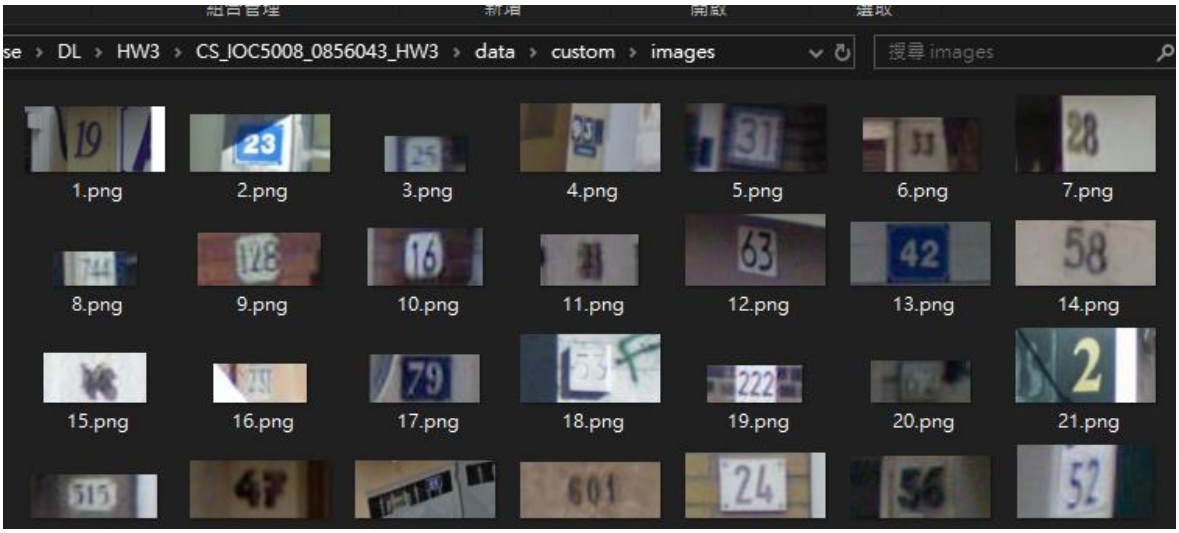
CS_IOC5008_0856043_HW2 Report

[Github link]

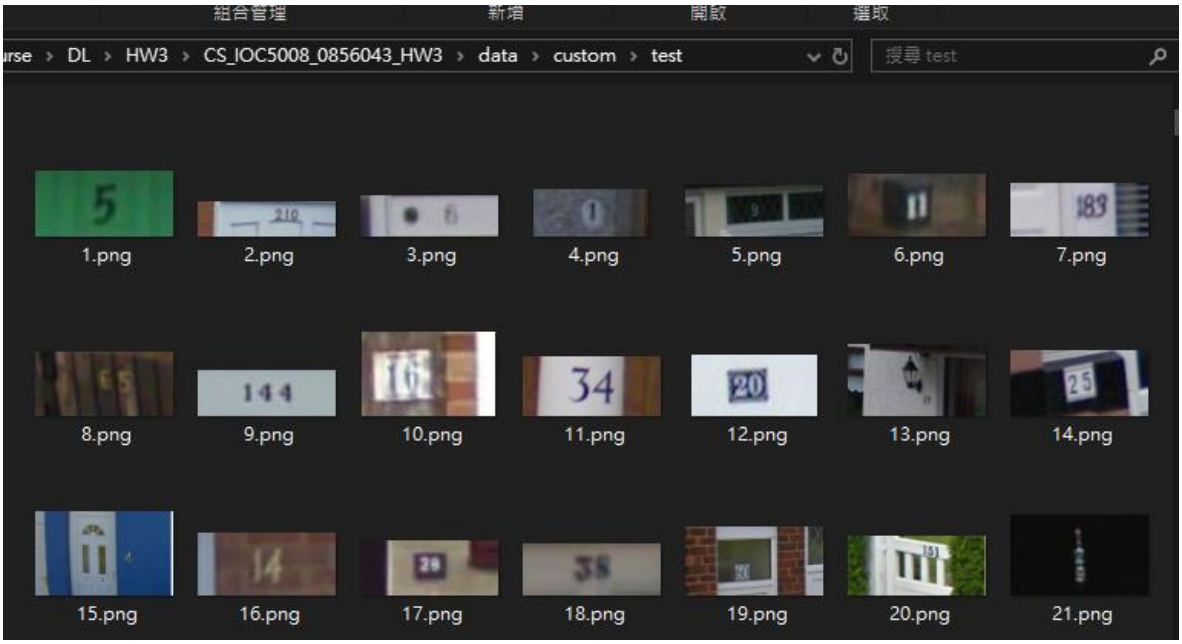
Brief introduction

1. Development environment
Python version : 3.7.4
Framework : Pytorch
Hardware : NVIDIA GeForce GTX 1080 Ti 11GB

2. How to run the code.
(1)put the train image in data/custom/images



(2)put the test images in data/custom/test



(3) analysis the digitStruct.mat file.
Run data/custom/parsedata.py

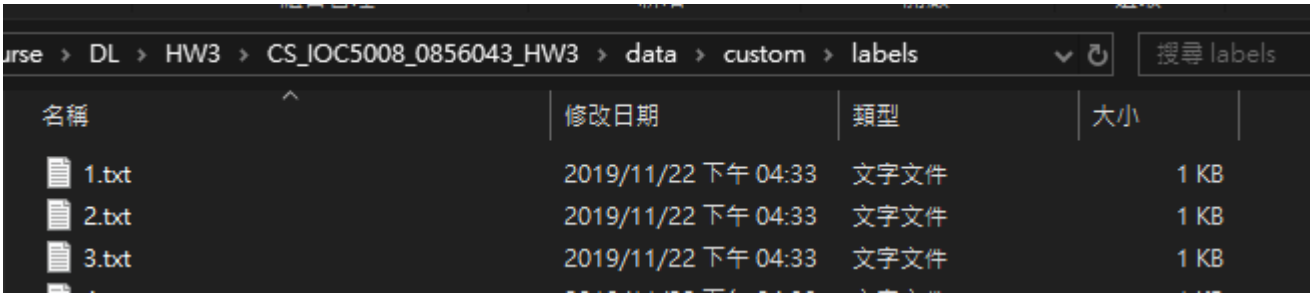
parsedata.py

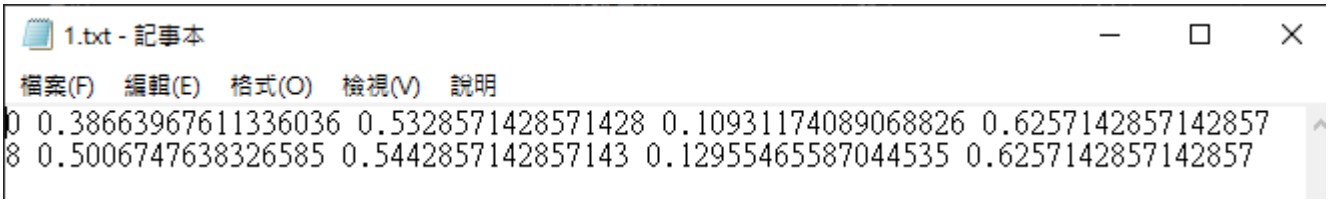
```
def makeTxt():
    dsFileName = './digitStruct.mat'
    testCounter = 0
    for dsObj in yieldNextDigitStruct(dsFileName):

        fp = open("./labels/"+dsObj.name[:-4]+'.txt', "a")
        im=Image.open('./images/'+dsObj.name)
        x = im.size[0]
        y = im.size[1]
        for bbox in dsObj.bboxList:

            fp.write("{} {} {} {} {}\n".format(
                bbox.label-1, bbox.left/x+bbox.width/(2*x), bbox.top/y+bbox.height/(2*y), bbox.width/x, bbox.height/y))
        fp.close()
        if testCounter >= 5:
            break
    print('done')
```

It will make each test images one txt file for the ground-truth in data/custom/labels.





(4)Spilt the train data using maketxt.py
It will store 90% data in data/custom/train.txt for train-set and 10% in data/custom/val.txt for validation-set.

maketxt.py

```
import glob
import os
import numpy as np
import sys
current_dir = "./data/custom/images"
split_pct = 10  # 10% validation set
file_train = open("data/custom/train.txt", "w")
file_val = open("data/custom/val.txt", "w")
counter = 1
index_test = round(100 / split_pct)
for fullpath in glob.iglob(os.path.join(current_dir, "*.png")):
  title, ext = os.path.splitext(os.path.basename(fullpath))
  if counter == index_test:
    counter = 1
    file_val.write(current_dir + "/" + title + '.png' + "\n")
  else:
    file_train.write(current_dir + "/" + title + '.png' + "\n")
    counter = counter + 1
file_train.close()
file_val.close()
```

train.txt - 記事本

檔案(F) 編輯(E) 格式(O) 檢視(V) 說明

```
./data/custom/images/998.png
./data/custom/images/9980.png
./data/custom/images/9981.png
./data/custom/images/9982.png
./data/custom/images/9983.png
./data/custom/images/9984.png
./data/custom/images/9985.png
./data/custom/images/9986.png
./data/custom/images/9987.png
./data/custom/images/9989.png
./data/custom/images/999.png
./data/custom/images/9990.png
./data/custom/images/9991.png
./data/custom/images/9992.png
./data/custom/images/9993.png
./data/custom/images/9994.png
./data/custom/images/9995.png
./data/custom/images/9996.png
./data/custom/images/9998.png
./data/custom/images/9999.png
```

第 30049 列，第 30 行 100% Windows (CRLF) UTF-8

val.txt - 記事本

檔案(F) 編輯(E) 格式(O) 檢視(V) 說明

```
./data/custom/images/9825.png
./data/custom/images/9834.png
./data/custom/images/9843.png
./data/custom/images/9852.png
./data/custom/images/9861.png
./data/custom/images/9870.png
./data/custom/images/988.png
./data/custom/images/9889.png
./data/custom/images/9898.png
./data/custom/images/9906.png
./data/custom/images/9915.png
./data/custom/images/9924.png
./data/custom/images/9933.png
./data/custom/images/9942.png
./data/custom/images/9951.png
./data/custom/images/9960.png
./data/custom/images/997.png
./data/custom/images/9979.png
./data/custom/images/9988.png
./data/custom/images/9997.png
```

第 3341 列，第 1 行 100% Windows (CRLF) UTF-8

(5)Run train.py

Change the pretrained_weights to train from the pretrained network.

```
59    # If specified we start from checkpoint
60    #opt.pretrained_weights="checkpoints/yolov3_color_pretrained_yolo_ckpt_29.pth"
61    opt.pretrained_weights="weights/yolov3.weights"
```

And then run this file

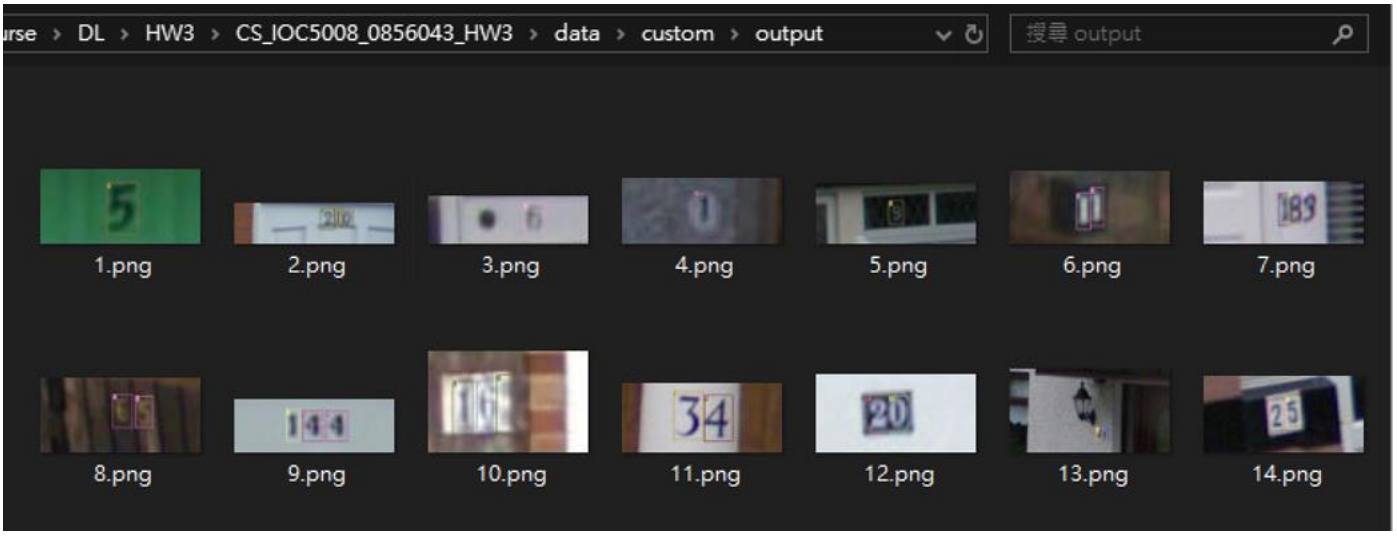
機 › 桌面 › course › DL › HW3 › CS_IOC5008_0856043_HW3 › checkpoints

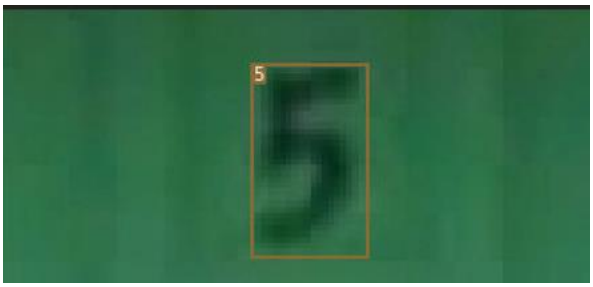
名稱	修改日期	類型
yolov3_color_pretrained_yolo_ckpt_29.pth	2019/11/25 下午 03:32	PTH 檔案

After train, it will create .pth file and we can do some test or predict the result.

(6)detect

Run the detect.py, it will draw the predict result on the test images in data/custom/output





(7)Print Json

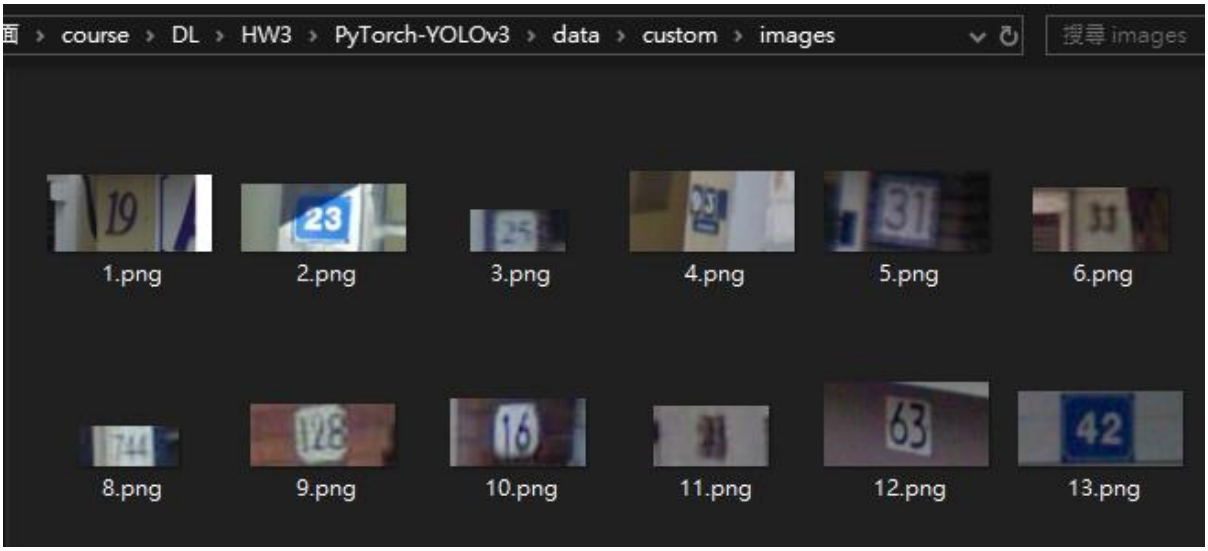
Run printjson.py and it will create the result that dump into the json form in data/custom/0856043_.json

0856043_.json

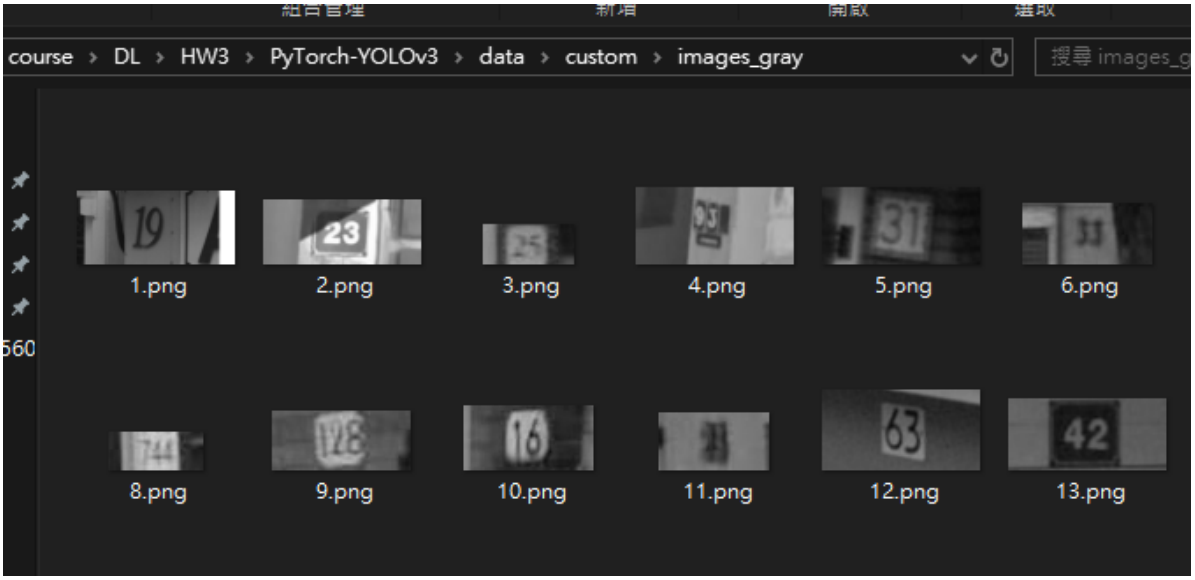

```
[
    {
        "bbox": [
            [
                9,
                41,
                41,
                60
            ]
        ],
        "label": [
            5
        ],
        "score": [
            0.998767614364624
        ]
    },
```

Methodology

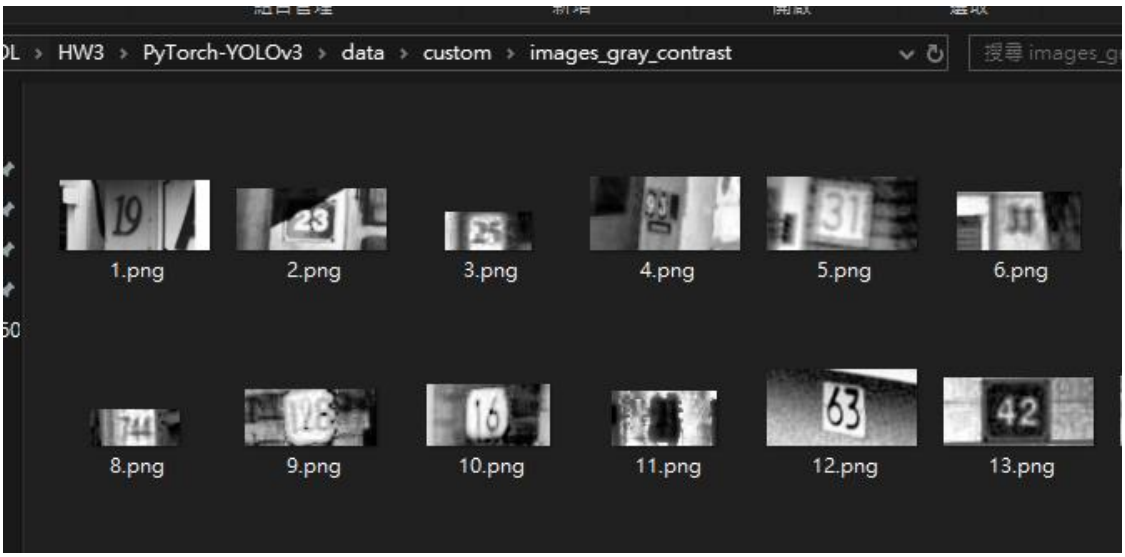
1. Data preprocess



I do some try, like convert the color to gray image.



And increase the contrast.



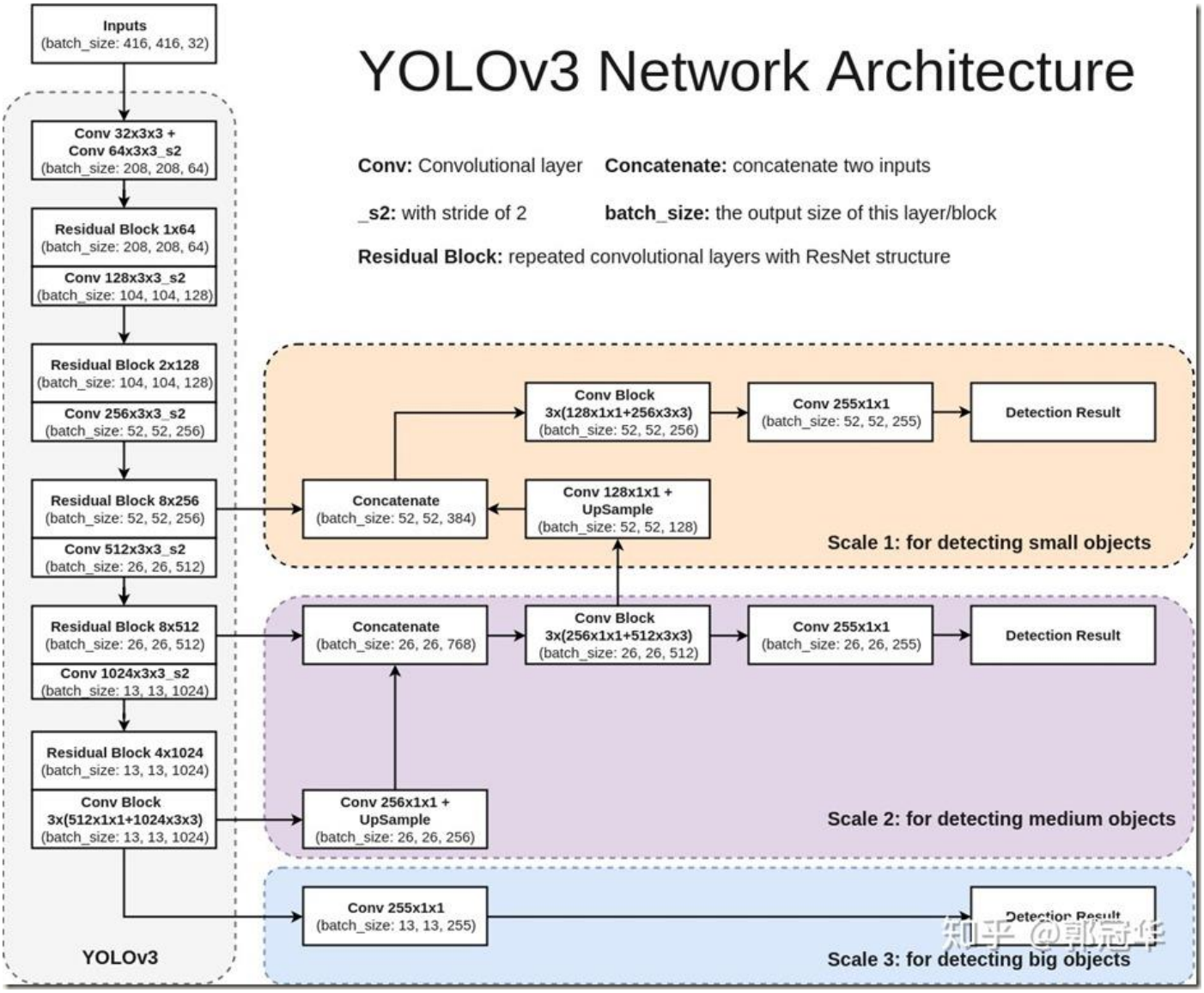
But they don’t increase the mAP, so I just use the original images.
And also use do some random flip.

```
# Apply augmentations
if self.augment:
    if np.random.random() < 0.5:
        img, targets = horisontal_flip(img, targets)
```

2. Models

I use yolov3 as my model.

Pre-trained on imagenet+Coco datasets.(https://pjreddie.com/media/files/yolov3.weights)



Compare to yolov2, version 3 use 3 different feature (13*13, 26*26, 52*52) to detect big, medium, and small objects.

3. Hyperparameters

Image size: 416*416

Loss function: binary cross-entropy loss

Output activation: Logistic loss

Base model: ResNet

Darknet model: darknet-53

learning_rate: 0.001

batch_size: 8

epochs: 30

Model speed benchmark

Upload my weight and test code into Colab.

```
[32] imgs = []  # Stores image paths
     img_detections = []  # Stores detections for each image index
     total_times=0
     print("\nPerforming object detection:")
     prev_time = time.time()
     for batch_i, (img_paths, input_imgs) in enumerate(dataloader):
         # Configure input
         input_imgs = Variable(input_imgs.type(Tensor))
         # Get detections
         with torch.no_grad():
             detections = model(input_imgs)
             detections = non_max_suppression(detections, conf_thres, nms_thres)
         # Log progress
         current_time = time.time()
         inference_time = datetime.timedelta(seconds=current_time - prev_time)
         time_v = current_time - prev_time
         prev_time = current_time
         print("\t+ Batch %d, Inference Time: %s" % (batch_i, inference_time))
         total_times += time_v

         # Save image and detections
         imgs.extend(img_paths)
         img_detections.extend(detections)

     print("average time:", total_times/200)
```

Test for 200 images

```
        + Batch 189, Inference Time: 0:00:00.027554
        + Batch 190, Inference Time: 0:00:00.029346
        + Batch 191, Inference Time: 0:00:00.027081
        + Batch 192, Inference Time: 0:00:00.027916
        + Batch 193, Inference Time: 0:00:00.030166
        + Batch 194, Inference Time: 0:00:00.027901
        + Batch 195, Inference Time: 0:00:00.027860
        + Batch 196, Inference Time: 0:00:00.027483
        + Batch 197, Inference Time: 0:00:00.029546
        + Batch 198, Inference Time: 0:00:00.027969
        + Batch 199, Inference Time: 0:00:00.027547
average time: 0.029423400163650512
```

Average time=29.4ms

Test for 100 images

```
           + Batch 92, Inference Time: 0:00:00.028591
           + Batch 93, Inference Time: 0:00:00.030214
           + Batch 94, Inference Time: 0:00:00.028774
           + Batch 95, Inference Time: 0:00:00.028023
           + Batch 96, Inference Time: 0:00:00.028052
           + Batch 97, Inference Time: 0:00:00.028789
           + Batch 98, Inference Time: 0:00:00.026763
           + Batch 99, Inference Time: 0:00:00.028151
   average time: 0.0297226619720459
```

Average time=29.7ms

Test for 1000 images

```
           + Batch 991, Inference Time: 0:00:00.033592
           + Batch 992, Inference Time: 0:00:00.028442
           + Batch 993, Inference Time: 0:00:00.027667
           + Batch 994, Inference Time: 0:00:00.027280
           + Batch 995, Inference Time: 0:00:00.027413
           + Batch 996, Inference Time: 0:00:00.028444
           + Batch 997, Inference Time: 0:00:00.027150
           + Batch 998, Inference Time: 0:00:00.028098
           + Batch 999, Inference Time: 0:00:00.028050
    average time: 0.028286385536193847
```

Average time=28.2ms

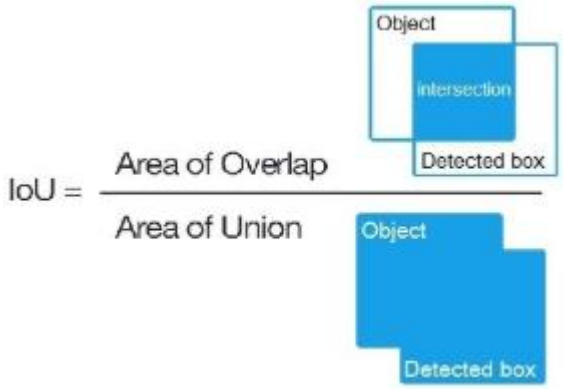
Findings

I think this task is very difficult because the image has some many other things that we don’t want to predict.

And it also very easy to predict overlapping.

So I also do some work to prevent this thing happened.

I use the concept of IOU.



When the bounding-box that have a big confident, we can delete the other when IOU value greater than some threshold.

 Here is the result.

But things got weird, when I use this idea in the whole prediction, the score of using IOU is always worse than not doing anything…

gray contrast	0.38461
gray contrast count iou	0.37262
color pretrained_darknet iou	0.42054
color pretrained_darknet	0.42929
gray contras pretrained_darknet	0.39479
gray contras pretrained_darknet iou	0.38529
color pretrained_yolov3 9	0.44315
color pretrained_yolov3 9 iou	0.43667
color pretrained_yolov3 19	0.45788
color pretrained_yolov3 19 iou	0.45259
color pretrained_yolov3 29	(1)0.46305
color pretrained_yolov3 29 iou	0.45732

Here is my grade records. The scores that using iou method to delete overlapping objects always get about 1% lower than original.

Reference

[Yolov3-pytorch-implement]

[Train Yolo on my dataset(Medium article)]

[Yolov3 explain(Chinese)]

[Yolo website]