

https://keras.io/api/applications/inceptionresnetv2/

In [1]:

```
import tensorflow as tf
import numpy as np
import pandas as pd
from sklearn.metrics import classification_report, confusion_matrix
import matplotlib.pyplot as plt
import seaborn as sns
import os
```

In [2]:

```
INFO:tensorflow:Enabling eager execution
INFO:tensorflow:Enabling v2 tensorshape
INFO:tensorflow:Enabling resource variables
INFO:tensorflow:Enabling tensor equality
INFO:tensorflow:Enabling control flow v2
```

In [3]:

```
epochs = 100 # quantidade de vezes a ser executado o algoritmo, uma epoch é quanto to
batch = 32 # número de amostras que será carregado a cada execução
```

In [4]:

```
#carrega o modelo da InceptionResNetV2 com os pesos aprendidos no treino da Inception
base_model = tf.keras.applications.InceptionResNetV2(weights='imagenet', include_top=False)
```

In [4]:

```
# o restante do modelo e suas camadas não são discutidos a seguir
# x recebe o final da InceptionResNetV2
x=base_model.output
```

In [5]:

```
#Nova configuração para o modelo

#adiciona apos x uma camada GlobalMaxPooling2D e atribui este no a x novamente (logo x)
x=tf.keras.layers.GlobalMaxPooling2D()(x)

#adiciona apos x uma camada densa com 128 neurônios com funcao de ativacao relu. Atribui x
x=tf.keras.layers.Dense(128,activation='relu')(x)

#adiciona apos x uma camada densa com 64 neurônios com funcao de ativacao relu. Atribui x
x=tf.keras.layers.Dense(64,activation='relu')(x)

#adiciona apos x uma camada densa com 32 neurônios com funcao de ativacao relu. Atribui x
x=tf.keras.layers.Dense(32,activation='relu')(x)

#adiciona apos x os neurônios que devem ser utilizados, nesse caso foram desligados 2
x=tf.keras.layers.Dropout(0.5)(x)

#adiciona apos x uma camada densa com 7 neurônios (sete classes) com funcao de ativacao
preds=tf.keras.layers.Dense(3,activation='softmax')(x)
#preds=tf.keras.layers.Dense(3,activation='sigmoid')(x)

#definindo modelo final
model=tf.keras.models.Model(inputs=base_model.input,outputs=preds)

#mostrando modelo final e sua estrutura
model.summary()
```

Model:	"model"		
Layer (type)	Output Shape	Param #	Connected to
-----			
input_1 (InputLayer)	[None, None, None, 0]	0	
-----			
conv2d (Conv2D)	(None, None, None, 3 864)		input_1[0][0]
-----			
batch_normalization (BatchNormaliza	(None, None, None, 3 96)		conv2d[0][0]
-----			
activation (Activation)	(None, None, None, 3 0)		batch_normalization
-----			
conv2d_1 (Conv2D)	(None, None, None, 3 9216)		activation[0][0]
-----			
batch_normalization_1 (BatchNor	(None, None, None, 3 96)		conv2d_1[0][0]
-----			
activation_1 (Activation)	(None, None, None, 3 0)		batch_normalization_1
-----			
conv2d_2 (Conv2D)	(None, None, None, 6 18432)		activation_1[0][0]
-----			
batch_normalization_2 (BatchNor	(None, None, None, 6 192)		conv2d_2[0][0]
-----			
activation_2 (Activation)	(None, None, None, 6 0)		batch_normalization_2
-----			
max_pooling2d (MaxPooling2D)	(None, None, None, 6 0)		activation_2[0][0]
-----			
conv2d_3 (Conv2D)	(None, None, None, 8 5120)		max_pooling2d[0][0]
-----			
batch_normalization_3 (BatchNor	(None, None, None, 8 240)		conv2d_3[0][0]
-----			
activation_3 (Activation)	(None, None, None, 8 0)		batch_normalization_3
-----			
conv2d_4 (Conv2D)	(None, None, None, 1 138240)		activation_3[0][0]
-----			
batch_normalization_4 (BatchNor	(None, None, None, 1 576)		conv2d_4[0][0]
-----			
activation_4 (Activation)	(None, None, None, 1 0)		batch_normalization_4
-----			
max_pooling2d_1 (MaxPooling2D)	(None, None, None, 1 0)		activation_4[0][0]
-----			
conv2d_8 (Conv2D)	(None, None, None, 6 12288)		max_pooling2d_1[0][0]
-----			
batch_normalization_8 (BatchNor	(None, None, None, 6 192)		conv2d_8[0][0]
-----			
activation_8 (Activation)	(None, None, None, 6 0)		batch_normalization_8
-----			
conv2d_6 (Conv2D)	(None, None, None, 4 9216)		max_pooling2d_1[0][0]
-----			
conv2d_9 (Conv2D)	(None, None, None, 9 55296)		activation_8[0][0]
-----			
batch_normalization_6 (BatchNor	(None, None, None, 4 144)		conv2d_6[0][0]
-----			
batch_normalization_9 (BatchNor	(None, None, None, 9 288)		conv2d_9[0][0]
-----			
activation_6 (Activation)	(None, None, None, 4 0)		batch_normalization_
-----			
activation_9 (Activation)	(None, None, None, 9 0)		batch_normalization_
-----			
average_pooling2d (AveragePooli	(None, None, None, 1 0)		max_pooling2d_1[0][0]
-----			
conv2d_5 (Conv2D)	(None, None, None, 9 18432)		max_pooling2d_1[0][0]
-----			
conv2d_7 (Conv2D)	(None, None, None, 6 76800)		activation_6[0][0]
-----			
conv2d_10 (Conv2D)	(None, None, None, 9 82944)		activation_9[0][0]
-----			
conv2d_11 (Conv2D)	(None, None, None, 6 12288)		average_pooling2d[0]
-----			
batch_normalization_5 (BatchNor	(None, None, None, 9 288)		conv2d_5[0][0]
-----			
batch_normalization_7 (BatchNor	(None, None, None, 6 192)		conv2d_7[0][0]
-----			
batch_normalization_10 (BatchNo	(None, None, None, 9 288)		conv2d_10[0][0]
-----			
batch_normalization_11 (BatchNo	(None, None, None, 6 192)		conv2d_11[0][0]
-----			
activation_5 (Activation)	(None, None, None, 9 0)		batch_normalization_5
-----			
activation_7 (Activation)	(None, None, None, 6 0)		batch_normalization_7
-----			
activation_10 (Activation)	(None, None, None, 9 0)		batch_normalization_1
-----			
activation_11 (Activation)	(None, None, None, 6 0)		batch_normalization_1
-----			
mixed_5b (Concatenate)	(None, None, None, 3 0)		activation_5[0][0]
-----			
			activation_7[0][0]
-----			
			activation_10[0][0]
-----			
			activation_11[0][0]
-----			
conv2d_15 (Conv2D)	(None, None, None, 3 10240)		mixed_5b[0][0]
-----			
batch_normalization_15 (BatchNo	(None, None, None, 3 96)		conv2d_15[0][0]
-----			
activation_15 (Activation)	(None, None, None, 3 0)		batch_normalization_1
-----			
conv2d_13 (Conv2D)	(None, None, None, 3 10240)		mixed_5b[0][0]
-----			
conv2d_16 (Conv2D)	(None, None, None, 4 13824)		activation_15[0][0]
-----			
batch_normalization_13 (BatchNo	(None, None, None, 3 96)		conv2d_13[0][0]
-----			
batch_normalization_16 (BatchNo	(None, None, None, 4 144)		conv2d_16[0][0]
-----			
activation_13 (Activation)	(None, None, None, 3 0)		batch_normalization_1
-----			
activation_16 (Activation)	(None, None, None, 4 0)		batch_normalization_1
-----			
conv2d_12 (Conv2D)	(None, None, None, 3 10240)		mixed_5b[0][0]
-----			
conv2d_14 (Conv2D)	(None, None, None, 3 9216)		activation_13[0][0]
-----			
conv2d_17 (Conv2D)	(None, None, None, 6 27648)		activation_16[0][0]
-----			
batch_normalization_12 (BatchNo	(None, None, None, 3 96)		conv2d_12[0][0]
-----			
batch_normalization_14 (BatchNo	(None, None, None, 3 96)		conv2d_14[0][0]
-----			
batch_normalization_17 (BatchNo	(None, None, None, 6 192)		conv2d_17[0][0]
-----			
activation_12 (Activation)	(None, None, None, 3 0)		batch_normalization_1
-----			
activation_14 (Activation)	(None, None, None, 3 0)		batch_normalization_1
-----			
activation_17 (Activation)	(None, None, None, 6 0)		batch_normalization_1
-----			
block35_1_mixed (Concatenate)	(None, None, None, 1 0)		activation_12[0][0]
-----			
			activation_14[0][0]
-----			
			activation_17[0][0]
-----			
block35_1_conv (Conv2D)	(None, None, None, 3 41280)		block35_1_mixed[0][0]
-----			
block35_1 (Lambda)	(None, None, None, 3 0)		mixed_5b[0][0]
-----			
block35_1_ac (Activation)	(None, None, None, 3 0)		block35_1_conv[0][0]
-----			
conv2d_21 (Conv2D)	(None, None, None, 3 10240)		block35_1_ac[0][0]
-----			
batch_normalization_21 (BatchNo	(None, None, None, 3 96)		conv2d_21[0][0]
-----			
activation_21 (Activation)	(None, None, None, 3 0)		batch_normalization_2
-----			
conv2d_19 (Conv2D)	(None, None, None, 3 10240)		block35_1_ac[0][0]
-----			
conv2d_22 (Conv2D)	(None, None, None, 4 13824)		activation_21[0][0]
-----			
batch_normalization_19 (BatchNo	(None, None, None, 3 96)		conv2d_19[0][0]
-----			
batch_normalization_22 (BatchNo	(None, None, None, 4 144)		conv2d_22[0][0]
-----			
activation_19 (Activation)	(None, None, None, 3 0)		batch_normalization_1
-----			
activation_22 (Activation)	(None, None, None, 4 0)		batch_normalization_2
-----			
conv2d_18 (Conv2D)	(None, None, None, 3 10240)		block35_1_ac[0][0]
-----			
conv2d_20 (Conv2D)	(None, None, None, 3 9216)		activation_19[0][0]
-----			
conv2d_23 (Conv2D)	(None, None, None, 6 27648)		activation_22[0][0]
-----			
batch_normalization_18 (BatchNo	(None, None, None, 3 96)		conv2d_18[0][0]
-----			
batch_normalization_20 (BatchNo	(None, None, None, 3 96)		conv2d_20[0][0]
-----			
batch_normalization_23 (BatchNo	(None, None, None, 6 192)		conv2d_23[0][0]
-----			
activation_18 (Activation)	(None, None, None, 3 0)		batch_normalization_1
-----			
activation_20 (Activation)	(None, None, None, 3 0)		batch_normalization_2
-----			
activation_23 (Activation)	(None, None, None, 6 0)		batch_normalization_2
-----			
block35_2_mixed (Concatenate)	(None, None, None, 1 0)		activation_18[0][0]
-----			
			activation_20[0][0]
-----			
			activation_23[0][0]
-----			
block35_2_conv (Conv2D)	(None, None, None, 3 41280)		block35_2_mixed[0][0]
-----			
block35_2 (Lambda)	(None, None, None, 3 0)		block35_1_ac[0][0]
-----			
block35_2_ac (Activation)	(None, None, None, 3 0)		block35_2_conv[0][0]
-----			
conv2d_24 (Conv2D)	(None, None, None, 3 10240)		block35_2_ac[0][0]
-----			
batch_normalization_27 (BatchNo	(None, None, None, 3 96)		conv2d_27[0][0]
-----			
activation_27 (Activation)	(None, None, None, 3 0)		batch_normalization_2
-----			
conv2d_25 (Conv2D)	(None, None, None, 3 10240)		block35_2_ac[0][0]
-----			
conv2d_28 (Conv2D)	(None, None, None, 4 13824)		activation_27[0][0]
-----			
batch_normalization_25 (BatchNo	(None, None, None, 3 96)		conv2d_25[0][0]
-----			
batch_normalization_28 (BatchNo	(None, None, None, 4 144)		conv2d_28[0][0]
-----			
activation_25 (Activation)	(None, None, None, 3 0)		batch_normalization_2
-----			
activation_28 (Activation)	(None, None, None, 4 0)		batch_normalization_2
-----			
conv2d_24 (Conv2D)	(None, None, None, 3 10240)		block35_2_ac[0][0]
-----			
conv2d_26 (Conv2D)	(None, None, None, 3 9216)		activation_25[0][0]
-----			
conv2d_29 (Conv2D)	(None, None, None, 6 27648)		activation_28[0][0]
-----			
batch_normalization_24 (BatchNo	(None, None, None, 3 96)		conv2d_24[0][0]
-----			
batch_normalization_26 (BatchNo	(None, None, None, 3 96)		conv2d_26[0][0]
-----			
batch_normalization_29 (BatchNo	(None, None, None, 6 192)		conv2d_29[0][0]
-----			
activation_24 (Activation)	(None, None, None, 3 0)		batch_normalization_2
-----			
activation_26 (Activation)	(None, None, None, 3 0)		batch_normalization_2
-----			
activation_29 (Activation)	(None, None, None, 6 0)		batch_normalization_2
-----			
block35_3_mixed (Concatenate)	(None, None, None, 1 0)		activation_24[0][0]
-----			
			activation_26[0][0]
-----			
			activation_29[0][0]
-----			
block35_3_conv (Conv2D)	(None, None, None, 3 41280)		block35_3_mixed[0][0]
-----			
block35_3 (Lambda)	(None, None, None, 3 0)		block35_2_ac[0][0]
-----			
block35_3_ac (Activation)	(None, None, None, 3 0)		block35_3_conv[0][0]
-----			
conv2d_33 (Conv2D)	(None, None, None, 3 10240)		block35_3_ac[0][0]
-----			
batch_normalization_33 (BatchNo	(None, None, None, 3 96)		conv2d_33[0][0]
-----			
activation_33 (Activation)	(None, None, None, 3 0)		batch_normalization_3
-----			
conv2d_31 (Conv2D)	(None, None, None, 3 10240)		block35_3_ac[0][0]
-----			
conv2d_34 (Conv2D)	(None, None, None, 4 13824)		activation_33[0][0]
-----			
batch_normalization_31 (BatchNo	(None, None, None, 3 96)		conv2d_31[0][0]
-----			
batch_normalization_34 (BatchNo	(None, None, None, 4 144)		conv2d_34[0][0]
-----			
activation_31 (Activation)	(None, None, None, 3 0)		batch_normalization_3
-----			
activation_34 (Activation)	(None, None, None, 4 0)		batch_normalization_3



4[0][0]		
activation_56 (Activation)	(None, None, None, 3 0	batch_normalization_56[0][0]
activation_59 (Activation)	(None, None, None, 6 0	batch_normalization_59[0][0]
block35_8_mixed (Concatenate)	(None, None, None, 1 0	activation_54[0][0] activation_56[0][0] activation_59[0][0]
block35_8_conv (Conv2D)	(None, None, None, 3 41280	block35_8_mixed[0][0]
block35_8 (Lambda)	(None, None, None, 3 0	block35_7_ac[0][0] block35_8_conv[0][0]
block35_8_ac (Activation)	(None, None, None, 3 0	block35_8[0][0]
conv2d_63 (Conv2D)	(None, None, None, 3 10240	block35_8_ac[0][0]
batch_normalization_63 (BatchNo	(None, None, None, 3 96	conv2d_63[0][0]
activation_63 (Activation)	(None, None, None, 3 0	batch_normalization_63[0][0]
conv2d_61 (Conv2D)	(None, None, None, 3 10240	block35_8_ac[0][0]
conv2d_64 (Conv2D)	(None, None, None, 4 13824	activation_63[0][0]
batch_normalization_61 (BatchNo	(None, None, None, 3 96	conv2d_61[0][0]
batch_normalization_64 (BatchNo	(None, None, None, 4 144	conv2d_64[0][0]
activation_61 (Activation)	(None, None, None, 3 0	batch_normalization_61[0][0]
activation_64 (Activation)	(None, None, None, 4 0	batch_normalization_64[0][0]
conv2d_60 (Conv2D)	(None, None, None, 3 10240	block35_8_ac[0][0]
conv2d_62 (Conv2D)	(None, None, None, 3 9216	activation_61[0][0]
conv2d_65 (Conv2D)	(None, None, None, 6 27648	activation_64[0][0]
batch_normalization_60 (BatchNo	(None, None, None, 3 96	conv2d_60[0][0]
batch_normalization_62 (BatchNo	(None, None, None, 3 96	conv2d_62[0][0]
batch_normalization_65 (BatchNo	(None, None, None, 6 192	conv2d_65[0][0]
activation_60 (Activation)	(None, None, None, 3 0	batch_normalization_60[0][0]
activation_62 (Activation)	(None, None, None, 3 0	batch_normalization_62[0][0]
activation_65 (Activation)	(None, None, None, 6 0	batch_normalization_65[0][0]
block35_9_mixed (Concatenate)	(None, None, None, 1 0	activation_60[0][0] activation_62[0][0] activation_65[0][0]
block35_9_conv (Conv2D)	(None, None, None, 3 41280	block35_9_mixed[0][0]
block35_9 (Lambda)	(None, None, None, 3 0	block35_8_ac[0][0] block35_9_conv[0][0]
block35_9_ac (Activation)	(None, None, None, 3 0	block35_9[0][0]
conv2d_69 (Conv2D)	(None, None, None, 3 10240	block35_9_ac[0][0]
batch_normalization_69 (BatchNo	(None, None, None, 3 96	conv2d_69[0][0]
activation_69 (Activation)	(None, None, None, 3 0	batch_normalization_69[0][0]
conv2d_67 (Conv2D)	(None, None, None, 3 10240	block35_9_ac[0][0]
conv2d_70 (Conv2D)	(None, None, None, 4 13824	activation_69[0][0]
batch_normalization_67 (BatchNo	(None, None, None, 3 96	conv2d_67[0][0]
batch_normalization_70 (BatchNo	(None, None, None, 4 144	conv2d_70[0][0]
activation_67 (Activation)	(None, None, None, 3 0	batch_normalization_67[0][0]
activation_70 (Activation)	(None, None, None, 4 0	batch_normalization_70[0][0]
conv2d_66 (Conv2D)	(None, None, None, 3 10240	block35_9_ac[0][0]
conv2d_68 (Conv2D)	(None, None, None, 3 9216	activation_67[0][0]
conv2d_71 (Conv2D)	(None, None, None, 6 27648	activation_70[0][0]
batch_normalization_66 (BatchNo	(None, None, None, 3 96	conv2d_66[0][0]
batch_normalization_68 (BatchNo	(None, None, None, 3 96	conv2d_68[0][0]
batch_normalization_71 (BatchNo	(None, None, None, 6 192	conv2d_71[0][0]
activation_66 (Activation)	(None, None, None, 3 0	batch_normalization_66[0][0]
activation_68 (Activation)	(None, None, None, 3 0	batch_normalization_68[0][0]
activation_71 (Activation)	(None, None, None, 6 0	batch_normalization_71[0][0]
block35_10_mixed (Concatenate)	(None, None, None, 1 0	activation_66[0][0] activation_68[0][0] activation_71[0][0]
block35_10_conv (Conv2D)	(None, None, None, 3 41280	block35_10_mixed[0]
block35_10 (Lambda)	(None, None, None, 3 0	block35_9_ac[0][0] block35_10_conv[0][0]
block35_10_ac (Activation)	(None, None, None, 3 0	block35_10[0][0]
conv2d_73 (Conv2D)	(None, None, None, 2 81920	block35_10_ac[0][0]
batch_normalization_73 (BatchNo	(None, None, None, 2 768	conv2d_73[0][0]
activation_73 (Activation)	(None, None, None, 2 0	batch_normalization_73[0][0]
conv2d_74 (Conv2D)	(None, None, None, 2 589824	activation_73[0][0]
batch_normalization_74 (BatchNo	(None, None, None, 2 768	conv2d_74[0][0]
activation_74 (Activation)	(None, None, None, 2 0	batch_normalization_74[0][0]
conv2d_72 (Conv2D)	(None, None, None, 3 1105920	block35_10_ac[0][0]
conv2d_75 (Conv2D)	(None, None, None, 3 884736	activation_74[0][0]
batch_normalization_72 (BatchNo	(None, None, None, 3 1152	conv2d_72[0][0]
batch_normalization_75 (BatchNo	(None, None, None, 3 1152	conv2d_75[0][0]
activation_72 (Activation)	(None, None, None, 3 0	batch_normalization_72[0][0]
activation_75 (Activation)	(None, None, None, 3 0	batch_normalization_75[0][0]
max_pooling2d_2 (MaxPooling2D)	(None, None, None, 3 0	block35_10_ac[0][0]
mixed_6a (Concatenate)	(None, None, None, 1 0	activation_72[0][0] activation_75[0][0] max_pooling2d_2[0][0]
conv2d_77 (Conv2D)	(None, None, None, 1 139264	mixed_6a[0][0]
batch_normalization_77 (BatchNo	(None, None, None, 1 384	conv2d_77[0][0]
activation_77 (Activation)	(None, None, None, 1 0	batch_normalization_77[0][0]
conv2d_78 (Conv2D)	(None, None, None, 1 143360	activation_77[0][0]
batch_normalization_78 (BatchNo	(None, None, None, 1 480	conv2d_78[0][0]
activation_78 (Activation)	(None, None, None, 1 0	batch_normalization_78[0][0]
conv2d_76 (Conv2D)	(None, None, None, 1 208896	mixed_6a[0][0]
conv2d_79 (Conv2D)	(None, None, None, 1 215040	activation_78[0][0]
batch_normalization_76 (BatchNo	(None, None, None, 1 576	conv2d_76[0][0]
batch_normalization_79 (BatchNo	(None, None, None, 1 576	conv2d_79[0][0]
activation_76 (Activation)	(None, None, None, 1 0	batch_normalization_76[0][0]
activation_79 (Activation)	(None, None, None, 1 0	batch_normalization_79[0][0]
block17_1_mixed (Concatenate)	(None, None, None, 3 0	activation_76[0][0] activation_79[0][0]
block17_1_conv (Conv2D)	(None, None, None, 1 418880	block17_1_mixed[0][0]
block17_1 (Lambda)	(None, None, None, 1 0	mixed_6a[0][0] block17_1_conv[0][0]
block17_1_ac (Activation)	(None, None, None, 1 0	block17_1[0][0]
conv2d_81 (Conv2D)	(None, None, None, 1 139264	block17_1_ac[0][0]
batch_normalization_81 (BatchNo	(None, None, None, 1 384	conv2d_81[0][0]
activation_81 (Activation)	(None, None, None, 1 0	batch_normalization_81[0][0]
conv2d_82 (Conv2D)	(None, None, None, 1 143360	activation_81[0][0]
batch_normalization_82 (BatchNo	(None, None, None, 1 480	conv2d_82[0][0]
activation_82 (Activation)	(None, None, None, 1 0	batch_normalization_82[0][0]
conv2d_80 (Conv2D)	(None, None, None, 1 208896	block17_1_ac[0][0]
conv2d_83 (Conv2D)	(None, None, None, 1 215040	activation_82[0][0]
batch_normalization_80 (BatchNo	(None, None, None, 1 576	conv2d_80[0][0]
batch_normalization_83 (BatchNo	(None, None, None, 1 576	conv2d_83[0][0]
activation_80 (Activation)	(None, None, None, 1 0	batch_normalization_80[0][0]
activation_83 (Activation)	(None, None, None, 1 0	batch_normalization_83[0][0]
block17_2_mixed (Concatenate)	(None, None, None, 3 0	activation_80[0][0] activation_83[0][0]
block17_2_conv (Conv2D)	(None, None, None, 1 418880	block17_2_mixed[0][0]
block17_2 (Lambda)	(None, None, None, 1 0	block17_1_ac[0][0] block17_2_conv[0][0]
block17_2_ac (Activation)	(None, None, None, 1 0	block17_2[0][0]
conv2d_85 (Conv2D)	(None, None, None, 1 139264	block17_2_ac[0][0]
batch_normalization_85 (BatchNo	(None, None, None, 1 384	conv2d_85[0][0]
activation_85 (Activation)	(None, None, None, 1 0	batch_normalization_85[0][0]
conv2d_86 (Conv2D)	(None, None, None, 1 143360	activation_85[0][0]
batch_normalization_86 (BatchNo	(None, None, None, 1 480	conv2d_86[0][0]
activation_86 (Activation)	(None, None, None, 1 0	batch_normalization_86[0][0]
conv2d_84 (Conv2D)	(None, None, None, 1 208896	block17_2_ac[0][0]
conv2d_87 (Conv2D)	(None, None, None, 1 215040	activation_86[0][0]
batch_normalization_84 (BatchNo	(None, None, None, 1 576	conv2d_84[0][0]
batch_normalization_87 (BatchNo	(None, None, None, 1 576	conv2d_87[0][0]
activation_84 (Activation)	(None, None, None, 1 0	batch_normalization_84[0][0]
activation_87 (Activation)	(None, None, None, 1 0	batch_normalization_87[0][0]
block17_3_mixed (Concatenate)	(None, None, None, 3 0	activation_84[0][0] activation_87[0][0]
block17_3_conv (Conv2D)	(None, None, None, 1 418880	block17_3_mixed[0][0]
block17_3 (Lambda)	(None, None, None, 1 0	block17_2_ac[0][0] block17_3_conv[0][0]
block17_3_ac (Activation)	(None, None, None, 1 0	block17_3[0][0]
conv2d_89 (Conv2D)	(None, None, None, 1 139264	block17_3_ac[0][0]
batch_normalization_89 (BatchNo	(None, None, None, 1 384	conv2d_89[0][0]
activation_89 (Activation)	(None, None, None, 1 0	batch_normalization_89[0][0]
conv2d_90 (Conv2D)	(None, None, None, 1 143360	activation_89[0][0]
batch_normalization_90 (BatchNo	(None, None, None, 1 480	conv2d_90[0][0]
activation_90 (Activation)	(None, None, None, 1 0	batch_normalization_90[0][0]
conv2d_88 (Conv2D)	(None, None, None, 1 208896	block17_3_ac[0][0]
conv2d_91 (Conv2D)	(None, None, None, 1 215040	activation_90[0][0]
batch_normalization_88 (BatchNo	(None, None, None, 1 576	conv2d_88[0][0]
batch_normalization_91 (BatchNo	(None, None, None, 1 576	conv2d_91[0][0]
activation_88 (Activation)	(None, None, None, 1 0	batch_normalization_88[0][0]
activation_91 (Activation)	(None, None, None, 1 0	batch_normalization_91[0][0]
block17_4_mixed (Concatenate)	(None, None, None, 3 0	activation_88[0][0] activation_91[0][0]
block17_4_conv (Conv2D)	(None, None, None, 1 418880	block17_4_mixed[0][0]
block17_4 (Lambda)	(None, None, None, 1 0	block17_3_ac[0][0] block17_4_conv[0][0]
block17_4_ac (Activation)	(None, None, None, 1 0	block17_4[0][0]
conv2d_93 (Conv2D)	(None, None, None, 1 139264	block17_4_ac[0][0]
batch_normalization_93 (BatchNo	(None, None, None, 1 384	conv2d_93[0][0]
activation_93 (Activation)	(None, None, None, 1 0	batch_normalization_93[0][0]
conv2d_94 (Conv2D)	(None, None, None, 1 143360	activation_93[0][0]
batch_normalization_94 (BatchNo	(None, None, None, 1 480	conv2d_94[0][0]
activation_94 (Activation)	(None, None, None, 1 0	batch_normalization_94[0][0]
conv2d_92 (Conv2D)	(None, None, None, 1 208896	block17_4_ac[0][0]
conv2d_95 (Conv2D)	(None, None, None, 1 215040	activation_94[0][0]
batch_normalization_92 (BatchNo	(None, None, None, 1 576	conv2d_92[0][0]
batch_normalization_95 (BatchNo	(None, None, None, 1 576	conv2d_95[0][0]
activation_92 (Activation)	(None, None, None, 1 0	batch_normalization_92[0][0]
activation_95 (Activation)	(None, None, None, 1 0	batch_normalization_95[0][0]
block17_5_mixed (Concatenate)	(None, None, None, 3 0	activation_92[0][0] activation_95[0][0]
block17_5_conv (Conv2D)	(None, None, None, 1 418880	block17_5_mixed[0][0]
block17_5 (Lambda)	(None, None, None, 1 0	block17_4_ac[0][0] block17_5_conv[0][0]
block17_5_ac (Activation)	(None, None, None, 1 0	block17_5[0][0]
conv2d_97 (Conv2D)	(None, None, None, 1 139264	block17_5_ac[0][0]
batch_normalization_97 (BatchNo	(None, None, None, 1 384	conv2d_97[0][0]
activation_97 (Activation)	(None, None, None, 1 0	batch_normalization_97[0][0]
conv2d_98 (Conv2D)	(None, None, None, 1 143360	activation_97[0][0]
batch_normalization_98 (BatchNo	(None, None, None, 1 480	conv2d_98[0][0]
activation_98 (Activation)	(None, None, None, 1 0	batch_normalization_98[0][0]
conv2d_96 (Conv2D)	(None, None, None, 1 208896	block17_5_ac[0][0]
conv2d_99 (Conv2D)	(None, None, None, 1 215040	activation_98[0][0]
batch_normalization_96 (BatchNo	(None, None, None, 1 576	conv2d_96[0][0]
batch_normalization_99 (BatchNo	(None, None, None, 1 576	conv2d_99[0][0]
activation_96 (Activation)	(None, None, None, 1 0	batch_normalization_96[0][0]
activation_99 (Activation)	(None, None, None, 1 0	batch_normalization_99[0][0]
block17_6_mixed (Concatenate)	(None, None, None, 3 0	activation_96[0][0] activation_99[0][0]
block17_6_conv (Conv2D)	(None, None, None, 1 418880	block17_6_mixed[0][0]
block17_6 (Lambda)	(None, None, None, 1 0	block17_5_ac[0][0] block17_6_conv[0][0]
block17_6_ac (Activation)	(None, None, None, 1 0	block17_6[0][0]
conv2d_101 (Conv2D)	(None, None, None, 1 139264	block17_6_ac[0][0]
batch_normalization_101 (BatchN	(None, None, None, 1 384	conv2d_101[0][0]
activation_101 (Activation)	(None, None, None, 1 0	batch_normalization_101[0][0]
conv2d_102 (Conv2D)	(None, None, None, 1 143360	activation_101[0][0]
batch_normalization_102 (BatchN	(None, None, None, 1 480	conv2d_102[0][0]
activation_102 (Activation)	(None, None, None, 1 0	batch_normalization_102[0][0]
conv2d_100 (Conv2D)	(None, None, None, 1 208896	block17_6_ac[0][0]
conv2d_103 (Conv2D)	(None, None, None, 1 215040	activation_102[0][0]
batch_normalization_100 (BatchN	(None, None, None, 1 576	conv2d_100[0][0]
batch_normalization_103 (BatchN	(None, None, None, 1 576	conv2d_103[0][0]
activation_100 (Activation)	(None, None, None, 1 0	batch_normalization_100[0][0]
activation_103 (Activation)	(None, None, None, 1 0	batch_normalization_103[0][0]
block17_7_mixed (Concatenate)	(None, None, None, 3 0	activation_100[0][0] activation_103[0][0]
block17_7_conv (Conv2D)	(None, None, None, 1 418880	block17_7_mixed[0][0]
block17_7 (Lambda)	(None, None, None, 1 0	block17_6_ac[0][0] block17_7_conv[0][0]
block17_7_ac (Activation)	(None, None, None, 1 0	block17_7[0][0]
conv2d_105 (Conv2D)	(None, None, None, 1 139264	block17_7_ac[0][0]
batch_normalization_105 (BatchN	(None, None, None, 1 384	conv2d_105[0][0]
activation_105 (Activation)	(None, None, None, 1 0	batch_normalization_105[0][0]
conv2d_106 (Conv2D)	(None, None, None, 1 143360	activation_105[0][0]
batch_normalization_106 (BatchN	(None, None, None, 1 480	conv2d_106[0][0]
activation_106 (Activation)	(None, None, None, 1 0	batch_normalization_106[0][0]
conv2d_104 (Conv2D)	(None, None, None, 1 208896	block17_7_ac[0][0]
conv2d_107 (Conv2D)	(None, None, None, 1 215040	activation_106[0][0]
batch_normalization_104 (BatchN	(None, None, None, 1 576	conv2d_104[0][0]
batch_normalization_107 (BatchN	(None, None, None, 1 576	conv2d_107[0][0]
activation_104 (Activation)	(None, None, None, 1 0	batch_normalization_104[0][0]
activation_107 (Activation)	(None, None, None, 1 0	batch_normalization_107[0][0]
block17_8_mixed (Concatenate)	(None, None, None, 3 0	activation_104[0][0] activation_107[0][0]
block17_8_conv (Conv2D)	(None, None, None, 1 418880	block17_8_mixed[0][0]
block17_8 (Lambda)	(None, None, None, 1 0	block17_7_ac[0][0] block17_8_conv[0][0]
block17_8_ac (Activation)	(None, None, None, 1 0	block17_8[0][0]
conv2d_109 (Conv2D)	(None, None, None, 1 139264	block17_8_ac[0][0]
batch_normalization_109 (BatchN	(None, None, None, 1 384	conv2d_109[0][0]
activation_109 (Activation)	(None, None, None, 1 0	batch_normalization_109[0][0]
conv2d_110 (Conv2D)	(None, None, None, 1 143360	activation_109[0][0]
batch_normalization_110 (BatchN	(None, None, None, 1 480	conv2d_110[0][0]
activation_110 (Activation)	(None, None, None, 1 0	batch_normalization_110[0][0]
conv2d_108 (Conv2D)	(None, None, None, 1 208896	block17_8_ac[0][0]
conv2d_111 (Conv2D)	(None, None, None, 1 215040	activation_110[0][0]
batch_normalization_108 (BatchN	(None, None, None, 1 576	conv2d_108[0][0]
batch_normalization_111 (BatchN	(None, None, None, 1 576	conv2d_111[0][0]
activation_108 (Activation)	(None, None, None, 1 0	batch_normalization_108[0][0]
activation_111 (Activation)	(None, None, None, 1 0	batch_normalization_111[0][0]
block17_9_mixed (Concatenate)	(None, None, None, 3 0	activation_108[0][0] activation_111[0][0]
block17_9_conv (Conv2D)	(None, None, None, 1 418880	block17_9_mixed[0][0]
block17_9 (Lambda)	(None, None, None, 1 0	block17_8_ac[0][0] block17_9_conv[0][0]
block17_9_ac (Activation)	(None, None, None, 1 0	block17_9[0][0]
conv2d_113 (Conv2D)	(None, None, None, 1 139264	block17_9_ac[0][0]
batch_normalization_113 (BatchN	(None, None, None, 1 384	conv2d_113[0][0]
activation_113 (Activation)	(None, None, None, 1 0	batch_normalization_113[0][0]
conv2d_114 (Conv2D)	(None, None, None, 1 143360	activation_113[0][0]
batch_normalization_114 (BatchN	(None, None, None, 1 480	conv2d_114[0][0]
activation_114 (Activation)	(None, None, None, 1 0	batch_normalization_114[0][0]
conv2d_112 (Conv2D)	(None, None, None, 1 208896	block17_9_ac[0][0]
conv2d_115 (Conv2D)	(None, None, None, 1 215040	activation_114[0][0]
batch_normalization_112 (BatchN	(None, None, None, 1 576	conv2d_112[0][0]
batch_normalization_115 (BatchN	(None, None, None, 1 576	conv2d_115[0][0]
activation_112 (Activation)	(None, None, None, 1 0	batch_normalization_112[0][0]
activation_115 (Activation)	(None, None, None, 1 0	batch_normalization_115[0][0]
block17_10_mixed (Concatenate)	(None, None, None, 3 0	activation_112[0][0] activation_115[0][0]
block17_10_conv (Conv2D)	(None, None, None, 1 418880	block17_10_mixed[0]
block17_10 (Lambda)	(None, None, None, 1 0	block17_9_ac[0][0] block17_10_conv[0][0]
block17_10_ac (Activation)	(None, None, None, 1 0	block17_10[0][0]

conv2d_117 (Conv2D)	(None, None, None, 1 139264)	block17_10_ac[0][0]
batch_normalization_117 (BatchN	(None, None, None, 1 384)	conv2d_117[0][0]
activation_117 (Activation)	(None, None, None, 1 0)	batch_normalization_117[0][0]
conv2d_118 (Conv2D)	(None, None, None, 1 143360)	activation_117[0][0]
batch_normalization_118 (BatchN	(None, None, None, 1 480)	conv2d_118[0][0]
activation_118 (Activation)	(None, None, None, 1 0)	batch_normalization_118[0][0]
conv2d_116 (Conv2D)	(None, None, None, 1 208896)	block17_10_ac[0][0]
conv2d_119 (Conv2D)	(None, None, None, 1 215040)	activation_118[0][0]
batch_normalization_116 (BatchN	(None, None, None, 1 576)	conv2d_116[0][0]
batch_normalization_119 (BatchN	(None, None, None, 1 576)	conv2d_119[0][0]
activation_116 (Activation)	(None, None, None, 1 0)	batch_normalization_116[0][0]
activation_119 (Activation)	(None, None, None, 1 0)	batch_normalization_119[0][0]
block17_11_mixed (Concatenate)	(None, None, None, 3 0)	activation_116[0][0]
block17_11_conv (Conv2D)	(None, None, None, 1 418880)	activation_119[0][0]
block17_11 (Lambda)	(None, None, None, 1 0)	block17_11_mixed[0]
block17_11_ac (Activation)	(None, None, None, 1 0)	block17_10_ac[0][0]
conv2d_121 (Conv2D)	(None, None, None, 1 139264)	block17_11_conv[0][0]
batch_normalization_121 (BatchN	(None, None, None, 1 384)	conv2d_121[0][0]
activation_121 (Activation)	(None, None, None, 1 0)	batch_normalization_121[0][0]
conv2d_122 (Conv2D)	(None, None, None, 1 143360)	activation_121[0][0]
batch_normalization_122 (BatchN	(None, None, None, 1 480)	conv2d_122[0][0]
activation_122 (Activation)	(None, None, None, 1 0)	batch_normalization_122[0][0]
conv2d_120 (Conv2D)	(None, None, None, 1 208896)	block17_11_ac[0][0]
conv2d_123 (Conv2D)	(None, None, None, 1 215040)	activation_122[0][0]
batch_normalization_120 (BatchN	(None, None, None, 1 576)	conv2d_120[0][0]
batch_normalization_123 (BatchN	(None, None, None, 1 576)	conv2d_123[0][0]
activation_120 (Activation)	(None, None, None, 1 0)	batch_normalization_120[0][0]
activation_123 (Activation)	(None, None, None, 1 0)	batch_normalization_123[0][0]
block17_12_mixed (Concatenate)	(None, None, None, 3 0)	activation_120[0][0]
block17_12_conv (Conv2D)	(None, None, None, 1 418880)	activation_123[0][0]
block17_12 (Lambda)	(None, None, None, 1 0)	block17_12_mixed[0]
block17_12_ac (Activation)	(None, None, None, 1 0)	block17_11_ac[0][0]
conv2d_125 (Conv2D)	(None, None, None, 1 139264)	block17_12_conv[0][0]
batch_normalization_125 (BatchN	(None, None, None, 1 384)	conv2d_125[0][0]
activation_125 (Activation)	(None, None, None, 1 0)	batch_normalization_125[0][0]
conv2d_126 (Conv2D)	(None, None, None, 1 143360)	activation_125[0][0]
batch_normalization_126 (BatchN	(None, None, None, 1 480)	conv2d_126[0][0]
activation_126 (Activation)	(None, None, None, 1 0)	batch_normalization_126[0][0]
conv2d_124 (Conv2D)	(None, None, None, 1 208896)	block17_12_ac[0][0]
conv2d_127 (Conv2D)	(None, None, None, 1 215040)	activation_126[0][0]
batch_normalization_124 (BatchN	(None, None, None, 1 576)	conv2d_124[0][0]
batch_normalization_127 (BatchN	(None, None, None, 1 576)	conv2d_127[0][0]
activation_124 (Activation)	(None, None, None, 1 0)	batch_normalization_124[0][0]
activation_127 (Activation)	(None, None, None, 1 0)	batch_normalization_127[0][0]
block17_13_mixed (Concatenate)	(None, None, None, 3 0)	activation_124[0][0]
block17_13_conv (Conv2D)	(None, None, None, 1 418880)	activation_127[0][0]
block17_13 (Lambda)	(None, None, None, 1 0)	block17_13_mixed[0]
block17_13_ac (Activation)	(None, None, None, 1 0)	block17_12_ac[0][0]
conv2d_129 (Conv2D)	(None, None, None, 1 139264)	block17_13_conv[0][0]
batch_normalization_129 (BatchN	(None, None, None, 1 384)	conv2d_129[0][0]
activation_129 (Activation)	(None, None, None, 1 0)	batch_normalization_129[0][0]
conv2d_130 (Conv2D)	(None, None, None, 1 143360)	activation_129[0][0]
batch_normalization_130 (BatchN	(None, None, None, 1 480)	conv2d_130[0][0]
activation_130 (Activation)	(None, None, None, 1 0)	batch_normalization_130[0][0]
conv2d_128 (Conv2D)	(None, None, None, 1 208896)	block17_13_ac[0][0]
conv2d_131 (Conv2D)	(None, None, None, 1 215040)	activation_130[0][0]
batch_normalization_128 (BatchN	(None, None, None, 1 576)	conv2d_128[0][0]
batch_normalization_131 (BatchN	(None, None, None, 1 576)	conv2d_131[0][0]
activation_128 (Activation)	(None, None, None, 1 0)	batch_normalization_128[0][0]
activation_131 (Activation)	(None, None, None, 1 0)	batch_normalization_131[0][0]
block17_14_mixed (Concatenate)	(None, None, None, 3 0)	activation_128[0][0]
block17_14_conv (Conv2D)	(None, None, None, 1 418880)	activation_131[0][0]
block17_14 (Lambda)	(None, None, None, 1 0)	block17_14_mixed[0]
block17_14_ac (Activation)	(None, None, None, 1 0)	block17_13_ac[0][0]
conv2d_133 (Conv2D)	(None, None, None, 1 139264)	block17_14_conv[0][0]
batch_normalization_133 (BatchN	(None, None, None, 1 384)	conv2d_133[0][0]
activation_133 (Activation)	(None, None, None, 1 0)	batch_normalization_133[0][0]
conv2d_134 (Conv2D)	(None, None, None, 1 143360)	activation_133[0][0]
batch_normalization_134 (BatchN	(None, None, None, 1 480)	conv2d_134[0][0]
activation_134 (Activation)	(None, None, None, 1 0)	batch_normalization_134[0][0]
conv2d_132 (Conv2D)	(None, None, None, 1 208896)	block17_14_ac[0][0]
conv2d_135 (Conv2D)	(None, None, None, 1 215040)	activation_134[0][0]
batch_normalization_132 (BatchN	(None, None, None, 1 576)	conv2d_132[0][0]
batch_normalization_135 (BatchN	(None, None, None, 1 576)	conv2d_135[0][0]
activation_132 (Activation)	(None, None, None, 1 0)	batch_normalization_132[0][0]
activation_135 (Activation)	(None, None, None, 1 0)	batch_normalization_135[0][0]
block17_15_mixed (Concatenate)	(None, None, None, 3 0)	activation_132[0][0]
block17_15_conv (Conv2D)	(None, None, None, 1 418880)	activation_135[0][0]
block17_15 (Lambda)	(None, None, None, 1 0)	block17_15_mixed[0]
block17_15_ac (Activation)	(None, None, None, 1 0)	block17_14_ac[0][0]
conv2d_137 (Conv2D)	(None, None, None, 1 139264)	block17_15_conv[0][0]
batch_normalization_137 (BatchN	(None, None, None, 1 384)	conv2d_137[0][0]
activation_137 (Activation)	(None, None, None, 1 0)	batch_normalization_137[0][0]
conv2d_138 (Conv2D)	(None, None, None, 1 143360)	activation_137[0][0]
batch_normalization_138 (BatchN	(None, None, None, 1 480)	conv2d_138[0][0]
activation_138 (Activation)	(None, None, None, 1 0)	batch_normalization_138[0][0]
conv2d_136 (Conv2D)	(None, None, None, 1 208896)	block17_15_ac[0][0]
conv2d_139 (Conv2D)	(None, None, None, 1 215040)	activation_138[0][0]
batch_normalization_136 (BatchN	(None, None, None, 1 576)	conv2d_136[0][0]
batch_normalization_139 (BatchN	(None, None, None, 1 576)	conv2d_139[0][0]
activation_136 (Activation)	(None, None, None, 1 0)	batch_normalization_136[0][0]
activation_139 (Activation)	(None, None, None, 1 0)	batch_normalization_139[0][0]
block17_16_mixed (Concatenate)	(None, None, None, 3 0)	activation_136[0][0]
block17_16_conv (Conv2D)	(None, None, None, 1 418880)	activation_139[0][0]
block17_16 (Lambda)	(None, None, None, 1 0)	block17_16_mixed[0]
block17_16_ac (Activation)	(None, None, None, 1 0)	block17_15_ac[0][0]
conv2d_141 (Conv2D)	(None, None, None, 1 139264)	block17_16_conv[0][0]
batch_normalization_141 (BatchN	(None, None, None, 1 384)	conv2d_141[0][0]
activation_141 (Activation)	(None, None, None, 1 0)	batch_normalization_141[0][0]
conv2d_142 (Conv2D)	(None, None, None, 1 143360)	activation_141[0][0]
batch_normalization_142 (BatchN	(None, None, None, 1 480)	conv2d_142[0][0]
activation_142 (Activation)	(None, None, None, 1 0)	batch_normalization_142[0][0]
conv2d_140 (Conv2D)	(None, None, None, 1 208896)	block17_16_ac[0][0]
conv2d_143 (Conv2D)	(None, None, None, 1 215040)	activation_142[0][0]
batch_normalization_140 (BatchN	(None, None, None, 1 576)	conv2d_140[0][0]
batch_normalization_143 (BatchN	(None, None, None, 1 576)	conv2d_143[0][0]
activation_140 (Activation)	(None, None, None, 1 0)	batch_normalization_140[0][0]
activation_143 (Activation)	(None, None, None, 1 0)	batch_normalization_143[0][0]
block17_17_mixed (Concatenate)	(None, None, None, 3 0)	activation_140[0][0]
block17_17_conv (Conv2D)	(None, None, None, 1 418880)	activation_143[0][0]
block17_17 (Lambda)	(None, None, None, 1 0)	block17_17_mixed[0]
block17_17_ac (Activation)	(None, None, None, 1 0)	block17_16_ac[0][0]
conv2d_145 (Conv2D)	(None, None, None, 1 139264)	block17_17_conv[0][0]
batch_normalization_145 (BatchN	(None, None, None, 1 384)	conv2d_145[0][0]
activation_145 (Activation)	(None, None, None, 1 0)	batch_normalization_145[0][0]
conv2d_146 (Conv2D)	(None, None, None, 1 143360)	activation_145[0][0]
batch_normalization_146 (BatchN	(None, None, None, 1 480)	conv2d_146[0][0]
activation_146 (Activation)	(None, None, None, 1 0)	batch_normalization_146[0][0]
conv2d_144 (Conv2D)	(None, None, None, 1 208896)	block17_17_ac[0][0]
conv2d_147 (Conv2D)	(None, None, None, 1 215040)	activation_146[0][0]
batch_normalization_144 (BatchN	(None, None, None, 1 576)	conv2d_144[0][0]
batch_normalization_147 (BatchN	(None, None, None, 1 576)	conv2d_147[0][0]
activation_144 (Activation)	(None, None, None, 1 0)	batch_normalization_144[0][0]
activation_147 (Activation)	(None, None, None, 1 0)	batch_normalization_147[0][0]
block17_18_mixed (Concatenate)	(None, None, None, 3 0)	activation_144[0][0]
block17_18_conv (Conv2D)	(None, None, None, 1 418880)	activation_147[0][0]
block17_18 (Lambda)	(None, None, None, 1 0)	block17_18_mixed[0]
block17_18_ac (Activation)	(None, None, None, 1 0)	block17_17_ac[0][0]
conv2d_149 (Conv2D)	(None, None, None, 1 139264)	block17_18_conv[0][0]
batch_normalization_149 (BatchN	(None, None, None, 1 384)	conv2d_149[0][0]
activation_149 (Activation)	(None, None, None, 1 0)	batch_normalization_149[0][0]
conv2d_150 (Conv2D)	(None, None, None, 1 143360)	activation_149[0][0]
batch_normalization_150 (BatchN	(None, None, None, 1 480)	conv2d_150[0][0]
activation_150 (Activation)	(None, None, None, 1 0)	batch_normalization_150[0][0]
conv2d_148 (Conv2D)	(None, None, None, 1 208896)	block17_18_ac[0][0]
conv2d_151 (Conv2D)	(None, None, None, 1 215040)	activation_150[0][0]
batch_normalization_148 (BatchN	(None, None, None, 1 576)	conv2d_148[0][0]
batch_normalization_151 (BatchN	(None, None, None, 1 576)	conv2d_151[0][0]
activation_148 (Activation)	(None, None, None, 1 0)	batch_normalization_148[0][0]
activation_151 (Activation)	(None, None, None, 1 0)	batch_normalization_151[0][0]
block17_19_mixed (Concatenate)	(None, None, None, 3 0)	activation_148[0][0]
block17_19_conv (Conv2D)	(None, None, None, 1 418880)	activation_151[0][0]
block17_19 (Lambda)	(None, None, None, 1 0)	block17_19_mixed[0]
block17_19_ac (Activation)	(None, None, None, 1 0)	block17_18_ac[0][0]
conv2d_153 (Conv2D)	(None, None, None, 1 139264)	block17_19_conv[0][0]
batch_normalization_153 (BatchN	(None, None, None, 1 384)	conv2d_153[0][0]
activation_153 (Activation)	(None, None, None, 1 0)	batch_normalization_153[0][0]
conv2d_154 (Conv2D)	(None, None, None, 1 143360)	activation_153[0][0]
batch_normalization_154 (BatchN	(None, None, None, 1 480)	conv2d_154[0][0]
activation_154 (Activation)	(None, None, None, 1 0)	batch_normalization_154[0][0]
conv2d_152 (Conv2D)	(None, None, None, 1 208896)	block17_19_ac[0][0]
conv2d_155 (Conv2D)	(None, None, None, 1 215040)	activation_154[0][0]
batch_normalization_152 (BatchN	(None, None, None, 1 576)	conv2d_152[0][0]
batch_normalization_155 (BatchN	(None, None, None, 1 576)	conv2d_155[0][0]
activation_152 (Activation)	(None, None, None, 1 0)	batch_normalization_152[0][0]
activation_155 (Activation)	(None, None, None, 1 0)	batch_normalization_155[0][0]
block17_20_mixed (Concatenate)	(None, None, None, 3 0)	activation_152[0][0]
block17_20_conv (Conv2D)	(None, None, None, 1 418880)	activation_155[0][0]
block17_20 (Lambda)	(None, None, None, 1 0)	block17_20_mixed[0]
block17_20_ac (Activation)	(None, None, None, 1 0)	block17_19_ac[0][0]
conv2d_160 (Conv2D)	(None, None, None, 2 278528)	block17_20_conv[0][0]
batch_normalization_160 (BatchN	(None, None, None, 2 768)	conv2d_160[0][0]
activation_160 (Activation)	(None, None, None, 2 0)	batch_normalization_160[0][0]
conv2d_156 (Conv2D)	(None, None, None, 2 278528)	block17_20_ac[0][0]
conv2d_158 (Conv2D)	(None, None, None, 2 278528)	block17_20_ac[0][0]
conv2d_161 (Conv2D)	(None, None, None, 2 663552)	activation_160[0][0]
batch_normalization_156 (BatchN	(None, None, None, 2 768)	conv2d_156[0][0]
batch_normalization_158 (BatchN	(None, None, None, 2 768)	conv2d_158[0][0]
batch_normalization_161 (BatchN	(None, None, None, 2 864)	conv2d_161[0][0]
activation_156 (Activation)	(None, None, None, 2 0)	batch_normalization_156[0][0]
activation_158 (Activation)	(None, None, None, 2 0)	batch_normalization_158[0][0]
activation_161 (Activation)	(None, None, None, 2 0)	batch_normalization_161[0][0]
conv2d_157 (Conv2D)	(None, None, None, 3 884736)	activation_156[0][0]
conv2d_159 (Conv2D)	(None, None, None, 2 663552)	activation_158[0][0]
conv2d_162 (Conv2D)	(None, None, None, 3 829440)	activation_161[0][0]
batch_normalization_157 (BatchN	(None, None, None, 3 1152)	conv2d_157[0][0]
batch_normalization_159 (BatchN	(None, None, None, 2 864)	conv2d_159[0][0]
batch_normalization_162 (BatchN	(None, None, None, 3 960)	conv2d_162[0][0]
activation_157 (Activation)	(None, None, None, 3 0)	batch_normalization_157[0][0]
activation_159 (Activation)	(None, None, None, 2 0)	batch_normalization_159[0][0]
activation_162 (Activation)	(None, None, None, 3 0)	batch_normalization_162[0][0]
max_pooling2d_3 (MaxPooling2D)	(None, None, None, 1 0)	block17_20_ac[0][0]
mixed_7a (Concatenate)	(None, None, None, 2 0)	activation_157[0][0]
conv2d_164 (Conv2D)	(None, None, None, 1 399360)	activation_159[0][0]
batch_normalization_164 (BatchN	(None, None, None, 1 576)	activation_162[0][0]
activation_164 (Activation)	(None, None, None, 1 0)	max_pooling2d_3[0][0]
conv2d_165 (Conv2D)	(None, None, None, 2 129024)	conv2d_164[0][0]
batch_normalization_165 (BatchN	(None, None, None, 2 672)	activation_164[0][0]
activation_165 (Activation)	(None, None, None, 2 0)	conv2d_165[0][0]
conv2d_163 (Conv2D)	(None, None, None, 1 399360)	batch_normalization_165[0][0]
conv2d_166 (Conv2D)	(None, None, None, 2 172032)	mixed_7a[0][0]
batch_normalization_163 (BatchN	(None, None, None, 1 576)	conv2d_163[0][0]
batch_normalization_166 (BatchN	(None, None, None, 2 768)	activation_165[0][0]
activation_166 (Activation)	(None, None, None, 2 0)	batch_normalization_163[0][0]
block8_mixed (Concatenate)	(None, None, None, 4 0)	conv2d_166[0][0]
block8_1_conv (Conv2D)	(None, None, None, 2 933920)	activation_166[0][0]
block8_1 (Lambda)	(None, None, None, 2 0)	block8_mixed[0][0]
block8_1_ac (Activation)	(None, None, None, 2 0)	block8_1_conv[0][0]
conv2d_168 (Conv2D)	(None, None, None, 1 399360)	block8_1_ac[0][0]
batch_normalization_168 (BatchN	(None, None, None, 1 576)	conv2d_168[0][0]
activation_168 (Activation)	(None, None, None, 1 0)	batch_normalization_168[0][0]
conv2d_169 (Conv2D)	(None, None, None, 2 129024)	activation_168[0][0]
batch_normalization_169 (BatchN	(None, None, None, 2 672)	conv2d_169[0][0]
activation_169 (Activation)	(None, None, None, 2 0)	batch_normalization_169[0][0]
conv2d_167 (Conv2D)	(None, None, None, 1 399360)	block8_1_ac[0][0]
conv2d_170 (Conv2D)	(None, None, None, 2 172032)	activation_169[0][0]
batch_normalization_167 (BatchN	(None, None, None, 1 576)	conv2d_167[0][0]
batch_normalization_170 (BatchN	(None, None, None, 2 768)	conv2d_170[0][0]
activation_167 (Activation)	(None, None, None, 1 0)	batch_normalization_167[0][0]
activation_170 (Activation)	(None, None, None, 2 0)	batch_normalization_170[0][0]
block8_2_mixed (Concatenate)	(None, None, None, 4 0)	activation_167[0][0]
block8_2_conv (Conv2D)	(None, None, None, 2 933920)	activation_170[0][0]
block8_2 (Lambda)	(None, None, None, 2 0)	block8_2_mixed[0][0]
block8_2_ac (Activation)	(None, None, None, 2 0)	block8_2_conv[0][0]
conv2d_172 (Conv2D)	(None, None, None, 1 399360)	block8_2_ac[0][0]
batch_normalization_172 (BatchN	(None, None, None, 1 576)	block8_2_ac[0][0]
activation_172 (Activation)	(None, None, None, 1 0)	conv2d_172[0][0]
conv2d_173 (Conv2D)	(None, None, None, 2 129024)	activation_172[0][0]
batch_normalization_173 (BatchN	(None, None, None, 2 672)	conv2d_173[0][0]
activation_173 (Activation)	(None, None, None, 2 0)	batch_normalization_173[0][0]
conv2d_171 (Conv2D)	(None, None, None, 1 399360)	block8_2_ac[0][0]
conv2d_174 (Conv2D)	(None, None, None, 2 172032)	activation_173[0][0]
batch_normalization_171 (BatchN	(None, None, None, 1 576)	conv2d_171[0][0]
batch_normalization_174 (BatchN	(None, None, None, 2 768)	conv2d_174[0][0]
activation_171 (Activation)	(None, None, None, 1 0)	batch_normalization_171[0][0]
activation_174 (Activation)	(None, None, None, 2 0)	batch_normalization_174[0][0]



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block8_3_mixed (Concatenate)	(None, None, None, 4, 0)			activation_171[0][0]
				activation_174[0][0]
block8_3_conv (Conv2D)	(None, None, None, 2, 933920)			block8_3_mixed[0][0]
block8_3 (Lambda)	(None, None, None, 2, 0)			block8_2_ac[0][0]
				block8_3_conv[0][0]
block8_3_ac (Activation)	(None, None, None, 2, 0)			block8_3[0][0]
conv2d_176 (Conv2D)	(None, None, None, 1, 399360)			block8_3_ac[0][0]
batch_normalization_176 (BatchN	(None, None, None, 1, 576)			conv2d_176[0][0]
activation_176 (Activation)	(None, None, None, 1, 0)			batch_normalization_176[0][0]
conv2d_177 (Conv2D)	(None, None, None, 2, 129024)			activation_176[0][0]
batch_normalization_177 (BatchN	(None, None, None, 2, 672)			conv2d_177[0][0]
activation_177 (Activation)	(None, None, None, 2, 0)			batch_normalization_177[0][0]
conv2d_175 (Conv2D)	(None, None, None, 1, 399360)			block8_3_ac[0][0]
conv2d_178 (Conv2D)	(None, None, None, 2, 172032)			activation_177[0][0]
batch_normalization_175 (BatchN	(None, None, None, 1, 576)			conv2d_175[0][0]
batch_normalization_178 (BatchN	(None, None, None, 2, 768)			conv2d_178[0][0]
activation_175 (Activation)	(None, None, None, 1, 0)			batch_normalization_175[0][0]
activation_178 (Activation)	(None, None, None, 2, 0)			batch_normalization_178[0][0]
block8_4_mixed (Concatenate)	(None, None, None, 4, 0)			activation_175[0][0]
				activation_178[0][0]
block8_4_conv (Conv2D)	(None, None, None, 2, 933920)			block8_4_mixed[0][0]
block8_4 (Lambda)	(None, None, None, 2, 0)			block8_3_ac[0][0]
				block8_4_conv[0][0]
block8_4_ac (Activation)	(None, None, None, 2, 0)			block8_4[0][0]
conv2d_180 (Conv2D)	(None, None, None, 1, 399360)			block8_4_ac[0][0]
batch_normalization_180 (BatchN	(None, None, None, 1, 576)			conv2d_180[0][0]
activation_180 (Activation)	(None, None, None, 1, 0)			batch_normalization_180[0][0]
conv2d_181 (Conv2D)	(None, None, None, 2, 129024)			activation_180[0][0]
batch_normalization_181 (BatchN	(None, None, None, 2, 672)			conv2d_181[0][0]
activation_181 (Activation)	(None, None, None, 2, 0)			batch_normalization_181[0][0]
conv2d_179 (Conv2D)	(None, None, None, 1, 399360)			block8_4_ac[0][0]
conv2d_182 (Conv2D)	(None, None, None, 2, 172032)			activation_181[0][0]
batch_normalization_179 (BatchN	(None, None, None, 1, 576)			conv2d_179[0][0]
batch_normalization_182 (BatchN	(None, None, None, 2, 768)			conv2d_182[0][0]
activation_179 (Activation)	(None, None, None, 1, 0)			batch_normalization_179[0][0]
activation_182 (Activation)	(None, None, None, 2, 0)			batch_normalization_182[0][0]
block8_5_mixed (Concatenate)	(None, None, None, 4, 0)			activation_179[0][0]
				activation_182[0][0]
block8_5_conv (Conv2D)	(None, None, None, 2, 933920)			block8_5_mixed[0][0]
block8_5 (Lambda)	(None, None, None, 2, 0)			block8_4_ac[0][0]
				block8_5_conv[0][0]
block8_5_ac (Activation)	(None, None, None, 2, 0)			block8_5[0][0]
conv2d_184 (Conv2D)	(None, None, None, 1, 399360)			block8_5_ac[0][0]
batch_normalization_184 (BatchN	(None, None, None, 1, 576)			conv2d_184[0][0]
activation_184 (Activation)	(None, None, None, 1, 0)			batch_normalization_184[0][0]
conv2d_185 (Conv2D)	(None, None, None, 2, 129024)			activation_184[0][0]
batch_normalization_185 (BatchN	(None, None, None, 2, 672)			conv2d_185[0][0]
activation_185 (Activation)	(None, None, None, 2, 0)			batch_normalization_185[0][0]
conv2d_183 (Conv2D)	(None, None, None, 1, 399360)			block8_5_ac[0][0]
conv2d_186 (Conv2D)	(None, None, None, 2, 172032)			activation_185[0][0]
batch_normalization_183 (BatchN	(None, None, None, 1, 576)			conv2d_183[0][0]
batch_normalization_186 (BatchN	(None, None, None, 2, 768)			conv2d_186[0][0]
activation_183 (Activation)	(None, None, None, 1, 0)			batch_normalization_183[0][0]
activation_186 (Activation)	(None, None, None, 2, 0)			batch_normalization_186[0][0]
block8_6_mixed (Concatenate)	(None, None, None, 4, 0)			activation_183[0][0]
				activation_186[0][0]
block8_6_conv (Conv2D)	(None, None, None, 2, 933920)			block8_6_mixed[0][0]
block8_6 (Lambda)	(None, None, None, 2, 0)			block8_5_ac[0][0]
				block8_6_conv[0][0]
block8_6_ac (Activation)	(None, None, None, 2, 0)			block8_6[0][0]
conv2d_188 (Conv2D)	(None, None, None, 1, 399360)			block8_6_ac[0][0]
batch_normalization_188 (BatchN	(None, None, None, 1, 576)			conv2d_188[0][0]
activation_188 (Activation)	(None, None, None, 1, 0)			batch_normalization_188[0][0]
conv2d_189 (Conv2D)	(None, None, None, 2, 129024)			activation_188[0][0]
batch_normalization_189 (BatchN	(None, None, None, 2, 672)			conv2d_189[0][0]
activation_189 (Activation)	(None, None, None, 2, 0)			batch_normalization_189[0][0]
conv2d_187 (Conv2D)	(None, None, None, 1, 399360)			block8_6_ac[0][0]
conv2d_190 (Conv2D)	(None, None, None, 2, 172032)			activation_189[0][0]
batch_normalization_187 (BatchN	(None, None, None, 1, 576)			conv2d_187[0][0]
batch_normalization_190 (BatchN	(None, None, None, 2, 768)			conv2d_190[0][0]
activation_187 (Activation)	(None, None, None, 1, 0)			batch_normalization_187[0][0]
activation_190 (Activation)	(None, None, None, 2, 0)			batch_normalization_190[0][0]
block8_7_mixed (Concatenate)	(None, None, None, 4, 0)			activation_187[0][0]
				activation_190[0][0]
block8_7_conv (Conv2D)	(None, None, None, 2, 933920)			block8_7_mixed[0][0]
block8_7 (Lambda)	(None, None, None, 2, 0)			block8_6_ac[0][0]
				block8_7_conv[0][0]
block8_7_ac (Activation)	(None, None, None, 2, 0)			block8_7[0][0]
conv2d_192 (Conv2D)	(None, None, None, 1, 399360)			block8_7_ac[0][0]
batch_normalization_192 (BatchN	(None, None, None, 1, 576)			conv2d_192[0][0]
activation_192 (Activation)	(None, None, None, 1, 0)			batch_normalization_192[0][0]
conv2d_193 (Conv2D)	(None, None, None, 2, 129024)			activation_192[0][0]
batch_normalization_193 (BatchN	(None, None, None, 2, 672)			conv2d_193[0][0]
activation_193 (Activation)	(None, None, None, 2, 0)			batch_normalization_193[0][0]
conv2d_191 (Conv2D)	(None, None, None, 1, 399360)			block8_7_ac[0][0]
conv2d_194 (Conv2D)	(None, None, None, 2, 172032)			activation_193[0][0]
batch_normalization_191 (BatchN	(None, None, None, 1, 576)			conv2d_191[0][0]
batch_normalization_194 (BatchN	(None, None, None, 2, 768)			conv2d_194[0][0]
activation_191 (Activation)	(None, None, None, 1, 0)			batch_normalization_191[0][0]
activation_194 (Activation)	(None, None, None, 2, 0)			batch_normalization_194[0][0]
block8_8_mixed (Concatenate)	(None, None, None, 4, 0)			activation_191[0][0]
				activation_194[0][0]
block8_8_conv (Conv2D)	(None, None, None, 2, 933920)			block8_8_mixed[0][0]
block8_8 (Lambda)	(None, None, None, 2, 0)			block8_7_ac[0][0]
				block8_8_conv[0][0]
block8_8_ac (Activation)	(None, None, None, 2, 0)			block8_8[0][0]
conv2d_196 (Conv2D)	(None, None, None, 1, 399360)			block8_8_ac[0][0]
batch_normalization_196 (BatchN	(None, None, None, 1, 576)			conv2d_196[0][0]
activation_196 (Activation)	(None, None, None, 1, 0)			batch_normalization_196[0][0]
conv2d_197 (Conv2D)	(None, None, None, 2, 129024)			activation_196[0][0]
batch_normalization_197 (BatchN	(None, None, None, 2, 672)			conv2d_197[0][0]
activation_197 (Activation)	(None, None, None, 2, 0)			batch_normalization_197[0][0]
conv2d_195 (Conv2D)	(None, None, None, 1, 399360)			block8_8_ac[0][0]
conv2d_198 (Conv2D)	(None, None, None, 2, 172032)			activation_197[0][0]
batch_normalization_195 (BatchN	(None, None, None, 1, 576)			conv2d_195[0][0]
batch_normalization_198 (BatchN	(None, None, None, 2, 768)			conv2d_198[0][0]
activation_195 (Activation)	(None, None, None, 1, 0)			batch_normalization_195[0][0]
activation_198 (Activation)	(None, None, None, 2, 0)			batch_normalization_198[0][0]
block8_9_mixed (Concatenate)	(None, None, None, 4, 0)			activation_195[0][0]
				activation_198[0][0]
block8_9_conv (Conv2D)	(None, None, None, 2, 933920)			block8_9_mixed[0][0]
block8_9 (Lambda)	(None, None, None, 2, 0)			block8_8_ac[0][0]
				block8_9_conv[0][0]
block8_9_ac (Activation)	(None, None, None, 2, 0)			block8_9[0][0]
conv2d_200 (Conv2D)	(None, None, None, 1, 399360)			block8_9_ac[0][0]
batch_normalization_200 (BatchN	(None, None, None, 1, 576)			conv2d_200[0][0]
activation_200 (Activation)	(None, None, None, 1, 0)			batch_normalization_200[0][0]
conv2d_201 (Conv2D)	(None, None, None, 2, 129024)			activation_200[0][0]
batch_normalization_201 (BatchN	(None, None, None, 2, 672)			conv2d_201[0][0]
activation_201 (Activation)	(None, None, None, 2, 0)			batch_normalization_201[0][0]
conv2d_199 (Conv2D)	(None, None, None, 1, 399360)			block8_9_ac[0][0]
conv2d_202 (Conv2D)	(None, None, None, 2, 172032)			activation_201[0][0]
batch_normalization_199 (BatchN	(None, None, None, 1, 576)			conv2d_199[0][0]
batch_normalization_202 (BatchN	(None, None, None, 2, 768)			conv2d_202[0][0]
activation_199 (Activation)	(None, None, None, 1, 0)			batch_normalization_199[0][0]
activation_202 (Activation)	(None, None, None, 2, 0)			batch_normalization_202[0][0]
block8_10_mixed (Concatenate)	(None, None, None, 4, 0)			activation_199[0][0]
				activation_202[0][0]
block8_10_conv (Conv2D)	(None, None, None, 2, 933920)			block8_10_mixed[0][0]
block8_10 (Lambda)	(None, None, None, 2, 0)			block8_9_ac[0][0]
				block8_10_conv[0][0]
conv_7b (Conv2D)	(None, None, None, 1, 3194880)			block8_10[0][0]
conv_7b_bn (BatchNormalization)	(None, None, None, 1, 4608)			conv_7b[0][0]
conv_7b_ac (Activation)	(None, None, None, 1, 0)			conv_7b_bn[0][0]
global_max_pooling2d (GlobalMax	(None, 1536)	0		conv_7b_ac[0][0]
dense (Dense)	(None, 128)	196736		global_max_pooling2d[0][0]
dense_1 (Dense)	(None, 64)	8256		dense[0][0]
dense_2 (Dense)	(None, 32)	2080		dense_1[0][0]
dropout (Dropout)	(None, 0.5)	0		dense_2[0][0]
dense_3 (Dense)	(None, 3)	99		dropout[0][0]
Total params: 54,543,907				
Trainable params: 54,483,363				
Non-trainable params: 60,544				

```
In [6]: #definindo os neuronios já treinados na ImageNet, queremos retreinar somente a ultima
for i in model.layers:
    if i.name.split('/')[-1][0] != 'dense':
        i.trainable=False
    else:
        i.trainable=True
```

```
In [7]: #definindo objeto que apanhara todas as imagens de treino, processando as imagens com
train_data_gen = tf.keras.preprocessing.image.ImageDataGenerator(preprocessing_function=
#definindo objeto que apanhara todas as imagens de teste, processando as imagens com
test_data_gen = tf.keras.preprocessing.image.ImageDataGenerator(preprocessing_function=
```

```
In [8]: #CARREGANDO PRÓPRIO DATASET PARA USO
#definindo gerador de imagens de treino
train_generator = train_data_gen.flow_from_directory('shapes_split/train',
target_size=(224, 224), # tamanho da
batch_size=batch_size,
class_mode='categorical',
shuffle=True)
#definindo gerador de imagens de teste
test_generator = test_data_gen.flow_from_directory('shapes_split/test',
target_size=(224, 224), # tamanho da
batch_size=batch_size,
class_mode='categorical',
shuffle=True)
```

Found 240 images belonging to 3 classes.  
Found 60 images belonging to 3 classes.

```
In [9]: lr = tf.keras.optimizers.Adam(learning_rate=0.001) #estabelecendo taxa de otimização
model.compile(optimizer=lr, loss='categorical_crossentropy', metrics=['accuracy'])
```

```
In [10]: #definicao dos steps
step_size_train = train_generator.n//train_generator.batch_size
step_size_test = test_generator.n//test_generator.batch_size
```

```
In [11]: #treinando e testando o modelo
history = model.fit_generator(generator=train_generator,
steps_per_epoch=step_size_train,
epochs=epochs,
validation_data=test_generator,
validation_steps=step_size_test)
```

```
Epoch 1/100
c:\Users\vinicius\appdata\local\programs\python\python39\lib\site-packages\tensorflow
python\keras\engine\training.py:1973: UserWarning: Model.fit_generator() is deprecated
and will be removed in a future version. Please use 'Model.fit()', which supports gene
rators.
warnings.warn('Model.fit_generator() is deprecated and
7/7 [=====] - 46s 5s/step - loss: 1.8705 - accuracy: 0.4511 -
val_loss: 0.3173 - val_accuracy: 0.9375
Epoch 2/100
7/7 [=====] - 31s 5s/step - loss: 0.4232 - accuracy: 0.7959 -
val_loss: 0.0395 - val_accuracy: 1.0000
Epoch 3/100
7/7 [=====] - 29s 4s/step - loss: 0.1309 - accuracy: 0.9395 -
val_loss: 0.0104 - val_accuracy: 1.0000
Epoch 4/100
7/7 [=====] - 29s 4s/step - loss: 0.0953 - accuracy: 0.9522 -
val_loss: 0.0065 - val_accuracy: 1.0000
Epoch 5/100
7/7 [=====] - 30s 5s/step - loss: 0.0989 - accuracy: 0.9681 -
val_loss: 1.1644e-04 - val_accuracy: 1.0000
Epoch 6/100
7/7 [=====] - 30s 4s/step - loss: 0.0618 - accuracy: 0.9751 -
val_loss: 0.0012 - val_accuracy: 1.0000
Epoch 7/100
7/7 [=====] - 31s 5s/step - loss: 0.0151 - accuracy: 0.9934 -
val_loss: 7.2008e-04 - val_accuracy: 1.0000
Epoch 8/100
7/7 [=====] - 29s 4s/step - loss: 0.0221 - accuracy: 0.9918 -
val_loss: 0.0296 - val_accuracy: 0.9688
Epoch 9/100
7/7 [=====] - 29s 4s/step - loss: 0.0312 - accuracy: 0.9795 -
val_loss: 0.0307 - val_accuracy: 0.9688
Epoch 10/100
7/7 [=====] - 30s 4s/step - loss: 0.0167 - accuracy: 0.9928 -
val_loss: 4.7024e-04 - val_accuracy: 1.0000
Epoch 11/100
7/7 [=====] - 31s 5s/step - loss: 0.0088 - accuracy: 0.9982 -
val_loss: 7.8598e-04 - val_accuracy: 1.0000
Epoch 12/100
7/7 [=====] - 30s 4s/step - loss: 0.0439 - accuracy: 0.9761 -
val_loss: 2.3220e-04 - val_accuracy: 1.0000
Epoch 13/100
7/7 [=====] - 30s 4s/step - loss: 0.0228 - accuracy: 0.9860 -
val_loss: 1.8959e-04 - val_accuracy: 1.0000
Epoch 14/100
7/7 [=====] - 30s 5s/step - loss: 0.0069 - accuracy: 1.0000 -
val_loss: 0.0028 - val_accuracy: 1.0000
Epoch 15/100
7/7 [=====] - 29s 4s/step - loss: 0.0186 - accuracy: 0.9880 -
val_loss: 0.0217 - val_accuracy: 1.0000
Epoch 16/100
7/7 [=====] - 29s 4s/step - loss: 0.0090 - accuracy: 0.9930 -
val_loss: 0.0174 - val_accuracy: 1.0000
Epoch 17/100
7/7 [=====] - 30s 4s/step - loss: 0.0097 - accuracy: 0.9935 -
val_loss: 6.7910e-04 - val_accuracy: 1.0000
Epoch 18/100
7/7 [=====] - 29s 4s/step - loss: 0.0070 - accuracy: 0.9981 -
val_loss: 0.0089 - val_accuracy: 1.0000
Epoch 19/100
7/7 [=====] - 31s 5s/step - loss: 0.0196 - accuracy: 0.9906 -
val_loss: 0.0018 - val_accuracy: 1.0000
Epoch 20/100
7/7 [=====] - 29s 4s/step - loss: 0.0076 - accuracy: 1.0000 -
val_loss: 3.0639e-04 - val_accuracy: 1.0000
Epoch 21/100
7/7 [=====] - 30s 4s/step - loss: 0.0075 - accuracy: 1.0000 -
val_loss: 0.0622 - val_accuracy: 0.9688
Epoch 22/100
7/7 [=====] - 30s 4s/step - loss: 0.0053 - accuracy: 0.9981 -
val_loss: 0.0048 - val_accuracy: 1.0000
Epoch 23/100
7/7 [=====] - 30s 4s/step - loss: 0.0110 - accuracy: 0.9930 -
val_loss: 2.5626e-04 - val_accuracy: 1.0000
Epoch 24/100
7/7 [=====] - 30s 4s/step - loss: 0.0042 - accuracy: 1.0000 -
val_loss: 2.4377e-04 - val_accuracy: 1.0000
Epoch 25/100
7/7 [=====] - 30s 4s/step - loss: 0.0353 - accuracy: 0.9880 -
val_loss: 4.9184e-05 - val_accuracy: 1.0000
Epoch 26/100
7/7 [=====] - 30s 4s/step - loss: 0.0194 - accuracy: 0.9902 -
val_loss: 3.9413e-06 - val_accuracy: 1.0000
Epoch 27/100
7/7 [=====] - 29s 4s/step - loss: 0.0059 - accuracy: 0.9988 -
val_loss: 2.1277e-04 - val_accuracy: 1.0000
Epoch 28/100
7/7 [=====] - 29s 4s/step - loss: 0.0080 - accuracy: 1.0000 -
val_loss: 0.0021 - val_accuracy: 1.0000
Epoch 29/100
7/7 [=====] - 31s 5s/step - loss: 0.0196 - accuracy: 0.9906 -
val_loss: 0.0018 - val_accuracy: 1.0000
Epoch 30/100
7/7 [=====] - 30s 4s/step - loss: 0.0076 - accuracy: 1.0000 -
val_loss: 3.0639e-04 - val_accuracy: 1.0000
Epoch 31/100
7/7 [=====] - 30s 4s/step - loss: 0.0075 - accuracy: 1.0000 -
val_loss: 0.0622 - val_accuracy: 0.9688
Epoch 32/100
7/7 [=====] - 30s 4s/step - loss: 0.0053 - accuracy: 0.9981 -
val_loss: 0.0048 - val_accuracy: 1.0000
Epoch 33/100
7/7 [=====] - 30s 4s/step - loss: 0.0110 - accuracy: 0.9930 -
val_loss: 2.5626e-04 - val_accuracy: 1.0000
Epoch 34/100
7/7 [=====] - 29s 4s/step - loss: 0.0042 - accuracy: 1.0000 -
val_loss: 2.4377e-04 - val_accuracy: 1.0000
Epoch 35/100
7/7 [=====] - 30s 4s/step - loss: 0.0353 - accuracy: 0.9880 -
val_loss: 4.9184e-05 - val_accuracy: 1.0000
Epoch 36/100
7/7 [=====] - 30s 4s/step - loss: 0.0194 - accuracy: 0.9902 -
val_loss: 3.9413e-06 - val_accuracy: 1.0000
Epoch 37/100
7/7 [=====] - 29s 4s/step - loss: 0.0059 - accuracy: 0.9988 -
val_loss: 2.1277e-04 - val_accuracy: 1.0000
Epoch 38/100
7/7 [=====] - 29s 4s/step - loss: 0.0080 - accuracy: 1.0000 -
val_loss: 0.0021 - val_accuracy: 1.0000
Epoch 39/100
7/7 [=====] - 31s 5s/step - loss: 0.0196 - accuracy: 0.9906 -
val_loss: 0.0018 - val_accuracy: 1.0000
Epoch 40/100
7/7 [=====] - 30s 4s/step - loss: 0.0076 - accuracy: 1.0000 -
val_loss: 3.0639e-04 - val_accuracy: 1.0000
Epoch 41/100
7/7 [=====] - 30s 4s/step - loss: 0.0075 - accuracy: 1.0000 -
val_loss: 0.0622 - val_accuracy: 0.9688
Epoch 42/100
7/7 [=====] - 30s 4s/step - loss: 0.0053 - accuracy: 0.9981 -
val_loss: 0.0048 - val_accuracy: 1.0000
Epoch 43/100
7/7 [=====] - 30s 4s/step - loss: 0.0110 - accuracy: 0.9930 -
val_loss: 2.5626e-04 - val_accuracy: 1.0000
Epoch 44/100
7/7 [=====] - 29s 4s/step - loss: 0.0042 - accuracy: 1.0000 -
val_loss: 2.4377e-04 - val_accuracy: 1.0000
Epoch 45/100
7/7 [=====] - 30s 4s/step - loss: 0.0353 - accuracy: 0.9880 -
val_loss: 4.9184e-05 - val_accuracy: 1.0000
Epoch 46/100
7/7 [=====] - 30s 4s/step - loss: 0.0194 - accuracy: 0.9902 -
val_loss: 3.9413e-06 - val_accuracy: 1.0000
Epoch 47/100
7/7 [=====] - 29s 4s/step - loss: 0.0059 - accuracy: 0.9988 -
val_loss: 2.1277e-04 - val_accuracy: 1.0000
Epoch 48/100
7/7 [=====] - 29s 4s/step - loss: 0.0080 - accuracy: 1.0000 -
val_loss: 0.0021 - val_accuracy: 1.0000
Epoch 49/100
7/7 [=====] - 31s 5s/step - loss: 0.0196 - accuracy: 0.9906 -
val_loss: 0.0018 - val_accuracy: 1.0000
Epoch 50/100
7/7 [=====] - 30s 4s/step - loss: 0.0076 - accuracy: 1.0000 -
val_loss: 3.0639e-04 - val_accuracy: 1.0000
Epoch 51/100
7/7 [=====] - 30s 4s/step - loss
```





```
In [15]: print('Criando classificações..')
labels = os.listdir('shapes_split/test')
print('Rótulos', labels)
#criando estruturas para métricas de avaliação, processo um pouco mais demorado
Y_pred = model.predict_generator(test_generator)
print('Preds Created')
y_pred = np.argmax(Y_pred, axis=1)
print('Preds 1D created')
```

Criando classificações..  
Rótulos ['circles', 'squares', 'triangles']

c:\users\vinicius\appdata\local\programs\python\python39\lib\site-packages\tensorflow\python\keras\engine\training.py:2001: UserWarning: 'Model.predict\_generator' is deprecated and will be removed in a future version. Please use 'Model.predict', which supports generators.

warnings.warn('Model.predict\_generator' is deprecated and 'Model.predict' is preferred for generators')

Preds Created

Preds 1D created

```
In [16]: classification = classification_report(test_generator.classes, y_pred, target_names=labels)
print('-----CLASSIFICATION-----')
print(classification)
matrix = confusion_matrix(test_generator.classes, y_pred)
df_cm = pd.DataFrame(matrix, index = [i for i in range(3)],
                      columns = [i for i in range(3)])
plt.figure(figsize = (10,7))
print('-----MATRIX-----')
sns.heatmap(df_cm, annot=True, linewidths=2.5)
```

	precision	recall	f1-score	support
circles	0.35	0.35	0.35	20
squares	0.40	0.40	0.40	20
triangles	0.35	0.35	0.35	20
accuracy			0.37	60
macro avg	0.37	0.37	0.37	60
weighted avg	0.37	0.37	0.37	60

-----MATRIX-----



```
In [ ] :
```