
Computer Vision Project

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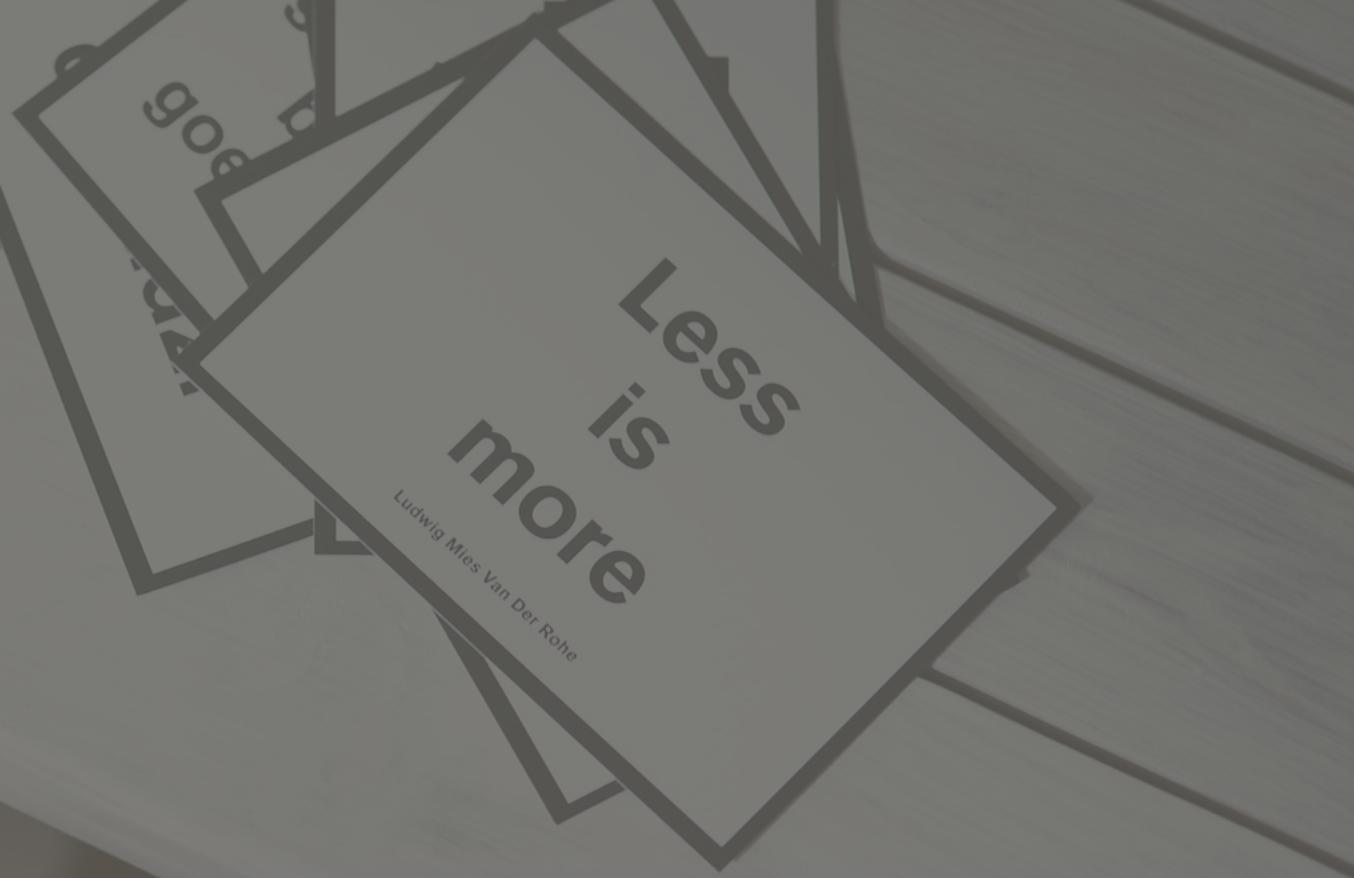


003 yolo를 활용한 모델 학습

- yolo-mark를 활용한 데이터 라벨링
- darknet을 활용한 데이터 학습



004 프로젝트 결과

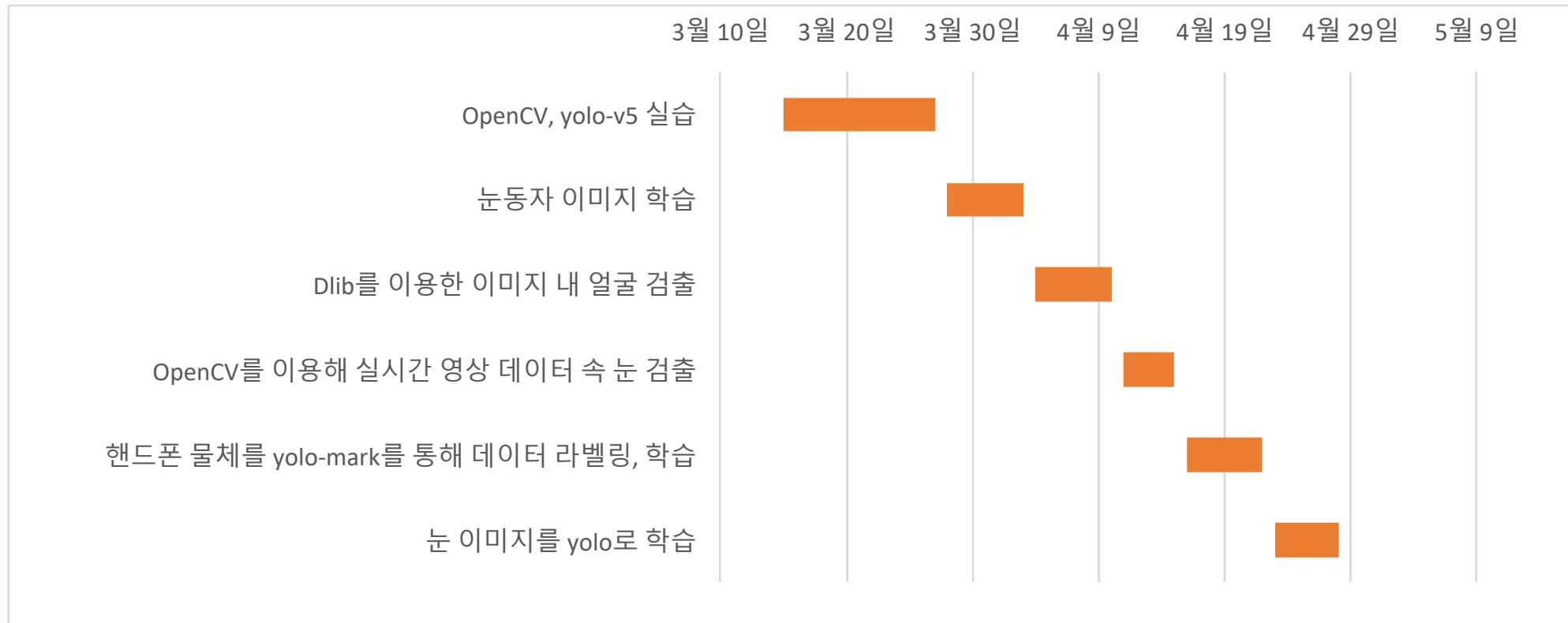


Part 1.

간트 차트



1. 간트 차트



Part 2.

파이토치를 이용한 모델 학습

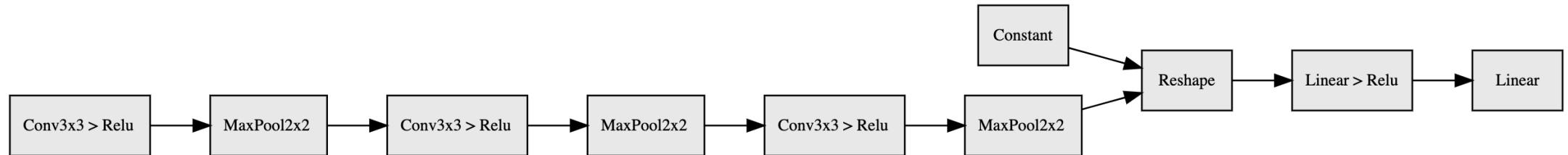


2. 파이토치를 이용한 모델 학습

파이토치의 모델 시각화

convolution layer, pooling layer, linear layer로 이루어져 있다.

```
import hiddenlayer as hl  
  
hl.build_graph(model, input)
```



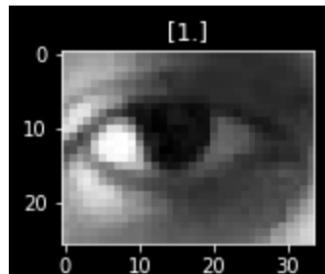
2. 파이토치를 이용한 모델 학습

총 다섯개의 파일로 이루어져 있다.

 dataclass.py	이미지 파일을 npy 형태로 변환
 detect.py	OpenCV를 활용하여 실시간 영상 속 물체 검출을 수행
 model.py	모델의 계층 구조
 test.py	데이터 test 진행
 train.py	데이터 training 진행

2. 파이토치를 이용한 모델 학습

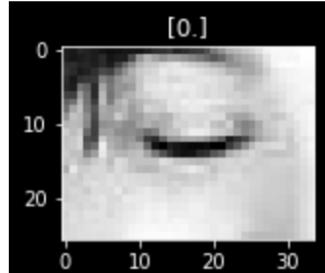
kaggle의 Eyes- Open or Closed 데이터 사용 train 데이터와 test 데이터는 7:3으로 진행



(26, 34, 1)

(26, 34, 1)

(26, 34)



(26, 34, 1)

(26, 34, 1)

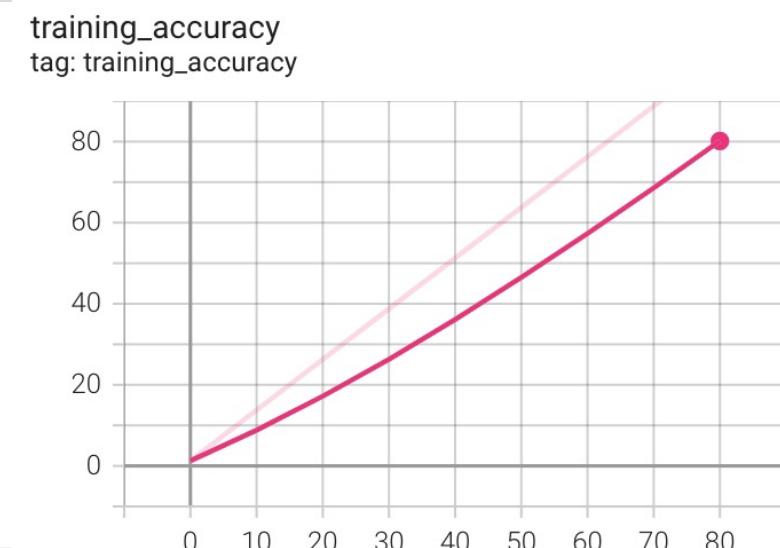
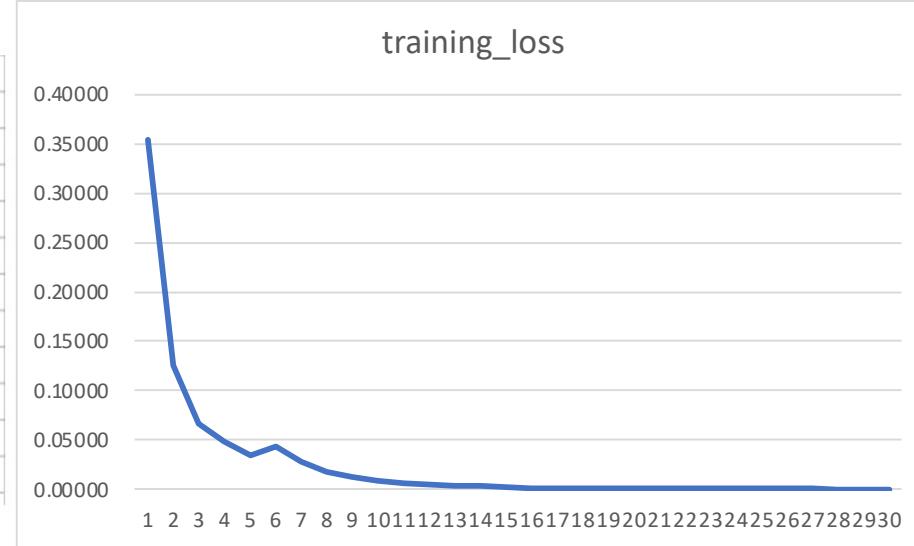
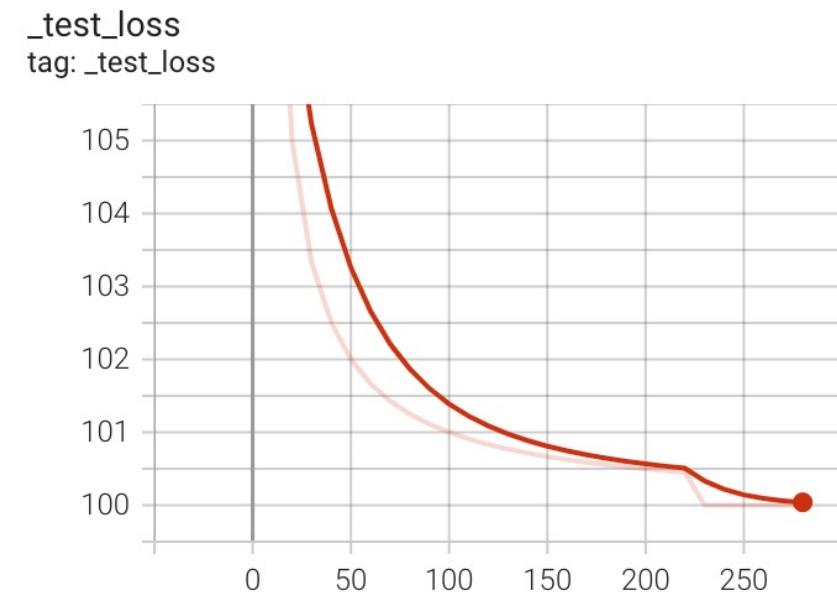
(26, 34)

```
epoch: [32/50] train_loss: 0.00031 train_acc: 100.00000
epoch: [33/50] train_loss: 0.00032 train_acc: 100.00000
epoch: [34/50] train_loss: 0.00030 train_acc: 100.00000
epoch: [35/50] train_loss: 0.00024 train_acc: 100.00000
epoch: [36/50] train_loss: 0.00021 train_acc: 100.00000
epoch: [37/50] train_loss: 0.00020 train_acc: 100.00000
epoch: [38/50] train_loss: 0.00018 train_acc: 100.00000
epoch: [39/50] train_loss: 0.00017 train_acc: 100.00000
epoch: [40/50] train_loss: 0.00017 train_acc: 100.00000
epoch: [41/50] train_loss: 0.00014 train_acc: 100.00000
epoch: [42/50] train_loss: 0.00013 train_acc: 100.00000
epoch: [43/50] train_loss: 0.00012 train_acc: 100.00000
epoch: [44/50] train_loss: 0.00012 train_acc: 100.00000
epoch: [45/50] train_loss: 0.00011 train_acc: 100.00000
epoch: [46/50] train_loss: 0.00011 train_acc: 100.00000
epoch: [47/50] train_loss: 0.00009 train_acc: 100.00000
epoch: [48/50] train_loss: 0.00008 train_acc: 100.00000
epoch: [49/50] train_loss: 0.00009 train_acc: 100.00000
epoch: [50/50] train_loss: 0.00007 train_acc: 100.00000
learning finish
<Figure size 432x288 with 0 Axes>
```

```
/usr/local/lib/python3.7/dist-packages/torch/uti
    cpuset_checked))
avarage acc: 99.65157 %
test finish!
```

2. 파이토치를 이용한 모델 학습

학습 결과 : test loss, training loss, training accuracy



2. 파이토치를 이용한 모델 학습

학습 결과 : 실시간 영상 속 물체 검출

뜨고 있는 눈을 1로 인식



감고 있는 눈을 0으로 인식



눈을 50프레임 이상 감고 있으면 경고 문구 출력



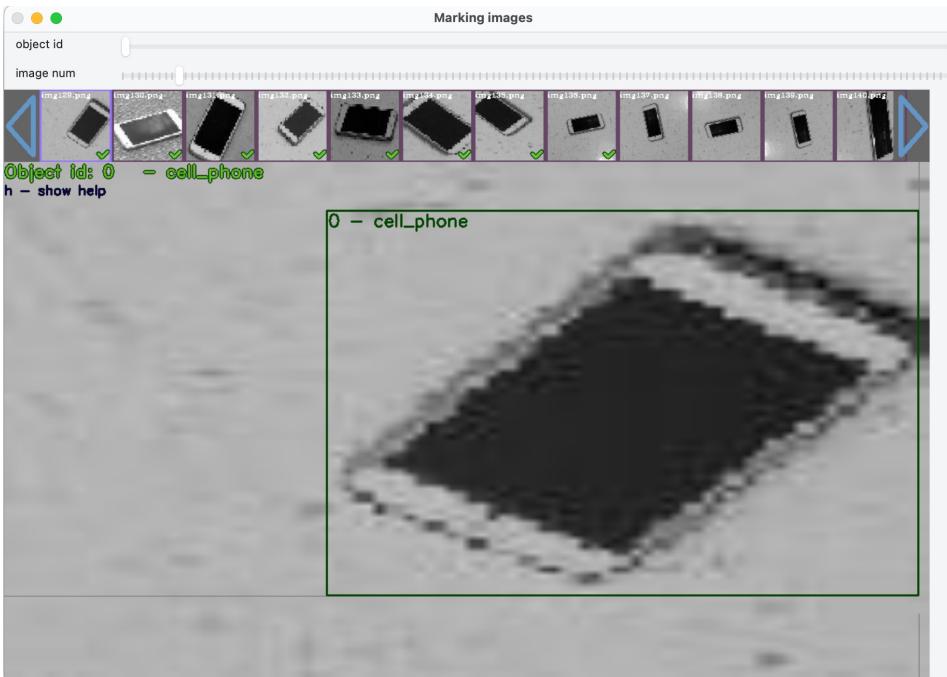
Part 3.

yolo를 활용한 모델 학습



3. yolo를 활용한 모델 학습

yolo-mark를 이용한 핸드폰
데이터 라벨링

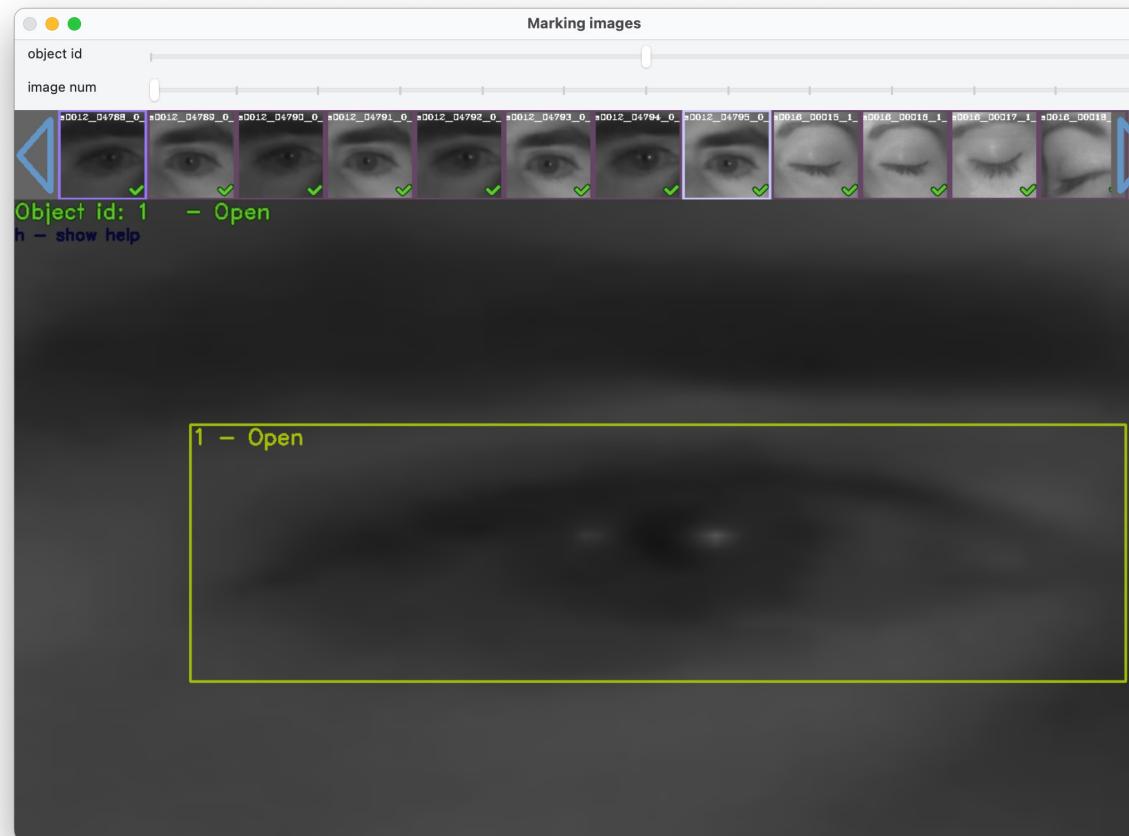


```
!./darknet detector train cfg/coco.data cfg/yolov3.cfg darknet53.conv.74 -gpu 0,1,3
```

The notebook cell contains the command to train a darknet detector using the specified configuration files and GPU indices.

3. yolo를 활용한 모델 학습

교수님의 조언을 듣고 yolo-mark를 이용한 눈 데이터 라벨링



3. yolo를 활용한 모델 학습



Darknet을 이용하여 yolo 학습 진행

eye.data

```
classes= 2
train  = /content/drive/MyDrive/yolo/darknet/cfg/label/eye.txt
test   = /content/drive/MyDrive/yolo/darknet/cfg/label/eye_test.txt
names  = /content/drive/MyDrive/yolo/darknet/cfg/eye.names
backup = /content/drive/MyDrive/yolo/darknet/cfg/backup
eye.txt
```



```
/content/drive/MyDrive/yolo/darknet/data/s0012_04799_0_0_1_0_0_03.jpg
/content/drive/MyDrive/yolo/darknet/data/s0012_04796_0_0_1_0_0_03.jpg
/content/drive/MyDrive/yolo/darknet/data/s0012_04849_0_0_1_0_1_03.jpg
/content/drive/MyDrive/yolo/darknet/data/s0012_04797_0_0_1_0_1_03.jpg
/content/drive/MyDrive/yolo/darknet/data/s0012_04798_0_0_1_0_0_03.jpg
/content/drive/MyDrive/yolo/darknet/data/s0012_04790_0_0_1_0_0_03.jpg
/content/drive/MyDrive/yolo/darknet/data/s0012_04792_0_0_1_0_0_03.jpg
/content/drive/MyDrive/yolo/darknet/data/s0012_04791_0_0_1_0_1_03.jpg
/content/drive/MyDrive/yolo/darknet/data/s0012_04789_0_0_1_0_0_03.jpg
/content/drive/MyDrive/yolo/darknet/data/s0012_04788_0_0_1_0_0_03.jpg
/content/drive/MyDrive/yolo/darknet/data/s0012_04918_0_0_1_0_0_03.jpg
/content/drive/MyDrive/yolo/darknet/data/s0012_04920_0_0_1_0_0_03.jpg
/content/drive/MyDrive/yolo/darknet/data/s0012_04919_0_0_1_2_1_03.jpg
/content/drive/MyDrive/yolo/darknet/data/s0012_04921_0_0_1_2_1_03.jpg
/content/drive/MyDrive/yolo/darknet/data/s0012_04917_0_0_1_2_1_03.ina
```

yolov4-custom.cfg 설정

```
1 [net]
2 # Testing
3 #batch=1
4 #subdivisions=1
5 # Training
6 batch=1
7 subdivisions=16
8 width=416
9 height=416
10 channels=3
11 momentum=0.949
12 decay=0.0005
13 angle=0
14 saturation = 1.5
15 exposure = 1.5
16 hue=.1
```

3. yolo를 활용한 모델 학습



Darknet을 이용하여 yolo 학습 진행

1시간여동안 1971회를 학습하였지만 평균 손실값이 0.934070에서 머물고 있다.

File Settings View Insert Kernel Help

File 수정 보기 삽입 런타임 도구 도움말 모든 변경사항이 저장됨

코드 텍스트

```
1 /content/drive/MyDrive/yolo/darknet/cfg/yolov4-custom.cfg /content/drive/MyDrive/yolo/darknet/build/darknet/x64/yolov4 Custom
```

1시간
1971
1971: 0.233826, 0.934070 avg loss, 0.001000 rate, 1.950245 seconds, 31536 images, 272.338927 hours left
Load: 0.000030 seconds
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 139 Avg (IOU: 0.000000), count: 1, class_loss = 0.000000, iou_loss = 0.000000,
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 150 Avg (IOU: 0.773529), count: 1, class_loss = 1.306092, iou_loss = 0.638713,
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 161 Avg (IOU: 0.744566), count: 2, class_loss = 0.502083, iou_loss = 0.453510,
total_bbox = 224825, rewritten_bbox = 0.000000 %
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 139 Avg (IOU: 0.000000), count: 1, class_loss = 0.000000, iou_loss = 0.000000,
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 150 Avg (IOU: 0.699760), count: 2, class_loss = 0.130842, iou_loss = 1.064782,
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 161 Avg (IOU: 0.784782), count: 2, class_loss = 0.000490, iou_loss = 0.357556,
total_bbox = 224829, rewritten_bbox = 0.000000 %
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 139 Avg (IOU: 0.000000), count: 1, class_loss = 0.000000, iou_loss = 0.000000,
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 150 Avg (IOU: 0.000000), count: 1, class_loss = 0.000002, iou_loss = 0.000000,
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 161 Avg (IOU: 0.823889), count: 2, class_loss = 0.000128, iou_loss = 0.122397,
total_bbox = 224831, rewritten_bbox = 0.000000 %
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 139 Avg (IOU: 0.000000), count: 1, class_loss = 0.000000, iou_loss = 0.000000,
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 150 Avg (IOU: 0.000000), count: 1, class_loss = 0.000027, iou_loss = 0.000000,
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 161 Avg (IOU: 0.739546), count: 3, class_loss = 2.230464, iou_loss = 0.375257,
total_bbox = 224834, rewritten_bbox = 0.000000 %

Tensor Cores are disabled until the first 3000 iterations are reached.

274: 7.474223, 4.245465 avg loss, 0.000073 rate, 0.928449 seconds, 4384 images, 183.118933 hours left
Loaded: 0.000046 seconds
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 139 Avg (IOU: 0.000000), count: 1, class_loss = 0.000022, iou_loss = 0.000000,
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 150 Avg (IOU: 0.506118), count: 7, class_loss = 16.532759, iou_loss = 1.327013,
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 161 Avg (IOU: 0.552234), count: 7, class_loss = 5.138873, iou_loss = 0.947058,
total_bbox = 31305, rewritten_bbox = 0.000000 %
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 139 Avg (IOU: 0.000000), count: 1, class_loss = 0.000015, iou_loss = 0.000000,
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 150 Avg (IOU: 0.586965), count: 5, class_loss = 5.262505, iou_loss = 1.208256,
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 161 Avg (IOU: 0.593037), count: 6, class_loss = 4.599446, iou_loss = 0.551837,
total_bbox = 31316, rewritten_bbox = 0.000000 %
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 139 Avg (IOU: 0.000000), count: 1, class_loss = 0.000016, iou_loss = 0.000000,
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 150 Avg (IOU: 0.695648), count: 7, class_loss = 9.385952, iou_loss = 3.063476,
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 161 Avg (IOU: 0.628614), count: 8, class_loss = 9.978852, iou_loss = 0.769950,
total_bbox = 31331, rewritten_bbox = 0.000000 %
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 139 Avg (IOU: 0.382467), count: 2, class_loss = 28.207008, iou_loss = 1.917545,
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 150 Avg (IOU: 0.451516), count: 6, class_loss = 10.305320, iou_loss = 1.092059,
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 161 Avg (IOU: 0.513809), count: 5, class_loss = 5.477566, iou_loss = 0.364031,
total_bbox = 31344, rewritten_bbox = 0.000000 %
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 139 Avg (IOU: 0.000000), count: 1, class_loss = 0.000009, iou_loss = 0.000000,
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 150 Avg (IOU: 0.614402), count: 5, class_loss = 7.788723, iou_loss = 1.278056,
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 161 Avg (IOU: 0.549283), count: 8, class_loss = 7.531178, iou_loss = 0.737470,
total_bbox = 31357, rewritten_bbox = 0.000000 %
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 139 Avg (IOU: 0.093116), count: 1, class_loss = 14.365291, iou_loss = 0.016017,

1시간 2분 11초 오후 4:51에 원료됨

batch 사이즈를 10으로, learning_rate를 0.001에서 0.013으로 각각 변경하여 학습을 진행

학습 274회 만에 평균 손실값이 4.245465로 최적화가 빠르게 진행 중인 것

File 설정 보기 삽입 런타임 도구 도움말 모든 변경사항이 저장됨

코드 텍스트

```
1 /content/drive/MyDrive/yolo/darknet/cfg/yolov4-custom.cfg /content/drive/MyDrive/yolo/darknet/build/darknet/x64/yolov4 Custom
```

... total_bbox = 31261, rewritten_bbox = 0.000000 %
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 139 Avg (IOU: 0.000000), count: 1, class_loss = 0.000023, iou_loss = 0.000000,
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 150 Avg (IOU: 0.679437), count: 4, class_loss = 5.374428, iou_loss = 1.158873,
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 161 Avg (IOU: 0.543173), count: 4, class_loss = 4.412124, iou_loss = 0.345972,
total_bbox = 31269, rewritten_bbox = 0.000000 %
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 139 Avg (IOU: 0.000000), count: 1, class_loss = 0.000037, iou_loss = 0.000000,
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 150 Avg (IOU: 0.601954), count: 3, class_loss = 3.455812, iou_loss = 1.182858,
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 161 Avg (IOU: 0.642753), count: 4, class_loss = 3.071567, iou_loss = 0.478492,
total_bbox = 31276, rewritten_bbox = 0.000000 %
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 139 Avg (IOU: 0.198729), count: 1, class_loss = 16.384327, iou_loss = 0.140387,
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 150 Avg (IOU: 0.473465), count: 8, class_loss = 9.904906, iou_loss = 2.121757,
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 161 Avg (IOU: 0.571952), count: 6, class_loss = 5.937375, iou_loss = 0.511271,
total_bbox = 31291, rewritten_bbox = 0.000000 %
Tensor Cores are disabled until the first 3000 iterations are reached.
274: 7.474223, 4.245465 avg loss, 0.000073 rate, 0.928449 seconds, 4384 images, 183.118933 hours left
Loaded: 0.000046 seconds
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 139 Avg (IOU: 0.000000), count: 1, class_loss = 0.000022, iou_loss = 0.000000,
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 150 Avg (IOU: 0.506118), count: 7, class_loss = 16.532759, iou_loss = 1.327013,
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 161 Avg (IOU: 0.552234), count: 7, class_loss = 5.138873, iou_loss = 0.947058,
total_bbox = 31305, rewritten_bbox = 0.000000 %
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 139 Avg (IOU: 0.000000), count: 1, class_loss = 0.000015, iou_loss = 0.000000,
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 150 Avg (IOU: 0.586965), count: 5, class_loss = 5.262505, iou_loss = 1.208256,
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 161 Avg (IOU: 0.593037), count: 6, class_loss = 4.599446, iou_loss = 0.551837,
total_bbox = 31316, rewritten_bbox = 0.000000 %
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 139 Avg (IOU: 0.000000), count: 1, class_loss = 0.000016, iou_loss = 0.000000,
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 150 Avg (IOU: 0.695648), count: 7, class_loss = 9.385952, iou_loss = 3.063476,
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 161 Avg (IOU: 0.628614), count: 8, class_loss = 9.978852, iou_loss = 0.769950,
total_bbox = 31331, rewritten_bbox = 0.000000 %
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 139 Avg (IOU: 0.382467), count: 2, class_loss = 28.207008, iou_loss = 1.917545,
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 150 Avg (IOU: 0.451516), count: 6, class_loss = 10.305320, iou_loss = 1.092059,
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 161 Avg (IOU: 0.513809), count: 5, class_loss = 5.477566, iou_loss = 0.364031,
total_bbox = 31344, rewritten_bbox = 0.000000 %
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 139 Avg (IOU: 0.000000), count: 1, class_loss = 0.000009, iou_loss = 0.000000,
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 150 Avg (IOU: 0.614402), count: 5, class_loss = 7.788723, iou_loss = 1.278056,
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 161 Avg (IOU: 0.549283), count: 8, class_loss = 7.531178, iou_loss = 0.737470,
total_bbox = 31357, rewritten_bbox = 0.000000 %
v3 (iou loss, Normalizer: (iou: 0.07, obj: 1.00, cls: 1.00) Region 139 Avg (IOU: 0.093116), count: 1, class_loss = 14.365291, iou_loss = 0.016017,

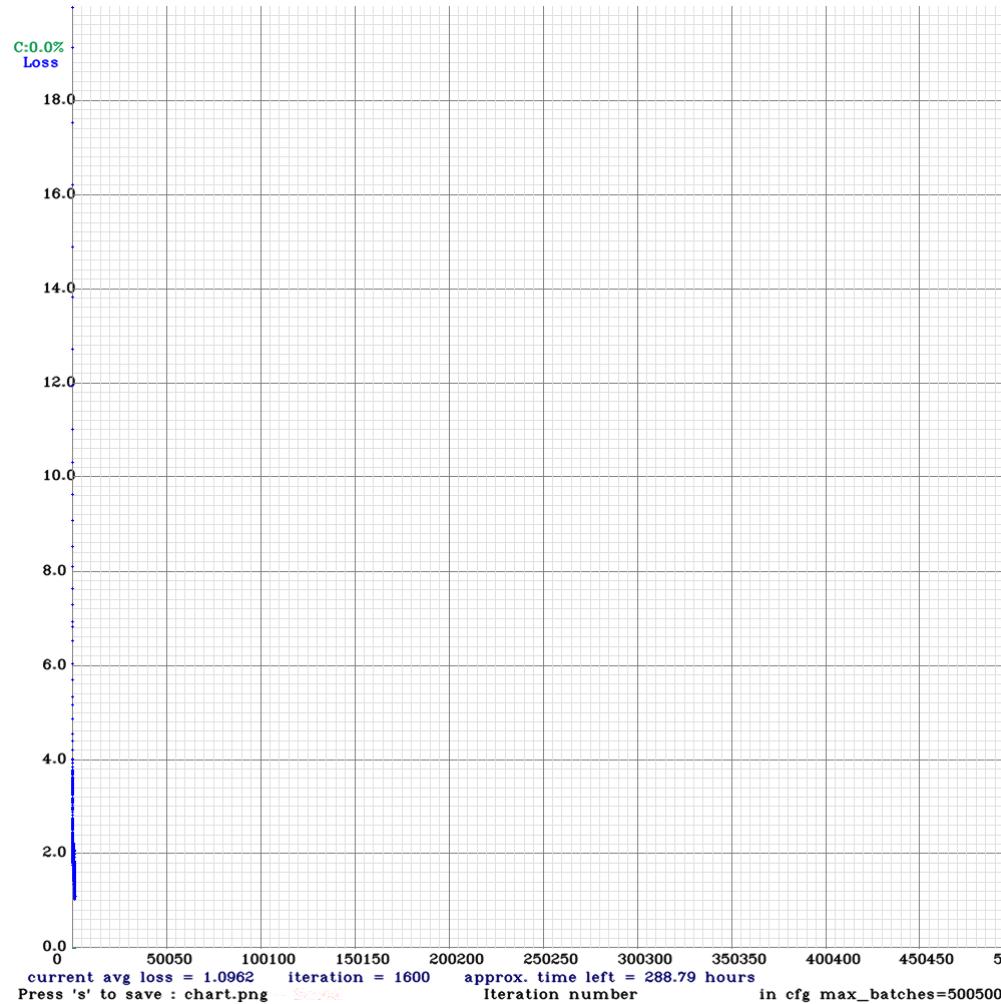
3. yolo를 활용한 모델 학습

Darknet을 이용하여 yolo 학습 진행 : 최종 test를 진행하며 학습결과를 확인하였다.

```
!./darknet detector test /content/drive/MyDrive/yolo/darknet/cfg/eye.data /content/drive/MyDrive/yolo/darknet/cfg/yolov4-custom.cfg /content/drive/MyDrive/yolo/darknet/cfg/coco.names  
120 conv 256 1 x 1/ 1 26 x 26 x 512 -> 26 x 26 x 256 0.177 BF  
121 route 120 118 -> 26 x 26 x 512  
122 conv 256 1 x 1/ 1 26 x 26 x 512 -> 26 x 26 x 256 0.177 BF  
123 conv 512 3 x 3/ 1 26 x 26 x 256 -> 26 x 26 x 512 1.595 BF  
124 conv 256 1 x 1/ 1 26 x 26 x 512 -> 26 x 26 x 256 0.177 BF  
125 conv 512 3 x 3/ 1 26 x 26 x 256 -> 26 x 26 x 512 1.595 BF  
126 conv 256 1 x 1/ 1 26 x 26 x 512 -> 26 x 26 x 256 0.177 BF  
127 conv 128 1 x 1/ 1 26 x 26 x 256 -> 26 x 26 x 128 0.044 BF  
128 upsample 2x 26 x 26 x 128 -> 52 x 52 x 128  
129 route 54 -> 52 x 52 x 256  
130 conv 128 1 x 1/ 1 52 x 52 x 256 -> 52 x 52 x 128 0.177 BF  
131 route 130 128 -> 52 x 52 x 256  
132 conv 128 1 x 1/ 1 52 x 52 x 256 -> 52 x 52 x 128 0.177 BF  
133 conv 256 3 x 3/ 1 52 x 52 x 128 -> 52 x 52 x 256 1.595 BF  
134 conv 128 1 x 1/ 1 52 x 52 x 256 -> 52 x 52 x 128 0.177 BF  
135 conv 256 3 x 3/ 1 52 x 52 x 128 -> 52 x 52 x 256 1.595 BF  
136 conv 128 1 x 1/ 1 52 x 52 x 256 -> 52 x 52 x 128 0.177 BF  
137 conv 256 3 x 3/ 1 52 x 52 x 128 -> 52 x 52 x 256 1.595 BF  
138 conv 21 1 x 1/ 1 52 x 52 x 256 -> 52 x 52 x 21 0.029 BF  
139 yolo  
[yolo] params: iou loss: ciou (4), iou_norm: 0.07, obj_norm: 1.00, cls_norm: 1.00, delta_norm: 1.00, scale_x_y: 1.20  
nms_kind: greedy_nms (1), beta = 0.600000  
140 route 136 -> 52 x 52 x 128  
141 conv 256 3 x 3/ 2 52 x 52 x 128 -> 26 x 26 x 256 0.399 BF  
142 route 141 126 -> 26 x 26 x 512  
143 conv 256 1 x 1/ 1 26 x 26 x 512 -> 26 x 26 x 256 0.177 BF  
144 conv 512 3 x 3/ 1 26 x 26 x 256 -> 26 x 26 x 512 1.595 BF  
145 conv 256 1 x 1/ 1 26 x 26 x 512 -> 26 x 26 x 256 0.177 BF  
146 conv 512 3 x 3/ 1 26 x 26 x 256 -> 26 x 26 x 512 1.595 BF  
147 conv 256 1 x 1/ 1 26 x 26 x 512 -> 26 x 26 x 256 0.177 BF  
148 conv 512 3 x 3/ 1 26 x 26 x 256 -> 26 x 26 x 512 1.595 BF  
149 conv 21 1 x 1/ 1 26 x 26 x 512 -> 26 x 26 x 21 0.015 BF  
150 yolo  
[yolo] params: iou loss: ciou (4), iou_norm: 0.07, obj_norm: 1.00, cls_norm: 1.00, delta_norm: 1.00, scale_x_y: 1.10
```

3. yolo를 활용한 모델 학습

손실값 확인



Part 4.

프로젝트 결과



4. 프로젝트 결과

눈을 뜨고 감고 있는 상황 : 눈을 감으면 0으로, 뜨면 1로 인식



4. 프로젝트 결과

눈을 계속 감고 있는 상황 : 경고 문구 출력

