

- #6) Object detection using Transfer Learning of CNN architectures
- Load in a pre-trained CNN model trained on a large dataset
 - Freeze parameters (weights) in model's lower convolutional layers
 - Add custom classifier with several layers of trainable parameters to model
 - Train classifier layers on training data available for task
 - Fine-tune hyper parameters and unfreeze more layers as needed

```
import tensorflow as tf
import pandas as pd
import matplotlib.pyplot as plt
from tensorflow.keras import Model
from tensorflow.keras.layers import Conv2D, Dense, MaxPooling2D, Dropout, Flatten, GlobalAveragePooling2D
from tensorflow.keras.models import Sequential
from tensorflow.keras.preprocessing.image import ImageDataGenerator
from tensorflow.keras.callbacks import ReduceLROnPlateau
from tensorflow.keras.layers import Input, Lambda, Dense, Flatten
from tensorflow.keras.models import Model
from tensorflow.keras.applications.inception_v3 import InceptionV3
from tensorflow.keras.applications.inception_v3 import preprocess_input
from tensorflow.keras.preprocessing import image
from tensorflow.keras.preprocessing.image import ImageDataGenerator, load_img
from tensorflow.keras.models import Sequential
import numpy as np
from glob import glob
```

Uploading Data via Kaggle Api

```
from google.colab import files
uploaded=files.upload()
```

Choose Files archive (5).zip

- archive (5).zip(application/zip) - 124379012 bytes, last modified: 10/17/2024 - 100% done

```
!mkdir -p ~/.kaggle
!cp kaggle.json ~/.kaggle/

!chmod 600 ~/.kaggle/kaggle.json
```

cp: cannot stat 'kaggle.json': No such file or directory
 chmod: cannot access '/root/.kaggle/kaggle.json': No such file or directory

```
!kaggle datasets download -d mohamedhanyyy/chest-ctscan-images
```

Dataset URL: <https://www.kaggle.com/datasets/mohamedhanyyy/chest-ctscan-images>
 License(s): ODbL-1.0
 Downloading chest-ctscan-images.zip to /content
 89% 106M/119M [00:00<00:00, 144MB/s]
 100% 119M/119M [00:00<00:00, 143MB/s]

```
from zipfile import ZipFile
file_name = "chest-ctscan-images.zip"
```

```
with ZipFile(file_name, 'r') as zip:
    zip.extractall()
    print('Done')
```

Done

```
#Give dataset path
train_path = '/content/Data/train'
test_path = '/content/Data/test'
```

```
#Give dataset path
train_path = '/content/Data/train'
test_path = '/content/Data/test'
```

```
import warnings
warnings.filterwarnings("ignore", category=FutureWarning)
```

Designing Our Model

```
InceptionV3_model = tf.keras.applications.InceptionV3(weights='imagenet', include_top=False, input_shape=(224, 224, 3))
```


↗ Downloading data from https://storage.googleapis.com/tensorflow/keras-applications/inception_v3/inception_v3_weights_tf_dim_ordering
87910968/87910968 ————— 1s 0us/step

```
from tensorflow.keras import Model
from tensorflow.keras.layers import Conv2D, Dense, MaxPooling2D, Dropout, Flatten, GlobalAveragePooling2D
from tensorflow.keras.models import Sequential
```

```
# The last 15 layers fine tune
for layer in InceptionV3_model.layers[:-15]:
    layer.trainable = False
```

```
x = InceptionV3_model.output
x = GlobalAveragePooling2D()(x)
x = Flatten()(x)
x = Dense(units=512, activation='relu')(x)
x = Dropout(0.3)(x)
x = Dense(units=512, activation='relu')(x)
x = Dropout(0.3)(x)
output = Dense(units=4, activation='softmax')(x)
model = Model(InceptionV3_model.input, output)
```

```
model.summary()
```

 Model: "functional"

Layer (type)	Output Shape	Param #	Connected to
input_layer (InputLayer)	(None, 224, 224, 3)	0	-
conv2d (Conv2D)	(None, 111, 111, 32)	864	input_layer[0][0]
batch_normalization (BatchNormalization)	(None, 111, 111, 32)	96	conv2d[0][0]
activation (Activation)	(None, 111, 111, 32)	0	batch_normalization[0...
conv2d_1 (Conv2D)	(None, 109, 109, 32)	9,216	activation[0][0]
batch_normalization_1 (BatchNormalization)	(None, 109, 109, 32)	96	conv2d_1[0][0]
activation_1 (Activation)	(None, 109, 109, 32)	0	batch_normalization_1...
conv2d_2 (Conv2D)	(None, 109, 109, 64)	18,432	activation_1[0][0]
batch_normalization_2 (BatchNormalization)	(None, 109, 109, 64)	192	conv2d_2[0][0]
activation_2 (Activation)	(None, 109, 109, 64)	0	batch_normalization_2...
max_pooling2d (MaxPooling2D)	(None, 54, 54, 64)	0	activation_2[0][0]
conv2d_3 (Conv2D)	(None, 54, 54, 80)	5,120	max_pooling2d[0][0]
batch_normalization_3 (BatchNormalization)	(None, 54, 54, 80)	240	conv2d_3[0][0]
activation_3 (Activation)	(None, 54, 54, 80)	0	batch_normalization_3...
conv2d_4 (Conv2D)	(None, 52, 52, 192)	138,240	activation_3[0][0]
batch_normalization_4 (BatchNormalization)	(None, 52, 52, 192)	576	conv2d_4[0][0]
activation_4 (Activation)	(None, 52, 52, 192)	0	batch_normalization_4...
max_pooling2d_1 (MaxPooling2D)	(None, 25, 25, 192)	0	activation_4[0][0]
conv2d_8 (Conv2D)	(None, 25, 25, 64)	12,288	max_pooling2d_1[0][0]
batch_normalization_8 (BatchNormalization)	(None, 25, 25, 64)	192	conv2d_8[0][0]
activation_8 (Activation)	(None, 25, 25, 64)	0	batch_normalization_8...
conv2d_6 (Conv2D)	(None, 25, 25, 48)	9,216	max_pooling2d_1[0][0]
conv2d_9 (Conv2D)	(None, 25, 25, 96)	55,296	activation_8[0][0]
batch_normalization_6 (BatchNormalization)	(None, 25, 25, 48)	144	conv2d_6[0][0]
batch_normalization_9 (BatchNormalization)	(None, 25, 25, 96)	288	conv2d_9[0][0]
activation_6 (Activation)	(None, 25, 25, 48)	0	batch_normalization_6...
activation_9 (Activation)	(None, 25, 25, 96)	0	batch_normalization_9...
average_pooling2d (AveragePooling2D)	(None, 25, 25, 192)	0	max_pooling2d_1[0][0]
conv2d_5 (Conv2D)	(None, 25, 25, 64)	12,288	max_pooling2d_1[0][0]
conv2d_7 (Conv2D)	(None, 25, 25, 64)	76,800	activation_6[0][0]
conv2d_10 (Conv2D)	(None, 25, 25, 96)	82,944	activation_9[0][0]
conv2d_11 (Conv2D)	(None, 25, 25, 32)	6,144	average_pooling2d[0][...
batch_normalization_5 (BatchNormalization)	(None, 25, 25, 64)	192	conv2d_5[0][0]
batch_normalization_7 (BatchNormalization)	(None, 25, 25, 64)	192	conv2d_7[0][0]
batch_normalization_10 (BatchNormalization)	(None, 25, 25, 96)	288	conv2d_10[0][0]
batch_normalization_11 (BatchNormalization)	(None, 25, 25, 32)	96	conv2d_11[0][0]
activation_5 (Activation)	(None, 25, 25, 64)	0	batch_normalization_5...

activation_7 (Activation)	(None, 25, 25, 64)	0	batch_normalization_7...
activation_10 (Activation)	(None, 25, 25, 96)	0	batch_normalization_1...
activation_11 (Activation)	(None, 25, 25, 32)	0	batch_normalization_1...
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)	16,384	mixed0[0][0]
batch_normalization_15 (BatchNormalization)	(None, 25, 25, 64)	192	conv2d_15[0][0]
activation_15 (Activation)	(None, 25, 25, 64)	0	batch_normalization_1...
conv2d_13 (Conv2D)	(None, 25, 25, 48)	12,288	mixed0[0][0]
conv2d_16 (Conv2D)	(None, 25, 25, 96)	55,296	activation_15[0][0]
batch_normalization_13 (BatchNormalization)	(None, 25, 25, 48)	144	conv2d_13[0][0]
batch_normalization_16 (BatchNormalization)	(None, 25, 25, 96)	288	conv2d_16[0][0]
activation_13 (Activation)	(None, 25, 25, 48)	0	batch_normalization_1...
activation_16 (Activation)	(None, 25, 25, 96)	0	batch_normalization_1...
average_pooling2d_1 (AveragePooling2D)	(None, 25, 25, 256)	0	mixed0[0][0]
conv2d_12 (Conv2D)	(None, 25, 25, 64)	16,384	mixed0[0][0]
conv2d_14 (Conv2D)	(None, 25, 25, 64)	76,800	activation_13[0][0]
conv2d_17 (Conv2D)	(None, 25, 25, 96)	82,944	activation_16[0][0]
conv2d_18 (Conv2D)	(None, 25, 25, 64)	16,384	average_pooling2d_1[0...
batch_normalization_12 (BatchNormalization)	(None, 25, 25, 64)	192	conv2d_12[0][0]
batch_normalization_14 (BatchNormalization)	(None, 25, 25, 64)	192	conv2d_14[0][0]
batch_normalization_17 (BatchNormalization)	(None, 25, 25, 96)	288	conv2d_17[0][0]
batch_normalization_18 (BatchNormalization)	(None, 25, 25, 64)	192	conv2d_18[0][0]
activation_12 (Activation)	(None, 25, 25, 64)	0	batch_normalization_1...
activation_14 (Activation)	(None, 25, 25, 64)	0	batch_normalization_1...
activation_17 (Activation)	(None, 25, 25, 96)	0	batch_normalization_1...
activation_18 (Activation)	(None, 25, 25, 64)	0	batch_normalization_1...
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)	18,432	mixed1[0][0]
batch_normalization_22 (BatchNormalization)	(None, 25, 25, 64)	192	conv2d_22[0][0]
activation_22 (Activation)	(None, 25, 25, 64)	0	batch_normalization_2...
conv2d_20 (Conv2D)	(None, 25, 25, 48)	13,824	mixed1[0][0]
conv2d_23 (Conv2D)	(None, 25, 25, 96)	55,296	activation_22[0][0]
batch_normalization_20 (BatchNormalization)	(None, 25, 25, 48)	144	conv2d_20[0][0]

batch_normalization_23 (BatchNormalization)	(None, 25, 25, 96)	288	conv2d_23[0][0]
activation_20 (Activation)	(None, 25, 25, 48)	0	batch_normalization_2...
activation_23 (Activation)	(None, 25, 25, 96)	0	batch_normalization_2...
average_pooling2d_2 (AveragePooling2D)	(None, 25, 25, 288)	0	mixed1[0][0]
conv2d_19 (Conv2D)	(None, 25, 25, 64)	18,432	mixed1[0][0]
conv2d_21 (Conv2D)	(None, 25, 25, 64)	76,800	activation_20[0][0]
conv2d_24 (Conv2D)	(None, 25, 25, 96)	82,944	activation_23[0][0]
conv2d_25 (Conv2D)	(None, 25, 25, 64)	18,432	average_pooling2d_2[0...
batch_normalization_19 (BatchNormalization)	(None, 25, 25, 64)	192	conv2d_19[0][0]
batch_normalization_21 (BatchNormalization)	(None, 25, 25, 64)	192	conv2d_21[0][0]
batch_normalization_24 (BatchNormalization)	(None, 25, 25, 96)	288	conv2d_24[0][0]
batch_normalization_25 (BatchNormalization)	(None, 25, 25, 64)	192	conv2d_25[0][0]
activation_19 (Activation)	(None, 25, 25, 64)	0	batch_normalization_1...
activation_21 (Activation)	(None, 25, 25, 64)	0	batch_normalization_2...
activation_24 (Activation)	(None, 25, 25, 96)	0	batch_normalization_2...
activation_25 (Activation)	(None, 25, 25, 64)	0	batch_normalization_2...
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)	18,432	mixed2[0][0]
batch_normalization_27 (BatchNormalization)	(None, 25, 25, 64)	192	conv2d_27[0][0]
activation_27 (Activation)	(None, 25, 25, 64)	0	batch_normalization_2...
conv2d_28 (Conv2D)	(None, 25, 25, 96)	55,296	activation_27[0][0]
batch_normalization_28 (BatchNormalization)	(None, 25, 25, 96)	288	conv2d_28[0][0]
activation_28 (Activation)	(None, 25, 25, 96)	0	batch_normalization_2...
conv2d_26 (Conv2D)	(None, 12, 12, 384)	995,328	mixed2[0][0]
conv2d_29 (Conv2D)	(None, 12, 12, 96)	82,944	activation_28[0][0]
batch_normalization_26 (BatchNormalization)	(None, 12, 12, 384)	1,152	conv2d_26[0][0]
batch_normalization_29 (BatchNormalization)	(None, 12, 12, 96)	288	conv2d_29[0][0]
activation_26 (Activation)	(None, 12, 12, 384)	0	batch_normalization_2...
activation_29 (Activation)	(None, 12, 12, 96)	0	batch_normalization_2...
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)	98,304	mixed3[0][0]
batch_normalization_34 (BatchNormalization)	(None, 12, 12, 128)	384	conv2d_34[0][0]

activation_34 (Activation)	(None, 12, 12, 128)	0	batch_normalization_3...
conv2d_35 (Conv2D)	(None, 12, 12, 128)	114,688	activation_34[0][0]
batch_normalization_35 (BatchNormalization)	(None, 12, 12, 128)	384	conv2d_35[0][0]
activation_35 (Activation)	(None, 12, 12, 128)	0	batch_normalization_3...
conv2d_31 (Conv2D)	(None, 12, 12, 128)	98,304	mixed3[0][0]
conv2d_36 (Conv2D)	(None, 12, 12, 128)	114,688	activation_35[0][0]
batch_normalization_31 (BatchNormalization)	(None, 12, 12, 128)	384	conv2d_31[0][0]
batch_normalization_36 (BatchNormalization)	(None, 12, 12, 128)	384	conv2d_36[0][0]
activation_31 (Activation)	(None, 12, 12, 128)	0	batch_normalization_3...
activation_36 (Activation)	(None, 12, 12, 128)	0	batch_normalization_3...
conv2d_32 (Conv2D)	(None, 12, 12, 128)	114,688	activation_31[0][0]
conv2d_37 (Conv2D)	(None, 12, 12, 128)	114,688	activation_36[0][0]
batch_normalization_32 (BatchNormalization)	(None, 12, 12, 128)	384	conv2d_32[0][0]
batch_normalization_37 (BatchNormalization)	(None, 12, 12, 128)	384	conv2d_37[0][0]
activation_32 (Activation)	(None, 12, 12, 128)	0	batch_normalization_3...
activation_37 (Activation)	(None, 12, 12, 128)	0	batch_normalization_3...
average_pooling2d_3 (AveragePooling2D)	(None, 12, 12, 768)	0	mixed3[0][0]
conv2d_30 (Conv2D)	(None, 12, 12, 192)	147,456	mixed3[0][0]
conv2d_33 (Conv2D)	(None, 12, 12, 192)	172,032	activation_32[0][0]
conv2d_38 (Conv2D)	(None, 12, 12, 192)	172,032	activation_37[0][0]
conv2d_39 (Conv2D)	(None, 12, 12, 192)	147,456	average_pooling2d_3[0...
batch_normalization_30 (BatchNormalization)	(None, 12, 12, 192)	576	conv2d_30[0][0]
batch_normalization_33 (BatchNormalization)	(None, 12, 12, 192)	576	conv2d_33[0][0]
batch_normalization_38 (BatchNormalization)	(None, 12, 12, 192)	576	conv2d_38[0][0]
batch_normalization_39 (BatchNormalization)	(None, 12, 12, 192)	576	conv2d_39[0][0]
activation_30 (Activation)	(None, 12, 12, 192)	0	batch_normalization_3...
activation_33 (Activation)	(None, 12, 12, 192)	0	batch_normalization_3...
activation_38 (Activation)	(None, 12, 12, 192)	0	batch_normalization_3...
activation_39 (Activation)	(None, 12, 12, 192)	0	batch_normalization_3...
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)	122,880	mixed4[0][0]
batch_normalization_44 (BatchNormalization)	(None, 12, 12, 160)	480	conv2d_44[0][0]
activation_44 (Activation)	(None, 12, 12, 160)	0	batch_normalization_4...

conv2d_45 (Conv2D)	(None, 12, 12, 160)	179,200	activation_44[0][0]
batch_normalization_45 (BatchNormalization)	(None, 12, 12, 160)	480	conv2d_45[0][0]
activation_45 (Activation)	(None, 12, 12, 160)	0	batch_normalization_4...
conv2d_41 (Conv2D)	(None, 12, 12, 160)	122,880	mixed4[0][0]
conv2d_46 (Conv2D)	(None, 12, 12, 160)	179,200	activation_45[0][0]
batch_normalization_41 (BatchNormalization)	(None, 12, 12, 160)	480	conv2d_41[0][0]
batch_normalization_46 (BatchNormalization)	(None, 12, 12, 160)	480	conv2d_46[0][0]
activation_41 (Activation)	(None, 12, 12, 160)	0	batch_normalization_4...
activation_46 (Activation)	(None, 12, 12, 160)	0	batch_normalization_4...
conv2d_42 (Conv2D)	(None, 12, 12, 160)	179,200	activation_41[0][0]
conv2d_47 (Conv2D)	(None, 12, 12, 160)	179,200	activation_46[0][0]
batch_normalization_42 (BatchNormalization)	(None, 12, 12, 160)	480	conv2d_42[0][0]
batch_normalization_47 (BatchNormalization)	(None, 12, 12, 160)	480	conv2d_47[0][0]
activation_42 (Activation)	(None, 12, 12, 160)	0	batch_normalization_4...
activation_47 (Activation)	(None, 12, 12, 160)	0	batch_normalization_4...
average_pooling2d_4 (AveragePooling2D)	(None, 12, 12, 768)	0	mixed4[0][0]
conv2d_40 (Conv2D)	(None, 12, 12, 192)	147,456	mixed4[0][0]
conv2d_43 (Conv2D)	(None, 12, 12, 192)	215,040	activation_42[0][0]
conv2d_48 (Conv2D)	(None, 12, 12, 192)	215,040	activation_47[0][0]
conv2d_49 (Conv2D)	(None, 12, 12, 192)	147,456	average_pooling2d_4[0...
batch_normalization_40 (BatchNormalization)	(None, 12, 12, 192)	576	conv2d_40[0][0]
batch_normalization_43 (BatchNormalization)	(None, 12, 12, 192)	576	conv2d_43[0][0]
batch_normalization_48 (BatchNormalization)	(None, 12, 12, 192)	576	conv2d_48[0][0]
batch_normalization_49 (BatchNormalization)	(None, 12, 12, 192)	576	conv2d_49[0][0]
activation_40 (Activation)	(None, 12, 12, 192)	0	batch_normalization_4...
activation_43 (Activation)	(None, 12, 12, 192)	0	batch_normalization_4...
activation_48 (Activation)	(None, 12, 12, 192)	0	batch_normalization_4...
activation_49 (Activation)	(None, 12, 12, 192)	0	batch_normalization_4...
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)	122,880	mixed5[0][0]
batch_normalization_54 (BatchNormalization)	(None, 12, 12, 160)	480	conv2d_54[0][0]
activation_54 (Activation)	(None, 12, 12, 160)	0	batch_normalization_5...
conv2d_55 (Conv2D)	(None, 12, 12, 160)	179,200	activation_54[0][0]
batch_normalization_55 (BatchNormalization)	(None, 12, 12, 160)	480	conv2d_55[0][0]

activation_55 (Activation)	(None, 12, 12, 160)	0	batch_normalization_5...
conv2d_51 (Conv2D)	(None, 12, 12, 160)	122,880	mixed5[0][0]
conv2d_56 (Conv2D)	(None, 12, 12, 160)	179,200	activation_55[0][0]
batch_normalization_51 (BatchNormalization)	(None, 12, 12, 160)	480	conv2d_51[0][0]
batch_normalization_56 (BatchNormalization)	(None, 12, 12, 160)	480	conv2d_56[0][0]
activation_51 (Activation)	(None, 12, 12, 160)	0	batch_normalization_5...
activation_56 (Activation)	(None, 12, 12, 160)	0	batch_normalization_5...
conv2d_52 (Conv2D)	(None, 12, 12, 160)	179,200	activation_51[0][0]
conv2d_57 (Conv2D)	(None, 12, 12, 160)	179,200	activation_56[0][0]
batch_normalization_52 (BatchNormalization)	(None, 12, 12, 160)	480	conv2d_52[0][0]
batch_normalization_57 (BatchNormalization)	(None, 12, 12, 160)	480	conv2d_57[0][0]
activation_52 (Activation)	(None, 12, 12, 160)	0	batch_normalization_5...
activation_57 (Activation)	(None, 12, 12, 160)	0	batch_normalization_5...
average_pooling2d_5 (AveragePooling2D)	(None, 12, 12, 768)	0	mixed5[0][0]
conv2d_50 (Conv2D)	(None, 12, 12, 192)	147,456	mixed5[0][0]
conv2d_53 (Conv2D)	(None, 12, 12, 192)	215,040	activation_52[0][0]
conv2d_58 (Conv2D)	(None, 12, 12, 192)	215,040	activation_57[0][0]
conv2d_59 (Conv2D)	(None, 12, 12, 192)	147,456	average_pooling2d_5[0...
batch_normalization_50 (BatchNormalization)	(None, 12, 12, 192)	576	conv2d_50[0][0]
batch_normalization_53 (BatchNormalization)	(None, 12, 12, 192)	576	conv2d_53[0][0]
batch_normalization_58 (BatchNormalization)	(None, 12, 12, 192)	576	conv2d_58[0][0]
batch_normalization_59 (BatchNormalization)	(None, 12, 12, 192)	576	conv2d_59[0][0]
activation_50 (Activation)	(None, 12, 12, 192)	0	batch_normalization_5...
activation_53 (Activation)	(None, 12, 12, 192)	0	batch_normalization_5...
activation_58 (Activation)	(None, 12, 12, 192)	0	batch_normalization_5...
activation_59 (Activation)	(None, 12, 12, 192)	0	batch_normalization_5...
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)	147,456	mixed6[0][0]
batch_normalization_64 (BatchNormalization)	(None, 12, 12, 192)	576	conv2d_64[0][0]
activation_64 (Activation)	(None, 12, 12, 192)	0	batch_normalization_6...
conv2d_65 (Conv2D)	(None, 12, 12, 192)	258,048	activation_64[0][0]
batch_normalization_65 (BatchNormalization)	(None, 12, 12, 192)	576	conv2d_65[0][0]
activation_65 (Activation)	(None, 12, 12, 192)	0	batch_normalization_6...
conv2d_61 (Conv2D)	(None, 12, 12, 192)	147,456	mixed6[0][0]

conv2d_66 (Conv2D)	(None, 12, 12, 192)	258,048	activation_65[0][0]
batch_normalization_61 (BatchNormalization)	(None, 12, 12, 192)	576	conv2d_61[0][0]
batch_normalization_66 (BatchNormalization)	(None, 12, 12, 192)	576	conv2d_66[0][0]
activation_61 (Activation)	(None, 12, 12, 192)	0	batch_normalization_6...
activation_66 (Activation)	(None, 12, 12, 192)	0	batch_normalization_6...
conv2d_62 (Conv2D)	(None, 12, 12, 192)	258,048	activation_61[0][0]
conv2d_67 (Conv2D)	(None, 12, 12, 192)	258,048	activation_66[0][0]
batch_normalization_62 (BatchNormalization)	(None, 12, 12, 192)	576	conv2d_62[0][0]
batch_normalization_67 (BatchNormalization)	(None, 12, 12, 192)	576	conv2d_67[0][0]
activation_62 (Activation)	(None, 12, 12, 192)	0	batch_normalization_6...
activation_67 (Activation)	(None, 12, 12, 192)	0	batch_normalization_6...
average_pooling2d_6 (AveragePooling2D)	(None, 12, 12, 768)	0	mixed6[0][0]
conv2d_60 (Conv2D)	(None, 12, 12, 192)	147,456	mixed6[0][0]
conv2d_63 (Conv2D)	(None, 12, 12, 192)	258,048	activation_62[0][0]
conv2d_68 (Conv2D)	(None, 12, 12, 192)	258,048	activation_67[0][0]
conv2d_69 (Conv2D)	(None, 12, 12, 192)	147,456	average_pooling2d_6[0...
batch_normalization_60 (BatchNormalization)	(None, 12, 12, 192)	576	conv2d_60[0][0]
batch_normalization_63 (BatchNormalization)	(None, 12, 12, 192)	576	conv2d_63[0][0]
batch_normalization_68 (BatchNormalization)	(None, 12, 12, 192)	576	conv2d_68[0][0]
batch_normalization_69 (BatchNormalization)	(None, 12, 12, 192)	576	conv2d_69[0][0]
activation_60 (Activation)	(None, 12, 12, 192)	0	batch_normalization_6...
activation_63 (Activation)	(None, 12, 12, 192)	0	batch_normalization_6...
activation_68 (Activation)	(None, 12, 12, 192)	0	batch_normalization_6...
activation_69 (Activation)	(None, 12, 12, 192)	0	batch_normalization_6...
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)	147,456	mixed7[0][0]
batch_normalization_72 (BatchNormalization)	(None, 12, 12, 192)	576	conv2d_72[0][0]
activation_72 (Activation)	(None, 12, 12, 192)	0	batch_normalization_7...
conv2d_73 (Conv2D)	(None, 12, 12, 192)	258,048	activation_72[0][0]
batch_normalization_73 (BatchNormalization)	(None, 12, 12, 192)	576	conv2d_73[0][0]
activation_73 (Activation)	(None, 12, 12, 192)	0	batch_normalization_7...
conv2d_70 (Conv2D)	(None, 12, 12, 192)	147,456	mixed7[0][0]
conv2d_74 (Conv2D)	(None, 12, 12, 192)	258,048	activation_73[0][0]
batch_normalization_70 (BatchNormalization)	(None, 12, 12, 192)	576	conv2d_70[0][0]