diseasesInLeaves

April 19, 2024

DATASET: https://data.mendeley.com/datasets/3f83gxmv57/2

0.1 IMPORTING LIBRARIES

[8]:
```
!pip install scikit-image
```

```
Collecting scikit-image
  Downloading scikit_image-0.23.1-cp311-cp311-win_amd64.whl.metadata (14 kB)
Requirement already satisfied: numpy>=1.23 in
c:\users\joshi\appdata\local\programs\python\python311\lib\site-packages (from
scikit-image) (1.26.0)
Requirement already satisfied: scipy>=1.9 in
c:\users\joshi\appdata\local\programs\python\python311\lib\site-packages (from
scikit-image) (1.11.3)
Requirement already satisfied: networkx>=2.8 in
c:\users\joshi\appdata\local\programs\python\python311\lib\site-packages (from
scikit-image) (3.1)
Requirement already satisfied: pillow>=9.1 in
c:\users\joshi\appdata\local\programs\python\python311\lib\site-packages (from
scikit-image) (10.0.1)
Requirement already satisfied: imageio>=2.33 in
c:\users\joshi\appdata\local\programs\python\python311\lib\site-packages (from
scikit-image) (2.33.0)
Collecting tifffile>=2022.8.12 (from scikit-image)
  Downloading tifffile-2024.2.12-py3-none-any.whl.metadata (31 kB)
Requirement already satisfied: packaging>=21 in
c:\users\joshi\appdata\local\programs\python\python311\lib\site-packages (from
scikit-image) (23.2)
Collecting lazy-loader>=0.4 (from scikit-image)
  Downloading lazy_loader-0.4-py3-none-any.whl.metadata (7.6 kB)
Downloading scikit_image-0.23.1-cp311-cp311-win_amd64.whl (12.7 MB)
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```

```
Downloading lazy_loader-0.4-py3-none-any.whl (12 kB)
Downloading tifffile-2024.2.12-py3-none-any.whl (224 kB)
   ---------------------------------------- 0.0/224.5 kB ? eta -:--:--
   ---------------------------------------- 224.5/224.5 kB 4.6 MB/s eta 0:00:00
Installing collected packages: tifffile, lazy-loader, scikit-image
Successfully installed lazy-loader-0.4 scikit-image-0.23.1 tifffile-2024.2.12
```

[1]:
```
import pandas as pd
from sklearn import svm
from sklearn.model_selection import GridSearchCV
import os
import matplotlib.pyplot as plt
from skimage.transform import resize
from skimage.io import imread
import numpy as np
from sklearn.model_selection import train_test_split
from sklearn.metrics import␣
 ↪classification_report,accuracy_score,confusion_matrix
import pickle
```

0.2 LOADING AND SPLITTING THE DATA

[2]:
```
Categories=['Black spot','canker','greening','healthy','Melanose']
```

[7]:
```
flat_data_arr=[]
target_arr=[]
#please use datadir='/content' if the files are upload on to google collab
#else mount the drive and give path of the parent-folder containing all␣
 ↪category images folders.
datadir='Leaves'
for i in Categories:
  print(f'loading... category : {i}')
  path=os.path.join(datadir,i)
  for img in os.listdir(path):
    img_array=imread(os.path.join(path,img))
    img_resized=resize(img_array,(150,150,3))
    flat_data_arr.append(img_resized.flatten())
    target_arr.append(Categories.index(i))
  print(f'loaded category:{i} successfully')
flat_data=np.array(flat_data_arr)
target=np.array(target_arr)
df=pd.DataFrame(flat_data)
df['Target']=target
df
```

```
loading… category : Black spot
loaded category:Black spot successfully
loading… category : canker
```

```
loaded category:canker successfully
loading… category : greening
loaded category:greening successfully
loading… category : healthy
loaded category:healthy successfully
loading… category : Melanose
loaded category:Melanose successfully
```

[7]:

	0	1	2	3	4	5	6	\
0	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	
1	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	
2	0.615686	0.603922	0.686275	0.615425	0.603660	0.686010	0.610159	
3	0.747545	0.735780	0.818133	0.744913	0.733148	0.815501	0.742675	
4	0.755388	0.735804	0.821387	0.752934	0.735798	0.818213	0.751800	
..	…	…	…	…	…	…	…	
604	0.240105	0.200938	0.063634	0.241783	0.210276	0.069158	0.227363	
605	0.165602	0.157807	0.166616	0.166986	0.159490	0.162513	0.156764	
606	0.195346	0.204692	0.128061	0.255137	0.270699	0.169157	0.231961	
607	0.327335	0.339926	0.248191	0.448439	0.432805	0.326547	0.459534	
608	0.111572	0.062371	0.029217	0.089398	0.051604	0.030011	0.154035	

	7	8	9	…	67491	67492	67493	\
0	1.000000	1.000000	1.000000	…	1.000000	1.000000	1.000000	
1	1.000000	1.000000	1.000000	…	1.000000	1.000000	1.000000	
2	0.598375	0.678909	0.611658	…	0.602998	0.591233	0.665656	
3	0.730929	0.813230	0.744315	…	0.746951	0.735186	0.817539	
4	0.732811	0.816991	0.749553	…	0.731324	0.719559	0.801884	
..	…	…	…	…	…	…	…	
604	0.192984	0.064577	0.207284	…	0.279953	0.319200	0.325634	
605	0.155802	0.153959	0.150853	…	0.394296	0.360037	0.286490	
606	0.238008	0.178372	0.253710	…	0.629652	0.563044	0.445590	
607	0.442984	0.329148	0.449932	…	0.570059	0.510257	0.381067	
608	0.119867	0.092989	0.166932	…	0.405933	0.486636	0.212540	

	67494	67495	67496	67497	67498	67499	Target
0	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	0
1	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	0
2	0.604990	0.593226	0.670268	0.605323	0.593559	0.668084	0
3	0.745078	0.733314	0.815667	0.745098	0.733333	0.815686	0
4	0.732978	0.721214	0.798686	0.732410	0.720646	0.802447	0
..	…	…	…	…	…	…	…
604	0.243386	0.281963	0.234130	0.246004	0.285418	0.187263	4
605	0.492223	0.446277	0.369662	0.600845	0.546456	0.457737	4
606	0.627494	0.561003	0.443394	0.580093	0.521206	0.407502	4
607	0.497348	0.438166	0.319033	0.376081	0.315847	0.222576	4
608	0.487367	0.526793	0.166651	0.345282	0.388067	0.077154	4

```
[609 rows x 67501 columns]
```

[8]:
```
x=df.iloc[:,:-1]
y=df.iloc[:,-1]
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.
  ↪20,random_state=77,stratify=y)
print('Splitted Successfully')
```

```
Splitted Successfully
```

0.3 TRAINING THE MODEL AND USING GRIDSEARCH FOR PARAMETER TUNING

[9]:
```
param_grid={'C':[0.1,1,10,100],'gamma':[0.0001,0.001,0.1,1],'kernel':
  ↪['rbf','poly']}
svc=svm.SVC(probability=True)
print("The training of the model is started, please wait for while as it may␣
  ↪take few minutes to complete")
model=GridSearchCV(svc,param_grid)
print("Parameters are done.")
model.fit(x_train,y_train)
print('The Model is trained well with the given images')
model.best_params_
```

```
The training of the model is started, please wait for while as it may take few
minutes to complete
Parameters are done.
The Model is trained well with the given images
```

[9]:
```
{'C': 10, 'gamma': 0.0001, 'kernel': 'rbf'}
```

0.4 EVALUATING THE MODEL

[10]:
```
y_pred=model.predict(x_test)
print("The predicted Data is :")
y_pred
```

```
The predicted Data is :
```

[10]:
```
array([1, 0, 0, 2, 2, 1, 0, 2, 0, 2, 3, 0, 3, 2, 2, 1, 2, 2, 3, 2, 1, 1,
       1, 0, 2, 1, 2, 2, 1, 2, 0, 0, 0, 1, 1, 1, 0, 1, 1, 2, 4, 0, 0, 2,
       3, 0, 0, 1, 2, 2, 1, 1, 0, 0, 1, 2, 0, 0, 3, 2, 0, 1, 2, 0, 0, 0,
       2, 0, 2, 2, 0, 2, 1, 0, 2, 1, 0, 0, 2, 3, 1, 0, 0, 2, 0, 1, 1, 3,
       1, 0, 1, 0, 1, 2, 0, 3, 2, 2, 1, 0, 2, 1, 2, 2, 2, 1, 1, 2, 0, 1,
       3, 0, 2, 2, 0, 1, 3, 2, 2, 0, 1, 2])
```

[11]:
```
print("The actual data is:")
np.array(y_test)
```

The actual data is:

[11]:
```
array([1, 2, 0, 2, 2, 1, 0, 2, 3, 2, 3, 2, 3, 0, 2, 1, 2, 2, 3, 0, 1, 1,
       1, 0, 2, 1, 2, 0, 2, 2, 0, 0, 0, 1, 1, 1, 0, 1, 1, 0, 4, 4, 0, 2,
       3, 0, 3, 1, 2, 0, 1, 1, 2, 0, 1, 2, 0, 0, 3, 2, 0, 1, 2, 0, 1, 0,
       2, 2, 2, 2, 0, 2, 1, 0, 2, 1, 2, 0, 2, 3, 1, 2, 0, 2, 0, 1, 1, 3,
       1, 0, 1, 0, 1, 2, 0, 3, 2, 0, 1, 0, 2, 1, 0, 2, 2, 1, 1, 2, 0, 1,
       3, 0, 2, 2, 2, 1, 3, 2, 2, 0, 1, 2])
```

[13]:
```
print(f"The model is {accuracy_score(y_test, y_pred) * 100:.2f}% accurate")

# Print the confusion matrix
print("Confusion Matrix:")
print(confusion_matrix(y_test, y_pred))

# Print the classification report
print("Classification Report:")
print(classification_report(y_test, y_pred))
```

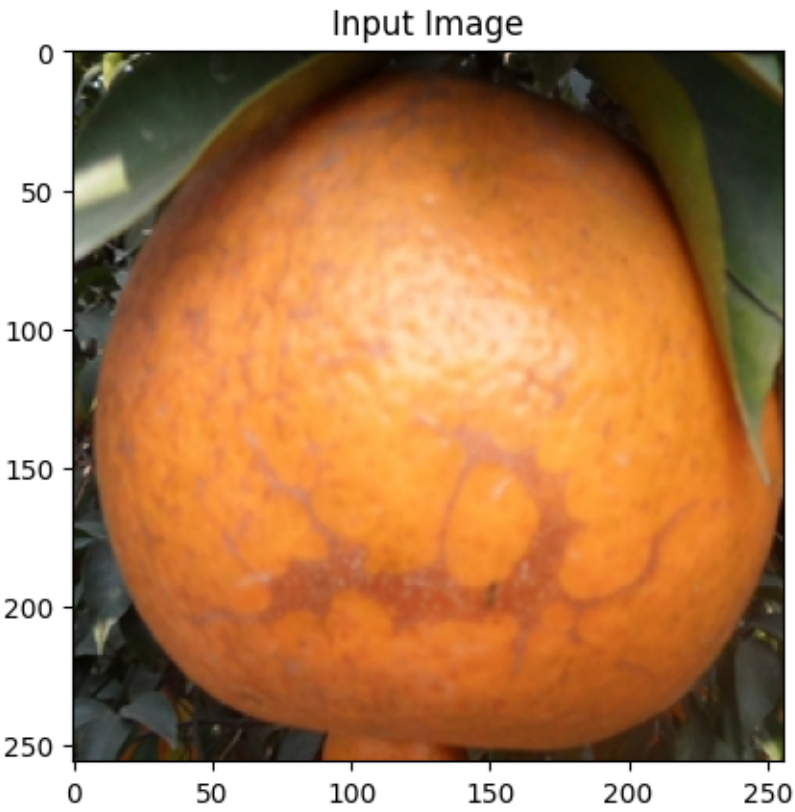
```
The model is 84.43% accurate
Confusion Matrix:
[[27  0  7  0  0]
 [ 1 32  0  0  0]
 [ 7  1 33  0  0]
 [ 2  0  0 10  0]
 [ 1  0  0  0  1]]
Classification Report:
              precision    recall  f1-score   support

           0       0.71      0.79      0.75        34
           1       0.97      0.97      0.97        33
           2       0.82      0.80      0.81        41
           3       1.00      0.83      0.91        12
           4       1.00      0.50      0.67         2

    accuracy                           0.84       122
   macro avg       0.90      0.78      0.82       122
weighted avg       0.85      0.84      0.85       122
```

[14]:
```
pickle.dump(model,open('img_model.p','wb'))
print("Pickle is dumped successfully")
```

```
Pickle is dumped successfully
```

[15]:
```
import os
import pickle
from skimage.io import imread
from skimage.transform import resize
import matplotlib.pyplot as plt
```

[17]:
```
# Load the pre-trained model from the file
model = pickle.load(open('img_model.p', 'rb'))

# Categories corresponding to the model's classes
Categories=['Black spot','canker','greening','healthy','Melanose']  # Update␣
 ↪with your actual categories

# Function to predict and display results
def predict_image(image_path):
    img = imread(image_path)
    plt.imshow(img)
    plt.title("Input Image")
    plt.show()

    # Resize image to match the input size the model was trained with
    img_resized = resize(img, (150, 150, 3))  # Adjust the size as per your␣
 ↪model training
    img_flattened = img_resized.flatten()[np.newaxis, :]

    # Predict the probabilities and class
    probabilities = model.predict_proba(img_flattened)[0]
    predicted_class = Categories[np.argmax(probabilities)]

    # Display predictions and probabilities
    print(f"The predicted image is: {predicted_class}")
    for category, probability in zip(Categories, probabilities):
        print(f'{category} = {probability*100:.2f}%')

# Get image path from user
image_path = 'Canker (96).jpg'
predict_image(image_path)
```




```
The predicted image is: Melanose
Black spot = 0.50%
canker = 2.93%
greening = 0.33%
healthy = 0.35%
Melanose = 95.89%
```