In [1]:
```
import numpy as np
import pandas as pd
from matplotlib import pyplot as plt
from sklearn import datasets
from sklearn import svm
from sklearn.metrics import classification_report
from sklearn.model_selection import train_test_split
from sklearn.tree import DecisionTreeClassifier
from sklearn.tree import DecisionTreeRegressor
```

In [4]:
```
df = pd.read_csv( "C:\\Users\\ADMIN\\Desktop\\chinni\\Kiran Sagar Codingrad\\csv datas\\iris.data.csv",
 names=['a','b','a1','b1','class'])
df
```

Out[4]:

	a	b	a1	b1	class
0	5.1	3.5	1.4	0.2	Iris-setosa
1	4.9	3.0	1.4	0.2	Iris-setosa
2	4.7	3.2	1.3	0.2	Iris-setosa
3	4.6	3.1	1.5	0.2	Iris-setosa
4	5.0	3.6	1.4	0.2	Iris-setosa
...	...	...	...	...	...
145	6.7	3.0	5.2	2.3	Iris-virginica
146	6.3	2.5	5.0	1.9	Iris-virginica
147	6.5	3.0	5.2	2.0	Iris-virginica
148	6.2	3.4	5.4	2.3	Iris-virginica
149	5.9	3.0	5.1	1.8	Iris-virginica

150 rows × 5 columns

In [5]:
```
features = df.iloc[:, :-1].values
labels = df.iloc[:, -1].values
```

In [6]:
```
features
```

Out[6]:
```
array([[5.1, 3.5, 1.4, 0.2],
       [4.9, 3. , 1.4, 0.2],
       [4.7, 3.2, 1.3, 0.2],
       [4.6, 3.1, 1.5, 0.2],
       [5. , 3.6, 1.4, 0.2],
       [5.4, 3.9, 1.7, 0.4],
       [4.6, 3.4, 1.4, 0.3],
       [5. , 3.4, 1.5, 0.2],
       [4.4, 2.9, 1.4, 0.2],
       [4.9, 3.1, 1.5, 0.1],
       [5.4, 3.7, 1.5, 0.2],
       [4.8, 3.4, 1.6, 0.2],
       [4.8, 3. , 1.4, 0.1],
       [4.3, 3. , 1.1, 0.1],
       [5.8, 4. , 1.2, 0.2],
       [5.7, 4.4, 1.5, 0.4],
       [5.4, 3.9, 1.3, 0.4],
       [5.1, 3.5, 1.4, 0.3],
       [5.7, 3.8, 1.7, 0.3],
       [5.1, 3.8, 1.5, 0.3],
       [5.4, 3.4, 1.7, 0.2],
       [5.1, 3.7, 1.5, 0.4],
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       [5.1, 3.3, 1.7, 0.5],
       [4.8, 3.4, 1.9, 0.2],
       [5. , 3. , 1.6, 0.2],
       [5. , 3.4, 1.6, 0.4],
       [5.2, 3.5, 1.5, 0.2],
       [5.2, 3.4, 1.4, 0.2],
       [4.7, 3.2, 1.6, 0.2],
       [4.8, 3.1, 1.6, 0.2],
       [5.4, 3.4, 1.5, 0.4],
       [5.2, 4.1, 1.5, 0.1],
       [5.5, 4.2, 1.4, 0.2],
       [4.9, 3.1, 1.5, 0.1],
       [5. , 3.2, 1.2, 0.2],
       [5.5, 3.5, 1.3, 0.2],
       [4.9, 3.1, 1.5, 0.1],
       [4.4, 3. , 1.3, 0.2],
```

```
[5.1, 3.4, 1.5, 0.2],
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[6.8, 2.8, 4.8, 1.4],
[6.7, 3. , 5. , 1.7],
[6. , 2.9, 4.5, 1.5],
[5.7, 2.6, 3.5, 1. ],
[5.5, 2.4, 3.8, 1.1],
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[5.8, 2.7, 3.9, 1.2],
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[6. , 3.4, 4.5, 1.6],
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[7.3, 2.9, 6.3, 1.8],
[6.7, 2.5, 5.8, 1.8],
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[6.5, 3.2, 5.1, 2. ],
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[7.7, 2.6, 6.9, 2.3],
[6. , 2.2, 5. , 1.5],
[6.9, 3.2, 5.7, 2.3],
[5.6, 2.8, 4.9, 2. ],
[7.7, 2.8, 6.7, 2. ],
[6.3, 2.7, 4.9, 1.8],
[6.7, 3.3, 5.7, 2.1],
[7.2, 3.2, 6. , 1.8],
[6.2, 2.8, 4.8, 1.8],
[6.1, 3. , 4.9, 1.8],
```

```
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       [7.2, 3. , 5.8, 1.6],
       [7.4, 2.8, 6.1, 1.9],
       [7.9, 3.8, 6.4, 2. ],
       [6.4, 2.8, 5.6, 2.2],
       [6.3, 2.8, 5.1, 1.5],
       [6.1, 2.6, 5.6, 1.4],
       [7.7, 3. , 6.1, 2.3],
       [6.3, 3.4, 5.6, 2.4],
       [6.4, 3.1, 5.5, 1.8],
       [6. , 3. , 4.8, 1.8],
       [6.9, 3.1, 5.4, 2.1],
       [6.7, 3.1, 5.6, 2.4],
       [6.9, 3.1, 5.1, 2.3],
       [5.8, 2.7, 5.1, 1.9],
       [6.8, 3.2, 5.9, 2.3],
       [6.7, 3.3, 5.7, 2.5],
       [6.7, 3. , 5.2, 2.3],
       [6.3, 2.5, 5. , 1.9],
       [6.5, 3. , 5.2, 2. ],
       [6.2, 3.4, 5.4, 2.3],
       [5.9, 3. , 5.1, 1.8]])
```

In [7]:

```
labels
```

Out[7]:

```
array(['Iris-setosa', 'Iris-setosa', 'Iris-setosa', 'Iris-setosa',
       'Iris-setosa', 'Iris-setosa', 'Iris-setosa', 'Iris-setosa',
       'Iris-setosa', 'Iris-setosa', 'Iris-setosa', 'Iris-setosa',
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       'Iris-setosa', 'Iris-setosa', 'Iris-setosa', 'Iris-setosa',
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       'Iris-setosa', 'Iris-setosa', 'Iris-setosa', 'Iris-setosa',
       'Iris-setosa', 'Iris-setosa', 'Iris-versicolor', 'Iris-versicolor',
       'Iris-versicolor', 'Iris-versicolor', 'Iris-versicolor',
       'Iris-versicolor', 'Iris-versicolor', 'Iris-versicolor',
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       'Iris-virginica', 'Iris-virginica', 'Iris-virginica',
       'Iris-virginica', 'Iris-virginica', 'Iris-virginica',
       'Iris-virginica', 'Iris-virginica', 'Iris-virginica',
       'Iris-virginica', 'Iris-virginica'], dtype=object)
```

In [8]:

```
x_train, x_test, y_train, y_test = train_test_split(features, labels,test_size=0.3,random_state=0)
```

In [9]:

```
x_train,x_test,y_train,y_test
```

Out[9]:

```
(array([[5. , 2. , 3.5, 1. ],
        [6.5, 3. , 5.5, 1.8],
        [6.7, 3.3, 5.7, 2.5],
        [6. , 2.2, 5. , 1.5],
        [6.7, 2.5, 5.8, 1.8],
```

```
[5.6, 2.5, 3.9, 1.1],
[7.7, 3. , 6.1, 2.3],
[6.3, 3.3, 4.7, 1.6],
[5.5, 2.4, 3.8, 1.1],
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[6.3, 2.5, 5. , 1.9],
[7. , 3.2, 4.7, 1.4],
[6.5, 3. , 5.2, 2. ],
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[4.8, 3.1, 1.6, 0.2],
[5.8, 2.7, 5.1, 1.9],
[5.6, 2.7, 4.2, 1.3],
[5.6, 2.9, 3.6, 1.3],
[5.5, 2.5, 4. , 1.3],
[6.1, 3. , 4.6, 1.4],
[7.2, 3.2, 6. , 1.8],
[5.3, 3.7, 1.5, 0.2],
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[6.2, 2.2, 4.5, 1.5],
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[7.1, 3. , 5.9, 2.1],
[6.9, 3.2, 5.7, 2.3],
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```

```
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       [6.1, 2.9, 4.7, 1.4],
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       [4.4, 2.9, 1.4, 0.2],
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       [4.6, 3.6, 1. , 0.2],
       [5.1, 3.8, 1.9, 0.4],
       [6.2, 2.9, 4.3, 1.3],
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       [5. , 3.4, 1.6, 0.4],
       [6.4, 3.1, 5.5, 1.8],
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       [5.2, 3.5, 1.5, 0.2],
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       [6.8, 3. , 5.5, 2.1],
       [4.7, 3.2, 1.3, 0.2],
       [6.9, 3.1, 5.1, 2.3],
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       [5.4, 3.7, 1.5, 0.2]]),
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       'Iris-versicolor', 'Iris-setosa', 'Iris-virginica',
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       'Iris-setosa', 'Iris-virginica', 'Iris-versicolor',
       'Iris-virginica', 'Iris-versicolor', 'Iris-setosa',
       'Iris-virginica', 'Iris-setosa', 'Iris-virginica', 'Iris-setosa',
       'Iris-setosa', 'Iris-virginica', 'Iris-setosa', 'Iris-virginica',
       'Iris-versicolor', 'Iris-versicolor', 'Iris-versicolor',
       'Iris-virginica', 'Iris-virginica', 'Iris-versicolor',
       'Iris-versicolor', 'Iris-setosa', 'Iris-versicolor',
       'Iris-virginica', 'Iris-virginica', 'Iris-setosa',
       'Iris-versicolor', 'Iris-versicolor', 'Iris-versicolor',
       'Iris-versicolor', 'Iris-setosa', 'Iris-setosa', 'Iris-setosa',
       'Iris-virginica', 'Iris-versicolor', 'Iris-virginica',
       'Iris-setosa'], dtype=object),
array(['Iris-virginica', 'Iris-versicolor', 'Iris-setosa',
```

```
        'Iris-virginica', 'Iris-setosa', 'Iris-virginica', 'Iris-setosa',
        'Iris-versicolor', 'Iris-versicolor', 'Iris-versicolor',
        'Iris-virginica', 'Iris-versicolor', 'Iris-versicolor',
        'Iris-versicolor', 'Iris-versicolor', 'Iris-setosa',
        'Iris-versicolor', 'Iris-versicolor', 'Iris-setosa', 'Iris-setosa',
        'Iris-virginica', 'Iris-versicolor', 'Iris-setosa', 'Iris-setosa',
        'Iris-virginica', 'Iris-setosa', 'Iris-setosa', 'Iris-versicolor',
        'Iris-versicolor', 'Iris-setosa', 'Iris-virginica',
        'Iris-versicolor', 'Iris-setosa', 'Iris-virginica',
        'Iris-virginica', 'Iris-versicolor', 'Iris-setosa',
        'Iris-versicolor', 'Iris-versicolor', 'Iris-versicolor',
        'Iris-virginica', 'Iris-setosa', 'Iris-virginica', 'Iris-setosa',
        'Iris-setosa'], dtype=object))
```

In [10]:
```
features.shape,labels.shape
```

Out[10]:
```
((150, 4), (150,))
```

In [11]:
```
from sklearn.metrics import r2_score,mean_squared_error
```

In [12]:
```
dt = DecisionTreeClassifier()
dt.fit(x_train, y_train)
```

Out[12]:
```
DecisionTreeClassifier()
```

In [13]:
```
y_pred = dt.predict(x_test)
y_pred
```

Out[13]:
```
array(['Iris-virginica', 'Iris-versicolor', 'Iris-setosa',
       'Iris-virginica', 'Iris-setosa', 'Iris-virginica', 'Iris-setosa',
       'Iris-versicolor', 'Iris-versicolor', 'Iris-versicolor',
       'Iris-virginica', 'Iris-versicolor', 'Iris-versicolor',
       'Iris-versicolor', 'Iris-versicolor', 'Iris-setosa',
       'Iris-versicolor', 'Iris-versicolor', 'Iris-setosa', 'Iris-setosa',
       'Iris-virginica', 'Iris-versicolor', 'Iris-setosa', 'Iris-setosa',
       'Iris-virginica', 'Iris-setosa', 'Iris-setosa', 'Iris-versicolor',
       'Iris-versicolor', 'Iris-setosa', 'Iris-virginica',
       'Iris-versicolor', 'Iris-setosa', 'Iris-virginica',
       'Iris-virginica', 'Iris-versicolor', 'Iris-setosa',
       'Iris-virginica', 'Iris-versicolor', 'Iris-versicolor',
       'Iris-virginica', 'Iris-setosa', 'Iris-virginica', 'Iris-setosa',
       'Iris-setosa'], dtype=object)
```

In [15]:
```
features_of_s_p = ['a','b','a1','b1']
df[features_of_s_p].describe()
```

Out[15]:

	a	b	a1	b1
count	150.000000	150.000000	150.000000	150.000000
mean	5.843333	3.054000	3.758667	1.198667
std	0.828066	0.433594	1.764420	0.763161
min	4.300000	2.000000	1.000000	0.100000
25%	5.100000	2.800000	1.600000	0.300000
50%	5.800000	3.000000	4.350000	1.300000
75%	6.400000	3.300000	5.100000	1.800000
max	7.900000	4.400000	6.900000	2.500000

In [16]:
```
#### Accuracy

from sklearn.metrics import accuracy_score
accuracy_score(y_test,y_pred)
```

Out[16]:
```
0.9777777777777777
```

In [17]:
```
from sklearn.metrics import classification_report
print(classification_report(y_test,y_pred))
```

```
                precision    recall  f1-score   support

    Iris-setosa       1.00      1.00      1.00        16
Iris-versicolor       1.00      0.94      0.97        18
 Iris-virginica       0.92      1.00      0.96        11

       accuracy                           0.98        45
      macro avg       0.97      0.98      0.98        45
   weighted avg       0.98      0.98      0.98        45
```

In [ ]:
```

```