6 yolov4-tiny

yolov4-tiny official website: https://github.com/AlexeyAB/darknet

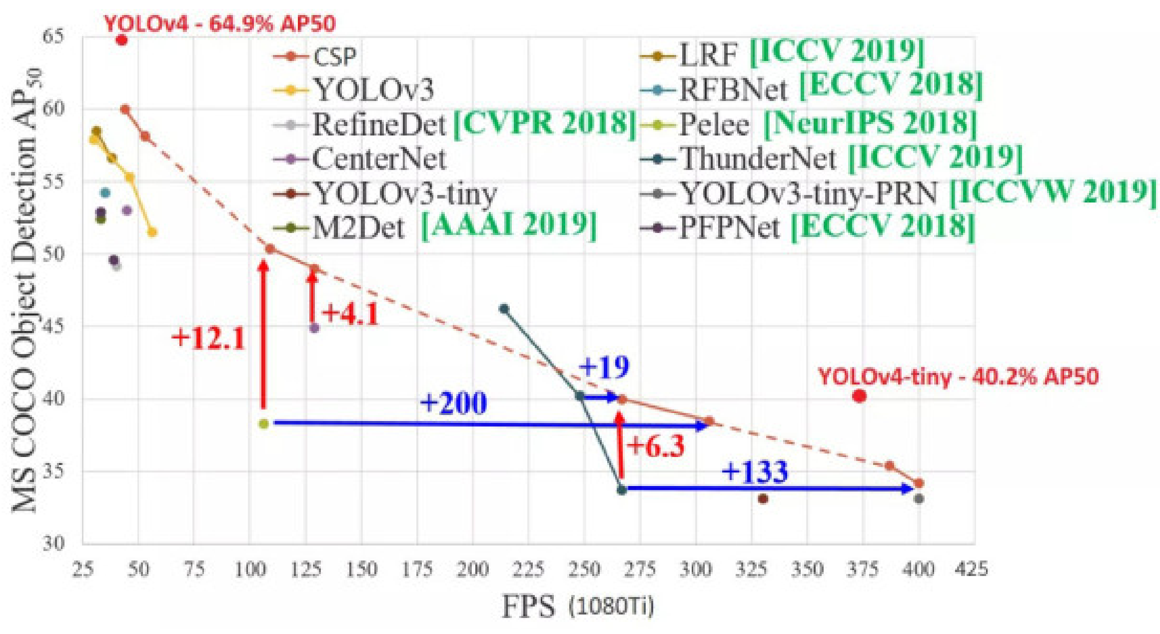
Source code: https://github.com/bubbliiiing/yolov4-tiny-tf2

6.1 Introduction

release time point

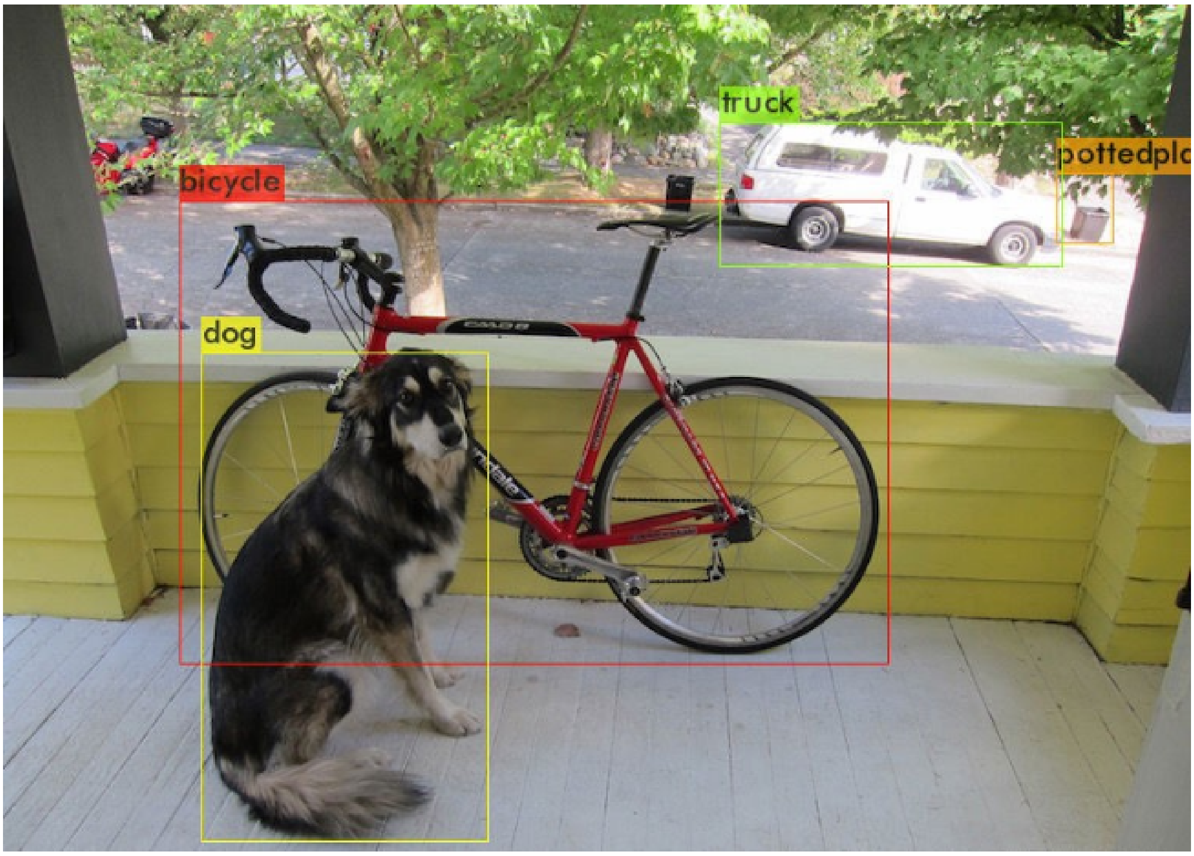
- 2020.04: YOLOv4 officially released
- 2020.06: YOLOv4-Tiny is officially released

The performance of YOLOv4-Tiny on COCO: **40.2% AP50, 371 FPS(GTX 1080 Ti)** Whether it is AP or FPS performance, it is a huge improvement compared to YOLOv3-Tiny, Pelee, and CSP, as shown in the figure below :



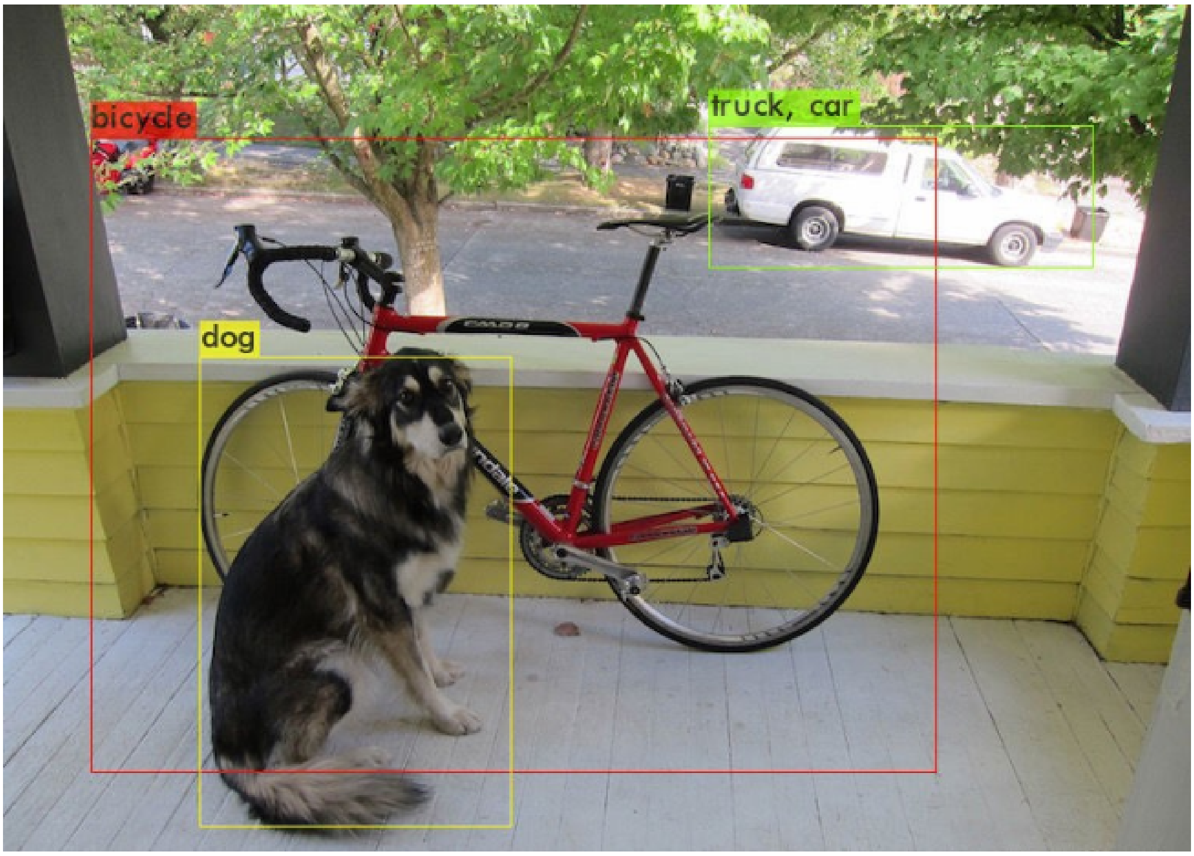
Comparison of YOLOv4 and YOLOv4-Tiny detection results, source network

YOLOv4 detection results




```
Done ! Loaded  162  layers  from  weights - file
data/dog.jpg :  Predicted  in  27.039000  milli - seconds.
bicycle :  92 %
dog :  98 %
truck :  92 %
pottedplant :  33 %
```

YOLOv4-Tiny detection results




```
Done ! Loaded  38  layers  from  weights - file
data/dog.jpg :  Predicted  in  2.609000  milli - seconds.
bicycle :  29 %
dog :  72 %
truck :  82 %
car :  46 %
```

We can see that the detection accuracy of Yolov4-tiny has decreased, but Yolov4-tiny has obvious advantages in terms of time consumption: Yolov4-tiny detection takes only 2.6 milliseconds, while Yolov4 detection takes 27 milliseconds, which is faster More than 10 times!

6.2 Use

Raspberry Pi version is supported. |
(Note: The Python version used on the Raspberry Pi is 3.7. Please use python3.7 when running commands!)

```
roslaunch yahboomcar_yolov4_tiny yolodetect.launch display:=true
```

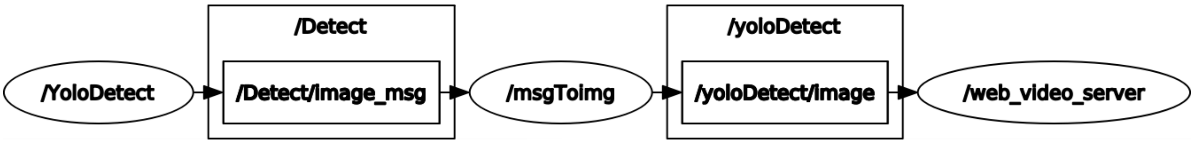
- [display] parameter: whether to enable the visual interface.

Support real-time monitoring of web pages, such as:

```
192.168.2.89:8080
```

View node information

```
rqt_graph
```



Print detection information

```
rostopic echo/DetectMsg
```

print as follows

```
data :
  -
    frame_id :  "person"
    stamp :
      secs :  1646128857
      nsecs :  530594825
    scores :  0.609634816647
    ptx :  109.685585022
    pty :  - 2.94450759888
    distw : 374.364135742
    disth : 236.672561646
    centerx :  187.182067871
    centery :  118.336280823
```

- frame_id: Identifying name.
- scores: Identify scores.
- ptx, pty: the coordinates of the upper left corner of the recognition box.
- distw, disth: The width and height of the recognition box.
- centerx, centery: Identify the center.

6.3 folder structure

```
yolov4 - tiny - tf2
├──  font                                # Store font package
|    └──  Block_Simplified.TTF
├──  garbage_data                        # dataset
|    ├──  GetData.py                      # Get the dataset code
|    ├──  image                           # target source file
|    ├──  JPEGImages                      # dataset images(as many as possible)
|    ├──  texture                         # background image(as many as possible)
|    └──  train The .txt                       label file corresponding to the
dataset image
├──  img                                 # store the test image
|    └──  1.j pg
├──  logs                                # Store the test log and the final
training model last1.h5.
├──  model_data                          # Store the pre-trained model(weight
file)
|    ├──  coco.txt
|    ──  garbage.h5
|    ├──  garbage # .txt                        Custom label file(corresponding to
the target source file)
|    ├──  yolo_anchors.txt
```

```
|     ├──  yolov4_tiny_weights_coco.h5     # weights file
|     └──  yolov4_tiny_weights_voc.h5      # weights file
├── predict_img .py  # detection Image                      code
├── predict_video .py  # detection video                    code
├──  README.md
├──  train # .py                              training model code
├──  utils                                 # library file
└──  yolo_nets                             # Network structure library file
```

The concept of anchor box was introduced in the YOLO-v2 version, which greatly increased the performance of target detection. The essence of anchor is the reverse of the idea of SPP(spatial pyramid pooling), and what SPP itself does is to combine different sizes The input resize becomes the output of the same size, so the inverse of SPP is to push the output of the same size backward to get the input of different size.

6.4 Environmental requirements

The factory image is already configured, no need to install

```
tensorflow-gpu==2.2.0
lxml
matplotlib
pandas
Pillow
scikit-learn
seaborn
tqdm
imgaug
```

Installation example

```
pip install imgaug
```

6.5 Custom training data set

6.5.1 Making a dataset

Method 1: Take some photos first, use the annotation tool to mark the target on each photo, create a [train.txt] file under the [garbage_data] folder, and write the target information in a specific format.

Method 2: Put background images(as many as possible) in the [garbage_data/texture] folder, modify the [GetData.py] code as required, and execute [GetData.py] to generate a dataset(as many as possible).

The name of the image and the label file should correspond. The label format in the [train.txt] file is as follows:

```
./garbage_data/JPEGImages/0.j, pg, 113, 163 293  #, 298, image, 9 label y  y + w, x + h,
```

Take method 2 as an example.

Open the [GetData.py] file

```
sudo vim GetData.py
```

Modify the total number of generated datasets and fill in as required. [More], too few datasets will lead to suboptimal training results.

```
img_total = 10000
```

Run the [GetData.py] file to get the dataset

```
python3 GetData.py
```

6.5.2 Add weight file

There are good weight files(pre-training model) [yolov4_tiny_weights_coco.h5] and [yolov4_tiny_weights_voc.h5] under the [model_data] file. Choose one of the two, and recommend coco's weight file.

If you need the latest weight file, you can download it by Baidu search.

6.5.3 Make label file

Be careful not to use Chinese labels and no spaces in the folder!

For example: garbage.txt

```
Zip_top_can
Old_school_bag
Newspaper
Book
Toilet_paper
 …
```

6.5.4 Modify the train.py file

According to your needs, refer to the notes to modify.

```
#tag position
annotation_path  =  'garbage_data/train.txt'
# Get the location of classes and anchors
classes_path  =  'model_data/garbage.txt'
anchors_path  =  'model_data/yolo_anchors.txt'
# The location of the pretrained model
weights_path  =  'model_data/yolov4_tiny_weights_coco.h5'
# get classes and anchors
class_names  =  get_classes(classes_path)
anchors  =  get_anchors(anchors_path)
# How many classes are there in total
num_classes  =  len(class_names)
num_anchors  =  len(anchors)
# The location where the trained model is saved
log_dir  =  'logs/'
```

```
# Enter the image size, if the video memory is relatively large, you can use 608x608
input_shape  =(416, 416)
# initial eTOCh value
Init_eTOCh  =  0
# Freeze training eTOCh values
Freeze_eTOCh  =  50
# The size of Batch_size, which indicates how much data is fed each time. If OOM or insufficient video memory, please reduce it.
batch_size  =  16
# max learning rate
learning_rate_base  =  1e-3
# total eTOCh value
ETOCh  =  100
```

According to the above process, after the operation is completed, you can directly run the [train.py] file for training.

```
python3 train.py
```

6.5.5 Model checking

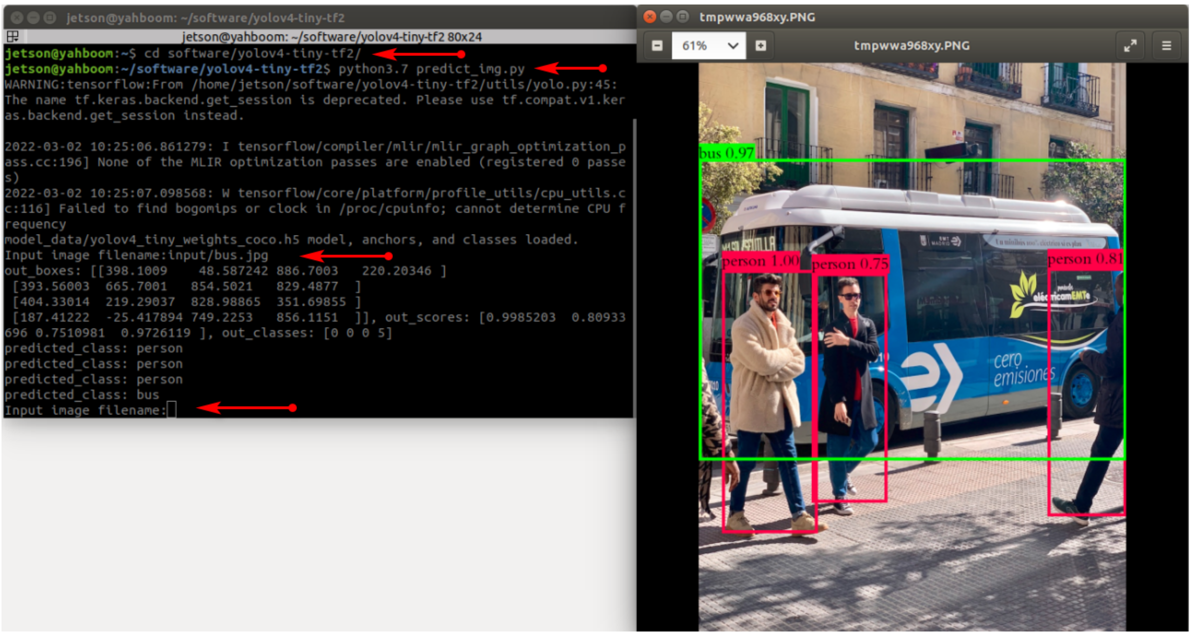
- Modify the yolov4-tiny-tf2/utils/yolo.py file

```
class  YOLO(object):
    _defaults  = {
        # For detection, the trained model path.
        "model_path" :  'model_data/garbage.h5',
        # yolo's model parameter anchors path
        "anchors_path" :  'model_data/yolo_anchors.txt',
        # Custom label file path
        "classes_path" :  'model_data/garbage.txt',
        "score"  :  0.5,
        "iou"  :  0.3,
        "eager"  :  False,
        # Use 416x416 by default(image size)
        "model_image_size"  :(416, 416)
}
 …
# font package path
self.font_path  =  'font/Block_Simplified.TTF'
```

- Image detection

```
python3 predict_img.py
```

During this period, you need to manually input the image to be detected, as shown below:



- Video detection

```
python3 predict_video.py
```