Musical Transcription of Drum Patterns Using Main Audio Features in KNN

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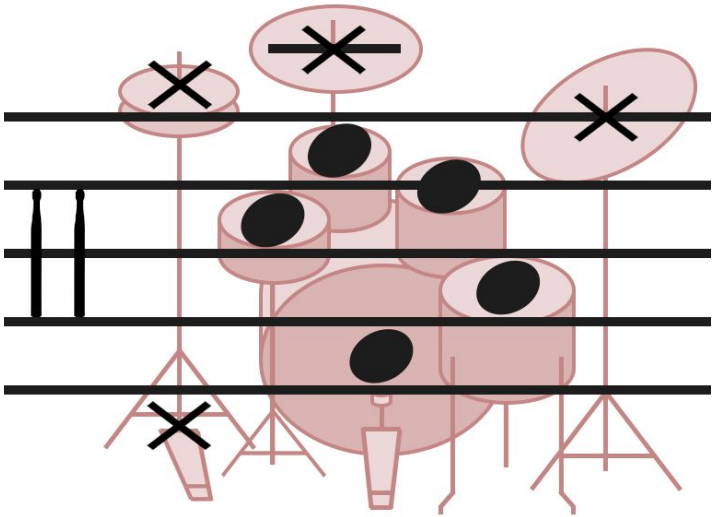
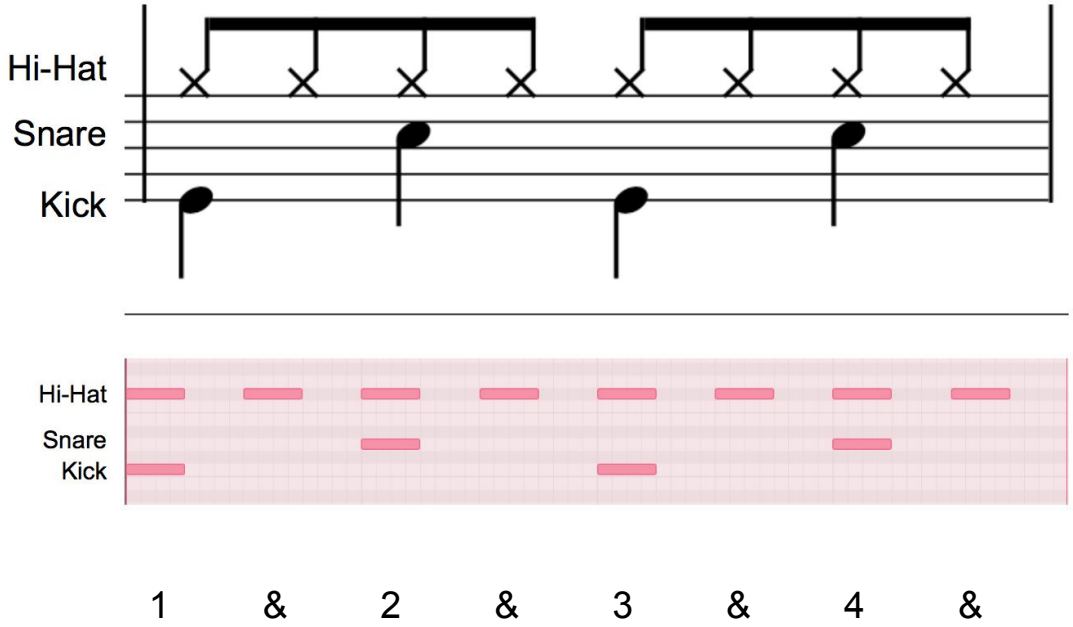
Abstract

Drums is a promient instrument in our musical culture. The most accurate way to learn how to play the drum parts of a song is by reading a drum musical chart. Learning and familiarizing to read drum notation can be an easy skill to pickup, but learning how to write charts takes more time and effort. This challenge encourages drummers to learn songs by ear, but people tend to forget the correct parts and play inconsistenly.

Automatic Drum Transcription (ADT) can encourage drummers to read charts, and reading unlocks learning. An algorighm was developed to transcribe drum recordings into two formats: MIDI and PDF. KNN was used to classify what particular instrument of the drums sounded off. The classifier used the drum's main audio features as a 77-dimensional feature vector. The algorithm yielded promising results to offer solution to the ADT problem.

Billy Jean





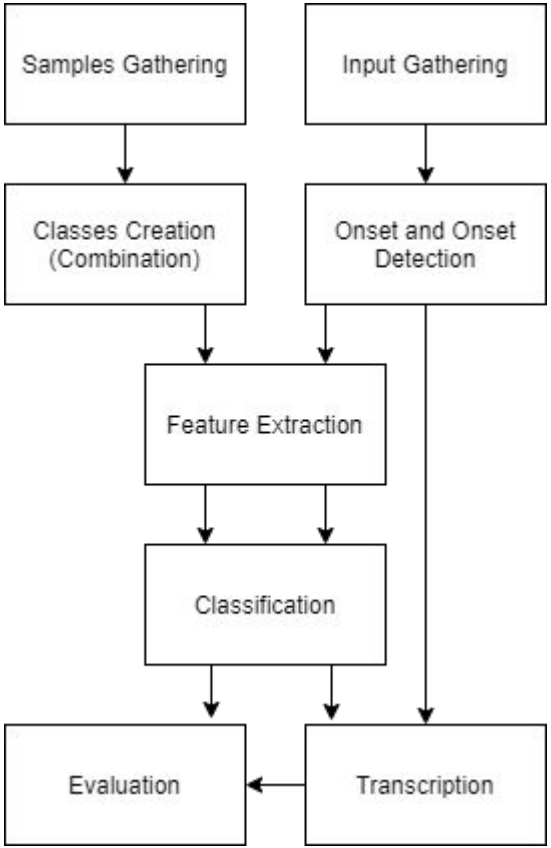
Introduction

Automatic Drum Transcription (ADT) in simple terms is the process of converting a drum performance into a record usually as a drum notation printed as a music sheet.

KNN is a classification algorithm which uses data points to find the k-number of closest classes as the basis of prediction.

Feature vector used

Methodology



Results

Classes	k=1	k=3	k=5	k=7	k=9
Simple	98.29%	95.44%	93.15%	91.41%	91.68%
Common	97.03%	93.59%	90.66%	88.26%	86.54%
All	87.41%	75.40%	68.35%	63.91%	60.82%

Table 1: KNN accuracy in varying k value and number of classes

Actual vs prediction

Class	bass	snare	hihat
bass	8	0	5
snare	0	4	0
hihat	2	4	4
Recall	80%	38%	88.71%
Precision	68.57%	95%	63.22%

Ovarall accuracy 69.1%

Table 2: Confusion matrix of bass, snare and hihat transcriptions

Actual vs prediction

Class	bs	sn	hh	hho	tm	fl	cr	rd
bass	22	7	5	1	2	3	2	1
snare	5	15	1	0	0	1	1	0
hihat	0	7	18	1	0	0	0	0
hhopn	0	0	0	7	0	0	0	1
tom	2	0	0	0	0	1	0	1
floor	2	0	0	0	2	0	0	0
crash	0	0	0	1	0	0	3	0
ride	0	1	16	0	0	0	2	2
Recall	51%	65%	69%	88%	0%	0%	75%	10%
Precisn	71%	50%	45%	70%	0%	0%	38%	40%

Ovarall accuracy 50.38%

Table 3: Confusion matrix for commonly used classes

Conclusion

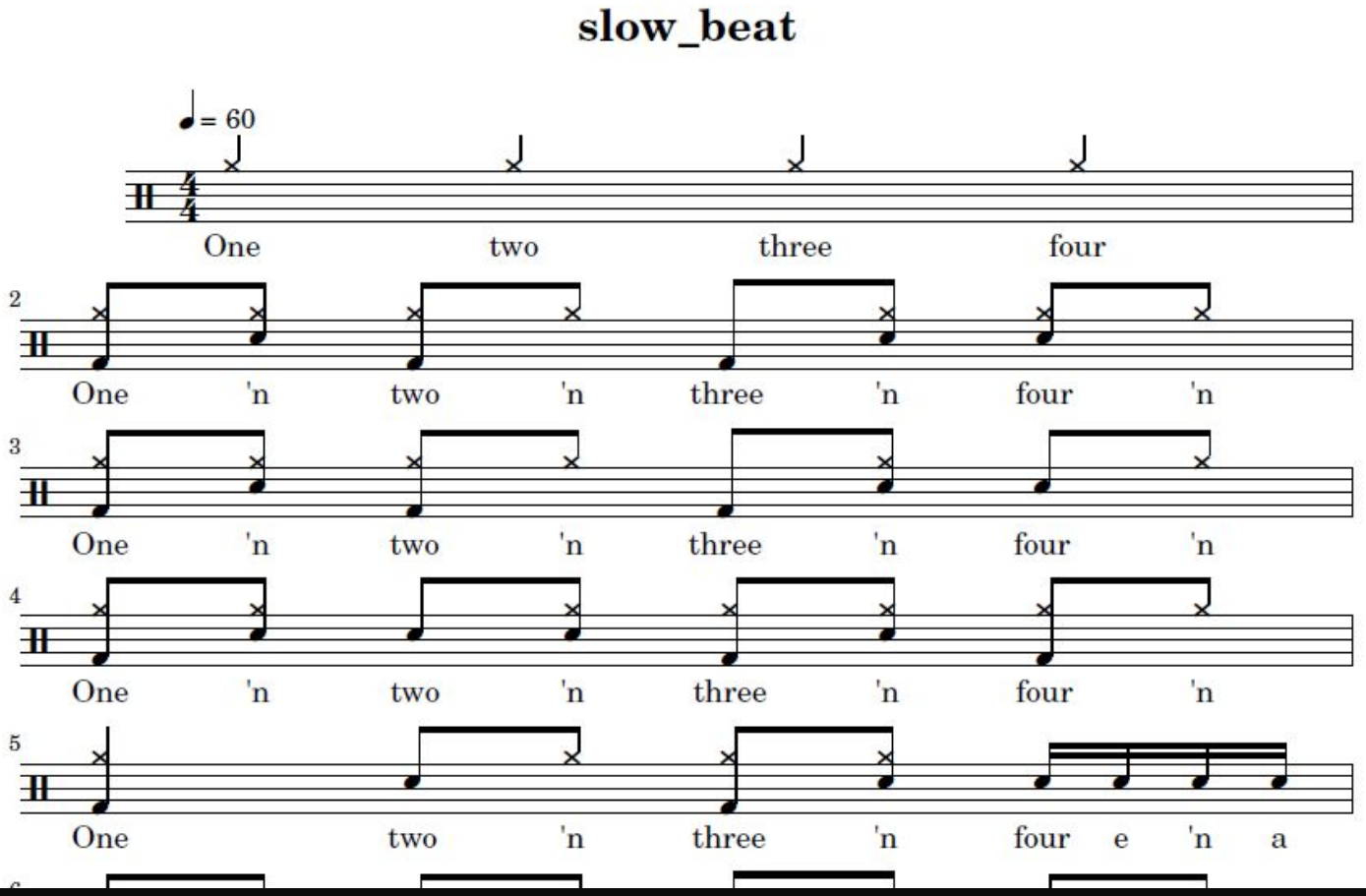
Using main audio features in KNN is effective in Automatic Drum Transcription (ADT), with the highest overall accuracy achieved when k=1, even with the feature vector dimension of 77, in this case.

Recommendation: Just like speech recognition, ADT may improve with the help of other machine learning techniques like Hidden Markov Model, or Neural Networks.

Demo

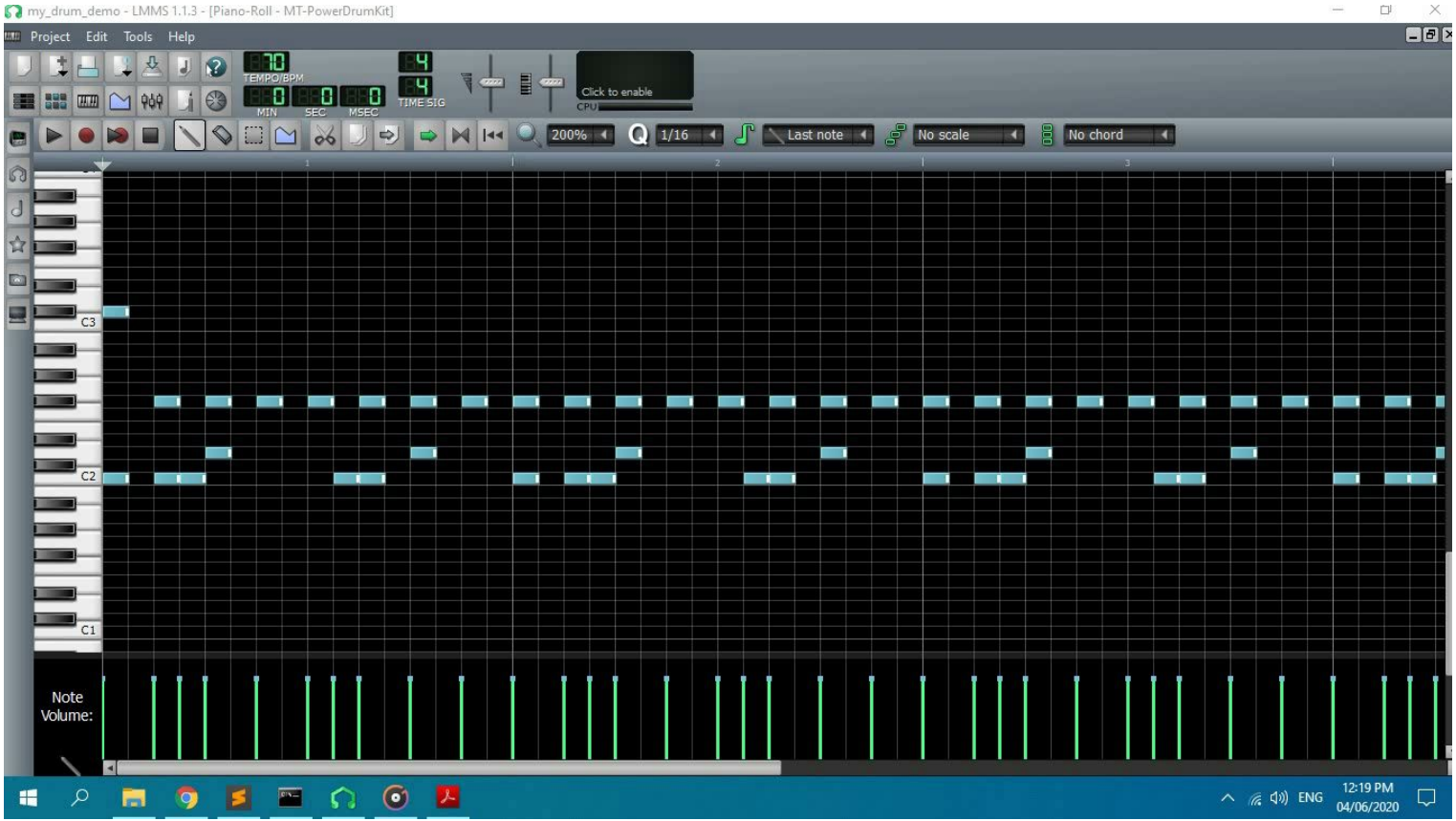
Input mp3

Output midi exported as wav

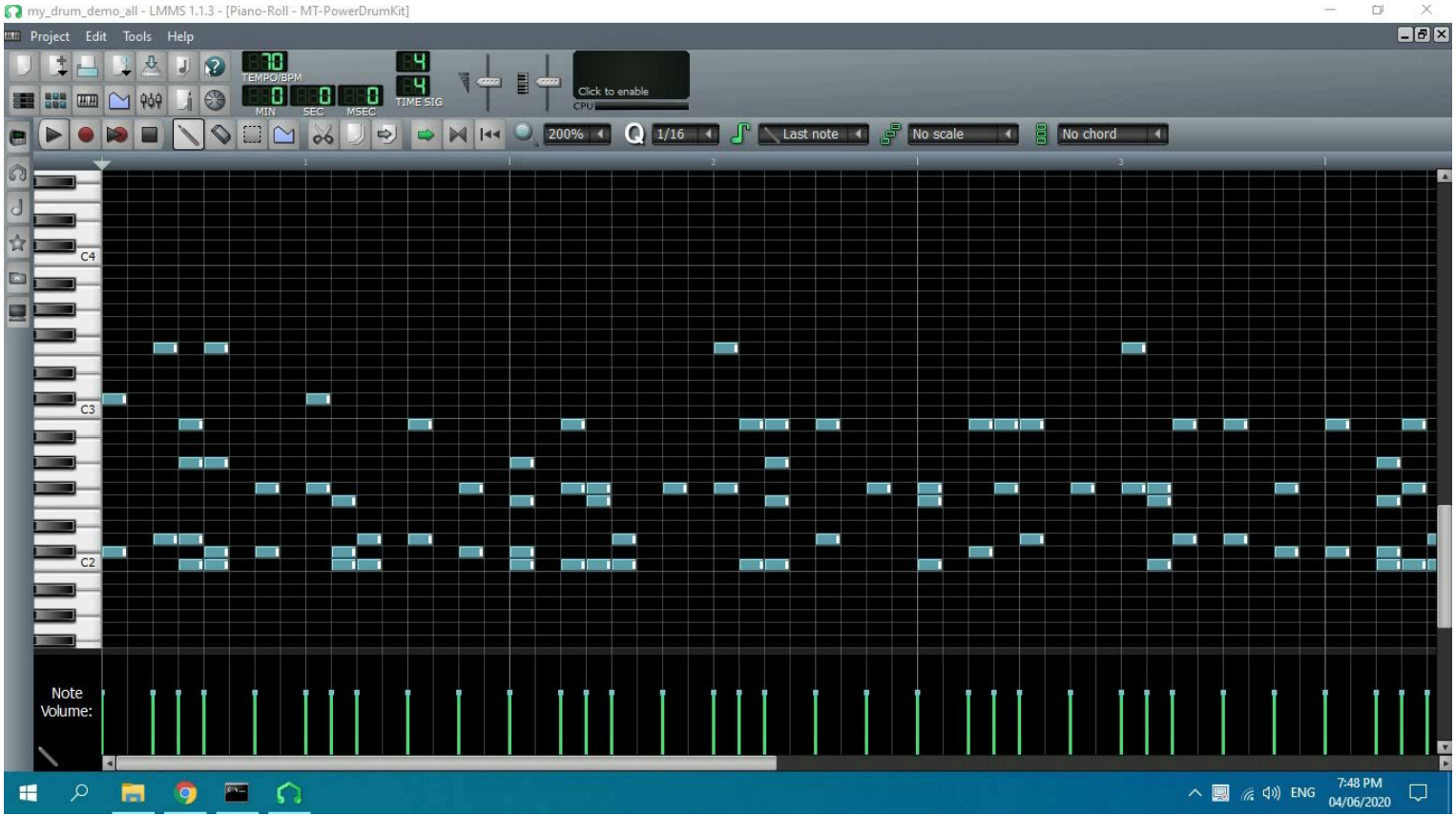



```
C:\Users\Toshiba\Documents\Codes\DTT>py main.py slow_beat.mp3 tempo 60 whitelist bass snare hihat remove bass,snare
```

Demo Input


my_drum_demo - LMMS 1.1.3 - [Piano-Roll - MT-PowerDrumKit]
Project
Edit
Tools
Help
TEMPO/BPM
TIME SIG
MIN
SEC
MSEC
Click to enable
CPU
200%
1/16
Last note
No scale
No chord
C3
C2
C1
Note Volume:
ENG
12:19 PM
04/06/2020

Demo Output


my_drum_demo_all - LMMS 1.1.3 - [Piano-Roll - MT-PowerDrumKit]
Project
Edit
Tools
Help
TEMPO/BPM
MIN
SEC
MSEC
TIME SIG
Click to enable
CPU
200%
1/16
Last note
No scale
No chord
C4
C3
C2
Note Volume:
ENG
7:48 PM
04/06/2020