jupyter KNN and Decision Tree - Iris Data Set14f13337 Last Checkpoint: 3 hours ago

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Code JupyterLab Python 3 (ipykernel)

[13]:
```
# This Python 3 environment comes with many helpful analytics libraries installed
# It is defined by the kaggle/python Docker image: https://github.com/kaggle/docker-python
# For example, here's several helpful packages to load

import numpy as np # linear algebra
import pandas as pd # data processing, CSV file I/O (e.g. pd.read_csv)

# Input data files are available in the read-only "../input/" directory
# For example, running this (by clicking run or pressing Shift+Enter) will list all files under the input directory

import os
for dirname, _, filenames in os.walk('C:\Abdullha'):
    for filename in filenames:# Th
        print(os.path.join(dirname, filename))

# You can write up to 20GB to the current directory (/kaggle/working/) that gets preserved as output when you create a version using "Save & Run All"
# You can also write temporary files to /kaggle/temp/, but they won't be saved outside of the current session
```

```
C:\Abdullha\Iris.csv
```

[14]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

[22]:
```
import pandas as pd

df = pd.read_csv(r'C:\Abdullha\Iris.csv')
df.head(10)
```

[22]:

	Id	SepalLengthCm	SepalWidthCm	PetalLengthCm	PetalWidthCm	Species
0	1	5.1	3.5	1.4	0.2	Iris-setosa
1	2	4.9	3.0	1.4	0.2	Iris-setosa
2	3	4.7	3.2	1.3	0.2	Iris-setosa
3	4	4.6	3.1	1.5	0.2	Iris-setosa
4	5	5.0	3.6	1.4	0.2	Iris-setosa
5	6	5.4	3.9	1.7	0.4	Iris-setosa
6	7	4.6	3.4	1.4	0.3	Iris-setosa
7	8	5.0	3.4	1.5	0.2	Iris-setosa
8	9	4.4	2.9	1.4	0.2	Iris-setosa
9	10	4.9	3.1	1.5	0.1	Iris-setosa

[23]:
```
df.tail(10)
```

[23]:

	Id	SepalLengthCm	SepalWidthCm	PetalLengthCm	PetalWidthCm	Species
140	141	6.7	3.1	5.6	2.4	Iris-virginica
141	142	6.9	3.1	5.1	2.3	Iris-virginica
142	143	5.8	2.7	5.1	1.9	Iris-virginica
143	144	6.8	3.2	5.9	2.3	Iris-virginica
144	145	6.7	3.3	5.7	2.5	Iris-virginica
145	146	6.7	3.0	5.2	2.3	Iris-virginica
146	147	6.3	2.5	5.0	1.9	Iris-virginica
147	148	6.5	3.0	5.2	2.0	Iris-virginica
148	149	6.2	3.4	5.4	2.3	Iris-virginica
149	150	5.9	3.0	5.1	1.8	Iris-virginica

[24]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 150 entries, 0 to 149
Data columns (total 6 columns):
 #   Column         Non-Null Count  Dtype  
---  ------         --------------  -----  
 0   Id             150 non-null    int64  
 1   SepalLengthCm  150 non-null    float64
 2   SepalWidthCm   150 non-null    float64
 3   PetalLengthCm  150 non-null    float64
 4   PetalWidthCm   150 non-null    float64
 5   Species        150 non-null    object 
dtypes: float64(4), int64(1), object(1)
memory usage: 7.2+ KB
```

[25]:
```
df.isnull().any().values
```

[25]:
```
array([False, False, False, False, False, False])
```

[26]:
```
df.describe().T
```

[26]:

	count	mean	std	min	25%	50%	75%	max
Id	150.0	75.500000	43.445368	1.0	38.25	75.50	112.75	150.0
SepalLengthCm	150.0	5.843333	0.828066	4.3	5.10	5.80	6.40	7.9
SepalWidthCm	150.0	3.054000	0.433594	2.0	2.80	3.00	3.30	4.4
PetalLengthCm	150.0	3.758667	1.764420	1.0	1.60	4.35	5.10	6.9
PetalWidthCm	150.0	1.198667	0.763161	0.1	0.30	1.30	1.80	2.5

[27]:
```
df['Species'].value_counts()
```

[27]:
```
Species
Iris-setosa        50
Iris-versicolor    50
Iris-virginica     50
Name: count, dtype: int64
```

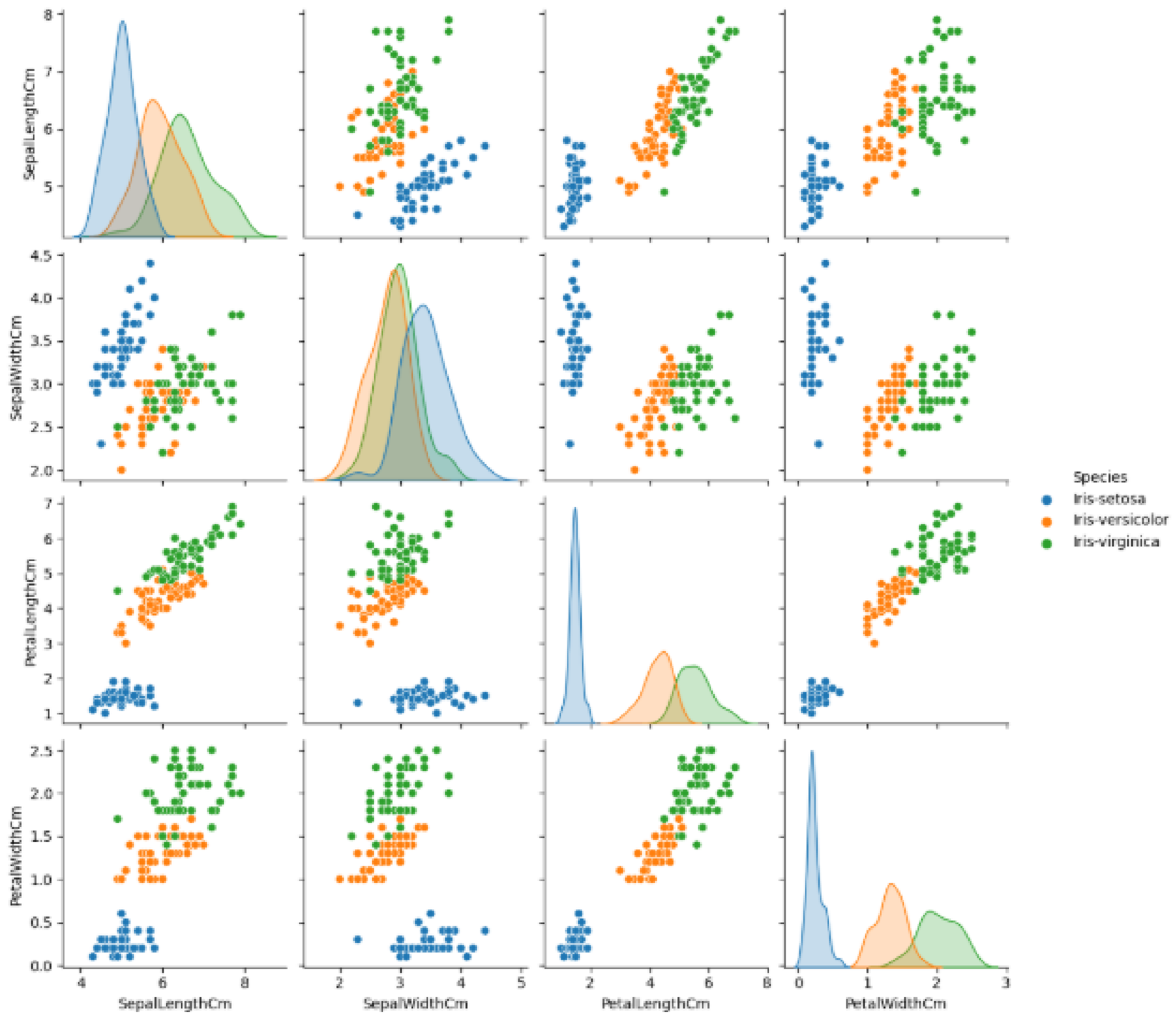
[28]:
```
## Visualization...
import warnings
warnings.filterwarnings('ignore')
```

[29]:
```
df = df.drop("Id", axis = 1)
df.head()
```

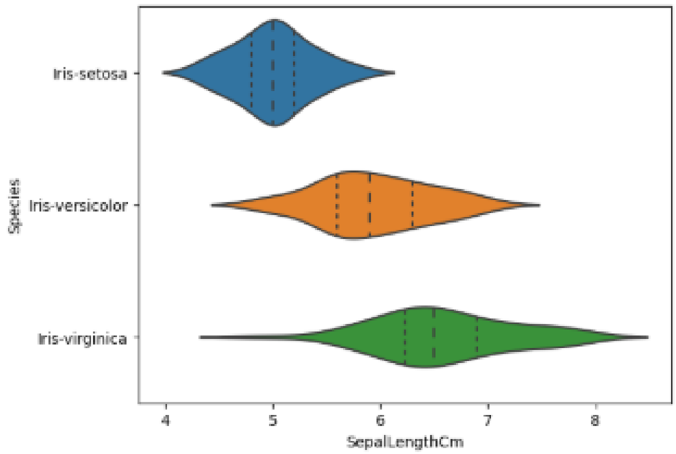
[29]:

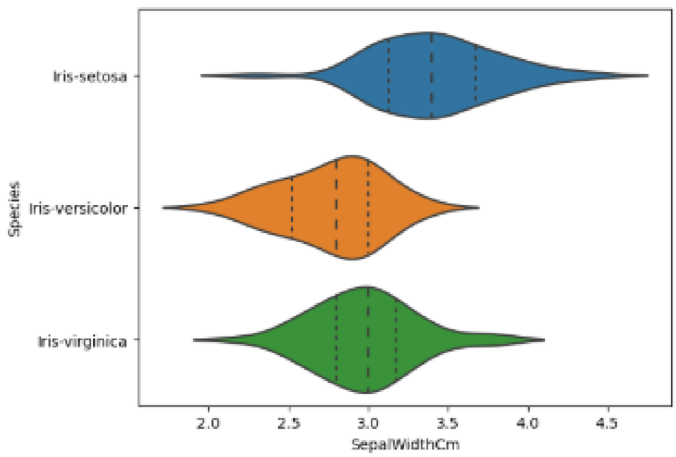
	SepalLengthCm	SepalWidthCm	PetalLengthCm	PetalWidthCm	Species
0	5.1	3.5	1.4	0.2	Iris-setosa
1	4.9	3.0	1.4	0.2	Iris-setosa
2	4.7	3.2	1.3	0.2	Iris-setosa
3	4.6	3.1	1.5	0.2	Iris-setosa
4	5.0	3.6	1.4	0.2	Iris-setosa

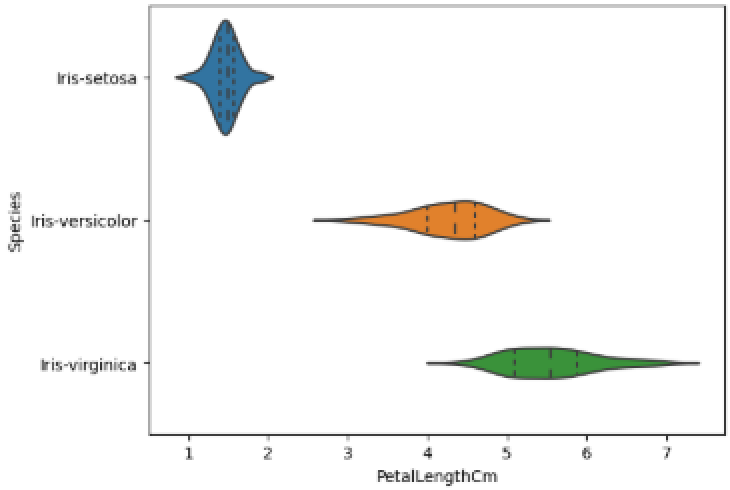
[30]:
```
#pairplot
pair_plot = sns.pairplot(df, hue = "Species")
plt.show()
```

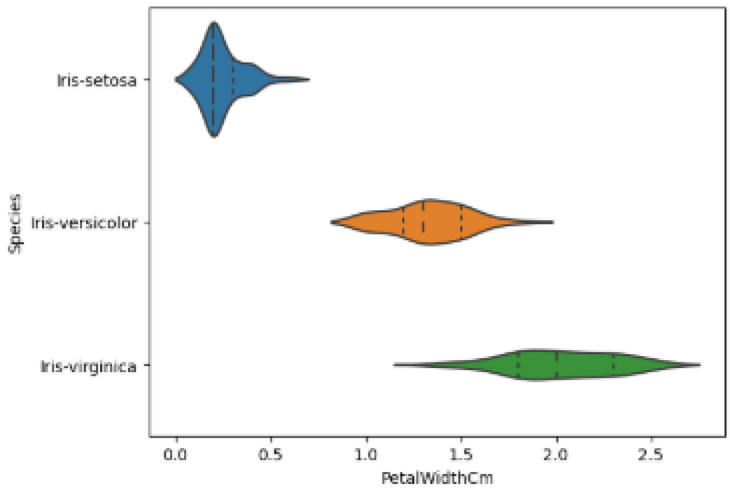


[31]:
```python
violin_sepal_length = sns.violinplot(y='Species', x='SepalLengthCm', data=df, inner='quartile')
plt.show()
violin_sepal_width = sns.violinplot(y='Species', x='SepalWidthCm', data=df, inner='quartile')
plt.show()
violin_petal_length = sns.violinplot(y='Species', x='PetalLengthCm', data=df, inner='quartile')
plt.show()
violin_petal_width = sns.violinplot(y='Species', x='PetalWidthCm', data=df, inner='quartile')
plt.show()
```

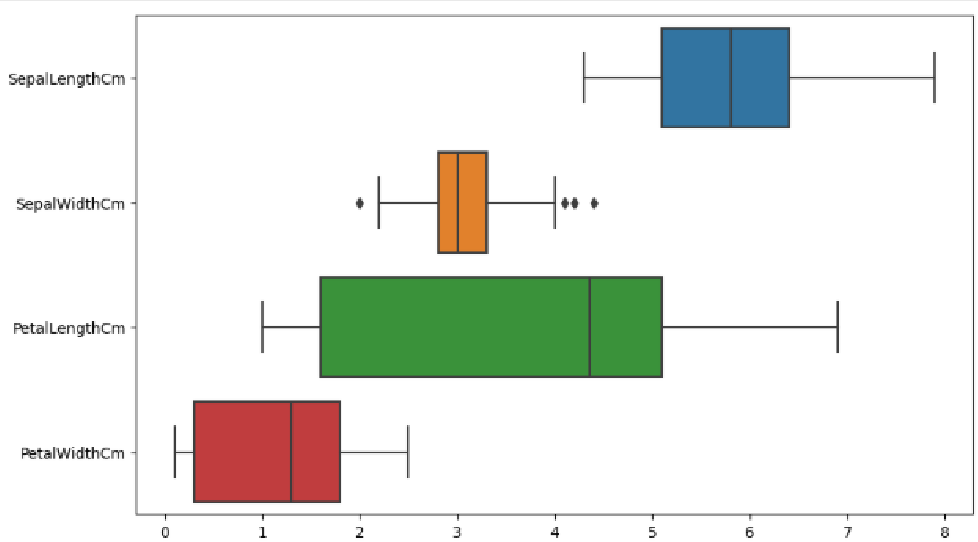








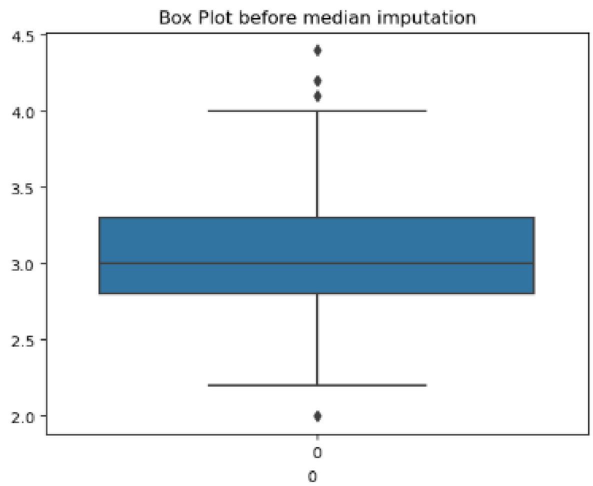
[32]:
```
#outlier
plt.figure(figsize=(10, 6))
sns.boxplot(data=df, orient='h')
plt.show()
```

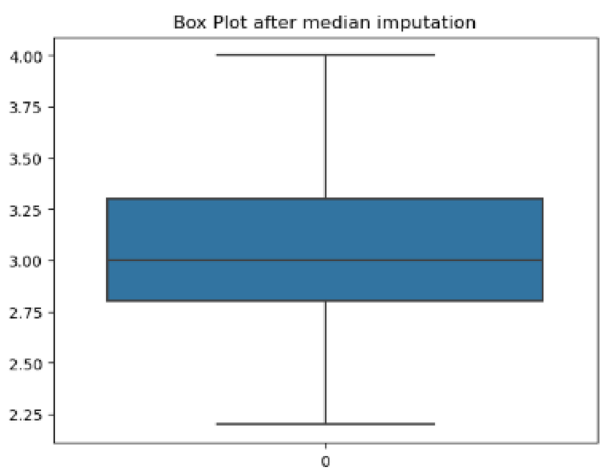


[33]:
```python
out=[]
def iqr_outliers(df):
    Q1 = df.quantile(0.25)
    Q3 = df.quantile(0.75)
    IQR = Q3-Q1
    Lower_tail = Q1 - 1.5 * IQR
    Upper_tail = Q3 + 1.5 * IQR
    for i in df:
        if i > Upper_tail or i < Lower_tail:
            out.append(i)
    print("Outliers:",out)
iqr_outliers(df['SepalWidthCm'])
```

```
Outliers: [4.4, 4.1, 4.2, 2.0]
```

[34]:
```python
#median imputation
sns.boxplot(df['SepalWidthCm'])
plt.title("Box Plot before median imputation")
plt.show()

Q1 = df['SepalWidthCm'].quantile(0.25)
Q3 = df['SepalWidthCm'].quantile(0.75)
IQR = Q3 - Q1
Lower_tail = Q1 - 1.5 * IQR
Upper_tail = Q3 + 1.5 * IQR

sepal_median = np.median(df['SepalWidthCm'])

for i in df['SepalWidthCm']:
    if i > Upper_tail or i < Lower_tail:
            df['SepalWidthCm'] = df['SepalWidthCm'].replace(i, sepal_median)

sns.boxplot(df['SepalWidthCm'])
plt.title("Box Plot after median imputation")
plt.show()
```





```
[35]: ##KNN
from sklearn import metrics
from sklearn.neighbors import KNeighborsClassifier
from sklearn.model_selection import train_test_split
from sklearn.metrics import accuracy_score
```

```
[36]: df.columns
```

```
[36]: Index(['SepalLengthCm', 'SepalWidthCm', 'PetalLengthCm', 'PetalWidthCm',
       'Species'],
      dtype='object')
```

```
[37]: X = df[["SepalLengthCm", "SepalWidthCm", "PetalLengthCm", "PetalWidthCm"]]
y = df["Species"]
```

```
[38]: from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size = 0.30, random_state = 42)
```

```
[39]: knn = KNeighborsClassifier()
knn_model = knn.fit(X_train, y_train)
```

```
[40]: y_pred = knn_model.predict(X_test)
accuracy_score(y_test, y_pred)
```

```
[40]: 1.0
```

```
[41]: #model tuning
from sklearn.model_selection import train_test_split, GridSearchCV, cross_val_score, cross_val_predict

knn_params = {"n_neighbors": np.arange(1,50)}

knn = KNeighborsClassifier()

knn_cv = GridSearchCV(knn, knn_params, cv=10)
knn_cv.fit(X_train, y_train)

print("The best score: " + str(knn_cv.best_score_))
print("The best parameters: " + str(knn_cv.best_params_))
```

```
The best score: 0.9627272727272727
The best parameters: {'n_neighbors': 11}
```

```
[42]: knn = KNeighborsClassifier(11)
knn_tuned = knn.fit(X_train, y_train)
```

```
[43]: knn_tuned.score(X_test, y_test)
```

```
[43]: 1.0
```

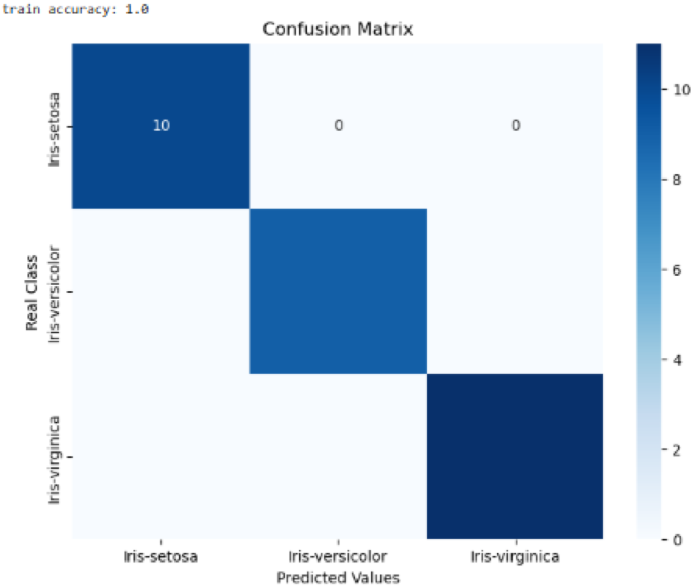
```
[44]: y_pred = knn_tuned.predict(X_test)
accuracy_score(y_test, y_pred)
```

```
[44]: 1.0
```

[45]:

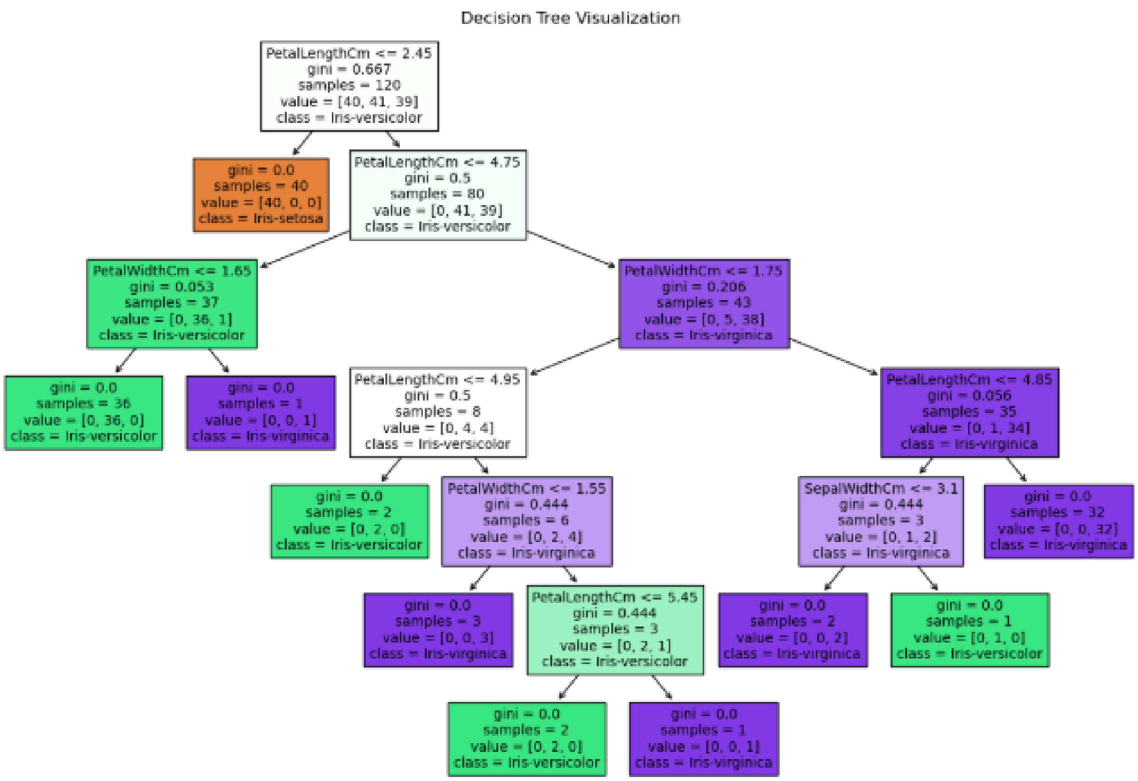
```python
##Decision Tree
from sklearn.model_selection import train_test_split
from sklearn.tree import DecisionTreeClassifier, plot_tree
from sklearn.metrics import accuracy_score, confusion_matrix

import matplotlib.pyplot as plt
import seaborn as sns
import pandas as pd

X = df[["SepalLengthCm", "SepalWidthCm", "PetalLengthCm", "PetalWidthCm"]]
y = df["Species"]

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)

tree_clf = DecisionTreeClassifier(criterion="gini", max_depth=30, random_state=42)
tree_clf.fit(X_train, y_train)

y_pred = tree_clf.predict(X_test)
accuracy = accuracy_score(y_test, y_pred)
print(f"test accuracy: {accuracy}")

y_pred_train = tree_clf.predict(X_train)
accuracy_train = accuracy_score(y_train, y_pred_train)
print(f"train accuracy: {accuracy_train}")

conf_matrix = confusion_matrix(y_test, y_pred)

plt.figure(figsize=(8, 6))
sns.heatmap(conf_matrix, annot=True, cmap="Blues", fmt="g",
            xticklabels=tree_clf.classes_,
            yticklabels=tree_clf.classes_)

plt.xlabel("Predicted Values")
plt.ylabel("Real Class")
plt.title("Confusion Matrix")
plt.show()
```

```
test accuracy: 1.0
train accuracy: 1.0
```



[46]:

```python
plt.figure(figsize=(15, 10))
plot_tree(tree_clf, filled=True,
          feature_names=X.columns,
          class_names=tree_clf.classes_)

plt.title("Decision Tree Visualization")
plt.show()  # Grafiği göster

feature_importances = tree_clf.feature_importances_

feature_names = X.columns

feature_importance_sorted = sorted(zip(feature_importances, feature_names), reverse=True)

for importance, feature_name in feature_importance_sorted:
    print(f"{feature_name}: {importance}")
```




```
PetalLengthCm: 0.9061433868879218
PetalWidthCm: 0.07718647349965893
SepalWidthCm: 0.016670139612419255
SepalLengthCm: 0.0
```