Psychoinformatics - Week 13 (Exercises)

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1 進一步研究CNN (4 points)

1.1 為何ResNet50會判斷小女孩照片為ping-pong_bal, bubble, or Band_Aid? (4 points)

In [ ]:
```
import numpy as np
import urllib.request
from tensorflow.keras.applications.resnet50 import ResNet50
from tensorflow.keras.preprocessing import image
from tensorflow.keras.applications.resnet50 import preprocess_input, decode_

model = ResNet50(weights='imagenet')

urllib.request.urlretrieve('http://mil.psy.ntu.edu.tw/~tren/girl.jpg','girl
img = image.load_img('girl.jpg', target_size=(224, 224)) # Or use cv2.resiz
x = image.img_to_array(img)
x = np.expand_dims(x, axis=0)
x = preprocess_input(x)

preds = model.predict(x)
# decode the results into a list of tuples (class, description, probability)
# (one such list for each sample in the batch)
print('Predicted:', decode_predictions(preds, top=3)[0])
```

```
2023-12-04 21:20:03.257716: I external/local_tsl/tsl/cuda/cudart_stub.cc:3
1] Could not find cuda drivers on your machine, GPU will not be used.
2023-12-04 21:20:03.292521: E external/local_xla/xla/stream_executor/cuda/c
uda_dnn.cc:9261] Unable to register cuDNN factory: Attempting to register f
actory for plugin cuDNN when one has already been registered
2023-12-04 21:20:03.292564: E external/local_xla/xla/stream_executor/cuda/c
uda_fft.cc:607] Unable to register cuFFT factory: Attempting to register fa
ctory for plugin cuFFT when one has already been registered
2023-12-04 21:20:03.293637: E external/local_xla/xla/stream_executor/cuda/c
uda_blas.cc:1515] Unable to register cuBLAS factory: Attempting to register
factory for plugin cuBLAS when one has already been registered
2023-12-04 21:20:03.299493: I external/local_tsl/tsl/cuda/cudart_stub.cc:3
1] Could not find cuda drivers on your machine, GPU will not be used.
2023-12-04 21:20:03.300107: I tensorflow/core/platform/cpu_feature_guard.c
c:182] This TensorFlow binary is optimized to use available CPU instruction
s in performance-critical operations.
To enable the following instructions: AVX2 FMA, in other operations, rebuil
d TensorFlow with the appropriate compiler flags.
2023-12-04 21:20:04.020038: W tensorflow/compiler/tf2tensorrt/utils/py_util
s.cc:38] TF-TRT Warning: Could not find TensorRT
/home/md703/anaconda3/lib/python3.9/site-packages/scipy/__init__.py:155: Us
erWarning: A NumPy version >=1.18.5 and <1.25.0 is required for this versio
n of SciPy (detected version 1.26.2
  warnings.warn(f"A NumPy version >={np_minversion} and <{np_maxversion}"
2023-12-04 21:20:04.916339: I external/local_xla/xla/stream_executor/cuda/c
uda_executor.cc:901] successful NUMA node read from SysFS had negative valu
e (-1), but there must be at least one NUMA node, so returning NUMA node ze
ro. See more at https://github.com/torvalds/linux/blob/v6.0/Documentation/A
BI/testing/sysfs-bus-pci#L344-L355
2023-12-04 21:20:04.921878: W tensorflow/core/common_runtime/gpu/gpu_devic
e.cc:2256] Cannot dlopen some GPU libraries. Please make sure the missing l
ibraries mentioned above are installed properly if you would like to use GP
U. Follow the guide at https://www.tensorflow.org/install/gpu for how to do
wnload and setup the required libraries for your platform.
Skipping registering GPU devices...
1/1 [==============================] - 1s 723ms/step
Predicted: [('n03942813', 'ping-pong_ball', 0.17623448), ('n09229709', 'bub
ble', 0.10817215), ('n02786058', 'Band_Aid', 0.089543946)]
```

傳統深度學習模型（例如 ResNet）在處理複雜環境下的訓練資料時，傾向於將所有可觀測到的特徵都納入學習與預測的過程。
然而，這樣的方法可能導致模型將與標籤相關的特徵視為重要，卻未必能區分出與類別本質相關的特徵。
在複雜環境中，傳統卷積網路難以將本質特徵和環境特徵有效區隔開來。
這種模型傾向於同時考慮所有特徵進行預測，因此當環境發生變化時，模型所學到的相關性可能無法適用於因果推論。

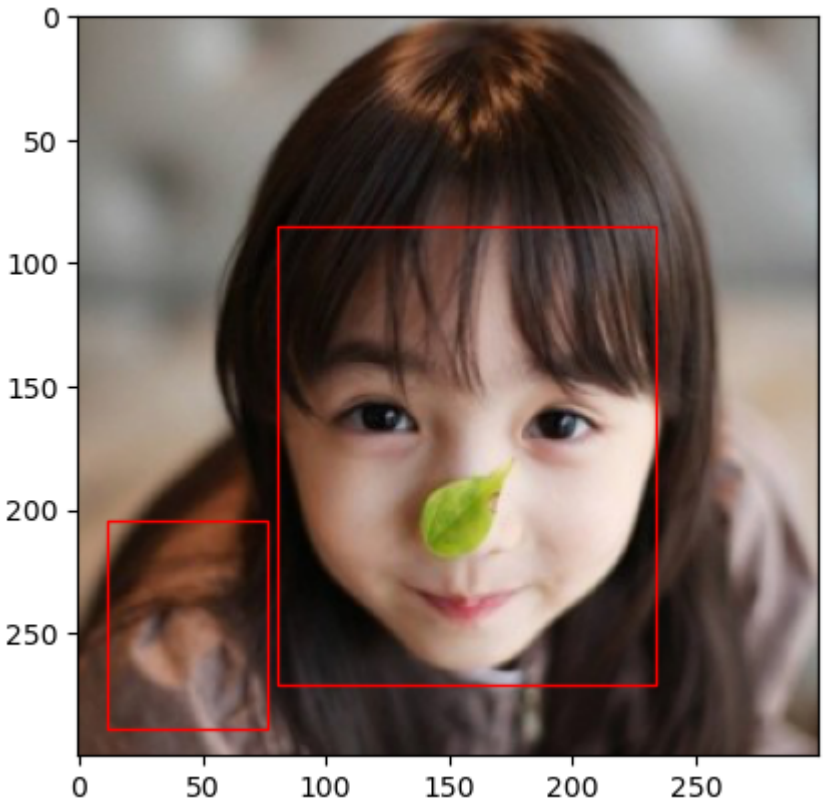
1.2 請展示有別人pre-trained好的Keras model可以成功辨認girl.jpg為人臉 (4 points)

In [ ]:

```
from matplotlib import pyplot as plt
from matplotlib.patches import Rectangle
from mtcnn.mtcnn import MTCNN
from PIL import Image

# Load image
img_path = 'girl.jpg'
pixels = plt.imread(img_path)

# Create the detector, using default weights
```

```
detector = MTCNN()

# Detect faces in the image
faces = detector.detect_faces(pixels)

# Plot the image with bounding boxes around the faces
plt.imshow(pixels)
ax = plt.gca()

for face in faces:
    x, y, width, height = face['box']
    rect = Rectangle((x, y), width, height, fill=False, color='red')
    ax.add_patch(rect)

plt.show()

# Check if any faces were detected
if len(faces) > 0:
    print("The image contains a human face.")
else:
    print("No human faces were detected in the image.")
```

```
1/1 [==============================] - 0s 95ms/step
1/1 [==============================] - 0s 60ms/step
1/1 [==============================] - 0s 15ms/step
1/1 [==============================] - 0s 13ms/step
1/1 [==============================] - 0s 14ms/step
1/1 [==============================] - 0s 12ms/step
1/1 [==============================] - 0s 13ms/step
1/1 [==============================] - 0s 13ms/step
3/3 [==============================] - 0s 4ms/step
1/1 [==============================] - 0s 83ms/step
```




```
The image contains a human face.
```