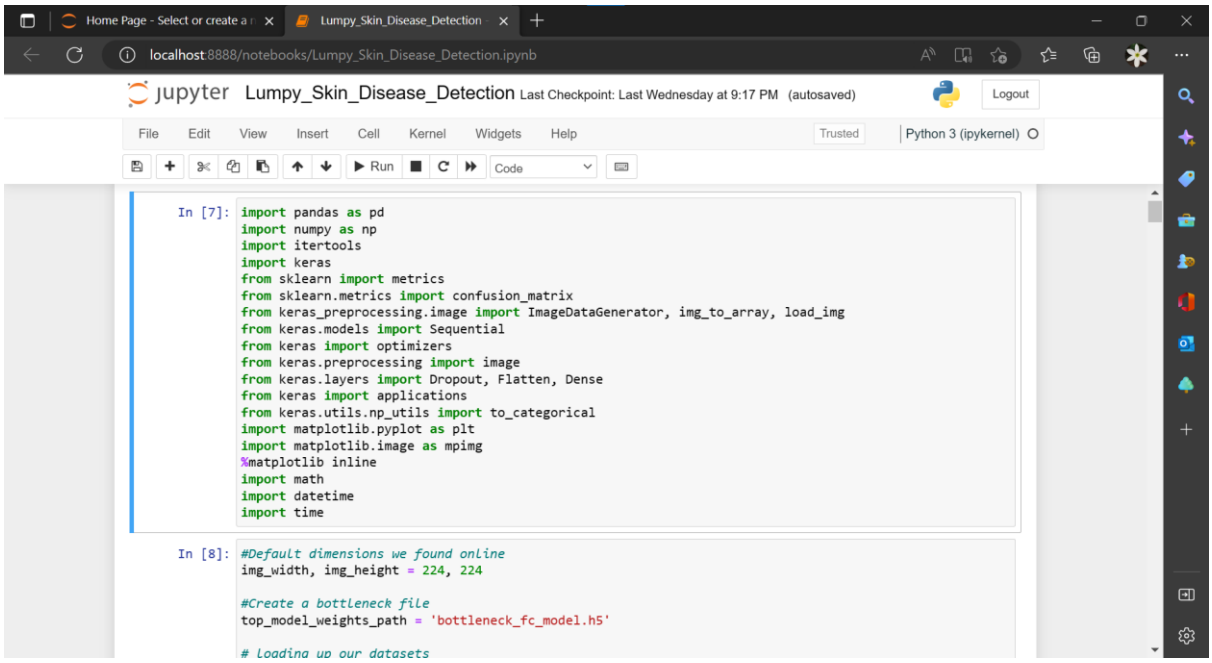
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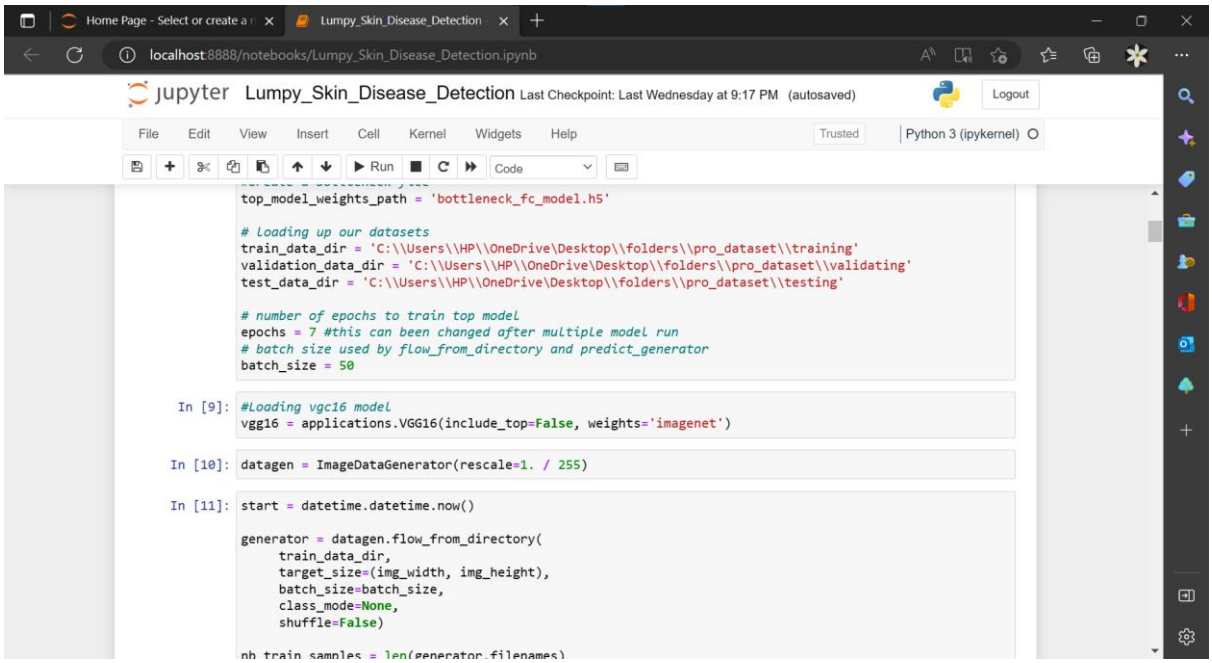
Trusted
Python 3 (ipykernel)
Run
Code
In [7]:
import pandas as pd
import numpy as np
import itertools
import keras
from sklearn import metrics
from sklearn.metrics import confusion_matrix
from keras_preprocessing.image import ImageDataGenerator, img_to_array, load_img
from keras.models import Sequential
from keras import optimizers
from keras.preprocessing import image
from keras.layers import Dropout, Flatten, Dense
from keras import applications
from keras.utils.np_utils import to_categorical
import matplotlib.pyplot as plt
import matplotlib.image as mpimg
%matplotlib inline
import math
import datetime
import time
In [8]:
#Default dimensions we found online
img_width, img_height = 224, 224
#Create a bottleneck file
top_model_weights_path = 'bottleneck_fc_model.h5'
# loading up our datasets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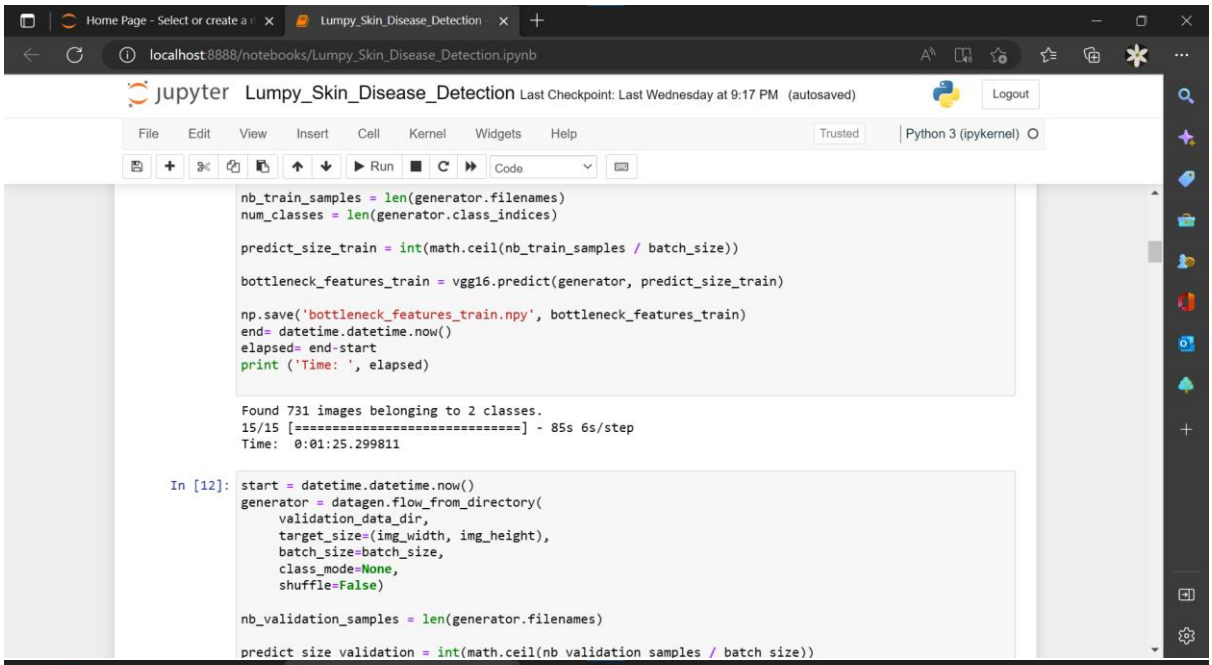
Python 3 (ipykernel)
Run
Code
top_model_weights_path = 'bottleneck_fc_model.h5'
# loading up our datasets
train_data_dir = 'C:\\Users\\HP\\OneDrive\Desktop\\folders\\pro_dataset\\training'
validation_data_dir = 'C:\\Users\\HP\\OneDrive\Desktop\\folders\\pro_dataset\\validating'
test_data_dir = 'C:\\Users\\HP\\OneDrive\Desktop\\folders\\pro_dataset\\testing'
# number of epochs to train top model
epochs = 7 #this can been changed after multiple model run
# batch size used by flow_from_directory and predict_generator
batch_size = 50
In [9]:
#Loading vgc16 model
vgg16 = applications.VGG16(include_top=False, weights='imagenet')
In [10]:
datagen = ImageDataGenerator(rescale=1. / 255)
In [11]:
start = datetime.datetime.now()
generator = datagen.flow_from_directory(
train_data_dir,
target_size=(img_width, img_height),
batch_size=batch_size,
class_mode=None,
shuffle=False)
nb_train_samples = len(generator.filenames)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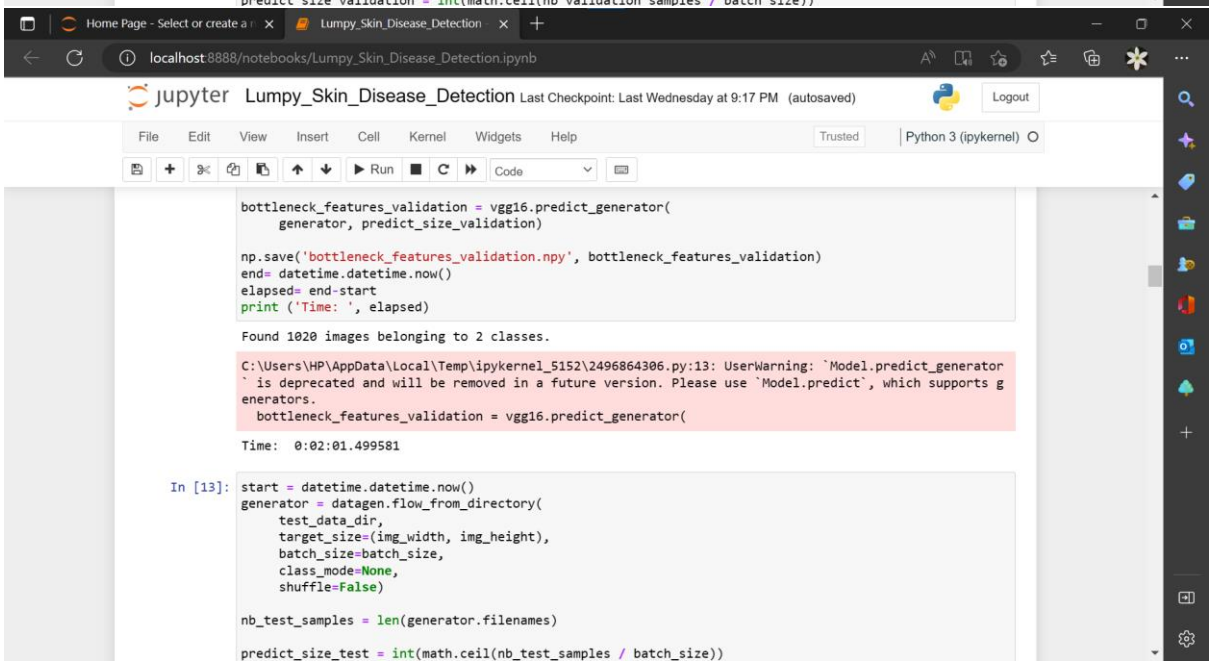
Python 3 (ipykernel)
Run
Code
nb_train_samples = len(generator.filenames)
num_classes = len(generator.class_indices)
predict_size_train = int(math.ceil(nb_train_samples / batch_size))
bottleneck_features_train = vgg16.predict(generator, predict_size_train)
np.save('bottleneck_features_train.npy', bottleneck_features_train)
end= datetime.datetime.now()
elapsed= end-start
print ('Time: ', elapsed)
Found 731 images belonging to 2 classes.
15/15 [==============================] - 85s 6s/step
Time: 0:01:25.299811
In [12]:
start = datetime.datetime.now()
generator = datagen.flow_from_directory(
validation_data_dir,
target_size=(img_width, img_height),
batch_size=batch_size,
class_mode=None,
shuffle=False)
nb_validation_samples = len(generator.filenames)
predict size validation = int(math.ceil(nb validation samples / batch size))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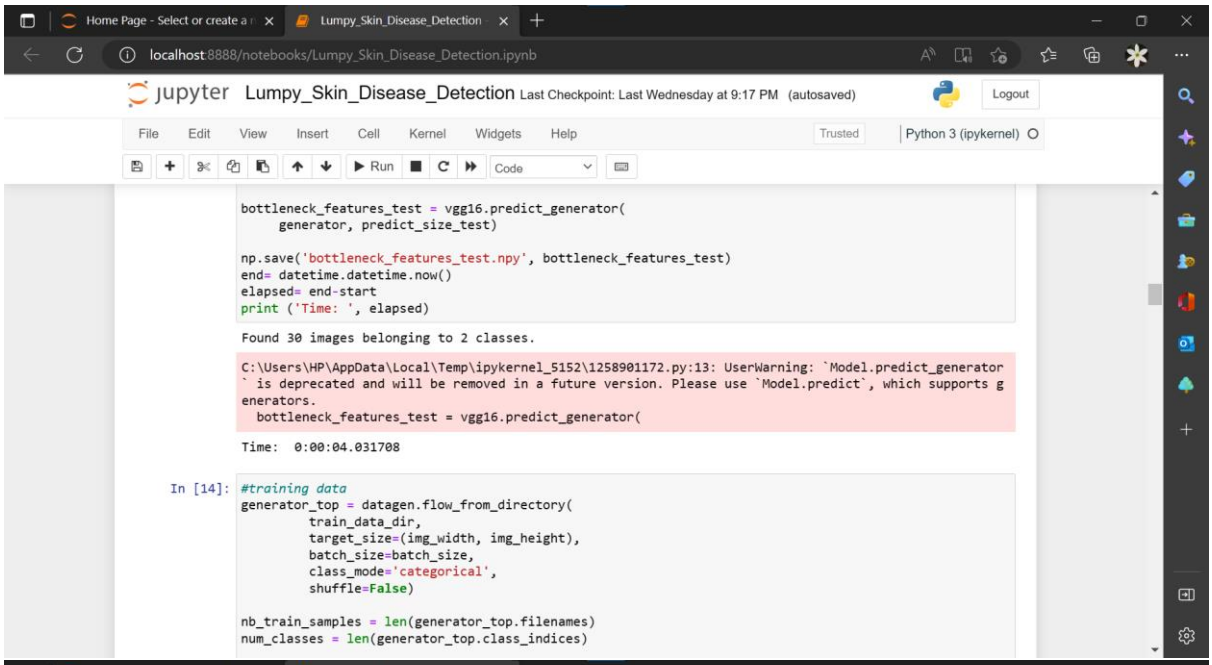
Python 3 (ipykernel)
Run
Code
bottleneck_features_validation = vgg16.predict_generator(
generator, predict_size_validation)
np.save('bottleneck_features_validation.npy', bottleneck_features_validation)
end= datetime.datetime.now()
elapsed= end-start
print ('Time: ', elapsed)
Found 1020 images belonging to 2 classes.
C:\Users\HP\AppData\Local\Temp\ipykernel_5152\2496864306.py:13: UserWarning: `Model.predict_generator` is deprecated and will be removed in a future version. Please use `Model.predict`, which supports generators.
bottleneck_features_validation = vgg16.predict_generator(
Time: 0:02:01.499581
In [13]:
start = datetime.datetime.now()
generator = datagen.flow_from_directory(
test_data_dir,
target_size=(img_width, img_height),
batch_size=batch_size,
class_mode=None,
shuffle=False)
nb_test_samples = len(generator.filenames)
predict_size_test = int(math.ceil(nb_test_samples / batch_size))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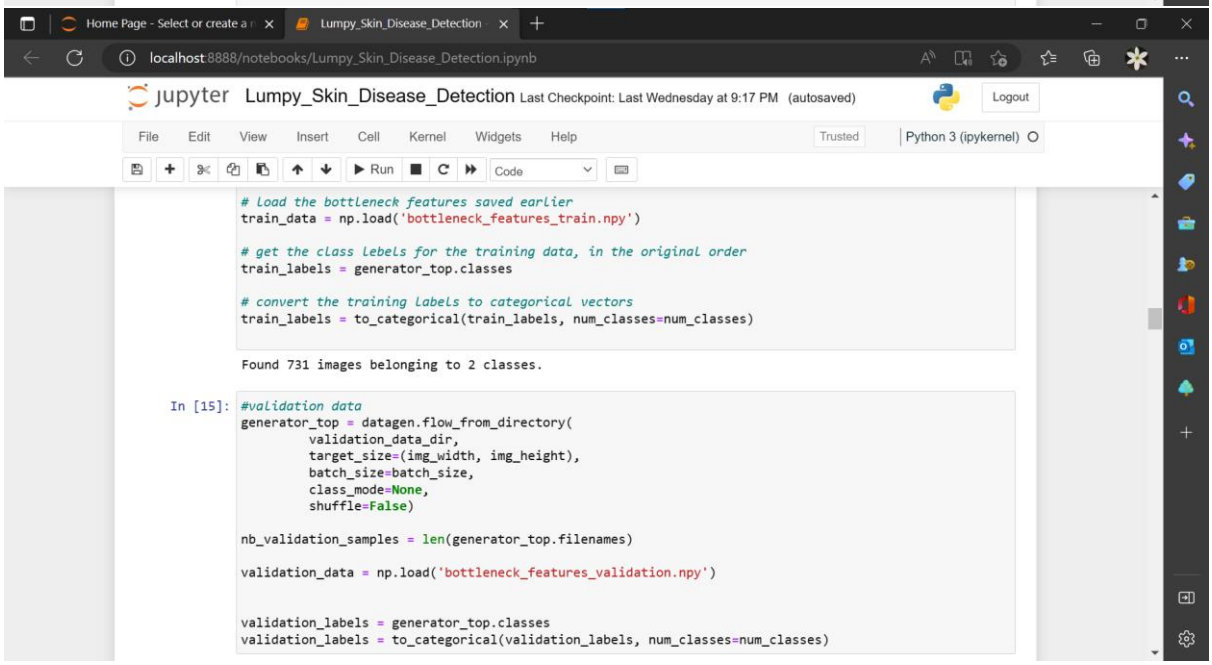
Python 3 (ipykernel)
Run
Code
bottleneck_features_test = vgg16.predict_generator(
generator, predict_size_test)
np.save('bottleneck_features_test.npy', bottleneck_features_test)
end= datetime.datetime.now()
elapsed= end-start
print ('Time: ', elapsed)
Found 30 images belonging to 2 classes.
C:\Users\HP\AppData\Local\Temp\ipykernel_5152\1258901172.py:13: UserWarning: `Model.predict_generator` is deprecated and will be removed in a future version. Please use `Model.predict`, which supports generators.
bottleneck_features_test = vgg16.predict_generator(
Time: 0:00:04.031708
In [14]:
#training data
generator_top = datagen.flow_from_directory(
train_data_dir,
target_size=(img_width, img_height),
batch_size=batch_size,
class_mode='categorical',
shuffle=False)
nb_train_samples = len(generator_top.filenames)
num_classes = len(generator_top.class_indices)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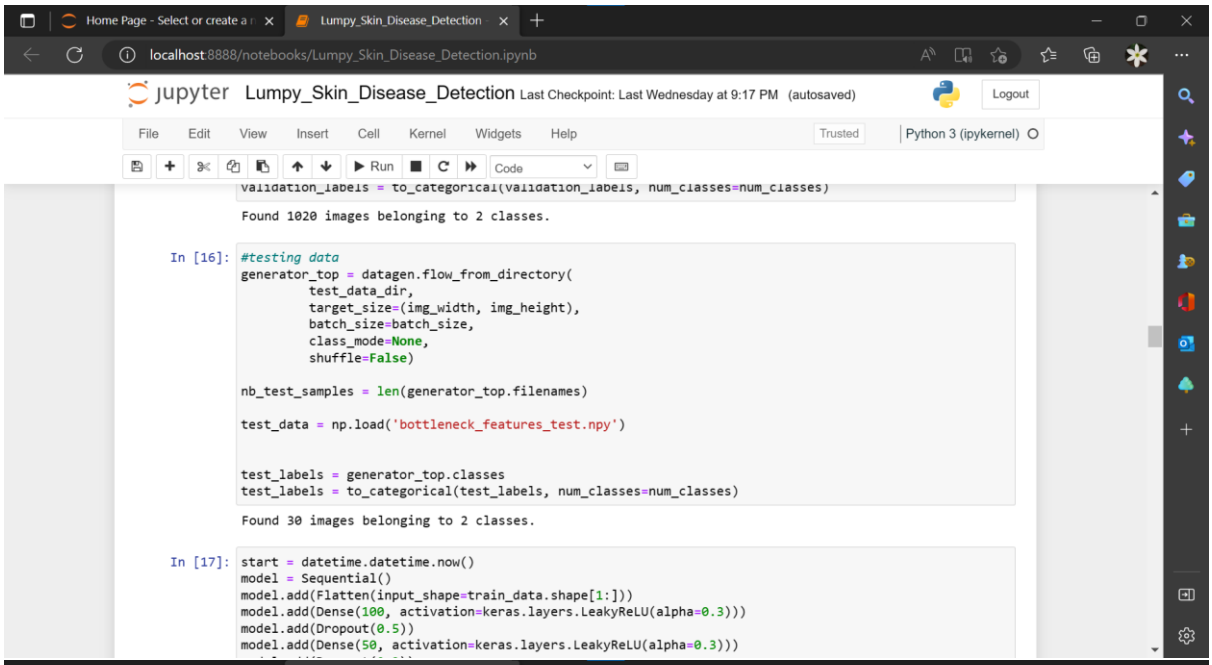
Python 3 (ipykernel)
Run
Code
# load the bottleneck features saved earlier
train_data = np.load('bottleneck_features_train.npy')
# get the class labels for the training data, in the original order
train_labels = generator_top.classes
# convert the training labels to categorical vectors
train_labels = to_categorical(train_labels, num_classes=num_classes)
Found 731 images belonging to 2 classes.
In [15]:
#validation data
generator_top = datagen.flow_from_directory(
validation_data_dir,
target_size=(img_width, img_height),
batch_size=batch_size,
class_mode=None,
shuffle=False)
nb_validation_samples = len(generator_top.filenames)
validation_data = np.load('bottleneck_features_validation.npy')
validation_labels = generator_top.classes
validation_labels = to_categorical(validation_labels, num_classes=num_classes)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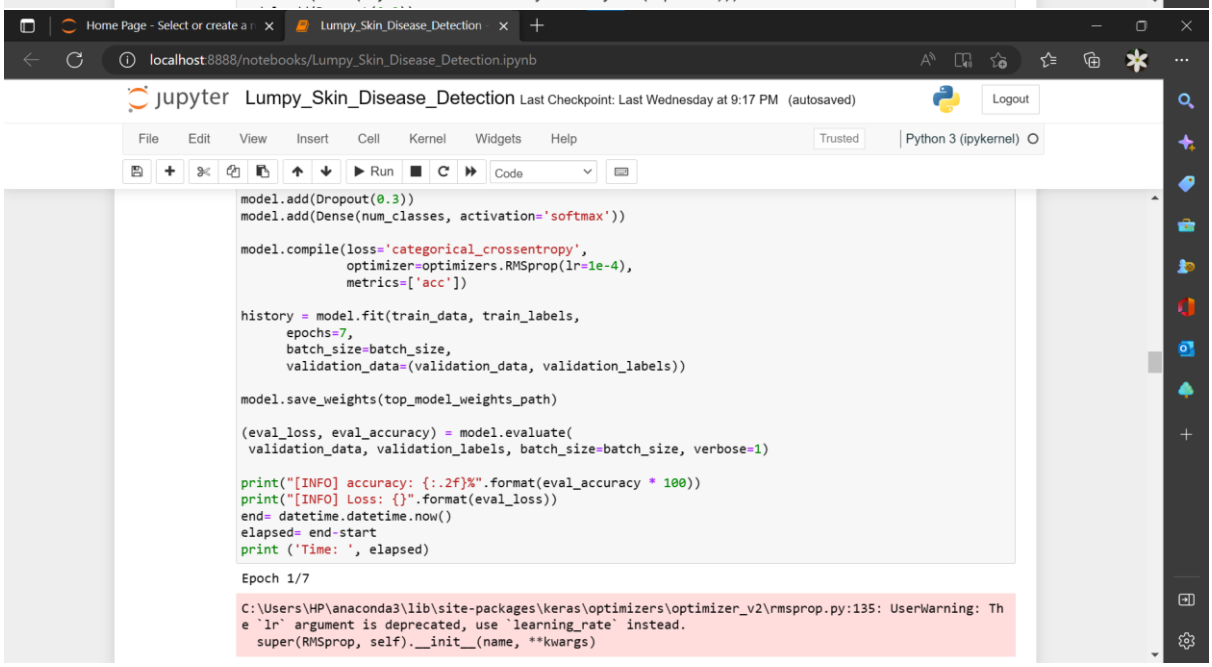
Python 3 (ipykernel)
Run
Code
validation_labels = to_categorical(validation_labels, num_classes=num_classes)
Found 1020 images belonging to 2 classes.
In [16]:
#testing data
generator_top = datagen.flow_from_directory(
test_data_dir,
target_size=(img_width, img_height),
batch_size=batch_size,
class_mode=None,
shuffle=False)
nb_test_samples = len(generator_top.filenames)
test_data = np.load('bottleneck_features_test.npy')
test_labels = generator_top.classes
test_labels = to_categorical(test_labels, num_classes=num_classes)
Found 30 images belonging to 2 classes.
In [17]:
start = datetime.datetime.now()
model = Sequential()
model.add(Flatten(input_shape=train_data.shape[1:]))
model.add(Dense(100, activation=keras.layers.LeakyReLU(alpha=0.3)))
model.add(Dropout(0.5))
model.add(Dense(50, activation=keras.layers.LeakyReLU(alpha=0.3)))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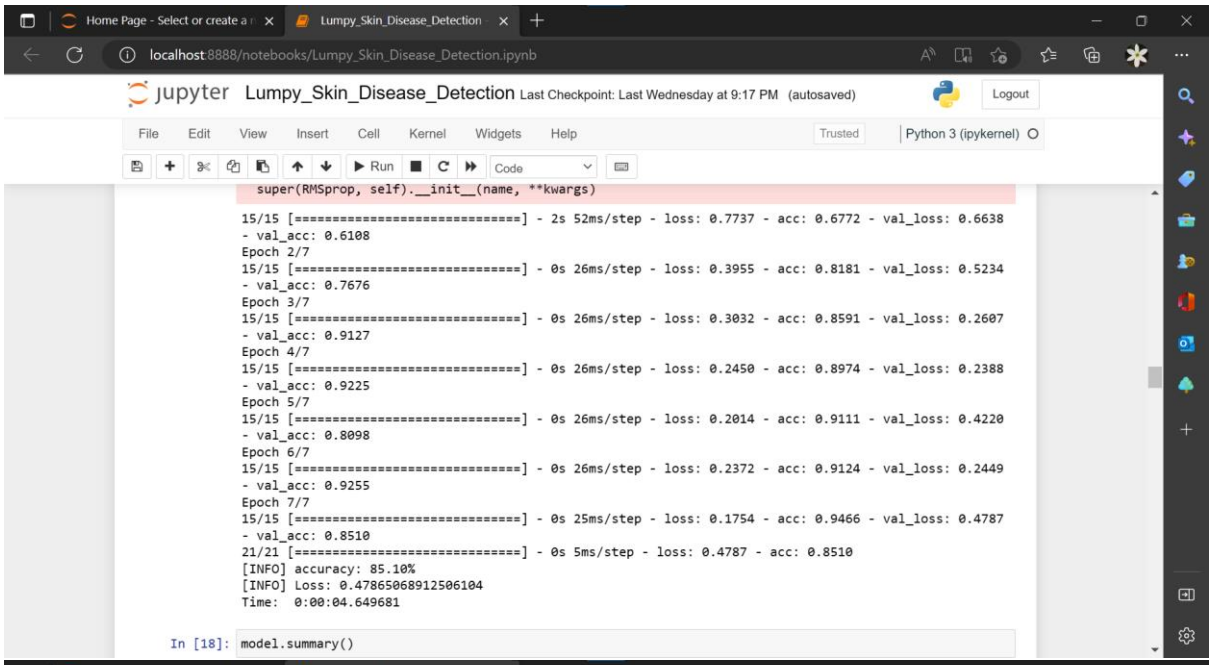
Python 3 (ipykernel)
Run
Code
model.add(Dropout(0.3))
model.add(Dense(num_classes, activation='softmax'))
model.compile(loss='categorical_crossentropy',
optimizer=optimizers.RMSprop(lr=1e-4),
metrics=['acc'])
history = model.fit(train_data, train_labels,
epochs=7,
batch_size=batch_size,
validation_data=(validation_data, validation_labels))
model.save_weights(top_model_weights_path)
(eval_loss, eval_accuracy) = model.evaluate(
validation_data, validation_labels, batch_size=batch_size, verbose=1)
print("[INFO] accuracy: {:.2f}%".format(eval_accuracy * 100))
print("[INFO] Loss: {}".format(eval_loss))
end= datetime.datetime.now()
elapsed= end-start
print ('Time: ', elapsed)
Epoch 1/7
C:\Users\HP\anaconda3\lib\site-packages\keras\optimizers\optimizer_v2\rmsprop.py:135: UserWarning: Th
e `lr` argument is deprecated, use `learning_rate` instead.
super(RMSprop, self).__init__(name, **kwargs)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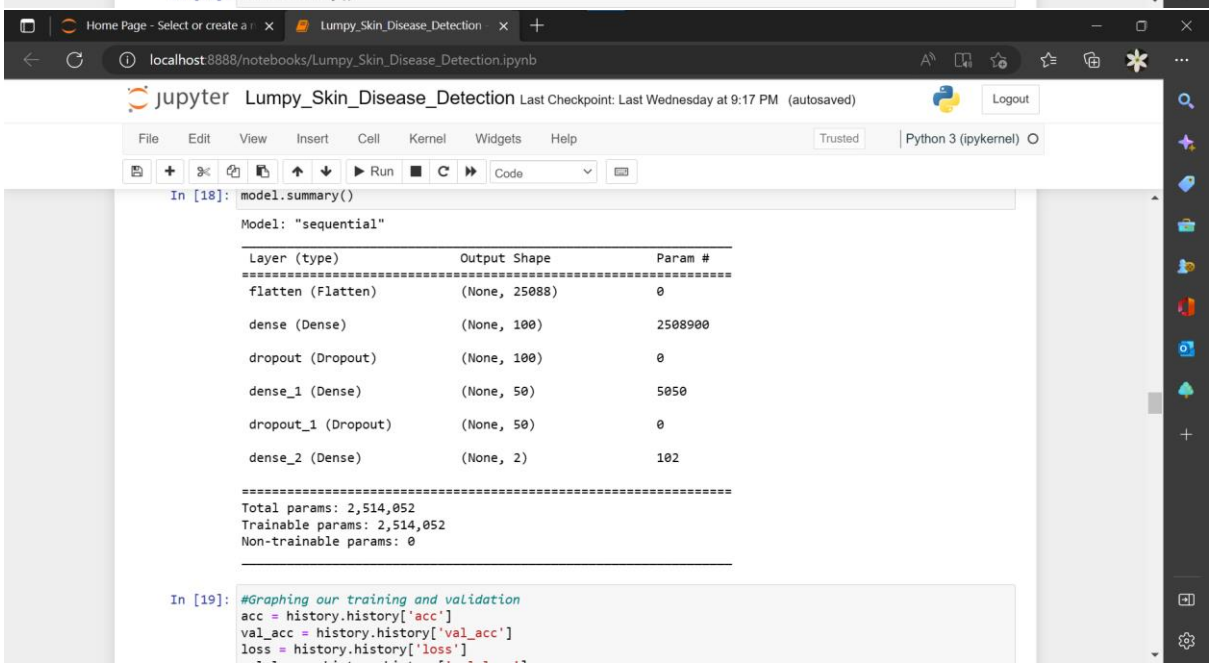
Python 3 (ipykernel)
Run
Code
super(RMSprop, self).__init__(name, **kwargs)
15/15 [==========] - 2s 52ms/step - loss: 0.7737 - acc: 0.6772 - val_loss: 0.6638
- val_acc: 0.6108
Epoch 2/7
15/15 [==========] - 0s 26ms/step - loss: 0.3955 - acc: 0.8181 - val_loss: 0.5234
- val_acc: 0.7676
Epoch 3/7
15/15 [==========] - 0s 26ms/step - loss: 0.3032 - acc: 0.8591 - val_loss: 0.2607
- val_acc: 0.9127
Epoch 4/7
15/15 [==========] - 0s 26ms/step - loss: 0.2450 - acc: 0.8974 - val_loss: 0.2388
- val_acc: 0.9225
Epoch 5/7
15/15 [==========] - 0s 26ms/step - loss: 0.2014 - acc: 0.9111 - val_loss: 0.4220
- val_acc: 0.8098
Epoch 6/7
15/15 [==========] - 0s 26ms/step - loss: 0.2372 - acc: 0.9124 - val_loss: 0.2449
- val_acc: 0.9255
Epoch 7/7
15/15 [==========] - 0s 25ms/step - loss: 0.1754 - acc: 0.9466 - val_loss: 0.4787
- val_acc: 0.8510
21/21 [==========] - 0s 5ms/step - loss: 0.4787 - acc: 0.8510
[INFO] accuracy: 85.10%
[INFO] Loss: 0.47865068912506104
Time: 0:00:04.649681
In [18]: model.summary()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Python 3 (ipykernel)
Run
Code
In [18]: model.summary()
Model: "sequential"
Layer (type) Output Shape Param #
flatten (Flatten) (None, 25088) 0
dense (Dense) (None, 100) 2508900
dropout (Dropout) (None, 100) 0
dense_1 (Dense) (None, 50) 5050
dropout_1 (Dropout) (None, 50) 0
dense_2 (Dense) (None, 2) 102
Total params: 2,514,052
Trainable params: 2,514,052
Non-trainable params: 0
In [19]: #Graphing our training and validation
acc = history.history['acc']
val_acc = history.history['val_acc']
loss = history.history['loss']

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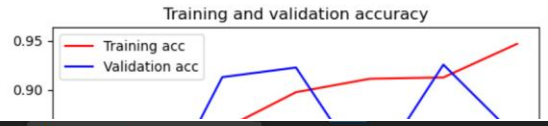
Run Code

In [19]:
```
#Graphing our training and validation
acc = history.history['acc']
val_acc = history.history['val_acc']
loss = history.history['loss']
val_loss = history.history['val_loss']
epochs = range(len(acc))
plt.plot(epochs, acc, 'r', label='Training acc')
plt.plot(epochs, val_acc, 'b', label='Validation acc')
plt.title('Training and validation accuracy')
plt.ylabel('accuracy')
plt.xlabel('epoch')
plt.legend()
plt.figure()
plt.plot(epochs, loss, 'r', label='Training loss')
plt.plot(epochs, val_loss, 'b', label='Validation loss')
plt.title('Training and validation loss')
plt.ylabel('loss')
plt.xlabel('epoch')
plt.legend()
plt.show()
```



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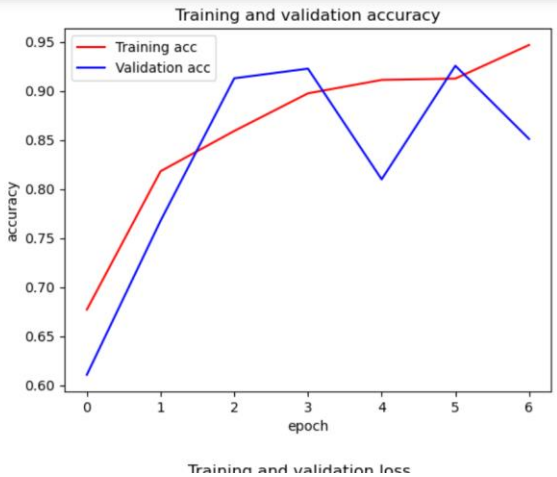
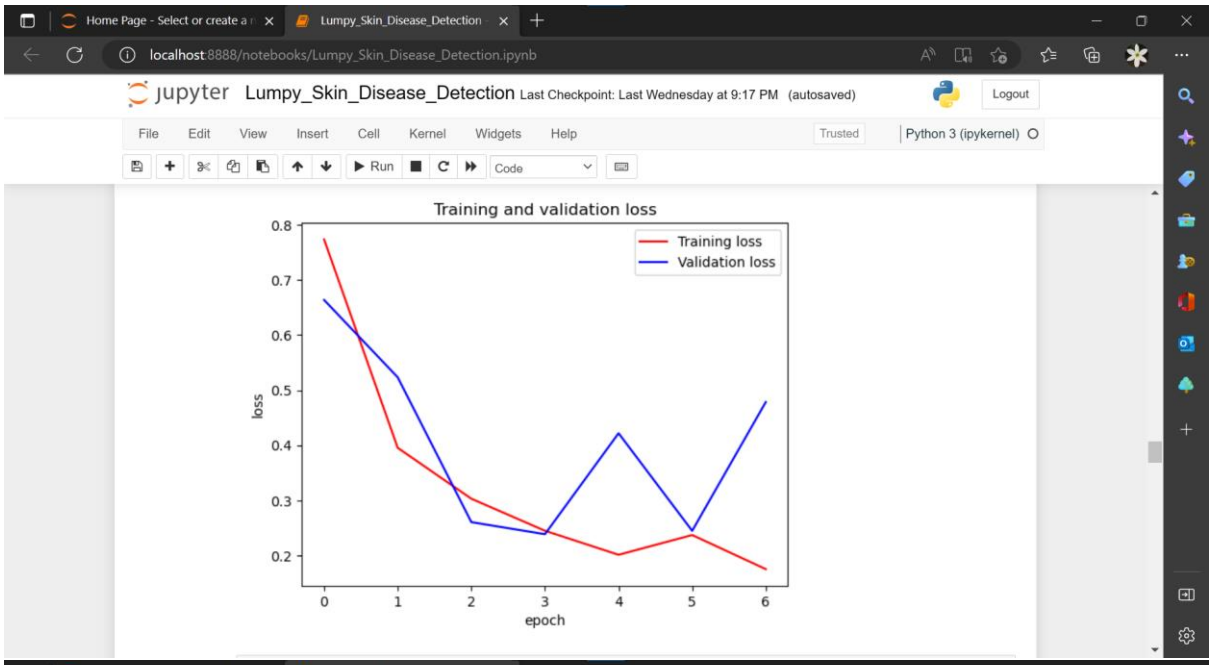


Training and validation loss



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Run Code

In [20]:
```
model.evaluate(test_data, test_labels)
```

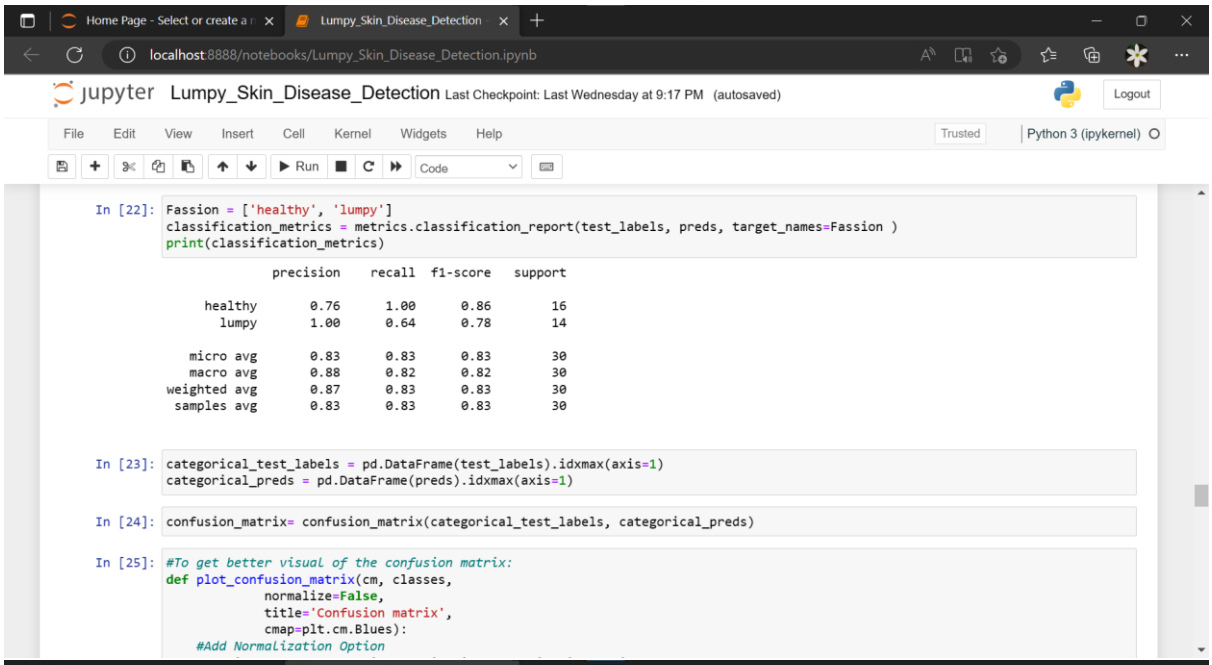
```
1/1 [==============================] - 0s 34ms/step - loss: 0.2991 - acc: 0.8333
```

Out[20]:
```
[0.2991317808628082, 0.8333333134651184]
```

In [21]:
```
print('test data', test_data)
preds = np.round(model.predict(test_data),0)
#to fit them into classification metrics, some additional modificaitions are required
print('rounded test_labels', preds)
```

```
test data [[[[0.61931896 0.         0.         ... 0.         0.8360786
    0.        ]
   [0.48080292 0.         0.         ... 0.         0.4936508
    0.        ]
   [0.18586707 0.         0.         ... 0.         0.6890369
    0.        ]
   ...
   [0.         0.         0.63667476 ... 0.         0.44588625
    0.        ]
   [0.18402433 0.         0.382191   ... 0.         0.7707309
    0.        ]
   [0.6177041  0.         1.0498042  ... 0.         0.76193434
    0.        ]]

  [[0.16720963 0.         0.6235392  ... 0.         0.73905635
    0.        ]
   [0.         0.         1.7925546  ... 0.         0.29497
```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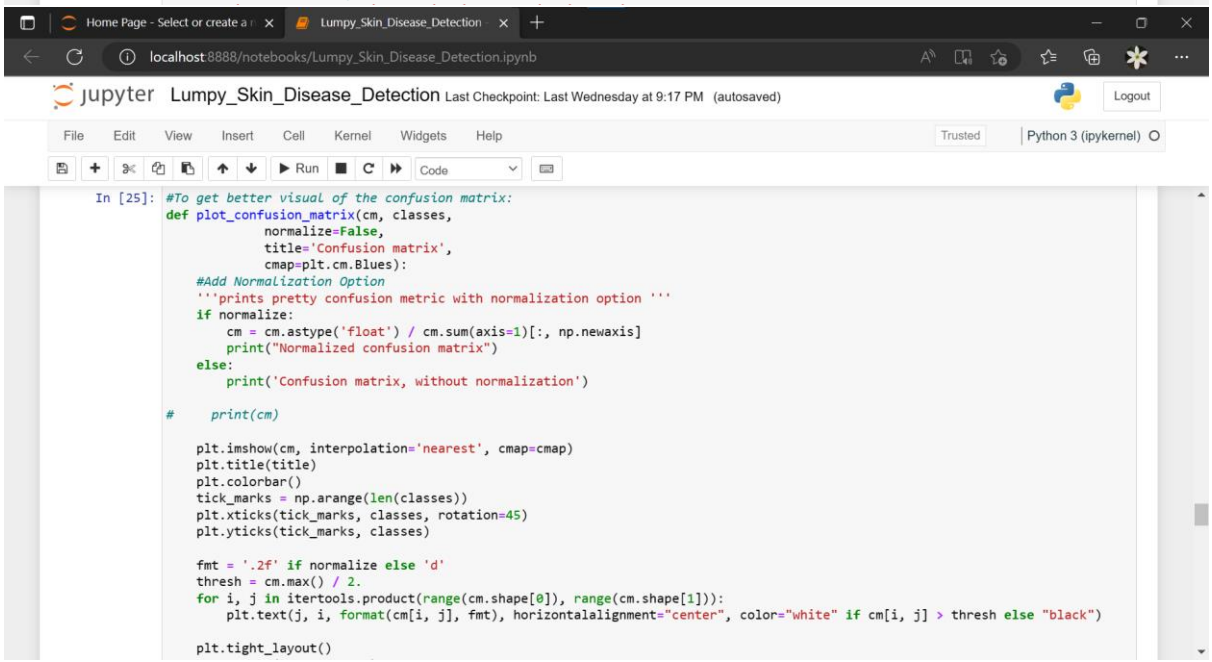
Python 3 (ipykernel)
Run
Code
In [22]:
Fassion = ['healthy', 'lumpy']
classification_metrics = metrics.classification_report(test_labels, preds, target_names=Fassion)
print(classification_metrics)
precision recall f1-score support
healthy 0.76 1.00 0.86 16
lumpy 1.00 0.64 0.78 14
micro avg 0.83 0.83 0.83 30
macro avg 0.88 0.82 0.82 30
weighted avg 0.87 0.83 0.83 30
samples avg 0.83 0.83 0.83 30
In [23]:
categorical_test_labels = pd.DataFrame(test_labels).idxmax(axis=1)
categorical_preds = pd.DataFrame(preds).idxmax(axis=1)
In [24]:
confusion_matrix= confusion_matrix(categorical_test_labels, categorical_preds)
In [25]:
#To get better visual of the confusion matrix:
def plot_confusion_matrix(cm, classes,
normalize=False,
title='Confusion matrix',
cmap=plt.cm.Blues):
#Add Normalization Option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Trusted
Python 3 (ipykernel)
Run
Code
In [25]:
#To get better visual of the confusion matrix:
def plot_confusion_matrix(cm, classes,
normalize=False,
title='Confusion matrix',
cmap=plt.cm.Blues):
#Add Normalization Option
'''prints pretty confusion metric with normalization option '''
if normalize:
cm = cm.astype('float') / cm.sum(axis=1)[:, np.newaxis]
print("Normalized confusion matrix")
else:
print('Confusion matrix, without normalization')
# print(cm)
plt.imshow(cm, interpolation='nearest', cmap=cmap)
plt.title(title)
plt.colorbar()
tick_marks = np.arange(len(classes))
plt.xticks(tick_marks, classes, rotation=45)
plt.yticks(tick_marks, classes)
fmt = '.2f' if normalize else 'd'
thresh = cm.max() / 2.
for i, j in itertools.product(range(cm.shape[0]), range(cm.shape[1])):
plt.text(j, i, format(cm[i, j], fmt), horizontalalignment="center", color="white" if cm[i, j] > thresh else "black")
plt.tight_layout()

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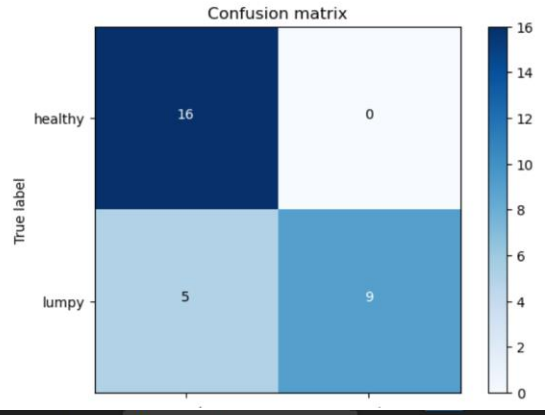
In [26]:
```
plot_confusion_matrix(confusion_matrix, ['healthy', 'lumpy'])
```

```
Confusion matrix, without normalization
```



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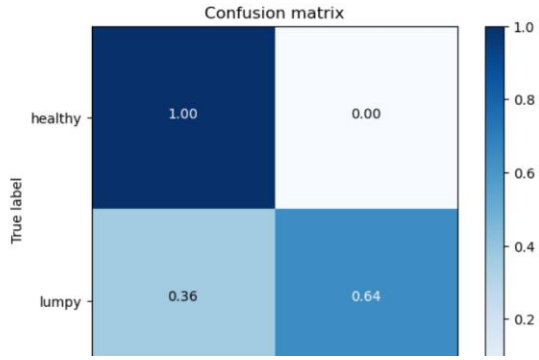
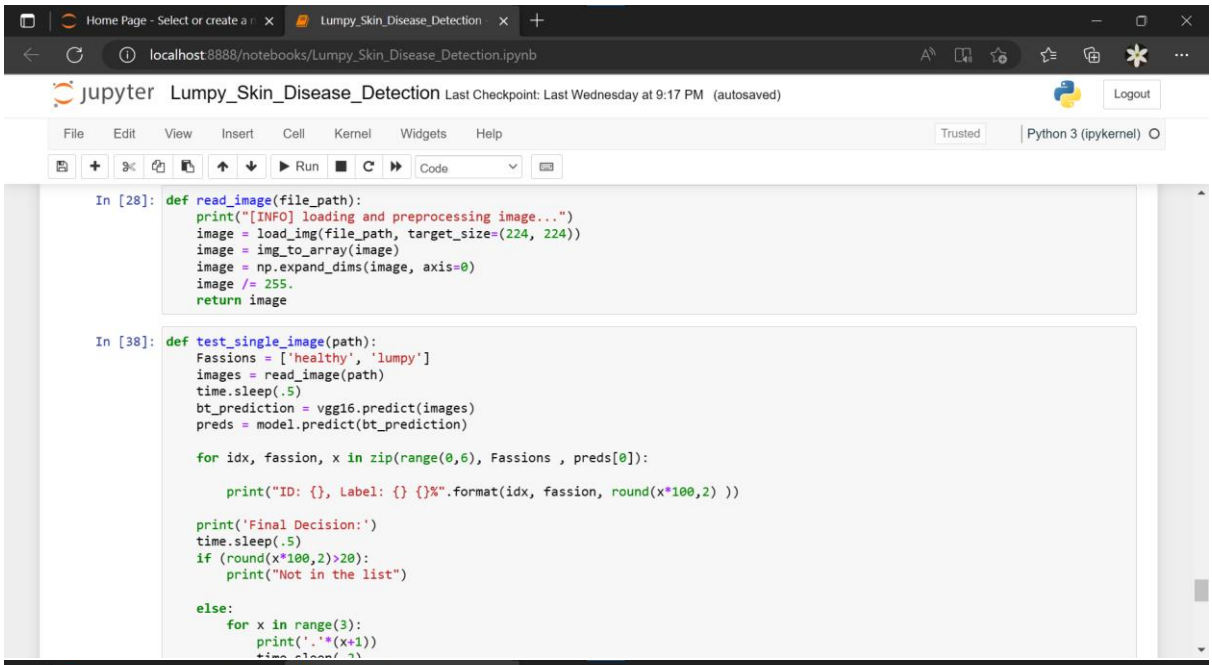
In [27]:
```
plot_confusion_matrix(confusion_matrix,
                      ['healthy', 'lumpy'],
                      normalize=True)
```

```
Normalized confusion matrix
```

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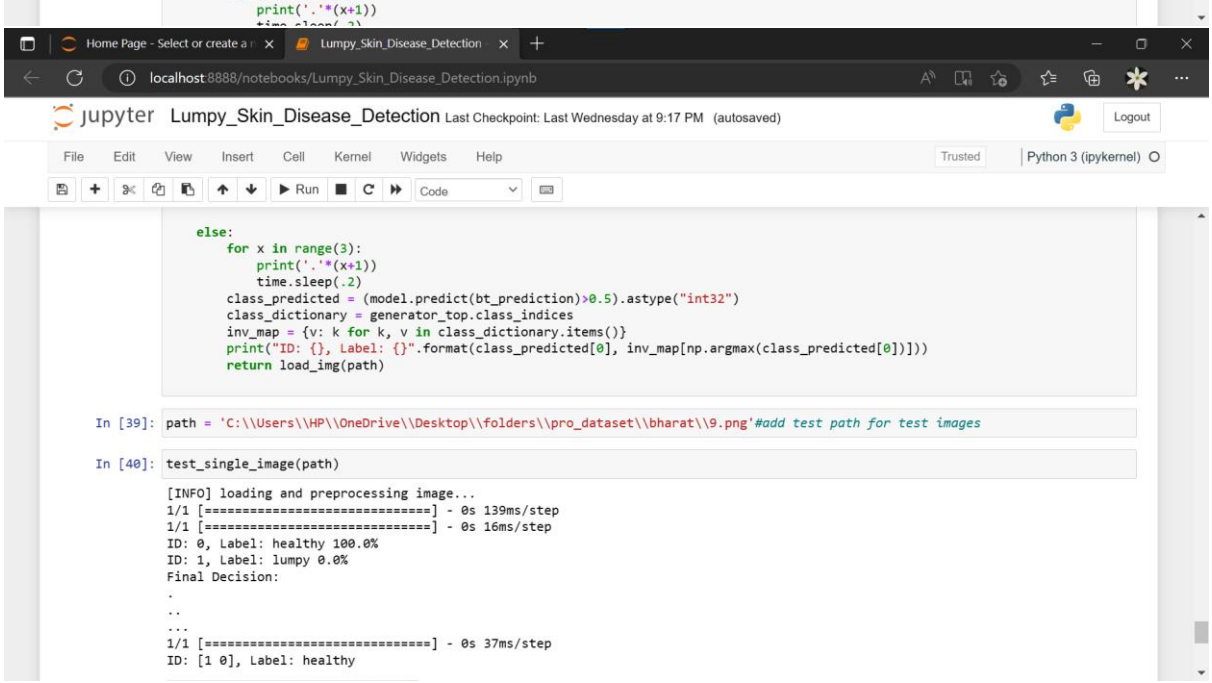
In [28]:
def read_image(file_path):
print("[INFO] loading and preprocessing image...")
image = load_img(file_path, target_size=(224, 224))
image = img_to_array(image)
image = np.expand_dims(image, axis=0)
image /= 255.
return image
In [38]:
def test_single_image(path):
Fassions = ['healthy', 'lumpy']
images = read_image(path)
time.sleep(.5)
bt_prediction = vgg16.predict(images)
preds = model.predict(bt_prediction)
for idx, fassion, x in zip(range(0,6), Fassions , preds[0]):
print("ID: {}, Label: {} {}%".format(idx, fassion, round(x*100,2)))
print('Final Decision:')
time.sleep(.5)
if (round(x*100,2)>20):
print("Not in the list")
else:
for x in range(3):
print('.'*(x+1))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else:
for x in range(3):
print('.'*(x+1))
time.sleep(.2)
class_predicted = (model.predict(bt_prediction)>0.5).astype("int32")
class_dictionary = generator_top.class_indices
inv_map = {v: k for k, v in class_dictionary.items()}
print("ID: {}, Label: {}".format(class_predicted[0], inv_map[np.argmax(class_predicted[0])]))
return load_img(path)
In [39]:
path = 'C:\\Users\\HP\\OneDrive\\Desktop\\folders\\pro_dataset\\bharat\\9.png'#add test path for test images
In [40]:
test_single_image(path)
[INFO] loading and preprocessing image...
1/1 [==============================] - 0s 139ms/step
1/1 [==============================] - 0s 16ms/step
ID: 0, Label: healthy 100.0%
ID: 1, Label: lumpy 0.0%
Final Decision:
.
..
...
1/1 [==============================] - 0s 37ms/step
ID: [1 0], Label: healthy

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```
[INFO] loading and preprocessing image...
1/1 [==============================] - 0s 139ms/step
1/1 [==============================] - 0s 16ms/step
ID: 0, Label: healthy 100.0%
ID: 1, Label: lumpy 0.0%
Final Decision:
.
..
...
1/1 [==============================] - 0s 37ms/step
ID: [1 0], Label: healthy
```

Out[40]: