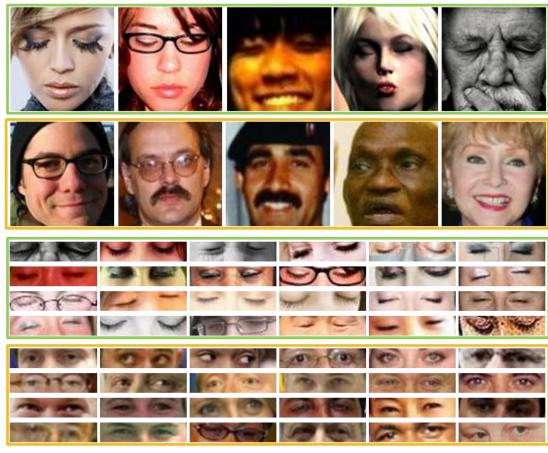
# Machine Learning

Application 1

#### Closeness detection



http://parnec.nuaa.edu.cn/xtan/data/ClosedEyeDatabases.html

## Closed Eyes In The Wild (Nanjing University)

















closed\_eye\_0003 .jpg\_face\_2.jpg

.jpg\_face\_1.jpg

closed\_eye\_0009 .jpg\_face\_1.jpg



closed\_eye\_0013 .BMP\_face\_1.jpg















closed\_eye\_0014 .jpg\_face\_2.jpg



closed\_eye\_0019 .jpg\_face\_1.jpg



closed\_eye\_0020 .jpg\_face\_1.jpg



closed\_eye\_0024 .jpg\_face\_2.jpg

closed\_eye\_0030 .jpg\_face\_2.jpg





closed\_eye\_0033







closed\_eye\_0038



closed\_eye\_0032 .jpg\_face\_1.jpg



closed\_eye\_0033 .jpg\_face\_3.jpg



closed\_eye\_0034 .jpg\_face\_4.jpg



closed\_eye\_0035 .BMP\_face\_1.jpg

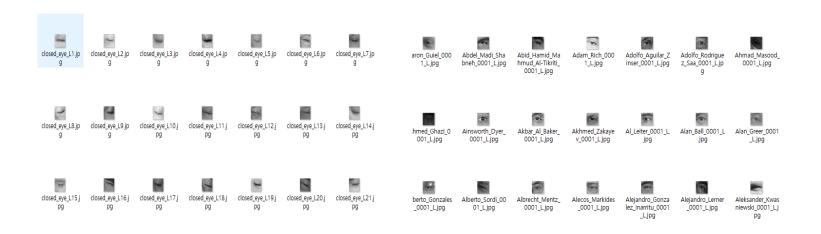


closed\_eye\_0043 .jpg\_face\_2.jpg

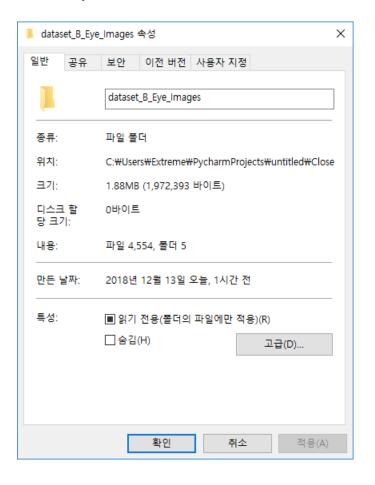


## Closed Eyes In The Wild

☐ closedLeftEyes	2018-12-13 오후 파일 폴더
closedRightEyes	2018-12-13 오후 파일 폴더
openLeftEyes	2018-12-13 오후 파일 폴더
openRightEyes	2018-12-13 오후 파일 폴더



#### Closed Eyes In The Wild



closedLeftEyes

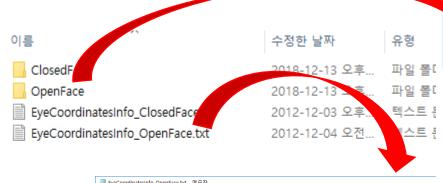
| closedRightEyes

openLeftEyes

openRightEyes

2018-12-13 오후... 파일 폴더 2018-12-13 오후... 파일 폴더 2018-12-13 오후... 파일 폴더 2018-12-13 오후... 파일 폴더

#### Closed Eyes In The Wild





Ahmed Ghazi 0



Ainsworth Dver

Alberto\_Sordi\_00











Akbar Al Baker

Albrecht\_Mentz\_



v\_0001.jpg

Alecos Markides





Alejandro\_Gonza



Alejandro\_Lerner

\_0001.jpg

z\_Saa\_0001.jpg



Alan\_Greer\_0001





Aleksander Kwas niewski\_0001.jpg

■ EyeCoordinatesInfo\_OpenFace.txt - 메모장

파일(F) 편집(E) 서식(O) 보기(V) 도움말(H)

| Aaron\_Guiel\_0001.jpg 30 39 71 45Abdel\_Madi\_Shabneh\_0001.jpg 34 40 71 43Abid\_Hamid\_Mahmud\_Al-Alberto\_Gonzales 1 42Alexandra\_Rozovskaya\_0001.jpg 33 34 68 43Alexandra\_Stevenson\_0001.jpg 37 41 69 43Alexandre\_E

in 0001,jpg 41 43 74 38Barry Alvarez 0001,jpg 35 41 66 44Barry Switzer 0001,jpg 35 39 72 36Bartosz Kizierowski 0001,jpg 34 37 71 38Beatriz Merino 0001,jpg 34 39 74 39Ben Braun 000 ly\_Crawford\_0001.jpg 35 42 71 47Bison\_Dele\_0001.jpg 30 39 73 40Bixente\_Llzarazu\_0001.jpg 35 41 72 41Blythe\_Danner\_0001.jpg 32 41 71 37Blythe\_Hartley\_0001.jpg 35 42 71 41Bob\_Alpei gory\_0001.jpg 34 44 69 42Brian\_McIntyre\_0001.jpg 40 47 70 37Brian\_Olson\_0001.jpg 38 42 72 38Brian\_Pavlich\_0001.jpg 35 37 70 37Brian\_StPierre\_0001.jpg 34 43 74 35Brian\_Weaver\_0001. 70 41Casy\_Preslar\_0001.jpg 34 47 74 43Catherine\_Ndereba\_0001.jpg 33 47 80 41Catherine\_Woodard\_0001.jpg 36 41 69 39Cathy\_Cunningham\_0001.jpg 35 44 69 40Cathy\_Freeman\_0001.jp .jpg 34 41 75 39Chris\_Claiborne\_0001.jpg 30 40 71 39Chris\_Cornell\_0001.jpg 32 44 77 40Chris\_Forsyth\_0001.jpg 34 39 70 43Chris\_Hernandez\_0001.jpg 37 44 72 42Chris\_Noth\_0001.jpg 34 42Crandall Bowles 0001.jpg 38 42 74 40Cristina Saralegui 0001.jpg 37 35 68 42Cruz Bustamante 0001.jpg 33 44 68 38DAngelo Jimenez 0001.jpg 31 42 72 38Dagmar Dunlevy 0001.jpg 30 42 74 40Cristina Saralegui 0001.jpg 30 42 74 40Cristina Saralegui 0001.jpg 30 40 74 4 s\_0001.jpg 38 45 69 36Dave\_McNealey\_0001.jpg 32 39 73 40Dave\_Odom\_0001.jpg 37 44 74 40Dave\_Ragone\_0001.jpg 47 42 82 40Dave\_Robertson\_0001.jpg 37 42 72 42David\_Alpay\_0001 iana\_Taurasi\_0001.jpg 36 41 69 39Diane\_Ladd\_0001.jpg 33 48 72 36Dick\_Devine\_0001.jpg 30 42 75 39Dick\_Latessa\_0001.jpg 35 43 73 40Diego\_Colorado\_0001.jpg 36 41 68 38Dieter\_Zetsch ullivan\_0001.jpg 33 41 71 38Eddy\_Hartenstein\_0001.jpg 28 44 63 39Edouard\_Michelin\_0001.jpg 35 41 70 41Eduardo\_Chillida\_0001.jpg 35 43 72 41Edward\_Greenspan\_0001.jpg 31 41 63 41 1.jpg 35 41 70 39Erin\_Hershey\_Presley\_0001.jpg 47 40 81 42Ernie\_Fletcher\_0001.jpg 31 45 69 39Ernie\_Grunfeld\_0001.jpg 36 44 69 41Erskine\_Bowles\_0001.jpg 37 43 70 40Erwin\_Abdullah\_0 1.jpg 35 38 75 44Frank\_Stallone\_0001.jpg 35 36 71 40Frank\_Van\_Ecke\_0001.jpg 41 43 71 41Franklin\_Brown\_0001.jpg 37 40 74 43Fred\_Rogers\_0001.jpg 37 44 72 39Fred\_Swan\_0001.jpg 31

40Gerhard\_Schmid\_0001.jpg 32 42 66 39Gerry\_Parsky\_0001.jpg 36 43 71 39Ghassan\_Elashi\_0001.jpg 37 41 68 41Gian\_Marco\_0001.jpg 37 38 71 41Gianna\_Angelopoulos-Daskalaki\_0001.jpg Hanns\_Schumacher\_0001.jpg 35 39 74 52Hans\_Peter\_Briegel\_0001.jpg 36 42 73 35Harvey\_Wachsman\_0001.jpg 34 41 73 43Hayden\_Panettiere\_0001.jpg 36 43 70 40Heather\_Chinnock\_0001 7 71 44Hunter\_Bates\_0001.jpg 33 42 70 40Hunter\_Kemper\_0001.jpg 36 39 69 38Hussam\_Mohammed\_Amin\_0001.jpg 40 44 71 38lain\_Anderson\_0001.jpg 37 46 72 39lbrahim\_Hilal\_0001.jpc James\_Gibson\_0001.jpg 35 39 69 42James\_Harris\_0001.jpg 31 40 75 40James\_Hill\_0001.jpg 35 39 70 42James\_Mathis\_0001.jpg 38 41 72 39James\_May\_0001.jpg 33 43 70 44James\_Phelps\_C ancois\_Pontal\_0001.jpg 32 43 72 47Jean-Marc\_Olive\_0001.jpg 35 44 74 38Jean-Patrick\_Nazon\_0001.jpg 34 44 73 44Jean\_Brumley\_0001.jpg 35 46 71 37Jean\_Nagel\_0001.jpg 33 44 71 43Jean\_Nagel\_0001.jpg 35 46 71 37Jean\_Nagel\_0001.jpg 35 44 74 38Jean\_Nagel\_0001.jpg 35 44 74 38Jean\_Nagel\_00 unning\_0001.jpg 33 45 70 43Jim\_Calhoun\_0001.jpg 38 44 67 46Jim\_Doyle\_0001.jpg 37 39 69 41Jim\_Fassel\_0001.jpg 34 43 73 41Jim\_Freudenberg\_0001.jpg 34 41 73 47Jim\_Hahn\_0001.jpg rg\_Haider\_0001.jpg 31 46 71 36John\_Banko\_0001.jpg 32 43 70 40John\_Barnett\_0001.jpg 29 40 70 39John\_Eder\_0001.jpg 36 46 71 42John\_Edwards\_0001.jpg 34 47 69 40John\_Garamendi\_0 imenez\_0001.jpg 33 42 72 36Jorge\_Moreno\_0001.jpg 31 42 78 38Jorge\_Quiroga\_0001.jpg 35 41 72 39Jorge\_Rodolfo\_Canicoba\_Corral\_0001.jpg 36 45 76 36Jorma\_Huhtala\_0001.jpg 36 41 g 37 45 69 39Karen\_Lynn\_Gorney\_0001.jpg 33 41 69 40Karin\_Stoiber\_0001.jpg 37 40 72 40Kaspar\_Villiger\_0001.jpg 39 36 74 42Kate\_Hudson\_0001.jpg 34 42 74 38Kate\_Lee\_0001.jpg 33 43 jpg 33 45 68 43Kim\_Hong-gul\_0001.jpg 29 38 70 38Kim\_Jong-Il\_0001.jpg 34 40 67 41Kim\_Ryong-sung\_0001.jpg 34 42 68 42Kimberly\_Stewart\_0001.jpg 37 40 71 43Kirsten\_Dunst\_0001.jpg r\_0001.jpg 38 40 74 39Laurence\_Tribe\_0001.jpg 33 44 69 35Laurie\_Chan\_0001.jpg 35 41 72 40Laurie\_Pirtle\_0001.jpg 35 40 72 43Lawrence\_MacAulay\_0001.jpg 30 45 67 37LeAnn\_Rimes\_001 r\_0001.jpg 37 44 70 39Lori\_Berenson\_0001.jpg 34 45 71 38Lorne\_Michaels\_0001.jpg 32 44 71 44Lorraine\_Bracco\_0001.jpg 33 40 70 45Louis\_Van\_Gaal\_0001.jpg 34 43 74 39Luca\_Cordero\_d 38Marcus\_Gronholm\_0001.jpg 37 39 71 40Maria\_Burks\_0001.jpg 38 42 76 40Mariam\_Ali\_Hassan\_0001.jpg 32 36 70 39Maribel\_Dominguez\_0001.jpg 33 39 74 44Marieta\_Chrousala\_0001.jpg 1.jpg 33 43 69 39Mary Descenza 0001.jpg 32 41 66 37Mary Hill 0001.jpg 36 41 71 45Mary Matalin 0001.jpg 35 43 65 36Mary McCarty 0001.jpg 37 42 72 36Matthias Sammer 0001.jpg 3 hael\_Rolinee\_0001.jpg 35 46 66 41Michael\_Shelby\_0001.jpg 36 41 72 42Michael\_Wayne\_0001.jpg 34 46 68 41Michel\_Minard\_0001.jpg 33 37 78 38Michelle\_Hofland\_0001.jpg 38 34 78 43W Bellucci\_0001.jpg 36 41 74 43Monique\_Garbrecht-Enfeldt\_0001.jpg 33 41 70 39Moon-So-ri\_0001.jpg 33 49 63 39Morgan\_Fairchild\_0001.jpg 36 39 71 38Mother\_Teresa\_0001.jpg 31 40 71 001.jpg 36 42 71 40Norio\_Ohga\_0001.jpg 33 43 69 39Norm\_Macdonald\_0001.jpg 34 42 71 39Norman\_Mailer\_0001.jpg 37 42 75 41Normand\_Legault\_0001.jpg 36 39 72 45Nuon\_Chea\_000 001.jpg 30 42 70 38Paul\_Coppin\_0001.jpg 38 44 71 42Paul\_Desmarais\_0001.jpg 34 44 75 38Paul\_Ebert\_0001.jpg 35 35 72 38Paul\_Earley\_0001.jpg 35 39 71 45Paul\_Johnson\_0001.jpg 37 42

#### • 데이터 불러오기

```
import cv2
import sys, os
import numpy as np
from numpy import genfromtxt
sys.path.append(os.pardir)
filePath = "Closed Eyes In The Wild (CEW)\\dataset_B_Eye_Images\\dataset_B_Eye_Images"
folderNames = os.listdir(filePath) # 경로 내 파일 및 폴더 명
target = 0
targetData = []
trainData = [])
```

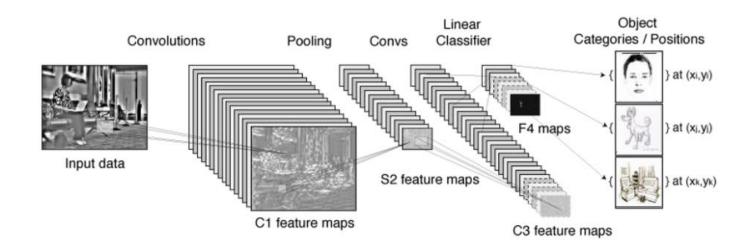
#### ■ 데이터 불러오기

```
for i in folderNames:
  fullPathName = filePath + "\\" + i
                                                  # 경로 내 파일 및 폴더
  fileNames = os.listdir(fullPathName)
  for j in fileNames:
    srcImage = cv2.imread(fullPathName + " \\ " + j, 0) # 이미지 로드
                                                   #데이터 타입 변경
    srcImage = srcImage.astype(np.float32)
                                                   #실수 데이터로 변환
    srcImage /= 255.0
    trainData.append(srcImage)
    targetData.append(target)
                                                   # 타겟 값 증가
  target += 1
trainData = np.array(trainData).reshape(-1, 1, 24, 24)
targetData = np.array(targetData)
s = np.arange(targetData.shape[0])
np.random.shuffle(s)
trainData = trainData[s] #학습 데이터 셋
targetData = targetData[s] #라벨 데이터 셋
```

#### ■ 데이터 불러오기

```
for i in folderNames:
  fullPathName = filePath + "\\" + i
                                                  # 경로 내 파일 및 폴더
  fileNames = os.listdir(fullPathName)
  for j in fileNames:
    srcImage = cv2.imread(fullPathName + " \\ " + j, 0) #이미지 로드
                                                 #데이터 타입 변경
    data = srcImage.astype(np.float32)
                                                 #실수 데이터로 변환
    data /= 255.0
    trainData.append(srcImage)
    targetData.append(target)
                                                   # 타겟 값 증가
  target += 1
trainData = np.array(trainData).reshape(-1, 1, 24, 24)
targetData = np.array(targetData)
s = np.arange(targetData.shape[0])
np.random.shuffle(s)
trainData = trainData[s] #학습 데이터 셋
targetData = targetData[s] #라벨 데이터 셋
```

■ 학습하기 & 학습 결과 파라미터 저장



#### ■ 테스트

```
import cv2
import sys, os
import numpy as np
sys.path.append(os.pardir)
from numpy import genfromtxt
def resultToStr(result):
  if np.argmax(result) == 0 or np.argmax(result) == 1:
    strTemp = "Closed"
  else:
    strTemp = "Opened"
  return strTemp
```

• 테스트(라벨 데이터 불러오기)

```
filePath = "Closed Eyes In The Wild (CEW)\\dataset_B_Facial_Images\\" openedFolderName = "OpenFace\\" closedFolderName = "ClosedFace\\" openedEyeLabel = "EyeCoordinatesInfo_OpenFace.txt" closedEyeLabel = "EyeCoordinatesInfo_ClosedFace.txt" data = genfromtxt(filePath + openedEyeLabel, delimiter=' ', dtype="U50")
# 신경망 초기화
# 학습 신경망 파라미터 로드
```

#### • 테스트(라벨 데이터 불러오기)

EyeCoordinatesInfo\_ClosedFace.txt - 메모장 PC data 파일(F) 편집(E) 서식(O) 보기(V) 도움말(H) closed\_eye\_0001.jpg\_face\_1.jpg 26 40 73 38closed\_eye\_0002.jpg\_face\_2.jpg 6 69 44closed\_eye\_0059.jpg\_face\_2.jpg 34 36 72 42closed\_eye\_0060.jpg\_fa jpg 36 48 66 43closed\_eye\_0124.jpg\_face\_2.jpg 31 45 71 38closed\_eye\_012 closed\_eye\_0001.jpg\_face\_1.jpg \_face\_1.jpg 37 43 78 43closed\_eye\_0189.jpg\_face\_1.jpg 30 43 70 36closed\_ closed\_eye\_0002.jpg\_face\_2.jpg 0243.jpg\_face\_1.jpg 32 46 72 39closed\_eye\_0243.jpg\_face\_2.jpg 28 32 69 4 closed\_eye\_0003.jpg\_face\_2.jpg sed\_eye\_0297.jpg\_face\_1.jpg\_34\_49\_71\_48closed\_eye\_0302.jpg\_face\_2.jpg\_29 closed eye 0007.jpg face 1.jpg closed eye 0009.jpg face 1.jpg 5 45closed\_eye\_0361.jpg\_face\_3.jpg 40 38 70 47closed\_eye\_0363.jpg\_face\_ 32 44 70 46closed\_eye\_0426.jpg\_face\_1.jpg 31 43 64 38closed\_eye\_0427.jp closed\_eye\_0012.jpg\_face\_1.jpg e\_1.jpg 33 44 67 38closed\_eye\_0505.jpg\_face\_1.jpg 32 42 72 43closed\_eye closed\_eye\_0013.BMP\_face\_1.jpg closed\_eye\_0014.jpg\_face\_2.jpg .jpg\_face\_1.jpg 33 37 72 38closed\_eye\_0593.jpg\_face\_1.jpg 29 43 75 42clos closed\_eye\_0015.jpg\_face\_1.jpg eye\_0646.jpg\_face\_1.jpg 34 41 72 44closed\_eye\_0649.jpg\_face\_1.jpg 33 45 closed\_eye\_0019.jpg\_face\_1.jpg closed\_eye\_0698.jpg\_face\_1.jpg 39 43 72 43closed\_eye\_0708.jpg\_face\_1.jpg closed eye 0020.jpg face 1.jpg 4 69 45closed\_eye\_0767.jpg\_face\_3.jpg 33 40 65 44closed\_eye\_0769.jpg\_fa closed\_eye\_0021.jpg\_face\_1.jpg jpg 33 40 73 40closed\_eye\_0820.BMP\_face\_1.jpg 31 39 69 45closed\_eye\_08 closed\_eye\_0024.jpg\_face\_2.jpg closed\_eye\_0030.jpg\_face\_2.jpg 0918.jpg\_face\_4.jpg 24 43 62 32closed\_eye\_0919.jpg\_face\_2.jpg 37 41 70 4 closed\_eye\_0032.jpg\_face\_1.jpg osed\_eye\_1015.png\_face\_1.jpg 34 43 74 44closed\_eye\_1023.jpg\_face\_1.jpg closed\_eye\_0033.jpg\_face\_2.jpg 82 44closed\_eye\_1113.jpg\_face\_3.jpg 26 28 61 43closed\_eye\_1114.jpg\_face closed eye 0033.jpg face 3.jpg g 33 49 82 45closed\_eye\_1181.jpg\_face\_1.jpg 41 41 67 47closed\_eye\_1190 closed eye 0034.jpg face 4.jpg ace 1.jpg 32 38 69 42closed eye 1243.jpg face 4.jpg 31 46 66 32closed e closed\_eye\_0035.BMP\_face\_1.jpg 78.jpg\_face\_3.jpg\_36\_41\_71\_42closed\_eye\_1279.jpg\_face\_1.jpg\_31\_45\_73\_45c closed\_eye\_0038.jpg\_face\_1.jpg d\_eye\_1318.jpg\_face\_2.jpg 32 43 65 37closed\_eye\_1319.jpg\_face\_1.jpg 31 4 closed\_eye\_0043.jpg\_face\_2.jpg 39closed\_eye\_1350.jpg\_face\_2.jpg 27 48 73 32closed\_eye\_1351.jpg\_face\_2.i closed\_eye\_0045.jpg\_face\_1.jpg 42 43 72 48closed\_eye\_1386.jpg\_face\_2.jpg 33 47 70 41closed\_eye\_1387.BI e\_2.jpg 31 37 71 42closed\_eye\_1460.jpg\_face\_1.jpg 28 42 71 38closed\_eye .jpg\_face\_1.jpg 32 44 73 35closed\_eye\_1496.jpg\_face\_1.jpg 34 47 63 38clos eye\_1531.jpg\_face\_1.jpg 34 45 69 41closed\_eye\_1533.jpg\_face\_2.jpg 35 36 closed\_eye\_1578.jpg\_face\_1.jpg 35 42 73 47closed\_eye\_1579.BMP\_face\_1.jp 3 68 38closed\_eye\_1640.jpg\_face\_1.jpg 33 36 81 30closed\_eye\_1641.jpg\_fa ✓ Colored cells jpg 34 43 73 43closed\_eye\_1679.BMP\_face\_1.jpg 33 42 69 43closed\_eye\_16 Resize Automatically \_face\_1.jpg 31 45 71 39closed\_eye\_1738.jpg\_face\_1.jpg 28 42 70 43closed\_ 1786.jpg\_face\_1.jpg 34 44 67 44closed\_eye\_1787.jpg\_face\_1.jpg 29 43 67 3

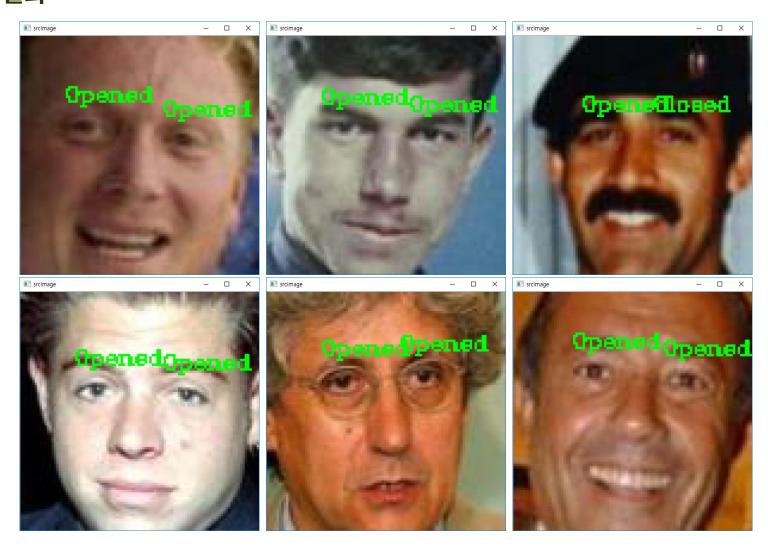
#### - 테스트

```
for i in data:
  srcImage = cv2.imread(filePath + openedFolderName + i[0])
  gray = cv2.cvtColor(srcImage, cv2.COLOR RGB2GRAY)
  leftCenterX = int(i[1]) - 12
  leftCenterY = int(i[2]) - 12
  rightCenterX = int(i[3]) - 12
  rightCenterY = int(i[4]) - 12
  #눈 영역 잘라내기
  leftEye = gray[leftCenterY: leftCenterY + 24, leftCenterX: leftCenterX + 24]/255
  rightEye = gray[rightCenterY : rightCenterY + 24, rightCenterX: rightCenterX + 24]/255
  leftEye = np.array(leftEye).reshape(-1, 1, 24, 24)
  rightEye = np.array(rightEye).reshape(-1, 1, 24, 24)
  #신경망 인식
  resultLeft = network.predict(leftEye)
  resultRight = network.predict(rightEye)
```

■ 테스트(for 문 계속)

```
strLeft = ""
  strRight = ""
  strLeft = resultToStr(resultLeft)
  strRight = resultToStr(resultRight)
  cv2.putText(srcImage, strLeft, (leftCenterX, leftCenterY),
cv2.FONT_HERSHEY_COMPLEX , 0.3, (0, 255, 0))
  cv2.putText(srcImage, strRight, (rightCenterX, rightCenterY),
cv2.FONT HERSHEY COMPLEX, 0.3, (0, 255, 0))
 srcImage = cv2.resize(srcImage, dsize=(512, 512), interpolation=cv2.INTER_AREA)
  cv2.imshow("srcImage", srcImage)
  cv2.waitKey(0)
```

#### ■ 결과



## ■ 결과

