```
import os
import numpy as np
import cv2
import matplotlib.pyplot as plt
labels = ['grass','soybean']
img_size = 200
data = []
def get_training_data(data_dir):
  for label in labels:
    path=os.path.join (data_dir, label)
    class_num = labels.index(label)
    print(class_num)
    for img in os.listdir (path):
      try:
        img_arr = cv2.imread(os.path. join (path, img), cv2.COLOR_BAYER_GB2RGB)
        # print(img_arr.shape)
        resized_arr = cv2.resize(img_arr, (img_size, img_size))
        data.append ([resized_arr, class_num])
      except Exception as e:
        print(e)
  return np.array(data)
train = get_training_data('/content/drive/MyDrive/Weed detection/dataset')
print(data)
```

```
        [0, 0, 0],
        [0, 0, 0],
        [0, 0, 0]],

       ...,

       [[0, 0, 0],
        [0, 0, 0],
        [0, 0, 0],
        ...,
        [0, 0, 0],
        [0, 0, 0],
        [0, 0, 0]],

       [[0, 0, 0],
        [0, 0, 0],
        [0, 0, 0],
        ...,
        [0, 0, 0],
        [0, 0, 0],
        [0, 0, 0]],

       [[0, 0, 0],
        [0, 0, 0],
        [0, 0, 0],
        ...,
        [0, 0, 0],
        [0, 0, 0],
        [0, 0, 0]]], dtype=uint8), 1]]
```

```
from google.colab import drive
drive.mount('/content/drive')
```

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.mount("/content/drive", force_remount=True).
```

```
for label in labels:
```

Automatic saving failed. This file was updated remotely or in another tab. Show diff

```
1
```

```
x=[]
y=[]
for i,j in data:
  x.append(i)
  y.append(j)
print(y)
```

```
[0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
```

```
y
```

```
0,
0,
0,
0,
0,
0,
0,
0,
0,
0,
...]
```

x

```
            [0, 0, 0],
            [0, 0, 0]],

           [[0, 0, 0],
            [0, 0, 0],
            [0, 0, 0],
            ...,
            [0, 0, 0],
            [0, 0, 0],
            [0, 0, 0]],

           [[0, 0, 0],
            [0, 0, 0],
            [0, 0, 0],
            ...,
            [0, 0, 0],
            [0, 0, 0],
            [0, 0, 0]]], dtype=uint8),
     ...]
```

```
from sklearn.model_selection import train_test_split
import numpy as np
import matplotlib.pyplot as plt
```

```
xtrain, xtest, ytrain, ytest = train_test_split(x, y, test_size = 0.25, random_state = 47)
```

```
xtrain
```

```
            [[0, 0, 0],
             [0, 0, 0],
             [0, 0, 0],
             ...,
             [0, 0, 0],
             [0, 0, 0],
             [0, 0, 0]],

            ...,

            [[0, 0, 0],
             [0, 0, 0],
             [0, 0, 0],
             ...,
             [0, 0, 0],
             [0, 0, 0],
             [0, 0, 0]],

            [[0, 0, 0],
             [0, 0, 0],
             [0, 0, 0],
             ...,
             [0, 0, 0],
             [0, 0, 0],
             [0, 0, 0]],

            [[0, 0, 0],
             [0, 0, 0],
             [0, 0, 0],
             ...,
             [0, 0, 0],
             [0, 0, 0],
             [0, 0, 0]]], dtype=uint8),
      ...]
```

```
import numpy as np
```



```
     array([[[0, 0, 0, ..., 0, 0, 0],
             [0, 0, 0, ..., 0, 0, 0],
             [0, 0, 0, ..., 0, 0, 0],
             ...,
             [0, 0, 0, ..., 0, 0, 0],
             [0, 0, 0, ..., 0, 0, 0],
             [0, 0, 0, ..., 0, 0, 0]], dtype=uint8)
```

```
print(np.array(xtrain).shape)
```

```
(1883, 200, 200, 3)
```

```
print(np.array(ytest).shape)
```

```
(628,)
```

```
x1=np.array(x).shape
```

```
x1
```

```
(2511, 120000)
```

```
x
```

```
array([[0, 0, 0, ..., 0, 0, 0],
       [0, 0, 0, ..., 0, 0, 0],
       [0, 0, 0, ..., 0, 0, 0],
       ...,
       [0, 0, 0, ..., 0, 0, 0],
       [0, 0, 0, ..., 0, 0, 0],
       [0, 0, 0, ..., 0, 0, 0]], dtype=uint8)
```

```
y1=np.array(y).shape
y1
```

```
(2511,)
```

```
d=np.array(xtrain).reshape(1883,120000)
d
```

```
array([[0, 0, 0, ..., 0, 0, 0],
       [0, 0, 0, ..., 0, 0, 0],
       [0, 0, 0, ..., 0, 0, 0],
```



```
       [0, 0, 0, ..., 0, 0, 0]], dtype=uint8)
```

```
e=np.array(xtest).reshape(628,120000)
e
```

```
array([[0, 0, 0, ..., 0, 0, 0],
       [0, 0, 0, ..., 0, 0, 0],
       [0, 0, 0, ..., 0, 0, 0],
       ...,
       [0, 0, 0, ..., 0, 0, 0],
```

```
            [0, 0, 0, ..., 0, 0, 0],
            [0, 0, 0, ..., 0, 0, 0]], dtype=uint8)
```

```
print(np.asarray(d.shape))
```

```
     [  1883 120000]
```

```
from sklearn.preprocessing import StandardScaler
sc_x = StandardScaler()
d= sc_x.fit_transform(d)#normalizing
e = sc_x.transform(e)
```

```
from sklearn.linear_model import LogisticRegression
model = LogisticRegression(random_state = 0)
```

```
model.fit(d, ytrain)
```

```
     /usr/local/lib/python3.9/dist-packages/sklearn/linear_model/_logistic.py:458: ConvergenceWarning: lbfgs failed to converge (status=1):
     STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

     Increase the number of iterations (max_iter) or scale the data as shown in:
         https://scikit-learn.org/stable/modules/preprocessing.html
     Please also refer to the documentation for alternative solver options:
         https://scikit-learn.org/stable/modules/linear_model.html#logistic-regression
       n_iter_i = _check_optimize_result(
```

```
▾        LogisticRegression
LogisticRegression(random_state=0)
```

```
y_pred=model.predict(e)
y_pred
```

```
     array([0, 1, 0, 0, 0, 0, 0, 1, 1, 1, 1, 0, 0, 0, 0, 1, 1, 1, 0, 0, 0, 1,
            1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 1, 1, 0, 0, 1, 1, 1, 1, 0, 1,
            1, 1, 1, 0, 0, 1, 1, 1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0, 1, 1,
            1, 1, 1, 0, 1, 0, 1, 1, 1, 1, 1, 0, 0, 1, 1, 0, 1, 1, 1, 1, 1, 1,
            1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 1, 0, 1, 0, 1, 1, 1, 1, 1, 1, 0,
            1, 0, 1, 0, 1, 1, 1, 1, 1, 1, 0, 0, 1, 0, 1, 1, 0, 1, 0, 1, 1, 1, 1,
            0, 0, 0, 1, 1, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 1, 0, 0, 0, 1, 1,
            1, 1, 0, 0, 0, 0, 1, 0, 0, 0, 1, 0, 0, 0, 0, 1, 0, 0, 1, 1, 1, 1,
            1, 0, 0, 0, 1, 1, 0, 1, 1, 1, 1, 1, 0, 0, 1, 1, 0, 1, 1, 1, 0, 1,
            0, 0, 0, 1, 1, 1, 0, 1, 0, 0, 1, 0, 1, 1, 1, 0, 1, 0, 1, 0, 1, 1,
            1, 1, 0, 0, 1, 1, 1, 1, 0, 0, 1, 1, 0, 1, 1, 0, 1, 1, 1, 1, 0, 1,
            0, 0, 1, 0, 0, 1, 1, 0, 1, 1, 1, 1, 0, 0, 1, 0, 1, 1, 0, 1, 1, 1,
            0, 0, 0, 0, 1, 1, 1, 0, 1, 0, 1, 0, 1, 0, 0, 0, 0, 1, 1, 1, 0, 1,
```

```
       0, 1, 1, 0, 0, 0, 0, 1, 1, 1, 0, 0, 1, 1, 0, 0, 1, 0, 1, 1, 1, 1,
       1, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1, 0, 1, 1, 1, 0, 0, 0,
       0, 1, 0, 0, 0, 1, 0, 0, 1, 0, 1, 1, 0, 1, 1, 1, 0, 0, 1, 0, 1, 0,
       0, 1, 1, 1, 1, 1, 1, 0, 1, 1, 0, 1, 0, 0, 1, 1, 0, 1, 1, 0, 1, 1,
       1, 1, 0, 1, 1, 1, 0, 1, 0, 0, 1, 1, 1, 0, 1, 1, 1, 1, 1, 1, 1, 0,
       1, 0, 0, 0, 1, 0, 1, 0, 1, 0, 0, 1, 1, 1, 0, 1, 1, 1, 0, 0, 0, 0,
       1, 1, 1, 0, 1, 1, 0, 1, 0, 1, 0, 1, 1, 0, 0, 0, 1, 1, 0, 1, 0, 1,
       1, 0, 0, 0, 1, 0, 1, 1, 0, 0, 0, 1, 1, 1, 1, 1, 1, 0, 0, 0, 1, 1,
       1, 0, 1, 1, 0, 0, 1, 0, 0, 1, 1, 0, 1, 1, 0, 0, 0, 0, 1, 0, 0, 0,
       0, 1, 1, 1, 0, 0, 1, 1, 0, 0, 0, 1, 0, 0, 0, 1, 0, 0, 1, 0, 1, 0,
       0, 1, 0, 1, 1, 1, 0, 1, 1, 1, 1, 1, 0, 0, 0, 0, 1, 1, 0, 1, 0, 1,
       1, 0, 0, 1, 0, 1, 1, 1, 0, 0, 0, 0, 1, 0, 0, 1, 1, 0, 0, 1, 0, 1,
       1, 0, 0, 1, 0, 0, 0, 0, 1, 0, 1, 0])
```

```
from sklearn.metrics import confusion_matrix
cm=confusion_matrix(ytest,y_pred)
print("Confusion matrix:\n",cm)
```

```
Confusion matrix:
 [[194 117]
 [ 86 231]]
```

```
from sklearn.metrics import accuracy_score
print("Accuracy:",accuracy_score(ytest,y_pred))
```

```
Accuracy: 0.6767515923566879
```

```
from sklearn.neighbors import KNeighborsClassifier
knn=KNeighborsClassifier(n_neighbors=12)#k value
```

```
knn.fit(d,ytrain)
```

```
KNeighborsClassifier
KNeighborsClassifier(n_neighbors=12)
```



```
y_pred
```

```
array([0, 1, 0, 0, 0, 0, 0, 1, 1, 1, 1, 0, 0, 0, 0, 1, 1, 1, 0, 0, 0, 1,
       1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 1, 1, 0, 0, 1, 1, 1, 1, 0, 1,
       0, 1, 0, 1, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0, 1, 1, 1, 0, 0, 1, 1, 1,
       0, 1, 0, 0, 1, 1, 0, 0, 1, 1, 1, 0, 1, 0, 0, 0, 0, 1, 1, 0, 1, 1,
       1, 1, 1, 1, 0, 1, 1, 0, 1, 1, 0, 1, 0, 0, 1, 1, 1, 0, 1, 1, 0, 1,
       1, 1, 1, 0, 0, 1, 1, 1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0, 1, 1,
       1, 1, 1, 0, 1, 0, 1, 1, 1, 1, 1, 0, 0, 1, 1, 0, 1, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 1, 0, 1, 0, 1, 1, 1, 1, 1, 1, 0,
       1, 0, 1, 0, 1, 1, 1, 1, 1, 0, 0, 1, 0, 1, 1, 0, 1, 0, 1, 1, 1, 1,
```

```
       0, 0, 0, 1, 1, 0, 1, 1, 1, 1, 1, 1, 1, 0, 0, 1, 0, 0, 0, 1, 1,
       1, 1, 0, 0, 0, 0, 1, 0, 0, 0, 1, 0, 0, 0, 0, 1, 0, 0, 1, 1, 1, 1,
       1, 0, 0, 0, 1, 1, 0, 1, 1, 1, 1, 1, 0, 0, 1, 1, 0, 1, 1, 1, 0, 1,
       0, 0, 0, 1, 1, 1, 0, 1, 0, 0, 1, 0, 1, 1, 1, 0, 1, 0, 1, 0, 1, 1,
       1, 1, 0, 0, 1, 1, 1, 1, 0, 0, 1, 1, 0, 1, 1, 0, 1, 1, 1, 1, 0, 1,
       0, 0, 1, 0, 0, 1, 1, 0, 1, 1, 1, 1, 0, 0, 1, 0, 1, 1, 0, 1, 1, 1,
       0, 0, 0, 0, 1, 1, 1, 0, 1, 0, 1, 0, 1, 0, 0, 0, 0, 1, 1, 1, 0, 1,
       0, 1, 1, 0, 0, 0, 0, 1, 1, 1, 0, 0, 1, 1, 0, 0, 1, 0, 1, 1, 1, 1,
       1, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1, 0, 1, 1, 1, 0, 0, 0,
       0, 1, 0, 0, 0, 1, 0, 0, 1, 0, 1, 1, 0, 1, 1, 1, 0, 0, 1, 0, 1, 0,
       0, 1, 1, 1, 1, 1, 1, 0, 1, 1, 0, 1, 0, 0, 1, 1, 0, 1, 1, 0, 1, 1,
       1, 1, 0, 1, 1, 1, 0, 1, 0, 0, 1, 1, 1, 0, 1, 1, 1, 1, 1, 1, 1, 0,
       1, 0, 0, 0, 1, 0, 1, 0, 1, 0, 0, 1, 1, 1, 0, 1, 1, 1, 0, 0, 0, 0,
       1, 1, 1, 0, 1, 1, 0, 1, 0, 1, 0, 1, 1, 0, 0, 0, 1, 1, 0, 1, 0, 1,
       1, 0, 0, 0, 1, 0, 1, 1, 0, 0, 0, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 1, 1,
       1, 0, 1, 1, 0, 0, 1, 0, 0, 1, 1, 0, 1, 1, 0, 0, 0, 0, 1, 0, 0, 0,
       0, 1, 1, 1, 0, 0, 1, 1, 0, 0, 0, 1, 0, 0, 0, 1, 0, 0, 1, 0, 1, 0,
       0, 1, 0, 1, 1, 1, 0, 1, 1, 1, 1, 1, 0, 0, 0, 0, 1, 1, 0, 1, 0, 1,
       1, 0, 0, 1, 0, 1, 1, 1, 0, 0, 0, 0, 1, 0, 0, 1, 1, 0, 0, 1, 0, 1,
       1, 0, 0, 1, 0, 0, 0, 0, 1, 0, 1, 0])


print("predicted value for training value",knn.score(d,ytrain))
print("predicted value for testing value",knn.score(e,ytest))
print("Overall Accuracy:",knn.score(sc_x.transform(x),y))

     predicted value for training value 0.7912904938927243
     predicted value for testing value 0.7229299363057324
     Overall Accuracy: 0.7741935483870968


y_pred=knn.predict(e)
y_pred

     array([1, 1, 1, 0, 0, 0, 1, 1, 1, 1, 1, 0, 1, 0, 1, 1, 0, 1, 0, 1, 0, 1,
            0, 0, 1, 1, 1, 0, 1, 0, 1, 0, 0, 0, 1, 1, 1, 0, 1, 1, 0, 1, 0, 1,
            0, 0, 0, 0, 0, 0, 1, 1, 1, 1, 1, 1, 0, 1, 0, 0, 0, 1, 0, 1, 1, 1,
            0, 1, 0, 1, 1, 1, 0, 0, 1, 1, 1, 1, 0, 1, 1, 0, 0, 1, 1, 1, 1, 1,
            0, 1, 1, 1, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 1, 0, 0, 1, 0,
            1,
            1,
            1,
            0, 1, 1, 1, 1, 1, 1, 0, 1, 0, 0, 1, 0, 1, 1, 0, 0, 0, 1, 1, 1, 1,
            1, 0, 0, 1, 0, 0, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 1, 0, 0, 1, 1,
            1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 1, 1, 1, 0, 1, 0, 1, 1,
            1, 0, 1, 0, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 1, 1, 1, 1, 1, 1, 0, 1,
            0, 0, 0, 1, 1, 1, 0, 1, 0, 1, 1, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
            0, 1, 1, 0, 1, 0, 1, 1, 0, 0, 1, 0, 0, 1, 1, 1, 1, 1, 1, 1, 0, 1,
            0, 1, 0, 1, 1, 0, 0, 0, 1, 0, 1, 1, 0, 0, 1, 1, 1, 1, 0, 1, 1, 0,
            1, 0, 0, 1, 1, 0, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 1, 0, 1, 1, 1, 0, 0,
            0, 1, 1, 0, 1, 0, 0, 0, 0, 1, 0, 1, 1, 1, 0, 0, 0, 0, 1, 1, 1, 0,
            0, 0, 1, 1, 1, 1, 0, 0, 1, 1, 0, 1, 1, 1, 0, 1, 0, 1, 1, 1, 0, 0, 1,
            0, 1, 0, 0, 0, 1, 0, 0, 1, 1, 1, 1, 0, 1, 0, 0, 1, 0, 1, 0, 1, 1,
```

```
           0, 1, 1, 1, 0, 0, 0, 0, 1, 1, 0, 1, 0, 0, 1, 1, 1, 1, 1, 0, 1, 1,
           1, 1, 1, 1, 1, 1, 0, 0, 1, 1, 1, 0, 1, 0, 1, 1, 1, 0, 1, 1, 0, 0,
           0, 1, 0, 0, 0, 0, 1, 0, 1, 1, 1, 1, 1, 1, 0, 1, 0, 0, 0, 1, 1, 1,
           1, 1, 1, 1, 1, 1, 0, 1, 1, 1, 0, 1, 1, 0, 1, 0, 1, 1, 0, 1, 1, 1,
           1, 0, 0, 0, 1, 0, 0, 1, 1, 1, 1, 0, 0, 1, 0, 1, 0, 1, 1, 0, 1, 1,
           1, 0, 1, 1, 0, 0, 0, 0, 1, 1, 1, 0, 1, 1, 0, 0, 1, 0, 1, 1, 1, 0,
           0, 1, 1, 0, 1, 0, 1, 1, 1, 0, 1, 0, 0, 0, 1, 1, 0, 0, 0, 1, 1, 1,
           1, 1, 0, 1, 0, 1, 0, 1, 1, 1, 1, 0, 1, 1, 0, 1, 1, 1, 1, 1, 0, 1,
           1, 0, 0, 1, 1, 0, 1, 0, 1, 1, 1, 1, 1, 0, 0, 1, 0, 0, 0, 1, 0, 1,
           1, 1, 0, 1, 1, 1, 1, 0, 1, 0, 1, 1])
```

```
from sklearn.metrics import confusion_matrix
knns=confusion_matrix(ytest,y_pred)
print("Confusion matrix:\n",knns)
```

```
     Confusion matrix:
      [[190 121]
      [ 53 264]]
```

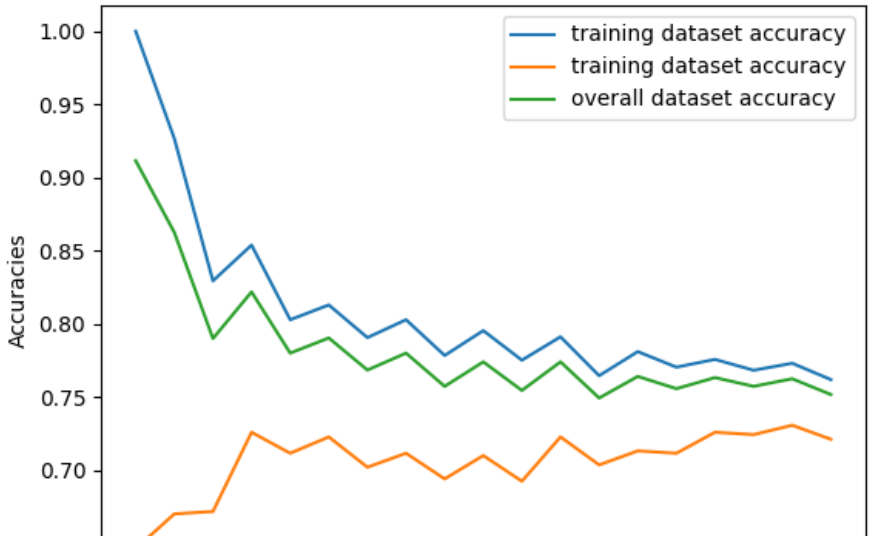
```
#this code is useful to find best k value using graphs
neighbors=np.arange(1,20)
train_accuracy=np.empty(len(neighbors))
test_accuracy=np.empty(len(neighbors))
overall_accuracy=np.empty(len(neighbors))
#loop over k values
for i,k in enumerate(neighbors):
  knn=KNeighborsClassifier(n_neighbors=k)
  knn.fit(d,ytrain)
  #compute the training and testing accuracy of ML model
  train_accuracy[i]=knn.score(d,ytrain)
  test_accuracy[i]=knn.score(e,ytest)

  #overall score
  overall_accuracy[i]=knn.score(sc_x.transform(x),y)

import matplotlib.pyplot as plt
```



```
plt.plot(neighbors,overall_accuracy,label='overall dataset accuracy')
plt.legend()
plt.xlabel('k values-n_neigbors')
plt.ylabel('Accuracies')
plt.show()
```




```
from sklearn import svm
SVM= svm.SVC()
```

K values-n_neigbors

```
SVM.fit(d, ytrain)
```

▾ SVC
SVC()

```
print("Training Accuracy",SVM.score(d,ytrain))
print("Testing Accuracy",SVM.score(e,ytest))
print("Overall Accuracy:",SVM.score(sc_x.transform(x),y))
```

```
Training Accuracy 0.9426447158789166
Testing Accuracy 0.7818471337579618
Overall Accuracy: 0.9234291110214616
```

Automatic saving failed. This file was updated remotely or in another tab. Show diff

```
y_pred=SVM.predict(e)
y_pred
```

```
array([0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1, 0, 1, 0, 1, 0, 0, 1, 0, 1, 0, 1,
       0, 0, 1, 1, 1, 0, 1, 0, 1, 0, 0, 0, 1, 1, 1, 0, 1, 1, 0, 1, 0, 1,
       0, 0, 0, 1, 0, 0, 0, 1, 1, 1, 1, 1, 0, 0, 0, 1, 0, 0, 0, 1, 1, 1,
       0, 1, 0, 0, 1, 1, 0, 0, 0, 1, 1, 0, 1, 1, 0, 0, 0, 1, 1, 0, 1, 1,
       1, 1, 1, 1, 0, 1, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 1, 0, 0, 1, 0, 1,
       1, 0, 1, 0, 1, 0, 1, 1, 0, 1, 1, 0, 0, 0, 0, 1, 1, 1, 0, 0, 1, 1,
       1, 1, 1, 0, 0, 0, 1, 1, 1, 1, 0, 0, 0, 1, 1, 1, 0, 1, 0, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 0, 0, 1, 0, 1, 1, 0, 1, 1, 1, 0, 1, 1, 1, 0, 1,
```

```
0, 1, 1, 1, 1, 1, 1, 1, 0, 0, 1, 0, 1, 1, 0, 1, 0, 0, 1, 1, 1,
0, 0, 0, 1, 1, 0, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 1, 0, 0, 1, 0,
1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1, 1, 0, 0, 0, 1, 1,
1, 0, 0, 0, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 1, 1, 0, 1, 1, 1, 0, 1,
0, 0, 0, 1, 1, 1, 0, 1, 0, 1, 1, 0, 1, 1, 1, 0, 0, 1, 1, 0, 1, 1,
0, 1, 0, 0, 1, 0, 1, 1, 0, 0, 1, 1, 0, 1, 1, 0, 1, 1, 1, 1, 0, 1,
0, 1, 1, 1, 0, 1, 0, 0, 1, 1, 1, 1, 0, 0, 1, 1, 0, 1, 1, 1, 1, 0,
1, 1, 1, 0, 1, 0, 1, 0, 1, 0, 1, 0, 1, 0, 0, 1, 0, 1, 1, 1, 0, 0,
0, 1, 1, 0, 0, 0, 0, 0, 0, 1, 1, 0, 1, 1, 0, 0, 0, 0, 1, 0, 0, 0,
0, 0, 1, 1, 1, 0, 0, 0, 1, 0, 0, 1, 1, 0, 1, 0, 1, 1, 1, 0, 0, 0,
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0, 0, 0, 1, 0, 0, 1, 1, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0, 0, 1, 0, 1,
1, 0, 0, 1, 1, 0, 1, 0, 1, 0, 1, 1])
```

```
from sklearn.metrics import confusion_matrix
SVMS=confusion_matrix(ytest,y_pred)
print("Confusion matrix:\n",SVMS)
```

```
Confusion matrix:
 [[233  78]
 [ 59 258]]
```

```
from sklearn.tree import DecisionTreeClassifier
dtc=DecisionTreeClassifier()
```

```
dtc.fit(d,ytrain)
```

▾ DecisionTreeClassifier


```
print("Training Accuracy",dtc.score(d,ytrain))
print("Testing Accuracy",dtc.score(e,ytest))
print("Overall Accuracy:",dtc.score(sc_x.transform(x),y))
```

```
Training Accuracy 1.0
Testing Accuracy 0.6353503184713376
Overall Accuracy: 0.9088012743926722
```

```
y_pred=dtc.predict(e)
y_pred
```

```
array([0, 0, 0, 0, 1, 1, 1, 1, 1, 1, 1, 0, 1, 0, 1, 0, 0, 0, 1, 1, 1, 0,
       1, 0, 0, 0, 1, 0, 1, 0, 1, 0, 0, 0, 1, 0, 1, 1, 0, 1, 0, 1, 1, 0,
       1, 1, 0, 1, 0, 1, 0, 0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0,
       0, 1, 1, 1, 1, 1, 0, 1, 0, 1, 1, 0, 1, 1, 0, 0, 0, 0, 0, 0, 1, 1,
       1, 1, 1, 0, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 1, 1, 0, 0, 1,
       1, 0, 1, 0, 1, 0, 1, 0, 1, 0, 0, 1, 0, 1, 0, 1, 0, 0, 0, 0, 0, 1,
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       0, 1, 0, 0, 1, 0, 0, 1, 1, 0, 0, 0, 0, 1, 1, 1, 0, 1, 1, 1, 0, 0,
       0, 0, 0, 0, 1, 0, 1, 1, 1, 0, 1, 1, 1, 1, 0, 0, 0, 1, 0, 0, 0, 1,
       0, 0, 0, 1, 1, 0, 0, 0, 0, 1, 1, 0, 0, 0, 0, 1, 1, 1, 0, 0, 0, 0,
       1, 0, 0, 1, 1, 1, 1, 1, 0, 1, 0, 1, 0, 0, 1, 1, 1, 1, 1, 0, 1, 1,
       0, 0, 1, 1, 1, 1, 0, 1, 0, 0, 1, 0, 1, 1, 1, 1, 1, 1, 0, 1, 1, 1,
       0, 1, 1, 0, 1, 0, 1, 1, 0, 0, 0, 1, 0, 1, 1, 1, 1, 1, 1, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 1, 1, 1, 1, 1, 0, 0, 0, 1, 1, 0, 1, 1, 1, 1, 0,
       1, 0, 1, 0, 1, 0, 1, 1, 1, 0, 0, 0, 1, 0, 0, 1, 0, 1, 1, 1, 0, 0,
       0, 1, 1, 0, 0, 0, 0, 1, 0, 1, 0, 0, 0, 1, 0, 0, 0, 0, 1, 0, 1, 1,
       0, 0, 1, 1, 1, 0, 1, 0, 0, 0, 1, 1, 1, 1, 1, 1, 0, 1, 0, 0, 0, 1,
       0, 0, 0, 0, 0, 1, 0, 0, 1, 0, 1, 1, 0, 0, 0, 1, 0, 0, 0, 0, 1, 0,
       0, 0, 1, 1, 0, 0, 0, 0, 1, 1, 0, 0, 0, 0, 0, 1, 0, 1, 1, 0, 1, 0,
       1, 0, 1, 1, 1, 1, 0, 1, 1, 0, 1, 0, 0, 0, 1, 1, 0, 0, 1, 1, 0, 1,
       0, 1, 1, 0, 0, 0, 1, 0, 1, 1, 1, 0, 1, 1, 0, 1, 0, 1, 0, 0, 0, 1,
       0, 1, 0, 1, 1, 1, 0, 0, 1, 0, 1, 0, 0, 0, 1, 0, 1, 1, 1, 1, 1, 0,
       0, 1, 1, 0, 0, 0, 1, 1, 0, 0, 0, 1, 0, 1, 0, 1, 0, 0, 1, 0, 0, 1,
       0, 1, 1, 1, 0, 1, 0, 0, 1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1, 1, 0, 0,
       0, 1, 0, 0, 0, 0, 0, 1, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0, 1, 1, 1, 0,
       1, 0, 1, 1, 0, 1, 1, 1, 1, 0, 0, 0, 1, 0, 0, 1, 1, 0, 1, 0, 0, 1,
       1, 0, 0, 1, 1, 0, 1, 1, 1, 1, 0, 0, 0, 0, 0, 1, 1, 1, 1, 1, 1, 1,
       0, 0, 0, 0, 1, 1, 0, 0, 1, 1, 1, 0])
```

```
from sklearn.metrics import confusion_matrix
dtcs=confusion_matrix(ytest,y_pred)
print("Confusion matrix:\n",dtcs)
```

```
Confusion matrix:
```

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