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Data Science & Business Analytics Internship

GRIP - The Spark Foundation

TASK 6 - Prediction using Decision Tree Algorithm

Objective :Create Decision Tree classifier on IRIS dataset 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.

● Dataset : https://bit.ly/3kXTdox

```
import numpy as np
import pandas as pd
from sklearn import tree
import matplotlib.pyplot as plt
from sklearn.datasets import load_iris
from sklearn.tree import DecisionTreeClassifier
from sklearn.ensemble import RandomForestClassifier
from sklearn.model_selection import train_test_split
%matplotlib inline
```

```
df=load_iris()
```

```
data=pd.DataFrame(df.data,columns=df.feature_names)
data['target']=df.target
```

```
data.head()
```

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

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 150 entries, 0 to 149
Data columns (total 5 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
 4   target             150 non-null    int64  
dtypes: float64(4), int64(1)
memory usage: 6.0 KB
```

```
data.describe()
```

	sepal length (cm)	sepal width (cm)	petal length (cm)	petal width (cm)	target
count	150.000000	150.000000	150.000000	150.000000	150.000000
mean	5.843333	3.057333	3.758000	1.199333	1.000000
std	0.828066	0.435866	1.765298	0.762238	0.819232
min	4.300000	2.000000	1.000000	0.100000	0.000000
25%	5.100000	2.800000	1.600000	0.300000	0.000000
50%	5.800000	3.000000	4.350000	1.300000	1.000000
75%	6.400000	3.300000	5.100000	1.800000	2.000000
max	7.900000	4.400000	6.900000	2.500000	2.000000

```
data.duplicated().sum()
```

```
1
```

```
data.drop_duplicates(inplace=True)
```

```
data.duplicated().sum()
```

```
0
```

Spliting data into Training and Test sets

```
X_train, X_test, Y_train, Y_test = train_test_split(data[df.feature_names], data['target'], random_s
```

Modeling the pattern

```
#Make an instance of the model
clf = DecisionTreeClassifier(max_depth = 2, random_state = 0)
```

```
clf.fit(X_train, Y_train)
```

```
DecisionTreeClassifier(ccp_alpha=0.0, class_weight=None, criterion='gini',
```

```
                       max_depth=2, 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=0, splitter='best')
```

```
y_pred=clf.predict(X_test)
```

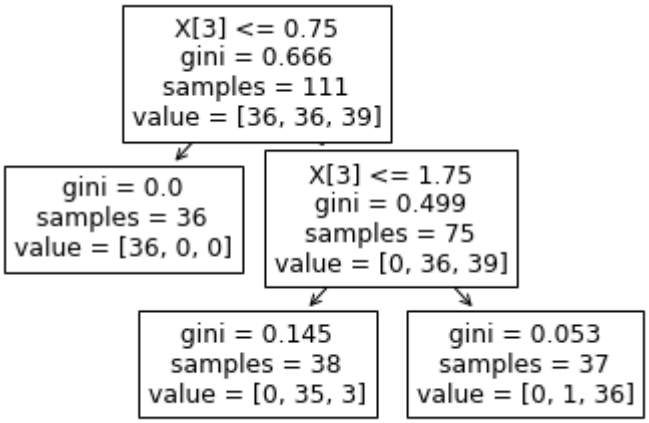
```
y_pred
```

```
array([1, 2, 1, 1, 0, 2, 2, 1, 2, 1, 0, 0, 1, 0, 0, 2, 2, 1, 0, 0, 0, 0,
       1, 0, 1, 1, 1, 0, 0, 1, 0, 1, 1, 1, 0, 2, 2, 1])
```

Visualize Decision Tree

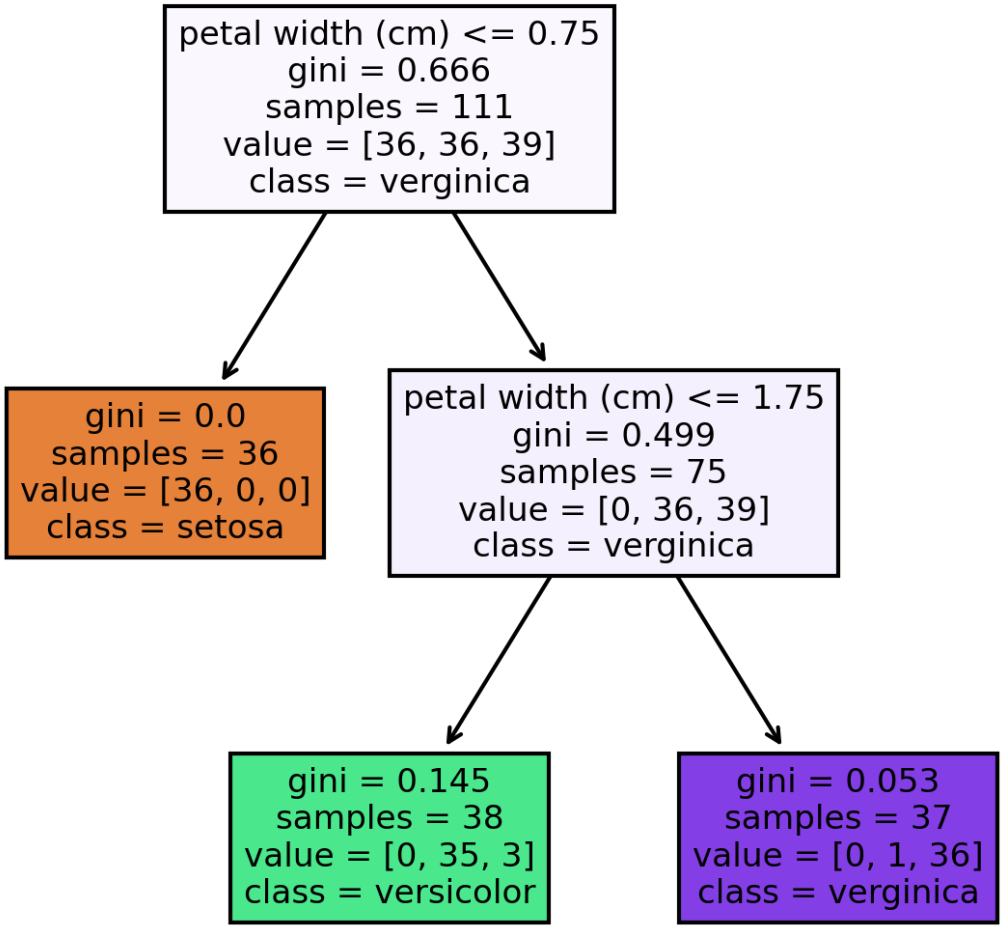
```
tree.plot_tree(clf)
```

```
[Text(133.92000000000002, 181.2, 'X[3] <= 0.75\ngini = 0.666\nsamples = 111\nvalue = [36, 36, 3
 Text(66.96000000000001, 108.72, 'gini = 0.0\nsamples = 36\nvalue = [36, 0, 0]'),
 Text(200.88000000000002, 108.72, 'X[3] <= 1.75\ngini = 0.499\nsamples = 75\nvalue = [0, 36, 39
 Text(133.92000000000002, 36.23999999999998, 'gini = 0.145\nsamples = 38\nvalue = [0, 35, 3]')
 Text(267.84000000000003, 36.23999999999998, 'gini = 0.053\nsamples = 37\nvalue = [0, 1, 36]')
```




```
features = ['sepal length (cm)', 'sepal width (cm)', 'petal length (cm)', 'petal width (cm)']
classes = ['setosa', 'versicolor', 'verginica']
```

```
fig,ax=plt.subplots(1,1,figsize=(5,5),dpi=300)
tree.plot_tree(clf,feature_names=features,class_names=classes,ax=ax,filled=True)
plt.show()
```




```
fig.savefig('iris_tree.png')
```

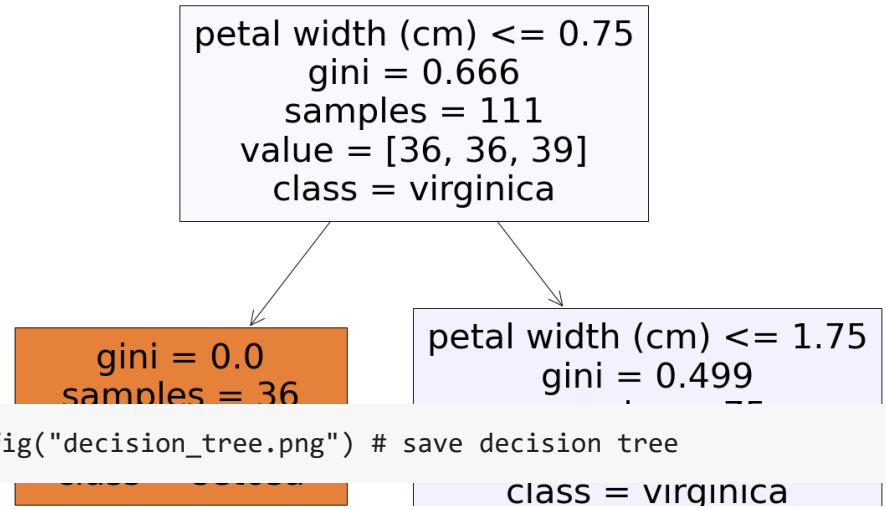
Type 2 Visualize A Decision Tree

```
text_representation=tree.export_text(clf)
text_representation
```

```
'|--- feature_3 <= 0.75\n|   |--- class: 0\n|--- feature_3 >  0.75\n|   |---
feature_3 <= 1.75\n|   |   |--- class: 1\n|   |--- feature_3 >  1.75\n|   |
```

```
# writing content to a file
with open("decision_tree.log", "w") as fout:
    fout.write(text_representation)
```

```
fig = plt.figure(figsize = (25 , 20))
tree1 = tree.plot_tree(clf, feature_names = df.feature_names, class_names = df.target_names, filled
```




```
fig.savefig("decision_tree.png") # save decision tree
```

Plot Decision Tree with dtreeviz package

```
iris = load_iris()
X = iris.data

y = iris.target

#Create decision Tree classifier object
clf = DecisionTreeClassifier(random_state = 0)

#Train model

model = clf.fit(X , y)
```

```
!pip install dtreeviz
```

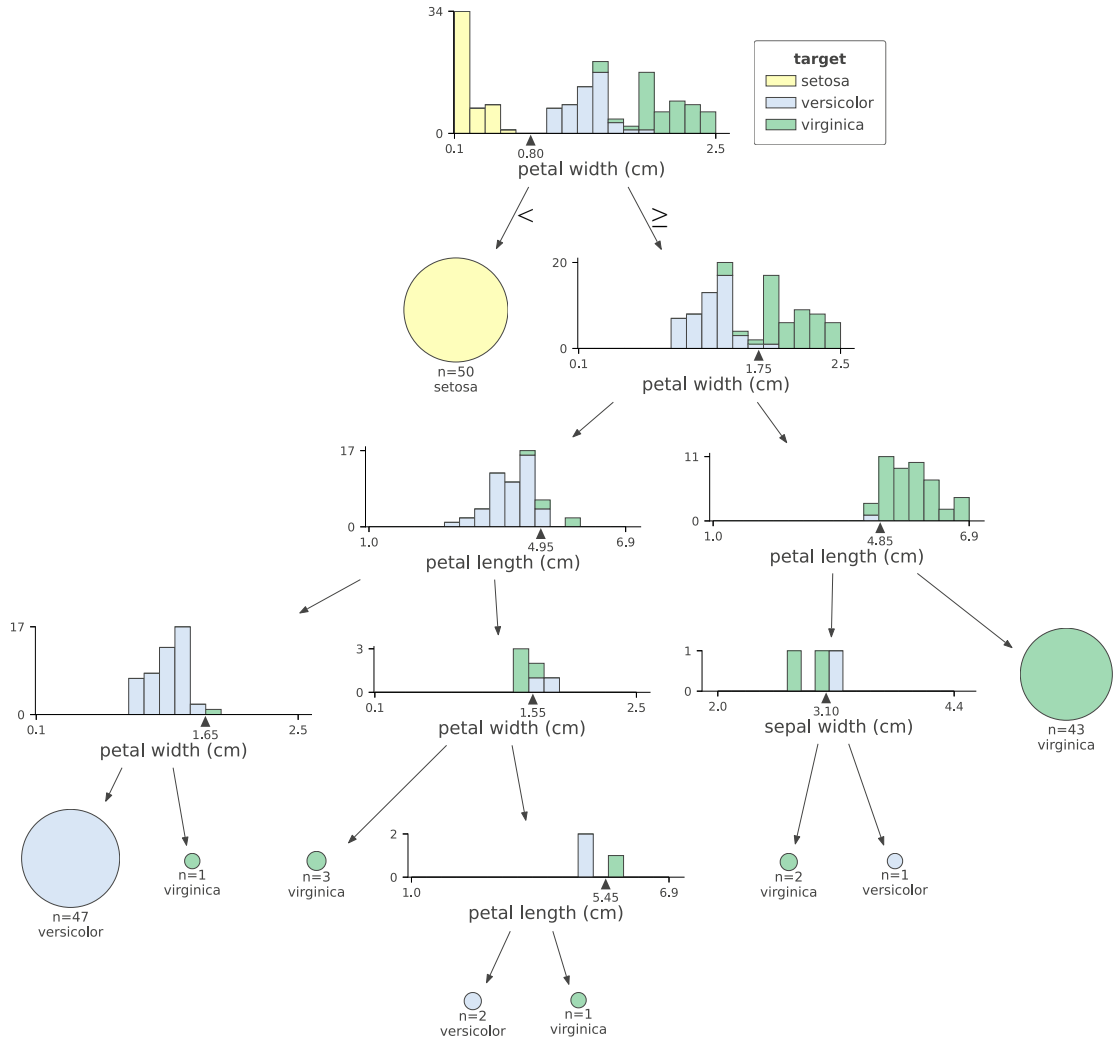
```
Collecting dtreeviz
  Downloading https://files.pythonhosted.org/packages/a7/3c/a0177c90c6e9aa01d77a0c82bb98c01a695
     |████████████████████████████████| 51kB 3.4MB/s
Requirement already satisfied: graphviz>=0.9 in /usr/local/lib/python3.6/dist-packages (from dt
Requirement already satisfied: pandas in /usr/local/lib/python3.6/dist-packages (from dtreeviz
Requirement already satisfied: numpy in /usr/local/lib/python3.6/dist-packages (from dtreeviz)
Requirement already satisfied: scikit-learn in /usr/local/lib/python3.6/dist-packages (from dtr
Requirement already satisfied: matplotlib in /usr/local/lib/python3.6/dist-packages (from dtree
Collecting colour
  Downloading https://files.pythonhosted.org/packages/74/46/e81907704ab203206769dee1385dc77e146
Requirement already satisfied: xgboost in /usr/local/lib/python3.6/dist-packages (from dtreeviz
Requirement already satisfied: pytest in /usr/local/lib/python3.6/dist-packages (from dtreeviz
Collecting pyspark
  Downloading https://files.pythonhosted.org/packages/f0/26/198fc8c0b98580f617cb03cb298c605658
     |████████████████████████████████| 204.2MB 70kB/s
Requirement already satisfied: pytz>=2017.2 in /usr/local/lib/python3.6/dist-packages (from pan
Requirement already satisfied: python-dateutil>=2.7.3 in /usr/local/lib/python3.6/dist-packages
Requirement already satisfied: scipy>=0.17.0 in /usr/local/lib/python3.6/dist-packages (from sc
Requirement already satisfied: joblib>=0.11 in /usr/local/lib/python3.6/dist-packages (from sci
Requirement already satisfied: kiwisolver>=1.0.1 in /usr/local/lib/python3.6/dist-packages (fro
Requirement already satisfied: pyparsing!=2.0.4,!=2.1.2,!=2.1.6,>=2.0.1 in /usr/local/lib/pytho
Requirement already satisfied: cycler>=0.10 in /usr/local/lib/python3.6/dist-packages (from mat
Requirement already satisfied: py>=1.5.0 in /usr/local/lib/python3.6/dist-packages (from pytest
Requirement already satisfied: setuptools in /usr/local/lib/python3.6/dist-packages (from pytes
Requirement already satisfied: more-itertools>=4.0.0 in /usr/local/lib/python3.6/dist-packages
Requirement already satisfied: attrs>=17.4.0 in /usr/local/lib/python3.6/dist-packages (from py
Requirement already satisfied: pluggy<0.8,>=0.5 in /usr/local/lib/python3.6/dist-packages (from
Requirement already satisfied: atomicwrites>=1.0 in /usr/local/lib/python3.6/dist-packages (fro
```

```
Requirement already satisfied: six>=1.10.0 in /usr/local/lib/python3.6/dist-packages (from pyte
Collecting py4j==0.10.9
  Downloading https://files.pythonhosted.org/packages/9e/b6/6a4fb90cd235dc8e265a6a2067f2a2c99f0
     |████████████████████████████████| 204kB 42.5MB/s
Building wheels for collected packages: dtreeviz, pyspark
  Building wheel for dtreeviz (setup.py) ... done
  Created wheel for dtreeviz: filename=dtreeviz-1.1.2-cp36-none-any.whl size=52359 sha256=24d8b
  Stored in directory: /root/.cache/pip/wheels/6c/42/13/06bfd7ecac5313d2bea233a1e1165fec14a4d36
  Building wheel for pyspark (setup.py) ... done
  Created wheel for pyspark: filename=pyspark-3.0.1-py2.py3-none-any.whl size=204612243 sha256=
  Stored in directory: /root/.cache/pip/wheels/5e/bd/07/031766ca628adec8435bb40f0bd83bb676ce65f
Successfully built dtreeviz pyspark
Installing collected packages: colour, py4j, pyspark, dtreeviz
Successfully installed colour-0.1.5 dtreeviz-1.1.2 py4j-0.10.9 pyspark-3.0.1
```

```
from dtreeviz.trees import dtreeviz
viz=dtreeviz(clf, X,y,target_name = "target", feature_names = iris.feature_names, class_names = list

viz
```

```
findfont: Font family ['Arial'] not found. Falling back to DejaVu Sans.
findfont: Font family ['Arial'] not found. Falling back to DejaVu Sans.
findfont: Font family ['Arial'] not found. Falling back to DejaVu Sans.
```




```
viz.save("decision_tree.svg") # save decision tree
```