커스텀 데이터셋(Custom dataset) Yolov5 학습(Training) 및 탐색(Detection)

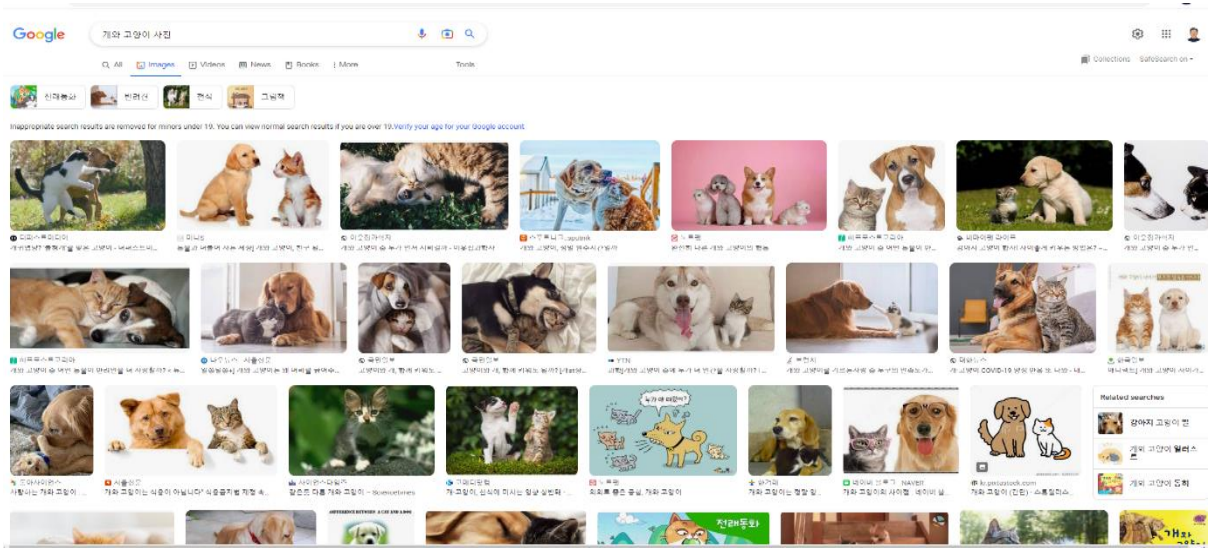
<커스텀 이미지 확보 및 Labelling>

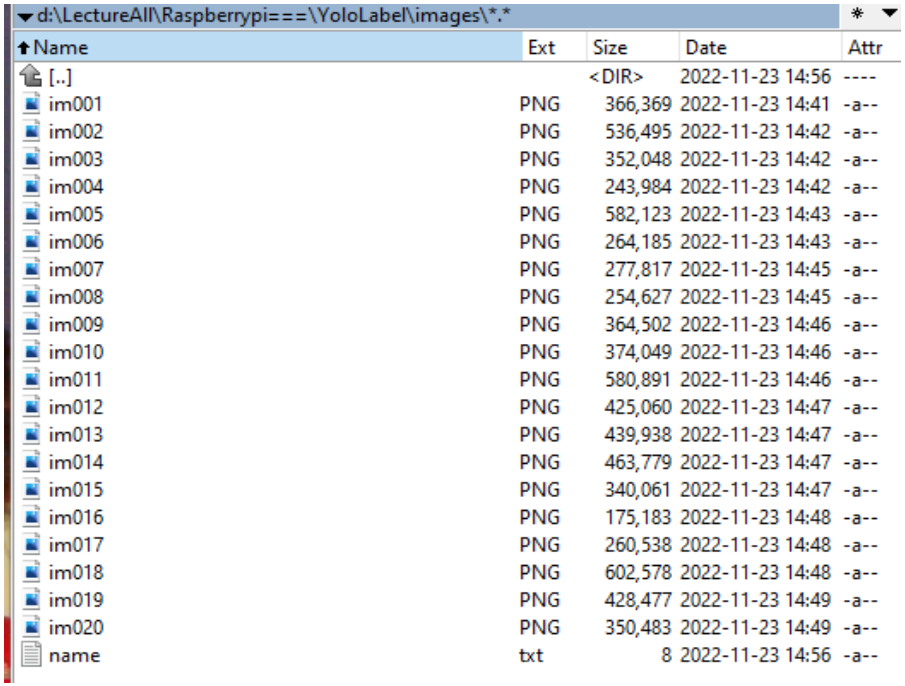
1) 객체(Object) 선정(예: dog, cat을 선정하고 객체 이름 파일(예: name.txt) 만들기(1줄 당 1개 객체 이름을 영어로 작성)

2) Dataset 준비: Web crawling(불법 위험 있음. 파이썬 프로그램 활용) 또는 직접 사진 준비. 이미지 저장폴더 **경로**는 **전부 영어로** 되어 있어야 함. 이미지 파일 (확장자는 png, jpg 등)과 name.txt는 **같은 폴더**에 위치

. name.txt 예

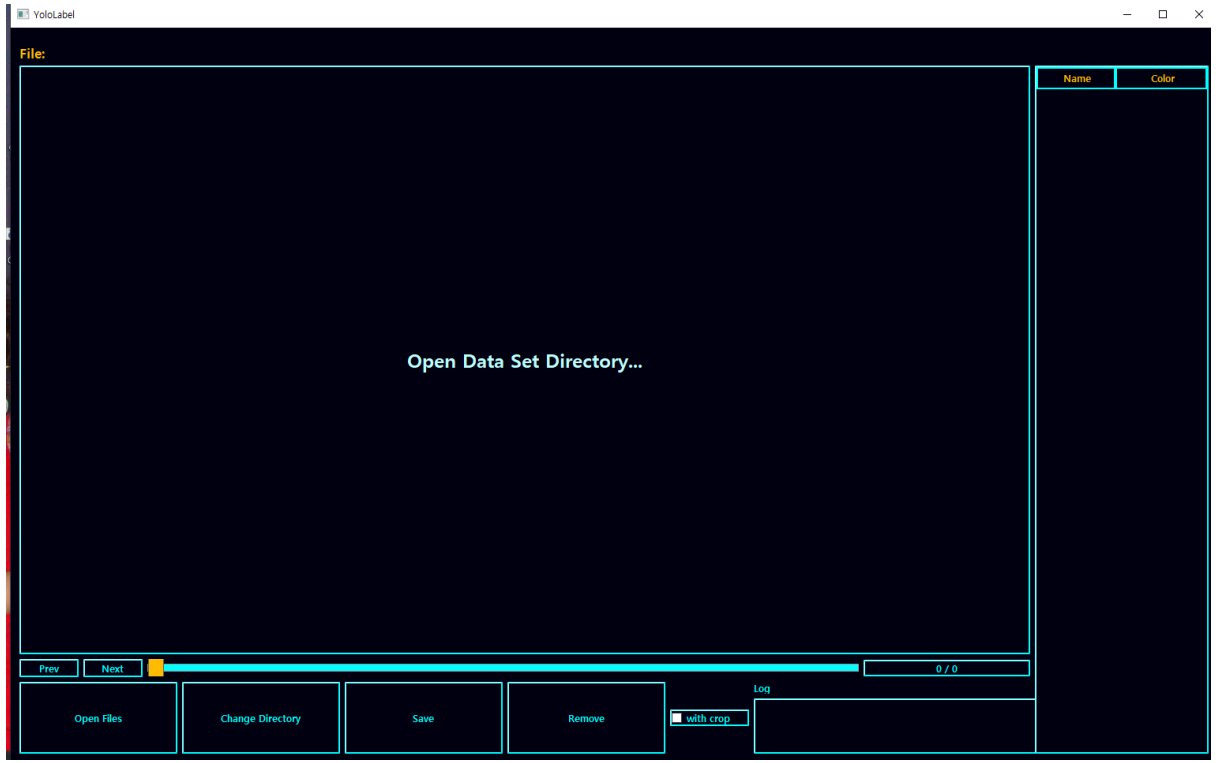
```
cat
dog
```

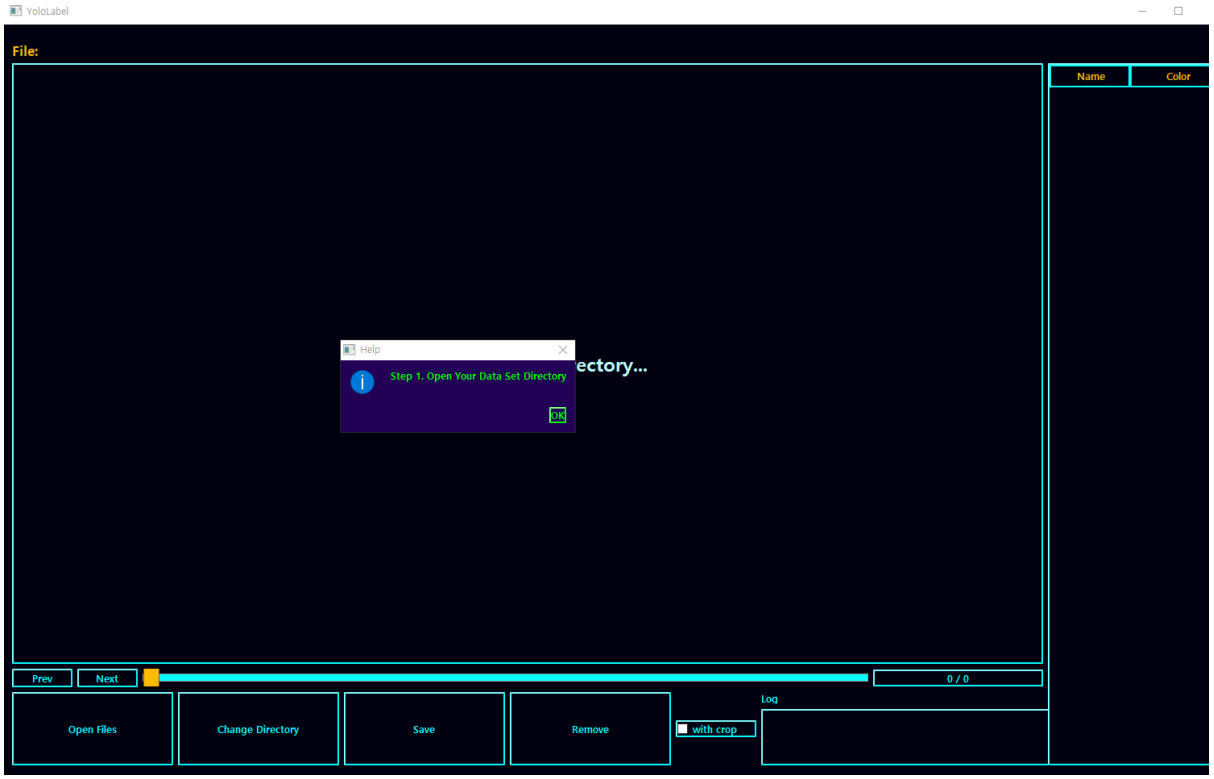




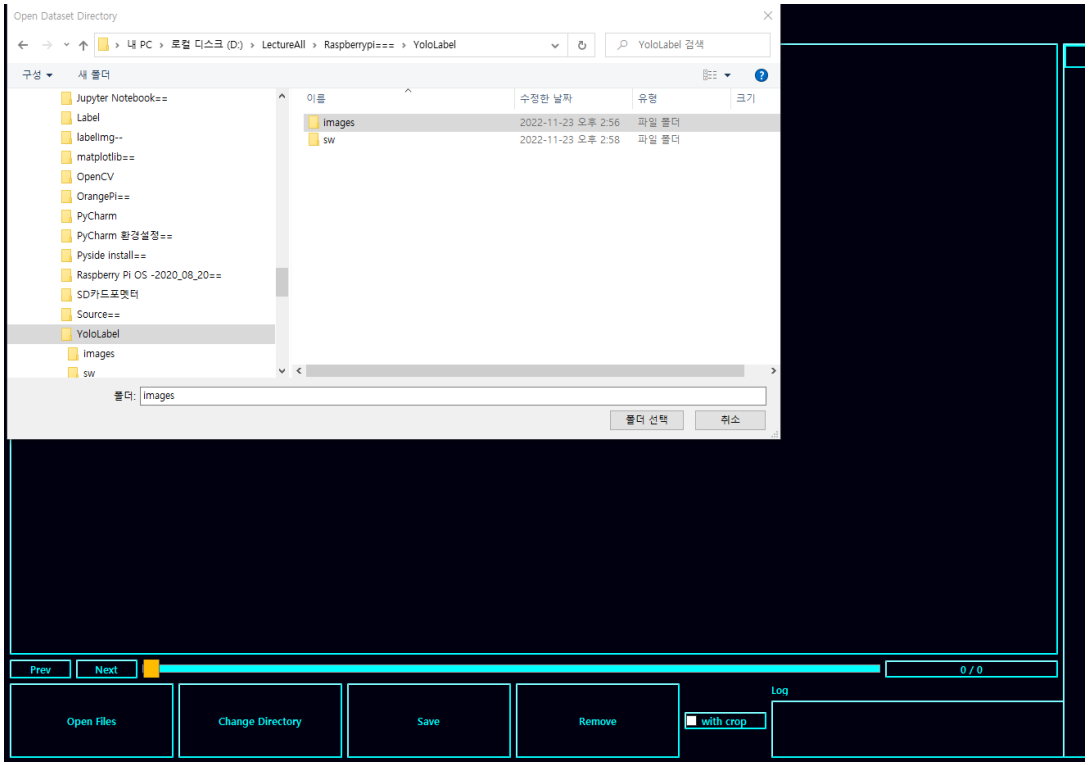
3) Labelling (예: YoloLabel은 적당한 폴더에 복사한 후에 YoloLabel.exe 실행)

. 하단에서 'Open Files' 클릭한 후 'Step 1. Open Your Data Set Directory'에서 'OK'를 클릭


YoloLabel
File:
Name
Color
Open Data Set Directory...
Prev
Next
0 / 0
Log
Open Files
Change Directory
Save
Remove
with crop

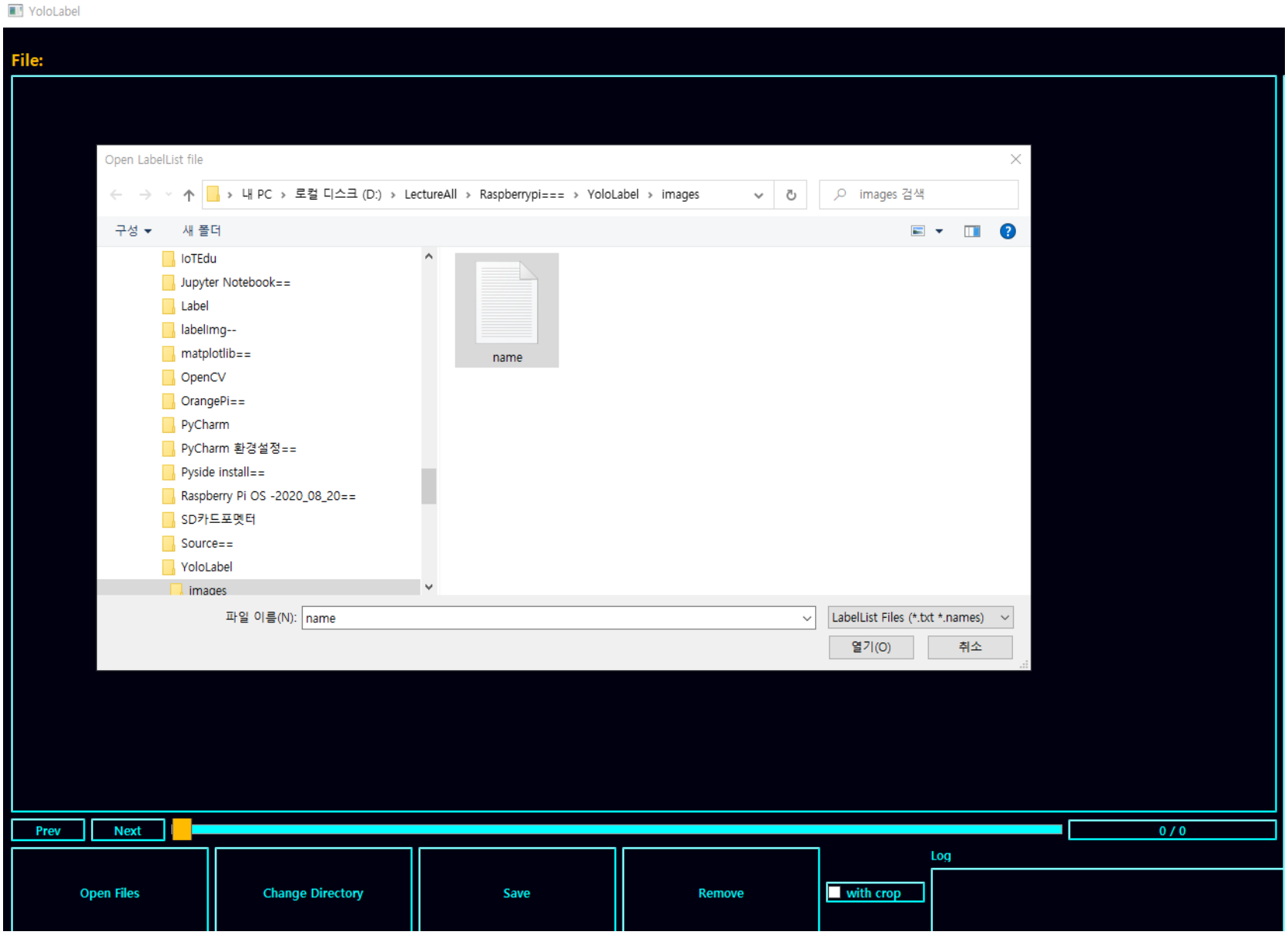


이미지가 저장된 '폴더 선택'



. ‘Step 2. Open Your Label List File’에서 OK를 누르고 name.txt가 있는 폴더

YoloLabel
File:
Help
Step 2. Open Your Label List File(*.txt or *.names)
OK
ory...
Prev
Next
0 / 0
Log
Open Files
Change Directory
Save
Remove
with crop


YoloLabel
File:
Open LabelList file
내 PC › 로컬 디스크 (D:) › LectureAll › Raspberrypi=== › YoloLabel › images
images 검색
구성
새 폴더
IoTEdu
Jupyter Notebook==
Label
labelImg--
matplotlib==
OpenCV
OrangePi==
PyCharm
PyCharm 환경설정==
Pyside install==
Raspberry Pi OS -2020_08_20==
SD카드포맷터
Source==
YoloLabel
images
name
파일 이름(N): name
LabelList Files (*.txt *.names)
열기(O)
취소
Prev
Next
0 / 0
Log
Open Files
Change Directory
Save
Remove
with crop

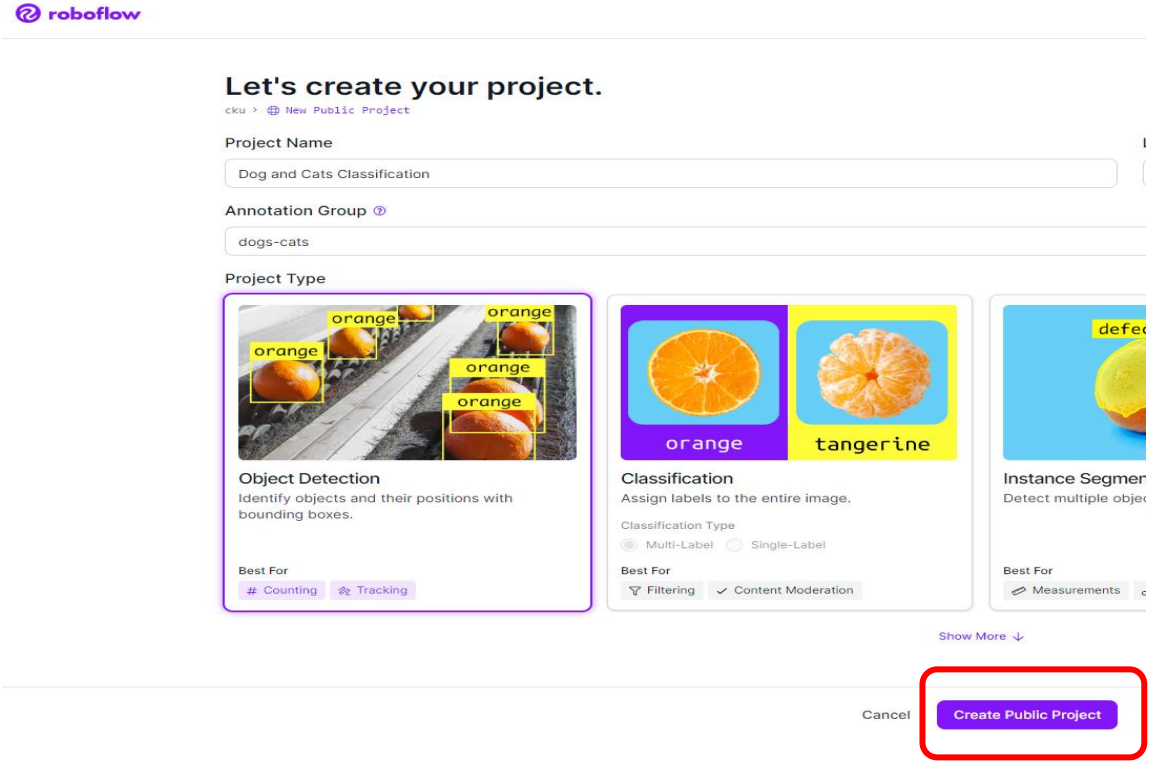
. 첫번째 사진부터 라벨링 작업 시작. 우측에서 해당되는 객체를 선택하고 라벨링(사각형)하고 마우스 좌측버튼 클릭. 라벨링 취소는 라벨선택한 후 마우스 우측 버튼 클릭. 라벨링후 하단에 'Save' 누르고, 하단에 'Next'를 클릭하여 다음 사진으로 진행해서 반복. 라벨링은 객체 전체가 포함되게 선택. 불필요한 사진 제거는 하단의 'Remove' 클릭

<Dataset 만들기(Roboflow 활용)>

1) Roboflow 사이트 로그인(https://roboflow.com/). 계정이 없으면 'Sign up'

. 상단 메뉴에서 ' Projects' 를 선택하고, 우측에서 '+ Create New Project'를 클릭

. Project Name 등 설정한 후 (영어로 이름), 'Create Public Project' 클릭

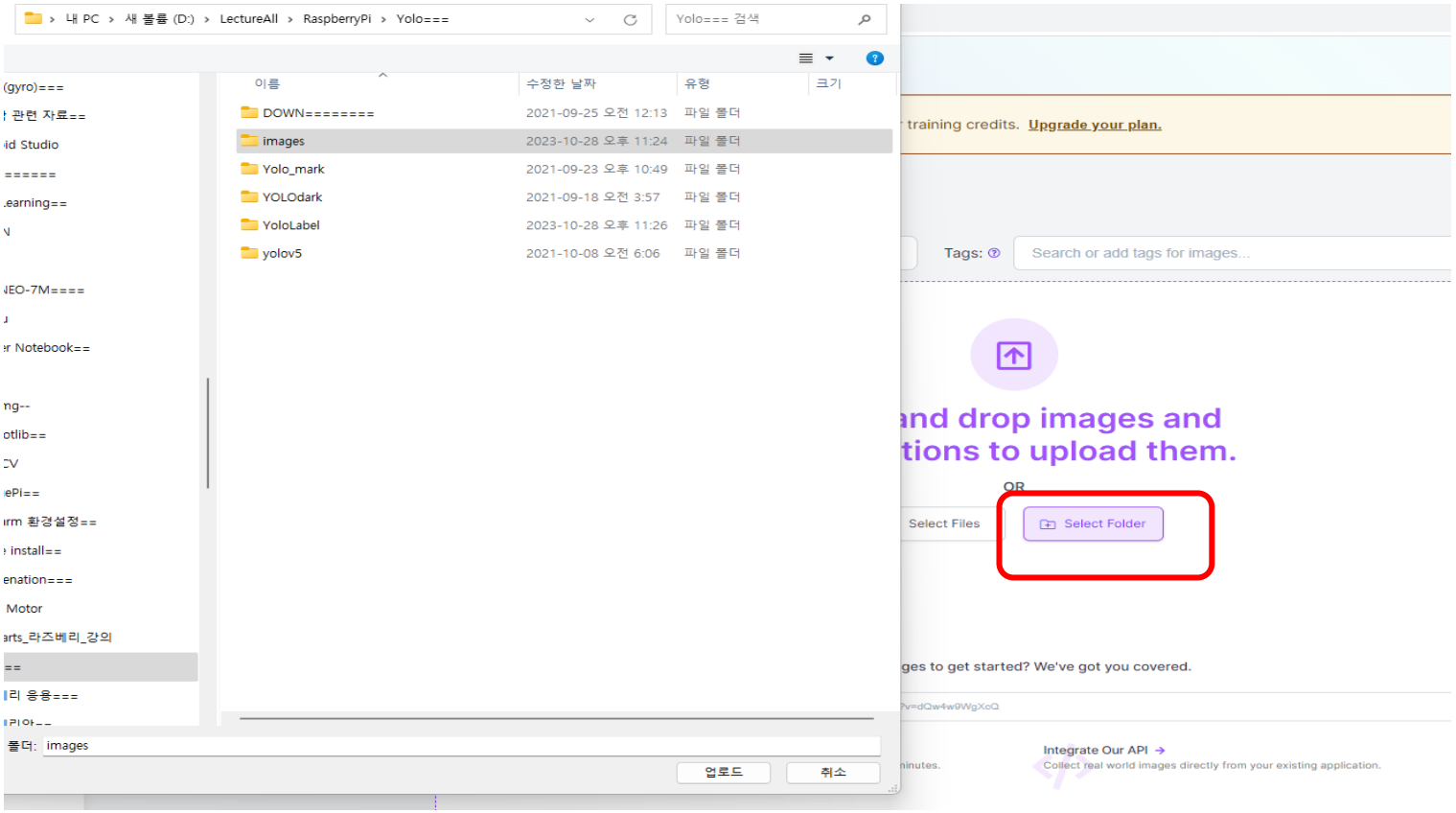


, Project Name: Dog and Cat classification (이름은 영어로 임의로 지정)

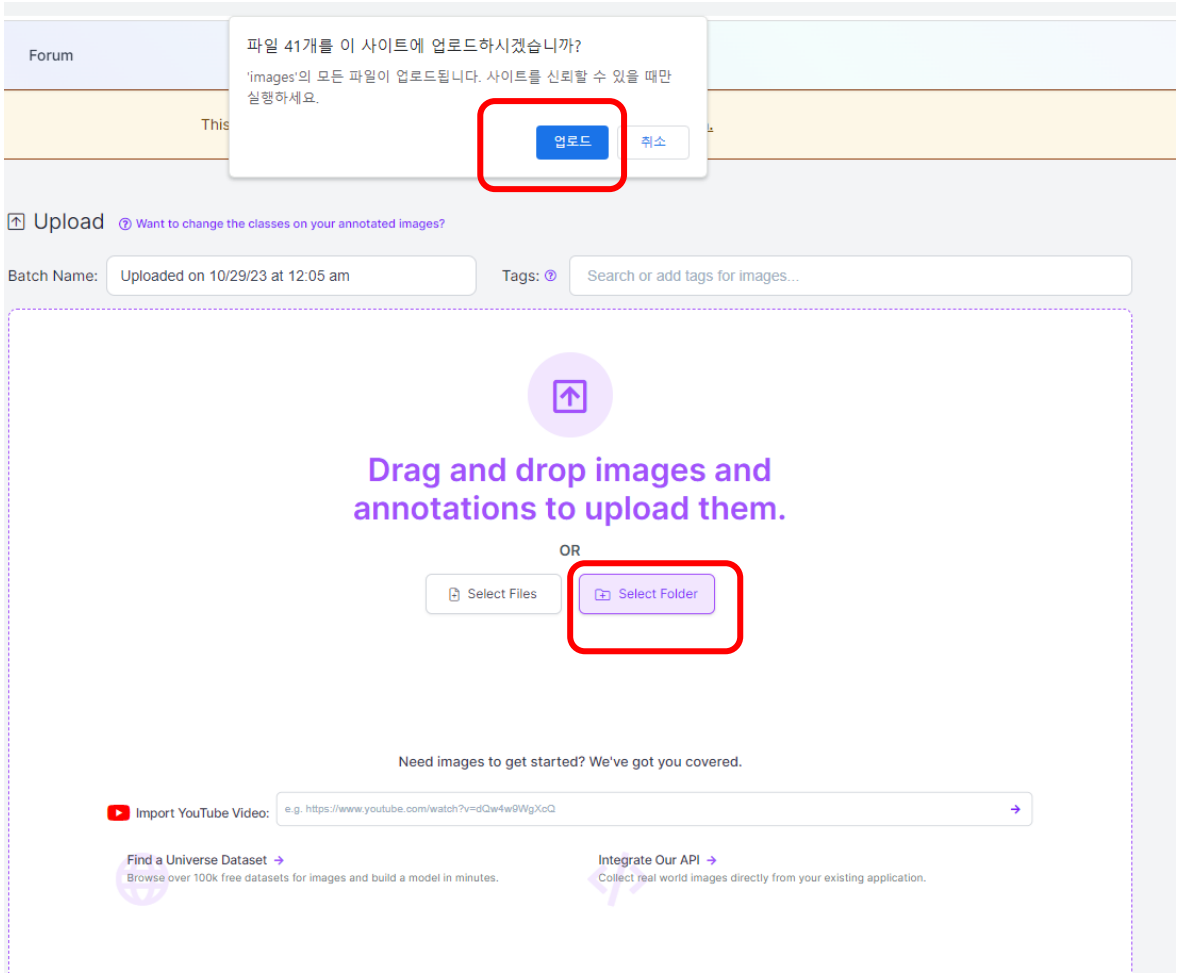
. Annotation Group: dogs-cats (영어로 임의로 지정)

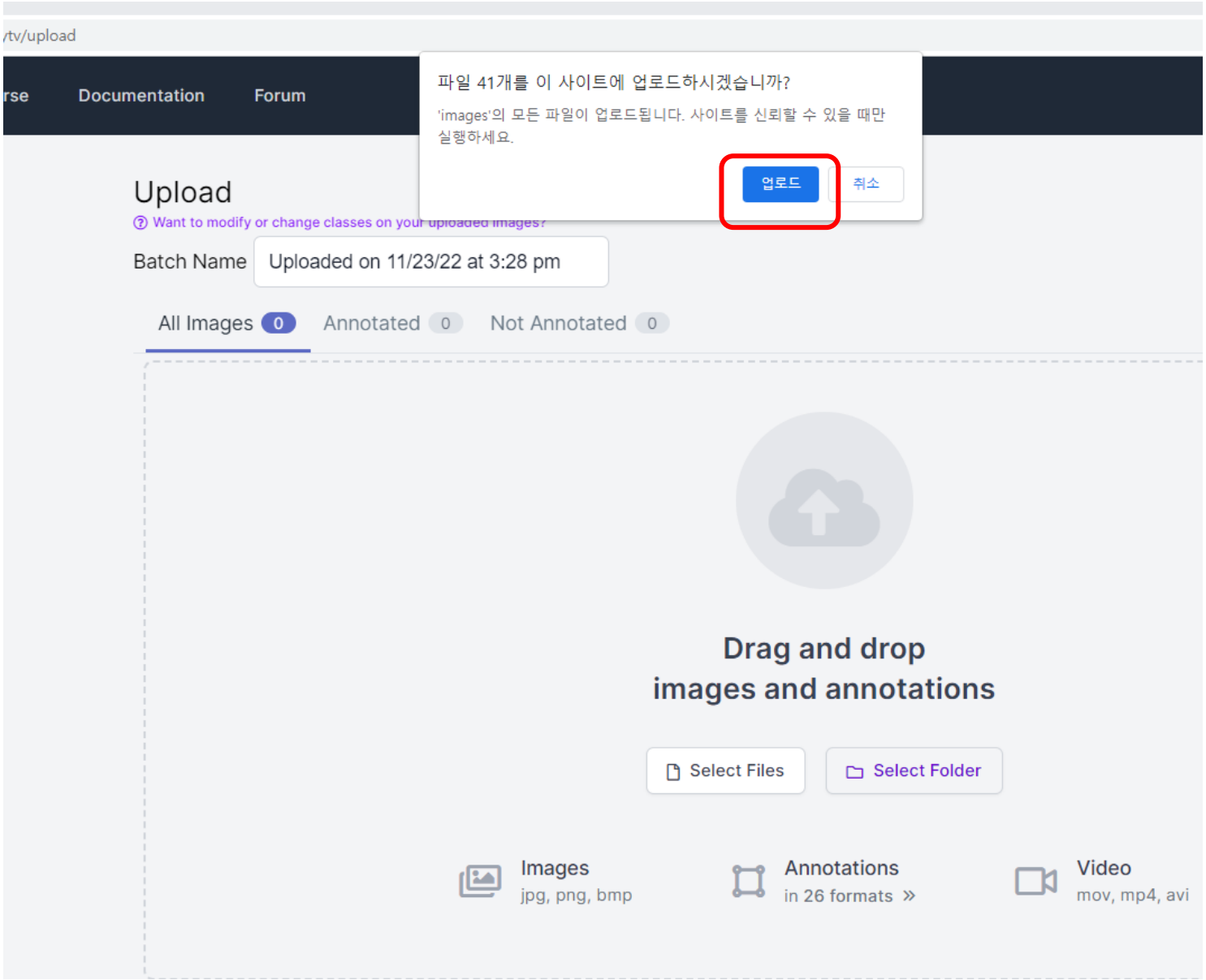
. 이상을 설정 후 우측 하단의 'Create Public Project'를 클릭

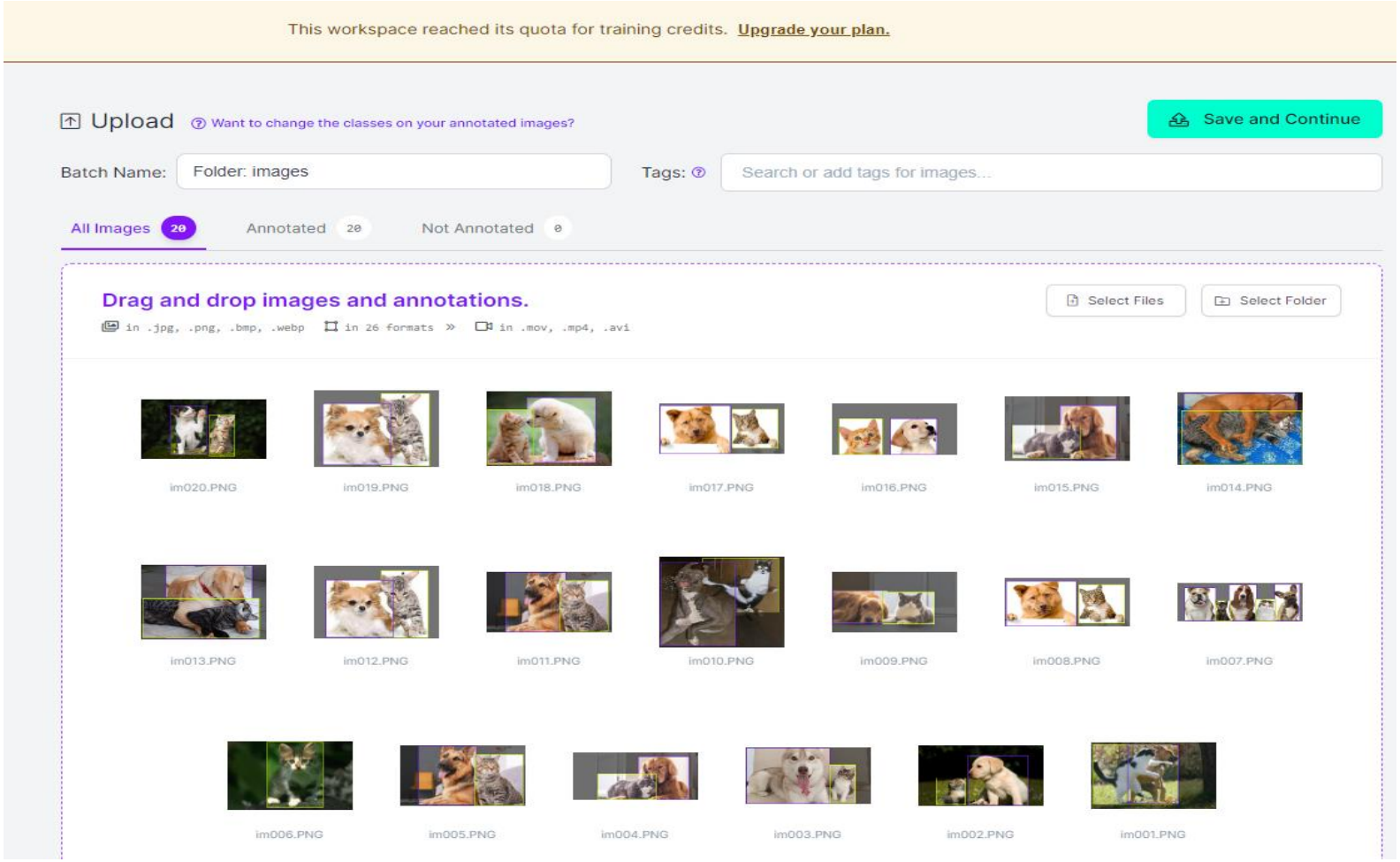
2) Upload화면 중앙에 있는 'Select Folder'를 클릭하여 image 폴더 지정한 후 '업로드'를 클릭하여 upload. 단 경로는 영어로 폴더명이 정해져야 함.



. 이때 다시 물어 보면 ‘업로드’를 클릭

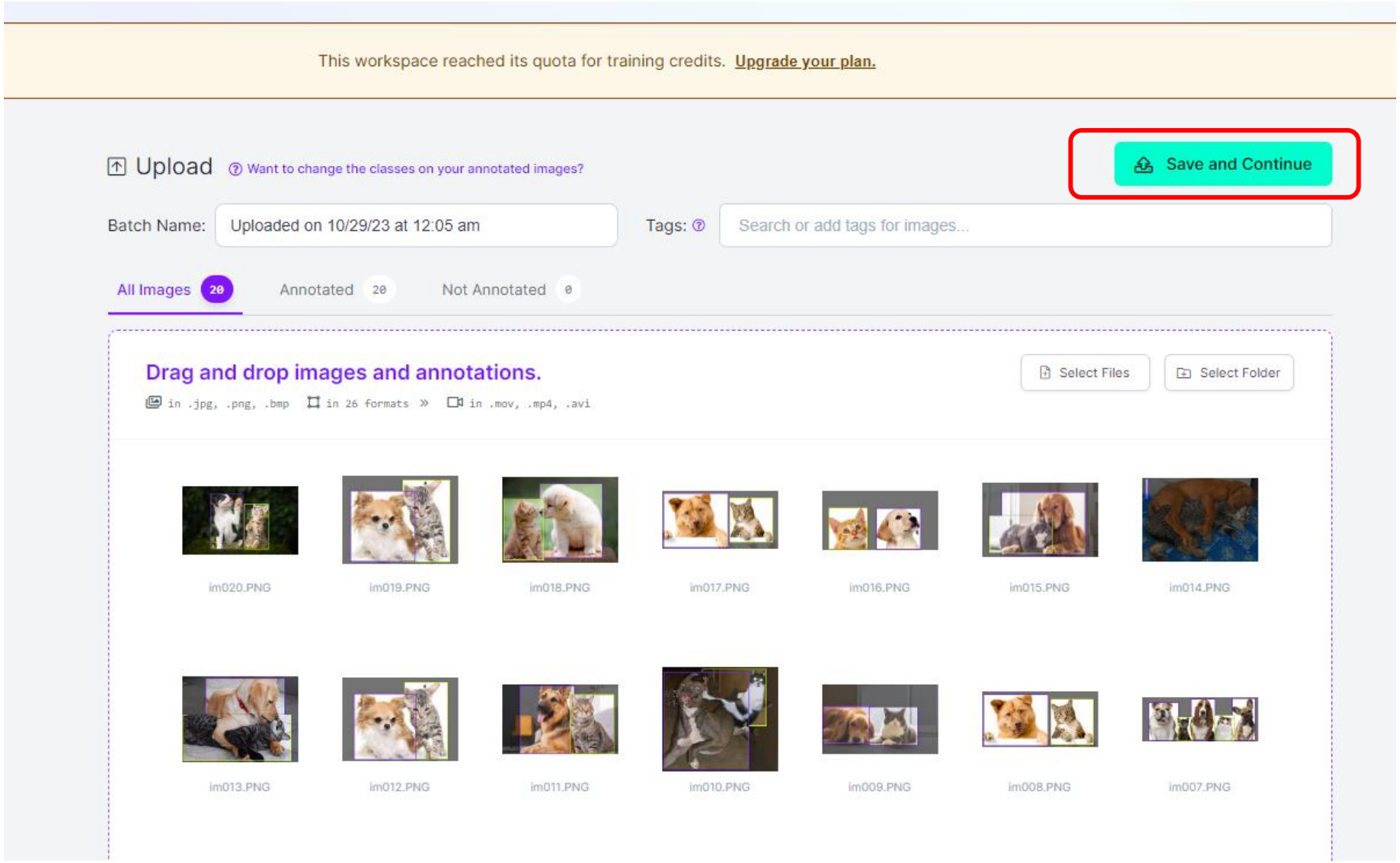



/tv/upload
rse
Documentation
Forum
파일 41개를 이 사이트에 업로드하시겠습니까?
'images'의 모든 파일이 업로드됩니다. 사이트를 신뢰할 수 있을 때만 실행하세요.
업로드
취소
Upload
Want to modify or change classes on your uploaded images?
Batch Name
Uploaded on 11/23/22 at 3:28 pm
All Images 0
Annotated 0
Not Annotated 0
Drag and drop
images and annotations
Select Files
Select Folder
Images
jpg, png, bmp
Annotations
in 26 formats »
Video
mov, mp4, avi

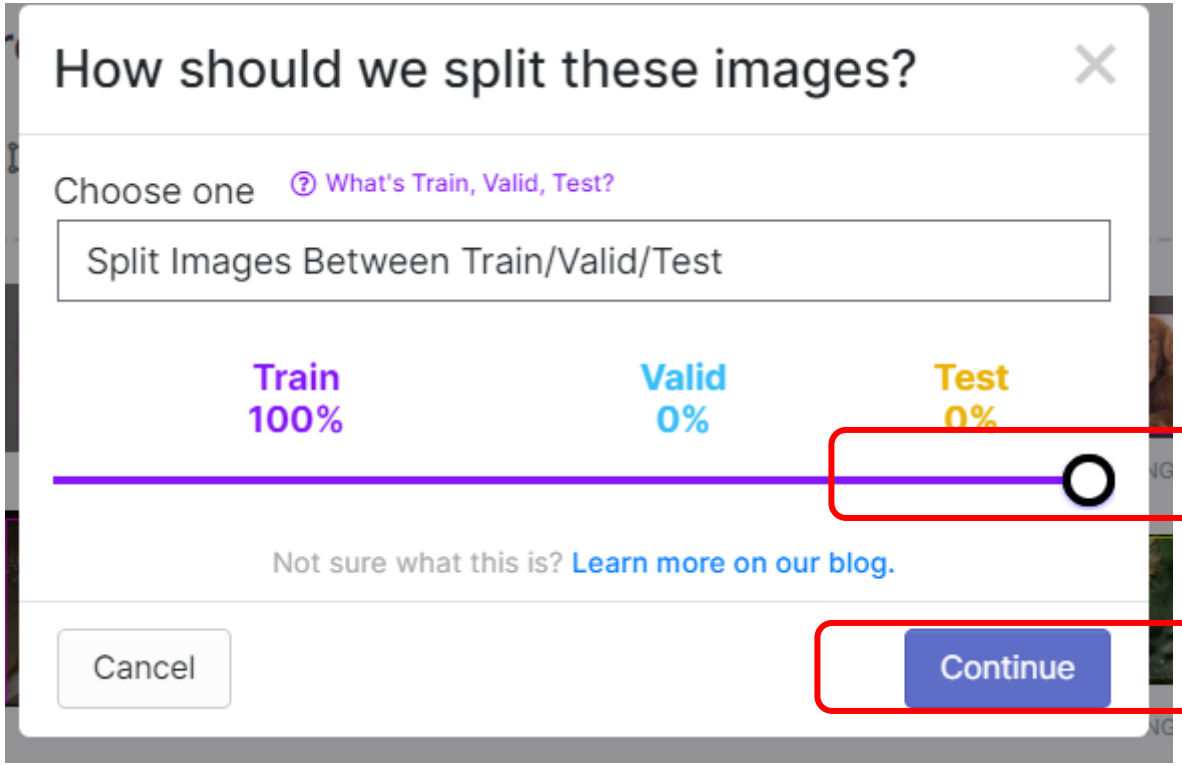


. 20개 image가 'Annotated'(라벨링)된 것을 보여줌. 혹시 'Not Annotated'된 것이 있으면 이 사이트에 다시 라벨링.

3) ‘Save and Continue’ 클릭



4) Split화면에서는 Train을 100%로 한 후 (슬라이드를 움직여서) 'Continue' 클릭.



5) Dog and Cat classification Dataset에서 중앙에 있는 '+ Generate New Version'을 클릭 (안 나타나면 Skip)

Dog Cat classification Dataset

Generate New Version

VERSIONS

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

Choose your dataset settings to get started.

Generating New Version

Prepare your images and data for training by compiling them into a version. Experiment with different configurations to achieve better training results.

Source Images

Images: 20

Classes: 2

Unannotated: 0

Train/Test Split

Training Set: 20 images

Validation Set: images

Testing Set: images

3 Preprocessing

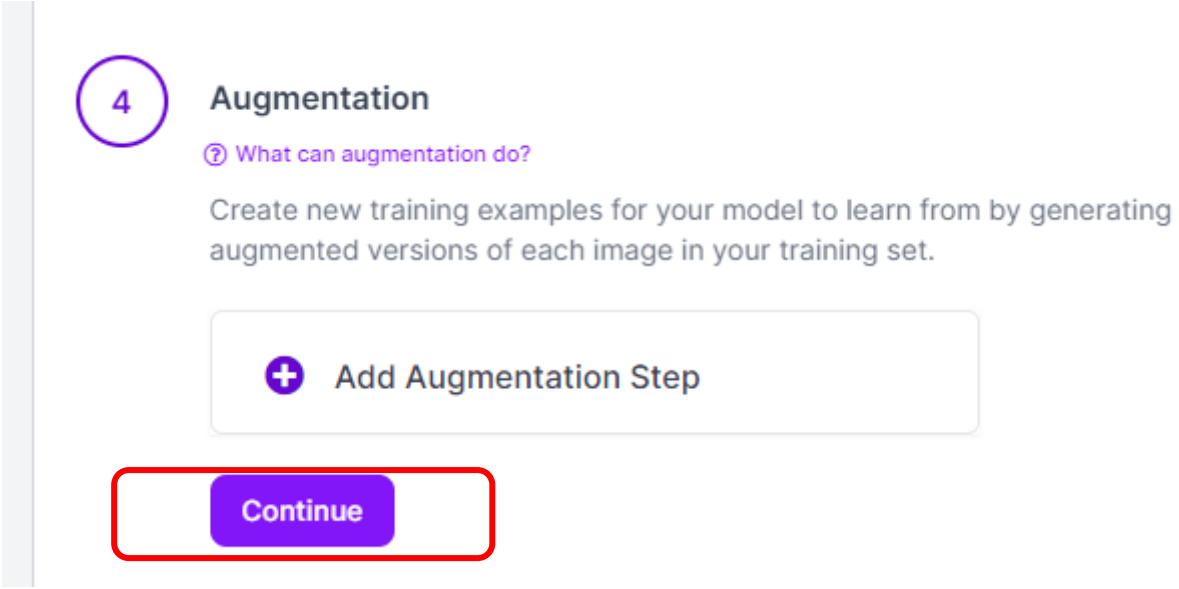
What can preprocessing do?

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

Auto-Orient Edit ×

6) **Preprocessing에서 'Continue' 클릭**

7) **Augmentation에서 'Continue' 클릭**



8) **Create에서 'Create'를 클릭**

9) **Dog and Cats classification Image Dataset에서 'Export Dataset' 클릭**

Dog Cat classification Image Dataset

Generate New Version

VERSIONS

2023-10-29 12:21am
v1 Oct 29, 2023

v1 **2023-10-29 12:21am**
Generated on Oct 29, 2023

Export Dataset

This version doesn't have a model.

Train an optimized, state of the art model with Roboflow or upload a custom trained model to use features like Label Assist and Model Evaluation and deployment options like our auto-scaling API and edge device support.

Get More Credits | Custom Train and Upload

Available Credits: 0

20 Total Images

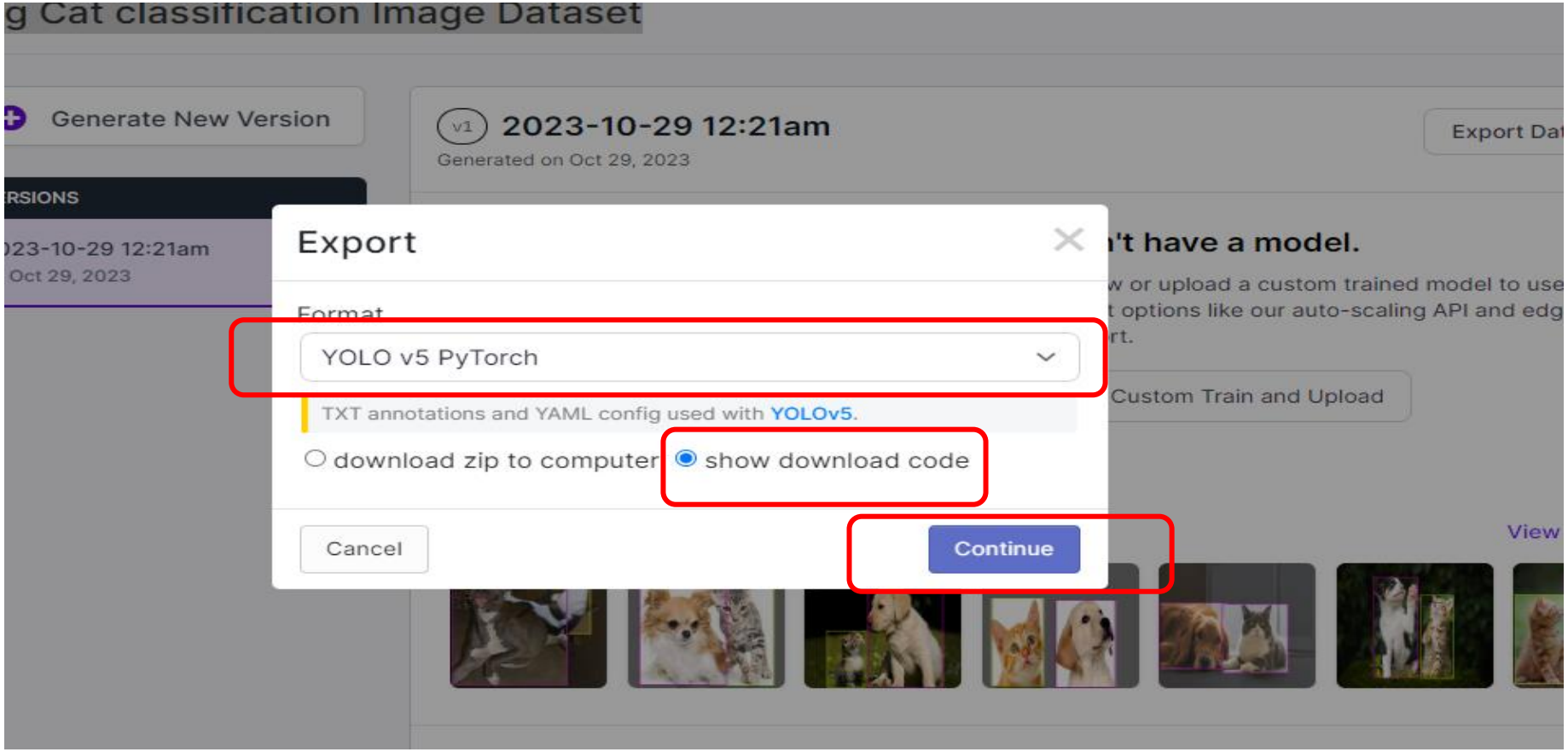
View All Images →

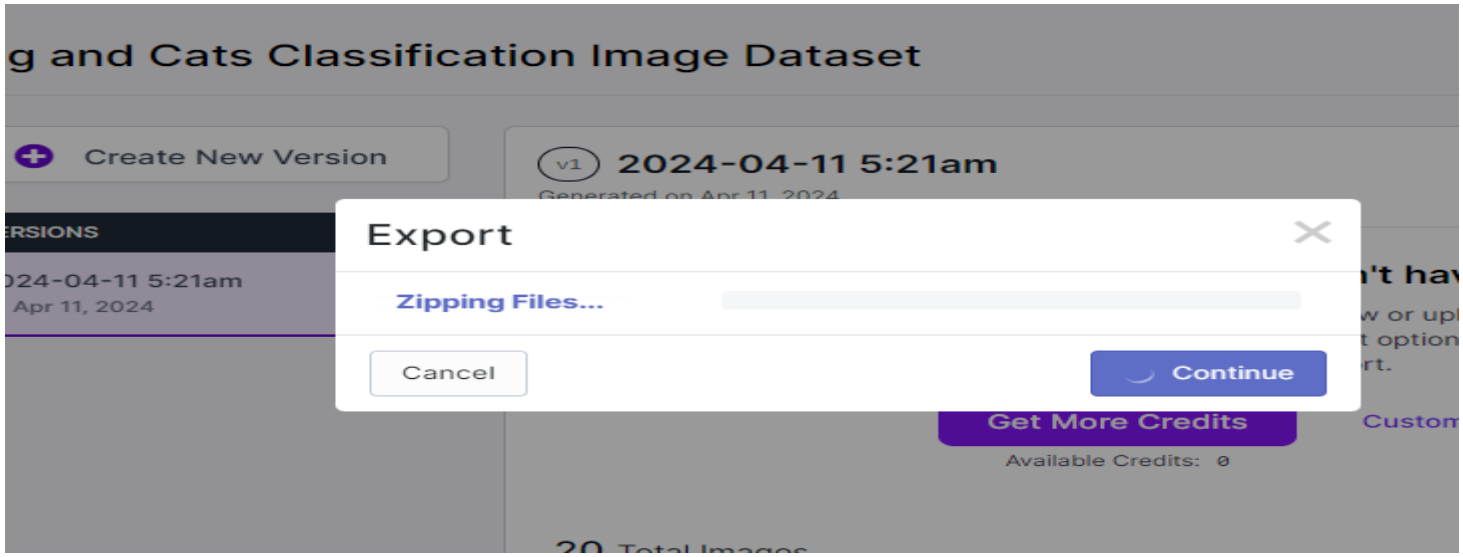
Dataset Split

TRAIN SET	VALID SET	TEST SET
100%	%	%
20 Images	0 Images	0 Images

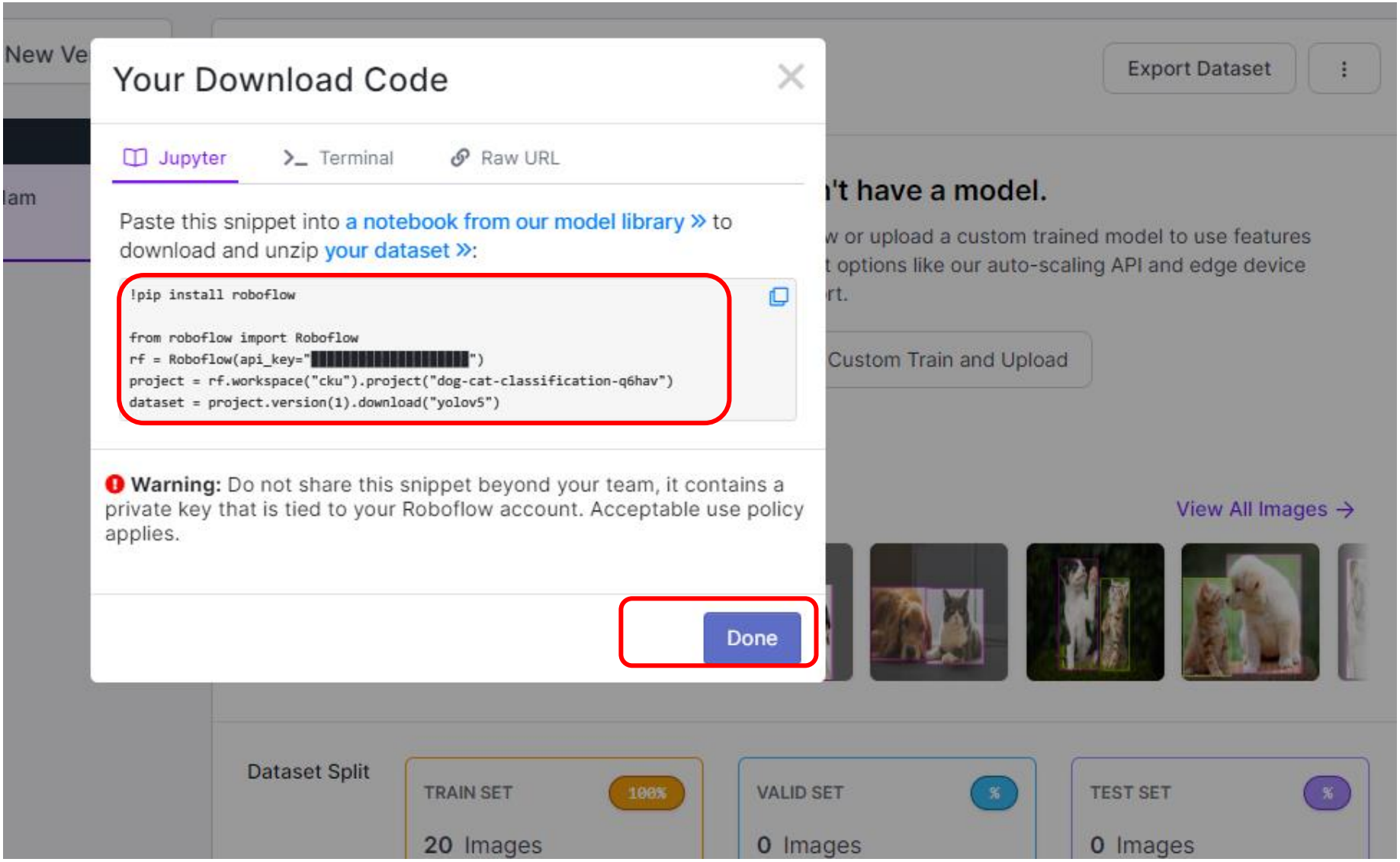
Preprocessing — Auto-Orient: Applied

10) Foramt은 'YOLO v5 PyTorch', 'show download code'를 선택하고 하단에 있는 'Continue' 버튼 클릭




g and Cats Classification Image Dataset
Create New Version
v1
2024-04-11 5:21am
Generated on Apr 11, 2024
ERSIONS
024-04-11 5:21am
Apr 11, 2024
Export
Zipping Files...
Cancel
Continue
Get More Credits
Available Credits: 0
Custom
20 Total Images

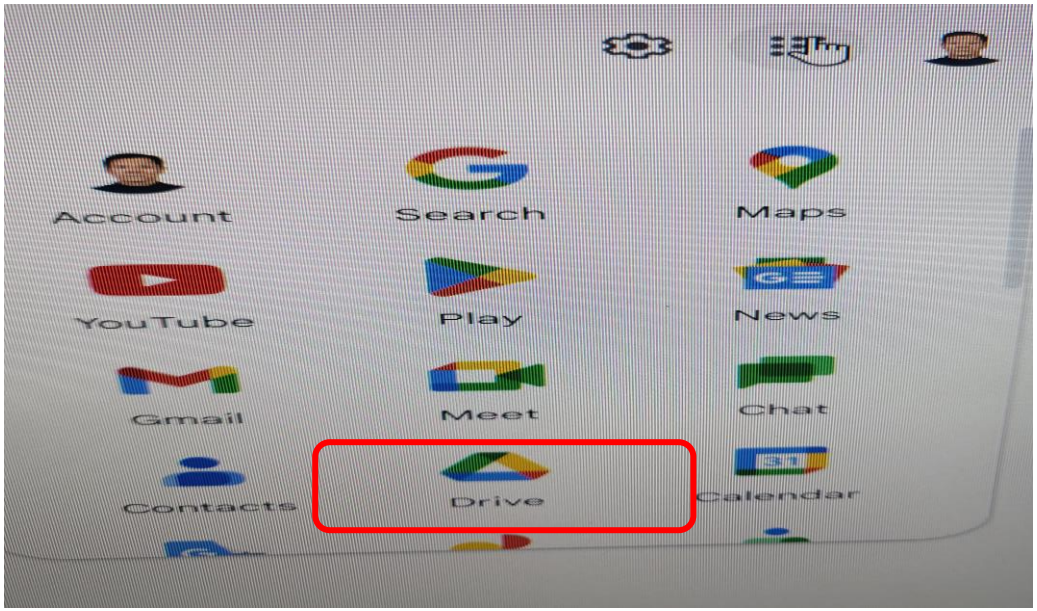
Your Download Code 에서 'Jupyter'를 선택후 중앙 박스 코드를 복사하고 'Done'을 클릭



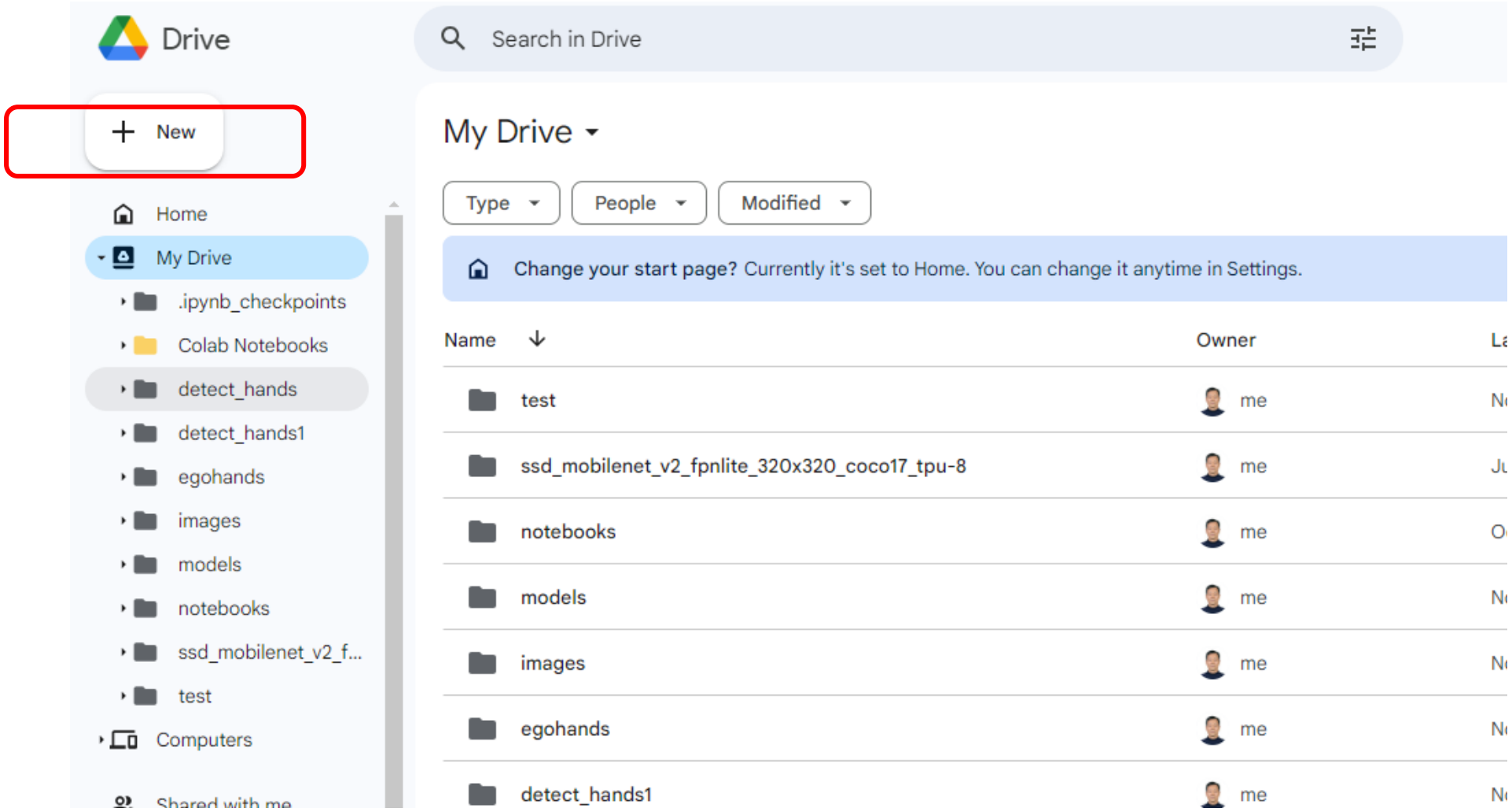
```
!pip install roboflow

from roboflow import Roboflow
rf = Roboflow(api_key="TBRLoVWy0oCer6eiqK0g")
project = rf.workspace("cku").project("dog-and-cats-classification")
version = project.version(1)
dataset = version.download("yolov5")
```

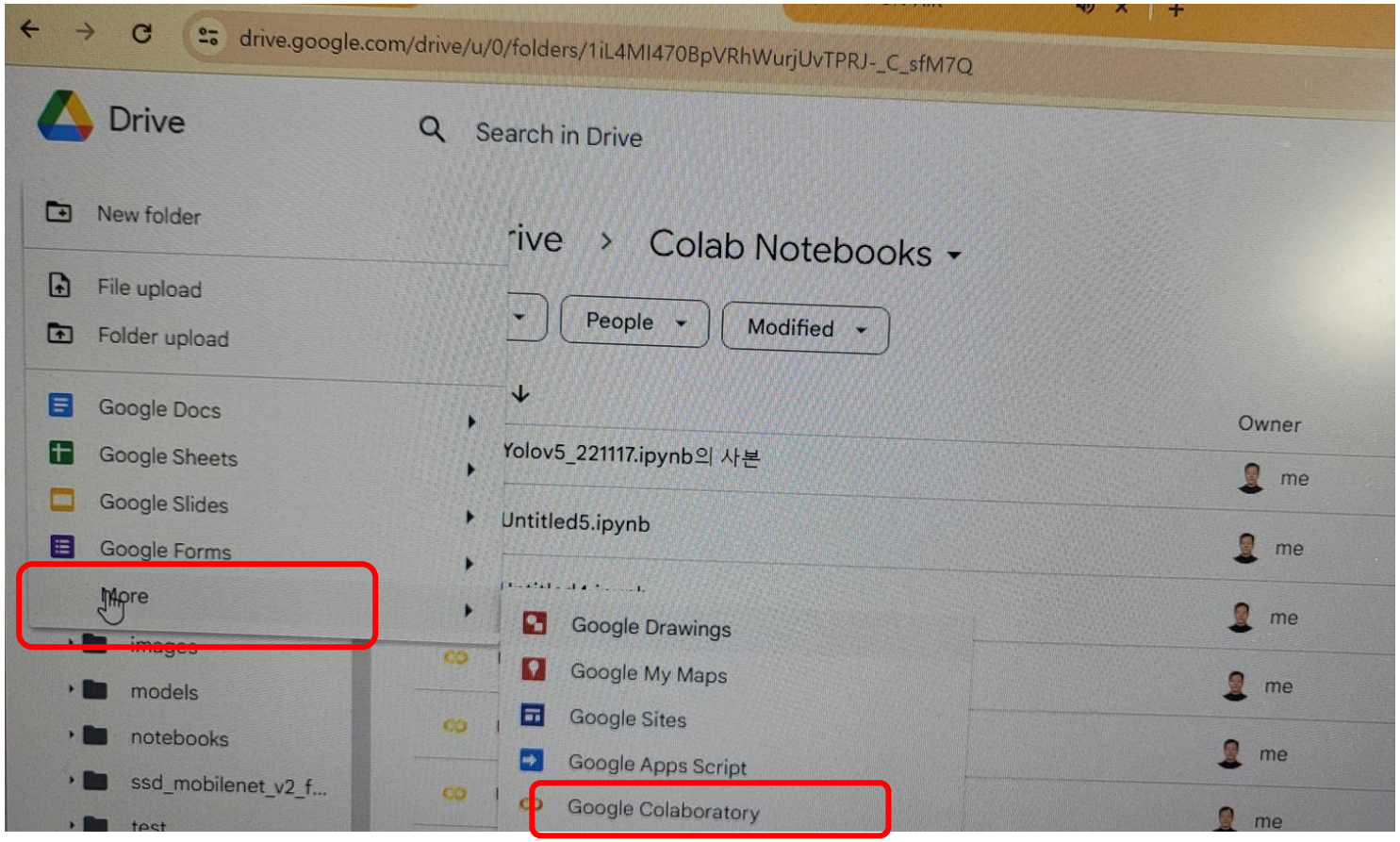
<Training (Colab)>

1) 구글 계정(없으면 가입)에서 사진 좌측의 점 9개를 클릭하면 보이는 Drive로 진입

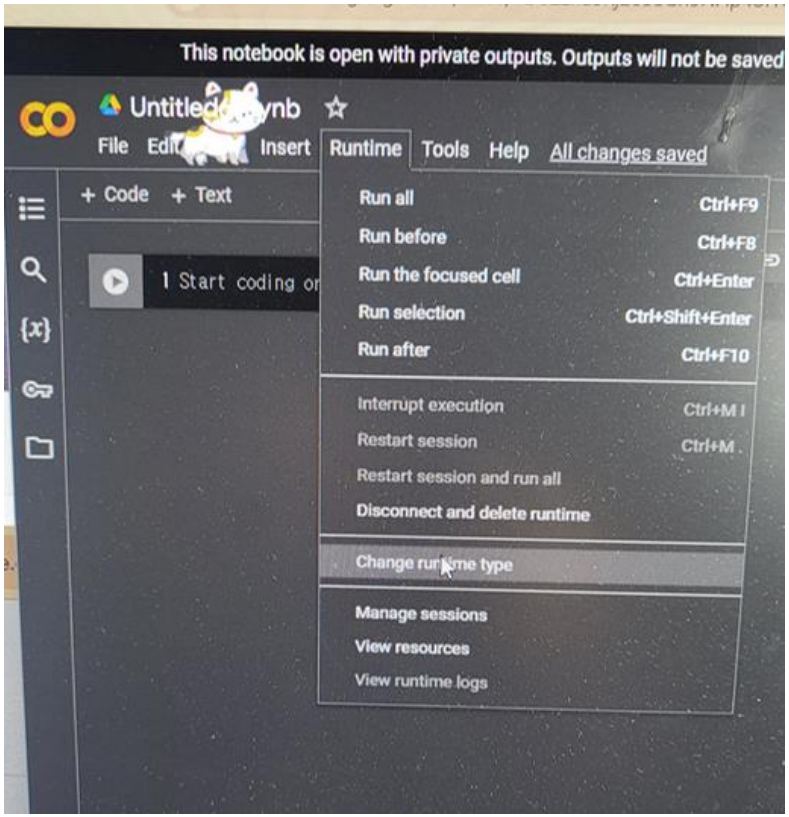


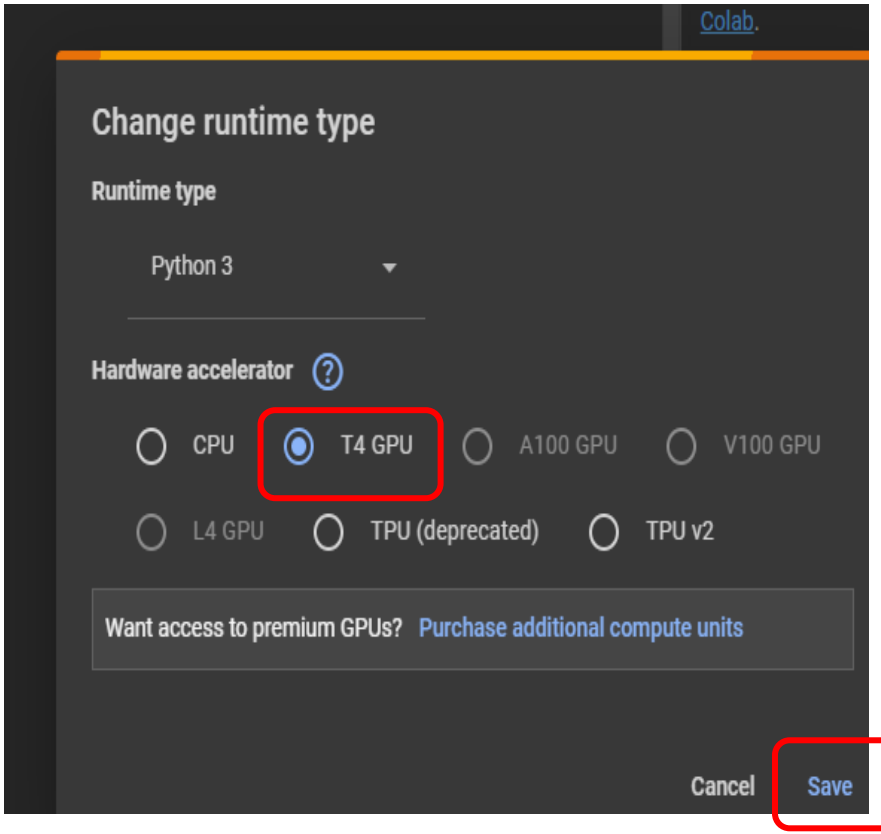
2) My Drive/New Folder/More/Google Colaboratory 선택 (안 보이면 '+ Connect more apps'를 클릭해서 찾음)


Drive
Search in Drive
New
Home
My Drive
.ipynb_checkpoints
Colab Notebooks
detect_hands
detect_hands1
egohands
images
models
notebooks
ssd_mobilenet_v2_f...
test
Computers
Shared with me
My Drive
Type
People
Modified
Change your start page? Currently it's set to Home. You can change it anytime in Settings.
Name
Owner
test
me
ssd_mobilenet_v2_fpnlite_320x320_coco17_tpu-8
me
notebooks
me
models
me
images
me
egohands
me
detect_hands1
me



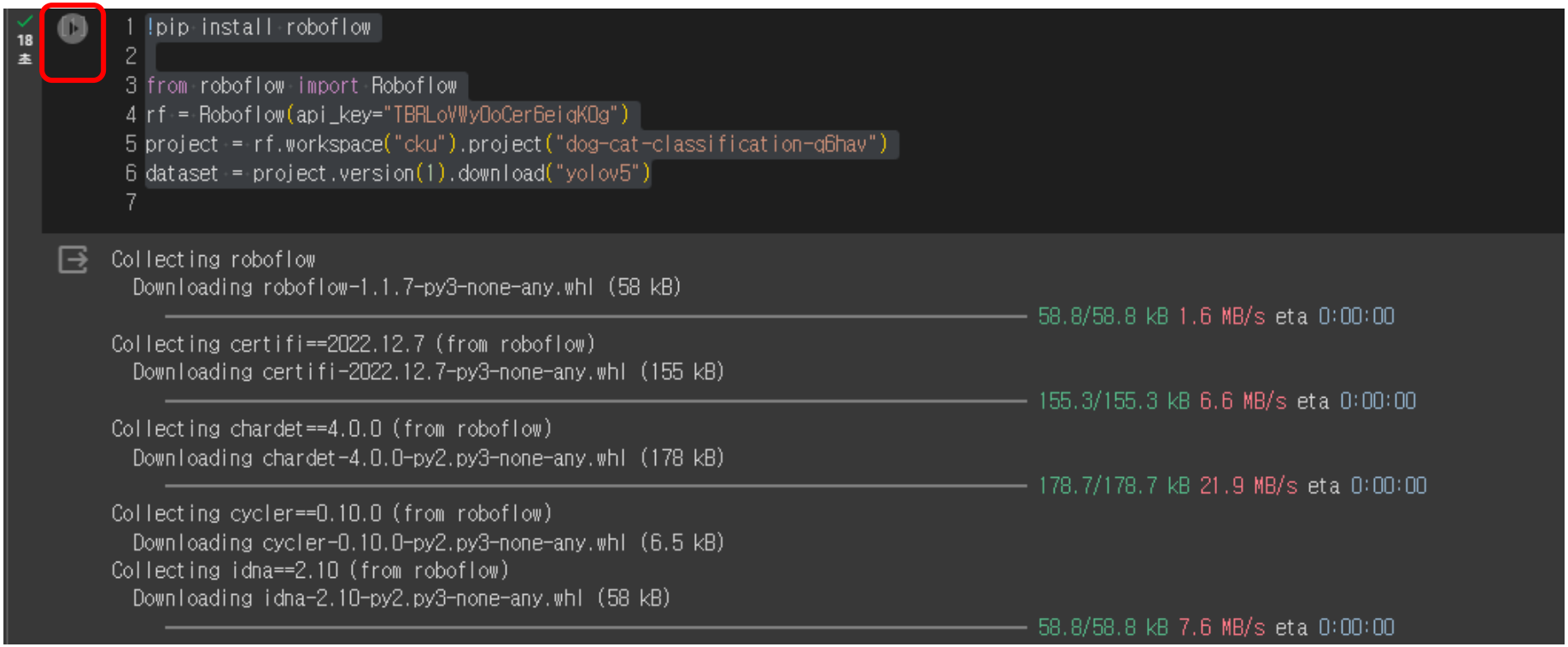
3) 아래의 Google Colab 상단 메뉴에서 'Runtime'(런타임)을 클릭하고 ' Change runtime type'(런타임 유형변경)을 선택한 후, 'T4 GPU' 선택한 후 'Save'(저장) 클릭



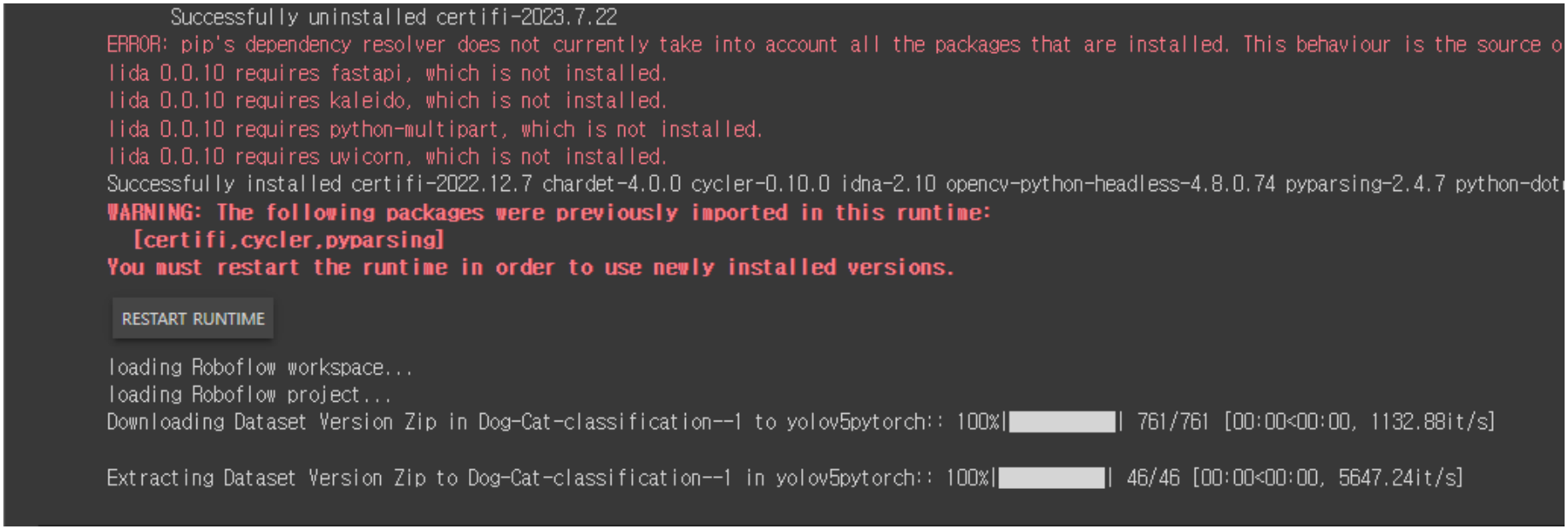


3) 데이터셋 load (첫번째 셀에 붙여 넣기(^V) 하고, 셀좌측의 우측세모를 클릭해서 실행

```
!pip install roboflow

from roboflow import Roboflow
rf = Roboflow(api_key="TBRLoVWyOoCer6eiqK0g")
project = rf.workspace("cku").project("dog-and-cats-classification")
version = project.version(1)
dataset = version.download("yolov5")
```


18
초
1 !pip install roboflow
2
3 from roboflow import Roboflow
4 rf = Roboflow(api_key="TBRLoVWyOoCer6eiqKOg")
5 project = rf.workspace("cku").project("dog-cat-classification-q6hav")
6 dataset = project.version(1).download("yolov5")
7
Collecting roboflow
Downloading roboflow-1.1.7-py3-none-any.whl (58 kB)
58.8/58.8 kB 1.6 MB/s eta 0:00:00
Collecting certifi==2022.12.7 (from roboflow)
Downloading certifi-2022.12.7-py3-none-any.whl (155 kB)
155.3/155.3 kB 6.6 MB/s eta 0:00:00
Collecting chardet==4.0.0 (from roboflow)
Downloading chardet-4.0.0-py2.py3-none-any.whl (178 kB)
178.7/178.7 kB 21.9 MB/s eta 0:00:00
Collecting cycler==0.10.0 (from roboflow)
Downloading cycler-0.10.0-py2.py3-none-any.whl (6.5 kB)
Collecting idna==2.10 (from roboflow)
Downloading idna-2.10-py2.py3-none-any.whl (58 kB)
58.8/58.8 kB 7.6 MB/s eta 0:00:00

(중략)



5) Yolov5 다운 및 학습 (상단에서 '+Code'를 클릭해서 새 cell 만들고 진행)

%cd /content

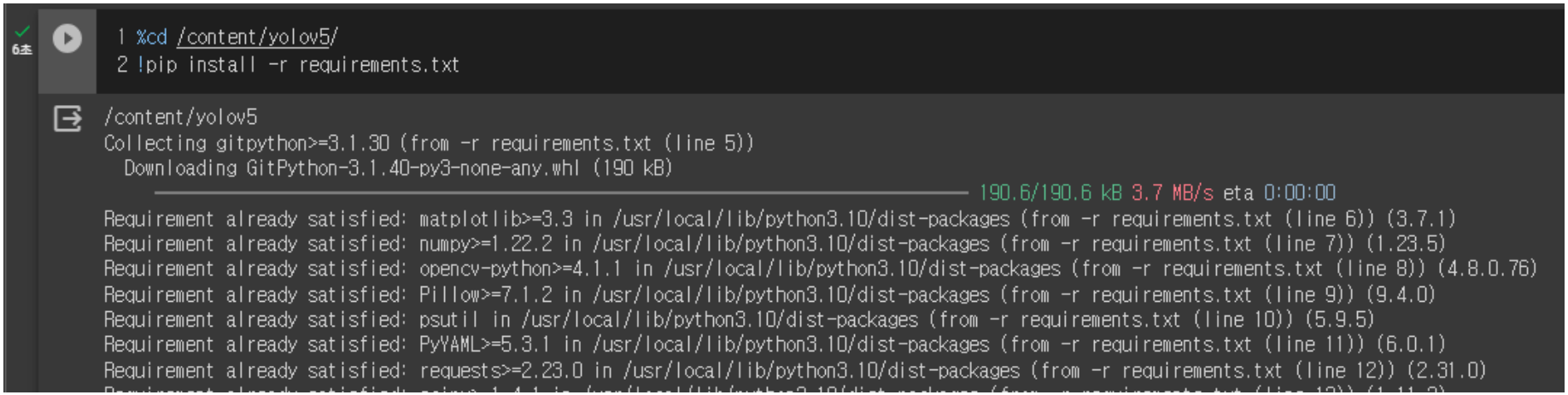
!git clone https://github.com/ultralytics/yolov5

```
1 %cd /content
2 !git clone https://github.com/ultralytics/yolov5
```

```
/content
Cloning into 'yolov5'...
remote: Enumerating objects: 16026, done.
remote: Counting objects: 100% (59/59), done.
remote: Compressing objects: 100% (34/34), done.
remote: Total 16026 (delta 33), reused 41 (delta 25), pack-reused 15967
Receiving objects: 100% (16026/16026), 14.68 MiB | 17.40 MiB/s, done.
Resolving deltas: 100% (10999/10999), done.
```

%cd /content/yolov5/

!pip install -r requirements.txt



```
1 %cd /content/yolov5/
2 !pip install -r requirements.txt
```

```
/content/yolov5
Collecting gitpython>=3.1.30 (from -r requirements.txt (line 5))
  Downloading GitPython-3.1.40-py3-none-any.whl (190 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 190.6/190.6 kB 3.7 MB/s eta 0:00:00
Requirement already satisfied: matplotlib>=3.3 in /usr/local/lib/python3.10/dist-packages (from -r requirements.txt (line 6)) (3.7.1)
Requirement already satisfied: numpy>=1.22.2 in /usr/local/lib/python3.10/dist-packages (from -r requirements.txt (line 7)) (1.23.5)
Requirement already satisfied: opencv-python>=4.1.1 in /usr/local/lib/python3.10/dist-packages (from -r requirements.txt (line 8)) (4.8.0.76)
Requirement already satisfied: Pillow>=7.1.2 in /usr/local/lib/python3.10/dist-packages (from -r requirements.txt (line 9)) (9.4.0)
Requirement already satisfied: psutil in /usr/local/lib/python3.10/dist-packages (from -r requirements.txt (line 10)) (5.9.5)
Requirement already satisfied: PyYAML>=5.3.1 in /usr/local/lib/python3.10/dist-packages (from -r requirements.txt (line 11)) (6.0.1)
Requirement already satisfied: requests>=2.23.0 in /usr/local/lib/python3.10/dist-packages (from -r requirements.txt (line 12)) (2.31.0)
```

(중략)

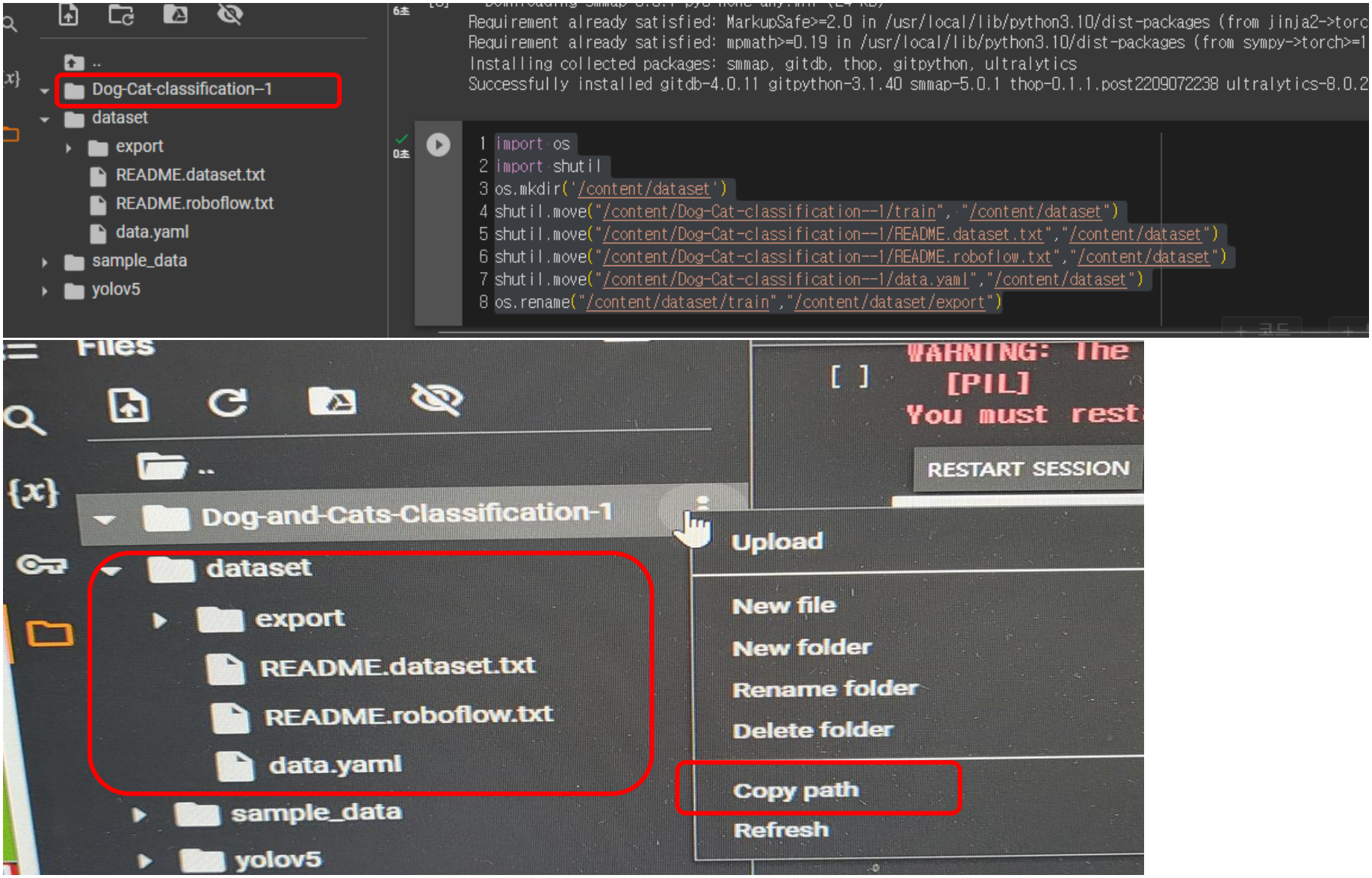
```
Requirement already satisfied: triton==2.1.0 in /usr/local/lib/python3.10/dist-packages (from torch>=1.8.0->-r requirements.txt (line 15)) (2.1.0)
Requirement already satisfied: py-cpuinfo in /usr/local/lib/python3.10/dist-packages (from ultralytics>=8.0.147->-r requirements.txt (line 18)) (9.0.0)
Requirement already satisfied: pytz>=2020.1 in /usr/local/lib/python3.10/dist-packages (from pandas>=1.1.4->-r requirements.txt (line 27)) (2023.3.post1)
Requirement already satisfied: six in /usr/local/lib/python3.10/dist-packages (from cycler>=0.10->matplotlib>=3.3->-r requirements.txt (line 6)) (1.16.0)
Collecting smmap<6,>=3.0.1 (from gitdb<5,>=4.0.1->gitpython>=3.1.30->-r requirements.txt (line 5))
  Downloading smmap-5.0.1-py3-none-any.whl (24 kB)
Requirement already satisfied: MarkupSafe>=2.0 in /usr/local/lib/python3.10/dist-packages (from jinja2->torch>=1.8.0->-r requirements.txt (line 15)) (2.1.3)
Requirement already satisfied: mpmath>=0.19 in /usr/local/lib/python3.10/dist-packages (from sympy->torch>=1.8.0->-r requirements.txt (line 15)) (1.3.0)
Installing collected packages: smmap, gitdb, thop, gitpython, ultralytics
Successfully installed gitdb-4.0.11 gitpython-3.1.40 smmap-5.0.1 thop-0.1.1.post2209072238 ultralytics-8.0.202
```

. dataset 폴더 만들기 (/content/dataset. /content가 화면에 보이는 제일 높은 경로)

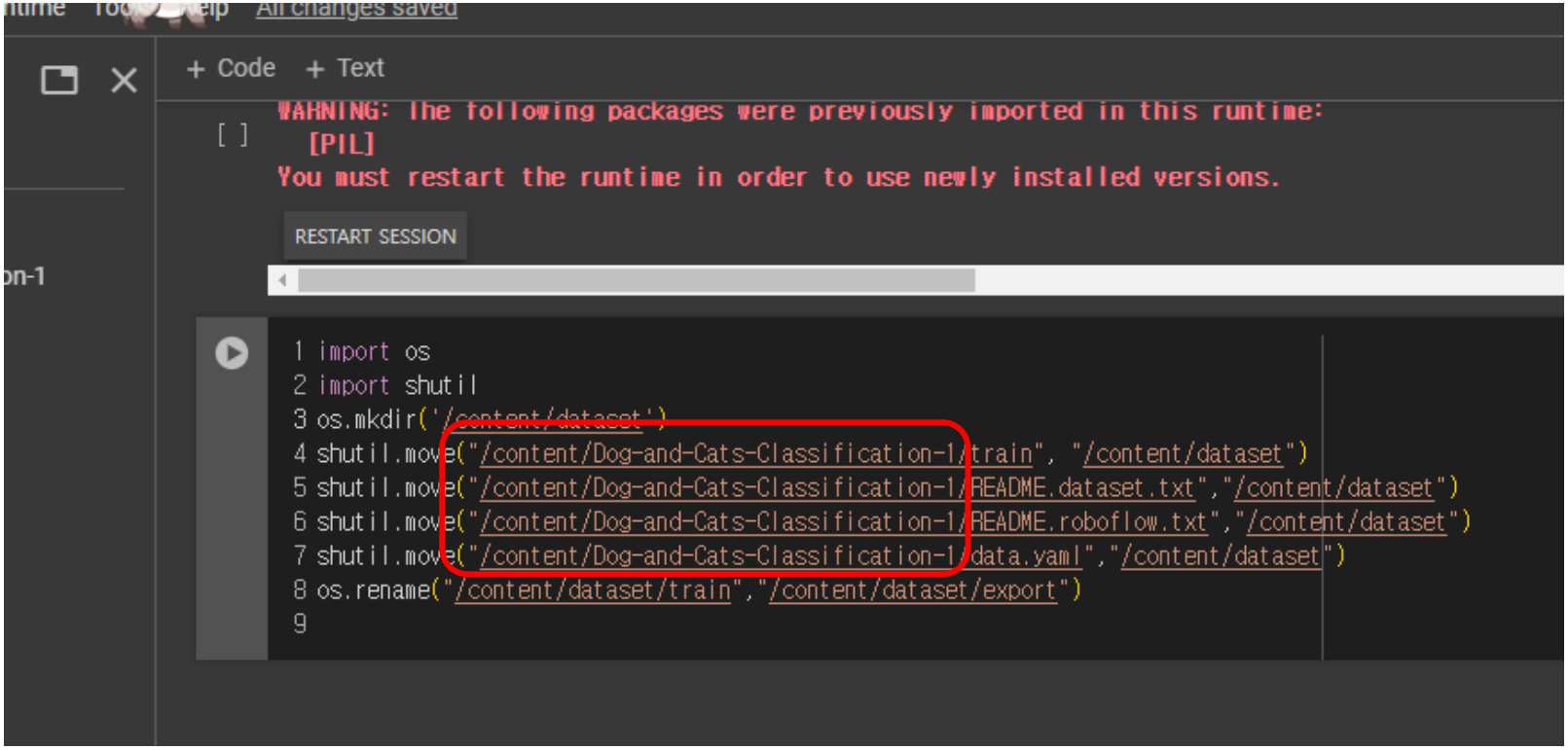
```
!pip install -r requirements.txt
```

위의 내용을 아래와 같이 고침. 단 경로는 'Dog-Cat-classification—1' 폴더 아래 4개 폴더 각각에 마우스 우측버턴을 눌러서 '경로복사'를 해 와서 위의 적색부분을 아래와 같이 수정

```
        import os
        import shutil
        os.mkdir('/content/dataset')
        shutil.move("/content/Dog-Cats-classification-1/train", "/content/dataset")
        shutil.move("/content/Dog-Cats-classification-1/README.dataset.txt","/content/dataset")
        shutil.move("/content/Dog-Cats-classification-1/README.roboflow.txt","/content/dataset")
        shutil.move("/content/Dog-Cats-classification-1/data.yaml","/content/dataset")
os.rename("/content/dataset/train","/content/dataset/export")
```


Dog-Cat-classification--1
dataset
export
README.dataset.txt
README.roboflow.txt
data.yaml
sample_data
yolov5
Requirement already satisfied: MarkupSafe>=2.0 in /usr/local/lib/python3.10/dist-packages (from jinja2->torc
Requirement already satisfied: mpmath>=0.19 in /usr/local/lib/python3.10/dist-packages (from sympy->torch>=1
Installing collected packages: smmap, gitdb, thop, gitpython, ultralytics
Successfully installed gitdb-4.0.11 gitpython-3.1.40 smmap-5.0.1 thop-0.1.1.post2209072238 ultralytics-8.0.2
1 import os
2 import shutil
3 os.mkdir('/content/dataset')
4 shutil.move("/content/Dog-Cat-classification--1/train", "/content/dataset")
5 shutil.move("/content/Dog-Cat-classification--1/README.dataset.txt","/content/dataset")
6 shutil.move("/content/Dog-Cat-classification--1/README.roboflow.txt","/content/dataset")
7 shutil.move("/content/Dog-Cat-classification--1/data.yaml","/content/dataset")
8 os.rename("/content/dataset/train","/content/dataset/export")
Files
WARNING: The
[PIL]
You must rest
RESTART SESSION
Dog-and-Cats-Classification-1
dataset
export
README.dataset.txt
README.roboflow.txt
data.yaml
sample_data
yolov5
Upload
New file
New folder
Rename folder
Delete folder
Copy path
Refresh

. Data Set 이름(Dog-and-Casts-Classification-1)에서 우측 버튼을 눌러서 'Copy path' 한 후 이전 그림에서 path를 수정



%cat /content/dataset/data.yaml

```
1 %cat /content/dataset/data.yaml
```

```
names:
- cat
- dog
nc: 2
roboflow:
  license: CC BY 4.0
  project: dog-cat-classification-q6hav
  url: https://universe.roboflow.com/cku/dog-cat-classification-q6hav/dataset/1
  version: 1
  workspace: cku
test: ../test/images
train: Dog-Cat-classification--1/train/images
val: Dog-Cat-classification--1/valid/images
```

%cd /

from glob import glob

img_list = glob('/content/dataset/export/images/*.jpg')

print(len(img_list))

```
1 %cd /
2 from glob import glob
3 img_list = glob('/content/dataset/export/images/*.jpg')
4 print(len(img_list))
```

```
/
20
```

```
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))
```

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

```
16 4
```

```
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')
```

```
1 with open('/content/dataset/train.txt', 'w') as f:
2   f.write('₩n'.join(train_img_list) + '₩n')
3 with open('/content/dataset/val.txt', 'w') as f:
4   f.write('₩n'.join(val_img_list) + '₩n')
```

```
import yaml

with open('/content/dataset/data.yaml','r') as f:

    data = yaml.full_load(f)
```

print(data)

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

```
{'names': ['cat', 'dog'], 'nc': 2, 'roboflow': {'license': 'CC BY 4.0', 'project': 'dog-cat-classification-q6hav', 'url': 'https://universe.roboflow.com/cku/dog-cat-classification-q6hav/dataset/1', 'ver
```

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)**

```
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)
```

print(data)

```
print(data)
```

```
{'names': ['cat', 'dog'], 'nc': 2, 'roboflow': {'license': 'CC BY 4.0', 'project': 'dog-cat-classification-q6hav', 'url': 'https://universe.roboflow.com/cku/dog-cat-classification-q6hav/dataset/1', 'version'
```

%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 dog_cats_yolov5s_results

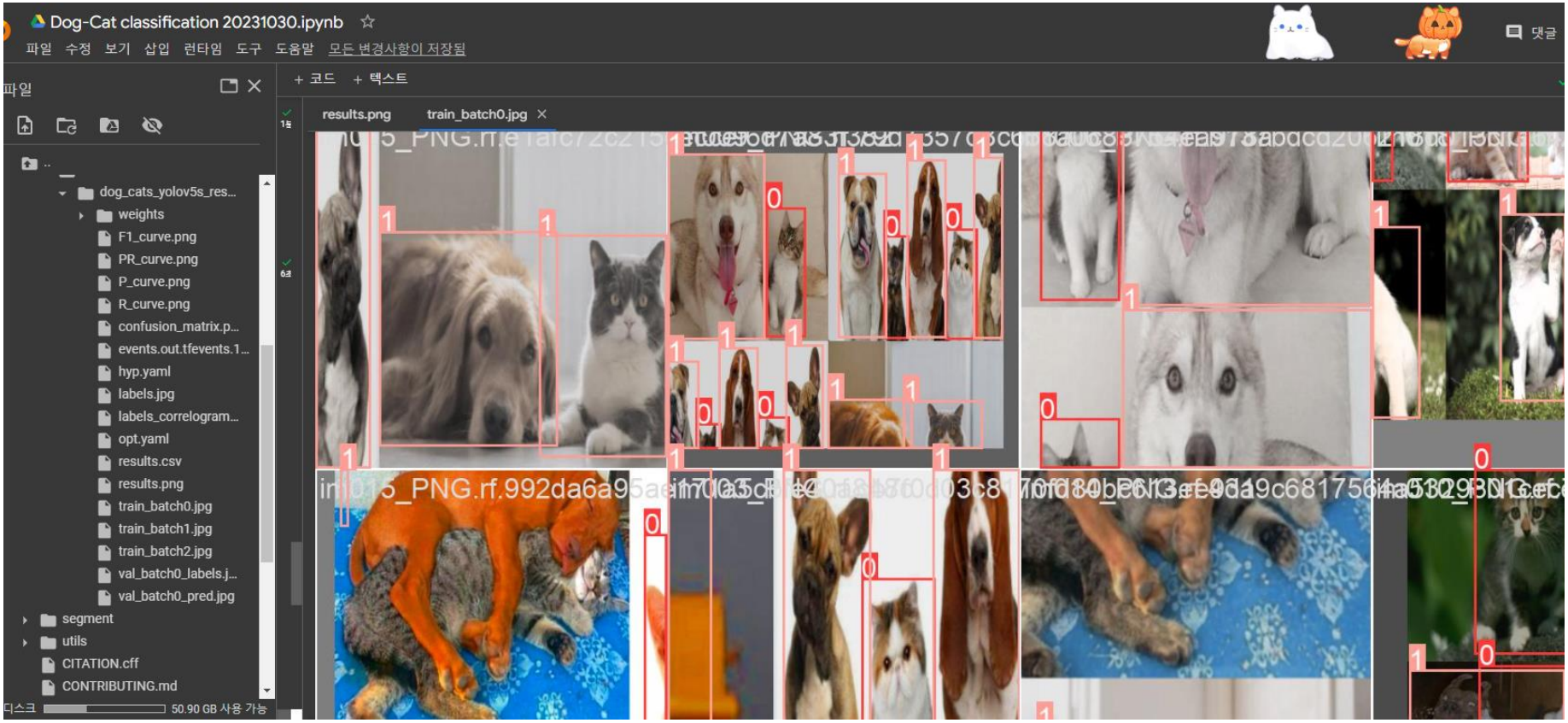
```
1 %cd /content/yolov5/
2 !python train.py --img 416 --batch 16 --epochs 50 --data /content/dataset/data.yaml --cfg ./models/yolov5s.yaml --weights yolov5s.pt --name dog_cats_yolov5s_results
```

```
/content/yolov5
2023-10-29 11:31:46.759181: E tensorflow/compiler/xla/stream_executor/cuda/cuda_dnn.cc:9342] Unable to register cuDNN factory: Attempting to register factory for plugin cuDNN when one has already been
2023-10-29 11:31:46.759243: E tensorflow/compiler/xla/stream_executor/cuda/cuda_fft.cc:609] Unable to register cuFFT factory: Attempting to register factory for plugin cuFFT when one has already been
2023-10-29 11:31:46.759298: E tensorflow/compiler/xla/stream_executor/cuda/cuda_blas.cc:1518] Unable to register cuBLAS factory: Attempting to register factory for plugin cuBLAS when one has already be
train: weights=yolov5s.pt, cfg=./models/yolov5s.yaml, data=/content/dataset/data.yaml, hyp=data/hyps/hyp.scratch-low.yaml, epochs=50, batch_size=16, imgsz=416, rect=False, resume=False, nosave=False,
github: up to date with https://github.com/ultralytics/yolov5
YOLOv5 v7.0-230-g53efd07 Python-3.10.12 torch-2.1.0+cu118 CUDA:0 (Tesla T4, 15102MiB)
```

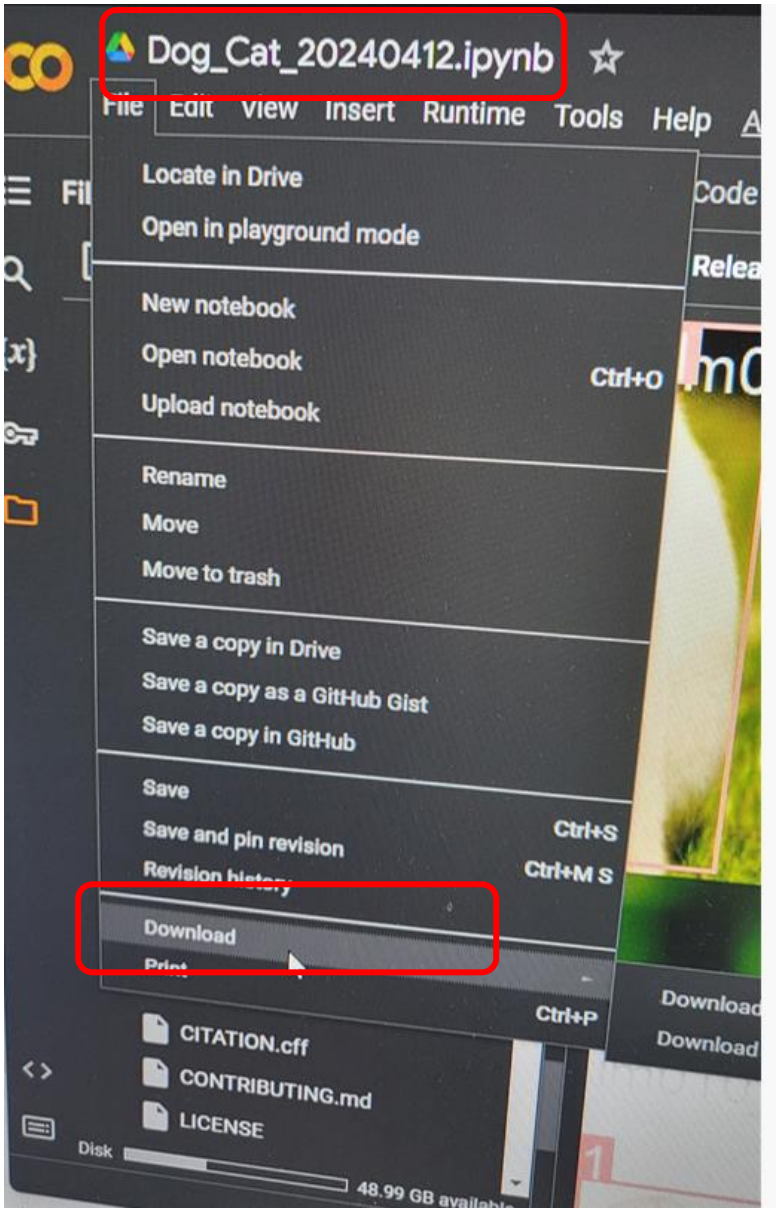
(중략)

```
      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      48/49      1.52G    0.08132    0.03729    0.02833         75        416: 100% 1/1 [00:00<00:00,  7.86it/s]
                 Class     Images  Instances          P          R      mAP50   mAP50-95: 100% 1/1 [00:00<00:00, 12.46it/s]
                   all          4          8    0.00667          1       0.24     0.0833

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
      49/49      1.52G    0.07321    0.03047    0.02612         60        416: 100% 1/1 [00:00<00:00, 10.20it/s]
                 Class     Images  Instances          P          R      mAP50   mAP50-95: 100% 1/1 [00:00<00:00,  7.45it/s]
                   all          4          8    0.00667          1       0.24     0.0833

50 epochs completed in 0.018 hours.
Optimizer stripped from runs/train/dog_cats_yolov5s_results/weights/last.pt, 14.3MB
Optimizer stripped from runs/train/dog_cats_yolov5s_results/weights/best.pt, 14.3MB

Validating runs/train/dog_cats_yolov5s_results/weights/best.pt...
Fusing layers...
YOLOv5s summary: 157 layers, 7015519 parameters, 0 gradients, 15.8 GFLOPs
                 Class     Images  Instances          P          R      mAP50   mAP50-95: 100% 1/1 [00:00<00:00, 13.33it/s]
                   all          4          8    0.00667          1      0.239     0.0827
                   cat          4          4    0.00659          1      0.176      0.077
                   dog          4          4    0.00675          1      0.303     0.0884
Results saved to runs/train/dog_cats_yolov5s_results
```

. Training 결과 보기(runs/train/dog_cats_yolov5s_results)



. 필요하면 Download할 수 있음.


Dog_Cat_20240412.ipynb
File Edit View Insert Runtime Tools Help
Locate in Drive
Open in playground mode
New notebook
Open notebook Ctrl+O
Upload notebook
Rename
Move
Move to trash
Save a copy in Drive
Save a copy as a GitHub Gist
Save a copy in GitHub
Save
Save and pin revision Ctrl+S
Revision history Ctrl+M S
Download
Print Ctrl+P
CITATION.cff
CONTRIBUTING.md
LICENSE
Disk
48.99 GB available

*** 참고: https://lynnshin.tistory.com/48, https://github.com/ultralytics/yolov5**

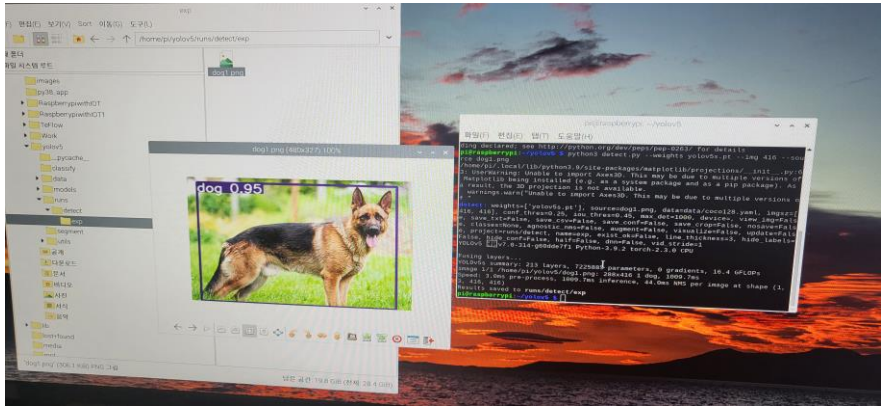
https://colab.research.google.com/github/ultralytics/yolov5/blob/master/tutorial.ipynb

```
!python detect.py --weights /content/yolov5/runs/train/gun_yolov5s_results/weights/best.pt --img 416--source /content/dataset/test/pistol1.png
```

*** pistol1.png를 dataset/test 폴더에 만들어서 넣은 후 detection. --source 0에서 cv2는 지원하지 않는다는 에러메시지**

라즈베리파이 상에서 detect

$ git clone https://github.com/ultralytics/yolov5

. 'yolov5s.pt', 'dog1.png' 를 라즈베리파이의 'yolov5' 폴더에 옮겨 놓은 후

$ python3 detect.py –weights yolov5s.pt –img 416 –source dog1.png