

```
In [1]: import os
from keras.preprocessing import image
import matplotlib.pyplot as plt
import numpy as np
from keras.utils.np_utils import to_categorical
import random,shutil
from keras.models import Sequential
from keras.layers import Dropout,Conv2D,Flatten,Dense, MaxPooling2D, BatchNormalization
from keras.models import load_model
```

```
In [2]: def generator(dir, gen=image.ImageDataGenerator(rescale=1./255), shuffle=True,batch_size=
        return gen.flow_from_directory(dir,batch_size=batch_size,shuffle=shuffle,color_mode=

BS= 32
TS=(24,24)
train_batch= generator(r'C:\Users\HP\Desktop\Final Project\dataset\train',shuffle=True,
test_batch= generator(r'C:\Users\HP\Desktop\Final Project\dataset\test',shuffle=True, ba
SPE= len(train_batch.classes)//BS
VS = len(test_batch.classes)//BS
print(SPE,TS)
```

```
Found 1233 images belonging to 4 classes.
Found 433 images belonging to 4 classes.
38 (24, 24)
```

```
In [3]: model = Sequential([
    Conv2D(32, kernel_size=(3, 3), activation='relu', input_shape=(24,24,1)),
    MaxPooling2D(pool_size=(1,1)),
    Conv2D(32, (3,3),activation='relu'),
    MaxPooling2D(pool_size=(1,1)),
    Conv2D(64, (3, 3), activation='relu'),
    MaxPooling2D(pool_size=(1,1)),

    Dropout(0.25),
    Flatten(),
    Dense(128, activation='relu'),
    Dropout(0.5),
    Dense(4, activation='softmax')
])
```

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

```
model.fit(train_batch, validation_data=test_batch,epochs=15,steps_per_epoch=SPE ,validat
```

```
Epoch 1/15
```

```
38/38 [=====] - 73s 2s/step - loss: 0.2380 - accuracy: 0.8926 -
val_loss: 11.0507 - val_accuracy: 0.5000
```

```
Epoch 2/15
```

```
38/38 [=====] - 20s 516ms/step - loss: 0.0581 - accuracy: 0.985
0 - val_loss: 8.7408 - val_accuracy: 0.5024
```

```
Epoch 3/15
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```
38/38 [=====] - 20s 514ms/step - loss: 0.0092 - accuracy: 0.998
3 - val_loss: 10.4870 - val_accuracy: 0.5000
```

```
Epoch 4/15
```

```
38/38 [=====] - 20s 537ms/step - loss: 7.5213e-04 - accuracy:
1.0000 - val_loss: 12.7346 - val_accuracy: 0.5048
```

```
Epoch 5/15
```

```
38/38 [=====] - 20s 519ms/step - loss: 0.0077 - accuracy: 0.996
7 - val_loss: 10.0732 - val_accuracy: 0.4952
```

```
Epoch 6/15
```

```
38/38 [=====] - 20s 533ms/step - loss: 0.0013 - accuracy: 1.000
0 - val_loss: 11.4873 - val_accuracy: 0.4952
```

```
Epoch 7/15
```

```
38/38 [=====] - 32s 848ms/step - loss: 2.3936e-04 - accuracy:
1.0000 - val_loss: 11.7751 - val_accuracy: 0.5024
Epoch 8/15
38/38 [=====] - 19s 507ms/step - loss: 2.1180e-04 - accuracy:
1.0000 - val_loss: 12.0600 - val_accuracy: 0.5120
Epoch 9/15
38/38 [=====] - 22s 572ms/step - loss: 1.1263e-04 - accuracy:
1.0000 - val_loss: 12.6715 - val_accuracy: 0.5000
Epoch 10/15
38/38 [=====] - 23s 590ms/step - loss: 7.8990e-05 - accuracy:
1.0000 - val_loss: 12.5397 - val_accuracy: 0.5144
Epoch 11/15
38/38 [=====] - 19s 504ms/step - loss: 7.4839e-05 - accuracy:
1.0000 - val_loss: 13.0340 - val_accuracy: 0.5024
Epoch 12/15
38/38 [=====] - 32s 856ms/step - loss: 5.0380e-05 - accuracy:
1.0000 - val_loss: 13.2913 - val_accuracy: 0.5024
Epoch 13/15
38/38 [=====] - 21s 547ms/step - loss: 4.2911e-05 - accuracy:
1.0000 - val_loss: 13.4248 - val_accuracy: 0.5048
Epoch 14/15
38/38 [=====] - 27s 725ms/step - loss: 3.8156e-05 - accuracy:
1.0000 - val_loss: 13.5952 - val_accuracy: 0.5000
Epoch 15/15
38/38 [=====] - 19s 507ms/step - loss: 3.2363e-05 - accuracy:
1.0000 - val_loss: 13.9115 - val_accuracy: 0.4976
Out[3]: <keras.callbacks.History at 0x1bb63823dc0>
```

```
In [4]: model.save('Models.h5', overwrite=True)
```

```
In [ ]:
```