（因跑太慢，故僅以 epoch=4來實作）

起始 lr 設為0.0001，以每個 epoch 除以10的方式遞減:

```
## training codes:

best_score = 0
eval_score = 0

# epochs為1~4 起始lr為0.0001
for epoch in range(epochs_start, epochs_end):
    epoch_loss = 0
    train_iterator = tqdm(train_loader, ncols=30)
    mulit_batch_ = 0
    #print("epoch={}".format(epoch))
    if epoch == 1:
        learning_rate = lr
    elif epoch == 2:
        learning_rate = lr/10
    elif epoch == 3:
        learning_rate = lr/100
    elif epoch == 4:
        learning_rate= lr/1000

    for param_group in optimizer.param_groups:
        param_group['lr'] = learning_rate

    for train_batch, (images, target) in enumerate(train_iterator):
        print('-------------------------train_batch={}'.format(train_batch))

        images = images.cuda()
```

Epoch=1時分數為0.004

```
[1] lr = 0.0001 batch_loss = 5-------------------------train_batch=199
[1] lr = 0.0001 batch_loss = 4-------------------------train_batch=200
[1] lr = 0.0001 batch_loss = 6-------------------------train_batch=201
[1] lr = 0.0001 batch_loss = 5-------------------------train_batch=202
[1] lr = 0.0001 batch_loss = 4-------------------------train_batch=203
[1] lr = 0.0001 batch_loss = 4-------------------------train_batch=204
[1] lr = 0.0001 batch_loss = 4-------------------------train_batch=205
[1] lr = 0.0001 batch_loss = 4-------------------------train_batch=206
[1] lr = 0.0001 batch_loss = 4-------------------------train_batch=207
-------------------------train_batch=208
[1] lr = 0.0001 batch_loss = 7
Evaluate~~~~~
  0%|          | 0/4952 [00:00<?, ?it/s]<ipython-input-38-31c985002e33>:100: UserWarning: indexing wit
  bbox = pred_bboxes[mask_box].data
100%|██████████| 4952/4952 [02:52<00:00, 28.63it/s]
<ipython-input-42-9a6077989612>:130: DeprecationWarning: `np.bool` is a deprecated alias for the built
Deprecated in NumPy 1.20; for more details and guidance: https://numpy.org/devdocs/release/1.20.0-note
  difficult = np.array([x['difficult'] for x in R]).astype(np.bool)
Begin to perform mAP estimation
mean_ap : 0.004 , best_ap: 0.004
```

Epoch=1時分數為0.02，有進步

```
[2] lr = 1e-05 batch_loss = 6.-------------------------train_batch=199
[2] lr = 1e-05 batch_loss = 4.-------------------------train_batch=200
[2] lr = 1e-05 batch_loss = 6.-------------------------train_batch=201
[2] lr = 1e-05 batch_loss = 3.-------------------------train_batch=202
[2] lr = 1e-05 batch_loss = 4.-------------------------train_batch=203
[2] lr = 1e-05 batch_loss = 3.-------------------------train_batch=204
[2] lr = 1e-05 batch_loss = 5.-------------------------train_batch=205
[2] lr = 1e-05 batch_loss = 5.-------------------------train_batch=206
[2] lr = 1e-05 batch_loss = 4.-------------------------train_batch=207
[2] lr = 1e-05 batch_loss = 3.-------------------------train_batch=208
[2] lr = 1e-05 batch_loss = 3.
Evaluate~~~~~
100%|██████████| 4952/4952 [02:43<00:00, 30.31it/s]
Begin to perform mAP estimation
mean ap : 0.020 , best ap: 0.020
```

Epoch=4時分數還是為0.02，看來已經收斂了

```
[4] lr = 1.0000000000000001e-0-------------------------train_batch=193
[4] lr = 1.0000000000000001e-0-------------------------train_batch=194
[4] lr = 1.0000000000000001e-0-------------------------train_batch=195
[4] lr = 1.0000000000000001e-0-------------------------train_batch=196
[4] lr = 1.0000000000000001e-0-------------------------train_batch=197
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[4] lr = 1.0000000000000001e-0-------------------------train_batch=204
[4] lr = 1.0000000000000001e-0-------------------------train_batch=205
[4] lr = 1.0000000000000001e-0-------------------------train_batch=206
[4] lr = 1.0000000000000001e-0-------------------------train_batch=207
[4] lr = 1.0000000000000001e-0-------------------------train_batch=208
[4] lr = 1.0000000000000001e-0
Evaluate~~~~~
100%|██████████| 4952/4952 [02:50<00:00, 29.00it/s]
Begin to perform mAP estimation
mean ap : 0.019 , best ap: 0.020
```

以下，起始 lr 改為0.00015，再做一次：

```
[1] lr = 0.00015 batch_loss = ------------------------train_batch=200
[1] lr = 0.00015 batch_loss = ------------------------train_batch=201
[1] lr = 0.00015 batch_loss = ------------------------train_batch=202
[1] lr = 0.00015 batch_loss = ------------------------train_batch=203
[1] lr = 0.00015 batch_loss = ------------------------train_batch=204
[1] lr = 0.00015 batch_loss = ------------------------train_batch=205
[1] lr = 0.00015 batch_loss = ------------------------train_batch=206
[1] lr = 0.00015 batch_loss = ------------------------train_batch=207
[1] lr = 0.00015 batch_loss = ------------------------train_batch=208
[1] lr = 0.00015 batch_loss =
Evaluate~~~~~
  0%|          | 0/4952 [00:00<?, ?it/s]<ipython-input-75-31c985002e33>:100: UserWarning: inde
  bbox = pred_bboxes[mask_box].data
100%|██████████| 4952/4952 [02:42<00:00, 30.51it/s]
<ipython-input-79-9a6077989612>:130: DeprecationWarning: `np.bool` is a deprecated alias for t
Deprecated in NumPy 1.20; for more details and guidance: https://numpy.org/devdocs/release/1.2
  difficult = np.array([x['difficult'] for x in R]).astype(np.bool)
Begin to perform mAP estimation
mean ap : 0.009 , best ap: 0.009
```

```
[2] lr = 1.4999999999999999e-0------------------------train_batch=199
[2] lr = 1.4999999999999999e-0------------------------train_batch=200
[2] lr = 1.4999999999999999e-0------------------------train_batch=201
[2] lr = 1.4999999999999999e-0------------------------train_batch=202
[2] lr = 1.4999999999999999e-0------------------------train_batch=203
[2] lr = 1.4999999999999999e-0------------------------train_batch=204
[2] lr = 1.4999999999999999e-0------------------------train_batch=205
[2] lr = 1.4999999999999999e-0------------------------train_batch=206
[2] lr = 1.4999999999999999e-0------------------------train_batch=207
[2] lr = 1.4999999999999999e-0------------------------train_batch=208
[2] lr = 1.4999999999999999e-0
Evaluate~~~~~
100%|██████████| 4952/4952 [02:41<00:00, 30.69it/s]
Begin to perform mAP estimation
mean ap : 0.009 , best ap: 0.009
```

```
[4] lr = 1.5e-07 batch_loss = ------------------------train_batch=198
[4] lr = 1.5e-07 batch_loss = ------------------------train_batch=199
[4] lr = 1.5e-07 batch_loss = ------------------------train_batch=200
[4] lr = 1.5e-07 batch_loss = ------------------------train_batch=201
[4] lr = 1.5e-07 batch_loss = ------------------------train_batch=202
[4] lr = 1.5e-07 batch_loss = ------------------------train_batch=203
[4] lr = 1.5e-07 batch_loss = ------------------------train_batch=204
[4] lr = 1.5e-07 batch_loss = ------------------------train_batch=205
[4] lr = 1.5e-07 batch_loss = ------------------------train_batch=206
[4] lr = 1.5e-07 batch_loss = ------------------------train_batch=207
------------------------train_batch=208
[4] lr = 1.5e-07 batch_loss =
Evaluate~~~~~
100%|██████████| 4952/4952 [02:44<00:00, 30.06it/s]
Begin to perform mAP estimation
mean ap : 0.020 , best ap: 0.020
```

最後還是收斂到0.02

可能 lr 要改差別大一點，結果才會有明顯差別