In [ ]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn import preprocessing
from scipy import stats
from sklearn.tree import DecisionTreeClassifier
from sklearn.svm import SVC
from sklearn.metrics import classification_report
from sklearn.preprocessing import LabelEncoder
from sklearn.preprocessing import StandardScaler
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
```

In [ ]:

```
columns = ["Sepal Length","Sepal width","Petal Length","Petal Width","Names"]
data = pd.read_csv("iris.data", names= columns)
data.head()
```

Out[ ]:

	Sepal Length	Sepal width	Petal Length	Petal Width	Names
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

In [ ]:

```
data.shape
```

Out[ ]:

```
(150, 5)
```

In [ ]:

```
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  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   Names         150 non-null    object 
dtypes: float64(4), object(1)
memory usage: 6.0+ KB
```

Statistical Description

In [ ]:

```
data.describe()
```

Out[ ]:

	Sepal Length	Sepal width	Petal Length	Petal Width
count	150.000000	150.000000	150.000000	150.000000

	Sepal Length	Sepal width	Petal Length	Petal Width
mean	5.843333	3.054000	3.758667	1.198667
std	0.828066	0.433594	1.764420	0.763161
min	4.300000	2.000000	1.000000	0.100000
25%	5.100000	2.800000	1.600000	0.300000
50%	5.800000	3.000000	4.350000	1.300000
75%	6.400000	3.300000	5.100000	1.800000
max	7.900000	4.400000	6.900000	2.500000

Finding Null Values

In [ ]:

```
data.isnull().sum()
```

Out[ ]:

```
Sepal Length    0
Sepal width     0
Petal Length    0
Petal Width     0
Names           0
dtype: int64
```

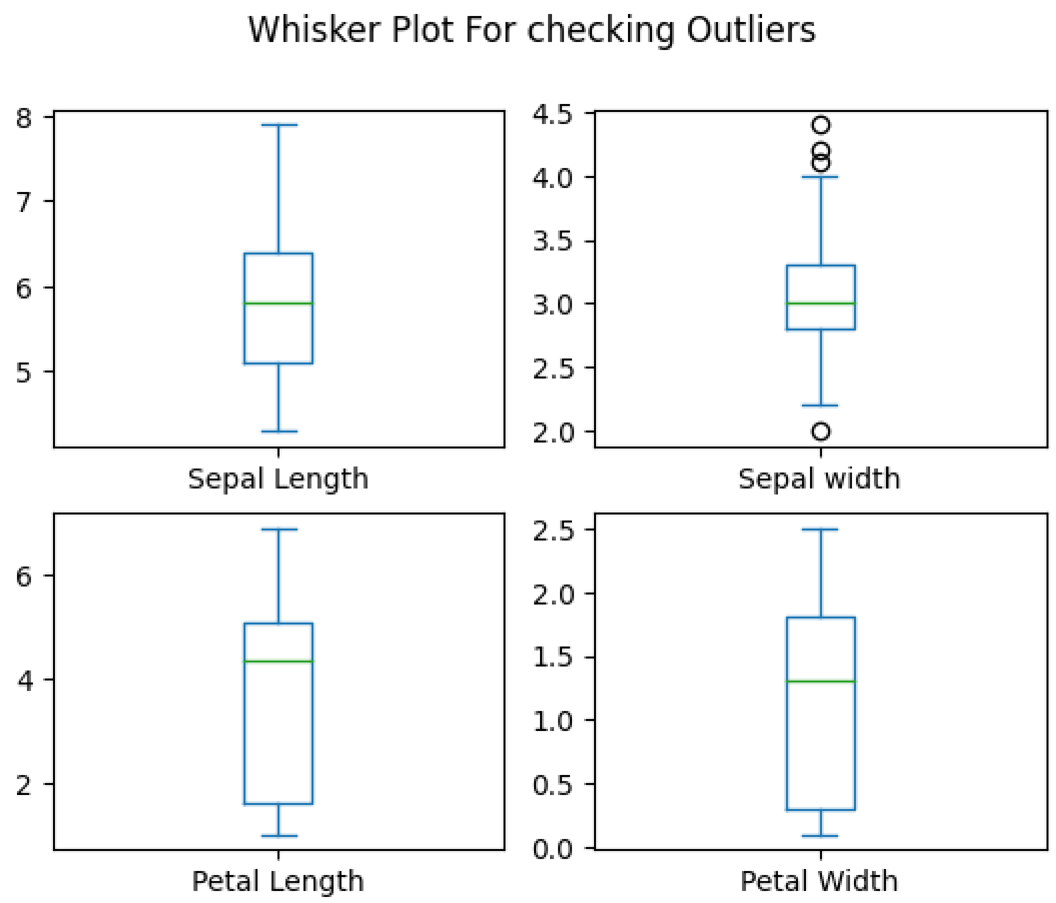
Checking Outliers

In [ ]:

```
data.plot(kind='box',subplots=True,layout=(2,2),title="Whisker Plot For checking Out
```

Out[ ]:

```
Sepal Length       Axes(0.125,0.53;0.352273x0.35)
Sepal width     Axes(0.547727,0.53;0.352273x0.35)
Petal Length       Axes(0.125,0.11;0.352273x0.35)
Petal Width     Axes(0.547727,0.11;0.352273x0.35)
dtype: object
```



Inter Quartile Range

```
In [ ]:
```

```
Q1 = data['Sepal width'].quantile(0.25)
Q3 = data['Sepal width'].quantile(0.75)
IQR = Q3 - Q1
print("Quartile 1 : ", Q1)
print("Quartile 3 : ", Q3)
print("Inter Quartile Range : ", IQR)
```

```
Quartile 1 :  2.8
Quartile 3 :  3.3
Inter Quartile Range :  0.5
```

Above Upper Bound

Formula : Quartile 3 which is upper side, is Added to (1.5 times the Inter Quartile range)

```
In [ ]:
```

```
upper = Q3+1.5*IQR
upper_arr = np.where(data['Sepal width']>upper)[0]
print("Upper Bound : ", upper)
# print(upper_arr.sum())
```

```
Upper Bound :  4.05
```

Below Lower Bound

Formula : Quartile 1 which is Lower side, is Subtracted to (1.5 times the Inter Quartile range)

```
In [ ]:
```

```
lower = Q1-1.5*IQR
lower_arr = np.where(data['Sepal width']<lower)[0]
```

```
print("Lower Bound : ",lower)
# print(lower_arr.sum())
```

```
Lower Bound :  2.05
```

Removing Outliers

In [ ]:

```
print("Before Removing Outliers : ", data.shape)
data = data.drop(index=upper_arr)
data = data.drop(index=lower_arr)
```

```
Before Removing Outliers :  (150, 5)
```

In [ ]:

```
print("After Removing Outliers : ", data.shape )
```

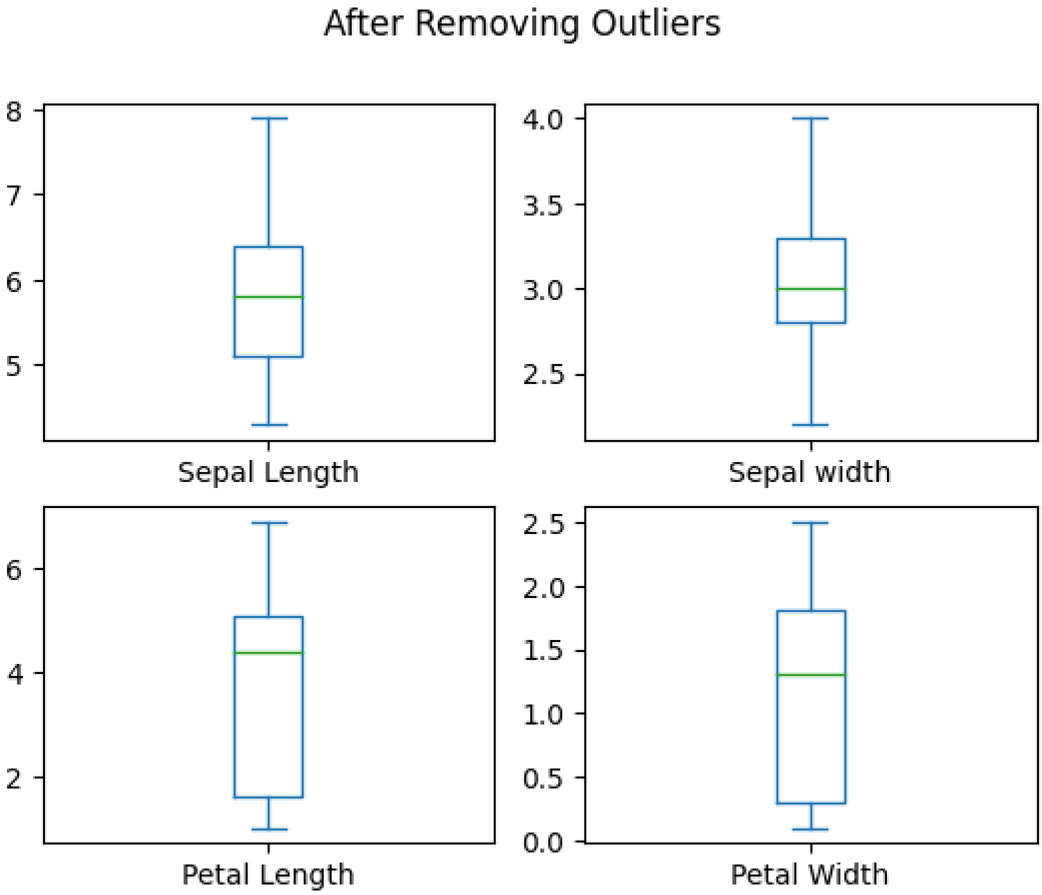
```
After Removing Outliers :  (146, 5)
```

In [ ]:

```
data.plot(kind = 'box',subplots = True, layout = (2,2), title = 'After Removing Outl
```

Out[ ]:

```
Sepal Length       Axes(0.125,0.53;0.352273x0.35)
Sepal width     Axes(0.547727,0.53;0.352273x0.35)
Petal Length       Axes(0.125,0.11;0.352273x0.35)
Petal Width     Axes(0.547727,0.11;0.352273x0.35)
dtype: object
```



Checking Skewness

In [ ]:

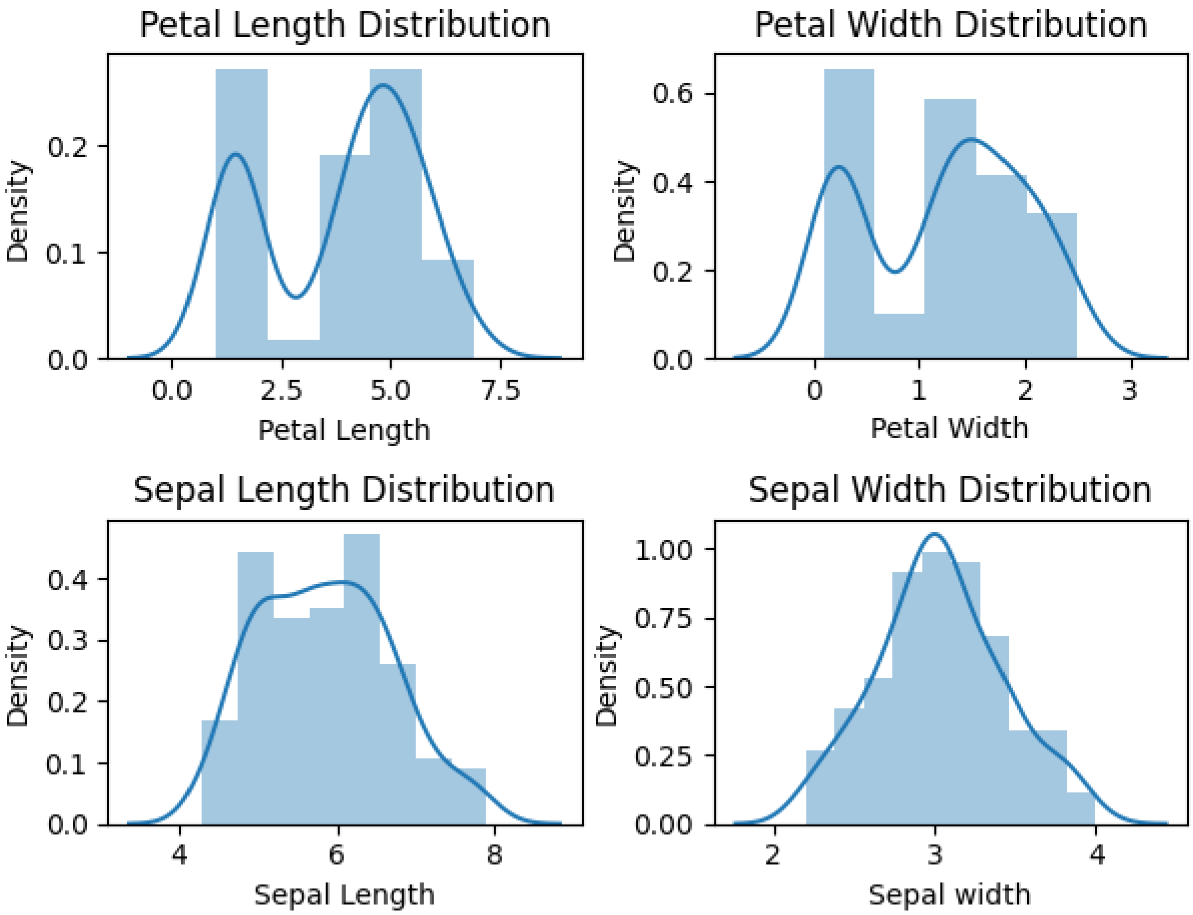
```
plt.subplot(2,2,1)
plt.tight_layout()
# The first parameter, 2, specifies the number of rows in the subplot grid.
# The second parameter, 2, specifies the number of columns in the subplot grid.
# The third parameter, 1, specifies the position of the current subplot within the g
```

```
plt.title("Petal Length Distribution")
sns.distplot(data['Petal Length'],)

plt.subplot(2,2,2)
plt.tight_layout()
plt.title("Petal Width Distribution")
sns.distplot(data["Petal Width"])

plt.subplot(2,2,3)
plt.tight_layout()
plt.title("Sepal Length Distribution")
sns.distplot(data["Sepal Length"])

plt.subplot(2,2,4)
plt.tight_layout()
plt.title("Sepal Width Distribution")
sns.distplot(data["Sepal width"])
```

```
C:\Users\Hunain\AppData\Local\Temp\ipykernel_12196\2321211178.py:7: UserWarning:

`distplot` is a deprecated function and will be removed in seaborn v0.14.0.

Please adapt your code to use either `displot` (a figure-level function with
similar flexibility) or `histplot` (an axes-level function for histograms).

For a guide to updating your code to use the new functions, please see
https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751

  sns.distplot(data['Petal Length'],)
C:\Users\Hunain\AppData\Local\Temp\ipykernel_12196\2321211178.py:12: UserWarning:

`distplot` is a deprecated function and will be removed in seaborn v0.14.0.

Please adapt your code to use either `displot` (a figure-level function with
similar flexibility) or `histplot` (an axes-level function for histograms).

For a guide to updating your code to use the new functions, please see
https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751

  sns.distplot(data["Petal Width"])
C:\Users\Hunain\AppData\Local\Temp\ipykernel_12196\2321211178.py:17: UserWarning:

`distplot` is a deprecated function and will be removed in seaborn v0.14.0.

Please adapt your code to use either `displot` (a figure-level function with
similar flexibility) or `histplot` (an axes-level function for histograms).

For a guide to updating your code to use the new functions, please see
https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751

  sns.distplot(data["Sepal Length"])
C:\Users\Hunain\AppData\Local\Temp\ipykernel_12196\2321211178.py:22: UserWarning:

`distplot` is a deprecated function and will be removed in seaborn v0.14.0.

Please adapt your code to use either `displot` (a figure-level function with
similar flexibility) or `histplot` (an axes-level function for histograms).

For a guide to updating your code to use the new functions, please see
https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751

  sns.distplot(data["Sepal width"])
```

Out[ ]:

```
<Axes: title={'center': 'Sepal Width Distribution'}, xlabel='Sepal width', ylabel='D
ensity'>
```



Label Encoding

Names Should be converted to labels as it can be recognizable.

In [ ]:

```
enc = LabelEncoder()
data['Names'] = enc.fit_transform(data['Names'])
data.head()
```

Out[ ]:

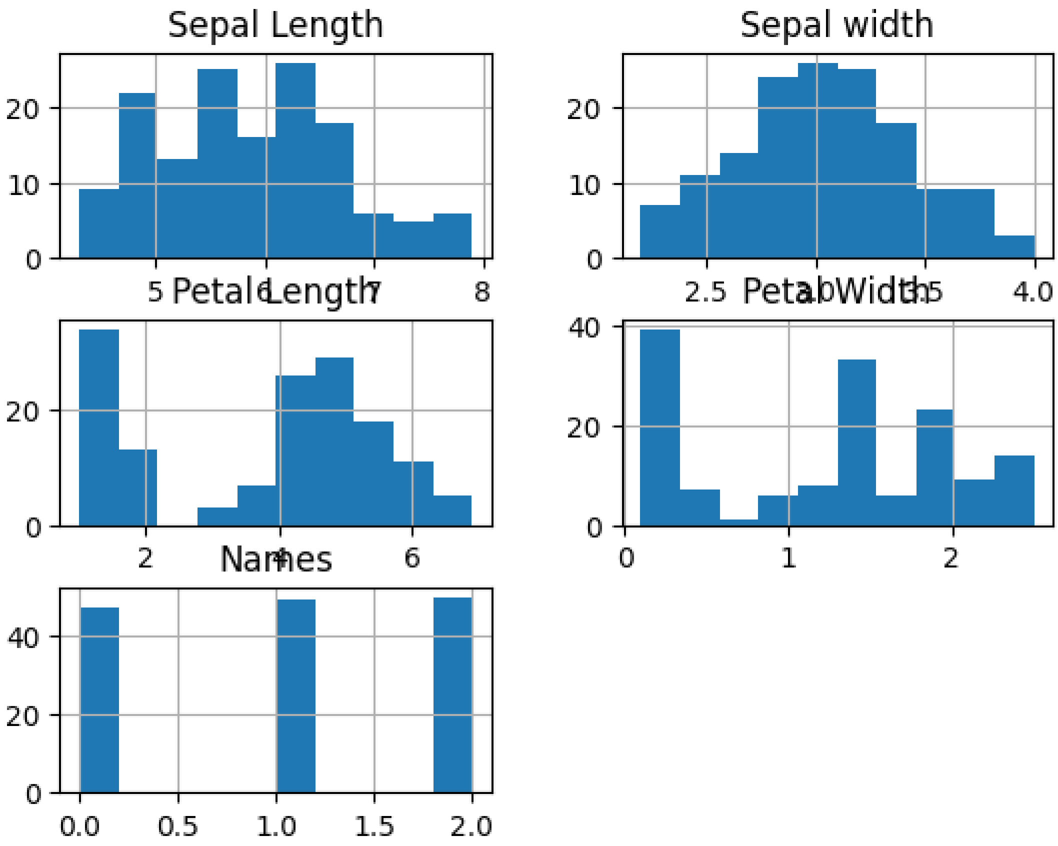
	Sepal Length	Sepal width	Petal Length	Petal Width	Names
0	5.1	3.5	1.4	0.2	0
1	4.9	3.0	1.4	0.2	0
2	4.7	3.2	1.3	0.2	0
3	4.6	3.1	1.5	0.2	0
4	5.0	3.6	1.4	0.2	0

In [ ]:

```
data.hist()
```

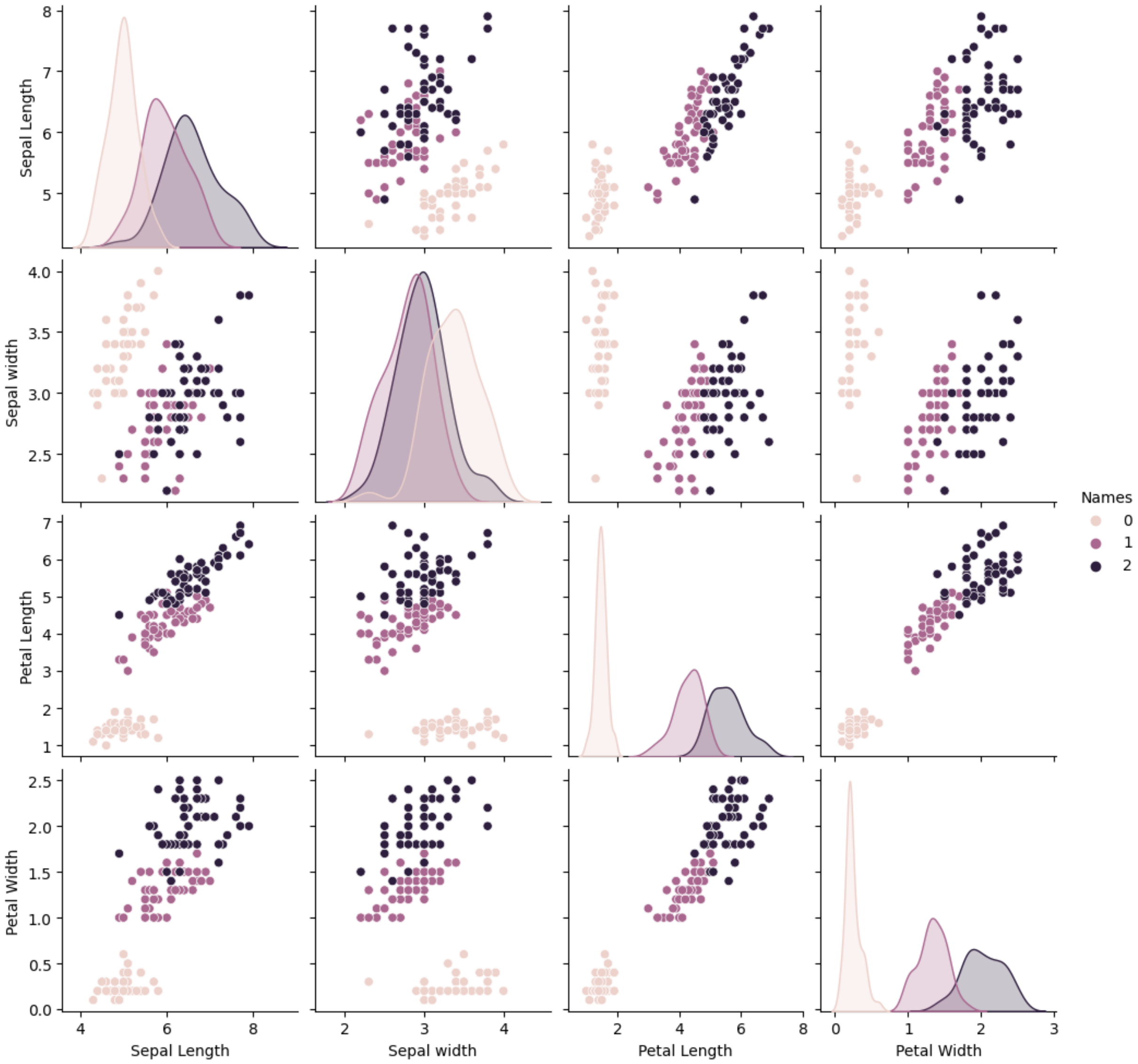
Out[ ]:

```
array([[<Axes: title={'center': 'Sepal Length'}>,
        <Axes: title={'center': 'Sepal width'}>],
       [<Axes: title={'center': 'Petal Length'}>,
        <Axes: title={'center': 'Petal Width'}>],
       [<Axes: title={'center': 'Names'}>, <Axes: >]], dtype=object)
```



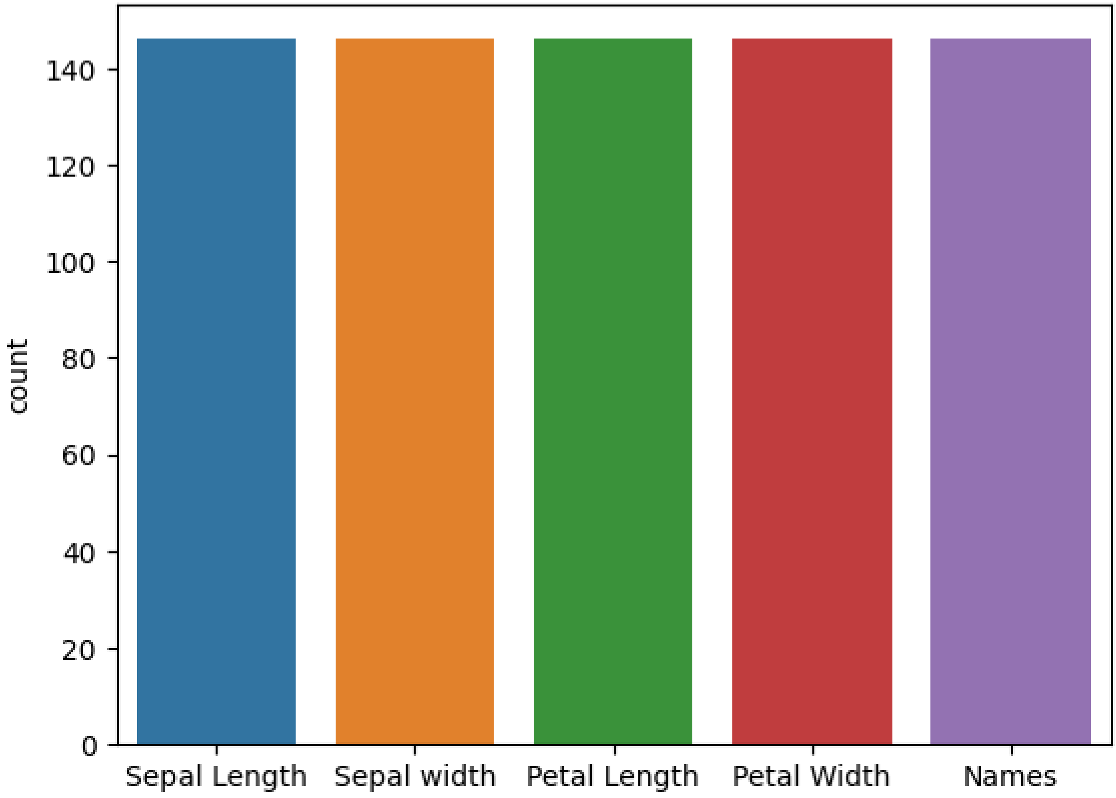
```
In [ ]: sns.pairplot(data,hue='Names')
```

```
Out[ ]: <seaborn.axisgrid.PairGrid at 0x1cb0e966410>
```



```
In [ ]: sns.countplot(data=data)
```

```
Out[ ]: <Axes: ylabel='count'>
```



Correlation

In [ ]:

```
data1 = data.drop('Names',axis=1) # Removing Names Because Correlation will not work
data1.corr()
```

Out[ ]:

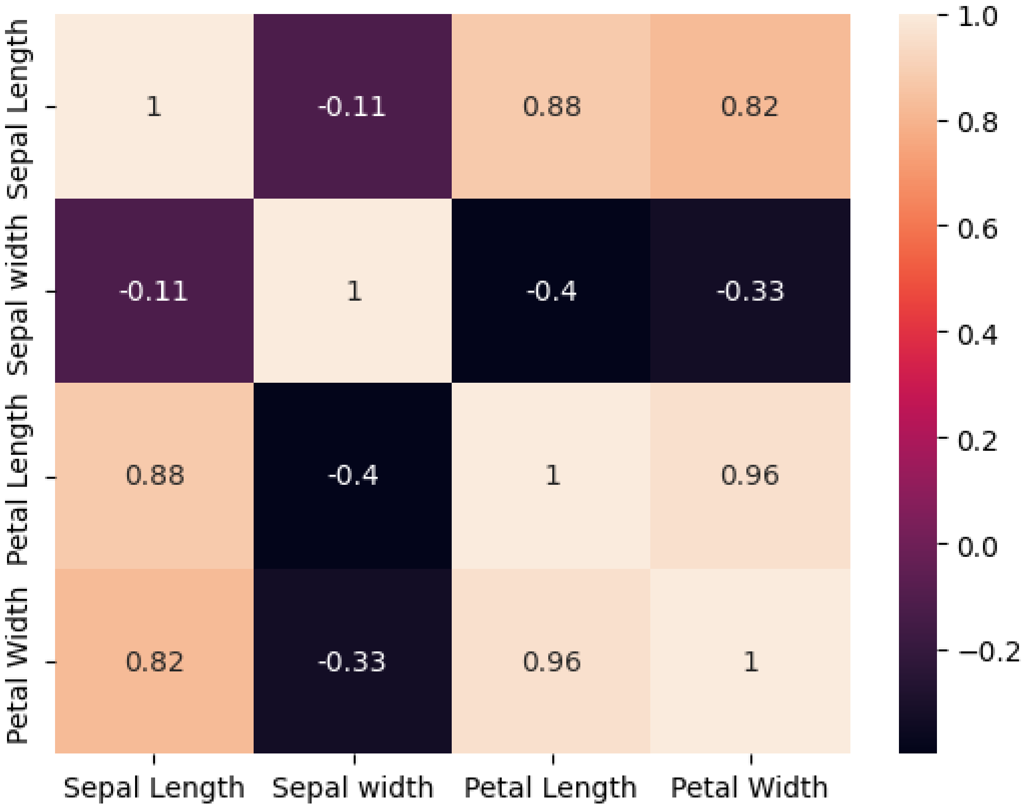
	Sepal Length	Sepal width	Petal Length	Petal Width
Sepal Length	1.000000	-0.113977	0.879374	0.822577
Sepal width	-0.113977	1.000000	-0.397123	-0.329782
Petal Length	0.879374	-0.397123	1.000000	0.961755
Petal Width	0.822577	-0.329782	0.961755	1.000000

In [ ]:

```
sns.heatmap(data1.corr(),annot=True)
```

Out[ ]:

```
<Axes: >
```



Training Set and Testing Set Selection

In [ ]:

```
x = data.drop(columns=['Names'])
y = data['Names']
```

In [ ]:

```
x_train,x_test,y_train,y_test = train_test_split(x,y,test_size=0.3,random_state=0)
```

In [ ]:

```
Lg = LogisticRegression()
Lg.fit(x_train,y_train)
```

Out[ ]:

```
▾ LogisticRegression

LogisticRegression()
```

In [ ]:

```
accuracy = Lg.score(x_test,y_test)*100
print("accuracy : ",accuracy)
```

```
accuracy :  97.72727272727273
```

In [ ]:

```
y_pred = Lg.predict(x_test)
```

Accuracy

In [ ]:

```
print(classification_report(y_test,y_pred))
```

```
              precision    recall  f1-score   support

           0       1.00      1.00      1.00        16
           1       1.00      0.94      0.97        16
           2       0.92      1.00      0.96        12

    accuracy                           0.98        44
   macro avg       0.97      0.98      0.98        44
weighted avg       0.98      0.98      0.98        44
```

New Values Prediction

In [ ]:

```
inp = np.array([[2.5,3.8,4.3,3.3],[3.5,2.8,4,3],[3.2,3.8,3.1,2.6]])
new_check = Lg.predict(inp)
print(new_check)
```

```
[2 2 0]
C:\Users\Hunain\AppData\Local\Packages\PythonSoftwareFoundation.Python.3.11_qbz5n2kf
ra8p0\LocalCache\local-packages\Python311\site-packages\sklearn\base.py:464: UserWar
ning: X does not have valid feature names, but LogisticRegression was fitted with fe
ature names
  warnings.warn(
```

Decision Tree Classifier (Accuracy)

In [ ]:

```
model = DecisionTreeClassifier()
```

In [ ]:

```
model.fit(x_train,y_train)
```

Out[ ]:

```
▾ DecisionTreeClassifier

DecisionTreeClassifier()
```

In [ ]:

```
print(model.score(x_test,y_test)*100,"%")
```

```
97.72727272727273 %
```

Support Vector Classifier (Accuracy)

In [ ]:

```
model_svc = SVC()
model_svc.fit(x_train,y_train)
```

Out[ ]:

```
▾ SVC

SVC()
```

In [ ]:

```
print(model.score(x_test,y_test)*100,"%")
```

```
97.72727272727273 %
```

In [ ]: