



SENTINEL WATCH: **ADVANCED HOME** **PROTECTION SYSTEM**

An open end lab project (OELP)

PRESENTED BY

RACHAMALLA SAI ROHAN(122101030)

LAKSHMI SAGAR REDDY(112101048)

FACULTY MENTOR :

DR .VIVEK CHATURVEDI

CONTENTS

- 1 Background
- 2 Methodology
- 3 YOLO Architecture
- 4 Work in Progress
- 5 Conclusion
- 6 Future Work

BACKGROUND:

- TRADITIONAL SURVEILLANCE SYSTEMS FREQUENTLY FALL SHORT OF OFFERING COMPLETE SOLUTIONS IN AN ERA OF GROWING WORRIES ABOUT HOME SECURITY BECAUSE OF LIMITS IN HARDWARE, STORAGE, AND PROCESSING CAPABILITIES.
- LARGE VIDEO FOOTAGE RETENTION IS HAMPERED BY LOW STORAGE CAPABILITIES, AND SYSTEM FLEXIBILITY IS RESTRICTED BY WIRED CONNECTIONS.
- BY CREATING A STATE-OF-THE-ART SURVEILLANCE SYSTEM THAT MAKES USE OF CLOUD STORAGE, WI-FI-ENABLED SECURITY CAMERAS, AND THE POTENT PROCESSING POWER OF THE JETSON NANO,
- THIS PROJECT SEEKS TO ADDRESS THESE ISSUES BY OFFERING
 - 1.REAL-TIME MONITORING,
 - 2.OBJECT TRACKING,
 - 3.MOVEMENT DETECTION,
 - 4.OBJECT DETECTION
 - 5.ABNORMAL ACTIVITY DETECTION.



METHODOLOGY



- **Hardware Setup:**

Install Wi-Fi-enabled security cameras in strategic locations within the monitored area.

- **Software Development:**

YOLO model for object detection, movement detection, abnormal activity detection, pose estimation, and object tracking

- **Integration:**

Integrate the Deep Learning models with the Jetson Nano for real-time processing of video footage.

- **Cloud Integration:**

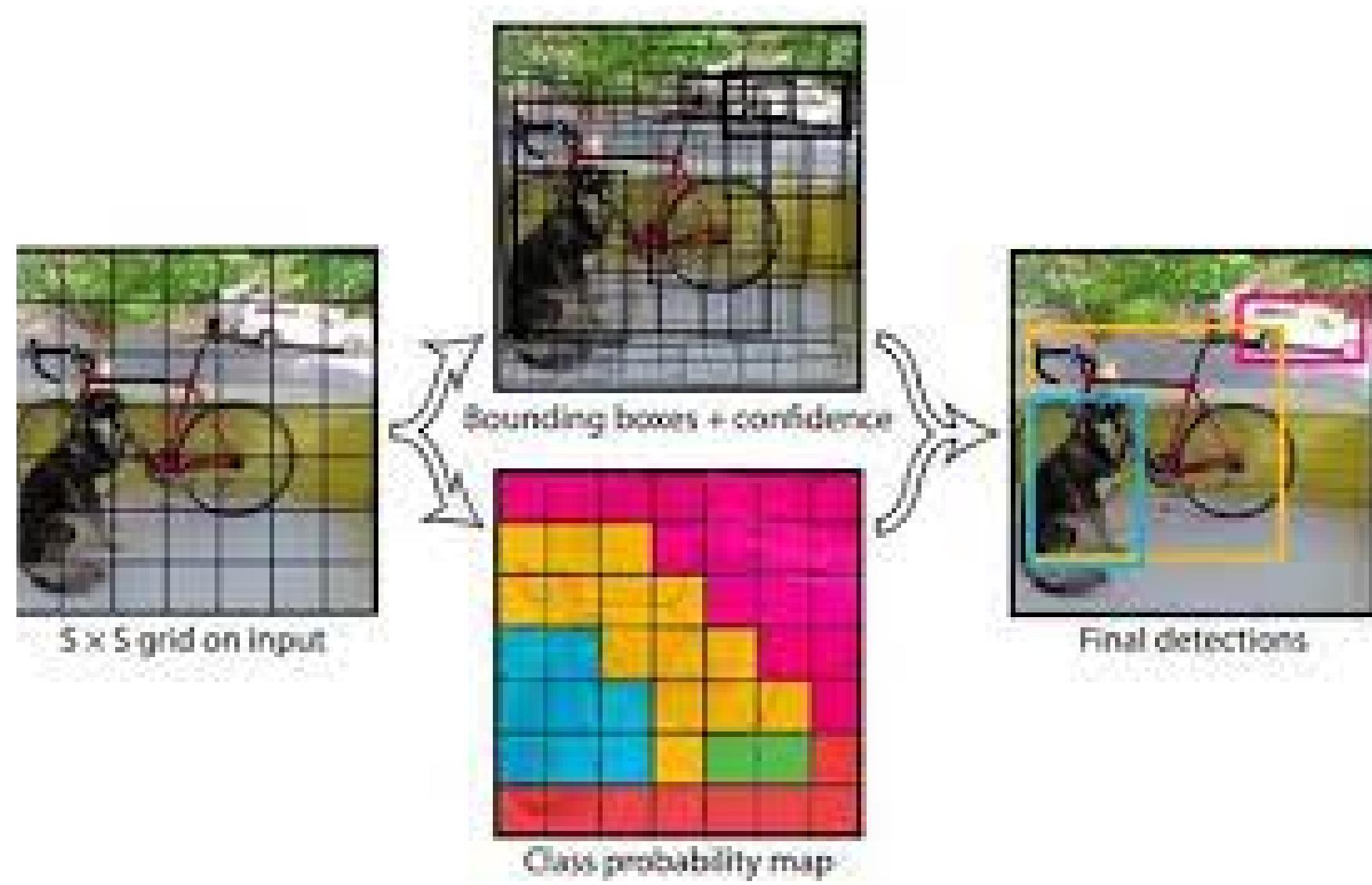
Utilise cloud services for secure storage and access to historical recordings, ensuring scalability and reliability.

- **Testing and Deployment:**

- Conduct thorough testing to ensure the reliability and effectiveness of the surveillance system, optimizing performance where necessary.
- Deploy the comprehensive surveillance system in homes

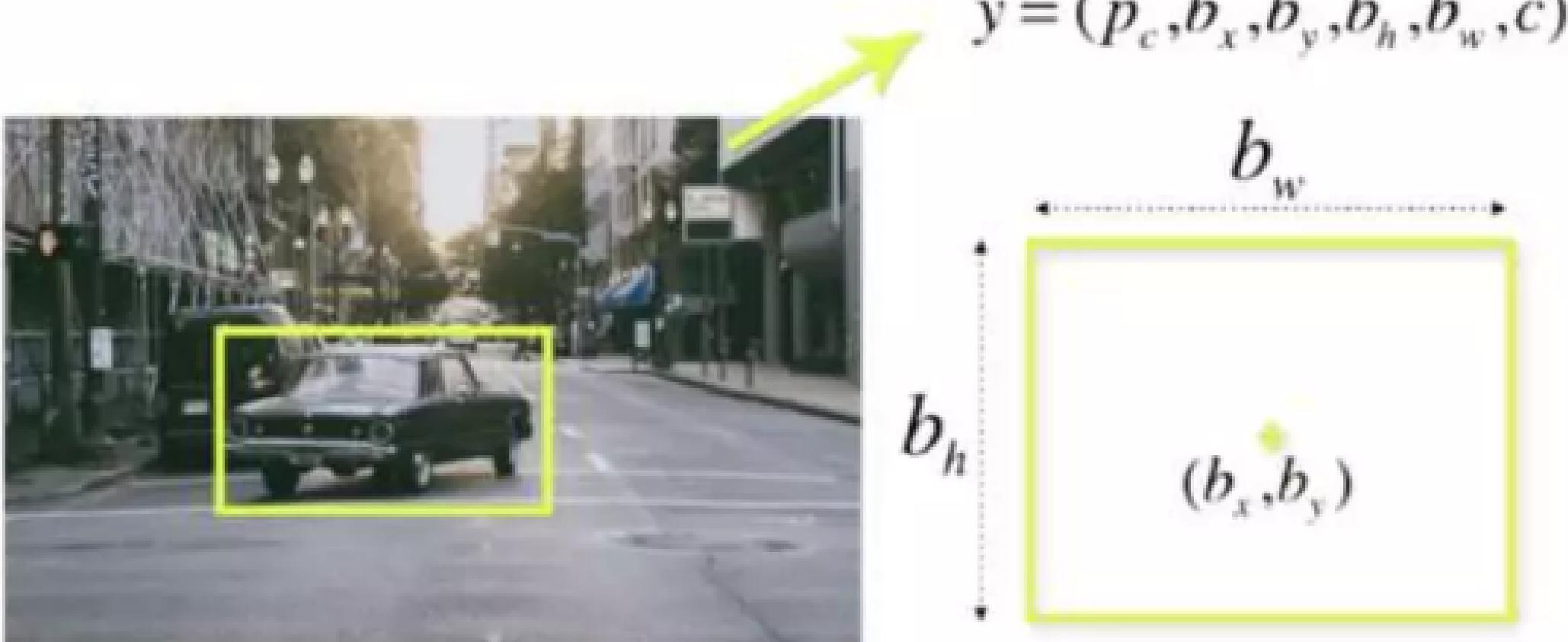
YOLO :

- YOLO : You only look at once
- YOLO Algorithm works by dividing the image into N grids , each having an equal dimensional region $S \times S$
- Each of these N grids is responsible for the detection and localization of the object it contains
- These grids predict B bounding box coordinates relative to their cell coordinates , along with the object label and probability of the object being present in the cell.



- Bounding box is the outline that highlights an object in the image

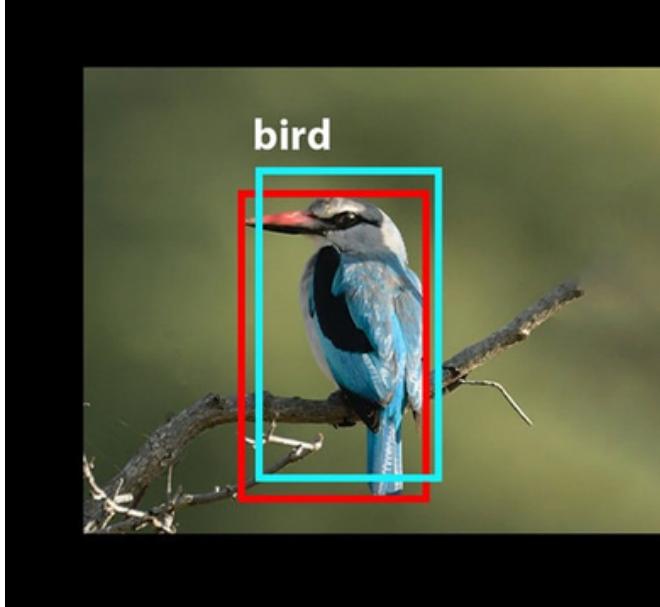
1. Width(b_w),
2. Height(b_h),
3. Class(c)
4. Bounding box center(b_x, b_y)
5. Probability of the class(p_c)



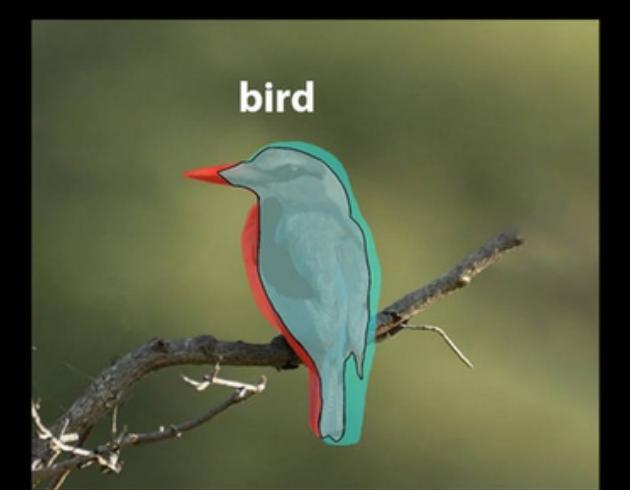
Non Maximal Suppression

- Non maximal suppression uses function called IOU(Intersection of Union)
- It is a performance metric used to evaluate the accuracy of annotation, segmentation, and object detection algorithms.
- IOU assures that the predicted bounding boxes are equal to the real bounding boxes of the objects
- It is used to eliminate unnecessary bounding boxes that doesn't meet the characteristics of the object. And gives the accurate bounding box that bound the object

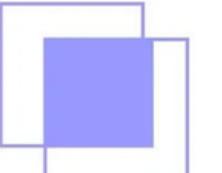
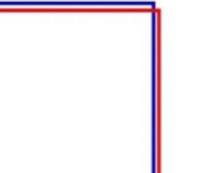
An IOU > 0.5 is taken as positive and IOU <0.5 is taken as negative



$$\text{IoU} = \frac{\text{Area of Overlap}}{\text{Area of Union}}$$



$$\text{IoU} = \frac{\text{Area of Overlap}}{\text{Area of Union}}$$

 Poor
 Good
 Excellent

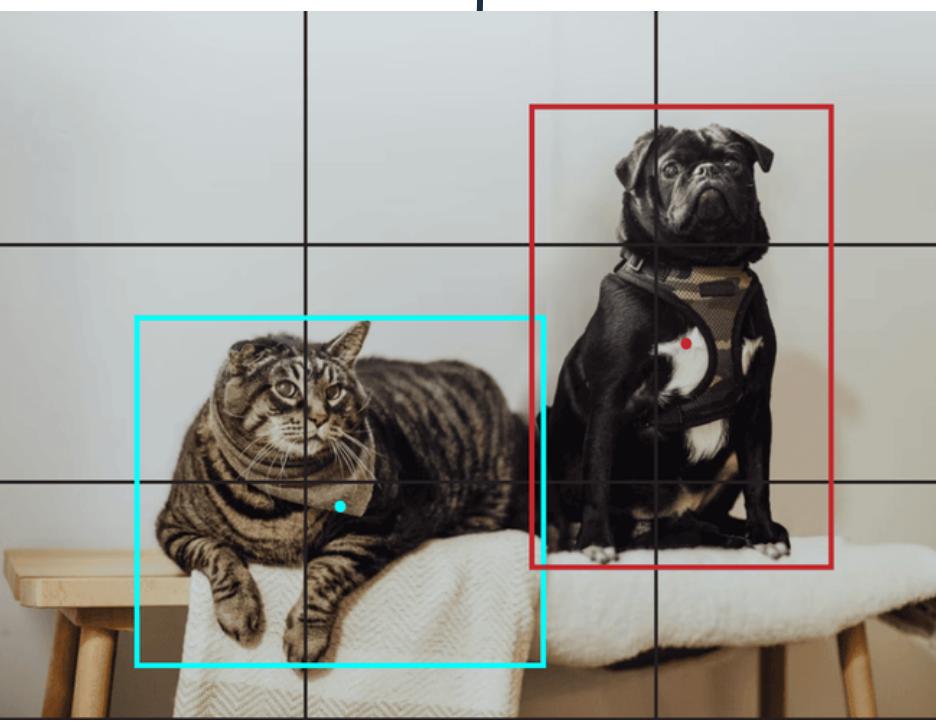
UNDERSTANDING YOLO WITH EXAMPLE

Dividing the image into a grid(3x3).

Encode a vector that will describe the cell

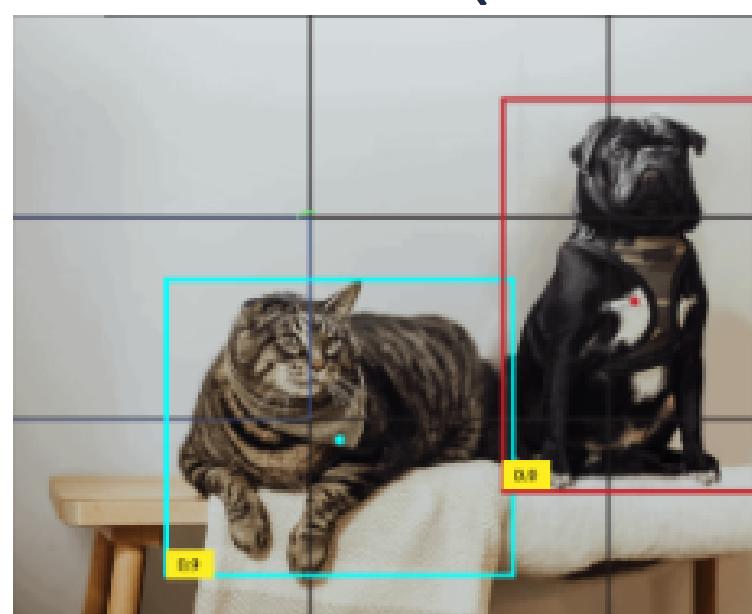
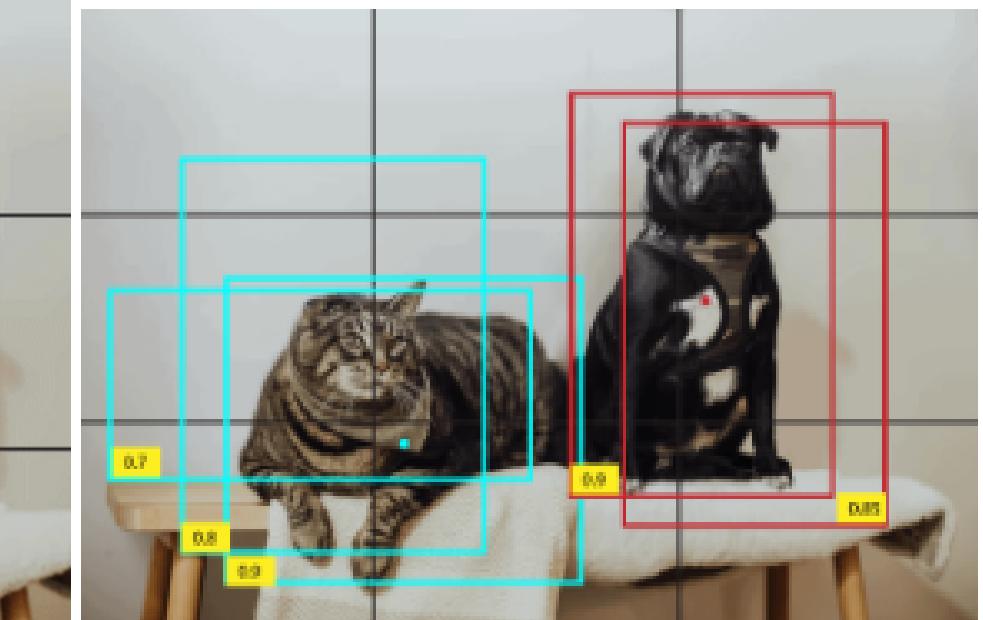
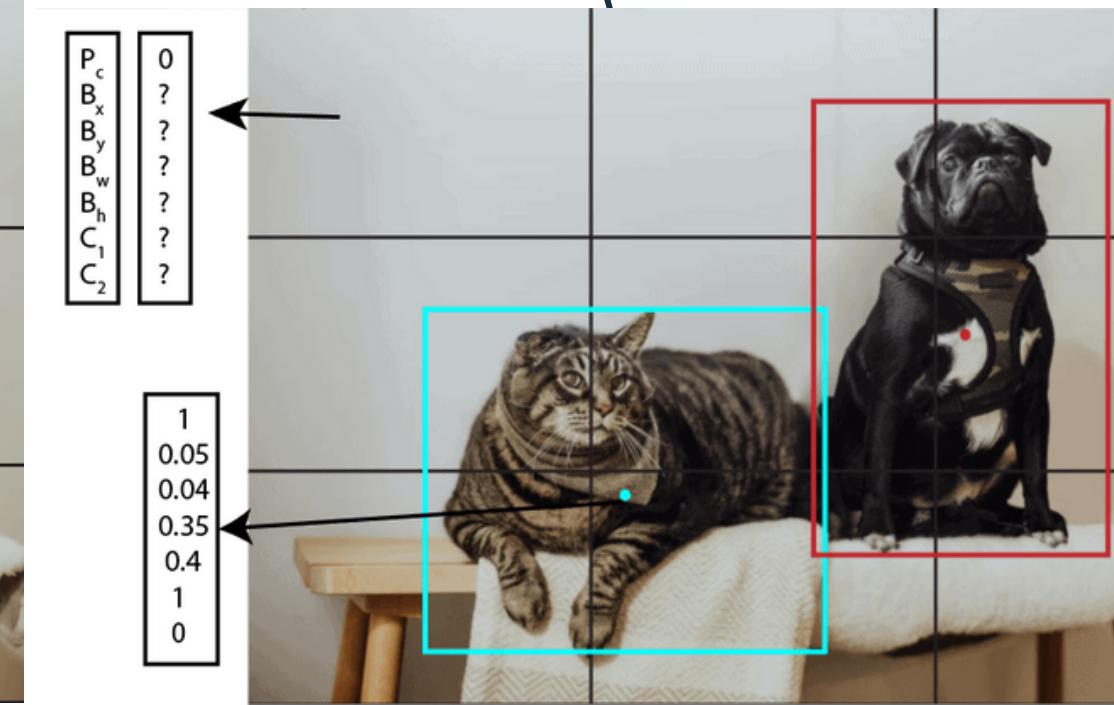
Non-Max Suppression using IOU

Detection of object



P_c	0
B_x	?
B_y	?
B_w	?
B_h	?
C_1	?
C_2	?

1
0.05
0.04
0.35
0.4
1
0



WORK IN PROGRESS

INITIAL OBJECTIVES

- 1) Face recognition of known persons
- 2) Fire Detection
- 3) Fall Detection

- Created a customized data set using makesense.ai for each task
- Trained the yolov8 model for each of the task using dataset made

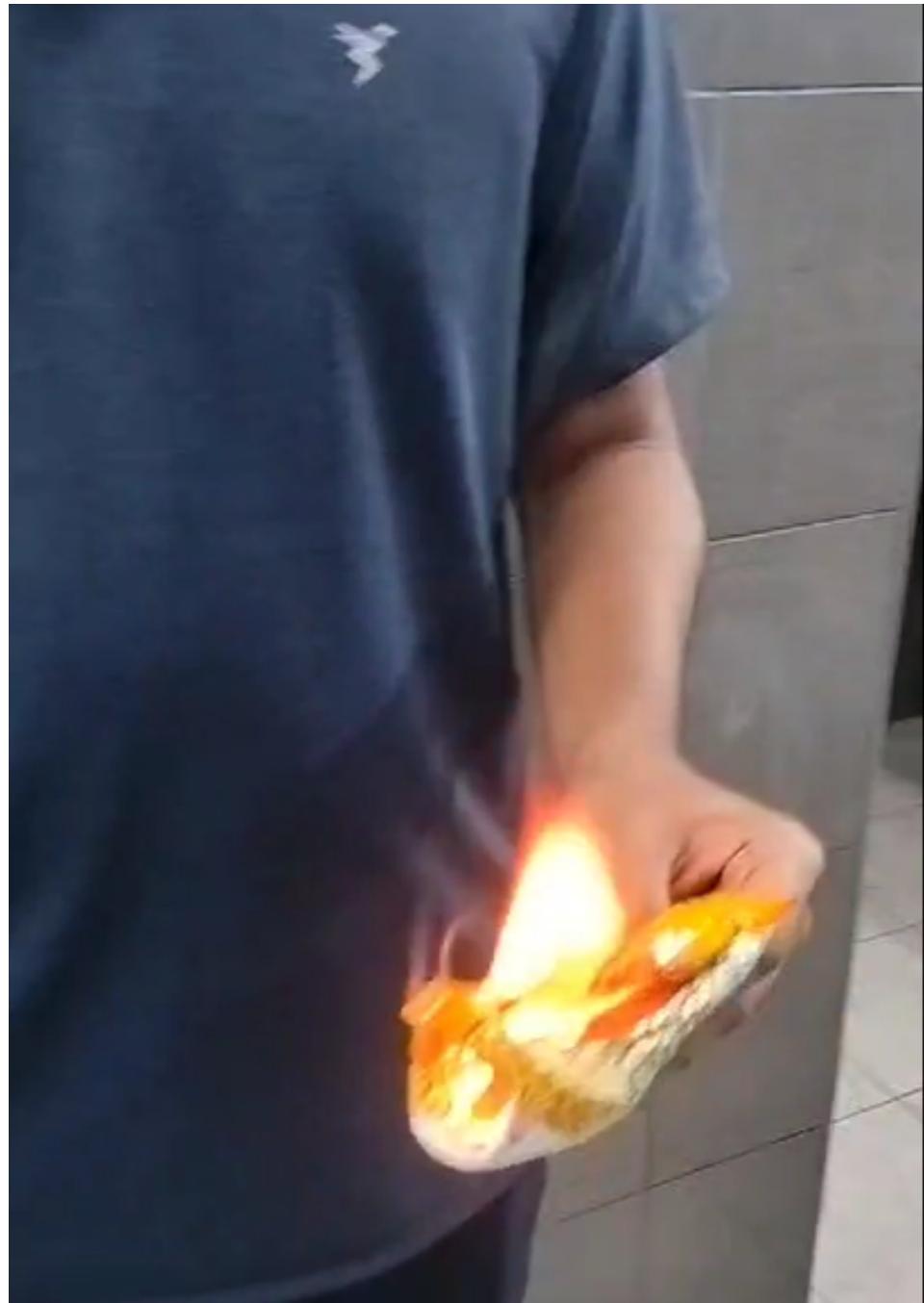
INPUT



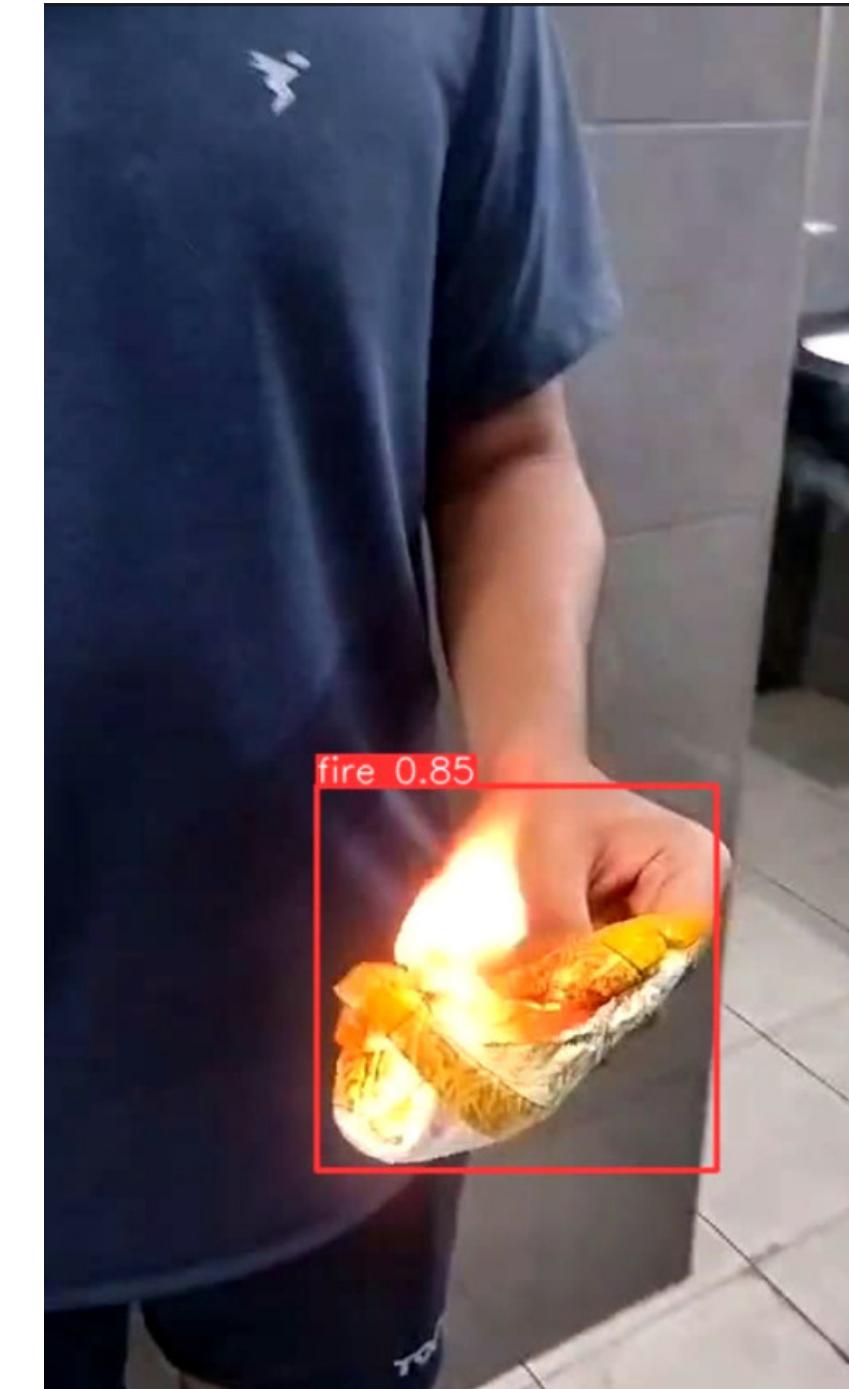
TRAINED MODEL



OUTPUT



FIRE DETECTION



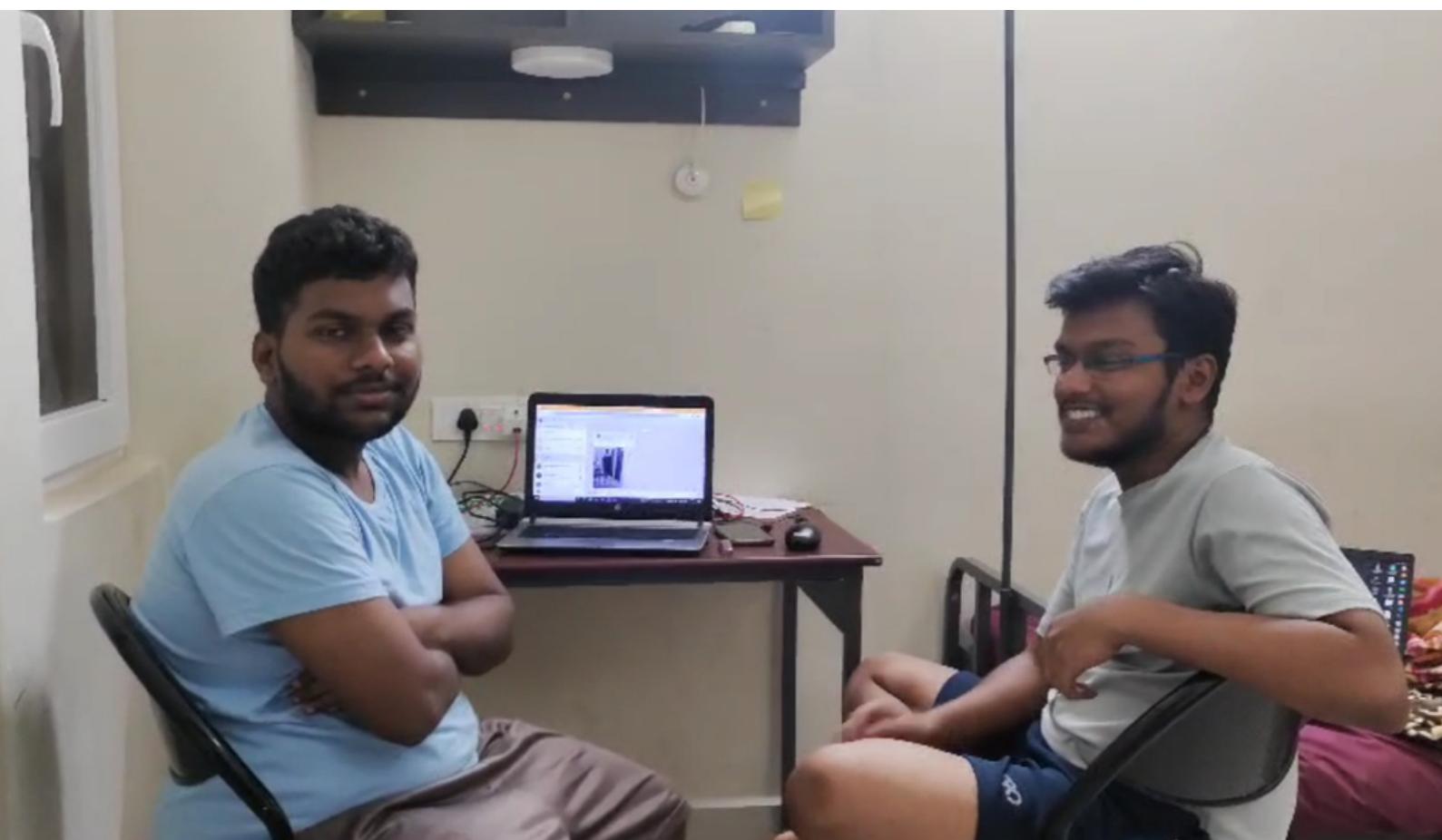
INPUT



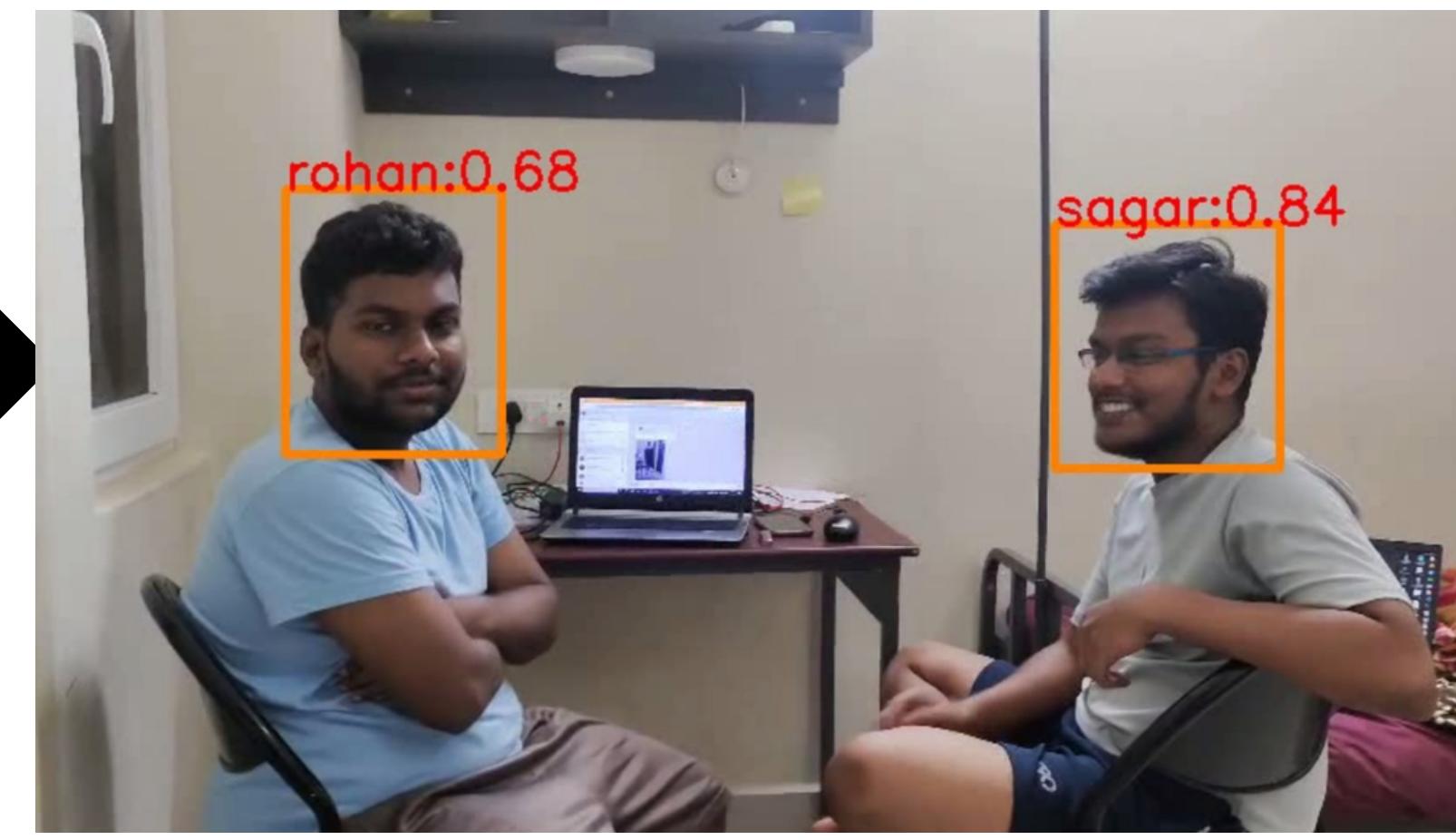
TRAINED MODEL



OUTPUT



**FACE
DETECTION**



INPUT



TRAINED MODEL

OUTPUT

FALL DETECTION



FUTURE WORK(FINAL OBJECTIVES)

Jetson Nano Board

- Understanding how to configure the Jetson Nano Board
- Deploying the Deep learning model (YOLO) in the Jetson Nano Board
- Connecting the Jetson Nano Board with Wi-Fi enabled camera

Notification Alert

- Alerting the admin through notification via telegram
- Creating a web server for the live tracking if any anonymous incident occurs

CONCLUSION

- There is always a need of help when a unfortunate situation happens in a home especially if the family contains elderly and young members.
- So the need of camera surveillance not only important for security but also for the protection of family members
- Using of AI models in computer is common thing now-a-days . In this project we have to deploy Deep learning model (YOLO) in the hardware board - Jetson nano board



After completion of the project , the guardian of the family gets an notification if

- Stranger entering into home other the family members
- Fire is detected
- Falling of a elder person who are along in the home



Thank You