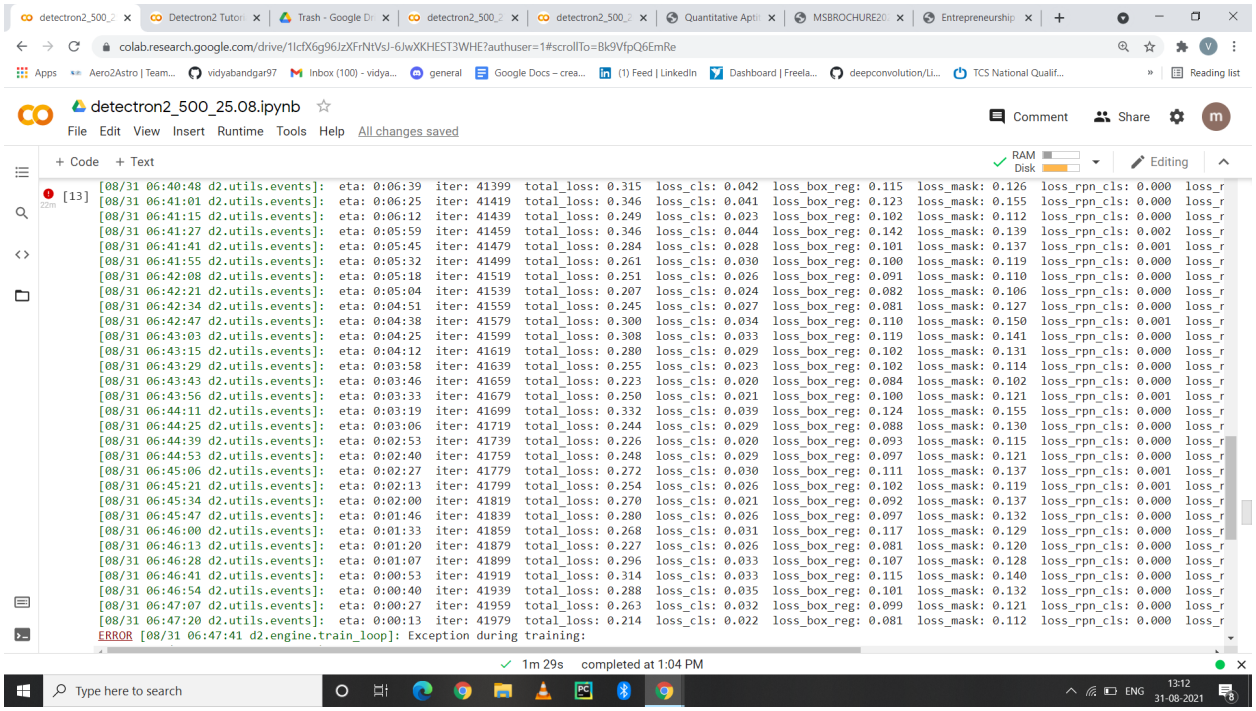
Work report

31 Aug 2021

Detectron2 for 500 instances
Deformable convolution (3x and 42.7 box AP)



1. Train evaluation:

```
 Average Precision  (AP) @[ IoU=0.50:0.95 | area=   all | maxDets=100 ] = 0.664
 Average Precision  (AP) @[ IoU=0.50      | area=   all | maxDets=100 ] = 0.967
 Average Precision  (AP) @[ IoU=0.75      | area=   all | maxDets=100 ] = 0.795
 Average Precision  (AP) @[ IoU=0.50:0.95 | area= small | maxDets=100 ] = 0.596
 Average Precision  (AP) @[ IoU=0.50:0.95 | area=medium | maxDets=100 ] = 0.702
 Average Precision  (AP) @[ IoU=0.50:0.95 | area= large | maxDets=100 ] = 0.826
 Average Recall     (AR) @[ IoU=0.50:0.95 | area=   all | maxDets=  1 ] = 0.279
 Average Recall     (AR) @[ IoU=0.50:0.95 | area=   all | maxDets= 10 ] = 0.710
 Average Recall     (AR) @[ IoU=0.50:0.95 | area=   all | maxDets=100 ] = 0.734
 Average Recall     (AR) @[ IoU=0.50:0.95 | area= small | maxDets=100 ] = 0.664
 Average Recall     (AR) @[ IoU=0.50:0.95 | area=medium | maxDets=100 ] = 0.770
 Average Recall     (AR) @[ IoU=0.50:0.95 | area= large | maxDets=100 ] = 0.868
[08/31 07:34:27 d2.evaluation.coco_evaluation]: Evaluation results for segm:
|   AP   |  AP50  |  AP75  |  APs   |  APm   |  APl   |
|:------:|:------:|:------:|:------:|:------:|:------:|
| 66.407 | 96.671 | 79.457 | 59.637 | 70.234 | 82.630 |
[08/31 07:34:27 d2.evaluation.coco_evaluation]: Per-category segm AP:
| category   | AP     | category   | AP     | category      | AP     |
|:-----------|:-------|:-----------|:-------|:--------------|:-------|
| aeroplane  | 68.636 | car        | 68.759 | chair         | 64.207 |
| cow        | 62.719 | person     | 65.339 | traffic_light | 68.784 |
```

2. Test evaluation:

```
 Average Precision  (AP) @[ IoU=0.50:0.95 | area=   all | maxDets=100 ] = 0.245
 Average Precision  (AP) @[ IoU=0.50      | area=   all | maxDets=100 ] = 0.438
 Average Precision  (AP) @[ IoU=0.75      | area=   all | maxDets=100 ] = 0.259
 Average Precision  (AP) @[ IoU=0.50:0.95 | area= small | maxDets=100 ] = 0.122
 Average Precision  (AP) @[ IoU=0.50:0.95 | area=medium | maxDets=100 ] = 0.326
 Average Precision  (AP) @[ IoU=0.50:0.95 | area= large | maxDets=100 ] = 0.378
 Average Recall     (AR) @[ IoU=0.50:0.95 | area=   all | maxDets=  1 ] = 0.165
 Average Recall     (AR) @[ IoU=0.50:0.95 | area=   all | maxDets= 10 ] = 0.369
 Average Recall     (AR) @[ IoU=0.50:0.95 | area=   all | maxDets=100 ] = 0.378
 Average Recall     (AR) @[ IoU=0.50:0.95 | area= small | maxDets=100 ] = 0.242
 Average Recall     (AR) @[ IoU=0.50:0.95 | area=medium | maxDets=100 ] = 0.453
 Average Recall     (AR) @[ IoU=0.50:0.95 | area= large | maxDets=100 ] = 0.535
[08/31 07:18:10 d2.evaluation.coco_evaluation]: Evaluation results for segm:
|   AP   |  AP50  |  AP75  |  APs   |  APm   |  APl   |
|:------:|:------:|:------:|:------:|:------:|:------:|
| 24.542 | 43.779 | 25.920 | 12.187 | 32.577 | 37.775 |
[08/31 07:18:10 d2.evaluation.coco_evaluation]: Per-category segm AP:
| category   | AP     | category   | AP     | category      | AP     |
|:-----------|:-------|:-----------|:-------|:--------------|:-------|
| aeroplane  | 39.863 | car        | 15.229 | chair         | 17.772 |
| cow        | 39.277 | person     | 11.053 | traffic_light | 24.057 |
```

3. Inference:

```
[08/31 07:17:27 d2.evaluation.evaluator]: Inference done 11/190. 0.1049 s / img. ETA=0:00:41
[08/31 07:17:32 d2.evaluation.evaluator]: Inference done 33/190. 0.1120 s / img. ETA=0:00:36
[08/31 07:17:37 d2.evaluation.evaluator]: Inference done 47/190. 0.1139 s / img. ETA=0:00:41
[08/31 07:17:43 d2.evaluation.evaluator]: Inference done 72/190. 0.1142 s / img. ETA=0:00:30
[08/31 07:17:48 d2.evaluation.evaluator]: Inference done 97/190. 0.1144 s / img. ETA=0:00:22
[08/31 07:17:53 d2.evaluation.evaluator]: Inference done 118/190. 0.1143 s / img. ETA=0:00:17
[08/31 07:17:58 d2.evaluation.evaluator]: Inference done 140/190. 0.1144 s / img. ETA=0:00:12
[08/31 07:18:03 d2.evaluation.evaluator]: Inference done 165/190. 0.1140 s / img. ETA=0:00:05
[08/31 07:18:08 d2.evaluation.evaluator]: Inference done 190/190. 0.1140 s / img. ETA=0:00:00
[08/31 07:18:08 d2.evaluation.evaluator]: Total inference time: 0:00:43.000383 (0.232435 s / img per device, on 1 devices)
[08/31 07:18:08 d2.evaluation.evaluator]: Total inference pure compute time: 0:00:21 (0.113990 s / img per device, on 1 devices)
[08/31 07:18:09 d2.evaluation.coco_evaluation]: Preparing results for COCO format ...
[08/31 07:18:09 d2.evaluation.coco_evaluation]: Saving results to /content/drive/MyDrive/detectron2_500/output_detect/coco_instances_results.json
```

Evaluation:(30.08.2021)

1. Train evaluation:

```
 Average Precision  (AP) @[ IoU=0.50:0.95 | area=   all | maxDets=100 ] = 0.646
 Average Precision  (AP) @[ IoU=0.50      | area=   all | maxDets=100 ] = 0.958
 Average Precision  (AP) @[ IoU=0.75      | area=   all | maxDets=100 ] = 0.771
 Average Precision  (AP) @[ IoU=0.50:0.95 | area= small | maxDets=100 ] = 0.574
 Average Precision  (AP) @[ IoU=0.50:0.95 | area=medium | maxDets=100 ] = 0.685
 Average Precision  (AP) @[ IoU=0.50:0.95 | area= large | maxDets=100 ] = 0.820
 Average Recall     (AR) @[ IoU=0.50:0.95 | area=   all | maxDets=  1 ] = 0.275
 Average Recall     (AR) @[ IoU=0.50:0.95 | area=   all | maxDets= 10 ] = 0.694
 Average Recall     (AR) @[ IoU=0.50:0.95 | area=   all | maxDets=100 ] = 0.719
 Average Recall     (AR) @[ IoU=0.50:0.95 | area= small | maxDets=100 ] = 0.645
 Average Recall     (AR) @[ IoU=0.50:0.95 | area=medium | maxDets=100 ] = 0.757
 Average Recall     (AR) @[ IoU=0.50:0.95 | area= large | maxDets=100 ] = 0.862
[08/30 09:14:56 d2.evaluation.coco_evaluation]: Evaluation results for segm:
|   AP   |  AP50  |  AP75  |  APs   |  APm   |  APl   |
|:------:|:------:|:------:|:------:|:------:|:------:|
| 64.617 | 95.810 | 77.099 | 57.430 | 68.532 | 82.030 |
[08/30 09:14:56 d2.evaluation.coco_evaluation]: Per-category segm AP:
| category   | AP     | category   | AP     | category      | AP     |
|:-----------|:-------|:-----------|:-------|:--------------|:-------|
| aeroplane  | 67.156 | car        | 67.161 | chair         | 60.983 |
| cow        | 63.354 | person     | 62.742 | traffic_light | 66.308 |
```

2. Test evaluation:

```
 Average Precision  (AP) @[ IoU=0.50:0.95 | area=   all | maxDets=100 ] = 0.250
 Average Precision  (AP) @[ IoU=0.50      | area=   all | maxDets=100 ] = 0.443
 Average Precision  (AP) @[ IoU=0.75      | area=   all | maxDets=100 ] = 0.272
 Average Precision  (AP) @[ IoU=0.50:0.95 | area= small | maxDets=100 ] = 0.121
 Average Precision  (AP) @[ IoU=0.50:0.95 | area=medium | maxDets=100 ] = 0.337
 Average Precision  (AP) @[ IoU=0.50:0.95 | area= large | maxDets=100 ] = 0.413
 Average Recall     (AR) @[ IoU=0.50:0.95 | area=   all | maxDets=  1 ] = 0.170
 Average Recall     (AR) @[ IoU=0.50:0.95 | area=   all | maxDets= 10 ] = 0.380
 Average Recall     (AR) @[ IoU=0.50:0.95 | area=   all | maxDets=100 ] = 0.389
 Average Recall     (AR) @[ IoU=0.50:0.95 | area= small | maxDets=100 ] = 0.244
 Average Recall     (AR) @[ IoU=0.50:0.95 | area=medium | maxDets=100 ] = 0.465
 Average Recall     (AR) @[ IoU=0.50:0.95 | area= large | maxDets=100 ] = 0.615
[08/30 09:19:39 d2.evaluation.coco_evaluation]: Evaluation results for segm:
|   AP   |  AP50  |  AP75  |  APs   |  APm   |  APl   |
|:------:|:------:|:------:|:------:|:------:|:------:|
| 25.027 | 44.345 | 27.189 | 12.107 | 33.652 | 41.332 |
[08/30 09:19:39 d2.evaluation.coco_evaluation]: Per-category segm AP:
| category   | AP     | category   | AP     | category      | AP     |
|:-----------|:-------|:-----------|:-------|:--------------|:-------|
| aeroplane  | 38.290 | car        | 14.908 | chair         | 17.020 |
| cow        | 45.209 | person     | 11.283 | traffic_light | 23.452 |
```

4.

yolov4 for 1000 instances.
Epochs 32303
Map
1.train

```
 calculation mAP (mean average precision)...
 Detection layer: 139 - type = 28
 Detection layer: 150 - type = 28
 Detection layer: 161 - type = 28
1192
 detections_count = 17173, unique_truth_count = 9852
class_id = 0, name = bird, ap = 85.69%           (TP = 359, FP = 106)
class_id = 1, name = book, ap = 78.50%           (TP = 788, FP = 199)
class_id = 2, name = bottle, ap = 95.00%         (TP = 946, FP = 80)
class_id = 3, name = car, ap = 90.15%            (TP = 4847, FP = 512)
class_id = 4, name = person, ap = 98.29%         (TP = 976, FP = 40)
class_id = 5, name = chair, ap = 96.68%          (TP = 960, FP = 50)

 for conf_thresh = 0.25, precision = 0.90, recall = 0.90, F1-score = 0.90
 for conf_thresh = 0.25, TP = 8876, FP = 987, FN = 976, average IoU = 77.70 %

 IoU threshold = 50 %, used Area-Under-Curve for each unique Recall
 mean average precision (mAP@0.50) = 0.907192, or 90.72 %
Total Detection Time: 683 Seconds
```

2. Test

```
 calculation mAP (mean average precision)...
 Detection layer: 139 - type = 28
 Detection layer: 150 - type = 28
 Detection layer: 161 - type = 28
180
 detections_count = 2164, unique_truth_count = 1995
class_id = 0, name = bird, ap = 12.87%           (TP = 31, FP = 25)
class_id = 1, name = book, ap = 0.09%            (TP = 1, FP = 72)
class_id = 2, name = bottle, ap = 12.56%         (TP = 39, FP = 50)
class_id = 3, name = car, ap = 4.83%     (TP = 126, FP = 294)
class_id = 4, name = chair, ap = 11.40%          (TP = 27, FP = 59)
class_id = 5, name = person, ap = 4.13%          (TP = 12, FP = 63)

 for conf_thresh = 0.25, precision = 0.30, recall = 0.12, F1-score = 0.17
 for conf_thresh = 0.25, TP = 236, FP = 563, FN = 1759, average IoU = 24.12 %

 IoU threshold = 50 %, used Area-Under-Curve for each unique Recall
 mean average precision (mAP@0.50) = 0.076448, or 7.64 %
Total Detection Time: 103 Seconds
```

Pp-yolo for 1000 instances

```
DONE (t=0.97s)
creating index...
index created!
Running per image evaluation...
Evaluate annotation type *bbox*
DONE (t=7.72s).
Accumulating evaluation results...
DONE (t=1.40s).
 Average Precision  (AP) @[ IoU=0.50:0.95 | area=   all | maxDets=100 ] = 0.039
 Average Precision  (AP) @[ IoU=0.50      | area=   all | maxDets=100 ] = 0.111
 Average Precision  (AP) @[ IoU=0.75      | area=   all | maxDets=100 ] = 0.017
 Average Precision  (AP) @[ IoU=0.50:0.95 | area= small | maxDets=100 ] = 0.037
 Average Precision  (AP) @[ IoU=0.50:0.95 | area=medium | maxDets=100 ] = 0.051
 Average Precision  (AP) @[ IoU=0.50:0.95 | area= large | maxDets=100 ] = 0.031
 Average Recall     (AR) @[ IoU=0.50:0.95 | area=   all | maxDets=  1 ] = 0.047
 Average Recall     (AR) @[ IoU=0.50:0.95 | area=   all | maxDets= 10 ] = 0.147
 Average Recall     (AR) @[ IoU=0.50:0.95 | area=   all | maxDets=100 ] = 0.210
 Average Recall     (AR) @[ IoU=0.50:0.95 | area= small | maxDets=100 ] = 0.160
 Average Recall     (AR) @[ IoU=0.50:0.95 | area=medium | maxDets=100 ] = 0.260
 Average Recall     (AR) @[ IoU=0.50:0.95 | area= large | maxDets=100 ] = 0.243
[08/14 05:42:22] ppdet.metrics.coco_utils INFO: Per-category of bbox AP:
+----------+-------+----------+-------+----------+-------+
| category | AP    | category | AP    | category | AP    |
+----------+-------+----------+-------+----------+-------+
| bird     | 0.011 | book     | 0.015 | bottle   | 0.124 |
| car      | 0.002 | chair    | 0.016 | person   | 0.064 |
+----------+-------+----------+-------+----------+-------+
[08/14 05:42:22] ppdet.metrics.coco_utils INFO: per-category PR curve has output to bbox_pr_curve folder.
[08/14 05:42:23] ppdet.engine INFO: Total sample number: 1093, averge FPS: 13.546782759184328
```