



# AgritechGuard

An Integrated Automated Farming and Security System

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**BTP Code** : B23PB01

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# OUTLINE

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# INTRODUCTION

1. Farmers face challenges like:
  1. More often visits to monitor water pump,
  2. Limited water resources,
  3. Untimely electricity,
  4. Labor shortages,
  5. Crop theft.
- Rural areas often struggle with unreliable internet access.
- AgritechGuard enhances farming efficiency, reduce manual labor, and empower farmers with real-time monitoring and control.
- Secure boundaries using computer vision.

# LITERATURE REVIEW

- **Reference-1:** This literature discusses automated irrigation systems that aim to conserve water and how it implemented.
- **Reference-2:** This literature explores the utilization of sensor data transmission via wireless communication in the presence of internet connectivity.
- **Reference-3:** YOLO v8 person detection.
- **Reference-4:** This literature introduces various Energy Harvesting techniques.

# OBJECTIVES

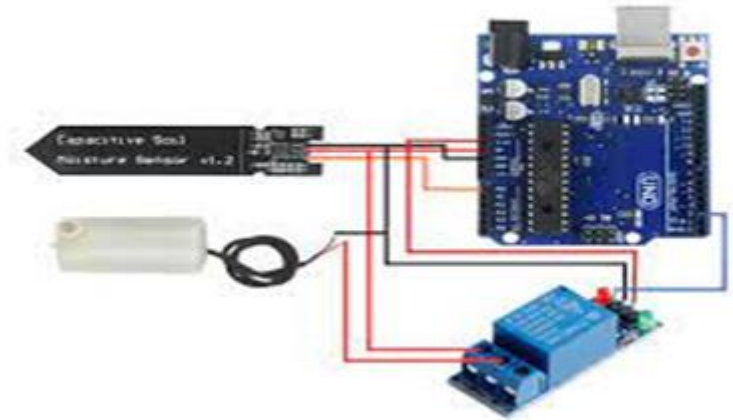
- The primary objective of this project is to reduce the amount of time farmer needed to spend in the field.
- Solar energy harvesting is employed to ensure sustainable power supply.
- Data transmission even if there is no internet connection.
- Secure boundaries using computer vision.

# PROPOSED METHODOLOGY

- Create a system that will allow user to operate water pump remotely or leave it to the automated system.
- Energy harvesting technique employed for sustainable power supply.
- Data can be transmitted to long distances using LoRaWAN technology in remote areas.
- Trespasser detection system using YOLO v8 model and COCO dataset to detect various anomalies.

# HARDWARE TOOLS USED

1. DHT11
2. Soil moisture sensor
3. Relay module
4. Water Pump
5. Arduino Uno
6. LoRa Tx & Rx
7. Raspberry Pi 3
8. LCD display
9. Camera Module



# SOFTWARE TOOLS USED

1. **Arduino IDE**
2. **Raspberry Pi Imager**
3. **Putty**
4. **VNC Viewer**
5. **PyCharm**
6. **YOLO v8**
7. **Coco Dataset**
8. **ThingSpeak Database**

## ✓ **Embedded C**

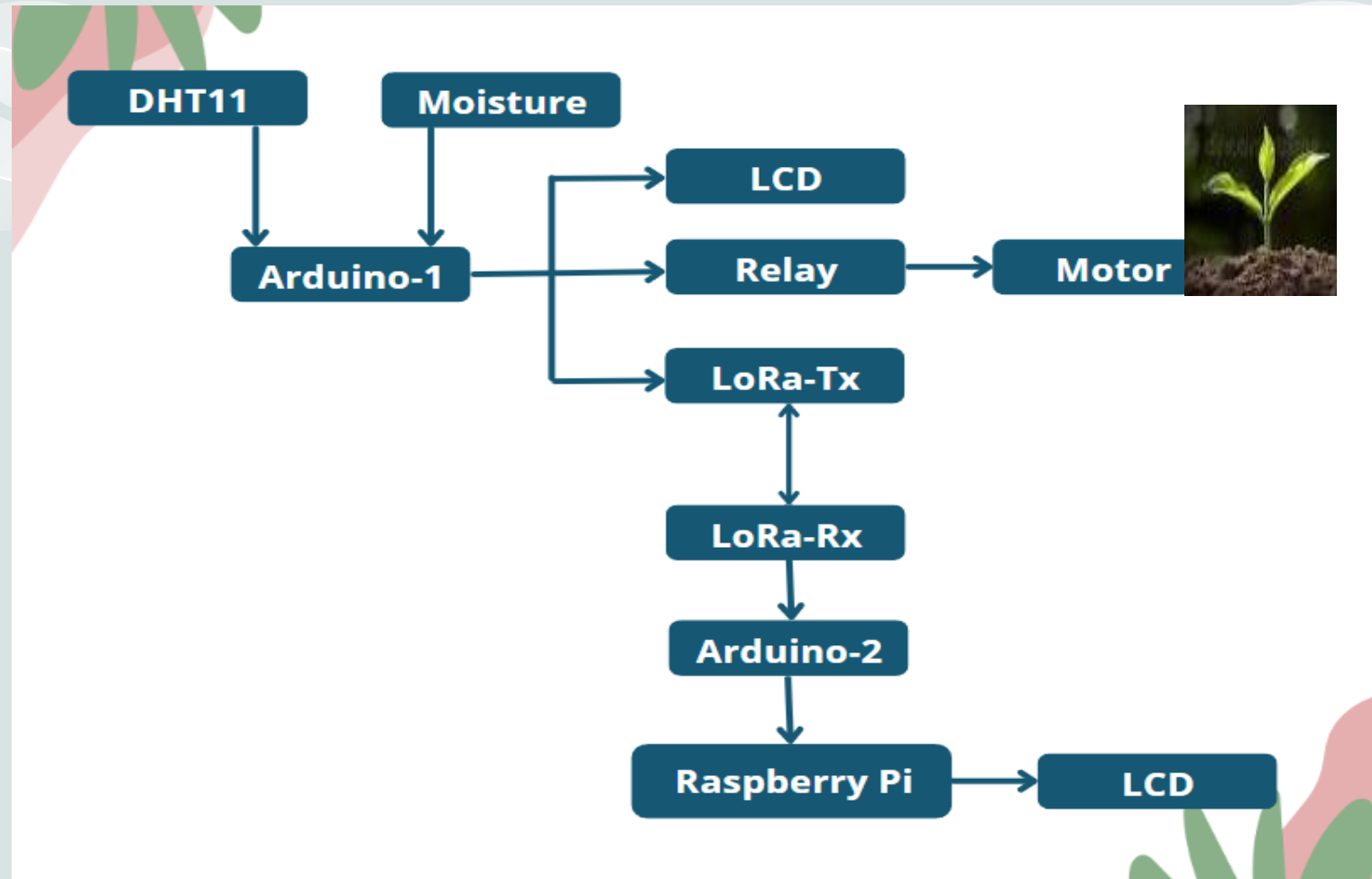
- RadioHead-master
- LiquidCrystal\_I2C
- LiquidCrystal
- DHT\_sensor\_library

## ✓ **Python**

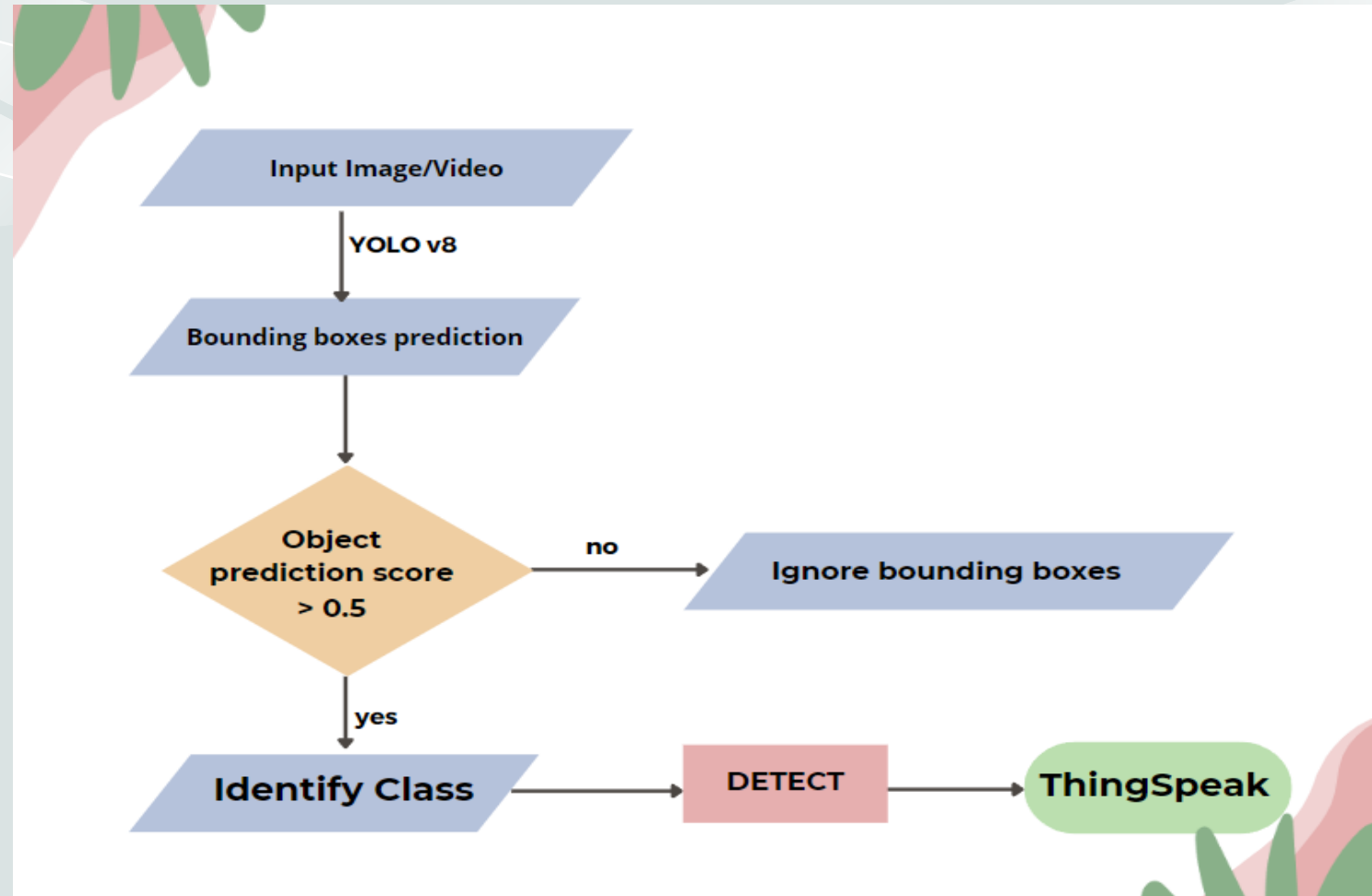
- ✓ OpenCV
- ✓ Ultralytics
- ✓ Pytorch
- ✓ Numpy



# BLOCK DIAGRAM



# BLOCK DIAGRAM



# WORK DONE

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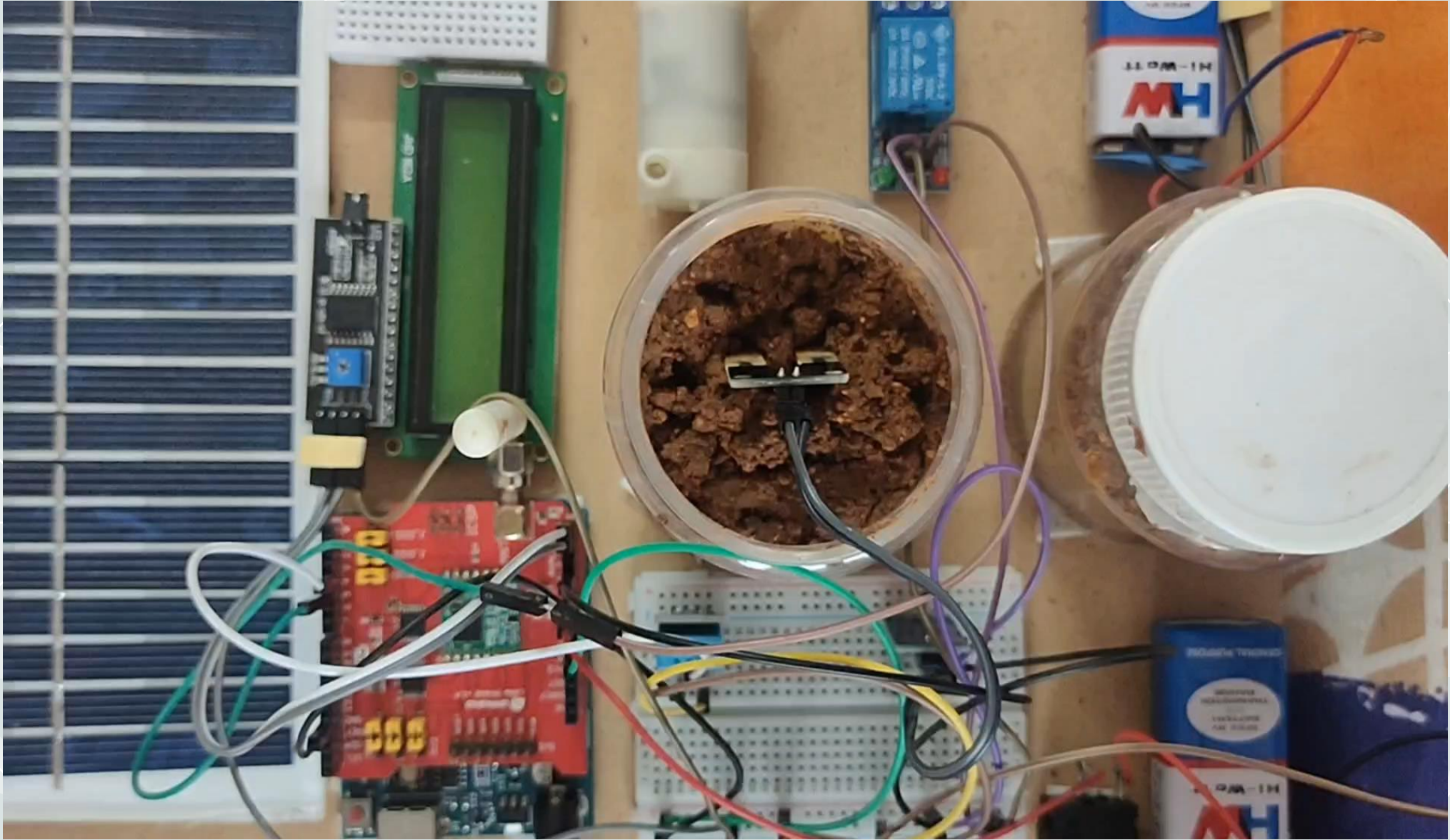
## IN 6<sup>th</sup> semester:

1. Implemented automatic irrigation system with remote monitoring.
2. Crafted LoRaWAN technology to transmit data over long ranges.
3. Solar energy harvesting is employed to ensure sustainable power supply.

## IN 7<sup>th</sup> semester:

1. Trespasser detection using computer vision and promptly send to ThingSpeak.
2. Implemented with Raspberry Pi 3.

# RESULTS





# RESULTS

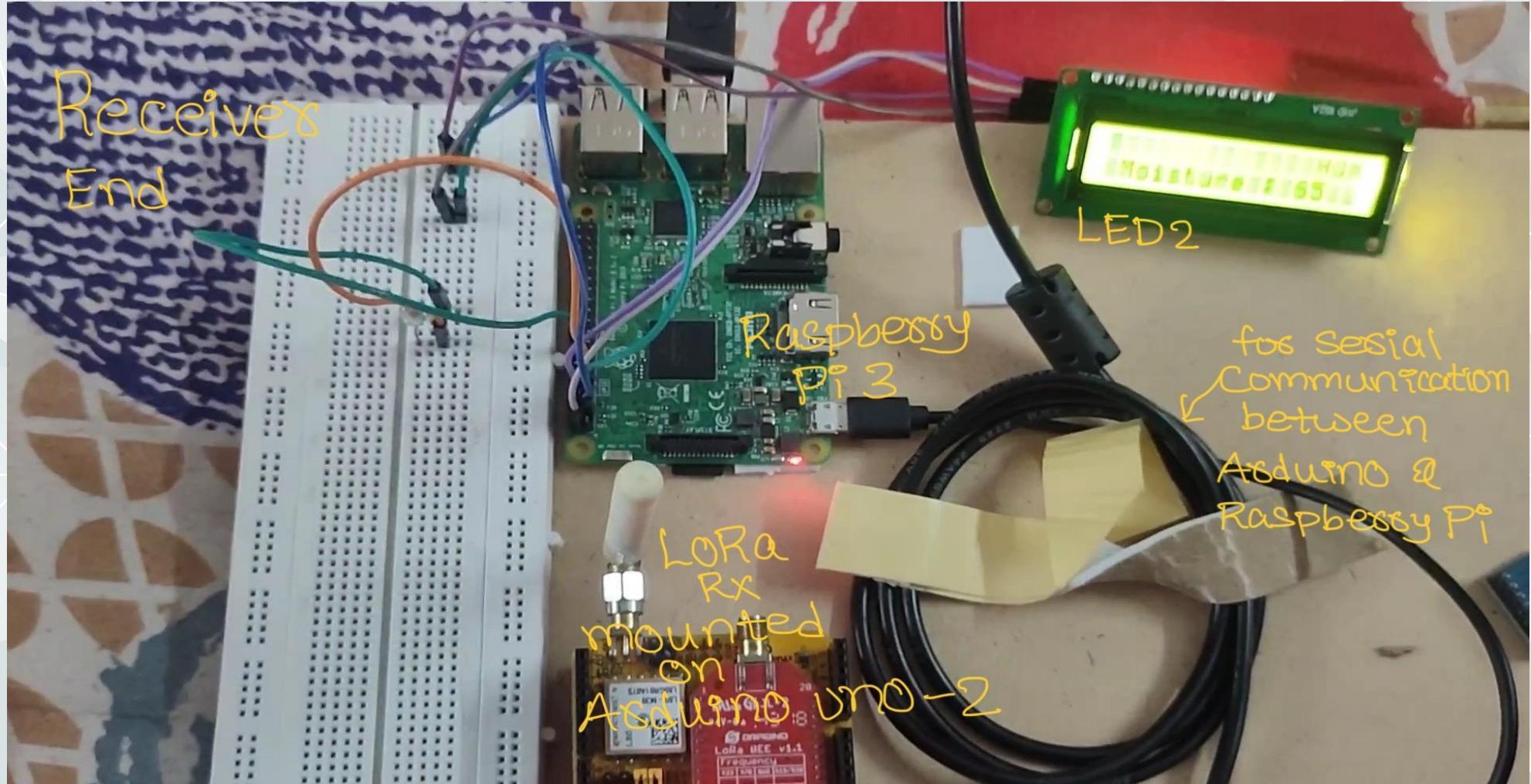
System at Transmitter end:





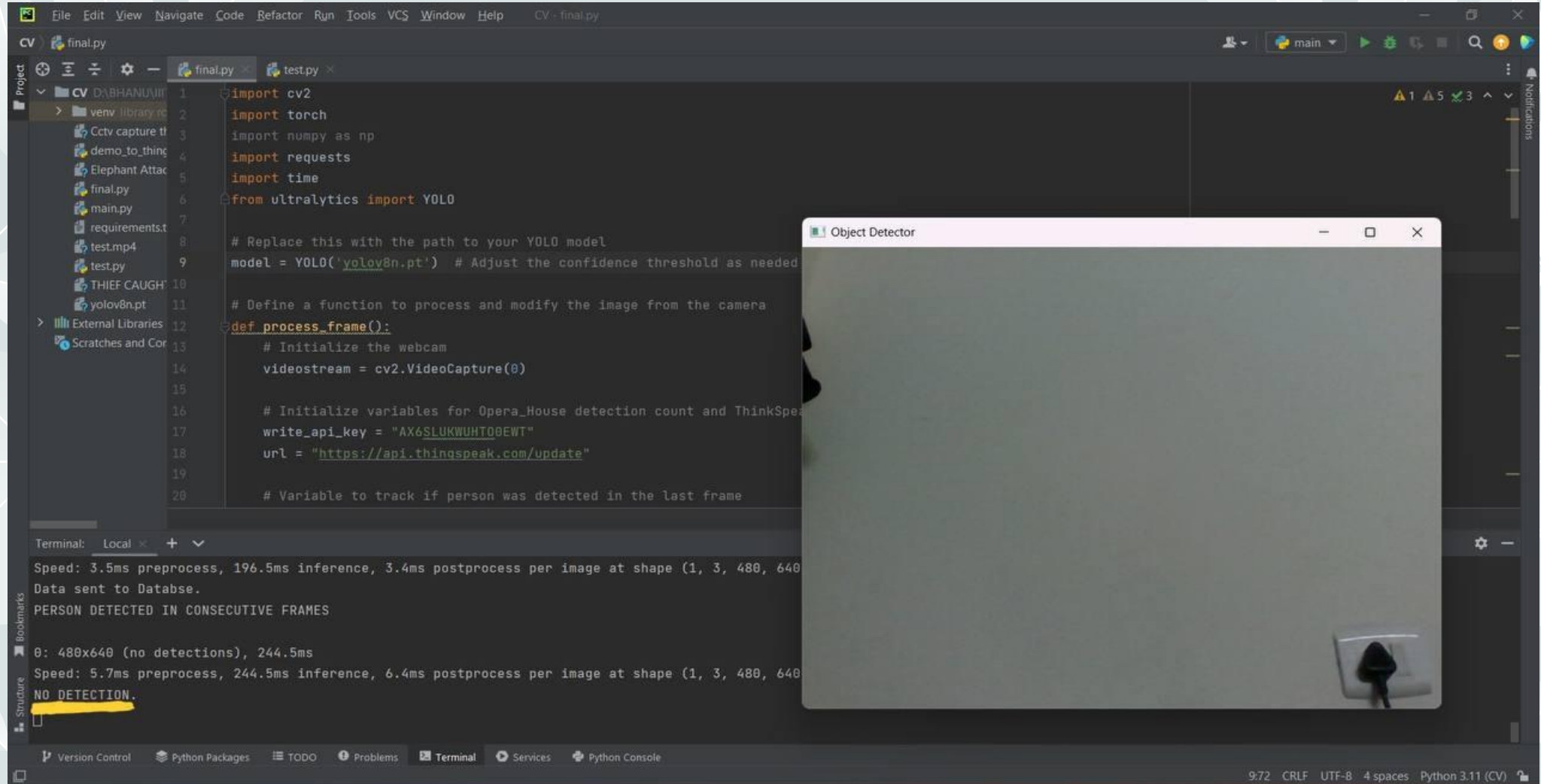
# RESULTS

System at Receiver end:



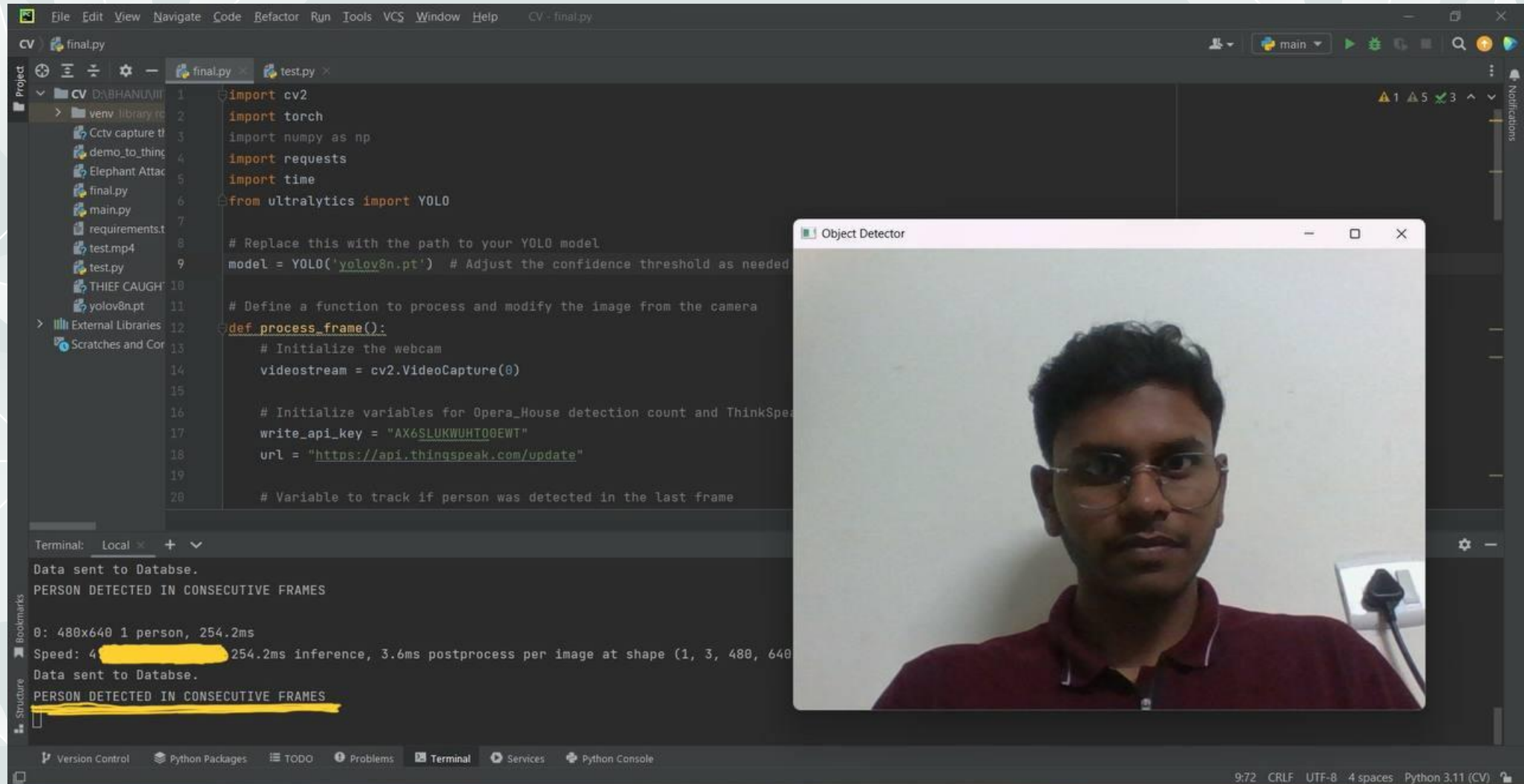
# RESULTS

**When no anomaly detected:**



# RESULTS

When anomaly detected:



The image shows a VS Code IDE interface with a Python script named `final.py` open. The script is designed for object detection using YOLOv8 and includes a function `process_frame()` that captures video from a webcam, processes frames, and sends data to a database. The terminal window at the bottom displays the output of the script, indicating that a person was detected in consecutive frames.

```
1 import cv2
2 import torch
3 import numpy as np
4 import requests
5 import time
6 from ultralytics import YOLO
7
8 # Replace this with the path to your YOLO model
9 model = YOLO('yolov8n.pt') # Adjust the confidence threshold as needed
10
11 # Define a function to process and modify the image from the camera
12 def process_frame():
13     # Initialize the webcam
14     videostream = cv2.VideoCapture(0)
15
16     # Initialize variables for Opera_House detection count and ThinkSpeak
17     write_api_key = "AX6SLUKWUHT08EWT"
18     url = "https://api.thingspeak.com/update"
19
20     # Variable to track if person was detected in the last frame
```

Terminal Output:

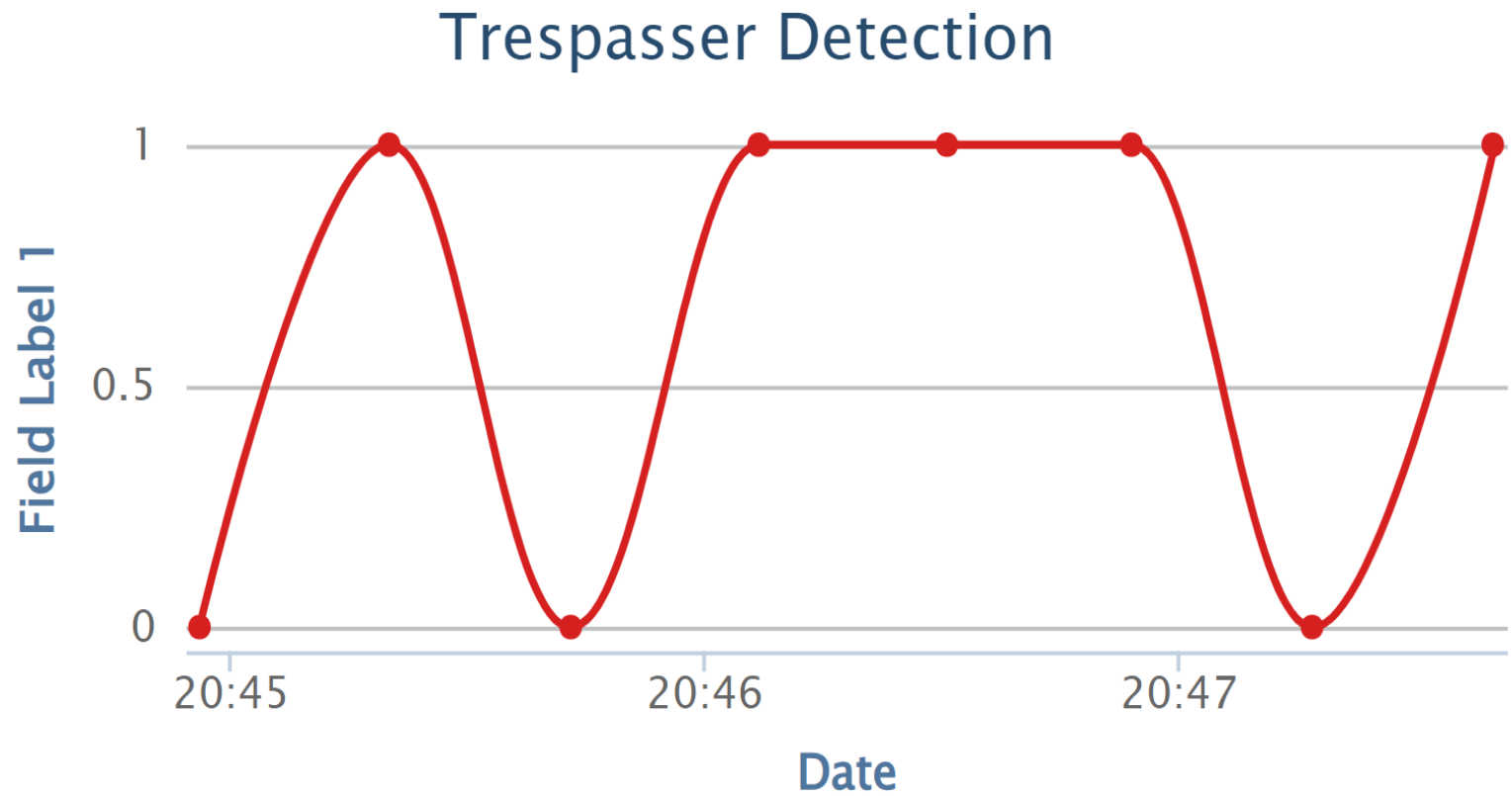
```
Local
Data sent to Database.
PERSON DETECTED IN CONSECUTIVE FRAMES
0: 480x640 1 person, 254.2ms
Speed: 4 [redacted] 254.2ms inference, 3.6ms postprocess per image at shape (1, 3, 480, 640)
Data sent to Database.
PERSON DETECTED IN CONSECUTIVE FRAMES
```

The `Object Detector` window shows a live video feed of a person with glasses and a maroon shirt, confirming the detection results.



# RESULTS

Data being sent to ThingSpeak database and updating in Real-Time:

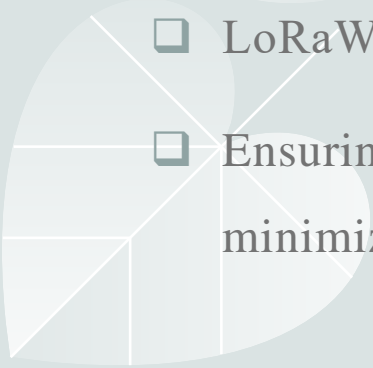





ThingSpeak.com



# CHALLENGES FACED



- ☐ Establishing a Wi Fi connection with Raspberry Pi 3.
  - ☐ The hardware connections proved to be challenging especially with i2C module.
  - ☐ LoRaWAN won't work as specified.
  - ☐ Ensuring accurate differentiate person, animals, and potential intruders, with a focus on minimizing false alarms.
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# CONCLUSION

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- Irrigation is initiated based on soil moisture levels, with the Arduino **autonomously controlling** the pump's operation.
- The farmer can conveniently monitor the farm **remotely** from their home.
- The system employs **solar energy** harvesting techniques for power efficiency.
- Additionally, it incorporates **computer vision** for detecting trespassers and issuing **alert messages** when unauthorized individuals are detected.

# REFERENCES

1. THILAGAVATHI, S., AISHWARYA RAJENDRAN, and K. PRIYADHARSHINI. "AUTOMATIC PLANT IRRIGATION SYSTEM." (2016).
2. S.Parthiban & V.P.Santhi & M.S.Snehapriya & K.Indumathi & P. Masilamani. "Recent Advances in Enhancing the Productivity of Mango through Hi-tech Practices." (2020).
3. J. -H. Kim, N. Kim and C. S. Won, "High-Speed Drone Detection Based On Yolo-V8," ICASSP 2023 - 2023 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), Rhodes Island, Greece, 2023, pp. 1-2, doi: 10.1109/ICASSP49357.2023.10095516.
4. Biswas, B., and Lalit Kumar. "Revolution of Mango production." Fertilizer Marketing News (2011): 1-24.

The background features a light gray surface with several clusters of stylized, semi-transparent leaf shapes. These leaves are rendered in a light gray color with white outlines and internal vein structures. They are arranged in a scattered, organic pattern, primarily concentrated on the left and center-left sides of the frame. The leaves vary in size and orientation, creating a sense of depth and movement. The text 'Thank you!' is centered horizontally and partially overlaid by these leaf patterns.

Thank you!

The background is a light gray color. On the left side, there are several stylized, light gray leaves of various shapes and sizes, some with white veins. A thin, horizontal white line is positioned in the upper right quadrant of the image.

Questions?