Object Recognition（Jetson-Nano)

By using OpenCV to call YOLOv4-tiny for object recognition and detection, the names of most objects can be identified.

Note:

1. **Before starting the program, please follow the [Assembly and Installation Tutorial] -> [Install Map] tutorial to correctly install the map before proceeding.**
2. **This example runs on the host machine; simply open a web browser and enter the IP address:8888**

1. Code path

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```
~/dofbot_ws/src/dofbot_basic_visual/scripts/06.Object_Recognition/06.Object_Reco
gnition.ipynb
```

2.File Configuration

First, we need to import the yolov4-tiny network model structure cfg file, the network weights file, and the COCO dataset classification names txt file. (Here, we directly use the official YOLOv4 dataset and model.)

3. Object Detection

3.1 Building the Model Network Structure

First, we use the **cv2.dnn.readNet()** function to construct the CSPDarknet53 network structure, passing in the model structure cfg file and the network weights file. OpenCV provides several methods for image classification, detection, and segmentation for its neural network modules, automatically performing preprocessing and post-processing of input images. Here, we use the object detection module **cv2.dnn_DetectionModel()**, passing in the network model.

```
self.net = cv2.dnn.readNet('yolov4-tiny.cfg', 'yolov4-tiny.weights')
self.model = cv2.dnn_DetectionModel(self.net)
```

3.2 Target Detection Methods

```
classids, scores, bboxes = self.model.detect(image, confThreshold,
numsThreshold)
```

Parameters:

frame: The input image

confThreshold: The confidence threshold used to filter the bounding boxes; the minimum confidence score for object detection.

numsThreshold: A custom threshold for non-maximum suppression.

Return Value:

classIds: Class index

confidences: Confidence score; the probability that a bounding box belongs to a certain class.

boxes: Bounding box information: top-left corner coordinates (x, y), width and height of the box (w, h).

3.3 Setting Model Input Parameters

```
self.model.setInputParams(size=(320,320), scale=1/255)
```

size indicates how large the input image will be scaled. A larger size results in better detection performance, but slower detection speed. **scale** indicates the scaling factor for pixel values.

4. Main Code

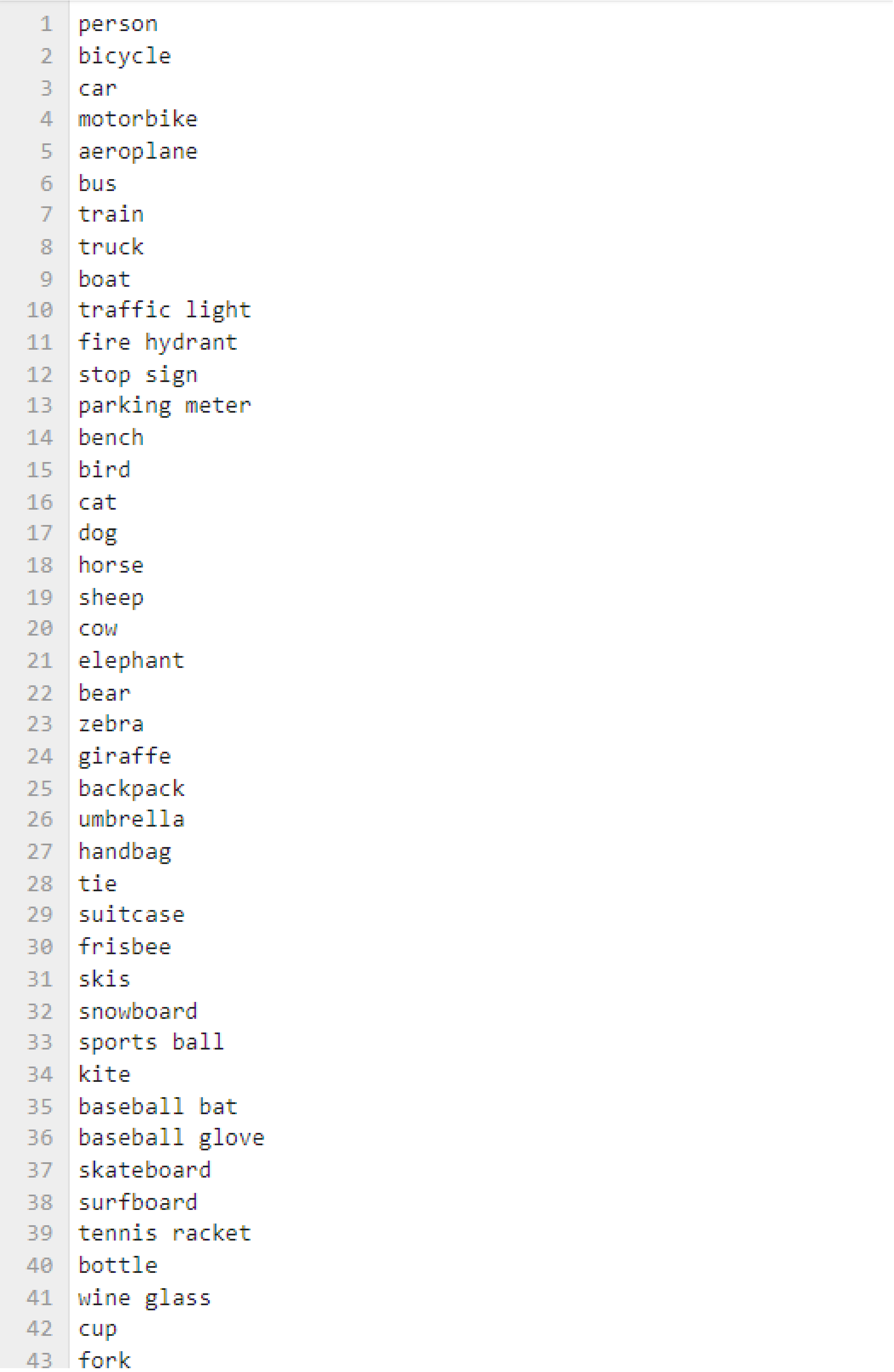
Importing various libraries and model files

```
#!/usr/bin/env python
# coding: utf-8
import Arm_Lib
import cv2 as cv
import threading
from time import sleep
import ipywidgets as widgets
from IPython.display import display
from Object_recognition import Object_recognition_identify
```

Object recognition function

```
def detect_image(self, image):

        classids, scores, bboxes = self.model.detect(image, 0.5, 0.3)

        for class_id, self.score, bbox in zip(classids, scores, bboxes):
            self.x, self.y, self.w, self.h = bbox
            self.class_name = self.classes[class_id]

        cv2.rectangle(image, (self.x,self.y), (self.x+self.w,self.y+self.h),
(255,255,0), 2)

        cv2.putText(image, self.class_name, (self.x,self.y+self.h+20),
cv2.FONT_HERSHEY_COMPLEX, 1, (0,255,0), 2)

        cv2.putText(image, str(int(self.score*100))+'%', (self.x,self.y-5),
cv2.FONT_HERSHEY_COMPLEX, 1, (0,255,255), 2)

        return image
```

List of object names:

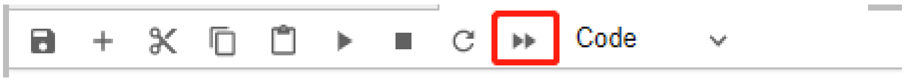


```
person
bicycle
car
motorbike
aeroplane
bus
train
truck
boat
traffic light
fire hydrant
stop sign
parking meter
bench
bird
cat
dog
horse
sheep
cow
elephant
bear
zebra
giraffe
backpack
umbrella
handbag
tie
suitcase
frisbee
skis
snowboard
sports ball
kite
baseball bat
baseball glove
skateboard
surfboard
tennis racket
bottle
wine glass
cup
fork
```

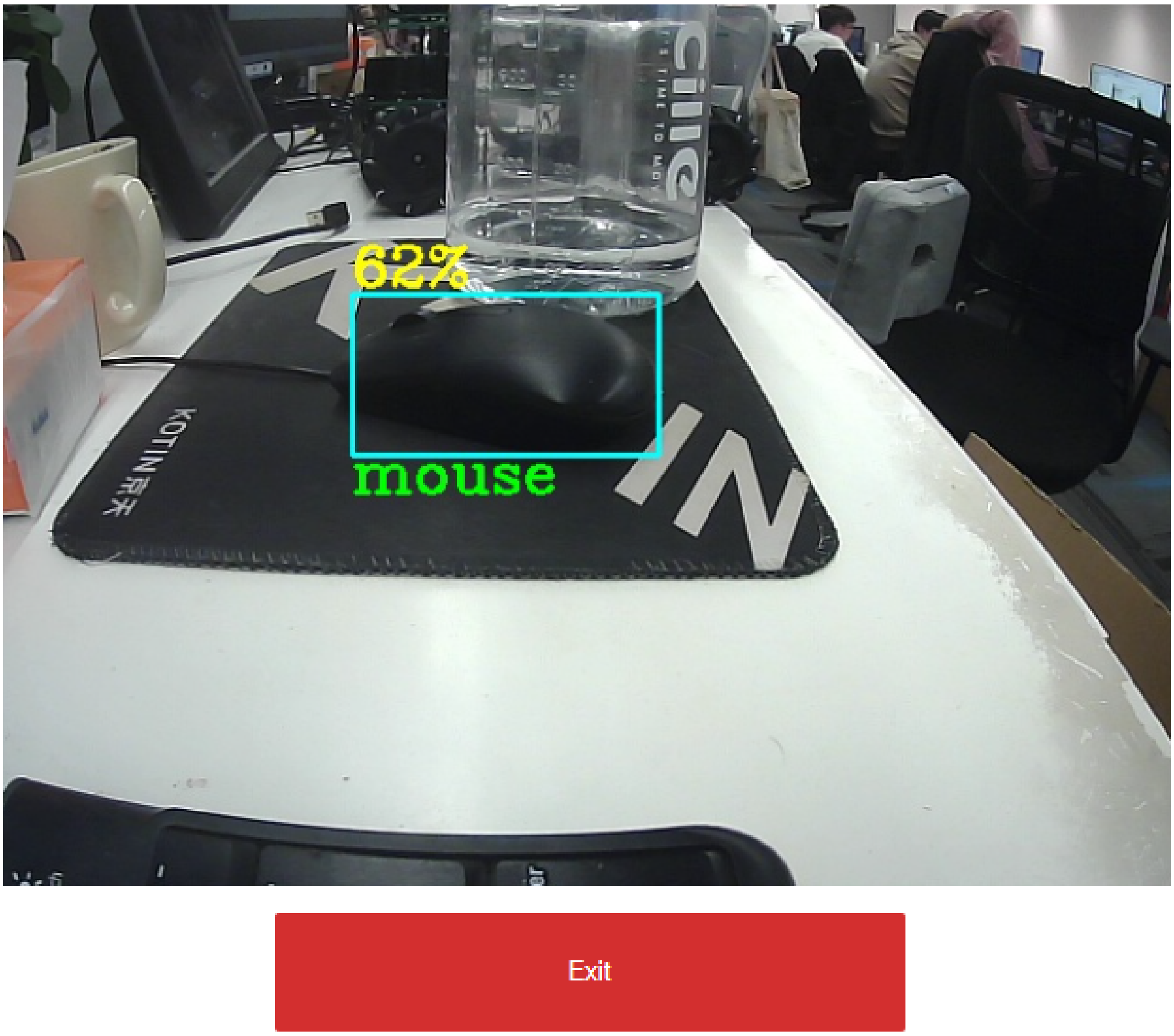
main thread

```
def camera():
    # 打开摄像头 Open camera
    capture = cv.VideoCapture(0)

    while capture.isOpened():
        try:
            _, img = capture.read()
            img = cv.resize(img, (640, 480))
            img = ob_re.detect_image(img)
            if model == 'Exit':
                cv.destroyAllWindows()
                capture.release()
                break
            imgbox.value = cv.imencode('.jpg', img)[1].tobytes()
        except KeyboardInterrupt:capture.release()
```

Click the "Run the whole program" button on the JupyterLab toolbar, then scroll to the bottom to see the camera component displayed.



At this point, placing a recognizable object into the camera's view will allow it to be framed and its name displayed.



If you need to exit the program, please click the "Exit" button.