

```
!git clone https://github.com/ultralytics/yolov5 # clone repo
%cd yolov5
!git reset --hard 886f1c03d839575afecb059accf74296fad395b6
```

```
Cloning into 'yolov5'...
remote: Enumerating objects: 10896, done.
remote: Total 10896 (delta 0), reused 0 (delta 0), pack-reused 10896
Receiving objects: 100% (10896/10896), 11.04 MiB | 14.49 MiB/s, done.
Resolving deltas: 100% (7520/7520), done.
/content/yolov5
HEAD is now at 886f1c0 DDP after autoanchor reorder (#2421)
```

```
!pip install -qr requirements.txt # install dependencies (ignore errors)
import torch
```

596 kB 4.4 MB/s

```
from IPython.display import Image, clear_output # to display images
from utils.google_utils import gdrive_download
```

```
print('Setup complete. Using torch %s %s' % (torch.__version__, torch.cuda.get_device_properties(0) if
```

```
Setup complete. Using torch 1.10.0+cu111 _CudaDeviceProperties(name='Tesla K80', major=3, minor=7)
```

Saved successfully!

```
from roboflow import Roboflow
rf = Roboflow(model_format="yolov5", notebook="roboflow-yolov5")
```

145 kB	6.0 MB/s
178 kB	30.0 MB/s
138 kB	37.2 MB/s
1.1 MB	42.9 MB/s
67 kB	5.8 MB/s
63 kB	1.7 MB/s

```
Building wheel for wget (setup.py) ... done
```

```
ERROR: pip's dependency resolver does not currently take into account all the packages that are in
google-colab 1.0.0 requires requests~2.23.0, but you have requests 2.27.1 which is incompatible.
datascience 0.10.6 requires folium==0.2.1, but you have folium 0.8.3 which is incompatible.
albumentations 0.1.12 requires imgaug<0.2.7,>=0.2.5, but you have imgaug 0.2.9 which is incompatil
upload and label your dataset, and get an API KEY here: https://app.roboflow.com/?model=yolov5&re
```

```
%cd /content/yolov5
```

/content/yolov5

```
!pip install roboflow
```

```
from roboflow import Roboflow
rf = Roboflow(api_key="H2SX1fYGaKbcwQ1Pi8to")
project = rf.workspace().project("fire-om9ay")
dataset = project.version(1).download("yolov5")
```

```
Requirement already satisfied: roboflow in /usr/local/lib/python3.7/dist-packages (0.2.2)
Requirement already satisfied: tqdm>=4.41.0 in /usr/local/lib/python3.7/dist-packages (from roboflow) (4.41.0)
Requirement already satisfied: urllib3==1.26.6 in /usr/local/lib/python3.7/dist-packages (from roboflow) (1.26.6)
Requirement already satisfied: Pillow>=7.1.2 in /usr/local/lib/python3.7/dist-packages (from roboflow) (7.1.2)
Requirement already satisfied: python-dateutil in /usr/local/lib/python3.7/dist-packages (from roboflow) (2.8.1)
Requirement already satisfied: numpy>=1.18.5 in /usr/local/lib/python3.7/dist-packages (from roboflow) (1.19.5)
Requirement already satisfied: matplotlib in /usr/local/lib/python3.7/dist-packages (from roboflow) (3.3.0)
Requirement already satisfied: pyparsing==2.4.7 in /usr/local/lib/python3.7/dist-packages (from roboflow) (2.4.7)
Requirement already satisfied: wget in /usr/local/lib/python3.7/dist-packages (from roboflow) (3.0)
Requirement already satisfied: opencv-python>=4.1.2 in /usr/local/lib/python3.7/dist-packages (from roboflow) (4.5.1.2)
Requirement already satisfied: idna==2.10 in /usr/local/lib/python3.7/dist-packages (from roboflow) (2.10)
Requirement already satisfied: certifi==2021.5.30 in /usr/local/lib/python3.7/dist-packages (from roboflow) (2021.5.30)
Requirement already satisfied: six in /usr/local/lib/python3.7/dist-packages (from roboflow) (1.16.0)
Requirement already satisfied: PyYAML>=5.3.1 in /usr/local/lib/python3.7/dist-packages (from roboflow) (5.4.1)
Requirement already satisfied: cycycler==0.10.0 in /usr/local/lib/python3.7/dist-packages (from roboflow) (0.10.0)
Requirement already satisfied: chardet==4.0.0 in /usr/local/lib/python3.7/dist-packages (from roboflow) (4.0.0)
Requirement already satisfied: kiwisolver==1.3.1 in /usr/local/lib/python3.7/dist-packages (from roboflow) (1.3.1)
Requirement already satisfied: python-dotenv in /usr/local/lib/python3.7/dist-packages (from roboflow) (0.19.0)
Requirement already satisfied: requests in /usr/local/lib/python3.7/dist-packages (from roboflow) (2.27.0)
Requirement already satisfied: charset-normalizer~=2.0.0 in /usr/local/lib/python3.7/dist-packages (from roboflow) (2.0.9)
loading Roboflow workspace...
loading Roboflow project...
Downloading Dataset Version Zip in fire-1 to yolov5pytorch: 100% [427731 / 427731] bytes
Extracting Dataset Version Zip to fire-1 in yolov5pytorch:: 100%|██████████| 52/52 [00:00<00:00, 1.00MB/s]
```

Saved successfully!



```
%cat {'/content/yolov5/fire-1'}/data.yaml
```

```
names:
- fire
- ground
- sky
- smoke
- tree leaves
- tree
- trees
nc: 7
train: fire-1/train/images
val: fire-1/valid/images
```

```
import yaml
with open("/content/yolov5/fire-1" + "/data.yaml", 'r') as stream:
    num_classes = str(yaml.safe_load(stream)['nc'])
```

```
%cat /content/yolov5/models/yolov5s.yaml
```

```
# parameters
nc: 80 # number of classes
```

```
depth_multiple: 0.33 # model depth multiple
width_multiple: 0.50 # layer channel multiple
```

```
# anchors
```

```
anchors:
```

```
- [10,13, 16,30, 33,23] # P3/8
- [30,61, 62,45, 59,119] # P4/16
- [116,90, 156,198, 373,326] # P5/32
```

```
# YOLOv5 backbone
```

```
backbone:
```

```
# [from, number, module, args]
[[-1, 1, Focus, [64, 3]], # 0-P1/2
 [-1, 1, Conv, [128, 3, 2]], # 1-P2/4
 [-1, 3, C3, [128]],
 [-1, 1, Conv, [256, 3, 2]], # 3-P3/8
 [-1, 9, C3, [256]],
 [-1, 1, Conv, [512, 3, 2]], # 5-P4/16
 [-1, 9, C3, [512]],
 [-1, 1, Conv, [1024, 3, 2]], # 7-P5/32
 [-1, 1, SPP, [1024, [5, 9, 13]]],
 [-1, 3, C3, [1024, False]], # 9
]
```

```
# YOLOv5 head
```

```
head:
```

```
[-1, 1, Conv, [512, 1, 1]],
 [-1, 1, nn.Upsample, [None, 2, 'nearest']],
 [[-1, 6], 1, Concat, [1]], # cat backbone P4
 [-1, 3, C3, [512, False]], # 13

[-1, 1, nn.Upsample, [None, 2, 'nearest']],
 [[-1, 4], 1, Concat, [1]], # cat backbone P3
 [-1, 3, C3, [256, False]], # 17 (P3/8-small)

[-1, 1, Conv, [256, 3, 2]],
 [[-1, 14], 1, Concat, [1]], # cat head P4
 [-1, 3, C3, [512, False]], # 20 (P4/16-medium)

[-1, 1, Conv, [512, 3, 2]],
 [[-1, 10], 1, Concat, [1]], # cat head P5
 [-1, 3, C3, [1024, False]], # 23 (P5/32-large)

[[17, 20, 23], 1, Detect, [nc, anchors]], # Detect(P3, P4, P5)
]
```

Saved successfully!



```
from IPython.core.magic import register_line_cell_magic
```

```
@register_line_cell_magic
```

```
def writetemplate(line, cell):
```

```
    with open(line, 'w') as f:
```

```
        f.write(cell.format(*globals()))
```

```
%%writetemplate /content/yolov5/models/custom_yolov5s.yaml
```

```

# parameters
nc: {num_classes} # number of classes
depth_multiple: 0.33 # model depth multiple
width_multiple: 0.50 # layer channel multiple

# anchors
anchors:
  - [10,13, 16,30, 33,23] # P3/8
  - [30,61, 62,45, 59,119] # P4/16
  - [116,90, 156,198, 373,326] # P5/32

# YOLOv5 backbone
backbone:
  # [from, number, module, args]
  [[-1, 1, Focus, [64, 3]], # 0-P1/2
  [-1, 1, Conv, [128, 3, 2]], # 1-P2/4
  [-1, 3, BottleneckCSP, [128]],
  [-1, 1, Conv, [256, 3, 2]], # 3-P3/8
  [-1, 9, BottleneckCSP, [256]],
  [-1, 1, Conv, [512, 3, 2]], # 5-P4/16
  [-1, 9, BottleneckCSP, [512]],
  [-1, 1, Conv, [1024, 3, 2]], # 7-P5/32
  [-1, 1, SPP, [1024, [5, 9, 13]]],
  [-1, 3, BottleneckCSP, [1024, False]], # 9
  ]

# YOLOv5 head
  [[-1, 1, Conv, [256, 3, 2]],
  [-1, 1, nn.Upsample, [None, 2, 'nearest']],
  [[-1, 6], 1, Concat, [1]], # cat backbone P4
  [-1, 3, BottleneckCSP, [512, False]], # 13

  [-1, 1, Conv, [256, 1, 1]],
  [-1, 1, nn.Upsample, [None, 2, 'nearest']],
  [[-1, 4], 1, Concat, [1]], # cat backbone P3
  [-1, 3, BottleneckCSP, [256, False]], # 17 (P3/8-small)

  [-1, 1, Conv, [256, 3, 2]],
  [[-1, 14], 1, Concat, [1]], # cat head P4
  [-1, 3, BottleneckCSP, [512, False]], # 20 (P4/16-medium)

  [-1, 1, Conv, [512, 3, 2]],
  [[-1, 10], 1, Concat, [1]], # cat head P5
  [-1, 3, BottleneckCSP, [1024, False]], # 23 (P5/32-large)

  [[17, 20, 23], 1, Detect, [nc, anchors]], # Detect(P3, P4, P5)
  ]

```

Saved successfully!



```

%%time
%cd /content/yolov5/

```

/content/yolov5

CPU times: user 1.49 ms, sys: 0 ns, total: 1.49 ms
Wall time: 17.5 ms

```
!pip install wandb
```

Collecting wandb

Downloading wandb-0.12.10-py2.py3-none-any.whl (1.7 MB)

████████████████████████████████████████ 1.7 MB 4.3 MB/s

Requirement already satisfied: six>=1.13.0 in /usr/local/lib/python3.7/dist-packages (from wandb)

Collecting sentry-sdk>=1.0.0

Downloading sentry_sdk-1.5.5-py2.py3-none-any.whl (144 kB)

████████████████████████████████████████ 144 kB 43.9 MB/s

Collecting docker-pycreds>=0.4.0

Downloading docker_pycreds-0.4.0-py2.py3-none-any.whl (9.0 kB)

Collecting GitPython>=1.0.0

Downloading GitPython-3.1.26-py3-none-any.whl (180 kB)

████████████████████████████████████████ 180 kB 40.1 MB/s

Requirement already satisfied: python-dateutil>=2.6.1 in /usr/local/lib/python3.7/dist-packages (from GitPython>=1.0.0)

Requirement already satisfied: protobuf>=3.12.0 in /usr/local/lib/python3.7/dist-packages (from wandb)

Requirement already satisfied: Click!=8.0.0,>=7.0 in /usr/local/lib/python3.7/dist-packages (from wandb)

Requirement already satisfied: requests<3,>=2.0.0 in /usr/local/lib/python3.7/dist-packages (from wandb)

Collecting yaspin>=1.0.0

Downloading yaspin-2.1.0-py3-none-any.whl (18 kB)

Requirement already satisfied: psutil>=5.0.0 in /usr/local/lib/python3.7/dist-packages (from wandb)

Requirement already satisfied: PyYAML in /usr/local/lib/python3.7/dist-packages (from wandb) (6.0)

Requirement already satisfied: promise<3,>=2.0 in /usr/local/lib/python3.7/dist-packages (from wandb)

Collecting shortuuid>=0.5.0

Downloading shortuuid-1.0.8-py3-none-any.whl (9.5 kB)

Saved successfully!



ar.gz (11 kB)

Downloading gitdb-4.0.9-py3-none-any.whl (63 kB)

████████████████████████████████████████ 63 kB 1.7 MB/s

Requirement already satisfied: typing-extensions>=3.7.4.3 in /usr/local/lib/python3.7/dist-packages (from gitdb-4.0.9)

Collecting smmap<6,>=3.0.1

Downloading smmap-5.0.0-py3-none-any.whl (24 kB)

Requirement already satisfied: urllib3<1.27,>=1.21.1 in /usr/local/lib/python3.7/dist-packages (from smmap-5.0.0)

Requirement already satisfied: charset-normalizer~=2.0.0 in /usr/local/lib/python3.7/dist-packages (from smmap-5.0.0)

Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.7/dist-packages (from smmap-5.0.0)

Requirement already satisfied: idna<4,>=2.5 in /usr/local/lib/python3.7/dist-packages (from smmap-5.0.0)

Requirement already satisfied: termcolor<2.0.0,>=1.1.0 in /usr/local/lib/python3.7/dist-packages (from smmap-5.0.0)

Building wheels for collected packages: pathtools

Building wheel for pathtools (setup.py) ... done

Created wheel for pathtools: filename=pathtools-0.1.2-py3-none-any.whl size=8806 sha256=79993bd1

Stored in directory: /root/.cache/pip/wheels/3e/31/09/fa59cef12cdcfecc627b3d24273699f390e718289

Successfully built pathtools

Installing collected packages: smmap, gitdb, yaspin, shortuuid, sentry-sdk, pathtools, GitPython,

Successfully installed GitPython-3.1.26 docker-pycreds-0.4.0 gitdb-4.0.9 pathtools-0.1.2 sentry-sd

```
##time
```

```
##cd /content/yolov5/
```

```
!python train.py --img 416 --batch 16 --epochs 50 --data {"/content/yolov5/fire-1"}/data.yaml --cfg ./m
```

github: ⚠ WARNING: code is out of date by 848 commits. Use 'git pull' to update or 'git clone'

Namespace(adam=False, batch_size=16, bucket='', cache_images=True, cfg='./models/custom_yolov5
 Start Tensorboard with "tensorboard --logdir runs/train", view at <http://localhost:6006/>
hyperparameters: lr0=0.01, lrf=0.2, momentum=0.937, weight_decay=0.0005, warmup_epochs=3.0, wa

	from	n	params	module	arguments
0	-1	1	3520	models.common.Focus	[3, 32, 3]
1	-1	1	18560	models.common.Conv	[32, 64, 3, 2]
2	-1	1	19904	models.common.BottleneckCSP	[64, 64, 1]
3	-1	1	73984	models.common.Conv	[64, 128, 3, 2]
4	-1	1	161152	models.common.BottleneckCSP	[128, 128, 3]
5	-1	1	295424	models.common.Conv	[128, 256, 3, 2]
6	-1	1	641792	models.common.BottleneckCSP	[256, 256, 3]
7	-1	1	1180672	models.common.Conv	[256, 512, 3, 2]
8	-1	1	656896	models.common.SPP	[512, 512, [5, 9,
9	-1	1	1248768	models.common.BottleneckCSP	[512, 512, 1, Fals
10	-1	1	131584	models.common.Conv	[512, 256, 1, 1]
11	-1	1	0	torch.nn.modules.upsampling.Upsample	[None, 2, 'nearest
12	[-1, 6]	1	0	models.common.Concat	[1]
13	-1	1	378624	models.common.BottleneckCSP	[512, 256, 1, Fals
14	-1	1	33024	models.common.Conv	[256, 128, 1, 1]
15	-1	1	0	torch.nn.modules.upsampling.Upsample	[None, 2, 'nearest
16	[-1, 4]	1	0	models.common.Concat	[1]
17	-1	1	95104	models.common.BottleneckCSP	[256, 128, 1, Fals
18	-1	1	147712	models.common.Conv	[128, 128, 3, 2]
19	[-1, 14]	1	0	models.common.Concat	[1]
20	-1	1	313088	models.common.BottleneckCSP	[256, 256, 1, Fals
21	-1	1	590336	models.common.Conv	[256, 256, 3, 2]
22	[-1, 10]	1	0	models.common.Concat	[1]
			768	models.common.BottleneckCSP	[512, 512, 1, Fals
			364	models.yolo.Detect	[7, [[10, 13, 16,

Saved successfully!



/usr/local/lib/python3.7/dist-packages/torch/functional.py:445: UserWarning: torch.meshgrid: i
 return _VF.meshgrid(tensors, **kwargs) # type: ignore[attr-defined]

Model Summary: 283 layers, 7271276 parameters, 7271276 gradients, 16.9 GFLOPS

Scaled weight_decay = 0.0005

Optimizer groups: 62 .bias, 70 conv.weight, 59 other

wandb: (1) Create a W&B account

wandb: (2) Use an existing W&B account

wandb: (3) Don't visualize my results

wandb: Enter your choice: 3

wandb: You chose 'Don't visualize my results'

wandb: **WARNING** `resume` will be ignored since W&B syncing is set to `offline`. Starting a new

wandb: W&B syncing is set to `offline` in this directory.

wandb: Run `wandb online` or set WANDB_MODE=online to enable cloud syncing.

train: Scanning 'fire-1/train/labels.cache' for images and labels... 14 found, 0 missing, 0 em

train: Caching images (0.0GB): 100% 14/14 [00:00<00:00, 466.60it/s]

val: Scanning 'fire-1/valid/labels' for images and labels... 4 found, 0 missing, 0 empty, 0 co

val: New cache created: fire-1/valid/labels.cache

val: Caching images (0.0GB): 100% 4/4 [00:00<00:00, 195.35it/s]

Plotting labels...

autoanchor: Analyzing anchors... anchors/target = 4.33, Best Possible Recall (BPR) = 1.0000

Image sizes 416 train, 416 test

```
# Start tensorboard
# Start tensorboard
# Launch after you have started training
# logs save in the folder "runs"
%load_ext tensorboard
%tensorboard --logdir runs
```

The tensorboard extension is already loaded. To reload it, use:
%reload_ext tensorboard
Reusing TensorBoard on port 6006 (pid 331), started 0:05:15 ago. (Use '!kill 331' to kill it.)

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

Tooltip sorting method:

default

Smoothing

0.6

Horizontal Axis

Saved successfully!

X

WALL

Runs

Write a regex to filter runs

☐

☐

train/yolov5s_results

☐

☐

train/yolov5s_results2

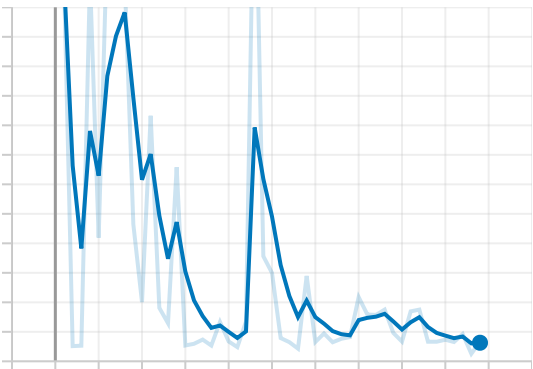
TOGGLE ALL RUNS

runs

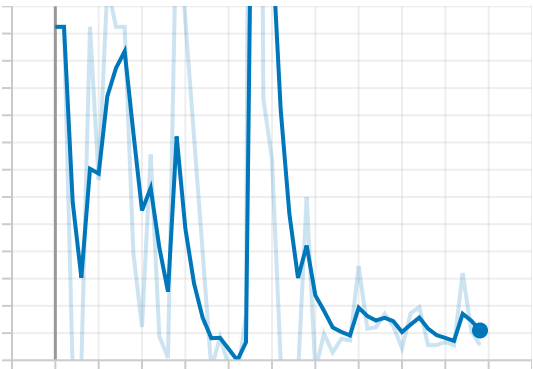
Filter tags (regular expressions supported)

metrics

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



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



metrics/precision
tag: metrics/precision




```
print("GROUND TRUTH TRAINING DATA:")
```

```
Image(filename='/content/yolov5/runs/train/yolov5s_results2/train_batch0.jpg', width=900)
```

GROUND TRUTH TRAINING DATA:




```
#print out an augmented training example
```

```
print("GROUND TRUTH AUGMENTED TRAINING DATA:")
```

```
Image(filename='/content/yolov5/runs/train/yolov5s_results2/train_batch1.jpg', width=900)
```

GROUND TRUTH AUGMENTED TRAINING DATA:



```
%ls runs/
```

```
train/
```

```
%ls /content/yolov5/runs/train/yolov5s_results/weights
```

```
%cd /content/yolov5/
```

```
!python detect.py --weights runs/train/yolov5s_results2/weights/best.pt --img 416 --conf 0.4 --source /
```

```
/content/yolov5
```

```
Namespace(agnostic_nms=False, augment=False, classes=None, conf_thres=0.4, device='', exist_ok=False,
YOLOv5 v4.0-126-g886f1c0 torch 1.10.0+cu111 CUDA:0 (Tesla K80, 11441.1875MB)
```

```
Fusing layers...
```

```
/usr/local/lib/python3.7/dist-packages/torch/functional.py:445: UserWarning: torch.meshgrid: in an
return _VF.meshgrid(tensors, **kwargs) # type: ignore[attr-defined]
```

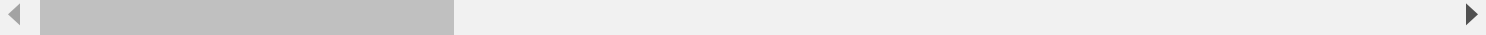
```
Model Summary: 232 layers, 7262700 parameters, 0 gradients, 16.8 GFLOPS
```

```
image 1/2 /content/yolov5/fire-1/test/images/abc009_jpg.rf.c1fecb857427be39124defb8c5a0650c.jpg: 4
```

```
image 2/2 /content/yolov5/fire-1/test/images/abc014_jpg.rf.1a4244351671b9674d87e37a7554f077.jpg: 4
```

```
Results saved to runs/detect/exp2
```

```
Done. (0.089s)
```



Saved successfully!

