Importing Libraries

```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
from sklearn import datasets
from sklearn.model_selection import train_test_split
from sklearn.tree import DecisionTreeClassifier
from sklearn.metrics import accuracy_score
```

Loading the dataset

```
wine = datasets.load_wine()
```

Covert wine dataset into a dataframe

```
import pandas as pd
from sklearn import datasets

wine = datasets.load_wine()
wine_df = pd.DataFrame(data=wine.data, columns=wine.feature_names)
wine_df['target'] = wine.target


# View the DataFrame
wine_df.head()
```

	alcohol	malic_acid	ash	alcalinity_of_ash	magnesium	total_phenols	flavanoids	nonflavanoid_phenols	proanthocyanins	color_i
0	14.23	1.71	2.43	15.6	127.0	2.80	3.06	0.28	2.29	
1	13.20	1.78	2.14	11.2	100.0	2.65	2.76	0.26	1.28	
2	13.16	2.36	2.67	18.6	101.0	2.80	3.24	0.30	2.81	
3	14.37	1.95	2.50	16.8	113.0	3.85	3.49	0.24	2.18	
4	13.24	2.59	2.87	21.0	118.0	2.80	2.69	0.39	1.82	

```
# View information about the data
wine_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 178 entries, 0 to 177
Data columns (total 14 columns):
 #   Column                        Non-Null Count  Dtype  
---  ------                        --------------  -----  
 0   alcohol                       178 non-null    float64
 1   malic_acid                    178 non-null    float64
 2   ash                           178 non-null    float64
 3   alcalinity_of_ash             178 non-null    float64
 4   magnesium                     178 non-null    float64
 5   total_phenols                 178 non-null    float64
 6   flavanoids                    178 non-null    float64
 7   nonflavanoid_phenols          178 non-null    float64
 8   proanthocyanins               178 non-null    float64
 9   color_intensity               178 non-null    float64
 10  hue                           178 non-null    float64
 11  od280/od315_of_diluted_wines  178 non-null    float64
 12  proline                       178 non-null    float64
 13  target                        178 non-null    int64  
dtypes: float64(13), int64(1)
memory usage: 19.6 KB
```

```
# Identifies all the different numbers that appear in the 'target' column
wine_df['target'].unique()
```

```
array([0, 1, 2])
```

```
# View DataFrame Description
wine_df.describe()
```

	alcohol	malic_acid	ash	alcalinity_of_ash	magnesium	total_phenols	flavanoids	nonflavanoid_phenols	proanthocya
count	178.000000	178.000000	178.000000	178.000000	178.000000	178.000000	178.000000	178.000000	178.00
mean	13.000618	2.336348	2.366517	19.494944	99.741573	2.295112	2.029270	0.361854	1.59
std	0.811827	1.117146	0.274344	3.339564	14.282484	0.625851	0.998859	0.124453	0.57
min	11.030000	0.740000	1.360000	10.600000	70.000000	0.980000	0.340000	0.130000	0.41
25%	12.362500	1.602500	2.210000	17.200000	88.000000	1.742500	1.205000	0.270000	1.25
50%	13.050000	1.865000	2.360000	19.500000	98.000000	2.355000	2.135000	0.340000	1.55
75%	13.677500	3.082500	2.557500	21.500000	107.000000	2.800000	2.875000	0.437500	1.95
max	14.830000	5.800000	3.230000	30.000000	162.000000	3.880000	5.080000	0.660000	3.58

Data Modelling

```
from sklearn.model_selection import train_test_split
from sklearn.tree import DecisionTreeClassifier

# Split the data into train and test
X_train, X_test, y_train, y_test = train_test_split(wine.data, wine.target, test_size=0.2, random_state=42)
```

```
from sklearn.tree import DecisionTreeClassifier

# Create a decision tree classifier
clf = DecisionTreeClassifier()

# Train the classifier on the training data
clf.fit(X_train, y_train)
```

```
▾ DecisionTreeClassifier  i ?
DecisionTreeClassifier()
```

Calculate performance metrics of the decision tree

```
from sklearn.metrics import accuracy_score, precision_score, recall_score, f1_score, confusion_matrix, classification_report

# Predict and evaluate the model
y_pred = clf.predict(X_test)

# Accuracy score
accuracy = accuracy_score(y_test, y_pred)
print(f"Accuracy: {accuracy * 100: .2f}%")
```

```
Accuracy:  94.44%
```

```
# Recall score
from sklearn.metrics import recall_score
recall = recall_score(y_test, y_pred, average='macro')
print(f"Recall : {recall * 100: .2f}%")
```

```
Recall :  93.45%
```

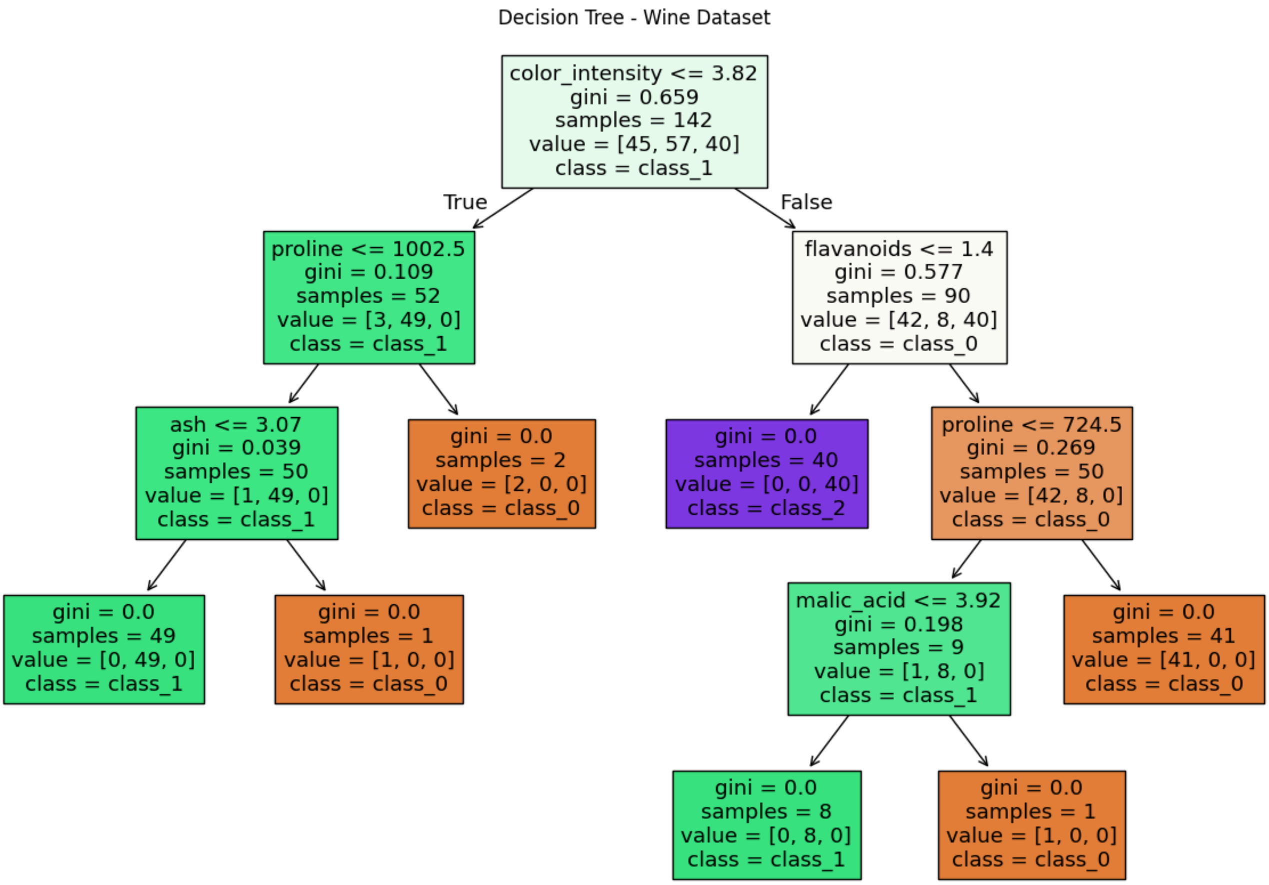
```
# Precision score
from sklearn.metrics import precision_score
precision = precision_score(y_test, y_pred, average='macro')
print(f"Precision : {precision * 100: .2f}%")
```

```
Precision :  95.83%
```

Data Visualization

```
import matplotlib.pyplot as plt
from sklearn import tree

# Decision Tree Visualization
plt.figure(figsize=(15, 10))
tree.plot_tree(clf, feature_names=wine.feature_names,
               class_names=wine.target_names, filled=True)
plt.title('Decision Tree - Wine Dataset')
plt.show()
```



Decision Tree - Wine Dataset