RandomForest_ML_04

March 15, 2022

1 *Random Forest model for Machine Learning*

- Decision tree Algorithm
- Splits due to entropy gain
- Class labels are assigned on a leafe node
- Slight change in the data set changes the whole tree
- Sensitive to the training data
- Therefore model fails to generalize
- Any unknown value prediction may effeted
- The solution is Random Forest making multiple decision tress

[ ]:
```
# Bootstrapping + Aggregation = Bagging
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from sklearn.ensemble import RandomForestClassifier
from sklearn.model_selection import train_test_split
from sklearn.metrics import accuracy_score
```

[ ]:
```
from sklearn import datasets

#Load dataset
iris = datasets.load_iris()
```

[ ]:
```
print(iris.data[0:5])

# print the iris labels (0:setosa, 1:versicolor, 2:virginica)
print(iris.target)
```

```
[[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]]
[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 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 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 2]
```

[ ]:
```
data=pd.DataFrame({
    'sepal length':iris.data[:,0],
    'sepal width':iris.data[:,1],
    'petal length':iris.data[:,2],
    'petal width':iris.data[:,3],
    'species':iris.target
})
data.head()
```

[ ]:

	sepal length	sepal width	petal length	petal width	species
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

[ ]:
```
X=data[['sepal length', 'sepal width', 'petal length', 'petal width']]  #␣
 ↪Features
y=data['species']  # Labels

# Split dataset into training set and test set
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2)
```

[ ]:
```
model = RandomForestClassifier(n_estimators=50)
model.fit(X,y)
```

[ ]:
```
RandomForestClassifier(n_estimators=50)
```

[ ]:
```
y_predict = model.predict(X_test)
y_predict
```

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

[ ]:
```
model.predict([[10,4,2,6]])
```

```
C:\Users\Sartaj\AppData\Local\Programs\Python\Python39\lib\site-
packages\sklearn\base.py:450: UserWarning: X does not have valid feature names,
but RandomForestClassifier was fitted with feature names
  warnings.warn(
```

[ ]:
```
array([0])
```

[ ]:
```
score = accuracy_score(y_test,y_predict)
score
```

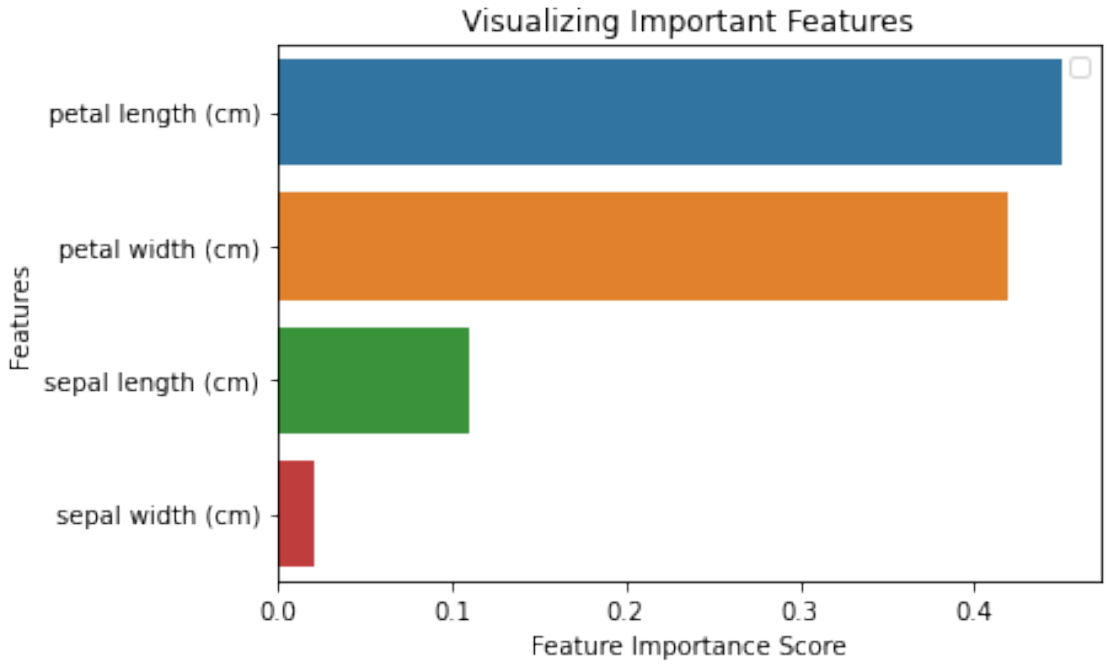
[ ]:
```
1.0
```

[ ]:
```
from sklearn import  metrics
cm = metrics.confusion_matrix(y_test,y_predict)
cm
```

[ ]:
```
array([[11,  0,  0],
       [ 0, 11,  0],
       [ 0,  0,  8]], dtype=int64)
```

[ ]:
```
feature_imp = pd.Series(model.feature_importances_,index=iris.feature_names).
 ↪sort_values(ascending=False)
feature_imp
import seaborn as sns
%matplotlib inline
# Creating a bar plot
sns.barplot(x=feature_imp, y=feature_imp.index)
# Add labels to your graph
plt.xlabel('Feature Importance Score')
plt.ylabel('Features')
plt.title("Visualizing Important Features")
plt.legend()
plt.show()
```

```
No handles with labels found to put in legend.
```



[ ]:
```
import seaborn as sns
plt.figure(figsize=(20,5))
sns.heatmap(cm, annot=True, fmt=".3f", linewidths=.5, square=True,␣
 ↪cmap="Spectral")
plt.ylabel("Actual Output")
plt.xlabel("Predicted Output")
all_sample_title = 'Accuracy Score :{0}'.format(score)
plt.title(all_sample_title, size = 15)
```

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