AUDIO GENRE CLASSIFICATION

HOLA!

We are
Skepsis

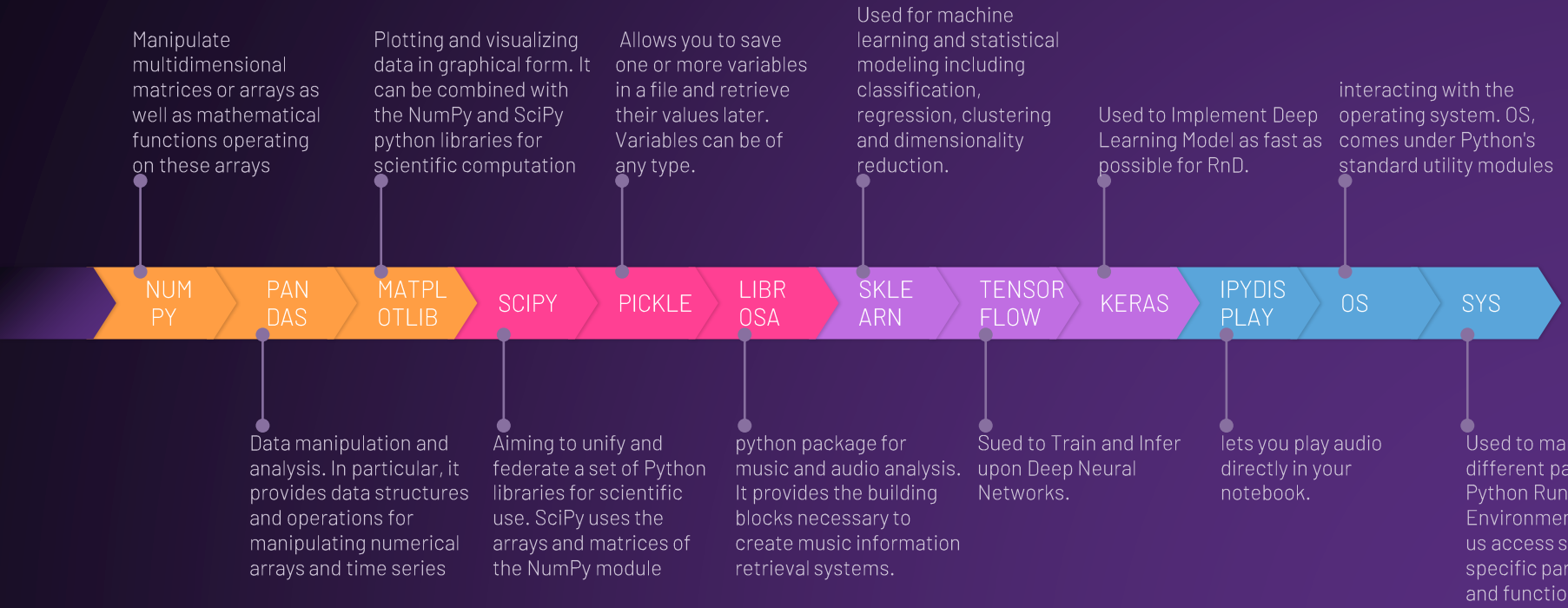
INTRODUCTION

Overview of the Project and summary of the Libraries used.

OBJECTIVE

In this Project we will see how to handle sound files in python, compute sound and audio features from them, and run machine learning algorithms on them and Classify the Audio Files according to their Genres.

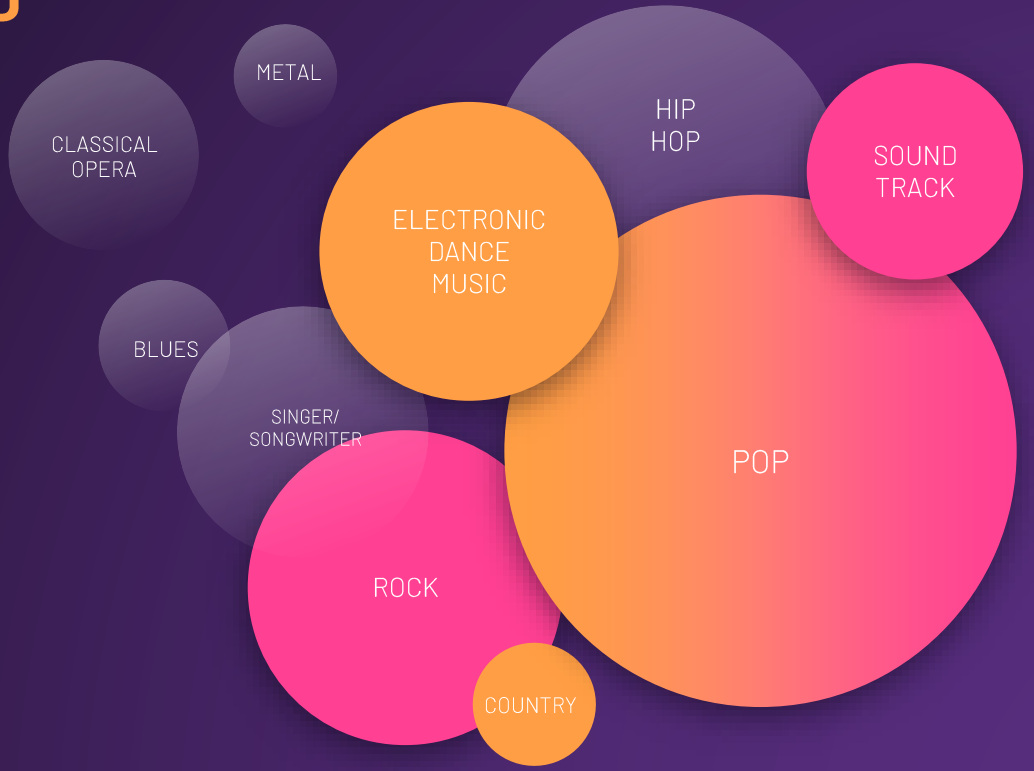
LIBRARIES USED IN THE MODEL



MUSIC GENRE CLASSIFICATION

Types, Applications & Difficulties

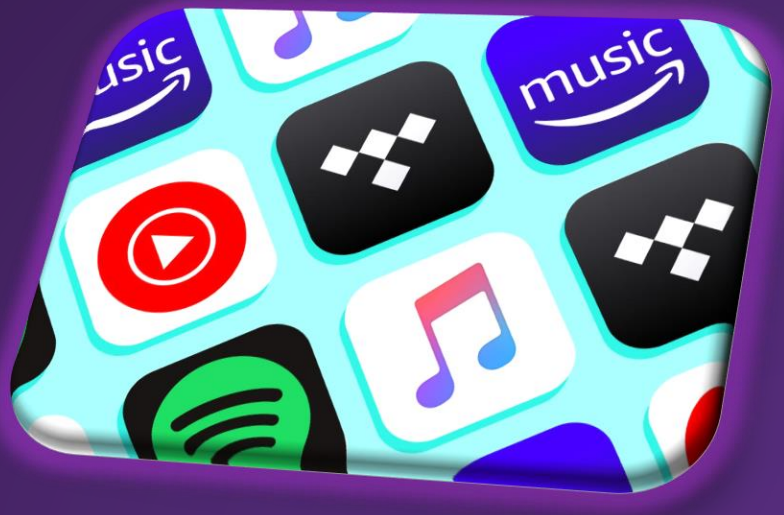
MUSIC GENRES ALL OVER THE WORLD



APPLICATIONS

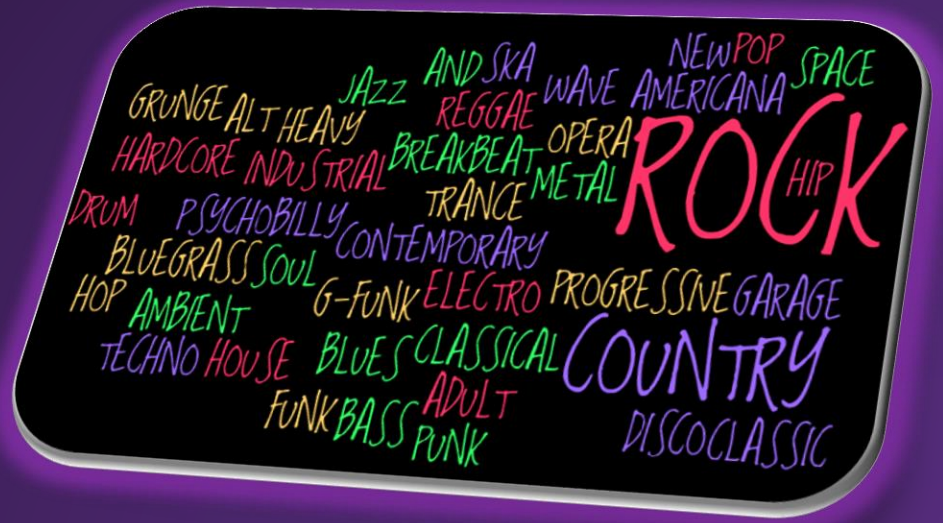
Automatically:

- Suggesting Genre-Specific Artists
- Recommend new music
- Organize music libraries
- Select Music according to choice



DIFFICULTIES

- Different songs' length
- Overlapping of genres during songs
- Mixed Genre Audios



ROADMAP

1. Loading and Decoding the Audio as a Time Series as a NumPy array with a default sampling rate(SR)

2. Visualizing the Audio File (Decoded into an Arraylike Time Series Data) with Raw Wave plot or the amplitude envelope of audio waveform

3. Plotting a Spectorgram to visually representing the signal loudness, of a signal over time at various frequencies present in a particular waveform.

4. Analyzing the Zero-Crossing Rate that can occur if successive samples have different algebraic signs. The rate at which zero crossings occur is a simple measure of the frequency content of a signal.

5. Plotting Chromagram to analyze music whose pitches can be meaningfully categorized and whose tuning approximates to the equal-tempered scale.

6. Preprocessing the data with SKLearn by encoding the label column with the function LabelEncoder()and splitting into test and train to obtain the Test Loss & Accuracy Score

THE GTZAN MUSIC GENRE DATASET

ABOUT THE DATASET

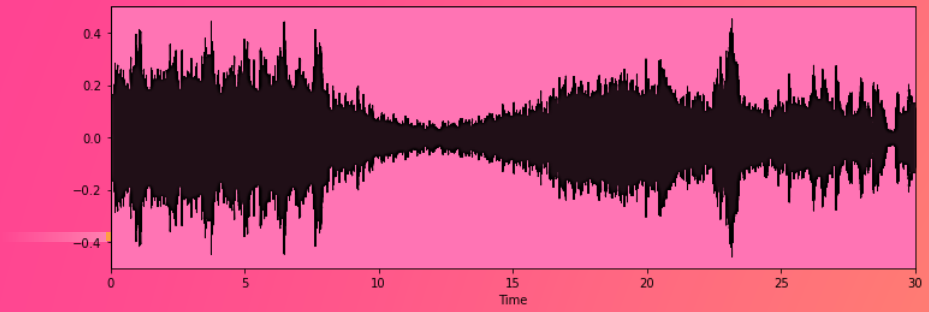
- **genres original** - A collection of 10 genres with 100 audio files each, all having a length of 30 seconds (the famous GTZAN dataset, the MNIST of sounds)
- **images original** - A visual representation for each audio file. One way to classify data is through neural networks. Because NNs (like CNN, what we will be using today) usually take in some sort of image representation, the audio files were converted to Mel Spectrograms to make this possible.

CONTENTS OF THE DATASET

- **CSV files** - Containing features of the audio files. One file has for each song (30 seconds long) a mean and variance computed over multiple features that can be extracted from an audio file. The other file has the same structure, but the songs were split before into 3 seconds audio files (this way increasing 10 times the amount of data we fuel into our classification models). With data, more is always better.

RAW WAVE PLOT

Plot Raw Wave plot is the amplitude envelope of a waveform



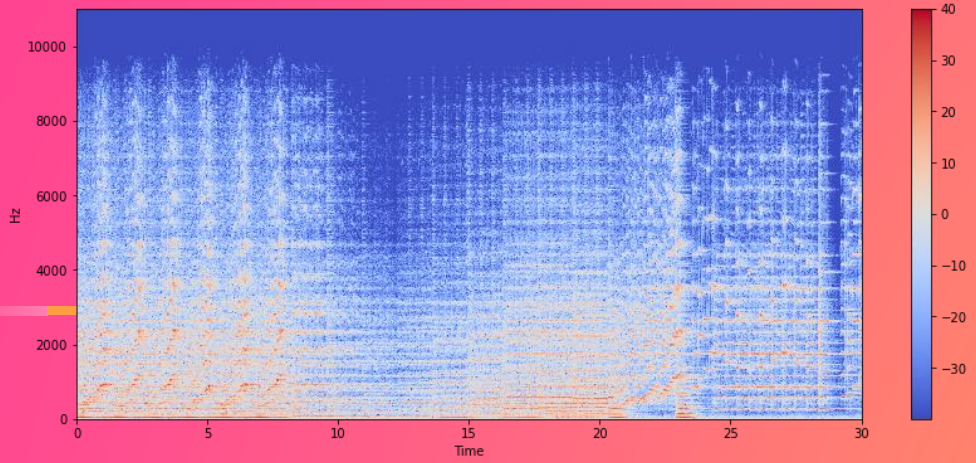

```
plt.figure(figsize=(12, 4))
librosa.display.waveplot(data, color = "#502A75")
plt.show()
```

Visualizing the Audio

Plotting raw wave file.

PLOT SPECTROGRAM

The Visual Way of representing the Signal Loudness of a Signal over time at Various Frequencies present in a particular waveform




```
X = librosa.stft(data)
Xdb = librosa.amplitude_to_db(abs(X))
plt.figure(figsize=(14, 6))
librosa.display.specshow(Xdb, sr=sr,
x_axis='time', y_axis='hz')
plt.colorbar()
```

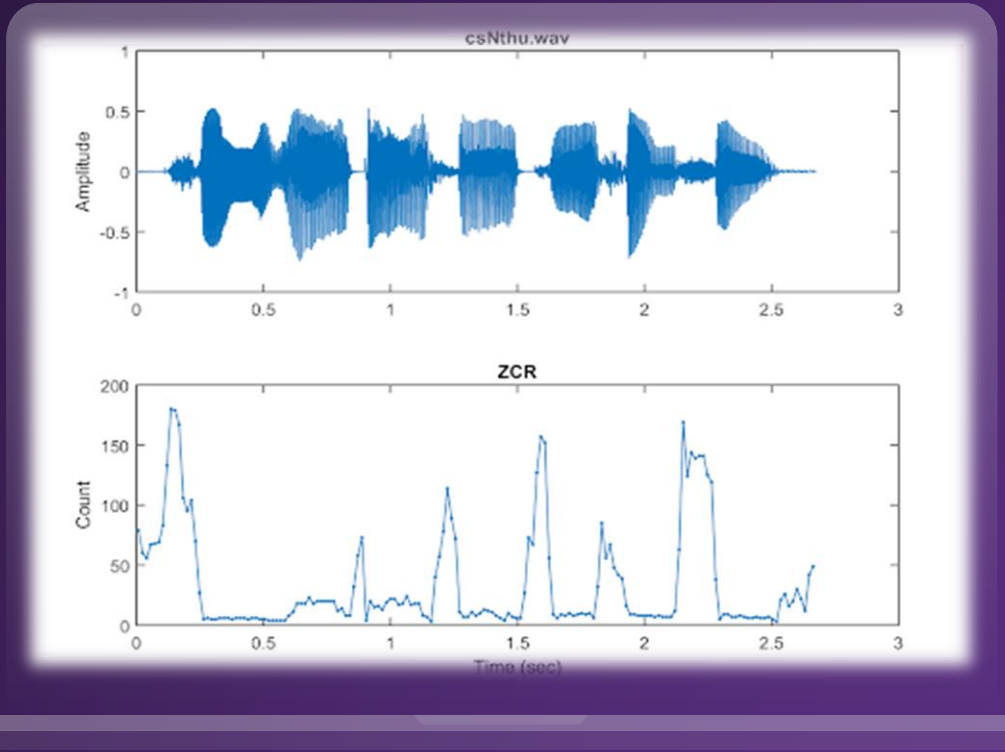
Plot Spectrogram

(Frequency vs Time)

ZERO CROSSING RATE

Said to occur if successsive samples have different Algebraic Signs

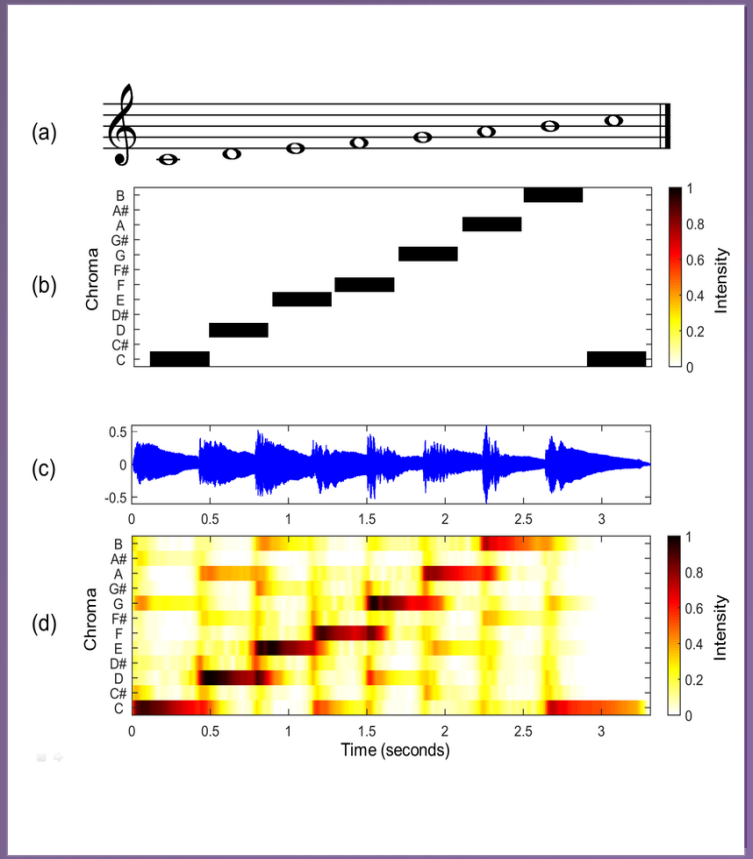
A Visualization of Zero Crossing Rate which is the rate at which a signal changes from positive to zero to negative or from negative to zero to positive.



CROMA FEATURE

A powerful tool for analyzing music whose pitches can be meaningfully categorized and whose tuning approximates to the equal-tempered scale.

Croma Feature capture harmonic and melodic characteristics of music, while being robust to changes in timbre and instrumentation.



PROCESS FLOW

FOUR LAYERED NEURAL NETWORK

We worked on the Dataset to Prepare a Four Layered Neural Network with the Four Consecutive Layers having 256, 128, 64, 10 Nodes respectively.

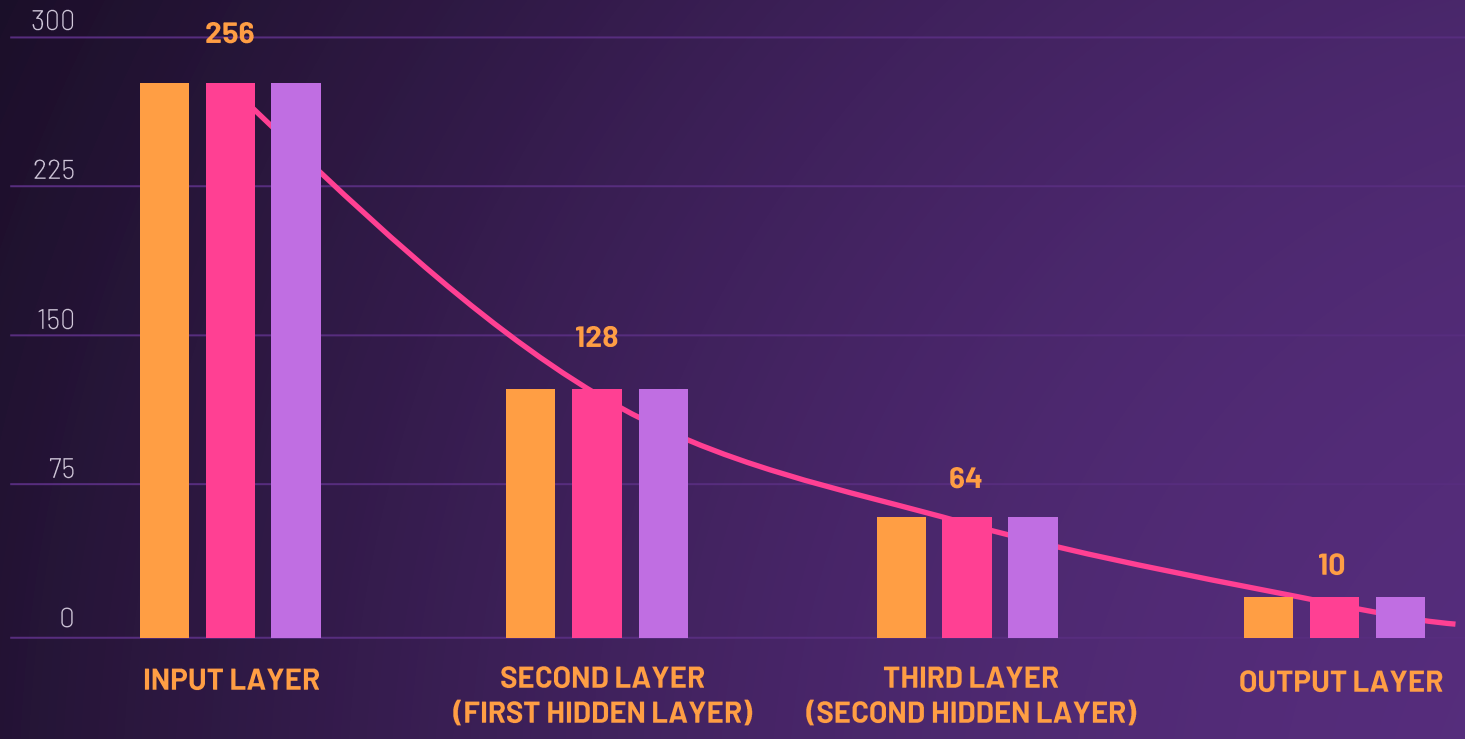
USING OF ACTIVATION FUNCTION

We used Rectified Linear Unit as the Activation Function in the first three layers and SOFTMAX in the Output a.k.a. the Final Layer and Adam as the Optimizer of the Neural Network

FEEDING THE DATA IN THE NEURAL NETWORK

We did the Train Test Split in a 67:33 Ratio and reshaped the Spectrogram's Data into a One Dimentional Data and feeded in a densely packed Neural Network.

NUMBER OF NODES PER LAYER



LINK TO THE NOTEBOOK

THE RESULT

150

Epoch Value

128

Batch Size

HYPERPARAMETERS

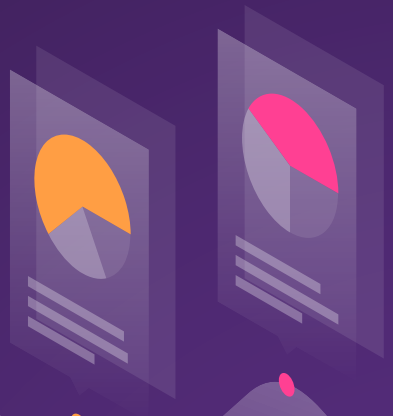
0.9038 (90.38%)

Test Accuracy

0.9931

Test Loss

RESULT



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Author: Bryan Landsdown, University of Birmingham

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Author: Peter Ahrendt

- MML Classification of Music Genres

Author: Adrian C. Bickerstaffe, Enes Makalic

- Mugec: Automatic music genre classification

Author: Rohit Singh, Coventry University

THANK YOU