

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_predictions
import ssl

ssl._create_default_https_context = ssl._create_unverified_context
model = ResNet50(weights='imagenet')

urllib.request.urlretrieve('http://mil.psy.ntu.edu.tw/~tren/girl.jpg', 'girl.jpg')
img = image.load_img('girl.jpg', target_size=(224, 224)) # Or use cv2.resize to resize images
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])
```

```
1/1 [=====] - 0s 401ms/step
Predicted: [('n03942813', 'ping-pong_ball', 0.17008646), ('n09229709', 'bubble', 0.10647271), ('n02786058', 'Band_Aid', 0.10364497)]
1/1 [=====] - 0s 401ms/step
Predicted: [('n03942813', 'ping-pong_ball', 0.17008646), ('n09229709', 'bubble', 0.10647271), ('n02786058', 'Band_Aid', 0.10364497)]
```

The prediction made by ResNet50 is based on the pre-trained weights on the ImageNet dataset. Here are some possible reasons why ResNet50 misclassifies the image:

1. Training Data Bias:
- The model was trained on a diverse set of images from the ImageNet dataset, which contains a wide variety of classes. However, it might not have been explicitly trained on images of small girls or human faces, resulting in a potential bias.
2. Similar Features:
- The features in the image of the small girl may share visual similarities with images in the ImageNet classes "ping-pong_ball," "bubble," or "Band_Aid." For example, the model might have learned patterns in the image that resemble textures, shapes, or colors associated with these classes.
3. Fine-Tuning for Specific Domains:
- The model may not have been fine-tuned on a dataset that includes images of small girls or specific classes related to the context of the image. Fine-tuning on relevant datasets could potentially improve predictions for specific classes.

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 [ ]: import numpy as np
import urllib.request
from keras.preprocessing import image
from keras_vggface.vggface import VGGFace
from keras_vggface import utils
import ssl

ssl._create_default_https_context = ssl._create_unverified_context

# Load VGGFace model
model = VGGFace()

# Load and preprocess the image
urllib.request.urlretrieve('http://mil.psy.ntu.edu.tw/~tren/girl.jpg', 'girl.jpg')
img = image.load_img('girl.jpg', target_size=(224, 224))
x = image.img_to_array(img)
x = np.expand_dims(x, axis=0)
x = utils.preprocess_input(x)

# Make predictions
preds = model.predict(x)

# Display the predictions
print('Predicted:', utils.decode_predictions(preds, top=3)[0])
```

```
1/1 [=====] - 0s 154ms/step
Predicted: [['b'Hye-kyo_Song'", 0.25975507], ["b'Doona_Bae'", 0.04744418], ["b'Tatsuya_Fujiwara'", 0.03683515]]
1/1 [=====] - 0s 154ms/step
Predicted: [['b'Hye-kyo_Song'", 0.25975507], ["b'Doona_Bae'", 0.04744418], ["b'Tatsuya_Fujiwara'", 0.03683515]]
```