In [1]:

```
import keras
from keras.preprocessing.image import ImageDataGenerator
from keras.applications import ResNet50
from keras.applications.resnet50 import preprocess_input
from keras import Model,layers
```

```
Using TensorFlow backend.
```

In [2]:

```
keras.__version__
```

Out[2]:

```
'2.2.4'
```

In [3]:

```
input_path ="C:/Users/Dell/Downloads/alien-vs-predator-images/data/"
```

In [4]:

```
train_gen = ImageDataGenerator(shear_range= 0.2, #break of image
                               zoom_range= 0.2, # zoom in or out
                               horizontal_flip=True, #Image Flip
                               preprocessing_function=preprocess_input)
```

In [5]:

```
train_dat = train_gen.flow_from_directory(input_path +'train' ,
                                          target_size=(224,224), # acutal size of the image
                                          class_mode= "binary", # because its a Classification tas
                                          batch_size=32)
```

```
Found 694 images belonging to 2 classes.
```

In [6]:

```
validation_gen =ImageDataGenerator(preprocessing_function=preprocess_input)
```

In [7]:

```
validation_dat = validation_gen.flow_from_directory(input_path + "validation",
                                                    target_size=(224,224),
                                                    class_mode="binary",
                                                    shuffle=False)
```

```
Found 200 images belonging to 2 classes.
```

In [8]:

```
conv_base = ResNet50(
    include_top=False,
    weights='imagenet')#Creating the network
```

```
WARNING:tensorflow:From C:\Users\Dell\Anaconda3\lib\site-
packages\tensorflow\python\framework\op_def_library.py:263: colocate_with (from
tensorflow.python.framework.ops) is deprecated and will be removed in a future version.
Instructions for updating:
Colocations handled automatically by placer.
```

```
C:\Users\Dell\Anaconda3\lib\site-packages\keras_applications\resnet50.py:265: UserWarning: The out
```

```
put shape of `ResNet50(include_top=False)` has been changed since Keras 2.2.0.
  warnings.warn('The output shape of `ResNet50(include_top=False)` '
```

In [9]:

```
for layer in conv_base.layers:
    layer.trainable = False
```

In [11]:

```
x = conv_base.output
x = layers.GlobalAveragePooling2D()(x)
x = layers.Dense(128, activation='relu')(x)
predictions = layers.Dense(2, activation='softmax')(x)  # adding hidden and output layer to the out
put got from Conv base
model = Model(conv_base.input, predictions)
```

In [12]:

```
optimizer = keras.optimizers.Adam()
model.compile(loss='sparse_categorical_crossentropy',
              optimizer=optimizer,                        #adding Optimizer
              metrics=['accuracy'])
```

In [14]:

```
model.summary()
```

```
__________________________________________________________________________________________________
Layer (type)                    Output Shape         Param #     Connected to
==================================================================================================
input_1 (InputLayer)            (None, None, None, 3 0
__________________________________________________________________________________________________
conv1_pad (ZeroPadding2D)       (None, None, None, 3 0           input_1[0][0]
__________________________________________________________________________________________________
conv1 (Conv2D)                  (None, None, None, 6 9472        conv1_pad[0][0]
__________________________________________________________________________________________________
bn_conv1 (BatchNormalization)   (None, None, None, 6 256         conv1[0][0]
__________________________________________________________________________________________________
activation_1 (Activation)       (None, None, None, 6 0           bn_conv1[0][0]
__________________________________________________________________________________________________
pool1_pad (ZeroPadding2D)       (None, None, None, 6 0           activation_1[0][0]
__________________________________________________________________________________________________
max_pooling2d_1 (MaxPooling2D)  (None, None, None, 6 0           pool1_pad[0][0]
__________________________________________________________________________________________________
res2a_branch2a (Conv2D)         (None, None, None, 6 4160        max_pooling2d_1[0][0]
__________________________________________________________________________________________________
bn2a_branch2a (BatchNormalizati (None, None, None, 6 256         res2a_branch2a[0][0]
__________________________________________________________________________________________________
activation_2 (Activation)       (None, None, None, 6 0           bn2a_branch2a[0][0]
__________________________________________________________________________________________________
res2a_branch2b (Conv2D)         (None, None, None, 6 36928       activation_2[0][0]
__________________________________________________________________________________________________
bn2a_branch2b (BatchNormalizati (None, None, None, 6 256         res2a_branch2b[0][0]
__________________________________________________________________________________________________
activation_3 (Activation)       (None, None, None, 6 0           bn2a_branch2b[0][0]
__________________________________________________________________________________________________
res2a_branch2c (Conv2D)         (None, None, None, 2 16640       activation_3[0][0]
__________________________________________________________________________________________________
res2a_branch1 (Conv2D)          (None, None, None, 2 16640       max_pooling2d_1[0][0]
__________________________________________________________________________________________________
bn2a_branch2c (BatchNormalizati (None, None, None, 2 1024        res2a_branch2c[0][0]
__________________________________________________________________________________________________
bn2a_branch1 (BatchNormalizatio (None, None, None, 2 1024        res2a_branch1[0][0]
__________________________________________________________________________________________________
add_1 (Add)                     (None, None, None, 2 0           bn2a_branch2c[0][0]
                                                                 bn2a_branch1[0][0]
__________________________________________________________________________________________________
activation_4 (Activation)       (None, None, None, 2 0           add_1[0][0]
__________________________________________________________________________________________________
res2b_branch2a (Conv2D)         (None, None, None, 6 16448       activation_4[0][0]
__________________________________________________________________________________________________
```

bn2b_branch2a (BatchNormalizati	(None, None, None, 6	256	res2b_branch2a[0][0]
activation_5 (Activation)	(None, None, None, 6	0	bn2b_branch2a[0][0]
res2b_branch2b (Conv2D)	(None, None, None, 6	36928	activation_5[0][0]
bn2b_branch2b (BatchNormalizati	(None, None, None, 6	256	res2b_branch2b[0][0]
activation_6 (Activation)	(None, None, None, 6	0	bn2b_branch2b[0][0]
res2b_branch2c (Conv2D)	(None, None, None, 2	16640	activation_6[0][0]
bn2b_branch2c (BatchNormalizati	(None, None, None, 2	1024	res2b_branch2c[0][0]
add_2 (Add)	(None, None, None, 2	0	bn2b_branch2c[0][0] activation_4[0][0]
activation_7 (Activation)	(None, None, None, 2	0	add_2[0][0]
res2c_branch2a (Conv2D)	(None, None, None, 6	16448	activation_7[0][0]
bn2c_branch2a (BatchNormalizati	(None, None, None, 6	256	res2c_branch2a[0][0]
activation_8 (Activation)	(None, None, None, 6	0	bn2c_branch2a[0][0]
res2c_branch2b (Conv2D)	(None, None, None, 6	36928	activation_8[0][0]
bn2c_branch2b (BatchNormalizati	(None, None, None, 6	256	res2c_branch2b[0][0]
activation_9 (Activation)	(None, None, None, 6	0	bn2c_branch2b[0][0]
res2c_branch2c (Conv2D)	(None, None, None, 2	16640	activation_9[0][0]
bn2c_branch2c (BatchNormalizati	(None, None, None, 2	1024	res2c_branch2c[0][0]
add_3 (Add)	(None, None, None, 2	0	bn2c_branch2c[0][0] activation_7[0][0]
activation_10 (Activation)	(None, None, None, 2	0	add_3[0][0]
res3a_branch2a (Conv2D)	(None, None, None, 1	32896	activation_10[0][0]
bn3a_branch2a (BatchNormalizati	(None, None, None, 1	512	res3a_branch2a[0][0]
activation_11 (Activation)	(None, None, None, 1	0	bn3a_branch2a[0][0]
res3a_branch2b (Conv2D)	(None, None, None, 1	147584	activation_11[0][0]
bn3a_branch2b (BatchNormalizati	(None, None, None, 1	512	res3a_branch2b[0][0]
activation_12 (Activation)	(None, None, None, 1	0	bn3a_branch2b[0][0]
res3a_branch2c (Conv2D)	(None, None, None, 5	66048	activation_12[0][0]
res3a_branch1 (Conv2D)	(None, None, None, 5	131584	activation_10[0][0]
bn3a_branch2c (BatchNormalizati	(None, None, None, 5	2048	res3a_branch2c[0][0]
bn3a_branch1 (BatchNormalizatio	(None, None, None, 5	2048	res3a_branch1[0][0]
add_4 (Add)	(None, None, None, 5	0	bn3a_branch2c[0][0] bn3a_branch1[0][0]
activation_13 (Activation)	(None, None, None, 5	0	add_4[0][0]
res3b_branch2a (Conv2D)	(None, None, None, 1	65664	activation_13[0][0]
bn3b_branch2a (BatchNormalizati	(None, None, None, 1	512	res3b_branch2a[0][0]
activation_14 (Activation)	(None, None, None, 1	0	bn3b_branch2a[0][0]
res3b_branch2b (Conv2D)	(None, None, None, 1	147584	activation_14[0][0]
bn3b_branch2b (BatchNormalizati	(None, None, None, 1	512	res3b_branch2b[0][0]
activation_15 (Activation)	(None, None, None, 1	0	bn3b_branch2b[0][0]

res3b_branch2c (Conv2D)	(None, None, None, 5	66048	activation_15[0][0]
bn3b_branch2c (BatchNormalizati	(None, None, None, 5	2048	res3b_branch2c[0][0]
add_5 (Add)	(None, None, None, 5	0	bn3b_branch2c[0][0] activation_13[0][0]
activation_16 (Activation)	(None, None, None, 5	0	add_5[0][0]
res3c_branch2a (Conv2D)	(None, None, None, 1	65664	activation_16[0][0]
bn3c_branch2a (BatchNormalizati	(None, None, None, 1	512	res3c_branch2a[0][0]
activation_17 (Activation)	(None, None, None, 1	0	bn3c_branch2a[0][0]
res3c_branch2b (Conv2D)	(None, None, None, 1	147584	activation_17[0][0]
bn3c_branch2b (BatchNormalizati	(None, None, None, 1	512	res3c_branch2b[0][0]
activation_18 (Activation)	(None, None, None, 1	0	bn3c_branch2b[0][0]
res3c_branch2c (Conv2D)	(None, None, None, 5	66048	activation_18[0][0]
bn3c_branch2c (BatchNormalizati	(None, None, None, 5	2048	res3c_branch2c[0][0]
add_6 (Add)	(None, None, None, 5	0	bn3c_branch2c[0][0] activation_16[0][0]
activation_19 (Activation)	(None, None, None, 5	0	add_6[0][0]
res3d_branch2a (Conv2D)	(None, None, None, 1	65664	activation_19[0][0]
bn3d_branch2a (BatchNormalizati	(None, None, None, 1	512	res3d_branch2a[0][0]
activation_20 (Activation)	(None, None, None, 1	0	bn3d_branch2a[0][0]
res3d_branch2b (Conv2D)	(None, None, None, 1	147584	activation_20[0][0]
bn3d_branch2b (BatchNormalizati	(None, None, None, 1	512	res3d_branch2b[0][0]
activation_21 (Activation)	(None, None, None, 1	0	bn3d_branch2b[0][0]
res3d_branch2c (Conv2D)	(None, None, None, 5	66048	activation_21[0][0]
bn3d_branch2c (BatchNormalizati	(None, None, None, 5	2048	res3d_branch2c[0][0]
add_7 (Add)	(None, None, None, 5	0	bn3d_branch2c[0][0] activation_19[0][0]
activation_22 (Activation)	(None, None, None, 5	0	add_7[0][0]
res4a_branch2a (Conv2D)	(None, None, None, 2	131328	activation_22[0][0]
bn4a_branch2a (BatchNormalizati	(None, None, None, 2	1024	res4a_branch2a[0][0]
activation_23 (Activation)	(None, None, None, 2	0	bn4a_branch2a[0][0]
res4a_branch2b (Conv2D)	(None, None, None, 2	590080	activation_23[0][0]
bn4a_branch2b (BatchNormalizati	(None, None, None, 2	1024	res4a_branch2b[0][0]
activation_24 (Activation)	(None, None, None, 2	0	bn4a_branch2b[0][0]
res4a_branch2c (Conv2D)	(None, None, None, 1	263168	activation_24[0][0]
res4a_branch1 (Conv2D)	(None, None, None, 1	525312	activation_22[0][0]
bn4a_branch2c (BatchNormalizati	(None, None, None, 1	4096	res4a_branch2c[0][0]
bn4a_branch1 (BatchNormalizatio	(None, None, None, 1	4096	res4a_branch1[0][0]
add_8 (Add)	(None, None, None, 1	0	bn4a_branch2c[0][0] bn4a_branch1[0][0]
activation_25 (Activation)	(None, None, None, 1	0	add_8[0][0]
res4b_branch2a (Conv2D)	(None, None, None, 2	262400	activation_25[0][0]

bn4b_branch2a (BatchNormalizati	(None, None, None, 2	1024	res4b_branch2a[0][0]
activation_26 (Activation)	(None, None, None, 2	0	bn4b_branch2a[0][0]
res4b_branch2b (Conv2D)	(None, None, None, 2	590080	activation_26[0][0]
bn4b_branch2b (BatchNormalizati	(None, None, None, 2	1024	res4b_branch2b[0][0]
activation_27 (Activation)	(None, None, None, 2	0	bn4b_branch2b[0][0]
res4b_branch2c (Conv2D)	(None, None, None, 1	263168	activation_27[0][0]
bn4b_branch2c (BatchNormalizati	(None, None, None, 1	4096	res4b_branch2c[0][0]
add_9 (Add)	(None, None, None, 1	0	bn4b_branch2c[0][0] activation_25[0][0]
activation_28 (Activation)	(None, None, None, 1	0	add_9[0][0]
res4c_branch2a (Conv2D)	(None, None, None, 2	262400	activation_28[0][0]
bn4c_branch2a (BatchNormalizati	(None, None, None, 2	1024	res4c_branch2a[0][0]
activation_29 (Activation)	(None, None, None, 2	0	bn4c_branch2a[0][0]
res4c_branch2b (Conv2D)	(None, None, None, 2	590080	activation_29[0][0]
bn4c_branch2b (BatchNormalizati	(None, None, None, 2	1024	res4c_branch2b[0][0]
activation_30 (Activation)	(None, None, None, 2	0	bn4c_branch2b[0][0]
res4c_branch2c (Conv2D)	(None, None, None, 1	263168	activation_30[0][0]
bn4c_branch2c (BatchNormalizati	(None, None, None, 1	4096	res4c_branch2c[0][0]
add_10 (Add)	(None, None, None, 1	0	bn4c_branch2c[0][0] activation_28[0][0]
activation_31 (Activation)	(None, None, None, 1	0	add_10[0][0]
res4d_branch2a (Conv2D)	(None, None, None, 2	262400	activation_31[0][0]
bn4d_branch2a (BatchNormalizati	(None, None, None, 2	1024	res4d_branch2a[0][0]
activation_32 (Activation)	(None, None, None, 2	0	bn4d_branch2a[0][0]
res4d_branch2b (Conv2D)	(None, None, None, 2	590080	activation_32[0][0]
bn4d_branch2b (BatchNormalizati	(None, None, None, 2	1024	res4d_branch2b[0][0]
activation_33 (Activation)	(None, None, None, 2	0	bn4d_branch2b[0][0]
res4d_branch2c (Conv2D)	(None, None, None, 1	263168	activation_33[0][0]
bn4d_branch2c (BatchNormalizati	(None, None, None, 1	4096	res4d_branch2c[0][0]
add_11 (Add)	(None, None, None, 1	0	bn4d_branch2c[0][0] activation_31[0][0]
activation_34 (Activation)	(None, None, None, 1	0	add_11[0][0]
res4e_branch2a (Conv2D)	(None, None, None, 2	262400	activation_34[0][0]
bn4e_branch2a (BatchNormalizati	(None, None, None, 2	1024	res4e_branch2a[0][0]
activation_35 (Activation)	(None, None, None, 2	0	bn4e_branch2a[0][0]
res4e_branch2b (Conv2D)	(None, None, None, 2	590080	activation_35[0][0]
bn4e_branch2b (BatchNormalizati	(None, None, None, 2	1024	res4e_branch2b[0][0]
activation_36 (Activation)	(None, None, None, 2	0	bn4e_branch2b[0][0]
res4e_branch2c (Conv2D)	(None, None, None, 1	263168	activation_36[0][0]
bn4e_branch2c (BatchNormalizati	(None, None, None, 1	4096	res4e_branch2c[0][0]

add_12 (Add)	(None, None, None, 1	0	bn4e_branch2c[0][0] activation_34[0][0]
activation_37 (Activation)	(None, None, None, 1	0	add_12[0][0]
res4f_branch2a (Conv2D)	(None, None, None, 2	262400	activation_37[0][0]
bn4f_branch2a (BatchNormalizati	(None, None, None, 2	1024	res4f_branch2a[0][0]
activation_38 (Activation)	(None, None, None, 2	0	bn4f_branch2a[0][0]
res4f_branch2b (Conv2D)	(None, None, None, 2	590080	activation_38[0][0]
bn4f_branch2b (BatchNormalizati	(None, None, None, 2	1024	res4f_branch2b[0][0]
activation_39 (Activation)	(None, None, None, 2	0	bn4f_branch2b[0][0]
res4f_branch2c (Conv2D)	(None, None, None, 1	263168	activation_39[0][0]
bn4f_branch2c (BatchNormalizati	(None, None, None, 1	4096	res4f_branch2c[0][0]
add_13 (Add)	(None, None, None, 1	0	bn4f_branch2c[0][0] activation_37[0][0]
activation_40 (Activation)	(None, None, None, 1	0	add_13[0][0]
res5a_branch2a (Conv2D)	(None, None, None, 5	524800	activation_40[0][0]
bn5a_branch2a (BatchNormalizati	(None, None, None, 5	2048	res5a_branch2a[0][0]
activation_41 (Activation)	(None, None, None, 5	0	bn5a_branch2a[0][0]
res5a_branch2b (Conv2D)	(None, None, None, 5	2359808	activation_41[0][0]
bn5a_branch2b (BatchNormalizati	(None, None, None, 5	2048	res5a_branch2b[0][0]
activation_42 (Activation)	(None, None, None, 5	0	bn5a_branch2b[0][0]
res5a_branch2c (Conv2D)	(None, None, None, 2	1050624	activation_42[0][0]
res5a_branch1 (Conv2D)	(None, None, None, 2	2099200	activation_40[0][0]
bn5a_branch2c (BatchNormalizati	(None, None, None, 2	8192	res5a_branch2c[0][0]
bn5a_branch1 (BatchNormalizatio	(None, None, None, 2	8192	res5a_branch1[0][0]
add_14 (Add)	(None, None, None, 2	0	bn5a_branch2c[0][0] bn5a_branch1[0][0]
activation_43 (Activation)	(None, None, None, 2	0	add_14[0][0]
res5b_branch2a (Conv2D)	(None, None, None, 5	1049088	activation_43[0][0]
bn5b_branch2a (BatchNormalizati	(None, None, None, 5	2048	res5b_branch2a[0][0]
activation_44 (Activation)	(None, None, None, 5	0	bn5b_branch2a[0][0]
res5b_branch2b (Conv2D)	(None, None, None, 5	2359808	activation_44[0][0]
bn5b_branch2b (BatchNormalizati	(None, None, None, 5	2048	res5b_branch2b[0][0]
activation_45 (Activation)	(None, None, None, 5	0	bn5b_branch2b[0][0]
res5b_branch2c (Conv2D)	(None, None, None, 2	1050624	activation_45[0][0]
bn5b_branch2c (BatchNormalizati	(None, None, None, 2	8192	res5b_branch2c[0][0]
add_15 (Add)	(None, None, None, 2	0	bn5b_branch2c[0][0] activation_43[0][0]
activation_46 (Activation)	(None, None, None, 2	0	add_15[0][0]
res5c_branch2a (Conv2D)	(None, None, None, 5	1049088	activation_46[0][0]
bn5c_branch2a (BatchNormalizati	(None, None, None, 5	2048	res5c_branch2a[0][0]

```
activation_47 (Activation)       (None, None, None, 5 0           bn5c_branch2a[0][0]
__________________________________________________________________________________________________
res5c_branch2b (Conv2D)          (None, None, None, 5 2359808     activation_47[0][0]
__________________________________________________________________________________________________
bn5c_branch2b (BatchNormalizati (None, None, None, 5 2048        res5c_branch2b[0][0]
__________________________________________________________________________________________________
activation_48 (Activation)       (None, None, None, 5 0           bn5c_branch2b[0][0]
__________________________________________________________________________________________________
res5c_branch2c (Conv2D)          (None, None, None, 2 1050624     activation_48[0][0]
__________________________________________________________________________________________________
bn5c_branch2c (BatchNormalizati (None, None, None, 2 8192        res5c_branch2c[0][0]
__________________________________________________________________________________________________
add_16 (Add)                     (None, None, None, 2 0           bn5c_branch2c[0][0]
                                                                  activation_46[0][0]
__________________________________________________________________________________________________
activation_49 (Activation)       (None, None, None, 2 0           add_16[0][0]
__________________________________________________________________________________________________
global_average_pooling2d_1 (Glo (None, 2048)         0           activation_49[0][0]
__________________________________________________________________________________________________
dense_1 (Dense)                  (None, 128)           262272      global_average_pooling2d_1[0][0]
__________________________________________________________________________________________________
dense_2 (Dense)                  (None, 2)             258         dense_1[0][0]
==================================================================================================
Total params: 23,850,242
Trainable params: 262,530
Non-trainable params: 23,587,712
__________________________________________________________________________________________________
```

In [ ]:

```
```

In [13]:

```
history = model.fit_generator(generator=train_dat,
                              steps_per_epoch=347 // 32,
                              epochs=3,
                              validation_data=validation_dat,
                              validation_steps=10
                             )
```

```
WARNING:tensorflow:From C:\Users\Dell\Anaconda3\lib\site-
packages\tensorflow\python\ops\math_ops.py:3066: to_int32 (from tensorflow.python.ops.math_ops) is
deprecated and will be removed in a future version.
Instructions for updating:
Use tf.cast instead.
Epoch 1/3
10/10 [==============================] - 435s 44s/step - loss: 0.8119 - acc: 0.6562 - val_loss: 0.
3781 - val_acc: 0.8074
Epoch 2/3
10/10 [==============================] - 394s 39s/step - loss: 0.2713 - acc: 0.8688 - val_loss: 0.
2289 - val_acc: 0.9122
Epoch 3/3
10/10 [==============================] - 376s 38s/step - loss: 0.2468 - acc: 0.8903 - val_loss: 0.
2000 - val_acc: 0.9301
```

In [21]:

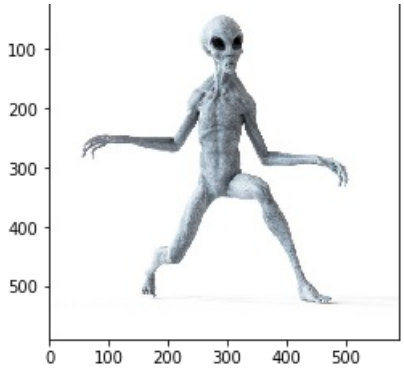
```
testing =image.load_img("C:/data/Alien.jpg",target_size=(224,224))
```

In [23]:

```
import matplotlib.pyplot as plt
import matplotlib.image as mpimg
plt.imshow(mpimg.imread("C:/data/Alien.jpg"))
```

Out[23]:

```
<matplotlib.image.AxesImage at 0x2e280c5c320>
```



In [24]:

```
testing=image.img_to_array(testing)  # converting into array
```

In [25]:

```
import numpy as np
```

In [26]:

```
img_pred = np.expand_dims(testing,axis=0)
```

In [30]:

```
result = model.predict(img_pred)
print(result)

if result[0][0]>=0.9:
    prediction = "Alien"
else:
    prediction ="Predator"

print(prediction)
```

```
[[0.9246974  0.07530263]]
Alien
```

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