

Yolo5 학습 및 탐색

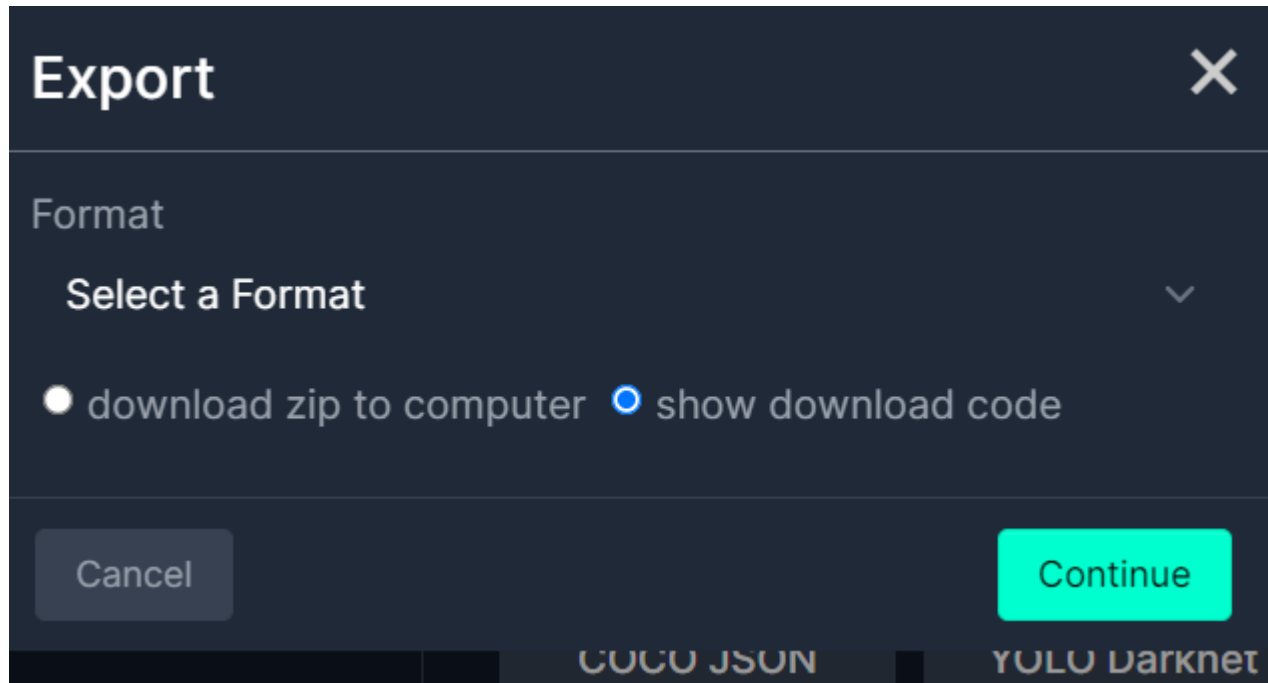
<dataset 확보>

참고: <https://minding-deep-learning.tistory.com/19>

. Dataset 구하기 ('<https://universe.roboflow.com/>'에서 <https://universe.roboflow.com/joseph-nelson/pistols>
(피스톨 데이터셋) 선택)

The screenshot shows the Roboflow Universe interface for the 'Pistols Computer Vision Project'. The page is dark-themed with a sidebar on the left containing navigation links: 'Pistols', 'Object Detection', 'Overview', 'Images' (2986), 'Dataset' (1), 'Model', and 'Health Check'. The main content area features the project title 'Pistols Computer Vision Project' with a star icon and a 'Download this Dataset' button. Below this is an 'Overview' section with text describing the dataset: 'This dataset contains 2986 images and 3448 labels across a single annotation class: pistols. Images are wide-ranging: pistols in-hand, cartoons, and staged studio quality images of guns. The dataset was originally released by the University of Grenada, duplicates removed, and rehosted by a Roboflow user.' A preview image of a handgun with a green bounding box is shown. On the right, a sidebar lists metadata: 'SOURCE: University of Grenada', 'MAINTAINER: Joseph Nelson', 'LAST UPDATED: 3 months ago', 'PROJECT TYPE: Object Detection', 'SUBJECT: Guns', 'CLASSES: pistol', and 'LICENSE: Public Domain'. At the bottom right, there are buttons for 'Object Detection' and 'Classic'.

. Download this dataset 클릭 => 'Yolov5 Pytorch'를 Format 으로 선택하고 'show downlad code' 선택하고 'Continue'



```
!pip install roboflow
```

```
from roboflow import Roboflow
rf = Roboflow(api_key="1I28shYwWWZasx0TI9sX")
project = rf.workspace("joseph-nelson").project("pistols")
dataset = project.version(1).download("yolov5")
```

Your Download Code

Jupyter

Terminal

Raw URL

Paste this snippet into [a notebook from our model library >>](#) to download and unzip [your dataset >>](#):

```
!pip install roboflow

from roboflow import Roboflow
rf = Roboflow(api_key="")
project = rf.workspace("joseph-nelson").project("pistols")
dataset = project.version(1).download("yolov5")
```

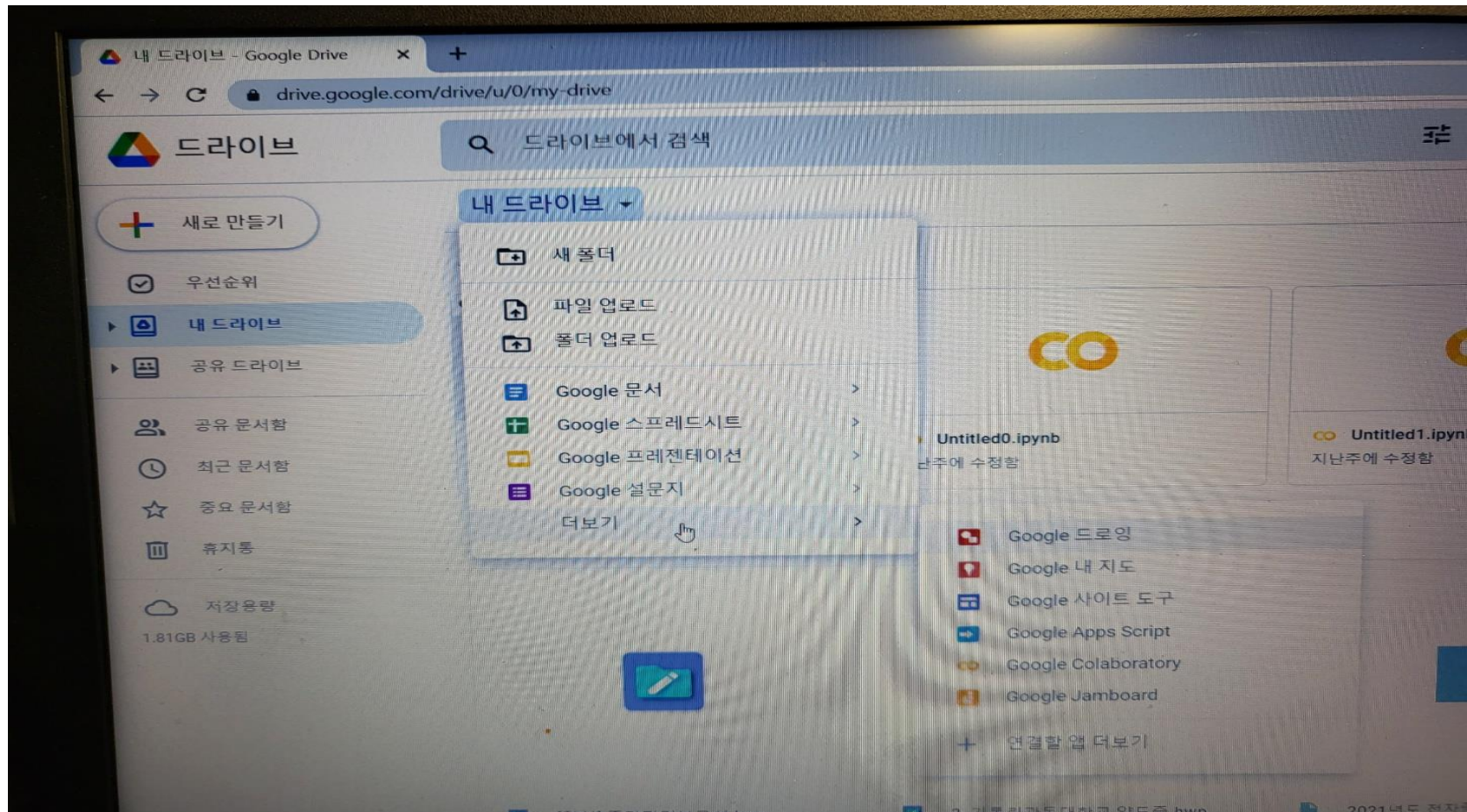
Warning: Do not share this snippet beyond your team, it contains a private key that is tied to your Roboflow account. Acceptable use policy applies.

Done

Choose a Model

<구글 Colab (Colaboratory, 클라우드서버) 들어가기>


. 구글 My drive / 더 보기 / Google colaboratory 선택



. 상단 메뉴에서 'runtime' / 'change runtime type'을 다음과 같이 선택한 후 'Save'

Notebook settings

Hardware accelerator

GPU 

Want access to premium GPUs?
[Purchase additional compute units here.](#)

☐ Omit code cell output when saving this notebook

Cancel Save

. 좌측 노란 폴더를 클릭하면 dir 구조(sample_data) 나옴

The screenshot shows the Roboflow web interface. At the top, there's a logo and the text "Untitled2.ipynb" with a star icon. Below this is a menu bar with "File", "Edit", "View", "Insert", "Runtime", "Tools", and "Help". On the right, there are "Comment" and "Share" buttons. The main area is split into two panels. The left panel, titled "Files", shows a file explorer with a search bar and icons for upload, download, and delete. It lists a folder named "sample_data". The right panel, titled "+ Code + Text", shows a code editor with a "Connected" status indicator and a play button icon.

. Roboflow 에서 복사한 코드를 붙여 넣기(^v)후 실행(우측 삼각형 클릭)

```
!pip install roboflow

from roboflow import Roboflow
rf = Roboflow(api_key="1I28shYwWWZasx0TI9sX")
project = rf.workspace("joseph-nelson").project("pistols")
dataset = project.version(1).download("yolov5")
```

The screenshot shows a code editor with a play button icon on the left. The code in the editor is as follows:

```
!pip install roboflow

from roboflow import Roboflow
rf = Roboflow(api_key="1I28shYwWWZasx0TI9sX")
project = rf.workspace("joseph-nelson").project("pistols")
dataset = project.version(1).download("yolov5")
```

Below the code, the output of the execution is shown. It starts with "Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wh" and "Collecting roboflow". It then shows the download progress for "roboflow-0.2.18-py3-none-any.whl (41 kB)" and "certifi-2021.5.30-py2.py3-none-any.whl (145 kB)". The output also shows that several requirements are already satisfied: "tqdm>=4.41.0 in /usr/local/lib/python3.7/dist-packages", "PyYAML>=5.3.1 in /usr/local/lib/python3.7/dist-packages", "opencv-python-headless>=4.5.1.48 in /usr/local/lib/python3.7/dist-packages", and "python-dotenv". Finally, it shows the download progress for "python-dotenv-0.21.0-py3-none-any.whl (18 kB)".


```

Downloading requests-2.28.1-py3-none-any.whl (62 kB)
|████████████████████████████████████████| 62 kB 1.1 MB/s

```

Building wheels for collected packages: wget

```
Created wheel for wget: filename=wget-3.2-py3-none-any.whl size=9675 sha256=t
```

Successfully built wget

```
Attempting uninstall: urllib3
```

Uninstalling urllib3-1.24.3:

```
Attempting uninstall: certifi
```

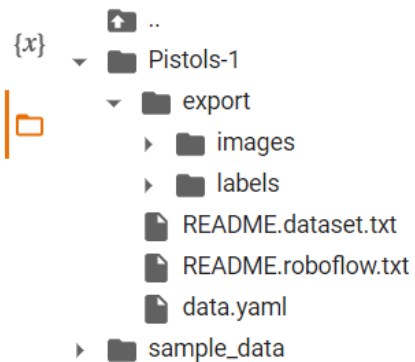
Uninstalling certifi-2022.9.24:

```
Attempting uninstall: requests
```

Uninstalling requests-2.23.0:

Attempting uninstall: pyparsing

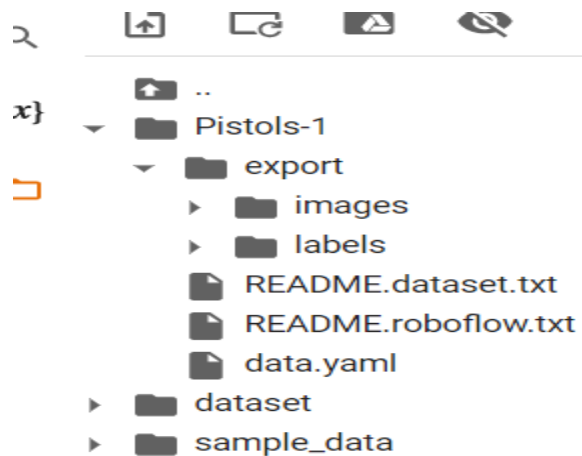
```
Found existing installation: pyparsing 3.0.9
```

```
from roboflow import Roboflow
rf = Roboflow(api_key="1I28shYwWZasx0TI9sX")
project = rf.workspace("joseph-nelson").project("pistols")
dataset = project.version(1).download("yolov5")
```

Looking in indexes: <https://pypi.org/simple>, <https://us-python.pkg.dev/colab-wl>
Collecting roboflow
Downloading roboflow-0.2.18-py3-none-any.whl (41 kB)
|██| 41 kB 226 kB/s

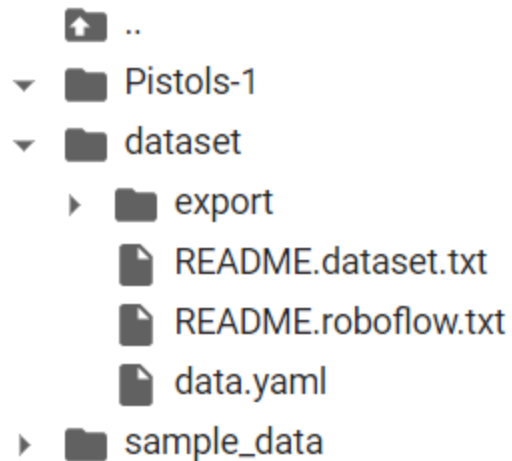
. 마우스 우측 버튼을 눌러서 새로 'dataset' 폴더를 만들고 dataset 폴더에 Pistols-1 아래 모든 폴더를 옮김



```
!pip install roboflow

from roboflow import Roboflow
rf = Roboflow(api_key="1I28shYwWZasx0TI9sX")
project = rf.workspace("joseph-nelson").project("pistols")
dataset = project.version(1).download("yolov5")
```

Looking in indexes:
Collecting roboflow
Downloading roboflow-0.2.18-py3-none-any.whl (41 kB)
|██| 41 kB 226 kB/s
Requirement already satisfied: requests in /usr/local/lib/python3.10/dist-packages (2.28.1)
Requirement already satisfied: tqdm in /usr/local/lib/python3.10/dist-packages (4.64.1)
Collecting cycler==0.1.0
Downloading cycler-0.1.0-py3-none-any.whl (10 kB)
Requirement already satisfied: numpy in /usr/local/lib/python3.10/dist-packages (1.24.2)
Requirement already satisfied: opencv-python in /usr/local/lib/python3.10/dist-packages (4.8.0.74)



```
from roboflow import Roboflow
rf = Roboflow(api_key="1I28shYwWwZ")
project = rf.workspace("joseph-nel")
dataset = project.version(1).download
```

Looking in indexes: <https://pypi.org>
Collecting roboflow
Downloading roboflow-0.2.18-py3-

. Yolov5 다운(현재 보이는 Content 폴더에)

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

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

Cloning into 'yolov5'...

remote: Enumerating objects: 14841, done.

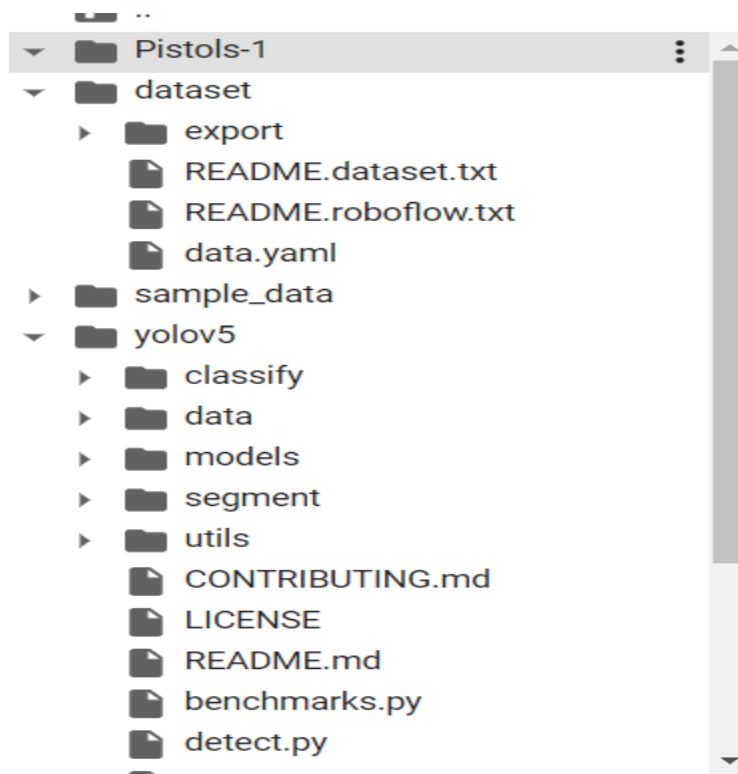
remote: Counting objects: 100% (172/172), done.

remote: Compressing objects: 100% (96/96), done.

remote: Total 14841 (delta 100), reused 131 (delta 75), pack-reused 14669

Receiving objects: 100% (14841/14841), 13.60 MiB | 22.65 MiB/s, done.

Resolving deltas: 100% (10239/10239), done.



. 필요한 패키지 설치

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

(중간생략)

```
Requirement already satisfied: importlib-metadata>=4.4 in /usr/local/lib/python3.7/dist-packages  
Requirement already satisfied: zipp>=0.5 in /usr/local/lib/python3.7/dist-packages  
Requirement already satisfied: pyasn1<0.5.0,>=0.4.6 in /usr/local/lib/python3.7/dist-packages  
Requirement already satisfied: oauthlib>=3.0.0 in /usr/local/lib/python3.7/dist-packages  
Requirement already satisfied: backcall in /usr/local/lib/python3.7/dist-packages  
Requirement already satisfied: pickleshare in /usr/local/lib/python3.7/dist-packages  
Collecting jedi>=0.10  
  Downloading jedi-0.18.1-py2.py3-none-any.whl (1.6 MB)  
    |████████████████████████████████████████| 1.6 MB 13.9 MB/s  
Requirement already satisfied: decorator in /usr/local/lib/python3.7/dist-packages  
Requirement already satisfied: prompt-toolkit<2.1.0,>=2.0.0 in /usr/local/lib/python3.7/dist-packages  
Requirement already satisfied: pygments in /usr/local/lib/python3.7/dist-packages  
Requirement already satisfied: pexpect in /usr/local/lib/python3.7/dist-packages  
Requirement already satisfied: traitlets>=4.2 in /usr/local/lib/python3.7/dist-packages  
Requirement already satisfied: parso<0.9.0,>=0.8.0 in /usr/local/lib/python3.7/dist-packages  
Requirement already satisfied: wcwidth in /usr/local/lib/python3.7/dist-packages  
Requirement already satisfied: ptyprocess>=0.5 in /usr/local/lib/python3.7/dist-packages  
Installing collected packages: jedi, thop  
Successfully installed jedi-0.18.1 thop-0.1.1.post2209072238
```

. dataset/data.yaml 수정

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



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

```
names:
- pistol
nc: 1
train: Pistols-1/train/images
val: Pistols-1/valid/images
```



YOLO v5 커스텀 학습 튜토리얼

```
Uninstalling pycocotools-2.0.1:
Successfully uninstalled pycocotools-2.0.1
Successfully installed PyYAML-5.3.1 numpy-1.17.3 pycocotools-2.0
WARNING: The following packages were previously imported in this runtime:
[numpy]
You must restart the runtime in order to use newly installed versions.
```

RESTART RUNTIME

```
[4] %cat /content/dataset/data.yaml
```


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

```
nc: 1
names: ['pistol']
```



.dir 를 root 로 바꾸고(%cd /), images 들의 경로 변경

```
%cd /  
from glob import glob  
img_list = glob('/content/dataset/export/images/*.jpg')  
print(len(img_list))
```



```
%cd /  
from glob import glob  
img_list = glob('/content/dataset/export/images/*.jpg')  
print(len(img_list))
```

```
/  
2971
```

. Image 나누기

```
from sklearn.model_selection import train_test_split  
train_img_list, val_img_list = train_test_split(img_list, test_size=0.2, random_state=2000)  
print(len(train_img_list), len(val_img_list))
```

```
✓ [13] from sklearn.model_selection import train_test_split  
0s      train_img_list, val_img_list = train_test_split(img_list, test_size=0.2, random_state=2000)  
      print(len(train_img_list), len(val_img_list))
```

2376 595

. Image 경로 txt 파일 만들기

```
with open('/content/dataset/train.txt', 'w') as f:  
    f.write('\n'.join(train_img_list) + '\n')
```

```
with open('/content/dataset/val.txt', 'w') as f:  
    f.write('\n'.join(val_img_list) + '\n')
```

```
✓ [16] with open('/content/dataset/train.txt', 'w') as f:  
0s      f.write('\n'.join(train_img_list) + '\n')
```

```
✓ [17] with open('/content/dataset/val.txt', 'w') as f:  
0s      f.write('\n'.join(val_img_list) + '\n')
```

.yaml 파일 읽기

```
import yaml
with open('/content/dataset/data.yaml', 'r') as f:
    data = yaml.full_load(f)
print(data)
```

```
✓ [20] import yaml
0s    with open('/content/dataset/data.yaml', 'r') as f:
        data = yaml.full_load(f)
        print(data)
```

```
{'names': ['pistol'], 'nc': 1, 'train': 'Pistols-1/train/images', 'val': 'Pistols-1/valid/images'}
```

.yaml 파일 이미지 경로 변경

```
data['train'] = '/content/dataset/train.txt'
data['val'] = '/content/dataset/val.txt'
with open('/content/dataset/data.yaml', 'w') as f:
    yaml.dump(data, f)
```

```
✓ [21] data['train'] = '/content/dataset/train.txt'
0s    data['val'] = '/content/dataset/val.txt'
        with open('/content/dataset/data.yaml', 'w') as f:
            yaml.dump(data, f)
```


. yaml 파일 변경 확인

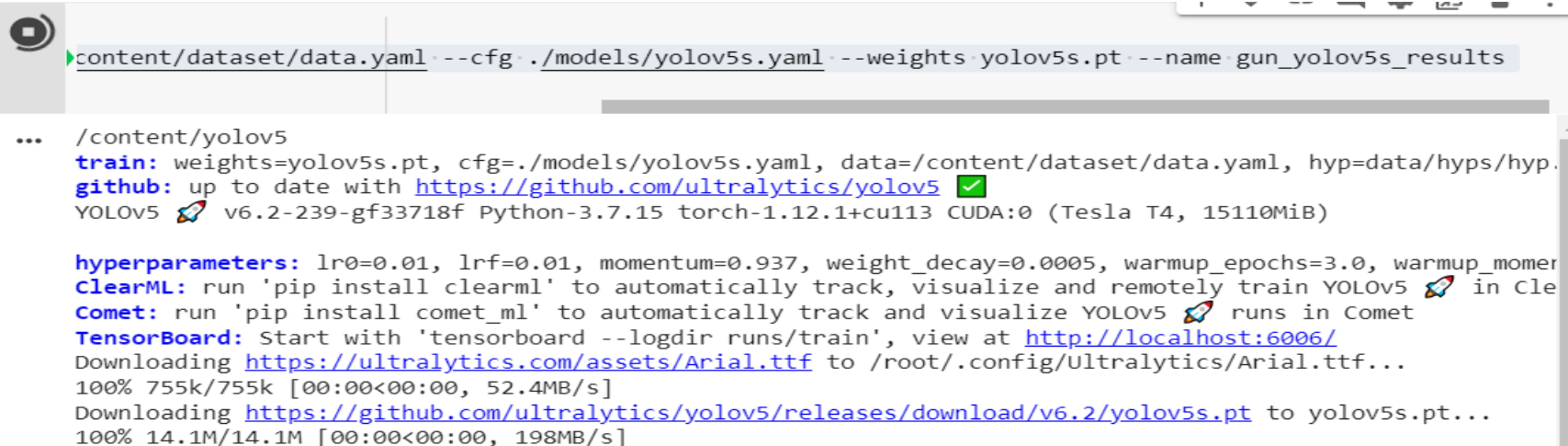
```
print(data)
```





```
[22] print(data)
```

```
{'names': ['pistol'], 'nc': 1, 'train': '/content/dataset/train.txt', 'val': '/content/dataset/val.txt'}
```

. Custom dataset 학습(training)

```
%cd /content/yolov5/  
!python train.py --img 416 --batch 16 --epochs 50 --  
data /content/dataset/data.yaml --cfg ./models/yolov5s.yaml --  
weights yolov5s.pt --name gun_yolov5s_results
```



```
content/dataset/data.yaml --cfg ./models/yolov5s.yaml --weights yolov5s.pt --name gun_yolov5s_results  
... /content/yolov5  
train: weights=yolov5s.pt, cfg=./models/yolov5s.yaml, data=/content/dataset/data.yaml, hyp=data/hyps/hyp.  
github: up to date with https://github.com/ultralytics/yolov5   
YOLOv5  v6.2-239-gf33718f Python-3.7.15 torch-1.12.1+cu113 CUDA:0 (Tesla T4, 15110MiB)  
  
hyperparameters: lr0=0.01, lrf=0.01, momentum=0.937, weight_decay=0.0005, warmup_epochs=3.0, warmup_mom  
ClearML: run 'pip install clearml' to automatically track, visualize and remotely train YOLOv5  in Cle  
Comet: run 'pip install comet_ml' to automatically track and visualize YOLOv5  runs in Comet  
TensorBoard: Start with 'tensorboard --logdir runs/train', view at http://localhost:6006/  
Downloading https://ultralytics.com/assets/Arial.ttf to /root/.config/Ultralytics/Arial.ttf...  
100% 755k/755k [00:00<00:00, 52.4MB/s]  
Downloading https://github.com/ultralytics/yolov5/releases/download/v6.2/yolov5s.pt to yolov5s.pt...  
100% 14.1M/14.1M [00:00<00:00, 198MB/s]
```

(중간 생략: 총 30 분 소요)



```
all          595          667          0.931          0.865          0.919 1
Epoch  GPU_mem  box_loss  obj_loss  cls_loss  Instances  Size
47/49   2.07G    0.02237   0.01121         0           23      416: 100% 149/149 [00:38<00:00,
Class    Images Instances      P      R    mAP50    mAP50-95: 100% 19/19 [00:
all       595          667          0.914          0.879          0.925          0.696

Epoch  GPU_mem  box_loss  obj_loss  cls_loss  Instances  Size
48/49   2.07G    0.02288   0.01099         0           15      416: 100% 149/149 [00:38<00:00,
Class    Images Instances      P      R    mAP50    mAP50-95: 100% 19/19 [00:
all       595          667          0.925          0.874          0.924          0.696

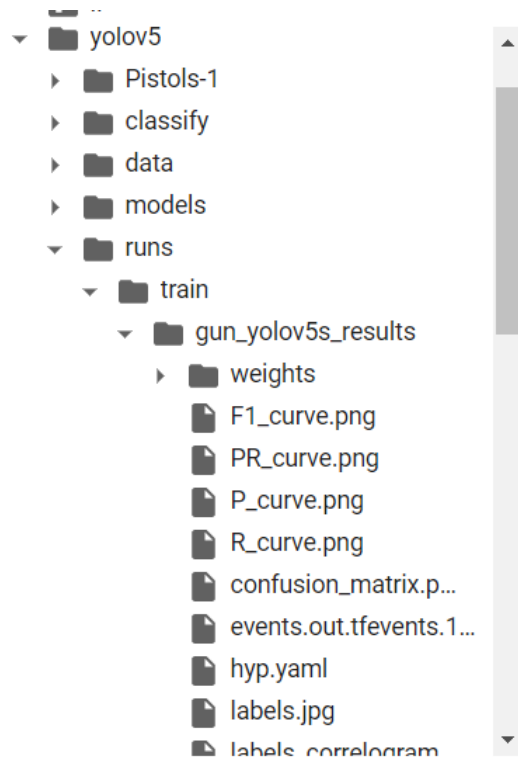
Epoch  GPU_mem  box_loss  obj_loss  cls_loss  Instances  Size
49/49   2.07G    0.02201   0.01089         0           23      416: 100% 149/149 [00:38<00:00,
Class    Images Instances      P      R    mAP50    mAP50-95: 100% 19/19 [00:
all       595          667          0.941          0.862          0.923          0.695

50 epochs completed in 0.606 hours.
Optimizer stripped from runs/train/gun_yolov5s_results/weights/last.pt, 14.3MB
Optimizer stripped from runs/train/gun_yolov5s_results/weights/best.pt, 14.3MB

Validating runs/train/gun_yolov5s_results/weights/best.pt...
Fusing layers...
YOLOv5s summary: 157 layers, 7012822 parameters, 0 gradients, 15.8 GFLOPs
Class    Images Instances      P      R    mAP50    mAP50-95: 100% 19/19 [00:
all       595          667          0.927          0.861          0.921          0.697

Results saved to runs/train/gun_yolov5s_results
```

. 결과 보기 (yolov5/runs/train/gun_yolov5s_results)



Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
0/49	1.71G	0.08675	0.02247	0	21	416: 1
	Class	Images	Instances	P	R	mAP50
	all	595	667	0.587	0.471	0.508
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
1/49	2.07G	0.05522	0.02007	0	22	416: 1
	Class	Images	Instances	P	R	mAP50
	all	595	667	0.505	0.655	0.525
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size
2/49	2.07G	0.04889	0.01865	0	22	416: 1
	Class	Images	Instances	P	R	mAP50
	all	595	667	0.828	0.694	0.804
Epoch	GPU_mem	box_loss	obj_loss	cls_loss	Instances	Size

New Section

Untitled2.ipynb ☆

File Edit View Insert Runtime Tools Help All changes saved

+ Code + Text

New Section

es

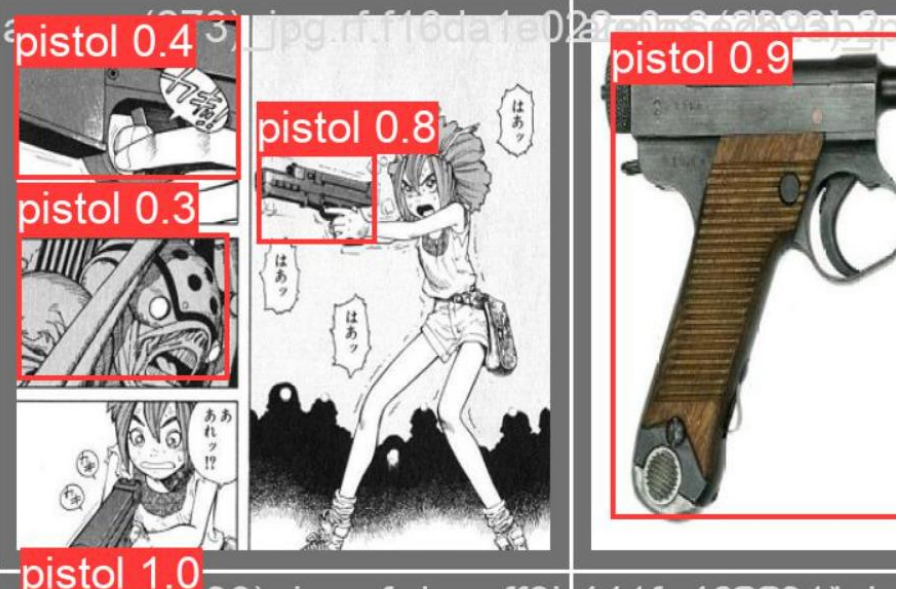
opt.yaml
results.csv
results.png
train_batch0.jpg
train_batch1.jpg
train_batch2.jpg
val_batch0_labels.j...
val_batch0_pred.jpg
val_batch1_labels.j...
val_batch1_pred.jpg
val_batch2_labels.j...
val_batch2_pred.jpg

segment
utils
CONTRIBUTING.md
LICENSE
README.md

55.40 GB available

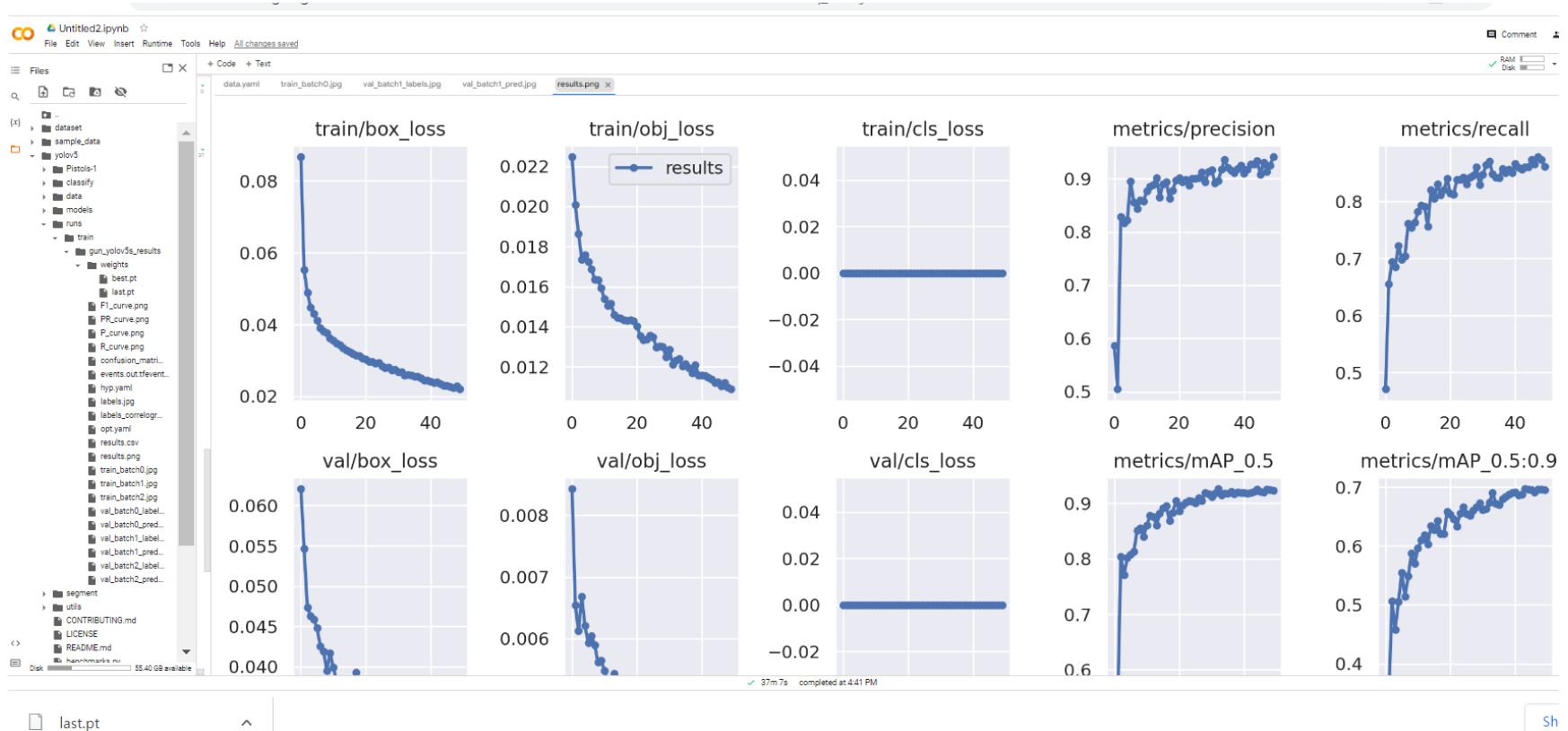
data.yaml train_batch0.jpg val_batch1_labels.jpg val_batch1_pred.jpg

pistol 0.4
pistol 0.3
pistol 0.8
pistol 1.0
pistol 0.9



. 최종 가중치

. results (results.png)



. 학습 결과

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



- ☐ Show data download links
- ☒ Ignore outliers in chart scaling

Tooltip sorting
method: **default**

Smoothing

0.6

Horizontal Axis

STEP

RELATIVE

WALL

Runs

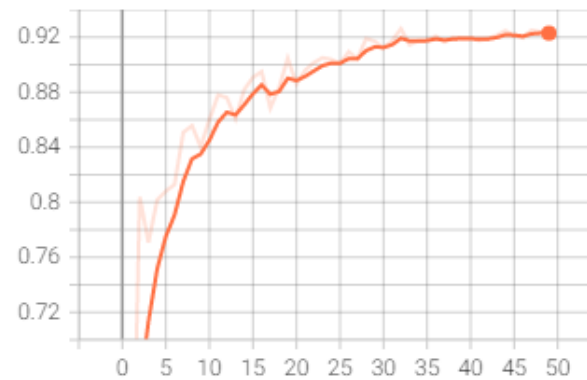
Write a regex to filter runs

☒ ☐ train/gun_yolov5s_results

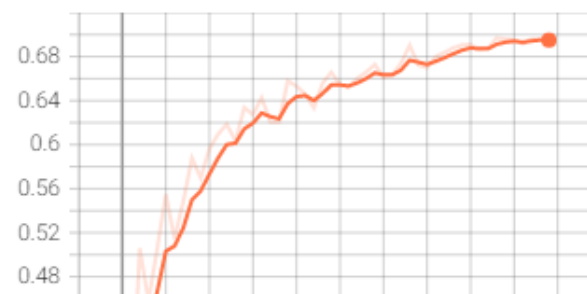
TOGGLE ALL RUNS

metrics

metrics/mAP_0.5
tag: metrics/mAP_0.5



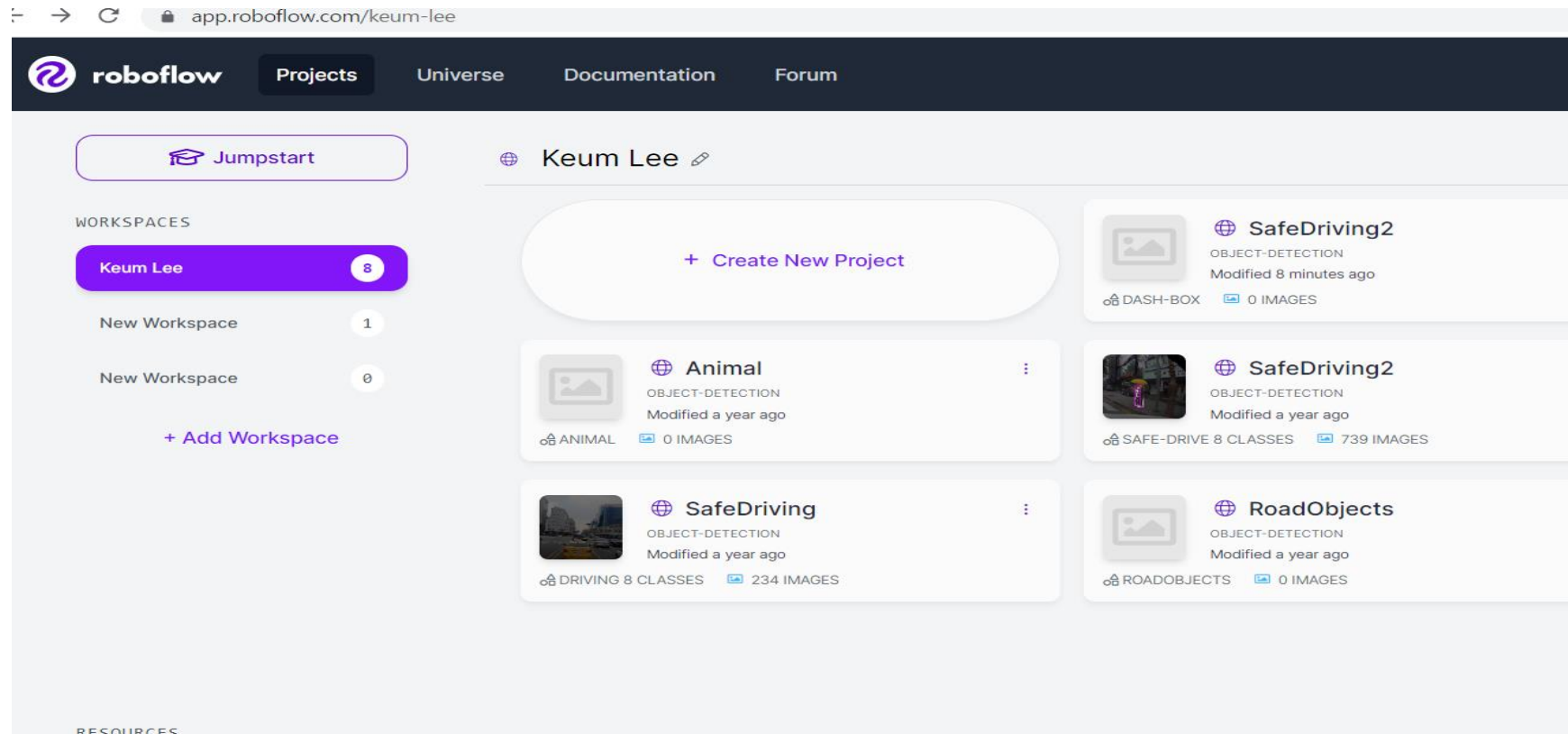
metrics/mAP_0.5:0.95
tag: metrics/mAP_0.5:0.95



✓ 5s completed at 5:25 PM

. Custom dataset 준비(roboflow (<http://www.roboflow.com> 에서 계좌를 만듬)활용)

. '+Create New Project'를 클릭



Create Project



Keum Lee / New Public Project

Project Name

SafeDriving2

License

CC BY 4.0



Project Type

Object Detection (Bounding Box)



What will your model predict? [?](#)

Dash-box

Cancel

Create Public Project

Upload

[?](#) Want to modify or change classes on your uploaded images?

Batch Name Uploaded on 11/14/22 at 12:56 am

All Images **0** Annotated **0** Not Annotated **0**



Drag and drop
images and annotations

Select Files

Select Folder



Images
jpg, png, bmp

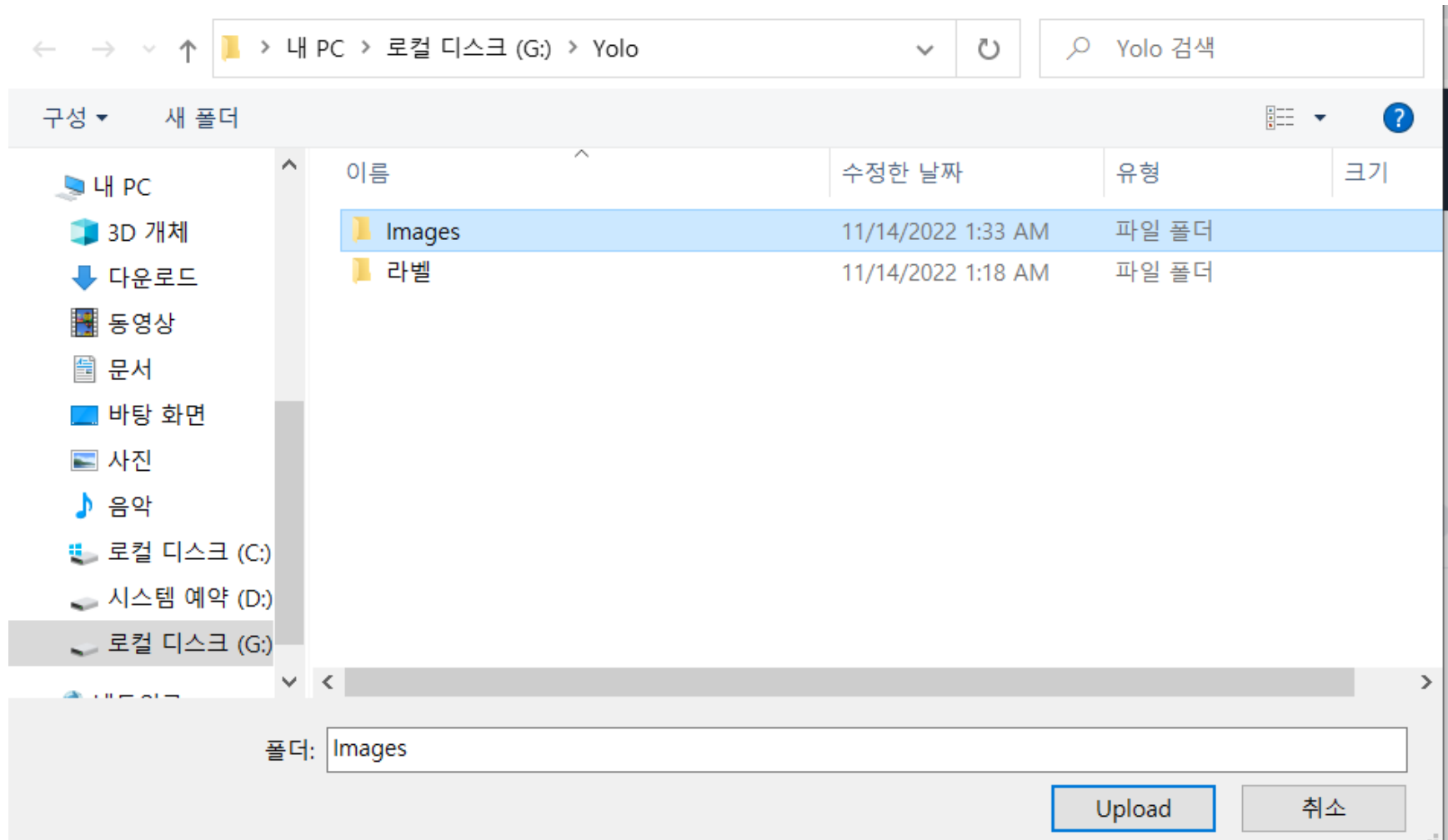


Annotations
in 26 formats >



Video
mov, mp4, avi

- Annotation 참고: <https://www.youtube.com/watch?v=kr3rvqWLEFE>,
<https://www.youtube.com/watch?v=rV7sYzYvTbA>
- Upload and drop images and annotations (select folder 를 통해서)



(images 폴더에서는 '**.png', '**.txt', 'name.txt'가 다 들어 있음.)

SafeDriving2 Dataset > Upload

app.roboflow.com/keum-lee/safedriving2-nvsrr/upload

roboflow Projects Universe Documentation Forum Keum Lee

Upload

Want to modify or change classes on your uploaded images?

Batch Name Uploaded on 11/14/22 at 12:56 am

All Images 625 Annotated 353 Not Annotated 272

KEUM LEE
SafeDriving2
Object Detection

- Overview
- Upload
- Assign
- Annotate
- Dataset
- Generate

beta 0

Save and Continue

cByc1113_040.png cByc1113_039.png cByc1113_038.png cByc1113_037.png cByc1113_035.png cByc1113_034.png cByc1113_033.png cByc1113_032.png cByc1113_031.png cByc1113_030.png

cByc1113_029.png cByc1113_028.png cByc1113_027.png cByc1113_026.png cByc1113_025.png cByc1113_024.png cByc1113_023.png cByc1113_022.png cByc1113_021.png cByc1113_020.png

cByc1113_019.png cByc1113_018.png cByc1113_017.png cByc1113_016.png cByc1113_015.png cByc1113_014.png cByc1113_013.png cByc1113_011.png cByc1113_010.png

cByc1113_009.png cByc1113_008.png cByc1113_007.png cByc1113_006.png cByc1113_005.png cByc1113_004.png cByc1113_003.png cByc1113_002.png cByc1113_001.png

. 우측 상단에서 'Save and Continue' . Train(70%), Valid(20%) 및 Test(10%)로 구분이 ok 이면 'Continue'

How should we split these images?



Choose one [? What's Train, Valid, Test?](#)

Split Images Between Train/Valid/Test

Train
70%

Valid
20%

Test
10%



Not sure what this is? [Learn more on our blog.](#)

Cancel

Continue

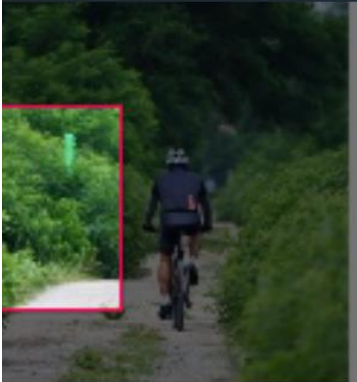
cByc1113_018.png

cByc1113_017.png

cByc1113_016.png

cByc1113_015.png

cByc1113_014.png



KEUM LEE

SafeDriving2

Object Detection

Overview

Upload

Assign

Annotate

Dataset

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Versions

beta

214

VERSIONS

To train a model, you must first generate a new version of your dataset.

Choose your dataset settings to get started.

Testing Set: 24 images

3

Preprocessing

What can preprocessing do?

Decrease training time and increase performance by applying image transformations to all images in this dataset.

Auto-Orient

Edit

x

Resize

Stretch to 640x640

Edit

x



Add Preprocessing Step

Continue

4

Augmentation

5

Generate

. Generate 클릭

VERSIONS

To train a model, you must first generate a new version of your dataset.

Choose your dataset settings to get started.

✓	Source Images	Images: 214 Classes: 4 Unannotated: 0
✓	Train/Test Split	Training Set: 152 images Validation Set: 38 images Testing Set: 24 images
✓	Preprocessing	Auto-Orient: Applied Resize: Stretch to 640×640
✓	Augmentation	Turned Off
5	Generate	<p>Review your selections then click "Generate" to create a moment-in-time snapshot of your dataset with the applied preprocessing steps.</p> <p>Maximum Version Size: 214 See how this is calculated >></p> <p>Generate</p>

. 아래에서 'Export'

SafeDriving2 Image Dataset

 Generate New Version

VERSIONS

2022-11-14 4:31am
v1 Nov 14, 2022

2022-11-14 4:31am

Version 1 Generated Nov 14, 2022

Export

Edit ⋮

TRAINING OPTIONS

Use Roboflow Train

Let us train your model and get results within 24 hours along with a hosted API endpoint for making predictions. [Learn More >>](#)

Start Training

Available Credits: 0

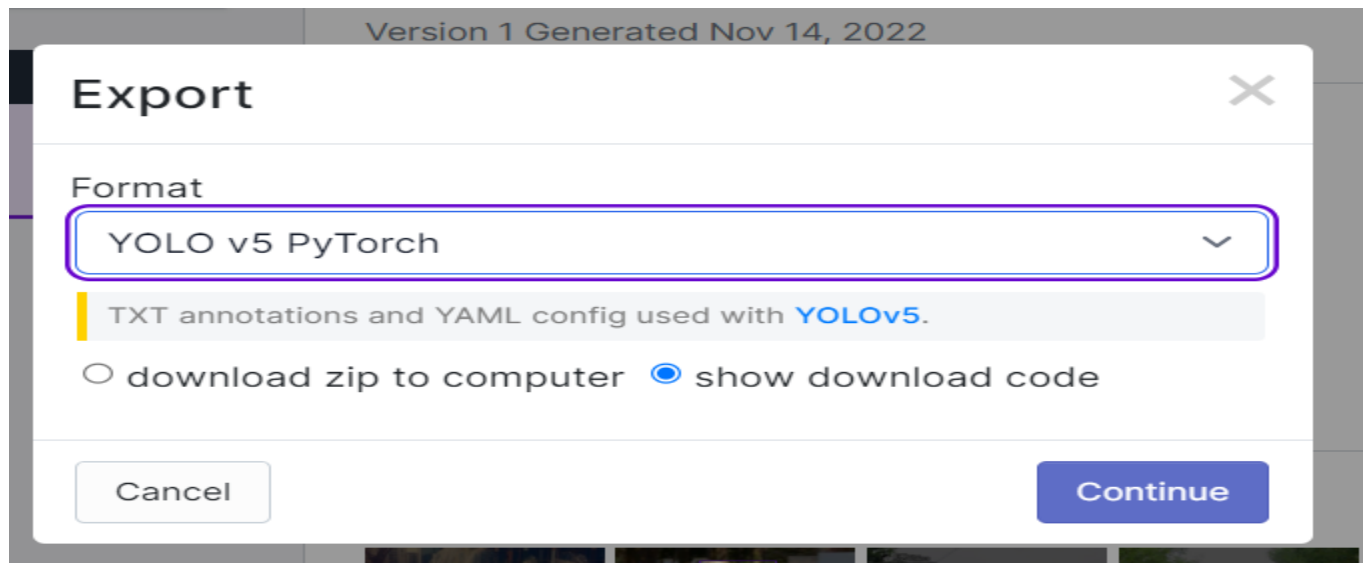
IMAGES



214 images

[View All Images >>](#)

. Format 'YOLO v5 PyTorch' 를 선택하고 'show download code'를 선택 후 'continue' 클릭



```
!pip install roboflow
```

```
from roboflow import Roboflow
rf = Roboflow(api_key="1I28shYwWWZasx0TI9sX")
project = rf.workspace("keum-lee").project("safedriving2-nvsrr")
dataset = project.version(1).download("yolov5")
```

ew

Your Download Code

✕

📖 Jupyter

➤ Terminal

🔗 Raw URL

Paste this snippet into [a notebook from our model library >>](#) to download and unzip [your dataset >>](#):

```
!pip install roboflow

from roboflow import Roboflow
rf = Roboflow(api_key="XXXXXXXXXXXXXXXXXXXX")
project = rf.workspace("keum-lee").project("safedriving2-nvsrr")
dataset = project.version(1).download("yolov5")
```

⚠ Warning: Do not share this snippet beyond your team, it contains a private key that is tied to your Roboflow account. Acceptable use policy applies.

Done

214 images

. 이 후는 앞서 권총(pistol) 학습의 순서를 따라 시행

