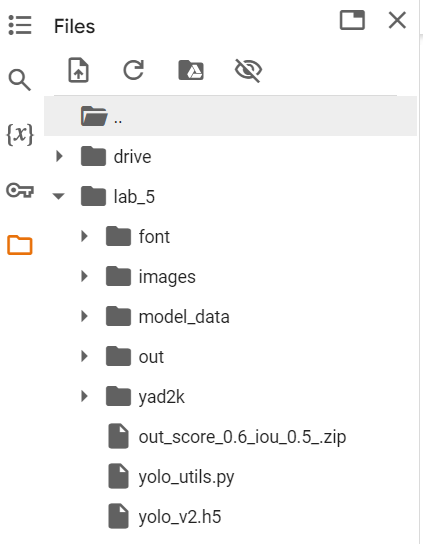
IT21229770– Thushantha L.P.A

Deep Learning - Lab 4 – YOLO object detection

1. Download the yolo\_v2.h5 weights file from the below google drive link. It contains the Yolo version 2 pre-trained model weights. Copy the downloaded file to the ‘model\_data’ directory.
   * Link: <https://drive.google.com/drive/folders/1ogvfqQsLADkVLWt64m-wABDfszHaE8EV?usp=sharing>
2. Zip all folders and file in the lab5.zip except the lab5\_labsheet.docx and Autonomous\_driving\_application\_car\_detection.ipynb and upload the zip file to a google drive folder.
3. Upload the jupyter notebook (i.e., Autonomous\_driving\_application\_car\_detection.ipynb) to Google colab root directory.
4. In the uploaded notebook, change the path in the second cell to the path of the zip file (one created and uploaded in step 2) and run the first two cells. Root directory should look similar to the below image after this.



1. Go through the Autonomous\_driving\_application\_car\_detection.ipynb notebook and try to understand the code.
2. Run the notebook. Make sure to change the dest\_folder path in the final cell before running it. At the end you should see the,
   * Result of the car detection demo (i.e., test.jpg).
   * Results of the random images (i.e., giraffe\_resized.jpg and DSC\_1643\_resized.jpg)
   * Results of all image in the autonomous driving dataset (i.e., 0100.jpg to 0120.jpg) saved to out directory.
   * A zip file containing all above images in the colab root as well as in your google drive.
3. In the below given cell, shape of the boxes.eval() is (1783,4). Why are there 1783 boxes? Explain the reason for it. What is the maximum number and minimum number you can get for that? Write these answers in a word file.

# Answers -

**Why are there 1783 boxes?**

* The shape `(1783, 4)` of `boxes.eval()` identifies that there are 1783 boxes that meet the filter set from the function `yolo\_filter\_boxes`. The number is bound by the number of boxes that have a confidence score above the threshold of 0.5.

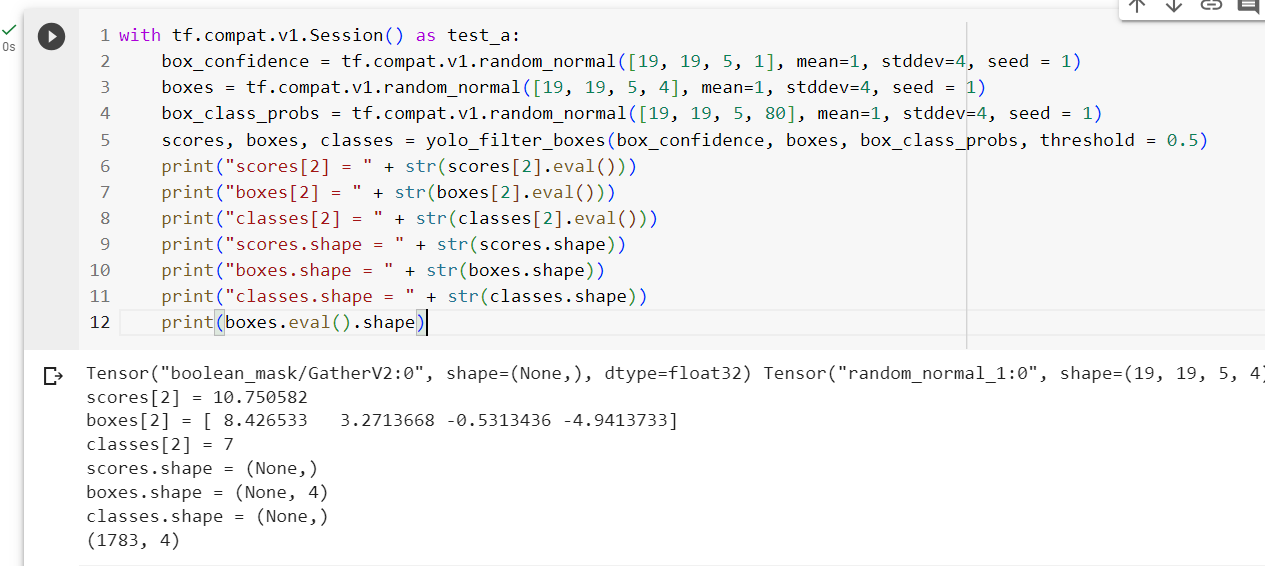
**What is the maximum number and minimum number you can get for that? –**

* The maximal number can be 1805, as that is the total number of boxes before filtering, and that would be if all boxes have their confidence scores higher than the threshold.  
  The minimal number of boxes you may get is 0, which will occur in the case when no boxes meet the criteria of the confidence threshold.

* + Change the values like mean and stddev in lines 2 and 4 as well as threshold value in line 5 and observe the different values you get for the boxes.eval().shape.

**Mean = 2, stddev=5, threshold = 0.4**

**the boxes.eval().shape** = classes.shape = (1794, 4)



1. yolo\_anchors.txt contains 10 values. They can be considered as height and width of 5 anchor boxes. What is the advantage of using such anchor boxes? What was the method used to determine the sizes of these anchor boxes? Give the answers to these questions in the word file.

# Answers –

* + **What is the advantage of using such anchor boxes?**

Anchor boxes improve object detection by helping the model handle different object sizes and shapes more accurately and efficiently.

* **What was the method used to determine the sizes of these anchor boxes?**

K-means clustering

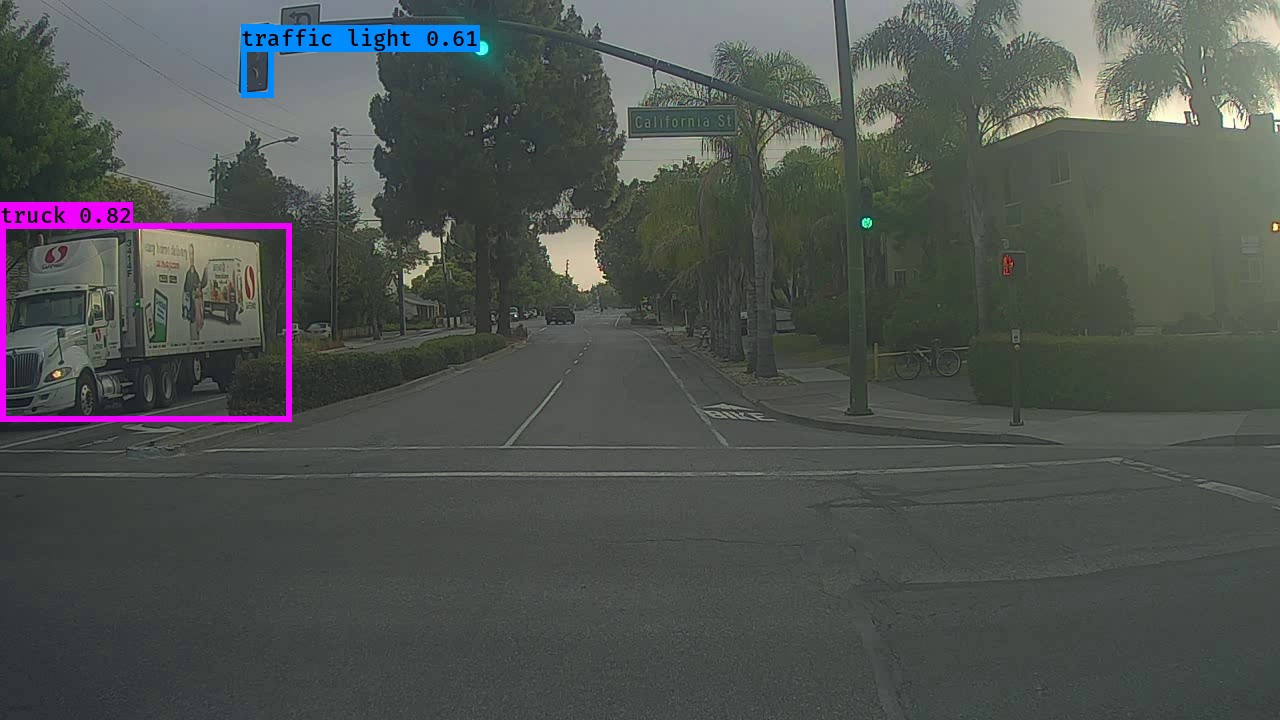
1. Upload a new traffic image to images and edit the code as needed to detect vehicles in that image.
2. Download the output images zip file from the google drive and observe the bounding boxes in the autonomous driving dataset (i.e., 21 images from 0100.jpg to 0120.jpg). Select 2 images from these 21 images and,
   * Write what you observe regarding correctly detected objects, incorrectly detected objects, undetected objects and incorrect bounding boxes in the word file.
   * Include these output 2 images as well as the original 2 images in the word file.

**First image bus correctly detect. No incorrectly detected objects. Traffic lights, Jeep, Bicycle and Truck should be detected**

**Second image both truck and traffic light detected. No incorrectly detected objects. Bicycle, Cars should be detected**



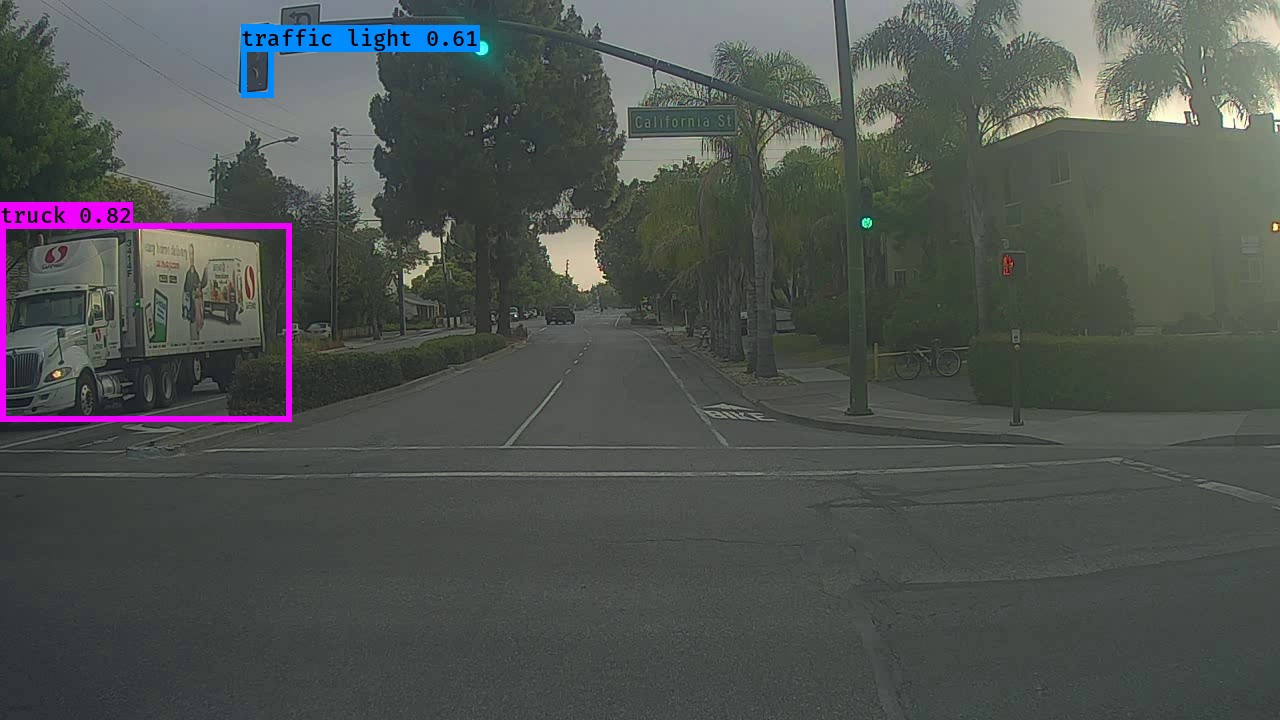
A street with a green light

Description automatically generated

1. Adjusting parameters like max\_boxes, score\_threshold, and iou\_threshold of the yolo\_eval function can potentially address the limitations you noticed in step 10.
   * Change the max\_boxes [integer value] to a different value but use the original values for other 2 variables. Rerun the required cells to get the output images for the autonomous driving dataset. Observe if this result in improvement compared to step 10 for the same two images. If there are any improvements, write them in the word file. Include the new 2 output images in the word file.

**A street with a green light

Description automatically generatedChange Max Box Size to 100 – nothing Changed**

****

* + Change the score\_threshold [value between 0-1] to a different value but use the original values for other 2 variables. Rerun the required cells to get the output images for the autonomous driving dataset. Observe if this result in improvement compared to step 10 for the same two images. If there are any improvements, write them in the word file. Include the new 2 output images in the word file.

**Changed score threshold value to 0.1 –**

**It detects 4 traffic lights, 3 cars and 2 buses in first image.**

**It detects more traffic lights closer to 7, 2 Bicycles one Truck and two cars**

**So, when threshold value decrease to 0.1 along with other two values there has a big improvement**

**A street with trees and signs

Description automatically generated with medium confidence**

* + Change the iou\_threshold [value between 0-1] to a different value but use the original values for other 2 variables. Rerun the required cells to get the output images for the autonomous driving dataset. Observe if this result in improvement compared to step 10 for the same two images. If there are any improvements, write them in the word file. Include the new 2 output images in the word file.

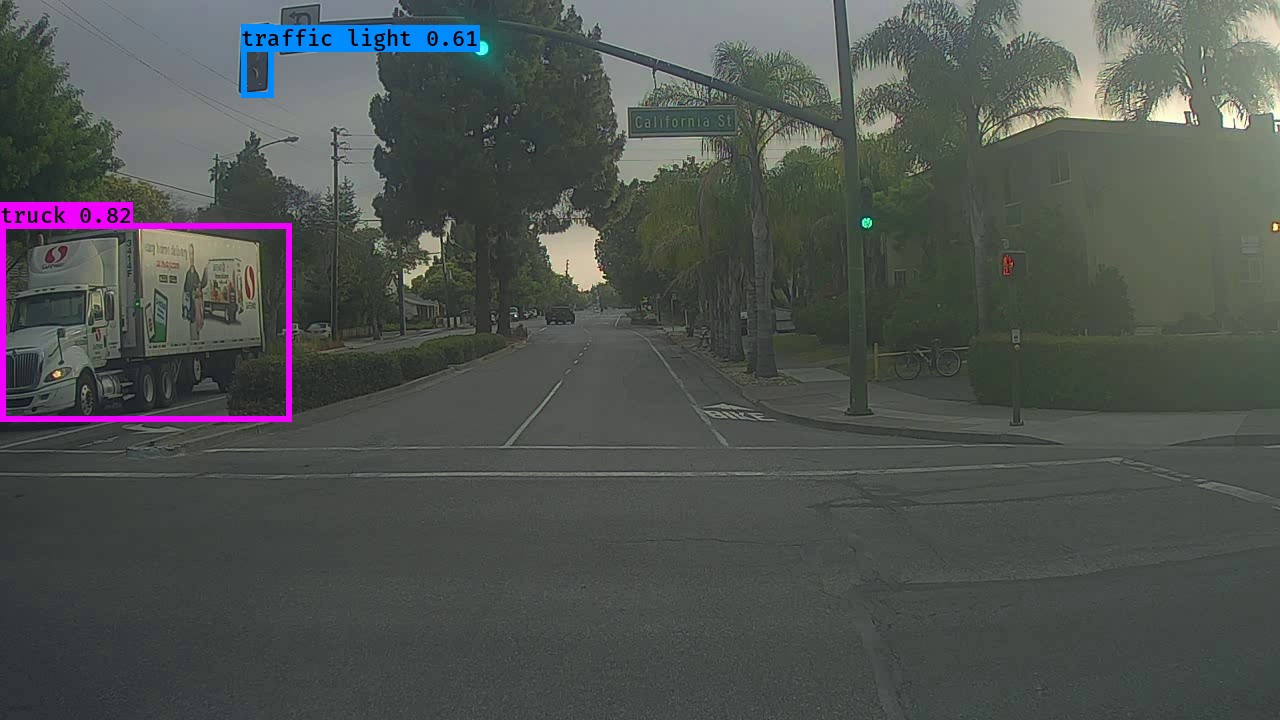
**Changed iou\_threshold value to 0.1 – changed nothing**

**Changed iou\_threshold value to 0.9 –**

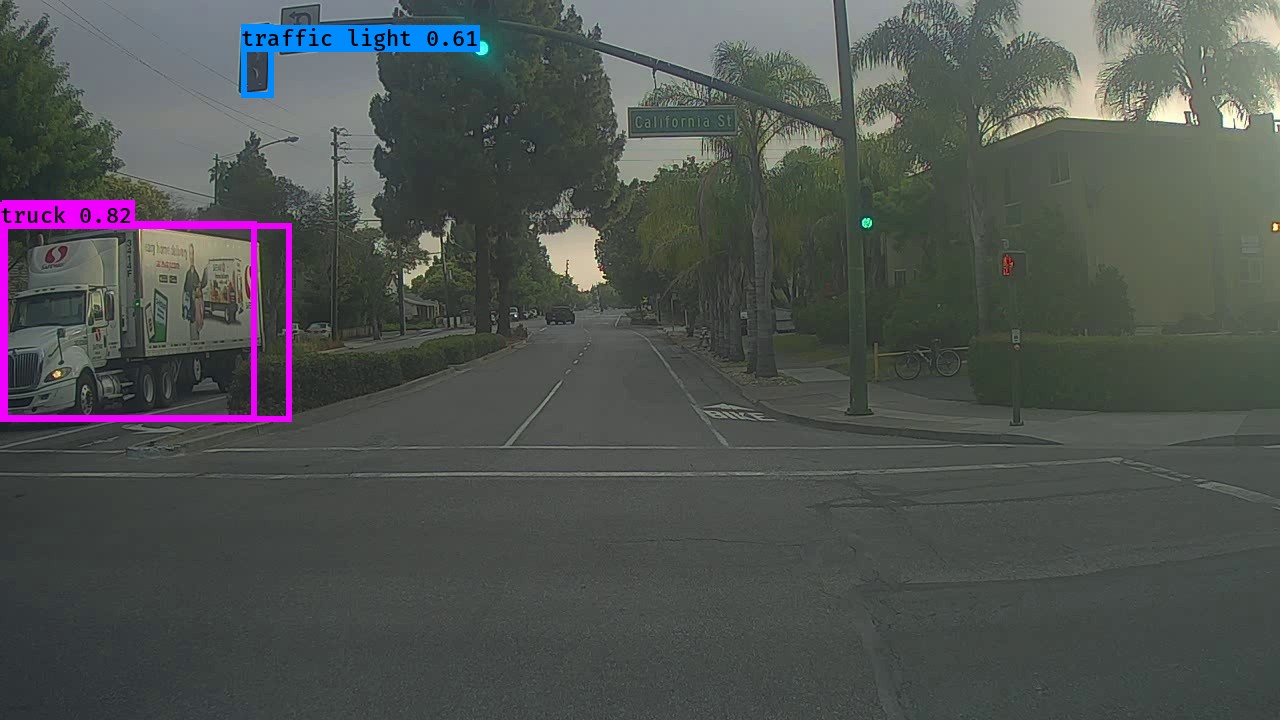
**First image changed nothing**

**But the Second images system detected different size boxes to same truck. It has overlapped in same image.**

**Out Put Images belong to value of iou\_threshold = 0.1**

****

**Out Put Images belong to value of iou\_threshold A street with a green light

Description automatically generated= 0.9**

**Submission.**

Download the final modified Autonomous\_driving\_application\_car\_detection.ipynb notebook. Add this notebook, the new image used in step 9 and the word file to a new zip file. Upload this zip file to the courseweb submission link. The file name should be your registration number.