

**Submission****✓ Ran successfully**

Submitted by NinaV 18 hours ago

**Public Score**

0.348

```
In [1]:
# This Python 3 environment comes with many helpful analytics libraries
# pre-installed
# It is defined by the kaggle/python docker image: https://github.com/kaggle/docker-python
# For example, here's several helpful packages to load in

import numpy as np # linear algebra
import pandas as pd # data processing, CSV file I/O (e.g. pd.read_csv)

# Input data files are available in the "../input/" directory.
# For example, running this (by clicking run or pressing Shift+Enter) will
# list the files in the input directory

import os
print(os.listdir("../input"))

# Any results you write to the current directory are saved as output.
```

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['inceptionresnetv2-oversampling', 'humpback-whale-identification', 'whales-cropped', 'oversampling']

```
In [2]:
HW = 'humpback-whale-identification'
# TRAIN = '../input/humpback-whale-identification/train/'
TRAIN_CROPPED = "whales-cropped/cropped_train/cropped_train/"
TRAIN_CROPPED_IN = '../input/' + TRAIN_CROPPED

# TEST = '../input/humpback-whale-identification/test/'
TEST_CROPPED = "whales-cropped/cropped_test/cropped_test/"
TEST_CROPPED_IN = '../input/' + TEST_CROPPED

LABELS = '../input/humpback-whale-identification/train.csv'
LABELS_OVERSAMPLED = '../input/oversampling/oversampled_train_and_validation.csv'

SAMPLE_SUB = '../input/humpback-whale-identification/sample_submission.csv'

train = pd.read_csv(LABELS)
print("With new_whale:")
train.head()
```

---

With new\_whale:

Out[2]:

	Image	Id
0	0000e88ab.jpg	w_f48451c
1	0001f9222.jpg	w_c3d896a
2	00029d126.jpg	w_20df2c5
3	00050a15a.jpg	new_whale
4	0005c1ef8.jpg	new_whale

```
In [3]:
MODEL_F = 'Model_InceptionResNetV2_flow.h5'
WEIGHTS_F = 'Weights_InceptionResNetV2_flow.h5'
MODEL = '../input/inceptionresnetv2-oversampling/' + MODEL_F
WEIGHTS = '../input/inceptionresnetv2-oversampling/' + WEIGHTS_F
```

---

```
In [4]:
train.describe()
```

Out[4]:

	Image	Id
count	25361	25361
unique	25361	5005
top	8c16710af.jpg	new_whale
freq	1	9664

In [5]:

```
import random
from IPython.display import Image
print("Example whale image")

#show sample image
name = random.choice(train['Image'])
print(name)
Image(filename = TRAIN_CROPPED_IN + name)
```

Example whale image  
1683955c4.jpg

Out[5]:



In [6]:

```
whales_train = pd.read_csv(LABELS_OVERSAMPLED)
print("Without new_whale:")
whales_train.head()
```

Without new\_whale:

Out[6]:

	Image	Id
0	74cd18adc.jpg	w_b3e445e
1	dbeb7e38a.jpg	w_8157927
2	49cf95c56.jpg	w_3c58b68
3	8a05a853c.jpg	w_180e241
4	471e75940.jpg	w_700ebb4

In [7]:

```
unique_labels = np.unique(whales_train.Id.values)
labels_list = unique_labels
print("Labels list:")
print(np.shape(labels_list))
print(labels_list[:20])
```

```
Labels list:  
(5004,)  
['w_0003639' 'w_0003c59' 'w_0027efa' 'w_00289b1' 'w_002c810' 'w_003  
'w_003bae6' 'w_00656c0' 'w_0066399' 'w_007fefa' 'w_00904a7' 'w_009  
'w_00a41ba' 'w_00b3dc2' 'w_00d50c9' 'w_00d5466' 'w_00d5e98' 'w_00f  
'w_010f858' 'w_0115c24']
```

---

In [8]:

```
import matplotlib.pyplot as plt  
import matplotlib.image as mpimg  
from matplotlib.pyplot import imshow  
  
from sklearn.preprocessing import LabelEncoder  
from sklearn.preprocessing import OneHotEncoder  
  
from keras import layers  
from keras.preprocessing import image  
from keras.preprocessing.image import ImageDataGenerator  
  
# from keras.applications.imagenet_utils import preprocess_input  
from keras.applications.inception_resnet_v2 import preprocess_input  
from keras.applications.inception_resnet_v2 import InceptionResNetV  
ocess_input  
  
from keras.losses import binary_crossentropy  
  
from keras.layers import Input, Dense, Activation, BatchNormalizati  
ten, Conv2D, GlobalAveragePooling2D  
from keras.layers import AveragePooling2D, MaxPooling2D, Dropout  
from keras.models import Model  
from keras.metrics import top_k_categorical_accuracy  
  
import keras.backend as K  
from keras.models import Sequential  
from PIL import Image  
import gc  
import warnings  
warnings.simplefilter("ignore", category=DeprecationWarning)  
  
%matplotlib inline
```

---

Using TensorFlow backend.

---

In [9]:

```
import keras.backend as K  
from keras.callbacks import Callback  
  
class GcCollectors(Callback):  
    def __init__(self):  
        super().__init__()  
  
    def on_epoch_end(self, ep, logs=None):  
        gc.collect()  
  
    def on_epoch_begin(self, ep, logs=None):  
        gc.collect()  
  
    def on_train_begin(self, logs=None):  
        gc.collect()  
  
    def on_train_end(self, logs=None):  
        gc.collect()
```

```
In [10]: gc_collector = GcCollectors()

In [11]:
def top_5_accuracy(y_true, y_pred):
    return top_k_categorical_accuracy(y_true, y_pred, k=5)

CLASSES = 5004
EPOCHS = 20
BATCH_SIZE = 32

IMAGE_HEIGHT = 299
IMAGE_WIDTH = 299
IMAGE_SHAPE = (IMAGE_HEIGHT, IMAGE_WIDTH, 3)
# setup model
# base_model = InceptionResNetV2(weights='imagenet', include_top=False,
t_shape = IMAGE_SHAPE)

# x = base_model.output
# x = GlobalAveragePooling2D(name='avg_pool')(x)
# x = Dropout(0.4)(x)
# predictions = Dense(CLASSES, activation='softmax')(x)
# model = Model(inputs=base_model.input, outputs=predictions)

# # transfer learning
# layers_len = len(model.layers)

# # I've chosen to train all the layers
# for layer in model.layers:
#     layer.trainable = True

# model.compile(optimizer='adam',
#                 loss='categorical_crossentropy',
#                 metrics=['accuracy', top_5_accuracy])

# model.summary()
```

```
In [12]: gc.collect()
```

```
Out[12]: 4
```

## Load model from disc

```
In [13]:
from keras.models import load_model

# returns a compiled model
# identical to the previous cell
model = load_model(MODEL, custom_objects={'top_5_accuracy': top_5_a
})
print("Loaded model architecture from disk")

model.load_weights(WEIGHTS)
print("Loaded model weights from disk")
model.summary()

gc.collect()
```

```
Loaded model architecture from disk
Loaded model weights from disk
```

Layer (type)	Output Shape	Param #	Cc
to			
input_1 (InputLayer)	(None, 299, 299, 3) 0		
conv2d_1 (Conv2D) [0][0]	(None, 149, 149, 32) 864	ir	
batch_normalization_1 (BatchNor [0][0]	(None, 149, 149, 32) 96	cc	
activation_1 (Activation) malization_1[0][0]	(None, 149, 149, 32) 0	be	
conv2d_2 (Conv2D) n_1[0][0]	(None, 147, 147, 32) 9216	ac	
batch_normalization_2 (BatchNor [0][0]	(None, 147, 147, 32) 96	cc	
activation_2 (Activation) malization_2[0][0]	(None, 147, 147, 32) 0	be	
conv2d_3 (Conv2D) n_2[0][0]	(None, 147, 147, 64) 18432	ac	
batch_normalization_3 (BatchNor [0][0]	(None, 147, 147, 64) 192	cc	
activation_3 (Activation) malization_3[0][0]	(None, 147, 147, 64) 0	be	
max_pooling2d_1 (MaxPooling2D) n_3[0][0]	(None, 73, 73, 64) 0	ac	
conv2d_4 (Conv2D) ng2d_1[0][0]	(None, 73, 73, 80) 5120	me	
batch_normalization_4 (BatchNor [0][0]	(None, 73, 73, 80) 240	cc	
activation_4 (Activation) malization_4[0][0]	(None, 73, 73, 80) 0	be	
conv2d_5 (Conv2D) n_4[0][0]	(None, 71, 71, 192) 138240	ac	
batch_normalization_5 (BatchNor			

[0][0]			
activation_5 (Activation)	(None, 71, 71, 192)	0	be
malization_5[0][0]			
max_pooling2d_2 (MaxPooling2D)	(None, 35, 35, 192)	0	ac
n_5[0][0]			
conv2d_9 (Conv2D)	(None, 35, 35, 64)	12288	me
ng2d_2[0][0]			
batch_normalization_9 (BatchNor	(None, 35, 35, 64)	192	cc
[0][0]			
activation_9 (Activation)	(None, 35, 35, 64)	0	be
malization_9[0][0]			
conv2d_7 (Conv2D)	(None, 35, 35, 48)	9216	me
ng2d_2[0][0]			
conv2d_10 (Conv2D)	(None, 35, 35, 96)	55296	ac
n_9[0][0]			
batch_normalization_7 (BatchNor	(None, 35, 35, 48)	144	cc
[0][0]			
batch_normalization_10 (BatchNo	(None, 35, 35, 96)	288	cc
[0][0]			
activation_7 (Activation)	(None, 35, 35, 48)	0	be
malization_7[0][0]			
activation_10 (Activation)	(None, 35, 35, 96)	0	be
malization_10[0][0]			
average_pooling2d_1 (AveragePoo	(None, 35, 35, 192)	0	me
ng2d_2[0][0]			
conv2d_6 (Conv2D)	(None, 35, 35, 96)	18432	me
ng2d_2[0][0]			
conv2d_8 (Conv2D)	(None, 35, 35, 64)	76800	ac
n_7[0][0]			
conv2d_11 (Conv2D)	(None, 35, 35, 96)	82944	ac
n_10[0][0]			
conv2d_12 (Conv2D)	(None, 35, 35, 64)	12288	av
ooling2d_1[0][0]			

batch_normalization_6 (BatchNor [0][0]	(None, 35, 35, 96)	288	cc
batch_normalization_8 (BatchNor [0][0]	(None, 35, 35, 64)	192	cc
batch_normalization_11 (BatchNo [0][0]	(None, 35, 35, 96)	288	cc
batch_normalization_12 (BatchNo [0][0]	(None, 35, 35, 64)	192	cc
activation_6 (Activation) malization_6[0][0]	(None, 35, 35, 96)	0	be
activation_8 (Activation) malization_8[0][0]	(None, 35, 35, 64)	0	be
activation_11 (Activation) malization_11[0][0]	(None, 35, 35, 96)	0	be
activation_12 (Activation) malization_12[0][0]	(None, 35, 35, 64)	0	be
mixed_5b (Concatenate) n_6[0][0]	(None, 35, 35, 320)	0	ac
n_8[0][0]			ac
n_11[0][0]			ac
n_12[0][0]			ac
conv2d_16 (Conv2D) [0][0]	(None, 35, 35, 32)	10240	mi
batch_normalization_16 (BatchNo [0][0]	(None, 35, 35, 32)	96	cc
activation_16 (Activation) malization_16[0][0]	(None, 35, 35, 32)	0	be
conv2d_14 (Conv2D) [0][0]	(None, 35, 35, 32)	10240	mi
conv2d_17 (Conv2D) n_16[0][0]	(None, 35, 35, 48)	13824	ac
batch_normalization_14 (BatchNo [0][0]	(None, 35, 35, 32)	96	cc

batch_normalization_17 (BatchNorm [0][0])	(None, 35, 35, 48)	144	cc
activation_14 (Activation) [0][0]	(None, 35, 35, 32)	0	be
activation_17 (Activation) [0][0]	(None, 35, 35, 48)	0	be
conv2d_13 (Conv2D) [0][0]	(None, 35, 35, 32)	10240	mi
conv2d_15 (Conv2D) n_14[0][0]	(None, 35, 35, 32)	9216	ac
conv2d_18 (Conv2D) n_17[0][0]	(None, 35, 35, 64)	27648	ac
batch_normalization_13 (BatchNorm [0][0])	(None, 35, 35, 32)	96	cc
batch_normalization_15 (BatchNorm [0][0])	(None, 35, 35, 32)	96	cc
batch_normalization_18 (BatchNorm [0][0])	(None, 35, 35, 64)	192	cc
activation_13 (Activation) [0][0]	(None, 35, 35, 32)	0	be
activation_15 (Activation) [0][0]	(None, 35, 35, 32)	0	be
activation_18 (Activation) [0][0]	(None, 35, 35, 64)	0	be
block35_1_mixed (Concatenate) n_13[0][0]	(None, 35, 35, 128)	0	ac
n_15[0][0]			ac
n_18[0][0]			ac
block35_1_conv (Conv2D) _mixed[0][0]	(None, 35, 35, 320)	41280	b1
block35_1 (Lambda) [0][0]	(None, 35, 35, 320)	0	mi
_conv[0][0]			b1

block35_1_ac (Activation)	(None, 35, 35, 320)	0	b1
[0][0]			
conv2d_22 (Conv2D)	(None, 35, 35, 32)	10240	b1
_ac[0][0]			
batch_normalization_22 (BatchNo	(None, 35, 35, 32)	96	cc
[0][0]			
activation_22 (Activation)	(None, 35, 35, 32)	0	bε
malization_22[0][0]			
conv2d_20 (Conv2D)	(None, 35, 35, 32)	10240	b1
_ac[0][0]			
conv2d_23 (Conv2D)	(None, 35, 35, 48)	13824	ac
n_22[0][0]			
batch_normalization_20 (BatchNo	(None, 35, 35, 32)	96	cc
[0][0]			
batch_normalization_23 (BatchNo	(None, 35, 35, 48)	144	cc
[0][0]			
activation_20 (Activation)	(None, 35, 35, 32)	0	bε
malization_20[0][0]			
activation_23 (Activation)	(None, 35, 35, 48)	0	bε
malization_23[0][0]			
conv2d_19 (Conv2D)	(None, 35, 35, 32)	10240	b1
_ac[0][0]			
conv2d_21 (Conv2D)	(None, 35, 35, 32)	9216	ac
n_20[0][0]			
conv2d_24 (Conv2D)	(None, 35, 35, 64)	27648	ac
n_23[0][0]			
batch_normalization_19 (BatchNo	(None, 35, 35, 32)	96	cc
[0][0]			
batch_normalization_21 (BatchNo	(None, 35, 35, 32)	96	cc
[0][0]			
batch_normalization_24 (BatchNo	(None, 35, 35, 64)	192	cc
[0][0]			
activation_19 (Activation)	(None, 35, 35, 32)	0	bε
malization_19[0][0]			

activation_21 (Activation)	(None, 35, 35, 32)	0	bε
malization_21[0][0]			
activation_24 (Activation)	(None, 35, 35, 64)	0	bε
malization_24[0][0]			
block35_2_mixed (Concatenate)	(None, 35, 35, 128)	0	ac
n_19[0][0]			ac
n_21[0][0]			ac
n_24[0][0]			ac
block35_2_conv (Conv2D)	(None, 35, 35, 320)	41280	b1
_mixed[0][0]			
block35_2 (Lambda)	(None, 35, 35, 320)	0	b1
_ac[0][0]			b1
_conv[0][0]			
block35_2_ac (Activation)	(None, 35, 35, 320)	0	b1
[0][0]			
conv2d_28 (Conv2D)	(None, 35, 35, 32)	10240	b1
_ac[0][0]			
batch_normalization_28 (BatchNo	(None, 35, 35, 32)	96	cc
[0][0]			
activation_28 (Activation)	(None, 35, 35, 32)	0	bε
malization_28[0][0]			
conv2d_26 (Conv2D)	(None, 35, 35, 32)	10240	b1
_ac[0][0]			
conv2d_29 (Conv2D)	(None, 35, 35, 48)	13824	ac
n_28[0][0]			
batch_normalization_26 (BatchNo	(None, 35, 35, 32)	96	cc
[0][0]			
batch_normalization_29 (BatchNo	(None, 35, 35, 48)	144	cc
[0][0]			
activation_26 (Activation)	(None, 35, 35, 32)	0	bε
malization_26[0][0]			
activation_29 (Activation)	(None, 35, 35, 48)	0	bε
malization_29[0][0]			

conv2d_25 (Conv2D) _ac[0][0]	(None, 35, 35, 32)	10240	b1
conv2d_27 (Conv2D) n_26[0][0]	(None, 35, 35, 32)	9216	ac
conv2d_30 (Conv2D) n_29[0][0]	(None, 35, 35, 64)	27648	ac
batch_normalization_25 (BatchNo [0][0]	(None, 35, 35, 32)	96	cc
batch_normalization_27 (BatchNo [0][0]	(None, 35, 35, 32)	96	cc
batch_normalization_30 (BatchNo [0][0]	(None, 35, 35, 64)	192	cc
activation_25 (Activation) malization_25[0][0]	(None, 35, 35, 32)	0	be
activation_27 (Activation) malization_27[0][0]	(None, 35, 35, 32)	0	be
activation_30 (Activation) malization_30[0][0]	(None, 35, 35, 64)	0	be
block35_3_mixed (Concatenate) n_25[0][0]	(None, 35, 35, 128)	0	ac
n_27[0][0]			ac
n_30[0][0]			ac
block35_3_conv (Conv2D) _mixed[0][0]	(None, 35, 35, 320)	41280	b1
block35_3 (Lambda) _ac[0][0]	(None, 35, 35, 320)	0	b1
_conv[0][0]			b1
block35_3_ac (Activation) [0][0]	(None, 35, 35, 320)	0	b1
conv2d_34 (Conv2D) _ac[0][0]	(None, 35, 35, 32)	10240	b1
batch_normalization_34 (BatchNo [0][0]	(None, 35, 35, 32)	96	cc

activation_34 (Activation)	(None, 35, 35, 32)	0	bε
batch_normalization_34[0][0]			
conv2d_32 (Conv2D)	(None, 35, 35, 32)	10240	b1
_ac[0][0]			
conv2d_35 (Conv2D)	(None, 35, 35, 48)	13824	ac
n_34[0][0]			
batch_normalization_32 (BatchNo	(None, 35, 35, 32)	96	cc
[0][0]			
batch_normalization_35 (BatchNo	(None, 35, 35, 48)	144	cc
[0][0]			
activation_32 (Activation)	(None, 35, 35, 32)	0	bε
batch_normalization_32[0][0]			
activation_35 (Activation)	(None, 35, 35, 48)	0	bε
batch_normalization_35[0][0]			
conv2d_31 (Conv2D)	(None, 35, 35, 32)	10240	b1
_ac[0][0]			
conv2d_33 (Conv2D)	(None, 35, 35, 32)	9216	ac
n_32[0][0]			
conv2d_36 (Conv2D)	(None, 35, 35, 64)	27648	ac
n_35[0][0]			
batch_normalization_31 (BatchNo	(None, 35, 35, 32)	96	cc
[0][0]			
batch_normalization_33 (BatchNo	(None, 35, 35, 32)	96	cc
[0][0]			
batch_normalization_36 (BatchNo	(None, 35, 35, 64)	192	cc
[0][0]			
activation_31 (Activation)	(None, 35, 35, 32)	0	bε
batch_normalization_31[0][0]			
activation_33 (Activation)	(None, 35, 35, 32)	0	bε
batch_normalization_33[0][0]			
activation_36 (Activation)	(None, 35, 35, 64)	0	bε
batch_normalization_36[0][0]			
block35_4_mixed (Concatenate)	(None, 35, 35, 128)	0	ac
n_31[0][0]			

n_31[0][0]			ac
n_33[0][0]			ac
n_36[0][0]			
-----			
block35_4_conv (Conv2D)	(None, 35, 35, 320)	41280	bl
_mixed[0][0]			
-----			
block35_4 (Lambda)	(None, 35, 35, 320)	0	bl
_ac[0][0]			
-----			
_conv[0][0]			bl
-----			
block35_4_ac (Activation)	(None, 35, 35, 320)	0	bl
[0][0]			
-----			
conv2d_40 (Conv2D)	(None, 35, 35, 32)	10240	bl
_ac[0][0]			
-----			
batch_normalization_40 (BatchNo	(None, 35, 35, 32)	96	cc
[0][0]			
-----			
activation_40 (Activation)	(None, 35, 35, 32)	0	be
malization_40[0][0]			
-----			
conv2d_38 (Conv2D)	(None, 35, 35, 32)	10240	bl
_ac[0][0]			
-----			
conv2d_41 (Conv2D)	(None, 35, 35, 48)	13824	ac
n_40[0][0]			
-----			
batch_normalization_38 (BatchNo	(None, 35, 35, 32)	96	cc
[0][0]			
-----			
batch_normalization_41 (BatchNo	(None, 35, 35, 48)	144	cc
[0][0]			
-----			
activation_38 (Activation)	(None, 35, 35, 32)	0	be
malization_38[0][0]			
-----			
activation_41 (Activation)	(None, 35, 35, 48)	0	be
malization_41[0][0]			
-----			
conv2d_37 (Conv2D)	(None, 35, 35, 32)	10240	bl
_ac[0][0]			
-----			
conv2d_39 (Conv2D)	(None, 35, 35, 32)	9216	ac
n_38[0][0]			
-----			
conv2d_42 (Conv2D)	(None, 35, 35, 64)	27648	ac
n_41[0][0]			

-----  
batch\_normalization\_37 (BatchNorm (None, 35, 35, 32) 96 cc  
[0][0]  
-----  
batch\_normalization\_39 (BatchNorm (None, 35, 35, 32) 96 cc  
[0][0]  
-----  
batch\_normalization\_42 (BatchNorm (None, 35, 35, 64) 192 cc  
[0][0]  
-----  
activation\_37 (Activation) (None, 35, 35, 32) 0 be  
malization\_37[0][0]  
-----  
activation\_39 (Activation) (None, 35, 35, 32) 0 be  
malization\_39[0][0]  
-----  
activation\_42 (Activation) (None, 35, 35, 64) 0 be  
malization\_42[0][0]  
-----  
block35\_5\_mixed (Concatenate) (None, 35, 35, 128) 0 ac  
n\_37[0][0]  
-----  
n\_39[0][0]  
-----  
n\_42[0][0]  
-----  
block35\_5\_conv (Conv2D) (None, 35, 35, 320) 41280 bl  
\_mixed[0][0]  
-----  
block35\_5 (Lambda) (None, 35, 35, 320) 0 bl  
\_ac[0][0]  
-----  
\_conv[0][0]  
-----  
block35\_5\_ac (Activation) (None, 35, 35, 320) 0 bl  
[0][0]  
-----  
conv2d\_46 (Conv2D) (None, 35, 35, 32) 10240 bl  
\_ac[0][0]  
-----  
batch\_normalization\_46 (BatchNorm (None, 35, 35, 32) 96 cc  
[0][0]  
-----  
activation\_46 (Activation) (None, 35, 35, 32) 0 be  
malization\_46[0][0]  
-----  
conv2d\_44 (Conv2D) (None, 35, 35, 32) 10240 bl  
\_ac[0][0]  
-----  
conv2d\_47 (Conv2D) (None, 35, 35, 48) 13824 ac  
n\_46[0][0]

batch_normalization_44 (BatchNorm [0][0])	(None, 35, 35, 32)	96	cc
batch_normalization_47 (BatchNorm [0][0])	(None, 35, 35, 48)	144	cc
activation_44 (Activation) [0][0]	(None, 35, 35, 32)	0	be
activation_47 (Activation) [0][0]	(None, 35, 35, 48)	0	be
conv2d_43 (Conv2D) [0][0]	(None, 35, 35, 32)	10240	bl
conv2d_45 (Conv2D) [0][0]	(None, 35, 35, 32)	9216	ac
conv2d_48 (Conv2D) [0][0]	(None, 35, 35, 64)	27648	ac
batch_normalization_43 (BatchNorm [0][0])	(None, 35, 35, 32)	96	cc
batch_normalization_45 (BatchNorm [0][0])	(None, 35, 35, 32)	96	cc
batch_normalization_48 (BatchNorm [0][0])	(None, 35, 35, 64)	192	cc
activation_43 (Activation) [0][0]	(None, 35, 35, 32)	0	be
activation_45 (Activation) [0][0]	(None, 35, 35, 32)	0	be
activation_48 (Activation) [0][0]	(None, 35, 35, 64)	0	be
block35_6_mixed (Concatenate) [0][0]	(None, 35, 35, 128)	0	ac
n_43[0][0]			ac
n_45[0][0]			ac
n_48[0][0]			ac
block35_6_conv (Conv2D) [0][0]	(None, 35, 35, 320)	41280	bl
block35_6 (Lambda)	(None, 35, 35, 320)	0	bl

```
    _ac[0][0]                                b]  
    _conv[0][0]  
  
-----  
    block35_6_ac (Activation)      (None, 35, 35, 320)  0      bl  
    [0][0]  
  
-----  
    conv2d_52 (Conv2D)           (None, 35, 35, 32)   10240     bl  
    _ac[0][0]  
  
-----  
    batch_normalization_52 (BatchNo (None, 35, 35, 32)  96      cc  
    [0][0]  
  
-----  
    activation_52 (Activation)    (None, 35, 35, 32)  0      b@  
    malization_52[0][0]  
  
-----  
    conv2d_50 (Conv2D)           (None, 35, 35, 32)   10240     bl  
    _ac[0][0]  
  
-----  
    conv2d_53 (Conv2D)           (None, 35, 35, 48)  13824     ac  
    n_52[0][0]  
  
-----  
    batch_normalization_50 (BatchNo (None, 35, 35, 32)  96      cc  
    [0][0]  
  
-----  
    batch_normalization_53 (BatchNo (None, 35, 35, 48)  144      cc  
    [0][0]  
  
-----  
    activation_50 (Activation)    (None, 35, 35, 32)  0      b@  
    malization_50[0][0]  
  
-----  
    activation_53 (Activation)    (None, 35, 35, 48)  0      b@  
    malization_53[0][0]  
  
-----  
    conv2d_49 (Conv2D)           (None, 35, 35, 32)   10240     bl  
    _ac[0][0]  
  
-----  
    conv2d_51 (Conv2D)           (None, 35, 35, 32)   9216      ac  
    n_50[0][0]  
  
-----  
    conv2d_54 (Conv2D)           (None, 35, 35, 64)  27648     ac  
    n_53[0][0]  
  
-----  
    batch_normalization_49 (BatchNo (None, 35, 35, 32)  96      cc  
    [0][0]  
  
-----  
    batch_normalization_51 (BatchNo (None, 35, 35, 32)  96      cc  
    [0][0]  
  
-----  
    batch_normalization_54 (BatchNo (None, 35, 35, 64)  192      cc
```

```
[0][0]
-----
activation_49 (Activation)      (None, 35, 35, 32)  0          bε
malization_49[0][0]
-----
activation_51 (Activation)      (None, 35, 35, 32)  0          bε
malization_51[0][0]
-----
activation_54 (Activation)      (None, 35, 35, 64)  0          bε
malization_54[0][0]
-----
block35_7_mixed (Concatenate)  (None, 35, 35, 128)  0          ac
n_49[0][0]
ac
n_51[0][0]
ac
n_54[0][0]
-----
block35_7_conv (Conv2D)        (None, 35, 35, 320) 41280      bl
_mixed[0][0]
-----
block35_7 (Lambda)             (None, 35, 35, 320)  0          bl
_ac[0][0]
bl
_conv[0][0]
-----
block35_7_ac (Activation)     (None, 35, 35, 320)  0          bl
[0][0]
-----
conv2d_58 (Conv2D)            (None, 35, 35, 32)   10240      bl
_ac[0][0]
-----
batch_normalization_58 (BatchNo (None, 35, 35, 32)  96         cc
[0][0]
-----
activation_58 (Activation)    (None, 35, 35, 32)  0          bε
malization_58[0][0]
-----
conv2d_56 (Conv2D)            (None, 35, 35, 32)   10240      bl
_ac[0][0]
-----
conv2d_59 (Conv2D)            (None, 35, 35, 48)   13824      ac
n_58[0][0]
-----
batch_normalization_56 (BatchNo (None, 35, 35, 32)  96         cc
[0][0]
-----
batch_normalization_59 (BatchNo (None, 35, 35, 48)   144         cc
[0][0]
-----
activation_56 (Activation)    (None, 35, 35, 32)  0          bε
malization_56[0][0]
```

```
initialization_56[0][0]
-----
activation_59 (Activation)      (None, 35, 35, 48)  0          bε
malization_59[0][0]
-----
conv2d_55 (Conv2D)            (None, 35, 35, 32)  10240     bl
_ac[0][0]
-----
conv2d_57 (Conv2D)            (None, 35, 35, 32)  9216      ac
n_56[0][0]
-----
conv2d_60 (Conv2D)            (None, 35, 35, 64)  27648     ac
n_59[0][0]
-----
batch_normalization_55 (BatchNo (None, 35, 35, 32)  96        cc
[0][0]
-----
batch_normalization_57 (BatchNo (None, 35, 35, 32)  96        cc
[0][0]
-----
batch_normalization_60 (BatchNo (None, 35, 35, 64)  192       cc
[0][0]
-----
activation_55 (Activation)    (None, 35, 35, 32)  0          bε
malization_55[0][0]
-----
activation_57 (Activation)    (None, 35, 35, 32)  0          bε
malization_57[0][0]
-----
activation_60 (Activation)    (None, 35, 35, 64)  0          bε
malization_60[0][0]
-----
block35_8_mixed (Concatenate) (None, 35, 35, 128)  0          ac
n_55[0][0]
ac
n_57[0][0]
ac
n_60[0][0]
-----
block35_8_conv (Conv2D)       (None, 35, 35, 320) 41280     bl
_mixed[0][0]
-----
block35_8 (Lambda)           (None, 35, 35, 320)  0          bl
_ac[0][0]
bl
_conv[0][0]
-----
block35_8_ac (Activation)    (None, 35, 35, 320)  0          bl
[0][0]
-----
conv2d_64 (Conv2D)           (None, 35, 35, 32)  10240     bl
_ac[0][0]
```

-----  
batch\_normalization\_64 (BatchNo (None, 35, 35, 32) 96 cc  
[0][0]  
-----  
activation\_64 (Activation) (None, 35, 35, 32) 0 be  
malization\_64[0][0]  
-----  
conv2d\_62 (Conv2D) (None, 35, 35, 32) 10240 bl  
\_ac[0][0]  
-----  
conv2d\_65 (Conv2D) (None, 35, 35, 48) 13824 ac  
n\_64[0][0]  
-----  
batch\_normalization\_62 (BatchNo (None, 35, 35, 32) 96 cc  
[0][0]  
-----  
batch\_normalization\_65 (BatchNo (None, 35, 35, 48) 144 cc  
[0][0]  
-----  
activation\_62 (Activation) (None, 35, 35, 32) 0 be  
malization\_62[0][0]  
-----  
activation\_65 (Activation) (None, 35, 35, 48) 0 be  
malization\_65[0][0]  
-----  
conv2d\_61 (Conv2D) (None, 35, 35, 32) 10240 bl  
\_ac[0][0]  
-----  
conv2d\_63 (Conv2D) (None, 35, 35, 32) 9216 ac  
n\_62[0][0]  
-----  
conv2d\_66 (Conv2D) (None, 35, 35, 64) 27648 ac  
n\_65[0][0]  
-----  
batch\_normalization\_61 (BatchNo (None, 35, 35, 32) 96 cc  
[0][0]  
-----  
batch\_normalization\_63 (BatchNo (None, 35, 35, 32) 96 cc  
[0][0]  
-----  
batch\_normalization\_66 (BatchNo (None, 35, 35, 64) 192 cc  
[0][0]  
-----  
activation\_61 (Activation) (None, 35, 35, 32) 0 be  
malization\_61[0][0]  
-----  
activation\_63 (Activation) (None, 35, 35, 32) 0 be  
malization\_63[0][0]  
-----

activation_66 (Activation)	(None, 35, 35, 64)	0	bε
batch_normalization_66[0][0]			
-----			
block35_9_mixed (Concatenate)	(None, 35, 35, 128)	0	ac
n_61[0][0]			
-----			
n_63[0][0]			ac
-----			
n_66[0][0]			ac
-----			
-----			
block35_9_conv (Conv2D)	(None, 35, 35, 320)	41280	bl
_mixed[0][0]			
-----			
-----			
block35_9_lambda (Lambda)	(None, 35, 35, 320)	0	bl
_ac[0][0]			
-----			
_ac[0][0]			bl
-----			
-----			
block35_9_activation (Activation)	(None, 35, 35, 320)	0	bl
[0][0]			
-----			
-----			
conv2d_70 (Conv2D)	(None, 35, 35, 32)	10240	bl
_ac[0][0]			
-----			
-----			
batch_normalization_70 (BatchNormalizat	(None, 35, 35, 32)	96	cc
[0][0]			
-----			
-----			
activation_70 (Activation)	(None, 35, 35, 32)	0	bε
malization_70[0][0]			
-----			
-----			
conv2d_68 (Conv2D)	(None, 35, 35, 32)	10240	bl
_ac[0][0]			
-----			
-----			
conv2d_71 (Conv2D)	(None, 35, 35, 48)	13824	ac
n_70[0][0]			
-----			
-----			
batch_normalization_68 (BatchNormalizat	(None, 35, 35, 32)	96	cc
[0][0]			
-----			
-----			
batch_normalization_71 (BatchNormalizat	(None, 35, 35, 48)	144	cc
[0][0]			
-----			
-----			
activation_68 (Activation)	(None, 35, 35, 32)	0	bε
malization_68[0][0]			
-----			
-----			
activation_71 (Activation)	(None, 35, 35, 48)	0	bε
malization_71[0][0]			
-----			
-----			
conv2d_67 (Conv2D)	(None, 35, 35, 32)	10240	bl
_ac[0][0]			
-----			
-----			
conv2d_69 (Conv2D)	(None, 35, 35, 32)	9216	ac
[0][0]			

n\_68[0][0]

-----

conv2d\_72 (Conv2D) (None, 35, 35, 64) 27648 ac

n\_71[0][0]

-----

batch\_normalization\_67 (BatchNo (None, 35, 35, 32) 96 cc

[0][0]

-----

batch\_normalization\_69 (BatchNo (None, 35, 35, 32) 96 cc

[0][0]

-----

batch\_normalization\_72 (BatchNo (None, 35, 35, 64) 192 cc

[0][0]

-----

activation\_67 (Activation) (None, 35, 35, 32) 0 bε

malization\_67[0][0]

-----

activation\_69 (Activation) (None, 35, 35, 32) 0 bε

malization\_69[0][0]

-----

activation\_72 (Activation) (None, 35, 35, 64) 0 bε

malization\_72[0][0]

-----

block35\_10\_mixed (Concatenate) (None, 35, 35, 128) 0 ac

n\_67[0][0]

-----

n\_69[0][0]

-----

n\_72[0][0]

-----

block35\_10\_conv (Conv2D) (None, 35, 35, 320) 41280 bl

0\_mixed[0][0]

-----

block35\_10 (Lambda) (None, 35, 35, 320) 0 bl

\_ac[0][0]

-----

0\_conv[0][0]

-----

block35\_10\_ac (Activation) (None, 35, 35, 320) 0 bl

0[0][0]

-----

conv2d\_74 (Conv2D) (None, 35, 35, 256) 81920 bl

0\_ac[0][0]

-----

batch\_normalization\_74 (BatchNo (None, 35, 35, 256) 768 cc

[0][0]

-----

activation\_74 (Activation) (None, 35, 35, 256) 0 bε

malization\_74[0][0]

-----

conv2d\_75 (Conv2D) (None, 35, 35, 256) 589824 ac

n\_74[0][0]

-----

batch\_normalization\_75 (BatchNo (None, 35, 35, 256) 768 cc  
[0][0]

-----

activation\_75 (Activation) (None, 35, 35, 256) 0 bε  
malization\_75[0][0]

-----

conv2d\_73 (Conv2D) (None, 17, 17, 384) 1105920 bl  
0\_ac[0][0]

-----

conv2d\_76 (Conv2D) (None, 17, 17, 384) 884736 ac  
n\_75[0][0]

-----

batch\_normalization\_73 (BatchNo (None, 17, 17, 384) 1152 cc  
[0][0]

-----

batch\_normalization\_76 (BatchNo (None, 17, 17, 384) 1152 cc  
[0][0]

-----

activation\_73 (Activation) (None, 17, 17, 384) 0 bε  
malization\_73[0][0]

-----

activation\_76 (Activation) (None, 17, 17, 384) 0 bε  
malization\_76[0][0]

-----

max\_pooling2d\_3 (MaxPooling2D) (None, 17, 17, 320) 0 bl  
0\_ac[0][0]

-----

mixed\_6a (Concatenate) (None, 17, 17, 1088) 0 ac  
n\_73[0][0]

-----

n\_76[0][0] ac  
ng2d\_3[0][0] mε

-----

conv2d\_78 (Conv2D) (None, 17, 17, 128) 139264 mi  
[0][0]

-----

batch\_normalization\_78 (BatchNo (None, 17, 17, 128) 384 cc  
[0][0]

-----

activation\_78 (Activation) (None, 17, 17, 128) 0 bε  
malization\_78[0][0]

-----

conv2d\_79 (Conv2D) (None, 17, 17, 160) 143360 ac  
n\_78[0][0]

-----

batch\_normalization\_79 (BatchNo (None, 17, 17, 160) 480 cc  
[0][0]

-----

```
activation_79 (Activation)      (None, 17, 17, 160)  0          b@  
malization_79[0][0]  
  
conv2d_77 (Conv2D)            (None, 17, 17, 192)  208896     mi  
[0][0]  
  
conv2d_80 (Conv2D)            (None, 17, 17, 192)  215040     ac  
n_79[0][0]  
  
batch_normalization_77 (BatchNo (None, 17, 17, 192)  576       cc  
[0][0]  
  
batch_normalization_80 (BatchNo (None, 17, 17, 192)  576       cc  
[0][0]  
  
activation_77 (Activation)    (None, 17, 17, 192)  0          b@  
malization_77[0][0]  
  
activation_80 (Activation)    (None, 17, 17, 192)  0          b@  
malization_80[0][0]  
  
block17_1_mixed (Concatenate) (None, 17, 17, 384)  0          ac  
n_77[0][0]  
ac  
n_80[0][0]  
  
block17_1_conv (Conv2D)       (None, 17, 17, 1088) 418880     bl  
_mixed[0][0]  
  
block17_1 (Lambda)           (None, 17, 17, 1088) 0          mi  
[0][0]  
bl  
_conv[0][0]  
  
block17_1_ac (Activation)    (None, 17, 17, 1088) 0          bl  
[0][0]  
  
conv2d_82 (Conv2D)           (None, 17, 17, 128)   139264     bl  
_ac[0][0]  
  
batch_normalization_82 (BatchNo (None, 17, 17, 128)  384       cc  
[0][0]  
  
activation_82 (Activation)    (None, 17, 17, 128)  0          b@  
malization_82[0][0]  
  
conv2d_83 (Conv2D)           (None, 17, 17, 160)  143360     ac  
n_82[0][0]  
  
batch_normalization_83 (BatchNo (None, 17, 17, 160)  480       cc  
[0][0]
```

```
-----  
activation_83 (Activation)      (None, 17, 17, 160)  0          bε  
malization_83[0][0]  
-----  
conv2d_81 (Conv2D)            (None, 17, 17, 192)  208896    bl  
_ac[0][0]  
-----  
conv2d_84 (Conv2D)            (None, 17, 17, 192)  215040    ac  
n_83[0][0]  
-----  
batch_normalization_81 (BatchNo (None, 17, 17, 192)  576        cc  
[0][0]  
-----  
batch_normalization_84 (BatchNo (None, 17, 17, 192)  576        cc  
[0][0]  
-----  
activation_81 (Activation)      (None, 17, 17, 192)  0          bε  
malization_81[0][0]  
-----  
activation_84 (Activation)      (None, 17, 17, 192)  0          bε  
malization_84[0][0]  
-----  
block17_2_mixed (Concatenate)  (None, 17, 17, 384)  0          ac  
n_81[0][0]  
-----  
n_84[0][0]  
-----  
block17_2_conv (Conv2D)        (None, 17, 17, 1088) 418880    bl  
_mixed[0][0]  
-----  
block17_2 (Lambda)             (None, 17, 17, 1088) 0          bl  
_ac[0][0]  
-----  
_conv[0][0]  
-----  
block17_2_ac (Activation)      (None, 17, 17, 1088) 0          bl  
[0][0]  
-----  
conv2d_86 (Conv2D)            (None, 17, 17, 128)   139264    bl  
_ac[0][0]  
-----  
batch_normalization_86 (BatchNo (None, 17, 17, 128)  384        cc  
[0][0]  
-----  
activation_86 (Activation)      (None, 17, 17, 128)  0          bε  
malization_86[0][0]  
-----  
conv2d_87 (Conv2D)            (None, 17, 17, 160)  143360    ac  
n_86[0][0]  
-----
```

batch\_normalization\_87 (BatchNorm (None, 17, 17, 160) 480 cc  
[0][0]

activation\_87 (Activation) (None, 17, 17, 160) 0 bε  
malization\_87[0][0]

conv2d\_85 (Conv2D) (None, 17, 17, 192) 208896 bl  
\_ac[0][0]

conv2d\_88 (Conv2D) (None, 17, 17, 192) 215040 ac  
n\_87[0][0]

batch\_normalization\_85 (BatchNorm (None, 17, 17, 192) 576 cc  
[0][0]

batch\_normalization\_88 (BatchNorm (None, 17, 17, 192) 576 cc  
[0][0]

activation\_85 (Activation) (None, 17, 17, 192) 0 bε  
malization\_85[0][0]

activation\_88 (Activation) (None, 17, 17, 192) 0 bε  
malization\_88[0][0]

block17\_3\_mixed (Concatenate) (None, 17, 17, 384) 0 ac  
n\_85[0][0]

n\_88[0][0]

block17\_3\_conv (Conv2D) (None, 17, 17, 1088) 418880 bl  
\_mixed[0][0]

block17\_3 (Lambda) (None, 17, 17, 1088) 0 bl  
\_ac[0][0]

\_conv[0][0]

block17\_3\_ac (Activation) (None, 17, 17, 1088) 0 bl  
[0][0]

conv2d\_90 (Conv2D) (None, 17, 17, 128) 139264 bl  
\_ac[0][0]

batch\_normalization\_90 (BatchNorm (None, 17, 17, 128) 384 cc  
[0][0]

activation\_90 (Activation) (None, 17, 17, 128) 0 bε  
malization\_90[0][0]

conv2d\_91 (Conv2D) (None, 17, 17, 160) 143360 ac  
n\_90[0][0]

```
batch_normalization_91 (BatchNo (None, 17, 17, 160) 480      cc
[0][0]

activation_91 (Activation)      (None, 17, 17, 160) 0      bε
malization_91[0][0]

conv2d_89 (Conv2D)            (None, 17, 17, 192) 208896    bl
_ac[0][0]

conv2d_92 (Conv2D)            (None, 17, 17, 192) 215040    ac
n_91[0][0]

batch_normalization_89 (BatchNo (None, 17, 17, 192) 576      cc
[0][0]

batch_normalization_92 (BatchNo (None, 17, 17, 192) 576      cc
[0][0]

activation_89 (Activation)    (None, 17, 17, 192) 0      bε
malization_89[0][0]

activation_92 (Activation)    (None, 17, 17, 192) 0      bε
malization_92[0][0]

block17_4_mixed (Concatenate) (None, 17, 17, 384) 0      ac
n_89[0][0]

ac
n_92[0][0]

block17_4_conv (Conv2D)       (None, 17, 17, 1088) 418880    bl
_mixed[0][0]

block17_4 (Lambda)           (None, 17, 17, 1088) 0      bl
_ac[0][0]

bl
_conv[0][0]

block17_4_ac (Activation)    (None, 17, 17, 1088) 0      bl
[0][0]

conv2d_94 (Conv2D)            (None, 17, 17, 128) 139264     bl
_ac[0][0]

batch_normalization_94 (BatchNo (None, 17, 17, 128) 384      cc
[0][0]

activation_94 (Activation)    (None, 17, 17, 128) 0      bε
malization_94[0][0]

conv2d_95 (Conv2D)            (None, 17, 17, 160) 143360    ac
```

n\_94[0][0]

-----

batch\_normalization\_95 (BatchNorm (None, 17, 17, 160) 480 cc  
[0][0]

-----

activation\_95 (Activation) (None, 17, 17, 160) 0 bε  
malization\_95[0][0]

-----

conv2d\_93 (Conv2D) (None, 17, 17, 192) 208896 bl  
\_ac[0][0]

-----

conv2d\_96 (Conv2D) (None, 17, 17, 192) 215040 ac  
n\_95[0][0]

-----

batch\_normalization\_93 (BatchNorm (None, 17, 17, 192) 576 cc  
[0][0]

-----

batch\_normalization\_96 (BatchNorm (None, 17, 17, 192) 576 cc  
[0][0]

-----

activation\_93 (Activation) (None, 17, 17, 192) 0 bε  
malization\_93[0][0]

-----

activation\_96 (Activation) (None, 17, 17, 192) 0 bε  
malization\_96[0][0]

-----

block17\_5\_mixed (Concatenate) (None, 17, 17, 384) 0 ac  
n\_93[0][0]

-----

n\_96[0][0]

-----

block17\_5\_conv (Conv2D) (None, 17, 17, 1088) 418880 bl  
\_mixed[0][0]

-----

block17\_5 (Lambda) (None, 17, 17, 1088) 0 bl  
\_ac[0][0]

-----

\_conv[0][0]

-----

block17\_5\_ac (Activation) (None, 17, 17, 1088) 0 bl  
[0][0]

-----

conv2d\_98 (Conv2D) (None, 17, 17, 128) 139264 bl  
\_ac[0][0]

-----

batch\_normalization\_98 (BatchNorm (None, 17, 17, 128) 384 cc  
[0][0]

-----

activation\_98 (Activation) (None, 17, 17, 128) 0 bε  
malization\_98[0][0]

-----

n_98[0][0]	conv2d_99 (Conv2D)	(None, 17, 17, 160)	143360	ac
[0][0]	batch_normalization_99 (BatchNo	(None, 17, 17, 160)	480	cc
	malization_99[0][0]			
	activation_99 (Activation)	(None, 17, 17, 160)	0	be
	malization_99[0][0]			
	conv2d_97 (Conv2D)	(None, 17, 17, 192)	208896	bl
	_ac[0][0]			
	conv2d_100 (Conv2D)	(None, 17, 17, 192)	215040	ac
	n_99[0][0]			
	batch_normalization_97 (BatchNo	(None, 17, 17, 192)	576	cc
	[0][0]			
	batch_normalization_100 (BatchN	(None, 17, 17, 192)	576	cc
	0[0][0]			
	activation_97 (Activation)	(None, 17, 17, 192)	0	be
	malization_97[0][0]			
	activation_100 (Activation)	(None, 17, 17, 192)	0	be
	malization_100[0][0]			
	block17_6_mixed (Concatenate)	(None, 17, 17, 384)	0	ac
	n_97[0][0]			
	n_100[0][0]			ac
	block17_6_conv (Conv2D)	(None, 17, 17, 1088)	418880	bl
	_mixed[0][0]			
	block17_6_lambda (Lambda)	(None, 17, 17, 1088)	0	bl
	_ac[0][0]			
	_conv[0][0]			bl
	block17_6_ac (Activation)	(None, 17, 17, 1088)	0	bl
	[0][0]			
	conv2d_102 (Conv2D)	(None, 17, 17, 128)	139264	bl
	_ac[0][0]			
	batch_normalization_102 (BatchN	(None, 17, 17, 128)	384	cc
	2[0][0]			
	activation_102 (Activation)	(None, 17, 17, 128)	0	be
	malization_102[0][0]			

-----  
conv2d\_103 (Conv2D) (None, 17, 17, 160) 143360 ac  
n\_102[0][0]  
-----  
batch\_normalization\_103 (BatchN (None, 17, 17, 160) 480 cc  
3[0][0]  
-----  
activation\_103 (Activation) (None, 17, 17, 160) 0 bε  
malization\_103[0][0]  
-----  
conv2d\_101 (Conv2D) (None, 17, 17, 192) 208896 bl  
\_ac[0][0]  
-----  
conv2d\_104 (Conv2D) (None, 17, 17, 192) 215040 ac  
n\_103[0][0]  
-----  
batch\_normalization\_101 (BatchN (None, 17, 17, 192) 576 cc  
1[0][0]  
-----  
batch\_normalization\_104 (BatchN (None, 17, 17, 192) 576 cc  
4[0][0]  
-----  
activation\_101 (Activation) (None, 17, 17, 192) 0 bε  
malization\_101[0][0]  
-----  
activation\_104 (Activation) (None, 17, 17, 192) 0 bε  
malization\_104[0][0]  
-----  
block17\_7\_mixed (Concatenate) (None, 17, 17, 384) 0 ac  
n\_101[0][0]  
-----  
n\_104[0][0]  
-----  
block17\_7\_conv (Conv2D) (None, 17, 17, 1088) 418880 bl  
\_mixed[0][0]  
-----  
block17\_7 (Lambda) (None, 17, 17, 1088) 0 bl  
\_ac[0][0]  
-----  
\_conv[0][0]  
-----  
block17\_7\_ac (Activation) (None, 17, 17, 1088) 0 bl  
[0][0]  
-----  
conv2d\_106 (Conv2D) (None, 17, 17, 128) 139264 bl  
\_ac[0][0]  
-----  
batch\_normalization\_106 (BatchN (None, 17, 17, 128) 384 cc  
6[0][0]  
-----

activation\_106 (Activation) (None, 17, 17, 128) 0 b  
malization\_106[0][0]

conv2d\_107 (Conv2D) (None, 17, 17, 160) 143360 ac  
n\_106[0][0]

batch\_normalization\_107 (BatchN (None, 17, 17, 160) 480 cc  
7[0][0]

activation\_107 (Activation) (None, 17, 17, 160) 0 b  
malization\_107[0][0]

conv2d\_105 (Conv2D) (None, 17, 17, 192) 208896 bl  
\_ac[0][0]

conv2d\_108 (Conv2D) (None, 17, 17, 192) 215040 ac  
n\_107[0][0]

batch\_normalization\_105 (BatchN (None, 17, 17, 192) 576 cc  
5[0][0]

batch\_normalization\_108 (BatchN (None, 17, 17, 192) 576 cc  
8[0][0]

activation\_105 (Activation) (None, 17, 17, 192) 0 b  
malization\_105[0][0]

activation\_108 (Activation) (None, 17, 17, 192) 0 b  
malization\_108[0][0]

block17\_8\_mixed (Concatenate) (None, 17, 17, 384) 0 ac  
n\_105[0][0]

n\_108[0][0]

block17\_8\_conv (Conv2D) (None, 17, 17, 1088) 418880 bl  
\_mixed[0][0]

block17\_8 (Lambda) (None, 17, 17, 1088) 0 bl  
\_ac[0][0]

\_conv[0][0]

block17\_8\_ac (Activation) (None, 17, 17, 1088) 0 bl  
[0][0]

conv2d\_110 (Conv2D) (None, 17, 17, 128) 139264 bl  
\_ac[0][0]

batch\_normalization\_110 (BatchN (None, 17, 17, 128) 384 cc  
0[0][0]

```
activation_110 (Activation)      (None, 17, 17, 128) 0          bε
malization_110[0][0]

conv2d_111 (Conv2D)            (None, 17, 17, 160) 143360      ac
n_110[0][0]

batch_normalization_111 (BatchN (None, 17, 17, 160) 480        cc
1[0][0]

activation_111 (Activation)      (None, 17, 17, 160) 0          bε
malization_111[0][0]

conv2d_109 (Conv2D)            (None, 17, 17, 192) 208896      bl
_ac[0][0]

conv2d_112 (Conv2D)            (None, 17, 17, 192) 215040      ac
n_111[0][0]

batch_normalization_109 (BatchN (None, 17, 17, 192) 576        cc
9[0][0]

batch_normalization_112 (BatchN (None, 17, 17, 192) 576        cc
2[0][0]

activation_109 (Activation)      (None, 17, 17, 192) 0          bε
malization_109[0][0]

activation_112 (Activation)      (None, 17, 17, 192) 0          bε
malization_112[0][0]

block17_9_mixed (Concatenate)   (None, 17, 17, 384) 0          ac
n_109[0][0]
ac
n_112[0][0]

block17_9_conv (Conv2D)         (None, 17, 17, 1088) 418880      bl
_mixed[0][0]

block17_9 (Lambda)              (None, 17, 17, 1088) 0          bl
_ac[0][0]
bl
_conv[0][0]

block17_9_ac (Activation)       (None, 17, 17, 1088) 0          bl
[0][0]

conv2d_114 (Conv2D)            (None, 17, 17, 128) 139264      bl
_ac[0][0]

batch_normalization_114 (BatchN (None, 17, 17, 128) 384        cc
```

4[0][0]

activation\_114 (Activation) (None, 17, 17, 128) 0 bε  
malization\_114[0][0]

conv2d\_115 (Conv2D) (None, 17, 17, 160) 143360 ac  
n\_114[0][0]

batch\_normalization\_115 (BatchN (None, 17, 17, 160) 480 cc  
5[0][0]

activation\_115 (Activation) (None, 17, 17, 160) 0 bε  
malization\_115[0][0]

conv2d\_113 (Conv2D) (None, 17, 17, 192) 208896 bl  
\_ac[0][0]

conv2d\_116 (Conv2D) (None, 17, 17, 192) 215040 ac  
n\_115[0][0]

batch\_normalization\_113 (BatchN (None, 17, 17, 192) 576 cc  
3[0][0]

batch\_normalization\_116 (BatchN (None, 17, 17, 192) 576 cc  
6[0][0]

activation\_113 (Activation) (None, 17, 17, 192) 0 bε  
malization\_113[0][0]

activation\_116 (Activation) (None, 17, 17, 192) 0 bε  
malization\_116[0][0]

block17\_10\_mixed (Concatenate) (None, 17, 17, 384) 0 ac  
n\_113[0][0]

ac  
n\_116[0][0]

block17\_10\_conv (Conv2D) (None, 17, 17, 1088) 418880 bl  
0\_mixed[0][0]

block17\_10 (Lambda) (None, 17, 17, 1088) 0 bl  
\_ac[0][0]

bl  
0\_conv[0][0]

block17\_10\_ac (Activation) (None, 17, 17, 1088) 0 bl  
0[0][0]

conv2d\_118 (Conv2D) (None, 17, 17, 128) 139264 bl  
0\_ac[0][0]

-----  
batch\_normalization\_118 (BatchN (None, 17, 17, 128) 384 cc  
8[0][0]  
-----  
activation\_118 (Activation) (None, 17, 17, 128) 0 be  
malization\_118[0][0]  
-----  
conv2d\_119 (Conv2D) (None, 17, 17, 160) 143360 ac  
n\_118[0][0]  
-----  
batch\_normalization\_119 (BatchN (None, 17, 17, 160) 480 cc  
9[0][0]  
-----  
activation\_119 (Activation) (None, 17, 17, 160) 0 be  
malization\_119[0][0]  
-----  
conv2d\_117 (Conv2D) (None, 17, 17, 192) 208896 bl  
0\_ac[0][0]  
-----  
conv2d\_120 (Conv2D) (None, 17, 17, 192) 215040 ac  
n\_119[0][0]  
-----  
batch\_normalization\_117 (BatchN (None, 17, 17, 192) 576 cc  
7[0][0]  
-----  
batch\_normalization\_120 (BatchN (None, 17, 17, 192) 576 cc  
0[0][0]  
-----  
activation\_117 (Activation) (None, 17, 17, 192) 0 be  
malization\_117[0][0]  
-----  
activation\_120 (Activation) (None, 17, 17, 192) 0 be  
malization\_120[0][0]  
-----  
block17\_11\_mixed (Concatenate) (None, 17, 17, 384) 0 ac  
n\_117[0][0]  
-----  
n\_120[0][0]  
-----  
block17\_11\_conv (Conv2D) (None, 17, 17, 1088) 418880 bl  
1\_mixed[0][0]  
-----  
block17\_11 (Lambda) (None, 17, 17, 1088) 0 bl  
0\_ac[0][0]  
-----  
bl  
1\_conv[0][0]  
-----  
block17\_11\_ac (Activation) (None, 17, 17, 1088) 0 bl  
1[0][0]  
-----  
conv2d\_122 (Conv2D) (None, 17, 17, 128) 139264 bl  
1\_ac[0][0]

-----  
batch\_normalization\_122 (BatchN (None, 17, 17, 128) 384 cc  
2[0][0]  
-----  
activation\_122 (Activation) (None, 17, 17, 128) 0 bε  
malization\_122[0][0]  
-----  
conv2d\_123 (Conv2D) (None, 17, 17, 160) 143360 ac  
n\_122[0][0]  
-----  
batch\_normalization\_123 (BatchN (None, 17, 17, 160) 480 cc  
3[0][0]  
-----  
activation\_123 (Activation) (None, 17, 17, 160) 0 bε  
malization\_123[0][0]  
-----  
conv2d\_121 (Conv2D) (None, 17, 17, 192) 208896 bl  
1\_ac[0][0]  
-----  
conv2d\_124 (Conv2D) (None, 17, 17, 192) 215040 ac  
n\_123[0][0]  
-----  
batch\_normalization\_121 (BatchN (None, 17, 17, 192) 576 cc  
1[0][0]  
-----  
batch\_normalization\_124 (BatchN (None, 17, 17, 192) 576 cc  
4[0][0]  
-----  
activation\_121 (Activation) (None, 17, 17, 192) 0 bε  
malization\_121[0][0]  
-----  
activation\_124 (Activation) (None, 17, 17, 192) 0 bε  
malization\_124[0][0]  
-----  
block17\_12\_mixed (Concatenate) (None, 17, 17, 384) 0 ac  
n\_121[0][0]  
-----  
n\_124[0][0]  
-----  
block17\_12\_conv (Conv2D) (None, 17, 17, 1088) 418880 bl  
2\_mixed[0][0]  
-----  
block17\_12 (Lambda) (None, 17, 17, 1088) 0 bl  
1\_ac[0][0]  
-----  
2\_conv[0][0]  
-----  
block17\_12\_ac (Activation) (None, 17, 17, 1088) 0 bl  
2[0][0]  
-----

conv2d_126 (Conv2D) 2_ac[0][0]	(None, 17, 17, 128)	139264	b1
batch_normalization_126 (BatchN 6[0][0])	(None, 17, 17, 128)	384	cc
activation_126 (Activation) malization_126[0][0]	(None, 17, 17, 128)	0	be
conv2d_127 (Conv2D) n_126[0][0]	(None, 17, 17, 160)	143360	ac
batch_normalization_127 (BatchN 7[0][0])	(None, 17, 17, 160)	480	cc
activation_127 (Activation) malization_127[0][0]	(None, 17, 17, 160)	0	be
conv2d_125 (Conv2D) 2_ac[0][0]	(None, 17, 17, 192)	208896	b1
conv2d_128 (Conv2D) n_127[0][0]	(None, 17, 17, 192)	215040	ac
batch_normalization_125 (BatchN 5[0][0])	(None, 17, 17, 192)	576	cc
batch_normalization_128 (BatchN 8[0][0])	(None, 17, 17, 192)	576	cc
activation_125 (Activation) malization_125[0][0]	(None, 17, 17, 192)	0	be
activation_128 (Activation) malization_128[0][0]	(None, 17, 17, 192)	0	be
block17_13_mixed (Concatenate) n_125[0][0]	(None, 17, 17, 384)	0	ac
n_128[0][0]			ac
block17_13_conv (Conv2D) 3_mixed[0][0]	(None, 17, 17, 1088)	418880	b1
block17_13 (Lambda) 2_ac[0][0]	(None, 17, 17, 1088)	0	b1
3_conv[0][0]			b1
block17_13_ac (Activation) 3[0][0]	(None, 17, 17, 1088)	0	b1

conv2d_130 (Conv2D) 3_ac[0][0]	(None, 17, 17, 128)	139264	b1
batch_normalization_130 (BatchN 0[0][0]	(None, 17, 17, 128)	384	cc
activation_130 (Activation) malization_130[0][0]	(None, 17, 17, 128)	0	be
conv2d_131 (Conv2D) n_130[0][0]	(None, 17, 17, 160)	143360	ac
batch_normalization_131 (BatchN 1[0][0]	(None, 17, 17, 160)	480	cc
activation_131 (Activation) malization_131[0][0]	(None, 17, 17, 160)	0	be
conv2d_129 (Conv2D) 3_ac[0][0]	(None, 17, 17, 192)	208896	b1
conv2d_132 (Conv2D) n_131[0][0]	(None, 17, 17, 192)	215040	ac
batch_normalization_129 (BatchN 9[0][0]	(None, 17, 17, 192)	576	cc
batch_normalization_132 (BatchN 2[0][0]	(None, 17, 17, 192)	576	cc
activation_129 (Activation) malization_129[0][0]	(None, 17, 17, 192)	0	be
activation_132 (Activation) malization_132[0][0]	(None, 17, 17, 192)	0	be
block17_14_mixed (Concatenate) n_129[0][0]	(None, 17, 17, 384)	0	ac
n_132[0][0]			ac
block17_14_conv (Conv2D) 4_mixed[0][0]	(None, 17, 17, 1088)	418880	b1
block17_14 (Lambda) 3_ac[0][0]	(None, 17, 17, 1088)	0	b1
4_conv[0][0]			b1
block17_14_ac (Activation)	(None, 17, 17, 1088)	0	b1

4[0][0]

---

conv2d\_134 (Conv2D) (None, 17, 17, 128) 139264 bl  
4\_ac[0][0]

---

batch\_normalization\_134 (BatchN (None, 17, 17, 128) 384 cc  
4[0][0]

---

activation\_134 (Activation) (None, 17, 17, 128) 0 be  
malization\_134[0][0]

---

conv2d\_135 (Conv2D) (None, 17, 17, 160) 143360 ac  
n\_134[0][0]

---

batch\_normalization\_135 (BatchN (None, 17, 17, 160) 480 cc  
5[0][0]

---

activation\_135 (Activation) (None, 17, 17, 160) 0 be  
malization\_135[0][0]

---

conv2d\_133 (Conv2D) (None, 17, 17, 192) 208896 bl  
4\_ac[0][0]

---

conv2d\_136 (Conv2D) (None, 17, 17, 192) 215040 ac  
n\_135[0][0]

---

batch\_normalization\_133 (BatchN (None, 17, 17, 192) 576 cc  
3[0][0]

---

batch\_normalization\_136 (BatchN (None, 17, 17, 192) 576 cc  
6[0][0]

---

activation\_133 (Activation) (None, 17, 17, 192) 0 be  
malization\_133[0][0]

---

activation\_136 (Activation) (None, 17, 17, 192) 0 be  
malization\_136[0][0]

---

block17\_15\_mixed (Concatenate) (None, 17, 17, 384) 0 ac  
n\_133[0][0]

---

n\_136[0][0] ac

---

block17\_15\_conv (Conv2D) (None, 17, 17, 1088) 418880 bl  
5\_mixed[0][0]

---

block17\_15 (Lambda) (None, 17, 17, 1088) 0 bl  
4\_ac[0][0]

---

5\_conv[0][0] bl

---

-----  
block17\_15\_ac (Activation) (None, 17, 17, 1088) 0 bl  
5[0][0]  
-----  
conv2d\_138 (Conv2D) (None, 17, 17, 128) 139264 bl  
5\_ac[0][0]  
-----  
batch\_normalization\_138 (BatchN (None, 17, 17, 128) 384 cc  
8[0][0]  
-----  
activation\_138 (Activation) (None, 17, 17, 128) 0 be  
malization\_138[0][0]  
-----  
conv2d\_139 (Conv2D) (None, 17, 17, 160) 143360 ac  
n\_138[0][0]  
-----  
batch\_normalization\_139 (BatchN (None, 17, 17, 160) 480 cc  
9[0][0]  
-----  
activation\_139 (Activation) (None, 17, 17, 160) 0 be  
malization\_139[0][0]  
-----  
conv2d\_137 (Conv2D) (None, 17, 17, 192) 208896 bl  
5\_ac[0][0]  
-----  
conv2d\_140 (Conv2D) (None, 17, 17, 192) 215040 ac  
n\_139[0][0]  
-----  
batch\_normalization\_137 (BatchN (None, 17, 17, 192) 576 cc  
7[0][0]  
-----  
batch\_normalization\_140 (BatchN (None, 17, 17, 192) 576 cc  
0[0][0]  
-----  
activation\_137 (Activation) (None, 17, 17, 192) 0 be  
malization\_137[0][0]  
-----  
activation\_140 (Activation) (None, 17, 17, 192) 0 be  
malization\_140[0][0]  
-----  
block17\_16\_mixed (Concatenate) (None, 17, 17, 384) 0 ac  
n\_137[0][0]  
-----  
n\_140[0][0]  
-----  
block17\_16\_conv (Conv2D) (None, 17, 17, 1088) 418880 bl  
6\_mixed[0][0]  
-----  
block17\_16 (Lambda) (None, 17, 17, 1088) 0 bl  
5\_ac[0][0]  
-----  
6\_conv[0][0]

block17\_16\_ac (Activation) (None, 17, 17, 1088) 0 b1  
6[0][0]

conv2d\_142 (Conv2D) (None, 17, 17, 128) 139264 b1  
6\_ac[0][0]

batch\_normalization\_142 (BatchN (None, 17, 17, 128) 384 cc  
2[0][0]

activation\_142 (Activation) (None, 17, 17, 128) 0 ba  
malization\_142[0][0]

conv2d\_143 (Conv2D) (None, 17, 17, 160) 143360 ac  
n\_142[0][0]

batch\_normalization\_143 (BatchN (None, 17, 17, 160) 480 cc  
3[0][0]

activation\_143 (Activation) (None, 17, 17, 160) 0 ba  
malization\_143[0][0]

conv2d\_141 (Conv2D) (None, 17, 17, 192) 208896 b1  
6\_ac[0][0]

conv2d\_144 (Conv2D) (None, 17, 17, 192) 215040 ac  
n\_143[0][0]

batch\_normalization\_141 (BatchN (None, 17, 17, 192) 576 cc  
1[0][0]

batch\_normalization\_144 (BatchN (None, 17, 17, 192) 576 cc  
4[0][0]

activation\_141 (Activation) (None, 17, 17, 192) 0 ba  
malization\_141[0][0]

activation\_144 (Activation) (None, 17, 17, 192) 0 ba  
malization\_144[0][0]

block17\_17\_mixed (Concatenate) (None, 17, 17, 384) 0 ac  
n\_141[0][0]

n\_144[0][0]

block17\_17\_conv (Conv2D) (None, 17, 17, 1088) 418880 b1  
7\_mixed[0][0]

block17\_17 (Lambda) (None, 17, 17, 1088) 0 b1  
6[0][0]

b1  
7\_conv[0][0]  
-----  
block17\_17\_ac (Activation) (None, 17, 17, 1088) 0 b1  
7[0][0]  
-----  
conv2d\_146 (Conv2D) (None, 17, 17, 128) 139264 b1  
7\_ac[0][0]  
-----  
batch\_normalization\_146 (BatchN (None, 17, 17, 128) 384 cc  
6[0][0]  
-----  
activation\_146 (Activation) (None, 17, 17, 128) 0 bε  
malization\_146[0][0]  
-----  
conv2d\_147 (Conv2D) (None, 17, 17, 160) 143360 ac  
n\_146[0][0]  
-----  
batch\_normalization\_147 (BatchN (None, 17, 17, 160) 480 cc  
7[0][0]  
-----  
activation\_147 (Activation) (None, 17, 17, 160) 0 bε  
malization\_147[0][0]  
-----  
conv2d\_145 (Conv2D) (None, 17, 17, 192) 208896 b1  
7\_ac[0][0]  
-----  
conv2d\_148 (Conv2D) (None, 17, 17, 192) 215040 ac  
n\_147[0][0]  
-----  
batch\_normalization\_145 (BatchN (None, 17, 17, 192) 576 cc  
5[0][0]  
-----  
batch\_normalization\_148 (BatchN (None, 17, 17, 192) 576 cc  
8[0][0]  
-----  
activation\_145 (Activation) (None, 17, 17, 192) 0 bε  
malization\_145[0][0]  
-----  
activation\_148 (Activation) (None, 17, 17, 192) 0 bε  
malization\_148[0][0]  
-----  
block17\_18\_mixed (Concatenate) (None, 17, 17, 384) 0 ac  
n\_145[0][0]  
-----  
ac  
n\_148[0][0]  
-----  
block17\_18\_conv (Conv2D) (None, 17, 17, 1088) 418880 b1  
8\_mixed[0][0]  
-----  
block17\_18 (Lambda) (None, 17, 17, 1088) 0 b1

```
block17_18 (Lambda)          (None, 17, 17, 1088) 0      bl  
7_ac[0][0]  
-----  
block17_18_ac (Activation)   (None, 17, 17, 1088) 0      bl  
8[0][0]  
-----  
conv2d_150 (Conv2D)         (None, 17, 17, 128) 139264    bl  
8_ac[0][0]  
-----  
batch_normalization_150 (BatchN (None, 17, 17, 128) 384      cc  
0[0][0]  
-----  
activation_150 (Activation)  (None, 17, 17, 128) 0      bε  
malization_150[0][0]  
-----  
conv2d_151 (Conv2D)         (None, 17, 17, 160) 143360    ac  
n_150[0][0]  
-----  
batch_normalization_151 (BatchN (None, 17, 17, 160) 480      cc  
1[0][0]  
-----  
activation_151 (Activation)  (None, 17, 17, 160) 0      bε  
malization_151[0][0]  
-----  
conv2d_149 (Conv2D)         (None, 17, 17, 192) 208896    bl  
8_ac[0][0]  
-----  
conv2d_152 (Conv2D)         (None, 17, 17, 192) 215040    ac  
n_151[0][0]  
-----  
batch_normalization_149 (BatchN (None, 17, 17, 192) 576      cc  
9[0][0]  
-----  
batch_normalization_152 (BatchN (None, 17, 17, 192) 576      cc  
2[0][0]  
-----  
activation_149 (Activation)  (None, 17, 17, 192) 0      bε  
malization_149[0][0]  
-----  
activation_152 (Activation)  (None, 17, 17, 192) 0      bε  
malization_152[0][0]  
-----  
block17_19_mixed (Concatenate) (None, 17, 17, 384) 0      ac  
n_149[0][0]  
-----  
n_152[0][0]  
-----  
block17_19_conv (Conv2D)     (None, 17, 17, 1088) 418880    bl  
9_mixed[0][0]
```

-----  
block17\_19 (Lambda) (None, 17, 17, 1088) 0 bl  
8\_ac[0][0]  
9\_conv[0][0]  
-----  
block17\_19\_ac (Activation) (None, 17, 17, 1088) 0 bl  
9[0][0]  
-----  
conv2d\_154 (Conv2D) (None, 17, 17, 128) 139264 bl  
9\_ac[0][0]  
-----  
batch\_normalization\_154 (BatchN (None, 17, 17, 128) 384 cc  
4[0][0]  
-----  
activation\_154 (Activation) (None, 17, 17, 128) 0 bε  
malization\_154[0][0]  
-----  
conv2d\_155 (Conv2D) (None, 17, 17, 160) 143360 ac  
n\_154[0][0]  
-----  
batch\_normalization\_155 (BatchN (None, 17, 17, 160) 480 cc  
5[0][0]  
-----  
activation\_155 (Activation) (None, 17, 17, 160) 0 bε  
malization\_155[0][0]  
-----  
conv2d\_153 (Conv2D) (None, 17, 17, 192) 208896 bl  
9\_ac[0][0]  
-----  
conv2d\_156 (Conv2D) (None, 17, 17, 192) 215040 ac  
n\_155[0][0]  
-----  
batch\_normalization\_153 (BatchN (None, 17, 17, 192) 576 cc  
3[0][0]  
-----  
batch\_normalization\_156 (BatchN (None, 17, 17, 192) 576 cc  
6[0][0]  
-----  
activation\_153 (Activation) (None, 17, 17, 192) 0 bε  
malization\_153[0][0]  
-----  
activation\_156 (Activation) (None, 17, 17, 192) 0 bε  
malization\_156[0][0]  
-----  
block17\_20\_mixed (Concatenate) (None, 17, 17, 384) 0 ac  
n\_153[0][0]  
ac  
n\_156[0][0]  
-----  
block17\_20\_conv (Conv2D) (None, 17, 17, 1088) 418880 bl  
9\_ac[0][0]

0_mixed[0][0]			
-----			
block17_20 (Lambda)	(None, 17, 17, 1088) 0	b1	
9_ac[0][0]		b1	
0_conv[0][0]			
-----			
block17_20_ac (Activation)	(None, 17, 17, 1088) 0	b1	
0[0][0]			
-----			
conv2d_161 (Conv2D)	(None, 17, 17, 256) 278528	b1	
0_ac[0][0]			
-----			
batch_normalization_161 (BatchN (None, 17, 17, 256) 768		cc	
1[0][0]			
-----			
activation_161 (Activation)	(None, 17, 17, 256) 0	bε	
malization_161[0][0]			
-----			
conv2d_157 (Conv2D)	(None, 17, 17, 256) 278528	b1	
0_ac[0][0]			
-----			
conv2d_159 (Conv2D)	(None, 17, 17, 256) 278528	b1	
0_ac[0][0]			
-----			
conv2d_162 (Conv2D)	(None, 17, 17, 288) 663552	ac	
n_161[0][0]			
-----			
batch_normalization_157 (BatchN (None, 17, 17, 256) 768		cc	
7[0][0]			
-----			
batch_normalization_159 (BatchN (None, 17, 17, 256) 768		cc	
9[0][0]			
-----			
batch_normalization_162 (BatchN (None, 17, 17, 288) 864		cc	
2[0][0]			
-----			
activation_157 (Activation)	(None, 17, 17, 256) 0	bε	
malization_157[0][0]			
-----			
activation_159 (Activation)	(None, 17, 17, 256) 0	bε	
malization_159[0][0]			
-----			
activation_162 (Activation)	(None, 17, 17, 288) 0	bε	
malization_162[0][0]			
-----			
conv2d_158 (Conv2D)	(None, 8, 8, 384) 884736	ac	
n_157[0][0]			
-----			
conv2d_160 (Conv2D)	(None, 8, 8, 288) 663552	ac	
n_159[0][0]			

conv2d_163 (Conv2D) n_162[0][0]	(None, 8, 8, 320)	829440	ac
batch_normalization_158 (BatchN 8[0][0]	(None, 8, 8, 384)	1152	cc
batch_normalization_160 (BatchN 0[0][0]	(None, 8, 8, 288)	864	cc
batch_normalization_163 (BatchN 3[0][0]	(None, 8, 8, 320)	960	cc
activation_158 (Activation) malization_158[0][0]	(None, 8, 8, 384)	0	be
activation_160 (Activation) malization_160[0][0]	(None, 8, 8, 288)	0	be
activation_163 (Activation) malization_163[0][0]	(None, 8, 8, 320)	0	be
max_pooling2d_4 (MaxPooling2D) 0_ac[0][0]	(None, 8, 8, 1088)	0	bl
mixed_7a (Concatenate) n_158[0][0]	(None, 8, 8, 2080)	0	ac
n_160[0][0]			ac
n_163[0][0]			me
ng2d_4[0][0]			
conv2d_165 (Conv2D) [0][0]	(None, 8, 8, 192)	399360	mi
batch_normalization_165 (BatchN 5[0][0]	(None, 8, 8, 192)	576	cc
activation_165 (Activation) malization_165[0][0]	(None, 8, 8, 192)	0	be
conv2d_166 (Conv2D) n_165[0][0]	(None, 8, 8, 224)	129024	ac
batch_normalization_166 (BatchN 6[0][0]	(None, 8, 8, 224)	672	cc
activation_166 (Activation) malization_166[0][0]	(None, 8, 8, 224)	0	be

conv2d_164 (Conv2D) [0][0]	(None, 8, 8, 192)	399360	mi
conv2d_167 (Conv2D) n_166[0][0]	(None, 8, 8, 256)	172032	ac
batch_normalization_164 (BatchN 4[0][0]	(None, 8, 8, 192)	576	cc
batch_normalization_167 (BatchN 7[0][0]	(None, 8, 8, 256)	768	cc
activation_164 (Activation) malization_164[0][0]	(None, 8, 8, 192)	0	be
activation_167 (Activation) malization_167[0][0]	(None, 8, 8, 256)	0	be
block8_1_mixed (Concatenate) n_164[0][0]	(None, 8, 8, 448)	0	ac
n_167[0][0]			ac
block8_1_conv (Conv2D) mixed[0][0]	(None, 8, 8, 2080)	933920	bl
block8_1 (Lambda) [0][0]	(None, 8, 8, 2080)	0	mi
conv[0][0]			bl
block8_1_ac (Activation) [0][0]	(None, 8, 8, 2080)	0	bl
conv2d_169 (Conv2D) ac[0][0]	(None, 8, 8, 192)	399360	bl
batch_normalization_169 (BatchN 9[0][0]	(None, 8, 8, 192)	576	cc
activation_169 (Activation) malization_169[0][0]	(None, 8, 8, 192)	0	be
conv2d_170 (Conv2D) n_169[0][0]	(None, 8, 8, 224)	129024	ac
batch_normalization_170 (BatchN 0[0][0]	(None, 8, 8, 224)	672	cc
activation_170 (Activation)	(None, 8, 8, 224)	0	be

activation_170 (Activation)	(None, 8, 8, 224)	0	bε
malization_170[0][0]			
-----	-----	-----	-----
conv2d_168 (Conv2D)	(None, 8, 8, 192)	399360	b1
ac[0][0]			
-----	-----	-----	-----
conv2d_171 (Conv2D)	(None, 8, 8, 256)	172032	ac
n_170[0][0]			
-----	-----	-----	-----
batch_normalization_168 (BatchN	(None, 8, 8, 192)	576	cc
8[0][0]			
-----	-----	-----	-----
batch_normalization_171 (BatchN	(None, 8, 8, 256)	768	cc
1[0][0]			
-----	-----	-----	-----
activation_168 (Activation)	(None, 8, 8, 192)	0	bε
malization_168[0][0]			
-----	-----	-----	-----
activation_171 (Activation)	(None, 8, 8, 256)	0	bε
malization_171[0][0]			
-----	-----	-----	-----
block8_2_mixed (Concatenate)	(None, 8, 8, 448)	0	ac
n_168[0][0]			
-----	-----	-----	-----
n_171[0][0]			
-----	-----	-----	-----
block8_2_conv (Conv2D)	(None, 8, 8, 2080)	933920	b1
mixed[0][0]			
-----	-----	-----	-----
block8_2 (Lambda)	(None, 8, 8, 2080)	0	b1
ac[0][0]			
-----	-----	-----	-----
conv[0][0]			
-----	-----	-----	-----
block8_2_ac (Activation)	(None, 8, 8, 2080)	0	b1
[0][0]			
-----	-----	-----	-----
conv2d_173 (Conv2D)	(None, 8, 8, 192)	399360	b1
ac[0][0]			
-----	-----	-----	-----
batch_normalization_173 (BatchN	(None, 8, 8, 192)	576	cc
3[0][0]			
-----	-----	-----	-----
activation_173 (Activation)	(None, 8, 8, 192)	0	bε
malization_173[0][0]			
-----	-----	-----	-----
conv2d_174 (Conv2D)	(None, 8, 8, 224)	129024	ac
n_173[0][0]			
-----	-----	-----	-----
batch_normalization_174 (BatchN	(None, 8, 8, 224)	672	cc
4[0][0]			
-----	-----	-----	-----

activation_174 (Activation)	(None, 8, 8, 224)	0	bε
malization_174[0][0]			
conv2d_172 (Conv2D)	(None, 8, 8, 192)	399360	bλ
ac[0][0]			
conv2d_175 (Conv2D)	(None, 8, 8, 256)	172032	ac
n_174[0][0]			
batch_normalization_172 (BatchN)	(None, 8, 8, 192)	576	cc
2[0][0]			
batch_normalization_175 (BatchN)	(None, 8, 8, 256)	768	cc
5[0][0]			
activation_172 (Activation)	(None, 8, 8, 192)	0	bε
malization_172[0][0]			
activation_175 (Activation)	(None, 8, 8, 256)	0	bε
malization_175[0][0]			
block8_3_mixed (Concatenate)	(None, 8, 8, 448)	0	ac
n_172[0][0]			
ac_175[0][0]			ac
block8_3_conv (Conv2D)	(None, 8, 8, 2080)	933920	bλ
mixed[0][0]			
block8_3 (Lambda)	(None, 8, 8, 2080)	0	bλ
ac[0][0]			
conv[0][0]			bλ
block8_3_ac (Activation)	(None, 8, 8, 2080)	0	bλ
[0][0]			
conv2d_177 (Conv2D)	(None, 8, 8, 192)	399360	bλ
ac[0][0]			
batch_normalization_177 (BatchN)	(None, 8, 8, 192)	576	cc
7[0][0]			
activation_177 (Activation)	(None, 8, 8, 192)	0	bε
malization_177[0][0]			
conv2d_178 (Conv2D)	(None, 8, 8, 224)	129024	ac
n_177[0][0]			
batch_normalization_178 (BatchN)	(None, 8, 8, 224)	672	cc
8[0][0]			

8[0][0]				
activation_178 (Activation)	(None, 8, 8, 224)	0	bε	
malization_178[0][0]				
conv2d_176 (Conv2D)	(None, 8, 8, 192)	399360	b1	
ac[0][0]				
conv2d_179 (Conv2D)	(None, 8, 8, 256)	172032	ac	
n_178[0][0]				
batch_normalization_176 (BatchN)	(None, 8, 8, 192)	576	cc	
6[0][0]				
batch_normalization_179 (BatchN)	(None, 8, 8, 256)	768	cc	
9[0][0]				
activation_176 (Activation)	(None, 8, 8, 192)	0	bε	
malization_176[0][0]				
activation_179 (Activation)	(None, 8, 8, 256)	0	bε	
malization_179[0][0]				
block8_4_mixed (Concatenate)	(None, 8, 8, 448)	0	ac	
n_176[0][0]				
ac_179[0][0]			ac	
block8_4_conv (Conv2D)	(None, 8, 8, 2080)	933920	b1	
mixed[0][0]				
block8_4 (Lambda)	(None, 8, 8, 2080)	0	b1	
ac[0][0]				
conv[0][0]			b1	
block8_4_ac (Activation)	(None, 8, 8, 2080)	0	b1	
[0][0]				
conv2d_181 (Conv2D)	(None, 8, 8, 192)	399360	b1	
ac[0][0]				
batch_normalization_181 (BatchN)	(None, 8, 8, 192)	576	cc	
1[0][0]				
activation_181 (Activation)	(None, 8, 8, 192)	0	bε	
malization_181[0][0]				
conv2d_182 (Conv2D)	(None, 8, 8, 224)	129024	ac	
n_181[0][0]				

batch_normalization_182 (BatchN	(None, 8, 8, 224)	672	cc
2[0][0]			
activation_182 (Activation)	(None, 8, 8, 224)	0	be
malization_182[0][0]			
conv2d_180 (Conv2D)	(None, 8, 8, 192)	399360	bl
ac[0][0]			
conv2d_183 (Conv2D)	(None, 8, 8, 256)	172032	ac
n_182[0][0]			
batch_normalization_180 (BatchN	(None, 8, 8, 192)	576	cc
0[0][0]			
batch_normalization_183 (BatchN	(None, 8, 8, 256)	768	cc
3[0][0]			
activation_180 (Activation)	(None, 8, 8, 192)	0	be
malization_180[0][0]			
activation_183 (Activation)	(None, 8, 8, 256)	0	be
malization_183[0][0]			
block8_5_mixed (Concatenate)	(None, 8, 8, 448)	0	ac
n_180[0][0]			
n_183[0][0]			ac
block8_5_conv (Conv2D)	(None, 8, 8, 2080)	933920	bl
mixed[0][0]			
block8_5 (Lambda)	(None, 8, 8, 2080)	0	bl
ac[0][0]			
conv[0][0]			bl
block8_5_ac (Activation)	(None, 8, 8, 2080)	0	bl
[0][0]			
conv2d_185 (Conv2D)	(None, 8, 8, 192)	399360	bl
ac[0][0]			
batch_normalization_185 (BatchN	(None, 8, 8, 192)	576	cc
5[0][0]			
activation_185 (Activation)	(None, 8, 8, 192)	0	be
malization_185[0][0]			
conv2d_186 (Conv2D)	(None, 8, 8, 224)	129024	ac
n_185[0][0]			

batch_normalization_186 (BatchN (None, 8, 8, 224) 6[0][0]	672	cc
activation_186 (Activation) malization_186[0][0]	0	be
conv2d_184 (Conv2D) ac[0][0]	(None, 8, 8, 192) 399360	bl
conv2d_187 (Conv2D) n_186[0][0]	(None, 8, 8, 256) 172032	ac
batch_normalization_184 (BatchN (None, 8, 8, 192) 4[0][0]	576	cc
batch_normalization_187 (BatchN (None, 8, 8, 256) 7[0][0]	768	cc
activation_184 (Activation) malization_184[0][0]	(None, 8, 8, 192) 0	be
activation_187 (Activation) malization_187[0][0]	(None, 8, 8, 256) 0	be
block8_6_mixed (Concatenate) n_184[0][0]	(None, 8, 8, 448) 0	ac
n_187[0][0]		ac
block8_6_conv (Conv2D) mixed[0][0]	(None, 8, 8, 2080) 933920	bl
block8_6 (Lambda) ac[0][0]	(None, 8, 8, 2080) 0	bl
conv[0][0]		bl
block8_6_ac (Activation) [0][0]	(None, 8, 8, 2080) 0	bl
conv2d_189 (Conv2D) ac[0][0]	(None, 8, 8, 192) 399360	bl
batch_normalization_189 (BatchN (None, 8, 8, 192) 9[0][0]	576	cc
activation_189 (Activation) malization_189[0][0]	(None, 8, 8, 192) 0	be
conv2d_190 (Conv2D)	(None, 8, 8, 224) 120024	cc

conv2d_190 (Conv2D) n_189[0][0]	(None, 8, 8, 224)	129024	ac
batch_normalization_190 (BatchN 0[0][0]	(None, 8, 8, 224)	672	cc
activation_190 (Activation) malization_190[0][0]	(None, 8, 8, 224)	0	be
conv2d_188 (Conv2D) ac[0][0]	(None, 8, 8, 192)	399360	bl
conv2d_191 (Conv2D) n_190[0][0]	(None, 8, 8, 256)	172032	ac
batch_normalization_188 (BatchN 8[0][0]	(None, 8, 8, 192)	576	cc
batch_normalization_191 (BatchN 1[0][0]	(None, 8, 8, 256)	768	cc
activation_188 (Activation) malization_188[0][0]	(None, 8, 8, 192)	0	be
activation_191 (Activation) malization_191[0][0]	(None, 8, 8, 256)	0	be
block8_7_mixed (Concatenate) n_188[0][0]	(None, 8, 8, 448)	0	ac
n_191[0][0]			ac
block8_7_conv (Conv2D) mixed[0][0]	(None, 8, 8, 2080)	933920	bl
block8_7 (Lambda) ac[0][0]	(None, 8, 8, 2080)	0	bl
conv[0][0]			bl
block8_7_ac (Activation) [0][0]	(None, 8, 8, 2080)	0	bl
conv2d_193 (Conv2D) ac[0][0]	(None, 8, 8, 192)	399360	bl
batch_normalization_193 (BatchN 3[0][0]	(None, 8, 8, 192)	576	cc
activation_193 (Activation) malization_193[0][0]	(None, 8, 8, 192)	0	be

conv2d_194 (Conv2D) n_193[0][0]	(None, 8, 8, 224)	129024	ac
batch_normalization_194 (BatchN 4[0][0]	(None, 8, 8, 224)	672	cc
activation_194 (Activation) malization_194[0][0]	(None, 8, 8, 224)	0	bε
conv2d_192 (Conv2D) ac[0][0]	(None, 8, 8, 192)	399360	bl
conv2d_195 (Conv2D) n_194[0][0]	(None, 8, 8, 256)	172032	ac
batch_normalization_192 (BatchN 2[0][0]	(None, 8, 8, 192)	576	cc
batch_normalization_195 (BatchN 5[0][0]	(None, 8, 8, 256)	768	cc
activation_192 (Activation) malization_192[0][0]	(None, 8, 8, 192)	0	bε
activation_195 (Activation) malization_195[0][0]	(None, 8, 8, 256)	0	bε
block8_8_mixed (Concatenate) n_192[0][0]	(None, 8, 8, 448)	0	ac
n_195[0][0]			ac
block8_8_conv (Conv2D) mixed[0][0]	(None, 8, 8, 2080)	933920	bl
block8_8 (Lambda) ac[0][0]	(None, 8, 8, 2080)	0	bl
conv[0][0]			bl
block8_8_ac (Activation) [0][0]	(None, 8, 8, 2080)	0	bl
conv2d_197 (Conv2D) ac[0][0]	(None, 8, 8, 192)	399360	bl
batch_normalization_197 (BatchN 7[0][0]	(None, 8, 8, 192)	576	cc
activation_197 (Activation)	(None, 8, 8, 192)	0	bε

```
    m alization_197[0][0]
    -----
    conv2d_198 (Conv2D)           (None, 8, 8, 224) 129024 ac
    n_197[0][0]
    -----
    batch_normalization_198 (BatchN (None, 8, 8, 224) 672 cc
    8[0][0]
    -----
    activation_198 (Activation)   (None, 8, 8, 224) 0 bε
    malization_198[0][0]
    -----
    conv2d_196 (Conv2D)           (None, 8, 8, 192) 399360 bl
    ac[0][0]
    -----
    conv2d_199 (Conv2D)           (None, 8, 8, 256) 172032 ac
    n_198[0][0]
    -----
    batch_normalization_196 (BatchN (None, 8, 8, 192) 576 cc
    6[0][0]
    -----
    batch_normalization_199 (BatchN (None, 8, 8, 256) 768 cc
    9[0][0]
    -----
    activation_196 (Activation)   (None, 8, 8, 192) 0 bε
    malization_196[0][0]
    -----
    activation_199 (Activation)   (None, 8, 8, 256) 0 bε
    malization_199[0][0]
    -----
    block8_9_mixed (Concatenate) (None, 8, 8, 448) 0 ac
    n_196[0][0]
    ac
    n_199[0][0]
    -----
    block8_9_conv (Conv2D)       (None, 8, 8, 2080) 933920 bl
    mixed[0][0]
    -----
    block8_9 (Lambda)            (None, 8, 8, 2080) 0 bl
    ac[0][0]
    bl
    conv[0][0]
    -----
    block8_9_ac (Activation)    (None, 8, 8, 2080) 0 bl
    [0][0]
    -----
    conv2d_201 (Conv2D)          (None, 8, 8, 192) 399360 bl
    ac[0][0]
    -----
    batch_normalization_201 (BatchN (None, 8, 8, 192) 576 cc
    1[0][0]
```

activation_201 (Activation)	(None, 8, 8, 192)	0	bε
batch_normalization_201[0][0]			
conv2d_202 (Conv2D)	(None, 8, 8, 224)	129024	ac
n_201[0][0]			
batch_normalization_202 (BatchN	(None, 8, 8, 224)	672	cc
2[0][0]			
activation_202 (Activation)	(None, 8, 8, 224)	0	bε
batch_normalization_202[0][0]			
conv2d_200 (Conv2D)	(None, 8, 8, 192)	399360	b]
ac[0][0]			
conv2d_203 (Conv2D)	(None, 8, 8, 256)	172032	ac
n_202[0][0]			
batch_normalization_200 (BatchN	(None, 8, 8, 192)	576	cc
0[0][0]			
batch_normalization_203 (BatchN	(None, 8, 8, 256)	768	cc
3[0][0]			
activation_200 (Activation)	(None, 8, 8, 192)	0	bε
batch_normalization_200[0][0]			
activation_203 (Activation)	(None, 8, 8, 256)	0	bε
batch_normalization_203[0][0]			
block8_10_mixed (Concatenate)	(None, 8, 8, 448)	0	ac
n_200[0][0]			
n_203[0][0]			ac
block8_10_conv (Conv2D)	(None, 8, 8, 2080)	933920	b]
_mixed[0][0]			
block8_10 (Lambda)	(None, 8, 8, 2080)	0	b]
ac[0][0]			
_conv[0][0]			b]
conv_7b (Conv2D)	(None, 8, 8, 1536)	3194880	b]
[0][0]			
conv_7b_bn (BatchNormalization)	(None, 8, 8, 1536)	4608	cc
[0][0]			
conv_7b_ac (Activation)	(None, 8, 8, 1536)	0	cc
n[0][0]			

```
-----  
avg_pool (GlobalAveragePooling2 (None, 1536) 0 cc  
c[0][0]  
-----  
dropout_1 (Dropout) (None, 1536) 0 av  
[0][0]  
-----  
dense_1 (Dense) (None, 5004) 7691148 dr  
[0][0]  
=====  
=====  
Total params: 62,027,884  
Trainable params: 61,967,340  
Non-trainable params: 60,544  
-----  
-----  
Out[13]:  
5
```

## Train more on augmented data

```
In [14]:  
from keras.callbacks import LambdaCallback, ModelCheckpoint  
# from keras.applications.imagenet_utils import preprocess_input  
  
ROTATE = 20  
SEED = 42  
gc.collect()  
  
batch_gc_callback = LambdaCallback(  
    on_epoch_begin=lambda epoch, logs: gc.collect())  
  
checkpointer = ModelCheckpoint(filepath='weights.hdf5',  
                               verbose=1, save_best_only=True)
```

```
train_datagen = ImageDataGenerator(  
    preprocessing_function=preprocess_input,  
    rescale=1./255,  
    fill_mode='nearest',  
    validation_split = 0.1,  
    rotation_range=ROTATE,  
    width_shift_range=0.2,  
    height_shift_range=0.2,  
    shear_range=0.2,  
    zoom_range=0.2,  
    horizontal_flip=False  
)
```

```
train_generator = train_datagen.flow_from_dataframe(  
    dataframe=whales_train,  
    subset = "training",  
    directory=TRAIN_CROPPED_IN,  
    x_col="Image",  
    y_col="Id",  
    has_ext=True,  
    seed = SEED,  
    color_mode= "rgb",  
    target_size=(IMAGE_HEIGHT, IMAGE_WIDTH),  
    batch_size=BATCH_SIZE,  
    class_mode='categorical')
```

```

validation_generator = train_datagen.flow_from_dataframe(
    dataframe=whales_train,
    subset = "validation",
    directory=TRAIN_CROPPED_IN,
    x_col="Image",
    y_col="Id",
    has_ext=True,
    seed = SEED,
    color_mode= "rgb",
    target_size=(IMAGE_HEIGHT, IMAGE_WIDTH),
    batch_size=BATCH_SIZE,
    class_mode='categorical')

gc.collect()

/opt/conda/lib/python3.6/site-packages/keras_preprocessing/image.py
SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: http://pandas.pydata.org/pandas/stable/indexing.html#indexing-view-versus-copy
    self.df[x_col] = self.df[x_col].astype(str)

Found 14155 images belonging to 5004 classes.
Found 1542 images belonging to 5004 classes.

```

Out[14]:

56

## Visualize augmented data

In [15]:

```

from skimage.io import imread
import PIL.Image as pimage

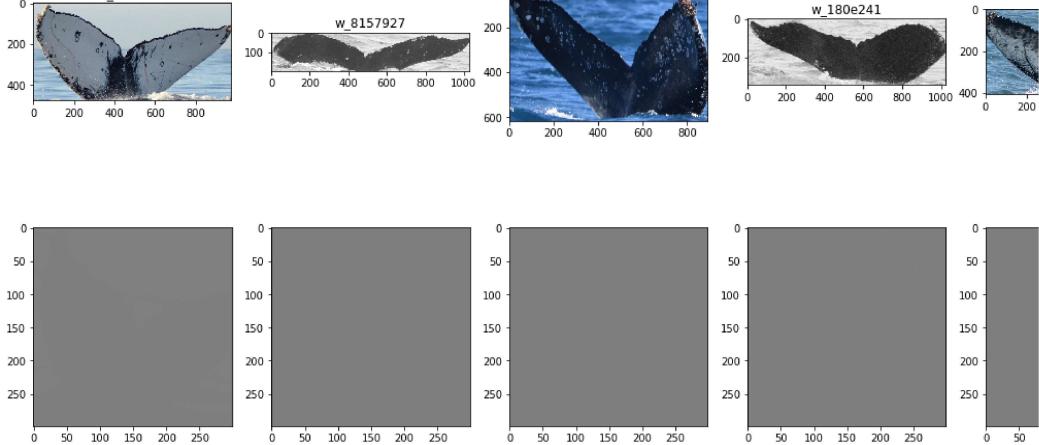
def plot_images(images_names, path):
    fig, m_axs = plt.subplots(1, len(images), figsize = (20, 10))
    #show the images and label them
    for ii, c_ax in enumerate(m_axs):
        img = imread(os.path.join(path,images_names[ii][0]))
        c_ax.imshow(img)
        c_ax.set_title(images_names[ii][1])

def plot_loaded_images(images_loaded, labels):
    fig, m_axs = plt.subplots(1, len(images_loaded), figsize = (20,
    #show the images and label them
    for ii, c_ax in enumerate(m_axs):
        img = pimage.fromarray(images_loaded[ii], "RGB")
        c_ax.imshow((images_loaded[ii] + 1) / 2)
    #        c_ax.set_title(labels[ii])

#get the first 5 whale images
images = [(whale_img, whale_label) for (whale_img, whale_label) in
es_train.Image[:5], whales_train.Id[:5])]
plot_images(images, TRAIN_CROPPED_IN)

x_batch, y_batch = next(validation_generator)
plot_loaded_images(x_batch[:5], y_batch[:5])

```



In [16]:

```
# fits the model on batches with real-time data augmentation:
STEP_SIZE_TRAIN=train_generator.n//train_generator.batch_size
STEP_SIZE_VALID=validation_generator.n//validation_generator.batch_size

# Train the loaded model
history = model.fit_generator(generator=train_generator,
                               steps_per_epoch=STEP_SIZE_TRAIN,
                               validation_data=validation_generator,
                               validation_steps=STEP_SIZE_VALID,
                               epochs=EPOCHS,
                               callbacks = [gc_collector])
```

```
Epoch 1/20
442/442 [=====] - 1306s 3s/step - loss: 1.
acc: 0.6277 - top_5_accuracy: 0.8595 - val_loss: 7.4103 - val_acc:
- val_top_5_accuracy: 0.3464
Epoch 2/20
442/442 [=====] - 1251s 3s/step - loss: 1.
acc: 0.6865 - top_5_accuracy: 0.8950 - val_loss: 7.0033 - val_acc:
- val_top_5_accuracy: 0.3927
Epoch 3/20
442/442 [=====] - 1258s 3s/step - loss: 1.
acc: 0.7259 - top_5_accuracy: 0.9227 - val_loss: 6.2988 - val_acc:
- val_top_5_accuracy: 0.4689
Epoch 4/20
442/442 [=====] - 1260s 3s/step - loss: 0.
acc: 0.7792 - top_5_accuracy: 0.9455 - val_loss: 6.3653 - val_acc:
- val_top_5_accuracy: 0.4768
Epoch 5/20
442/442 [=====] - 1260s 3s/step - loss: 0.
acc: 0.8189 - top_5_accuracy: 0.9626 - val_loss: 6.5453 - val_acc:
- val_top_5_accuracy: 0.4563
Epoch 6/20
442/442 [=====] - 1267s 3s/step - loss: 0.
acc: 0.8404 - top_5_accuracy: 0.9736 - val_loss: 6.5995 - val_acc:
- val_top_5_accuracy: 0.4510
Epoch 7/20
442/442 [=====] - 1267s 3s/step - loss: 0.
acc: 0.8580 - top_5_accuracy: 0.9784 - val_loss: 7.5678 - val_acc:
- val_top_5_accuracy: 0.3768
Epoch 8/20
442/442 [=====] - 1270s 3s/step - loss: 0.
acc: 0.8875 - top_5_accuracy: 0.9842 - val_loss: 6.3014 - val_acc:
- val_top_5_accuracy: 0.4967
Epoch 9/20
442/442 [=====] - 1257s 3s/step - loss: 0.
acc: 0.9039 - top_5_accuracy: 0.9877 - val_loss: 6.5180 - val_acc:
- val_top_5_accuracy: 0.4596
Epoch 10/20
442/442 [=====] - 1255s 3s/step - loss: 0.
acc: 0.9131 - top_5_accuracy: 0.9919 - val_loss: 6.4760 - val_acc:
- val_top_5_accuracy: 0.4742
```

```
Epoch 11/20
442/442 [=====] - 1253s 3s/step - loss: 0.
acc: 0.9229 - top_5_accuracy: 0.9926 - val_loss: 7.5852 - val_acc:
- val_top_5_accuracy: 0.3914
Epoch 12/20
442/442 [=====] - 1252s 3s/step - loss: 0.
acc: 0.9358 - top_5_accuracy: 0.9929 - val_loss: 6.5343 - val_acc:
- val_top_5_accuracy: 0.4709
Epoch 13/20
442/442 [=====] - 1249s 3s/step - loss: 0.
acc: 0.9410 - top_5_accuracy: 0.9948 - val_loss: 8.3127 - val_acc:
- val_top_5_accuracy: 0.2967
Epoch 14/20
442/442 [=====] - 1260s 3s/step - loss: 0.
acc: 0.9416 - top_5_accuracy: 0.9963 - val_loss: 6.5842 - val_acc:
- val_top_5_accuracy: 0.4921
Epoch 15/20
442/442 [=====] - 1260s 3s/step - loss: 0.
acc: 0.9476 - top_5_accuracy: 0.9956 - val_loss: 8.8011 - val_acc:
- val_top_5_accuracy: 0.3179
Epoch 16/20
442/442 [=====] - 1258s 3s/step - loss: 0.
acc: 0.9533 - top_5_accuracy: 0.9971 - val_loss: 6.3716 - val_acc:
- val_top_5_accuracy: 0.4934
Epoch 17/20
442/442 [=====] - 1255s 3s/step - loss: 0.
acc: 0.9584 - top_5_accuracy: 0.9969 - val_loss: 6.5642 - val_acc:
- val_top_5_accuracy: 0.4947
Epoch 18/20
442/442 [=====] - 1254s 3s/step - loss: 0.
acc: 0.9607 - top_5_accuracy: 0.9978 - val_loss: 6.5788 - val_acc:
- val_top_5_accuracy: 0.4881
Epoch 19/20
442/442 [=====] - 1254s 3s/step - loss: 0.
acc: 0.9603 - top_5_accuracy: 0.9980 - val_loss: 7.0443 - val_acc:
- val_top_5_accuracy: 0.4543
Epoch 20/20
```

## InceptionResNetV2 - oversampling

Python notebook using data from [multiple data sources](#) · 62 views · multiple data sources



## Plot train results

### Version 5

9 commits

forked from InceptionResNetV2

### Notebook

Data

Output

Log

Comments

In [17]:

```
def plot_accuracy(history, should_plot_val = False):
    acc = history.history['acc']
    l1 = plt.plot(acc, label='acc')

    if should_plot_val:
        val_acc = history.history['val_acc']
        l2 = plt.plot(val_acc, label='val_acc')

    plt.legend(loc=2, fontsize="small")
    plt.title('Model accuracy')
    plt.ylabel('Accuracy')
    plt.xlabel('Epoch')
    plt.show()

def plot_loss(history, should_plot_val = False):
    loss = history.history['loss']
    l1 = plt.plot(loss, label='loss')

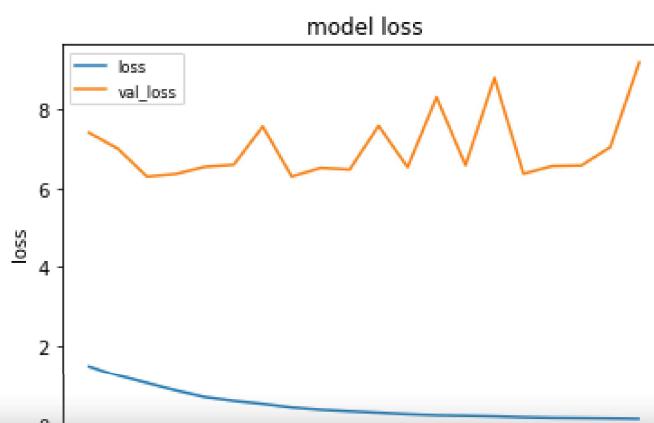
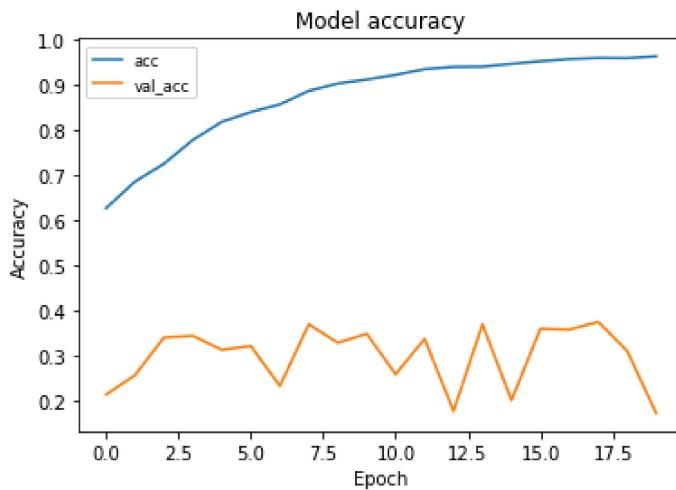
    if should_plot_val:
```

```
val_loss = history.history['val_loss']
plt.plot(val_loss, label='val_loss')

plt.legend(loc=2, fontsize="small")
plt.title('model loss')
plt.ylabel('loss')
plt.xlabel('epoch')
plt.show()
```

In [18]:

```
plot_accuracy(history, True)
plot_loss(history, True)
```



Notebook

Data

Output

Log

Comments

In [19]:

```
model.save(MODEL_F)
print("Saved model architecture to disk")
model.save_weights(WEIGHTS_F)
print("Saved model weights to disk")
```

Saved model architecture to disk  
Saved model weights to disk

In [20]:

```
test = os.listdir(TEST_CROPPED_IN)
print("Test set length: "+str(len(test)))
```

Test set length: 7960

In [21]:

```
col = ['Image']
test_df = pd.DataFrame(test, columns=col)
test_df['Id'] = ''
```

Test set prediction using generator and flow from dataframe

```
In [22]:  
    test_datagen = ImageDataGenerator(  
        preprocessing_function=preprocess_input,  
        rescale=1./255,  
        fill_mode='nearest')  
  
    test_generator = test_datagen.flow_from_dataframe(  
        dataframe=test_df,  
        directory=TEST_CROPPED_IN,  
        x_col="Image",  
        y_col=None,  
        class_mode=None,  
        shuffle=False,  
        color_mode="rgb",  
        target_size=(IMAGE_HEIGHT, IMAGE_WIDTH),  
        batch_size=1)  
  
    #we need to use .reset() here otherwise  
    #the other of predictions will be different  
    #then the expected  
    test_generator.reset()  
    predictions = model.predict_generator(test_generator, verbose = 1, st  
)  
  
    print("Predictions shape:")  
    print(np.shape(predictions))
```

```
Found 7960 images.  
7960/7960 [=====] - 664s 83ms/step  
Predictions shape:  
(7960, 5004)
```

## Test set predictions

```
In [23]:  
    predicted_class_indices=np.argmax(predictions, axis=1)  
  
    np.save("predictions.npy", predictions)  
    np.save("predicted_class_indices.npy", predicted_class_indices)  
    np.save('test_filenames_generator.npy', test_generator.filenames)  
    np.save('train_class_indices.npy', train_generator.class_indices)  
  
    print('predicted class indices:')  
    print(predicted_class_indices)  
  
    # print('Indices mapping:')  
    # print(train_generator.class_indices)  
  
predicted class indices:  
[3333 1211 3745 ... 4686 2687 343]
```

```
In [24]:  
    print(labels_list[:7])  
    labels_with_new_whale = np.concatenate(([ 'new_whale'], labels_list)  
)  
    print(labels_with_new_whale[:7])
```

```
[ 'w_0003639' 'w_0003c59' 'w_0027efa' 'w_00289b1' 'w_002c810' 'w_003  
]
```

```
'w_003bae6']
['new_whale' 'w_0003639' 'w_0003c59' 'w_0027efa' 'w_00289b1' 'w_002
'w_0032a46']
```

```
In [25]:
```

```
def add_new_whale_to_predictions(preds):
    sorted_preds = np.sort(preds)
    avg_of_max_predictions = np.average(sorted_preds[:, -1:])
    print("Average of max probabilities column:" + str(avg_of_max_p
ns))
    best_threshold = avg_of_max_predictions
    # print(np.shape(preds))
    shape_to_add = (np.shape(preds)[0], 1)

    # Add a column with the best threshold probability to the prediction
    column_to_add = np.zeros(shape_to_add) + best_threshold
    predictions_w_new_whale = np.concatenate([column_to_add, preds]
)
    return predictions_w_new_whale
```

```
In [26]:
```

```
classes = dict((v,k) for k,v in train_generator.class_indices.items

def get_generator_class(index):
    if index == 0:
        return 'new_whale'
    return classes[index-1]

def create_results_csv(preds, labels_with_new_whale, test_file_name
t_filename):
    sample_df = pd.read_csv(SAMPLE_SUB)
    sample_images = list(sample_df.Image)

    print("Test file names for decoding:")
    print(test_file_names[:7])

    #     classes = dict((v,k) for k,v in train_generator.class_indices.:.
    #     print("Generator classes:")
    #     print(classes)

    pred_list = [[get_generator_class(i) for i in p.argsort()[-5:][
or p in preds]
    print(pred_list[:10])

    pred_dic = dict((key, value) for (key, value) in zip(test_file_
red_list))
    pred_list_for_test = [' '.join(pred_dic[id]) for id in sample_i

    #     print(np.shape(pred_list))
    #     print(np.shape(test_file_names))
    df = pd.DataFrame({'Image': sample_images, 'Id': pred_list_for_
df.to_csv(output_filename, header=True, index=False)
    return df
```

```
In [27]:
```

```
p = add_new_whale_to_predictions(predictions)
test_df = create_results_csv(p, labels_with_new_whale, test_generat
ames, "submission.csv")
print(test_df[:10])
```

```
Average of max probabilities column:0.65336853
Test file names for decoding:
['00028a005.jpg', '000dcf7d8.jpg', '000e7c7df.jpg', '0019c34f4.jpg'
4d292.jpg', '00247bc36.jpg', '0027089a4.jpg']
[['new_whale', 'w_a1a4bb2', 'w_11d8c70', 'w_8d9af77', 'w_f7cd240']].
```

```

    7763b', 'new_whale', 'w_e3956f5', 'w_2b17316', 'w_0e93f25'], ['w_66
    'new_whale', 'w_cd4cb49', 'w_591a2c5', 'w_5a7e338'], ['new_whale',
    e9f', 'w_fec331a', 'w_f66ec54', 'w_27597ff'], ['new_whale', 'w_e237
    'w_06619ff', 'w_502e72f', 'w_b60ef24'], ['new_whale', 'w_0e7ec27',
    09b', 'w_059d9e0', 'w_71a1a08'], ['new_whale', 'w_9d6c63d', 'w_7e2e
    'w_65f142a', 'w_be36790'], ['w_b5cf062', 'new_whale', 'w_591a2c5',
    2d6', 'w_06619ff'], ['w_c6d75ff', 'new_whale', 'w_9490369', 'w_591a
    'w_1f41b98'], ['w_d3baa35', 'new_whale', 'w_b60ef24', 'w_7a083f7',
    442']]
```

	Image	Id
0	00028a005.jpg	new_whale w_a1a4bb2 w_11d8c70 w_8d9af77 w_f7cd246
1	000dcf7d8.jpg	w_6e7763b new_whale w_e3956f5 w_2b17316 w_0e93f25
2	000e7c7df.jpg	w_6658081 new_whale w_cd4cb49 w_591a2c5 w_5a7e338
3	0019c34f4.jpg	new_whale w_bc7de9f w_fec331a w_f66ec54 w_27597ff
4	001a4d292.jpg	new_whale w_e2372d6 w_06619ff w_502e72f w_b60ef24
5	00247bc36.jpg	new_whale w_0e7ec27 w_9b5109b w_059d9e0 w_71a1a08
6	0027089a4.jpg	new_whale w_9d6c63d w_7e2eb3d w_65f142a w_be36790
7	002de4d94.jpg	w_b5cf062 new_whale w_591a2c5 w_e2372d6 w_06619ff
8	002f52f0c.jpg	w_c6d75ff new_whale w_9490369 w_591a2c5 w_1f41b98
9	002fd89d4.jpg	w_d3baa35 new_whale w_b60ef24 w_7a083f7 w_01ed442

This kernel has been released under the [Apache 2.0](#) open source license.

Did you find this Kernel useful?  
Show your appreciation with an upvote

0

## Data

**Data Sources**

- ▼ Humpback Whale Id...
  - sam... 7960 x 2
  - train... 25.4k x 2
- ▼ test.zip
  - 0027089a4.jpg
  - 00313e2d2.jpg
  - 004344e9f.jpg
  - 008a4bc86.jpg
  - 00ac0fcfa6.jpg
  - 00ff45291.jpg
  - 012dbdb59.jpg
  - 0169cec0e.jpg
  - 01830c9cf.jpg
  - 01b1ecf7b.jpg
  - ... 1000+ more
- ▼ train.zip
  - 002b4615d.jpg
  - 00600ce17.jpg
  - 00d641885.jpg
  - 00eaedfab.jpg

**Humpback Whale Identification**

Can you identify a whale by its tail?

Last Updated: 2 months ago

**About this Competition**

This training data contains thousands of images of humpback whale flukes. Individual whales have been identified by researchers and given an `Id`. The challenge is to predict the whale `Id` of images in the test set. What makes this such a challenge is that there are only a few examples for each of 3,000+ whale IDs.

**File descriptions**

- **train.zip** - a folder containing the training images
- **train.csv** - maps the training `Image` to the appropriate whale `Id`. Whales that are not predicted to have a `label` identified in the training data should be labeled as `new_whale`.
- **test.zip** - a folder containing the test images to predict the whale `Id`
- **sample\_submission.csv** - a sample submission file in the correct format



## Output Files

[New Dataset](#)[New Kernel](#)[Download All](#)

### Output Files

- submission.csv
- Model\_InceptionRes...
- predicted\_class\_indic...
- predictions.npy
- test\_filenames\_gener...
- train\_class\_indices.npy
- Weights\_InceptionRe...

### About this file

 [Submit to Competition](#)

This file was created from a Kernel, it does not have a description.

### submission.csv



1	Image	Id
2	00028a005.jpg	new_whale w_a1a4bb2 w_11d8c70 w_8d9af77 w_f7cd240
3	000dcf7d8.jpg	w_6e7763b new_whale w_e3956f5 w_2b17316 w_0e93f25
4	000e7c7df.jpg	w_6658081 new_whale w_cd4cb49 w_591a2c5 w_5a7e338
5	0019c34f4.jpg	new_whale w_bc7de9f w_fec331a w_f66ec54 w_27597ff
6	001a4d292.jpg	new_whale w_e2372d6 w_06619ff w_502e72f w_b60ef24
7	00247bc36.jpg	new_whale w_0e7ec27 w_9b5109b w_059d9e0 w_71a1a08
8	0027089a4.jpg	new_whale w_9d6c63d w_7e2eb3d w_65f142a w_be36790
9	002de4d94.jpg	w_b5cf062 new_whale w_591a2c5 w_e2372d6 w_06619ff
10	002f52f0c.jpg	w_c6d75ff new_whale w_9490369 w_501a2c5

## Run Info

Succeeded	True	Run Time	26307 seconds
Exit Code	0	Queue Time	0 seconds
Docker Image Name	/python(Dockerfile)	Output Size	0
Timeout Exceeded	False	Used All Space	False
Failure Message			

## Log

[Download Log](#)

```

Time  Line # Log Message
2.7s    1 [NbConvertApp] Converting notebook __notebook__.ipynb to notebook
2.8s    2 [NbConvertApp] Executing notebook with kernel: python3
8.1s    3 2019-02-05 06:37:34.674021: I
        tensorflow/stream_executor/cuda/cuda_gpu_executor.cc:964]
        successful NUMA node read from SysFS had negative value (-1), but
        there must be at least one NUMA node, so returning NUMA node zero
8.1s    4 2019-02-05 06:37:34.674914: I
        tensorflow/core/common_runtime/gpu/gpu_device.cc:1432] Found
        device 0 with properties:
        name: Tesla K80 major: 3 minor: 7 memoryClockRate(GHz): 0.8235
        pciBusID: 0000:00:04.0
        totalMemory: 11.17GiB freeMemory: 11.10GiB
        2019-02-05 06:37:34.674955: I
        tensorflow/core/common_runtime/gpu/gpu_device.cc:1511] Adding
        visible gpu devices: 0
8.4s    5 2019-02-05 06:37:35.013447: I
        tensorflow/core/common_runtime/gpu/gpu_device.cc:982] Device
        interconnect StreamExecutor with strength 1 edge matrix:
        2019-02-05 06:37:35.013515: I
        tensorflow/core/common_runtime/gpu/gpu_device.cc:988]      0
        2019-02-05 06:37:35.013533: I
        tensorflow/core/common_runtime/gpu/gpu_device.cc:1001] 0:   N
8.5s    6 2019-02-05 06:37:35.013909: I
        tensorflow/core/common_runtime/gpu/gpu_device.cc:1115] Created
        TensorFlow device (/job:localhost/replica:0/task:0/device:GPU:0
        with 10758 MB memory) -> physical GPU (device: 0, name: Tesla
        K80, pci bus id: 0000:00:04.0, compute capability: 3.7)
163.1s   7 2019-02-05 06:40:09.629178: W
        tensorflow/core/common_runtime/bfc_allocator.cc:211] Allocator
        (GPU_0_bfc) ran out of memory trying to allocate 2.15GiB. The
        caller indicates that this is not a failure, but may mean that
        there could be performance gains if more memory were available.
163.7s   8 2019-02-05 06:40:10.290724: W
        tensorflow/core/common_runtime/bfc_allocator.cc:211] Allocator
        (GPU_0_bfc) ran out of memory trying to allocate 3.42GiB. The
        caller indicates that this is not a failure, but may mean that
        there could be performance gains if more memory were available.
163.8s   9 2019-02-05 06:40:10.315936: W
        tensorflow/core/common_runtime/bfc_allocator.cc:211] Allocator
        (GPU_0_bfc) ran out of memory trying to allocate 3.67GiB. The
        caller indicates that this is not a failure, but may mean that
        there could be performance gains if more memory were available.
26303.8s 10 [NbConvertApp] Writing 576825 bytes to __notebook__.ipynb
26305.9s 11 [NbConvertApp] Converting notebook __notebook__.ipynb to html
26306.5s 12 [NbConvertApp] Support files will be in __results__files/
        [NbConvertApp] Making directory __results__files
26306.5s 13 [NbConvertApp] Making directory __results__files
        [NbConvertApp] Making directory __results__files
        [NbConvertApp] Making directory __results__files
        [NbConvertApp] Making directory __results__files
        [NbConvertApp] Writing 491103 bytes to __results__.html
26306.5s 14
26306.5s 16 Complete. Exited with code 0.

```

## Comments (0)



Click here to enter a comment...