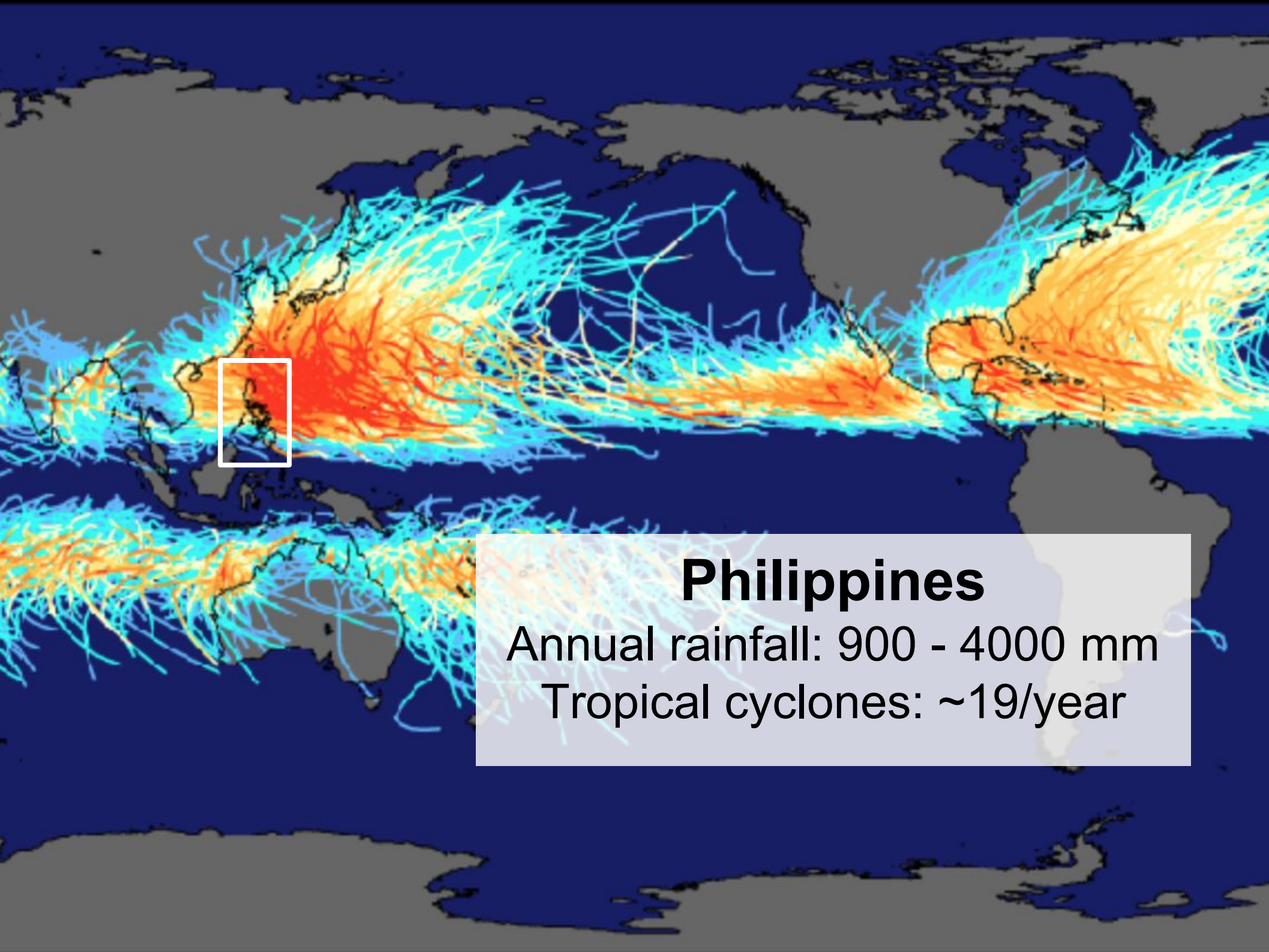




# Environmental research activities @ ASTI

Jay Samuel Combinido  
Advanced Science and Technology Institute  
Department of Science and Technology

International Symposium on Grids and Clouds  
Academia Sinica, Taipei, Taiwan  
20 March 2018



## **Philippines**

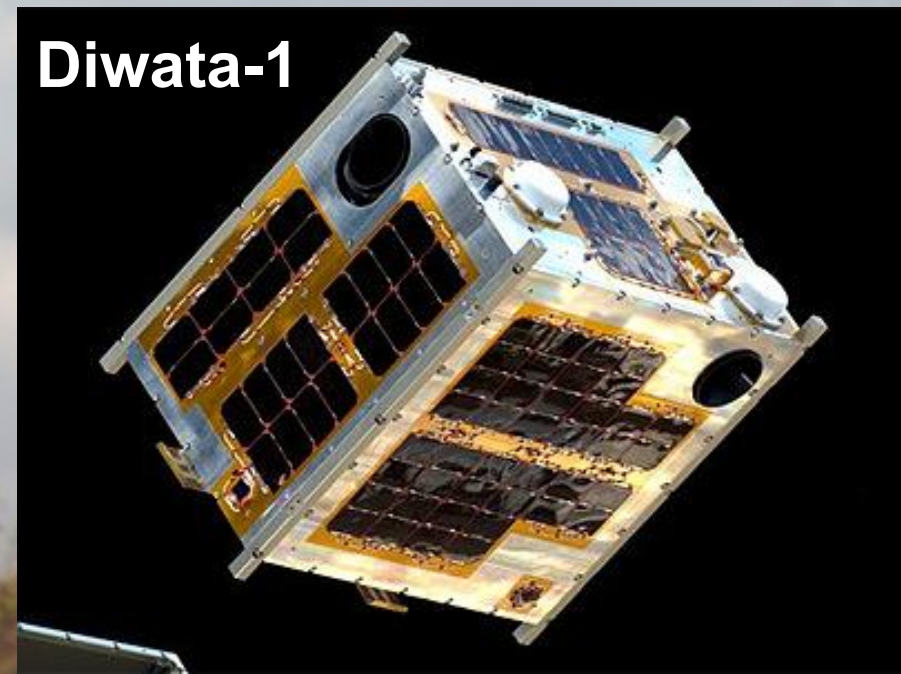
Annual rainfall: 900 - 4000 mm

Tropical cyclones: ~19/year

# PEDRO ground receiving station

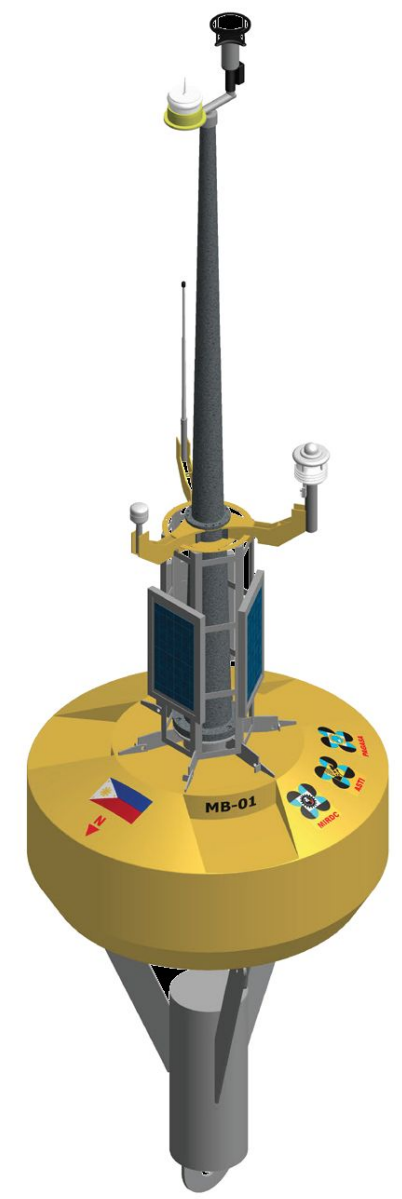


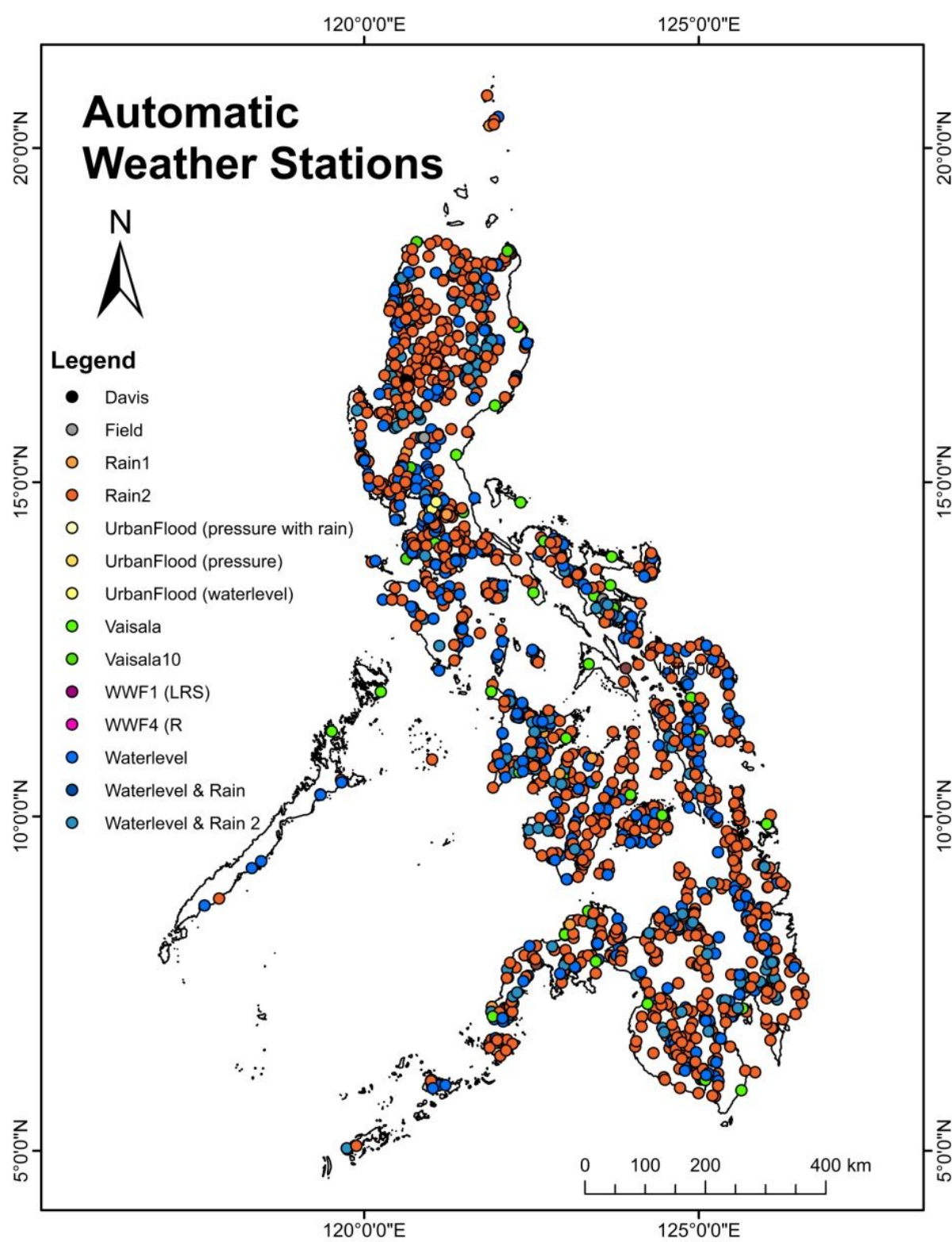
**Diwata-1**





# ASTI Automated Weather Station, Rain Gauge, Water level Devices





# Outline

- 1. Land cover classification using neural networks**
  - create dynamic base maps for disaster management
- 2. Predicting ASTI automated weather station failure based on data-sending behavior**
  - perform station maintenance with enough lead time

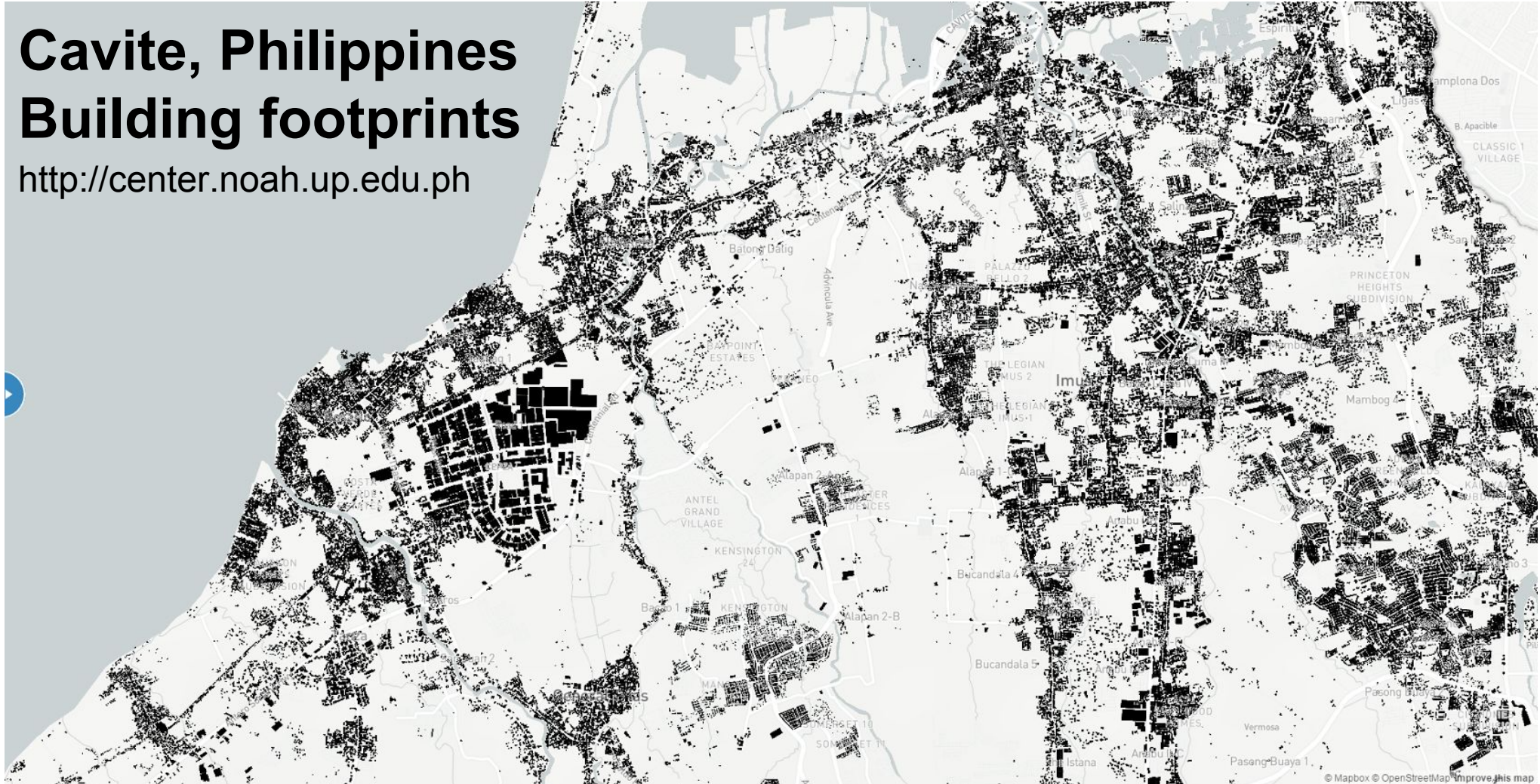


# Land cover classification using neural networks

Land cover classification is a very tedious task.

## Cavite, Philippines Building footprints

<http://center.noah.up.edu.ph>



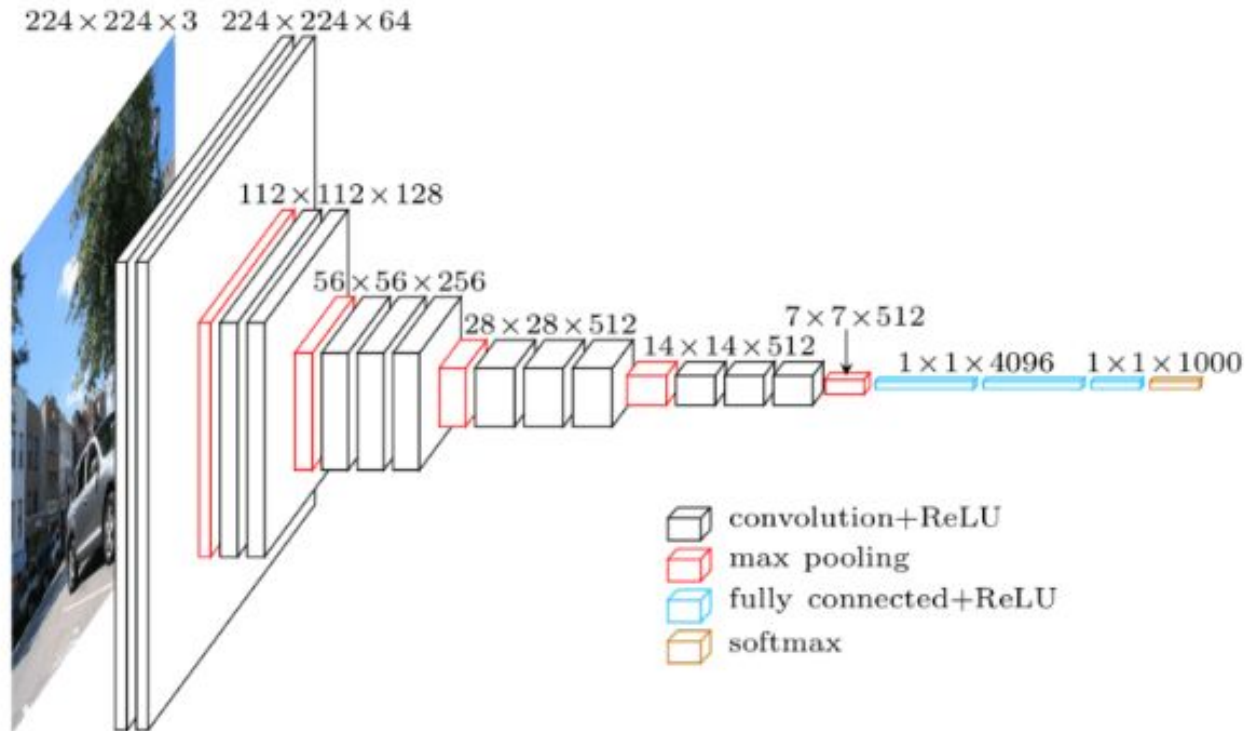
# Land cover classification using neural networks

Google Maps API



Open Street Map TagInfo

Key	Objects	Nodes
building	275 643 642 5.65%	912 701 0.71%
source	186 063 414 3.82%	45 004 778 35.03%
highway	126 141 124 2.59%	9 092 715 7.08%
addr:housenumber	76 658 718 1.57%	41 485 530 32.29%
addr:street	70 034 334 1.44%	36 253 005 28.22%
name	61 236 045 1.26%	15 612 117 12.15%
addr:city	56 849 168 1.17%	30 508 471 23.75%
addr:postcode	52 742 948 1.08%	28 820 354 22.43%
natural	30 654 981 0.63%	11 352 876 8.84%





# Land cover classification using neural networks



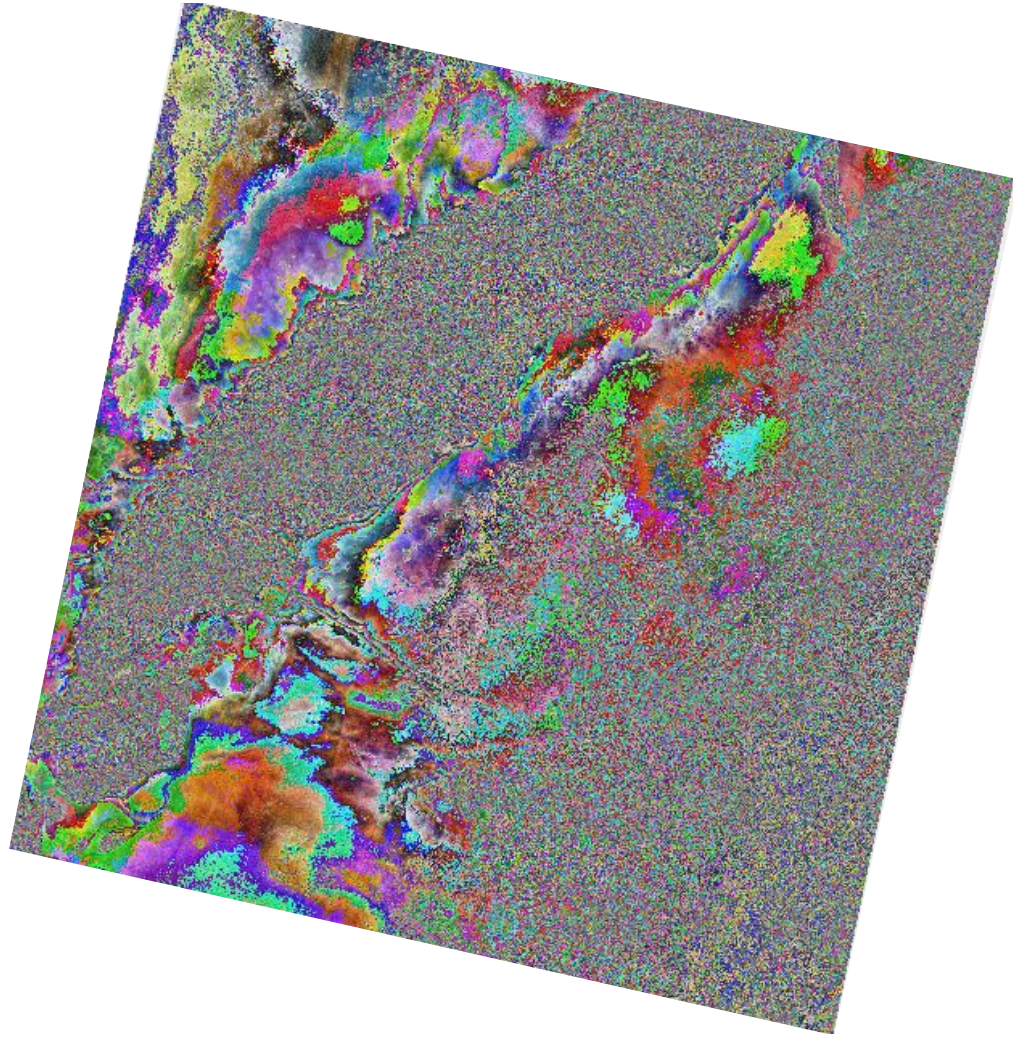


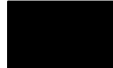





# Land cover classification using neural networks

**Goal:** Image segmentation



 water  
 not water

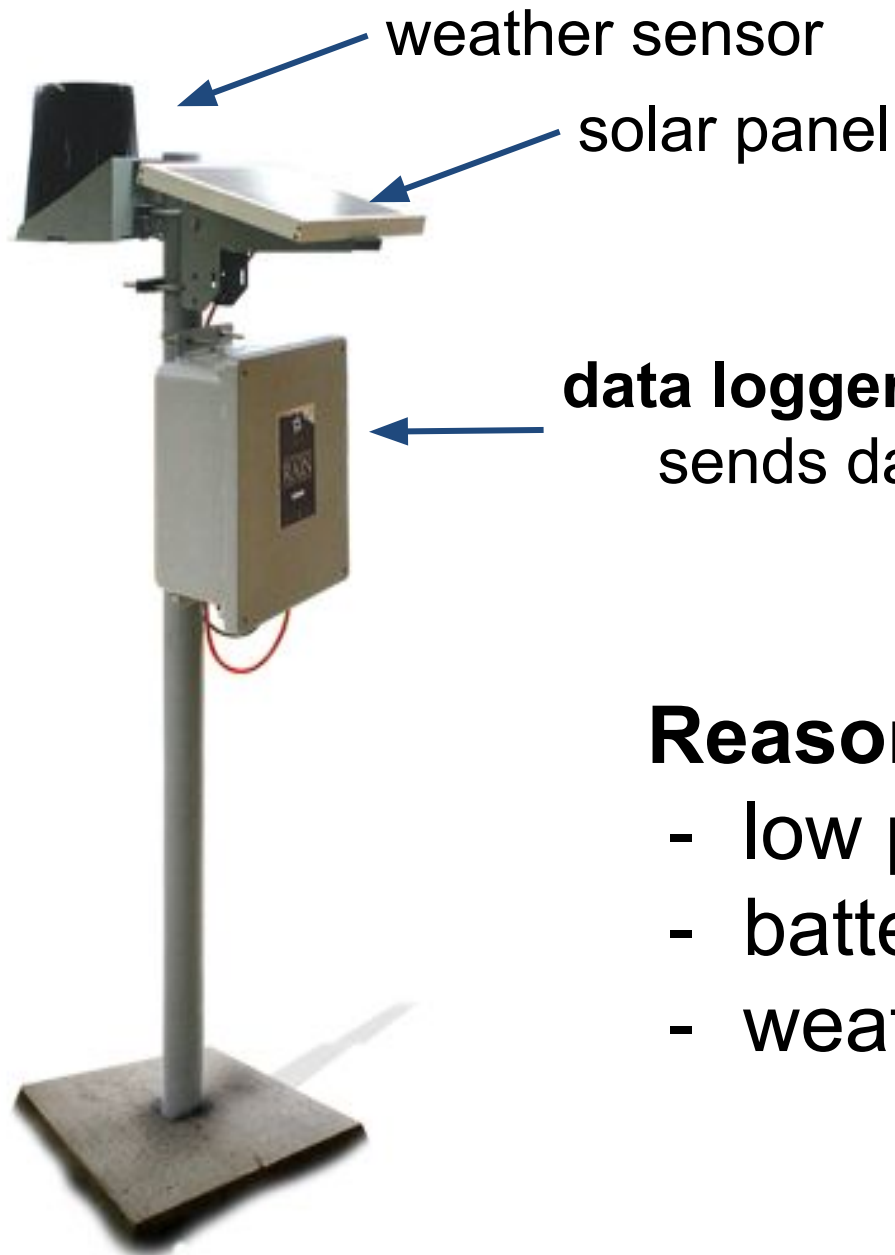


# Land cover classification using neural networks

## **Applications**

- More frequent land cover classification
- Fast damage detection and estimation
- Flood monitoring
- Infrastructure monitoring

# Predicting ASTI automated weather station failure based on ...



weather sensor

solar panel

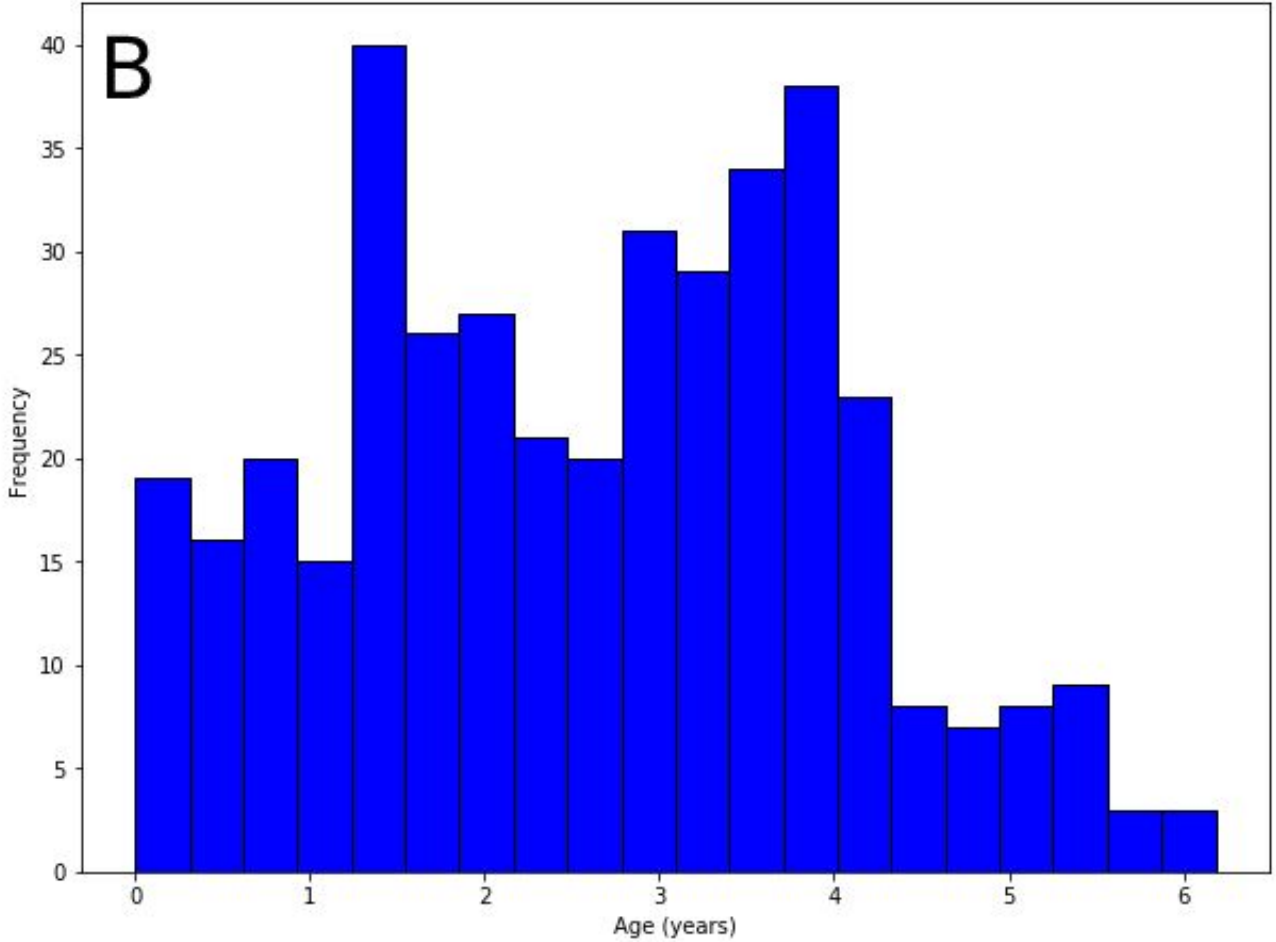
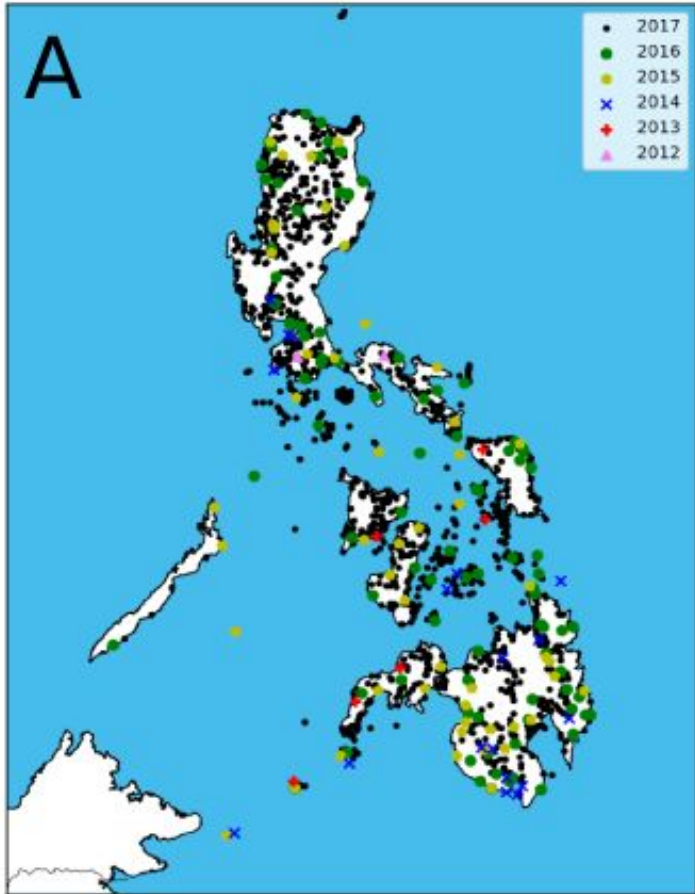
**data logger:**

sends data every 10 or 15 minutes

## **Reason for send failure:**

- low power (limited sunlight)
- battery failure
- weather related (e.g. typhoons)

# Predicting ASTI automated weather station failure based on ...



Average lifespan = ~ 3 years



# Predicting ASTI automated weather station failure based on ...

**Data send frequency time series contain signs of failure**

## METHODOLOGY

- 7-day mean and variance of the normalized daily frequency of forwarded data
- 1 to 8 weeks of lead times were considered

## LABELS

<b>PASS</b>	when the normalized frequency is greater than 0.65
<b>WARNING</b>	when the normalized frequency is less than or equal to 0.65
<b>FAIL</b>	device does not send data during the day at all

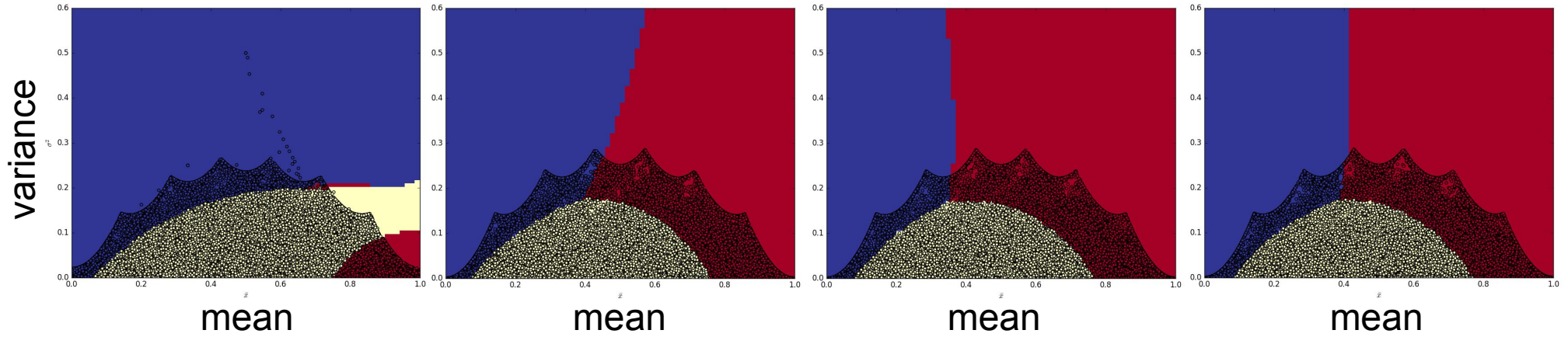
# Predicting ASTI automated weather station failure based on ...

1st week

2nd week

3rd week

4th week

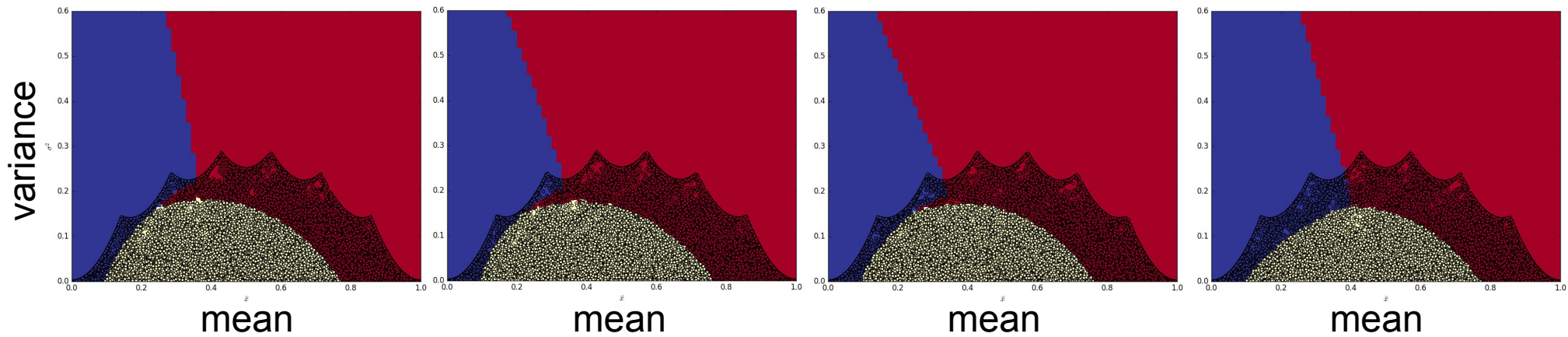


5th week

6th week

7th week

8th week

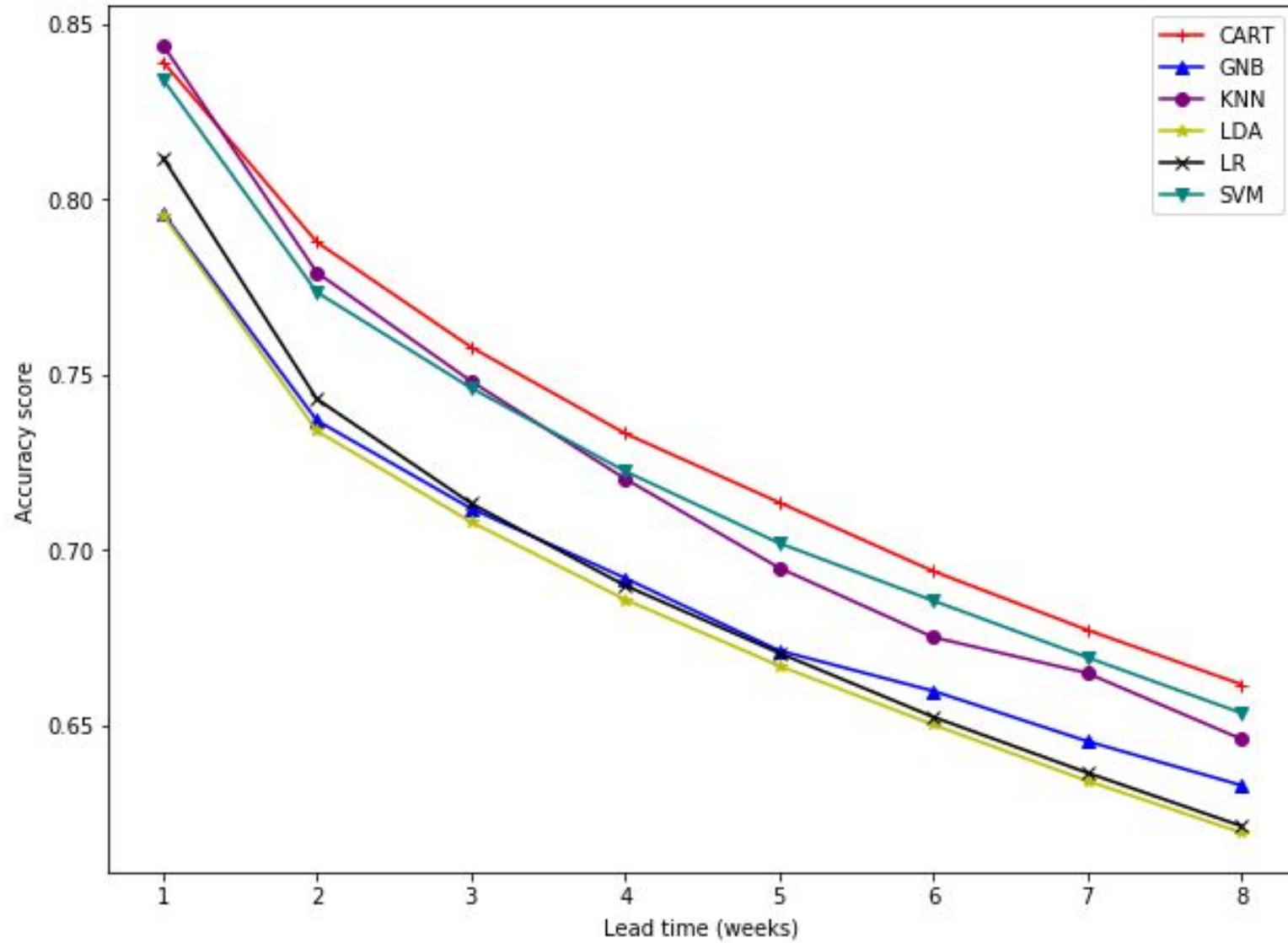


 PASS

 WARNING

 FAIL

# Predicting ASTI automated weather station failure based on ...





## Summary

- Gearing towards machine learning and artificial intelligence with the huge amount of data (satellite and weather) generated daily
- The goal is to strengthen and sustain disaster mitigation and management efforts in the Philippines



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