

#Phapale Apeksha Roll NO: 4231 Div:B

DL Practical NO.3A

```
from tensorflow.keras.preprocessing.image import ImageDataGenerator,
load_img,img_to_array
train_dir = r'C:\Users\apeksha\Downloads\DL\pract_3\train'
val_dir = r'C:\Users\apeksha\Downloads\DL\pract_3\valid'
img_size = 224
batch_size = 32
```

```
#preprocessing
train_datagen = ImageDataGenerator(rescale=1./255)
train_generator = train_datagen.flow_from_directory(train_dir,
target_size=(img_size,img_size),
batch_size=batch_size,
class_mode='categorical')
```

```
val_datagen = ImageDataGenerator(rescale=1./255)
val_generator = val_datagen.flow_from_directory(val_dir,
target_size=(img_size,img_size),
batch_size=batch_size,
class_mode='categorical')
```

```
print(list(train_generator.class_indices))
```

```
#model building
```

```
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Conv2D, MaxPooling2D, Flatten, Dense,Dropout,
BatchNormalization
model = Sequential()
model.add((Conv2D(32, (3,3), activation='relu', input_shape=(img_size,img_size, 3))))
model.add(BatchNormalization())
model.add((MaxPooling2D(2,2)))
model.add((Conv2D(64, (3,3), activation='relu')))
model.add(BatchNormalization())
model.add((MaxPooling2D(2,2)))
model.add((Conv2D(64, (3,3), activation='relu')))
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```
model.add(BatchNormalization())
model.add((MaxPooling2D(2,2)))
model.add((Conv2D(128, (3,3), activation='relu')))
model.add(BatchNormalization())
model.add((MaxPooling2D(2,2)))
model.add((Flatten()))
model.add((Dense(128, activation='relu')))
model.add((Dropout(0.2)))
model.add((Dense(64, activation='relu')))
model.add((Dense(train_generator.num_classes, activation='softmax')))
model.summary()
```

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

```
#training of model
```

```
model.fit(train_generator, epochs=50, validation_data=val_generator)
```

```
#model evaluation
```

```
loss, accuracy = model.evaluate(val_generator)
```

```
print("Loss :",loss)
```

```
print("Accuracy (Test Data) :",accuracy*100)
```

```
#model testing
```

```
import numpy as np
```

```
img_path
```

```
=r'C:\Users\apeksha\Downloads\DL\pract_3\valid\Tomato___Bacterial_spot\0ab54691-ba9f-4c1f-a69b-ec0501df4401___GCREC_Bact.Sp 3170.jpg'
```

```
img = load_img(img_path, target_size=(224, 224))
```

```
img_array = img_to_array(img)
```

```
img_array = np.expand_dims(img_array, axis=0)
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```
img_array /= 255.
```

```
prediction = model.predict(img_array)
```

```
class_names=['Tomato___Bacterial_spot', 'Tomato___Early_blight', 'Tomato___healthy']
```

```
predicted_class = np.argmax(prediction)
```

```
print(prediction)
```

```
print(predicted_class)
```

```
print('Predicted class:', class_names[predicted_class])
```

Output:

Found 600 images belonging to 3 classes.

Found 600 images belonging to 3 classes.

['Tomato___Bacterial_spot', 'Tomato___Early_blight', 'Tomato___healthy']

Model: "sequential_1"

Layer (type)	Output Shape	Param #
=====		
conv2d_4 (Conv2D)	(None, 222, 222, 32)	896
batch_normalization_4 (Batch Normalization)	(None, 222, 222, 32)	128
max_pooling2d_4 (MaxPooling2D)	(None, 111, 111, 32)	0
conv2d_5 (Conv2D)	(None, 109, 109, 64)	18496
batch_normalization_5 (Batch Normalization)	(None, 109, 109, 64)	256
max_pooling2d_5 (MaxPooling2D)	(None, 54, 54, 64)	0
conv2d_6 (Conv2D)	(None, 52, 52, 64)	36928
batch_normalization_6 (Batch Normalization)	(None, 52, 52, 64)	256
max_pooling2d_6 (MaxPooling2D)	(None, 26, 26, 64)	0
conv2d_7 (Conv2D)	(None, 24, 24, 128)	73856
batch_normalization_7 (Batch Normalization)	(None, 24, 24, 128)	512

hNormalization)

max_pooling2d_7 (MaxPooling (None, 12, 12, 128) 0
2D)

flatten_1 (Flatten) (None, 18432) 0

dense_3 (Dense) (None, 128) 2359424

dropout_1 (Dropout) (None, 128) 0

dense_4 (Dense) (None, 64) 8256

dense_5 (Dense) (None, 3) 195

=====

Total params: 2,499,203

Trainable params: 2,498,627

Non-trainable params: 576

Epoch 1/50

19/19 [=====] - 92s 5s/step - loss: 1.1134 - accuracy: 0.7567 -
val_loss: 1.7457 - val_accuracy: 0.3817

Epoch 2/50

19/19 [=====] - 120s 6s/step - loss: 0.5225 - accuracy: 0.9117 -
val_loss: 1.0388 - val_accuracy: 0.5467

Epoch 3/50

19/19 [=====] - 84s 4s/step - loss: 0.3798 - accuracy: 0.9133 -
val_loss: 3.3749 - val_accuracy: 0.3333

Epoch 4/50

19/19 [=====] - 53s 3s/step - loss: 0.2983 - accuracy: 0.9183 -
val_loss: 10.1802 - val_accuracy: 0.3333

Epoch 5/50

19/19 [=====] - 60s 3s/step - loss: 0.1306 - accuracy: 0.9583 -
val_loss: 14.1626 - val_accuracy: 0.3333

Epoch 6/50

19/19 [=====] - 47s 2s/step - loss: 0.1297 - accuracy: 0.9700 -
val_loss: 10.3084 - val_accuracy: 0.4250

Epoch 7/50

19/19 [=====] - 37s 2s/step - loss: 0.0608 - accuracy: 0.9783 -
val_loss: 7.7283 - val_accuracy: 0.2700

Epoch 8/50

19/19 [=====] - 42s 2s/step - loss: 0.1580 - accuracy: 0.9617 -
val_loss: 3.6830 - val_accuracy: 0.4333

Epoch 9/50

19/19 [=====] - 39s 2s/step - loss: 0.0546 - accuracy: 0.9833 -
val_loss: 4.4959 - val_accuracy: 0.4350

Epoch 10/50

19/19 [=====] - 40s 2s/step - loss: 0.0226 - accuracy: 0.9933 -
val_loss: 6.3895 - val_accuracy: 0.4767

Epoch 11/50

19/19 [=====] - 42s 2s/step - loss: 0.0817 - accuracy: 0.9767 -
val_loss: 4.2788 - val_accuracy: 0.4817

Epoch 12/50

19/19 [=====] - 40s 2s/step - loss: 0.0901 - accuracy: 0.9717 -
val_loss: 6.7955 - val_accuracy: 0.5150

Epoch 13/50

19/19 [=====] - 43s 2s/step - loss: 0.0667 - accuracy: 0.9800 -
val_loss: 2.0756 - val_accuracy: 0.4967

Epoch 14/50

19/19 [=====] - 40s 2s/step - loss: 0.1474 - accuracy: 0.9617 -
val_loss: 3.0550 - val_accuracy: 0.5267

Epoch 15/50

19/19 [=====] - 38s 2s/step - loss: 0.1481 - accuracy: 0.9667 -
val_loss: 12.0756 - val_accuracy: 0.3717

Epoch 16/50

19/19 [=====] - 37s 2s/step - loss: 0.1517 - accuracy: 0.9717 -
val_loss: 11.6753 - val_accuracy: 0.5100

Epoch 17/50

19/19 [=====] - 38s 2s/step - loss: 0.1017 - accuracy: 0.9783 -
val_loss: 10.5598 - val_accuracy: 0.3800

Epoch 18/50

19/19 [=====] - 37s 2s/step - loss: 0.1428 - accuracy: 0.9767 -
val_loss: 5.1567 - val_accuracy: 0.5233

Epoch 19/50

19/19 [=====] - 37s 2s/step - loss: 0.0945 - accuracy: 0.9767 -
val_loss: 3.9768 - val_accuracy: 0.5983
Epoch 20/50
19/19 [=====] - 37s 2s/step - loss: 0.0975 - accuracy: 0.9683 -
val_loss: 8.6274 - val_accuracy: 0.4317
Epoch 21/50
19/19 [=====] - 36s 2s/step - loss: 0.1087 - accuracy: 0.9767 -
val_loss: 3.5811 - val_accuracy: 0.5867
Epoch 22/50
19/19 [=====] - 37s 2s/step - loss: 0.1602 - accuracy: 0.9767 -
val_loss: 4.8522 - val_accuracy: 0.6517
Epoch 23/50
19/19 [=====] - 36s 2s/step - loss: 0.1764 - accuracy: 0.9650 -
val_loss: 1.4186 - val_accuracy: 0.8383
Epoch 24/50
19/19 [=====] - 37s 2s/step - loss: 0.1202 - accuracy: 0.9783 -
val_loss: 2.0933 - val_accuracy: 0.8733
Epoch 25/50
19/19 [=====] - 37s 2s/step - loss: 0.0925 - accuracy: 0.9850 -
val_loss: 1.0901 - val_accuracy: 0.8850
Epoch 26/50
19/19 [=====] - 37s 2s/step - loss: 0.0865 - accuracy: 0.9833 -
val_loss: 1.6068 - val_accuracy: 0.8600
Epoch 27/50
19/19 [=====] - 44s 2s/step - loss: 0.0886 - accuracy: 0.9817 -
val_loss: 2.7704 - val_accuracy: 0.7800
Epoch 28/50
19/19 [=====] - 41s 2s/step - loss: 0.2818 - accuracy: 0.9583 -
val_loss: 2.5845 - val_accuracy: 0.8683
Epoch 29/50
19/19 [=====] - 37s 2s/step - loss: 0.1771 - accuracy: 0.9817 -
val_loss: 0.9145 - val_accuracy: 0.8950
Epoch 30/50
19/19 [=====] - 44s 2s/step - loss: 0.1389 - accuracy: 0.9850 -
val_loss: 1.4133 - val_accuracy: 0.8517
Epoch 31/50
19/19 [=====] - 40s 2s/step - loss: 0.0950 - accuracy: 0.9883 -
val_loss: 2.3810 - val_accuracy: 0.7650

Epoch 32/50

19/19 [=====] - 38s 2s/step - loss: 0.0426 - accuracy: 0.9917 -
val_loss: 1.5762 - val_accuracy: 0.8233

Epoch 33/50

19/19 [=====] - 43s 2s/step - loss: 0.1423 - accuracy: 0.9850 -
val_loss: 1.4126 - val_accuracy: 0.8950

Epoch 34/50

19/19 [=====] - 46s 2s/step - loss: 0.0357 - accuracy: 0.9900 -
val_loss: 1.7652 - val_accuracy: 0.8383

Epoch 35/50

19/19 [=====] - 44s 2s/step - loss: 0.0834 - accuracy: 0.9867 -
val_loss: 1.0388 - val_accuracy: 0.9067

Epoch 36/50

19/19 [=====] - 40s 2s/step - loss: 0.0499 - accuracy: 0.9867 -
val_loss: 2.2424 - val_accuracy: 0.8350

Epoch 37/50

19/19 [=====] - 40s 2s/step - loss: 0.0086 - accuracy: 0.9983 -
val_loss: 0.6219 - val_accuracy: 0.9283

Epoch 38/50

19/19 [=====] - 39s 2s/step - loss: 0.0202 - accuracy: 0.9933 -
val_loss: 0.7721 - val_accuracy: 0.9183

Epoch 39/50

19/19 [=====] - 40s 2s/step - loss: 0.0281 - accuracy: 0.9950 -
val_loss: 0.4594 - val_accuracy: 0.9300

Epoch 40/50

19/19 [=====] - 43s 2s/step - loss: 0.0098 - accuracy: 0.9967 -
val_loss: 0.9981 - val_accuracy: 0.9050

Epoch 41/50

19/19 [=====] - 41s 2s/step - loss: 0.0113 - accuracy: 0.9950 -
val_loss: 0.4874 - val_accuracy: 0.9267

Epoch 42/50

19/19 [=====] - 38s 2s/step - loss: 0.0304 - accuracy: 0.9883 -
val_loss: 1.0453 - val_accuracy: 0.9167

Epoch 43/50

19/19 [=====] - 37s 2s/step - loss: 0.0101 - accuracy: 0.9950 -
val_loss: 0.7275 - val_accuracy: 0.9417

Epoch 44/50

19/19 [=====] - 37s 2s/step - loss: 0.0121 - accuracy: 0.9967 -
val_loss: 0.7437 - val_accuracy: 0.9433

Epoch 45/50

19/19 [=====] - 37s 2s/step - loss: 0.0322 - accuracy: 0.9883 -
val_loss: 1.8394 - val_accuracy: 0.8450

Epoch 46/50

19/19 [=====] - 37s 2s/step - loss: 0.0728 - accuracy: 0.9833 -
val_loss: 2.9631 - val_accuracy: 0.8017

Epoch 47/50

19/19 [=====] - 37s 2s/step - loss: 0.0375 - accuracy: 0.9933 -
val_loss: 1.4118 - val_accuracy: 0.8933

Epoch 48/50

19/19 [=====] - 37s 2s/step - loss: 0.0139 - accuracy: 0.9950 -
val_loss: 1.9822 - val_accuracy: 0.8850

Epoch 49/50

19/19 [=====] - 36s 2s/step - loss: 0.0168 - accuracy: 0.9950 -
val_loss: 1.9292 - val_accuracy: 0.8867

Epoch 50/50

19/19 [=====] - 37s 2s/step - loss: 0.0494 - accuracy: 0.9900 -
val_loss: 5.6442 - val_accuracy: 0.6833

19/19 [=====] - 7s 391ms/step - loss: 5.6442 - accuracy: 0.6833

Loss : 5.644160747528076

Accuracy (Test Data) : 68.33333373069763

1/1 [=====] - 0s 205ms/step

[[9.9983656e-01 1.6345676e-04 1.3824682e-11]]

0

Predicted class: Tomato___Bacterial_spot


```
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C:\Users\Pallavi Nile\Downloads\DL\pract_3\DL_3A.py

1 while Pollavi Roll NO: 4217 Div:8
2 # DL Pract 3 DL_3A
3
4 from tensorflow.keras.preprocessing.image import ImageDataGenerator, load_img, img_to_array
5 train_dir = r'C:\Users\Pallavi Nile\Downloads\DL\pract_3\train'
6 val_dir = r'C:\Users\Pallavi Nile\Downloads\DL\pract_3\valid'
7 img_size = 224
8 batch_size = 32
9
10 #preprocessing
11 train_datagen = ImageDataGenerator(rescale=1./255)
12 train_generator = train_datagen.flow_from_directory(train_dir,
13 target_size=(img_size,img_size),
14 batch_size=batch_size,
15 class_mode='categorical')
16
17 val_datagen = ImageDataGenerator(rescale=1./255)
18 val_generator = val_datagen.flow_from_directory(val_dir,
19 target_size=(img_size,img_size),
20 batch_size=batch_size,
21 class_mode='categorical')
22
23 print(list(train_generator.class_indices))
24
25 #model building
26 from tensorflow.keras.models import Sequential
27 from tensorflow.keras.layers import Conv2D, MaxPooling2D, Flatten, Dense, Dropout, BatchNormalization
28 model = Sequential()
29 model.add(Conv2D(64, (3,3), activation='relu', input_shape=(img_size,img_size, 3)))
30 model.add(BatchNormalization())
31 model.add(MaxPooling2D(2,2))
32 model.add(Conv2D(64, (3,3), activation='relu'))
33 model.add(BatchNormalization())
34 model.add(MaxPooling2D(2,2))
35 model.add(Conv2D(64, (3,3), activation='relu'))
36 model.add(BatchNormalization())
37 model.add(MaxPooling2D(2,2))
38 model.add(Conv2D(128, (3,3), activation='relu'))
39 model.add(BatchNormalization())
40 model.add(MaxPooling2D(2,2))
41 model.add(Conv2D(128, (3,3), activation='relu'))
42 model.add(BatchNormalization())
43 model.add(Flatten())
44 model.add(Dense(128, activation='relu'))
45 model.add(Dropout(0.2))
46 model.add(Dense(1000, activation='softmax'))
47
48 #training of model
49 model.compile(optimizer='adam', loss='categorical_crossentropy', metrics=['accuracy'])
50
51 #training of model
52 model.fit(train_generator, epochs=50, validation_data=val_generator)
53
54 #model evaluation
55 loss, accuracy = model.evaluate(val_generator)
56 print("Loss :", loss)
57 print("Accuracy (Test Data) :", accuracy*100)
58
59 #model testing
60 import numpy as np
61 img_path = r'C:\Users\Pallavi Nile\Downloads\DL\pract_3\valid\Tomato_Bacterial_spot\4b54691-ba9f-4c'
62 img = load_img(img_path, target_size=(224, 224))
63 img_array = img_to_array(img)
64 img_array = np.expand_dims(img_array, axis=0)
65 img_array /= 255.
66
67 prediction = model.predict(img_array)
68 class_names = ['Tomato_Bacterial_spot', 'Tomato_Early_blight', 'Tomato_healthy']
69
70 predicted_class = np.argmax(prediction)
71 print(prediction)
72 print(predicted_class)
73 print('Predicted class:', class_names[predicted_class])
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C:\Users\Pallavi M\Downloads\DL\pract_3\pract_3.py

pract_3.py

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temp.py X

colorize.py X

D3.py X

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D7_38.py X

D8_38.py X

Colorizing-black-and-white-images-using-Python-master

Colorizing-black

untitled1.py

21

class_mode='categorical')

22

23

print(list(train_generator.class_indices))

24

25

#Model Building

26

from tensorflow.keras.models import Sequential

27

from tensorflow.keras.layers import Conv2D, MaxPooling2D, Flatten, Dense, Dropout, BatchNormalization

28

model = Sequential()

29

model.add(Conv2D(32, (3,3), activation='relu', input_shape=(img_size,img_size, 3)))

30

model.add(BatchNormalization())

31

model.add(MaxPooling2D(2,2))

32

model.add(Conv2D(64, (3,3), activation='relu'))

33

model.add(BatchNormalization())

34

model.add(MaxPooling2D(2,2))

35

model.add(Conv2D(64, (3,3), activation='relu'))

36

model.add(BatchNormalization())

37

model.add(MaxPooling2D(2,2))

38

model.add(Conv2D(128, (3,3), activation='relu'))

39

model.add(BatchNormalization())

40

model.add(MaxPooling2D(2,2))

41

model.add(Dropout(0.2))

42

model.add(Flatten())

43

model.add(Dense(128, activation='relu'))

44

model.add(Dropout(0.2))

45

model.add(Dense(50, activation='relu'))

46

model.add(Dense(train_generator.num_classes, activation='softmax'))

47

model.summary()

48

49

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

50

51

#training of model

52

model.fit(train_generator, epochs=50, validation_data=val_generator)

53

54

#model evaluation

55

loss, accuracy = model.evaluate(val_generator)

56

print("loss :",loss)

57

print("Accuracy (test Data) :",accuracy*100)

58

59

#Model testing

60

import numpy as np

61

img_path = 'C:\Users\Pallavi M\Downloads\DL\pract_3\valid\Tomato_Bacterial_spot\4b54691-ba9f-4c'

62

img = load_img(img_path, target_size=(224, 224))

63

img_array = img_to_array(img)

64

img_array = np.expand_dims(img_array, axis=0)

65

img_array /= 255.

20 %

Help Variable Explorer Watch Files Breakpoints

batch_normalization_3 (Batch Normalization)

max_pooling2d_3 (Max Pooling)

flatten (Flatten)

dense (Dense)

dropout (Dropout)

dense_1 (Dense)

dense_2 (Dense)

Total params: 2,499,203

Trainable params: 2,498,627

Non-trainable params: 576

Epoch 1/50

19/19 [=====] - 39s 2s/step - loss: 1.1440 - accuracy: 0.7667 - val_loss: 1.2763 - val_accuracy: 0.4300

Epoch 2/50

19/19 [=====] - 37s 2s/step - loss: 0.3628 - accuracy: 0.8983 - val_loss: 2.0089 - val_accuracy: 0.5217

Epoch 3/50

19/19 [=====] - 38s 2s/step - loss: 0.4112 - accuracy: 0.9183 - val_loss: 1.8712 - val_accuracy: 0.4767

Epoch 4/50

19/19 [=====] - 37s 2s/step - loss: 0.3866 - accuracy: 0.9117 - val_loss: 1.8032 - val_accuracy: 0.3817

Epoch 5/50

19/19 [=====] - 37s 2s/step - loss: 0.2321 - accuracy: 0.9350 - val_loss: 4.9104 - val_accuracy: 0.2850

Epoch 6/50

19/19 [=====] - 36s 2s/step - loss: 0.1715 - accuracy: 0.9467 - val_loss: 2.8691 - val_accuracy: 0.3383

Epoch 7/50

19/19 [=====] - 38s 2s/step - loss: 0.1791 - accuracy: 0.9454 - val_loss: 4.9050 - val_accuracy: 0.2867

Python Console History

conda (Python 3.10.8) - 100% Completion: conda - 100% Python Line 2, Col 21 UTF-8 CRLF RW Mem 55%