Exp-7 Decision Tree Random forest

November 1, 2022

[1]:
```
import pandas
from sklearn import tree
from sklearn.tree import DecisionTreeClassifier
import matplotlib.pyplot as plt
```

[2]:
```
from sklearn.model_selection import train_test_split
from sklearn.datasets import load_iris
```

[3]:
```
irisData = load_iris()
```

[4]:
```
X = irisData.data
y = irisData.target
```

[5]:
```
X
```

[5]:
```
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],
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       [5.4, 3.7, 1.5, 0.2],
       [4.8, 3.4, 1.6, 0.2],
       [4.8, 3. , 1.4, 0.1],
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       [5.8, 4. , 1.2, 0.2],
       [5.7, 4.4, 1.5, 0.4],
       [5.4, 3.9, 1.3, 0.4],
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       [5.7, 3.8, 1.7, 0.3],
       [5.1, 3.8, 1.5, 0.3],
       [5.4, 3.4, 1.7, 0.2],
       [5.1, 3.7, 1.5, 0.4],
       [4.6, 3.6, 1. , 0.2],
```

```
[5.1, 3.3, 1.7, 0.5],
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[5.6, 2.9, 3.6, 1.3],
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[6.2, 2.2, 4.5, 1.5],
[5.6, 2.5, 3.9, 1.1],
```

```
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[5.5, 2.4, 3.7, 1. ],
[5.8, 2.7, 3.9, 1.2],
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[6. , 3.4, 4.5, 1.6],
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[5.5, 2.6, 4.4, 1.2],
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[5.8, 2.6, 4. , 1.2],
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[5.7, 3. , 4.2, 1.2],
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[6.2, 2.9, 4.3, 1.3],
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[5.8, 2.7, 5.1, 1.9],
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[6.5, 3. , 5.8, 2.2],
[7.6, 3. , 6.6, 2.1],
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[7.3, 2.9, 6.3, 1.8],
[6.7, 2.5, 5.8, 1.8],
[7.2, 3.6, 6.1, 2.5],
[6.5, 3.2, 5.1, 2. ],
[6.4, 2.7, 5.3, 1.9],
[6.8, 3. , 5.5, 2.1],
[5.7, 2.5, 5. , 2. ],
[5.8, 2.8, 5.1, 2.4],
[6.4, 3.2, 5.3, 2.3],
[6.5, 3. , 5.5, 1.8],
```

```
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       [7.7, 2.6, 6.9, 2.3],
       [6. , 2.2, 5. , 1.5],
       [6.9, 3.2, 5.7, 2.3],
       [5.6, 2.8, 4.9, 2. ],
       [7.7, 2.8, 6.7, 2. ],
       [6.3, 2.7, 4.9, 1.8],
       [6.7, 3.3, 5.7, 2.1],
       [7.2, 3.2, 6. , 1.8],
       [6.2, 2.8, 4.8, 1.8],
       [6.1, 3. , 4.9, 1.8],
       [6.4, 2.8, 5.6, 2.1],
       [7.2, 3. , 5.8, 1.6],
       [7.4, 2.8, 6.1, 1.9],
       [7.9, 3.8, 6.4, 2. ],
       [6.4, 2.8, 5.6, 2.2],
       [6.3, 2.8, 5.1, 1.5],
       [6.1, 2.6, 5.6, 1.4],
       [7.7, 3. , 6.1, 2.3],
       [6.3, 3.4, 5.6, 2.4],
       [6.4, 3.1, 5.5, 1.8],
       [6. , 3. , 4.8, 1.8],
       [6.9, 3.1, 5.4, 2.1],
       [6.7, 3.1, 5.6, 2.4],
       [6.9, 3.1, 5.1, 2.3],
       [5.8, 2.7, 5.1, 1.9],
       [6.8, 3.2, 5.9, 2.3],
       [6.7, 3.3, 5.7, 2.5],
       [6.7, 3. , 5.2, 2.3],
       [6.3, 2.5, 5. , 1.9],
       [6.5, 3. , 5.2, 2. ],
       [6.2, 3.4, 5.4, 2.3],
       [5.9, 3. , 5.1, 1.8]])
```

[6]:
```
y
```

[6]:
```
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])
```

[7]:
```
X_train, X_test, y_train, y_test = train_test_split(
X, y, test_size = 0.3, random_state=50)
```

[8]:
```
dtree = DecisionTreeClassifier()
dtree.fit(X_train, y_train)
```

[8]:
```
DecisionTreeClassifier()
```

[9]:
```
y_pred = dtree.predict(X_test)
```

[10]:
```
y_pred
```

[10]:
```
array([1, 1, 0, 0, 2, 2, 2, 0, 0, 1, 0, 2, 0, 2, 1, 0, 1, 0, 1, 2, 2, 1,
       0, 2, 1, 2, 1, 1, 1, 2, 2, 1, 1, 2, 0, 0, 1, 1, 1, 0, 0, 1, 2, 0,
       2])
```

[11]:
```
from sklearn.metrics import confusion_matrix, accuracy_score,␣
 ↪classification_report

cm_DT = confusion_matrix(y_test, y_pred)

print(f"Confusion Matrix for DT:\n{cm_DT}\n")

acc_DT = accuracy_score(y_test, y_pred)
print(f"Accuracy Score: {acc_DT}")
```

```
Confusion Matrix for DT:
[[14  0  0]
 [ 0 16  1]
 [ 0  1 13]]

Accuracy Score: 0.9555555555555556
```

[12]:
```
print(f"Classification Report for DT:\n{classification_report(y_test,␣
 ↪y_pred)}\n")
```

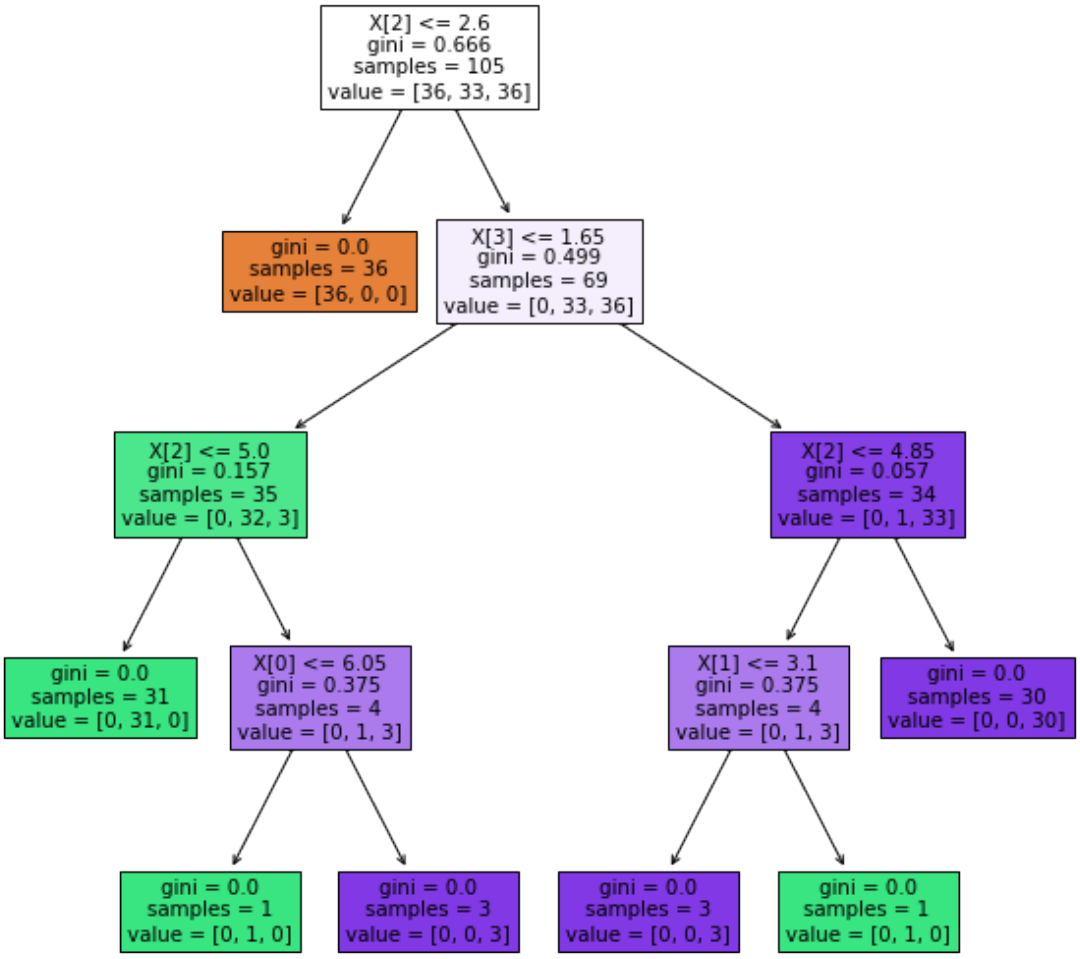
```
Classification Report for DT:
              precision    recall  f1-score   support

           0       1.00      1.00      1.00        14
           1       0.94      0.94      0.94        17
           2       0.93      0.93      0.93        14

    accuracy                           0.96        45
   macro avg       0.96      0.96      0.96        45
weighted avg       0.96      0.96      0.96        45
```

[13]:
```
from sklearn import tree
```

[14]:
```
plt.figure(figsize=(10, 10)) # Resize figure
tree.plot_tree(dtree, filled=True)
plt.show()
```



1 Random Forest

[15]:
```
from sklearn.ensemble import RandomForestClassifier
```

[16]:
```
classifier_rf = RandomForestClassifier(random_state=0, n_jobs=-1, max_depth=10,
n_estimators=100, oob_score=True)
```

[17]:
```
classifier_rf.fit(X_train, y_train)
```

[17]:
```
RandomForestClassifier(max_depth=10, n_jobs=-1, oob_score=True, random_state=0)
```

[18]:
```
y_pred_RF = classifier_rf.predict(X_test)
```

[19]:
```
y_pred_RF
```

[19]:
```
array([1, 1, 0, 0, 2, 2, 2, 0, 0, 1, 0, 2, 0, 2, 1, 0, 1, 0, 1, 2, 2, 1,
       0, 2, 1, 2, 1, 1, 1, 2, 2, 1, 1, 2, 0, 0, 1, 1, 1, 0, 0, 1, 2, 0,
       2])
```

[20]:
```
# Confusion Matrix
cm_RF= confusion_matrix(y_test, y_pred_RF)
print(f"Confusion Matrix for RF:\n{cm_RF}\n")
```

```
Confusion Matrix for RF:
[[14  0  0]
 [ 0 16  1]
 [ 0  1 13]]
```

[21]:
```
# Accuracy Score
acc_RF = accuracy_score(y_test, y_pred_RF)
print(f"Accuracy Score: {acc_RF}")
```

```
Accuracy Score: 0.9555555555555556
```

[22]:
```
# Classification Report
print(f"Classification Report for RF:\n{classification_report(y_test,␣
 ↪y_pred_RF)}\n")
```

```
Classification Report for RF:
              precision    recall  f1-score   support

           0       1.00      1.00      1.00        14
           1       0.94      0.94      0.94        17
           2       0.93      0.93      0.93        14

    accuracy                           0.96        45
   macro avg       0.96      0.96      0.96        45
weighted avg       0.96      0.96      0.96        45
```