Object Detection Project

mercoledì 1 febbraio 2023   10:16

1) In this project it was created a CNN to detect and classify objects using data from Waymo dataset and a SSD Resnet 50 640x640 model. At first some exploratory data analysis has been performed on the image batch (Exploratory Data Analysis notebook), then the model has been trained and evaluated

2) Proposed project structure ins't changed; I've tried different augmentation solution (as described in the following lines) using a new config file called "pipeline_new_augm.config"

3) After the train process I've generated tensorboard output:

   a.

   b.

   c.

4) Augmentation solutions:
   a. Tried to random to RGB but total loss got worse
```
data_augmentation_options {
  random_rgb_to_gray {
  probability: 0.2
  }
}
```

b.
```
Instructions for updating:
Use fn output signature instead
W0203 08:36:24.087379 139812484196096 deprecation.py:506] From /data/virtual_env
s/sdc-c1-gpu-augment/lib/python3.7/site-packages/tensorflow/python/util/deprecat
ion.py:574: calling map_fn_v2 (from tensorflow.python.ops.map_fn) with dtype is
deprecated and will be removed in a future version.
Instructions for updating:
Use fn_output_signature instead
INFO:tensorflow:Step 100 per-step time 0.742s loss=34.557
I0203 08:37:55.216678 139819689174848 model_lib_v2.py:682] Step 100 per-step tim
e 0.742s loss=34.557
INFO:tensorflow:Step 200 per-step time 0.735s loss=3458.960
I0203 08:39:10.726650 139819689174848 model_lib_v2.py:682] Step 200 per-step tim
e 0.735s loss=3458.960
INFO:tensorflow:Step 300 per-step time 0.767s loss=633283.250
I0203 08:40:26.047991 139819689174848 model_lib_v2.py:682] Step 300 per-step tim
e 0.767s loss=633283.250
INFO:tensorflow:Step 400 per-step time 0.751s loss=746740.875
I0203 08:41:41.073862 139819689174848 model_lib_v2.py:682] Step 400 per-step tim
e 0.751s loss=746740.875
INFO:tensorflow:Step 500 per-step time 0.767s loss=179844808704.000
I0203 08:42:55.908188 139819689174848 model_lib_v2.py:682] Step 500 per-step tim
e 0.767s loss=179844808704.000
INFO:tensorflow:Step 600 per-step time 0.753s loss=207451766784.000
I0203 08:44:12.144542 139819689174848 model_lib_v2.py:682] Step 600 per-step tim
e 0.753s loss=207451766784.000
INFO:tensorflow:Step 700 per-step time 0.752s loss=201495576576.000
I0203 08:45:26.904174 139819689174848 model_lib_v2.py:682] Step 700 per-step tim
e 0.752s loss=201495576576.000
^CTraceback (most recent call last):
```

c. Tried to adjust brightness but got worse
```
data_augmentation_options {
    random_adjust_brightness {
    max_delta: 0.2
    }
}:
```
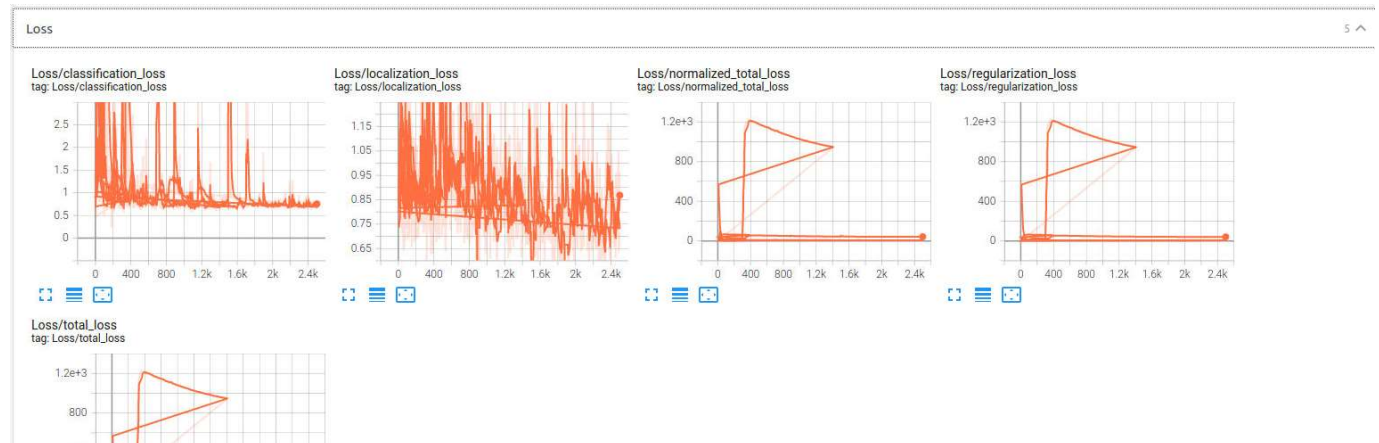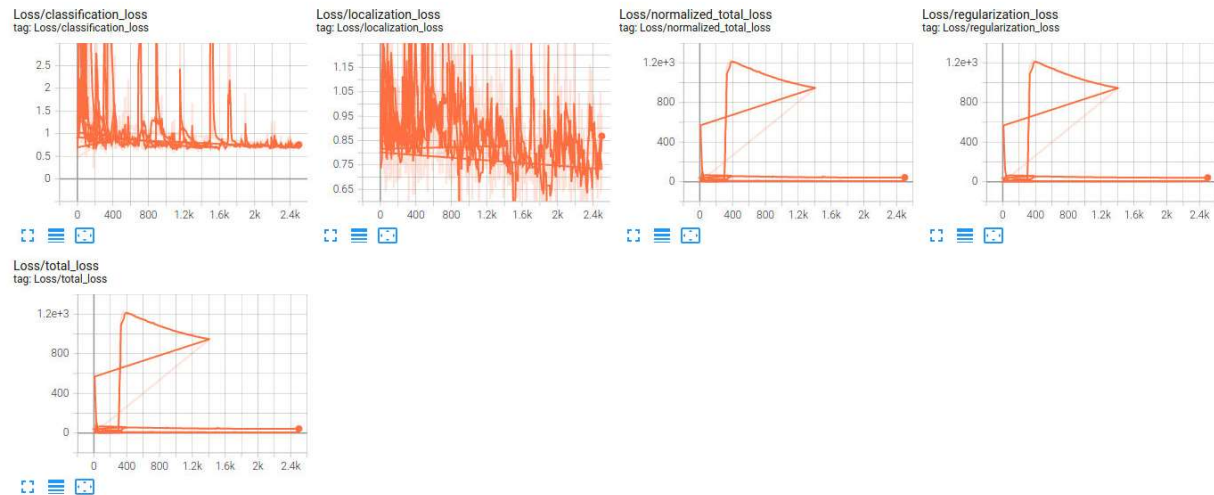
d.
```
INFO:tensorflow:Step 100 per-step time 0.748s loss=108.949
I0203 07:40:51.998161 139968419444544 model_lib_v2.py:682] Step 100 per-step tim
e 0.748s loss=108.949
INFO:tensorflow:Step 200 per-step time 0.781s loss=25.424
I0203 07:42:07.785071 139968419444544 model_lib_v2.py:682] Step 200 per-step tim
e 0.781s loss=25.424
INFO:tensorflow:Step 300 per-step time 0.752s loss=24.902
I0203 07:43:23.660087 139968419444544 model_lib_v2.py:682] Step 300 per-step tim
e 0.752s loss=24.902
INFO:tensorflow:Step 400 per-step time 0.776s loss=55.750
I0203 07:44:39.024864 139968419444544 model_lib_v2.py:682] Step 400 per-step tim
e 0.776s loss=55.750
INFO:tensorflow:Step 500 per-step time 0.742s loss=54.928
I0203 07:45:54.449510 139968419444544 model_lib_v2.py:682] Step 500 per-step tim
e 0.742s loss=54.928
INFO:tensorflow:Step 600 per-step time 0.742s loss=53.301
I0203 07:47:10.761209 139968419444544 model_lib_v2.py:682] Step 600 per-step tim
e 0.742s loss=53.301
INFO:tensorflow:Step 700 per-step time 0.753s loss=51.976
I0203 07:48:26.145914 139968419444544 model_lib_v2.py:682] Step 700 per-step tim
e 0.753s loss=51.976
INFO:tensorflow:Step 800 per-step time 0.781s loss=50.443
I0203 07:49:41.258471 139968419444544 model_lib_v2.py:682] Step 800 per-step tim
e 0.781s loss=50.443
INFO:tensorflow:Step 900 per-step time 0.731s loss=49.430
I0203 07:50:56.328361 139968419444544 model_lib_v2.py:682] Step 900 per-step tim
e 0.731s loss=49.430
INFO:tensorflow:Step 1000 per-step time 0.734s loss=47.918
I0203 07:52:11.211351 139968419444544 model_lib_v2.py:682] Step 1000 per-step ti
me 0.734s loss=47.918
INFO:tensorflow:Step 1100 per-step time 0.758s loss=46.765
I0203 07:53:27.430363 139968419444544 model_lib_v2.py:682] Step 1100 per-step ti
me 0.758s loss=46.765
INFO:tensorflow:Step 1200 per-step time 0.750s loss=46.264
I0203 07:54:42.756016 139968419444544 model_lib_v2.py:682] Step 1200 per-step ti
me 0.750s loss=46.264
INFO:tensorflow:Step 1300 per-step time 0.739s loss=45.368
I0203 07:55:57.838390 139968419444544 model_lib_v2.py:682] Step 1300 per-step ti
me 0.739s loss=45.368
INFO:tensorflow:Step 1400 per-step time 0.789s loss=44.358
I0203 07:57:12.945989 139968419444544 model_lib_v2.py:682] Step 1400 per-step ti
me 0.789s loss=44.358
INFO:tensorflow:Step 1500 per-step time 0.761s loss=43.762
I0203 07:58:28.856368 139968419444544 model_lib_v2.py:682] Step 1500 per-step ti
me 0.761s loss=43.762
INFO:tensorflow:Step 1600 per-step time 0.761s loss=43.383
I0203 07:59:44.980885 139968419444544 model_lib_v2.py:682] Step 1600 per-step ti
```

e.

Loss

Loss/classification_loss
tag: Loss/classification_loss

Loss/localization_loss
tag: Loss/localization_loss

Loss/normalized_total_loss
tag: Loss/normalized_total_loss

Loss/regularization_loss
tag: Loss/regularization_loss

Loss/total_loss
tag: Loss/total_loss

e.

f. Tried to adjust random saturation but got worse

```
data_augmentation_options {
    random_adjust_saturation {
    min_delta: 0.8
    max_delta: 1.2
    }
}
```

g.

```
INFO:tensorflow:Step 200 per-step time 0.774s loss=10.574
I0203 08:55:39.570151 140078879766336 model_lib_v2.py:682] Step 200 per-step tim
e 0.774s loss=10.574
INFO:tensorflow:Step 300 per-step time 0.746s loss=10.971
I0203 08:56:55.028082 140078879766336 model_lib_v2.py:682] Step 300 per-step tim
e 0.746s loss=10.971
INFO:tensorflow:Step 400 per-step time 0.744s loss=9.812
I0203 08:58:10.772084 140078879766336 model_lib_v2.py:682] Step 400 per-step tim
e 0.744s loss=9.812
INFO:tensorflow:Step 500 per-step time 0.744s loss=10.438
I0203 08:59:26.252357 140078879766336 model_lib_v2.py:682] Step 500 per-step tim
e 0.744s loss=10.438
INFO:tensorflow:Step 600 per-step time 0.755s loss=9.585
I0203 09:00:43.129761 140078879766336 model_lib_v2.py:682] Step 600 per-step tim
e 0.755s loss=9.585
INFO:tensorflow:Step 700 per-step time 0.743s loss=8.985
I0203 09:01:58.887022 140078879766336 model_lib_v2.py:682] Step 700 per-step tim
e 0.743s loss=8.985
INFO:tensorflow:Step 800 per-step time 0.765s loss=8.812
I0203 09:03:14.409610 140078879766336 model_lib_v2.py:682] Step 800 per-step tim
e 0.765s loss=8.812
INFO:tensorflow:Step 900 per-step time 0.770s loss=8.459
I0203 09:04:30.176244 140078879766336 model_lib_v2.py:682] Step 900 per-step tim
e 0.770s loss=8.459
INFO:tensorflow:Step 1000 per-step time 0.796s loss=8.351
I0203 09:05:45.711604 140078879766336 model_lib_v2.py:682] Step 1000 per-step ti
me 0.796s loss=8.351
INFO:tensorflow:Step 1100 per-step time 0.779s loss=8.329
I0203 09:07:02.676710 140078879766336 model_lib_v2.py:682] Step 1100 per-step ti
me 0.779s loss=8.329
INFO:tensorflow:Step 1200 per-step time 0.787s loss=8.199
I0203 09:08:18.456783 140078879766336 model_lib_v2.py:682] Step 1200 per-step ti
me 0.787s loss=8.199
INFO:tensorflow:Step 1300 per-step time 0.761s loss=8.062
I0203 09:09:34.701248 140078879766336 model_lib_v2.py:682] Step 1300 per-step ti
me 0.761s loss=8.062
INFO:tensorflow:Step 1400 per-step time 0.741s loss=7.815
I0203 09:10:50.214036 140078879766336 model_lib_v2.py:682] Step 1400 per-step ti
me 0.741s loss=7.815
INFO:tensorflow:Step 1500 per-step time 0.742s loss=7.947
I0203 09:12:06.065754 140078879766336 model_lib_v2.py:682] Step 1500 per-step ti
me 0.742s loss=7.947
INFO:tensorflow:Step 1600 per-step time 0.758s loss=7.987
I0203 09:13:23.425882 140078879766336 model_lib_v2.py:682] Step 1600 per-step ti
me 0.758s loss=7.987
INFO:tensorflow:Step 1700 per-step time 0.734s loss=8.751
I0203 09:14:38.940760 140078879766336 model_lib_v2.py:682] Step 1700 per-step ti
me 0.734s loss=8.751
```

h. Tried to adjust random contrast but got worse

```
data_augmentation_options {
    random_adjust_contrast {
    min_delta: 0.8
    max_delta: 1.25
    }
}
```

```
Use fn_output_signature instead
INFO:tensorflow:Step 100 per-step time 0.758s loss=6.793
I0203 09:29:08.051635 140710147364672 model_lib_v2.py:682] Step 100 per-step tim
e 0.758s loss=6.793
INFO:tensorflow:Step 200 per-step time 0.783s loss=7.361
I0203 09:30:24.149159 140710147364672 model_lib_v2.py:682] Step 200 per-step tim
e 0.783s loss=7.361
INFO:tensorflow:Step 300 per-step time 0.791s loss=890.721
I0203 09:31:40.224653 140710147364672 model_lib_v2.py:682] Step 300 per-step tim
e 0.791s loss=890.721
INFO:tensorflow:Step 400 per-step time 0.759s loss=45585.809
I0203 09:32:55.861202 140710147364672 model_lib_v2.py:682] Step 400 per-step tim
e 0.759s loss=45585.809
INFO:tensorflow:Step 500 per-step time 0.744s loss=122399936.000
I0203 09:34:11.263839 140710147364672 model_lib_v2.py:682] Step 500 per-step tim
e 0.744s loss=122399936.000
INFO:tensorflow:Step 600 per-step time 0.779s loss=143120608.000
I0203 09:35:28.363411 140710147364672 model_lib_v2.py:682] Step 600 per-step tim
e 0.779s loss=143120608.000
INFO:tensorflow:Step 700 per-step time 0.738s loss=139004176.000
I0203 09:36:43.701898 140710147364672 model_lib_v2.py:682] Step 700 per-step tim
e 0.738s loss=139004176.000
```

5) Summary: since tensorboard was showing "disturbed behavior" at early steps in the graphics (please, see picture below; for all the different trainings, even if checkpoint were erased), making it useless for the evaluation, I've based the analysis on the loss showed in the terminal; all the augmentations added to training dataset didn't decrease the loss (as shown in the screenshoots), on the contrary; so the final version of the model doesn't include further augmentation except for the ones already present (random crop and random horizontal flip). Unfortunately I wasn't able to create the video due to lack of space on the disk (many tfevents files that shouldn't be erased, as per instructions "You should however keep the tf.events files located in the train and eval folder of your experiments"). Evaluation Juptyter notebooks continuos crashes prevented to perform visual evaluation of the augmented images.

a.

Loss/total_loss
tag: Loss/total_loss