OpenCV Installation

OpenCV (Open Source Computer Vision Library) is an open-source computer vision library with bindings for C++, Python, and Java. It is used for a wide range of applications, including medical image analysis, stitching street view images, surveillance video, detecting and recognizing faces, tracking moving objects, extracting 3D models, and much more. OpenCV can take advantage of multi-core processing and features GPU acceleration for real-time operation.

OpenCV-Python is a library of Python bindings designed to solve computer vision problems. OpenCV-Python uses of NumPy, a highly optimized library for numerical operations with a MATLAB-style syntax. All the OpenCV array structures are converted to and from NumPy arrays.

Pre-Requisites

- A system running on Windows/Ubuntu APP/Ubuntu OS
- A user account with sudo/administration privileges
- Access to a terminal window/command-line

Before continuing with this tutorial, make sure you are logged in as root or a user with sudo/administration privileges.

In this tutorial, we will show you how to install OpenCV on Windows and Ubuntu.

1. Install OpenCV on Windows
2. Install OpenCV on Ubuntu APP (Windows 10) or Ubuntu OS
3. Install OpenCV on PyCharm

If you are working on the Windows system, please follow step 1, step 2, and step 3, but if you are working on Ubuntu OS, you follow only step 2 and step 3.

1. Install OpenCV on Windows

Windows systems typically do not have OpenCV build-in. Before installing OpenCV, make sure you have installed Python 3+ version. Let us look at how to install OpenCV on Windows:

- Open a Command Terminal from Windows system and verify Python & Pip as follow:

```
$ python --version

$ python -m pip --version
```

```
C:\Program Files>
C:\Program Files>python --version
Python 3.7.7

C:\Program Files>python -m pip --version
pip 20.0.2 from C:\Users\somak\AppData\Roaming\Python\Python37\site-packages\pip (python 3.7)

C:\Program Files>
```

- To verify OpenCV, go to Python Console and type as below:

```
>> import cv2
```

```
C:\Program Files>python
Python 3.7.7 (tags/v3.7.7:d7c567b08f, Mar 10 2020, 10:41:24) [MSC v.1900 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license" for more information.
>>>
>>>
>>> import cv2
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
ModuleNotFoundError: No module named 'cv2'
>>>
```

- If you do not have OpenCV, then running the above command will give no module error as above. Now, to install OpenCV from Command Terminal type the command as below:

```
$ python -m pip install opencv-python
```

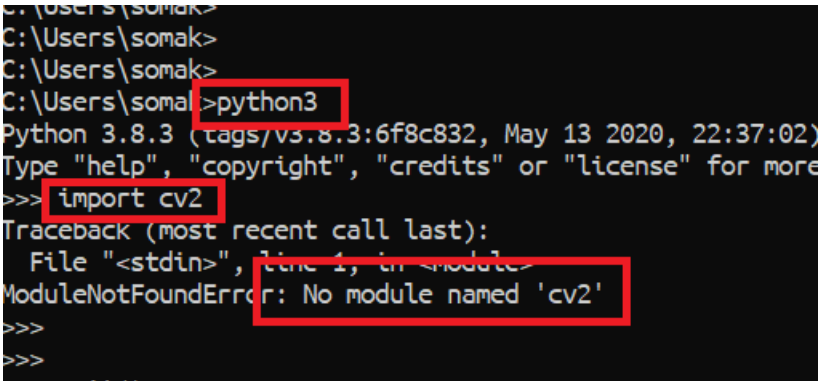
```
C:\Program Files>
C:\Program Files>python -m pip install opencv-python
Collecting opencv-python
  Using cached opencv_python-4.2.0.34-cp37-cp37m-win_amd64.whl (33.0 MB)
Collecting numpy>=1.14.5
  Using cached numpy-1.18.5-cp37-cp37m-win_amd64.whl (12.7 MB)
Installing collected packages: numpy, opencv-python
Successfully installed numpy-1.18.5 opencv-python-4.2.0.34
WARNING: You are using pip version 20.0.2; however, version 20.1.1 is available.
You should consider upgrading via the 'C:\Program Files\Python37\python.exe -m pip install --upgrade pip' command.

C:\Program Files>
```

- Verify OpenCV

```
C:\Program Files>python
Python 3.7.7 (tags/v3.7.7:d7c567b08f, Mar 10 2020, 10:41:24) [MSC v.1900 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license" for more information.
>>
>> import cv2
>>
>>
```

- As above, you can see we installed OpenCV for Python version, not for Python3 version. So, if you call or run any Python program with “python code.py,” then the above process will work for you. But if you want to run with “python3 code.py,” then it will not work.



- To install OpenCV with Python3, please follow the below steps:

- First, go here and search for OpenCV as below:

OpenCV: a real time computer vision library.

opencv_python-4.2.0-cp38-cp38-win_amd64.whl
opencv_python-4.2.0-cp38-cp38-win32.whl
opencv_python-4.2.0-cp37-cp37m-win_amd64.whl
opencv_python-4.2.0-cp37-cp37m-win32.whl
opencv_python-4.2.0-cp36-cp36m-win_amd64.whl
opencv_python-4.2.0-cp36-cp36m-win32.whl
opencv_python-4.1.2-cp38-cp38-win_amd64.whl
opencv_python-4.1.2-cp38-cp38-win32.whl
opencv_python-4.1.2-cp37-cp37m-win_amd64.whl
opencv_python-4.1.2-cp37-cp37m-win32.whl
opencv_python-4.1.2-cp36-cp36m-win_amd64.whl
opencv_python-4.1.2-cp36-cp36m-win32.whl
opencv_python-4.1.2-cp35-cp35m-win_amd64.whl
opencv_python-4.1.2-cp35-cp35m-win32.whl
opencv_python-4.1.2+contrib-cp38-cp38-win_amd64.whl
opencv_python-4.1.2+contrib-cp38-cp38-win32.whl

- Here you will get many Windows Wheel file. You need to download them on your computer and install it. On my computer, I have Python 3.7, Windows10, and 64 bits. So, for me "opencv_python-4.2.0-cp38-cp38-win_amd64.whl" worked. Maybe it will be different for you. So, it will be better if you can download them and install them. If that file does not work, then try with another.

- To install Wheel file, copy them from the Downloads folder to your "C:" drive. Inside of the "C:" drive, you can create a new folder, and you can paste it there.

- Now go to your Command Terminal on Windows system and run the below command to install them. Remember, for your computer, you may need to install another file, but the power will be the same. Also, you need to install Numpy with this process.

```
$ python3 -m pip install opencv_python-4.2.0-cp38-cp38-
win_amd64.whl

$ python3 -m pip install numpy
```

```
C:\Users\somak\Opencv>python3 -m pip install opencv_python-4.2.0-cp38-cp38-win_amd64.whl
Processing c:\users\somak\opencv\opencv_python-4.2.0-cp38-cp38-win_amd64.whl
Installing collected packages: opencv-python
Successfully installed opencv-python-4.2.0
```

```
C:\Users\somak\Opencv>
C:\Users\somak\Opencv>python3 -m pip install numpy
Collecting numpy
  Downloading numpy-1.18.5-cp38-cp38-win_amd64.whl (12.8 MB)
     |                                | 12.8 MB 2.2 MB/s
Installing collected packages: numpy
  WARNING: The script f2py.exe is installed in 'C:\Users\somak\AppData\Local\Packages\Py
  Consider adding this directory to PATH or, if you prefer to suppress this warning, use
Successfully installed numpy-1.18.5
```

- Then verify OpenCV as below:

```
C:\Users\somak\Opencv>
C:\Users\somak\Opencv>python3
Python 3.8.3 (tags/v3.8.3:6f8c832, May 13 2020, 22:37:02) [MSC v.1924 64 bit (A
Type "help", "copyright", "credits" or "license" for more information.
>>>
>>>
>>>
>>> import cv2
>>>
```

2. Install OpenCV on Ubuntu APP (Windows 10) or Ubuntu OS

There are several ways you can install OpenCV on the Ubuntu system, and you can use any of the below process on Ubuntu APP or Ubuntu OS because all are the same.

1. Install OpenCV from the Ubuntu Repository.
2. Install OpenCV from the Source.
3. Install OpenCV from the Shell Scripts.

1. Install OpenCV from the Ubuntu Repository

To find out what version(s) you have, open a Terminal window from Ubuntu OS or open Ubuntu APP from Windows 10, and try the following commands:

```
$ python3 -c "import cv2; print(cv2.__version__)"
```

```
somak@LAPTOP-2QHNB620:~$
somak@LAPTOP-2QHNB620:~$ python3 -c "import cv2; print(cv2.__version__)"
Traceback (most recent call last):
  File "<string>", line 1, in <module>
ModuleNotFoundError: No module named 'cv2'
somak@LAPTOP-2QHNB620:~$
somak@LAPTOP-2QHNB620:~$
```

The OpenCV package is available from the Ubuntu 18.04 distribution repository. At the time of writing, the version in the repositories is 3.2, not the latest version. To install OpenCV from the Ubuntu 18.04 repositories, follow these steps:

- Refresh the packages index and install the OpenCV package by typing:

```
$ sudo apt update

$ sudo apt install python3-opencv
```

```
somak@LAPTOP-2QHNB620:~$
somak@LAPTOP-2QHNB620:~$
somak@LAPTOP-2QHNB620:~$ sudo apt update
[sudo] password for somak:
Get:1 http://security.ubuntu.com/ubuntu bionic-security InRelease [88.7 kB]
Hit:2 http://archive.ubuntu.com/ubuntu bionic InRelease
```

```
somak@LAPTOP-2QHNB620:~$ sudo apt install python3-opencv
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  gdal-data i965-va-driver ibverbs-providers libaacs0 libaec0 libarmadillo8 libarpack2 libavcodec57
  libdapclient6v5 libdc1394-22 libepsilon1 libexif12 libfabric1 libfreexl1 libfyba0 libgd3 libgdal2
```

- To verify the installation, import the cv2 module and print the OpenCV version:

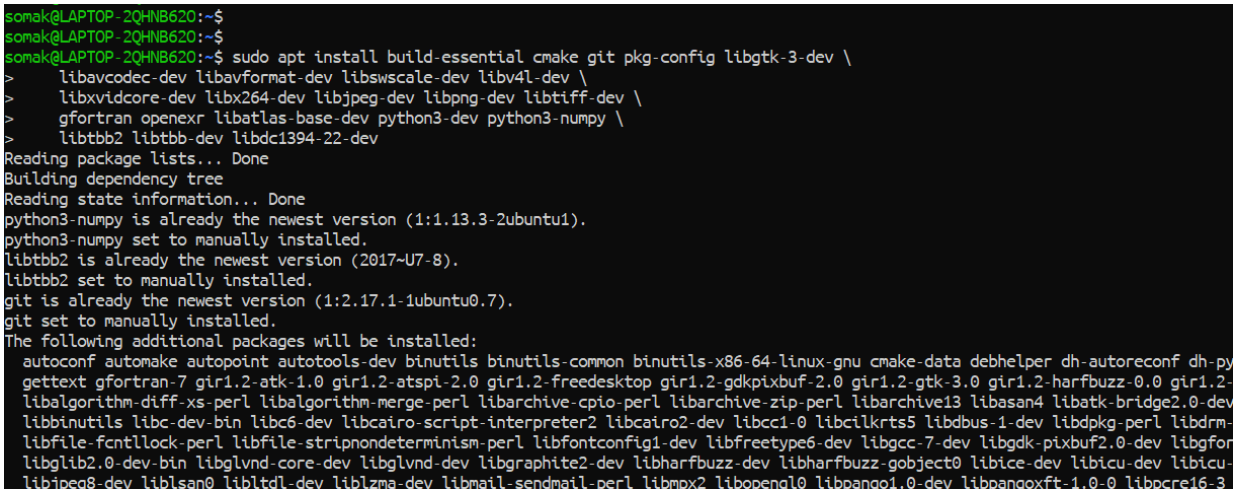
```
somak@LAPTOP-2QHNB620:~$
somak@LAPTOP-2QHNB620:~$ python3 -c "import cv2; print(cv2.__version__)"
3.2.0
somak@LAPTOP-2QHNB620:~$
somak@LAPTOP-2QHNB620:~$
```

2. Install OpenCV from the Source

Building the OpenCV library from source is the recommended way of installing OpenCV. It will be optimized for your system, and you will have complete control over the build options. To install the latest OpenCV version from the source, perform the following steps:

- Install the required dependencies and press “Y” to continue:

```
$ sudo apt install build-essential cmake git pkg-config libgtk-3-dev
\
    libavcodec-dev libavformat-dev libswscale-dev libv4l-dev \
    libxvidcore-dev libx264-dev libjpeg-dev libpng-dev libtiff-dev
\
    gfortran openexr libatlas-base-dev python3-dev python3-numpy \
    libtbb2 libtbb-dev libdc1394-22-dev
```



- Clone the OpenCV’s and OpenCV Contrib repositories:

```
$ mkdir ~/opencv_build && cd ~/opencv_build

$ git clone https://github.com/opencv/opencv.git

$ git clone https://github.com/opencv/opencv_contrib.git
```

```
somak@LAPTOP-2QHNB620:~$
somak@LAPTOP-2QHNB620:~$ mkdir ~/opencv_build && cd ~/opencv_build
somak@LAPTOP-2QHNB620:~/opencv_build$ git clone https://github.com/opencv/opencv.git
Cloning into 'opencv'...
remote: Enumerating objects: 156, done.
remote: Counting objects: 100% (156/156), done.
remote: Compressing objects: 100% (149/149), done.
remote: Total 274974 (delta 37), reused 19 (delta 5), pack-reused 274818
Receiving objects: 100% (274974/274974), 469.50 MiB | 1.35 MiB/s, done.
Resolving deltas: 100% (192042/192042), done.
Checking out files: 100% (6419/6419), done.
somak@LAPTOP-2QHNB620:~/opencv_build$ git clone https://github.com/opencv/opencv_contrib.git
Cloning into 'opencv_contrib'...
remote: Enumerating objects: 5, done.
remote: Counting objects: 100% (5/5), done.
remote: Compressing objects: 100% (5/5), done.
remote: Total 32312 (delta 0), reused 0 (delta 0), pack-reused 32307
Receiving objects: 100% (32312/32312), 129.08 MiB | 1024.00 KiB/s, done.
Resolving deltas: 100% (19988/19988), done.
Checking out files: 100% (2657/2657), done.
somak@LAPTOP-2QHNB620:~/opencv_build$
```

- At the time of writing, the default version in the GitHub repositories is version 4.2.0 if you want to install an older version of OpenCV, cd to both OpenCV and OpenCV_Contrib directories and run git checkout.

- Now changed the directory after the download is done:

```
$ cd ~/opencv_build/opencv

$ mkdir build && cd build
```

```
somak@LAPTOP-2QHNB620:~/opencv_build$
somak@LAPTOP-2QHNB620:~/opencv_build$
somak@LAPTOP-2QHNB620:~/opencv_build$ cd ~/opencv_build/opencv
somak@LAPTOP-2QHNB620:~/opencv_build/opencv$
somak@LAPTOP-2QHNB620:~/opencv_build/opencv$
somak@LAPTOP-2QHNB620:~/opencv_build/opencv$
somak@LAPTOP-2QHNB620:~/opencv_build/opencv$ mkdir build && cd build
somak@LAPTOP-2QHNB620:~/opencv_build/opencv/build$
somak@LAPTOP-2QHNB620:~/opencv_build/opencv/build$
```

- Set up the OpenCV build with CMake:

```
$ cmake -D CMAKE_BUILD_TYPE=RELEASE \
    -D CMAKE_INSTALL_PREFIX=/usr/local \
    -D INSTALL_C_EXAMPLES=ON \
    -D INSTALL_PYTHON_EXAMPLES=ON \
    -D OPENCV_GENERATE_PKGCONFIG=ON \
    -D
OPENCV_EXTRA_MODULES_PATH=~/opencv_build/opencv_contrib/modules \
    -D BUILD_EXAMPLES=ON ..
```

```
somak@LAPTOP-2QHNB620:~/opencv_build/opencv/build$
somak@LAPTOP-2QHNB620:~/opencv_build/opencv/build$
somak@LAPTOP-2QHNB620:~/opencv_build/opencv/build$ cmake -D CMAKE_BUILD_TYPE=RELEASE \
>     -D CMAKE_INSTALL_PREFIX=/usr/local \
>     -D INSTALL_C_EXAMPLES=ON \
>     -D INSTALL_PYTHON_EXAMPLES=ON \
>     -D OPENCV_GENERATE_PKGCONFIG=ON \
>     -D OPENCV_EXTRA_MODULES_PATH=~/opencv_build/opencv_contrib/modules \
>     -D BUILD_EXAMPLES=ON ..
-- The CXX compiler identification is GNU 7.5.0
-- The C compiler identification is GNU 7.5.0
-- Check for working CXX compiler: /usr/bin/c++
-- Check for working CXX compiler: /usr/bin/c++ -- works
-- Detecting CXX compiler ABI info
-- Detecting CXX compiler ABI info - done
-- Detecting CXX compile features
```

- Start the compilation process with make -j8. This process is going to take 10-20 minutes.

```
$ make -j8
```

```
somak@LAPTOP-2QHNB620:~/opencv_build/opencv/build$
somak@LAPTOP-2QHNB620:~/opencv_build/opencv/build$
somak@LAPTOP-2QHNB620:~/opencv_build/opencv/build$ make -j8
Scanning dependencies of target gen-pkgconfig
Scanning dependencies of target libjasper
Scanning dependencies of target libwebp
Scanning dependencies of target ippiw
Scanning dependencies of target quirc
Scanning dependencies of target IlmImf
Scanning dependencies of target ittnotify
Scanning dependencies of target libprotobuf
[  1%] Generate opencv4.pc
[  1%] Building C object 3rdparty/quirc/CMakeFiles/quirc.dir/src/decode.c.o
```

- Install OpenCV with:

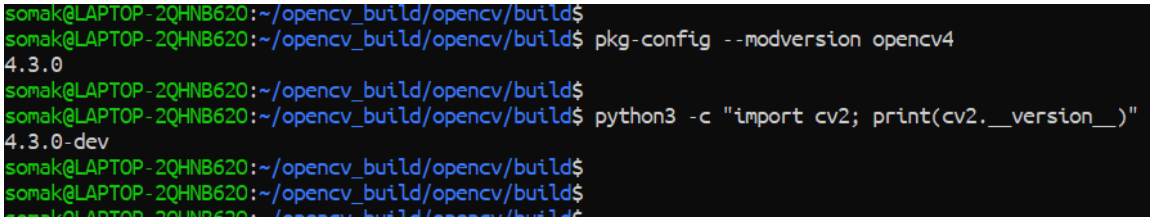
```
$ sudo make install
```

```
somak@LAPTOP-2QHNB620:~/opencv_build/opencv/build$
somak@LAPTOP-2QHNB620:~/opencv_build/opencv/build$ sudo make install
[sudo] password for somak:
[  1%] Built target gen-pkgconfig
[  5%] Built target libwebp
[  6%] Built target libjasper
[  9%] Built target IlmImf
[ 10%] Built target ippiw
[ 13%] Built target libprotobuf
```

- Now verify the OpenCV version:

```
$ pkg-config --modversion opencv4

$ python3 -c "import cv2; print(cv2.__version__)"
```



3. Install OpenCV from the Shell Script

First, we need to download the Robotic-Greeter folder from the [Robotic-Greeter-GitHub] link.

You can download it in two ways:

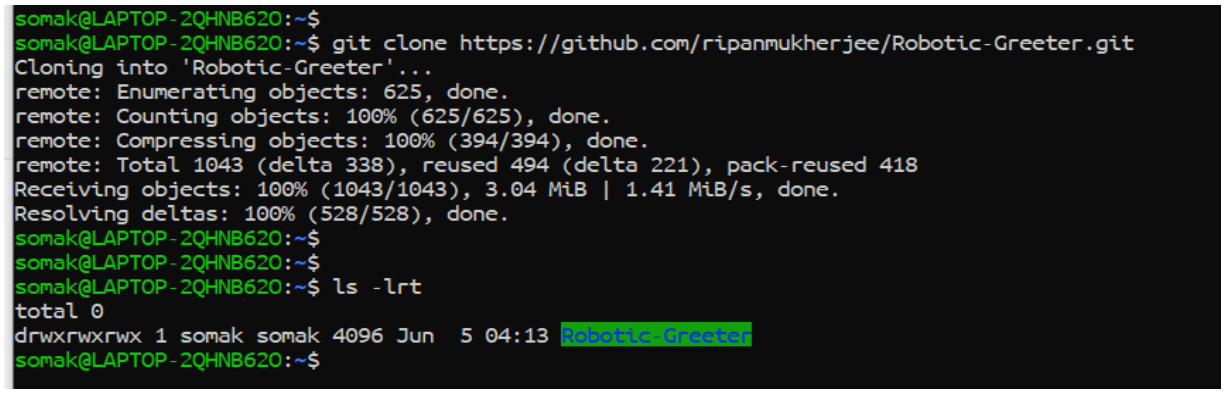
1. Clone it with Command Terminal
2. Download it as a Zip file

Inside of the Robotic-Greeter folder, we have the shell (Unix) script, which you need to run, and this script will automatically install OpenCV on your computer.

1. Using Clone method

Go to Ubuntu APP from Windows 10 or Command Terminal from Ubuntu OS and run the following command:

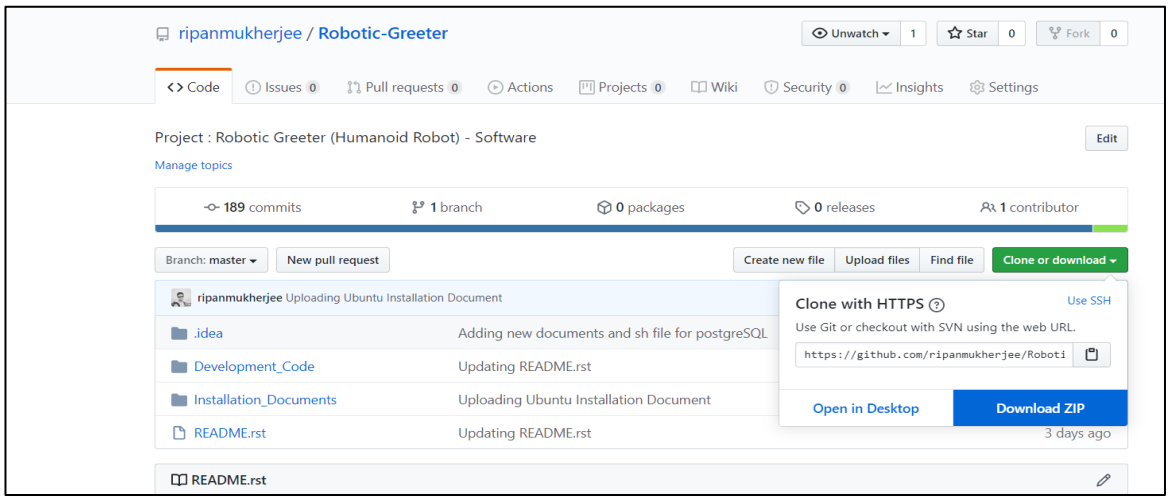
```
$ git clone https://github.com/ripanmukherjee/Robotic-Greeter.git
```



This command will automatically download the Robotic-Greeter folder on your computer.

2. Download as Zip

Also, you can directly download the Zip file and Unzip it. Then it would be best if you put it in the proper directory or your project directory.



Once the download is complete, please go to the following directory from Ubuntu APP Terminal or Command Terminal on Ubuntu OS:

```
$ cd Robotic-Greeter/Installation_Documents/OpenCV_Installation
```

In the OpenCV_Installation folder, you will get ***OpenCV_Installation.sh*** script. To list the directories and files in this folder, run “ls -lrt” and later change the executable permission for the file with “chmod.”

```
$ ls -lrt

$ chmod +x *.sh
```

```
somak@LAPTOP-2QHNB620:~$
somak@LAPTOP-2QHNB620:~$ cd Robo*
somak@LAPTOP-2QHNB620:~/Robotic-Greeter$ cd In*
somak@LAPTOP-2QHNB620:~/Robotic-Greeter/Installation_Documents$ cd Open*
somak@LAPTOP-2QHNB620:~/Robotic-Greeter/Installation_Documents/OpenCV_Installation$
somak@LAPTOP-2QHNB620:~/Robotic-Greeter/Installation_Documents/OpenCV_Installation$
somak@LAPTOP-2QHNB620:~/Robotic-Greeter/Installation_Documents/OpenCV_Installation$
somak@LAPTOP-2QHNB620:~/Robotic-Greeter/Installation_Documents/OpenCV_Installation$ ls -lrt
total 8
-rwxrwxrwx 1 somak somak 1606 Jun  6 20:23 OpenCV_Installation.sh
-rw-rw-rw- 1 somak somak 4008 Jun  6 20:23 README.rst
somak@LAPTOP-2QHNB620:~/Robotic-Greeter/Installation_Documents/OpenCV_Installation$ chmod +x *.sh
somak@LAPTOP-2QHNB620:~/Robotic-Greeter/Installation_Documents/OpenCV_Installation$
```

After that, run the scripts as follow:

```
$ sh OpenCV_Installation.sh
```

```
somak@LAPTOP-2QHNB620:~/Robotic-Greeter/Installation_Documents/OpenCV_Installation$
somak@LAPTOP-2QHNB620:~/Robotic-Greeter/Installation_Documents/OpenCV_Installation$ sh OpenCV_Installation.sh
Checking OpenCV Version before installing!!!
Traceback (most recent call last):
  File "<string>", line 1, in <module>
ModuleNotFoundError: No module named 'cv2'

Starting Installing OpenCV!!
[sudo] password for somak:
Get:1 http://security.ubuntu.com/ubuntu focal-security InRelease [107 kB]
Hit:2 http://archive.ubuntu.com/ubuntu focal InRelease
Get:3 http://archive.ubuntu.com/ubuntu focal-updates InRelease [107 kB]
Get:4 http://apt.postgresql.org/pub/repos/apt bionic-pgdg InRelease [84.6 kB]
```

Later, you can again verify it as below:

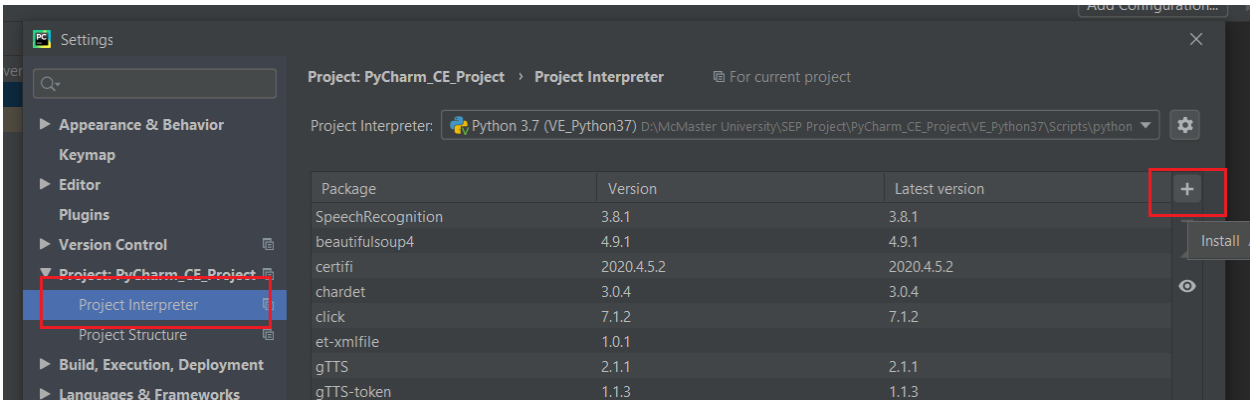
```
somak@LAPTOP-2QHNB620:~/opencv_build/opencv/build$
somak@LAPTOP-2QHNB620:~/opencv_build/opencv/build$ python3 -c "import cv2; print(cv2.__version__)"
4.3.0-dev
somak@LAPTOP-2QHNB620:~/opencv_build/opencv/build$
somak@LAPTOP-2QHNB620:~/opencv_build/opencv/build$
```

Installation done!!

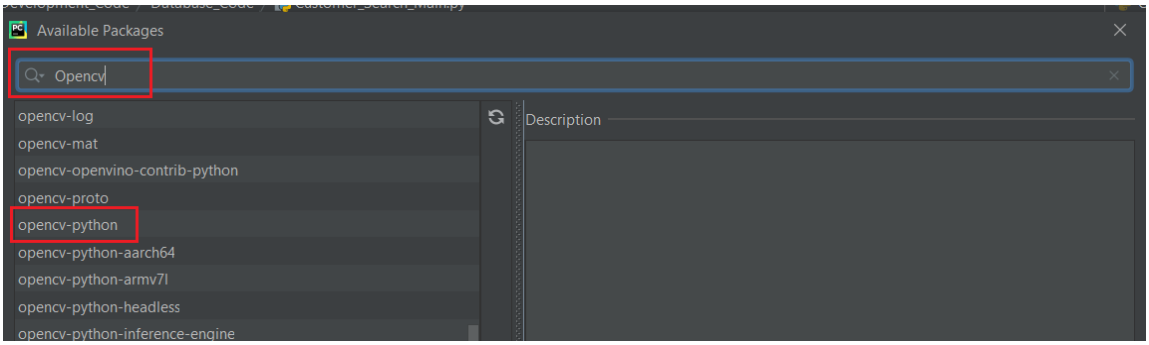
3. Install OpenCV on PyCharm

If you are wished to run or execute the code from PyCharm CE, and PyCharm CE gives error regarding OpenCV module, then you can also install it from PyCharm Packages as below:

- Go to Settings and click on Project Interpreter
- In the Project Interpreter, click on “+” to add packages.



- In the Available Packages tab, you can search for “OpenCV-python” and install it. You can install any packages related to OpenCV.



For more details related to OpenCV, please visit the OpenCV.org website.