Sprint-2

Model Building

Date	4 November 2022
Team ID	PNT2022TMID12745
Project Name	AI-powered Nutrition Analyzer for Fitness Enthusiasts
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/1jzDjV7jYcIzlIieagaJdubMJ3YeLsry1/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.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_289_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_28_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_290_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_291_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_292_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_293_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_294_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_295_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_296_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_297_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_298_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_299_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_29_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_2_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_300_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_301_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_302_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_303_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_304_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_305_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_306_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_307_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_308_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_309_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_30_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_310_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_311_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_312_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_313_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_314_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_315_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_31_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_32_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_33_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_34_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_35_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_36_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_37_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_38_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_39_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_3_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_40_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_41_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_42_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_43_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_44_100.jpg
     inflating: Dataset/TRAIN_SET/WATERMELON/r_45_100.jpg
```

```
  inflating: Dataset/TRAIN_SET/WATERMELON/r_46_100.jpg
  inflating: Dataset/TRAIN_SET/WATERMELON/r_4_100.jpg
  inflating: Dataset/TRAIN_SET/WATERMELON/r_50_100.jpg
  inflating: Dataset/TRAIN_SET/WATERMELON/r_57_100.jpg
  inflating: Dataset/TRAIN_SET/WATERMELON/r_5_100.jpg
  inflating: Dataset/TRAIN_SET/WATERMELON/r_6_100.jpg
  inflating: Dataset/TRAIN_SET/WATERMELON/r_7_100.jpg
  inflating: Dataset/TRAIN_SET/WATERMELON/r_81_100.jpg
  inflating: Dataset/TRAIN_SET/WATERMELON/r_8_100.jpg
  inflating: Dataset/TRAIN_SET/WATERMELON/r_9_100.jpg
```

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 Trainset And Testset

```
#Applying Image DataGenerator Functionality To Trainset And Testset
x_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_directory(
    r'/content/Dataset/TEST_SET',
    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.class_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 c
c(x_train .labels)
```

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

Model Building

1. Importing The Model Building Libraries

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

2. Initializing The Model

```
model = Sequential()
```

3. 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 layer
classifier.add(MaxPooling2D(pool_size=(2, 2)))

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

4. Adding Dense Layers

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

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


#summary of our model
classifier.summary()
```

```
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 (MaxPooling  (None, 14, 14, 32)       0
 2D)

 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
_________________________________________________________________
```

5. Configure The Learning Process

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

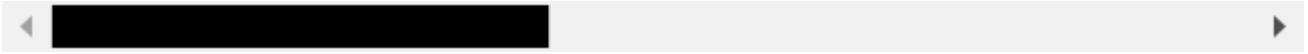
6. Train The Model

```
#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>
```



7. Saving The Model

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

8. Testing The Model

```
#Predict the results
from tensorflow.keras.models import load_model
from 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_size= (64,
#image to array
x = img_to_array(img)
#changing the shape
x = np.expand_dims(x,axis = 0)
```

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

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

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

```
'APPLES'
```