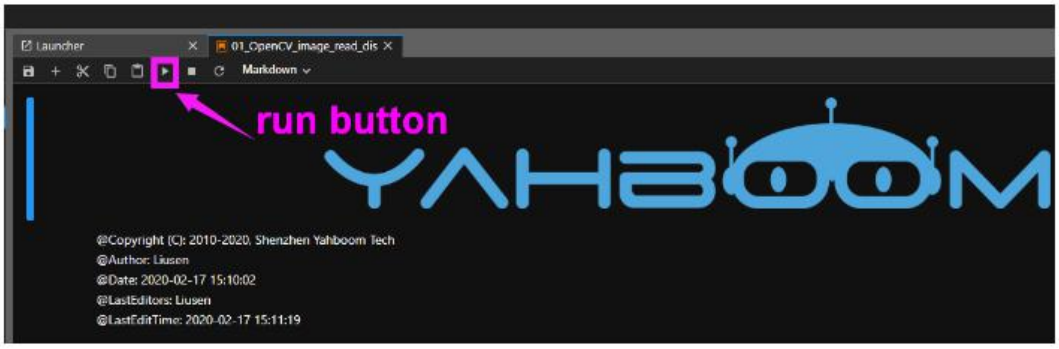
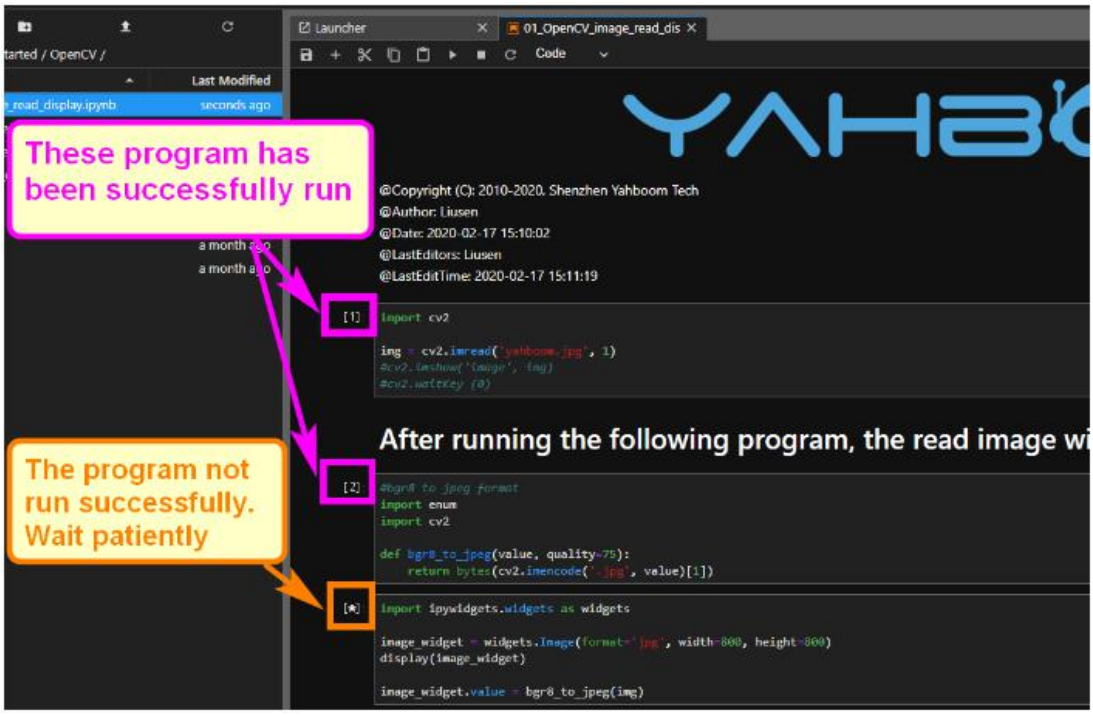
1. About code

Please check **Human_detection_alarm** file.

2. Run program on JupyterLab





3. Program analysis

3.1 Import opencv, tensorflow, control display related libraries.

```
[1]: import numpy as np
     import cv2
     import os,time
     import tensorflow as tf
     from object_detection.utils import label_map_util
     from object_detection.utils import visualization_utils as vis_utils
     import ipywidgets.widgets as widgets
     from image_fun import bgr8_to_jpeg
```

3.2 Import jetcham library for camera use.

Note:

The camera number used when calling the jetcham library needs to be video0.

For example, the code we are using now is a CSI camera, so the CSI camera number in the system also needs to be video0 to be able to call normally.

If you need to use a USB camera, you need to remove the CSI camera on the Jeston NANO.

If you connect a USB camera and a CSI camera at the same time, it is generally assigned to the CSI camera as video0 and the USB camera as video1, so that the USB camera cannot be used normally.

```
[2]: #from jetcam.usb_camera import USBCamera
     from jetcam.csi_camera import CSICamera
     from jetcam.utils import bgr8_to_jpeg

     #camera = USBCamera(width=320, height=240, capture_fps=30)
     camera = CSICamera(width=320, height=240, capture_fps=30)

     camera.running = True
```

3.3 Import libraries related to tensorflow object recognition and create camera display controls.

After running, a frame of the camera will be displayed, and the real-time image will only be displayed if the following continuous cycle update is required.

```
[3]: # Init tf model

     MODEL_NAME = 'ssdlite_mobilenet_v2_coco_2018_05_09' #fast
     PATH_TO_CKPT = MODEL_NAME + '/frozen_inference_graph.pb'
     PATH_TO_LABELS = os.path.join('data', 'mscoco_label_map.pbtxt')

     NUM_CLASSES = 90
     IMAGE_SIZE = (12, 8)
     fileAlreadyExists = os.path.isfile(PATH_TO_CKPT)

     if not fileAlreadyExists:
         print('Model does not exsist !')
         exit
```

```
[4]: # LOAD GRAPH
     print('Loading...')
     detection_graph = tf.Graph()
     with detection_graph.as_default(): #语句下定义属于计算图detection_graph的张量和操作
         od_graph_def = tf.compat.v1.GraphDef()
         with tf.io.gfile.GFile(PATH_TO_CKPT, 'rb') as fid:
             serialized_graph = fid.read()
             od_graph_def.ParseFromString(serialized_graph)
             tf.import_graph_def(od_graph_def, name='')
     label_map = label_map_util.load_labelmap(PATH_TO_LABELS)
     categories = label_map_util.convert_label_map_to_categories(label_map, max_num_classes=NUM_CLASSES, use_display_name=True)
     category_index = label_map_util.create_category_index(categories)
     print('Finish Load Graph..')
```

```
Loading...
Finish Load Graph..
```

```
[5]: print(type(category_index))
```

```
<class 'dict'>
```

```
[ ]: print("dict['Name']: ", category_index[1]['name'])
```

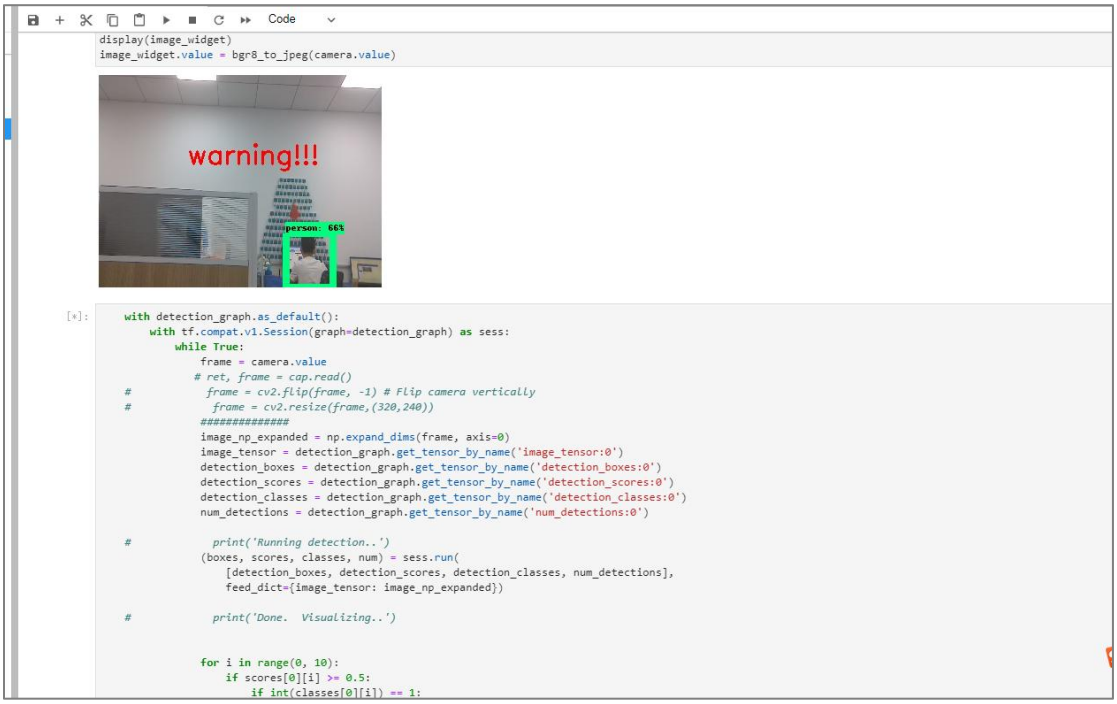
```
[ ]: image_widget = widgets.Image(format='jpg', width=320, height=240)
     display(image_widget)
     image_widget.value = bgr8_to_jpeg(camera.value)
```

3.4 By judging whether there is an ID number corresponding to the person by the value in the class list, it can be judged whether the human body is recognized.

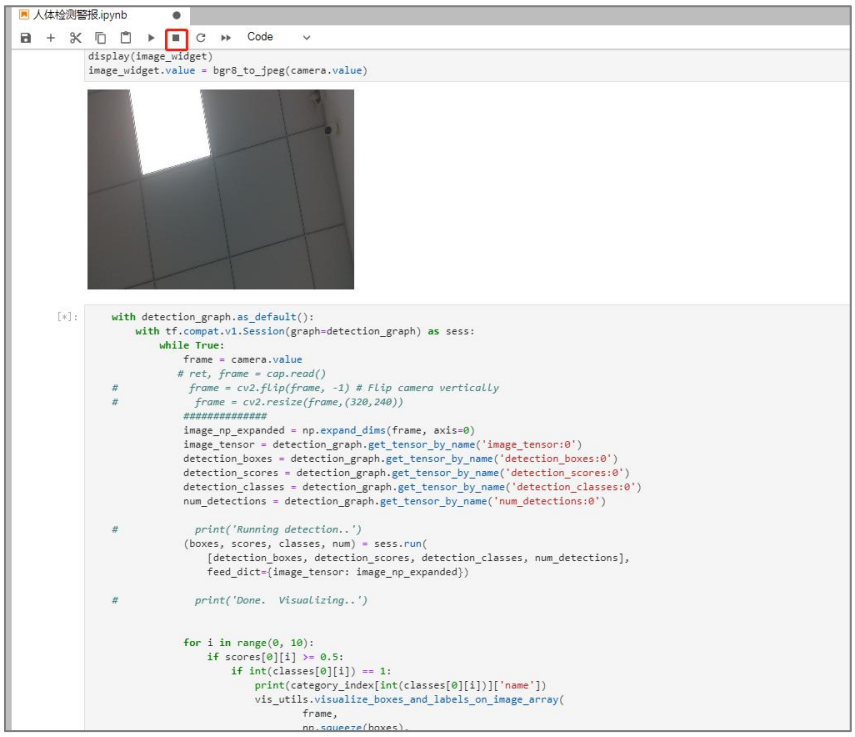
When the human body is recognized, circle the human body with a green wire frame, and the warning is displayed on the screen! ! ! Typeface.

```
with detection_graph.as_default():
    with tf.compat.v1.Session(graph=detection_graph) as sess:
        while True:
            frame = camera.value
           # ret, frame = cap.read()
#            frame = cv2.flip(frame, -1) # Flip camera vertically
#            frame = cv2.resize(frame,(320,240))
            ##############
            image_np_expanded = np.expand_dims(frame, axis=0)
            image_tensor = detection_graph.get_tensor_by_name('image_tensor:0')
            detection_boxes = detection_graph.get_tensor_by_name('detection_boxes:0')
            detection_scores = detection_graph.get_tensor_by_name('detection_scores:0')
            detection_classes = detection_graph.get_tensor_by_name('detection_classes:0')
            num_detections = detection_graph.get_tensor_by_name('num_detections:0')

#            print('Running detection..')
            (boxes, scores, classes, num) = sess.run(
                [detection_boxes, detection_scores, detection_classes, num_detections],
                feed_dict={image_tensor: image_np_expanded})

#            print('Done.  Visualizing..')


            for i in range(0, 10):
                if scores[0][i] >= 0.5:
                    if int(classes[0][i]) == 1:
                        print(category_index[int(classes[0][i])]['name'])
                        vis_utils.visualize_boxes_and_labels_on_image_array(
                                frame,
                                np.squeeze(boxes),
                                np.squeeze(classes).astype(np.int32),
                                np.squeeze(scores),
                                category_index,
                                use_normalized_coordinates=True,
                                line_thickness=8)
                        cv2.putText(frame, "warning!!!", (100,100), cv2.FONT_HERSHEY_SIMPLEX, 1, (0,0,255), 2)


            image_widget.value = bgr8_to_jpeg(frame)
```

As shown below.

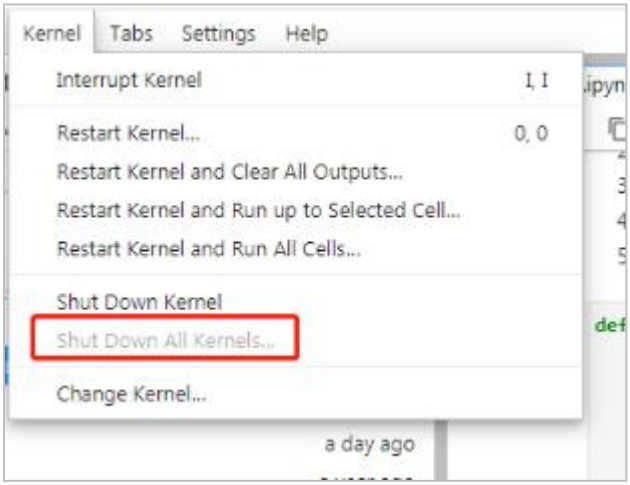


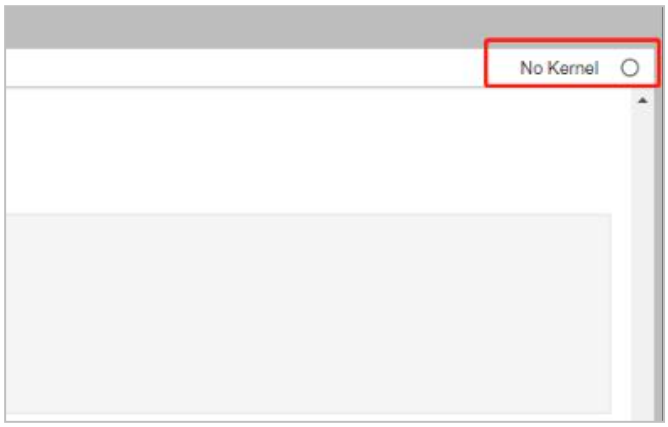
3.5 You can press stop button on JupyterLab to stop this program.



3.6 If you need to shut down this process completely, please do the following operation .

1) Click **[shut down all kernels]** and wait for **[no kernels]** on the upper right corner. After restarting the kernel and clear output, wait for the right side to become python3. If the camera is still occupied, it is recommended to restart





2) Click [restart kernel and clear output], and wait for [Python3] on the upper right corner.