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Task-6 Decision Tree

In [1]:
```
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import pandas as pd

#for encoding
from sklearn.preprocessing import LabelEncoder
#for train test splitting
from sklearn.model_selection import train_test_split
#for decision tree object
from sklearn.tree import DecisionTreeClassifier
#for checking testing results
from sklearn.metrics import classification_report, confusion_matrix
#for visualizing tree
from sklearn.tree import plot_tree
```

In [2]:
```
df=pd.read_csv("Iris.csv")
```

In [3]:
```
df
```

Out[3]:

	Id	SepalLengthCm	SepalWidthCm	PetalLengthCm	PetalWidthCm	Species
0	1	5.1	3.5	1.4	0.2	Iris-setosa
1	2	4.9	3.0	1.4	0.2	Iris-setosa
2	3	4.7	3.2	1.3	0.2	Iris-setosa
3	4	4.6	3.1	1.5	0.2	Iris-setosa
4	5	5.0	3.6	1.4	0.2	Iris-setosa
...	...	...	...	...	...	...
145	146	6.7	3.0	5.2	2.3	Iris-virginica
146	147	6.3	2.5	5.0	1.9	Iris-virginica
147	148	6.5	3.0	5.2	2.0	Iris-virginica
148	149	6.2	3.4	5.4	2.3	Iris-virginica
149	150	5.9	3.0	5.1	1.8	Iris-virginica

150 rows × 6 columns

In [4]:
```
df.head()
```

Out[4]:

	Id	SepalLengthCm	SepalWidthCm	PetalLengthCm	PetalWidthCm	Species
0	1	5.1	3.5	1.4	0.2	Iris-setosa
1	2	4.9	3.0	1.4	0.2	Iris-setosa
2	3	4.7	3.2	1.3	0.2	Iris-setosa

	Id	SepalLengthCm	SepalWidthCm	PetalLengthCm	PetalWidthCm	Species
3	4	4.6	3.1	1.5	0.2	Iris-setosa
4	5	5.0	3.6	1.4	0.2	Iris-setosa

In [6]:
```
#Gettiing information of dataset
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 150 entries, 0 to 149
Data columns (total 6 columns):
 #   Column         Non-Null Count  Dtype  
---  ------         --------------  -----  
 0   Id             150 non-null    int64  
 1   SepalLengthCm  150 non-null    float64
 2   SepalWidthCm   150 non-null    float64
 3   PetalLengthCm  150 non-null    float64
 4   PetalWidthCm   150 non-null    float64
 5   Species        150 non-null    object 
dtypes: float64(4), int64(1), object(1)
memory usage: 7.2+ KB
```

In [7]:
```
#Check the null values
df.isnull().any()
```

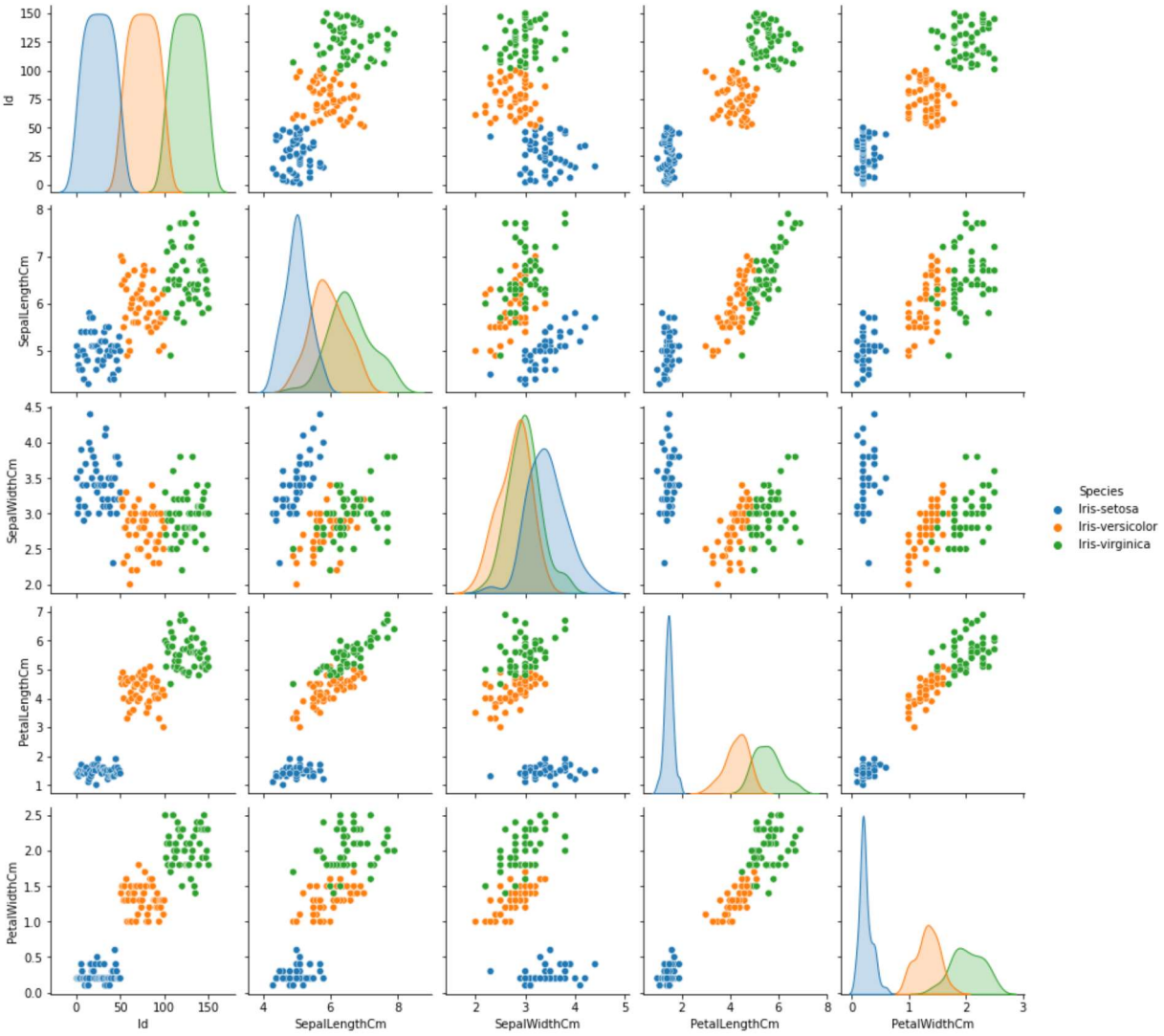
Out[7]:
```
Id               False
SepalLengthCm    False
SepalWidthCm     False
PetalLengthCm    False
PetalWidthCm     False
Species          False
dtype: bool
```

In [8]:
```
df.shape
```

Out[8]:
```
(150, 6)
```

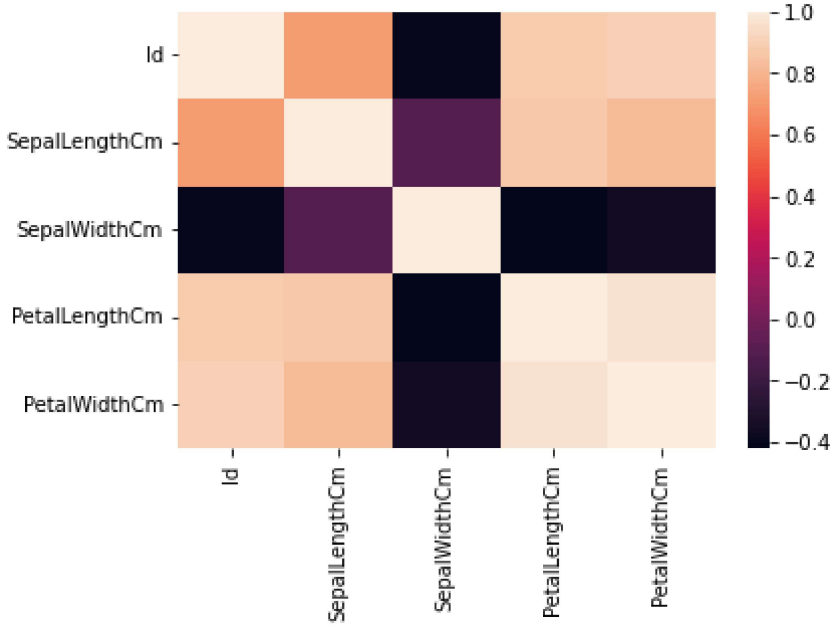
In [9]:
```
#et's plot pair plot to visualise the attributes all at once
sns.pairplot(data=df, hue = 'Species')
```

Out[9]:
```
<seaborn.axisgrid.PairGrid at 0x2b61db91bb0>
```



In [10]:
```
# correlation matrix
sns.heatmap(df.corr())
```

Out[10]: <AxesSubplot:>



Decision Tree Algorithm

In [11]:
```
target = df['Species']
#creating a copy to avoid deleting the column from original data set
df1 = df.copy()
#dropping target variable
df1 = df1.drop('Species', axis =1)
df1.shape
```

Out[11]:
```
(150, 5)
```

In [12]:
```
# Defining the attributes
X = df1
```

In [13]:
```
target
```

Out[13]:
```
0         Iris-setosa
1         Iris-setosa
2         Iris-setosa
3         Iris-setosa
4         Iris-setosa
            ...
145    Iris-virginica
146    Iris-virginica
147    Iris-virginica
148    Iris-virginica
149    Iris-virginica
Name: Species, Length: 150, dtype: object
```

In [14]:
```
#Label encoding
le = LabelEncoder()
target = le.fit_transform(target)#to convert categorical variables to numerical vari
target
```

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

In [15]:
```
y=target
```

In [16]:
```
# Splitting the data - 80:20 ratio
X_train, X_test, y_train, y_test = train_test_split(X , y, test_size = 0.2, random_s

print("Training split input- ", X_train.shape)
print("Testing split input- ", X_test.shape)
```

```
Training split input-  (120, 5)
Testing split input-  (30, 5)
```

In [17]:
```
# Defining the decision tree algorithm

dtree=DecisionTreeClassifier()
dtree.fit(X_train,y_train)

print('Decision Tree Classifer Created')
```

```
Decision Tree Classifer Created
```

In [18]:
```
# Predicting the values of test data
y_pred = dtree.predict(X_test)
print("Classification report - \n", classification_report(y_test,y_pred))
```

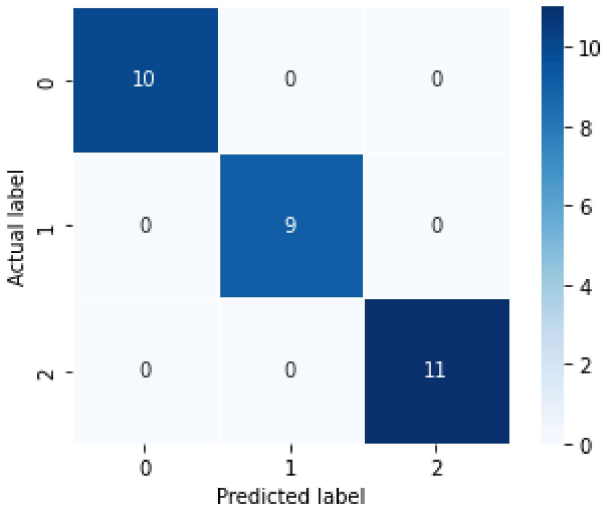
```
Classification report -
              precision    recall  f1-score   support

           0       1.00      1.00      1.00        10
           1       1.00      1.00      1.00         9
           2       1.00      1.00      1.00        11

    accuracy                           1.00        30
   macro avg       1.00      1.00      1.00        30
weighted avg       1.00      1.00      1.00        30
```

In [19]:
```
cm =confusion_matrix(y_test, y_pred)
print(cm)
```

```
[[10  0  0]
 [ 0  9  0]
 [ 0  0 11]]
```

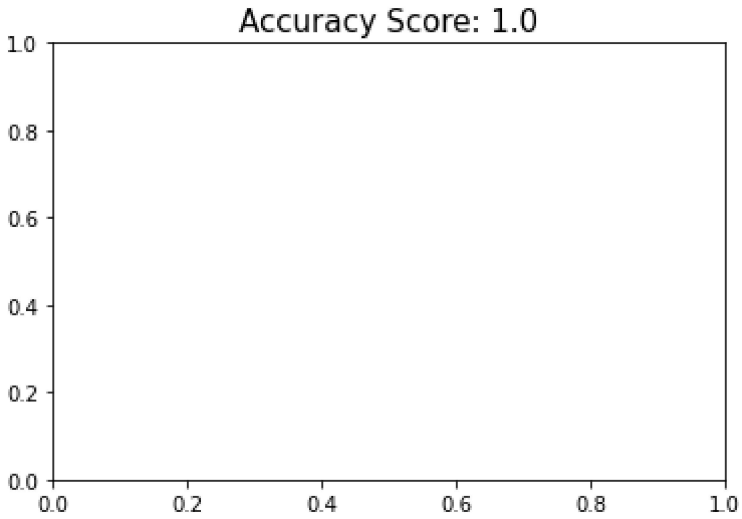
In [20]:
```
sns.heatmap(data=cm,linewidths=.5, annot=True,square = True,  cmap = 'Blues')
plt.ylabel('Actual label')
plt.xlabel('Predicted label')
```

Out[20]:
```
Text(0.5, 15.0, 'Predicted label')
```



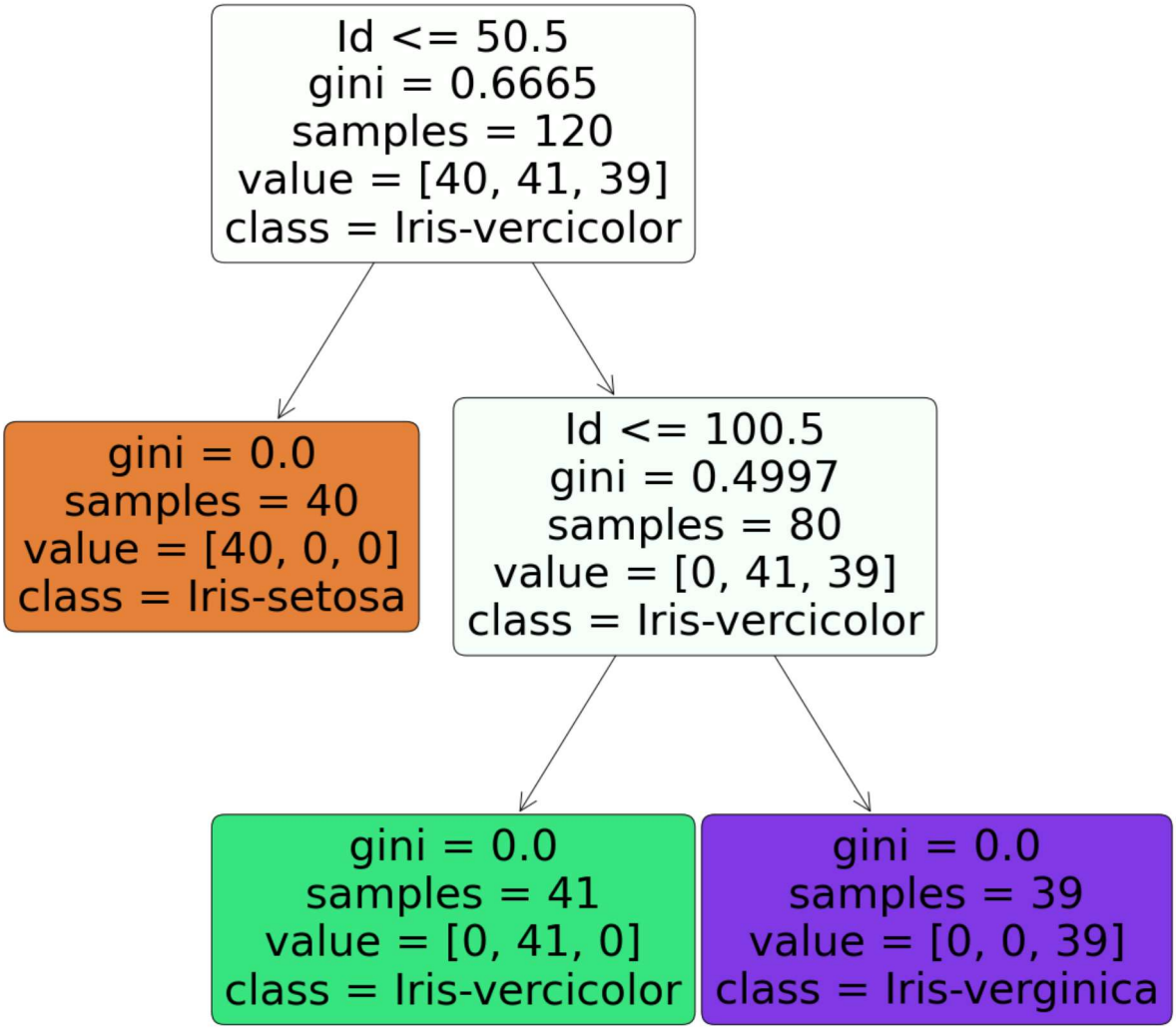
In [21]:
```
all_sample_title = 'Accuracy Score: {0}'.format(dtree.score(X_test, y_test))
plt.title(all_sample_title, size = 15)
```

Out[21]:
```
Text(0.5, 1.0, 'Accuracy Score: 1.0')
```



In [22]:

```
# Visualising the graph without the use of graphviz

plt.figure(figsize = (20,20))
dec_tree = plot_tree(decision_tree=dtree, feature_names = df1.columns,
                     class_names =["Iris-setosa", "Iris-vercicolor", "Iris-verginica
```



In [ ]: