

2022년 IoT기반 스마트 솔루션 개발자 양성과정



# Programming : Python

## 11-OpenCV

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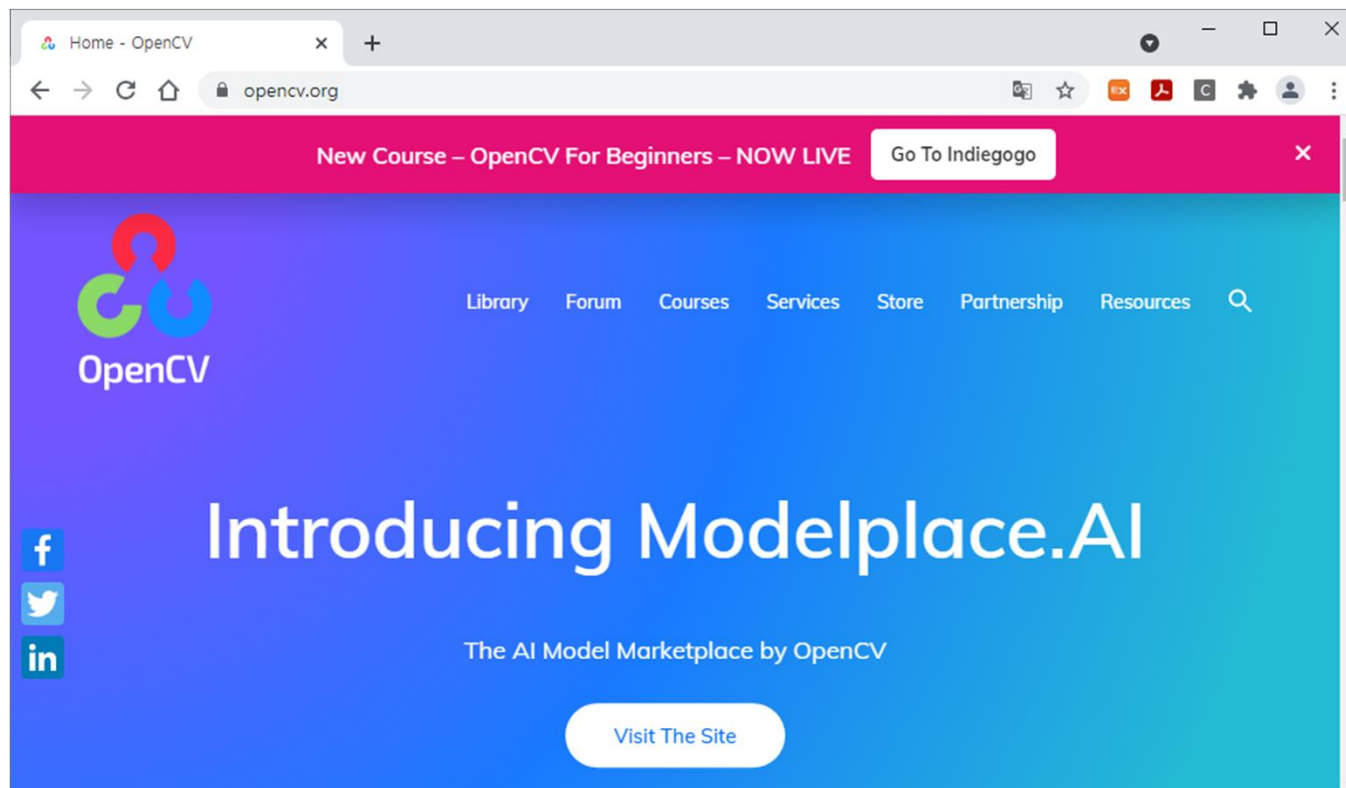
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# Open Source Computer Vision Library

- 실시간 컴퓨터 비전을 목적으로 한 프로그래밍 라이브러리
- C/C++ 프로그래밍 언어로 개발 되었으며 Python , Java 및 Matlab / Octave에 바인딩 되어 프로그래머에게 개발 환경을 지원
- 주요 기능
  - 이진화(binarization)
  - 노이즈 제거
  - 외곽선 검출(edge detection)
  - 패턴인식
  - 기계학습(machine learning)
  - ROI(Region Of Interest) 설정
  - 이미지 변환(image warping)
  - 하드웨어 가속



# opencv.org



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# Install python3-opencv

```
$ sudo apt install python3-opencv
```

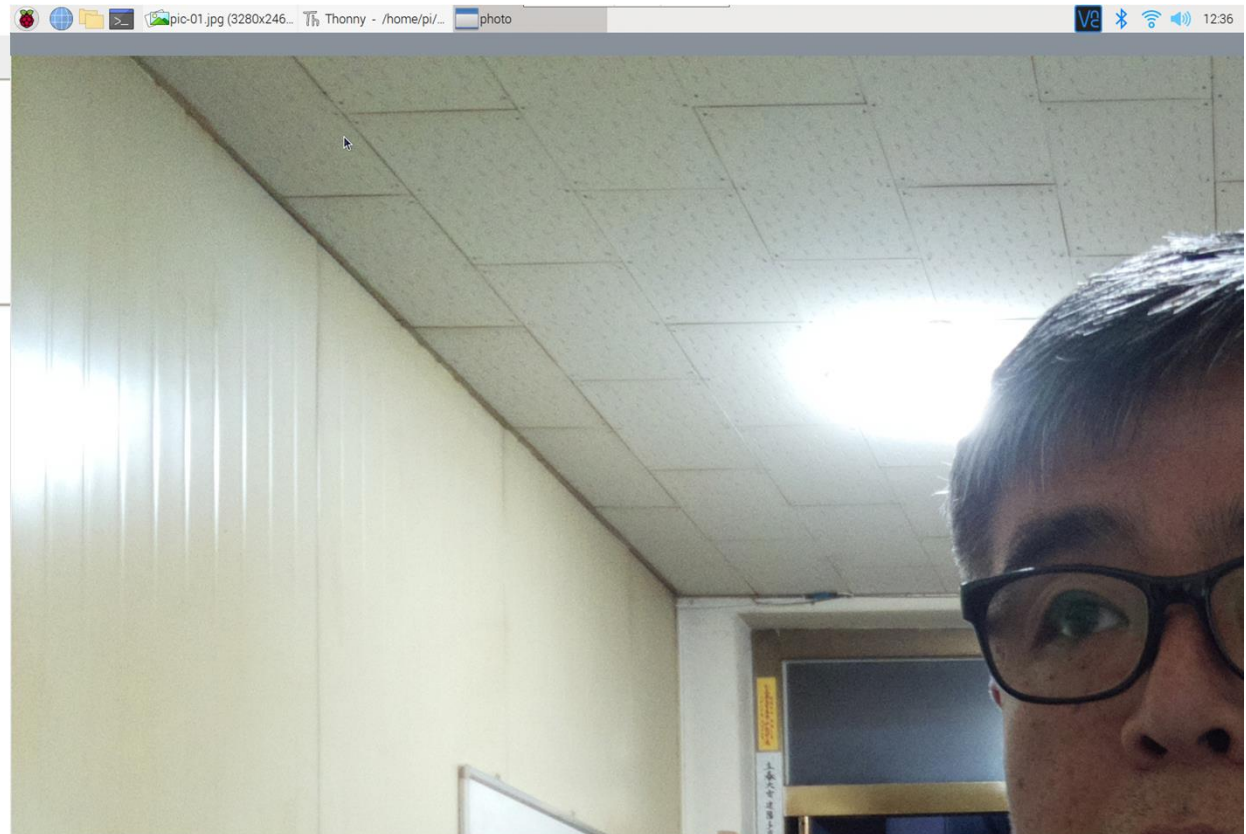
```
pi@raspberrypi: ~  
File Edit Tabs Help  
pi@raspberrypi:~ $ sudo apt-get install python3-opencv  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
The following additional packages will be installed:  
autoconf automake autotools-dev gdal-data gfortran gfortran-8 libaec0  
libarmadillo9 libarpack2 libcaf-openmpi-3 libcharls2 libcoarrays-dev  
libcoarrays-openmpi-dev libdap25 libdapclient6v5 libdapserver7v5 libepsilon1  
libevent-core-2.1-6 libevent-pthreads-2.1-6 libfreexl1 libfyba0 libgdal20  
libgdcm2.8 libgeos-3.7.1 libgeos-clv5 libgeotiff2 libgfortran-8-dev  
libgl2ps1.4 libhdf4-0-alt libhdf5-103 libhdf5-openmpi-103 libhwloc-dev  
libhwloc-plugins libhwloc5 libibverbs-dev libjsoncpp1 libkmlbase1  
libkmlconvenience1 libkmlengine1 libkmlregionator1 libkmlxsd1  
liblpt5 libltdl-dev libminizip1 libnetcdf-c++4 libnetcdf13 libnl-3-dev  
libnl-route-3-dev libodbc1 libogdi3.2 libopencv-calib3d3.2  
libopencv-contrib3.2 libopencv-core3.2 libopencv-features2d3.2  
libopencv-flann3.2 libopencv-highgui3.2 libopencv-imgcodecs3.2  
libopencv-imgproc3.2 libopencv-ml3.2 libopencv-objdetect3.2  
libopencv-photo3.2 libopencv-shape3.2 libopencv-stitching3.2  
libopencv-superres3.2 libopencv-video3.2 libopencv-videoio3.2  
libopencv-videostab3.2 libopencv-viz3.2 libopenmpi-dev libopenmpi3 libpmix2  
libproj13 libqhull7 libsigsegv2 libsocket++1 libspatialite7 libsuperlu5  
libsz2 libtbb2 libtesseract4 libtool liburiparser1 libvtk6.3 libxerces-c3.2  
m4 ocl-icd-libopencl1 odbcinst odbcinstdebian2 openmpi-bin openmpi-common  
proj-bin proj-data  
Suggested packages:  
autoconf-archive gnu-standards autoconf-doc gettext gfortran-doc  
gfortran-8-doc libgfortran5-dbg geotiff-bin gdal-bin libgeotiff-epsg  
libhdf4-doc libhdf4-alt-dev hdf4-tools libhwloc-contrib-plugins libtool-doc  
libmyodbc odbc.postgresql tdsodbc unixodbc-bin ogdi-bin openmpi-doc gcj-jdk  
mpi-default-bin vtk6-doc vtk6-examples m4-doc opencl-icd  
The following NEW packages will be installed:  
autoconf automake autotools-dev gdal-data gfortran gfortran-8 libaec0
```



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# cv2.imread( )

```
cv2-imageRead.py x
1 import cv2
2
3 img=cv2.imread('pic-01.jpg')
4
5 cv2.imshow('photo',img)
6 cv2.waitKey(0)
7 cv2.destroyAllWindows()
```



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# cv2.imread( )

cv2-imageRead.py \*

```
1 import cv2
2
3 img=cv2.imread('pic-03.jpg')
4
5 cv2.imshow('photo',img)
6 cv2.waitKey(0)
7 cv2.destroyAllWindows()
8 |
```



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# cv2.resize( )

cv2-imageRead.py ✕ cv2-gray.py ✕ cv2-resize.py ✕

```
1 import cv2
2
3 img=cv2.imread('pic-01.jpg')
4 resizeImg=cv2.resize(img,(640,480))
5
6 cv2.imshow('photo',resizeImg)
7 cv2.waitKey(0)
8 cv2.destroyAllWindows()
9
```



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# cv2.cvtColor( )

```
cv2-imageRead.py x cv2-gray.py x
1 import cv2
2
3 img=cv2.imread('pic-03.jpg')
4 gray=cv2.cvtColor(img,cv2.COLOR_BGR2GRAY)
5
6 cv2.imshow('photo',gray)
7 cv2.waitKey(0)
8 cv2.destroyAllWindows()
9
```



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# cv2.IMREAD\_GRAYSCALE

```
cv2-gray.py x cv2-gray2.py x
1 import cv2
2
3 img=cv2.imread('pic-03.jpg',cv2.IMREAD_GRAYSCALE)
4
5 cv2.imshow('photo',img)
6 cv2.waitKey(0)
7 cv2.destroyAllWindows()
8
```



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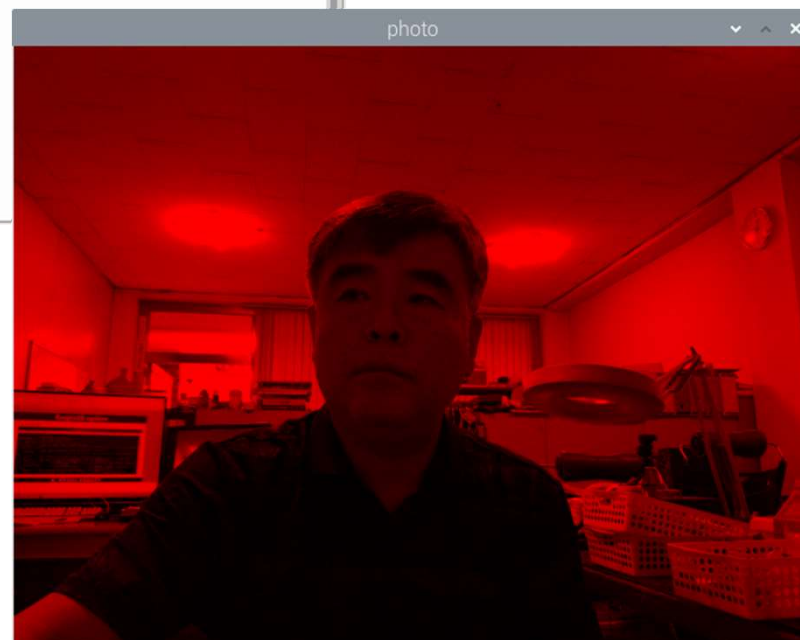
# cv2.split( ), merge( )

cv2\_split.py \*✕

```
1 import cv2
2 import numpy as np
3
4 img=cv2.imread('pic-03.jpg',cv2.IMREAD_COLOR)
5 B_img,G_img,R_img=cv2.split(img)
6 zeroImg=np.zeros((img.shape[0],img.shape[1]),dtype='uint8')
7 mergeImg=cv2.merge([zeroImg,zeroImg,R_img])
8
9 cv2.imshow('photo',mergeImg)
10 cv2.waitKey(0)
11 cv2.destroyAllWindows()
12
```

cv2.merge(B,G,R)

\$ sudo apt-get install python3-numpy

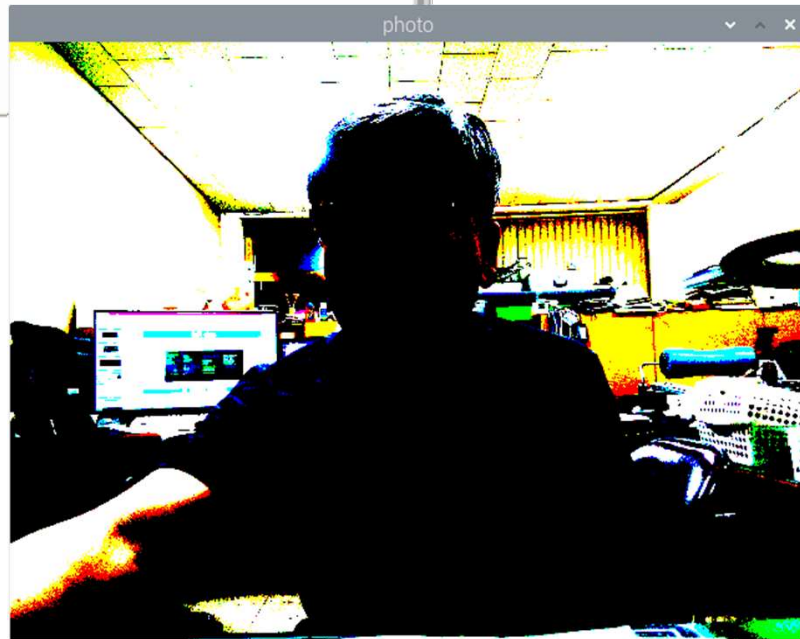
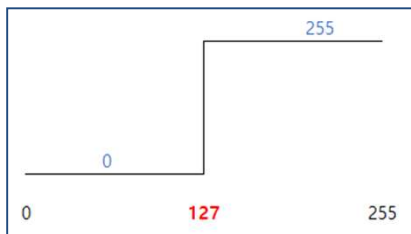


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# cv2.threshold( )

```
cv2-thresh_binary.py ✕  
1 import cv2  
2  
3 img=cv2.imread('pic-01.jpg')  
4 resizeImg=cv2.resize(img,(640,480))  
5 ret,threshHoldImage=cv2.threshold(resizeImg,127,255,cv2.THRESH_BINARY)  
6  
7 cv2.imshow('photo',threshHoldImage)  
8 cv2.waitKey(0)  
9 cv2.destroyAllWindows()  
10
```

cv2.threshold(img,thr value,value,flag)



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# cv2.gray + thresh

cv2-resize-gray-thresh.py ✕

```
1 import cv2
2
3 img=cv2.imread('pic-01.jpg')
4 resizeImg=cv2.resize(img,(640,480))
5 resizeGray=cv2.cvtColor(resizeImg,cv2.COLOR_BGR2GRAY)
6 ret,threshHoldImage=cv2.threshold(resizeGray,127,255,cv2.THRESH_BINARY)
7
8 cv2.imshow('photo',threshHoldImage)
9 cv2.waitKey(0)
10 cv2.destroyAllWindows()
11 |
```



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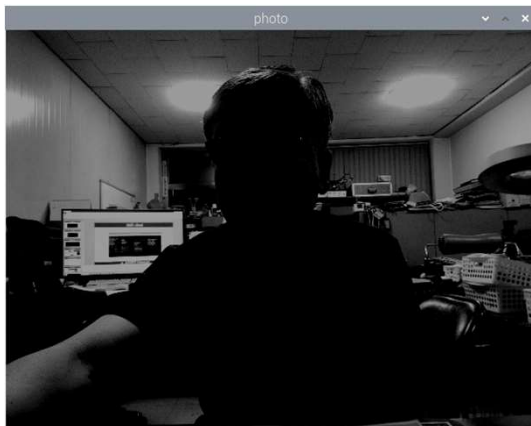
# cv2.add( )

cv2-add.py

```
1 import cv2
2
3 img=cv2.imread('pic-01.jpg')
4 resizeImg=cv2.resize(img,(640,480))
5 resizeGray=cv2.cvtColor(resizeImg,cv2.COLOR_BGR2GRAY)
6 mathImg=cv2.add(resizeGray,-100)
7
8 cv2.imshow('photo',mathImg)
9 cv2.waitKey(0)
10 cv2.destroyAllWindows()
11
```

결과값 { 0>: 0 , 255<:255 }

cv2.subtract( )



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# cv2.multiply( )

```
cv2-add.py x cv2-multiply.py x
1 import cv2
2
3 img=cv2.imread('pic-01.jpg')
4 resizeImg=cv2.resize(img,(640,480))
5 resizeGray=cv2.cvtColor(resizeImg,cv2.COLOR_BGR2GRAY)
6 mathImg=cv2.multiply(resizeGray,2)
7
8 cv2.imshow('photo',mathImg)
9 cv2.waitKey(0)
10 cv2.destroyAllWindows()
11
```

결과값 { 0>: 0 , 255<:255 }

cv2.divide( )



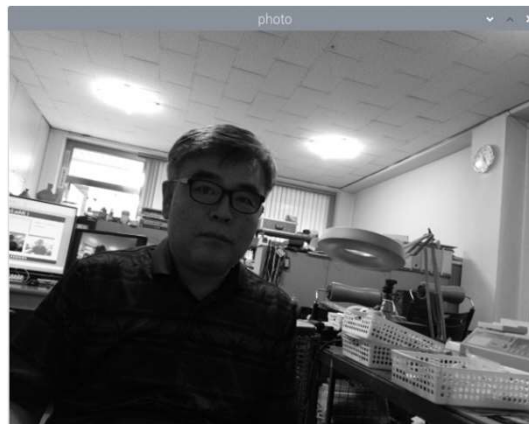
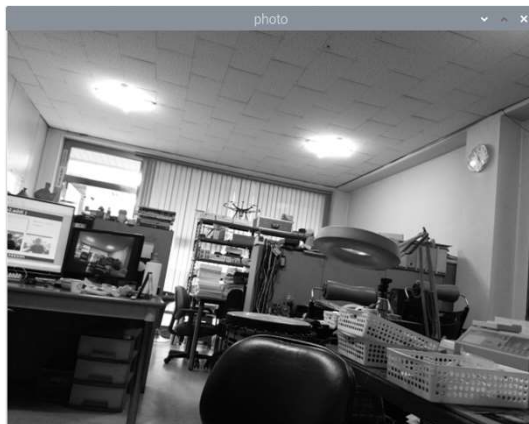
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# cv2.absdiff( )


cv2-absdiff.py ✕

```
1 import cv2
2
3 img_1=cv2.imread('pic-04.jpg',cv2.IMREAD_GRAYSCALE)
4 img_2=cv2.imread('pic-05.jpg',cv2.IMREAD_GRAYSCALE)
5 mathImg=cv2.bitwise_not(cv2.absdiff(img_2,img_1))
6
7 cv2.imshow('photo',mathImg)
8 cv2.waitKey(0)
9 cv2.destroyAllWindows()
10
```

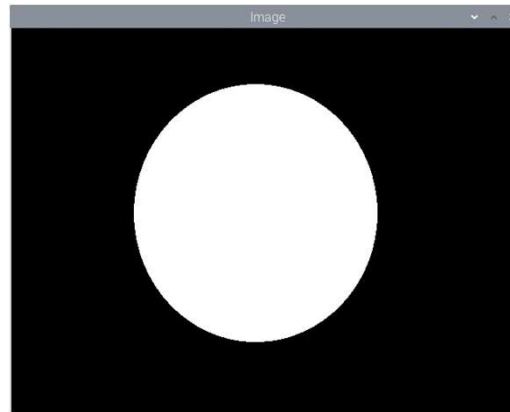


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# cv2.bitwise\_and( )

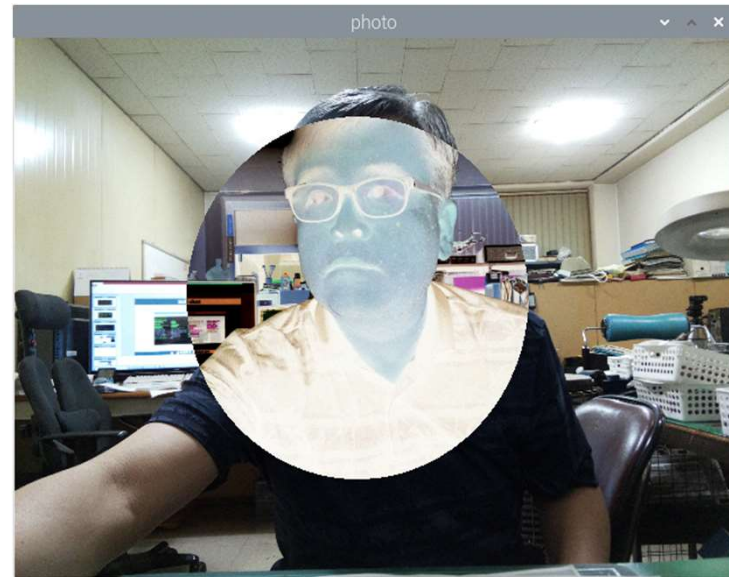
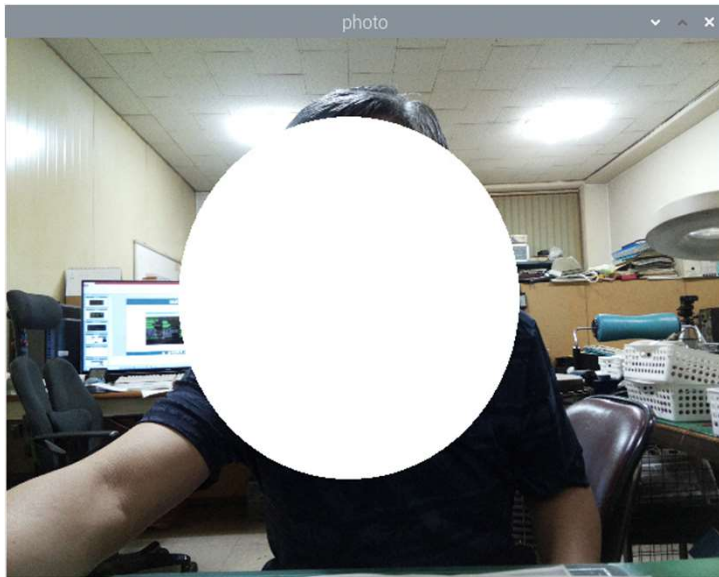
cv2-mask.py \*

```
1 import cv2
2
3 img=cv2.imread('pic-01.jpg')
4 resizeImg=cv2.resize(img,(640,480))
5 maskImg=cv2.imread('mask-01.jpg')
6
7 masked=cv2.bitwise_and(resizeImg,maskImg)
8
9 cv2.imshow('photo',masked)
10 cv2.waitKey(0)
11 cv2.destroyAllWindows()
12 |
```



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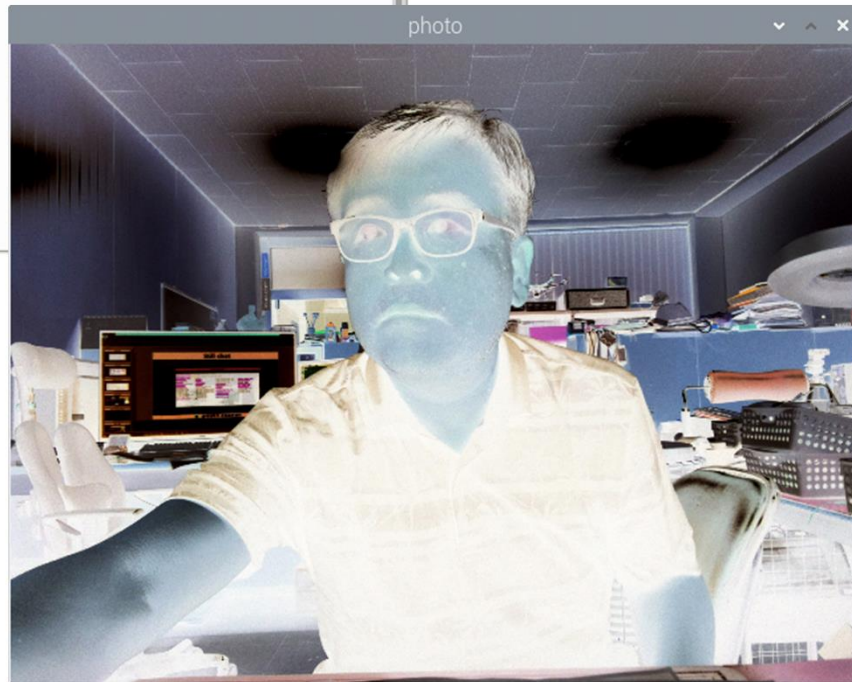
# cv2.bitwise\_or( ) , xor( )



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# cv2.bitwise\_not( )

```
cv2-mask.py x cv2-bitwise_not.py x
1 import cv2
2
3 img=cv2.imread('pic-01.jpg')
4 resizeImg=cv2.resize(img,(640,480))
5 maskImg=cv2.imread('mask-01.jpg')
6
7 inverse=cv2.bitwise_not(resizeImg)
8
9 cv2.imshow('photo',inverse)
10 cv2.waitKey(0)
11 cv2.destroyAllWindows()
12
```



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