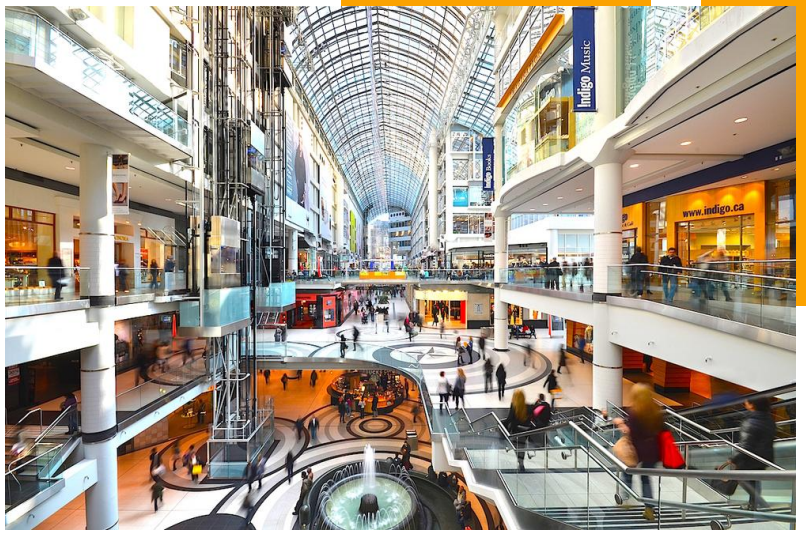
The Study of Applying Edge Computing to Music Recognition

by Suchanat Mangkhangjaoren

Motivation



MOTIVATION

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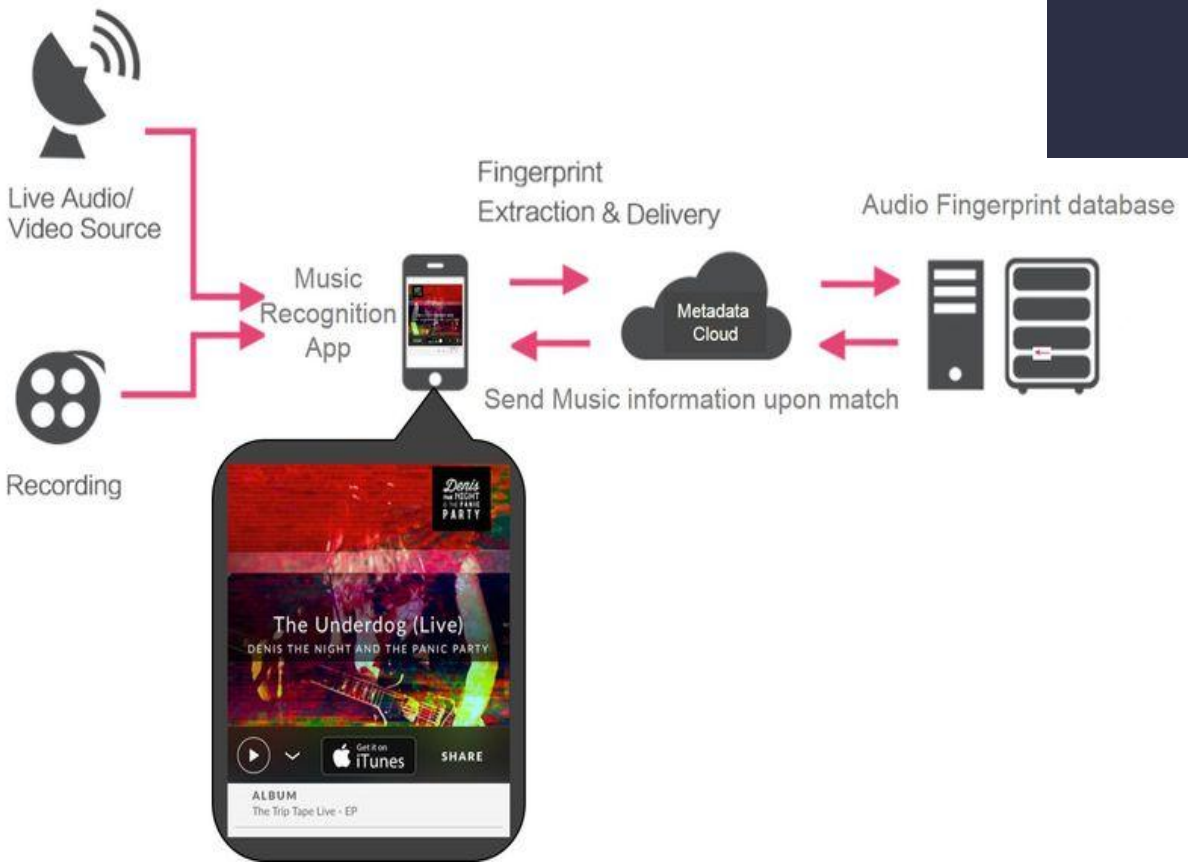
There are many cloud-based music recognition services that can help us identify the names of songs, which we hear from any environment



MOTIVATION

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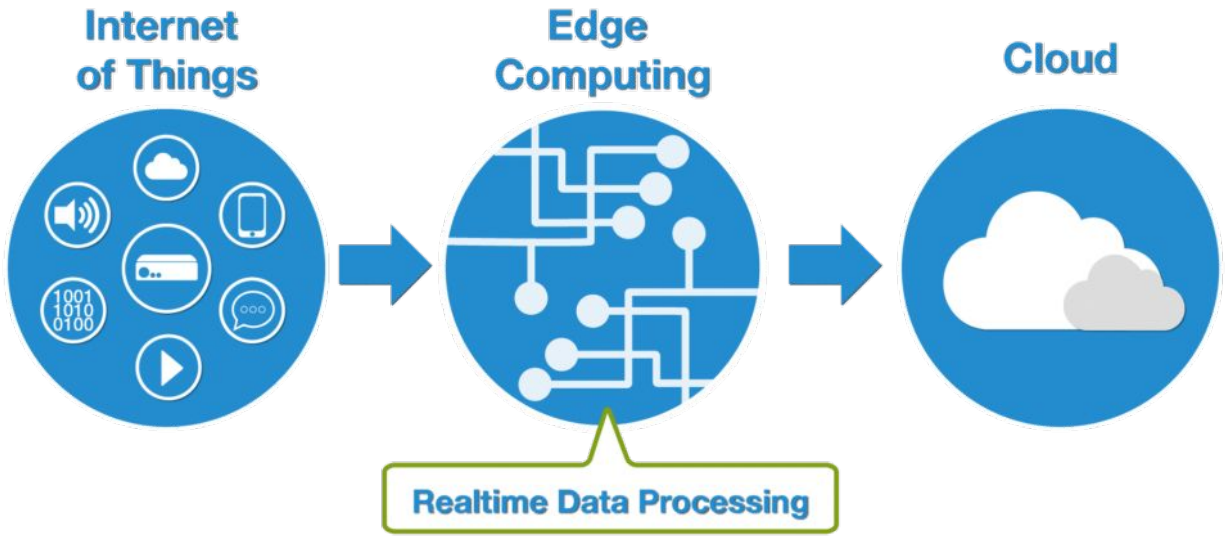
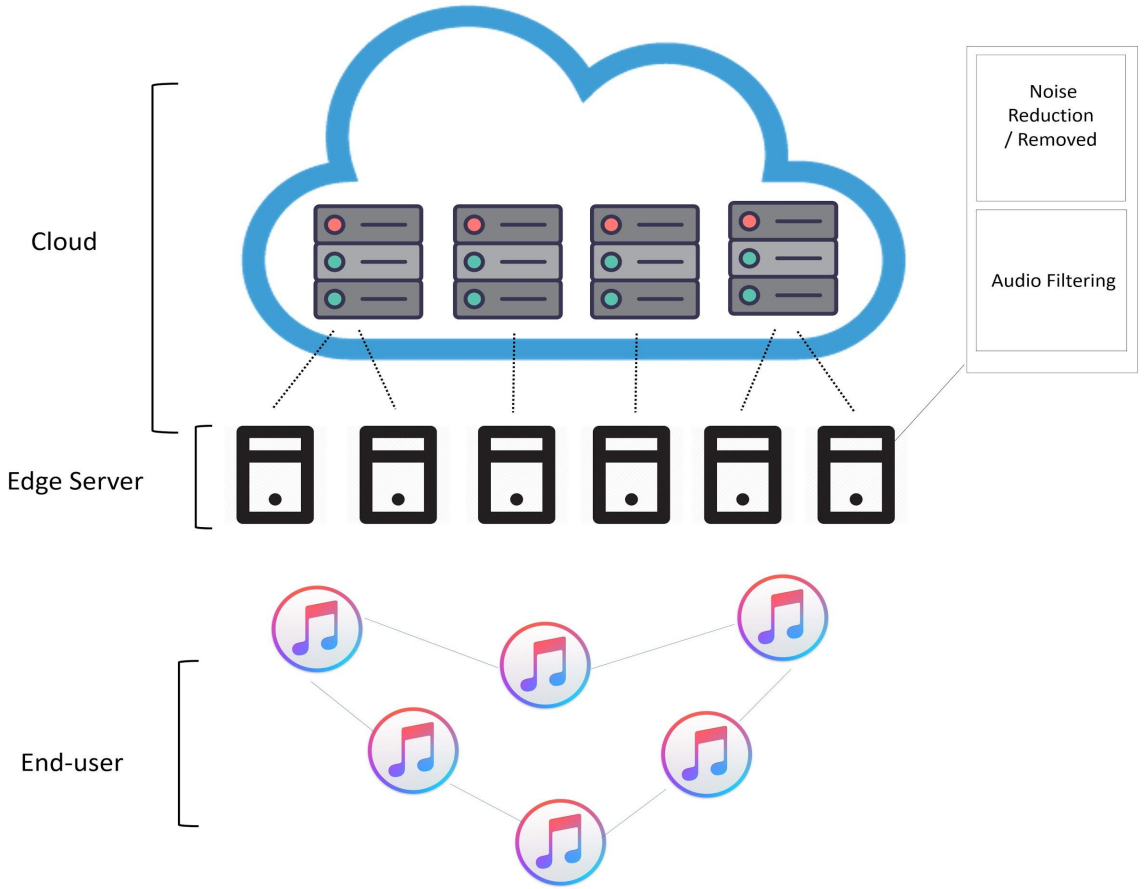
However these cloud-based music recognition services cannot correctly recognize many kinds of music input (e.g., music together with noise, or with voice that is not a musical pitch)

What is edge computing?



Edge computing allows data produced by internet of things (IoT) devices to be processed closer to where it is created instead of sending it across long routes to data centers or clouds.

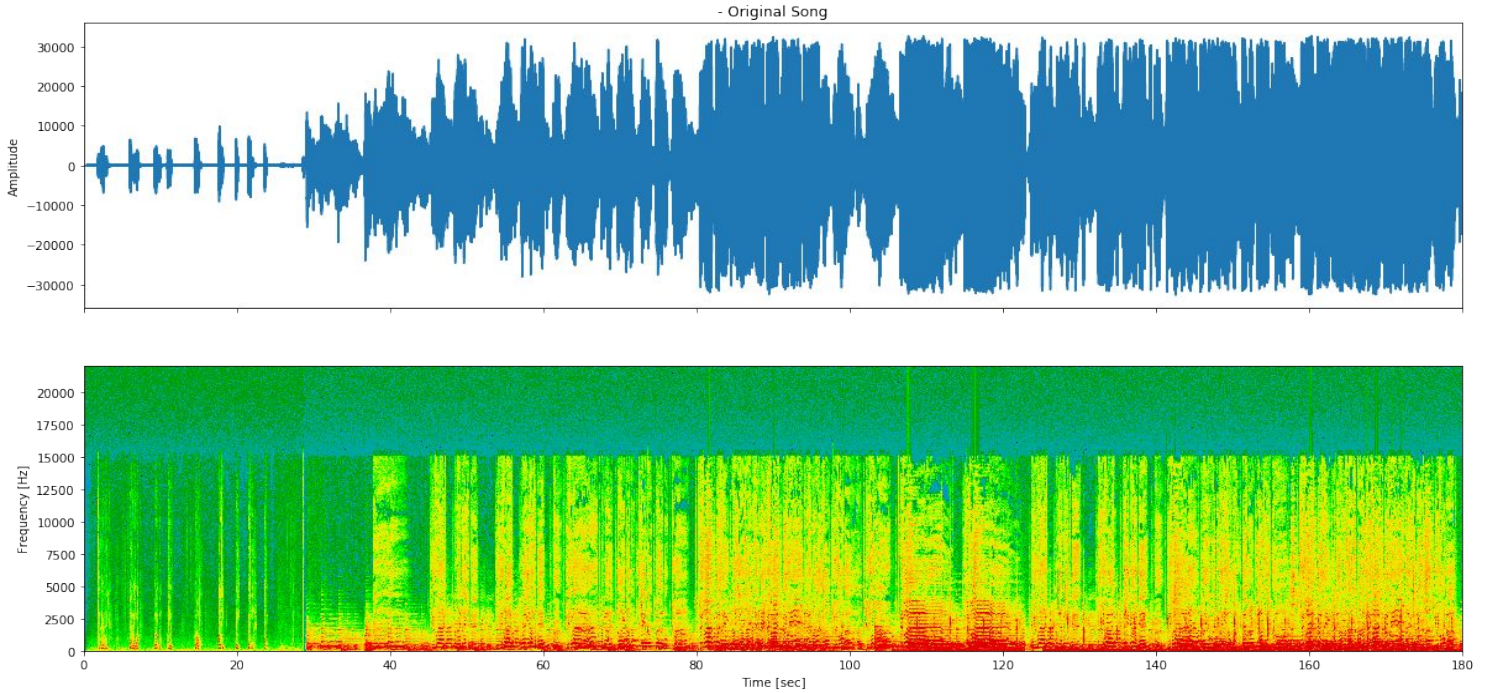
What are we going to do?



We study the potential benefits of edge computing for the music recognition application. An edge server can pre-processing user audio files to reduce, cut noise, or clip out some irrelevant voice in these files before sending them to a cloud server to perform music recognition.

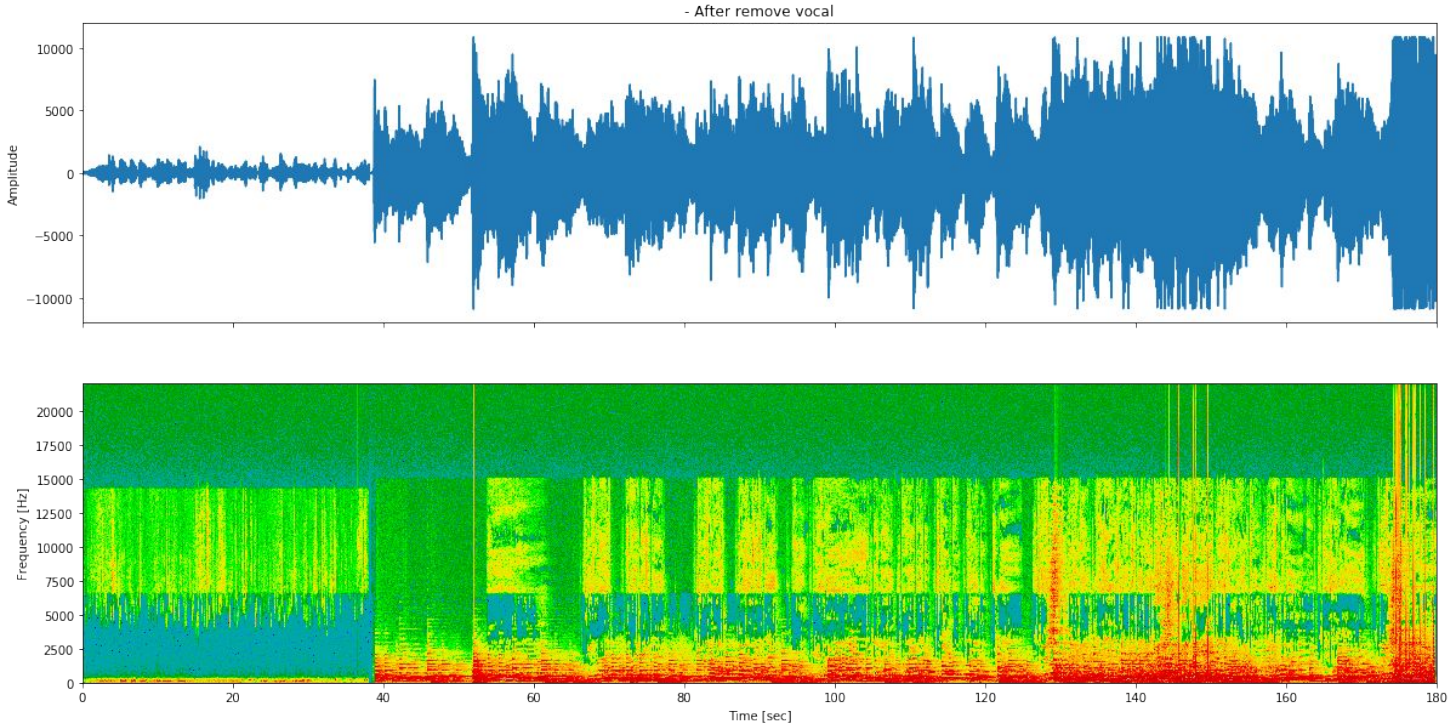
Objective

Methodology



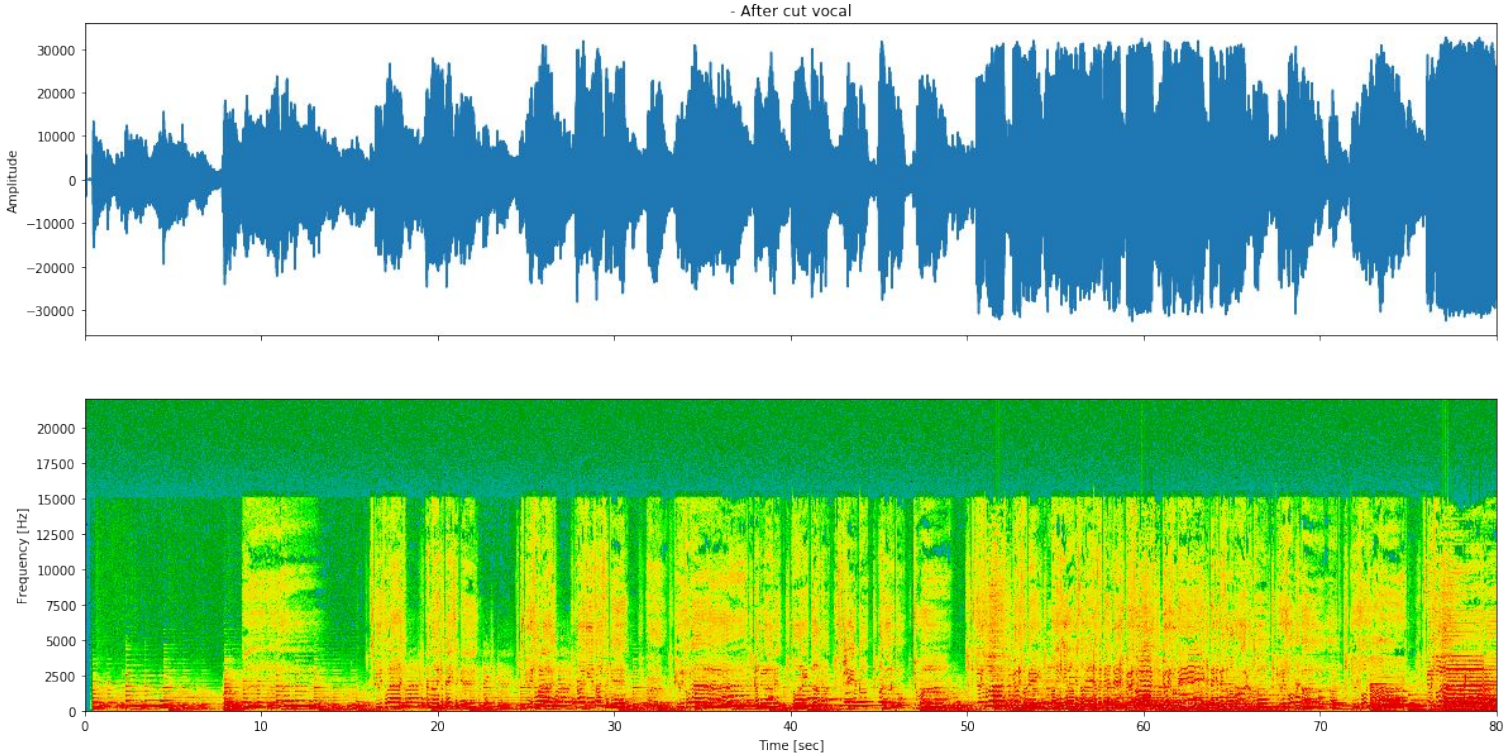
Receive audio clip

Methodology



Methodology(2)

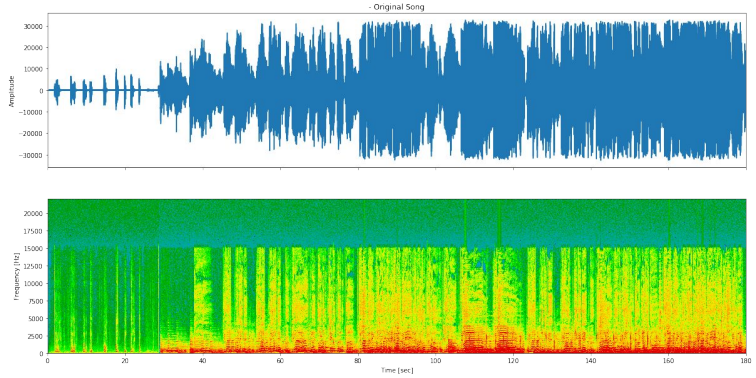
Get Channel by Wave library. Invert channel[1] and combine it back to the channel[0] in order to remove everything panned in center.



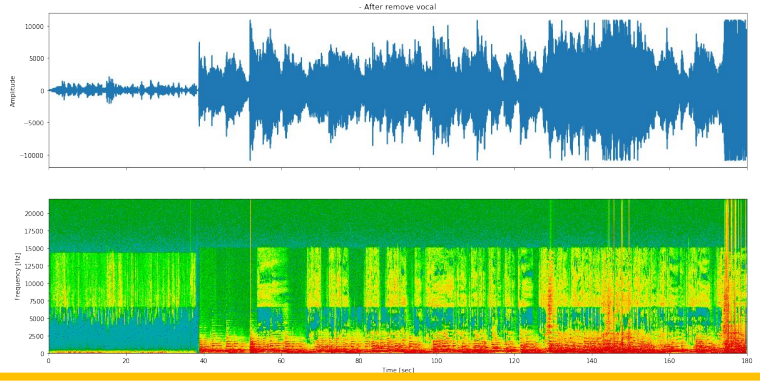
Methodology(3)

Cut all of the voice from audio and get new audio that cloud can recognize

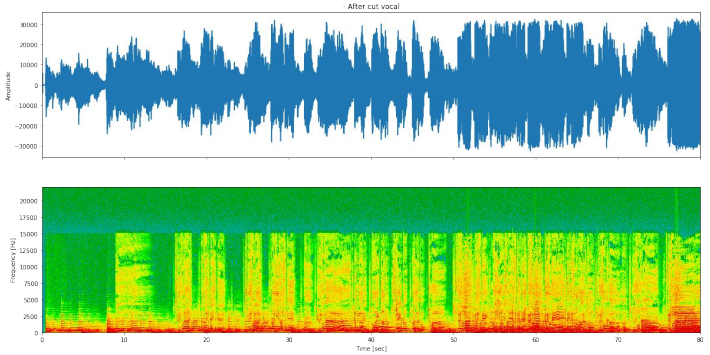
1



2



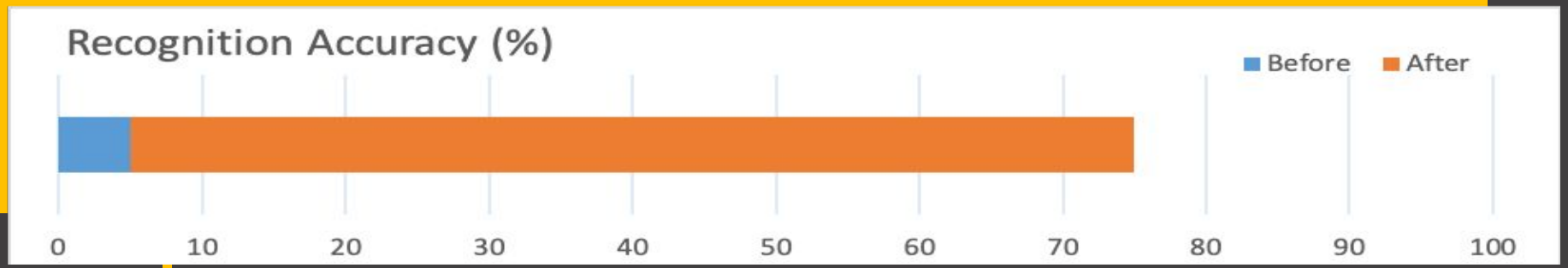
3



Methodology(4)

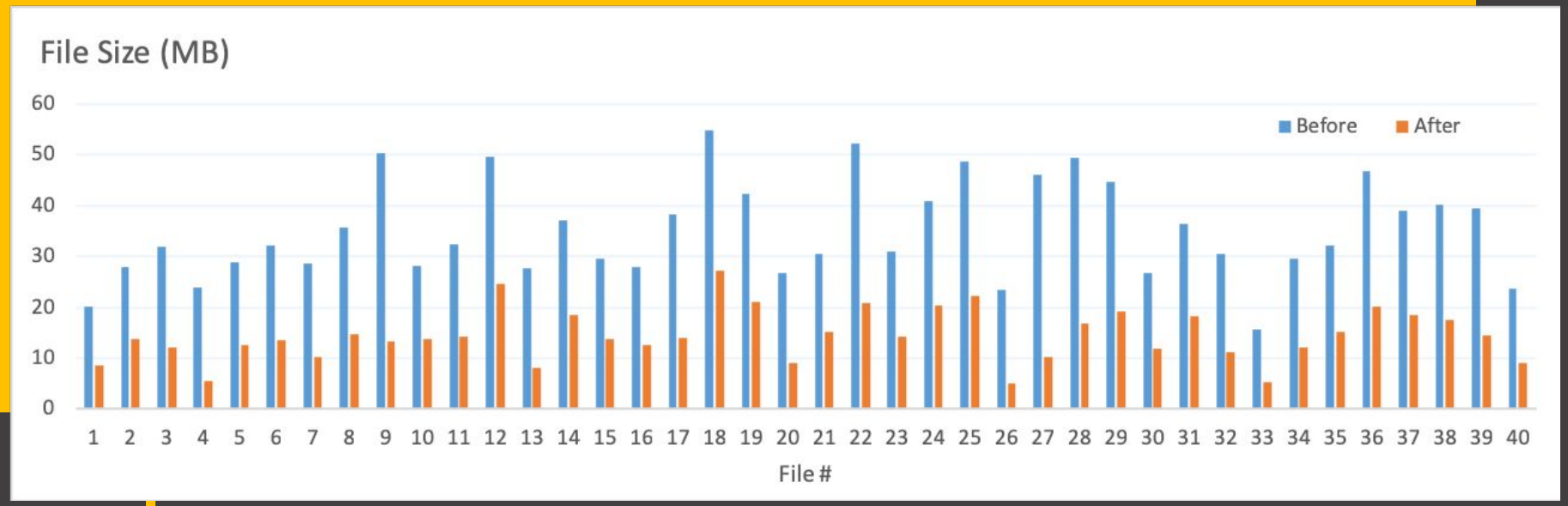
Performance Evaluation

Music Recognition Accuracy



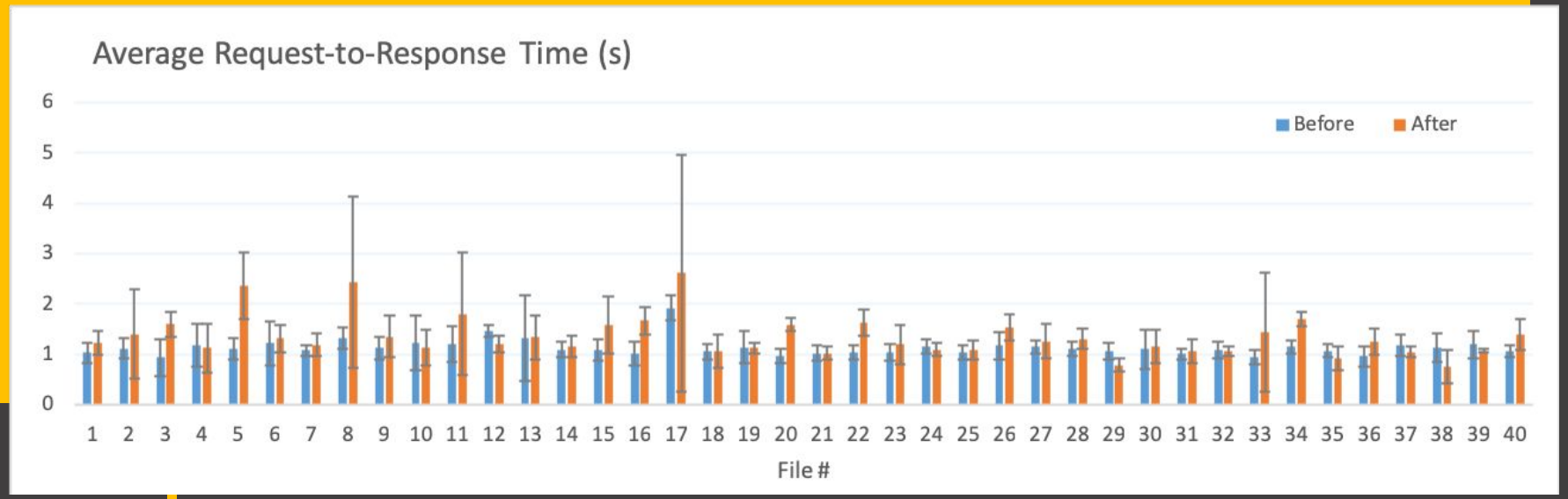
After preprocessing, the accuracy increases from 5 to 70.000 percent.

Transfer Data Size



After pre-processing (before limiting the size), the average decrease in file size is 59.043 percent

Elaspsed time to the Cloud



The average time spent sending a request to receiving the response from the cloud server slightly increases mostly due to the network condition

Conclusion

This works begins our study in applying edge computing to music recognition. We first investigated signal processing techniques to remove vocals from audio files. Having some pre-processing at the edge can potentially help decreasing traffic data to be sent to the cloud server. By 59% on average and, at the same time improve the recognition accuracy by 70%

Future

01 Experimenting with the real edge/cloud setup (AWS has lambda@edge services)

02 Explore with other kinds of preprocessing (Noise reduction/removal, compression, result caching, etc.)

03 Collect or obtain more realistic dataset (from daily environment, from mobile app, etc.)

Referrence

[1] AmericoDias,AudioprocesingwithPython, [Online].Available: https:/americodias.com/docs/python/audio_python.md [AccesedMarch.22, 2019]

[2] BrandonButler,What is edge computing and how it’s changing the network Available:https:/www.networkworld.com/article/3224893/what-is-edge-computing-and-how-it-s-changing-the-network.html [AccesedMarch.22, 2019]

Q & A