# EECE7398 – Lab 3

#### 1. Dataset

The Stanford Dogs Dataset, consisting of 120 categories and 20,580 images, was used to fine-tune the YOLOv6-n model. The dataset was split into (70% training, 15% validation, 15% testing): Training set: 14,406 images, Validation set: 3,087 images, Testing set: 3,087 images

## 2. Outputs

Command used:

!python /content/YOLOv6/tools/eval.py --weights yolov6n.pt --data /content/data.yaml --device 0

```
Fusing model...
Switch model to deploy modality.
Model Summary: Params: 4.65M, Gflops: 11.39
img record infomation path is:/content/YOLOv6/dataset/custom_dataset/images/.val_cache.json
Val: Checking formats of labels with 8 process(es):
3087 label(s) found, 0 label(s) missing, 0 label(s) empty, 0 invalid label files: 100% 3087/3087 [00:00<00:00, 9373.52it/s]
Convert to COCO format
100% 3087/3087 [00:00<00:00, 169705.05it/s]
Convert to COCO format finished. Resutls saved in /content/YOLOv6/dataset/custom_dataset/annotations/instances_val.json Val: Final numbers of valid images: 3087/ labels: 3087.
0.6s for dataset initialization.
Inferencing model in val datasets.: 100%|
                                                                      | 97/97 [00:52<00:00, 1.85it/s]
Evaluating speed.
Average pre-process time: 0.10 ms
Average inference time: 0.71 ms
Average NMS time: 1.63 ms
Evaluating mAP by pycocotools.
Saving runs/val/exp1/predictions.json...
loading annotations into memory...
Done (t=0.02s)
creating index...
index created!
Loading and preparing results...
DONE (t=4.17s)
creating index...
index created!
Running per image evaluation...
Evaluate annotation type *bbox*
DONE (t=27.13s).
Accumulating evaluation results...
DONE (t=12.18s).
                                                       all
 Average Precision
                     (AP) @[ IoU=0.50:0.95
                                              area=
                                                             maxDets=100 ] = 0.001
 Average Precision
                                                       all
                     (AP) @[ IoU=0.50
                                                                          ] = 0.001
                                              area=
                                                             maxDets=100
 Average Precision
                     (AP) @[
                             IoU=0.75
                                                       all
                                                             maxDets=100
                                                                            = 0.001
                                              area=
 Average Precision
                     (AP) @[ IoU=0.50:0.95
                                                             maxDets=100
                                              area= small
                                                                          1 = -1.000
 Average Precision
                     (AP) @[ IoU=0.50:0.95
                                              area=medium
                                                             maxDets=100
                                                                           = 0.001
                     (AP) @[
                             IoU=0.50:0.95
 Average Precision
                                              area= large
                                                             maxDets=100
                                                                            = 0.001
                     (AR) @[
                             IoU=0.50:0.95
                                                             maxDets= 1
 Average Recall
                                                       all
                                                                            = 0.066
                                              area=
 Average Recall
                     (AR) @[
                             IoU=0.50:0.95
                                                       all
                                                             maxDets= 10
                                                                            = 0.100
                                              area=
 Average Recall
                     (AR) @[ IoU=0.50:0.95
                                                                            = 0.103
                                                       all
                                                             maxDets=100
                                              area=
 Average Recall
                     (AR) @[
                             IoU=0.50:0.95
                                              area= small
                                                             maxDets=100
                                                                            = -1.000
 Average Recall
                     (AR) @[ IoU=0.50:0.95
                                                             maxDets=100
                                                                            = 0.188
                                              area=medium
                     (AR) @[ IoU=0.50:0.95
 Average Recall
                                              area= large
                                                             maxDets=100 ] = 0.103
```

Figure 1: Testing on the target dataset without pretraining

### Command used:

```
!python /content/YOLOv6/tools/train.py \
    --batch-size 32 \
    --conf-file /content/YOLOv6/configs/yolov6n_finetune.py \
    --epochs 100 \
    --img-size 1280 \
    --data-path /content/data.yaml \
    --device 0 \
    --name yolov6n_finetune
```

```
Epoch
                 lr
                     iou_loss dfl_loss cls_loss
    45/99
             0.002056
                        0.2615
                                       0
                                             1.226: 100% 451/451 [03:56<00:00, 1.90it/]
                 lr iou_loss dfl_loss cls_loss
    Epoch
    46/99
             0.002012
                        0.2616
                                             1.217: 100%
                                                                 451/451 [03:56<00:00, 1.91it/]
                                       Ø
                 lr iou_loss dfl_loss cls_loss
    Epoch
    47/99
            0.001968
                        0.2597
                                             1.216: 100%
                                                                   | 451/451 [03:56<00:00,
                                                                                            1.90it/]
                 lr iou_loss dfl_loss cls_loss
    Epoch
                                                                  | 451/451 [03:57<00:00,
    48/99
            0.001925
                        0.2602
                                             1.212: 100%
                                                                                           1.90it/l
    Epoch
                 lr iou_loss dfl_loss cls_loss
                        0.2577
                                             1.202: 100%
    49/99
             0.00188
                                                                  | 451/451 [03:57<00:00,
                                                                                           1.90it/]
    Epoch
                 lr iou_loss dfl_loss cls_loss
    50/99
            0.001836
                                                                  | 451/451 [03:57<00:00, 1.90it/]
                        0.2578
                                            1.207: 100%
                                       0
Inferencing model in train datasets.: 100%|
                                                                    49/49 [00:32<00:00, 1.49it/s]
Evaluating speed.
Evaluating mAP by pycocotools.
Saving runs/train/yolov6n_finetune/predictions.json...
loading annotations into memory...
Done (t=0.02s)
creating index...
index created!
Loading and preparing results...
DONE (t=2.07s)
creating index...
index created!
Running per image evaluation...
Evaluate annotation type *bbox*
DONE (t=29.47s).
Accumulating evaluation results...
DONE (t=9.89s).
Average Precision (AP) @[ IoU=0.50:0.95 |
                                                   all | maxDets=100 ] = 0.500
                                           area=
Average Precision (AP) @[ IoU=0.50
                                           area=
                                                   all
                                                         maxDets=100] = 0.665
Average Precision (AP) @[ IoU=0.75
                                                   all
                                                         maxDets=100] = 0.582
                                           area=
                                           area= small
Average Precision
                  (AP) @[ IoU=0.50:0.95
                                                         maxDets=100] = -1.000
Average Precision
                                                         maxDets=100 ] = 0.537
                   (AP) @[ IoU=0.50:0.95
                                           area=medium
Average Precision
                  (AP) @[ IoU=0.50:0.95
                                           area= large
                                                         maxDets=100] = 0.502
Average Recall
                   (AR) @[ IoU=0.50:0.95
                                           area=
                                                   all
                                                         maxDets = 1 ] = 0.726
                   (AR) @[ IoU=0.50:0.95
                                                   all
                                                         maxDets = 10 ] = 0.806
Average Recall
                                           area=
Average Recall
                   (AR) @[ IoU=0.50:0.95
                                           area=
                                                   all
                                                         maxDets=100 l = 0.807
Average Recall
                   (AR) @[ IoU=0.50:0.95
                                           area= small
                                                         maxDets=100 l = -1.000
Average Recall
                   (AR) @[ IoU=0.50:0.95
                                                         maxDets=100 l = 0.753
                                           area=medium
                   (AR) @[ IoU=0.50:0.95 | area= large | maxDets=100 ] = 0.808
Average Recall
Results saved to runs/train/yolov6n_finetune
Epoch: 50 | mAP@0.5: 0.6647831825312775 | mAP@0.50:0.95: 0.4996499776763347
                 lr iou_loss dfl_loss cls_loss
    Epoch
    51/99
                                             1.198: 100%
            0.001792
                        0.2583
                                                                  | 451/451 [03:57<00:00,
                                                                                           1.90it/]
                 lr iou_loss dfl_loss cls_loss
    Epoch
    52/99
                                                                  | 451/451 [03:56<00:00,
            0.001748
                        0.2573
                                             1.196: 100%
                                                                                           1.91it/]
    Epoch
                 lr iou_loss dfl_loss cls_loss
                                             1.192: 100%
    53/99
             0.001704
                        0.2573
                                                                  | 451/451 [03:56<00:00, 1.91it/]
```

Figure 2: YOLOv6-n finetune training process

### Command used:

```
Fusing model...
Switch model to deploy modality.
Model Summary: Params: 4.66M, Gflops: 11.42
img record infomation path is:/content/YOLOv6/dataset/custom_dataset/images/.val_cache.json
Val: Checking formats of labels with 8 process(es):
3087 label(s) found, 0 label(s) missing, 0 label(s) empty, 0 invalid label files: 100% 3087/3087 [00:00<00:00, 9974.87it/s]
Convert to COCO format
100% 3087/3087 [00:00<00:00, 163183.77it/s]
Convert to COCO format finished. Resutls saved in /content/YOLOv6/dataset/custom_dataset/annotations/instances_val.json
Val: Final numbers of valid images: 3087/ labels: 3087.
0.6s for dataset initialization.
Inferencing model in val datasets.: 100%
                                                                       ■ 97/97 [00:18<00:00, 5.25it/s]</p>
Evaluating speed.
Average pre-process time: 0.10 ms
Average inference time: 0.76 ms
Average NMS time: 1.22 ms
Evaluating mAP by pycocotools.
Saving runs/val/exp2/predictions.json...
loading annotations into memory...
Done (t=0.02s)
creating index...
index created!
Loading and preparing results...
DONE (t=0.92s)
creating index...
index created!
Running per image evaluation...
Evaluate annotation type *bbox*
DONE (t=15.51s).
Accumulating evaluation results...
DONE (t=5.03s).
 Average Precision
                    (AP) @[ IoU=0.50:0.95
                                                       all |
                                                             maxDets=100 ] = 0.691
                                              area=
                                                                          ] = 0.779
] = 0.739
 Average Precision
                     (AP) @[ IoU=0.50
                                                       all
                                                             maxDets=100
                                               area=
                                                                            = 0.739
 Average Precision
                     (AP) @[ IoU=0.75
                                                       all
                                                              maxDets=100
                                               area=
 Average Precision
                     (AP) @[ IoU=0.50:0.95
                                                                           ] = -1.000
                                               area= small
                                                             maxDets=100
 Average Precision
                     (AP) @[ IoU=0.50:0.95
                                                                           ] = 0.555
                                               area=medium
                                                             maxDets=100
 Average Precision
                     (AP) @[ IoU=0.50:0.95
                                               area= large
                                                             maxDets=100
                                                                            = 0.696
                                                                           ] = 0.847
 Average Recall
                     (AR) @[ IoU=0.50:0.95
                                                       all
                                                             maxDets= 1
                                               area=
                                                              maxDets= 10
 Average Recall
                     (AR) @[ IoU=0.50:0.95
                                                       all
                                                                            = 0.910
                                               area=
 Average Recall
                     (AR) @[ IoU=0.50:0.95
                                               area=
                                                       all
                                                              maxDets=100
                                                                            = 0.910
                                                             maxDets=100
                     (AR) @[ IoU=0.50:0.95
 Average Recall
                                               area= small
                                                                            = -1.000
 Average Recall
                     (AR) @[ IoU=0.50:0.95
                                                              maxDets=100
                                               area=medium
                                                                            = 0.783
 Average Recall
                     (AR) @[ IoU=0.50:0.95
                                              area= large
                                                             maxDets=100 ] = 0.913
```

Figure 3: Testing on the target dataset after pretraining