

Work report

30 Aug 2021

Detectron2 for 500 instances

Deformable convolution (3x and 42.7 box AP)

```
[08/30 07:49:45 d2.utils.events]: eta: 0:06:32 iter: 34419 total_loss: 0.287 loss_cls: 0.051 loss_box_reg: 0.125 loss_mask: 0.134 loss_rpn_cls: 0.001 loss_r
[08/30 07:49:57 d2.utils.events]: eta: 0:06:19 iter: 34439 total_loss: 0.386 loss_cls: 0.045 loss_box_reg: 0.150 loss_mask: 0.159 loss_rpn_cls: 0.001 loss_r
[08/30 07:50:11 d2.utils.events]: eta: 0:06:06 iter: 34459 total_loss: 0.250 loss_cls: 0.025 loss_box_reg: 0.095 loss_mask: 0.119 loss_rpn_cls: 0.000 loss_r
[08/30 07:50:25 d2.utils.events]: eta: 0:05:53 iter: 34479 total_loss: 0.296 loss_cls: 0.036 loss_box_reg: 0.115 loss_mask: 0.146 loss_rpn_cls: 0.000 loss_r
[08/30 07:50:40 d2.utils.events]: eta: 0:05:40 iter: 34499 total_loss: 0.296 loss_cls: 0.038 loss_box_reg: 0.115 loss_mask: 0.129 loss_rpn_cls: 0.001 loss_r
[08/30 07:50:54 d2.utils.events]: eta: 0:05:26 iter: 34519 total_loss: 0.304 loss_cls: 0.030 loss_box_reg: 0.127 loss_mask: 0.149 loss_rpn_cls: 0.000 loss_r
[08/30 07:51:07 d2.utils.events]: eta: 0:05:12 iter: 34539 total_loss: 0.202 loss_cls: 0.022 loss_box_reg: 0.081 loss_mask: 0.096 loss_rpn_cls: 0.000 loss_r
[08/30 07:51:21 d2.utils.events]: eta: 0:04:59 iter: 34559 total_loss: 0.237 loss_cls: 0.026 loss_box_reg: 0.098 loss_mask: 0.133 loss_rpn_cls: 0.000 loss_r
[08/30 07:51:34 d2.utils.events]: eta: 0:04:45 iter: 34579 total_loss: 0.309 loss_cls: 0.035 loss_box_reg: 0.115 loss_mask: 0.136 loss_rpn_cls: 0.000 loss_r
[08/30 07:51:50 d2.utils.events]: eta: 0:04:31 iter: 34599 total_loss: 0.338 loss_cls: 0.039 loss_box_reg: 0.130 loss_mask: 0.138 loss_rpn_cls: 0.000 loss_r
[08/30 07:52:03 d2.utils.events]: eta: 0:04:18 iter: 34619 total_loss: 0.373 loss_cls: 0.053 loss_box_reg: 0.146 loss_mask: 0.148 loss_rpn_cls: 0.001 loss_r
[08/30 07:52:17 d2.utils.events]: eta: 0:04:04 iter: 34639 total_loss: 0.223 loss_cls: 0.022 loss_box_reg: 0.083 loss_mask: 0.107 loss_rpn_cls: 0.000 loss_r
[08/30 07:52:30 d2.utils.events]: eta: 0:03:51 iter: 34659 total_loss: 0.318 loss_cls: 0.033 loss_box_reg: 0.125 loss_mask: 0.137 loss_rpn_cls: 0.000 loss_r
[08/30 07:52:44 d2.utils.events]: eta: 0:03:37 iter: 34679 total_loss: 0.277 loss_cls: 0.028 loss_box_reg: 0.106 loss_mask: 0.132 loss_rpn_cls: 0.001 loss_r
[08/30 07:52:59 d2.utils.events]: eta: 0:03:24 iter: 34699 total_loss: 0.321 loss_cls: 0.033 loss_box_reg: 0.125 loss_mask: 0.129 loss_rpn_cls: 0.001 loss_r
[08/30 07:53:13 d2.utils.events]: eta: 0:03:10 iter: 34719 total_loss: 0.258 loss_cls: 0.035 loss_box_reg: 0.108 loss_mask: 0.124 loss_rpn_cls: 0.001 loss_r
[08/30 07:53:26 d2.utils.events]: eta: 0:02:57 iter: 34739 total_loss: 0.326 loss_cls: 0.031 loss_box_reg: 0.118 loss_mask: 0.147 loss_rpn_cls: 0.001 loss_r
[08/30 07:53:40 d2.utils.events]: eta: 0:02:43 iter: 34759 total_loss: 0.277 loss_cls: 0.026 loss_box_reg: 0.093 loss_mask: 0.128 loss_rpn_cls: 0.000 loss_r
[08/30 07:53:54 d2.utils.events]: eta: 0:02:30 iter: 34779 total_loss: 0.295 loss_cls: 0.039 loss_box_reg: 0.119 loss_mask: 0.141 loss_rpn_cls: 0.001 loss_r
[08/30 07:54:09 d2.utils.events]: eta: 0:02:16 iter: 34799 total_loss: 0.346 loss_cls: 0.033 loss_box_reg: 0.131 loss_mask: 0.148 loss_rpn_cls: 0.001 loss_r
[08/30 07:54:23 d2.utils.events]: eta: 0:02:02 iter: 34819 total_loss: 0.279 loss_cls: 0.033 loss_box_reg: 0.104 loss_mask: 0.124 loss_rpn_cls: 0.000 loss_r
[08/30 07:54:36 d2.utils.events]: eta: 0:01:49 iter: 34839 total_loss: 0.288 loss_cls: 0.021 loss_box_reg: 0.102 loss_mask: 0.137 loss_rpn_cls: 0.000 loss_r
[08/30 07:54:50 d2.utils.events]: eta: 0:01:35 iter: 34859 total_loss: 0.264 loss_cls: 0.029 loss_box_reg: 0.107 loss_mask: 0.122 loss_rpn_cls: 0.001 loss_r
[08/30 07:55:03 d2.utils.events]: eta: 0:01:22 iter: 34879 total_loss: 0.290 loss_cls: 0.030 loss_box_reg: 0.110 loss_mask: 0.141 loss_rpn_cls: 0.000 loss_r
[08/30 07:55:18 d2.utils.events]: eta: 0:01:08 iter: 34899 total_loss: 0.275 loss_cls: 0.039 loss_box_reg: 0.096 loss_mask: 0.125 loss_rpn_cls: 0.000 loss_r
[08/30 07:55:32 d2.utils.events]: eta: 0:00:55 iter: 34919 total_loss: 0.258 loss_cls: 0.025 loss_box_reg: 0.094 loss_mask: 0.120 loss_rpn_cls: 0.000 loss_r
[08/30 07:55:46 d2.utils.events]: eta: 0:00:41 iter: 34939 total_loss: 0.252 loss_cls: 0.026 loss_box_reg: 0.102 loss_mask: 0.120 loss_rpn_cls: 0.000 loss_r
[08/30 07:55:59 d2.utils.events]: eta: 0:00:27 iter: 34959 total_loss: 0.261 loss_cls: 0.030 loss_box_reg: 0.095 loss_mask: 0.130 loss_rpn_cls: 0.000 loss_r
[08/30 07:56:13 d2.utils.events]: eta: 0:00:14 iter: 34979 total_loss: 0.270 loss_cls: 0.024 loss_box_reg: 0.086 loss_mask: 0.129 loss_rpn_cls: 0.001 loss_r
ERROR [08/30 07:56:31 d2.engine.train_loop]: Exception during training:
Traceback (most recent call last):
  File "/usr/local/lib/python3.7/dist-packages/detectron2/engine/train_loop.py", line 133, in train
```

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 |
```

3. Inference:

```
[08/30 09:19:15 d2.evaluation.evaluator]: Inference done 11/190. 0.1138 s / img. ETA=0:00:21
[08/30 09:19:20 d2.evaluation.evaluator]: Inference done 50/190. 0.1235 s / img. ETA=0:00:18
[08/30 09:19:25 d2.evaluation.evaluator]: Inference done 89/190. 0.1243 s / img. ETA=0:00:13
[08/30 09:19:30 d2.evaluation.evaluator]: Inference done 127/190. 0.1246 s / img. ETA=0:00:08
[08/30 09:19:35 d2.evaluation.evaluator]: Inference done 165/190. 0.1248 s / img. ETA=0:00:03
[08/30 09:19:38 d2.evaluation.evaluator]: Total inference time: 0:00:24.405979 (0.131924 s / img per device, on 1 devices)
[08/30 09:19:39 d2.evaluation.evaluator]: Total inference pure compute time: 0:00:23 (0.125160 s / img per device, on 1 devices)
[08/30 09:19:39 d2.evaluation.coco_evaluation]: Preparing results for COCO format ...
[08/30 09:19:39 d2.evaluation.coco_evaluation]: Saving results to /content/drive/MyDrive/detectron2_500/output_detect/coco_instances_resul
```

Evaluation:(28.08.2021)

1. Train evaluation:

```
Average Precision (AP) @[ IoU=0.50:0.95 | area= all | maxDets=100 ] = 0.801
Average Precision (AP) @[ IoU=0.50      | area= all | maxDets=100 ] = 0.973
Average Precision (AP) @[ IoU=0.75      | area= all | maxDets=100 ] = 0.907
Average Precision (AP) @[ IoU=0.50:0.95 | area= small | maxDets=100 ] = 0.736
Average Precision (AP) @[ IoU=0.50:0.95 | area=medium | maxDets=100 ] = 0.863
Average Precision (AP) @[ IoU=0.50:0.95 | area= large | maxDets=100 ] = 0.919
Average Recall (AR) @[ IoU=0.50:0.95 | area= all | maxDets= 1 ] = 0.324
Average Recall (AR) @[ IoU=0.50:0.95 | area= all | maxDets= 10 ] = 0.812
Average Recall (AR) @[ IoU=0.50:0.95 | area= all | maxDets=100 ] = 0.843
Average Recall (AR) @[ IoU=0.50:0.95 | area= small | maxDets=100 ] = 0.777
Average Recall (AR) @[ IoU=0.50:0.95 | area=medium | maxDets=100 ] = 0.901
Average Recall (AR) @[ IoU=0.50:0.95 | area= large | maxDets=100 ] = 0.954
```

[08/28 12:05:10 d2.evaluation.coco_evaluation]: Evaluation results for bbox:

AP	AP50	AP75	APs	APm	APl
80.122	97.341	90.739	73.581	86.256	91.937

[08/28 12:05:10 d2.evaluation.coco_evaluation]: Per-category bbox AP:

category	AP	category	AP	category	AP
aeroplane	91.669	car	76.208	chair	80.810
cow	82.875	person	81.247	traffic_light	67.926

2. Test evaluation:

```
Average Precision (AP) @[ IoU=0.50:0.95 | area= all | maxDets=100 ] = 0.313
Average Precision (AP) @[ IoU=0.50      | area= all | maxDets=100 ] = 0.485
Average Precision (AP) @[ IoU=0.75      | area= all | maxDets=100 ] = 0.329
Average Precision (AP) @[ IoU=0.50:0.95 | area= small | maxDets=100 ] = 0.164
Average Precision (AP) @[ IoU=0.50:0.95 | area=medium | maxDets=100 ] = 0.412
Average Precision (AP) @[ IoU=0.50:0.95 | area= large | maxDets=100 ] = 0.498
Average Recall (AR) @[ IoU=0.50:0.95 | area= all | maxDets= 1 ] = 0.197
Average Recall (AR) @[ IoU=0.50:0.95 | area= all | maxDets= 10 ] = 0.445
Average Recall (AR) @[ IoU=0.50:0.95 | area= all | maxDets=100 ] = 0.461
Average Recall (AR) @[ IoU=0.50:0.95 | area= small | maxDets=100 ] = 0.289
Average Recall (AR) @[ IoU=0.50:0.95 | area=medium | maxDets=100 ] = 0.535
Average Recall (AR) @[ IoU=0.50:0.95 | area= large | maxDets=100 ] = 0.752
```

[08/28 11:59:54 d2.evaluation.coco_evaluation]: Evaluation results for bbox:

AP	AP50	AP75	APs	APm	APl
31.323	48.542	32.874	16.368	41.206	49.817

[08/28 11:59:54 d2.evaluation.coco_evaluation]: Per-category bbox AP:

category	AP	category	AP	category	AP
aeroplane	52.881	car	18.314	chair	24.517
cow	50.986	person	15.526	traffic_light	25.713

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=0.77s)
creating index...
index created!
Running per image evaluation...
Evaluate annotation type *bbox*
DONE (t=7.72s).
Accumulating evaluation...
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] ppydet.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] ppydet.metrics.coco_utils INFO: per-category PR curve has output to bbox_pr_curve folder.
[08/14 05:42:23] ppydet.engine INFO: Total sample number: 1093, average FPS: 13.546782759184328
```