

```
!pip install roboflow
```

```
from roboflow import Roboflow
rf = Roboflow(api_key="vZV4ItqyYGeuNdaKbFa")
project = rf.workspace("roboflow-universe-projects").project("construction-site-safety")
version = project.version(30)
dataset = version.download("yolov8")
```

```
Requirement already satisfied: roboflow in /usr/local/lib/python3.10/dist-packages (1.1.27)
Requirement already satisfied: certifi==2023.7.22 in /usr/local/lib/python3.10/dist-packages (from roboflow) (2023.7.22)
Requirement already satisfied: chardet==4.0.0 in /usr/local/lib/python3.10/dist-packages (from roboflow) (4.0.0)
Requirement already satisfied: cyclr==0.10.0 in /usr/local/lib/python3.10/dist-packages (from roboflow) (0.10.0)
Requirement already satisfied: idna==2.10 in /usr/local/lib/python3.10/dist-packages (from roboflow) (2.10)
Requirement already satisfied: kiwisolver==1.3.1 in /usr/local/lib/python3.10/dist-packages (from roboflow) (1.4.5)
Requirement already satisfied: matplotlib in /usr/local/lib/python3.10/dist-packages (from roboflow) (3.7.1)
Requirement already satisfied: numpy==1.18.5 in /usr/local/lib/python3.10/dist-packages (from roboflow) (1.25.2)
Requirement already satisfied: opencv-python-headless==4.8.0.74 in /usr/local/lib/python3.10/dist-packages (from roboflow) (4.8.0.74)
Requirement already satisfied: Pillow>=7.1.2 in /usr/local/lib/python3.10/dist-packages (from roboflow) (9.4.0)
Requirement already satisfied: python-dateutil in /usr/local/lib/python3.10/dist-packages (from roboflow) (2.8.2)
Requirement already satisfied: python-dotenv in /usr/local/lib/python3.10/dist-packages (from roboflow) (1.0.1)
Requirement already satisfied: requests in /usr/local/lib/python3.10/dist-packages (from roboflow) (2.31.0)
Requirement already satisfied: six in /usr/local/lib/python3.10/dist-packages (from roboflow) (1.16.0)
Requirement already satisfied: urllib3>=1.26.6 in /usr/local/lib/python3.10/dist-packages (from roboflow) (2.0.7)
Requirement already satisfied: tqdm==4.41.0 in /usr/local/lib/python3.10/dist-packages (from roboflow) (4.66.2)
Requirement already satisfied: PyYAML>=5.3.1 in /usr/local/lib/python3.10/dist-packages (from roboflow) (6.0.1)
Requirement already satisfied: requests-toolbelt in /usr/local/lib/python3.10/dist-packages (from roboflow) (1.0.0)
Requirement already satisfied: python-magic in /usr/local/lib/python3.10/dist-packages (from roboflow) (0.4.27)
Requirement already satisfied: contourpy>=1.0.1 in /usr/local/lib/python3.10/dist-packages (from matplotlib->roboflow) (1.2.1)
Requirement already satisfied: fonttools>=4.22.0 in /usr/local/lib/python3.10/dist-packages (from matplotlib->roboflow) (4.51.0)
Requirement already satisfied: packaging>=20.0 in /usr/local/lib/python3.10/dist-packages (from matplotlib->roboflow) (24.0)
Requirement already satisfied: pyparsing>=2.3.1 in /usr/local/lib/python3.10/dist-packages (from matplotlib->roboflow) (3.1.2)
Requirement already satisfied: charset-normalizer<4,>=2 in /usr/local/lib/python3.10/dist-packages (from requests->roboflow) (3.3.2)
loading Roboflow workspace...
loading Roboflow project...
[WARNING] we noticed you are downloading a `yolov8` datasets but you don't have `ultralytics` installed. Roboflow `deploy` supports only models trai
Downloading Dataset Version Zip in Construction-Site-Safety-30 to yolov8:: 100%|██████████| 80230/80230 [00:01<00:00, 47207.64it/s]

Extracting Dataset Version Zip to Construction-Site-Safety-30 in yolov8:: 100%|██████████| 1446/1446 [00:00<00:00, 2476.43it/s]
```

```
! pip install ultralytics
```

```
from ultralytics import YOLO, settings
```

```
settings
```

```
{'settings_version': '0.0.4',
 'datasets_dir': '/content/datasets',
 'weights_dir': 'weights',
 'runs_dir': 'runs',
 'uuid': '569f3ba64b326db489132663f79cd37279811de477381b83ac131e6cdd129cbb',
 'sync': True,
 'api_key': '',
 'openai_api_key': '',
 'clearml': True,
 'comet': True,
 'dvc': True,
 'hub': True,
 'mlflow': True,
 'neptune': True,
 'raytune': True,
 'tensorboard': True,
 'wandb': True}
```

```
settings['datasets_dir'] = '/content/'
settings
```

```
{'settings_version': '0.0.4',
 'datasets_dir': '/content/',
 'weights_dir': 'weights',
 'runs_dir': 'runs',
 'uuid': '569f3ba64b326db489132663f79cd37279811de477381b83ac131e6cdd129cbb',
 'sync': True,
 'api_key': '',
 'openai_api_key': '',
 'clearml': True,
 'comet': True,
 'dvc': True,
```

```
{
  'hub': True,
  'mlflow': True,
  'neptune': True,
  'raytune': True,
  'tensorboard': True,
  'wandb': True}

```

```
model = YOLO()
```

Downloading <https://github.com/ultralytics/assets/releases/download/v8.1.0/yolov8n.pt> to 'yolov8n.pt'...
100%|██████████| 6.23M/6.23M [00:00<00:00, 92.0MB/s]

```
# 학습
```

```
model.train(model='/content/yolov8n.pt',
            data='/content/Construction-Site-Safety-30/data.yaml',
            epochs=10,
            )
```

Ultralytics YOLOv8.1.47 Python-3.10.12 torch-2.2.1+cu121 CPU (Intel Xeon 2.20GHz)

engine/trainer: task=detect, mode=train, model=/content/yolov8n.pt, data=/content/Construction-Site-Safety-30/data.yaml, epochs=10, time=None, pat
Downloading <https://ultralytics.com/assets/Arial.ttf> to '/root/.config/Ultralytics/Arial.ttf'...

100%|██████████| 755k/755k [00:00<00:00, 22.9MB/s]

Overriding model.yaml nc=80 with nc=25

	from	n	params	module	arguments
0	-1	1	464	ultralytics.nn.modules.conv.Conv	[3, 16, 3, 2]
1	-1	1	4672	ultralytics.nn.modules.conv.Conv	[16, 32, 3, 2]
2	-1	1	7360	ultralytics.nn.modules.block.C2f	[32, 32, 1, True]
3	-1	1	18560	ultralytics.nn.modules.conv.Conv	[32, 64, 3, 2]
4	-1	2	49664	ultralytics.nn.modules.block.C2f	[64, 64, 2, True]
5	-1	1	73984	ultralytics.nn.modules.conv.Conv	[64, 128, 3, 2]
6	-1	2	197632	ultralytics.nn.modules.block.C2f	[128, 128, 2, True]
7	-1	1	295424	ultralytics.nn.modules.conv.Conv	[128, 256, 3, 2]
8	-1	1	460288	ultralytics.nn.modules.block.C2f	[256, 256, 1, True]
9	-1	1	164608	ultralytics.nn.modules.block.SPPF	[256, 256, 5]
10	-1	1	0	torch.nn.modules.upsampling.Upsample	[None, 2, 'nearest']
11	[-1, 6]	1	0	ultralytics.nn.modules.conv.Concat	[1]
12	-1	1	148224	ultralytics.nn.modules.block.C2f	[384, 128, 1]
13	-1	1	0	torch.nn.modules.upsampling.Upsample	[None, 2, 'nearest']
14	[-1, 4]	1	0	ultralytics.nn.modules.conv.Concat	[1]
15	-1	1	37248	ultralytics.nn.modules.block.C2f	[192, 64, 1]
16	-1	1	36992	ultralytics.nn.modules.conv.Conv	[64, 64, 3, 2]
17	[-1, 12]	1	0	ultralytics.nn.modules.conv.Concat	[1]
18	-1	1	123648	ultralytics.nn.modules.block.C2f	[192, 128, 1]
19	-1	1	147712	ultralytics.nn.modules.conv.Conv	[128, 128, 3, 2]
20	[-1, 9]	1	0	ultralytics.nn.modules.conv.Concat	[1]
21	-1	1	493056	ultralytics.nn.modules.block.C2f	[384, 256, 1]
22	[15, 18, 21]	1	756187	ultralytics.nn.modules.head.Detect	[25, [64, 128, 256]]

Model summary: 225 layers, 3015723 parameters, 3015707 gradients, 8.2 GFLOPs

Transferred 319/355 items from pretrained weights

TensorBoard: Start with 'tensorboard --logdir runs/detect/train', view at <http://localhost:6006/>

Freezing layer 'model.22.dfl.conv.weight'

train: Scanning /content/Construction-Site-Safety-30/train/labels... 521 images, 34 backgrounds, 0 corrupt: 100%|██████████| 521/521 [00:01<00:00,

albumentations: Blur(p=0.01, blur_limit=(3, 7)), MedianBlur(p=0.01, blur_limit=(3, 7)), ToGray(p=0.01), CLAHE(p=0.01, clip_limit=(1, 4.0), tile_gr

val: Scanning /content/Construction-Site-Safety-30/valid/labels... 114 images, 10 backgrounds, 0 corrupt: 100%|██████████| 114/114 [00:00<00:00, 5

Plotting labels to runs/detect/train/labels.jpg...

optimizer: 'optimizer=auto' found, ignoring 'lr0=0.01' and 'momentum=0.937' and determining best 'optimizer', 'lr0' and 'momentum' automatically..
optimizer: AdamW(lr=0.000345, momentum=0.9) with parameter groups 57 weight(decay=0.0), 64 weight(decay=0.0005), 63 bias(decay=0.0)

TensorBoard: model graph visualization added

Image sizes 640 train, 640 val

Using 0 dataloader workers

Logging results to runs/detect/train

Starting training for 10 epochs...

Closing dataloader mosaic

albumentations: Blur(p=0.01, blur_limit=(3, 7)), MedianBlur(p=0.01, blur_limit=(3, 7)), ToGray(p=0.01), CLAHE(p=0.01, clip_limit=(1, 4.0), tile_gr

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
1/10	0G	1.426	4.516	1.461	95	640: 100% ██████████ 33/33 [07:07<00:00, 12.95s/it]
	Class	Images	Instances	Box(P	R	mAP50 mAP50-95): 100% ██████████ 4/4 [00:30<00:00, 7.66s/it]

Epoch	GPU_mem	box_loss	cls_loss	dfl_loss	Instances	Size
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```
model.predict(source='/content/Construction-Site-Safety-30/test/images',
              conf=0.25,
              iou=0.7,
              save=True)
```

```

image 1/82 /content/Construction-Site-Safety-30/test/images/-4405-_png.jpg.rf.937688313347dbcd3b24201dd7882906.jpg: 640x640 (no detections), 247.6
image 2/82 /content/Construction-Site-Safety-30/test/images/000005.jpg.rf.c613c066b79795d219855aca269760e6.jpg: 448x640 1 Hardhat, 2 NO-Hardhats,
image 3/82 /content/Construction-Site-Safety-30/test/images/002551.jpg.rf.b09484b130c1587abfa8365c3d774bf1.jpg: 448x640 2 Hardhats, 1 NO-Mask, 7 N
image 4/82 /content/Construction-Site-Safety-30/test/images/003357.jpg.rf.9fb1f2cebc239b4276a81ce2cbf9e911.jpg: 480x640 1 Person, 1 Safety Cone, 1
image 5/82 /content/Construction-Site-Safety-30/test/images/004063.jpg.rf.6ecc587c20a87ec176841aea39b8f5db.jpg: 448x640 4 Hardhats, 4 NO-Safety Ve
image 6/82 /content/Construction-Site-Safety-30/test/images/004763.jpg.rf.c8f1bd1cb7cf6037f7c90a6c213d6364.jpg: 384x640 3 Hardhats, 1 NO-Hardhat,
image 7/82 /content/Construction-Site-Safety-30/test/images/006463.jpg.rf.f134bfc3f96f0e501a027414ffffcc82.jpg: 448x640 14 Hardhats, 2 Masks, 4 NO
image 8/82 /content/Construction-Site-Safety-30/test/images/006672.jpg.rf.657b0a9ecd720d07ca5dd75338a058d5.jpg: 448x640 6 Hardhats, 6 Persons, 5 S
image 9/82 /content/Construction-Site-Safety-30/test/images/0.jpg.rf.209c19e4338c1f03ab706bb5a60a7ebc.jpg: 384x640 3 Persons, 4 Safety Vests, 125.
image 10/82 /content/Construction-Site-Safety-30/test/images/2008_008320.jpg.rf.a1f52d3537abe3e294e37dd0476e3213.jpg: 480x640 1 NO-Hardhat, 1 NO-S
image 11/82 /content/Construction-Site-Safety-30/test/images/2008_008519.jpg.rf.25dde55db72f63ad185c58fef6f641669.jpg: 480x640 2 Persons, 3 Safety
image 12/82 /content/Construction-Site-Safety-30/test/images/2009_000059.jpg.rf.fdad92b3365ec373f467210a8e174d5.jpg: 448x640 1 NO-Mask, 2 Persons
image 13/82 /content/Construction-Site-Safety-30/test/images/2009_000496.jpg.rf.526febe2671041fd29a3610fcc8fc5e.jpg: 480x640 2 Persons, 156.0ms
image 14/82 /content/Construction-Site-Safety-30/test/images/3e7e40981ddd4c0b55c7ffe4c2af5d8.jpg.rf.b567109d2ee96ef70202417c57d54716.jpg: 640x640
image 15/82 /content/Construction-Site-Safety-30/test/images/777.jpg.rf.27d751af375f635de7f523cd8b2c880d.jpg: 640x448 2 Persons, 1 Safety Cone, 1
image 16/82 /content/Construction-Site-Safety-30/test/images/Bookstore_More_Merchandise.jpg.rf.8e11c8031e6cb962d94630cf0051bd3c.jpg: 640x640 (no d
image 17/82 /content/Construction-Site-Safety-30/test/images/IMG_0871_MOV-12.jpg.rf.5b7840ad63e4e8a855d568b0466886d9.jpg: 640x384 1 Mask, 1 NO-Har
image 18/82 /content/Construction-Site-Safety-30/test/images/IMG_0871_mp4-11.jpg.rf.077108e2788da772f239603052c49ee1.jpg: 640x384 1 Mask, 1 NO-Har
image 19/82 /content/Construction-Site-Safety-30/test/images/IMG_0871_mp4-23.jpg.rf.29e223be9ce24464a75d15cf808ed496.jpg: 640x384 1 Mask, 1 NO-Har
image 20/82 /content/Construction-Site-Safety-30/test/images/IMG_3100_mp4-12.jpg.rf.f5426fa2b87a0cdfb03f2a6aff0f44f4.jpg: 640x384 1 Mask, 1 NO-Har
image 21/82 /content/Construction-Site-Safety-30/test/images/IMG_3100_mp4-9.jpg.rf.d54541c51751c2cb0338583189e24839.jpg: 640x384 1 Mask, 1 NO-Hard
image 22/82 /content/Construction-Site-Safety-30/test/images/IMG_3103_mp4-9.jpg.rf.2214fc01d9fda8c5aee91f19700d8a15.jpg: 640x384 2 Masks, 2 NO-Har
image 23/82 /content/Construction-Site-Safety-30/test/images/IMG_5846.jpg.rf.f82d7ebbe6b6c050cacb8a7e0ff64424.jpg: 448x640 32 Hardhats, 3 NO-Safet
image 24/82 /content/Construction-Site-Safety-30/test/images/Image36.jpg.rf.137e9f15ce037d4f965dd8b538091cd5.jpg: 640x640 3 Glovess, 6 Hardhats, 5
image 25/82 /content/Construction-Site-Safety-30/test/images/Inside-merge_mov-58.jpg.rf.d047f7eb88be9e76af0186ea28f0a2dcb.jpg: 640x384 (no detectio
image 26/82 /content/Construction-Site-Safety-30/test/images/Movie-on-10-31-22-at-10_08-AM_mov-20.jpg.rf.4268dff03e46f99b21f374eeec482ea.jpg: 448
image 27/82 /content/Construction-Site-Safety-30/test/images/Movie-on-10-31-22-at-10_08-AM_mov-24.jpg.rf.95ec6998880e7bb081f76b11a5e978e9.jpg: 448
image 28/82 /content/Construction-Site-Safety-30/test/images/NX_img_177.jpg.rf.96ecd1df106d0d0386ff1f8f03877833.jpg: 384x640 1 Hardhat, 3 NO-Hardh
image 29/82 /content/Construction-Site-Safety-30/test/images/RPRplay_Final1667001201_MP4-100.jpg.rf.fdb27274140f19750e4dc2b4afb5b639.jpg: 640x640
image 30/82 /content/Construction-Site-Safety-30/test/images/autox3_mp4-187.jpg.rf.f6dbfa62978709b34eb0eff8566a95e6.jpg: 384x640 4 Safety Cones, 1
image 31/82 /content/Construction-Site-Safety-30/test/images/autox3_mp4-277.jpg.rf.7ac59b2be1a8dfb27585b0be147c2488.jpg: 384x640 6 Safety Cones, 1
image 32/82 /content/Construction-Site-Safety-30/test/images/autox3_mp4-65.jpg.rf.26810af3536770a87b688d05b11371c1.jpg: 384x640 3 Safety Cones, 1
image 33/82 /content/Construction-Site-Safety-30/test/images/autox_mp4-44.jpg.rf.317f7a695014ece74d16ffe43006d6b3.jpg: 384x640 1 Person, 5 Safety
image 34/82 /content/Construction-Site-Safety-30/test/images/bookstore_44_08_flickr.jpg.rf.d8a84f735b617392112d3522df586dd8.jpg: 640x480 3 NO-Mask
image 35/82 /content/Construction-Site-Safety-30/test/images/class1_150.jpg.rf.a3502c0a13f5c127ed58b8a0beb8db7e.jpg: 640x384 3 Hardhats, 2 Ladders
image 36/82 /content/Construction-Site-Safety-30/test/images/class2_131.jpg.rf.cf84f49dae7b8935651cf49b1c4700c8.jpg: 640x384 1 Hardhat, 2 Ladders,
image 37/82 /content/Construction-Site-Safety-30/test/images/class2_145.jpg.rf.0b9591cc733f21d8544822f33b755a4b.jpg: 640x384 1 Ladder, 1 NO-Hardha
image 38/82 /content/Construction-Site-Safety-30/test/images/construction-1159-.jpg.rf.f9a51910ef9772d402665f109a955a27.jpg: 640x640 1 dump truck,
image 39/82 /content/Construction-Site-Safety-30/test/images/construction-192-.jpg.rf.71d09a9d5a1b4ff3e266176c4ecba2af.jpg: 448x640 1 dump truck,
image 40/82 /content/Construction-Site-Safety-30/test/images/construction-2-_mp4-13.jpg.rf.36956cedb12777fcc7a4598371a735f3.jpg: 384x640 1 dump tr
image 41/82 /content/Construction-Site-Safety-30/test/images/construction-2-_mp4-162.jpg.rf.edc08e7528429b4315f59637aaf65cf0.jpg: 384x640 2 wheel
image 42/82 /content/Construction-Site-Safety-30/test/images/construction-2-_mp4-84.jpg.rf.33dc035ad31b50143a399f673d2ac5b9.jpg: 384x640 1 dump tr
image 43/82 /content/Construction-Site-Safety-30/test/images/construction-275-.jpg.rf.493424daf6048b6dfdb021e36c8f88f.jpg: 448x640 (no detections
image 44/82 /content/Construction-Site-Safety-30/test/images/construction-597-.jpg.rf.9dd911d5f3d52dbb9d39f53a586e727.jpg: 448x640 3 dump trucks,
image 45/82 /content/Construction-Site-Safety-30/test/images/construction-639-.jpg.rf.fdd330cae93414106cdd1b97a1657d11a.jpg: 448x640 1 dump truck,
image 46/82 /content/Construction-Site-Safety-30/test/images/construction-651-.jpg.rf.83efd7c849c41cf9a0e0b5369eeefedf.jpg: 448x640 1 Person, 1 du
image 47/82 /content/Construction-Site-Safety-30/test/images/construction-675-.jpg.rf.b84f55bdd16f9e64e8933d093eedd012.jpg: 448x640 2 Persons, 1 d
image 48/82 /content/Construction-Site-Safety-30/test/images/construction-800-.jpg.rf.512a681c007f270bddfc17f40904de9b.jpg: 448x640 1 dump truck,
image 49/82 /content/Construction-Site-Safety-30/test/images/construction-843-.jpg.rf.fb01746c72b5356a4d9722b38f29fac6.jpg: 448x640 1 dump truck,
image 50/82 /content/Construction-Site-Safety-30/test/images/image_53.jpg.rf.126c05efe93729b667ca2860e6fd0ac3.jpg: 480x640 2 Glovess, 1 Hardhat, 1
image 51/82 /content/Construction-Site-Safety-30/test/images/image_55.jpg.rf.51b5b121599680f79fff1ad2d6aefba0.jpg: 480x640 1 Gloves, 1 Hardhat, 1
image 52/82 /content/Construction-Site-Safety-30/test/images/ka_01181_png.jpg.rf.9c3964077521e121d1bc9b552af45413.jpg: 448x640 1 Excavator, 4 Safe
image 53/82 /content/Construction-Site-Safety-30/test/images/librairie_51.jpg.rf.8379541dc5031c3582290fba26a0cdcf.jpg: 640x640 (no detections), 20
image 54/82 /content/Construction-Site-Safety-30/test/images/maksssksskss17_png.jpg.rf.92a0c41078e0ebbbc5210f350413156a.jpg: 640x512 1 Mask, 1 NO-
image 55/82 /content/Construction-Site-Safety-30/test/images/ppe_0018.jpg.rf.7b9c376fd49f5537eb4a7fed3e4d3b1.jpg: 480x640 2 Hardhats, 1 NO-Mask,
image 56/82 /content/Construction-Site-Safety-30/test/images/ppe_1073.jpg.rf.92536fa1d42874966bc7622b6f87290a.jpg: 416x640 7 Hardhats, 6 NO-Masks,

```

코딩을 시작하거나 AI로 코드를 생성하세요.

