050_01

September 24, 2020

1 Lab 10 : Task 1

Applying CNN on fruits dataset dataset:(https://www.kaggle.com/moltean/fruits)

[1]:
```
import shutil,os
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
from matplotlib.image import imread
%matplotlib inline
```

[2]:
```
my_data_dir = '../input/fruits/fruits-360'
os.listdir(my_data_dir)
```

[2]:
```
['Training', 'LICENSE', 'test-multiple_fruits', 'papers', 'readme.md', 'Test']
```

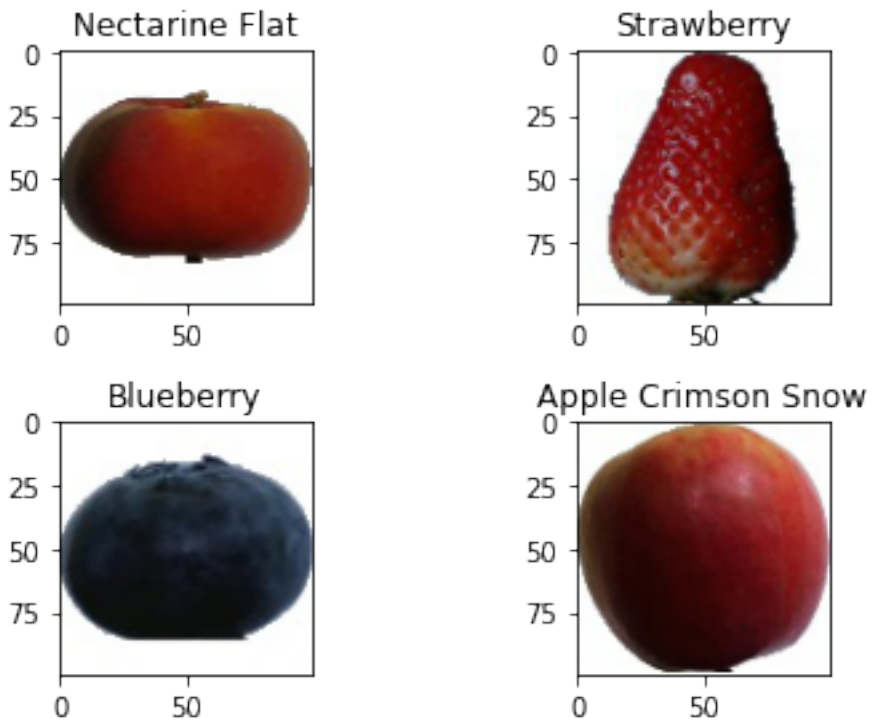
[3]:
```
train_path = my_data_dir+'/Training/'
test_path = my_data_dir+'/Test/'
```

[4]:
```
classes = os.listdir(train_path)
print(classes)
```

```
['Nectarine Flat', 'Peach 2', 'Nut Pecan', 'Pear Williams', 'Pomegranate',
'Granadilla', 'Tangelo', 'Pear Red', 'Apple Golden 3', 'Cherry Wax Black',
'Papaya', 'Apple Red 3', 'Apple Pink Lady', 'Pepper Yellow', 'Cactus fruit',
'Corn Husk', 'Grapefruit White', 'Beetroot', 'Pear Abate', 'Raspberry', 'Dates',
'Avocado', 'Strawberry', 'Cherry 1', 'Pear', 'Rambutan', 'Pear Forelle',
'Avocado ripe', 'Plum 3', 'Tomato not Ripened', 'Tomato 3', 'Cherry 2', 'Peach',
'Tamarillo', 'Huckleberry', 'Pepino', 'Pitahaya Red', 'Carambula', 'Apple Red
Delicious', 'Apple Braeburn', 'Onion Red', 'Mangostan', 'Grapefruit Pink',
'Cherry Wax Red', 'Blueberry', 'Passion Fruit', 'Corn', 'Redcurrant',
'Cantaloupe 1', 'Peach Flat', 'Pepper Orange', 'Grape White', 'Quince',
'Pineapple Mini', 'Kumquats', 'Pear Kaiser', 'Apple Golden 1', 'Apricot',
'Pepper Red', 'Walnut', 'Maracuja', 'Salak', 'Kiwi', 'Cucumber Ripe 2',
'Watermelon', 'Mango', 'Apple Crimson Snow', 'Cherry Wax Yellow', 'Clementine',
'Apple Red 1', 'Apple Red 2', 'Cherry Rainier', 'Mango Red', 'Potato Red',
'Tomato Maroon', 'Grape Pink', 'Plum 2', 'Pear Monster', 'Nut Forest',
```

```
'Nectarine', 'Lemon Meyer', 'Apple Golden 2', 'Physalis', 'Melon Piel de Sapo',
'Banana', 'Tomato 1', 'Tomato Heart', 'Tomato 4', 'Chestnut', 'Plum', 'Apple Red
Yellow 2', 'Limes', 'Apple Granny Smith', 'Fig', 'Banana Red', 'Tomato 2',
'Onion Red Peeled', 'Grape Blue', 'Hazelnut', 'Grape White 4', 'Pomelo Sweetie',
'Cucumber Ripe', 'Cauliflower', 'Banana Lady Finger', 'Potato Sweet', 'Grape
White 2', 'Pear 2', 'Lychee', 'Apple Red Yellow 1', 'Grape White 3', 'Orange',
'Kohlrabi', 'Lemon', 'Strawberry Wedge', 'Guava', 'Ginger Root', 'Mulberry',
'Potato White', 'Cantaloupe 2', 'Onion White', 'Eggplant', 'Tomato Cherry Red',
'Pear Stone', 'Potato Red Washed', 'Cocos', 'Kaki', 'Mandarine', 'Pepper Green',
'Tomato Yellow', 'Pineapple', 'Physalis with Husk']
```

[5]:
```
file_name = '0_100.jpg'
width=8
height=8
rows = 2
cols = 2
axes=[]
fig=plt.figure()
i=0
for a in range(rows*cols):
    img = imread(train_path+classes[i]+'/'+file_name)
    axes.append( fig.add_subplot(rows, cols, a+1) )
    subplot_title=classes[i]
    axes[-1].set_title(subplot_title)
    plt.imshow(img)
    i=i+22
fig.tight_layout()
plt.show()
img_shape=img.shape
print("Image shape:"+str(img_shape))
```




```
Image shape:(100, 100, 3)
```

[26]:
```
from tensorflow.keras.preprocessing.image import ImageDataGenerator
# help(ImageDataGenerator)
```

[7]:
```
image_gen = ImageDataGenerator(rotation_range=20, # rotate the image 20 degrees
                               width_shift_range=0.10, # Shift the pic width by␣
↪a max of 5%
                               height_shift_range=0.10, # Shift the pic height␣
↪by a max of 5%
                               rescale=1/255, # Rescale the image by normalzing␣
↪it.
                               shear_range=0.1, # Shear means cutting away part␣
↪of the image (max 10%)
                               zoom_range=0.1, # Zoom in by 10% max
                               horizontal_flip=True, # Allo horizontal flipping
                               fill_mode='nearest' # Fill in missing pixels␣
↪with the nearest filled value
                              )
```

[8]:
```
batch_size=512
```

[9]:
```
train_image_gen = image_gen.flow_from_directory(train_path,
                                                target_size=img_shape[:2],
                                                 color_mode='rgb',
                                                batch_size=batch_size,
                                                class_mode='categorical')
```

```
Found 67692 images belonging to 131 classes.
```

[10]:
```
test_image_gen = image_gen.flow_from_directory(test_path,
                                                target_size=img_shape[:2],
                                                color_mode='rgb',
                                                batch_size=batch_size,
                                               ␣
 ↪class_mode='categorical',shuffle=False)
```

```
Found 22688 images belonging to 131 classes.
```

[11]:
```
import tensorflow as tf
```

[13]:
```
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Activation, Dropout, Flatten,␣
 ↪Dense,Conv2D,MaxPooling2D
from tensorflow.keras.callbacks import EarlyStopping
```

[25]:
```
# help(MaxPooling2D)
```

[17]:
```
model = Sequential()

model.add(Conv2D(filters=16, kernel_size=(5,5),input_shape=img_shape,␣
 ↪activation='relu'))
model.add(MaxPooling2D(pool_size=(2, 2),strides=2))

model.add(Conv2D(filters=32, kernel_size=(5,5),input_shape=img_shape,␣
 ↪activation='relu'))
model.add(MaxPooling2D(pool_size=(2, 2),strides=2))

model.add(Conv2D(filters=64, kernel_size=(5,5),input_shape=img_shape,␣
 ↪activation='relu'))
model.add(MaxPooling2D(pool_size=(2, 2),strides=2))


model.add(Flatten())


model.add(Dense(1024))
model.add(Activation('relu'))
```

```
# Dropouts help reduce overfitting by randomly turning neurons off during␣
 ↪training.
# Here we say randomly turn off 50% of neurons.
model.add(Dropout(0.5))

model.add(Dense(131))
model.add(Activation('softmax'))
model.compile(loss='categorical_crossentropy',␣
 ↪optimizer='adam',metrics=['accuracy'])
```

[18]:
```
early_stop = EarlyStopping(monitor='val_loss',verbose=1, patience=2)
```

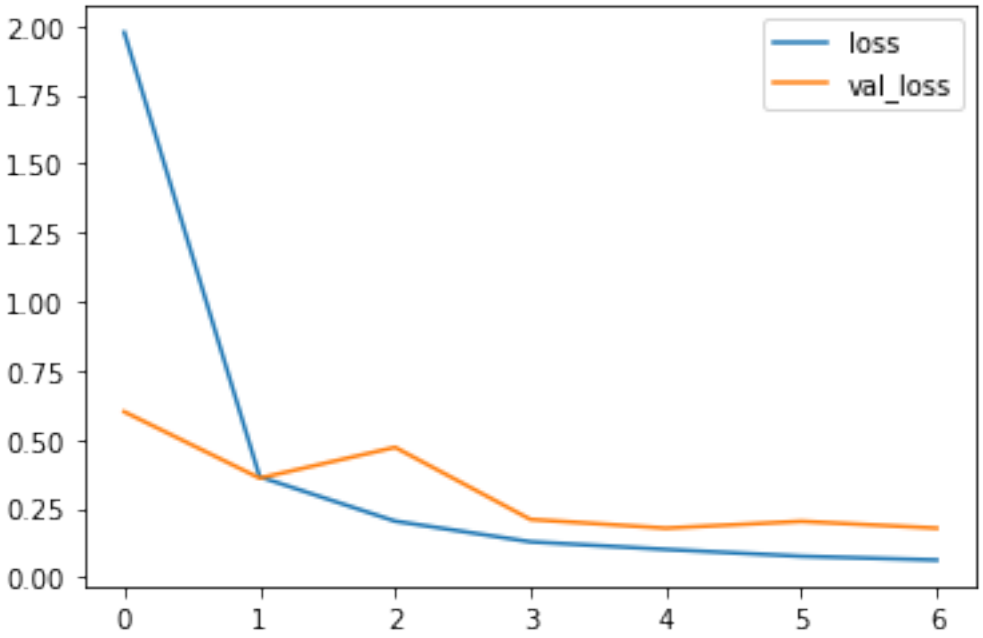
[19]:
```
#Ignore warnings
with tf.device('/GPU:0'):
    results = model.
 ↪fit(train_image_gen,validation_data=test_image_gen,callbacks=[early_stop],epochs=12
                  )
```

```
Epoch 1/12
133/133 [==============================] - 430s 3s/step - loss: 1.9765 -
accuracy: 0.4752 - val_loss: 0.6007 - val_accuracy: 0.8268
Epoch 2/12
133/133 [==============================] - 300s 2s/step - loss: 0.3648 -
accuracy: 0.8796 - val_loss: 0.3599 - val_accuracy: 0.9030
Epoch 3/12
133/133 [==============================] - 297s 2s/step - loss: 0.2040 -
accuracy: 0.9312 - val_loss: 0.4718 - val_accuracy: 0.8784
Epoch 4/12
133/133 [==============================] - 295s 2s/step - loss: 0.1291 -
accuracy: 0.9561 - val_loss: 0.2103 - val_accuracy: 0.9489
Epoch 5/12
133/133 [==============================] - 298s 2s/step - loss: 0.1015 -
accuracy: 0.9657 - val_loss: 0.1785 - val_accuracy: 0.9575
Epoch 6/12
133/133 [==============================] - 301s 2s/step - loss: 0.0766 -
accuracy: 0.9747 - val_loss: 0.2032 - val_accuracy: 0.9530
Epoch 7/12
133/133 [==============================] - 297s 2s/step - loss: 0.0631 -
accuracy: 0.9784 - val_loss: 0.1786 - val_accuracy: 0.9609
Epoch 00007: early stopping
```

[20]:
```
losses = pd.DataFrame(model.history.history)
```

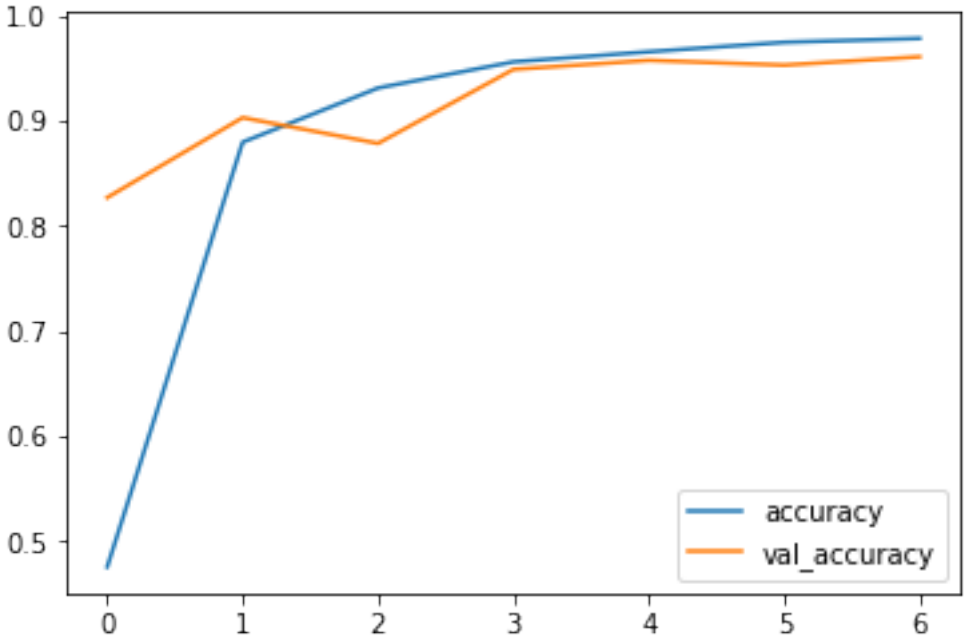
[21]:
```
losses[['loss','val_loss']].plot()
```

[21]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f18650977d0>
```



[22]:
```
losses[['accuracy','val_accuracy']].plot()
```

[22]: <matplotlib.axes._subplots.AxesSubplot at 0x7f189d9dc4d0>



[23]:
```
model.evaluate_generator(test_image_gen)
#[loss,accuracy]
```

[23]:
```
[0.17831288278102875, 0.9603755474090576]
```

[24]:
```
model.save('Fruits_Classifier_v1.h5')
```

[ ]:
```

```