MAIS 202 - PROJECT DELIVERABLE 3

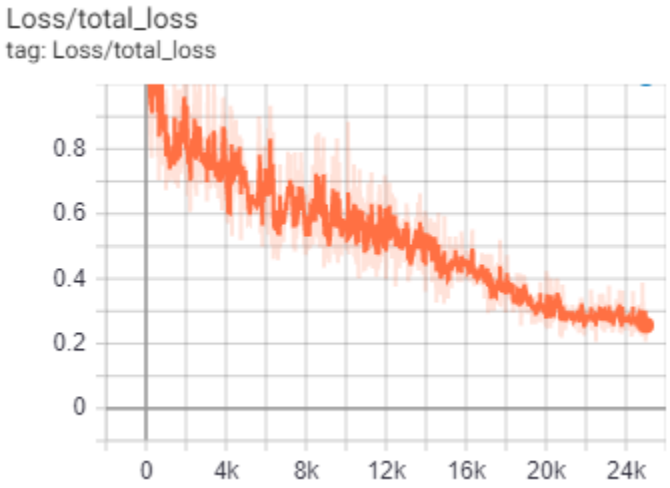
Steps taken since the last deliverable:

1) TF Records generated:
- From the CSV of the annotations, a helper python code was modified in order to generate tfRecords of both train and test data.

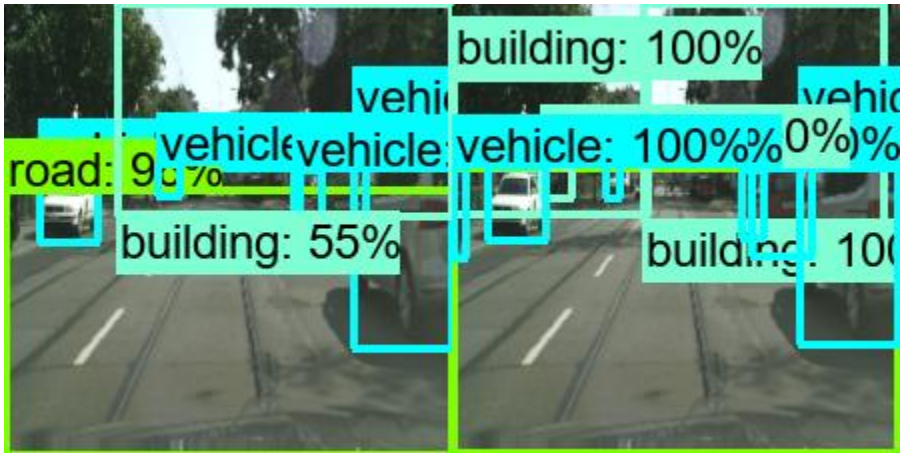
2) Training model chosen:
- Tensorflow API's SSD ResNet50 V1 FPN 640x640, pre-trained on COCO dataset was chosen, since it is a balance between performance and speed. This is a RetineNet50 model. It is 46ms and 34.3 mAP (mean average precision) trained on COCO.

3) Model configuration:
- The model was configured to fit the training data, where the number of classes was changed and batch size, with a few other characteristics.
- Memory allocation problem: Having just built a new computer, I finally was able to train the model on GPU, which is must faster, but I was receiving a memory allocation problem (not enough GPU memory available). I reduced the batch size all the way to 2, and was finally able to train the model.

4) Results:
- The model was trained to 25000 steps, where the total loss was approximately 0.26 at the end of training.



Test set:
- The model was then evaluated using the test set and the following results were observed:



- Visually, while most of the objects are correctly detected and identified, the detection percentages are relatively low. *Is this ok/normal?*

  Metrics:

```
Accumulating evaluation results...
DONE (t=0.25s).
 Average Precision  (AP) @[ IoU=0.50:0.95 | area=   all | maxDets=100 ] = 0.162
 Average Precision  (AP) @[ IoU=0.50       | area=   all | maxDets=100 ] = 0.308
 Average Precision  (AP) @[ IoU=0.75       | area=   all | maxDets=100 ] = 0.154
 Average Precision  (AP) @[ IoU=0.50:0.95 | area= small | maxDets=100 ] = 0.096
 Average Precision  (AP) @[ IoU=0.50:0.95 | area=medium | maxDets=100 ] = 0.219
 Average Precision  (AP) @[ IoU=0.50:0.95 | area= large | maxDets=100 ] = 0.452
 Average Recall     (AR) @[ IoU=0.50:0.95 | area=   all | maxDets=  1 ] = 0.092
 Average Recall     (AR) @[ IoU=0.50:0.95 | area=   all | maxDets= 10 ] = 0.249
 Average Recall     (AR) @[ IoU=0.50:0.95 | area=   all | maxDets=100 ] = 0.304
 Average Recall     (AR) @[ IoU=0.50:0.95 | area= small | maxDets=100 ] = 0.172
 Average Recall     (AR) @[ IoU=0.50:0.95 | area=medium | maxDets=100 ] = 0.442
 Average Recall     (AR) @[ IoU=0.50:0.95 | area= large | maxDets=100 ] = 0.699
INFO:tensorflow:Eval metrics at step 25000
```

- Notice that for larger sized boxes, the precision and recall are much larger than for smaller. *What threshold values should I be aiming to obtain?*

- Do you have any suggestions on how to make this model better? Tried using RCNN instead and more memory allocation troubles…
- What should I tune to give me better results?