

# Object detection

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## Object detection

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References

Using Python to demonstrate **Ultralytics**: Object Detection in images, videos, and real-time detection.

## 1. Enable optimal performance of the board

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### Enable Jetson Clocks

Enabling Jetson Clocks will ensure that all CPU and GPU cores run at maximum frequency:

```
sudo jetson_clocks
```

## 2. Target prediction: image

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Use yolo11n.pt to predict the images provided by the ultralytics project.

Enter the code folder:

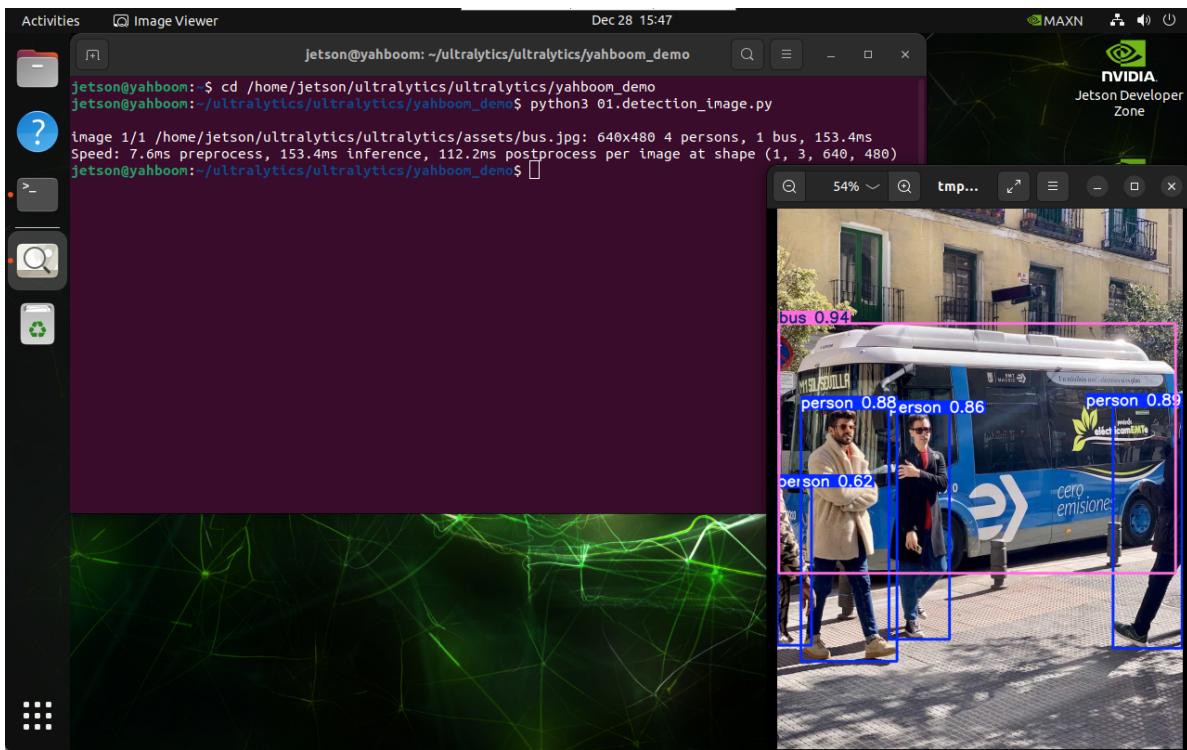
```
cd /home/jetson/ultralytics/ultralytics/yahboom_demo
```

Run the code:

```
python3 01.detection_image.py
```

### Effect preview

Yolo recognition output image location: /home/jetson/ultralytics/ultralytics/output/



Sample code:

```
from ultralytics import YOLO

# Load a model
model = YOLO("/home/jetson/ultralytics/ultralytics/yolo11n.pt")

# Run batched inference on a list of images
results = model("/home/jetson/ultralytics/ultralytics/assets/bus.jpg") # return
a list of Results objects

# Process results list
for result in results:
    boxes = result.boxes # Boxes object for bounding box outputs
    # masks = result.masks # Masks object for segmentation masks outputs
    # keypoints = result.keypoints # Keypoints object for pose outputs
    # probs = result.probs # Probs object for classification outputs
    # obb = result.obb # Oriented boxes object for OBB outputs
    result.show() # display to screen

    result.save(filename="/home/jetson/ultralytics/ultralytics/output/bus_output.jp
g") # save to disk
```

### 3. Target prediction: video

Use `yolo11n.pt` to predict videos under the `ultralytics` project (not the videos that come with `ultralytics`).

Enter the code folder:

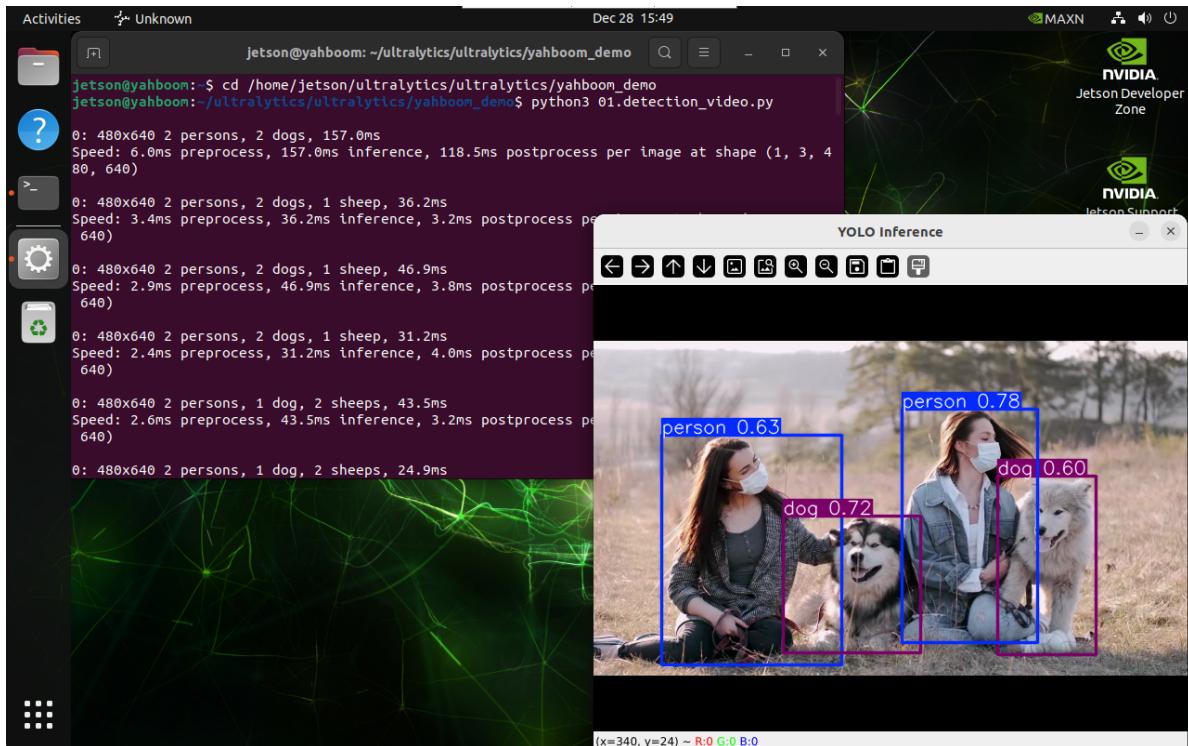
```
cd /home/jetson/ultralytics/ultralytics/yahboom_demo
```

Run the code:

```
python3 01.detection_video.py
```

## Effect preview

Video location of yolo recognition output: /home/jetson/ultralytics/ultralytics/output/



Sample code:

```
import cv2
from ultralytics import YOLO

# Load the YOLO model
model = YOLO("/home/jetson/ultralytics/ultralytics/yolo11n.pt")

# Open the video file
video_path = "/home/jetson/ultralytics/ultralytics/videos/people_animals.mp4"
cap = cv2.VideoCapture(video_path)

# Get the video frame size and frame rate
frame_width = int(cap.get(cv2.CAP_PROP_FRAME_WIDTH))
frame_height = int(cap.get(cv2.CAP_PROP_FRAME_HEIGHT))
fps = int(cap.get(cv2.CAP_PROP_FPS))

# Define the codec and create a Videowriter object to output the processed video
output_path =
"/home/jetson/ultralytics/ultralytics/output/01.people_animals_output.mp4"
fourcc = cv2.VideoWriter_fourcc(*'mp4v') # You can use 'XVID' or 'mp4v'
depending on your platform
out = cv2.VideoWriter(output_path, fourcc, fps, (frame_width, frame_height))

# Loop through the video frames
while cap.isOpened():
    # Read a frame from the video
    success, frame = cap.read()
```

```

if success:
    # Run YOLO inference on the frame
    results = model(frame)

    # Visualize the results on the frame
    annotated_frame = results[0].plot()

    # Write the annotated frame to the output video file
    out.write(annotated_frame)

    # Display the annotated frame
    cv2.imshow("YOLO Inference", annotated_frame)

    # Break the loop if 'q' is pressed
    if cv2.waitKey(1) & 0xFF == ord("q"):
        break
    else:
        # Break the loop if the end of the video is reached
        break

# Release the video capture and writer objects, and close the display window
cap.release()
out.release()
cv2.destroyAllWindows()

```

## 4. Target prediction: real-time detection

Use yolo11n.engine to predict the camera image.

Start the camera.

```

#usb camera
ros2 launch usb_cam camera.launch.py
#nuwa camera
ros2 launch ascamera hp60c.launch.py

```

Enter the code folder:

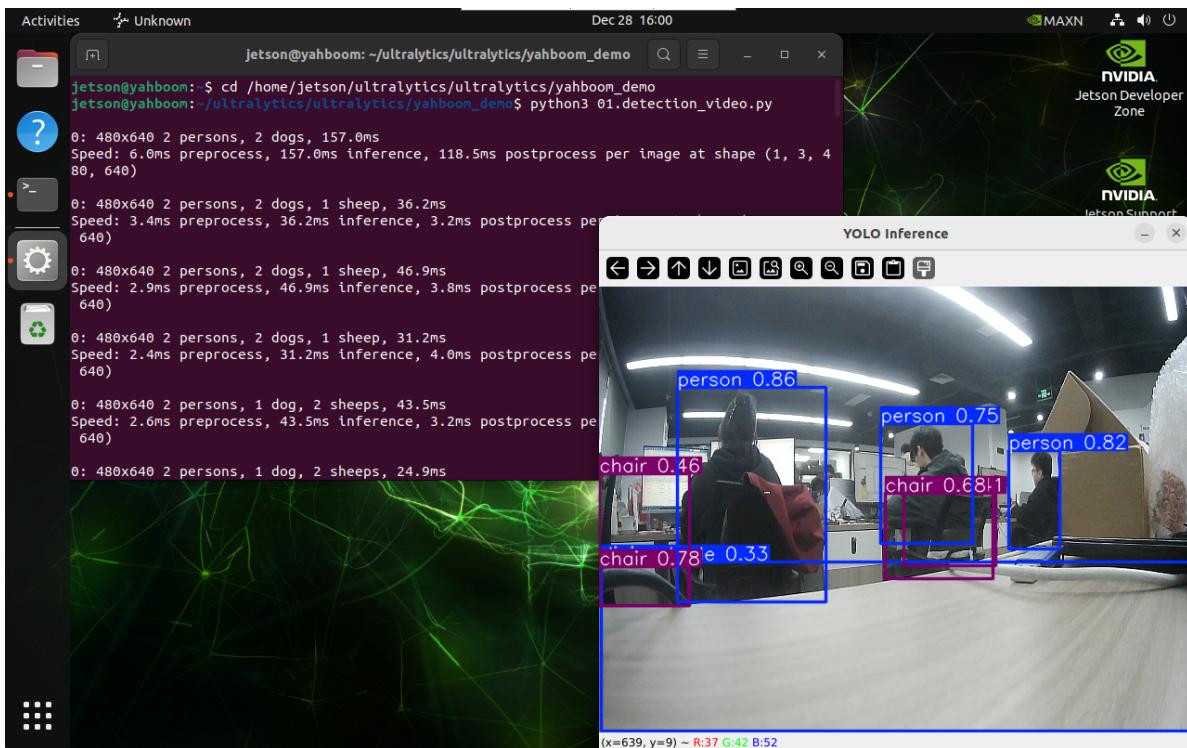
```
cd /home/jetson/ultralytics/ultralytics/yahboom_demo
```

Run the code: Click the preview screen and press the q key to terminate the program!

```
python3 01.detection_camera_usb.py
```

## Effect preview

Video location of yolo recognition output: /home/jetson/ultralytics/ultralytics/output/



Sample code:

```

#!/usr/bin/env python3
import rclpy
from rclpy.node import Node
from sensor_msgs.msg import Image, CompressedImage
from cv_bridge import CvBridge
import cv2
from ultralytics import YOLO
import os
import time

class Image_detection(Node):
    def __init__(self):
        super().__init__('Image_detection')
        self.model = YOLO("/home/jetson/ultralytics/ultralytics/yolo1ln.engine")
        self.camera_type = os.getenv('CAMERA_TYPE', 'usb')
        self.bridge = CvBridge()
        if self.camera_type == 'usb':
            topic_name = '/usb_cam/image_raw'
        else:
            topic_name = '/ascamera_hp60c/camera_publisher/rgb0/image'

        self.subscription = self.create_subscription(Image,topic_name,
        self.image_callback,10)

        # Get the video frame size and frame rate
        frame_width = 640
        frame_height = 480
        fps = 30
        output_path =
        "/home/jetson/ultralytics/ultralytics/output/01.detection_camera_usb.mp4"
        fourcc = cv2.VideoWriter_fourcc(*'mp4v') # You can use 'XVID' or 'mp4v'
depending on your platform
        self.out = cv2.VideoWriter(output_path, fourcc, fps, (frame_width,
        frame_height))
    
```

```

# Initialize time for FPS calculation
self.prev_time = 0

def image_callback(self, msg):
    cv_image = self.bridge.imgmsg_to_cv2(msg, desired_encoding='bgr8')

    self.proecc(cv_image)

# Loop through the video frames
def proecc(self,frame):
    # Run YOLO inference on the frame
    results = self.model(frame)

    # visualize the results on the frame
    annotated_frame = results[0].plot()

    # calculate FPS
    current_time = time.time()
    fps = 1 / (current_time - self.prev_time)
    self.prev_time = current_time

    # Display FPS on frame
    cv2.putText(annotated_frame, f"FPS: {fps:.2f}", (10, 30),
cv2.FONT_HERSHEY_SIMPLEX, 1, (0, 255, 0), 2)

    # Write the annotated frame to the output video file
    self.out.write(annotated_frame)

    # Display the annotated frame
    cv2.imshow("YOLO Inference", cv2.resize(annotated_frame, (640, 480)))

    # Break the loop if 'q' is pressed
    cv2.waitKey(1) & 0xFF == ord("q")

def cancel(self):
    cv2.destroyAllWindows()
    self.out.release()

def main(args=None):
    rclpy.init(args=args)
    node = Image_detection()
    try:
        rclpy.spin(node)
    except KeyboardInterrupt:
        pass
    finally:
        node.cancel()
        node.destroy_node()
        rclpy.shutdown()

if __name__ == '__main__':
    main()

```

## References

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<https://docs.ultralytics.com/tasks/detect/>