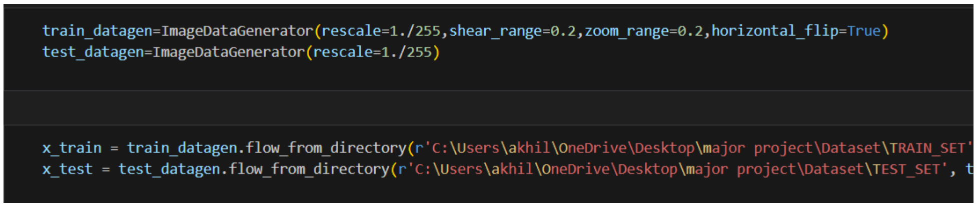
Model Optimization and Tuning Phase Template

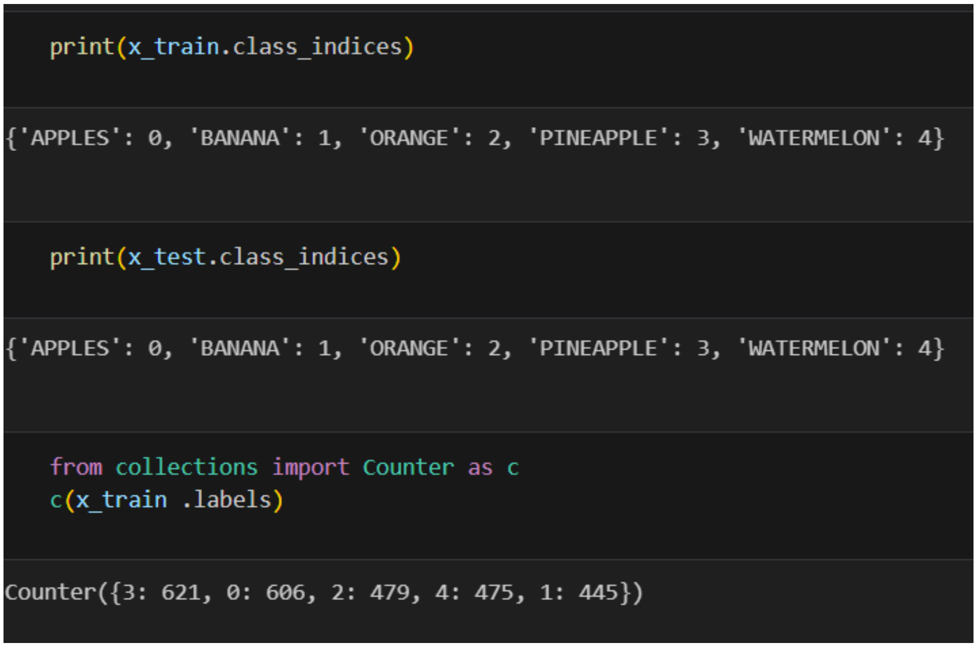
Date	27 October 2024
Team ID	739842
Project Title	Ai-Powered Nutrition Analyzer For Fitness Enthusiasts
Maximum Marks	10 Marks

Model Optimization and Tuning Phase

The Model Optimization and Tuning Phase for the Ai-Powered Nutrition Analyzer involved fine-tuning hyperparameters such as learning rate, batch size, and the number of convolutional layers. Techniques like early stopping, dropout, and data augmentation were applied to prevent overfitting and improve generalization. Grid search and random search were used to systematically explore the best configurations. Performance metrics such as accuracy, precision, recall, and F1 score were continuously monitored to assess improvements. The final optimized model achieved better balance between accuracy and computational efficiency.

Model	Tuned Hyperparameters

Model 1	 `train_datagen=ImageDataGenerator(rescale=1./255,shear_range=0.2,zoom_range=0.2,horizontal_flip=True)`
	`test_datagen=ImageDataGenerator(rescale=1./255)`
	`x_train = train_datagen.flow_from_directory(r'C:\Users\akhil\OneDrive\Desktop\major project\Dataset\TRAIN_SET'`
	`x_test = test_datagen.flow_from_directory(r'C:\Users\akhil\OneDrive\Desktop\major project\Dataset\TEST_SET', t`



```
print(x_train.class_indices)
```

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

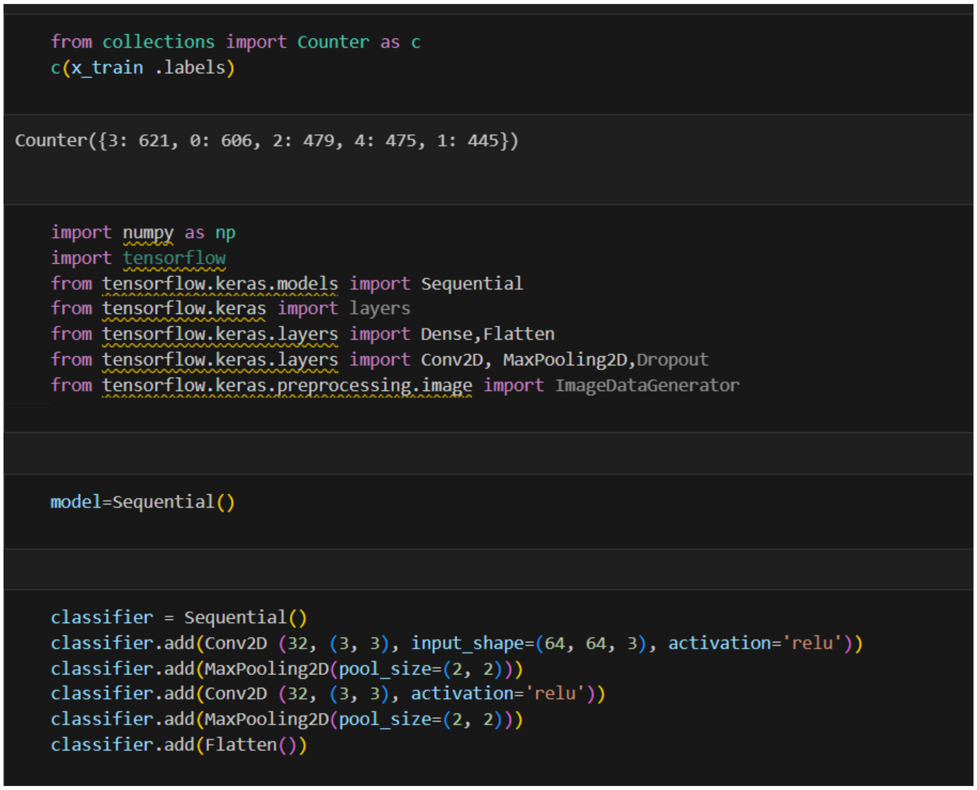
```
print(x_test.class_indices)
```

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

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

```
Counter({3: 621, 0: 606, 2: 479, 4: 475, 1: 445})
```

…



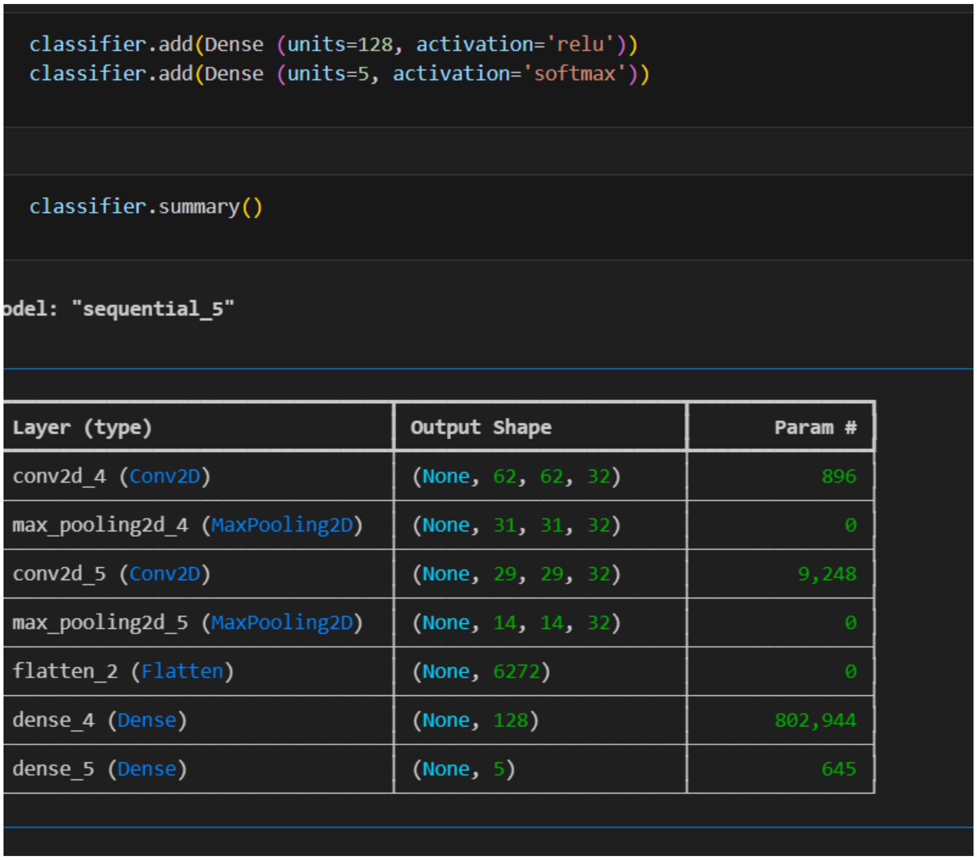
```
from collections import Counter as c
c(x_train .labels)
```

```
Counter({3: 621, 0: 606, 2: 479, 4: 475, 1: 445})
```

```
import numpy as np
import tensorflow
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
from tensorflow.keras.preprocessing.image import ImageDataGenerator
```

```
model=Sequential()
```

```
classifier = Sequential()
classifier.add(Conv2D (32, (3, 3), input_shape=(64, 64, 3), activation='relu'))
classifier.add(MaxPooling2D(pool_size=(2, 2)))
classifier.add(Conv2D (32, (3, 3), activation='relu'))
classifier.add(MaxPooling2D(pool_size=(2, 2)))
classifier.add(Flatten())
```

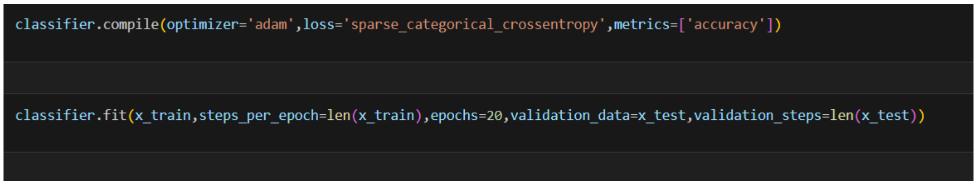


```
classifier.add(Dense (units=128, activation='relu'))
classifier.add(Dense (units=5, activation='softmax'))
```

```
classifier.summary()
```

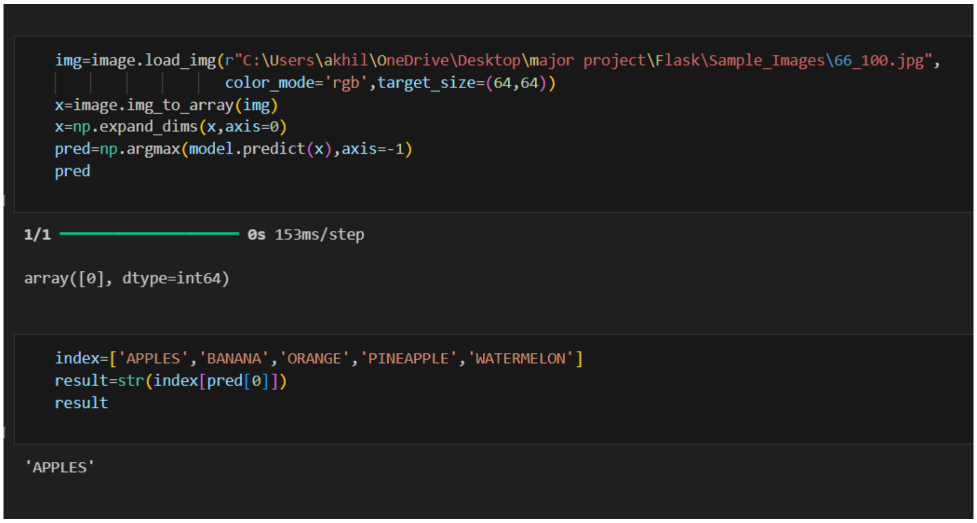
```
odel: "sequential_5"

Layer (type)                     Output Shape              Param #
conv2d_4 (Conv2D)                (None, 62, 62, 32)            896
max_pooling2d_4 (MaxPooling2D)   (None, 31, 31, 32)              0
conv2d_5 (Conv2D)                (None, 29, 29, 32)          9,248
max_pooling2d_5 (MaxPooling2D)   (None, 14, 14, 32)              0
flatten_2 (Flatten)              (None, 6272)                    0
dense_4 (Dense)                  (None, 128)               802,944
dense_5 (Dense)                  (None, 5)                     645
```



```
classifier.compile(optimizer='adam',loss='sparse_categorical_crossentropy',metrics=['accuracy'])

classifier.fit(x_train,steps_per_epoch=len(x_train),epochs=20,validation_data=x_test,validation_steps=len(x_test))
```

```
img=image.load_img(r"C:\Users\akhil\OneDrive\Desktop\major project\Flask\Sample_Images\66_100.jpg",
                   color_mode='rgb',target_size=(64,64))
x=image.img_to_array(img)
x=np.expand_dims(x,axis=0)
pred=np.argmax(model.predict(x),axis=-1)
pred
```

```
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 153ms/step

array([0], dtype=int64)
```

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

```
'APPLES'
```

Final Model Selection Justification (2 Marks):

Final Model	Reasoning
	The reasoning behind the Ai-Powered Nutrition Analyzer For Fitness Enthusiasts is to provide a personalized and efficient solution for managing nutrition based on deep learning and computer vision technologies. By leveraging advanced models, such as convolutional neural networks (CNNs), the system can analyze meal images to classify and predict nutritional content accurately. This approach helps fitness enthusiasts make data-driven decisions to optimize their diets.