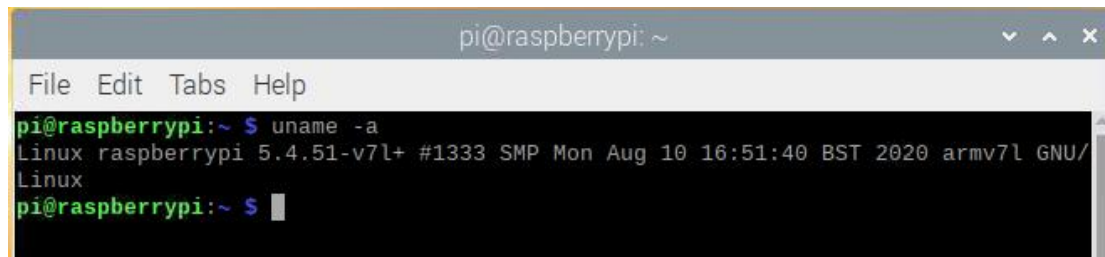


1. Based on the Raspbian image

This course is based on 2020-08-20-raspbian-buster-armhf.img to install Opencv4.5.0, Input the command `uname -a` to view the kernel version of the Raspberry Pi.

If you use other versions of image files, this tutorial may not be applicable.



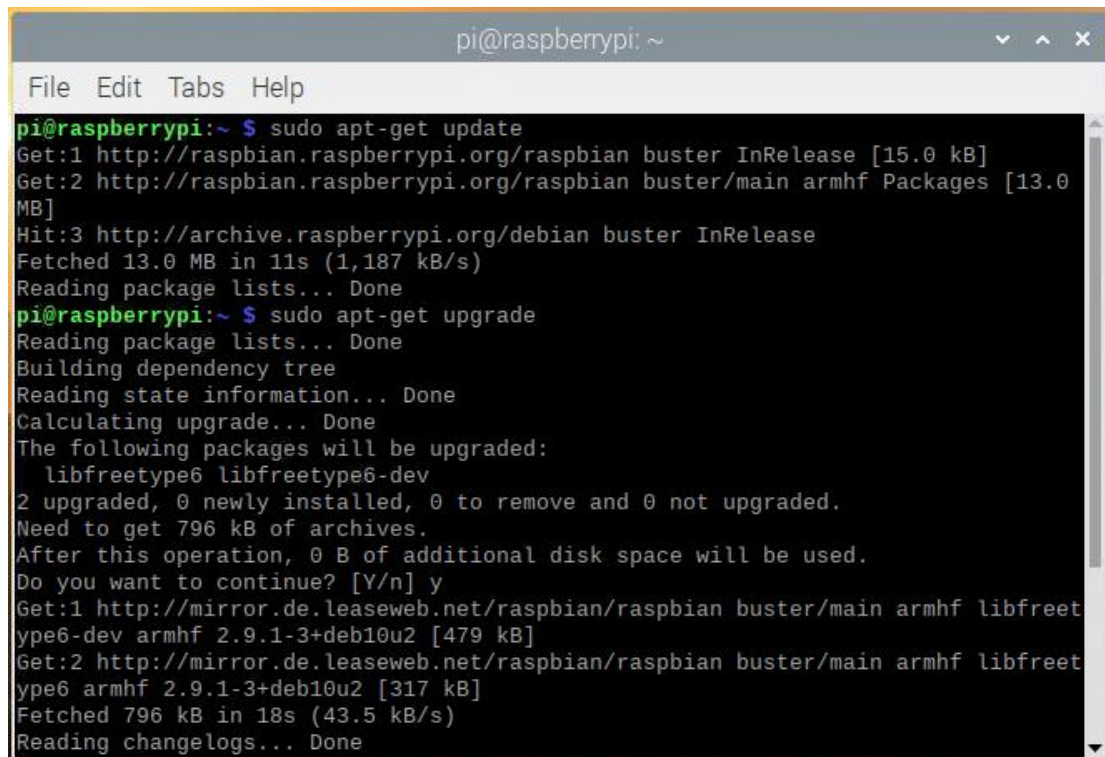
```
pi@raspberrypi: ~  
File Edit Tabs Help  
pi@raspberrypi:~$ uname -a  
Linux raspberrypi 5.4.51-v7l+ #1333 SMP Mon Aug 10 16:51:40 BST 2020 armv7l GNU/Linux  
pi@raspberrypi:~$
```

It is recommended to use the official source of Raspberry Pi.

Input following command to update system.

`sudo apt-get update`

`sudo apt-get upgrade`



```
pi@raspberrypi: ~  
File Edit Tabs Help  
pi@raspberrypi:~$ sudo apt-get update  
Get:1 http://raspbian.raspberrypi.org/raspbian buster InRelease [15.0 kB]  
Get:2 http://raspbian.raspberrypi.org/raspbian buster/main armhf Packages [13.0 MB]  
Hit:3 http://archive.raspberrypi.org/debian buster InRelease  
Fetched 13.0 MB in 11s (1,187 kB/s)  
Reading package lists... Done  
pi@raspberrypi:~$ sudo apt-get upgrade  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
Calculating upgrade... Done  
The following packages will be upgraded:  
  libfreetype6 libfreetype6-dev  
2 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.  
Need to get 796 kB of archives.  
After this operation, 0 B of additional disk space will be used.  
Do you want to continue? [Y/n] y  
Get:1 http://mirror.de.leaseweb.net/raspbian/raspbian buster/main armhf libfreetype6-dev armhf 2.9.1-3+deb10u2 [479 kB]  
Get:2 http://mirror.de.leaseweb.net/raspbian/raspbian buster/main armhf libfreetype6 armhf 2.9.1-3+deb10u2 [317 kB]  
Fetched 796 kB in 18s (43.5 kB/s)  
Reading changelogs... Done
```

```

pi@raspberrypi: ~
File Edit Tabs Help
Building dependency tree
Reading state information... Done
Calculating upgrade... Done
The following packages will be upgraded:
  libfreetype6 libfreetype6-dev
2 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
Need to get 796 kB of archives.
After this operation, 0 B of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://mirror.de.leaseweb.net/raspbian/raspbian buster/main armhf libfreetype6-dev armhf 2.9.1-3+deb10u2 [479 kB]
Get:2 http://mirror.de.leaseweb.net/raspbian/raspbian buster/main armhf libfreetype6 armhf 2.9.1-3+deb10u2 [317 kB]
Fetched 796 kB in 18s (43.5 kB/s)
Reading changelogs... Done
(Reading database ... 102451 files and directories currently installed.)
Preparing to unpack .../libfreetype6-dev_2.9.1-3+deb10u2_armhf.deb ...
Unpacking libfreetype6-dev:armhf (2.9.1-3+deb10u2) over (2.9.1-3+deb10u1) ...
Preparing to unpack .../libfreetype6_2.9.1-3+deb10u2_armhf.deb ...
Unpacking libfreetype6:armhf (2.9.1-3+deb10u2) over (2.9.1-3+deb10u1) ...
Setting up libfreetype6:armhf (2.9.1-3+deb10u2) ...
Setting up libfreetype6-dev:armhf (2.9.1-3+deb10u2) ...
Processing triggers for libc-bin (2.28-10+rpi1) ...
pi@raspberrypi:~$

```

2. Expand the file system

The function of this part is to expand the memory of the SD card to prevent insufficient memory during the installation and compilation process. Enter the following command in the terminal to enter the Raspberry Pi configuration interface.

sudo raspi-config

Choose [7 Advanced Options].

```

pi@raspberrypi: ~
File Edit Tabs Help
Raspberry Pi 4 Model B Rev 1.4

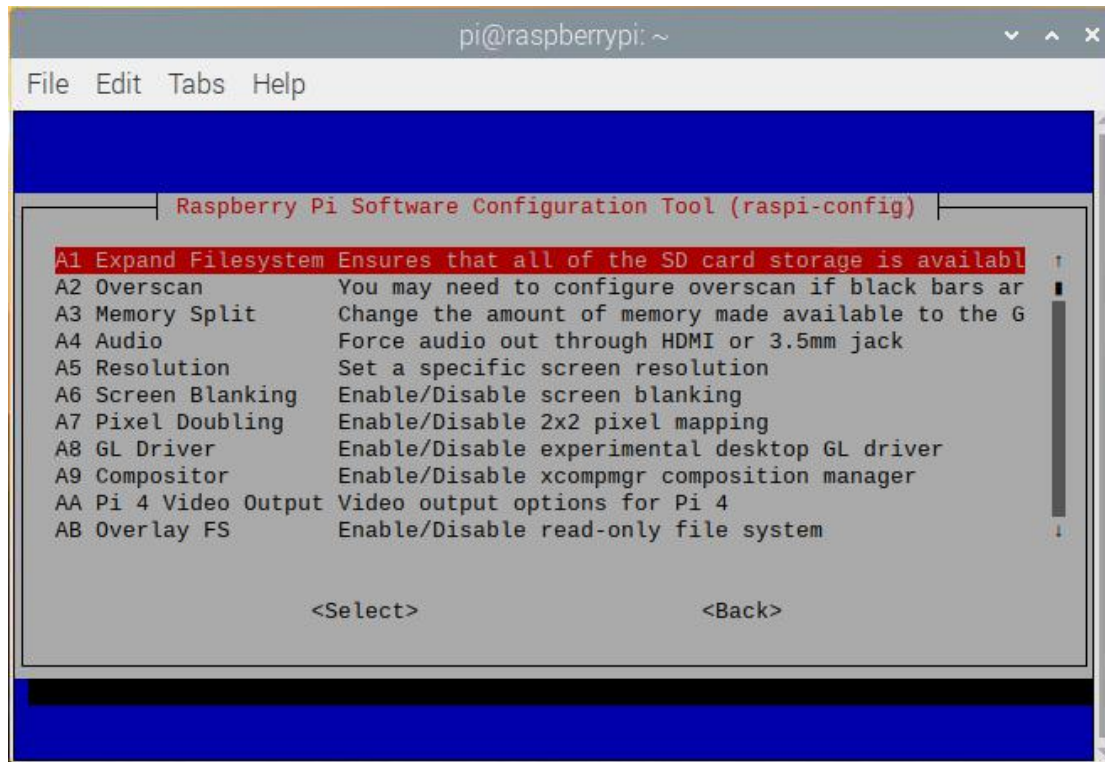
Raspberry Pi Software Configuration Tool (raspi-config)

1 Change User Password  Change password for the 'pi' user
2 Network Options       Configure network settings
3 Boot Options          Configure options for start-up
4 Localisation Options  Set up language and regional settings to match your
5 Interfacing Options   Configure connections to peripherals
6 Overclock             Configure overclocking for your Pi
7 Advanced Options      Configure advanced settings
8 Update               Update this tool to the latest version
9 About raspi-config    Information about this configuration tool

<Select>                <Finish>

```

Choose[A1 Expand Filesystem].



Input following command to restart Raspberry Pi.

```
sudo reboot
```

3. Install dependencies/libraries

Input following command to install compiler:

```
sudo apt-get install build-essential
```

Input following command to install dependencies:

```
sudo apt-get install cmake git
```

```
sudo apt-get install libgtk2.0-dev
```

```
sudo apt-get install pkg-config libavcodec-dev libavformat-dev libswscale-dev
```

Input following command to install dependencies provided for official:

```
sudo apt-get install python-dev python-numpy libtbb2 libtbb-dev libjpeg-dev
```

```
libpng-dev libtiff-dev libjasper-dev libdc1394-22-dev
```

Input following command to install picture and video operation library:

```
sudo apt-get install libjpeg-dev libpng-dev libtiff-dev
```

```
sudo apt-get install libavcodec-dev libavformat-dev libswscale-dev libv4l-dev
```

```
sudo apt-get install libxvidcore-dev libx264-dev
```

Install GTK and warning filters:

```
sudo apt-get install libgtk-3-dev
```

```
sudo apt-get install libcanberra-gtk*
```

(The asterisk * indicates that the version of the corresponding Raspberry Pi ARM

architecture is automatically obtained)

Install OpenCV optimized data library:

```
sudo apt-get install libatlas-base-dev gfortran
```

Install Python3 development-related libraries:

```
sudo apt-get install python3-dev
```

```
sudo apt-get install libjasper-dev libjasper1
```

Install HDF5 and QT libraries:

```
sudo apt-get install libhdf5-dev
```

```
sudo apt-get install libhdf5-serial-dev
```

```
sudo apt-get install libatlas-base-dev
```

```
sudo apt-get install libjasper-dev
```

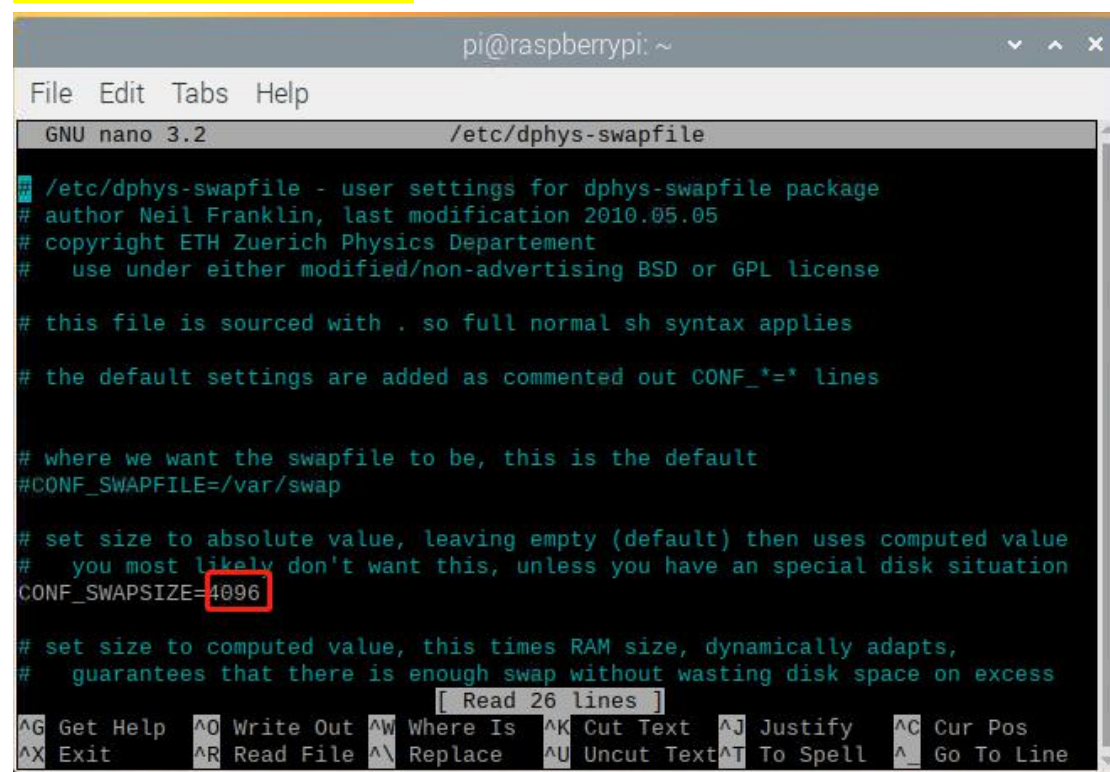
```
sudo apt-get install libqtgui4
```

```
sudo apt-get install libqt4-test
```

4. Increase virtual memory

During the installation process, a large amount of memory is required, so we need to change the size of the virtual memory. First of all, edit the configuration file of the virtual memory and enter in the terminal:

```
sudo nano /etc/dphys-swapfile
```



```

pi@raspberrypi: ~
File Edit Tabs Help
GNU nano 3.2 /etc/dphys-swapfile

/etc/dphys-swapfile - user settings for dphys-swapfile package
# author Neil Franklin, last modification 2010.05.05
# copyright ETH Zuerich Physik Departement
# use under either modified/non-advertising BSD or GPL license

# this file is sourced with . so full normal sh syntax applies

# the default settings are added as commented out CONF_*=* lines

# where we want the swapfile to be, this is the default
#CONF_SWAPFILE=/var/swap

# set size to absolute value, leaving empty (default) then uses computed value
# you most likely don't want this, unless you have a special disk situation
CONF_SWAPSIZE=4096

# set size to computed value, this times RAM size, dynamically adapts,
# guarantees that there is enough swap without wasting disk space on excess
[ Read 26 lines ]
^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify ^C Cur Pos
^X Exit ^R Read File ^\ Replace ^U Uncut Text ^T To Spell ^_ Go To Line

```

Find the item CONF_SWAPSIZE and set it to 4096, which is about 4G of memory space. Modify the sentence:

CONF_SWAPSIZE=4096

Enter ctrl+x, then press Y to save and exit.

Input following commands in the terminal to stop and restart the virtual memory to take effect 4G space.

```
sudo /etc/init.d/dphys-swapfile stop  
sudo /etc/init.d/dphys-swapfile start
```

5. Download OpenCV pack

Method-1:

Download pack online:

Input following command to download pack.

```
git clone https://github.com/opencv/opencv.git  
git clone https://github.com/opencv/opencv\_contrib.git
```

Method-1:

Download pack offline:

After downloading the software package, use winSCP offline transfer to the Raspberry Pi for offline installation (recommended).

This tutorial provides the OpenCV4.5.0 offline package, which can be directly transferred to the Raspberry Pi and decompressed for installation.

OpenCV official download URL: <https://opencv.org/releases/>

After the transmission is complete, unzip the OpenCV offline package and enter the following command in the terminal:

```
unzip opencv.zip  
unzip opencv_contrib.zip
```

Input following command to modify name of folder:

```
mv opencv-master opecv  
mv opencv_contrib-master opencv_contrib
```

6. Configure and compile OpenCV

6.1 Input following command in proper order:

```
Cd
```

```
cd opencv
```

```
mkdir build
```

```
cd build
```

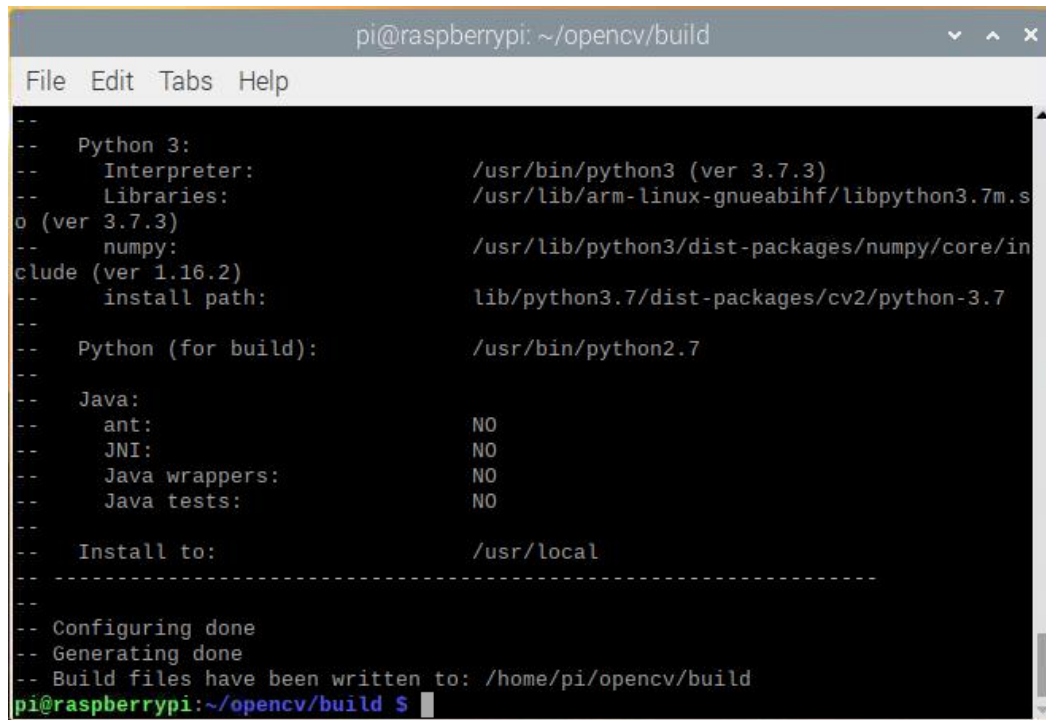
```
cmake -D CMAKE_BUILD_TYPE=RELEASE -D CMAKE_INSTALL_PREFIX=/usr/local -D  
INSTALL_C_EXAMPLES=OFF -D INSTALL_PYTHON_EXAMPLES=OFF -D
```

```

OPENCV_GENERATE_PKGCONFIG=ON      -D      ENABLE_NEON=ON      -D
OPENCV_EXTRA_EXE_LINKER_FLAGS=-latomic -D      ENABLE_VFPV3=ON -D
BUILD_TESTS=OFF                  -D      OPENCV_ENABLE_NONFREE=ON -D
OPENCV_EXTRA_MODULES_PATH=~/.opencv_contrib/modules -D
BUILD_EXAMPLES=OFF ..

```

The following is the configuration information after I run cmake:



```

pi@raspberrypi: ~/opencv/build
File Edit Tabs Help
--
-- Python 3:
--   Interpreter:           /usr/bin/python3 (ver 3.7.3)
--   Libraries:            /usr/lib/arm-linux-gnueabi/libpython3.7m.so
--   numpy:                /usr/lib/python3/dist-packages/numpy/core/in
--   include (ver 1.16.2)
--   install path:         lib/python3.7/dist-packages/cv2/python-3.7
--
-- Python (for build):      /usr/bin/python2.7
--
-- Java:
--   ant:                  NO
--   JNI:                  NO
--   Java wrappers:        NO
--   Java tests:           NO
--
-- Install to:             /usr/local
--
-----
-- Configuring done
-- Generating done
-- Build files have been written to: /home/pi/opencv/build
pi@raspberrypi:~/opencv/build $

```

6.2 Start compile

Input following command:

make

```

pi@raspberrypi: ~/opencv/build
File Edit Tabs Help
--
-- Python 3:
--   Interpreter:           /usr/bin/python3 (ver 3.7.3)
--   Libraries:             /usr/lib/arm-linux-gnueabi/hf/libpython3.7m.s
o (ver 3.7.3)
--   numpy:                 /usr/lib/python3/dist-packages/numpy/core/in
clude (ver 1.16.2)
--   install path:          lib/python3.7/dist-packages/cv2/python-3.7
--
-- Python (for build):      /usr/bin/python2.7
--
-- Java:
--   ant:                   NO
--   JNI:                   NO
--   Java wrappers:         NO
--   Java tests:            NO
--
-- Install to:              /usr/local
-----
-- Configuring done
-- Generating done
-- Build files have been written to: /home/pi/opencv/build
pi@raspberrypi:~/opencv/build $ make

```

Compilation will take a long time, please be patient and wait for it to complete. There will be a warning when compiling and can be ignored.

But there may be an error fatal `error: boostdesc_bgm.i: no such file or directory`, as shown in the figure below.

```

[ 71%] Built target opencv_objdetect
[ 72%] Built target opencv_perf_objdetect
[ 73%] Built target opencv_rapid
[ 75%] Built target opencv_rgbd
[ 75%] Built target opencv_perf_rgbd
[ 75%] Built target opencv_shape
[ 75%] Built target opencv_structured_light
[ 76%] Built target opencv_video
[ 77%] Built target opencv_perf_video
[ 77%] Built target opencv_videostab
[ 77%] Building CXX object modules/xfeatures2d/CMakeFiles/opencv_xfeatures2d.dir
/home/pi/opencv_contrib/modules/xfeatures2d/src/boostdesc.cpp.o
/home/pi/opencv_contrib/modules/xfeatures2d/src/boostdesc.cpp:654:20: fatal erro
r: boostdesc_bgm.i: No such file or directory
    #include "boostdesc_bgm.i"
           ^
compilation terminated.
make[2]: *** [modules/xfeatures2d/CMakeFiles/opencv_xfeatures2d.dir/build.make:8
1: modules/xfeatures2d/CMakeFiles/opencv_xfeatures2d.dir/src/boostdesc.cpp.o] Er
ror 1
make[1]: *** [CMakeFiles/Makefile2:5857: modules/xfeatures2d/CMakeFiles/opencv_x
features2d.dir/all] Error 2
make: *** [Makefile:163: all] Error 2
pi@raspberrypi:~/opencv/build $

```

The reason for the error is the lack of the following configuration files:

```

boostdesc_bgm.i
boostdesc_bgm_bi.i
boostdesc_bgm_hd.i

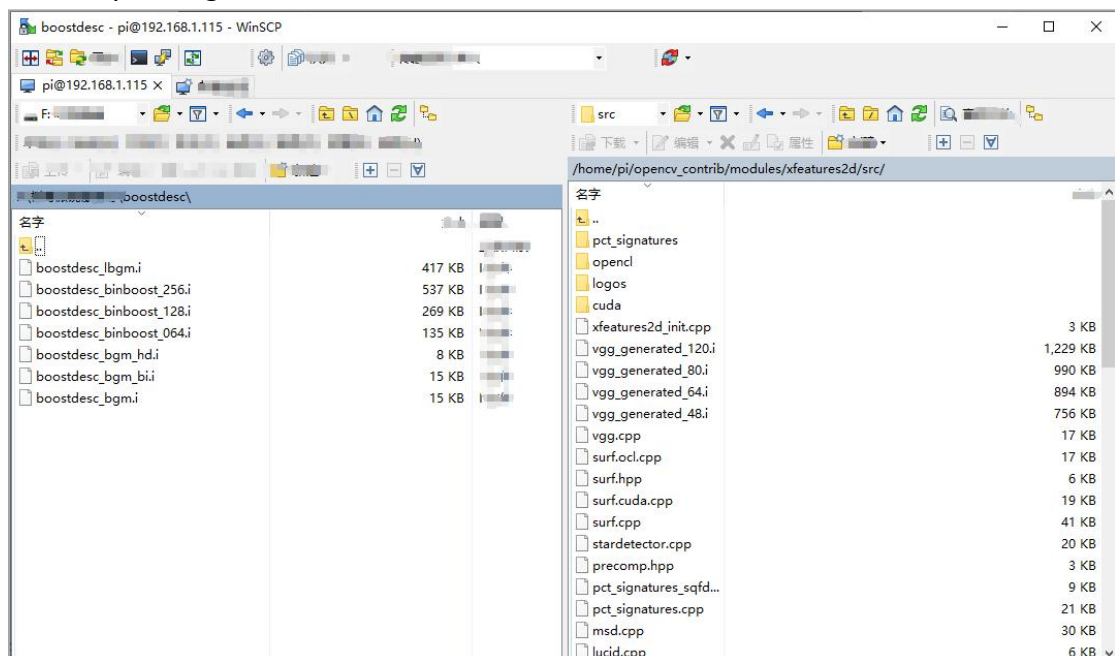
```

```

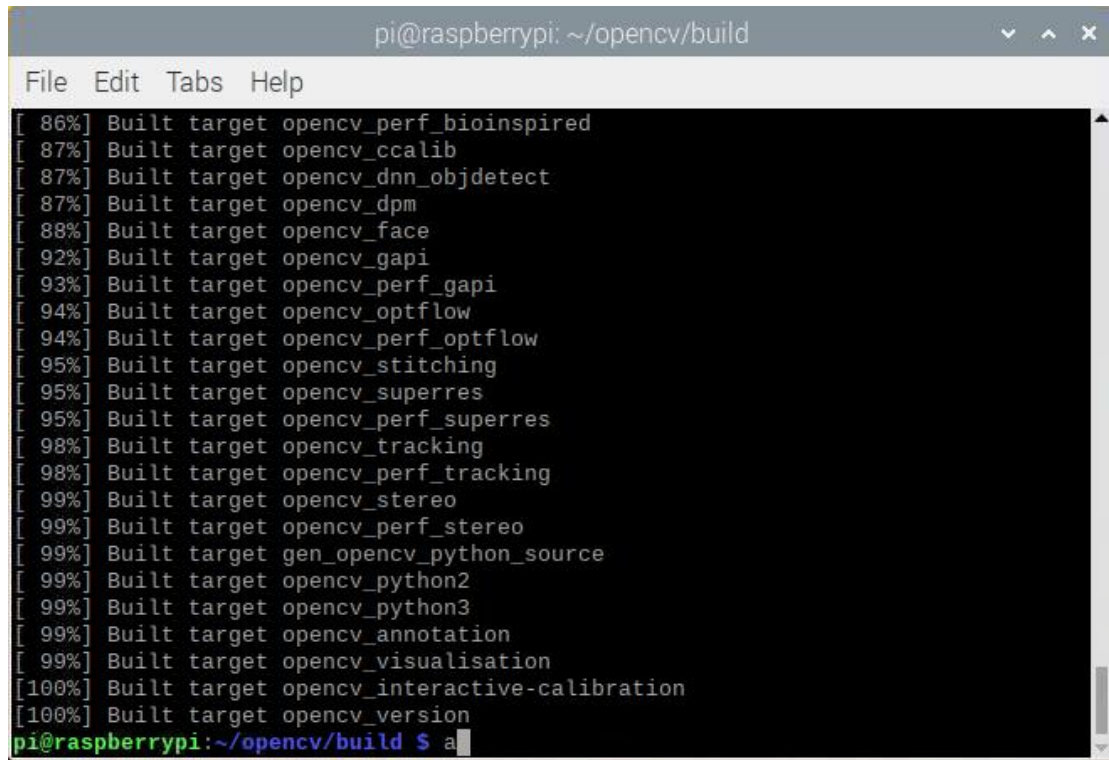
boostdesc_lbgm.i
boostdesc_binboost_064.i
boostdesc_binboost_128.i
boostdesc_binboost_256.i
vgg_generated_120.i
vgg_generated_64.i
vgg_generated_80.i
vgg_generated_48.i

```

We have provided all the missing configuration files, which have also been transferred offline to the error directory of the Raspberry Pi, and then recompiled. For example, my error directory is /home/pi/opencv_contrib/modules/xfeatures2d/src/, then Just transfer the above files to the Raspberry Pi /home/pi/opencv_contrib/modules/xfeatures2d/src/ directory through winSCP.



When the system prompts "[100%] Built target opencv_version", it means that the compilation has been successfully completed.



```
pi@raspberrypi: ~/opencv/build
File Edit Tabs Help
[ 86%] Built target opencv_perf_bioinspired
[ 87%] Built target opencv_ccalib
[ 87%] Built target opencv_dnn_objdetect
[ 87%] Built target opencv_dpm
[ 88%] Built target opencv_face
[ 92%] Built target opencv_gapi
[ 93%] Built target opencv_perf_gapi
[ 94%] Built target opencv_optflow
[ 94%] Built target opencv_perf_optflow
[ 95%] Built target opencv_stitching
[ 95%] Built target opencv_superres
[ 95%] Built target opencv_perf_superres
[ 98%] Built target opencv_tracking
[ 98%] Built target opencv_perf_tracking
[ 99%] Built target opencv_stereo
[ 99%] Built target opencv_perf_stereo
[ 99%] Built target gen_opencv_python_source
[ 99%] Built target opencv_python2
[ 99%] Built target opencv_python3
[ 99%] Built target opencv_annotation
[ 99%] Built target opencv_visualisation
[100%] Built target opencv_interactive-calibration
[100%] Built target opencv_version
pi@raspberrypi:~/opencv/build $
```

Input following command to install.

```
sudo make install
```

Wait patiently for the installation to complete, and then we can detect OpenCV, as shown below.

```
cd
python3
import cv2
cv2.__version__
```

```
pi@raspberrypi: ~  
File Edit Tabs Help  
-- Up-to-date: /usr/local/share/opencv4/haarcascades/haarcascade_russian_plate_number.xml  
-- Up-to-date: /usr/local/share/opencv4/haarcascades/haarcascade_smile.xml  
-- Up-to-date: /usr/local/share/opencv4/haarcascades/haarcascade_upperbody.xml  
-- Up-to-date: /usr/local/share/opencv4/lbpcascades/lbpcascade_frontalcatface.xml  
-- Up-to-date: /usr/local/share/opencv4/lbpcascades/lbpcascade_frontalface.xml  
-- Up-to-date: /usr/local/share/opencv4/lbpcascades/lbpcascade_frontalface_improved.xml  
-- Up-to-date: /usr/local/share/opencv4/lbpcascades/lbpcascade_profileface.xml  
-- Up-to-date: /usr/local/share/opencv4/lbpcascades/lbpcascade_silverware.xml  
-- Up-to-date: /usr/local/bin/opencv_annotation  
-- Up-to-date: /usr/local/bin/opencv_visualisation  
-- Up-to-date: /usr/local/bin/opencv_interactive-calibration  
-- Up-to-date: /usr/local/bin/opencv_version  
pi@raspberrypi:~/opencv/build $ cd  
pi@raspberrypi:~ $ python3  
Python 3.7.3 (default, Jul 25 2020, 13:03:44)  
[GCC 8.3.0] on linux  
Type "help", "copyright", "credits" or "license" for more information.  
>>> import cv2  
>>> cv2.__version__  
'4.5.0-dev'  
>>>
```