Unit 3.2 Graded Assignment = Implementation of classification algorithm

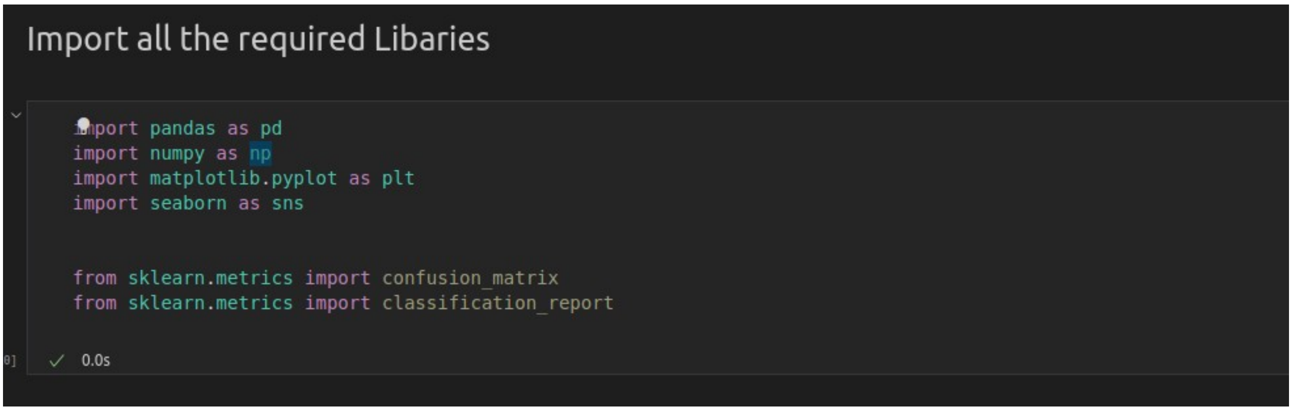
Instructions:
Implement a single classification model of your choice and try to achieve at least an 80% F1 score on the wine dataset.

Submitted by:

1. **Ali Nasir (2303.KHI.DEG.012)**
2. **Saif ur Rehman (2303.KHI.DEG.007)**

Solution:

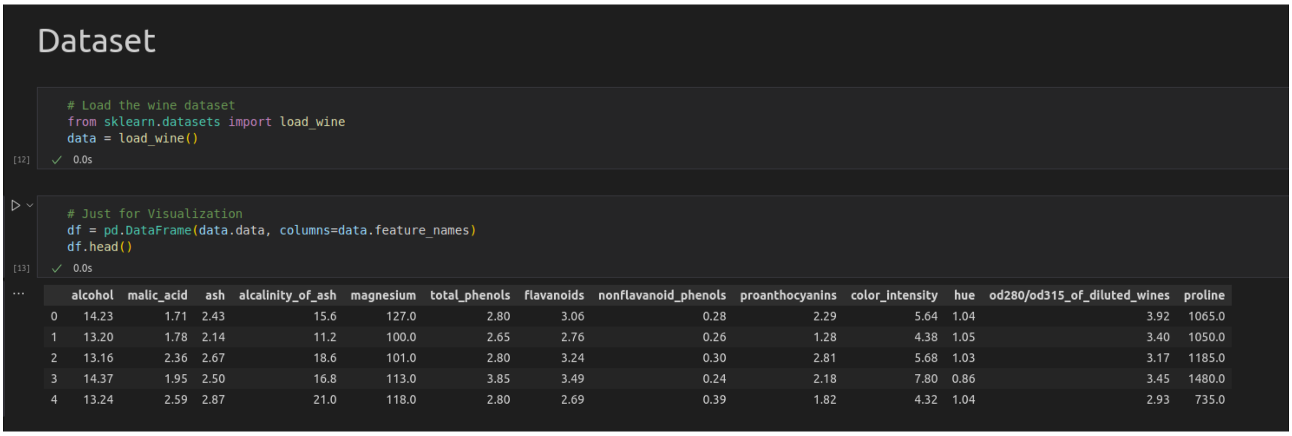
1. First we will import all the required libraries.



Import all the required Libaries

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns


from sklearn.metrics import confusion_matrix
from sklearn.metrics import classification_report
```

2. Import the builtin data from the sklearn library.



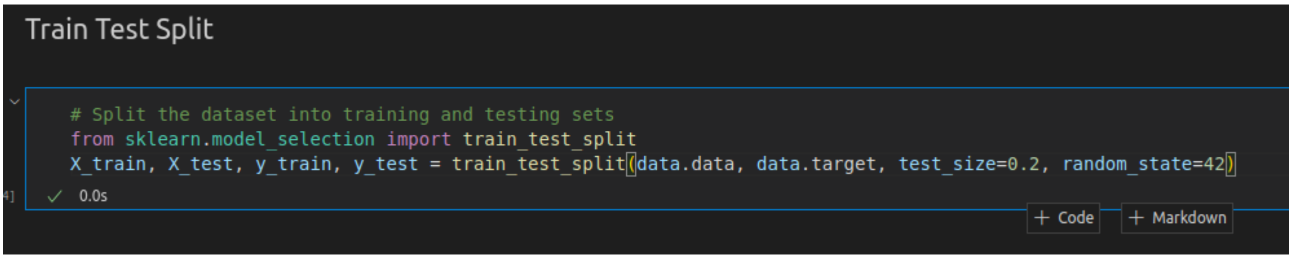
Dataset

```
# Load the wine dataset
from sklearn.datasets import load_wine
data = load_wine()
```

```
# Just for Visualization
df = pd.DataFrame(data.data, columns=data.feature_names)
df.head()
```

```
   alcohol  malic_acid   ash  alcalinity_of_ash  magnesium  total_phenols  flavanoids  nonflavanoid_phenols  proanthocyanins  color_intensity   hue  od280/od315_of_diluted_wines  proline
0    14.23        1.71  2.43               15.6      127.0           2.80        3.06                  0.28             2.29             5.64  1.04                          3.92   1065.0
1    13.20        1.78  2.14               11.2      100.0           2.65        2.76                  0.26             1.28             4.38  1.05                          3.40   1050.0
2    13.16        2.36  2.67               18.6      101.0           2.80        3.24                  0.30             2.81             5.68  1.03                          3.17   1185.0
3    14.37        1.95  2.50               16.8      113.0           3.85        3.49                  0.24             2.18             7.80  0.86                          3.45   1480.0
4    13.24        2.59  2.87               21.0      118.0           2.80        2.69                  0.39             1.82             4.32  1.04                          2.93    735.0
```

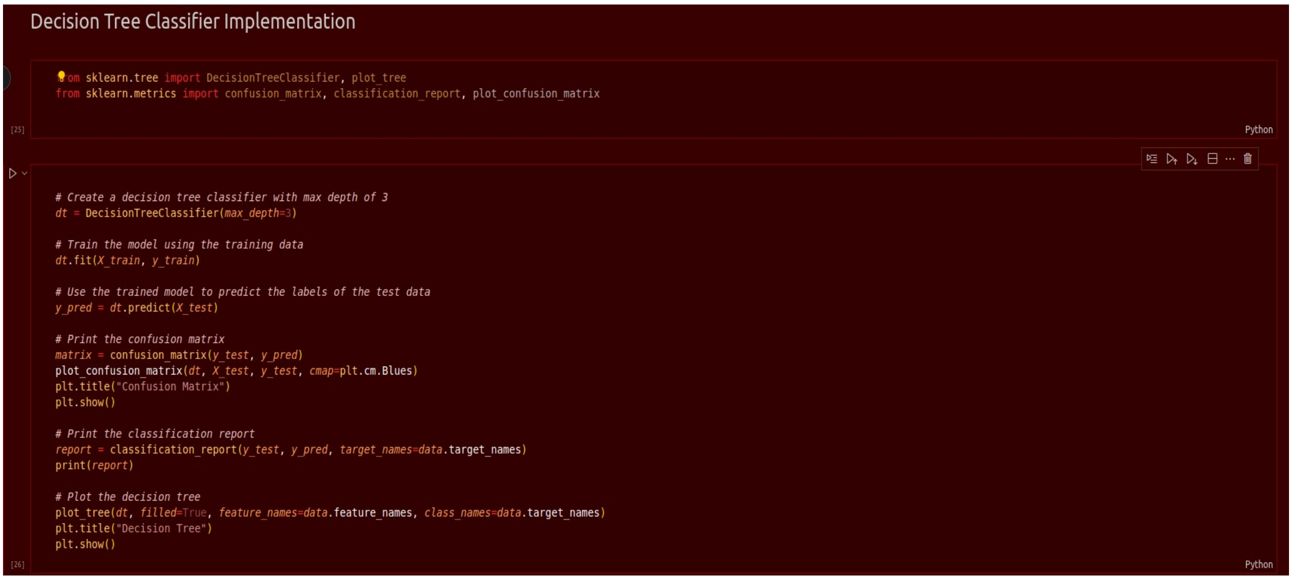
3. We have split our dataset into test size 0.2 which means 80 % training data and 20% testing data and a random state of 42 so that any bias ness could be removed.



Train Test Split

```
# Split the dataset into training and testing sets
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(data.data, data.target, test_size=0.2, random_state=42)
```

4. Here we have implemented the decision tree with max depth 3.

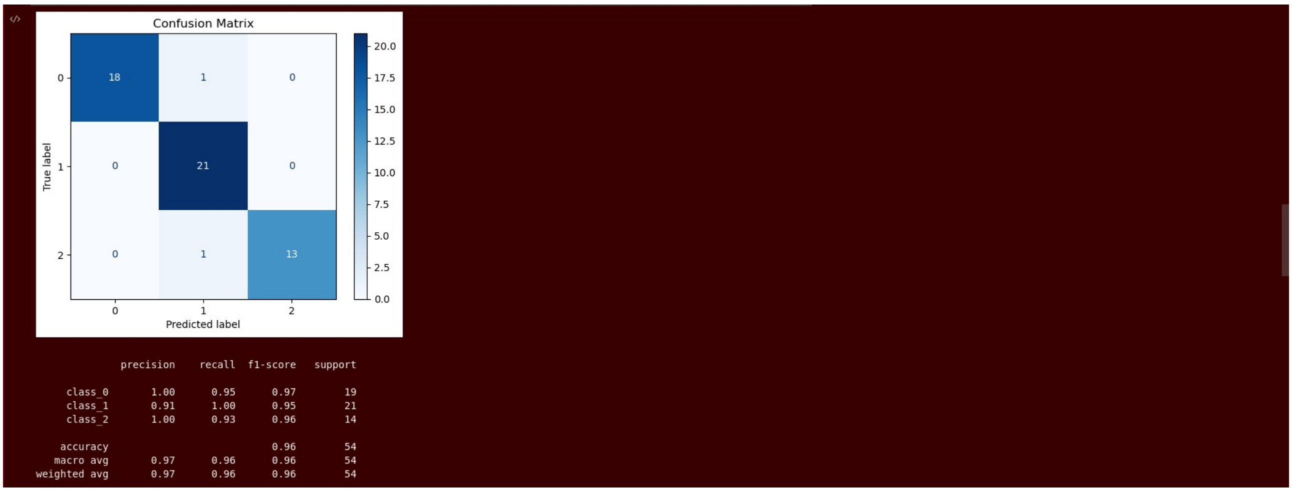


Decision Tree Classifier Implementation

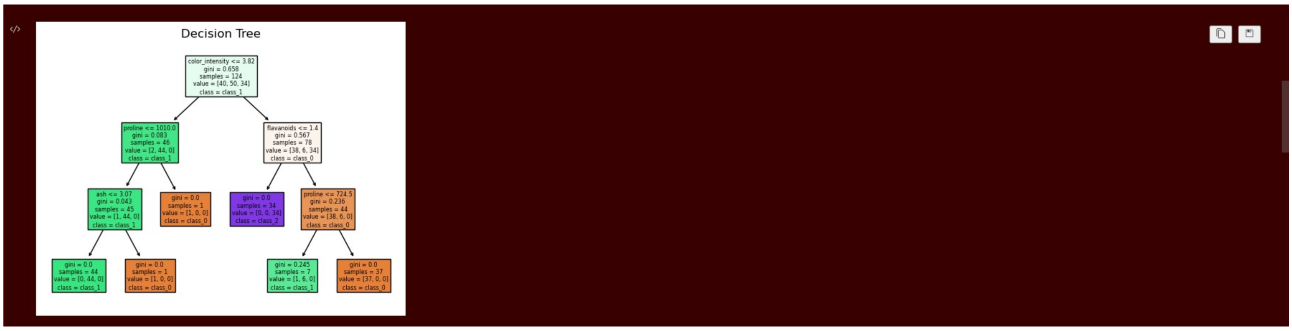
```
💡om sklearn.tree import DecisionTreeClassifier, plot_tree
from sklearn.metrics import confusion_matrix, classification_report, plot_confusion_matrix
```

```
# Create a decision tree classifier with max depth of 3
dt = DecisionTreeClassifier(max_depth=3)

# Train the model using the training data
dt.fit(X_train, y_train)

# Use the trained model to predict the labels of the test data
y_pred = dt.predict(X_test)

# Print the confusion matrix
matrix = confusion_matrix(y_test, y_pred)
plot_confusion_matrix(dt, X_test, y_test, cmap=plt.cm.Blues)
plt.title("Confusion Matrix")
plt.show()

# Print the classification report
report = classification_report(y_test, y_pred, target_names=data.target_names)
print(report)

# Plot the decision tree
plot_tree(dt, filled=True, feature_names=data.feature_names, class_names=data.target_names)
plt.title("Decision Tree")
plt.show()
```

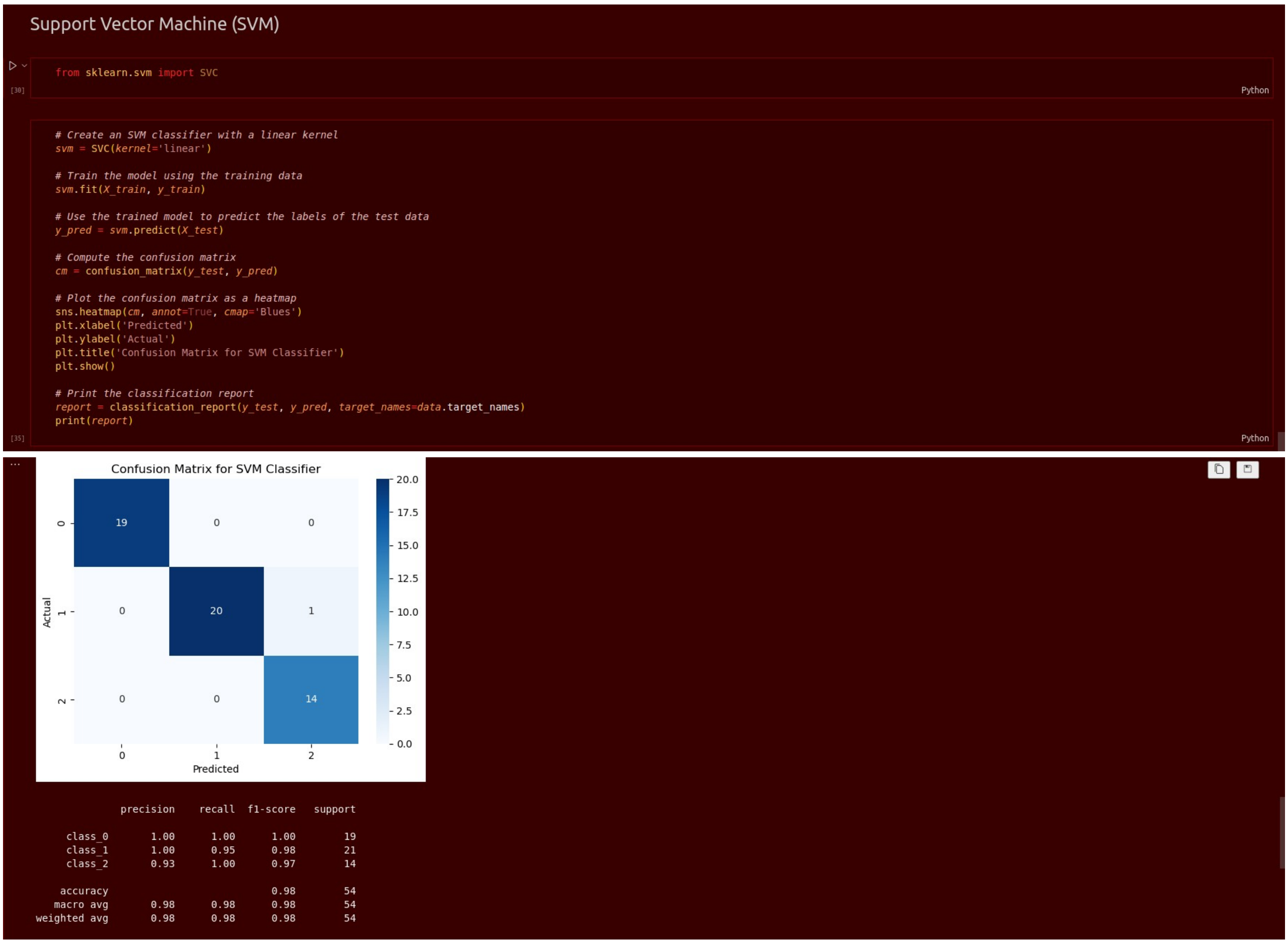
In our classification report, it can be seen that our f1 score is 0.97, with a complete decision tree.



```
              precision    recall  f1-score   support

     class_0       1.00      0.95      0.97        19
     class_1       0.91      1.00      0.95        21
     class_2       1.00      0.93      0.96        14

    accuracy                           0.96        54
   macro avg       0.97      0.96      0.96        54
weighted avg       0.97      0.96      0.96        54
```



The second algorithm we have implemented is support vector machine with F1 score 97.



Support Vector Machine (SVM)

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```python
from sklearn.svm import SVC
```

Python

```python
# Create an SVM classifier with a linear kernel
svm = SVC(kernel='linear')

# Train the model using the training data
svm.fit(X_train, y_train)

# Use the trained model to predict the labels of the test data
y_pred = svm.predict(X_test)

# Compute the confusion matrix
cm = confusion_matrix(y_test, y_pred)

# Plot the confusion matrix as a heatmap
sns.heatmap(cm, annot=True, cmap='Blues')
plt.xlabel('Predicted')
plt.ylabel('Actual')
plt.title('Confusion Matrix for SVM Classifier')
plt.show()

# Print the classification report
report = classification_report(y_test, y_pred, target_names=data.target_names)
print(report)
```

[35]

Python

```
              precision    recall  f1-score   support

     class_0       1.00      1.00      1.00        19
     class_1       1.00      0.95      0.98        21
     class_2       0.93      1.00      0.97        14

    accuracy                           0.98        54
   macro avg       0.98      0.98      0.98        54
weighted avg       0.98      0.98      0.98        54
```