**SAMPLE CODINGS**

import tensorflow as tf

import os

from tensorflow.keras.preprocessing.image import ImageDataGenerator

from tensorflow.keras import layers, models

import matplotlib.pyplot as plt

import numpy as np

from sklearn.model\_selection import train\_test\_split

from tensorflow import keras

train\_dir=r'F:\2020\JPDL19-Rice Leaf Disease Detection\SOURCE CODE\Rice leaf disease detection\model\train'

test\_dir=r'F:\2020\JPDL19-Rice Leaf Disease Detection\SOURCE CODE\Rice leaf disease detection\model\validation'

batch\_size = 20

epochs = 7

img\_height = 224

img\_width = 224

train\_image\_generator = ImageDataGenerator(rescale=1./255)

train\_data\_gen = train\_image\_generator.flow\_from\_directory(batch\_size=batch\_size,directory=train\_dir,shuffle=True,target\_size=(img\_height, img\_width),class\_mode='categorical')

Found 1697 images belonging to 4 classes.

train\_image\_generator = ImageDataGenerator(rescale=1./255)

val\_data\_gen = train\_image\_generator.flow\_from\_directory(batch\_size=batch\_size,directory=test\_dir,shuffle=True,target\_size=(img\_height, img\_width),class\_mode='categorical')

Found 861 images belonging to 4 classes.

# !pip install -U efficientnet

import os

import efficientnet.tfkeras as efn

base\_model = efn.EfficientNetB5(

weights='imagenet',

input\_shape=(224,224,3),

include\_top=False,

pooling='max'

)

Downloading data from https://github.com/Callidior/keras-applications/releases/download/efficientnet/efficientnet-b5\_weights\_tf\_dim\_ordering\_tf\_kernels\_autoaugment\_notop.h5

115515256/115515256 [==============================] - 14s 0us/step

base\_model.trainable = False

base\_model.summary()

Model: "efficientnet-b5"

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Layer (type) Output Shape Param # Connected to

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input\_1 (InputLayer) [(None, 224, 224, 3 0 []

)]

stem\_conv (Conv2D) (None, 112, 112, 48 1296 ['input\_1[0][0]']

)

stem\_bn (BatchNormalization) (None, 112, 112, 48 192 ['stem\_conv[0][0]']

)

stem\_activation (Activation) (None, 112, 112, 48 0 ['stem\_bn[0][0]']

)

block1a\_dwconv (DepthwiseConv2 (None, 112, 112, 48 432 ['stem\_activation[0][0]']

D) )

block1a\_bn (BatchNormalization (None, 112, 112, 48 192 ['block1a\_dwconv[0][0]']

) )

block1a\_activation (Activation (None, 112, 112, 48 0 ['block1a\_bn[0][0]']

) )

block1a\_se\_squeeze (GlobalAver (None, 48) 0 ['block1a\_activation[0][0]']

agePooling2D)

block1a\_se\_reshape (Reshape) (None, 1, 1, 48) 0 ['block1a\_se\_squeeze[0][0]']

block1a\_se\_reduce (Conv2D) (None, 1, 1, 12) 588 ['block1a\_se\_reshape[0][0]']

block1a\_se\_expand (Conv2D) (None, 1, 1, 48) 624 ['block1a\_se\_reduce[0][0]']

block1a\_se\_excite (Multiply) (None, 112, 112, 48 0 ['block1a\_activation[0][0]',

) 'block1a\_se\_expand[0][0]']

block1a\_project\_conv (Conv2D) (None, 112, 112, 24 1152 ['block1a\_se\_excite[0][0]']

)

block1a\_project\_bn (BatchNorma (None, 112, 112, 24 96 ['block1a\_project\_conv[0][0]']

lization) )

block1b\_dwconv (DepthwiseConv2 (None, 112, 112, 24 216 ['block1a\_project\_bn[0][0]']

D) )

block1b\_bn (BatchNormalization (None, 112, 112, 24 96 ['block1b\_dwconv[0][0]']

) )

block1b\_activation (Activation (None, 112, 112, 24 0 ['block1b\_bn[0][0]']

) )

block1b\_se\_squeeze (GlobalAver (None, 24) 0 ['block1b\_activation[0][0]']

agePooling2D)

block1b\_se\_reshape (Reshape) (None, 1, 1, 24) 0 ['block1b\_se\_squeeze[0][0]']

block1b\_se\_reduce (Conv2D) (None, 1, 1, 6) 150 ['block1b\_se\_reshape[0][0]']

block1b\_se\_expand (Conv2D) (None, 1, 1, 24) 168 ['block1b\_se\_reduce[0][0]']

block1b\_se\_excite (Multiply) (None, 112, 112, 24 0 ['block1b\_activation[0][0]',

) 'block1b\_se\_expand[0][0]']

block1b\_project\_conv (Conv2D) (None, 112, 112, 24 576 ['block1b\_se\_excite[0][0]']

)

block1b\_project\_bn (BatchNorma (None, 112, 112, 24 96 ['block1b\_project\_conv[0][0]']

lization) )

block1b\_drop (FixedDropout) (None, 112, 112, 24 0 ['block1b\_project\_bn[0][0]']

)

block1b\_add (Add) (None, 112, 112, 24 0 ['block1b\_drop[0][0]',

) 'block1a\_project\_bn[0][0]']

block1c\_dwconv (DepthwiseConv2 (None, 112, 112, 24 216 ['block1b\_add[0][0]']

D) )

block1c\_bn (BatchNormalization (None, 112, 112, 24 96 ['block1c\_dwconv[0][0]']

) )

block1c\_activation (Activation (None, 112, 112, 24 0 ['block1c\_bn[0][0]']

) )

block1c\_se\_squeeze (GlobalAver (None, 24) 0 ['block1c\_activation[0][0]']

agePooling2D)

block1c\_se\_reshape (Reshape) (None, 1, 1, 24) 0 ['block1c\_se\_squeeze[0][0]']

block1c\_se\_reduce (Conv2D) (None, 1, 1, 6) 150 ['block1c\_se\_reshape[0][0]']

block1c\_se\_expand (Conv2D) (None, 1, 1, 24) 168 ['block1c\_se\_reduce[0][0]']

block1c\_se\_excite (Multiply) (None, 112, 112, 24 0 ['block1c\_activation[0][0]',

) 'block1c\_se\_expand[0][0]']

block1c\_project\_conv (Conv2D) (None, 112, 112, 24 576 ['block1c\_se\_excite[0][0]']

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block1c\_project\_bn (BatchNorma (None, 112, 112, 24 96 ['block1c\_project\_conv[0][0]']

lization) )

block1c\_drop (FixedDropout) (None, 112, 112, 24 0 ['block1c\_project\_bn[0][0]']

)

block1c\_add (Add) (None, 112, 112, 24 0 ['block1c\_drop[0][0]',

) 'block1b\_add[0][0]']

block2a\_expand\_conv (Conv2D) (None, 112, 112, 14 3456 ['block1c\_add[0][0]']

4)

block2a\_expand\_bn (BatchNormal (None, 112, 112, 14 576 ['block2a\_expand\_conv[0][0]']

ization) 4)

block2a\_expand\_activation (Act (None, 112, 112, 14 0 ['block2a\_expand\_bn[0][0]']

ivation) 4)

block2a\_dwconv (DepthwiseConv2 (None, 56, 56, 144) 1296 ['block2a\_expand\_activation[0][0]

D) ']

block2a\_bn (BatchNormalization (None, 56, 56, 144) 576 ['block2a\_dwconv[0][0]']

)

block2a\_activation (Activation (None, 56, 56, 144) 0 ['block2a\_bn[0][0]']

)

block2a\_se\_squeeze (GlobalAver (None, 144) 0 ['block2a\_activation[0][0]']

agePooling2D)

block2a\_se\_reshape (Reshape) (None, 1, 1, 144) 0 ['block2a\_se\_squeeze[0][0]']

block2a\_se\_reduce (Conv2D) (None, 1, 1, 6) 870 ['block2a\_se\_reshape[0][0]']

block2a\_se\_expand (Conv2D) (None, 1, 1, 144) 1008 ['block2a\_se\_reduce[0][0]']

block2a\_se\_excite (Multiply) (None, 56, 56, 144) 0 ['block2a\_activation[0][0]',

'block2a\_se\_expand[0][0]']

block2a\_project\_conv (Conv2D) (None, 56, 56, 40) 5760 ['block2a\_se\_excite[0][0]']

block2a\_project\_bn (BatchNorma (None, 56, 56, 40) 160 ['block2a\_project\_conv[0][0]']

lization)

block2b\_expand\_conv (Conv2D) (None, 56, 56, 240) 9600 ['block2a\_project\_bn[0][0]']

block2b\_expand\_bn (BatchNormal (None, 56, 56, 240) 960 ['block2b\_expand\_conv[0][0]']

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block2b\_expand\_activation (Act (None, 56, 56, 240) 0 ['block2b\_expand\_bn[0][0]']

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block2b\_dwconv (DepthwiseConv2 (None, 56, 56, 240) 2160 ['block2b\_expand\_activation[0][0]

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block2b\_bn (BatchNormalization (None, 56, 56, 240) 960 ['block2b\_dwconv[0][0]']

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block2b\_se\_squeeze (GlobalAver (None, 240) 0 ['block2b\_activation[0][0]']

agePooling2D)

block2b\_se\_reshape (Reshape) (None, 1, 1, 240) 0 ['block2b\_se\_squeeze[0][0]']

block2b\_se\_reduce (Conv2D) (None, 1, 1, 10) 2410 ['block2b\_se\_reshape[0][0]']

block2b\_se\_expand (Conv2D) (None, 1, 1, 240) 2640 ['block2b\_se\_reduce[0][0]']

block2b\_se\_excite (Multiply) (None, 56, 56, 240) 0 ['block2b\_activation[0][0]',

'block2b\_se\_expand[0][0]']

block2b\_project\_conv (Conv2D) (None, 56, 56, 40) 9600 ['block2b\_se\_excite[0][0]']

block2b\_project\_bn (BatchNorma (None, 56, 56, 40) 160 ['block2b\_project\_conv[0][0]']

lization)

block2b\_drop (FixedDropout) (None, 56, 56, 40) 0 ['block2b\_project\_bn[0][0]']

block2b\_add (Add) (None, 56, 56, 40) 0 ['block2b\_drop[0][0]',

'block2a\_project\_bn[0][0]']

block2c\_expand\_conv (Conv2D) (None, 56, 56, 240) 9600 ['block2b\_add[0][0]']

block2c\_expand\_bn (BatchNormal (None, 56, 56, 240) 960 ['block2c\_expand\_conv[0][0]']

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block2c\_dwconv (DepthwiseConv2 (None, 56, 56, 240) 2160 ['block2c\_expand\_activation[0][0]

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block2c\_bn (BatchNormalization (None, 56, 56, 240) 960 ['block2c\_dwconv[0][0]']

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block2c\_se\_reduce (Conv2D) (None, 1, 1, 10) 2410 ['block2c\_se\_reshape[0][0]']

block2c\_se\_expand (Conv2D) (None, 1, 1, 240) 2640 ['block2c\_se\_reduce[0][0]']

block2c\_se\_excite (Multiply) (None, 56, 56, 240) 0 ['block2c\_activation[0][0]',

'block2c\_se\_expand[0][0]']

block2c\_project\_conv (Conv2D) (None, 56, 56, 40) 9600 ['block2c\_se\_excite[0][0]']

block2c\_project\_bn (BatchNorma (None, 56, 56, 40) 160 ['block2c\_project\_conv[0][0]']

lization)

block2c\_drop (FixedDropout) (None, 56, 56, 40) 0 ['block2c\_project\_bn[0][0]']

block2c\_add (Add) (None, 56, 56, 40) 0 ['block2c\_drop[0][0]',

'block2b\_add[0][0]']

block2d\_expand\_conv (Conv2D) (None, 56, 56, 240) 9600 ['block2c\_add[0][0]']

block2d\_expand\_bn (BatchNormal (None, 56, 56, 240) 960 ['block2d\_expand\_conv[0][0]']

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block2d\_expand\_activation (Act (None, 56, 56, 240) 0 ['block2d\_expand\_bn[0][0]']

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block2d\_dwconv (DepthwiseConv2 (None, 56, 56, 240) 2160 ['block2d\_expand\_activation[0][0]

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block2d\_bn (BatchNormalization (None, 56, 56, 240) 960 ['block2d\_dwconv[0][0]']

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block2d\_se\_squeeze (GlobalAver (None, 240) 0 ['block2d\_activation[0][0]']

agePooling2D)

block2d\_se\_reshape (Reshape) (None, 1, 1, 240) 0 ['block2d\_se\_squeeze[0][0]']

block2d\_se\_reduce (Conv2D) (None, 1, 1, 10) 2410 ['block2d\_se\_reshape[0][0]']

block2d\_se\_expand (Conv2D) (None, 1, 1, 240) 2640 ['block2d\_se\_reduce[0][0]']

block2d\_se\_excite (Multiply) (None, 56, 56, 240) 0 ['block2d\_activation[0][0]',

'block2d\_se\_expand[0][0]']

block2d\_project\_conv (Conv2D) (None, 56, 56, 40) 9600 ['block2d\_se\_excite[0][0]']

block2d\_project\_bn (BatchNorma (None, 56, 56, 40) 160 ['block2d\_project\_conv[0][0]']

lization)

block2d\_drop (FixedDropout) (None, 56, 56, 40) 0 ['block2d\_project\_bn[0][0]']

block2d\_add (Add) (None, 56, 56, 40) 0 ['block2d\_drop[0][0]',

'block2c\_add[0][0]']

block2e\_expand\_conv (Conv2D) (None, 56, 56, 240) 9600 ['block2d\_add[0][0]']

block2e\_expand\_bn (BatchNormal (None, 56, 56, 240) 960 ['block2e\_expand\_conv[0][0]']

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block2e\_expand\_activation (Act (None, 56, 56, 240) 0 ['block2e\_expand\_bn[0][0]']

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block2e\_dwconv (DepthwiseConv2 (None, 56, 56, 240) 2160 ['block2e\_expand\_activation[0][0]

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block2e\_bn (BatchNormalization (None, 56, 56, 240) 960 ['block2e\_dwconv[0][0]']

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block2e\_activation (Activation (None, 56, 56, 240) 0 ['block2e\_bn[0][0]']

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block2e\_se\_squeeze (GlobalAver (None, 240) 0 ['block2e\_activation[0][0]']

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block2e\_se\_reshape (Reshape) (None, 1, 1, 240) 0 ['block2e\_se\_squeeze[0][0]']

block2e\_se\_reduce (Conv2D) (None, 1, 1, 10) 2410 ['block2e\_se\_reshape[0][0]']

block2e\_se\_expand (Conv2D) (None, 1, 1, 240) 2640 ['block2e\_se\_reduce[0][0]']

block2e\_se\_excite (Multiply) (None, 56, 56, 240) 0 ['block2e\_activation[0][0]',

'block2e\_se\_expand[0][0]']

block2e\_project\_conv (Conv2D) (None, 56, 56, 40) 9600 ['block2e\_se\_excite[0][0]']

block2e\_project\_bn (BatchNorma (None, 56, 56, 40) 160 ['block2e\_project\_conv[0][0]']

lization)

block2e\_drop (FixedDropout) (None, 56, 56, 40) 0 ['block2e\_project\_bn[0][0]']

block2e\_add (Add) (None, 56, 56, 40) 0 ['block2e\_drop[0][0]',

'block2d\_add[0][0]']

block3a\_expand\_conv (Conv2D) (None, 56, 56, 240) 9600 ['block2e\_add[0][0]']

block3a\_expand\_bn (BatchNormal (None, 56, 56, 240) 960 ['block3a\_expand\_conv[0][0]']

ization)

block3a\_expand\_activation (Act (None, 56, 56, 240) 0 ['block3a\_expand\_bn[0][0]']

ivation)

block3a\_dwconv (DepthwiseConv2 (None, 28, 28, 240) 6000 ['block3a\_expand\_activation[0][0]

D) ']

block3a\_bn (BatchNormalization (None, 28, 28, 240) 960 ['block3a\_dwconv[0][0]']

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block3a\_activation (Activation (None, 28, 28, 240) 0 ['block3a\_bn[0][0]']

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block3a\_se\_squeeze (GlobalAver (None, 240) 0 ['block3a\_activation[0][0]']

agePooling2D)

block3a\_se\_reshape (Reshape) (None, 1, 1, 240) 0 ['block3a\_se\_squeeze[0][0]']

block3a\_se\_reduce (Conv2D) (None, 1, 1, 10) 2410 ['block3a\_se\_reshape[0][0]']

block3a\_se\_expand (Conv2D) (None, 1, 1, 240) 2640 ['block3a\_se\_reduce[0][0]']

block3a\_se\_excite (Multiply) (None, 28, 28, 240) 0 ['block3a\_activation[0][0]',

'block3a\_se\_expand[0][0]']

block3a\_project\_conv (Conv2D) (None, 28, 28, 64) 15360 ['block3a\_se\_excite[0][0]']

block3a\_project\_bn (BatchNorma (None, 28, 28, 64) 256 ['block3a\_project\_conv[0][0]']

lization)

block3b\_expand\_conv (Conv2D) (None, 28, 28, 384) 24576 ['block3a\_project\_bn[0][0]']

block3b\_expand\_bn (BatchNormal (None, 28, 28, 384) 1536 ['block3b\_expand\_conv[0][0]']

ization)

block3b\_expand\_activation (Act (None, 28, 28, 384) 0 ['block3b\_expand\_bn[0][0]']

ivation)

block3b\_dwconv (DepthwiseConv2 (None, 28, 28, 384) 9600 ['block3b\_expand\_activation[0][0]

D) ']

block3b\_bn (BatchNormalization (None, 28, 28, 384) 1536 ['block3b\_dwconv[0][0]']

)

block3b\_activation (Activation (None, 28, 28, 384) 0 ['block3b\_bn[0][0]']

)

block3b\_se\_squeeze (GlobalAver (None, 384) 0 ['block3b\_activation[0][0]']

agePooling2D)

block3b\_se\_reshape (Reshape) (None, 1, 1, 384) 0 ['block3b\_se\_squeeze[0][0]']

block3b\_se\_reduce (Conv2D) (None, 1, 1, 16) 6160 ['block3b\_se\_reshape[0][0]']

block3b\_se\_expand (Conv2D) (None, 1, 1, 384) 6528 ['block3b\_se\_reduce[0][0]']

block3b\_se\_excite (Multiply) (None, 28, 28, 384) 0 ['block3b\_activation[0][0]',

'block3b\_se\_expand[0][0]']

block3b\_project\_conv (Conv2D) (None, 28, 28, 64) 24576 ['block3b\_se\_excite[0][0]']

block3b\_project\_bn (BatchNorma (None, 28, 28, 64) 256 ['block3b\_project\_conv[0][0]']

lization)

block3b\_drop (FixedDropout) (None, 28, 28, 64) 0 ['block3b\_project\_bn[0][0]']

block3b\_add (Add) (None, 28, 28, 64) 0 ['block3b\_drop[0][0]',

'block3a\_project\_bn[0][0]']

block3c\_expand\_conv (Conv2D) (None, 28, 28, 384) 24576 ['block3b\_add[0][0]']

block3c\_expand\_bn (BatchNormal (None, 28, 28, 384) 1536 ['block3c\_expand\_conv[0][0]']

ization)

block3c\_expand\_activation (Act (None, 28, 28, 384) 0 ['block3c\_expand\_bn[0][0]']

ivation)

block3c\_dwconv (DepthwiseConv2 (None, 28, 28, 384) 9600 ['block3c\_expand\_activation[0][0]

D) ']

block3c\_bn (BatchNormalization (None, 28, 28, 384) 1536 ['block3c\_dwconv[0][0]']

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block3c\_activation (Activation (None, 28, 28, 384) 0 ['block3c\_bn[0][0]']

)

block3c\_se\_squeeze (GlobalAver (None, 384) 0 ['block3c\_activation[0][0]']

agePooling2D)

block3c\_se\_reshape (Reshape) (None, 1, 1, 384) 0 ['block3c\_se\_squeeze[0][0]']

block3c\_se\_reduce (Conv2D) (None, 1, 1, 16) 6160 ['block3c\_se\_reshape[0][0]']

block3c\_se\_expand (Conv2D) (None, 1, 1, 384) 6528 ['block3c\_se\_reduce[0][0]']

block3c\_se\_excite (Multiply) (None, 28, 28, 384) 0 ['block3c\_activation[0][0]',

'block3c\_se\_expand[0][0]']

block3c\_project\_conv (Conv2D) (None, 28, 28, 64) 24576 ['block3c\_se\_excite[0][0]']

block3c\_project\_bn (BatchNorma (None, 28, 28, 64) 256 ['block3c\_project\_conv[0][0]']

lization)

block3c\_drop (FixedDropout) (None, 28, 28, 64) 0 ['block3c\_project\_bn[0][0]']

block3c\_add (Add) (None, 28, 28, 64) 0 ['block3c\_drop[0][0]',

'block3b\_add[0][0]']

block3d\_expand\_conv (Conv2D) (None, 28, 28, 384) 24576 ['block3c\_add[0][0]']

block3d\_expand\_bn (BatchNormal (None, 28, 28, 384) 1536 ['block3d\_expand\_conv[0][0]']

ization)

block3d\_expand\_activation (Act (None, 28, 28, 384) 0 ['block3d\_expand\_bn[0][0]']

ivation)

block3d\_dwconv (DepthwiseConv2 (None, 28, 28, 384) 9600 ['block3d\_expand\_activation[0][0]

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block3d\_bn (BatchNormalization (None, 28, 28, 384) 1536 ['block3d\_dwconv[0][0]']

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block3d\_activation (Activation (None, 28, 28, 384) 0 ['block3d\_bn[0][0]']

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block3d\_se\_squeeze (GlobalAver (None, 384) 0 ['block3d\_activation[0][0]']

agePooling2D)

block3d\_se\_reshape (Reshape) (None, 1, 1, 384) 0 ['block3d\_se\_squeeze[0][0]']

block3d\_se\_reduce (Conv2D) (None, 1, 1, 16) 6160 ['block3d\_se\_reshape[0][0]']

block3d\_se\_expand (Conv2D) (None, 1, 1, 384) 6528 ['block3d\_se\_reduce[0][0]']

block3d\_se\_excite (Multiply) (None, 28, 28, 384) 0 ['block3d\_activation[0][0]',

'block3d\_se\_expand[0][0]']

block3d\_project\_conv (Conv2D) (None, 28, 28, 64) 24576 ['block3d\_se\_excite[0][0]']

block3d\_project\_bn (BatchNorma (None, 28, 28, 64) 256 ['block3d\_project\_conv[0][0]']

lization)

block3d\_drop (FixedDropout) (None, 28, 28, 64) 0 ['block3d\_project\_bn[0][0]']

block3d\_add (Add) (None, 28, 28, 64) 0 ['block3d\_drop[0][0]',

'block3c\_add[0][0]']

block3e\_expand\_conv (Conv2D) (None, 28, 28, 384) 24576 ['block3d\_add[0][0]']

block3e\_expand\_bn (BatchNormal (None, 28, 28, 384) 1536 ['block3e\_expand\_conv[0][0]']

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block3e\_expand\_activation (Act (None, 28, 28, 384) 0 ['block3e\_expand\_bn[0][0]']

ivation)

block3e\_dwconv (DepthwiseConv2 (None, 28, 28, 384) 9600 ['block3e\_expand\_activation[0][0]

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block3e\_bn (BatchNormalization (None, 28, 28, 384) 1536 ['block3e\_dwconv[0][0]']

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block3e\_activation (Activation (None, 28, 28, 384) 0 ['block3e\_bn[0][0]']

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block3e\_se\_squeeze (GlobalAver (None, 384) 0 ['block3e\_activation[0][0]']

agePooling2D)

block3e\_se\_reshape (Reshape) (None, 1, 1, 384) 0 ['block3e\_se\_squeeze[0][0]']

block3e\_se\_reduce (Conv2D) (None, 1, 1, 16) 6160 ['block3e\_se\_reshape[0][0]']

block3e\_se\_expand (Conv2D) (None, 1, 1, 384) 6528 ['block3e\_se\_reduce[0][0]']

block3e\_se\_excite (Multiply) (None, 28, 28, 384) 0 ['block3e\_activation[0][0]',

'block3e\_se\_expand[0][0]']

block3e\_project\_conv (Conv2D) (None, 28, 28, 64) 24576 ['block3e\_se\_excite[0][0]']

block3e\_project\_bn (BatchNorma (None, 28, 28, 64) 256 ['block3e\_project\_conv[0][0]']

lization)

block3e\_drop (FixedDropout) (None, 28, 28, 64) 0 ['block3e\_project\_bn[0][0]']

block3e\_add (Add) (None, 28, 28, 64) 0 ['block3e\_drop[0][0]',

'block3d\_add[0][0]']

block4a\_expand\_conv (Conv2D) (None, 28, 28, 384) 24576 ['block3e\_add[0][0]']

block4a\_expand\_bn (BatchNormal (None, 28, 28, 384) 1536 ['block4a\_expand\_conv[0][0]']

ization)

block4a\_expand\_activation (Act (None, 28, 28, 384) 0 ['block4a\_expand\_bn[0][0]']

ivation)

block4a\_dwconv (DepthwiseConv2 (None, 14, 14, 384) 3456 ['block4a\_expand\_activation[0][0]

D) ']

block4a\_bn (BatchNormalization (None, 14, 14, 384) 1536 ['block4a\_dwconv[0][0]']

)

block4a\_activation (Activation (None, 14, 14, 384) 0 ['block4a\_bn[0][0]']

)

block4a\_se\_squeeze (GlobalAver (None, 384) 0 ['block4a\_activation[0][0]']

agePooling2D)

block4a\_se\_reshape (Reshape) (None, 1, 1, 384) 0 ['block4a\_se\_squeeze[0][0]']

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'block4a\_se\_expand[0][0]']

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block4a\_project\_bn (BatchNorma (None, 14, 14, 128) 512 ['block4a\_project\_conv[0][0]']

lization)

block4b\_expand\_conv (Conv2D) (None, 14, 14, 768) 98304 ['block4a\_project\_bn[0][0]']

block4b\_expand\_bn (BatchNormal (None, 14, 14, 768) 3072 ['block4b\_expand\_conv[0][0]']

ization)

block4b\_expand\_activation (Act (None, 14, 14, 768) 0 ['block4b\_expand\_bn[0][0]']

ivation)

block4b\_dwconv (DepthwiseConv2 (None, 14, 14, 768) 6912 ['block4b\_expand\_activation[0][0]

D) ']

block4b\_bn (BatchNormalization (None, 14, 14, 768) 3072 ['block4b\_dwconv[0][0]']

)

block4b\_activation (Activation (None, 14, 14, 768) 0 ['block4b\_bn[0][0]']

)

block4b\_se\_squeeze (GlobalAver (None, 768) 0 ['block4b\_activation[0][0]']

agePooling2D)

block4b\_se\_reshape (Reshape) (None, 1, 1, 768) 0 ['block4b\_se\_squeeze[0][0]']

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block4b\_se\_expand (Conv2D) (None, 1, 1, 768) 25344 ['block4b\_se\_reduce[0][0]']

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'block4b\_se\_expand[0][0]']

block4b\_project\_conv (Conv2D) (None, 14, 14, 128) 98304 ['block4b\_se\_excite[0][0]']

block4b\_project\_bn (BatchNorma (None, 14, 14, 128) 512 ['block4b\_project\_conv[0][0]']

lization)

block4b\_drop (FixedDropout) (None, 14, 14, 128) 0 ['block4b\_project\_bn[0][0]']

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'block4a\_project\_bn[0][0]']

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ization)

block4c\_expand\_activation (Act (None, 14, 14, 768) 0 ['block4c\_expand\_bn[0][0]']

ivation)

block4c\_dwconv (DepthwiseConv2 (None, 14, 14, 768) 6912 ['block4c\_expand\_activation[0][0]

D) ']

block4c\_bn (BatchNormalization (None, 14, 14, 768) 3072 ['block4c\_dwconv[0][0]']

)

block4c\_activation (Activation (None, 14, 14, 768) 0 ['block4c\_bn[0][0]']

)

block4c\_se\_squeeze (GlobalAver (None, 768) 0 ['block4c\_activation[0][0]']

agePooling2D)

block4c\_se\_reshape (Reshape) (None, 1, 1, 768) 0 ['block4c\_se\_squeeze[0][0]']

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block4c\_se\_expand (Conv2D) (None, 1, 1, 768) 25344 ['block4c\_se\_reduce[0][0]']

block4c\_se\_excite (Multiply) (None, 14, 14, 768) 0 ['block4c\_activation[0][0]',

'block4c\_se\_expand[0][0]']

block4c\_project\_conv (Conv2D) (None, 14, 14, 128) 98304 ['block4c\_se\_excite[0][0]']

block4c\_project\_bn (BatchNorma (None, 14, 14, 128) 512 ['block4c\_project\_conv[0][0]']

lization)

block4c\_drop (FixedDropout) (None, 14, 14, 128) 0 ['block4c\_project\_bn[0][0]']

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block4d\_expand\_bn (BatchNormal (None, 14, 14, 768) 3072 ['block4d\_expand\_conv[0][0]']

ization)

block4d\_expand\_activation (Act (None, 14, 14, 768) 0 ['block4d\_expand\_bn[0][0]']

ivation)

block4d\_dwconv (DepthwiseConv2 (None, 14, 14, 768) 6912 ['block4d\_expand\_activation[0][0]

D) ']

block4d\_bn (BatchNormalization (None, 14, 14, 768) 3072 ['block4d\_dwconv[0][0]']

)

block4d\_activation (Activation (None, 14, 14, 768) 0 ['block4d\_bn[0][0]']

)

block4d\_se\_squeeze (GlobalAver (None, 768) 0 ['block4d\_activation[0][0]']

agePooling2D)

block4d\_se\_reshape (Reshape) (None, 1, 1, 768) 0 ['block4d\_se\_squeeze[0][0]']

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block4d\_se\_expand (Conv2D) (None, 1, 1, 768) 25344 ['block4d\_se\_reduce[0][0]']

block4d\_se\_excite (Multiply) (None, 14, 14, 768) 0 ['block4d\_activation[0][0]',

'block4d\_se\_expand[0][0]']

block4d\_project\_conv (Conv2D) (None, 14, 14, 128) 98304 ['block4d\_se\_excite[0][0]']

block4d\_project\_bn (BatchNorma (None, 14, 14, 128) 512 ['block4d\_project\_conv[0][0]']

lization)

block4d\_drop (FixedDropout) (None, 14, 14, 128) 0 ['block4d\_project\_bn[0][0]']

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ization)

block4e\_expand\_activation (Act (None, 14, 14, 768) 0 ['block4e\_expand\_bn[0][0]']

ivation)

block4e\_dwconv (DepthwiseConv2 (None, 14, 14, 768) 6912 ['block4e\_expand\_activation[0][0]

D) ']

block4e\_bn (BatchNormalization (None, 14, 14, 768) 3072 ['block4e\_dwconv[0][0]']

)

block4e\_activation (Activation (None, 14, 14, 768) 0 ['block4e\_bn[0][0]']

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block4e\_se\_squeeze (GlobalAver (None, 768) 0 ['block4e\_activation[0][0]']

agePooling2D)

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block4e\_se\_expand (Conv2D) (None, 1, 1, 768) 25344 ['block4e\_se\_reduce[0][0]']

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block4e\_project\_bn (BatchNorma (None, 14, 14, 128) 512 ['block4e\_project\_conv[0][0]']

lization)

block4e\_drop (FixedDropout) (None, 14, 14, 128) 0 ['block4e\_project\_bn[0][0]']

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block4f\_expand\_bn (BatchNormal (None, 14, 14, 768) 3072 ['block4f\_expand\_conv[0][0]']

ization)

block4f\_expand\_activation (Act (None, 14, 14, 768) 0 ['block4f\_expand\_bn[0][0]']

ivation)

block4f\_dwconv (DepthwiseConv2 (None, 14, 14, 768) 6912 ['block4f\_expand\_activation[0][0]

D) ']

block4f\_bn (BatchNormalization (None, 14, 14, 768) 3072 ['block4f\_dwconv[0][0]']

)

block4f\_activation (Activation (None, 14, 14, 768) 0 ['block4f\_bn[0][0]']

)

block4f\_se\_squeeze (GlobalAver (None, 768) 0 ['block4f\_activation[0][0]']

agePooling2D)

block4f\_se\_reshape (Reshape) (None, 1, 1, 768) 0 ['block4f\_se\_squeeze[0][0]']

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block4f\_se\_expand (Conv2D) (None, 1, 1, 768) 25344 ['block4f\_se\_reduce[0][0]']

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'block4f\_se\_expand[0][0]']

block4f\_project\_conv (Conv2D) (None, 14, 14, 128) 98304 ['block4f\_se\_excite[0][0]']

block4f\_project\_bn (BatchNorma (None, 14, 14, 128) 512 ['block4f\_project\_conv[0][0]']

lization)

block4f\_drop (FixedDropout) (None, 14, 14, 128) 0 ['block4f\_project\_bn[0][0]']

block4f\_add (Add) (None, 14, 14, 128) 0 ['block4f\_drop[0][0]',

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block4g\_expand\_conv (Conv2D) (None, 14, 14, 768) 98304 ['block4f\_add[0][0]']

block4g\_expand\_bn (BatchNormal (None, 14, 14, 768) 3072 ['block4g\_expand\_conv[0][0]']

ization)

block4g\_expand\_activation (Act (None, 14, 14, 768) 0 ['block4g\_expand\_bn[0][0]']

ivation)

block4g\_dwconv (DepthwiseConv2 (None, 14, 14, 768) 6912 ['block4g\_expand\_activation[0][0]

D) ']

block4g\_bn (BatchNormalization (None, 14, 14, 768) 3072 ['block4g\_dwconv[0][0]']

)

block4g\_activation (Activation (None, 14, 14, 768) 0 ['block4g\_bn[0][0]']

)

block4g\_se\_squeeze (GlobalAver (None, 768) 0 ['block4g\_activation[0][0]']

agePooling2D)

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block4g\_se\_reduce (Conv2D) (None, 1, 1, 32) 24608 ['block4g\_se\_reshape[0][0]']

block4g\_se\_expand (Conv2D) (None, 1, 1, 768) 25344 ['block4g\_se\_reduce[0][0]']

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block4g\_project\_bn (BatchNorma (None, 14, 14, 128) 512 ['block4g\_project\_conv[0][0]']

lization)

block4g\_drop (FixedDropout) (None, 14, 14, 128) 0 ['block4g\_project\_bn[0][0]']

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block5a\_expand\_conv (Conv2D) (None, 14, 14, 768) 98304 ['block4g\_add[0][0]']

block5a\_expand\_bn (BatchNormal (None, 14, 14, 768) 3072 ['block5a\_expand\_conv[0][0]']

ization)

block5a\_expand\_activation (Act (None, 14, 14, 768) 0 ['block5a\_expand\_bn[0][0]']

ivation)

block5a\_dwconv (DepthwiseConv2 (None, 14, 14, 768) 19200 ['block5a\_expand\_activation[0][0]

D) ']

block5a\_bn (BatchNormalization (None, 14, 14, 768) 3072 ['block5a\_dwconv[0][0]']

)

block5a\_activation (Activation (None, 14, 14, 768) 0 ['block5a\_bn[0][0]']

)

block5a\_se\_squeeze (GlobalAver (None, 768) 0 ['block5a\_activation[0][0]']

agePooling2D)

block5a\_se\_reshape (Reshape) (None, 1, 1, 768) 0 ['block5a\_se\_squeeze[0][0]']

block5a\_se\_reduce (Conv2D) (None, 1, 1, 32) 24608 ['block5a\_se\_reshape[0][0]']

block5a\_se\_expand (Conv2D) (None, 1, 1, 768) 25344 ['block5a\_se\_reduce[0][0]']

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lization)

block5b\_expand\_conv (Conv2D) (None, 14, 14, 1056 185856 ['block5a\_project\_bn[0][0]']

)

block5b\_expand\_bn (BatchNormal (None, 14, 14, 1056 4224 ['block5b\_expand\_conv[0][0]']

ization) )

block5b\_expand\_activation (Act (None, 14, 14, 1056 0 ['block5b\_expand\_bn[0][0]']

ivation) )

block5b\_dwconv (DepthwiseConv2 (None, 14, 14, 1056 26400 ['block5b\_expand\_activation[0][0]

D) ) ']

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) )

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) )

block5b\_se\_squeeze (GlobalAver (None, 1056) 0 ['block5b\_activation[0][0]']

agePooling2D)

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block5b\_project\_conv (Conv2D) (None, 14, 14, 176) 185856 ['block5b\_se\_excite[0][0]']

block5b\_project\_bn (BatchNorma (None, 14, 14, 176) 704 ['block5b\_project\_conv[0][0]']

lization)

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block5c\_expand\_conv (Conv2D) (None, 14, 14, 1056 185856 ['block5b\_add[0][0]']

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block5c\_expand\_bn (BatchNormal (None, 14, 14, 1056 4224 ['block5c\_expand\_conv[0][0]']

ization) )

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ivation) )

block5c\_dwconv (DepthwiseConv2 (None, 14, 14, 1056 26400 ['block5c\_expand\_activation[0][0]

D) ) ']

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) )

block5c\_activation (Activation (None, 14, 14, 1056 0 ['block5c\_bn[0][0]']

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block5c\_project\_bn (BatchNorma (None, 14, 14, 176) 704 ['block5c\_project\_conv[0][0]']

lization)

block5c\_drop (FixedDropout) (None, 14, 14, 176) 0 ['block5c\_project\_bn[0][0]']

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)

block5d\_expand\_bn (BatchNormal (None, 14, 14, 1056 4224 ['block5d\_expand\_conv[0][0]']

ization) )

block5d\_expand\_activation (Act (None, 14, 14, 1056 0 ['block5d\_expand\_bn[0][0]']

ivation) )

block5d\_dwconv (DepthwiseConv2 (None, 14, 14, 1056 26400 ['block5d\_expand\_activation[0][0]

D) ) ']

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block5d\_project\_conv (Conv2D) (None, 14, 14, 176) 185856 ['block5d\_se\_excite[0][0]']

block5d\_project\_bn (BatchNorma (None, 14, 14, 176) 704 ['block5d\_project\_conv[0][0]']

lization)

block5d\_drop (FixedDropout) (None, 14, 14, 176) 0 ['block5d\_project\_bn[0][0]']

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block5e\_expand\_conv (Conv2D) (None, 14, 14, 1056 185856 ['block5d\_add[0][0]']

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block5e\_expand\_bn (BatchNormal (None, 14, 14, 1056 4224 ['block5e\_expand\_conv[0][0]']

ization) )

block5e\_expand\_activation (Act (None, 14, 14, 1056 0 ['block5e\_expand\_bn[0][0]']

ivation) )

block5e\_dwconv (DepthwiseConv2 (None, 14, 14, 1056 26400 ['block5e\_expand\_activation[0][0]

D) ) ']

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agePooling2D)

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block5e\_project\_conv (Conv2D) (None, 14, 14, 176) 185856 ['block5e\_se\_excite[0][0]']

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lization)

block5e\_drop (FixedDropout) (None, 14, 14, 176) 0 ['block5e\_project\_bn[0][0]']

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block5f\_expand\_conv (Conv2D) (None, 14, 14, 1056 185856 ['block5e\_add[0][0]']

)

block5f\_expand\_bn (BatchNormal (None, 14, 14, 1056 4224 ['block5f\_expand\_conv[0][0]']

ization) )

block5f\_expand\_activation (Act (None, 14, 14, 1056 0 ['block5f\_expand\_bn[0][0]']

ivation) )

block5f\_dwconv (DepthwiseConv2 (None, 14, 14, 1056 26400 ['block5f\_expand\_activation[0][0]

D) ) ']

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lization)

block5f\_drop (FixedDropout) (None, 14, 14, 176) 0 ['block5f\_project\_bn[0][0]']

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block5g\_expand\_conv (Conv2D) (None, 14, 14, 1056 185856 ['block5f\_add[0][0]']

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block5g\_expand\_bn (BatchNormal (None, 14, 14, 1056 4224 ['block5g\_expand\_conv[0][0]']

ization) )

block5g\_expand\_activation (Act (None, 14, 14, 1056 0 ['block5g\_expand\_bn[0][0]']

ivation) )

block5g\_dwconv (DepthwiseConv2 (None, 14, 14, 1056 26400 ['block5g\_expand\_activation[0][0]

D) ) ']

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block5g\_se\_reduce (Conv2D) (None, 1, 1, 44) 46508 ['block5g\_se\_reshape[0][0]']

block5g\_se\_expand (Conv2D) (None, 1, 1, 1056) 47520 ['block5g\_se\_reduce[0][0]']

block5g\_se\_excite (Multiply) (None, 14, 14, 1056 0 ['block5g\_activation[0][0]',

) 'block5g\_se\_expand[0][0]']

block5g\_project\_conv (Conv2D) (None, 14, 14, 176) 185856 ['block5g\_se\_excite[0][0]']

block5g\_project\_bn (BatchNorma (None, 14, 14, 176) 704 ['block5g\_project\_conv[0][0]']

lization)

block5g\_drop (FixedDropout) (None, 14, 14, 176) 0 ['block5g\_project\_bn[0][0]']

block5g\_add (Add) (None, 14, 14, 176) 0 ['block5g\_drop[0][0]',

'block5f\_add[0][0]']

block6a\_expand\_conv (Conv2D) (None, 14, 14, 1056 185856 ['block5g\_add[0][0]']

)

block6a\_expand\_bn (BatchNormal (None, 14, 14, 1056 4224 ['block6a\_expand\_conv[0][0]']

ization) )

block6a\_expand\_activation (Act (None, 14, 14, 1056 0 ['block6a\_expand\_bn[0][0]']

ivation) )

block6a\_dwconv (DepthwiseConv2 (None, 7, 7, 1056) 26400 ['block6a\_expand\_activation[0][0]

D) ']

block6a\_bn (BatchNormalization (None, 7, 7, 1056) 4224 ['block6a\_dwconv[0][0]']

)

block6a\_activation (Activation (None, 7, 7, 1056) 0 ['block6a\_bn[0][0]']

)

block6a\_se\_squeeze (GlobalAver (None, 1056) 0 ['block6a\_activation[0][0]']

agePooling2D)

block6a\_se\_reshape (Reshape) (None, 1, 1, 1056) 0 ['block6a\_se\_squeeze[0][0]']

block6a\_se\_reduce (Conv2D) (None, 1, 1, 44) 46508 ['block6a\_se\_reshape[0][0]']

block6a\_se\_expand (Conv2D) (None, 1, 1, 1056) 47520 ['block6a\_se\_reduce[0][0]']

block6a\_se\_excite (Multiply) (None, 7, 7, 1056) 0 ['block6a\_activation[0][0]',

'block6a\_se\_expand[0][0]']

block6a\_project\_conv (Conv2D) (None, 7, 7, 304) 321024 ['block6a\_se\_excite[0][0]']

block6a\_project\_bn (BatchNorma (None, 7, 7, 304) 1216 ['block6a\_project\_conv[0][0]']

lization)

block6b\_expand\_conv (Conv2D) (None, 7, 7, 1824) 554496 ['block6a\_project\_bn[0][0]']

block6b\_expand\_bn (BatchNormal (None, 7, 7, 1824) 7296 ['block6b\_expand\_conv[0][0]']

ization)

block6b\_expand\_activation (Act (None, 7, 7, 1824) 0 ['block6b\_expand\_bn[0][0]']

ivation)

block6b\_dwconv (DepthwiseConv2 (None, 7, 7, 1824) 45600 ['block6b\_expand\_activation[0][0]

D) ']

block6b\_bn (BatchNormalization (None, 7, 7, 1824) 7296 ['block6b\_dwconv[0][0]']

)

block6b\_activation (Activation (None, 7, 7, 1824) 0 ['block6b\_bn[0][0]']

)

block6b\_se\_squeeze (GlobalAver (None, 1824) 0 ['block6b\_activation[0][0]']

agePooling2D)

block6b\_se\_reshape (Reshape) (None, 1, 1, 1824) 0 ['block6b\_se\_squeeze[0][0]']

block6b\_se\_reduce (Conv2D) (None, 1, 1, 76) 138700 ['block6b\_se\_reshape[0][0]']

block6b\_se\_expand (Conv2D) (None, 1, 1, 1824) 140448 ['block6b\_se\_reduce[0][0]']

block6b\_se\_excite (Multiply) (None, 7, 7, 1824) 0 ['block6b\_activation[0][0]',

'block6b\_se\_expand[0][0]']

block6b\_project\_conv (Conv2D) (None, 7, 7, 304) 554496 ['block6b\_se\_excite[0][0]']

block6b\_project\_bn (BatchNorma (None, 7, 7, 304) 1216 ['block6b\_project\_conv[0][0]']

lization)

block6b\_drop (FixedDropout) (None, 7, 7, 304) 0 ['block6b\_project\_bn[0][0]']

block6b\_add (Add) (None, 7, 7, 304) 0 ['block6b\_drop[0][0]',

'block6a\_project\_bn[0][0]']

block6c\_expand\_conv (Conv2D) (None, 7, 7, 1824) 554496 ['block6b\_add[0][0]']

block6c\_expand\_bn (BatchNormal (None, 7, 7, 1824) 7296 ['block6c\_expand\_conv[0][0]']

ization)

block6c\_expand\_activation (Act (None, 7, 7, 1824) 0 ['block6c\_expand\_bn[0][0]']

ivation)

block6c\_dwconv (DepthwiseConv2 (None, 7, 7, 1824) 45600 ['block6c\_expand\_activation[0][0]

D) ']

block6c\_bn (BatchNormalization (None, 7, 7, 1824) 7296 ['block6c\_dwconv[0][0]']

)

block6c\_activation (Activation (None, 7, 7, 1824) 0 ['block6c\_bn[0][0]']

)

block6c\_se\_squeeze (GlobalAver (None, 1824) 0 ['block6c\_activation[0][0]']

agePooling2D)

block6c\_se\_reshape (Reshape) (None, 1, 1, 1824) 0 ['block6c\_se\_squeeze[0][0]']

block6c\_se\_reduce (Conv2D) (None, 1, 1, 76) 138700 ['block6c\_se\_reshape[0][0]']

block6c\_se\_expand (Conv2D) (None, 1, 1, 1824) 140448 ['block6c\_se\_reduce[0][0]']

block6c\_se\_excite (Multiply) (None, 7, 7, 1824) 0 ['block6c\_activation[0][0]',

'block6c\_se\_expand[0][0]']

block6c\_project\_conv (Conv2D) (None, 7, 7, 304) 554496 ['block6c\_se\_excite[0][0]']

block6c\_project\_bn (BatchNorma (None, 7, 7, 304) 1216 ['block6c\_project\_conv[0][0]']

lization)

block6c\_drop (FixedDropout) (None, 7, 7, 304) 0 ['block6c\_project\_bn[0][0]']

block6c\_add (Add) (None, 7, 7, 304) 0 ['block6c\_drop[0][0]',

'block6b\_add[0][0]']

block6d\_expand\_conv (Conv2D) (None, 7, 7, 1824) 554496 ['block6c\_add[0][0]']

block6d\_expand\_bn (BatchNormal (None, 7, 7, 1824) 7296 ['block6d\_expand\_conv[0][0]']

ization)

block6d\_expand\_activation (Act (None, 7, 7, 1824) 0 ['block6d\_expand\_bn[0][0]']

ivation)

block6d\_dwconv (DepthwiseConv2 (None, 7, 7, 1824) 45600 ['block6d\_expand\_activation[0][0]

D) ']

block6d\_bn (BatchNormalization (None, 7, 7, 1824) 7296 ['block6d\_dwconv[0][0]']

)

block6d\_activation (Activation (None, 7, 7, 1824) 0 ['block6d\_bn[0][0]']

)

block6d\_se\_squeeze (GlobalAver (None, 1824) 0 ['block6d\_activation[0][0]']

agePooling2D)

block6d\_se\_reshape (Reshape) (None, 1, 1, 1824) 0 ['block6d\_se\_squeeze[0][0]']

block6d\_se\_reduce (Conv2D) (None, 1, 1, 76) 138700 ['block6d\_se\_reshape[0][0]']

block6d\_se\_expand (Conv2D) (None, 1, 1, 1824) 140448 ['block6d\_se\_reduce[0][0]']

block6d\_se\_excite (Multiply) (None, 7, 7, 1824) 0 ['block6d\_activation[0][0]',

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block6d\_project\_conv (Conv2D) (None, 7, 7, 304) 554496 ['block6d\_se\_excite[0][0]']

block6d\_project\_bn (BatchNorma (None, 7, 7, 304) 1216 ['block6d\_project\_conv[0][0]']

lization)

block6d\_drop (FixedDropout) (None, 7, 7, 304) 0 ['block6d\_project\_bn[0][0]']

block6d\_add (Add) (None, 7, 7, 304) 0 ['block6d\_drop[0][0]',

'block6c\_add[0][0]']

block6e\_expand\_conv (Conv2D) (None, 7, 7, 1824) 554496 ['block6d\_add[0][0]']

block6e\_expand\_bn (BatchNormal (None, 7, 7, 1824) 7296 ['block6e\_expand\_conv[0][0]']

ization)

block6e\_expand\_activation (Act (None, 7, 7, 1824) 0 ['block6e\_expand\_bn[0][0]']

ivation)

block6e\_dwconv (DepthwiseConv2 (None, 7, 7, 1824) 45600 ['block6e\_expand\_activation[0][0]

D) ']

block6e\_bn (BatchNormalization (None, 7, 7, 1824) 7296 ['block6e\_dwconv[0][0]']

)

block6e\_activation (Activation (None, 7, 7, 1824) 0 ['block6e\_bn[0][0]']

)

block6e\_se\_squeeze (GlobalAver (None, 1824) 0 ['block6e\_activation[0][0]']

agePooling2D)

block6e\_se\_reshape (Reshape) (None, 1, 1, 1824) 0 ['block6e\_se\_squeeze[0][0]']

block6e\_se\_reduce (Conv2D) (None, 1, 1, 76) 138700 ['block6e\_se\_reshape[0][0]']

block6e\_se\_expand (Conv2D) (None, 1, 1, 1824) 140448 ['block6e\_se\_reduce[0][0]']

block6e\_se\_excite (Multiply) (None, 7, 7, 1824) 0 ['block6e\_activation[0][0]',

'block6e\_se\_expand[0][0]']

block6e\_project\_conv (Conv2D) (None, 7, 7, 304) 554496 ['block6e\_se\_excite[0][0]']

block6e\_project\_bn (BatchNorma (None, 7, 7, 304) 1216 ['block6e\_project\_conv[0][0]']

lization)

block6e\_drop (FixedDropout) (None, 7, 7, 304) 0 ['block6e\_project\_bn[0][0]']

block6e\_add (Add) (None, 7, 7, 304) 0 ['block6e\_drop[0][0]',

'block6d\_add[0][0]']

block6f\_expand\_conv (Conv2D) (None, 7, 7, 1824) 554496 ['block6e\_add[0][0]']

block6f\_expand\_bn (BatchNormal (None, 7, 7, 1824) 7296 ['block6f\_expand\_conv[0][0]']

ization)

block6f\_expand\_activation (Act (None, 7, 7, 1824) 0 ['block6f\_expand\_bn[0][0]']

ivation)

block6f\_dwconv (DepthwiseConv2 (None, 7, 7, 1824) 45600 ['block6f\_expand\_activation[0][0]

D) ']

block6f\_bn (BatchNormalization (None, 7, 7, 1824) 7296 ['block6f\_dwconv[0][0]']

)

block6f\_activation (Activation (None, 7, 7, 1824) 0 ['block6f\_bn[0][0]']

)

block6f\_se\_squeeze (GlobalAver (None, 1824) 0 ['block6f\_activation[0][0]']

agePooling2D)

block6f\_se\_reshape (Reshape) (None, 1, 1, 1824) 0 ['block6f\_se\_squeeze[0][0]']

block6f\_se\_reduce (Conv2D) (None, 1, 1, 76) 138700 ['block6f\_se\_reshape[0][0]']

block6f\_se\_expand (Conv2D) (None, 1, 1, 1824) 140448 ['block6f\_se\_reduce[0][0]']

block6f\_se\_excite (Multiply) (None, 7, 7, 1824) 0 ['block6f\_activation[0][0]',

'block6f\_se\_expand[0][0]']

block6f\_project\_conv (Conv2D) (None, 7, 7, 304) 554496 ['block6f\_se\_excite[0][0]']

block6f\_project\_bn (BatchNorma (None, 7, 7, 304) 1216 ['block6f\_project\_conv[0][0]']

lization)

block6f\_drop (FixedDropout) (None, 7, 7, 304) 0 ['block6f\_project\_bn[0][0]']

block6f\_add (Add) (None, 7, 7, 304) 0 ['block6f\_drop[0][0]',

'block6e\_add[0][0]']

block6g\_expand\_conv (Conv2D) (None, 7, 7, 1824) 554496 ['block6f\_add[0][0]']

block6g\_expand\_bn (BatchNormal (None, 7, 7, 1824) 7296 ['block6g\_expand\_conv[0][0]']

ization)

block6g\_expand\_activation (Act (None, 7, 7, 1824) 0 ['block6g\_expand\_bn[0][0]']

ivation)

block6g\_dwconv (DepthwiseConv2 (None, 7, 7, 1824) 45600 ['block6g\_expand\_activation[0][0]

D) ']

block6g\_bn (BatchNormalization (None, 7, 7, 1824) 7296 ['block6g\_dwconv[0][0]']

)

block6g\_activation (Activation (None, 7, 7, 1824) 0 ['block6g\_bn[0][0]']

)

block6g\_se\_squeeze (GlobalAver (None, 1824) 0 ['block6g\_activation[0][0]']

agePooling2D)

block6g\_se\_reshape (Reshape) (None, 1, 1, 1824) 0 ['block6g\_se\_squeeze[0][0]']

block6g\_se\_reduce (Conv2D) (None, 1, 1, 76) 138700 ['block6g\_se\_reshape[0][0]']

block6g\_se\_expand (Conv2D) (None, 1, 1, 1824) 140448 ['block6g\_se\_reduce[0][0]']

block6g\_se\_excite (Multiply) (None, 7, 7, 1824) 0 ['block6g\_activation[0][0]',

'block6g\_se\_expand[0][0]']

block6g\_project\_conv (Conv2D) (None, 7, 7, 304) 554496 ['block6g\_se\_excite[0][0]']

block6g\_project\_bn (BatchNorma (None, 7, 7, 304) 1216 ['block6g\_project\_conv[0][0]']

lization)

block6g\_drop (FixedDropout) (None, 7, 7, 304) 0 ['block6g\_project\_bn[0][0]']

block6g\_add (Add) (None, 7, 7, 304) 0 ['block6g\_drop[0][0]',

'block6f\_add[0][0]']

block6h\_expand\_conv (Conv2D) (None, 7, 7, 1824) 554496 ['block6g\_add[0][0]']

block6h\_expand\_bn (BatchNormal (None, 7, 7, 1824) 7296 ['block6h\_expand\_conv[0][0]']

ization)

block6h\_expand\_activation (Act (None, 7, 7, 1824) 0 ['block6h\_expand\_bn[0][0]']

ivation)

block6h\_dwconv (DepthwiseConv2 (None, 7, 7, 1824) 45600 ['block6h\_expand\_activation[0][0]

D) ']

block6h\_bn (BatchNormalization (None, 7, 7, 1824) 7296 ['block6h\_dwconv[0][0]']

)

block6h\_activation (Activation (None, 7, 7, 1824) 0 ['block6h\_bn[0][0]']

)

block6h\_se\_squeeze (GlobalAver (None, 1824) 0 ['block6h\_activation[0][0]']

agePooling2D)

block6h\_se\_reshape (Reshape) (None, 1, 1, 1824) 0 ['block6h\_se\_squeeze[0][0]']

block6h\_se\_reduce (Conv2D) (None, 1, 1, 76) 138700 ['block6h\_se\_reshape[0][0]']

block6h\_se\_expand (Conv2D) (None, 1, 1, 1824) 140448 ['block6h\_se\_reduce[0][0]']

block6h\_se\_excite (Multiply) (None, 7, 7, 1824) 0 ['block6h\_activation[0][0]',

'block6h\_se\_expand[0][0]']

block6h\_project\_conv (Conv2D) (None, 7, 7, 304) 554496 ['block6h\_se\_excite[0][0]']

block6h\_project\_bn (BatchNorma (None, 7, 7, 304) 1216 ['block6h\_project\_conv[0][0]']

lization)

block6h\_drop (FixedDropout) (None, 7, 7, 304) 0 ['block6h\_project\_bn[0][0]']

block6h\_add (Add) (None, 7, 7, 304) 0 ['block6h\_drop[0][0]',

'block6g\_add[0][0]']

block6i\_expand\_conv (Conv2D) (None, 7, 7, 1824) 554496 ['block6h\_add[0][0]']

block6i\_expand\_bn (BatchNormal (None, 7, 7, 1824) 7296 ['block6i\_expand\_conv[0][0]']

ization)

block6i\_expand\_activation (Act (None, 7, 7, 1824) 0 ['block6i\_expand\_bn[0][0]']

ivation)

block6i\_dwconv (DepthwiseConv2 (None, 7, 7, 1824) 45600 ['block6i\_expand\_activation[0][0]

D) ']

block6i\_bn (BatchNormalization (None, 7, 7, 1824) 7296 ['block6i\_dwconv[0][0]']

)

block6i\_activation (Activation (None, 7, 7, 1824) 0 ['block6i\_bn[0][0]']

)

block6i\_se\_squeeze (GlobalAver (None, 1824) 0 ['block6i\_activation[0][0]']

agePooling2D)

block6i\_se\_reshape (Reshape) (None, 1, 1, 1824) 0 ['block6i\_se\_squeeze[0][0]']

block6i\_se\_reduce (Conv2D) (None, 1, 1, 76) 138700 ['block6i\_se\_reshape[0][0]']

block6i\_se\_expand (Conv2D) (None, 1, 1, 1824) 140448 ['block6i\_se\_reduce[0][0]']

block6i\_se\_excite (Multiply) (None, 7, 7, 1824) 0 ['block6i\_activation[0][0]',

'block6i\_se\_expand[0][0]']

block6i\_project\_conv (Conv2D) (None, 7, 7, 304) 554496 ['block6i\_se\_excite[0][0]']

block6i\_project\_bn (BatchNorma (None, 7, 7, 304) 1216 ['block6i\_project\_conv[0][0]']

lization)

block6i\_drop (FixedDropout) (None, 7, 7, 304) 0 ['block6i\_project\_bn[0][0]']

block6i\_add (Add) (None, 7, 7, 304) 0 ['block6i\_drop[0][0]',

'block6h\_add[0][0]']

block7a\_expand\_conv (Conv2D) (None, 7, 7, 1824) 554496 ['block6i\_add[0][0]']

block7a\_expand\_bn (BatchNormal (None, 7, 7, 1824) 7296 ['block7a\_expand\_conv[0][0]']

ization)

block7a\_expand\_activation (Act (None, 7, 7, 1824) 0 ['block7a\_expand\_bn[0][0]']

ivation)

block7a\_dwconv (DepthwiseConv2 (None, 7, 7, 1824) 16416 ['block7a\_expand\_activation[0][0]

D) ']

block7a\_bn (BatchNormalization (None, 7, 7, 1824) 7296 ['block7a\_dwconv[0][0]']

)

block7a\_activation (Activation (None, 7, 7, 1824) 0 ['block7a\_bn[0][0]']

)

block7a\_se\_squeeze (GlobalAver (None, 1824) 0 ['block7a\_activation[0][0]']

agePooling2D)

block7a\_se\_reshape (Reshape) (None, 1, 1, 1824) 0 ['block7a\_se\_squeeze[0][0]']

block7a\_se\_reduce (Conv2D) (None, 1, 1, 76) 138700 ['block7a\_se\_reshape[0][0]']

block7a\_se\_expand (Conv2D) (None, 1, 1, 1824) 140448 ['block7a\_se\_reduce[0][0]']

block7a\_se\_excite (Multiply) (None, 7, 7, 1824) 0 ['block7a\_activation[0][0]',

'block7a\_se\_expand[0][0]']

block7a\_project\_conv (Conv2D) (None, 7, 7, 512) 933888 ['block7a\_se\_excite[0][0]']

block7a\_project\_bn (BatchNorma (None, 7, 7, 512) 2048 ['block7a\_project\_conv[0][0]']

lization)

block7b\_expand\_conv (Conv2D) (None, 7, 7, 3072) 1572864 ['block7a\_project\_bn[0][0]']

block7b\_expand\_bn (BatchNormal (None, 7, 7, 3072) 12288 ['block7b\_expand\_conv[0][0]']

ization)

block7b\_expand\_activation (Act (None, 7, 7, 3072) 0 ['block7b\_expand\_bn[0][0]']

ivation)

block7b\_dwconv (DepthwiseConv2 (None, 7, 7, 3072) 27648 ['block7b\_expand\_activation[0][0]

D) ']

block7b\_bn (BatchNormalization (None, 7, 7, 3072) 12288 ['block7b\_dwconv[0][0]']

)

block7b\_activation (Activation (None, 7, 7, 3072) 0 ['block7b\_bn[0][0]']

)

block7b\_se\_squeeze (GlobalAver (None, 3072) 0 ['block7b\_activation[0][0]']

agePooling2D)

block7b\_se\_reshape (Reshape) (None, 1, 1, 3072) 0 ['block7b\_se\_squeeze[0][0]']

block7b\_se\_reduce (Conv2D) (None, 1, 1, 128) 393344 ['block7b\_se\_reshape[0][0]']

block7b\_se\_expand (Conv2D) (None, 1, 1, 3072) 396288 ['block7b\_se\_reduce[0][0]']

block7b\_se\_excite (Multiply) (None, 7, 7, 3072) 0 ['block7b\_activation[0][0]',

'block7b\_se\_expand[0][0]']

block7b\_project\_conv (Conv2D) (None, 7, 7, 512) 1572864 ['block7b\_se\_excite[0][0]']

block7b\_project\_bn (BatchNorma (None, 7, 7, 512) 2048 ['block7b\_project\_conv[0][0]']

lization)

block7b\_drop (FixedDropout) (None, 7, 7, 512) 0 ['block7b\_project\_bn[0][0]']

block7b\_add (Add) (None, 7, 7, 512) 0 ['block7b\_drop[0][0]',

'block7a\_project\_bn[0][0]']

block7c\_expand\_conv (Conv2D) (None, 7, 7, 3072) 1572864 ['block7b\_add[0][0]']

block7c\_expand\_bn (BatchNormal (None, 7, 7, 3072) 12288 ['block7c\_expand\_conv[0][0]']

ization)

block7c\_expand\_activation (Act (None, 7, 7, 3072) 0 ['block7c\_expand\_bn[0][0]']

ivation)

block7c\_dwconv (DepthwiseConv2 (None, 7, 7, 3072) 27648 ['block7c\_expand\_activation[0][0]

D) ']

block7c\_bn (BatchNormalization (None, 7, 7, 3072) 12288 ['block7c\_dwconv[0][0]']

)

block7c\_activation (Activation (None, 7, 7, 3072) 0 ['block7c\_bn[0][0]']

)

block7c\_se\_squeeze (GlobalAver (None, 3072) 0 ['block7c\_activation[0][0]']

agePooling2D)

block7c\_se\_reshape (Reshape) (None, 1, 1, 3072) 0 ['block7c\_se\_squeeze[0][0]']

block7c\_se\_reduce (Conv2D) (None, 1, 1, 128) 393344 ['block7c\_se\_reshape[0][0]']

block7c\_se\_expand (Conv2D) (None, 1, 1, 3072) 396288 ['block7c\_se\_reduce[0][0]']

block7c\_se\_excite (Multiply) (None, 7, 7, 3072) 0 ['block7c\_activation[0][0]',

'block7c\_se\_expand[0][0]']

block7c\_project\_conv (Conv2D) (None, 7, 7, 512) 1572864 ['block7c\_se\_excite[0][0]']

block7c\_project\_bn (BatchNorma (None, 7, 7, 512) 2048 ['block7c\_project\_conv[0][0]']

lization)

block7c\_drop (FixedDropout) (None, 7, 7, 512) 0 ['block7c\_project\_bn[0][0]']

block7c\_add (Add) (None, 7, 7, 512) 0 ['block7c\_drop[0][0]',

'block7b\_add[0][0]']

top\_conv (Conv2D) (None, 7, 7, 2048) 1048576 ['block7c\_add[0][0]']

top\_bn (BatchNormalization) (None, 7, 7, 2048) 8192 ['top\_conv[0][0]']

top\_activation (Activation) (None, 7, 7, 2048) 0 ['top\_bn[0][0]']

max\_pool (GlobalMaxPooling2D) (None, 2048) 0 ['top\_activation[0][0]']

==================================================================================================

Total params: 28,513,520

Trainable params: 0

Non-trainable params: 28,513,520

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

cnn\_model = keras.models.Sequential([

base\_model,

keras.layers.Flatten(),

keras.layers.Dense(84, activation="relu"),

keras.layers.Dense(4, activation="softmax")

])

cnn\_model.summary()

Model: "sequential"

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Layer (type) Output Shape Param #

=================================================================

efficientnet-b5 (Functional (None, 2048) 28513520

)

flatten (Flatten) (None, 2048) 0

dense (Dense) (None, 84) 172116

dense\_1 (Dense) (None, 4) 340

=================================================================

Total params: 28,685,976

Trainable params: 172,456

Non-trainable params: 28,513,520

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cnn\_model.compile(optimizer='adam',

loss='categorical\_crossentropy',

metrics=['accuracy'])

history = cnn\_model.fit(train\_data\_gen, epochs=9,

validation\_data= val\_data\_gen)

Epoch 1/9

85/85 [==============================] - 190s 2s/step - loss: 1.9707 - accuracy: 0.7448 - val\_loss: 0.1827 - val\_accuracy: 0.9315

Epoch 2/9

85/85 [==============================] - 179s 2s/step - loss: 0.2906 - accuracy: 0.8833 - val\_loss: 0.1131 - val\_accuracy: 0.9640

Epoch 3/9

85/85 [==============================] - 181s 2s/step - loss: 0.2261 - accuracy: 0.9199 - val\_loss: 0.0973 - val\_accuracy: 0.9721

Epoch 4/9

85/85 [==============================] - 183s 2s/step - loss: 0.2346 - accuracy: 0.9181 - val\_loss: 0.1587 - val\_accuracy: 0.9373

Epoch 5/9

85/85 [==============================] - 180s 2s/step - loss: 0.2111 - accuracy: 0.9316 - val\_loss: 0.1192 - val\_accuracy: 0.9675

Epoch 6/9

85/85 [==============================] - 180s 2s/step - loss: 0.1502 - accuracy: 0.9434 - val\_loss: 0.0639 - val\_accuracy: 0.9791

Epoch 7/9

85/85 [==============================] - 177s 2s/step - loss: 0.1125 - accuracy: 0.9611 - val\_loss: 0.0473 - val\_accuracy: 0.9837

Epoch 8/9

85/85 [==============================] - 177s 2s/step - loss: 0.1189 - accuracy: 0.9534 - val\_loss: 0.0560 - val\_accuracy: 0.9721

Epoch 9/9

85/85 [==============================] - 179s 2s/step - loss: 0.1371 - accuracy: 0.9505 - val\_loss: 0.0551 - val\_accuracy: 0.9756

cnn\_model.save('efficient.h5')

import numpy as np

y=np.concatenate([val\_data\_gen.next()[1] for i in range(val\_data\_gen.\_\_len\_\_())])

true\_labels=np.argmax(y, axis=-1)

prediction= cnn\_model.predict(val\_data\_gen, verbose=2)

prediction=np.argmax(prediction, axis=-1)

44/44 - 60s - 60s/epoch - 1s/step

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.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')

from sklearn.metrics import confusion\_matrix

import itertools

import matplotlib.pyplot as plt

cm = confusion\_matrix(y\_true=true\_labels, y\_pred=prediction)

cm\_plot\_labels = ['Bacterial leaf blight','Brown spot','Healty','Rice leaf blast']

plot\_confusion\_matrix(cm=cm, classes=cm\_plot\_labels, title='Confusion Matrix')

from sklearn.metrics import accuracy\_score

acc=accuracy\_score(true\_labels,prediction)

print('Accuracy: %.3f' % acc)

from sklearn.metrics import precision\_score

precision = precision\_score(true\_labels,prediction,labels=[1,2], average='micro')

print('Precision: %.3f' % precision)

from sklearn.metrics import recall\_score

recall = recall\_score(true\_labels,prediction, average='micro')

print('Recall: %.3f' % recall)

from sklearn.metrics import f1\_score

score = f1\_score(true\_labels,prediction, average='micro')

print('F-Measure: %.3f' % score)

Confusion matrix, without normalization

[[ 60 0 0 4]

[ 0 115 8 0]

[ 0 0 594 0]

[ 9 0 0 71]]

Accuracy: 0.976

Precision: 0.989

Recall: 0.976

F-Measure: 0.976