```python
import tensorflow as tf
import numpy as np
from keras.preprocessing.image import ImageDataGenerator
from keras.applications.inception_v3 import InceptionV3
from keras import models, layers, optimizers

train_dir = "DermMel/train"
test_dir = "DermMel/Test"
val_dir = "DermMel/Valid"

image_size =(224,224)
batch_size = 32

import matplotlib.pyplot as plt
import matplotlib.image as mpimg

import matplotlib.pyplot as plt
from matplotlib.pyplot import figure

figure(figsize=(8, 6), dpi=80)

img = mpimg.imread("DermMel/test/Melanoma/AUG_0_11.jpeg")
imgplot = plt.imshow(img)

plt.show()

figure(figsize=(8, 6), dpi=80)
img = mpimg.imread("DermMel/test/NotMelanoma/ISIC_0024307.jpg")
imgplot = plt.imshow(img)

plt.show()
```
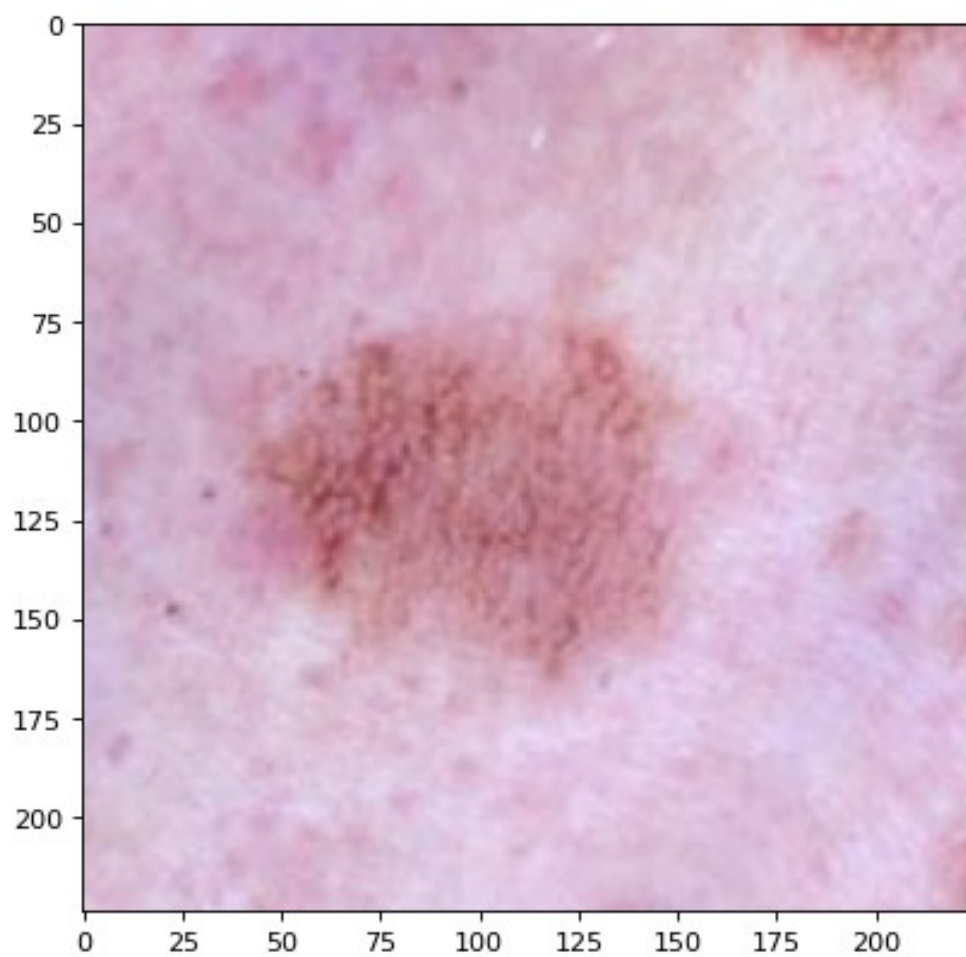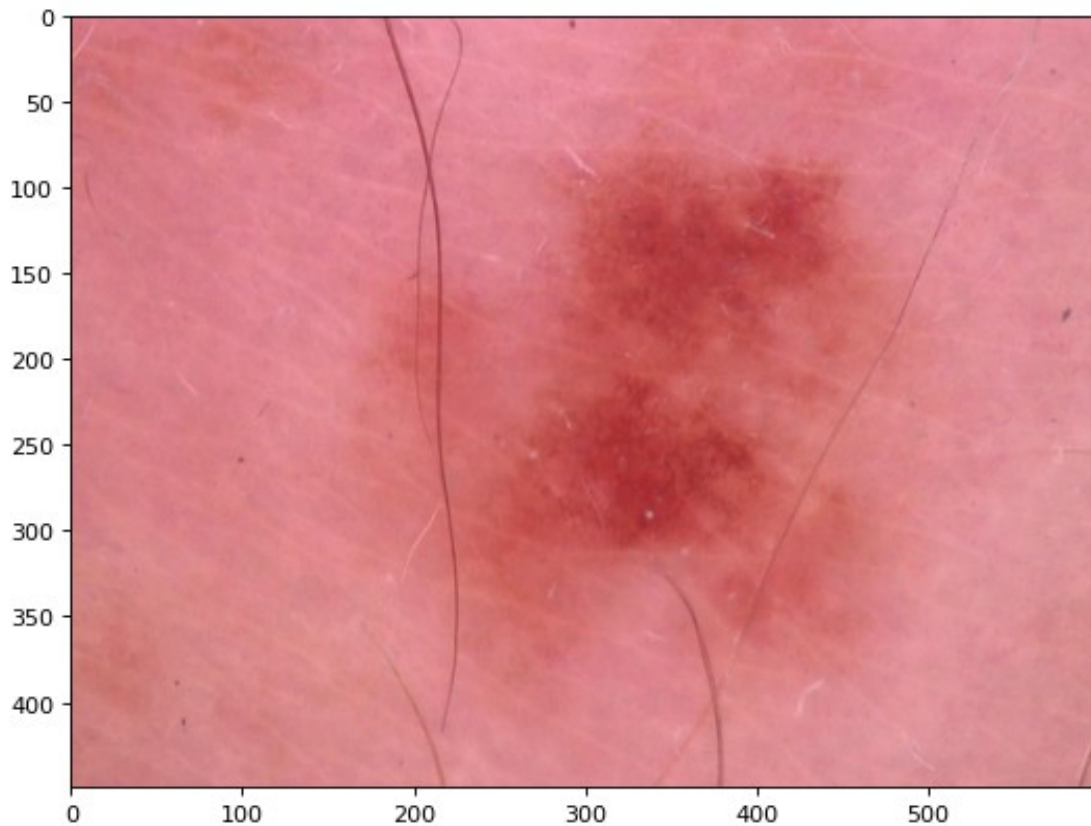
```python
from keras.preprocessing.image import ImageDataGenerator
train_datagen = ImageDataGenerator(rescale=1./255,
                                   horizontal_flip=True,
                                   vertical_flip=True,
                                   rotation_range=50,
                                   width_shift_range=0.5,
                                   height_shift_range=0.5,
                                   shear_range=0.7,
                                   zoom_range=0.7,
                                   fill_mode='nearest'
                                   )

valid_datagen = ImageDataGenerator(rescale=1./255)

test_datagen = ImageDataGenerator(rescale=1./255)

train_generator = train_datagen.flow_from_directory(
    train_dir,
    target_size=image_size,
    batch_size=batch_size,
    class_mode='binary'
)
```

Found 10682 images belonging to 2 classes.

```python
valid_generator = valid_datagen.flow_from_directory(
    val_dir,
    target_size=image_size,
    batch_size=batch_size,
    class_mode='binary'
)
```

Found 3562 images belonging to 2 classes.

```python
test_generator = test_datagen.flow_from_directory(test_dir,
    target_size=image_size,
    batch_size=batch_size,
    class_mode='binary')
```

Found 3561 images belonging to 2 classes.

```python
print(train_generator.class_indices)
```

{'Melanoma': 0, 'NotMelanoma': 1}

```python
print(train_generator.class_mode)
```

binary

```python
class_count = np.unique(train_generator.classes, return_counts=True)[1]
print(class_count)
total_samples = np.sum(class_count)
print(total_samples)
class_weights = {0: total_samples / (2.0 * class_count[0]),
                 1: total_samples / (2.0 * class_count[1])}
print(class_weights)
```

[5341 5341]
10682
{0: 1.0, 1: 1.0}

```python
base_model = InceptionV3(weights='imagenet',
                         include_top=False,
                         input_shape=(224, 224, 3)
                         )
```

```python
print(base_model.summary())
```

Model: "inception_v3"

_____
_____

 Layer (type)   Output Shape   Param #
Connected to
===
===========================
 input_1 (InputLayer)   [(None, 224, 224, 3   0   []
```

```
                                    )]


 conv2d (Conv2D)                    (None, 111, 111, 32   864
['input_1[0][0]']
                                    )



 batch_normalization (BatchNorm     (None, 111, 111, 32   96
['conv2d[0][0]']
 alization)                         )



 activation (Activation)            (None, 111, 111, 32   0
['batch_normalization[0][0]']
                                    )



 conv2d_1 (Conv2D)                  (None, 109, 109, 32   9216
['activation[0][0]']
                                    )



 batch_normalization_1 (BatchNo     (None, 109, 109, 32   96
['conv2d_1[0][0]']
 rmalization)                       )



 activation_1 (Activation)          (None, 109, 109, 32   0
['batch_normalization_1[0][0]']
                                    )



 conv2d_2 (Conv2D)                  (None, 109, 109, 64   18432
['activation_1[0][0]']
                                    )



 batch_normalization_2 (BatchNo     (None, 109, 109, 64   192
['conv2d_2[0][0]']
 rmalization)                       )
```

```
 activation_2 (Activation)        (None, 109, 109, 64   0
['batch_normalization_2[0][0]']
                                  )


 max_pooling2d (MaxPooling2D)     (None, 54, 54, 64)    0
['activation_2[0][0]']


 conv2d_3 (Conv2D)                (None, 54, 54, 80)    5120
['max_pooling2d[0][0]']


 batch_normalization_3 (BatchNo   (None, 54, 54, 80)    240
['conv2d_3[0][0]']
 rmalization)


 activation_3 (Activation)        (None, 54, 54, 80)    0
['batch_normalization_3[0][0]']


 conv2d_4 (Conv2D)                (None, 52, 52, 192)   138240
['activation_3[0][0]']


 batch_normalization_4 (BatchNo   (None, 52, 52, 192)   576
['conv2d_4[0][0]']
 rmalization)


 activation_4 (Activation)        (None, 52, 52, 192)   0
['batch_normalization_4[0][0]']


 max_pooling2d_1 (MaxPooling2D)   (None, 25, 25, 192)   0
['activation_4[0][0]']


 conv2d_8 (Conv2D)                (None, 25, 25, 64)    12288
['max_pooling2d_1[0][0]']
```

```
 batch_normalization_8 (BatchNo   (None, 25, 25, 64)   192
['conv2d_8[0][0]']
 rmalization)


 activation_8 (Activation)        (None, 25, 25, 64)   0
['batch_normalization_8[0][0]']


 conv2d_6 (Conv2D)                (None, 25, 25, 48)   9216
['max_pooling2d_1[0][0]']


 conv2d_9 (Conv2D)                (None, 25, 25, 96)   55296
['activation_8[0][0]']


 batch_normalization_6 (BatchNo   (None, 25, 25, 48)   144
['conv2d_6[0][0]']
 rmalization)


 batch_normalization_9 (BatchNo   (None, 25, 25, 96)   288
['conv2d_9[0][0]']
 rmalization)


 activation_6 (Activation)        (None, 25, 25, 48)   0
['batch_normalization_6[0][0]']


 activation_9 (Activation)        (None, 25, 25, 96)   0
['batch_normalization_9[0][0]']


 average_pooling2d (AveragePool   (None, 25, 25, 192)  0
['max_pooling2d_1[0][0]']
 ing2D)


 conv2d_5 (Conv2D)                (None, 25, 25, 64)   12288
['max_pooling2d_1[0][0]']


 conv2d_7 (Conv2D)                (None, 25, 25, 64)   76800
```

['activation_6[0][0]']

 conv2d_10 (Conv2D)   (None, 25, 25, 96)   82944
['activation_9[0][0]']

 conv2d_11 (Conv2D)   (None, 25, 25, 32)   6144
['average_pooling2d[0][0]']

 batch_normalization_5 (BatchNo (None, 25, 25, 64)   192
['conv2d_5[0][0]']
 rmalization)

 batch_normalization_7 (BatchNo (None, 25, 25, 64)   192
['conv2d_7[0][0]']
 rmalization)

 batch_normalization_10 (BatchN (None, 25, 25, 96)   288
['conv2d_10[0][0]']
 ormalization)

 batch_normalization_11 (BatchN (None, 25, 25, 32)   96
['conv2d_11[0][0]']
 ormalization)

 activation_5 (Activation)   (None, 25, 25, 64)   0
['batch_normalization_5[0][0]']

 activation_7 (Activation)   (None, 25, 25, 64)   0
['batch_normalization_7[0][0]']

 activation_10 (Activation)   (None, 25, 25, 96)   0
['batch_normalization_10[0][0]']

 activation_11 (Activation)   (None, 25, 25, 32)   0
['batch_normalization_11[0][0]']

mixed0 (Concatenate)   (None, 25, 25, 256) 0
['activation_5[0][0]',

'activation_7[0][0]',

'activation_10[0][0]',

'activation_11[0][0]']

 conv2d_15 (Conv2D)   (None, 25, 25, 64)   16384
['mixed0[0][0]']

 batch_normalization_15 (BatchN (None, 25, 25, 64)   192
['conv2d_15[0][0]']
 ormalization)

 activation_15 (Activation)   (None, 25, 25, 64)   0
['batch_normalization_15[0][0]']

 conv2d_13 (Conv2D)   (None, 25, 25, 48)   12288
['mixed0[0][0]']

 conv2d_16 (Conv2D)   (None, 25, 25, 96)   55296
['activation_15[0][0]']

 batch_normalization_13 (BatchN (None, 25, 25, 48)   144
['conv2d_13[0][0]']
 ormalization)

 batch_normalization_16 (BatchN (None, 25, 25, 96)   288
['conv2d_16[0][0]']
 ormalization)

 activation_13 (Activation)   (None, 25, 25, 48)   0
['batch_normalization_13[0][0]']

```
 activation_16 (Activation)      (None, 25, 25, 96)   0
['batch_normalization_16[0][0]']


 average_pooling2d_1 (AveragePo  (None, 25, 25, 256)  0
['mixed0[0][0]']
 oling2D)



 conv2d_12 (Conv2D)              (None, 25, 25, 64)    16384
['mixed0[0][0]']


 conv2d_14 (Conv2D)              (None, 25, 25, 64)    76800
['activation_13[0][0]']


 conv2d_17 (Conv2D)              (None, 25, 25, 96)    82944
['activation_16[0][0]']


 conv2d_18 (Conv2D)              (None, 25, 25, 64)    16384
['average_pooling2d_1[0][0]']


 batch_normalization_12 (BatchN  (None, 25, 25, 64)   192
['conv2d_12[0][0]']
 ormalization)



 batch_normalization_14 (BatchN  (None, 25, 25, 64)   192
['conv2d_14[0][0]']
 ormalization)



 batch_normalization_17 (BatchN  (None, 25, 25, 96)   288
['conv2d_17[0][0]']
 ormalization)



 batch_normalization_18 (BatchN  (None, 25, 25, 64)   192
['conv2d_18[0][0]']
 ormalization)
```

```
 activation_12 (Activation)      (None, 25, 25, 64)   0
['batch_normalization_12[0][0]']


 activation_14 (Activation)      (None, 25, 25, 64)   0
['batch_normalization_14[0][0]']


 activation_17 (Activation)      (None, 25, 25, 96)   0
['batch_normalization_17[0][0]']


 activation_18 (Activation)      (None, 25, 25, 64)   0
['batch_normalization_18[0][0]']


 mixed1 (Concatenate)            (None, 25, 25, 288)  0
['activation_12[0][0]',

'activation_14[0][0]',

'activation_17[0][0]',

'activation_18[0][0]']


 conv2d_22 (Conv2D)              (None, 25, 25, 64)   18432
['mixed1[0][0]']


 batch_normalization_22 (BatchN  (None, 25, 25, 64)   192
['conv2d_22[0][0]']
 ormalization)



 activation_22 (Activation)      (None, 25, 25, 64)   0
['batch_normalization_22[0][0]']

 conv2d_20 (Conv2D)              (None, 25, 25, 48)   13824
['mixed1[0][0]']


 conv2d_23 (Conv2D)              (None, 25, 25, 96)   55296
['activation_22[0][0]']
```

```
 batch_normalization_20 (BatchN   (None, 25, 25, 48)   144
['conv2d_20[0][0]']
 ormalization)


 batch_normalization_23 (BatchN   (None, 25, 25, 96)   288
['conv2d_23[0][0]']
 ormalization)


 activation_20 (Activation)      (None, 25, 25, 48)   0
['batch_normalization_20[0][0]']


 activation_23 (Activation)      (None, 25, 25, 96)   0
['batch_normalization_23[0][0]']


 average_pooling2d_2 (AveragePo   (None, 25, 25, 288)  0
['mixed1[0][0]']
 oling2D)


 conv2d_19 (Conv2D)              (None, 25, 25, 64)   18432
['mixed1[0][0]']


 conv2d_21 (Conv2D)              (None, 25, 25, 64)   76800
['activation_20[0][0]']


 conv2d_24 (Conv2D)              (None, 25, 25, 96)   82944
['activation_23[0][0]']


 conv2d_25 (Conv2D)              (None, 25, 25, 64)   18432
['average_pooling2d_2[0][0]']


 batch_normalization_19 (BatchN   (None, 25, 25, 64)   192
['conv2d_19[0][0]']
 ormalization)
```

```
batch_normalization_21 (BatchN   (None, 25, 25, 64)   192
['conv2d_21[0][0]']
 ormalization)


batch_normalization_24 (BatchN   (None, 25, 25, 96)   288
['conv2d_24[0][0]']
 ormalization)


batch_normalization_25 (BatchN   (None, 25, 25, 64)   192
['conv2d_25[0][0]']
 ormalization)



 activation_19 (Activation)      (None, 25, 25, 64)   0
['batch_normalization_19[0][0]']


 activation_21 (Activation)      (None, 25, 25, 64)   0
['batch_normalization_21[0][0]']


 activation_24 (Activation)      (None, 25, 25, 96)   0
['batch_normalization_24[0][0]']


 activation_25 (Activation)      (None, 25, 25, 64)   0
['batch_normalization_25[0][0]']


 mixed2 (Concatenate)            (None, 25, 25, 288)  0
['activation_19[0][0]',

'activation_21[0][0]',

'activation_24[0][0]',

'activation_25[0][0]']


 conv2d_27 (Conv2D)              (None, 25, 25, 64)   18432
['mixed2[0][0]']


 batch_normalization_27 (BatchN  (None, 25, 25, 64)   192
```

```
                                          ['conv2d_27[0][0]']
 ormalization)


 activation_27 (Activation)      (None, 25, 25, 64)    0
['batch_normalization_27[0][0]']


 conv2d_28 (Conv2D)              (None, 25, 25, 96)    55296
['activation_27[0][0]']


 batch_normalization_28 (BatchN  (None, 25, 25, 96)    288
['conv2d_28[0][0]']
 ormalization)


 activation_28 (Activation)      (None, 25, 25, 96)    0
['batch_normalization_28[0][0]']


 conv2d_26 (Conv2D)              (None, 12, 12, 384)   995328
['mixed2[0][0]']


 conv2d_29 (Conv2D)              (None, 12, 12, 96)    82944
['activation_28[0][0]']


 batch_normalization_26 (BatchN  (None, 12, 12, 384)   1152
['conv2d_26[0][0]']
 ormalization)


 batch_normalization_29 (BatchN  (None, 12, 12, 96)    288
['conv2d_29[0][0]']
 ormalization)


 activation_26 (Activation)      (None, 12, 12, 384)   0
['batch_normalization_26[0][0]']


 activation_29 (Activation)      (None, 12, 12, 96)    0
['batch_normalization_29[0][0]']
```

```
 max_pooling2d_2 (MaxPooling2D)   (None, 12, 12, 288)  0
['mixed2[0][0]']


 mixed3 (Concatenate)            (None, 12, 12, 768)  0
['activation_26[0][0]',

'activation_29[0][0]',

'max_pooling2d_2[0][0]']


 conv2d_34 (Conv2D)              (None, 12, 12, 128)  98304
['mixed3[0][0]']


 batch_normalization_34 (BatchN  (None, 12, 12, 128)  384
['conv2d_34[0][0]']
 ormalization)



 activation_34 (Activation)      (None, 12, 12, 128)  0
['batch_normalization_34[0][0]']


 conv2d_35 (Conv2D)              (None, 12, 12, 128)  114688
['activation_34[0][0]']


 batch_normalization_35 (BatchN  (None, 12, 12, 128)  384
['conv2d_35[0][0]']
 ormalization)



 activation_35 (Activation)      (None, 12, 12, 128)  0
['batch_normalization_35[0][0]']


 conv2d_31 (Conv2D)              (None, 12, 12, 128)  98304
['mixed3[0][0]']


 conv2d_36 (Conv2D)              (None, 12, 12, 128)  114688
['activation_35[0][0]']
```

```
 batch_normalization_31 (BatchN   (None, 12, 12, 128)   384
['conv2d_31[0][0]']
 ormalization)


 batch_normalization_36 (BatchN   (None, 12, 12, 128)   384
['conv2d_36[0][0]']
 ormalization)



 activation_31 (Activation)      (None, 12, 12, 128)   0
['batch_normalization_31[0][0]']


 activation_36 (Activation)      (None, 12, 12, 128)   0
['batch_normalization_36[0][0]']


 conv2d_32 (Conv2D)              (None, 12, 12, 128)   114688
['activation_31[0][0]']


 conv2d_37 (Conv2D)              (None, 12, 12, 128)   114688
['activation_36[0][0]']


 batch_normalization_32 (BatchN   (None, 12, 12, 128)   384
['conv2d_32[0][0]']
 ormalization)



 batch_normalization_37 (BatchN   (None, 12, 12, 128)   384
['conv2d_37[0][0]']
 ormalization)



 activation_32 (Activation)      (None, 12, 12, 128)   0
['batch_normalization_32[0][0]']


 activation_37 (Activation)      (None, 12, 12, 128)   0
['batch_normalization_37[0][0]']
```

```
 average_pooling2d_3 (AveragePo   (None, 12, 12, 768)   0
['mixed3[0][0]']
 oling2D)


 conv2d_30 (Conv2D)               (None, 12, 12, 192)   147456
['mixed3[0][0]']


 conv2d_33 (Conv2D)               (None, 12, 12, 192)   172032
['activation_32[0][0]']


 conv2d_38 (Conv2D)               (None, 12, 12, 192)   172032
['activation_37[0][0]']


 conv2d_39 (Conv2D)               (None, 12, 12, 192)   147456
['average_pooling2d_3[0][0]']


 batch_normalization_30 (BatchN   (None, 12, 12, 192)   576
['conv2d_30[0][0]']
 ormalization)


 batch_normalization_33 (BatchN   (None, 12, 12, 192)   576
['conv2d_33[0][0]']
 ormalization)


 batch_normalization_38 (BatchN   (None, 12, 12, 192)   576
['conv2d_38[0][0]']
 ormalization)


 batch_normalization_39 (BatchN   (None, 12, 12, 192)   576
['conv2d_39[0][0]']
 ormalization)


 activation_30 (Activation)       (None, 12, 12, 192)   0
['batch_normalization_30[0][0]']
```

```
 activation_33 (Activation)      (None, 12, 12, 192)  0
['batch_normalization_33[0][0]']


 activation_38 (Activation)      (None, 12, 12, 192)  0
['batch_normalization_38[0][0]']


 activation_39 (Activation)      (None, 12, 12, 192)  0
['batch_normalization_39[0][0]']


 mixed4 (Concatenate)            (None, 12, 12, 768)  0
['activation_30[0][0]',

'activation_33[0][0]',

'activation_38[0][0]',

'activation_39[0][0]']


 conv2d_44 (Conv2D)              (None, 12, 12, 160)  122880
['mixed4[0][0]']


 batch_normalization_44 (BatchN  (None, 12, 12, 160)  480
['conv2d_44[0][0]']
 ormalization)


 activation_44 (Activation)      (None, 12, 12, 160)  0
['batch_normalization_44[0][0]']


 conv2d_45 (Conv2D)              (None, 12, 12, 160)  179200
['activation_44[0][0]']


 batch_normalization_45 (BatchN  (None, 12, 12, 160)  480
['conv2d_45[0][0]']
 ormalization)


 activation_45 (Activation)      (None, 12, 12, 160)  0
['batch_normalization_45[0][0]']
```

```
 conv2d_41 (Conv2D)              (None, 12, 12, 160)  122880
['mixed4[0][0]']


 conv2d_46 (Conv2D)              (None, 12, 12, 160)  179200
['activation_45[0][0]']


 batch_normalization_41 (BatchN  (None, 12, 12, 160)  480
['conv2d_41[0][0]']
 ormalization)



 batch_normalization_46 (BatchN  (None, 12, 12, 160)  480
['conv2d_46[0][0]']
 ormalization)



 activation_41 (Activation)      (None, 12, 12, 160)  0
['batch_normalization_41[0][0]']


 activation_46 (Activation)      (None, 12, 12, 160)  0
['batch_normalization_46[0][0]']


 conv2d_42 (Conv2D)              (None, 12, 12, 160)  179200
['activation_41[0][0]']


 conv2d_47 (Conv2D)              (None, 12, 12, 160)  179200
['activation_46[0][0]']


 batch_normalization_42 (BatchN  (None, 12, 12, 160)  480
['conv2d_42[0][0]']
 ormalization)



 batch_normalization_47 (BatchN  (None, 12, 12, 160)  480
['conv2d_47[0][0]']
 ormalization)
```

activation_42 (Activation)   (None, 12, 12, 160) 0
['batch_normalization_42[0][0]']

activation_47 (Activation)   (None, 12, 12, 160) 0
['batch_normalization_47[0][0]']

average_pooling2d_4 (AveragePo (None, 12, 12, 768) 0
['mixed4[0][0]']
 oling2D)

conv2d_40 (Conv2D)   (None, 12, 12, 192) 147456
['mixed4[0][0]']

conv2d_43 (Conv2D)   (None, 12, 12, 192) 215040
['activation_42[0][0]']

conv2d_48 (Conv2D)   (None, 12, 12, 192) 215040
['activation_47[0][0]']

conv2d_49 (Conv2D)   (None, 12, 12, 192) 147456
['average_pooling2d_4[0][0]']

batch_normalization_40 (BatchN (None, 12, 12, 192) 576
['conv2d_40[0][0]']
 ormalization)

batch_normalization_43 (BatchN (None, 12, 12, 192) 576
['conv2d_43[0][0]']
 ormalization)

batch_normalization_48 (BatchN (None, 12, 12, 192) 576
['conv2d_48[0][0]']
 ormalization)

```
batch_normalization_49 (BatchN   (None, 12, 12, 192)   576
['conv2d_49[0][0]']
 ormalization)


 activation_40 (Activation)      (None, 12, 12, 192)   0
['batch_normalization_40[0][0]']


 activation_43 (Activation)      (None, 12, 12, 192)   0
['batch_normalization_43[0][0]']


 activation_48 (Activation)      (None, 12, 12, 192)   0
['batch_normalization_48[0][0]']


 activation_49 (Activation)      (None, 12, 12, 192)   0
['batch_normalization_49[0][0]']


 mixed5 (Concatenate)            (None, 12, 12, 768)   0
['activation_40[0][0]',

'activation_43[0][0]',

'activation_48[0][0]',

'activation_49[0][0]']


 conv2d_54 (Conv2D)              (None, 12, 12, 160)   122880
['mixed5[0][0]']


 batch_normalization_54 (BatchN  (None, 12, 12, 160)   480
['conv2d_54[0][0]']
 ormalization)


 activation_54 (Activation)      (None, 12, 12, 160)   0
['batch_normalization_54[0][0]']


 conv2d_55 (Conv2D)              (None, 12, 12, 160)   179200
['activation_54[0][0]']
```

```
 batch_normalization_55 (BatchN   (None, 12, 12, 160)   480
['conv2d_55[0][0]']
 ormalization)


 activation_55 (Activation)      (None, 12, 12, 160)   0
['batch_normalization_55[0][0]']


 conv2d_51 (Conv2D)              (None, 12, 12, 160)   122880
['mixed5[0][0]']


 conv2d_56 (Conv2D)              (None, 12, 12, 160)   179200
['activation_55[0][0]']


 batch_normalization_51 (BatchN   (None, 12, 12, 160)   480
['conv2d_51[0][0]']
 ormalization)


 batch_normalization_56 (BatchN   (None, 12, 12, 160)   480
['conv2d_56[0][0]']
 ormalization)


 activation_51 (Activation)      (None, 12, 12, 160)   0
['batch_normalization_51[0][0]']


 activation_56 (Activation)      (None, 12, 12, 160)   0
['batch_normalization_56[0][0]']


 conv2d_52 (Conv2D)              (None, 12, 12, 160)   179200
['activation_51[0][0]']


 conv2d_57 (Conv2D)              (None, 12, 12, 160)   179200
['activation_56[0][0]']


 batch_normalization_52 (BatchN   (None, 12, 12, 160)   480
['conv2d_52[0][0]']
```

ormalization)

 batch_normalization_57 (BatchN (None, 12, 12, 160) 480
['conv2d_57[0][0]']
 ormalization)

 activation_52 (Activation)   (None, 12, 12, 160) 0
['batch_normalization_52[0][0]']

 activation_57 (Activation)   (None, 12, 12, 160) 0
['batch_normalization_57[0][0]']

 average_pooling2d_5 (AveragePo (None, 12, 12, 768) 0
['mixed5[0][0]']
 oling2D)

 conv2d_50 (Conv2D)   (None, 12, 12, 192) 147456
['mixed5[0][0]']

 conv2d_53 (Conv2D)   (None, 12, 12, 192) 215040
['activation_52[0][0]']

 conv2d_58 (Conv2D)   (None, 12, 12, 192) 215040
['activation_57[0][0]']

 conv2d_59 (Conv2D)   (None, 12, 12, 192) 147456
['average_pooling2d_5[0][0]']

 batch_normalization_50 (BatchN (None, 12, 12, 192) 576
['conv2d_50[0][0]']
 ormalization)

 batch_normalization_53 (BatchN (None, 12, 12, 192) 576
['conv2d_53[0][0]']
 ormalization)

batch_normalization_58 (BatchN (None, 12, 12, 192) 576   ['conv2d_58[0][0]']
 ormalization)

batch_normalization_59 (BatchN (None, 12, 12, 192) 576   ['conv2d_59[0][0]']
 ormalization)

 activation_50 (Activation)   (None, 12, 12, 192) 0   ['batch_normalization_50[0][0]']

 activation_53 (Activation)   (None, 12, 12, 192) 0   ['batch_normalization_53[0][0]']

 activation_58 (Activation)   (None, 12, 12, 192) 0   ['batch_normalization_58[0][0]']

 activation_59 (Activation)   (None, 12, 12, 192) 0   ['batch_normalization_59[0][0]']

 mixed6 (Concatenate)   (None, 12, 12, 768) 0   ['activation_50[0][0]',

'activation_53[0][0]',

'activation_58[0][0]',

'activation_59[0][0]']

 conv2d_64 (Conv2D)   (None, 12, 12, 192) 147456   ['mixed6[0][0]']

 batch_normalization_64 (BatchN (None, 12, 12, 192) 576   ['conv2d_64[0][0]']
 ormalization)

activation_64 (Activation)   (None, 12, 12, 192)   0
['batch_normalization_64[0][0]']

 conv2d_65 (Conv2D)   (None, 12, 12, 192)   258048
['activation_64[0][0]']

 batch_normalization_65 (BatchN (None, 12, 12, 192)   576
['conv2d_65[0][0]']
 ormalization)

 activation_65 (Activation)   (None, 12, 12, 192)   0
['batch_normalization_65[0][0]']

 conv2d_61 (Conv2D)   (None, 12, 12, 192)   147456
['mixed6[0][0]']

 conv2d_66 (Conv2D)   (None, 12, 12, 192)   258048
['activation_65[0][0]']

 batch_normalization_61 (BatchN (None, 12, 12, 192)   576
['conv2d_61[0][0]']
 ormalization)

 batch_normalization_66 (BatchN (None, 12, 12, 192)   576
['conv2d_66[0][0]']
 ormalization)

 activation_61 (Activation)   (None, 12, 12, 192)   0
['batch_normalization_61[0][0]']

 activation_66 (Activation)   (None, 12, 12, 192)   0
['batch_normalization_66[0][0]']

 conv2d_62 (Conv2D)   (None, 12, 12, 192)   258048

['activation_61[0][0]']

 conv2d_67 (Conv2D)   (None, 12, 12, 192) 258048
['activation_66[0][0]']

 batch_normalization_62 (BatchN (None, 12, 12, 192) 576
['conv2d_62[0][0]']
 ormalization)

 batch_normalization_67 (BatchN (None, 12, 12, 192) 576
['conv2d_67[0][0]']
 ormalization)

 activation_62 (Activation)   (None, 12, 12, 192) 0
['batch_normalization_62[0][0]']

 activation_67 (Activation)   (None, 12, 12, 192) 0
['batch_normalization_67[0][0]']

 average_pooling2d_6 (AveragePo (None, 12, 12, 768) 0
['mixed6[0][0]']
 oling2D)

 conv2d_60 (Conv2D)   (None, 12, 12, 192) 147456
['mixed6[0][0]']

 conv2d_63 (Conv2D)   (None, 12, 12, 192) 258048
['activation_62[0][0]']

 conv2d_68 (Conv2D)   (None, 12, 12, 192) 258048
['activation_67[0][0]']

 conv2d_69 (Conv2D)   (None, 12, 12, 192) 147456
['average_pooling2d_6[0][0]']

```
batch_normalization_60 (BatchN  (None, 12, 12, 192)  576
['conv2d_60[0][0]']
 ormalization)


batch_normalization_63 (BatchN  (None, 12, 12, 192)  576
['conv2d_63[0][0]']
 ormalization)


batch_normalization_68 (BatchN  (None, 12, 12, 192)  576
['conv2d_68[0][0]']
 ormalization)


batch_normalization_69 (BatchN  (None, 12, 12, 192)  576
['conv2d_69[0][0]']
 ormalization)


 activation_60 (Activation)     (None, 12, 12, 192)  0
['batch_normalization_60[0][0]']


 activation_63 (Activation)     (None, 12, 12, 192)  0
['batch_normalization_63[0][0]']


 activation_68 (Activation)     (None, 12, 12, 192)  0
['batch_normalization_68[0][0]']


 activation_69 (Activation)     (None, 12, 12, 192)  0
['batch_normalization_69[0][0]']


 mixed7 (Concatenate)           (None, 12, 12, 768)  0
['activation_60[0][0]',

'activation_63[0][0]',

'activation_68[0][0]',

'activation_69[0][0]']
```

```
 conv2d_72 (Conv2D)              (None, 12, 12, 192)  147456
['mixed7[0][0]']


 batch_normalization_72 (BatchN  (None, 12, 12, 192)  576
['conv2d_72[0][0]']
 ormalization)



 activation_72 (Activation)     (None, 12, 12, 192)  0
['batch_normalization_72[0][0]']


 conv2d_73 (Conv2D)              (None, 12, 12, 192)  258048
['activation_72[0][0]']


 batch_normalization_73 (BatchN  (None, 12, 12, 192)  576
['conv2d_73[0][0]']
 ormalization)



 activation_73 (Activation)     (None, 12, 12, 192)  0
['batch_normalization_73[0][0]']


 conv2d_70 (Conv2D)              (None, 12, 12, 192)  147456
['mixed7[0][0]']


 conv2d_74 (Conv2D)              (None, 12, 12, 192)  258048
['activation_73[0][0]']


 batch_normalization_70 (BatchN  (None, 12, 12, 192)  576
['conv2d_70[0][0]']
 ormalization)



 batch_normalization_74 (BatchN  (None, 12, 12, 192)  576
['conv2d_74[0][0]']
 ormalization)
```

```
 activation_70 (Activation)      (None, 12, 12, 192)   0
['batch_normalization_70[0][0]']


 activation_74 (Activation)      (None, 12, 12, 192)   0
['batch_normalization_74[0][0]']


 conv2d_71 (Conv2D)              (None, 5, 5, 320)     552960
['activation_70[0][0]']


 conv2d_75 (Conv2D)              (None, 5, 5, 192)     331776
['activation_74[0][0]']


 batch_normalization_71 (BatchN  (None, 5, 5, 320)     960
['conv2d_71[0][0]']
 ormalization)


 batch_normalization_75 (BatchN  (None, 5, 5, 192)     576
['conv2d_75[0][0]']
 ormalization)


 activation_71 (Activation)      (None, 5, 5, 320)     0
['batch_normalization_71[0][0]']


 activation_75 (Activation)      (None, 5, 5, 192)     0
['batch_normalization_75[0][0]']


 max_pooling2d_3 (MaxPooling2D)  (None, 5, 5, 768)     0
['mixed7[0][0]']


 mixed8 (Concatenate)            (None, 5, 5, 1280)    0
['activation_71[0][0]',

'activation_75[0][0]',

'max_pooling2d_3[0][0]']


 conv2d_80 (Conv2D)              (None, 5, 5, 448)     573440
```

['mixed8[0][0]']

 batch_normalization_80 (BatchN (None, 5, 5, 448)   1344
['conv2d_80[0][0]']
 ormalization)

 activation_80 (Activation)   (None, 5, 5, 448)   0
['batch_normalization_80[0][0]']

 conv2d_77 (Conv2D)   (None, 5, 5, 384)   491520
['mixed8[0][0]']

 conv2d_81 (Conv2D)   (None, 5, 5, 384)   1548288
['activation_80[0][0]']

 batch_normalization_77 (BatchN (None, 5, 5, 384)   1152
['conv2d_77[0][0]']
 ormalization)

 batch_normalization_81 (BatchN (None, 5, 5, 384)   1152
['conv2d_81[0][0]']
 ormalization)

 activation_77 (Activation)   (None, 5, 5, 384)   0
['batch_normalization_77[0][0]']

 activation_81 (Activation)   (None, 5, 5, 384)   0
['batch_normalization_81[0][0]']

 conv2d_78 (Conv2D)   (None, 5, 5, 384)   442368
['activation_77[0][0]']

 conv2d_79 (Conv2D)   (None, 5, 5, 384)   442368
['activation_77[0][0]']

```
 conv2d_82 (Conv2D)              (None, 5, 5, 384)     442368
['activation_81[0][0]']


 conv2d_83 (Conv2D)              (None, 5, 5, 384)     442368
['activation_81[0][0]']


 average_pooling2d_7 (AveragePo  (None, 5, 5, 1280)    0
['mixed8[0][0]']
 oling2D)


 conv2d_76 (Conv2D)              (None, 5, 5, 320)     409600
['mixed8[0][0]']


 batch_normalization_78 (BatchN  (None, 5, 5, 384)     1152
['conv2d_78[0][0]']
 ormalization)


 batch_normalization_79 (BatchN  (None, 5, 5, 384)     1152
['conv2d_79[0][0]']
 ormalization)


 batch_normalization_82 (BatchN  (None, 5, 5, 384)     1152
['conv2d_82[0][0]']
 ormalization)


 batch_normalization_83 (BatchN  (None, 5, 5, 384)     1152
['conv2d_83[0][0]']
 ormalization)


 conv2d_84 (Conv2D)              (None, 5, 5, 192)     245760
['average_pooling2d_7[0][0]']


 batch_normalization_76 (BatchN  (None, 5, 5, 320)     960
['conv2d_76[0][0]']
 ormalization)
```

```
 activation_78 (Activation)        (None, 5, 5, 384)     0
['batch_normalization_78[0][0]']


 activation_79 (Activation)        (None, 5, 5, 384)     0
['batch_normalization_79[0][0]']


 activation_82 (Activation)        (None, 5, 5, 384)     0
['batch_normalization_82[0][0]']


 activation_83 (Activation)        (None, 5, 5, 384)     0
['batch_normalization_83[0][0]']


 batch_normalization_84 (BatchN  (None, 5, 5, 192)    576
['conv2d_84[0][0]']
 ormalization)


 activation_76 (Activation)        (None, 5, 5, 320)     0
['batch_normalization_76[0][0]']


 mixed9_0 (Concatenate)            (None, 5, 5, 768)     0
['activation_78[0][0]',

'activation_79[0][0]']


 concatenate (Concatenate)         (None, 5, 5, 768)     0
['activation_82[0][0]',

'activation_83[0][0]']


 activation_84 (Activation)        (None, 5, 5, 192)     0
['batch_normalization_84[0][0]']


 mixed9 (Concatenate)              (None, 5, 5, 2048)    0
['activation_76[0][0]',

'mixed9_0[0][0]',
```

'concatenate[0][0]',

'activation_84[0][0]']

 conv2d_89 (Conv2D)   (None, 5, 5, 448)   917504
['mixed9[0][0]']

 batch_normalization_89 (BatchN (None, 5, 5, 448)   1344
['conv2d_89[0][0]']
 ormalization)

 activation_89 (Activation)   (None, 5, 5, 448)   0
['batch_normalization_89[0][0]']

 conv2d_86 (Conv2D)   (None, 5, 5, 384)   786432
['mixed9[0][0]']

 conv2d_90 (Conv2D)   (None, 5, 5, 384)   1548288
['activation_89[0][0]']

 batch_normalization_86 (BatchN (None, 5, 5, 384)   1152
['conv2d_86[0][0]']
 ormalization)

 batch_normalization_90 (BatchN (None, 5, 5, 384)   1152
['conv2d_90[0][0]']
 ormalization)

 activation_86 (Activation)   (None, 5, 5, 384)   0
['batch_normalization_86[0][0]']

 activation_90 (Activation)   (None, 5, 5, 384)   0
['batch_normalization_90[0][0]']

 conv2d_87 (Conv2D)   (None, 5, 5, 384)   442368

['activation_86[0][0]']

 conv2d_88 (Conv2D)   (None, 5, 5, 384)   442368
['activation_86[0][0]']

 conv2d_91 (Conv2D)   (None, 5, 5, 384)   442368
['activation_90[0][0]']

 conv2d_92 (Conv2D)   (None, 5, 5, 384)   442368
['activation_90[0][0]']

 average_pooling2d_8 (AveragePo (None, 5, 5, 2048)   0
['mixed9[0][0]']
 oling2D)

 conv2d_85 (Conv2D)   (None, 5, 5, 320)   655360
['mixed9[0][0]']

 batch_normalization_87 (BatchN (None, 5, 5, 384)   1152
['conv2d_87[0][0]']
 ormalization)

 batch_normalization_88 (BatchN (None, 5, 5, 384)   1152
['conv2d_88[0][0]']
 ormalization)

 batch_normalization_91 (BatchN (None, 5, 5, 384)   1152
['conv2d_91[0][0]']
 ormalization)

 batch_normalization_92 (BatchN (None, 5, 5, 384)   1152
['conv2d_92[0][0]']
 ormalization)

```
 conv2d_93 (Conv2D)            (None, 5, 5, 192)    393216
['average_pooling2d_8[0][0]']


 batch_normalization_85 (BatchN  (None, 5, 5, 320)   960
['conv2d_85[0][0]']
 ormalization)



 activation_87 (Activation)    (None, 5, 5, 384)    0
['batch_normalization_87[0][0]']


 activation_88 (Activation)    (None, 5, 5, 384)    0
['batch_normalization_88[0][0]']


 activation_91 (Activation)    (None, 5, 5, 384)    0
['batch_normalization_91[0][0]']


 activation_92 (Activation)    (None, 5, 5, 384)    0
['batch_normalization_92[0][0]']


 batch_normalization_93 (BatchN  (None, 5, 5, 192)   576
['conv2d_93[0][0]']
 ormalization)



 activation_85 (Activation)    (None, 5, 5, 320)    0
['batch_normalization_85[0][0]']


 mixed9_1 (Concatenate)        (None, 5, 5, 768)    0
['activation_87[0][0]',

'activation_88[0][0]']


 concatenate_1 (Concatenate)   (None, 5, 5, 768)    0
['activation_91[0][0]',

'activation_92[0][0]']


 activation_93 (Activation)    (None, 5, 5, 192)    0
```

```
['batch_normalization_93[0][0]']


 mixed10 (Concatenate)              (None, 5, 5, 2048)    0
['activation_85[0][0]',

'mixed9_1[0][0]',

'concatenate_1[0][0]',

'activation_93[0][0]']


=====================================================================
============================
Total params: 21,802,784
Trainable params: 21,768,352
Non-trainable params: 34,432

_____
_____
None
```

```python
for layers in base_model.layers:
    layers.trainable = False

from keras import layers

model = models.Sequential()
model.add(base_model)
model.add(layers.Flatten())
model.add(layers.Dropout(0.2))
model.add(layers.Dense(512, activation='relu'))
model.add(layers.Dropout(0.2))
model.add(layers.Dense(1, activation='sigmoid'))

model.compile(optimizer='adam',
              loss='binary_crossentropy',
              metrics=['accuracy'])

model.summary()
```

Model: "sequential"

Layer (type)	Output Shape	Param #
inception_v3 (Functional)	(None, 5, 5, 2048)	21802784
flatten (Flatten)	(None, 51200)	0
dropout (Dropout)	(None, 51200)	0

```
dense (Dense)                 (None, 512)                26214912

dropout_1 (Dropout)           (None, 512)                0

dense_1 (Dense)               (None, 1)                  513

=================================================================
Total params: 48,018,209
Trainable params: 26,215,425
Non-trainable params: 21,802,784

_____
```

```
history = model.fit(train_generator,
                    steps_per_epoch=300,
                    epochs=50,
                    class_weight=class_weights,
                    validation_data=valid_generator,
                    validation_steps=100)

Epoch 1/50
300/300 [==============================] - 112s 350ms/step - loss:
1.3648 - accuracy: 0.7750 - val_loss: 0.4336 - val_accuracy: 0.7997
Epoch 2/50
300/300 [==============================] - 104s 348ms/step - loss:
0.3654 - accuracy: 0.8425 - val_loss: 0.3887 - val_accuracy: 0.8363
Epoch 3/50
300/300 [==============================] - 106s 353ms/step - loss:
0.3405 - accuracy: 0.8577 - val_loss: 0.3117 - val_accuracy: 0.8694
Epoch 4/50
300/300 [==============================] - 103s 344ms/step - loss:
0.3356 - accuracy: 0.8544 - val_loss: 0.3777 - val_accuracy: 0.8494
Epoch 5/50
300/300 [==============================] - 106s 352ms/step - loss:
0.3378 - accuracy: 0.8594 - val_loss: 0.3226 - val_accuracy: 0.8616
Epoch 6/50
300/300 [==============================] - 106s 352ms/step - loss:
0.3241 - accuracy: 0.8679 - val_loss: 0.3082 - val_accuracy: 0.8703
Epoch 7/50
300/300 [==============================] - 106s 352ms/step - loss:
0.3026 - accuracy: 0.8689 - val_loss: 0.3562 - val_accuracy: 0.8341
Epoch 8/50
300/300 [==============================] - 106s 354ms/step - loss:
0.3090 - accuracy: 0.8678 - val_loss: 0.2745 - val_accuracy: 0.8841
Epoch 9/50
300/300 [==============================] - 109s 364ms/step - loss:
0.2930 - accuracy: 0.8748 - val_loss: 0.2523 - val_accuracy: 0.8969
Epoch 10/50
300/300 [==============================] - 110s 367ms/step - loss:
0.2987 - accuracy: 0.8698 - val_loss: 0.3094 - val_accuracy: 0.8694
```

```
Epoch 11/50
300/300 [==============================] - 105s 350ms/step - loss:
0.3014 - accuracy: 0.8752 - val_loss: 0.3611 - val_accuracy: 0.8353
Epoch 12/50
300/300 [==============================] - 113s 375ms/step - loss:
0.3071 - accuracy: 0.8723 - val_loss: 0.2646 - val_accuracy: 0.8853
Epoch 13/50
300/300 [==============================] - 108s 361ms/step - loss:
0.2917 - accuracy: 0.8773 - val_loss: 0.3043 - val_accuracy: 0.8684
Epoch 14/50
300/300 [==============================] - 106s 354ms/step - loss:
0.2896 - accuracy: 0.8787 - val_loss: 0.2594 - val_accuracy: 0.8875
Epoch 15/50
300/300 [==============================] - 105s 350ms/step - loss:
0.2899 - accuracy: 0.8807 - val_loss: 0.2565 - val_accuracy: 0.8956
Epoch 16/50
300/300 [==============================] - 106s 352ms/step - loss:
0.2779 - accuracy: 0.8808 - val_loss: 0.2353 - val_accuracy: 0.9003
Epoch 17/50
300/300 [==============================] - 107s 355ms/step - loss:
0.2913 - accuracy: 0.8797 - val_loss: 0.2561 - val_accuracy: 0.8866
Epoch 18/50
300/300 [==============================] - 105s 351ms/step - loss:
0.2959 - accuracy: 0.8755 - val_loss: 0.2990 - val_accuracy: 0.8725
Epoch 19/50
300/300 [==============================] - 106s 352ms/step - loss:
0.2799 - accuracy: 0.8825 - val_loss: 0.2691 - val_accuracy: 0.8813
Epoch 20/50
300/300 [==============================] - 105s 350ms/step - loss:
0.2795 - accuracy: 0.8853 - val_loss: 0.2584 - val_accuracy: 0.8828
Epoch 21/50
300/300 [==============================] - 106s 352ms/step - loss:
0.2849 - accuracy: 0.8815 - val_loss: 0.3481 - val_accuracy: 0.8300
Epoch 22/50
300/300 [==============================] - 105s 351ms/step - loss:
0.2791 - accuracy: 0.8844 - val_loss: 0.3151 - val_accuracy: 0.8619
Epoch 23/50
300/300 [==============================] - 108s 360ms/step - loss:
0.2769 - accuracy: 0.8856 - val_loss: 0.2611 - val_accuracy: 0.8856
Epoch 24/50
300/300 [==============================] - 105s 350ms/step - loss:
0.2789 - accuracy: 0.8847 - val_loss: 0.2350 - val_accuracy: 0.9000
Epoch 25/50
300/300 [==============================] - 105s 351ms/step - loss:
0.2707 - accuracy: 0.8857 - val_loss: 0.2286 - val_accuracy: 0.8994
Epoch 26/50
300/300 [==============================] - 107s 355ms/step - loss:
0.2767 - accuracy: 0.8869 - val_loss: 0.2859 - val_accuracy: 0.8747
Epoch 27/50
300/300 [==============================] - 105s 349ms/step - loss:
```

```
0.2851 - accuracy: 0.8835 - val_loss: 0.2812 - val_accuracy: 0.8766
Epoch 28/50
300/300 [==============================] - 106s 354ms/step - loss:
0.2812 - accuracy: 0.8837 - val_loss: 0.2904 - val_accuracy: 0.8675
Epoch 29/50
300/300 [==============================] - 106s 353ms/step - loss:
0.2662 - accuracy: 0.8882 - val_loss: 0.2683 - val_accuracy: 0.8863
Epoch 30/50
300/300 [==============================] - 105s 350ms/step - loss:
0.2695 - accuracy: 0.8846 - val_loss: 0.2701 - val_accuracy: 0.8834
Epoch 31/50
300/300 [==============================] - 106s 352ms/step - loss:
0.2760 - accuracy: 0.8860 - val_loss: 0.2529 - val_accuracy: 0.8888
Epoch 32/50
300/300 [==============================] - 106s 353ms/step - loss:
0.2747 - accuracy: 0.8870 - val_loss: 0.3030 - val_accuracy: 0.8606
Epoch 33/50
300/300 [==============================] - 106s 353ms/step - loss:
0.2645 - accuracy: 0.8916 - val_loss: 0.2823 - val_accuracy: 0.8741
Epoch 34/50
300/300 [==============================] - 106s 353ms/step - loss:
0.2777 - accuracy: 0.8812 - val_loss: 0.2899 - val_accuracy: 0.8747
Epoch 35/50
300/300 [==============================] - 105s 351ms/step - loss:
0.2704 - accuracy: 0.8843 - val_loss: 0.2749 - val_accuracy: 0.8788
Epoch 36/50
300/300 [==============================] - 106s 352ms/step - loss:
0.2811 - accuracy: 0.8854 - val_loss: 0.3091 - val_accuracy: 0.8612
Epoch 37/50
300/300 [==============================] - 106s 352ms/step - loss:
0.2737 - accuracy: 0.8848 - val_loss: 0.2768 - val_accuracy: 0.8838
Epoch 38/50
300/300 [==============================] - 106s 351ms/step - loss:
0.2720 - accuracy: 0.8859 - val_loss: 0.2430 - val_accuracy: 0.9003
Epoch 39/50
300/300 [==============================] - 105s 349ms/step - loss:
0.2656 - accuracy: 0.8887 - val_loss: 0.2576 - val_accuracy: 0.8963
Epoch 40/50
300/300 [==============================] - 106s 352ms/step - loss:
0.2650 - accuracy: 0.8902 - val_loss: 0.2902 - val_accuracy: 0.8750
Epoch 41/50
300/300 [==============================] - 106s 352ms/step - loss:
0.2811 - accuracy: 0.8844 - val_loss: 0.2471 - val_accuracy: 0.8972
Epoch 42/50
300/300 [==============================] - 106s 352ms/step - loss:
0.2762 - accuracy: 0.8850 - val_loss: 0.2824 - val_accuracy: 0.8791
Epoch 43/50
300/300 [==============================] - 106s 352ms/step - loss:
0.2692 - accuracy: 0.8859 - val_loss: 0.3135 - val_accuracy: 0.8734
Epoch 44/50
```

```
300/300 [==============================] - 105s 350ms/step - loss:
0.2669 - accuracy: 0.8918 - val_loss: 0.2704 - val_accuracy: 0.8822
Epoch 45/50
300/300 [==============================] - 107s 358ms/step - loss:
0.2701 - accuracy: 0.8898 - val_loss: 0.2478 - val_accuracy: 0.8966
Epoch 46/50
300/300 [==============================] - 106s 351ms/step - loss:
0.2642 - accuracy: 0.8916 - val_loss: 0.2762 - val_accuracy: 0.8722
Epoch 47/50
300/300 [==============================] - 106s 352ms/step - loss:
0.2615 - accuracy: 0.8897 - val_loss: 0.3490 - val_accuracy: 0.8413
Epoch 48/50
300/300 [==============================] - 106s 352ms/step - loss:
0.2664 - accuracy: 0.8886 - val_loss: 0.3238 - val_accuracy: 0.8363
Epoch 49/50
300/300 [==============================] - 105s 351ms/step - loss:
0.2654 - accuracy: 0.8890 - val_loss: 0.2712 - val_accuracy: 0.8809
Epoch 50/50
300/300 [==============================] - 106s 353ms/step - loss:
0.2737 - accuracy: 0.8826 - val_loss: 0.2744 - val_accuracy: 0.8781

model.save('iv3_model_v2.h5')

import cv2
import numpy as np
import matplotlib.pyplot as plt
import os
import random
from tensorflow import keras

model = keras.models.load_model('iv3_model_v2.h5')
# Folder path containing the images
folder_path = 'DermMel/test/Melanoma'

# Get a list of all image files in the folder
image_files = [os.path.join(folder_path, file) for file in
os.listdir(folder_path) if file.endswith('.jpg')]

# Randomly select 10 images from the list
random_images = random.sample(image_files, 10)

# Define the desired smaller image size
smaller_size = (224, 224)

for f in random_images:
    img = cv2.imread(str(f))
    img = cv2.resize(img, smaller_size)  # Resize the image to a
smaller size
    img = img.astype(np.float32) / 255.0
    img = np.expand_dims(img, axis=0)
```

```python
# Clip the image data to the valid range
img = np.clip(img, 0, 1)

# Create a smaller plot for the image
fig, ax = plt.subplots(figsize=(3, 3))
ax.imshow(cv2.cvtColor(img[0], cv2.COLOR_BGR2RGB))
ax.axis('off')
plt.show()

pred = model.predict(img)
predicted_value = pred[0][0]

if predicted_value > 0.56:
    print("Not Melanoma")
else:
    print("Melanoma")
print("Predicted Value:", predicted_value)
print("--------------------------------------")
```
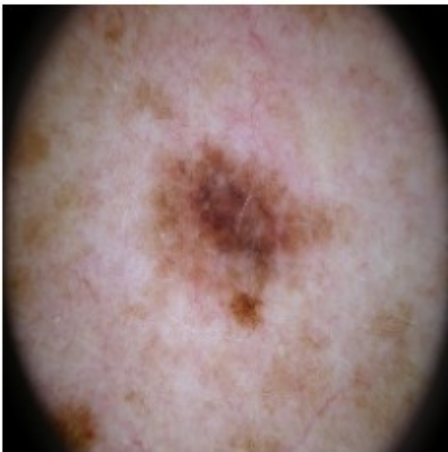


```
WARNING:tensorflow:5 out of the last 13 calls to <function
Model.make_predict_function.<locals>.predict_function at
0x000001E81B3A3EB0> triggered tf.function retracing. Tracing is
expensive and the excessive number of tracings could be due to (1)
creating @tf.function repeatedly in a loop, (2) passing tensors with
different shapes, (3) passing Python objects instead of tensors. For
(1), please define your @tf.function outside of the loop. For (2),
@tf.function has reduce_retracing=True option that can avoid
unnecessary retracing. For (3), please refer to
https://www.tensorflow.org/guide/function#controlling_retracing and
https://www.tensorflow.org/api_docs/python/tf/function for  more
details.
1/1 [==============================] - 1s 1s/step
Not Melanoma
```

Predicted Value: 0.64319164

1/1 [==============================] - 0s 31ms/step
Not Melanoma
Predicted Value: 0.9887439

1/1 [==============================] - 0s 32ms/step
Not Melanoma
Predicted Value: 0.6932634

```
1/1 [==============================] - 0s 39ms/step
Not Melanoma
Predicted Value: 0.6932634
----------------------------------------
```
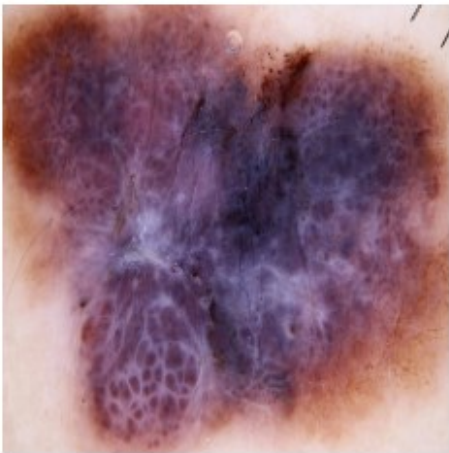


```
1/1 [==============================] - 0s 31ms/step
Melanoma
Predicted Value: 0.47733474
----------------------------------------
```
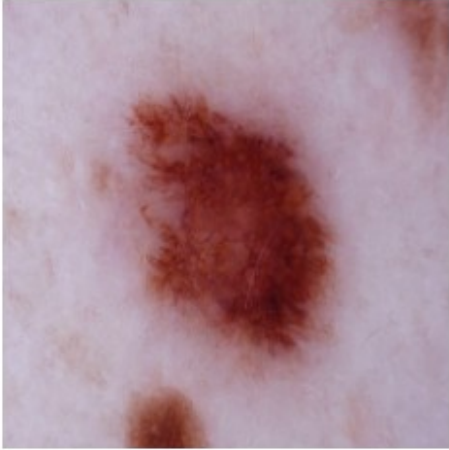
```
1/1 [==============================] - 0s 41ms/step
Not Melanoma
Predicted Value: 0.72782433
```

```
1/1 [==============================] - 0s 41ms/step
Melanoma
Predicted Value: 0.49182555
```
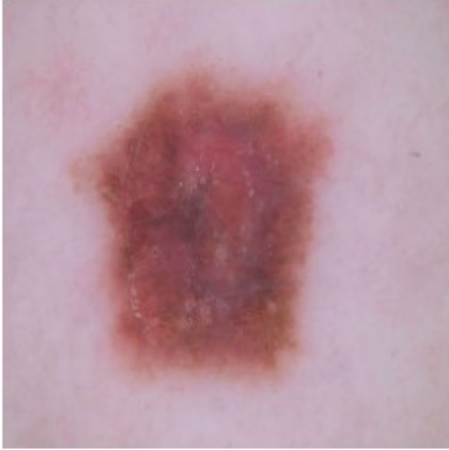
```
1/1 [==============================] - 0s 43ms/step
Not Melanoma
Predicted Value: 0.74254435
----------------------------------------
```



```
1/1 [==============================] - 0s 35ms/step
Not Melanoma
Predicted Value: 0.7240244
----------------------------------------
```

```
1/1 [==============================] - 0s 34ms/step
Not Melanoma
Predicted Value: 0.7507489
----------------------------------------
```
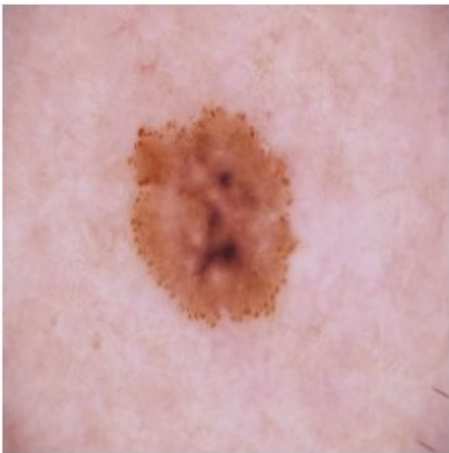


```
1/1 [==============================] - 0s 46ms/step
Not Melanoma
Predicted Value: 0.7795775
----------------------------------------
```
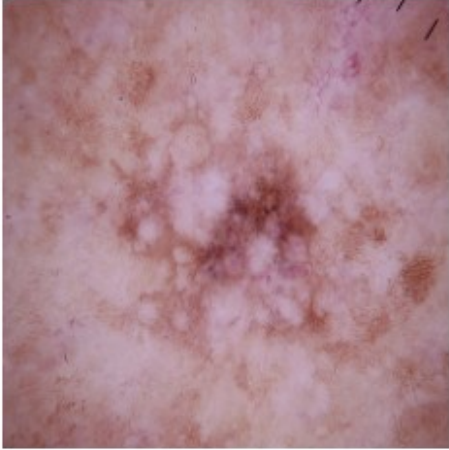
```
1/1 [==============================] - 0s 45ms/step
```
Not Melanoma
Predicted Value: 0.8575287
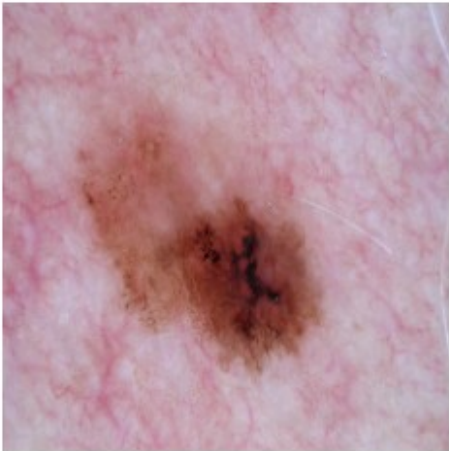
```
1/1 [==============================] - 0s 44ms/step
```
Not Melanoma
Predicted Value: 0.87406063
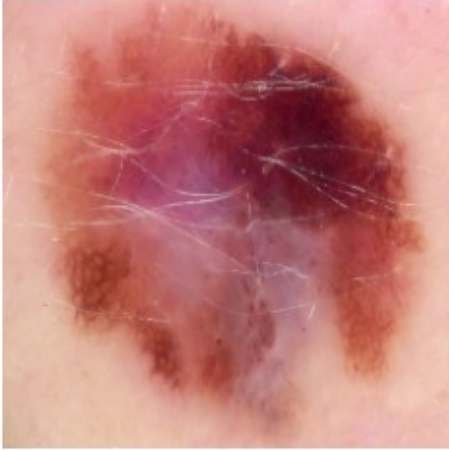
```
1/1 [==============================] - 0s 40ms/step
Not Melanoma
Predicted Value: 0.9960514
----------------------------------------
```
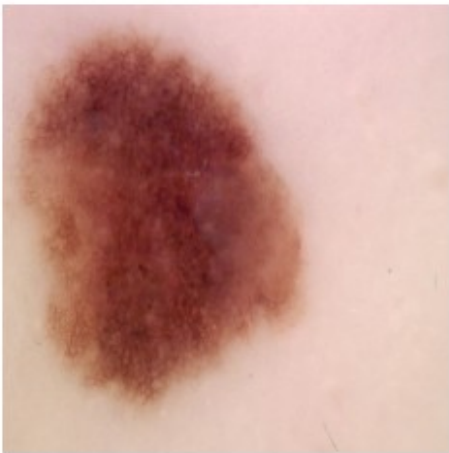


```
1/1 [==============================] - 0s 46ms/step
Not Melanoma
Predicted Value: 0.9256165
----------------------------------------
```

```
1/1 [==============================] - 0s 35ms/step
Not Melanoma
Predicted Value: 0.8275755
----------------------------------------
```
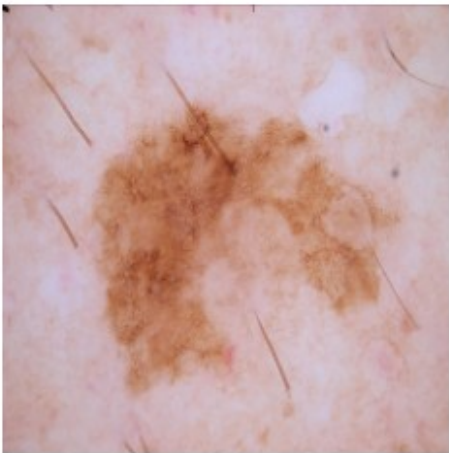


```
1/1 [==============================] - 0s 30ms/step
Not Melanoma
Predicted Value: 0.87381595
----------------------------------------
```
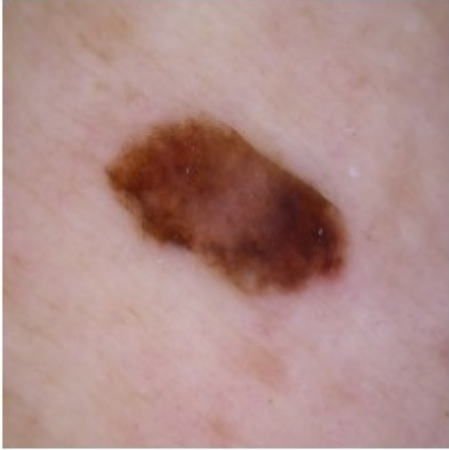
```
1/1 [==============================] - 0s 36ms/step
Not Melanoma
Predicted Value: 0.8814958
----------------------------------------
```
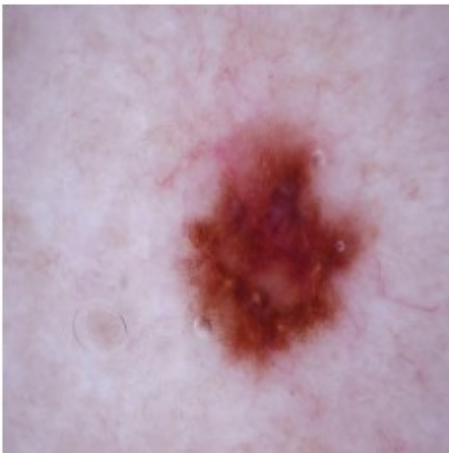


```
1/1 [==============================] - 0s 41ms/step
Not Melanoma
Predicted Value: 0.71929157
----------------------------------------
```

```
1/1 [==============================] - 0s 35ms/step
Melanoma
Predicted Value: 0.45768943
-----------------------------------------
```
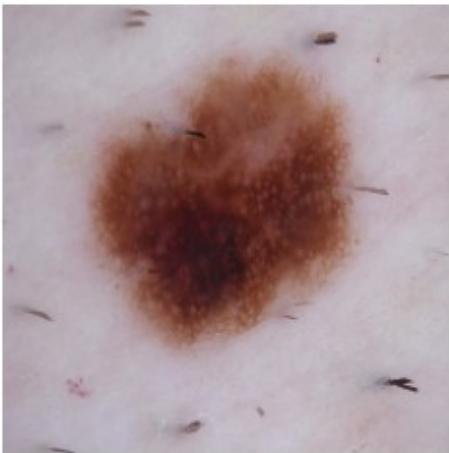


```
1/1 [==============================] - 0s 65ms/step
Not Melanoma
Predicted Value: 0.76847464
-----------------------------------------
```
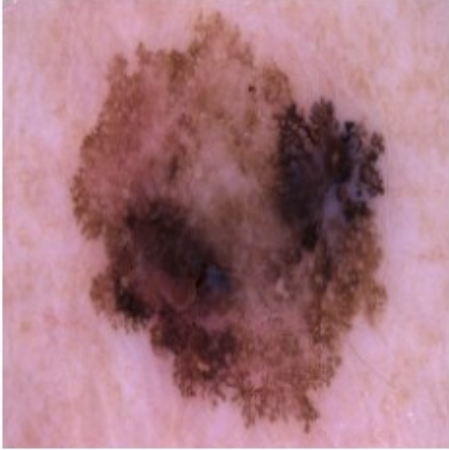
```
1/1 [==============================] - 0s 35ms/step
Melanoma
Predicted Value: 0.5145186
----------------------------------------
```
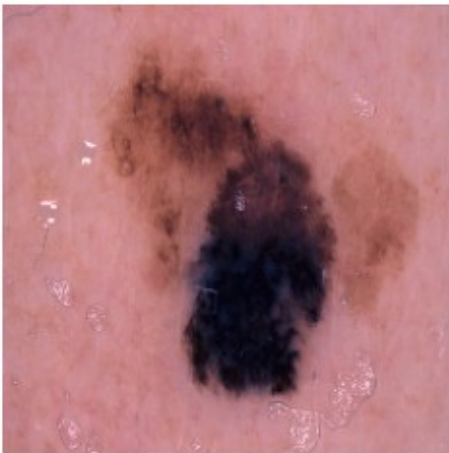


```
1/1 [==============================] - 0s 48ms/step
Melanoma
Predicted Value: 0.2991615
----------------------------------------
```

```
1/1 [==============================] - 0s 39ms/step
Not Melanoma
Predicted Value: 0.6932634
----------------------------------------
```
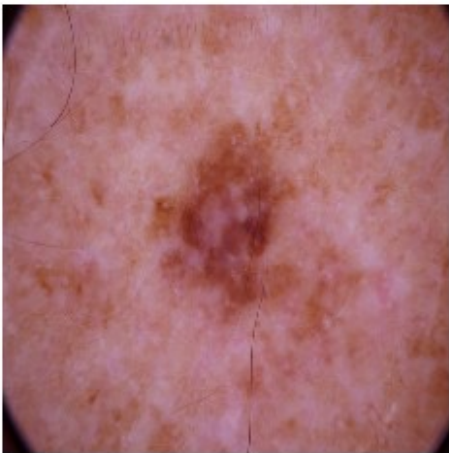


```
1/1 [==============================] - 0s 37ms/step
Melanoma
Predicted Value: 0.26827854
----------------------------------------
```

```
1/1 [==============================] - 0s 31ms/step
Not Melanoma
Predicted Value: 0.9970235
----------------------------------------
```
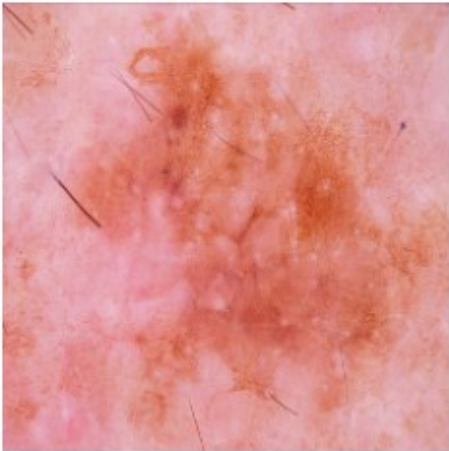


```
1/1 [==============================] - 0s 38ms/step
Not Melanoma
Predicted Value: 0.9982529
----------------------------------------
```
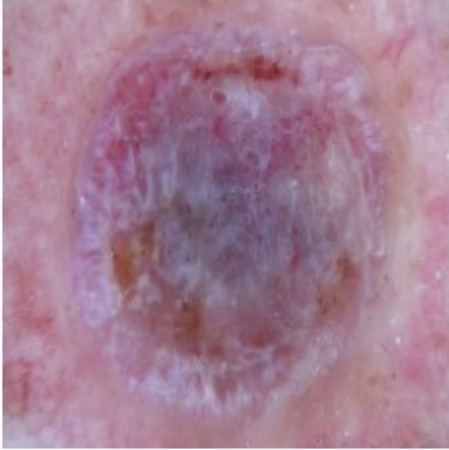
```
1/1 [==============================] - 0s 67ms/step
Not Melanoma
Predicted Value: 0.9931839
----------------------------------------
```



```
1/1 [==============================] - 0s 33ms/step
Not Melanoma
Predicted Value: 0.8763194
----------------------------------------
```
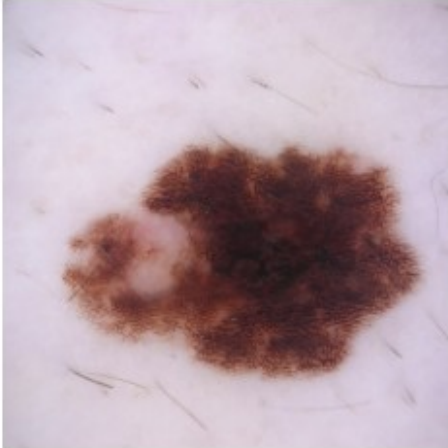
```
1/1 [==============================] - 0s 39ms/step
Not Melanoma
Predicted Value: 0.9208052
----------------------------------------
```



```
1/1 [==============================] - 0s 65ms/step
Not Melanoma
Predicted Value: 0.94999695
----------------------------------------
```
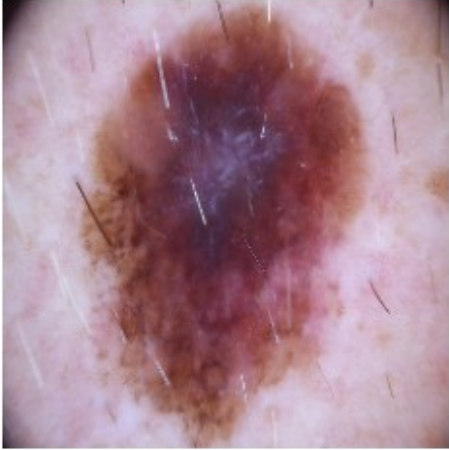
```
1/1 [==============================] - 0s 42ms/step
Not Melanoma
Predicted Value: 0.87241983
----------------------------------------
```



```
1/1 [==============================] - 0s 46ms/step
Not Melanoma
Predicted Value: 0.6932634
----------------------------------------
```
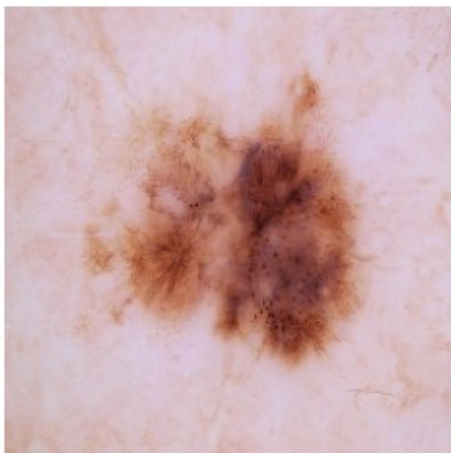
```
1/1 [==============================] - 0s 42ms/step
Not Melanoma
Predicted Value: 0.73434556
```
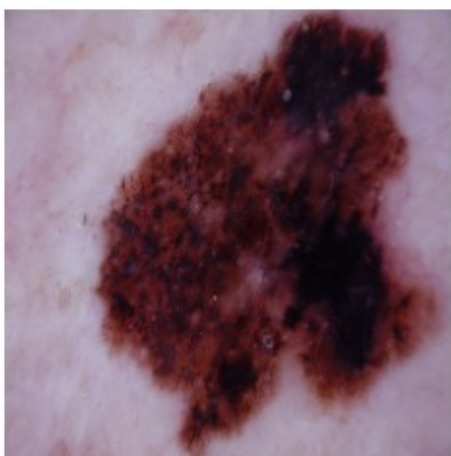
```
1/1 [==============================] - 0s 40ms/step
Melanoma
Predicted Value: 0.528178
```
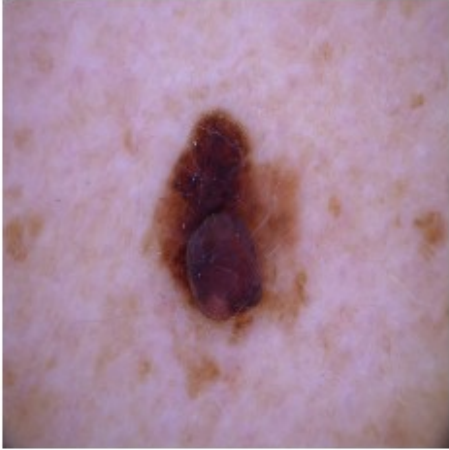
```
1/1 [==============================] - 0s 37ms/step
Not Melanoma
Predicted Value: 0.9981304
-----------------------------------------
```



```
1/1 [==============================] - 0s 43ms/step
Not Melanoma
Predicted Value: 0.8908655
-----------------------------------------
```
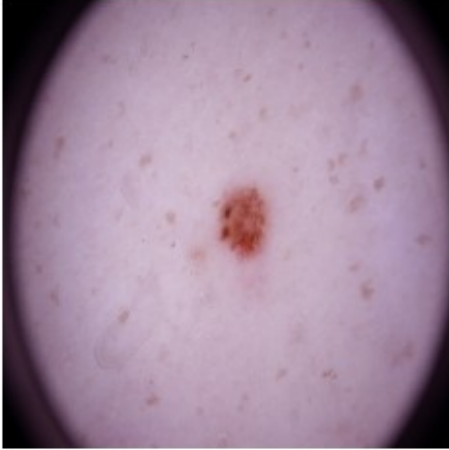
```
1/1 [==============================] - 0s 65ms/step
Not Melanoma
Predicted Value: 0.666444
----------------------------------------
```
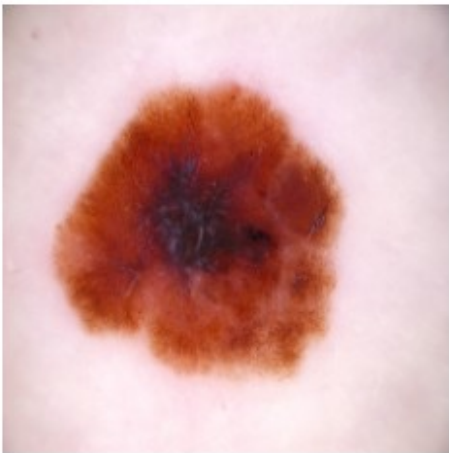


```
1/1 [==============================] - 0s 66ms/step
Not Melanoma
Predicted Value: 0.9694123
----------------------------------------
```
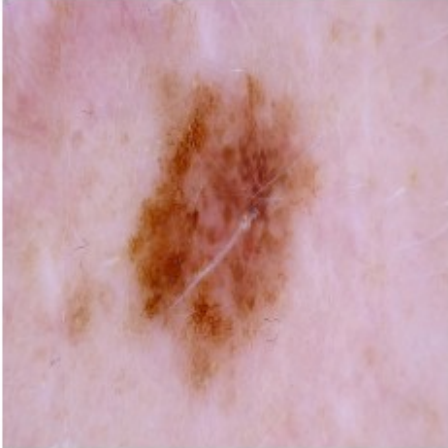
```
1/1 [==============================] - 0s 73ms/step
Not Melanoma
Predicted Value: 0.9646516
----------------------------------------
```

```python
from tensorflow import keras

model = keras.models.load_model('iv3_model_v2.h5')

test_loss, test_accuracy = model.evaluate(test_generator)
print("Test Loss:", test_loss)
print("Test Accuracy:", test_accuracy)
```

```
112/112 [==============================] - 15s 119ms/step - loss:
0.2009 - accuracy: 0.9225
Test Loss: 0.20094002783298492
Test Accuracy: 0.9224936962127686
```

```python
from tensorflow import keras

model = keras.models.load_model('dh_model2.h5')

test_loss, test_accuracy = model.evaluate(test_generator)
print("Test Loss:", test_loss)
print("Test Accuracy:", test_accuracy)
```

```
112/112 [==============================] - 15s 118ms/step - loss:
0.2009 - accuracy: 0.9225
Test Loss: 0.20094002783298492
Test Accuracy: 0.9224936962127686
```