Московский государственный технический университет им. Н.Э. Баумана
Кафедра «Системы обработки информации и управления»

Лабораторная работа №5
по дисциплине
«Технологии машинного обучения»
на тему
«Линейные модели, SVM и деревья решений»

Выполнил:
студент группы ИУ5-63Б
Кривцов Н. А.

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1. Лабораторная работа №5. Линейные модели, SVM и деревья решений.

[0]:
```
import numpy as np
import pandas as pd
from sklearn.datasets import load_wine
from sklearn.model_selection import train_test_split
```

1.1. Загрузка набора данных. Разбиение на тестовую и обучающую выборки

[0]:
```
X, y = load_wine(return_X_y=True)
X_train, X_test, y_train, y_test = train_test_split(X, y,
↪random_state=42)
```

[3]:
```
print(X_train.shape)
print(X_test.shape)
print(y_train.shape)
print(y_test.shape)
```

```
(133, 13)
(45, 13)
(133,)
(45,)
```

[0]:
```
from sklearn.svm import NuSVC
from sklearn.metrics import classification_report

# Отчёт о метриках модели
def test_model(model, x, y):
  results = model.predict(x)
  return classification_report(y, results)
```

1.2. Классификатор на методе опорных векторов

[5]:
```
nu_svc = NuSVC(nu=0.5)
nu_svc.fit(X_train, y_train)
print(test_model(nu_svc, X_test, y_test))
```

```
              precision    recall  f1-score   support

           0       1.00      1.00      1.00        15
           1       1.00      1.00      1.00        18
           2       1.00      1.00      1.00        12

    accuracy                           1.00        45
```

```
   macro avg       1.00      1.00      1.00        45
weighted avg       1.00      1.00      1.00        45
```

1.3. Дерево решений

[0]:
```
from sklearn.tree import DecisionTreeClassifier
```

[7]:
```
dtc = DecisionTreeClassifier(max_depth=None)
dtc.fit(X_train, y_train)
print("Всего листьев: {}".format(dtc.get_n_leaves()))
print("Глубина дерева: {}\n".format(dtc.get_depth()))
print(test_model(dtc, X_test, y_test))
```

```
Всего листьев: 7
Глубина дерева: 4

              precision    recall  f1-score   support

           0       0.93      0.93      0.93        15
           1       0.95      1.00      0.97        18
           2       1.00      0.92      0.96        12

    accuracy                           0.96        45
   macro avg       0.96      0.95      0.95        45
weighted avg       0.96      0.96      0.96        45
```

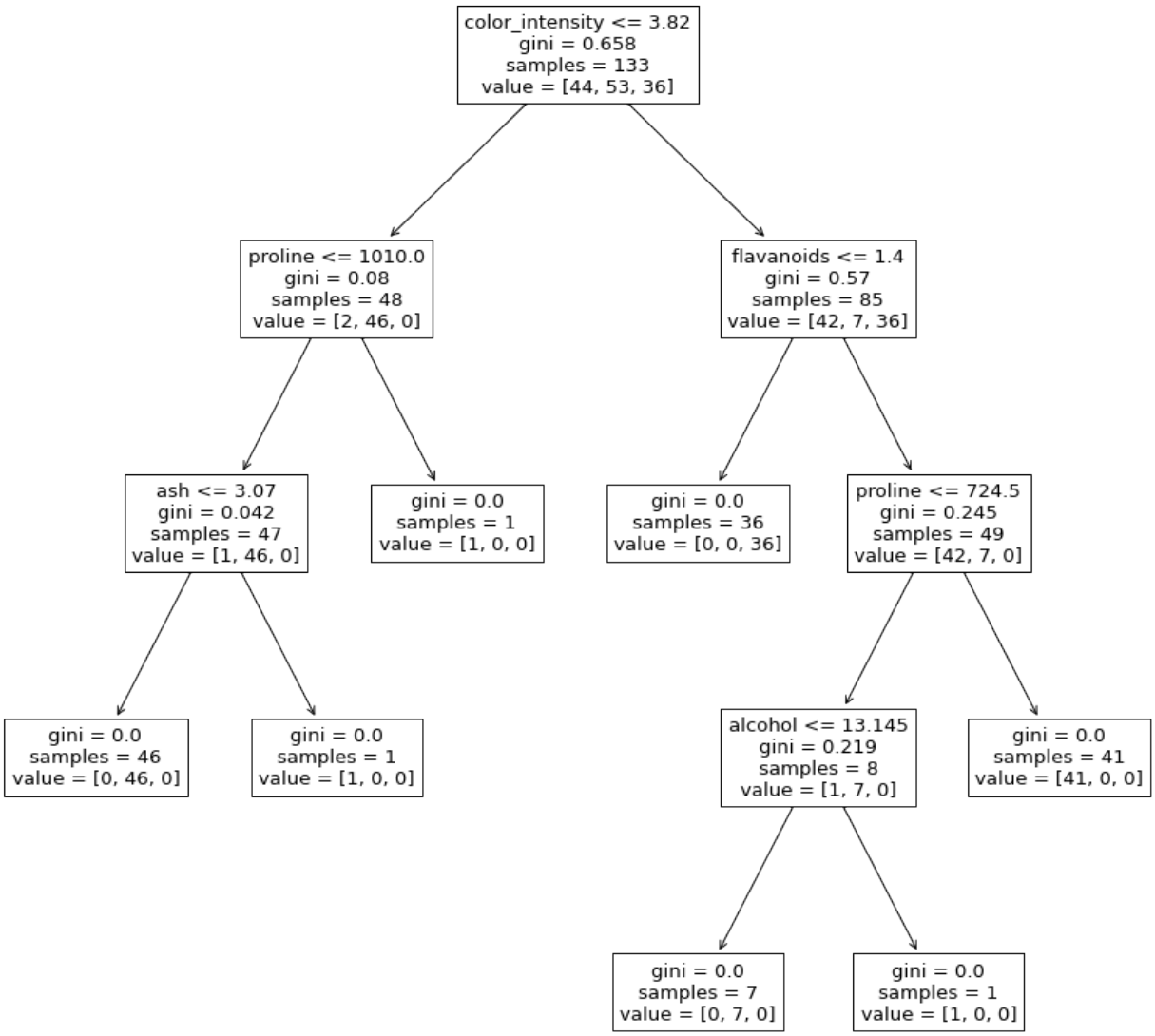
1.4. Визуализация дерева решений

[0]:
```
from sklearn.tree import plot_tree
from matplotlib import pyplot as plt
```

[10]:
```
plt.figure(figsize=[15, 15])
plot_tree(dtc, feature_names=load_wine()["feature_names"], filled=False)
```

[10]:
```
[Text(418.5, 733.86, 'color_intensity <= 3.82\ngini = 0.658\nsamples =
133\nvalue = [44, 53, 36]'),
 Text(251.10000000000002, 570.78, 'proline <= 1010.0\ngini = 0.
 ↪08\nsamples =
48\nvalue = [2, 46, 0]'),
 Text(167.4, 407.70000000000005, 'ash <= 3.07\ngini = 0.042\nsamples =
 ↪47\nvalue
= [1, 46, 0]'),
 Text(83.7, 244.62, 'gini = 0.0\nsamples = 46\nvalue = [0, 46, 0]'),
 Text(251.10000000000002, 244.62, 'gini = 0.0\nsamples = 1\nvalue = [1,
 ↪0, 0]'),
 Text(334.8, 407.70000000000005, 'gini = 0.0\nsamples = 1\nvalue = [1,
 ↪0, 0]'),
```

```
 Text(585.9, 570.78, 'flavanoids <= 1.4\ngini = 0.57\nsamples =
 ↪85\nvalue = [42,
7, 36]'),
 Text(502.20000000000005, 407.70000000000005, 'gini = 0.0\nsamples =
 ↪36\nvalue =
[0, 0, 36]'),
 Text(669.6, 407.70000000000005, 'proline <= 724.5\ngini = 0.
 ↪245\nsamples =
49\nvalue = [42, 7, 0]'),
 Text(585.9, 244.62, 'alcohol <= 13.145\ngini = 0.219\nsamples =
 ↪8\nvalue = [1,
7, 0]'),
 Text(502.20000000000005, 81.54000000000008, 'gini = 0.0\nsamples =
 ↪7\nvalue =
[0, 7, 0]'),
 Text(669.6, 81.54000000000008, 'gini = 0.0\nsamples = 1\nvalue = [1,
 ↪0, 0]'),
 Text(753.3000000000001, 244.62, 'gini = 0.0\nsamples = 41\nvalue =
 ↪[41, 0,
0]')]
```


color_intensity <= 3.82
gini = 0.658
samples = 133
value = [44, 53, 36]
proline <= 1010.0
gini = 0.08
samples = 48
value = [2, 46, 0]
flavanoids <= 1.4
gini = 0.57
samples = 85
value = [42, 7, 36]
ash <= 3.07
gini = 0.042
samples = 47
value = [1, 46, 0]
gini = 0.0
samples = 1
value = [1, 0, 0]
gini = 0.0
samples = 36
value = [0, 0, 36]
proline <= 724.5
gini = 0.245
samples = 49
value = [42, 7, 0]
gini = 0.0
samples = 46
value = [0, 46, 0]
gini = 0.0
samples = 1
value = [1, 0, 0]
alcohol <= 13.145
gini = 0.219
samples = 8
value = [1, 7, 0]
gini = 0.0
samples = 41
value = [41, 0, 0]
gini = 0.0
samples = 7
value = [0, 7, 0]
gini = 0.0
samples = 1
value = [1, 0, 0]