



BIRD SONG ID



DEMO PRESENTATION

BIRD SONG IDENTIFICATION

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22 May 2019

Outline

- introduction
- methodology
- results & discussion
- deployment & demo

INTRODUCTION



MOTIVATION



PREVIOUS
STUDIES



OBJECTIVE



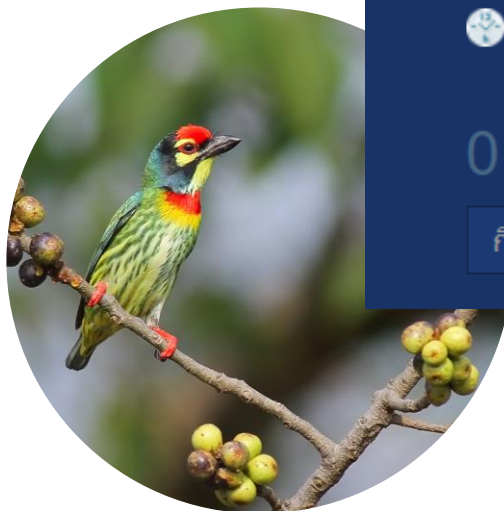
BENEFITS

Introduction

Motivation







นกอะไรครับที่มันร้อง วี๊ด วี๊ด วี๊ด วี๊ด วีววีววีววีววีว

นก บ้าน

ได้ยินมันร้องแถวบ้านตอนเช้าครับ แปลกดี ไม่รู้เป็นนกอะไร
ถ้ายากไป เอาเสียงนี้ก็ได้ครับ วี๊ด หวด วีว วี๊ด หวด วี๊ด

🕒 แก้ไขข้อความเมื่อ 19 มีนาคม 2558 เวลา 07:44 น.

0 + 1



สมาชิกหมายเลข 796174
19 มีนาคม 2558 เวลา 07:34 น. [IP: 180.180.120.17]

กินนึม ปากลิ่ง

Introduction

Previous studies

- NIPS4B 2013 → France
- ICML 2013 → France
- MLSP 2013 → USA
- BirdCLEF 2014-2019 → USA



Bird Song Id Automatic Recognition & Reference - Birds of the British Isles 4+

Mullen & Pohland GbR

#52 in Reference

★★★★☆ 4.3, 425 Ratings

£3.99



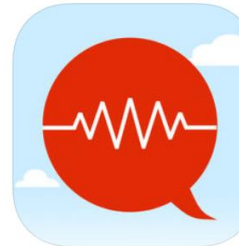
Warblr: Identify UK bird songs

Warblr

#57 in Reference

★★★☆☆ 2.0, 26 Ratings

£4.99



ChirpOMatic USA 4+

Automatic Bird Song ID

Spiny Software Ltd

£3.99

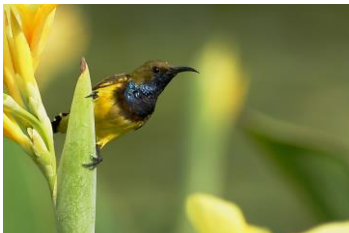


What about Thai birds?

Introduction

Objective

- to develop the program for identifying bird species from their sounds
- including only **40 common birds in Thailand**



Introduction

Benefits

- bird learning
- look-alike bird identification
- population/migration monitoring



METHODOLOGY



DATASET



REFERENCES



FEATURE
GENERATION



NETWORK
ARCHITECTURE

Methodology

Dataset

- bird song dataset - <https://www.xeno-canto.org/>

xeno-canto

Sharing bird sounds from around the world

Search recordings...

Search

Advanced Search
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North East Siberia



Siberian Cranes in their breeding area © Sunny Tseng

XC396665



Siberian Crane (*Leucogeranus leucogeranus*) · call
Sunny

A team from Taiwan, consisting of Sunny Tseng (XC recordist), Chen-Fu Hsu, and Li-Chung Lu, recorded and photographed the extraordinary avifauna of the Arctic tundra of the Indigirka delta in North East Siberia in the summer of 2017. Dr. Sergei Sleptsov, an ornithologist from the Russian Academy of Science, guided them. Sunny shares recordings and a picture from this magnificent wilderness. In case you wonder how the Taiwanese ended up there, take some time to have a look at this documentary.

Collection Statistics

452364 Recordings
10079 Species
11126 Subspecies
5172 Recordists
7199:18:39 Recording Time
330186 Records to GBIF

More...

Latest New Species

Chatham Parakeet
Chatham Oystercatcher
Scottish Crossbill
Gould's Petrel
Fea's Petrel

xeno-canto

Sharing bird sounds from around the world

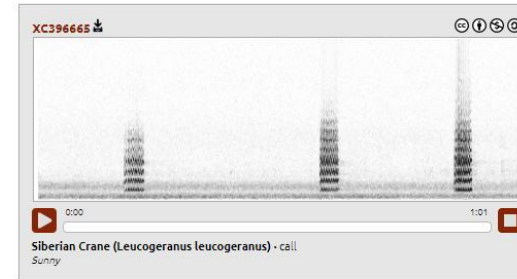
Search recordings...

Search

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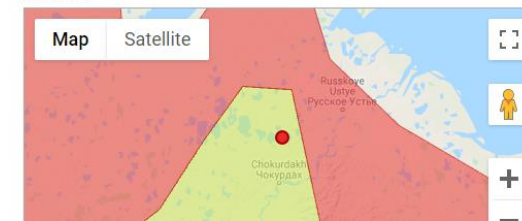
XC396665 · Siberian Crane · *Leucogeranus leucogeranus*



Remarks from the Recordist

High pass filter (400Hz, 6dB)
bird-seen:yes
playback-used:no

Location



Recording data

Recordist Sunny
Date 2017-07-08
Time 19:30
Latitude 70.9409
Longitude 147.9749
Location Allaikovsky District, Sakha Republic
Country Russian Federation
Elevation 10 m
Background none

Actions

Download audio File
Download full-length sonogram
Embed
Discuss
Edit
Delete
Add to Set

Audio file properties

Length 61.9 (s)
Sampling rate 44100 (Hz)
Bitrate of mp3 320000 (bps)
Channels 2 (stereo)

Sound characteristics

Type call



Mario Lasseck

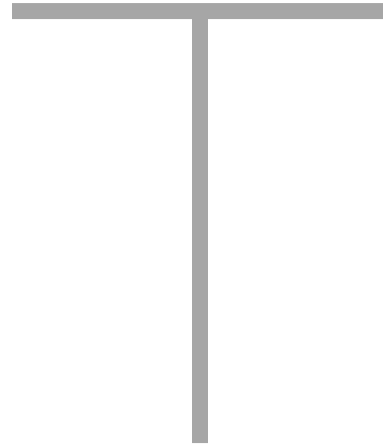
winning solution

NIPS4B 2013

Elias Sprengel et al.

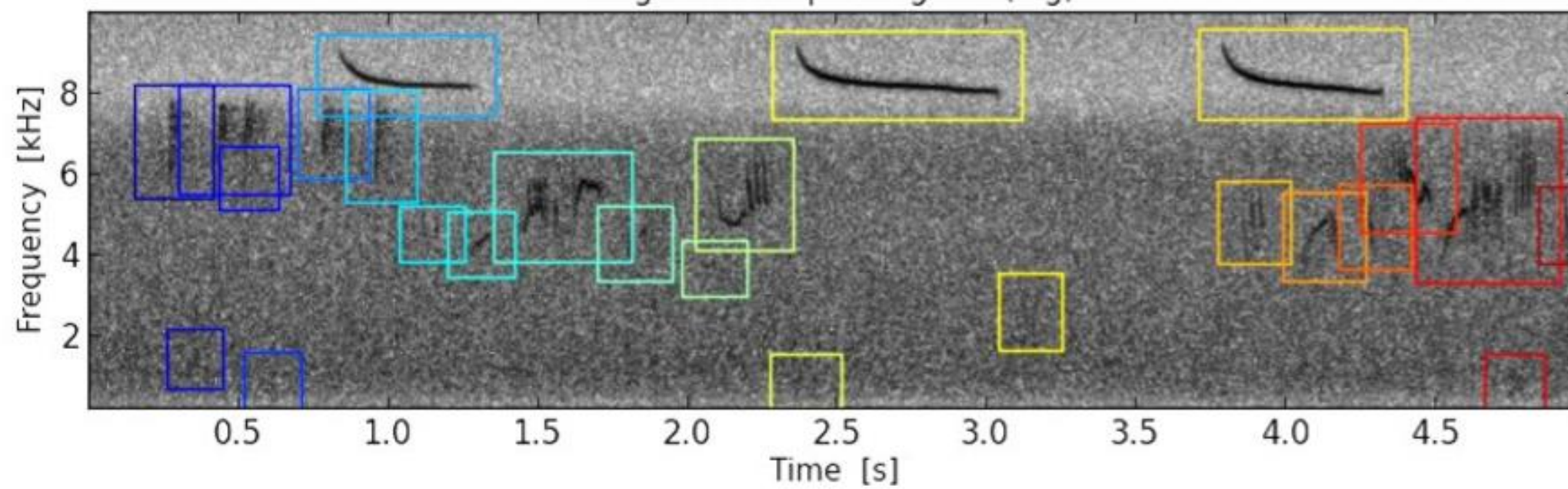
winning solution

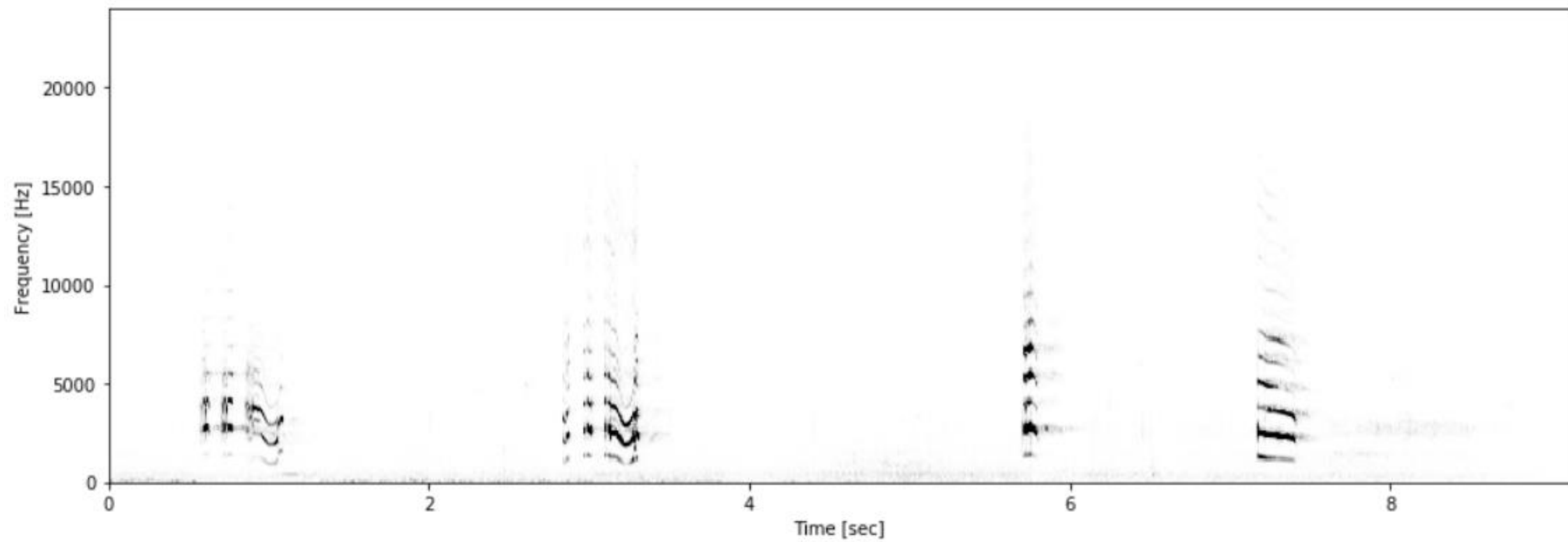
BirdCLEF 2016

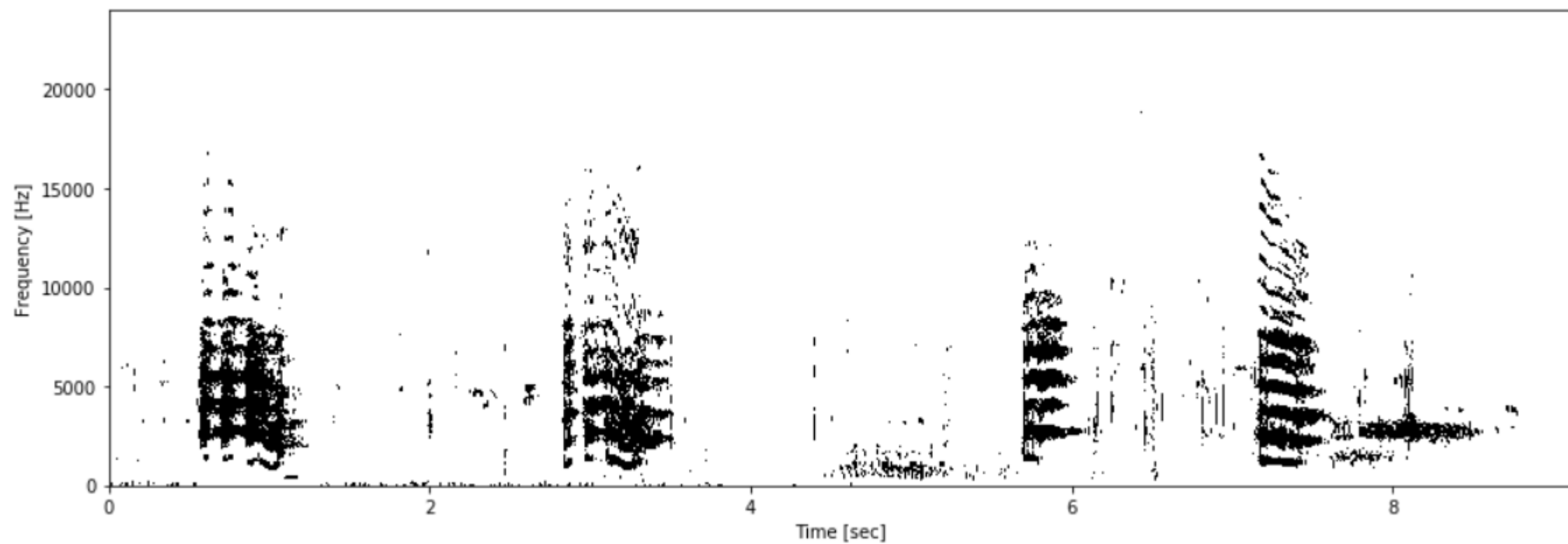


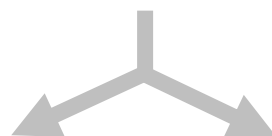
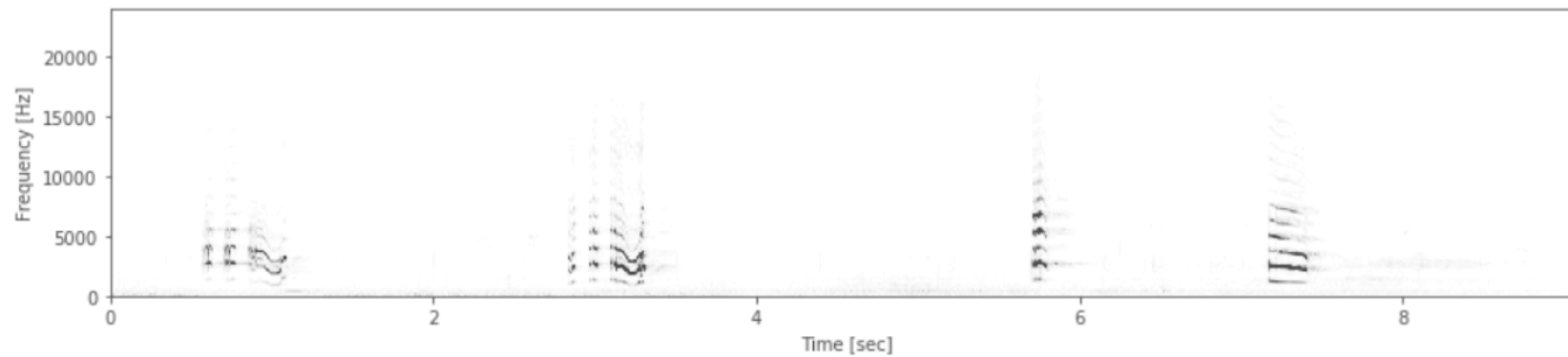
Multi-label classification with CNN

Segmented Spectrogram (log)

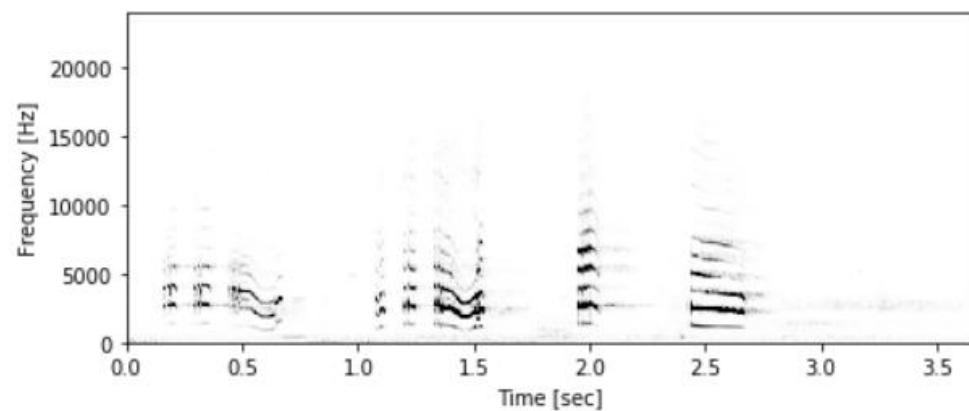




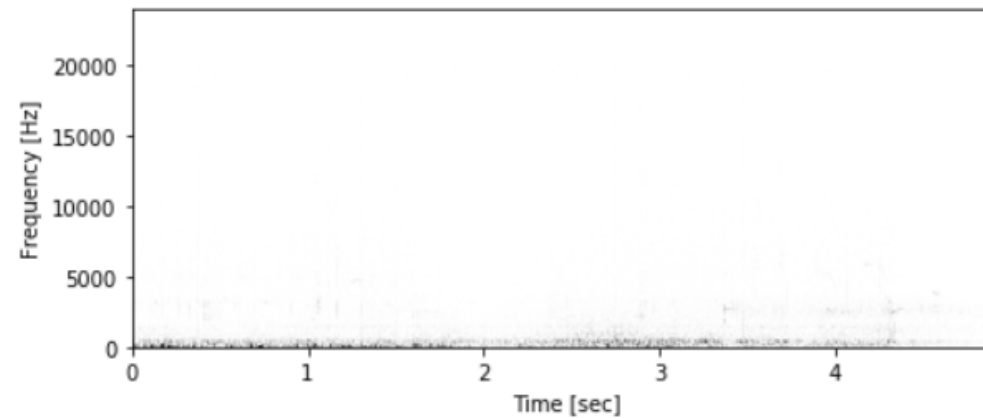




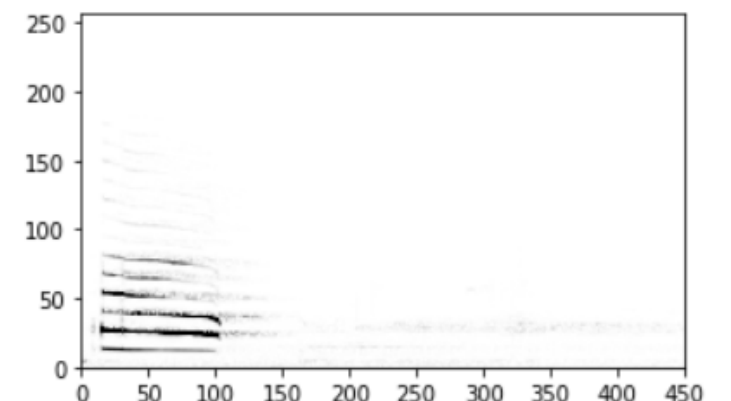
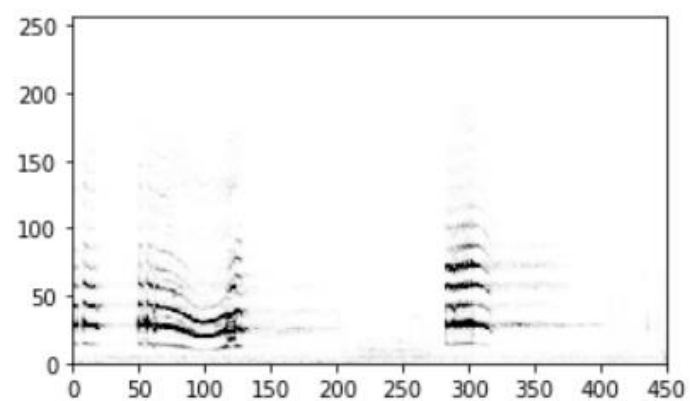
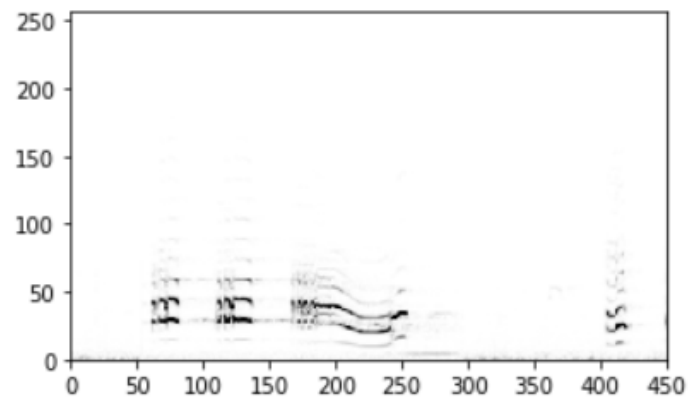
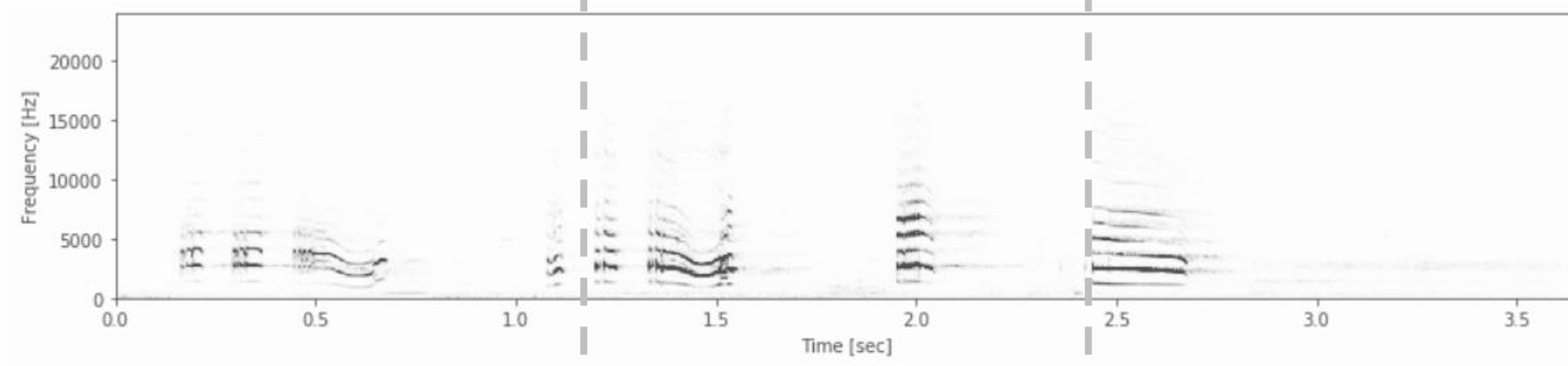
signal part

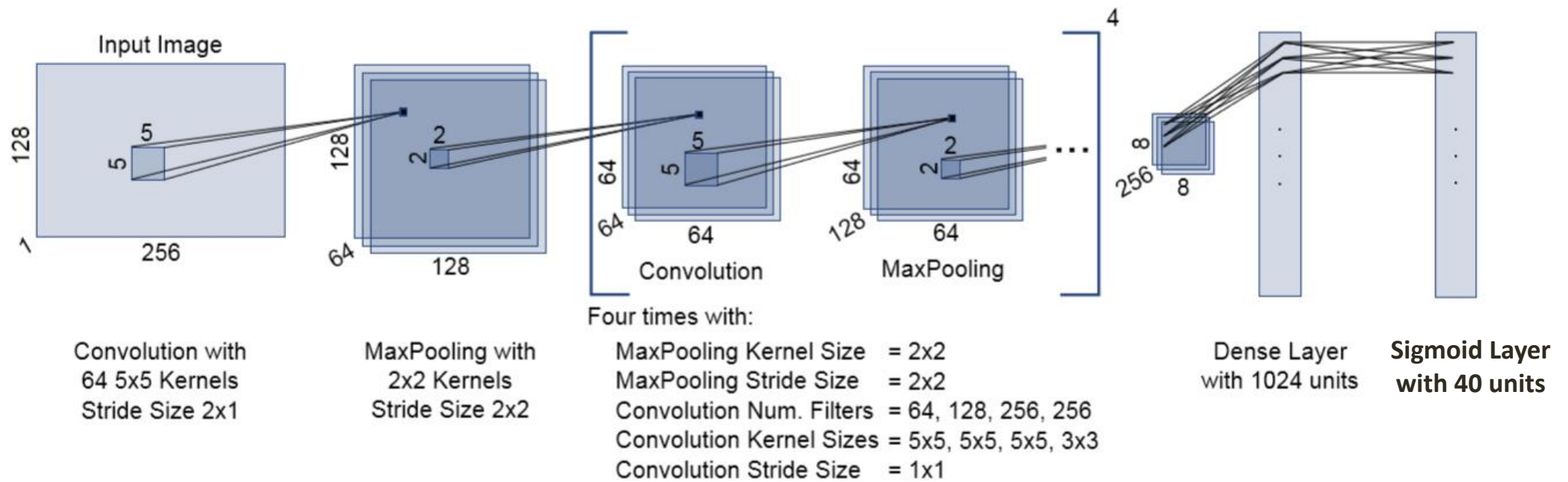


noise part



signal part







...	0.63	0.01	0.03	0.94	0.02	0.00	0.01	0.23	...
-----	------	------	------	------	------	------	------	------	-----



A horizontal array of numerical values is displayed, enclosed in a light gray border. The array consists of ten cells. The first and last cells contain an ellipsis (...). The remaining eight cells contain the following values from left to right: 0.63, 0.01, 0.03, 0.94, 0.02, 0.00, 0.01, and 0.23. Three light blue rectangular boxes are drawn around the array, highlighting the first, fourth, and eighth cells, which contain the values 0.63, 0.94, and 0.23 respectively.

...	0.63	0.01	0.03	0.94	0.02	0.00	0.01	0.23	...
-----	------	------	------	------	------	------	------	------	-----

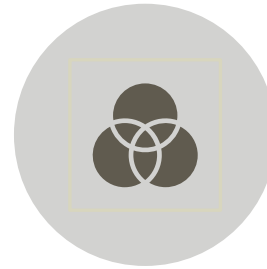
RESULTS



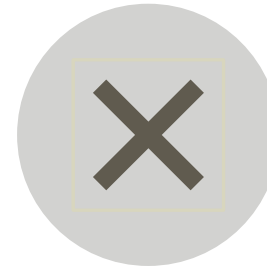
MODEL EVALUATION
METHODS



ACCURACY &
CONFUSION MATRIX



FINAL MODEL
PERFORMANCE



ERROR ANALYSIS



...	0.63	0.01	0.03	0.94	0.02	0.00	0.01	0.23	...
-----	------	------	------	------	------	------	------	------	-----



69%



A horizontal array of numerical values is displayed, enclosed in a light gray rectangular border. The array consists of ten cells, each containing a value. The values are: ..., 0.63, 0.01, 0.03, 0.94, 0.02, 0.00, 0.01, 0.23, and Three specific elements are highlighted with teal rectangular boxes: the value 0.63, the value 0.94, and the value 0.23. To the left of the array, there is a vertical teal line.

...	0.63	0.01	0.03	0.94	0.02	0.00	0.01	0.23	...
-----	------	------	------	------	------	------	------	------	-----

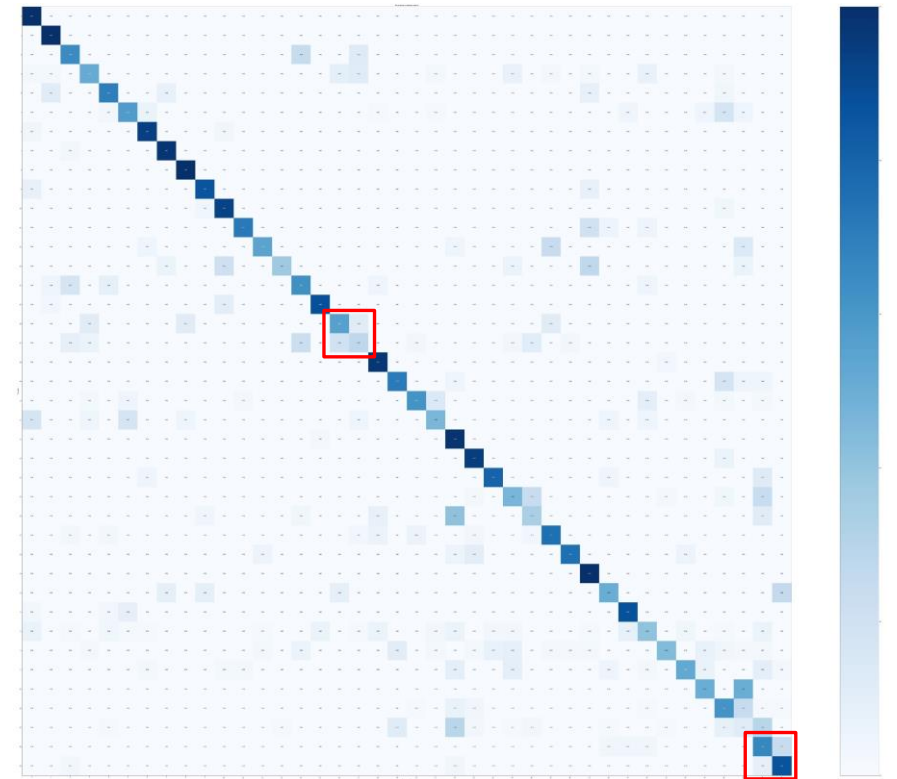


82%

Results

Error analysis

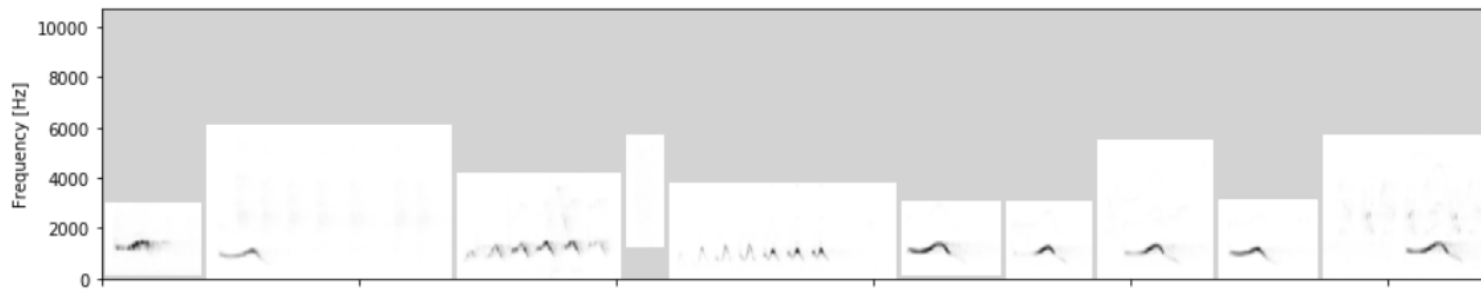
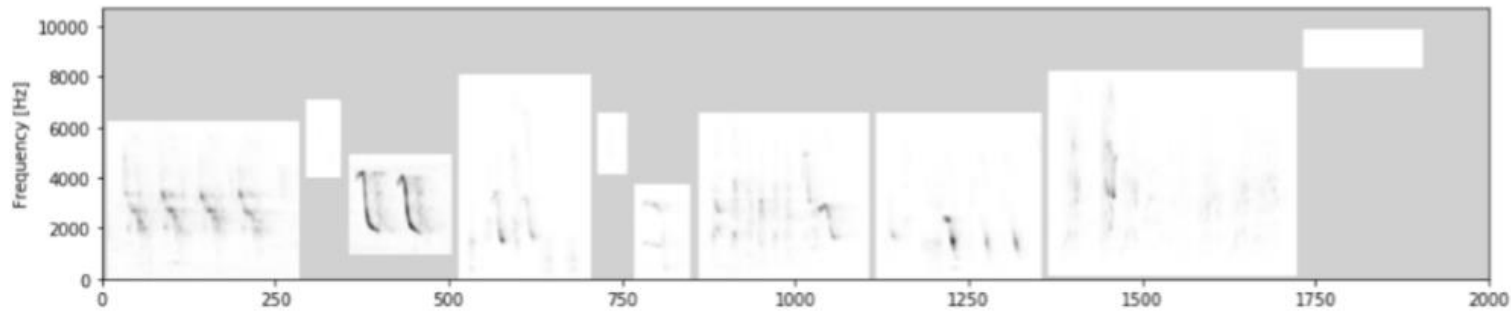
- some common mistake
 - นกกระรางหัวขวาน, นกโพระดกธรรมดา → นกตีทอง
 - นกกระจัดเขียวคล้ำ, นกสีชมพูสวน → นกจับแมลงสีน้ำตาล
 - นกกินปลีอกเหลือง ↔ นกกินปลีดำม่วง
 - นกกระจอกบ้าน ↔ นกกระจอกใหญ่



Results

Error analysis

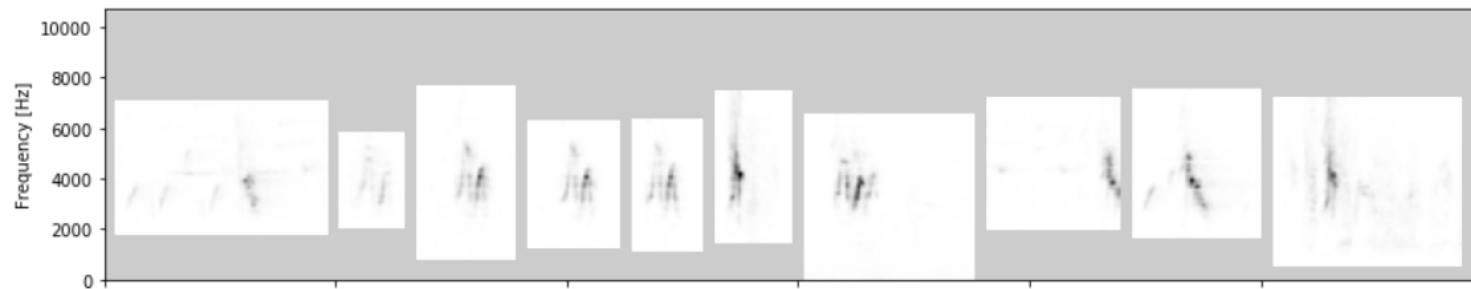
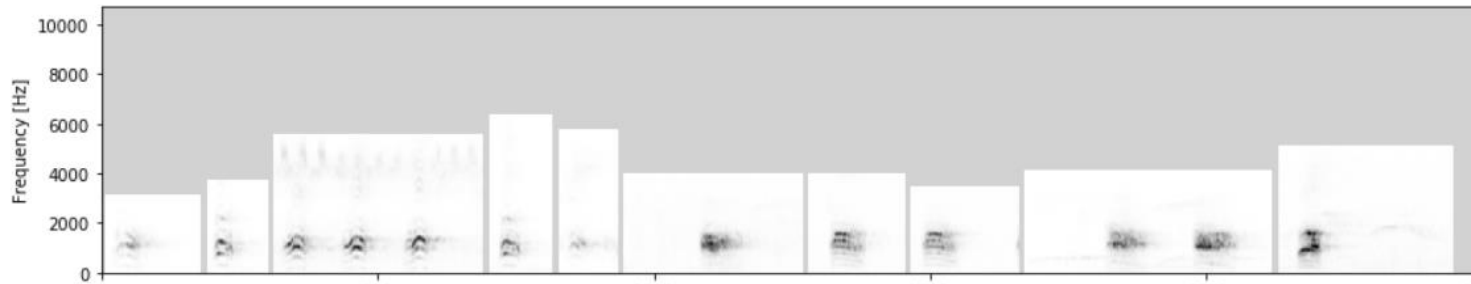
- the low-performance class e.g. นกเอี้ยงสาริกา, นกกินปลีออกเหลือง



Results

Error analysis

- the high-performance class e.g. อีกา, นกกาเหว่า



Results

Error analysis

- Multi-label classification with random forest
 - feature generation take long time and not scalable
- Multi-label classification with CNN
 - sensitive to class imbalance
 - only 8/80 class after 1 000 epoch (acc. 24%)
 - longer time training

Discussion

Limitations

- restricted species due to conservation concerns
- microphone quality & noise handling



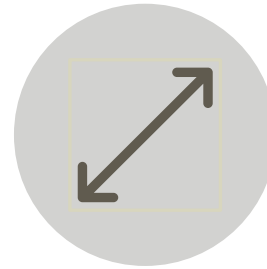
DEPLOYMENT & DEMO



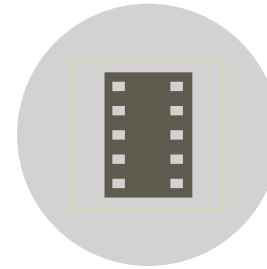
DEPLOYMENT
DIAGRAM



DEPLOYMENT
TOOLS



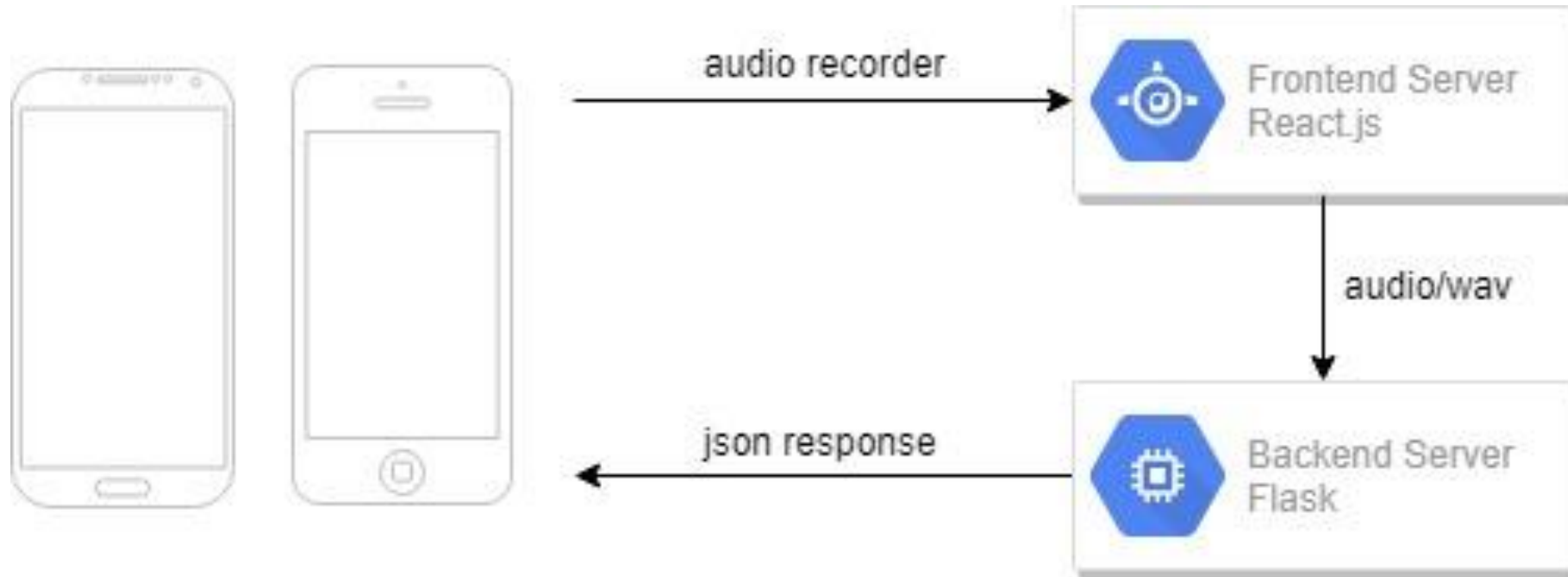
SAMPLE UI



LIVE DEMO

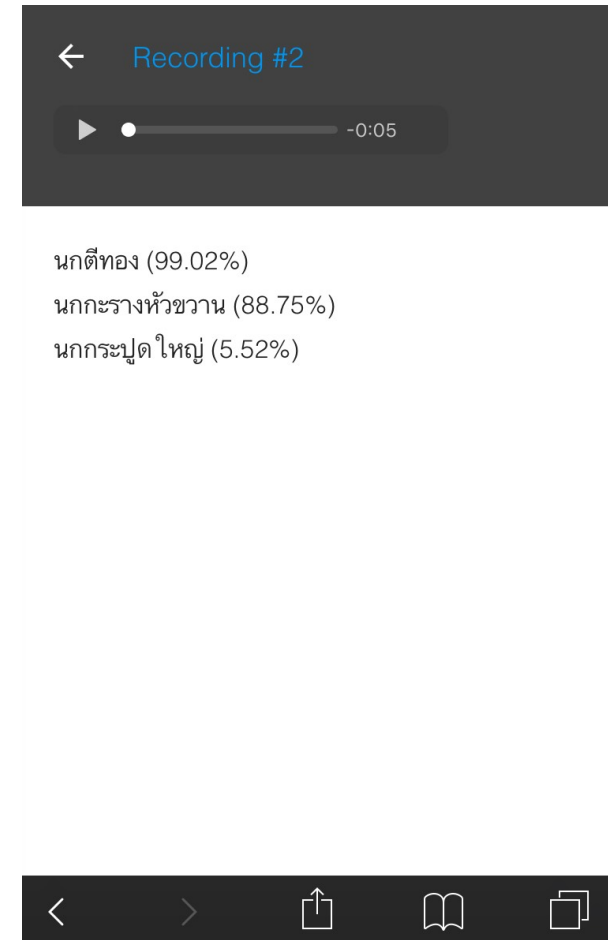
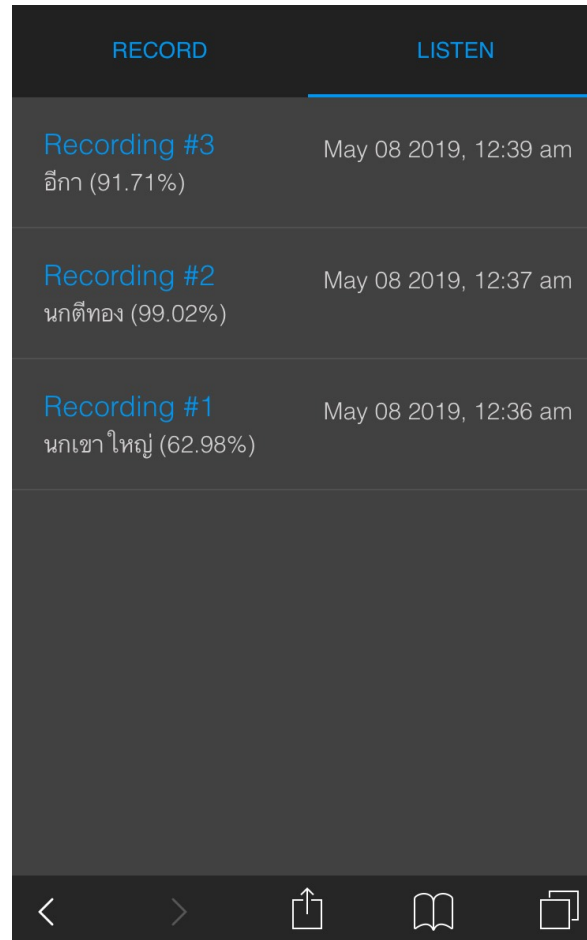
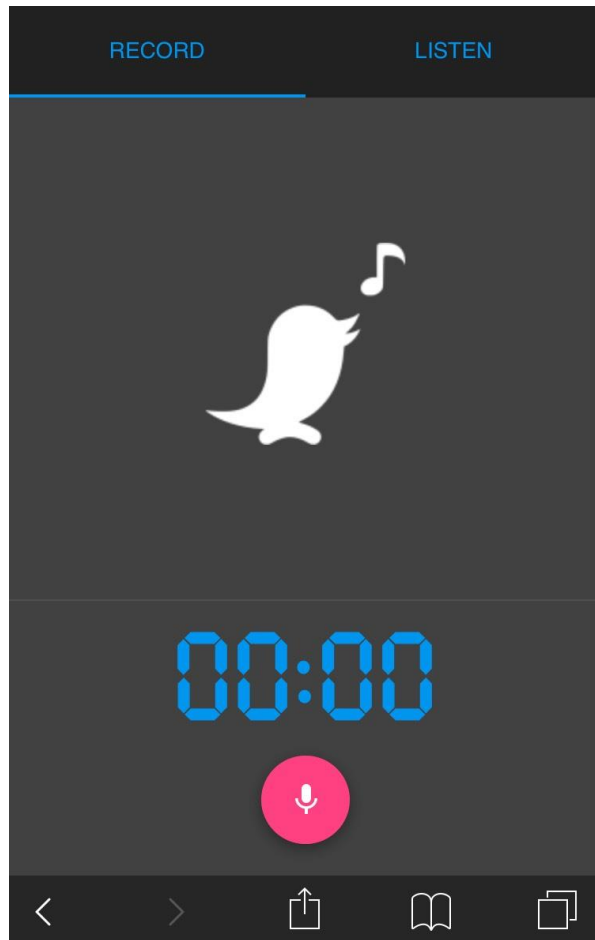
Deployment

Diagram



Deployment

Sample UI



Demo

- <https://www.youtube.com/watch?v=vwPgfybdAHY> นักอ๊วบตั๊กแตน
- <https://www.youtube.com/watch?v=ZAsUX0IN6n4> อีกา
- <https://www.youtube.com/watch?v=Hfu6b29FhtA> นกตีทอง
- <https://www.youtube.com/watch?v=UoWQGzJUXJ4> นกเขาใหญ่
- <https://www.youtube.com/watch?v=pM5ll1VLceo> นกเขาชวา
- https://www.youtube.com/watch?v=Qpjz2oE_Awg นกกระจัดธรรมดา
- <https://www.youtube.com/watch?v=9BMb4NseG4A> นกเอี้ยงสาริกา
- https://www.youtube.com/watch?v=qsBtyLAlx_w นกกินปลีอกเหลือง



Q&A