

Project Development Phase

Sprint 3

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| Team ID | PNT2022TMID49001 |
| Project Name | VirtualEye-Life Guard for swimming pools to detect active drowning |
| Maximum Mark | 8 marks |

```
import requests
import progressbar as pb
import os import cv2
import numpy as np
import time [5:36 pm, 12/11/2022] Revathi: def download_file(url,
file_name, dest_dir):
if not os.path.exists(dest_dir):
    os.makedirs(dest_dir) full_path_to_file = dest_dir +

    os.path.sep + file_name

if os.path.exists(dest_dir + os.path.sep + file_name):
return full_path_to_file print("Downloading " +
file_name + " from " + url)

try:
    r = requests.get(url, allow_redirects=True, stream=True)
except:
    print("Could not establish connection. Download failed") return
    None

file_size = int(r.headers['Content-Length']) chunk_size
= 1024
numBars = round(file_size / chunk_size) bar =

pb.ProgressBar(maxval=numBars).start()

if r.status_code != requests.codes.ok:
    print("Error occurred while downloading file") return
    None
```

```

count = 0
with open(full_path_to_file, 'wb') as file:
    for chunk in r.iter_content(chunk_size=chunk_size):
        file.write(chunk)
        bar.update(count)
        count +=1

return full_path_to_file
[5:36 pm, 12/11/2022] Revathi: initialize = True net
= None
dest_dir = os.path.expanduser('~') + os.path.sep + '.cvlib' + os.path.sep + 'object_detection'
+ os.path.sep + 'yolo' + os.path.sep + 'yolov3' classes = None
#colors are BGR instead of RGB in python COLORS
= [0,0,255], [255,0,0]

def populate_class_labels():
    #we are using a pre existent classifier which is more reliable and more efficient than one
    #we could make using only a laptop
    #The classifier should be downloaded automatically when you run this script
    class_file_name = 'yolov3_classes.txt'
    class_file_abs_path = dest_dir + os.path.sep + class_file_name url =
'https://github.com/Nico31415/Drowning-Detector/raw/master/yolov3.txt' if
not os.path.exists(class_file_abs_path):
    download_file(url=...
[5:37 pm, 12/11/2022] Revathi: def get_output_layers(net):

    #the number of output layers in a neural network is the number of possible
    #things the network can detect, such as a person, a dog, a tie, a phone...
    layer_names = net.getLayerNames() output_layers = [layer_names[i[0] - 1] for
i in net.getUnconnectedOutLayers()]

    return output_layers
def draw_bbox(img, bbox, labels, confidence, Drowning, write_conf=False):

    global COLORS global
    classes

    if classes is None: classes =
populate_class_labels() for i, label in
enumerate(labels):

    #if the person is drowning, the box will be drawn red instead of blue if
    label == 'person' and Drowning:
        color = COLORS[0]
        label = 'DROWNING'
    else:
        color = COLORS[1]

```

```

if write_conf:
    label += ' ' + str(format(confidence[i] * 100, '.2f')) + '%'

    #you only need to points (the opposite corners) to draw a rectangle. These points
    #are stored in the variable bbox
    cv2.rectangle(img, (bbox[i][0],bbox[i][1]), (bbox[i][2],bbox[i][3]), color, 2)

    cv2.putText(img, label, (bbox[i][0],bbox[i][1]-10), cv2.FONT_HERSHEY_SIMPLEX, 0.5,
    color, 2)

    return img
def detect_common_objects(image, confidence=0.5, nms_thresh=0.3):

    Height, Width = image.shape[:2] scale
    = 0.00392

    global classes global
    dest_dir

    #all the weights and the neural network algorithm are already preconfigured
    #as we are using YOLO

    #this part of the script just downloads the YOLO files config_file_name
    = 'yolov3.cfg'
    config_file_abs_path = dest_dir + os.path.sep + config_file_name
weights_file_name = 'yolov3.weights'
    weights_file_abs_path = dest_dir + os.path.sep + weights_file_name url =

    'https://github.com/Nico31415/Drowning-Detector/raw/master/yolov3.cfg'

    if not os.path.exists(config_file_abs_path): download_file(url=url,
    file_name=config_file_name, dest_dir=dest_dir) url =
    'https://pjreddie.com/media/files/yolov3.weights'

    if not os.path.exists(weights_file_abs_path):
        download_file(url=url, file_name=weights_file_name, dest_dir=dest_dir)

global initialize
global net

if initialize:
    classes = populate_class_labels()
    net = cv2.dnn.readNet(weights_file_abs_path, config_file_abs_path)
    initialize = False

```

```
blob = cv2.dnn.blobFromImage(image, scale, (416,416), (0,0,0), True, crop=False)
```

```
net.setInput(blob) outs = net.forward(get_output_layers(net))
```

```
class_ids = []  
confidences = []  
boxes = []
```

```
for out in outs:
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```
    for detection in out:
```

```
        scores = detection[5:] class_id =  
        np.argmax(scores) max_conf =  
        scores[class_id] if max_conf >  
        confidence: center_x = int(detection[0] *  
        Width) center_y = int(detection[1] *  
        Height) w = int(detection[2] * Width) h =  
        int(detection[3] * Height) x = center_x -  
        w / 2 y = center_y - h / 2  
        class_ids.append(class_id)  
        confidences.append(float(max_conf))  
        boxes.append([x, y, w, h])
```

```
indices = cv2.dnn.NMSBoxes(boxes, confidences, confidence, nms_thresh)
```

```
bbox = []  
label = []  
conf = []
```

```
for i in indices: i =
```

```
    i[0]
```

```
    box = boxes[i]
```

```
    x = box[0] y =
```

```
    box[1] w =
```

```
    box[2] h =
```

```
    box[3]
```

```
    bbox.append([round(x), round(y), round(x+w), round(y+h)])
```

```
    label.append(str(classes[class_ids[i]])) conf.append(confidences[i])
```

```
    return bbox, label, conf
```

```
#for PiCamera
```

```
#from picamera Import PiCamera
```

```
#camera = PiCamera
```

```
#camera.start_preview() #
```

```
open webcam
```

```
webcam = cv2.VideoCapture(0)
```

```
if not webcam.isOpened():
```

```
    print("Could not open webcam") exit()
```

```

t0 = time.time() #gives time in seconds after 1970
#variable dcount stands for how many seconds the person has been standing still for centre0
= np.zeros(2)
isDrowning = False

```

```

#this loop happens approximately every 1 second, so if a person doesn't move,
#or moves very little for 10seconds, we can say they are drowning

```

```

#loop through frames while
webcam.isOpened():

```

```

    # read frame from webcam status,
    frame = webcam.read()
if not status:
    print("Could not read frame") exit()

    # apply object detection
    bbox, label, conf = cv.detect_common_objects(frame)
    #simplifying for only 1 person

```

```

    #s = (len(bbox), 2)
if(len(bbox)>0):
    bbox0 = bbox[0] #centre
    = np.zeros(s)
    centre = [0,0]

    #for i in range(0, len(bbox)):
        #centre[i] =[(bbox[i][0]+bbox[i][2])/2,(bbox[i][1]+bbox[i][3])/2 ]
centre =[(bbox0[0]+bbox0[2])/2,(bbox0[1]+bbox0[3])/2 ]
    #make vertical and horizontal movement variables hmov
    = abs(centre[0]-centre0[0])
    vmov = abs(centre[1]-centre0[1])

```

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    #there is still need to tweek the threshold
    #this threshold is for checking how much the centre has moved

```

```

    x=time.time()

```

```

    threshold = 10 if(hmov>threshold or
    vmov>threshold): print(x-t0, 's') t0 =
    time.time() isDrowning = False

```

```

else:

```

```

    print(x-t0, 's')
    if((time.time() - t0) > 10):
        isDrowning = True

```

```
#print('bounding box: ', bbox, 'label: ' label , 'confidence: ' conf[0], 'centre: ', centre)
#print(bbox,label ,conf, centre)
print('bbox: ', bbox, 'centre:', centre, 'centre0:', centre0) print('Is
he drowning: ', isDrowning)
```

```
centre0 = centre
# draw bounding box over detected objects
```

```
out = draw_bbox(frame, bbox, label, conf,isDrowning)
```

```
#print('Seconds since last epoch: ', time.time()-t0)
```

```
# display output
cv2.imshow("Real-time object detection", out)
# press "Q" to stop if cv2.waitKey(1)
& 0xFF == ord('q'):
    break
```

```
# release resources
webcam.release()
cv2.destroyAllWindows()
```