

The Jupyter Notebook interface shows a file explorer at the top with the following contents:

File Name	Size	Type
01-08-2022 18:05	<DIR>	Fruit-dataset
03-08-2022 19:48	111,319,456	Fruits.H5
01-08-2022 18:06	<DIR>	Veg-dataset
03-08-2022 13:39	111,324,768	Vegetables.H5
2 File(s)		222,644,216 Bytes
4 Dir(s)		61,699,586,176 Bytes free

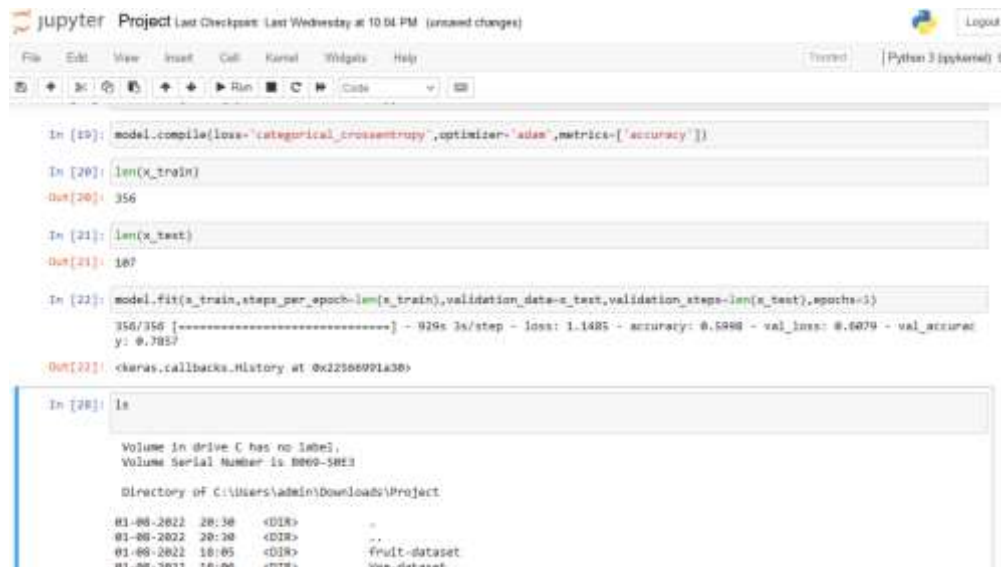
The code execution area shows the following commands and outputs:

```
In [13]: x_train=train_datagen.flow_from_directory('C:\\Users\\admin\\Downloads\\Project\\Veg-dataset\\train_set',target_size=(64,64),
<
Found 11300 images belonging to 9 classes.

In [14]: x_test=test_datagen.Flow_from_directory('C:\\Users\\admin\\Downloads\\Project\\Veg-dataset\\test_set',target_size=(64,64),cl
<
Found 3416 images belonging to 9 classes.

In [15]: x_train.class_indices
Out[15]: {'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_Rolt': 7,
'Tomato_Septoria_leaf_spot': 8}
```

Figure 1 Python coding for plant disease detection in jupyter notebook



The Jupyter Notebook interface shows the following code execution:

```
In [19]: model.compile(loss='categorical_crossentropy',optimizer='adam',metrics=['accuracy'])

In [20]: len(x_train)
Out[20]: 356

In [21]: len(x_test)
Out[21]: 167

In [22]: model.fit(x_train,steps_per_epoch=len(x_train),validation_data=x_test,validation_steps=len(x_test),epochs=5)
356/356 [=====] - 929s 2s/step - loss: 1.1485 - accuracy: 0.5988 - val_loss: 0.6079 - val_accuac
y: 0.7857

Out[22]: <keras.callbacks.History at 0x22588991a38>

In [28]: ls
Volume in Drive C has no label.
Volume Serial Number is 8069-58E3

Directory of C:\\Users\\admin\\Downloads\\Project

01-08-2022 28:38 <DIR> .
01-08-2022 20:30 <DIR> ..
01-08-2022 18:05 <DIR> Fruit-dataset
01-08-2022 18:06 <DIR> Veg-dataset
```

Figure 2 Accuracy of tested dataset by CNN


```

jupyter Project Last Checkpoint: Last Wednesday at 10:04 PM (unsaved changes)
File Edit View Insert Cell Format Widgets Help
In [48]: index=[ 'Pepper_bell_Bacterial_spot', 'Pepper_bell_healthy', 'Potato_Early_blight', 'Potato_Late_blight', 'Potato_healthy', 'Tomato_healthy', 'Tomato_Leaf_Spot' ]
index[y[0]]
1/1 [-----] = 8s 31ms/step
Out[48]: 'Potato_Early_blight'

In [49]: img=image.load_img('C:\\Users\\admin\\Downloads\\Project\\Veg-dataset\\test_set\\tomato_Late_blight\\HS_Late_6-6424.jpg'), target_size=(64,64)
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_healthy', 'Tomato_Leaf_Spot' ]
index[y[0]]
1/1 [-----] = 8s 31ms/step
Out[49]: 'Potato_Early_blight'

In [50]: img=image.load_img('C:\\Users\\admin\\Downloads\\Project\\Veg-dataset\\test_set\\Tomato_Sepioria_leaf_spot\\Keller-St_CG_189.jpg'), target_size=(64,64)
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_healthy', 'Tomato_Leaf_Spot' ]
index[y[0]]
1/1 [-----] = 8s 31ms/step
Out[50]: 'Tomato_Sepioria_leaf_spot'

```

Figure 5 Test results for plant disease detection using CNN

```

jupyter Project-Fruit disease detection Last Checkpoint: Last Wednesday at 10:04 PM (autosaved)
File Edit View Insert Cell Format Widgets Help
In [10]: cry('C:\\Users\\admin\\Downloads\\Project\\fruit-dataset\\train',target_size=(64,64),class_mode='categorical',batch_size=32)
Found 5304 images belonging to 6 classes.

In [11]: tury('C:\\Users\\admin\\Downloads\\Project\\fruit-dataset\\test',target_size=(64,64),class_mode='categorical',batch_size=32)
Found 1688 images belonging to 6 classes.

In [11]: x_train,class_indices
Out[11]: ['Apple_Black_rot': 0,
'Apple_healthy': 1,
'Corn_(maize)_Northern_Leaf_Blight': 2,
'Corn_(maize)_healthy': 3,
'Peach_Bacterial_spot': 4,
'Peach_healthy': 5]

CNN

```

Figure 6 Coding for fruit disease detection using CNN



```
jupyter Project-Fruit disease detection Last Checkpoint: Last Wednesday at 10:04 PM (unsaved changes) Logout

File Edit View Insert Cell Format Widgets Help Theme Python 3 (pykernel) C

In [47]: index=[ 'Apple_black_rot', 'Apple_healthy', 'Corn_(maize)_Northern_Leaf_Blight', 'Corn_(maize)_healthy', 'Peach_Bacterial_spot',
index[y[0]]
1/1 [-----] - 0s 48ms/step

Out[48]: 'Corn_(maize)_healthy'

In [49]: img=image.load_img('C:\\Users\\admin\\Downloads\\Project\\fruit-dataset\\test\\Peach_Bacterial_spot\\8C07F254-8215-4066-954C-
x=image.img_to_array(img)
x=np.expand_dims(x,axis=0)
y=np.argmax(model.predict(x),axis=1)
index=[ 'Apple_black_rot', 'Apple_healthy', 'Corn_(maize)_Northern_Leaf_Blight', 'Corn_(maize)_healthy', 'Peach_Bacterial_spot',
index[y[0]]
1/1 [-----] - 0s 31ms/step

Out[49]: 'Peach_Bacterial_spot'

In [50]: img=image.load_img('C:\\Users\\admin\\Downloads\\Project\\fruit-dataset\\test\\Corn_(maize)_healthy\\2a88f1c9-5c54-481c-a81f-
x=image.img_to_array(img)
x=np.expand_dims(x,axis=0)
y=np.argmax(model.predict(x),axis=1)
index=[ 'Apple_black_rot', 'Apple_healthy', 'Corn_(maize)_Northern_Leaf_Blight', 'Corn_(maize)_healthy', 'Peach_Bacterial_spot',
index[y[0]]
1/1 [-----] - 0s 115ms/step

Out[50]: 'Corn_(maize)_healthy'
```

Figure 9 Test results 2 for fruit disease detection using CNN