

Submission**✓ Ran successfully**

Submitted by NinaV 2 hours ago

Public Score

0.429

```
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.
```

['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	85700387a.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
0a5216ef5.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

Tn [z].

```
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:

Easels

[Lw_00036391] [Lw_00036591] [Lw_0027efab] [Lw_00288b11] [Lw_002c8110] [Lw_003

```
[ w_0003039 ' w_0003c39 ' w_0027e1a ' w_00289b1 ' w_002c818 ' w_002  
' 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 InceptionResNetV2
process_input

from keras.losses import binary_crossentropy

from keras.layers import Input, Dense, Activation, BatchNormalization,
    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 = 10  
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) (None, 149, 149, 32) 864 ir [0][0] =====
=====
===== batch_normalization_1 (BatchNor (None, 149, 149, 32) 96 cc [0][0] =====
=====
===== activation_1 (Activation) (None, 149, 149, 32) 0 bε malization_1[0][0] =====
=====
===== conv2d_2 (Conv2D) (None, 147, 147, 32) 9216 ac n_1[0][0] =====
=====
===== batch_normalization_2 (BatchNor (None, 147, 147, 32) 96 cc [0][0] =====
=====
===== activation_2 (Activation) (None, 147, 147, 32) 0 bε malization_2[0][0] =====
=====
===== conv2d_3 (Conv2D) (None, 147, 147, 64) 18432 ac n_2[0][0] =====
=====
===== batch_normalization_3 (BatchNor (None, 147, 147, 64) 192 cc [0][0] =====
=====
===== activation_3 (Activation) (None, 147, 147, 64) 0 bε malization_3[0][0] =====
=====
===== max_pooling2d_1 (MaxPooling2D) (None, 73, 73, 64) 0 ac n_3[0][0] =====
=====
===== conv2d_4 (Conv2D) (None, 73, 73, 80) 5120 mε ng2d_1[0][0] =====
=====
===== batch_normalization_4 (BatchNor (None, 73, 73, 80) 240 cc [0][0] =====
=====
===== activation_4 (Activation) (None, 73, 73, 80) 0 bε malization_4[0][0] =====
=====
===== conv2d_5 (Conv2D) (None, 71, 71, 192) 138240 ac n_4[0][0] =====
=====
===== batch_normalization_5 (BatchNor (None, 71, 71, 192) 576 cc [0][0] =====
=====
===== activation_5 (Activation) (None, 71, 71, 192) 0 bε malization_5[0][0] =====
```

activation_5 (Activation)	(None, 71, 71, 192)	0	be
batch_normalization_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	(None, 35, 35, 96)	288	cc
[0][0]			

batch_normalization_8 (BatchNor	(None, 35, 35, 64)	192	cc
[0][0]			
batch_normalization_11 (BatchNo	(None, 35, 35, 96)	288	cc
[0][0]			
batch_normalization_12 (BatchNo	(None, 35, 35, 64)	192	cc
[0][0]			
activation_6 (Activation)	(None, 35, 35, 96)	0	be
malization_6[0][0]			
activation_8 (Activation)	(None, 35, 35, 64)	0	be
malization_8[0][0]			
activation_11 (Activation)	(None, 35, 35, 96)	0	be
malization_11[0][0]			
activation_12 (Activation)	(None, 35, 35, 64)	0	be
malization_12[0][0]			
mixed_5b (Concatenate)	(None, 35, 35, 320)	0	ac
n_6[0][0]			ac
n_8[0][0]			ac
n_11[0][0]			ac
n_12[0][0]			ac
conv2d_16 (Conv2D)	(None, 35, 35, 32)	10240	mi
[0][0]			
batch_normalization_16 (BatchNo	(None, 35, 35, 32)	96	cc
[0][0]			
activation_16 (Activation)	(None, 35, 35, 32)	0	be
malization_16[0][0]			
conv2d_14 (Conv2D)	(None, 35, 35, 32)	10240	mi
[0][0]			
conv2d_17 (Conv2D)	(None, 35, 35, 48)	13824	ac
n_16[0][0]			
batch_normalization_14 (BatchNo	(None, 35, 35, 32)	96	cc
[0][0]			
batch_normalization_17 (BatchNo	(None, 35, 35, 48)	144	cc
[0][0]			

activation_14 (Activation)	(None, 35, 35, 32)	0	bε
mализация_14[0][0]			
-----	-----	-----	-----
activation_17 (Activation)	(None, 35, 35, 48)	0	bε
мализация_17[0][0]			
-----	-----	-----	-----
conv2d_13 (Conv2D)	(None, 35, 35, 32)	10240	mi
[0][0]			
-----	-----	-----	-----
conv2d_15 (Conv2D)	(None, 35, 35, 32)	9216	ac
n_14[0][0]			
-----	-----	-----	-----
conv2d_18 (Conv2D)	(None, 35, 35, 64)	27648	ac
n_17[0][0]			
-----	-----	-----	-----
batch_normalization_13 (BatchNo	(None, 35, 35, 32)	96	cc
[0][0]			
-----	-----	-----	-----
batch_normalization_15 (BatchNo	(None, 35, 35, 32)	96	cc
[0][0]			
-----	-----	-----	-----
batch_normalization_18 (BatchNo	(None, 35, 35, 64)	192	cc
[0][0]			
-----	-----	-----	-----
activation_13 (Activation)	(None, 35, 35, 32)	0	bε
мализация_13[0][0]			
-----	-----	-----	-----
activation_15 (Activation)	(None, 35, 35, 32)	0	bε
мализация_15[0][0]			
-----	-----	-----	-----
activation_18 (Activation)	(None, 35, 35, 64)	0	bε
мализация_18[0][0]			
-----	-----	-----	-----
block35_1_mixed (Concatenate)	(None, 35, 35, 128)	0	ac
n_13[0][0]			
-----	-----	-----	-----
n_15[0][0]			ac
-----	-----	-----	-----
n_18[0][0]			ac
-----	-----	-----	-----
block35_1_conv (Conv2D)	(None, 35, 35, 320)	41280	b1
_mixed[0][0]			
-----	-----	-----	-----
block35_1 (Lambda)	(None, 35, 35, 320)	0	mi
[0][0]			
-----	-----	-----	-----
_conv[0][0]			b1
-----	-----	-----	-----
block35_1_ac (Activation)	(None, 35, 35, 320)	0	b1
[0][0]			
-----	-----	-----	-----

conv2d_22 (Conv2D) _ac[0][0]	(None, 35, 35, 32)	10240	b1
batch_normalization_22 (BatchNo [0][0]	(None, 35, 35, 32)	96	cc
activation_22 (Activation) malization_22[0][0]	(None, 35, 35, 32)	0	be
conv2d_20 (Conv2D) _ac[0][0]	(None, 35, 35, 32)	10240	b1
conv2d_23 (Conv2D) n_22[0][0]	(None, 35, 35, 48)	13824	ac
batch_normalization_20 (BatchNo [0][0]	(None, 35, 35, 32)	96	cc
batch_normalization_23 (BatchNo [0][0]	(None, 35, 35, 48)	144	cc
activation_20 (Activation) malization_20[0][0]	(None, 35, 35, 32)	0	be
activation_23 (Activation) malization_23[0][0]	(None, 35, 35, 48)	0	be
conv2d_19 (Conv2D) _ac[0][0]	(None, 35, 35, 32)	10240	b1
conv2d_21 (Conv2D) n_20[0][0]	(None, 35, 35, 32)	9216	ac
conv2d_24 (Conv2D) n_23[0][0]	(None, 35, 35, 64)	27648	ac
batch_normalization_19 (BatchNo [0][0]	(None, 35, 35, 32)	96	cc
batch_normalization_21 (BatchNo [0][0]	(None, 35, 35, 32)	96	cc
batch_normalization_24 (BatchNo [0][0]	(None, 35, 35, 64)	192	cc
activation_19 (Activation) malization_19[0][0]	(None, 35, 35, 32)	0	be
activation_21 (Activation) malization_21[0][0]	(None, 35, 35, 32)	0	be

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]

block35_2_conv (Conv2D) (None, 35, 35, 320) 41280 bl
_mixed[0][0]

block35_2_lambda (Lambda) (None, 35, 35, 320) 0 bl
_ac[0][0]
bl
_conv[0][0]

block35_2_activation (Activation) (None, 35, 35, 320) 0 bl
[0][0]

conv2d_28 (Conv2D) (None, 35, 35, 32) 10240 bl
_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 bl
_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) (None, 35, 35, 32) 10240 bl
_ac[0][0]

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	bl
block35_3 (Lambda) _ac[0][0]	(None, 35, 35, 320)	0	bl
_conv[0][0]			bl
block35_3_ac (Activation) [0][0]	(None, 35, 35, 320)	0	bl
conv2d_34 (Conv2D) _ac[0][0]	(None, 35, 35, 32)	10240	bl
batch_normalization_34 (BatchNo [0][0]	(None, 35, 35, 32)	96	cc
activation_34 (Activation) malization_34[0][0]	(None, 35, 35, 32)	0	be

conv2d_32 (Conv2D) _ac[0][0]	(None, 35, 35, 32)	10240	b1
conv2d_35 (Conv2D) n_34[0][0]	(None, 35, 35, 48)	13824	ac
batch_normalization_32 (BatchNo [0][0]	(None, 35, 35, 32)	96	cc
batch_normalization_35 (BatchNo [0][0]	(None, 35, 35, 48)	144	cc
activation_32 (Activation) malization_32[0][0]	(None, 35, 35, 32)	0	bε
activation_35 (Activation) malization_35[0][0]	(None, 35, 35, 48)	0	bε
conv2d_31 (Conv2D) _ac[0][0]	(None, 35, 35, 32)	10240	b1
conv2d_33 (Conv2D) n_32[0][0]	(None, 35, 35, 32)	9216	ac
conv2d_36 (Conv2D) n_35[0][0]	(None, 35, 35, 64)	27648	ac
batch_normalization_31 (BatchNo [0][0]	(None, 35, 35, 32)	96	cc
batch_normalization_33 (BatchNo [0][0]	(None, 35, 35, 32)	96	cc
batch_normalization_36 (BatchNo [0][0]	(None, 35, 35, 64)	192	cc
activation_31 (Activation) malization_31[0][0]	(None, 35, 35, 32)	0	bε
activation_33 (Activation) malization_33[0][0]	(None, 35, 35, 32)	0	bε
activation_36 (Activation) malization_36[0][0]	(None, 35, 35, 64)	0	bε
block35_4_mixed (Concatenate) n_31[0][0]	(None, 35, 35, 128)	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]

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 (BatchNo (None, 35, 35, 32) 96 cc
[0][0]

[0][0]

batch_normalization_39 (BatchNo (None, 35, 35, 32) 96 cc
[0][0]

batch_normalization_42 (BatchNo (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 (Lambda) (None, 35, 35, 320) 0 bl
_ac[0][0]

block35_5_conv (Conv2D) (None, 35, 35, 320) 0 bl
_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 (BatchNo (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 (BatchNo (None, 35, 35, 32) 96 cc
[0][0]

batch_normalization_47 (BatchNorm (None, 35, 35, 48) 144 cc
[0][0]

activation_44 (Activation) (None, 35, 35, 32) 0 bε
malization_44[0][0]

activation_47 (Activation) (None, 35, 35, 48) 0 bε
malization_47[0][0]

conv2d_43 (Conv2D) (None, 35, 35, 32) 10240 bl
_ac[0][0]

conv2d_45 (Conv2D) (None, 35, 35, 32) 9216 ac
n_44[0][0]

conv2d_48 (Conv2D) (None, 35, 35, 64) 27648 ac
n_47[0][0]

batch_normalization_43 (BatchNorm (None, 35, 35, 32) 96 cc
[0][0]

batch_normalization_45 (BatchNorm (None, 35, 35, 32) 96 cc
[0][0]

batch_normalization_48 (BatchNorm (None, 35, 35, 64) 192 cc
[0][0]

activation_43 (Activation) (None, 35, 35, 32) 0 bε
malization_43[0][0]

activation_45 (Activation) (None, 35, 35, 32) 0 bε
malization_45[0][0]

activation_48 (Activation) (None, 35, 35, 64) 0 bε
malization_48[0][0]

block35_6_mixed (Concatenate) (None, 35, 35, 128) 0 ac
n_43[0][0]

n_45[0][0] ac
n_48[0][0] ac

block35_6_conv (Conv2D) (None, 35, 35, 320) 41280 bl
_mixed[0][0]

block35_6 (Lambda) (None, 35, 35, 320) 0 bl
_ac[0][0]

_conv[0][0] bl

block35_6_ac (Activation) [0][0]	(None, 35, 35, 32)	0	b1
conv2d_52 (Conv2D) _ac[0][0]	(None, 35, 35, 32)	10240	b1
batch_normalization_52 (BatchNo [0][0]	(None, 35, 35, 32)	96	cc
activation_52 (Activation) malization_52[0][0]	(None, 35, 35, 32)	0	ba
conv2d_50 (Conv2D) _ac[0][0]	(None, 35, 35, 32)	10240	b1
conv2d_53 (Conv2D) n_52[0][0]	(None, 35, 35, 48)	13824	ac
batch_normalization_50 (BatchNo [0][0]	(None, 35, 35, 32)	96	cc
batch_normalization_53 (BatchNo [0][0]	(None, 35, 35, 48)	144	cc
activation_50 (Activation) malization_50[0][0]	(None, 35, 35, 32)	0	ba
activation_53 (Activation) malization_53[0][0]	(None, 35, 35, 48)	0	ba
conv2d_49 (Conv2D) _ac[0][0]	(None, 35, 35, 32)	10240	b1
conv2d_51 (Conv2D) n_50[0][0]	(None, 35, 35, 32)	9216	ac
conv2d_54 (Conv2D) n_53[0][0]	(None, 35, 35, 64)	27648	ac
batch_normalization_49 (BatchNo [0][0]	(None, 35, 35, 32)	96	cc
batch_normalization_51 (BatchNo [0][0]	(None, 35, 35, 32)	96	cc
batch_normalization_54 (BatchNo [0][0]	(None, 35, 35, 64)	192	cc
activation_49 (Activation) [0][0]	(None, 35, 35, 32)	0	ba

```
activation_49 (Activation)      (None, 35, 35, 32)  0      be  
malization_49[0][0]  
  
activation_51 (Activation)      (None, 35, 35, 32)  0      be  
malization_51[0][0]  
  
activation_54 (Activation)      (None, 35, 35, 64)  0      be  
malization_54[0][0]  
  
block35_7_mixed (Concatenate)  (None, 35, 35, 128)  0      ac  
n_49[0][0]  
n_51[0][0]  
n_54[0][0]  
  
block35_7_conv (Conv2D)        (None, 35, 35, 320)  41280    bl  
_mixed[0][0]  
  
block35_7_lambda (Lambda)      (None, 35, 35, 320)  0      bl  
_ac[0][0]  
_conv[0][0]  
  
block35_7_activation (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      be  
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      be  
malization_56[0][0]  
  
activation_59 (Activation)      (None, 35, 35, 48)  0      be
```

malization_59[0][0]

conv2d_55 (Conv2D) (None, 35, 35, 32) 10240 b1
_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 ba
malization_55[0][0]

activation_57 (Activation) (None, 35, 35, 32) 0 ba
malization_57[0][0]

activation_60 (Activation) (None, 35, 35, 64) 0 ba
malization_60[0][0]

block35_8_mixed (Concatenate) (None, 35, 35, 128) 0 ac
n_55[0][0]

n_57[0][0]

n_60[0][0]

block35_8_conv (Conv2D) (None, 35, 35, 320) 41280 b1
_mixed[0][0]

block35_8 (Lambda) (None, 35, 35, 320) 0 b1
_ac[0][0]

_conv[0][0]

block35_8_ac (Activation) (None, 35, 35, 320) 0 b1
[0][0]

conv2d_64 (Conv2D) (None, 35, 35, 32) 10240 b1
_ac[0][0]

batch_normalization_64 (BatchNo (None, 35, 35, 32) 96 cc
[0][0]

[0][0]					
activation_64 (Activation)	(None, 35, 35, 32)	0	bε		
malization_64[0][0]					
conv2d_62 (Conv2D)	(None, 35, 35, 32)	10240	b1		
_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	bε		
malization_62[0][0]					
activation_65 (Activation)	(None, 35, 35, 48)	0	bε		
malization_65[0][0]					
conv2d_61 (Conv2D)	(None, 35, 35, 32)	10240	b1		
_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	bε		
malization_61[0][0]					
activation_63 (Activation)	(None, 35, 35, 32)	0	bε		
malization_63[0][0]					
activation_66 (Activation)	(None, 35, 35, 64)	0	bε		
malization_66[0][0]					

```
    block35_9_mixed (Concatenate)  (None, 35, 35, 128)  0          ac
      n_61[0][0]
      ac
      n_63[0][0]
      ac
      n_66[0][0]
      -----
      -----
      block35_9_conv (Conv2D)        (None, 35, 35, 320)  41280     bl
      _mixed[0][0]
      -----
      -----
      block35_9 (Lambda)           (None, 35, 35, 320)  0          bl
      _ac[0][0]
      bl
      _conv[0][0]
      -----
      -----
      block35_9_ac (Activation)    (None, 35, 35, 320)  0          bl
      [0][0]
      -----
      -----
      conv2d_70 (Conv2D)           (None, 35, 35, 32)   10240     bl
      _ac[0][0]
      -----
      -----
      batch_normalization_70 (BatchNo (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 (BatchNo (None, 35, 35, 32)  96         cc
      [0][0]
      -----
      -----
      batch_normalization_71 (BatchNo (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
      n_68[0][0]
      -----
```

conv2d_72 (Conv2D) n_71[0][0]	(None, 35, 35, 64)	27648	ac
batch_normalization_67 (BatchNo [0][0]	(None, 35, 35, 32)	96	cc
batch_normalization_69 (BatchNo [0][0]	(None, 35, 35, 32)	96	cc
batch_normalization_72 (BatchNo [0][0]	(None, 35, 35, 64)	192	cc
activation_67 (Activation) malization_67[0][0]	(None, 35, 35, 32)	0	be
activation_69 (Activation) malization_69[0][0]	(None, 35, 35, 32)	0	be
activation_72 (Activation) malization_72[0][0]	(None, 35, 35, 64)	0	be
block35_10_mixed (Concatenate) n_67[0][0]	(None, 35, 35, 128)	0	ac
n_69[0][0]			ac
n_72[0][0]			ac
block35_10_conv (Conv2D) 0_mixed[0][0]	(None, 35, 35, 320)	41280	bl
block35_10_lambda _ac[0][0]	(None, 35, 35, 320)	0	bl
0_conv[0][0]			bl
block35_10_ac (Activation) 0[0][0]	(None, 35, 35, 320)	0	bl
conv2d_74 (Conv2D) 0_ac[0][0]	(None, 35, 35, 256)	81920	bl
batch_normalization_74 (BatchNo [0][0]	(None, 35, 35, 256)	768	cc
activation_74 (Activation) malization_74[0][0]	(None, 35, 35, 256)	0	be
conv2d_75 (Conv2D) n_74[0][0]	(None, 35, 35, 256)	589824	ac
batch_normalization_75 (BatchNo [0][0]	(None, 35, 35, 256)	768	cc

batch_normalization_73 (BatchNorm (None, 35, 35, 256) 700
[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]

ac
n_76[0][0]

mε
ng2d_3[0][0]

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 bε
malization_79[0][0]

conv2d_77 (Conv2D) [0][0]	(None, 17, 17, 192)	208896	mi
conv2d_80 (Conv2D) n_79[0][0]	(None, 17, 17, 192)	215040	ac
batch_normalization_77 (BatchNo [0][0]	(None, 17, 17, 192)	576	cc
batch_normalization_80 (BatchNo [0][0]	(None, 17, 17, 192)	576	cc
activation_77 (Activation) malization_77[0][0]	(None, 17, 17, 192)	0	be
activation_80 (Activation) malization_80[0][0]	(None, 17, 17, 192)	0	be
block17_1_mixed (Concatenate) n_77[0][0]	(None, 17, 17, 384)	0	ac
n_80[0][0]			ac
block17_1_conv (Conv2D) _mixed[0][0]	(None, 17, 17, 1088)	418880	bl
block17_1 (Lambda) [0][0]	(None, 17, 17, 1088)	0	mi
_conv[0][0]			bl
block17_1_ac (Activation) [0][0]	(None, 17, 17, 1088)	0	bl
conv2d_82 (Conv2D) _ac[0][0]	(None, 17, 17, 128)	139264	bl
batch_normalization_82 (BatchNo [0][0]	(None, 17, 17, 128)	384	cc
activation_82 (Activation) malization_82[0][0]	(None, 17, 17, 128)	0	be
conv2d_83 (Conv2D) n_82[0][0]	(None, 17, 17, 160)	143360	ac
batch_normalization_83 (BatchNo [0][0]	(None, 17, 17, 160)	480	cc
activation_83 (Activation) _li[0][0]	(None, 17, 17, 160)	0	be

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 be
malization_81[0][0]

activation_84 (Activation) (None, 17, 17, 192) 0 be
malization_84[0][0]

block17_2_mixed (Concatenate) (None, 17, 17, 384) 0 ac
n_81[0][0]

ac
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]

bl
_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 be
malization_86[0][0]

conv2d_87 (Conv2D) (None, 17, 17, 160) 143360 ac
n_86[0][0]

batch_normalization_87 (BatchNo (None, 17, 17, 160) 480 cc
[0][0]

activation_87 (Activation)	(None, 17, 17, 160)	0	b@
batch_normalization_87[0][0]			
conv2d_85 (Conv2D)	(None, 17, 17, 192)	208896	b1
_ac[0][0]			
conv2d_88 (Conv2D)	(None, 17, 17, 192)	215040	ac
n_87[0][0]			
batch_normalization_85 (BatchNo)	(None, 17, 17, 192)	576	cc
[0][0]			
batch_normalization_88 (BatchNo)	(None, 17, 17, 192)	576	cc
[0][0]			
activation_85 (Activation)	(None, 17, 17, 192)	0	b@
batch_normalization_85[0][0]			
activation_88 (Activation)	(None, 17, 17, 192)	0	b@
batch_normalization_88[0][0]			
block17_3_mixed (Concatenate)	(None, 17, 17, 384)	0	ac
n_85[0][0]			
n_88[0][0]			ac
block17_3_conv (Conv2D)	(None, 17, 17, 1088)	418880	b1
_mixed[0][0]			
block17_3 (Lambda)	(None, 17, 17, 1088)	0	b1
_ac[0][0]			
_conv[0][0]			b1
block17_3_ac (Activation)	(None, 17, 17, 1088)	0	b1
[0][0]			
conv2d_90 (Conv2D)	(None, 17, 17, 128)	139264	b1
_ac[0][0]			
batch_normalization_90 (BatchNo)	(None, 17, 17, 128)	384	cc
[0][0]			
activation_90 (Activation)	(None, 17, 17, 128)	0	b@
batch_normalization_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 (BatchNo (None, 17, 17, 160) 480 cc

batch_normalization_93 (BatchNo (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 (BatchNo (None, 17, 17, 192) 576 cc
[0][0]

batch_normalization_96 (BatchNo (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]

ac
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]

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

activation_98 (Activation) (None, 17, 17, 128) 0 bε
malization_98[0][0]

conv2d_99 (Conv2D) (None, 17, 17, 160) 143360 ac
n_98[0][0]

batch_normalization_99 (BatchNo (None, 17, 17, 160) 480 cc
[0][0]

activation_99 (Activation) (None, 17, 17, 160) 0 bε
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 (BatchN (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 bε
malization_97[0][0]

activation_100 (Activation) (None, 17, 17, 192) 0 bε
malization_100[0][0]

block17_6_mixed (Concatenate) (None, 17, 17, 384) 0 ac
n_97[0][0]

n_100[0][0]

block17_6_conv (Conv2D) (None, 17, 17, 1088) 418880 bl
_mixed[0][0]

block17_6 (Lambda) (None, 17, 17, 1088) 0 bl
_ac[0][0]

bl
_conv[0][0]

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 bε
malization_102[0][0]

conv2d_103 (Conv2D) (None, 17, 17, 160) 143360 ac
_ac[0][0]

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] ac

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] bl

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 bε
malization_106[0][0]

conv2d_107 (Conv2D) n_106[0][0]	(None, 17, 17, 160)	143360	ac
batch_normalization_107 (BatchN 7[0][0]	(None, 17, 17, 160)	480	cc
activation_107 (Activation) malization_107[0][0]	(None, 17, 17, 160)	0	be
conv2d_105 (Conv2D) _ac[0][0]	(None, 17, 17, 192)	208896	bl
conv2d_108 (Conv2D) n_107[0][0]	(None, 17, 17, 192)	215040	ac
batch_normalization_105 (BatchN 5[0][0]	(None, 17, 17, 192)	576	cc
batch_normalization_108 (BatchN 8[0][0]	(None, 17, 17, 192)	576	cc
activation_105 (Activation) malization_105[0][0]	(None, 17, 17, 192)	0	be
activation_108 (Activation) malization_108[0][0]	(None, 17, 17, 192)	0	be
block17_8_mixed (Concatenate) n_105[0][0]	(None, 17, 17, 384)	0	ac
n_108[0][0]			ac
block17_8_conv (Conv2D) _mixed[0][0]	(None, 17, 17, 1088)	418880	bl
block17_8 (Lambda) _ac[0][0]	(None, 17, 17, 1088)	0	bl
_conv[0][0]			bl
block17_8_ac (Activation) [0][0]	(None, 17, 17, 1088)	0	bl
conv2d_110 (Conv2D) _ac[0][0]	(None, 17, 17, 128)	139264	bl
batch_normalization_110 (BatchN 0[0][0]	(None, 17, 17, 128)	384	cc
activation_110 (Activation) malization_110[0][0]	(None, 17, 17, 128)	0	be

conv2d_111 (Conv2D) n_110[0][0]	(None, 17, 17, 160)	143360	ac
batch_normalization_111 (BatchN 1[0][0]	(None, 17, 17, 160)	480	cc
activation_111 (Activation) malization_111[0][0]	(None, 17, 17, 160)	0	bε
conv2d_109 (Conv2D) _ac[0][0]	(None, 17, 17, 192)	208896	bl
conv2d_112 (Conv2D) n_111[0][0]	(None, 17, 17, 192)	215040	ac
batch_normalization_109 (BatchN 9[0][0]	(None, 17, 17, 192)	576	cc
batch_normalization_112 (BatchN 2[0][0]	(None, 17, 17, 192)	576	cc
activation_109 (Activation) malization_109[0][0]	(None, 17, 17, 192)	0	bε
activation_112 (Activation) malization_112[0][0]	(None, 17, 17, 192)	0	bε
block17_9_mixed (Concatenate) n_109[0][0]	(None, 17, 17, 384)	0	ac
n_112[0][0]			ac
block17_9_conv (Conv2D) _mixed[0][0]	(None, 17, 17, 1088)	418880	bl
block17_9 (Lambda) _ac[0][0]	(None, 17, 17, 1088)	0	bl
_conv[0][0]			bl
block17_9_ac (Activation) [0][0]	(None, 17, 17, 1088)	0	bl
conv2d_114 (Conv2D) _ac[0][0]	(None, 17, 17, 128)	139264	bl
batch_normalization_114 (BatchN 4[0][0]	(None, 17, 17, 128)	384	cc
activation_114 (Activation)	(None, 17, 17, 128)	0	bc

```
activation_114 (Activation)      (None, 17, 17, 128)  0          bc
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          b@  
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          b@  
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          b@  
malization_117[0][0]  
  
activation_120 (Activation)      (None, 17, 17, 192)  0          b@  
malization_120[0][0]  
  
block17_11_mixed (Concatenate) (None, 17, 17, 384)  0          ac  
n_117[0][0]  
ac  
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  
111
```

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] ac

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]

bl
2_conv[0][0]

block17_12_ac (Activation) (None, 17, 17, 1088) 0 bl
2[0][0]

conv2d_126 (Conv2D) (None, 17, 17, 128) 139264 bl
2_ac[0][0]

batch_normalization_126 (BatchN (None, 17, 17, 128) 384 cc
6[0][0]

activation_126 (Activation) (None, 17, 17, 128) 0 bε
malization_126[0][0]

conv2d_127 (Conv2D) (None, 17, 17, 160) 143360 ac
n_126[0][0]

batch_normalization_127 (BatchN (None, 17, 17, 160) 480 cc
7[0][0]

activation_127 (Activation) (None, 17, 17, 160) 0 bε
malization_127[0][0]

conv2d_125 (Conv2D) (None, 17, 17, 192) 208896 bl
2_ac[0][0]

conv2d_128 (Conv2D) (None, 17, 17, 192) 215040 ac
n_127[0][0]

batch_normalization_125 (BatchN (None, 17, 17, 192) 576 cc
5[0][0]

batch_normalization_128 (BatchN (None, 17, 17, 192) 576 cc
8[0][0]

activation_125 (Activation) (None, 17, 17, 192) 0 bε
malization_125[0][0]

activation_128 (Activation) (None, 17, 17, 192) 0 bε
malization_128[0][0]

block17_13_mixed (Concatenate) (None, 17, 17, 384) 0 ac
n_125[0][0]

n_128[0][0] ac

block17_13_conv (Conv2D) (None, 17, 17, 1088) 418880 bl
3_mixed[0][0]

block17_13 (Lambda) (None, 17, 17, 1088) 0 bl
2_ac[0][0]

b1
3_conv[0][0]

block17_13_ac (Activation) (None, 17, 17, 1088) 0 bl
3[0][0]

conv2d_130 (Conv2D) (None, 17, 17, 128) 139264 bl
3_ac[0][0]

```
-----  
batch_normalization_130 (BatchN (None, 17, 17, 128) 384 cc  
0[0][0]  
-----  
activation_130 (Activation) (None, 17, 17, 128) 0 bε  
malization_130[0][0]  
-----  
conv2d_131 (Conv2D) (None, 17, 17, 160) 143360 ac  
n_130[0][0]  
-----  
batch_normalization_131 (BatchN (None, 17, 17, 160) 480 cc  
1[0][0]  
-----  
activation_131 (Activation) (None, 17, 17, 160) 0 bε  
malization_131[0][0]  
-----  
conv2d_129 (Conv2D) (None, 17, 17, 192) 208896 bl  
3_ac[0][0]  
-----  
conv2d_132 (Conv2D) (None, 17, 17, 192) 215040 ac  
n_131[0][0]  
-----  
batch_normalization_129 (BatchN (None, 17, 17, 192) 576 cc  
9[0][0]  
-----  
batch_normalization_132 (BatchN (None, 17, 17, 192) 576 cc  
2[0][0]  
-----  
activation_129 (Activation) (None, 17, 17, 192) 0 bε  
malization_129[0][0]  
-----  
activation_132 (Activation) (None, 17, 17, 192) 0 bε  
malization_132[0][0]  
-----  
block17_14_mixed (Concatenate) (None, 17, 17, 384) 0 ac  
n_129[0][0]  
-----  
n_132[0][0]  
-----  
block17_14_conv (Conv2D) (None, 17, 17, 1088) 418880 bl  
4_mixed[0][0]  
-----  
block17_14 (Lambda) (None, 17, 17, 1088) 0 bl  
3_ac[0][0]  
-----  
4_conv[0][0]  
-----  
block17_14_ac (Activation) (None, 17, 17, 1088) 0 bl  
4[0][0]  
-----  
copy2d_124 (Copy2D) (None, 17, 17, 128) 120264 bl
```

conv2d_134 (Conv2D)	(None, 17, 17, 128)	139264	b1
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	b1
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	b1
5_mixed[0][0]			
block17_15 (Lambda)	(None, 17, 17, 1088)	0	b1
4_ac[0][0]			
5_conv[0][0]			b1
block17_15_ac (Activation)	(None, 17, 17, 1088)	0	b1
5[0][0]			

conv2d_138 (Conv2D) 5_ac[0][0]	(None, 17, 17, 128)	139264	b1
batch_normalization_138 (BatchN) 8[0][0]	(None, 17, 17, 128)	384	cc
activation_138 (Activation) malization_138[0][0]	(None, 17, 17, 128)	0	be
conv2d_139 (Conv2D) n_138[0][0]	(None, 17, 17, 160)	143360	ac
batch_normalization_139 (BatchN) 9[0][0]	(None, 17, 17, 160)	480	cc
activation_139 (Activation) malization_139[0][0]	(None, 17, 17, 160)	0	be
conv2d_137 (Conv2D) 5_ac[0][0]	(None, 17, 17, 192)	208896	b1
conv2d_140 (Conv2D) n_139[0][0]	(None, 17, 17, 192)	215040	ac
batch_normalization_137 (BatchN) 7[0][0]	(None, 17, 17, 192)	576	cc
batch_normalization_140 (BatchN) 0[0][0]	(None, 17, 17, 192)	576	cc
activation_137 (Activation) malization_137[0][0]	(None, 17, 17, 192)	0	be
activation_140 (Activation) malization_140[0][0]	(None, 17, 17, 192)	0	be
block17_16_mixed (Concatenate) n_137[0][0]	(None, 17, 17, 384)	0	ac
n_140[0][0]			ac
block17_16_conv (Conv2D) 6_mixed[0][0]	(None, 17, 17, 1088)	418880	b1
block17_16 (Lambda) 5_ac[0][0]	(None, 17, 17, 1088)	0	b1
6_conv[0][0]			b1
block17_16_ac (Activation)	(None, 17, 17, 1088)	0	b1

6[0][0]

conv2d_142 (Conv2D) (None, 17, 17, 128) 139264 bl
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 be
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 be
malization_143[0][0]

conv2d_141 (Conv2D) (None, 17, 17, 192) 208896 bl
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 be
malization_141[0][0]

activation_144 (Activation) (None, 17, 17, 192) 0 be
malization_144[0][0]

block17_17_mixed (Concatenate) (None, 17, 17, 384) 0 ac
n_141[0][0]

n_144[0][0] ac

block17_17_conv (Conv2D) (None, 17, 17, 1088) 418880 bl
7_mixed[0][0]

block17_17 (Lambda) (None, 17, 17, 1088) 0 bl
6_ac[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	be
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	be
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	be
malization_145[0][0]		
activation_148 (Activation)	(None, 17, 17, 192) 0	be
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
7_ac[0][0]		
b1		
8_conv[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          b@  
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          b@  
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          b@  
malization_149[0][0]  
-----  
activation_152 (Activation)    (None, 17, 17, 192) 0          b@  
malization_152[0][0]  
-----  
block17_19_mixed (Concatenate) (None, 17, 17, 384) 0          ac  
n_149[0][0]  
-----  
n_152[0][0]  
-----  
activation_152 (Activation)    (None, 17, 17, 192) 0          b@  
malization_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 b1
9[0][0]

conv2d_154 (Conv2D) (None, 17, 17, 128) 139264 b1
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 b1
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]

n_156[0][0]

block17_20_conv (Conv2D) (None, 17, 17, 1088) 418880 b1
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 bl
0[0][0]

conv2d_161 (Conv2D) (None, 17, 17, 256) 278528 bl
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 be
malization_161[0][0]

conv2d_157 (Conv2D) (None, 17, 17, 256) 278528 bl
0_ac[0][0]

conv2d_159 (Conv2D) (None, 17, 17, 256) 278528 bl
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 be
malization_157[0][0]

activation_159 (Activation) (None, 17, 17, 256) 0 be
malization_159[0][0]

activation_162 (Activation) (None, 17, 17, 288) 0 be
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) (None, 8, 8, 320) 829440 ac

n_162[0][0]

batch_normalization_158 (BatchN (None, 8, 8, 384) 1152 cc
8[0][0]

batch_normalization_160 (BatchN (None, 8, 8, 288) 864 cc
0[0][0]

batch_normalization_163 (BatchN (None, 8, 8, 320) 960 cc
3[0][0]

activation_158 (Activation) (None, 8, 8, 384) 0 be
malization_158[0][0]

activation_160 (Activation) (None, 8, 8, 288) 0 be
malization_160[0][0]

activation_163 (Activation) (None, 8, 8, 320) 0 be
malization_163[0][0]

max_pooling2d_4 (MaxPooling2D) (None, 8, 8, 1088) 0 bl
0_ac[0][0]

mixed_7a (Concatenate) (None, 8, 8, 2080) 0 ac
n_158[0][0]

n_160[0][0] ac
n_163[0][0] me
ng2d_4[0][0]

conv2d_165 (Conv2D) (None, 8, 8, 192) 399360 mi
[0][0]

batch_normalization_165 (BatchN (None, 8, 8, 192) 576 cc
5[0][0]

activation_165 (Activation) (None, 8, 8, 192) 0 be
malization_165[0][0]

conv2d_166 (Conv2D) (None, 8, 8, 224) 129024 ac
n_165[0][0]

batch_normalization_166 (BatchN (None, 8, 8, 224) 672 cc
6[0][0]

activation_166 (Activation) (None, 8, 8, 224) 0 be
malization_166[0][0]

conv2d_164 (Conv2D) (None, 8, 8, 192) 399360 mi
[0][0]

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) malization_170[0][0]	(None, 8, 8, 224)	0	be

conv2d_168 (Conv2D) ac[0][0]	(None, 8, 8, 192)	399360	b1
conv2d_171 (Conv2D) n_170[0][0]	(None, 8, 8, 256)	172032	ac
batch_normalization_168 (BatchN 8[0][0]	(None, 8, 8, 192)	576	cc
batch_normalization_171 (BatchN 1[0][0]	(None, 8, 8, 256)	768	cc
activation_168 (Activation) malization_168[0][0]	(None, 8, 8, 192)	0	ba
activation_171 (Activation) malization_171[0][0]	(None, 8, 8, 256)	0	ba
block8_2_mixed (Concatenate) n_168[0][0]	(None, 8, 8, 448)	0	ac
n_171[0][0]			ac
block8_2_conv (Conv2D) mixed[0][0]	(None, 8, 8, 2080)	933920	b1
block8_2 (Lambda) ac[0][0]	(None, 8, 8, 2080)	0	b1
conv[0][0]			b1
block8_2_ac (Activation) [0][0]	(None, 8, 8, 2080)	0	b1
conv2d_173 (Conv2D) ac[0][0]	(None, 8, 8, 192)	399360	b1
batch_normalization_173 (BatchN 3[0][0]	(None, 8, 8, 192)	576	cc
activation_173 (Activation) malization_173[0][0]	(None, 8, 8, 192)	0	ba
conv2d_174 (Conv2D) n_173[0][0]	(None, 8, 8, 224)	129024	ac
batch_normalization_174 (BatchN 4[0][0]	(None, 8, 8, 224)	672	cc
activation_174 (Activation) malization_174[0][0]	(None, 8, 8, 224)	0	ba

conv2d_172 (Conv2D) ac[0][0]	(None, 8, 8, 192)	399360	b1
conv2d_175 (Conv2D) n_174[0][0]	(None, 8, 8, 256)	172032	ac
batch_normalization_172 (BatchN 2[0][0]	(None, 8, 8, 192)	576	cc
batch_normalization_175 (BatchN 5[0][0]	(None, 8, 8, 256)	768	cc
activation_172 (Activation) malization_172[0][0]	(None, 8, 8, 192)	0	be
activation_175 (Activation) malization_175[0][0]	(None, 8, 8, 256)	0	be
block8_3_mixed (Concatenate) n_172[0][0]	(None, 8, 8, 448)	0	ac
n_175[0][0]			ac
block8_3_conv (Conv2D) mixed[0][0]	(None, 8, 8, 2080)	933920	b1
block8_3 (Lambda) ac[0][0]	(None, 8, 8, 2080)	0	b1
conv[0][0]			b1
block8_3_ac (Activation) [0][0]	(None, 8, 8, 2080)	0	b1
conv2d_177 (Conv2D) ac[0][0]	(None, 8, 8, 192)	399360	b1
batch_normalization_177 (BatchN 7[0][0]	(None, 8, 8, 192)	576	cc
activation_177 (Activation) malization_177[0][0]	(None, 8, 8, 192)	0	be
conv2d_178 (Conv2D) n_177[0][0]	(None, 8, 8, 224)	129024	ac
batch_normalization_178 (BatchN 8[0][0]	(None, 8, 8, 224)	672	cc
activation_178 (Activation) [0][0]	(None, 8, 8, 224)	0	be

```
        malization_178[0][0]
-----
conv2d_176 (Conv2D)           (None, 8, 8, 192) 399360 bl
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
n_179[0][0]
-----
block8_4_conv (Conv2D)        (None, 8, 8, 2080) 933920 bl
mixed[0][0]
-----
block8_4 (Lambda)             (None, 8, 8, 2080) 0 bl
ac[0][0]
bl
conv[0][0]
-----
block8_4_ac (Activation)     (None, 8, 8, 2080) 0 bl
[0][0]
-----
conv2d_181 (Conv2D)           (None, 8, 8, 192) 399360 bl
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	bε
malization_182[0][0]			
conv2d_180 (Conv2D)	(None, 8, 8, 192)	399360	bλ
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	bε
malization_180[0][0]			
activation_183 (Activation)	(None, 8, 8, 256)	0	bε
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	bλ
mixed[0][0]			
block8_5 (Lambda)	(None, 8, 8, 2080)	0	bλ
ac[0][0]			
conv[0][0]			bλ
block8_5_ac (Activation)	(None, 8, 8, 2080)	0	bλ
[0][0]			
conv2d_185 (Conv2D)	(None, 8, 8, 192)	399360	bλ
ac[0][0]			
batch_normalization_185 (BatchN	(None, 8, 8, 192)	576	cc
5[0][0]			
activation_185 (Activation)	(None, 8, 8, 192)	0	bε
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)	672	cc
6[0][0]			

activation_186 (Activation)	(None, 8, 8, 224)	0	b@
batch_normalization_186[0][0]			
conv2d_184 (Conv2D)	(None, 8, 8, 192)	399360	b@
ac[0][0]			
conv2d_187 (Conv2D)	(None, 8, 8, 256)	172032	ac
n_186[0][0]			
batch_normalization_184 (BatchN	(None, 8, 8, 192)	576	cc
4[0][0]			
batch_normalization_187 (BatchN	(None, 8, 8, 256)	768	cc
7[0][0]			
activation_184 (Activation)	(None, 8, 8, 192)	0	b@
batch_normalization_184[0][0]			
activation_187 (Activation)	(None, 8, 8, 256)	0	b@
batch_normalization_187[0][0]			
block8_6_mixed (Concatenate)	(None, 8, 8, 448)	0	ac
n_184[0][0]			
ac_187[0][0]			ac
block8_6_conv (Conv2D)	(None, 8, 8, 2080)	933920	b@
mixed[0][0]			
block8_6 (Lambda)	(None, 8, 8, 2080)	0	b@
ac[0][0]			
conv[0][0]			b@
block8_6_ac (Activation)	(None, 8, 8, 2080)	0	b@
[0][0]			
conv2d_189 (Conv2D)	(None, 8, 8, 192)	399360	b@
ac[0][0]			
batch_normalization_189 (BatchN	(None, 8, 8, 192)	576	cc
9[0][0]			
activation_189 (Activation)	(None, 8, 8, 192)	0	b@
batch_normalization_189[0][0]			
conv2d_190 (Conv2D)	(None, 8, 8, 224)	129024	ac
n_189[0][0]			

batch_normalization_190 (BatchN (None, 8, 8, 224) 672 cc
0[0][0]

activation_190 (Activation) (None, 8, 8, 224) 0 bε
malization_190[0][0]

conv2d_188 (Conv2D) (None, 8, 8, 192) 399360 bl
ac[0][0]

conv2d_191 (Conv2D) (None, 8, 8, 256) 172032 ac
n_190[0][0]

batch_normalization_188 (BatchN (None, 8, 8, 192) 576 cc
8[0][0]

batch_normalization_191 (BatchN (None, 8, 8, 256) 768 cc
1[0][0]

activation_188 (Activation) (None, 8, 8, 192) 0 bε
malization_188[0][0]

activation_191 (Activation) (None, 8, 8, 256) 0 bε
malization_191[0][0]

block8_7_mixed (Concatenate) (None, 8, 8, 448) 0 ac
n_188[0][0]

ac
n_191[0][0]

block8_7_conv (Conv2D) (None, 8, 8, 2080) 933920 bl
mixed[0][0]

block8_7 (Lambda) (None, 8, 8, 2080) 0 bl
ac[0][0]

bl
conv[0][0]

block8_7_ac (Activation) (None, 8, 8, 2080) 0 bl
[0][0]

conv2d_193 (Conv2D) (None, 8, 8, 192) 399360 bl
ac[0][0]

batch_normalization_193 (BatchN (None, 8, 8, 192) 576 cc
3[0][0]

activation_193 (Activation) (None, 8, 8, 192) 0 bε
malization_193[0][0]

conv2d_194 (Conv2D) (None, 8, 8, 224) 129024 ac
n_193[0][0]

batch_normalization_194 (BatchN (None, 8, 8, 224) 672 cc 4[0][0]
activation_194 (Activation) (None, 8, 8, 224) 0 bε malization_194[0][0]
conv2d_192 (Conv2D) (None, 8, 8, 192) 399360 bl ac[0][0]
conv2d_195 (Conv2D) (None, 8, 8, 256) 172032 ac n_194[0][0]
batch_normalization_192 (BatchN (None, 8, 8, 192) 576 cc 2[0][0]
batch_normalization_195 (BatchN (None, 8, 8, 256) 768 cc 5[0][0]
activation_192 (Activation) (None, 8, 8, 192) 0 bε malization_192[0][0]
activation_195 (Activation) (None, 8, 8, 256) 0 bε malization_195[0][0]
block8_8_mixed (Concatenate) (None, 8, 8, 448) 0 ac n_192[0][0]
ac n_195[0][0]
block8_8_conv (Conv2D) (None, 8, 8, 2080) 933920 bl mixed[0][0]
block8_8 (Lambda) (None, 8, 8, 2080) 0 bl ac[0][0]
bl conv[0][0]
block8_8_ac (Activation) (None, 8, 8, 2080) 0 bl [0][0]
conv2d_197 (Conv2D) (None, 8, 8, 192) 399360 bl ac[0][0]
batch_normalization_197 (BatchN (None, 8, 8, 192) 576 cc 7[0][0]
activation_197 (Activation) (None, 8, 8, 192) 0 bε malization_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
malization_201[0][0]

conv2d_202 (Conv2D) n_201[0][0]	(None, 8, 8, 224)	129024	ac
batch_normalization_202 (BatchN 2[0][0]	(None, 8, 8, 224)	672	cc
activation_202 (Activation) malization_202[0][0]	(None, 8, 8, 224)	0	be
conv2d_200 (Conv2D) ac[0][0]	(None, 8, 8, 192)	399360	bl
conv2d_203 (Conv2D) n_202[0][0]	(None, 8, 8, 256)	172032	ac
batch_normalization_200 (BatchN 0[0][0]	(None, 8, 8, 192)	576	cc
batch_normalization_203 (BatchN 3[0][0]	(None, 8, 8, 256)	768	cc
activation_200 (Activation) malization_200[0][0]	(None, 8, 8, 192)	0	be
activation_203 (Activation) malization_203[0][0]	(None, 8, 8, 256)	0	be
block8_10_mixed (Concatenate) n_200[0][0]	(None, 8, 8, 448)	0	ac
n_203[0][0]			ac
block8_10_conv (Conv2D) _mixed[0][0]	(None, 8, 8, 2080)	933920	bl
block8_10 (Lambda) ac[0][0]	(None, 8, 8, 2080)	0	bl
_conv[0][0]			bl
conv_7b (Conv2D) [0][0]	(None, 8, 8, 1536)	3194880	bl
conv_7b_bn (BatchNormalization) [0][0]	(None, 8, 8, 1536)	4608	cc
conv_7b_ac (Activation) n[0][0]	(None, 8, 8, 1536)	0	cc
avg_pool (GlobalAveragePooling2 [0][0]	(None, 1536)	0	cc

```

-----  

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 15697 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])

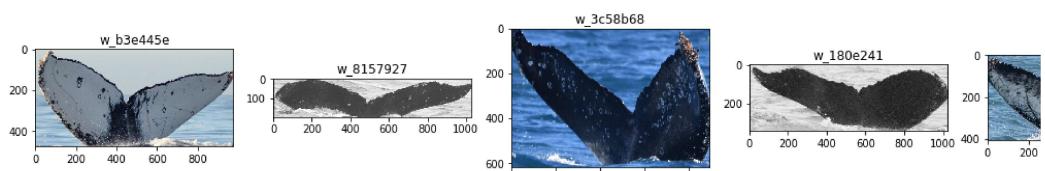
def plot_loaded_images(images_loaded, labels):
    fig, m_axs = plt.subplots(1, len(images_loaded), figsize = (20, 10))
    #show the images and label them
    for ii, c_ax in enumerate(m_axs):
        img = pimage.fromarray(images_loaded[ii], "RGB")
        c_ax.imshow((images_loaded[ii] + 1) / 2)
    #        c_ax.set_title(labels[ii])

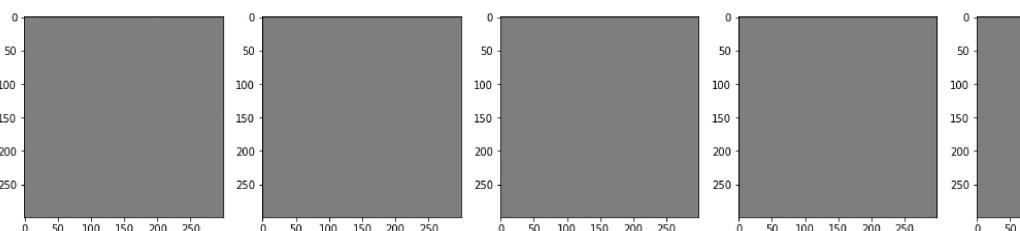
#get the first 5 whale images
images = [(whale_img, whale_label) for (whale_img, whale_label) in
es_train.Image[:5], whales_train.Id[:5])]

plot_images(images, TRAIN_CROPPED_IN)

x_batch, y_batch = next(train_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 more without validation  
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 1/10  
490/490 [=====] - 1370s 3s/step - loss: 0.  
acc: 0.8968 - top_5_accuracy: 0.9519  
Epoch 2/10  
490/490 [=====] - 1325s 3s/step - loss: 0.  
acc: 0.9188 - top_5_accuracy: 0.9649  
Epoch 3/10  
490/490 [=====] - 1326s 3s/step - loss: 0.  
acc: 0.9330 - top_5_accuracy: 0.9720  
Epoch 4/10  
490/490 [=====] - 1325s 3s/step - loss: 0.  
acc: 0.9434 - top_5_accuracy: 0.9762  
Epoch 5/10  
490/490 [=====] - 1325s 3s/step - loss: 0.  
acc: 0.9486 - top_5_accuracy: 0.9785  
Epoch 6/10  
490/490 [=====] - 1323s 3s/step - loss: 0.  
acc: 0.9487 - top_5_accuracy: 0.9794  
Epoch 7/10  
490/490 [=====] - 1322s 3s/step - loss: 0.  
acc: 0.9558 - top_5_accuracy: 0.9827  
Epoch 8/10  
490/490 [=====] - 1324s 3s/step - loss: 0.  
acc: 0.9556 - top_5_accuracy: 0.9829  
Epoch 9/10  
490/490 [=====] - 1322s 3s/step - loss: 0.  
acc: 0.9634 - top_5_accuracy: 0.9834  
Epoch 10/10  
490/490 [=====] - 1323s 3s/step - loss: 0.
```

InceptionResNetV2 - oversampling

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Plot train results

Version 7

9 commits

forked from InceptionResNetV2

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')
```

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

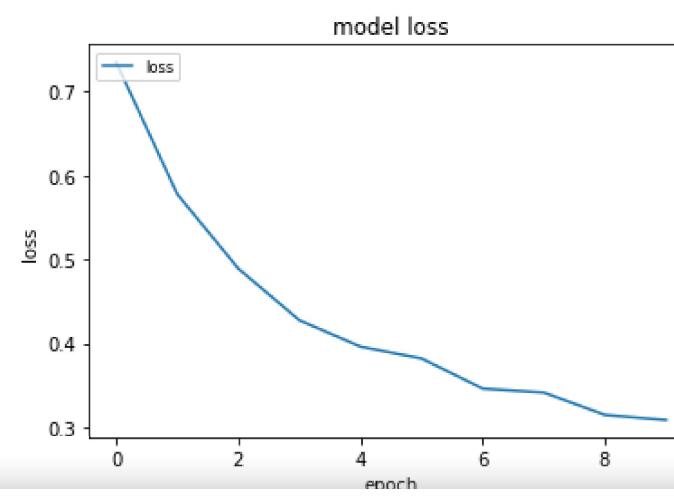
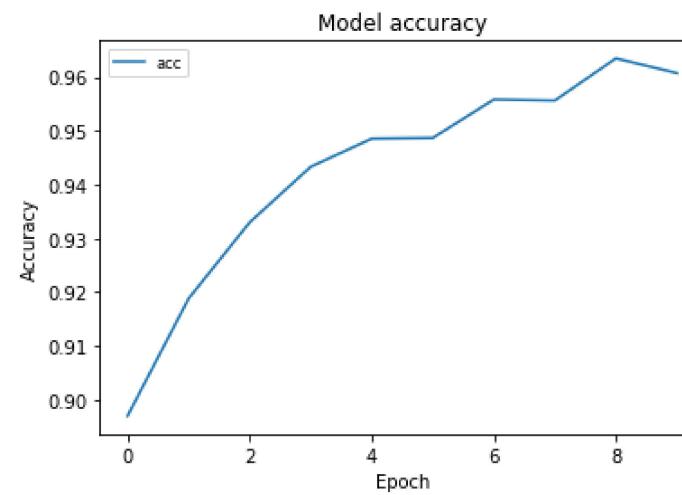
```
def plot_loss(history, should_plot_val = False):
    loss = history.history['loss']
    l1 = plt.plot(loss, label='loss')

    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, False)
plot_loss(history, False)
```



Notebook

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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, steps=1)  
  
print("Predictions shape:")  
print(np.shape(predictions))
```

```
Found 7960 images.  
7960/7960 [=====] - 689s 87ms/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:  
[2992 52 3610 ... 729 3737 1546]
```

```
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_predictions))  
    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 predictions  
    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.items)  
    # print("Generator classes:")  
    # print(classes)  
  
    pred_list = [[get_generator_class(i) for i in p.argsort()[-5:][0] or p] for p in preds]  
    print(pred_list[:10])  
  
    pred_dic = dict((key, value) for (key, value) in zip(test_file_names, pred_list))  
    pred_list_for_test = [ ' '.join(pred_dic[id]) for id in sample_images]  
  
    # print(np.shape(pred_list))  
    # print(np.shape(test_file_names))  
    df = pd.DataFrame({'Image': sample_images, 'Id': pred_list_for_test})  
    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:0.63003767  
Test file names for decoding:  
['00028a005.jpg', '000dcf7d8.jpg', '000e7c7df.jpg', '0019c34f4.jpg'  
4d292.jpg', '00247bc36.jpg', '0027089a4.jpg']  
[['new_whale', 'w_0f8b8e2', 'w_b5c3634', 'w_2f67f0a', 'w_80124ae'],  
17316', 'new_whale', 'w_e3956f5', 'w_21591ba', 'w_dc662ea'], ['new_  
'w_d10d0c5', 'w_0a84ac5', 'w_1cce93', 'w_88bb921'], ['new_whale',  
841', 'w_59052ad', 'w_08630fd', 'w_b9d5945'], ['new_whale', 'w_9e18  
'w_799b208', 'w_d1e0f06', 'w_8b61e65'], ['new_whale', 'w_615a631',  

```

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



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
- 00fee3975.jpg
- 010a1f0eb.jpg
- 01237f1ce.jpg
- 01dc420f.jpg
- 0202dfb29.jpg
- 020ab0f9b.jpg
- ... 1000+ more



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	About this file
<ul style="list-style-type: none"> submission.csv Model_InceptionRes... predicted_class_indic... predictions.npy test_filenames_gener... train_class_indices.npy Weights_InceptionRe... 	<p>Submit to Competition</p> <p>This file was created from a Kernel, it does not have a description.</p>

submission.csv

1	Image	Id
2	00028a005.jpg	new_whale w_0f8b8e2 w_b5c3634 w_2f67f0a w_80124ae
3	000dcf7d8.jpg	w_2b17316 new_whale w_e3956f5 w_21591ba w_dc662ea

4	000e7c7df.jpg	new_whale w_d10d0c5 w_0a84ac5 w_1cce93 w_88bb921	
5	0019c34f4.jpg	new_whale w_67a9841 w_59052ad w_08630fd w_b9d5945	
6	001a4d292.jpg	new_whale w_9e18daa w_799b208 w_d1e0f06 w_8b61e65	
7	00247bc36.jpg	new_whale w_615a631 w_0f8ab07 w_0e7ec27 w_276d61d	
8	0027089a4.jpg	new_whale w_5b227ec w_7e2eb3d w_a5a0a57 w_c6c89db	
9	002de4d94.jpg	new_whale w_4d7df64 w_fbddd6 w_99d3313 w_224bf5	
10	002f52f0c.jpg	new_whale w_e4ae199 w_e47e686	

Run Info

Succeeded	True	Run Time	14384.5 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
2.8s    1  [NbConvertApp] Converting notebook __notebook__.ipynb to notebook
2.9s    2  [NbConvertApp] Executing notebook with kernel: python3
8.1s    3  2019-02-05 20:47:30.908568: 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 20:47:30.909295: 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 20:47:30.909376: I
          tensorflow/core/common_runtime/gpu/gpu_device.cc:1511] Adding
          visible gpu devices: 0
8.6s    5  2019-02-05 20:47:31.331100: I
          tensorflow/core/common_runtime/gpu/gpu_device.cc:982] Device
          interconnect StreamExecutor with strength 1 edge matrix:
          2019-02-05 20:47:31.331170: I
          tensorflow/core/common_runtime/gpu/gpu_device.cc:988]      0
          2019-02-05 20:47:31.331187: I
          tensorflow/core/common_runtime/gpu/gpu_device.cc:1001] 0:  N
8.6s    6  2019-02-05 20:47:31.331542: 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)
149.3s   7  2019-02-05 20:49:52.089359: 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.
150.0s   8  2019-02-05 20:49:52.736755: 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.

150.0s   9 2019-02-05 20:49:52.760708: 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.

14381.1s 10 [NbConvertApp] Writing 537958 bytes to __notebook__.ipynb
14383.4s 11 [NbConvertApp] Converting notebook __notebook__.ipynb to html
14384.0s 12 [NbConvertApp] Support files will be in __results__files/
14384.0s 13 [NbConvertApp] Making directory __results__files
[NbConvertApp] Writing 487218 bytes to __results__.html

14384.0s 14
14384.0s 16 Complete. Exited with code 0.
```

Comments (0)



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