

yolov5

1 What is YOLO?

YOLO, an acronym for 'You only look once', is an algorithm for object detection that divides images into a grid system. Each cell in the grid is responsible for detecting objects or objects whose physical center point falls within the network itself. YOLO is one of the most famous object detection algorithms due to its speed and accuracy.

2. What is YOLO V5

YOLO V5 is an open source version of YOLO developed by Ultralytics and is completely implemented based on PyTorch, which has brought good news to a large number of AI personnel. While we were still amazed at YOLOv4's various cool operations and rich experimental comparisons, YOLOv5 brought stronger, real-time, and more accurate target detection technology.

1. Faster and more real-time According to official figures, the current version of YOLOv5 has the fastest inference time of 0.007 seconds per image, that is, 140 frames per second (FPS). On the CPU, the inference time of each image is as fast as 7ms. , meaning 140 frames per second (FPS)! Far greater than the 20 frames required by the human eye. In comparison, YOLOv4 can only reach 50 frames under the same conditions. On the GPU, the FPS is higher, up to 400.
2. Smaller (less memory) The weight file size of YOLOv5 is only 1/9 of YOLOv4.
3. Shorter training time. In the case of a single V-100 GPU, the training time of YOLOv5 on the COCO 2017 data set is:

YOLOv5 s	YOLOv5 m	YOLOv5 l	YOLOv5 x
2天	4天	6天	8天

This chapter is suitable for building the Raspberry Pi 5B official image by yourself. If you are using the YAHBOOM version of the image, this tutorial can be ignored.

Required hardware: Raspberry Pi 5B

The hardware is Raspberry Pi 5B 4G version, and the python version is 3.11

Install PyTorch

The official download URL is: https://download.pytorch.org/whl/torch_stable.html

[Jinja2-3.1.2-py3-none-any.whl](#)
[MarkupSafe-2.1.2-cp310-cp310-macosx_10_9_universal2.whl](#)
[MarkupSafe-2.1.2-cp310-cp310-macosx_10_9_x86_64.whl](#)
[MarkupSafe-2.1.2-cp310-cp310-manylinux_2_17_x86_64.manylinux2014_x86_64.whl](#)
[MarkupSafe-2.1.2-cp310-cp310-win_amd64.whl](#)
[MarkupSafe-2.1.2-cp311-cp311-macosx_10_9_universal2.whl](#)
[MarkupSafe-2.1.2-cp311-cp311-macosx_10_9_x86_64.whl](#)
[MarkupSafe-2.1.2-cp311-cp311-manylinux_2_17_x86_64.manylinux2014_x86_64.whl](#)
[MarkupSafe-2.1.2-cp311-cp311-win_amd64.whl](#)
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[MarkupSafe-2.1.2-cp38-cp38-macosx_10_9_x86_64.whl](#)
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[MarkupSafe-2.1.2-cp39-cp39-macosx_10_9_x86_64.whl](#)
[MarkupSafe-2.1.2-cp39-cp39-manylinux_2_17_x86_64.manylinux2014_x86_64.whl](#)
[MarkupSafe-2.1.2-cp39-cp39-win_amd64.whl](#)
[MarkupSafe-2.1.3-cp310-cp310-macosx_10_9_universal2.whl](#)
[MarkupSafe-2.1.3-cp310-cp310-macosx_10_9_x86_64.whl](#)
[MarkupSafe-2.1.3-cp310-cp310-manylinux_2_17_aarch64.manylinux2014_aarch64.whl](#)
[MarkupSafe-2.1.3-cp310-cp310-manylinux_2_17_x86_64.manylinux2014_x86_64.whl](#)
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[MarkupSafe-2.1.3-cp311-cp311-macosx_10_9_universal2.whl](#)
[MarkupSafe-2.1.3-cp311-cp311-macosx_10_9_x86_64.whl](#)
[MarkupSafe-2.1.3-cp311-cp311-manylinux_2_17_aarch64.manylinux2014_aarch64.whl](#)
[MarkupSafe-2.1.3-cp311-cp311-manylinux_2_17_x86_64.manylinux2014_x86_64.whl](#)
[MarkupSafe-2.1.3-cp311-cp311-win_amd64.whl](#)
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[MarkupSafe-2.1.3-cp312-cp312-macosx_10_9_x86_64.whl](#)
[MarkupSafe-2.1.3-cp312-cp312-manylinux_2_17_aarch64.manylinux2014_aarch64.whl](#)
[MarkupSafe-2.1.3-cp312-cp312-manylinux_2_17_x86_64.manylinux2014_x86_64.whl](#)
[MarkupSafe-2.1.3-cp312-cp312-win_amd64.whl](#)
[MarkupSafe-2.1.3-cp38-cp38-macosx_10_9_universal2.whl](#)
[MarkupSafe-2.1.3-cp38-cp38-macosx_10_9_x86_64.whl](#)
[MarkupSafe-2.1.3-cp38-cp38-manylinux_2_17_aarch64.manylinux2014_aarch64.whl](#)
[MarkupSafe-2.1.3-cp38-cp38-manylinux_2_17_x86_64.manylinux2014_x86_64.whl](#)
[MarkupSafe-2.1.3-cp38-cp38-win_amd64.whl](#)

If you download it yourself, you need to find the corresponding torch and torchvision versions.

This experiment downloaded torch-2.1.2-cp311-cp311-manylinux_2_17_aarch64.manylinux2014_aarch64.whl and torchvision-0.16.2-cp311-cp311-linux_aarch64.whl

The above two files can be obtained from the attachment and transferred to the Raspberry Pi through winSCP

Installation command:

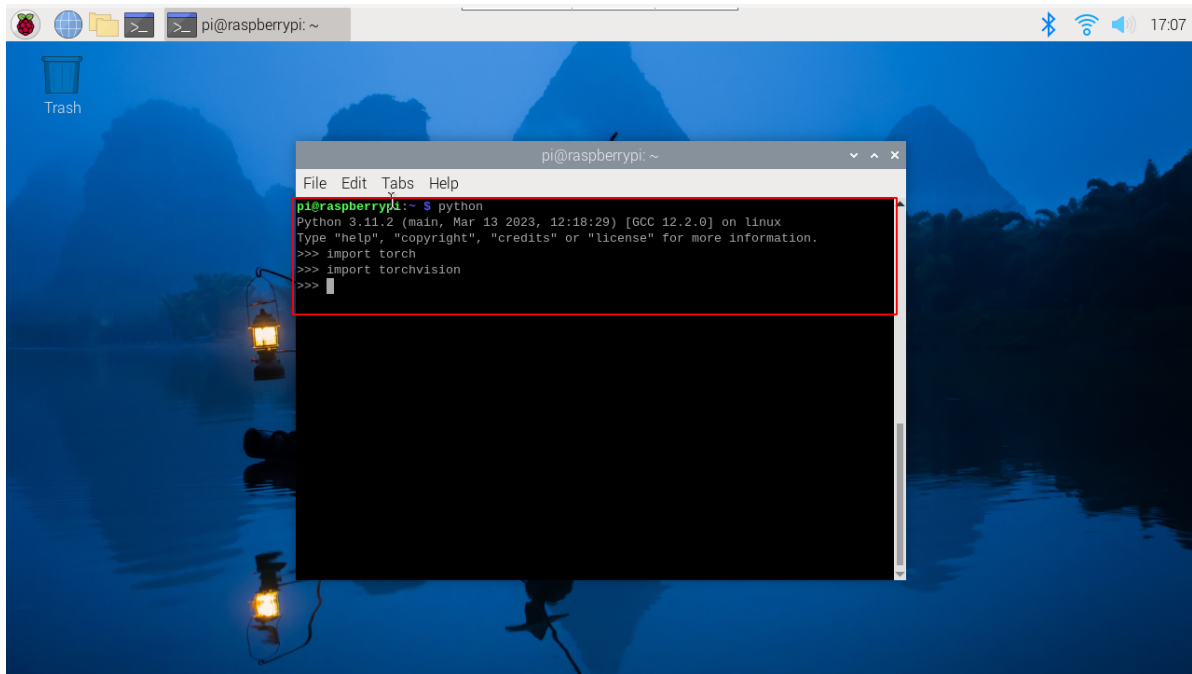
```
pip3 install torch-2.1.2-cp311-cp311-  
manylinux_2_17_aarch64.manylinux2014_aarch64.whl  
  
pip3 install torchvision-0.16.2-cp311-cp311-linux_aarch64.whl
```

After the installation is complete, update numpy

```
sudo pip3 install numpy --upgrade --ignore-installed
```

Check whether the installation is successful

If you run as shown below and there are no errors, it means the installation is successful.



Download the source code of yolov5

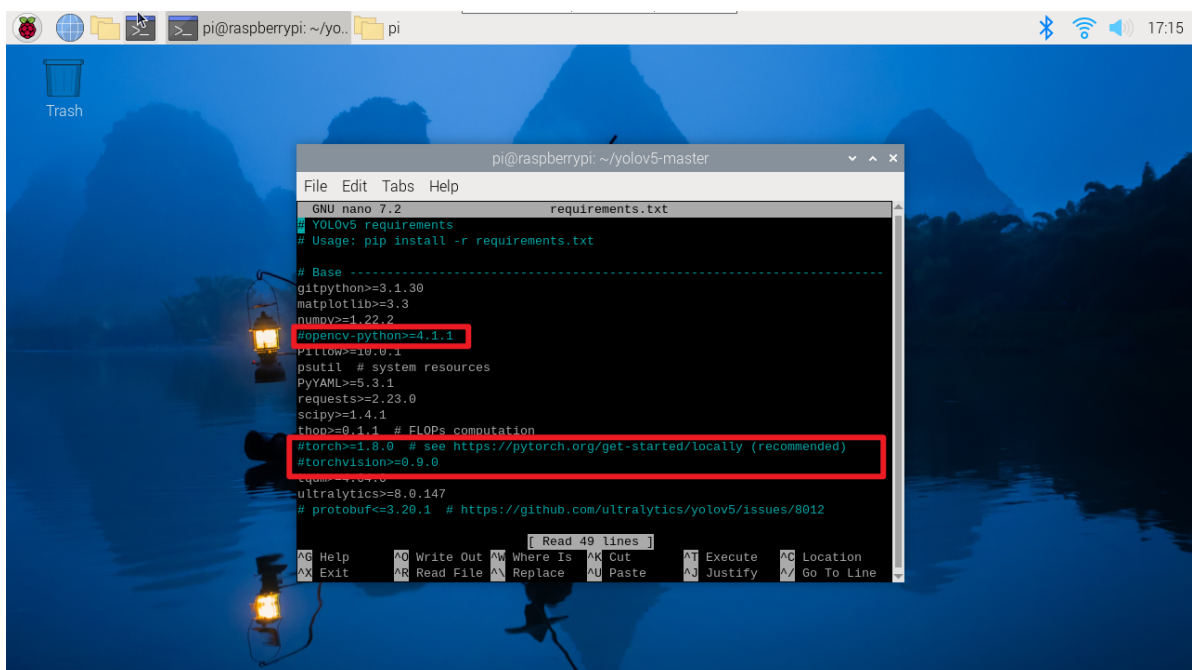
Can be obtained from the attachment and uploaded to the Raspberry Pi via winscp

You can also get it directly from (<https://github.com/ultralytics/yolov5>), and then upload the file to the Raspberry Pi through winscp.

Install yolov5 environment running program

```
cd /home/pi/yolov5-master/ #This is to enter the yolov5 folder in your Raspberry
Pi system
sudo nano requirements.txt
```

Comment out the lines corresponding to torch, opencv and torchvision in the file, then save and exit the file.



Download the installation package

pip3 install requirements.txt

The picture below indicates successful installation

```
Downloading Pillow-10.1.0-cp311-cp311-manylinux_2_28_aarch64.whl (3.5 MB)
Requirement already satisfied: psutil in /usr/lib/python3/dist-packages (from -r requirements.txt (line 10)) (5.9.4)
Requirement already satisfied: PyYAML>=5.3.1 in /usr/local/lib/python3.11/dist-packages (from -r requirements.txt (line 11)) (6.0.1)
Requirement already satisfied: requests>=2.23.0 in /usr/local/lib/python3.11/dist-packages (from -r requirements.txt (line 12)) (2.31.0)
Collecting scitype-1.4.1
  Downloading scitype-1.4.1-cp311-cp311-manylinux_2_17_aarch64_musl-manylinux2014_aarch64.whl (32.9 MB)
  32.9/32.9 MB 0.3 MB/s eta 0:00:00
Collecting thop>=0.1.1
  Downloading thop-0.1.1.post2209072238-py3-none-any.whl (15 kB)
Collecting tqdm>=4.66.0
  Downloading https://www.piwheels.org/simple/tqdm/tqdm-4.66.1-py3-none-any.whl (78 kB)
  78.3/78.3 kB 133.1 kB/s eta 0:00:00
Collecting ultralytics>=8.0.147
  Downloading https://www.piwheels.org/simple/ultralytics/ultralytics-8.0.227-py3-none-any.whl (660 kB)
  660.5/660.5 kB 816.0 kB/s eta 0:00:00
Collecting pandas>=1.4
  Downloading pandas-2.1.4-cp311-cp311-manylinux_2_17_aarch64_musl-manylinux2014_aarch64.whl (14.8 MB)
  14.8/14.8 MB 10.4 MB/s eta 0:00:00
Collecting seaborn>=0.11.0
  Downloading https://www.piwheels.org/simple/seaborn/seaborn-0.13.0-py3-none-any.whl (294 kB)
  294.6/294.6 kB 368.4 kB/s eta 0:00:00
Requirement already satisfied: setuptools==65.5.1 in /usr/lib/python3/dist-packages (from -r requirements.txt (line 42)) (66.1.1)
Collecting gitdb<5,>=4.0.1
  Downloading https://www.piwheels.org/simple/gitdb/gitdb-4.0.11-py3-none-any.whl (62 kB)
  62.0/62.0 kB 78.0 MB/s eta 0:00:00
Requirement already satisfied: contourpy==1.0.1 in /home/pi/.local/lib/python3.11/site-packages (from matplotlib>=3.3.0->-r requirements.txt (line 6)) (1.2.0)
Requirement already satisfied: cycler==0.10 in /home/pi/.local/lib/python3.11/site-packages (from matplotlib>=3.3.0->-r requirements.txt (line 6)) (0.12.1)
Requirement already satisfied: fonttools==4.22.0 in /home/pi/.local/lib/python3.11/site-packages (from matplotlib>=3.3.0->-r requirements.txt (line 6)) (4.47.0)
Requirement already satisfied: kiwisolver==1.3.1 in /home/pi/.local/lib/python3.11/site-packages (from matplotlib>=3.3.0->-r requirements.txt (line 6)) (1.4.5)
Requirement already satisfied: packaging==20.0 in /usr/local/lib/python3.11/dist-packages (from matplotlib>=3.3.0->-r requirements.txt (line 6)) (23.2)
Requirement already satisfied: pyparsing==2.3.1 in /home/pi/.local/lib/python3.11/site-packages (from matplotlib>=3.3.0->-r requirements.txt (line 6)) (3.1.1)
Requirement already satisfied: python-dateutil==2.2 in /usr/local/lib/python3.11/dist-packages (from matplotlib>=3.3.0->-r requirements.txt (line 6)) (2.8.2)
Requirement already satisfied: charset-normalizer<4,>=2 in /usr/lib/python3/dist-packages (from requests>=2.23.0->-r requirements.txt (line 12)) (3.0.1)
Requirement already satisfied: idna==2.5 in /usr/lib/python3/dist-packages (from requests>=2.23.0->-r requirements.txt (line 12)) (3.3)
Requirement already satisfied: urllib3<=1.21.1 in /usr/lib/python3/dist-packages (from requests>=2.23.0->-r requirements.txt (line 12)) (1.26.12)
Requirement already satisfied: certifi==2017.4.17 in /usr/lib/python3/dist-packages (from requests>=2.23.0->-r requirements.txt (line 12)) (2022.9.24)
Requirement already satisfied: torch in /home/pi/.local/lib/python3.11/site-packages (from thop>=0.1.1->-r requirements.txt (line 14)) (2.1.2)
Collecting opencv-python-4.0
  Downloading opencv-python-4.8.1.78-cp37-abi3-manylinux_2_17_aarch64_musl-manylinux2014_aarch64.whl (41.0 MB)
  41.0/41.0 MB 6.0 MB/s eta 0:00:00
Requirement already satisfied: torchvision==0.10 in /home/pi/.local/lib/python3.11/site-packages (from ultralytics>=8.0.147->-r requirements.txt (line 18)) (0.16.2)
Collecting py-cpuinfo
  Downloading https://www.piwheels.org/simple/py-cpuinfo/py-cpuinfo-9.0.0-py3-none-any.whl (22 kB)
Requirement already satisfied: pytz==2020.1 in /usr/lib/python3/dist-packages (from pandas>=1.4->-r requirements.txt (line 27)) (2022.7.1)
Collecting tzdata>=2022.1
  Downloading https://www.piwheels.org/simple/tzdata/tzdata-2023.3-py3-none-any.whl (341 kB)
  341.0/341.0 kB 816.8 kB/s eta 0:00:00
Collecting smmap>=3.0.1
  Downloading https://www.piwheels.org/simple/smmap/smmap-5.0.1-py3-none-any.whl (24 kB)
Requirement already satisfied: sime==1.5 in /usr/lib/python3/dist-packages (from python-dateutil==2.7->-r requirements.txt (line 6)) (1.16.0)
Requirement already satisfied: filelock in /home/pi/.local/lib/python3.11/site-packages (from torch>thop>=0.1.1->-r requirements.txt (line 14)) (3.13.1)
Requirement already satisfied: typing-extensions in /usr/lib/python3/dist-packages (from torch>thop>=0.1.1->-r requirements.txt (line 14)) (4.4.0)
Requirement already satisfied: sympy in /home/pi/.local/lib/python3.11/site-packages (from torch>thop>=0.1.1->-r requirements.txt (line 14)) (1.12)
Requirement already satisfied: networkx in /home/pi/.local/lib/python3.11/site-packages (from torch>thop>=0.1.1->-r requirements.txt (line 14)) (3.2.1)
Requirement already satisfied: imageio in /usr/lib/python3/dist-packages (from torch>thop>=0.1.1->-r requirements.txt (line 14)) (3.1.2)
Requirement already satisfied: imageio-ffmpeg in /home/pi/.local/lib/python3.11/site-packages (from torch>thop>=0.1.1->-r requirements.txt (line 14)) (2023.12.2)
Requirement already satisfied: imageio-ffmpeg in /home/pi/.local/lib/python3.11/site-packages (from torch>thop>=0.1.1->-r requirements.txt (line 14)) (1.3.0)
Installing collected packages: py-cpuinfo, tzdata, torch, torchvision, opencv-python, pandas, numpy, scitype, thop, seaborn, matplotlib, ultralytics
Successfully installed Pillow-10.1.0 gitdb-4.0.11 gitpython-3.1.40 opencv-python-4.8.1.78 pandas-2.1.4 py-cpuinfo-9.0.0 scitype-1.4.1 seaborn-0.13.0 smmap-5.0.1 thop-0.1.1.post2209072238 tqdm-4.66.1 tzdata-2023.3 ultralytics-8.0.227
```

Use camera detection

```
cd /home/pi/yolov5-usb / # This goes into the yolov5 folder on your Raspberry pi system, suitable for USB camera
python3 detect.py --source 0

cd /home/pi/yolov5-csi / # This is the yolov5 folder that goes into your Raspberry pi system, suitable for CSI camera
python3 detect.py --source 0
```

