

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

Mounted at /content/drive

```
!unzip '/content/drive/MyDrive/fruits-360-original-size.zip'
```

Streaming output truncated to the last 5000 lines.

```
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r0_96.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r0_98.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_0.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_10.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_100.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_102.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_104.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_106.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_108.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_110.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_112.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_114.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_116.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_118.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_12.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_120.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_122.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_124.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_126.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_128.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_130.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_132.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_134.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_136.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_138.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_14.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_140.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_142.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_144.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_146.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_148.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_150.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_152.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_154.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_156.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_158.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_16.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_160.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_162.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_164.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_166.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_168.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_170.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_172.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_174.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_176.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_178.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_18.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_180.jpg
```

```

inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_182.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_184.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_186.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_188.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_190.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_192.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_194.jpg
inflating: fruits-360-original-size/Training/apple_red_yellow_1/r1_196.jpg

```

```

import numpy as np
import tensorflow as tf
from tensorflow.keras import layers
from tensorflow.keras.models import Sequential
from tensorflow.keras.preprocessing.image import ImageDataGenerator
from tensorflow.keras.layers import Convolution2D, MaxPooling2D, Flatten, Dense
import matplotlib.pyplot as plt
batch_size = 32
img_height = 180
img_width = 180
data_dir = "/content/fruits-360-original-size"

# Import necessary library

from tensorflow.keras.preprocessing.image import ImageDataGenerator

train_datagen = ImageDataGenerator(rescale = 1./255, horizontal_flip = True, vertical_flip = True)

x_train = train_datagen.flow_from_directory("/content/fruits-360-original-size",
                                             target_size=(64,64),
                                             class_mode='categorical',
                                             batch_size=100)

Found 12455 images belonging to 5 classes.

# Data augmentation on testing variable

test_datagen = ImageDataGenerator(rescale=1./255)

xtrain = train_datagen.flow_from_directory('/content/fruits-360-original-size/Training',
                                           target_size=(64,64),
                                           class_mode='categorical',
                                           batch_size=100)

Found 6231 images belonging to 24 classes.

xtest = test_datagen.flow_from_directory('/content/fruits-360-original-size/Test',
                                         target_size=(64,64),
                                         class_mode='categorical',
                                         batch_size=100)

Found 3110 images belonging to 24 classes.

```

```
model=Sequential()
```

```
from tensorflow.keras.layers import Convolution2D,MaxPooling2D,Flatten,Dense
model=Sequential()
```

```
model.add(Convolution2D(32, (3,3), activation = 'relu', input_shape = (64,64,3) ))
```

```
model.add(MaxPooling2D(pool_size = (2,2)))
```

```
model.add(Flatten())
```

```
model.add(Dense(300, activation = "relu"))
```

```
model.add(Dense(150, activation = "relu"))
```

```
model.add(Dense(5, activation = "softmax"))
```

```
model.summary()
```

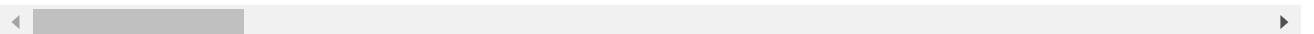
Model: "sequential_1"

| Layer (type) | Output Shape | Param # |
|------------------------------|--------------------|---------|
| ===== | | |
| conv2d (Conv2D) | (None, 62, 62, 32) | 896 |
| max_pooling2d (MaxPooling2D) | (None, 31, 31, 32) | 0 |
| flatten (Flatten) | (None, 30752) | 0 |
| dense (Dense) | (None, 300) | 9225900 |
| dense_1 (Dense) | (None, 150) | 45150 |
| dense_2 (Dense) | (None, 5) | 755 |
| ===== | | |
| Total params: 9,272,701 | | |
| Trainable params: 9,272,701 | | |
| Non-trainable params: 0 | | |

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

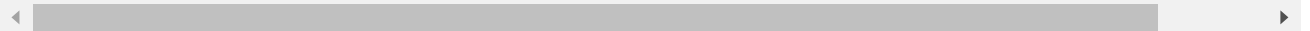
```
print(xtrain.class_indices)
```

```
{'apple_6': 0, 'apple_braeburn_1': 1, 'apple_crimson_snow_1': 2, 'apple_golden_1': 3
```



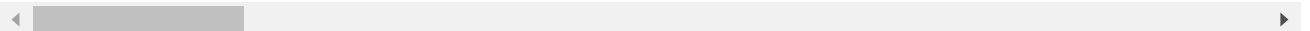
```
model.fit(x_train, epochs = 15, steps_per_epoch = len(x_train))
```

```
Epoch 1/15
125/125 [=====] - 107s 845ms/step - loss: 1.2280 - accuracy
Epoch 2/15
125/125 [=====] - 107s 858ms/step - loss: 1.0490 - accuracy
Epoch 3/15
125/125 [=====] - 105s 838ms/step - loss: 1.0467 - accuracy
Epoch 4/15
125/125 [=====] - 104s 833ms/step - loss: 1.0465 - accuracy
Epoch 5/15
125/125 [=====] - 104s 833ms/step - loss: 1.0441 - accuracy
Epoch 6/15
125/125 [=====] - 104s 832ms/step - loss: 1.0445 - accuracy
Epoch 7/15
125/125 [=====] - 106s 849ms/step - loss: 1.0442 - accuracy
Epoch 8/15
125/125 [=====] - 104s 831ms/step - loss: 1.0429 - accuracy
Epoch 9/15
125/125 [=====] - 104s 834ms/step - loss: 1.0444 - accuracy
Epoch 10/15
125/125 [=====] - 105s 836ms/step - loss: 1.0431 - accuracy
Epoch 11/15
125/125 [=====] - 104s 834ms/step - loss: 1.0421 - accuracy
Epoch 12/15
125/125 [=====] - 104s 831ms/step - loss: 1.0428 - accuracy
Epoch 13/15
125/125 [=====] - 104s 831ms/step - loss: 1.0415 - accuracy
Epoch 14/15
125/125 [=====] - 104s 827ms/step - loss: 1.0418 - accuracy
Epoch 15/15
125/125 [=====] - 104s 826ms/step - loss: 1.0410 - accuracy
<keras.callbacks.History at 0x7f6533abe710>
```



```
print(xtest.class_indices)
```

```
{'apple_6': 0, 'apple_braeburn_1': 1, 'apple_crimson_snow_1': 2, 'apple_golden_1': 3
```



```
model.save('fruits-360-original-size.h5')
```

```
from tensorflow.keras.models import load_model
from keras.preprocessing import image
model=load_model("fruits-360-original-size.h5")
```