**MINI PROJECT – I**

**(2018-19)**

# Tensorflow-Neural Network

(Music Instrument Identification)

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**MID TERM REPORT**



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**Abstract**

In the context of music, instrument identifcation would contribute improvements in music information retrieval, genres classification, and audio engineering. In this report, the neural network model was applied to identify music instruments given one note from sets of orchestral musical sounds.

Source separation from mixed audio signals has always been a high-demanding topic in audio signal processing. Instrument identication is of significant importance in solving many problems such as remastering archived recordings in audio industry. Previously, work of music instruments recognition focused on the Support Vector Machine (SVM) classifcation method with the Fast Fourier Transformation (FFT) based cepstral-coeffecients or FFT based mel-frequency cepstral coeffecients as features.

**Goal**

In this project, a neural network model will be trained and optimized to identify music

instruments relative high precisions. In particular, with the different characteristics of musical instruments, sets of musical sounds are presented, and the neural nets will recognize what instruments they are.

**Research**

After reading reports, I tried to get deep into Digital Signal Processing, opted for an online course on Audio Signal processing for music applications where I learn about:

1) Fourier’s Transform

2) Fast Fouriers Transform(FFT)

3) Analysis of Spectrogram

4) Usage of tools like audacity, Spectral modelling synthesis tools(SMS).

**Models**

In this section, different models and techniques were tested with respect to dimensions of input data and computation cost. Eventually, Neural Network using Tensor Flow and SVM were applied to this project.

**Summary**

I will try to train this model on various datasets available online, currently I’m collecting the best datasets possible.The dataset used will contain the sounds of instruments like: Guitar, Oboe, Voilin, Trumpet, Clarinet, English Horn, Banjo etc.

The audio samples being used will near to 4th octave like A4,B4,C4.., and all the frequencies obtained after FFT will be trimmed between 0-1000Hz range. Frequency shift would also be included in the experiment to shift all frequencies near 440Hz(A4), this results in audio samples regardless of tone having a similar representation and therefore minimizing the risk of the network learning to classify different tones rather than classifying musical instruments.

Having obtained the frequency spectrum, we will divide it into 50 feature vectors and will then average over each feature vector to obtain an average frequency, therefore we would have 50 average values for the input of our Neural Network.

The base initial steps towards the goal would be from Audio processing through fouriers transform. Further I will try adjusting the various Hyperparameters in a Neural Network.

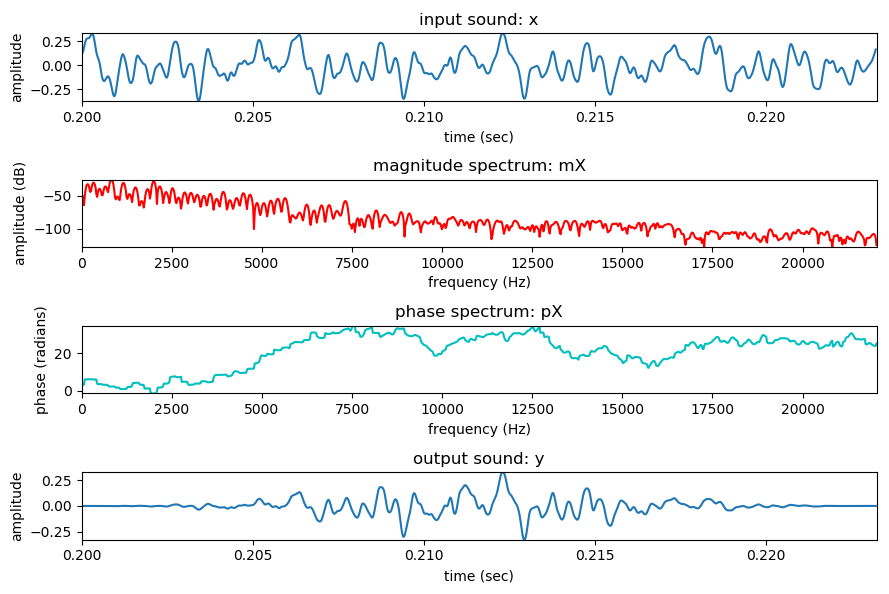
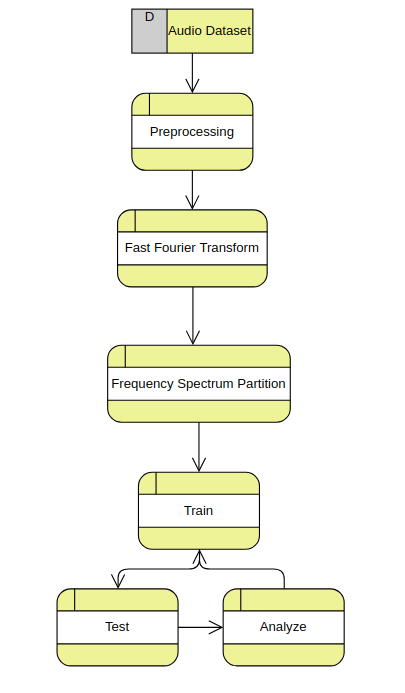


Fig showing FFT of an audio input with magnitude and phase spectrum with a window size of 1024 and FFT size of 2048



**References**

To build this project,I tried gathering a lots of information, reading research papers and related project reports, some of them are mentioned here:

1) Identification of Musical Instruments by Means of the Hough-Transformation

2) Musical Instrument Identification with Feature Selection Using Evolutionary Methods-

R´ois´ın Bernadette Loughran

3) Instrument Identification in Polyphonic Music: Feature Weighting to Minimize Influence of Sound Overlaps

4) Novel approach for musical instrument identification- 2015 Annual IEEE India Conference (INDICON)

5) Quality of Musical Instrument Sound Identification for Various Levels of Accompanying Sound-Alicja Wieczorkowska, Elżbieta Kolczyńska

6) Musical Instrument Timbres Classification with Spectral Features. EURASIP Journal on Applied Signal Processing 1, 1–11 (2003)