

```
from google.colab import drive
drive.mount('/content/drive')

Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.mount("/content/drive", force_remount=True)

from numpy import mean
from numpy import std
from matplotlib import pyplot
from sklearn.model_selection import KFold
from keras.datasets import mnist
from keras.utils import to_categorical
from keras.models import Sequential
from keras.layers import Conv2D
from keras.layers import MaxPooling2D
from keras.layers import Dense
from keras.layers import Flatten
from keras.optimizers import SGD
from keras.layers import Dropout
from keras.layers import BatchNormalization
import keras
from keras import backend as K
import matplotlib.pyplot as plt
import sklearn

path_normal = '/content/drive/MyDrive/Deep learning demo project/Normal/'
path_pneumonia = '/content/drive/MyDrive/Deep learning demo project/pneumonia/'

##Import necessary libraries
import numpy as np
import PIL
import cv2
import os
data1 = list()
data2 = list()
x = list()

##Class-1 images##

for image in os.walk(path_normal):
    data1.append(image[2])

for i in range(len(data1[0])):
    str_complete = path_normal + data1[0][i]
    img = cv2.imread(str_complete)
    img = cv2.resize(img, (224, 224))
    x.append(img)
    print(i)#Ensure all images are loaded
```

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print(img.shape)

(224, 224, 3)

##Class-2 images##

for image in os.walk(path_pneumonia):
    data2.append(image[2])

for i in range(len(data2[0])):
    str_complete = path_pneumonia + data2[0][i]
    img = cv2.imread(str_complete)
    img = cv2.resize(img, (224, 224))
    x.append(img)#Ensure all images are loaded
    print(i)
```

Downloading data from https://storage.googleapis.com/tensorflow/keras-applications/densenet/densenet169_weights_tf_dim_ordering_tf_kernels_51877672/densenet169_weights_tf_dim_ordering_tf_kernels_51877672 [=====] - 0s 0us/step

```
Epoch 1/5
5/5 [=====] - 304s 60s/step - loss: 31.9810 - accuracy: 0.5847 - val_loss: 4.5188 - val_accuracy:
Epoch 2/5
5/5 [=====] - 283s 59s/step - loss: 7.3738 - accuracy: 0.7908 - val_loss: 0.5054 - val_accuracy:
Epoch 3/5
5/5 [=====] - 280s 58s/step - loss: 0.9397 - accuracy: 0.9673 - val_loss: 3.4236 - val_accuracy:
Epoch 4/5
5/5 [=====] - 282s 58s/step - loss: 1.6902 - accuracy: 0.9531 - val_loss: 1.0137 - val_accuracy:
Epoch 5/5
5/5 [=====] - 291s 60s/step - loss: 0.3384 - accuracy: 0.9908 - val_loss: 0.0882 - val_accuracy:
<keras.callbacks.History at 0x7f073ff9b280>
```

```
import sklearn
from sklearn.metrics import confusion_matrix
```

```
test_loss, test_acc = model.evaluate(np.array(x_test), np.array(y_te_one_hot), verbose=0)
print(test_acc)
##Evaluating Sensitivity, Accuracy and Kappa scores
y_prob = model.predict(x_test)
Y_pred = y_prob.argmax(axis=-1)
```

```
0.9964285492897034
9/9 [=====] - 66s 7s/step
```

```
cm1 = confusion_matrix(y_test-1,Y_pred)
print("confusion matrix \n",cm1)
```

```
confusion matrix
[[136   1]
 [  0 143]]
```

```
from sklearn.metrics import classification_report
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import pandas as pd
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print(pd.DataFrame(classification_report(y_test-1,Y_pred,output_dict=True)).T)
Kappa=sklearn.metrics.cohen_kappa_score(y_test-1,Y_pred)
print('Kappa=',Kappa)
```

```

┌→ precision    recall  f1-score   support
0.0          1.000000   0.992701   0.996337    137.000000
1.0          0.993056   1.000000   0.996516    143.000000
accuracy          0.996429   0.996429   0.996429     0.996429
macro avg          0.996528   0.996350   0.996426    280.000000
weighted avg       0.996453   0.996429   0.996428    280.000000
Kappa= 0.9928527670002042
```

+ Code

+ Text