In [1]:

```
# Não exibir warnings
import os
import sys
sys.stderr = open(os.devnull, "w")  # silence stderr
sys.stderr = sys.__stderr__  # unsilence stderr
```

In [2]:

```
#https://github.com/PacktPublishing/Neural-Network-Projects-with-Python/blob/master/Chapter04/main_vgg16.py

from keras.applications.vgg16 import VGG16
from keras.models import Model

from keras.models import Sequential
from keras.layers import Conv2D
from keras.layers import MaxPooling2D
from keras.layers import Flatten
from keras.layers import Dense
import matplotlib.pyplot as plt
from sklearn.metrics import classification_report, confusion_matrix
import tensorflow as tf
import numpy as np
import pandas as pd
import seaborn as sns

from PIL import Image, ImageFile
ImageFile.LOAD_TRUNCATED_IMAGES = True
```

In [3]:

```
# load and evaluate a saved model
from numpy import loadtxt
from keras.models import load_model

# load model
model = load_model('modelo_classificador_B_InceptionV3_novo.h5')
# summarize model.
model.summary()
```

```
WARNING:tensorflow:From D:\Usuarios\spi112884\Anaconda3\lib\site-packages
\tensorflow_core\python\ops\resource_variable_ops.py:1630: calling BaseRes
ourceVariable.__init__ (from tensorflow.python.ops.resource_variable_ops)
with constraint is deprecated and will be removed in a future version.
Instructions for updating:
If using Keras pass *_constraint arguments to layers.
WARNING:tensorflow:From D:\Usuarios\spi112884\Anaconda3\lib\site-packages
\keras\backend\tensorflow_backend.py:4070: The name tf.nn.max_pool is depr
ecated. Please use tf.nn.max_pool2d instead.

WARNING:tensorflow:From D:\Usuarios\spi112884\Anaconda3\lib\site-packages
\keras\backend\tensorflow_backend.py:4074: The name tf.nn.avg_pool is depr
ecated. Please use tf.nn.avg_pool2d instead.

WARNING:tensorflow:From D:\Usuarios\spi112884\Anaconda3\lib\site-packages
\keras\backend\tensorflow_backend.py:422: The name tf.global_variables is
deprecated. Please use tf.compat.v1.global_variables instead.

Model: "model_1"
_________________________________________________________________________
_________________________
Layer (type)                 Output Shape              Param #     Connected
to
=========================================================================
=========================
input_1 (InputLayer)         (None, 128, 128, 3)       0
_________________________________________________________________________
_________________________
conv2d_1 (Conv2D)            (None, 63, 63, 32)        864         input_1
[0][0]
_________________________________________________________________________
_________________________
batch_normalization_1 (BatchNor (None, 63, 63, 32)        96          conv2d_1
[0][0]
_________________________________________________________________________
_________________________
activation_1 (Activation)    (None, 63, 63, 32)        0           batch_nor
malization_1[0][0]
_________________________________________________________________________
_________________________
conv2d_2 (Conv2D)            (None, 61, 61, 32)        9216        activatio
n_1[0][0]
_________________________________________________________________________
_________________________
batch_normalization_2 (BatchNor (None, 61, 61, 32)        96          conv2d_2
[0][0]
_________________________________________________________________________
_________________________
activation_2 (Activation)    (None, 61, 61, 32)        0           batch_nor
malization_2[0][0]
_________________________________________________________________________
_________________________
conv2d_3 (Conv2D)            (None, 61, 61, 64)        18432       activatio
n_2[0][0]
_________________________________________________________________________
_________________________
batch_normalization_3 (BatchNor (None, 61, 61, 64)        192         conv2d_3
[0][0]
_________________________________________________________________________
_________________________
activation_3 (Activation)    (None, 61, 61, 64)        0           batch_nor
```

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malization_3[0][0]
__________________________________________________________________________________________________
max_pooling2d_1 (MaxPooling2D)  (None, 30, 30, 64)   0           activatio
n_3[0][0]
__________________________________________________________________________________________________
conv2d_4 (Conv2D)               (None, 30, 30, 80)   5120        max_pooli
ng2d_1[0][0]
__________________________________________________________________________________________________
batch_normalization_4 (BatchNor (None, 30, 30, 80)   240         conv2d_4
[0][0]
__________________________________________________________________________________________________
activation_4 (Activation)       (None, 30, 30, 80)   0           batch_nor
malization_4[0][0]
__________________________________________________________________________________________________
conv2d_5 (Conv2D)               (None, 28, 28, 192)  138240      activatio
n_4[0][0]
__________________________________________________________________________________________________
batch_normalization_5 (BatchNor (None, 28, 28, 192)  576         conv2d_5
[0][0]
__________________________________________________________________________________________________
activation_5 (Activation)       (None, 28, 28, 192)  0           batch_nor
malization_5[0][0]
__________________________________________________________________________________________________
max_pooling2d_2 (MaxPooling2D)  (None, 13, 13, 192)  0           activatio
n_5[0][0]
__________________________________________________________________________________________________
conv2d_9 (Conv2D)               (None, 13, 13, 64)   12288       max_pooli
ng2d_2[0][0]
__________________________________________________________________________________________________
batch_normalization_9 (BatchNor (None, 13, 13, 64)   192         conv2d_9
[0][0]
__________________________________________________________________________________________________
activation_9 (Activation)       (None, 13, 13, 64)   0           batch_nor
malization_9[0][0]
__________________________________________________________________________________________________
conv2d_7 (Conv2D)               (None, 13, 13, 48)   9216        max_pooli
ng2d_2[0][0]
__________________________________________________________________________________________________
conv2d_10 (Conv2D)              (None, 13, 13, 96)   55296       activatio
n_9[0][0]
__________________________________________________________________________________________________
batch_normalization_7 (BatchNor (None, 13, 13, 48)   144         conv2d_7
[0][0]
__________________________________________________________________________________________________
batch_normalization_10 (BatchNo (None, 13, 13, 96)   288         conv2d_10
[0][0]
```

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__________________________________________________________________________________________________
activation_7 (Activation)       (None, 13, 13, 48)   0           batch_normalization_7[0][0]
__________________________________________________________________________________________________
activation_10 (Activation)      (None, 13, 13, 96)   0           batch_normalization_10[0][0]
__________________________________________________________________________________________________
average_pooling2d_1 (AveragePoo (None, 13, 13, 192)  0           max_pooling2d_2[0][0]
__________________________________________________________________________________________________
conv2d_6 (Conv2D)               (None, 13, 13, 64)   12288       max_pooling2d_2[0][0]
__________________________________________________________________________________________________
conv2d_8 (Conv2D)               (None, 13, 13, 64)   76800       activation_7[0][0]
__________________________________________________________________________________________________
conv2d_11 (Conv2D)              (None, 13, 13, 96)   82944       activation_10[0][0]
__________________________________________________________________________________________________
conv2d_12 (Conv2D)              (None, 13, 13, 32)   6144        average_pooling2d_1[0][0]
__________________________________________________________________________________________________
batch_normalization_6 (BatchNor (None, 13, 13, 64)   192         conv2d_6[0][0]
__________________________________________________________________________________________________
batch_normalization_8 (BatchNor (None, 13, 13, 64)   192         conv2d_8[0][0]
__________________________________________________________________________________________________
batch_normalization_11 (BatchNo (None, 13, 13, 96)   288         conv2d_11[0][0]
__________________________________________________________________________________________________
batch_normalization_12 (BatchNo (None, 13, 13, 32)   96          conv2d_12[0][0]
__________________________________________________________________________________________________
activation_6 (Activation)       (None, 13, 13, 64)   0           batch_normalization_6[0][0]
__________________________________________________________________________________________________
activation_8 (Activation)       (None, 13, 13, 64)   0           batch_normalization_8[0][0]
__________________________________________________________________________________________________
activation_11 (Activation)      (None, 13, 13, 96)   0           batch_normalization_11[0][0]
__________________________________________________________________________________________________
activation_12 (Activation)      (None, 13, 13, 32)   0           batch_normalization_12[0][0]
__________________________________________________________________________________________________
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__________________________
mixed0 (Concatenate)            (None, 13, 13, 256)  0           activatio
n_6[0][0]
                                                                 activatio
n_8[0][0]
                                                                 activatio
n_11[0][0]
                                                                 activatio
n_12[0][0]
__________________________________________________________________________
__________________________
conv2d_16 (Conv2D)              (None, 13, 13, 64)   16384       mixed0[0]
[0]
__________________________________________________________________________
__________________________
batch_normalization_16 (BatchNo (None, 13, 13, 64)   192         conv2d_16
[0][0]
__________________________________________________________________________
__________________________
activation_16 (Activation)      (None, 13, 13, 64)   0           batch_nor
malization_16[0][0]
__________________________________________________________________________
__________________________
conv2d_14 (Conv2D)              (None, 13, 13, 48)   12288       mixed0[0]
[0]
__________________________________________________________________________
__________________________
conv2d_17 (Conv2D)              (None, 13, 13, 96)   55296       activatio
n_16[0][0]
__________________________________________________________________________
__________________________
batch_normalization_14 (BatchNo (None, 13, 13, 48)   144         conv2d_14
[0][0]
__________________________________________________________________________
__________________________
batch_normalization_17 (BatchNo (None, 13, 13, 96)   288         conv2d_17
[0][0]
__________________________________________________________________________
__________________________
activation_14 (Activation)      (None, 13, 13, 48)   0           batch_nor
malization_14[0][0]
__________________________________________________________________________
__________________________
activation_17 (Activation)      (None, 13, 13, 96)   0           batch_nor
malization_17[0][0]
__________________________________________________________________________
__________________________
average_pooling2d_2 (AveragePoo (None, 13, 13, 256)  0           mixed0[0]
[0]
__________________________________________________________________________
__________________________
conv2d_13 (Conv2D)              (None, 13, 13, 64)   16384       mixed0[0]
[0]
__________________________________________________________________________
__________________________
conv2d_15 (Conv2D)              (None, 13, 13, 64)   76800       activatio
n_14[0][0]
__________________________________________________________________________
__________________________
conv2d_18 (Conv2D)              (None, 13, 13, 96)   82944       activatio
n_17[0][0]
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__________________________________________________________________________________________________
conv2d_19 (Conv2D)              (None, 13, 13, 64)   16384       average_p
ooling2d_2[0][0]
__________________________________________________________________________________________________
batch_normalization_13 (BatchNo (None, 13, 13, 64)   192         conv2d_13
[0][0]
__________________________________________________________________________________________________
batch_normalization_15 (BatchNo (None, 13, 13, 64)   192         conv2d_15
[0][0]
__________________________________________________________________________________________________
batch_normalization_18 (BatchNo (None, 13, 13, 96)   288         conv2d_18
[0][0]
__________________________________________________________________________________________________
batch_normalization_19 (BatchNo (None, 13, 13, 64)   192         conv2d_19
[0][0]
__________________________________________________________________________________________________
activation_13 (Activation)      (None, 13, 13, 64)   0           batch_nor
malization_13[0][0]
__________________________________________________________________________________________________
activation_15 (Activation)      (None, 13, 13, 64)   0           batch_nor
malization_15[0][0]
__________________________________________________________________________________________________
activation_18 (Activation)      (None, 13, 13, 96)   0           batch_nor
malization_18[0][0]
__________________________________________________________________________________________________
activation_19 (Activation)      (None, 13, 13, 64)   0           batch_nor
malization_19[0][0]
__________________________________________________________________________________________________
mixed1 (Concatenate)            (None, 13, 13, 288)  0           activatio
n_13[0][0]
                                                                 activatio
n_15[0][0]
                                                                 activatio
n_18[0][0]
                                                                 activatio
n_19[0][0]
__________________________________________________________________________________________________
conv2d_23 (Conv2D)              (None, 13, 13, 64)   18432       mixed1[0]
[0]
__________________________________________________________________________________________________
batch_normalization_23 (BatchNo (None, 13, 13, 64)   192         conv2d_23
[0][0]
__________________________________________________________________________________________________
activation_23 (Activation)      (None, 13, 13, 64)   0           batch_nor
malization_23[0][0]
__________________________________________________________________________________________________
conv2d_21 (Conv2D)              (None, 13, 13, 48)   13824       mixed1[0]
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[0]
__________________________________________________________________________________________________
__________________________
conv2d_24 (Conv2D)              (None, 13, 13, 96)   55296       activatio
n_23[0][0]
__________________________________________________________________________________________________
__________________________
batch_normalization_21 (BatchNo (None, 13, 13, 48)   144         conv2d_21
[0][0]
__________________________________________________________________________________________________
__________________________
batch_normalization_24 (BatchNo (None, 13, 13, 96)   288         conv2d_24
[0][0]
__________________________________________________________________________________________________
__________________________
activation_21 (Activation)      (None, 13, 13, 48)   0           batch_nor
malization_21[0][0]
__________________________________________________________________________________________________
__________________________
activation_24 (Activation)      (None, 13, 13, 96)   0           batch_nor
malization_24[0][0]
__________________________________________________________________________________________________
__________________________
average_pooling2d_3 (AveragePoo (None, 13, 13, 288)  0           mixed1[0]
[0]
__________________________________________________________________________________________________
__________________________
conv2d_20 (Conv2D)              (None, 13, 13, 64)   18432       mixed1[0]
[0]
__________________________________________________________________________________________________
__________________________
conv2d_22 (Conv2D)              (None, 13, 13, 64)   76800       activatio
n_21[0][0]
__________________________________________________________________________________________________
__________________________
conv2d_25 (Conv2D)              (None, 13, 13, 96)   82944       activatio
n_24[0][0]
__________________________________________________________________________________________________
__________________________
conv2d_26 (Conv2D)              (None, 13, 13, 64)   18432       average_p
ooling2d_3[0][0]
__________________________________________________________________________________________________
__________________________
batch_normalization_20 (BatchNo (None, 13, 13, 64)   192         conv2d_20
[0][0]
__________________________________________________________________________________________________
__________________________
batch_normalization_22 (BatchNo (None, 13, 13, 64)   192         conv2d_22
[0][0]
__________________________________________________________________________________________________
__________________________
batch_normalization_25 (BatchNo (None, 13, 13, 96)   288         conv2d_25
[0][0]
__________________________________________________________________________________________________
__________________________
batch_normalization_26 (BatchNo (None, 13, 13, 64)   192         conv2d_26
[0][0]
__________________________________________________________________________________________________
__________________________
activation_20 (Activation)      (None, 13, 13, 64)   0           batch_nor
malization_20[0][0]
```

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__________________________________________________________________________________________________
__________________________
activation_22 (Activation)      (None, 13, 13, 64)   0           batch_nor
malization_22[0][0]
__________________________________________________________________________________________________
__________________________
activation_25 (Activation)      (None, 13, 13, 96)   0           batch_nor
malization_25[0][0]
__________________________________________________________________________________________________
__________________________
activation_26 (Activation)      (None, 13, 13, 64)   0           batch_nor
malization_26[0][0]
__________________________________________________________________________________________________
__________________________
mixed2 (Concatenate)            (None, 13, 13, 288)  0           activatio
n_20[0][0]
                                                                 activatio
n_22[0][0]
                                                                 activatio
n_25[0][0]
                                                                 activatio
n_26[0][0]
__________________________________________________________________________________________________
__________________________
conv2d_28 (Conv2D)              (None, 13, 13, 64)   18432       mixed2[0]
[0]
__________________________________________________________________________________________________
__________________________
batch_normalization_28 (BatchNo (None, 13, 13, 64)   192         conv2d_28
[0][0]
__________________________________________________________________________________________________
__________________________
activation_28 (Activation)      (None, 13, 13, 64)   0           batch_nor
malization_28[0][0]
__________________________________________________________________________________________________
__________________________
conv2d_29 (Conv2D)              (None, 13, 13, 96)   55296       activatio
n_28[0][0]
__________________________________________________________________________________________________
__________________________
batch_normalization_29 (BatchNo (None, 13, 13, 96)   288         conv2d_29
[0][0]
__________________________________________________________________________________________________
__________________________
activation_29 (Activation)      (None, 13, 13, 96)   0           batch_nor
malization_29[0][0]
__________________________________________________________________________________________________
__________________________
conv2d_27 (Conv2D)              (None, 6, 6, 384)    995328      mixed2[0]
[0]
__________________________________________________________________________________________________
__________________________
conv2d_30 (Conv2D)              (None, 6, 6, 96)     82944       activatio
n_29[0][0]
__________________________________________________________________________________________________
__________________________
batch_normalization_27 (BatchNo (None, 6, 6, 384)    1152        conv2d_27
[0][0]
__________________________________________________________________________________________________
__________________________
batch_normalization_30 (BatchNo (None, 6, 6, 96)     288         conv2d_30
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[0][0]
__________________________________________________________________________________________________
activation_27 (Activation)      (None, 6, 6, 384)    0           batch_normalization_27[0][0]
__________________________________________________________________________________________________
activation_30 (Activation)      (None, 6, 6, 96)     0           batch_normalization_30[0][0]
__________________________________________________________________________________________________
max_pooling2d_3 (MaxPooling2D)  (None, 6, 6, 288)    0           mixed2[0][0]
__________________________________________________________________________________________________
mixed3 (Concatenate)            (None, 6, 6, 768)    0           activation_27[0][0]
                                                                 activation_30[0][0]
                                                                 max_pooling2d_3[0][0]
__________________________________________________________________________________________________
conv2d_35 (Conv2D)              (None, 6, 6, 128)    98304       mixed3[0][0]
__________________________________________________________________________________________________
batch_normalization_35 (BatchNo (None, 6, 6, 128)    384         conv2d_35[0][0]
__________________________________________________________________________________________________
activation_35 (Activation)      (None, 6, 6, 128)    0           batch_normalization_35[0][0]
__________________________________________________________________________________________________
conv2d_36 (Conv2D)              (None, 6, 6, 128)    114688      activation_35[0][0]
__________________________________________________________________________________________________
batch_normalization_36 (BatchNo (None, 6, 6, 128)    384         conv2d_36[0][0]
__________________________________________________________________________________________________
activation_36 (Activation)      (None, 6, 6, 128)    0           batch_normalization_36[0][0]
__________________________________________________________________________________________________
conv2d_32 (Conv2D)              (None, 6, 6, 128)    98304       mixed3[0][0]
__________________________________________________________________________________________________
conv2d_37 (Conv2D)              (None, 6, 6, 128)    114688      activation_36[0][0]
__________________________________________________________________________________________________
batch_normalization_32 (BatchNo (None, 6, 6, 128)    384         conv2d_32[0][0]
__________________________________________________________________________________________________
batch_normalization_37 (BatchNo (None, 6, 6, 128)    384         conv2d_37[0][0]
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__________________________________________________________________________________________________
activation_32 (Activation)      (None, 6, 6, 128)    0           batch_nor
malization_32[0][0]
__________________________________________________________________________________________________
activation_37 (Activation)      (None, 6, 6, 128)    0           batch_nor
malization_37[0][0]
__________________________________________________________________________________________________
conv2d_33 (Conv2D)              (None, 6, 6, 128)    114688      activatio
n_32[0][0]
__________________________________________________________________________________________________
conv2d_38 (Conv2D)              (None, 6, 6, 128)    114688      activatio
n_37[0][0]
__________________________________________________________________________________________________
batch_normalization_33 (BatchNo (None, 6, 6, 128)    384         conv2d_33
[0][0]
__________________________________________________________________________________________________
batch_normalization_38 (BatchNo (None, 6, 6, 128)    384         conv2d_38
[0][0]
__________________________________________________________________________________________________
activation_33 (Activation)      (None, 6, 6, 128)    0           batch_nor
malization_33[0][0]
__________________________________________________________________________________________________
activation_38 (Activation)      (None, 6, 6, 128)    0           batch_nor
malization_38[0][0]
__________________________________________________________________________________________________
average_pooling2d_4 (AveragePoo (None, 6, 6, 768)    0           mixed3[0]
[0]
__________________________________________________________________________________________________
conv2d_31 (Conv2D)              (None, 6, 6, 192)    147456      mixed3[0]
[0]
__________________________________________________________________________________________________
conv2d_34 (Conv2D)              (None, 6, 6, 192)    172032      activatio
n_33[0][0]
__________________________________________________________________________________________________
conv2d_39 (Conv2D)              (None, 6, 6, 192)    172032      activatio
n_38[0][0]
__________________________________________________________________________________________________
conv2d_40 (Conv2D)              (None, 6, 6, 192)    147456      average_p
ooling2d_4[0][0]
__________________________________________________________________________________________________
batch_normalization_31 (BatchNo (None, 6, 6, 192)    576         conv2d_31
[0][0]
__________________________________________________________________________________________________
batch_normalization_34 (BatchNo (None, 6, 6, 192)    576         conv2d_34
[0][0]
__________________________________________________________________________________________________
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__________________________
batch_normalization_39 (BatchNo (None, 6, 6, 192)    576         conv2d_39
[0][0]
__________________________________________________________________________
__________________________
batch_normalization_40 (BatchNo (None, 6, 6, 192)    576         conv2d_40
[0][0]
__________________________________________________________________________
__________________________
activation_31 (Activation)      (None, 6, 6, 192)    0           batch_nor
malization_31[0][0]
__________________________________________________________________________
__________________________
activation_34 (Activation)      (None, 6, 6, 192)    0           batch_nor
malization_34[0][0]
__________________________________________________________________________
__________________________
activation_39 (Activation)      (None, 6, 6, 192)    0           batch_nor
malization_39[0][0]
__________________________________________________________________________
__________________________
activation_40 (Activation)      (None, 6, 6, 192)    0           batch_nor
malization_40[0][0]
__________________________________________________________________________
__________________________
mixed4 (Concatenate)            (None, 6, 6, 768)    0           activatio
n_31[0][0]
                                                                 activatio
n_34[0][0]
                                                                 activatio
n_39[0][0]
                                                                 activatio
n_40[0][0]
__________________________________________________________________________
__________________________
conv2d_45 (Conv2D)              (None, 6, 6, 160)    122880      mixed4[0]
[0]
__________________________________________________________________________
__________________________
batch_normalization_45 (BatchNo (None, 6, 6, 160)    480         conv2d_45
[0][0]
__________________________________________________________________________
__________________________
activation_45 (Activation)      (None, 6, 6, 160)    0           batch_nor
malization_45[0][0]
__________________________________________________________________________
__________________________
conv2d_46 (Conv2D)              (None, 6, 6, 160)    179200      activatio
n_45[0][0]
__________________________________________________________________________
__________________________
batch_normalization_46 (BatchNo (None, 6, 6, 160)    480         conv2d_46
[0][0]
__________________________________________________________________________
__________________________
activation_46 (Activation)      (None, 6, 6, 160)    0           batch_nor
malization_46[0][0]
__________________________________________________________________________
__________________________
conv2d_42 (Conv2D)              (None, 6, 6, 160)    122880      mixed4[0]
[0]
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__________________________________________________________________________________________________
conv2d_47 (Conv2D)              (None, 6, 6, 160)    179200      activation_46[0][0]
__________________________________________________________________________________________________
batch_normalization_42 (BatchNo (None, 6, 6, 160)    480         conv2d_42[0][0]
__________________________________________________________________________________________________
batch_normalization_47 (BatchNo (None, 6, 6, 160)    480         conv2d_47[0][0]
__________________________________________________________________________________________________
activation_42 (Activation)      (None, 6, 6, 160)    0           batch_normalization_42[0][0]
__________________________________________________________________________________________________
activation_47 (Activation)      (None, 6, 6, 160)    0           batch_normalization_47[0][0]
__________________________________________________________________________________________________
conv2d_43 (Conv2D)              (None, 6, 6, 160)    179200      activation_42[0][0]
__________________________________________________________________________________________________
conv2d_48 (Conv2D)              (None, 6, 6, 160)    179200      activation_47[0][0]
__________________________________________________________________________________________________
batch_normalization_43 (BatchNo (None, 6, 6, 160)    480         conv2d_43[0][0]
__________________________________________________________________________________________________
batch_normalization_48 (BatchNo (None, 6, 6, 160)    480         conv2d_48[0][0]
__________________________________________________________________________________________________
activation_43 (Activation)      (None, 6, 6, 160)    0           batch_normalization_43[0][0]
__________________________________________________________________________________________________
activation_48 (Activation)      (None, 6, 6, 160)    0           batch_normalization_48[0][0]
__________________________________________________________________________________________________
average_pooling2d_5 (AveragePoo (None, 6, 6, 768)    0           mixed4[0][0]
__________________________________________________________________________________________________
conv2d_41 (Conv2D)              (None, 6, 6, 192)    147456      mixed4[0][0]
__________________________________________________________________________________________________
conv2d_44 (Conv2D)              (None, 6, 6, 192)    215040      activation_43[0][0]
__________________________________________________________________________________________________
conv2d_49 (Conv2D)              (None, 6, 6, 192)    215040      activation_48[0][0]
__________________________________________________________________________________________________
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__________________________
conv2d_50 (Conv2D)              (None, 6, 6, 192)    147456      average_p
ooling2d_5[0][0]
__________________________________________________________________________
__________________________
batch_normalization_41 (BatchNo (None, 6, 6, 192)    576         conv2d_41
[0][0]
__________________________________________________________________________
__________________________
batch_normalization_44 (BatchNo (None, 6, 6, 192)    576         conv2d_44
[0][0]
__________________________________________________________________________
__________________________
batch_normalization_49 (BatchNo (None, 6, 6, 192)    576         conv2d_49
[0][0]
__________________________________________________________________________
__________________________
batch_normalization_50 (BatchNo (None, 6, 6, 192)    576         conv2d_50
[0][0]
__________________________________________________________________________
__________________________
activation_41 (Activation)      (None, 6, 6, 192)    0           batch_nor
malization_41[0][0]
__________________________________________________________________________
__________________________
activation_44 (Activation)      (None, 6, 6, 192)    0           batch_nor
malization_44[0][0]
__________________________________________________________________________
__________________________
activation_49 (Activation)      (None, 6, 6, 192)    0           batch_nor
malization_49[0][0]
__________________________________________________________________________
__________________________
activation_50 (Activation)      (None, 6, 6, 192)    0           batch_nor
malization_50[0][0]
__________________________________________________________________________
__________________________
mixed5 (Concatenate)            (None, 6, 6, 768)    0           activatio
n_41[0][0]
                                                                 activatio
n_44[0][0]
                                                                 activatio
n_49[0][0]
                                                                 activatio
n_50[0][0]
__________________________________________________________________________
__________________________
conv2d_55 (Conv2D)              (None, 6, 6, 160)    122880      mixed5[0]
[0]
__________________________________________________________________________
__________________________
batch_normalization_55 (BatchNo (None, 6, 6, 160)    480         conv2d_55
[0][0]
__________________________________________________________________________
__________________________
activation_55 (Activation)      (None, 6, 6, 160)    0           batch_nor
malization_55[0][0]
__________________________________________________________________________
__________________________
conv2d_56 (Conv2D)              (None, 6, 6, 160)    179200      activatio
n_55[0][0]
```

```
__________________________________________________________________________________________________
batch_normalization_56 (BatchNo (None, 6, 6, 160)    480         conv2d_56[0][0]
__________________________________________________________________________________________________
activation_56 (Activation)      (None, 6, 6, 160)    0           batch_normalization_56[0][0]
__________________________________________________________________________________________________
conv2d_52 (Conv2D)              (None, 6, 6, 160)    122880      mixed5[0][0]
__________________________________________________________________________________________________
conv2d_57 (Conv2D)              (None, 6, 6, 160)    179200      activation_56[0][0]
__________________________________________________________________________________________________
batch_normalization_52 (BatchNo (None, 6, 6, 160)    480         conv2d_52[0][0]
__________________________________________________________________________________________________
batch_normalization_57 (BatchNo (None, 6, 6, 160)    480         conv2d_57[0][0]
__________________________________________________________________________________________________
activation_52 (Activation)      (None, 6, 6, 160)    0           batch_normalization_52[0][0]
__________________________________________________________________________________________________
activation_57 (Activation)      (None, 6, 6, 160)    0           batch_normalization_57[0][0]
__________________________________________________________________________________________________
conv2d_53 (Conv2D)              (None, 6, 6, 160)    179200      activation_52[0][0]
__________________________________________________________________________________________________
conv2d_58 (Conv2D)              (None, 6, 6, 160)    179200      activation_57[0][0]
__________________________________________________________________________________________________
batch_normalization_53 (BatchNo (None, 6, 6, 160)    480         conv2d_53[0][0]
__________________________________________________________________________________________________
batch_normalization_58 (BatchNo (None, 6, 6, 160)    480         conv2d_58[0][0]
__________________________________________________________________________________________________
activation_53 (Activation)      (None, 6, 6, 160)    0           batch_normalization_53[0][0]
__________________________________________________________________________________________________
activation_58 (Activation)      (None, 6, 6, 160)    0           batch_normalization_58[0][0]
__________________________________________________________________________________________________
average_pooling2d_6 (AveragePoo (None, 6, 6, 768)    0           mixed5[0][0]
__________________________________________________________________________________________________
```

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__________________________
conv2d_51 (Conv2D)              (None, 6, 6, 192)    147456      mixed5[0]
[0]
__________________________________________________________________________
__________________________
conv2d_54 (Conv2D)              (None, 6, 6, 192)    215040      activatio
n_53[0][0]
__________________________________________________________________________
__________________________
conv2d_59 (Conv2D)              (None, 6, 6, 192)    215040      activatio
n_58[0][0]
__________________________________________________________________________
__________________________
conv2d_60 (Conv2D)              (None, 6, 6, 192)    147456      average_p
ooling2d_6[0][0]
__________________________________________________________________________
__________________________
batch_normalization_51 (BatchNo (None, 6, 6, 192)    576         conv2d_51
[0][0]
__________________________________________________________________________
__________________________
batch_normalization_54 (BatchNo (None, 6, 6, 192)    576         conv2d_54
[0][0]
__________________________________________________________________________
__________________________
batch_normalization_59 (BatchNo (None, 6, 6, 192)    576         conv2d_59
[0][0]
__________________________________________________________________________
__________________________
batch_normalization_60 (BatchNo (None, 6, 6, 192)    576         conv2d_60
[0][0]
__________________________________________________________________________
__________________________
activation_51 (Activation)      (None, 6, 6, 192)    0           batch_nor
malization_51[0][0]
__________________________________________________________________________
__________________________
activation_54 (Activation)      (None, 6, 6, 192)    0           batch_nor
malization_54[0][0]
__________________________________________________________________________
__________________________
activation_59 (Activation)      (None, 6, 6, 192)    0           batch_nor
malization_59[0][0]
__________________________________________________________________________
__________________________
activation_60 (Activation)      (None, 6, 6, 192)    0           batch_nor
malization_60[0][0]
__________________________________________________________________________
__________________________
mixed6 (Concatenate)            (None, 6, 6, 768)    0           activatio
n_51[0][0]
                                                                 activatio
n_54[0][0]
                                                                 activatio
n_59[0][0]
                                                                 activatio
n_60[0][0]
__________________________________________________________________________
__________________________
conv2d_65 (Conv2D)              (None, 6, 6, 192)    147456      mixed6[0]
[0]
```

```
__________________________________________________________________________________________________
__________________________
batch_normalization_65 (BatchNo (None, 6, 6, 192)    576         conv2d_65
[0][0]
__________________________________________________________________________________________________
__________________________
activation_65 (Activation)      (None, 6, 6, 192)    0           batch_nor
malization_65[0][0]
__________________________________________________________________________________________________
__________________________
conv2d_66 (Conv2D)              (None, 6, 6, 192)    258048      activatio
n_65[0][0]
__________________________________________________________________________________________________
__________________________
batch_normalization_66 (BatchNo (None, 6, 6, 192)    576         conv2d_66
[0][0]
__________________________________________________________________________________________________
__________________________
activation_66 (Activation)      (None, 6, 6, 192)    0           batch_nor
malization_66[0][0]
__________________________________________________________________________________________________
__________________________
conv2d_62 (Conv2D)              (None, 6, 6, 192)    147456      mixed6[0]
[0]
__________________________________________________________________________________________________
__________________________
conv2d_67 (Conv2D)              (None, 6, 6, 192)    258048      activatio
n_66[0][0]
__________________________________________________________________________________________________
__________________________
batch_normalization_62 (BatchNo (None, 6, 6, 192)    576         conv2d_62
[0][0]
__________________________________________________________________________________________________
__________________________
batch_normalization_67 (BatchNo (None, 6, 6, 192)    576         conv2d_67
[0][0]
__________________________________________________________________________________________________
__________________________
activation_62 (Activation)      (None, 6, 6, 192)    0           batch_nor
malization_62[0][0]
__________________________________________________________________________________________________
__________________________
activation_67 (Activation)      (None, 6, 6, 192)    0           batch_nor
malization_67[0][0]
__________________________________________________________________________________________________
__________________________
conv2d_63 (Conv2D)              (None, 6, 6, 192)    258048      activatio
n_62[0][0]
__________________________________________________________________________________________________
__________________________
conv2d_68 (Conv2D)              (None, 6, 6, 192)    258048      activatio
n_67[0][0]
__________________________________________________________________________________________________
__________________________
batch_normalization_63 (BatchNo (None, 6, 6, 192)    576         conv2d_63
[0][0]
__________________________________________________________________________________________________
__________________________
batch_normalization_68 (BatchNo (None, 6, 6, 192)    576         conv2d_68
[0][0]
__________________________________________________________________________________________________
```

```
__________________________
activation_63 (Activation)      (None, 6, 6, 192)    0           batch_nor
malization_63[0][0]
__________________________________________________________________________
__________________________
activation_68 (Activation)      (None, 6, 6, 192)    0           batch_nor
malization_68[0][0]
__________________________________________________________________________
__________________________
average_pooling2d_7 (AveragePoo (None, 6, 6, 768)    0           mixed6[0]
[0]
__________________________________________________________________________
__________________________
conv2d_61 (Conv2D)              (None, 6, 6, 192)    147456      mixed6[0]
[0]
__________________________________________________________________________
__________________________
conv2d_64 (Conv2D)              (None, 6, 6, 192)    258048      activatio
n_63[0][0]
__________________________________________________________________________
__________________________
conv2d_69 (Conv2D)              (None, 6, 6, 192)    258048      activatio
n_68[0][0]
__________________________________________________________________________
__________________________
conv2d_70 (Conv2D)              (None, 6, 6, 192)    147456      average_p
ooling2d_7[0][0]
__________________________________________________________________________
__________________________
batch_normalization_61 (BatchNo (None, 6, 6, 192)    576         conv2d_61
[0][0]
__________________________________________________________________________
__________________________
batch_normalization_64 (BatchNo (None, 6, 6, 192)    576         conv2d_64
[0][0]
__________________________________________________________________________
__________________________
batch_normalization_69 (BatchNo (None, 6, 6, 192)    576         conv2d_69
[0][0]
__________________________________________________________________________
__________________________
batch_normalization_70 (BatchNo (None, 6, 6, 192)    576         conv2d_70
[0][0]
__________________________________________________________________________
__________________________
activation_61 (Activation)      (None, 6, 6, 192)    0           batch_nor
malization_61[0][0]
__________________________________________________________________________
__________________________
activation_64 (Activation)      (None, 6, 6, 192)    0           batch_nor
malization_64[0][0]
__________________________________________________________________________
__________________________
activation_69 (Activation)      (None, 6, 6, 192)    0           batch_nor
malization_69[0][0]
__________________________________________________________________________
__________________________
activation_70 (Activation)      (None, 6, 6, 192)    0           batch_nor
malization_70[0][0]
__________________________________________________________________________
__________________________
```

```
mixed7 (Concatenate)            (None, 6, 6, 768)    0           activation_61[0][0]
                                                                 activation_64[0][0]
                                                                 activation_69[0][0]
                                                                 activation_70[0][0]
__________________________________________________________________________________________________
conv2d_73 (Conv2D)              (None, 6, 6, 192)    147456      mixed7[0][0]
__________________________________________________________________________________________________
batch_normalization_73 (BatchNo (None, 6, 6, 192)    576         conv2d_73[0][0]
__________________________________________________________________________________________________
activation_73 (Activation)      (None, 6, 6, 192)    0           batch_normalization_73[0][0]
__________________________________________________________________________________________________
conv2d_74 (Conv2D)              (None, 6, 6, 192)    258048      activation_73[0][0]
__________________________________________________________________________________________________
batch_normalization_74 (BatchNo (None, 6, 6, 192)    576         conv2d_74[0][0]
__________________________________________________________________________________________________
activation_74 (Activation)      (None, 6, 6, 192)    0           batch_normalization_74[0][0]
__________________________________________________________________________________________________
conv2d_71 (Conv2D)              (None, 6, 6, 192)    147456      mixed7[0][0]
__________________________________________________________________________________________________
conv2d_75 (Conv2D)              (None, 6, 6, 192)    258048      activation_74[0][0]
__________________________________________________________________________________________________
batch_normalization_71 (BatchNo (None, 6, 6, 192)    576         conv2d_71[0][0]
__________________________________________________________________________________________________
batch_normalization_75 (BatchNo (None, 6, 6, 192)    576         conv2d_75[0][0]
__________________________________________________________________________________________________
activation_71 (Activation)      (None, 6, 6, 192)    0           batch_normalization_71[0][0]
__________________________________________________________________________________________________
activation_75 (Activation)      (None, 6, 6, 192)    0           batch_normalization_75[0][0]
__________________________________________________________________________________________________
conv2d_72 (Conv2D)              (None, 2, 2, 320)    552960      activation_71[0][0]
__________________________________________________________________________________________________
```

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__________________________
conv2d_76 (Conv2D)              (None, 2, 2, 192)    331776      activatio
n_75[0][0]
__________________________________________________________________________
__________________________
batch_normalization_72 (BatchNo (None, 2, 2, 320)    960         conv2d_72
[0][0]
__________________________________________________________________________
__________________________
batch_normalization_76 (BatchNo (None, 2, 2, 192)    576         conv2d_76
[0][0]
__________________________________________________________________________
__________________________
activation_72 (Activation)      (None, 2, 2, 320)    0           batch_nor
malization_72[0][0]
__________________________________________________________________________
__________________________
activation_76 (Activation)      (None, 2, 2, 192)    0           batch_nor
malization_76[0][0]
__________________________________________________________________________
__________________________
max_pooling2d_4 (MaxPooling2D)  (None, 2, 2, 768)    0           mixed7[0]
[0]
__________________________________________________________________________
__________________________
mixed8 (Concatenate)            (None, 2, 2, 1280)   0           activatio
n_72[0][0]
                                                                 activatio
n_76[0][0]
                                                                 max_pooli
ng2d_4[0][0]
__________________________________________________________________________
__________________________
conv2d_81 (Conv2D)              (None, 2, 2, 448)    573440      mixed8[0]
[0]
__________________________________________________________________________
__________________________
batch_normalization_81 (BatchNo (None, 2, 2, 448)    1344        conv2d_81
[0][0]
__________________________________________________________________________
__________________________
activation_81 (Activation)      (None, 2, 2, 448)    0           batch_nor
malization_81[0][0]
__________________________________________________________________________
__________________________
conv2d_78 (Conv2D)              (None, 2, 2, 384)    491520      mixed8[0]
[0]
__________________________________________________________________________
__________________________
conv2d_82 (Conv2D)              (None, 2, 2, 384)    1548288     activatio
n_81[0][0]
__________________________________________________________________________
__________________________
batch_normalization_78 (BatchNo (None, 2, 2, 384)    1152        conv2d_78
[0][0]
__________________________________________________________________________
__________________________
batch_normalization_82 (BatchNo (None, 2, 2, 384)    1152        conv2d_82
[0][0]
__________________________________________________________________________
__________________________
```

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activation_78 (Activation)      (None, 2, 2, 384)    0           batch_nor
malization_78[0][0]
__________________________________________________________________________
_____________________
activation_82 (Activation)      (None, 2, 2, 384)    0           batch_nor
malization_82[0][0]
__________________________________________________________________________
_____________________
conv2d_79 (Conv2D)              (None, 2, 2, 384)    442368      activatio
n_78[0][0]
__________________________________________________________________________
_____________________
conv2d_80 (Conv2D)              (None, 2, 2, 384)    442368      activatio
n_78[0][0]
__________________________________________________________________________
_____________________
conv2d_83 (Conv2D)              (None, 2, 2, 384)    442368      activatio
n_82[0][0]
__________________________________________________________________________
_____________________
conv2d_84 (Conv2D)              (None, 2, 2, 384)    442368      activatio
n_82[0][0]
__________________________________________________________________________
_____________________
average_pooling2d_8 (AveragePoo (None, 2, 2, 1280)   0           mixed8[0]
[0]
__________________________________________________________________________
_____________________
conv2d_77 (Conv2D)              (None, 2, 2, 320)    409600      mixed8[0]
[0]
__________________________________________________________________________
_____________________
batch_normalization_79 (BatchNo (None, 2, 2, 384)    1152        conv2d_79
[0][0]
__________________________________________________________________________
_____________________
batch_normalization_80 (BatchNo (None, 2, 2, 384)    1152        conv2d_80
[0][0]
__________________________________________________________________________
_____________________
batch_normalization_83 (BatchNo (None, 2, 2, 384)    1152        conv2d_83
[0][0]
__________________________________________________________________________
_____________________
batch_normalization_84 (BatchNo (None, 2, 2, 384)    1152        conv2d_84
[0][0]
__________________________________________________________________________
_____________________
conv2d_85 (Conv2D)              (None, 2, 2, 192)    245760      average_p
ooling2d_8[0][0]
__________________________________________________________________________
_____________________
batch_normalization_77 (BatchNo (None, 2, 2, 320)    960         conv2d_77
[0][0]
__________________________________________________________________________
_____________________
activation_79 (Activation)      (None, 2, 2, 384)    0           batch_nor
malization_79[0][0]
__________________________________________________________________________
_____________________
activation_80 (Activation)      (None, 2, 2, 384)    0           batch_nor
```

```
malization_80[0][0]
__________________________________________________________________________________________________
__________________________
activation_83 (Activation)      (None, 2, 2, 384)    0           batch_nor
malization_83[0][0]
__________________________________________________________________________________________________
__________________________
activation_84 (Activation)      (None, 2, 2, 384)    0           batch_nor
malization_84[0][0]
__________________________________________________________________________________________________
__________________________
batch_normalization_85 (BatchNo (None, 2, 2, 192)    576         conv2d_85
[0][0]
__________________________________________________________________________________________________
__________________________
activation_77 (Activation)      (None, 2, 2, 320)    0           batch_nor
malization_77[0][0]
__________________________________________________________________________________________________
__________________________
mixed9_0 (Concatenate)          (None, 2, 2, 768)    0           activatio
n_79[0][0]
                                                                 activatio
n_80[0][0]
__________________________________________________________________________________________________
__________________________
concatenate_1 (Concatenate)     (None, 2, 2, 768)    0           activatio
n_83[0][0]
                                                                 activatio
n_84[0][0]
__________________________________________________________________________________________________
__________________________
activation_85 (Activation)      (None, 2, 2, 192)    0           batch_nor
malization_85[0][0]
__________________________________________________________________________________________________
__________________________
mixed9 (Concatenate)            (None, 2, 2, 2048)   0           activatio
n_77[0][0]
                                                                 mixed9_0
[0][0]
                                                                 concatena
te_1[0][0]
                                                                 activatio
n_85[0][0]
__________________________________________________________________________________________________
__________________________
conv2d_90 (Conv2D)              (None, 2, 2, 448)    917504      mixed9[0]
[0]
__________________________________________________________________________________________________
__________________________
batch_normalization_90 (BatchNo (None, 2, 2, 448)    1344        conv2d_90
[0][0]
__________________________________________________________________________________________________
__________________________
activation_90 (Activation)      (None, 2, 2, 448)    0           batch_nor
malization_90[0][0]
__________________________________________________________________________________________________
__________________________
conv2d_87 (Conv2D)              (None, 2, 2, 384)    786432      mixed9[0]
[0]
__________________________________________________________________________________________________
__________________________
```

```
conv2d_91 (Conv2D)              (None, 2, 2, 384)    1548288     activatio
n_90[0][0]
__________________________________________________________________________
_____________________
batch_normalization_87 (BatchNo (None, 2, 2, 384)    1152        conv2d_87
[0][0]
__________________________________________________________________________
_____________________
batch_normalization_91 (BatchNo (None, 2, 2, 384)    1152        conv2d_91
[0][0]
__________________________________________________________________________
_____________________
activation_87 (Activation)      (None, 2, 2, 384)    0           batch_nor
malization_87[0][0]
__________________________________________________________________________
_____________________
activation_91 (Activation)      (None, 2, 2, 384)    0           batch_nor
malization_91[0][0]
__________________________________________________________________________
_____________________
conv2d_88 (Conv2D)              (None, 2, 2, 384)    442368      activatio
n_87[0][0]
__________________________________________________________________________
_____________________
conv2d_89 (Conv2D)              (None, 2, 2, 384)    442368      activatio
n_87[0][0]
__________________________________________________________________________
_____________________
conv2d_92 (Conv2D)              (None, 2, 2, 384)    442368      activatio
n_91[0][0]
__________________________________________________________________________
_____________________
conv2d_93 (Conv2D)              (None, 2, 2, 384)    442368      activatio
n_91[0][0]
__________________________________________________________________________
_____________________
average_pooling2d_9 (AveragePoo (None, 2, 2, 2048)   0           mixed9[0]
[0]
__________________________________________________________________________
_____________________
conv2d_86 (Conv2D)              (None, 2, 2, 320)    655360      mixed9[0]
[0]
__________________________________________________________________________
_____________________
batch_normalization_88 (BatchNo (None, 2, 2, 384)    1152        conv2d_88
[0][0]
__________________________________________________________________________
_____________________
batch_normalization_89 (BatchNo (None, 2, 2, 384)    1152        conv2d_89
[0][0]
__________________________________________________________________________
_____________________
batch_normalization_92 (BatchNo (None, 2, 2, 384)    1152        conv2d_92
[0][0]
__________________________________________________________________________
_____________________
batch_normalization_93 (BatchNo (None, 2, 2, 384)    1152        conv2d_93
[0][0]
__________________________________________________________________________
_____________________
conv2d_94 (Conv2D)              (None, 2, 2, 192)    393216      average_p
```

```
ooling2d_9[0][0]
__________________________________________________________________________________________________
batch_normalization_86 (BatchNo (None, 2, 2, 320)    960         conv2d_86
[0][0]
__________________________________________________________________________________________________
activation_88 (Activation)      (None, 2, 2, 384)    0           batch_nor
malization_88[0][0]
__________________________________________________________________________________________________
activation_89 (Activation)      (None, 2, 2, 384)    0           batch_nor
malization_89[0][0]
__________________________________________________________________________________________________
activation_92 (Activation)      (None, 2, 2, 384)    0           batch_nor
malization_92[0][0]
__________________________________________________________________________________________________
activation_93 (Activation)      (None, 2, 2, 384)    0           batch_nor
malization_93[0][0]
__________________________________________________________________________________________________
batch_normalization_94 (BatchNo (None, 2, 2, 192)    576         conv2d_94
[0][0]
__________________________________________________________________________________________________
activation_86 (Activation)      (None, 2, 2, 320)    0           batch_nor
malization_86[0][0]
__________________________________________________________________________________________________
mixed9_1 (Concatenate)          (None, 2, 2, 768)    0           activatio
n_88[0][0]
                                                                 activatio
n_89[0][0]
__________________________________________________________________________________________________
concatenate_2 (Concatenate)     (None, 2, 2, 768)    0           activatio
n_92[0][0]
                                                                 activatio
n_93[0][0]
__________________________________________________________________________________________________
activation_94 (Activation)      (None, 2, 2, 192)    0           batch_nor
malization_94[0][0]
__________________________________________________________________________________________________
mixed10 (Concatenate)           (None, 2, 2, 2048)   0           activatio
n_86[0][0]
                                                                 mixed9_1
[0][0]
                                                                 concatena
te_2[0][0]
                                                                 activatio
n_94[0][0]
__________________________________________________________________________________________________
global_average_pooling2d_1 (Glo (None, 2048)         0           mixed10
[0][0]
__________________________________________________________________________________________________
```

```
dense_1 (Dense)                 (None, 2)             4098        global_av
erage_pooling2d_1[0][0]
==================================================================================
==========
Total params: 21,806,882
Trainable params: 4,098
Non-trainable params: 21,802,784
__________________________________________________________________________________
__________
```

In [4]:

```
#Função de geração da matriz de confusão
def print_confusion_matrix(confusion_matrix, class_names, figsize = (10,7), fontsize=11
):
    df_cm = pd.DataFrame(
        confusion_matrix, index=class_names, columns=class_names,
    )
    fig = plt.figure(figsize=figsize)
    try:
        heatmap = sns.heatmap(df_cm, cmap="YlGnBu", annot=True, fmt="d")
    except ValueError:
        raise ValueError("Confusion matrix values must be integers.")
    heatmap.yaxis.set_ticklabels(heatmap.yaxis.get_ticklabels(), rotation=0, ha='right'
, fontsize=fontsize)
    heatmap.xaxis.set_ticklabels(heatmap.xaxis.get_ticklabels(), rotation=30, ha='righ
t', fontsize=fontsize)

    b, t = plt.ylim() # discover the values for bottom and top
    b += 0.5 # Add 0.5 to the bottom
    t -= 0.5 # Subtract 0.5 from the top
    plt.ylim(b, t) # update the ylim(bottom, top) values

    plt.ylabel('True label')
    plt.xlabel('Predicted label')
    #return fig
```

In [5]:

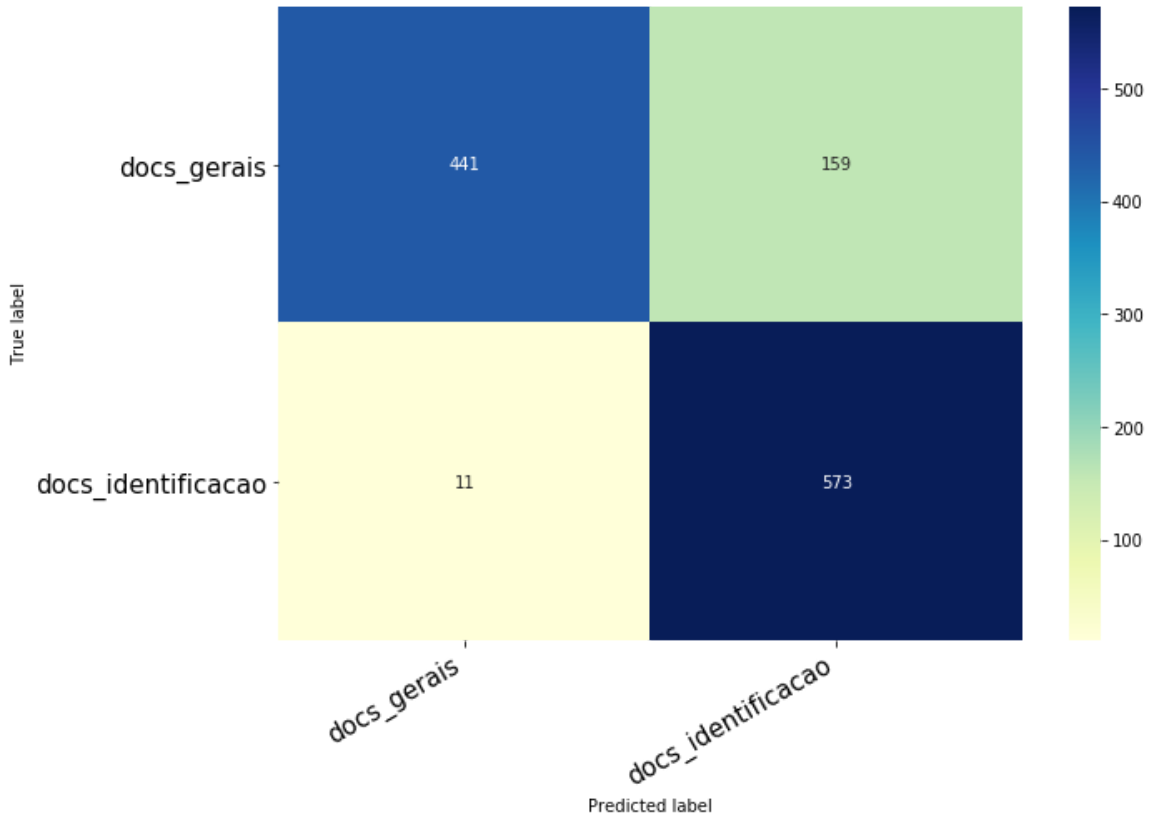
```
batch = 32


from keras.preprocessing.image import ImageDataGenerator

validation_datagen = ImageDataGenerator(rescale = 1./255)

validation_set = validation_datagen.flow_from_directory('classificador_B/validation/',
                                                        target_size = (128, 128),
                                                        color_mode="rgb",
                                                        batch_size = batch, #alterado para 1
                                                        class_mode = 'categorical',
                                                        shuffle=True)
num_validation = validation_set.samples
```

```
Found 1200 images belonging to 2 classes.
```

In [6]:

```
### Conjunto de Validação ###

print ("### Matriz de confusão para o conjunto de validação ###")

#Conjunto de validação
validation_datagen = ImageDataGenerator(rescale = 1./255)

validation_set = validation_datagen.flow_from_directory('classificador_B/validation/',
                                                        target_size = (128, 128),
                                                        color_mode="rgb",
                                                        batch_size = batch, #alterado para 1
                                                        class_mode = 'categorical',
                                                        shuffle= False)


#Confution Matrix
Y_pred = model.predict_generator(validation_set, num_validation//batch, verbose=1)

test_preds = np.argmax(Y_pred, axis=-1)
l=test_preds.shape[0]
test_trues = validation_set.classes
cm =confusion_matrix(test_trues[:l], test_preds)

print_confusion_matrix(cm, ["docs_gerais", "docs_identificacao"], figsize = (10,7), fon
tsize=15)
```

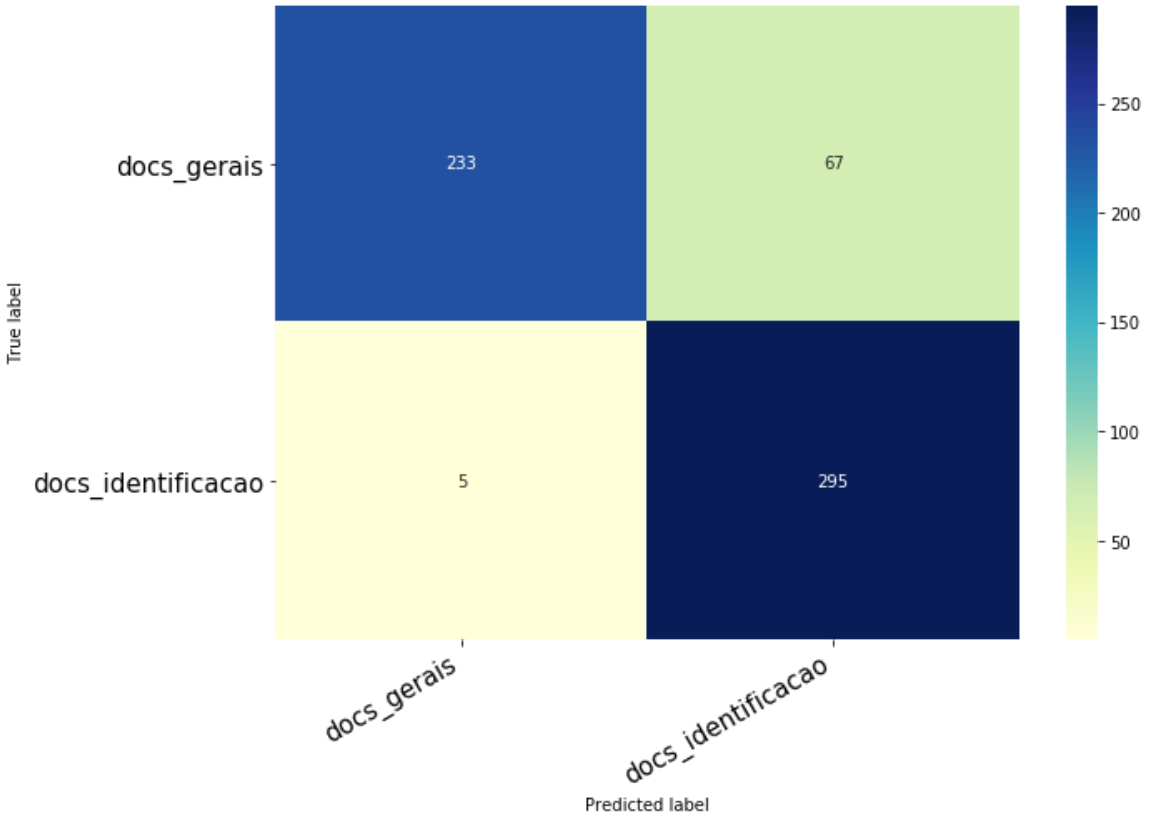
```
### Matriz de confusão para o conjunto de validação ###
Found 1200 images belonging to 2 classes.
37/37 [==============================] - 20s 542ms/step
```



In [7]:

```
### Conjunto de Teste ###

print ("### Matriz de confusão para o conjunto de teste ###")

test_datagen = ImageDataGenerator(rescale = 1./255)

test_set = test_datagen.flow_from_directory('classificador_B/test/',
                                            target_size = (128, 128),
                                            color_mode="rgb",
                                            batch_size = 1,
                                            class_mode = 'categorical',
                                            shuffle=False)
num_test = test_set.samples


#Confution Matrix
Y_pred = model.predict_generator(test_set, num_test, verbose=1)

test_preds = np.argmax(Y_pred, axis=-1)
l=test_preds.shape[0]
test_trues = test_set.classes
cm =confusion_matrix(test_trues[:l], test_preds)

print_confusion_matrix(cm, ["docs_gerais", "docs_identificacao"], figsize = (10,7), fon
tsize=15)

# Accuracy and Loss for the Test set
loss, acc = model.evaluate_generator(test_set, num_test, verbose=1)

# Final accuracy and loss
print ("Test accuracy: %.3f" % acc)
print ("Test loss: %.3f" % loss)
```

```
### Matriz de confusão para o conjunto de teste ###
Found 600 images belonging to 2 classes.
600/600 [==============================] - 22s 37ms/step
600/600 [==============================] - 25s 42ms/step
Test accuracy: 0.880
Test loss: 0.000
```



In [ ]: