

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

```
/content
fatal: destination path 'yolov5' already exists and is not an empty directory.
```

```
%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)
Requirement already satisfied: PyYAML>=5.3.1 in /usr/local/lib/python3.7/dist-packages (from -r requirements.txt (line 8)) (6.0)
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)) (1.9.0+cu111)
Requirement already satisfied: torchvision>=0.8.1 in /usr/local/lib/python3.7/dist-packages (from -r requirements.txt (line 12)) (0.10.0+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)) (2.6.0)
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)
Requirement already satisfied: thop in /usr/local/lib/python3.7/dist-packages (from -r requirements.txt (line 36)) (0.0.31.post2005241907)
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: 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)) (0.10.0)
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)) (2.8.1)
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.txt (line 9)) (1.25.11)
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)) (3.7.4.3)
Requirement already satisfied: absl-py>=0.4 in /usr/local/lib/python3.7/dist-packages (from tensorboard>=2.4.1->-r requirements.txt (line 16)) (0.12.0)
Requirement already satisfied: protobuf>=3.6.0 in /usr/local/lib/python3.7/dist-packages (from tensorboard>=2.4.1->-r requirements.txt (line 16)) (3.17.3)
Requirement already satisfied: grpcio>=1.24.3 in /usr/local/lib/python3.7/dist-packages (from tensorboard>=2.4.1->-r requirements.txt (line 16)) (1.41.0)
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 (line 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)) (1.6.0)
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: wheel>=0.26 in /usr/local/lib/python3.7/dist-packages (from tensorboard>=2.4.1->-r requirements.txt (line 16)) (0.37.0)
Requirement already satisfied: tensorboard-data-server<0.7.0,>=0.6.0 in /usr/local/lib/python3.7/dist-packages (from tensorboard>=2.4.1->-r requirements.txt (line 16)) (0.6.0)
```

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)) (50.0.0)
Requirement already satisfied: markdown>=2.6.8 in /usr/local/lib/python3.7/dist-packages (from tensorboard>=2.4.1->-r requirements.txt (line 16)) (3.3.6)
Requirement already satisfied: google-auth<2,>=1.6.3 in /usr/local/lib/python3.7/dist-packages (from tensorboard>=2.4.1->-r requirements.txt (line 16)) (2.1.0)
Requirement already satisfied: pytz>=2017.2 in /usr/local/lib/python3.7/dist-packages (from pandas>=1.1.4->-r requirements.txt (line 20)) (2018.9)
Requirement already satisfied: six in /usr/local/lib/python3.7/dist-packages (from absl-py>=0.4->tensorboard>=2.4.1->-r requirements.txt (line 16)) (1.12.0)
Requirement already satisfied: pyasn1-modules>=0.2.1 in /usr/local/lib/python3.7/dist-packages (from google-auth<2,>=1.6.3->tensorboard>=2.4.1->-r requirements.txt (line 16)) (0.2.8)
Requirement already satisfied: cachetools<5.0,>=2.0.0 in /usr/local/lib/python3.7/dist-packages (from google-auth<2,>=1.6.3->tensorboard>=2.4.1->-r requirements.txt (line 16)) (4.1.1)
Requirement already satisfied: rsa<5,>=3.1.4 in /usr/local/lib/python3.7/dist-packages (from google-auth<2,>=1.6.3->tensorboard>=2.4.1->-r requirements.txt (line 16)) (4.7.2)
Requirement already satisfied: requests-oauthlib>=0.7.0 in /usr/local/lib/python3.7/dist-packages (from google-auth-oauthlib<0.5,>=0.4.1->tensorboard>=2.4.1->-r requirements.txt (line 16)) (1.3.0)
Requirement already satisfied: importlib-metadata in /usr/local/lib/python3.7/dist-packages (from markdown>=2.6.8->tensorboard>=2.4.1->-r requirements.txt (line 16)) (4.2.0)
Requirement already satisfied: pyasn1<0.5.0,>=0.4.6 in /usr/local/lib/python3.7/dist-packages (from pyasn1-modules>=0.2.1->google-auth<2,>=1.6.3->tensorboard>=2.4.1->-r requirements.txt (line 16)) (0.4.8)
Requirement already satisfied: oauthlib>=3.0.0 in /usr/local/lib/python3.7/dist-packages (from requests-oauthlib>=0.7.0->google-auth-oauthlib<0.5,>=0.4.1->tensorboard>=2.4.1->-r requirements.txt (line 16)) (3.1.0)
Requirement already satisfied: zipp>=0.5 in /usr/local/lib/python3.7/dist-packages (from importlib-metadata->markdown>=2.6.8->tensorboard>=2.4.1->-r requirements.txt (line 16)) (3.6.0)

```
%cd /  
from glob import glob  
  
img_list=glob('/content/dataset/images/*.jpg')  
print(len(img_list))  
  
/  
154  
  
from sklearn.model_selection import train_test_split  
  
train_img_list, val_img_list=train_test_split(img_list, test_size=0.1, random_state=0)  
print(len(train_img_list), len(val_img_list))  
  
138 16  
  
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')  
  
import yaml
```

dataform= {'train': '/content/dataset/train.txt', 'val': '/content/dataset/val.txt', 'nc': 2, 'names' : ['crop', 'juk']}

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

%cat /content/dataset/data.yaml

```
names:
- crop
- juk
nc: 2
train: /content/dataset/train.txt
val: /content/dataset/val.txt
```

%cd /content/yolov5/

!python train.py --img 640 --batch 16 --epochs 30 --data /content/dataset/data.yaml --cfg ./models/yolov5s.yaml --weights yolov5s.pt --name grain_results

12/29	OG	0.1161	0.1936	0.007976	1386	640: 100% 6/6 [03:03<00:00, 30.56s/it]
	Class	Images	Labels	P	R	mAP@.5 mAP@.5:.95: 0% 0/1 [00:00<?, ?it/s]WARNING: NMS time limit 10.0s exceeded
	Class	Images	Labels	P	R	mAP@.5 mAP@.5:.95: 100% 1/1 [00:22<00:00, 22.15s/it]
	all	12	1012	0.0847	0.151	0.0655 0.0141
Epoch	gpu_mem	box	obj	cls	labels	img_size
13/29	OG	0.1121	0.2076	0.007568	1510	640: 100% 6/6 [02:57<00:00, 29.61s/it]
	Class	Images	Labels	P	R	mAP@.5 mAP@.5:.95: 100% 1/1 [00:19<00:00, 19.90s/it]
	all	12	1012	0.101	0.146	0.0689 0.0146
Epoch	gpu_mem	box	obj	cls	labels	img_size
14/29	OG	0.1098	0.2135	0.006453	843	640: 100% 6/6 [02:59<00:00, 29.92s/it]
	Class	Images	Labels	P	R	mAP@.5 mAP@.5:.95: 100% 1/1 [00:19<00:00, 19.15s/it]
	all	12	1012	0.604	0.165	0.0818 0.0171
Epoch	gpu_mem	box	obj	cls	labels	img_size
15/29	OG	0.1075	0.2199	0.005999	1329	640: 100% 6/6 [03:07<00:00, 31.17s/it]
	Class	Images	Labels	P	R	mAP@.5 mAP@.5:.95: 100% 1/1 [00:17<00:00, 17.86s/it]
	all	12	1012	0.614	0.15	0.0837 0.0172
Epoch	gpu_mem	box	obj	cls	labels	img_size
16/29	OG	0.1041	0.1986	0.005434	1045	640: 100% 6/6 [03:01<00:00, 30.33s/it]
	Class	Images	Labels	P	R	mAP@.5 mAP@.5:.95: 100% 1/1 [00:17<00:00, 17.42s/it]
	all	12	1012	0.618	0.18	0.096 0.0204

Epoch	gpu_mem	box	obj	cls	labels	img_size	
17/29	OG	0.1017	0.2044	0.004964	985	640:	100% 6/6 [03:02<00:00, 30.35s/it]
	Class	Images	Labels	P	R	mAP@.5	mAP@.5:.95: 100% 1/1 [00:16<00:00, 16.86s/it]
	all	12	1012	0.621	0.19	0.0995	0.0208
Epoch	gpu_mem	box	obj	cls	labels	img_size	
18/29	OG	0.1002	0.2189	0.005108	1352	640:	100% 6/6 [03:10<00:00, 31.69s/it]
	Class	Images	Labels	P	R	mAP@.5	mAP@.5:.95: 100% 1/1 [00:17<00:00, 17.87s/it]
	all	12	1012	0.64	0.198	0.118	0.0253
Epoch	gpu_mem	box	obj	cls	labels	img_size	
19/29	OG	0.09766	0.2247	0.004897	769	640:	100% 6/6 [03:02<00:00, 30.38s/it]
	Class	Images	Labels	P	R	mAP@.5	mAP@.5:.95: 100% 1/1 [00:16<00:00, 16.10s/it]
	all	12	1012	0.636	0.206	0.118	0.0258
Epoch	gpu_mem	box	obj	cls	labels	img_size	
20/29	OG	0.09851	0.2262	0.005278	1191	640:	100% 6/6 [03:02<00:00, 30.33s/it]
	Class	Images	Labels	P	R	mAP@.5	mAP@.5:.95: 100% 1/1 [00:15<00:00, 15.75s/it]
	all	12	1012	0.638	0.227	0.134	0.029
Epoch	gpu_mem	box	obj	cls	labels	img_size	
21/29	OG	0.09674	0.2111	0.004326	1353	640:	100% 6/6 [03:09<00:00, 31.61s/it]
	Class	Images	Labels	P	R	mAP@.5	mAP@.5:.95: 100% 1/1 [00:15<00:00, 15.40s/it]
	all	12	1012	0.141	0.271	0.152	0.0348
Epoch	gpu_mem	box	obj	cls	labels	img_size	
22/29	OG	0.09709	0.2103	0.004401	1402	640:	100% 6/6 [03:04<00:00, 30.70s/it]
	Class	Images	Labels	P	R	mAP@.5	mAP@.5:.95: 100% 1/1 [00:14<00:00, 14.71s/it]
	all	12	1012	0.163	0.251	0.158	0.0365
Epoch	gpu_mem	box	obj	cls	labels	img_size	
23/29	OG	0.09168	0.2216	0.004604	1008	640:	100% 6/6 [03:03<00:00, 30.65s/it]
	Class	Images	Labels	P	R	mAP@.5	mAP@.5:.95: 100% 1/1 [00:14<00:00, 14.72s/it]
	all	12	1012	0.177	0.224	0.168	0.0266

%load_ext tensorboard

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

The tensorboard extension is already loaded. To reload it, use:
`%reload_ext tensorboard`

TensorBoard

SCALARS

IMAGES

GRAPHS

TIME SERIES

INACTIVE

🔍 Filter runs (regex)

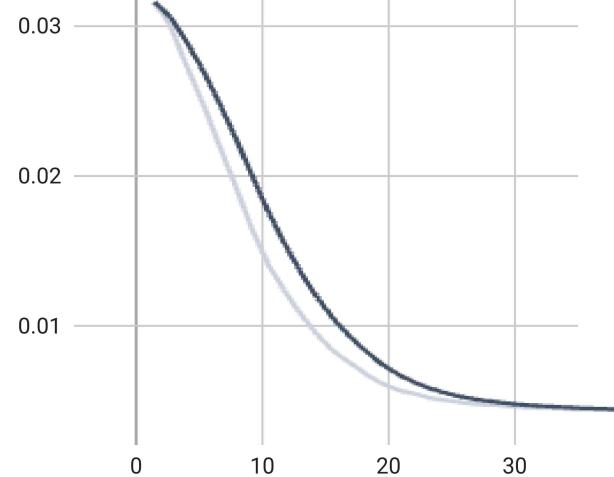
☒ Run

☒ train/grain_results

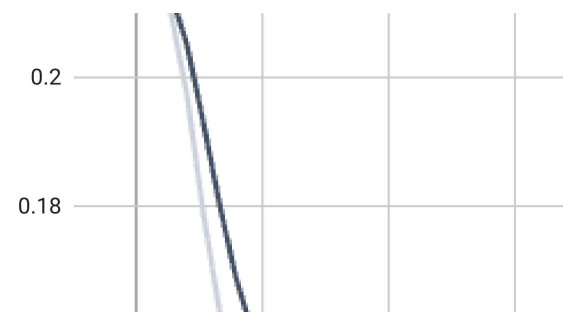
🔍 Filter tags (regex)

⚙️ Settings

cls_loss



obj_loss



Settings

GENERAL

Horizontal Axis

Step

SCALARS

Smoothing

0.6

Tooltip sorting method

Default

☒ Ignore outliers in chart scaling

☐ Partition non-monotonic X axis

HISTOGRAMS

Mode

Offset

IMAGES

Brightness

0.16

Contrast

```
!python detect.py --weights ./runs/train/grain_results/weights/best.pt --img 640 --conf 0.5 --source '/content/dataset/images/20210913_225822.jpg'
```

```
detect: weights=['./runs/train/grain_results/weights/best.pt'], source=/content/dataset/images/20210913_225822.jpg, imgsz=[640, 640], conf_thres=0.5,  
YOLOv5 🚀 v6.0-43-g19c8760 torch 1.9.0+cu111 CPU
```

Fusing layers...

Model Summary: 213 layers, 7015519 parameters, 0 gradients, 15.8 GFLOPs

image 1/1 /content/dataset/images/20210913_225822.jpg: 384x640 145 crops, Done. (0.207s)

Speed: 1.1ms pre-process, 206.8ms inference, 1.7ms NMS per image at shape (1, 3, 640, 640)

Results saved to runs/detect/exp

! 27초 오후 10:42에 완료됨

