DATA MINING

LA2

- Submitted To: **Mrs. Vani K.S.**

GROUP 12

Implement Decision with Gini and entropy. Compare the accuracies using both and plot the trees.

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Implementation using Python

```
from sklearn.metrics import accuracy_score
from sklearn.tree import DecisionTreeClassifier
import matplotlib.pyplot as plt
from sklearn.tree import plot_tree
from sklearn.preprocessing import LabelEncoder
from sklearn.model_selection import train_test_split
import seaborn as sns


# Function to make predictions
def prediction(X_test, clf_object):
    # Predicton on test with giniIndex
    y_pred = clf_object.predict(X_test)
    print("Predicted values: ")
    print(y_pred)
    return y_pred


df = sns.load_dataset('iris')
df.info()
```

```
df.isnull().any()
df.shape
target = df['species']
df1 = df.copy()
df1 = df1.drop('species', axis=1)
df1.shape
df1.head()
# Defining the attributes
X = df1
target
# label encoding
le = LabelEncoder()
target = le.fit_transform(target)
target
y = target
X_train, X_test, y_train, y_test = train_test_split(
    X, y, test_size=0.5, random_state=42)

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

# Creating Decision Tree Classifier
dtree = DecisionTreeClassifier(criterion='entropy')
dtree.fit(X_train, y_train)
gini_dtree = DecisionTreeClassifier(criterion='gini')
gini_dtree.fit(X_train, y_train)

# accuracy
# entropy
y_pred = prediction(X_test, dtree)
entropy_accuracy = accuracy_score(y_test, y_pred)
print("Accuracy using entopry: ", entropy_accuracy)

# gini
y_pred_gini = prediction(X_test, gini_dtree)
gini_accuracy = accuracy_score(y_test, y_pred_gini)
print("Accuracy using gini: ", gini_accuracy)

if entropy_accuracy > gini_accuracy:
    print("\nAccuracy with Entropy is higher\n")
else:
    print("\nAccuracy with Gini is higher\n")

# Decision Tree plotting
plt.figure(figsize=(20, 20))
```

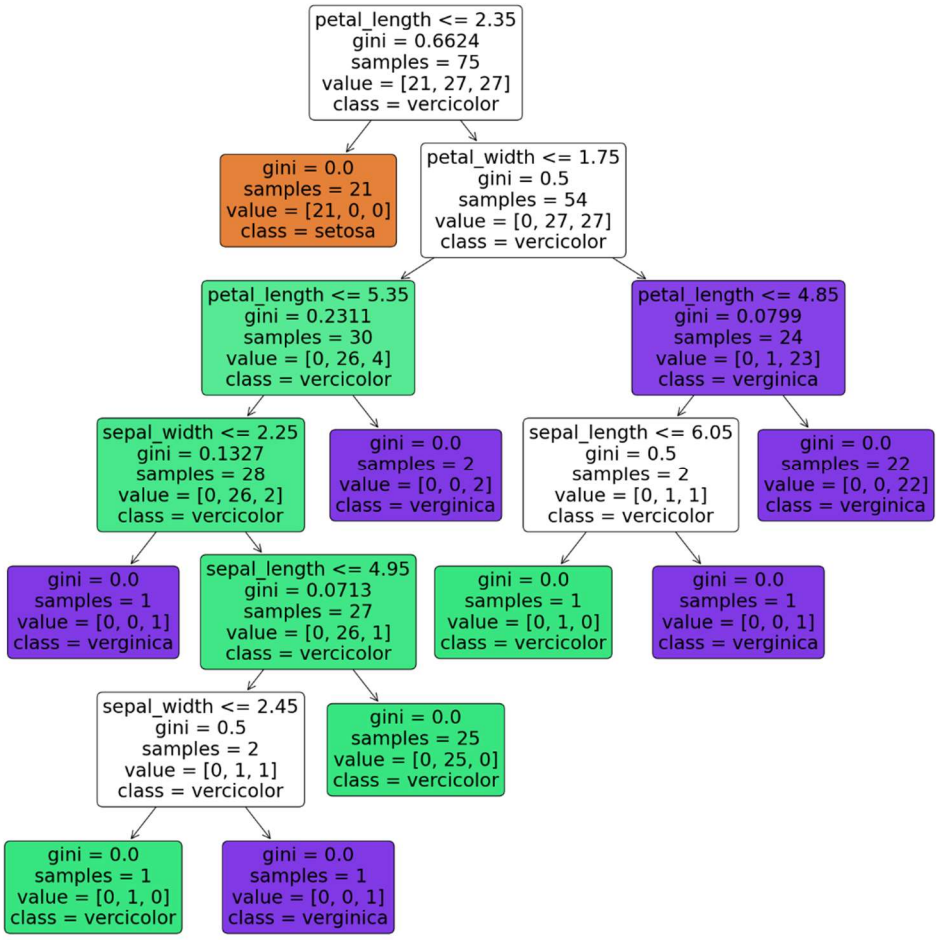
```
dec_tree = plot_tree(decision_tree=dtree, feature_names=df1.columns,
                     class_names=["setosa", "vercicolor", "verginica"],
filled=True, precision=4, rounded=True)

plt.savefig("IrisTree_Entropy.png")

plt.figure(figsize=(20, 20))
gini_dec_tree = plot_tree(decision_tree=gini_dtree,
feature_names=df1.columns,
                          class_names=["setosa", "vercicolor", "verginica"],
filled=True, precision=4, rounded=True)

plt.savefig("IrisTree_Gini.png")

plt.show()
```

Output:

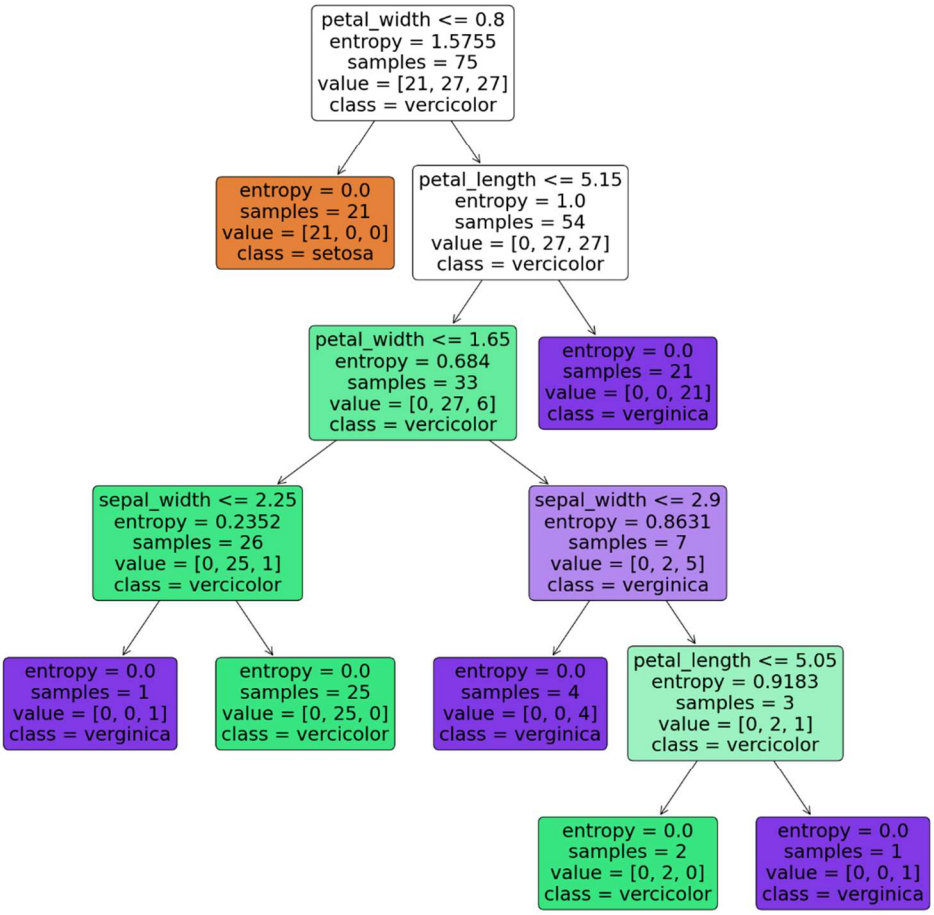
```
RangeIndex: 150 entries, 0 to 149
Data columns (total 5 columns):
 #   Column        Non-Null Count  Dtype
---  ------        --------------  -----
 0   sepal_length  150 non-null    float64
 1   sepal_width   150 non-null    float64
 2   petal_length  150 non-null    float64
 3   petal_width   150 non-null    float64
 4   species       150 non-null    object
dtypes: float64(4), object(1)
memory usage: 6.0+ KB
Training split input:  (75, 4)
Testing split input:  (75, 4)
Predicted values:
[1 0 2 1 1 0 1 2 2 1 2 0 0 0 0 1 2 1 1 2 0 1 0 2 2 2 2 2 0 0 0 0 1 0 0 2 1
 0 0 0 2 1 1 0 0 1 1 2 1 2 1 2 1 0 2 1 0 0 0 2 2 0 0 0 1 0 1 2 0 1 2 0 1 2
 2]
Accuracy using entopry:  0.92
Predicted values:
[1 0 2 1 1 0 1 2 2 1 2 0 0 0 0 1 2 1 1 2 0 2 0 2 2 2 2 2 0 0 0 0 1 0 0 2 1
 0 0 0 2 1 1 0 0 1 1 2 1 2 1 2 1 0 2 1 0 0 0 2 2 0 0 0 1 0 1 2 0 1 2 0 2 2
 2]
Accuracy using gini:  0.9466666666666667

Accuracy with gini index is higher
```

Decision Trees:

Gini



Entropy


petal_width <= 0.8
entropy = 1.5755
samples = 75
value = [21, 27, 27]
class = vercicolor
entropy = 0.0
samples = 21
value = [21, 0, 0]
class = setosa
petal_length <= 5.15
entropy = 1.0
samples = 54
value = [0, 27, 27]
class = vercicolor
petal_width <= 1.65
entropy = 0.684
samples = 33
value = [0, 27, 6]
class = vercicolor
entropy = 0.0
samples = 21
value = [0, 0, 21]
class = verginica
sepal_width <= 2.25
entropy = 0.2352
samples = 26
value = [0, 25, 1]
class = vercicolor
sepal_width <= 2.9
entropy = 0.8631
samples = 7
value = [0, 2, 5]
class = verginica
entropy = 0.0
samples = 1
value = [0, 0, 1]
class = verginica
entropy = 0.0
samples = 25
value = [0, 25, 0]
class = vercicolor
entropy = 0.0
samples = 4
value = [0, 0, 4]
class = verginica
petal_length <= 5.05
entropy = 0.9183
samples = 3
value = [0, 2, 1]
class = vercicolor
entropy = 0.0
samples = 2
value = [0, 2, 0]
class = vercicolor
entropy = 0.0
samples = 1
value = [0, 0, 1]
class = verginica