+ Code   + Text

Fine Tuning using InceptionResNetV2

Gayanthika Shankar

School of Computing and Data Science

gayanthika.s-26@scds.saiuniversity.edu.in

```python
from google.colab import drive
drive.mount('/content/gdrive')
```

```
Mounted at /content/gdrive
```

```python
import tensorflow as tf
print(tf.__version__)

from tensorflow import keras
tf.random.set_seed(42)

import numpy as np
np.random.seed(42)

import matplotlib.pyplot as plt
%matplotlib inline

import glob
import PIL
from PIL import Image
```

```
2.17.1
```

Load the preprocessed dataset and model from drive

```python
# load numpy array from npy file
from numpy import load

X_train_std = load('/content/gdrive/MyDrive/DL/X_train_std_model3.npy')
X_test_std = load('/content/gdrive/MyDrive/DL/X_test_std_model3.npy')

y_train = load('/content/gdrive/MyDrive/DL/y_train_model3.npy')
y_test = load('/content/gdrive/MyDrive/DL/y_test_model3.npy')


print("X_train_std_shape: {}".format(X_train_std.shape))
print("X_test_std_shape: {}".format(X_test_std.shape))
```

```
X_train_std_shape: (1245, 299, 299, 3)
X_test_std_shape: (416, 299, 299, 3)
```

```python
base_model3 = keras.applications.InceptionResNetV2(
    include_top=False,
    input_shape=(299,299,3),
    weights='imagenet'
)
base_model3.trainable = False

x = keras.layers.GlobalAveragePooling2D()(base_model3.output)
x = keras.layers.Dropout(0.15)(x)
output_ = keras.layers.Dense(3, activation='softmax')(x)
model3 = keras.models.Model(inputs=[base_model3.input], outputs=[output_])

#Compile the model
model3.compile(
    optimizer='adam',
    loss='categorical_crossentropy',
    metrics=['accuracy']
)

#Load the saved weights
model3.load_weights('/content/gdrive/MyDrive/DL/InceptionResNetV2_Best_Model_TL.h
```

```
Downloading data from https://storage.googleapis.com/tensorflow/keras-applicat
219055592/219055592 ──────────────── 10s 0us/step
```

```python
model3.summary()
```

```
Model: "functional"
```

Layer (type)	Output Shape	Param #	Connec
input_layer (InputLayer)	(None, 299, 299, 3)	0	–
conv2d (Conv2D)	(None, 149, 149, 32)	864	input_
batch_normalization (BatchNormalization)	(None, 149, 149, 32)	96	conv2c
activation (Activation)	(None, 149, 149, 32)	0	batch_
conv2d_1 (Conv2D)	(None, 147, 147, 32)	9,216	activa
batch_normalization_1 (BatchNormalization)	(None, 147, 147, 32)	96	conv2c
activation_1 (Activation)	(None, 147, 147, 32)	0	batch_
conv2d_2 (Conv2D)	(None, 147, 147, 64)	18,432	activa
batch_normalization_2 (BatchNormalization)	(None, 147, 147, 64)	192	conv2c
activation_2 (Activation)	(None, 147, 147, 64)	0	batch_
max_pooling2d (MaxPooling2D)	(None, 73, 73, 64)	0	activa
conv2d_3 (Conv2D)	(None, 73, 73, 80)	5,120	max_pc
batch_normalization_3 (BatchNormalization)	(None, 73, 73, 80)	240	conv2c
activation_3 (Activation)	(None, 73, 73, 80)	0	batch_
conv2d_4 (Conv2D)	(None, 71, 71, 192)	138,240	activa
batch_normalization_4 (BatchNormalization)	(None, 71, 71, 192)	576	conv2c
activation_4 (Activation)	(None, 71, 71, 192)	0	batch_
max_pooling2d_1 (MaxPooling2D)	(None, 35, 35, 192)	0	activa
conv2d_8 (Conv2D)	(None, 35, 35, 64)	12,288	max_pc
batch_normalization_8 (BatchNormalization)	(None, 35, 35, 64)	192	conv2c
activation_8 (Activation)	(None, 35, 35, 64)	0	batch_
conv2d_6 (Conv2D)	(None, 35, 35, 48)	9,216	max_pc

conv2d_9 (Conv2D)	(None, 35, 35, 96)	55,296	activa
batch_normalization_6 (BatchNormalization)	(None, 35, 35, 48)	144	conv2d
batch_normalization_9 (BatchNormalization)	(None, 35, 35, 96)	288	conv2d
activation_6 (Activation)	(None, 35, 35, 48)	0	batch_
activation_9 (Activation)	(None, 35, 35, 96)	0	batch_
average_pooling2d (AveragePooling2D)	(None, 35, 35, 192)	0	max_po
conv2d_5 (Conv2D)	(None, 35, 35, 96)	18,432	max_po
conv2d_7 (Conv2D)	(None, 35, 35, 64)	76,800	activa
conv2d_10 (Conv2D)	(None, 35, 35, 96)	82,944	activa
conv2d_11 (Conv2D)	(None, 35, 35, 64)	12,288	averag
batch_normalization_5 (BatchNormalization)	(None, 35, 35, 96)	288	conv2d
batch_normalization_7 (BatchNormalization)	(None, 35, 35, 64)	192	conv2d
batch_normalization_10 (BatchNormalization)	(None, 35, 35, 96)	288	conv2d
batch_normalization_11 (BatchNormalization)	(None, 35, 35, 64)	192	conv2d
activation_5 (Activation)	(None, 35, 35, 96)	0	batch_
activation_7 (Activation)	(None, 35, 35, 64)	0	batch_
activation_10 (Activation)	(None, 35, 35, 96)	0	batch_
activation_11 (Activation)	(None, 35, 35, 64)	0	batch_
mixed_5b (Concatenate)	(None, 35, 35, 320)	0	activa activa activa activa
conv2d_15 (Conv2D)	(None, 35, 35, 32)	10,240	mixed_
batch_normalization_15	(None, 35, 35, 32)	96	conv2d

batch_normalization_15 (BatchNormalization)	(None, 35, 35, 32)	96	conv2(
activation_15 (Activation)	(None, 35, 35, 32)	0	batch_
conv2d_13 (Conv2D)	(None, 35, 35, 32)	10,240	mixed_
conv2d_16 (Conv2D)	(None, 35, 35, 48)	13,824	activa
batch_normalization_13 (BatchNormalization)	(None, 35, 35, 32)	96	conv2(
batch_normalization_16 (BatchNormalization)	(None, 35, 35, 48)	144	conv2(
activation_13 (Activation)	(None, 35, 35, 32)	0	batch_
activation_16 (Activation)	(None, 35, 35, 48)	0	batch_
conv2d_12 (Conv2D)	(None, 35, 35, 32)	10,240	mixed_
conv2d_14 (Conv2D)	(None, 35, 35, 32)	9,216	activa
conv2d_17 (Conv2D)	(None, 35, 35, 64)	27,648	activa
batch_normalization_12 (BatchNormalization)	(None, 35, 35, 32)	96	conv2(
batch_normalization_14 (BatchNormalization)	(None, 35, 35, 32)	96	conv2(
batch_normalization_17 (BatchNormalization)	(None, 35, 35, 64)	192	conv2(
activation_12 (Activation)	(None, 35, 35, 32)	0	batch_
activation_14 (Activation)	(None, 35, 35, 32)	0	batch_
activation_17 (Activation)	(None, 35, 35, 64)	0	batch_
block35_1_mixed (Concatenate)	(None, 35, 35, 128)	0	activa activa activa
block35_1_conv (Conv2D)	(None, 35, 35, 320)	41,280	block3
custom_scale_layer (CustomScaleLayer)	(None, 35, 35, 320)	0	mixed_ block3

block35_1_ac (Activation)	(None, 35, 35, 320)	0	custom
conv2d_21 (Conv2D)	(None, 35, 35, 32)	10,240	block3
batch_normalization_21 (BatchNormalization)	(None, 35, 35, 32)	96	conv2c
activation_21 (Activation)	(None, 35, 35, 32)	0	batch_
conv2d_19 (Conv2D)	(None, 35, 35, 32)	10,240	block3
conv2d_22 (Conv2D)	(None, 35, 35, 48)	13,824	activa
batch_normalization_19 (BatchNormalization)	(None, 35, 35, 32)	96	conv2c
batch_normalization_22 (BatchNormalization)	(None, 35, 35, 48)	144	conv2c
activation_19 (Activation)	(None, 35, 35, 32)	0	batch_
activation_22 (Activation)	(None, 35, 35, 48)	0	batch_
conv2d_18 (Conv2D)	(None, 35, 35, 32)	10,240	block3
conv2d_20 (Conv2D)	(None, 35, 35, 32)	9,216	activa
conv2d_23 (Conv2D)	(None, 35, 35, 64)	27,648	activa
batch_normalization_18 (BatchNormalization)	(None, 35, 35, 32)	96	conv2c
batch_normalization_20 (BatchNormalization)	(None, 35, 35, 32)	96	conv2c
batch_normalization_23 (BatchNormalization)	(None, 35, 35, 64)	192	conv2c
activation_18 (Activation)	(None, 35, 35, 32)	0	batch_
activation_20 (Activation)	(None, 35, 35, 32)	0	batch_
activation_23 (Activation)	(None, 35, 35, 64)	0	batch_
block35_2_mixed (Concatenate)	(None, 35, 35, 128)	0	activa activa activa

			activ
block35_2_conv (Conv2D)	(None, 35, 35, 320)	41,280	block3
custom_scale_layer_1 (CustomScaleLayer)	(None, 35, 35, 320)	0	block3 block3
block35_2_ac (Activation)	(None, 35, 35, 320)	0	custor
conv2d_27 (Conv2D)	(None, 35, 35, 32)	10,240	block3
batch_normalization_27 (BatchNormalization)	(None, 35, 35, 32)	96	conv2c
activation_27 (Activation)	(None, 35, 35, 32)	0	batch_
conv2d_25 (Conv2D)	(None, 35, 35, 32)	10,240	block3
conv2d_28 (Conv2D)	(None, 35, 35, 48)	13,824	activa
batch_normalization_25 (BatchNormalization)	(None, 35, 35, 32)	96	conv2c
batch_normalization_28 (BatchNormalization)	(None, 35, 35, 48)	144	conv2c
activation_25 (Activation)	(None, 35, 35, 32)	0	batch_
activation_28 (Activation)	(None, 35, 35, 48)	0	batch_
conv2d_24 (Conv2D)	(None, 35, 35, 32)	10,240	block3
conv2d_26 (Conv2D)	(None, 35, 35, 32)	9,216	activa
conv2d_29 (Conv2D)	(None, 35, 35, 64)	27,648	activa
batch_normalization_24 (BatchNormalization)	(None, 35, 35, 32)	96	conv2c
batch_normalization_26 (BatchNormalization)	(None, 35, 35, 32)	96	conv2c
batch_normalization_29 (BatchNormalization)	(None, 35, 35, 64)	192	conv2c
activation_24 (Activation)	(None, 35, 35, 32)	0	batch_
activation_26 (Activation)	(None, 35, 35, 32)	0	batch_

Layer	Output Shape	Param #	Connected to
activation_29 (Activation)	(None, 35, 35, 64)	0	batch_
block35_3_mixed (Concatenate)	(None, 35, 35, 128)	0	activa activa activa
block35_3_conv (Conv2D)	(None, 35, 35, 320)	41,280	block3
custom_scale_layer_2 (CustomScaleLayer)	(None, 35, 35, 320)	0	block3 block3
block35_3_ac (Activation)	(None, 35, 35, 320)	0	custor
conv2d_33 (Conv2D)	(None, 35, 35, 32)	10,240	block3
batch_normalization_33 (BatchNormalization)	(None, 35, 35, 32)	96	conv2c
activation_33 (Activation)	(None, 35, 35, 32)	0	batch_
conv2d_31 (Conv2D)	(None, 35, 35, 32)	10,240	block3
conv2d_34 (Conv2D)	(None, 35, 35, 48)	13,824	activa
batch_normalization_31 (BatchNormalization)	(None, 35, 35, 32)	96	conv2c
batch_normalization_34 (BatchNormalization)	(None, 35, 35, 48)	144	conv2c
activation_31 (Activation)	(None, 35, 35, 32)	0	batch_
activation_34 (Activation)	(None, 35, 35, 48)	0	batch_
conv2d_30 (Conv2D)	(None, 35, 35, 32)	10,240	block3
conv2d_32 (Conv2D)	(None, 35, 35, 32)	9,216	activa
conv2d_35 (Conv2D)	(None, 35, 35, 64)	27,648	activa
batch_normalization_30 (BatchNormalization)	(None, 35, 35, 32)	96	conv2c
batch_normalization_32 (BatchNormalization)	(None, 35, 35, 32)	96	conv2c
batch_normalization_35 (BatchNormalization)	(None, 35, 35, 64)	192	conv2c
activation_30	(None, 35, 35, 32)	0	batch_

activation_30 (Activation)	(None, 35, 35, 32)	0	batch_
activation_32 (Activation)	(None, 35, 35, 32)	0	batch_
activation_35 (Activation)	(None, 35, 35, 64)	0	batch_
block35_4_mixed (Concatenate)	(None, 35, 35, 128)	0	activa activa activa
block35_4_conv (Conv2D)	(None, 35, 35, 320)	41,280	block3
custom_scale_layer_3 (CustomScaleLayer)	(None, 35, 35, 320)	0	block3 block3
block35_4_ac (Activation)	(None, 35, 35, 320)	0	custom
conv2d_39 (Conv2D)	(None, 35, 35, 32)	10,240	block3
batch_normalization_39 (BatchNormalization)	(None, 35, 35, 32)	96	conv2c
activation_39 (Activation)	(None, 35, 35, 32)	0	batch_
conv2d_37 (Conv2D)	(None, 35, 35, 32)	10,240	block3
conv2d_40 (Conv2D)	(None, 35, 35, 48)	13,824	activa
batch_normalization_37 (BatchNormalization)	(None, 35, 35, 32)	96	conv2c
batch_normalization_40 (BatchNormalization)	(None, 35, 35, 48)	144	conv2c
activation_37 (Activation)	(None, 35, 35, 32)	0	batch_
activation_40 (Activation)	(None, 35, 35, 48)	0	batch_
conv2d_36 (Conv2D)	(None, 35, 35, 32)	10,240	block3
conv2d_38 (Conv2D)	(None, 35, 35, 32)	9,216	activa
conv2d_41 (Conv2D)	(None, 35, 35, 64)	27,648	activa
batch_normalization_36 (BatchNormalization)	(None, 35, 35, 32)	96	conv2c
batch_normalization_38 (BatchNormalization)	(None, 35, 35, 32)	96	conv2c

(BatchNormalization)			
batch_normalization_41 (BatchNormalization)	(None, 35, 35, 64)	192	conv2d
activation_36 (Activation)	(None, 35, 35, 32)	0	batch_
activation_38 (Activation)	(None, 35, 35, 32)	0	batch_
activation_41 (Activation)	(None, 35, 35, 64)	0	batch_
block35_5_mixed (Concatenate)	(None, 35, 35, 128)	0	activa activa activa
block35_5_conv (Conv2D)	(None, 35, 35, 320)	41,280	block3
custom_scale_layer_4 (CustomScaleLayer)	(None, 35, 35, 320)	0	block3 block3
block35_5_ac (Activation)	(None, 35, 35, 320)	0	custom
conv2d_45 (Conv2D)	(None, 35, 35, 32)	10,240	block3
batch_normalization_45 (BatchNormalization)	(None, 35, 35, 32)	96	conv2d
activation_45 (Activation)	(None, 35, 35, 32)	0	batch_
conv2d_43 (Conv2D)	(None, 35, 35, 32)	10,240	block3
conv2d_46 (Conv2D)	(None, 35, 35, 48)	13,824	activa
batch_normalization_43 (BatchNormalization)	(None, 35, 35, 32)	96	conv2d
batch_normalization_46 (BatchNormalization)	(None, 35, 35, 48)	144	conv2d
activation_43 (Activation)	(None, 35, 35, 32)	0	batch_
activation_46 (Activation)	(None, 35, 35, 48)	0	batch_
conv2d_42 (Conv2D)	(None, 35, 35, 32)	10,240	block3
conv2d_44 (Conv2D)	(None, 35, 35, 32)	9,216	activa
conv2d_47 (Conv2D)	(None, 35, 35, 64)	27,648	activa

conv2d_47 (Conv2D)	(None, 35, 35, 64)	17,040	conv2d
batch_normalization_42 (BatchNormalization)	(None, 35, 35, 32)	96	conv2d
batch_normalization_44 (BatchNormalization)	(None, 35, 35, 32)	96	conv2d
batch_normalization_47 (BatchNormalization)	(None, 35, 35, 64)	192	conv2d
activation_42 (Activation)	(None, 35, 35, 32)	0	batch_
activation_44 (Activation)	(None, 35, 35, 32)	0	batch_
activation_47 (Activation)	(None, 35, 35, 64)	0	batch_
block35_6_mixed (Concatenate)	(None, 35, 35, 128)	0	activa activa activa
block35_6_conv (Conv2D)	(None, 35, 35, 320)	41,280	block3
custom_scale_layer_5 (CustomScaleLayer)	(None, 35, 35, 320)	0	block3 block3
block35_6_ac (Activation)	(None, 35, 35, 320)	0	custom
conv2d_51 (Conv2D)	(None, 35, 35, 32)	10,240	block3
batch_normalization_51 (BatchNormalization)	(None, 35, 35, 32)	96	conv2d
activation_51 (Activation)	(None, 35, 35, 32)	0	batch_
conv2d_49 (Conv2D)	(None, 35, 35, 32)	10,240	block3
conv2d_52 (Conv2D)	(None, 35, 35, 48)	13,824	activa
batch_normalization_49 (BatchNormalization)	(None, 35, 35, 32)	96	conv2d
batch_normalization_52 (BatchNormalization)	(None, 35, 35, 48)	144	conv2d
activation_49 (Activation)	(None, 35, 35, 32)	0	batch_
activation_52 (Activation)	(None, 35, 35, 48)	0	batch_

Layer	Output Shape	Param #	Connected to
conv2d_48 (Conv2D)	(None, 35, 35, 32)	10,240	block3
conv2d_50 (Conv2D)	(None, 35, 35, 32)	9,216	activa
conv2d_53 (Conv2D)	(None, 35, 35, 64)	27,648	activa
batch_normalization_48 (BatchNormalization)	(None, 35, 35, 32)	96	conv2c
batch_normalization_50 (BatchNormalization)	(None, 35, 35, 32)	96	conv2c
batch_normalization_53 (BatchNormalization)	(None, 35, 35, 64)	192	conv2c
activation_48 (Activation)	(None, 35, 35, 32)	0	batch_
activation_50 (Activation)	(None, 35, 35, 32)	0	batch_
activation_53 (Activation)	(None, 35, 35, 64)	0	batch_
block35_7_mixed (Concatenate)	(None, 35, 35, 128)	0	activa activa activa
block35_7_conv (Conv2D)	(None, 35, 35, 320)	41,280	block3
custom_scale_layer_6 (CustomScaleLayer)	(None, 35, 35, 320)	0	block3 block3
block35_7_ac (Activation)	(None, 35, 35, 320)	0	custor
conv2d_57 (Conv2D)	(None, 35, 35, 32)	10,240	block3
batch_normalization_57 (BatchNormalization)	(None, 35, 35, 32)	96	conv2c
activation_57 (Activation)	(None, 35, 35, 32)	0	batch_
conv2d_55 (Conv2D)	(None, 35, 35, 32)	10,240	block3
conv2d_58 (Conv2D)	(None, 35, 35, 48)	13,824	activa
batch_normalization_55 (BatchNormalization)	(None, 35, 35, 32)	96	conv2c
batch_normalization_58 (BatchNormalization)	(None, 35, 35, 48)	144	conv2c

activation_55 (Activation)	(None, 35, 35, 32)	0	batch_
conv2d_54 (Conv2D)	(None, 35, 35, 32)	10,240	block3
conv2d_56 (Conv2D)	(None, 35, 35, 32)	9,216	activa
conv2d_59 (Conv2D)	(None, 35, 35, 64)	27,648	activa
batch_normalization_54 (BatchNormalization)	(None, 35, 35, 32)	96	conv2c
batch_normalization_56 (BatchNormalization)	(None, 35, 35, 32)	96	conv2c
batch_normalization_59 (BatchNormalization)	(None, 35, 35, 64)	192	conv2c
activation_54 (Activation)	(None, 35, 35, 32)	0	batch_
activation_56 (Activation)	(None, 35, 35, 32)	0	batch_
activation_59 (Activation)	(None, 35, 35, 64)	0	batch_
block35_8_mixed (Concatenate)	(None, 35, 35, 128)	0	activa activa activa
block35_8_conv (Conv2D)	(None, 35, 35, 320)	41,280	block3
custom_scale_layer_7 (CustomScaleLayer)	(None, 35, 35, 320)	0	block3 block3
block35_8_ac (Activation)	(None, 35, 35, 320)	0	custor
conv2d_63 (Conv2D)	(None, 35, 35, 32)	10,240	block3
batch_normalization_63 (BatchNormalization)	(None, 35, 35, 32)	96	conv2c
activation_63 (Activation)	(None, 35, 35, 32)	0	batch_
conv2d_61 (Conv2D)	(None, 35, 35, 32)	10,240	block3
conv2d_64 (Conv2D)	(None, 35, 35, 48)	13,824	activa
batch_normalization_61	(None, 35, 35, 32)	96	conv2c

Layer	Output Shape	Param #	Connected to
batch_normalization_61 (BatchNormalization)	(None, 35, 35, 32)	96	conv2d
batch_normalization_64 (BatchNormalization)	(None, 35, 35, 48)	144	conv2d
activation_61 (Activation)	(None, 35, 35, 32)	0	batch_
activation_64 (Activation)	(None, 35, 35, 48)	0	batch_
conv2d_60 (Conv2D)	(None, 35, 35, 32)	10,240	block3
conv2d_62 (Conv2D)	(None, 35, 35, 32)	9,216	activa
conv2d_65 (Conv2D)	(None, 35, 35, 64)	27,648	activa
batch_normalization_60 (BatchNormalization)	(None, 35, 35, 32)	96	conv2d
batch_normalization_62 (BatchNormalization)	(None, 35, 35, 32)	96	conv2d
batch_normalization_65 (BatchNormalization)	(None, 35, 35, 64)	192	conv2d
activation_60 (Activation)	(None, 35, 35, 32)	0	batch_
activation_62 (Activation)	(None, 35, 35, 32)	0	batch_
activation_65 (Activation)	(None, 35, 35, 64)	0	batch_
block35_9_mixed (Concatenate)	(None, 35, 35, 128)	0	activa activa activa
block35_9_conv (Conv2D)	(None, 35, 35, 320)	41,280	block3
custom_scale_layer_8 (CustomScaleLayer)	(None, 35, 35, 320)	0	block3 block3
block35_9_ac (Activation)	(None, 35, 35, 320)	0	custom
conv2d_69 (Conv2D)	(None, 35, 35, 32)	10,240	block3
batch_normalization_69 (BatchNormalization)	(None, 35, 35, 32)	96	conv2d
activation_69 (Activation)	(None, 35, 35, 32)	0	batch_

conv2d_67 (Conv2D)	(None, 35, 35, 32)	10,240	block3
conv2d_70 (Conv2D)	(None, 35, 35, 48)	13,824	activa
batch_normalization_67 (BatchNormalization)	(None, 35, 35, 32)	96	conv2c
batch_normalization_70 (BatchNormalization)	(None, 35, 35, 48)	144	conv2c
activation_67 (Activation)	(None, 35, 35, 32)	0	batch_
activation_70 (Activation)	(None, 35, 35, 48)	0	batch_
conv2d_66 (Conv2D)	(None, 35, 35, 32)	10,240	block3
conv2d_68 (Conv2D)	(None, 35, 35, 32)	9,216	activa
conv2d_71 (Conv2D)	(None, 35, 35, 64)	27,648	activa
batch_normalization_66 (BatchNormalization)	(None, 35, 35, 32)	96	conv2c
batch_normalization_68 (BatchNormalization)	(None, 35, 35, 32)	96	conv2c
batch_normalization_71 (BatchNormalization)	(None, 35, 35, 64)	192	conv2c
activation_66 (Activation)	(None, 35, 35, 32)	0	batch_
activation_68 (Activation)	(None, 35, 35, 32)	0	batch_
activation_71 (Activation)	(None, 35, 35, 64)	0	batch_
block35_10_mixed (Concatenate)	(None, 35, 35, 128)	0	activa activa activa
block35_10_conv (Conv2D)	(None, 35, 35, 320)	41,280	block3
custom_scale_layer_9 (CustomScaleLayer)	(None, 35, 35, 320)	0	block3 block3
block35_10_ac (Activation)	(None, 35, 35, 320)	0	custom
conv2d_73 (Conv2D)	(None, 35, 35, 256)	81,920	block3

conv2d_73 (Conv2D)	(None, 35, 35, 256)	81,920	block3
batch_normalization_73 (BatchNormalization)	(None, 35, 35, 256)	768	conv2d
activation_73 (Activation)	(None, 35, 35, 256)	0	batch_
conv2d_74 (Conv2D)	(None, 35, 35, 256)	589,824	activa
batch_normalization_74 (BatchNormalization)	(None, 35, 35, 256)	768	conv2d
activation_74 (Activation)	(None, 35, 35, 256)	0	batch_
conv2d_72 (Conv2D)	(None, 17, 17, 384)	1,105,920	block3
conv2d_75 (Conv2D)	(None, 17, 17, 384)	884,736	activa
batch_normalization_72 (BatchNormalization)	(None, 17, 17, 384)	1,152	conv2d
batch_normalization_75 (BatchNormalization)	(None, 17, 17, 384)	1,152	conv2d
activation_72 (Activation)	(None, 17, 17, 384)	0	batch_
activation_75 (Activation)	(None, 17, 17, 384)	0	batch_
max_pooling2d_2 (MaxPooling2D)	(None, 17, 17, 320)	0	block3
mixed_6a (Concatenate)	(None, 17, 17, 1088)	0	activa activa max_po
conv2d_77 (Conv2D)	(None, 17, 17, 128)	139,264	mixed_
batch_normalization_77 (BatchNormalization)	(None, 17, 17, 128)	384	conv2d
activation_77 (Activation)	(None, 17, 17, 128)	0	batch_
conv2d_78 (Conv2D)	(None, 17, 17, 160)	143,360	activa
batch_normalization_78 (BatchNormalization)	(None, 17, 17, 160)	480	conv2d
activation_78 (Activation)	(None, 17, 17, 160)	0	batch_

conv2d_76 (Conv2D)	(None, 17, 17, 192)	208,896	mixed_
conv2d_79 (Conv2D)	(None, 17, 17, 192)	215,040	activa
batch_normalization_76 (BatchNormalization)	(None, 17, 17, 192)	576	conv2c
batch_normalization_79 (BatchNormalization)	(None, 17, 17, 192)	576	conv2c
activation_76 (Activation)	(None, 17, 17, 192)	0	batch_
activation_79 (Activation)	(None, 17, 17, 192)	0	batch_
block17_1_mixed (Concatenate)	(None, 17, 17, 384)	0	activa activa
block17_1_conv (Conv2D)	(None, 17, 17, 1088)	418,880	block1
custom_scale_layer_10 (CustomScaleLayer)	(None, 17, 17, 1088)	0	mixed_ block1
block17_1_ac (Activation)	(None, 17, 17, 1088)	0	custon
conv2d_81 (Conv2D)	(None, 17, 17, 128)	139,264	block1
batch_normalization_81 (BatchNormalization)	(None, 17, 17, 128)	384	conv2c
activation_81 (Activation)	(None, 17, 17, 128)	0	batch_
conv2d_82 (Conv2D)	(None, 17, 17, 160)	143,360	activa
batch_normalization_82 (BatchNormalization)	(None, 17, 17, 160)	480	conv2c
activation_82 (Activation)	(None, 17, 17, 160)	0	batch_
conv2d_80 (Conv2D)	(None, 17, 17, 192)	208,896	block1
conv2d_83 (Conv2D)	(None, 17, 17, 192)	215,040	activa
batch_normalization_80 (BatchNormalization)	(None, 17, 17, 192)	576	conv2c
batch_normalization_83 (BatchNormalization)	(None, 17, 17, 192)	576	conv2c
activation 80	(None, 17, 17, 192)	0	batch

activation_83 (Activation)	(None, 17, 17, 192)	0	batch_
activation_83 (Activation)	(None, 17, 17, 192)	0	batch_
block17_2_mixed (Concatenate)	(None, 17, 17, 384)	0	activa... activa...
block17_2_conv (Conv2D)	(None, 17, 17, 1088)	418,880	block1
custom_scale_layer_11 (CustomScaleLayer)	(None, 17, 17, 1088)	0	block1 block1
block17_2_ac (Activation)	(None, 17, 17, 1088)	0	custor
conv2d_85 (Conv2D)	(None, 17, 17, 128)	139,264	block1
batch_normalization_85 (BatchNormalization)	(None, 17, 17, 128)	384	conv2c
activation_85 (Activation)	(None, 17, 17, 128)	0	batch_
conv2d_86 (Conv2D)	(None, 17, 17, 160)	143,360	activa
batch_normalization_86 (BatchNormalization)	(None, 17, 17, 160)	480	conv2c
activation_86 (Activation)	(None, 17, 17, 160)	0	batch_
conv2d_84 (Conv2D)	(None, 17, 17, 192)	208,896	block1
conv2d_87 (Conv2D)	(None, 17, 17, 192)	215,040	activa
batch_normalization_84 (BatchNormalization)	(None, 17, 17, 192)	576	conv2c
batch_normalization_87 (BatchNormalization)	(None, 17, 17, 192)	576	conv2c
activation_84 (Activation)	(None, 17, 17, 192)	0	batch_
activation_87 (Activation)	(None, 17, 17, 192)	0	batch_
block17_3_mixed (Concatenate)	(None, 17, 17, 384)	0	activa activa
block17_3_conv (Conv2D)	(None, 17, 17, 1088)	418,880	block1
custom_scale_layer_12 (CustomScaleLayer)	(None, 17, 17, 1088)	0	block1 block1

(CustomScaleLayer)			block1
block17_3_ac (Activation)	(None, 17, 17, 1088)	0	custor
conv2d_89 (Conv2D)	(None, 17, 17, 128)	139,264	block1
batch_normalization_89 (BatchNormalization)	(None, 17, 17, 128)	384	conv2c
activation_89 (Activation)	(None, 17, 17, 128)	0	batch_
conv2d_90 (Conv2D)	(None, 17, 17, 160)	143,360	activa
batch_normalization_90 (BatchNormalization)	(None, 17, 17, 160)	480	conv2c
activation_90 (Activation)	(None, 17, 17, 160)	0	batch_
conv2d_88 (Conv2D)	(None, 17, 17, 192)	208,896	block1
conv2d_91 (Conv2D)	(None, 17, 17, 192)	215,040	activa
batch_normalization_88 (BatchNormalization)	(None, 17, 17, 192)	576	conv2c
batch_normalization_91 (BatchNormalization)	(None, 17, 17, 192)	576	conv2c
activation_88 (Activation)	(None, 17, 17, 192)	0	batch_
activation_91 (Activation)	(None, 17, 17, 192)	0	batch_
block17_4_mixed (Concatenate)	(None, 17, 17, 384)	0	activa activa
block17_4_conv (Conv2D)	(None, 17, 17, 1088)	418,880	block1
custom_scale_layer_13 (CustomScaleLayer)	(None, 17, 17, 1088)	0	block1 block1
block17_4_ac (Activation)	(None, 17, 17, 1088)	0	custor
conv2d_93 (Conv2D)	(None, 17, 17, 128)	139,264	block1
batch_normalization_93 (BatchNormalization)	(None, 17, 17, 128)	384	conv2c
activation_93 (Activation)	(None, 17, 17, 128)	0	batch_

conv2d_94 (Conv2D)	(None, 17, 17, 160)	143,360	activa
batch_normalization_94 (BatchNormalization)	(None, 17, 17, 160)	480	conv2d
activation_94 (Activation)	(None, 17, 17, 160)	0	batch_
conv2d_92 (Conv2D)	(None, 17, 17, 192)	208,896	block1
conv2d_95 (Conv2D)	(None, 17, 17, 192)	215,040	activa
batch_normalization_92 (BatchNormalization)	(None, 17, 17, 192)	576	conv2d
batch_normalization_95 (BatchNormalization)	(None, 17, 17, 192)	576	conv2d
activation_92 (Activation)	(None, 17, 17, 192)	0	batch_
activation_95 (Activation)	(None, 17, 17, 192)	0	batch_
block17_5_mixed (Concatenate)	(None, 17, 17, 384)	0	activa activa
block17_5_conv (Conv2D)	(None, 17, 17, 1088)	418,880	block1
custom_scale_layer_14 (CustomScaleLayer)	(None, 17, 17, 1088)	0	block1 block1
block17_5_ac (Activation)	(None, 17, 17, 1088)	0	custom
conv2d_97 (Conv2D)	(None, 17, 17, 128)	139,264	block1
batch_normalization_97 (BatchNormalization)	(None, 17, 17, 128)	384	conv2d
activation_97 (Activation)	(None, 17, 17, 128)	0	batch_
conv2d_98 (Conv2D)	(None, 17, 17, 160)	143,360	activa
batch_normalization_98 (BatchNormalization)	(None, 17, 17, 160)	480	conv2d
activation_98 (Activation)	(None, 17, 17, 160)	0	batch_
conv2d_96 (Conv2D)	(None, 17, 17, 192)	208,896	block1
conv2d_99 (Conv2D)	(None, 17, 17, 192)	215,040	activa

batch_normalization_96 (BatchNormalization)	(None, 17, 17, 192)	576	conv2d
batch_normalization_99 (BatchNormalization)	(None, 17, 17, 192)	576	conv2d
activation_96 (Activation)	(None, 17, 17, 192)	0	batch_
activation_99 (Activation)	(None, 17, 17, 192)	0	batch_
block17_6_mixed (Concatenate)	(None, 17, 17, 384)	0	activa activa
block17_6_conv (Conv2D)	(None, 17, 17, 1088)	418,880	block1
custom_scale_layer_15 (CustomScaleLayer)	(None, 17, 17, 1088)	0	block1 block1
block17_6_ac (Activation)	(None, 17, 17, 1088)	0	custom
conv2d_101 (Conv2D)	(None, 17, 17, 128)	139,264	block1
batch_normalization_101 (BatchNormalization)	(None, 17, 17, 128)	384	conv2d
activation_101 (Activation)	(None, 17, 17, 128)	0	batch_
conv2d_102 (Conv2D)	(None, 17, 17, 160)	143,360	activa
batch_normalization_102 (BatchNormalization)	(None, 17, 17, 160)	480	conv2d
activation_102 (Activation)	(None, 17, 17, 160)	0	batch_
conv2d_100 (Conv2D)	(None, 17, 17, 192)	208,896	block1
conv2d_103 (Conv2D)	(None, 17, 17, 192)	215,040	activa
batch_normalization_100 (BatchNormalization)	(None, 17, 17, 192)	576	conv2d
batch_normalization_103 (BatchNormalization)	(None, 17, 17, 192)	576	conv2d
activation_100 (Activation)	(None, 17, 17, 192)	0	batch_
activation_103 (Activation)	(None, 17, 17, 192)	0	batch_

block17_7_mixed (Concatenate)	(None, 17, 17, 384)	0	activ activ
block17_7_conv (Conv2D)	(None, 17, 17, 1088)	418,880	block1
custom_scale_layer_16 (CustomScaleLayer)	(None, 17, 17, 1088)	0	block1 block1
block17_7_ac (Activation)	(None, 17, 17, 1088)	0	custor
conv2d_105 (Conv2D)	(None, 17, 17, 128)	139,264	block1
batch_normalization_105 (BatchNormalization)	(None, 17, 17, 128)	384	conv2c
activation_105 (Activation)	(None, 17, 17, 128)	0	batch_
conv2d_106 (Conv2D)	(None, 17, 17, 160)	143,360	activa
batch_normalization_106 (BatchNormalization)	(None, 17, 17, 160)	480	conv2c
activation_106 (Activation)	(None, 17, 17, 160)	0	batch_
conv2d_104 (Conv2D)	(None, 17, 17, 192)	208,896	block1
conv2d_107 (Conv2D)	(None, 17, 17, 192)	215,040	activa
batch_normalization_104 (BatchNormalization)	(None, 17, 17, 192)	576	conv2c
batch_normalization_107 (BatchNormalization)	(None, 17, 17, 192)	576	conv2c
activation_104 (Activation)	(None, 17, 17, 192)	0	batch_
activation_107 (Activation)	(None, 17, 17, 192)	0	batch_
block17_8_mixed (Concatenate)	(None, 17, 17, 384)	0	activa activa
block17_8_conv (Conv2D)	(None, 17, 17, 1088)	418,880	block1
custom_scale_layer_17 (CustomScaleLayer)	(None, 17, 17, 1088)	0	block1 block1
block17_8_ac (Activation)	(None, 17, 17, 1088)	0	custor
conv2d_109 (Conv2D)	(None, 17, 17, 128)	139,264	block1

conv2d_109 (Conv2D)	(None, 17, 17, 128)	139,264	block
batch_normalization_109 (BatchNormalization)	(None, 17, 17, 128)	384	conv2d
activation_109 (Activation)	(None, 17, 17, 128)	0	batch_
conv2d_110 (Conv2D)	(None, 17, 17, 160)	143,360	activa
batch_normalization_110 (BatchNormalization)	(None, 17, 17, 160)	480	conv2d
activation_110 (Activation)	(None, 17, 17, 160)	0	batch_
conv2d_108 (Conv2D)	(None, 17, 17, 192)	208,896	block1
conv2d_111 (Conv2D)	(None, 17, 17, 192)	215,040	activa
batch_normalization_108 (BatchNormalization)	(None, 17, 17, 192)	576	conv2d
batch_normalization_111 (BatchNormalization)	(None, 17, 17, 192)	576	conv2d
activation_108 (Activation)	(None, 17, 17, 192)	0	batch_
activation_111 (Activation)	(None, 17, 17, 192)	0	batch_
block17_9_mixed (Concatenate)	(None, 17, 17, 384)	0	activa activa
block17_9_conv (Conv2D)	(None, 17, 17, 1088)	418,880	block1
custom_scale_layer_18 (CustomScaleLayer)	(None, 17, 17, 1088)	0	block1 block1
block17_9_ac (Activation)	(None, 17, 17, 1088)	0	custom
conv2d_113 (Conv2D)	(None, 17, 17, 128)	139,264	block1
batch_normalization_113 (BatchNormalization)	(None, 17, 17, 128)	384	conv2d
activation_113 (Activation)	(None, 17, 17, 128)	0	batch_
conv2d_114 (Conv2D)	(None, 17, 17, 160)	143,360	activa
batch_normalization_114 (BatchNormalization)	(None, 17, 17, 160)	480	conv2d

activation_114 (Activation)	(None, 17, 17, 160)	0	batch_
conv2d_112 (Conv2D)	(None, 17, 17, 192)	208,896	block1
conv2d_115 (Conv2D)	(None, 17, 17, 192)	215,040	activa
batch_normalization_112 (BatchNormalization)	(None, 17, 17, 192)	576	conv2c
batch_normalization_115 (BatchNormalization)	(None, 17, 17, 192)	576	conv2c
activation_112 (Activation)	(None, 17, 17, 192)	0	batch_
activation_115 (Activation)	(None, 17, 17, 192)	0	batch_
block17_10_mixed (Concatenate)	(None, 17, 17, 384)	0	activa activa
block17_10_conv (Conv2D)	(None, 17, 17, 1088)	418,880	block1
custom_scale_layer_19 (CustomScaleLayer)	(None, 17, 17, 1088)	0	block1 block1
block17_10_ac (Activation)	(None, 17, 17, 1088)	0	custor
conv2d_117 (Conv2D)	(None, 17, 17, 128)	139,264	block1
batch_normalization_117 (BatchNormalization)	(None, 17, 17, 128)	384	conv2c
activation_117 (Activation)	(None, 17, 17, 128)	0	batch_
conv2d_118 (Conv2D)	(None, 17, 17, 160)	143,360	activa
batch_normalization_118 (BatchNormalization)	(None, 17, 17, 160)	480	conv2c
activation_118 (Activation)	(None, 17, 17, 160)	0	batch_
conv2d_116 (Conv2D)	(None, 17, 17, 192)	208,896	block1
conv2d_119 (Conv2D)	(None, 17, 17, 192)	215,040	activa
batch_normalization_116 (BatchNormalization)	(None, 17, 17, 192)	576	conv2c

batch_normalization_119 (BatchNormalization)	(None, 17, 17, 192)	576	conv2d
activation_116 (Activation)	(None, 17, 17, 192)	0	batch_
activation_119 (Activation)	(None, 17, 17, 192)	0	batch_
block17_11_mixed (Concatenate)	(None, 17, 17, 384)	0	activa... activa...
block17_11_conv (Conv2D)	(None, 17, 17, 1088)	418,880	block1
custom_scale_layer_20 (CustomScaleLayer)	(None, 17, 17, 1088)	0	block1... block1...
block17_11_ac (Activation)	(None, 17, 17, 1088)	0	custom
conv2d_121 (Conv2D)	(None, 17, 17, 128)	139,264	block1
batch_normalization_121 (BatchNormalization)	(None, 17, 17, 128)	384	conv2d
activation_121 (Activation)	(None, 17, 17, 128)	0	batch_
conv2d_122 (Conv2D)	(None, 17, 17, 160)	143,360	activa
batch_normalization_122 (BatchNormalization)	(None, 17, 17, 160)	480	conv2d
activation_122 (Activation)	(None, 17, 17, 160)	0	batch_
conv2d_120 (Conv2D)	(None, 17, 17, 192)	208,896	block1
conv2d_123 (Conv2D)	(None, 17, 17, 192)	215,040	activa
batch_normalization_120 (BatchNormalization)	(None, 17, 17, 192)	576	conv2d
batch_normalization_123 (BatchNormalization)	(None, 17, 17, 192)	576	conv2d
activation_120 (Activation)	(None, 17, 17, 192)	0	batch_
activation_123 (Activation)	(None, 17, 17, 192)	0	batch_
block17_12_mixed	(None, 17, 17, 384)	0	activa

(Concatenate)			activa
block17_12_conv (Conv2D)	(None, 17, 17, 1088)	418,880	block1
custom_scale_layer_21 (CustomScaleLayer)	(None, 17, 17, 1088)	0	block1 block1
block17_12_ac (Activation)	(None, 17, 17, 1088)	0	custom
conv2d_125 (Conv2D)	(None, 17, 17, 128)	139,264	block1
batch_normalization_125 (BatchNormalization)	(None, 17, 17, 128)	384	conv2c
activation_125 (Activation)	(None, 17, 17, 128)	0	batch_
conv2d_126 (Conv2D)	(None, 17, 17, 160)	143,360	activa
batch_normalization_126 (BatchNormalization)	(None, 17, 17, 160)	480	conv2c
activation_126 (Activation)	(None, 17, 17, 160)	0	batch_
conv2d_124 (Conv2D)	(None, 17, 17, 192)	208,896	block1
conv2d_127 (Conv2D)	(None, 17, 17, 192)	215,040	activa
batch_normalization_124 (BatchNormalization)	(None, 17, 17, 192)	576	conv2c
batch_normalization_127 (BatchNormalization)	(None, 17, 17, 192)	576	conv2c
activation_124 (Activation)	(None, 17, 17, 192)	0	batch_
activation_127 (Activation)	(None, 17, 17, 192)	0	batch_
block17_13_mixed (Concatenate)	(None, 17, 17, 384)	0	activa activa
block17_13_conv (Conv2D)	(None, 17, 17, 1088)	418,880	block1
custom_scale_layer_22 (CustomScaleLayer)	(None, 17, 17, 1088)	0	block1 block1
block17_13_ac (Activation)	(None, 17, 17, 1088)	0	custom
conv2d_129 (Conv2D)	(None, 17, 17, 128)	139,264	block1

conv2d_128 (Conv2D)	(None, 17, 17, 128)	110,104	block
batch_normalization_129 (BatchNormalization)	(None, 17, 17, 128)	384	conv2d
activation_129 (Activation)	(None, 17, 17, 128)	0	batch_
conv2d_130 (Conv2D)	(None, 17, 17, 160)	143,360	activa
batch_normalization_130 (BatchNormalization)	(None, 17, 17, 160)	480	conv2d
activation_130 (Activation)	(None, 17, 17, 160)	0	batch_
conv2d_128 (Conv2D)	(None, 17, 17, 192)	208,896	block1
conv2d_131 (Conv2D)	(None, 17, 17, 192)	215,040	activa
batch_normalization_128 (BatchNormalization)	(None, 17, 17, 192)	576	conv2d
batch_normalization_131 (BatchNormalization)	(None, 17, 17, 192)	576	conv2d
activation_128 (Activation)	(None, 17, 17, 192)	0	batch_
activation_131 (Activation)	(None, 17, 17, 192)	0	batch_
block17_14_mixed (Concatenate)	(None, 17, 17, 384)	0	activa activa
block17_14_conv (Conv2D)	(None, 17, 17, 1088)	418,880	block1
custom_scale_layer_23 (CustomScaleLayer)	(None, 17, 17, 1088)	0	block1 block1
block17_14_ac (Activation)	(None, 17, 17, 1088)	0	custom
conv2d_133 (Conv2D)	(None, 17, 17, 128)	139,264	block1
batch_normalization_133 (BatchNormalization)	(None, 17, 17, 128)	384	conv2d
activation_133 (Activation)	(None, 17, 17, 128)	0	batch_
conv2d_134 (Conv2D)	(None, 17, 17, 160)	143,360	activa
batch_normalization_134 (BatchNormalization)	(None, 17, 17, 160)	480	conv2d

(BatchNormalization)			
activation_134 (Activation)	(None, 17, 17, 160)	0	batch_
conv2d_132 (Conv2D)	(None, 17, 17, 192)	208,896	block1
conv2d_135 (Conv2D)	(None, 17, 17, 192)	215,040	activa
batch_normalization_132 (BatchNormalization)	(None, 17, 17, 192)	576	conv2c
batch_normalization_135 (BatchNormalization)	(None, 17, 17, 192)	576	conv2c
activation_132 (Activation)	(None, 17, 17, 192)	0	batch_
activation_135 (Activation)	(None, 17, 17, 192)	0	batch_
block17_15_mixed (Concatenate)	(None, 17, 17, 384)	0	activa activa
block17_15_conv (Conv2D)	(None, 17, 17, 1088)	418,880	block1
custom_scale_layer_24 (CustomScaleLayer)	(None, 17, 17, 1088)	0	block1 block1
block17_15_ac (Activation)	(None, 17, 17, 1088)	0	custor
conv2d_137 (Conv2D)	(None, 17, 17, 128)	139,264	block1
batch_normalization_137 (BatchNormalization)	(None, 17, 17, 128)	384	conv2c
activation_137 (Activation)	(None, 17, 17, 128)	0	batch_
conv2d_138 (Conv2D)	(None, 17, 17, 160)	143,360	activa
batch_normalization_138 (BatchNormalization)	(None, 17, 17, 160)	480	conv2c
activation_138 (Activation)	(None, 17, 17, 160)	0	batch_
conv2d_136 (Conv2D)	(None, 17, 17, 192)	208,896	block1
conv2d_139 (Conv2D)	(None, 17, 17, 192)	215,040	activa
batch_normalization_136 (BatchNormalization)	(None, 17, 17, 192)	576	conv2c

batch_normalization_139 (BatchNormalization)	(None, 17, 17, 192)	576	conv2d
activation_136 (Activation)	(None, 17, 17, 192)	0	batch_
activation_139 (Activation)	(None, 17, 17, 192)	0	batch_
block17_16_mixed (Concatenate)	(None, 17, 17, 384)	0	activa activa
block17_16_conv (Conv2D)	(None, 17, 17, 1088)	418,880	block1
custom_scale_layer_25 (CustomScaleLayer)	(None, 17, 17, 1088)	0	block1 block1
block17_16_ac (Activation)	(None, 17, 17, 1088)	0	custom
conv2d_141 (Conv2D)	(None, 17, 17, 128)	139,264	block1
batch_normalization_141 (BatchNormalization)	(None, 17, 17, 128)	384	conv2d
activation_141 (Activation)	(None, 17, 17, 128)	0	batch_
conv2d_142 (Conv2D)	(None, 17, 17, 160)	143,360	activa
batch_normalization_142 (BatchNormalization)	(None, 17, 17, 160)	480	conv2d
activation_142 (Activation)	(None, 17, 17, 160)	0	batch_
conv2d_140 (Conv2D)	(None, 17, 17, 192)	208,896	block1
conv2d_143 (Conv2D)	(None, 17, 17, 192)	215,040	activa
batch_normalization_140 (BatchNormalization)	(None, 17, 17, 192)	576	conv2d
batch_normalization_143 (BatchNormalization)	(None, 17, 17, 192)	576	conv2d
activation_140 (Activation)	(None, 17, 17, 192)	0	batch_
activation_143 (Activation)	(None, 17, 17, 192)	0	batch_
block17_17_mixed	(None, 17, 17, 384)	0	activa

block17_17_mixed (Concatenate)	(None, 17, 17, 384)	0	activ activ
block17_17_conv (Conv2D)	(None, 17, 17, 1088)	418,880	block1
custom_scale_layer_26 (CustomScaleLayer)	(None, 17, 17, 1088)	0	block1 block1
block17_17_ac (Activation)	(None, 17, 17, 1088)	0	custor
conv2d_145 (Conv2D)	(None, 17, 17, 128)	139,264	block1
batch_normalization_145 (BatchNormalization)	(None, 17, 17, 128)	384	conv2c
activation_145 (Activation)	(None, 17, 17, 128)	0	batch_
conv2d_146 (Conv2D)	(None, 17, 17, 160)	143,360	activa
batch_normalization_146 (BatchNormalization)	(None, 17, 17, 160)	480	conv2c
activation_146 (Activation)	(None, 17, 17, 160)	0	batch_
conv2d_144 (Conv2D)	(None, 17, 17, 192)	208,896	block1
conv2d_147 (Conv2D)	(None, 17, 17, 192)	215,040	activa
batch_normalization_144 (BatchNormalization)	(None, 17, 17, 192)	576	conv2c
batch_normalization_147 (BatchNormalization)	(None, 17, 17, 192)	576	conv2c
activation_144 (Activation)	(None, 17, 17, 192)	0	batch_
activation_147 (Activation)	(None, 17, 17, 192)	0	batch_
block17_18_mixed (Concatenate)	(None, 17, 17, 384)	0	activa activa
block17_18_conv (Conv2D)	(None, 17, 17, 1088)	418,880	block1
custom_scale_layer_27 (CustomScaleLayer)	(None, 17, 17, 1088)	0	block1 block1
block17_18_ac (Activation)	(None, 17, 17, 1088)	0	custor

Layer	Output Shape	Param #	Connected to
conv2d_149 (Conv2D)	(None, 17, 17, 128)	139,264	block1
batch_normalization_149 (BatchNormalization)	(None, 17, 17, 128)	384	conv2d
activation_149 (Activation)	(None, 17, 17, 128)	0	batch_
conv2d_150 (Conv2D)	(None, 17, 17, 160)	143,360	activa
batch_normalization_150 (BatchNormalization)	(None, 17, 17, 160)	480	conv2d
activation_150 (Activation)	(None, 17, 17, 160)	0	batch_
conv2d_148 (Conv2D)	(None, 17, 17, 192)	208,896	block1
conv2d_151 (Conv2D)	(None, 17, 17, 192)	215,040	activa
batch_normalization_148 (BatchNormalization)	(None, 17, 17, 192)	576	conv2d
batch_normalization_151 (BatchNormalization)	(None, 17, 17, 192)	576	conv2d
activation_148 (Activation)	(None, 17, 17, 192)	0	batch_
activation_151 (Activation)	(None, 17, 17, 192)	0	batch_
block17_19_mixed (Concatenate)	(None, 17, 17, 384)	0	activa activa
block17_19_conv (Conv2D)	(None, 17, 17, 1088)	418,880	block1
custom_scale_layer_28 (CustomScaleLayer)	(None, 17, 17, 1088)	0	block1 block1
block17_19_ac (Activation)	(None, 17, 17, 1088)	0	custom
conv2d_153 (Conv2D)	(None, 17, 17, 128)	139,264	block1
batch_normalization_153 (BatchNormalization)	(None, 17, 17, 128)	384	conv2d
activation_153 (Activation)	(None, 17, 17, 128)	0	batch_
conv2d_154 (Conv2D)	(None, 17, 17, 160)	143,360	activa
batch_normalization_154	(None, 17, 17, 160)	480	conv2d

batch_normalization_154 (BatchNormalization)	(None, 17, 17, 160)	480	conv2
activation_154 (Activation)	(None, 17, 17, 160)	0	batch_
conv2d_152 (Conv2D)	(None, 17, 17, 192)	208,896	block1
conv2d_155 (Conv2D)	(None, 17, 17, 192)	215,040	activa
batch_normalization_152 (BatchNormalization)	(None, 17, 17, 192)	576	conv2c
batch_normalization_155 (BatchNormalization)	(None, 17, 17, 192)	576	conv2c
activation_152 (Activation)	(None, 17, 17, 192)	0	batch_
activation_155 (Activation)	(None, 17, 17, 192)	0	batch_
block17_20_mixed (Concatenate)	(None, 17, 17, 384)	0	activa activa
block17_20_conv (Conv2D)	(None, 17, 17, 1088)	418,880	block1
custom_scale_layer_29 (CustomScaleLayer)	(None, 17, 17, 1088)	0	block1 block1
block17_20_ac (Activation)	(None, 17, 17, 1088)	0	custom
conv2d_160 (Conv2D)	(None, 17, 17, 256)	278,528	block1
batch_normalization_160 (BatchNormalization)	(None, 17, 17, 256)	768	conv2c
activation_160 (Activation)	(None, 17, 17, 256)	0	batch_
conv2d_156 (Conv2D)	(None, 17, 17, 256)	278,528	block1
conv2d_158 (Conv2D)	(None, 17, 17, 256)	278,528	block1
conv2d_161 (Conv2D)	(None, 17, 17, 288)	663,552	activa
batch_normalization_156 (BatchNormalization)	(None, 17, 17, 256)	768	conv2c
batch_normalization_158 (BatchNormalization)	(None, 17, 17, 256)	768	conv2c
batch_normalization_161	(None, 17, 17, 288)	864	conv2c

(BatchNormalization)			
activation_156 (Activation)	(None, 17, 17, 256)	0	batch_
activation_158 (Activation)	(None, 17, 17, 256)	0	batch_
activation_161 (Activation)	(None, 17, 17, 288)	0	batch_
conv2d_157 (Conv2D)	(None, 8, 8, 384)	884,736	activa
conv2d_159 (Conv2D)	(None, 8, 8, 288)	663,552	activa
conv2d_162 (Conv2D)	(None, 8, 8, 320)	829,440	activa
batch_normalization_157 (BatchNormalization)	(None, 8, 8, 384)	1,152	conv2c
batch_normalization_159 (BatchNormalization)	(None, 8, 8, 288)	864	conv2c
batch_normalization_162 (BatchNormalization)	(None, 8, 8, 320)	960	conv2c
activation_157 (Activation)	(None, 8, 8, 384)	0	batch_
activation_159 (Activation)	(None, 8, 8, 288)	0	batch_
activation_162 (Activation)	(None, 8, 8, 320)	0	batch_
max_pooling2d_3 (MaxPooling2D)	(None, 8, 8, 1088)	0	block1
mixed_7a (Concatenate)	(None, 8, 8, 2080)	0	activa activa activa max_pc
conv2d_164 (Conv2D)	(None, 8, 8, 192)	399,360	mixed_
batch_normalization_164 (BatchNormalization)	(None, 8, 8, 192)	576	conv2c
activation_164 (Activation)	(None, 8, 8, 192)	0	batch_
conv2d_165 (Conv2D)	(None, 8, 8, 224)	129,024	activa
batch_normalization_165	(None, 8, 8, 224)	672	conv2c

Layer (type)	Output Shape	Param #	Connected to
batch_normalization_165 (BatchNormalization)	(None, 8, 8, 224)	672	conv2…
activation_165 (Activation)	(None, 8, 8, 224)	0	batch_…
conv2d_163 (Conv2D)	(None, 8, 8, 192)	399,360	mixed_…
conv2d_166 (Conv2D)	(None, 8, 8, 256)	172,032	activa…
batch_normalization_163 (BatchNormalization)	(None, 8, 8, 192)	576	conv2d…
batch_normalization_166 (BatchNormalization)	(None, 8, 8, 256)	768	conv2d…
activation_163 (Activation)	(None, 8, 8, 192)	0	batch_…
activation_166 (Activation)	(None, 8, 8, 256)	0	batch_…
block8_1_mixed (Concatenate)	(None, 8, 8, 448)	0	activa… activa…
block8_1_conv (Conv2D)	(None, 8, 8, 2080)	933,920	block8…
custom_scale_layer_30 (CustomScaleLayer)	(None, 8, 8, 2080)	0	mixed_… block8…
block8_1_ac (Activation)	(None, 8, 8, 2080)	0	custor…
conv2d_168 (Conv2D)	(None, 8, 8, 192)	399,360	block8…
batch_normalization_168 (BatchNormalization)	(None, 8, 8, 192)	576	conv2d…
activation_168 (Activation)	(None, 8, 8, 192)	0	batch_…
conv2d_169 (Conv2D)	(None, 8, 8, 224)	129,024	activa…
batch_normalization_169 (BatchNormalization)	(None, 8, 8, 224)	672	conv2d…
activation_169 (Activation)	(None, 8, 8, 224)	0	batch_…
conv2d_167 (Conv2D)	(None, 8, 8, 192)	399,360	block8…
conv2d_170 (Conv2D)	(None, 8, 8, 256)	172,032	activa…
batch_normalization_167 (BatchNormalization)	(None, 8, 8, 192)	576	conv2d…

batch_normalization_170 (BatchNormalization)	(None, 8, 8, 256)	768	conv2d
activation_167 (Activation)	(None, 8, 8, 192)	0	batch_
activation_170 (Activation)	(None, 8, 8, 256)	0	batch_
block8_2_mixed (Concatenate)	(None, 8, 8, 448)	0	activa... activa
block8_2_conv (Conv2D)	(None, 8, 8, 2080)	933,920	block8
custom_scale_layer_31 (CustomScaleLayer)	(None, 8, 8, 2080)	0	block8 block8
block8_2_ac (Activation)	(None, 8, 8, 2080)	0	custor
conv2d_172 (Conv2D)	(None, 8, 8, 192)	399,360	block8
batch_normalization_172 (BatchNormalization)	(None, 8, 8, 192)	576	conv2d
activation_172 (Activation)	(None, 8, 8, 192)	0	batch_
conv2d_173 (Conv2D)	(None, 8, 8, 224)	129,024	activa
batch_normalization_173 (BatchNormalization)	(None, 8, 8, 224)	672	conv2d
activation_173 (Activation)	(None, 8, 8, 224)	0	batch_
conv2d_171 (Conv2D)	(None, 8, 8, 192)	399,360	block8
conv2d_174 (Conv2D)	(None, 8, 8, 256)	172,032	activa
batch_normalization_171 (BatchNormalization)	(None, 8, 8, 192)	576	conv2d
batch_normalization_174 (BatchNormalization)	(None, 8, 8, 256)	768	conv2d
activation_171 (Activation)	(None, 8, 8, 192)	0	batch_
activation_174 (Activation)	(None, 8, 8, 256)	0	batch_
block8_3_mixed (Concatenate)	(None, 8, 8, 448)	0	activa... activa

Layer	Output Shape	Param #	Connected to
block8_3_conv (Conv2D)	(None, 8, 8, 2080)	933,920	block8
custom_scale_layer_32 (CustomScaleLayer)	(None, 8, 8, 2080)	0	block8 block8
block8_3_ac (Activation)	(None, 8, 8, 2080)	0	custom
conv2d_176 (Conv2D)	(None, 8, 8, 192)	399,360	block8
batch_normalization_176 (BatchNormalization)	(None, 8, 8, 192)	576	conv2d
activation_176 (Activation)	(None, 8, 8, 192)	0	batch_
conv2d_177 (Conv2D)	(None, 8, 8, 224)	129,024	activa
batch_normalization_177 (BatchNormalization)	(None, 8, 8, 224)	672	conv2d
activation_177 (Activation)	(None, 8, 8, 224)	0	batch_
conv2d_175 (Conv2D)	(None, 8, 8, 192)	399,360	block8
conv2d_178 (Conv2D)	(None, 8, 8, 256)	172,032	activa
batch_normalization_175 (BatchNormalization)	(None, 8, 8, 192)	576	conv2d
batch_normalization_178 (BatchNormalization)	(None, 8, 8, 256)	768	conv2d
activation_175 (Activation)	(None, 8, 8, 192)	0	batch_
activation_178 (Activation)	(None, 8, 8, 256)	0	batch_
block8_4_mixed (Concatenate)	(None, 8, 8, 448)	0	activa activa
block8_4_conv (Conv2D)	(None, 8, 8, 2080)	933,920	block8
custom_scale_layer_33 (CustomScaleLayer)	(None, 8, 8, 2080)	0	block8 block8
block8_4_ac (Activation)	(None, 8, 8, 2080)	0	custom
conv2d_180 (Conv2D)	(None, 8, 8, 192)	399,360	block8
batch_normalization_180 (BatchNormalization)	(None, 8, 8, 192)	576	conv2d

(BatchNormalization)			
activation_180 (Activation)	(None, 8, 8, 192)	0	batch_
conv2d_181 (Conv2D)	(None, 8, 8, 224)	129,024	activa
batch_normalization_181 (BatchNormalization)	(None, 8, 8, 224)	672	conv2c
activation_181 (Activation)	(None, 8, 8, 224)	0	batch_
conv2d_179 (Conv2D)	(None, 8, 8, 192)	399,360	block8
conv2d_182 (Conv2D)	(None, 8, 8, 256)	172,032	activa
batch_normalization_179 (BatchNormalization)	(None, 8, 8, 192)	576	conv2c
batch_normalization_182 (BatchNormalization)	(None, 8, 8, 256)	768	conv2c
activation_179 (Activation)	(None, 8, 8, 192)	0	batch_
activation_182 (Activation)	(None, 8, 8, 256)	0	batch_
block8_5_mixed (Concatenate)	(None, 8, 8, 448)	0	activa activa
block8_5_conv (Conv2D)	(None, 8, 8, 2080)	933,920	block8
custom_scale_layer_34 (CustomScaleLayer)	(None, 8, 8, 2080)	0	block8 block8
block8_5_ac (Activation)	(None, 8, 8, 2080)	0	custom
conv2d_184 (Conv2D)	(None, 8, 8, 192)	399,360	block8
batch_normalization_184 (BatchNormalization)	(None, 8, 8, 192)	576	conv2c
activation_184 (Activation)	(None, 8, 8, 192)	0	batch_
conv2d_185 (Conv2D)	(None, 8, 8, 224)	129,024	activa
batch_normalization_185 (BatchNormalization)	(None, 8, 8, 224)	672	conv2c
activation_185 (Activation)	(None, 8, 8, 224)	0	batch_

conv2d_183 (Conv2D)	(None, 8, 8, 192)	399,360	block8
conv2d_186 (Conv2D)	(None, 8, 8, 256)	172,032	activa
batch_normalization_183 (BatchNormalization)	(None, 8, 8, 192)	576	conv2c
batch_normalization_186 (BatchNormalization)	(None, 8, 8, 256)	768	conv2c
activation_183 (Activation)	(None, 8, 8, 192)	0	batch_
activation_186 (Activation)	(None, 8, 8, 256)	0	batch_
block8_6_mixed (Concatenate)	(None, 8, 8, 448)	0	activa activa
block8_6_conv (Conv2D)	(None, 8, 8, 2080)	933,920	block8
custom_scale_layer_35 (CustomScaleLayer)	(None, 8, 8, 2080)	0	block8 block8
block8_6_ac (Activation)	(None, 8, 8, 2080)	0	custor
conv2d_188 (Conv2D)	(None, 8, 8, 192)	399,360	block8
batch_normalization_188 (BatchNormalization)	(None, 8, 8, 192)	576	conv2c
activation_188 (Activation)	(None, 8, 8, 192)	0	batch_
conv2d_189 (Conv2D)	(None, 8, 8, 224)	129,024	activa
batch_normalization_189 (BatchNormalization)	(None, 8, 8, 224)	672	conv2c
activation_189 (Activation)	(None, 8, 8, 224)	0	batch_
conv2d_187 (Conv2D)	(None, 8, 8, 192)	399,360	block8
conv2d_190 (Conv2D)	(None, 8, 8, 256)	172,032	activa
batch_normalization_187 (BatchNormalization)	(None, 8, 8, 192)	576	conv2c
batch_normalization_190 (BatchNormalization)	(None, 8, 8, 256)	768	conv2c
activation_187	(None, 8, 8, 192)	0	batch

activation_187 (Activation)	(None, 8, 8, 192)	0	batch_
activation_190 (Activation)	(None, 8, 8, 256)	0	batch_
block8_7_mixed (Concatenate)	(None, 8, 8, 448)	0	activa activa
block8_7_conv (Conv2D)	(None, 8, 8, 2080)	933,920	block8
custom_scale_layer_36 (CustomScaleLayer)	(None, 8, 8, 2080)	0	block8 block8
block8_7_ac (Activation)	(None, 8, 8, 2080)	0	custom
conv2d_192 (Conv2D)	(None, 8, 8, 192)	399,360	block8
batch_normalization_192 (BatchNormalization)	(None, 8, 8, 192)	576	conv2c
activation_192 (Activation)	(None, 8, 8, 192)	0	batch_
conv2d_193 (Conv2D)	(None, 8, 8, 224)	129,024	activa
batch_normalization_193 (BatchNormalization)	(None, 8, 8, 224)	672	conv2c
activation_193 (Activation)	(None, 8, 8, 224)	0	batch_
conv2d_191 (Conv2D)	(None, 8, 8, 192)	399,360	block8
conv2d_194 (Conv2D)	(None, 8, 8, 256)	172,032	activa
batch_normalization_191 (BatchNormalization)	(None, 8, 8, 192)	576	conv2c
batch_normalization_194 (BatchNormalization)	(None, 8, 8, 256)	768	conv2c
activation_191 (Activation)	(None, 8, 8, 192)	0	batch_
activation_194 (Activation)	(None, 8, 8, 256)	0	batch_
block8_8_mixed (Concatenate)	(None, 8, 8, 448)	0	activa activa
block8_8_conv (Conv2D)	(None, 8, 8, 2080)	933,920	block8
custom_scale_layer_37	(None, 8, 8, 2080)	0	block8

(CustomScaleLayer)			block8
block8_8_ac (Activation)	(None, 8, 8, 2080)	0	custom
conv2d_196 (Conv2D)	(None, 8, 8, 192)	399,360	block8
batch_normalization_196 (BatchNormalization)	(None, 8, 8, 192)	576	conv2d
activation_196 (Activation)	(None, 8, 8, 192)	0	batch_
conv2d_197 (Conv2D)	(None, 8, 8, 224)	129,024	activa
batch_normalization_197 (BatchNormalization)	(None, 8, 8, 224)	672	conv2d
activation_197 (Activation)	(None, 8, 8, 224)	0	batch_
conv2d_195 (Conv2D)	(None, 8, 8, 192)	399,360	block8
conv2d_198 (Conv2D)	(None, 8, 8, 256)	172,032	activa
batch_normalization_195 (BatchNormalization)	(None, 8, 8, 192)	576	conv2d
batch_normalization_198 (BatchNormalization)	(None, 8, 8, 256)	768	conv2d
activation_195 (Activation)	(None, 8, 8, 192)	0	batch_
activation_198 (Activation)	(None, 8, 8, 256)	0	batch_
block8_9_mixed (Concatenate)	(None, 8, 8, 448)	0	activa activa
block8_9_conv (Conv2D)	(None, 8, 8, 2080)	933,920	block8
custom_scale_layer_38 (CustomScaleLayer)	(None, 8, 8, 2080)	0	block8 block8
block8_9_ac (Activation)	(None, 8, 8, 2080)	0	custom
conv2d_200 (Conv2D)	(None, 8, 8, 192)	399,360	block8
batch_normalization_200 (BatchNormalization)	(None, 8, 8, 192)	576	conv2d
activation_200 (Activation)	(None, 8, 8, 192)	0	batch_

Layer	Output Shape	Params	Connected to
conv2d_201 (Conv2D)	(None, 8, 8, 224)	129,024	activa
batch_normalization_201 (BatchNormalization)	(None, 8, 8, 224)	672	conv2d
activation_201 (Activation)	(None, 8, 8, 224)	0	batch_
conv2d_199 (Conv2D)	(None, 8, 8, 192)	399,360	block8
conv2d_202 (Conv2D)	(None, 8, 8, 256)	172,032	activa
batch_normalization_199 (BatchNormalization)	(None, 8, 8, 192)	576	conv2d
batch_normalization_202 (BatchNormalization)	(None, 8, 8, 256)	768	conv2d
activation_199 (Activation)	(None, 8, 8, 192)	0	batch_
activation_202 (Activation)	(None, 8, 8, 256)	0	batch_
block8_10_mixed (Concatenate)	(None, 8, 8, 448)	0	activa activa
block8_10_conv (Conv2D)	(None, 8, 8, 2080)	933,920	block8
custom_scale_layer_39 (CustomScaleLayer)	(None, 8, 8, 2080)	0	block8 block8
conv_7b (Conv2D)	(None, 8, 8, 1536)	3,194,880	custom
conv_7b_bn (BatchNormalization)	(None, 8, 8, 1536)	4,608	conv_7
conv_7b_ac (Activation)	(None, 8, 8, 1536)	0	conv_7
global_average_pooling2d (GlobalAveragePooling2D)	(None, 1536)	0	conv_7
dropout (Dropout)	(None, 1536)	0	global
dense (Dense)	(None, 3)	4,611	dropou

Total params: 54,341,347 (207.30 MB)
Trainable params: 4,611 (18.01 KB)
Non-trainable params: 54,336,736 (207.28 MB)

⌄ Fine tuning:

- Set all layers as trainable

```
for layer in model3.layers:
    layer.trainable = True
```

⌄ Compile and train the model

```
from tensorflow.keras import regularizers
from tensorflow.keras.callbacks import EarlyStopping, ReduceLROnPlateau
from tensorflow.keras.optimizers import Adam
from tensorflow.keras.preprocessing.image import ImageDataGenerator
import numpy as np

model3.compile(loss='sparse_categorical_crossentropy',
                optimizer='adam',
                metrics=['accuracy'])


#Use the same data augmentation setup we used for transfer learning
datagen = ImageDataGenerator(
    rotation_range=20,
    width_shift_range=0.2,
    height_shift_range=0.2,
    horizontal_flip=True,
    fill_mode='nearest',
    validation_split=0.1
)

#Create generators
train_generator = datagen.flow(
    X_train_std,
    y_train,
    batch_size=16,
    subset='training'
)

validation_generator = datagen.flow(
```

```
        X_train_std,
        y_train,
        batch_size=16,
        subset='validation'
)


callbacks3_FT = [
    keras.callbacks.ModelCheckpoint(
        "best_incepresnet_FT.weights.h5",
        monitor='val_accuracy',
        save_weights_only=True,
        save_best_only=True
    ),
]


#Train
history3_FT = model3.fit(
    train_generator,
    validation_data=validation_generator,
    epochs=10,
    callbacks=callbacks3_FT
)
```
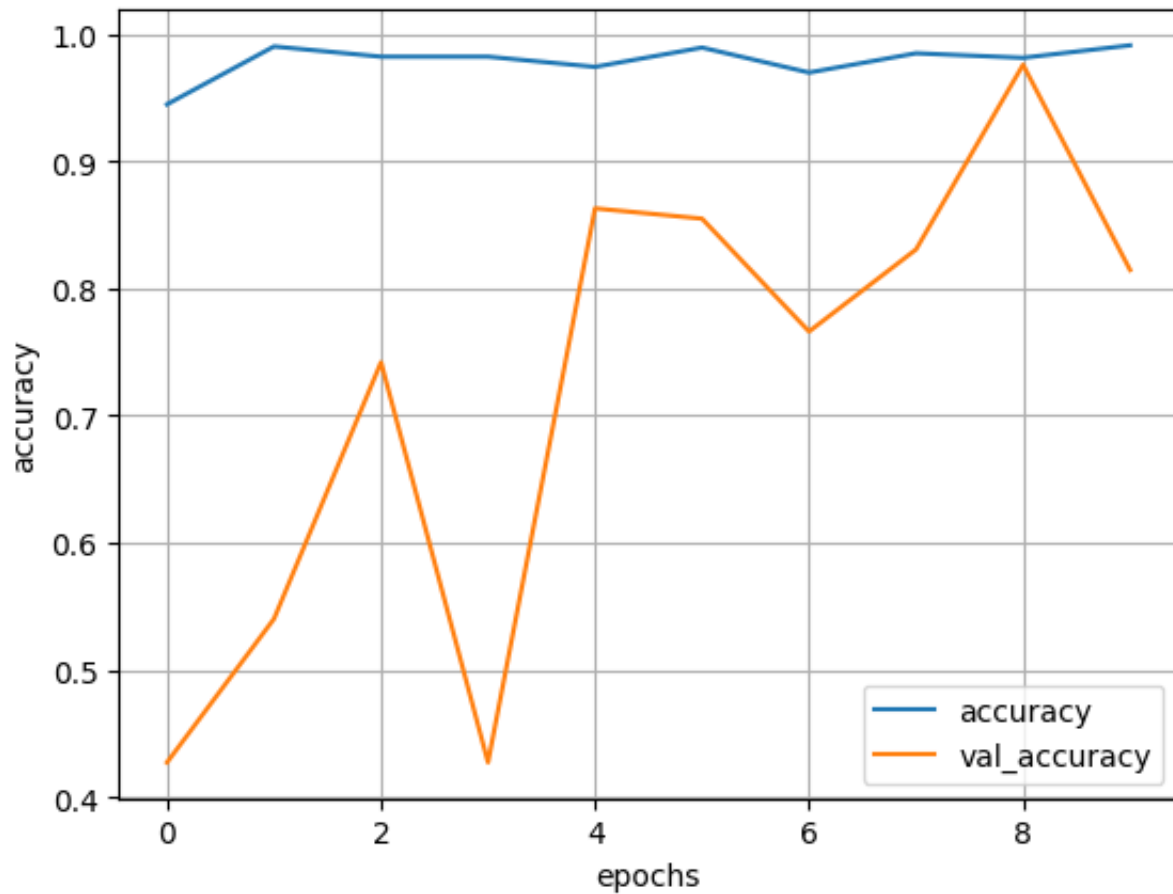
⥸ Epoch 1/10
    /usr/local/lib/python3.10/dist-packages/keras/src/trainers/data_adapters/py_da
      self._warn_if_super_not_called()
    71/71 ━━━━━━━━━━━━━━━━━ **298s** 2s/step - accuracy: 0.9224 - loss: 0.2694 - va
    Epoch 2/10
    71/71 ━━━━━━━━━━━━━━━━━ **45s** 599ms/step - accuracy: 0.9877 - loss: 0.0396 -
    Epoch 3/10
    71/71 ━━━━━━━━━━━━━━━━━ **44s** 588ms/step - accuracy: 0.9845 - loss: 0.0489 -
    Epoch 4/10
    71/71 ━━━━━━━━━━━━━━━━━ **42s** 556ms/step - accuracy: 0.9855 - loss: 0.0596 -
    Epoch 5/10
    71/71 ━━━━━━━━━━━━━━━━━ **44s** 587ms/step - accuracy: 0.9777 - loss: 0.0768 -
    Epoch 6/10
    71/71 ━━━━━━━━━━━━━━━━━ **42s** 558ms/step - accuracy: 0.9908 - loss: 0.0386 -
    Epoch 7/10
    71/71 ━━━━━━━━━━━━━━━━━ **41s** 550ms/step - accuracy: 0.9752 - loss: 0.0743 -
    Epoch 8/10
    71/71 ━━━━━━━━━━━━━━━━━ **42s** 555ms/step - accuracy: 0.9901 - loss: 0.0540 -
    Epoch 9/10
    71/71 ━━━━━━━━━━━━━━━━━ **44s** 589ms/step - accuracy: 0.9668 - loss: 0.0840 -
    Epoch 10/10
    71/71 ━━━━━━━━━━━━━━━━━ **42s** 561ms/step - accuracy: 0.9862 - loss: 0.0283 -

```python
import pandas as pd
#Visualize accuracy
progress = {k:v for k,v in history3_FT.history.items() if k in ['accuracy', 'val_ac

pd.DataFrame(progress).plot()
plt.xlabel("epochs")
plt.ylabel("accuracy")
plt.grid(True)
plt.show()
```


Evaluate Fine tuned model

```python
testLoss3_FT, testAccuracy3_FT = model3.evaluate(x = X_test_std, y = y_test)
print("Test-loss: %f, Test-accuracy: %f" % (testLoss3_FT, testAccuracy3_FT))
```

```
13/13 ──────────────────────────  20s 296ms/step - accuracy: 0.6831 - loss: 2.0716
Test-loss: 1.755759, Test-accuracy: 0.697115
```

Update model using best weights

```
model3.load_weights("best_incepresnet_FT.weights.h5")

testLoss3_FT, testAccuracy3_FT = model3.evaluate(x = X_test_std, y = y_test)

print("Test-loss: %f, Test-accuracy: %f" % (testLoss3_FT, testAccuracy3_FT))
```

```
13/13 ──────────────── 4s 301ms/step - accuracy: 0.9904 - loss: 0.0153
Test-loss: 0.022620, Test-accuracy: 0.987981
```

Model performance

```
y_prob = model3.predict(X_test_std)
y_predict = np.argmax(y_prob, axis=-1)
print(y_predict)
```

```
13/13 ──────────────── 12s 270ms/step
[1 1 0 0 0 0 0 1 0 0 0 1 0 0 1 1 1 1 0 1 1 1 1 1 0 0 0 0 1 0 1 0 0 0 0 1
 0 0 0 1 0 1 0 0 1 1 0 0 1 1 1 1 0 1 1 1 0 0 0 1 0 0 1 1 1 0 0 0 0 1 0
 0 1 1 0 1 0 1 0 2 1 0 1 0 0 0 0 1 1 1 0 0 2 0 0 1 0 0 0 0 1 1 1 1 0 0
 0 0 0 1 1 1 1 1 1 1 0 0 0 1 1 1 1 0 2 0 1 1 1 0 1 0 0 1 1 0 1 1 1 0 1 1 1
 1 0 1 0 1 1 1 1 0 2 1 0 0 1 0 1 1 0 0 0 1 0 0 1 1 1 0 1 0 0 0 0 0 0 1 1
 1 0 1 0 0 1 1 0 1 1 0 1 0 2 0 0 0 1 1 1 1 0 0 0 1 0 0 0 1 2 0 0 1 0 0 0 1
 0 1 0 0 0 0 1 0 1 1 0 1 0 1 0 1 1 1 1 1 1 1 0 0 0 0 0 0 1 0 1 0 1 1 1 0 0 1
 0 1 0 1 0 0 1 1 1 0 0 1 0 0 1 1 1 0 0 0 0 1 0 1 0 1 0 0 1 0 1 2 1 1 1 1 0
 0 2 1 0 0 1 0 1 1 0 0 1 0 1 1 1 0 0 1 1 0 2 1 2 0 0 0 0 1 0 1 0 0 0 1 1 1
 1 0 1 1 1 1 0 0 1 0 1 2 0 2 0 1 1 0 0 0 0 1 1 0 0 0 1 0 1 1 0 1 1 1 1 1 1
 0 0 1 1 0 0 1 0 1 1 1 0 0 0 0 0 1 1 1 1 0 2 1 1 1 0 1 1 1 0 1 0 1 1 0 1
 0 1 0 2 1 0 1 0 0]
```

```
#confusion matrix

from sklearn.metrics import confusion_matrix
cm = confusion_matrix(y_true = y_test, y_pred = y_predict)

fig, ax = plt.subplots(figsize=(6, 6))
ax.matshow(cm, cmap=plt.cm.Blues, alpha=0.3)

for i in range(cm.shape[0]):
    for j in range(cm.shape[1]):
```

```
        ax.text(x=j, y=i, s=cm[i, j], va='center', ha='center')

ax.title.set_text('Model 3 FT\n')
plt.xlabel('Predicted label')
plt.ylabel('True label')

plt.tight_layout()
plt.savefig("ConfusionMatrix_InceptionResNetV2.png", dpi=300, format='png', pad_i
plt.show()
```
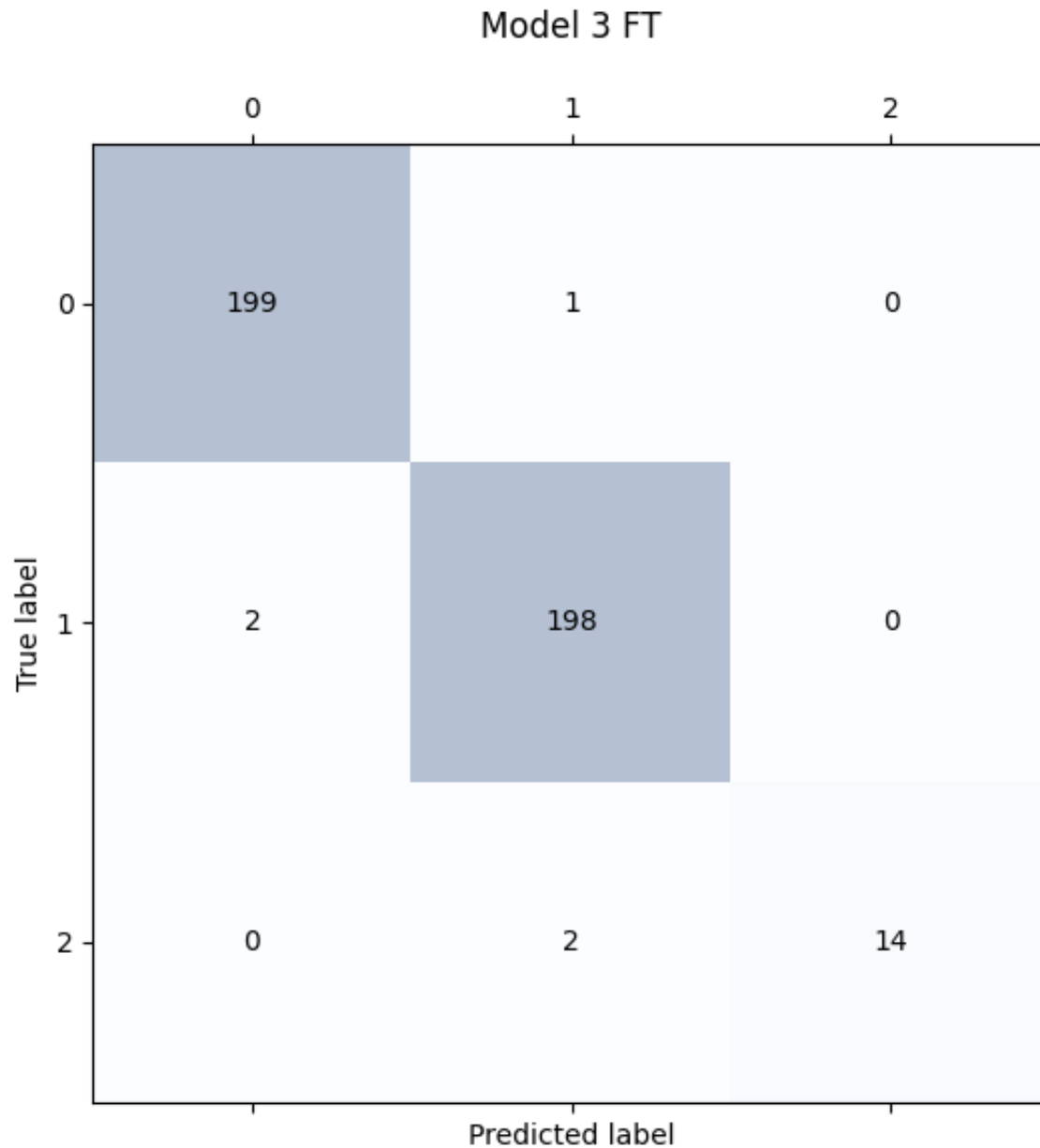
Model 3 FT

```python
#classification scores

from sklearn.metrics import precision_score, recall_score, f1_score

pScore = precision_score(y_true= y_test, y_pred = y_predict, average = 'weighted'
print("Precision: ", pScore)


rScore = recall_score(y_true= y_test, y_pred = y_predict, average = 'weighted')
print("Recall: ", rScore)


fScore = f1_score(y_true= y_test, y_pred = y_predict, average = 'weighted')
print("F1-score: ", fScore)
```

```
Precision:  0.9880405663987755
Recall:  0.9879807692307693
F1-score:  0.987844491335763
```

⌄ Save best model

```python
model3.save('/content/gdrive/MyDrive/DL/InceptionResNetV2_Best_Model_FT.h5')
```

```
WARNING:absl:You are saving your model as an HDF5 file via `model.save()` or `
```