memory)and MLP(Multi-Layer Perceptron). The issues faced by them are unsuccessful results by using MLP,SVM and KNN. They achieved a maximum accuracy of 89.824 percent. The feature used is Mel-Frequency Cepstral Components(MFCC) and music Sample is Jazz dataset. Evaluation of Music Features for PUK Kernel based Genre Classification, by Santosh Chapaneri, Renia Lopes, Deepak Jayaswal. The algorithm used by them is SVM classifier, it is used for the implementation of SMO(sequential minimal optimization). They have also used WEKA toolkit The issues faced by them is no clear identification. The achieved am accuracy of 82 percent. The features used by them are 4 broad categories i.e. Dynamic, Rhythm, Tonal and Spectral. Cross validation is performed on the samples. The music sample used is Bench Mark Database. Statistical Evaluation of music information retrieval information. The algorithm used in this paper is Gaussian Mixture Model classifier. The issues faced are unsuccessful results by using MLP,SVM and KNN. They achieved an accuracy of 93 percent. The feature used is Mel-Frequency Cepstral Components(MFCC). They used GTZAN dataset.

Sr. No.	Paper	Algorithm Used	Music Smaple	Accuracy(Lat percentage)	Features Used	Issues
[1]	Exploring different approaches for music genre classification	Digital Music files	SVMs	65.06	Use of entropies and fractal dimensions	Ambiguity and subjectivity in the classification and the dynamism of music styles
[2]	Jazz Music Sub-Genre Classification using deep learning	Jazz dataset	LSTM (Long Short Term Memory)and MLP(Multi-Layer Perceptron)	89.824	Mel-Frequency Cepstral Components (MFCC)	Unsuccessful results by using MLP,SVM and KNN
[3]	Statistical Evaluation of music information retrieval information	Gaussian Mixture Model classifier	GTZAN dataset	93	-	-
[4]	Evaluation of Music Features for PUK Kernel based Genre Classification	SVM classifier used for the implementation of SMO(sequential minimal optimization). WEKA toolkit	BenchMark Database	82	4 broad categories i.e. Dynamic, Rhythm, Tonal and Spectral. Cross validation is performed on the samples	No clear identification

Chapter 3
System Design

3.1 Block Diagram

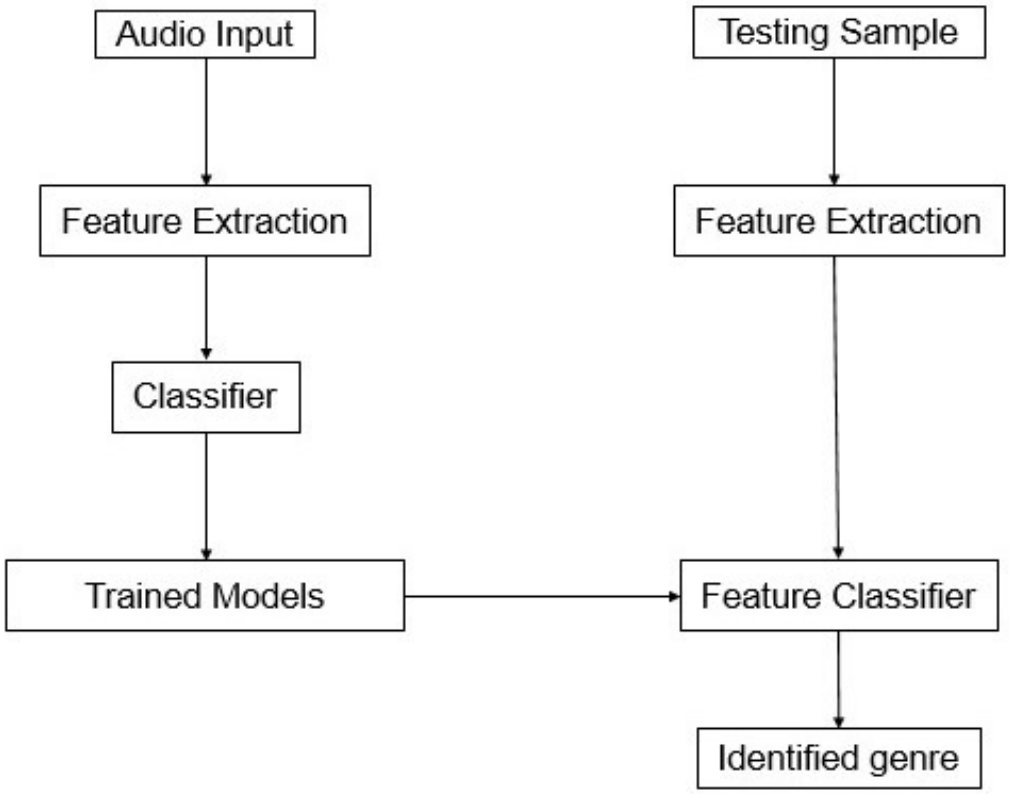

Figure 3.1: Block Diagram of a Classifier

3.2 Data Flow Diagram

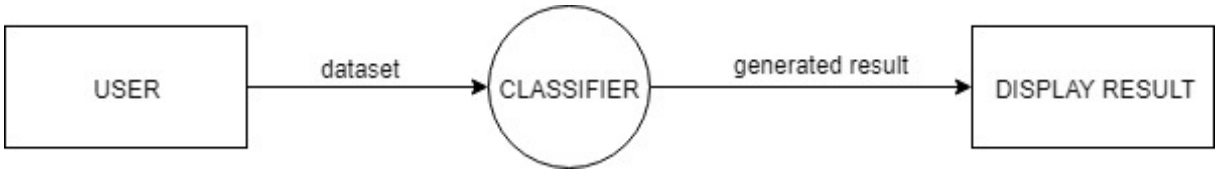

Figure 3.2: Level 0: Dataflow Diagram

3.3 Activity Diagram

3.4 Working

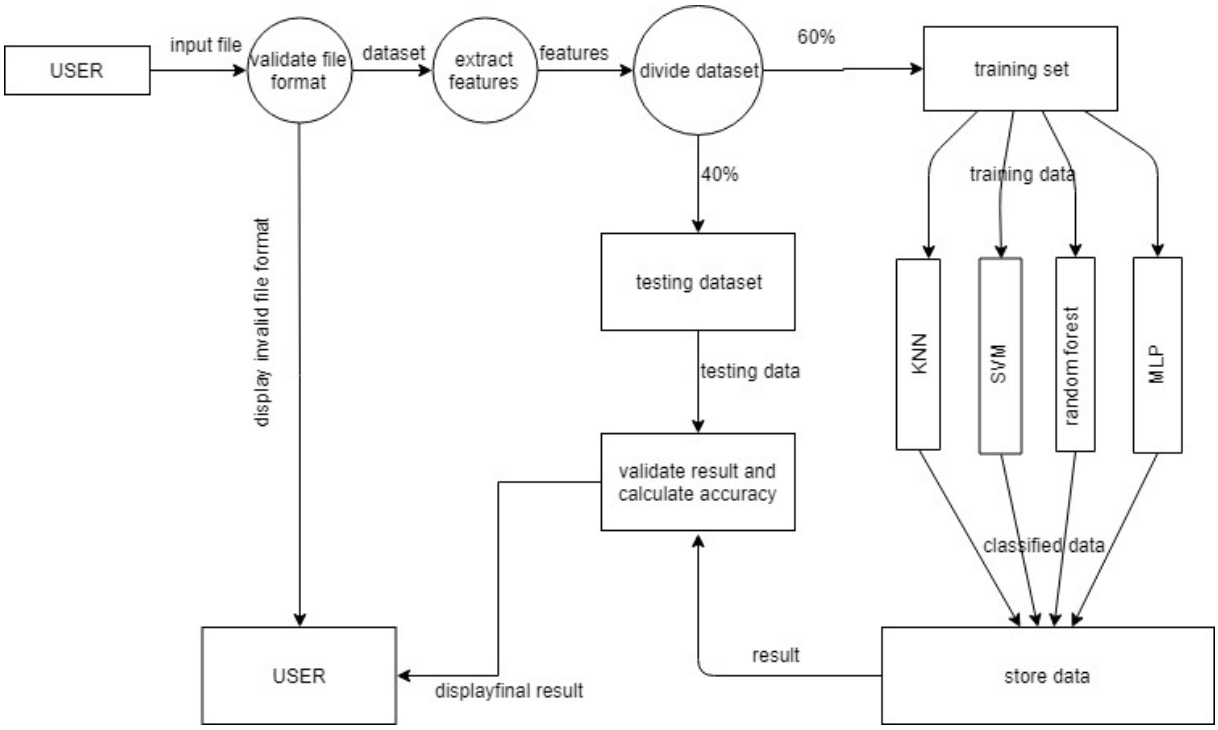

Figure 3.3: Level 1: Dataflow Diagram

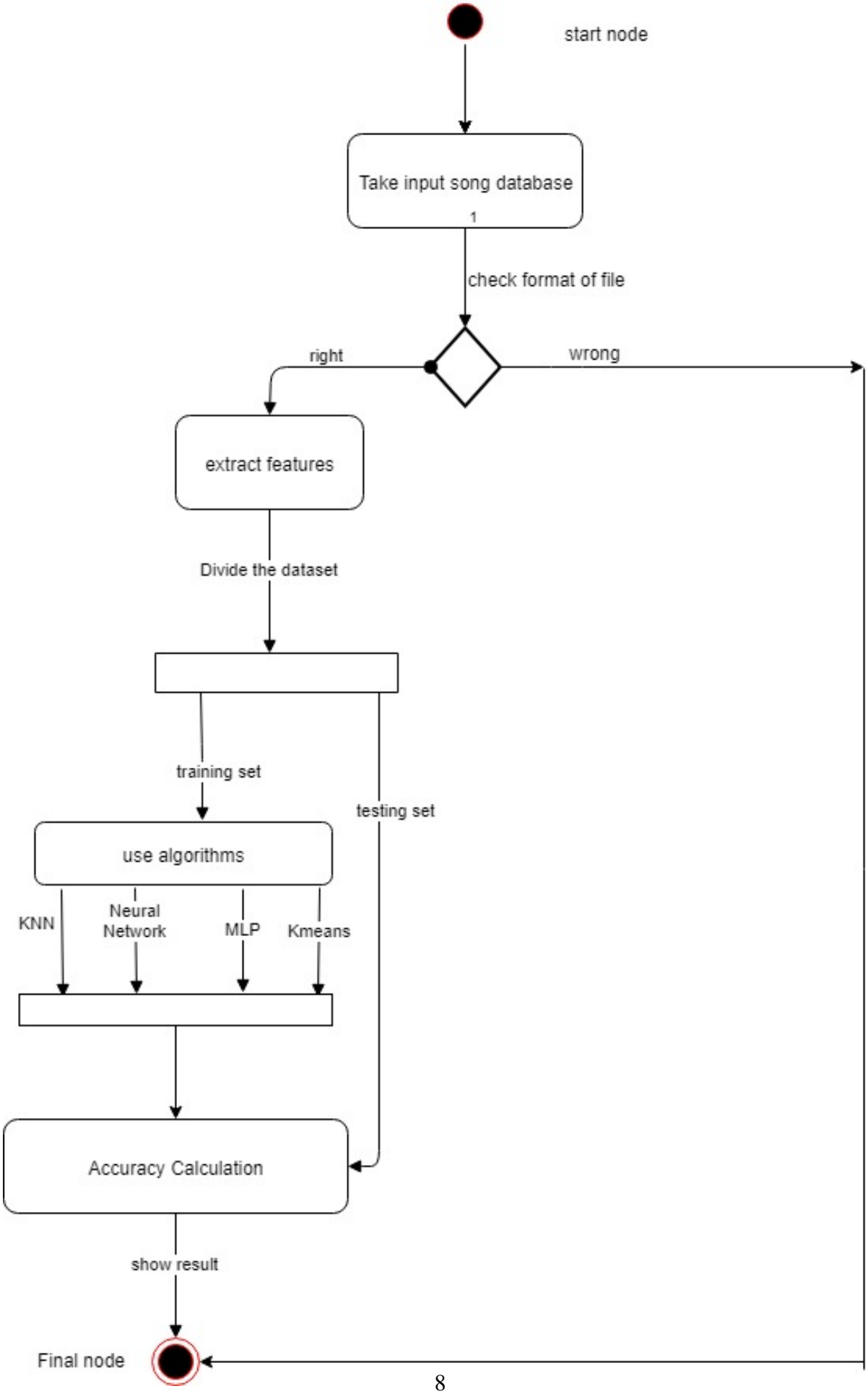

Figure 3.4: Activity Diagram

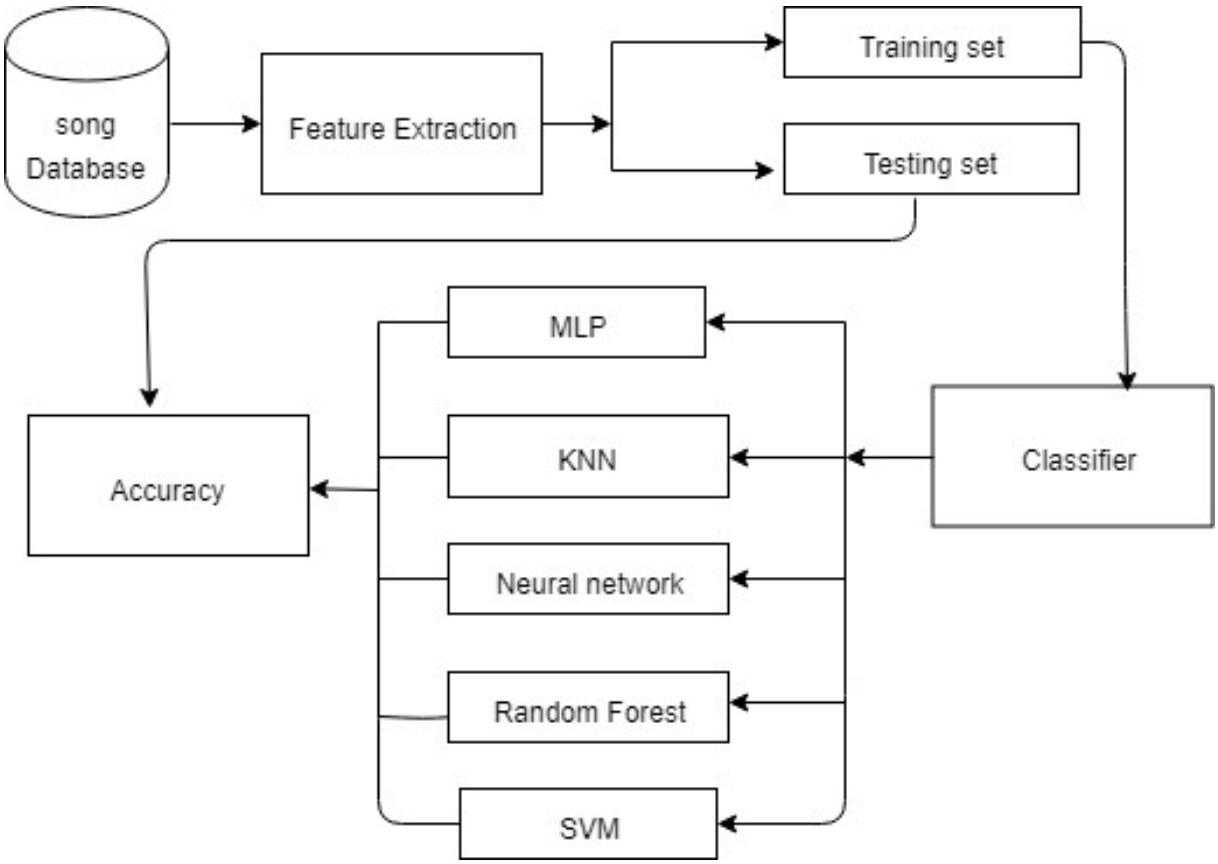

Figure 3.5: Flow Diagram of the System