In [1]:
```
# Import libraries
import os,cv2
import time

import numpy as np
import matplotlib.pyplot as plt

from sklearn.utils import shuffle
from sklearn.model_selection import train_test_split
from keras.preprocessing import image
from keras.utils import np_utils
from keras.models import Sequential
from keras.layers import Input
from keras.layers.core import Dense, Dropout, Activation, Flatten
from keras.layers.convolutional import Convolution2D, MaxPooling2D
from keras import callbacks
from keras import backend as K
K.set_image_data_format('channels_last')
from sklearn.metrics import classification_report,confusion_matrix
import itertools
from keras.models import Model
# from tensorflow.keras.applications.resnet import ResNet50
from tensorflow.keras.applications.inception_v3 import InceptionV3
from tensorflow.keras.applications.inception_v3 import decode_predictions
```

Set path for application

In [2]:
```
data_path = 'D:/Harold/MyDNN/DataSet/Chest_xray_seperate'
data_dir_list = os.listdir(data_path)
print(data_path)
```

```
D:/Harold/MyDNN/DataSet/Chest_xray_seperate
```

Set Image Size and Epocs

In [3]:
```
img_rows=128
img_cols=128
num_channel=3
num_epoch=100
```

Define the number of classes

In [4]:
```
num_classes = 2

img_data_list=[]
```

In [5]:
```
def preprocess_input(x):
    x[:, :, :, 0] -= 103.939
    x[:, :, :, 1] -= 116.779
    x[:, :, :, 2] -= 123.68
    # 'RGB'->'BGR'
    x = x[:, :, :, ::-1]
    return x

def data_preperation():
    for dataset in data_dir_list:
        img_list=os.listdir(data_path+'/'+ dataset)
        print ('Loading the images of dataset-'+'{}\n'.format(dataset))
        for img in img_list:
            img_path = data_path + '/'+ dataset + '/'+ img
            img = image.load_img(img_path, target_size=(224, 224))
            x = image.img_to_array(img)
            x = np.expand_dims(x, axis=0)
            x = preprocess_input(x)
#             print('Input image shape:', x.shape)
            img_data_list.append(x)
        print('Loading Complete')

#     for dataset in data_dir_list:
#         img_list=os.listdir(data_path+'/'+ dataset)
#         print ('Loading the images of dataset-'+'{}\n'.format(dataset))
#         for img in img_list:
#             img_path = data_path + '/'+ dataset + '/'+ img
#             img = image.load_img(img_path, target_size=(224, 224))
#             x = image.img_to_array(img)
#             x = np.expand_dims(x, axis=0)
#             x = preprocess_input(x)
# #             print('Input image shape:', x.shape)
#             img_data_list.append(x)
#         print('Loading Complete')

def display_loss_accuracy(hist):
    train_loss=hist.history['loss']
    val_loss=hist.history['val_loss']
    train_acc=hist.history['accuracy']
    val_acc=hist.history['val_accuracy']
    xc=range(num_epoch)

    plt.figure(1,figsize=(7,5))
    plt.plot(xc,train_loss)
    plt.plot(xc,val_loss)
    plt.xlabel('num of Epochs')
    plt.ylabel('loss')
    plt.title('train_loss vs val_loss')
    plt.grid(True)
    plt.legend(['train','val'])
    #print plt.style.available # use bmh, classic,ggplot for big pictures
    plt.style.use(['classic'])

    plt.figure(2,figsize=(7,5))
    plt.plot(xc,train_acc)
    plt.plot(xc,val_acc)
    plt.xlabel('num of Epochs')
    plt.ylabel('accuracy')
    plt.title('train_acc vs val_acc')
    plt.grid(True)
    plt.legend(['train','val'],loc=4)
    #print plt.style.available # use bmh, classic,ggplot for big pictures
    plt.style.use(['classic'])
```

```
def get_featuremaps(model, layer_idx, X_batch):
    get_activations = K.function([model.layers[0].input, K.learning_phase()],[mode
l.layers[layer_idx].output,])
    activations = get_activations([X_batch,0])
    return activations

def plot_featuremap_activations(activations):
    print (np.shape(activations))
    feature_maps = activations[0][0]
    print (np.shape(feature_maps))
    print (feature_maps.shape)

    fig=plt.figure(figsize=(16,16))
    plt.imshow(feature_maps[:,:,filter_num],cmap='gray')
    plt.savefig("featuremaps-layer-{}".format(layer_num) + "-filternum-{}".format(f
ilter_num)+'.jpg')

    num_of_featuremaps=feature_maps.shape[2]
    fig=plt.figure(figsize=(16,16))
    plt.title("featuremaps-layer-{}".format(layer_num))
    subplot_num=int(np.ceil(np.sqrt(num_of_featuremaps)))
    for i in range(int(num_of_featuremaps)):
        ax = fig.add_subplot(subplot_num, subplot_num, i+1)
        #ax.imshow(output_image[0,:,:,i],interpolation='nearest' ) #to see the firs
t filter
        ax.imshow(feature_maps[:,:,i],cmap='gray')
        plt.xticks([])
        plt.yticks([])
        plt.tight_layout()
    plt.show()
    fig.savefig("featuremaps-layer-{}".format(layer_num) + '.jpg')

# Plotting the confusion matrix
def plot_confusion_matrix(cm, classes,
                          normalize=False,
                          title='Confusion matrix',
                          cmap=plt.cm.Blues):
    """
    This function prints and plots the confusion matrix.
    Normalization can be applied by setting `normalize=True`.
    """
    plt.figure()
    plt.imshow(cm, interpolation='nearest', cmap=cmap)
    plt.title(title)
    plt.colorbar()
    tick_marks = np.arange(len(classes))
    plt.xticks(tick_marks, classes, rotation=45)
    plt.yticks(tick_marks, classes)

    if normalize:
        cm = cm.astype('float') / cm.sum(axis=1)[:, np.newaxis]
        print("Normalized confusion matrix")
    else:
        print('Confusion matrix, without normalization')

    print(cm)

    thresh = cm.max() / 2.
    for i, j in itertools.product(range(cm.shape[0]), range(cm.shape[1])):
        plt.text(j, i, cm[i, j],
                 horizontalalignment="center",
                 color="white" if cm[i, j] > thresh else "black")
```

```
    plt.tight_layout()
    plt.ylabel('True label')
    plt.xlabel('Predicted label')
    plt.show()
```

Data Preperation

In [6]:
```
# Calling Data Preperation
data_preperation()
```

```
Loading the images of dataset-NORMAL

Loading Complete
Loading the images of dataset-PNEUMONIA

Loading Complete
```

In [7]:
```
print (len(img_data_list))
img_data = np.array(img_data_list)
#img_data = img_data.astype('float32')
print (img_data.shape)
img_data=np.rollaxis(img_data,1,0)
print (img_data.shape)
img_data=img_data[0]
print (img_data.shape)
```

```
5856
(5856, 1, 224, 224, 3)
(1, 5856, 224, 224, 3)
(5856, 224, 224, 3)
```

Assiging Labels

In [8]:
```
num_of_samples = img_data.shape[0]
labels = np.ones((num_of_samples,),dtype='int64')

labels[0:1582]=0
labels[1583:5856]=1

names = ['normal','pneumonia']
```

Creating clasas labels to one-hot encoding

In [9]:
```
# convert class labels to on-hot encoding
Y = np_utils.to_categorical(labels, num_classes)
```

Split Data set into training and validation set

In [10]:
```
#Shuffle the dataset
x,y = shuffle(img_data,Y, random_state=2)
# Split the dataset
X_train, X_test, y_train, y_test = train_test_split(x, y, test_size=0.2, random_sta
te=2)
```

Model Definition

Training the classifier alone

In [11]:
```
image_input = Input(shape=(224, 224, 3))
model = InceptionV3(input_tensor=image_input, include_top=True,weights='imagenet')
model.summary()
last_layer = model.get_layer('avg_pool').output
x= Flatten(name='flatten')(last_layer)
out = Dense(num_classes, activation='softmax', name='output_layer')(x)
custom_resnet_model = Model(inputs=image_input,outputs= out)
custom_resnet_model.summary()
```

```
Model: "inception_v3"
__________________________________________________________________________________________________
Layer (type)                    Output Shape         Param #     Connected to
==================================================================================================
input_1 (InputLayer)            [(None, 224, 224, 3) 0
__________________________________________________________________________________________________
conv2d (Conv2D)                 (None, 111, 111, 32) 864         input_1[0][0]
__________________________________________________________________________________________________
batch_normalization (BatchNorma (None, 111, 111, 32) 96          conv2d[0][0]
__________________________________________________________________________________________________
activation (Activation)         (None, 111, 111, 32) 0           batch_normaliza
tion[0][0]
__________________________________________________________________________________________________
conv2d_1 (Conv2D)               (None, 109, 109, 32) 9216        activation
[0][0]
__________________________________________________________________________________________________
batch_normalization_1 (BatchNor (None, 109, 109, 32) 96          conv2d_1[0][0]
__________________________________________________________________________________________________
activation_1 (Activation)       (None, 109, 109, 32) 0           batch_normaliza
tion_1[0][0]
__________________________________________________________________________________________________
conv2d_2 (Conv2D)               (None, 109, 109, 64) 18432       activation_1
[0][0]
__________________________________________________________________________________________________
batch_normalization_2 (BatchNor (None, 109, 109, 64) 192         conv2d_2[0][0]
__________________________________________________________________________________________________
activation_2 (Activation)       (None, 109, 109, 64) 0           batch_normaliza
tion_2[0][0]
__________________________________________________________________________________________________
max_pooling2d (MaxPooling2D)    (None, 54, 54, 64)   0           activation_2
[0][0]
__________________________________________________________________________________________________
conv2d_3 (Conv2D)               (None, 54, 54, 80)   5120        max_pooling2d
[0][0]
__________________________________________________________________________________________________
batch_normalization_3 (BatchNor (None, 54, 54, 80)   240         conv2d_3[0][0]
__________________________________________________________________________________________________
activation_3 (Activation)       (None, 54, 54, 80)   0           batch_normaliza
tion_3[0][0]
__________________________________________________________________________________________________
conv2d_4 (Conv2D)               (None, 52, 52, 192)  138240      activation_3
[0][0]
__________________________________________________________________________________________________
batch_normalization_4 (BatchNor (None, 52, 52, 192)  576         conv2d_4[0][0]
__________________________________________________________________________________________________
```

```
activation_4 (Activation)       (None, 52, 52, 192)  0           batch_normaliza
tion_4[0][0]
__________________________________________________________________________________
__________________
max_pooling2d_1 (MaxPooling2D)  (None, 25, 25, 192)  0           activation_4
[0][0]
__________________________________________________________________________________
__________________
conv2d_8 (Conv2D)               (None, 25, 25, 64)   12288       max_pooling2d_1
[0][0]
__________________________________________________________________________________
__________________
batch_normalization_8 (BatchNor (None, 25, 25, 64)   192         conv2d_8[0][0]
__________________________________________________________________________________
__________________
activation_8 (Activation)       (None, 25, 25, 64)   0           batch_normaliza
tion_8[0][0]
__________________________________________________________________________________
__________________
conv2d_6 (Conv2D)               (None, 25, 25, 48)   9216        max_pooling2d_1
[0][0]
__________________________________________________________________________________
__________________
conv2d_9 (Conv2D)               (None, 25, 25, 96)   55296       activation_8
[0][0]
__________________________________________________________________________________
__________________
batch_normalization_6 (BatchNor (None, 25, 25, 48)   144         conv2d_6[0][0]
__________________________________________________________________________________
__________________
batch_normalization_9 (BatchNor (None, 25, 25, 96)   288         conv2d_9[0][0]
__________________________________________________________________________________
__________________
activation_6 (Activation)       (None, 25, 25, 48)   0           batch_normaliza
tion_6[0][0]
__________________________________________________________________________________
__________________
activation_9 (Activation)       (None, 25, 25, 96)   0           batch_normaliza
tion_9[0][0]
__________________________________________________________________________________
__________________
average_pooling2d (AveragePooli (None, 25, 25, 192)  0           max_pooling2d_1
[0][0]
__________________________________________________________________________________
__________________
conv2d_5 (Conv2D)               (None, 25, 25, 64)   12288       max_pooling2d_1
[0][0]
__________________________________________________________________________________
__________________
conv2d_7 (Conv2D)               (None, 25, 25, 64)   76800       activation_6
[0][0]
__________________________________________________________________________________
__________________
conv2d_10 (Conv2D)              (None, 25, 25, 96)   82944       activation_9
[0][0]
__________________________________________________________________________________
__________________
conv2d_11 (Conv2D)              (None, 25, 25, 32)   6144        average_pooling
2d[0][0]
__________________________________________________________________________________
__________________
batch_normalization_5 (BatchNor (None, 25, 25, 64)   192         conv2d_5[0][0]
__________________________________________________________________________________
__________________
```

```
batch_normalization_7 (BatchNor (None, 25, 25, 64)   192         conv2d_7[0][0]
__________________________________________________________________________________________
batch_normalization_10 (BatchNo (None, 25, 25, 96)   288         conv2d_10[0][0]
__________________________________________________________________________________________
batch_normalization_11 (BatchNo (None, 25, 25, 32)   96          conv2d_11[0][0]
__________________________________________________________________________________________
activation_5 (Activation)       (None, 25, 25, 64)   0           batch_normaliza
tion_5[0][0]
__________________________________________________________________________________________
activation_7 (Activation)       (None, 25, 25, 64)   0           batch_normaliza
tion_7[0][0]
__________________________________________________________________________________________
activation_10 (Activation)      (None, 25, 25, 96)   0           batch_normaliza
tion_10[0][0]
__________________________________________________________________________________________
activation_11 (Activation)      (None, 25, 25, 32)   0           batch_normaliza
tion_11[0][0]
__________________________________________________________________________________________
mixed0 (Concatenate)            (None, 25, 25, 256)  0           activation_5
[0][0]
                                                                 activation_7
[0][0]
                                                                 activation_10
[0][0]
                                                                 activation_11
[0][0]
__________________________________________________________________________________________
conv2d_15 (Conv2D)              (None, 25, 25, 64)   16384       mixed0[0][0]
__________________________________________________________________________________________
batch_normalization_15 (BatchNo (None, 25, 25, 64)   192         conv2d_15[0][0]
__________________________________________________________________________________________
activation_15 (Activation)      (None, 25, 25, 64)   0           batch_normaliza
tion_15[0][0]
__________________________________________________________________________________________
conv2d_13 (Conv2D)              (None, 25, 25, 48)   12288       mixed0[0][0]
__________________________________________________________________________________________
conv2d_16 (Conv2D)              (None, 25, 25, 96)   55296       activation_15
[0][0]
__________________________________________________________________________________________
batch_normalization_13 (BatchNo (None, 25, 25, 48)   144         conv2d_13[0][0]
__________________________________________________________________________________________
batch_normalization_16 (BatchNo (None, 25, 25, 96)   288         conv2d_16[0][0]
__________________________________________________________________________________________
activation_13 (Activation)      (None, 25, 25, 48)   0           batch_normaliza
tion_13[0][0]
__________________________________________________________________________________________
activation_16 (Activation)      (None, 25, 25, 96)   0           batch_normaliza
tion_16[0][0]
```

```
__________________________________________________________________________________________________
__________________
average_pooling2d_1 (AveragePoo (None, 25, 25, 256)  0           mixed0[0][0]
__________________________________________________________________________________________________
__________________
conv2d_12 (Conv2D)              (None, 25, 25, 64)   16384       mixed0[0][0]
__________________________________________________________________________________________________
__________________
conv2d_14 (Conv2D)              (None, 25, 25, 64)   76800       activation_13
[0][0]
__________________________________________________________________________________________________
__________________
conv2d_17 (Conv2D)              (None, 25, 25, 96)   82944       activation_16
[0][0]
__________________________________________________________________________________________________
__________________
conv2d_18 (Conv2D)              (None, 25, 25, 64)   16384       average_pooling
2d_1[0][0]
__________________________________________________________________________________________________
__________________
batch_normalization_12 (BatchNo (None, 25, 25, 64)   192         conv2d_12[0][0]
__________________________________________________________________________________________________
__________________
batch_normalization_14 (BatchNo (None, 25, 25, 64)   192         conv2d_14[0][0]
__________________________________________________________________________________________________
__________________
batch_normalization_17 (BatchNo (None, 25, 25, 96)   288         conv2d_17[0][0]
__________________________________________________________________________________________________
__________________
batch_normalization_18 (BatchNo (None, 25, 25, 64)   192         conv2d_18[0][0]
__________________________________________________________________________________________________
__________________
activation_12 (Activation)      (None, 25, 25, 64)   0           batch_normaliza
tion_12[0][0]
__________________________________________________________________________________________________
__________________
activation_14 (Activation)      (None, 25, 25, 64)   0           batch_normaliza
tion_14[0][0]
__________________________________________________________________________________________________
__________________
activation_17 (Activation)      (None, 25, 25, 96)   0           batch_normaliza
tion_17[0][0]
__________________________________________________________________________________________________
__________________
activation_18 (Activation)      (None, 25, 25, 64)   0           batch_normaliza
tion_18[0][0]
__________________________________________________________________________________________________
__________________
mixed1 (Concatenate)            (None, 25, 25, 288)  0           activation_12
[0][0]
                                                                 activation_14
[0][0]
                                                                 activation_17
[0][0]
                                                                 activation_18
[0][0]
__________________________________________________________________________________________________
__________________
conv2d_22 (Conv2D)              (None, 25, 25, 64)   18432       mixed1[0][0]
__________________________________________________________________________________________________
__________________
batch_normalization_22 (BatchNo (None, 25, 25, 64)   192         conv2d_22[0][0]
__________________________________________________________________________________________________
__________________
```

```
activation_22 (Activation)      (None, 25, 25, 64)   0           batch_normaliza
tion_22[0][0]
__________________________________________________________________________________
__________________
conv2d_20 (Conv2D)              (None, 25, 25, 48)   13824       mixed1[0][0]
__________________________________________________________________________________
__________________
conv2d_23 (Conv2D)              (None, 25, 25, 96)   55296       activation_22
[0][0]
__________________________________________________________________________________
__________________
batch_normalization_20 (BatchNo (None, 25, 25, 48)   144         conv2d_20[0][0]
__________________________________________________________________________________
__________________
batch_normalization_23 (BatchNo (None, 25, 25, 96)   288         conv2d_23[0][0]
__________________________________________________________________________________
__________________
activation_20 (Activation)      (None, 25, 25, 48)   0           batch_normaliza
tion_20[0][0]
__________________________________________________________________________________
__________________
activation_23 (Activation)      (None, 25, 25, 96)   0           batch_normaliza
tion_23[0][0]
__________________________________________________________________________________
__________________
average_pooling2d_2 (AveragePoo (None, 25, 25, 288)  0           mixed1[0][0]
__________________________________________________________________________________
__________________
conv2d_19 (Conv2D)              (None, 25, 25, 64)   18432       mixed1[0][0]
__________________________________________________________________________________
__________________
conv2d_21 (Conv2D)              (None, 25, 25, 64)   76800       activation_20
[0][0]
__________________________________________________________________________________
__________________
conv2d_24 (Conv2D)              (None, 25, 25, 96)   82944       activation_23
[0][0]
__________________________________________________________________________________
__________________
conv2d_25 (Conv2D)              (None, 25, 25, 64)   18432       average_pooling
2d_2[0][0]
__________________________________________________________________________________
__________________
batch_normalization_19 (BatchNo (None, 25, 25, 64)   192         conv2d_19[0][0]
__________________________________________________________________________________
__________________
batch_normalization_21 (BatchNo (None, 25, 25, 64)   192         conv2d_21[0][0]
__________________________________________________________________________________
__________________
batch_normalization_24 (BatchNo (None, 25, 25, 96)   288         conv2d_24[0][0]
__________________________________________________________________________________
__________________
batch_normalization_25 (BatchNo (None, 25, 25, 64)   192         conv2d_25[0][0]
__________________________________________________________________________________
__________________
activation_19 (Activation)      (None, 25, 25, 64)   0           batch_normaliza
tion_19[0][0]
__________________________________________________________________________________
__________________
activation_21 (Activation)      (None, 25, 25, 64)   0           batch_normaliza
tion_21[0][0]
__________________________________________________________________________________
__________________
activation_24 (Activation)      (None, 25, 25, 96)   0           batch_normaliza
```

```
tion_24[0][0]
__________________________________________________________________________________________________
activation_25 (Activation)      (None, 25, 25, 64)   0           batch_normaliza
tion_25[0][0]
__________________________________________________________________________________________________
mixed2 (Concatenate)            (None, 25, 25, 288)  0           activation_19
[0][0]
                                                                 activation_21
[0][0]
                                                                 activation_24
[0][0]
                                                                 activation_25
[0][0]
__________________________________________________________________________________________________
conv2d_27 (Conv2D)              (None, 25, 25, 64)   18432       mixed2[0][0]
__________________________________________________________________________________________________
batch_normalization_27 (BatchNo (None, 25, 25, 64)   192         conv2d_27[0][0]
__________________________________________________________________________________________________
activation_27 (Activation)      (None, 25, 25, 64)   0           batch_normaliza
tion_27[0][0]
__________________________________________________________________________________________________
conv2d_28 (Conv2D)              (None, 25, 25, 96)   55296       activation_27
[0][0]
__________________________________________________________________________________________________
batch_normalization_28 (BatchNo (None, 25, 25, 96)   288         conv2d_28[0][0]
__________________________________________________________________________________________________
activation_28 (Activation)      (None, 25, 25, 96)   0           batch_normaliza
tion_28[0][0]
__________________________________________________________________________________________________
conv2d_26 (Conv2D)              (None, 12, 12, 384)  995328      mixed2[0][0]
__________________________________________________________________________________________________
conv2d_29 (Conv2D)              (None, 12, 12, 96)   82944       activation_28
[0][0]
__________________________________________________________________________________________________
batch_normalization_26 (BatchNo (None, 12, 12, 384)  1152        conv2d_26[0][0]
__________________________________________________________________________________________________
batch_normalization_29 (BatchNo (None, 12, 12, 96)   288         conv2d_29[0][0]
__________________________________________________________________________________________________
activation_26 (Activation)      (None, 12, 12, 384)  0           batch_normaliza
tion_26[0][0]
__________________________________________________________________________________________________
activation_29 (Activation)      (None, 12, 12, 96)   0           batch_normaliza
tion_29[0][0]
__________________________________________________________________________________________________
max_pooling2d_2 (MaxPooling2D)  (None, 12, 12, 288)  0           mixed2[0][0]
__________________________________________________________________________________________________
mixed3 (Concatenate)            (None, 12, 12, 768)  0           activation_26
[0][0]
```

```
                                                                 activation_29
[0][0]
                                                                 max_pooling2d_2
[0][0]
__________________________________________________________________________________________________
conv2d_34 (Conv2D)              (None, 12, 12, 128)  98304       mixed3[0][0]
__________________________________________________________________________________________________
batch_normalization_34 (BatchNo (None, 12, 12, 128)  384         conv2d_34[0][0]
__________________________________________________________________________________________________
activation_34 (Activation)      (None, 12, 12, 128)  0           batch_normaliza
tion_34[0][0]
__________________________________________________________________________________________________
conv2d_35 (Conv2D)              (None, 12, 12, 128)  114688      activation_34
[0][0]
__________________________________________________________________________________________________
batch_normalization_35 (BatchNo (None, 12, 12, 128)  384         conv2d_35[0][0]
__________________________________________________________________________________________________
activation_35 (Activation)      (None, 12, 12, 128)  0           batch_normaliza
tion_35[0][0]
__________________________________________________________________________________________________
conv2d_31 (Conv2D)              (None, 12, 12, 128)  98304       mixed3[0][0]
__________________________________________________________________________________________________
conv2d_36 (Conv2D)              (None, 12, 12, 128)  114688      activation_35
[0][0]
__________________________________________________________________________________________________
batch_normalization_31 (BatchNo (None, 12, 12, 128)  384         conv2d_31[0][0]
__________________________________________________________________________________________________
batch_normalization_36 (BatchNo (None, 12, 12, 128)  384         conv2d_36[0][0]
__________________________________________________________________________________________________
activation_31 (Activation)      (None, 12, 12, 128)  0           batch_normaliza
tion_31[0][0]
__________________________________________________________________________________________________
activation_36 (Activation)      (None, 12, 12, 128)  0           batch_normaliza
tion_36[0][0]
__________________________________________________________________________________________________
conv2d_32 (Conv2D)              (None, 12, 12, 128)  114688      activation_31
[0][0]
__________________________________________________________________________________________________
conv2d_37 (Conv2D)              (None, 12, 12, 128)  114688      activation_36
[0][0]
__________________________________________________________________________________________________
batch_normalization_32 (BatchNo (None, 12, 12, 128)  384         conv2d_32[0][0]
__________________________________________________________________________________________________
batch_normalization_37 (BatchNo (None, 12, 12, 128)  384         conv2d_37[0][0]
__________________________________________________________________________________________________
activation_32 (Activation)      (None, 12, 12, 128)  0           batch_normaliza
tion_32[0][0]
```

```
__________________________________________________________________________________________________
activation_37 (Activation)      (None, 12, 12, 128)  0           batch_normaliza
tion_37[0][0]
__________________________________________________________________________________________________
average_pooling2d_3 (AveragePoo (None, 12, 12, 768)  0           mixed3[0][0]
__________________________________________________________________________________________________
conv2d_30 (Conv2D)              (None, 12, 12, 192)  147456      mixed3[0][0]
__________________________________________________________________________________________________
conv2d_33 (Conv2D)              (None, 12, 12, 192)  172032      activation_32
[0][0]
__________________________________________________________________________________________________
conv2d_38 (Conv2D)              (None, 12, 12, 192)  172032      activation_37
[0][0]
__________________________________________________________________________________________________
conv2d_39 (Conv2D)              (None, 12, 12, 192)  147456      average_pooling
2d_3[0][0]
__________________________________________________________________________________________________
batch_normalization_30 (BatchNo (None, 12, 12, 192)  576         conv2d_30[0][0]
__________________________________________________________________________________________________
batch_normalization_33 (BatchNo (None, 12, 12, 192)  576         conv2d_33[0][0]
__________________________________________________________________________________________________
batch_normalization_38 (BatchNo (None, 12, 12, 192)  576         conv2d_38[0][0]
__________________________________________________________________________________________________
batch_normalization_39 (BatchNo (None, 12, 12, 192)  576         conv2d_39[0][0]
__________________________________________________________________________________________________
activation_30 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_30[0][0]
__________________________________________________________________________________________________
activation_33 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_33[0][0]
__________________________________________________________________________________________________
activation_38 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_38[0][0]
__________________________________________________________________________________________________
activation_39 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_39[0][0]
__________________________________________________________________________________________________
mixed4 (Concatenate)            (None, 12, 12, 768)  0           activation_30
[0][0]
                                                                 activation_33
[0][0]
                                                                 activation_38
[0][0]
                                                                 activation_39
[0][0]
__________________________________________________________________________________________________
conv2d_44 (Conv2D)              (None, 12, 12, 160)  122880      mixed4[0][0]
__________________________________________________________________________________________________
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____________________
batch_normalization_44 (BatchNo (None, 12, 12, 160)  480         conv2d_44[0][0]
__________________________________________________________________________________________________
____________________
activation_44 (Activation)      (None, 12, 12, 160)  0           batch_normaliza
tion_44[0][0]
__________________________________________________________________________________________________
____________________
conv2d_45 (Conv2D)              (None, 12, 12, 160)  179200      activation_44
[0][0]
__________________________________________________________________________________________________
____________________
batch_normalization_45 (BatchNo (None, 12, 12, 160)  480         conv2d_45[0][0]
__________________________________________________________________________________________________
____________________
activation_45 (Activation)      (None, 12, 12, 160)  0           batch_normaliza
tion_45[0][0]
__________________________________________________________________________________________________
____________________
conv2d_41 (Conv2D)              (None, 12, 12, 160)  122880      mixed4[0][0]
__________________________________________________________________________________________________
____________________
conv2d_46 (Conv2D)              (None, 12, 12, 160)  179200      activation_45
[0][0]
__________________________________________________________________________________________________
____________________
batch_normalization_41 (BatchNo (None, 12, 12, 160)  480         conv2d_41[0][0]
__________________________________________________________________________________________________
____________________
batch_normalization_46 (BatchNo (None, 12, 12, 160)  480         conv2d_46[0][0]
__________________________________________________________________________________________________
____________________
activation_41 (Activation)      (None, 12, 12, 160)  0           batch_normaliza
tion_41[0][0]
__________________________________________________________________________________________________
____________________
activation_46 (Activation)      (None, 12, 12, 160)  0           batch_normaliza
tion_46[0][0]
__________________________________________________________________________________________________
____________________
conv2d_42 (Conv2D)              (None, 12, 12, 160)  179200      activation_41
[0][0]
__________________________________________________________________________________________________
____________________
conv2d_47 (Conv2D)              (None, 12, 12, 160)  179200      activation_46
[0][0]
__________________________________________________________________________________________________
____________________
batch_normalization_42 (BatchNo (None, 12, 12, 160)  480         conv2d_42[0][0]
__________________________________________________________________________________________________
____________________
batch_normalization_47 (BatchNo (None, 12, 12, 160)  480         conv2d_47[0][0]
__________________________________________________________________________________________________
____________________
activation_42 (Activation)      (None, 12, 12, 160)  0           batch_normaliza
tion_42[0][0]
__________________________________________________________________________________________________
____________________
activation_47 (Activation)      (None, 12, 12, 160)  0           batch_normaliza
tion_47[0][0]
__________________________________________________________________________________________________
____________________
average_pooling2d_4 (AveragePoo (None, 12, 12, 768)  0           mixed4[0][0]
__________________________________________________________________________________________________
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__________________
conv2d_40 (Conv2D)              (None, 12, 12, 192)  147456      mixed4[0][0]
__________________________________________________________________________________
__________________
conv2d_43 (Conv2D)              (None, 12, 12, 192)  215040      activation_42
[0][0]
__________________________________________________________________________________
__________________
conv2d_48 (Conv2D)              (None, 12, 12, 192)  215040      activation_47
[0][0]
__________________________________________________________________________________
__________________
conv2d_49 (Conv2D)              (None, 12, 12, 192)  147456      average_pooling
2d_4[0][0]
__________________________________________________________________________________
__________________
batch_normalization_40 (BatchNo (None, 12, 12, 192)  576         conv2d_40[0][0]
__________________________________________________________________________________
__________________
batch_normalization_43 (BatchNo (None, 12, 12, 192)  576         conv2d_43[0][0]
__________________________________________________________________________________
__________________
batch_normalization_48 (BatchNo (None, 12, 12, 192)  576         conv2d_48[0][0]
__________________________________________________________________________________
__________________
batch_normalization_49 (BatchNo (None, 12, 12, 192)  576         conv2d_49[0][0]
__________________________________________________________________________________
__________________
activation_40 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_40[0][0]
__________________________________________________________________________________
__________________
activation_43 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_43[0][0]
__________________________________________________________________________________
__________________
activation_48 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_48[0][0]
__________________________________________________________________________________
__________________
activation_49 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_49[0][0]
__________________________________________________________________________________
__________________
mixed5 (Concatenate)            (None, 12, 12, 768)  0           activation_40
[0][0]
                                                                 activation_43
[0][0]
                                                                 activation_48
[0][0]
                                                                 activation_49
[0][0]
__________________________________________________________________________________
__________________
conv2d_54 (Conv2D)              (None, 12, 12, 160)  122880      mixed5[0][0]
__________________________________________________________________________________
__________________
batch_normalization_54 (BatchNo (None, 12, 12, 160)  480         conv2d_54[0][0]
__________________________________________________________________________________
__________________
activation_54 (Activation)      (None, 12, 12, 160)  0           batch_normaliza
tion_54[0][0]
__________________________________________________________________________________
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conv2d_55 (Conv2D)              (None, 12, 12, 160)  179200      activation_54
[0][0]
__________________________________________________________________________________
__________________
batch_normalization_55 (BatchNo (None, 12, 12, 160)  480         conv2d_55[0][0]
__________________________________________________________________________________
__________________
activation_55 (Activation)      (None, 12, 12, 160)  0           batch_normaliza
tion_55[0][0]
__________________________________________________________________________________
__________________
conv2d_51 (Conv2D)              (None, 12, 12, 160)  122880      mixed5[0][0]
__________________________________________________________________________________
__________________
conv2d_56 (Conv2D)              (None, 12, 12, 160)  179200      activation_55
[0][0]
__________________________________________________________________________________
__________________
batch_normalization_51 (BatchNo (None, 12, 12, 160)  480         conv2d_51[0][0]
__________________________________________________________________________________
__________________
batch_normalization_56 (BatchNo (None, 12, 12, 160)  480         conv2d_56[0][0]
__________________________________________________________________________________
__________________
activation_51 (Activation)      (None, 12, 12, 160)  0           batch_normaliza
tion_51[0][0]
__________________________________________________________________________________
__________________
activation_56 (Activation)      (None, 12, 12, 160)  0           batch_normaliza
tion_56[0][0]
__________________________________________________________________________________
__________________
conv2d_52 (Conv2D)              (None, 12, 12, 160)  179200      activation_51
[0][0]
__________________________________________________________________________________
__________________
conv2d_57 (Conv2D)              (None, 12, 12, 160)  179200      activation_56
[0][0]
__________________________________________________________________________________
__________________
batch_normalization_52 (BatchNo (None, 12, 12, 160)  480         conv2d_52[0][0]
__________________________________________________________________________________
__________________
batch_normalization_57 (BatchNo (None, 12, 12, 160)  480         conv2d_57[0][0]
__________________________________________________________________________________
__________________
activation_52 (Activation)      (None, 12, 12, 160)  0           batch_normaliza
tion_52[0][0]
__________________________________________________________________________________
__________________
activation_57 (Activation)      (None, 12, 12, 160)  0           batch_normaliza
tion_57[0][0]
__________________________________________________________________________________
__________________
average_pooling2d_5 (AveragePoo (None, 12, 12, 768)  0           mixed5[0][0]
__________________________________________________________________________________
__________________
conv2d_50 (Conv2D)              (None, 12, 12, 192)  147456      mixed5[0][0]
__________________________________________________________________________________
__________________
conv2d_53 (Conv2D)              (None, 12, 12, 192)  215040      activation_52
[0][0]
__________________________________________________________________________________
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conv2d_58 (Conv2D)              (None, 12, 12, 192)  215040      activation_57
[0][0]
__________________________________________________________________________________________
__________________
conv2d_59 (Conv2D)              (None, 12, 12, 192)  147456      average_pooling
2d_5[0][0]
__________________________________________________________________________________________
__________________
batch_normalization_50 (BatchNo (None, 12, 12, 192)  576         conv2d_50[0][0]
__________________________________________________________________________________________
__________________
batch_normalization_53 (BatchNo (None, 12, 12, 192)  576         conv2d_53[0][0]
__________________________________________________________________________________________
__________________
batch_normalization_58 (BatchNo (None, 12, 12, 192)  576         conv2d_58[0][0]
__________________________________________________________________________________________
__________________
batch_normalization_59 (BatchNo (None, 12, 12, 192)  576         conv2d_59[0][0]
__________________________________________________________________________________________
__________________
activation_50 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_50[0][0]
__________________________________________________________________________________________
__________________
activation_53 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_53[0][0]
__________________________________________________________________________________________
__________________
activation_58 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_58[0][0]
__________________________________________________________________________________________
__________________
activation_59 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_59[0][0]
__________________________________________________________________________________________
__________________
mixed6 (Concatenate)            (None, 12, 12, 768)  0           activation_50
[0][0]
                                                                 activation_53
[0][0]
                                                                 activation_58
[0][0]
                                                                 activation_59
[0][0]
__________________________________________________________________________________________
__________________
conv2d_64 (Conv2D)              (None, 12, 12, 192)  147456      mixed6[0][0]
__________________________________________________________________________________________
__________________
batch_normalization_64 (BatchNo (None, 12, 12, 192)  576         conv2d_64[0][0]
__________________________________________________________________________________________
__________________
activation_64 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_64[0][0]
__________________________________________________________________________________________
__________________
conv2d_65 (Conv2D)              (None, 12, 12, 192)  258048      activation_64
[0][0]
__________________________________________________________________________________________
__________________
batch_normalization_65 (BatchNo (None, 12, 12, 192)  576         conv2d_65[0][0]
__________________________________________________________________________________________
__________________
activation_65 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
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tion_65[0][0]
__________________________________________________________________________________________________
__________________
conv2d_61 (Conv2D)              (None, 12, 12, 192)  147456      mixed6[0][0]
__________________________________________________________________________________________________
__________________
conv2d_66 (Conv2D)              (None, 12, 12, 192)  258048      activation_65
[0][0]
__________________________________________________________________________________________________
__________________
batch_normalization_61 (BatchNo (None, 12, 12, 192)  576         conv2d_61[0][0]
__________________________________________________________________________________________________
__________________
batch_normalization_66 (BatchNo (None, 12, 12, 192)  576         conv2d_66[0][0]
__________________________________________________________________________________________________
__________________
activation_61 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_61[0][0]
__________________________________________________________________________________________________
__________________
activation_66 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_66[0][0]
__________________________________________________________________________________________________
__________________
conv2d_62 (Conv2D)              (None, 12, 12, 192)  258048      activation_61
[0][0]
__________________________________________________________________________________________________
__________________
conv2d_67 (Conv2D)              (None, 12, 12, 192)  258048      activation_66
[0][0]
__________________________________________________________________________________________________
__________________
batch_normalization_62 (BatchNo (None, 12, 12, 192)  576         conv2d_62[0][0]
__________________________________________________________________________________________________
__________________
batch_normalization_67 (BatchNo (None, 12, 12, 192)  576         conv2d_67[0][0]
__________________________________________________________________________________________________
__________________
activation_62 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_62[0][0]
__________________________________________________________________________________________________
__________________
activation_67 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_67[0][0]
__________________________________________________________________________________________________
__________________
average_pooling2d_6 (AveragePoo (None, 12, 12, 768)  0           mixed6[0][0]
__________________________________________________________________________________________________
__________________
conv2d_60 (Conv2D)              (None, 12, 12, 192)  147456      mixed6[0][0]
__________________________________________________________________________________________________
__________________
conv2d_63 (Conv2D)              (None, 12, 12, 192)  258048      activation_62
[0][0]
__________________________________________________________________________________________________
__________________
conv2d_68 (Conv2D)              (None, 12, 12, 192)  258048      activation_67
[0][0]
__________________________________________________________________________________________________
__________________
conv2d_69 (Conv2D)              (None, 12, 12, 192)  147456      average_pooling
2d_6[0][0]
__________________________________________________________________________________________________
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batch_normalization_60 (BatchNo (None, 12, 12, 192)  576         conv2d_60[0][0]
__________________________________________________________________________________________________
batch_normalization_63 (BatchNo (None, 12, 12, 192)  576         conv2d_63[0][0]
__________________________________________________________________________________________________
batch_normalization_68 (BatchNo (None, 12, 12, 192)  576         conv2d_68[0][0]
__________________________________________________________________________________________________
batch_normalization_69 (BatchNo (None, 12, 12, 192)  576         conv2d_69[0][0]
__________________________________________________________________________________________________
activation_60 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_60[0][0]
__________________________________________________________________________________________________
activation_63 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_63[0][0]
__________________________________________________________________________________________________
activation_68 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_68[0][0]
__________________________________________________________________________________________________
activation_69 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_69[0][0]
__________________________________________________________________________________________________
mixed7 (Concatenate)            (None, 12, 12, 768)  0           activation_60
[0][0]
                                                                 activation_63
[0][0]
                                                                 activation_68
[0][0]
                                                                 activation_69
[0][0]
__________________________________________________________________________________________________
conv2d_72 (Conv2D)              (None, 12, 12, 192)  147456      mixed7[0][0]
__________________________________________________________________________________________________
batch_normalization_72 (BatchNo (None, 12, 12, 192)  576         conv2d_72[0][0]
__________________________________________________________________________________________________
activation_72 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_72[0][0]
__________________________________________________________________________________________________
conv2d_73 (Conv2D)              (None, 12, 12, 192)  258048      activation_72
[0][0]
__________________________________________________________________________________________________
batch_normalization_73 (BatchNo (None, 12, 12, 192)  576         conv2d_73[0][0]
__________________________________________________________________________________________________
activation_73 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_73[0][0]
__________________________________________________________________________________________________
conv2d_70 (Conv2D)              (None, 12, 12, 192)  147456      mixed7[0][0]
__________________________________________________________________________________________________
conv2d_74 (Conv2D)              (None, 12, 12, 192)  258048      activation_73
[0][0]
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__________________________________________________________________________________________________
batch_normalization_70 (BatchNo (None, 12, 12, 192)  576         conv2d_70[0][0]
__________________________________________________________________________________________________
batch_normalization_74 (BatchNo (None, 12, 12, 192)  576         conv2d_74[0][0]
__________________________________________________________________________________________________
activation_70 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_70[0][0]
__________________________________________________________________________________________________
activation_74 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_74[0][0]
__________________________________________________________________________________________________
conv2d_71 (Conv2D)              (None, 5, 5, 320)    552960      activation_70
[0][0]
__________________________________________________________________________________________________
conv2d_75 (Conv2D)              (None, 5, 5, 192)    331776      activation_74
[0][0]
__________________________________________________________________________________________________
batch_normalization_71 (BatchNo (None, 5, 5, 320)    960         conv2d_71[0][0]
__________________________________________________________________________________________________
batch_normalization_75 (BatchNo (None, 5, 5, 192)    576         conv2d_75[0][0]
__________________________________________________________________________________________________
activation_71 (Activation)      (None, 5, 5, 320)    0           batch_normaliza
tion_71[0][0]
__________________________________________________________________________________________________
activation_75 (Activation)      (None, 5, 5, 192)    0           batch_normaliza
tion_75[0][0]
__________________________________________________________________________________________________
max_pooling2d_3 (MaxPooling2D)  (None, 5, 5, 768)    0           mixed7[0][0]
__________________________________________________________________________________________________
mixed8 (Concatenate)            (None, 5, 5, 1280)   0           activation_71
[0][0]
                                                                 activation_75
[0][0]
                                                                 max_pooling2d_3
[0][0]
__________________________________________________________________________________________________
conv2d_80 (Conv2D)              (None, 5, 5, 448)    573440      mixed8[0][0]
__________________________________________________________________________________________________
batch_normalization_80 (BatchNo (None, 5, 5, 448)    1344        conv2d_80[0][0]
__________________________________________________________________________________________________
activation_80 (Activation)      (None, 5, 5, 448)    0           batch_normaliza
tion_80[0][0]
__________________________________________________________________________________________________
conv2d_77 (Conv2D)              (None, 5, 5, 384)    491520      mixed8[0][0]
__________________________________________________________________________________________________
conv2d_81 (Conv2D)              (None, 5, 5, 384)    1548288     activation_80
[0][0]
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__________________________________________________________________________________________________
batch_normalization_77 (BatchNo (None, 5, 5, 384)    1152        conv2d_77[0][0]
__________________________________________________________________________________________________
batch_normalization_81 (BatchNo (None, 5, 5, 384)    1152        conv2d_81[0][0]
__________________________________________________________________________________________________
activation_77 (Activation)      (None, 5, 5, 384)    0           batch_normaliza
tion_77[0][0]
__________________________________________________________________________________________________
activation_81 (Activation)      (None, 5, 5, 384)    0           batch_normaliza
tion_81[0][0]
__________________________________________________________________________________________________
conv2d_78 (Conv2D)              (None, 5, 5, 384)    442368      activation_77
[0][0]
__________________________________________________________________________________________________
conv2d_79 (Conv2D)              (None, 5, 5, 384)    442368      activation_77
[0][0]
__________________________________________________________________________________________________
conv2d_82 (Conv2D)              (None, 5, 5, 384)    442368      activation_81
[0][0]
__________________________________________________________________________________________________
conv2d_83 (Conv2D)              (None, 5, 5, 384)    442368      activation_81
[0][0]
__________________________________________________________________________________________________
average_pooling2d_7 (AveragePoo (None, 5, 5, 1280)   0           mixed8[0][0]
__________________________________________________________________________________________________
conv2d_76 (Conv2D)              (None, 5, 5, 320)    409600      mixed8[0][0]
__________________________________________________________________________________________________
batch_normalization_78 (BatchNo (None, 5, 5, 384)    1152        conv2d_78[0][0]
__________________________________________________________________________________________________
batch_normalization_79 (BatchNo (None, 5, 5, 384)    1152        conv2d_79[0][0]
__________________________________________________________________________________________________
batch_normalization_82 (BatchNo (None, 5, 5, 384)    1152        conv2d_82[0][0]
__________________________________________________________________________________________________
batch_normalization_83 (BatchNo (None, 5, 5, 384)    1152        conv2d_83[0][0]
__________________________________________________________________________________________________
conv2d_84 (Conv2D)              (None, 5, 5, 192)    245760      average_pooling
2d_7[0][0]
__________________________________________________________________________________________________
batch_normalization_76 (BatchNo (None, 5, 5, 320)    960         conv2d_76[0][0]
__________________________________________________________________________________________________
activation_78 (Activation)      (None, 5, 5, 384)    0           batch_normaliza
tion_78[0][0]
__________________________________________________________________________________________________
activation_79 (Activation)      (None, 5, 5, 384)    0           batch_normaliza
tion_79[0][0]
__________________________________________________________________________________________________
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__________________
activation_82 (Activation)      (None, 5, 5, 384)    0           batch_normaliza
tion_82[0][0]
__________________________________________________________________________________
__________________
activation_83 (Activation)      (None, 5, 5, 384)    0           batch_normaliza
tion_83[0][0]
__________________________________________________________________________________
__________________
batch_normalization_84 (BatchNo (None, 5, 5, 192)    576         conv2d_84[0][0]
__________________________________________________________________________________
__________________
activation_76 (Activation)      (None, 5, 5, 320)    0           batch_normaliza
tion_76[0][0]
__________________________________________________________________________________
__________________
mixed9_0 (Concatenate)          (None, 5, 5, 768)    0           activation_78
[0][0]
                                                                 activation_79
[0][0]
__________________________________________________________________________________
__________________
concatenate (Concatenate)       (None, 5, 5, 768)    0           activation_82
[0][0]
                                                                 activation_83
[0][0]
__________________________________________________________________________________
__________________
activation_84 (Activation)      (None, 5, 5, 192)    0           batch_normaliza
tion_84[0][0]
__________________________________________________________________________________
__________________
mixed9 (Concatenate)            (None, 5, 5, 2048)   0           activation_76
[0][0]
                                                                 mixed9_0[0][0]
                                                                 concatenate
[0][0]
                                                                 activation_84
[0][0]
__________________________________________________________________________________
__________________
conv2d_89 (Conv2D)              (None, 5, 5, 448)    917504      mixed9[0][0]
__________________________________________________________________________________
__________________
batch_normalization_89 (BatchNo (None, 5, 5, 448)    1344        conv2d_89[0][0]
__________________________________________________________________________________
__________________
activation_89 (Activation)      (None, 5, 5, 448)    0           batch_normaliza
tion_89[0][0]
__________________________________________________________________________________
__________________
conv2d_86 (Conv2D)              (None, 5, 5, 384)    786432      mixed9[0][0]
__________________________________________________________________________________
__________________
conv2d_90 (Conv2D)              (None, 5, 5, 384)    1548288     activation_89
[0][0]
__________________________________________________________________________________
__________________
batch_normalization_86 (BatchNo (None, 5, 5, 384)    1152        conv2d_86[0][0]
__________________________________________________________________________________
__________________
batch_normalization_90 (BatchNo (None, 5, 5, 384)    1152        conv2d_90[0][0]
__________________________________________________________________________________
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activation_86 (Activation)      (None, 5, 5, 384)    0           batch_normaliza
tion_86[0][0]
__________________________________________________________________________________
__________________
activation_90 (Activation)      (None, 5, 5, 384)    0           batch_normaliza
tion_90[0][0]
__________________________________________________________________________________
__________________
conv2d_87 (Conv2D)              (None, 5, 5, 384)    442368      activation_86
[0][0]
__________________________________________________________________________________
__________________
conv2d_88 (Conv2D)              (None, 5, 5, 384)    442368      activation_86
[0][0]
__________________________________________________________________________________
__________________
conv2d_91 (Conv2D)              (None, 5, 5, 384)    442368      activation_90
[0][0]
__________________________________________________________________________________
__________________
conv2d_92 (Conv2D)              (None, 5, 5, 384)    442368      activation_90
[0][0]
__________________________________________________________________________________
__________________
average_pooling2d_8 (AveragePoo (None, 5, 5, 2048)   0           mixed9[0][0]
__________________________________________________________________________________
__________________
conv2d_85 (Conv2D)              (None, 5, 5, 320)    655360      mixed9[0][0]
__________________________________________________________________________________
__________________
batch_normalization_87 (BatchNo (None, 5, 5, 384)    1152        conv2d_87[0][0]
__________________________________________________________________________________
__________________
batch_normalization_88 (BatchNo (None, 5, 5, 384)    1152        conv2d_88[0][0]
__________________________________________________________________________________
__________________
batch_normalization_91 (BatchNo (None, 5, 5, 384)    1152        conv2d_91[0][0]
__________________________________________________________________________________
__________________
batch_normalization_92 (BatchNo (None, 5, 5, 384)    1152        conv2d_92[0][0]
__________________________________________________________________________________
__________________
conv2d_93 (Conv2D)              (None, 5, 5, 192)    393216      average_pooling
2d_8[0][0]
__________________________________________________________________________________
__________________
batch_normalization_85 (BatchNo (None, 5, 5, 320)    960         conv2d_85[0][0]
__________________________________________________________________________________
__________________
activation_87 (Activation)      (None, 5, 5, 384)    0           batch_normaliza
tion_87[0][0]
__________________________________________________________________________________
__________________
activation_88 (Activation)      (None, 5, 5, 384)    0           batch_normaliza
tion_88[0][0]
__________________________________________________________________________________
__________________
activation_91 (Activation)      (None, 5, 5, 384)    0           batch_normaliza
tion_91[0][0]
__________________________________________________________________________________
__________________
activation_92 (Activation)      (None, 5, 5, 384)    0           batch_normaliza
tion_92[0][0]
__________________________________________________________________________________
```

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__________________
batch_normalization_93 (BatchNo (None, 5, 5, 192)    576         conv2d_93[0][0]
_____________________________________________________________________________
__________________
activation_85 (Activation)      (None, 5, 5, 320)    0           batch_normaliza
tion_85[0][0]
_____________________________________________________________________________
__________________
mixed9_1 (Concatenate)          (None, 5, 5, 768)    0           activation_87
[0][0]
                                                                 activation_88
[0][0]
_____________________________________________________________________________
__________________
concatenate_1 (Concatenate)     (None, 5, 5, 768)    0           activation_91
[0][0]
                                                                 activation_92
[0][0]
_____________________________________________________________________________
__________________
activation_93 (Activation)      (None, 5, 5, 192)    0           batch_normaliza
tion_93[0][0]
_____________________________________________________________________________
__________________
mixed10 (Concatenate)           (None, 5, 5, 2048)   0           activation_85
[0][0]
                                                                 mixed9_1[0][0]
                                                                 concatenate_1
[0][0]
                                                                 activation_93
[0][0]
_____________________________________________________________________________
__________________
avg_pool (GlobalAveragePooling2 (None, 2048)         0           mixed10[0][0]
_____________________________________________________________________________
__________________
predictions (Dense)             (None, 1000)         2049000     avg_pool[0][0]
=============================================================================
==================
Total params: 23,851,784
Trainable params: 23,817,352
Non-trainable params: 34,432
_____________________________________________________________________________
__________________
Model: "functional_1"
_____________________________________________________________________________
__________________
Layer (type)                    Output Shape         Param #     Connected to
=============================================================================
==================
input_1 (InputLayer)            [(None, 224, 224, 3) 0
_____________________________________________________________________________
__________________
conv2d (Conv2D)                 (None, 111, 111, 32) 864         input_1[0][0]
_____________________________________________________________________________
__________________
batch_normalization (BatchNorma (None, 111, 111, 32) 96          conv2d[0][0]
_____________________________________________________________________________
__________________
activation (Activation)         (None, 111, 111, 32) 0           batch_normaliza
tion[0][0]
_____________________________________________________________________________
__________________
conv2d_1 (Conv2D)               (None, 109, 109, 32) 9216        activation
```

```
[0][0]
__________________________________________________________________________________________________
__________________
batch_normalization_1 (BatchNor (None, 109, 109, 32) 96          conv2d_1[0][0]
__________________________________________________________________________________________________
__________________
activation_1 (Activation)       (None, 109, 109, 32) 0           batch_normaliza
tion_1[0][0]
__________________________________________________________________________________________________
__________________
conv2d_2 (Conv2D)               (None, 109, 109, 64) 18432       activation_1
[0][0]
__________________________________________________________________________________________________
__________________
batch_normalization_2 (BatchNor (None, 109, 109, 64) 192         conv2d_2[0][0]
__________________________________________________________________________________________________
__________________
activation_2 (Activation)       (None, 109, 109, 64) 0           batch_normaliza
tion_2[0][0]
__________________________________________________________________________________________________
__________________
max_pooling2d (MaxPooling2D)    (None, 54, 54, 64)   0           activation_2
[0][0]
__________________________________________________________________________________________________
__________________
conv2d_3 (Conv2D)               (None, 54, 54, 80)   5120        max_pooling2d
[0][0]
__________________________________________________________________________________________________
__________________
batch_normalization_3 (BatchNor (None, 54, 54, 80)   240         conv2d_3[0][0]
__________________________________________________________________________________________________
__________________
activation_3 (Activation)       (None, 54, 54, 80)   0           batch_normaliza
tion_3[0][0]
__________________________________________________________________________________________________
__________________
conv2d_4 (Conv2D)               (None, 52, 52, 192)  138240      activation_3
[0][0]
__________________________________________________________________________________________________
__________________
batch_normalization_4 (BatchNor (None, 52, 52, 192)  576         conv2d_4[0][0]
__________________________________________________________________________________________________
__________________
activation_4 (Activation)       (None, 52, 52, 192)  0           batch_normaliza
tion_4[0][0]
__________________________________________________________________________________________________
__________________
max_pooling2d_1 (MaxPooling2D)  (None, 25, 25, 192)  0           activation_4
[0][0]
__________________________________________________________________________________________________
__________________
conv2d_8 (Conv2D)               (None, 25, 25, 64)   12288       max_pooling2d_1
[0][0]
__________________________________________________________________________________________________
__________________
batch_normalization_8 (BatchNor (None, 25, 25, 64)   192         conv2d_8[0][0]
__________________________________________________________________________________________________
__________________
activation_8 (Activation)       (None, 25, 25, 64)   0           batch_normaliza
tion_8[0][0]
__________________________________________________________________________________________________
__________________
conv2d_6 (Conv2D)               (None, 25, 25, 48)   9216        max_pooling2d_1
[0][0]
```

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__________________________________________________________________________________________________
____________________
conv2d_9 (Conv2D)               (None, 25, 25, 96)   55296       activation_8
[0][0]
__________________________________________________________________________________________________
____________________
batch_normalization_6 (BatchNor (None, 25, 25, 48)   144         conv2d_6[0][0]
__________________________________________________________________________________________________
____________________
batch_normalization_9 (BatchNor (None, 25, 25, 96)   288         conv2d_9[0][0]
__________________________________________________________________________________________________
____________________
activation_6 (Activation)       (None, 25, 25, 48)   0           batch_normaliza
tion_6[0][0]
__________________________________________________________________________________________________
____________________
activation_9 (Activation)       (None, 25, 25, 96)   0           batch_normaliza
tion_9[0][0]
__________________________________________________________________________________________________
____________________
average_pooling2d (AveragePooli (None, 25, 25, 192)  0           max_pooling2d_1
[0][0]
__________________________________________________________________________________________________
____________________
conv2d_5 (Conv2D)               (None, 25, 25, 64)   12288       max_pooling2d_1
[0][0]
__________________________________________________________________________________________________
____________________
conv2d_7 (Conv2D)               (None, 25, 25, 64)   76800       activation_6
[0][0]
__________________________________________________________________________________________________
____________________
conv2d_10 (Conv2D)              (None, 25, 25, 96)   82944       activation_9
[0][0]
__________________________________________________________________________________________________
____________________
conv2d_11 (Conv2D)              (None, 25, 25, 32)   6144        average_pooling
2d[0][0]
__________________________________________________________________________________________________
____________________
batch_normalization_5 (BatchNor (None, 25, 25, 64)   192         conv2d_5[0][0]
__________________________________________________________________________________________________
____________________
batch_normalization_7 (BatchNor (None, 25, 25, 64)   192         conv2d_7[0][0]
__________________________________________________________________________________________________
____________________
batch_normalization_10 (BatchNo (None, 25, 25, 96)   288         conv2d_10[0][0]
__________________________________________________________________________________________________
____________________
batch_normalization_11 (BatchNo (None, 25, 25, 32)   96          conv2d_11[0][0]
__________________________________________________________________________________________________
____________________
activation_5 (Activation)       (None, 25, 25, 64)   0           batch_normaliza
tion_5[0][0]
__________________________________________________________________________________________________
____________________
activation_7 (Activation)       (None, 25, 25, 64)   0           batch_normaliza
tion_7[0][0]
__________________________________________________________________________________________________
____________________
activation_10 (Activation)      (None, 25, 25, 96)   0           batch_normaliza
tion_10[0][0]
__________________________________________________________________________________________________
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activation_11 (Activation)      (None, 25, 25, 32)   0           batch_normaliza
tion_11[0][0]
__________________________________________________________________________________
__________________
mixed0 (Concatenate)            (None, 25, 25, 256)  0           activation_5
[0][0]
                                                                 activation_7
[0][0]
                                                                 activation_10
[0][0]
                                                                 activation_11
[0][0]
__________________________________________________________________________________
__________________
conv2d_15 (Conv2D)              (None, 25, 25, 64)   16384       mixed0[0][0]
__________________________________________________________________________________
__________________
batch_normalization_15 (BatchNo (None, 25, 25, 64)   192         conv2d_15[0][0]
__________________________________________________________________________________
__________________
activation_15 (Activation)      (None, 25, 25, 64)   0           batch_normaliza
tion_15[0][0]
__________________________________________________________________________________
__________________
conv2d_13 (Conv2D)              (None, 25, 25, 48)   12288       mixed0[0][0]
__________________________________________________________________________________
__________________
conv2d_16 (Conv2D)              (None, 25, 25, 96)   55296       activation_15
[0][0]
__________________________________________________________________________________
__________________
batch_normalization_13 (BatchNo (None, 25, 25, 48)   144         conv2d_13[0][0]
__________________________________________________________________________________
__________________
batch_normalization_16 (BatchNo (None, 25, 25, 96)   288         conv2d_16[0][0]
__________________________________________________________________________________
__________________
activation_13 (Activation)      (None, 25, 25, 48)   0           batch_normaliza
tion_13[0][0]
__________________________________________________________________________________
__________________
activation_16 (Activation)      (None, 25, 25, 96)   0           batch_normaliza
tion_16[0][0]
__________________________________________________________________________________
__________________
average_pooling2d_1 (AveragePoo (None, 25, 25, 256)  0           mixed0[0][0]
__________________________________________________________________________________
__________________
conv2d_12 (Conv2D)              (None, 25, 25, 64)   16384       mixed0[0][0]
__________________________________________________________________________________
__________________
conv2d_14 (Conv2D)              (None, 25, 25, 64)   76800       activation_13
[0][0]
__________________________________________________________________________________
__________________
conv2d_17 (Conv2D)              (None, 25, 25, 96)   82944       activation_16
[0][0]
__________________________________________________________________________________
__________________
conv2d_18 (Conv2D)              (None, 25, 25, 64)   16384       average_pooling
2d_1[0][0]
__________________________________________________________________________________
__________________
batch_normalization_12 (BatchNo (None, 25, 25, 64)   192         conv2d_12[0][0]
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__________________________________________________________________________________________________
batch_normalization_14 (BatchNo (None, 25, 25, 64)   192         conv2d_14[0][0]
__________________________________________________________________________________________________
batch_normalization_17 (BatchNo (None, 25, 25, 96)   288         conv2d_17[0][0]
__________________________________________________________________________________________________
batch_normalization_18 (BatchNo (None, 25, 25, 64)   192         conv2d_18[0][0]
__________________________________________________________________________________________________
activation_12 (Activation)      (None, 25, 25, 64)   0           batch_normaliza
tion_12[0][0]
__________________________________________________________________________________________________
activation_14 (Activation)      (None, 25, 25, 64)   0           batch_normaliza
tion_14[0][0]
__________________________________________________________________________________________________
activation_17 (Activation)      (None, 25, 25, 96)   0           batch_normaliza
tion_17[0][0]
__________________________________________________________________________________________________
activation_18 (Activation)      (None, 25, 25, 64)   0           batch_normaliza
tion_18[0][0]
__________________________________________________________________________________________________
mixed1 (Concatenate)            (None, 25, 25, 288)  0           activation_12
[0][0]
                                                                 activation_14
[0][0]
                                                                 activation_17
[0][0]
                                                                 activation_18
[0][0]
__________________________________________________________________________________________________
conv2d_22 (Conv2D)              (None, 25, 25, 64)   18432       mixed1[0][0]
__________________________________________________________________________________________________
batch_normalization_22 (BatchNo (None, 25, 25, 64)   192         conv2d_22[0][0]
__________________________________________________________________________________________________
activation_22 (Activation)      (None, 25, 25, 64)   0           batch_normaliza
tion_22[0][0]
__________________________________________________________________________________________________
conv2d_20 (Conv2D)              (None, 25, 25, 48)   13824       mixed1[0][0]
__________________________________________________________________________________________________
conv2d_23 (Conv2D)              (None, 25, 25, 96)   55296       activation_22
[0][0]
__________________________________________________________________________________________________
batch_normalization_20 (BatchNo (None, 25, 25, 48)   144         conv2d_20[0][0]
__________________________________________________________________________________________________
batch_normalization_23 (BatchNo (None, 25, 25, 96)   288         conv2d_23[0][0]
__________________________________________________________________________________________________
activation_20 (Activation)      (None, 25, 25, 48)   0           batch_normaliza
tion_20[0][0]
__________________________________________________________________________________________________
```

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activation_23 (Activation)      (None, 25, 25, 96)   0           batch_normaliza
tion_23[0][0]
__________________________________________________________________________________
__________________
average_pooling2d_2 (AveragePoo (None, 25, 25, 288)  0           mixed1[0][0]
__________________________________________________________________________________
__________________
conv2d_19 (Conv2D)              (None, 25, 25, 64)   18432       mixed1[0][0]
__________________________________________________________________________________
__________________
conv2d_21 (Conv2D)              (None, 25, 25, 64)   76800       activation_20
[0][0]
__________________________________________________________________________________
__________________
conv2d_24 (Conv2D)              (None, 25, 25, 96)   82944       activation_23
[0][0]
__________________________________________________________________________________
__________________
conv2d_25 (Conv2D)              (None, 25, 25, 64)   18432       average_pooling
2d_2[0][0]
__________________________________________________________________________________
__________________
batch_normalization_19 (BatchNo (None, 25, 25, 64)   192         conv2d_19[0][0]
__________________________________________________________________________________
__________________
batch_normalization_21 (BatchNo (None, 25, 25, 64)   192         conv2d_21[0][0]
__________________________________________________________________________________
__________________
batch_normalization_24 (BatchNo (None, 25, 25, 96)   288         conv2d_24[0][0]
__________________________________________________________________________________
__________________
batch_normalization_25 (BatchNo (None, 25, 25, 64)   192         conv2d_25[0][0]
__________________________________________________________________________________
__________________
activation_19 (Activation)      (None, 25, 25, 64)   0           batch_normaliza
tion_19[0][0]
__________________________________________________________________________________
__________________
activation_21 (Activation)      (None, 25, 25, 64)   0           batch_normaliza
tion_21[0][0]
__________________________________________________________________________________
__________________
activation_24 (Activation)      (None, 25, 25, 96)   0           batch_normaliza
tion_24[0][0]
__________________________________________________________________________________
__________________
activation_25 (Activation)      (None, 25, 25, 64)   0           batch_normaliza
tion_25[0][0]
__________________________________________________________________________________
__________________
mixed2 (Concatenate)            (None, 25, 25, 288)  0           activation_19
[0][0]
                                                                 activation_21
[0][0]
                                                                 activation_24
[0][0]
                                                                 activation_25
[0][0]
__________________________________________________________________________________
__________________
conv2d_27 (Conv2D)              (None, 25, 25, 64)   18432       mixed2[0][0]
__________________________________________________________________________________
__________________
batch_normalization_27 (BatchNo (None, 25, 25, 64)   192         conv2d_27[0][0]
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__________________________________________________________________________________________________
activation_27 (Activation)      (None, 25, 25, 64)   0           batch_normaliza
tion_27[0][0]
__________________________________________________________________________________________________
conv2d_28 (Conv2D)              (None, 25, 25, 96)   55296       activation_27
[0][0]
__________________________________________________________________________________________________
batch_normalization_28 (BatchNo (None, 25, 25, 96)   288         conv2d_28[0][0]
__________________________________________________________________________________________________
activation_28 (Activation)      (None, 25, 25, 96)   0           batch_normaliza
tion_28[0][0]
__________________________________________________________________________________________________
conv2d_26 (Conv2D)              (None, 12, 12, 384)  995328      mixed2[0][0]
__________________________________________________________________________________________________
conv2d_29 (Conv2D)              (None, 12, 12, 96)   82944       activation_28
[0][0]
__________________________________________________________________________________________________
batch_normalization_26 (BatchNo (None, 12, 12, 384)  1152        conv2d_26[0][0]
__________________________________________________________________________________________________
batch_normalization_29 (BatchNo (None, 12, 12, 96)   288         conv2d_29[0][0]
__________________________________________________________________________________________________
activation_26 (Activation)      (None, 12, 12, 384)  0           batch_normaliza
tion_26[0][0]
__________________________________________________________________________________________________
activation_29 (Activation)      (None, 12, 12, 96)   0           batch_normaliza
tion_29[0][0]
__________________________________________________________________________________________________
max_pooling2d_2 (MaxPooling2D)  (None, 12, 12, 288)  0           mixed2[0][0]
__________________________________________________________________________________________________
mixed3 (Concatenate)            (None, 12, 12, 768)  0           activation_26
[0][0]
                                                                 activation_29
[0][0]
                                                                 max_pooling2d_2
[0][0]
__________________________________________________________________________________________________
conv2d_34 (Conv2D)              (None, 12, 12, 128)  98304       mixed3[0][0]
__________________________________________________________________________________________________
batch_normalization_34 (BatchNo (None, 12, 12, 128)  384         conv2d_34[0][0]
__________________________________________________________________________________________________
activation_34 (Activation)      (None, 12, 12, 128)  0           batch_normaliza
tion_34[0][0]
__________________________________________________________________________________________________
conv2d_35 (Conv2D)              (None, 12, 12, 128)  114688      activation_34
[0][0]
__________________________________________________________________________________________________
batch_normalization_35 (BatchNo (None, 12, 12, 128)  384         conv2d_35[0][0]
```

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__________________________________________________________________________________________________
activation_35 (Activation)      (None, 12, 12, 128)  0           batch_normaliza
tion_35[0][0]
__________________________________________________________________________________________________
conv2d_31 (Conv2D)              (None, 12, 12, 128)  98304       mixed3[0][0]
__________________________________________________________________________________________________
conv2d_36 (Conv2D)              (None, 12, 12, 128)  114688      activation_35
[0][0]
__________________________________________________________________________________________________
batch_normalization_31 (BatchNo (None, 12, 12, 128)  384         conv2d_31[0][0]
__________________________________________________________________________________________________
batch_normalization_36 (BatchNo (None, 12, 12, 128)  384         conv2d_36[0][0]
__________________________________________________________________________________________________
activation_31 (Activation)      (None, 12, 12, 128)  0           batch_normaliza
tion_31[0][0]
__________________________________________________________________________________________________
activation_36 (Activation)      (None, 12, 12, 128)  0           batch_normaliza
tion_36[0][0]
__________________________________________________________________________________________________
conv2d_32 (Conv2D)              (None, 12, 12, 128)  114688      activation_31
[0][0]
__________________________________________________________________________________________________
conv2d_37 (Conv2D)              (None, 12, 12, 128)  114688      activation_36
[0][0]
__________________________________________________________________________________________________
batch_normalization_32 (BatchNo (None, 12, 12, 128)  384         conv2d_32[0][0]
__________________________________________________________________________________________________
batch_normalization_37 (BatchNo (None, 12, 12, 128)  384         conv2d_37[0][0]
__________________________________________________________________________________________________
activation_32 (Activation)      (None, 12, 12, 128)  0           batch_normaliza
tion_32[0][0]
__________________________________________________________________________________________________
activation_37 (Activation)      (None, 12, 12, 128)  0           batch_normaliza
tion_37[0][0]
__________________________________________________________________________________________________
average_pooling2d_3 (AveragePoo (None, 12, 12, 768)  0           mixed3[0][0]
__________________________________________________________________________________________________
conv2d_30 (Conv2D)              (None, 12, 12, 192)  147456      mixed3[0][0]
__________________________________________________________________________________________________
conv2d_33 (Conv2D)              (None, 12, 12, 192)  172032      activation_32
[0][0]
__________________________________________________________________________________________________
conv2d_38 (Conv2D)              (None, 12, 12, 192)  172032      activation_37
[0][0]
__________________________________________________________________________________________________
conv2d_39 (Conv2D)              (None, 12, 12, 192)  147456      average_pooling
```

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2d_3[0][0]
__________________________________________________________________________________________________
batch_normalization_30 (BatchNo (None, 12, 12, 192)  576         conv2d_30[0][0]
__________________________________________________________________________________________________
batch_normalization_33 (BatchNo (None, 12, 12, 192)  576         conv2d_33[0][0]
__________________________________________________________________________________________________
batch_normalization_38 (BatchNo (None, 12, 12, 192)  576         conv2d_38[0][0]
__________________________________________________________________________________________________
batch_normalization_39 (BatchNo (None, 12, 12, 192)  576         conv2d_39[0][0]
__________________________________________________________________________________________________
activation_30 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_30[0][0]
__________________________________________________________________________________________________
activation_33 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_33[0][0]
__________________________________________________________________________________________________
activation_38 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_38[0][0]
__________________________________________________________________________________________________
activation_39 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_39[0][0]
__________________________________________________________________________________________________
mixed4 (Concatenate)            (None, 12, 12, 768)  0           activation_30
[0][0]
                                                                 activation_33
[0][0]
                                                                 activation_38
[0][0]
                                                                 activation_39
[0][0]
__________________________________________________________________________________________________
conv2d_44 (Conv2D)              (None, 12, 12, 160)  122880      mixed4[0][0]
__________________________________________________________________________________________________
batch_normalization_44 (BatchNo (None, 12, 12, 160)  480         conv2d_44[0][0]
__________________________________________________________________________________________________
activation_44 (Activation)      (None, 12, 12, 160)  0           batch_normaliza
tion_44[0][0]
__________________________________________________________________________________________________
conv2d_45 (Conv2D)              (None, 12, 12, 160)  179200      activation_44
[0][0]
__________________________________________________________________________________________________
batch_normalization_45 (BatchNo (None, 12, 12, 160)  480         conv2d_45[0][0]
__________________________________________________________________________________________________
activation_45 (Activation)      (None, 12, 12, 160)  0           batch_normaliza
tion_45[0][0]
__________________________________________________________________________________________________
conv2d_41 (Conv2D)              (None, 12, 12, 160)  122880      mixed4[0][0]
__________________________________________________________________________________________________
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__________________
conv2d_46 (Conv2D)              (None, 12, 12, 160)  179200      activation_45
[0][0]
__________________________________________________________________________________
__________________
batch_normalization_41 (BatchNo (None, 12, 12, 160)  480         conv2d_41[0][0]
__________________________________________________________________________________
__________________
batch_normalization_46 (BatchNo (None, 12, 12, 160)  480         conv2d_46[0][0]
__________________________________________________________________________________
__________________
activation_41 (Activation)      (None, 12, 12, 160)  0           batch_normaliza
tion_41[0][0]
__________________________________________________________________________________
__________________
activation_46 (Activation)      (None, 12, 12, 160)  0           batch_normaliza
tion_46[0][0]
__________________________________________________________________________________
__________________
conv2d_42 (Conv2D)              (None, 12, 12, 160)  179200      activation_41
[0][0]
__________________________________________________________________________________
__________________
conv2d_47 (Conv2D)              (None, 12, 12, 160)  179200      activation_46
[0][0]
__________________________________________________________________________________
__________________
batch_normalization_42 (BatchNo (None, 12, 12, 160)  480         conv2d_42[0][0]
__________________________________________________________________________________
__________________
batch_normalization_47 (BatchNo (None, 12, 12, 160)  480         conv2d_47[0][0]
__________________________________________________________________________________
__________________
activation_42 (Activation)      (None, 12, 12, 160)  0           batch_normaliza
tion_42[0][0]
__________________________________________________________________________________
__________________
activation_47 (Activation)      (None, 12, 12, 160)  0           batch_normaliza
tion_47[0][0]
__________________________________________________________________________________
__________________
average_pooling2d_4 (AveragePoo (None, 12, 12, 768)  0           mixed4[0][0]
__________________________________________________________________________________
__________________
conv2d_40 (Conv2D)              (None, 12, 12, 192)  147456      mixed4[0][0]
__________________________________________________________________________________
__________________
conv2d_43 (Conv2D)              (None, 12, 12, 192)  215040      activation_42
[0][0]
__________________________________________________________________________________
__________________
conv2d_48 (Conv2D)              (None, 12, 12, 192)  215040      activation_47
[0][0]
__________________________________________________________________________________
__________________
conv2d_49 (Conv2D)              (None, 12, 12, 192)  147456      average_pooling
2d_4[0][0]
__________________________________________________________________________________
__________________
batch_normalization_40 (BatchNo (None, 12, 12, 192)  576         conv2d_40[0][0]
__________________________________________________________________________________
__________________
batch_normalization_43 (BatchNo (None, 12, 12, 192)  576         conv2d_43[0][0]
__________________________________________________________________________________
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__________________
batch_normalization_48 (BatchNo (None, 12, 12, 192)  576         conv2d_48[0][0]
__________________________________________________________________________________________
__________________
batch_normalization_49 (BatchNo (None, 12, 12, 192)  576         conv2d_49[0][0]
__________________________________________________________________________________________
__________________
activation_40 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_40[0][0]
__________________________________________________________________________________________
__________________
activation_43 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_43[0][0]
__________________________________________________________________________________________
__________________
activation_48 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_48[0][0]
__________________________________________________________________________________________
__________________
activation_49 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_49[0][0]
__________________________________________________________________________________________
__________________
mixed5 (Concatenate)            (None, 12, 12, 768)  0           activation_40
[0][0]
                                                                 activation_43
[0][0]
                                                                 activation_48
[0][0]
                                                                 activation_49
[0][0]
__________________________________________________________________________________________
__________________
conv2d_54 (Conv2D)              (None, 12, 12, 160)  122880      mixed5[0][0]
__________________________________________________________________________________________
__________________
batch_normalization_54 (BatchNo (None, 12, 12, 160)  480         conv2d_54[0][0]
__________________________________________________________________________________________
__________________
activation_54 (Activation)      (None, 12, 12, 160)  0           batch_normaliza
tion_54[0][0]
__________________________________________________________________________________________
__________________
conv2d_55 (Conv2D)              (None, 12, 12, 160)  179200      activation_54
[0][0]
__________________________________________________________________________________________
__________________
batch_normalization_55 (BatchNo (None, 12, 12, 160)  480         conv2d_55[0][0]
__________________________________________________________________________________________
__________________
activation_55 (Activation)      (None, 12, 12, 160)  0           batch_normaliza
tion_55[0][0]
__________________________________________________________________________________________
__________________
conv2d_51 (Conv2D)              (None, 12, 12, 160)  122880      mixed5[0][0]
__________________________________________________________________________________________
__________________
conv2d_56 (Conv2D)              (None, 12, 12, 160)  179200      activation_55
[0][0]
__________________________________________________________________________________________
__________________
batch_normalization_51 (BatchNo (None, 12, 12, 160)  480         conv2d_51[0][0]
__________________________________________________________________________________________
__________________
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batch_normalization_56 (BatchNo (None, 12, 12, 160)  480         conv2d_56[0][0]
__________________________________________________________________________________________________
activation_51 (Activation)      (None, 12, 12, 160)  0           batch_normaliza
tion_51[0][0]
__________________________________________________________________________________________________
activation_56 (Activation)      (None, 12, 12, 160)  0           batch_normaliza
tion_56[0][0]
__________________________________________________________________________________________________
conv2d_52 (Conv2D)              (None, 12, 12, 160)  179200      activation_51
[0][0]
__________________________________________________________________________________________________
conv2d_57 (Conv2D)              (None, 12, 12, 160)  179200      activation_56
[0][0]
__________________________________________________________________________________________________
batch_normalization_52 (BatchNo (None, 12, 12, 160)  480         conv2d_52[0][0]
__________________________________________________________________________________________________
batch_normalization_57 (BatchNo (None, 12, 12, 160)  480         conv2d_57[0][0]
__________________________________________________________________________________________________
activation_52 (Activation)      (None, 12, 12, 160)  0           batch_normaliza
tion_52[0][0]
__________________________________________________________________________________________________
activation_57 (Activation)      (None, 12, 12, 160)  0           batch_normaliza
tion_57[0][0]
__________________________________________________________________________________________________
average_pooling2d_5 (AveragePoo (None, 12, 12, 768)  0           mixed5[0][0]
__________________________________________________________________________________________________
conv2d_50 (Conv2D)              (None, 12, 12, 192)  147456      mixed5[0][0]
__________________________________________________________________________________________________
conv2d_53 (Conv2D)              (None, 12, 12, 192)  215040      activation_52
[0][0]
__________________________________________________________________________________________________
conv2d_58 (Conv2D)              (None, 12, 12, 192)  215040      activation_57
[0][0]
__________________________________________________________________________________________________
conv2d_59 (Conv2D)              (None, 12, 12, 192)  147456      average_pooling
2d_5[0][0]
__________________________________________________________________________________________________
batch_normalization_50 (BatchNo (None, 12, 12, 192)  576         conv2d_50[0][0]
__________________________________________________________________________________________________
batch_normalization_53 (BatchNo (None, 12, 12, 192)  576         conv2d_53[0][0]
__________________________________________________________________________________________________
batch_normalization_58 (BatchNo (None, 12, 12, 192)  576         conv2d_58[0][0]
__________________________________________________________________________________________________
batch_normalization_59 (BatchNo (None, 12, 12, 192)  576         conv2d_59[0][0]
__________________________________________________________________________________________________
activation_50 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
```

```
tion_50[0][0]
__________________________________________________________________________________________________
activation_53 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_53[0][0]
__________________________________________________________________________________________________
activation_58 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_58[0][0]
__________________________________________________________________________________________________
activation_59 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_59[0][0]
__________________________________________________________________________________________________
mixed6 (Concatenate)            (None, 12, 12, 768)  0           activation_50
[0][0]
                                                                 activation_53
[0][0]
                                                                 activation_58
[0][0]
                                                                 activation_59
[0][0]
__________________________________________________________________________________________________
conv2d_64 (Conv2D)              (None, 12, 12, 192)  147456      mixed6[0][0]
__________________________________________________________________________________________________
batch_normalization_64 (BatchNo (None, 12, 12, 192)  576         conv2d_64[0][0]
__________________________________________________________________________________________________
activation_64 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_64[0][0]
__________________________________________________________________________________________________
conv2d_65 (Conv2D)              (None, 12, 12, 192)  258048      activation_64
[0][0]
__________________________________________________________________________________________________
batch_normalization_65 (BatchNo (None, 12, 12, 192)  576         conv2d_65[0][0]
__________________________________________________________________________________________________
activation_65 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_65[0][0]
__________________________________________________________________________________________________
conv2d_61 (Conv2D)              (None, 12, 12, 192)  147456      mixed6[0][0]
__________________________________________________________________________________________________
conv2d_66 (Conv2D)              (None, 12, 12, 192)  258048      activation_65
[0][0]
__________________________________________________________________________________________________
batch_normalization_61 (BatchNo (None, 12, 12, 192)  576         conv2d_61[0][0]
__________________________________________________________________________________________________
batch_normalization_66 (BatchNo (None, 12, 12, 192)  576         conv2d_66[0][0]
__________________________________________________________________________________________________
activation_61 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_61[0][0]
__________________________________________________________________________________________________
activation_66 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
```

```
tion_66[0][0]
__________________________________________________________________________________________________
conv2d_62 (Conv2D)              (None, 12, 12, 192)  258048      activation_61
[0][0]
__________________________________________________________________________________________________
conv2d_67 (Conv2D)              (None, 12, 12, 192)  258048      activation_66
[0][0]
__________________________________________________________________________________________________
batch_normalization_62 (BatchNo (None, 12, 12, 192)  576         conv2d_62[0][0]
__________________________________________________________________________________________________
batch_normalization_67 (BatchNo (None, 12, 12, 192)  576         conv2d_67[0][0]
__________________________________________________________________________________________________
activation_62 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_62[0][0]
__________________________________________________________________________________________________
activation_67 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_67[0][0]
__________________________________________________________________________________________________
average_pooling2d_6 (AveragePoo (None, 12, 12, 768)  0           mixed6[0][0]
__________________________________________________________________________________________________
conv2d_60 (Conv2D)              (None, 12, 12, 192)  147456      mixed6[0][0]
__________________________________________________________________________________________________
conv2d_63 (Conv2D)              (None, 12, 12, 192)  258048      activation_62
[0][0]
__________________________________________________________________________________________________
conv2d_68 (Conv2D)              (None, 12, 12, 192)  258048      activation_67
[0][0]
__________________________________________________________________________________________________
conv2d_69 (Conv2D)              (None, 12, 12, 192)  147456      average_pooling
2d_6[0][0]
__________________________________________________________________________________________________
batch_normalization_60 (BatchNo (None, 12, 12, 192)  576         conv2d_60[0][0]
__________________________________________________________________________________________________
batch_normalization_63 (BatchNo (None, 12, 12, 192)  576         conv2d_63[0][0]
__________________________________________________________________________________________________
batch_normalization_68 (BatchNo (None, 12, 12, 192)  576         conv2d_68[0][0]
__________________________________________________________________________________________________
batch_normalization_69 (BatchNo (None, 12, 12, 192)  576         conv2d_69[0][0]
__________________________________________________________________________________________________
activation_60 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_60[0][0]
__________________________________________________________________________________________________
activation_63 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_63[0][0]
__________________________________________________________________________________________________
activation_68 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
```

```
tion_68[0][0]
__________________________________________________________________________________________________
__________________
activation_69 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_69[0][0]
__________________________________________________________________________________________________
__________________
mixed7 (Concatenate)            (None, 12, 12, 768)  0           activation_60
[0][0]
                                                                 activation_63
[0][0]
                                                                 activation_68
[0][0]
                                                                 activation_69
[0][0]
__________________________________________________________________________________________________
__________________
conv2d_72 (Conv2D)              (None, 12, 12, 192)  147456      mixed7[0][0]
__________________________________________________________________________________________________
__________________
batch_normalization_72 (BatchNo (None, 12, 12, 192)  576         conv2d_72[0][0]
__________________________________________________________________________________________________
__________________
activation_72 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_72[0][0]
__________________________________________________________________________________________________
__________________
conv2d_73 (Conv2D)              (None, 12, 12, 192)  258048      activation_72
[0][0]
__________________________________________________________________________________________________
__________________
batch_normalization_73 (BatchNo (None, 12, 12, 192)  576         conv2d_73[0][0]
__________________________________________________________________________________________________
__________________
activation_73 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_73[0][0]
__________________________________________________________________________________________________
__________________
conv2d_70 (Conv2D)              (None, 12, 12, 192)  147456      mixed7[0][0]
__________________________________________________________________________________________________
__________________
conv2d_74 (Conv2D)              (None, 12, 12, 192)  258048      activation_73
[0][0]
__________________________________________________________________________________________________
__________________
batch_normalization_70 (BatchNo (None, 12, 12, 192)  576         conv2d_70[0][0]
__________________________________________________________________________________________________
__________________
batch_normalization_74 (BatchNo (None, 12, 12, 192)  576         conv2d_74[0][0]
__________________________________________________________________________________________________
__________________
activation_70 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_70[0][0]
__________________________________________________________________________________________________
__________________
activation_74 (Activation)      (None, 12, 12, 192)  0           batch_normaliza
tion_74[0][0]
__________________________________________________________________________________________________
__________________
conv2d_71 (Conv2D)              (None, 5, 5, 320)    552960      activation_70
[0][0]
__________________________________________________________________________________________________
__________________
conv2d_75 (Conv2D)              (None, 5, 5, 192)    331776      activation_74
```

```
[0][0]
__________________________________________________________________________________________________
batch_normalization_71 (BatchNo (None, 5, 5, 320)    960         conv2d_71[0][0]
__________________________________________________________________________________________________
batch_normalization_75 (BatchNo (None, 5, 5, 192)    576         conv2d_75[0][0]
__________________________________________________________________________________________________
activation_71 (Activation)      (None, 5, 5, 320)    0           batch_normaliza
tion_71[0][0]
__________________________________________________________________________________________________
activation_75 (Activation)      (None, 5, 5, 192)    0           batch_normaliza
tion_75[0][0]
__________________________________________________________________________________________________
max_pooling2d_3 (MaxPooling2D)  (None, 5, 5, 768)    0           mixed7[0][0]
__________________________________________________________________________________________________
mixed8 (Concatenate)            (None, 5, 5, 1280)   0           activation_71
[0][0]
                                                                 activation_75
[0][0]
                                                                 max_pooling2d_3
[0][0]
__________________________________________________________________________________________________
conv2d_80 (Conv2D)              (None, 5, 5, 448)    573440      mixed8[0][0]
__________________________________________________________________________________________________
batch_normalization_80 (BatchNo (None, 5, 5, 448)    1344        conv2d_80[0][0]
__________________________________________________________________________________________________
activation_80 (Activation)      (None, 5, 5, 448)    0           batch_normaliza
tion_80[0][0]
__________________________________________________________________________________________________
conv2d_77 (Conv2D)              (None, 5, 5, 384)    491520      mixed8[0][0]
__________________________________________________________________________________________________
conv2d_81 (Conv2D)              (None, 5, 5, 384)    1548288     activation_80
[0][0]
__________________________________________________________________________________________________
batch_normalization_77 (BatchNo (None, 5, 5, 384)    1152        conv2d_77[0][0]
__________________________________________________________________________________________________
batch_normalization_81 (BatchNo (None, 5, 5, 384)    1152        conv2d_81[0][0]
__________________________________________________________________________________________________
activation_77 (Activation)      (None, 5, 5, 384)    0           batch_normaliza
tion_77[0][0]
__________________________________________________________________________________________________
activation_81 (Activation)      (None, 5, 5, 384)    0           batch_normaliza
tion_81[0][0]
__________________________________________________________________________________________________
conv2d_78 (Conv2D)              (None, 5, 5, 384)    442368      activation_77
[0][0]
__________________________________________________________________________________________________
conv2d_79 (Conv2D)              (None, 5, 5, 384)    442368      activation_77
```

```
[0][0]
__________________________________________________________________________________________________
conv2d_82 (Conv2D)              (None, 5, 5, 384)    442368      activation_81
[0][0]
__________________________________________________________________________________________________
conv2d_83 (Conv2D)              (None, 5, 5, 384)    442368      activation_81
[0][0]
__________________________________________________________________________________________________
average_pooling2d_7 (AveragePoo (None, 5, 5, 1280)   0           mixed8[0][0]
__________________________________________________________________________________________________
conv2d_76 (Conv2D)              (None, 5, 5, 320)    409600      mixed8[0][0]
__________________________________________________________________________________________________
batch_normalization_78 (BatchNo (None, 5, 5, 384)    1152        conv2d_78[0][0]
__________________________________________________________________________________________________
batch_normalization_79 (BatchNo (None, 5, 5, 384)    1152        conv2d_79[0][0]
__________________________________________________________________________________________________
batch_normalization_82 (BatchNo (None, 5, 5, 384)    1152        conv2d_82[0][0]
__________________________________________________________________________________________________
batch_normalization_83 (BatchNo (None, 5, 5, 384)    1152        conv2d_83[0][0]
__________________________________________________________________________________________________
conv2d_84 (Conv2D)              (None, 5, 5, 192)    245760      average_pooling
2d_7[0][0]
__________________________________________________________________________________________________
batch_normalization_76 (BatchNo (None, 5, 5, 320)    960         conv2d_76[0][0]
__________________________________________________________________________________________________
activation_78 (Activation)      (None, 5, 5, 384)    0           batch_normaliza
tion_78[0][0]
__________________________________________________________________________________________________
activation_79 (Activation)      (None, 5, 5, 384)    0           batch_normaliza
tion_79[0][0]
__________________________________________________________________________________________________
activation_82 (Activation)      (None, 5, 5, 384)    0           batch_normaliza
tion_82[0][0]
__________________________________________________________________________________________________
activation_83 (Activation)      (None, 5, 5, 384)    0           batch_normaliza
tion_83[0][0]
__________________________________________________________________________________________________
batch_normalization_84 (BatchNo (None, 5, 5, 192)    576         conv2d_84[0][0]
__________________________________________________________________________________________________
activation_76 (Activation)      (None, 5, 5, 320)    0           batch_normaliza
tion_76[0][0]
__________________________________________________________________________________________________
mixed9_0 (Concatenate)          (None, 5, 5, 768)    0           activation_78
[0][0]
                                                                 activation_79
[0][0]
__________________________________________________________________________________________________
```

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__________________
concatenate (Concatenate)       (None, 5, 5, 768)    0           activation_82
[0][0]
                                                                 activation_83
[0][0]
__________________________________________________________________________________
__________________
activation_84 (Activation)      (None, 5, 5, 192)    0           batch_normaliza
tion_84[0][0]
__________________________________________________________________________________
__________________
mixed9 (Concatenate)            (None, 5, 5, 2048)   0           activation_76
[0][0]
                                                                 mixed9_0[0][0]
                                                                 concatenate
[0][0]
                                                                 activation_84
[0][0]
__________________________________________________________________________________
__________________
conv2d_89 (Conv2D)              (None, 5, 5, 448)    917504      mixed9[0][0]
__________________________________________________________________________________
__________________
batch_normalization_89 (BatchNo (None, 5, 5, 448)    1344        conv2d_89[0][0]
__________________________________________________________________________________
__________________
activation_89 (Activation)      (None, 5, 5, 448)    0           batch_normaliza
tion_89[0][0]
__________________________________________________________________________________
__________________
conv2d_86 (Conv2D)              (None, 5, 5, 384)    786432      mixed9[0][0]
__________________________________________________________________________________
__________________
conv2d_90 (Conv2D)              (None, 5, 5, 384)    1548288     activation_89
[0][0]
__________________________________________________________________________________
__________________
batch_normalization_86 (BatchNo (None, 5, 5, 384)    1152        conv2d_86[0][0]
__________________________________________________________________________________
__________________
batch_normalization_90 (BatchNo (None, 5, 5, 384)    1152        conv2d_90[0][0]
__________________________________________________________________________________
__________________
activation_86 (Activation)      (None, 5, 5, 384)    0           batch_normaliza
tion_86[0][0]
__________________________________________________________________________________
__________________
activation_90 (Activation)      (None, 5, 5, 384)    0           batch_normaliza
tion_90[0][0]
__________________________________________________________________________________
__________________
conv2d_87 (Conv2D)              (None, 5, 5, 384)    442368      activation_86
[0][0]
__________________________________________________________________________________
__________________
conv2d_88 (Conv2D)              (None, 5, 5, 384)    442368      activation_86
[0][0]
__________________________________________________________________________________
__________________
conv2d_91 (Conv2D)              (None, 5, 5, 384)    442368      activation_90
[0][0]
__________________________________________________________________________________
__________________
conv2d_92 (Conv2D)              (None, 5, 5, 384)    442368      activation_90
```

```
[0][0]
__________________________________________________________________________________________________
__________________
average_pooling2d_8 (AveragePoo (None, 5, 5, 2048)   0           mixed9[0][0]
__________________________________________________________________________________________________
__________________
conv2d_85 (Conv2D)              (None, 5, 5, 320)    655360      mixed9[0][0]
__________________________________________________________________________________________________
__________________
batch_normalization_87 (BatchNo (None, 5, 5, 384)    1152        conv2d_87[0][0]
__________________________________________________________________________________________________
__________________
batch_normalization_88 (BatchNo (None, 5, 5, 384)    1152        conv2d_88[0][0]
__________________________________________________________________________________________________
__________________
batch_normalization_91 (BatchNo (None, 5, 5, 384)    1152        conv2d_91[0][0]
__________________________________________________________________________________________________
__________________
batch_normalization_92 (BatchNo (None, 5, 5, 384)    1152        conv2d_92[0][0]
__________________________________________________________________________________________________
__________________
conv2d_93 (Conv2D)              (None, 5, 5, 192)    393216      average_pooling
2d_8[0][0]
__________________________________________________________________________________________________
__________________
batch_normalization_85 (BatchNo (None, 5, 5, 320)    960         conv2d_85[0][0]
__________________________________________________________________________________________________
__________________
activation_87 (Activation)      (None, 5, 5, 384)    0           batch_normaliza
tion_87[0][0]
__________________________________________________________________________________________________
__________________
activation_88 (Activation)      (None, 5, 5, 384)    0           batch_normaliza
tion_88[0][0]
__________________________________________________________________________________________________
__________________
activation_91 (Activation)      (None, 5, 5, 384)    0           batch_normaliza
tion_91[0][0]
__________________________________________________________________________________________________
__________________
activation_92 (Activation)      (None, 5, 5, 384)    0           batch_normaliza
tion_92[0][0]
__________________________________________________________________________________________________
__________________
batch_normalization_93 (BatchNo (None, 5, 5, 192)    576         conv2d_93[0][0]
__________________________________________________________________________________________________
__________________
activation_85 (Activation)      (None, 5, 5, 320)    0           batch_normaliza
tion_85[0][0]
__________________________________________________________________________________________________
__________________
mixed9_1 (Concatenate)          (None, 5, 5, 768)    0           activation_87
[0][0]
                                                                 activation_88
[0][0]
__________________________________________________________________________________________________
__________________
concatenate_1 (Concatenate)     (None, 5, 5, 768)    0           activation_91
[0][0]
                                                                 activation_92
[0][0]
__________________________________________________________________________________________________
__________________
activation_93 (Activation)      (None, 5, 5, 192)    0           batch_normaliza
```

```
tion_93[0][0]
__________________________________________________________________________________________________
mixed10 (Concatenate)           (None, 5, 5, 2048)   0           activation_85
[0][0]
                                                                 mixed9_1[0][0]
                                                                 concatenate_1
[0][0]
                                                                 activation_93
[0][0]
__________________________________________________________________________________________________
```

In [12]:
```
for layer in custom_resnet_model.layers[:-1]:
    layer.trainable = False

custom_resnet_model.layers[-1].trainable
```

Out[12]:
```
True
```

In [13]:
```
custom_resnet_model.compile(loss='categorical_crossentropy',optimizer='adam',metrics=['accuracy'])
```

In [14]:
```
t=time.time()
hist = custom_resnet_model.fit(X_train, y_train, batch_size=32, epochs=num_epoch, v
erbose=1, validation_data=(X_test, y_test))
print('Training time: %s' % (t - time.time()))
(loss, accuracy) = custom_resnet_model.evaluate(X_test, y_test, batch_size=10, verb
ose=1)
print("[INFO] loss={:.4f}, accuracy: {:.4f}%".format(loss,accuracy * 100))
```

```
Epoch 1/100
147/147 [==============================] - 11s 72ms/step - loss: 1.0208 - accura
cy: 0.8461 - val_loss: 0.4900 - val_accuracy: 0.8993
Epoch 2/100
147/147 [==============================] - 8s 58ms/step - loss: 0.6434 - accurac
y: 0.8824 - val_loss: 0.7102 - val_accuracy: 0.8754
Epoch 3/100
147/147 [==============================] - 9s 58ms/step - loss: 0.4469 - accurac
y: 0.9084 - val_loss: 0.3235 - val_accuracy: 0.9121
Epoch 4/100
147/147 [==============================] - 8s 58ms/step - loss: 0.3187 - accurac
y: 0.9155 - val_loss: 0.3676 - val_accuracy: 0.9172
Epoch 5/100
147/147 [==============================] - 8s 58ms/step - loss: 0.4683 - accurac
y: 0.8999 - val_loss: 1.7047 - val_accuracy: 0.8362
Epoch 6/100
147/147 [==============================] - 9s 58ms/step - loss: 0.4260 - accurac
y: 0.9187 - val_loss: 0.3735 - val_accuracy: 0.9215
Epoch 7/100
147/147 [==============================] - 9s 58ms/step - loss: 0.3582 - accurac
y: 0.9214 - val_loss: 0.3865 - val_accuracy: 0.9172
Epoch 8/100
147/147 [==============================] - 9s 58ms/step - loss: 0.3495 - accurac
y: 0.9204 - val_loss: 0.7358 - val_accuracy: 0.8968
Epoch 9/100
147/147 [==============================] - 9s 58ms/step - loss: 0.3342 - accurac
y: 0.9263 - val_loss: 0.4181 - val_accuracy: 0.9189
Epoch 10/100
147/147 [==============================] - 9s 58ms/step - loss: 0.2527 - accurac
y: 0.9360 - val_loss: 0.3568 - val_accuracy: 0.9224
Epoch 11/100
147/147 [==============================] - 9s 58ms/step - loss: 0.2203 - accurac
y: 0.9402 - val_loss: 0.3575 - val_accuracy: 0.9164
Epoch 12/100
147/147 [==============================] - 9s 58ms/step - loss: 0.2663 - accurac
y: 0.9283 - val_loss: 0.4710 - val_accuracy: 0.8993
Epoch 13/100
147/147 [==============================] - 9s 58ms/step - loss: 0.3595 - accurac
y: 0.9281 - val_loss: 0.5862 - val_accuracy: 0.9036
Epoch 14/100
147/147 [==============================] - 9s 58ms/step - loss: 0.3339 - accurac
y: 0.9268 - val_loss: 0.3374 - val_accuracy: 0.9343
Epoch 15/100
147/147 [==============================] - 9s 58ms/step - loss: 0.2060 - accurac
y: 0.9441 - val_loss: 0.3339 - val_accuracy: 0.9275
Epoch 16/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1878 - accurac
y: 0.9458 - val_loss: 0.3770 - val_accuracy: 0.9181
Epoch 17/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1934 - accurac
y: 0.9466 - val_loss: 0.6175 - val_accuracy: 0.8814
Epoch 18/100
147/147 [==============================] - 9s 58ms/step - loss: 0.3152 - accurac
y: 0.9310 - val_loss: 0.5921 - val_accuracy: 0.8925
Epoch 19/100
147/147 [==============================] - 9s 58ms/step - loss: 0.2916 - accurac
y: 0.9353 - val_loss: 0.9115 - val_accuracy: 0.8626
Epoch 20/100
147/147 [==============================] - 9s 58ms/step - loss: 0.3590 - accurac
y: 0.9255 - val_loss: 0.5896 - val_accuracy: 0.9027
Epoch 21/100
147/147 [==============================] - 9s 58ms/step - loss: 0.3249 - accurac
y: 0.9327 - val_loss: 0.7492 - val_accuracy: 0.9027
```

```
Epoch 22/100
147/147 [==============================] - 9s 58ms/step - loss: 0.2257 - accurac
y: 0.9466 - val_loss: 0.4125 - val_accuracy: 0.9189
Epoch 23/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1791 - accurac
y: 0.9494 - val_loss: 1.2673 - val_accuracy: 0.7986
Epoch 24/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1686 - accurac
y: 0.9547 - val_loss: 0.3550 - val_accuracy: 0.9198
Epoch 25/100
147/147 [==============================] - 9s 58ms/step - loss: 0.2954 - accurac
y: 0.9323 - val_loss: 0.3836 - val_accuracy: 0.9386
Epoch 26/100
147/147 [==============================] - 9s 58ms/step - loss: 0.2097 - accurac
y: 0.9445 - val_loss: 0.5146 - val_accuracy: 0.9198
Epoch 27/100
147/147 [==============================] - 9s 58ms/step - loss: 0.2833 - accurac
y: 0.9381 - val_loss: 0.4192 - val_accuracy: 0.9249
Epoch 28/100
147/147 [==============================] - 9s 58ms/step - loss: 0.2050 - accurac
y: 0.9507 - val_loss: 0.4302 - val_accuracy: 0.9275
Epoch 29/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1999 - accurac
y: 0.9515 - val_loss: 0.5634 - val_accuracy: 0.9096
Epoch 30/100
147/147 [==============================] - 9s 58ms/step - loss: 0.2181 - accurac
y: 0.9524 - val_loss: 0.5809 - val_accuracy: 0.9027
Epoch 31/100
147/147 [==============================] - 9s 58ms/step - loss: 0.2148 - accurac
y: 0.9434 - val_loss: 0.4878 - val_accuracy: 0.9224
Epoch 32/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1840 - accurac
y: 0.9503 - val_loss: 0.4427 - val_accuracy: 0.9275
Epoch 33/100
147/147 [==============================] - 9s 58ms/step - loss: 0.2038 - accurac
y: 0.9451 - val_loss: 1.0047 - val_accuracy: 0.8899
Epoch 34/100
147/147 [==============================] - 9s 58ms/step - loss: 0.2110 - accurac
y: 0.9503 - val_loss: 0.4074 - val_accuracy: 0.9283
Epoch 35/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1570 - accurac
y: 0.9539 - val_loss: 0.4282 - val_accuracy: 0.9275
Epoch 36/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1780 - accurac
y: 0.9528 - val_loss: 0.4919 - val_accuracy: 0.9258
Epoch 37/100
147/147 [==============================] - 9s 59ms/step - loss: 0.1496 - accurac
y: 0.9594 - val_loss: 0.3967 - val_accuracy: 0.9334
Epoch 38/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1540 - accurac
y: 0.9573 - val_loss: 0.4740 - val_accuracy: 0.9198
Epoch 39/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1406 - accurac
y: 0.9556 - val_loss: 0.4325 - val_accuracy: 0.9300
Epoch 40/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1090 - accurac
y: 0.9667 - val_loss: 0.4443 - val_accuracy: 0.9206
Epoch 41/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1838 - accurac
y: 0.9513 - val_loss: 0.5371 - val_accuracy: 0.9189
Epoch 42/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1798 - accurac
y: 0.9543 - val_loss: 0.4792 - val_accuracy: 0.9275
Epoch 43/100
```

```
147/147 [==============================] - 9s 58ms/step - loss: 0.1250 - accurac
y: 0.9635 - val_loss: 0.4698 - val_accuracy: 0.9198
Epoch 44/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1898 - accurac
y: 0.9518 - val_loss: 0.4537 - val_accuracy: 0.9266
Epoch 45/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1291 - accurac
y: 0.9639 - val_loss: 0.5048 - val_accuracy: 0.9181
Epoch 46/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1098 - accurac
y: 0.9667 - val_loss: 0.4585 - val_accuracy: 0.9258
Epoch 47/100
147/147 [==============================] - 9s 58ms/step - loss: 0.4061 - accurac
y: 0.9300 - val_loss: 0.5552 - val_accuracy: 0.9309
Epoch 48/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1978 - accurac
y: 0.9513 - val_loss: 0.5558 - val_accuracy: 0.9309
Epoch 49/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1393 - accurac
y: 0.9611 - val_loss: 0.4993 - val_accuracy: 0.9326
Epoch 50/100
147/147 [==============================] - 9s 58ms/step - loss: 0.2257 - accurac
y: 0.9503 - val_loss: 0.6781 - val_accuracy: 0.9138
Epoch 51/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1340 - accurac
y: 0.9622 - val_loss: 0.6502 - val_accuracy: 0.9224
Epoch 52/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1399 - accurac
y: 0.9614 - val_loss: 0.5504 - val_accuracy: 0.9189
Epoch 53/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1438 - accurac
y: 0.9614 - val_loss: 0.5303 - val_accuracy: 0.9224
Epoch 54/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1315 - accurac
y: 0.9637 - val_loss: 0.4481 - val_accuracy: 0.9258
Epoch 55/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1471 - accurac
y: 0.9603 - val_loss: 0.4904 - val_accuracy: 0.9369
Epoch 56/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1115 - accurac
y: 0.9663 - val_loss: 0.5338 - val_accuracy: 0.9206
Epoch 57/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1683 - accurac
y: 0.9592 - val_loss: 0.5840 - val_accuracy: 0.9155
Epoch 58/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1663 - accurac
y: 0.9567 - val_loss: 0.7930 - val_accuracy: 0.9019
Epoch 59/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1136 - accurac
y: 0.9669 - val_loss: 0.7413 - val_accuracy: 0.8891
Epoch 60/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1238 - accurac
y: 0.9616 - val_loss: 0.5597 - val_accuracy: 0.9283
Epoch 61/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1638 - accurac
y: 0.9562 - val_loss: 0.8839 - val_accuracy: 0.8848
Epoch 62/100
147/147 [==============================] - 9s 58ms/step - loss: 0.0959 - accurac
y: 0.9720 - val_loss: 0.6772 - val_accuracy: 0.9053
Epoch 63/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1185 - accurac
y: 0.9669 - val_loss: 1.1789 - val_accuracy: 0.8387
Epoch 64/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1434 - accurac
```

```
y: 0.9631 - val_loss: 0.6470 - val_accuracy: 0.9121
Epoch 65/100
147/147 [==============================] - 9s 58ms/step - loss: 0.0817 - accurac
y: 0.9752 - val_loss: 0.5366 - val_accuracy: 0.9198
Epoch 66/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1093 - accurac
y: 0.9686 - val_loss: 0.5944 - val_accuracy: 0.9292
Epoch 67/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1161 - accurac
y: 0.9684 - val_loss: 0.8564 - val_accuracy: 0.8720
Epoch 68/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1014 - accurac
y: 0.9708 - val_loss: 0.7628 - val_accuracy: 0.9130
Epoch 69/100
147/147 [==============================] - 9s 58ms/step - loss: 0.2305 - accurac
y: 0.9518 - val_loss: 0.7955 - val_accuracy: 0.8985
Epoch 70/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1172 - accurac
y: 0.9680 - val_loss: 0.5821 - val_accuracy: 0.9215
Epoch 71/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1571 - accurac
y: 0.9609 - val_loss: 0.7850 - val_accuracy: 0.9036
Epoch 72/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1807 - accurac
y: 0.9571 - val_loss: 1.1599 - val_accuracy: 0.8567
Epoch 73/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1128 - accurac
y: 0.9661 - val_loss: 0.6321 - val_accuracy: 0.9258
Epoch 74/100
147/147 [==============================] - 9s 58ms/step - loss: 0.0692 - accurac
y: 0.9767 - val_loss: 0.5624 - val_accuracy: 0.9317
Epoch 75/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1054 - accurac
y: 0.9686 - val_loss: 0.5877 - val_accuracy: 0.9249
Epoch 76/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1229 - accurac
y: 0.9652 - val_loss: 0.5991 - val_accuracy: 0.9241
Epoch 77/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1235 - accurac
y: 0.9678 - val_loss: 0.5696 - val_accuracy: 0.9224
Epoch 78/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1132 - accurac
y: 0.9703 - val_loss: 0.6181 - val_accuracy: 0.9258
Epoch 79/100
147/147 [==============================] - 9s 58ms/step - loss: 0.2153 - accurac
y: 0.9550 - val_loss: 0.6405 - val_accuracy: 0.9266
Epoch 80/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1074 - accurac
y: 0.9658 - val_loss: 0.5567 - val_accuracy: 0.9249
Epoch 81/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1743 - accurac
y: 0.9599 - val_loss: 0.6895 - val_accuracy: 0.9258
Epoch 82/100
147/147 [==============================] - 9s 58ms/step - loss: 0.0895 - accurac
y: 0.9740 - val_loss: 0.5883 - val_accuracy: 0.9224
Epoch 83/100
147/147 [==============================] - 9s 58ms/step - loss: 0.0770 - accurac
y: 0.9750 - val_loss: 0.6008 - val_accuracy: 0.9215
Epoch 84/100
147/147 [==============================] - 9s 58ms/step - loss: 0.0511 - accurac
y: 0.9836 - val_loss: 0.9341 - val_accuracy: 0.8908
Epoch 85/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1628 - accurac
y: 0.9639 - val_loss: 0.6709 - val_accuracy: 0.9155
```

```
Epoch 86/100
147/147 [==============================] - 9s 58ms/step - loss: 0.0954 - accurac
y: 0.9727 - val_loss: 0.5795 - val_accuracy: 0.9249
Epoch 87/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1080 - accurac
y: 0.9671 - val_loss: 0.9625 - val_accuracy: 0.8942
Epoch 88/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1346 - accurac
y: 0.9633 - val_loss: 0.6700 - val_accuracy: 0.9164
Epoch 89/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1471 - accurac
y: 0.9665 - val_loss: 0.5886 - val_accuracy: 0.9275
Epoch 90/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1547 - accurac
y: 0.9616 - val_loss: 0.7518 - val_accuracy: 0.9130
Epoch 91/100
147/147 [==============================] - 9s 58ms/step - loss: 0.0603 - accurac
y: 0.9791 - val_loss: 0.6492 - val_accuracy: 0.9232
Epoch 92/100
147/147 [==============================] - 9s 58ms/step - loss: 0.0439 - accurac
y: 0.9829 - val_loss: 0.6758 - val_accuracy: 0.9172
Epoch 93/100
147/147 [==============================] - 9s 58ms/step - loss: 0.0618 - accurac
y: 0.9778 - val_loss: 0.6672 - val_accuracy: 0.9147
Epoch 94/100
147/147 [==============================] - 9s 58ms/step - loss: 0.2206 - accurac
y: 0.9554 - val_loss: 0.8791 - val_accuracy: 0.9053
Epoch 95/100
147/147 [==============================] - 9s 58ms/step - loss: 0.0679 - accurac
y: 0.9780 - val_loss: 0.6570 - val_accuracy: 0.9172
Epoch 96/100
147/147 [==============================] - 9s 58ms/step - loss: 0.0579 - accurac
y: 0.9812 - val_loss: 0.6256 - val_accuracy: 0.9275
Epoch 97/100
147/147 [==============================] - 9s 58ms/step - loss: 0.0550 - accurac
y: 0.9793 - val_loss: 0.6989 - val_accuracy: 0.9241
Epoch 98/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1363 - accurac
y: 0.9654 - val_loss: 0.7348 - val_accuracy: 0.9113
Epoch 99/100
147/147 [==============================] - 9s 58ms/step - loss: 0.0883 - accurac
y: 0.9752 - val_loss: 0.7566 - val_accuracy: 0.9147
Epoch 100/100
147/147 [==============================] - 9s 58ms/step - loss: 0.1449 - accurac
y: 0.9665 - val_loss: 0.9426 - val_accuracy: 0.9044
Training time: -868.8096132278442
118/118 [==============================] - 4s 30ms/step - loss: 0.9426 - accurac
```

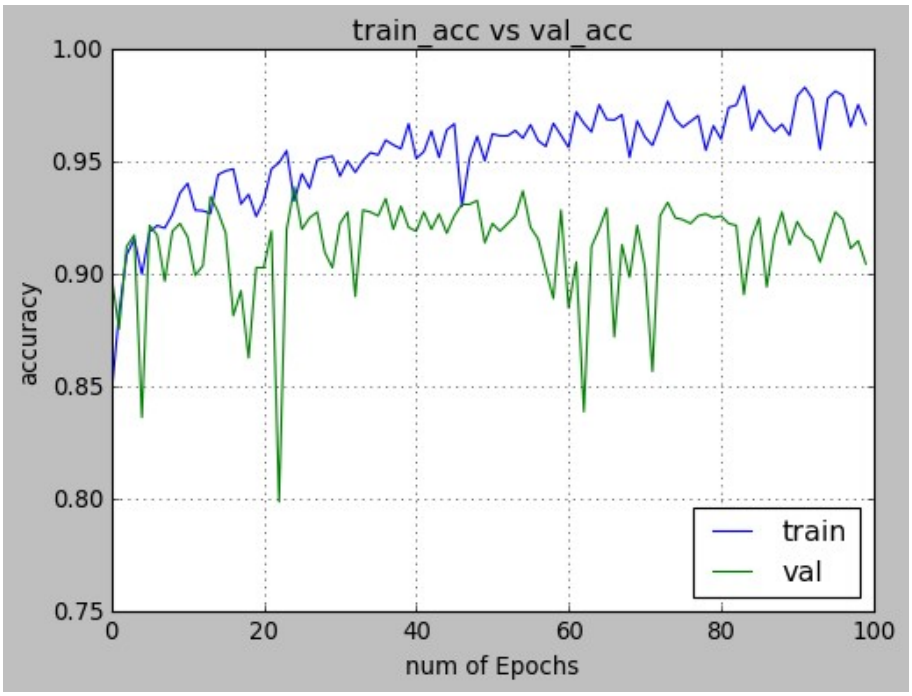
In [15]:
```
(loss, accuracy) = custom_resnet_model.evaluate(X_test, y_test, batch_size=10, verb
ose=1)

print("[INFO] loss={:.4f}, accuracy: {:.4f}%".format(loss,accuracy * 100))
```

```
118/118 [==============================] - 3s 25ms/step - loss: 0.9426 - accurac
y: 0.9044
[INFO] loss=0.9426, accuracy: 90.4437%
```

visualizing losses and accuracy

In [16]:
```
display_loss_accuracy(hist)
```



Evaluating the model

In [17]:
```
score = custom_resnet_model.evaluate(X_test, y_test, verbose=0)
print('Test Loss:', score[0])
print('Test accuracy:', score[1])

test_image = X_test[0:1]
print (test_image.shape)

print(model.predict(test_image))
print(model.predict_classes(test_image))
print(y_test[0:1])
```

```
Test Loss: 0.9426031112670898
Test accuracy: 0.9044368863105774
(1, 224, 224, 3)
[[0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00
  0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00
  0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00
  0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00
  0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00
  0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00
  5.03167715e-37 0.00000000e+00 0.00000000e+00 0.00000000e+00
  0.00000000e+00 0.00000000e+00 1.74047309e-38 0.00000000e+00
  0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00
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  0.00000000e+00 0.00000000e+00 1.10367954e-12 3.56901005e-17
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  0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00
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  1.57690685e-34 0.00000000e+00 0.00000000e+00 0.00000000e+00
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0.00000000e+00 0.00000000e+00 4.44405603e-34 0.00000000e+00
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```

```
---------------------------------------------------------------------------
AttributeError                            Traceback (most recent call last)
<ipython-input-17-83421ec204f5> in <module>
      7
      8 print(model.predict(test_image))
----> 9 print(model.predict_classes(test_image))
```

Testing a new image

In [18]:
```
test_image_path = 'D:/Harold/MyDNN/DataSet/Chest_xray_seperate/PNEUMONIA/person11_bacteria_45.jpeg'
test_image = image.load_img(test_image_path, target_size=(224, 224))
x = image.img_to_array(test_image)
x = np.expand_dims(x, axis=0)
x = preprocess_input(x)
print (x.shape)


# if num_channel==1:
#     if (K.image_data_format() == 'channels_first'):
#         test_image= np.expand_dims(test_image, axis=0)
#         test_image= np.expand_dims(test_image, axis=0)
#         print (test_image.shape)
#     else:
#         test_image= np.expand_dims(test_image, axis=3)
#         test_image= np.expand_dims(test_image, axis=0)
#         print (test_image.shape)
# else:
#     if (K.image_data_format() == 'channels_first'):
#         test_image=np.rollaxis(test_image,2,0)
#         test_image= np.expand_dims(test_image, axis=0)
#         print (test_image.shape)
#     else:
#         test_image= np.expand_dims(test_image, axis=0)
#         print (test_image.shape)


# Predicting the test image
yhat = custom_resnet_model.predict(x)
print(yhat)
# print(custom_resnet_model.predict_classes(x))
label = decode_predictions(yhat)
# retrieve the most likely result, e.g. highest probability
label = label[0][0]
```

```
(1, 224, 224, 3)
[[7.9543006e-20 1.0000000e+00]]

---------------------------------------------------------------------------
ValueError                                Traceback (most recent call last)
<ipython-input-18-505048f79341> in <module>
     30 print(yhat)
     31 # print(custom_resnet_model.predict_classes(x))
---> 32 label = decode_predictions(yhat)
     33 # retrieve the most likely result, e.g. highest probability
     34 label = label[0][0]

D:\Anaconda3\lib\site-packages\tensorflow\python\keras\applications\inception_v
3.py in decode_predictions(preds, top)
    412 @keras_export('keras.applications.inception_v3.decode_predictions')
    413 def decode_predictions(preds, top=5):
--> 414   return imagenet_utils.decode_predictions(preds, top=top)
    415
    416

D:\Anaconda3\lib\site-packages\tensorflow\python\keras\applications\imagenet_uti
ls.py in decode_predictions(preds, top)
    149                      'a batch of predictions '
    150                      '(i.e. a 2D array of shape (samples, 1000)). '
--> 151                      'Found array with shape: ' + str(preds.shape))
    152   if CLASS_INDEX is None:
    153     fpath = data_utils.get_file(

ValueError: `decode_predictions` expects a batch of predictions (i.e. a 2D array
of shape (samples, 1000)). Found array with shape: (1, 2)
```

Visualizing the intermediate layer

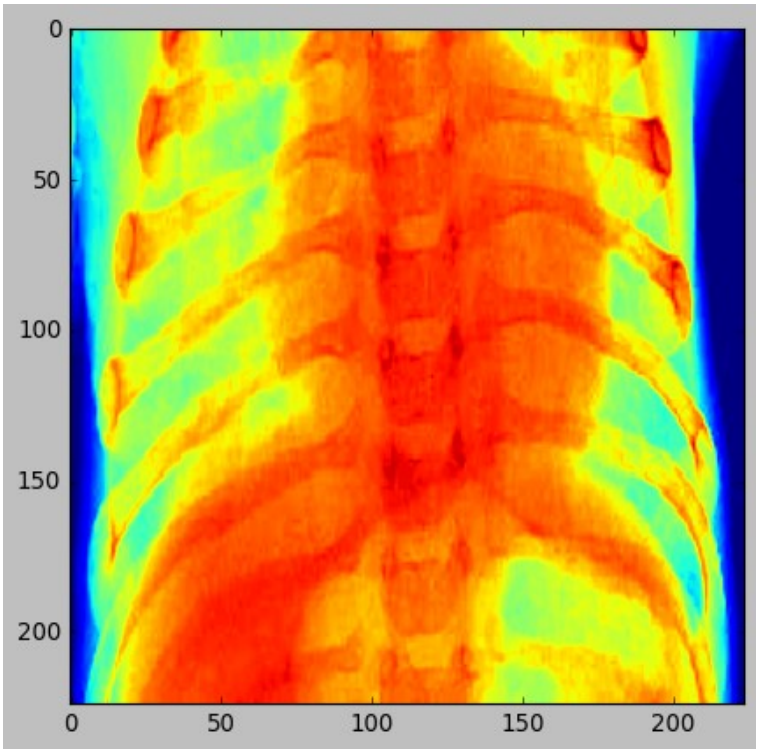
In [19]:
```
from keras.models import Model
layer_outputs = [layer.output for layer in model.layers]
activation_model = Model(inputs=custom_resnet_model.input, outputs=layer_outputs)
activations = custom_resnet_model.predict(X_train[10].reshape(1,224,224,3))
print(activations.shape)
def display_activation(activations, col_size, row_size, act_index):
    activation = activations[0, act_index]
    activation_index=1
    fig, ax = plt.subplots(row_size, col_size, figsize=(row_size*2.5,col_size*1))
    for row in range(0,row_size):
        for col in range(0,col_size):
            ax[row][col].imshow(activation[0, :, :, activation_index], cmap='gray')
            activation_index += 1
plt.imshow(test_image)
plt.imshow(X_train[10][:,:,0]);
display_activation(activations, 8, 4, 1)
```

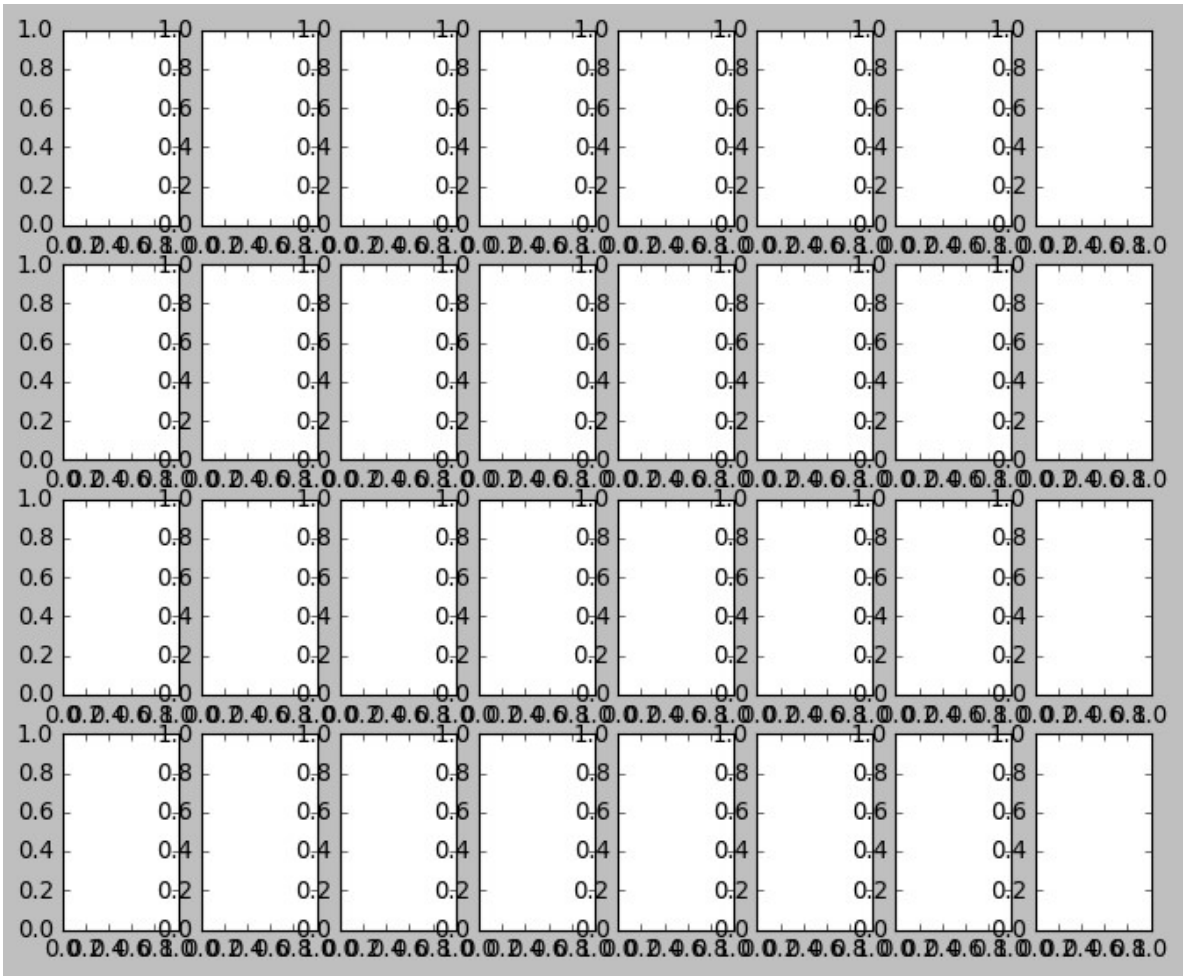
```
(1, 2)
```

```
---------------------------------------------------------------------------
IndexError                                Traceback (most recent call last)
<ipython-input-19-32e8200fb41b> in <module>
     14 plt.imshow(test_image)
     15 plt.imshow(X_train[10][:,:,0]);
---> 16 display_activation(activations, 8, 4, 1)

<ipython-input-19-32e8200fb41b> in display_activation(activations, col_size, row
_size, act_index)
     10     for row in range(0,row_size):
     11         for col in range(0,col_size):
---> 12             ax[row][col].imshow(activation[0, :, :, activation_index], c
map='gray')
     13             activation_index += 1
     14 plt.imshow(test_image)

IndexError: invalid index to scalar variable.
```





Confusion matrix

In [20]:
```
Y_pred = custom_resnet_model.predict(X_test)
print(Y_pred)
y_pred = np.argmax(Y_pred, axis=1)
print(y_pred)
#y_pred = model.predict_classes(X_test)
#print(y_pred)
target_names = ['class 0(Normal)', 'class 1(Pneumonia)']
print(classification_report(np.argmax(y_test,axis=1), y_pred,target_names=target_na
mes))
print(confusion_matrix(np.argmax(y_test,axis=1), y_pred))
```

```
[[2.1685484e-10 1.0000000e+00]
 [9.9941623e-01 5.8379851e-04]
 [2.1206019e-14 1.0000000e+00]
 ...
 [3.4830153e-22 1.0000000e+00]
 [1.7426691e-19 1.0000000e+00]
 [8.4951813e-07 9.9999917e-01]]
[1 0 1 ... 1 1 1]
                    precision    recall  f1-score   support

   class 0(Normal)       0.93      0.70      0.79       312
class 1(Pneumonia)       0.90      0.98      0.94       860

          accuracy                           0.90      1172
         macro avg       0.91      0.84      0.87      1172
      weighted avg       0.91      0.90      0.90      1172

[[217  95]
 [ 17 843]]
```

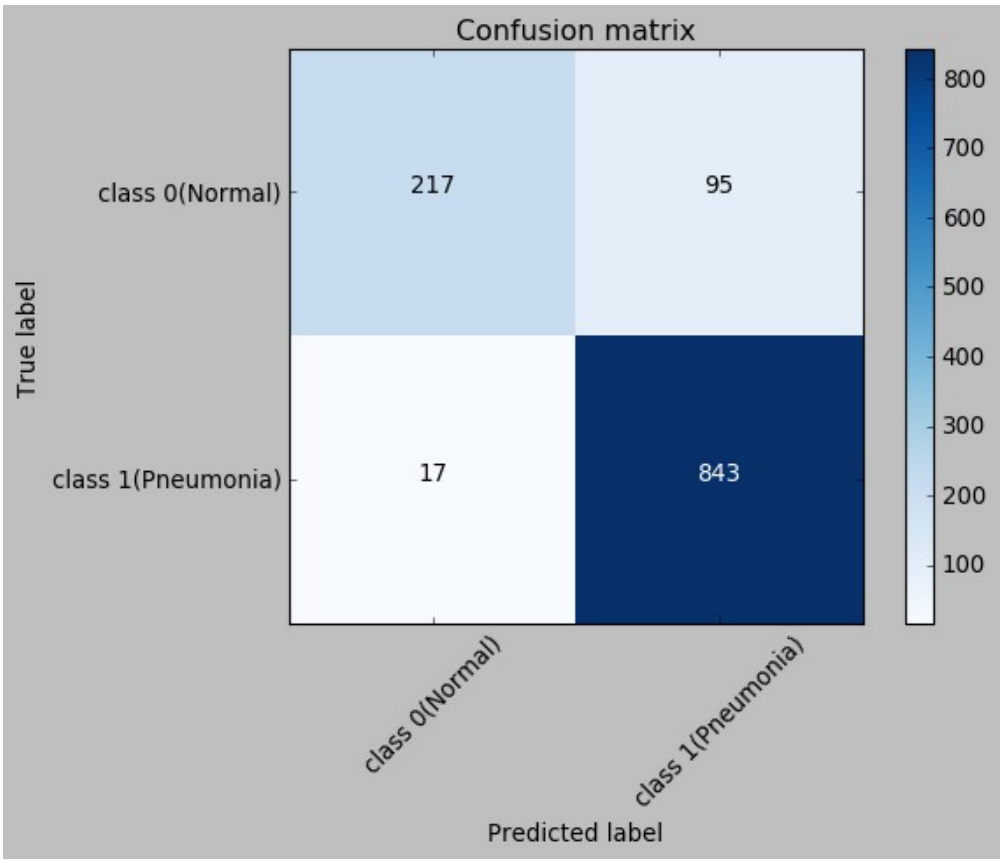
Compute confusion matrix

In [21]:
```
# Compute confusion matrix
cnf_matrix = (confusion_matrix(np.argmax(y_test,axis=1), y_pred))

np.set_printoptions(precision=2)

# Plot non-normalized confusion matrix
plot_confusion_matrix(cnf_matrix, classes=target_names,
                      title='Confusion matrix')
```

```
Confusion matrix, without normalization
[[217  95]
 [ 17 843]]
```



In [ ]:

In [ ]: