hw3

May 3, 2021

```
[1]: import os
     import cv2
     import numpy as np
     from tqdm import tqdm
     import seaborn as sns
     import tensorflow as tf
     from tensorflow import keras
     import matplotlib.pyplot as plt
     from tensorflow.keras import layers
     from tensorflow.keras import models
     from mpl_toolkits.axes_grid1 import ImageGrid
     from tensorflow.keras.applications  import InceptionResNetV2
     from sklearn.metrics import confusion_matrix ,plot_confusion_matrix
     from tensorflow.keras.preprocessing.image import ImageDataGenerator


     epoch_iter = 6
```

0.1 Step 1

This is the portions where I import the pre_model. I grab layers one in order to visualize it in
the next step. The entire summary is printed here, it's very long. Before I turn off the trainable
parameters, this model has 54,276,192 trainable parameters.

```
[2]: pre_model =␣
     ↪InceptionResNetV2(weights='imagenet',include_top=False,input_shape=(150,150,3))
     pre_model.summary()
     layer1 = pre_model.get_layer(name=pre_model.layers[1].name)
```

```
Model: "inception_resnet_v2"

_____
_____
Layer (type)                    Output Shape         Param #     Connected to
================================================================================
==================
input_1 (InputLayer)            [(None, 150, 150, 3) 0

_____
_____
conv2d (Conv2D)                 (None, 74, 74, 32)   864         input_1[0][0]
```

```
--------------------------------------------------------------------------------
------------------
batch_normalization (BatchNorma (None, 74, 74, 32)   96          conv2d[0][0]
--------------------------------------------------------------------------------
------------------
activation (Activation)         (None, 74, 74, 32)   0
batch_normalization[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_1 (Conv2D)               (None, 72, 72, 32)   9216
activation[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_1 (BatchNor (None, 72, 72, 32)   96          conv2d_1[0][0]
--------------------------------------------------------------------------------
------------------
activation_1 (Activation)       (None, 72, 72, 32)   0
batch_normalization_1[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_2 (Conv2D)               (None, 72, 72, 64)   18432
activation_1[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_2 (BatchNor (None, 72, 72, 64)   192         conv2d_2[0][0]
--------------------------------------------------------------------------------
------------------
activation_2 (Activation)       (None, 72, 72, 64)   0
batch_normalization_2[0][0]
--------------------------------------------------------------------------------
------------------
max_pooling2d (MaxPooling2D)    (None, 35, 35, 64)   0
activation_2[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_3 (Conv2D)               (None, 35, 35, 80)   5120
max_pooling2d[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_3 (BatchNor (None, 35, 35, 80)   240         conv2d_3[0][0]
--------------------------------------------------------------------------------
------------------
activation_3 (Activation)       (None, 35, 35, 80)   0
batch_normalization_3[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_4 (Conv2D)               (None, 33, 33, 192)  138240
activation_3[0][0]
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------------------
batch_normalization_4 (BatchNor (None, 33, 33, 192)  576         conv2d_4[0][0]
--------------------------------------------------------------------------------
------------------
activation_4 (Activation)       (None, 33, 33, 192)  0
batch_normalization_4[0][0]
--------------------------------------------------------------------------------
------------------
max_pooling2d_1 (MaxPooling2D)  (None, 16, 16, 192)  0
activation_4[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_8 (Conv2D)               (None, 16, 16, 64)   12288
max_pooling2d_1[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_8 (BatchNor (None, 16, 16, 64)   192         conv2d_8[0][0]
--------------------------------------------------------------------------------
------------------
activation_8 (Activation)       (None, 16, 16, 64)   0
batch_normalization_8[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_6 (Conv2D)               (None, 16, 16, 48)   9216
max_pooling2d_1[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_9 (Conv2D)               (None, 16, 16, 96)   55296
activation_8[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_6 (BatchNor (None, 16, 16, 48)   144         conv2d_6[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_9 (BatchNor (None, 16, 16, 96)   288         conv2d_9[0][0]
--------------------------------------------------------------------------------
------------------
activation_6 (Activation)       (None, 16, 16, 48)   0
batch_normalization_6[0][0]
--------------------------------------------------------------------------------
------------------
activation_9 (Activation)       (None, 16, 16, 96)   0
batch_normalization_9[0][0]
--------------------------------------------------------------------------------
------------------
average_pooling2d (AveragePooli (None, 16, 16, 192)  0
max_pooling2d_1[0][0]
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------------------
conv2d_5 (Conv2D)              (None, 16, 16, 96)   18432
max_pooling2d_1[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_7 (Conv2D)              (None, 16, 16, 64)   76800
activation_6[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_10 (Conv2D)             (None, 16, 16, 96)   82944
activation_9[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_11 (Conv2D)             (None, 16, 16, 64)   12288
average_pooling2d[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_5 (BatchNor (None, 16, 16, 96)   288         conv2d_5[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_7 (BatchNor (None, 16, 16, 64)   192         conv2d_7[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_10 (BatchNo (None, 16, 16, 96)   288         conv2d_10[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_11 (BatchNo (None, 16, 16, 64)   192         conv2d_11[0][0]
--------------------------------------------------------------------------------
------------------
activation_5 (Activation)      (None, 16, 16, 96)   0
batch_normalization_5[0][0]
--------------------------------------------------------------------------------
------------------
activation_7 (Activation)      (None, 16, 16, 64)   0
batch_normalization_7[0][0]
--------------------------------------------------------------------------------
------------------
activation_10 (Activation)     (None, 16, 16, 96)   0
batch_normalization_10[0][0]
--------------------------------------------------------------------------------
------------------
activation_11 (Activation)     (None, 16, 16, 64)   0
batch_normalization_11[0][0]
--------------------------------------------------------------------------------
------------------
mixed_5b (Concatenate)         (None, 16, 16, 320)  0
activation_5[0][0]
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                                                    activation_7[0][0]
                                                    activation_10[0][0]
                                                    activation_11[0][0]
_____
_____
conv2d_15 (Conv2D)              (None, 16, 16, 32)   10240       mixed_5b[0][0]
_____
_____
batch_normalization_15 (BatchNo (None, 16, 16, 32)   96          conv2d_15[0][0]
_____
_____
activation_15 (Activation)      (None, 16, 16, 32)   0
batch_normalization_15[0][0]
_____
_____
conv2d_13 (Conv2D)              (None, 16, 16, 32)   10240       mixed_5b[0][0]
_____
_____
conv2d_16 (Conv2D)              (None, 16, 16, 48)   13824
activation_15[0][0]
_____
_____
batch_normalization_13 (BatchNo (None, 16, 16, 32)   96          conv2d_13[0][0]
_____
_____
batch_normalization_16 (BatchNo (None, 16, 16, 48)   144         conv2d_16[0][0]
_____
_____
activation_13 (Activation)      (None, 16, 16, 32)   0
batch_normalization_13[0][0]
_____
_____
activation_16 (Activation)      (None, 16, 16, 48)   0
batch_normalization_16[0][0]
_____
_____
conv2d_12 (Conv2D)              (None, 16, 16, 32)   10240       mixed_5b[0][0]
_____
_____
conv2d_14 (Conv2D)              (None, 16, 16, 32)   9216
activation_13[0][0]
_____
_____
conv2d_17 (Conv2D)              (None, 16, 16, 64)   27648
activation_16[0][0]
_____
_____
batch_normalization_12 (BatchNo (None, 16, 16, 32)   96          conv2d_12[0][0]
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batch_normalization_14 (BatchNo (None, 16, 16, 32)   96          conv2d_14[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_17 (BatchNo (None, 16, 16, 64)   192         conv2d_17[0][0]
--------------------------------------------------------------------------------
------------------
activation_12 (Activation)      (None, 16, 16, 32)   0
batch_normalization_12[0][0]
--------------------------------------------------------------------------------
------------------
activation_14 (Activation)      (None, 16, 16, 32)   0
batch_normalization_14[0][0]
--------------------------------------------------------------------------------
------------------
activation_17 (Activation)      (None, 16, 16, 64)   0
batch_normalization_17[0][0]
--------------------------------------------------------------------------------
------------------
block35_1_mixed (Concatenate)   (None, 16, 16, 128)  0
activation_12[0][0]
activation_14[0][0]
activation_17[0][0]
--------------------------------------------------------------------------------
------------------
block35_1_conv (Conv2D)         (None, 16, 16, 320)  41280
block35_1_mixed[0][0]
--------------------------------------------------------------------------------
------------------
block35_1 (Lambda)              (None, 16, 16, 320)  0           mixed_5b[0][0]
block35_1_conv[0][0]
--------------------------------------------------------------------------------
------------------
block35_1_ac (Activation)       (None, 16, 16, 320)  0           block35_1[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_21 (Conv2D)              (None, 16, 16, 32)   10240
block35_1_ac[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_21 (BatchNo (None, 16, 16, 32)   96          conv2d_21[0][0]
--------------------------------------------------------------------------------
------------------
activation_21 (Activation)      (None, 16, 16, 32)   0
batch_normalization_21[0][0]
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conv2d_19 (Conv2D)              (None, 16, 16, 32)   10240
block35_1_ac[0][0]
_____
_____
conv2d_22 (Conv2D)              (None, 16, 16, 48)   13824
activation_21[0][0]
_____
_____
batch_normalization_19 (BatchNo (None, 16, 16, 32)   96          conv2d_19[0][0]
_____
_____
batch_normalization_22 (BatchNo (None, 16, 16, 48)   144         conv2d_22[0][0]
_____
_____
activation_19 (Activation)      (None, 16, 16, 32)   0
batch_normalization_19[0][0]
_____
_____
activation_22 (Activation)      (None, 16, 16, 48)   0
batch_normalization_22[0][0]
_____
_____
conv2d_18 (Conv2D)              (None, 16, 16, 32)   10240
block35_1_ac[0][0]
_____
_____
conv2d_20 (Conv2D)              (None, 16, 16, 32)   9216
activation_19[0][0]
_____
_____
conv2d_23 (Conv2D)              (None, 16, 16, 64)   27648
activation_22[0][0]
_____
_____
batch_normalization_18 (BatchNo (None, 16, 16, 32)   96          conv2d_18[0][0]
_____
_____
batch_normalization_20 (BatchNo (None, 16, 16, 32)   96          conv2d_20[0][0]
_____
_____
batch_normalization_23 (BatchNo (None, 16, 16, 64)   192         conv2d_23[0][0]
_____
_____
activation_18 (Activation)      (None, 16, 16, 32)   0
batch_normalization_18[0][0]
_____
_____
activation_20 (Activation)      (None, 16, 16, 32)   0
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                                   batch_normalization_20[0][0]
_____
activation_23 (Activation)      (None, 16, 16, 64)   0
batch_normalization_23[0][0]
_____
block35_2_mixed (Concatenate)   (None, 16, 16, 128)  0
activation_18[0][0]
activation_20[0][0]
activation_23[0][0]
_____
block35_2_conv (Conv2D)         (None, 16, 16, 320)  41280
block35_2_mixed[0][0]
_____
block35_2 (Lambda)              (None, 16, 16, 320)  0
block35_1_ac[0][0]
block35_2_conv[0][0]
_____
block35_2_ac (Activation)       (None, 16, 16, 320)  0           block35_2[0][0]
_____
conv2d_27 (Conv2D)              (None, 16, 16, 32)   10240
block35_2_ac[0][0]
_____
batch_normalization_27 (BatchNo (None, 16, 16, 32)   96          conv2d_27[0][0]
_____
activation_27 (Activation)      (None, 16, 16, 32)   0
batch_normalization_27[0][0]
_____
conv2d_25 (Conv2D)              (None, 16, 16, 32)   10240
block35_2_ac[0][0]
_____
conv2d_28 (Conv2D)              (None, 16, 16, 48)   13824
activation_27[0][0]
_____
batch_normalization_25 (BatchNo (None, 16, 16, 32)   96          conv2d_25[0][0]
_____
batch_normalization_28 (BatchNo (None, 16, 16, 48)   144         conv2d_28[0][0]
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------------------
activation_25 (Activation)      (None, 16, 16, 32)   0
batch_normalization_25[0][0]
--------------------------------------------------------------------------------
------------------
activation_28 (Activation)      (None, 16, 16, 48)   0
batch_normalization_28[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_24 (Conv2D)              (None, 16, 16, 32)   10240
block35_2_ac[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_26 (Conv2D)              (None, 16, 16, 32)   9216
activation_25[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_29 (Conv2D)              (None, 16, 16, 64)   27648
activation_28[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_24 (BatchNo (None, 16, 16, 32)   96          conv2d_24[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_26 (BatchNo (None, 16, 16, 32)   96          conv2d_26[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_29 (BatchNo (None, 16, 16, 64)   192         conv2d_29[0][0]
--------------------------------------------------------------------------------
------------------
activation_24 (Activation)      (None, 16, 16, 32)   0
batch_normalization_24[0][0]
--------------------------------------------------------------------------------
------------------
activation_26 (Activation)      (None, 16, 16, 32)   0
batch_normalization_26[0][0]
--------------------------------------------------------------------------------
------------------
activation_29 (Activation)      (None, 16, 16, 64)   0
batch_normalization_29[0][0]
--------------------------------------------------------------------------------
------------------
block35_3_mixed (Concatenate)   (None, 16, 16, 128)  0
activation_24[0][0]
activation_26[0][0]
activation_29[0][0]
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block35_3_conv (Conv2D)        (None, 16, 16, 320)  41280
block35_3_mixed[0][0]
_____
------------------
block35_3 (Lambda)             (None, 16, 16, 320)  0
block35_2_ac[0][0]
block35_3_conv[0][0]
_____
------------------
block35_3_ac (Activation)      (None, 16, 16, 320)  0          block35_3[0][0]
_____
------------------
conv2d_33 (Conv2D)             (None, 16, 16, 32)   10240
block35_3_ac[0][0]
_____
------------------
batch_normalization_33 (BatchNo (None, 16, 16, 32)  96         conv2d_33[0][0]
_____
------------------
activation_33 (Activation)     (None, 16, 16, 32)   0
batch_normalization_33[0][0]
_____
------------------
conv2d_31 (Conv2D)             (None, 16, 16, 32)   10240
block35_3_ac[0][0]
_____
------------------
conv2d_34 (Conv2D)             (None, 16, 16, 48)   13824
activation_33[0][0]
_____
------------------
batch_normalization_31 (BatchNo (None, 16, 16, 32)  96         conv2d_31[0][0]
_____
------------------
batch_normalization_34 (BatchNo (None, 16, 16, 48)  144        conv2d_34[0][0]
_____
------------------
activation_31 (Activation)     (None, 16, 16, 32)   0
batch_normalization_31[0][0]
_____
------------------
activation_34 (Activation)     (None, 16, 16, 48)   0
batch_normalization_34[0][0]
_____
------------------
conv2d_30 (Conv2D)             (None, 16, 16, 32)   10240
block35_3_ac[0][0]
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------------------
conv2d_32 (Conv2D)              (None, 16, 16, 32)   9216
activation_31[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_35 (Conv2D)              (None, 16, 16, 64)   27648
activation_34[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_30 (BatchNo (None, 16, 16, 32)   96          conv2d_30[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_32 (BatchNo (None, 16, 16, 32)   96          conv2d_32[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_35 (BatchNo (None, 16, 16, 64)   192         conv2d_35[0][0]
--------------------------------------------------------------------------------
------------------
activation_30 (Activation)      (None, 16, 16, 32)   0
batch_normalization_30[0][0]
--------------------------------------------------------------------------------
------------------
activation_32 (Activation)      (None, 16, 16, 32)   0
batch_normalization_32[0][0]
--------------------------------------------------------------------------------
------------------
activation_35 (Activation)      (None, 16, 16, 64)   0
batch_normalization_35[0][0]
--------------------------------------------------------------------------------
------------------
block35_4_mixed (Concatenate)   (None, 16, 16, 128)  0
activation_30[0][0]
activation_32[0][0]
activation_35[0][0]
--------------------------------------------------------------------------------
------------------
block35_4_conv (Conv2D)         (None, 16, 16, 320)  41280
block35_4_mixed[0][0]
--------------------------------------------------------------------------------
------------------
block35_4 (Lambda)              (None, 16, 16, 320)  0
block35_3_ac[0][0]
block35_4_conv[0][0]
--------------------------------------------------------------------------------
------------------
block35_4_ac (Activation)       (None, 16, 16, 320)  0           block35_4[0][0]
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11

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conv2d_39 (Conv2D)              (None, 16, 16, 32)   10240
block35_4_ac[0][0]
_____
-----------------
batch_normalization_39 (BatchNo (None, 16, 16, 32)   96          conv2d_39[0][0]
_____
-----------------
activation_39 (Activation)      (None, 16, 16, 32)   0
batch_normalization_39[0][0]
_____
-----------------
conv2d_37 (Conv2D)              (None, 16, 16, 32)   10240
block35_4_ac[0][0]
_____
-----------------
conv2d_40 (Conv2D)              (None, 16, 16, 48)   13824
activation_39[0][0]
_____
-----------------
batch_normalization_37 (BatchNo (None, 16, 16, 32)   96          conv2d_37[0][0]
_____
-----------------
batch_normalization_40 (BatchNo (None, 16, 16, 48)   144         conv2d_40[0][0]
_____
-----------------
activation_37 (Activation)      (None, 16, 16, 32)   0
batch_normalization_37[0][0]
_____
-----------------
activation_40 (Activation)      (None, 16, 16, 48)   0
batch_normalization_40[0][0]
_____
-----------------
conv2d_36 (Conv2D)              (None, 16, 16, 32)   10240
block35_4_ac[0][0]
_____
-----------------
conv2d_38 (Conv2D)              (None, 16, 16, 32)   9216
activation_37[0][0]
_____
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conv2d_41 (Conv2D)              (None, 16, 16, 64)   27648
activation_40[0][0]
_____
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batch_normalization_36 (BatchNo (None, 16, 16, 32)   96          conv2d_36[0][0]
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batch_normalization_38 (BatchNo (None, 16, 16, 32)   96          conv2d_38[0][0]
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------------------
batch_normalization_41 (BatchNo (None, 16, 16, 64)   192         conv2d_41[0][0]
--------------------------------------------------------------------------------
------------------
activation_36 (Activation)      (None, 16, 16, 32)   0
batch_normalization_36[0][0]
--------------------------------------------------------------------------------
------------------
activation_38 (Activation)      (None, 16, 16, 32)   0
batch_normalization_38[0][0]
--------------------------------------------------------------------------------
------------------
activation_41 (Activation)      (None, 16, 16, 64)   0
batch_normalization_41[0][0]
--------------------------------------------------------------------------------
------------------
block35_5_mixed (Concatenate)   (None, 16, 16, 128)  0
activation_36[0][0]
activation_38[0][0]
activation_41[0][0]
--------------------------------------------------------------------------------
------------------
block35_5_conv (Conv2D)         (None, 16, 16, 320)  41280
block35_5_mixed[0][0]
--------------------------------------------------------------------------------
------------------
block35_5 (Lambda)              (None, 16, 16, 320)  0
block35_4_ac[0][0]
block35_5_conv[0][0]
--------------------------------------------------------------------------------
------------------
block35_5_ac (Activation)       (None, 16, 16, 320)  0          block35_5[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_45 (Conv2D)              (None, 16, 16, 32)   10240
block35_5_ac[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_45 (BatchNo (None, 16, 16, 32)   96          conv2d_45[0][0]
--------------------------------------------------------------------------------
------------------
activation_45 (Activation)      (None, 16, 16, 32)   0
batch_normalization_45[0][0]
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conv2d_43 (Conv2D)              (None, 16, 16, 32)   10240
block35_5_ac[0][0]
_____
_____
conv2d_46 (Conv2D)              (None, 16, 16, 48)   13824
activation_45[0][0]
_____
_____
batch_normalization_43 (BatchNo (None, 16, 16, 32)   96          conv2d_43[0][0]
_____
_____
batch_normalization_46 (BatchNo (None, 16, 16, 48)   144         conv2d_46[0][0]
_____
_____
activation_43 (Activation)      (None, 16, 16, 32)   0
batch_normalization_43[0][0]
_____
_____
activation_46 (Activation)      (None, 16, 16, 48)   0
batch_normalization_46[0][0]
_____
_____
conv2d_42 (Conv2D)              (None, 16, 16, 32)   10240
block35_5_ac[0][0]
_____
_____
conv2d_44 (Conv2D)              (None, 16, 16, 32)   9216
activation_43[0][0]
_____
_____
conv2d_47 (Conv2D)              (None, 16, 16, 64)   27648
activation_46[0][0]
_____
_____
batch_normalization_42 (BatchNo (None, 16, 16, 32)   96          conv2d_42[0][0]
_____
_____
batch_normalization_44 (BatchNo (None, 16, 16, 32)   96          conv2d_44[0][0]
_____
_____
batch_normalization_47 (BatchNo (None, 16, 16, 64)   192         conv2d_47[0][0]
_____
_____
activation_42 (Activation)      (None, 16, 16, 32)   0
batch_normalization_42[0][0]
_____
_____
activation_44 (Activation)      (None, 16, 16, 32)   0
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                                   batch_normalization_44[0][0]
_____
_____
activation_47 (Activation)       (None, 16, 16, 64)   0
batch_normalization_47[0][0]
_____
_____
block35_6_mixed (Concatenate)    (None, 16, 16, 128)  0
activation_42[0][0]
activation_44[0][0]
activation_47[0][0]
_____
_____
block35_6_conv (Conv2D)          (None, 16, 16, 320)  41280
block35_6_mixed[0][0]
_____
_____
block35_6 (Lambda)               (None, 16, 16, 320)  0
block35_5_ac[0][0]
block35_6_conv[0][0]
_____
_____
block35_6_ac (Activation)        (None, 16, 16, 320)  0          block35_6[0][0]
_____
_____
conv2d_51 (Conv2D)               (None, 16, 16, 32)   10240
block35_6_ac[0][0]
_____
_____
batch_normalization_51 (BatchNo  (None, 16, 16, 32)   96         conv2d_51[0][0]
_____
_____
activation_51 (Activation)       (None, 16, 16, 32)   0
batch_normalization_51[0][0]
_____
_____
conv2d_49 (Conv2D)               (None, 16, 16, 32)   10240
block35_6_ac[0][0]
_____
_____
conv2d_52 (Conv2D)               (None, 16, 16, 48)   13824
activation_51[0][0]
_____
_____
batch_normalization_49 (BatchNo  (None, 16, 16, 32)   96         conv2d_49[0][0]
_____
_____
batch_normalization_52 (BatchNo  (None, 16, 16, 48)   144        conv2d_52[0][0]
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activation_49 (Activation)       (None, 16, 16, 32)   0
batch_normalization_49[0][0]
--------------------------------------------------------------------------------
------------------
activation_52 (Activation)       (None, 16, 16, 48)   0
batch_normalization_52[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_48 (Conv2D)               (None, 16, 16, 32)   10240
block35_6_ac[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_50 (Conv2D)               (None, 16, 16, 32)   9216
activation_49[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_53 (Conv2D)               (None, 16, 16, 64)   27648
activation_52[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_48 (BatchNo (None, 16, 16, 32)   96          conv2d_48[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_50 (BatchNo (None, 16, 16, 32)   96          conv2d_50[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_53 (BatchNo (None, 16, 16, 64)   192         conv2d_53[0][0]
--------------------------------------------------------------------------------
------------------
activation_48 (Activation)       (None, 16, 16, 32)   0
batch_normalization_48[0][0]
--------------------------------------------------------------------------------
------------------
activation_50 (Activation)       (None, 16, 16, 32)   0
batch_normalization_50[0][0]
--------------------------------------------------------------------------------
------------------
activation_53 (Activation)       (None, 16, 16, 64)   0
batch_normalization_53[0][0]
--------------------------------------------------------------------------------
------------------
block35_7_mixed (Concatenate)    (None, 16, 16, 128)  0
activation_48[0][0]
activation_50[0][0]
activation_53[0][0]
--------------------------------------------------------------------------------
------------------
```

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------------------
block35_7_conv (Conv2D)          (None, 16, 16, 320)  41280
block35_7_mixed[0][0]

--------------------------------------------------------------------------------
------------------
block35_7 (Lambda)               (None, 16, 16, 320)  0
block35_6_ac[0][0]
block35_7_conv[0][0]

--------------------------------------------------------------------------------
------------------
block35_7_ac (Activation)        (None, 16, 16, 320)  0              block35_7[0][0]

--------------------------------------------------------------------------------
------------------
conv2d_57 (Conv2D)               (None, 16, 16, 32)   10240
block35_7_ac[0][0]

--------------------------------------------------------------------------------
------------------
batch_normalization_57 (BatchNo  (None, 16, 16, 32)   96             conv2d_57[0][0]

--------------------------------------------------------------------------------
------------------
activation_57 (Activation)       (None, 16, 16, 32)   0
batch_normalization_57[0][0]

--------------------------------------------------------------------------------
------------------
conv2d_55 (Conv2D)               (None, 16, 16, 32)   10240
block35_7_ac[0][0]

--------------------------------------------------------------------------------
------------------
conv2d_58 (Conv2D)               (None, 16, 16, 48)   13824
activation_57[0][0]

--------------------------------------------------------------------------------
------------------
batch_normalization_55 (BatchNo  (None, 16, 16, 32)   96             conv2d_55[0][0]

--------------------------------------------------------------------------------
------------------
batch_normalization_58 (BatchNo  (None, 16, 16, 48)   144            conv2d_58[0][0]

--------------------------------------------------------------------------------
------------------
activation_55 (Activation)       (None, 16, 16, 32)   0
batch_normalization_55[0][0]

--------------------------------------------------------------------------------
------------------
activation_58 (Activation)       (None, 16, 16, 48)   0
batch_normalization_58[0][0]

--------------------------------------------------------------------------------
------------------
conv2d_54 (Conv2D)               (None, 16, 16, 32)   10240
block35_7_ac[0][0]
```

```
--------------------------------------------------------------------------------
------------------
conv2d_56 (Conv2D)              (None, 16, 16, 32)   9216
activation_55[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_59 (Conv2D)              (None, 16, 16, 64)   27648
activation_58[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_54 (BatchNo (None, 16, 16, 32)   96          conv2d_54[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_56 (BatchNo (None, 16, 16, 32)   96          conv2d_56[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_59 (BatchNo (None, 16, 16, 64)   192         conv2d_59[0][0]
--------------------------------------------------------------------------------
------------------
activation_54 (Activation)      (None, 16, 16, 32)   0
batch_normalization_54[0][0]
--------------------------------------------------------------------------------
------------------
activation_56 (Activation)      (None, 16, 16, 32)   0
batch_normalization_56[0][0]
--------------------------------------------------------------------------------
------------------
activation_59 (Activation)      (None, 16, 16, 64)   0
batch_normalization_59[0][0]
--------------------------------------------------------------------------------
------------------
block35_8_mixed (Concatenate)   (None, 16, 16, 128)  0
activation_54[0][0]
activation_56[0][0]
activation_59[0][0]
--------------------------------------------------------------------------------
------------------
block35_8_conv (Conv2D)         (None, 16, 16, 320)  41280
block35_8_mixed[0][0]
--------------------------------------------------------------------------------
------------------
block35_8 (Lambda)              (None, 16, 16, 320)  0
block35_7_ac[0][0]
block35_8_conv[0][0]
--------------------------------------------------------------------------------
------------------
block35_8_ac (Activation)       (None, 16, 16, 320)  0           block35_8[0][0]
--------------------------------------------------------------------------------
```

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------------------
conv2d_63 (Conv2D)              (None, 16, 16, 32)   10240
block35_8_ac[0][0]
_____
------------------
batch_normalization_63 (BatchNo (None, 16, 16, 32)   96          conv2d_63[0][0]
_____
------------------
activation_63 (Activation)      (None, 16, 16, 32)   0
batch_normalization_63[0][0]
_____
------------------
conv2d_61 (Conv2D)              (None, 16, 16, 32)   10240
block35_8_ac[0][0]
_____
------------------
conv2d_64 (Conv2D)              (None, 16, 16, 48)   13824
activation_63[0][0]
_____
------------------
batch_normalization_61 (BatchNo (None, 16, 16, 32)   96          conv2d_61[0][0]
_____
------------------
batch_normalization_64 (BatchNo (None, 16, 16, 48)   144         conv2d_64[0][0]
_____
------------------
activation_61 (Activation)      (None, 16, 16, 32)   0
batch_normalization_61[0][0]
_____
------------------
activation_64 (Activation)      (None, 16, 16, 48)   0
batch_normalization_64[0][0]
_____
------------------
conv2d_60 (Conv2D)              (None, 16, 16, 32)   10240
block35_8_ac[0][0]
_____
------------------
conv2d_62 (Conv2D)              (None, 16, 16, 32)   9216
activation_61[0][0]
_____
------------------
conv2d_65 (Conv2D)              (None, 16, 16, 64)   27648
activation_64[0][0]
_____
------------------
batch_normalization_60 (BatchNo (None, 16, 16, 32)   96          conv2d_60[0][0]
_____
```

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------------------
batch_normalization_62 (BatchNo (None, 16, 16, 32)   96          conv2d_62[0][0]
_____
------------------
batch_normalization_65 (BatchNo (None, 16, 16, 64)   192         conv2d_65[0][0]
_____
------------------
activation_60 (Activation)      (None, 16, 16, 32)   0
batch_normalization_60[0][0]
_____
------------------
activation_62 (Activation)      (None, 16, 16, 32)   0
batch_normalization_62[0][0]
_____
------------------
activation_65 (Activation)      (None, 16, 16, 64)   0
batch_normalization_65[0][0]
_____
------------------
block35_9_mixed (Concatenate)   (None, 16, 16, 128)  0
activation_60[0][0]
activation_62[0][0]
activation_65[0][0]
_____
------------------
block35_9_conv (Conv2D)         (None, 16, 16, 320)  41280
block35_9_mixed[0][0]
_____
------------------
block35_9 (Lambda)              (None, 16, 16, 320)  0
block35_8_ac[0][0]
block35_9_conv[0][0]
_____
------------------
block35_9_ac (Activation)       (None, 16, 16, 320)  0           block35_9[0][0]
_____
------------------
conv2d_69 (Conv2D)              (None, 16, 16, 32)   10240
block35_9_ac[0][0]
_____
------------------
batch_normalization_69 (BatchNo (None, 16, 16, 32)   96          conv2d_69[0][0]
_____
------------------
activation_69 (Activation)      (None, 16, 16, 32)   0
batch_normalization_69[0][0]
_____
------------------
```

```
conv2d_67 (Conv2D)              (None, 16, 16, 32)   10240
block35_9_ac[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_70 (Conv2D)              (None, 16, 16, 48)   13824
activation_69[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_67 (BatchNo (None, 16, 16, 32)   96          conv2d_67[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_70 (BatchNo (None, 16, 16, 48)   144         conv2d_70[0][0]
--------------------------------------------------------------------------------
------------------
activation_67 (Activation)      (None, 16, 16, 32)   0
batch_normalization_67[0][0]
--------------------------------------------------------------------------------
------------------
activation_70 (Activation)      (None, 16, 16, 48)   0
batch_normalization_70[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_66 (Conv2D)              (None, 16, 16, 32)   10240
block35_9_ac[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_68 (Conv2D)              (None, 16, 16, 32)   9216
activation_67[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_71 (Conv2D)              (None, 16, 16, 64)   27648
activation_70[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_66 (BatchNo (None, 16, 16, 32)   96          conv2d_66[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_68 (BatchNo (None, 16, 16, 32)   96          conv2d_68[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_71 (BatchNo (None, 16, 16, 64)   192         conv2d_71[0][0]
--------------------------------------------------------------------------------
------------------
activation_66 (Activation)      (None, 16, 16, 32)   0
batch_normalization_66[0][0]
--------------------------------------------------------------------------------
------------------
activation_68 (Activation)      (None, 16, 16, 32)   0
```

```
                                          batch_normalization_68[0][0]
_____
_____
activation_71 (Activation)      (None, 16, 16, 64)    0
batch_normalization_71[0][0]
_____
_____
block35_10_mixed (Concatenate)  (None, 16, 16, 128)   0
activation_66[0][0]
activation_68[0][0]
activation_71[0][0]
_____
_____
block35_10_conv (Conv2D)        (None, 16, 16, 320)   41280
block35_10_mixed[0][0]
_____
_____
block35_10 (Lambda)             (None, 16, 16, 320)   0
block35_9_ac[0][0]
block35_10_conv[0][0]
_____
_____
block35_10_ac (Activation)      (None, 16, 16, 320)   0
block35_10[0][0]
_____
_____
conv2d_73 (Conv2D)              (None, 16, 16, 256)   81920
block35_10_ac[0][0]
_____
_____
batch_normalization_73 (BatchNo (None, 16, 16, 256)   768        conv2d_73[0][0]
_____
_____
activation_73 (Activation)      (None, 16, 16, 256)   0
batch_normalization_73[0][0]
_____
_____
conv2d_74 (Conv2D)              (None, 16, 16, 256)   589824
activation_73[0][0]
_____
_____
batch_normalization_74 (BatchNo (None, 16, 16, 256)   768        conv2d_74[0][0]
_____
_____
activation_74 (Activation)      (None, 16, 16, 256)   0
batch_normalization_74[0][0]
_____
_____
```

```
conv2d_72 (Conv2D)              (None, 7, 7, 384)    1105920
block35_10_ac[0][0]
----------------------------------------------------------------------
------------------
conv2d_75 (Conv2D)              (None, 7, 7, 384)    884736
activation_74[0][0]
----------------------------------------------------------------------
------------------
batch_normalization_72 (BatchNo (None, 7, 7, 384)    1152        conv2d_72[0][0]
----------------------------------------------------------------------
------------------
batch_normalization_75 (BatchNo (None, 7, 7, 384)    1152        conv2d_75[0][0]
----------------------------------------------------------------------
------------------
activation_72 (Activation)      (None, 7, 7, 384)    0
batch_normalization_72[0][0]
----------------------------------------------------------------------
------------------
activation_75 (Activation)      (None, 7, 7, 384)    0
batch_normalization_75[0][0]
----------------------------------------------------------------------
------------------
max_pooling2d_2 (MaxPooling2D)  (None, 7, 7, 320)    0
block35_10_ac[0][0]
----------------------------------------------------------------------
------------------
mixed_6a (Concatenate)          (None, 7, 7, 1088)   0
activation_72[0][0]
activation_75[0][0]
max_pooling2d_2[0][0]
----------------------------------------------------------------------
------------------
conv2d_77 (Conv2D)              (None, 7, 7, 128)    139264      mixed_6a[0][0]
----------------------------------------------------------------------
------------------
batch_normalization_77 (BatchNo (None, 7, 7, 128)    384         conv2d_77[0][0]
----------------------------------------------------------------------
------------------
activation_77 (Activation)      (None, 7, 7, 128)    0
batch_normalization_77[0][0]
----------------------------------------------------------------------
------------------
conv2d_78 (Conv2D)              (None, 7, 7, 160)    143360
activation_77[0][0]
----------------------------------------------------------------------
------------------
batch_normalization_78 (BatchNo (None, 7, 7, 160)    480         conv2d_78[0][0]
----------------------------------------------------------------------
------------------
```

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------------------
activation_78 (Activation)        (None, 7, 7, 160)    0
batch_normalization_78[0][0]
_____
------------------
conv2d_76 (Conv2D)                (None, 7, 7, 192)    208896      mixed_6a[0][0]
_____
------------------
conv2d_79 (Conv2D)                (None, 7, 7, 192)    215040
activation_78[0][0]
_____
------------------
batch_normalization_76 (BatchNo   (None, 7, 7, 192)    576         conv2d_76[0][0]
_____
------------------
batch_normalization_79 (BatchNo   (None, 7, 7, 192)    576         conv2d_79[0][0]
_____
------------------
activation_76 (Activation)        (None, 7, 7, 192)    0
batch_normalization_76[0][0]
_____
------------------
activation_79 (Activation)        (None, 7, 7, 192)    0
batch_normalization_79[0][0]
_____
------------------
block17_1_mixed (Concatenate)     (None, 7, 7, 384)    0
activation_76[0][0]
activation_79[0][0]
_____
------------------
block17_1_conv (Conv2D)           (None, 7, 7, 1088)   418880
block17_1_mixed[0][0]
_____
------------------
block17_1 (Lambda)                (None, 7, 7, 1088)   0           mixed_6a[0][0]
block17_1_conv[0][0]
_____
------------------
block17_1_ac (Activation)         (None, 7, 7, 1088)   0           block17_1[0][0]
_____
------------------
conv2d_81 (Conv2D)                (None, 7, 7, 128)    139264
block17_1_ac[0][0]
_____
------------------
batch_normalization_81 (BatchNo   (None, 7, 7, 128)    384         conv2d_81[0][0]
_____
```

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-----------------
activation_81 (Activation)       (None, 7, 7, 128)    0
batch_normalization_81[0][0]
_____
-----------------
conv2d_82 (Conv2D)               (None, 7, 7, 160)    143360
activation_81[0][0]
_____
-----------------
batch_normalization_82 (BatchNo (None, 7, 7, 160)    480       conv2d_82[0][0]
_____
-----------------
activation_82 (Activation)       (None, 7, 7, 160)    0
batch_normalization_82[0][0]
_____
-----------------
conv2d_80 (Conv2D)               (None, 7, 7, 192)    208896
block17_1_ac[0][0]
_____
-----------------
conv2d_83 (Conv2D)               (None, 7, 7, 192)    215040
activation_82[0][0]
_____
-----------------
batch_normalization_80 (BatchNo (None, 7, 7, 192)    576       conv2d_80[0][0]
_____
-----------------
batch_normalization_83 (BatchNo (None, 7, 7, 192)    576       conv2d_83[0][0]
_____
-----------------
activation_80 (Activation)       (None, 7, 7, 192)    0
batch_normalization_80[0][0]
_____
-----------------
activation_83 (Activation)       (None, 7, 7, 192)    0
batch_normalization_83[0][0]
_____
-----------------
block17_2_mixed (Concatenate)    (None, 7, 7, 384)    0
activation_80[0][0]
activation_83[0][0]
_____
-----------------
block17_2_conv (Conv2D)          (None, 7, 7, 1088)   418880
block17_2_mixed[0][0]
_____
-----------------
block17_2 (Lambda)               (None, 7, 7, 1088)   0
```

```
block17_1_ac[0][0]
block17_2_conv[0][0]
_____
_____
block17_2_ac (Activation)      (None, 7, 7, 1088)  0           block17_2[0][0]
_____
_____
conv2d_85 (Conv2D)             (None, 7, 7, 128)   139264
block17_2_ac[0][0]
_____
_____
batch_normalization_85 (BatchNo (None, 7, 7, 128)  384         conv2d_85[0][0]
_____
_____
activation_85 (Activation)     (None, 7, 7, 128)   0
batch_normalization_85[0][0]
_____
_____
conv2d_86 (Conv2D)             (None, 7, 7, 160)   143360
activation_85[0][0]
_____
_____
batch_normalization_86 (BatchNo (None, 7, 7, 160)  480         conv2d_86[0][0]
_____
_____
activation_86 (Activation)     (None, 7, 7, 160)   0
batch_normalization_86[0][0]
_____
_____
conv2d_84 (Conv2D)             (None, 7, 7, 192)   208896
block17_2_ac[0][0]
_____
_____
conv2d_87 (Conv2D)             (None, 7, 7, 192)   215040
activation_86[0][0]
_____
_____
batch_normalization_84 (BatchNo (None, 7, 7, 192)  576         conv2d_84[0][0]
_____
_____
batch_normalization_87 (BatchNo (None, 7, 7, 192)  576         conv2d_87[0][0]
_____
_____
activation_84 (Activation)     (None, 7, 7, 192)   0
batch_normalization_84[0][0]
_____
_____
activation_87 (Activation)     (None, 7, 7, 192)   0
```

```
batch_normalization_87[0][0]
_____
_____
block17_3_mixed (Concatenate)   (None, 7, 7, 384)    0
activation_84[0][0]
activation_87[0][0]
_____
_____
block17_3_conv (Conv2D)         (None, 7, 7, 1088)    418880
block17_3_mixed[0][0]
_____
_____
block17_3 (Lambda)              (None, 7, 7, 1088)    0
block17_2_ac[0][0]
block17_3_conv[0][0]
_____
_____
block17_3_ac (Activation)       (None, 7, 7, 1088)    0            block17_3[0][0]
_____
_____
conv2d_89 (Conv2D)              (None, 7, 7, 128)     139264
block17_3_ac[0][0]
_____
_____
batch_normalization_89 (BatchNo (None, 7, 7, 128)     384          conv2d_89[0][0]
_____
_____
activation_89 (Activation)      (None, 7, 7, 128)     0
batch_normalization_89[0][0]
_____
_____
conv2d_90 (Conv2D)              (None, 7, 7, 160)     143360
activation_89[0][0]
_____
_____
batch_normalization_90 (BatchNo (None, 7, 7, 160)     480          conv2d_90[0][0]
_____
_____
activation_90 (Activation)      (None, 7, 7, 160)     0
batch_normalization_90[0][0]
_____
_____
conv2d_88 (Conv2D)              (None, 7, 7, 192)     208896
block17_3_ac[0][0]
_____
_____
conv2d_91 (Conv2D)              (None, 7, 7, 192)     215040
activation_90[0][0]
```

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--------------------------------------------------------------------------------
------------------
batch_normalization_88 (BatchNo (None, 7, 7, 192)    576         conv2d_88[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_91 (BatchNo (None, 7, 7, 192)    576         conv2d_91[0][0]
--------------------------------------------------------------------------------
------------------
activation_88 (Activation)      (None, 7, 7, 192)    0
batch_normalization_88[0][0]
--------------------------------------------------------------------------------
------------------
activation_91 (Activation)      (None, 7, 7, 192)    0
batch_normalization_91[0][0]
--------------------------------------------------------------------------------
------------------
block17_4_mixed (Concatenate)   (None, 7, 7, 384)    0
activation_88[0][0]
activation_91[0][0]
--------------------------------------------------------------------------------
------------------
block17_4_conv (Conv2D)         (None, 7, 7, 1088)   418880
block17_4_mixed[0][0]
--------------------------------------------------------------------------------
------------------
block17_4 (Lambda)              (None, 7, 7, 1088)   0
block17_3_ac[0][0]
block17_4_conv[0][0]
--------------------------------------------------------------------------------
------------------
block17_4_ac (Activation)       (None, 7, 7, 1088)   0           block17_4[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_93 (Conv2D)              (None, 7, 7, 128)    139264
block17_4_ac[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_93 (BatchNo (None, 7, 7, 128)    384         conv2d_93[0][0]
--------------------------------------------------------------------------------
------------------
activation_93 (Activation)      (None, 7, 7, 128)    0
batch_normalization_93[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_94 (Conv2D)              (None, 7, 7, 160)    143360
activation_93[0][0]
--------------------------------------------------------------------------------
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28

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batch_normalization_94 (BatchNo (None, 7, 7, 160)      480          conv2d_94[0][0]
_____
_____
activation_94 (Activation)      (None, 7, 7, 160)      0
batch_normalization_94[0][0]
_____
_____
conv2d_92 (Conv2D)              (None, 7, 7, 192)      208896
block17_4_ac[0][0]
_____
_____
conv2d_95 (Conv2D)              (None, 7, 7, 192)      215040
activation_94[0][0]
_____
_____
batch_normalization_92 (BatchNo (None, 7, 7, 192)      576          conv2d_92[0][0]
_____
_____
batch_normalization_95 (BatchNo (None, 7, 7, 192)      576          conv2d_95[0][0]
_____
_____
activation_92 (Activation)      (None, 7, 7, 192)      0
batch_normalization_92[0][0]
_____
_____
activation_95 (Activation)      (None, 7, 7, 192)      0
batch_normalization_95[0][0]
_____
_____
block17_5_mixed (Concatenate)   (None, 7, 7, 384)      0
activation_92[0][0]
activation_95[0][0]
_____
_____
block17_5_conv (Conv2D)         (None, 7, 7, 1088)     418880
block17_5_mixed[0][0]
_____
_____
block17_5 (Lambda)              (None, 7, 7, 1088)     0
block17_4_ac[0][0]
block17_5_conv[0][0]
_____
_____
block17_5_ac (Activation)       (None, 7, 7, 1088)     0            block17_5[0][0]
_____
_____
conv2d_97 (Conv2D)              (None, 7, 7, 128)      139264
block17_5_ac[0][0]
```

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--------------------------------------------------------------------------------
------------------
batch_normalization_97 (BatchNo (None, 7, 7, 128)    384         conv2d_97[0][0]
--------------------------------------------------------------------------------
------------------
activation_97 (Activation)      (None, 7, 7, 128)    0
batch_normalization_97[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_98 (Conv2D)              (None, 7, 7, 160)    143360
activation_97[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_98 (BatchNo (None, 7, 7, 160)    480         conv2d_98[0][0]
--------------------------------------------------------------------------------
------------------
activation_98 (Activation)      (None, 7, 7, 160)    0
batch_normalization_98[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_96 (Conv2D)              (None, 7, 7, 192)    208896
block17_5_ac[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_99 (Conv2D)              (None, 7, 7, 192)    215040
activation_98[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_96 (BatchNo (None, 7, 7, 192)    576         conv2d_96[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_99 (BatchNo (None, 7, 7, 192)    576         conv2d_99[0][0]
--------------------------------------------------------------------------------
------------------
activation_96 (Activation)      (None, 7, 7, 192)    0
batch_normalization_96[0][0]
--------------------------------------------------------------------------------
------------------
activation_99 (Activation)      (None, 7, 7, 192)    0
batch_normalization_99[0][0]
--------------------------------------------------------------------------------
------------------
block17_6_mixed (Concatenate)   (None, 7, 7, 384)    0
activation_96[0][0]
activation_99[0][0]
--------------------------------------------------------------------------------
------------------
block17_6_conv (Conv2D)         (None, 7, 7, 1088)   418880
```

```
block17_6_mixed[0][0]
--------------------------------------------------------------------------------
------------------
block17_6 (Lambda)              (None, 7, 7, 1088)   0
block17_5_ac[0][0]
block17_6_conv[0][0]
--------------------------------------------------------------------------------
------------------
block17_6_ac (Activation)       (None, 7, 7, 1088)   0           block17_6[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_101 (Conv2D)             (None, 7, 7, 128)    139264
block17_6_ac[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_101 (BatchN (None, 7, 7, 128)    384
conv2d_101[0][0]
--------------------------------------------------------------------------------
------------------
activation_101 (Activation)     (None, 7, 7, 128)    0
batch_normalization_101[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_102 (Conv2D)             (None, 7, 7, 160)    143360
activation_101[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_102 (BatchN (None, 7, 7, 160)    480
conv2d_102[0][0]
--------------------------------------------------------------------------------
------------------
activation_102 (Activation)     (None, 7, 7, 160)    0
batch_normalization_102[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_100 (Conv2D)             (None, 7, 7, 192)    208896
block17_6_ac[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_103 (Conv2D)             (None, 7, 7, 192)    215040
activation_102[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_100 (BatchN (None, 7, 7, 192)    576
conv2d_100[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_103 (BatchN (None, 7, 7, 192)    576
```

```
conv2d_103[0][0]
_____
activation_100 (Activation)     (None, 7, 7, 192)    0
batch_normalization_100[0][0]
_____
activation_103 (Activation)     (None, 7, 7, 192)    0
batch_normalization_103[0][0]
_____
block17_7_mixed (Concatenate)   (None, 7, 7, 384)    0
activation_100[0][0]
activation_103[0][0]
_____
block17_7_conv (Conv2D)         (None, 7, 7, 1088)   418880
block17_7_mixed[0][0]
_____
block17_7 (Lambda)              (None, 7, 7, 1088)   0
block17_6_ac[0][0]
block17_7_conv[0][0]
_____
block17_7_ac (Activation)       (None, 7, 7, 1088)   0           block17_7[0][0]
_____
conv2d_105 (Conv2D)             (None, 7, 7, 128)    139264
block17_7_ac[0][0]
_____
batch_normalization_105 (BatchN (None, 7, 7, 128)    384
conv2d_105[0][0]
_____
activation_105 (Activation)     (None, 7, 7, 128)    0
batch_normalization_105[0][0]
_____
conv2d_106 (Conv2D)             (None, 7, 7, 160)    143360
activation_105[0][0]
_____
batch_normalization_106 (BatchN (None, 7, 7, 160)    480
conv2d_106[0][0]
_____
```

```
activation_106 (Activation)      (None, 7, 7, 160)    0
batch_normalization_106[0][0]
_____
conv2d_104 (Conv2D)              (None, 7, 7, 192)    208896
block17_7_ac[0][0]
_____
conv2d_107 (Conv2D)              (None, 7, 7, 192)    215040
activation_106[0][0]
_____
batch_normalization_104 (BatchN  (None, 7, 7, 192)    576
conv2d_104[0][0]
_____
batch_normalization_107 (BatchN  (None, 7, 7, 192)    576
conv2d_107[0][0]
_____
activation_104 (Activation)      (None, 7, 7, 192)    0
batch_normalization_104[0][0]
_____
activation_107 (Activation)      (None, 7, 7, 192)    0
batch_normalization_107[0][0]
_____
block17_8_mixed (Concatenate)    (None, 7, 7, 384)    0
activation_104[0][0]
activation_107[0][0]
_____
block17_8_conv (Conv2D)          (None, 7, 7, 1088)   418880
block17_8_mixed[0][0]
_____
block17_8 (Lambda)               (None, 7, 7, 1088)   0
block17_7_ac[0][0]
block17_8_conv[0][0]
_____
block17_8_ac (Activation)        (None, 7, 7, 1088)   0           block17_8[0][0]
_____
conv2d_109 (Conv2D)              (None, 7, 7, 128)    139264
block17_8_ac[0][0]
_____
```

```
------------------
batch_normalization_109 (BatchN (None, 7, 7, 128)    384
conv2d_109[0][0]
_____
------------------
activation_109 (Activation)     (None, 7, 7, 128)    0
batch_normalization_109[0][0]
_____
------------------
conv2d_110 (Conv2D)             (None, 7, 7, 160)    143360
activation_109[0][0]
_____
------------------
batch_normalization_110 (BatchN (None, 7, 7, 160)    480
conv2d_110[0][0]
_____
------------------
activation_110 (Activation)     (None, 7, 7, 160)    0
batch_normalization_110[0][0]
_____
------------------
conv2d_108 (Conv2D)             (None, 7, 7, 192)    208896
block17_8_ac[0][0]
_____
------------------
conv2d_111 (Conv2D)             (None, 7, 7, 192)    215040
activation_110[0][0]
_____
------------------
batch_normalization_108 (BatchN (None, 7, 7, 192)    576
conv2d_108[0][0]
_____
------------------
batch_normalization_111 (BatchN (None, 7, 7, 192)    576
conv2d_111[0][0]
_____
------------------
activation_108 (Activation)     (None, 7, 7, 192)    0
batch_normalization_108[0][0]
_____
------------------
activation_111 (Activation)     (None, 7, 7, 192)    0
batch_normalization_111[0][0]
_____
------------------
block17_9_mixed (Concatenate)   (None, 7, 7, 384)    0
activation_108[0][0]
activation_111[0][0]
```

```
--------------------------------------------------------------------------------
------------------
block17_9_conv (Conv2D)          (None, 7, 7, 1088)   418880
block17_9_mixed[0][0]
--------------------------------------------------------------------------------
------------------
block17_9 (Lambda)               (None, 7, 7, 1088)   0
block17_8_ac[0][0]
block17_9_conv[0][0]
--------------------------------------------------------------------------------
------------------
block17_9_ac (Activation)        (None, 7, 7, 1088)   0              block17_9[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_113 (Conv2D)              (None, 7, 7, 128)    139264
block17_9_ac[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_113 (BatchN  (None, 7, 7, 128)    384
conv2d_113[0][0]
--------------------------------------------------------------------------------
------------------
activation_113 (Activation)      (None, 7, 7, 128)    0
batch_normalization_113[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_114 (Conv2D)              (None, 7, 7, 160)    143360
activation_113[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_114 (BatchN  (None, 7, 7, 160)    480
conv2d_114[0][0]
--------------------------------------------------------------------------------
------------------
activation_114 (Activation)      (None, 7, 7, 160)    0
batch_normalization_114[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_112 (Conv2D)              (None, 7, 7, 192)    208896
block17_9_ac[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_115 (Conv2D)              (None, 7, 7, 192)    215040
activation_114[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_112 (BatchN  (None, 7, 7, 192)    576
conv2d_112[0][0]
```

```
--------------------------------------------------------------------------------
------------------
batch_normalization_115 (BatchN (None, 7, 7, 192)    576
conv2d_115[0][0]
--------------------------------------------------------------------------------
------------------
activation_112 (Activation)     (None, 7, 7, 192)    0
batch_normalization_112[0][0]
--------------------------------------------------------------------------------
------------------
activation_115 (Activation)     (None, 7, 7, 192)    0
batch_normalization_115[0][0]
--------------------------------------------------------------------------------
------------------
block17_10_mixed (Concatenate)  (None, 7, 7, 384)    0
activation_112[0][0]
activation_115[0][0]
--------------------------------------------------------------------------------
------------------
block17_10_conv (Conv2D)        (None, 7, 7, 1088)   418880
block17_10_mixed[0][0]
--------------------------------------------------------------------------------
------------------
block17_10 (Lambda)             (None, 7, 7, 1088)   0
block17_9_ac[0][0]
block17_10_conv[0][0]
--------------------------------------------------------------------------------
------------------
block17_10_ac (Activation)      (None, 7, 7, 1088)   0
block17_10[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_117 (Conv2D)             (None, 7, 7, 128)    139264
block17_10_ac[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_117 (BatchN (None, 7, 7, 128)    384
conv2d_117[0][0]
--------------------------------------------------------------------------------
------------------
activation_117 (Activation)     (None, 7, 7, 128)    0
batch_normalization_117[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_118 (Conv2D)             (None, 7, 7, 160)    143360
activation_117[0][0]
--------------------------------------------------------------------------------
------------------
```

```
batch_normalization_118 (BatchN (None, 7, 7, 160)     480
conv2d_118[0][0]
_____
_____
activation_118 (Activation)     (None, 7, 7, 160)     0
batch_normalization_118[0][0]
_____
_____
conv2d_116 (Conv2D)             (None, 7, 7, 192)     208896
block17_10_ac[0][0]
_____
_____
conv2d_119 (Conv2D)             (None, 7, 7, 192)     215040
activation_118[0][0]
_____
_____
batch_normalization_116 (BatchN (None, 7, 7, 192)     576
conv2d_116[0][0]
_____
_____
batch_normalization_119 (BatchN (None, 7, 7, 192)     576
conv2d_119[0][0]
_____
_____
activation_116 (Activation)     (None, 7, 7, 192)     0
batch_normalization_116[0][0]
_____
_____
activation_119 (Activation)     (None, 7, 7, 192)     0
batch_normalization_119[0][0]
_____
_____
block17_11_mixed (Concatenate)  (None, 7, 7, 384)     0
activation_116[0][0]
activation_119[0][0]
_____
_____
block17_11_conv (Conv2D)        (None, 7, 7, 1088)    418880
block17_11_mixed[0][0]
_____
_____
block17_11 (Lambda)             (None, 7, 7, 1088)    0
block17_10_ac[0][0]
block17_11_conv[0][0]
_____
_____
block17_11_ac (Activation)      (None, 7, 7, 1088)    0
block17_11[0][0]
```

```
--------------------------------------------------------------------------------
------------------
conv2d_121 (Conv2D)              (None, 7, 7, 128)    139264
block17_11_ac[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_121 (BatchN (None, 7, 7, 128)    384
conv2d_121[0][0]
--------------------------------------------------------------------------------
------------------
activation_121 (Activation)     (None, 7, 7, 128)    0
batch_normalization_121[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_122 (Conv2D)              (None, 7, 7, 160)    143360
activation_121[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_122 (BatchN (None, 7, 7, 160)    480
conv2d_122[0][0]
--------------------------------------------------------------------------------
------------------
activation_122 (Activation)     (None, 7, 7, 160)    0
batch_normalization_122[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_120 (Conv2D)              (None, 7, 7, 192)    208896
block17_11_ac[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_123 (Conv2D)              (None, 7, 7, 192)    215040
activation_122[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_120 (BatchN (None, 7, 7, 192)    576
conv2d_120[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_123 (BatchN (None, 7, 7, 192)    576
conv2d_123[0][0]
--------------------------------------------------------------------------------
------------------
activation_120 (Activation)     (None, 7, 7, 192)    0
batch_normalization_120[0][0]
--------------------------------------------------------------------------------
------------------
activation_123 (Activation)     (None, 7, 7, 192)    0
batch_normalization_123[0][0]
```

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--------------------------------------------------------------------------------
------------------
block17_12_mixed (Concatenate)  (None, 7, 7, 384)    0
activation_120[0][0]
activation_123[0][0]
--------------------------------------------------------------------------------
------------------
block17_12_conv (Conv2D)        (None, 7, 7, 1088)   418880
block17_12_mixed[0][0]
--------------------------------------------------------------------------------
------------------
block17_12 (Lambda)             (None, 7, 7, 1088)   0
block17_11_ac[0][0]
block17_12_conv[0][0]
--------------------------------------------------------------------------------
------------------
block17_12_ac (Activation)      (None, 7, 7, 1088)   0
block17_12[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_125 (Conv2D)             (None, 7, 7, 128)    139264
block17_12_ac[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_125 (BatchN (None, 7, 7, 128)    384
conv2d_125[0][0]
--------------------------------------------------------------------------------
------------------
activation_125 (Activation)     (None, 7, 7, 128)    0
batch_normalization_125[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_126 (Conv2D)             (None, 7, 7, 160)    143360
activation_125[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_126 (BatchN (None, 7, 7, 160)    480
conv2d_126[0][0]
--------------------------------------------------------------------------------
------------------
activation_126 (Activation)     (None, 7, 7, 160)    0
batch_normalization_126[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_124 (Conv2D)             (None, 7, 7, 192)    208896
block17_12_ac[0][0]
--------------------------------------------------------------------------------
------------------
```

```
conv2d_127 (Conv2D)            (None, 7, 7, 192)    215040
activation_126[0][0]
_____
_____
batch_normalization_124 (BatchN (None, 7, 7, 192)    576
conv2d_124[0][0]
_____
_____
batch_normalization_127 (BatchN (None, 7, 7, 192)    576
conv2d_127[0][0]
_____
_____
activation_124 (Activation)    (None, 7, 7, 192)    0
batch_normalization_124[0][0]
_____
_____
activation_127 (Activation)    (None, 7, 7, 192)    0
batch_normalization_127[0][0]
_____
_____
block17_13_mixed (Concatenate)  (None, 7, 7, 384)    0
activation_124[0][0]
activation_127[0][0]
_____
_____
block17_13_conv (Conv2D)       (None, 7, 7, 1088)   418880
block17_13_mixed[0][0]
_____
_____
block17_13 (Lambda)            (None, 7, 7, 1088)   0
block17_12_ac[0][0]
block17_13_conv[0][0]
_____
_____
block17_13_ac (Activation)     (None, 7, 7, 1088)   0
block17_13[0][0]
_____
_____
conv2d_129 (Conv2D)            (None, 7, 7, 128)    139264
block17_13_ac[0][0]
_____
_____
batch_normalization_129 (BatchN (None, 7, 7, 128)    384
conv2d_129[0][0]
_____
_____
activation_129 (Activation)    (None, 7, 7, 128)    0
batch_normalization_129[0][0]
```

```
------------------------------------------------------------------------------
------------------
conv2d_130 (Conv2D)              (None, 7, 7, 160)    143360
activation_129[0][0]
------------------------------------------------------------------------------
------------------
batch_normalization_130 (BatchN  (None, 7, 7, 160)    480
conv2d_130[0][0]
------------------------------------------------------------------------------
------------------
activation_130 (Activation)      (None, 7, 7, 160)    0
batch_normalization_130[0][0]
------------------------------------------------------------------------------
------------------
conv2d_128 (Conv2D)              (None, 7, 7, 192)    208896
block17_13_ac[0][0]
------------------------------------------------------------------------------
------------------
conv2d_131 (Conv2D)              (None, 7, 7, 192)    215040
activation_130[0][0]
------------------------------------------------------------------------------
------------------
batch_normalization_128 (BatchN  (None, 7, 7, 192)    576
conv2d_128[0][0]
------------------------------------------------------------------------------
------------------
batch_normalization_131 (BatchN  (None, 7, 7, 192)    576
conv2d_131[0][0]
------------------------------------------------------------------------------
------------------
activation_128 (Activation)      (None, 7, 7, 192)    0
batch_normalization_128[0][0]
------------------------------------------------------------------------------
------------------
activation_131 (Activation)      (None, 7, 7, 192)    0
batch_normalization_131[0][0]
------------------------------------------------------------------------------
------------------
block17_14_mixed (Concatenate)   (None, 7, 7, 384)    0
activation_128[0][0]
activation_131[0][0]
------------------------------------------------------------------------------
------------------
block17_14_conv (Conv2D)         (None, 7, 7, 1088)   418880
block17_14_mixed[0][0]
------------------------------------------------------------------------------
------------------
block17_14 (Lambda)              (None, 7, 7, 1088)   0
```

```
block17_13_ac[0][0]
block17_14_conv[0][0]
----------------------------------------------------------------------------------
------------------
block17_14_ac (Activation)      (None, 7, 7, 1088)   0
block17_14[0][0]
----------------------------------------------------------------------------------
------------------
conv2d_133 (Conv2D)             (None, 7, 7, 128)     139264
block17_14_ac[0][0]
----------------------------------------------------------------------------------
------------------
batch_normalization_133 (BatchN (None, 7, 7, 128)     384
conv2d_133[0][0]
----------------------------------------------------------------------------------
------------------
activation_133 (Activation)     (None, 7, 7, 128)     0
batch_normalization_133[0][0]
----------------------------------------------------------------------------------
------------------
conv2d_134 (Conv2D)             (None, 7, 7, 160)     143360
activation_133[0][0]
----------------------------------------------------------------------------------
------------------
batch_normalization_134 (BatchN (None, 7, 7, 160)     480
conv2d_134[0][0]
----------------------------------------------------------------------------------
------------------
activation_134 (Activation)     (None, 7, 7, 160)     0
batch_normalization_134[0][0]
----------------------------------------------------------------------------------
------------------
conv2d_132 (Conv2D)             (None, 7, 7, 192)     208896
block17_14_ac[0][0]
----------------------------------------------------------------------------------
------------------
conv2d_135 (Conv2D)             (None, 7, 7, 192)     215040
activation_134[0][0]
----------------------------------------------------------------------------------
------------------
batch_normalization_132 (BatchN (None, 7, 7, 192)     576
conv2d_132[0][0]
----------------------------------------------------------------------------------
------------------
batch_normalization_135 (BatchN (None, 7, 7, 192)     576
conv2d_135[0][0]
----------------------------------------------------------------------------------
------------------
```

```
activation_132 (Activation)      (None, 7, 7, 192)    0
batch_normalization_132[0][0]
_____
_____
activation_135 (Activation)      (None, 7, 7, 192)    0
batch_normalization_135[0][0]
_____
_____
block17_15_mixed (Concatenate)  (None, 7, 7, 384)    0
activation_132[0][0]
activation_135[0][0]
_____
_____
block17_15_conv (Conv2D)        (None, 7, 7, 1088)   418880
block17_15_mixed[0][0]
_____
_____
block17_15 (Lambda)             (None, 7, 7, 1088)   0
block17_14_ac[0][0]
block17_15_conv[0][0]
_____
_____
block17_15_ac (Activation)      (None, 7, 7, 1088)   0
block17_15[0][0]
_____
_____
conv2d_137 (Conv2D)             (None, 7, 7, 128)    139264
block17_15_ac[0][0]
_____
_____
batch_normalization_137 (BatchN (None, 7, 7, 128)    384
conv2d_137[0][0]
_____
_____
activation_137 (Activation)     (None, 7, 7, 128)    0
batch_normalization_137[0][0]
_____
_____
conv2d_138 (Conv2D)             (None, 7, 7, 160)    143360
activation_137[0][0]
_____
_____
batch_normalization_138 (BatchN (None, 7, 7, 160)    480
conv2d_138[0][0]
_____
_____
activation_138 (Activation)     (None, 7, 7, 160)    0
batch_normalization_138[0][0]
```

43

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--------------------------------------------------------------------------------
------------------
conv2d_136 (Conv2D)              (None, 7, 7, 192)    208896
block17_15_ac[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_139 (Conv2D)              (None, 7, 7, 192)    215040
activation_138[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_136 (BatchN  (None, 7, 7, 192)    576
conv2d_136[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_139 (BatchN  (None, 7, 7, 192)    576
conv2d_139[0][0]
--------------------------------------------------------------------------------
------------------
activation_136 (Activation)      (None, 7, 7, 192)    0
batch_normalization_136[0][0]
--------------------------------------------------------------------------------
------------------
activation_139 (Activation)      (None, 7, 7, 192)    0
batch_normalization_139[0][0]
--------------------------------------------------------------------------------
------------------
block17_16_mixed (Concatenate)   (None, 7, 7, 384)    0
activation_136[0][0]
activation_139[0][0]
--------------------------------------------------------------------------------
------------------
block17_16_conv (Conv2D)         (None, 7, 7, 1088)   418880
block17_16_mixed[0][0]
--------------------------------------------------------------------------------
------------------
block17_16 (Lambda)              (None, 7, 7, 1088)   0
block17_15_ac[0][0]
block17_16_conv[0][0]
--------------------------------------------------------------------------------
------------------
block17_16_ac (Activation)       (None, 7, 7, 1088)   0
block17_16[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_141 (Conv2D)              (None, 7, 7, 128)    139264
block17_16_ac[0][0]
--------------------------------------------------------------------------------
------------------
```

```
batch_normalization_141 (BatchN (None, 7, 7, 128)    384
conv2d_141[0][0]
_____
_____
activation_141 (Activation)     (None, 7, 7, 128)    0
batch_normalization_141[0][0]
_____
_____
conv2d_142 (Conv2D)             (None, 7, 7, 160)    143360
activation_141[0][0]
_____
_____
batch_normalization_142 (BatchN (None, 7, 7, 160)    480
conv2d_142[0][0]
_____
_____
activation_142 (Activation)     (None, 7, 7, 160)    0
batch_normalization_142[0][0]
_____
_____
conv2d_140 (Conv2D)             (None, 7, 7, 192)    208896
block17_16_ac[0][0]
_____
_____
conv2d_143 (Conv2D)             (None, 7, 7, 192)    215040
activation_142[0][0]
_____
_____
batch_normalization_140 (BatchN (None, 7, 7, 192)    576
conv2d_140[0][0]
_____
_____
batch_normalization_143 (BatchN (None, 7, 7, 192)    576
conv2d_143[0][0]
_____
_____
activation_140 (Activation)     (None, 7, 7, 192)    0
batch_normalization_140[0][0]
_____
_____
activation_143 (Activation)     (None, 7, 7, 192)    0
batch_normalization_143[0][0]
_____
_____
block17_17_mixed (Concatenate)  (None, 7, 7, 384)    0
activation_140[0][0]
activation_143[0][0]
_____
_____
```

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------------------
block17_17_conv (Conv2D)         (None, 7, 7, 1088)   418880
block17_17_mixed[0][0]
_____
------------------
block17_17 (Lambda)              (None, 7, 7, 1088)   0
block17_16_ac[0][0]
block17_17_conv[0][0]
_____
------------------
block17_17_ac (Activation)       (None, 7, 7, 1088)   0
block17_17[0][0]
_____
------------------
conv2d_145 (Conv2D)              (None, 7, 7, 128)    139264
block17_17_ac[0][0]
_____
------------------
batch_normalization_145 (BatchN  (None, 7, 7, 128)    384
conv2d_145[0][0]
_____
------------------
activation_145 (Activation)      (None, 7, 7, 128)    0
batch_normalization_145[0][0]
_____
------------------
conv2d_146 (Conv2D)              (None, 7, 7, 160)    143360
activation_145[0][0]
_____
------------------
batch_normalization_146 (BatchN  (None, 7, 7, 160)    480
conv2d_146[0][0]
_____
------------------
activation_146 (Activation)      (None, 7, 7, 160)    0
batch_normalization_146[0][0]
_____
------------------
conv2d_144 (Conv2D)              (None, 7, 7, 192)    208896
block17_17_ac[0][0]
_____
------------------
conv2d_147 (Conv2D)              (None, 7, 7, 192)    215040
activation_146[0][0]
_____
------------------
batch_normalization_144 (BatchN  (None, 7, 7, 192)    576
conv2d_144[0][0]
```

```
--------------------------------------------------------------------------------
------------------
batch_normalization_147 (BatchN (None, 7, 7, 192)    576
conv2d_147[0][0]
--------------------------------------------------------------------------------
------------------
activation_144 (Activation)     (None, 7, 7, 192)    0
batch_normalization_144[0][0]
--------------------------------------------------------------------------------
------------------
activation_147 (Activation)     (None, 7, 7, 192)    0
batch_normalization_147[0][0]
--------------------------------------------------------------------------------
------------------
block17_18_mixed (Concatenate)  (None, 7, 7, 384)    0
activation_144[0][0]
activation_147[0][0]
--------------------------------------------------------------------------------
------------------
block17_18_conv (Conv2D)        (None, 7, 7, 1088)   418880
block17_18_mixed[0][0]
--------------------------------------------------------------------------------
------------------
block17_18 (Lambda)             (None, 7, 7, 1088)   0
block17_17_ac[0][0]
block17_18_conv[0][0]
--------------------------------------------------------------------------------
------------------
block17_18_ac (Activation)      (None, 7, 7, 1088)   0
block17_18[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_149 (Conv2D)             (None, 7, 7, 128)    139264
block17_18_ac[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_149 (BatchN (None, 7, 7, 128)    384
conv2d_149[0][0]
--------------------------------------------------------------------------------
------------------
activation_149 (Activation)     (None, 7, 7, 128)    0
batch_normalization_149[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_150 (Conv2D)             (None, 7, 7, 160)    143360
activation_149[0][0]
--------------------------------------------------------------------------------
------------------
```

```
batch_normalization_150 (BatchN (None, 7, 7, 160)    480
conv2d_150[0][0]
_____
_____
activation_150 (Activation)    (None, 7, 7, 160)    0
batch_normalization_150[0][0]
_____
_____
conv2d_148 (Conv2D)            (None, 7, 7, 192)    208896
block17_18_ac[0][0]
_____
_____
conv2d_151 (Conv2D)            (None, 7, 7, 192)    215040
activation_150[0][0]
_____
_____
batch_normalization_148 (BatchN (None, 7, 7, 192)    576
conv2d_148[0][0]
_____
_____
batch_normalization_151 (BatchN (None, 7, 7, 192)    576
conv2d_151[0][0]
_____
_____
activation_148 (Activation)    (None, 7, 7, 192)    0
batch_normalization_148[0][0]
_____
_____
activation_151 (Activation)    (None, 7, 7, 192)    0
batch_normalization_151[0][0]
_____
_____
block17_19_mixed (Concatenate)  (None, 7, 7, 384)    0
activation_148[0][0]
activation_151[0][0]
_____
_____
block17_19_conv (Conv2D)       (None, 7, 7, 1088)   418880
block17_19_mixed[0][0]
_____
_____
block17_19 (Lambda)            (None, 7, 7, 1088)   0
block17_18_ac[0][0]
block17_19_conv[0][0]
_____
_____
block17_19_ac (Activation)     (None, 7, 7, 1088)   0
block17_19[0][0]
```

```
--------------------------------------------------------------------------------
------------------
conv2d_153 (Conv2D)              (None, 7, 7, 128)    139264
block17_19_ac[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_153 (BatchN (None, 7, 7, 128)    384
conv2d_153[0][0]
--------------------------------------------------------------------------------
------------------
activation_153 (Activation)     (None, 7, 7, 128)    0
batch_normalization_153[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_154 (Conv2D)              (None, 7, 7, 160)    143360
activation_153[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_154 (BatchN (None, 7, 7, 160)    480
conv2d_154[0][0]
--------------------------------------------------------------------------------
------------------
activation_154 (Activation)     (None, 7, 7, 160)    0
batch_normalization_154[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_152 (Conv2D)              (None, 7, 7, 192)    208896
block17_19_ac[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_155 (Conv2D)              (None, 7, 7, 192)    215040
activation_154[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_152 (BatchN (None, 7, 7, 192)    576
conv2d_152[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_155 (BatchN (None, 7, 7, 192)    576
conv2d_155[0][0]
--------------------------------------------------------------------------------
------------------
activation_152 (Activation)     (None, 7, 7, 192)    0
batch_normalization_152[0][0]
--------------------------------------------------------------------------------
------------------
activation_155 (Activation)     (None, 7, 7, 192)    0
batch_normalization_155[0][0]
```

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--------------------------------------------------------------------------------
------------------
block17_20_mixed (Concatenate)  (None, 7, 7, 384)    0
activation_152[0][0]
activation_155[0][0]
--------------------------------------------------------------------------------
------------------
block17_20_conv (Conv2D)        (None, 7, 7, 1088)   418880
block17_20_mixed[0][0]
--------------------------------------------------------------------------------
------------------
block17_20 (Lambda)             (None, 7, 7, 1088)   0
block17_19_ac[0][0]
block17_20_conv[0][0]
--------------------------------------------------------------------------------
------------------
block17_20_ac (Activation)      (None, 7, 7, 1088)   0
block17_20[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_160 (Conv2D)             (None, 7, 7, 256)    278528
block17_20_ac[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_160 (BatchN (None, 7, 7, 256)    768
conv2d_160[0][0]
--------------------------------------------------------------------------------
------------------
activation_160 (Activation)     (None, 7, 7, 256)    0
batch_normalization_160[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_156 (Conv2D)             (None, 7, 7, 256)    278528
block17_20_ac[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_158 (Conv2D)             (None, 7, 7, 256)    278528
block17_20_ac[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_161 (Conv2D)             (None, 7, 7, 288)    663552
activation_160[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_156 (BatchN (None, 7, 7, 256)    768
conv2d_156[0][0]
--------------------------------------------------------------------------------
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```

```
batch_normalization_158 (BatchN (None, 7, 7, 256)    768
conv2d_158[0][0]
_____
_____
batch_normalization_161 (BatchN (None, 7, 7, 288)    864
conv2d_161[0][0]
_____
_____
activation_156 (Activation)     (None, 7, 7, 256)    0
batch_normalization_156[0][0]
_____
_____
activation_158 (Activation)     (None, 7, 7, 256)    0
batch_normalization_158[0][0]
_____
_____
activation_161 (Activation)     (None, 7, 7, 288)    0
batch_normalization_161[0][0]
_____
_____
conv2d_157 (Conv2D)             (None, 3, 3, 384)    884736
activation_156[0][0]
_____
_____
conv2d_159 (Conv2D)             (None, 3, 3, 288)    663552
activation_158[0][0]
_____
_____
conv2d_162 (Conv2D)             (None, 3, 3, 320)    829440
activation_161[0][0]
_____
_____
batch_normalization_157 (BatchN (None, 3, 3, 384)    1152
conv2d_157[0][0]
_____
_____
batch_normalization_159 (BatchN (None, 3, 3, 288)    864
conv2d_159[0][0]
_____
_____
batch_normalization_162 (BatchN (None, 3, 3, 320)    960
conv2d_162[0][0]
_____
_____
activation_157 (Activation)     (None, 3, 3, 384)    0
batch_normalization_157[0][0]
_____
_____
```

```
activation_159 (Activation)      (None, 3, 3, 288)    0
batch_normalization_159[0][0]
_____
_____
activation_162 (Activation)      (None, 3, 3, 320)    0
batch_normalization_162[0][0]
_____
_____
max_pooling2d_3 (MaxPooling2D)   (None, 3, 3, 1088)   0
block17_20_ac[0][0]
_____
_____
mixed_7a (Concatenate)           (None, 3, 3, 2080)   0
activation_157[0][0]
activation_159[0][0]
activation_162[0][0]
max_pooling2d_3[0][0]
_____
_____
conv2d_164 (Conv2D)              (None, 3, 3, 192)    399360    mixed_7a[0][0]
_____
_____
batch_normalization_164 (BatchN  (None, 3, 3, 192)    576
conv2d_164[0][0]
_____
_____
activation_164 (Activation)      (None, 3, 3, 192)    0
batch_normalization_164[0][0]
_____
_____
conv2d_165 (Conv2D)              (None, 3, 3, 224)    129024
activation_164[0][0]
_____
_____
batch_normalization_165 (BatchN  (None, 3, 3, 224)    672
conv2d_165[0][0]
_____
_____
activation_165 (Activation)      (None, 3, 3, 224)    0
batch_normalization_165[0][0]
_____
_____
conv2d_163 (Conv2D)              (None, 3, 3, 192)    399360    mixed_7a[0][0]
_____
_____
conv2d_166 (Conv2D)              (None, 3, 3, 256)    172032
activation_165[0][0]
_____
_____
```

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------------------
batch_normalization_163 (BatchN (None, 3, 3, 192)    576         conv2d_163[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_166 (BatchN (None, 3, 3, 256)    768         conv2d_166[0][0]
--------------------------------------------------------------------------------
------------------
activation_163 (Activation)     (None, 3, 3, 192)    0           batch_normalization_163[0][0]
--------------------------------------------------------------------------------
------------------
activation_166 (Activation)     (None, 3, 3, 256)    0           batch_normalization_166[0][0]
--------------------------------------------------------------------------------
------------------
block8_1_mixed (Concatenate)    (None, 3, 3, 448)    0           activation_163[0][0]
                                                                 activation_166[0][0]
--------------------------------------------------------------------------------
------------------
block8_1_conv (Conv2D)          (None, 3, 3, 2080)   933920      block8_1_mixed[0][0]
--------------------------------------------------------------------------------
------------------
block8_1 (Lambda)               (None, 3, 3, 2080)   0           mixed_7a[0][0]
                                                                 block8_1_conv[0][0]
--------------------------------------------------------------------------------
------------------
block8_1_ac (Activation)        (None, 3, 3, 2080)   0           block8_1[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_168 (Conv2D)             (None, 3, 3, 192)    399360      block8_1_ac[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_168 (BatchN (None, 3, 3, 192)    576         conv2d_168[0][0]
--------------------------------------------------------------------------------
------------------
activation_168 (Activation)     (None, 3, 3, 192)    0           batch_normalization_168[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_169 (Conv2D)             (None, 3, 3, 224)    129024      activation_168[0][0]
--------------------------------------------------------------------------------
```

```
------------------
batch_normalization_169 (BatchN (None, 3, 3, 224)    672
conv2d_169[0][0]
--------------------------------------------------------------------------------
------------------
activation_169 (Activation)     (None, 3, 3, 224)    0
batch_normalization_169[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_167 (Conv2D)             (None, 3, 3, 192)    399360
block8_1_ac[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_170 (Conv2D)             (None, 3, 3, 256)    172032
activation_169[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_167 (BatchN (None, 3, 3, 192)    576
conv2d_167[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_170 (BatchN (None, 3, 3, 256)    768
conv2d_170[0][0]
--------------------------------------------------------------------------------
------------------
activation_167 (Activation)     (None, 3, 3, 192)    0
batch_normalization_167[0][0]
--------------------------------------------------------------------------------
------------------
activation_170 (Activation)     (None, 3, 3, 256)    0
batch_normalization_170[0][0]
--------------------------------------------------------------------------------
------------------
block8_2_mixed (Concatenate)    (None, 3, 3, 448)    0
activation_167[0][0]
activation_170[0][0]
--------------------------------------------------------------------------------
------------------
block8_2_conv (Conv2D)          (None, 3, 3, 2080)   933920
block8_2_mixed[0][0]
--------------------------------------------------------------------------------
------------------
block8_2 (Lambda)               (None, 3, 3, 2080)   0
block8_1_ac[0][0]
block8_2_conv[0][0]
--------------------------------------------------------------------------------
------------------
block8_2_ac (Activation)        (None, 3, 3, 2080)   0              block8_2[0][0]
```

```
--------------------------------------------------------------------------------
------------------
conv2d_172 (Conv2D)            (None, 3, 3, 192)    399360
block8_2_ac[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_172 (BatchN (None, 3, 3, 192)   576
conv2d_172[0][0]
--------------------------------------------------------------------------------
------------------
activation_172 (Activation)    (None, 3, 3, 192)    0
batch_normalization_172[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_173 (Conv2D)            (None, 3, 3, 224)    129024
activation_172[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_173 (BatchN (None, 3, 3, 224)   672
conv2d_173[0][0]
--------------------------------------------------------------------------------
------------------
activation_173 (Activation)    (None, 3, 3, 224)    0
batch_normalization_173[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_171 (Conv2D)            (None, 3, 3, 192)    399360
block8_2_ac[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_174 (Conv2D)            (None, 3, 3, 256)    172032
activation_173[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_171 (BatchN (None, 3, 3, 192)   576
conv2d_171[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_174 (BatchN (None, 3, 3, 256)   768
conv2d_174[0][0]
--------------------------------------------------------------------------------
------------------
activation_171 (Activation)    (None, 3, 3, 192)    0
batch_normalization_171[0][0]
--------------------------------------------------------------------------------
------------------
activation_174 (Activation)    (None, 3, 3, 256)    0
batch_normalization_174[0][0]
```

```
--------------------------------------------------------------------------------
------------------
block8_3_mixed (Concatenate)    (None, 3, 3, 448)    0
activation_171[0][0]
activation_174[0][0]
--------------------------------------------------------------------------------
------------------
block8_3_conv (Conv2D)          (None, 3, 3, 2080)   933920
block8_3_mixed[0][0]
--------------------------------------------------------------------------------
------------------
block8_3 (Lambda)               (None, 3, 3, 2080)   0
block8_2_ac[0][0]
block8_3_conv[0][0]
--------------------------------------------------------------------------------
------------------
block8_3_ac (Activation)        (None, 3, 3, 2080)   0            block8_3[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_176 (Conv2D)             (None, 3, 3, 192)    399360
block8_3_ac[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_176 (BatchN (None, 3, 3, 192)    576
conv2d_176[0][0]
--------------------------------------------------------------------------------
------------------
activation_176 (Activation)     (None, 3, 3, 192)    0
batch_normalization_176[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_177 (Conv2D)             (None, 3, 3, 224)    129024
activation_176[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_177 (BatchN (None, 3, 3, 224)    672
conv2d_177[0][0]
--------------------------------------------------------------------------------
------------------
activation_177 (Activation)     (None, 3, 3, 224)    0
batch_normalization_177[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_175 (Conv2D)             (None, 3, 3, 192)    399360
block8_3_ac[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_178 (Conv2D)             (None, 3, 3, 256)    172032
```

```
activation_177[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_175 (BatchN (None, 3, 3, 192)    576
conv2d_175[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_178 (BatchN (None, 3, 3, 256)    768
conv2d_178[0][0]
--------------------------------------------------------------------------------
------------------
activation_175 (Activation)     (None, 3, 3, 192)    0
batch_normalization_175[0][0]
--------------------------------------------------------------------------------
------------------
activation_178 (Activation)     (None, 3, 3, 256)    0
batch_normalization_178[0][0]
--------------------------------------------------------------------------------
------------------
block8_4_mixed (Concatenate)    (None, 3, 3, 448)    0
activation_175[0][0]
activation_178[0][0]
--------------------------------------------------------------------------------
------------------
block8_4_conv (Conv2D)          (None, 3, 3, 2080)   933920
block8_4_mixed[0][0]
--------------------------------------------------------------------------------
------------------
block8_4 (Lambda)               (None, 3, 3, 2080)   0
block8_3_ac[0][0]
block8_4_conv[0][0]
--------------------------------------------------------------------------------
------------------
block8_4_ac (Activation)        (None, 3, 3, 2080)   0          block8_4[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_180 (Conv2D)             (None, 3, 3, 192)    399360
block8_4_ac[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_180 (BatchN (None, 3, 3, 192)    576
conv2d_180[0][0]
--------------------------------------------------------------------------------
------------------
activation_180 (Activation)     (None, 3, 3, 192)    0
batch_normalization_180[0][0]
--------------------------------------------------------------------------------
------------------
```

```
conv2d_181 (Conv2D)              (None, 3, 3, 224)    129024
activation_180[0][0]
_____
_____
batch_normalization_181 (BatchN (None, 3, 3, 224)    672
conv2d_181[0][0]
_____
_____
activation_181 (Activation)      (None, 3, 3, 224)    0
batch_normalization_181[0][0]
_____
_____
conv2d_179 (Conv2D)              (None, 3, 3, 192)    399360
block8_4_ac[0][0]
_____
_____
conv2d_182 (Conv2D)              (None, 3, 3, 256)    172032
activation_181[0][0]
_____
_____
batch_normalization_179 (BatchN (None, 3, 3, 192)    576
conv2d_179[0][0]
_____
_____
batch_normalization_182 (BatchN (None, 3, 3, 256)    768
conv2d_182[0][0]
_____
_____
activation_179 (Activation)      (None, 3, 3, 192)    0
batch_normalization_179[0][0]
_____
_____
activation_182 (Activation)      (None, 3, 3, 256)    0
batch_normalization_182[0][0]
_____
_____
block8_5_mixed (Concatenate)     (None, 3, 3, 448)    0
activation_179[0][0]
activation_182[0][0]
_____
_____
block8_5_conv (Conv2D)           (None, 3, 3, 2080)   933920
block8_5_mixed[0][0]
_____
_____
block8_5 (Lambda)                (None, 3, 3, 2080)   0
block8_4_ac[0][0]
block8_5_conv[0][0]
```

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--------------------------------------------------------------------------------
------------------
block8_5_ac (Activation)       (None, 3, 3, 2080)   0           block8_5[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_184 (Conv2D)            (None, 3, 3, 192)    399360
block8_5_ac[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_184 (BatchN (None, 3, 3, 192)   576
conv2d_184[0][0]
--------------------------------------------------------------------------------
------------------
activation_184 (Activation)    (None, 3, 3, 192)    0
batch_normalization_184[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_185 (Conv2D)            (None, 3, 3, 224)    129024
activation_184[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_185 (BatchN (None, 3, 3, 224)   672
conv2d_185[0][0]
--------------------------------------------------------------------------------
------------------
activation_185 (Activation)    (None, 3, 3, 224)    0
batch_normalization_185[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_183 (Conv2D)            (None, 3, 3, 192)    399360
block8_5_ac[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_186 (Conv2D)            (None, 3, 3, 256)    172032
activation_185[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_183 (BatchN (None, 3, 3, 192)   576
conv2d_183[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_186 (BatchN (None, 3, 3, 256)   768
conv2d_186[0][0]
--------------------------------------------------------------------------------
------------------
activation_183 (Activation)    (None, 3, 3, 192)    0
batch_normalization_183[0][0]
--------------------------------------------------------------------------------
------------------
```

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------------------
activation_186 (Activation)      (None, 3, 3, 256)    0
batch_normalization_186[0][0]
--------------------------------------------------------------------------------
------------------
block8_6_mixed (Concatenate)     (None, 3, 3, 448)    0
activation_183[0][0]
activation_186[0][0]
--------------------------------------------------------------------------------
------------------
block8_6_conv (Conv2D)           (None, 3, 3, 2080)   933920
block8_6_mixed[0][0]
--------------------------------------------------------------------------------
------------------
block8_6 (Lambda)                (None, 3, 3, 2080)   0
block8_5_ac[0][0]
block8_6_conv[0][0]
--------------------------------------------------------------------------------
------------------
block8_6_ac (Activation)         (None, 3, 3, 2080)   0            block8_6[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_188 (Conv2D)              (None, 3, 3, 192)    399360
block8_6_ac[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_188 (BatchN  (None, 3, 3, 192)    576
conv2d_188[0][0]
--------------------------------------------------------------------------------
------------------
activation_188 (Activation)      (None, 3, 3, 192)    0
batch_normalization_188[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_189 (Conv2D)              (None, 3, 3, 224)    129024
activation_188[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_189 (BatchN  (None, 3, 3, 224)    672
conv2d_189[0][0]
--------------------------------------------------------------------------------
------------------
activation_189 (Activation)      (None, 3, 3, 224)    0
batch_normalization_189[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_187 (Conv2D)              (None, 3, 3, 192)    399360
block8_6_ac[0][0]
```

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--------------------------------------------------------------------------------
------------------
conv2d_190 (Conv2D)              (None, 3, 3, 256)    172032
activation_189[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_187 (BatchN (None, 3, 3, 192)    576
conv2d_187[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_190 (BatchN (None, 3, 3, 256)    768
conv2d_190[0][0]
--------------------------------------------------------------------------------
------------------
activation_187 (Activation)     (None, 3, 3, 192)    0
batch_normalization_187[0][0]
--------------------------------------------------------------------------------
------------------
activation_190 (Activation)     (None, 3, 3, 256)    0
batch_normalization_190[0][0]
--------------------------------------------------------------------------------
------------------
block8_7_mixed (Concatenate)    (None, 3, 3, 448)    0
activation_187[0][0]
activation_190[0][0]
--------------------------------------------------------------------------------
------------------
block8_7_conv (Conv2D)          (None, 3, 3, 2080)   933920
block8_7_mixed[0][0]
--------------------------------------------------------------------------------
------------------
block8_7 (Lambda)               (None, 3, 3, 2080)   0
block8_6_ac[0][0]
block8_7_conv[0][0]
--------------------------------------------------------------------------------
------------------
block8_7_ac (Activation)        (None, 3, 3, 2080)   0            block8_7[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_192 (Conv2D)             (None, 3, 3, 192)    399360
block8_7_ac[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_192 (BatchN (None, 3, 3, 192)    576
conv2d_192[0][0]
--------------------------------------------------------------------------------
------------------
activation_192 (Activation)     (None, 3, 3, 192)    0
```

```
batch_normalization_192[0][0]
_____
_____
conv2d_193 (Conv2D)              (None, 3, 3, 224)    129024
activation_192[0][0]
_____
_____
batch_normalization_193 (BatchN (None, 3, 3, 224)    672
conv2d_193[0][0]
_____
_____
activation_193 (Activation)      (None, 3, 3, 224)    0
batch_normalization_193[0][0]
_____
_____
conv2d_191 (Conv2D)              (None, 3, 3, 192)    399360
block8_7_ac[0][0]
_____
_____
conv2d_194 (Conv2D)              (None, 3, 3, 256)    172032
activation_193[0][0]
_____
_____
batch_normalization_191 (BatchN (None, 3, 3, 192)    576
conv2d_191[0][0]
_____
_____
batch_normalization_194 (BatchN (None, 3, 3, 256)    768
conv2d_194[0][0]
_____
_____
activation_191 (Activation)      (None, 3, 3, 192)    0
batch_normalization_191[0][0]
_____
_____
activation_194 (Activation)      (None, 3, 3, 256)    0
batch_normalization_194[0][0]
_____
_____
block8_8_mixed (Concatenate)     (None, 3, 3, 448)    0
activation_191[0][0]
activation_194[0][0]
_____
_____
block8_8_conv (Conv2D)           (None, 3, 3, 2080)   933920
block8_8_mixed[0][0]
_____
_____
```

```
block8_8 (Lambda)             (None, 3, 3, 2080)   0
block8_7_ac[0][0]
block8_8_conv[0][0]
_____
_____
block8_8_ac (Activation)      (None, 3, 3, 2080)   0           block8_8[0][0]
_____
_____
conv2d_196 (Conv2D)           (None, 3, 3, 192)    399360
block8_8_ac[0][0]
_____
_____
batch_normalization_196 (BatchN (None, 3, 3, 192)  576
conv2d_196[0][0]
_____
_____
activation_196 (Activation)   (None, 3, 3, 192)    0
batch_normalization_196[0][0]
_____
_____
conv2d_197 (Conv2D)           (None, 3, 3, 224)    129024
activation_196[0][0]
_____
_____
batch_normalization_197 (BatchN (None, 3, 3, 224)  672
conv2d_197[0][0]
_____
_____
activation_197 (Activation)   (None, 3, 3, 224)    0
batch_normalization_197[0][0]
_____
_____
conv2d_195 (Conv2D)           (None, 3, 3, 192)    399360
block8_8_ac[0][0]
_____
_____
conv2d_198 (Conv2D)           (None, 3, 3, 256)    172032
activation_197[0][0]
_____
_____
batch_normalization_195 (BatchN (None, 3, 3, 192)  576
conv2d_195[0][0]
_____
_____
batch_normalization_198 (BatchN (None, 3, 3, 256)  768
conv2d_198[0][0]
_____
_____
```

```
activation_195 (Activation)      (None, 3, 3, 192)    0
batch_normalization_195[0][0]
_____
_____
activation_198 (Activation)      (None, 3, 3, 256)    0
batch_normalization_198[0][0]
_____
_____
block8_9_mixed (Concatenate)     (None, 3, 3, 448)    0
activation_195[0][0]
activation_198[0][0]
_____
_____
block8_9_conv (Conv2D)           (None, 3, 3, 2080)   933920
block8_9_mixed[0][0]
_____
_____
block8_9 (Lambda)                (None, 3, 3, 2080)   0
block8_8_ac[0][0]
block8_9_conv[0][0]
_____
_____
block8_9_ac (Activation)         (None, 3, 3, 2080)   0          block8_9[0][0]
_____
_____
conv2d_200 (Conv2D)              (None, 3, 3, 192)    399360
block8_9_ac[0][0]
_____
_____
batch_normalization_200 (BatchN  (None, 3, 3, 192)    576
conv2d_200[0][0]
_____
_____
activation_200 (Activation)      (None, 3, 3, 192)    0
batch_normalization_200[0][0]
_____
_____
conv2d_201 (Conv2D)              (None, 3, 3, 224)    129024
activation_200[0][0]
_____
_____
batch_normalization_201 (BatchN  (None, 3, 3, 224)    672
conv2d_201[0][0]
_____
_____
activation_201 (Activation)      (None, 3, 3, 224)    0
batch_normalization_201[0][0]
_____
_____
```

```
------------------
conv2d_199 (Conv2D)          (None, 3, 3, 192)    399360
block8_9_ac[0][0]
--------------------------------------------------------------------------------
------------------
conv2d_202 (Conv2D)          (None, 3, 3, 256)    172032
activation_201[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_199 (BatchN (None, 3, 3, 192)  576
conv2d_199[0][0]
--------------------------------------------------------------------------------
------------------
batch_normalization_202 (BatchN (None, 3, 3, 256)  768
conv2d_202[0][0]
--------------------------------------------------------------------------------
------------------
activation_199 (Activation)    (None, 3, 3, 192)    0
batch_normalization_199[0][0]
--------------------------------------------------------------------------------
------------------
activation_202 (Activation)    (None, 3, 3, 256)    0
batch_normalization_202[0][0]
--------------------------------------------------------------------------------
------------------
block8_10_mixed (Concatenate)  (None, 3, 3, 448)    0
activation_199[0][0]
activation_202[0][0]
--------------------------------------------------------------------------------
------------------
block8_10_conv (Conv2D)        (None, 3, 3, 2080)   933920
block8_10_mixed[0][0]
--------------------------------------------------------------------------------
------------------
block8_10 (Lambda)             (None, 3, 3, 2080)   0
block8_9_ac[0][0]
block8_10_conv[0][0]
--------------------------------------------------------------------------------
------------------
conv_7b (Conv2D)               (None, 3, 3, 1536)   3194880    block8_10[0][0]
--------------------------------------------------------------------------------
------------------
conv_7b_bn (BatchNormalization) (None, 3, 3, 1536)  4608       conv_7b[0][0]
--------------------------------------------------------------------------------
------------------
conv_7b_ac (Activation)        (None, 3, 3, 1536)   0
conv_7b_bn[0][0]
================================================================================
```

```
==================
Total params: 54,336,736
Trainable params: 54,276,192
Non-trainable params: 60,544

--------------------------------------------------------------------------------
------------------
```

Here I visualize the first layer. I originally made a mistake and tried to visualize the input layer, however, I was unable to do that. The function "deprocess_image" I took directly from the Keras manual site. It was a good way to clean the image up. As per advice from Dr. Rhodes, I just printed the weights of the layer, and used that as my visualization. It had 32 3×3 filters, which I displayed below.

It's really interesting because we can see that these little filters are focused on colors and vertical/horizontal lines. They're very primitive compared to the filters that will probably come up later in the model.

```
[3]:  #https://keras.io/examples/vision/visualizing_what_convnets_learn/

      w = np.array(layer1.get_weights())
      w = w[0].T
      w.shape

      def deprocess_image(img):
          # Normalize array: center on 0., ensure variance is 0.15
          img -= img.mean()
          img /= img.std() + 1e-5
          img *= 0.15


          # Clip to [0, 1]
          img += 0.5
          img = np.clip(img, 0, 1)

          # Convert to RGB array
          img *= 255
          img = np.clip(img, 0, 255).astype("uint8")
          return img

      fig = plt.figure(figsize=(10, 8))
      grid = ImageGrid(fig, 111,  # similar to subplot(111)
                       nrows_ncols=(4, 8),
                       axes_pad=0.1,
                       )

      for ax, im in zip(grid, w):
          # Iterating over the grid returns the Axes.
          ax.imshow(deprocess_image(im))
```

```
plt.show()
```
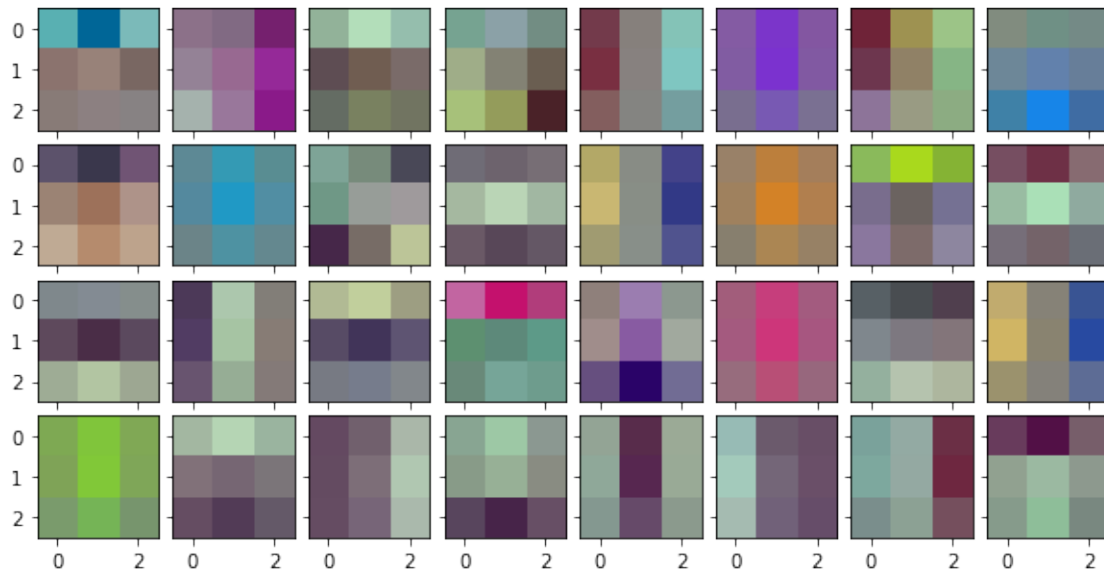

0.2 Step 2

I imported the images using tensorflow directly. The *ImageDataGenerator* was a good tool to use for this job. Using it, I could normalize my images and I also split the training data into a validation set(80/20 split). I used this same technique to normalize my test data. Using this data generator, I applied it to my data set with *flow_from_directory* and made 32 batches and resized my imges to RGB 150×150 images.

For my test data, I did something a little different though. I did not batch the data and I also separated my images and labels in order to use the tensorflow predict function. I found it easier to use that to make my confusion graph later on.

```
[4]: train_datagen = ImageDataGenerator(
        rescale=1./255,
        validation_split=0.2)
    test_datagen = ImageDataGenerator(rescale=1./255)
    train_generator = train_datagen.flow_from_directory(
        'dataset/training_set',
        target_size=(150, 150),
        batch_size=32,
        subset= 'training',
        class_mode='binary')
    validation_generator = train_datagen.flow_from_directory(
        'dataset/training_set',
        target_size=(150, 150),
        batch_size=32,
```

```
        subset= 'validation',
        class_mode='binary')
test_generator = test_datagen.flow_from_directory(
        'dataset/test_set',
        target_size=(150, 150),
        batch_size=-1,          #no batch size, all in
        class_mode='binary')

images, labels = test_generator.next()
print(images.shape,labels.shape)
```

```
Found 6400 images belonging to 2 classes.
Found 1600 images belonging to 2 classes.
Found 2000 images belonging to 2 classes.
(1999, 150, 150, 3) (1999,)
```

0.3 Step 3

(i)   This is the point where we transfer the old model into the new model. The summary is below
and the number of trainable paramters is 57,815,649. And we freeze the pre_model weights and
compile model with an adam optimizer, binary crossentropy loss function and set the metric to be
based on accuracy.

```
[5]: model = models.Sequential()
     model.add(pre_model)
     model.add(layers.Flatten())
     model.add(layers.Dense(256,activation='relu'))
     model.add(layers.Dense(1,activation='sigmoid'))

     print(model.summary())
```

```
Model: "sequential"

_____
Layer (type)                 Output Shape              Param #
=================================================================
inception_resnet_v2 (Functio (None, 3, 3, 1536)        54336736

_____
flatten (Flatten)            (None, 13824)             0

_____
dense (Dense)                (None, 256)               3539200

_____
dense_1 (Dense)              (None, 1)                 257
=================================================================
Total params: 57,876,193
Trainable params: 57,815,649
Non-trainable params: 60,544

_____
None
```

```
[6]: pre_model.trainable = False

     model.compile(optimizer='adam',
                   loss=tf.keras.losses.binary_crossentropy,
                   metrics=['accuracy'])
```

0.4 Step 4

(i) This is when I used predict using the model with the set of test images. The confusion matrix below and the accuracy shows that the model is pretty much guessing. This is obvious because it's accuracy at about ~ 50%.

```
[7]: results = model.evaluate(images,labels)
     print("test loss, test acc:", results)

     predictions = model.predict(images)
     lab = ['cats', 'dogs']
     cm = confusion_matrix(labels, tf.math.round(predictions))
     print(cm)
     fig = plt.figure()
     ax = fig.add_subplot(111)
     cax = ax.matshow(cm,cmap = "jet")
     plt.title('Confusion matrix of the classifier')
     fig.colorbar(cax)
     ax.set_xticks(np.arange(len(lab)))
     ax.set_yticks(np.arange(len(lab)))
     ax.set_xticklabels(lab)
     ax.set_yticklabels(lab)
     plt.xlabel('Predicted')
     plt.ylabel('True')
     for i in range(len(cm)):
         for j in range(len(cm)):
             text = ax.text(j, i, cm[i, j],
                            ha="center", va="center", color="w")

     plt.show()
```

```
63/63 [==============================] - 26s 371ms/step - loss: 1.3656 -
accuracy: 0.5416
test loss, test acc: [1.3934545516967773, 0.5412706136703491]
[[981  19]
 [898 101]]
```

Confusion matrix of the classifier
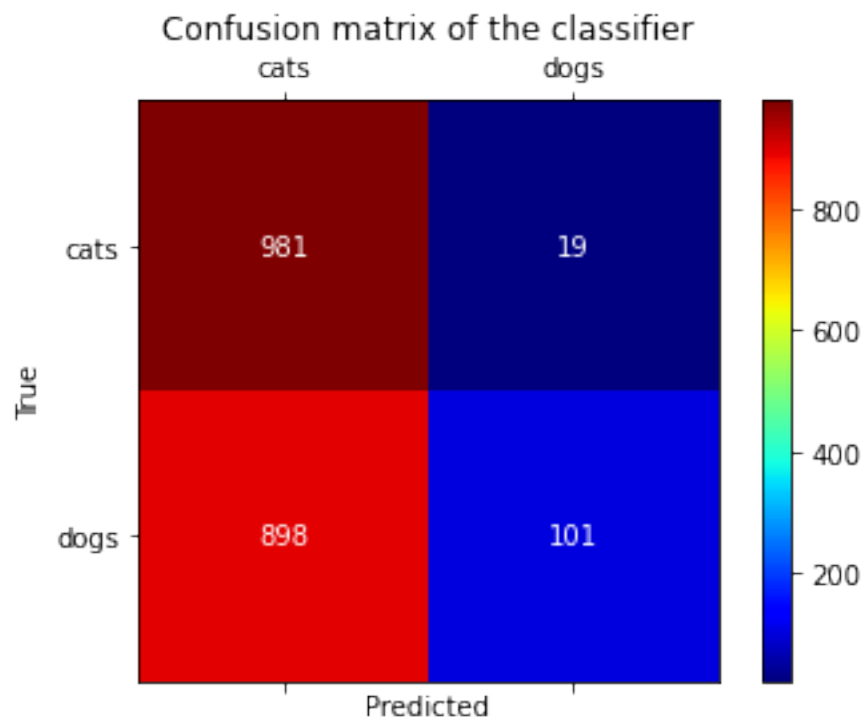
(ii) This is when we train the model. I used the validation data to get a better sense of how the model is doing after each epoch. I'm going to keep the epochs relatively small, and make have 100 iteration per epoch and 6 epochs.

Below we can see that TensorFlow displays the loss and the accuracy of borth the training data and the validation. The loss drops quickly and the accuracy rises quickly during the first epoch. After that, the accruracy continues to improve, but not very quickly. The validation is also not as good as the training data, but that is to be expected.

```
[8]: model.fit(
         train_generator,
         epochs=epoch_iter,
         batch_size=32,
         steps_per_epoch=100,
         validation_freq=1,
         validation_data=validation_generator,
         verbose = 1)
```

```
Epoch 1/6
100/100 [==============================] - 67s 617ms/step - loss: 0.4933 -
accuracy: 0.8050 - val_loss: 0.3045 - val_accuracy: 0.8769
Epoch 2/6
100/100 [==============================] - 59s 591ms/step - loss: 0.3032 -
accuracy: 0.8741 - val_loss: 1.0448 - val_accuracy: 0.8112
```

70

```
Epoch 3/6
100/100 [==============================] - 59s 593ms/step - loss: 0.2769 -
accuracy: 0.8803 - val_loss: 1.0148 - val_accuracy: 0.7856
Epoch 4/6
100/100 [==============================] - 59s 590ms/step - loss: 0.2185 -
accuracy: 0.9053 - val_loss: 1.6842 - val_accuracy: 0.8369
Epoch 5/6
100/100 [==============================] - 59s 591ms/step - loss: 0.1972 -
accuracy: 0.9187 - val_loss: 0.8589 - val_accuracy: 0.9006
Epoch 6/6
100/100 [==============================] - 59s 589ms/step - loss: 0.2128 -
accuracy: 0.9103 - val_loss: 7.2829 - val_accuracy: 0.8800
```

[8]: `<tensorflow.python.keras.callbacks.History at 0x12890bdf0>`

This is when we do the evaluation on the test set. The confusion matrix below is displayed, and it shows that the model does much better (~90%).

[9]:
```python
results = model.evaluate(images,labels)
print("test loss, test acc:", results)
```

```
63/63 [==============================] - 23s 368ms/step - loss: 6.3730 -
accuracy: 0.8914
test loss, test acc: [6.372960090637207, 0.8914456963539124]
```

[10]:
```python
predictions = model.predict(images)
lab = ['cats', 'dogs']
cm = confusion_matrix(labels, tf.math.round(predictions))
print(cm)
fig = plt.figure()
ax = fig.add_subplot(111)
cax = ax.matshow(cm,cmap = "jet")
plt.title('Confusion matrix of the classifier')
fig.colorbar(cax)
ax.set_xticks(np.arange(len(lab)))
ax.set_yticks(np.arange(len(lab)))
ax.set_xticklabels(lab)
ax.set_yticklabels(lab)
plt.xlabel('Predicted')
plt.ylabel('True')
for i in range(len(cm)):
    for j in range(len(cm)):
        text = ax.text(j, i, cm[i, j],
                       ha="center", va="center", color="w")

plt.show()
```

```
[[919  81]
```

```
[136 863]]
```

Confusion matrix of the classifier
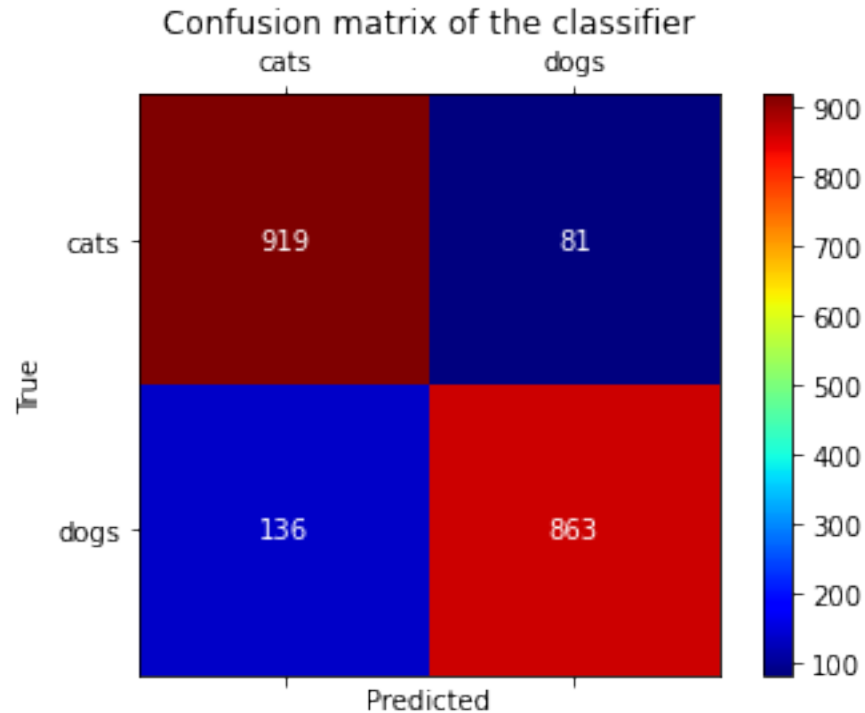
(iii)   This is when I create my sub network. The network is almost exactly the same as the last one, except the pre_model stops at layer 27 and trains for 30 epochs. Scaling the model down did not imprve the performance at all. In fact it went way down. I tried to raise the accuracy with more training, however that didn't help as much. The model stops at around ~70% with the training data, and ~60% with the test data. That means that the model is doing slightly better than a guess.

I will say that the model trains a lot faster though.

```
[11]: subnetLayer = 27

      subnet = pre_model.layers[subnetLayer].output
      my_subnet = keras.layers.Dense(units=128, activation="relu")(subnet)
      my_submodel = keras.models.Model(inputs=pre_model.input, outputs=my_subnet)
      my_submodel.trainable = False
      print(len(my_submodel.layers))
      print(my_submodel.summary())
```

```
20
Model: "model"

_____
Layer (type)                 Output Shape              Param #
```

```
=================================================================
input_1 (InputLayer)         [(None, 150, 150, 3)]    0
-----------------------------------------------------------------
conv2d (Conv2D)              (None, 74, 74, 32)       864
-----------------------------------------------------------------
batch_normalization (BatchNo (None, 74, 74, 32)       96
-----------------------------------------------------------------
activation (Activation)      (None, 74, 74, 32)       0
-----------------------------------------------------------------
conv2d_1 (Conv2D)            (None, 72, 72, 32)       9216
-----------------------------------------------------------------
batch_normalization_1 (Batch (None, 72, 72, 32)       96
-----------------------------------------------------------------
activation_1 (Activation)    (None, 72, 72, 32)       0
-----------------------------------------------------------------
conv2d_2 (Conv2D)            (None, 72, 72, 64)       18432
-----------------------------------------------------------------
batch_normalization_2 (Batch (None, 72, 72, 64)       192
-----------------------------------------------------------------
activation_2 (Activation)    (None, 72, 72, 64)       0
-----------------------------------------------------------------
max_pooling2d (MaxPooling2D) (None, 35, 35, 64)       0
-----------------------------------------------------------------
conv2d_3 (Conv2D)            (None, 35, 35, 80)       5120
-----------------------------------------------------------------
batch_normalization_3 (Batch (None, 35, 35, 80)       240
-----------------------------------------------------------------
activation_3 (Activation)    (None, 35, 35, 80)       0
-----------------------------------------------------------------
conv2d_4 (Conv2D)            (None, 33, 33, 192)      138240
-----------------------------------------------------------------
batch_normalization_4 (Batch (None, 33, 33, 192)      576
-----------------------------------------------------------------
activation_4 (Activation)    (None, 33, 33, 192)      0
-----------------------------------------------------------------
max_pooling2d_1 (MaxPooling2 (None, 16, 16, 192)      0
-----------------------------------------------------------------
average_pooling2d (AveragePo (None, 16, 16, 192)      0
-----------------------------------------------------------------
dense_2 (Dense)              (None, 16, 16, 128)      24704
=================================================================
Total params: 197,776
Trainable params: 0
Non-trainable params: 197,776

-----------------------------------------------------------------
None
```

```
[12]: new_model = models.Sequential()
      new_model.add(my_submodel.layers[0])
      new_model.add(layers.Flatten())
      new_model.add(layers.Dense(256,activation='relu'))
      new_model.add(layers.Dense(1,activation='sigmoid'))

      print(model.summary())
```

```
Model: "sequential"
_____
Layer (type)                 Output Shape              Param #
=================================================================
inception_resnet_v2 (Functio (None, 3, 3, 1536)        54336736

_____
flatten (Flatten)            (None, 13824)             0

_____
dense (Dense)                (None, 256)               3539200

_____
dense_1 (Dense)              (None, 1)                 257
=================================================================
Total params: 57,876,193
Trainable params: 3,539,457
Non-trainable params: 54,336,736

_____
None
```

```
[13]: my_submodel.trainable = False

      new_model.compile(optimizer='adam',
                  loss=tf.keras.losses.binary_crossentropy,
                  metrics=['accuracy'])
```

```
[14]: predictions = new_model.predict(images)
      lab = ['cats', 'dogs']
      cm = confusion_matrix(labels, tf.math.round(predictions))
      print(cm)
      fig = plt.figure()
      ax = fig.add_subplot(111)
      cax = ax.matshow(cm,cmap = "jet")
      plt.title('Confusion matrix of the classifier')
      fig.colorbar(cax)
      ax.set_xticks(np.arange(len(lab)))
      ax.set_yticks(np.arange(len(lab)))
      ax.set_xticklabels(lab)
      ax.set_yticklabels(lab)
      plt.xlabel('Predicted')
      plt.ylabel('True')
```

```
for i in range(len(cm)):
    for j in range(len(cm)):
        text = ax.text(j, i, cm[i, j],
                       ha="center", va="center", color="w")

plt.show()
```

```
[[483 517]
 [529 470]]
```


Confusion matrix of the classifier
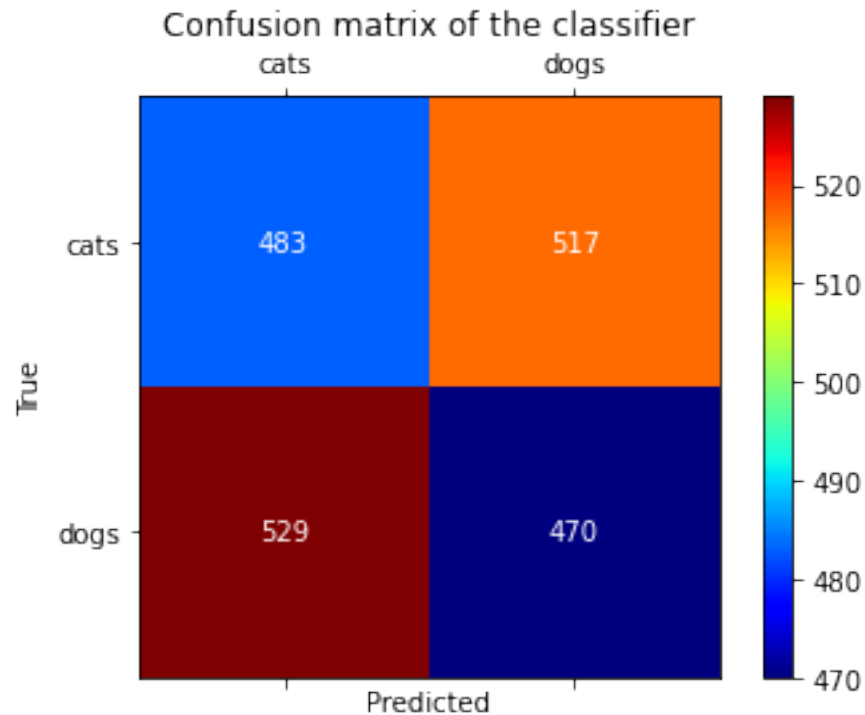
```
[15]: new_model.fit(
          train_generator,
          epochs=30,
          batch_size=32,
          steps_per_epoch=200,
          validation_freq=5,
          validation_data=validation_generator,
          verbose = 1)
```

```
Epoch 1/30
200/200 [==============================] - 11s 52ms/step - loss: 11.8383 -
accuracy: 0.5034
Epoch 2/30
200/200 [==============================] - 9s 47ms/step - loss: 3.2282 -
```

```
accuracy: 0.5329
Epoch 3/30
200/200 [==============================] - 9s 47ms/step - loss: 1.5266 -
accuracy: 0.5780
Epoch 4/30
200/200 [==============================] - 9s 43ms/step - loss: 1.5425 -
accuracy: 0.5861
Epoch 5/30
200/200 [==============================] - 11s 54ms/step - loss: 1.4238 -
accuracy: 0.5991 - val_loss: 1.0738 - val_accuracy: 0.5569
Epoch 6/30
200/200 [==============================] - 9s 43ms/step - loss: 1.1675 -
accuracy: 0.5899
Epoch 7/30
200/200 [==============================] - 9s 43ms/step - loss: 0.8598 -
accuracy: 0.5987
Epoch 8/30
200/200 [==============================] - 9s 43ms/step - loss: 0.6459 -
accuracy: 0.6561
Epoch 9/30
200/200 [==============================] - 9s 43ms/step - loss: 0.7584 -
accuracy: 0.6334
Epoch 10/30
200/200 [==============================] - 11s 55ms/step - loss: 0.7994 -
accuracy: 0.6262 - val_loss: 0.8845 - val_accuracy: 0.5356
Epoch 11/30
200/200 [==============================] - 9s 46ms/step - loss: 0.6057 -
accuracy: 0.6700
Epoch 12/30
200/200 [==============================] - 9s 45ms/step - loss: 0.5939 -
accuracy: 0.6863
Epoch 13/30
200/200 [==============================] - 9s 44ms/step - loss: 0.6174 -
accuracy: 0.6695
Epoch 14/30
200/200 [==============================] - 9s 43ms/step - loss: 0.5562 -
accuracy: 0.7213
Epoch 15/30
200/200 [==============================] - 11s 56ms/step - loss: 0.5899 -
accuracy: 0.6806 - val_loss: 0.7466 - val_accuracy: 0.5813
Epoch 16/30
200/200 [==============================] - 10s 48ms/step - loss: 0.5571 -
accuracy: 0.7109
Epoch 17/30
200/200 [==============================] - 9s 45ms/step - loss: 0.5673 -
accuracy: 0.7002
Epoch 18/30
200/200 [==============================] - 9s 43ms/step - loss: 0.6039 -
```

```
accuracy: 0.6860
Epoch 19/30
200/200 [==============================] - 9s 43ms/step - loss: 0.6114 -
accuracy: 0.6692
Epoch 20/30
200/200 [==============================] - 11s 54ms/step - loss: 0.5547 -
accuracy: 0.7229 - val_loss: 0.7028 - val_accuracy: 0.5944
Epoch 21/30
200/200 [==============================] - 9s 43ms/step - loss: 0.5511 -
accuracy: 0.7125
Epoch 22/30
200/200 [==============================] - 9s 43ms/step - loss: 0.5754 -
accuracy: 0.6975
Epoch 23/30
200/200 [==============================] - 9s 43ms/step - loss: 0.5713 -
accuracy: 0.7049
Epoch 24/30
200/200 [==============================] - 9s 44ms/step - loss: 0.5699 -
accuracy: 0.6950
Epoch 25/30
200/200 [==============================] - 11s 55ms/step - loss: 0.5723 -
accuracy: 0.6962 - val_loss: 0.7005 - val_accuracy: 0.5888
Epoch 26/30
200/200 [==============================] - 9s 43ms/step - loss: 0.5653 -
accuracy: 0.6935
Epoch 27/30
200/200 [==============================] - 8s 42ms/step - loss: 0.5670 -
accuracy: 0.7018
Epoch 28/30
200/200 [==============================] - 9s 43ms/step - loss: 0.5371 -
accuracy: 0.7367
Epoch 29/30
200/200 [==============================] - 9s 43ms/step - loss: 0.5584 -
accuracy: 0.7116
Epoch 30/30
200/200 [==============================] - 11s 53ms/step - loss: 0.5729 -
accuracy: 0.7034 - val_loss: 0.6626 - val_accuracy: 0.6212
```

[15]: `<tensorflow.python.keras.callbacks.History at 0x174b1b2e0>`

[16]:
```python
results = new_model.evaluate(images,labels)
print("test loss, test acc:", results)
```
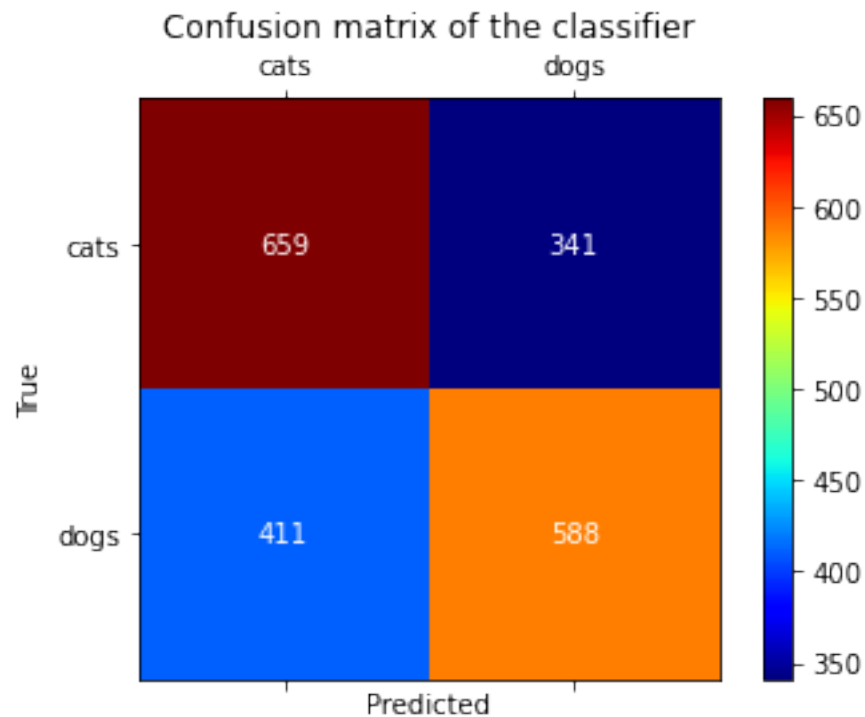
```
63/63 [==============================] - 1s 15ms/step - loss: 0.6550 - accuracy:
0.6238
test loss, test acc: [0.6549517512321472, 0.6238119006156921]
```

```
[17]: predictions = new_model.predict(images)
      lab = ['cats', 'dogs']
      cm = confusion_matrix(labels, tf.math.round(predictions))
      print(cm)
      fig = plt.figure()
      ax = fig.add_subplot(111)
      cax = ax.matshow(cm,cmap = "jet")
      plt.title('Confusion matrix of the classifier')
      fig.colorbar(cax)
      ax.set_xticks(np.arange(len(lab)))
      ax.set_yticks(np.arange(len(lab)))
      ax.set_xticklabels(lab)
      ax.set_yticklabels(lab)
      plt.xlabel('Predicted')
      plt.ylabel('True')
      for i in range(len(cm)):
          for j in range(len(cm)):
              text = ax.text(j, i, cm[i, j],
                             ha="center", va="center", color="w")

      plt.show()
```

```
[[659 341]
 [411 588]]
```

[ ]: