ML/DL 스터디 발표

2024/04/01

GDSC Server / General 이정재

YOLO?

Object Detection

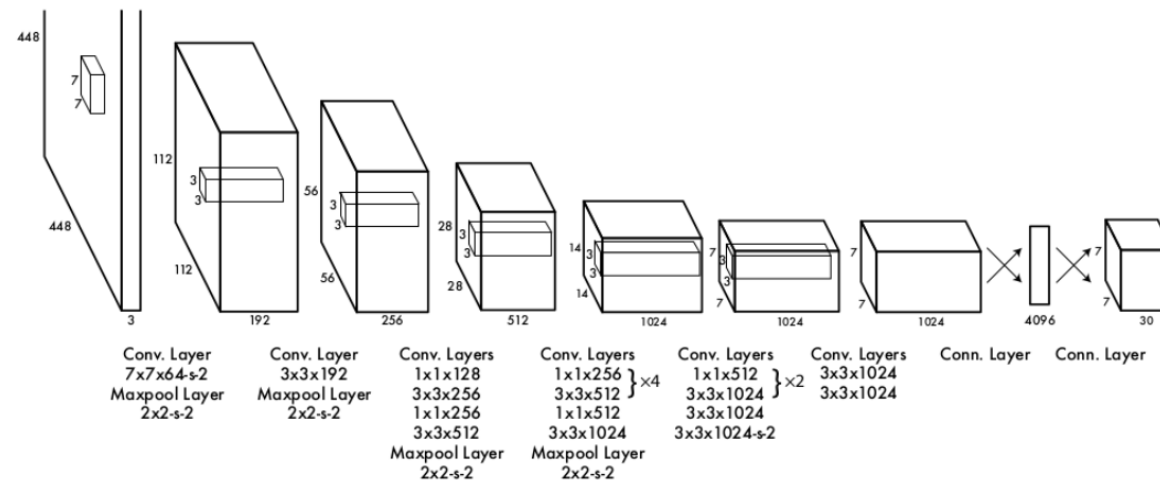이미지 내에 존재하는 물체를 찾고, 구분하는 기술

물체 영역의 위치를 Bounding Box로 표시

Box 내 존재하는 물체 : Label로 분류

YOLO : You Only Look Once

이미지를 한번만 보고 바로 물체를 검출하는 기술

빠른 속도로 Object Detection 수행

Figure 3: The Architecture. Our detection network has 24 convolutional layers followed by 2 fully connected layers. Alternating 1×1 convolutional layers reduce the features space from preceding layers. We pretrain the convolutional layers on the ImageNet classification task at half the resolution (224×224 input image) and then double the resolution for detection.

YOLO : You Only Look Once

이미지를 7x7 그리드로 나눠서 분석
각 그리드 셀 별로 2개의 Bounding Box 예측
→ 한 장 당 98개의 Bounding Box 예측
→ NMS(Non-Maximum Suppression) 통해 확률값이 높
은 예측결과 도출

Figure 3: The Architecture. Our detection network has 24 convolutional layers followed by 2 fully connected layers. Alternating 1×1 convolutional layers reduce the features space from preceding layers. We pretrain the convolutional layers on the ImageNet classification task at half the resolution (224×224 input image) and then double the resolution for detection.
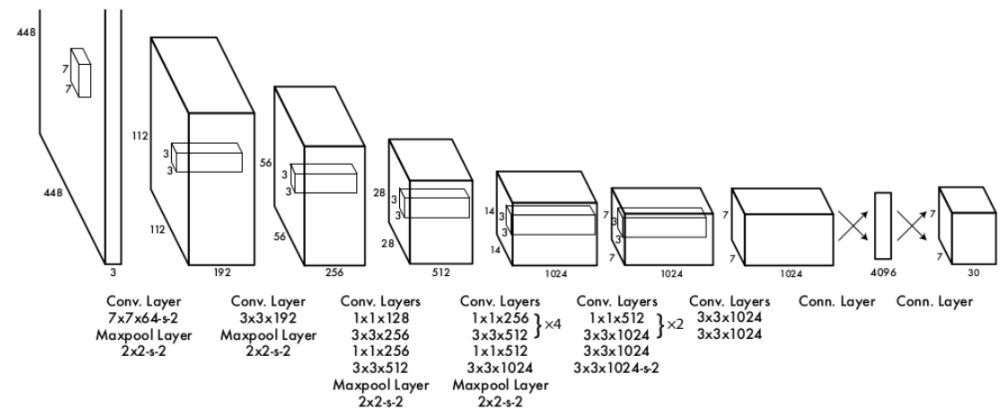
GPU 설정

```yaml
1 names:
2 - car
3 - free
4 nc: 2
5 roboflow:
6   license: MIT
7   project: real-time-parking-lot-vehicle-detection
8   url: https://universe.roboflow.com/swastik-abhijit-p
9   version: 1
10   workspace: swastik-abhijit-patra-zlamm
11 test: ../test/images
12 train: ../train/images
13 val: ../valid/images
14
```

```
[11]  !yolo task=detect mode=train model=/content/yolov8m.pt data={dataset.location}/data.yaml epochs=20 imgsz=640 plots=True
```

```
      Epoch    GPU_mem   box_loss   cls_loss   dfl_loss  Instances       Size
       1/20     8.28G      1.919      1.649      1.834         55        640: 100% 102/102 [01:06<00:00,  1.53it/s]
                Class     Images  Instances      Box(P          R      mAP50  mAP50-95): 100% 7/7 [00:05<00:00,  1.25it/s]
                  all        215       6275      0.493      0.407      0.368      0.158

      Epoch    GPU_mem   box_loss   cls_loss   dfl_loss  Instances       Size
       2/20     8.19G      1.813      1.364      1.762        171        640: 100% 102/102 [00:56<00:00,  1.80it/s]
                Class     Images  Instances      Box(P          R      mAP50  mAP50-95): 100% 7/7 [00:04<00:00,  1.59it/s]
                  all        215       6275      0.613      0.553      0.539      0.243

      Epoch    GPU_mem   box_loss   cls_loss   dfl_loss  Instances       Size
       3/20      8.5G      1.795      1.376      1.747         74        640: 100% 102/102 [00:56<00:00,  1.80it/s]
                Class     Images  Instances      Box(P          R      mAP50  mAP50-95): 100% 7/7 [00:04<00:00,  1.51it/s]
                  all        215       6275      0.676      0.661      0.682      0.316

      Epoch    GPU_mem   box_loss   cls_loss   dfl_loss  Instances       Size
       4/20     9.33G      1.761      1.314      1.734         25        640: 100% 102/102 [00:56<00:00,  1.80it/s]
                Class     Images  Instances      Box(P          R      mAP50  mAP50-95): 100% 7/7 [00:04<00:00,  1.51it/s]
                  all        215       6275      0.694      0.695      0.678      0.316

      Epoch    GPU_mem   box_loss   cls_loss   dfl_loss  Instances       Size
       5/20     9.87G      1.707      1.262      1.688         83        640: 100% 102/102 [00:55<00:00,  1.83it/s]
                Class     Images  Instances      Box(P          R      mAP50  mAP50-95): 100% 7/7 [00:04<00:00,  1.50it/s]
                  all        215       6275      0.743      0.712      0.737      0.364

      Epoch    GPU_mem   box_loss   cls_loss   dfl_loss  Instances       Size
       6/20     9.48G      1.671      1.217      1.646        122        640: 100% 102/102 [00:56<00:00,  1.81it/s]
                Class     Images  Instances      Box(P          R      mAP50  mAP50-95): 100% 7/7 [00:04<00:00,  1.56it/s]
                  all        215       6275      0.751      0.784       0.76       0.37

      Epoch    GPU_mem   box_loss   cls_loss   dfl_loss  Instances       Size
       7/20     9.77G      1.636      1.177      1.615        160        640: 100% 102/102 [00:55<00:00,  1.84it/s]
                Class     Images  Instances      Box(P          R      mAP50  mAP50-95): 100% 7/7 [00:04<00:00,  1.56it/s]
                  all        215       6275      0.765      0.768      0.763      0.374
```

```
     Epoch    GPU_mem   box_loss   cls_loss   dfl_loss   Instances       Size
      8/20     9.01G      1.596      1.109       1.59         54          640: 100% 102/102 [00:56<00:00,  1.81it/s]
                Class     Images   Instances      Box(P          R        mAP50  mAP50-95): 100% 7/7 [00:04<00:00,  1.60it/s]
                  all        215       6275       0.765       0.77       0.784       0.392

     Epoch    GPU_mem   box_loss   cls_loss   dfl_loss   Instances       Size
      9/20     9.06G      1.567      1.048      1.571        130          640: 100% 102/102 [00:55<00:00,  1.82it/s]
                Class     Images   Instances      Box(P          R        mAP50  mAP50-95): 100% 7/7 [00:04<00:00,  1.56it/s]
                  all        215       6275       0.779      0.797       0.803       0.405

     Epoch    GPU_mem   box_loss   cls_loss   dfl_loss   Instances       Size
     10/20     8.33G      1.532       1.02      1.549         47          640: 100% 102/102 [00:55<00:00,  1.83it/s]
                Class     Images   Instances      Box(P          R        mAP50  mAP50-95): 100% 7/7 [00:04<00:00,  1.61it/s]
                  all        215       6275       0.802      0.806       0.823       0.451
Closing dataloader mosaic
albumentations: Blur(p=0.01, blur_limit=(3, 7)), MedianBlur(p=0.01, blur_limit=(3, 7)), ToGray(p=0.01), CLAHE(p=0.01, clip_li

     Epoch    GPU_mem   box_loss   cls_loss   dfl_loss   Instances       Size
     11/20     7.72G      1.524     0.9791      1.595         18          640: 100% 102/102 [01:01<00:00,  1.67it/s]
                Class     Images   Instances      Box(P          R        mAP50  mAP50-95): 100% 7/7 [00:03<00:00,  1.78it/s]
                  all        215       6275       0.801      0.824       0.839       0.451

     Epoch    GPU_mem   box_loss   cls_loss   dfl_loss   Instances       Size
     12/20     8.33G      1.493     0.9478      1.588         56          640: 100% 102/102 [00:54<00:00,  1.88it/s]
                Class     Images   Instances      Box(P          R        mAP50  mAP50-95): 100% 7/7 [00:04<00:00,  1.64it/s]
                  all        215       6275       0.814      0.822       0.857       0.461

     Epoch    GPU_mem   box_loss   cls_loss   dfl_loss   Instances       Size
     13/20     8.82G      1.458     0.8749       1.55         33          640: 100% 102/102 [00:53<00:00,  1.89it/s]
                Class     Images   Instances      Box(P          R        mAP50  mAP50-95): 100% 7/7 [00:04<00:00,  1.64it/s]
                  all        215       6275       0.819       0.84       0.864       0.466
```

```
Epoch    GPU_mem    box_loss    cls_loss    dfl_loss    Instances        Size
14/20      9.04G       1.458      0.8482       1.548           41         640: 100% 102/102 [00:53<00:00,  1.89it/s]
           Class      Images   Instances      Box(P            R        mAP50  mAP50-95): 100% 7/7 [00:04<00:00,  1.73it/s]
             all         215        6275       0.837        0.847        0.877      0.482

Epoch    GPU_mem    box_loss    cls_loss    dfl_loss    Instances        Size
15/20      8.32G       1.394      0.8104       1.503           23         640: 100% 102/102 [00:53<00:00,  1.89it/s]
           Class      Images   Instances      Box(P            R        mAP50  mAP50-95): 100% 7/7 [00:03<00:00,  1.82it/s]
             all         215        6275       0.842        0.859        0.894       0.52

Epoch    GPU_mem    box_loss    cls_loss    dfl_loss    Instances        Size
16/20      8.31G       1.358      0.7596       1.471           66         640: 100% 102/102 [00:54<00:00,  1.88it/s]
           Class      Images   Instances      Box(P            R        mAP50  mAP50-95): 100% 7/7 [00:03<00:00,  1.81it/s]
             all         215        6275        0.85        0.871        0.904      0.526

Epoch    GPU_mem    box_loss    cls_loss    dfl_loss    Instances        Size
17/20      9.01G       1.312      0.7293       1.451           60         640: 100% 102/102 [00:54<00:00,  1.88it/s]
           Class      Images   Instances      Box(P            R        mAP50  mAP50-95): 100% 7/7 [00:03<00:00,  1.84it/s]
             all         215        6275       0.855        0.872        0.898      0.537

Epoch    GPU_mem    box_loss    cls_loss    dfl_loss    Instances        Size
18/20         9G       1.279      0.6949       1.422           47         640: 100% 102/102 [00:54<00:00,  1.89it/s]
           Class      Images   Instances      Box(P            R        mAP50  mAP50-95): 100% 7/7 [00:04<00:00,  1.56it/s]
             all         215        6275       0.864        0.876        0.895      0.529

Epoch    GPU_mem    box_loss    cls_loss    dfl_loss    Instances        Size
19/20      8.77G        1.23      0.6562        1.39           45         640: 100% 102/102 [00:54<00:00,  1.89it/s]
           Class      Images   Instances      Box(P            R        mAP50  mAP50-95): 100% 7/7 [00:03<00:00,  1.76it/s]
             all         215        6275       0.877        0.882        0.928      0.579

Epoch    GPU_mem    box_loss    cls_loss    dfl_loss    Instances        Size
20/20       8.1G       1.188      0.6348       1.362           18         640: 100% 102/102 [00:54<00:00,  1.89it/s]
           Class      Images   Instances      Box(P            R        mAP50  mAP50-95): 100% 7/7 [00:03<00:00,  1.83it/s]
             all         215        6275       0.873        0.894        0.926       0.58
```

학습 모델 결과

```
20 epochs completed in 0.350 hours.
Optimizer stripped from runs/detect/train/weights/last.pt, 52.0MB
Optimizer stripped from runs/detect/train/weights/best.pt, 52.0MB

Validating runs/detect/train/weights/best.pt...
Ultralytics YOLOv8.0.196 🚀 Python-3.10.12 torch-2.2.1+cu121 CUDA:0 (Tesla T4, 15102MiB)
Model summary (fused): 218 layers, 25840918 parameters, 0 gradients, 78.7 GFLOPs
                 Class     Images  Instances      Box(P          R      mAP50  mAP50-95): 100% 7/7 [00:21<00:00,  3.14s/it]
                   all        215       6275      0.873      0.894      0.925       0.58
                   car        215       3680      0.934      0.919      0.965      0.613
                  free        215       2595      0.812      0.869      0.886      0.547
Speed: 1.0ms preprocess, 11.2ms inference, 0.1ms loss, 4.2ms postprocess per image
Results saved to runs/detect/train
💡  Learn more at https://docs.ultralytics.com/modes/train
```
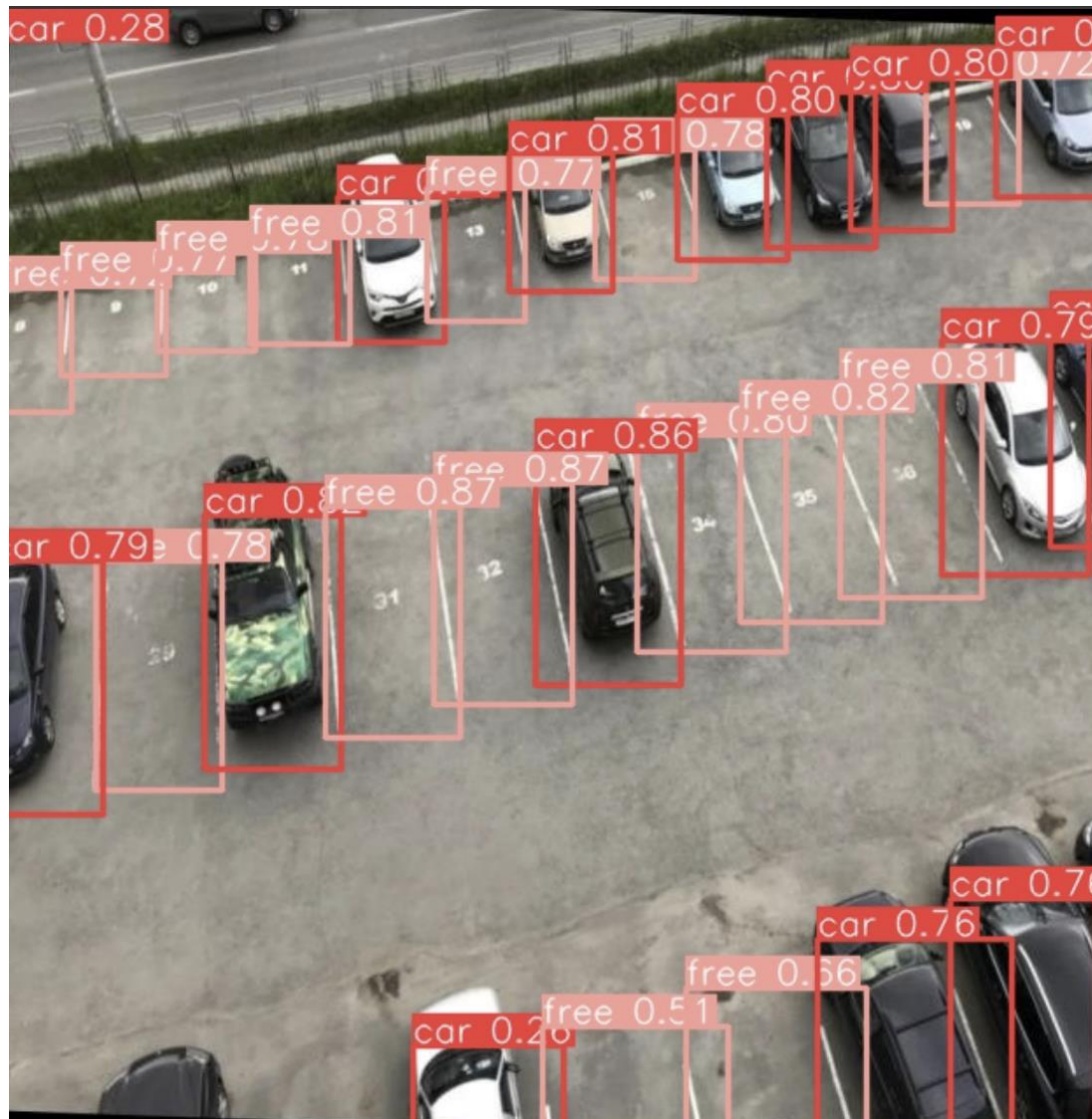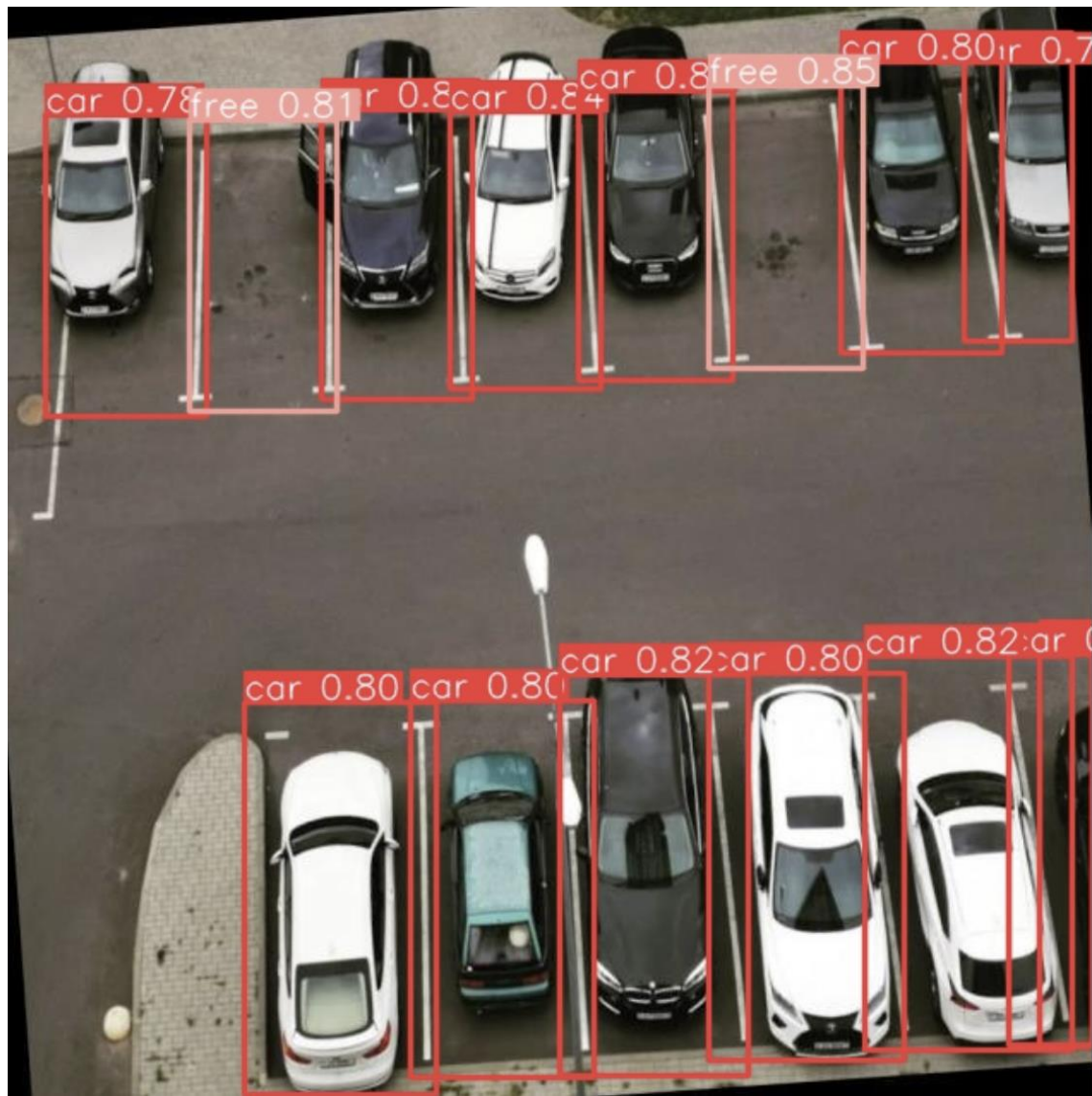
60.0
mAP
이상

학습 모델 추론

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감사합니다!