Face data type and format from different face detectors

Shengping Jiang

This notebook explains face rectangle data type and from from dlib hog detector, dlib cnn detector, OpenCV Haar Cascade detector, face_recognition.face_locations and mtcnn.detect_faces()

In [1]:
```
# Several face detection methods. Running on face1
import numpy as np
import os
import face_recognition as frg
from sklearn.neighbors import KNeighborsClassifier
import re
import math
import mtcnn
import matplotlib.pyplot as plt
```

In [2]:
```
from PIL import Image, ImageDraw, ImageFont
from IPython.display import display

def show_face(img_path, location):
    #location is a rectangle in order [left,top,right,bottom]
    pil_image = Image.open(img_path).convert("RGB")
    [left,top,right,bottom] = location

    draw = ImageDraw.Draw(pil_image)
    draw.rectangle(((right, top), (left, bottom)), outline=(0, 0, 25
    display(pil_image)
```

Face type and format from dlib.get_frontal_face_detector()

The dlib.get_frontal_face_detector() returns a face detector with HOG model
Type of faces from HOG detector: <class '_dlib_pybind11.rectangles'>.
This is a dlib data type. A two faces example: rectangles[[(79, 130) (154, 204)], [(247, 92) (354, 199)]]. The rectangles looks a python list
Type of face is: <class '_dlib_pybind11.rectangle'>. It is not a python list or tuple. The format is [(left,top) (right, bottom)]. For example: [(79, 130) (154, 204)]
Each number in the rectangle can get in below:
left = face.left()
top = face.top()
right = face.right()
bottom = face.bottom()

Face type and format from dlib.cnn_face_detection_model_v1(dlib_cnn_model_path)

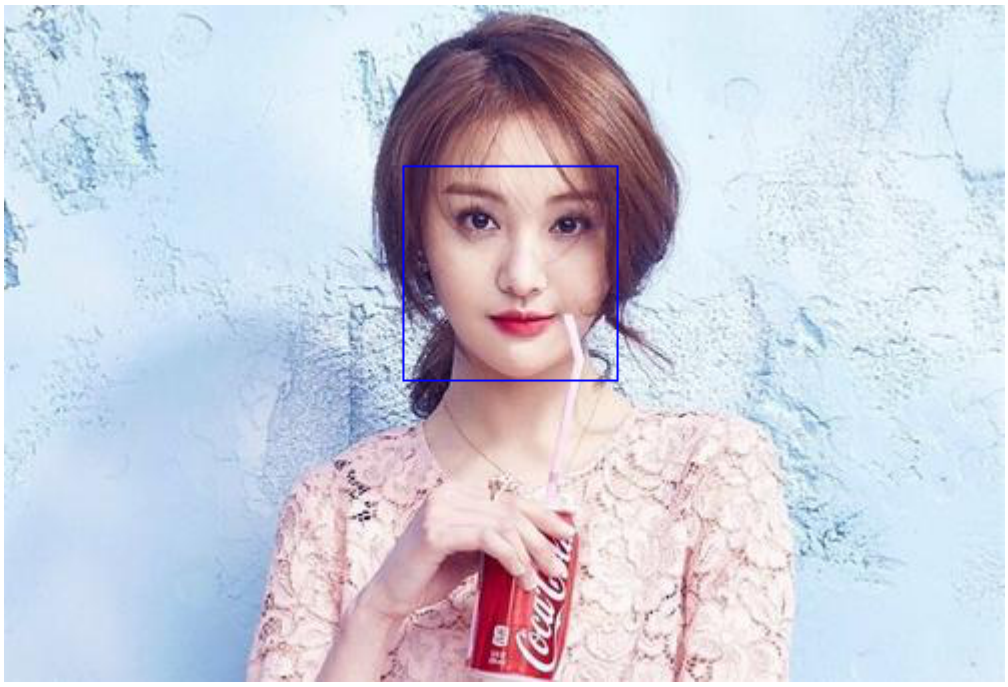
Type of faces from cnn detector: <class '_dlib_pybind11.mmod_rectangles'>.
This is a dlib data type. A two faces example: mmod_rectangles[[(260, 97) (342, 179)], [(70, 122) (151, 204)]].
Type of face is: <class '_dlib_pybind11.mmod_rectangle'>. It is not a python list or tuple but a <_dlib_pybind11.mmod_rectangle object>.
Type of face.rect: <class '_dlib_pybind11.rectangle'>
The face rectangle is represented as face.rect. The format is [(left,top) (right, bottom)]. For example: [(79, 130) (154, 204)]
Each number in the rectangle can be obtained as below:
left = face.rect.left()
top = face.rect.top()
right = face.rect.right()
bottom = face.rect.bottom()

In [3]:

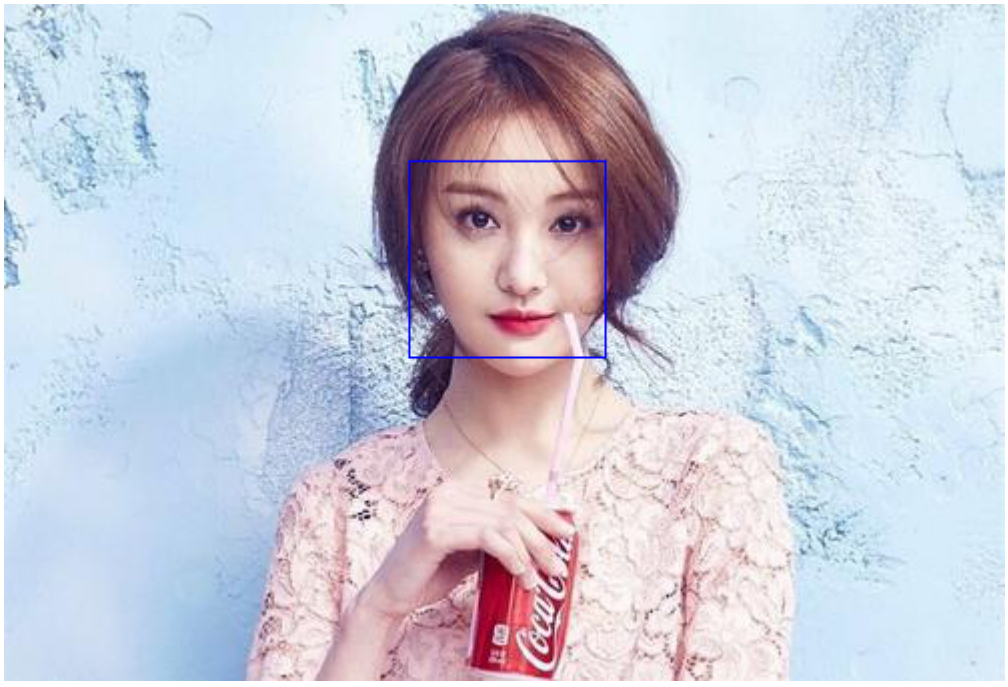
```
# dlib_hog_face_detector()---dlib.get_frontal_face_detector()

import dlib
import cv2

dlib_hog_face_detector = dlib.get_frontal_face_detector()
dlib_cnn_model_path = 'models/mmod_human_face_detector.dat'
dlib_cnn_face_detector = dlib.cnn_face_detection_model_v1(dlib_cnn_m
#img_path = 'notebook_images/kit_with_rose.jpg'
img_path = 'notebook_images/015.jpg'
img = cv2.imread(img_path)

#Test hog model
# type of face:  <class '_dlib_pybind11.rectangle'>
#_dlib_pybind11.rectangle format: [(left,top) (right,bottom)]
faces = dlib_hog_face_detector(img, 1)
print('type of faces(hog)', type(faces))
print('faces(hog):',faces)

#to draw faces on image

for face in faces:
    print('type of face(hog):', type(face))
    print('face(hog):',face)
    left = face.left()
    top = face.top()
    right = face.right()
    bottom = face.bottom()
    location = [left,top,right,bottom]
    #print("type of location:",type(location))
    #print("location:",location)
    print("Face found with HOG model:")
    show_face(img_path, location)

# test cnn model
# type of face:  <class '_dlib_pybind11.mmod_rectangle'>
#_dlib_pybind11.mmod_rectangle.rect -> [(left,top) (right,bottom)]
faces = dlib_cnn_face_detector(img, 1) # result
print('type of faces(cnn)', type(faces))
print('faces(cnn):',faces)
#to draw faces on image

for face in faces:
    print('type of face.rect(cnn)', type(face.rect))
    print('face.rect(cnn):',face.rect)
    left = face.rect.left()
    top = face.rect.top()
    right = face.rect.right()
    bottom = face.rect.bottom()
    location = [left,top,right,bottom]
    #print("type of location:",type(location))
    #print("location:",location)
    print("Face found with CNN model:")
    show_face(img_path, location)
```

```
type of faces(hog) <class '_dlib_pybind11.rectangles'>
```

```
faces(hog): rectangles[[(199, 80) (306, 187)]]
type of face(hog): <class '_dlib_pybind11.rectangle'>
face(hog): [(199, 80) (306, 187)]
Face found with HOG model:
```



```
type of faces(cnn) <class '_dlib_pybind11.mmod_rectangles'>
faces(cnn): mmod_rectangles[[(202, 78) (300, 176)]]
type of face.rect(cnn) <class '_dlib_pybind11.rectangle'>
face.rect(cnn): [(202, 78) (300, 176)]
Face found with CNN model:
```



Face data type and format from OpenCV cv2.CascadeClassifier

type of faces(openCV): <class 'numpy.ndarray'>
faces format(openCV): [[75 117 87 87] [244 89 105 105]]
type of face(openCV): <class 'numpy.ndarray'>
face format(openCV): [left top width height]. for example: [75 117 87 87]
Get each number of a face rectangle as below:
left, top, width, height = face

In [4]:
```
# Haar Cascade
# https://towardsdatascience.com/face-detection-models-which-to-use-

import cv2
classifier = cv2.CascadeClassifier('models/haarcascade_frontalface_a
#img_path = 'notebook_images/kit_with_rose.jpg'
img_path = 'notebook_images/001.jpg'
img = cv2.imread(img_path)
faces = classifier.detectMultiScale(img)# result
print('type of faces(openCV):', type(faces))
print('faces format(openCV):',faces)

# type of face(openCV): <class 'numpy.ndarray'>
# face format(openCV): [x y w h]
#to draw faces on image
for face in faces:
    print('type of face(openCV):', type(face))
    print('face format(openCV):',face)
    x, y, w, h = face
    location = [x, y, x+w,y+h]
    show_face(img_path, location)
```

```
type of faces(openCV): <class 'numpy.ndarray'>
faces format(openCV): [[89 24 84 84]]
type of face(openCV): <class 'numpy.ndarray'>
face format(openCV): [89 24 84 84]
```

Face data type and format from face_recognition.face_locations are as below:

Faces (if more than one face found) is a list of tuples. Each tuple has four numbers which is a face rectangle. Example: [(130, 154, 204, 79), (92, 354, 199, 247)] (two face rectangles). Each face rectangle is in format: (top, right, bottom, left). For example: (130, 154, 204, 79) When use ace_recognition, Face data type and format are same either use hog model or cnn model

In [8]:

```
# face_recognition
# Face rectangles detected by HOG model
import face_recognition as frg

img_path = 'notebook_images/kit_with_rose.jpg'
img = cv2.imread(img_path)

#Use face_recognition.face_locations(image, model='hog')
#format: A list of tuples face locations (top, right, bottom, left)
faces = frg.face_locations(img, model='hog')
print('type of faces:', type(faces))
print('faces:',faces)

for face in faces:
    print('type of face(hog):', type(face))
    print('face(hog):',face)
    # you can use [top, right, bottom, left] = face, (top, right, bo
    # and below method to get each number
    top, right, bottom, left = face
    print('top, right, bottom, left:',top, right, bottom, left)
    # change to location format of show_face()
    location = [left, top, right, bottom]
    print("Face found with HOG model:")
    show_face(img_path, location)
```

```
type of faces: <class 'list'>
faces: [(130, 154, 204, 79), (92, 354, 199, 247)]
type of face(hog): <class 'tuple'>
face(hog): (130, 154, 204, 79)
top, right, bottom, left: 130 154 204 79
Face found with HOG model:
```


```
type of face(hog): <class 'tuple'>
face(hog): (92, 354, 199, 247)
top, right, bottom, left: 92 354 199 247
Face found with HOG model:
```


HBO
GAME OF THRONES
WesterosVIP

In [9]:

```
# face_recognition
# Face rectangles detected by CNN model
import face_recognition as frg

img_path = 'notebook_images/kit_with_rose.jpg'
img = cv2.imread(img_path)

#Use face_recognition.face_locations(image, model='cnn')
#format: A list of tuples face locations (top, right, bottom, left)
faces = frg.face_locations(img, model='cnn')
print('type of faces:', type(faces))
print('faces:',faces)

for face in faces:
    print('type of face(cnn):', type(face))
    print('face(cnn):',face)
    # you can use [top, right, bottom, left] = face, (top, right, bo
    # and below method to get each number
    top, right, bottom, left = face
    print('top, right, bottom, left:',top, right, bottom, left)
    # change to location format of show_face()
    location = [left, top, right, bottom]
    print("Face found with CNN model:")
    show_face(img_path, location)

```

```
type of faces: <class 'list'>
faces: [(97, 342, 179, 260), (122, 151, 204, 70)]
type of face(cnn): <class 'tuple'>
face(cnn): (97, 342, 179, 260)
top, right, bottom, left: 97 342 179 260
Face found with CNN model:
```


```
type of face(cnn): <class 'tuple'>
face(cnn): (122, 151, 204, 70)
top, right, bottom, left: 122 151 204 70
Face found with CNN model:
```


HBO
GAME OF THRONES
WesterosVIP

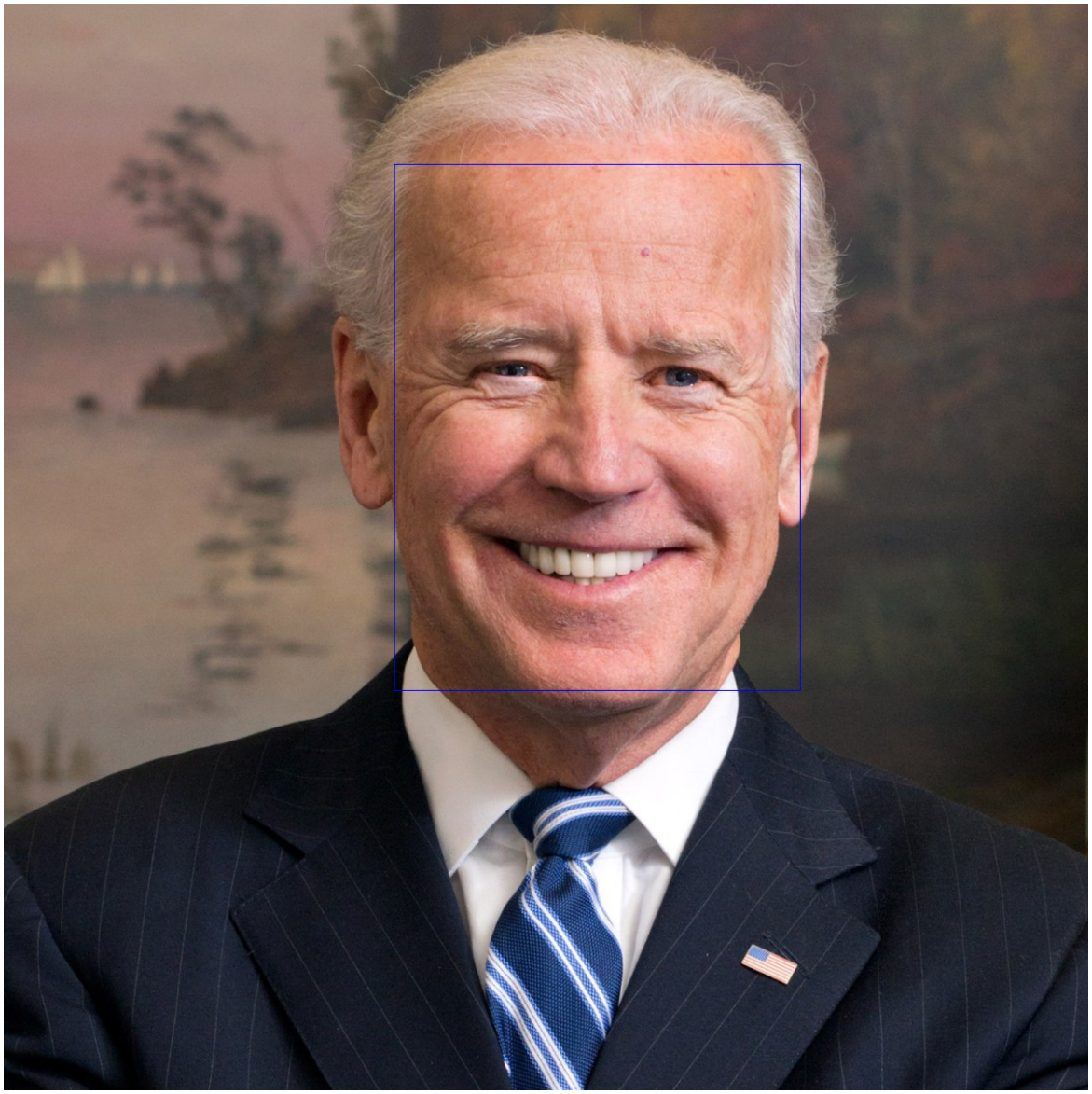
Face data type and format from mtcnn.detect_faces(img)

1 The type of faces is a list. But each element (face) of the list is a dict(字典). The format of faces is [{...},{...},...{...}]
The face rectangle is the value of key 'box' of a dict. It is face['box'] while face is an element of faces
The face['box'] is a list of four numbers. It is in format [left, top, width, height]. For example: face['box']: [78, 112, 74, 95]

In [11]:

```
# mtcnn
import mtcnn

img_path = 'notebook_images/biden2.jpg'
#img_path = 'notebook_images/kit_with_rose.jpg'
img = cv2.imread(img_path)

detector = mtcnn.MTCNN()
# detect faces in the image
faces = detector.detect_faces(img)
print('type of faces:',type(faces))
print('faces:',faces)
for face in faces:
    # get coordinates
    print('Type of face(mtcnn):',type(face))
    print('format of face(mtcnn):',face)
    print("type of face['box']:",type(face['box']))
    print("face['box']:",face['box'])
    x, y, w, h = face['box']
    print('x, y, w, h:',x, y, w, h)
    #change to location of show_face()--[left, top, right, bottom]
    location = [x, y, x+w, y+h]
    print('locations:',location)
    show_face(img_path, location)


```

```
type of faces: <class 'list'>
faces: [{'box': [432, 177, 449, 581], 'confidence': 0.997352838516235
4, 'keypoints': {'left_eye': (560, 400), 'right_eye': (755, 410), 'nos
e': (652, 526), 'mouth_left': (538, 593), 'mouth_right': (763, 604)}}]
Type of face(mtcnn): <class 'dict'>
format of face(mtcnn): {'box': [432, 177, 449, 581], 'confidence': 0.9
973528385162354, 'keypoints': {'left_eye': (560, 400), 'right_eye': (7
55, 410), 'nose': (652, 526), 'mouth_left': (538, 593), 'mouth_right':
(763, 604)}}
type of face['box']: <class 'list'>
face['box']: [432, 177, 449, 581]
x, y, w, h: 432 177 449 581
locations: [432, 177, 881, 758]
```



In [ ]:
```
1
```

In [ ]:
```
1
```