

# ***UAV Velocity Prediction Using Audio data***

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# Members



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# AGENDA

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# Introduction

Motivation

Related work

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Purpose of project



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# Motivation

What a drone picking up blood samples tells about healthcare in India [1]



Will drones transform farmers' lives in Thailand? [2]

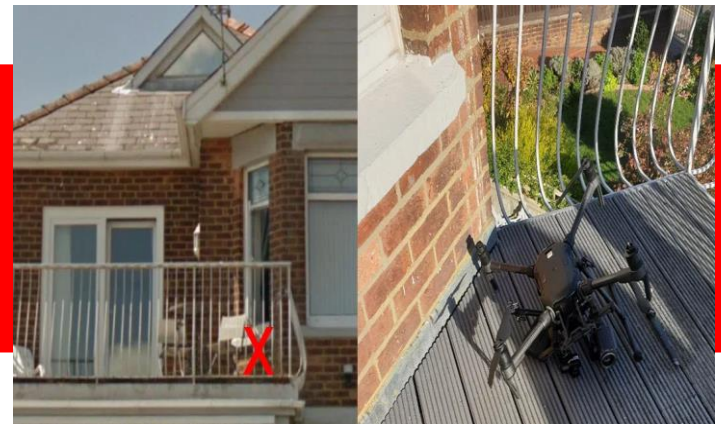


# Motivation

**FBI says PA electricity station likely 'target' of drone incident [3]**

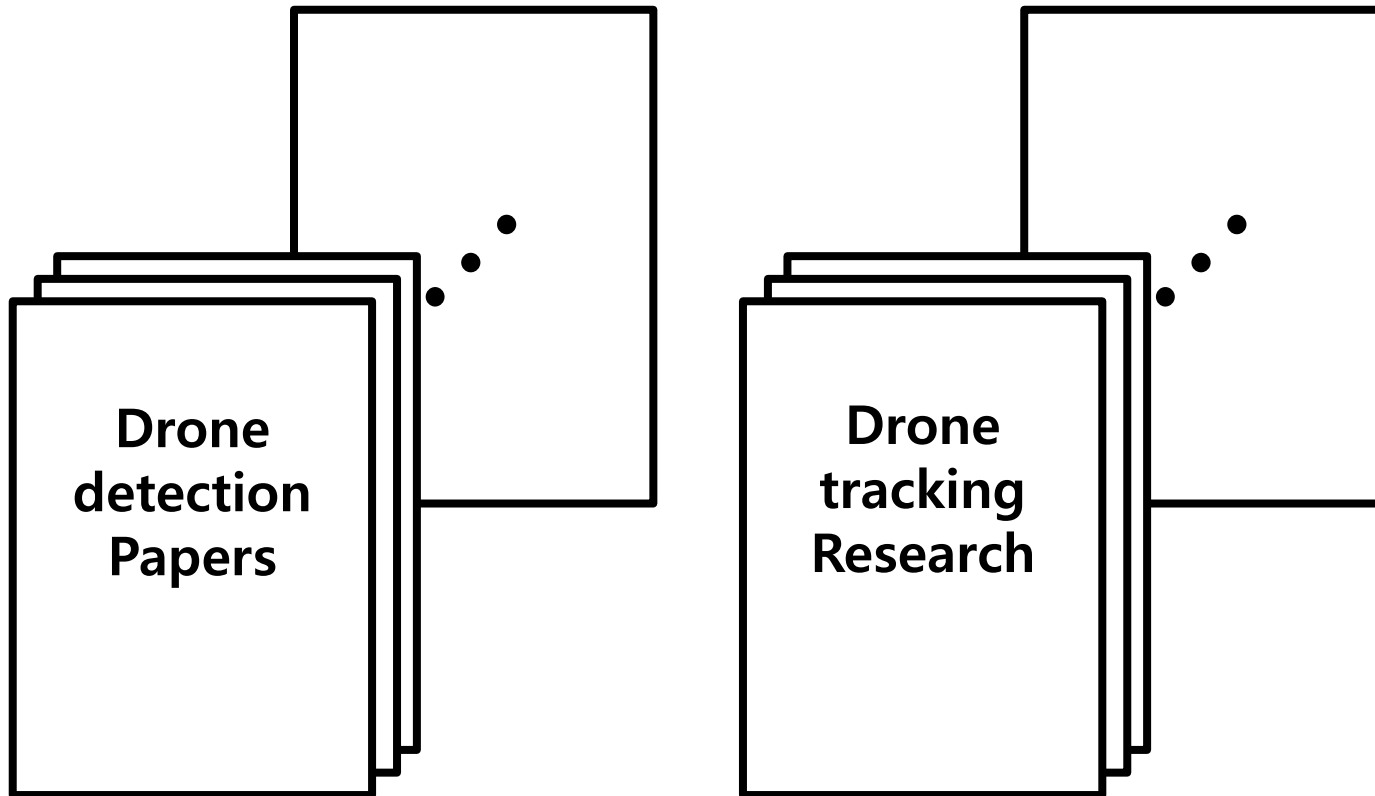


**Did this police drone crash help DJI improve the M300? [4]**



# *Motivation*

**Because of the malicious UAVs**



## How to Predict?



## How to Predict?



## Why Audio data?

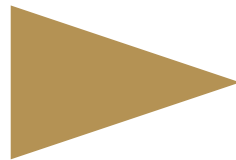
Audio data obtain relatively results at **less cost** than other methods.

Even with noise limitations, it provides **good results** for distinguishing the drone's sound [9], [10], [11].



## How to Experiment

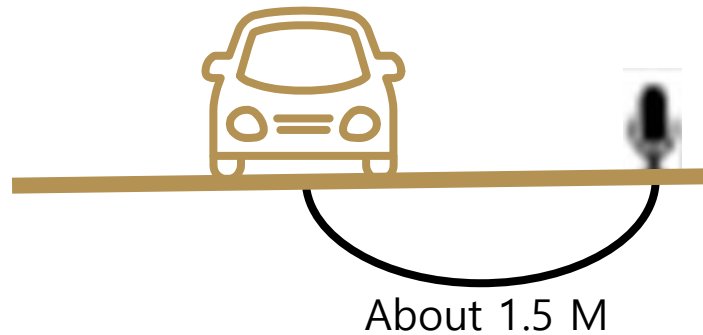
The U.S. FAA set  
UAV speed limit  
**100mph.**



**100mph over speed  
UAV is  
a high probability that  
malicious UAV**

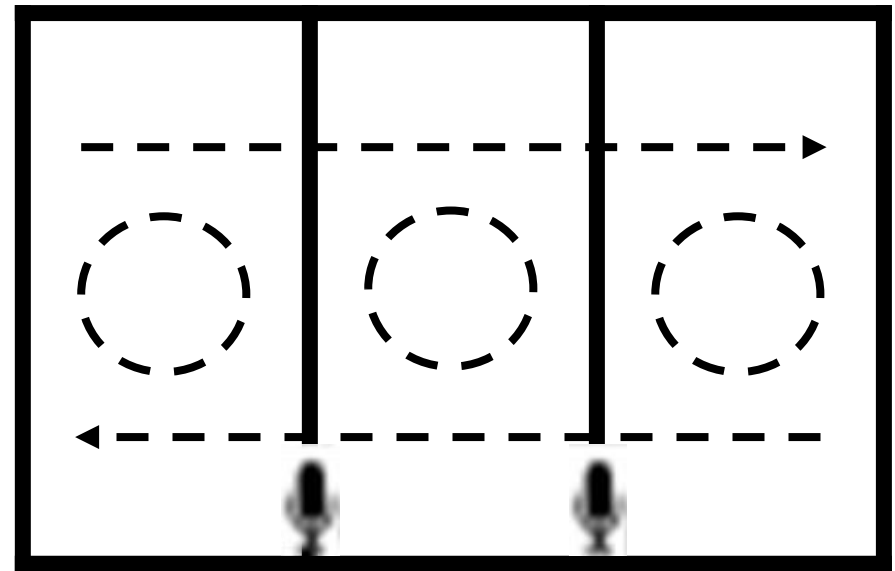
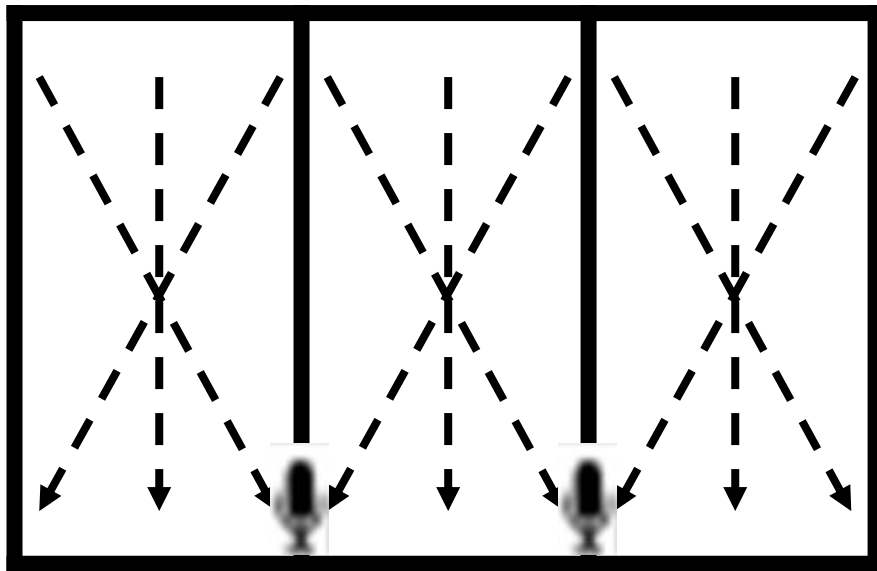
# *Related work*

Discovering speed changes of vehicles from audio data [5]



# *Related work*

## Single Node Detection on Direction of Approach [8]



# *Purpose of project*

**Our goal is**



# *Purpose of project*

**Our goal is**

**UAV Velocity Prediction  
Using Audio data**

# Technical details

Overview

Dataset

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Feature extraction

Classifiers

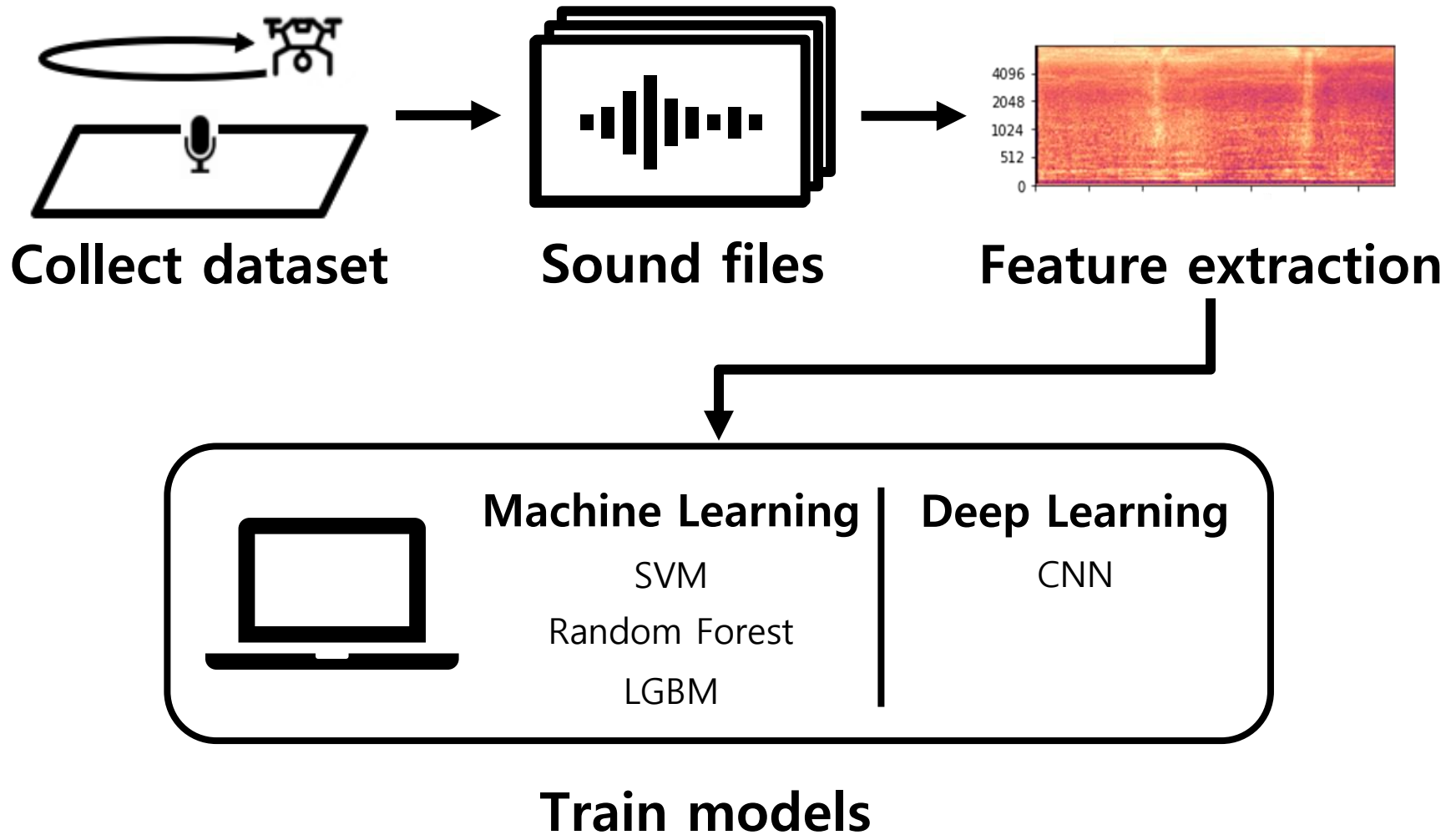


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# Overview



# Dataset

## Drone Information



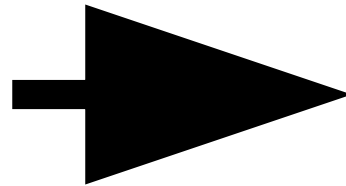
Item No.	X5UW	X8SW
Charging time	About 130 minutes	About 150 minutes
Controlling distance	About 50 meters	About 70 meters
Flying time	About 7 minutes	About 9 minutes
Product Size	32 X 32 X 7 cm	50 X 50 X 19 cm

# *Dataset*

Drone  
Information



Stability



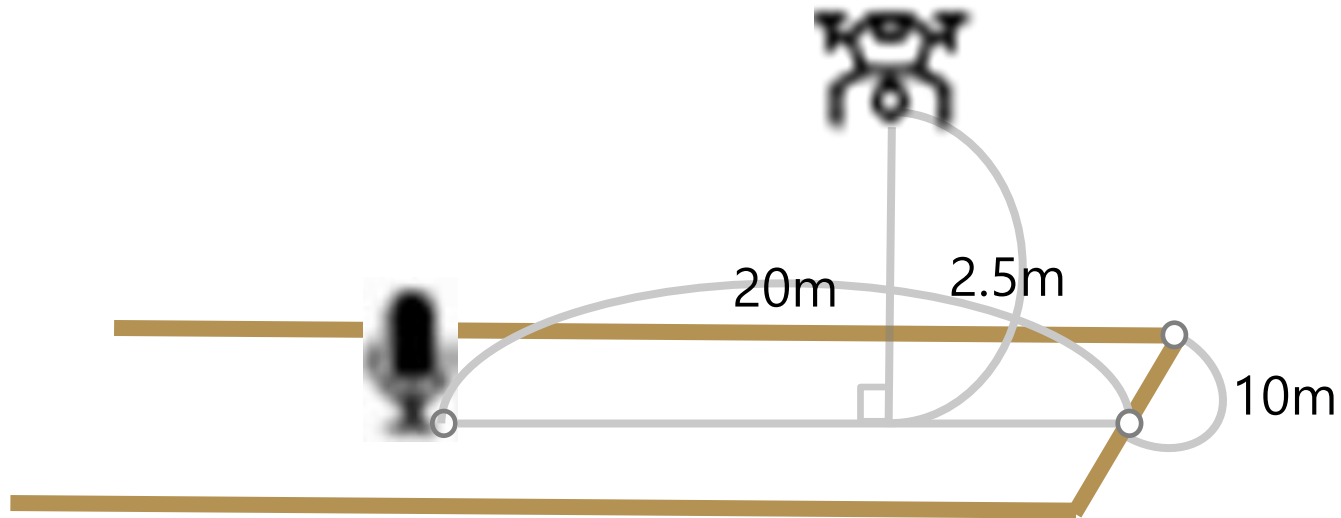
Controlled  
condition



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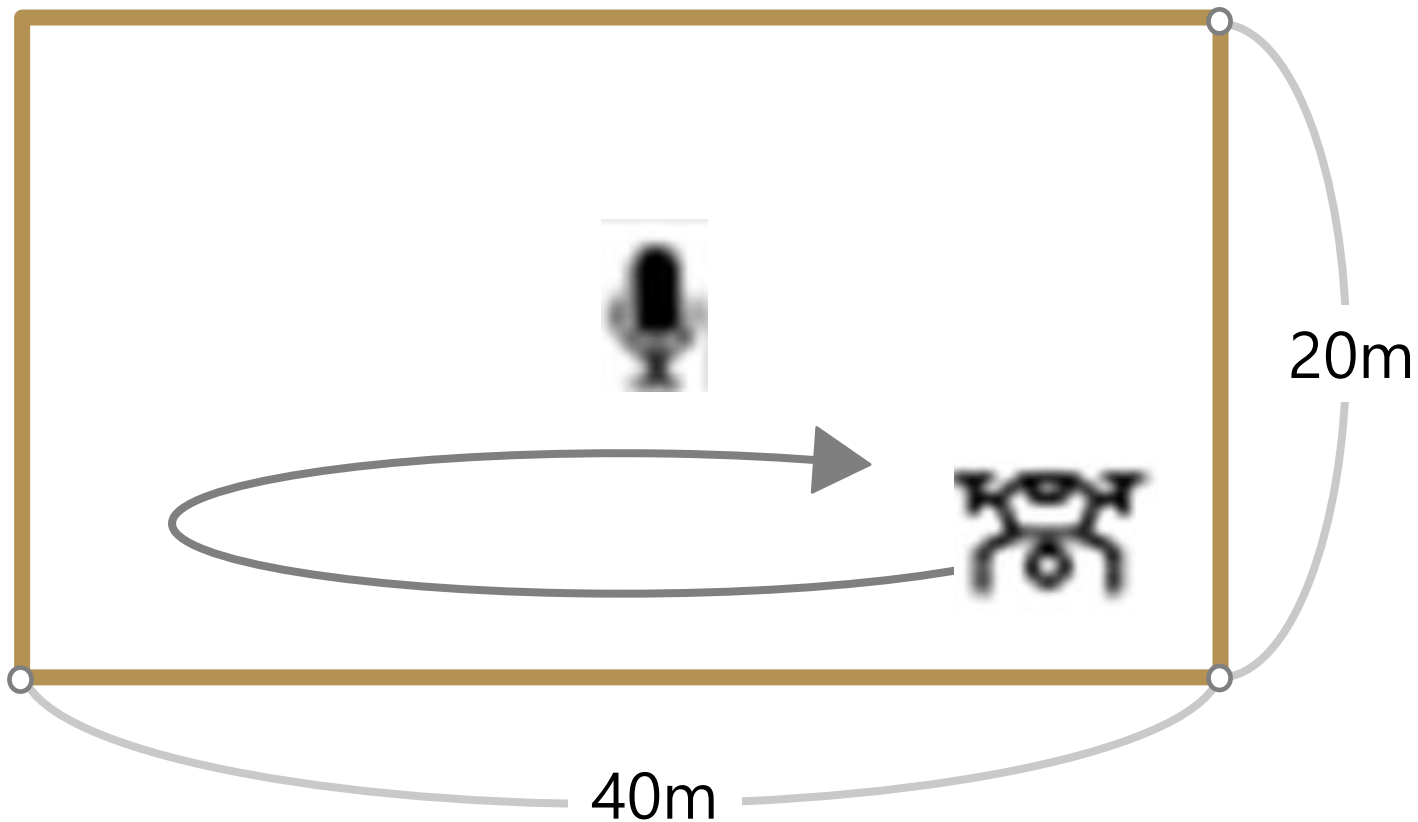
# Dataset



Microphone	Speed gun	Place
Dell XPS15 9570 Samsung Galaxy A51	Bushnell Velocity Speed Gun (Accuracy: +/- 1 mph)	K-SW 2th floor

# Dataset

## How to collect a dataset?



# Dataset

## How many collect Dataset?

UAV \ Speed	Speed	
	Low	High
X5UW	30	30
X8SW	30	30

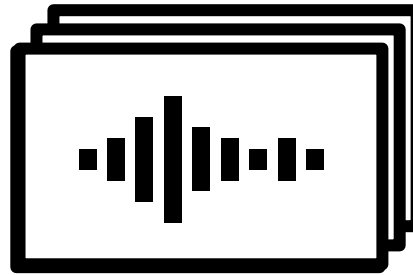
(Unit: min)

# Feature extraction

## A Feature Engineering Focused System for Acoustic UAV Detection [6]

Feature	Accuracy average (SVM, GNB, KNN, NN)
Chroma_stft	0.878
Mel	0.831
<b>MFCC</b>	<b>0.994</b>
Contrast	0.854
tonnetz	0.731

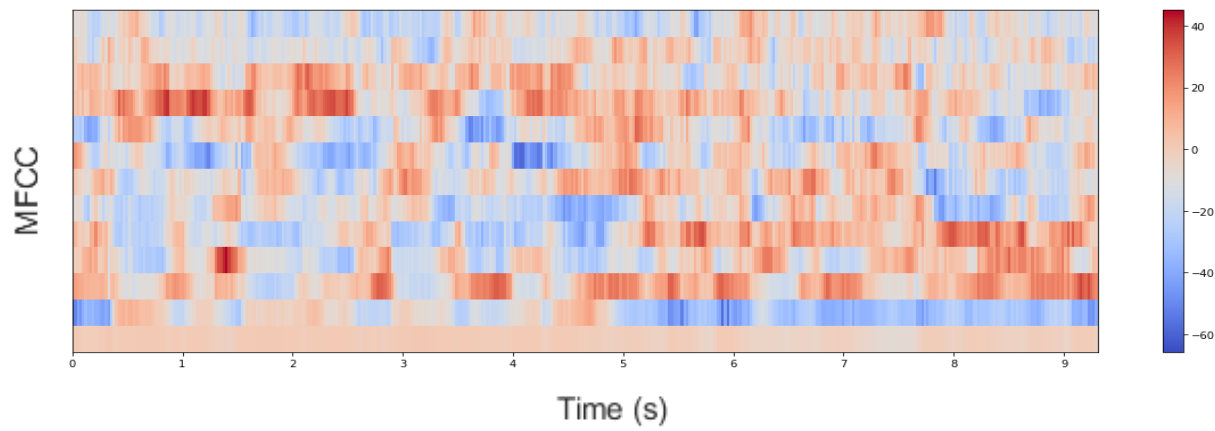
# Feature extraction



Sound files



MFCC image file [12]





# *Classifiers*

## Classify Model

**Machine  
Learning**

**SVM,  
Random Forest,  
LightGBM**



**Deep  
Learning**

**CNN**

# Research progress

Detailed Schedule

Future Plan

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Conclusion



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# Detailed Schedule

Task \ Weekend	4	5	6	7	8	9	10	11	12
	(~6/5)	(~6/12)	(~6/19)	(~6/26)	(~7/3)	(~7/10)	(~7/17)	(~7/24)	(~8/2)
Collect Dataset									
Feature extraction									
Writing code									
Preparing presentation									
Writing a paper									

# *Future Plan*

- **Collecting Dataset.**
- **Writing training code for models.**
- **Regular meeting with Yaqin Wang.**

## *Conclusion*

# Our 'UAV Velocity Prediction Using an Audio data' right now

Choose Machine learning and Deep learning models.

Collected half of our dataset

Writing Paper introduction

# *Conclusion*

## **Our 'UAV Velocity Prediction Using an Audio data' in the future**

Write Feature Extraction code

Write Machine Learning and Deep Learning Code

Finish Final Presentation and the paper

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# *Thank you for listening*

## Q&A

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