Task 6 - Prediction using Decision Tree Algorithm

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Decision Tree classifier

Objective:

- Create the Decision Tree classifier and visualize it graphically.
- The purpose is if we feed any new data to this classifier, it would be able to predict the right class accordingly.

Importing the Required Libraries

In [1]:
```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib
%matplotlib inline
from matplotlib import pyplot as plt
import sklearn.datasets as datasets
```

Importing the Dataset

In [2]:
```
iris = datasets.load_iris()

df = pd.DataFrame(iris.data, columns=iris.feature_names)
```

In [3]:
```
df.head()
```

Out[3]:

	sepal length (cm)	sepal width (cm)	petal length (cm)	petal width (cm)
0	5.1	3.5	1.4	0.2
1	4.9	3.0	1.4	0.2
2	4.7	3.2	1.3	0.2
3	4.6	3.1	1.5	0.2
4	5.0	3.6	1.4	0.2

In [4]:
```
df.shape
```

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

Let's check the summary of data

In [5]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 150 entries, 0 to 149
Data columns (total 4 columns):
 #   Column             Non-Null Count  Dtype  
---  ------             --------------  -----  
 0   sepal length (cm)  150 non-null    float64
 1   sepal width (cm)   150 non-null    float64
 2   petal length (cm)  150 non-null    float64
 3   petal width (cm)   150 non-null    float64
dtypes: float64(4)
memory usage: 4.8 KB
```

In [6]:
```
df.describe().T
```

Out[6]:

	count	mean	std	min	25%	50%	75%	max
sepal length (cm)	150.0	5.843333	0.828066	4.3	5.1	5.80	6.4	7.9
sepal width (cm)	150.0	3.057333	0.435866	2.0	2.8	3.00	3.3	4.4
petal length (cm)	150.0	3.758000	1.765298	1.0	1.6	4.35	5.1	6.9
petal width (cm)	150.0	1.199333	0.762238	0.1	0.3	1.30	1.8	2.5

Missing Value

In [7]:
```
df.isnull().sum()
```

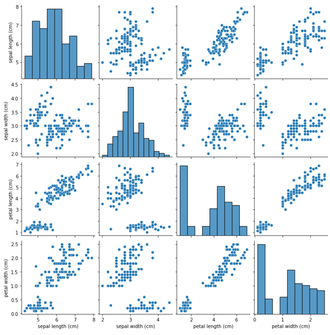
Out[7]:
```
sepal length (cm)    0
sepal width (cm)     0
petal length (cm)    0
petal width (cm)     0
dtype: int64
```

- As we see, there is no missing value in the dataset

Data Visualizing

In [8]:
```
sns.pairplot(df)
```

Out[8]:
```
<seaborn.axisgrid.PairGrid at 0x1e8eaf5a7c8>
```



In [9]:
```
X = iris.data
Y = iris.target
Y = Y.astype(int)
```

In [10]:
```
from sklearn.preprocessing import StandardScaler
scaler=StandardScaler()

scaler.fit(X)

X = scaler.transform(X)
```

Splitting dataset into train and test sets

In [11]:
```
from sklearn.model_selection import train_test_split
X_train, X_test, Y_train, Y_test = train_test_split(X, Y, test_size=0.25, random_state=42)
```

In [12]:
```
X_train.shape, X_test.shape, Y_train.shape, Y_test.shape
```

Out[12]:
```
((112, 4), (38, 4), (112,), (38,))
```

Defining the Decision Tree Algorithm

In [13]:
```
from sklearn.tree import DecisionTreeClassifier
model = DecisionTreeClassifier()

model.fit(X_train, Y_train)
```

Out[13]:
```
DecisionTreeClassifier(ccp_alpha=0.0, class_weight=None, criterion='gini',
                       max_depth=None, max_features=None, max_leaf_nodes=None,
                       min_impurity_decrease=0.0, min_impurity_split=None,
                       min_samples_leaf=1, min_samples_split=2,
                       min_weight_fraction_leaf=0.0, presort='deprecated',
                       random_state=None, splitter='best')
```

In [14]:
```
y_pred = model.predict(X_test)

y_pred
```

Out[14]:
```
array([1, 0, 2, 1, 1, 0, 1, 2, 1, 1, 2, 0, 0, 0, 0, 1, 2, 1, 1, 2, 0, 2,
       0, 2, 2, 2, 2, 2, 0, 0, 0, 0, 1, 0, 0, 2, 1, 0])
```

In [15]:
```
cmp = pd.DataFrame({'Actual':Y_test, 'Predicted':y_pred})

cmp.head()
```

Out[15]:

	Actual	Predicted
0	1	1
1	0	0
2	2	2
3	1	1
4	1	1

Constructing Confusion Matrix

In [16]:
```
from sklearn.metrics import confusion_matrix, accuracy_score, classification_report

print("confusion matrix :")
print(confusion_matrix(Y_test, y_pred))

print("\n")

print("Accuracy score :")
print(accuracy_score(Y_test, y_pred))

print("\n")

print("Classification Report :")
print(classification_report(Y_test, y_pred))
```

```
confusion matrix :
[[15  0  0]
 [ 0 11  0]
 [ 0  0 12]]


Accuracy score :
1.0


Classification Report :
              precision    recall  f1-score   support

           0       1.00      1.00      1.00        15
           1       1.00      1.00      1.00        11
           2       1.00      1.00      1.00        12

    accuracy                           1.00        38
   macro avg       1.00      1.00      1.00        38
weighted avg       1.00      1.00      1.00        38
```

In [17]:
```
print(list(zip(df.columns,model.feature_importances_)))
```

```
[('sepal length (cm)', 0.03575133668502114), ('sepal width (cm)', 0.0), ('petal length (cm)', 0.39794323988722234), ('petal width (cm)', 0.5663054235122565)]
```

Visualize of the Decision Tree

In [18]:
```
from sklearn import tree
with open("model_DecisionTree.txt","w") as f:
    f=tree.export_graphviz(model,feature_names = df.columns[:],out_file = f)
```

In [19]:
```
fn=['sepal length (cm)','sepal width (cm)','petal length (cm)','petal width (cm)']
cn=['setosa','versicolor','virginica']

fig, axes = plt.subplots(nrows = 1, ncols = 1, figsize = (4,4), dpi = 300)

tree.plot_tree(model, feature_names = fn, class_names = cn, filled = True,rounded=True);
```