

TRAINING MODEL

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```
#import random

#import cv2

#from keras.preprocessing import image

#import scipy.misc as sm

#from keras.utils import to_categorical

from keras.models import Model

from keras.layers import Dense, GlobalAveragePooling2D

from keras.optimizers import SGD#, Adam


from keras.applications.resnet50 import ResNet50

from keras.preprocessing.image import ImageDataGenerator

#import numpy as np

#import os

#from matplotlib import pyplot

#from sklearn.preprocessing import LabelEncoder

# from keras.preprocessing.image import flow_from_directory

#from keras.preprocessing.image import img_to_array

#from sklearn.preprocessing import LabelBinarizer

#from sklearn.model_selection import train_test_split

#import matplotlib.pyplot as plt

#from imutils import paths

#import scipy.misc as sm

#from keras.models import model_from_json


data = ['C:/Users/ankur/.spyder-py3/autosave/data']

labels = []

IMAGE_DIMS = (224,224,3)
```

```
print("1")
```

```
count=0
```

```
ls1=os.listdir('color1')
```

```
dic1={}
```

```
for idx,i in enumerate(ls1):
```

```
    dic1[i]=idx
```

```
    ls2=os.listdir('color1/'+i)
```

```
    for j in ls2:
```

```
        #im1=np.asarray(sm.imread('color/'+i+'/'+j))
```

```
        #temp=np.zeros((len(im1),len(im1[0]),len(im1[0][0])  ))
```

```
        count=count+1
```

```
print(count)
```

```
print(dic1)
```

```
X=np.zeros((count,224,224,3))
```

```
Y=np.zeros((count,1))
```

```
vap=0
```

```
for idx,i in enumerate(ls1):
```

```
    dic1[i]=idx
```

```
    ls2=os.listdir('color1/'+i)
```

```
    for j in ls2:
```

```
        img = image.load_img('color1/'+i+'/'+j, target_size=(224, 224))
```

```
        #im1=np.asarray(sm.imread('color1/'+i+'/'+j))
```

```
        img = image.img_to_array(img)
```

```
        print(img[0])
```

```
        print(img.shape)
```

```
        #X[vap,::,:]=im1
```

```
        #Y[vap,0]=idx
```

```
        vap=vap+1
```

```

"""

# imagePath = sorted(list(paths.list_images("color")))

# i=0

# print("2")

# for imagePath in imagePath:

    # load the image, pre-process it, and store it in the data list
    # img = image.load_img(imagePath,target_size=(224,224))
    # img = img_to_array(img)
    # data.append(img)
    # """im0=np.asarray(image)
    # data[i,:,:,:]=im0"""

    # extract set of class labels from the image path and update the
    # labels list
    # l = label = imagePath.split(os.path.sep)[-2]
    # labels.append(l)

# print("3")

# data = np.array(data, dtype="float") / 255.0

# ltb=labels = np.array(labels)
# print(labels[16])
# lb = LabelBinarizer()
# labels = lb.fit_transform(labels)

"""

train_labels = os.listdir("color")

le = LabelEncoder()

le.fit([tl for tl in train_labels])

le = LabelEncoder()

```

```

le_labels = le.fit_transform(ltb)
"""

# (trainX, testX, trainY, testY) = train_test_split(data,
# labels, test_size=0.3, random_state=42)

# print("4")
# print(trainX.shape)
"""

ind_train = random.sample(list(range(trainX.shape[0])), 20)
trainX = trainX[ind_train]
trainY = trainY[ind_train]

# test data
ind_test = random.sample(list(range(testX.shape[0])), 5)
testX = testX[ind_test]
testY = testY[ind_test]

def resize_data(data):
    data_upscaled = np.zeros((data.shape[0], 320, 320, 3))
    for i, img in enumerate(data):
        large_img = cv2.resize(img, dsize=(320, 320), interpolation=cv2.INTER_CUBIC)
        data_upscaled[i] = large_img
    return data_upscaled

# resize train and test data
x_train_resized = resize_data(trainX)
x_test_resized = resize_data(testX)
"""

# y_train_hot_encoded = to_categorical(trainY)

# y_test_hot_encoded = to_categorical(testY)

"""for i in range(0, len(trainY)):

```

```

        print(y_train_hot_encoded[i])
        print("\n")
"""

aug = ImageDataGenerator(rotation_range=25, width_shift_range=0.1,
                        height_shift_range=0.1, shear_range=0.2, zoom_range=0.2,
                        horizontal_flip=True, fill_mode="nearest")

train_generator=aug.flow_from_directory(
[10:35, 11/8/2022] Irin: directory="C:/Users/ankur/.spyder-py3/autosave/data/train",
    target_size=(224,224),
    color_mode="rgb",
    batch_size=64,
    class_mode="categorical",
    shuffle=True,
    seed=None
)

valid_generator=aug.flow_from_directory(
    directory="C:/Users/ankur/.spyder-py3/autosave/data/test",
    target_size=(224,224),
    color_mode="rgb",
    batch_size=64,
    class_mode="categorical",
    shuffle=True,
    seed=None
)

```

```

def model(base_model):

    print("5")

    # get layers and add average pooling layer
    x = base_model.output
    x = GlobalAveragePooling2D()(x)

    # add fully-connected layer
    x = Dense(512, activation='relu')(x)

    # add output layer
    predictions = Dense(7, activation='softmax')(x)

    model = Model(inputs=base_model.input, outputs=predictions)

    # fname = "weights.hdf5"
    # model.load_weights(fname)
    # freeze pre-trained model area's layer
    for layer in base_model.layers:
        layer.trainable = False

    # update the weight that are added
    # model.compile(optimizer='rmsprop', loss='categorical_crossentropy')
    # model.fit(x_train, y_train, epochs=4)

    # choose the layers which are updated by training
    layer_num = len(model.layers)
    print(layer_num, " number of layers")
    for layer in model.layers[:int(layer_num * 0.7)]:

```

```

        layer.trainable = False

for layer in model.layers[int(layer_num * 0.7):]:
    layer.trainable = True

# update the weights
model.compile(optimizer=SGD(lr=1e-4,decay=1e-6, momentum=0.9),
loss='categorical_crossentropy', metrics=['accuracy'])

"""history = model.fit_generator(
aug.flow(x_train, y_train,),
validation_data=(testX, testY),
steps_per_epoch=len(trainX),
epochs=5, verbose=1)"""

STEP_SIZE_TRAIN=train_generator.n//train_generator.batch_size
STEP_SIZE_VALID=valid_generator.n//valid_generator.batch_size
history=model.fit_generator(generator=train_generator,

                            steps_per_epoch=STEP_SIZE_TRAIN,
                            validation_data=valid_generator,
                            validation_steps=STEP_SIZE_VALID,
                            # use_multiprocessing=True,
                            # workers=3,
                            # verbose=2,
                            epochs=100

                            )

# print(model.evaluate_generator(generator=valid_generator))

model_json = model.to_json()

with open("C:/Users/ankur/.spyder-py3/autosave/model.json", "w") as json_file:
    json_file.write(model_json)

# serialize weights to HDF5

```

```

model.save_weights("model.h5")

print("Saved model to disk")

fname="C:/Users/ankur/.spyder-py3/autosave/weights1.hdf5"

model.save_weights(fname,overwrite=True)


# prediction

#img =
image.load_img(r'C:\Users\WASD\Desktop\hoga\color\Pepper,bell__Bacterial_spot\29.jpg',target_size=(224,224))

#img = image.img_to_array(img)

#img=np.expand_dims(img,axis=0)

#predictedclass = model.predict(img)

# print(train_generator.class_indices)

# predictedclass


#for i in train_generator.class_indices:

#     if train_generator.class_indices[i] == np.argmax(predictedclass):

#         print(i)

#         break


# history = model.fit(x_train, y_train, epochs=7,batch_size=10)

# pyplot.plot(history.history['loss'])

# pyplot.plot(history.history['val_loss'])

# pyplot.title('model train vs validation loss')

# pyplot.ylabel('loss')

# pyplot.xlabel('epoch')

# pyplot.legend(['train', 'validation'], loc='upper right')

# pyplot.show()


# print(model.summary())

```



```
return history
```

```
res_50_model = ResNet50(weights='imagenet', include_top=False)
```

```
history=model(res_50_model)
```