YOLOv5

Basic Detection Process

(using roboflow)

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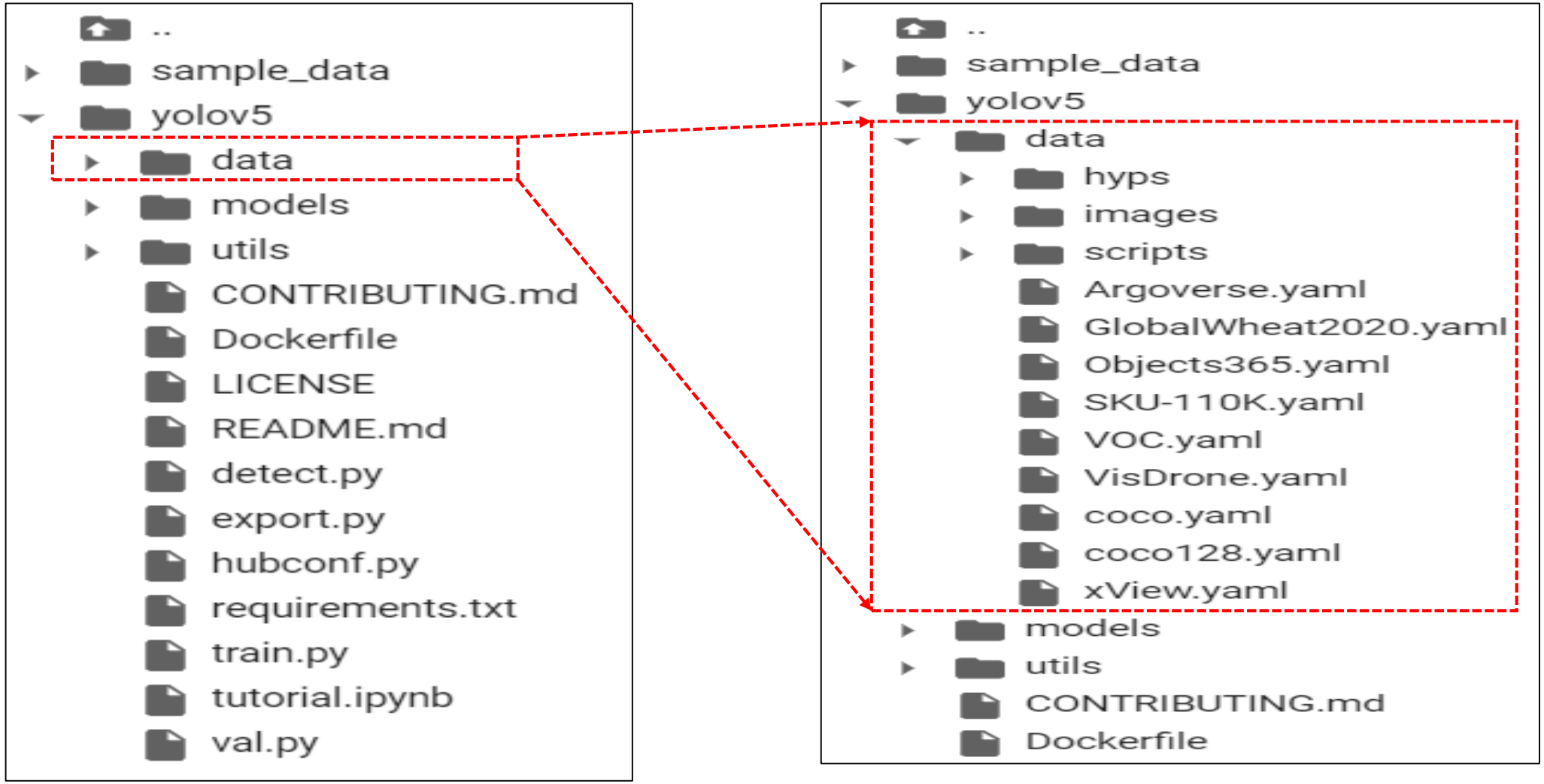
YOLOv5 git clone

```
%cd /content

!git clone https://github.com/ultralytics/yolov5.git
```



필수 라이브러리 설치

```
# 필수 라이브러리 설치

!pip install -r /content/yolov5/requirements.txt
```

```
Requirement already satisfied: matplotlib>=3.2.2 in /usr/local/lib/python3.7/dist-packages (from -r /conten
Requirement already satisfied: numpy>=1.18.5 in /usr/local/lib/python3.7/dist-packages (from -r /content/yo
Requirement already satisfied: opencv-python>=4.1.2 in /usr/local/lib/python3.7/dist-packages (from -r /con
Requirement already satisfied: Pillow>=7.1.2 in /usr/local/lib/python3.7/dist-packages (from -r /content/yo
Collecting PyYAML>=5.3.1
  Downloading PyYAML-6.0-cp37-cp37m-manylinux_2_5_x86_64.manylinux1_x86_64.manylinux_2_12_x86_64.manylinux2
     |████████████████████████████████| 596 kB 13.3 MB/s
Requirement already satisfied: requests>=2.23.0 in /usr/local/lib/python3.7/dist-packages (from -r /content
Requirement already satisfied: scipy>=1.4.1 in /usr/local/lib/python3.7/dist-packages (from -r /content/yol
Requirement already satisfied: torch>=1.7.0 in /usr/local/lib/python3.7/dist-packages (from -r /content/yol
Requirement already satisfied: torchvision>=0.8.1 in /usr/local/lib/python3.7/dist-packages (from -r /conte
Requirement already satisfied: tqdm>=4.41.0 in /usr/local/lib/python3.7/dist-packages (from -r /content/yol
Requirement already satisfied: tensorboard>=2.4.1 in /usr/local/lib/python3.7/dist-packages (from -r /conte
Requirement already satisfied: pandas>=1.1.4 in /usr/local/lib/python3.7/dist-packages (from -r /content/yo
Requirement already satisfied: seaborn>=0.11.0 in /usr/local/lib/python3.7/dist-packages (from -r /content/
Collecting thop
  Downloading thop-0.0.31.post2005241907-py3-none-any.whl (8.7 kB)
Requirement already satisfied: kiwisolver>=1.0.1 in /usr/local/lib/python3.7/dist-packages (from matplotlib
```

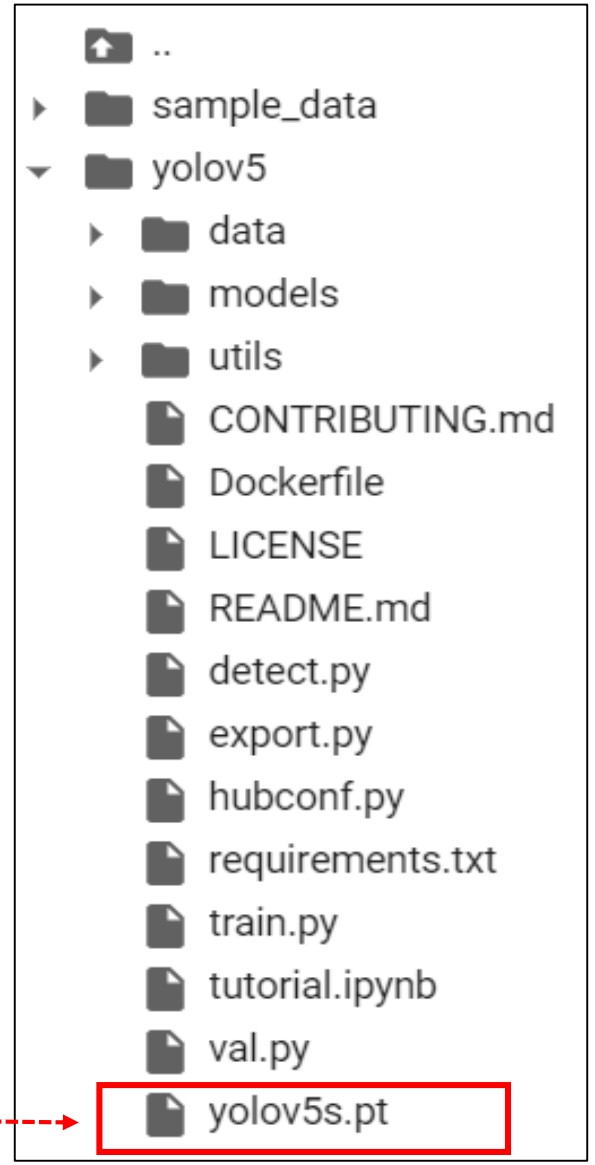
pre-trained model 다운로드 (option)

```
!wget -P /content/yolov5/  https://github.com/ultralytics/yolov5/releases/download/v6.0/yolov5s.pt

--2021-10-22 11:19:27--  https://github.com/ultralytics/yolov5/releases/download/v6.0/yolov5s.pt
Resolving github.com (github.com)... 140.82.113.4
Connecting to github.com (github.com)|140.82.113.4|:443... connected.
HTTP request sent, awaiting response... 302 Found
Location: https://github-releases.githubusercontent.com/264818686/eab38592-7168-4731-bdff-ad5ede200
--2021-10-22 11:19:27--  https://github-releases.githubusercontent.com/264818686/eab38592-7168-4731-
Resolving github-releases.githubusercontent.com (github-releases.githubusercontent.com)... 185.199.
Connecting to github-releases.githubusercontent.com (github-releases.githubusercontent.com)|185.199
HTTP request sent, awaiting response... 200 OK
Length: 14698491 (14M) [application/octet-stream]
Saving to:  '/content/yolov5/yolov5s.pt'

yolov5s.pt          100%[===================>]  14.02M  --.-KB/s    in 0.1s

2021-10-22 11:19:27 (101 MB/s) -  '/content/yolov5/yolov5s.pt'  saved [14698491/14698491]
```



detect 실행 시에, 자동으로 다운로드 된 pre-trained model (default=yolo5s.pt). COCO Dataset으로 이미 학습되어 있음

roboflow – computer vision datasets (https://public.roboflow.com/)

roboflow

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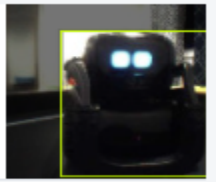
DATASET TYPE

- All Datasets 39
- Object Detection 35
- Classification 4

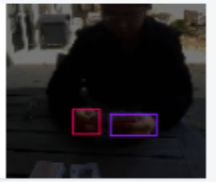
Computer Vision Datasets

Roboflow hosts free public computer vision datasets in many popular formats (including CreateML JSON, COCO JSON, Pascal VOC XML, YOLO v3, and Tensorflow TFRecords). For your convenience, we also have downsized and augmented versions available.

If you'd like us to host your dataset, please get in touch.

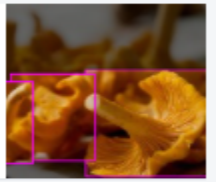


Anki Vector Robot Dataset Dataset
Object Detection (Bounding Box)
417 images | 8 exports | Last updated a day ago



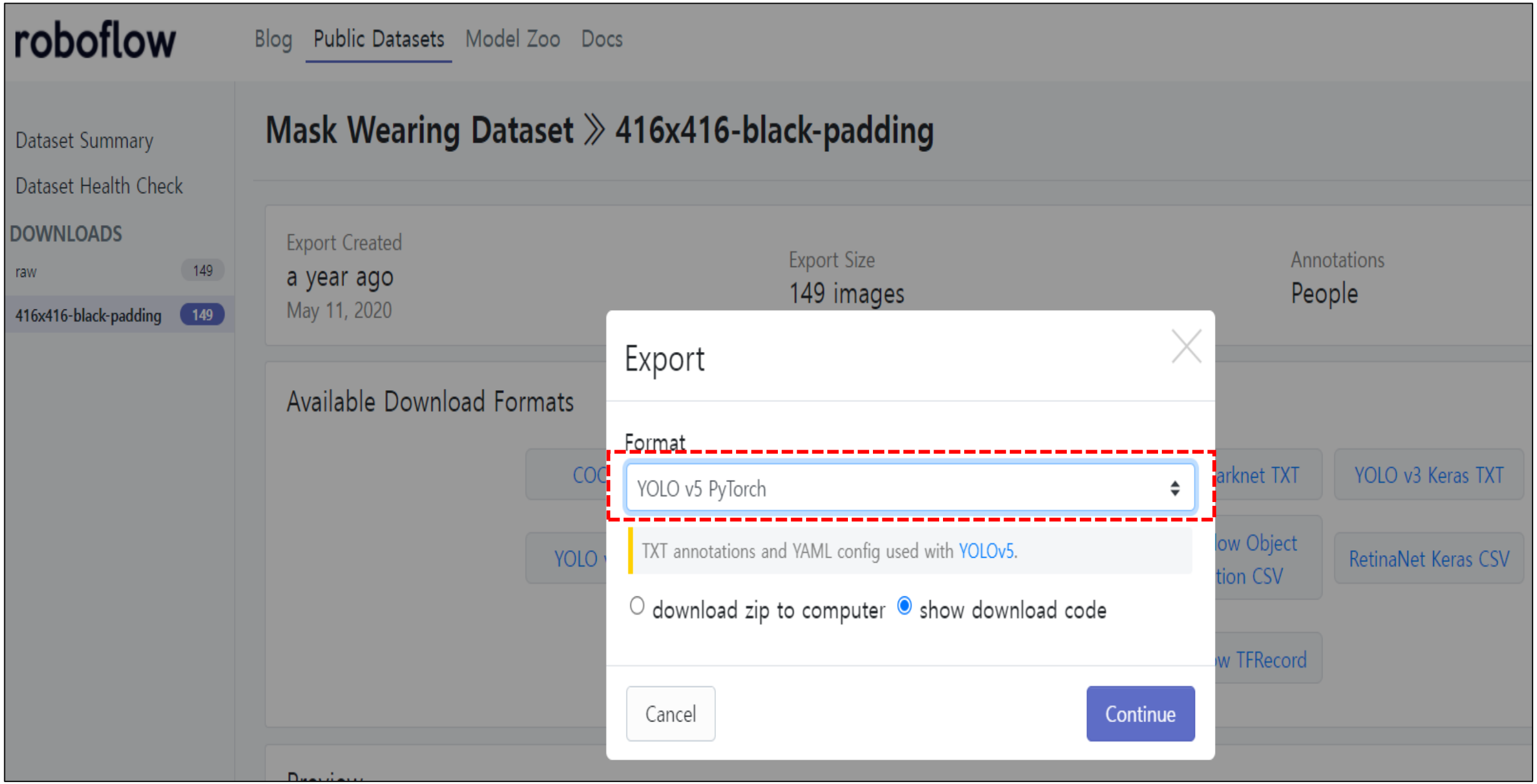
EgoHands Dataset
Object Detection (Bounding Box)
4800 images | 5 exports | Last updated 5 days ago

Microsoft COCO 2017 Dataset
Object Detection (Bounding Box)
121448 images | 9 exports | Last updated a month ago

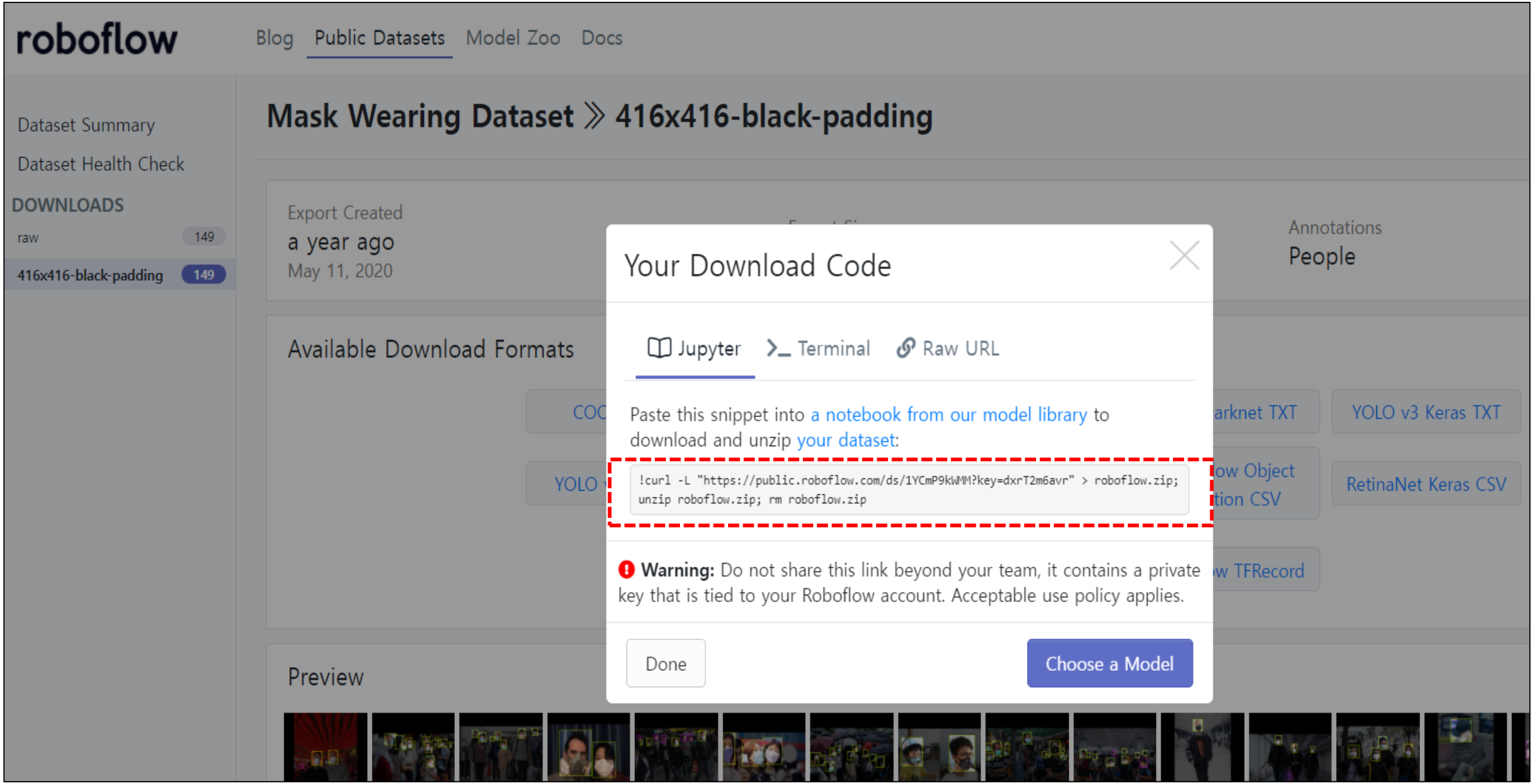


North American Mushrooms Dataset
Object Detection (Bounding Box)
51 images | 3 exports | Last updated 2 months ago

roboflow – computer vision datasets (https://public.roboflow.com/)



roboflow – computer vision datasets (https://public.roboflow.com/)



YOLO5 - Mask Wearing Dataset (custom data) 다운로드

Public Dataset : https://public.roboflow.com/object-detection/mask-wearing

```
[ ]  # custom 데이터 디렉토리 생성

     %mkdir /content/Mask_Data

     %cd /content/Mask_Data/
```

```
     /content/Mask_Data
```

```
[ ]  # custom 데이터 다운로드 (Mask Wearing Dataset)

     !curl -L "https://public.roboflow.com/ds/1YCmP9kWMM?key=dxrT2m6avr" > roboflow.zip; unzip roboflow.zip; rm roboflow.zip
```

```
       % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                      Dload  Upload   Total   Spent    Left  Speed
     100   896  100   896    0     0   1866      0 --:--:-- --:--:-- --:--:--  1862
     100 3791k  100 3791k    0     0  6276k      0 --:--:-- --:--:-- --:--:-- 6276k
     Archive:  roboflow.zip
      extracting: test/images/w1240-p16x9-0e48e0098f6e832f27d8b581b33bbc72b9967a63_jpg.rf.34ed1e8f70eebdabaf43ab9d40dc1c9b.jp
      extracting: test/images/RTX7CCFN_jpg.rf.66ed5c5054f30d933d19ab3d56ace004.jpg
      extracting: test/images/the-first-day-of-wuhan-s-closure-some-people-fled-some-panicked_jpg.rf.0302fefb0879eb37736a704c
      extracting: test/images/1288126-10255706714jpg_jpg.rf.95f7324cbfd48e0386e0660b5e932223.jpg
      extracting: test/images/126202-untitled-design-13_jpg.rf.56b50d413464989bb2232448a8fbb915.jpg
      extracting: test/images/r1p00017o8171png407_jpg.rf.6fd25b7219a249e97f54fcabf2b52726.jpg
```

yaml 파일 설정 (데이터셋 위치 알려주는 config file)

```
%cat /content/Mask_Data/data.yaml
```

```
train: ../train/images
val: ../valid/images

nc: 2
names: ['mask', 'no-mask']
```

```
# yaml 파일을 학습이 가능하도록 경로 설정.
# cat 결과 내용을 data['train'], data['val'], data['nc'], data['names'] 에 넣어주는데,
# 가장 중요한 부분은 데이터 경로 설정임.
# 즉 train: ../train/images 에서 .. 부분은 절대경로인 /content/Maks_Data 바꾸어 주는것이 중요
# https://stackoverflow.com/questions/69564817/typeerror-load-missing-1-required-positional-argument-loader-in-google-col
# yaml.load() => yaml.safe_load()

import yaml

with open('/content/Mask_Data/data.yaml', 'r') as f:
  data = yaml.safe_load(f)

print(data)

data['train'] = '/content/Mask_Data/train/images/'
data['val'] = '/content/Mask_Data/valid/images/'

data['nc'] = 2
data['names'] = ['mask','no-mask']

with open('/content/Mask_Data/data.yaml', 'w') as f:
  yaml.dump(data, f)

print(data)
```

학습 데이터 디렉토리는 다음과 같이 구성되야함

- data/train/images
- data/train/labels
- data/valid/images
- data/valid/labels

```
{'train': '../train/images', 'val': '../valid/images', 'nc': 2, 'names': ['mask', 'no-mask']}
{'train': '/content/Mask_Data/train/images/', 'val': '/content/Mask_Data/valid/images/', 'nc': 2, 'names': ['mask', 'no-mask']}
```

하이퍼 파라미터 설정 및 train

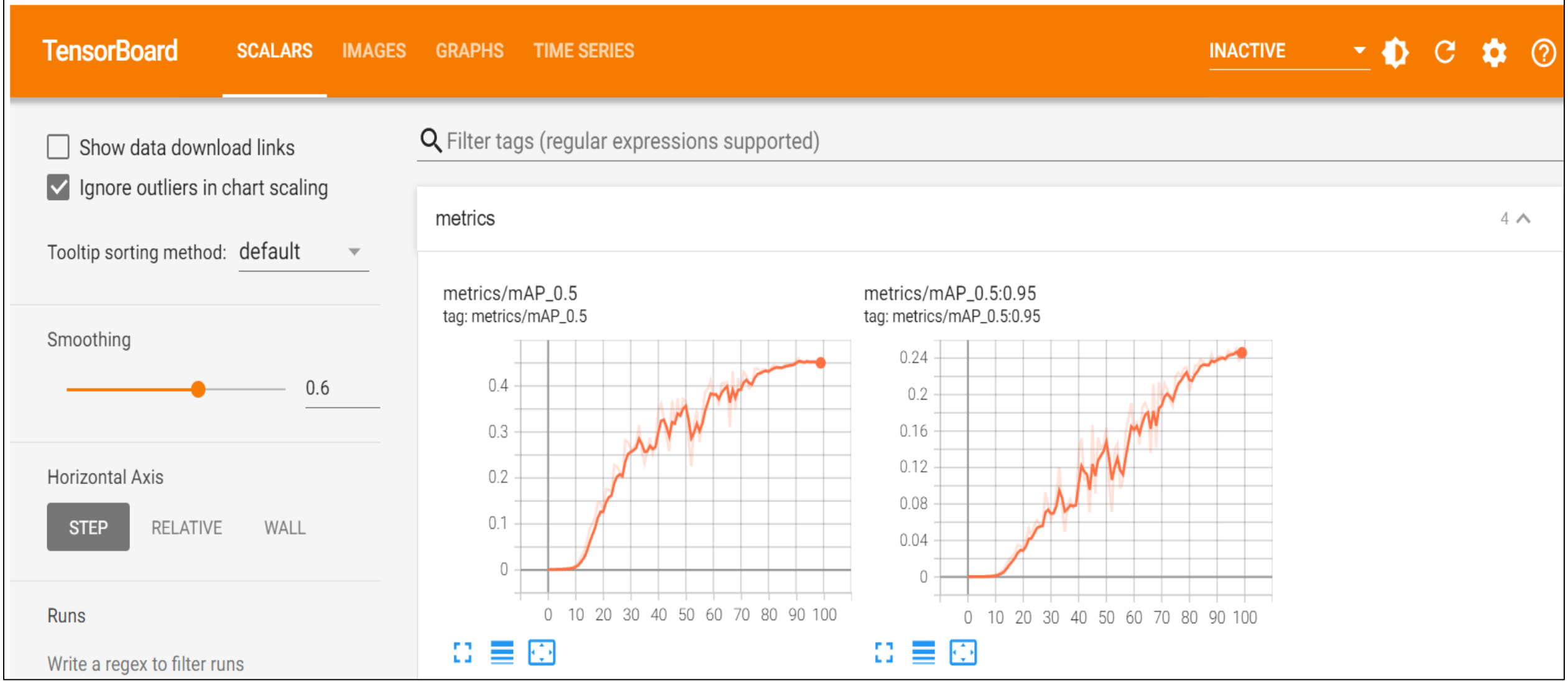
```
# 하이퍼 파라미터 설정

img_size = 416
bacth_size = 32
epochs = 100

data_path = '/content/mask_data/data.yaml'
yalm_path = '/content/yolov5/models/yolov5s.yaml'
weights_path = '/content/yolov5/yolov5s.pt'


# train

!python3 /content/yolov5/train.py --img {img_size} --batch {bacth_size} --epochs {epochs} --data {data_path} ₩
--cfg {yalm_path} --weights {weights_path}
```

```
Downloading https://ultralytics.com/assets/Arial.ttf to /root/.config/Ultralytics/Arial.ttf...
train: weights=/content/yolov5/yolov5s.pt, cfg=/content/yolov5/models/yolov5s.yaml, data=/content/mask_data/data.yaml, hyp
github: skipping check (not a git repository), for updates see https://github.com/ultralytics/yolov5
YOLOv5 🚀 v6.0-30-gfee83c1 torch 1.9.0+cu111 CUDA:0 (Tesla K80, 11441.1875MB)

hyperparameters: lr0=0.01, lrf=0.1, momentum=0.937, weight_decay=0.0005, warmup_epochs=3.0, warmup_momentum=0.8, warmup_b
Weights & Biases: run 'pip install wandb' to automatically track and visualize YOLOv5 🚀 runs (RECOMMENDED)
TensorBoard: Start with 'tensorboard --logdir yolov5/runs/train', view at http://localhost:6006/
Overriding model.yaml nc=80 with nc=2

                 from  n    params  module                                  arguments
  0                -1  1      3520  models.common.Conv                      [3, 32, 6, 2, 2]
```

텐서보드를 이용한 학습과정 출력

train 명령어 실행할 경우, 학습과정 저장 디렉토리가 출력되므로 --logdir 다음에 해당 디렉토리를 적어주면 된다

```
%load_ext tensorboard
%tensorboard --logdir /content/yolov5/runs/train/exp/
```



테스트 이미지 데이터 생성 및 확인

```python
# 테스트 이미지

from glob import glob

test_image_list = glob('/content/mask_data/test/images/*.jpg')

print(len(test_image_list))

test_image_list.sort()

for i in range(len(test_image_list)):

    print('i = ',i, test_image_list[i])
```

```
15
i =  0 /content/mask_data/test/images/0_Concern-In-China-As-Mystery-Virus-Spreads_jpg.rf.3135dfc5feab288d76a4ccfd22dfc5bf.jpg
i =  1 /content/mask_data/test/images/1224331650_g_400-w_g_jpg.rf.b816f49e2d84044fc997a8cbd55c347d.jpg
i =  2 /content/mask_data/test/images/126202-untitled-design-13_jpg.rf.56b50d413464989bb2232448a8fbb915.jpg
i =  3 /content/mask_data/test/images/1288126-10255706714jpg_jpg.rf.95f7324cbfd48e0386e0660b5e932223.jpg
i =  4 /content/mask_data/test/images/15391513324714o1n0r10n6_jpg.rf.a91fbc7be8a94ed3c48d2e4b35bd53bb.jpg
i =  5 /content/mask_data/test/images/15391513329330sooq10859_jpg.rf.89c8524c2096175fa2c728e5d73f1c28.jpg
i =  6 /content/mask_data/test/images/1579924271_jpg.rf.be5b27c2b2801bccc191e6dbd9bfccca.jpg
i =  7 /content/mask_data/test/images/RTX7CCFN_jpg.rf.66ed5c5054f30d933d19ab3d56ace004.jpg
i =  8 /content/mask_data/test/images/phplpE73q_jpg.rf.bd81cab9f8ff2674ce2e58278f7d37fa.jpg
i =  9 /content/mask_data/test/images/r1p00017o8171pnq407_jpg.rf.6fd25b7219a249e97f54fcabf2b52726.jpg
i =  10 /content/mask_data/test/images/shutterstock_1627199179_jpg.rf.8432d033a37b3d142ec4ffcede508c7d.jpg
i =  11 /content/mask_data/test/images/the-first-day-of-wuhan-s-closure-some-people-fled-some-panicked_jpg.rf.0302fefb0879eb37736a704ca5
i =  12 /content/mask_data/test/images/w1240-p16x9-0e48e0098f6e832f27d8b581b33bbc72b9967a63_jpg.rf.34ed1e8f70eebdabaf43ab9d40dc1c9b.jpg
i =  13 /content/mask_data/test/images/w1240-p16x9-2019-10-04t075956z_1862636027_rc15d4d49d00_rtrmadp_3_hongkong-protests_jpg.rf.061f2c7
i =  14 /content/mask_data/test/images/w1240-p16x9-fa978043deff83fed485af12d16e39c61398fc30_jpg.rf.185d01b7e55e049c6661b8ecd49679fc.jpg
```

YOLOv5 이용한 이미지내의 객체 검출 (Inference)

```
[ ]  # inference

     !python3 /content/yolov5/detect.py --weights /content/yolov5/runs/train/exp/weights/best.pt --img 416 --conf 0.5 --source /content/mask_data/test/images/
```

```
detect: weights=['/content/yolov5/runs/train/exp/weights/best.pt'], source=/content/mask_data/test/images/, imgsz=[416, 416], conf_thres=0.5, iou_thres=0
YOLOv5 🚀 v6.0-30-gfee83c1 torch 1.9.0+cu111 CUDA:0 (Tesla K80, 11441.1875MB)

Fusing layers...
Model Summary: 213 layers, 7015519 parameters, 0 gradients, 15.8 GFLOPs
image 1/15 /content/mask_data/test/images/0_Concern-In-China-As-Mystery-Virus-Spreads_jpg.rf.3135dfc5feab288d76a4ccfd22dfc5bf.jpg: 416x416 2 masks, Done.
image 2/15 /content/mask_data/test/images/1224331650_g_400-w_g_jpg.rf.b816f49e2d84044fc997a8cbd55c347d.jpg: 416x416 4 masks, Done. (0.027s)
image 3/15 /content/mask_data/test/images/126202-untitled-design-13_jpg.rf.56b50d413464989bb2232448a8fbb915.jpg: 416x416 5 masks, Done. (0.028s)
image 4/15 /content/mask_data/test/images/1288126-10255706714jpg_jpg.rf.95f7324cbfd48e0386e0660b5e932223.jpg: 416x416 2 masks, Done. (0.028s)
image 5/15 /content/mask_data/test/images/15391513324714o1n0r10n6_jpg.rf.a91fbc7be8a94ed3c48d2e4b35bd53bb.jpg: 416x416 1 mask, Done. (0.028s)
image 6/15 /content/mask_data/test/images/15391513329330sooq10859_jpg.rf.89c8524c2096175fa2c728e5d73f1c28.jpg: 416x416 1 mask, Done. (0.028s)
image 7/15 /content/mask_data/test/images/1579924271_jpg.rf.be5b27c2b2801bccc191e6dbd9bfccca.jpg: 416x416 7 masks, Done. (0.028s)
image 8/15 /content/mask_data/test/images/RTX7CCFN_jpg.rf.66ed5c5054f30d933d19ab3d56ace004.jpg: 416x416 2 masks, Done. (0.028s)
image 9/15 /content/mask_data/test/images/phplpE73q_jpg.rf.bd81cab9f8ff2674ce2e58278f7d37fa.jpg: 416x416 29 masks, Done. (0.028s)
image 10/15 /content/mask_data/test/images/r1p00017o8171pnq407_jpg.rf.6fd25b7219a249e97f54fcabf2b52726.jpg: 416x416 1 mask, Done. (0.028s)
image 11/15 /content/mask_data/test/images/shutterstock_1627199179_jpg.rf.8432d033a37b3d142ec4ffcede508c7d.jpg: 416x416 5 masks, Done. (0.028s)
image 12/15 /content/mask_data/test/images/the-first-day-of-wuhan-s-closure-some-people-fled-some-panicked_jpg.rf.0302fefb0879eb37736a704ca5d070ff.jpg: 41
image 13/15 /content/mask_data/test/images/w1240-p16x9-0e48e0098f6e832f27d8b581b33bbc72b9967a63_jpg.rf.34ed1e8f70eebdabaf43ab9d40dc1c9b.jpg: 416x416 2 mas
image 14/15 /content/mask_data/test/images/w1240-p16x9-2019-10-04t075956z_1862636027_rc15d4d49d00_rtrmadp_3_hongkong-protests_jpg.rf.061f2c7f7d17a0b472510
image 15/15 /content/mask_data/test/images/w1240-p16x9-fa978043deff83fed485af12d16e39c61398fc30_jpg.rf.185d01b7e55e049c6661b8ecd49679fc.jpg: 416x416 1 mas
Speed: 0.4ms pre-process, 28.0ms inference, 1.5ms NMS per image at shape (1, 3, 416, 416)
Results saved to yolov5/runs/detect/exp
```

결과 확인 및 다운로드

```
[ ]  import glob

     detetced_image_list = glob.glob(('/content/yolov5/runs/detect/exp/*.jpg'))

     detected_image_nums = len(detetced_image_list)

     print(detected_image_nums)

     print(detetced_image_list)
```

```
15
['/content/yolov5/runs/detect/exp/phplpE73q_jpg.rf.bd81cab9f8ff2674ce2e58278f7d37fa.jpg', '/content/yolov5/runs/
```

```
import zipfile
import os

if not os.path.exists('/content/detected_result/'):
    os.mkdir('/content/detected_result/')
    print('detected_result dir is created !!!')


with zipfile.ZipFile('/content/detected_result/Mask_detected_images.zip', 'w') as detected_images:

    for idx in range(detected_image_nums):
        detected_images.write(detetced_image_list[idx])
```

```
# 파일 다운로드

import shutil
from google.colab import files

shutil.copy('/content/yolov5/runs/train/exp/weights/best.pt', '/content/yolov5/Mask_best.pt')

files.download('/content/detected_result/Mask_detected_images.zip')

files.download('/content/yolov5/Mask_best.pt')
```