

In [1]:

```
ls
```

Volume in drive C is Local disk :  
Volume Serial Number is EE22-D61B

Directory of C:\Users\LonelyDinesh

```
11/03/2022  03:45 AM    <DIR>          .
07/30/2022  09:28 AM    <DIR>          ..
10/25/2022  01:24 PM                6,329 .bash_history
10/25/2022  12:29 AM                212 .gitconfig
11/03/2022  03:45 AM    <DIR>          .ipynb_checkpoints
11/03/2022  01:16 AM    <DIR>          .ipython
11/03/2022  03:35 AM    <DIR>          .jupyter
11/03/2022  01:12 AM    <DIR>          .keras
09/22/2022  11:10 PM                20 .lessht
11/03/2022  01:06 AM    <DIR>          .matplotlib
11/02/2022  09:06 PM    <DIR>          .node-red
11/03/2022  01:02 AM    <DIR>          .spyder-py3
09/30/2022  07:10 PM    <DIR>          .ssh
11/03/2022  12:57 AM    <DIR>          anaconda3
05/14/2022  09:14 PM    <DIR>          Contacts
08/14/2022  10:41 PM    <DIR>          Documents
09/21/2022  02:05 PM    <DIR>          Dropbox
09/18/2022  10:51 PM    <DIR>          Favorites
11/03/2022  01:16 AM      339,185,106 Fertilizers_Recommendation_ System_For_Disease_ Pr
ediction (2).zip
11/03/2022  03:11 AM      9,184,528 fruit.h5
11/03/2022  01:29 AM      2,951 ImagePreProcessing for Fruit and veg dataset.ipynb
09/18/2022  10:51 PM    <DIR>          Links
11/03/2022  03:44 AM      112,467 Model Building For Fruit Disease Prediction.ipynb
08/12/2022  09:36 PM    <DIR>          Music
09/20/2022  09:20 PM    <DIR>          OneDrive
05/14/2022  09:14 PM    <DIR>          Saved Games
09/24/2022  08:15 PM    <DIR>          Searches
11/03/2022  01:28 AM      2,951 Untitled.ipynb
11/03/2022  03:45 AM        72 Untitled1.ipynb
08/12/2022  09:37 PM    <DIR>          Videos
          9 File(s)      348,494,636 bytes
          21 Dir(s)   206,472,675,328 bytes free
```

In [2]:

```
pwd
```

Out[2]:

```
'C:\\Users\\LonelyDinesh'
```

## Image Augmentation

In [3]:

```
from tensorflow.keras.preprocessing.image import ImageDataGenerator
```

In [4]:

```
train_datagen=ImageDataGenerator(rescale=1./255,zoom_range=0.2,horizontal_flip=True,verti
cal_flip=False)
```

In [5]:

```
test_datagen=ImageDataGenerator(rescale=1./255)
```

Tn [7]:

```
x_train=train_datagen.flow_from_directory(r"E:\IBM\Fertilizers_Recommendation_System_For_Disease_Prediction\Dataset Plant Disease\Veg-dataset\Veg-dataset\train_set",target_size=(128,128),
                                         class_mode='categorical',batch_size=24)
x_test=test_datagen.flow_from_directory(r'E:\IBM\Fertilizers_Recommendation_System_For_Disease_Prediction\Dataset Plant Disease\Veg-dataset\Veg-dataset\test_set',target_size=(128,128),
                                         class_mode='categorical',batch_size=24)
```

Found 11385 images belonging to 9 classes.  
Found 3416 images belonging to 9 classes.

In [8]:

```
x_train.class_indices
```

Out[8]:

```
{'Pepper_bell__Bacterial_spot': 0,
 'Pepper_bell__healthy': 1,
 'Potato_Early_blight': 2,
 'Potato_Late_blight': 3,
 'Potato_healthy': 4,
 'Tomato_Bacterial_spot': 5,
 'Tomato_Late_blight': 6,
 'Tomato_Leaf_Mold': 7,
 'Tomato_Septoria_leaf_spot': 8}
```

# CNN

In [9]:

```
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense,Convolution2D,MaxPooling2D,Flatten
```

In [10]:

```
model=Sequential()
```

In [11]:

```
model.add(Convolution2D(32,(3,3),input_shape=(128,128,3),activation='relu'))
```

In [12]:

```
model.add(MaxPooling2D(pool_size=(2,2)))
```

In [13]:

```
model.add(Flatten())
```

In [14]:

```
model.summary()
```

Model: "sequential"

Layer (type)	Output Shape	Param #
=====		
conv2d (Conv2D)	(None, 126, 126, 32)	896
max_pooling2d (MaxPooling2D)	(None, 63, 63, 32)	0
flatten (Flatten)	(None, 127008)	0
=====		
Total params: 896		
Trainable params: 896		

Non-trainable params: 0

## Hidden Layers

In [15]:

```
model.add(Dense(300,activation='relu'))
model.add(Dense(150,activation='relu'))
```

## Output Layer

In [16]:

```
model.add(Dense(6,activation='softmax'))
```

In [17]:

```
model.compile(loss='categorical_crossentropy',optimizer='adam',metrics=['accuracy'])
```

In [18]:

```
len(x_train)
```

Out[18]:

475

In [19]:

```
1238/24
```

Out[19]:

51.583333333333336

## Saving Model

In [21]:

```
ls
```

Volume in drive C is Local disk :  
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Directory of C:\Users\LonelyDinesh

11/03/2022	03:56 AM	<DIR>	.
07/30/2022	09:28 AM	<DIR>	..
10/25/2022	01:24 PM		6,329 .bash_history
10/25/2022	12:29 AM		212 .gitconfig
11/03/2022	03:49 AM	<DIR>	.ipynb_checkpoints
11/03/2022	01:16 AM	<DIR>	.ipython
11/03/2022	03:35 AM	<DIR>	.jupyter
11/03/2022	01:12 AM	<DIR>	.keras
09/22/2022	11:10 PM		20 .lessht
11/03/2022	01:06 AM	<DIR>	.matplotlib
11/02/2022	09:06 PM	<DIR>	.node-red
11/03/2022	01:02 AM	<DIR>	.spyder-py3
09/30/2022	07:10 PM	<DIR>	.ssh
11/03/2022	12:57 AM	<DIR>	anaconda3
05/14/2022	09:14 PM	<DIR>	Contacts
08/14/2022	10:41 PM	<DIR>	Documents
09/21/2022	02:05 PM	<DIR>	Dropbox
09/18/2022	10:51 PM	<DIR>	Favorites
11/03/2022	01:16 AM		339,185,106 Fertilizers_Recommendation_System_For_Disease_Pr

```

ediction (2).zip
11/03/2022 03:11 AM          9,184,528 fruit.h5
11/03/2022 01:29 AM          2,951 ImagePreProcessing for Fruit and veg dataset.ipynb
09/18/2022 10:51 PM      <DIR>          Links
11/03/2022 03:44 AM        112,467 Model Building For Fruit Disease Prediction.ipynb
11/03/2022 03:49 AM        112,467 Model Building For Fruit Disease Prediction-Copy1.
ipynb
11/03/2022 03:55 AM          9,061 Model Building For Vegetable Disease Prediction.ip
ynb
08/12/2022 09:36 PM      <DIR>          Music
09/20/2022 09:20 PM      <DIR>          OneDrive
05/14/2022 09:14 PM      <DIR>          Saved Games
09/24/2022 08:15 PM      <DIR>          Searches
11/03/2022 01:28 AM          2,951 Untitled.ipynb
11/03/2022 03:56 AM        152,619,128 vegetable.h5
08/12/2022 09:37 PM      <DIR>          Videos
      11 File(s)          501,235,220 bytes
      21 Dir(s)    206,326,890,496 bytes free

```

In [20]:

```
model.save('vegetable.h5')
```

In [22]:

```
ls
```

Volume in drive C is Local disk :  
Volume Serial Number is EE22-D61B

Directory of C:\Users\LonelyDinesh

```

11/03/2022 03:56 AM      <DIR>          .
07/30/2022 09:28 AM      <DIR>          ..
10/25/2022 01:24 PM          6,329 .bash_history
10/25/2022 12:29 AM          212 .gitconfig
11/03/2022 03:49 AM      <DIR>          .ipynb_checkpoints
11/03/2022 01:16 AM      <DIR>          .ipython
11/03/2022 03:35 AM      <DIR>          .jupyter
11/03/2022 01:12 AM      <DIR>          .keras
09/22/2022 11:10 PM          20 .lessht
11/03/2022 01:06 AM      <DIR>          .matplotlib
11/02/2022 09:06 PM      <DIR>          .node-red
11/03/2022 01:02 AM      <DIR>          .spyder-py3
09/30/2022 07:10 PM      <DIR>          .ssh
11/03/2022 12:57 AM      <DIR>          anaconda3
05/14/2022 09:14 PM      <DIR>          Contacts
08/14/2022 10:41 PM      <DIR>          Documents
09/21/2022 02:05 PM      <DIR>          Dropbox
09/18/2022 10:51 PM      <DIR>          Favorites
11/03/2022 01:16 AM        339,185,106 Fertilizers_Recommendation_System_For_Disease_Pr
ediction (2).zip
11/03/2022 03:11 AM          9,184,528 fruit.h5
11/03/2022 01:29 AM          2,951 ImagePreProcessing for Fruit and veg dataset.ipynb
09/18/2022 10:51 PM      <DIR>          Links
11/03/2022 03:44 AM        112,467 Model Building For Fruit Disease Prediction.ipynb
11/03/2022 03:49 AM        112,467 Model Building For Fruit Disease Prediction-Copy1.
ipynb
11/03/2022 03:55 AM          9,061 Model Building For Vegetable Disease Prediction.ip
ynb
08/12/2022 09:36 PM      <DIR>          Music
09/20/2022 09:20 PM      <DIR>          OneDrive
05/14/2022 09:14 PM      <DIR>          Saved Games
09/24/2022 08:15 PM      <DIR>          Searches
11/03/2022 01:28 AM          2,951 Untitled.ipynb
11/03/2022 03:56 AM        152,619,128 vegetable.h5
08/12/2022 09:37 PM      <DIR>          Videos
      11 File(s)          501,235,220 bytes
      21 Dir(s)    206,326,886,400 bytes free

```

**Test The Model**

# Test the Model

In [23]:

```
import numpy as np
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
```

In [24]:

```
model=load_model('vegetable.h5')
```

In [28]:

```
img=image.load_img(r"E:\IBM\Fertilizers_Recommendation_System_For_Disease_Prediction\Dataset Plant Disease\Veg-dataset\Veg-dataset\test_set\Pepper,_bell___Bacterial_spot\bcf56f7d-d584-4fed-b42e-5cbf3b8707b7___JR_B.Spot_3197.JPG")
```

In [29]:

```
img
```

Out[29]:



In [30]:

```
img=image.load_img(r"E:\IBM\Fertilizers_Recommendation_System_For_Disease_Prediction\Dataset Plant Disease\Veg-dataset\Veg-dataset\test_set\Pepper,_bell___Bacterial_spot\c27c09cc-acf8-4e46-a828-a48a96249642___JR_B.Spot_3232.JPG")
```

In [31]:

```
img
```

Out[31]:



In [32]:

```
x=image.img_to_array(img)
```

In [33]:

```
x
```

Out[33]:

```
array([[120., 115., 145.],
       [116., 111., 141.],
       [130., 125., 155.],
       ...,
       [102.,  94., 118.],
       [ 42.,  34.,  58.],
       [ 69.,  61.,  85.]],

      [[121., 116., 146.],
       [124., 119., 149.],
       [125., 120., 150.],
       ...,
       [ 52.,  44.,  68.],
       [ 76.,  68.,  92.],
       [ 75.,  67.,  91.]],

      [[131., 126., 156.],
       [135., 130., 160.],
       [126., 121., 151.],
       ...,
       [ 84.,  76., 100.],
       [ 80.,  72.,  96.],
       [ 84.,  76., 100.]],

      ...,

      [[ 65.,  56.,  75.],
       [ 62.,  53.,  72.],
       [115., 106., 125.],
       ...,
       [ 52.,  37.,  56.],
       [ 96.,  81., 100.],
       [ 80.,  65.,  84.]],

      [[ 87.,  78.,  97.],
       [ 72.,  63.,  82.],
       [ 53.,  44.,  63.],
       ...,
       [ 43.,  28.,  47.],
       [ 99.,  84., 103.],
       [ 89.,  74.,  93.]],

      [[ 81.,  72.,  91.],
       [ 66.,  57.,  76.],
       [ 64.,  55.,  74.],
       ...,
       [100.,  85., 104.],
       [ 81.,  66.,  85.],
       [117., 102., 121.] ]], dtype=float32)
```

In [ ]:

```
x=np.expand_dims(x,axis=0)
```

In [35]:

```
x
```

Out[35]:

```
array([[[[120., 115., 145.],
         [116., 111., 141.],
         [130., 125., 155.],
         ...,
         [102.,  94., 118.],
         [ 42.,  34.,  58.]
```

```

[ 69.,  61.,  85.]],

[[121., 116., 146.],
 [124., 119., 149.],
 [125., 120., 150.],
 ...,
 [ 52.,  44.,  68.],
 [ 76.,  68.,  92.],
 [ 75.,  67.,  91.]],

[[131., 126., 156.],
 [135., 130., 160.],
 [126., 121., 151.],
 ...,
 [ 84.,  76., 100.],
 [ 80.,  72.,  96.],
 [ 84.,  76., 100.]],

...,

[[ 65.,  56.,  75.],
 [ 62.,  53.,  72.],
 [115., 106., 125.],
 ...,
 [ 52.,  37.,  56.],
 [ 96.,  81., 100.],
 [ 80.,  65.,  84.]],

[[ 87.,  78.,  97.],
 [ 72.,  63.,  82.],
 [ 53.,  44.,  63.],
 ...,
 [ 43.,  28.,  47.],
 [ 99.,  84., 103.],
 [ 89.,  74.,  93.]],

[[ 81.,  72.,  91.],
 [ 66.,  57.,  76.],
 [ 64.,  55.,  74.],
 ...,
 [100.,  85., 104.],
 [ 81.,  66.,  85.],
 [117., 102., 121.]]]], dtype=float32)

```

In [ ]:

```
y=np.argmax(model.predict(x),axis=1)
```

In [ ]:

```
1/1 [=====] - 0s 92ms/step
```

In [47]:

```
x_train.class_indices
```

Out[47]:

```

{'Pepper__bell__Bacterial_spot': 0,
 'Pepper__bell__healthy': 1,
 'Potato__Early_blight': 2,
 'Potato__Late_blight': 3,
 'Potato__healthy': 4,
 'Tomato__Bacterial_spot': 5,
 'Tomato__Late_blight': 6,
 'Tomato__Leaf_Mold': 7,
 'Tomato__Septoria_leaf_spot': 8}

```

In [48]:

```
index=['Pepper__bell__Bacterial_spot','Pepper__bell__healthy','Potato__Early_blight','
```

```
Potato__Late_blight','Potato__healthy','Tomato__Bacterial_spot','Tomato__Late_blight',  
, 'Tomato__Leaf_Mold', 'Tomato__Septoria_leaf_spot']
```

```
In [ ]:
```

```
index[y[0]]
```

```
In [ ]:
```

```
'Potato__Late_blight'
```

```
In [ ]:
```

```
img=image.load_img(r"E:\IBM\Fertilizers_Recommendation_System_For_Disease_Prediction\Da  
taset Plant Disease\Veg-dataset\Veg-dataset\test_set\Potato__healthy\f4b5ec24-d318-4309-  
8294-9126450d5d7f__RS_HL_1824".JPG",target_size=(128,128))  
x=image.img_to_array(img)  
x=np.expand_dims(x,axis=0)  
y=np.argmax(model.predict(x),axis=1)  
index=['Pepper_bell__Bacterial_spot','Pepper_bell__healthy','Potato__Early_blight','  
Potato__Late_blight','Potato__healthy','Tomato__Bacterial_spot','Tomato__Leaf_Mold','  
Tomato__Septoria_leaf_spot']  
index[y[0]]
```

```
In [ ]:
```

```
1/1 [=====] - 0s 25ms/step  
'Potato__Late_blight'
```