Sprint-2

Model Building(Training,Saving,Testing the model)

Date	02 November 2022
Team ID	PNT2022TMID37845
Project Name	AI-powered Nutrition Analyzer for FitnessEnthusiasts
Maximum Marks	

Dataset:

- In our dataset we have collected images of the five variety of fruits.
  - Apple
  - Orange
  - Pineapple
  - Watermelon
  - Banana

Drive link : https://drive.google.com/file/d/1jzDjV7jYcIzIlieagaJdubMJ3YeLsry1/view?usp=share_link

Image Pre-processing:

- Import The ImageDataGenerator Library
- Configure ImageDataGenerator Class
- Apply Image DataGenerator Functionality To Trainset And Testset

Model Building:

- Importing The Model Building Libraries
- Initializing The Model
- Adding CNN Layers
- Adding Dense Layers
- Configure The Learning Process
- Train the model
- Save the model
- Test the model

Data Collection

Download the dataset here

```
# Unzipping the dataset
!unzip '/content/Dataset.zip'
```

```
        inflating:
        Dataset/TRAIN_SET/WATERMELON/r_288_100.j
        pginflating:
        Dataset/TRAIN_SET/WATERMELON/r_289_100.j
        pginflating:
        Dataset/TRAIN_SET/WATERMELON/r_28_100.jp
        g inflating:
        Dataset/TRAIN_SET/WATERMELON/r_290_100.j
        pginflating:
        Dataset/TRAIN_SET/WATERMELON/r_291_100.j
        pginflating:
        Dataset/TRAIN_SET/WATERMELON/r_292_100.j
        pginflating:
        Dataset/TRAIN_SET/WATERMELON/r_293_100.j
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        Dataset/TRAIN_SET/WATERMELON/r_294_100.j
        pginflating:
        Dataset/TRAIN_SET/WATERMELON/r_295_100.j
        pginflating:
        Dataset/TRAIN_SET/WATERMELON/r_296_100.j
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        Dataset/TRAIN_SET/WATERMELON/r_297_100.j
        pginflating:
        Dataset/TRAIN_SET/WATERMELON/r_298_100.j
        pginflating:
        Dataset/TRAIN_SET/WATERMELON/r_299_100.j
        pginflating:
        Dataset/TRAIN_SET/WATERMELON/r_29_100.jp
        g inflating:
        Dataset/TRAIN_SET/WATERMELON/r_2_100.jpg
        inflating:
        Dataset/TRAIN_SET/WATERMELON/r_300_100.j
        pg                              inflating:
        Dataset/TRAIN_SET/WATERMELON/r_301_100.j
        pg                              inflating:
        Dataset/TRAIN_SET/WATERMELON/r_302_100.j
        pg                              inflating:
        Dataset/TRAIN_SET/WATERMELON/r_303_100.j
        pg                              inflating:
        Dataset/TRAIN_SET/WATERMELON/r_304_100.j
        pg                              inflating:
        Dataset/TRAIN_SET/WATERMELON/r_305_100.j
        pg                              inflating:
        Dataset/TRAIN_SET/WATERMELON/r_306_100.j
        pg                              inflating:
        Dataset/TRAIN_SET/WATERMELON/r_307_100.j
        pg                              inflating:
```

```
Dataset/TRAIN_SET/WATERMELON/r_308_100.j
pg
inflating:
Dataset/TRAIN_SET/WATERMELON/r_309_100.j
pginflating:
Dataset/TRAIN_SET/WATERMELON/r_30_100.jp
g inflating:
Dataset/TRAIN_SET/WATERMELON/r_310_100.j
pginflating:
Dataset/TRAIN_SET/WATERMELON/r_311_100.j
pginflating:
Dataset/TRAIN_SET/WATERMELON/r_312_100.j
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Dataset/TRAIN_SET/WATERMELON/r_313_100.j
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Dataset/TRAIN_SET/WATERMELON/r_314_100.j
pginflating:
Dataset/TRAIN_SET/WATERMELON/r_315_100.j
pginflating:
Dataset/TRAIN_SET/WATERMELON/r_31_100.jp
g inflating:
Dataset/TRAIN_SET/WATERMELON/r_32_100.jp
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Dataset/TRAIN_SET/WATERMELON/r_37_100.jp
g inflating:
Dataset/TRAIN_SET/WATERMELON/r_38_100.jp
g inflating:
Dataset/TRAIN_SET/WATERMELON/r_39_100.jp
g inflating:
Dataset/TRAIN_SET/WATERMELON/r_3_100.jpg
inflating:
Dataset/TRAIN_SET/WATERMELON/r_40_100.j
pg                            inflating:
Dataset/TRAIN_SET/WATERMELON/r_41_100.j
pg                            inflating:
Dataset/TRAIN_SET/WATERMELON/r_42_100.j
pg                            inflating:
Dataset/TRAIN_SET/WATERMELON/r_43_100.j
pg                            inflating:
Dataset/TRAIN_SET/WATERMELON/r_44_100.j
pg                            inflating:
```

```
Dataset/TRAIN_SET/WATERMELON/r_45_100.j
pg

inflating:
Dataset/TRAIN_SET/WATERMELON/r_46_100.j
pginflating:
Dataset/TRAIN_SET/WATERMELON/r_4_100.jp
g inflating:
Dataset/TRAIN_SET/WATERMELON/r_50_100.j
pginflating:
Dataset/TRAIN_SET/WATERMELON/r_57_100.j
pginflating:
Dataset/TRAIN_SET/WATERMELON/r_5_100.jp
g inflating:
Dataset/TRAIN_SET/WATERMELON/r_6_100.jp
g inflating:
Dataset/TRAIN_SET/WATERMELON/r_7_100.jp
g inflating:
Dataset/TRAIN_SET/WATERMELON/r_81_100.j
pginflating:
Dataset/TRAIN_SET/WATERMELON/r_8_100.jp
g inflating:
Dataset/TRAIN_SET/WATERMELON/r_9_100.jp
g
```

Image Preprocessing

```
#Importing The ImageDataGenerator Library
from keras.preprocessing.image import ImageDataGenerator
```

Image Data Augmentation

```
#Configure ImageDataGenerator Class
train_datagen =
ImageDataGenerator(rescale=1./255,shear_range=0.2,zoom_range=0.2,horizonta
test_datagen=ImageDataGenerator(rescale=1./255)
```

Applying Image DataGenerator Functionality To TrainsetAnd Testset

```
#Applying Image DataGenerator Functionality To
Trainset And Testsetx_train =
train_datagen.flow_from_directory(
    r'/content/Dataset/TRAIN_SET',
    target_size=(64,
64),batch_size=5,color_mode='rgb',class_mode='sparse')
#Applying Image DataGenerator Functionality To Testset
x_test =
    test_datagen.flow_from_di
    rectory(
    r'/content/Dataset/TEST_S
    ET',
    target_size=(64, 64),batch_size=5,color_mode='rgb',class_mode='sparse')
```

```
 Found 4118 images belonging
 to 5 classes.Found 929
 images belonging to 5
 classes.
```

```
#checking the
number of classes
print(x_train.clas
s_indices)
```

```
{'APPLES': 0, 'BANANA': 1, 'ORANGE': 2, 'PINEAPPLE': 3, 'WATERMELON': 4}
```

```
#checking the
number of classes
print(x_test.class
_indices)
```

```
{'APPLES': 0, 'BANANA': 1, 'ORANGE': 2, 'PINEAPPLE': 3, 'WATERMELON': 4}
```

```
from collections import
Counter as cc(x_train
.labels)
```

```
Counter({0: 995, 1: 1354, 2: 1019, 3: 275, 4: 475})
```

Model Building

- Importing The Model Building Libraries

```
import numpy as np
import tensorflow as tf
from tensorflow.keras.models
import Sequentialfrom
tensorflow.keras import layers
from tensorflow.keras.layers import Dense,Flatten
from tensorflow.keras.layers import Conv2D,MaxPooling2D,Dropout
```

- Initializing The Model

```
model = Sequential()
```

- Adding CNN Layers

```
# Initializing the CNN
classifier = Sequential()

# First convolution layer and pooling
classifier.add(Conv2D(32, (3, 3), input_shape=(64, 64, 3), activation='relu'))
classifier.add(MaxPooling2D(pool_size=(2, 2)))

# Second convolution layer and pooling
classifier.add(Conv2D(32, (3, 3), activation='relu'))

# input_shape is going to be the pooled feature maps from the previous
convolution layerclassifier.add(MaxPooling2D(pool_size=(2, 2)))

# Flattening the layers
classifier.add(Flatten())
```

- Adding Dense Layers

```
classifier.add(Dense(units=128, activation='relu'))

classifier.add(Dense(units=5, activation='softmax'))


#summary
of our
model
classifi
er.summa
ry()
```

```
Model: "sequential_1"
 Layer (type)                 Output Shape              Param #
=================================================================
```

conv2d (Conv2D)	(None, 62, 62, 32)	896
max_pooling2d (MaxPooling2D)	(None, 31, 31, 32)	0
conv2d_1 (Conv2D)	(None, 29, 29, 32)	9248
max_pooling2d_1 (MaxPooling2D)	(None, 14, 14, 32)	0
flatten (Flatten)	(None, 6272)	0
dense (Dense)	(None, 128)	802944
dense_1 (Dense)	(None, 5)	645

```
=================================================================
Total params: 813,733
Trainable params: 813,733
Non-trainable params: 0
```

- Configure The Learning Process

```
# Compiling the CNN
# categorical_crossentropy for more than 2
classifier.compile(optimizer='adam', loss='sparse_categorical_crossentropy',
metrics=['acc
```

- Train The Model

```
#Fitting the model
classifier.fit_generator(generator=x_train,steps_per_epoch =
len(x_train),epochs=20, valid
```

```
Epoch 1/20
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:2:
UserWarning: `Model.
```

824/824 [==============================]	- 21s	16ms/step	- loss:	0.6172	- accuracy:
Epoch 2/20					
824/824 [==============================]	- 13s	15ms/step	- loss:	0.4115	- accuracy:
Epoch 3/20					
824/824 [==============================]	- 13s	16ms/step	- loss:	0.3766	- accuracy:
Epoch 4/20					
824/824 [==============================]	- 13s	16ms/step	- loss:	0.3484	- accuracy:
Epoch 5/20					

824/824 [==============================]	- 13s	16ms/step	- loss:	0.3243	- accuracy:
Epoch 6/20					
824/824 [==============================]	- 13s	16ms/step	- loss:	0.3240	- accuracy:
Epoch 7/20					
824/824 [==============================]	- 13s	16ms/step	- loss:	0.2887	- accuracy:
Epoch 8/20					
824/824 [==============================]	- 13s	16ms/step	- loss:	0.2728	- accuracy:
Epoch 9/20					
824/824 [==============================]	- 13s	16ms/step	- loss:	0.2717	- accuracy:
Epoch 10/20					
824/824 [==============================]	- 14s	17ms/step	- loss:	0.2365	- accuracy:
Epoch 11/20					
824/824 [==============================]	- 13s	15ms/step	- loss:	0.2301	- accuracy:
Epoch 12/20					
824/824 [==============================]	- 13s	15ms/step	- loss:	0.2083	- accuracy:
Epoch 13/20					
824/824 [==============================]	- 13s	15ms/step	- loss:	0.2049	- accuracy:
Epoch 14/20					

824/824 [==============================]	- 12s	15ms/step	- loss:	0.1930	- accuracy:
Epoch 15/20 824/824 [==============================]	- 13s	15ms/step	- loss:	0.1807	- accuracy:
Epoch 16/20 824/824 [==============================]	- 13s	15ms/step	- loss:	0.1712	- accuracy:
Epoch 17/20					
824/824 [==============================]	- 13s	15ms/step	- loss:	0.1599	- accuracy:
Epoch 18/20 824/824 [==============================]	- 13s	15ms/step	- loss:	0.1619	- accuracy:
Epoch 19/20 824/824 [==============================]	- 13s	15ms/step	- loss:	0.1505	- accuracy:
Epoch 20/20					
824/824 [==============================]	- 12s	15ms/step	- loss:	0.1211	- accuracy:

<keras.callbacks.History at 0x7fd655833d90>

- Saving The Model

```
classifier.save('nutrition.h5')
```

- Testing The Model

```
#Predict the results
from tensorflow.keras.models
import load_modelfrom
keras.preprocessing import image
model = load_model("nutrition.h5")


from tensorflow.keras.utils import
img_to_array#loading of the image
img =
load_img(r'/content/Sample_Images/Test_Image1.jpg',grayscale=False,target_siz
e= (64,#image to array
x =
img_to_a
rray(img
)
```

```
#changin
g the
shape
x = np.expand_dims(x,axis = 0)

predict_x=model.predict(x)
classes_x=np.argmax(predi
ct_x,axis=-1)classes_x
```

```
1/1 [==============================] - 0s 18ms/step
array([0])
```

```
index=['APPLES', 'BANANA', 'ORANGE','PINEAPPLE','WATERMELON']
result=str(index[c
lasses_x[0]])
result
```

```
'APPLES'
```

Colab HYPERLINK "https://colab.research.google.com/signup?utm_source=footer&utm_medium=link&utm_campaign=footer_li

nks" HYPERLINK "https://colab.research.google.com/signup?utm_source=footer&utm_medium=link&utm_campaign=footer_links"paid HYPERLINK "https://colab.research.google.com/signup?utm_source=footer&utm_medium=link&utm_campaign=footer_links" HYPERLINK "https://colab.research.google.com/signup?utm_source=footer&utm_medium=link&utm_campaign=footer_links"products - Cancel HYPERLINK "https://colab.research.google.com/cancel-subscription" HYPERLINK "https://colab.research.google.com/cancel-subscription"contracts HYPERLINK "https://colab.research.google.com/cancel-subscription" HYPERLINK "https://colab.research.google.com/cancel-subscription"here