학부연구생 활동 (YOLOv5 Custom Data 학습& Object Detection)

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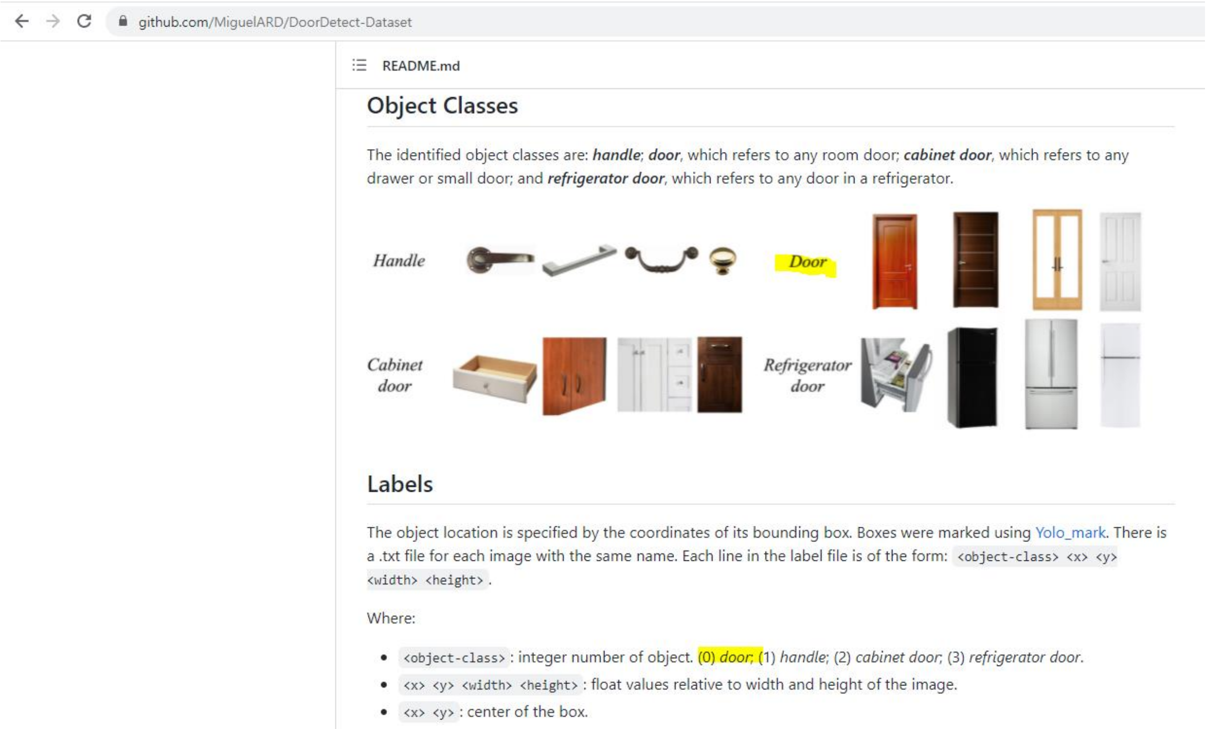
- **목적:** 병실 영상 속 문을 감지하여 bounding box좌표를 자동으로 추출
- **Image 데이터 수집:** github.com/MiguelARD/DoorDetect-Dataset 중 class 0인 문 이미지와 라벨만 추출하여 사용



github.com/MiguelARD/DoorDetect-Dataset

README.md

Object Classes

The identified object classes are: ***handle***; ***door***, which refers to any room door; ***cabinet door***, which refers to any drawer or small door; and ***refrigerator door***, which refers to any door in a refrigerator.

Labels

The object location is specified by the coordinates of its bounding box. Boxes were marked using Yolo_mark. There is a .txt file for each image with the same name. Each line in the label file is of the form: `<object-class> <x> <y> <width> <height>`.

Where:

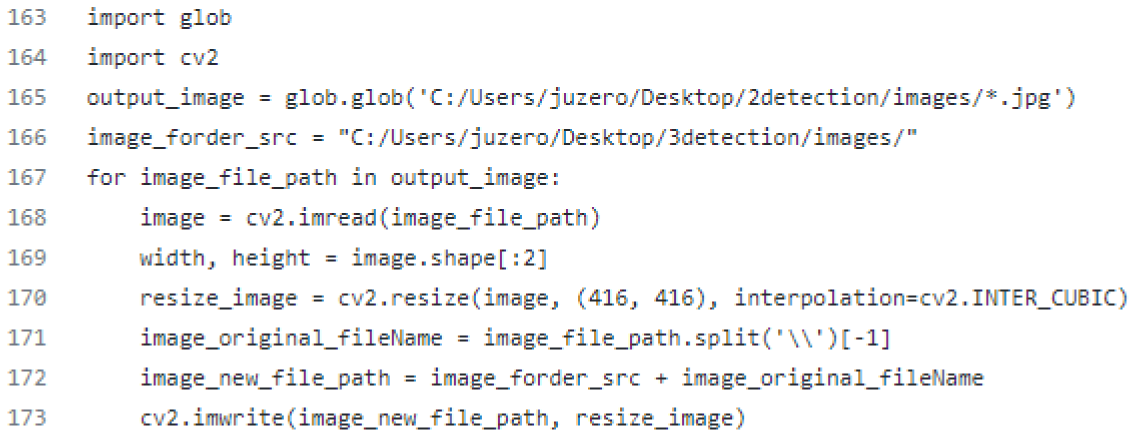
- `<object-class>` : integer number of object. (0) *door*; (1) *handle*; (2) *cabinet door*; (3) *refrigerator door*.
- `<x> <y> <width> <height>` : float values relative to width and height of the image.
- `<x> <y>` : center of the box.

- **과정**

① OpenCV를 사용하여 문 이미지 좌우반전하여 데이터 2배로 늘리기

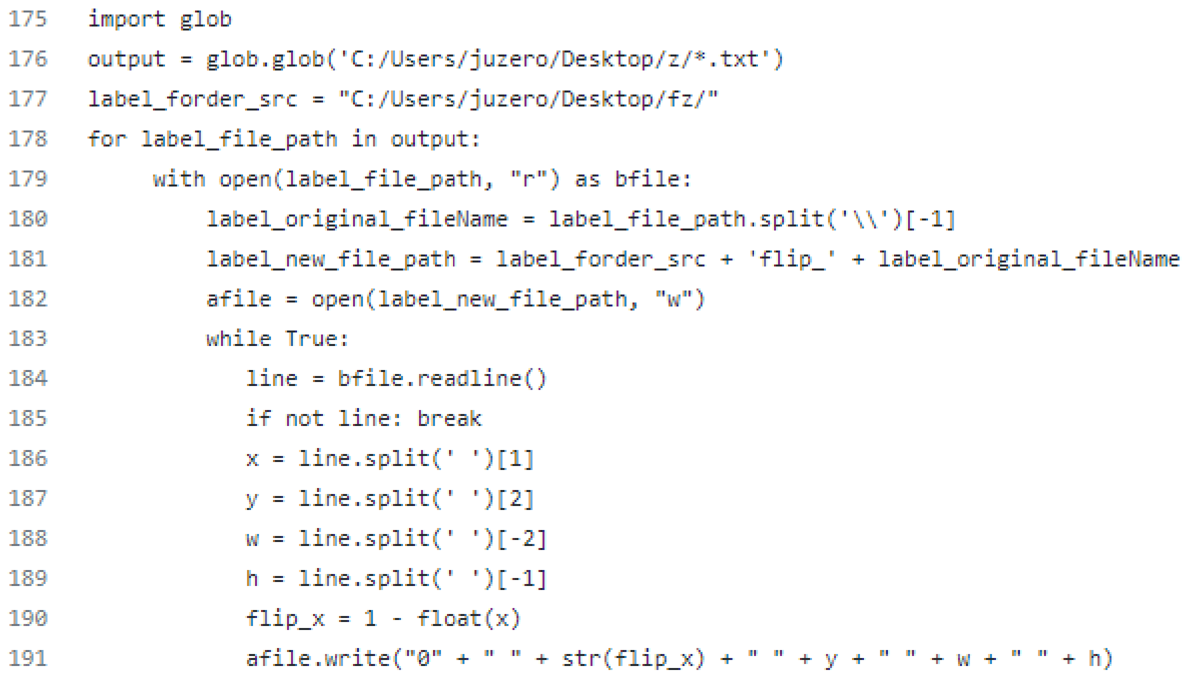
```
import glob
import cv2
output_image = glob.glob('C:/Users/juzero/Desktop/detection/images/*.jpg')
output_label = glob.glob('C:/Users/juzero/Desktop/detection/labels/*.txt')
image_forder_src = "C:/Users/juzero/Desktop/fimage/"
label_forder_src = "C:/Users/juzero/Desktop/flabel/"
for image_file_path in output_image:
    image = cv2.imread(image_file_path)
    flip_image = cv2.flip(image, 1)
    image_original_fileName = image_file_path.split('\\')[-1]
    image_new_file_path = image_forder_src + 'flip_' + image_original_fileName
    cv2.imwrite(image_new_file_path, flip_image)
```

② Image Resizing: OpenCV를 사용하여 동일한 크기로 맞추기



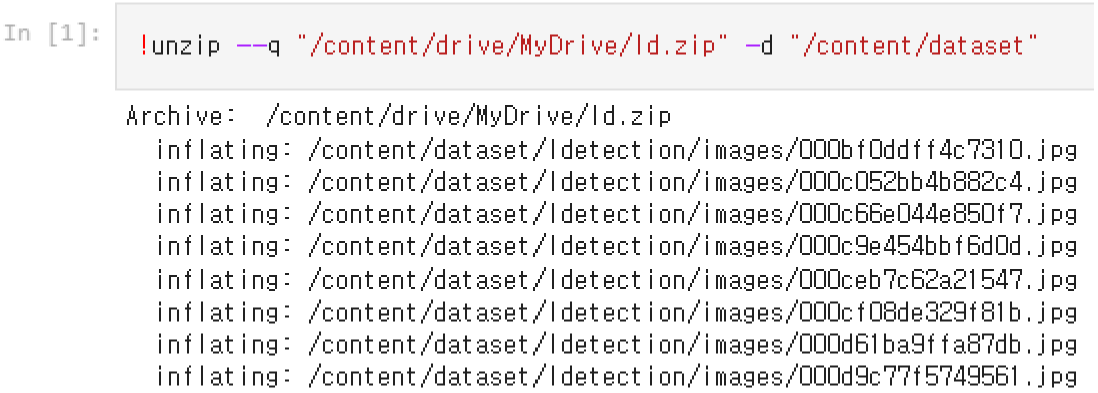
```python
import glob
import cv2
output_image = glob.glob('C:/Users/juzero/Desktop/2detection/images/*.jpg')
image_forder_src = "C:/Users/juzero/Desktop/3detection/images/"
for image_file_path in output_image:
    image = cv2.imread(image_file_path)
    width, height = image.shape[:2]
    resize_image = cv2.resize(image, (416, 416), interpolation=cv2.INTER_CUBIC)
    image_original_fileName = image_file_path.split('\\')[-1]
    image_new_file_path = image_forder_src + image_original_fileName
    cv2.imwrite(image_new_file_path, resize_image)
```

③ Image Labeling: 라벨을 한 줄씩 읽어와 좌우반전된 이미지에 맞는 라벨로 수정하여 저장



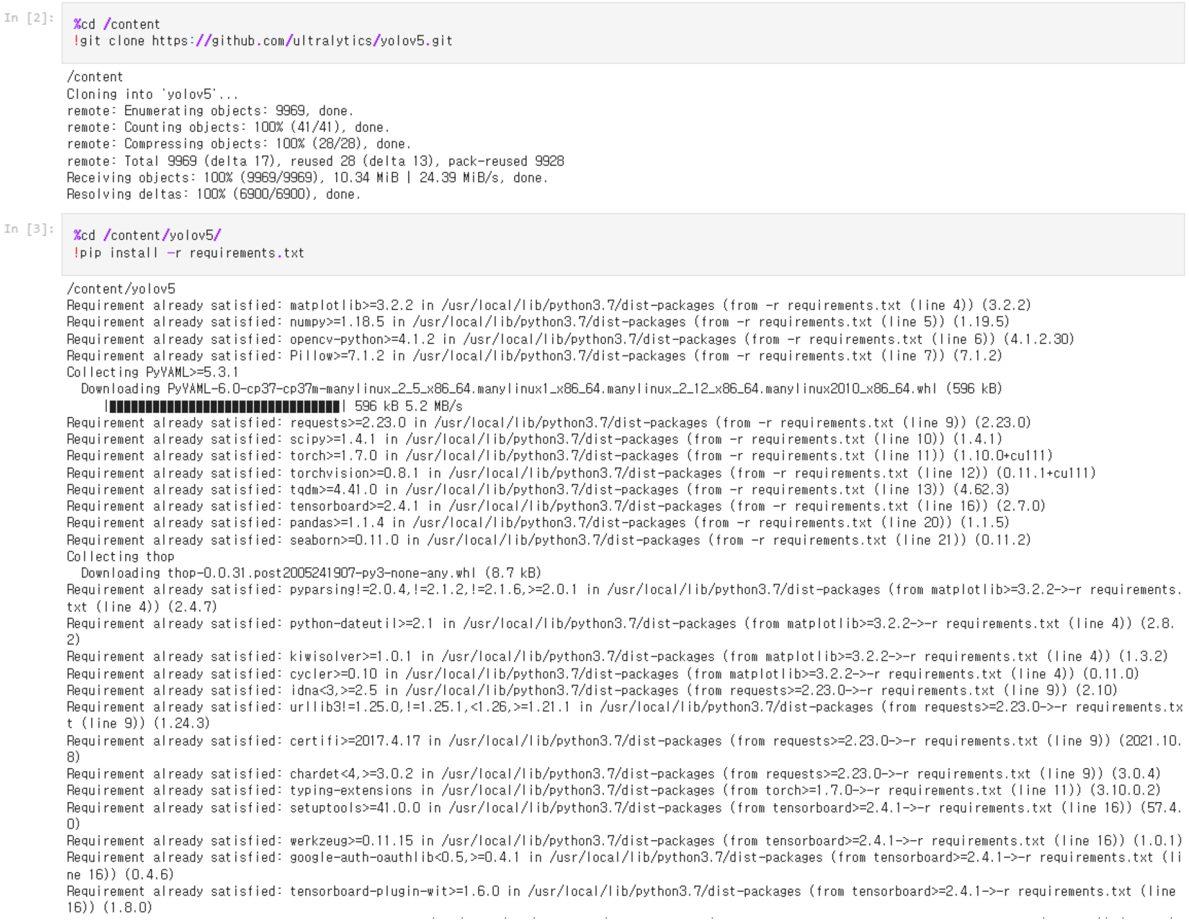
```python
import glob
output = glob.glob('C:/Users/juzero/Desktop/z/*.txt')
label_forder_src = "C:/Users/juzero/Desktop/fz/"
for label_file_path in output:
     with open(label_file_path, "r") as bfile:
         label_original_fileName = label_file_path.split('\\')[-1]
         label_new_file_path = label_forder_src + 'flip_' + label_original_fileName
         afile = open(label_new_file_path, "w")
         while True:
            line = bfile.readline()
            if not line: break
            x = line.split(' ')[1]
            y = line.split(' ')[2]
            w = line.split(' ')[-2]
            h = line.split(' ')[-1]
            flip_x = 1 - float(x)
            afile.write("0" + " " + str(flip_x) + " " + y + " " + w + " " + h)
```

④ 이미지, 라벨 파일을 구글 드라이브 마운트 후



```
In [1]: !unzip --q "/content/drive/MyDrive/ld.zip" -d "/content/dataset"

Archive:  /content/drive/MyDrive/ld.zip
  inflating: /content/dataset/ldetection/images/000bf0ddff4c7310.jpg
  inflating: /content/dataset/ldetection/images/000c052bb4b882c4.jpg
  inflating: /content/dataset/ldetection/images/000c66e044e850f7.jpg
  inflating: /content/dataset/ldetection/images/000c9e454bbf6d0d.jpg
  inflating: /content/dataset/ldetection/images/000ceb7c62a21547.jpg
  inflating: /content/dataset/ldetection/images/000cf08de329f81b.jpg
  inflating: /content/dataset/ldetection/images/000d61ba9ffa87db.jpg
  inflating: /content/dataset/ldetection/images/000d9c77f5749561.jpg
```

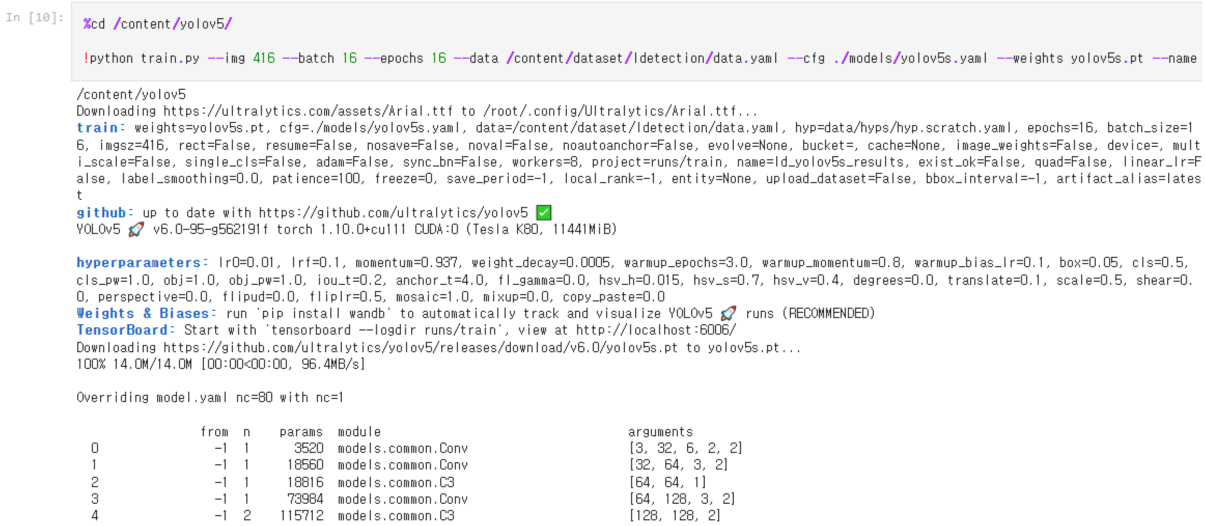
⑤ YOLOv5 패키지 설치



```
In [2]: %cd /content
        !git clone https://github.com/ultralytics/yolov5.git

/content
Cloning into 'yolov5'...
remote: Enumerating objects: 9969, done.
remote: Counting objects: 100% (41/41), done.
remote: Compressing objects: 100% (28/28), done.
remote: Total 9969 (delta 17), reused 28 (delta 13), pack-reused 9928
Receiving objects: 100% (9969/9969), 10.34 MiB | 24.39 MiB/s, done.
Resolving deltas: 100% (6900/6900), done.

In [3]: %cd /content/yolov5/
        !pip install -r requirements.txt

/content/yolov5
Requirement already satisfied: matplotlib>=3.2.2 in /usr/local/lib/python3.7/dist-packages (from -r requirements.txt (line 4)) (3.2.2)
Requirement already satisfied: numpy>=1.18.5 in /usr/local/lib/python3.7/dist-packages (from -r requirements.txt (line 5)) (1.19.5)
Requirement already satisfied: opencv-python>=4.1.2 in /usr/local/lib/python3.7/dist-packages (from -r requirements.txt (line 6)) (4.1.2.30)
Requirement already satisfied: Pillow>=7.1.2 in /usr/local/lib/python3.7/dist-packages (from -r requirements.txt (line 7)) (7.1.2)
Collecting PyYAML>=5.3.1
  Downloading PyYAML-6.0-cp37-cp37m-manylinux_2_5_x86_64.manylinux1_x86_64.manylinux_2_12_x86_64.manylinux2010_x86_64.whl (596 kB)
     |████████████████████████████████| 596 kB 5.2 MB/s
Requirement already satisfied: requests>=2.23.0 in /usr/local/lib/python3.7/dist-packages (from -r requirements.txt (line 9)) (2.23.0)
Requirement already satisfied: scipy>=1.4.1 in /usr/local/lib/python3.7/dist-packages (from -r requirements.txt (line 10)) (1.4.1)
Requirement already satisfied: torch>=1.7.0 in /usr/local/lib/python3.7/dist-packages (from -r requirements.txt (line 11)) (1.10.0+cu111)
Requirement already satisfied: torchvision>=0.8.1 in /usr/local/lib/python3.7/dist-packages (from -r requirements.txt (line 12)) (0.11.1+cu111)
Requirement already satisfied: tqdm>=4.41.0 in /usr/local/lib/python3.7/dist-packages (from -r requirements.txt (line 13)) (4.62.3)
Requirement already satisfied: tensorboard>=2.4.1 in /usr/local/lib/python3.7/dist-packages (from -r requirements.txt (line 16)) (2.7.0)
Requirement already satisfied: pandas>=1.1.4 in /usr/local/lib/python3.7/dist-packages (from -r requirements.txt (line 20)) (1.1.5)
Requirement already satisfied: seaborn>=0.11.0 in /usr/local/lib/python3.7/dist-packages (from -r requirements.txt (line 21)) (0.11.2)
Collecting thop
  Downloading thop-0.0.31.post2005241907-py3-none-any.whl (8.7 kB)
Requirement already satisfied: pyparsing!=2.0.4,!=2.1.2,!=2.1.6,>=2.0.1 in /usr/local/lib/python3.7/dist-packages (from matplotlib>=3.2.2->-r requirements.
txt (line 4)) (2.4.7)
Requirement already satisfied: python-dateutil>=2.1 in /usr/local/lib/python3.7/dist-packages (from matplotlib>=3.2.2->-r requirements.txt (line 4)) (2.8.
2)
Requirement already satisfied: kiwisolver>=1.0.1 in /usr/local/lib/python3.7/dist-packages (from matplotlib>=3.2.2->-r requirements.txt (line 4)) (1.3.2)
Requirement already satisfied: cycler>=0.10 in /usr/local/lib/python3.7/dist-packages (from matplotlib>=3.2.2->-r requirements.txt (line 4)) (0.11.0)
Requirement already satisfied: idna<3,>=2.5 in /usr/local/lib/python3.7/dist-packages (from requests>=2.23.0->-r requirements.txt (line 9)) (2.10)
Requirement already satisfied: urllib3!=1.25.0,!=1.25.1,<1.26,>=1.21.1 in /usr/local/lib/python3.7/dist-packages (from requests>=2.23.0->-r requirements.tx
t (line 9)) (1.24.3)
Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.7/dist-packages (from requests>=2.23.0->-r requirements.txt (line 9)) (2021.10.
8)
Requirement already satisfied: chardet<4,>=3.0.2 in /usr/local/lib/python3.7/dist-packages (from requests>=2.23.0->-r requirements.txt (line 9)) (3.0.4)
Requirement already satisfied: typing-extensions in /usr/local/lib/python3.7/dist-packages (from torch>=1.7.0->-r requirements.txt (line 11)) (3.10.0.2)
Requirement already satisfied: setuptools>=41.0.0 in /usr/local/lib/python3.7/dist-packages (from tensorboard>=2.4.1->-r requirements.txt (line 16)) (57.4.
0)
Requirement already satisfied: werkzeug>=0.11.15 in /usr/local/lib/python3.7/dist-packages (from tensorboard>=2.4.1->-r requirements.txt (line 16)) (1.0.1)
Requirement already satisfied: google-auth-oauthlib<0.5,>=0.4.1 in /usr/local/lib/python3.7/dist-packages (from tensorboard>=2.4.1->-r requirements.txt (li
ne 16)) (0.4.6)
Requirement already satisfied: tensorboard-plugin-wit>=1.6.0 in /usr/local/lib/python3.7/dist-packages (from tensorboard>=2.4.1->-r requirements.txt (line
16)) (1.8.0)
```

⑥ test(20%), train(80%) dataset 나누기

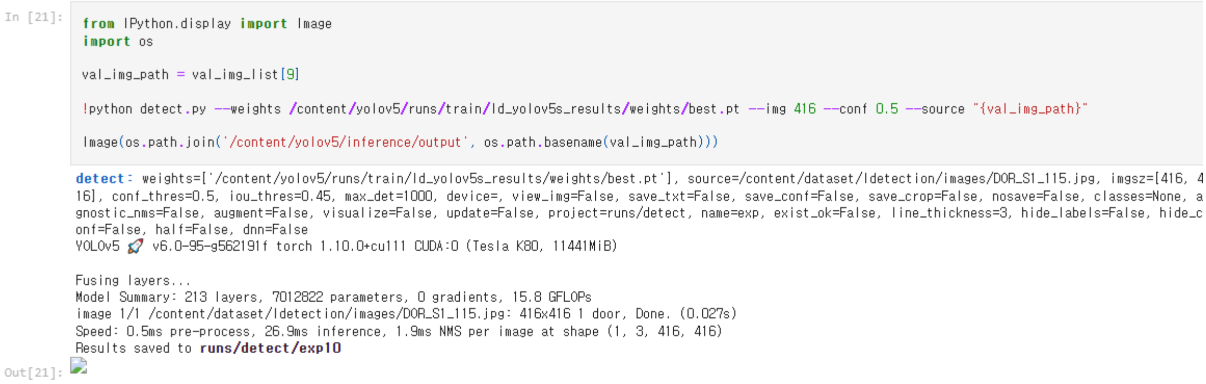
⑦ 학습



```
In [10]:

%cd /content/yolov5/

!python train.py --img 416 --batch 16 --epochs 16 --data /content/dataset/Idetection/data.yaml --cfg ./models/yolov5s.yaml --weights yolov5s.pt --name
```

```
/content/yolov5
Downloading https://ultralytics.com/assets/Arial.ttf to /root/.config/Ultralytics/Arial.ttf...
train: weights=yolov5s.pt, cfg=./models/yolov5s.yaml, data=/content/dataset/Idetection/data.yaml, hyp=data/hyps/hyp.scratch.yaml, epochs=16, batch_size=1
6, imgsz=416, rect=False, resume=False, nosave=False, noval=False, noautoanchor=False, evolve=None, bucket=, cache=None, image_weights=False, device=, mult
i_scale=False, single_cls=False, adam=False, sync_bn=False, workers=8, project=runs/train, name=Id_yolov5s_results, exist_ok=False, quad=False, linear_lr=F
alse, label_smoothing=0.0, patience=100, freeze=0, save_period=-1, local_rank=-1, entity=None, upload_dataset=False, bbox_interval=-1, artifact_alias=lates
t
github: up to date with https://github.com/ultralytics/yolov5 ✅
YOLOv5 🚀 v6.0-95-g562191f torch 1.10.0+cu111 CUDA:0 (Tesla K80, 11441MiB)

hyperparameters: lr0=0.01, lrf=0.1, momentum=0.937, weight_decay=0.0005, warmup_epochs=3.0, warmup_momentum=0.8, warmup_bias_lr=0.1, box=0.05, cls=0.5,
cls_pw=1.0, obj=1.0, obj_pw=1.0, iou_t=0.2, anchor_t=4.0, fl_gamma=0.0, hsv_h=0.015, hsv_s=0.7, hsv_v=0.4, degrees=0.0, translate=0.1, scale=0.5, shear=0.
0, perspective=0.0, flipud=0.0, fliplr=0.5, mosaic=1.0, mixup=0.0, copy_paste=0.0
Weights & Biases: run 'pip install wandb' to automatically track and visualize YOLOv5 🚀 runs (RECOMMENDED)
TensorBoard: Start with 'tensorboard --logdir runs/train', view at http://localhost:6006/
Downloading https://github.com/ultralytics/yolov5/releases/download/v6.0/yolov5s.pt to yolov5s.pt...
100% 14.0M/14.0M [00:00<00:00, 96.4MB/s]

Overriding model.yaml nc=80 with nc=1

                 from  n    params  module                                  arguments
  0                -1  1      3520  models.common.Conv                      [3, 32, 6, 2, 2]
  1                -1  1     18560  models.common.Conv                      [32, 64, 3, 2]
  2                -1  1     18816  models.common.C3                        [64, 64, 1]
  3                -1  1     73984  models.common.Conv                      [64, 128, 3, 2]
  4                -1  2    115712  models.common.C3                        [128, 128, 2]
```

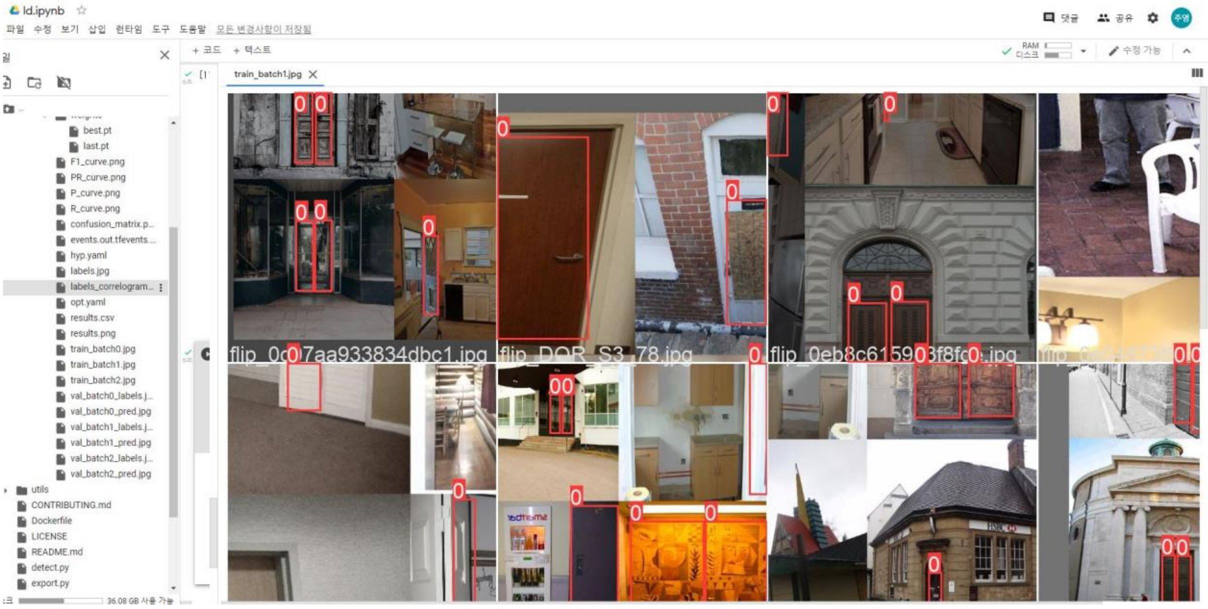
⑧ best.pt 적용

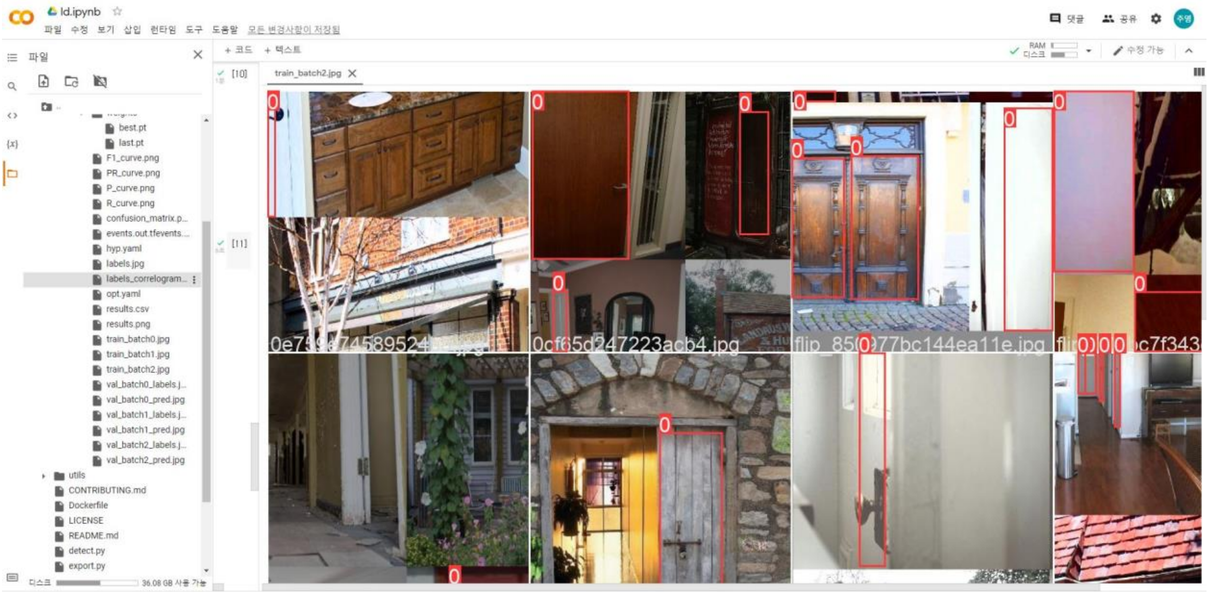


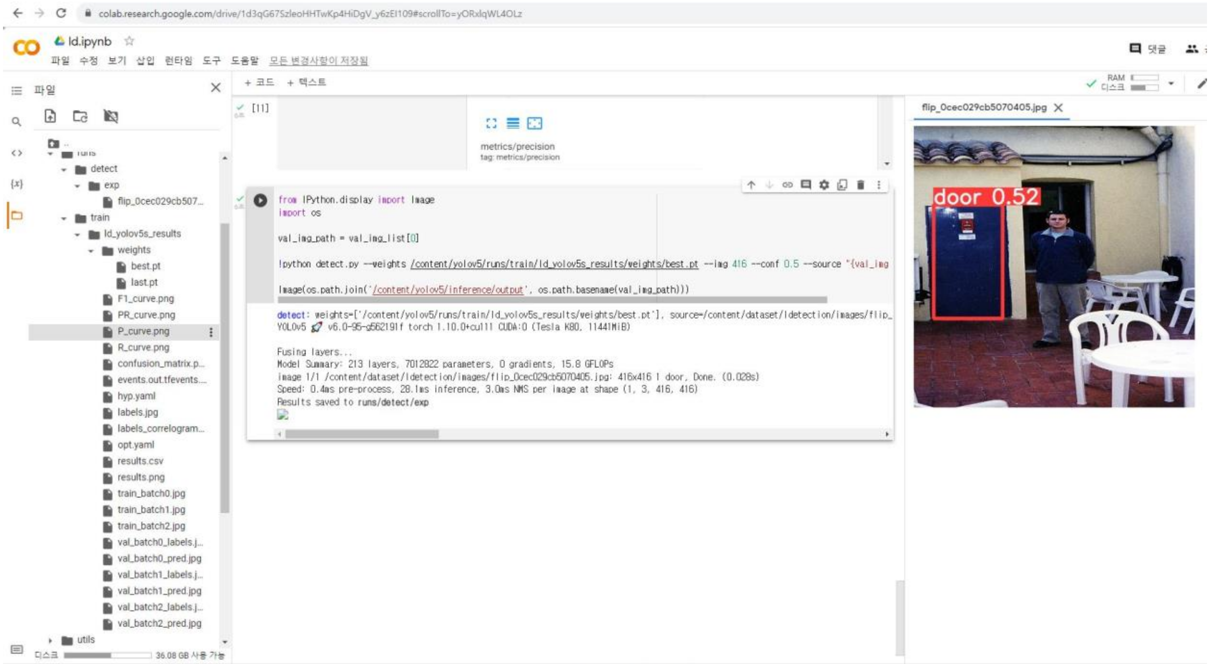
```
In [21]:

from IPython.display import Image
import os

val_img_path = val_img_list[9]

!python detect.py --weights /content/yolov5/runs/train/Id_yolov5s_results/weights/best.pt --img 416 --conf 0.5 --source "{val_img_path}"

Image(os.path.join('/content/yolov5/inference/output', os.path.basename(val_img_path)))
```

```
detect: weights=['/content/yolov5/runs/train/Id_yolov5s_results/weights/best.pt'], source=/content/dataset/Idetection/images/DOR_S1_115.jpg, imgsz=[416, 4
16], conf_thres=0.5, iou_thres=0.45, max_det=1000, device=, view_img=False, save_txt=False, save_conf=False, save_crop=False, nosave=False, classes=None, a
gnostic_nms=False, augment=False, visualize=False, update=False, project=runs/detect, name=exp, exist_ok=False, line_thickness=3, hide_labels=False, hide_c
onf=False, half=False, dnn=False
YOLOv5 🚀 v6.0-95-g562191f torch 1.10.0+cu111 CUDA:0 (Tesla K80, 11441MiB)

Fusing layers...
Model Summary: 213 layers, 7012822 parameters, 0 gradients, 15.8 GFLOPs
image 1/1 /content/dataset/Idetection/images/DOR_S1_115.jpg: 416x416 1 door, Done. (0.027s)
Speed: 0.5ms pre-process, 26.9ms inference, 1.9ms NMS per image at shape (1, 3, 416, 416)
Results saved to runs/detect/exp10
Out[21]:
```

- **결과**

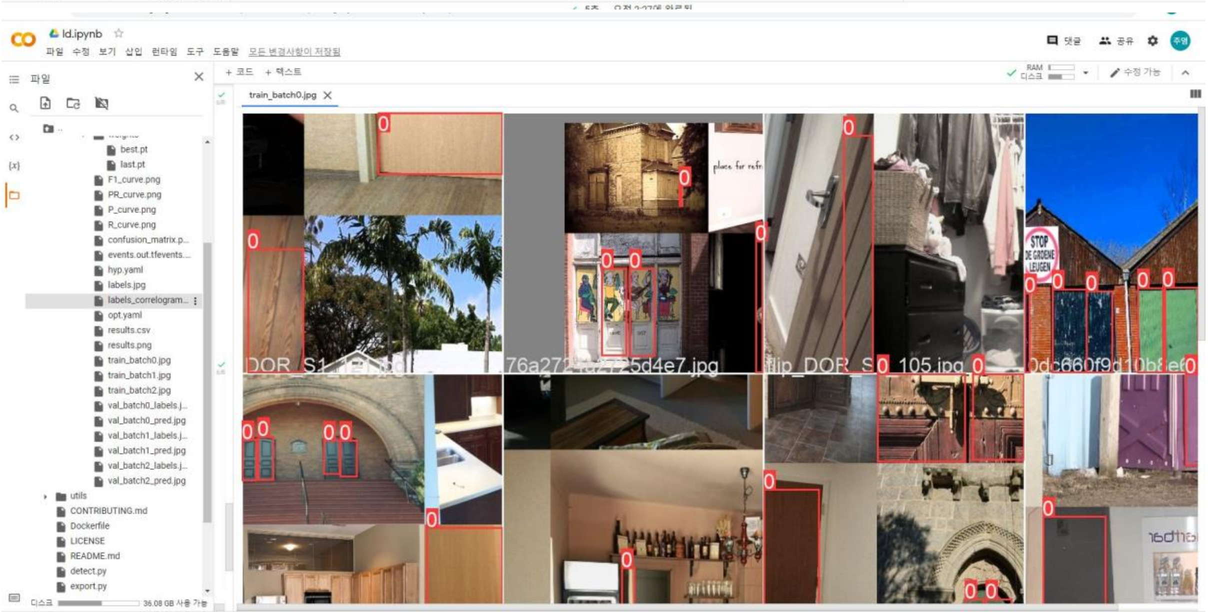

ld.ipynb
파일 수정 보기 삽입 런타임 도구 도움말 모든 변경사항이 저장됨
댓글 공유
+ 코드 + 텍스트
RAM 디스크
수정 가능
train_batch1.jpg
best.pt
last.pt
F1_curve.png
PR_curve.png
P_curve.png
R_curve.png
confusion_matrix.p...
events.out.tfevents...
hyp.yaml
labels.jpg
labels_correlogram...
opt.yaml
results.csv
results.png
train_batch0.jpg
train_batch1.jpg
train_batch2.jpg
val_batch0_labels.j...
val_batch0_pred.jpg
val_batch1_labels.j...
val_batch1_pred.jpg
val_batch2_labels.j...
val_batch2_pred.jpg
utils
CONTRIBUTING.md
Dockerfile
LICENSE
README.md
detect.py
export.py
36.08 GB 사용 가능
flip_0c0l7aa933834dbc1.jpg
flip_DOR_S3_78.jpg
flip_0eb8c61590 3f8fc0.jpg

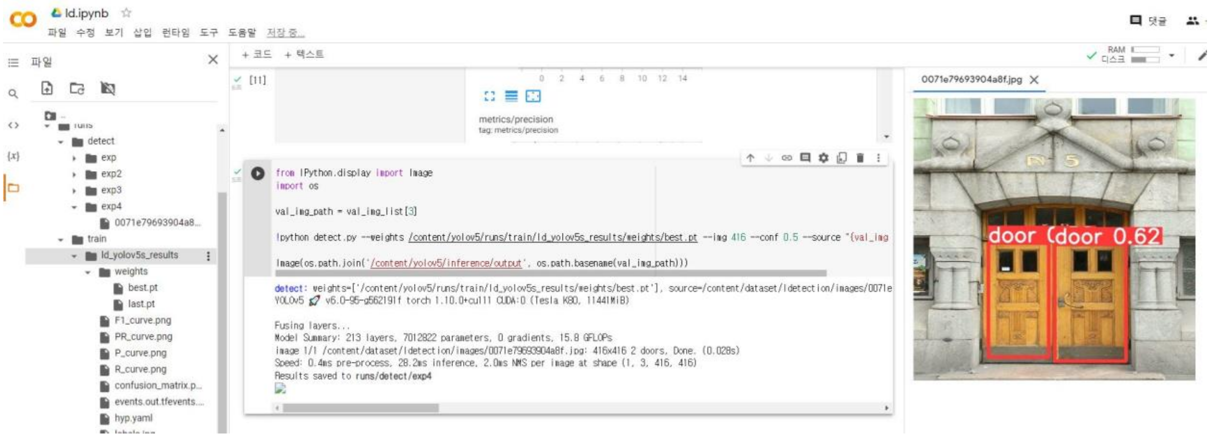

ld.ipynb
파일 수정 보기 삽입 런타임 도구 도움말 모든 변경사항이 저장됨
댓글 공유
파일
+ 코드 + 텍스트
RAM 디스크
수정 가능
[10]
[11]
train_batch2.jpg
best.pt
last.pt
F1_curve.png
PR_curve.png
P_curve.png
R_curve.png
confusion_matrix.p...
events.out.tfevents...
hyp.yaml
labels.jpg
labels_correlogram...
opt.yaml
results.csv
results.png
train_batch0.jpg
train_batch1.jpg
train_batch2.jpg
val_batch0_labels.j...
val_batch0_pred.jpg
val_batch1_labels.j...
val_batch1_pred.jpg
val_batch2_labels.j...
val_batch2_pred.jpg
utils
CONTRIBUTING.md
Dockerfile
LICENSE
README.md
detect.py
export.py
디스크 36.08 GB 사용 가능
0cf65d247223acb4.jpg
flip_85027bc144ea11e.jpg



```
from IPython.display import Image
import os

val_img_path = val_img_list[0]

!python detect.py --weights /content/yolov5/runs/train/ld_yolov5s_results/weights/best.pt --img 416 --conf 0.5 --source "{val_img

Image(os.path.join('/content/yolov5/inference/output', os.path.basename(val_img_path)))
```

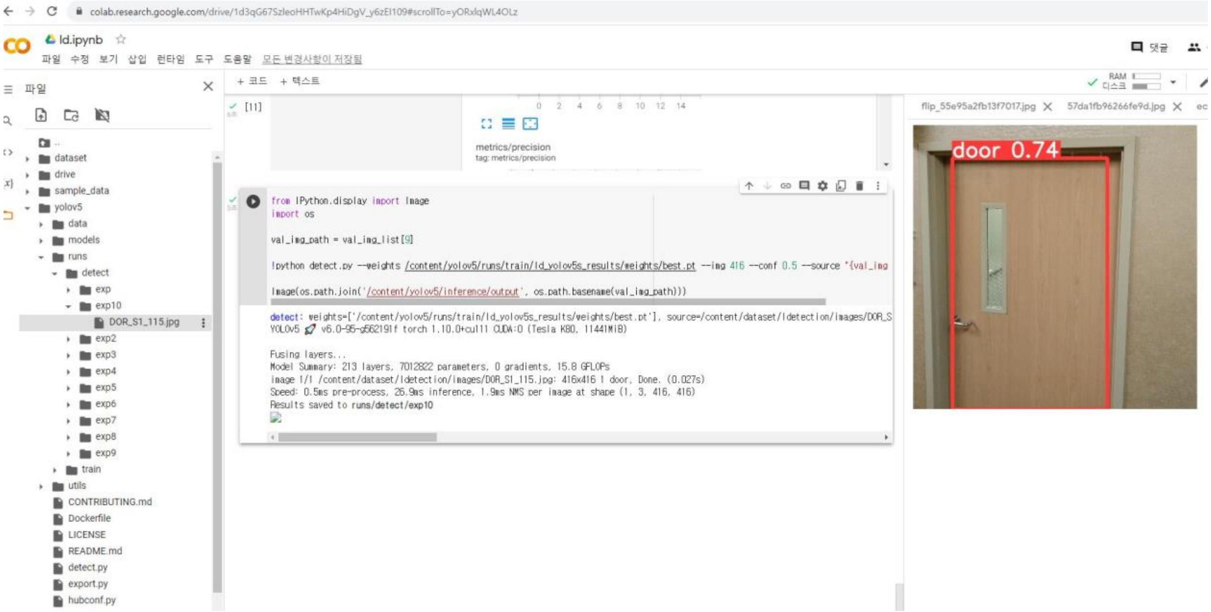
```
detect: weights=['/content/yolov5/runs/train/ld_yolov5s_results/weights/best.pt'], source=/content/dataset/ldetection/images/flip_
YOLOv5 🚀 v6.0-95-g562191f torch 1.10.0+cu111 CUDA:0 (Tesla K80, 11441MiB)

Fusing layers...
Model Summary: 213 layers, 7012822 parameters, 0 gradients, 15.8 GFLOPs
image 1/1 /content/dataset/ldetection/images/flip_0cec029cb5070405.jpg: 416x416 1 door, Done. (0.028s)
Speed: 0.4ms pre-process, 28.1ms inference, 3.0ms NMS per image at shape (1, 3, 416, 416)
Results saved to runs/detect/exp
```





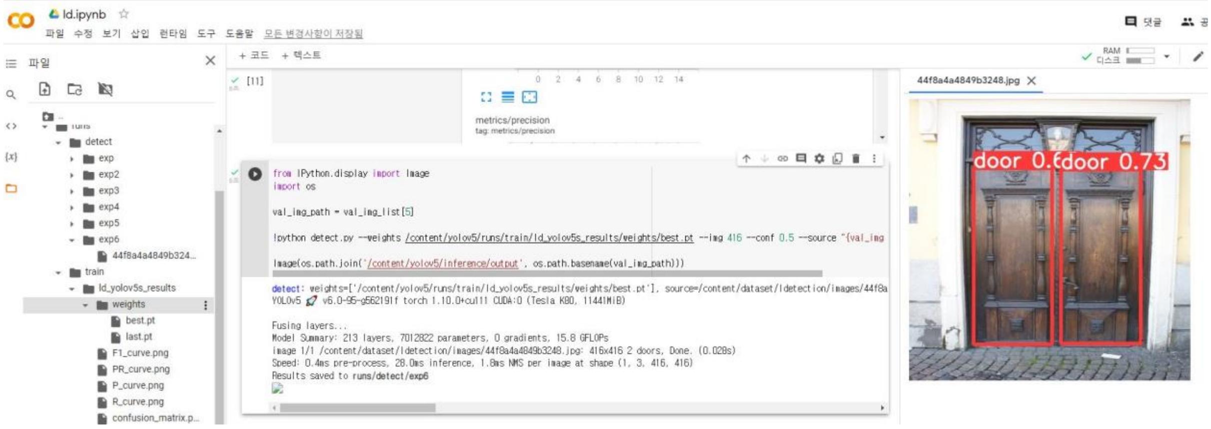
```
from IPython.display import Image
import os

val_img_path = val_img_list[3]

!python detect.py --weights /content/yolov5/runs/train/ld_yolov5s_results/weights/best.pt --img 416 --conf 0.5 --source "{val_img

Image(os.path.join('/content/yolov5/inference/output', os.path.basename(val_img_path)))
```

```
detect: weights=['/content/yolov5/runs/train/ld_yolov5s_results/weights/best.pt'], source=/content/dataset/ldetection/images/0071e
YOLOv5 🚀 v6.0-95-g562191f torch 1.10.0+cu111 CUDA:0 (Tesla K80, 11441MiB)

Fusing layers...
Model Summary: 213 layers, 7012822 parameters, 0 gradients, 15.8 GFLOPs
image 1/1 /content/dataset/ldetection/images/0071e79693904a8f.jpg: 416x416 2 doors, Done. (0.028s)
Speed: 0.4ms pre-process, 28.2ms inference, 2.0ms NMS per image at shape (1, 3, 416, 416)
Results saved to runs/detect/exp4
```



```
from IPython.display import Image
import os

val_img_path = val_img_list[9]

!python detect.py --weights /content/yolov5/runs/train/ld_yolov5s_results/weights/best.pt --img 416 --conf 0.5 --source "{val_img

Image(os.path.join('/content/yolov5/inference/output', os.path.basename(val_img_path)))
```

```
detect: weights=['/content/yolov5/runs/train/ld_yolov5s_results/weights/best.pt'], source=/content/dataset/ldetection/images/DOR_S
YOLOv5 🚀 v6.0-95-g562191f torch 1.10.0+cu111 CUDA:0 (Tesla K80, 11441MiB)

Fusing layers...
Model Summary: 213 layers, 7012822 parameters, 0 gradients, 15.8 GFLOPs
image 1/1 /content/dataset/ldetection/images/DOR_S1_115.jpg: 416x416 1 door, Done. (0.027s)
Speed: 0.5ms pre-process, 26.9ms inference, 1.9ms NMS per image at shape (1, 3, 416, 416)
Results saved to runs/detect/exp10
```



```
from IPython.display import Image
import os

val_img_path = val_img_list[5]

!python detect.py --weights /content/yolov5/runs/train/ld_yolov5s_results/weights/best.pt --img 416 --conf 0.5 --source "{val_img

Image(os.path.join('/content/yolov5/inference/output', os.path.basename(val_img_path)))
```

```
detect: weights=['/content/yolov5/runs/train/ld_yolov5s_results/weights/best.pt'], source=/content/dataset/ldetection/images/44f8a
YOLOv5 🚀 v6.0-95-g562191f torch 1.10.0+cu111 CUDA:0 (Tesla K80, 11441MiB)

Fusing layers...
Model Summary: 213 layers, 7012822 parameters, 0 gradients, 15.8 GFLOPs
image 1/1 /content/dataset/ldetection/images/44f8a4a4849b3248.jpg: 416x416 2 doors, Done. (0.028s)
Speed: 0.4ms pre-process, 28.0ms inference, 1.8ms NMS per image at shape (1, 3, 416, 416)
Results saved to runs/detect/exp6
```