

# yolov5 environment setup

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## 1 What is YOLO?

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YOLO is the acronym for 'You only look once' and is an algorithm for object detection that divides an image 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

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

1. Faster and more real-time According to the official numbers, the current version of YOLOv5 has a fastest inference time of 0.007 seconds per image, that is, 140 frames per second (FPS). On the CPU, the inference time per image is as fast as 7ms, which means 140 frames per second (FPS)! Far greater than the human eye's requirement of 20 frames. In contrast, 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 that of YOLOv4.
3. Shorter training time YOLOv5 under a single V-100 GPU

**This chapter is suitable for self-build of the official image of Raspberry Pi 5B. If you are using the YAHBOOM version of the image, this tutorial can be ignored.**

Required hardware: one Raspberry Pi 5B

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

## Install PyTorch

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Official download link: [https://download.pytorch.org/whl/torch\\_stable.html](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](#)  
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[MarkupSafe-2.1.2-cp38-cp38-macosx\\_10\\_9\\_universal2.whl](#)  
[MarkupSafe-2.1.2-cp38-cp38-macosx\\_10\\_9\\_x86\\_64.whl](#)  
[MarkupSafe-2.1.2-cp38-cp38-manylinux\\_2\\_17\\_x86\\_64.manylinux2014\\_x86\\_64.whl](#)  
[MarkupSafe-2.1.2-cp38-cp38-win\\_amd64.whl](#)  
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[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](#)  
[MarkupSafe-2.1.3-cp310-cp310-win\\_amd64.whl](#)  
[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](#)  
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[MarkupSafe-2.1.3-cp312-cp312-manylinux\\_2\\_17\\_x86\\_64.manylinux2014\\_x86\\_64.whl](#)  
[MarkupSafe-2.1.3-cp312-cp312-win\\_amd64.whl](#)  
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[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 downloads 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 via winSCP**

Installation command:

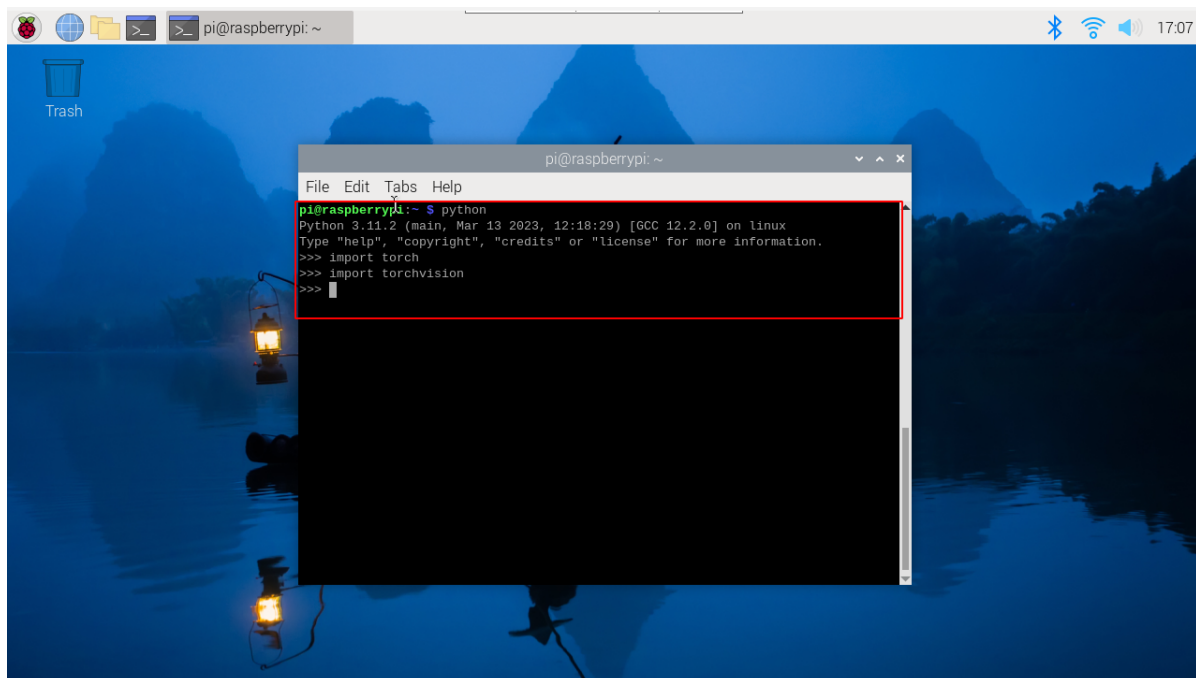
```
pip3 install torch-2.1.2-cp311-cp311-  
manylinux_2_17_aarch64.manylinux2014_aarch64.whl  
  
pip3 install torchvision-0.16.2-cp311-cp311-linux_aarch64.whl
```

After the installation is complete, update numpy

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

Verify whether the installation is successful

If there is no error message when running as shown below, it means the installation is successful



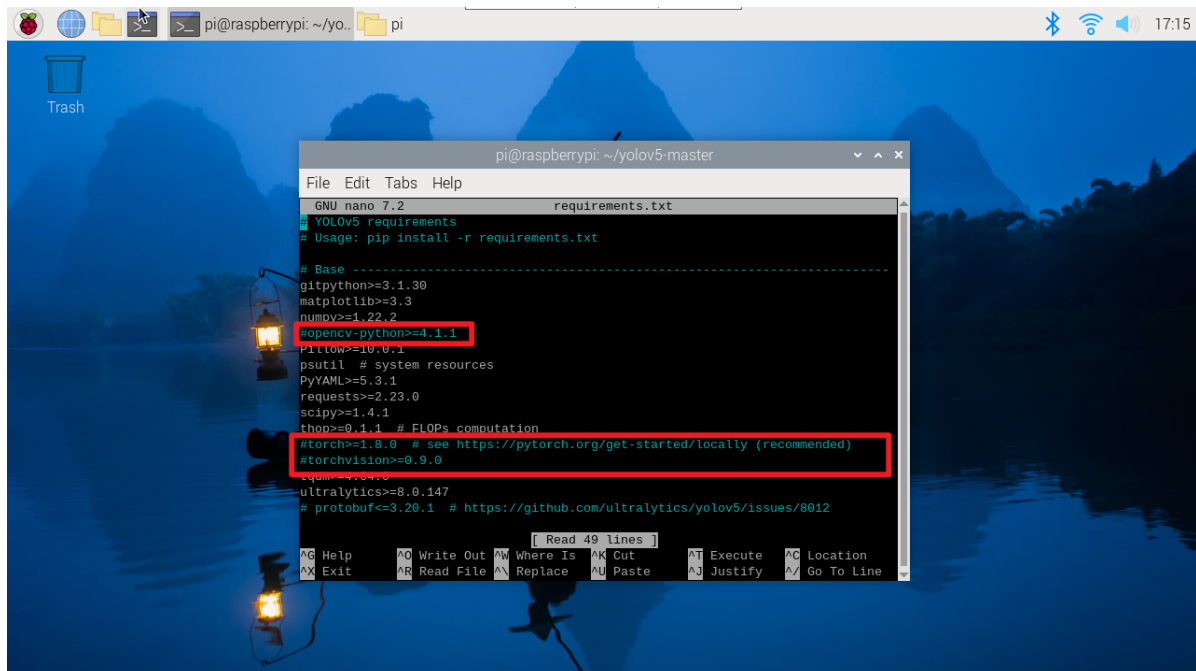
## Download the source code of yolov5

Get it from the attachment and upload it to the Raspberry Pi via winscp

## Install the yolov5 environment to run the program

```
cd /home/pi/yolov5-CSI/  
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 following figure shows that the installation is successful

```

Downloading Pillow-10.1.0-cp311-cp311-manylinux_2_28_aarch64.whl (3.5 MB)
3.5/3.5 MB 2.9 MB/s eta 0:00:00
Requirement already satisfied: psutil in /usr/lib/python3/dist-packages (from -r requirements.txt (line 10)) (5.9.4)
Requirement already satisfied: pyyaml>=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 scipy>=1.4.1
  Downloading scipy-1.11.4-cp311-cp311-manylinux_2_17_aarch64_manylinux2014_aarch64.whl (32.9 MB)
32.9/32.9 MB 6.3 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>=4.64.0
  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>=1.1.4
  Downloading pandas-2.1.4-cp311-cp311-manylinux_2_17_aarch64_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)
294.0/294.0 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)
40.1/40.1 kB 8.0 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->-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->-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->-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->-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->-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->-r requirements.txt (line 6)) (3.1.1)
Requirement already satisfied: python-dateutil>=2.7 in /usr/local/lib/python3.11/dist-packages (from matplotlib>=3.3->-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<4,>=2.5 in /usr/lib/python3/dist-packages (from requests>=2.23.0->-r requirements.txt (line 12)) (3.3)
Requirement already satisfied: urllib3<3,>=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>=4.6.0
  Downloading opencv-python-4.8.1.78-cp37-ab3-manylinux_2_17_aarch64_manylinux2014_aarch64.whl (41.0 MB)
41.0/41.0 MB 6.9 MB/s eta 0:00:00
Requirement already satisfied: torchvision>=0.9.0 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-py2-none-any.whl (22 kB)
Requirement already satisfied: pytz>=2020.1 in /usr/lib/python3/dist-packages (from pandas>=1.1.4->-r requirements.txt (line 27)) (2022.7.1)
Collecting tzdata>=2022.1
  Downloading https://www.piwheels.org/simple/tzdata/tzdata-2023.3-py2-py3-none-any.whl (341 kB)
341.0/341.0 kB 8.8 MB/s eta 0:00:00
Collecting smmap>=6,>=3.0.1
  Downloading https://www.piwheels.org/simple/smmap/smmap-5.0.1-py3-none-any.whl (24 kB)
Requirement already satisfied: six>=1.5 in /usr/lib/python3/dist-packages (from python-dateutil>=2.7->matplotlib>=3.3->-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: numpy in /usr/lib/python3/dist-packages (from torch>thop>=0.1.1->-r requirements.txt (line 14)) (1.21.2)
Requirement already satisfied: mmh3 in /home/pi/.local/lib/python3.11/site-packages (from sympy>torch>thop>=0.1.1->-r requirements.txt (line 14)) (2023.12.2)
Requirement already satisfied: mpmath>=0.19 in /home/pi/.local/lib/python3.11/site-packages (from sympy>torch>thop>=0.1.1->-r requirements.txt (line 14)) (1.3.0)
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 scipy-1.11.4 seaborn-0.13.0 smmap-5.0.1 thop-0.1.1.post2209072238 tqdm-4.66.1 tzdata-2023.3 ultralytics-8.0.227
pi@raspberrypi:~/yolov5-CSI$

```

Use camera detection

**Note:** In this case, the AI camera does not have a computing power bonus, and it is called as a normal camera!

```
cd /home/pi/yolov5-CSI/
python3 detect.py --source 0
```

