# Data Preprocessing & ready the datset

```
!pip install tensorflow
```

```
Defaulting to user installation because normal site-packages is not writeable
Requirement already satisfied: tensorflow in c:\users\bariu\appdata\roaming\pytho
Requirement already satisfied: tensorflow-intel==2.14.0 in c:\users\bariu\appdata
Requirement already satisfied: absl-py>=1.0.0 in c:\users\bariu\appdata\roaming\py
Requirement already satisfied: astunparse>=1.6.0 in c:\users\bariu\appdata\roamin
Requirement already satisfied: flatbuffers>=23.5.26 in c:\users\bariu\appdata\roa
Requirement already satisfied: gast!=0.5.0,!=0.5.1,!=0.5.2,>=0.2.1 in c:\users\ba
Requirement already satisfied: google-pasta>=0.1.1 in c:\users\bariu\appdata\roam
Requirement already satisfied: h5py>=2.9.0 in c:\programdata\anaconda3\lib\site-p
Requirement already satisfied: libclang>=13.0.0 in c:\users\bariu\appdata\roaming
Requirement already satisfied: ml-dtypes==0.2.0 in c:\users\bariu\appdata\roaming
Requirement already satisfied: numpy>=1.23.5 in c:\programdata\anaconda3\lib\site
Requirement already satisfied: opt-einsum>=2.3.2 in c:\users\bariu\appdata\roamin
Requirement already satisfied: packaging in c:\programdata\anaconda3\lib\site-pac
Requirement already satisfied: protobuf!=4.21.0,!=4.21.1,!=4.21.2,!=4.21.3,!=4.21
Requirement already satisfied: setuptools in c:\programdata\anaconda3\lib\site-pa
Requirement already satisfied: six>=1.12.0 in c:\programdata\anaconda3\lib\site-p
Requirement already satisfied: termcolor>=1.1.0 in c:\users\bariu\appdata\roaming
Requirement already satisfied: typing-extensions>=3.6.6 in c:\programdata\anacond
Requirement already satisfied: wrapt<1.15,>=1.11.0 in c:\programdata\anaconda3\li
Requirement already satisfied: tensorflow-io-gcs-filesystem>=0.23.1 in c:\users\b
Requirement already satisfied: grpcio<2.0,>=1.24.3 in c:\users\bariu\appdata\roam
Requirement already satisfied: tensorboard<2.15,>=2.14 in c:\users\bariu\appdata\
Requirement already satisfied: tensorflow-estimator<2.15,>=2.14.0 in c:\users\bar
Requirement already satisfied: keras<2.15,>=2.14.0 in c:\users\bariu\appdata\roam
Requirement already satisfied: wheel<1.0,>=0.23.0 in c:\programdata\anaconda3\lib
Requirement already satisfied: google-auth<3,>=1.6.3 in c:\users\bariu\appdata\ro
Requirement already satisfied: google-auth-oauthlib<1.1,>=0.5 in c:\users\bariu\a
Requirement already satisfied: markdown>=2.6.8 in c:\programdata\anaconda3\lib\si
Requirement already satisfied: requests<3,>=2.21.0 in c:\programdata\anaconda3\li
Requirement already satisfied: tensorboard-data-server<0.8.0,>=0.7.0 in c:\users\
Requirement already satisfied: werkzeug>=1.0.1 in c:\programdata\anaconda3\lib\si
Requirement already satisfied: cachetools<6.0,>=2.0.0 in c:\users\bariu\appdata\r
Requirement already satisfied: pyasn1-modules>=0.2.1 in c:\programdata\anaconda3\
Requirement already satisfied: rsa<5,>=3.1.4 in c:\users\bariu\appdata\roaming\py
Requirement already satisfied: requests-oauthlib>=0.7.0 in c:\users\bariu\appdata
Requirement already satisfied: charset-normalizer<4,>=2 in c:\programdata\anacond
Requirement already satisfied: idna<4,>=2.5 in c:\programdata\anaconda3\lib\site-
Requirement already satisfied: urllib3<3,>=1.21.1 in c:\programdata\anaconda3\lib
Requirement already satisfied: certifi>=2017.4.17 in c:\programdata\anaconda3\lib
Requirement already satisfied: MarkupSafe>=2.1.1 in c:\programdata\anaconda3\lib\
Requirement already satisfied: pyasn1<0.5.0,>=0.4.6 in c:\programdata\anaconda3\l
Requirement already satisfied: oauthlib>=3.0.0 in c:\users\bariu\appdata\roaming\
```

```python
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import tensorflow as tf

from tensorflow import keras
from tensorflow.keras import layers
```

```python
import os

# Specify the path to your dataset using an absolute path
data_train_path = os.path.abspath("C:\\Users\\bariu\\Python\\Image_Classification\\Fruits_Veget
data_test_path = os.path.abspath("C:\\Users\\bariu\\Python\\Image_Classification\\Fruits_Vegeta
data_val_path = os.path.abspath("C:\\Users\\bariu\\Python\\Image_Classification\\Fruits_Vegetab
```

```python
# data_train_path = 'Python/Image_Classification/Fruits_Vegetables/train'
# data_train_test ='Python/Image_Classification/Fruits_Vegetables/test'
# data_train_val = 'Python/Image_Classification/Fruits_Vegetables/validation'
```

## set our images in similar size(fixed width & fixed height

```python
img_width = 180
img_height = 180
```

## The tf.keras.utils.image_dataset_from_directory function is a convenient way to load image data from a directory structure and convert it into a TensorFlow dataset, which can be used for training machine learning models. This function handles various

# aspects such as reading images, resizing, shuffling, and batching, making it suitable for image classification tasks.

```
data_train = tf.keras.utils.image_dataset_from_directory(
    data_train_path,
    shuffle=True,
    image_size=(img_width, img_height),
    batch_size=32,
    validation_split=False)
```

```
Found 3115 files belonging to 36 classes.
```

# Show class_Name by this function and keep that function in a variable for later use

```
data_cat=data_train.class_names
```

```
data_cat
```

```
['apple',
 'banana',
 'beetroot',
 'bell pepper',
 'cabbage',
 'capsicum',
 'carrot',
 'cauliflower',
 'chilli pepper',
 'corn',
 'cucumber',
 'eggplant',
 'garlic',
 'ginger',
 'grapes',
 'jalepeno',
 'kiwi',
 'lemon',
 'lettuce',
 'mango',
 'onion',
 'orange',
 'paprika',
 'pear',
 'peas',
 'pineapple',
 'pomegranate',
 'potato',
 'raddish',
 'soy beans',
 'spinach',
 'sweetcorn',
 'sweetpotato',
 'tomato',
 'turnip',
 'watermelon']
```

```
data_val = tf.keras.utils.image_dataset_from_directory(data_val_path,
                                                       image_size=(img_height, img_width),
                                                       batch_size=32,
                                                       shuffle=False,
                                                       validation_split=False)
```

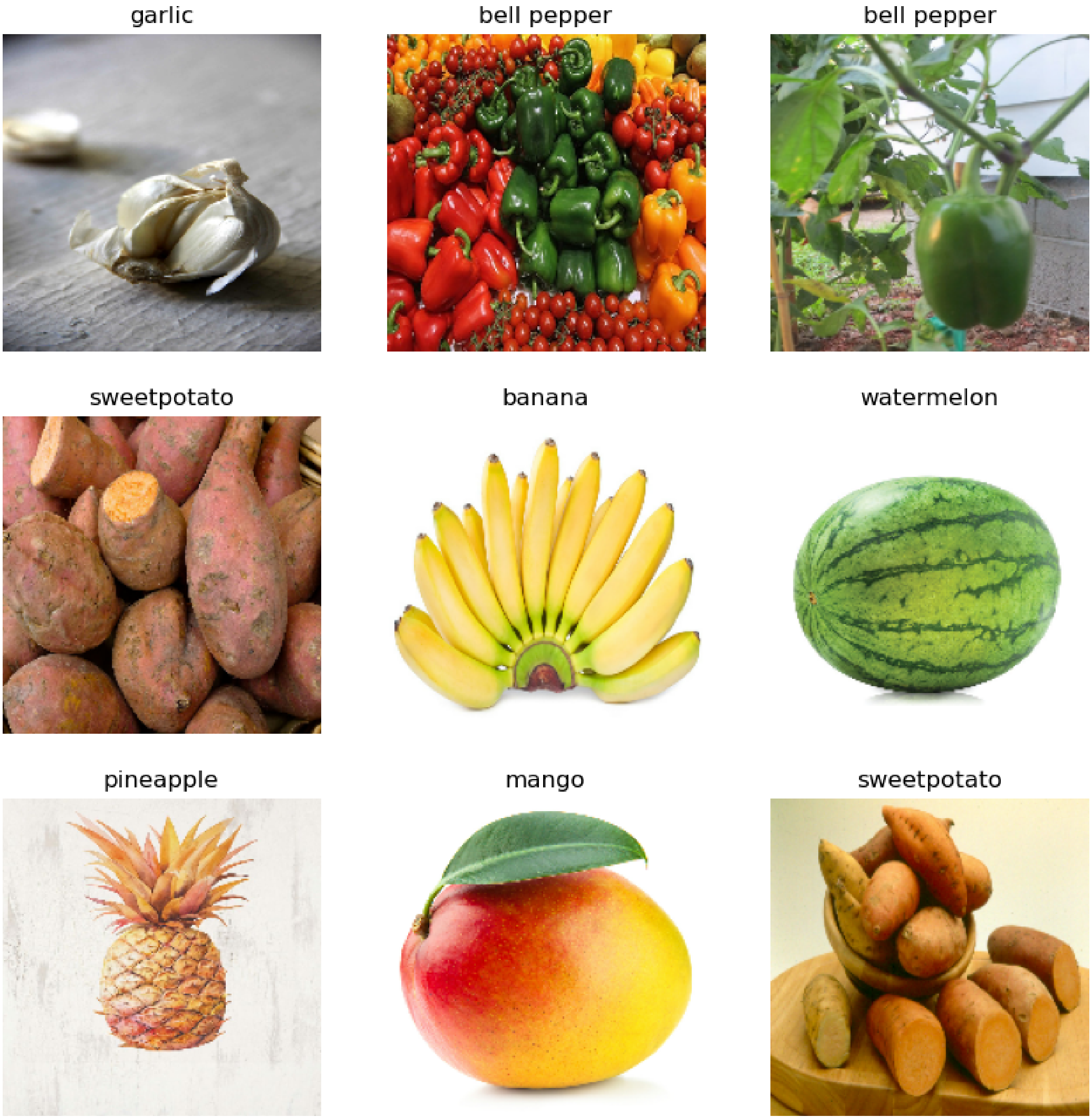
```
Found 351 files belonging to 36 classes.
```

```
data_test = tf.keras.utils.image_dataset_from_directory(data_test_path,
                                                       image_size=(img_height, img_width),
                                                       shuffle=False,
                                                       batch_size=32,
                                                       validation_split=False)
```

```
Found 359 files belonging to 36 classes.
```

## Let's print some images from training dataset

```
plt.figure(figsize=(10,10))
for image, labels in data_train.take(1):
    for i in range(9):
        plt.subplot(3,3,i+1)
        plt.imshow(image[i].numpy().astype('uint8'))
        plt.title(data_cat[labels[i]])
        plt.axis('off')
```



# model creation

## create layers within model

```
from tensorflow.keras.models import Sequential
```

```
data_train
```

```
<_PrefetchDataset element_spec=(TensorSpec(shape=(None, 180, 180, 3), dtype=tf.fl
```

```
model = Sequential([
    layers.Rescaling(1./255),
    layers.Conv2D(16,3, padding='same', activation='relu'),
    layers.MaxPooling2D(),
    layers.Conv2D(32,3,padding='same',activation='relu'),
    layers.MaxPooling2D(),
    layers.Conv2D(64,3,padding='same',activation='relu'),
    layers.MaxPooling2D(),
    layers.Flatten(),
    layers.Dropout(0.2),
    layers.Dense(128),
    layers.Dense(len(data_cat))

])
```

# already model has been created now model compiling

```
model.compile(optimizer='adam',loss=tf.keras.losses.SparseCategoricalCrossentropy(from_logits=T
```

```
epochs_size = 25
history = model.fit(data_train, validation_data=data_val, epochs=epochs_size)
```

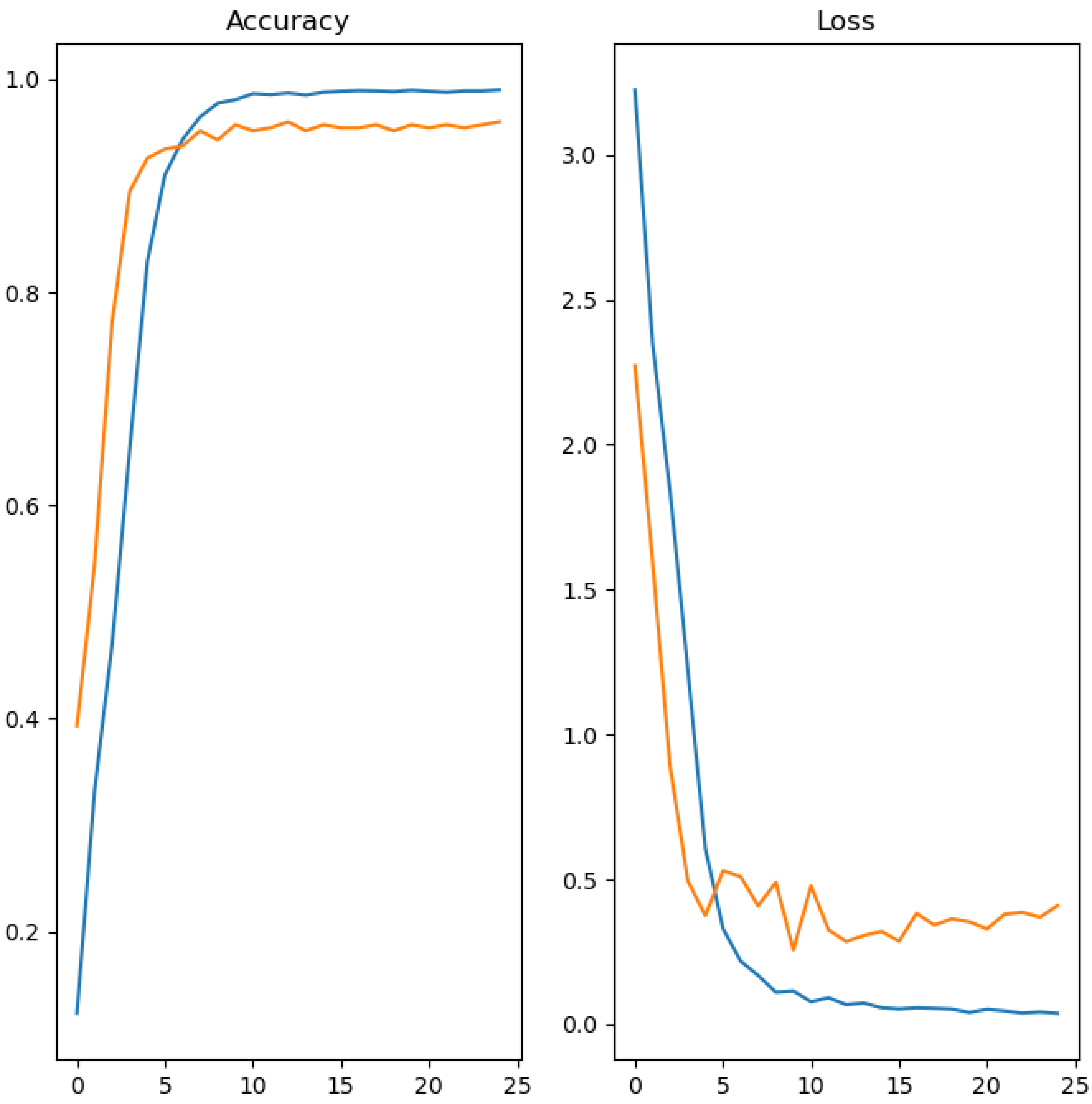
```
Epoch 1/25
98/98 [==============================] - 116s 1s/step - loss: 3.2249 - accuracy:
Epoch 2/25
98/98 [==============================] - 95s 888ms/step - loss: 2.3506 - accuracy
Epoch 3/25
98/98 [==============================] - 75s 728ms/step - loss: 1.8370 - accuracy
Epoch 4/25
98/98 [==============================] - 84s 818ms/step - loss: 1.2253 - accuracy
Epoch 5/25
98/98 [==============================] - 88s 853ms/step - loss: 0.6061 - accuracy
Epoch 6/25
98/98 [==============================] - 97s 957ms/step - loss: 0.3303 - accuracy
Epoch 7/25
98/98 [==============================] - 119s 1s/step - loss: 0.2175 - accuracy:
Epoch 8/25
98/98 [==============================] - 122s 1s/step - loss: 0.1681 - accuracy:
Epoch 9/25
98/98 [==============================] - 121s 1s/step - loss: 0.1103 - accuracy:
Epoch 10/25
98/98 [==============================] - 84s 819ms/step - loss: 0.1144 - accuracy
Epoch 11/25
98/98 [==============================] - 97s 954ms/step - loss: 0.0773 - accuracy
Epoch 12/25
98/98 [==============================] - 107s 1s/step - loss: 0.0911 - accuracy:
Epoch 13/25
98/98 [==============================] - 104s 1s/step - loss: 0.0673 - accuracy:
Epoch 14/25
98/98 [==============================] - 102s 996ms/step - loss: 0.0728 - accurac
Epoch 15/25
98/98 [==============================] - 102s 992ms/step - loss: 0.0569 - accurac
Epoch 16/25
98/98 [==============================] - 102s 996ms/step - loss: 0.0522 - accurac
Epoch 17/25
98/98 [==============================] - 102s 987ms/step - loss: 0.0564 - accurac
Epoch 18/25
98/98 [==============================] - 102s 1000ms/step - loss: 0.0544 - accura
Epoch 19/25
98/98 [==============================] - 104s 1s/step - loss: 0.0518 - accuracy:
Epoch 20/25
98/98 [==============================] - 106s 1s/step - loss: 0.0403 - accuracy:
Epoch 21/25
98/98 [==============================] - 101s 984ms/step - loss: 0.0512 - accurac
Epoch 22/25
```

```
98/98 [==============================] - 102s 994ms/step - loss: 0.0455 - accurac
Epoch 23/25
98/98 [==============================] - 103s 998ms/step - loss: 0.0379 - accurac
Epoch 24/25
98/98 [==============================] - 103s 998ms/step - loss: 0.0418 - accurac
Epoch 25/25
98/98 [==============================] - 103s 1s/step - loss: 0.0371 - accuracy:
```

```
epochs_size = 25
epochs_range = range(epochs_size)
plt.figure(figsize=(8,8))
plt.subplot(1,2,1)
plt.plot(epochs_range,history.history['accuracy'], label='Training Accuracy')
plt.plot(epochs_range,history.history['val_accuracy'], label='Validation Accuracy')
plt.title('Accuracy')

plt.subplot(1,2,2)
plt.plot(epochs_range,history.history['loss'], label='Training Loss')
plt.plot(epochs_range,history.history['val_loss'], label='Validation Loss')
plt.title('Loss')
```

```
Text(0.5, 1.0, 'Loss')
```



# Now let's print the summary of the model

```
model.summary()
```

```
Model: "sequential_1"
_________________________________________________________________
 Layer (type)                Output Shape              Param #   
=================================================================
 rescaling_1 (Rescaling)     (None, 180, 180, 3)       0         
                                                                 
 conv2d_3 (Conv2D)           (None, 180, 180, 16)      448       
                                                                 
 max_pooling2d_3 (MaxPoolin  (None, 90, 90, 16)        0         
 g2D)                                                            
                                                                 
 conv2d_4 (Conv2D)           (None, 90, 90, 32)        4640      
                                                                 
 max_pooling2d_4 (MaxPoolin  (None, 45, 45, 32)        0         
 g2D)                                                            
                                                                 
 conv2d_5 (Conv2D)           (None, 45, 45, 64)        18496     
                                                                 
 max_pooling2d_5 (MaxPoolin  (None, 22, 22, 64)        0         
 g2D)                                                            
                                                                 
 flatten_1 (Flatten)         (None, 30976)             0         
                                                                 
 dropout_1 (Dropout)         (None, 30976)             0         
                                                                 
 dense_2 (Dense)             (None, 128)               3965056   
                                                                 
 dense_3 (Dense)             (None, 36)                4644      
                                                                 
=================================================================
Total params: 3993284 (15.23 MB)
Trainable params: 3993284 (15.23 MB)
Non-trainable params: 0 (0.00 Byte)
_________________________________________________________________
```

# Predictiong Value from model

```
image = "C:\\Users\\bariu\\Python\\Image_Classification\\apple.jpg"
image = tf.keras.utils.load_img(image,target_size= (img_height,img_width))
img_arr = tf.keras.utils.array_to_img(image)
img_bat = tf.expand_dims(img_arr,0)
```

```
predict = model.predict(img_bat)
```

```
1/1 [==============================] - 0s 26ms/step
```

```
score = tf.nn.softmax(predict)
```

```
print('Veg/Fruit in image is {} with accuracy of {:0.2f}' .format(data_cat[np.argmax(score)],np
```

```
Veg/Fruit in image is apple with accuracy of 99.99
```

```
model.save('Image_classify.keras')
```