Data Science and Business Analytics Intern #GRIPSEP22

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Task-1: Exploratory Data Analysis Using Decision Tree

Task-2: Prediction Using Unsupervised ML (Level-Beginner)

Source Python

Library

In [1]:
```
import numpy as np
import matplotlib.pyplot as mplt
import pandas as pd
import seaborn as sbn
from sklearn.datasets import load_iris
import sklearn.metrics as skm
from sklearn import tree
from sklearn.tree import DecisionTreeClassifier
from sklearn.model_selection import train_test_split
```

Import Data Set

In [2]:
```
iris = load_iris()
X = iris.data[:,:]
y = iris.target
```

In [3]:
```
X[:20]
```

Out[3]:
```
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]])
```

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

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

In [5]:
```
y
```

Out[5]:
```
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])
```

Checking Dependent Values

In [6]:
```
iris.target_names
```

Out[6]:
```
array(['setosa', 'versicolor', 'virginica'], dtype='<U10')
```

Exploratory Data Analysis

Converting the Dataset into DataFrame

In [7]:
```
data = pd.DataFrame(iris["data"],columns=["Sepal Length","Sepal Width","Petal Le
```

In [8]:
```
data.sample(5)
```

Out[8]:

	Sepal Length	Sepal Width	Petal Length	Petal Width
13	4.3	3.0	1.1	0.1
70	5.9	3.2	4.8	1.8
44	5.1	3.8	1.9	0.4
135	7.7	3.0	6.1	2.3
41	4.5	2.3	1.3	0.3

In [9]:
```
data.shape
```

Out[9]:
```
(150, 4)
```

Number of rows 150, and number of columns 5 in thedataset

Data Cleaning

NULL (empty) values in the dataset

In [10]:
```
data.isnull().sum()
```

Out[10]:
```
Sepal Length    0
Sepal Width     0
Petal Length    0
Petal Width     0
dtype: int64
```

There is no NULL (empty) values in the dataset

Duplicated values in the dataset

In [11]:
```
data.duplicated().sum()
```

Out[11]:
```
1
```

There is one duplicated value in the dataset

Removing duplicate values

In [12]:
```
data = data.drop_duplicates()
```

In [13]:
```
data.duplicated().sum()
```

Out[13]:
```
0
```

Descriptive Statistics

In [14]:
```
data.describe()
```

Out[14]:

	Sepal Length	Sepal Width	Petal Length	Petal Width
count	149.000000	149.000000	149.000000	149.000000
mean	5.843624	3.059732	3.748993	1.194631
std	0.830851	0.436342	1.767791	0.762622
min	4.300000	2.000000	1.000000	0.100000
25%	5.100000	2.800000	1.600000	0.300000
50%	5.800000	3.000000	4.300000	1.300000
75%	6.400000	3.300000	5.100000	1.800000
max	7.900000	4.400000	6.900000	2.500000

In [15]:
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 149 entries, 0 to 149
Data columns (total 4 columns):
 #   Column        Non-Null Count  Dtype  
---  ------        --------------  -----  
 0   Sepal Length  149 non-null    float64
 1   Sepal Width   149 non-null    float64
 2   Petal Length  149 non-null    float64
 3   Petal Width   149 non-null    float64
dtypes: float64(4)
memory usage: 5.8 KB
```

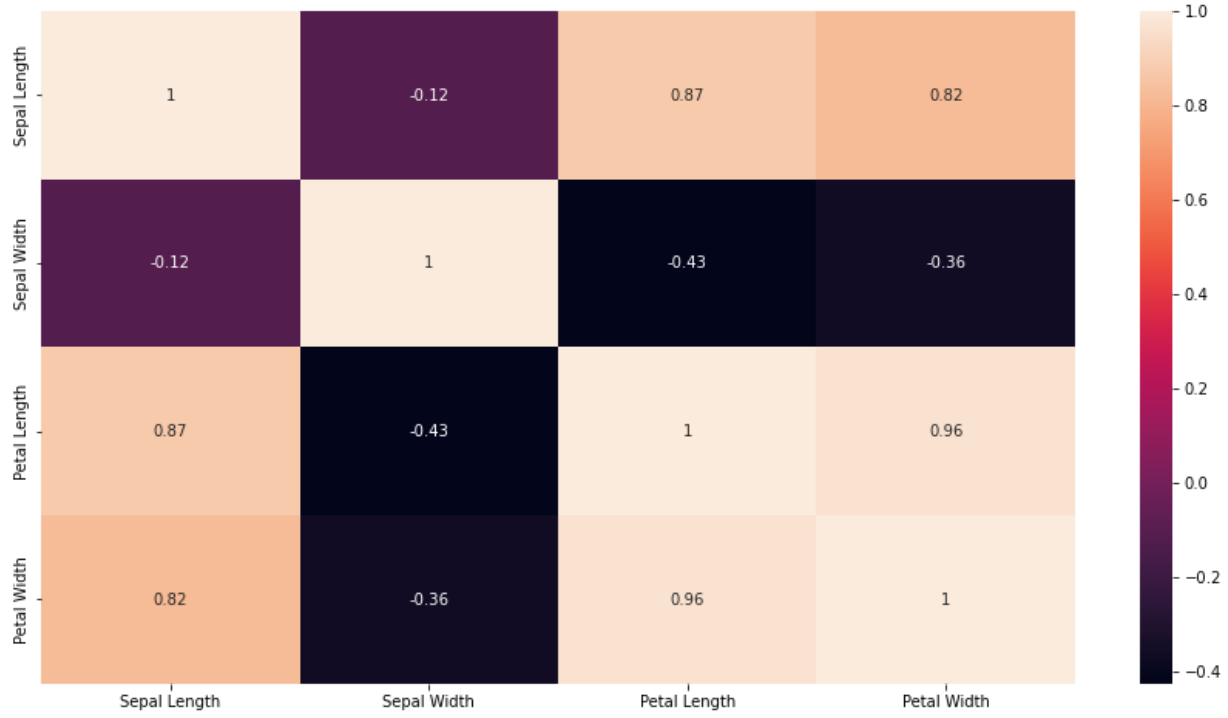
In [16]:
```
data.corr()
```

Out[16]:

	Sepal Length	Sepal Width	Petal Length	Petal Width
Sepal Length	1.000000	-0.118129	0.873738	0.820620
Sepal Width	-0.118129	1.000000	-0.426028	-0.362894
Petal Length	0.873738	-0.426028	1.000000	0.962772
Petal Width	0.820620	-0.362894	0.962772	1.000000

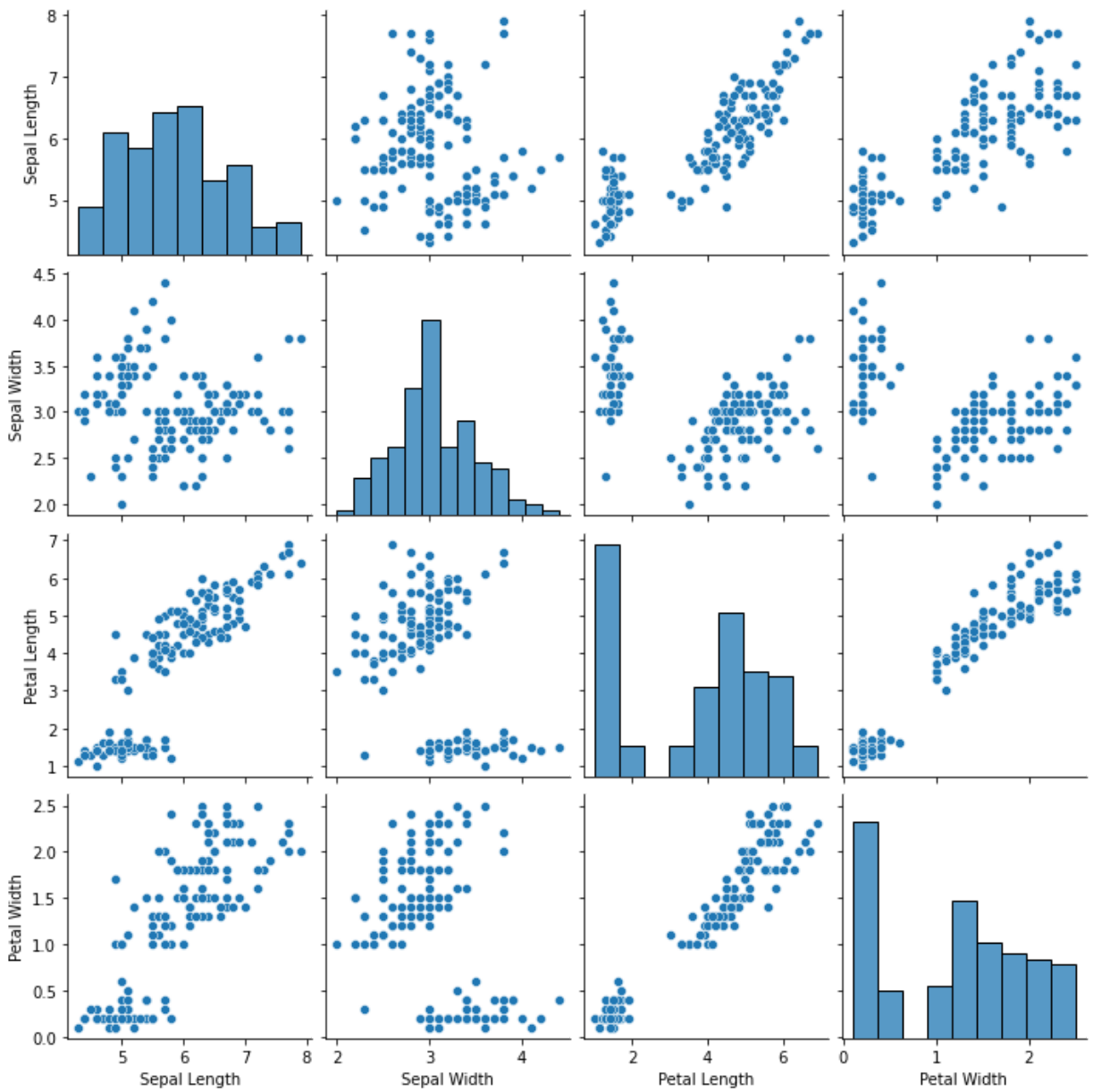
Data Visualization

In [17]:
```
mplt.figure(figsize=(15,8))
sbn.heatmap(data.corr(),annot=True)
mplt.show()
```



Pairplot Plotting

In [18]:
```
sbn.pairplot(data)
mplt.show()
```



Decision Tree Model Training for the Dataset

In [19]:
```
X_tain, X_test, y_train, y_test = train_test_split(X, y, test_size = 0.3, random_
```

In [20]:
```
dtc = DecisionTreeClassifier()
dtc.fit(X_tain,y_train)
```

Out[20]:
```
DecisionTreeClassifier()
```

In [21]:
```
y_pred = dtc.predict(X_test)
y_pred
```

Out[21]:
```
array([0, 1, 1, 0, 2, 1, 2, 0, 0, 2, 1, 0, 2, 1, 1, 0, 1, 1, 0, 0, 1, 1,
       2, 0, 2, 1, 0, 0, 1, 2, 1, 2, 1, 2, 2, 0, 1, 0, 1, 2, 2, 0, 1, 2,
       1])
```

Comaparision Between Actual & Predicted values

In [22]:
```
pd.DataFrame({"Actual":y_test, "Predicted":y_pred})
```

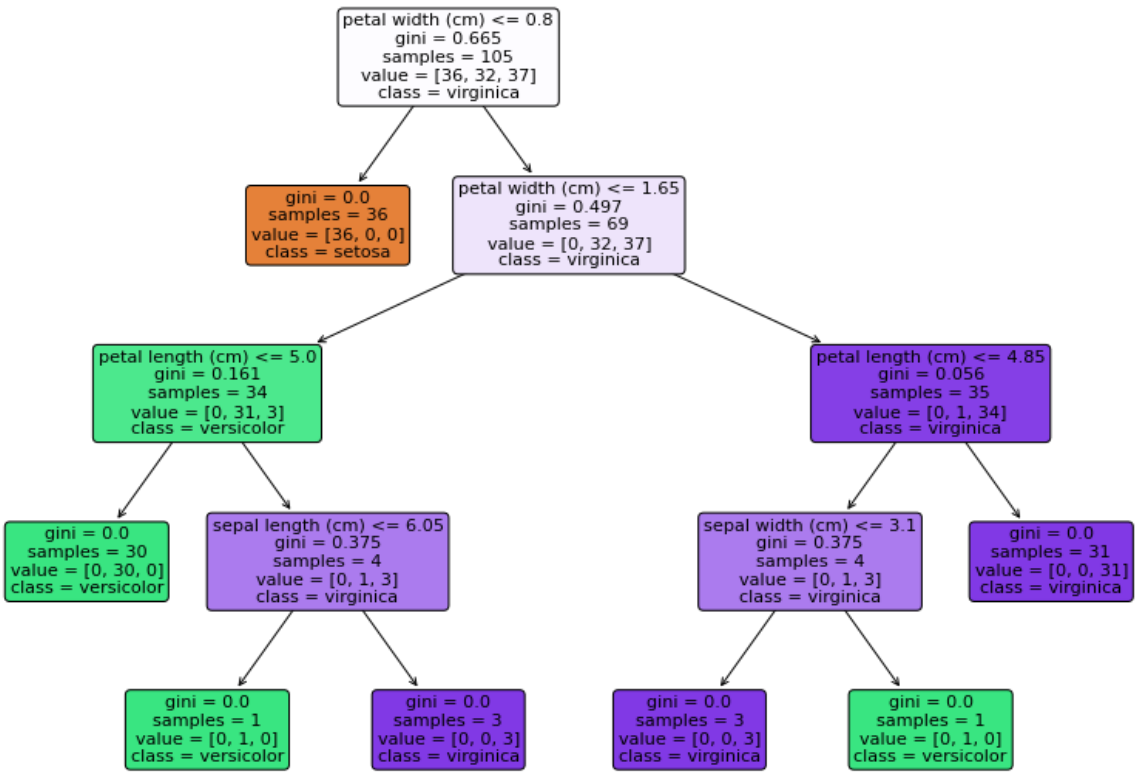
Out[22]:

	Actual	Predicted
0	0	0
1	1	1
2	1	1
3	0	0
4	2	2
5	1	1
6	2	2
7	0	0
8	0	0
9	2	2
10	1	1
11	0	0
12	2	2
13	1	1
14	1	1
15	0	0
16	1	1
17	1	1
18	0	0
19	0	0
20	1	1
21	1	1
22	1	2
23	0	0
24	2	2
25	1	1
26	0	0
27	0	0
28	1	1
29	2	2
30	1	1
31	2	2
32	1	1
33	2	2

	Actual	Predicted
34	2	2
35	0	0
36	1	1
37	0	0
38	1	1
39	2	2
40	2	2
41	0	0
42	2	1
43	2	2
44	1	1

Trained Model Visaulization

In [23]:
```
mplt.figure(figsize=(14,10))
tree.plot_tree(dtc, class_names=iris.target_names, feature_names=iris.feature_nam
mplt.show()
```



New Data Feeding to Trained Model

Prediction of Class Output for Few Random Feeds

In [27]:
```
pre_result = dtc.predict([[6.5, 3.4, 4.7, 2.1]])
if pre_result == [0]:
    print("setosa")
elif pre_result == [1]:
    print("versicolor")
else:
    print("virginica")
```

```
versicolor
```

The Model Prediction for Values 6.5, 3.4, 4.7, 2.1 is 'versicolor'

In [31]:
```
pre_result = dtc.predict([[3.5, 5.9, 6.3, 8.7]])
if pre_result == [0]:
    print("setosa")
elif pre_result == [1]:
    print("versicolor")
else:
    print("virginica")
```

```
virginica
```

The Model Prediction for Values 3.5, 5.9, 6.3, 8.7 is 'virginica'

Model Accuracy

In [32]:
```
print("Accuracy Score: ",skm.accuracy_score(y_test, y_pred))
```

```
Accuracy Score:  0.9555555555555556
```

The Model Accuracy is 0.95 or 95.56%

Kmean Clusturing

In [33]:
```
iris = pd.DataFrame(iris.data, columns = iris.feature_names)
iris.head()
```

Out[33]:

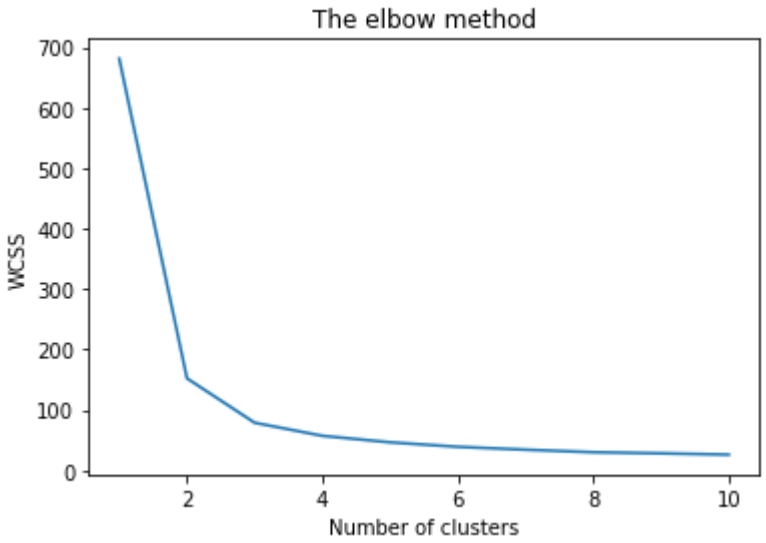
	sepal length (cm)	sepal width (cm)	petal length (cm)	petal width (cm)
0	5.1	3.5	1.4	0.2
1	4.9	3.0	1.4	0.2
2	4.7	3.2	1.3	0.2
3	4.6	3.1	1.5	0.2
4	5.0	3.6	1.4	0.2

The Elbow Method (Within Cluster Sum of Squares)

In [34]:
```
x = iris.iloc[:, [0, 1, 2, 3]].values
from sklearn.cluster import KMeans
wcss = []
for i in range(1, 11):
    kmeans = KMeans(n_clusters = i, init = 'k-means++', max_iter = 300, n_init =
    kmeans.fit(x)
    wcss.append(kmeans.inertia_)

mplt.plot(range(1, 11), wcss)  #WCSS= Within cluster sum of squares
mplt.title('The elbow method')
mplt.xlabel('Number of clusters')
mplt.ylabel('WCSS')
mplt.show()
```

```
C:\Users\ASUS\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:881: UserW
arning: KMeans is known to have a memory leak on Windows with MKL, when there a
re less chunks than available threads. You can avoid it by setting the environm
ent variable OMP_NUM_THREADS=1.
  warnings.warn(
```



From above figure, which has a shape of elbow. This method for determinig the optimum numbers of clustres is know as "The Elbow Method". The optimum numbers of clusters is the point, at which first elbow occures. In the present data set elbow occures at "3", so the optimum numbers of clusters is "3". Thus, for further visualization the optimum numbers of samples is taken as "3".

Kmeans and Cluster Visualization

Kmeans classifier

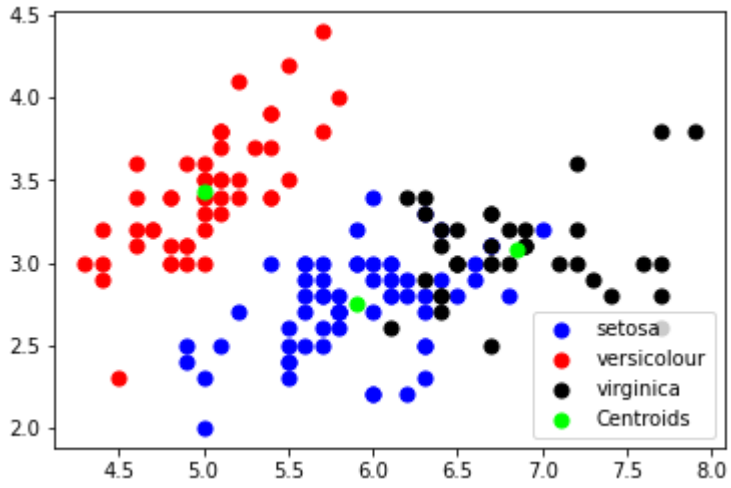
In [35]:
```
kmeans = KMeans(n_clusters = 3, init = 'k-means++', max_iter = 300, n_init = 10,
y_kmeans = kmeans.fit_predict(x)
```

Visualising first two colums

In [36]:
```
mplt.scatter(x[y_kmeans == 0, 0], x[y_kmeans == 0, 1], s = 50, c = 'blue', label
mplt.scatter(x[y_kmeans == 1, 0], x[y_kmeans == 1, 1], s = 50, c = 'red', label =
mplt.scatter(x[y_kmeans == 2, 0], x[y_kmeans == 2, 1], s = 50, c = 'black', label

# Clusters' Centroids
mplt.scatter(kmeans.cluster_centers_[:, 0], kmeans.cluster_centers_[:,1],s = 50,
mplt.legend()
```

Out[36]:
```
<matplotlib.legend.Legend at 0x18171c38fa0>
```



In [ ]:
```
```