Decision Tree : Classification & Regressor

In [4]:

```
import math
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.tree import DecisionTreeClassifier ,plot_tree

from sklearn.metrics import accuracy_score
```

In [24]:

```
data = pd.read_csv("../DataSets/iris.csv")
data.head()
```

Out[24]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa

1. Feature & Label Seperation

In [25]:

```
x = data.drop("species",axis=1)
y = data["species"]

x_train ,x_test ,y_train ,y_test = train_test_split(x,y,test_size=0.2 ,random_state=42)
```

In [7]:

```
##2. Split data to train test
```

In [26]:

```
x_train ,x_test ,y_train ,y_test = train_test_split(x,y,test_size=0.2 ,random_state=42)
```

3. Model prediction of set data set

In [44]:

```
clf = DecisionTreeClassifier()

clf.fit(x_train , y_train )

y_preds = clf.predict(x_test)
y_preds
data.head()
```

Out[44]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa

In [42]:

```
import pandas as pd

sepal_len = float(input("sepal_len: "))
sepal_width = float(input("sepal_width: "))
petal_len = float(input("petal_len: "))
petal_width = float(input("petal_width: "))

input_test = pd.DataFrame({"sepal_length": [sepal_len],
                           "sepal_width": [sepal_width],
                           "petal_length": [petal_len],
                           "petal_width": [petal_width]})

print(input_test)
y_input_predicted = clf.predict(input_test)
print("The flower is = ",y_input_predicted)
```

```
sepal_len: 5
sepal_width: 3.6
petal_len: 1.4
petal_width: 0.2
   sepal_length  sepal_width  petal_length  petal_width
0           5.0          3.6           1.4          0.2
The flower is =  ['setosa']
```

In [54]:

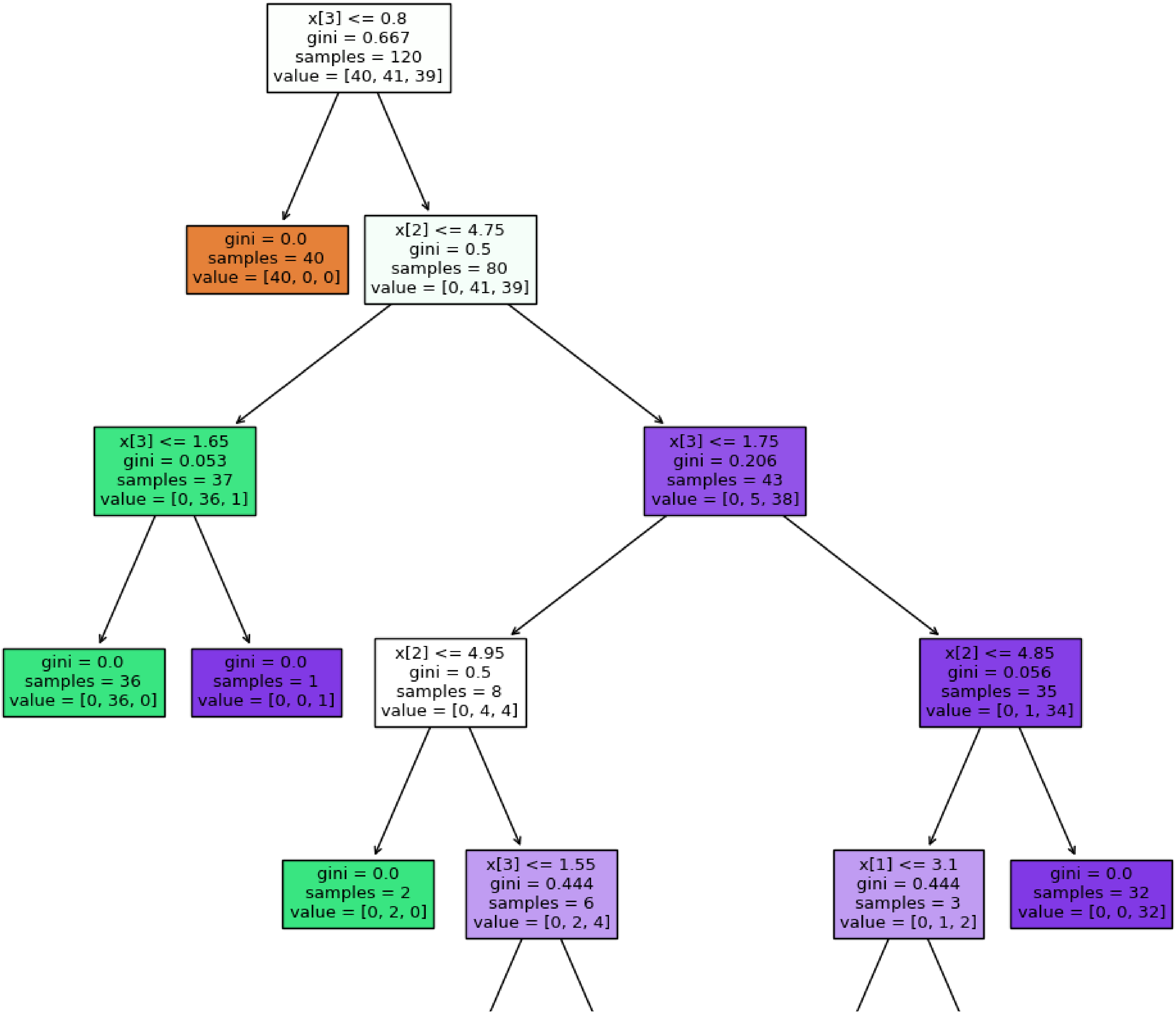
```
#  accuracy

accuracy = accuracy_score(y_test,y_preds)
print(accuracy)


print(clf.score(x_test,y_test))
```

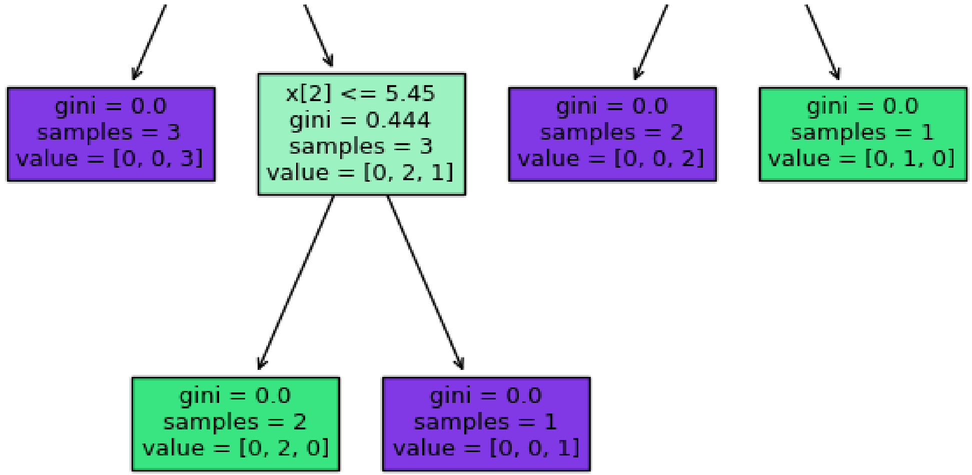
```
1.0
1.0
```

4-Plotting the tree at large

In [19]:

```
plt.figure(figsize=(12,15))
plot_tree(clf ,filled=True );
```

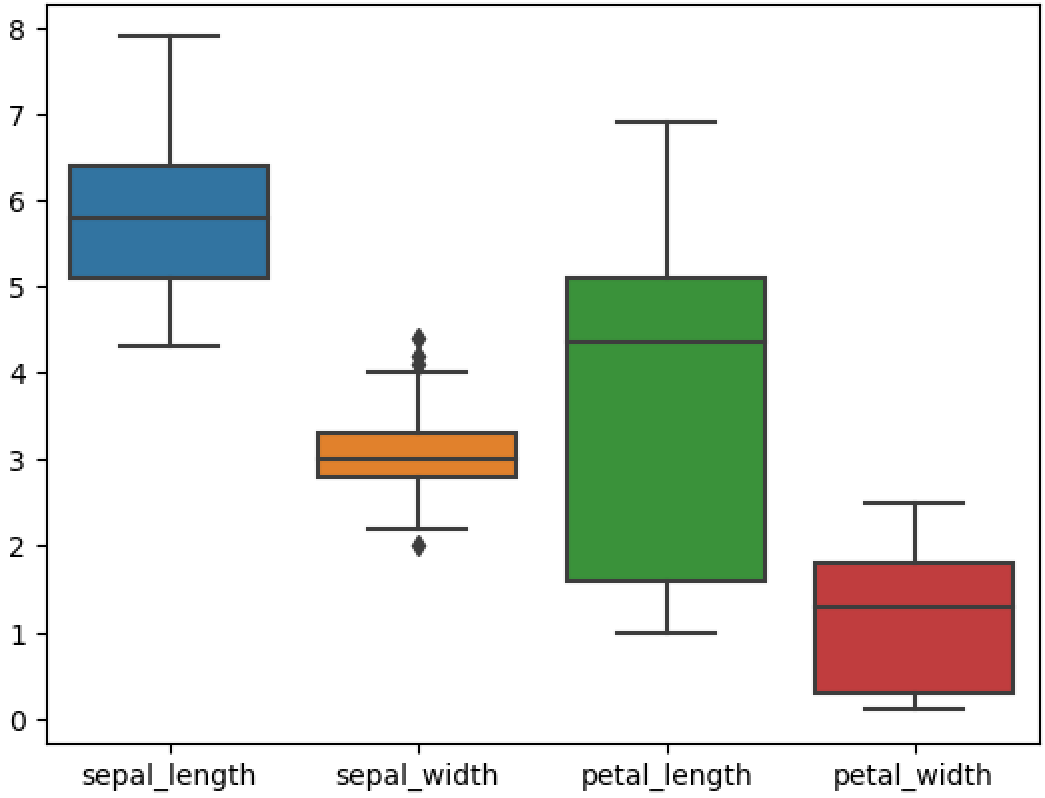

x[3] <= 0.8
gini = 0.667
samples = 120
value = [40, 41, 39]
gini = 0.0
samples = 40
value = [40, 0, 0]
x[2] <= 4.75
gini = 0.5
samples = 80
value = [0, 41, 39]
x[3] <= 1.65
gini = 0.053
samples = 37
value = [0, 36, 1]
x[3] <= 1.75
gini = 0.206
samples = 43
value = [0, 5, 38]
gini = 0.0
samples = 36
value = [0, 36, 0]
gini = 0.0
samples = 1
value = [0, 0, 1]
x[2] <= 4.95
gini = 0.5
samples = 8
value = [0, 4, 4]
x[2] <= 4.85
gini = 0.056
samples = 35
value = [0, 1, 34]
gini = 0.0
samples = 2
value = [0, 2, 0]
x[3] <= 1.55
gini = 0.444
samples = 6
value = [0, 2, 4]
x[1] <= 3.1
gini = 0.444
samples = 3
value = [0, 1, 2]
gini = 0.0
samples = 32
value = [0, 0, 32]


gini = 0.0
samples = 3
value = [0, 0, 3]
x[2] <= 5.45
gini = 0.444
samples = 3
value = [0, 2, 1]
gini = 0.0
samples = 2
value = [0, 0, 2]
gini = 0.0
samples = 1
value = [0, 1, 0]
gini = 0.0
samples = 2
value = [0, 2, 0]
gini = 0.0
samples = 1
value = [0, 0, 1]

5-Identify outliers using a box plot

In [12]:

```
sns.boxplot(data=data);

## sepal width has some outliers
```



6-Calculate the Entropy

In [21]:

```
total = len(y)
class_counts = y.value_counts()
print(class_counts)

entropy = 0.0
for i in class_counts:
    print(i)
    probability = i / total
    entropy -= probability * math.log2(probability)

print('Entropy:', entropy)
```

```
setosa        50
versicolor    50
virginica     50
Name: species, dtype: int64
50
50
50
Entropy: 1.584962500721156
```

7- Calculate the gini index

In [14]:
```
import numpy as np

def gini_index(labels):
    classes, count = np.unique(labels, return_counts=True)

    prob = count / len(labels)
    gini = 1 - np.sum(prob ** 2)
    return gini



gini = gini_index(y)
print("Gini Index:", gini)
```

```
Gini Index: 0.6666666666666667
```

In [ ]:

In [ ]: