Import Necassary Libraries

```
import numpy as np
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import LabelEncoder, StandardScaler
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import accuracy_score, classification_report, confusion_matrix
import seaborn as sns
import matplotlib.pyplot as plt
from sklearn.datasets import load_iris
```

Loading the dataset and seeing the class names

```
iris = load_iris()
X = iris.data
y = iris.target
classes = np.unique(y)

print(classes)
```

```
[0 1 2]
```

Function to convert numerical to real class names

```
obj = {
    0.0: "setosa",
    1.0: "versicolor",
    2.0: "virginica"
}

def get_label(i):
  return obj[i]
```

Creating a dataframe from above numpy nd arrays and checking the columns data

```
iris_df = pd.DataFrame(data=np.c_[iris['data'], iris['target']], columns=iris['feature_names'] + ['target']).sample(frac=1)
iris_df["target"] = iris_df["target"].apply(get_label)
iris_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 150 entries, 146 to 52
Data columns (total 5 columns):
 #   Column             Non-Null Count  Dtype  
---  ------             --------------  -----  
 0   sepal length (cm)  150 non-null    float64
 1   sepal width (cm)   150 non-null    float64
 2   petal length (cm)  150 non-null    float64
 3   petal width (cm)   150 non-null    float64
 4   target             150 non-null    object 
dtypes: float64(4), object(1)
memory usage: 7.0+ KB
```

Visualizing the first few rows of dataframe

```
iris_df.head()
```

	sepal length (cm)	sepal width (cm)	petal length (cm)	petal width (cm)	target
146	6.3	2.5	5.0	1.9	virginica
114	5.8	2.8	5.1	2.4	virginica
32	5.2	4.1	1.5	0.1	setosa
140	6.7	3.1	5.6	2.4	virginica
69	5.6	2.5	3.9	1.1	versicolor

Checking if it has any duplicate values

```
iris_df.duplicated().sum()
```

```
1
```

Removing the duplicate values

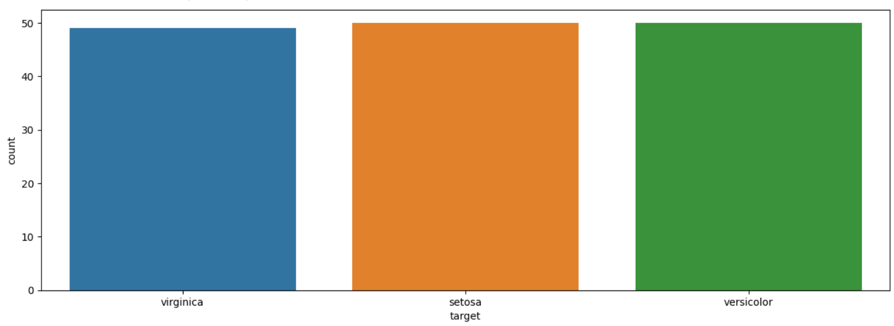
```
iris_df.drop_duplicates(subset=None, keep='first', inplace=True)
iris_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 149 entries, 146 to 52
Data columns (total 5 columns):
 #   Column             Non-Null Count  Dtype
---  ------             --------------  -----
 0   sepal length (cm)  149 non-null    float64
 1   sepal width (cm)   149 non-null    float64
 2   petal length (cm)  149 non-null    float64
 3   petal width (cm)   149 non-null    float64
 4   target             149 non-null    object
dtypes: float64(4), object(1)
memory usage: 7.0+ KB
```

Checking the count and balance of class labels

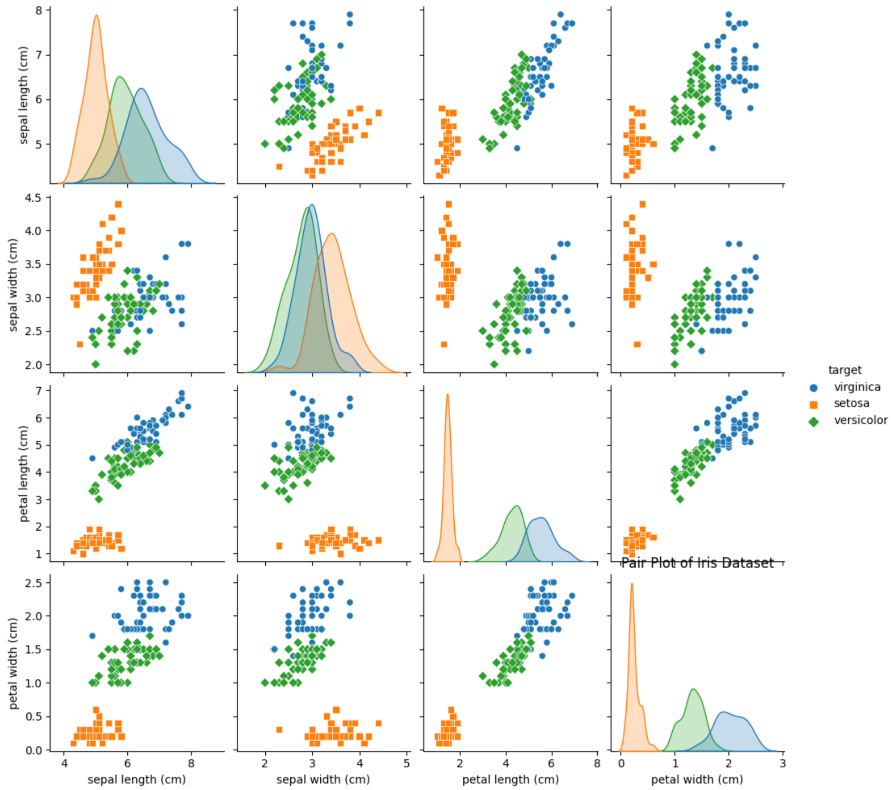
```
# visualize the Label count
print(classes)
plt.figure(figsize=(15,5))
sns.countplot(x = "target", data = iris_df)
```

```
[0 1 2]
<Axes: xlabel='target', ylabel='count'>
```



Check the relationship of columns with eachother using graph

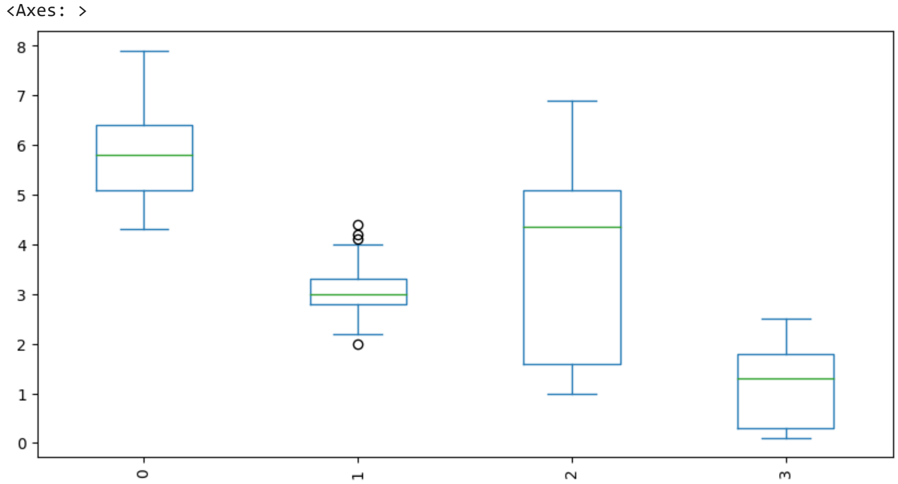
```
sns.pairplot(iris_df, hue='target', markers=["o", "s", "D"])
plt.title("Pair Plot of Iris Dataset")
plt.show()
```



Check the distribution of input features

```
plt.rcParams.update({'figure.figsize':(10,5), 'figure.dpi':100})
pd.DataFrame(X).plot.box(rot = 90)
```

<Axes: >



```
X = iris_df.iloc[:, :-1]
y = iris_df.iloc[:, -1]
```

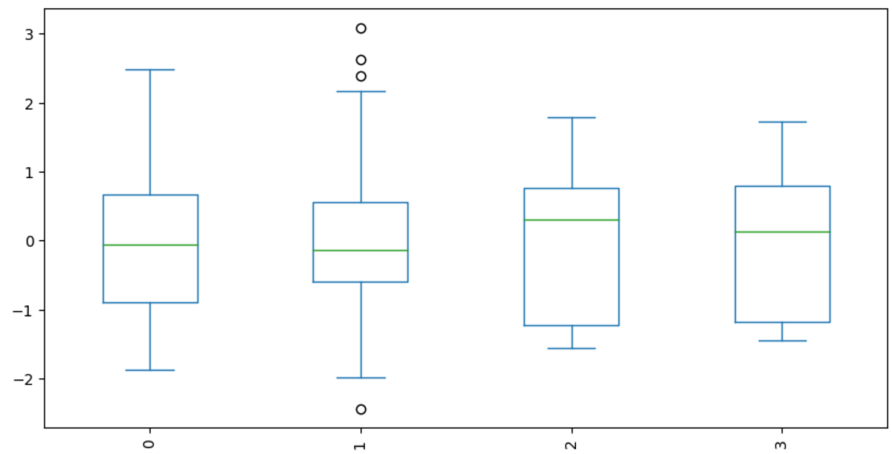
```
le = LabelEncoder()
iris_df['target'] = le.fit_transform(iris_df['target'])
```

Standardize the input feature and then visaulizing it again

```
# standardize the data
scaler = StandardScaler()
X = scaler.fit_transform(X)
```

```
plt.rcParams.update({'figure.figsize':(10,5), 'figure.dpi':100})
pd.DataFrame(X).plot.box(rot = 90)
```

```
<Axes: >
```



Dividing the dataset into train and test split

```
# Split the dataset into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
```

Creating LR Model and training on train data

```
model = LogisticRegression()
model.fit(X_train, y_train)
```

```
▾ LogisticRegression
LogisticRegression()
```

Evaluating the model

```
# Model evaluation
y_pred = model.predict(X_test)
accuracy = accuracy_score(y_test, y_pred)

print(accuracy)
```

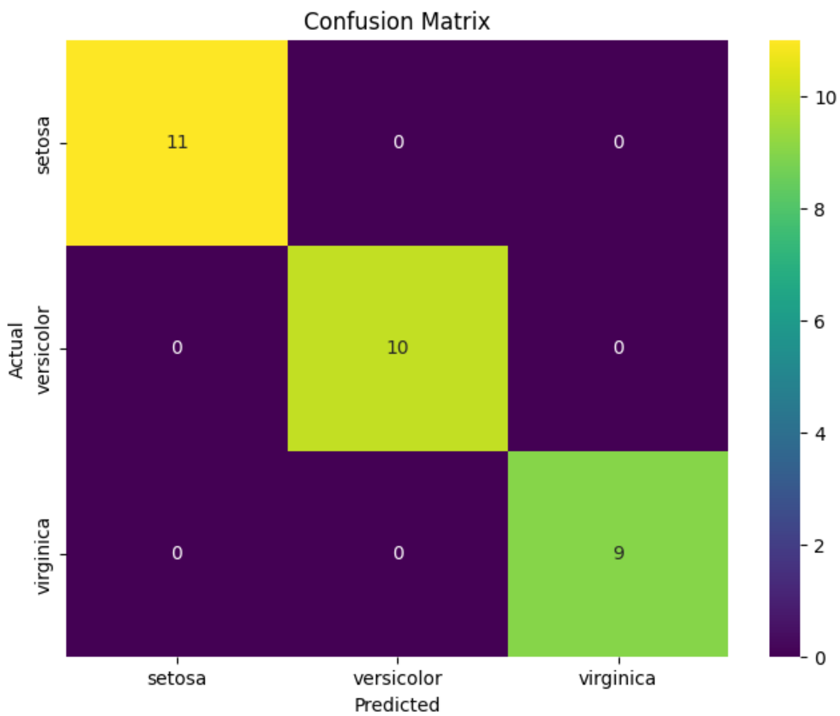
```
1.0
```

```
conf_matrix = confusion_matrix(y_test, y_pred)

class_names = list(map(get_label, classes))

plt.figure(figsize=(8, 6))
sns.heatmap(conf_matrix, annot=True, fmt='d', cmap='viridis', xticklabels=class_names, yticklabels=class_names)
plt.xlabel('Predicted')
plt.ylabel('Actual')
plt.title('Confusion Matrix')
plt.show()
```

```
plt.show()
```



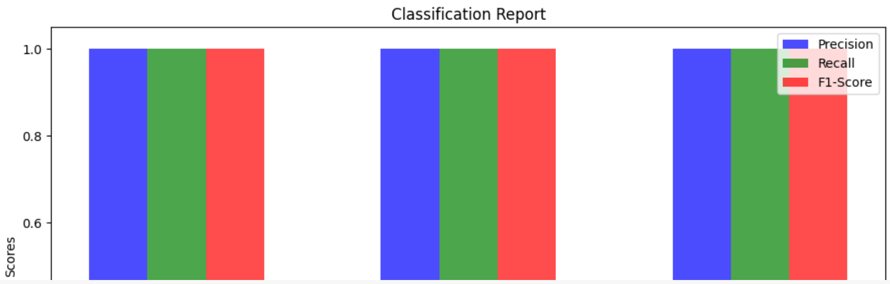

```
report_dict = classification_report(y_test, y_pred, target_names=classes, output_dict=True)

# Extract precision, recall, and F1-score for each class
# class_names = list(classes)
precisions = [report_dict[class_name]['precision'] for class_name in class_names]
recalls = [report_dict[class_name]['recall'] for class_name in class_names]
f1_scores = [report_dict[class_name]['f1-score'] for class_name in class_names]

# Create a bar chart
plt.figure(figsize=(10, 6))
bar_width = 0.2
index = np.arange(len(class_names))

plt.bar(index, precisions, bar_width, label='Precision', color='b', alpha=0.7)
plt.bar(index + bar_width, recalls, bar_width, label='Recall', color='g', alpha=0.7)
plt.bar(index + 2 * bar_width, f1_scores, bar_width, label='F1-Score', color='r', alpha=0.7)

plt.xlabel('Classes')
plt.ylabel('Scores')
plt.title('Classification Report')
plt.xticks(index + bar_width, class_names)
plt.legend(loc='best')
plt.tight_layout()
plt.show()
```




```
# Prediction (You can create a function or a user interface for this)
new_data = np.array([[5.1, 3.5, 1.4, 0.2]])  # Example new data point
predicted_class = model.predict(new_data)
print(f"Predicted class for new data: {get_label(predicted_class[0])}")
```

```
Predicted class for new data: versicolor
```

Saving the model

```
import joblib

joblib.dump(model, 'iris_model.pkl')
```

```
['iris_model.pkl']
```

```
# Load the model from the file
loaded_model = joblib.load('iris_model.pkl')
```

```
loaded_model
```

```
▾ LogisticRegression
LogisticRegression()
```