

Work report

2 Sep 2021

Detecron2 for 500 instances

Deformable convolution (3x and 42.7 box AP)

```
[09/02 09:54:02 d2.utils.events]: eta: 0:10:53 iter: 57639 total_loss: 0.211 loss_cls: 0.019 loss_box_reg: 0.080 loss_mask: 0.105 loss_rpn_cls: 0.000 loss_rpn_box_reg: 0.000
[09/02 09:54:38 d2.utils.events]: eta: 0:10:18 iter: 57659 total_loss: 0.202 loss_cls: 0.023 loss_box_reg: 0.066 loss_mask: 0.097 loss_rpn_cls: 0.000 loss_rpn_box_reg: 0.000
[09/02 09:55:15 d2.utils.events]: eta: 0:09:41 iter: 57679 total_loss: 0.174 loss_cls: 0.017 loss_box_reg: 0.068 loss_mask: 0.091 loss_rpn_cls: 0.000 loss_rpn_box_reg: 0.000
[09/02 09:55:51 d2.utils.events]: eta: 0:09:05 iter: 57699 total_loss: 0.282 loss_cls: 0.032 loss_box_reg: 0.101 loss_mask: 0.132 loss_rpn_cls: 0.001 loss_rpn_box_reg: 0.001
[09/02 09:56:27 d2.utils.events]: eta: 0:08:29 iter: 57719 total_loss: 0.200 loss_cls: 0.026 loss_box_reg: 0.076 loss_mask: 0.115 loss_rpn_cls: 0.000 loss_rpn_box_reg: 0.000
[09/02 09:57:03 d2.utils.events]: eta: 0:07:52 iter: 57739 total_loss: 0.223 loss_cls: 0.018 loss_box_reg: 0.088 loss_mask: 0.115 loss_rpn_cls: 0.000 loss_rpn_box_reg: 0.000
[09/02 09:57:38 d2.utils.events]: eta: 0:07:15 iter: 57759 total_loss: 0.295 loss_cls: 0.033 loss_box_reg: 0.100 loss_mask: 0.123 loss_rpn_cls: 0.001 loss_rpn_box_reg: 0.001
[09/02 09:58:15 d2.utils.events]: eta: 0:06:39 iter: 57779 total_loss: 0.219 loss_cls: 0.032 loss_box_reg: 0.088 loss_mask: 0.114 loss_rpn_cls: 0.000 loss_rpn_box_reg: 0.000
[09/02 09:58:49 d2.utils.events]: eta: 0:06:03 iter: 57799 total_loss: 0.292 loss_cls: 0.027 loss_box_reg: 0.120 loss_mask: 0.124 loss_rpn_cls: 0.001 loss_rpn_box_reg: 0.001
[09/02 09:59:24 d2.utils.events]: eta: 0:05:26 iter: 57819 total_loss: 0.212 loss_cls: 0.021 loss_box_reg: 0.083 loss_mask: 0.107 loss_rpn_cls: 0.000 loss_rpn_box_reg: 0.000
[09/02 09:59:59 d2.utils.events]: eta: 0:04:50 iter: 57839 total_loss: 0.240 loss_cls: 0.024 loss_box_reg: 0.088 loss_mask: 0.113 loss_rpn_cls: 0.001 loss_rpn_box_reg: 0.001
[09/02 10:00:35 d2.utils.events]: eta: 0:04:14 iter: 57859 total_loss: 0.242 loss_cls: 0.022 loss_box_reg: 0.094 loss_mask: 0.109 loss_rpn_cls: 0.000 loss_rpn_box_reg: 0.000
[09/02 10:01:10 d2.utils.events]: eta: 0:03:38 iter: 57879 total_loss: 0.244 loss_cls: 0.030 loss_box_reg: 0.085 loss_mask: 0.110 loss_rpn_cls: 0.001 loss_rpn_box_reg: 0.001
[09/02 10:01:47 d2.utils.events]: eta: 0:03:02 iter: 57899 total_loss: 0.221 loss_cls: 0.020 loss_box_reg: 0.090 loss_mask: 0.109 loss_rpn_cls: 0.000 loss_rpn_box_reg: 0.000
[09/02 10:02:23 d2.utils.events]: eta: 0:02:26 iter: 57919 total_loss: 0.226 loss_cls: 0.020 loss_box_reg: 0.079 loss_mask: 0.111 loss_rpn_cls: 0.000 loss_rpn_box_reg: 0.000
[09/02 10:03:00 d2.utils.events]: eta: 0:01:49 iter: 57939 total_loss: 0.234 loss_cls: 0.022 loss_box_reg: 0.074 loss_mask: 0.124 loss_rpn_cls: 0.000 loss_rpn_box_reg: 0.000
[09/02 10:03:37 d2.utils.events]: eta: 0:01:13 iter: 57959 total_loss: 0.212 loss_cls: 0.025 loss_box_reg: 0.084 loss_mask: 0.105 loss_rpn_cls: 0.000 loss_rpn_box_reg: 0.000
[09/02 10:04:14 d2.utils.events]: eta: 0:00:37 iter: 57979 total_loss: 0.246 loss_cls: 0.024 loss_box_reg: 0.088 loss_mask: 0.127 loss_rpn_cls: 0.000 loss_rpn_box_reg: 0.000
[09/02 10:04:54 d2.data.build]: Distribution of instances among all 6 categories:
category | #instances | category | #instances | category | #instances
:-----:|:-----:|:-----:|:-----:|:-----:|:-----:
aeroplane | 100 | car | 99 | chair | 99
cow | 100 | person | 100 | traffic_light | 99
total | 597 |
[09/02 10:04:54 d2.data.common]: Serializing 190 elements to byte tensors and concatenating them all ...
[09/02 10:04:54 d2.data.common]: Serialized dataset takes 0.34 MiB
WARNING [09/02 10:04:54 d2.engine.defaults]: No evaluator found. Use 'DefaultTrainer.test(evaluators=)', or implement its 'build_evaluator' method.
[09/02 10:04:54 d2.utils.events]: eta: 0:00:01 iter: 57999 total_loss: 0.237 loss_cls: 0.023 loss_box_reg: 0.081 loss_mask: 0.112 loss_rpn_cls: 0.000 loss_rpn_box_reg: 0.000
[09/02 10:04:54 d2.engine.hooks]: Overall training speed: 7997 iterations in 4:02:30 (1.8196 s / it)
[09/02 10:04:54 d2.engine.hooks]: Total training time: 4:02:58 (0:00:27 on hooks)
```

1. Train evaluation:

Average Precision	(AP)	@[IoU=0.50:0.95	| area= all	| maxDets=100	] = 0.684
Average Precision	(AP)	@[IoU=0.50	| area= all	| maxDets=100	] = 0.969
Average Precision	(AP)	@[IoU=0.75	| area= all	| maxDets=100	] = 0.819
Average Precision	(AP)	@[IoU=0.50:0.95	| area= small	| maxDets=100	] = 0.622
Average Precision	(AP)	@[IoU=0.50:0.95	| area= medium	| maxDets=100	] = 0.723
Average Precision	(AP)	@[IoU=0.50:0.95	| area= large	| maxDets=100	] = 0.838
Average Recall	(AR)	@[IoU=0.50:0.95	| area= all	| maxDets= 1	] = 0.286
Average Recall	(AR)	@[IoU=0.50:0.95	| area= all	| maxDets= 10	] = 0.729
Average Recall	(AR)	@[IoU=0.50:0.95	| area= all	| maxDets=100	] = 0.754
Average Recall	(AR)	@[IoU=0.50:0.95	| area= small	| maxDets=100	] = 0.688
Average Recall	(AR)	@[IoU=0.50:0.95	| area= medium	| maxDets=100	] = 0.787
Average Recall	(AR)	@[IoU=0.50:0.95	| area= large	| maxDets=100	] = 0.877

[09/02 10:58:59 d2.evaluation.coco_evaluation]: Evaluation results for segm:

AP	AP50	AP75	APs	APm	APl
:-----:	:-----:	:-----:	:-----:	:-----:	:-----:
68.398	96.917	81.912	62.207	72.333	83.818

[09/02 10:58:59 d2.evaluation.coco_evaluation]: Per-category segm AP:

category	AP	category	AP	category	AP
:-----:	:-----:	:-----:	:-----:	:-----:	:-----:
aeroplane	70.458	car	70.475	chair	66.117
cow	64.706	person	66.906	traffic_light	71.725

2. Test evaluation:

```
-----
Average Precision (AP) @[ IoU=0.50:0.95 | area= all | maxDets=100 ] = 0.242
Average Precision (AP) @[ IoU=0.50      | area= all | maxDets=100 ] = 0.434
Average Precision (AP) @[ IoU=0.75      | area= all | maxDets=100 ] = 0.265
Average Precision (AP) @[ IoU=0.50:0.95 | area= small | maxDets=100 ] = 0.120
Average Precision (AP) @[ IoU=0.50:0.95 | area=medium | maxDets=100 ] = 0.338
Average Precision (AP) @[ IoU=0.50:0.95 | area= large | maxDets=100 ] = 0.388
Average Recall    (AR) @[ IoU=0.50:0.95 | area= all | maxDets= 1 ] = 0.163
Average Recall    (AR) @[ IoU=0.50:0.95 | area= all | maxDets= 10 ] = 0.355
Average Recall    (AR) @[ IoU=0.50:0.95 | area= all | maxDets=100 ] = 0.365
Average Recall    (AR) @[ IoU=0.50:0.95 | area= small | maxDets=100 ] = 0.219
Average Recall    (AR) @[ IoU=0.50:0.95 | area=medium | maxDets=100 ] = 0.450
Average Recall    (AR) @[ IoU=0.50:0.95 | area= large | maxDets=100 ] = 0.544
```

[09/02 10:51:25 d2.evaluation.coco_evaluation]: Evaluation results for segm:

AP	AP50	AP75	APs	APm	APl
24.198	43.379	26.451	11.997	33.753	38.784

[09/02 10:51:25 d2.evaluation.coco_evaluation]: Per-category segm AP:

category	AP	category	AP	category	AP
aeroplane	40.207	car	14.769	chair	15.868
cow	43.465	person	8.808	traffic_light	22.069

3. Inference:

```
[09/02 10:50:11 d2.evaluation.evaluator]: Inference done 11/190. 0.3727 s / img. ETA=0:01:08
[09/02 10:50:16 d2.evaluation.evaluator]: Inference done 24/190. 0.3886 s / img. ETA=0:01:05
[09/02 10:50:22 d2.evaluation.evaluator]: Inference done 37/190. 0.3954 s / img. ETA=0:01:01
[09/02 10:50:27 d2.evaluation.evaluator]: Inference done 50/190. 0.3968 s / img. ETA=0:00:56
[09/02 10:50:32 d2.evaluation.evaluator]: Inference done 63/190. 0.3950 s / img. ETA=0:00:51
[09/02 10:50:37 d2.evaluation.evaluator]: Inference done 76/190. 0.3966 s / img. ETA=0:00:46
[09/02 10:50:43 d2.evaluation.evaluator]: Inference done 89/190. 0.3974 s / img. ETA=0:00:40
[09/02 10:50:48 d2.evaluation.evaluator]: Inference done 102/190. 0.3963 s / img. ETA=0:00:35
[09/02 10:50:53 d2.evaluation.evaluator]: Inference done 115/190. 0.3965 s / img. ETA=0:00:30
[09/02 10:50:58 d2.evaluation.evaluator]: Inference done 128/190. 0.3965 s / img. ETA=0:00:25
[09/02 10:51:04 d2.evaluation.evaluator]: Inference done 141/190. 0.3970 s / img. ETA=0:00:19
[09/02 10:51:09 d2.evaluation.evaluator]: Inference done 154/190. 0.3952 s / img. ETA=0:00:14
[09/02 10:51:14 d2.evaluation.evaluator]: Inference done 167/190. 0.3950 s / img. ETA=0:00:09
[09/02 10:51:19 d2.evaluation.evaluator]: Inference done 180/190. 0.3954 s / img. ETA=0:00:04
[09/02 10:51:23 d2.evaluation.evaluator]: Total inference time: 0:01:14.438052 (0.402368 s / img per device, on 1 devices)
[09/02 10:51:23 d2.evaluation.evaluator]: Total inference pure compute time: 0:01:13 (0.394828 s / img per device, on 1 devices)
[09/02 10:51:23 d2.evaluation.coco_evaluation]: Preparing results for COCO format ...
[09/02 10:51:23 d2.evaluation.coco_evaluation]: Saving results to /content/drive/MyDrive/detectron2_500/output_detect/coco_instances_results.json
```

Evaluation:(01.09.2021)

1. Train evaluation:

```
Average Precision (AP) @[ IoU=0.50:0.95 | area= all | maxDets=100 ] = 0.671
Average Precision (AP) @[ IoU=0.50      | area= all | maxDets=100 ] = 0.965
Average Precision (AP) @[ IoU=0.75      | area= all | maxDets=100 ] = 0.802
Average Precision (AP) @[ IoU=0.50:0.95 | area= small | maxDets=100 ] = 0.608
Average Precision (AP) @[ IoU=0.50:0.95 | area=medium | maxDets=100 ] = 0.707
Average Precision (AP) @[ IoU=0.50:0.95 | area= large | maxDets=100 ] = 0.834
Average Recall (AR) @[ IoU=0.50:0.95 | area= all | maxDets= 1 ] = 0.281
Average Recall (AR) @[ IoU=0.50:0.95 | area= all | maxDets= 10 ] = 0.717
Average Recall (AR) @[ IoU=0.50:0.95 | area= all | maxDets=100 ] = 0.742
Average Recall (AR) @[ IoU=0.50:0.95 | area= small | maxDets=100 ] = 0.677
Average Recall (AR) @[ IoU=0.50:0.95 | area=medium | maxDets=100 ] = 0.776
Average Recall (AR) @[ IoU=0.50:0.95 | area= large | maxDets=100 ] = 0.874
[09/01 07:45:21 d2.evaluation.coco_evaluation]: Evaluation results for segm:
| AP | AP50 | AP75 | APs | APm | AP1 |
|:-----:|:-----:|:-----:|:-----:|:-----:|:-----:|
| 67.112 | 96.515 | 80.231 | 60.784 | 70.737 | 83.417 |
[09/01 07:45:21 d2.evaluation.coco_evaluation]: Per-category segm AP:
| category | AP | category | AP | category | AP |
|:-----:|:-----:|:-----:|:-----:|:-----:|:-----:|
| aeroplane | 69.001 | car | 70.164 | chair | 64.822 |
| cow | 64.355 | person | 65.236 | traffic_light | 69.094 |
```

2. Test evaluation:

```
Average Precision (AP) @[ IoU=0.50:0.95 | area= all | maxDets=100 ] = 0.239
Average Precision (AP) @[ IoU=0.50      | area= all | maxDets=100 ] = 0.433
Average Precision (AP) @[ IoU=0.75      | area= all | maxDets=100 ] = 0.255
Average Precision (AP) @[ IoU=0.50:0.95 | area= small | maxDets=100 ] = 0.113
Average Precision (AP) @[ IoU=0.50:0.95 | area=medium | maxDets=100 ] = 0.322
Average Precision (AP) @[ IoU=0.50:0.95 | area= large | maxDets=100 ] = 0.399
Average Recall (AR) @[ IoU=0.50:0.95 | area= all | maxDets= 1 ] = 0.160
Average Recall (AR) @[ IoU=0.50:0.95 | area= all | maxDets= 10 ] = 0.354
Average Recall (AR) @[ IoU=0.50:0.95 | area= all | maxDets=100 ] = 0.363
Average Recall (AR) @[ IoU=0.50:0.95 | area= small | maxDets=100 ] = 0.224
Average Recall (AR) @[ IoU=0.50:0.95 | area=medium | maxDets=100 ] = 0.432
Average Recall (AR) @[ IoU=0.50:0.95 | area= large | maxDets=100 ] = 0.548
[09/01 07:39:43 d2.evaluation.coco_evaluation]: Evaluation results for segm:
| AP | AP50 | AP75 | APs | APm | AP1 |
|:-----:|:-----:|:-----:|:-----:|:-----:|:-----:|
| 23.905 | 43.314 | 25.529 | 11.302 | 32.250 | 39.914 |
[09/01 07:39:43 d2.evaluation.coco_evaluation]: Per-category segm AP:
| category | AP | category | AP | category | AP |
|:-----:|:-----:|:-----:|:-----:|:-----:|:-----:|
| aeroplane | 38.574 | car | 13.750 | chair | 17.007 |
| cow | 41.265 | person | 10.261 | traffic_light | 22.571 |
```

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=0.57s)
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, average FPS: 13.546782759184328
```